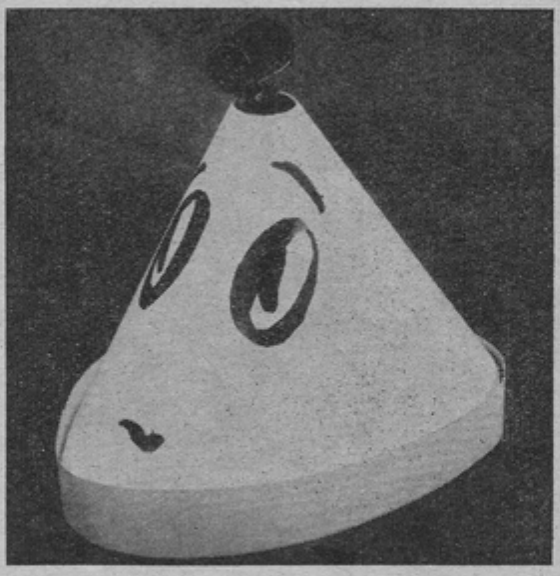
FRED

HAVE FUN; BUILD THIS EASY, LIGHT OPERATED HOMING DEVICE BY PETER HOLLAND



FRED is a light seeking electrically propelled tricycle with a light sensitive automatic homing device. The basic principles of light sensitive circuits have been combined with a simple scanning device to give proportional automatic steering to a single driving wheel.

The mechanical layout enables the drive unit and scanner to be operated by one small electric motor and this unit can be housed in a variety of different vehicle bodies.

In order to obtain results with a minimum of effort Fred was designed as a conical (not comical) box on a plywood chassis. No doubt with the festive season upon us readers may care to follow a number of seasonal applications, perhaps some inspiration can be found in the various M.M. "Space Models" series. However, space is pressing so on with the description of the mechanical bits and pieces which are used in conjunction with circuit shown in Fig. 8 of "Light Entertainment" (page 579).

The Drive Unit

The driving unit is simply a modifiation with the power unit used on "Pulscycle", June *R.C.M. & E.* A simple aluminium sheet frame (cut out with tin snips and bent at right angles) is drilled to accommodate a bolt which serves as a stub axle carrying a small rubber tyred wheel and a Ripmax pulley. The motor is a Milliperm which is secured to the bracket by its end lugs.

The motor's armature shaft is fitted with a small pinion, the original came from a Mighty Midget motor, but a set of Eldi gears would do just as well. The bent over top part of the bracket is drilled for a 16 s.w.g. threaded brass bush of the type normally used for rubber driven model aeroplanes, this forms a spigot on which the whole unit turns. A brass tube or two suitable nuts soldered together form a bearing. The fact that a bush moves up and down a small amount as it turns when nuts are used for the bearing is unimportant. The tube or nuts are in turn soldered to the printed circuit board which carries the complete mechanism and switching system.

A 16 s.w.g. piano wire shaft passes through the centre of the bush and carries on its lower end an Eldi counterate gear which is driven by the aforementioned pinion. The upper end of the shaft carries a very small Ripmax pulley from which a rubber band drive is taken to a large pulley on the scanning tower to be described later. A second rubber band provides the transmission to the pulley on the driving wheel. Pulley and wheel are bolted together or bonded with Evo-Stik and are free to run on the stub axle bolt.

Steering Actuator

If one does not wish to buy a ready made servo (actuator), then a low power low consumption motor may be adapted by using a belt and pulley or Ripmax gear reduction.

The Scanning Tower

A piece of cardboard tube about $\frac{1}{2}$ in. diameter forms a horizontal scanning tube which ensures that no excess light can reach the far end of the tube.

An ORP12 light sensitive resistor is mounted so that its sensitive face points into the tube. The tube is fixed to a 2 pin plug which fits a socket on the scanning tower (a second piece of tube).

Tower Base

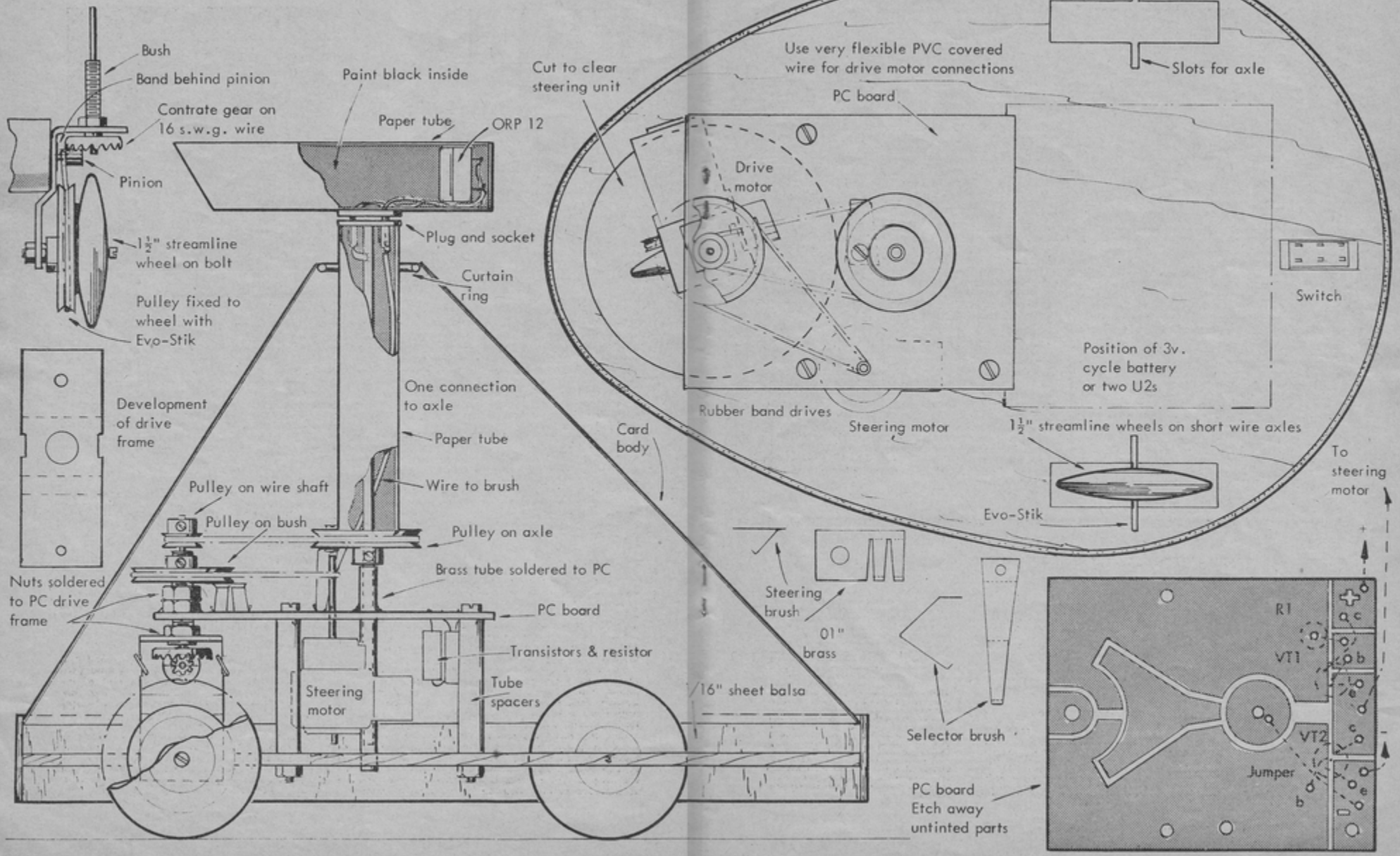
Take a piece of printed circuit laminate and drill it centrally for a scrap of 12 s.w.g. brass tube. Etch or cut the circuit on the board and bolt to the chassis using spare tube. The board serves to support the 12 s.w.g. brass tube which forms a bearing for a piece of rod or tube on which the whole tower will rotate.

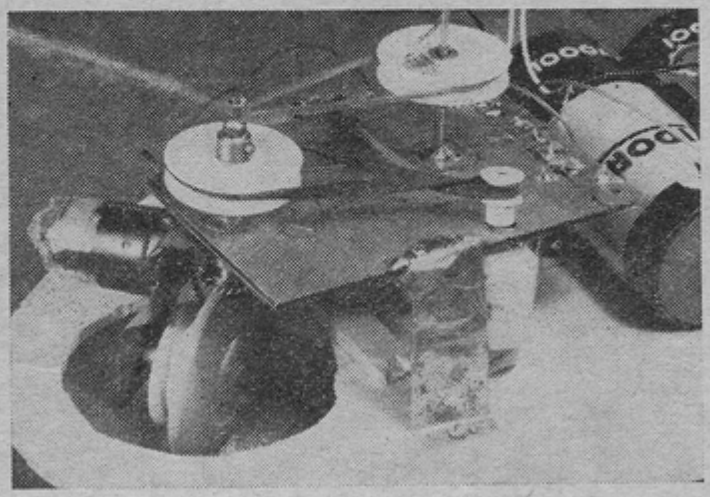
Use the largest size Ripmax pulleys and drill to take two 10 B.A. bolts. These bolts retain two springy brass bushes cut from an old 4.5 v. flat battery. The ORP12 socket leads are soldered to spindle and bolt on the upper surface of the pulley. The periscope part of the tower is bonded to the pulley with

FRED

Designed by Peter Holland

Scale : Full size





Prototype "Fred" uses tinplate brackets to support P.C. and a Microperm T05 and 41:1 gearbox for steering.

Evo-Stik and carefully aligned so that when the outer wiper is centrally placed at the front of the chassis the eyebrow hood is directly above it. The brushes are carefully adjusted so that both bear evenly on the P.C. board, the scanner provides the necessary pressure. Check that the tower is vertical and spins round freely without excessive vibration. A large curtain ring fixed with Evo-Stick to the top of the body or soldered to a tall bracket on the chassis can also be used as an additional steady. This is only necessary on much larger versions of Fred.

If the P.C. board has been wired up correctly the test may be carried out by turning the tower at 90 deg. and connecting the servo battery. Upon shining a torch into the hood at the top of the scanner the steering actuator should turn the drive unit so that it tries to face the same direction as the scanner. If it does not, re-check the wiring. If it turns in the opposite direction reverse the servo motor brush connections. When the scanner is facing forward and its brush on the small segments of the wiper track the servo should run to neutral when light is applied to the scanner. The complete sub chassis is made on one P.C. board as shown on the plan.

The Main Chassis

A piece of $\frac{1}{8}$ in. plywood is cut to the outline of the chassis and pierced to clear the drive unit and to rear wheels. The latter run on scraps of 16 s.w.g. piano wire or even nails bonded with Evo-Stik into a couple of saw cuts in the ply. The batteries are placed a little behind the rear wheels so that the steering unit is not loaded too heavily, the centre of gravity of the finished vehicle should not be more than 2 in. in front of the rear wheels for the best results. The sub chassis is bolted to the upper surface of the ply and the whole unit checked for operation once again.

A narrow strip of balsa is glued round the edge of the chassis to locate the body. The original machine carried a Bristol board box made rather like a sawn-off lampshade. This was very easy to make with one lap joint at the back. Make it over size and fit it carefully around the scanning tower. The bottom edge is then trimmed to fit snugly into the chassis edge. The lower part of the edging serves to hide the wheels and should be about $\frac{1}{4}$ in. clear to the ground. The on/off switches can be mounted under the chassis for neatness.

Control

Use a fixed light source such as a table lamp with shade removed, or a powerful torch will serve as a homing beacon. Fred is switched on and placed several yards away pointing in any direction. After making a turn he will steer towards the light, correcting any over control automatically, finally heading straight for the beacon. If the light is switched off he will continue travelling on the last course whether it be curved or straight, re-seeking the light when it is switched on or moved about. The control response is not particularly fast so the beacon should be moved fairly slowly if it is required to guide Fred round corners.