

Junior Certificate Technology



The Ultimate
Driving Machine



Mercedes-Benz

Higher Level

Design Folio



Year

2009

Design Task

A

Examination Number

148416

School Roll Number

68261G

Note:

The content layout in this exemplar design folio follow the headings as outlined in the Technology Design Tasks document (SEC Ref . S.67).

The content itself serves as a guideline only to the brief presented.

Design Task

Design and make a working model of a motorised display of a car manufacturer's logo. The display should illuminate automatically at night.

Analysis of chosen task

To decide the final design specifications, a number of considerations have to be taken into account. These are associated with the requirements of the design task.

- The solution must incorporate a car manufacturer's logo.
- The logo must be motorised.
- The display must illuminate automatically at night.

Design Task Specifications

In order to satisfy the design task requirements the following specifications are required.

- I must design and make a display model of a car manufacturer's logo.
- I must include a motorised control system to operate the logo display.
- I must include a *light sensitive* electronic circuit to allow for *automatic illumination* of the display at night.
- I must use materials which are strong, durable and suitable for purpose of use.
- The model must be well assembled, realistic with a high quality of finish suitable for presentation.
- The model must be eye catching to attract customers into the showroom.
- The model must be safe to use with no sharp edges. All wires and components must be neatly housed.
- The total cost should not exceed €25.
- The chosen task must be completed with the given time frame i.e. 30th April.

Research and Investigation

So as to decide on a final design solution that would satisfy all of the design specifications listed previously it was important to carry out research and investigation using a number of different sources. These included:

- Visiting car sales garages in the locality
- Internet research
- Car magazines
- Technology school book
- Discussion with teacher and friends regarding their opinions and preferences.

Visiting local car sales garages

I visited local garages to see what displays were available in my own area.

I took the following photographs:



Volvo display



Fiat display

The two displays above – Volvo and Fiat were both visible at the main garage entrance.

All other garages visited had displays in similar prominent positions.



Hyundai display



Kia display



Peugeot display



Renault display

None of the garages visited had motorised logo displays.
Some of them were lit at night.

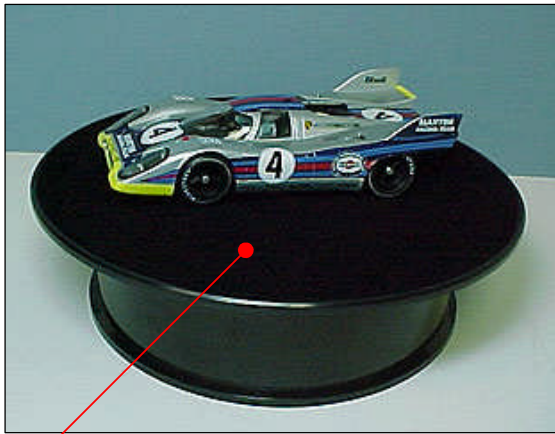
Internet Research

I researched the internet using *Google images* and found a wide variety of car logos. These are shown below:



Rotating Displays

Images were available of different motorised displays some of which involved revolving 'turn table' type car displays. However I did not find any solution which showed a car logo display which rotated and illuminated automatically at night.



A wooden revolving display with a flat surface



Mechanism inside a metal base with a glass rotating stand



Plastic base with solar panels fitted.

Solar powered rotating display

Subsystem Research

The internet was also used to search for other information on the electronic and mechanical control systems so that the display model could be *motorised* and *illuminate automatically at night*.

Following discussions with my technology teacher and fellow students I decided to look at a number of websites including:

www.technologystudent.com

www.t4.ie

Other websites associated with suppliers of electronic and electromechanical components were also visited.

Electromechanical Research

The basic input components for any motorised control system are as follows:

Motor



Switch



Power supply

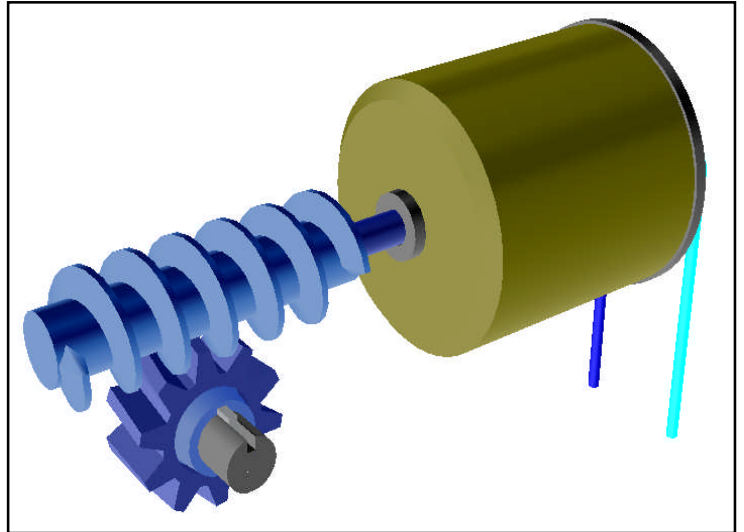


To control the output speed of the system a gear or pulley system may be used.

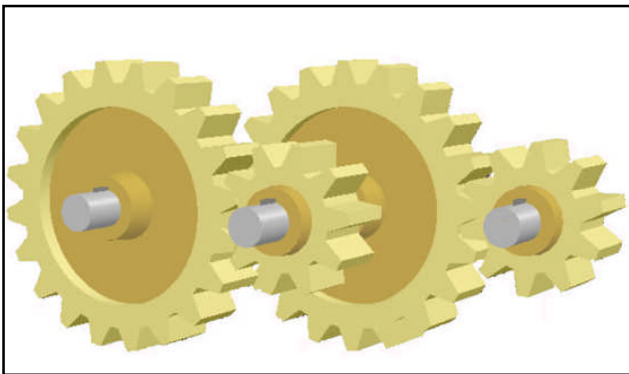
Gear systems



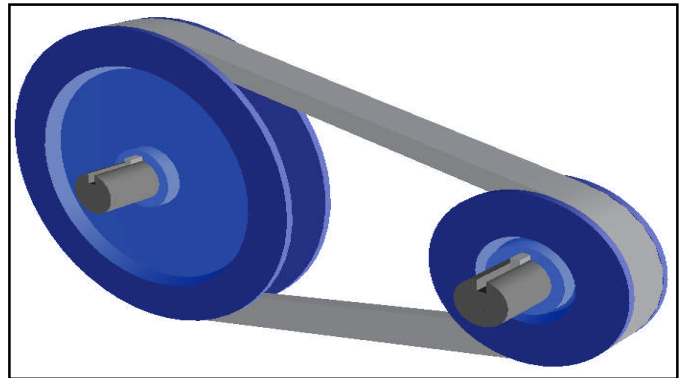
Simple gear



Worm and wheel



Compound gear



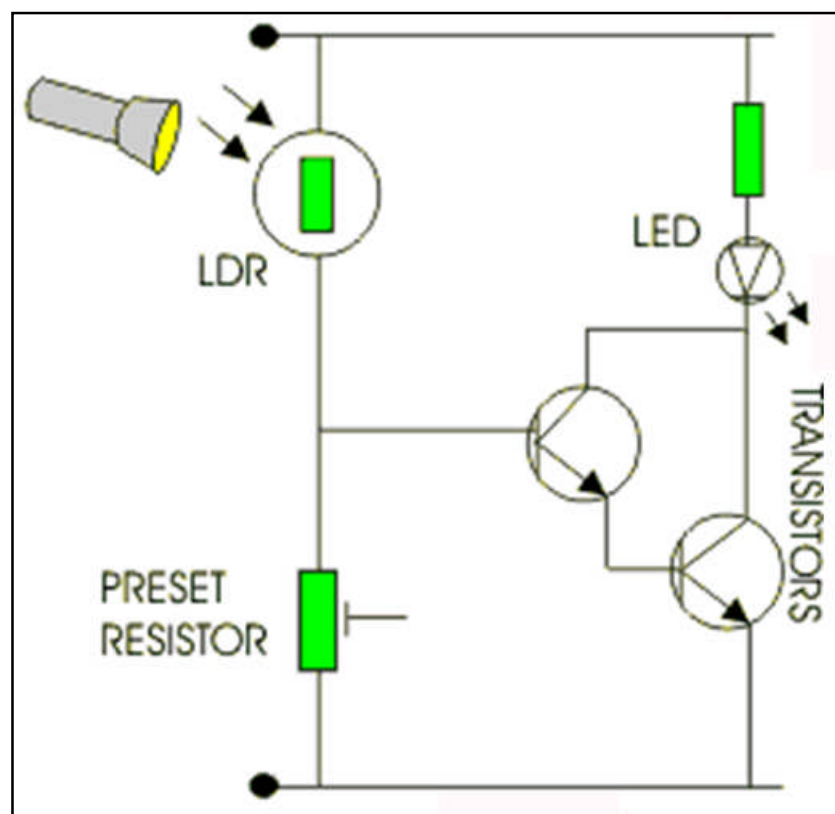
Pulley system

Electronic System research

From my research I found that I needed to use a light sensor circuit for the display to '*illuminate automatically at night*'.

The circuit shown below uses an LDR and resistor as part of a 'potential divider'. This circuit however activates in bright conditions when a light is shone on the LDR.

So that the circuit would activate automatically in darkness the positions of the LDR and resistor should be interchanged.

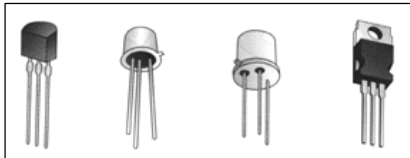


Electronic Components

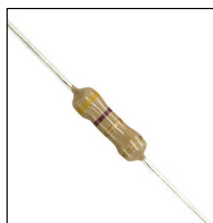
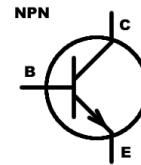
Symbol



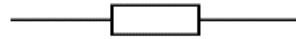
Switch



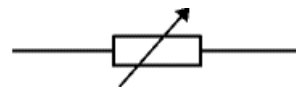
Transistor



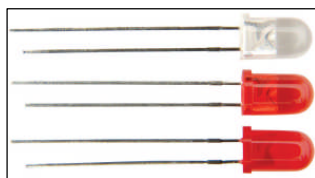
Fixed resistor



Variable resistor



LDR



Led



The above components may be used for a light sensing circuit.

Summary of research findings

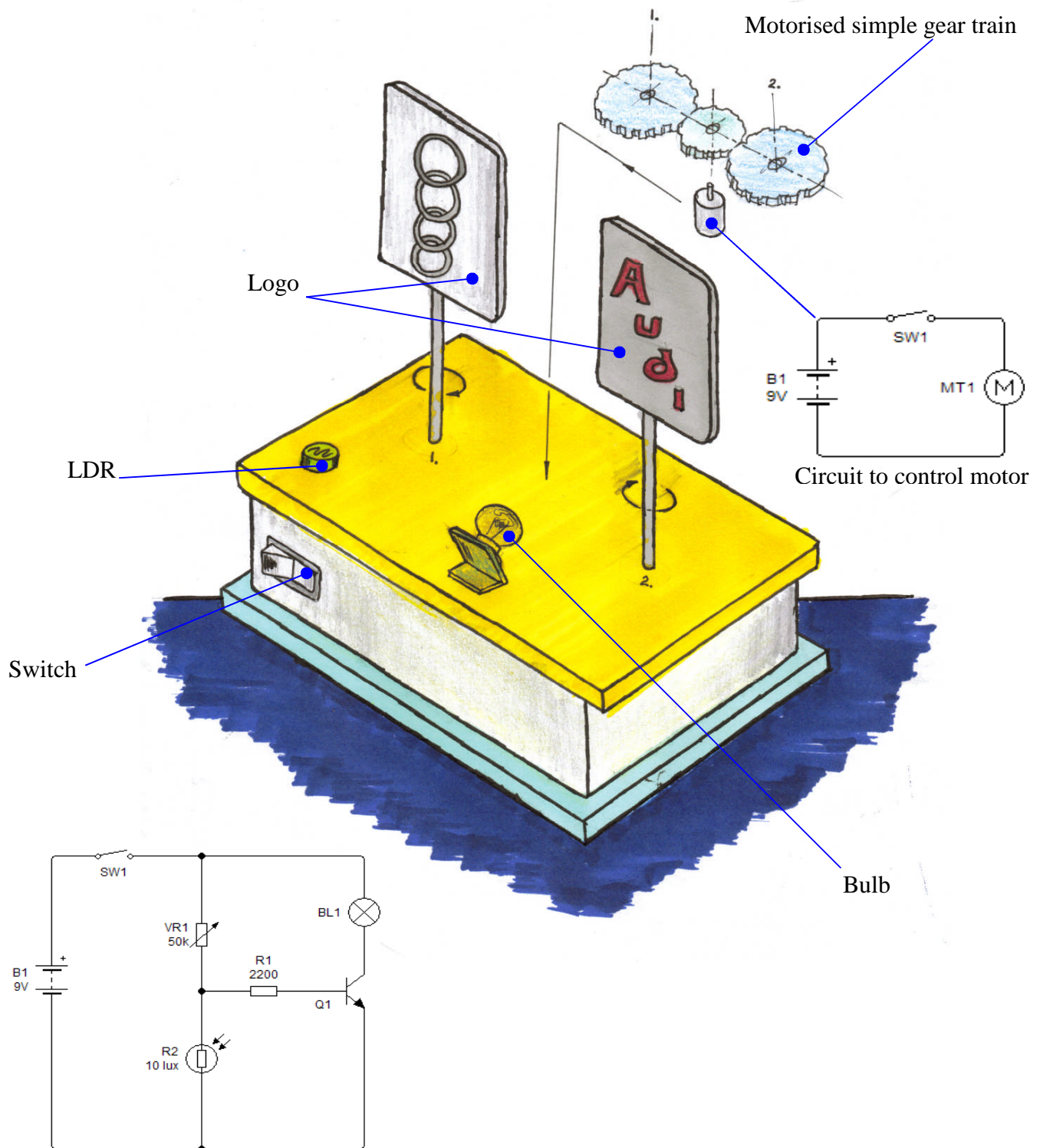
From my research I found:

- None of the garages visited had motorised display logos
- None of the garages visited appeared to have automatic illumination at night
- There are a wide variety of car logos available
- Two circuits may be used – one to control the motor and another to illuminate the display at night
- A potential divider circuit with an LDR may be used to activate the light at night
- The logo display must revolve at a suitable speed.

Development of Ideas

Idea 1

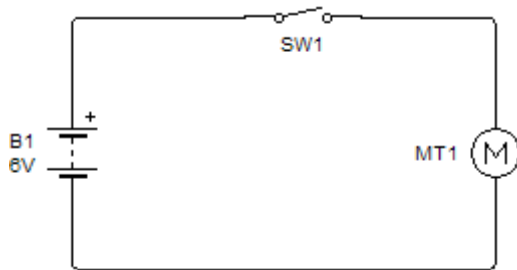
This idea uses a gear system to rotate two logo display signs.
An LDR which forms part of a light sensor circuit is mounted on the top so when it gets dark a bulb switches on automatically.



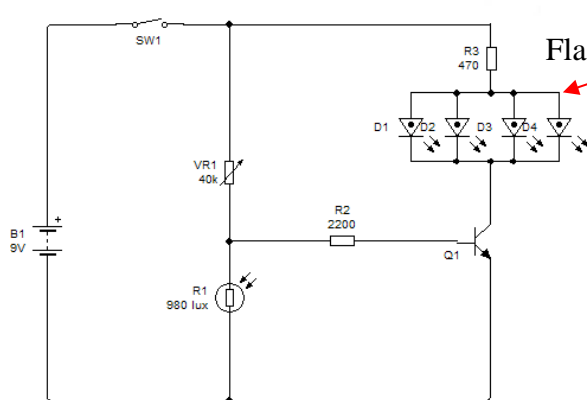
Transistor circuit with LDR input.

Idea 2

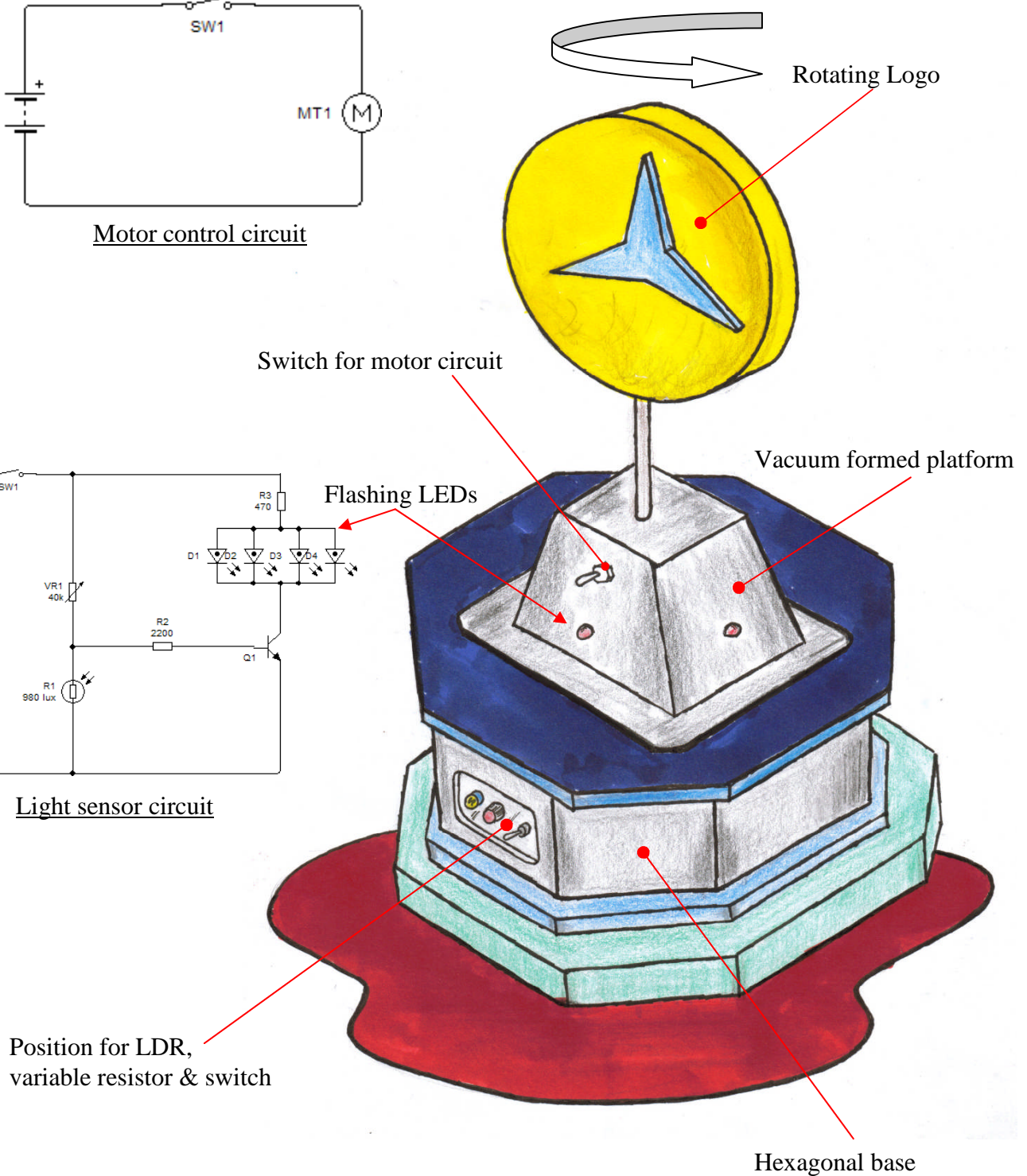
This idea builds on the previous design. A large base is used to support a platform and also accommodate the light sensor circuit. A vacuum formed mounting is used to house a ***gearbox*** motor and support the logo shaft. This design uses flashing LEDs to illuminate the display.



Motor control circuit



Light sensor circuit



Selection and justification of final solution

Idea 1

This idea meets the design specifications.

The gear system might prove to be a little difficult to connect and line up accurately when using two separate logo displays, therefore I decided not to select this as the final solution.

Also, the base would have to be quite large to accommodate both control systems.

Idea 2 – Final Solution

This idea has been chosen as the *final solution*.

The octagonal shaped base, top and side is attractive, aesthetically pleasing and well proportioned.

There is plenty of space to accommodate both control systems with the LDR circuit placed in the base and the motor circuit in the vacuum formed mount.

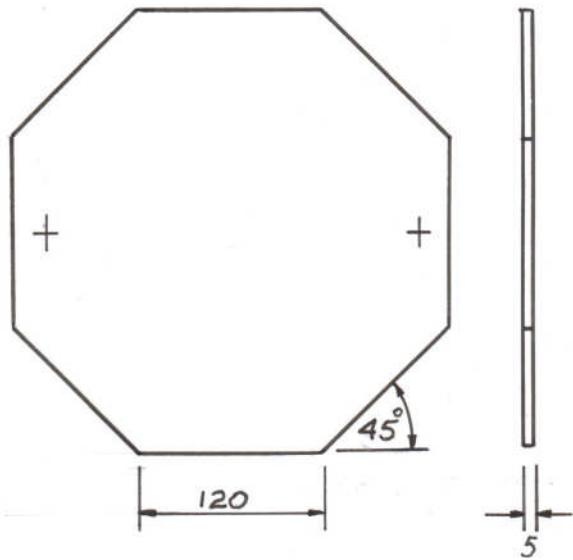
The vacuum formed mount allows the logo to be clearly seen.

The use of LEDs instead of a bulb will extend the battery life of the light sensing circuit.

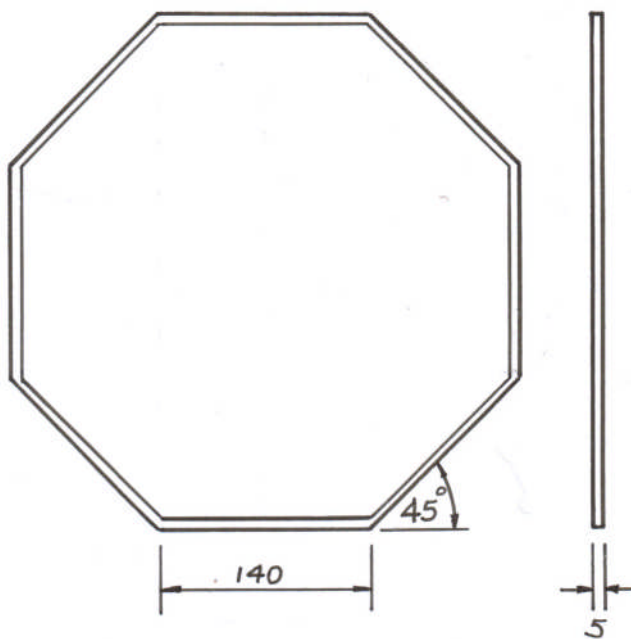
A separate power supply is used for the motor.

A gearbox motor is used to reduce the output speed.

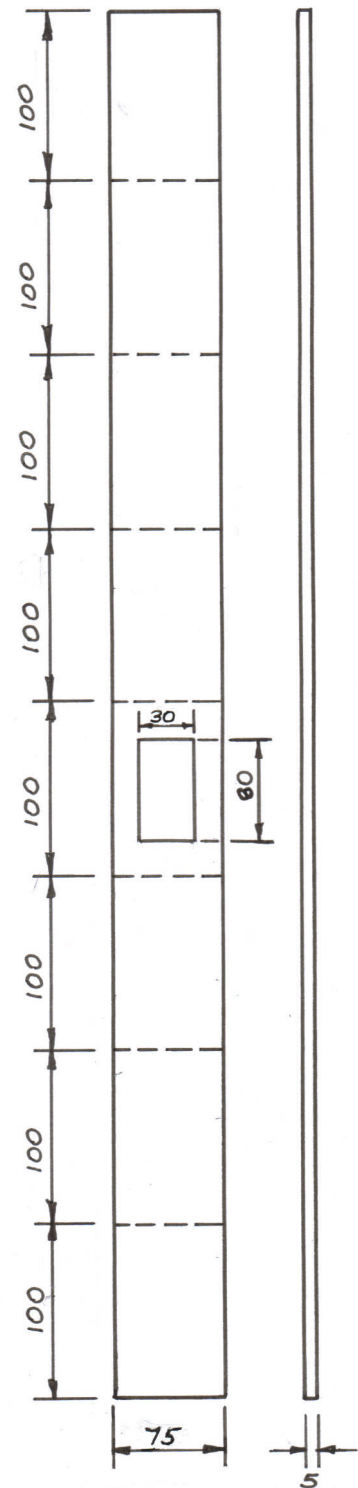
Manufacturing Drawings



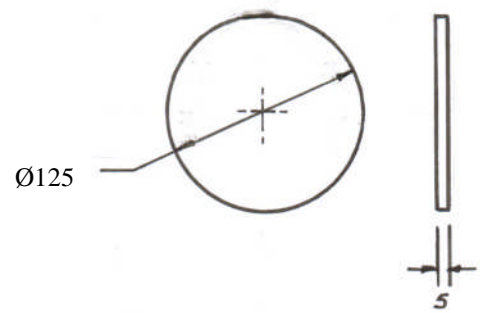
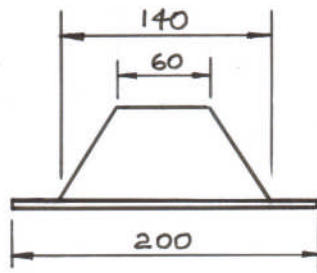
Top / Bottom



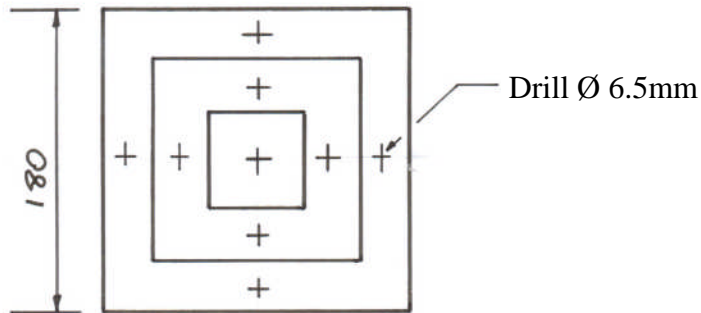
Base



Side



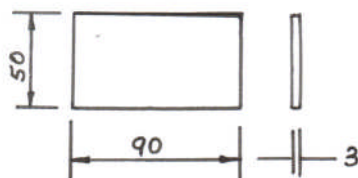
Logo Disc



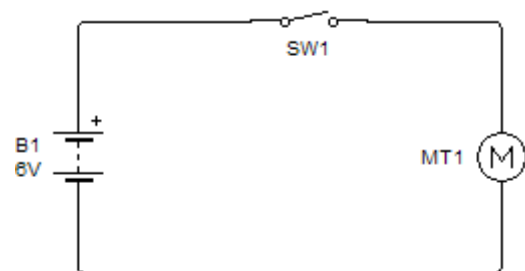
Logo Mounting

Scale 1:4

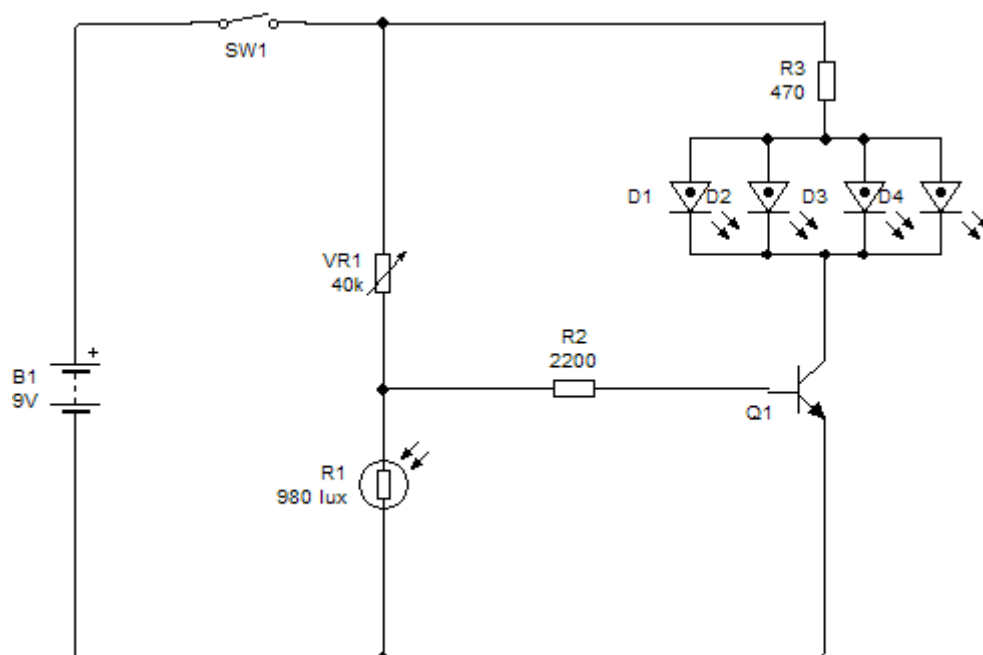
Motor Circuit



Clear panel



Light Sensor Circuit



Manufacturing Sequence

1. Mark out all parts to the measurements specified in the manufacturing drawings.
2. Cut out octagonal acrylic *top* and *bottom* using the scroll saw.
3. Cut out the acrylic *side panel* using the jig saw. (The scroll saw could also be used.)
4. Drill a hole in the *side* panel to allow a scroll saw blade to be inserted and then re-attach to the scroll saw.
5. Cut out the slot for the light sensor mounting panel as specified on the *side panel*.
6. Cut out the clear acrylic mounting panel.
7. Cut out the *logo disc* and drill a hole to accommodate the motor shaft.
8. Vacuum form the *logo mounting* using the wooden mould already manufactured.
9. Cut out the plywood *base* using the jigsaw. Route around each side of the base.
10. Finish each part by filing and sanding as appropriate.
11. Bend the acrylic octagonal side using the strip heater



12. Drill all *holes* necessary for attaching all parts together and for mounting all other electrical components.
13. Construct the *electronic control light sensor* and *motor circuits* by soldering.
14. Fix both control systems in place as per the final solution drawing.
15. Fix the *top* and *bottom* to the *octagonal side panel* and then mount onto the *routed base*.
16. Attach the *logo disc* to the motor shaft.

Note: All standard workshop safety rules should be followed at all times during the manufacturing process.

Materials list and costing

Part	Material	Length (mm)	Width (mm)	Thickness (mm)	Number Req.	Cost
Top/bottom	Acrylic	360	360	5	2	€6.00
Base	Plywood	420	420	15	1	€1.00
Side	Acrylic	800	80	5	1	€1.50
Logo mount	PVC	300	300	3	1	€0.80
Clear panel	Acrylic	90	50	3	1	€0.60
Total Cost						€9.90

Components list and costing

Item	Cost
Gearbox motor	€ 8.00
Switch (two req.)	€ 1.98
Transistor (TIP 121)	€ 0.79
Resistor(two req.)	€ 0.02
Variable Resistor	€ 0.80
Flashing led(four req.)	€ 1.80
LDR	€ 1.20
Total Cost	€14.59

Total cost of Task

€24.49

Testing

Once the assembly was complete the display model was tested to establish if it worked correctly.

- The logo disc rotated when the motor was switched on.
- The first time the LDR was covered the LEDs did not light automatically. I had to adjust the variable resistor to turn on the LEDs at night.
- The materials selected are durable and suited for purpose of use.
- The product is an attractive, eye catching model.



Completed display model

Evaluation

Overall I am very pleased with the completed display model as it works well and satisfies all of the design specifications.

The model is well assembled and finished and is safe for use. All components are neatly housed and the battery is accessible.

The task was completed within the given timeframe and within budget.

The manufacture of the display model went smoothly, although the bending of the octagonal side on the strip heater was a little difficult because of the length of the material involved.

Also the soldering iron used for constructing the circuits had to be 'tinned' as the iron had overheated and burned and so could not form a good soldered joint.

The logo rotates a little too quickly. This could be corrected by using a variable resistor as part of the motor control system to allow the speed of the motor to be adjusted.

To improve presentation I could add a control knob to the variable resistor shaft.

The flashing LED's could be replaced by ultra bright LED's to give more light at night.

If I was to complete this task again I would consider using a solar cell to charge the batteries, similar to the turn table model shown in the research section.

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