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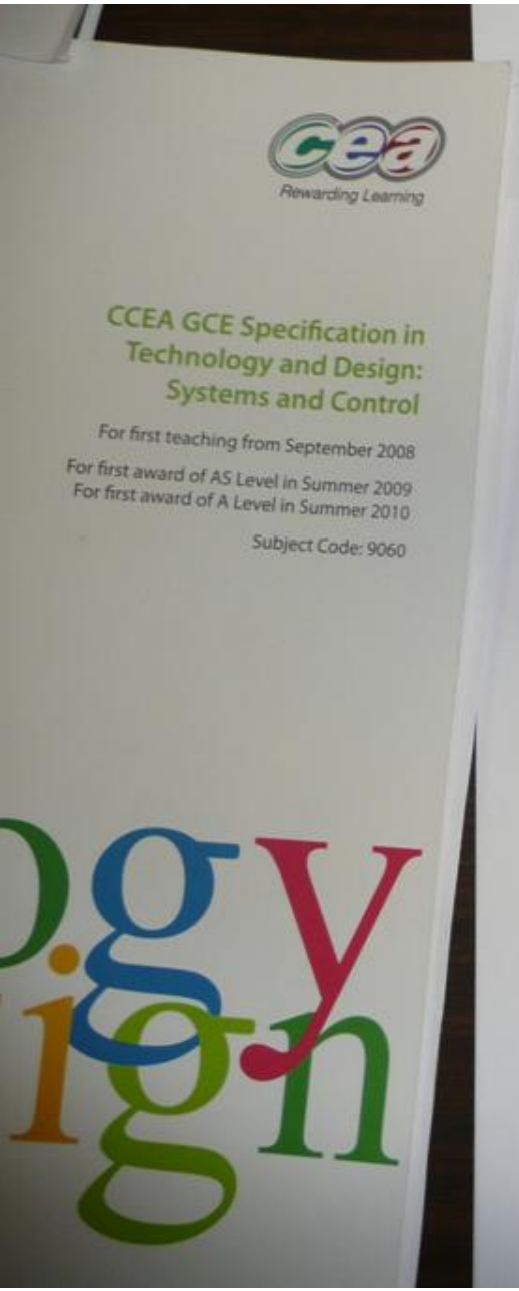
HAMILTON BEACH



AS GCE Advanced Subsidiary Examinations
CANDIDATE RECORD SHEET: Technology and Design
Summer 200_

Rewarding Learning

Centre name: _____ Centre number: 71
_____ Candidate number:

AS Unit 2: Product Development 7 staple gun 16 9 5 9

Criteria	Maximum mark	Mark awarded	Folio Page No.				Comment	
Investigation and analysis of product	20	6 7-8	20	9	17-18	17	20	A Top end B mid high C 30-35 D 30-35 E mid - high
Re-design solutions and development	30	10 9-10	25	18	26 24-26	27 24	23	F mid - high G 30-35 H High I 40 J
Manufacture	40	10 18	35	30	33 34-36	38 35	26	K L M N O
Testing and evaluation	10	3 4-5	9		5 5-6	9 8	8-9	P Q R
TOTAL	100	29 29-34	89 90-95		75-80	80	91	

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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 _____ (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)

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AS

GCE Advanced Subsidiary Examinations
CANDIDATE RECORD SHEET: Technology and Design
Summer 200_

Rewarding Learning

Centre name: _____ Centre number: 7 1 _ _ _

_____ Candidate number: _ _ _ _ _

AS Unit 2: Product Development

Criteria	Maximum mark	Mark awarded	Folio Page No.					Comment
		7	staple gun	16	9	5	9	
				Drill	Bandsaw	Disc sander	Sandpaper	
Investigation and analysis of product	20	6 7-8	20	9	17-18	17	20	A Top mid bottom high B mid high C 30-35 D 30-35 E mid - high
Re-design solutions and development	30	10 9-10	25	18	26 24-26	27 24	23	F mid - high G 30-35 H High I 40 J
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Safety

The product does not have any indents or crevices deeper than 3mm which could collect dirt or moisture as this could become unhygienic. The product is made using water resistant materials because it would not clean very well were it made from materials that were not water resistant. If the device is dropped onto a hard floor from a distance of 2 metres it does not shatter, split, fracture or fragment into smaller parts revealing sharp edges or points. Moisture does not affect the materials of which the product is made off and the materials do not release any toxic fumes when exposed to moisture. The product does not emit poisonous fumes or become a fire hazard if exposed to heat. The blade is fully covered by the guard when not in use so that it can not harm the user when the product is not in use. The idea of the guard is to minimise the risk that the user can harm themselves on the sharp blade of the cutter.

9/10

Ergonomics

The product can be used by both genders from the age of 10 upwards. It caters for the 95 percentile range of the population. So 95% of the population is able to use the product at their ease. The user is able to hold the device easily and comfortably in one hand and this is because the handle is not less then 140mm in length.

8/10

Quality Control

In industry products being manufactured must meet certain standards for the safety of the user and all of the products that I have analysed have done this. Because my product is only a prototype and will not go into mass production it does not have to reach these standards but I made it so that meets these standards anyway:

- It must be corrosion resistant so that it does not rust and so the blade does not lose its sharpness.
- It must not shatter or fragment when dropped from a height of 2 metres.
- It must not ignite when a naked flame is held on it for ten seconds.

10/10

Aesthetics

The finished product appeals to 65%-75% of the user market under the following areas:
Colour- the colour of the product appeals to both genders and to most of the user market.
Size/form-the shape/form is liked by most users and the product is easy and comfortable to use.
Texture-the product offers the user easy grip as the texture can make the product easy to hold and operate.
Price- although my product will not be mass produced or sold, but if I was to do this I would set the price of the product to be around £7-£11. This would make it very competitive with other products in the market.

9/10

I could have made the handle slightly longer so that larger users would also be able to use the product with ease.

I could have made a curve on the guard of the cutter and this would have made the product easier to use as the user would not have to raise their hand up as high to use the cutter.

I could have made the server much thinner so that it is easier to lift the pizza slice on to the server. The user would then not have to lift the pizza slice slightly on to the cutter.

These are improvements I would make to my product if I were to make it again.

Evaluation and Proposals for futher Development

	Score
Function The pizza cutter has a server added onto it so that as well as cutting pizza the user will also be able to serve it using the same utensil. This increases the function of the product as it adds another feature to it in the shape of a server. The server of the product also acts as a guard to protect the user from cutting themselves when not using the cutter part of the product. It also guards the blade on the cutter.	8/10
Performance The product is able to guard the blade completely without ever actually touching the blade. It is able to cover the blade without trapping any dirt or debris in the guard. The product is also able to lift and move the pizza with the help of the user, without it falling off easily. Once on the server, the pizza slice does not fall off easily.	9/10
Size and Form The dimensions of this product does not exceed 250mm x 50mm x 80mm as it should not be too large or else it would be difficult to use and store. The device is easily held in one hand and it is also easily fitted in a drawer, if the user prefers this option to storing it in the block. The shape and form of the object fit in the users hand easily as well.	9/10
Environment The product fits into the space available to it for storage, e.g. in a drawer therefore it should not exceed 250mm x 50mm x 80mm. This product must be able to withstand a large variety of temperatures because pizzas come out of the oven at around 200°C but it cools rapidly once out of the oven to around 70°C at the time of cutting. The materials will need to be able to withstand these extreme temperatures in order to carry out its function efficiently. Moisture or condensation must not cause rusting to my product. The devices colour must appeal to most of the population so that most people like the colour and look of it. The product should be easily used in the environment that it is suited for (kitchen).	7/10

Testing

Drop Test

Description-In this test, some of the items used to make the product are dropped from a set height. From this I will be able to see if the materials used are suitable.

Results-After 5 drops there were small scratches to the handle and base. The base pulled away from the handle and my wooden block dented. After 10 drops there were small chips being removed from the base. After 15 drops cracks started to appear in the base and there were chips in the handle. After 20 drops the whole piece had cracked and the plastic layers were pulling apart. My wooden block was heavily dented now.

Conclusion-After being dropped 20 times my acrylic cutter and server would be considerably chipped and scratched and the acrylic layers would be pulling apart. My wooden block would be heavily dented and would begin to split.

Ergonomics

Description-In this test, the ease of use and safety of the final product will be tested.

Results-I asked 10 people how easy to use my product is and how safe they think it is. There were complaints that the cutter was difficult to use as the user has to raise there arm up quite high to use it as the guard comes down so low to the blade as seen in the picture as the product as a cutter. Other than this complaint my product was viewed by the people I asked as easy to use.

Conclusion-I think that my cutter is quite difficult to use because of the reasons I stated. Another problem was that the product is quite heavy for its size, so it may be tiring to use for long periods though such circumstances should not arise. Apart from this I think my product is easy to use as the handle is easily held by the user. The server end is also easily removed and put back on to the cutter end.

Cost

Materials	Cost
Acrylic 400mm x 400mm	£5.00
Metal 60mm x 60mm	£0.70
Mahogany 300mm x 300mm	£2.30
Total	£8.00
Total cost of manufacture	£9.00
R.R.P	£11.00

Description -This evaluates the total cost of the product. It will take into account the materials used and also the total hours required to produce the final product. This will evaluate whether the product is financially viable.

Results-The product would make around £2.00 in profit per unit. The R.R.P of the product is £11.00 set from my specifications. The cost of manufacture per unit would be £1.00.

Conclusion- I think my product would be profitable to sell in the market as it is making quite a large profit per unit a £2.00. I think I could even make the product cheaper to buy, which would reduce my profit margin but would encourage more sales and greater profits. If I could reduce the price of my materials especially the acrylic and mahogany, I would be able to manufacture the product for less and so I could charge a cheaper price.

Aesthetics

Description-This test will investigate the appearance of the product and will determine how physically attractive people believe it is to the eye.

Results-I asked 10 people what they thought of the shape and colours of the product. 8 out of the 10 people agreed that the product was an attractive shape and colour and that the block was also attractive piece.

Conclusion
I think that my product is very attractive to look at as the shape and colours of the piece are pleasing to the eye. The curvatures and contours look attractive and the colour scheme of red, silver and mahogany brown makes a good combination for the final piece.

Size and Form

Description-The size of the product will be tested here. It will determine how easy the product is to store and the suitability to the user.

Results-My product is the correct size for a pizza cutter and pizza server. It is easily held because of the size of it-it's not too big and it's not too small. The product is easily stored as I have made a block for it to sit in when not being used. This can easily sit on a kitchen worktop out of the way.

Conclusion-I can see that my product is a good size as it is easily used both in the server and cutter form. To improve usability I could have increased the length of the handles for users with larger hands as the handles may be too small for larger people although it is a perfect size for me.

Function

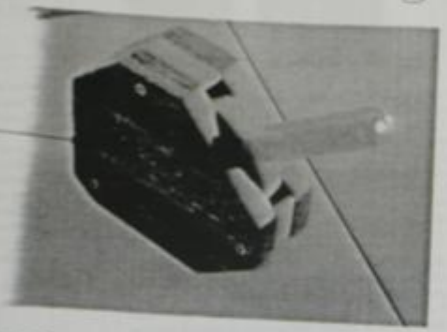
Description- My product is designed to cut and server pizza with the one device. I will test how well my product does this by testing it in a number of ways.

Results-My product was able to cut through all types of pizza with the exception of pizza with a very tough crust. My server is quite thick so to lift the pizza I had to lift the pizza slice slightly on to the end of the server with my hand and then the product could lift it from there. My base for the product carries out its function as it holds the product perfectly and looks aesthetically pleasing.

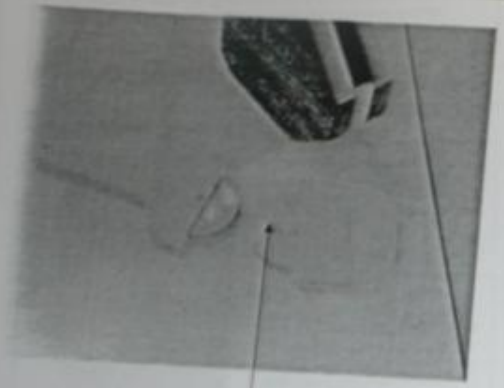
Conclusion-My pizza cutter is very good at its function with a few rare exceptions. My server is not so good at its function as the user needs to initially lift the slice on to the and of the server slightly. Since my product is only a prototype, I would look to resolve these slight flaws in my product if I were to put it into production.

Changes made during Manufacture

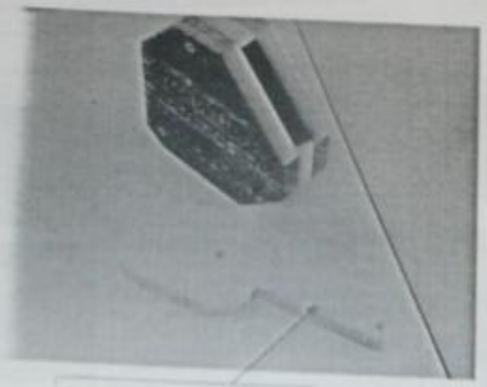
During manufacture I thought that it would be better for my product if I made an appliance that my product could stand up in as it would make the product more aesthetically pleasing when not in use. It will also mean that my product will be held more secure when it is not being used and there is less chance of it being damaged. So I manufactured this mahogany and acrylic block that my product can sit in easily.



In my initial idea I had planned to make the handle and the top of the server as two different pieces of acrylic but during manufacture I realised that this was not right as I would not be able to connect the handle to the base so I went back to solid works and made it so that the handle and the top of the server were the one piece. I also meant I had less work o do and it made the piece more flush and sturdy.



Instead of cutting the top of the server off flat, I left a semi-circle on the top of the middle layer. I then milled this down so that it was very thin. Then it could be pushed up into the cutter so that the server and the cutter fixed together looking flush.



I decided to make my handles with only one side of it engraved in text. I done this as I thought that two sides with text on it would have been too much and that with just one side engraved by then CNC machine was enough

The engraving of the text on the handle was too small and difficult to make out. So I went on to solid works and made the text on the handle bigger so it could be easier to read.

(Teacher)

Plan of Manufacturing

Tools	Description	Time
Computer with solid works	I will design all the components and parts on the computer and present a working drawing of the product.	120 minutes

Tools	Description	Time
Acrylic, aluminium, ruler, spirit marker, tri square	I will mark out the general sizes and shapes of the parts of the product. I will only have to mark out the size of the blade as I will have the shape of the rest marked out on the solid works programme.	30 minutes

Tools	Description	Time
DFX file, computer controlled router	I will cut out the plastic, using the DFX file, under the supervision of the technician.	60 minutes

Tools	Description	Time
Band saw	The technician will cut out a piece of aluminium of 70mm in diameter to form the blade of the product.	180 minutes

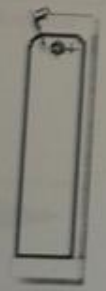
Tools	Description	Time
File, wet and dry paper, polishing machine	I will draw file the plastic edges to remove any scratches. I will then use wet and dry paper to fully smooth the edges and then I will polish the edges using the polishing machine.	120 minutes

Tools	Description	Time
Tensol cement, clamps	I will glue the three different layers of my product together with tensol cement and I will clamp them together when drying to ensure a tight hold.	240 minutes

Tools	Description	Time
Polishing machine, emery cloth, brush	I will remove the clear plastic cover of the acrylic and polish it up if need be. I with clean the aluminium blade and polish it.	120 minutes

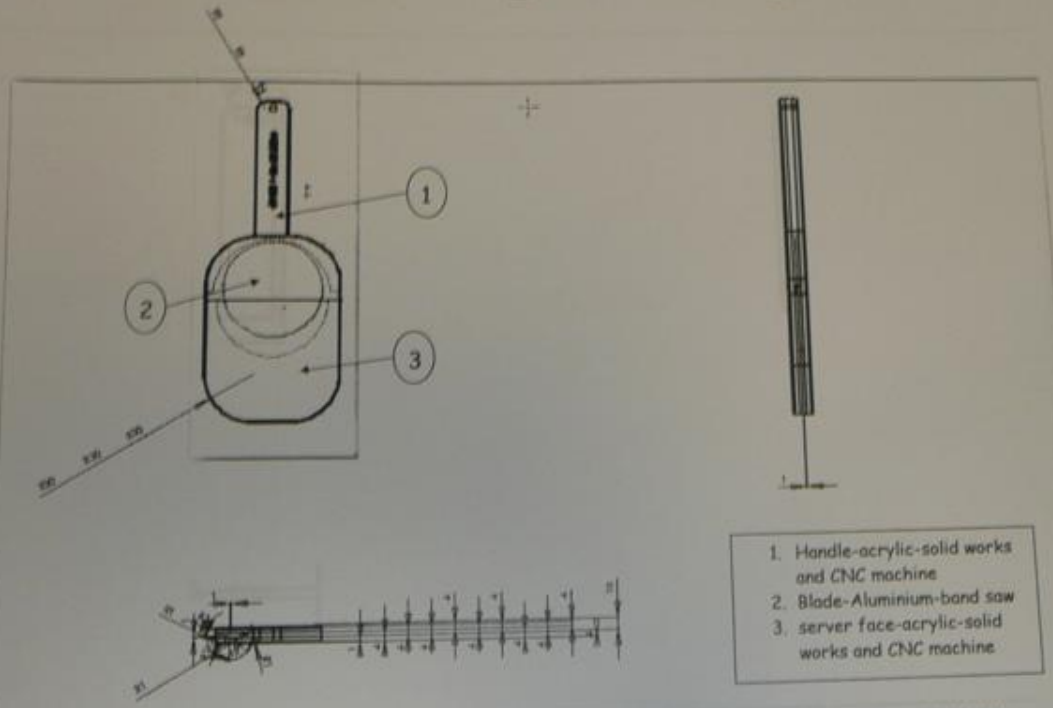
Tools	Description	Time
Pillar drill, drill bit, ruler, spirit marker	I will drill a hole of circumference 2mm through the blade and through the acrylic server so that I can attach a hinge to hold the blade and server together.	60 minutes

Tools	Description	Time
Screwdriver, nut and bolt	I will need to assemble my product, that is, attach the blade to the server together. After this, my product will be complete.	120 minutes



PIZZA SERVER AND CUTTER DRAWN BY EOIN MANNELLY SCALE 1:5 MATERIALS: ACRYLIC DRAWING 2

Working Drawing



1. Handle-acrylic-solid works and CNC machine
2. Blade-Aluminium-band saw
3. server face-acrylic-solid works and CNC machine

PIZZA SERVER AND CUTTER DRAWN BY EOIN MANDELY SCALE 1:1.5 MATERIALS:ACRYLIC AND ALUMINIUM DRAWING 1

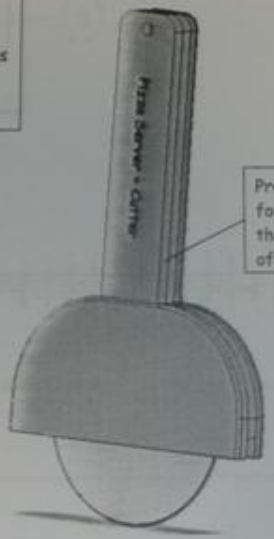
Development of Housing

Text cut extruded into the acrylic.

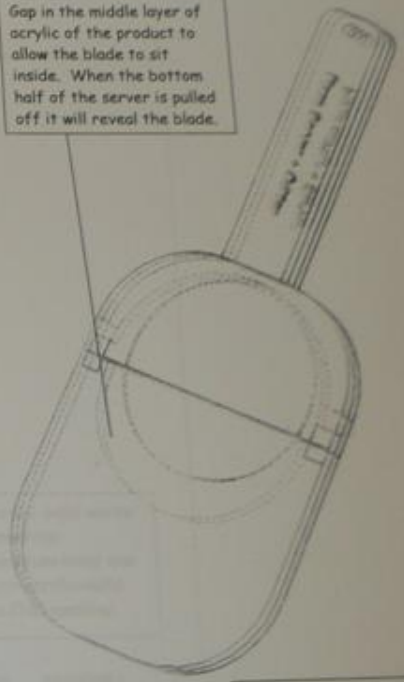
Blade- edge is chamfered so the edge of it is sharp for easy cutting.

Hanging loop to allow product to be hung from a hook.

Edges are all filleted for smoothness.



Product in the cutter form. Bottom half of the server is slid off.



Gap in the middle layer of acrylic of the product to allow the blade to sit inside. When the bottom half of the server is pulled off it will reveal the blade.

Middle layer is shaped so that the blade can sit inside the product.

Built up in 3 layers of 4mm acrylic.

Appeal to buy	I think that there is a good appeal to but this product as the potential buyers would find the design a good idea that the blade actually sits inside the server. (9)	This product would have a good appeal to buy as the design of the product i.e. the hinged server to reveal a circular blade to be used to cut the pizza would appeal to many potential users. (8)	This product would be appealing to buy because it looks good and carries out two functions effectively. Though on the other hand people may not buy it as they may think that you could just buy a pizza cutter and pizza server separately. (6)
Total mark	50/60	38/60	47/60
Overall conclusion	This is an excellent score for this product and I think that this product best suits my specifications so this is the idea that I will be carrying forward to manufacture. I think that I can improve it even further during manufacture.	This is not as good a score for this idea than compared to the scores of the other ideas and I will not carry it on to be manufactured. This idea is too unsafe and it is hard for the user to operate.	This is also a high score for this idea though it is just not as high as idea 1 and I think it is not high enough to satisfy my specifications. I think this idea would need to be adjusted slightly to be suitable enough to be manufacture.

Evaluation and Selection of Initial Ideas

	Idea 1	Idea 2	Idea 3
Fitness for purpose	This product is suitable for its purpose as it can easily lift and move pizza slices with the large server. It can also cut the pizza easily as it has a sharp circular blade. (9)	This product is fit for its purpose as the blade will easily cut pizza The large face on the server will also easily lift and move a pizza slice. (7)	This product is fit for its purpose as it will cut pizza and it will also lift and hold a pizza slice with complete ease. (8)
Aesthetics	This product looks good as it looks flush and tidy. The cap with covers the blade and forms the top of the server and this adds to the good look of the overall idea. (8)	This product is pleasing to look at when in the cutter form but not so good to look at when in the server form, as the handle is of centre and there is a gap down the middle of the serving face. (6)	This product is very pleasing to look at as it looks very sophisticated and compact. It also appears flush and tidy. (8)
Ease of use	This product is easily used to serve the pizza but it may become harder to use to cut the pizza. It may need to be held in an awkward position for the use in order for the blade to get good contact with the pizza so that it can cut it properly. (7)	This product may be awkward to operate the cutting facility as the blade is so far from the handle and so the user will have less control of the blade which may become unsafe. The server part is also hard to use as the handle is at one side of the product and so may be hard to operate and it may also become unbalanced. (4)	This product is easy to use as it is just a simple cutter and server hinged together so there should be no difficulties when using it because if anyone can use a normal pizza cutter or pizza server then they should have no difficulties using this. (8)
Maintenance	Minimal maintenance is required her with this product. The product will only require a light clean or rub down after use. The user must ensure that no food debris gets caught up in between the blade and the cavity which it sits in as this could become unhygienic, though this should not be a problem. (8)	The maintenance on this product is minimal though some food debris may get caught in the gap in the server and if not removed this could become unhygienic. The product may need a light cleaning after use. (8)	There is minimal maintenance required with this product as it will only require a light clean or rub after use. (9)
Safety	Safety is an important factor with this idea due to the sharp circular blade involved in the idea. The users should be careful not to cut themselves when using the cutter. The cap which fits over the blade ensures that the users cannot cut themselves when not using the cutter feature of the idea or when not using the product at all e.g. reaching into a drawer. Most of the blade is concealed, which is also very safe. (9)	This product may be hard to use in the cutter form, as the blade is quite far from the handle so the user will have less control over the blade and this increases the risk of an accident so it is more unsafe than the other ideas. (5)	Safety here is a priority because of the sharp blade involved in the idea. The users must be careful not to cut themselves when using the cutter but there is a guard in place to ensure that they do not. (8)

My Selection

My chosen idea to develop will be idea 1. I think this idea it the most practical and it is clearly the best product from the scores on the table. This idea looks the best in my opinion and it is very easily maintained. This idea was also the first concept idea that I thought of so it is the original idea that I had planned to manufacture. I am now looking forward to carrying out the manufacture of this product as I am eager to find out how it will end up and am looking forward to trying to overcome the problems that arise with the manufacture of the idea.

Initial Ideas

IDEA 3

Server and cutter END out so that they are in a straight horizontal line

blade — handle — hinge — cutter — guard — server

one — light and durable

hinge — handle — cutter — guard — blade — handle — server

Stainless steel — hygenic and does not rust

guard — line of pin — pin — line of pin

handle — hinge

The server is shaped in such a way so that it is easy to lift and move pizza slices

hinge — handle — guard — metal pin — blade — server

server

metal pin

blade

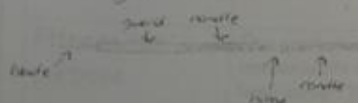
Users must be careful not to cut themselves on the blade

Stainless steel — as it is hygenic and does not rust

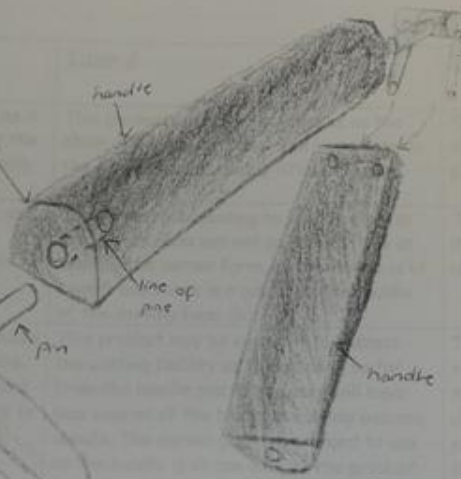
Initial Ideas

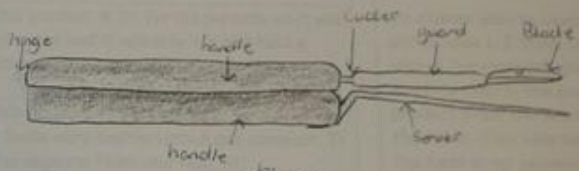
IDEA 3

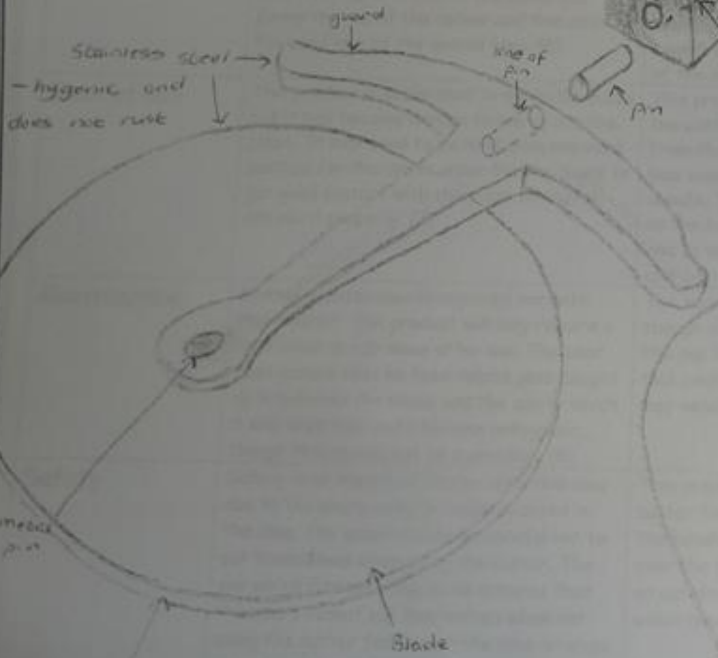
Server and cutter flip out so that they are in a straight tensioned line.



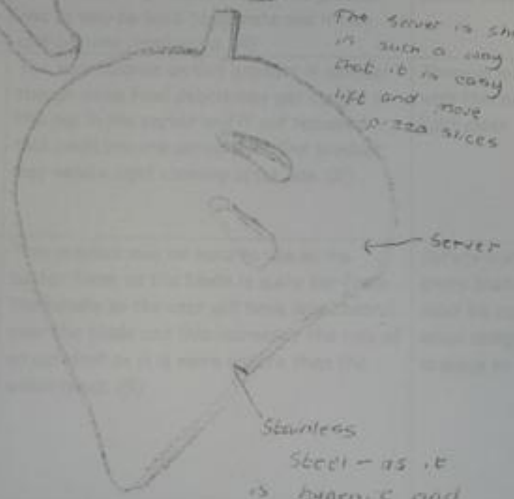
Fine – light and durable





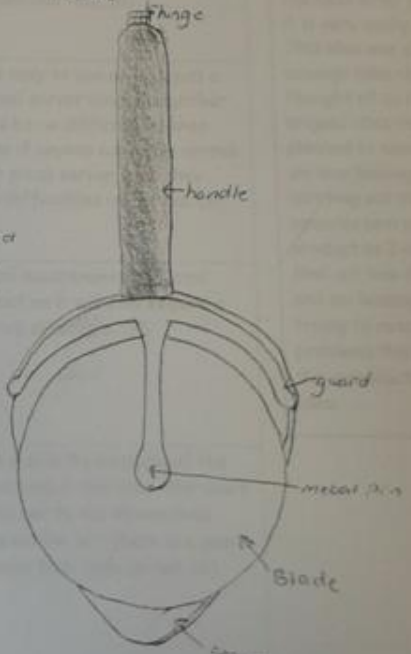


Users must be careful not to cut themselves on the blade



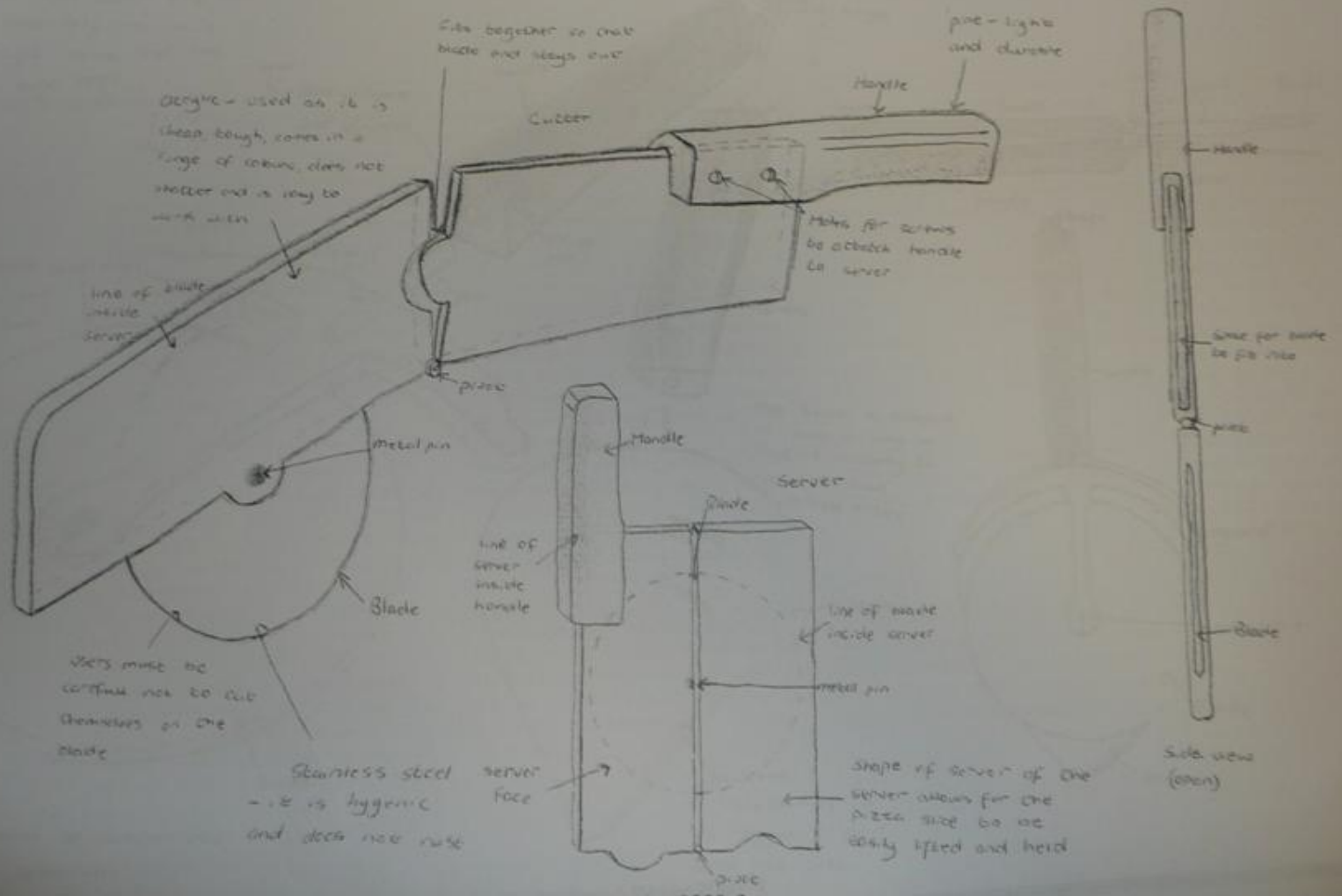
The server is shaped in such a way so that it is easy to lift and move pizza slices

Stainless Steel – as it is hygenic and does not rust



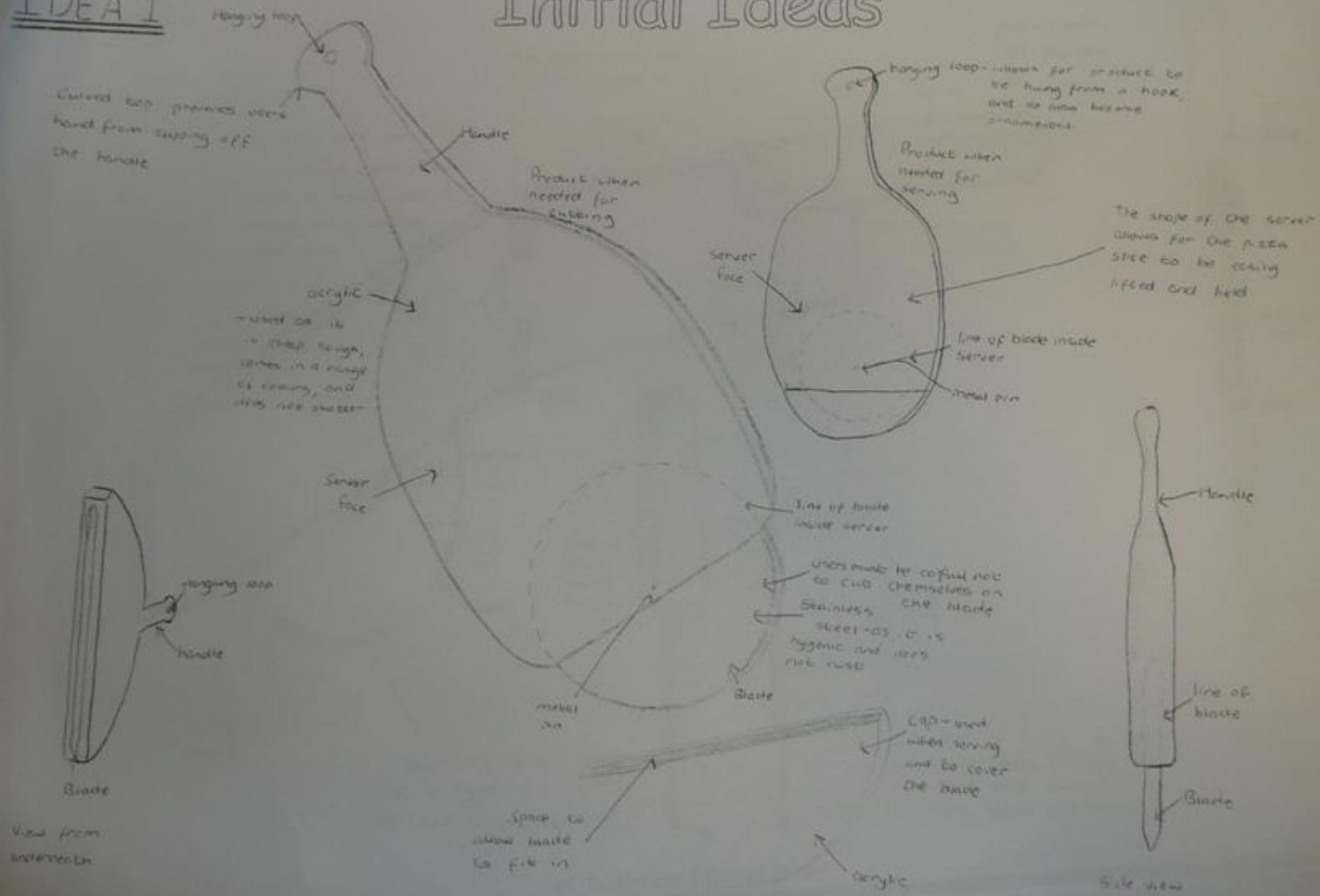
Initial Ideas

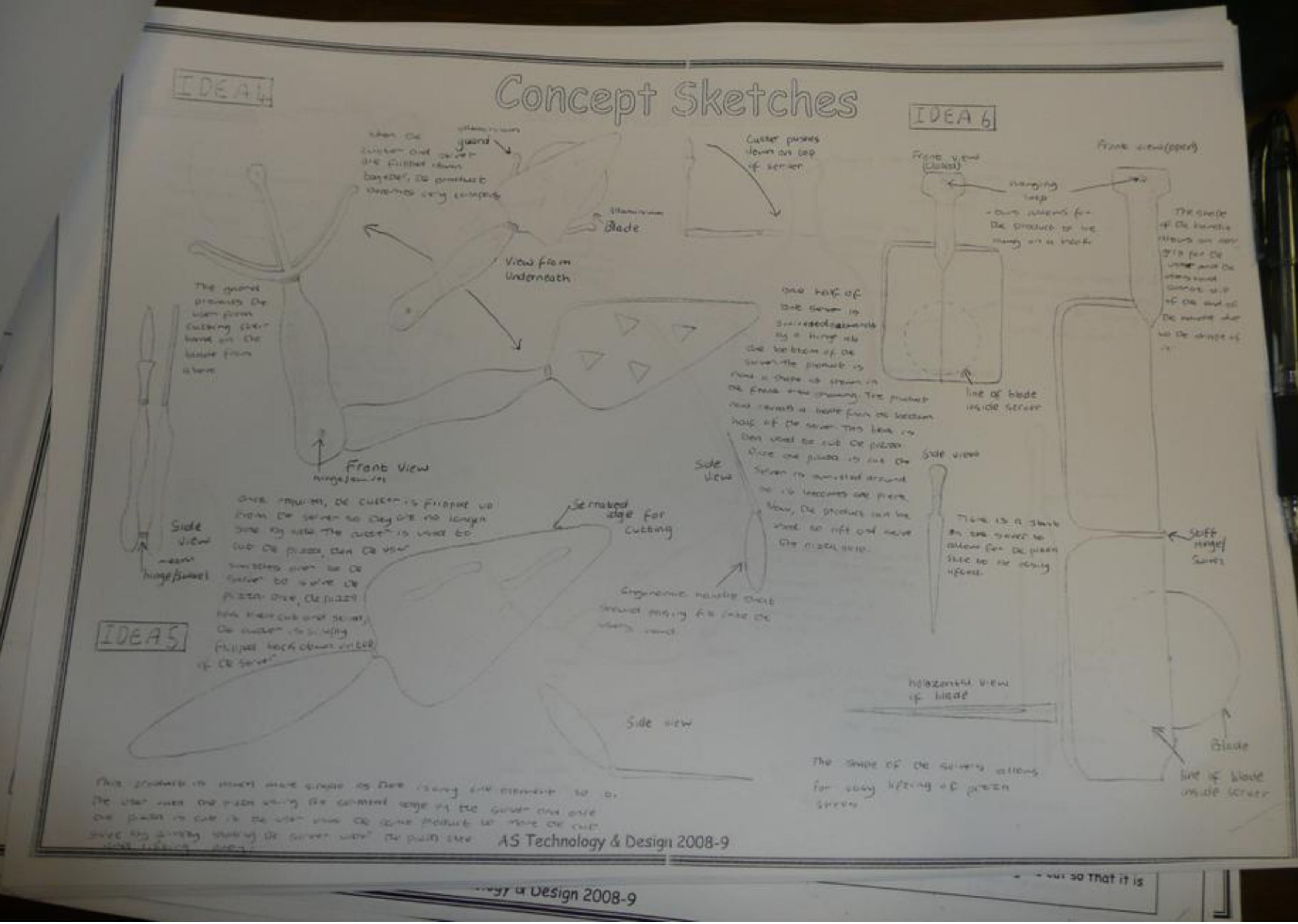
IDEA 2



Initial Ideas

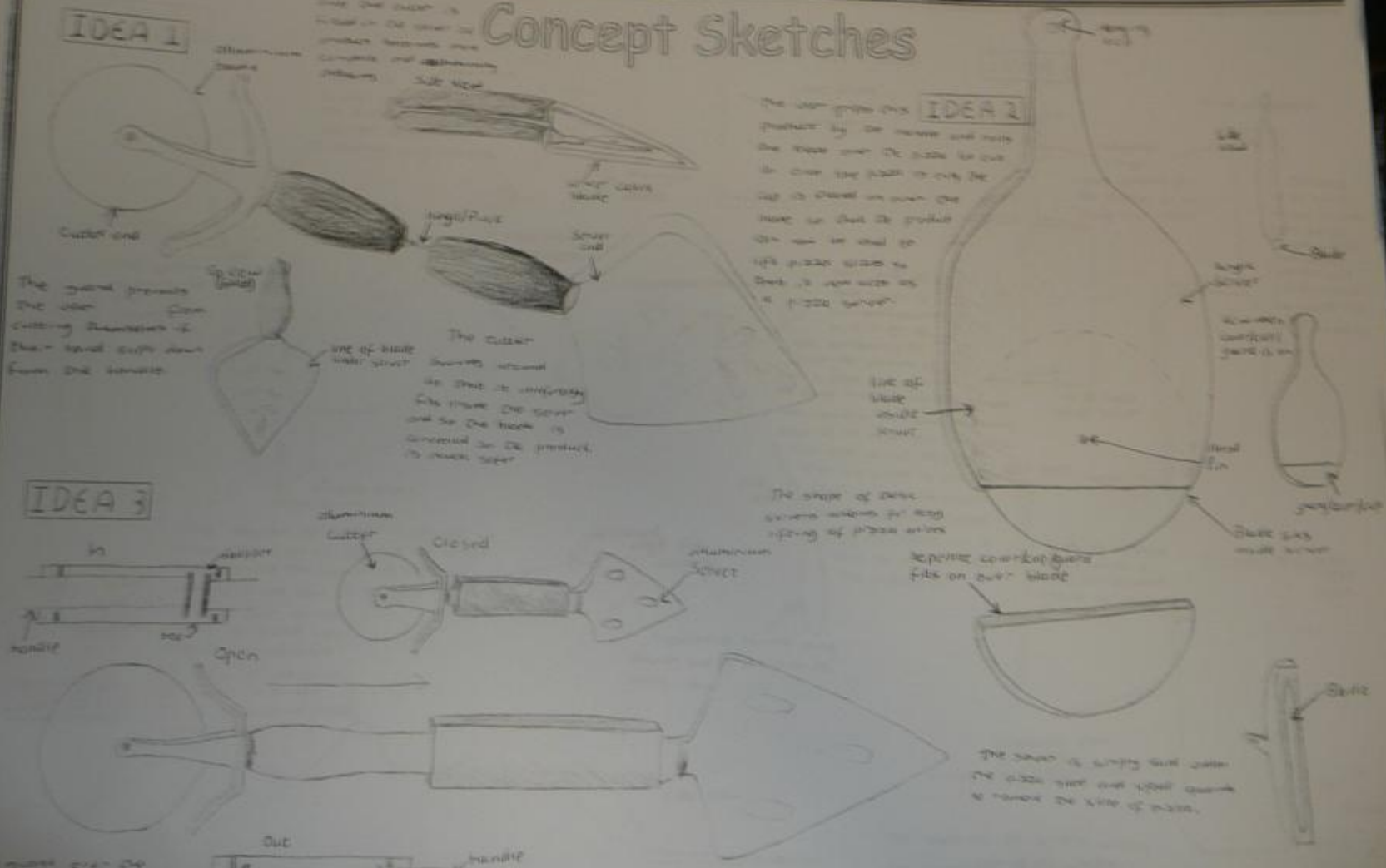
IDEA 1





Concept Sketches
IDEA 4
IDEA 6
IDEA 5
guard
Blade
View from Underneath
Front View
Side View
Serrated edge for cutting
Cutter pushes down on top of server
Front view (closed)
hanging loop
line of blade inside server
Side view
Soft Hinge/ Swivel
horizontal view of blade
Side view
Blade
line of blade inside server
AS Technology & Design 2008-9

Concept Sketches



...uction

- My product does hold my bow steadily and safely this is made easier with the adjustable height and the design of the bow holder.
- The arrows are held as safely as a normal arrow holder but it could be improved.
- The product is not easily assembled or disassembled because of a fairly drastic change in the original design.

Safety

- My product is very safe and could be used by people of all ages.
- My product has no sharp edges.
- My product contains safe materials none of them are toxic or dangerous.
- The bow and arrows are held in a safe position and this position is adjustable which improves its safety for a variety of bows.

Aesthetics

- My product is made up of neutral colours that will appeal to the majority of consumers.
- My product contains some curves but not as many as I hoped, I still think it looks quite good.
- I did not paint the metal a metallic colour due to the other colours.

Durability

- My product is durable but because it can't be disassembled there is no concern of it getting scratched by other archery equipment in a bag.
- My product can support my bow and does not get scratched by the arrows.

Shape

- The original idea I had for the shape is very different from the actual shape, the tripod has changed to a wooden base and the tubular piece of metal is now three pieces of box section.
- Because the product cannot easily be disassembled this point isn't valid.
- Not everything in my product is natural looking; it is more of a combination of simplistic shapes and interesting curves.

Colour

- My product is made up of the colours black and orange along with the varnished wooden base.

Size

- My product is a little larger than predicted but it depends what height it is set at.
- The height of the bow stand is adjustable this means it is well suited for nearly any bow, but it cannot be disassembled easily.
- The footprint of the base of my product does not exceed 1 and a half feet.

Timescale

- The product took longer than 4 weeks to make this was unforeseen and unfortunate.

Weight

- I would have preferred if my product was lighter but that would affect the effectiveness.
- The product is around 2kg which is twice as heavy as I thought it was going to be but again it is necessary.

Manufacturing methods

- This design is completely different than the original, I didn't use tubular steel, I used 25mm thick box sections of mild steel and I only drilled a total of six holes.
- My product had the idea of legs taken away from it at quite an early stage and instead has a wooden base made of oak.
- The original idea of having an acrylic bow holder and acrylic arrow/string holder stayed with the design and came to fruition however instead of rubber bits on the end of the legs there is a rubbery mat on the base of my product.
- I did exactly what I planned to do with the finish except a few minor changes.

Ergonomics

- My product is easy to use.
- Any consumer could easily use my product.
- My product is very different to existing ones but does not include the Barnett quiver idea I decided quite early that there were too many risks with this idea and that it would not work well in this case because there are many different sizes of arrows.

Materials

- My product as planned consists of steel, acrylic, and rubber or a rubbery textured plastic, with the addition of oak.
- These materials were fairly cheep and were easy to get and in cases of the steel and rubber they are suited to there function and are necessary if that function is to be performed well.

Economics

- I got all the materials for my product for under £15 as I had hoped.
- If the product was to be sold in shops I would sell it for around £20 this gives a good profit and is slightly cheaper than all similar products.
- If it was being sold on the internet I would sell it for £17.50 making it a better deal than other similar products on the web, also this way delivery can be charged so people are paying more than they think so it sells as many or more and gives a good profit.

Surface Finishes

- The steel in my product is spray painted black rather than a more metallic colour.
- The plastic has a smooth texture with rubbery parts to help the adjustability of the arrow holder.

Environmental matters

- There are still no environmental problems with this product that I am aware of.

Evaluation of Final design

I like my product, I think although there have been many alterations in the design all of them have helped its progression and I have ended up making a unique product that I have never seen or seen anything like before, if I had more time I could make further improvements but it has provided a good foundation and room for advancement, I think the idea is solid and that it is much better than the ground quivers most clubs have in this day and age.

Testing

My product fulfils its purpose, I was quite pleased with the result the bow fits well and the arrow holder holds the arrows easily, the adjustability of the arrow holder works as planned and the bow holder came out well even with none of it being laser cut and the fact that it had to be bent by hand.

The bow is held sturdily by my product, the shaft and arrow holder are adjustable this is useful because it allows the bow/arrow holder to be adaptable to suit various users and types of bows. I also think that the way it can be made much taller than ordinary bow holders is good because in my opinion I think the bow holders on market at the minute are too close to the ground and too hard to see.

The mat worked well the holder grips all the surfaces it would be used on, and the bow holder does not seem easy to break, it is useable in most environments and is water proof.

10. Evaluation

9. Manufacture

This page is going to explain how I manufactured my product, including what machines I used, and what methods I used for joining, and finishing etc. first I will go through how I made the shaft piece with the mild steel and how it is meant to work, then I will move onto how the base was made, then I will describe the creation of the bow holder and arrow holder, and finally I will talk about all the finishing touches.

1. The first thing I did to do with my manufacture was go to our technician Dave with my design and asked him what materials would be best to use, for the shaft he said it would be best to use mild steel and gave me two different sizes of box section which I then cut and filed down to size.

2. Once I cut the metal pieces down to size I drilled the 1cm holes, the holes on the longer piece of metal were half the distance apart as the ones on the bigger piece of metal that goes over it. I also had to do a lot of filing to get rid of bits of metal that were sticking out and so that the three pieces of the shaft would fit together.

3. After I had drilled all the holes and the shaft all fitted together I made sure all of the bolts fitted and had to file some of the quite a lot so that the bolts would all fit. This was quite time consuming and could have been avoided with more consideration and preparation before drilling.

4. The shaft was basically done so I moved onto the base, for this I cut out the triangular shape from a plank of oak that I bought previously using a Tenon saw, and then I sanded down all the edges first with the belt sander and then sand paper.

5. I found the centre point of my base and drew a circle out on some MDF I then cut this out and sanded it down to the line using a belt sander, and then used sand paper to slightly chamfer the edges and make it smoother.

6. After my circle was finished I measured two holes on either side of the centre on both the base and the circular piece of MDF, after I drilled these holes I put screws up through and these seemed to be strong enough to hold the circular piece of MDF firmly to the base.

7. I then chiselled down into the circular piece of MDF so that the shaft would fit snugly into it but did not yet attach it.

8. after all of this was done I made my bow holder, which was made using a tubular piece of plastic that I cut to the correct length to hold the bow handle and then cut a section out of it so the bow could be placed into it, I then obtained a plastic rod that fitted into the shaft and attached it to the tubular section by using a screw which first had to be bored, I then cut out two identical pieces of orange plastic and sanded and filed them so that the would both be in the shape of a fat T these were placed into the convection oven for quite along time until they were hot enough to easily bend around the other part of my holder, this just makes it look better and doesn't really have any other purpose.

9. After I had finished my bow holder essentially I made my string holder on solid works and sent it away to be laser cut.

10. I sanded the wooden base again and put a coat of varnish on it. Then I left it for a day and repeated this process and then I repeated it one last time to get an excellent finish on the base.

11. At the same time as the lengthy process of varnishing the base I spray painted my metal shaft black, this took about 3 coats of paint and altogether took about 3 hours to wait for each coat to dry and spray it.

I also rubbed diluted wood glue into the circular piece of MDF in order to prepare it for varnish or paint, but I decided to go with paint because MDF isn't a particularly attractive type of wood.

12. My laser cut plastic arrived and I stuck the pieces of acrylic together to make the arrow/string holder.

13. I used wet and dry sandpaper on my arrow/string holder and then polished it to give it a nice finish.

14. I finished the bow holder by polishing it up, and then assembled my project.

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8. Final design

Final Design: This is my final design it is combining elements of all my initial designs and drawings but is mostly based around my second design, this page will show the detailed design and the measurements I am hoping to use, with solid works and drawings both, the main changes from the second design are the arrow holder which I decided did not offer enough flexibility considering most people would want more than three arrows in their quiver, the string holder is on the opposite side but still on the arrow holder, the bow holder will be more alike to the holder in two or a combination of the holder from design two and design three using the extra support and the plastic curving over the top of the bow.

The bow holder was designed using none of the different initial ideas, it has the round shape and the length for support but it is different from them all in the way it was made and it is a lot lighter.

I formed the plastic round the bow holder using a convection heat oven and some heatproof gloves.

Here are the bolts used to fasten the shaft in each position.

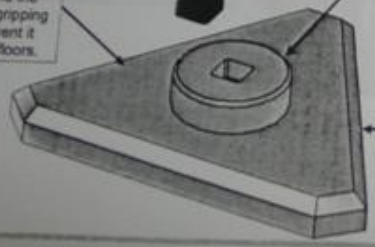
The arrow/ string holder will be laser cut to get the right shape which would be very difficult to obtain by any other means. It was made using a similar design to my third idea and also quite similar to my first.

For the finish on the shaft I have to sand down all the metal with wet and dry and then give it about 3 or 4 coats of black spray paint.

The shaft of the final design is designed so that there will be one long box section and two others that fit over it with holes drilled different distances apart to offer varying heights.

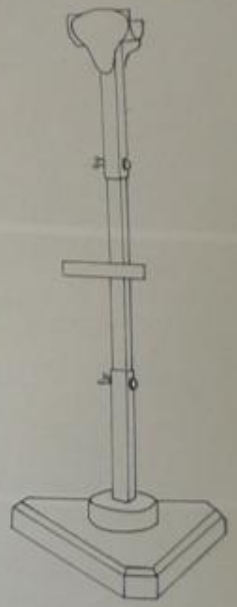
The MDF circular section above the base was made by drawing it out, cutting and sanding the MDF down to a circle, I then chiselled down the centre in order to fit the shaft into the base, I then will rub diluted wood glue into it to get rid of porous material on the surface of the wood so it can be painted.

The oak base will be varnished to give it a nice finish and the bottom will have some gripping material put on it to prevent it from sliding on wooden floors.



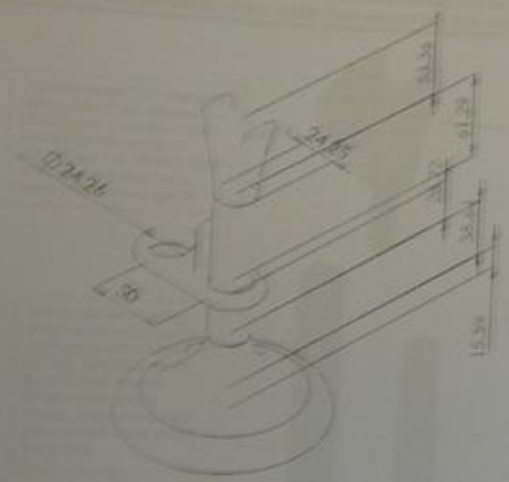
The base is made of Oak, the shape I chose in the end seemed to offer good stability and it looked quite good with the rest of the relatively industrial design.

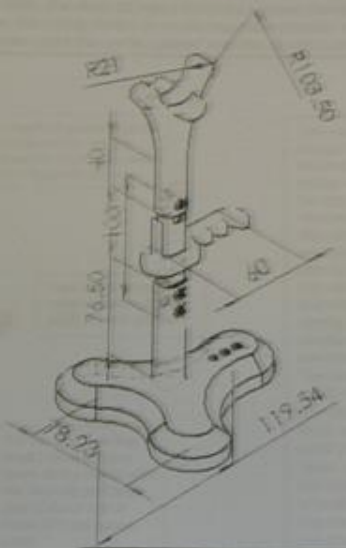
The mechanisms in this design are all fairly simple, the first one is the bow holder which simply fits into the top of the shaft and is removable. The second is also simple, the arrow/string holder will be able to slide up and down the middle part of the shaft, and this will be achieved simply by using foam like plastic material that will grip the metal but still let it slide. The last mechanism is easily the most complicated; the shaft is in three pieces the middle two outer pieces have two holes at one of there ends, the middle piece has holes at both ends but the holes are the same size but half the distance apart this allows 8 stages of adjustability rather than 4 which would have been achieved with uniform holes.

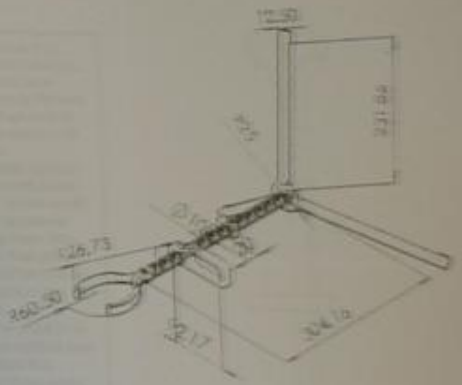


Plan of manufacture	
1.	Make a cardboard model of parts of me project to see how it would work and so I can predict future problems.
2.	Cut my metal to size and drill all the holes so it can all fit together and slide easily.
3.	Cut my base from oak, and shape it.
4.	Make a circular piece of MDF to hold my bow stand and attach it to the base with screws.
5.	Make the bow holder using the plastic oven with acrylic plastic and attach it to a tubular piece of plastic and have a rod to hold it in place in the shaft.
6.	Stick together bow/ arrow holder using acrylic and plastic glue.
7.	Varnish wooden base, spray paint all metal, and paint MDF.
8.	Assemble.

7B. Working Drawings

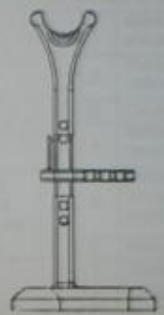






This is the working and orthographic drawings for my first initial design is the smallest of all my initial designs, it is quite simplistic but because of the multitude of curves it seemed fairly improbable that I could make it, also because of the size it would not perform its function to maximum efficiency and the bow would be too low to the ground which is one of the problems with current bow stands that I am trying to solve.

This is my second initial design it is what I want my final design to look something like it is one of the biggest, offers an achievable adjustability for height, and the curves could be laser cut, the size is closely linked to the sort of size I want my final design to be, but I think it is unlikely that the arrow holder and the bow holder will be as shown or anywhere near the size.



This is my third initial design shown through orthographic drawings and working drawings. This is the largest of my initial designs and is the most similar to normal bow holders, but unfortunately because of the design I think it would be too difficult to make because of all the holes, and the many separate parts, ideally this would be excellent but there is no chance of me being able to make something like this within the time available.

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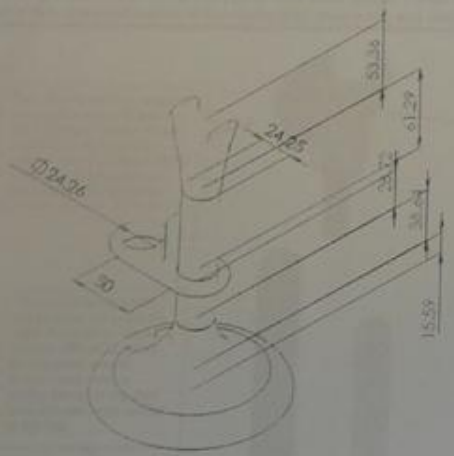

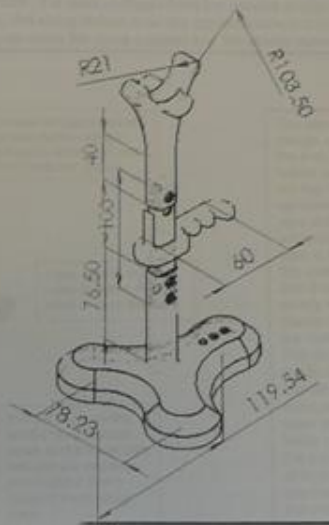

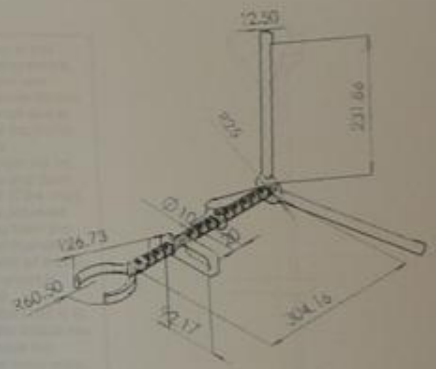

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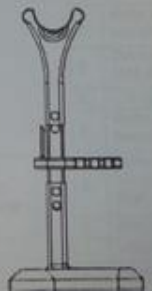
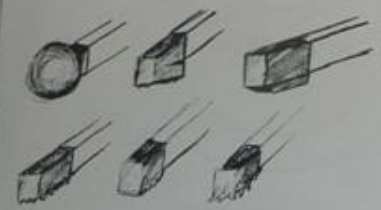


7. Initial designs

This is my third design, unlike the others this is a much more generic design combining elements of common bow stand designs. The colours I choose again are very common, and the materials would be aluminium and plastic but unfortunately I can not get any aluminium so it will be made of a type of steel. The design of the shaft is made so that you can adjust every part of the design and remove each part. This would be done by drilling holes into a piece of tubular metal, and then using pins that fit the holes.

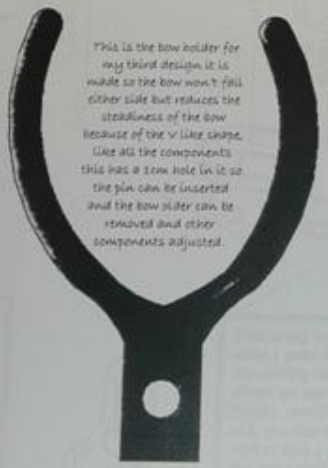
Now that I have all my initial designs finished I will need to move on to my final design, I would like to base the final design most strongly on my second initial design, partly because it felt the most natural and original and those are key selling points in nearly all products. Of course I will use different elements of all my initial designs. My first design is very natural looking and minimal but not complex enough, my third design is far more complicated than it needs to be and doesn't look as nice as either of the first two, and the second design is a sort of happy medium it isn't to complex and has a nice level of naturalism I will design it more carefully and think about the flaws in it so I can correct them, of course one of the factors that I mainly set out to make less of a problem is easy set up from a small compact shape into a larger spread sturdy shape and the second design or anything like it will be very easy to set up but will definitely not be a compact shape to begin with, though this does give a weight advantage which will allow extra steadiness.

Here are some sketches I did of different kinds of ways to go about designing the bow legs mainly exploring which type of grip would be best for the end considering the variety in the market at the minute, that's why I decided to draw out some different options for what I should do to best solve the grip problem. grip is directly related to the bows stability so the better the grip the better the bow/arrow stand.



Here is the final design for my bow/arrow stand leg, it I picked it because of how easy it would be to make and how it would grip any surface, it will be made out of a rubbery plastic most likely. There is of course the possibility that the grip could be interchangeable and people could choose their own grip.

This is the bow holder for my third design it is made so the bow won't fall either side but reduces the steadiness of the bow because of the V like shape. Like all the components this has a 10m hole in it so the pin can be inserted and the bow rider can be removed and other components adjusted.



This is the string holder for my design, it is adjustable and the notch at the top will let the string be easily put in and harder to take out.

This is the arrow holder of my third design, it is designed to hold multiple arrows and to be adjustable, the arrows are not held in place but because it is separate from the string holder it allows the arrows more room and more vertical room.

This whole design is designed for an easy set up and relative efficiency, it uses many ideas from already existing products, like three legs, a removable bow and string holder, and adjustability. I would like the legs to be foldable so that they could fold one way and lock when they are in position, to do this all components could be locked at the top including the base and then the legs could fold down one way against the shaft.

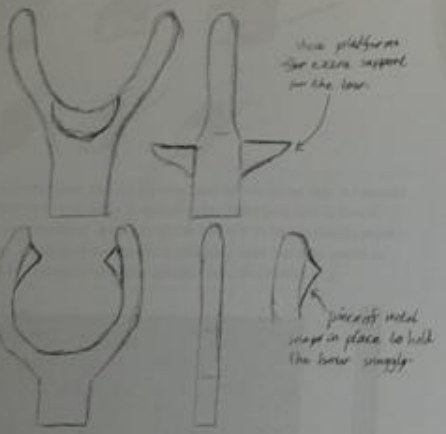
The design also lends some aspects from a cymbal stand used in a drum kit, because the legs will only open to a certain point and there is a lot of adjustability in both. The main difference is that the cymbal stands use a tighten and slide system. this is another option for the design but would make more sense in my second design than this one.

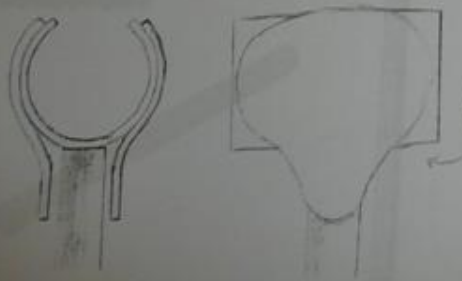
This is the base of my holder it is designed so that it will be adjustable and can be moved up the bow holder with the rest of the components so that it will make the whole holder easily set up and put away, the legs will be attached to this permanently but I don't know how yet, preferably folding but possible by magnets.

6. Initial designs

Bow/Arrow Stand Initial Designs
On this page I have drawn my second design for a bow/arrow stand and some ideas for different bow holders.

Here are some concept drawings of what the bow holder could look like: the one I used in this design is the one I think is the best for the function. All the designs I have used are based on already existing designs except the one I used has a + shape which I have not seen in any existing designs though it uses a similar concept as the limb holder seen in some designs. Also the idea of the bow holder becoming part of the shaft and being strong in itself is unusual considering usually it is just put at the top of the shaft and is simply made of weak plastic, the drawings demonstrate some ideas like clips that keep the bow in but I went for a good but simpler design.





These two pieces are really very unique to this bow stand and I haven't seen anything like this done before, and I don't really see a reason why it hasn't been done. the arrow clipping in idea is used in Barret quivers and I thought they looked really good so I decided to use it in this design. and as for the bow holder I saw no reason why I shouldn't put in something extra to support the bow.

This is the bow holder and this has been taken into careful consideration, so it can hold the bow steady, and make it easy to set the bow down.

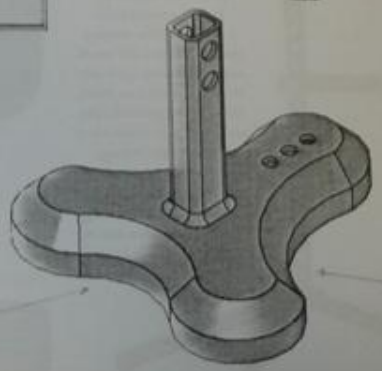
I really like this design because its really original and combines a lot of the better aspects of different related products, I really hope I can make my final design something like this, and it offers good stability and would be easy to pack away because it can be seperated into different pieces, I would like to use elements of this in my final

These are the holes that will be combined with bolts or pins to join the different pieces of the design.

This is a shaft piece attached to the string/arrow holder and used to offer some adjustability and link the base with the bow holder.

This is the arrow/string holder, the string holder has a raised bump to keep the string in place, and the three cut out bits should hold the arrow snugly.

The base will be heavy for increased stability. The shape should make it relatively easy to carry.



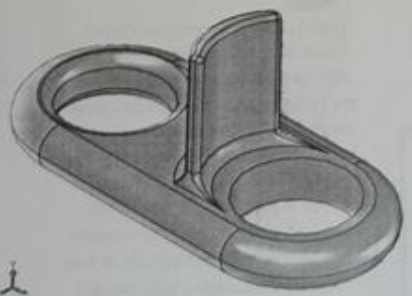
This the base of my bow holder, it would be made of a metal base welded onto a metal shaft, the three holes are for arrows to sit in and the cases interesting shape is for increased stability and to make it more appealing to look at, the colour scheme again is consistent throughout.

5. Initial designs

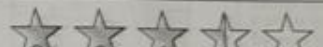
Bow/Arrow Stand Initial Designs

On this page I have drawn my first design for a bow/arrow stand, the idea is that it will be a piece of archery equipment that holds the bow steady when you're collecting your arrows in the same way as a bow stand, and holds the arrows the same way as a ground quiver. This design would be far more useful than all other archery equipment except maybe the bow itself, no matter what design I use I would like for it to be almost completely adjustable, there are several ways I can do this so I will explore each with the following design pages, this first design is fairly basic and will be developed.

Here's the base and bow holder all in one. This circular/cylindrical design is very minimalist and symmetrical; I like the idea of a thick bow/arrow stand that has a wide base offering a lot of stability. also I like the whole idea of having a hole in the base to let the arrows sit in place, unfortunately this does not offer much adjustability.



Here's the arrow/string holder, this would be one (of two possible) adjustable parts. this looks good and the string holder is quite well designed, the two holes in the base and the arrow holder are the same size, this should keep the arrows well grouped yet easily taken out and placed in the holder. This is the only piece of this design that offers adjustability unfortunately.

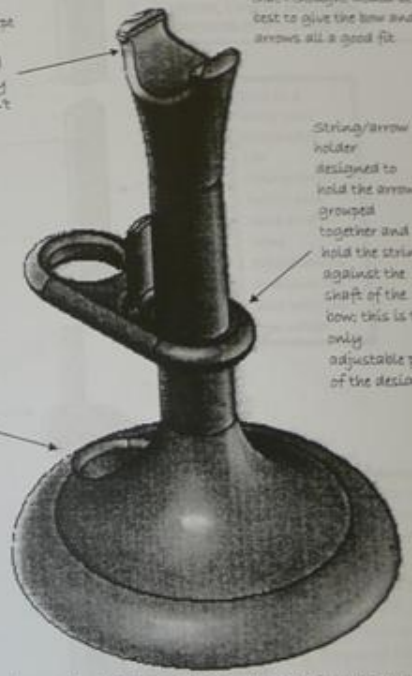


I used measurements throughout this design that I thought would be best to give the bow and arrows all a good fit.

Bow holder designed so the bow can be set down easily and be kept steady, it is curvy to fit in with the rest of the design. This could possibly offer some adjustability but with a design like this I don't see the point.

String/arrow holder designed to hold the arrows grouped together and hold the string against the shaft of the bow; this is the only adjustable part of the design.

The base of the bow stand is designed to be heavy so that it stays in one place and doesn't fall over, and there is a hole that the arrows can be aroused in.



This bow/arrow stand design offers a steadier and much stronger alternative to the weak flexible ground quiver, because it is made out of only two pieces and one of them being adjustable this design can be made to look good and also be very practical for its purpose, the shaft is thick so it can easily support the bow and the string holder bends round the shaft so the string will be as tight as it can be to it meaning the bow will not twist and turn, which is a big problem with many bow stands, the only problem with this bow stand is the weight which is unfortunately a beneficial part of the design, the other problem is the lack of adjustability which is one of the original problems with a ground quiver.

4. Design Specification

Design Specification: I am going to list all the different factors I need to consider and evaluate each one saying what I am going to do in each case and giving you a good idea of how my product will be designed, what it will look like when it is completed, how it will be made, and what I will use to make it. I will then list some initial designs and explain them.

Function
- I will make my product so that it will hold a bow steadily and safely.
- It will hold arrows steadily and safely.
- It will be easily assembled or unassembled.

Safety
- I need my product to be as safe as possible for the use of all ages,
- It will have no sharp edges
- It will not contain any dangerous materials
- The bow and arrows will be held in a safe position

Aesthetics
- My product must appeal to all types of consumers, so I will probably make it black or silver or another relatively neutral colour
- I will hopefully include a lot of curves in my design to give a natural look which always makes things look better.
- If I paint the metal I will use a metallic coloured paint because in my experience the metallic shine makes the product look better.

Durability
- My product needs to be very durable since it will be put into a bag filled with other archery equipment which would be made of metal
- It needs to be able to support the bow and not be scratched by the arrows so it can last a long time.

Shape
- The shape of the product while assembled will be similar to that of a tripod for the legs but with a long tubular piece of metal going up the middle.
- The shape of the product while unassembled will be a single thin piece of metal the legs will fold up to the middle piece of tubular metal.
- Everything will look smooth and natural.

Colour
- My product will likely be a neutral colour of black, silver, white.
- I may go for a standard colour of red, blue or green.

Size
- My product is unlikely to exceed a height of two feet.
- The height needs to be taken into careful consideration, it needs to hold the bow at a reasonable height while assembled and easily fit into a bag while disassembled.
- The legs should not create a footprint larger than a diameter of 1 and a half feet.

Timescale
- Hopefully the product will not take longer than 4 weeks to make.

Weight
- My product needs to be a weight that allows it to be carried around easily.
- I am hoping for the weight to be around 1 kg considering this is around the weight of existing products of this nature.

Manufacturing methods
- I will need to get a tubular piece of steal about 1.5 cm thick and then drill holes of uniform size about ever centimetre.
- Then I will create the legs out of either tubular or box section steel, these will be attached to a mechanism that slides up the tubular steel.
- After the bulk of manufacture is done I will create the plastic parts that hold the bow, hold the string, hold the limb, and put rubber ends on the legs.
- Finally I will finish by painting the steel and giving the plastic a nice finish.

Ergonomics
- I will make sure that my product is self-explanatory
- It will be easy to use for all consumers
- It will be appealing to all consumers and include a new idea that hasn't really been seen before this gives it the edge found in the barnett quiver that makes it so popular.

Materials
- My product will most likely consist of tubular steel, acrylic, and rubber or a rubbery textured plastic.
- These materials should be fairly cheep and are easy to get and in cases of the tubular steel and rubber they are suited to there function and are necessary if that function is to be performed well.

Economics
- I am hoping to get all the materials for my product for under £15.
- If the product was to be sold in shops I would sell it for around £20 this gives a good profit and is slightly cheaper than all similar products.
- If it was being sold on the internet I would sell it for £17.50 making it a better deal than other similar products on the web, also this way delivery can be charged so people are paying more than they think so it sells as many or more and gives a good profit.

Surface Finishes
- I want all the steel to be shiny and possibly painted with a metallic paint.
- I want the plastic to have either a smooth texture possibly with rubbery parts to help hold the bow.

Environmental matters
- There are no environmental problems with this product I am aware of

Evaluation of initial design

Going by my specification and factors I have analysed my product sounds like it will work well and will be new and different in comparison to the current market, but a lot of the stuff will be very difficult to do and I don't know if it will work the way I plan or if the cost and time I have set myself will be enough, and if either of them are badly judged it could ruin my project. There will likely be modifications made to the design as time goes on as is suggested by "initial".

Ideas for design

Bow / arrow stand

This is the basic idea of having a bow stand with an arrow holder or two attachable to it, everything would be adjustable, and this has never really be done before and I don't understand why when it could very easily be done.

Bow / arrow stand with limb holder

This is similar to my basic idea but with an adjustable limb holder attached to the bow, this would offer the bow much more stability and would hold it at more of an angle making it less likely that people would trip over it, making it easier to pick up and set down, and it wont take up as much room on the floor, unfortunately this would make it harder to use than the bow/arrow stand but when people learn how to use the limb holder the whole thing will be easy to use.

Bow / arrow stand with magnetic legs

This can be combined with either of the two designs above, when disassembled the legs will be able to be attached along the shaft by magnets, and when it is being assembled they are simply removed from those magnets and attached to the slightly angled magnets within angled holes in the base, this will offer good strong stability but it can be difficult getting the legs in and out of the holes.

Bow / arrow stand with fold up legs

This can be combined with either of the two designs above but there are a couple of different ways it can be done, the legs can twist to a position along side the shaft for an unassembled position that can be easily fitted into a bag, then the legs can be twisted back to an assembled position similar to the magnetic legs, this is easier to assemble/ disassemble but the support is not as strong and it is possible that it could unfold under the weight of the bow. The legs can be folded down in a similar way and then a bolt tightened when they are in a good position this offers adjustability, finally my idea for folding is a ring around the shaft that slides up and down it, the legs could be attached to this and then it is slid up as far as the bow holder the legs will fold along the shaft, then when it is slid down to the base it can be held in place by a bolt or pin and the legs can unfold and this will have a similar mechanism to a pin knife the legs will fold to a certain extent and will only fold back when weight is exerted in one direction so while the weight of the bow is on it the legs will not unfold, this offers easy setup and it will not unfold unless you want it to.

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3. Analysis of Products

Back Quiver

Purpose **Rating: 4/5**

This quiver is very traditional and is good at its job it keeps arrows safe and out of the way and allows them to be removed with ease, also this is the only type of quiver that it would be possible to attach a bow to, so something like this that is easily put on your back and performs its function well would be a good choice to improve on for a bowtarrow holder.

Materials and Manufacture **Rating: 5/5**

The material used in these types of almost ornamental quivers is usually cured leather, the leather is tough so the arrows don't damage it and it also lets the arrows slip over it easily, there also tends to be some embroidery/patterning on these types of quivers, it is made in a similar way to the standard quiver but goes on your back and uses more expensive materials so it needs to be adapted.

Systems **Rating: 0/5**

This product has no systems.

Ergonomics **Rating: 5/5**

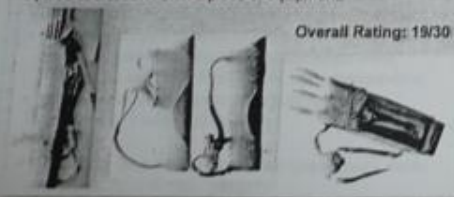
The back quiver is possibly the easiest of all these products to use, you simply put the strap over your head onto your right shoulder and leave the other one below your left arm and the quiver should sit at a slight angle, that is all there is to it really apart from the fact you have to take the arrows in and out of it, the tightness of the strap is adjustable meaning the whole quiver can be adjusted depending on self-preference.

Aesthetics **Rating: 4/5**

Probably the best looking product not modern but it has the most possibilities for different designs, the product looks as good as it costs and the more expensive the back quiver the better it will look. You can even buy authentic replica quivers from your favourite films like lord of the rings, braveheart, and many more, these quivers can be used, if you are shooting a longbow back quivers are a must have, but otherwise I think the problem with them generally is they don't go well with any other bows or equipment related to other bows and this is a large influence on any consumers.

Economics **Rating: 1/5**

These back quivers cost a lot of money unless they are one of the cheep fabric made ones which will not last very long and are really only for children, but the normal traditional back quiver can cost up to £200 at least, they are very expensive but really they are not for beginner archers and are almost like a piece of art rather than a piece of equipment.



Overall Rating: 19/30

Bow stand with limb holder

Purpose **Rating: 5/5**

This is much like the standard bow stand but is for a more experienced archer who would likely be going to competitions, since at a competition with a lot of other archers it is a must to have the bow steady, not taking up a lot of room, clearly visible to other people, this bow stand if modified would be perfect to model my design on, it performs its function very well.

Materials and Manufacture **Rating: 4/5**

Again this is much like the standard bow stand, it is made from painted steel and is used in the form of circular sections, and this makes it less expensive, lighter, and stronger. The whole thing is finished with plastic parts to hold the bow, the bow limb, and the bow string. It is manufactured by attaching all the sections but nearly all of them can be removed, and nearly all of the parts that are attached are attached by screws so they can be disassembled completely.

Systems **Rating: 3/5**

This product again is similar to the standard bow stand so I will not repeat all of it but some different features are it has legs that twist into a set up position and also its string holder and limb holder are adjustable.

Ergonomics **Rating: 5/5**

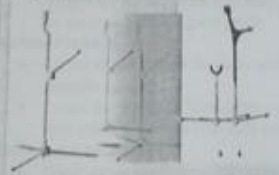
This product is slightly harder to use than the standard bow stand but it is pretty self explanatory and someone could figure out how to use it within about 3 minutes, the height of the product is quite good and the way it is held higher due to the design means it is easier to pick up the bow and set it down and the way it holds the recurve bow perfectly means it is easier to set down and means there is no unsteadiness which you often get with the ground quiver and the standard bow stand.

Aesthetics **Rating: 5/5**

The product is available in several different colours, the design is practical and it looks good, even the way it holds the bow makes it look much better, it goes well with most archery equipment and appeals to all audiences due to its use of colour that is not too vibrant or too dull.

Economics **Rating: 2/5**

This product is considerably more expensive than the standard bow stand. They seem to range from about £20-£30 which is really this products only failing considering it excels everywhere else and is worth the price because of quality and lifespan.



Overall Rating: 24/30

Target quiver

Purpose **Rating: 4/5**

The Barnett quiver used largely in hunting is a very good quality that holds arrows within a small area and is attachable to belts and bows etc. it holds the arrows well gripping them and allows them to be put in to the individual spaces easily, the problem with these quivers is they can only hold a few arrows at a time but the idea of them being attached to the bow is quite clever.

Materials and Manufacture **Rating: 5/5**

This product is made of light rigid steel that is always painted, it needs to be well joined and completely covered so that it is not damaged in hunting situations this is also why the material needs to be strong, it needs to be light so the huntsman can move fast, and the way it is designed is so the arrows can be gripped by the quiver and equally spaced, so that he wont need to look at his quiver when reaching for his arrows and they are kept steady and don't rattle around.

Systems **Rating: 3/5**

This product has a few adjustable parts including the individual arrow holders of which there is nearly always 1 or 2, but it cannot be assembled or disassembled but there is little point, considering the size and shape.

Ergonomics **Rating: 4/5**

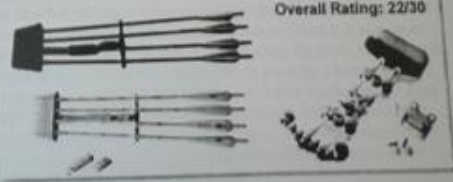
The product is self explanatory and very easy to use it is easy to see exactly where the arrows go and how it can be attached to various items (e.g. belts or the bow itself) the arrows are always easy to reach and equally spaced so you can easily get an arrow without looking, and they are held steady because of the quivers grip like design, the distance from your hand to the arrow really depends on where you place the quiver this makes it quite versatile and suitable for many consumers.

Aesthetics **Rating: 4/5**

This quivers unique design makes its appeal a lot more than other quivers and makes the consumer interested in it, the colour is nearly always a type of camouflaged patterning which appeals to outdoor archers and young people ranging from the age of about 6-25, but I think it's mainly the design that appeals to people.

Economics **Rating: 2/5**

This product is pretty expensive and in my opinion not really worth it unless you really need a quiver like this, it is similar to the bow stand with limb holder in that sense and is also around £20-£30.



Overall Rating: 22/30

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2. Analysis of Products

Ground quiver

Purpose: **Rating: 4/5**

The ground quiver is ideally the closest product to solving the problem; but it is not at all ideal it is terrible; it may be alright for children who use small light bows but when using a freestyle recurve bow that badly needs to be off the ground it is useless.

Materials and Manufacture: **Rating: 1/5**

The only material used in an outdoor ground quiver is steel; and when it is indoor the only difference is that it's attached to a wooden base; but materials can vary.
The metal is folded to get the basic shapes; and then the pieces (usually 3 pieces) are welded together.

Systems: **Rating: 0/5**

This product has no systems.

Ergonomics: **Rating: 4/5**

This product is relatively simple to use; though to know where to put the bow and arrows and how to place them on the stand would require past experience with equipment; but when you know what goes where it becomes very simple to use and most people can figure out how to use it within 5 minutes or so; it holds the bow and arrows at a good height off the ground which is useful. The product is really intended for club members and isn't something an individual archer would usually buy.

Aesthetics: **Rating: 2/5**

The products appearance has obviously not been considered by the manufacturer; the ground quiver is purely designed to perform a function; a function it does not perform well.
The height off the ground of the ground quiver is adjustable; considering how far you put it into the ground, but when inside it is to high and the weight of the bow makes the stand bend and when it bends the bow falls and is damaged; of course it being higher means you don't have to bend down as much to put the bow on it. The arrow holder is very small and it is quite hard to put in multiple arrows at one time; of course this is a problem in most cases of quiver and ground quiver. Finally the base takes up more room than needed and is heavier than it needs to be considering it doesn't affect the fact that the metal bends under the weight of the bow.

Economics: **Rating: 1/5**

This specific product is £13.00 but prices vary from about £8.00-£15.00 this is quite expensive for the type and amount of materials used; and really its wasted money since it is frankly rubbish.

Overall Rating: 14/30

Standard bow stand

Purpose: **Rating: 4/5**

The standard bow stand is excellent for holding a bow; it is easily assembled and does not take up much room when on the floor or in a bag; it performs its function well and could easily be modified to hold arrows as well as the bow.

Materials and Manufacture: **Rating: 3/5**

The materials used in these bow stands are of higher quality than the ones used in ground quivers; steel is used again but is painted and is used in the form of circular sections; and this makes it less expensive; lighter; and stronger. The whole thing is finished with plastic parts to hold the bow and the bow string.

Systems: **Rating: 2/5**

This product has legs which are either screw able or have magnets on the end and there are six holes they can fit into; 3 equally spaced moving up the shaft for when it is being packed away; and 3 equally spaced facing towards the ground at about a 25º angle for when it is supporting a bow; the bow string holder is also adjustable and the bow holder itself removable; these systems are useful but not very complex, and there are problems with the string holder sliding; the bow holder falling off; and the legs getting stuck so I would like to use a similar system but improve on it.

Ergonomics: **Rating: 4/5**

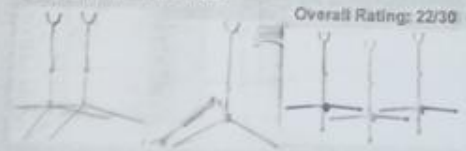
The product is straight forward to set up and use; a child could do it and I think it was made that way because the target consumers are of all ages so children need to be taken into consideration; the only thing that is wrong with it is the height, if it was higher it would be easier to set the bow on it and to lift it off; it would also allow others to see it more easily.

Aesthetics: **Rating: 4/5**

The products design seems to have been taken into careful consideration; the whole thing is a nice bright colour (appeals to children) and has different textures; the way it all works well and is able to look good whether assembled or disassembled, and it appeals to all ages but especially younger consumers.
Unfortunately it does have quite a large flaw, it is too short so people have to bend down to put there bow on it and to pick it up and this also means the bow is lower to the ground and can be tripped over, or even damaged.

Economics: **Rating: 5/5**

This product is quite cheap and definitely a good bow stand to get if you are just starting; I think I got mine for about £5 but I'm sure the price varies a bit. This is a good price for the type and amount of materials used.



Overall Rating: 22/30

Standard quiver

Purpose: **Rating: 3/5**

The standard quiver is great for holding arrows as well as holding tabs, bracers, and displaying archery badges you maybe have won. Because it is attached to you it is useful for when you are collecting your arrows and when you are firing your bow. All in all it is excellent at performing its function but does not and cannot incorporate a bow holder.

Materials and Manufacture: **Rating: 4/5**

There are quite a good range of materials used in this product. A plastic based fabric, acrylic, and a rubbery plastic. The product is made mostly of the fabric and is made in a way so that it can be attached to your belt, and has 3 pockets for tabs, bracers and anything else you might need for compound, recurve or long bows. In the arrow pouched it has 3 acrylic tubes to hold the arrows and make sure they do not damage the fabric and making them easier to pull from your quiver.

Systems: **Rating: 0/5**

This product has no systems.

Ergonomics: **Rating: 5/5**

As long as you know how to put on your belt you should have no problems with this product it is easily attached to your side with a belt. The product is easy to use; the arrows easily go into the three assigned plastic tubes and are easily removed when firing the bow; the proportions are perfect, the quiver is made in a way that it sits perfectly out of your way and has the arrows at a good height so you can easily remove them for firing and place them back in the quiver; and you don't have to bend down at all to put anything in any of the pouches or pockets.

Aesthetics: **Rating: 5/5**

The products design is very good and is optimal for its purpose; the way when the quiver hangs on you it is angled so the arrows are diagonal rather than straight up or horizontal so they aren't in the way and at the same time aren't falling over and are easy to reach pull out and put in the bow, the colour used black is good because it goes with everything, other common colours available are green, yellow, blue and red. The range in colours is good because this makes it more appealing to many more consumers than just black would, the lining on the fabric and use of over 4 different textures also improves how the product looks and it goes well with all other archery gear you may purchase.

Economics: **Rating: 3/5**

This product is fairly dear at £14.95 but is of a high quality and I would say considering it will probably last u a lifetime it is worth it, it is much better than most other quivers and most archers once they have one like this wont change it.

Overall Rating: 29/30

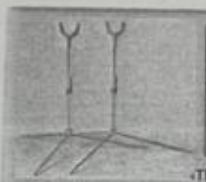
1. Problem and Existing solutions

I would like to design a product that solves the problem, of bows and arrows being dropped on the ground and damaged, in cases where there is a lack of bow stands, bows are left on the ground when the client goes to collect his/her arrows as carrying the bow with them is an inconvenience, if they put their bow down when outside, the bow can get dirty or wet which can lead to problems especially with the bow limbs, and if they put the bow down inside the site is liable to get damaged or bent; and there is a big risk of people standing on the bow or tripping on it causing large amounts of damage to the bow, and possibly to the person. The problem is similar with arrows, it is a huge nuisance to have the arrows laying on the ground because the client would have to bend down and pick up the arrow every time and there is a risk of the arrow getting stepped on and broken, if outside arrows can be stuck into the ground but this could easily damage the arrow.

In my view this product solves the problem but is terribly designed and can cause greater problems, it does not look good and is to fragile and flexible to hold a bow, the only advantage I can see is that it doesn't use much material and should be cheep, I would give it a rating of 2/5.

This is a normal outdoor ground quiver designed to hold the bow and arrows, this carries out the functions that I want to achieve but unfortunately it does not carry them out well, this is the problem because this is really the only quiver/arrow stand, the problems are to do with the thinness of the metal making it bend when the bow is placed on it and the fact that its shape is easily changed for example if it is stood on and then it can no longer fulfil its purpose, so I want to design a widely available easily assembled/disassembled alternative, that does not easily bend or fall over, and holds the arrows well.

Basically I will be making a much better version of this ground quiver that is widely available to all people for reasonable price.



In my view this product is a good solution to half the problem, in my experience these holders are cheap and relatively affective but they do not hold arrows, I would rate it 3.5/5

This is a standard bow stand, it is probably the most commonly bought and used for holding a bow in any situation being it indoors or outdoors, I myself own one of these stands and it is very good, it is relatively easily assembled, it uses magnets on the end of the legs and the metal is strong and the whole stand has always proven very stable, the main problem is the looseness of the components, like the string holder and the actual bow holder, which can be an inconvenience. Also this bow stand has no way to hold your arrows which means you have to buy a quiver separately when it would be very easy to make an attachment to this bow stand that holds arrows, this would reduce the amount a client would have to spend on archery equipment considering quivers can cost from £5-£30 (can be more).

In my view this product is again a good solution to half the problem but this time to the other half, this will hold your arrows very well and comes in very handy for holding other equipment my product will not in anyway replace this type of quiver, I would happily rate it 4/5.

This is a standard quiver for arrows, it is of a good standard and often seen. Holds arrows in any situation and keeps them safe and undamaged; I myself own a quiver exactly like this one, and there aren't really any problems with it at all except that it can be inconvenient for other archers and yourself walking around with arrows sticking out all over the place, and the price is around £15 which is quite steep just to hold arrows. There are no quivers that are attached to a person that can hold the bow as well as the arrows, I am not going for a device that holds the bow and arrows and is attached to the client unless it is attached to the back of the person, because attaching it to the a quiver that goes by someone's side like in this example it would cause huge inconvenience and increase chances of bow damage greatly.

In my view this product is inferior to other quivers, but really it comes down to your opinion of it, it serves only the purpose of holding arrows and can't do much else. I would rate it 2/5

This is a more traditional type of quiver, it is a back quiver and is slung over the back and arrows put in the large pouch, it depends on the person whether they like to take the arrows from their back or their side, it is slightly more inconvenient taking arrows from the back and slightly more dangerous, because there is more time that the arrow is not in the bow after being drawn from the quiver which means more time for something dangerous to happen, that is really the only inconvenience, the advantage of the back quiver is that it does not get in the way as much as the side quiver and is more easily taken off. This type of quiver is the only way I could have the bow holder attached to the client, so that when the client is ready to put the bow down they can attach it somehow to there back, this wont get in the way but will be quite difficult for the client.

In my view this is simply a better version of the standard bow stand, of course this is more expensive but because of the better string holder, the limb holder and twistable legs, I think this stand is worth the money, a mild adjustment to this could be very useful; I would rate this product 4/5

this type of bow stand is more expensive than the previous ones I have shown you, it holds the bow by the handle and the bottom limb so the bow is stood up almost straight making it easier to set down; no need for adjustment every time; takes up less room; and less chance of someone knocking into or tripping over the bow. This is a great design and I am hoping to use many aspects of it in my final piece, although I have not used it I am sure it has some of the same problems as the standard arrow stand, like components slipping to easily down the bow, this is why in my design I will either have holes for pegs do go under these components or a bolt that you tighten either of these would solve that problem, as for attaching a ground quiver to it that wouldn't be hard to do, simple a piece of circular plastic jutting out from the stand would do the job.

In my view this is a unique product and its design gives people reason to buy it, hopefully my design will be different enough to capture the imaginations of consumers. rated 4/5

This is an expensive type of quiver that is called a Barnett quiver and is very well designed by the company that made it. It is mainly used in hunting and or with compound bows, it keeps the arrows in place gripped evenly spaced and is attachable to the bow, this is so the archer can fire the arrows much fast and can put them into the bow more easily, I have no experience with these but if it works well it seems like an excellent idea and I would like to use some of its aspects in my design, the main problems I could imagine for this is that there maybe be problems when the bow is released of instability throughout the frame, this is a big problem with many of the components of a bow and can cause inaccuracy and damage to the bow, if there is a way for the arrow stand and the arrows to be tightly fastened to the bow and not be inconvenient then this idea would be excellent and save a lot of trouble.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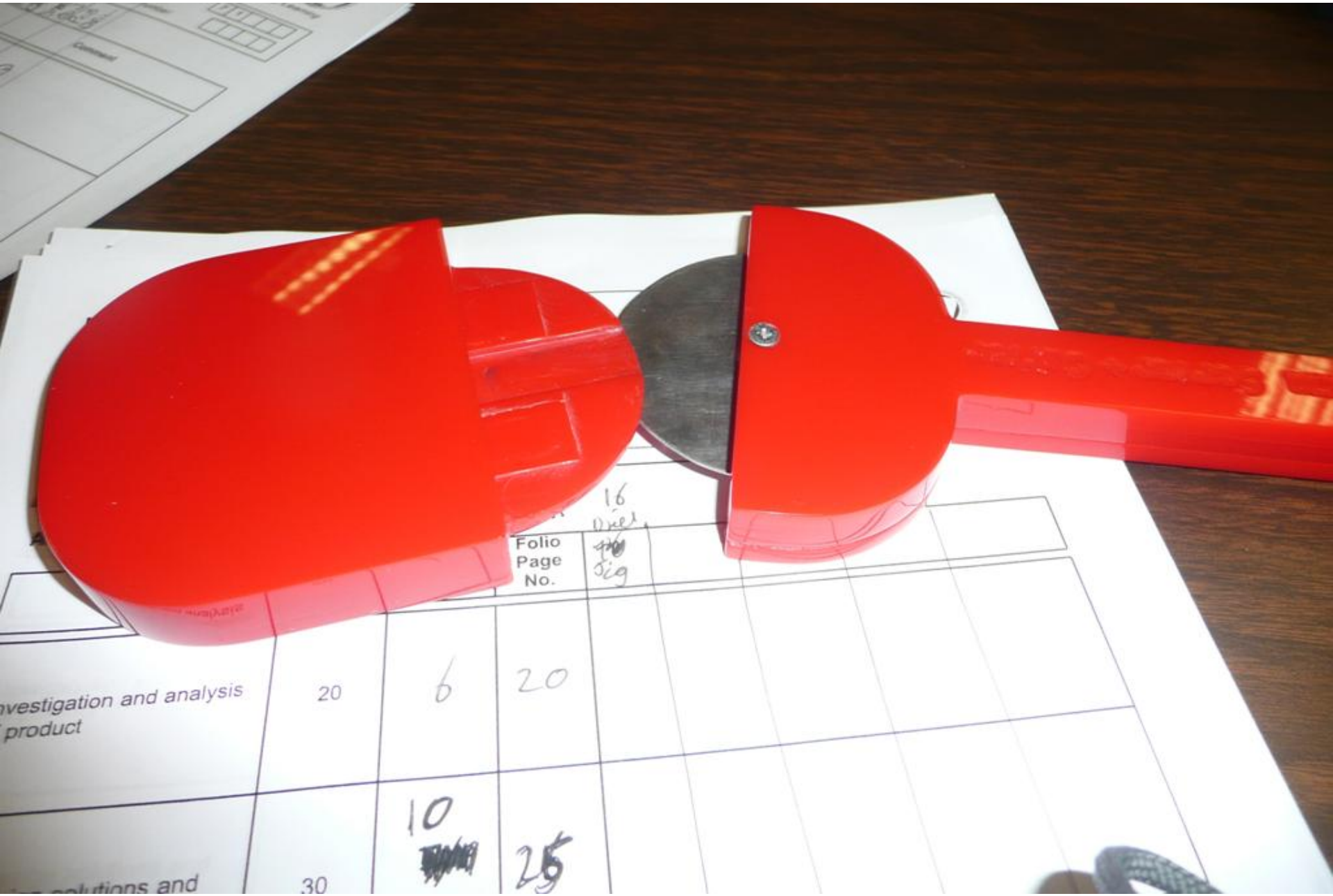
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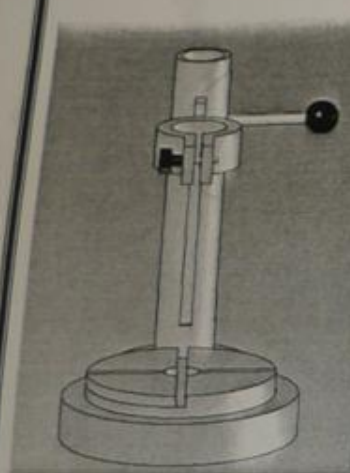
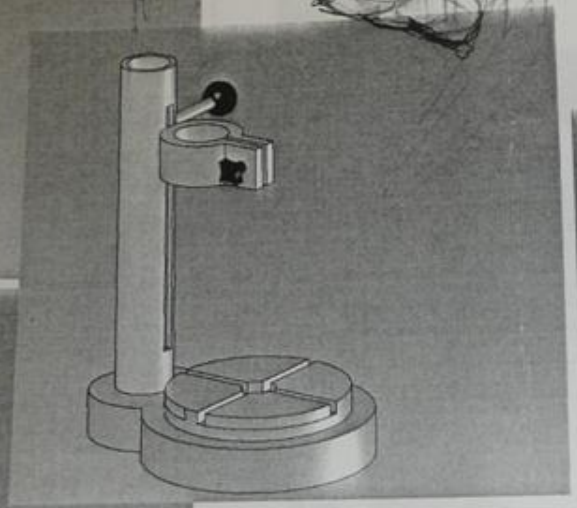
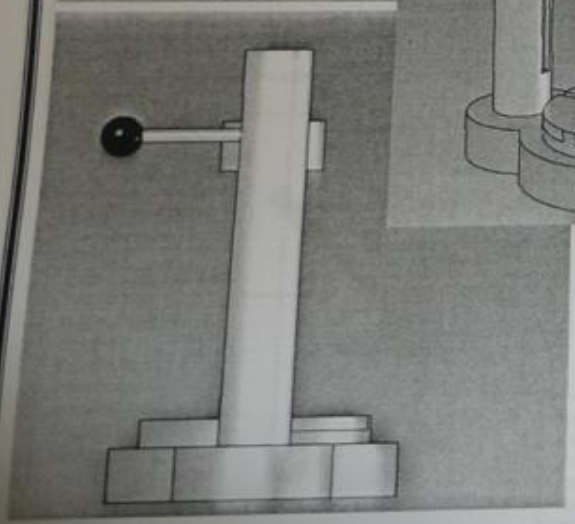
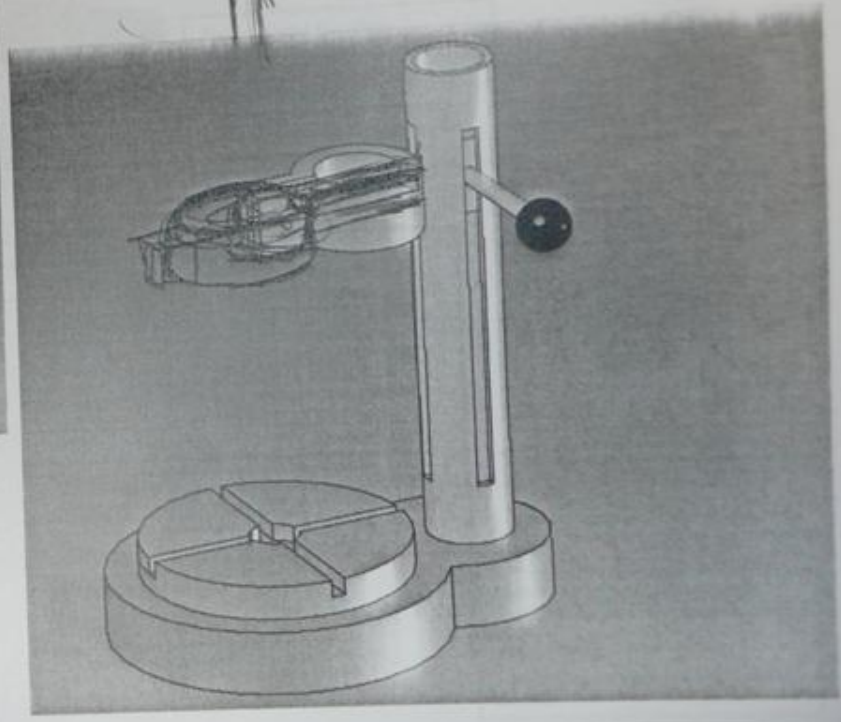
REDESIGN SOLUTIONS AND DEVELOPMENT









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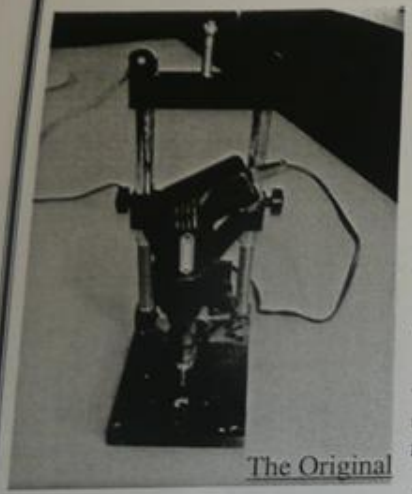

The Original

Evaluation

To evaluate my product I compared it to the specifications I had written for it whilst comparing those to the original product. By doing this I could discover what advantages the redesigned tool could have over the original table drill.

"The product as a whole must be small enough to be used at an average workshop table"

Although the original product was able to be used at a work bench table I believe my redesign has a greater use of that compact size as it has more features. Where work can only be rested on the original, it can be both rotated, and ideally clamped, on the redesign.

"The turntable must be capable of holding the work steady and secure as it is rotated, it must be able to turn freely from the base without obstruction."

The turntable is able to move very freely and independently from the base. I feel that this addition to the product allows for greater accessibility to the work as it can be worked on from many new angles previously unavailable with the original model.

"The clamp must be adjustable to fit the diameter of the most common workshop tools."

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Modifications

If I had to make the design over there is a few things I would improve about it:

1. I would make the grip on the lever larger and possibly add moulded finger threads. This would create more grip and make the leaver easier to operate.
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I had originally planned on having a spring inside the column of the product; this was discovered during the manufacturing process not to be possible with the materials, tools and equipment available in the workshop and so was not completed.

TESTING AND EVALUATION

With the manufacture complete I will now conduct a series of tests to assess the product:

Drop test

By dropping the product from a height of around 1m onto a semi-shock absorbent surface I will be able to distinguish how fragile it is without it breaking completely. Also I will be able to tell if more support would be needed for the actual build and if so, where.
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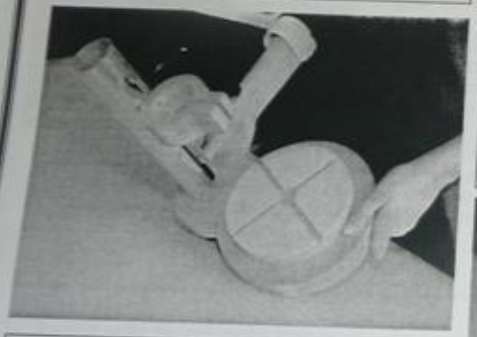

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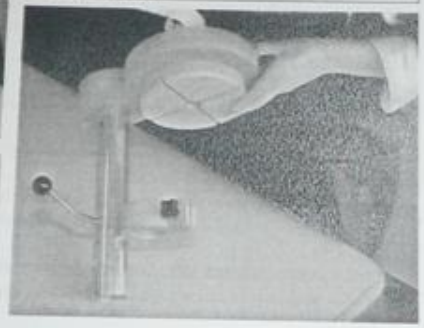

Field test

To get a non-biased opinion of the viability and ease of use of my product I will have a few different people test it out.

Movement test

To make sure the lever is able to be used easily I will test it by lowering and raising it 10 times in a row, ensuring that it moves freely and that the plug is the fitted tightly inside the column.
The turntable will also have to be tested. I will do this by turning it both clockwise and anti-clockwise 3 times to ensure it can fully rotate.

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The turntable and tool grip must be able to withstand certain amounts of weight and tension. Each will be tested by holding weights of up to MEASUREMENT for at least 10 minutes each.

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PLAN OF MANUFACTURE

Week 1-3.
Two MDF boards, around 20mm in thickness, will be glued together for the making of the base and tool grip, this will ensure the base will be sturdy enough to support the product. The outline for base is marked on the MDF and the band saw used to cut it to shape. The band facer, orbital sander and sandpaper are used to smooth edges. A 40mm hole will be drilled out from the centre of the base.

Week 3-5.
A 160mm diameter circles will be cut from the same thickness of MDF board, another from a thinner board, around 15-20 in thickness. A 25mm hole needs to be cut from the centre of one circle and then cut into four right angle segments. These segments will be glued on top of the first circle. A dowel will be attached to the base of the turntable and slotted into the hole in the base, allowing the turntable to move.
An aluminium tube will have two channels, at right angle to each other, milled into it; both approx. 230mm in length. The tube is then cut to a length of 290-300mm. The aluminium is polished using the buffer to give it a high-shine finish.

Week 5-6.
The outline for the grip is marked out on a thick MDF board, much smaller than that used for the base. The band saw will be used to cut it to shape. Again the band facer, orbital sander and sandpaper are used to smooth edges. A hole of 50mm will be drilled from the centre of the grip and the band saw used again to cut an opening through the front. The grip will also need a 5mm hole drilled through the flat, front plane to allow the pin to slot in.

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A block of Jelutong will be shaped, with the band facer, into a cylinder to fit the inside of the aluminium tubing. A hole, approx. 10mm will be drilled into one side of it; this is where the lever will be screwed into after it has been inserted into the aluminium cylinder.

Week 7-8.
A brass rod, around 45-50mm, in length will be used along with a knob/grip to make a pin for the tool grip; this will represent a screw which would hold the grip closed and allow the diameter it to be adjusted.
A grip or knob will be added to the lever at this point.

Task / Week	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
Base									
Turntable									
Cylindrical column									
Tool grip									
Lever rod & plug									
Lever grip & holding pin for tool grip									
Assembly									

Equipment/Tool Available

- Band saw
- Polisher/buffer
- Jigsaw
- Milling machine
- Band facer
- Pedestal drill
- Orbital sander
- Hand file
- Countersunk screws
- Sandpaper
- Wood glue

Materials Available

Woods: Mahogany block
Varying thickness of MDF boards

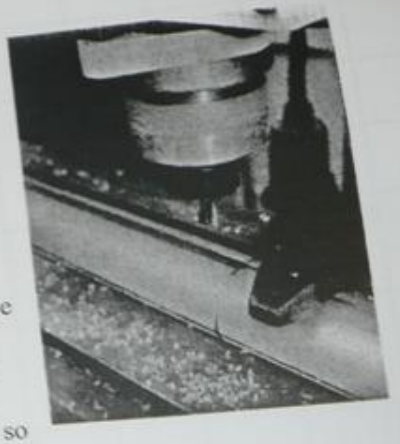
Metals: Aluminium tubing
Brass bar

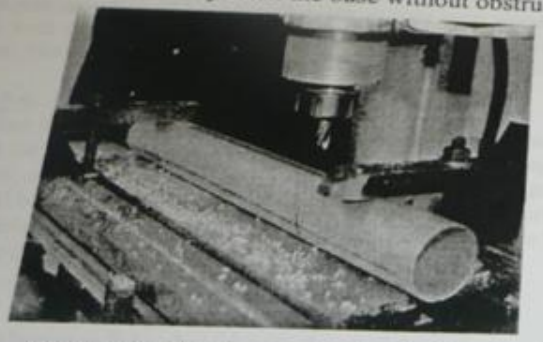
Plastics: urea formaldehyde (for pin and lever grips)

REDESIGN SOLUTIONS AND DEVELOPMENT

Specification

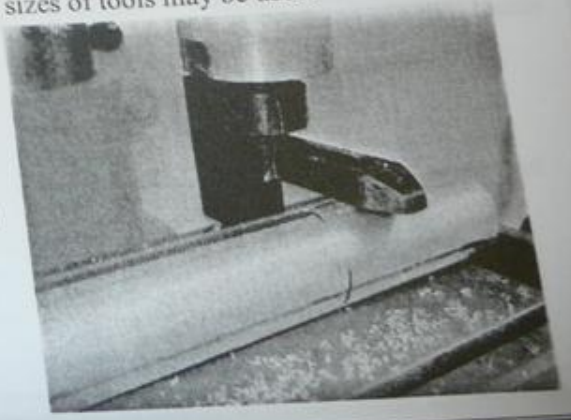
- The product as a whole must be small enough to be used at an average workshop table.
- It must not exceed a maximum height of 330mm and a maximum length of 300mm.
- The finished product will consist of a base, a turntable, a column, a clamp, a lever and a spring.
- The base must be of suitable dimensions, maximum 300mm x 210mm, and a suitable weight to ensure the product can stand alone without supports. So that it can be moved if needed, by one person alone, it must not exceed a maximum weight of 5KG.
- The turntable must be capable of holding the work steady and secure as it is rotated, it must be able to turn freely from the base without obstruction.





- The column must be made from a hard wearing, durable, high shine metal such as aluminium. It must be hollow and no more than 3mm in thickness.
- Two channels will need to be milled into the column; they must not exceed 230mm in length and 10mm in width. They must be approximately 60 degrees apart, so one does not obstruct the others pathway.
- The clamp must be adjustable to fit the diameter of the most common workshop tools.
- A pin will be made to ensure the clamp can be tightly closed so the tool is secured. A knob on one end of the pin will allow it to be used like a screw, this will make it easier to change the diameter of the clamp, so differing sizes of tools may be used.

- The lever which operates the holding clamp will be attached to a solid, hardwood plug which must fit tightly and securely inside the aluminium column.
- The lever rod must be able to be lowered and raised with ease and be free from obstruction. It must not exceed a maximum height of 265mm and a minimum height of 80mm from the base of the product.
- A "grip" or knob will be added to the end of the lever rod, so as to make it much easier to get a grip of the handle and move the lever.
- A spring will be added inside the column, underneath the wooden plug, so when released the tool will return to its original highered position.



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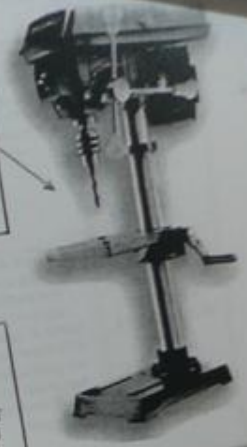

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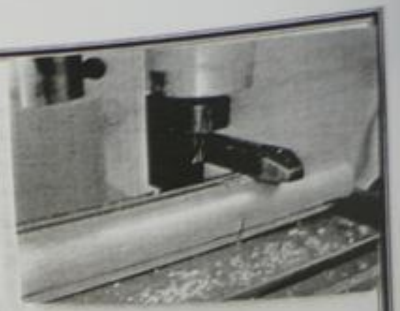

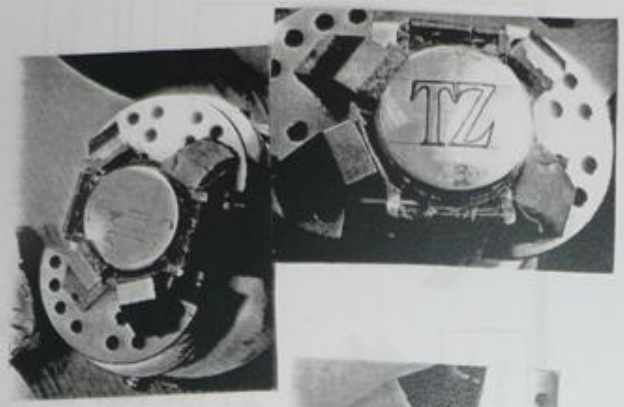

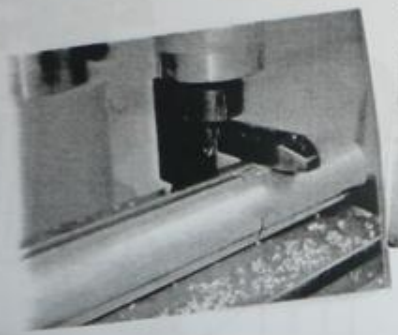

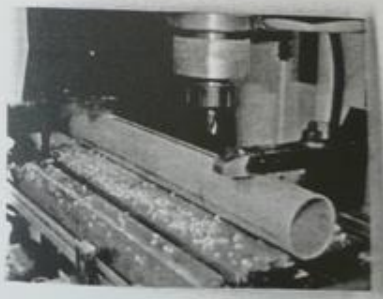

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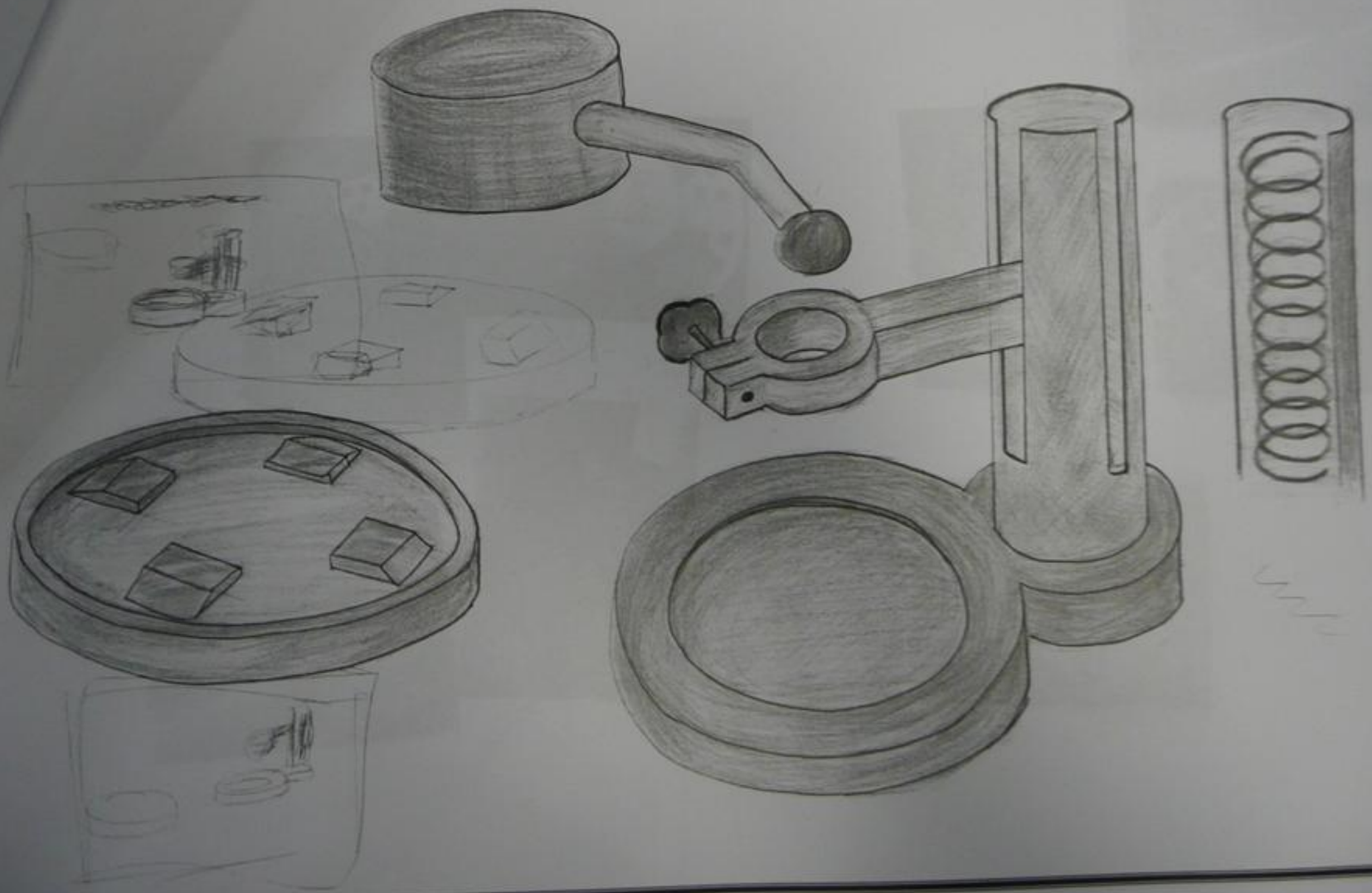

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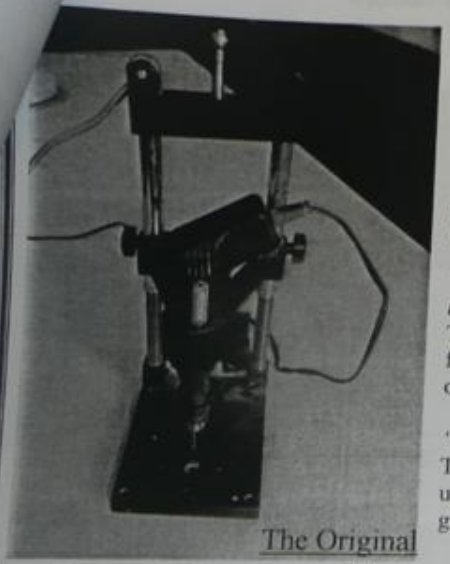

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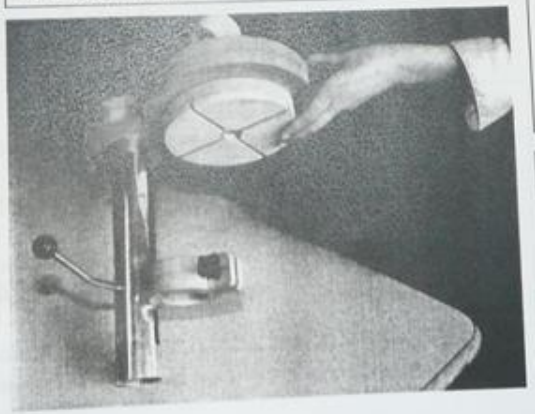

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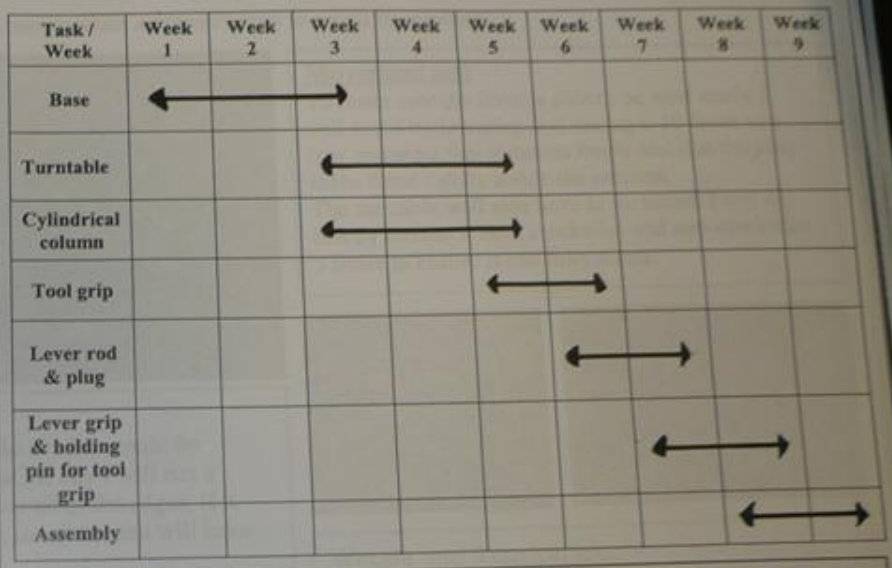

Equipment/Tool Available

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- Milling machine
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- Orbital sander
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- Sandpaper
- Wood glue

Materials Available

Woods: Mahogany block
Varying thickness of MDF boards

Metals: Aluminium tubing
Brass bar

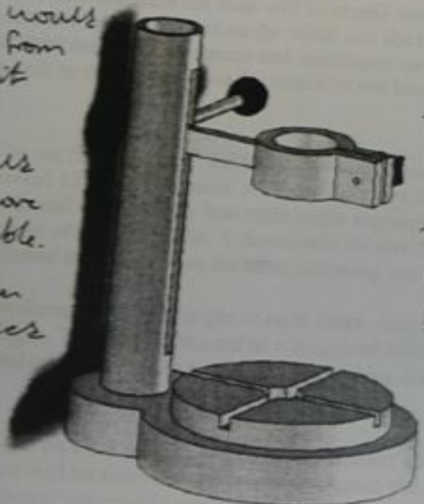
Plastics: urea formaldehyde (for pin and lever grips)

REDESIGN SOLUTIONS AND DEVELOPMENT

The materials I will use to make my redesign would need to be different from those used would it be made in industry.

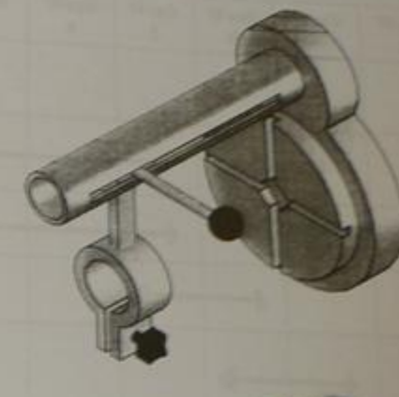
In industry they would have to be much more durable and sustainable.

A majority of the wooden components would need to be replaced with metal ones, primarily steel.



These are CAD drawings from different angles, of what I hope my finished product will look like.

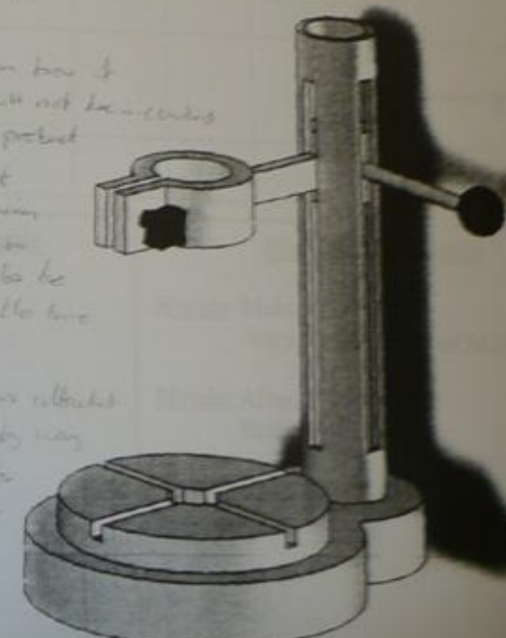
The only part which I feel would be a problem is the lever rod. Because it is straight it may make the lever harder to operate.

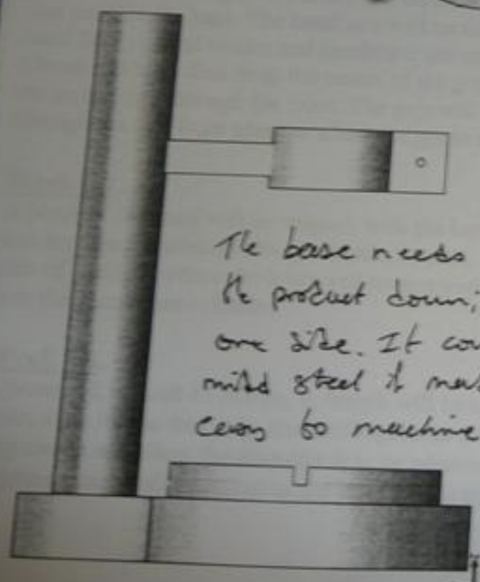


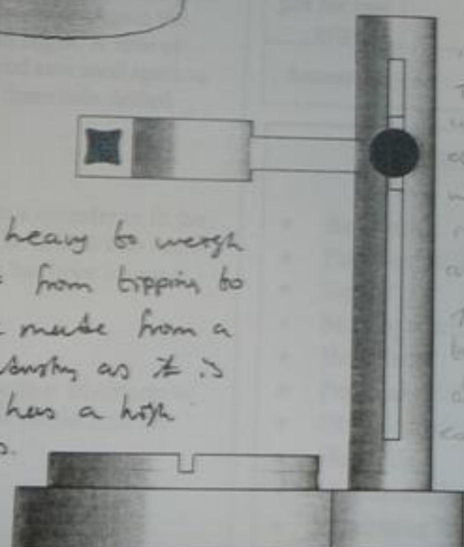
The extension bar of the tool holder will not be including in the final product

The component was broken during assembly and so was unable to be rebuilt with the time available

The holder was attached to the plug by way of screws to compensate for this.

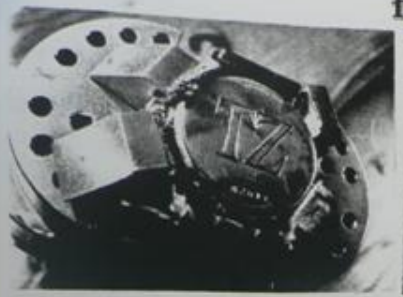




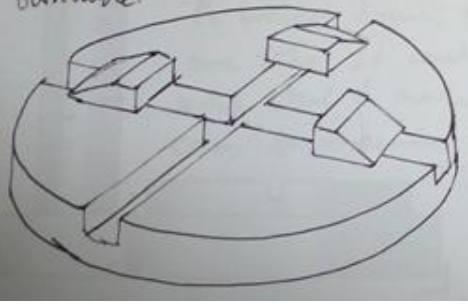


The base needs to be heavy to weigh the product down; stop it from tipping to one side. It could be made from a mild steel if made in industry as it is easy to machine and has a high stiffness.

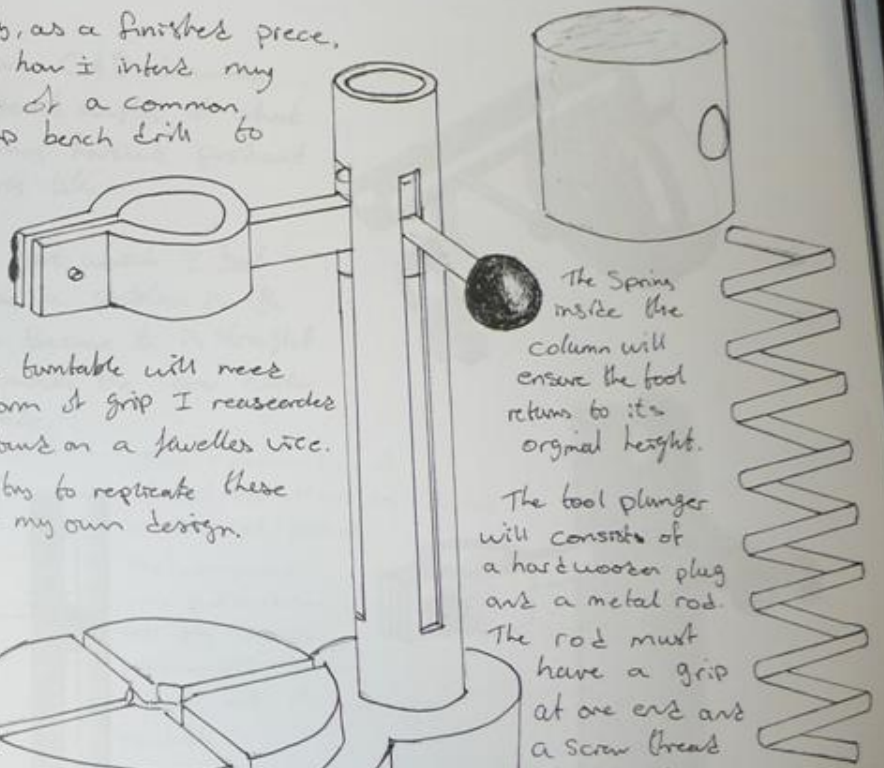
REDESIGN SOLUTIONS AND DEVELOPMENT



One idea for the turntable was to have small metal grips, very like those seen in the Jeller vice above. Channels would allow the metal pieces to slide easily, backwards and forwards along the turntable.



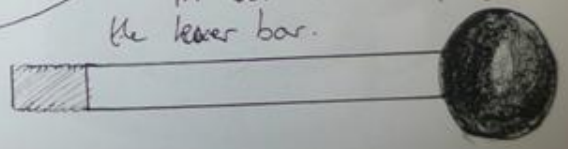
Hopefully, as a finished piece, this is how I intend my redesign of a common workshop bench drill to look.



As the turntable will need some form of grip I researched those found on a Jewellers vice. I will try to replicate these for my own design.

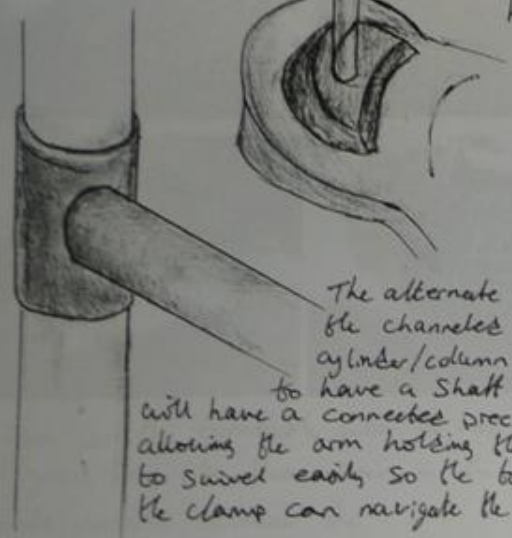
The spring inside the column will ensure the tool returns to its orginal height.

The tool plunger will consists of a hardwood plug and a metal rod. The rod must have a grip at one end and a screw thread at the other. The screw thread will ensure a tight fit between the plug and the lever bar.

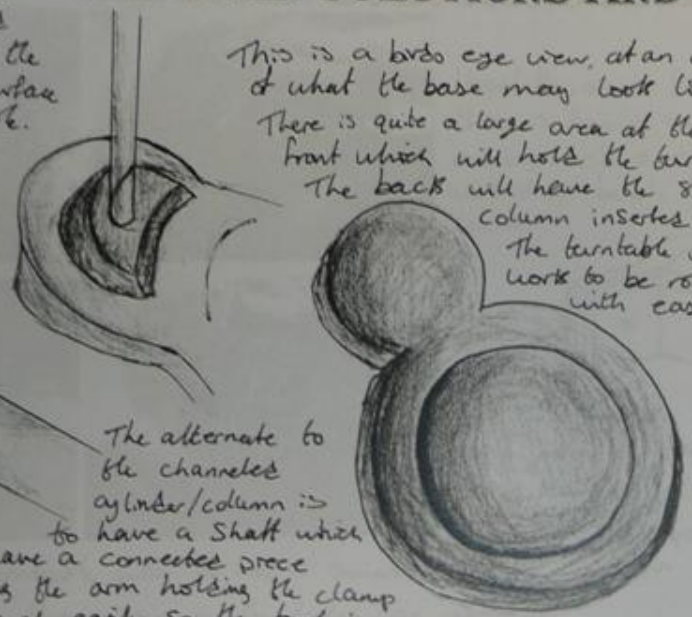


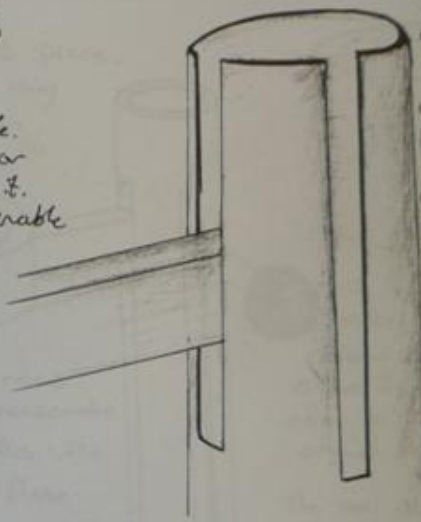
REDESIGN SOLUTIONS AND DEVELOPMENT

Initially I was to have the shaft on a raised area at the rear of the design but a flat surface was more suitable.



This is a birds eye view, at an angle, of what the base may look like. There is quite a large area at the front which will hold the turntable. The back will have the shaft or column inserted into it. The turntable will enable work to be rotated with ease.



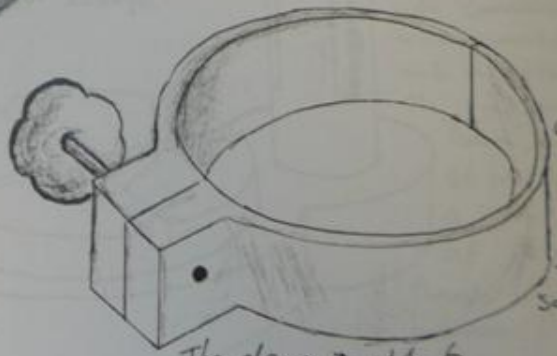


I plan on milling a grooved channel into the metal column. One at the front to allow for the tool grip to be held and one at the back or side to allow for the handle to be positioned.

The alternate to the channeled cylinder/column is to have a shaft which will have a connected piece allowing the arm holding the clamp to swivel easily so the tool in the clamp can navigate the work with ease.

Another idea for clamping the work is to simply have a 'holder' for the tool which can be inserted without the need to open it.

The clamp and shaft are connected by a swivel ball. It allows the holder to be adjusted slightly to make working on the material much easier as it will not have to be moved as much.

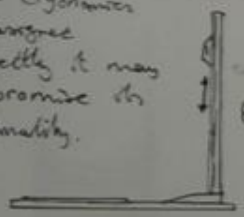


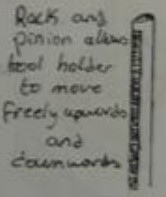
One way in which the work could be held in place is by way of a simple clamp. This is one idea said clamp.

The clamp is able to be open due to the hinge in the back. once unscrewed the bolt at the front can be removed and the clamp opened.

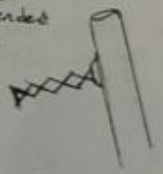
REDESIGN SOLUTIONS AND DEVELOPMENT

The ergonomics of a product are equally as important as the functionality of it. If the ergonomics are designed incorrectly it may compromise its functionality.

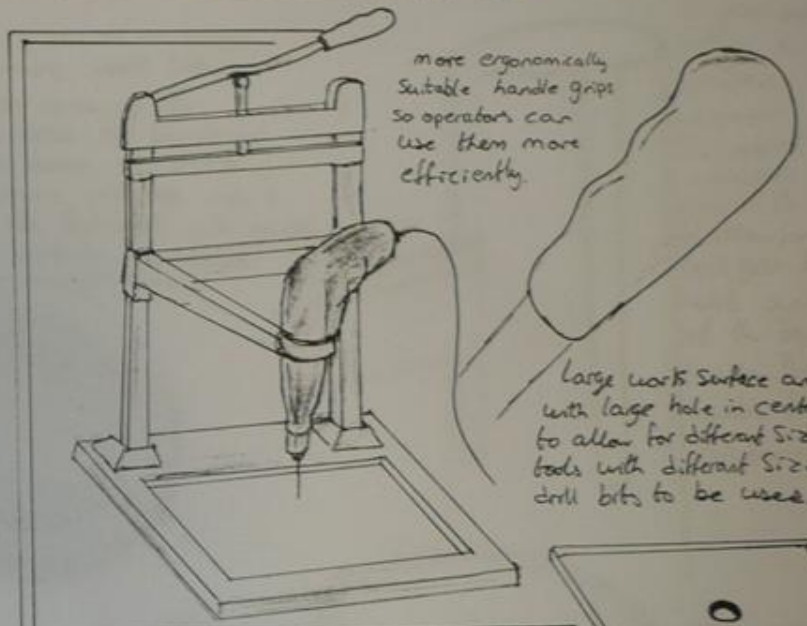




Extended scissor links allow for tool to be extended to needed length.

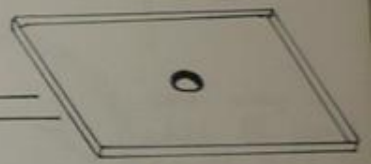


Tool held in place by simple holder of ajustable size for different sizes drills.

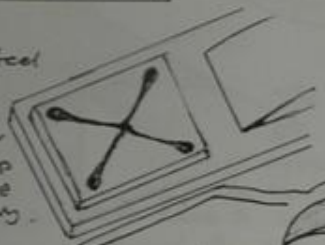


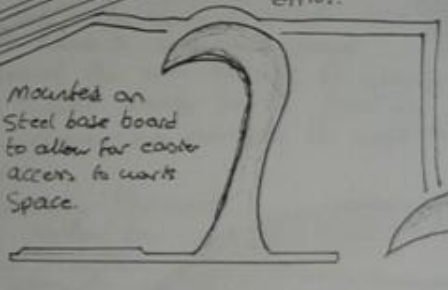
more ergonomically suitable handle grips so operators can use them more efficiently.

Large work surface area with large hole in center to allow for different sizes tools with different sizes drill bits to be used.



Die cast steel work area with grooves indents allow for a clamp to be moved as necessary.





Mounted on steel base board to allow for easier access to work space.

Small opening for drill cable to slot through to keep it out of the tools path.

pivotable joints allow for movement of holder

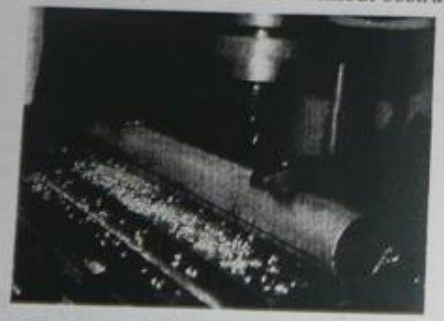
Tool can be removed from holder and held there when not in use

The 'collar' of the stand, the holder of the tool, has been modified so it can be extended to allow for larger tool to be used. Pressing the button in releases a latch at the other end which allows the collar to be extended. Releasing the button allows the latch to catch one of the ridges and holds the collar closed. Similar to how a cable tie works

REDESIGN SOLUTIONS AND DEVELOPMENT

Specification

- The product as a whole must be small enough to be used at an average workshop table.
- It must not exceed a maximum height of 330mm and a maximum length of 300mm.
- The finished product will consist of a base, a turntable, a column, a clamp, a lever and a spring.
- The base must be of suitable dimensions, maximum 300mm x 210mm, and a suitable weight to ensure the product can stand alone without supports. So that it can be moved if needed, by one person alone, it must not exceed a maximum weight of 5KG.
- The turntable must be capable of holding the work steady and secure as it is rotated, it must be able to turn freely from the base without obstruction.



- The column must be made from a hard wearing, durable, high shine metal such as aluminium. It must be hollow and no more than 3mm in thickness.
- Two channels will need to be milled into the column; they must not exceed 230mm in length and 10mm in width. They must be approximately 60 degrees apart, so one does not obstruct the others pathway.
- The clamp must be adjustable to fit the diameter of the most common workshop tools.
- A pin will be made to ensure the clamp can be tightly closed so the tool is secured. A knob on one end of the pin will allow it to be used like a screw, this will make it easier to change the diameter of the clamp, so differing sizes of tools may be used.
- The lever which operates the holding clamp will be attached to a solid, hardwood plug which must fit tightly and securely inside the aluminium column.
- The lever rod must be able to be lowered and raised with ease and be free from obstruction. It must not exceed a maximum height of 265mm and a minimum height of 80mm from the base of the product.
- A "grip" or knob will be added to the end of the lever rod, so as to make it much easier to get a grip of the handle and move the lever.
- A spring will be added inside the column, underneath the wooden plug, so when released the tool will return to its original highered position.

PRODUCT ANALYSIS

(2)

Product chosen	Product differential	Materials used	Fitness for purpose	Aesthesis	Ergonomic suitability	Mechanisms used	Ease of use	Cost
	This product is a modern version of the most common design. The stand has been changed to become more ergonomic and the colours and styles make it more ascetically pleasing.	A hardened steel shaft would be best for the main shaft; the moulded base would be made from a die cast steel as would the holding device. The lever end has a rubber grip.	The maximum height of which the drill can be raised isn't as high as would be desired for a product such as this. There is little room underneath the drill piece.	This tool is aesthetically pleasing as there are no rough edges or visible joins. The use of subtle colour adds to this.	The lever could be longer so less force would be needed but the hand grip is very ergonomically suited.	A lever is used to lower the drill onto the material being used. A rack and pinion mechanism is also used to adjust the drill position and height.	The rubber grip on the lever makes it easier to get a grip on it so it moving the drill steadily is easier.	£55.00 This is a good price for a device such as this, especially because it has the added, moulded bit storage.
	This product is the most different in design to the others. The pivoted join of the two shafts allowed for maximum movement. It is also the lightest in weight of the four.	As it is the most lightweight, aluminium is the most suitable for this product. A heavier steel base ensures the stand has stability. The turning cogs would be made from a moulded plastic.	This is a very simple product with very limited uses. It works well for what it was designed to be used for.	Again there are no rough edges on this product. It has a very simple and minimalist design. The use of the shiny metals against the matt black plastics adds to its ease on the eye.	The grips on handles aren't completely smooth; this gives them better grip so it is easier to turn. The base is a solid piece of cast metal, this ensures it does not knock over under the weight of the tool in the grip.	A pivoted joint allows the tool to be lowered or raised freely at a ninety degree angle.	This is the easiest to use due to its simple and lightweight design. It would work better if the rod holding the tool was longer and more flexible though.	£14.99 This is a very reasonable price for a simple product such as this.
	This is the largest of the four, it is also the heaviest. The wheels allow it to be moved about a workshop with ease. This is the most industrial of the four products and would most likely not be found in a technology work shop but more likely in a garage or auto repair shop.	Aluminium or a harden steel would be suitable for the main shaft. The rack and pinion on the shaft would have to be a die cast steel as would the base.	This product was designed to be portable. The wheels, despite what they look like, are very strongly attached to the base so they could withstand the weight.	The use of bright colours makes the jack a lot more eye catching. The fact you cannot see any obvious joins also makes it nicer to look at.	Like the "Dremel Drill Master" the handle has rubber stoppers on the hand grips to make it easier and more comfortable to use.	A rack and pinion is used, along with the handle, to allow the tool grip to be raised or lowered. The wheels allow for the Jack to be moved easily.	It was designed to be heavy enough to take the weight of the tool but light enough to be portable; it works well for this; although the handle position after tightening or loosening might get in the way of the tool being used in the Jack.	£80.00 The most expensive of the four, a bit too expensive for the smaller portable version of this product.
	This is a larger design used for more industrial work. This has fastens to connect it to the work surface. The handle is a lot larger than usual to help create greater leverage due to its size.	Die cast steel would be most suitable for the moulded base and top piece. The main shaft would be made from hardened tubular steel, the clamp handle and lever from steel.	This works well as the clamp is very securely fixed to the base but can be moved if needed. The "press" also works very smoothly.	As the main pieces of the clamp are one piece-die cast metals there are no obvious joins seen. This makes the product more aesthetically pleasing.	The handle end could be larger or have a rubber cover on the end to add comfort for the user as it if used for a prolonged period it could become uncomfortable to use.	The main mechanism used here is the lever used to lower the press. Another is the screw thread used to open and close the clamp.	Long lever allows for easier use of press. Clamp position can be adjusted very easily and removed if necessary.	£35.00 This is relatively cheap compared to other tool presses such as this.

INVESTIGATION AND ANALYSIS OF PRODUCT

Name: Dremel Drill Master.
Function: Holds steady mini-drill.
Price: £55.00.
Part being investigated: Bit storage device.

Name: Lee Precision Load-Master.
Function: Reloads empty bullet shells progressively or singly without spilled powder or components.
Price: £14.99
Part being investigated: Movement available in lowering parts up and down.

Name: Rockwell Pedestal Drill.
Function: Drilling holes of variable width in bigger projects.
Price: £1090.
Part being investigated: Method of lowering the drill bit.

Name: Dremel Easy Press.
Function: Hold dremal/drill style tool.
Price: £45.00.
Part being investigated: Method of lowering mechanism and lever used to lower device.

Name: Adjustable Soldering Clamp.
Function: Holds steady a soldering tool and allows for movement up or down.
Price: £14.99
Part being investigated: Movement available in lowering parts up and down.

Name: DeWalt Tool Press & Clamp.
Function: Lowers tool towards material held in clamp.
Price: £35.00
Part being investigating: Clamp for holding material.

Name: Dremel Duo.
Function: Holds multiple dermal tools and bits.
Price: £64.99.
Part being investigated: Method of holding tool.

Name: Husqvarna Precision Drilling Jack.
Function: Portable drill stand.
Price: £80.00
Part being investigated: Method of rack & pinion used for movement of device.

Name: Dremel Mini-Drill Guider.
Function: Holds drill/dermal style tool steady
Price: £50.00
Part being investigated: Tool holding device.

Testing

The product gains aesthetic quality from the use of black and clear acrylic in the grips and the key. This compliments the colour and tone of the aluminium.

The can opener can be easily gripped. The large grips provide a large surface area so that people with weak hands, arthritis or other such motor disorders can easily use the can opener even with limited use of their hands.

The bottle opener can be easily used without disruption to or by the workings of the can opener itself. It is placed so that:

- No additional pieces of material are needed. Is cut into existing piece.
- Maximum leverage is gained by using the existing rather than gripping the mechanism.
- Increases functionality replacing having a separate bottle opener in the kitchen.

Evaluation

Materials

The can opener is made of a variety of materials. A small sheet of mild steel has been bent to form the main part of the mechanism. The blade has been bent and shaped from the piece of mild steel. The other component of the mechanism has been formed from two strips of aluminium, a high carbon tooth wheel and a piece of polythene to provide clearance. The key and grips are made from acrylic as this provides sufficient grip, is aesthetically pleasing, is comfortable to the touch and can easily be shaped to form an ergonomic handle.

Safety

The bottle opener on the can opener is much safer to use than on the common can opener because to gain maximum leverage you do not need to grip the cutting mechanism. All sharp edges have been rounded and the can opener has no unnecessary points. The can opener does not require electricity which virtually makes risk of burns or electric shock impossible however the can opener has a significant amount of bare metal. The bare metal rarely needs to be directly touched by the user as all necessary grips have been formed from acrylic, thus insulating the metal parts of the can opener that may need to be held.

Ergonomics

The can opener has improved ergonomics as the palm grip has rounded edges to allow the palm to fit comfortably yet firmly around the handle. The finger grip has wedge cut out of it with round notches cut into it to allow the fingers to wrap comfortably around the handle. The key has rounded edges to allow the hand to grip it more comfortably. The key has countersunk holes drilled in either side to improve grip. The holes are countersunk to allow grip to be more comfortable.

Portability of the can opener has been reduced as the weight and size of the can opener has been increased.

Aesthetics

The can opener has been made to suit the modern kitchen: the choice of black and clear acrylic suits black marble kitchen surfaces which my research led me to believe are growing very popular. The aluminium and steel components have been given a brushed finish which is also very popular and attractive in the modern kitchen. The acrylic and metal components of the can opener also independently compliment each other. The can opener has been designed to have no unnecessary straight edges as smooth curves are considered to be more aesthetically pleasing.

Durability

I found while making the can opener that the acrylic grips were very durable and would be hard to break especially when the metal components act as a skeleton for the key and grips. However I found that the finish given to acrylic using wet/ dry paper and polish was easily damaged or scuffed. The metal components are sufficiently durable and hold their brushed finish very well. However I found that the aluminium components were much more easily deformed than the steel components.

Effort required

The effort required to open a can is much the same as the common can opener, which is sufficient to open a can with ease. However the bottle opener has increased leverage as the handle is longer and the user grips the handle to gain maximum leverage, as opposed to holding the cutting mechanism.

Ease of manufacture/ cost/ time

The cost of the materials to make the can opener can to no more than £5. The manufacturing process required a variety of techniques which increased difficulty. To create the product materials had to be; sawed, hammered, drilled, filed, sanded (with sand paper, emery cloth and wet/dry paper), bent, riveted, glued and shaped on a band-facer. Class time, study time and after school sessions were spent making the can opener. Rounding the edges on the grips was the most time consuming job as it had to be done using a file to decrease the risk of damaging the product. Improving the finish on the product could be dome at home with emery cloth and wet/dry paper.

Plan of manufacture

Handle/ grip

One handle will be made using a strip of mild steel. The other will be made using a strip of aluminium cut from the main part of the cutting mechanism. The grips will be made by sandwiching the metal parts of the handle in five layers of acrylic, approximately 3mm thick each. They will be coloured, clear and black.

The metal parts of the grip will have black acrylic around the edges so as to make them invisible to the naked eye.

The acrylic will be fixed together using tensol cement and given its basic shape with a band facer and file. The grips will be given a good finish with emery cloth, wet and dry paper and a polisher.

The grips will have curved edges and will be rounded at the ends.

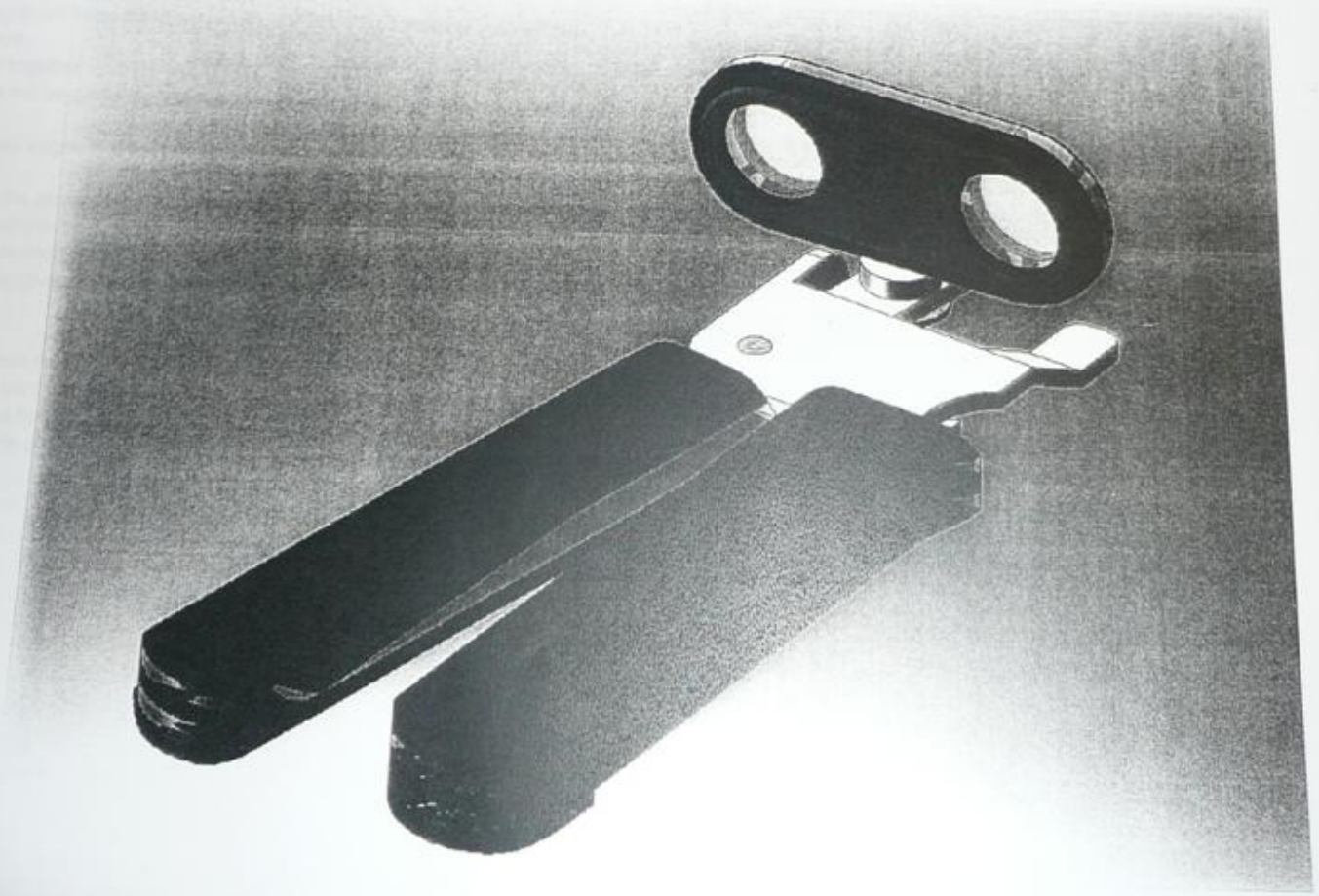
Key

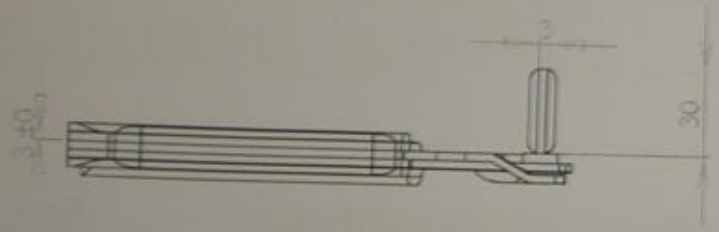
The key will be made in the same design as the grips. The tooth wheel will have a strip of steel running through it. This will be sandwiched with three layers of black and clear acrylic.

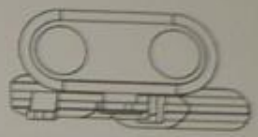
The key will be rounded at each end and will have four countersunk holes drilled into it; two on either side. The key will be given its finish with emery cloth, wet/dry paper and a polisher.

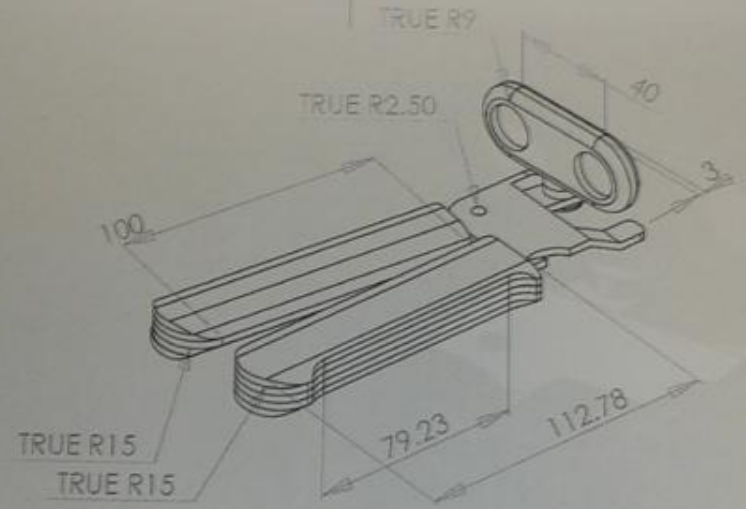
Mechanism

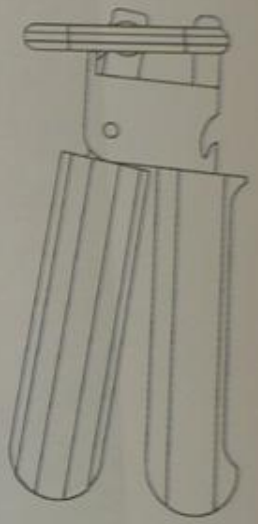
The mechanism will be made from a piece of sheet aluminium and a strip of mild steel. The sheet of aluminium will be bent into shape to form a point which can be used to penetrate cans. The strip of steel will have a hole through one end through which the tooth weel will be fastened to the key. The strip of steel and sheet aluminium will be held together with a bolt.











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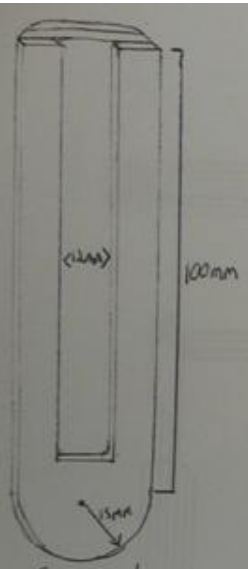

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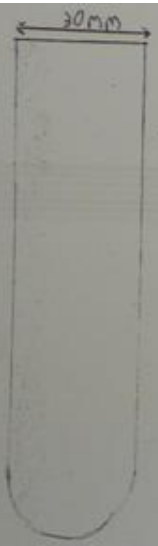
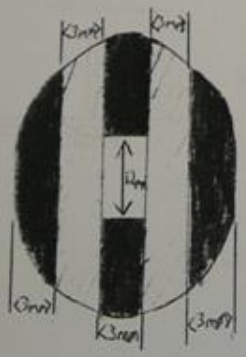
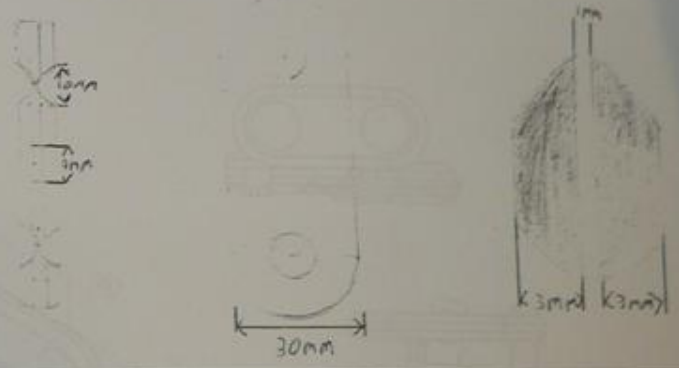


Front

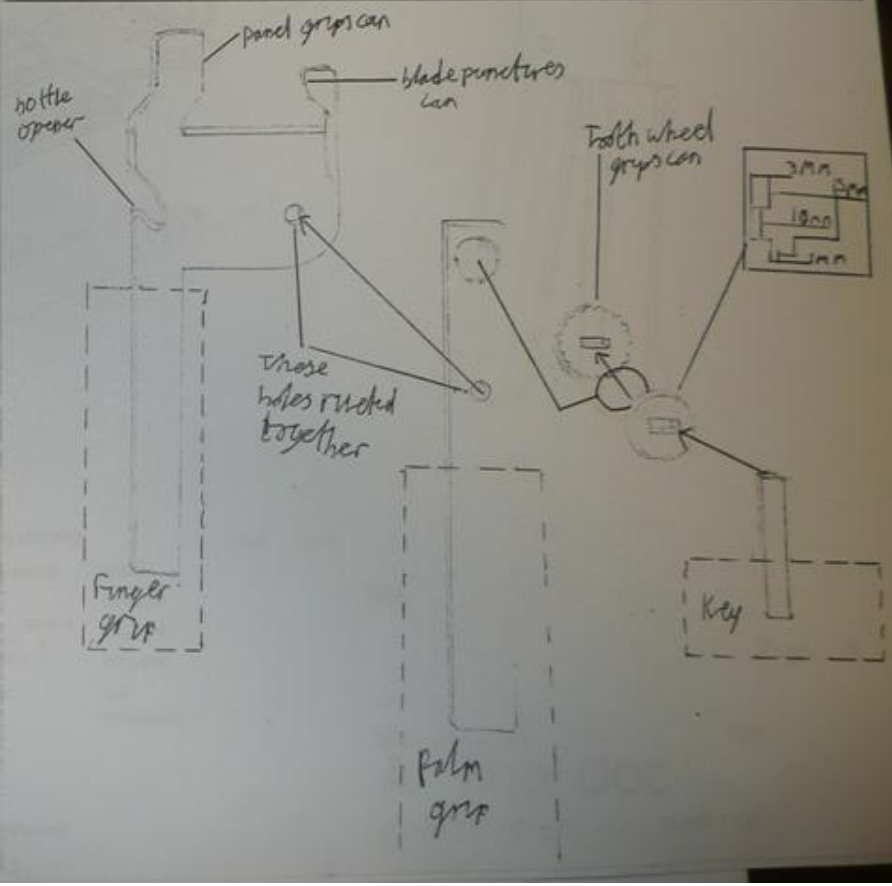


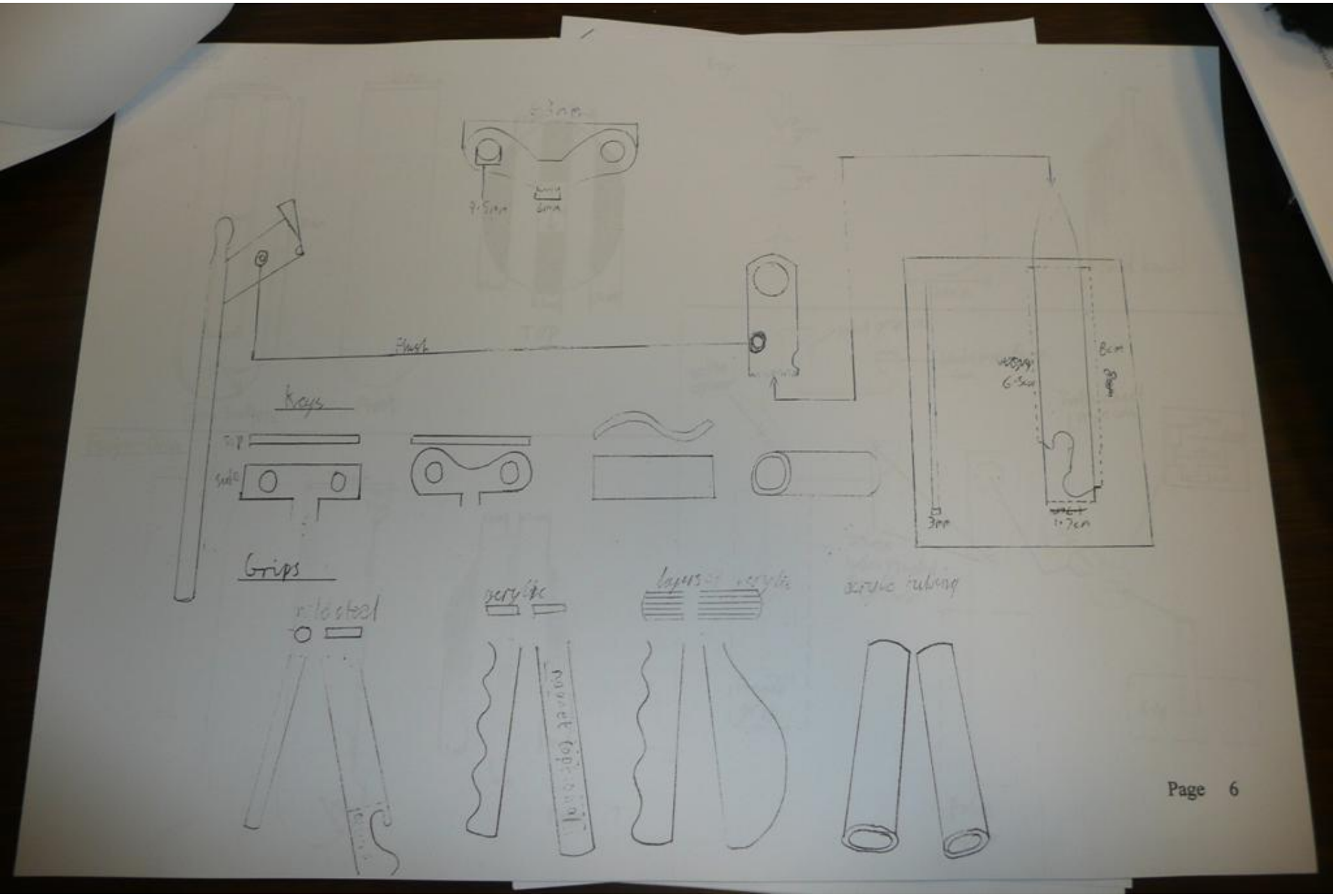
TOP

Key



Finger Grip




Keys
Grips


wall bracket

Specification

My product must:

1. Open cans efficiently and with ease
2. Open bottles which have been closed with a metal cap
3. Have a comfortable, ergonomic grip.
4. Be aesthetically pleasing with;
   i. Aesthetic shape, curves, few straight edges.
   ii. Colours which match and compliment each other.
5. Have a key which is easy to turn. With a leverage advantage.

1. Open cans efficiently and with ease

In order to open the can efficiently I will make the can opener with a suitable blade for piercing and severing the lid of the can.
In order to make the can opener easy to use, I will make it with a reasonably long grip to provide ample leverage to pierce the top of the can.

2. Open bottles which have been closed with a metal cap

In order to allow the user to open bottles with the can opener, it will be made with a bottle opener cut into the design. This will be situated above the grip, near the actual mechanism of the can opener.

3. Have a comfortable, ergonomic grip.

The grip of the can opener will be made from four layers of acrylic of approximately three millimetres in thickness. The acrylic will give a warm comfortable touch and will be smooth to increase comfort. For both comfort and ergonomics the edges of the grip will be rounded, this will make the grip more comfortable and allow the can opener to fit well in the hand. One part of the grip will have a gap cut into it so as to allow the fingers to fit securely around the grip.

4. Be aesthetically pleasing with;

i. Aesthetic shape, curves, few straight edges.

The bottom ends of the grip will be rounded into semi-circles to give the design a more constant, pleasing shape. Most edges will be rounded or at least sanded down to remove sharpness. This will keep with the smooth, round design of the product.

ii. Colours which match and compliment each other.

The can opener will be made using acrylic and aluminium. The acrylic will be black and transparent. These choices of acrylic compliment each other and also go well with the colour of the aluminium.

5. Have a key which is comfortable and easy to use.

The key will be made from acrylic as this will give it a warm, comfortable touch.

Modifications

For my Product I will be improving on the common can opener.

I will be focusing on the aspects of ergonomics and aesthetics.

I will be making it warmer and more comfortable to the touch by using acrylic.
Using acrylic instead of steel for the outer part of the grip will also improve the aesthetic qualities.
I will also be making the grip larger so as to provide the user with better grip as the surface area in contact between the hand and grip will be greater.
The Key will be made from several layers of acrylic to improve aesthetic qualities. This will also make the key warmer and more comfortable to the touch.
The colours of the acrylic will be coordinated as black and transparent. I have chosen this colour scheme as it compliments the natural colour of the aluminium and steel. The colours also go well with black marble surfaces and other similarly styled aspects of the modern kitchen.
I may also improve the storage accessibility of the product by incorporating a magnet so that it can be kept on fridge doors etc.
The key will have holes drilled on either side to improve grip, however as an improvement I will use counter sunk holes to improve comfort.
The bottle opener attachment will be moved so that it is next to the cutting mechanism. This will improve aesthetics and will also allow the user to achieve maximum leverage without having to grip the mechanism end (this was a flaw with the common can opener).

Viability

It would be easily viable to create the handle and key with an acrylic grip, as it would only require five layers of acrylic which is readily available and basic skills to assemble and shape it. The only tools that would be needed would be; a band facer, band saw, file, emery cloth, wet and dry paper and a polisher. Tensol cement would also be needed to assemble the grip.
To include countersunk holes in the key of my product would be viable as it would only require a drill with a countersinking bit.
The magnet attachment may not be very viable as it would be difficult to hide a magnet within the product, unless it was under a layer of acrylic, however then it would be difficult to find a magnet strong enough to be effective through a layer of acrylic. Also it would be difficult to find a point on the product with no contours to put the magnet.
The bottle opener attachment would be easily viable as it requires no extra materials and only requires a hacksaw and file to create.

P-38 can opener

	Analysis	score
Materials	• This product is made out of nickel plated iron and steel. The main body (handle) is made out of nickel plated iron and the blade is made of steel. These two parts are hinged together with a piece of steel rod. I think that these materials satisfy the strength required of them.	8/10
Safety	• Out of all of the selected products this one is the least safe. It should only be used by people who have been shown how to use it. The user must have his fingers very close to the blade while using it and the blade has been known to slip.	2/10
Ergonomics	• This product is ergonomically quite well designed as it can be worn around the neck as a dog tag. The blade can be folded in so that it is flush with the handle. Other then this the product has no ergonomic features.	2/10
Aesthetics	• This product has not been designed aesthetically and has no such features. However the nickel plating gives the product a nice finish.	3/10
Durability	• This product is very durable as it is not intended for domestic use, but rather for outdoor camping activities. Despite this the product is supplied in packs of two as they are cheap and the blade eventually becomes very blunt.	10/10
Cost	• One P-38 can opener retails for around £0.40. They were also readily supplied to armed forces, as each c-ration pack contains a p-38 can opener. However this product is becoming obsolete as campers, hikers and soldiers are using fewer cans of food and more pouches. This means that the product is becoming more expensive as they are being made on a smaller scale.	9/10
Portability	• This product is the most portable of all the selected products as it is made to be so. It is worn around the neck like a dog tag and can easily fit in the pocket or on a keychain.	10/10
Effort required	• This product requires a lot of effort as there is barely any leverage provided by the device. The only real feature of this device which lessens the effort required is the sharp edge on the blade.	3/10
Ease of use	• This product is difficult to use and requires a lot of practice. The product is relatively intuitive as it is a very simple design and function.	3/10
Ease of manufacture	• This product is very easy to manufacture as it only requires a small amount of material and only a few processes. These products were originally intended to be made on an extremely large scale and therefore the manufacturing process was kept small.	10/10

Retro can opener

	Analysis	score
Materials	• The main body of this product is made of painted aluminium; the can opener attachment is made of nickel plated iron with a steel blade.	10/10
Safety	• This product is safe as the can is clamped to the mechanism so as the user does not have to hold it while it is being opened. • However the blade is quite exposed and is quite dangerous to clean.	7/10
Ergonomics	• The product has a good ergonomic design as the product is operated by a lever to clamp the can and a switch to activate the mechanism. • The product has a handle which aids in moving the product as it is quite heavy.	7/10
Aesthetics	• Aesthetically, this model is very attractive. The body has a retro shape and a hot-rod paint job. This gives the product more character than the others and the most aesthetically desirable. The can opener attachment however is not as aesthetically pleasing as it has a dull finish, ugly shape and does not suit the body.	10/10
Durability	• The product has a strong aluminium body and the attachment is made of strong iron, making this product very durable.	6/10
Cost	• This product is very expensive as it was discontinued in the 1970's and is considered a collectable. It costs upwards of £80.	1/10
Portability	• The product is intended as stationary as it requires power from the mains. • However the product does have a convenient carry handle. • The product is heavier and larger than all the other models.	1/10
Effort required	• The effort to open the can is provided by a motor which is powered by a mains power source. • The effort required to clamp the can is provided by the user pushing down on the lever. This is quite easy as the lever is quite long.	10/10
Ease of use	• The product can be difficult to clean, as the attachment cannot be easily dismantled and food from the cans gets lodged deep in the attachment.	9/10
Ease of manufacture	• The product could be very difficult to manufacture as there are a lot of materials needed and even more manufacturing processes.	5/10

Electric can opener

	Analysis	score
Materials	• The body of this product is made of white plastic. • The blade is made of steel.	8/10
Safety	• This product is very safe as the user does not have to touch blade or have any fingers near the blade or can.	10/10
Ergonomics	• This product is ergonomically well designed as it is simple to use. • The button to operate the device is placed conveniently on the top of the product.	9/10
Aesthetics	• The product has a pearl white finish which is aesthetically pleasing. • The shape has no straight edges or sharp angles, but rather smooth curves which suits the product.	6/10
Durability	• The strong plastic shell makes the product quite durable. Unlike most of the other models however, this product is vulnerable to water as it uses electricity to provide the driving force.	4/10
Cost	• This model is quite expensive but is good quality. It retails for around £15.	5/10
Portability	• This product is not very portable. It is intended to be stationary as the lead restricts how far it can be used from a power source.	1/10
Effort required	• The effort to operate this product is supplied by a motor which is powered by a mains power supply.	10/10
Ease of use	• It is difficult to position because the can must be placed off-centre; The guide wheel/cog is not centred under the top of the movable opener head portion and the large top of the removable head blocks your view of where you are trying to align the can with the cog wheel. If not positioned properly, it starts tearing off pieces of the label and doesn't puncture the can.	10/10
Ease of manufacture	• This product would be difficult to manufacture as it uses many materials and many manufacturing processes.	3/10

Evaluation

I have chosen the improve upon the common can opener. After analysing this product I found it was the one that required the most improvement as it had been designed purely for economy. I will improve the aesthetic and ergonomic aspects of this product.

Analysis

Common can opener

	Analysis	score
Materials	• The body is made out of stainless steel • The blade is made out of high carbon steel. • The parts have been milled and bent in places. • The parts are held together by a rivet. • I think the materials chosen are suitable for the intended purpose but have little other features other than strength.	6/10
Safety	• For the user; this model can be quite dangerous as the blade is very much exposed and the user must use their fingers to get the lid of the can out of the can once it has been cut. • For the manufacturer; this model would be quite safe to manufacture as it does not involve many complicated processes and therefore does not need to be handled much by workers.	5/10
Ergonomics	• Ergonomically, not a lot of effort has been put into this model. • The handle has not got any grip qualities however the key has two holes drilled in it to provide grip.	4/10
Aesthetics	• Aesthetically; not much effort has been put into the design of this model of can opener. For aesthetics, this model has a shiny stainless steel finish and is also available in brushed steel.	3/10
Durability	• This model is often deformed by use over time. • It is made out of a durable metal. • Over all; the model is quite durable.	5/10
Cost	• This model is very cheap and is made to be so. It is not made for intense use, just someone who occasionally needs a can opener.	9/10
Portability	• This model is very portable as it can fit into a pocket and is quite lightweight.	7/10
Effort required	• This model uses the effort from the users grip and the effort used by the user to turn the butterfly key.	6/10
Ease of use	• This model is quite easy to use for most people but not for those who have problems with grip, such as arthritis.	7/10
Ease of manufacture	• This model is simple to manufacture it is made from mostly steel of one thickness.	8/10

ergonomic can opener

	Analysis	score
Materials	• I think that these materials are suitable for all aspects of the product	9/10
Safety	• The blades are completely exposed which makes this model more unsafe. • The way the can cuts the can leave a blunter edge on the lid of the can.	7/10
Ergonomics	• It has a comfortable, ergonomic handle which fits comfortably within the hand. The grip uses plastic and rubber, which uses friction to provide extra grip.	8/10
Aesthetics	• Aesthetically the can opener is greatly improved. • The shape does not have any straight edges. • The colours are coordinated so as they match.	8/10
Durability	• This design is much more durable than the common can opener as the mechanism has a much stronger bolt holding it together.	6/10
Cost	• This model of can opener is relatively inexpensive however more expensive than similar designs of this model. •	5/10
Portability	• This model is quite portable. It can fit into a pocket however the ergonomic handle is quite large and bulky however is quite lightweight.	6/10
Effort required	• The effort used is provided by the force used to press the two parts of the handle together and to twist the key. This effort uses the blade to penetrate the can and turn the can.	7/10
Ease of use	• This model is quite easy to use and is relatively intuitive. The grip makes the device easier to use however still requires almost as much force as the common can opener.	7/10
Ease of manufacture	• This model may be slightly harder to manufacture than the common can opener as it involves machining three materials. Plastic, rubber and steel. This model has quite a lot of parts which must be made from different materials using different processes.	7/10

Wall mounted can opener

	Analysis	score
Materials	• This model is made from enamelled steel and plastic. The handles are steel which are plastic covered. The steel has been pressed into shape and riveted together. The plastic sleeves on the handles have been injection moulded.	7/10
Safety	• The device is very safe as there is no need to have any limbs near the can or blade while in use.	10/10
Ergonomics	• This model is ergonomically well designed. It is easy to use by people with motor disorders. The can does not have to be held while in use as a pedestal holds the can against the blade.	9/10
Aesthetics	• The only aesthetic quality of this model of can opener is that it has an enamel coating. Not much effort has been put into the aesthetics of this product as.	1/10
Durability	• The model is as durable as it needs to be. As it is mounted on a wall, forces are rarely exerted on it other than those intended for its purpose.	5/10
Cost	• This product is made for people with disabilities. Therefore the cost of this product is kept low at around £5.00. The product can also be acquired for free by people on disability benefit as it is covered by a government subsidy.	10/10
Portability	• The product is not intended to be portable. It is intended to be in a fixed position. However if it is to be moved, it must be unscrewed from the wall.	3/10
Effort required	• An advantage to this is that the device can be fitted to the wall meaning that only one hand is needed to operate it. It does not take much effort to use as the handle is long enough to provide sufficient leverage.	9/10
Ease of use	• The product is very easy to use. It has sufficient leverage so that only very little force must be exerted to open the can. The user does not have to open the can.	8/10
Ease of manufacture	• This product is easy to manufacture as most of the parts are machined using the same process (pressing steel.) The products are not made on a very large scale, so the production line may be slower and there may be less machinery and more workers.	6/10

Investigation

This is the common can opener. It is made of stainless steel except for the blade which is made of high carbon steel. This model of can opener is made to be cheap: it uses a minimum amount of material and work to make. This however leaves the product with a lot of problems and room for improvement.

They cost approximately £1.

They weigh around 100 grams.

The can opener is 16 cm from end to end.

This model opens a regular sized can in around 10-15 seconds when new.

There are many models of the can opener, all of which do the same thing however each one is designed for a different users or conditions. Some are designed for economy, for people who just want a simple, inexpensive, yet user friendly can opener. Some are designed for restaurants or for establishments/ homes which heavily use can openers. Some are designed for people with disabilities who need an easy to use can opener which requires little effort yet must be inexpensive. Some models have no moving parts and are designed to be compact and easy to carry around.

How and why has the Tin Opener changed?

The earliest model of can opener was invented during the American civil war. It was fashioned around the design of a bayonet. They were very unsafe and would have never been used domestically. They were only used by soldiers and in shops where the shop keeper would open the can for the customer when it was bought.

Who is the Tin Opener for?

The tin opener is generally for everyone (excluding children) who prepare food. This generally covers the entire population. Therefore the tin opener comes in many designs.

How is the tin opener made?

Most tin openers are made out of mild steel. The manufacturers try to use as few processes as possible.

Part	Machine	Action	What is the effect?
handle	lever	turns the can around	a hole is made in the lid of the can
wheel	wedge	is forced into the lid	The cutter is forced into the lid of the can. the wheel and the cutter grip the can
cutter	wheel	turns the wheel of the can opener	the cutter cuts the lid away from the can
key	wheel	is pulled down	it turns the can around

This can opener is an improved model of the standard can opener. It is made of various types of plastic and has some steel components.

- It has two blades to increase efficiency.
- The handle has a rubber grip
- There is a lock on it which clamps the mechanism to the top of can.

This can opener is designed for regular domestic use similar to the cheaper stainless steel model. It weighs approximately 130 grams. From end to end the can opener measures 195mm. This model of can opener costs around £14.99. This model is also available in green or black.

This is a wall mounted can opener. It clamps the can to the cutting mechanism using a screw thread mechanism. This model of can opener is made of steel with an enamel coating. It is made specifically for people suffering from disabilities, such as arthritis. This model retails for around £5.

It weighs approximately 300 grams. It measures 300mm in height, 150mm in width and 150mm in depth.

The can opener uses a freely rotating pedestal to support the can. The height of this pedestal is adjusted using a screw thread mechanism.

Invented and used by the army from WW2 to the mid 1980s the P-38 can opener was developed to be both cheap to make and small, making it popular with campers and hikers. The mechanism is a simple blade which relies on the strength of the user to penetrate the can, by repeatedly levering the can opener the blade eventually removes the lid of the can. This model costs around £0.40.

It is made out of nickel plated iron with steel. The steel blade is always exposed however can be kept flush with the main body when not in use. The blade and body are held together with a piece of steel rod. This allows the blade to hinge with the body. The can opener measures 1.5" in length.

This model is a standard Kenwood electric can opener. The effort applied to open the can comes from an electric motor inside the body. The motor uses a power supply from the mains. The device can be operated by one hand and requires virtually no effort from the user. These models of can opener also often include a knife sharpener. This can opener could be used either domestically or commercially. The can is clamped between two wheels by the rim. One of the wheels carries a sharp rotary blade. The motor turns the two wheels which in turn removes the top of the can. The body of this product is made of white plastic. The blade and much of the mechanism is made of steel. The body has a pearl white finish. The shape has no straight edges or sharp angles but rather smooth curves. The can opener is powered by mains electricity. This model retails for around £15.

This model of can opener is originally a mixer however is supplied with many attachments ranging from a meat tenderiser to a coffee grinder. Therefore this appliance can use the one main unit (motor) to carry out various tasks. The can opener is powered and operated similarly to the above Kenwood can opener as it is powered the same way. However this model of can opener requires regular maintenance. The main unit is designed in a 'retro' fashion and is available in many designs (Left: Hot Rod Flame paint job). The attachment is made of galvanised steel. The main body is made of painted aluminium. The can opener is made of nickel plated iron with a steel blade. The blade is exposed. the can opener is powered by a motor which is powered by mains electricity. A lever is used to clamp the can to the mechanism. The can opener attachment has a dull finish. This model costs upward of £50.

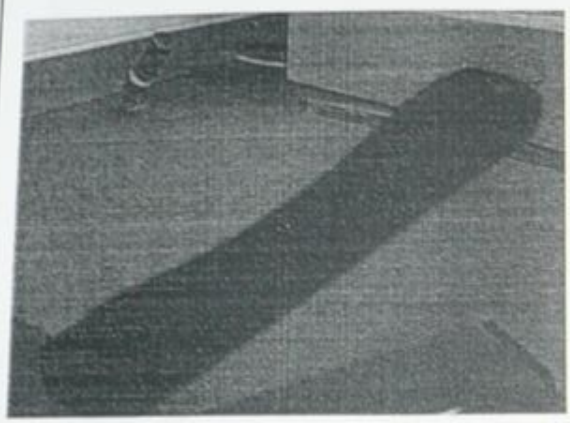
The can opener weighs approximately 2.5 kg.


Technology and Design
14
Manufacture
40
Testing and evaluation
10


of product
100
29
Candidate
The coursework I have submitte
acknowledged.
Signature

Modifications During Manufacture

Originally I had planned to just have one strip of metal running from the top to the end of the stapler as you will have seen throughout my folder, especially in the Solid Works Drawings, but after making and testing this idea I discovered it put the whole product off balance so I made the metal the full width of the gun, and a bit wider. I also continued the front over out round the sides of the gun, as to protect and balance it, doing to jobs at once.



Here you will notice how I have changed the overall design of the lever to allow for a better ergonomic factor, and a more comfortable use. It also goes better with the overall shape of the staple gun, as the overall shape is very curvy, and so if the lever was to remain what it was like before hand, as you will have seen in my solid works, it would look out of place and not aesthetically pleasing.

Here I had to change the shape of the safety trigger to make it work. If I had kept it the original shape the back end would have hit of the roof of the staple gun and not fully activated.
So by changing this I have created a prototype that works and has been finished to a good standard.

action	- The new design for the staple gun does ensure that children are unable to activate the gun, and in the case of the gun being dropped, the safety trigger prevents accidental firing. - It does house an extra storage compartment for an extra round of staples to be stored. - The hand grip is comfortable to use and is superior to the pervious staple gun. - The new aluminium surface of the gun is rigid and durable; it prevents scrapping on the plastic. It can withstand the wear and tear of the surfaces it will be pressed against. - The lever on the gun is superior to the previous one as it is longer – allowing for less force to be applied, and it is more comfortable.
Fitness for Purpose	- The stapler looks aesthetically pleasing with the new contrasting colours – black and red. - The new grip allows for longer periods of use, due to the improved ergonomic factor introduced to its design. - The extra storage compartments can hold a variety of different sizes of staples.
Aesthetics	- In my opinion the product looks stylish, modern and sleek. The red casing combines well with the black components, and the metal aluminium cover. - The outer casing looks more professional with the company logo –CLARKE- attached to the outer casing. - Due to how the product was produced it can be made in a variety of colours.
Ergonomics	- The prototype is lightweight and is able to be carried around for long periods of time, it weighs approximately 280grams. - For an adult or mature person the safety trigger can be comprehended, and is easy for such a person to use with ease. - The staples are easy to place in the magazine and the extra storage compartment. - The new lever and hand grip are quite comfortable, and easy to use. However the spacing between the finger slots may not suit all users.
Maintenance	- There are a few holes, cracks and crevices – so dirty may get in these and prevent the staple gun from operating, be this is only a prototype. - The gun can be taken apart but not easily, in practise – it would probably have to be sent back to the manufacturer to be repaired.
Materials and Production Methods	- The materials are strong, however not fully resistant to impact as I do not believe the staple gun would survive if dropped from a height, but the aluminium covering would help this. - I did incorporated wood, plastic and metal into my product. Where wood was used for producing the shape of the mould and in the production of the lever and safety trigger. Plastic was used to produce the mould and the outer shells of the lever and safety trigger. Aluminium was used in producing the protective cover around the outer shell of the gun.
Cost	- The product – after adding up the costs – does not exceed to price of £12.00.
Safety	- The new finger slots do not allow the users hand to slip when using under wet conditions. - The new incorporated safety trigger does not allow for accidental firing when dropped, of in any other circumstances. - There are no sharp corners or edges, as everything was rounded, even the metal cover.
Dimensions	- The total width of the gun was 32mm, and the overall length was 178mm so I kept to my measurements for storage and hand size.
Durability	- The outer materials are able to withstand slight impact, but are very easily scratched. - The inner workings are quite reliable, but if dirt or shock was to be put into the equation, I don't believe it would last that long.
Time	- The prototype was completed by March 2009.

Manufacturing Process

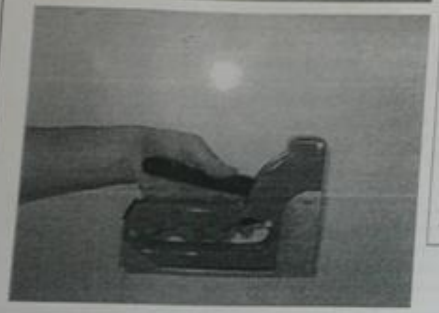
If this product was going to be mass produced it should be made via different means, than of that which I used to produce it, mostly because of the man hours I put into its planning and manufacturing. It quite simply would not be profitable or even realistic.
I believe the shell of the product would be injection moulded to prevent wastage of materials, and because the process is relatively quick. The handle and the safety trigger, in the same instance should be either blow moulded or injection mould to cut down on time and wastage.
The aluminium cover would be made from a single piece of metal – not aluminium as it is not all that durable and resistant to scratching.
These are the three main modifications that I thought of and made.

Future Modifications

If I were able to make this product again there would be a few modifications that I feel would make the ergonomics, aesthetics and storage better.
Here are some of my ideas:

1) I would design a storage clip that would how the lever down so as the gun can be easily stored in a tool box.
2) If possible I would use a different method of joining the staple gun together as the bolts do not make a totally satisfying look for the aesthetics.
3) I would put some sort of rudder around the handle to give a more comfortable and secure grip.
4) I would create a locking mechanism for the extra storage compartment as it just slides out when held vertical, rather than double sided tape.
5) I would make the mould more accurate, for a more flush and secure finish.

Testing and Evaluation



Here you can see how I have tested the hand grip and finger slots. As you can see the finger slots are of average size, and will fit most users' hands.
The handle also has a curve in the shape of my hand to provide extra comfort and add to the ergonomic factor.
You can also see the inside of the stapler to see how the mechanism works. As you can see it is in the closer position.

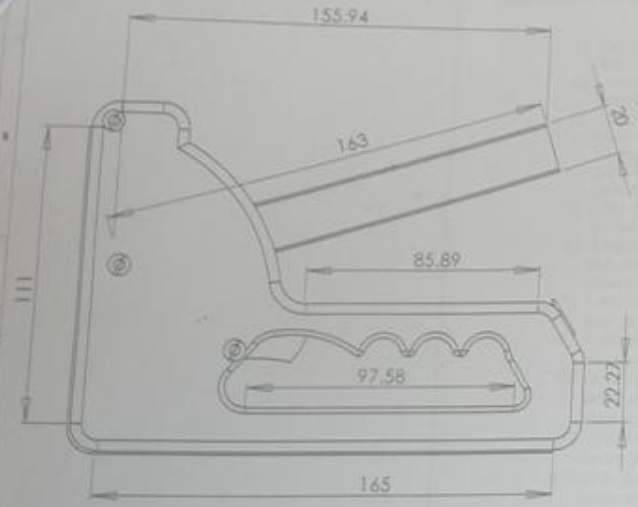
Here I am testing how the extra storage device works, and showing you how it slides in and out.
It has no spring so it involves the user having to push it back in.
The stapler as a whole works well and has been finished to a high standard.
The mechanism functions well, and the extra storage space will hold up to 100 staples.

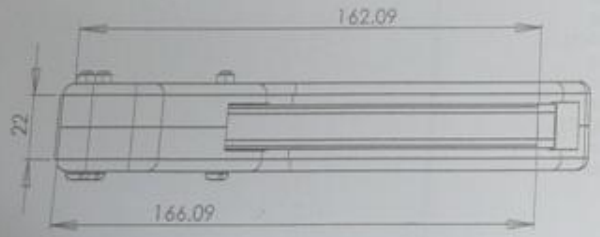
Here you can see me testing the mechanism on the outside, where the above picture shows how the lever cannot be activated unless the safety trigger is activated, as shown in the bottom picture.
Throughout all the pictures you can see how the aluminium cover does not allow the actual stapler to come into contact with the surfaces it will be pressed against. Also how it acts as a flat surface so the user can determine where he/she is stapling.

- All centres visited
- Moderation AS Wed 19th May to Wed 26th May

Plan of Manufacture

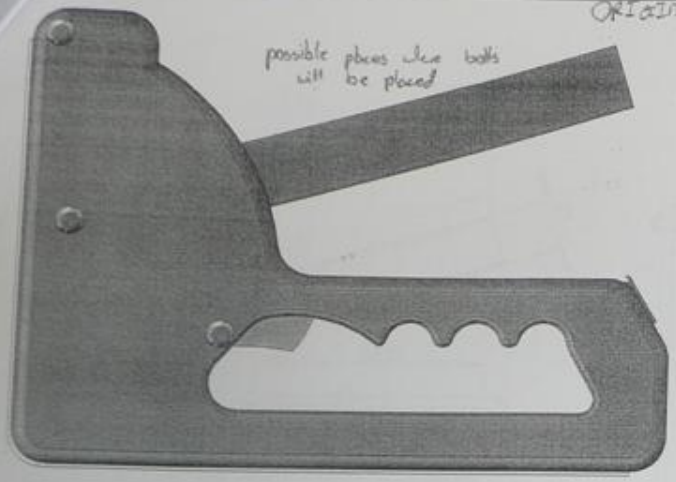
1) I will start by sticking two pieces of 15mm MDF together with the method of double sided tape
2) I will then draw the outline of the staple gun, then with the help of the teacher cut out the shape via the ban-saw.
3) After I get the desire shape of the stapler cut out I will file and sand down the edges to get smooth rounded corners. the sanding will give a more smoother curving and it will have a better outcome on the vacuum former.
4) After I have got the desired shape for the mould I will use two screw drivers to prize them apart.
5) After separating them I will place them on the vacuum former to get the overall shell of the staple gun.
6) After the two sides have cooled and hardened, using the gerbil I will cut them out, approx 4 – 5mm up from the surface to give an even join when sticking them together.
7) I will then file down the rough edges with glass paper and a light file, so the fit also perfectly together.
8) I will then design the safety trigger mechanism, using models and precise measurement to make sure the pivots are in the correct place.
9) Once I have the measurements complete I will make the hand trigger and the safety trigger with the spacing in the middle of the hand trigger to allow the stopper to move between it when the safety trigger is activated.
10) I will make these via the use of MDF and acrylic, where the MDF will take up the centre of the piece and the acrylic on the outside.
11) After these two triggers are made I will cut, file and sand them down to the desire shape and size, them finally spray them black.
12) Next I will more on to making the extra magazine cartage which will house the extra staples, this will involve me cutting out a hole in the back of the gun 22mm by 19mm to house the piece of MDF which will take on the shape of the extra cartridge holder which is 100mm long.
13) Then I will make the back cover for this, from black acrylic 25mm by 19mm.
14) Then for the pieces of metal which will act as supports and covers for the bottom of the staple gun, I will make them out of aluminium. And bend them into shape.
15) Once this has been achieved I will file and wet and dry the metal down to get desired appeal.
16) Next I will decide where I will place the bolts, only two of them though as two will act as the pivots for the triggers.
17) Once the bolts are fitted I will join the whole thing together and fit all the pieces, such as the piece of black acrylic to show where the actual staples to be used will go.



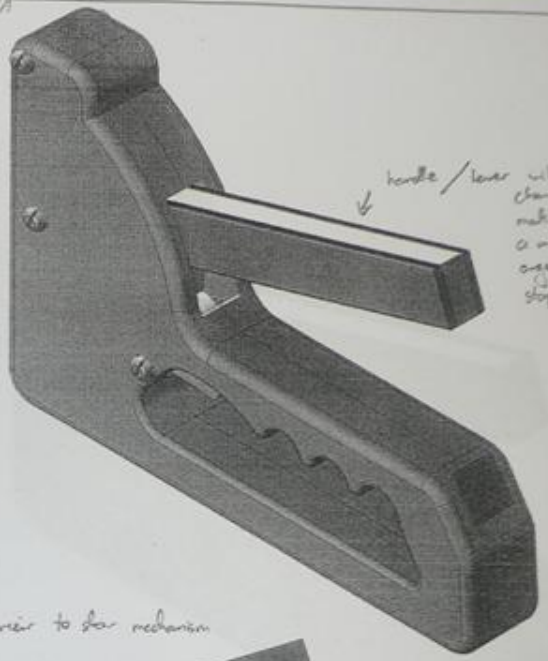


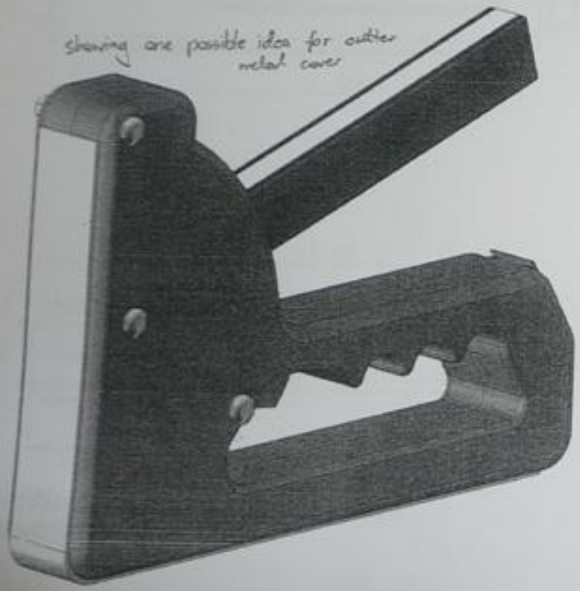
sean cusack assembl

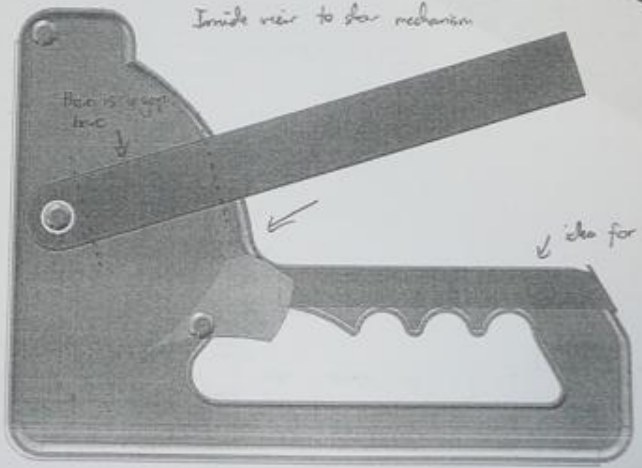
ORIGINAL FINISHED IDEA



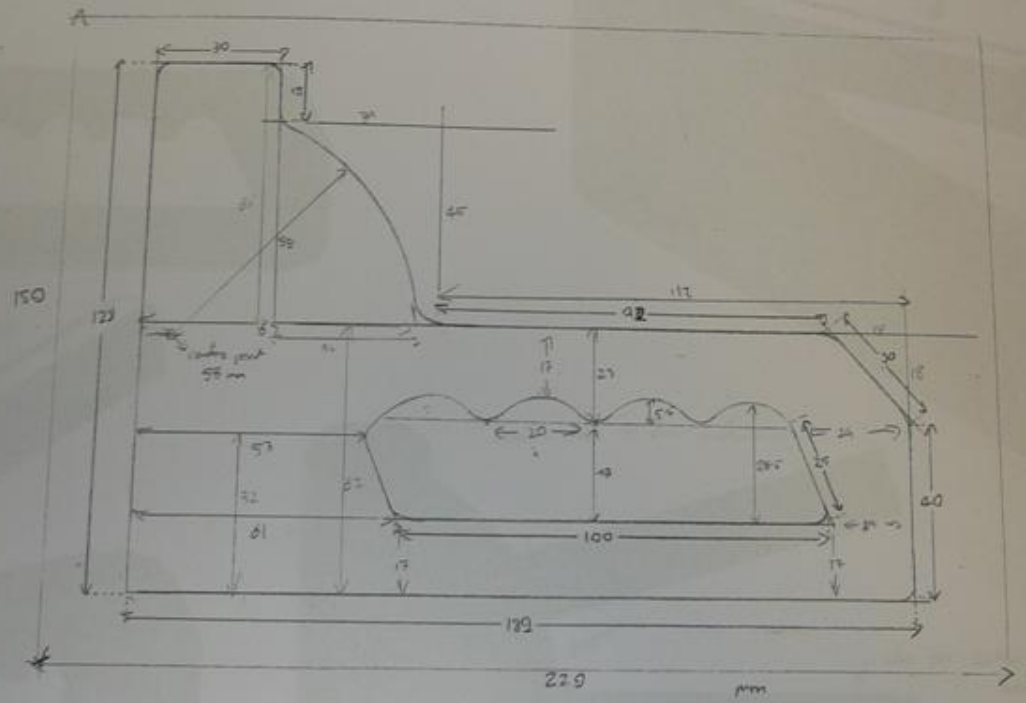
but was changed during manufacture



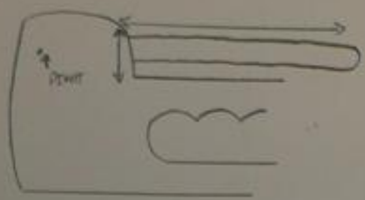




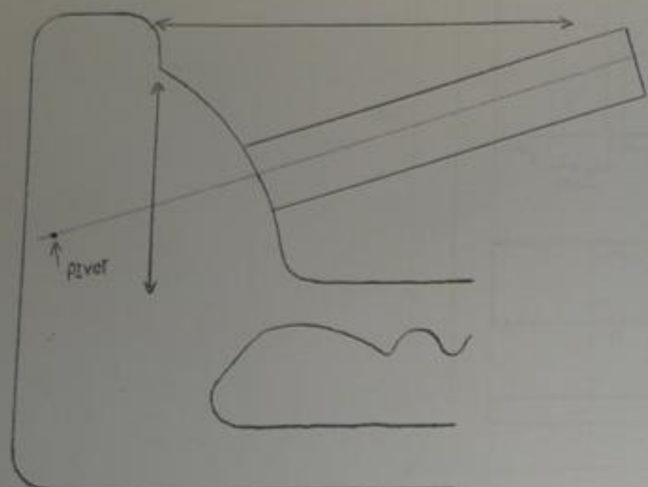
Sean Cusack 135
Staple gun mould



IMPROVED LEVERAGE



This is an average example of how a staple gun is levered & pivoted, its but not great as it does have a lot & can require a lot of pressure to activate



This would allow the hand trigger to be extended further up, allowing for extra lever, if needed this means that less pressure will need to be applied to the device for it to be activated thus making it more comfortable for the user & more ergonomic. Also if the hand were to be extended this would allow for less effort & a more ergonomic device

Evaluation of Ideas

1. Improvements to Handle Grip

This will drastically improve the comfort of the stapler compared to the last one, it will also improve grip so as it will be difficult for the users hand to slip when wet. But from this I will have to consider the size of the space between each finger placement as not everyone's hands are the same size, so I will have to come up with and average.

2. Extra Magazine

This is a clever way of storing extra staples instead of the user having to carry them about in their pockets. It is a good and easy idea to make due to the fact there is a lot of space on the staple not being used.
But if I decide to put them in the same compartment where I intend to make the finger grip mod I will have to think about sizes, as I will not want to increase any sizes for a minor mod.

3. Improved Shaped for the Hand Trigger

Due to the fact the was not a whole lot of shape to the pervious hand trigger making it more ergonomic and user friendly will improve consumer satisfaction, and prevent slippage as well. I will also look at the material used to make the trigger as the pervious one was made out of metal – not a very comfortable material to use, so I will consider using MDF or plastic.

4. Stability Improvement and the Ability to Stand Wear and Tear

Due to the fact the bottom of the gun has to be put through a lot of wear and tear, I have decided to consider using a metal basing to introduce extra resistance, and this intern will act as a device which will give the stapler more stability due to the flat surface – compared with the curved acrylic surface.
Here I will have to consider joining methods, and take any sharp edges of the metal.

5. Safety Trigger

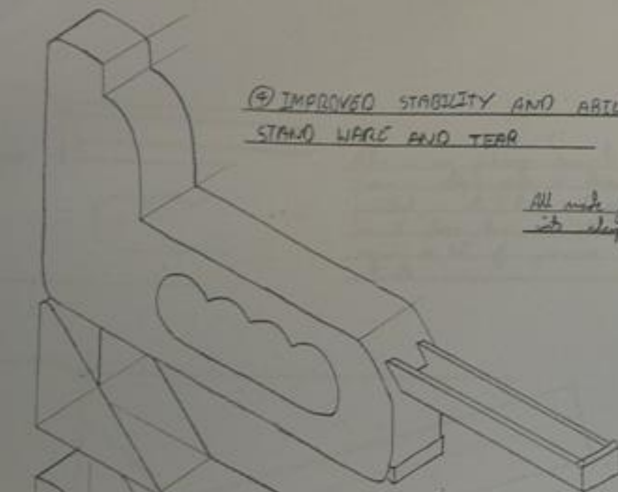
This idea will not allow children to operate the staple gun and it will prevent accidental firing if the stapler was to be dropped.
This idea will involve a lot of time and planning, to try and get the pivots in the right place for it to function properly. The overall design of the gun will be based around this idea if I choose to pursue it, as you will have noticed throughout my ideas page, with the shape of the hand trigger, etc.

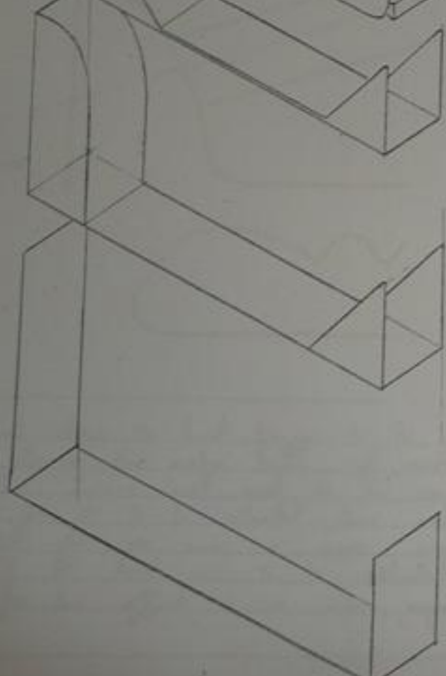
6. Improved Leverage

This idea will allow the stapler to be easily activated compared with the pervious one, whose wasn't levered that high and wasn't all that long, so by doing this I will increase the ergonomic properties and user friendliness, making it easily for the people – such as the elderly to use.

④ IMPROVED STABILITY AND ABILITY TO STAND WARE AND TEAR

All made from aluminium & bent into shape.

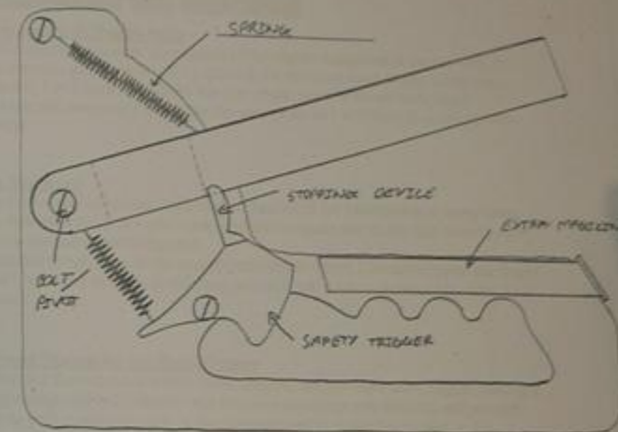




First example - gives a flat surface for more accurate firing & gives protection to the gun from the wear & tear of the forces it will be pressed against

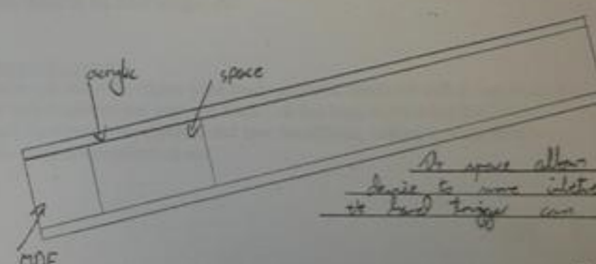
Second example - gives the same, only a little more protection than the first, only this one matches the curves on the gun!

this one would give more protection than stability, as it is not as good - but it is easier to make



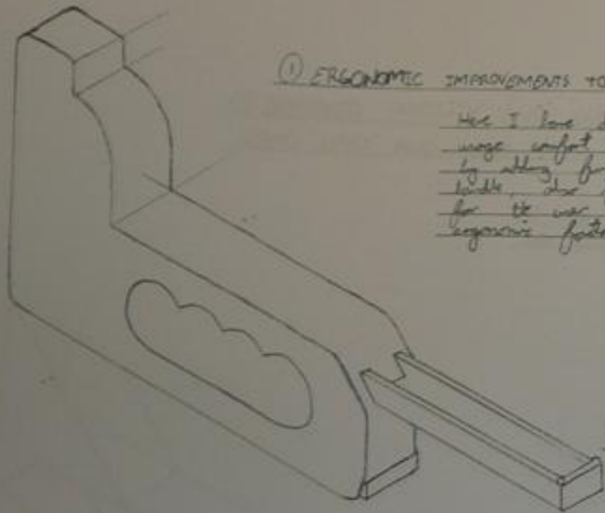
⑤ SAFETY TRIGGER - CHILD PROTECTOR + PREVENTOR OF ACCIDENTAL ACTIVATION MECHANISM

As with the mechanism above, the STOPPING DEVICE prevents the lead trigger from being activated unless the SAFETY TRIGGER is pressed in first thus preventing accidental firing & children from using it, then once released the SPRING pulls the triggers back into their original position



the space allows the stopping device to move inbetween it so the lead trigger can be activated

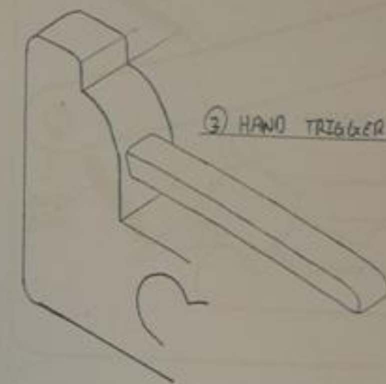
① ERGONOMIC IMPROVEMENTS TO FINGER GRIP



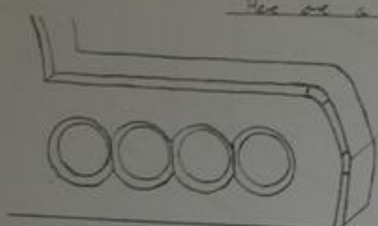
Here I have decided to improve the usage comfort of the staple gun by adding finger grooves to the handle, also providing better grip for the user increasing overall ergonomic factor

② EXTRA MAGAZINE

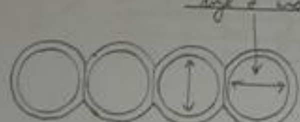
③ HAND TRIGGER IMPROVEMENTS



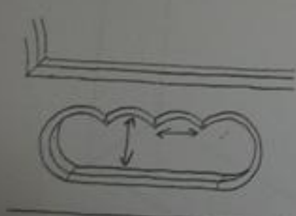
Here are a few examples



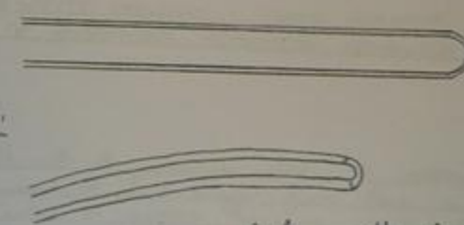
size & width would be difficult to determine!



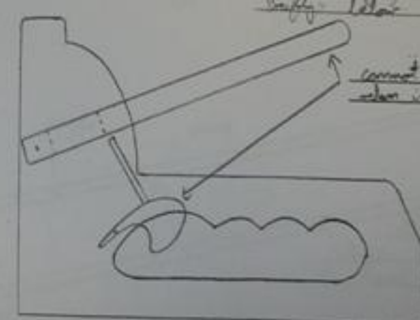
This idea is relatively straight forward. These four holes would be drilled in the mould I came out over vacuum formed but after research I have decided it would not suit all user sizes!



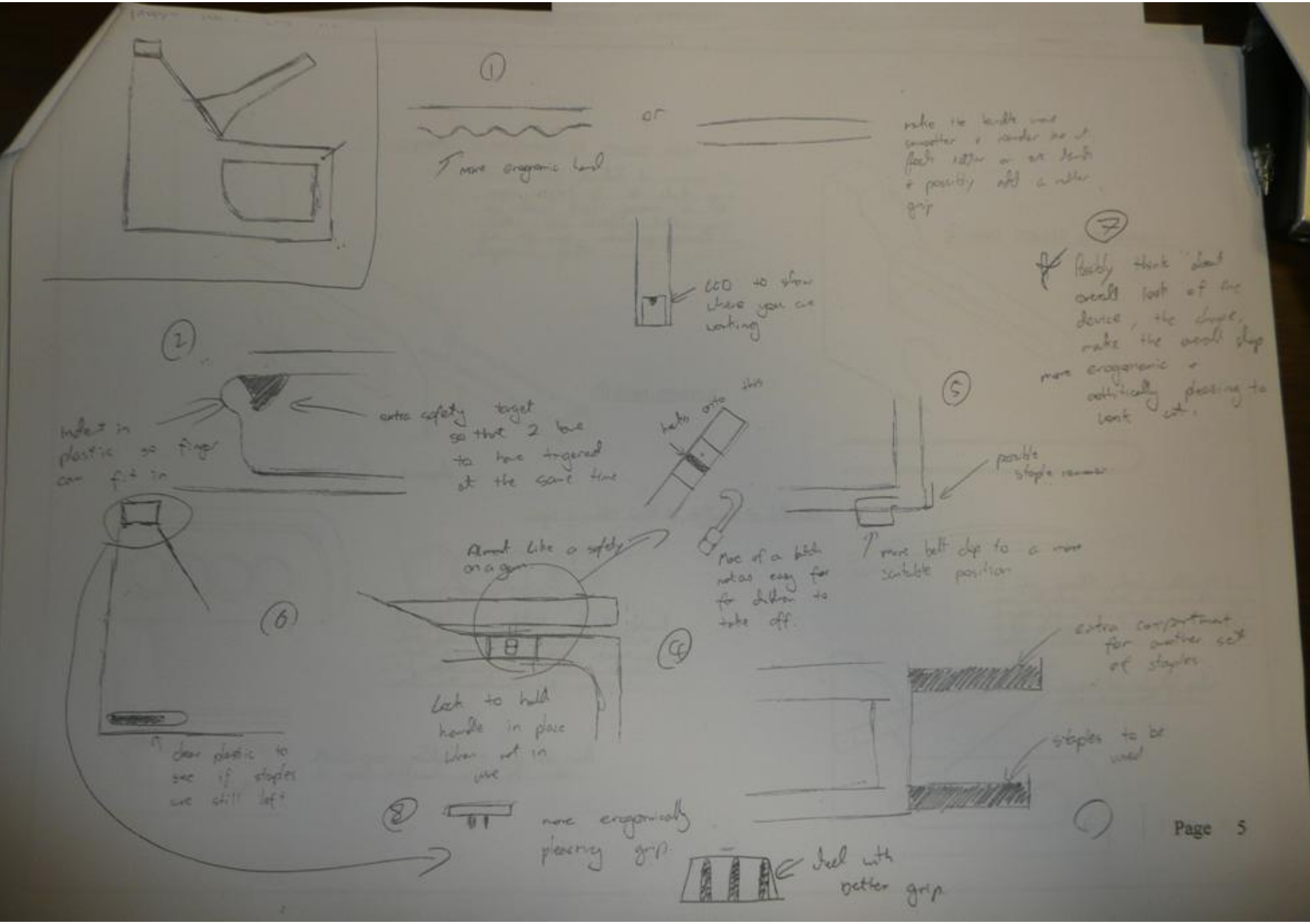
Much more realistic & can be made to suit different sizes of users.



A few possible ideas, although I am thinking about a possible safety trigger as the shape may need to change so I will explain briefly below.

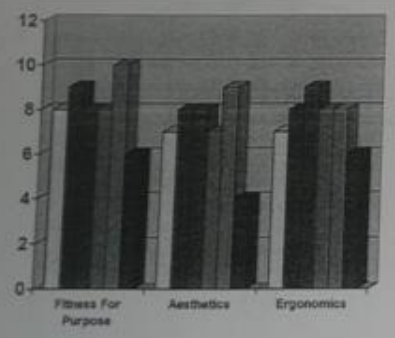


cannot be activated unless lever is pressed first.



1
or
more ergonomic handle
make the handle more smoother & rounder so it feels better in the hands & possibly add a rubber grip
LED to show where you are working
7
Possibly think about overall look of the device, the shape, make the overall shape more ergonomic & aesthetically pleasing to look at.
2
Indent in plastic so finger can fit in
extra safety trigget so that 2 have to have triggered at the same time
hooks onto this
5
possible staple remover
move belt clip to a more suitable position
Almost like a safety on a gun
More of a latch not as easy for for children to take off.
6
clear plastic to see if staples are still left
4
Lock to hold handle in place when not in use
extra compartment for another set of staples
staples to be used
8
more ergonomically pleasing grip.
Feel with better grip

	Clarke CEN120 Electric Staple and Nail Gun	Arrow CT50K 10.8v Li-Ion Staple Gun Kit	PRO140EL Electric Stapler and Nailer (230v)	Tacwise 'Ranger 40 Duo' Cordless Staple and Nail Gun	Z3-140P Hand Tacker/ Nailer Kit	CSG10 Staple and Nail Gun
Fitness For Purpose	8/10	9/10	8/10	8/10	10/10	6/10
Aesthetics	7/10	8/10	8/10	7/10	9/10	4/10
Ergonomics	7/10	8/10	9/10	8/10	8/10	6/10
Maintenance	5/10	6/10	7/10	6/10	8/10	6/10
Materials and Production Methods	8/10	9/10	7/10	8/10	8/10	8/10
Cost	7/10	7/10	7/10	7/10	9/10	9/10
Safety	9/10	5/10	5/10	8/10	7/10	5/10
Durability	7/10	7/10	6/10	7/10	7/10	8/10
Total	58/80	59/80	52/70	59/80	66/80	52/80



- Clarke CEN120 Electric Staple and Nail Gun
- Arrow CT50K 10.8v Li-Ion Staple Gun Kit
- PRO140EL Electric Stapler and Nailer (230v)
- Tacwise'Ranger 40 Duo' Cordless Staple and Nail Gun
- Z3-140P Hand Tacker/Nailer Kit
- CSG10 Staple and Nail Gun

Conclusion

The information that I have collected throughout my analysis section has helped me to choose the product that I am going to develop and modify. The figures on the comparison table show two possible options that I could have chosen due to there low suitability. CSG10 Staple and Nail Gun and the PRO140EL Electric Stapler and Nailer (230v), however this does not necessarily mean that I should choose one of these ones. The 3 main areas that I intend to modify are the safety area, ergonomics and the fitness for purpose. The score that each staple gun received, via my opinion, is portrayed in the bar chart above.
The chart shows that the CSG10 Staple and Nail Gun was the lowest in all the areas that I plan to modify and that the PRO140EL Electric Stapler and Nailer was relatively higher in these areas, thus so making my decision for that that the staple gun I will be redesigning and modify is the CSG10 Staple and Nail Gun.

	Specification
Function	• The new redesign stapler should ensure that a child is unable to use it and that accidental activation is prevented. • It must have a storage compartment for extra staples. • It must have a superior hand grip to the last version. • The part of the gun that comes in contact with the various surfaces must be able to withstand the wear and tear. • The leverage of the gun must be better than the pervious gun.
Fitness for purpose	• The stapler should have enough force to penetrate a range of materials. • The gun should look aesthetically pleasing. • It should be comfortable to use. • It should be able to take a range of different staples.
Aesthetics	• The stapler should have a curved, comfortable look. • The outer casing should have the company logo for a more professional look. • The staplers colour should be eye catching to attract customers attention, and so it can be easily spotted on the building site.
Ergonomics	• The prototype should be lightweight and comfortable to use over long periods of time. • The lever and the safety trigger must be easy to use for and adult, and easy to understand how it operates. • New staples must be easy to load into the magazine. • It must be quite in operation. • The new griping must be comfortable to use and a variety of hand sizes must be able to use it.
Maintenance	• There must be no holes, cracks or crevices for dirty to get into, all the joints must be sealed. • If necessary the [redacted] must be able to be taken apart, in the case the mechanism breaks.
Materials and Production Methods	• The materials used must be strong, resistant to impact and resistant to corrosion. • A range of materials should be employed when making the project. • The materials should be easily cleaned and maintained. • The manufacturing process should have minimal wastage. • Materials should be suitable for mass production.
Cost	• The overall cost of the stapler should be under £12.00. • Product should be suitable for mass production to increase profit. • Standardisation should be used where possible.
Safety	• There must be a method that prevents the users hand from slipping. • There must be a method that prevents accidental activation and children for using it. • There should be no sharp edges.
Dimensions	• The total width of the gun should be no more than 35mm to insure most varieties if hand sizes can fit around it. • The overall length should be no more than 185mm for storage purposes.
Durability	• The outer materials should be durable enough to withstand impact and scratching. • The inner workings must be reliable enough to work for long periods of time without breaking.
Time	• The project must be completed March 15th.

Tacwise 'Ranger 40 Duo' Cordless Staple & Nail Gun

	Analysis	Score
Fitness for purpose	The staple gun is very fit for its purpose due to the fact it can be used to staple almost all woods and, as it is a heavy duty staple. But this size adds weight so it can strain the wrist over a period of time. It can hold at one time up to 1500 staples, and the battery lasts for 3 hours of constant use. It is a multi functioning gun as it has the ability to fire out nails as well as staples.	8/10
Aesthetics	The overall shape of the staple gun is aesthetically pleasing and functional. The orange colour of the grip is very eye catching and appealing to consumers. The overall shape of the shell is quite aesthetically appealing, all these characteristics make it stand out.	7/10
Ergonomics	The shell of the gun is made out of ABS a hardened plastic that is molded down from drled to form the shape. There is no rubber grip or indents on the handle so it is difficult to hold with wet hands. The weight of the device is 2.3kg so it is quite heavy and uncomfortable to hold for long periods of time, but there is a baffle system to lessen the recoil when the device is fired. The gun can be taken apart but unless the user is skilled in repairing pneumatic and gas operated components there is little point. The magazine is easily detached via pressing the release button as is the compartment for storing the gas cylinders. Easy to store as it comes with a case, where all components can be placed.	8/10
Maintenance	The overall shell can be taken apart via a screw driver, the body is splash resistant and rusts resistant. It can be easily cleaned, but dirt (example – saw dust) can get trapped in the small section cut out to supply to inner circuitry with fresh air. Also the user would have to be skilled in pneumatics and gas operated components to repair the device. But the device comes with a 2 year guarantee.	6/10
Materials and production methods	The 2 side of the gun are made via injection moulding from ABS plastic, which reduces waste and can be used as a mass production method. ABS is a tough material which is needed for the conditions on the building site this gun will go through. The aluminium magazines are made via die casting, gives them the complex mould they have and paint to give a good shiny finish.	8/10
Cost	The cost of this staple gun is £137.98 The cost per pack of staples is £2.49 and nails – depends on lengths. Overall due to the high quality of the device, it is worth the price which it is being charged, as it comes with 2 battery packs and a heavy duty carrier case, and it is hard to break. The fact it fires nails and staples means you are getting 2 in the 1 so a good bargain.	7/10
Safety	The gun comes with a double trigger system which means it cannot be fired unless it flies it flat on the surface of another and the trigger is pressed. There is also a locking mechanism which when activated the device cannot be used.	8/10
Durability	Because the shell is hollow inside if dropped the circuitry can be bashed about, but it is tightly held in place so only if dropped from an extreme high can it be damage, also the ABS is quite tough preventing fractures etc.	7/10

ZS-140P Hand Tacker / Nailer Kit

	Analysis	Score
Fitness for purpose	This is a small heavy duty hand staple gun used by professionals due to its small size, and because it is easy to transport. It can use 2 different types of staples, and the hand trigger locks down for provide easy storage. The small turn button on the side acts as a depth gauge allowing the device to be operated on with different densities of materials. The gun has a belt clip attached so the tradesman can clip it onto his belt. It also has a small gap on its side so the user can see if replacement staple are needed.	10/10
Aesthetics	The staple gun surfaces are all smoothed out and all the edges are rounded to give a nice streamlined appearance. The bright orange colour makes it eye catching and easy to see on a building site. It comes in a range of colours adding to its aesthetic value, and each separate button on the device is a contrasting colour to make it obvious and stand out, adding to its aesthetic characteristics. The company's logo (TACWISE) is moulded onto its side adding further to its aesthetically pleasing abilities.	9/10
Ergonomics	The handling of the gun is comfortable due to the smooth surfaces and curved edges on the device, as there are no sharp corners or edges. The hand trigger is moulded in the shape of a human palm to provide optimum comfort when the user is pressing it down hard. Staples are easy to replace due to the pop-out reel set in device. All the small components on the device have small picture printed on them to show what they are use for, creating a high user friendly level. The device is small and compact for easy storage and transportation – making it very user friendly.	9/10
Maintenance	Because there is not many seams or small fixtures dirt can get into the cleaning of this device is relatively easy. The device cannot be taken apart so for maintenance it will have to be sent back to the manufacturer, but due to the high quality nature of the device faults should rarely, if ever occur.	9/10
Materials and production methods	The staple gun has been made from the injection forming process to give and accurate profile of the small complex design also giving the minimum wastage, so the process is a profitable as possible. It is made from ABS a very tough plastic, so it can withstand the wear and tear of the average building site, it can also withstand heavy usage as the manufacturer guarantees it will last for more than 5 years. The small piece of aluminium at the front is made via die casting as it is a process which can be mass produced. The overall set up of injection moulding and die casting has high initial costs but if the product is successful it will pay itself off over time.	8/10
Cost	The cost of the staple gun is £15.54 And the cost of replacement staple is £1.98, making this particular staple gun very good value for money due to the given guarantee of the time it will last and the relative cheapness of replacement staples.	9/10
Safety	All the edges and corners are smoothed and curved so no injury can be gotten in that form. There is also a locking mechanism to lock the handle in place when not in use, and the hand trigger is hard to activate so a child would be unable to do so.	7/10
Durability	The device is relatively small so the outer body holds the inner components tight, so when its dropped they are not dislodged. The tough ABS is splash resistant and the overall device is waterproof as there is no circuitry. The ABS can withstand most crushing forces but on a building site if something heavy is dropped on it, it will crack.	7/10

CSG10 Staple & Nail Gun

	Analysis	Score
Fitness for purpose	The staple gun is an effective device for staple a range of materials together. It can hold 3 different types and sizes of staples so it could be said to be a multi-functional device. Its body is extremely durable and it is water resistant so it fulfils its primary function quite well, and it has a safety device which doesn't allow it to be fired unless released, but it is easy to open. Overall it fulfils its primary functions well but has a limited range of additional features.	6/10
Aesthetics	The overall shape of the device is functional, with little aesthetically pleasing values, although the manufacturer has tried to make it more aesthetically pleasing via the contrasting colours, on the front and on the inside of the handle.	6/10
Ergonomics	The body of the device is aluminium which can be difficult to grip and handle, especially with wet hands. The handle is not made from smooth aluminium to give a more comfortable handling but once again it is cold/weird to use with wet hands. Because aluminium is lightweight, this provides comfort when using the device for extended periods of time. The device is relatively compact as the hand trigger can be held flat in place to make for easy storage. The compartment which holds the staple is very easy to open and replace, as it is a push to pull down mechanism which saves time and effort.	6/10
Maintenance	Because the body is made from aluminium it is not liable to rusting so it is easily cleaned via the use of water. The device is easy to take apart so maintenance can take place inside as well as outside, to ensure all the mechanisms are functioning properly. But because the inner workings are small and complex maintenance can be a time consuming process and a regular use of dirt gets lodged in the inner parts.	6/10
Materials and production methods	The shell of the staple gun is made from die cast aluminium which is an advantage as it can be mass produced, also complex forms and shapes can be added into the mould. The inside are very complex and cannot be made from the same process and have to be made via a casting process. The inner mechanism is housed on this, where a spring is tightly held in place, then released to shoot out the staple with great force. All three processes are suitable as they mass all parts of the staple gun can be mass produced. These materials are very durable so the finished staple gun is durable and aluminium is not prone to rusting.	8/10
Cost	The cost of this staple gun is £8.59. Replacement staples range from, £1.98 – £ 2.98 and depending on the size of the pack, the number of staples varies. The overall cost of the gun has been kept to a minimum as it is mass produced and all components are standardised. Due to the durability of the device, meaning it will last a long time and its relative low cost means this is a good value for money purchase.	9/10
Safety	The main safety feature is the locking mechanism which prevents accidental firing of the device and prevents children from using it, but it is easy to remove and forget about, thus posing a significant threat.	8/10
Durability	The guns die cast body, means it is highly resistant to rough terrain it will be put through.	8/10

Section 2: Analysis

Clarke CTSN120 Electric Staple & Nail Gun (230v)

	Analysis	Score
Fitness for purpose	This staple gun is an effective product for its purpose, it can shot nails through different materials with different densities and the magazine can be easily changed and reloaded. It is quite durable due to the hardened plastic around it so it will not break easily if dropped. It is easily stored so it can be transported easily.	8/10
Aesthetics	The shape of the gun is functional, the yellow colour is aesthetically appealing and eye catching. It has a smooth body shape with no points or jagged edges and the stamped logo on the eye background stands out for more appealing characteristics.	7/10
Ergonomics	The overall main body is made out of ABS a hard and durable plastic with additional rubber hand grips for extra comfort, and it is only 2.1kg so most of the ergonomic necessities are met, such as not being too heavy to hold for extended periods of time. (relatively lightweight for its size) The magazine comes off with relative ease for a mature adult as it is child proof, and is easy to reattach. It comes with a storage hook so the gun and magazine cartridges are easily stored away.	7/10
Maintenance	The staple gun is glued together and there are no fixtures such as screws to take apart and reassemble, so if repairs are needed the user cannot fix it, so it would have to be sent back to the manufacturer if a fault were to occur. But due to the overall quality of the device maintenance is rarely needed – as stated by the manufacturer.	5/10
Materials and production methods	The outer casing of the staple gun is made out of ABS, a hardened, strong, durable and resistant plastic – made via the method of injection moulding to get the complex and smooth shapes involved in the staple gun. This leaves a relatively large area with which to house the circuit which operates the gun. The magazine is made from die cast aluminium, so complex shapes can be produced, this also is a durable, strong material so it can resist scoring from the heavy usage. Finally the front of the gun where the staples are fired from, is made from a hardened stainless steel and coated with a surface paint. This part is made from stainless steel as it has to resist a lot of wear and tear due to the fact this is the only point in the product which will come into contact with the materials intended to be stapled. All of these materials can be mass produced decreasing the cost per unit manufacture.	8/10
Cost	The cost of the gun is - £63.89 The cost of staples for the device is £1.89 per packet. The cost for the electric is of average price and has been kept this way because the capability of mass producing its components, and due to its heavy usage and the cheap cost of staples it is a good value for money buy, also due to the 2 year warranty.	7/10
Safety	Because the front of the gun has to be pressed up tight against the surface of the intended material to be stapled, the gun cannot be fired. Because when the front is pressed tightly up against a surface is activates a trigger allowing the gun to be fired creating a high safety factor. Also the hand guard where the magazines is held also acts as a barrier if the gun were to slip, thus the users hand would not be injured.	9/10
Durability	The hardened ABS and die cast body allow for a resistant surface. They also act as shock absorbers to prevent the inner circuitry from being damaged, thus being very durable and resistant to impact.	7/10

Arrow CT50K 10.8v Li-Ion Cordless Staple Gun Kit

	Analysis	Score
Fitness for purpose	This staple is almost perfectly suited for its purpose, it is small and compact in its easy to transport. It is very lightweight so it doesn't strain the users hand and if it is dropped it is unlikely to break or fracture due to the hardened ABS it is made from. It also has a depth gauge so you can choose how hard the staple is fired from the gun, allowing it to be used for a wide range of materials. It is battery powered which lasts long periods of time, fires up to 2000 staples with one charge, and the staples are easily replaced in the magazine. It also has an LED placed on the front so the user can see where they are stapling in small dark hard to get at places.	9/10
Aesthetics	The gun has three main colours red, black and grey which makes it stand out, and the company logo is moulded onto the shell also quite aesthetically pleasing. The smooth shape and feel of the gun also make it quite attractive to customers, but it catches the consumers eye via the contrasting colours.	8/10
Ergonomics	The handle it relatively slim so it is easy for any user, even ones with smaller hands, to grip and hold firmly. Also because it is made from rubber the user hand is less likely to slip. The trigger is placed just where your index finger goes and is easy to press and comfortable to use. The gun can be used via left handed or right handed users as it is perfectly symmetrical, it is also very lightweight so it can be used for extended periods of time. Staples are easily replaced by opening the red slot at the back, which is also very noticeable due to its colour.	8/10
Maintenance	The gun is fixed together via glue and there are no fixtures or fittings such as screws, to show signs that it can be taken apart so if repairs are needed the owner of the device cannot conduct these, it has to be returned to the manufacturer. However the overall quality of the product means it has a low breaking risk.	6/10
Materials and production methods	All the materials on the device (the handle, trigger, depth gauge, battery holder and staple holder) have all been made via injection moulding from ABS plastic. This is a relatively cheap process involving once the initial capital cost is recovered, as it pays for itself over a period of time, due to the fact there is no waste and the gun can be mass produced. The overall shell has shock absorbers lining around the inside layer of the shell so the if the device were to be dropped in circuitry is not damaged. The circuitry is made via PCB board the printing the correct set up onto it etc.	9/10
Cost	The cost of the staple gun is £67.98 Replacement staples for the gun are priced at £1.97 per pack. The gun is quite expensive but due to the quality it can be priced this high so the company can cover the costs of the initial capital costs and make a profit. This product is average value for money as the user is guaranteed high quality and it comes with a 2 year warrantee.	7/10
Safety	The device has a safety button which has to be deactivated before the device can be used. But if left open the gun is easy for children to use and cause serious harm.	5/10
Durability	This staple gun is quite durable as it will avoid cracking if dropped from small heights and the shock absorbers will add to this prevention.	7/10

PRO140EL Electric Stapler & Nailer (230v)

	Analysis	Score
Fitness for purpose	This staple gun is quite fit for its purpose, it is small and compact thus being easy to store a transport. It can house two different types of staples allowing for a wider range of depths which it can penetrate, in turn widening the range of materials it can be used for. It has a clip on the back as a professional tradesman can hook it onto their belt for easy transportation. The battery can last up to 2 of constant usage so there is no need to constantly recharge it.	8/10
Aesthetics	Overall the device is quite appealing due to the contrasting colours and the curved, smooth shape. The contrasting colours make it eye catching to consumers, and the company logo moulded onto the shell also makes for an aesthetically pleasing feature. The grip mould on the hand which leads on up to the part which houses the mechanism also makes for an aesthetically pleasing part.	8/10
Ergonomics	The gun edges are all smoothed out making it more comfortable to use and handle. The rubber grip allows for a more secure hold along with the indents on the rubber preventing slippage, which all add up for a more comfortable hold. The gun is perfectly symmetrical, allowing the use of right handed and left handed users. To operate the device the safety has to be turned off and then the user pulls the trigger which is very easy to operate as there is not much force needed to do so. Finally it has a double buffer system installed which will add for improved comfort as it will absorb any recoil shock once the gun is fired.	9/10
Maintenance	The device is fixed together and cannot be taken apart by the user. If a fault occurs it has to be sent back to the manufacturer for repairs, but it has a 3 year warrantee. But the quality section in the manual states that it is a high quality device and is very unlikely to break.	7/10
Materials and production methods	The process used to make this gun is injection moulding as it can make the complex shape used in the design of the device, using ABS plastic because it is easily melted into shape and produces a hard protective, resistant shell when dried. This process is expensive to start up as it involves high initial costs but after time, because this process is used to mass produce products, it will pay itself off. The small clip attached to the back, for tradesmen to attach to their belts is made from stainless steel, as it is only a small part.	7/10
Cost	The cost of the gun is £67.99 Cost for replacement staples is £1.98 and £4.45, depending on which the user requires. Overall it is good value for money due to the fact there is a three year guarantee and replacement staples are relatively cheap.	8/10
Safety	The main safety feature on the gun is that it has a safety lock, but this can easily be forgotten to be activated and if a small child where to get hold of it, it could cause serious injury.	5/10
Durability	The gun is quite durable as it will avoid cracking if dropped from small heights and it is splash resistant.	6/10

ection 1: Introduction of Intended Product

Clarke CESN120 Electric Staple & Nail Gun (230v)

The main purpose of this product is to be able to drive a staple or nail through an intended piece of material to firmly hold it in place with another. (material it is intended to be used with is all types of timber and manufacturing board). It is not intended for the basic everyday user such as a teacher stapling a poster to a board wall, as it is a heavy duty stapler; it would be best suited and is intended to be used by the people in the professional trade.
It weighs 2.1kg – not very light, more evidence that it is for industrial use. As it is a stapler/nail gun, it holds staples and nails. It can hold a variety of nails and staples, to suit the different situations it is used in.
The sprung safety probe does not aloe the stapler to be activated unless it is pressed tight against the surface it is going to be fired at.
This prevents children from using it, and accidental firing
It has a very smooth outer casing with no points or sharp edges – adding to the ergonomic and aesthetic properties.
The bright yellow is very eye catching and makes it easily spotted on the building site.
The main shell of the gun has been injection moulded from ABS due to the complex shape of the body which is also a very cost effective process. The magazine is made from stainless steel, via the process of die casting, as it is not a very complex shape and it needs to be strong and durable as it will be shifted and moved about a lot and possible dropped from time to time – so it needs to be able to withstand wear and tear.
The cost of the staple gun is £63.89, with the average price for a packet of staples being £1.89 per pack.

Tacwise 'Ranger 40 Duo' Cordless Staple & Nail Gun

This product is a heavy duty staple gun used by professional tradesmen to nail or staple dense heavy materials to others with enough force to be able to easily penetrate the materials.
It is cordless and it can be used anywhere and has two battery packs so one can be in use while the other charges.
It's ideal for many fixing and fastening jobs such as door frames & Skirting, beading & molding, fixing roofing sheets etc. it is not intended however for small tedious tasks due to its powerful nature.
Because of its weight it must be comfortable of the user to hold for long periods of time and must be sweat resistant so its does not slip out of the users hand while in use, weight – 4.5kg
There is a number of magazines that are easily refilled so the user can get back to work as soon as possible and waste little time, they also are easily installed back into the device.
he safety precaution prevents the user from firing the gun unless the spring action device is pressed against a surface.
The batteries last a relatively decent period of time to let the tradesmen's work continue with little time wasted, they are easy to remove and replace back into the device.
Due to the complex shapes of the gun it has been injection moulded from ABS and then each face joint together via screws so it can be easily repaired etc. the components such as the belt attach, the battery and the magazine will all be standardised so the customer can replace them without high costs to them and the manufacturer.
The outer casing is also splash resistant.
The manufacturer has used rigid polystyrene and stainless steel because of the cost effectiveness of the materials, although having to train the staff would be the disadvantage of using the injection mould process.
Its costs £137.98, with each cartridge of staples averaging around £2.49.

Arrow CT50K 10.8v Li-Ion Cordless Staple Gun Kit

The main purpose for this particular product is to staple materials to others, within the relative density. The gun allows the staple to be forced into a particular material, for example: it can be used for various DIY purposes and stapling upholstery onto objects - for carpet or insulation fitting, securing vapor barrier or plasterers metal laths etc.
This staple gun can be used by every tradesman, DIY enthusiasts and your everyday hobby user and teachers stapling postery to walls etc.
There is a depth control gauge which allows the user to decide how much force he/she wants the staple to be shoot out at – depending on the relative density of the material it is being shoot into.
There should be a safety switch, to prevent accidental activation, and as a child prevention device.
The battery should last for long periods of time – it can shoot out 2000 staples on a fully charged battery.
The product should be lightweight so it can be used for long periods of time. Also the device should be comfortable to use, so the handle should have some sort of comfort factor to improve ergonomics.
The small LED should have a lot of light produced so the user can see what they are doing.
Staples should be easily replaced.
Once again the shell should be made from injection molded ABS due to the complex shape, and the manufacturer should try to make it a cost effective process and make it as cheap as possible, so possibly made out of a rigid polystyrene plastic. It should be strong and durable due to the heavy usage it will go through. The materials used such as the plastic and stainless steel used need to be low cost and light weight.
It is priced at £67.98, and the average cost per pack of replacement staples is £1.97.
It should come with some sort of warrantee, incase it breaks.

ZJ-140P Hand Tacker / Nailer Kit

The intended purpose of this particular "manual" staple gun is to be lightweight and easily carried about and transported.
It is intended to staple materials together to have a firm and secure hold, but at the same time not to have too much force whereas it would damage the materials.
It is not an automatic staple gun so it will not shoot out as many staples per minute as the pervious guns I have examined.
It is meant for the professional user, home owner or DIY hobbyist, for all the basic staple gun uses.
It weighs 1.5kg – so it is light and easy to use for long periods of time.
There is a locking device which allows the handle to be locked down in place, to allow for easy storing.
There is a belt clip which allows the tradesman to hook it on to his belt, rather than leaving it behind or having to carry it about.
The orange colour adds to aesthetics and allows it to be easily spotted.
The overall shape is very smooth and curved, adding to comfort factor for the users etc.
Hardened plastic shell allows for a shatter proof device and splash proof.
The manufacturing technique used in this case is spit moulding where 'TACWISE' would produce the two faces then join them together via screws so the faces can be taken apart and repairs can be made if necessary.
The smaller parts of the device would clearly have to be injection moulded due to their size.
It costs £19.54, with replacement staples averaging out at £1.98 per pack.

PRO140EL Electric Stapler & Nailer (230v)

The main purpose for this pro14EL, is to easily staple materials together for the everyday user, such as fastening furniture and general hobby uses. This staple gun is intended for the tradesmen and your basic everyday user due to the small compact size of the device, and its weight
The gun should be light weight and ergonomic to hold so the user can experience comfort as well as reliability, this is due to the double buffer system which will recoil to absorb any shock caused by the firing of the device, furthermore the handle will be made of a soft rubber material to reinforce the ergonomic factor.
It is easy to reload and switch between staples and nails, the magazines can hold 100 staples.
It can house 2 different sizes of staples.
The lasts up till 2 hours of constant use.
It is light enough for tradesmen to attach to their work belt due to the fact it has a belt hook 0.8kg.
The rubber handle allows for good grip and ergonomic properties, and the overall shape is very curvy and this improves the ergonomic factor as well as the aesthetic factor.
Finally there is a safety button so the gun can be locked, when not in use, to prevent it from causing harm to children.
This particular gun is injection molded from ABS due the complex shapes and components on the device, this can be a cost effective method but it has high capital due to the high costing machinery and the training needed for the staff to use the machinery.
However since the device has been mass produced it will become a cost effective process as they will not have to stop and change the machines so often to make new products.
It costs £67.99, with the average cost of a replacement pack of staples being £1.98 - £4.45.
A guarantee should come when bought new.

CSG10 Staple & Nail Gun

It is intended to give a good strong hold, and not be easy to take apart. It can hold 4 – 14mm, 10 – 12mm and 10 – 14mm staples.
This staple gun is intended for heavy duty use and therefore is mainly used by professional tradesmen and DIY enthusiasts.
The outer casing of the staple gun is made of a durable material as it will be used on building sites where the terrain is rough, so it must withstand a lot of wear and tear. T
he gun should be able to withstand occurrences such as falling onto hard surfaces from steep heights, so this is a likely occurrence on the building site. T
he staple gun should have a long life and last for a numbers in these rough conditions on the building site.
All corners and edges are rounded to make it comfortable to carry around and transport.
The staples should be easy to replace once the current set has run out, and the hand trigger should have a safety lock so it does not fire accidentally or so a child cannot active it.
The casing is made from aluminium as it is a very durable material. The inside of the shell has a very complex shape which helps to house the mechanism which fires the staples.
The hand trigger and the depth gauge would also be made from cast aluminium.
The device is held together via star head screws and a threaded bottom, this threaded bottom screws into the opposite side of the device holding both side together which means it can be taken apart if repairs are needed.
The company logo is stuck on via adhesive once product is finished.
It costs £8.98, with staple packets costing £1.98 - £2.98.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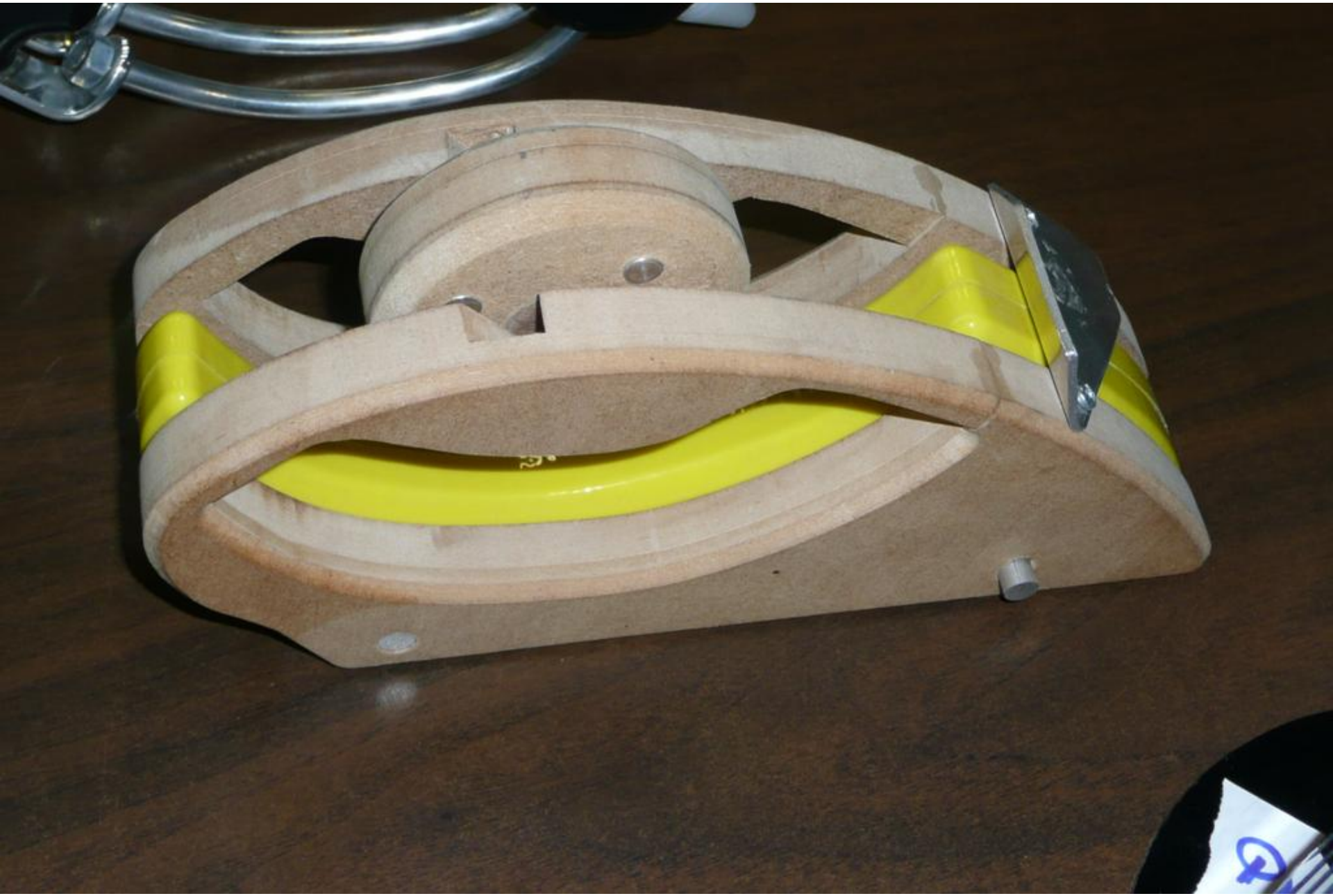


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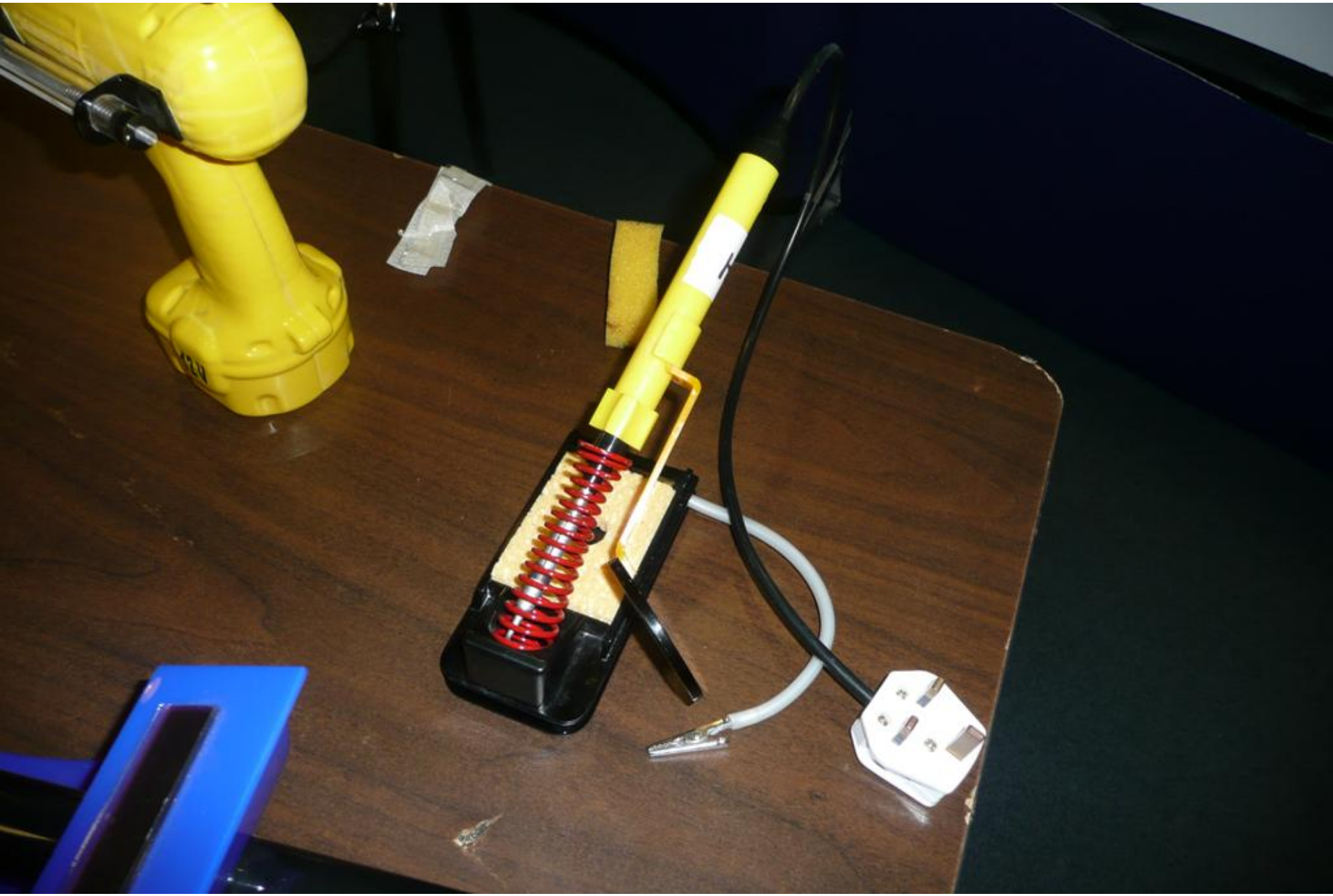


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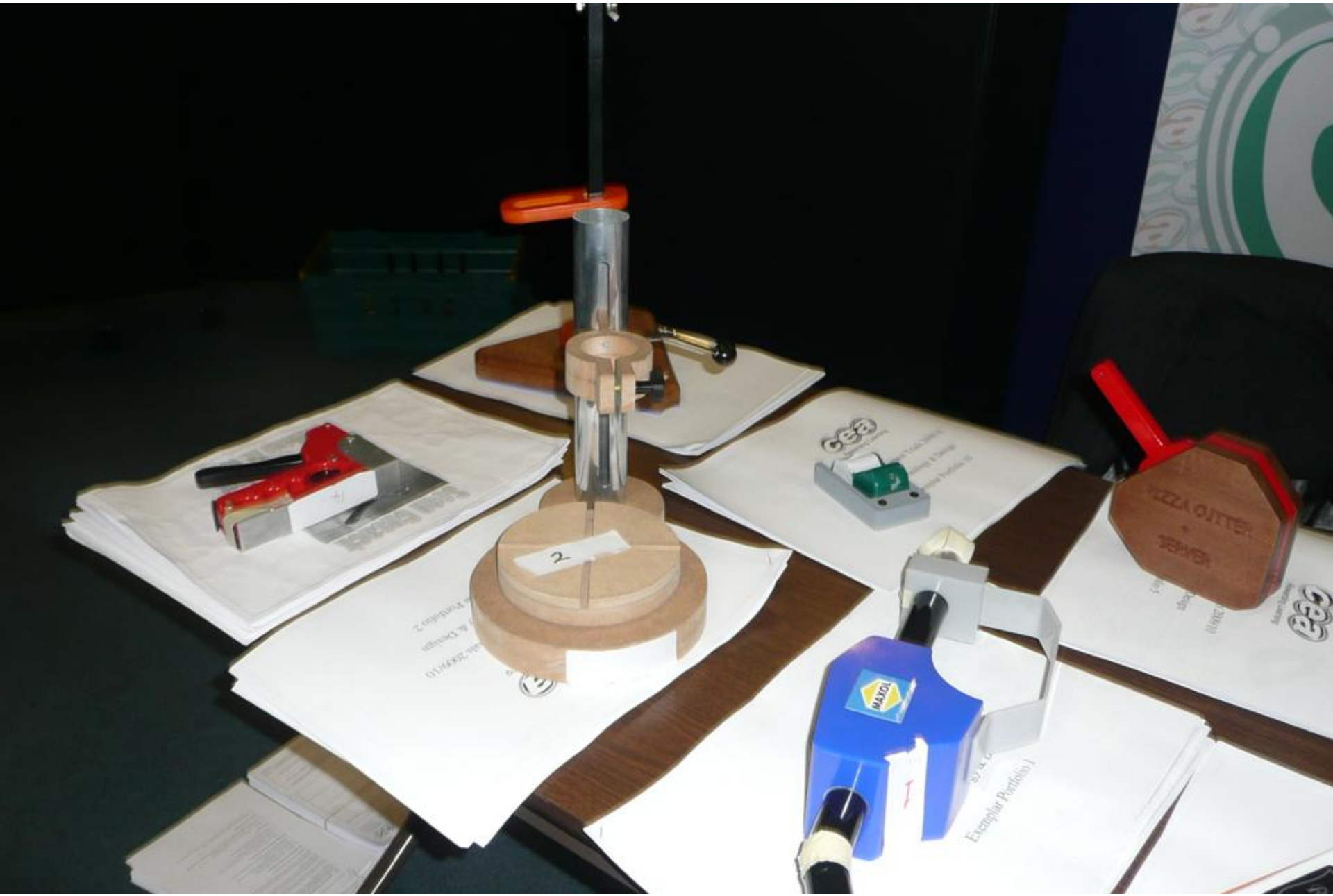
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