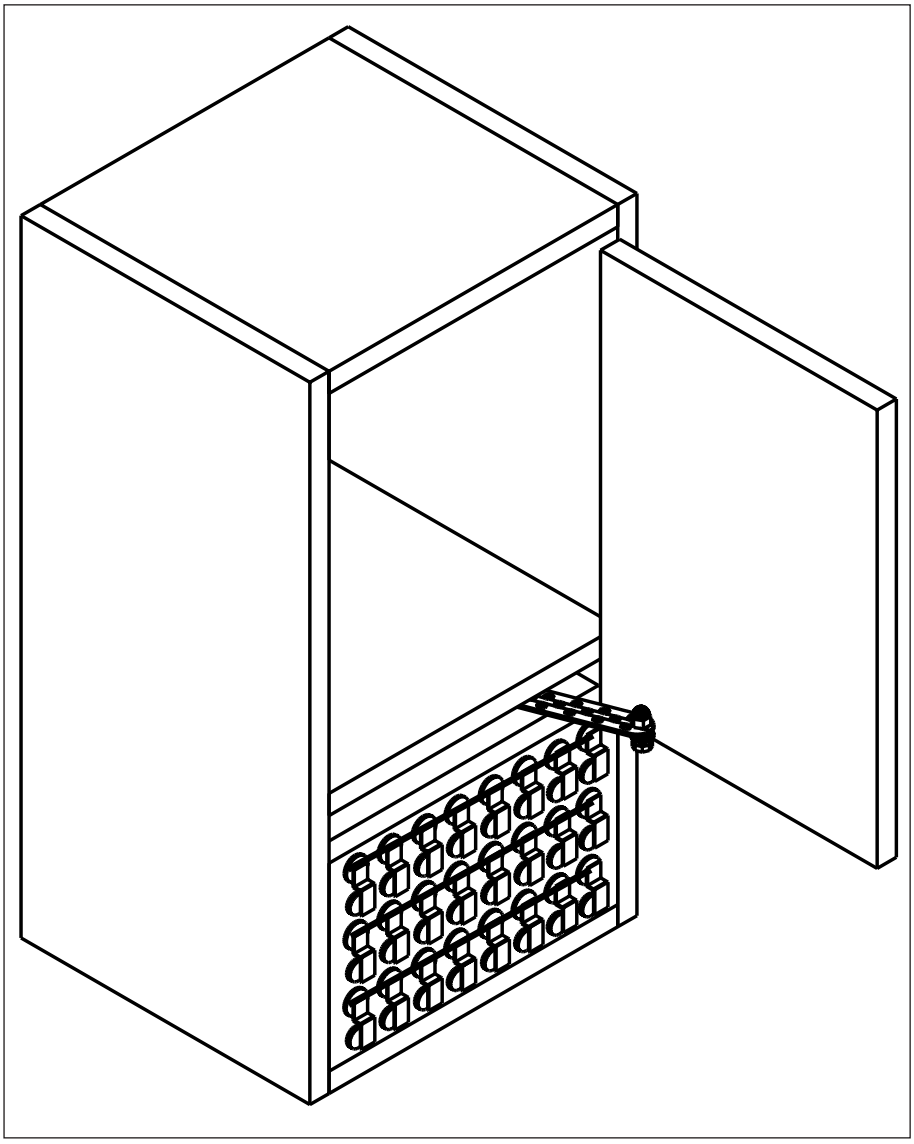
105.026

Safe with Secret Code



Please Note

The OPITEC range of projects is not intended as play toys for young children. They are teaching aids for young people learning the skills of Craft, Design and Technolo- gy.These projects should only be undertaken and tested with the guidance of a fully qualified adult. The finished projects are not suitable to give to children under 3 years old. Some parts can be swallowed. Dan- ger of suffocation!

1. Product information:

Article: Useable product;

Suitability: Key Stage 3 11-14 years;

2. Material information:

2.1. Material: Insulated wire;
Multi strand, insulated wire (0,14 mm^2);

Working: Cut and remove insulation with electronic snips/stripper

2.2. Material: Gearbox(factory finished)

Working: Assembling, screwing

2.3. Material: Plywood, multi layered;
Each layer set in the opposite direction;

Working: Plywood can be sawn with a fret saw, shaped and sanded;
Mark out using a pattern or measurements;

Joining: Use PVA wood glue, screws;

Finish: Use wax, fluid or solid
Wood paint (undercoat/top coat)
Wood stain (coloured and water soluable-finish with varnish);

2.4. Material: Pine, softwood

Working: Pine can sawn, shaped, drilled and sanded.
Mark out using a pattern or measurements.

Joining: See plywood

Finish: See plywood

2.5. Material: Bronze band (an alloy of copper and tin)
Hard, good conductor

Working: Cut with tin snips, remove burr with a file.

Joining: Soldering

2.6. Material: Relay
Electromagnetic switch

2.7. Material: Holed metal strip (pre-made)
Zinc plated

Working: Cut with tin snips, remove burr with a file

Joining: Soldering, screws

3. Tools:

Soldering: For the soldering in this project use a 15-30 Watt Soldering iron. Use a 'helping hands' clamp or a small vice to hold the circuit board so that you have both hands free.

Using a file/rasp: Choose the grade according to the work in hand. Use a needle file for small slots and holes.

Saws: Use a fret saw for all rounded shapes and a straight backed saw for other work.

Note! Fret saw blades must be inserted with the teeth facing forward.

Hold the work securely on a sawing board. The Puk-saws in our catalogue, are ideal for sawing dowel and small strips.

Note! Werkstück einspannen;

Sanding: Use a block and glasspaper for finishing all flat surfaces.

Drilling: Use a handrill or pillar drill;

Note! Take note of the safety precautions when drilling. (all long hair to be tied back, no loose clothing or jewelry to be worn and wear safety glasses)

Holding: We recommend clamping the work G clamps or similar are best for holding the parts whilst the glue is drying.;

Cutting: Use electronic snips/cutters for the insulated wire and tin snips for metal strip.;

Note! Be careful not to leave sharp edges as these cause cuts.

4. Parts list:

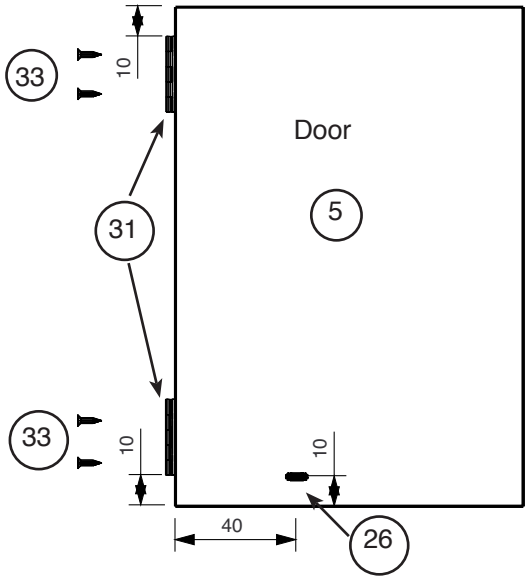
Part	Value/type/size	Quant.	Diagram/Part-N°
Pine strip	20 x 20 x 75 mm	2	1
Pine strip	10 x 20 x 250 mm	1	2
Plywood	8 x 75 x 120 mm	1	3
Plywood	8 x 100 x 120 mm	1	4
Plywood	8 x 115 x 165 mm	1	5
Plywood	8 x 120 x 120 mm	2	6
Plywood	8 x 120 x 244 mm	1	7
Plywood	8 x 120 x 260 mm	2	8
Welding rod	ø 1 x 500 mm	1	9
Holed metal	0,7 x 10 x 165 mm	1	10
Bronze strip	0,2 x 5,5 x 250 mm	2	11
Double gear	10/50 Zähne, rot	2	12
Double gear	10/50 Zähne, weiß	3	13
Motor drive gear		1	14
Angle plates		2	15
Distance pieces		2	16
Distance tubes	25 mm	2	17
Motor	R 20	1	18
Threaded rod	3 x 20 mm	2	19
Threaded rod	3 x 35 mm	2	20
Wood screws	3 x 16 mm	4	21
Nuts	M3	6	22
Shafts	ø 3 x 70 mm	2	23a 23b
Brass tube	ø 4 x 5 mm	1	24
Spade connector	6,3 mm	1	25
Screw eye	10 mm	1	26
Domed nut	M3	1	27
Drawing pins		24	28
Relay	12V, 1x um	1	29
Split pins		24	30
Hinges	15 x 25 mm	2	31
Insulated wire	ca. 1 m	1	32
Screws	2 x 6 mm	8	33

5. Planning and making overview:

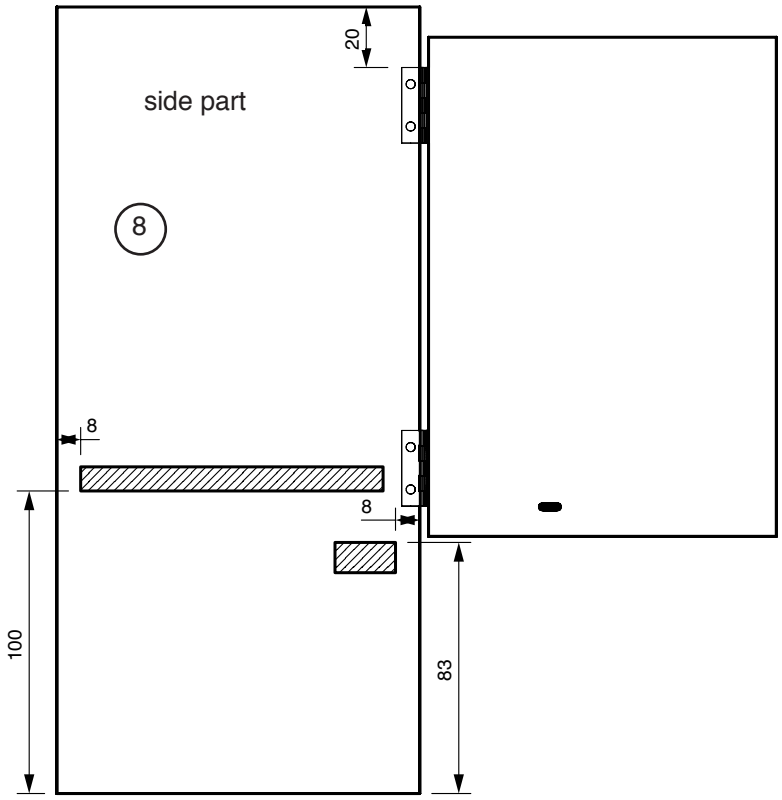
5.1 Assembling the hinges, sides and door.
5.2 Planning and making the case
5.3 Soldering the metal strip on the drive shaft and adding the motor connections.
5.4 Assembling the gearbox
5.5 Mounting the gearbox and mechanism
5.6 Planning and making the switches
5.7 Making the switch panel
5.8 Wiring the circuit
5.9 Testing
5.10 Gluing the shelf in position

5.1. Assembling the hinges, sides and door:

- Screw (33) the hinges (31) on the door (5) according to the measurements as shown.
- Insert the screw eye (26) in the door as shown.(use a bradawl to start the hole)

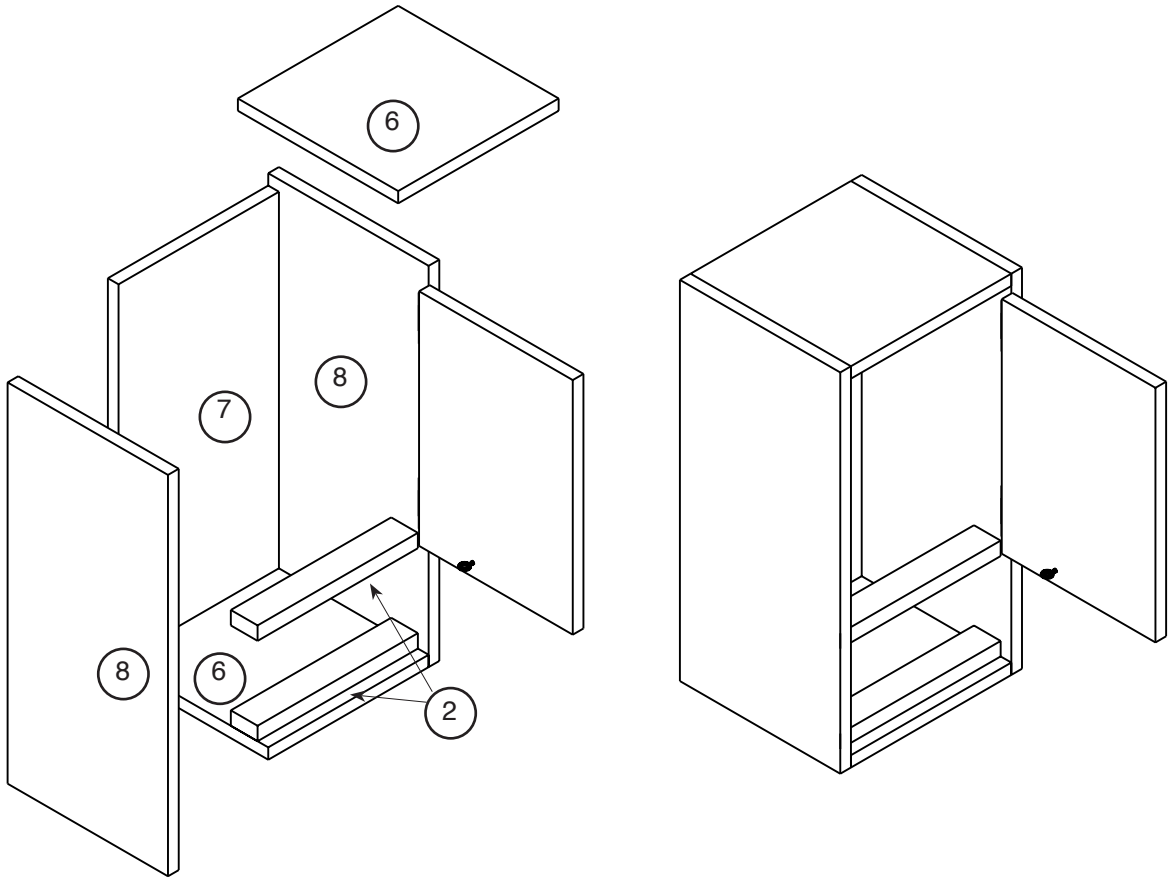


- Mark out and glue the supports (2) and (4) where indicated by the shaded lines on to one of the side parts (8). Finally mount the door on to the side.



5.2. Planning and making the case:

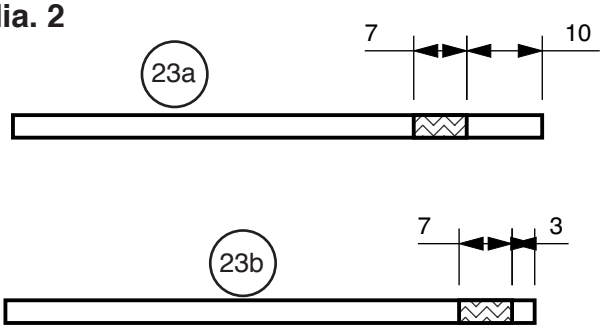
- Cut two pieces 10 x 20 x 120mm from the pine strip (2) 10 x 20 x 250 mm
- Assemble all the parts as shown and glue them together.



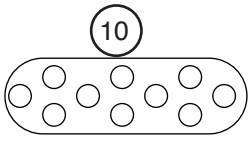
5.3. Soldering the metal strip on the drive shaft, and adding the motor connectons:

- Cut a length 4 holes long from the holed metal strip (10) as shown in diagram. Remove any burr with a file. See diagram 1
- Using a pair of side cutters make a series of cuts/identations in the drive shafts (23a 23b) as shown in dia 2. These cuts are to ensure that the red gears (12) are a very tight fit on the shafts.
- Clean up any burr on the end of the shaft.
- Mount the holed metal strip on the end of the shaft (23a) and solder it about 3 mm from the end. See diagram 3.
- Cut two lengths of insulated wire (32) each 150 mm long and remove the insulation from the ends.
- Solder one length to each connector on the motor (18)
- Finally mount the red gears (12) on the shafts where the cuts/indentations have been made ensuring that they are both a tight fit, use a two component glue if necessary.

dia. 2

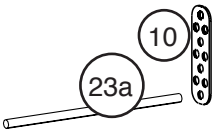


dia. 1

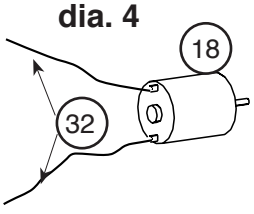


dis. 5

dia. 3

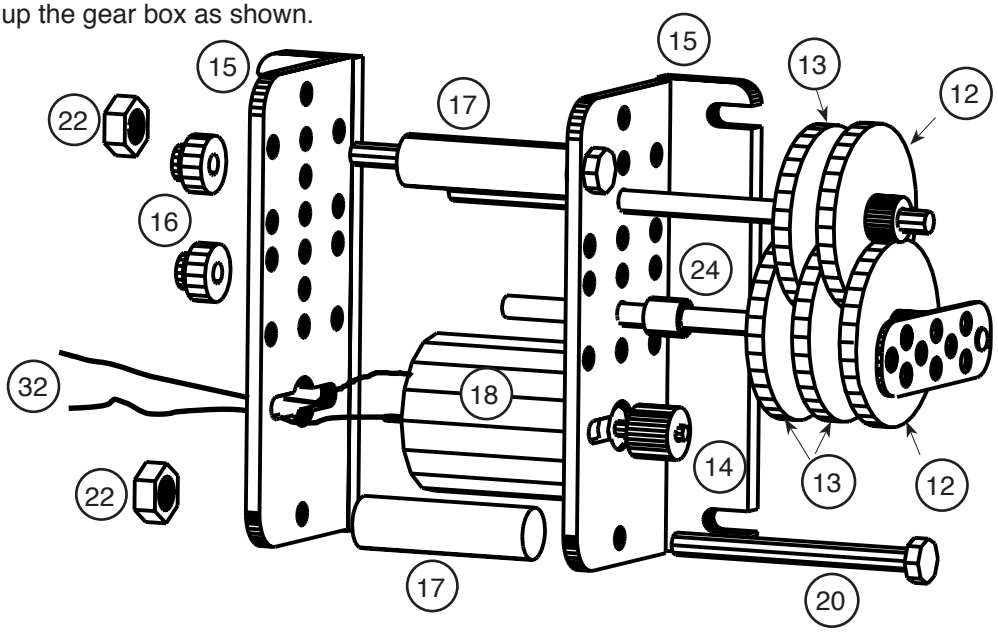


dia. 4



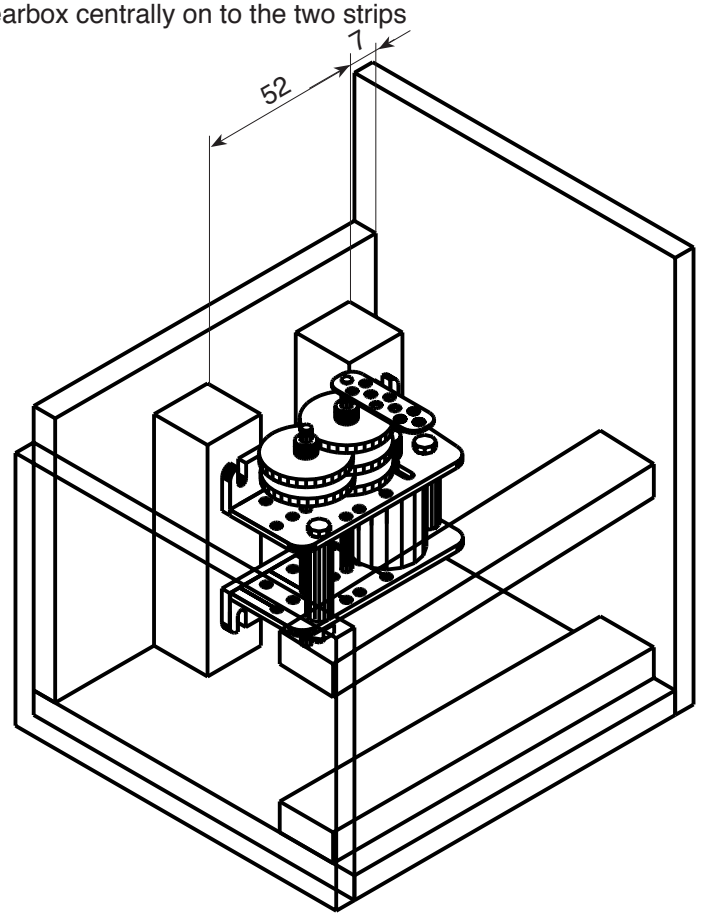
5.4. Assembling the gearbox:

Make up the gear box as shown.



5.5. Mounting the gearbox and mechanism:

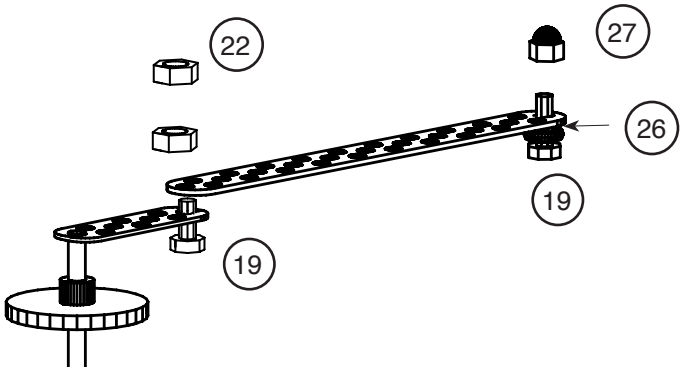
- Glue the two strips (1) in the case as shown
- Screw (21) the gearbox centrally on to the two strips



Take the remaining holed metal strip (10) and shorten it to 11 holes long (approx 93mm) remove burr and round the ends.

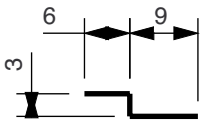
- Finally use the machine screw(19) nuts(22) and domed nut (27) to join the 10 holed strp to the screw eye on the door and t

page 8



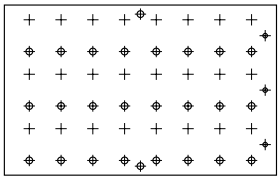
5.6. Making the switches:

• Cut the bronze band (11) into 24 strips each 18mm long and bend as shown.



5.7. Making the switch panel

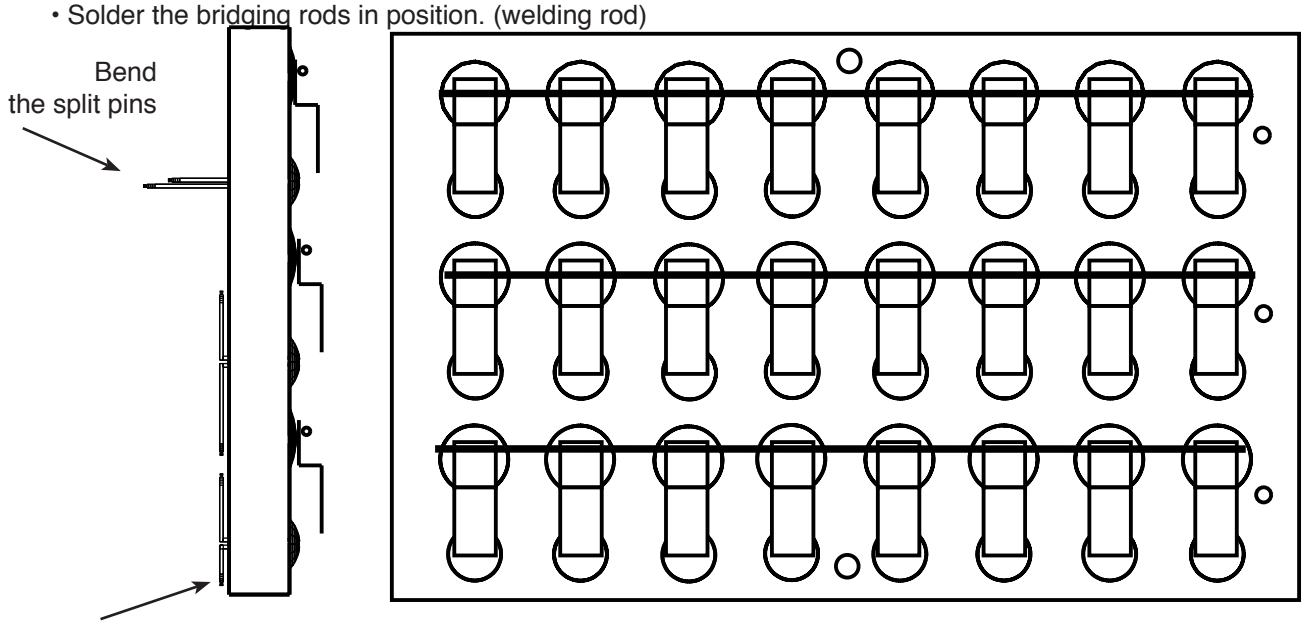
• Mark out the position of the switches using the pattern on page 11 on the switch panel (3) 8 x 75 x 120 mm. Mark out and drill the holes, 3 mm dia for the split pins, 3 mm dia for the screws and 2 mm for the wire.



• Cut three lengths, 100 mm long from the welding rod (9)
• Insert the drawing pins (28) into the panel. Push the split pins (30) through the holes and bend. Tin the drawing pin heads.

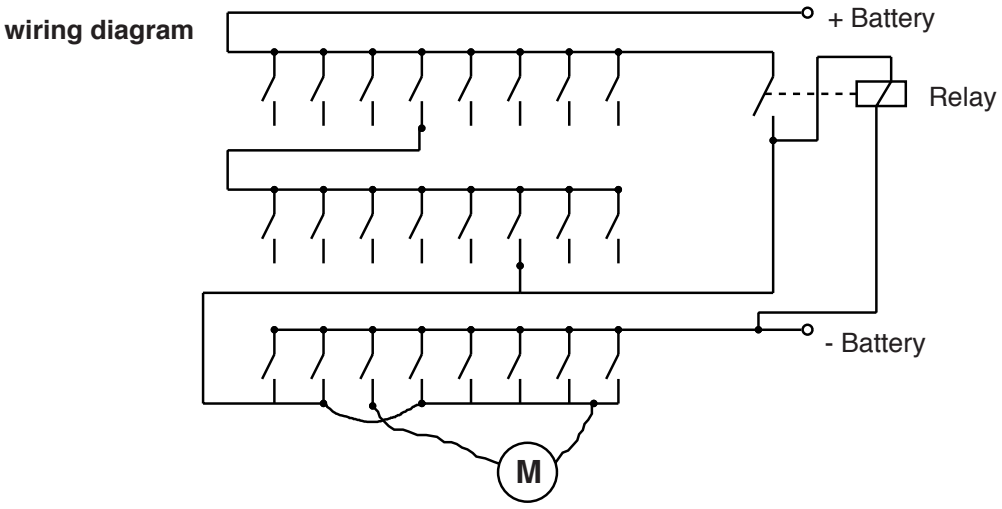
Note: use a multicore solder with flux.

• Solder the switches to the drawing pin heads.
• Solder the bridging rods in position. (welding rod)

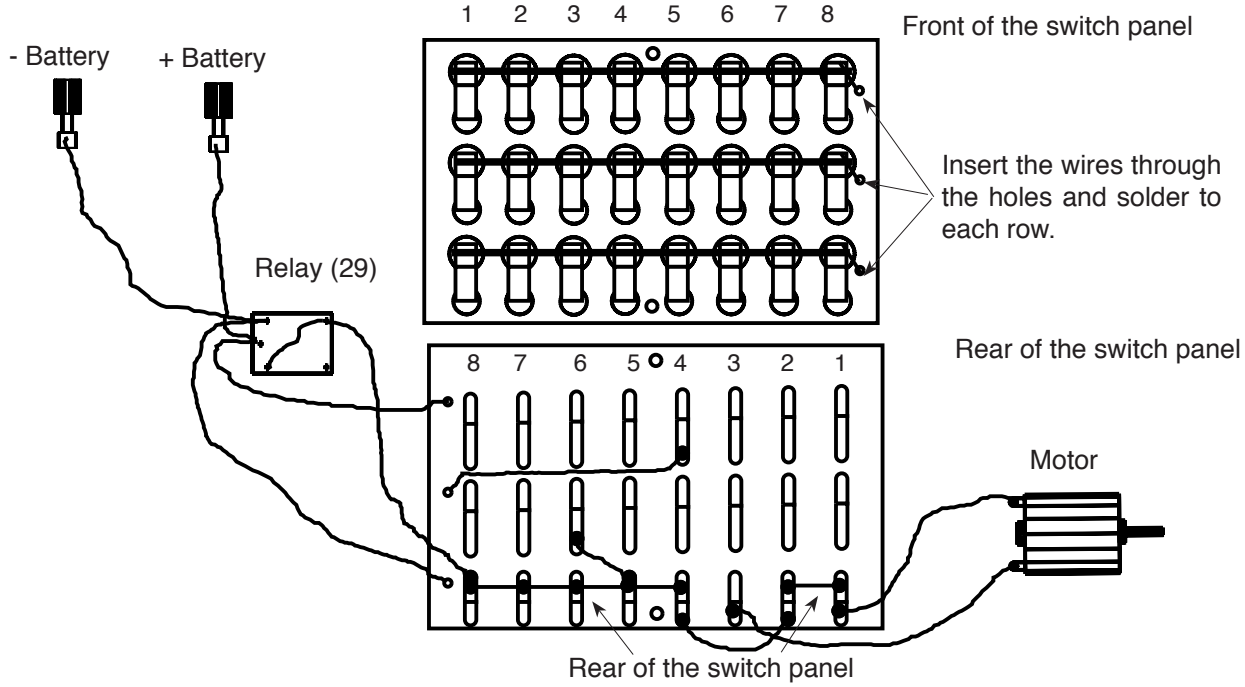


Snip off the excess legs from the lower row of split pins with side cutters

5.8. Wiring the circuit:



- Cut three 100mm long lengths from the insulated wire and tin the ends. Insert one wire through the hole in the switch panel and solder the end to the first row of drawing pins. The rest of the wiring is carried out as shown in the diagram.
- The code for the door opening is 4 -6- 3. Of course another code can be 'wired' up.
- Screw the shelf (21) on the pine strips (2) (Use two roundhead screws)

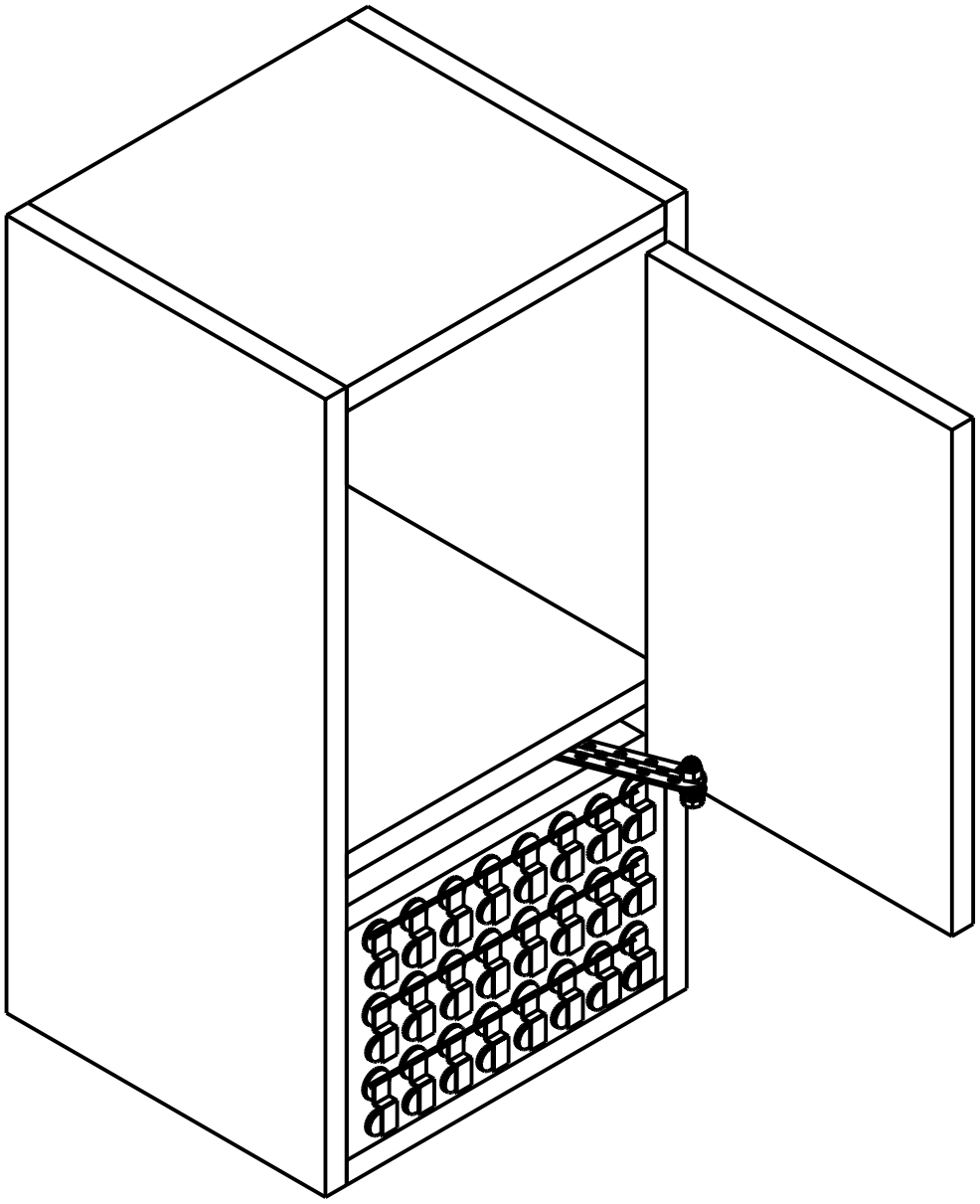


5.9. Testing:

The safe can be opened only when the correct code is entered. The door is opened by the action of the gearbox and mechanism, which in turn is operated by the relay and motor. The code is made up from the action of three switches. We have chosen the code 4-6-3. To open the door you must press the fourth switch in the top row and the sixth switch in the middle row at the same time. The relay is now activated and you only have to press the third switch in the bottom row and the door should open. The motor will only work as long as the switch 3 is pressed. If an incorrect switch in the bottom row is pressed a short circuit is made and the relay is de-activated. The switches in rows 1 and 2 must then be re-pressed.

Note: Do not press a switch in the bottom row when the door is closed, otherwise the contact in the relay will activate and the battery will run down.

5.10. Gluing the shelf in position:



Pattern - Switch panel scale 1 .1