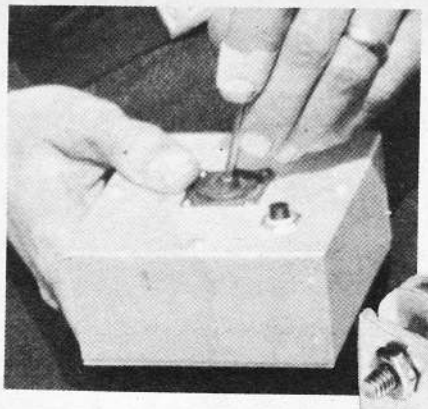
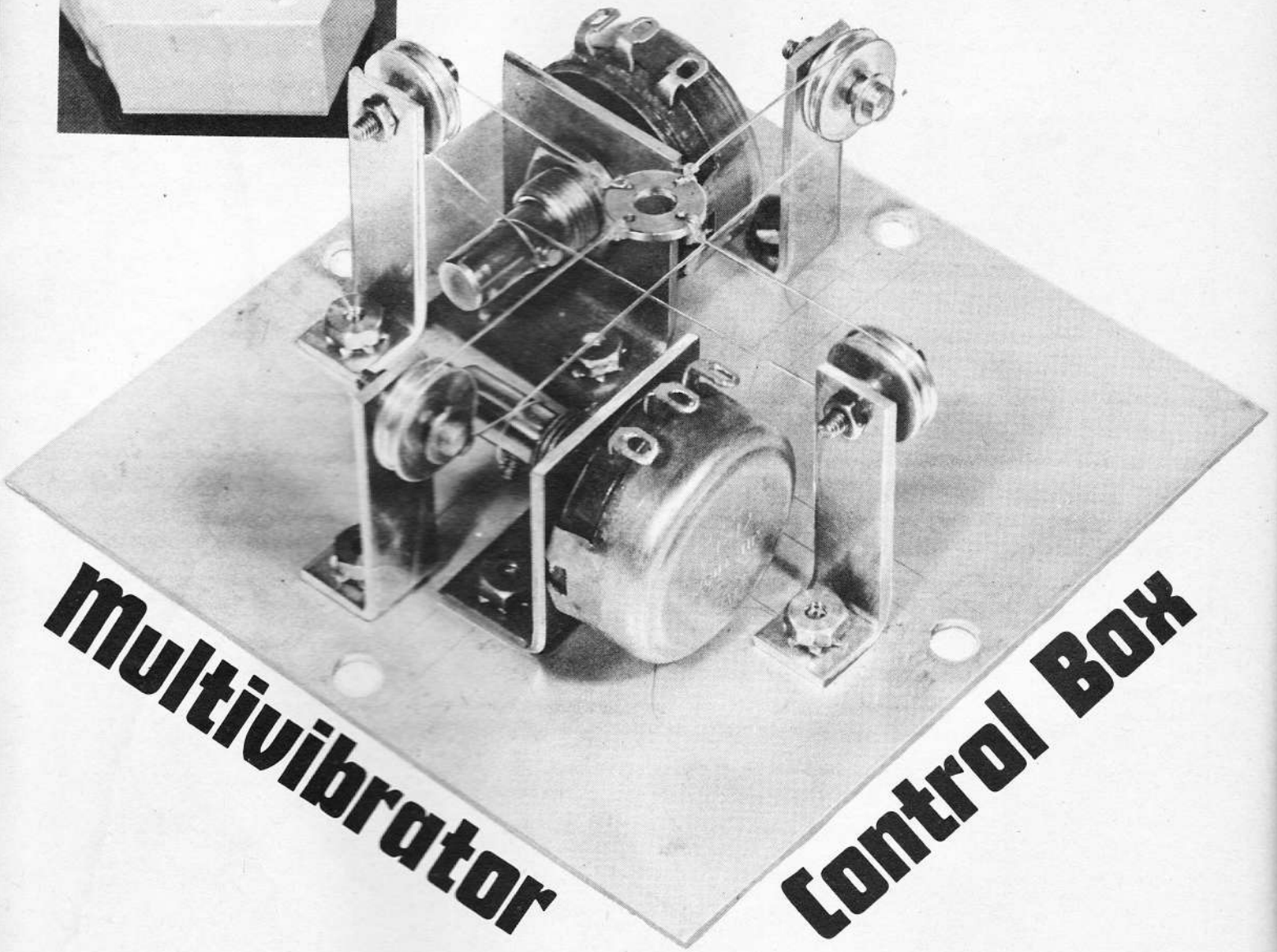
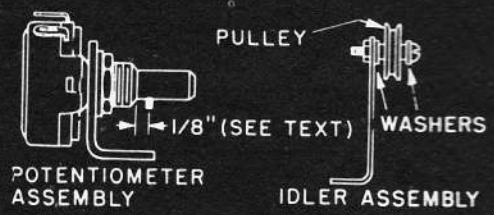


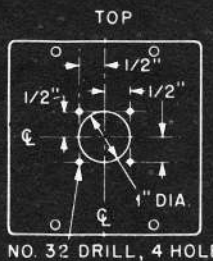
Praise the Lord mounts and pass the dial cord idlers for here's a control box you build in a couple of evenings!

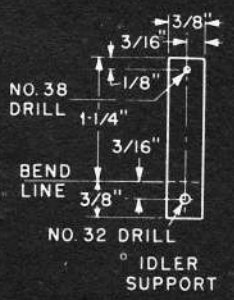
By HERB HONECKER

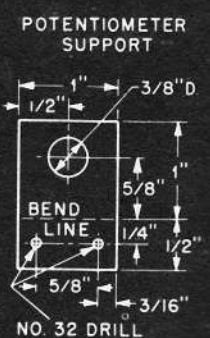
Multivibrator Control Box

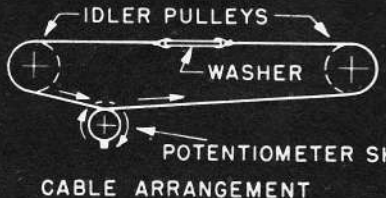












■ Recently at least three systems for dual proportional control have been developed. All three depend on controlling one function, such as rudder, by the widely used pulse-width principle. A second function, such as elevator, is controlled by pulse-frequency. Since a pulse-frequency change ratio, from high to low, of at least 4 to 1 is required to operate such a system satisfactorily and since it is desirable to keep the lowest frequency as high as possible to minimize waggle of the control surface, it is obvious that some form of multivibrator provides the best method of generating the control pulses. Thus, the control stick operated by the pilot must control the multivibrator, usually by means of potentiometers.

The author has built several versions of this type control box, using gears to translate the stick movement to the pots. Experience demostrates that a week or so of spare-time work is involved in making and assembling the various rather precise parts. There is also the problem of locating suitable gears.

A request for several control boxes, combined with inborn laziness, resulted in this design.

This box can be built in one or two evenings with hand tools only, although a drill press saves time and effort.

The resistance values of the potentiometers will depend on the particular multivibrator to be controlled; in any case Ohmite Type J "pots" are recommended for their reliability and low noise factor. If Type J pots are used, it will be necessary to relieve their contact pressure. Accomplish this by bending up tabs and snapping off back cover. Lighten pressure on two inner contact fingers by prying them up with a small screwdriver. Relieve pressure on carbon brush in same manner and reassemble the pot. Now, turn shaft in clockwise direction as far as it will go, then locate and center-punch a hole directly in line with left-hand connection tab and ⅛" from pot shoulder; see potentiometer assembly sketch. Drill and tap the hole for a 2-56 machine screw. Cut off shaft to a length of about ½" and set aside. Prepare the other pot in same manner.

Next make two potentiometer supports of ⅛" thick brass or aluminum; after drilling all holes bend to 90 degrees along bend line. Assemble pots to their supports according to sketch and run a 2-56 screw into its hole and tighten securely. Cut off screw to ⅛" length.

Cut out four idler supports from 1/16" thick brass or aluminum, drill and bend. (Note: Distance from idler axle hole to bend line determines stick movement. Dimensions given result in a stick deflection of about 30 degrees each side of neutral position. To increase stick travel, increase distance from idler axle hole to bend line, and vice versa.) The pulleys are radio dial cord idlers, ½" in diameter, (ICA Type 603). Assemble two washers and ¼" length of ⅛" O.D. tube together with a pulley on a 3-48 machine screw and attach to an idler support. Assemble other idler supports.

Drill one cover of a 4"x4"x2" utility box, such as ICA Type 3810, according to top sketch. Mount a four-pound, Series 100, Lord Mount on the top with 4-40x¼" machine screws. Assemble the various parts to base according to the general arrangement sketch. Use 4-40x¼" machine screws and be sure to use lock washers, preferably internal star type, under all nuts on the base assembly. Drill a flat No. 8 washer as shown.

Use 12 to 15 pound test Nylon fishing leader for cables. Arrows on cable arrangement sketch show cable direction, starting at one side of washer and following around to other side. Secure cable against slippage on potentiometer shaft by throwing a clove hitch on the 2-56 screw. When making final cable tie to washer, pinch the two affected pulleys together slightly. This will maintain tension on cable and take up any slack. Make sure all knots are secure and slip-proof. Adjustments of washer neutral position can be made by rotating pots in their supports.

Attach bases to box with washer in the neutral (center) position. Cut off a piece of 5/32" diameter tube, 4 to 5 inches long; this is the control stick. Drill a small hole ¼" from one end and slip a ¼" length of scrap wire (paper clip is good) through stick and secure with solder. Slip stick through Lord Mount and set cover in place on box with the stick protruding through washer and pin resting on it. Scratch Lord Mount location on stick and remove. Secure stick in Lord Mount with soldered pins or washers.

The wiring circuit, switches, indicating lights, etc. and their locations depend on requirements of the multivibrator and fancy of the builder. One of the advantages of the design is ease of disassembly, for trouble shooting, modifications, or just plain curiosity.