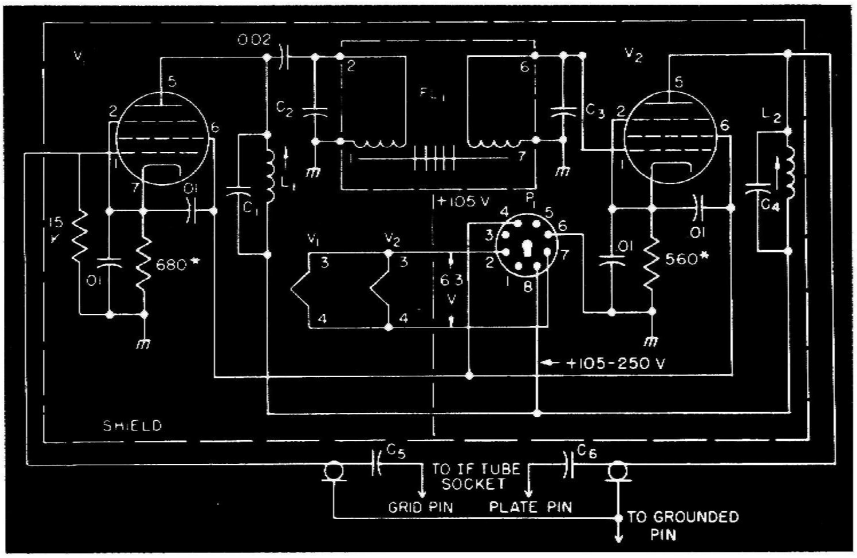

Fig. 3. Schematic diagram of the mechanical filter adapter.

PARTS LIST

C_1, C_4—600-mmf ceramic (270- and 330-mmf in parallel).

C_2, C_3—120-mmf ceramic.

C_5, C_6—10-mmf tubular ceramic (Aerovox Type CI-1 or Erie Type 315).

FL_1—455-kilocycle mechanical filter with 3.1-kilocycle bandwidth and 9-pin miniature plug-in base (Collins 455J-31).

L_1, L_2—200-uh iron slug-tuned coil (Grayburne or Superex Vari-loopstick Model VL, or Miller No. 6300).

P_1—male octal plug with retaining ring (Amphenol 86-PM-8).

V_1, V_2—6BA6 or 6BJ6 tubes.

cycle mechanical filter bandwidth suitable for AM and SSB reception. Compare this curve with "A," which is drawn to the same scale!

A mechanical filter is, as the name implies, a series of vibrating, mechanically resonant, disks tied together with small rods that transmit the vibrations from disk to disk. Small inductances coupled to the disks at both ends convert the electrical energy passing through them into mechanical vibrations at the input end and back into electrical energy at the output end. Each disk has a "Q" 20 times as high as an ordinary tuned circuit, so that several disks of slightly different resonant frequencies must be coupled together to achieve a nearly rectangular bandpass response curve.[1]

Since the filter characteristic determines the over-all intermediate frequency bandwidth, any other tuned circuits in the intermediate-frequency amplifier may utilize a low-cost, readily available coil, such as the vari-loopstick, instead of more expensive IF coupling transformers.

The adapter model pictured on the cover was assembled from parts that cost about five dollars (plus $45.00 for the Collins F-455J-31 filter). W2FZW, designer of the adapter, was so pleased with his station receiver's new-found selectivity (formerly about 30 kilocycles broad at the −60-db points) after testing the adapter that he promptly added "A4" to the receiver's model number!

Receivers with an intermediate-frequency amplifier on 465 kilocycles (mostly found in pre-World War II receivers) must be re-aligned to the 455-kilocycle center frequency of the mechanical filter, otherwise very little signal will be heard when the adapter is added. This change in the intermediate frequency will render the crystal filter practically inoperative unless a 455-kilocycle filter crystal is substituted for the original.

The adapter picks up the signal from the control grid of the receiver's first IF amplifier tube socket through coupling capacitor C_5, then feeds it to the grid of a pentode tube, V_1, in the adapter unit, as shown in the schematic diagram, Fig. 3. The plate circuit of V_1 is capacity-coupled to the input terminals on the mechanical filter to keep plate current from flowing through this coil. A much wider signal voltage range can be handled by the filter without distortion when no current flows through the coils. Both filter coils are tuned to resonance at the operating frequency by fixed capacitors C_2 and C_3.

[1]A comprehensive discussion of mechanical filters may be found in the following articles: *QST* magazine, "Mechanical Bandpass Filters for IF Ranges," February, 1955, page 22; *Proceedings of the IRE*, January, 1957, page 5; and in *Collins Application Bulletin No. 200.*

The filter output terminals are connected directly to the control grid of V_2 and the chassis, since no grid current will flow in this stage. The output signal from V_2 is again capacity coupled back into the plate terminal of the receiver's IF tube socket. The tuned circuits connected to the plates of both V_1 and V_2 are composed of vari-loopstick coils, L_1 and L_2, shunted by fixed capacitors C_1 and C_4.

The input and output coaxial cables are 16-inch lengths of RG-58/U. This cable forms the 40-mmf ground leg of a capacitor voltage divider, C_5 being the other leg, that reduces the signal voltage applied to V_1 to about ¼ of the voltage across the secondary of the receiver's first IF transformer.

The over-all signal amplification of the adapter has been held down to a few decibels more than the 10-db loss through the filter through use of small input and output coupling capacitors and fairly large cathode bias resistors in both amplifier stages. This is suitable for receivers having two or more intermediate-frequency amplifier stages, but additional gain from the adapter may be obtained by reducing the value of one or both cathode resistors to 270 ohms. This may be desirable when the adapter is operated with a receiver having only one intermediate frequency amplifier stage. The capacity ratio in the input voltage divider may be reduced by shortening the input cable, or increasing C_5 to 25 mmf, for a further increase in gain, but the first IF transformer in the receiver may then have to be retuned to achieve maximum signal.

Power was brought into this unit through a male octal chassis plug, but a three- or four-wire cable may be substituted. The pin connections were made as shown so that this adapter could be plugged directly into the "NBFM" adapter socket on certain National receiver models. Most communications receivers have an accessory power socket on the rear of the chassis from which power may be obtained. If 6BJ6 tubes are used for V_1 and V_2, the power required (6.3 volts at 0.3 amperes, and 105 to 250 volts at 10 ma) may be

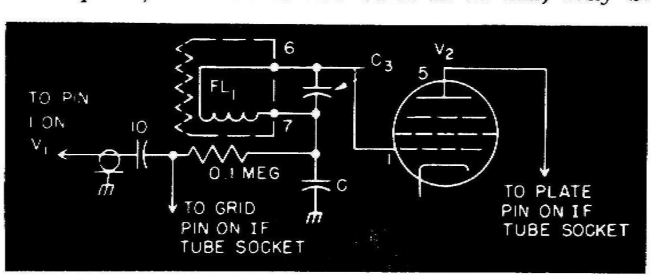

Fig. 4. Alternate output coupling and optional AVC connections in the adapter.