PACKAGED SELECTIVITY

GENERAL INFORMATION

There are clear channels on today's crowded amateur bands even though you may not find them easily with your present communications receiver. Try tuning one of the new high-selectivity amateur receivers across a popular band and several clear channels usually will be found.

It is now possible to add this new order of selectivity to your present receiver—which otherwise may be quite satisfactory—by constructing a simple mechanical filter adapter unit that is substituted for the first 455-kilocycle intermediate-frequency amplifier tube (or the IF tube) without making any under-chassis changes in the receiver. Simply connect the adapter to a power source, remove an IF amplifier tube, and insert two short coaxial cables into the tube socket, as shown in Fig. 1. These cables carry the IF signal to and from the adapter, which may then be tucked away in an unoccupied corner of your receiver cabinet. An adapter that plugs directly into the tube socket could be constructed, but the available space is very restricted in many receivers.

The primary design and construction consideration of this adapter is to completely isolate the input and output circuits. Any stray coupling can cause signal leakage around the filter unit, thus impairing its effectiveness. For this reason, we recommend that the adapter be constructed as described.

Many modern medium-priced and older high-priced communications receivers now in general use are convenient to operate, have good frequency stability and sensitivity, but lack the necessary "skirt" selectivity to sufficiently reject strong signals that are only a few kilocycles higher or lower in frequency from a desired signal. The shaded area of curve "A" in Fig. 2 shows the typical selectivity characteristic of several popular medium-priced communications receivers. Although the peak, or "nose" of this curve is usually only a few kilocycles wide, the "skirt" selectivity 60 decibels down from the peak may be from 15 to 30 kilocycles broad! Small wonder that strong local signals a few kilocycles up the band from a station you are trying to copy may sometimes paralyze your receiver!

Incidentally, the curves at "A" are the bandwidth figures for a receiver with the selectivity control set for the sharpest bandwidth that does not utilize the crystal filter, if the receiver has one. Switching in the crystal filter will greatly sharpen the "nose" of the selectivity curve, but the width of the "skirts" may not be materially reduced.

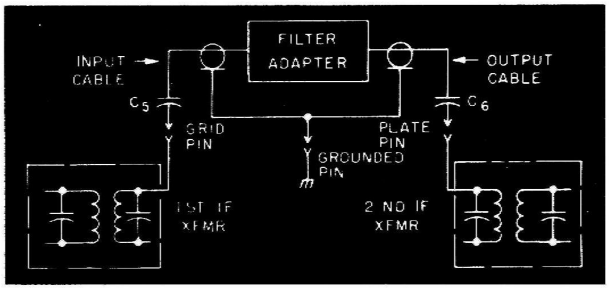

Fig. 1. Diagram showing how the mechanical filter adapter is connected to the first IF tube socket in the receiver.

When the "PACKAGED SELECTIVITY" adapter is installed in a receiver of this type, the crystal filter can then be utilized to reject, or "notch out" any heterodyne-type interference that may fall within the bandpass of the mechanical filter. Or, a "Q" multiplier may be connected into the receiver for this purpose. The mechanical filter has none of the characteristic "ringing" sound that sometimes results when a crystal filter is adjusted to produce an extremely sharp selectivity peak response curve. And lastly, the random noise output from the receiver will be reduced.

SELECTIVITY SYSTEMS

There are two systems generally used to obtain a bandpass characteristic that approaches the "ideal" communications receiver selectivity curve for voice-modulated signals, shown at "B" in Fig. 2. One system is the "packaged filter," including the mechanical filter as used in this adapter circuit, the crystal lattice filter, and certain toroidally-wound inductive filters. A good crystal lattice filter usually must be assembled from carefully matched war-surplus quartz crystals in this frequency range, while the toroidal filter operates at a lower frequency and requires a more complex frequency conversion adapter circuit.

The second method is to utilize a string of high "Q" circuits in the receiver's IF amplifier that are tuned to achieve the desired bandpass. This system can be space consuming, difficult to adjust and fairly expensive if quality components are employed.

Of the three packaged filters, the mechanical type has certain advantages. It is very compact, readily available in a variety of bandwidths, has an excellent selectivity curve, and is roughly equivalent in cost to the other systems having comparable selectivity. Curve "C" in Fig. 2 illustrates the selectivity of the 3.1-kilo-

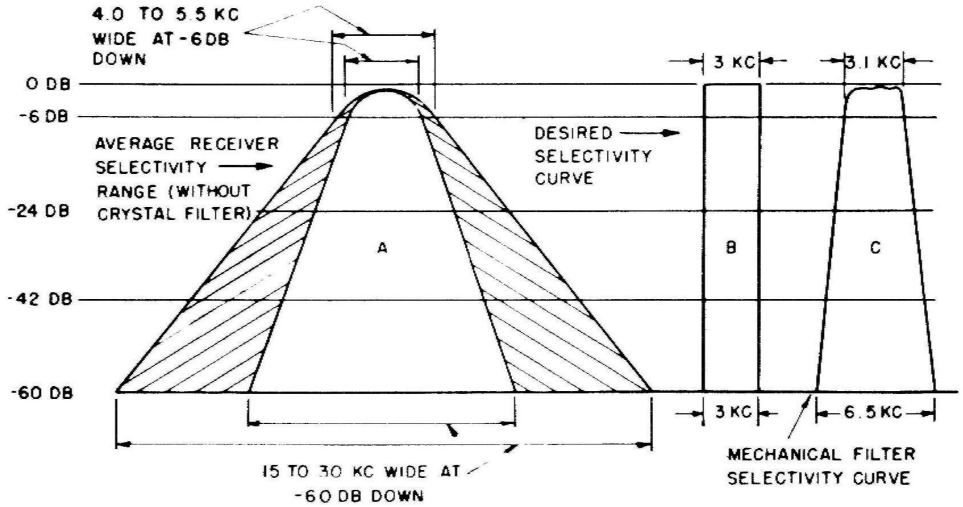

Fig. 2. Bandwidth curves showing: A—selectivity range of most medium-priced single-conversion receivers with crystal filter out of circuit; B—ideal selectivity curve for voice reception; and C—selectivity curve of a 455-kilocycle mechanical filter with a 3.1-kilocycle bandwidth.