



AS

GCE Advanced Subsidiary Examinations
 CANDIDATE RECORD SHEET: Technology and Design
 Summer 201_



Rewarding Learning

Centre name: _____ Centre number:

Air Pump pipe Candidate number:

AS Unit 2: Product Development 8 | Blue Green Staple gear

Criteria	Maximum mark	Mark awarded	Folio Page No.		Comment
Investigation and analysis of product	20	⁽¹⁴⁾ 19	17 (19)	⁽²⁰⁾ 20	⁽¹⁸⁾ 18
Re-design solutions and development	30	⁽¹⁸⁾ 23	28 (24)	⁽²²⁾ 24	⁽²¹⁾ 21
Manufacture	40	⁽³⁸⁾ 38	37 (37)	⁽⁴⁰⁾ 36	⁽³⁵⁾ 35
Testing and evaluation	10	⁽⁷⁾ 8	9 (9)	⁽¹⁰⁾ 10	⁽⁷⁾ 7
TOTAL	100	⁽⁷⁵⁾ 75		⁽⁹⁵⁾ 95	

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Candidate

The coursework I have submitted is my own work. Any help I have received from my teacher or others has been acknowledged.

Signature David Patten (Candidate)

Teacher

I confirm that this is the candidate's own work and that it has been completed in accordance with the conditions specified by CCEA.

Signature _____ (Teacher)

Evaluation against Specification

Function

- The reel is able to hold different types and sizes of electric fence wire
- The locking pin is not very strong but does secure the reel and stop it from turning
- The reel can rotate around off the ground so it is able to hang on the fence line
- The reel is quite simple to detach from the frame so it is only a matter of taking the Widge out and the reel comes apart but the Widge is quite strong and can be difficult to take out
- When reeling in, the wire doesn't tangle up but you need to tie the end of the wire once it has been reeled in to stop it from unreefing
- The protective cover provides good protection of the wire

Ergonomics

- The carrying handle I found to be a bit uncomfortable because the flat metal that I used was 50mm wide which makes it quite wide and there isn't much grip with using flat metal as a handle and because it is lightweight it does not strain your hand
- The reel revolves very easily and reeling wire in is very easy for the user but I did find that the wire sometimes came up over the side of the reel and got wound round the frame but this did not happen very often
- The reel's carrying handle isn't very comfortable but the turning handle is very comfortable in your hand but the turning handle does not revolve round when you are reeling in wire

Aesthetics

- I think the colours of the plastic and the metal do suit the reel and it doesn't look out strange compared to other reels
- The protective cover and the frame do come out a bit further than the side of the reel which makes the reel look a bit big for the reel it is covering however the reel seems to balance itself well and doesn't tip over easily

Safety

- There are no sharp edges on the reel as all metal was done with emery cloth to take the roughness off the edges and then wet and dry paper was used smooth it down
- The reel is very stable and doesn't move about or rattle which makes it very stable when it is sitting on the ground

Materials

- I think the metal I used makes the reel look strong and durable while the plastic gives it a professional look
- The colours I used for the plastic I think look good on the reel and it makes it look like a proper outdoor reel
- The frame I used was 50mm wide by 3mm thick aluminium which is very strong and because it is aluminium it is very resistant to rust and so therefore can be used outside without protection

Durability

- The reel can withstand impact as the frame does protection to the plastic which is not as strong as the metal but can withstand impact and the frame will hit against something
- The materials I think will last a long time because the aluminium frame will not rust and the plastic will not rust or corrode like other materials and the handle is made from nylon so they are very durable and will withstand wear
- All the metal I used was stainless steel or aluminium so it won't rust and it did not need painting or any other form of protection

Availability

- The reel is simple to take off and on and the wire can be taken off and reel simply slides off the handle you however the locking pin is quite strong and nearly too strong for the reel and is quite difficult to take off
- The locking pin is made of metal so it is quite strong and stays about when it is on the locking position and when it is off it is quite easy to take off because there is only one notch for the locking pin the other pin doesn't have a notch so it is quite easy to take off

Maintenance

- The metal frame and protective cover are made of metal and the reel can be taken off the frame to make cleaning it quick and easy and the protective cover can be taken off the reel and then new wire fed onto the pipe and then wound onto the pipe by reeling it in

Cost

- The reel was manufactured for less than £25

Size/Shape

- I made the reel 270mm in diameter and 170mm wide which made the reel small but big enough to hold a lot of wire
- The reel is circular for aesthetic reasons and it is easier to reel in wire onto something that is circular compared to something that is rectangular

Time

- The reel took 6 months to make and I was very happy with how well I had planned

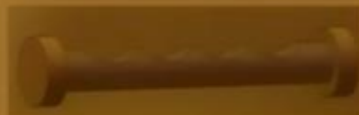
Conclusions from Testing

After testing the reel I found that the main ways I would improve the reel would be to change the turning handle so that it could revolve round, provide a better handgrip on the carrying handle and change the shape of the locking pin so that it would be easier to use.

I have shown how I would make these changes by showing them in Solid Works drawings.

Modifications after Testing

This Solid Works drawing shows how I would improve the turning handle by allowing it to revolve round when you were turning the reel. There is a hole drilled the full length of the handle and the two pins at either end thread into each other inside the handle and the handle therefore revolves around these pins.



This is how I would improve the carrying handle. The grip is nearly the same as the turning handle pictured above however it would be cut in half in order to provide a flat edge so that it could be stuck to the frame using Araldite. The grip for your fingers would provide a lot more grip and make the carrying handle a lot more comfortable to hold in your hand.



This is how I would improve the locking pin. I would change the shape to this layout where two pieces of metal would be used instead of just one bit of metal. To make this you could either weld or braze them together or if it was made from aluminium then Araldite could be used to stick them together. As the picture shows the part of the locking pin that you would grip has been knurled the whole way in order to provide lots of grip but if this didn't look right aesthetically then either end of the metal could just be knurled in order to aid its aesthetic appeal.





This picture shows the locking pin. I found that the knurling on the end of it gave a good grip but if the pin was either an L shape or T-shaped it would be much easier to use. I also found that the locking pin was very loose and was a bit thin for the hole I had drilled for it to go through even with a bushing in the hole.



These pictures show how the reel is taken off the frame. The R-clip is removed and then the reel slides off the middle pin. The R-clip I used was nearly too strong for its purpose and can be quite difficult to remove if you want to take the reel off. But once the R-clip has been removed I found that the reel slid off very easily and allowed complete access to both the reel and the frame for easy cleaning.



Testing



This is the locking pin in the 'unlocked' position. I found that there was plenty of clearance between the locking pin and the side of the reel but I found that with only one catch for the locking pin, it sat crooked when it was like this. To overcome this I think that two catches should have been used so that both ends of the role pin would have somewhere to catch hold of.



This picture shows the reel being turned. I used string instead of electric fence wire to avoid scratching the plastic. I found that the string was easy to reel in and the reel turned very freely. However the string came up round the side of the reel once and got caught round the frame this could be solved with the aid of a wire guide.



This shows the locking pin in the 'locked' position. I found that the locking pin stopped the reel from turning but again the holes I drilled in the side of the reel for the locking pin to sit into were a bit too big and this made the pin a bit loose when it should have been tight and not moved. I also found that the spring I used for was of adequate strength but I had to shorten the spring to make it fit and because of this the spring sometimes wrapped round the role pin and therefore lost strength.



These pictures show the reel on its stand. This could be where the reel would sit when it is not in use. The reel sat on the stand with good clearance off the ground to avoid it being scratched. The stand was also very stable and was able to support the reel very well.

Testing



This is the carrying handle which I found to be very wide and a bit uncomfortable to hold in your hand and there is no grip for your hand as you are just holding gripping flat metal.



This picture shows the reel hanging on a bit of barbed wire which the wire clips performed perfectly as there was plenty of clearance between the protective cover and the barbed wire which avoided the reel being scratched. The reel also sat very straight when it was hanging on the wire and wasn't unbalanced or unstable.



This picture again shows the reel hanging on the barbed wire. This was to see whether or not the reel looked 'at home' or 'out of place' when it was outside. The blue plastic certainly makes it stand out compared to other reels but I think that it looks like a proper reel when it is hanging on the fence line.



This picture shows the turning handle and I found the handle to be very comfortable to turn. The handle does not vibrate when it is turned. This means that your hand is comfortable to hold properly when it is turning.



This picture shows that the protective cover provides good coverage and protection of the reel which would help preserve the electric fence wire that would be attached to the reel.



This was to see if the reel strained your hand because of its weight. I found the reel to be very lightweight and didn't strain your hand and even with a full reel of wire on it, it would still be very lightweight as the wire doesn't weigh very much.

Working Drawings of Parts

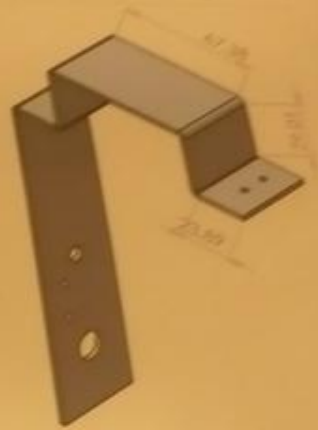
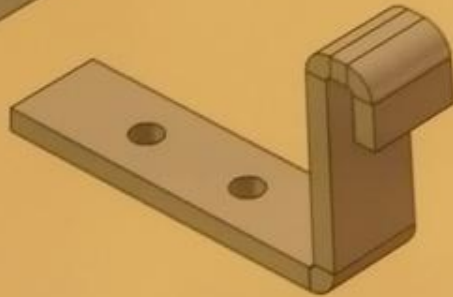
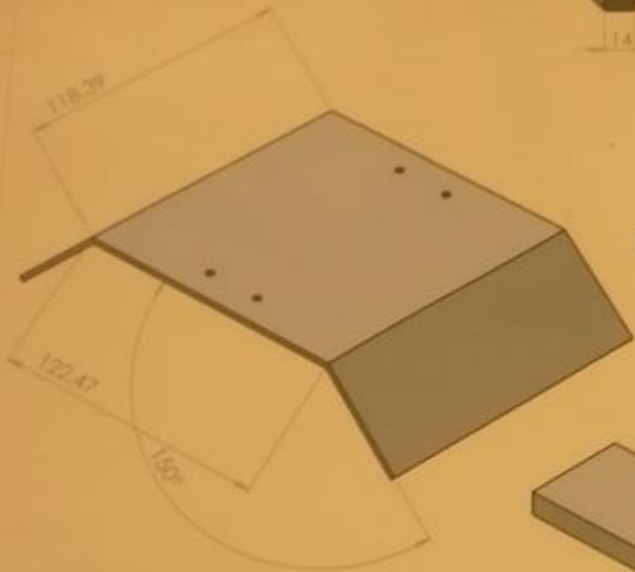


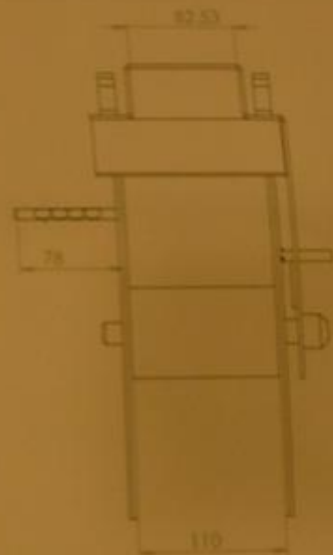
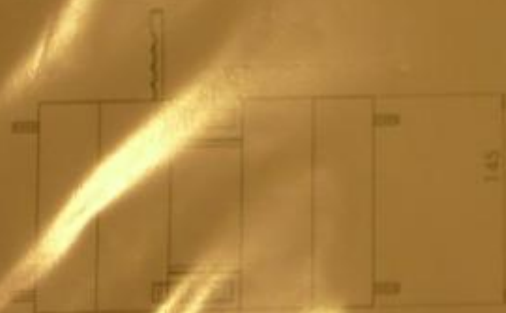
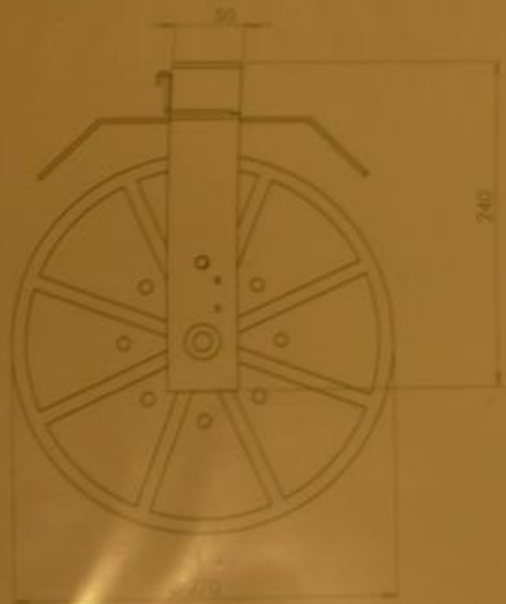
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NO.	DATE	REVISION	BY

working drawings 2

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working drawing - projecte

Plan of Manufacture

Middle Pin

- I am going to make the middle pin from solid aluminium round bar which will be 175mm long and 15mm in diameter.
- I am going to turn it to the correct size on the lathe and chamfer both ends.
- After it has been lathed I will drill a hole at one end for an R-clip to be inserted.
- I will finish the pin with emery cloth and wet and dry paper.

Frame

- To make the frame I am going to use flat aluminium which will be 430mm long and 100mm wide.
- Before this I will mark out where I want to drill the holes for the middle pin and the locking pin to go through.
- I will drill these holes first and then I will use emery cloth and wet and dry paper to finish the surface of the metal.
- Then I will use the metal folder to bend the metal into position and then clean any marks left using emery cloth and wet and dry.

Wire clip

- To make the wire clip I am going to use small flat aluminium which will be cut using the chop saw at 115mm long.
- I am going to drill two holes in it so it can be bolted to the frame.
- I will use emery cloth and wet and dry paper to finish the metal.
- Then I will bend into shape in the metal folder.

Turning Handle

- The turning handle I am going to make from black solid plastic dowel rod cut at 110mm long.
- I will drill a hole in the centre of one end of it and then tap it so that it can be attached to the reel.
- I am going to use a half-round file to file out places for your fingers to grip.
- Then I will use emery cloth and wet and dry paper to finish it and then I will polish it.

Locking pin

- The locking pin I am going to make will be made of three parts - the pin, a spring and a roll pin.
- The actual pin I am going to make from small round aluminium bar cut at 45mm long. I am going to knurl it at one end and drill a hole at the other end. Then it will be finished with emery cloth and wet and dry.
- The roll pin will be inserted into the hole at the end and the spring will fit over the pin between the roll pin and the frame.

Locking pin catch

- The catch for the locking pin I am going to make from small flat aluminium cut at 75mm long.
- I will drill two holes in it so that it can be bolted to the frame.
- Then I will bend it into shape with the metal folder and then finally finished off with emery cloth and wet and dry paper.

Plastic sides

- The plastic sides will be cut out using a laser cutter in order to get an accurate cut and there will be no finishing to do to it.
- All four of the plastic sides which will be circular will be 270mm in diameter and two will be blue and two will be grey.
- In one of the solid circular pieces of plastic I am going to drill a series of holes for the locking pin to sit into.

Bushes

- I am going to have to make several different bushes which will all be an interference fit with what they will sit into.
- I am going to make the bushes from nylon as it is mechanically strong and durable.
- I will lath it down to the correct size for the hole it has to sit into and then using the lathe I will drill a hole of the correct size in it.
- Then it will cut them off at the correct length then fit them into their place.

Pipe

- The pipe I am going to use will be 175mm long and 9.4mm in diameter and it will be made from clear plastic tubing so that you will be able to see the middle pin going through the centre of the reel.
- I am going to drill two holes at both ends of the pipe so that a circular bit of MDF can be screwed in. The MDF ends will be made by cutting out a square and then creating a jig that will enable the square piece of MDF to be sanded into a round shape.

Protective Cover

- The protective cover I am going to make from aluminium plate cut at 250mm long and 125mm wide.
- To start I will drill four holes in it so that it can be attached to the frame and then I will clean the metal with emery cloth and wet and dry paper.
- After that I will fold the metal in the metal folder and then finally finish the metal to get rid of any marks left from using the metal folder.

Modifications during Manufacture

In the plan of manufacture I said that I was going to make the turning handle from black coloured solid plastic dowel rod. However when it came to making the turning handle I decided to use a blue coloured dowel rod for the turning handle in order to match the colour of the plastic sides on the reel and make them blend in better.



I also found that when I put the reel together there was nothing to stop the locking pin from catching the side of the reel so I made a nylon spacer which was an interference fit with the middle pin. The spacer slid over the pin and was enough to keep the locking pin clear of the reel when it was revolving.



I also made a nylon washer to go between the R clip and the side of the reel. This was to stop the R clip from scratching the reel when it was revolving.





This Solid Works picture shows what my final project will look like when it is finished. I have shown all the components involved in making the reel in this page.

Final Design

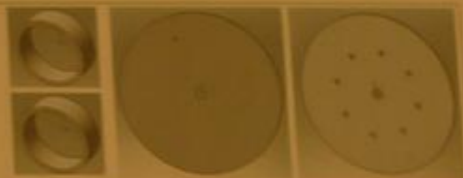


This is the middle pin. This is what the whole reel revolves around. It will be made from aluminium. It will be an interference fit with the frame below.



Above shows the locking pin and the locking pin catch. As you can see from the picture there is a roll pin in one end of the locking pin. There will also be a spring on the locking pin so that it will be 'spring loaded'. The roll pin is there to hold the locking pin out when you want to turn the reel around. The locking pin will probably be knurled at one end to provide extra grip. The catch has two holes so it can be attached to the frame and will be bent into shape using the metal folder.

To the right shows the circular bits of plastic which make up the shape of the reel. There will be two layers of plastic. The first layer is different on each side. On one side the first layer just has two holes - one for the middle pin and one for the handle to be attached as you can see directly above. On the other side the first layer has a series of holes drilled in it for the locking pin to slot into - that can be seen in the top right. To the right shows a circle with a series of cut outs in it. This is the second layer of plastic which will be stuck on top of the first layer on both sides.



This is the frame I am going to make. It will be made from flat aluminium and bent into shape using the metal folder. The holes drilled in it are for the middle pin and the locking pin. The two smaller holes are to attach the wire clips for the locking pin onto the frame. You can also see two holes drilled at the top of the frame which are there to attach the wire clips and the protective cover onto the frame.



This is the wire clip. There will be two of these attached to the top of the reel. The 'hooked' end is where the locking pin will clip over the reel. The two holes are there for two nuts and bolts in order to attach it to the frame.

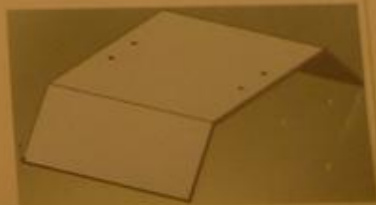


The turning handle I am using is a 'bar out'. The 'bar out' is a piece of pipe which will give much more grip when turning the handle. The hole drilled in the end of it is to attach it to the reel.

To the right shows the pipe. This holds the circular bits of plastic together. It will be made of clear plastic piping. The two circular shapes below the pipe and they will be made from MDF. This is what the circular plastic sides will be screwed onto. Because the whole reel will be turning on the middle pin bushes will be needed. To two shapes beneath the two ends of the pipe are bushes. These will be an interference fit with the holes drilled in the two pipe ends. The bushes will be made from nylon as it is very tough and durable.



To the right shows the protective cover. It will be attached by nuts and bolts to the top of the frame. It will be made from light aluminium sheeting and will be bent into shape using the metal folder.



Evaluation of Ideas

At the end of my Analysis I decided that I would improve the reel in terms of its Aesthetics, Ergonomics, Function and Design Features. I have three pages of ideas, some of which I would like to develop further and incorporate them into the final design. On this page I have evaluated my ideas and stated which of them I am going to pursue further.

Aesthetics

In the Analysis I said that the **P25/300 Insulated reel** looked more like a garden reel than an agricultural product. This is purely because of the colour. Ideas 1 and 2 side of the reel which I think could be made from a different colour of plastic rather than green to make it look more like an agricultural product. This will improve the Aesthetic appeal of the product and make it look stronger.

Ergonomics

I decided to improve the product in terms of ergonomics as I thought that both the turning handle and carrying handle on the **P25/300 Insulated reel** were very poorly shaped. On my design pages ideas 3 and 4 show possible solutions to improve both handles. Idea 5 shows a locking mechanism but it also shows the carrying handle as part of the frame so the handle and the frame are one complete part. I would like to try and take this idea further and incorporate the carrying handle into one unit. This would make the reel easier to make and with it being one complete part it would be stronger. On the Solid Works page I showed an idea for a carrying handle whereby two pieces of aluminium were shaped and then riveted to the frame. This would provide a strong handle but it might make the frame look a bit 'patchy' with it being riveted.

As for the turning handle, idea 3 on the design pages shows a simple turning handle which I think would suit the reel fine. I also did this drawing out in Solid Works to give a 3D view of it. It could be easily made from aluminium on the lathe and I think that knurling on the handle would give it a professional look.

Function and Design Features

The **P25/300 Insulated reel** had limited functions and the design features were not very useful or even necessary for the reel. The reel had a fixing post which it clamped onto. This meant extra expense and extra weight to carry around. In my design pages I done a page of Solid Works and on it I showed an idea for a small wire clip which would allow the reel to hang on the fence line. It could easily be made from aluminium which would not only lower the cost of the reel it would mean that there would be no fixing post to carry around. On the Solid Works page I also showed an idea which incorporated the wire clip on the frame. This would make it strong but it would be hard to make a carrying handle for it and it might ruin the Aesthetic appeal.

The **P25/300 Insulated reel** offered very little protection to the wire which the reel was holding. On my design pages idea 2 shows a protective cover made from aluminium or plastic. This would protect the wire from the rain and help maintain the wire for longer. The cover could be easily made from aluminium plate or plastic. Aluminium would be stronger but plastic would be more aesthetically pleasing. I would like to pursue this idea further and use it in my final design.

The **P25/300 Insulated reel** did not have any kind of locking mechanism which is essential to stop the reel unravelling. On my design pages idea 5 shows a locking mechanism that could be somehow be incorporated into the reel. The actual lock could be made from aluminium turned on the lathe. A series of holes could be drilled in the reel into which the lock would sit into therefore locking the reel in place. This is an idea I am going to develop further and include on



Ergonomic development of the Carrying Handle
 This is an idea for a frame. It would be made from flat metal aluminium for lightness and for strength. The two circular sides which make up the reel could sit to the inside of the flat metal. The frame also incorporates a handle. The handle is made from flat aluminium which would be bent into shape. It could be attached to the top of the frame using two nuts and bolts. This would be a simple frame to make but I don't think that handle would give enough grip and would be tough to hold.



Aesthetic development of the Middle Pin
 This is an idea that I had for a middle pin which would go right through the middle of the reel. It could be made from aluminium lathed down to size. This would be very strong but also very light compared to mild steel. The ends could be chamfered to remove the sharp edges. There is also a hole drilled at one end so that an R-clip can be put on to secure the reel in place. I think this would be more than strong enough and a bit of metal work in the reel would give it a professional look.



Design feature development of the Wire Clip
 This is an idea for a wire clip. It would be made from aluminium. This would allow the reel to be latched down to size. They look neat and if they were latched using two nuts and bolts then it would be very strong as well. It could be bent into shape to fit the metal folder.

Solid works Ideas

Aesthetic/Ergonomic development of Turning Handle
 This is an idea for a turning handle. It is filleted at one end so there are no sharp edges. A hole is drilled at one end so that it can be attached to the plastic reel. Knurling could be used on the surface so that it provides a better grip.



Design feature development of the Frame
 This is an idea for a frame that incorporates a different type of wire clip. This would mean the wire clip would be stronger but this way there might be very little room for your hand to hold the frame. It also might ruin the aesthetic appeal of the reel.

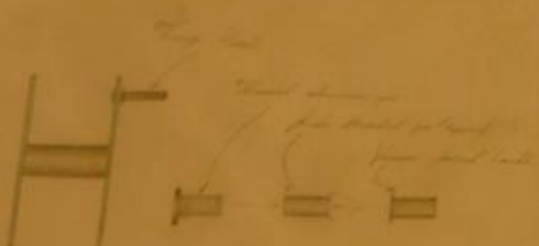


Aesthetic/Ergonomic development of the Turning Handle

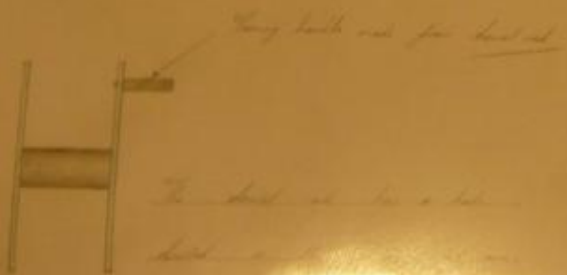
This is another idea for a turning handle. It would be lathed down to size but like the idea for the middle pin it would be bigger at one end. A hole would be drilled at one end and then threaded so that it could be attached to the reel. I think if it was made from aluminium it would be very strong but quite heavy for its purpose as well.



Ergonomic development of the Turning Handle



The handle should be for the hand
 The handle should be for the hand
 The handle should be for the hand

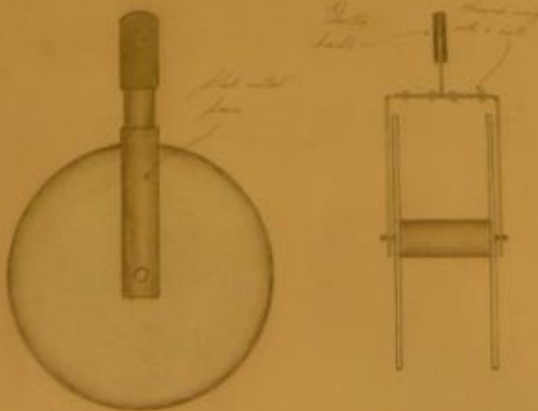


The handle should be for the hand
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Ergonomic development of the Carrying Handle

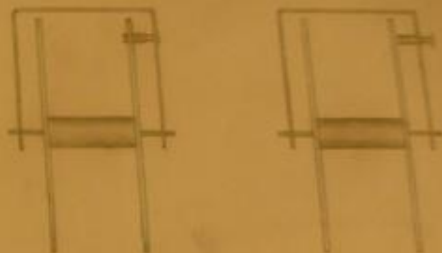


The handle should be for the hand
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The handle should be for the hand
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Function development of the Locking Mechanism

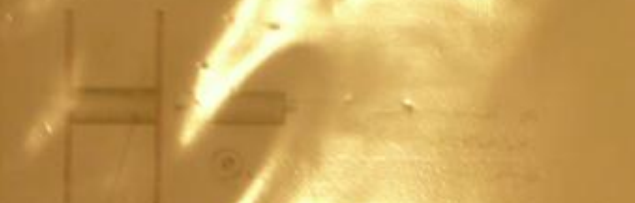
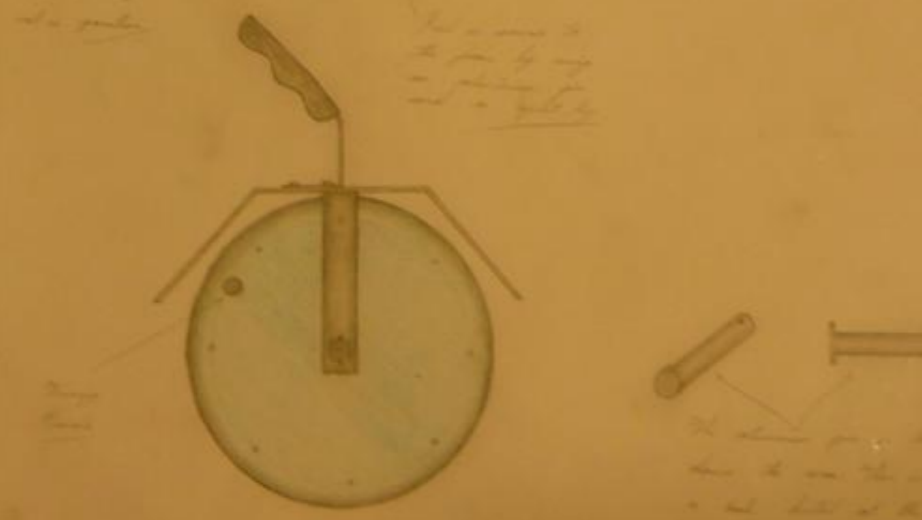
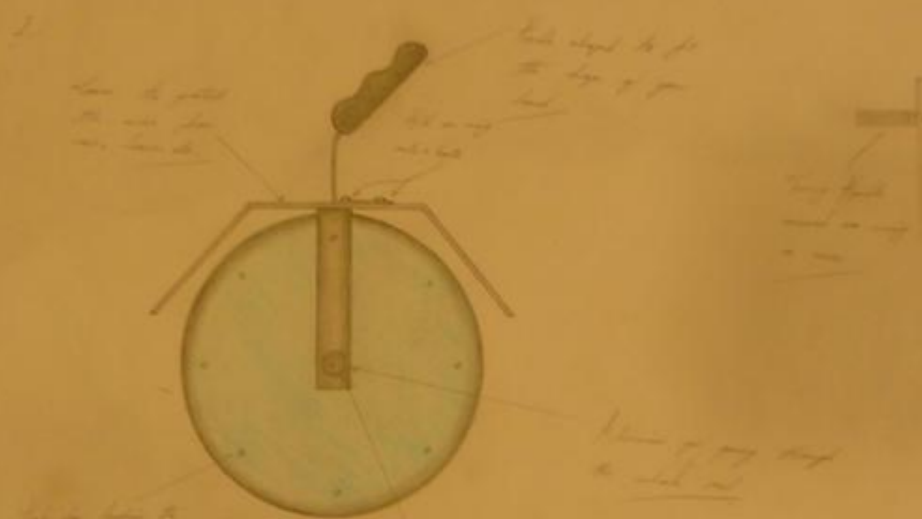
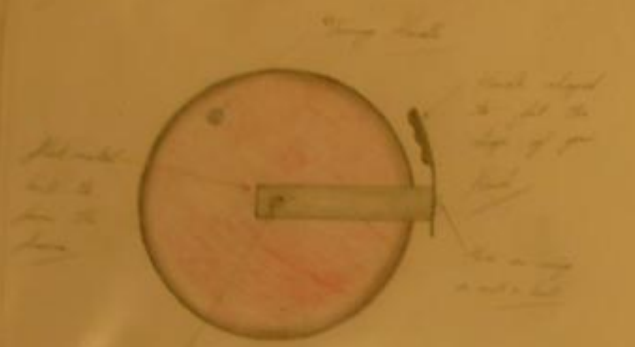


The handle should be for the hand
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The handle should be for the hand
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Ergonomic development of the Frame and Turning Handle

Aesthetic and Design feature development of the Protective Cover



Redesign Specification

Function

- It must be able to hold different brands of electric fence wire
- It should have a quick release locking mechanism
- It should be able to remain elevated off the ground
- The reel should be simple to connect/disconnect
- When reeling in it should not get tangled the wire up
- It should have a protective cover top protect the wire

Ergonomics

- It must have a good handle so it can be carried about easily
- Wire should be easily reeled in and out
- The reel must be comfortable to hold
- It should be lightweight not exceeding 300mm in diameter

Aesthetics

- The colours of the product should suit the product
- The finished reel mustn't look out of proportion
- The reel must be balanced so that it doesn't tip over
- A company name/logo would help aid its aesthetic appeal

Safety

- There must be no sharp edges on the reel
- It must be stable
- Any metal used must be filed down with no sharp edges

Materials

- Materials used must look professional
- The materials must be well finished
- The colours used mustn't look of place
- The overall frame must be strong and resistant to corrosion

Durability

- It should be able to withstand impact
- The materials should last a long time
- Any metal used should be aluminium to prevent rust or if another sort of metal is used then it should be properly protected from rust

Accessibility

- Access to the reel must be simple and it should be easy to take off completely
- The locking mechanism must be easy to access and use

Maintenance

- The materials used should be easy to clean
- Replacing the wire should be simple

Cost

- The reel should cost no more than £15 to manufacture

Size/Shape

- The reel I am going to manufacture should not exceed 300mm in diameter and no more than 150mm in width
- The shape of the reel must be circular

Time

- The manufacture of the reel should not take any longer than 3-4 months



Analysis



O'Brien 1:1 Standard Reel	
Function - this reel has three functions as well. It can hold the wire on the reel, it can be attached to a fitting post and it has a locking mechanism which is like a ratchet. The reel can hold up to 200m of polywire or 500m of polytape.	6 / 10
Fitness for Purpose - this reel is very much fit for its purpose because the materials used are strong and durable. Also it is a New Zealand company that makes the reel and this country is well known for making electric fence tools.	9 / 10
Design Features - the head on the end of the handle is designed to fit into a fitting bracket as a means of holding it up off the ground. Also the ratchet mechanism is designed so that the reel can wind but not out so that when it is on the fitting post the wire doesn't come undone but the lever for the ratchet can be opened so that the reel can operate completely freely.	8 / 10
Materials/production methods - a mild steel frame has been used on this reel which is galvanneal to stop it from rusting which is essential for a reel. The handle has been pressed into shape through laser treatment before being galvanneal. The handle is also partly dipped into a bath of ABS plastic. This gives plenty of grip when you are holding it. An injection moulded ABS plastic carrying handle has been made apart from the rest of the reel. The carrying handle components (carriage and handle) are made from the same injection moulded plastic. The carrying handle is made from a high impact plastic.	8 / 10
Ergonomics - the reel is designed to fit the shape of your hand better and the carrying handle is big so that it is easy for your hand to turn it. Also the carrying handle is in the middle so that it isn't out of balance when you are carrying it.	8 / 10
Aesthetics - the reel is made from a mild steel which is galvanneal and the carrying handle is made from ABS plastic. The reel is a simple design and has been made in a way that it is easy to use. The reel is a simple design and has been made in a way that it is easy to use.	8 / 10
Cost - this reel costs £ 34.95. I think that this is quite highly priced but it is a bit more expensive because 'O' Gallagher are a well known company and known for their good products but are a bit more expensive than others.	7 / 10
Safety - the reel is very safe and with a knuckle guard on it then your hand is protected from the wire going round and round the reel.	7 / 10
Maintenance - there are no moving parts on this reel so there is no need for maintenance.	7 / 10

Gallagher Ground Reel	
Function - this reel has three functions. It can hold the wire, it has a locking mechanism and it can be attached to a fitting post to secure it. The reel can hold up to 500m of polywire, 400m of rubber wire or 200m of polytape.	8 / 10
Fitness for Purpose - this reel I think is perfectly fit for its purpose not only because of the materials and production methods used but because it is made by an Australian company called 'Gallagher'. They are very well known for making electric fencing systems on a large scale.	9 / 10
Design Features - this reel has a knuckle guard to protect your knuckles when you are winding to the wire. It is made from injection moulded plastic and is incorporated into the handle. The handle also has a head at the bottom of it to allow it to be secured to a fitting post. The reel also has a chatter proof lock which allows the reel to be locked in either of two positions.	7 / 10
Materials/production methods - the chatter proof lock is made from high impact plastic which can withstand impact from being dropped on the ground or hit against something. Again a mild steel frame is used and it has been dip plated to prevent rust from starting and a nut as both have been used to secure the handle to the frame. A lock nut has been used to secure the handle which is essential as it stops the reel from coming undone. An injection moulded ABS carrying handle is used and it is a long handle to make winding the reel in and out very easy.	8 / 10
Ergonomics - the handle is curved to fit the shape of your hand better and the carrying handle is big so that it is easy for your hand to turn it. Also the carrying handle is in the middle so that it isn't out of balance when you are carrying it.	8 / 10
Aesthetics - with the handle being in the middle it makes the reel very well balanced and the handle doesn't look out of proportion to the reel. The carriage used on the spool of reel and doesn't make it look out of place.	8 / 10
Cost - this reel is a bit more expensive than the other reels I have investigated because it costs for £ 34.95. I think that this is quite highly priced but it is a bit more expensive because 'O' Gallagher are a well known company and known for their good products but are a bit more expensive than others.	8 / 10
Safety - this reel is very safe and with a knuckle guard on it then your hand is protected from the wire going round and round the reel.	7 / 10
Maintenance - the ridding on this reel add strength but make it a bit more difficult to clean however if kept well then I think that a bit of cleaning would be all this reel needs.	7 / 10

P25G/300 3:1 Ground Reel	
Function - this reel has five functions. It can hold wire, be secured to a fitting post as the picture shows, it has a wire guide, it has an automatic mechanism for better turning and it has a locking mechanism. The reel can hold up to 1000m of polywire, 800m of galvanneal wire, 200m of electric rope, and 200m of electric tape.	8 / 10
Fitness for Purpose - this reel is very much fit for its purpose because there has been a lot of thought put into the manufacture of this reel.	9 / 10
Design Features - the main design feature in this reel is the automatic turn function. This is where the reel rotates three times for every one turn of the turning handle. It also has a wire guide where the wire is fed through to stop it from coming up over the sides of the reel. This is a very good idea which can save a lot of time when you are trying to get wire arranged when it has come up over the sides of the reel. The reel can also be attached to a fitting post as the picture shows. There is also a locking mechanism on it the same as the ratchet mechanism on the O'Brien reel on the left page.	8 / 10
Materials/production methods - all the plastic used is injection moulded ABS plastic which is very strong and durable and therefore will withstand a lot of usage. Mild steel is used for the frame and again it is dip plated to prevent rust and it is fastened to the frame using a nut and lock. The carrying handle is made from injection moulded ABS plastic and on the inside of the handle there are grooves in it to give the handle plenty of grip. The wire guide is injection moulded and is a simple yet very useful tool. The wire is led through the gap in the wire guide which stops the wire from coming over the side of the reel and getting tangled which can waste a lot of your time.	8 / 10
Ergonomics - the handle is shaped the fit your hand and groove in it to give extra grip when holding it. The wire guide helps when you are winding the reel in because you can turn the handle as fast as you like with out having to worry about the wire coming over the sides and getting tangled. With the reel being so big and with all these extra on it, the reel is the heaviest one I have investigated which means that you really have to love the fitting post as well to make it secure to reel in and out.	7 / 10
Aesthetics - this reel is quite big and it takes the fitting post to allow the wire to be loaded in easily. Again the handle is in the middle to make it well-balanced and the handle is made the right size so it isn't out of proportion with the rest of the reel. Also the wire guide is made the right size and so doesn't look out of proportion.	8 / 10
Cost - this reel costs for £ 43.99. I think that this is quite expensive even more than the Gallagher reel however out of the six reels I have investigated this is the most developed reel of them all.	8 / 10
Safety - this reel is very safe and there when it is attached to the fitting post then there is no strain on your hand as all you are doing is turning the handle.	7 / 10
Maintenance - there is a slight ridding on this reel however it is quite small and I don't think it would affect the cleaning of the reel too much.	7 / 10

Overall Analysis of P25/300 Insulated Reel

Function	5/10	The reel is designed to hold the wire, be secured to a fitting post and it has a locking mechanism which is like a ratchet. The reel can hold up to 200m of polywire or 500m of polytape.
Ergonomics	5/10	The reel is designed to fit the shape of your hand better and the carrying handle is big so that it is easy for your hand to turn it. Also the carrying handle is in the middle so that it isn't out of balance when you are carrying it.
Function and Design Features	5/10	The reel is made from a mild steel which is galvanneal and the carrying handle is made from ABS plastic. The reel is a simple design and has been made in a way that it is easy to use.

Conclusion

I have analysed all six reels and have found different conclusions for each of them. I have found that the very basic reels lack the strength and durability of more expensive more popular reels. The more expensive reels had obviously much more time spent on them considering the ergonomics and aesthetics of the reels and made them overall a lot better than the low budget reels. E.g. the O'Brien reel and the P25G/300 3:1 Ground Reel are much more developed from an aesthetic and ergonomic point of view and the materials used on them. I also found that the best reels were made by Australian and New Zealand companies and they are well known for making the best reels. I am going to develop the first reel I investigated. The P25/300 Plastic Insulated Reel I think has extremely poor ergonomics and it is the least aesthetic pleasing. There isn't a carrying handle as such, it is designed to clamp onto a fitting bracket which I think is not only a waste of money but also a waste of materials as other reels have investigated have used other ways to solve this problem. As I stand in the Overall Analysis table I am going to develop the reel in different ways. Firstly I am going to improve the Aesthetics of the reel to make it look more like an agricultural reel rather than a garden hose reel. The ergonomics of the reel are very poor so I am going to develop the reel further paying more attention to the ergonomics of the reel. Also the reel lacks functions and design features so I am going to develop it further by creating new functions and improving them and I am going to add to the design features which will vastly improve the reel.



Analysis



<p>P2U X10 Plastic Insulated Reel Function - the reel has two functions. One is to hold the wire on the reel and the second is to clip onto the fixing bracket. It can hold up to 300m of polywin, 300m of galvanized wire, 100m of electric rope or 100m of rope. This is sufficient enough to meet the needs of most people as it would be mainly used to section off part of a field.</p>	2 / 10
<p>Fitness for Purpose - I think that this reel is fit to meet the needs of the user however I think that it is a very low budget reel and is made to a low standard.</p>	4 / 10
<p>Design Features - this reel has one design feature which is the handle which is designed to act like a clamp so that it can be attached to the fixing bracket which is shown in the picture. The fixing bracket is designed to stick into the ground through the use of the spikes.</p>	3 / 10
<p>Materials/production methods - the materials used for the reel are ABS plastic which is a UV resistant polymer plastic which stops it from going out of shape or fading from the sun. I think that this is essential as the reel would be sitting outside all day. The handles are injection moulded and so is the reel. This is an appropriate method of production to use as the reel can be mass produced and made cheaply which keeps the price low when you go to buy it. Zinc plated mild steel is used for the frame. It has been bent into shape using heat treatment. Mild steel is perfectly strong enough to use as the frame as it is quite strong and it can be shape easily.</p>	6 / 10
<p>Ergonomics - the ergonomics on this reel are very poor. If you do not buy the fixing bracket then it makes it extremely difficult to hold the reel and turn the handle as well. The turning handle isn't shaped well and doesn't fit the shape of your hand at all. However it is very lightweight which means your hand is put under less stress.</p>	2 / 10
<p>Aesthetics - the reel is small and compact which makes it lightweight and it isn't out of proportion as the weight of reel is balanced well. The colour of the reel is very off putting if you were going to buy it because the green makes it look more like a garden product rather than an agricultural product. The yellow handles make the reel look very strange compared to other reels on the market, because most other reels are made from black plastic and are colours like white or grey.</p>	1 / 10
<p>Cost - the reel retails for £19.15 which I think is very cheap considering how poorly designed the reel is. Also you will have to pay an extra £22.15 for the fixing p.st as well so it is quite expensive when you add it all up and then buy the wire as well.</p>	2 / 10
<p>Safety - the reel is quite safe to use as there are no sharp edges and because it is made from plastic there there is no chance of the reel getting electrified.</p>	4 / 10
<p>Maintenance - this reel requires very little maintenance because the shape is so simple but there is a bit of riddling on the reel which could make cleaning a little awkward but not wouldn't cause too much of a problem. The handle could be a bit difficult to clean because of its shape.</p>	7 / 10

<p>Economy Plastic Reel Function - this reel has three functions unlike the first reel. Again one of its functions is to hold the wire on the reel and the second function is the wire clip which allows it to hang on the fence line. The third function is a locking mechanism. A zinc plated pin fits into a hole made in the reel. The reel can hold a little bit more than the first reel, it can hold up to 200m of polytape or 300m of polywin.</p>	4 / 10
<p>Fitness for Purpose - I think that this reel is fit for its purpose and is a good example of a low budget reel as it has a better designed handle and a locking mechanism which is essential.</p>	6 / 10
<p>Design Features - the elongated handle on this reel is far better shaped than the first reel because unlike the first reel the handle doesn't clamp onto a fixing bracket, instead the wire clip allows the reel to hang on the actual fence line which keeps the reel off the ground and it means that you don't have to buy a fixing bracket for the reel.</p>	5 / 10
<p>Materials/production methods - the materials used for this reel are the same as the first reel. Injection moulded ABS plastic is used for the reel and the handle to protect them from the sun and with the colour of the plastic chosen being black it would absorb heat much more so a protective plastic is a must. The wire clip which is made from mild steel has been bent into position through heat treatment and has been zinc plated not only to protect it from rust but because it looks good as well. The mild steel wire used is perfectly capable of taking the weight of the reel on the fence line and because it has been bent through heat treatment it has not been weakened.</p>	7 / 10
<p>Ergonomics - The handle is shaped far better than the first reel as it fits your hand better therefore less effort is needed to hold the reel and also the turning handle is made so that it can revolve round so it makes it easier to wind the reel in and out. The turning handle is also larger which provides a better grip.</p>	5 / 10
<p>Aesthetics - the colours used on this reel are much better looking than the first reel and the handles look much better shaped than the first reel. The reel isn't too big and the handle seems to be very big for this size of reel which makes it look out of proportion.</p>	5 / 10
<p>Cost - this reel retails for £9.99. I think that this is very cheap considering the price of the first reel and you can see the difference in the ergonomics and aesthetics of the reel.</p>	8 / 10
<p>Safety - the reel looks to be quite safe but the wire clip is designed to hang on the electric fence line which creates the risk of you getting an electric shock if by accident you don't turn the fence off and go to lift the reel.</p>	3 / 10
<p>Maintenance - the reel again needs very little maintenance apart from a cleaning every so often after it has been in use however cleaning the wheel is difficult because of the ribbed wheel.</p>	7 / 10

<p>R15 Multi-Purpose Plastic Reel Function - this reel has three functions. One of them is to hold the wire. The second is to clip onto the fence line. The double handles make it more secure when it is on the fence line. And the third is a locking function. The reel can hold up to 400m of polywin, 400m of galvanized wire, 100m of electric rope or 100m of rope which can be up to 12mm wide.</p>	5 / 10
<p>Fitness for Purpose - I think that this is a very good example of a reel and it is a very popular reel with farmers in Ireland.</p>	8 / 10
<p>Design Features - the handle on this reel is completely different as it is shaped different and it incorporates two plastic clips to allow the reel to hang on the fence line and it has a locking function where a small plastic pin can fit into different holes on the other side of the reel. The reel is in the centre of gravity with the handle for better weight distribution.</p>	6 / 10
<p>Materials/production methods - the injection moulded ABS plastic that is used for this reel is very strong and so can take the weight of the wire easily. The handle which also incorporates the wire clips as well means the whole reel is reinforced. A split key is used to secure the reel over the drum which is a clever way of securing it as it is quick and easy to undo and the split key is zinc plated as well so it will not rust.</p>	7 / 10
<p>Ergonomics - the handle isn't very well shaped however it does provide lots of grip and room for your hand and it also incorporates the two clips. The reel is also very lightweight which means less stress on your hand when you are holding it. The split key used to secure the reel is an excellent and quick way of removing the reel and putting it back on again. However the split key can be dangerous when you are opening and closing it as it can slip and nip your fingers very easily.</p>	6 / 10
<p>Aesthetics - not much attention has been paid to the aesthetics of this reel and because of the strange shape of the handle it can make winding out the reel harder than the other reels as it puts the reel out of balance. The colours used are quite simple and although the reel is small in size it doesn't look out of proportion with the handle.</p>	5 / 10
<p>Cost - this reel retails at £16.95 which I think is a reasonable price because as well as the wire clips it has the locking mechanism as well.</p>	8 / 10
<p>Safety - the is very safe and much more than the last one because on the last reel the wire clip was made of mild steel but on this reel it is incorporated into the injection moulded handle which means there is no chance that the handle will be electrified.</p>	6 / 10
<p>Maintenance - this reel probably requires the least maintenance of all the reels apart from cleaning the reel every so often and putting it back on the drum it is more or less maintenance free.</p>	7 / 10

Chris Murphy 13K

AS Technology

Electric Fence Reels



Evaluation against specification

Function

- The inflator has the ability to deflate tyres but to change the flow you have to pull out the pin instead of push a button making it easier to use.
- It has a clip on connector but can not be removed to put on a dual connector.
- It has a mock tyre valve in which you can store the dust cap during usage.

Classed for purpose

- The inflator does not have the ability to use a dual connector.
- It has a black PSI and BAR readout which makes it harder to read but is still distinguishable.
- It has a Perspex cover on the gauge but it is not magnified however it is still large enough to be read clearly.
- It has the ability to be used by both left and right handed people.

Design features

- I did not include the pre-set gauge because when I put it on during manufacture it was too big and did not fit in with the rest of the gauge.
- I used the most robust materials that were available to me and the end product is solid and could endure a considerable amount of wear and tear.
- It is easily stored away because the hose flex's round the item however it would be even easier if the hose was detachable and could clip on the side of the handle.

Materials and production methods

- I have used cheap but durable and strong materials in the manufacture of my product.
- I have made two curves in the handle and in the trigger to improve the comfort and also the grip of the overall product during use.
- I have used an original hose from another yet similar inflator; I have used a real one instead of making another one due to the fact that we do not have the right facilities in the workshop to do so. It was also not a part of the product in which I was improving.
- The gauge is made from a rigid polystyrene because of its suitability to vacuum form and its durability. I would have liked to have imitated the ribbed effect but this would have caused difficulties when trying to remove from mould after forming.

Ergonomics

- The handle is comfortable to use due to the enhanced finger moulds.
- The overall product weighs about 420g. This is just over my target but I think it is still a good weight as it can still be held comfortably in the hand.
- I have placed all of the function buttons near the resting position of the hand so that they are within easy reach.
- The gauge is large enough to read however I feel it is lightly oversized for the handle.

Aesthetics

- The inflator is well designed for the environment because the gauge is made from Perspex so it will not break easily and it also has a acrylic plastic covering on either side of the handle so it will not be easily damaged or broken. I would have liked to have made this from a vacuum form but difficult to line up the two parts when assembling the final product.
- The overall feel is well balanced in the hand although the hose may feel slightly too large.

Cost

- The prototype inflator costs less than £20.00 to make the overall product.
- It would all be suitable for a mass production as the parts were mainly done on machines and cleaned up by hand.
- I have used standard sized screws where possible but there were times when I had to make my own pins for aesthetic reasons.
- The main waste came from the vacuum form and the making of the handle but in the making of the pins there was minimal waste.

Time

- The inflator was manufactured within the time limit of 18 hours.

Safety

- All the edges were polished down and sanded round to make it safe for the user.
- All parts were well secured the only part that was loose was the gauge but I fixed it by putting a splint in the bottom of the pin.

Manufacture

- I have only used materials and tools that are available in the school workshop.

Modifications after Testing

1. I think that the gauge should be angled more towards the user so you do not have to look down at the gauge and can look directly at it. This would help the overall aesthetics and ergonomics of the inflator.
2. I would have made a detachable dual connector that could be clipped on two the side by two 'gripper catches' this means the connector will not get in the way when you are storing the inflator in a cupboard or a tool bag. This would also mean you have the choice between a clip on connector and a dual push on connector.
3. A tyre thread measurer that is slotted in to a hole in the top of the inflator that pulls out when you need to check the amount of thread on the tyres. This means that you will always know where the thread checker is and there is less of a chance of loosing it. It also means all of your equipment for up keeping and maintaining you tyres is in the one place.
4. I would have put on a cover on the gauge as it stands there is no cover over the glass gauge and this could shatter if it hits up against other tools in a tool bag. It would have used the flip lid with the LEDs on the inside as I think it would last the most and it would also be the most durable.
5. I would put in a pre set pin so that you know when stop inflating your tyre when it lines up with the pressure gauge pin. This would give a more accurate inflation.

Product Testing



- The overall size of the inflator is good as it sits in the hand nicely and all the triggers and switches are all near the position your hand is in when using the product. This makes it easier to control all aspects of the device. The hose is also a reasonable length so can reach into for example lorry tyres which are deep dish and have the valves at the back.
- This shows that the holder for the dust caps is easily accessible and quick to use. This is the dust cap being put on to the cap holder. I found that there is enough space for your fingers to move around the cap without anything getting in the way. You can also see the spring which causes the trigger to retract when it is applied.
- This shows that the gauge is big enough to see but is not too heavy so that the user does not have to use a lot of strength to hold it up.
- The LED's are in a good position so that when the pump is used in poor lighting they illuminate the entire gauge.



- This is the trigger which starts the flow of air through the inflator. The trigger has curves on it so that the user's finger can comfortably sit in the curves and not slip off if the trigger becomes oily. It is spring loaded so that when pressure is applied to the trigger it compresses the spring, and when released the spring pushes it out and stops the air flow. As you can see the dust cap holder is close to the position of the hand during the use of the compressor this means that it is easy to use and access during usage.
- The connector is placed in on to the airline which supplies it with compressed air which is lightly lubricated so that the inflator does not seize up inside. The chamfers and ribs in the connector are in place to stop the connector from slipping out during use it hooks on to the airline and can not be released until the outer sleeve of the airline is pulled back.
- This shows that the gauge is large enough to clearly read from far away and you do not have to look closely to see it. It also shows that the reverse airflow is close to where you put your hand during use. It also shows that the reverse airflow pin and the light switch are positioned close to the hand position during use.

Conclusion after testing

I have found that all of the aspects that I have improved on during the remanufacture of the product have mostly been successful. However, if I was to do the design again there is a couple of things I would have changed such as the reverse air flow pin which people may find slightly hard to use. I regret not putting in the preset pin although my reason for leaving it out was because it compromised on the aesthetic appeal of the product. I would have also made if possible to remove and change the hose length and type of the connector on the end.

Plan of manufacture

Mould:

- 72mm diameter MDF X 47mm with a 10 degree taper finished all round
- should be drilled in the centre by 52mm diameter and cut 21mm
- Two 8mm holes to be drilled for 5mm LED's.

Gauge:

- Vacuum form using the mould and cut out on the garbil cutter
- It has two 8mm holes drilled to fit the LED's in
- A disc measuring 70mm diameter is used to plug the bottom of the gauge and also connects the gauge pillar to the handle
- Two discs one clear one and one white one measuring 30mm diameter are used for the dials of the gauge.

Gauge pillar:

- A 15mm mild steel rod will need to be cut 25 mm long and taken down to *13mm diameter
- 10 mm from the end it will need to be taken down to a 6mm diameter.
- There should be a 2mm chamfer at 25° at the 13mm end to insure it has a smooth entrance to the gauge.

Handle:

- Handle is cut out of a 13mm MDF board; it should be roughly cut out on the hand saw and then filed and sanded down to a good standard ready for painting.
- Clamp two pieces of 3mm thick acrylic plastic to either side of the MDF and filed down to the same size as the wood.
- It should be sanded with wet and dry sandpaper and polished to a high standard.
- Before painting the end edge of the MDF has to be sealed with a thin layer of glue and when dried given a light sand so it can be effectively painted.

Airline connector:

- To be machined on the lathe from a 20mm rod of mild steel, cut at a length 50 mm long and turned to the specific sizes. All edges need to be knurled and chamfered.*

Trigger:

- To be made from a 6mm thick MDF and cut to size.
- The finger curves need to be filed down and to fit the ring and baby finger comfortably.
- The MDF is to be painted on the edges but on the sides it is to be covered with a thin sheet of aluminium.

Reverse airflow:

- Machined on the lathe down to 13mm and chamfered and knurled.
- Pin to be 6mm thick going through a 6mm thick hole in the acrylic and into a 13 mm hole in the MDF where the gauge and nut are.

Changes during manufacture

1st change: Colour

I have changed the overall colour scheme of the product. The MDF will now be sprayed black whilst the acrylic remains grey so it has a more appealing look. Not only does it look better the paint will also, be more easily maintained for example form damp.



2nd change: Height of gauge

A final revision I have made to the original design is to reduce the height. Formerly I felt it was at an inappropriate height which was causing imbalance to the overall inflator. I took it down by about 7mm in the end so it was not too low but was high enough not compromise the comfort of any of the other functions such as the dust cap holder.



3rd change: Chamfered the gauge

I decided to slightly chamfer the sides of the gauge by about 5° to enhance the aesthetic appeal of my product along with minimising the number of sharp edges. I also chamfered the housing of the LEDs as not only does it look better, but it is also safer.



* When taking metal off on the lathe do not take more than 2mm at a time

Working drawings of parts



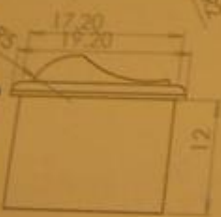
led and bezel, these are both standard components. It is a 5mm led in a 8mm bezel which are put in to pre-drilled holes in the gauge so that the gauge can be seen in poorly light areas.



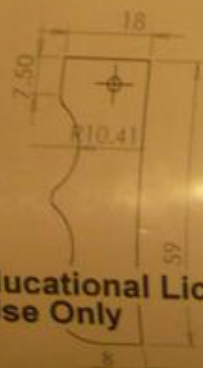
This is the base component that everything is attached or screwed on to. It is made from a mdf centre which is painted black and either side has a 3mm sheet of acrylic plastic. The gauge, airline connector, flexi hose, duct cap holder and reverse airflow are all drilled and countersunk if needed. It has two curves on the handle to allow the ring and baby finger to sit comfortably during use.



This is a valve which has been cut of a tyre and drilled in to the right hand side of the handle this is to hold the dust cap during inflation so that it is not lost. This is a standard valve where the outer plastic has been peeled of and pushed in to an interference fit hole.



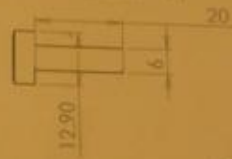
this is the switch that is used to turn on the lights LEDs which are used to light up the gauge. it is positioned in a hole in the MDF part of the handle.



This is the trigger which starts the flow of air to the tyre it is made from a mdf centre which is sprayed black and either side has a aluminium sheet cut to the correct size. it has two curves to provide comfort whilst using the devise.



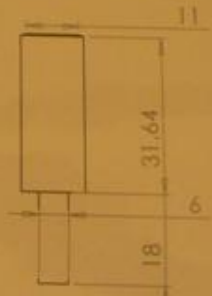
This is the airline connector which has been turned on a lathe from a round piece of aluminium. It has knurling on the top of the connector so it has grip for removing and attaching the hose to the product.



This pin is to reverse the air flow it is positioned on the left hand side of the handle. It is spring loaded so when you release it it automatically pulls back in and returns to normal flow.



this is made from a vacuum formed body and a mdf disc on the bottom. there is an clear Perspex disc on the top which covers the gauge. the mould was made in there layers the base layer the hollow circle layer which is there so you can drop the gauge in to then there is the 1/4 circle layer which is made for drilling the leds in to.



This is turned on lathe it is the connector pin which holds on the gauge to the handle. it is made from an aluminium rod and a chamfer on the top o guide it in easier.

UNLESS OTHERWISE SPECIFIED:		FINISH	TEXT AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION
DIMENSIONS ARE IN MILLIMETERS					
SURFACE FINISH					
TOLERANCES					
LINEAR					
ANGULAR					
DATE	NAME	DESIGNED	DATE		
DRAWN					
CHECKED					
APPROVED					
BY					
DATE					

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Development of ideas



I have chosen this handle as it looks like it will fit the best in the hand and your fingers will sit comfortably in the groves. I also think it looks better than the flush handle as it adds a more curvaceous and modern touch to overall looks.



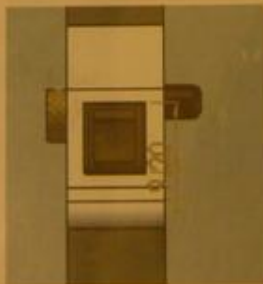
I have chosen the pull out reverse airflow pin. I think it would give a more responsive feedback as the spring will give a good bit of resistance. It is also more conspicuous as a button would sit out further and this is sleeker.



I have chosen to go with the gauge with the two LEDs as not only will it be easier to make but I think it gives it a better look. Also the lid may start to become lose over time and would be easily snapped of.



I have decided to go for the dust cap holder instead of compartment as I think the compartment would be hard to make and impractical as it would take up a lot of room and the closing fitting would probably loosen after a while and the compartment would open randomly.



I have went with the rocker switch on the rear of the handle as I think it is a nicer switch to use and it is the most practically positioned.



I have decided to go with the handle with the finger groves simply because it will match the handle.



Have went for the basic clip on connector as it is the easiest to use and also the most practical if the device is being moved around.

Concept Sketches: 3

7. Dust Cap holders



This is a dust cap holder that you place your dust cap on whilst you are inflating the tyre this means you will not lose the valve. It is positioned so that when you are placing the dust cap on the holder your hand does not hit of the gauge causing discomfort and affect the overall ergonomic experience of the inflator.

This is a small compartment located on the right hand side of the handle which is ideal for holding new and the existing dust caps of the wheel. It means that you do not have to walk back and forth to the work top to get a new valve for the wheel

8. Hooks



This hook is positioned on the back of the handle this is a strong part of the handle so it could take the full weight of the inflator without causing any damage, the only let back is that it is in the same position if the rocker switch which is the best place for the switch in my opinion.



This hook is positioned on the top of the gauge which means it can be hung on almost any hook or nail which is handy for a small garage or a workshop. The top of the gauge because it is made from vacuum formed acrylic is not very strong so it will put a lot of pressure on the corners and this may cause stretch marks to appear.



This is a clip on connector which has an LED on the bottom of it. This helps to find the valve if it is dark or if you are having problems locating the valve. The light my compromise on the ability to get at hard to reach places.

Concept sketches: 2

4. Lights switch position



This is a black rocker switch positioned on the top of the handle where it is easily accessed while you are using the inflator. The rocker switch means that you only have to flick the switch to on and don't have to hold it down.



This is a push button switch positioned in the same place as the previous switch but this means to keep the light on you have to hold it down. The chamfer on the sides of the button gives a nice feel when you push it down.



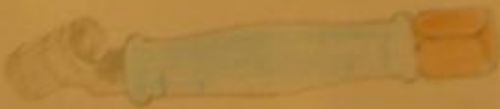
This is a toggle switch positioned on the right hand side so only if it is out of the way it is hard to get to but it gets in the way when you try to get on the dust cap to the valve holder.

5. Gauges



This gauge has two LEDs positioned to light up the numbers if they are not visible. It does not have a protector over the Perspex but it is sunk down in to the gauge so it is not easily broken or lit up against anything. The gauge is positioned at a slight angle for better visibility during use.

6. Air flow connectors



This is a detachable dual connector, the dual end makes it easier for the user to get valves which are hard to reach with a clip on connector. It is detachable as it takes up a lot of space when you are storing it. There is a handle for extra grip while you are using the dual connector. Although it does not clip in so it may slip off the valve when you are using it causing an inaccurate inflation.



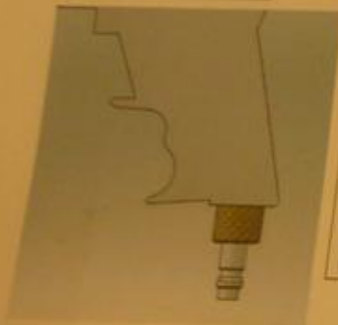
This gauge has a flip up lid with 4 LEDs on the inside that activate when the lid is lifted. This also saves room on the handle as you do not need to have a switch on the handle which takes up room and may compromise the overall performance of the device.



This connector is a simple clip on connector which clips on to the end of the tyre valve and so it does not pop off during the inflation although it is sometimes hard to get on to the valve and it can be a problem as it does not work until securely connected to the valve.

Concept Sketches: 1

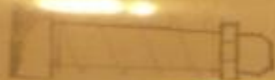
1: Handle



This is a handle with a mould for the index and baby finger to sit in whilst you are using the inflator. The two curves provide not only comfort but also grip when in use as the fingers sit comfortably in the grooves and when your hands get slippery from oil. This would be a good improvement for me to put on my product as it would heal the ergonomics and the overall aesthetics. The only problem is that there is a possibility that someone's hands may be too large to fit in the curves and would cause discomfort in use.

This is a handle which is flush and has not curves in for the fingers to rest in. The handle is not as aesthetically pleasing but looks like it is comfortable to hold. The lack of finger grooves means that if oil gets on the users hand it could easily slide off and lose control of the inflator. But with the lip at the bottom of the handle it helps with this situation.

3: Pull out reverse airflow pin



2: Trigger



This trigger has curves in it to help with the overall ergonomic feel and user experience. The indents help trigger to be controlled easier as they reduce the risk of the fingers slipping from the trigger causing an accurate pressure reading.



This trigger has a flush front with a small lip at the end and this helps from the users hand slipping off the trigger during use. This helps with an accurate inflation because you have complete control over the device throughout use.

3: Reverse airflow



This is a reverse air flow pull out this pin to reverse the direction of flow control valve. The pin has been knurled and chamfered so that it is easy to grip and pull out without it sliding between your fingers. The knurling and the chamfer also helps the look of pin. There is a spring at the back of the pin which means that when you let go of the pin it springs back in to place and makes the flow go back to normal.

This is a button for the reverse air flow switch, this sits out a bit further than the pin reverse airflow switch so it could catch on things when it is being transported. The button is chamfered so it has a better feel when you apply pressure to the button as the edges are no longer sharp.



Redesign Specification

Function:

- It should be able to inflate and deflate tyres.
- It should have a clip on connector but also have ability for a dual connector.
- The redesigned product should have a location point for dust caps.
- Additional feature of night light to read dial at night time.

Fitness for purpose:

- The attachable dual connector should be able to fit on the side of inflator.
- It should have colour coded PSI and Bars reading.
- It should have a magnifying glass over gauge to maximise the visibility of the dial.
- Should be able to be used by both left and right handed people.

Design features:

- It should include a preset gauge.
- It should be durable and shock resistant.
- It should have a deflation button on the side.
- It should be easily stored away.
- It should be durable and efficient.

Materials and production methods:

- Materials need to be cost effective and long lasting.
- The hose must be strong but also flexible.
- All materials should be easily maintained.

Ergonomics:

- The handle must be comfortable to use.
- The handle will have grip so the user can have full control of the inflator without slipping.
- It should weigh less than 400g when finished.
- The buttons should be easily accessible.
- The detachable ends should be easy to engage and disengage.
- The gauge should be easily read.

Aesthetics:

- It should have a modern attractive appeal.
- It should be well balanced when in use.
- All parts should be in proportion.
- A brand name should help the aesthetic appearance of the prototype.

Cost:

- The prototype production budget should be less than £20.00
- It should be suitable for mass production.
- Standard components should be used as much as possible.
- Minimum wastage should keep costs low.

Time:

- Must be completed by March 2011.
- Must be completed in school time and take less than 18 hours.

Safety:

- The finished product should have no sharp edges.
- All parts should be well secured.

Tools:

- Must be completed using materials from the school workshop.
- The end product will be manufactured using machines from the school workshop.

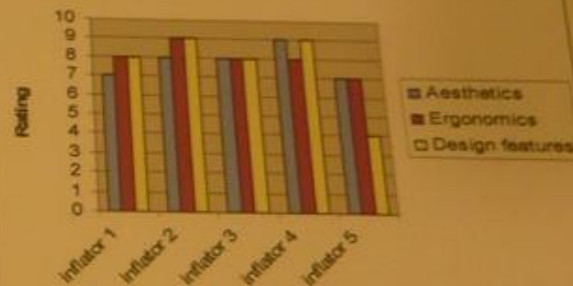
Size:

- Should not exceed the standard size of an airgun around 250mm X 200mm X 50mm

Inflator 4	Analysis <i>Air Line Inflator</i>	Rating (10)
Function	This product does not have the ability to deflate tyres but it can inflate tyres quickly with its direct flow valve which does not restrict the flow and means the air passes through it quickly. This gives you an increased inflation time.	8
Fitness for purpose	I think it is fit for purpose because it inflates tyres quickly whilst also giving a precise reading with the robust ceramic tip. One problem is that it does not deflate tyres but it makes up for this because it displays the pressure in PSI, BARs and KPa.	9
Design features	It has a robust highly sensitive ceramic tip that is very precise and is above the UK's standard for the gauge accuracy. It has a clip on connector that clips on to the valve so it doesn't have to be held on during use.	9
Materials	It is made from an injection moulded plastic and covered with a soft touch rubber. It has an aluminium clip connector that has been zinc coated for protection from rust. The handle is also made from aluminium.	8
Ergonomics	The handle is around the outside of the gauge and you simply squeeze the rubber around to activate it. The clip connector is easily used as the spring is tight but the clip is long so little pressure has to be applied to open it.	8
Aesthetics	The soft touch grey rubber means it feels nice and also looks good. The dials are colour coded so you can tell the difference between the different units of measurement easily. The large gauge also balance the weight of the air line when it is attached to the bottom.	9
Maintenance	There is little maintenance needed for this product except from replacing parts that have been worn out due to general wear and tear. The hose and gaskets may need to be replaced if they start to leak out air.	7
Cost	This product is on the market for £54.48 which I think is quite expensive because there are products for less that this that are capable of more than this one.	6
Safety	This product is very safe because there is a clip connector which means that the hose can not blow off during use as it is connected securely to the valve.	7

Inflator 5	Analysis <i>Silverline Air Line Tyre Inflator 10 - 120 PSI</i>	Rating (10)
Function	This product does serve the uses that are expected from an air line inflator. However, the stick pressure gauge means you have to take off the air line hose and put on the pressure gauge instead.	7
Fitness for purpose	I think that it is not fully fit for purpose because you have to take it off the air line to read the pressure so it takes up a lot of time. The stick gauge reads in only BARs and is also very inaccurate. It can also not deflate tyres.	6
Design features	It has a plastic coated body which is good for comfort when gripping the inflator. It only has a push-on connector which means that valve has to be held tightly when in use, but it does have a twin connector end which means you can get at valves that are difficult to reach.	4
Materials	It is made from die cast aluminium that has been coated in a plastic for comfort, protection and durability.	7
Ergonomics	Apart from the plastic coating, and the small dent on the thumb trigger in which the thumb rests in, this product has minimal comfort features. The push on valve has no extra grip or knurling so it could easily become slippery with dirt from the tyres.	7
Aesthetics	The black plastic coating on the handle makes it look better. The gauge is hidden and only appears when it is being used so it is tidy and easy to store without the risk of breaking the gauge. It is well balanced out because it is nearly the same weight along the whole length of the handle.	7
Maintenance	There is little maintenance with this product because it does not need any of the parts cleaned or replaced as there are no filters on the machine. Gaskets may need to be replaced in case they start to leak or break.	8
Cost	This product is on the market for £6.99 which is very cheap because it still does the job although it is not as accurate as others. This may seem to be good value, however the build quality does not look as good as others on the market.	9
Safety	This is not as safe as other products because it does not have a clip on connector that connects to the valve so there is a possibility that it can fly off when the pressure builds.	8

Comparison of Features



The product that I am going to improve is inflator 1 which is the Draper Air Tyre Inflator with Pressure Gauge. I think I will be able to improve the aesthetics and ergonomics of this easily.



DRAPER
AIR TYRE INFLATOR



Inflator 1	Analysis <u>Draper Air Line Tyre Inflator with Pressure Gauge</u>	Inflator 1
Function	This product has the ability to inflate and deflate tyres with the aid of a compressor. It can read in PSI and BARs. You can deflate the tyre by pushing a button which changes the direction on the flow valve. The pressure can be read from the gauge on the top of the handle. This good because the gauge is close to the user and because it is in both PSI and BARs it is universal to all tyre pressure gauges.	Function
Fitness for purpose	This product is fit for purpose because it does everything it is asked for, although it does not have a twin connector and a metal bar at the end for stability during use.	Fitness for purpose
Design features	It has the ability to inflate and also deflate which is an added feature that is particularly useful if tyres are over inflated. It has a large hook which is useful for storage in the garage and the large ribbed black surround on the gauge means it can withstand a considerable impact.	Design features
Materials	The main body is made from a die cast metal which is lightweight. The rubber hose is made from heavy duty rubber for strength. There is a Perspex cover on the gauge dial which is stronger and safer than glass. The clip on connector has been zinc coated to stop it from rusting. This has the advantage of being safe and durable, whilst also adding aesthetic value.	Materials
Ergonomics	The handle has been in mould grips from the shape of the die cast so it is easier to grip during use. The clip on connector has a small but usable clip so it does not get in the way, but can also be used properly.	Ergonomics
Aesthetics	The shape of the handle is not only for comfort, but is also aesthetically pleasing. The large dial is useful because it balances the weight of the air line when it is attached. The dials are coloured so you can distinguish easily between the PSI and BARs.	Aesthetics
Maintenance	There is minimal maintenance with this product because it should not get excessively dirty or require parts replaced, except perhaps if they have been broken or the rubbers have deteriorated in the hose.	Maintenance
Cost	This product is not the market for £16.99 which I think is reasonable because it does everything that can be asked from an air compressor in £40s and it also comes with a twin connector for the surface, a feature which other products do not have.	Cost
Safety	This product is very safe due to the clip on connector that clips on to the top of the valve as it does not blow off the tyre when compressed air is being passed through it. The Perspex dial can make it feel like the pressure is not really accurate.	Safety



Inflator 2	Analysis <u>Draper Psi Accura 1 Digital Tyre Inflator</u>	Rating (10)
Function	This product is designed to inflate tyres at high speed. It does not have the ability to deflate tyres. The product reads the tyre pressure with a ceramic tipped gauge that is read out on a digital dial in PSI only. It does not have the ability to read in BARs which means it may cause confusion to some users who are not familiar with PSI-BAR conversions.	7
Fitness for purpose	This product is fit for purpose although it does not have the feature of deflating tyres which other cheaper products do. It can also only read in PSI and not BARs. If it had the ability to read in BARs, this could be a potential selling point.	6
Design features	It has a digital readout which means it can be more precise. It also has a clip on connector which allows it to latch on to the tyre valve when in use so it does not fly off. I find the clip-on connector hard to use on things such as valves where the valves are harder to reach and a push on connector would be more suitable.	9
Materials	It is made out of a rigid polystyrene that has been coated in a rubber so that if it is dropped or hits off something it is going to harmlessly absorb most of the shock. The handle is made from aluminium and the clip connector is made from zinc coated aluminium. The hose is made from rubber that is reinforced with metal mesh, which helps the rigidity of the hose.	8
Ergonomics	The handle is positioned at the bottom of the gauge. It is a homophic handle so it is touch sensitive, which could become a problem in the work environment if it touches up against your leg or arm when not in use.	9
Aesthetics	The soft touch rubber gives it a nice feel when being used. The long hose enables you to use the inflator quite a distance away from the tyre, but it could also get in the way. The digital dial means that it is easy for the user to read and receive a precise measurement.	8
Maintenance	There is not much maintenance with this except from the 3V battery which will need to be replaced once it has run out of power. The hose may also need replacing if the rubber is damaged or begins to rot. But this isn't likely to happen if the inflator is used often.	8
Cost	This is on the market for £84.99 this is quite a bit considering it can not deflate tyres and it only read in PSI although the digital dial and the ceramic tip pressure sensor give it a bit of an edge over competitors.	5
Safety	This product is very safe due to the clip on connector which means that the hose is secure on to the valve when being used.	9



Inflator 3	Analysis <u>Draper Air Line Tyre Inflator with Camax Twin Connector</u>	Rating (10)
Function	This product is designed to inflate the tyre with its twin push on connector. It does not have the ability to deflate tyres which is quite a disappointment, but it can read the pressure in both BARs and PSI. There is no clip on connector which means it has to be held onto the valve, but there is a bar with a grip which facilitates this.	8
Fitness for purpose	This product is fit for purpose as it inflated the tyre and displayed the pressure in PSI and BARs. However, it can not deflate the tyre nor does it have a clip-on connector. But it does have a twin push on connector which is better for getting to valves which are harder reach.	7
Design features	This product is designed to inflate tyres and display the pressure in both PSI and BARs. It has a brass trigger on the base so it can be used with the thumb and does not interrupt the view of the dials. The brass also gives it a good aesthetic look.	7
Materials	It is made with a die cast metal and has plastic trim for comfort and for overall look. The dials are covered with clear Perspex is good because it does not smash easily.	8
Ergonomics	The handle is a long rectangular shape with ribs on the side of it for improved grip. The grip on the push on connector means that it does not slip when it is being used. It has a brass trigger that is operated by the thumb when in resting position.	8
Aesthetics	The plastic trim on the top look good and are a good base for the legs and safety instructions to stick on to. The vertical dial which is red and black means you can distinguish easily between the PSI and BARs.	8
Maintenance	It does not need any maintenance unless you are fixing a part that has worn due to wear and tear. The rubber hose may need to be changed if it starts to rot or leak air.	9
Cost	This is on the market for £65.54 which I think is quite expensive because it does not have the ability to deflate tyres and it also cannot latch on to the valves during usage.	6
Safety	This product is relatively safe but it does not have a clip on connector so it has to be held on whilst in use this could be dangerous if your hand slips and the hose disconnects and causes injury.	7



I am Andrew Smyth, a Sixth Form Student at St. Patrick's Grammar School, Downpatrick. For our coursework assignment, we were set the task of investigating, analysing and developing a component. I have chosen to examine variations of Air-Line Tyre Inflators. My findings are detailed below.

Digital Air Tyre Inflator with Pressure Gauge

Materials and Manufacturing Processes

The handle of the gun is made out of aluminium and has been die cast to get the shape of the curves which provide the grip. The hose is made from a flexible rubber that has been extruded and has had a wire mesh added to it to give it strength with a fine coated clip connector that connects on to the tyre valve. The pressure gauge is a standard pressure gauge with a rubber surround with ribs that has been injection moulded. The gauge is protected by a sheet of clear Perspex. The gauge is on a standard base made from brass that screws in to the top of the gun. It uses standard components such as the rivet holding on the trigger.

Design Features

The rubber surround absorbs the impact if it is dropped. The gauge on the top shows the amount of air that is in the tyre. There is a metal ring up back above the handle. It has a detachable air line that so it can be used with different types of air lines. It has the ability to drain the air from tyres through the black button on the side of the handle that has been injection moulded which reverses the flow of the valve. The button is held on by a rivet.

Function

The main function of this is to inflate the tyre to a wanted pressure but one of the pressure gauge that reads on PSI and BAR's. It also has the ability to drain air from tyres if they are over inflated by the black button on the side of the handle. This is on the order of £10.99.

Aesthetics and Ergonomics

The lever is placed so that two fingers can fit on the handle and be used comfortably. The trigger that activates the air flow has been bent in to shape at the end so it will reduce slipping, the hook on the top means that it is easy to store. The grey finish is not only for looks but is also so that it does not rust. The coloured gauge means it is easy to distinguish against PSI and BAR's.



Digital Air Tyre Inflator 1 Digital Tyre Inflator

Materials and manufacturing processes

The robust shockproof cover around the digital readout is made polycarbonate that has been injection moulded and covered in a grey rubber. The bimorphic handle is made from thin aluminium so that there is no trigger but you squeeze the handle to let the air flow. It has a direct valve mechanism means that it has a fast flow of air.

Design Features

The digital read out allows for a precise inflation. The lightweight cover with bimorphic handle allow for a quick deflation and inflation rate of 910L/min @ 1.5bar. The bimorphic handle means that it has no trigger but you squeeze the handle to let the air flow. It has a direct valve mechanism means that it has a fast flow of air.

Function

This product is designed to inflate tyres at a high speed to a precise amount of PSI, the clip connector means that it can be attached easily on to a tyre and does not have to be held on when in use. It also has the ability to deflate the air from tyres at high speeds. This only has the ability to read in PSI where as others can read in PSI and BAR's. This product cost £84.79.

Aesthetics and ergonomics

The bimorphic handle means you can control it from any part of the handle. It has a 1.4m hose. It has two hooks on the top so it can be hung up when it is not use. It has a digital readout for ease of reading and so it is precise. It comes with a 7v lithium battery that powers the digital readout.

Digital Air Line Tyre Inflator with Ceramic Twin Connector

Materials and manufacturing processes

The body is the cast metal, surrounded in a plastic rim that has been injection moulded to fit around the die cast. The trigger and the clip connector have been zinc coated to avoid rust, and the hose and grip on the twin connector have been extruded from a highly durable rubber. It uses both standard components, such as springs and the rivet holding on the flow-activating trigger, and special components that have been made just for this item and the mechanisms inside it.

Design Features

The product has a metal pipe on the end of the hose for control, it has a 50cm hose with a rubber grip that has been produced out of rubber and has a wire mesh inside for strength. On the end of the metal pipe there is a twin connector for different shaped valves. It has a covered air line connector, the pressure of which is read out in both PSI and BAR's. It does not, however, have the ability to deflate tyres.

Function

The function is to inflate tyres with speed, and display the pressure of the tyre in PSI and BAR's. The twin connector means it is easy to fit into lorry wheel valves. This type of product is on the market at £65.34 inc VAT.

Aesthetics and ergonomics

The trigger is placed so it can be easily used by the thumb without interrupting the view of the gauge. The grip on the pipe means it can be controlled well when it is being put on to the valve, and it reads at a range of 0-10 BAR's and 0-140PSI. It has metal ribs on the side for grip. The hose is flexible and detachable so you can fit different ends on to it.



Air tyre inflator

Manufacturing processes and materials

The gauge is light weight robust rubber surround on the dial that has been injection moulded and covered in a rubber surround. The gauge is covered in clear Perspex, the sensor has been made of a strong ceramic pin. It has an aluminium surround on the handle which has been cut and bent in to shape. The clip on connector is made from a zinc coated aluminium, the hose is made from a strong rubber hose that has been extruded and has a metal mesh core for strength and stability in use.

Design Features

It has a ceramic tip that is precise and is well above the industry standard EN60 G17. The clip on connector which is made from aluminium means that it clips on to the wheel so it is secure for use. It has an inflation flow of 910L/min @ 1.5bar. It reads in PSU BAR's/ KPa that is displayed on an analogue clock face. It has a direct flow valve for fast inflation.

Function

Its function is to inflate tyres at high speeds to a precise unit of measurement it has the ability to read in three units on measurement. The clip on connector means it does not have to be held on during use and is not going to slip off. This product costs £54.48. The back light makes it easy to read in as daily light workshop or road side.

Aesthetics and ergonomics

It has a bimorphic handle so it does not have a designated trigger spot. It has hooks on the top so it can be easily hung up. It has a precise readout in three different units. The digital read out is easy to read.



Digital Air Line Tyre Inflator 10 - 120 PSI

Manufacturing processes and materials

It is made from aluminium which has been cast in to shape and fitted together with heavy duty brass valves and fittings; the push on connector is made from aluminium and has been coated in zinc to protect from rust and it gives it a good finish. The cover over the analogue readout is clear Perspex that has been hardened so it does not break if dropped, the cast body is covered in a black plastic so it is more comfortable to hold.

Design Features

It has a stick gauge which measures from 0-127PSI and from 0.7-8.5 BAR's. It has an aluminium push on connector that is detachable. It has a 50cm long hose that is made from a highly durable rubber and is reinforced with a metal mesh core. It has a 1/4 inch quick release fitting for the air line hose. It is on the market for £6.99 inc VAT.

Function

Its main function is to inflate tyres; it has the ability to read in PSI and BAR's. It has a push on connector so it can be used quickly. It has a 15cm long metal pipe at the end of the hose helps for when inflating the tyres to have pressure applied to the valve.

Aesthetics and ergonomics

The trigger is placed at the bottom of the handle and is operated by the thumb. It has a plastic coating so it is easy to grip and hold. The product only weighs 500g and it is well balanced. The hose end is detachable so different ends can be fitted on to it, like twin connectors.

Modifications

Modification 1

The primary modification that I have decided to make is to further improve ergonomics and anthropometrics. Testing showed that the product is ergonomically sound but I fear that too much emphasis has been put on comfort rather than practicality. The handle is too smooth and doesn't supply sufficient grip to the hand of the user; in a practical situation there would be a danger of damaging the device by dropping it. Therefore rubber has been added to the handle to increase grip and minimise the dangers posed by a lack of grip. Such an addition would improve grip while maintaining comfort, it will also improve aesthetics.

Modification 2

During my initial research I discovered a solution to a problem that often arises during the use of high quality glue guns. Often it is difficult to apply glue to awkward spaces and a possible solution is to give the device a long nozzle that becomes flexible under heat. This solution can be seen in many of my concept sketches but in the end this solution was not implemented. This was not implemented because the materials required are expensive and the nozzle can be prone to blockage. However I believe that this solution would give my product a major advantage over its competitors and that is why I decided to implement it.

Modification 3

One of the main design flaws with the project is that it is unable to sit upright. It is possible that by redesigning the trigger guard it may also function as a stand. This will have no negative effects on aesthetics or on ergonomics but will allow the user to set the device down in such a way as it will be easy to pick up. The stand will angle the device so that the handle is easily accessible from a standing position. This minor modification will have a major impact on the practicality of the device.



Before modifications



After Modifications



Modified Design

Glue Gun

1. Investigation and Analysis Of Product

2. Re- design Solutions and Development

3. Manufacture

4. Testing and Evaluation

Evaluation Against Specification

Ergonomics

- The product must be lightweight (1 kg at maximum).
- The product weighs a mere 0.56kg.
- The handle must fit comfortably in the users hand.
- The handles curvature matches that of the hand perfectly.
- The product should be balanced.
- Balance has been sacrificed somewhat for the sake of aesthetics. Repositioning or redesigning the handle could have overcome this problem.
- The trigger must operate with minimal effort to avoid strain on the user.
- Operation is simple and the trigger moves with ease although the trigger doesn't move smoothly. Care during manufacturing could have avoided any complications within the trigger mechanism.

Materials

- The chosen materials must be cheap, lightweight and be readily available.
- The chosen materials fulfilled their criteria and functioned as desired.

Maintenance

- The finishing applied must work well with each given material, and the product must need little to no maintenance.
- The finishing worked well and improved aesthetics (MDF - paint and gloss, Nylon and Acrylic- polish.) The product requires no maintenance.

Manufacturing

- The manufacturing must be planned so as to avoid complications.
- The manufacturing was not extensively planned but all complications were overcome. Careful planning could have avoided unnecessary complications.
- The manufacturing must be safe and not overly time consuming.
- Although safety precautions were made manufacturing was more time consuming than planned.

Economics

- The product must be as cost effective as possible and be capable of competing in the market in both performance and price.
- The device is inexpensive to manufacture and is valued at roughly £30/ £33.62

Anthropometrics

- The handle must fit comfortably into the users hand.
- Both the trigger and handle are comfortable.
- Operation must be simple and all switches easy to access whilst in use.
- The switches are easily accessed whilst in use and the device is simple to use.
- The product must be lightweight and balanced.
- The product weighs a mere 0.56kg, however it is not perfectly balanced. Balance is a factor that should have been considered during the designing of the product.

Functional Requirements

- The product must be capable of withstanding shocks or impacts from a fall of at least 1.5m as this is the height of a normal desk.
- The device is relatively shock resistant but is vulnerable at various points; in any case it would survive a 1.5m fall with no damage.
- Operation Of all triggers and switches must be smooth and efficient.
- The trigger functions as intended but not as smoothly as desired.
- The product must fit into a stand or have a built in support mechanism.
- A stand/ Support mechanism was not included as it was thought that incorporating one would affect the aesthetics. As the modifications page will show this problem could have been overcome with little to no aesthetic.

Safety

- The product must not have any sharp edges which could cause injury.
- There are no sharp edges or hazardous attributes.

Aesthetic

- The design must be original, standing out among its competitors and aesthetically attractive.
- The colour scheme must be interesting and the colours must work well together.
- The colour scheme has a professional feel and the glossy finish is aesthetically attractive.
- The product must be as compact as possible to avoid becoming large or bulky and to save money on material costs. (The handle must fit comfortably and the product mustn't exceed 0.025 cubic metres.)
- The device does not pass my limit in volume (0.025 cubic metres) but this is not a concern as it is desirable. Volume is a factor that should have been considered during the design of the product.

Evaluation



	Ergonomics	Materials	Maintenance	Manufacturing	Economics
Score Out Of 10	8	8	8	8	8
	Anthropometrics	Functional Requirements	Safety	Aesthetics	
Score Out Of 10	7	8	8	8	

Total (Out Of 90) = 98

76%

Blue Gun

1. Investigation and Analysis Of Product

The aim of my project as was presented in the specification was to build a glue gun which was easily operated whilst in use, ergonomically designed, aesthetically pleasing and lightweight (1kg at maximum). The thorough testing has shown that the device meets these vital criteria. The smooth finish of the handle coupled with its unique curvature give it a comfortable fit in the users hand. The product has a unique design which improves its aesthetic quality and has original design ideas at its heart such as the glue magazine and the use of a butane reactor instead of a conventional electronic design.



2. Re-design Solutions and Development

The feedback from testing was predominantly positive, particularly with respect to aesthetics and ergonomics. However there was also disappointing feedback as well, I had hoped that the trigger would function perfectly and smoothly but this is not the case. Although largely a success the trigger mechanism is not without flaw, it does not move smoothly on a single plane as expected. This is most likely due to an excessive amount of material being removed during manufacturing. Also (although efforts were made to reduce this) visibility has suffered somewhat. The unique shape of the device blocks the users line of sight somewhat whilst in use. Despite these minor flaws I consider my product success as it has met the specification required. The device meets all safety requirements having no sharp edges and having relative shock resistance. Operation is simple and the trigger is easy to use. However the gloss finish could be of a higher standard.



There was a danger with the design that it might be too unique and therefore might not be easily identified as a glue gun. However the use of glue cartridges and the obvious required function made it clear what the device was. The other main concern was that the device may be difficult to use or be uncomfortable in the users hand. The unique design has affected anthropometrics, however testing has shown that the project still maintains relative ease of use and has a comfortable fit in the users hand. Unfortunately the product is not balanced as required and is front heavy. Aesthetically the project is successful meeting all criteria; the colour scheme is interesting and catches the eye. Also the glossy finish helps improve the aesthetics of the product, unfortunately a stand/ support mechanism could not be included for the sake of aesthetics. The chosen materials were cheap and lightweight.

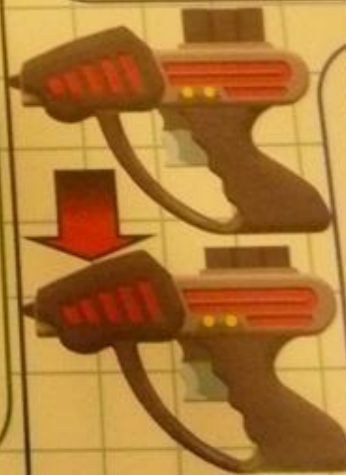
3. Manufacture



4. Testing and Evaluation

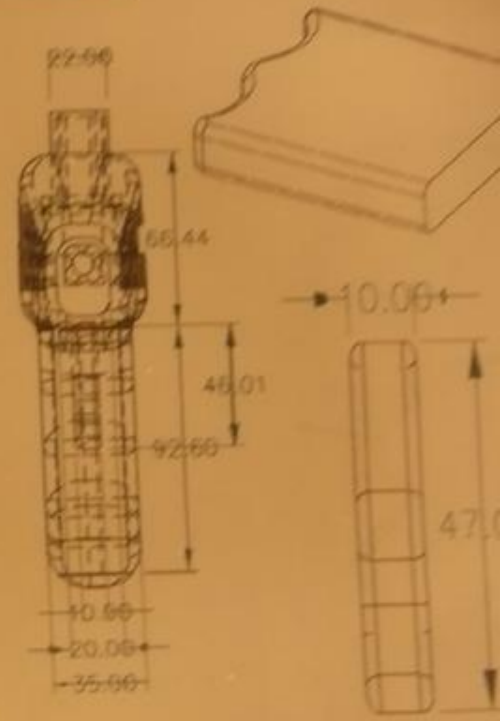
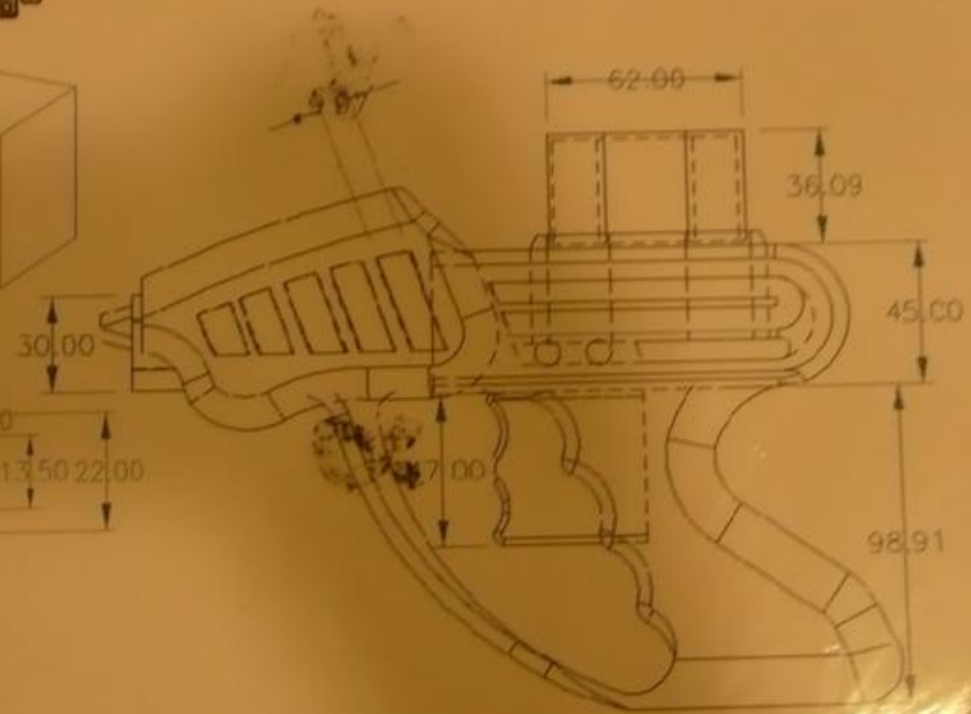
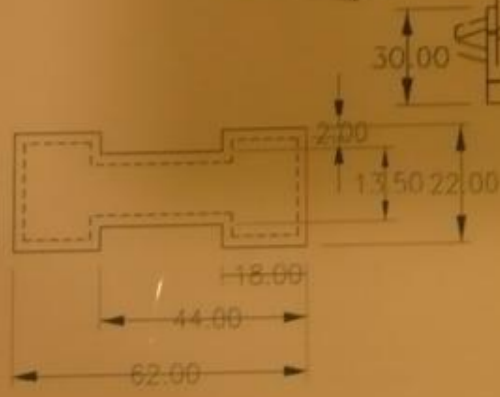
Modifications Made During Manufacturing

The main modification made to my project whilst in use was a material adjustment. Originally the trigger was designed to be made from a polished metal such as aluminium or mild steel as shown in the album drawings. However this was impractical and expensive. I therefore decided to substitute the metal for a clear acrylic; this solved the problem created by the use of metal whilst maintaining a good aesthetic quality. I decided to design the trigger to be operated by two fingers rather than one. Although unconventional it was decided that two fingers would provide a greater force whilst maintaining comfort. This modification may seem minor but it has made a large difference to aesthetics and given the product a more unique quality.

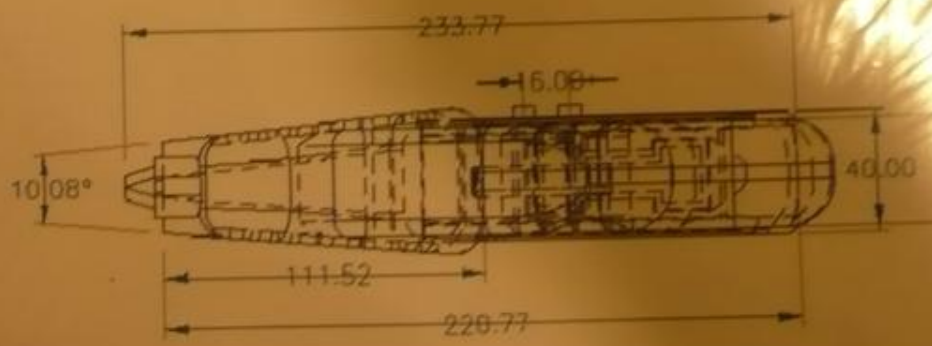


The second modification that was made was to sink the nylon magazine into the main body of the project to give it a more streamline quality. This adaptation also had a practical application, during manufacture I discovered that an overly large magazine would obscure the view of the operator thus affecting the performance whilst in use. By removing the magazine we improved the aesthetics of the glue gun. By removing the magazine the design became more streamlined and sleeker.

Working Drawings



- Cutting List:**
- 2x MDF blocks
length- 250mm
breadth- 200mm
Height- 25mm
 - 1x Nylon blocks
length- 65mm
breadth- 25mm
Height- 40mm
 - 1x Clear PVC Block
length- 60mm
breadth- 50mm
height- 10mm



Glue Gun

1. Investigative and Analysis Of Product

2. Re- design Solutions and Development

3. Manufacture

4. Testing and Evaluation



Exploded View

The exploded view shows the various components that will be included in the manufacturing. Components 1, 2 and 3 will be assembled together into 1 piece of MDF using the CNC micro router. The resulting component will then be sanded, sealed and spray painted. Parts 4 and 5 will be manufactured separately and combined with the centrepiece. Component 4 is a trigger and will be made using either aluminium or clear plastic. A slot must be cut within component 1 to accommodate the trigger and allow it to be returned using springs. Component 5 is a magazine that will be used as an alternative to the more popular glue sticks. This component will be made from nylon plastic.

Trigger

The trigger has been designed to maximise ease of use and anthropometrics. The trigger will need minimal effort to operate but to minimise this further the trigger has been designed to accommodate two fingers (Index and middle); This will allow for extreme ease of use. The edges have also been rounded to maintain a comfortable fit. Furthermore the trigger will only be needed to move a minimal distance and will be spring

Assembled View

This image shows what my product should look like after manufacturing, assembly and finishing. I predict that this product s will be front heavy and vulnerable to breakage at the handle guard. The gentle curvature of the design will greatly improve ascetics provided that care is taken when applying any finish.



Activation

Deactivation

The two yellow buttons shown shall be used to operate the device. The first button will activate the heater and the second will deactivate it respectively. They shall be sprayed yellow or another bright colour in order to attract attention and improve anthropometrics.

Blue Gun

1. Investigation and Analysis Of Product

2. Re- design Solutions and Development

3. Manufacture

4. Testing and Evaluation

This Page shows what my product should look like after assembly and finishing. The various angle give a good representation of this.



3D Perspective



Front View



Rear View

Magazine- This is a secondary component of my product. It is an innovative replacement for the common glue sticks. This will improve operation life and help counter the front heavy balance.

The yellow buttons seen will be used to activate the devices heater and to deactivate it respectively.



Side View

Trigger- This will be a secondary component for operating the device. I have given it a double finger grip in order to improve ease of use. I will use a dense material for this component to help counter the balance.



3D Perspective

Glue Gun

1. Investigation and Analysis Of Product

2. Re- design Solutions and Development

3. Manufacture

4. Testing and Evaluation

Technical Design Modifications



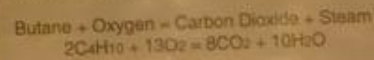
Front Profile

Balance, weight and cost of materials must all be considered before choosing a design.

An Adjustable precision applicator similar to the... of a modern screwdriver could be used to ensure accurate application of glue.



The heater could be fuelled in the catalytic reaction of butane with oxygen in a non toxic flameless reaction.



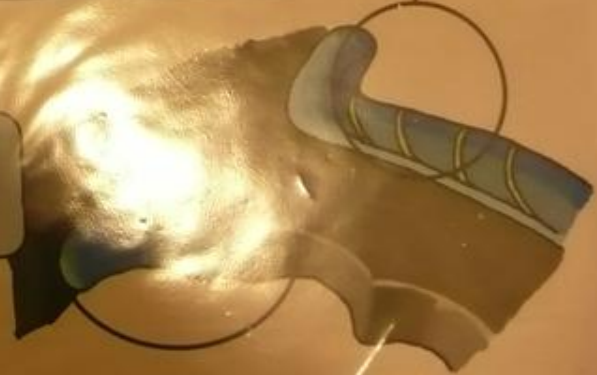
Handle must be designed to maximise grip and ergonomics.



The trigger shape and size must be altered to maximise comfort and ease of use while maintaining aesthetics.

Additional Features

The product could have several additional features for ergonomic purposes. Such features could include: on/ off switches, support stands and heat indicator



Blue Gun

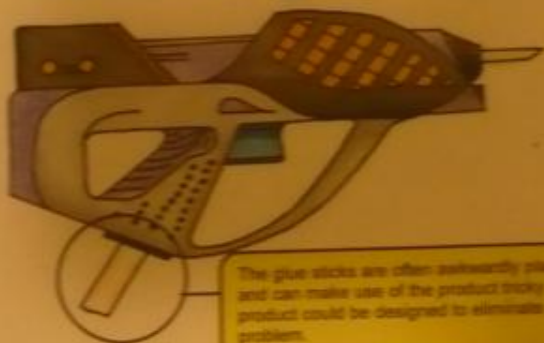
1. Investigation and Analysis Of Product

2. Re- design Solutions and Development

3. Manufacture

4. Testing and Evaluation

Technical Design Modifications



The glue sticks are often awkwardly placed and can make use of the product tricky. My product could be designed to eliminate this problem.



The power cable is often awkwardly placed and can make use of the product awkward. My product could be designed to eliminate this problem.



A front mounted handle grip could stabilise the product during use making application more precise.

A magazine or cartridge could be used to replace the popular glue sticks.

The nozzle of the product could be longer and flexible allowing the user to apply glue into tight areas he couldn't otherwise access.



A decision must be made regarding which delivery mechanism to use be it trigger, lever or pump.

A handle guard could be introduced to improve safety, aesthetics and possibly balance.



A rear handle grip could stabilise the product during use making application more precise.





1. Investigation and Analysis Of Product

Ergonomics Of The Gun-

- The product must be lightweight (1kg at maximum) and compact as it must be to be completely portable.
- The product must be balanced so as to ensure accurate application while in use.

Ergonomics Of The Handle-

- The handle must fit comfortably within the users hand.
- The product must be easy to operate and user friendly.
- The trigger must operate with minimal effort so as to exert strain on the user.

Materials- (For main body, trigger and magazine)

- For the manufacture of my product I will use materials that are readily available in the workshop such as Mild steel, acrylic and MDF.
- The materials I choose has to be easy to work with, have a good weight to strength ratio, be fairly cheap and be easily modified should the product need adjustments.
- The material costs must remain as low as possible.
- The material I have chosen for the main body of my product is Medium Density Fibreboard. The trigger shall be made from acrylic or aluminium and the magazine will be made from either nylon or another plastic.

Maintenance Of The Product-

- An appropriate finish must be researched and applied to the finished product. (Wood- Paint, Plastic And Metal- Polish)
- The product must be easy to manufacture and require minimal maintenance.

Manufacturing-

- The manufacturing must be planned so as to avoid complications.
- The manufacturing has to be safe and not overly time consuming.
- The chosen materials must be ones that I am familiar with and are readily available.
- The product will be designed to make manufacture as easy as possible.
- The manufacturing will consist of Computer Aided Design followed by various stages to improve the finish of the product such as painting.

2. Re- design Solutions and Development

Safety- The design of the product must consider several safety requirements:

- The product must not have sharp edges which could cause injury.
- The product must be assembled with care to avoid breakages.
- The power source has to be contained to prevent any possible risk to the user.
- The product must be capable of functioning continuously for extended periods of time without failing or posing any risk to the user.

Economics-

- The product must be as cost effective as is practical.
- The product must be capable of competing with similar products in both performance, and price.
- The materials and manufacture of the product must be as inexpensive as possible. (prices mustn't exceed £500/ cubic metre)

Functional Requirements- General

- The product must be capable of withstanding the shocks or impacts, it must be able to withstand a fall from at least 1.5m as this is the height of an ordinary desk.
- The product must be unaffected by the high temperatures it will generate.

Trigger And Operation

- Operation of all triggers and switches must be smooth, and efficient.
- The product must fit in a station or have a built in stand or support mechanism.
- The trigger mechanism must be easy to operate and function smoothly.

Anthropometrics- (comfort and handle)

- The handle must fit comfortably into the users hand.
- The product must not be too heavy or unbalanced.
- Operation must be simple and all switches easy to access when in use.
- The trigger has to be curved so it does not cut into the users fingers.

3. Manufactures

4. Testing and Evaluation

Aesthetics Of The Product-

- The product must be pleasing to the eye and be aesthetically attractive.
- The colour scheme applied to the product must be interesting and the colours must work well together.
- The product has to have a unique design which stands out in comparison to similar products.
- Internal circuitry and inner workings must be kept hidden.
- The design has to be modern and contemporary and above all original.
- The product must be as compact as practical to avoid becoming large or bulky. (the handle must fit comfortably into any hand and product mustn't exceed 0.025 cubic metres.)

Production Plan

Stages Of Manufacturing-

- All components of my CAD drawing will be manufactured electronically by a CNC microrouter, this will guarantee a higher quality. There are 3 main components to be manufactured.
 - (A) Main Housing (2 parts) -Medium Density Fibreboard
 - (B) Magazine -Nylon/ other plastic
 - (C) Trigger -Aluminium/ clear acrylic
- Glue the main housing pieces together, sand down edge produce a smooth finish, then coat in a wood sealer.
- File, smooth and polish the edges of the other components.
- Construct a trigger mechanism in the glue gun and mill for the magazine to rest in.
- Prime the main component before spray painting it.
- Assemble components to form finished product.
- Finishing touches.



Blue Gun

1. Investigation and Analysis Of Product



Gas Tec 150

Function-
The product is unique in that its cordless design runs on readily available butane gas. The glue is heated in a fuelless catalytic reaction. There is a thermostat to regulate temperature for constant use and the reaction that heats the glue commences faster than in a standard gun. The product is completely portable and highly lightweight (1.2 kg); the retractable stand allows the device to be kept upright while not in use.

Features-
1. Ignition Switch
2. Handle stores gas while remaining ergonomically comfortable
3. Built in retractable stand
4. Heater runs on butane gas which can be replenished with cigarette lighter canisters.
5. Glue loading mechanism.

Fitness For Purpose-
The product is highly efficient with a melt rate of 0.5kg/hr and takes only 5 minutes to reach operating temperature. Refilling takes just ten seconds and the product can be filled with cigarette lighter canisters. Once filled it can last up to 2 hours and is very simple to use.

Material Usage-
The casing is made from a special polyvinyl chloride (PVC) which is resistant to the varying chemical and thermal changes which take place within the device. It is also easily machined strong and lightweight. However this is a relatively expensive material.
Industrial Processes-
The main body was manufactured using compression moulding allowing for a unique design with flowing curves and a high quality finish. All minor components were formed by injection moulding.

Ergonomics-
The product is very easy to operate and is lightweight. However the balance is front heavy due to the position of the handle this distorts the otherwise precise application provided by the cordless design. The product fit comfortably into the users hand.

Aesthetics-
The product is aesthetically pleasing due to its unique contours, sleek cordless design and retractable stand. Aesthetics suffer due to the lines of the design not being parallel. It is bulky however and lacks necessary detail or colour in places. The components have been implemented into the design in a non-disruptive way. The melt finishing is of a high standard.

Function-

The product is specifically designed to operate at lower and safer temperatures. The product is a variant of the standard Hobby Tec 150/1 glue gun. Its features have been altered for ease of use, value for money and predominantly for safety. This is due to it most widely being used in a teaching environment. The melt chamber is very efficient producing 0.4kg/hr.

Features-

1. Rear glue loading mechanism.
2. Trigger positioned to minimise effort required to operate.
3. Handle serves as stand.
4. Slim design allows for good visibility and accurate application.
5. Low temperature heater.

Fitness For Purpose-

The product is lightweight (1.15kg) but unbalanced. It uses special low melt economic glue sticks and a low melt heater. This unique feature makes it ideal for safety and use with fragile materials. It is highly efficient producing 0.4kg/hr and offers excellent value for money.

Material Usage-

The casing is made from a low grade polystyrene (PS), it is relatively strong and lightweight however it is vulnerable to impact. It was mainly chosen for its ease of manufacture. The trigger and stand were made from a higher grade of PP to improve strength and resistance to impact.
Industrial Processes-
The product was manufactured with price being of key importance; therefore all components were made using an injection moulding process. This allowed for cheap large scale production.

Ergonomics-

The product is very easy to operate and is lightweight however the cable restricts movement and the product doesn't fit comfortably into the users hand. The handle doubles as a stand however this also disrupts balance. The trigger is arched to fit the users fingers.

Aesthetics-

The slim simplistic design lacks curvature but all lines are parallel and give the gun a professional appearance; the vents are also parallel with the handle. The yellow colour is mild and catches the eye. However the design lacks detail and could be called over simplistic. The manufactured glue sticks are of a high quality and the melt finishing is of a high standard.



Hobby Tec 150 LT

Product-	A	B	C	D	E
Function And Purpose	(10/ 10)	(7/ 10)	(9/ 10)	(8/ 10)	(7/ 10)
Fitness For Purpose	(9/ 10)	(6/ 10)	(8/ 10)	(8/ 10)	(7/ 10)
Ergonomics	(9/ 10)	(6/ 10)	(6/ 10)	(8/ 10)	(6/ 10)
Aesthetics	(7/ 10)	(7/ 10)	(6/ 10)	(9/ 10)	(7/ 10)
Total	35/ 40	25/ 40	29/ 40	33/ 40	26/ 40

A= TEC 7300

B= Hobby TEC 150/ 1

C=TEC 3150/ 1

D= Gas TEC 100

E= Hobby TEC 150 LT



Glue Gun

1. Investigation and Analysis Of Product

-£410



TEC 7300

Function
The product provides construction standard fixation to all surfaces including possibly sensitive ones, the fully adjustable gun can apply adhesive spray to a large area. The device uses a pneumatic hotmelt system and uses mains electricity to function. Settings can be changed allowing the glue to be applied in a precise fashion.

Features-
1. Built in speed loader
2. Heater control
3. Handle also serves as stand
4. Rear mounted spray pattern control knob.
5. Adjustable and changeable spray knob.
6. 110 volt heater for fast application.

Fitness For Purpose-
The speed loader eliminates reload time for continuous operation. The product is fully adjustable and perfectly balanced for precise application. It is fairly lightweight (1.5Kg). The highly efficient heater produces a melt rate of 5.25Kg/ hr.

Material Usage-
High grade Polypropylene is the primary material in this product due to its ease of manufacture, heat resistance and strength. Due to its dense nature the casing can be made thinner reducing cost.
Industrial Processes-
The products main body and major components were manufactured using a Compression moulding method on a large scale, this ensured a high quality finish and allowed concept models to be manufactured quickly and cheaply.

Ergonomics-
The product is as light as possible and is perfectly balanced. The stand allows the user to grab the device with ease and it fits comfortably into the users hand. Operation is simple and adjustments can be made however the power cable restricts movement.

Aesthetics-
The product is designed to be lightweight, portable and efficient but sacrifices aesthetics for efficiency. The stand and speed loader distort the otherwise smooth curvature of the design. The housing is simple but is not distinctive, this disadvantages it in the market. However, the gloss finish is of a professional standard, and the gun fits in well within a working environment.

Function-
The product is designed specifically for hobby and craft use; with this in mind its key aspects are value for money, reliability and ease of use. The gun uses readily available standard issue glue sticks, and operation is simple and safe. The heat chamber is very efficient for a gun of this type producing a melt rate of 400g/ hr.

Features-
1. Rear glue loading mechanism.
2. Trigger positioned to minimised effort required to operate.
3. Handle serves as stand.
4. Slim design allows good visibility and precise application.
5. Highly Efficient heater for gun of this type.

Fitness For Purpose-
The product is lightweight (1.15kg) however the front heavy balance affects otherwise precise application. Its slim design gives excellent visibility and takes only ten minutes to reach operating temperature.

Material Usage-
The casing is made from a low grade Melamine formaldehyde (MF), it is relatively strong and lightweight, however, it is vulnerable to impacts. It was mainly chosen for its ease of manufacture. The trigger and stand wire made from a higher grade of MF to improve strength and resistance to impacts.
Industrial Processes-
The product was manufactured with price being of key importance; therefore all components were made using an injection moulding process. This allowed for cheap mass scale production despite high set up costs.

Ergonomics-
The product is very easy to operate and is lightweight however the trigger restricts movement and the product doesn't fit comfortably into the users hand. The handle doubles as a stand however this also disrupts balance. The trigger is arched to fit the users fingers.

Aesthetics-
The slim simplistic design lacks curvature but all lines are parallel and give the gun a professional appearance; the wires are also parallel with the handle. The yellow colour is bright and catches the eye. However the stand locks vision and restricts movement.

-£10



Holby TEC 150

-£210



Function-
The product is a heavy duty glue gun ideal as a production tool and for product assembly. The product is designed to outperform all other glue guns on this type. The product runs on mains electricity and uses 2 150 watt stainless steel cartridge heaters. The product is

Features-
1. Glue cartridges are rear loaded slowing production.
2. Requires mains electricity which makes application.
3. Handle also serves as stand.
4. Precise applicator allows for accuracy in use and clean cut off.

Fitness For Purpose-
The heaters are thermostatically controlled guaranteeing ease of use and produces a melt rate of up to 3.5kg/ hr. The handle also serves as a stand but the cable restricts movement. The product has a precise

Material Usage-
The casing is made using a dense polyamide (nylon). This is a strong shock resistant material that is also resistant to signs of fatigue. However, this is also a more expensive material and requires special machinery for moulding purposes. The trigger is made from a high grade, denser acrylic.
Industrial Processes-
The main body was manufactured using a specialised extrusion moulding

The product is as light as possible and is perfectly balanced. The stand allows the user to grab the device with ease and it fits comfortably into the users hand. Operation is simple and adjustments can be made however the power cable restricts movement.

Aesthetics-
The product is not aesthetically pleasing due to its cumbersome and bulky design; aesthetics have been sacrificed for the sake of function and practicality. It is built to balance perfectly but this too affects aesthetics negatively distorting the design. The housing is simplistic in shape and lacks colour or curvature.

AS-Level Technology Coursework - Evaluation against Specification

> Function and Durability

The entire product has been made out of high quality materials, and I am confident that it will not degrade or fail in the near future. However, for safety reasons, I did not sharpen the cutting blade and therefore it may not actually cut pizzas. Despite this, if the product was to be translated to a large scale manufacturing process, the blade would be sharpened and fully functional.

> Safety

The pizza cutter now has a mechanism that means, when it is not in use, there will be an acrylic covering that will protect the user from most of the blade and from severe injury. However, due to the complexity of the internal mechanisms, the product is not dishwasher friendly though it is easy to disassemble and clean.

> Size

The final product is quite large for its use and may not be stored very easily. Also, it has exceeded my original specification length of 200mm by 80mm, although the width of the product is 20mm smaller than what was outlined. The product weighs just about 300 grams, conforming to my specification.

> Maintenance

The cutter is very easy to dismantle and clean; however, it is too complicated to be washed in a dishwasher, and therefore has to be hand-washed. This can be time consuming. All parts are easy to replace or be reproduced should the product become damaged.

> Production Methods

All processes employed in the production of this utility are relatively inexpensive and can be repeated while maintaining a high standard of quality. Also, processes such as vacuum forming and lathe work can be replicated on a large scale with ease due to CNC. The processes that I used were all available to me.

> Materials

My product is made of standard materials, and all materials that I used are of standard sizes. They were all relatively inexpensive and can be easily cleaned and maintained.

> Cost

The product cost £5 to produce, and if it was to be introduced to the kitchen utility market, it would be sold at roughly £10.

> Aesthetics

With reference to its aesthetic qualities, my product does look quite stylish and it fits into the modern kitchen surroundings well. However, I have only used black and grey as the colour of my product and as a result, the lack of brightness and variation affect its visual appeal.

I feel that my product is in proportion, although the handle is quite large compared to the rest of it.

> Ergonomics

Due to the shaped contours of the handle, the product is very comfortable to hold and is very easy to operate. The guard functions very smoothly and engages and disengages easily.

> Time

The completed product was manufactured by end of April 2010.

AS-Level Technology Coursework - Future Modifications

In this section, I will look at what I would change within my product. I will convey such changes through the use of solidworks illustrations.

- 1) The first modification I would make is to the blade cover. I would adjust the shape as shown in the below illustration (fig 1). This would involve moving the hole position for the connecting rod, creating a wider range of movement, and changing the shape so that it covers the blade entirely.



Fig 1

- 2) The second modification that I would make is to alter the design of the carriage. At the moment, there is only one thin strip of acrylic keeping the slider steady. I would add another above to inhibit the slider's ability to move upwards. This would greatly improve the ergonomics of the pizza cutter.



Fig 2

- 3) Fig 3, shows the third modification that I would make to the pizza cutter. Here, I recessed the endpin, allowing for a more comfortable grip and a more aesthetically appealing design.



Fig 3



AS-Level Technology Coursework - Testing (2)



➤ Testing of Function and Durability

For safety reasons, I was unable to sharpen the blade of the pizza cutter to the point that it would be able to cut the pizza. Therefore I was unable to test it against this aspect of my specification.
However, should it be sharpened, it would definitely be able to cut through pizza or any other food usually cut by this product.



The product is made out of strong, durable materials, so I am confident that it will not degrade quickly, and it will be able to carry out its task without failure.



I have also tested the bottle opening abilities of my product. As shown, I have made an aluminium "church-key" style bottle opener and added it to the rear end of the pizza cutter as a secondary function.

This addition works very well and will open the bottle. However, aluminium is not the best choice for this operation due to its poor strength. When opening the bottle the aluminium bent slightly and may break with further use. If I were to repeat the manufacturing, I would choose a different, stronger, material.



➤ Testing of Maintenance



As shown in this photograph (used before to show materials), the product is easy to dismantle and easy to clean. Also, the mechanical fixtures are made out of common components of standard sizes, and therefore are easy to replace.

If some components however, such as the blade cover or handle, are broken or damaged beyond repair, then the purchase of a new product may be required.

➤ Testing of Production Methods

All of the production methods that I have used to manufacture this product can be replicated on a large scale. This includes processes such as vacuum forming and lathe work, all of which can be achieved through the use of Computer Numeric Control (CNC).
The production methods that I used are all relatively inexpensive to carry out.

➤ Testing of Size

In my specification, I established that the size of the pizza cutter was to be no longer than 200mm, and no wider than 50mm.
With regards to the final product, I have kept within the width guidelines by 20mm; however, I have exceeded the length by 80mm.



AS-Level Technology Coursework - Testing



> Testing of Aesthetics

To the right is an image of my finished product. It shows the aesthetic qualities, which I am pleased with. The product has a smooth shape and no sharp or jagged edges. The colours are quite stylish and fit in well with any kitchen environment.

However, they are quite bland and there is not a wide range of different colours.

The knurled pins give the product a very professional quality and help improve the pizza cutter's aesthetics.



The size, shape, and proportions of the pizza cutter are shown in the images to the left.

As you can see, the handle is quite large and is slightly out of proportion to the rest of the product. However, the blade and blade cover are of suitable size and are in proportion to each other.

> Testing of Materials

The image on the right shows the wide range of common materials that I have used in the production of the pizza cutter.

The handle is made from rigid polystyrene, while the blade cover is made from acrylic. Both of these materials are relatively inexpensive and are very easy to maintain. The blade and connecting rod are both made from aluminium which is slightly more expensive, but is much stronger and durable than plastic.

Over all, the choice of material works well with the product.



> Testing of Ergonomics



The relation of the product to the user is shown in the two photographs to the left and to the right.

The two photos together show that the product is usable by both left and right handed people, and also shows the grip in use.

The shaped grip is very comfortable to hold and the spaces are sufficient for the user to hold the product easily.



The knurled thumb-operated pin end allows the user to operate the blade cover movement with ease, while the knurled pin holding the blade in place allows for easy dismantling for maintenance.

> Testing of Safety

The safety of the pizza cutter is one of the main areas that I wanted to improve upon. The three bottom images in this box show the fully constructed safety mechanism, while the box to the upper right shows the sliding mechanism in use.

The mechanism does work, and there is some unwanted movement when the thumb is in use.

These images show the blade cover, which is made to specification, which will provide safety. The blade cover does provide significant protection, but it does not cover the entire blade.

The cover and blade are both easy to clean.

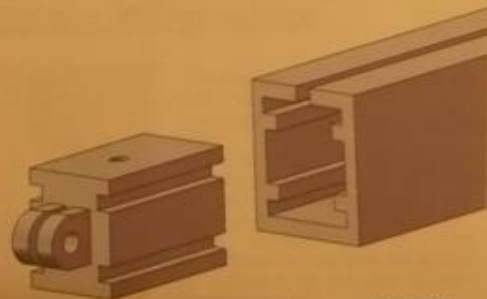


AS-Level Technology Coursework - Modifications during Manufacture

The first change that I made during manufacture was to the production of the blade cover. I had originally planned to use the coping saw to cut out the thin strip of black acrylic used to cut the blade. However, I attempted this several times, and each time the thin plastic snapped. In order to overcome this, I had to send the design off to be cut with a laser.



My second change was the design of the sliding mechanism. The slider was going to be made out of strips of acrylic built up to form a shape that would correspond to a similarly produced hole, allowing it to pass through with ease. I decided that this was overly complicated, and the design would be time consuming to create. Instead I chose to use a piece of square ABS tube to make it, along with an acrylic guides. I felt that this replicated the effect, but was much more simplistic and time efficient.



Old Design

ogy Coursework sting



> Testing of Materials

The image on the right shows the wide range of common materials that I have used in the production of the pizza cutter.

The handle is made from rigid polystyrene, while the blade cover is made from acrylic. Both of these materials are relatively inexpensive and are very easy to maintain. The blade and connecting rod are both made from aluminium which is slightly more expensive, but is much stronger and durable than plastic.

Overall, the choice of material works well with the product.



> Testing of Safety

The safety of the pizza cutter is one of the main areas that I wanted to improve upon. The three bottom images in the box show the fully constructed safety mechanism, while the box to the upper right shows the sliding mechanism in use.

The mechanism does work, and works well. There is some unwanted movement when the blade is pushed through the cover.

These images show the blade cover in use. The cover does provide significant protection, although the cover does not cover the entire blade.

The cover and blade are both easy to clean.





AS-Level Technology Coursework - Plan of Manufacture



Handle

- Once the design of the product has been drafted, I will transfer it to a block of manufactured board. This block will be made out of two pieces of 18mm thick MDF.
- When this has been completed, I will proceed to cut the shape of the pizza cutter out of the MDF, adding in any curves, chamfers, or holes. The resulting product will be split, and used as the two moulds for the vacuum forming process.
- Then, after the moulds have been vacuum formed, I will cut out any slots or holes for moving pieces and pins within the product. This includes the slots for the blade, the thumb operated pin, and the bottle opener, and the hole for the pin allowing the blade to rotate around its centre, and the pin for keeping the rear of the product securely fastened.

Blade

- To create the blade, I will cut a 2mm thick piece of aluminium into a circle with diameter 42mm, and a centre hole of 4mm.
- Then, I will finish the edges by filing, using emery cloth, and wet and drying them. The emery cloth and wet and dry process will be repeated on the face of the blade to remove any scratches and to finish it to a high standard.

Blade Cover

- The blade cover will be constructed by building up two layers of acrylic. The first layer will be cut out of grey acrylic and placed on a jig in order to make it into a semi-circle, of dimensions slightly larger than the blade.
- A 4mm hole will be drilled out of the acrylic of the pin to pass through, and all edges will be finished to a high standard.
- The second layer of acrylic will be made in a similar way. The piece of black acrylic will be placed in the same jig and finished in the same way. However, the entire centre of the semi circle will be removed leaving only a 2mm wide curve.

Carriage System

- To form the guides, I will cut out two identical rectangles out of grey acrylic. Then, I will stick two thinner rectangles to the bottom of one face on each rectangle.
- Once they have been finished, they will be glued onto the inner wall of each vacuum formed handle side.
- By cutting out a section of square ABS tube and inserting all of the required pins, I will make the slider. These will include a pin for the spring, for the connecting rod and another to keep the slider steady.
- The connecting rod will be cut and shaped from sheet aluminium. Two holes will be drilled in at each end. Some material will also be wasted to ensure the optimum range of motion.

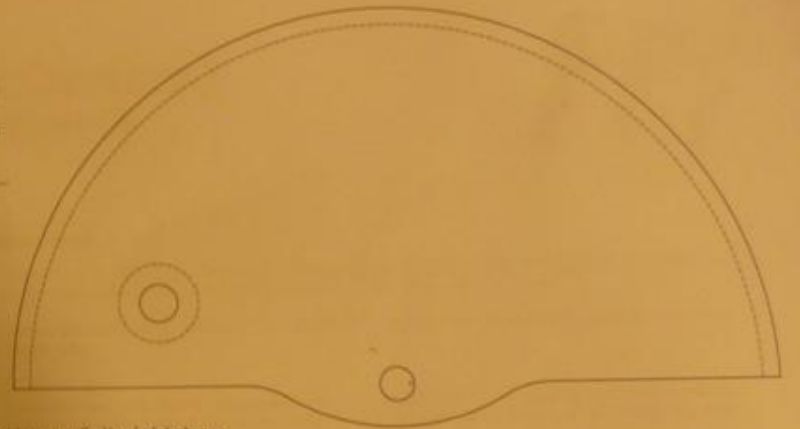
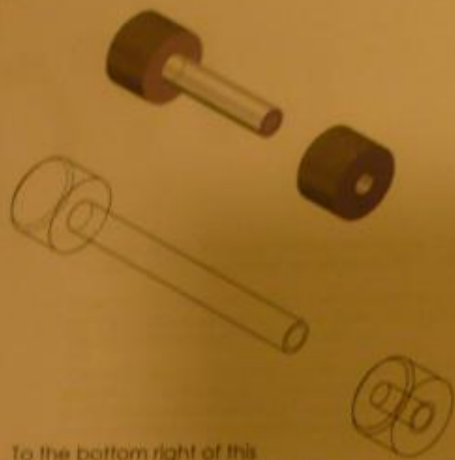
Pins

- The first pin is to travel through the centre of the blade. It will be made from aluminium in the lathe, and will have a knurled end with a chamfer.
- Part of the pin will be tapped, and the corresponding nut will be a replica of the bolt end.
- The second pin will be made in the same way as the first, except it will be longer and will travel through the handle near the bottom. This pin will also hold the bottle opener in place.

Bottle Opener

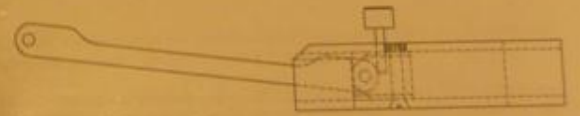
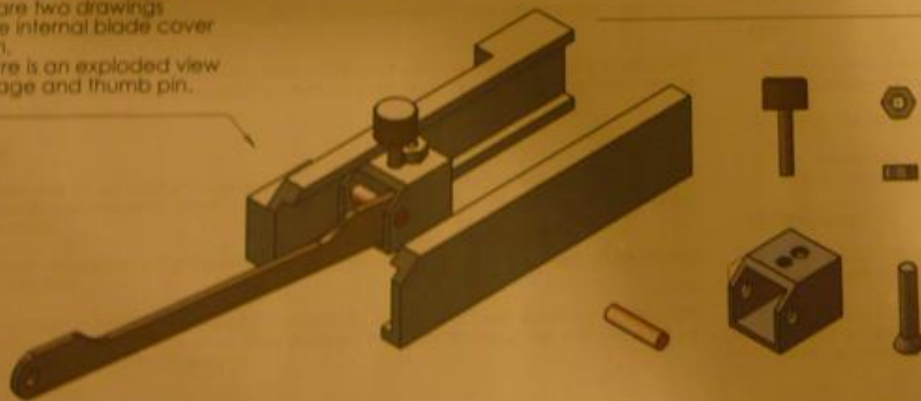
- After the pins have been made, I plan to cut the net shape for the opener from sheet aluminium and drill any holes. I will then bend the metal to form the final shape.
- I will cut out the wooden block from MDF and drill out the slots for the bottle opener. Then, I will screw the spring into the block, holding it in place. This block will be held inside the handle through the use of the second aforementioned pin.

To the left are two drawings of both pins used in my product. The top one for the blade pin, and the bottom for the rear of the handle. Both pins have corresponding knurled nuts.
 To show variation, both drawings are given in different styling formats.



To the above and immediately right show images of the blade cover and bottle opener respectively.

To the bottom right of this annotation, and centre right of this page, are two drawings showing the internal blade cover mechanism.
 In the centre is an exploded view of the carriage and thumb pin.



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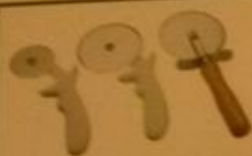
CHECK DIMENSIONS AND UNIT CONVERSIONS ARE BY DIMENSION SURFACES, PINS, CLEARANCES, LENGTH, WEIGHT, etc.				CHECK AND MARK SHARP EDGES	DO NOT SCALE DRAWINGS	REVISION
DRAWN DATE APPROV. DATE I.S.A.	NAME	SIGNATURE	DATE	TITLE	DWG NO.	SHEET 1 OF 1
				MATERIAL	drawing of parts	
				WEIGHT	SCALE: 1	



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REVISIONS		DATE	BY	APP'D

Working drawing 1



AS-Level Technology Coursework - Evaluation of Ideas



> Safety function

The main aspect of the pizza cutter that I want to improve is the safety of the device. I have several ideas on how to achieve this, and I will evaluate and choose the best one here.

The first idea is that the cover will be operated by hand only. This means that no internal or external mechanisms will be used. Although this is the simplest concept, it is not very practical and only serves as a safety device if the user remembers to enable it.

The second concept is that the blade cover will be opened by hand, and when finished, a spring will be released. This would then make the cover rotate covering the blade and protecting the user. This idea is more practical than the aforementioned hands only approach, however its design is more complicated and, like the above design, the user's hand is required to be quite close to the blade. This in itself is a safety hazard, and may cause injury to the consumer's fingers or hand.

My final idea is the most complex of all three, however, it is also the safest, most practical, and easiest to activate. Here, the blade cover is operated by an internal mechanism centred on a thumb-operated pin. The mechanism is not unlike a typical crank and slider, although the slider is used as the operating force, and the crank is the

> Shape

Comfort and visual appeal is the main aspect of the design that shape affects. My objective is to make a design with the highest possible aesthetic and ergonomic qualities.

The first design that I will evaluate is the straight handle. This would be the easiest design to manufacture and ergonomically efficient, however, its aesthetic appeal would be quite low.

The second concept is that of a "bend" in the handle. This would be very visually appealing and comfortable to hold, making it a better choice than a straight design. Despite this, a bend would make it very difficult to develop any internal mechanisms.

The final design is a compromise between the two above concepts. Here, the handle is just slightly bent. This keeps its aesthetic and ergonomic qualities, but allows for internal development.

Another development of shape is the handle's grip.

There are only two main differences in shape design of grip. The first concept is to not have a shaped handle at all. This would be the most efficient in terms of manufacture, but would have poor aesthetic and ergonomic qualities.

The second and final concept is to have the handle shaped to the user's hand. This is the most aesthetic and ergonomically viable choice, however, it is much more complicated to manufacture.

> Colour schemes

Colour is a very important aspect of design, and here, I hope to choose a scheme that will both suit my product and the environment that it will be used in.

The first colour scheme that I will evaluate is the monochrome green colour. Here, the entire product is coloured a dark shade of green. This design is quite stylish; however, the colour may not fit in well within kitchen surroundings, and people with colour preferences may choose to pass it up for a colour they like.

The second scheme is a mixture of grey and black, both of which are neutral colours. Grey and black both go with each other very well and fit into the kitchen environment. Despite this, both are quite bland and not very visually appealing.

The third and final concept of colour is to use two shades of blue. Like the first idea, this would be more stylish than just black and grey, but may not fit into the kitchen surroundings well and purchase will always depend on colour preferences. However, it is the most visually stimulating out of all three ideas.

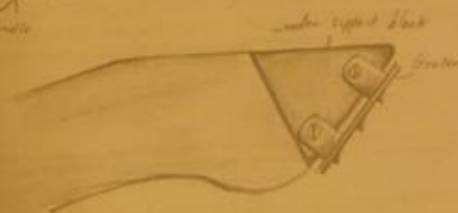
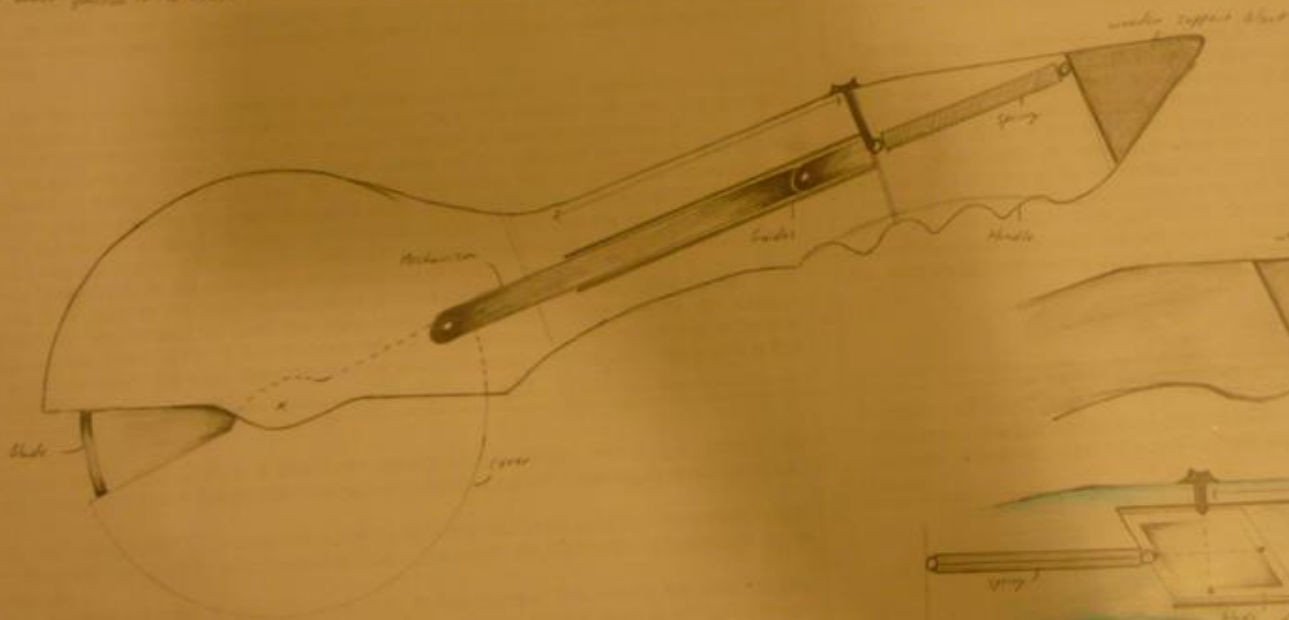
> Second function

I have already explored the evaluation of several secondary functions for the product previously. These include a miniature cheese grater, a Stanley-style knife, and a bottle opener.

As Low Technology - Concept Study / 1000/1000 Room Cooler (1)

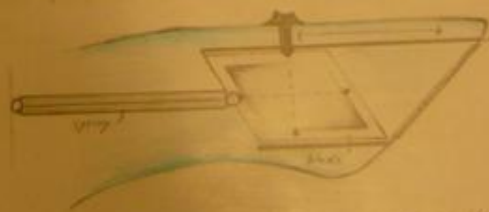
INTERNAL MECHANISMS

The page sketches have to internal mechanisms for the press with wind used, and also expand on some ideas for an added function to the device.



① Choke Brake

This idea can help in the preparation of the press, however, the water will have to be kept small. As a result, this may be an impractical design.



② Sliding Blade

This pump is more practical than the choke gate. However, it will need to be tested.

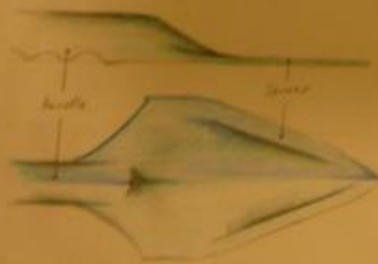


③ Bottle Opener

This is a 12 inch pressure die and will need to be used. The die of the wind press is very common. The die will be the pressure range and will require the application.



Two different handle shapes are shown in the above sketches. The first shows a more curved shape, while the second has more of an angled upward. The second shape would be more experimentally efficient, however, the first shape would be easier to form.



Here, a groove has been added to the rear of the piece cutter handle. Like the green steel version (shown to the left), this would give the product an additional function.

In the drawing below, I have incorporated the shaped handle into the cover. The reason that the small groove is similar, even to steel, and easier to use. The cover could be either formed as made from sheets' except. The cover formed method would be easier to apply, and would create a more aesthetically appealing product.

Here there has been a version of the same idea, in both directions - a piece like cover is incorporated into the design and shape of the piece cutter.

The first design has the cover formed into the blade cover, while the second version has it added to the rear end of the handle.

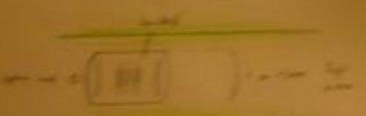
This addition would give the piece cutter a second function.



The Leaf Technology: Growth and Structure - Basic Lecture



A general plant anatomy subject to use from the top of the leaf and the base. It is possible to see some of the features when the leaf is cut in half to show the structure. This diagram is repeated by a similar one to illustrate the same feature.



The vascular bundle is the main part of the leaf.

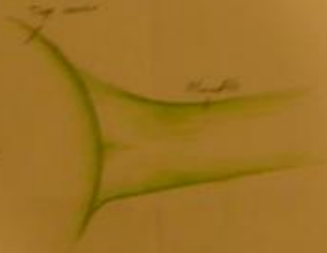


A vascular bundle is the main part of the leaf. It is possible to see some of the features when the leaf is cut in half to show the structure. This diagram is repeated by a similar one to illustrate the same feature.



The structure to the left shows how the vascular bundle is attached to the stem. The vascular bundle is made of xylem and phloem. It is possible to see some of the features when the leaf is cut in half to show the structure. This diagram is repeated by a similar one to illustrate the same feature.

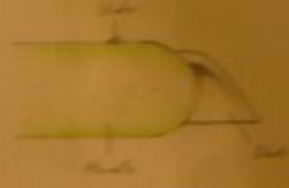
In this diagram, the vascular bundle is shown in detail. It is possible to see some of the features when the leaf is cut in half to show the structure. This diagram is repeated by a similar one to illustrate the same feature.



The vascular bundle is the main part of the leaf. It is possible to see some of the features when the leaf is cut in half to show the structure. This diagram is repeated by a similar one to illustrate the same feature.



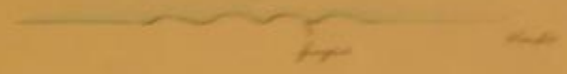
Internal view of vascular bundle



External view of vascular bundle



Side view



To represent the structure of the vascular bundle, I have drawn the vascular bundle in a more complete form. It is possible to see some of the features when the leaf is cut in half to show the structure. This diagram is repeated by a similar one to illustrate the same feature.

The vascular bundle is the main part of the leaf. It is possible to see some of the features when the leaf is cut in half to show the structure. This diagram is repeated by a similar one to illustrate the same feature.

The vascular bundle is the main part of the leaf. It is possible to see some of the features when the leaf is cut in half to show the structure. This diagram is repeated by a similar one to illustrate the same feature.



AS-Level Technology Coursework - Analysis Conclusion

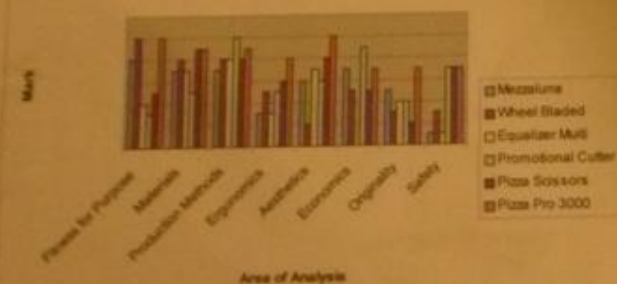
Name	Fitness for Purpose	Materials	Production Methods	Ergonomics	Aesthetics	Economics	Originality	Safety	Total (8)
Mezzaluna	8/10	7/10	7/10	3/10	6/10	7/10	3/10	3/10	44
Wheel Bladed	10/10	8/10	8/10	5/10	2/10	5/10	3/10	2/10	44
Equalizer Multi	4/10	7/10	8/10	3/10	7/10	0/10	4/10	1/10	37
Promotional Cutter	5/10	7/10	10/10	3/10	6/10	8/10	4/10	7/10	49
Pizza Scissors	3/10	8/10	8/10	4/10	8/10	5/10	2/10	7/10	60
Pizza Pro 3000	10/10	8/10	8/10	8/10	10/10	7/10	7/10	7/10	67



Product Choice

Although the wheel bladed pizza cutter wasn't the lowest scoring product above, I have chosen to use it as the basis of my coursework. This is because it is quite basic, and therefore offers the most opportunity for improvement and re-designing. The areas of improvement that I wish to expand upon are the aesthetics, ergonomics and safety. Also, I want to add another function to the product to create a wider range of uses for it.

Analysis Results



AS-Level Technology Coursework - Specification

> Function and Durability

The blade must be of a high standard of quality, and must be sharp enough to cut the pizza easily. The product must also be capable of carrying out this task without breakage or failure.

> Safety

The pizza cutter should have some form of mechanism that covers the blade when it is not in use. The product should be safe to use and be safe to clean/maintain.

> Size

The product must be small enough to store easily, but big enough to use with comfort. Dimensions must be less than 200 mm long by 50 mm wide. The product must weigh less than 500 grams.

> Maintenance

The product must be easy to access, and easy to clean. Any mechanical difficulties should be easy to fix without requiring the purchase of another product.

> Production Methods

Production methods used in the manufacturing of the pizza cutter must keep the final cost of the product down, but without sacrificing its quality. They must be easily translated to a large scale manufacturing process. The processes that I use must be available to me.

> Materials

The product should be made from standard materials and components to keep all costs at a minimum. Any materials should be chosen with the intention of selecting the best materials for the lowest price. All materials chosen should be easily cleaned and maintained.

> Cost

The product must cost no more than £10 to manufacture as the intended selling price would be around £10 - £15.

> Aesthetics

The product must be visually appealing, employing a range of attractive colours. The product must also look modern and stylish, fitting in to the modern kitchen environment. The product must be in proportion, including logos to aid its visual appearance.

> Ergonomics

The pizza cutter must be comfortable to hold and not cause pain or discomfort when in use. It must be easy to operate. The guard protecting the user from the blade must be able to engage and disengage easily, and do so only when the user wishes.

> Time

The completed product should be manufactured by end of March 2020.



AS-Level Technology Coursework

Analysis (2)



Criteria	Description	Mark	Criteria	Description	Mark	Criteria	Description	Mark
Function	The pizza cutter is designed to be a user who can produce the given cut of pizza without any issues, with the cutter being a replacement however. The blade is made from a material that provides a cut that will allow for cutting. Also, the product has a quite small and can take several rotations of the blade to cut the entire length of the pizza. This has been designed to be completed as it is easy to use, also, the product has a dial that allows you to cut to your desired size of pizza.	6/10	Form for purpose	The pizza cutter uses a different idea than the previous product in that instead of using an rotating or sliding blade, they use a drawing motion to cut the pizza. The blade is vertical pressure on the pizza or rolls to roll on the previous cutter. The wheel also have a small size wheel attached to the end to improve the ease of use. Unfortunately the size of the wheel cannot be adjusted. Also, problems can arise if the blade do not reach the centre of the pizza, sometimes it also improved as more of the user hands need to touch the food.	6/10	Form for purpose	The Pizz Pro 2000 is a wheel based pizza cutter with improved aesthetics, improved ergonomics and improved safety. The method of cutting the pizza is the same as it wheel based cutter, by using rotary motion instead of a roller's sharp motion. However, the new blade design provides change properties.	6/10
Materials	The entire product is made from new plastic or polycarbonate as it is easy and more light than other materials. The use of new material helps to keep the cost down and also use of new material is used to give them some resistance, it plastic blade is not as efficient as it changes over time.	6/10	Materials	The handle of the pizza, and the wheel, are made from ABS, a plastic commonly used in consumer products. This is a good choice of material as it has a good resistance to stress and fatigue. The two drawing blades are made from stainless steel, due to its corrosion resistant properties and its good strength. This is also a good choice of material.	6/10	Materials	The cutting disc, like the wheel based pizza cutter, is made from polycarbonate as it is easy to rotate and clean, and has a long life. The strength of the material is also a factor when choosing it. The handle part of the device is made from Acrylonitrile Butadiene Styrene (ABS), as it is easy to form and has a property of being cheap and lightweight. The drawing over the wheel is made from more ABS. Again, this is due to its capability of being lightweight.	6/10
Production method	Injection moulding is used for the making of the polycarbonate pizza cutter. This is the perfect choice of forming the product as it allows the exact same shape to be formed countless number of times with the exact same detail, and keep the cost down. Also, it allows the product to be created on a large scale, needed to cope with the large demand of the products in local markets. Injection moulding also creates an attractive finish, without the need for painting, and removes the need for assembly.	6/10	Production method	The ABS handle is injection moulded, as is the plastic wheel, and it is a quick and easy method of producing a product on a large scale. The same design can be replicated over and over again, while keeping any cost at a minimum. Therefore it is a suitable choice of production technique. Drawing from steel provides steel is a good production method for the blades as it can be completely controlled on a large scale, leaving cost of production, and therefore the product down, also it automatically protects the blades.	6/10	Production method	The handle of the cutter is injection moulded, as this can be repeated thousands of times with the same detail as the first, and give an attractive finish. Also, it is a relatively cheap process and can reduce the cost of the final product. Therefore it is a good choice of production. The drawing of the blade is also injection moulded for the same reasons. The disc is drawn from steel stainless steel and its improved properties allow it to be used to cut the pizza. The process is also a good process as it keeps the cost down, while not affecting the pizza cutter's ability to carry out its function.	6/10
Ergonomics	A shaped section of the pizza cutter has been incorporated into the mould. However, the handle section is still quite thin and can be uncomfortable to grip. No real support has been given to the rest of the hand, therefore the ergonomics appear poor. Despite this, the product is lightweight and easy to clean, maintain, improve the ergonomics.	6/10	Ergonomics	The handle are ergonomically comfortable to hold. However, the grip could be much improved by adding the handle a raised shape. Also, a very good aspect of the product ergonomics is that it is suitable for left handed users. The roller attached to the wheel any comes in one size, and therefore, it could be difficult when cutting a large pizza. This is a poor design of ergonomics.	6/10	Ergonomics	The handle has been developed more than the regular pizza cutter to be more comfortable when it is used. Using the product for gripping the handle, the Pizz Pro 2000 uses an eye through the centre of the user's hand. The roller shape also has a reduced weight, making it more comfortable to hold, and easier to use.	6/10
Aesthetics	The product is available in several different colour depending on the customer's choice. These colours help improve the aesthetic appeal of the product, and the customer is confident that the customer is satisfied with the product. However, some may find the choice of bright colours as 'basic' and/or less modern.	6/10	Aesthetics	The aesthetic appeal of the product is actually quite high. All of the colours are rounded and the drawing design creates a modern look. The colour scheme of black, green and silver improve the aesthetic even further. The product also seems to be in proportion to itself, and it fits within the environment of a modern kitchen.	6/10	Aesthetics	The main colour being the Pizz Pro 2000 is its aesthetics. It has been designed to look like a circular one, and in doing so, it has really increased the number of people who would purchase the product. The use of blue has also made the product more attractive, increasing its aesthetic appeal. However, the overall design of the product does not suit everyone, and it is not modern enough to suit a modern kitchen environment.	6/10
Economics	The Pizz Pro 2000 hand-cranked pizza cutter has been designed to be a cost-effective product. They are very cheap, however they can only be bought in bulk and the quality and design of the product have been compromised to keep the price as low as possible. Despite this, the pizza cutter is still a good value for money.	6/10	Economics	The use of production methods such as injection moulding has helped to lower the cost of the pizza cutter. However, the pizza cutter cost the same as a regular wheel based pizza cutter (approximately 10 pounds), but it is harder to use, harder to store, and harder to find in shops.	6/10	Economics	The cost of the pizza cutter meets the 6/10 mark, and is therefore more expensive than the regular pizza cutter. However, for that extra price you are getting a device that works so good, if not better, than a regular pizza cutter, and has really improved aesthetics. The safety of the product has also been improved.	6/10
Originality	The idea of using a pizza cutter as a replacement tool is not very original, and the design is heavily based from the existing market. However, the product has been created of a new size and the method and materials do seem to have some originality points.	6/10	Originality	The entire idea of the product is taken from the already existing pizza product. As the manufacturer has changed a rolling a serving pizza to the size of it, which, as noted above, can also be a criticism.	6/10	Originality	While a lot of the design has come from the original wheel based pizza cutter, the idea to make it look like a circular one is a new original idea.	6/10
Safety	The plastic blade used in the product is not as dangerous as steel blades and can with capability of cutting very thin slices. However, this is at the expense of its ability to carry out its function of cutting pizza.	6/10	Safety	While the blades are reduced when it is used, unlike the wheel or rotating type pizza cutters, when not in use, the blades are not exposed. Also, all edges of the product are rounded so as not to hurt the user.	6/10	Safety	Compared to a normal wheel based pizza cutter, the safety has been improved. The blade covering reduced the risk of injury. However, the bottom half of the blade is still exposed at all times.	6/10



AS-Level Technology Coursework - Analysis



Material	Information	Rating
Fitness for purpose	The Mezzaluna is a product designed for quick and easy cutting of steaks, ribs, and other food items. It excels at these tasks due mainly to its design. One of the main specifications for a pizza-cutting device is that it does not damage any of the toppings as an average knife would. The Mezzaluna achieves this through the oscillating motion needed to operate it. The only downside is that the Mezzaluna is only capable of cutting pizza either the same size, or smaller than it. Also, the device is limited to the one function of cutting. As the device is rather large it can be difficult to store.	6/10
Materials	The handles are made out of wood, with brass rings attaching it to the stainless steel blade. Stainless steel is a good choice of material due to its resistance to corrosion and its cutting properties. Wood and brass are not great choices for handles as they can be uncomfortable, and are difficult to wash and maintain. The use of stainless steel keeps the cost of the product relatively low.	7/10
Production methods	The wooden handles are turned on a lathe, which is a suitable choice of production, however, this can be hard to replicate on a large scale without CNC. The blade rings are turned on a lathe, while the blade is cut and finished from sheet metal. These latter are suitable techniques as casting yields an attractive and strong material, while sheet stainless steel can be cut to a desired shape on a large scale.	7/10
Ergonomics	The wooden handles are poorly shaped and are quite small, therefore can be difficult to use. However, the mezzaluna is a simple product to use and does not require any instructions. Another aspect of ergonomics is that the mezzaluna requires quite a lot of effort to operate it due to its size and large weight. Also, it can only be operated using both hands.	3/10
Aesthetics	Despite the lack of good ergonomics, the combination of wood and brass creates a product with good aesthetics. However, the small handles make it seem out of proportion to the rest of the product, as does the thinner sections of the blade. There is little use of bright or attractive colours, but the wood gives it a more traditional feel.	8/10
Economics	The Mezzaluna cutting device usually costs close to twenty-five pounds (£25). This may seem quite high, but for this price you get a device that can not only cut pizza without damaging the toppings, but can cut almost any food or other item.	7/10
Originality	As mentioned above, the Mezzaluna is quite a traditional product, although some more modern versions have incorporated greater aesthetic and ergonomic appeal, and improved the safety precautions.	5/10
Safety	There are virtually no safety features on this product. The large blade is exposed at all times and is capable of causing serious injury.	1/10

Wheel Bladed Pizza Cutter	Information	Rating
Fitness for purpose	The type of pizza cutter has been designed for the cutting of pizza with ease and without damaging any of the toppings. The rotating blade allows the cutter to glide over the pizza and cutting it with ease, opposite to the linear cutting of a regular knife.	10/10
Materials	The ABS handle is a suitable choice of material as it is easily available, easy to form, and is cost effective. The blade, like the Mezzaluna, is made from stainless steel due to its corrosion-resistant properties and ability to cut easily. The centre pin is also made from stainless steel.	8/10
Production methods	The plastic handle is made from injection moulded ABS and is a suitable choice of production as it can keep the cost of the product down and can produce the product on a large scale. The cutting disc is cut from sheet stainless steel and is sharpened around the edges to give it its cutting qualities. Part such as the disc pin are made from stainless steel and are turned in the lathe.	8/10
Ergonomics	The handle of the pizza cutter shown has been partially shaped to fit the user's hand, however, other than a round handle and a small 'cut-off' for the user thumb, the ergonomics are quite poor. A positive aspect of ergonomics within this product is the efforted hole, designed for the storage of the product on a hook.	5/10
Aesthetics	This pizza cutter in general is quite bland, however, the product is in proportion to itself, and it is balanced well. Despite this, the colour and style of the product are poor examples of modern aesthetic design. Environment is an important factor when considering aesthetic appeal. As the product does not fit in with a modern kitchen, the aesthetic appeal suffers.	2/10
Economics	The wheel pizza cutter can cost around ten pounds (£10). However, within this product, it seems that design and ergonomics have been sacrificed in order to keep the cost down. Much of the pizza cutter is made using standard components.	5/10
Originality	There is some variation between existing wheel pizza cutters, but this one seems very similar to others already on the market. Also, there are variations with improved design features, but cost the same, such as the Raymond Blanc Anolon Pizza Cutter.	3/10
Safety	There has been a 'lid' incorporated into the design of this product, which acts as a safety feature. Despite this, the blade is still left uncovered and exposed when in use. Also, the blade is easily accessed by young children, increasing the risk of injury.	3/10

Multi-blade Pizza Cutter	Information	Rating
Fitness for purpose	The multi-blade is very good at cutting pizza due to the press blades and oscillating motion. However, the cutting qualities of the multi-blade are linked to the size of the pizza. If the pizza is larger than the device, it will be unable to cut it. An added disadvantage is that the product can only slice the pizza into eight slices, as there is no way to adjust the number of slices, except by another product. However, the wooden base is suited to its purpose as it was to maintain.	6/10
Materials	The multi-blade has been created mainly out of stainless steel, which is a good choice of material as stainless steel is easy to clean and maintain and is corrosion-resistant as well. However, using it as a handle is not a good idea as it can be cold and uncomfortable to operate. The base for the device has been made from maple, with a handle left on one side for easy carrying. Maple is a hard wood and therefore is a suitable choice of material to use as a cutting board.	7/10
Production methods	The round ring handles of the multi-blade are extruded, bent, and spot-welded together to form the handles and connectors of the blades. This is a good production method as the handle is a long uniform device, perfect for extruding. The wooden base is cut from a board of maple and sanded round the edges, which can be replicated for a machine, keeping costs of the final product down. The eight blades are cut from sheet stainless steel and sharpened at the edges. The stainless steel parts are polished and the wooden board is varnished to give it an attractive finish.	8/10
Ergonomics	The ergonomics of this product are very poor. The handle is made from metal, which can be cold and uncomfortable to grip. Also, the handles are quite thin, creating difficulties when using the product. In addition to this, the handle of the cutting board is small, thin, and when the product is on a hot surface, it can be hard to pick up as there is no way to slide under it. Despite this, the low amount of materials used in the product keep the weight of it down.	3/10
Aesthetics	Despite the poor ergonomics, the product is quite modern in appearance and is quite attractive, due to the polishing and varnishing of the materials used in its production. However, it also looks quite dangerous, due to the large number of metal blades. Some people may find this aesthetically unappealing, especially as the handles are out of proportion to the rest of the product, and there is very sparse use of colour.	7/10
Economics	The multi-blade can cost between one hundred and twenty pounds (£100 to one hundred and fifty pounds (£150), depending on the size, which is undoubtedly expensive for a product like this. Especially considering that the production methods are generally low cost, and that standard materials are used.	5/10
Originality	Although the idea of an equal cutting device is quite original, much of the design has been developed from the Mezzaluna. However, the Mezzaluna does this job as well, is easier to store, and is relatively cheaper.	4/10
Safety	Very few safety features have been included in this product. All of the blades are exposed at all times, and when in use, the user's hands are dangerously close to the blades.	1/10



AS-Level Technology Coursework - Investigation



My name is Claran Magee and this is my year thirteen, AS-level Technology coursework. Within this project I will be investigating and improving an existing product. To carry out this task, I have chosen to investigate, improve and manufacture a pizza cutter. In total, this coursework will be worth 50% of my AS-level grade.



Mezzaluna

The first device I have chosen to investigate is the mezzaluna, Italian for 'half moon'. This blade uses a rocking motion to cut the pizza, and can be used for slicing vegetables or herbs.

While a regular knife uses a linear motion to cut the pizza, the mezzaluna uses an oscillating motion. This is because the linear motion of the knife can pull away at the pizza toppings.

The handles are made from mahogany and are turned on a lathe to form the round shape. The wood is then varnished to give it a suitable finish. The blade section is formed from stainless steel, due to its corrosion resistant properties, and given a very sharp edge in order to cut through a variety of food types. A brass ring joins the steel to the wood, and acts as a decorative aspect to the design. As you can see from the photograph, the company's logo has been printed on the blade.

The price of a mezzaluna varies, but mainly ranges between £10 and £20. They are also available with stainless steel and rubber handles, and some come with a pre-grooved board for ease of use.



Wheel Bladed Pizza Slicer

The second pizza cutter is the wheel bladed slicer, and is shown in the image to the left. Like the mezzaluna, this device

doesn't use linear motion to cut the pizza. Instead, the bladed wheel keeps a constant vertical pressure on the pizza, ensuring that no toppings are pulled away.

The handle of the pizza cutter is made from injection moulded Acrylonitrile Butadiene Styrene (ABS), with an circular hole, as seen on the handle, incorporated into the mould for improved storage functions. The circular blade is a thin stainless steel disc with a small hole drilled into the centre for attachment to the handle. This is achieved through the use of a small pin. This pin acts as a pivot for the disc to rotate freely.

A 'hill' (located at the top of the handle) is made from ABS and is also incorporated into the injection moulding mould. This particular design feature acts as a safety precaution to protect the user from the blade when in use.

Wheel bladed pizza cutters usually costs between £5 and £10 and can also be used for cutting jobs and craft work.



Equaliser Multi-Slicer

The multi-slicer is an eight bladed device used for cutting both pizza and pies into eight equal slices. A wooden cutting board of the same size often accompanies it. All of the blades operate with a slight curve so they can be rocked back and

forth over the pizza, applying a vertical pressure on it.

The two metal rings on the top of the multi-slicer are extruded and, through heating, are bent to give a perfect circle, and are spot welded to join the two ends together. The blades are cut from sheet stainless steel through shearing, which gives the blades a sharpened edge.

The wooden base is a circle cut from maple (a hardwood), with a single handle left on to make it easier to lift.

The multi-slicer can cost upwards of £120, rising to £150 for larger sizes (to accommodate larger pizzas). Also, variations with different number of blades are available.



JH-Studio Promotional Pizza Cutter

This is a promotional tool designed to be low cost, low maintenance, and easy to produce. The oscillating motion of the plastic 'blade' is used to slice the pizza without removing or dislodging any toppings.

The example shown above is injection moulded from a non-toxic plastic such as ABS, with finger and thumb slots for added ease of use. The name of a company, including some contact details, can be printed on the top of this product as a means of advertising. This has probably been carried out using a vinyl cutter.

The use of plastic in this product means that it is a highly safe product, however, it also means that it cannot be sharpened.

This product is designed to be given away as promotion for a company or service. They can be bought in bulk with a price of 60p each and a minimum purchase of 250 cutters, or 45p each with an order of 5000, and a range of colours are available.



Scissor Pizza Cutter

The scissor pizza cutter is essentially a specially designed pair of scissors, used for the cutting and serving of pizza. Like regular scissors, a first-class lever is used to close two straight stainless steel blades together in a clamping motion, shearing the pizza into its divisions.

A pizza server is attached to one side of the scissor mechanism to help with the lifting and serving of the now cut pizza slice. It can also act as a measurement tool to evenly calculate the size of the pizza slice.

The handle of the scissor mechanism is made from injection moulded ABS plastic and is attached to two stainless steel blades. The shearing action between the two blades is what gives the device most of its power. The server is made from ABS, and has been injection moulded to the desired shape.

This device usually costs between £5 and £10, depending on the distributor.



Pizza Pro 3000

This product is similar to the wheel bladed pizza cutter as they both use a stainless steel cutting disc to slice the pizza. However, this device is operated straight from the palm of the hand, meaning it has no extended handle.

The above product has been specifically designed to take the form of a circular saw, with a large, moulded ABS handle.

The sheet covering and handle are both made out of injection moulded ABS, with an injection moulded blade covering. The blade is a stainless steel disc, cut from sheet stainless steel through shearing, giving it a sharp edge. The logo of the manufacturer and the name of the product are printed on the blade. This product can cost around £10 depending on the retailer.



Finished Product

This page has pictures of the final product and its various features ready for display on sale.



The device is safely stored into a base where it can charge and be placed on display for shops. The base matches the design of the drill with the same colours and strips down it



The pivot is very simply made so that nothing much can go wrong with it. It holds the device in two positions and moves easily for one to the other. There are no bolts or anything showing aesthetically pleasing.



The trigger is on a spring so that it slides into the device to press a push electric motor to start. The new developed shape of the trigger and handle makes it more manageable and easier to use. The trigger returns to its original state once released and moves freely without and hassle.

Testing

Handle of the product

My product is easily held, but the circumference of the handle could be reduced to make it more comfortable to grip because I have found it does not feel natural.

Weight of the product

It is not very heavy but if weight was reduced through either using a different material or removing material, this could be done through making it smaller, and then the device would feel more natural.



The Features

The main feature of the Product is the pivot which allows the handle to rotate, which works well but with a little more thought and time could have been designed more efficiently. There could be something to hold it in place as my desired modifications indicate.



The Features

The second feature of the hand-held screwdriver was the trigger which I had designed to pivot back, but this did not work when I tried to design it and I was forced to modify it to function properly.



The Conclusion

In conclusion I can say my device works as a product which could be sold to customers for use, but it could be improved significantly. My product is in a prototype which could in the future be improved to work well on the market as a day to day usage tool.



Modifications

Modification 1

One of the main things I noticed when making my product was that the size was ever so slightly too big so I would need to tackle that problem by reducing the size but still keep it big enough to use easily and so that it still retains its stability and durability.



Modification 2

Another feature of the product that I noticed was flawed was the pivot which worked but need to be redesigned in a way that it could be released easier and could move more freely when needed.

Pin inserted



Modification 3

The third thing I thought could have been changed about the device was the feature on it. The product was simple, there could have been a feature as a revise rotation switch, as the battery was low. Most of all I needed an on/off switch as well.



Rotation direction switch

Modifications During Manufacturing

During the manufacturing of my project I ran into some problems which require the device to be modified so that it would perform better.

Modification 1

During the Manufacturing I came up with the idea of creating a stand or cradle for my product to house and store it efficiently, therefore I have incorporated drawings of it into the CAD drawings of my product.



Modification 2

I also decided to alter the trigger mechanism in the product so that it was no longer on a pivot because this was more complicated to make. Instead I have placed a spring behind the trigger so that it will still perform all the required tasks but be easier to manufacture.



Power screwdriver



The drill piece of the device was also constructed using the 4th axis on the CNC machine, but there were parts which would have been too difficult to do, so I had to chisel out the vents for the motor by hand, which was a bit of time as I had to have both sides of the model the exact same because it was made to be symmetrical.

Assembly and painting



These are pictures mostly of the priming stages before painting my model. And the final picture is of the finished handle after painting but still with the grips and trigger to be added.

Finished product



Evaluation Against Specification

- **Ergonomics of the handle**
 - It must be easy to use and user friendly
 - It is easily used
 - It must have and easily used operation trigger and on an off button which can be used in case something goes wrong with the product and the user needs the power to be shut down.
 - The trigger is very easily accessed and used simply
- **Ergonomics of the drill**
 - The product is easily transported as it will need to be regularly without causing harm to the user
 - The product is larger than expected but still manageable
 - My product must fit in with its required environment
 - The product fits in well with its natural work environment
 - The design must be made from recyclable materials so that if the product breaks it can be recycled
 - That not to cause damage to the environment
 - The product was made from materials which were available easily moved for use and must not put the user in risk of injury
 - All moving parts of the device must be secure and not run the risk of breaking causing injury to the user
 - All necessary safety precautions have been taken to ensure the user can just use the product without any of the above risks
- **Manufacturing**
 - My product will be designed so that it will be as easy as possible for me to manufacture
 - The product turned out more attractively than expected from the materials on the workstation

- **Safety**
 - To ensure my product is made as safe as possible, it will have to incorporate a number of things
 1. The power wire or any power source will need to be stored safely so that it does not put the user in any risk
 2. There must be no sharp edges on it so that once an injury has occurred it may have to be waterproof if it is to be used in a damp environment or in a damp location or in a damp environment so no electronic components which could cause the product to stop working or in a damp location or in a damp environment
 - 4. All moving parts of the device must be secure and not run the risk of breaking causing injury to the user
 - All necessary safety precautions have been taken to ensure the user can just use the product without any of the above risks
- **Maintenance**
 - My project will need to be designed so it is easily manufactured and its upkeep requires little work
 - The materials used are very basic and maintenance simple to do
 - As the user is not meant to be using the product for a long time, I had already gained a knowledge of the materials used in the part through already familiar with.
 - I should use materials that I am already familiar with.
- **Cost**
 - The design could be more expensive as an electrical level as it is not as simple as it could be
 - The product should be able to be manufactured so that it can be in the same price range as similar products on the market
 - The product can still be sold at a competitive price on the market
- **Function of the Trigger**
 - The product must function smoothly and efficiently
 - The mechanisms in the product work well, without hassle or any unexpected
- **Function of the Pivot**
 - The pivot must function properly and not be hazardous
 - Changing parts move freely and easily
 - It must do the job it was intended to do and not be dangerous
 - It does the job intended very well without any hazards
- **Anthropometrics for the handle**
 - The button on the product should be easily located by the user
 - The trigger to operate it is easily found and designed to work with
 - My product must be attractive to the person using it and fit into the environment of use
 - The product was a modern design to attract the modern person
 - It must be easy for the user to touch and hold therefore not sharp edges or no splinters if wood is used
 - The wood is sealed and the shape of the device is consider at the whole
- **Aesthetics of the handle**
 - The product has been designed to be modern looking and trendy from the start having a smooth touch given touch and stylish shaped trigger and grip
 - A very tall or wide product would be hard to work with
 - The product is proportionately balanced for use
 - I would like my product to remain in compact as possible but big enough so that it is not difficult to hold
 - The product is made from an aluminium alloy. It is not compact enough. It is not compact and more compact it would be easier to hold as well

- **Economics**
 - My design must be manufactured as inexpensively as possible
 - The design could be more expensive as an electrical level as it is not as simple as it could be
 - The product should be able to be manufactured so that it can be in the same price range as similar products on the market
 - The product can still be sold at a competitive price on the market
- **Function of the Trigger**
 - The product must function smoothly and efficiently
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 - The product was a modern design to attract the modern person
 - It must be easy for the user to touch and hold therefore not sharp edges or no splinters if wood is used
 - The wood is sealed and the shape of the device is consider at the whole
- **Aesthetics of the Product**
 - My product must be aesthetically pleasing to compete with 100's of other product that are on the market
 - The device is aesthetically pleasing, it fits in with its surrounding environment and is designed to be modern and eye catching to customers
 - Within the same structure there are grooves that are eye catching and give the device a modern look to it
 - The product must be modern and trendy
 - The product has been designed to be modern looking and trendy from the start having a smooth touch given touch and stylish shaped trigger and grip
 - A very tall or wide product would be hard to work with
 - The product is proportionately balanced for use
 - I would like my product to remain in compact as possible but big enough so that it is not difficult to hold
 - The product is made from an aluminium alloy. It is not compact enough. It is not compact and more compact it would be easier to hold as well

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Top of handle



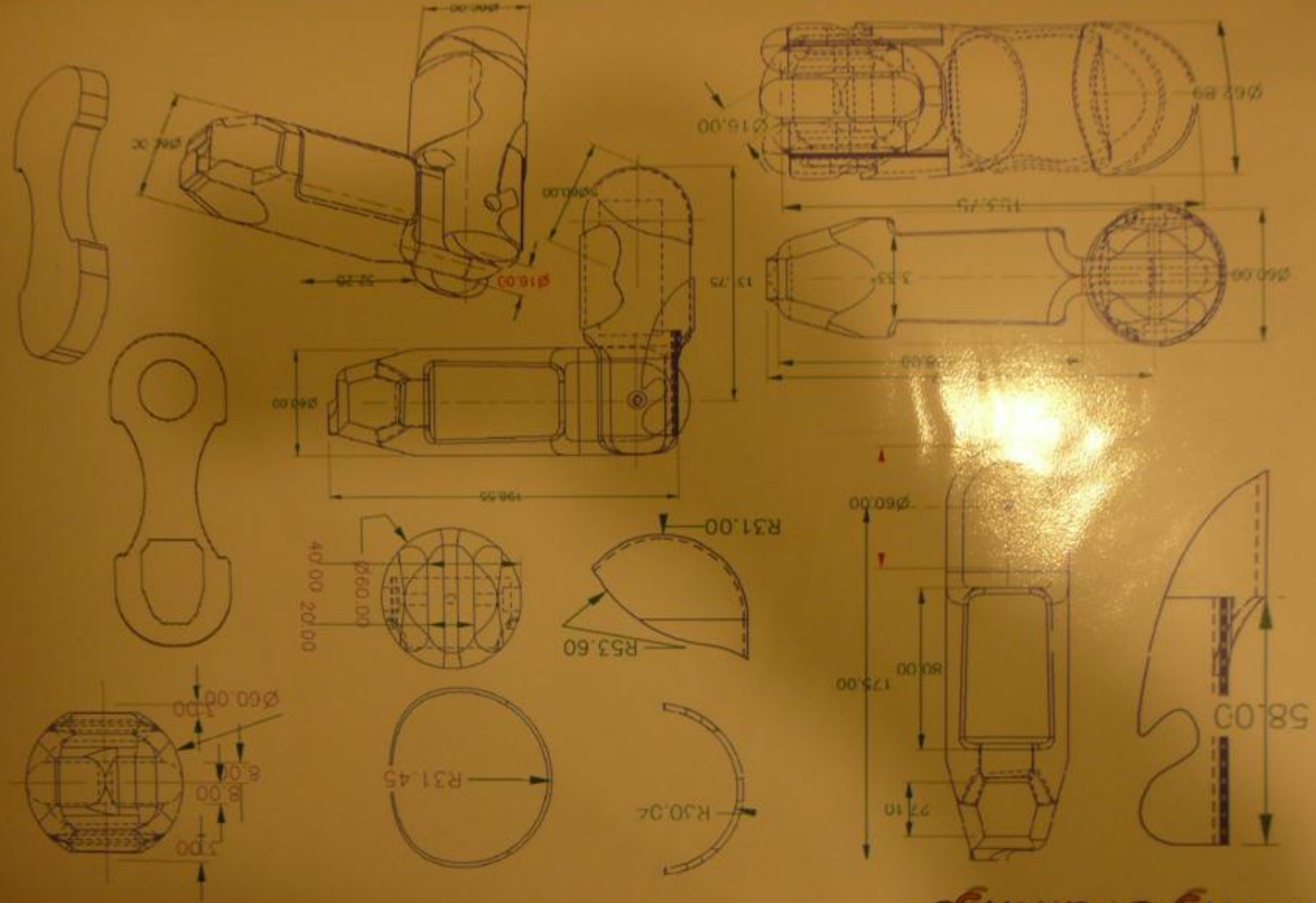
I had to divide the handle into three parts so that I could manufacture it successfully. It consisted of two identical part which were made in the CNC machine separately and then glued together to form the pivoting part of the handle.

The final part of the handle had to be made using the 4th axis on the CNC machine which rotated the MDF and cut out a circular shape for the bottom of the handle, with a slot out of it for the trigger mechanism which I was later going to construct.

Bottom of handle



Working Drawings



CAD Drawings



The main body of the drill piece will be made out of MDF but I will need to cut the air holes and pivot hole by hand after.



I have shaped the grips around the handle and will make it by hand out of rubber when the structure is made.



The trigger will be made after the structure so that it will fit freely into the groove cut out of the handle. It is shaped so that it is comfortable to use and to improve grip, grooves may be cut out of it.



The handle will be made from MDF and milled out in the centre for the trigger to swing back into it. A pivot will also be drilled out of the structure to connect the other drill piece onto it.



I have decided that my project, to finish it off, would look better with a stand or base. This would also be used to charge the device through a plug and as a place to store the device when it is not in use. To make the product fit comfortably into the station I will be using a foam or other soft material to hold the device in place.



CAD Drawings

Air slots
 These are to make sure the motor does not get too hot, they will be one of the last things I do, but I will have to find a way to cut these out the whole way through the product.

Grips
 The grips will be made of rubber sheets and cut to the right shape when the structure is moulded. I will shape them myself and adjust them if need be to make sure the device is comfortable to hold and carry.

Trigger
 I will have to make this to fit the structure and then fit a mechanism to it so that it will be able to operate freely and return to its original position, which will be on a pivot for the trigger to swing back, and something which will stop the trigger from going back too far.

Pivot Hole
 The pivot will consist of a screw or bolt through a hole which will be able to be tightened so that the device will not pivot when in use. The screw will also be able to change the shape of the device.

Assembly View
 This is how all the pieces of my product will fit together in the end.

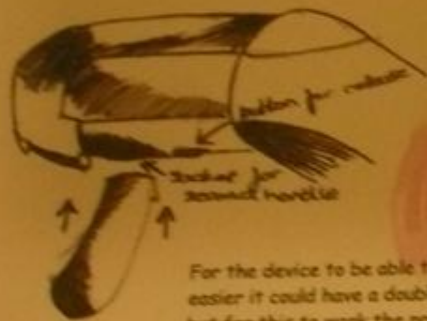
Rear View
 This is what the device will look like when assembled from the back, with the grip wrapped around for top.

Pivot
 To hold the two pieces together I will need to either cut out curves into the pivot so that it will lock into place when tightened. Another way to hold the device in place would be to put a layer of rubber in between the surfaces to create grip when tightened.

Front View
 This is what the front of the product will look like when it is in the original shape.



Double Grip



For the device to be able to be held easier it could have a double grip design, but for this to work the product may have to be long for it to be held comfortably

The second handle on the product could be removable so that it wouldn't always have to be used. A clip mechanism could be used to hold it in place and a push button release mechanism to disconnect it.

Grip Design and new shape concept



The Trigger



The trigger could be built into the handle so that instead of having to pull a button trigger the user would simply have to squeeze the handle and a piece would slide into the power button inside the handle.



The mechanism will use a spring loaded pin that will make the trigger return to its place after being pushed in

The grips will be placed so that it is comfortable to hold. The shape of the screwdriver has also been edited so that it is easier to handle and designed so it looks more modern.

While moving back the trigger will run into a trace which will guide it back smoothly and keep it in place, not allowing it to shift from side to side.

Concept Modifications

Handle Design



Battery Pack



The battery could be stored inside the handle and be removable so that you could charge it off a lead. The advantage of this is that you could have two batteries at once but the is advantage is that you could lose a battery when it is not in the device.



will be able to grip the pack in excess of pieces. The handle will be able to grip the pack fully.



The device will need to be docked onto some sort of station which will charge the battery while the screwdriver is not in use. This will need to incorporate the shape of the screwdriver so that it is held securely inside it. The docking station will then be powered by the mains.

Making the pivot further into the handle to allow better rotation would give the handle a bigger angle of pivot but the shape of the handle may also restrict it; therefore the shape will need altered also.

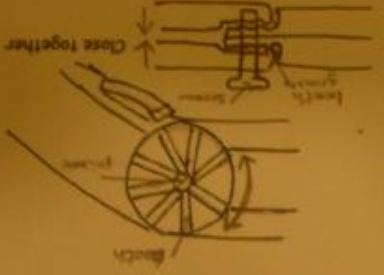


To hold the handle in place I would need to design some sort of teeth or gripping mechanism that I can tighten with a screw or such which will stop the handle from slipping out of position.

Chuck Nozzle



The handle will rotate about a circular pivot which will mean the final shape of the device will need to incorporate a circular pivot into it.



I could use the mechanism out of a standard drill. In this case I would need a key to tighten the screw piece into position, which is strong but time consuming. This could also mean standard drill pieces could be used with it.

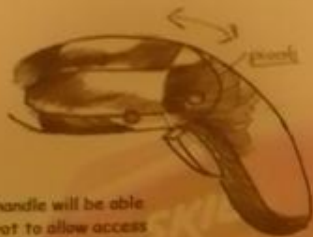
The other option is to keep the original mechanism in most hand held power screw drivers, which is a magnetic head which attracts to the metal of the screw piece to hold it securely. This is not so strong, but very fast to use.

Concept Sketches

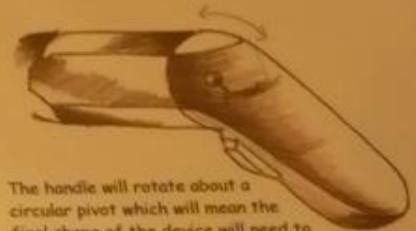
Handle Design



The handle will be able to pivot to allow access into hard to get places. This may not work because the handle be able to pivot fully



Making the pivot further into the handle to allow better rotation would give the handle a bigger angle of pivot but the shape of the handle may also restrict it; therefore the shape will need altered also.



The handle will rotate about a circular pivot which will mean the final shape of the device will need to incorporate a circular pivot into it.

Battery Pack

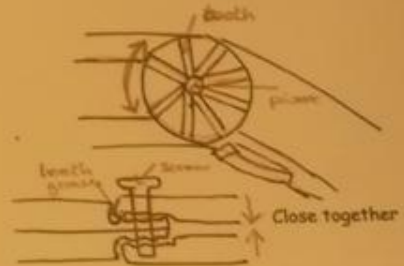


The battery could be stored inside the handle and be removable so that you could charge it off a lead. The advantage of this is that you could have two batteries at once but the is advantage is that you could lose a battery when it is not in the device



The device will need to be docked onto some sort of station which will charge the battery while the screwdriver is not in use. This will need to incorporate the shape of the screwdriver so that it is held securely inside it. The docking station will then be powered by the mains

To hold the handle in place I would need to design some sort of teeth or gripping mechanism that I can tighten with a screw or such which will stop the handle from slipping out of position.



Chuck Nozzle



I could use the mechanism out of a standard drill, the chuck. In this case I would need a key to tighten the screw piece into position, which is strong but time consuming. This could also mean standard drill pieces could be used with it.



The other option is to keep the original mechanism in place and held power screw drivers, which is a magnetic head which attracts to the metal of the screw piece to hold it securely. This is not so strong, but very fast to use.

Specification

- Ergonomics**
 - It must be easy to use and user friendly.
 - It must have and easily used operation trigger and on-off button which can be used in some product and the user needs the product to be shut down.
 - The product is easily transported to be shut down.
 - The button and triggers should be obvious place so allow easy access.
- Environment**
 - My product must fit in with its environment.
 - My product must be able to handle the sort of hardwearing environments it will be used in.
- Materials**
 - For this product I will use materials which are readily available to me in the workshop. The main materials produced are acrylic and MDF. I will make my product out of materials which are easily worked with, fairly inexpensive, easy transported, light but as strong as possible, costly cut and modified as possible. The finished product need modified.
 - I have to ensure that the products material costs are kept as low as possible.
- Manufacturing**
 - My product will be designed so that it will be as easy as possible for me to manufacture.
 - I should use materials that I am already familiar with.

- I need to be able to manufacture my product in a safe environment, following all the rules and regulations manufacture using materials available in the workshop.
- I need to be able to manufacture my complete project in a set number of hours.
- I need to pin out my manufacturing so that I do not face many problems.
- Maintenance**
 - I have to work out how many hours I would need to be working on the maintenance of my project each night.
 - The project will need to be designed so easily manufactured and its upkeep doesn't take up too much of the work.
 - My project needs to investigate into how I would need to cost my product and how it will affect people how buy the product.
- Safety**
 - To ensure my product is made as safe as possible, it will have to incorporate a number of things.
 - The power wire or any power source will need to be stored safely so that it does not put the user in any risk.
 - There must be no sharp edges on it so that once can injure themselves. It may have to be waterproof if it is to be used outside or in a damp environment so as no electronic are destroyed which could damage the product.
 - The device must not be too heavy for use and must not put the user as it will have to be easily moved.
 - All moving parts of the device must be secure and not run the risk of breaking causing injury to the user.
- Economics**
 - My design must be manufactured as inexpensively as possible.

Production plan

- Stages of manufacturing**
 - Split my cod drawing up into sized parts which would be able to be manufactured on the C/C machine.
 - Main Drill Piece(Made using the 4" axis)
 - Handle (which is split into 3 part)
 - The sides of the part
 - Bottom of the handle with trigger insert
 - Trigger.
 - Give the handle parts together, sand and prepare the surfaces of all the pieces for priming and painting, through the use of sander.
 - Prim the pieces before coating in several layers of paint.
 - Assemble the pieces and finishing touches (handle grips, trigger assembly, pivot)

Date
1/12/08
15/12/08
22/12/08
29/1/09

- The product should be able to be manufactured so that it can be in the same price range as similar products on the market.
- The product must not have the appearance of being too expensive in case of theft.
- The product must be durable and not easily destroyed, being able to with stand any wear and tear that it is going to face.
- Life and service**
 - The product must function smoothly and efficiently.
 - Moving parts must function properly and not be hazardous.
 - It must do the job it was intended to do and not be dangerous.
- Anthropometrics**
 - The buttons on the product should be easily located by the user.
 - They should be easily accessed from holding the drill comfortably.
- Function**
 - The product must be modern and trendy.
 - The product must be built to suit a size so that it can be easily used and transported.
 - A very tall or wide product would be hard to work with.
 - I would like my product to remain as compact as possible but big enough so that it is not difficult to hold.
 - The design will have to be modern as to appeal and be design in a way that it is comfortable to hold.
- Aesthetics**
 - My product must be attractive to the person using it and fit into its environment of use.
 - It must be easy for the user to touch and hold therefore not sharp edges or no splinters if wood is used.
 - My product must be aesthetically pleasing to compete with 100's of other product that are on the market.

Specification

Ergonomics of the handle

- It must be easy to use and user friendly
- It must have an easily used operation trigger and an on/off button which can be used in case something goes wrong with the product and the user needs the power to be shut down.
- The buttons and triggers should be in obvious place so allow easy access.

Ergonomics of the drill

- The product is easily transported so it will need to be regularly without causing harm to the user.

Environment

- My product must fit in with its required environment.
- The design must be made from recyclable materials so that if the product breaks it can be recycle so that not to cause damage to the environment.
- My product must be able to handle the sort of hardwearing environments it will be used in.

Materials

- For this product I will use materials which are readily available to me in the workshop, the main materials provided are acrylic and MDF.
- I will make my product out of materials which are easily worked with, fairly inexpensive, easily transported, light but as strong as possible, easily cut and modified should the finished product need modified.
- I have to ensure that the products material costs are kept as low as possible.

Manufacturing

- My product will be designed so that it will be as easy as possible for me to manufacture.
- I should use materials that I am already familiar with.

- I need to be able to manufacture my product in a safe environment, following all the rules and regulations
- The product should be able to be manufacture using materials available in the workshop.
- I need to be able to manufacture my complete project in a set number of hours.
- I need to plan out my manufacturing so that I do not face many problems.

Maintenance

- I have to work out how many hours I would need to be working on the maintenance of my project each night
- My project will need to be designed so it is easily maintain and its upkeep requires little work.
- I will have to investigate into how I would need to cost my product and how it will affect people how buy the product.

Safety

- To ensure my product is made as safe as possible, it will have to incorporate a number of things
 1. The power wire or any power source will need to be stored safely so that it does not put the user in any risk.
 2. There must be no sharp edges on it so that once can injure themselves. It may have to be waterproof if it is to be used outside or in a damp environment so as no electronic are destroyed which could damage the product.
 3. The device must not be too heavy as it will have to be easily moved for use and must not put the user in risk of injury.
 4. All moving parts of the device must be secure and not run the risk of breaking causing injury to the user.

Economics

- My design must be manufactured as inexpensively as possible.

- The product should be able to be manufactured so that it can be in the same price range as similar products on the market.
- The product must not have the appearance of being too expensive in case of theft.

Life and service of the handle

- The Handle must be durable and not easily destroyed, being able to with stand any wear and tear that it is going to face.

Function of the trigger

- The trigger must function smoothly and efficiently.

Function of the Pivot

- The pivot must function properly and not be hazardous.
- It must do the job it was intended to do and not be dangerous.

Anthropometrics for the handle

- The buttons on the product should be easily located by the user.
- They should be easily accessed from holding the drill comfortably.

Aesthetics of the handle

- My product must be attractive to the person using it and fit into its environment of use.
- It must be easy for the user to touch and hold therefore not sharp edges or no splinters if wood is used.
- The design will have to be modern so to appeal and be design in a way that it is comfortable to hold.
- The Handle must be built to not a size so that it can be easily used and transported.

Aesthetics of the Product

- My product must be aesthetically pleasing to compete with 100's of other product that are on the market.
- The product must be modern and trendy.
- A very tall or wide product would be hard to work with.
- I would like my product to remain as compact as possible but big enough so that it is not difficult to hold.

Production plan

Stages of manufacturing

1. Split my cad drawing up into sized parts which would be able to be manufactured on the CNC machine.
 - a. Main Drill Piece (Made using the 4th axis)
 - b. Handle (which is split into 3 part)
 - i. Two sides of the pivot
 - ii. Bottom of the handle with trigger insert
 - c. Trigger.
2. Glue the handle parts together, sand and prepare the surfaces of all the pieces for priming and painting, through the use of sander.
3. Prime the pieces before coating in several layers of paint.
4. Assemble the pieces and finishing touches (handle grips, trigger assembly, pivot)

Date

10/12/08

15/12/08

22/12/08

29/1/09



Bosch IXO III Screwdriver
0603959170 3.6V



Function & Purpose
This is a small and more powerful screwdriver. Able to get into hard to reach areas. Built in rechargeable battery which will never lose battery life, allowing the product to be portable. Forward and reverse ability for retracting screws. Reversible screw heads allowing the user to change the size of screw head in accordance to the screw he is using. The head is very light only weighing 0.2 kgs.
Moderniser priced at £28.98

- Features**
1. Comfortable handle for grip to ensure
 2. Change level indicator to show the user
 3. Trigger for easy operation and use
 4. Switch to alter the direction of
 5. Reversible screw head for different sizes of screw.

Fitness for purpose
Lithium-ion technology allows you to pick up the tool after a few months without use and it's still ready to go.
Able to change the size of screw head and portable for household use.
The consumer would want the product to be reliable and last in comparison to more he is paying for it.
Contracting others to make it stand out giving it a modern and stylish design.
Smooth design to look more on par. The handle has a curve shaped to fit into the hands of the consumer more easily and it also includes a grip which makes it easier to hold with a design to be more appealing to people.

Ergonomics
The handle is shaped to fit human hand with grip to give it comfort and extra hard with the tool after a few months use. The operation trigger is comfortable to use. Product has been designed with a purpose of household use in mind therefore very small, lightweight and portable.
Slightly secure and very comfy.
For faster things to go along with it.
Aesthetics
Contracting others to make it stand out giving it a modern and stylish design.
Smooth design to look more on par. The handle has a curve shaped to fit into the hands of the consumer more easily and it also includes a grip which makes it easier to hold with a design to be more appealing to people.

Bosch IXO III Screwdriver
0603959170 3.6V



Function & Purpose
This model offers a more 'high' for assembly and fastening work than other VIXX battery which is high torque driving torque applications such as hand demolition drilling other VIXX products. Hex shank collar for easy bit change. The tool speed 0.25/0.62rpm. Priced reasonably at £49.98

- Features**
1. Removable battery for recharging and use
 2. Rings on the handle to ensure a comfortable hold on the tool
 3. Trigger mechanism for operating the product comfortably
 4. Switch for stirring in between the type
 5. Hex shank collar for easy bit change.

Fitness for purpose
Able to change the size of screw head in accordance to the screw he is using. The head is very light only weighing 0.2 kgs.
Moderniser priced at £28.98

- Material usage**
- Injection moulding like Phenolic resin commonly used to use exacted appearance and lasting in accordance of price
 - The product should be reliable and long lasting in accordance of price
 - Battery which can be used in different jobs
 - Small and portable for household use
 - 2 different speeds for different sorts of

Ergonomics
The handle is long and is easy to hold as more of the weight is concentrated on this part, making it easier for human to hold and control.
This compact driver is small enough to fit in the kitchen drawer, but packs plenty of power to take on projects all over the house.
Aesthetics
This has powerful screw driving in a convenient, compact design, with bright contrasting colour. Handle has a grip as it with human hand size taken into consideration so that it is good when the person using the drill would place his or her hand.

Product	Function and Purpose	Fitness for Purpose	Ergonomics	Aesthetics	Total
Product 1	10/10	9/10	7/10	7/10	33/40
Product 2	9/10	9/10	8/10	7/10	35/40
Product 3	7/10	7/10	6/10	5/10	25/40
Product 4	9/10	9/10	9/10	8/10	36/40
Product 5	10/10	8/10	8/10	8/10	34/40



Investigation and Analysis of Product

Makita Auto-Feed Screwdriver 6844/1 110V



Function & Purpose

The manufacturer would have designed this product to be able to be used on an industrial scale to install and remove screws successfully into a number of carbon surfaces or materials. With this in mind the product must be powerful enough to do such a job, which is why it has no load speeds and operates at 1,000 rpm. As it is a bigger and more powerful product it also can hold magazines of dry wall screws up to a 75mm. Philips and square head bits are both applied. The surface depth is variable so that different sizes of screws can be inserted. The product is coated and uses 10 volts. Its weight is 2.3kg. This product would be more industrially used because of its size.

Features

1. Handle for gripping comfortably
2. Heavy duty power cord
3. Screws are feed into the machine via the slot by a magazine.
4. The screw is lowered here and then feed into a desired surface. Also is used to set the depth which the screw goes in.
5. The trigger to operate the screwdriver and a safety switch to ensure safe usage.
6. Slot for water to breath and keep cool inside casing.

Fitness for purpose

- The product is bigger and bulkier which makes it suitable for industrial use.
- Screw magazine allows continuous work making jobs faster and easier to do, saving industrial work time to be cut.

Material usage

- Premium-Grade Steel - used to produce structure shafts and gears, and graded to the highest industry standard.
- High-Grade Magnetic Copper Wire - 97% Pure Copper for superior current flow and to withstand extreme temperatures.
- Premium-Grade Magnetic Steel - ensures efficient current flow and higher output of power.
- Injection moulding Urea Formaldehyde is commonly used to case electrical appliances and is strong enough for the job.

Ergonomics

The Power Screwdriver is designed to more weight is on the handle which makes it easier for the user to handle. The handle is also shaped so that this is not uncomfortable for the user.

New Magazines of screw are easily purchased and there is a year's warranty on the product if it breaks with the first year.

Aesthetics

The product look modern and there far is appealing to the eye. The materials it is made out of suggest that it is strong in return and well made. The handle is shaped for your hand and there is a groove in between part 1 and two for your thumb as the user can hold it more comfortably. For the position of the buttons are easily reached.

Ergonomics

Ergonomic soft grip handle for comfortable handling, which also allows the product to be gripped properly, minimising the risk of dropping it.

Product is designed for around the house, thus being very small and light weight to suit its job and replacement parts are easily come across.

Aesthetics

It has a compact 2-position pistol and in-line design. The product is very small and thus easily handled. The handle is curved to fit into the users hand and has a groove for placing your thumb into for a comfortable hold, with a trigger for easy use which along with all the other buttons which are easily pressed or accessed.

Fitness for purpose

- Light weight for ease of use
- Variable handle to allow into hand to reach areas.
- Reversible rotation to allow retraction of screws.
- Comfort for portability.
- Changeable screw head for multiple jobs.
- Small for household use.

Material Usage

- Injection moulding Urea Formaldehyde is commonly used to case electrical appliances and is strong enough for the job.

Features

1. Handle for a comfortable grip
2. Forward/Reverse Indicator to let you know the direction of the rotation.
3. Trigger for easy operation and comfort.
4. Sliding switch to change the direction of rotation of the screwdriver.
5. Chuck with automatic spindle lock to manually tighten or loosen screws and bolts.

Function & Purpose

The Manufacturer would have designed this to be a light weight hand held electric screwdriver, small and light for doing jobs around the house. It has pivoting setting for working in hard to reach places. Forward/Reverse indicator enables you to see at a glance which director is on. Product is offered with 10 x screw bits and a 2mm hexagon drill bit for pre-drilling a hole for bigger size screws. It is cordless using a 4.8v internal rechargeable battery. It weighs 0.4 kg's.

Skil Cordless Screwdriver FO152348AB 4.8V



Function & Purpose

The Manufacturer designed this product to be a very light weight screwdriver suitable for most household screw driving applications. Small and very portable being cordless taking 5 hours to fully charge. Small enough to get into hard to reach places with an adjustable handle to change the shape. Double ended screw bits to save space and cost. Forward and reverse capability to retract screws. The product only takes 3.6 v not making it very powerful and only suitable for smaller jobs. Very cheaply made only costing £4.78

Features

1. Forward and reverse rotation button to enable you to switch between the two functions.
2. Handle shaped to fit hand.
3. Button for pivoting handle.
4. Screwdriver nozzle.

Fitness for purpose

- Low power motor so it is only suitable for small household jobs.
- Double ended screw bits for space saving and weight.
- Interchanging screw heads.
- Small and portable for household use.
- Light weight for ease of use.

Material Usage

- Injection moulding Urea Formaldehyde is commonly used to case electrical appliances and is strong enough for the job.

Ergonomics

The handle has been shaped with a human hand size in mind and takes into mind postures so that it is not uncomfortable holding the screwdriver when using.

Double ended screw bits save weight and cost. It has been designed to be light and thus has little power in it there for is only made to do little jobs. Very simple tool meaning not much can go wrong with it.

Aesthetics

The product looks very light and cheap to appeal to people who are only looking for a smaller tool to help them. The handle has a curve for your thumb to fit into so that it can be easily held with the button in a position where the user does not have to change the grip or pressure. The shape of the handle also makes it easier to access other parts of the tool.

Performance Power Cordless Screwdriver Kit NLH36SD 3.6V



Investigation and Analysis of Product

Mobita Auto-Feed Screwdriver 6844/1 110V



Function & Purpose

The manufacturer would have designed this product to be able to be used on an industrial scale to install and remove screws automatically into a number of various surfaces or materials. While this is used the product must be powerful enough to do such a job, which is why it has so many gears and operates at 28000 rpm. As it is a bigger and more powerful product it also can hold magazines of dry wall screws up to a 15mm. The gears and gears head bits are both exposed. The surface depth is variable so that different sizes of screws can be inserted. The product is corded and costs £20 only. Its weight is 2 kg. This product would be more industrially used because of its size.

Features

1. Handle for gripping comfortably
2. Heavy duty power cord
3. Screws are fed into the machine on this disk for a magazine
4. The screw is lowered here and then fed into a drilled hole and then it is used to set the depth about the screw goes in
5. The trigger to operate the mechanism and a safety switch to ensure safe usage
6. Bit for screw to insert and keep good inside working

Fitness for purpose

- The product is bigger and bulkier which makes it suitable for industrial use
- Given magazine allows continuous work making jobs faster and easier to do, saving industrial work time to be cut

Material usage

- Premium Grade Steel - used to produce structure shafts and gears, and graded to the highest industry standard
- High Grade Magnetic Copper Wire - With Pure Copper for superior current flow and to withstand extreme temperatures
- Premium Grade Magnetic Steel - ensures efficient current flow and higher output of power
- Insulated mounting Unit Polymethylacrylate or PVC is commonly used to case electrical appliances and is strong enough for the job

Ergonomics

The Power Screwdriver is designed to more weight to on the handle which makes it easier for the user to handle. The handle is also shaped so that this is not uncomfortable for the user.

The magazines of screws are easily purchased and there is a year's warranty on the product if it breaks with the first year.

Aesthetics

The product looks modern and there for it appealing to the eye. The materials it is made out of suggest that it is strong in nature and well made. The handle is shaped for your hand and there is a grip in between part 1 and two for your thumb so the user can hold it more comfortably. For this position all the surfaces are easily reached.

Ergonomics

Engineers will grip handle for comfortable handling, which also allows the product to be gripped properly, minimising the risk of dropping it.

Product is designed for around the knee. This being very small and light weight to suit the job and replacement parts are easily come across.

Aesthetics

It has a compact, 2 position pistol and in-line design. The product is very good and thus easily handled. The handle is curved to fit into the user's hand, and has a grip for steering user. Thumb into for a comfortable hold, with a trigger for easy use which along with all the other buttons which are easily accessed or reached.

Fitness for purpose

- Light weight for ease of use
- Textured handle to allow user hand to hold more
- Adjustable release to allow correction of angles
- Release for portability
- Adjustable screw head for multiple jobs
- Small for household use

Material Usage

- Expensive mounting Unit Polymethylacrylate or PVC is commonly used to case electrical appliances and is strong enough for the job

Features

1. Handle for a comfortable grip
2. Forward/Reverse Indicator to let you know the direction of the rotation
3. Trigger for easy operation and control
4. Sliding switch to change the direction of rotation of the screwdriver
5. Chuck with automatic spindle lock to manually tighten or loosen screws and bits

Function & Purpose

The Manufacturer would have designed this to be a light weight hand held electric screwdriver, small and light for doing jobs around the house. It has pre-set setting for working in hard to reach places. Forward/Reverse indicator enables you to see of a glove which direction is on. Product is offered with 30 x screw bits and a dual hexagon drill bit for pre-drilling a hole for bigger size screws. It is cordless using a 4.8v internal rechargeable battery. It weighs 0.4 kg.

Skil Cordless Screwdriver FO152348AB 4.8V



Function & Purpose

The Manufacturer designed this product to be a very light weight screwdriver suitable for most household screw driving applications, small and very portable being suitable taking 5 hours to fully charge. Small enough to get into hard to reach places with an adjustable handle to change the shape. Double ended screw bits to save space and cost. Forward and reverse capability to extract screws. The product only takes 3.8 x not making it very powerful and only suitable for smaller jobs. Very cheaply made only costing £ 4.78

Features

1. Forward and reverse rotation button to enable you to switch between the two functions
2. Handle shaped to fit hand
3. Button for pre-tightening
4. Screwdriver nozzle

Fitness for purpose

- Low power motor as it is only suitable for small household jobs
- Double ended screw bits for space saving and weight
- Interchanging screw heads
- Small and portable for household use
- Light weight for ease of use

Material Usage

- Expensive mounting Unit Polymethylacrylate is commonly used to electrical housings making it strong enough for the job.

Ergonomics

The handle has been shaped with a human hand size in mind and takes into mind posture so that it is not uncomfortable holding the screwdriver when using.

Double ended screw bits save weight and cost. It has been designed to be light and thus has little power so it there for is only made to do little jobs. Very simple tool meaning not much can go wrong with it.

Aesthetics

The product looks very light and cheap to appeal to people who are only looking for a smaller tool to help them. The handle has a curve for your thumb to fit into so that it can be easily held with the button in a position when the user does not have to shift the grip in position. The shape of the handle also makes it easier to wrap your hand around.

Performance Power Cordless Screwdriver Kit NLH365D 3.6V





Manufacturing Of Parts

Page 11

Manufacture Of End Brackets



When manufacturing the end brackets I was advised to treat it as two separate drawings to cut. The reason for this is because the acrylic needed mechanically held in place because of the amount of force being applied to it by the cutter. To do this I saved two drawings. The first being the 5mm circular cut in the middle to house the end of the plastic tubing with the four holes for the socket caps. The second drawing was to cut away the inner circle and also to cut away the excess material from around the outside. As shown in the picture one above, all the separate parts have been screwed to the wood meaning there is no possibility of small parts being caught by the cutter and flying around the machine possibly damaging the rest of the brackets. The first cut allowed this as I was able to use the socket cap holes for the screws. This means no extra holes were needed to be drilled in the work.

Manufacture Of Non-Return Valve



When making the non return valve I tried to cut the hypalon with a scalpel, cutting around a circular disk slightly smaller than the valve. This did not work as the cut was not very neat. I then did a solid works drawing of the valve and used the Vinyl Cutter to cut the circle. This is shown in picture one above. To secure the hypalon to the valve itself I made a small brass M4 screw on the lathe and cut a small slit for a flat head screw driver. This is shown in picture three above. Unfortunately I was unable to get images of the cross being made.

Manufacturing Of Hull And Hypalon Tubing

When manufacturing the hull of my project I used the CNC machine. This was because I needed the hole cut out perfectly from the middle for a perfect fit. I then used the finisher to round the edges to improve aesthetics. I then primed and painted it, trying to get as close a match to the actual hull colour of my boat. I cut the hypalon tubing as a rectangle and marked a 10mm overlap for gluing. The glue I used was specifically designed for hypalon and is waterproof. As I have stated on previous pages, the jubilee clip is there so as the tubing can be removed if required.

Testing and Evaluation

Page 10

Changes During Manufacture

During manufacture I changed very few things. These consisted of, the non return flap, a jubilee clip and the popper on the hypalon tubing.

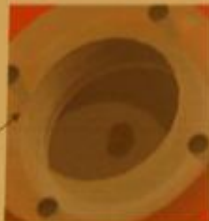
Non-Return Valve

The first thing I changed about my product was the distance the hypalon flap could move. I limited this because when I was testing the non return flap before assembly I discovered that because it is a stiff material, it did not close properly meaning water could leak into the boat from the outside when stationary. To avoid this I made the end brackets overlap the hole in the boat hull. This means the flap can only go so far before it stops and returns to being fully closed.



Overlap.

From this image you can see the amount of room the flap has to move. This gap still allows water to escape but now also allows the hypalon to close fully.



Jubilee Clip

The second modification I have made to my product during manufacture is using a jubilee clip to hold the tubing onto the outside bracket. I decided to do this so as the product could be easily disassembled and maintained. This option is instead of using an adhesive to attach the tubing as this would be permanent.



These pictures show a stainless steel jubilee clip which securely attaches the tubing to the outside bracket.



Popper on Hypalon Tubing

The popper was added for several reasons. I thought that by doing this it would improve the aesthetics of the product when closed. When the boat is out of the water the popper could be opened meaning if there is heavy rain the water would drain quicker.



These pictures show the popper open and also closed. The closed popper would be used when the boat is in the water and the open popper would be used when out of the water.



Testing



When testing my product, I wanted to use an air gun as I was worried that the paint may bubble or the MDF may become damaged if I used water. Unfortunately the air gun was not available so I went back to using water. I put my product under the tap, and shown above are the results. Pictures one and two and three show the water able to escape from the boat, both with popper open and closed. Picture four shows that no water is able to enter the boat through the system and finally picture five shows the build up of water inside the tubing as it cannot escape.

If this product was being manufactured in factories I would change some materials. The hull would obviously be on the boat already so this would be made from fibreglass. The socket caps I have used would ideally be stainless steel or treated with something (galvanised), this would be the same for the brass screw holding the hypalon flap in position. The acrylic brackets would be more suitable if made from nylon. This would be less expensive to produce and the nylon would be injection moulded into the bracket shapes. I am very pleased with the way my project has turned out. It does the job it was designed to do, reasonably well and I feel that it fits the specification stated.



These two pictures show the tubing popped closed. This allows less water to back flow into the non return valve meaning it protects the valve and gives it less work. In my opinion, it looks more attractive when it is in this position.



1. This system must be automatic to make it as easy to use as possible. The original system was manual and was a hassle to operate.
2. This system must be able to be used easily and look easy to use both in and out of the water. Although the system will be automatic, the aesthetics are still important as you want the product to look as well as you can get it.
3. This system must be easily accessible and maintained. As the product will be held in place with four M6 socket caps it will be able to easily be taken apart allowing the different parts to be cleaned or replaced.
4. This system must be good aesthetically as it will be seen from inside the boat. This is why I was thinking of a round idea. I feel that blunt edges look better aesthetically than straight edges.
5. This system should have tubing to allow water to escape. A shorter length or the original tubing could be used as it will be attached to the bracket on the outside of the boat and will not need to fold away.
6. This system must have a non return valve to stop the water entering the boat through the tubing. This will have to be extremely effective as the boat could fill with water while sitting stationary if it is not.
7. The tubing must be shorter than the original as there is no need for it to be folded away as I have stated previously: Eg., 150mm. this tubing will help to cover the bailing system meaning there will be less water entering the system for the non return valve to block.
8. The new tube must have a diameter of no more than 100mm to avoid it being an unnecessary size. The original elephant trunk is 100mm and this is the reason I liked it. It was near impossible to become blocked. I also feel 100mm is slightly large and an 80mm tube would be the perfect size to avoid blockages but not be too large.
9. This system must be able to bail water from a boat efficiently and effectively. People will be more likely to buy a system that will bail the water quickly and without them having to do anything. This system will not have electrics either which means there is less to go wrong.
10. This system must cost no more than £20 to stay at a competitive price. Most automatic products are around this price or more so at a maximum I would like my product to cost £20.

1. My Product is automatic and so is very easy to use.
2. As the system is inside the hull and all that can be seen are the two brackets, this product does look easy to use. It also looks very neat.
3. As the product is held together by four M6 socket caps it can be easily taken apart and maintained.
4. As I have chosen to use clear acrylic and made it a round shape, the product looks very neat and attractive.
5. My product does have a shorter length of tubing than the original "elephant trunk" idea on the outside.
6. My product does have a non return valve which stops water entering the boat from the outside while moving and stationary.
7. The tubing on my product is very much shorter than the original and now has a popper at the end so as the user can choose whether or not to have the tubing fully open or not. This means that it can protect the valve as well as allowing less water to reach the valve from the outside.
8. The new system is less than 100mm in diameter and so agrees with the specification.
9. My product does bail water efficiently and effectively which again agrees with my specification.
10. For my product I would charge between £15 and £20 which does stay at a competitive price.



These two pictures show the tubing open. This would allow more water to leave the boat which is why I have not made it permanently closed like in the previous two pictures. This does not look as neat as being closed. As I have said previously, this allows more water to force itself against the valve from the outside and so could damage it.

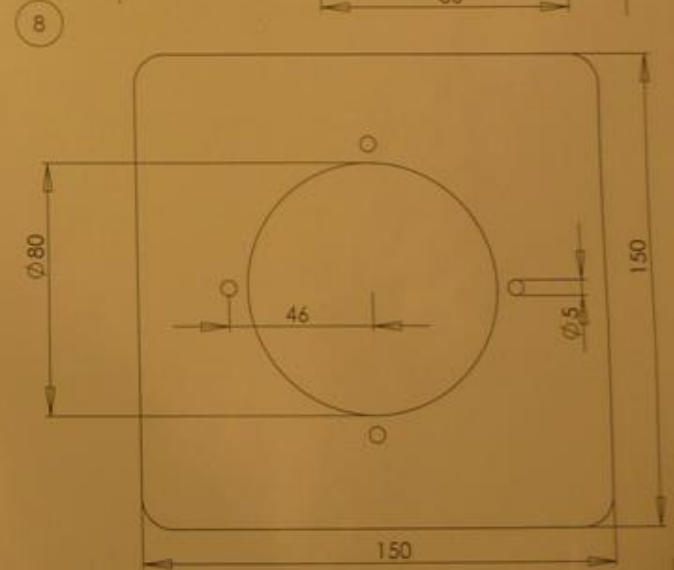
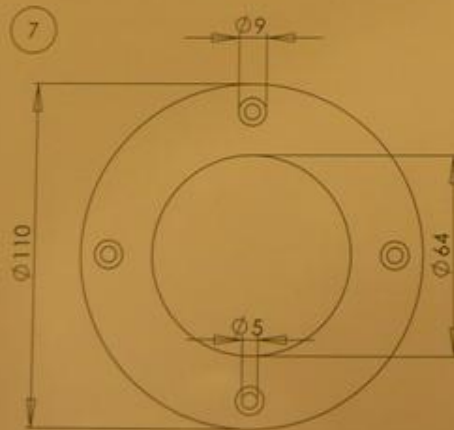
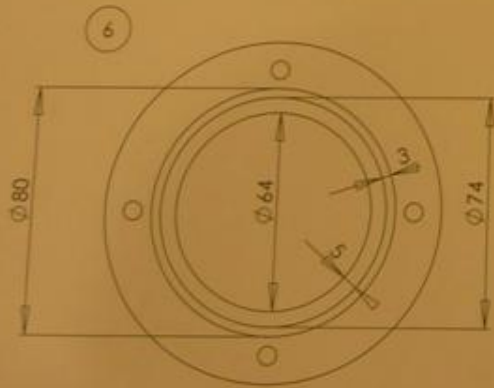
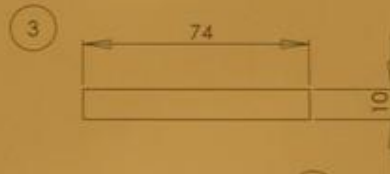
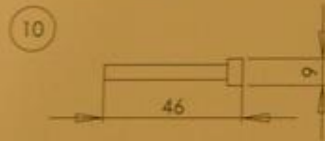
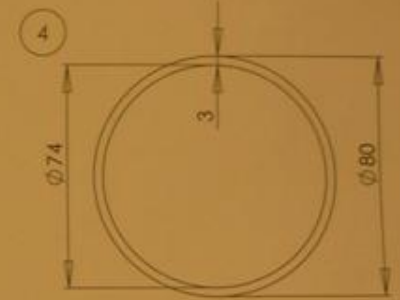
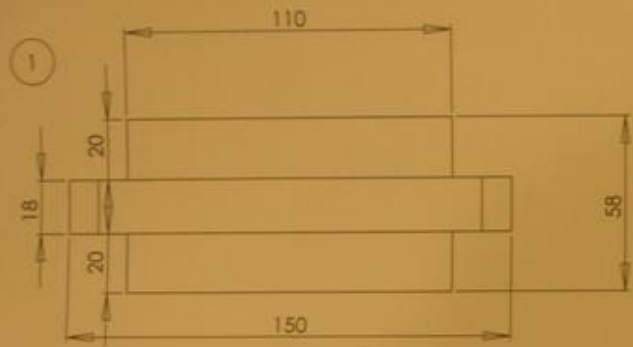


One of the main reasons I decided to put a popper on, was because I thought it would be a good idea to have it open when the boat is out of the water in case of heavy rain but closed when in the water to protect the valve and also to improve the aesthetics of the product.



Left- This is a picture of the original system.
Right- These are pictures of my new product.





1. Final Assembly Dimensions.
2. Non-Return Valve Dimensions.
3. Non-Return Valve Dimensions.
4. Centre Tube Dimensions.
5. Centre Tube Dimensions.
6. Inside Face Of Bracket Dimensions.
7. Outside Face Of Bracket Dimensions.
8. Hull Dimensions.
9. Hull Dimensions.
10. M6 Socket Cap Dimensions.

Parts Idea Development

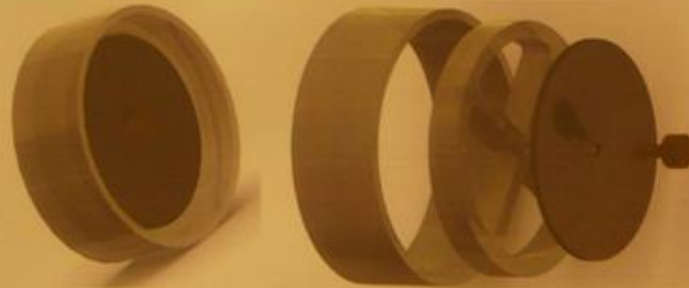
When I found that I would no longer achieve my product the way I first imagined it I thought of a new, more feasible way. I decided to use 80mm hollow tube and make a thicker non return valve to put inside it. This would mean I would not need a protective door as the new valve is 10mm thick instead of 5mm and would be more robust. To secure the tube to the hull I had to design two brackets, one for each end. The two brackets are the same apart from the outer holes for the socket caps which will connect the two brackets together. On the bracket inside the boat the holes go the full way through and have been counter bored to make the M6 socket caps sit flush. The bracket on the outside of the boat has holes bored only half way through and have been threaded for the socket caps to tighten into.

Valve Development

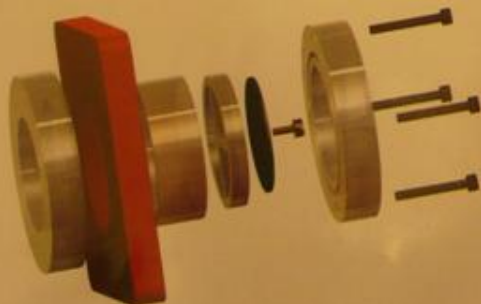
I also decided to change the door idea to a flap made from hypalon as I feel this would be more effective. To secure the flap in place I will turn a length of brass rod on the lathe and thread it. The hole in the centre of the valve will be tapped to locate the brass screw.



As this idea uses hollow tubing instead of solid I had to make the valve in two separate parts that would fit together. I would plan on making the valve itself by rapid prototyping it.



The image below shows an exploded view of my final product and allows you to see clearly how the product fits together.



Bracket Development

In this idea I have decided to make two brackets in the same way, with the only difference being that one bracket will have tapped holes to allow the socket caps to catch and the other will not be tapped but have clearance holes to allow the head of the socket caps to sit flush with the surface.



These brackets have slots cut in them to allow the tubing to fit neatly inside.



SOLIDWORKS

Plan Of Manufacture Solid Idea Development

1. Find materials
2. Cut to correct sizes
3. Cut center tubing to correct length. 80mm Clear acrylic
4. CNC two end brackets firstly in MDF to make sure center tubing fits in slots
5. CNC proper end brackets out of clear acrylic
6. Laser cut non return valve. Clear acrylic
7. Cut 80mm hole in MDF hull and adjust to fit center tubing
8. Fit non return valve in center tubing
9. Fit center tubing into MDF hull.
10. Fit two end brackets
11. Tighten together with M6 socket caps
12. Testing and Evaluation.

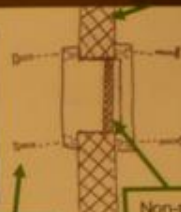
	Week One 01/02/19	Week Two 08/02/19	Week Three 15/02/19	Week Four 22/02/19
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Price

Screw Holes



I think this idea will work very well as from the outside, there will not be much visual change. But on the inside this system will stop any problems that occurred before.



Screws

Non-return Valve

When I decided on my final idea I started thinking of ways to achieve it. I first started to think of a way to stop the water coming into the boat but allow it to exit. I used an idea of a non return valve which I saw in one of the other ballers I researched. Firstly, I designed a non return valve for my product, but obviously I would need something to secure it in place, so I started thinking of ways to achieve this. My product is made from 80mm tubing and trying to source solid 80mm tubing was very difficult, as I had to buy tube that size in 2m lengths, which ended up being too expensive. I was planning to CNC or put the tubing in the lathe to achieve the two shapes below on the left, but again came up with a problem. There would be far too much waste material after machining away the inside of the tubing. Lastly, I wanted to make a door that would be operated by a float. This would protect the 5mm fragile valve. This would simply be machined out of a sheet of acrylic. My final idea is shown on the far right of the page.

Valve



This valve would be made from one solid piece of clear acrylic. I would plan to do this on the CNC router. The reason for this valve being made from one piece is because it would increase the strength.

When I had designed the valve I went on to think of a way to connect it to the hull of the boat.

Bracket Development



I would place the valve in the hole and use another small piece of acrylic made in the same way to pull the two halves together.



The idea I came up with was again a solid piece of clear acrylic that I would somehow bore a large hole in.



Where is the product going to be used?

- This product is going to be used in a marine environment so I had to think about what materials I was going to use. I couldn't use metals unless it was stainless steel or treated which would be very expensive, so I choose plastic as it does not rust and is cheaper.

Maintenance

- This product is put together using socket caps and so can be dismantled and maintained if needed.

Life and Service

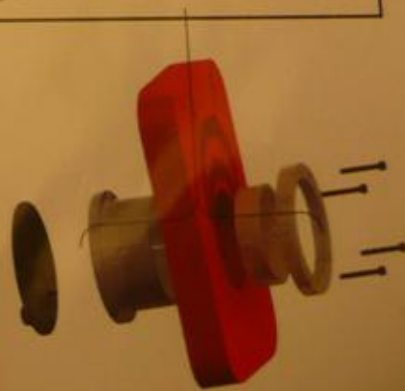
- This product should last for a long time. It cannot rust and it can be easily maintained.



I then moved on to thinking about the idea of a non return valve. I wanted water to escape but not come back in.

The idea I came up with was a door attached by a pivot. This door has a small float attached to it which would allow water inside the boat to swing the door open and escape but water outside could not get past and therefore cannot get in.

Door

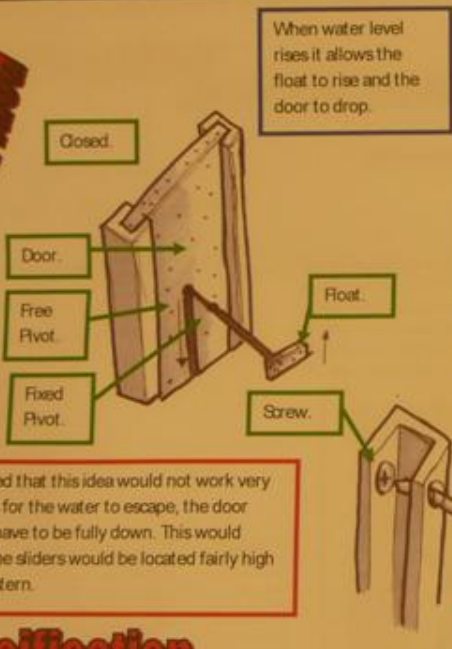


Sketches

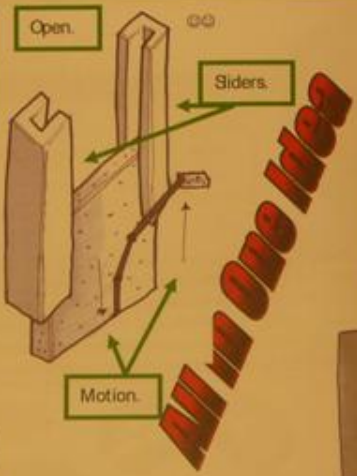
PROP 5

- Positive.
- Negative.
- Information.

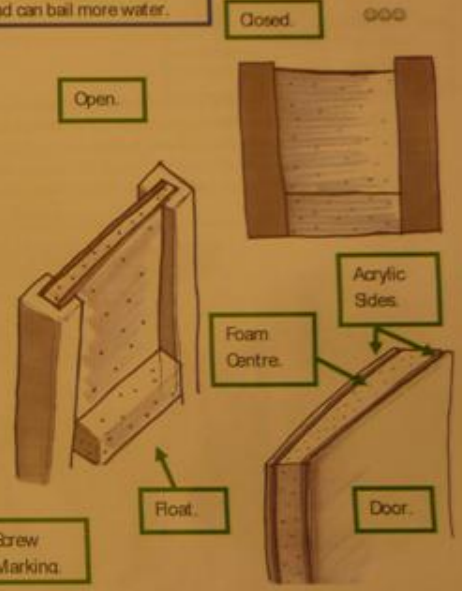
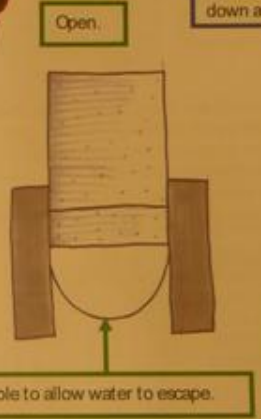
Linkage And Float Idea



I decided that this idea would not work very well, as for the water to escape, the door would have to be fully down. This would mean the sliders would be located fairly high on the stern.



This idea has changed in that the float is attached to the door without pivots. This means the door can open up rather than down and can bail more water.



Design Specification

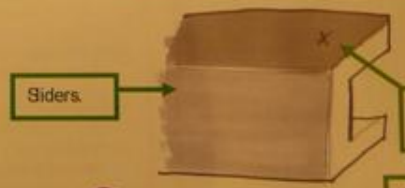
1. This system must be automatic to make it as easy to use as possible. The original system was manual and was a hassle to operate.
2. This system must be able to be used easily and look easy to use both in and out of the water. Although the system will be automatic, the aesthetics are still important as you want the product to look as well as you can get it.
3. This system must be easily accessible and maintained. As the product will be held in place with four M6 socket caps it can easily be taken apart allowing the different parts to be cleaned or replaced.
4. This system must be good aesthetically as it will be seen from inside the boat. This is why I was thinking of a round idea. I feel that blunt edges look better aesthetically than straight edges.
5. This system should have tubing to allow water to escape. A shorter length or the original tubing could be used as it will be attached to the bracket on the outside of the boat and will not need to fold away.
6. This system must have a non return valve to stop the water entering the boat through the tubing. This will have to be extremely effective as the boat could fill with water while sitting stationary if it isn't.
7. The tubing must be shorter than the original as there is no need for it to be folded away as I have stated previously. E.g., 150mm, this tubing will help to cover the bailing system meaning there will be less water entering the system for the non return valve to block.
8. The new tube must have a diameter of no more than 100mm to avoid it being an unnecessary size. The original elephant trunk is 100mm and this is the reason I liked it. It was near impossible to become blocked. I also feel 100mm is slightly large and an 80mm tube would be the perfect size to avoid blockages but not be too large.
9. This system must be able to bail water from a boat efficiently and effectively. People will be more likely to buy a system that will bail the water quickly and without them having to do anything. This system will not have electric either which means there is less to go

Ergonomics

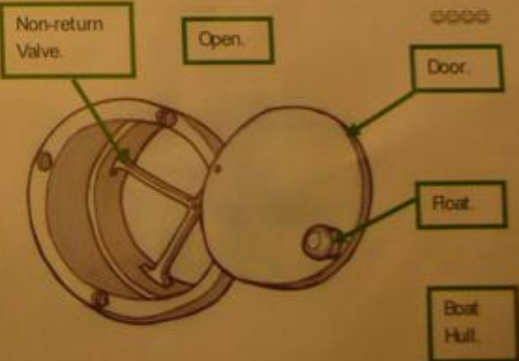
Aesthetics

Function

Round Bailing Idea

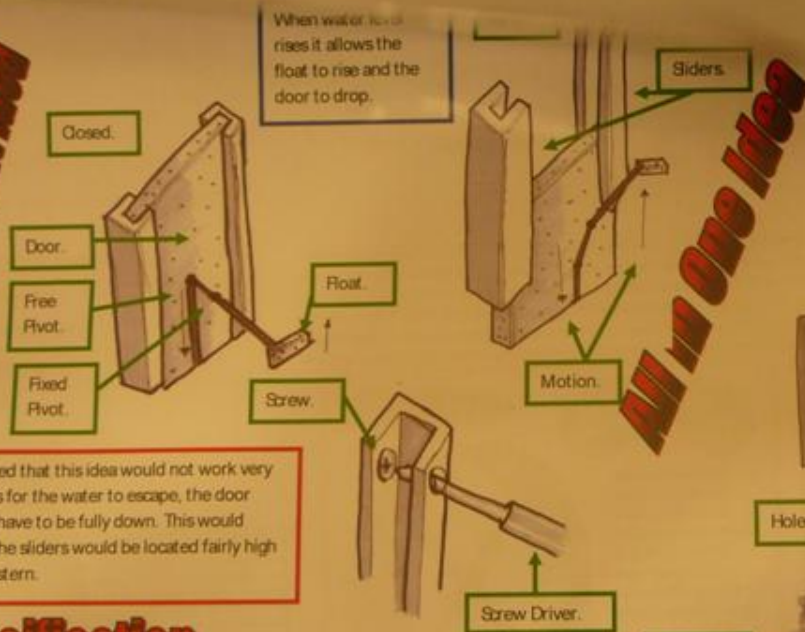


For this next idea, I went back to the non-return valve. I am going to put a valve inside the tube and attach a valve inside the tube and attach a door with a float on the inside of the boat.





Liftgate And Float Idea



I decided that this idea would not work very well, as for the water to escape, the door would have to be fully down. This would mean the sliders would be located fairly high on the stern.

Design Specification

Ergonomics

1. This system must be automatic to make it as easy to use as possible. The original system was manual and was a hassle to operate.
2. This system must be able to be used easily and look easy to use both in and out of the water. Although the system will be automatic, the aesthetics are still important as you want the product to look as well as you can get it.
3. This system must be easily accessible and maintained. As the product will be held in place with four M6 socket caps it can easily be taken apart allowing the different parts to be cleaned or replaced.

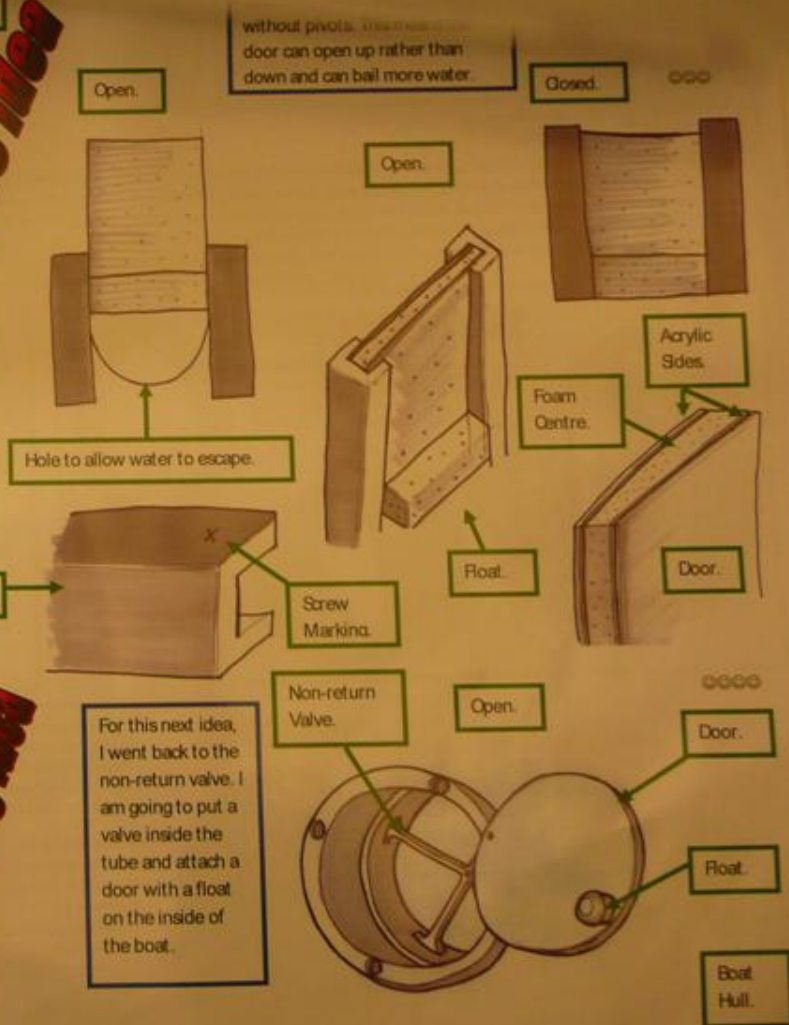
Aesthetics

4. This system must be good aesthetically as it will be seen from inside the boat. This is why I was thinking of a round idea. I feel that blunt edges look better aesthetically than straight edges.

Function

5. This system should have tubing to allow water to escape. A shorter length or the original tubing could be used as it will be attached to the bracket on the outside of the boat and will not need to fold away.
6. This system must have a non return valve to stop the water entering the boat through the tubing. This will have to be extremely effective as the boat could fill with water while sitting stationary if it isn't.
7. The tubing must be shorter than the original as there is no need for it to be folded away as I have stated previously. E.g., 150mm. This tubing will help to cover the bailing system meaning there will be less water entering the system for the non return valve to block.
8. The new tube must have a diameter of no more than 100mm to avoid it being an unnecessary size. The original elephant trunk is 100mm and this is the reason I liked it. It was near impossible to become blocked. I also feel 100mm is slightly large and an 80mm tube would be the perfect size to avoid blockages but not be too large.
9. This system must be able to bail water from a boat efficiently and effectively. People will be more likely to buy a system that will bail the water quickly and without them having to do anything. This system will not have electrics either which means there is less to go

Compact Bailing Idea

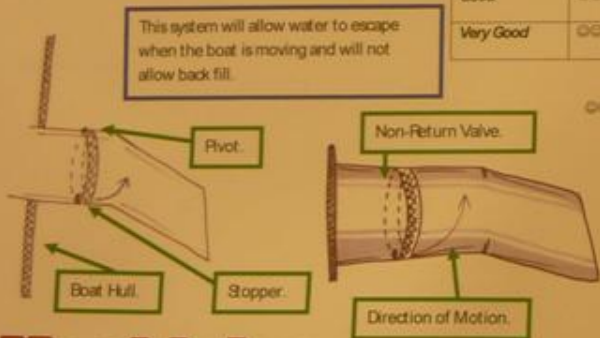


For this next idea, I went back to the non-return valve. I am going to put a valve inside the tube and attach a door with a float on the inside of the boat.

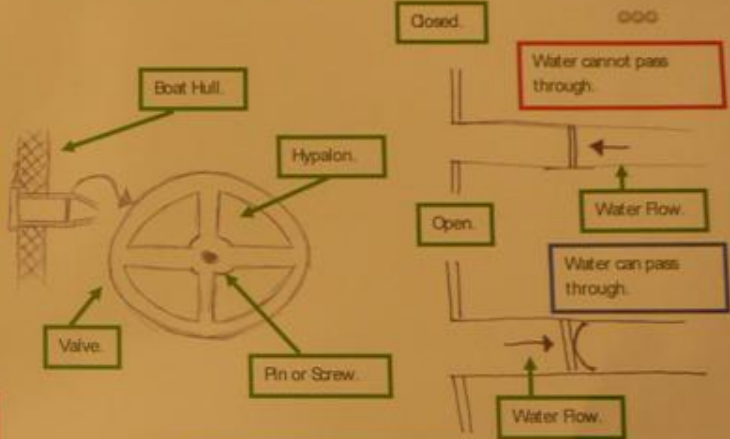
Viability of Design Modifications follows:

Very Poor	○
Poor	○○
Good	○○○
Very Good	○○○○

Non Return Valve



I then changed the idea of the non return flap and valve.



Mechinism

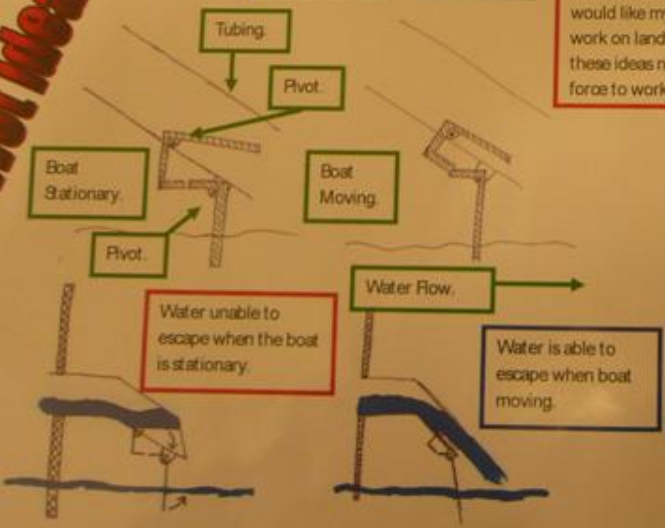
Pivots are spring loaded and so will close when the boat stops.

These ideas will not work for what I set out to achieve. I would like my product to work on land as well and these ideas need a large force to work.

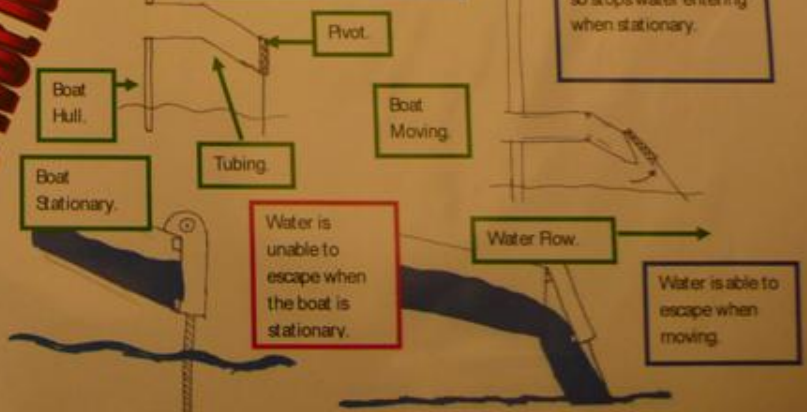
This is a much simpler idea than the "double Pivot" idea and so I thought it would work more efficiently.

Again, this idea has spring loaded pivots and so stops water entering when stationary.

Double Pivot Idea



Single Pivot Idea





Aesthetic Suitability

- The aesthetics are not good.
- This screw bung is just a small lump of plastic with threads.
- It's small and can only be seen out of the water so in this case aesthetics are not important.
- This product looks like it would be easy to use which is a positive point to be considered.
- Although this is not the most exciting product to look at, sometimes aesthetics are less important for different reasons, like will it be seen? In this case the system cannot be seen when in the water and it's so small that when out of the water it doesn't attract attention as it is located out of the way and is really only seen when being used.



Aesthetic Suitability

- The aesthetics of this product are important as it will be seen at all times. Keeping in mind the technology inside this casing I think the manufacturers have done a good job.
- However, if I was changing this I would put a cover over the bilge pump the same colour as the deck of the boat at this would take the attention away from the colours are bright and although I think they have done a good job there are still alterations that could be made to make the product slightly more attractive.
- This product does look quite confusing to operate as when you purchase one you have to connect it to a power supply, which could be very off-putting for someone who has limited electrical knowledge.
- This system can also be damaged if stood on, so a cover would need to be fitted.



Aesthetic Suitability

- The aesthetics are not very important as the system is fitted on the outside of the boat and cannot easily be seen when in the water.
- The bailer is made from translucent acrylic which shows all the dirt that gets stuck in the system.
- I would add a filter to either side of the balling system, hopefully cutting the risk of dirt clogging this system and allowing water to flow out of the boat more freely.
- This system looks very simple to use which is a sign that aesthetics have been thought about.
- This system could be made bigger to avoid the problem of blocking.



Aesthetic Suitability

- The aesthetics are not very good as it is an unattractive piece of plastic sliding into the back of your boat. If this product was being developed I feel this would need to be looked at.
- This product is like the electric bilge pump in that it is inside the boat and will be seen at all times so they could improve this by covering it up or improving it.
- Again aesthetics have clearly been thought about as the product does look very simple to use.



Aesthetic Suitability

- The aesthetics on this product have not really been thought about.
- By looking at it we can see that it is not that easy on the eye.
- Although this product is located on the outside of the boat the aesthetics are important as when it is not in use it can be seen and this problem would need to be examined.
- The reason the tube pulls up so far is so the water cannot enter the boat through the bailer when sitting stationary in the water.

The system I am going to re design is the elephant trunk, which is 100mm and this means water can freely escape and out of blockage problems.

It scored the highest amount of marks in my evaluation yet I think there is a lot I could do with this product to improve it, such as making it automatic.

	Function and Purpose	Features	Materials and Industrial Production Methods	Evaluation of Fitness For Purpose	Ergonomics	Suitability	
Screw Bung	4/10	4/10	4/10	5/10	7/10	6/10	30/60
Bilge Pump	6/10	5/10	5/10	6/10	7/10	5/10	34/60
Ball System	5/10	3/10	5/10	4/10	6/10	5/10	28/60
Expanding bung	5/10	5/10	5/10	7/10	7/10	5/10	34/60
Elephant Trunk	8/10	6/10	6/10	5/10	6/10	6/10	37/60

Investigation and Analysis of Product

Page 2



Analysis of Use for purpose

- This is not a very good system.
- The diameter of the hole is around 20mm and this is not wide enough to avoid the hole getting blocked.
- From experience this system does not allow a lot of water to exit at a quick enough rate, and often becomes blocked.
- This bung balls the water between the two hulls. The water gets into the boat through the anchor locker and deck fittings. The problem with this being that it quite often becomes very difficult to unscrew the bung as the air between the two hulls has expanded and increases the friction on the screw.
- This system can only be used out of the water.



Analysis of Use for purpose

- This is a good system.
- If the battery goes dead the bilge cannot be used and sometimes the bilge can be the cause of the battery going dead.
- The impeller sucks up tiny stones and small fragments of dirt causing it to break meaning a new pump is needed.
- There have been incidents of this system catching fire.
- This system is quick to use and is not that noisy.
- This system is particularly useful if rain water gets into the boat while afloat.



Analysis of Use for purpose

- This is a modern system and only comes standard to few boat makes.
- This makes them difficult to find or replace.
- It is necessary to continuously clean this system as the bell sticks a lot due to seaweed residue and leaves.
- The ball does not 100% cover the hole when the boat slows down so there is always water entering the boat slowly.



Analysis of Use for purpose

- This bilge is very simple to use thus it is a good system.
- Similarly to other systems, the hole is easily blocked.
- Another more costly problem is that the rubber part that expands cracks due to heat. This means a new bung has to be purchased.
- These are old systems so it can be difficult to find replacements.



Analysis of Use for purpose

- This bilge is very simple to use as the mechanism is simply a rope pulling the tubing up or letting it down.
- Unlike previous systems, the diameter of the hole is quite large which stops it getting blocked and causing problems.
- The problem with this system is that the tubing is not solid and when the system is being used out of the water it creases and the water is not heavy enough to pass through the crease.
- This system allows a large quantity of water to get out quickly.

Analysis of Ergonomics

- The ergonomics of this system are good.
- It is very simple to use as it is just a screw.
- To operate the bung you unscrew it in an anti-clockwise direction.
- It has a device so as the bung stays connected to the boat when unscrewed. This saves finding somewhere to put it or losing it.
- This bung would only be used when out of the water.

Analysis of Ergonomics

- Again the ergonomics are good.
- This is an automatic system so although it will drain water automatically, the user must be cautious it does not drain the battery or overheat.
- The user has a switch with two options on the console. The first option is automatic and the second option is manual which means you have to hold down the button to activate the bilge.

Analysis of Ergonomics

- This is the same idea as the bilge pump in that it is automatic however it is not electrical so there is no worry of it overheating or going on fire.
- The system is operated by the pressure of the water pushing it.
- In my opinion this system is better because there is less that can go wrong and there is only one working part.

Analysis of Ergonomics

- The ergonomics of this product could be better. The plunger can be stiff for the user and they have to leave the steering position and take off their kill cord to operate the system which is a safety risk.
- The lever would need to be longer to make the action easier for the user.

Analysis of Ergonomics

- The ergonomics of this product is good as the product looks easy to use and in this case it is very easy to use.
- Although, you do have to leave the steering position to go to the stern of the boat to lower the system and return to the steering position. This is dangerous as you will have to take the kill cord off which stops the boat if you fall out.



Function and Purpose

- The function and purpose of this system is to allow water in the boat to drain out while out of the water.
- It is self controlled which is why it can only be used out of the water.
- It is located on the transom of the boat, at the bottom of the hull.
- These bungs are priced at around £4.99



Function and Purpose

- This system is automatic and connected to a 12v battery.
- It was designed to make bailing a boat easy and quicker.
- It works by a float switch.
- When the water gets to a certain level the floats lift and the automatic bilge pump will start.
- The impeller in the casing sucks up the water and forces it through a hose out the back of the boat.
- The electric bilge pump is designed to be used both in and out of the water but there are some problems which are highlighted in later sections.
- The bilge pump is priced at around £30



Function and Purpose

- This bilge is automatic.
- When water is inside the boat the ball is pushed away from the plug and the water is forced out.
- When stopped, the force of the water pushes the ball back over the hole and so stops water going back into the boat.
- This bilge is designed to work in the water but it can be used out of the water as well.
- This is a fairly new system and it can be difficult to find replacements for.



Function and Purpose

- Manual bilge.
- Expandable bung.
- When the lever is set at a ninety degree angle red rubber expands and blocks the hole.
- When the bung is out there is a non return flap meaning when the boat stops the amount of water entering the boat caused by the stem wake and change in velocity, is reduced to a minimum.
- This bilge is designed to work in and out of the water and has a return flap to avoid water entering the boat when speed is reduced.



Function and Purpose

- Manual bilge.
- Large hypalon tubing.
- Connected to the hull by a jubilee clip and alkaloflex which is a waterproof sealant.
- The purpose of this system is to manually remove water from the boat by lowering the tubing using a small rope and allowing the water to run out.
- The bilge is designed to work in and out of the water but there are a few problems which are highlighted in later sections.

Features

- This is a simple system.
- It has a plastic bung with threads that screw into a threaded corresponding hole.
- The hole is connected to the hull by two stainless steel bolts and a waterproof sealant.

Features

- This system is operated by a 12v battery.
- It has a small plastic impeller inside a casing made from urea formaldehyde.
- The water is forced through a strengthened hose into sea.
- The float switch is also urea formaldehyde filled with foam so as the water can activate it.

Features

- This is an automatic system.
- It has an acrylic case with a very light polypropylene ball so that it can move easily with little water pressure needed.

Features

- Manual system.
- Lever to activate the rubber bung expansion.
- Non return flap to reduce amount of water coming back into the boat.

Features

- Manual system
- Hypalon tubing to allow water to escape.
- Rope to operate system.
- Jammer cleat to hold tubing up when not being used.
- Jubilee clip to hold tubing to boat.



- Injection moulded.
- Polythene - high density.
- Waterproof seal (alkaloflex).
- Two stainless steel screws.
- Rubber washer for tight fit on threaded bung.



- Urea Formaldehyde casing and impeller.
- PVC hose with wire support.
- Stainless steel jubilee clips.
- The casing is injection moulded and the two halves dip together.



- Acrylic casing.
- Waterproof seal (alkaloflex).
- Four stainless steel screws.
- Injection moulded polypropylene ball - light.
- The casing is injection moulded and screwed to the deck.



- Polythene lever.
- Rubber bung.
- Hypalon non return flap.
- Both halves are injection moulded and joined together by a plastic dowel which acts like a pivot.



- Hypalon tubing.
- Stainless Steel jubilee clip.
- Nylon rope.
- Alloy jammer cleat.
- This system is formed by rolling a flat sheet of hypalon and gluing the edge. There is then a stainless Steel system fitted for the rope.

Paul Magowan

AS Coursework 2010



AS Coursework 2010



Bailing System



Evaluation against Specification

Function

- The product does have those features that have been attached on to the guard but as it is a prototype it doesn't function properly.
- The guard has been finished to a high standard and the guard has been changed slightly to accommodate the polish squarer. There have been places on the guard that were formed with the guard mould.
- The polisher disc was done at 150mm and has been given a slight chamfer which allows the user head to be replaced by sliding on.

Fitness for Purpose

- This product is very easy to use and has been made with the right materials to make it durable for polishing cars.
- I was going to make a bottle for the polish to go in but there wasn't enough space in the polisher casing, hence it is contained within the mould.
- The two adjustable handles can be used by both right and left-handed users.
- Chased to a suitable size for preventing the user.

Design Features

- There is vents on the top of the casing to allow heat to escape and not letting the motor overheat (Note: Polisher is a prototype so there is no working motor.)
- Handles have been finished to this looks aesthetically pleasing.
- Handles are adjustable up to 90°, although this could have been improved by adding an extra hole to allow them to be locked at 45°.
- Appropriate materials have been used which give the product a strong, sturdy feel when in use.

Materials and Product Methods

- This product makes use of standard materials that are cheap and readily available.
- Product has been made using machines in the workshop. The casing and the guard have been made using the various former handles, pins and the squarer handles have been made using the hand tools.
- All production methods are appropriate and for mass production would be achievable.

Ergonomics

- The product has finished handles which provide sufficient grip for the user but would have benefited with finger grooves for comfort.
- It is about 1.5kg in weight which is light for a polisher but the weight would increase if I were to place the polish bottle and the motor with an estimate weight of 3.5kg.
- Handles are easily adjustable for the comfort of the user and to aid when doing difficult angles on a car.
- Switch for depressing the polish has been placed on the casing but I think that it would have looked better and been easier to use if it had been placed on the handles themselves.
- There is a company logo and labels on the bottom. Instructions to be stuck onto the back of the casing.

Aesthetics

- Product has an aesthetically pleasing blue for the casing and a shiny grey coloured guard. This gives the product a modern, clean and attractive look. Colours complement each other.
- This product sits well in its working environment although the handles are not proportional to the actual body of the product, but this doesn't affect the overall performance of the product.
- The air vents at the top of the product add to the aesthetic appeal of the product.

Cost

- This product has been made from materials that were cheap but durable and strong. This product hasn't exceeded the initial set price of £15.00. However, if I were to make this product work I would have to spend money on things like working electronic buttons and a motor to rotate the polisher disc.

Time

- This product was made within the 18 hours workshop time limit although if it was to be made again, it could be made easily and to the correct standard within 9 workshop hours.
- Product was manufactured within the school workshop.

Safety

- Product has a guard that comes down to protect the user from the mop. This has been made the correct size and to a high standard which prevents the user, preventing any droplets of polish that could splash out.
- Air vents are in appropriate place to stop polisher motor overheating.

Manufacture

- All parts of this product have been manufactured to a high standard using the facilities in the school workshop.
- All components and materials used in this product have been from the school workshop.



Size - 240mm by 150mm by 140mm high

Conclusion

In conclusion, I believe that this product has been made to highest standard possible with facilities that I have. I also believe that this product has fixed all the problems that most polishers have faced before. Finally after testing the product out, I have come across a couple of things that I believe could be improved on if it made again.

Further Modifications after Testing

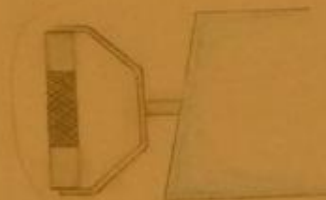
Rotating Hand Grips

Making the pins from 10 and drilling the holes at 8.1-0, this would allow the handles to rotate during use giving the user more control while in use.



Smaller Handles

By decreasing the size of the handles it would increase the aesthetic appeal, make the product more balanced in proportion and give a better grip on the product.



Bigger Polisher Disc

By increasing the polisher disc size to 170mm Ø, this would increase the area polished, making the polisher more efficient.





Testing



This pin shows the locking pin engagement. This locks the handles but there is still a bit of movement when it is in use. I think that if I was making the product again that this would have to be changed so that there would be little or no movement when the pin was in place.

The images to the right show the handles in both positions. I think that these work well, although the pin lets this down as there is a lot of movement when using the product. However the handles do turn with ease, which is what I wanted them to do. I think that there should be a bearing in the hole entering the casing to improve the strength as I think with extended use that frosting would start to form around the plastic of the hole. The ergonomic knurling that has been done on the handles is fine but I think if there was more knurling or handle grooves, that this would enhance the grip of the product.



The squirters for the product seem to work well. The only thing is that I think that the space between each squighter head is too great so I think that instead of them being 30° apart that 15° would be a more suitable distance. But these squirters would give out a good even spread of polish onto the car. However this could cause too much waste of polish on the car, making it less cost effective. The squirters don't add any unnecessary weight to the product, leaving it easy to manoeuvre and control.



As can be seen, this product sits well in the working environment, moving over the car with ease and there is a small amount of movement in the disc when in use but I think that this helps the disc to cover any groves or curves in the bodywork. Also this helps to cover a wider polish area, meaning that it is more efficient and more cost effective. It seems to be good at doing the sharp curves that are in the body work and it is something that I think the original product was weak on. The only thing that I think this product is let down it is that I think that the disc could have been slightly bigger, also that the handles could have been a smaller as this would have improved the proportion of the product.



I decided to have a look to see what the product was like in its working environment and tried it with the handles in its first position. I think that it is good but if I were doing it again, the handle's first position should be tilted forward slightly as I think that this 'straight up' position isn't giving the grip that I initially thought.



This photo was taken when the products handles are in its downward facing position. I think that this is the best part of the product because it gives the user total control of the product. I think that if I had of had the facilities to do so, that polish dispensing button would have been placed on one of the handles itself. Also, I should have rounded off the handles at the top so that there would be less risk of any injury to the user. Finally, as can be seen from the picture, I think that this product could have benefited from having thumb groves to aid the comfort of the user.



On the left is a picture of the push button that must be pressed for the polish to dispense. This works to a high standard although I think that the product should have this button in a more convenient place. The reason for this is because the user has to stop polishing to hit the button because it

isn't in the most ideal place. I would recommend that if the button was to be repositioned that it should go on one of the handles. Also the bung that is positioned at the top of the product has been made well meaning it is easily removed and placed back in.





Plan of Manufacture

Casing

- Cut block of wood 90mm by 90mm by 90mm and taper 5° by adjusting table on hand face.
- Mill 3 slots 10mm deep, 3mm apart.
- Mark out holes on sides for handles, polish dispenser button, handle lock pin and polish bung.
- Vacuum form, and remove mould from casing.
- Drill out marked holes.

Guard

- Stick 18mm block of MDF 170mm by 170mm (hand face until circular) to block of wood 12mm thick, 80mm by 80mm (hand face until circular), chamfer both, mark holes for fixings, cut in half piece of drilled rod for spigot tubes. Make holes for pins to attach the guard to the base and hole for pivot pin.
- Vacuum form mould, remove mould from vacuum.
- Form and put on guard.
- Drill marked holes.
- Screw together guard with sprayed black finish thick.
- Block of wood 80mm by 80mm.

Handles

- Cut 2x 190mm length of aluminium bar, bend on box pan, drill holes for fitting.
- Knurl aluminium cylinder bar 120mm in length, 6mmØ.
- Fit together using interference fit.

External Mechanism

- Press fit piece of machinery into slightly bigger piece of box section 25mm by 25mm by 45mm.
- Mark out holes and drill.
- Press fit through aluminium rod 6mmØ, 120mm in length and get central.
- Create nylon spacers (30mm long, 25mmØ) with a hole drilled through the centre (6mmØ) and glue to inside of casing.

Disc

- Shape block 18mm thick, 150mm by 150mm and chamfer edges on hand face.

Spigot Nozzles

- Machine nozzles on the lathe using aluminium bar 4mmØ.
- Make nozzles 4mmØ, 3mm in length and chamfer. Drill hole 1mm Ø straight through.
- Stick on front of spigot pipes using Araldite.

Handle Lock Pin

- Machine pin on lathe using aluminium bar 10mmØ.
- Make pin 8mmØ for head, 5mmØ for shaft, and 44mm in length. Face off top of pin and knurl top pulling head.
- Thread top of pin 20mm.
- Fit spring and nut (to be fitted at a later stage.)

Polish Bung

- Machine bung on lathe using aluminium bar 25mm Ø.
- Make bung 25mmØ, 10mm in length for head. Make shaft 15mmØ, 15mm in length for shaft. Face off top of pin and knurl the head.

Fitting

- Fit mechanism into casing and attach handles on using lathe-made fitting nuts.
- Using lathe-made pivot pin attach polish disc to guard (spacer will need to go between guard and disc.)
- Lathe-made bung to go onto top of product.
- Casing to slide onto base block of wood.
- Fit button for polish squirting.
- Fit pin and lock nut (reinforcing with piece of MDF on inside of casing) for handle locking.



Modifications during Manufacture

Knurling on Handles

In order to get a good knurl on the handles we had to have top-down on 10mmØ grip the handle on the lathe properly.



Extra strengthening nuts

Two extra nuts were placed on the base and the guard. This is to strengthen the structure of the product.

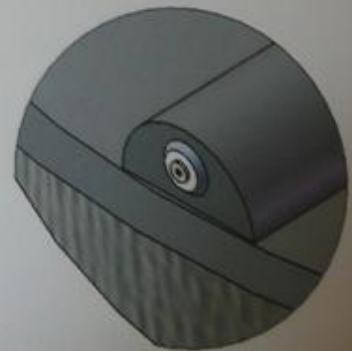
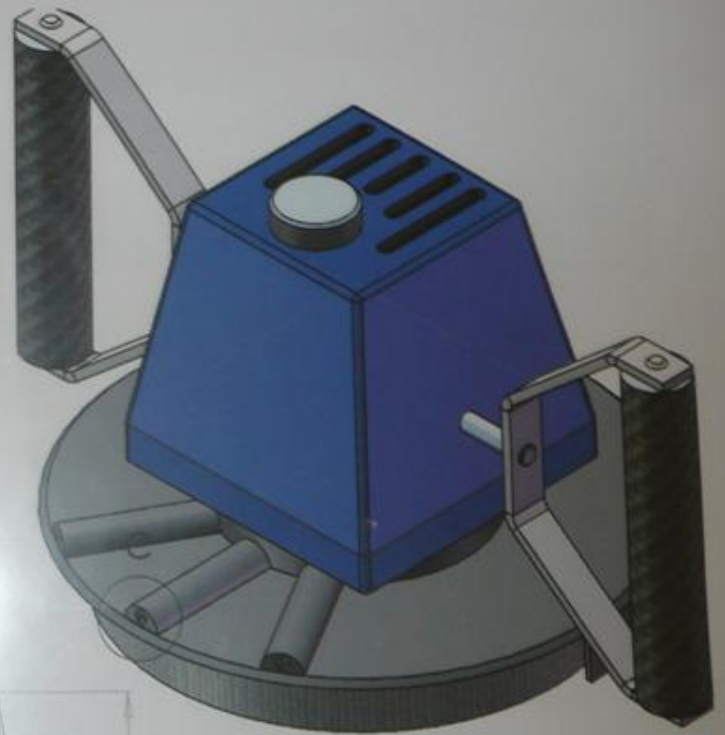
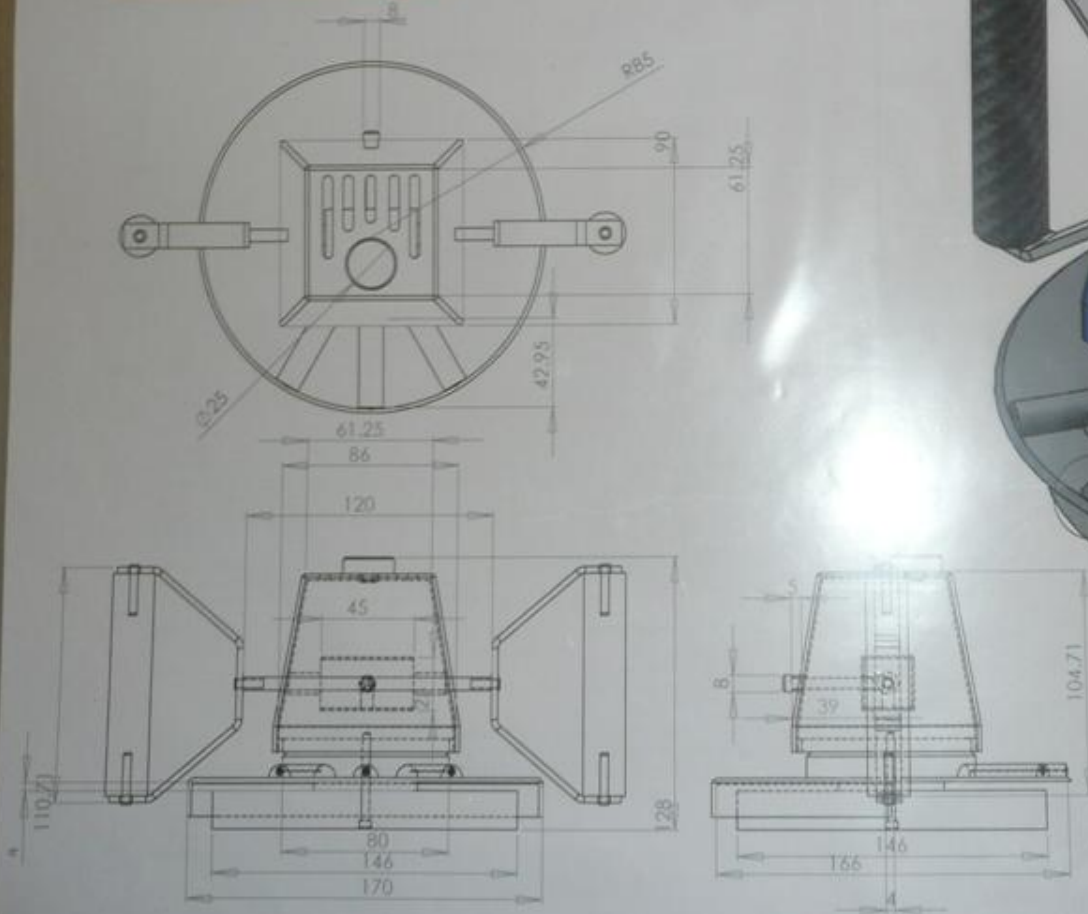


Wooden strengthening for Lock Pin

Wood was placed on the inner side of the casing as I needed to strengthen the lock pin. Spring on over time this would weaken the plastic.



Final Design



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Development of Ideas



Fig 1a. Handles in upward position

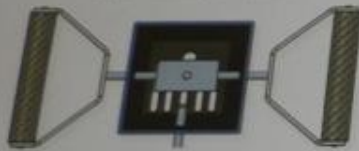


Fig 1b. Spring-loaded pin pulled back

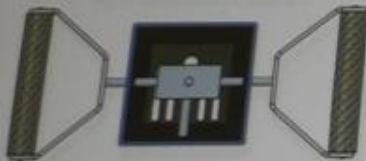


Fig 1c. Handles in downward position

Fig 3a is the pin that I will be using to make the disc spin. A hole will be drilled up through the wooden disc 6mm with a recessed hole 15mm \varnothing , 10mm deep, when there will be a self-made neon spacer and then through a bearing up through the top of the plastic guard. When the pin is in place there will be a nut placed and tightened. This will allow the disc to spin when needed to.



Fig 2b. Polisher Disc

This is the mechanism that I have decided to go for. It will be made from a box section, hardwood and an aluminium bar. As Fig 1a indicates the piece of box section would be hidden inside the actual casing, meaning that it would not be visible and aesthetically pleasing. The spring-loaded pin would be going into the back of the mould and when the pin is pulled out (Fig 1b), the box section should be free to move about 90° and slotting into the next whole meaning that the handles would be locked in their downward position like in Fig 1c. This product will have to be durable so what I may have to include during manufacturing is some extra support for the spring-loaded pin as it will be pressing on vacuum formed abs which over time could frost and may weaken.



Fig 2. Vent placements

Fig 2 shows the placements that I will be putting the vents. This will be an important part of the product as without vents the product would overheat. Also, the product may also benefit from the vents being aesthetically pleasing for the user.



Fig 3a. Disc pin

The polisher disc (Fig 3b.) size will be 150mm \varnothing . The reason for this is it was a size that most of the polishers on the current market averaged out at. The disc will be made from 18mm thick MDF as this is readily available to me in the workshop. The circular shape can be easily made by using the linciner in the workshop.

Fig 4a shows the guard design that I have chosen to use. I have added an extra level of plastic to the top as this will create some much needed space between the mould and guard, allowing the handles to turn without them scraping the guard. Furthermore, in Fig 4b, I have decided to incorporate the polisher squirters in the guard and also make a square base to which the mould will slip onto and be secure. There are three squirters as I felt that three would help to get an even coat over a larger area meaning it is more cost effective. Also if I had of went for the making the squirter tubes separate from the mould that it could have been too messy and time consuming. There will be small nozzles on the end of each tube which will be made from aluminium and shaped on the lathe hat is readily available in our workshop.



Fig 4a. Chosen guard design



Fig 4b. Modified chosen guard design

The button that I am using here in Fig 5 is the button that I am going to use for to dispense the polish. It is a simple push-to-make switch which will be an appropriate, as for the function that I want the button to perform, a button like a leveller would be inappropriate. This button can also be placed on the mould with ease as it only required a small hole for placement. Button is easy to get in the workshop equalling low costs to make this product as I am making use of standard components. Will be tightened on by using the nut provided with the standard component. I chose the colour black as I thought it was aesthetically pleasing.



Fig 5. Push button for polish dispenser





Concept Sketches 3

5. Rotating Handles

From my analysis, there was one thing that stood out in all of the polishers, that there was never the option to be able to rotate the handles. I believe that if each of the polishers had this option that this would enhance the usability and versatility of the product. When testing the products, I could see that the products were difficult to hold at several angles when polishing the car. With adjustable handles the polisher would be able to cope with a number of different angles, leaving a better finish on the car.

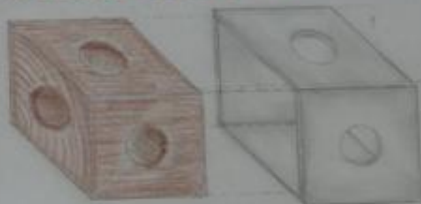
There a number of ways which I think this could be achieved. Also with the facilities that are available to me in school that this is an achievable improvement.



A. This mechanism is based on the same idea as sketch B. There would be one bit of box section on the outside of the mould, attached to two separate aluminium bars. Each bar would have its own box section mechanism. These would be smaller than the box section in sketch B. There are a number of good points. I think that it would be useful to have the option to change the position of the two handles separately. This would allow the user to decide depending on the angle of the car that has to be polished. There is also some down sides to this option: it isn't as tidy as some of the other options, would be difficult to make as it would have to be made very small and this would increase the chances for something not to be accurate on the mechanism, meaning that it may not work as well as some of the others could. In conclusion, this is an idea worth considering but may not be the best option for me.

C. This design would be one of the simpler of the ideas. For this a series of holes around the cylinder would be drilled, with the potential to have multiple different handle angles. The sketch shows the handle having 4 options, which means that it could be locked at 0°, 90°, 180° and 360°. There are 100 many slot options in this sketch but I believe that two holes 90° from each other would suffice. If I was to go for this option, then later during manufacturing, there could be the chance to give the handles a locking option of 45° from each other. This could give the user even more ways to adjust the handles when in use. This design would be a nice way to do the mechanism as it wouldn't take up too much space in the product but, when the holes are being drilled, the lining up of a spring-loaded pin Fig J would have to be very accurate.

B.



B. This mechanism was thought of by looking at materials that we had in the workshop. As can be seen, this mechanism utilises box section, a hardwood (beech was readily available to me) and a length of aluminium bar, threaded at each end. There would be two holes drilled in to two of the faces (shown in sketch B). The hardwood shape would be measured to be slightly smaller than the box section to be then interference fitted together. There would then be a hole drilled through the middle to allow the aluminium bar to run through it. This would then be glued together, meaning that when the box section was turned, the bar would rotate. The handles would be on either end of the bar. As this mechanism a spring-loaded pin like shown in Fig J would be used to lock it in place at 90°. One of the issues that may be a problem would be that the hole in the middle may be a problem as the mould would have to be made to fit it. Another issue is that this would be one of the more expensive to make.

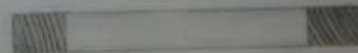


Fig J. Spring-loaded pin

D.



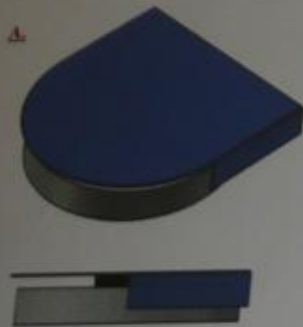
D. For this mechanism, I looked at the way that a clutch locks into place. For this to work, two holes would be drilled in an outer hollow cylinder, 90° from each other. Then on an inner cylinder, have a spring-loaded domed pin that, when pushed down and rotated, locks into the second hole, locking the handles 90° from their original point. This would be a very efficient and tidy option but there could be a couple of issues. Firstly, the cylinder would have to be running through the middle of the product casing, so if you wanted to rotate the handles, there would have to be access to press down the pin, although this could be solved by positioning the pin on the outside of the casing on one side of the cylinder. Secondly, there is a large chance for the holes not lining up, due to human error. Finally, we don't have the facilities to make the domed shaped pin head.



Concept Sketches 2

3. Guard Design

For my third idea, I want to have a look at the prospect of having a splash guard. I think that this would be an appropriate modification. The reason for this is because when the polish is put on the surface of the car and the polisher is turned on, it is evident that some droplets of polish splash out in all directions. In order to improve this product, making a splash guard would reduce the splashing, therefore improving its efficiency. This would mean that less polish would be escaping and as it would hit the guard, it would run down to the polish mop. This would in turn reduce wastage and costs. Having tested various products currently available it is noted that the mop head is too visible and for safety purposes it would be appropriate to have the guard. For example, if the user was to put their hands on to the mop while the motor was turned on, they could possibly do damage to their fingers.



A. In this design, I went for a simple square shape. This polisher would be easy to make in the workshop that I have available. The problem that seems to come with this design is that firstly, it doesn't look very stylish for a polisher. Secondly, the corners that would be on the underside of the polisher may collect a lot of dirt or any liquid polish could collect there and harden, causing the user having to continually clean it out. Finally, the sharp edges may scrape the car if the polisher was to drop. In conclusion, I believe that this could do the job that it needs to do but that may not be the best option for me to take.



B. For my second design, I decided to look at some designs that I have seen before and focused on the aesthetic appeal for this one. This guard looks good but it would be slightly impractical for what I'm looking for the guard to do. What I'm trying to improve on is to stop any polish droplets hitting the user. As can be seen from the design on the left, the guard doesn't come right down to the bottom of the polish mop so the user will still be hit with the droplets. So for what I want the guard to be made for, this will not do the job. The last thing I will say about the product is that with the facilities available to me in the workshop, making the mould would be too costly, time consuming and very difficult to try and get the taper on. In conclusion, I don't believe that this guard would be one of the strongest of the designs.

C.



C. ✓

For this design, I decided to have a look at just a simple design that I thought may look appropriate for a polisher. As you can see, the guard will be slightly bigger than the mop head, and the protective bits of plastic come down, almost hugging the disc as I felt that this would be the most effective way of stopping any droplet of polish hitting the user. The only flaw that I can see in this product is that there could be a risk of hardened polish building up on the underside of the guard. This could be avoided by making the polisher head detachable so that it can be cleaned out. In conclusion, I believe that this polisher guard may be the most practical out of all the guards that I have looked at. This design will be one of the easiest to make.

D.



D.

I have designed this guard as I wanted to have a look at making the guard but so that it would be easy to clean as well. The hinges allow the user to get to the underside of the guard. This is the most likely place for the polish to collect and harden. As can be seen in enlargement A, the guard will have a movable section at the front and the hinges will make this possible. There are a couple of problems that might occur if I were to use this design. Firstly, I would have to make the handles which may take up too much time and there could be a lot of things that could go wrong. Secondly, I don't think that the plastic that is available to me would be strong enough to cut and be drilling holes into for the hinges. In conclusion, I believe that this is a design that I should give some consideration to as it has the potential to be a good guard.

4. Detachable Handle



Fig 1. Handles attached with pin inserted to lock

As you can see from Fig2, when the pin is taken out, the handles slide off with ease. The only problem with this idea is that I would have to make something to hold the polisher handles and the pins to attach them for storage purposes. This handle holder could be located on the side of the product if the handles were redesigned to be slightly smaller. There are a couple of problems with this idea. I think that to make this idea may be very time consuming which when making a product, should be avoided. Also, I think that there is too much that could go wrong due to human error (e.g. the holes not lining up correctly). But it is something that is worth considering.

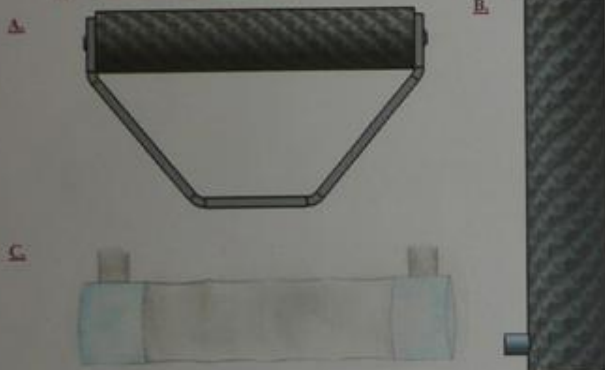
This concept came from when I was looking at the other polishers currently on the market, they all seem to have a problem in common; they all have handle(s) that can cause obstruction when storing away. So I decided to try and design handles that can be easily removed, making the polisher more storable. There was a couple of ways that I could have gone with this. I could have attached the handles on with a clip or a spring-loaded lock in order to lock the handle and the metal bar going into the main body of the polisher. But as can be seen from Fig 1, the easiest way of going about this was to just use a slide-on bar with a removable pin that just locks the two bars together.

Fig 2. Pin taken out so handles can be detached



Concept Sketches 1

1. Handle Designs

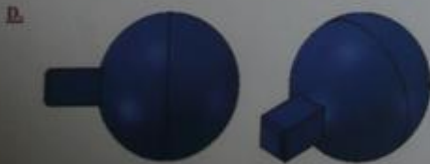


Handle A
 This handle would be made from mild steel or aluminium which would be easy to bend on the Box Pan. The handle would be knurled on the lathe. This handle would be a good idea as it would provide a more an even grip than the other handles could. There could be more tensile strength over the polisher because of the way it would be attached. The down side is that it would be difficult to get two of the lengths of metal to bend at the right angles to leave it with an even finish.

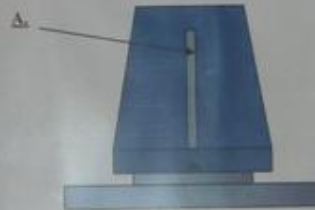
Handle B
 Handle 2 could be made from either aluminium or mild steel. This handle would also be knurled using the lathe and a hole would have to be drilled for the cylinder to be attached. This in turn would be attached to the main body of the product. This product would be good as it could be easily made. However it is noted that it would not have as much tensile strength as some of the other handle designs.

Handle C
 This handle would be made from plastic and have a rubberised grip. I could heat the rubber grip and then shape it into the shape of a hand or just have finger grooves on it. This would give it better grip and control over the product. However this plastic isn't readily available in the technology department and it would raise the cost of the product because it would have to be ordered in.

Handle D
 This handle would be made from ABS or acrylic plastic. This handle would be mostly used for guiding the product as it is used. I think that this product would look well if it was produced correctly. It is noted that with the correct school facilities, it wouldn't be something that we could produce with ease. Also, when compared to the other designs, I don't think that it would give as good a grip to the user and that the handle would be awkward to work with.



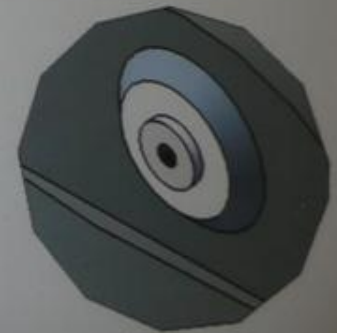
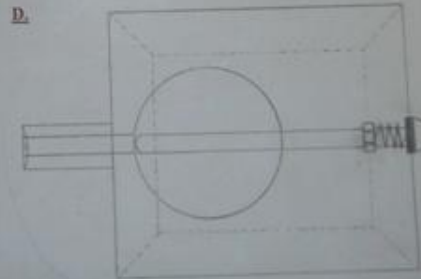
2. Polish Dispenser



A
 This shows a top view of the polisher casing. As you can see the placement for the polish would be slightly to the front of the product to allow space for any other mechanisms that may have to be added into the product. Also it means that we would be able to put a small bit of perspex plastic into the front of the product so we can see how much polish is left. For the user, the level of polish could be seen easily.

B
 This shows the interior of the polisher casing. As can be seen, a metal bung is used to close the opening of the polish holder. This would then be removed when needing to refill the polisher. The bung would be slotted into the polisher casing and used as the polisher holder. Then, at the bottom of the holder, there would be a mechanism that would allow the polish to be shut down the pipe and out of the front spray nozzle. The ejection of the polish could be done by a spring or through a circuit.

C
 This drawing shows how I would release the polish. As can be seen from the drawing, I would be able to have a spring-loaded pin running the length of the polisher and when the pin is pulled, the polish liquid would run into the small pipe running to the front of the squirter. When the pin is released, the pin would spring back down the pipe and force the polish out of the squitter nozzle. This would be a good idea because the facilities available in school would allow this to be made to a high standard.



Abstract
 This idea is about making the polisher have a refillable space that can store polish liquid and that it can be sprayed out at the front during use. This would give the product an extra function. It would be something that I think would be useful in a product and a function that most users would find useful.

A
 This shows a clear piece of plastic that means that the user could monitor the amount of polish that is left in the polisher dispenser. This would be made to be in millilitres and would have the capacity of around 100ml. This would be a good amount as it wouldn't add too much weight to the product. It would not be expensive to refill.

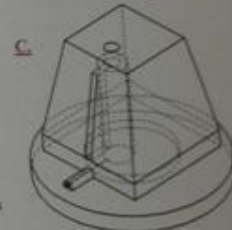


Fig. 1. Squirter Design



Redesign Specification



Function

- The product should have an additional function of containing and spraying polish when in use.
- There will be a guard above the polisher pad to protect the user from touching the pad while in motion and to protect the user from getting splashed from polish.
- Should have minimum of 150mm diameter polish pad

Fitness for Purpose

- Shall be resistant against any water and will be durable against any dropping and falls.
- Shall have a storage bottle for polish.
- Suitable for right/ left-handed users.

Design Features

- Will have a strong casing.
- Adjustable handle/wheel would allow the user to use the polisher at a range of angles.
- Will be durable and versatile.
- Will have air vents to let out heat when the polisher is in operation.
- Squares to release polish should be included into the overall design.

Materials and Product Methods

- The materials will be cheap and durable.
- The casing should be made from strong plastic to avoid leakage during use.
- The materials used should be readily available and cheap, and easily cleaned.
- Will be made from rigid polystyrene which is suitable for vacuum forming.

Ergonomics

- The handles should have finger grooves ergonomics for the comfort of the user.
- Product should weight less than 2kg.
- Polish should be easy to pour in, and dispense when desired.
- Mop head must be easily detached for cleaning purposes.
- Position of switches should be accessible and clearly labelled.
- The handles should be adjustable to suit the user and give more control while in use.

Aesthetics

- Should be made from an attractive colour of plastic.
- Should have a modern design.
- Should look suitable and fit in with its working environment.
- All parts/ modifications should be in proportion to the overall product.

Cost

- This prototype should cost less than £15.00 to manufacture.
- Product should make use of standard components to minimise costs.
- Should be suitable for mass production.

Time

- This product must be complete for February 2011.
- Will be complete in school hours.
- Will be complete within 18 hours.

Safety

- A guard must be included to prevent anything getting trapping in the rotary mop.
- Must have no jagged edges on finished product.
- Air vent should be included to prevent overheating.
- Splash guard will be fitting to prevent any polish droplets hitting the user.

Manufacture

- Must contain parts available in the school workshop.
- Must be manufactured from machines in the school workshop.

Size

- The size of the prototype should be in line with the existing "Streetwise" polisher 150mm by 130mm by 150mm.



Product 4: Sealley		
Aspects	Comments	Mark
Function	This products function is simple, to polish cars. I think that this polisher does this to a reasonable standard because it is not as easy to use as the others and may not, in some cases, get as good a finish as some of its competitors on the market. This is because it doesn't seem to have as good of a shape and handles as the others.	5
Fitness for Purpose	This product's purpose is to deliver a nice polish on the user. I think that it is good but that there could be a lot of improvements done to it to make sure that it is easier for the user to use. Things like the handles are not easy to use. Also there isn't anything to wrap the lead up with which prohibits the storage of the product. Also there is no power light to indicate that the product is on.	6
Design Features	This product doesn't have a lot of design features as others on the market. The main feature would be the controlling handle on the front of the product and I think that it isn't very good as there are little ergonomics to help the user control the product with ease.	2
Materials	The product has been made out of standard ABS which is a good choice because it leaves the product strong and durable. This product has been injection moulded which means minimal plastic wastage and leaving the product cheaper.	7
Ergonomics	The only ergonomics on this product that seem to make a difference is the hand grooves on the main handle. This isn't sufficient enough to make the product easy for the user. The position of the switch is good as it lets the user switch the product on/off with ease. The product is quite an operation. Finally it is one of the lightest polishers on the market at just 2.07kg.	4
Aesthetics	This product has been made in a neat black plastic which leaves the product seeming clean. It doesn't have a good company logo on it which makes the product look unprofessional. The product does have a stylish modern look which the consumer may find attractive.	5
Maintenance	This product seems easy enough to maintain. All that has to be done is to replace the mop head. This pulls off with ease and slots in just as easily. This is where the product is strongest.	8
Cost	£92.85 is the price of this product. I think considering the type of product it is and what you get for your money, I think the price seems reasonable enough.	6
Safety	This product's safety doesn't seem to be very good. The handle at the front of the product looks as though it wouldn't be of much use. All that you would be relying on would be the one at the back which doesn't seem to be the best design that could have been applied.	3



Product 5: Streetwise		
Aspects	Comments	Mark
Function	This products function is to polish cars. I think that it does this well but is limited with its 100mm pad. This will increase polishing time where as other products on the market have a larger mop head which makes doing the job quicker.	5
Fitness for Purpose	I think this polisher does this job fairly well. The product is well balanced but as has been mentioned in the previous point, it hasn't got the sufficient size of mop head that most other competitors have. Although it is strong and durable, suited the style of job.	8
Design Features	The product's main design features are its handles. They have been well designed I give the user maximum grip of the product however I think this could be helped with adjustable handles. But the disadvantages of this product is that it has a power cable. This leaves the product not as versatile and not as easy to use. Also, this led has nothing to be wrapped around when being stored.	6
Materials	This product has been made from injection moulding using standard ABS plastic which means no waste, so it's cost effective. Also this product makes use of standard components which means that it can be easily repaired and the parts for the product are easy to get.	9
Ergonomics	The main ergonomics on this product are in the handles. They have finger grooves that have been added in the mould. This is a key feature in this product as it gives the user a very strong grip on the product, leaving that if pressure need to be applied that it can be done so with ease. The product is lightweight so easy to carry and so for long periods. The position of the switch is appropriate but could trigger be mistaken.	8
Aesthetics	This product has been given a nice plastic finish. This is aesthetically pleasing for the user. The product has a modern design that will look significantly pleasing to the consumer. I believe that is one of the best looking products on the market. However, the company doesn't have a company logo, which is a bit disappointing.	9
Maintenance	This product doesn't have any maintenance issues. All that has to be changed is the mop head in the pad, which can be changed in 10 seconds and cleaned. This product has got a good design for the mop body and the disc which means that it is easy to change the mop head. If this happened the user could remove it in less than 10 seconds.	8
Cost	£21.48 is the price of this product. I think that this is a very reasonable price considering the features and the capabilities of the product.	8
Safety	This product has got a switch on the handle of the product. I think that this product should have more safety parts like pressure button or a LED power light. Another safety aspect would be the ergonomic handles which gives the user more control over the product. The products moving parts are exposed and would benefit from a guard.	5



Product	Overall Rating out of 100
Fein WPO	64
Draper	61
Bosch	73
Sealey	46
Streetwise	66



Conclusion

The product that I have chosen to improve is the Streetwise. The reason that I have chosen to do this is because there is a lot of areas that I feel could improve this product. I will improve the ergonomics, safety and feature. This product, in my opinion, is one of the better products on the market, therefore, I am going to take the bits that I think should be improved and help this product reach the 100/100 mark. Although this is a good product, I believe that I can improve this product so that it will be the best on the current market.

Analysis

Product 1: Fein WPO

Aspects	Comments	Mark
Function	This product is used to polish cars and the head can be changed to become a sander to sand down the paint on cars. I think this product does its job to a high standard. But I think that its function is limited by not being a cordless polisher which would bring its mark down.	8
Fitness for Purpose	This product is very often in very well suited to the job. It also has a function to change the head of the product into a sander which makes it easy for the user to use its second function. One thing that lets this product down is that there is no cord wrap and difficult to store away when not in use.	8
Design Features	This product has a long, slim body to it which can be very attractive to the consumer. The main design feature to this product is the fact that it can be changed to become a sander. It is two products in one which is good way for the owner to save space but the power cable could cause problems. There is no way of hanging the product up. Finally, the design features are limited but it has an industry look about it.	7
Materials	This product is made from a standard ABS plastic. This is easy to mould which would mean it could be injection moulded so there would be very little waste, leaving the product cost effective. Also the head of the polisher has been sand coated which would leave little waste but quite expensive. This product makes use of standard components.	9
Ergonomics	There isn't a lot of ergonomics on this product. This is a big hindrance for this product. I would make it more ergonomically viable by putting finger grooves on the main body for more control over the product. Also, there isn't a guide handle or anything on this product which could be added on to improve stability.	5
Aesthetics	This product has a very appealing colour of orange. This would attract the consumer to the product. The product also has a slender design that looks attractive and gives a professional finish. I do think that this product could have been made cordless as this would improve the movement and freedom of the product. Also it has a company logo on the side which is aesthetically pleasing.	8
Maintenance	There isn't a lot that you would have to do to keep this product in peak condition. The only thing that you would have to replace would be the polish mop. This comes off very easily so makes it easy to replace. I think that this is one of the strong points of this product. The rotary head of the product could be kept free moving by having a grease nipple.	9
Cost	£430.05 is the price of this product. I think that this is far too expensive for this sort of product. It doesn't work as well as some of the others in the market.	6
Safety	There aren't any major safety points to this product. I think that there should have been some kind of safety switch that should be pressed down or guard for when you are using the product as a sander.	4

Product 2: Draper

Aspects	Comments	Mark
Function	This product's function is to polish-up cars. I think that this product does its job to a high standard but the way that the product has been designed its handles are easy to hold for the user to use the polisher to its full potential. The 2 metres of power cable is at an appropriate length.	6
Fitness for Purpose	This product seems to be well suited for its purpose. It has a wide span of size which makes it easy for the user to cover a wide area quickly when polishing. This product would benefit from having a power light and a slimmer appearance would make it store away easily.	7
Design Features	This product has been given been given a very basic design. But one design feature that does stick-out is the guiding handle on the front of the product. This seems to be the only thing that the product has that can help user get control of the product. But it doesn't work very well as it lacks a grip. The rounded shape is a more modern style of a polisher.	5
Materials	This product, like many on the market, is made from standard ABS. This product makes use of standard products such as switches and screws. This leaves the product cheap to make and makes it easy to get replacement parts for the polisher. The polisher also makes use of standard size polish head and polish mop head. Injection moulded is appropriate for this complex shape.	7
Ergonomics	There are only a few considerations of ergonomics considered on this product. There are some on the main handle of the product at the back but I believe that if this product were to be improved, that this product could be more user friendly if it were changeable. The sphere guide handle gives the user great control over the product.	4
Aesthetics	This product has been given a plastic blue finish. This makes the product look good and attractive to the consumer. Also, this product has a 2 metre cable which I think should be made longer but at the same time still gives a user plenty of cable to get the job done. Also the "Draper" logo increases aesthetic appearance. Since the product has been injection moulded, it could be available in a range of colours.	9
Maintenance	All this product needs when it comes to maintenance is the changing of the mop head. This also makes it quick to change, saving time and effort. I think that there should be a release button just above the disc to be able to clear away any polish that might prohibit the performance. The product would be easy to clean.	7
Cost	£26.95 is the price for this product. I believe that this is a good price as you are paying for style, shape and quality of product and this product is worth the RRP.	9
Safety	This product has a switch at the top of the handle at the back. This is a safety precaution as it gives the user the control to stop the product if something were to go wrong. Also, the product has a guide handle at the front of it which gives the user more control over the polisher when being used.	7

Product 3: Bosch

Aspects	Comments	Mark
Function	This product's function is to polish cars. I believe that this product does this well and to a high standard. One thing that does prohibit the product is that it is powered by a cable which is 4 metres long but the user should be able to use the product with ease.	8
Fitness for Purpose	This product is very fit for the polishing job. It has a handle at the front of it which makes it easier for the user to control the product, equalling better results. Overall, I think this product was well designed product. The one hindrance is the fact that there is nothing for the user to wrap around which can leave this product difficult to store.	9
Design Features	This product's main design feature is the handle at the head of the product to enable full control of the product. Also this product is slim line which means that it is easily carried around which I believe is one of the strong points about this product. There is also strengthening at the top of the cable, as it enters the casing.	10
Materials	This product has been moulded out of ABS plastic which is a good choice as it leaves the product strong and durable. The product's handle and body have been injection moulded which cuts down on wastage cost. Also it makes use of standard components (e.g. mop head) and for attaching the mould together. The product has been made with a sand cast head and green plastic which is a good colour scheme for the product.	8
Ergonomics	This product has an ergonomics guide handle and body. This leaves the user in better control of the product. I think that this is one of the main things of this product. Also there are some ergonomics on the handle at the end of the main body. This product weighs 3.5kg which is quite heavy for a polisher.	6
Aesthetics	This product has been given a green metal/plastic finish which is aesthetically pleasing and matches other Bosch products. This product has got a company logo on the side of it which is also aesthetically pleasing. Product is stylish but industrial at the same time.	7
Maintenance	All this product needs, like the others, is that the polishing mop needs changed occasionally. This can be done very easily as all that needs to be done is the mop slid off the top and another slid back on as the mop clings onto the head through an elastic material. The drive mechanism can be greased to keep it free moving.	8
Cost	£263.95 is the price for this product. I believe that this is a satisfactory price for this product as this product is one of the "top of the range" polishers and is worth the asking price. The brand name is reflected in the price.	8
Safety	The safety of this product is one of the best bits of this product. It has a triple speed control switch which gives the user more control over the speed of the output pad. Also the handle at the head of the product gives a better grip and control over the head and will give better results. I think that a guard would enhance its safety features.	9





My name is Ryan Connor. I am a year 13 student doing Technology AS. The product I have chosen to redevelop is a polisher.

Fein WPO 12-27 E Angle Polisher

Price: £430.05
Size: Polishing Disc 250mm
Voltage: 240V

Function

This product is used in conjunction with the angle grinder WSG 12-70 E which makes it an ideal surface finishing treatment combination. The polisher also has a variable electronic speed control which is good for optimum application on the cars. This aids in the function of the product. Also, it has a high voltage of 240V which gives it a good output of up to 2700 rpm.

Design Features

This product looks compact and would be easy to store. Also this will leave it very versatile for the user. It also has a self-star lock that prevents uncontrolled reactivation following power supply interruption. Its power is supplied by a cable as it is not a cordless polisher. This product has a spindle brake which allows the user to make quick tool changes. Cable is strengthened at it enters the injection mould casting.

Materials and Manufacturing Processes

This product is made out of standard abs plastic which leaves the product strong, durable, and easy to injection mould. It makes use of standard components which reduces the cost of the product. Also extrusion is used to create the plastic coating on the cable. The casing is held together with hexagonal bolts that are recessed.

Aesthetics/Ergonomics

There is a company logo on the side of the product which enhances the aesthetic appeal. Furthermore, the weight of the product is only 2.3kg which is light for a polisher. This polisher has an orange finish which gives it a modern, bright colour. The top of the product can be clipped off to change the pad and to change the head to become a sander.



Draper Soft Grip Polisher

Price: £26.95
Size: Polishing Disc 240mm
Voltage: 240V

Function

The voltage of this product is 240V which gives out 3000 rpm which is about average for a polisher on the markets. Also this product has a 2m power cable that there isn't anything to wrap it around on the main body of the product. The pad is attached separate from the mop. The mop then pulls over the pad and is attached with a lining in the mould.

Design Features

This product has a pad size of 240mm. The pad on this product is flexible which is ideal for polishing curved services. The weight of this product is 2.2kg; this is a very light polisher and is good for the user as they won't tire easily. Also this leaves it that it is a light product to carry around. It also has a handle with ergonomic consideration on it and a guide handles shaped in a sphere to provide a grip for the user. Also there are vents on the casing to stop the polisher overheating then become design features.

Materials and Manufacturing Processes

This product has been formed from the process of injection moulding. It also has holes recessed in the mould to be used to screw the split mould together. Also the hole for would have been recessed into the mould too.

Aesthetics/Ergonomics

This product, unlike the other, does have a soft grip guide handle which does leave it that the user should be able to control the polisher a lot more. The guide handle has been given a ball shape to improve the grip for the user. There is a logo which looks aesthetically pleasing. Only available in blue.



Investigation

Bosch GPO 12E Polisher

Price: £263.95
Size: Polishing Disc 160mm
Voltage: 240V

Function

This product has a powerful motor of 1200W which gives it a power output of 700W and 3000 rpm. This product has a low weight of 3.5kg but this isn't the lightest on the market. The polisher is corded which decreases the versatility of the product. The polisher pad is only 160mm diameter. This could be bigger for such a powerful polisher.

Design Features

As for the design features, the product has an adjustable gear housing which can be adjusted up to 90° in four directions. Also, the handle on the head of the polisher can be taken out and put in the other side of the product to make it usable for left-handed people. There is also an adjustable speed function so that it can be changed depending on what job you intend to do. As for the safety of the product, there is a control switch and placement of the handle for better grip.

Materials and Manufacturing Processes

This product was made from a standard abs and standard rubber. The main body of this product would have been injection moulded, but the metal handle would have been casted. The head casing has been threaded to provide an additional handle.

Aesthetics/Ergonomics

This product is quiet when in operation, more so than any competitors on the market. The colours of this product are complementary to each other. The third handle gives better grip of the product. Switch for power is accessible. Product is in proportion.



Sealey ER150P Car Polisher

Price: £32.85
Size: Polisher Disc 150mm
Voltage: 230V

Function

The weight of this product is only 2.07kg which leaves it very handy for the user and easy to carry around. The pad of this product is only 150mm which seems to be the smallest on the market. As for the power of the product, the power supply is 230V giving a motor power of 60W which puts out 3800 rpm.

Design Features

It has one main handle with a little bit of ergonomic handle grip on it. The power cable is 4 metres long which means it could get in the way. It also has a small handle on the front of it which is used for controlling the product when polishing. This leaves the polisher smooth which provides even buffing/ polishing with no hot spots. This leaves this polisher perfect for polishing car bonnets and such. The vents have been added to keep the product cool when in use.

Materials and Manufacturing Processes

This product is moulded out of standard abs plastic. This is a key feature in this product as the ABS is impact resistant which is key as a polisher could slide out of your hand, so it leaves the polisher strong. The casing is a two part mould with recessed standard components.

Aesthetics/Ergonomics

On the main handle the product is where the switch of the product is, giving the user more safety and control over the product. There is a guide handle with sloping ergonomics. There isn't much style but it does have a matt black finish which is aesthetically pleasing. All of the parts seem to be proportionate and would be well balanced when in use.



Streetwise Orbital Car Polisher

Price: £40.37
Size: Polisher Disc 100mm
Voltage: 240V

Function

This product puts out 3500 rpm from 240V. Product has a light weight of 2.5kg which is one of the lightest on the market, this product has a 4 metre power cable which leaves the polisher restricted and it doesn't have something to wrap up the cable when finished with the product. This product has only one speed available.

Design Features

This products main feature is its two handles on either side of the product. These have some finger ergonomics to improve comfort for the user. This leaves the product controllable but restricted in which it can be used. The on/off switch is on the handle. This product has a 4 metre cable which can get in the way but is strengthened at the casing. Also, this product has vents at the top of the main body which lets air into the motor and stop it from overheating.

Materials and Manufacturing Processes

This product has been injection moulded and the vents at the top have been recessed into the mould. The body has been made out of standard ABS plastic. The cable has been made out of normal cable plastic but the strengthening placement at the entrance to the product has been made from a stronger plastic.

Aesthetics/Ergonomics

This product has some finger groves on the handles. It has been made out of an aesthetically pleasing blue plastic. It also has vents on the top which look good on the product. It doesn't have any company stickers anywhere on the product. The product is in proportion and well balanced.



Evaluation

In this section I am evaluating the products and went well and what could be improved upon if I were to make this product again.

Function:

- The product does its main function without any problem as it lifts tiles and also is able to position them correctly.
- The product has a rotary head which allows for easy positioning of the tile
- The additional function of wiper is working effectively and does remove grit, dirt and grout however the wiper could only be tightened in one position and manufactured
- The product has a locking mechanism which locks in position and is quite strong and is only released after pressing the button. However the button was small so was hard to operate it.

Aesthetics:

- The product is quite heavy for its size and I could have used an alternative material to make it more lightweight.
- The colours chosen were appropriate and complement each other. The product fits into the working environment.

Ergonomics:

- The product is comfortable to use and hold. The finger grooves on the trigger make it comfortable to hold during use.
- The product is no longer than 140x165 mm so is an appropriate size for a tile lifter.
- The rotary head is easy to turn and so adjustment of tiles is simple for placing them into difficult position.

Cost:

- The product costs less than £5.00 to make therefore is cheap to make. Also standard components were used to minimise the overall cost.

Durability:

- The product is resistant to impact and also sturdy so can lift heavy tiles.

Safety:

- The product does not have any hazardous sides or parts therefore safe to be used also easily assembled without any risks.

Materials:

- The product makes use of standard components such as spring for the trigger release. Also uses counter sunk screws to hold the main frame and side together. The materials used are suitable for the product as it is strong and withstand impact.
- The materials used where lightweight materials such as acrylic and also are insulating.

Weight:

- The product is quite light weight and under 500 grams.
- The handle evenly distributes the weight so it doesn't case strain for the users hand

Time:

- This product was completed before march 31st 2011

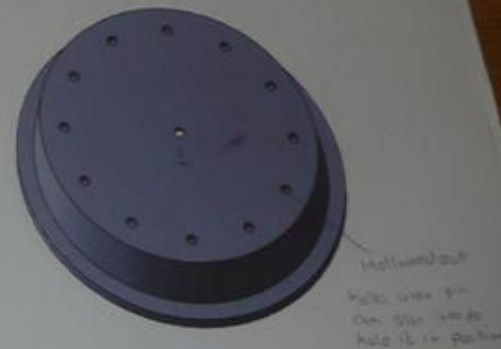
Further Modifications

These are the further modifications I can do if I were to make the product again.

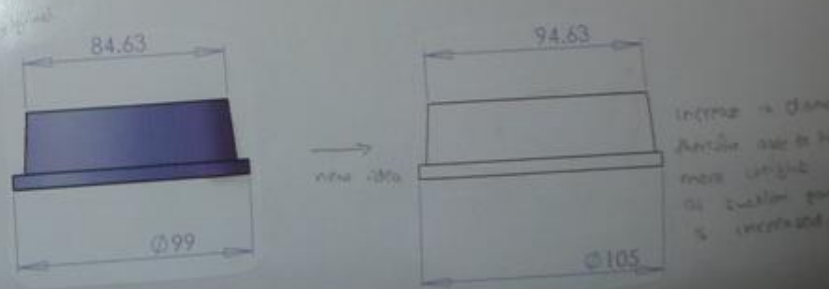
Locking button:



Locking pin for head:



Suction head:



Testing

Extendable Wiper



Left: the trigger locked into position

Right: the trigger released from locked position.



This is another important feature I researched in the functions. This is a wiper I designed to clean grit and dust on tiles before using the suction cup. It is extendable so when retracted it sits behind the suction cup and doesn't get in the way while lifting tiles.



The wiper in extend and retracted position.



This is how my final product looks like. I will be testing and evaluating my finished product. The product on the left shows the trigger pulled back and locked into position. The product on the right shows the product not locked into the suction mode.

Suction cup



This is the head of the suction cup and an important function I added which allows the head to be able to be turned for easy positioning of the tiles. After testing it found that the head is easy to turn thus making it easy to position the tile easily with one hand. The only problem I found is that the head turns easily so adding a tightening feature to help it hold the tile in position.

Locking Pin

The locking pin provided the suction to be kept it once locked into position and therefore no need to hold on to the trigger. However the pin can be hard to release as the button is too small.



The knob is able to be fasted to a fixed position so it doesn't slip up and down easily and can be fastened in one position. Also knurled to provide extra grip.

Trigger

This is an important part of the product as the user will be using this lot during the operation. After testing the product I have found that the addition of the grooves, the trigger is very comfortable to hold.

The only disadvantage I found was that the edges of the grooves in the trigger are quite cornered so would be uncomfortable for long uses. So modification would be to curve the trigger corners.



Counter sunken screw

The screws on the side of the product to hold the main frame and the plastic together can easily be taken off in case if there was a need to clean the product also it doesn't suit the look of the product as screws can become lose and this can be a potential hazard in a workplace area.

Spacer

The spacer separating the main body and the head has a large length difference this makes the head to be very loose while in use.

Conclusion

Overall the entire product meets its expectations such as the wiper which without any problems however there are still some areas that still needs to improve. These areas include the locking mechanism, the head which is lose and needs to be tightened or add a locking mechanism.

Plan of Manufacture

Suction Head

- Mould made from MDF with 89mm diameter and 25mm depth. Used finisher to taper the sides.
- Added a round piece of MDF with 99mm diameter and 6 mm depth to create the lip of the suction head
- 1 4mm hole drilled on top of the suction head for the pin to link it to the main body.

Main Frame

- MDF 5mm x4 were glued together 140mmx120mm
- Used coping saw to cut it in shape intended.
- Drilled 4mm hole on the head of the frame to connect with the suction head.

Side plastic

- Drill 4mm hole 15mm from the straight side on the head and 25mm from the bottom.

Trigger body

- 3x4mm depth MDF glued together 144mmx38 mm length
- Drill 4mm hole 7mm from bottom and 12mm from the edge of the sloping side.

Wiper head

- 150mmx25mm plastic strip is heated in an oven and the bend around the original mould.

Metal slider

- 12mm x100mm metal bar bended at 15° for the wiper to sit on top.
- 2 2mm holes drilled on the head to bolt down the wiper.
- 1 6mm hole drilled at other end for the tightening pin.

Pin for slider

- 25mmx 12 mm diameter for the head the threaded end is 10mmx 6mm diameter

Pivot bar for trigger

- 30mm x 4mm diameter for the pivot pin for the trigger to pivot on.

Spacer for main frame and suction head.

- 18 mm diameter x10mm length with 4mm hole drilled in middle for the pin connecting suction head and main frame.

Modifications made during manufacture

Aesthetics:

During manufacture of the product I felt the aesthetic appeal of the product was dropping as the main frame had a lot of scratches and the wood looked bland in order to increase the aesthetics I painted the main frame of the product in black this matched with the black painted trigger gave off good finish. Also the front metal slider against the black painted wood looked much more appealing.

Main frame:

Originally the main plan was to glue the plastic to the either side of the main body frame therefore preserving the good finish on the plastic. However after I analysed this idea it became clear that once I stick it on I will not be able to take it off therefore will not allow me to do any improvements on either the main frame, plastic or any other parts that goes inside such as the trigger. To counter this problem I used 2 screws to fasten the plastic and wood together and the screw were countersunk as to provide good finish also made it possible to take it apart any time to make changes necessary.

Trigger:

The improvement on the trigger was one of the major modifications done during manufacture. This included adding a switch to the trigger and drilling a hole on the plastic to provide a place for the switch to lock into. It is a push button switch which when released springs back the trigger to release suction.

Wiper:

There was need for a small modification to be made during manufacture to the wiper. When I first put the wiper on it was at an angled position and over side of the suction cup therefore not being able to lift any objects to overcome this I slightly bended the metal bar near the end till it was at an angle to the rim of the suction cup and the wiper was able to sit behind without getting in the way of the lifting.



Countersunk screw



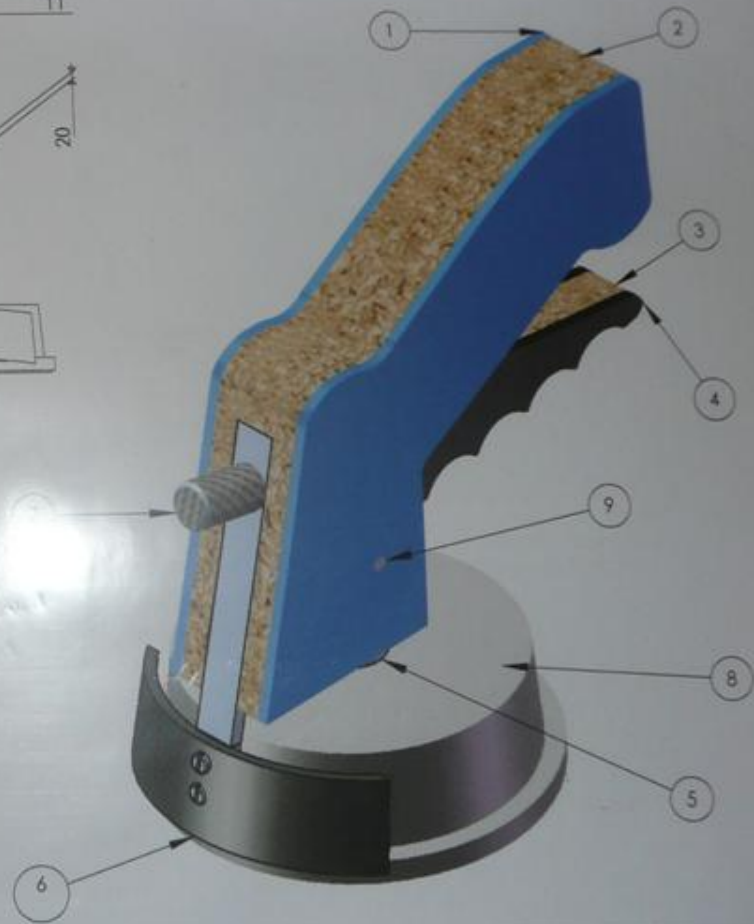
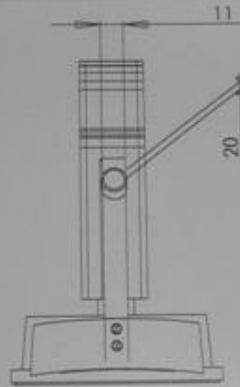
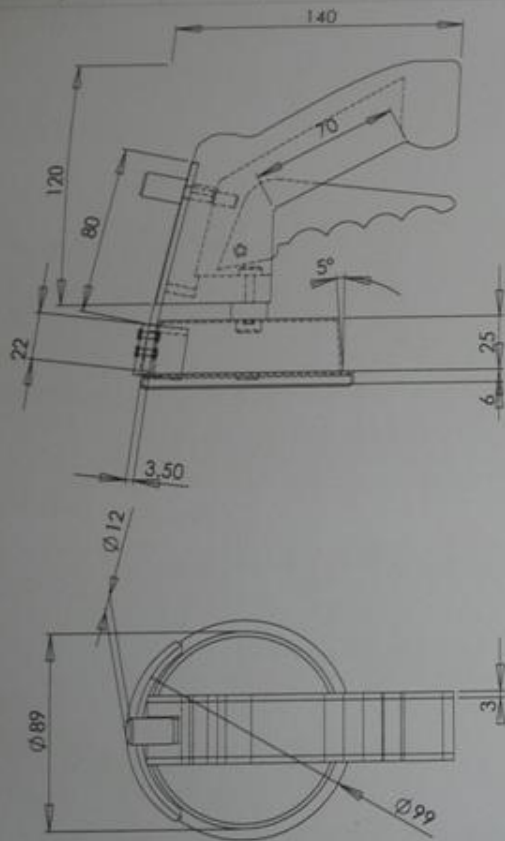
Push button which locks and releases the trigger



The main frame painted black



The metal bar bended slightly so the wiper does not "overhang" the suction cup



ITEM NO.	PART NUMBER	QTY.
1	Plastic body	2
2	Main Frame	1
3	Trigger wood	1
4	Trigger Plastic	2
5	Pin connecting the mold handle	1
6	The Wiper	1
7	Top Pin	1
8	suction cup	1
9	Pivot Pin	1
10	Spacers	2

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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH
TOLERANCES:
LINEAR
ANGULAR

FINISH

LEADER AND BREAK SHARP EDGES

DO NOT SCALE DRAWING

REVISION

DATE	NAME	SIGNATURE	DATE	TITLE

MATERIAL

WEIGHT

SCALE: 1:1

SHEET 1 OF 1

Final Working Drawing

Development of Ideas

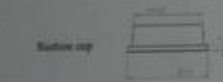


Trigger Body- made from MDF and cut out around the template and goes in the middle of the two plastic trigger template. I am going to use band saw to sand the product down to size and shape of the template. Then using glue each side is stuck to the plastic template

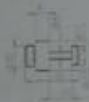
Trigger Plastic- use acrylic to make template for a trigger then use coping saw to cut out the shape then using file and emery cloth to form them into shape. Finally using polisher to polish the sides the product.



Spacer & pin connecting suction cup



Suction cup



Pin connecting wiper and slider



Pivot pin- this pin is used to make the trigger pivot allowing the activation of the suction. It can be made from aluminium. Can be interference fit rather than gluing it together as this means it can be taken apart while cleaning

Spacers for pivot pin- this is to provide an even space between each side of the trigger to provide easy movement.



The trigger fixed inside the handle by the pivot pin with a spring at the head to help it spring back. The pivot is slotted into the hole in the plastic which is on either side of the main frame. The slider can be fixed into the main frame by using a bolt on the other side of the slot on the front. The suction head is then fixed onto the main frame by the pin and spacer. The plastic can be fixed onto the main frame either by glue for permanent fixing or either by countersunk screw which can be taken apart if needed to clean the product.

Metal Slider- metal slider used to move the wiper which can be slid up and down. It can be made out of aluminium and also can use box pan folder to bend the end of the metal bar to create an angled end so the wiper could slide up and without hitting the suction head cup

Wiper- this is used to wipe away dust or other particles that is on tile. It can be manufactured using an oven which is used to heat a strip of black plastic and then bend around the original mould used for the suction head. This helps provide a perfect fit.

Top Pin- This is the pin used to connect the slider and the wooden frame of the product which enables the wiper to be moved up and down. Use the lathe to make pin from aluminium rod. It could be knurled at the top which would provide a good grip. Also the end would be threaded using stock and die. Small bolt is sanded down on the other side to minimise the catching on the suction cup.

The pin is connecting the wiper and the slider. Made from aluminium and threaded.

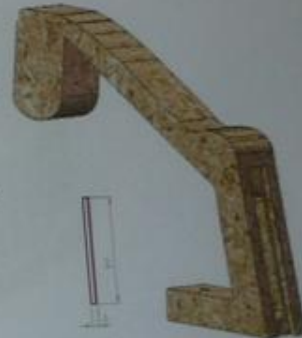
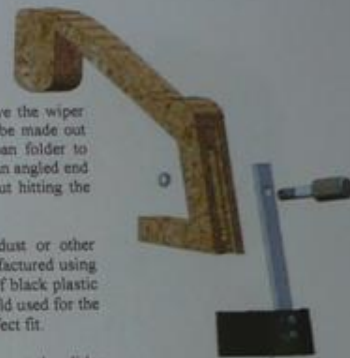
Main Frame- This is the back bone of the product and the middle is cut away using the band saw and then is filed down to fit the plastic body to either side of this. A slot is milled in the front so the wiper could easily slide up and down. Also near the end there is a drilled space for the pin to connect the head. The plastic could be attached to the main frame by using araldite

Plastic Body- made from acrylic and then using coping saw to cut out the basic shape then use filing and wet and drying to finish the product down and finally use polisher to polish the product.

Suction Head- use vacuum forming to form the mould having two pieces of mould stuck together to form the ridge around the suction cup. To find the exact centre drill a hole in the centre of the mould before vacuum forming, then after taking it out drill the hole. The threaded end goes in the suction head

The spacer/Pin- puts space between the main frame and suction head. The pin is made from aluminium and threaded at the end. The spacer in the middle is made from nylon with a hole drilled in the centre which allows the pin to pass through it. The bolt at the end is locked on inside the suction cup which holds it together.

This is the suction rubber which is industrially cut to fit the suction cup.



Features



Evaluation
The angle for the slider needs to be lower so it will not catch the position hand.

This idea was about having a user attached to the tile lifter.

After analyzing the idea must think about to add on this Point on so it would help lift the original product again.



Then To install the user the hand need to be angled to create the user is to sit up and down.



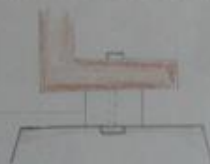
DETAIL B
SCALE 1:1

This detailed view shows how the magazine is stopped from extracting out too much.



The center can be cut the same.

I decided to wrap this idea into the product I am going to make as a very handy and practical position tile design.



Spacer

Another function that could be added would be making the hand turnable.

This enables positioning of tiles during installation of tiles paper.



Another idea is to have a control slot on each side which acts as a channel to help drive the magazine into the handle.

After further research I decided to abandon the idea as when using the spacers there was a risk for too much than a magazine of tile spacers.

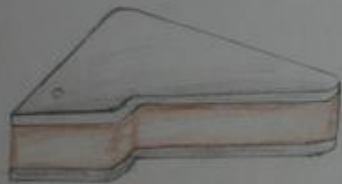
This was one of first ideas that I came up with for improvement. It is a magazine which holds tile spacers when it necessary with putting tiles.



I decided to reuse this idea after analyzing the function I am necessary.

Another idea is to have 2 different surface strength depending on the tile mat is being used using different types of injection strength can provide surface of some tile.

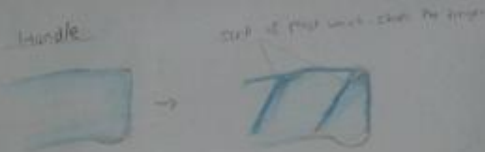
Ergonomics/Aesthetics



The improvement to ergonomics
Product could include a VFA
for the trigger.



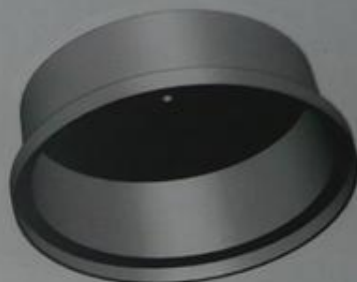
For better ergonomics
the trigger and the
handle should be
connected from
the back side.



At the end of the
handle there should
be a hole that will
be larger for going
into the handle.

from the

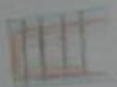
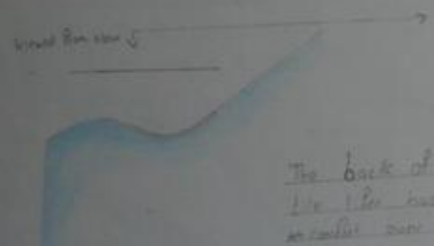
marked



The custom head
below was the first
idea but because
it is not strong
enough for heavy
the lifting.



Below I have the idea
inside the pipe and
to be the trigger and
to be the gun of the



To wire

Can all parts be
the trigger gun
to make it and
a more comfortable
for the pump.

the trigger gun
to make it and
a more comfortable
for the pump.

Evaluation
The idea of the
trigger is a good
because it needs to be
from behind using
some measurements

otherwise will not fit into the handle

The idea of a trigger
connector to add to
the product include the
handle, trigger and suction
head.

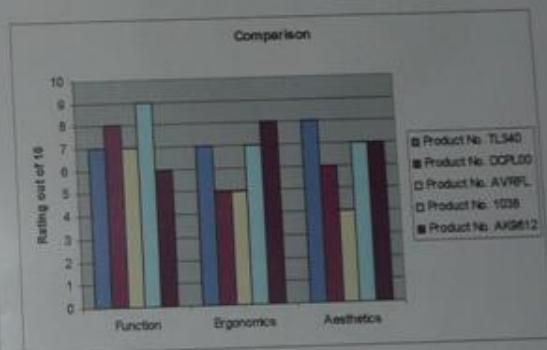
Section 2: Analysis



Raimondi® Super-Grip 5" Suction Cup (for textured tile) Tile lift Ref. 1038	Rating
Function - this tile lifter is used to lift not only smooth surfaced tiles but also tiles that have textures which make it hard to be lifted by other tile lifters. This tile lifter can also lift tiles which have small porous surface which the other tile lifters cannot do. It performs its main function to a high standard	9/10
Fitness for purpose - this tile lifter does its job well and the single suction cup means it can easily be carried and stored and also the small shape means it can easily be used anywhere. It also has a small lever at the finger tip for quick suction release. Also it takes up little space in the toolbox	8/10
Materials/ Production Methods - the handle is made from injection moulded ABS. The plastic cover over the suction cup acts as a seal to keep suction active. The rim of the plastic cover is made with rubber to suit the textured tiles. It uses standard components such as pivoting pin and spring inside the suction cup cover.	8/10
Aesthetics - this product has a very modern style and also has good finish. This product is available in two different colours. The product has an industrial appearance and has a quite modern style. The colours complement each other.	7/10
Ergonomics - the handgrip is quite unique and also comfortable. This product is light weight as it is made from plastic and also the suction release lever is in good position so that the product can easily be engaged and disengaged. This tile lifter is easy to operate.	7/10
Price - Although it is a specialised tile lifter it still only costs £16.00. This can attract a lot of consumers as it only costs less and it can lift both textured and smooth surfaced tiles. This product would be a common buy for an average household.	7/10
Maintenance - this product needs very little maintenance as the product is small and can easily be cleaned and the user only needs to replace the suction cup if it gets worn out.	7/10
Safety - this product is quite safe to use as it doesn't have any sharp parts or any small parts that can cause any problems.	9/10

Sealey Suction Cup Lifter with Pistol Grip Tile lift Ref. AK9812	Rating
Function - the function of this tile lifter is to make lifting tiles easier and not to cause a strain on the wrist of the user. This tile lifter has a pistol grip which makes it easier to lift tiles and also provide a better grip. However this product has the weakest lifting power out of all the other products analysed.	6/10
Fitness for purpose - the purpose of this tile lifter is to help lift tiles easier and this product does its job well as the grip on this tile lifter is unique and also aesthetically pleasing. This product can lift any object that has a smooth surface as well so it can be used all around. It has suction locking device which once the trigger is pulled the suction locks into place and can only be released by pushing the button on the side.	8/10
Materials/ Production Methods - the handle is made from PVC which a cheap and widely used product also durable so it lasts a long time without wearing down. Also this product uses standard components which means it can be cheaply produced and sold cheaply. The suction cup is made from rubber which provides powerful grip but it doesn't lose any suction. There is minimal assembly on this product.	7/10
Aesthetics - the product looks good to the user as the pistol grip is easy to use and also because of the unique design the product can appeal to a lot of consumers. Also the blue colour is quite appealing as well as that it looks quite modern and the product is in proportion.	7/10
Ergonomics - the product has a pistol grip which is comfortable for the user and doesn't have as much pressure on the wrist of the user as some of the other products have. The pistol grip also permits greater manoeuvrability to position tiles exactly.	8/10
Price - this product is very cheap as it sells for only £9.30 which is attracts a lot of consumers.	9/10
Maintenance - this product has very little maintenance to do as the product can be easily cleaned and also is wear resistant and only needs to replace the suction cup.	6/10
Safety - this product is not hazardous in any way as it does not have any sharp parts. However when pressing the side button the trigger springs back quickly so having a slowed down trigger rebound would make it safer. The spring loaded button on the side also means that it would be difficult to deactivate the suction accidentally.	7/10

Product No	Total Rating (out of 80)
TL340	59
DCPL003	50
AVRFL	51
1038	62
AK9812	58



Above is a graph comparing the products against the 3 main criteria's analysed.

Conclusion

The product I am going to develop is Sealey Suction Cup Lifter with Pistol Grip (Tile lift Ref. AK9812) since it scored the lowest in the out of the all the other products in function. The areas I would like to develop are Function, ergonomics and aesthetics.



Section 2: Analysis



Plasplug suction tile lifter TL340	Rating
Function - this tile suction lifter only has one main purpose and that is to lift the tile with out damaging it and it fulfills its function very well with out any problems. The product is easy to use as all the user needs to do is to push the handle into horizontal position to activate the suction. The hole at the top of the handle allows the product to be hung up or clipped onto a tool belt.	7/10
Fitness for purpose - this tile lifter is used to lift tiles and does its job very well how ever it is only limited to lift smooth tiled surfaces and can't lift textured tiles, which would result in losing suction. Also the product is quite compact when handle is in locked position. It can lift up to a weight of 17kg.	6/10
Materials/Production Methods - the main body of the tile lifter is made from PVC through the process of injection moulding and the suction cup is made from rubber which is industrially cut this means that this has even edges and so doesn't lose suction. The product uses standard components which lowers the manufacturing cost. The product has good surface finish. The connecting pin is recessed and is not in the user's way whilst in use.	8/10
Aesthetics - the product is made from brightly yellow PVC plastic which is quite eye catching but isn't available in any other different colour. I think this product is in proportion and also the style of the product is quite unique as it only has one handle unlike many of the other products in the market. The holes in the handle enhance its aesthetic appeal.	8/10
Ergonomics - This product is easy to use and lightweight. The handle also is comfortable and fits into the users hand. This product is also easy to store as it is not bulky.	7/10
Price - the price of this tile lifter is cheap as it only costs £10.34. It has minimal assembly and manufacturing processes used are cost effective. It is good value for money.	9/10
Maintenance - this product requires very little maintenance, this product is quite small so quite hard to damage. Only needs an occasional clean and maybe replacing the suction cup when the dimple effect and ribbed handle may trap dust.	8/10
Safety - this product is quite safe and doesn't have any hazardous parts. However the edge of the handle is point and could perhaps be rounded off to prevent any accidents happening. There is also the possibility of suction being released accidentally.	6/10

Tile lift Ref: DCPL003	Rating
Function - This product only has one use and that is to lift tiles and this tile lifter has 3 suction cups which means it can provide a very powerful suction which is good for lifting heavy tiles and does its job well. This product is operated by the three leavers on top of each of the suction head this means each needs to be operated separately which can be a downside.	8/10
Fitness for purpose - The three suction head is connected by ribs of aluminum which provides strong support when lifting heavy tiles. This product is quite hard to store since it is quite bulky. This suction lifter allows the user to lift larger tiles than with a single or double suction lifter. The three suction levers need to be activated separately which is a disadvantage and is time consuming.	6/10
Materials/ Production Methods - the main body is made from aluminum through the process of casting which is corrosion resistant and also has a nice finish. The suction releasing handle on top of the three suction cups are made from PVC which is made through injection moulding. The suction cups made from rubber are attached to the end and this means the product is exact fit and doesn't lose suction. Also this product uses standard components such as the pivot pins on the lever.	7/10
Aesthetics - the product is made from a grey metal which has a good finish. This product looks quite professional and is very appealing to the user. Balance may be a little off as it is in use due to one suction device being on the side.	6/10
Ergonomics - this product is lightweight and has a user friendly grip. It is however quite bulky to carry around. The handle of this tile lifter is more to the side which makes it not in proportion and can be awkward to lift therefore the product is not in proportion. The suction clamps have ribs to reduce slippage when being activated by the thumb. Main handle lacks grip/ fringe greaves for comfort.	5/10
Price - this is more of an industrial tile lifter that can be used for other things such as lifting lass but most likely too expensive for the average household as it costs £92.00.	3/10
Maintenance - this product doesn't need to maintained very much just cleaning it sometimes and cleaning the suction cup to prevent suction loss.	7/10
Safety - this product is quite safe to use as there isn't any hazardous parts. However this product is the heaviest out of the other product analysed since it had 3 suction cups and can cause damage if dropped onto something.	8/10

Tile lift Ref: AVRFL	Rating
Function - this tile lifter is mainly used for industrial purposes as it is more plain and has one main function to lift tiles and keep the suction as long as possible and also having 2 suction cups means more suction power. Such grips are available in two different sizes to accommodate different items and different lifting forces.	7/10
Fitness for purpose - this tile lifter has a fingertip suction release lever which can be handy to quickly release the suction and also the two suction cups provide powerful suction that is useful in lifting both large and small tiles. This product can be stored easily as it isn't bulky. This product would have strong resistance to impact.	7/10
Materials/ Production Methods - the main body of this product is made from aluminum which is made through the process of casting also quite lightweight, has a good finish and also corrosion resistant. The suction cup is available in two standard sizes 4 inch and 5 inch in diameter so there is less money spent on manufacturing specific materials. It uses standard components such as the nut and the threaded bar. However this product doesn't make use of any other materials. The release bracket is manufactured quite cheaply through bending and there is minimum assembly.	7/10
Aesthetics - this product has a rather plain look and doesn't appeal to the consumer very much as the product style is quite old fashioned. However the metallic finish is quite good.	4/10
Ergonomics - The overall shape of the design looks difficult and uncomfortable to hold over long periods of time. Its simplistic nature however makes it simple and easy to operate. The release bracket also lacks grips or finger grooves.	5/10
Price - the price for this product is quite expensive this could be due to the fact because of the two suction cups. The selling price of £38.88 which is quite expensive for a dated product.	6/10
Maintenance - this product needs very little maintenance as the product is very basic and there isn't very much to maintain as the materials is mainly aluminum and just need to clean it occasionally and you can change the suction cup easily if required.	8/10
Safety - this product is quite safe as it doesn't have any hazardous edges. However the lever could have a user friendly grip added to it as polling the lever could cause strain on the fingers.	7/10

Section 1: Investigation

My name is Benjo Jose and this is my AS technology coursework which is worth 50% of my total AS grade. In my investigation I am looking at different types of suction tile lifer available on the market



Tile lift Ref. TL340

Function

This product's main function is to lift tiles and other products that have smooth and non-porous surfaces. Also when the handle is in horizontal position, the tile lifter could slot into a tool belt; this is an additional function. The handle is easy to grip and easy to use as the entire user has to do is to push the handle down to activate the suction. This product can carry up to 17kg.

Design Features

The diameter of the suction cup on the product is 95mm. The holes in the handle are a unique design and the handle itself is the locking mechanism and when pushed into horizontal position, the suction is activated.

Materials/Production methods

This tile lifter is made from PVC plastic which is one of the common plastics used and the product is made using injection moulding where the heated plastic is forced into a die and it can create quite complex shapes. The product is made in two parts: the handle and the suction cup cover. The suction cup is made from rubber and industrially cut to size. Both parts are injection moulded. This product makes use of standard components such as the hexagonal bolt connecting the two parts together and also an internal spring and connecting square bar.

Ergonomics/Aesthetics

The product is quite pleasing to the eye as it has a bright yellow colour which catches the consumer's eye. The holes in the handle are also quite unique and the handle has a comfortable grip. The product is in balance and is quite cheap as it sells for only £10.34.



Tile lift Ref. DCPI.003

Function

This product is mainly used to lift heavy and large tiles; however, it can also lift non-porous surface materials such as glass and sheets of smooth metal. This tile lifter has 3 suction cups of 100mm diameter which can create quite a large suction force which is suitable for safely lifting heavy, large and awkward tiles. Each locking device needs to be locked independently. It can carry up to 50Kg in horizontal position.

Design Feature

This product has 3 suction cups which each has its own suction lever which allows the user to use suction cups independently. The unique design this product has is the ribs on top of the suction heads; this not only adds to its aesthetics but is also providing strength when in use. The shape of the locking mechanism is quite appealing.

Materials/Production methods

The body is made from aluminium alloy which is lightweight and corrosion resistant and is manufactured in one whole piece through casting. The lever for the suction cup is made from PVC using injection moulding and is durable. The suction cup is made from rubber which is cut industrially. It also uses standard components such as stainless steel pivot pins and the springs used inside the suction cup.

Ergonomics/Aesthetics

The product has a metal finish and is industrially sprayed which is quite pleasing to the eye. The handle on it is not centred which could cause problems for the user. The product is also costly at £92.00. All parts are in proportion and the product is quite modern.



Tile lift Ref. AVREL

Function

This product's main function is to lift tiles. Press suction lifter against the smooth surface of the panel to achieve suction. To release the panel, just squeeze the release trigger below the handle. This tool is suitable for lifting floor panels out of their floor location and also for putting in tiles. This product can carry up to 45 Kg in horizontal position.

Design Features

This product is available with two different suction cups: one 4-inch diameter and the other 5-inch diameter. It has a quick release lever which is at the finger tips which releases the suction quickly and easily. Also, the suction cup is exposed which means it can be changed easily without much fuss, unlike the other tile lifters where the suction cup was hidden away.

Materials/Production methods

The body of the tile lifter is made using cast aluminium which is sturdy and lightweight and also has a good finish. This product makes use of standard components such as nuts and the threaded bar. The suction cups are made of rubber and wear-resistant and industrially cut. The release handle is sheet mild steel and shaped through the process of bending.

Ergonomics/Aesthetics

This product has a metal finish which is quite appealing and also the product shape is in balance and also lightweight. The product's style is simple and plain. The position of the release lever is at the finger tip. This product costs £38.88.



Tile lift Ref. 1038

Function

This product is used to lift tiles. The suction is activated by pushing the handle into horizontal position. Also when the handle is in horizontal position, this product can be slotted into a tool belt. The suction cup has a diameter of 5 inches. Has a felt rim under the suction cup which makes it possible to lift textured and porous tiles. Has a lifting capacity of 40 kg.

Design Features

This product has a fingertip suction release lever and also this tile lifter has a special feature which allows it to lift textured and porous tiles. It is available in two different colours: brown and white. The unique design of the handle is also its main design feature.

Materials/Production methods

The handle is made from injection moulded ABS. This product is also available in different injection moulded colours. The rubber suction cup is industrially cut to provide exact fit. This product also makes use of standard components such as the stainless steel pivoting pin.

Ergonomics/Aesthetics

This product is available in different colours which enhances its aesthetic appeal. The unique grip ensures comfortable grip. This product is lightweight and easy to use. This product is quite modern looking. This product costs £18.00.



Tile lift Ref. AK9812

Function

This product is used to lift tiles and other non-porous surface material. It is a tile lifter that fits into the palm of a hand and is used to lift tiles. The suction is activated by pulling the trigger and the bottom springs into the locating hole. It can lift up to 15kg in horizontal position.

Design Features

This product has a 70 mm suction cup and is made from rubber which is machine cut. Also, the handle has a hole drilled on the bottom so that it can be hung from a tool belt. The grip of this product is quite unique and provides comfortable grip to the user.

Materials/Production methods

The product is made from injection moulded PVC and is made in 3 parts: handle, trigger, and the suction cup. The suction cup is industrially cut. This product also makes use of standard components such as the springing the handle which pushes the trigger back out.

Ergonomics/Aesthetics

This product has a unique shape of a pistol grip. The blue colour is quite eye-catching as well. This product is lightweight and fits into the hand so easy to use. This tile lifter is also the cheapest costing £9.30.

Evaluation regarding specification

Function

- This product is a prototype as the grippers aren't functional
- The handle does not extend as I did not think it was necessary since the product was assembled
- The head does pivot to allow use in tight spaces, however the locking mechanism would need to be more robust for heavy use
- The product now has a guard to cover the teeth when not in use which is effective but could cover more to add to safety benefits
- The product doesn't have an internal cutter so planned as the benefits were minimal if at all existent.
- The weight of the product did not exceed the set limit of 1kg

Ergonomics

- The rear pad is ergonomically shaped and soft for comfort but the front handle isn't and could be improved with hand grips or a knurled section
- The product can be easily adjusted by one hand but this can be time consuming and would benefit from a "quick lock" type mechanism

Aesthetics

- The colours of this product look stylish and suit the environment of use; It also looks professional and would look in place in a fitness tool box.
- The product has a brushed logo which also makes it look professional
- The polished finish looks good but may scratch easily when in use

Safety

- There is now a soft rear pad to allow safe use
- The tool has no sharp edges that pose a threat to the user
- A spring loaded guard now protects the gripper head when not in use but could be improved with a larger surface area

Materials

- Overall the product has succeeded in looking striking and professional, the metal has been polished to a high shine and this compliments the knurled pins and black gloss appearance of the plastic. The vacuum formed plastic would need to be far more robust to be used for real as it is very brittle

Maintenance

- The product is easily dismantled and easily wiped down when necessary
- The gripper head is not easily replaced as this is a prototype and thus the head is not functional and is held in place by Tensol cement

Size/shape

- The gripper head was not widened as in hindsight the benefits were minimal and this would have made the tool out of proportion
- The tool overall is small enough to be used by a range of people and thus is suitable to be sold, but may have benefited from an extendable section.

Durability

- As this is not a fully functioning model durability is hard to test, however the joints are all strong and the mechanism is somewhat robust under normal use
- The rear pad was wrapped with synthetic leather to promote a long effective lifespan, the seams however may be a weak point

Design features

- The product has a more bulky handle than originally intended but this serves the purpose of keeping it in proportion and rigid
- There are no finger grooves as this was not possible with the material used (small wall thickness)

Cost

- The cost to manufacture this tool did not exceed the £15 budget set

Time

- This project was completed well within timeframe but still to a high standard

Conclusions From Testing

After carrying out testing on my product, I found that I would improve several things if I were to manufacture it again. I would include a tighter curved rear knee pad for better user comfort, and I would make it softer so that it was easier to use. I would also include a more robust locking mechanism for the pivoting head so that it could stand up to application of force. Lastly I would include a guard that covered more to further reduce the risk of injury when in use

Modifications after Testing

In hindsight I would make the handle section more for comfort and add extra finger grooves for someone grip and comfort.



I would also have included a more stable 3 position locking head through use of a pin which drops into 3 holes to secure the position as shown here... I would make the overall product deeper.



I would also have more drastically curved the rear pad as this would pose much more comfortable and further reduce the risk of a strain injury when used repeatedly.

Testing



This shows the tool can clearly be held comfortably and stably in one hand. It is easy to hold however could benefit from added hand/palm grooves for a more comfortable grip during prolonged use. The polished finish looks well aesthetically and the angular construction gives the tool strong aesthetic lines, however this smooth finish hinders grip slightly and the metal feels cold on the user's hands, here a plastic handle would be of greater benefit.



The pivoting head here is a great advantage to getting in to knee the carpet in awkward places like this tight corner where the wall was protruding at the other side of the door and I could not get a full swing at it when hitting straight. The locking mechanism also held this angle well and didn't slip when force was applied. A more robust locking mechanism with set angles may have been of more use as it would allow a greater force to be applied and possibly to be set quicker too.



Here the curved knee pad is shown against my knee to show how it offers added support and reduced risk of slipping. This could possibly have benefitted from being more tightly curved however it may not fit some users then so I believe this was the best route to take. The pad proved very comfortable against my knee when in use and I felt more at ease applying a large force to it as I was certain my knee would not slip.



Here the guard is shown in operation, my hand would not accidentally touch the gripper head as I would have to have applied considerable force to make the springs compress and thus make the guard retract. There is a small risk of peoples fingers slipping past the guard and touching the teeth but this is unlikely, and overall this guard has greatly improved the safety of this device. A larger guard may have been more obtrusive but could have added increased protection also.



The guard is shown here retracted, this shows how it smoothly slides back to reveal the teeth when force is applied to it, therefore the tool can be used normally once the pressure has been applied, and when this pressure is released the guard springs back to conceal the gripper head. This is a vast improvement over the conventional clip on design in which the guard was easily forgotten, misplaced or broken when removed.



Here the carpet stretcher is shown in use, when no pressure is applied the guard stays up and the teeth stay clear of the carpet, with pressure applied the head lowers and allows normal use of the tool. This shows that the new guard mechanism causes minimal intrusion to normal operation but also vastly improves safety compared to the standard clip on design.



This picture shows how the tool fits in with other tools and wouldn't look out of place in a fitter's toolbox. The bold angular shape of the product I believe has helped to achieve this affect. The only disk I can see is that the leather may not stand up to the abrasive or sharp edges of other tools, however this is relatively avoidable if the user takes good care of the product.

Plan of Manufacture

Should

- MDF section 120x110mm, 7-degree taper finished all around
- Front top edge tapered 15mm in at an angle of 45 degrees. Front should then be narrowed to a point through bevelling of 25 degrees at each edge to a depth of 15mm.
- A 15mm recess, 3mm deep should then be filed/chamfered to the corners of the rear of the mould.

Head

- V-groove formed from mould and cut using the gaff.
- 2 holes below are to be drilled in a continuation of the rear recess, 15mm apart
- A 15mm hole should be drilled in the top of the mould for the dial, and 2 4mm holes 15mm from the edge and 25mm apart should be drilled in the two side edges of the top.

Bracket

- A piece of 50x3mm aluminium should be cut to 65mm length and bent to a 40 degree angle at 25mm
- 2 holes should be drilled on each straight edge, in a centre line, 15mm apart, 4mm diameter, and countersunk
- The part should then be polished to a shine

Metal handle sections

- These should be cut out roughly on the bandsaw to shape and filed and sanded. One should have a 40 degree angle to match the bracket
- They should be cut halfway through with a protruding edge on the opposite side to the other, so that they can interlock (as shown in working drawings of parts)
- A 4mm hole should be drilled in the corner of the upper handle (15mm from front edge) to allow the pivoting pin to be inserted.

Handle plugs

- Wood should be sanded to 20x20mm and press fitted into the metal handles, then cut down at all sides to fit perfectly inside.
- Corresponding holes should be drilled (4mm) in the metal outer handles. The 2 diagonal holes should be countersunk at the opposing end to allow nuts to be inserted and tightened.
- A nut should also be countersunk into the wood below the pivoting pin section to allow it to tighten.

Rear handle

- Wood section 120x30mm to be smoothed and painted and press fitted into the main handle.

Rear pad bracket

- 100x100x12mm mild board to be chamfered to 2mm depth at 45 degrees around all edges and sanded/painted black and affixed to the rear handle with 2 wood screws

Rear pad plastic

- 160x100mm acrylic, edges should be polished and then 2 bends at the sides to 25 degrees, 30mm in should be made using the heat strip bender
- 6.3mm holes should be drilled and countersunk to allow small wood screws to attach this to the rear pad bracket.

Main pin

- 43x1.5mm aluminium bar to be turned down to 4mm for 35mm and 13mm for remaining 10mm.
- Chamfered edges (1mm 30 degrees) to be done and a knurled head on the 13mm part.
- The 4mm section should then be threaded to M4 for 20mm depth

Dial

- 35mm length of 40mm diameter aluminium to be turned down to 15mm for 20mm and all edges chamfered to 30 degrees 2mm depth
- Then the larger section should be knurled for grip.

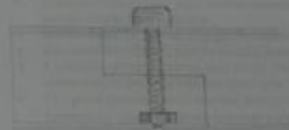
Guard pins

- heads to be made from 10mm diameter aluminium 10mm depth faced off and chamfered to 2mm 30 degrees
- a hole should be drilled at 3.9mm 3mm deep on the reverse side
- Threaded bar should then be press fitted into this (M4 x 40mm) to attach the guard to.

Metal guard

- 250mmx12mmx1.5mm angle section aluminium (wall thickness 1.5mm) should be marked and cut 70mm from each side.
- checks should be cut out of angle 90 degrees symmetrical to the 70mm perpendicular line
- The aluminium should then be bent by hand in a vice to form 90 degree corners at these points
- 2 holes should be drilled on each of the 70mm sides 35mm apart 4mm diameter to allow connection to the head with the guard pins.
- The guard pins should be inserted through the head of the tool, held with a nut and a spring between the guard and head, and then a nut to retain the guard on each pin.

Modifications During Manufacture



Instead of using a 2 part threaded head pin, I used a one part threaded pin and a counterbore nut as this was easier to make and also allows more limited adjustment to the tool.



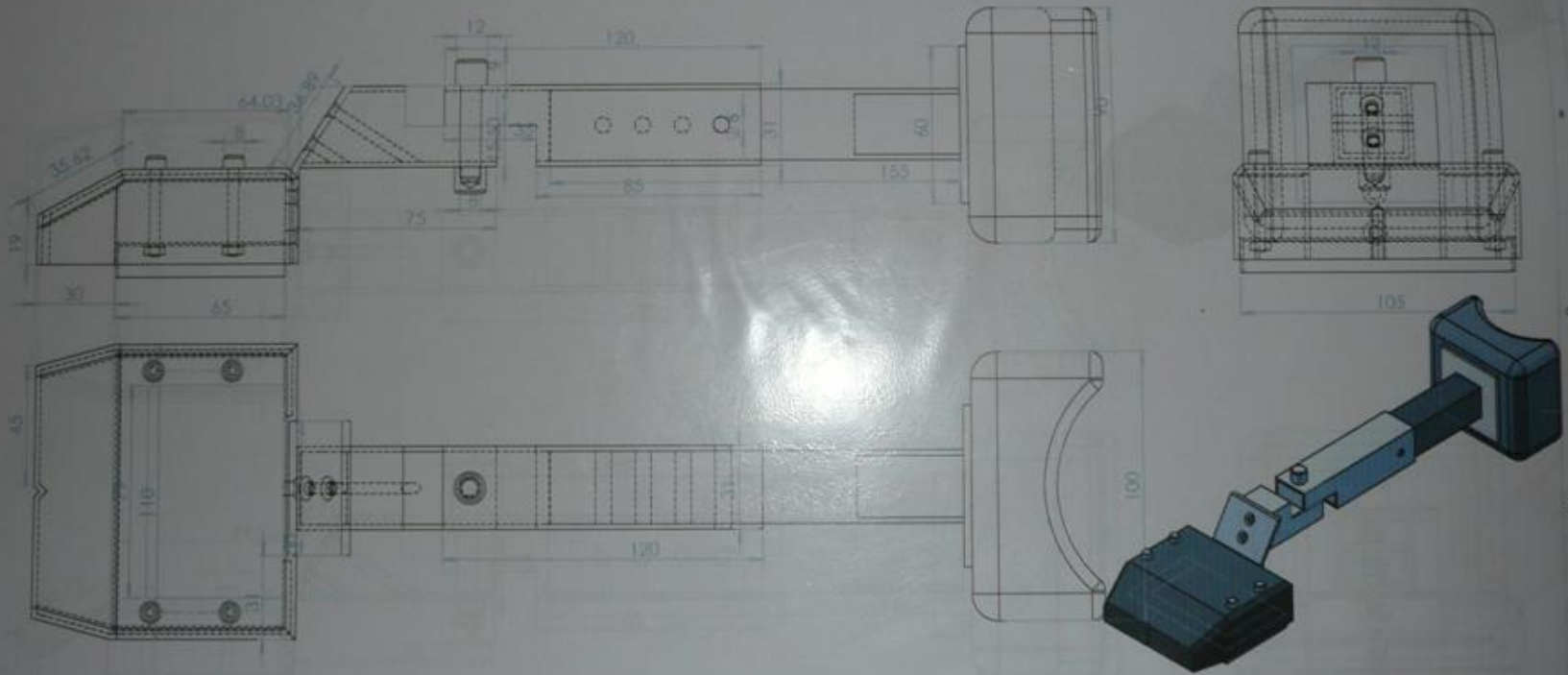
here it shows how I mounted an aluminium metal plate on the rear of the bracket as it did not hold to a high degree and meant the calibration



For the rear pad I had changed to a previous idea of a bent plastic knob. I then stuck sheets of foam to the end and cut this to size before wrapping in leather for stability and durability. This was done on a solid block of foam - proved difficult to work on.



Working Drawing - Carpet Stretcher

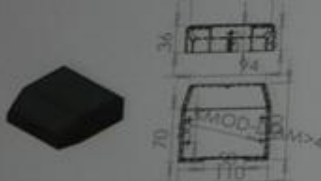


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UNLESS OTHERWISE SPECIFIED: FINISH: NONE DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: UNLESS OTHERWISE SPECIFIED TOLERANCES: HOLE: ±0.05 ANGULAR: ±0.5°			DIMENSIONS AND DIMENSIONS UNLESS OTHERWISE SPECIFIED	DIMENSIONS AND DIMENSIONS UNLESS OTHERWISE SPECIFIED	DIMENSIONS AND DIMENSIONS UNLESS OTHERWISE SPECIFIED
DRAWN: _____ CHECKED: _____ APPROVED: _____ DATE: _____	NAME: _____ SURNAME: _____ DATE: _____	TITLE: _____	TITLE: _____	TITLE: _____	TITLE: _____
D.K. _____	MATERIAL: _____	SCALE: _____	SCALE: _____	SCALE: _____	SCALE: _____

Working drawing sheet

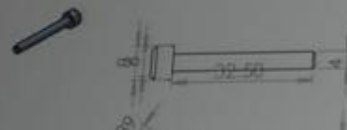
Working drawings of parts



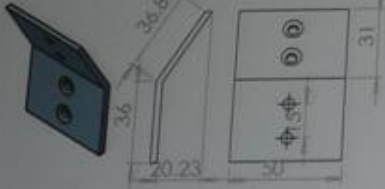
Front head of Carpet Kicker- This should be manufactured from Vacuum formed rigid polystyrene over an MDF mould. 4 holes should then be drilled in the top section (4mm) and 2 on the rear section (4mm) to allow attachment of the guard and handle bracket to the head of the cutter. The mould will be formed through the use of the bandsaw for the basic shape, the lisher to refine this shape to the exact dimensions and then sanding and abrasion to ensure a smooth surface.



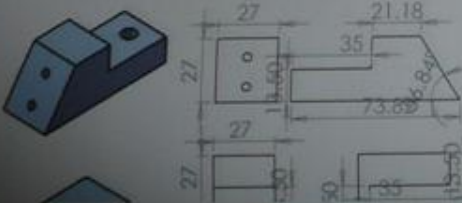
Guard- This is to be manufactured from angle section aluminium. (10mm side) a V shape should be cut out at 2 points and the metal is bent to take the open box shape, this enables it to cover the 3 open sides of the gripper head as the rear is covered already by the handle bracket and this poses little safety threat to the user, the edges of the guard are then to be filed to eliminate any burrs as the guard itself posing a safety hazard would not be acceptable.



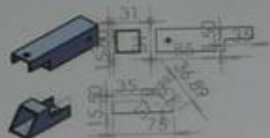
Guard pins, the head should be lathed, a 3.9mm hole bored partially through it and then both edges faced up, and a 30 degree chamfer is to be added for aesthetics.



Handle bracket- To be made from 50x3mm aluminium straight section which is then to be bent using the metal bending machine in the centre. 2.5mm holes should then be drilled on each face and countersunk at opposing ends to allow the bolts used to sit flush to the surface.



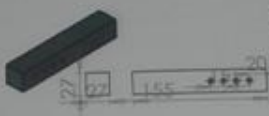
Handle centres 1 and 2- these are to be made from wood, using the bandsaw to cut the rough shape then finished to the exact shape. These should then be drilled using the bench drill on the top and diagonal sides, and the bottom countersunk to allow a nut to be affixed.



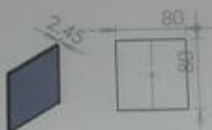
Handle and handle bracket- These are to be made from 30mm aluminium box section cut and filed into shape, then to be drilled in corresponding places to the handle centres. This should then be abraded with wet and dry paper and polished with Brasso.



Main pin- to be lathed to size, knurled top for added grip, threaded at the bottom to tighten handle into position.



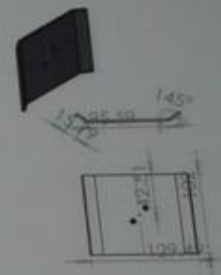
Rear handle extension- to be cut and finished from wood, then drilled and painted black for aesthetics.



Rear handle plate- purely aesthetic, to be made from 2mm sheet aluminium then cut and polished, with Brasso. 2 holes are then to be drilled on a diagonal in the centre to allow screws to pass through.

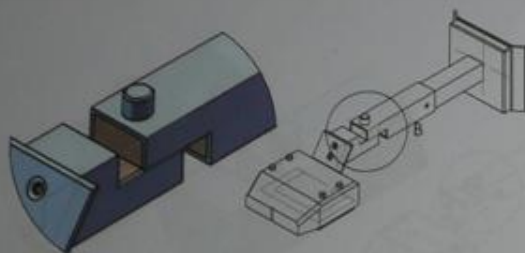


Rear kicker boss- Manufactured from MDF, cut on the bandsaw then chamfered with the lisher (3mm). The part is then sprayed black using acrylic paint.



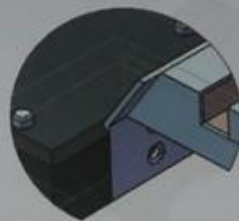
Rear kicker frame- should be manufactured from 3mm sheet acrylic, first cut with a coping saw then finished, then should be finished with wet and dry paper and using the polisher. It should then be bent close to the edges using the heat shrink bander around a mould to get the desired shape and allowed to cool.

Development of ideas

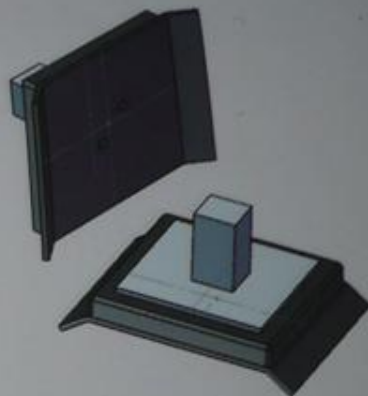


The tuning mechanism will be manufactured utilising a split handle. This will be made from box aluminium with a split down the centre as shown, and the interior will have press fitted MDF plugs to allow the material to pivot and also to prevent dust getting inside the tool. These plugs would be made from MDF and lathed/filled to a smooth yet tight interference fit. A corresponding hole would be drilled through both of the materials to allow the pin to slide in and tighten in position. The pin would be manufactured on the lathe, chamfered, knurled for grip and threaded on one end and tapped on the other to M4 to allow the two halves to tighten into each other.

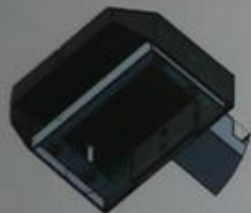
The related/straight position of the handle would be locked by a male/female threaded and tapered pin as shown here. The top would be knurled also for extra grip and aesthetic appeal.



A recess would need to exist on the back of the head to allow the bracket to sit flush and look professional. This would be achieved by neatly filing/chiseling a groove into the rear of the drilled mould. 4mm holes would need to be drilled corresponding to the bracket holes to allow it to be affixed using short M4 nuts and bolts (countersunk for aesthetics). This will overall help in making the tool look streamlined, robust, and more like the original it is based on. The handle is then attached by countersunk bolts and captive nuts in the bottom of the wood, over which the metal outer handle slides to conceal them.



This is a complex design for a curved rear knee pad. It consists of a chamfered and painted square metal backplate, with a cuboid bracket screwed to it to allow it to slide into the main handle (interference fit) of the tool. Affixed to this back plate is a curved bracket made of 3mm acrylic bent on the heat strip bender into a form to accommodate the users knee best. This could then have a foam or padded cushion attached to it, which would be wrapped in leather or a synthetic material to ensure a long product life free from rips or tears during abusive use.



This shows two methods of making the guard: both are spring loaded and would only retract upon the application of deliberate pressure - thus reducing the risk of injury. The first is made by bent angle section aluminium around the perimeter, which is lightweight and unobtrusive but provides minimal protection.

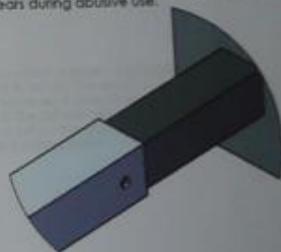


The guard pins would have lathed heads with 3.9mm holes drilled in the centre (blind hole 5mm deep) with M4 threaded bar press-fitted into them for the guard to attach to by means of M4 nuts. The pin will be inserted from the top of the head, held in place by a nut on the underside. Between the nut and the guard there will be a compressed spring, and then a further M4 nut on the underside of the guard to secure it in place.

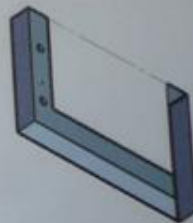


This shows how the pins would protrude above the front of the tool. The smooth appearance of the polished metal and the chamfer compliment the black colour and lines of the product and do not look out of place. They serve the purpose of holding the guard in place but are much more aesthetically pleasing than bolts which could have been used in their place.

This shows how the rear handle will be constructed. The rear inner handle is constructed from wood and is a tight interference fit inside the metal handle. It is attached to the rear pad bracket with 2 woodscrews and is a pressure fit to the front of the handle. One hole is drilled on the outer handle and a series of holes are drilled on the inner handle so that a pin can be used to change the length of the tool to suit the user.



This is the best idea in my opinion on how to make the guard. It is made from angle section 12mm side aluminium with cheeks cut out at the interior corners and bent to an open rectangle shape. The result is a lightweight yet rigid and functional guard for the perimeter of the gripping head. An alternative to this could be bent acrylic or even a vacuum form but I believe this method is the least intrusive on the operation of the product as it takes little space and adds little extra weight to the tool, which is important as it is a portable unit.



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Evaluation of ideas

Function ideas:

- ✓ **Pivoting head** - This could prove useful when the tool is in use in confined or tight spaces/corners. It may be difficult to manufacture to a high standard but would be worth the effort of extra fabrication for the benefit of the final product.
- Compartment for tacks**- This would be simply manufactured however may look crude. The need for tacks or nails when this tool is in use is also minimal so this function may seem unnecessary. It would however give the tool more uses and make use of empty space in the head of the tool. Another downside is the tacks/nails will rattle when the tool is being kicked which could annoy the user.
- Stanley knife storage**- The inclusion of storage for a knife would allow convenient access to a tool which is used at the same time as the stretcher, it would prove very useful and would be easily manufactured, but it may prove difficult to have enough free space to store the additional tool in without making the carpet stretcher look out of proportion.
- Integrated cutting mechanism**- This gets around the problem of not having enough space for a separate cutting tool by including it in the carpet kicker itself. This has the advantage of a second function however its usefulness may be compromised by the bulky nature of the original tool.

Ergonomic ideas:

- Handle grips**- These could be easily achieved with a hand file and would provide extra grip, however they could not be very defined as I plan on using a hollow material with a shallow wall thickness, so their usefulness may be negligible.
- Knurled grip**- This would provide extra grip but may prove uncomfortable. It would also need to be on a round material which leaves some of my possible handle designed void as they are rectangular. It may prove more hassle than benefit.
- Knurled dial**- This both looks good and is functional, it would suit the style of the tool and compliment black plastic well.
- Finger hole dial**- This may provide extra grip but may prove awkward to use, and the finger hole would need to be big enough to suit a variety of people.
- Dial with handle** - This would prove easier to set than the finger hole dial however an extra part on a heavily used tool like this may be prone to breaking would reduce the risk of the user slipping and injuring themselves and it would also be quite easily made to look good and function well.
- ✓ **Curved Knee Pad** - This would prove both more comfortable and safer for the user to use as it reduces risk of injury. It could also be easily manufactured.
- Pivoting knee pad**- This could make the tool more portable however would compromise the stability of the rear pad where force is applied, which could result in injury or damage to the wall/skirting board, therefore it may not be a good idea to implement.

Safety ideas:

- ✓ **Metal guard**- This would be functional and easily made and could also be polished up to match the rest of the product, it could be made from aluminium to be lightweight and also strong. The spring loaded action would also prove practical and safe when in use.
- Vacuum formed guard**- this would add further protection however the vacuum formed material would not be hardwearing and may break during the stress it will be subjected to in use.

Retractable teeth- Retracting teeth would be very safe and would make it very unlikely for a person to injure themselves accidentally, however it would be difficult to manufacture a mechanism to stand up to the constant stress it would be subjected to in regular use.

Front bumper- this would be an easy upgrade to the product which would reduce risk of damaging skirting boards when stretching carpet, however would need to be made of rubber or a shock absorbent material which I wouldn't have access to in the workshop.

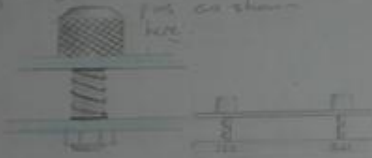
SAFETY IDEAS

METAL GUARD



The guard would be made from angle section 10mm dia. pieces and would be bolted to head with checks cut at the corners.

This is a retractable guard to cover teeth when not in use. It covers the perimeter of the head and retracts with pressure and springs back into position. It is held by 4 bolted and threaded pins as shown here.



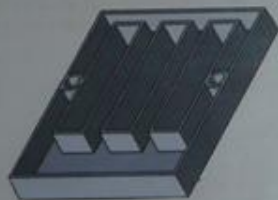
VACUUM FORMED GUARD



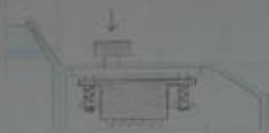
This is another retractable guard similar to the above. This guard however is manufactured through vacuum forming and provides additional protection from accidents due to it covering a greater area of the gripping head.

- This guard would be manufactured from rigid polyethylene using vacuum forming and an MPPE mould (plan view to the right). Although it covers more area, it may prove better through regular abuse.
- The guard would be held in place by the same method as above with springs and pins, and then would attach to the guard on a counter-bolt hole with a nut.

Plan view of mould



RETRACTABLE TEETH



Retractable teeth are an alternative to a guard, as they allow the sharp edges to be concealed when not in use. This method requires the user to push down when in use to reveal the gripping heads. If the springs kick into position when pressure is removed, and is held in place with 2 bolted threads per



This method shows an alternative lever design which allows the user to maintain a firm grip on the tool when in use.

FRONT BUMPER



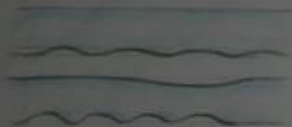
- A soft front bumper or guard would still reduce the risk of accidental damage or shattering lenses and also make the tool less hazardous to the user carrying this figure.
- The bumper would be manufactured from foam or synthetic rubber cut and abraded into the desired tapered shape. Both the cut the black color foam would be partly white.

front view



ERGONOMICS IDEAS

HANDLE GRIPS



• These would give the handle greater grip and give the user more control. They would be best for the control valve with a curved grip. A palm rest could also be possible.

• A knurled metal handle would also provide extra grip and reduce vibration.



The grips could be achieved on both metal and bar sections.

KNURLED GRIP

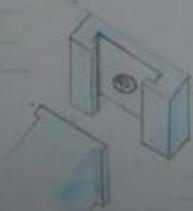
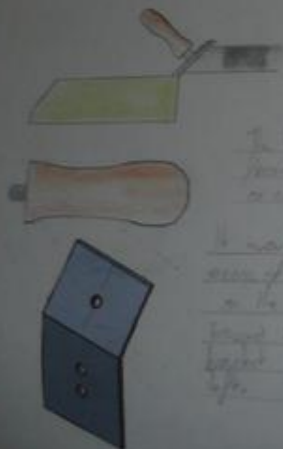


ADDITIONAL FRONT HANDLE

• An additional handle on the front of the device would allow the user a more flexible range of grip to hold onto. This may be used to hold the tool.

The handle could be made from wood, being able to grip a single, operable element.

It would be attached by means of a handle and a fixed hole in the metal bracket as shown to the left.



clip attached mechanism

An alternative view of the handle on the front would be a sliding part. This could be manufactured from sheets of 3mm acrylic and would be covered to provide a non-slip surface.

KNURLED DIAL



This knurled dial offers more grip and control. It could be made from aluminium or acrylic and would be manufactured on the lathe.

FINGER HOLE DIAL



A dial with a finger loop would allow the user to grip the dial with the index finger, which would make the tool easier to use.



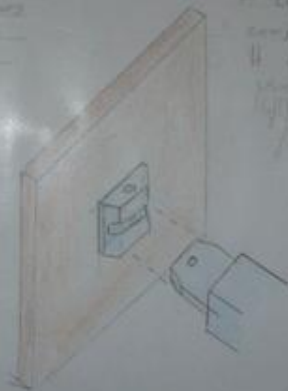
This dial allows the user to grip the dial with the index finger, which would make the tool easier to use. It could be made from aluminium or acrylic and would be manufactured on the lathe.

CURVED KNEE PAD



A curved knee pad would provide more comfort and reduce the risk of injury. It could be manufactured from acrylic or polyurethane, which would be a light material. It could also be made from a cut block of foam or rubber (light).

PIVOTING KNEE PAD



A pivoting knee pad on the tool would allow it to be moved and used in various ways. This could be achieved with a handle on the side and held still by either a ball joint or a ball and socket joint.

FUNCTION IDEAS

PIVOTING HEAD



A pivoting feature would allow the tool to be used in more compact areas where a perpendicular slide with the user's leg may not be possible. The pivoting action would be controlled by a threaded pin with a knurled head for grip and a nut in the lower half of the handle.

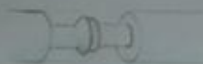
COMPARTMENT FOR TACKS



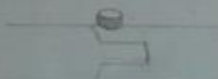
A compartment would give the tool a convenient storage place for tacks etc. It could be made in the middle of the head and a tie attached so when in the left hand could be secured with the nut on the right.

This shows a possible drawer that could be incorporated into the handle for storage.

also rollers



ball and socket joint

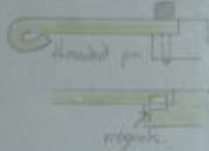


3-way split handle for increased stability



cross section showing possible counterweight and handle sections

locking mechanism



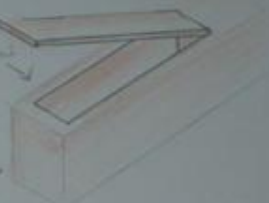
Compartment 'flap'



STANLEY KNIFE STORAGE



There are some possible ideas that could be used to allow a knife to fit into the side of the tool for compact access. They would be made for strength and not using the tool's edge blades.



It also shows a possible design compacted for a Stanley knife or similar tool in the handle of the pencil. It would be made to match exactly to the pencil's body - compacted and secured in a similar fashion.

INTEGRATED CUTTING MECHANISM

Integrating rollers into the grip would give the pencil the additional function of being used to cut under by one wheel. This also gives the protection edge and the compaction. The assembly would be mounted inside as shown in the left.

The mechanism could be formed by a screw mechanism through a tapered hole; the top plate would be attached by rollers to the side of the body and a knurled pin protrudes from the



alternative mechanism



push button mechanism alternative, quicker method of blade extension

alternative roller



A slotted blade added to a sliding wheel for precision

Redesign Specification

Function

- It must be able to grip multiple layers of carpet
- It must have an extendable handle to suit different users and areas of work
- It should have a pivoting head to allow use in tight corners and confined spaces
- It should have a guard that conceals the teeth automatically when not in use
- It should have an integrated cutter as a second function for cutting carpet

Ergonomics

- It must have a soft rear pad for the users comfort
- It should have an ergonomically shaped front handle for ease of use and positioning
- It should have a curved rear pad to better fit the users knee and absorb shock better
- The adjustable head should be easily locked into position
- The weight of the product should not exceed 1kg.

Aesthetics

- The colours of this product should suit the working environment
- The product should look eye-catching and interesting
- The product must look in proportion and well balanced
- It should have a brand logo as this will increase its professional appearance

Safety

- There must be no sharp edges on the tool, except for the necessary gripper head
- A guard should be included to cover the teeth when not in use
- The padding on the knee surface must be adequate enough to reduce the risk of the user straining themselves in use

Materials

- The materials used must look professional
- The materials must achieve a high quality finish
- The product overall should be strong and therefore fit for its purpose (repeated pressure)

Maintenance

- The product should be easy to clean and maintain
- The materials must be easily cleaned
- Replacing the gripping head must be simple to boost the lifespan of the product

Size and shape

- This tool overall should not exceed the length of 600mm to ensure it is useable for a wide range of people
- The gripper head shall be widened as it will allow the tool to grip the carpet and less risk of damage

Durability

- The product must be able to withstand repeated heavy impact during use
- The gripping surface must be long lasting yet replaceable when necessary
- The foam and handle must be long lasting to ensure comfortable use throughout the tools life

Design features

- This product should have a slim handle with finger grooves for comfortable and easy use
- It must have a padded area to absorb the shock

Cost

- This product should not cost more than £15 to manufacture

Time

- This prototype should be completed by March 2011

Draper 409 Carpet Stretcher



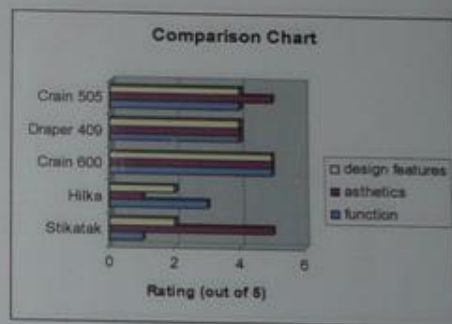
Comments	Rating
Function This product has the single function of gripping and stretching carpet, however the adjustable teeth increase its range of uses on different carpets. As with most of these tools, this would benefit from a second function. The staggered arrangement of the teeth on this tool means it evenly distributes the load and reduces the risk of ripping or tearing the carpet.	☆☆☆
Materials The majority of this tool is manufactured from preformed steel tubing, this makes it lightweight, strong and durable and therefore I think it is a good choice of material. The aluminium alloy end plates complement this as they further reduce the weight.	☆☆☆
Safety This particular carpet stretcher comes with a plastic guard with serrated edges for ease of removal, however this means it may also be accidentally removed during transport and cause injury. This guard does not protect the user from the sharp teeth when in use and as such does not function as well as it could. The adjustable arm on this tool allows the user to adjust it to their preference, reducing the risk of strains or injuries.	☆☆☆
Cost This particular stretcher is in the middle price band and can be bought for as little as £36.50, this is a good price point in my opinion as it has all the features a professional would need but is still affordable to the DIY market unlike the Crain range which are relatively high priced by comparison. This gives the product a wider appeal and a larger market.	☆☆☆
Ergonomics This product is both lightweight and comfortable to use, and the slim foam grip allows easy and comfortable positioning. The foam contact area also provides comfortable use however this product would benefit from more ergonomically shaped handles to improve accuracy and comfort.	☆☆☆
Aesthetics The black glossy finish is eye-catching and looks good, and this is well complemented by the chrome plating on the extendable shaft. The size is not bulky and therefore manageable and in proportion. The symmetrical shape is both balanced and usable and overall this product is quite attractive, but would benefit from a brighter finish.	☆☆☆
Maintenance This tool can be easily dismantled as it is assembled through the use of bolts and standard components. This makes maintenance and cleaning relatively easy however no spare parts such as gripper heads are available from the manufacturer so once a new one is needed the whole product will need replacing.	☆☆☆
Design features The extendable handle on this particular tool both allows it to be used in confined spaces and to be adjusted to suit the users size. The adjustable pin depth allows a greater flexibility and the large non pad allows comfortable use. This product would benefit from a more individual design as although it is quite attractive, looks very similar to its competitors.	☆☆☆
Fitness for purpose This kicker, being one of the lower priced options, exceeds all expectations as it is both lightweight, strong and durable due to its preformed steel tube main body. It is also fully adjustable to ensure a healthy range of uses and can be taken apart easily to be cleaned. Overall I would whole heartedly recommend this product.	☆☆☆

Crain 505 Carpet Stretcher



Comments	Rating
Function The gripper head has 16 staggered gripping pins to grip multiple layers of carpet to stretch it to meet the perimeter of the wall. These can be adjusted accurately through the use of an adjustment knob, however the markings could be clearer on this. This tool also lacks a second function, which would greatly improve the product.	☆☆☆
Materials The full steel construction of this product proved heavyweight yet durable, which will provide a long life yet may inhibit speed and accuracy of use. The use of steel makes this product quite bulky and heavy as a result I believe this product would benefit greatly from a reduced weight construction.	☆☆☆
Safety When bought, this tool comes with a hard and durable plastic guard which clips over the teeth and is quite easy to remove, however this guard is easily misplaced and when the product is in use, there is nothing to stop the user slipping and cutting themselves on the sharp teeth. The guard would benefit from being attached permanently so it could not be misplaced or lost as usual.	☆☆☆
Cost This particular carpet stretcher is priced at £49.95, which is similar with big names like this, you pay for the quality and reliability. This particular stretcher may be an expensive option for the DIY market but is suitable for most DIY use however it is also suitable for professional use as it is reliable and well made.	☆☆☆
Ergonomics The slim construction of this product makes it easy to manoeuvre, however the heavy weight does make it difficult to use. However accurately and easily it can be removed. The foam contact area also proves comfortable to use, but this does not seem to be a shock absorbent front hand grip.	☆☆☆
Aesthetics The bright blue metallic painted finish is eye-catching and allows it to stand out against its competitors and looks very good, this is reflected by its well balanced and symmetrical appearance. Overall I think this is the best looking product of its type on the market and this definitely will increase its appeal both on the shelf and to the user in general.	☆☆☆
Maintenance As with the entire range of Crain Knee Kickers, this product is fully dismantable and this serves the user as an easy maintenance and cleaning feature. If a part is broken or misplaced, it can be ordered from an extensive range available from the manufacturer. This means the product can have a long life and could end up a lot cheaper than buying several, un-repairable cheap alternatives.	☆☆☆
Design features This tool features an extendable 2 position, double locking handle for secure adjustment of the length of the shaft. This means that the user can both work safely in confined spaces and make the tool fit their posture. The seamless rear pad and smooth clean lines of this product are distinctive, attractive and typical of the brand, however it does not appear rugged in comparison to others on the market.	☆☆☆
Fitness for purpose As with a high priced tool such as this, you expect both unrivalled performance and durability, and the Crain brand delivers on these. The full steel construction of this tool proves durable however may hinder a less experienced users handling of the tool. This tool is fully adjustable and can be used on pretty much all types of carpet, therefore overall, I fully recommend this product to the more experienced user.	☆☆☆

Product	Overall rating out of 40 stars
Stikatak	24.0
HILKA	23.0
Crain 600	34.0
Draper 409	31.0
Crain 505	32.0



Conclusion

After thorough investigation, I have chosen to develop the Draper 409 carpet stretcher. Although this product is one of the higher scoring knee kickers on the market, in my opinion, I believe with a few modifications it could surpass any competitor's products. The relatively low price of this product has also attracted me to it as it is probably the best value carpet stretcher available as it is only surpassed by models costing 2 or 3 times its price. The areas I have chosen to develop it in are ergonomics, function and aesthetics as I believe it was not best developed with ergonomics in mind, and also that all of the carpet stretchers I have investigated only have a single function, which greatly limits their use. I have chosen to also develop the aesthetics of the product as I believe this is the only element of this product that shows it is a budget tool, when compared to the high quality finishes of the Crain brand.

Introduction

My name is Christopher Mackin and I am a year 11 technology student in St Patrick's Grammar. The product I have chosen to develop is a carpet stretcher, also known as a knee kicker. I have chosen this device as I have used one before and have acknowledged that vast improvements could be made to its design.

Hilka Carpet Stretcher

Function

This product has the single function of gripping and stretching a single layer of carpet to meet a grip-strip on the edge of a carpeted surface. It does this through a tapered row of teeth which lock into the bottom backing of modern carpet. The user applies force to the padded area through their knee to stretch the carpet. The shaft/body of the tool also functions as a handle for lifting and positioning the carpet stretcher.

Design features

This product features a one piece main body, this means the product has less manufacturing processes, which is reflected in its price. It features teeth at a single level at the front to grip most types of carpet, and a well rubber padded area at the back to add the users comfort. The product comes with a guard for the teeth when not in use for safety.

Materials and Manufacturing Processes

The Hilka carpet stretcher has been manufactured from a single aluminium alloy, which is the reason for the company branding it as "lightweight". It has been manufactured through the use of sand casting to give the product additional strength. The non-gripping surface have been manufactured through the casting from an aluminium-silicon alloy to improve strength. This product makes use of a 2 holes (standard components) to affix the teeth to the main body, and the rubber pad to the rear is attached through the use of adhesives, to ensure a smooth contact surface. The removable guard for the teeth is manufactured from injection moulded acrylic as it is relatively low cost and functions well in this application.

Aesthetics/Ergonomics

This product is finished in a lacquer over the aluminium alloy to add a glossy finish; this is complimented by a black rubber pad to the rear which gives it a residential, industrial look. The product is well balanced and the shape is typical of the range of products, however features an individual pattern at the gripping head which both has aesthetic benefits and increases strength at this otherwise vulnerable point. The slim shaft allows the user to carry the tool one handed which aids in transportation. The product also has a raised sticker at the handle to give the company name and also to enhance the aesthetic appeal.



Hilka budget carpet stretcher

Function

This tool functions by allowing 3 rows of tapered teeth to penetrate the carpet and grip the strong backing layer, allowing the user to then manipulate and stretch the carpet. The adjustable length of these grips allows the user to change the depth to best suit the carpet they are working on. The handle is extended by putting pressure on a spring loaded ball bearing in a socket, much like a truck, and then sliding the handle to the best width.

Design features

Hilka have manufactured this tool with longevity and robustness in mind, and the design reflects this. Dully shapes and strong lines have been used to benefit the strength of this tool. It features adjustable teeth from 15mm-20mm to grip different types of carpet and a 4 stage extendable handle for flexibility.

Materials and Manufacturing Processes

The main body of this tool is manufactured from prefabricated steel tubing. These are then welded together to provide a strong, permanent bond. The front and rear pads have been made from injection moulded synthetic rubber to provide a strong gripping surface. The steel gripping surface has been manufactured using die casting for precision and the guard for this front section moulded also plastic for durability. Standard components (i.e. screws) have been used to fix parts of this product to the main body. The teeth are made from steel by the process of stamping and shearing.

Aesthetics/Ergonomics

The Hilka carpet stretcher is finished in a matt green powder coat finish which makes it look different from its competitors. Its large and bulky appearance gives the impression of a robust product yet its soft grip handles allow easy and comfortable use of the product. Both the front and rear sections appear oversized but as a result the whole product looks to be balanced and in proportion. The product has small numbers on the adjustment knob to indicate the level.



Craic 600

Function

This tool benefits from 16 adjustable steel pins on the gripping surface along with 3 top grip-lines of teeth. This allows a high level of flexibility and can be adjusted to the end users preference. The gripper head uses 3 pressure rods to help stabilize and more efficiently transfer force to the gripper head. This feature is unique to this product.

Design features

This tool features a stainless steel padded surface for extra user comfort, with minimal opportunities for wear due to its stainless nature. The handle is extendable from 17.5 inches to 21.5 inches to allow ease of transport and flexibility of use. A trigger system operates this function which allows the mechanism to be hidden.

Materials and Manufacturing Processes

The main body of the Craic 600 carpet stretcher has been manufactured from steel through a sand casting process, and then chrome plated for durability and aesthetics. The rear section of the lifter has been made from injection moulded high impact plastic for durability and weight saving. A seamless neoprene boot is affixed to this through the use of standard components (i.e. screws) to reduce wear. The steel gripping surface has been die cast for precision and is yet again reinforced through the use of screws and a spring mechanism. The adjustment knob has been manufactured from aluminium through use of die casting as this best suits the shape of the component. The extendable arm has slots which have been milled to help keep the tool straight and reduce weight.

Aesthetics/Ergonomics

The Craic 600 benefits from a chrome plated main body which is both durable and aesthetically pleasing. Mechanisms which operate the extendable handle is concealed to both compliment the smooth appearance of the body and also to reduce any risk of injury to the user's hand and also to reduce wear to the user's hand. The tool also features a slick styling and a high level of ergonomics for the user. The handle is designed to be high to fit in the hand and be moved and rotated around the hand and wrist. The tool also features a high level of ergonomics and a high level of grip applied to the adjustment knob.



Draper 400

Function

This performs by gripping and stretching carpet to the gripper role around the perimeter of a room. This device carries out this purpose through the use of an adjustable row of teeth which grip the backing of the carpet. The adjustable teeth add the flexibility to be used on a variety of thicker and thinner carpets, which is effectively a second function of the product.

Design features

This product features a padded foam handle for user comfort and a rear padded lifter for padding use. This product also has the advantage of a 4 position extendable handle, from 400mm to 600mm depending on how much leverage is required. A soft foam padded area to the rear of this tool offers increased user comfort.

Materials and Manufacturing Processes

The shaft of this product has been manufactured from steel tubing, a high strength metal to improve the lifespan of the product. The end plates on both sides of the shaft have been manufactured from an aluminium alloy through die casting for strength and weight reduction. The dial on the front of the tool has been made from injection moulded acrylic as it is best suited to the shape and finish required. The shaft are milled to the shape and finish required. The shaft are manufactured from steel for strength and longevity. Standard components such as springs are used to hold the gripping plate steady, and screws are affix the back plate to the main body of the tool.

Aesthetics/Ergonomics

This tool features an electroplated black steel shaft and alloy end sections. This coating both gives the product a slick look and feel and adds an extra layer of protection to the metal. The chrome plated smaller section of tubing makes the product look more appealing, and is designed to withstand friction from the sliding motion due to its hardwearing properties. This product features a padded foam hand grip and a soft rear lifter for a high level of user comfort whilst maintaining a reasonable grip on the product. The extendable nature of this product allows it to be stored easily and extended when needed. The shape of this product is typical of this type of tool, and is well balanced and symmetrical as it has no unnecessary parts or edges. This bold styling could be said to add to the aesthetics of the product.



Craic 900

Function

A large section of 18 metal spikes on the bottom of this tool function by gripping the fibrous backing layer of the carpet and stretching it to meet the starting board of the room and prevent wrinkles/cracks. The user applies force through their knee to the stainless pad to the rear, and this force is directly applied to the carpet. The teeth have an adjustable height of up to 20mm to allow use on different varieties of carpet.

Design features

This tool benefits from a stainless padded rear lifter to improve the users experience and comfort of use. This product also benefits from a 4 position extendable handle for ease of use. The slim handle allows easy use and carrying of the tool. A plastic guard is included with this stretcher which allows it to be safely transported.

Materials and Manufacturing Processes

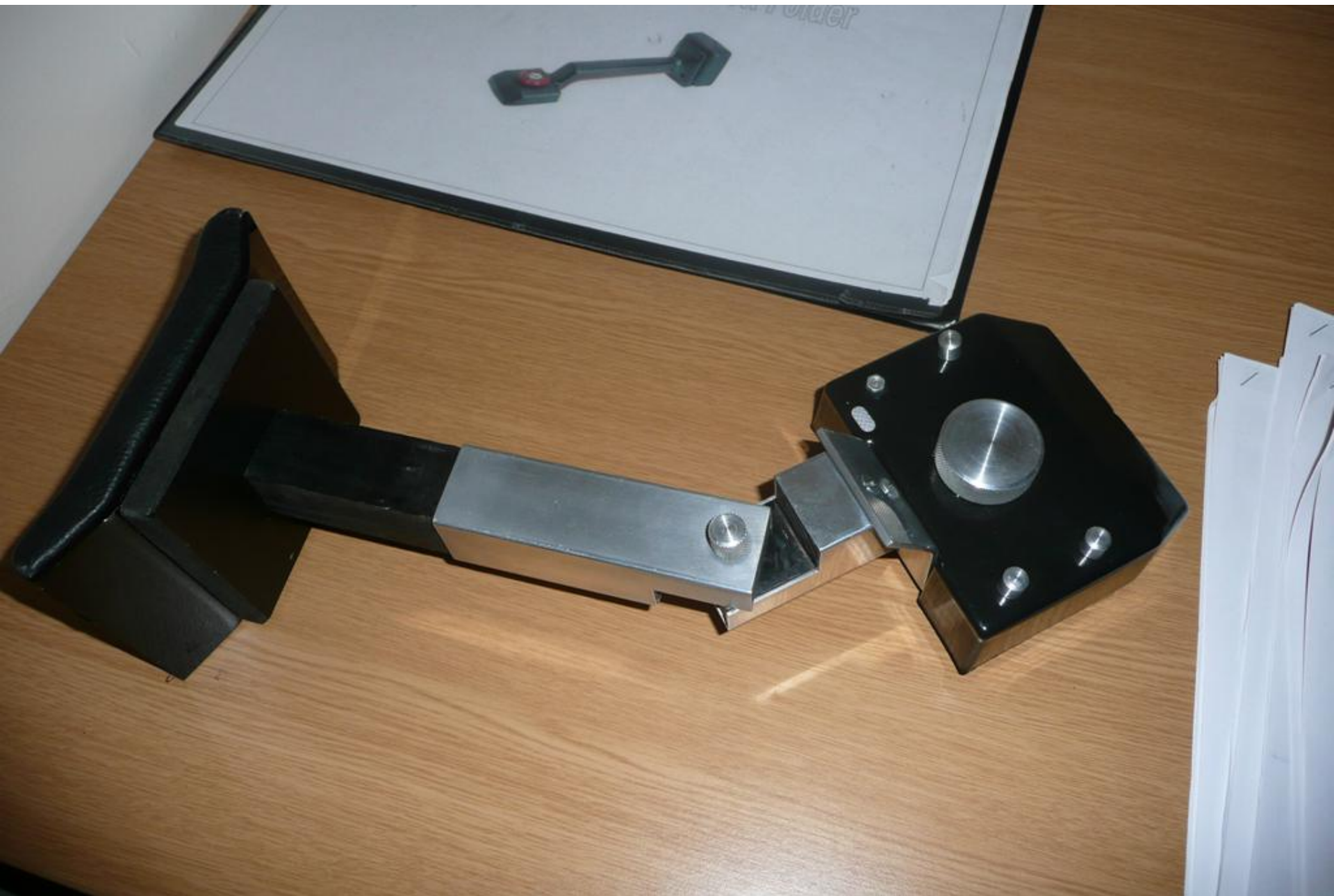
The main shaft of this product has been manufactured using two sections of steel tubing. This has been attached to the dial end front and rear plates through the use of a bolt head which has been cast into the parts and a lock nut (standard component) in place to secure them. The parts have been stamped and sheared from steel for a long product life and the guard for these has been formed from injection moulded ABS plastic. Holes have been drilled in the gripping surface to allow it to be attached to the main body. The dial has been machined from 6061 aluminium by a CNC router to produce the complex shape.

Aesthetics/Ergonomics

This tool features a bright finish, which is synonymous of the Craic brand. It features a bright metallic blue painted finish over the main body of the tool. This is complimented by the black hardware such as the rear padding and guard. The highly polished finish of the adjustment knob compliments the high gloss finish on the rest of the tool. The extendable handle on this product allows it to be adjusted to the users preference and also allows the user to use the tool in more compact areas such as stairways. The smooth appearance of this product is well balanced and stylish and makes it easily distinguishable from any competitors.







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Chris Mackin 138
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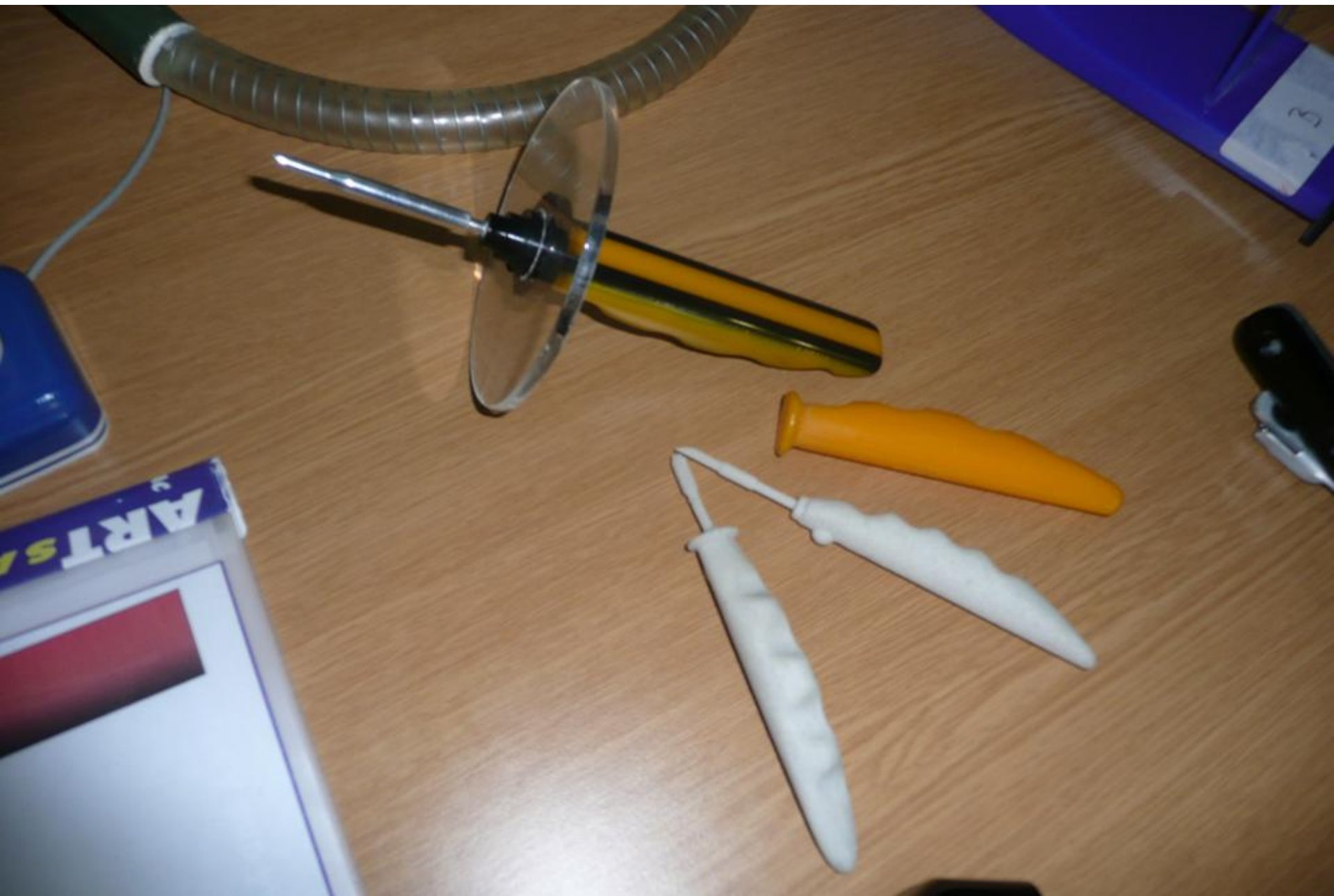
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