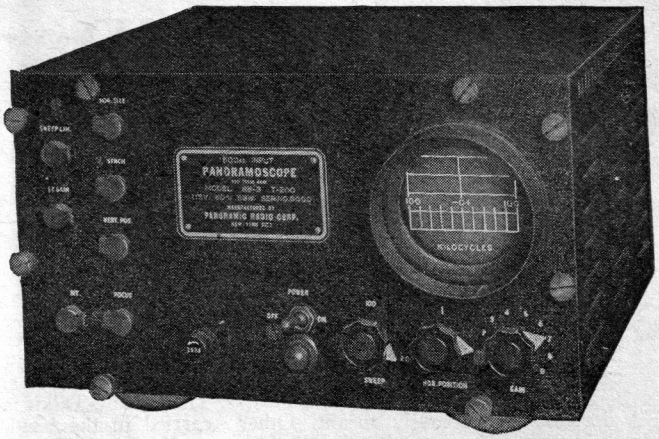
No Selectivity in This Radio

By I. QUEEN



Courtesy Panoramic Radio Corporation

The Panoramoscope uses electronic means of varying the sweep oscillator which produces the various traces on the screen.

THE importance of selectivity has been stressed in radio texts and periodicals since the earliest days. Even sensitivity is sometimes considered of little value unless adequate selectivity exists. Now we are confronted with a receiver which makes use of absolutely no selectivity at all! Such a receiver promises to revolutionize radio, since it makes possible reception from all transmitters within a given band, each affecting the receiver equally and simultaneously.

This radio system has been in operation for several years and has given an excellent account of itself as a war weapon. The panoramic radio also offers powerful possibilities in peace-time communications, amateur, broadcast, aircraft and research fields. Briefly, it is a method which permits visual monitoring of all radio energy within range of a radio antenna, covering a desired band of frequencies.

Each transmitter produces a line on an oscilloscope, its position indicating the frequency, its height showing intensity and its width denoting whether it is being modulated. It is also possible to tell whether code is being transmitted and sometimes to read it directly. An entire band may be instantaneously monitored, thus making it possible for Signal Corps personnel to detect enemy transmissions, for aircraft to determine position, for radio amateurs to pick up a "CQ" or an answer thereto, for research workers for determining field intensity, and for the short-wave listener in seeking new stations.

Fig. 1 shows a basic form of panoramic superheterodyne. The stages are, in order, an oscillator-detector, I.F. second detector and an A.F. stage feeding into a speaker. Oscillator and input circuits are ganged as usual. In addition to A and B, the usual tuning capacitances, additional shunting circuits are included (by closing the DPST switch). Each of these is composed of a normally fixed (manually operated) condenser and a rotating condenser turning with motor M. The ratio of one to the other determines the change in capacitance (band width) as the motor turns over.

When the motor is turned on, the receiver rapidly and continuously sweeps the band. On the same shaft is mounted a commutator wheel contacted by a brush. Half of the commutator W is insulated, the other half conducting. When insulated from ground, condenser C charges gradually from the high-voltage source of the set. When the commutator rotates, allowing the brush to contact the conducting portion, C is grounded and discharges abruptly through a low resistance. The condenser voltage connects directly to the horizontal plates of the oscilloscope, deflecting the beam accordingly.

Timing is adjusted so that when the commutator is just changing from the conducting to insulated portion at the brush, maximum capacitance is obtained on the rotating condenser. Therefore, as C starts to charge, the receiver is tuned to its lowest frequency. As the beam travels to the right the frequency rises, until the entire band is scanned. If energy is received at any point, the beam will be deflected upwards at that point, its amplitude determined by the intensity. Fig. 2 shows relationship between angular displacement of the condenser and the deflection voltage.

A typical pattern is illustrated in Fig. 3. The width of the received band is under the control of the operator. He can either change the ratio of capacitances (fixed to variable) in the shunt circuits across A and B so that the band has less or more width,

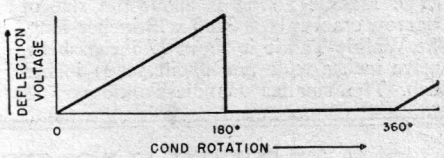


Fig. 2—Condenser rotation vs. deflection.

or he can increase the sweep voltage on the oscilloscope.

The sweep may also be varied by electronic means, as is done in the Panoramic receiver illustrated at the top of the page. In such cases the sweep technique is the same as that used to swing the frequency in FM, oscillator and reactance tubes shifting the signal across a range of frequencies, producing results similar to those of the rotating-condenser method just described. The Panoramic receiver uses a 30-cycle sweep,

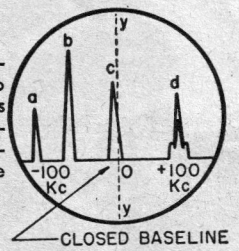


Fig. 3 — Typical pattern. Peaks a and b are constant carriers or slowly-keyed stations, c is rapid keying and d is a phone broadcast station.

much faster than that afforded by mechanical devices. Electronic sweep is especially adapted to apparatus designed to cover a comparatively narrow frequency band intensively.

An interesting possibility includes means to displace the pattern on the screen so that the frequency received on the speaker always corresponds to that appearing at the center of the screen. This may be done as in Fig. 4. Here two channels are shown: a video channel which produces the image, and an audio channel for listening. If condensers 1 and 1a are ganged correctly, the audio signal heard will be the same as the one seen on the center axis Y (Fig. 3). As a check on this, the regeneration may be turned up to cause a whistle on the received frequency. This shows up on the screen as an added disturbance on the visual peak.

(Continued on page 598)

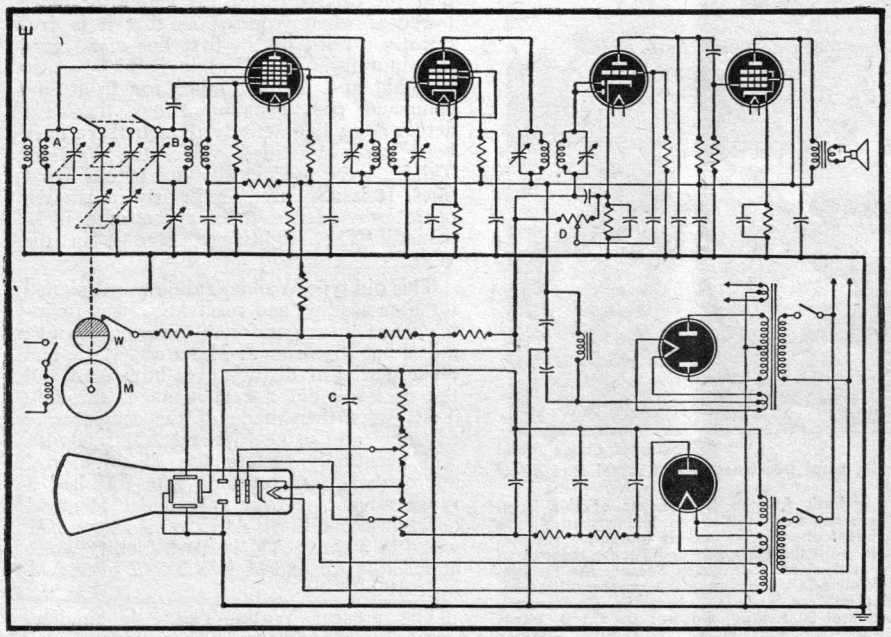


Fig. 1—Schematic of system which depends on mechanically varying the oscillator capacitor.

NO SELECTIVITY IN THIS RADIO

(Continued from page 555)

Panoramic radio offers a unique and accurate means of direction finding. By connecting the oscilloscope and direction-finding antenna to rotate simultaneously (Fig. 5) instantaneous bearings may be taken on a number of stations.

The cardioid characteristic of these antennae is taken advantage of. Their sensitivity is maximum in one direction, nil in the opposite direction, intermediate in all others. The series of figures shows the result of manipulating the loop (and scope). As an example, imagine four stations within range, one located at each cardinal point of the compass (Fig. 6). Note that a null point is secured on the East station in the west direction only, and likewise for the others. The operator need only rotate the control until such a null is seen, whence the direction of the signal is identified.

Such a system operated on broadcast frequencies would give means for continuous position finding, no matter how fast the aircraft is traveling. The changing height of the curve would also show when the aircraft is approaching, when receding and when it is directly over the transmitter.

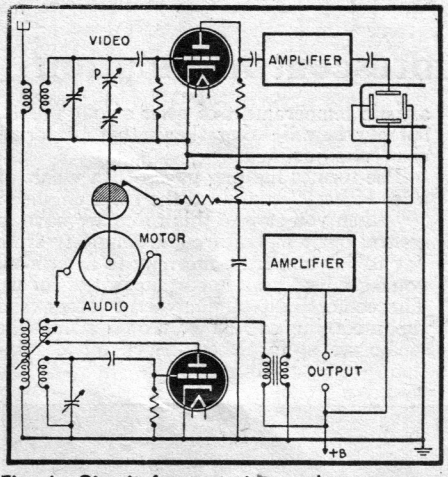


Fig. 4—Circuit for centering peak on screen.

OTHER APPLICATIONS

For research work such as in experimenting with directional antennae, the Panoramic gives a quick indication of field strength at any location in comparison with any number of transmitters. The Panoramic will give one solution to the interference problem on the amateur bands. No more need for long-winded "CQ's." Just let the other fellow "break-in" and the QSO is joined. If a change of frequency is necessitated you can follow him as his signal creeps to a vacant spot, and such spots will be easy to find.

Right now, of course, the war use of Panoramic is all-important. Take an actual occurrence at Anzio, where the Nazis were employing clever tactics to get their messages through secretly. During any given message, they changed frequency several times, their own receivers being automatically controlled to make the same changes simultaneously.

Unknown to the enemy, our Signal Corps had Panoramic-equipped receivers on the scene. During a critical phase of the battle, an important message was pieced together by rapidly changing frequency to conform with the changing pattern on the Panoramic screen. Our big guns promptly opened up on the newly-formed Nazi wedge, temporarily sending many of the enemy closer to Heaven than Nazis usually get.

Some amateur communications receivers are manufactured with panoramic circuits already installed. For others adapters are made, which have successfully been made to be connected to existing receivers on the various fronts. These use 3" oscilloscope screens and various models are available for different intermediate frequencies and maximum sweepwidths.

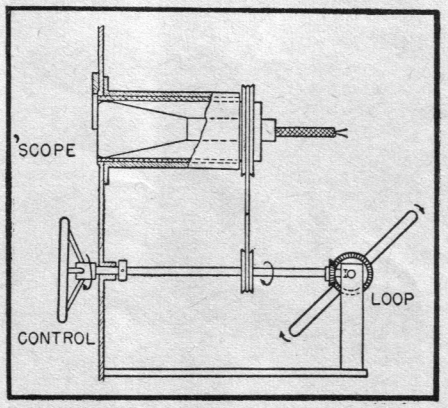
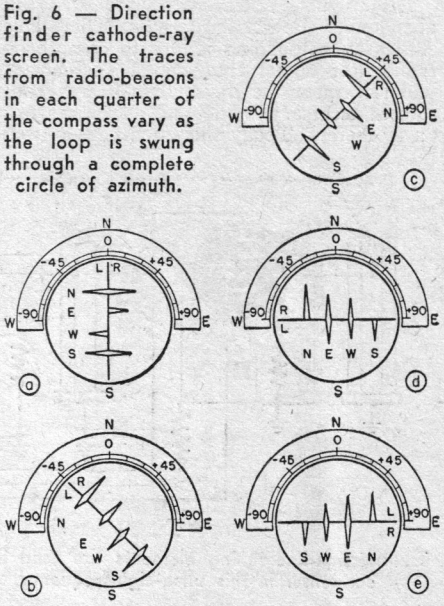


Fig. 5—A panoramic direction finder set-up.

Fig. 6 — Direction finder cathode-ray screen. The traces from radio-beacons in each quarter of the compass vary as the loop is swung through a complete circle of azimuth.



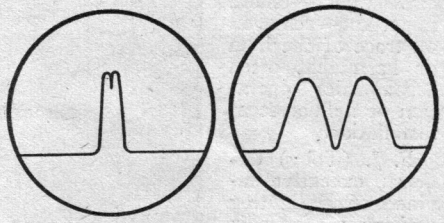


Fig. 7—Two signals separated by 3 Kc. on a wide-band apparatus (E) and narrow-band (F). Instruments covering a wide frequency range cannot separate close-together stations. As bandwidth is decreased, resolution increases.