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The 45A Transmitter

THE COLLINS RADIO COMPANY has had an excellent opportunity to determine what features are most desirable in a general purpose, small sized transmitter. Requirements of amateurs, commercial organizations, governments, etc., have been studied during the past several years and hundreds of transmitters of various types have been built. At first, it did not seem possible to meet, in a single model, the needs of every kind of user, but an extensive engineering development program was undertaken to see what could be accomplished. The 45A transmitter was designed as a result of this work and it was found possible to incorporate features which make it desirable for almost every kind of service.

The first design factor to be considered by the transmitter engineer is the amount of power to be delivered by the set to the antenna. A radiophone output of 30 to 50 watts was decided upon as the maximum which could be obtained in a general purpose transmitter without exceeding limitations of cost, size and power consumption. The rated output of the 45A is 40 watts telephone, 125 watts telegraph. On tests, these sets show actual outputs of 50 watts telephone, 160 watts telegraph, with excellent over-all efficiencies. The type of modulation employed permits the full tube and power supply capacity to be used effectively on both telegraph and telephone, and, accordingly, the telegraph output is very unusual for a transmitter of this size.

Its extreme compactness permits the 45A to be "installed" by merely placing it on the operating table beside the usual communications-type receiver, where it occupies only slightly more space than the latter. Every component is self-contained except the microphone, the telegraph key and the leads to the 110 volt outlet and the antenna. The control switches are on the transmitter panel at the operator's finger tips. The cabinet construction of the 45A is adapted from aircraft transmitter design, and circuit components are located systematically to assure efficient operation and complete freedom from interaction. Perforations in the sides, rear and bottom provide adequate ventilation and give a pleasing appearance similar to that of high-power transmitters. The tubes and frequency shift units are inserted through the hinged top, which is fitted with a power interlock to remove high voltages when the top is opened. The cabinet is fitted with special heavy rubber feet which protect the surface on which the transmitter rests. These feet may be replaced with aircraft-type vibration-damping mountings when the transmitter is installed in a motor car or truck. The cabinet itself is constructed of first grade auto-body steel, which is heavily copper plated as a protection against corrosion in tropical climates or on shipboard and to give good electrical conductivity. The plated metal is finished on the outside with crystalline baked enamel and on the inside with aluminum lacquer.

One of the most interesting features of the 45A is the new unit type frequency shift which allows the set to be operated instantly on any predetermined frequency up to 30 megacycles. The frequency shift unit consists of a small aluminum case containing not only the pre-tuned excitation tank circuits but also the crystal for each frequency on which it is desired to operate. This unit and the output tank coil are plugged into the transmitter through the hinged top, one frequency shift unit and one output tank coil being used for each frequency. The only tuning controls on the panel are the grid and plate condensers in the final amplifier, and their calibrated positions are shown on a card attached to the top of the frequency shift unit. The operation of changing from one frequency to another occupies less than 10 seconds, including the time required to set the two tuning condensers. The frequency shift unit is normally tuned and locked at the factory, although the user may change crystals and adjust the excitation tank circuits while the frequency shift unit is in the set. However, the frequency shift units are low in cost, and for convenience it is desirable to have a separate unit for each crystal so that the excitation tuning may be locked.

A considerable amount of time has been spent in the design of this method of changing frequencies. An alternative arrangement which was tried and discarded involved the use of a panel control to change from one band to another. This system was not adopted because only three or four bands could be covered, and it was not possible to add new channels after the set was placed in use. The unit type frequency shift system allows the set to be used on any number of bands on any frequency whatever between 1.5 megacycles and 30 megacycles, and, in fact, frequency shift units can be supplied on special order for frequencies as low as 600 kilocycles. All of the advantages of plug-in coils are obtained without the annoyance incident to inserting a multitude of coils and crystals and retuning all of their circuits whenever the frequency is changed.

Amateurs who are primarily interested in CW operation can obtain the frequency shift units fitted with a type 294 Variable Air-gap Holder so arranged that the air gap can be readily adjusted to vary the frequency over a range of several kilocycles. This makes it possible to move the frequency of the transmitter to avoid an interfering signal. This method of adjusting frequency is also very useful on the 14 mc. phone band during conditions of severe interference.

The radio frequency tube lineup is very interesting and bears consideration in connection with the frequency shift method just described. The Collins C-100 oscillator tube was developed specifically for use in crystal controlled transmitters. This tube has a special type of control element which reduces the crystal current and contributes toward very per-