

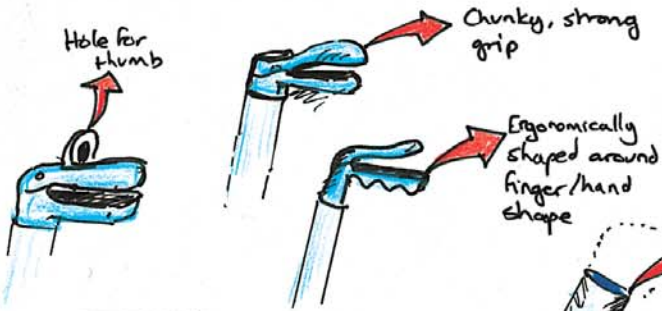
2005 Arkwright Aptitude Paper

Exemplar Material relating to Question 3

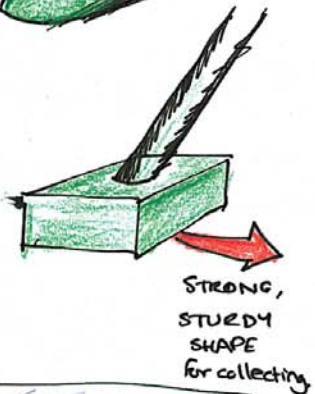
<u>SPECIFICATION:</u>			
<u>SIZE:</u>	This grabber unit must be able to be used manually by only one person. It must be manageable, manoeuvrable and not at all awkward. Size should be 900mm in length to avoid contact with litter, and 200x100 in breadth and width to fit to an operator's hand	<u>BRITISH STANDARDS:</u> The grabber unit must conform to all British Standards applicable.	PAGE 1 OF 4
<u>WEIGHT:</u>	Must be light enough to ensure use by one person to actually pick up litter is viable. Very maximum weight 10kg.	<u>MAINTENANCE:</u>	Must be able to be regularly emptied without human contact between rubbish.
<u>COST:</u>	Must be cheap enough to be produced in a batch to equip all the council's litter pickers, so £15-£20 is a reasonable viable figure	<u>TIME:</u>	Needs to be produced quickly to deal with upsurge in littering. Max. 1 week for one to be produced.
<u>DURABILITY:</u>	Must withstand all weathers, forms of waste: including glass, metal and needles. Also must be strong enough to withstand constant use from different people.		
<u>RELIABILITY:</u>	Must function every time used to the very best to avoid any danger to the user.		
<u>MATERIAL:</u>	A material that is strong enough to fulfil the durability and reliability specifications. This will probably require mild steel body and parts, with plastic shielding.		
<u>SURFACE FINISH:</u>	A waterproof finish of paint or a layer of varnish to prevent corrosion in bad weather is a definite requirement.		
<u>ERGONOMICS:</u>	A handle shaped to fit the user's hand to facilitate use, and a long, preferably thin body for maximum accessibility to waste.		
<u>AESTHETICS:</u>	Must not be ^{be} a specialist tool, anything less might be dangerous. This could include streamlining or interior working parts.		
<u>SAFETY:</u>	Of paramount importance, the user must be protected from any harmful waste, and also the unit must have no sharp edges, no unsecured compressed parts, and no loose electronics.		

INITIAL CONCEPTS.

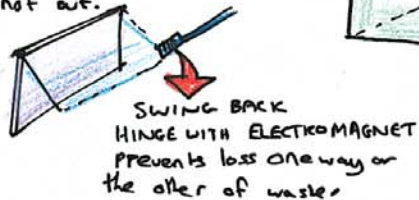
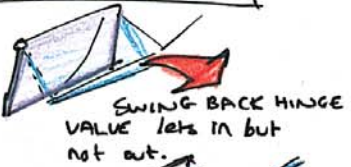
POSSIBLE HANDLE DESIGNS:



COLLECTOR:

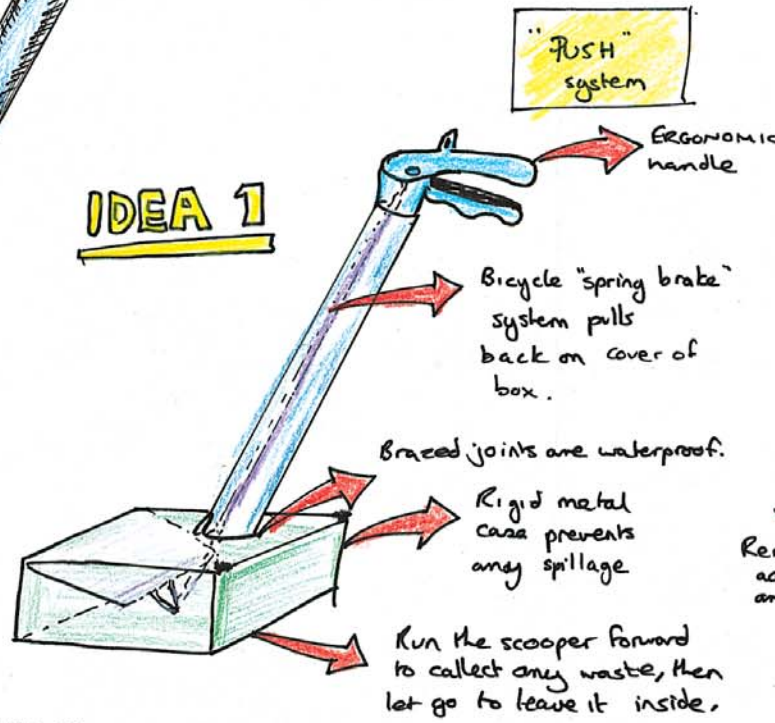


KEEPER MECHANISMS:



CENTREPIECE
made from a mild steel tube, the shape most resistant to torsion forces
Can contain parts to connect user to unit

IDEA 1



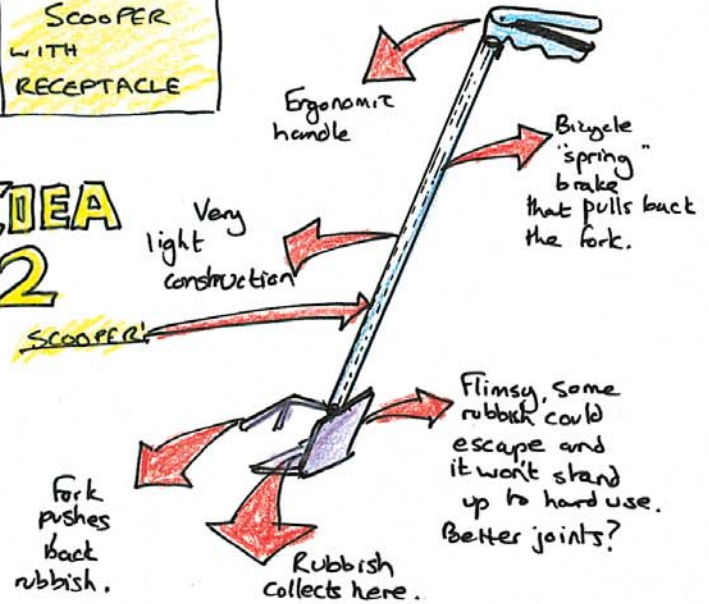
"PUSH" system

- ERGONOMIC handle
- Bicycle "spring brake" system pulls back on cover of box.
- Brazed joints are waterproof.
- Rigid metal case prevents any spillage
- Run the scooper forward to collect any waste, then let go to leave it inside.

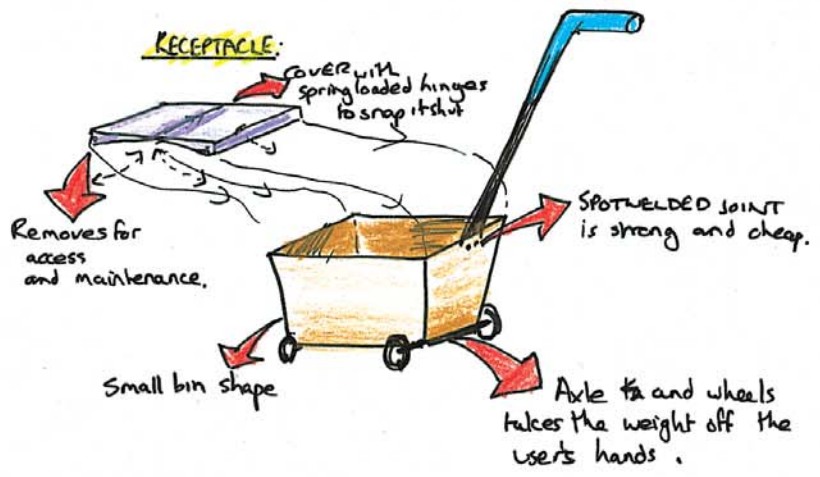
SCOOPER WITH RECEPTACLE

IDEA 2

SCOOPER

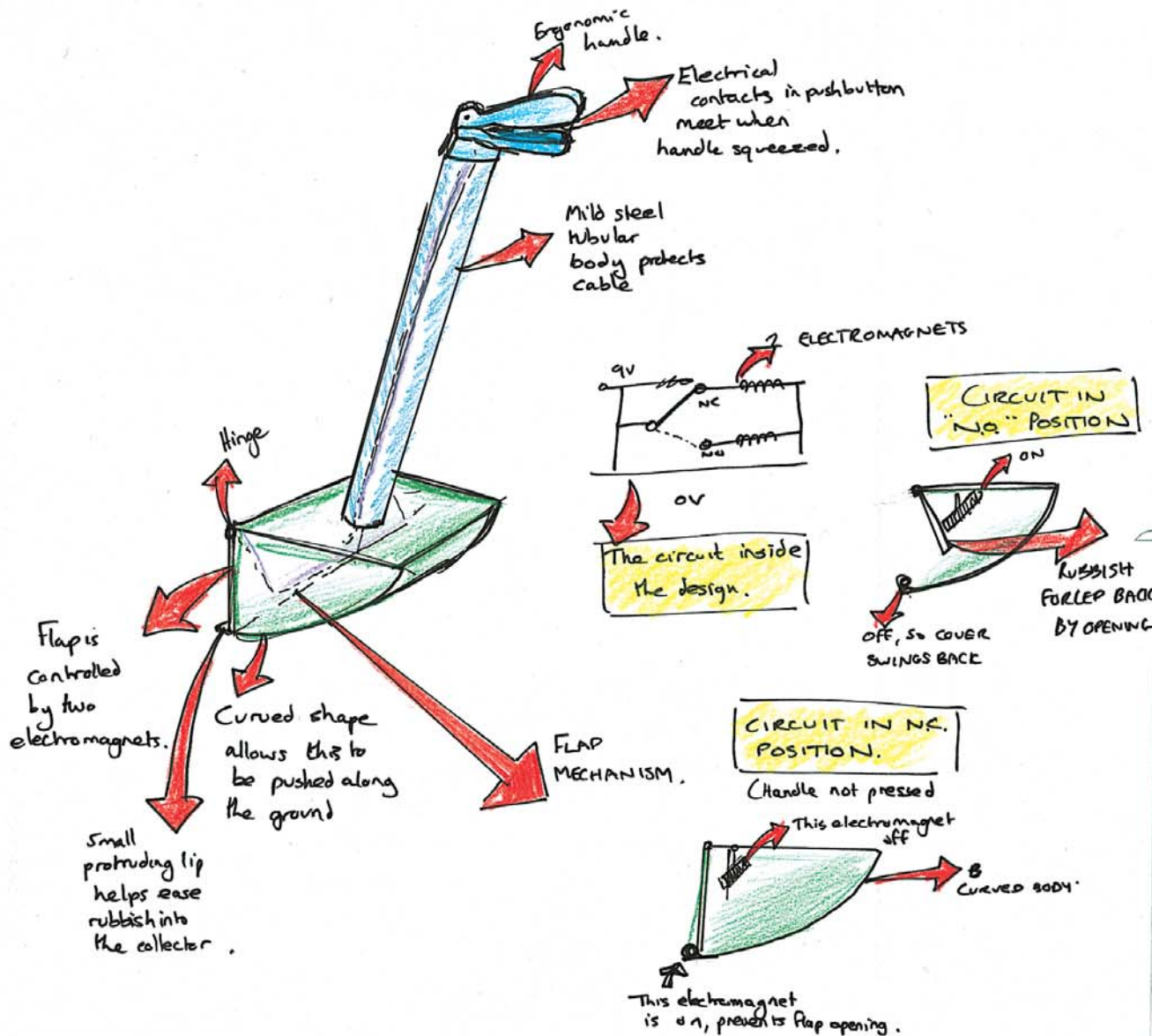


RECEPTACLE:



- Cover with spring loaded hinges to snap it shut
- Removes for access and maintenance.
- Small bin shape
- SPOTWELDED JOINT is strong and cheap.
- Axle & wheels takes the weight off the user's hands.
- Very light construction
- Bicycle "spring" brake that pulls back the fork.
- Flimsy, some rubbish could escape and it won't stand up to hard use. Better joints?
- Rubbish collects here.
- Fork pushes back rubbish.

IDEA 3



SUMMARY

	PROS	CONS.
IDEA 1:	STRONG HANDLE, WELL MADE BOX WITHSTANDS THE USE. NICE HANDLE FOR THE USER.	HEAVY, RUBBISH MIGHT FALL BACK OUT WHEN OPENED.
IDEA 2:	WHEELS GIVE IT GREAT MOBILITY. SEPARATE COLLECTOR PREVENTS FALL OUT OF RUBBISH	FIRMLY COLLECTOR OPERATOR HAS TO USE BOTH HANDS.
IDEA 3:	CURVED BASE GIVES SCOOTING STRENGTH ALONG FLOOR. ELECTROMAGNETS WON'T "COME UNDONE"	NEEDS A BATTERY PACK. RUBBISH CAN EASILY FALL BACK OUT.

DEVELOPMENT:

Materials:

- Mild steel tubular body and handle.
- 1: to protect electronics
- 2: to give a strong support against torsion force and other regular forces.
- Aluminium rubbish casing
 - 1: lightweight
 - 2: won't be subject to magnetism from magnets.

Construction

- Handle shaped and welded to body, with 2 way push button switch positioned so that it is pushed when handle closed.
- Body welded to aluminium base, with electronics inside, protected by a screw in plate.
- electromagnets positioned.
- Paint the whole thing.

Function

- When handle is pressed, ~~holding~~ electromagnet switches off, pull-up electromagnet on, the flap sweeps any rubbish already there into the collector, and receives any new rubbish.
- When handle released, ~~holding~~ magnet switches on and stamps flap swings forward ~~down~~ and can be used to collect any rubbish.

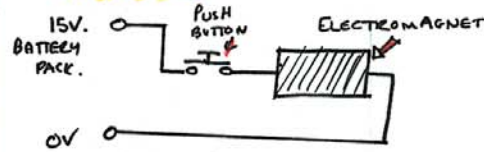
Features

- Ergonomic handle
- Replaceable battery behind flap.
- Rubbish deposit that can be easily emptied.
- Curved base for easy movement.

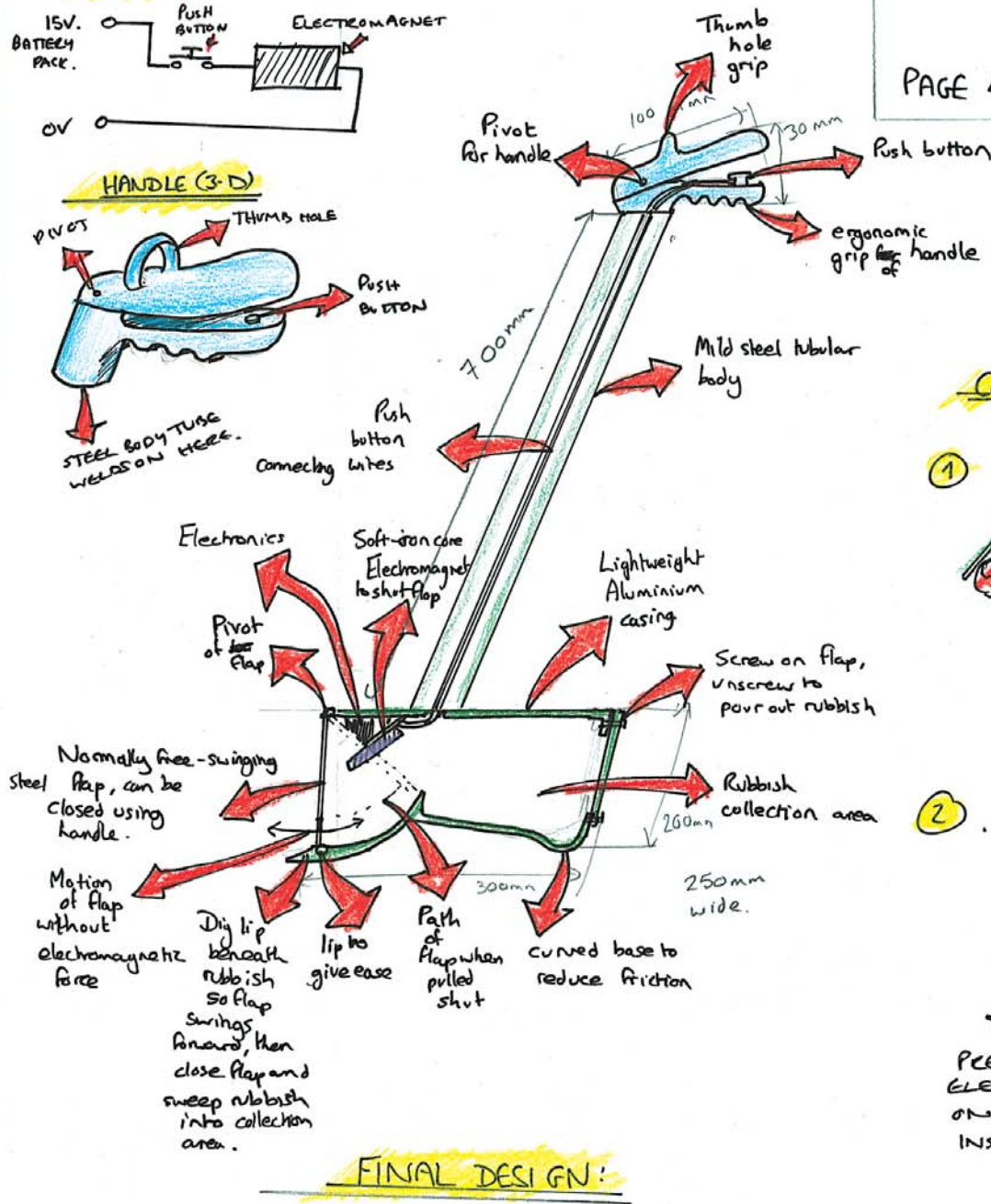
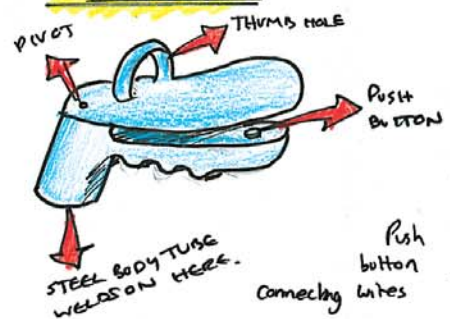
Sizes

Handle: 100 x 30 x 30 mm
 Tube: 700 x 30 mm Ø
 Base: 200 x 300 x 250 mm.

CIRCUIT:



HANDLE (3-D)



FINAL DESIGN:

COLLECTING RUBBISH:

