Elevator & Proportional Rudder from One Actuator

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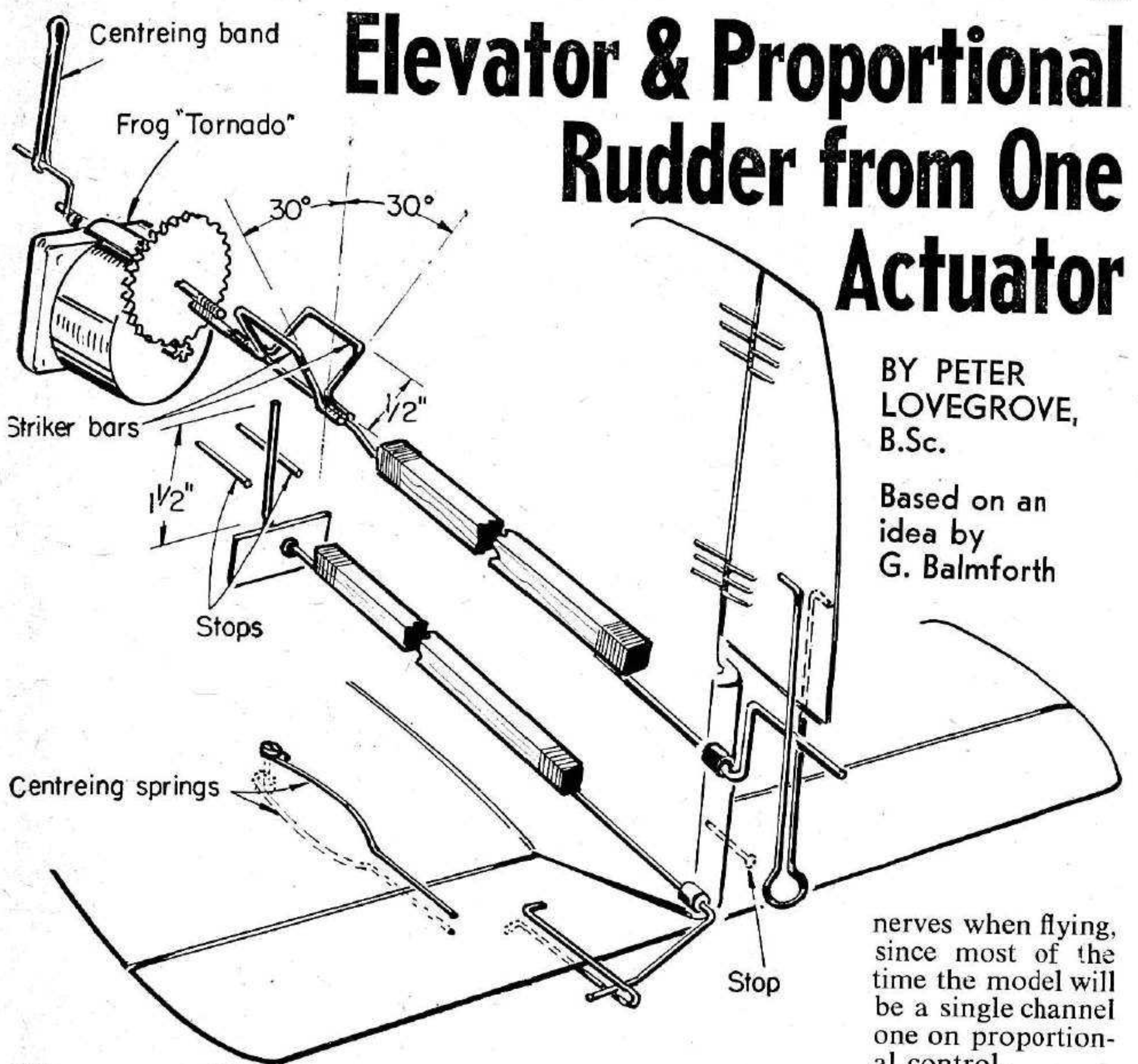
Based on an idea by G. Balmforth



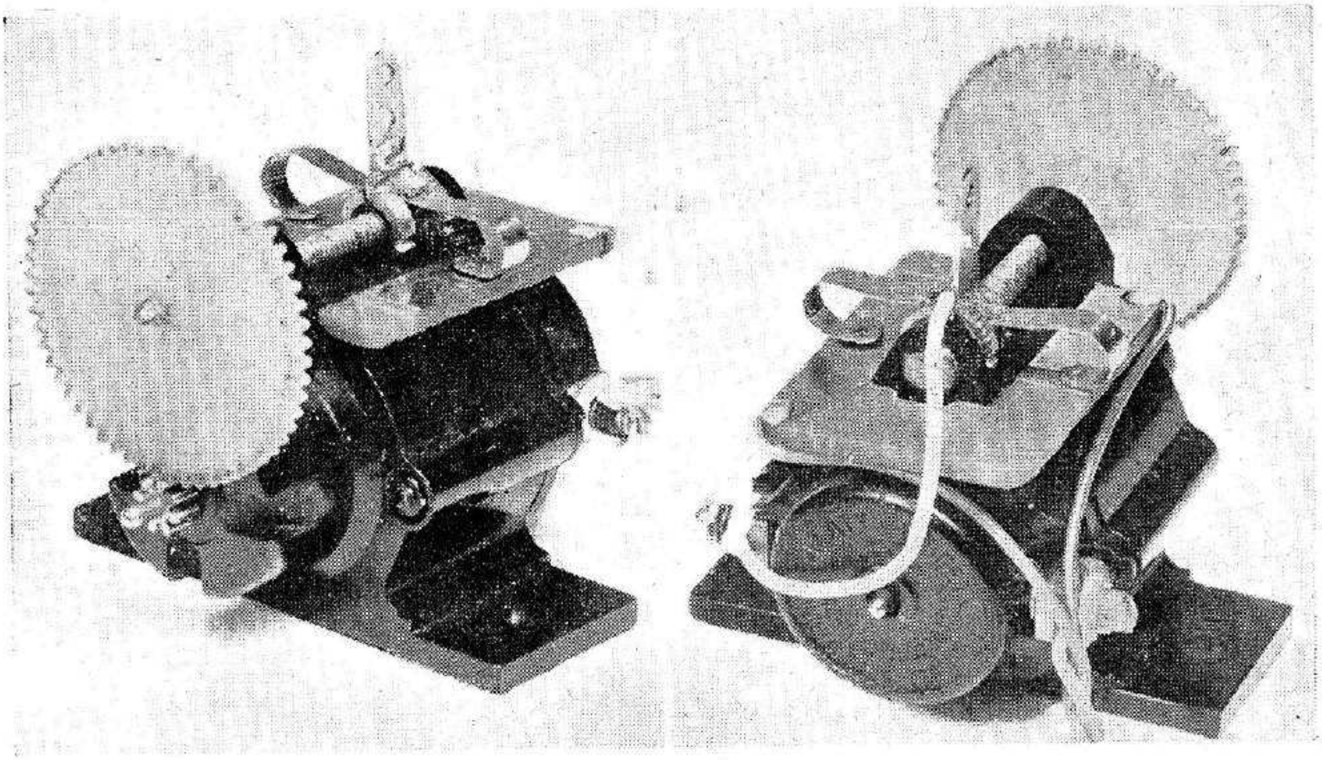
THIS system differs from the Galloping Ghost scheme in that the rudder is pulsed at a fixed rate and automatically goes neutral when up or down elevator is brought in by full or no-signal. Such a scheme requires rather less in the way of control gear at the transmitting end and is also far easier to fly successfully than the G.G. system. This is in no way meant as a criticism of the latter; dual-proportional control in any form is excellent, but it is not easy to learn to fly it. Nor is it merely a case of keeping the control surfaces small on the first models in order to make them manageable for learning. I reduced the control areas on one low-wing G.G. design to produce a pylon racer and the darned thing turned out to be the most manoeuvrable I had ever made!

Therefore I think there is much to be said for a non-simultaneous rudder-elevator system. The tyro is less likely to clobber his model so often and generally will not be in such a state of nerves when flying, since most of the time the model will be a single channel one on proportional control.

The actuator in this system, like that in the G.G., consists of one motor. There is no weight problem and the scheme has been used by G. Balmforth in a "Gasser" by which it seems ideally suited. He used a Frog Tornado with its own nylon gears. A single No. 8 battery served, with a tap between each 1½ V. cell. With 1½ V. the Tornado draws only 60-80 m.A. current so that a reasonable life is obtained.

Reference to drawing will show the principles of the system. The layshaft of the motor drives a crank which controls the rudder proportionally in the normal way. This crank only swings in the upper 180° arc, its movement being restricted by the rate of pulsing, mark-space variation, battery supply, and spring tension. If full or no-signal is given the motor drives the crank round to bottom dead centre where it hits a stop.

The rudder loop is enlarged slightly at the bottom so that it can rest neutral



Mighty Midget Modified . . . .

WE have received from Mr. M. Franklin of Leicester a very neat little servo using the Mighty Midget as a basis. He has been using it for about a year for trimmable engine control and has found it very satisfactory. It is now being used in conjunction with a standard Bonner for trimmable elevator for inverted flying.

The main Nylon gear is threaded partly 6 B.A. and is a tight fit on a 6 B.A. shaft. The nut on the shaft is a standard M/Midget filed flat on one side to allow it to slide on the paxolin switch board. This board is a standard printed circuit board cut to allow travel to the maximum either end of the shaft.

The sliding contacts are centre punched to give better running either way. The P.C. board is cut so as to allow the shaft to assist the contact pressure as it rotates.

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although the crank is actually a few degrees off centre due to the stop. Slip-stream helps to hold the rudder when elevator is applied.

On this rudder-control shaft are two square loops or cranks which, when the rudder crank swings to B.D.C., strike the elevator linkage and apply up or down elevator as the case may be. The elevator is spring-loaded neutral as is done with compound escapements.

Points to concentrate experiments on:—

1. Centring pull and radius at which it is applied to gear shaft.
2. Angle between the square 'striker' loops, and radius of striker bars relative to (3).
3. Length of actuating levers on front and rear of elevator torque rod.
4. Positioning of pivots for elevator torque rod relative to rudder torque rod pivots.
5. Stiffness of elevator centring springs.
6. Pulse rate on control box. Four to eight cycles seems to be the best range from which to choose.

One simple modification may be made and that is to omit the stop at the bottom of the rudder crank swing. On full or no-signal the motor will then rotate freely in one direction or the other. The elevator is thus fully deflected and returns to neutral once in every revolution of the rudder crank. This avoids stalling the motor (not serious really at 80 m.A.) but still gives up or down elevator with neutral rudder. But, of course, to rotate fully the striker loops must be able to ride up off the end of the elevator lever.