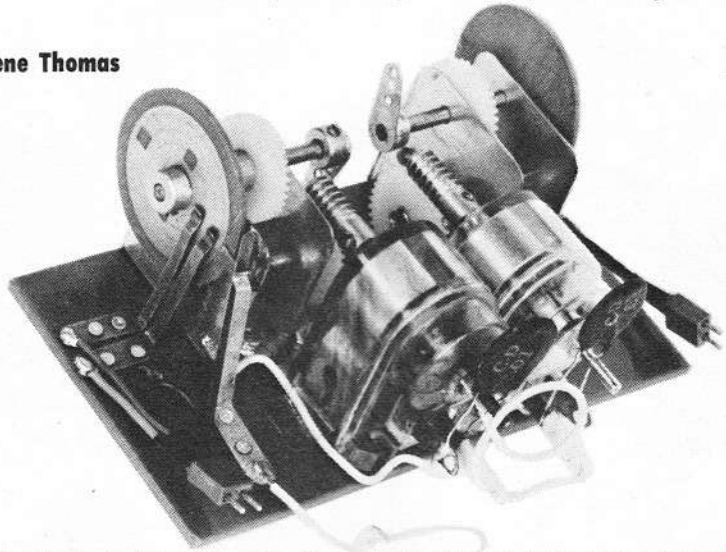
3P2N R/C SERVO

The next step after beginning R/C seems to drift to do-it-yourself projects. If this is your case, and you've a need for a single or double servo unit, try building this project. Complete plans.

by Gene Thomas



The author's unit was a double servo to supply rudder and elevator control. However, the plans are drawn so that it is possible to build a single unit. Two units are coupled together on one chassis to obtain the double. Remember to reverse the gear train assemblies in case you do this.

● With the current trend of economy and the seemingly high price of R/C equipment, this servo may be a boon to dirt scratching modellers. While this is not the simplest means to an end, it is an interesting project, and will serve as a good basis for servo operation to the beginner. The builder as he proceeds with this may find room for improvement or modification, of which there are many. As most of us have a tendency to modify most things to suit our whims, here is a good basis from which to start.

Using the Wilson Tiny Atom Motor and worm gear, driving a bank of nylon and brass gears from Pittman gear reduction sets, this unit will cost about $8.00 as is, or half that amount for the single unit illustrated. This by comparison to similar equipment on the market today is dirt cheap. Both sides of the servo are identical, one being set up in reverse of the other so that both crank arms are in the center of the unit for easy adjusment.

The motor control unit was set up as a separate circuit on the original, to operate a "Tower" 2-Speed Tank, operating on 4½ volts. The drawings do not show this adaption, however this can clearly be seen in the photos. The illustrations and schematic show a set-up where a commonpower supply is used for all accessories.

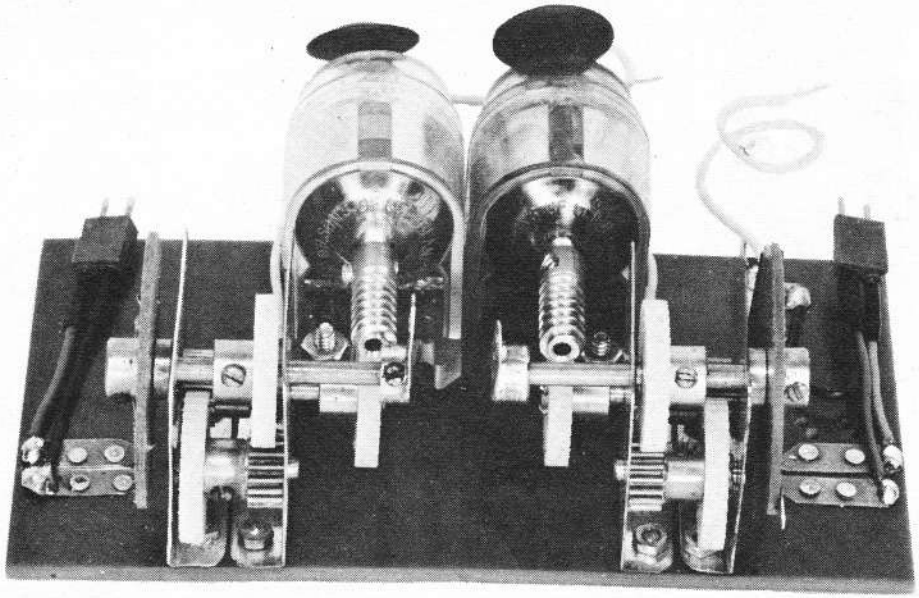
This unit is of the pulse type, and can be modified for proportional operation if so desired. The drawing above the see-thru, clearly indicates the pulse sequence of the unit which is illustrated with the direction of rotation being clock-wise. This unit is also of the continuous rotation type. The commutator does not reverse its travel at any time during the operation of this unit, which is the case with the proportional type servo, do not confuse the two. Before starting construction of this unit, it would be wise to study both drawings thoroughly, becoming familiar with its operation.

The pulse sequence which is illustrated is as follows: One (1) pulse and hold—left/up; two (2) pulses and hold —neutral motor; three (3) pulses and hold — right/down. No signal in any of the three positions will return the servo to the first neutral position. The motor speed circuit will only operate when the keying button and the receiver relay are in the closed position. No speed change will occur while the servo moves to neutral automatically, or the keying button is not depressed.

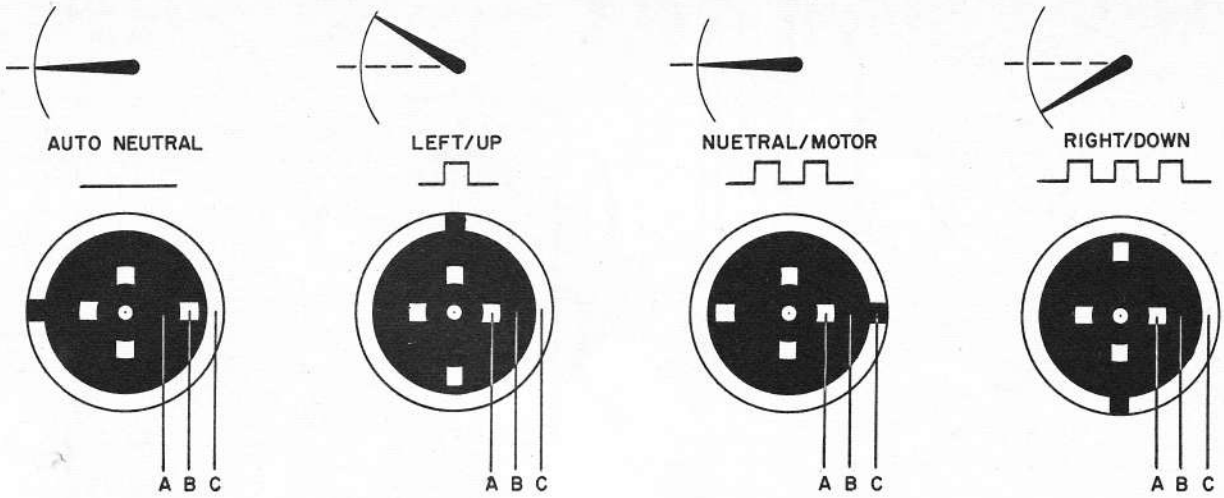
In order to obtain any position, one must key the proper sequence and hold. If no hold is given, the unit will continue to cycle around until it reaches the next stop, which is the neutral position. The drawings indicate clockwise rotation, however this may be changed by reversing the power and ground lead going to the motor if so desired.

The construction of this unit was purposely designed so that a minimum of power tools are required, actually none are, however a drill press would aid in the accuracy in which the gear train brackets are drilled. The components are mounted on a 1/16" sheet of fiber or other insulating board. Cut to shape and drill as shown, with the exception of the wiper arm holes. Drilling at this time might lead to serious alignment difficulties later. Cut

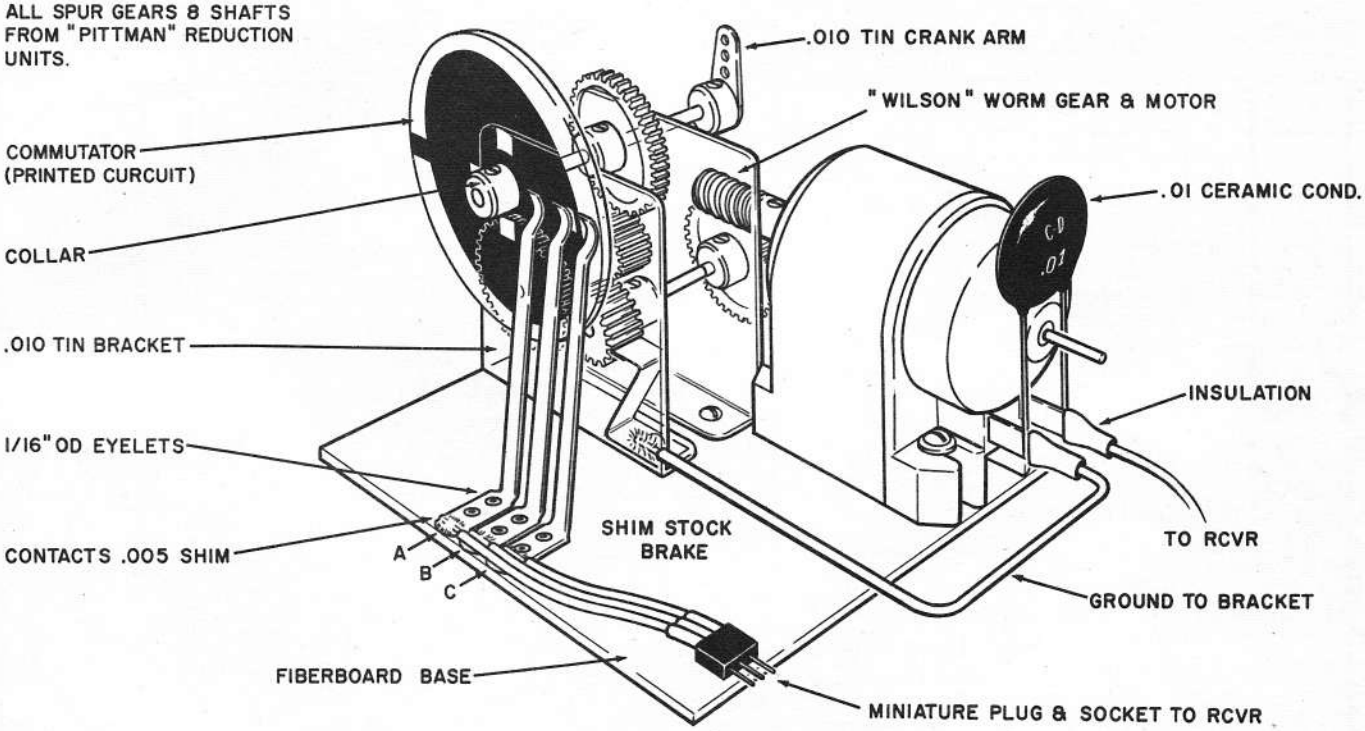
(*Please turn to Page* 39)



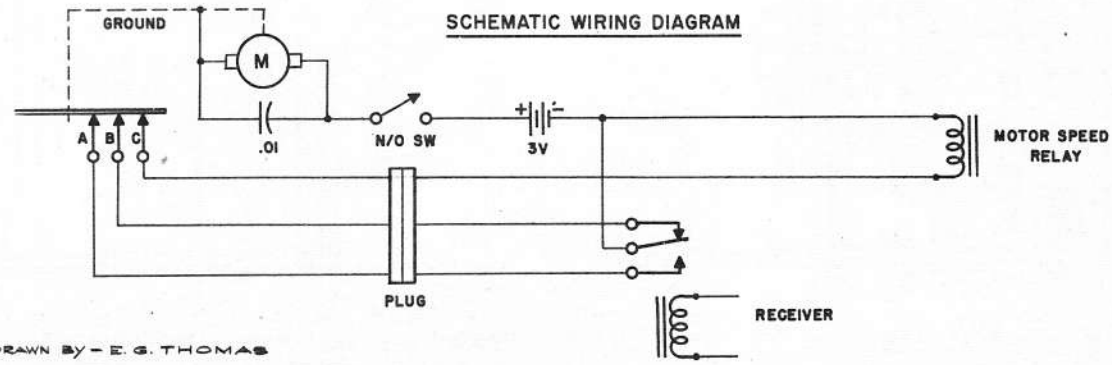
PULSE SEQUENCE



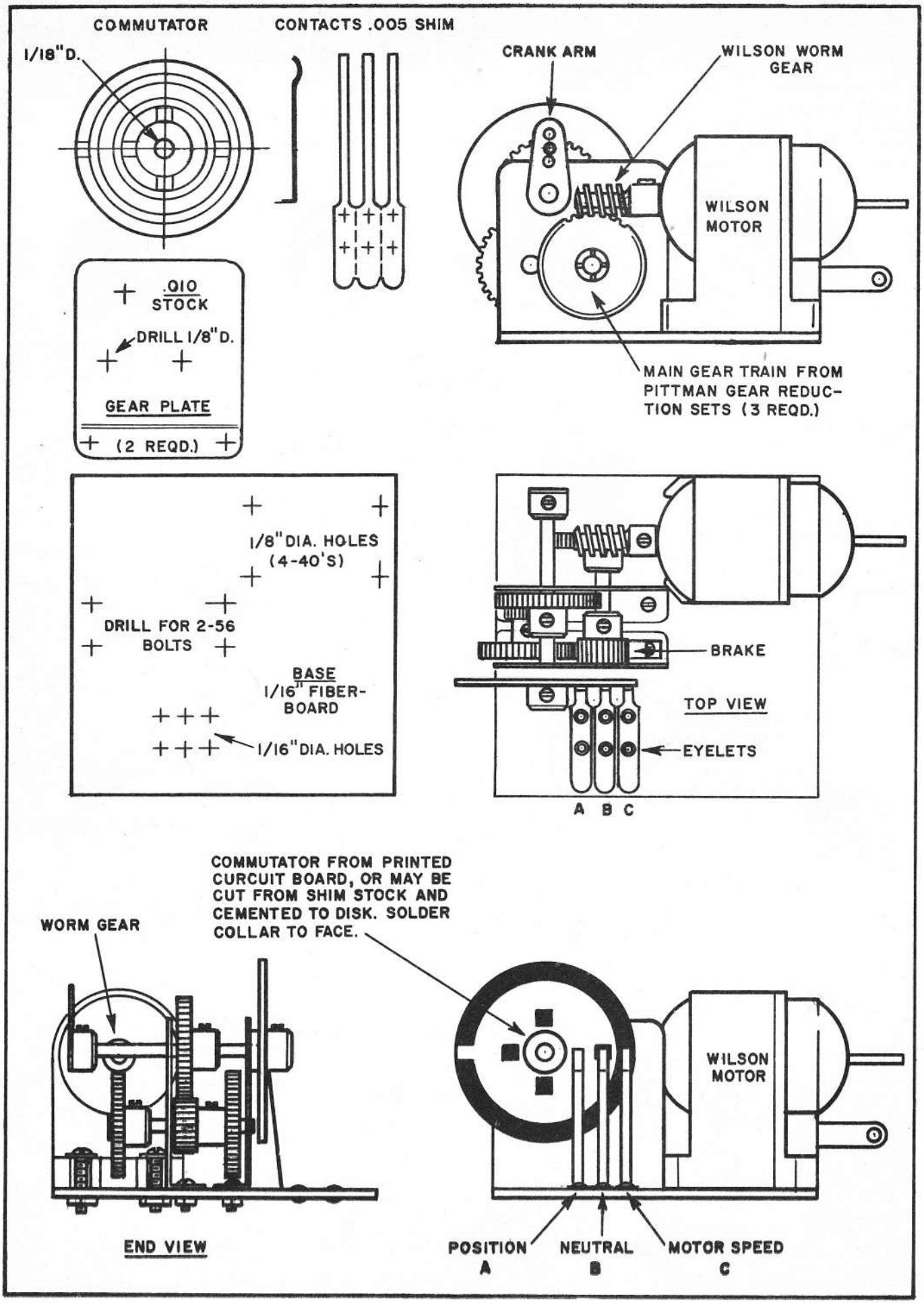
NOTE:
ALL SPUR GEARS & SHAFTS FROM "PITTMAN" REDUCTION UNITS.



SCHEMATIC WIRING DIAGRAM



DESIGNED AND DRAWN BY - E. G. THOMAS


COMMUTATOR
CONTACTS .005 SHIM
1/18"D.
.010 STOCK
DRILL 1/8"D.
GEAR PLATE
(2 REQD.)
CRANK ARM
WILSON WORM GEAR
WILSON MOTOR
MAIN GEAR TRAIN FROM PITTMAN GEAR REDUCTION SETS (3 REQD.)
1/8"DIA. HOLES (4-40'S)
DRILL FOR 2-56 BOLTS
BASE 1/16" FIBER-BOARD
1/16"DIA. HOLES
BRAKE
TOP VIEW
EYELETS
A B C
COMMUTATOR FROM PRINTED CURCUIT BOARD, OR MAY BE CUT FROM SHIM STOCK AND CEMENTED TO DISK. SOLDER COLLAR TO FACE.
WORM GEAR
END VIEW
WILSON MOTOR
POSITION A
NEUTRAL B
MOTOR SPEED C

R/C SERVO

(*Continued from Page* 14)

out the tin stock gear plates and drill all holes before bending. Two of these are required, and should be bent opposite to each other. When doing so, check to see that the shaft holes are lined up and not in the wrong position.

The commutator disk was made as a printed circuit. If you do not have these facilities available, cement a sheet of thin shim stock to a fiber disk and scribe using the pattern given, removing the dead spots as indicated. A brass collar is soldered to the center of the disk as shown.

All gears used are easily obtainable at your local hobby shop. The Pittman gear reduction units come with shafts which can easily be cut to the proper length. The gear train should be mounted first. Before securing bolts, check to see that all gears are running smoothly. The motor should be mounted next loosely again, turn the shaft by hand to assure free running gears. After the motor and gear assembly are properly aligned and all rough spots taken out, secure tightly.

Use a battery to run the unit as a whole. If the unit does not run smoothly correct this now as it will be more difficult to do so once the wiper arms are mounted. The crank arm is cut from tin can stock and soldered to a collar as shown, and can be mounted along with the commutator disk and aligned in the proper position.

With the commutator mounted, the contact arm pattern should be traced onto a sheet of beryllium copper and cut out as a unit, drill six 1/16" diameter holes for rivets or eyelets of the same size. Bend the ends of the arms to the proper radius over a piece of 1/8" rod. Bend the mounting tabs to a 30° angle, which should give the proper tension to the arms when mounted. Position the contact arms in their proper relation to the commutator disk, which should be set in the auto neutral position, as shown on the diagram.

Clamp the contacts in place, and drill through the holes previously made in the copper. Secure with small rivets or eyelets. A tight fit is highly desirable here, as loose contacts will short out on the commutator plate and cause the servo to rotate continuously. Take your time here, do it right the first time. If the wiper arm contacts need any adjustments, they should be done with a pair of needle nose pliers. Grasp the contact at the base where it will do the most good, bending elsewhere will result in an unsightly bent mess and make further adjustments more difficult.

After the arms have been mounted, they are slit apart with a jewelers saw. Avoid leaving any filings between slots which might short out contacts. Using the same care, solder all wires in place as shown in the schematic. This should prove to be suited to most receivers. The miniature plugs shown in the photos were cut from ceramic multi-prong connectors which are available in most surplus stores. A similar plug is made for hearing aid use and should not be too hard to obtain.

Set up a test stand before mounting in model and check out the unit using your transmitter, this will give you a chance to become accustomed to the pulsing rate and give you a chance to debug the entire system before final mounting. A brake may be necessary if you find your servo skipping. Before going into this, check the wipers for misalignment or shorts. A brake of sorts is shown on the see-thru drawing and is easy to make.