The 'Cyclic Sidewinder'

by Steve Tonkin.

Photographs by Alan Partridge

THIS is rather an intriguing device in which a motor drives a trolley, but no road wheels are driven mechanically. The drive is obtained by steering the wheels, and making use of the side force thus obtained.

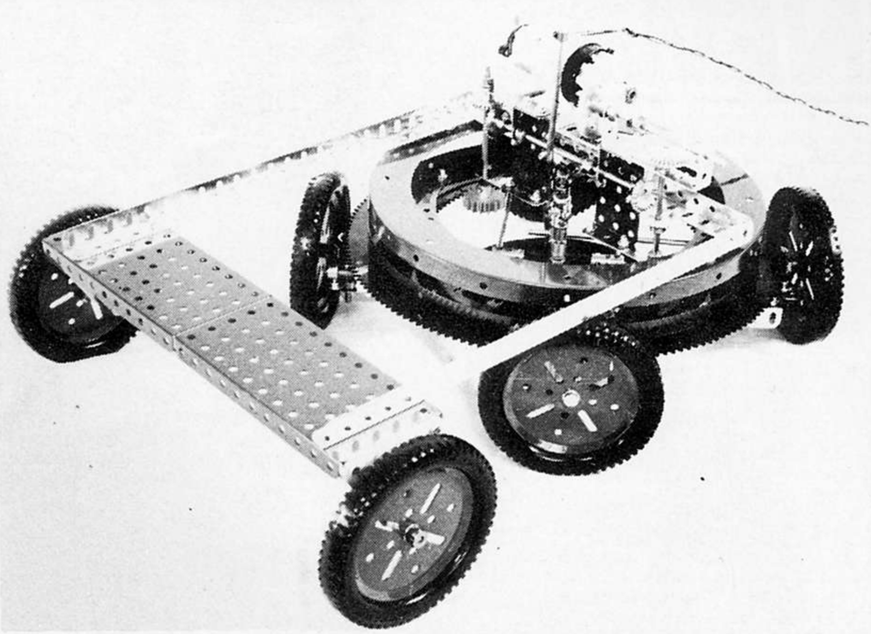


Fig 1. A general view of the cyclic sidewinder, described here by Mr. Steve Tonkin.

I should begin with a sort of apology. I read an article on this device in an engineering journal about fifteen years ago. Some ingenious chap, whose name escapes me so I can't give him the credit, had written this article on the device, which he may well have patented, and listed a number of possible uses. I have never seen it used, so perhaps it is just one more invention which bit the dust. Quite honestly, although it was most ingenious, I thought at the time it might run into a lot of sales resistance. For outdoor use it would be an efficient mud making machine. One indoor use suggested was to drive television cameras around the studio, but the tyres probably made an intolerable squeaking on a polished floor.

First, the basic scheme. Imagine a carousel resting on three wheels. If the wheels are mounted so that all their axles are radial, when the carousel is rotated the wheels will simply roll in a circle and the carousel will not go anywhere. Suppose the wheels are mounted on king-pins as in the front wheels of a car, and suppose they are now steered so that their axles all pass through a fixed point on the carousel, then as the carousel is rotated it will move in an eccentric circle. The trouble is that the carousel still does not go anywhere useful.

However, if we arrange that the axles of the wheels pass through a point fixed in space rather than fixed on the carousel, then the centre of the carousel will move continuously in a fixed direction. If we now consider each wheel, we realise that it is cyclically steered. One could do this with long axles extending inwards from each wheel, and arranging that they all pass through a point which is under our control. This method, whilst looking simple, presents problems in getting a number of crossing shafts to pass through the same point, and in the fact that the carousel moves at right angles to the displacement of the shafts.

Instead, we can use a mechanism which is not basically dissimilar from the mechanism in a helicopter hub, which controls the cyclic pitch on the blades.

The carousel is of course driven round by a motor. At once a minor problem comes up. How is one to provide the reaction torque for the drive? The answer is very simple. One attaches the carousel, via its roller bearing, to a simple chassis having a couple of independent wheels, like the rear wheels of a front-wheel-drive car. The motor and gearbox which drives the carousel is then mounted on the chassis.

Now to execute the device in Meccano. The first problem to be solved is no mean problem. One has to devise a carousel bearing which leaves the centre free and unoccupied. One could base such a bearing on parts 143 or 145. To get the maximum room available, a pair of Flanged Rings (167b) was used, and a set of four Large-Toothed Quadrants (167a) with two Large Toothed Quadrant Pinions (167c) used for the drive.

The rollers used were ½" Pulleys. A Circular Strip was fitted with a number of radial spindles using Rod and Strip Connectors. Two of these spindles carried ½" Pulleys with boss, to give as much radial positioning as possible. The rest of the rollers are ½" Pulleys without boss so that they may tilt to comply with any slight non-circularity in the Flanged Rings.

As most Meccano parts have sets of holes in lines at 90° rather than 120° it was convenient to use 4 wheels instead of 3. Incidentally, one could actually use 2 wheels or even a single wheel, as long as one does not have to push against any resistance.

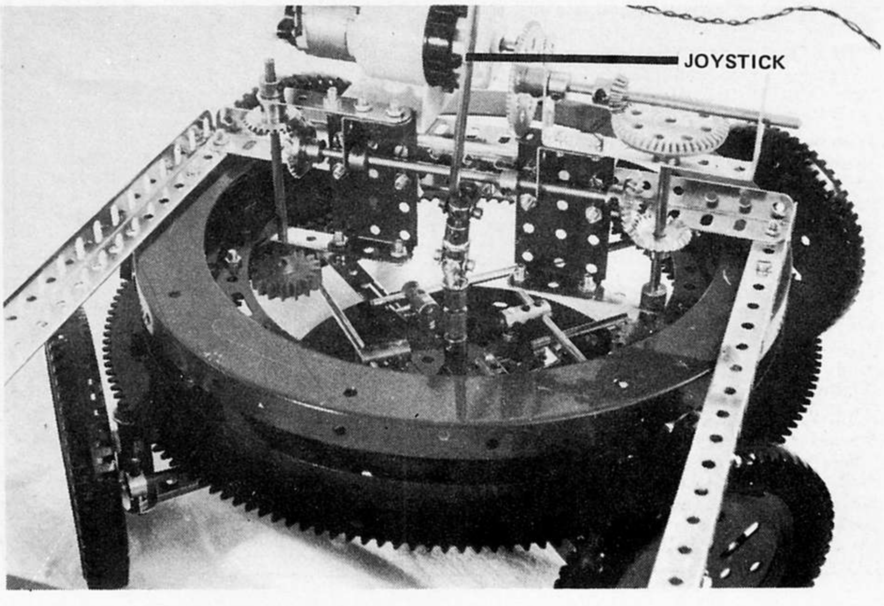
In the centre of the carousel is a Faceplate (see Fig. 3) the centre of which is controlled by the joystick. This Faceplate is made to rotate with the carousel by means of an Oldham coupling, which consists of two 3½" Double Angle Strips, one on the Faceplate and one on the carousel, coupled by a shaped arrangment of Rods and a Coupling.

Four Bolts in the outer holes of the faceplate are coupled by four 'Track' Rods to Bolts on Cranks which steer the wheels. At the inner end the track rod pivots are Couplings pivoting on their threaded bores on ⅜" Bolts. At the outer end, Collars are used in the same way with short Bolts, not quite screwed in far enough to touch the track rod. The road wheels run on Pivot Bolts which are locked to the bosses of the steering Cranks.

The drive to the carousel is by two diametrically opposite Large Tooth Quadant Pinions. Two are used instead of one, to help the somewhat imperfect carousel roller bearing. The motor was run on reduced voltage for a reason which is irrelevant to the present discussion, and with the gearbox at 60:1, so some further gear reduction to that shown is probably necessary.

If the carousel is driven in the correct direc-

Fig 2. Close-up of the drive gearing and joystick control lever.



tion, the device will creep in any direction at any rate according to the joystick deflection. If it were not for the noise it would undoubtedly make,one can see that it would be ideal for a TV camera trolley. As the basis of a fork lift truck for tricky positioning jobs, like fitting aircraft engines into wing pylons, it looks useful. It would be possible to have a carousel at each end of the trolley (with suitable joystick coupling for fore and aft control) so that the trolley itself can be steered as well as the motion of one end.

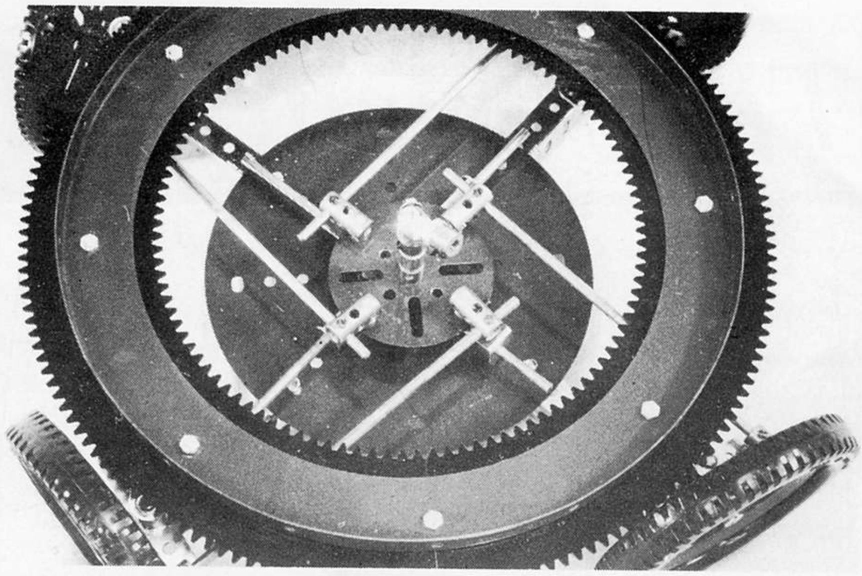


Fig 3.
The cyclic steering mechanism. The slide Rods and 3½" x ½" Double Angle Strips comprising the Oldham's coupling are visible beneath the four track Rods. Note the central 6" Circular Plate to the underside of which are bolted four 5½" Angle Girders.

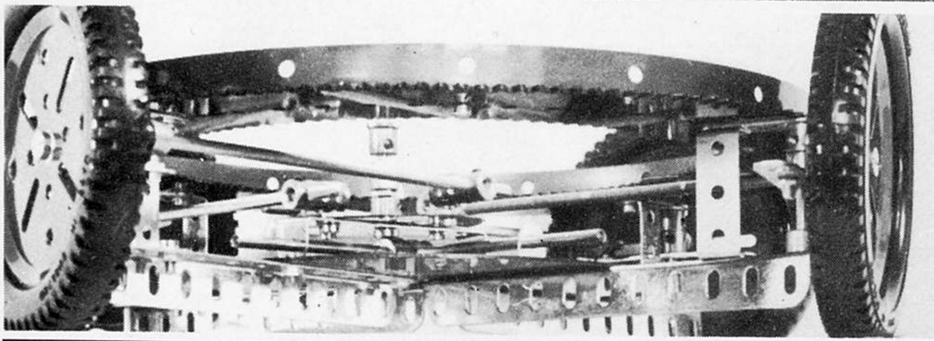


Fig 4.
Edge-on underside view showing the right-hand king-pin supported in the end hole of a 5½" Angle Girder by a Collar, (bottom), and a Crank, (top). All four steering axles are supported in this manner.

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