



IMPROVED R. C. RECEIVER

THE author has several times tried to construct a Good Brothers type radio control receiver, using a standard Sigma 4F relay instead of the special polarized relay which comes with the set as it is purchased. The results have always been very disappointing. This set is designed to work with a relay which operates with around 1/2 ma. plate current change, and such relays are not readily available on the market. However, after analysis of the circuit and some serious contemplation, a modification was theorized which makes this set operate a standard Sigma relay, and gets the set away from the "criticalness" which has always characterized it. In the author's opinion, this new setup is one of the simplest to construct and adjust of any known at this time.

The modification consists simply of coupling the second half (B) of the 3A5 tube to the super-regenerative stage (A) in such a manner that in the absence of signal, 3A5-B draws moderate current, on about 2 ma. at 67-1/2 volts plate supply. This current drops to zero when a signal is transmitted.

The circuit is illustrated herewith, and operation is as follows: the 3A5-A works as a normal self-quenched super-regenerative detector. When it is in the super-regenerating condition, there is a certain amount of R.F. energy present in the tank circuit. This R.F. energy is coupled to the grid 3A5-B by means of the 100 mmf. condenser, and because the grid and filament of this second half act as a rectifier, a negative grid voltage is developed across resistor R_2 . The R.F. choke is necessary to prevent short circuiting of the R.F. energy to ground through the .005 mf. condenser.

When a signal is received, it adds a small amount of energy into the tank circuit of the 3A5-A. This energy is amplified through the feedback action of this tube until it becomes a large value. This increased amplitude signal is presented to the grid of 3A5-B, causing the bias on this half to increase and its plate current to drop to zero.

In operation then, 3A5-A is caused to super-regenerate by adjusting the grid resistor R_3 and also by having the correct

connections to the quench coil. (A pair of earphones clipped across the resistance R_1 will make the hiss audible; if no hiss is heard, either the primary connections or the secondary connections to the quench coil—but not both—should be reversed.) With the values of components shown in the diagram, the grid resistance R_3 should be varied until the relay in the plate circuit of 3A5-B just closes. This means that with the normal amount of R.F. energy present in the tank circuit, only a small amount of bias is being developed in the grid circuit of the second half of the tube (1/2 volt across R_2 , as measured with a 10,000 ohm-per-volt meter).

Now if a signal is tuned in, the additional energy will cause the grid bias of 3A5-B to rise to about 4 volts, which is enough to cause the tube to "cut off" and the relay to open. The author found that if the relay (Sigma 4F) was adjusted to pull in at about 1-1/2 ma., and to drop out at a 1/4 ma. roughly, it needed no readjustment when placed in the circuit. The armatures should be free and not sticky, and the gap small, for it to operate under these conditions.

Once the set is constructed and thus adjusted, almost any length antenna may be used as long as it is not resonant, which would cause the first half of the tube to cease operation. The set is not the least bit critical and no body effects have been noticed. Long leads have no effect, nor do variations in the supply voltages. Four things might be remembered to make operation easy:

1. Listen for the super-regenerative hiss with earphones across R_1 ; reverse connections to the quench coil (one side only) if the hiss is not heard.
2. Keep the two halves of the high frequency tuning coil close together and make connection to the outer end of each with the plate and grid.
3. Adjust the grid resistor R_3 to a value which causes the relay to close. Listen to be sure that the set is still super-regenerating when this occurs.

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4. Change R_2 to a larger value, if the relay does not open with signal. However, if a meter is placed in the plate battery lead, and a current change of 2 ma. is observed, do not change R_2 ; but instead, adjust the relay both in gap and spring tension until it operates with this change.

The R.F. choke used may be any good high frequency choke, or a winding consisting of about 35 turns of No. 30 cotton covered wire scramble wound on a small 10 meg. resistor, the ends of the winding connected to the ends of the resistor.

For the quench coil, the unit from a *Beacon Electronics* receiver works very well. Also, it is possible to use two 5 mh. single-pie chokes with the windings set very close together. For those who have the necessary measuring equipment, it was found that a .127 mh. coil for the secondary and .038 mh. for the primary are about optimum. Manufactured quench coils, available from most amateur radio supply houses, should also do the job nicely.
