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OSCILLATOR-MONITOR

Phone—CW Monitor and Code Practice Oscillator for Novice or Oldtimer

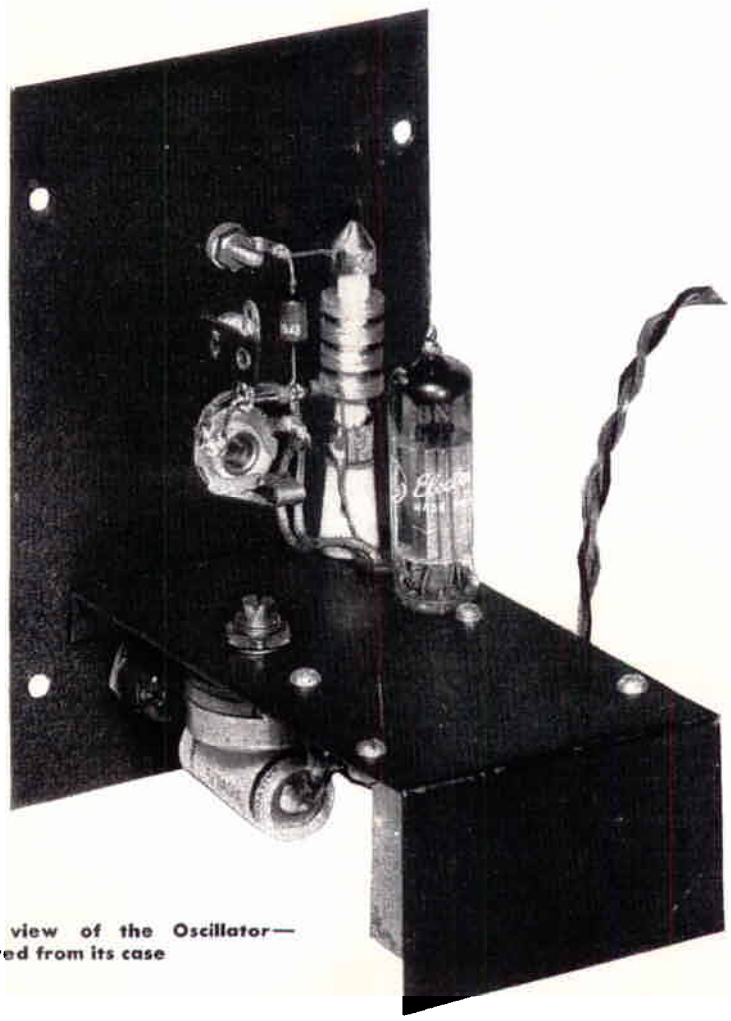

Fig. 1. Rear view of the Oscillator—Monitor removed from its case

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OSCILLATOR-MONITOR

This monitor enables the c.w. operator to hear his own keying, and it allows the 'phone operator to constantly listen to his modulated signal. Also, this device can serve as an audio oscillator, which may be used for code practice work or for m.c.w. operation. This Oscillator-Monitor would be especially useful to the beginning amateur, as it could be used for code practice work in the beginning, and serve as either a 'phone or c.w. monitor after the station was built and on the air.

ELECTRICAL DETAILS

With reference to the circuit diagram, Fig. 2, it will be seen that a single 6BN6 tube is employed. This tube is a 7-pin miniature tube of recent design, and is known as a gated-beam tube. While similar in appearance to regular receiving tubes, the 6BN6 is actually a new species of tube, with several interesting characteristics. For example, this tube is capable of cutting off its own plate current with its own self bias.

In the Oscillator-Monitor circuit the 6BN6 is used in this manner. A portion of the tube operates as an audio oscillator. Another section of the tube is triggered by an incoming r.f. signal so as to allow the audio frequency note to pass through the tube to the output circuit. This action provides monitoring action for c.w. operators. For use as a code-practice oscillator, the keying circuit triggers the tube, rather than the r.f. signal, and again the output circuit receives the audio tone. For 'phone work, the oscillator section is put out of action, and the tube acts as an audio amplifier.

Refer again to Fig. 2. When switch S is open, and no r.f. signal is present on grid 3, the following occurs. Grid 2 is supplied with approximately 80 volts through the transformer, T. The resulting current flows through the cathode bias resistor R_3, and the voltage drop across this resistor is a bias sufficient to stop the plate current flow. The bias on grid 1 is adjusted, by means of R_3, until grid 1 and grid 2 form a negative transconductance oscillator. The exact frequency is determined by the constants of T, C_2, C_3 and R_2.

Now, even though this section is oscillating, no audio output will appear in the plate circuit because the tube is supplied with cutoff bias. However, we can overcome this bias by connecting the cathode of the tube to grid 3. By placing a key between these two points the audio tone is passed on to the plate circuit and a code oscillator is formed. We can accomplish the same action and again overcome the cutoff bias by means of the r.f. signal. In this case the signal is picked up by the antenna post, is rectified by a germanium diode, and the resulting d.c. bias triggers the tube and passes the audio tone through to the plate circuit. If the r.f. signal picked up is a keyed signal, then the audio tone appearing in the output circuit is a faithful reproduction of the signal being transmitted. Note that this monitor is actuated from the r.f. signal itself, so that if you hear an audio tone, you know that the transmitter is actually on the air.

For 'phone monitoring, switch S is closed, which stops the oscillation between grid 1 and 2. Now, the germanium diode, G, acts as a detector to remove the audio intelligence from a 'phone signal, and the 6BN6 acts as an audio amplifier.

CONSTRUCTIONAL DETAILS

The unit shown in the photographs contains no power supply. One could be built to use with the Oscillator-Monitor, but the power requirements are so low that most builders will want to supply power from a source already available. The voltage required is 80 to 300 volts, and the current drain is approximately 10 ma. For battery operation, 90 volts is recommended.

Referring to the photographs, the unit is built in a 4 by 5 by 6 inch utility cabinet. The one shown (ICA No. 3819) has a handy shelf attached to the front panel which serves as the chassis. Parts placement is not critical, but the layout shown is a tried and tested mechanical arrangement. As shown in Fig. 3, the antenna post, the keying jack (J_1), the output jack (J_2) and the switch are placed on the front panel. Jack J_1 is just below the antenna post.

Electrical Circuit

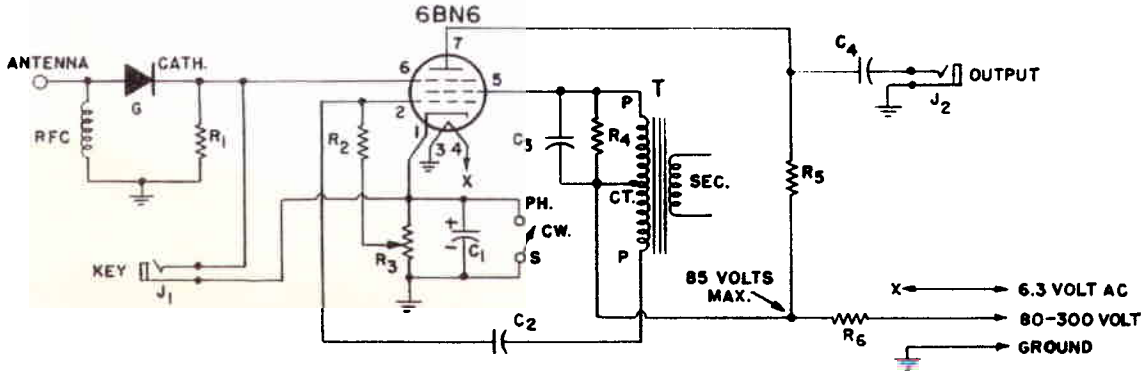

Fig. 2. Circuit diagram of the Oscillator-Monitor

The cathode bias resistor, R_3, is mounted on the chassis and is provided with a screwdriver slot for adjustment. Once this control is set no further changes are required in the setting unless another tube is used. Fig. 1 shows how the r.f. part of the circuit is mounted above the chassis. All other parts are mounted under the chassis. A hole must be provided in the rear of the cabinet to pass the three-wire power cable.

The antenna post and the keying jack must be insulated from the front panel. This may be accomplished with fiber washers. The output jack does not require insulation, but make certain that condenser C_1 connects to the ungrounded terminal of this jack.

The germanium diode, G, is connected as indicated. Most diodes are marked with a line around one end. This end is the cathode end, and should connect to R_1, as the circuit diagram indicates.

Transformer T is a standard universal output transformer. The secondary is not used. The primary is connected as indicated, using the push-pull connection, with one plate end going to pin 5, the other plate end going to C_2, and C_3 and R_4 connected from the center-tap to the plate end which connects to pin 5.

In the circuit diagram you will note that a maximum voltage of 85 volts may exist at the junction of R_5 and R_6. This is very important. If too much voltage is applied to grid 2, the tube will not operate in the intended manner, and it may be damaged. Resistor R_6 is intended to drop the voltage to approximately 80 volts when 300 volts is applied externally. If you intend to use an external source of voltage which is lower than 300 volts, then R_6 may be made smaller. For example, if you use 100 volts, R_6 could be 1500 ohms. Whatever the external voltage may be, use a value for R_6 which will reduce the voltage on the other side of R_6 to at least 85 volts, and you may go as low as 50 volts at this point if you wish.

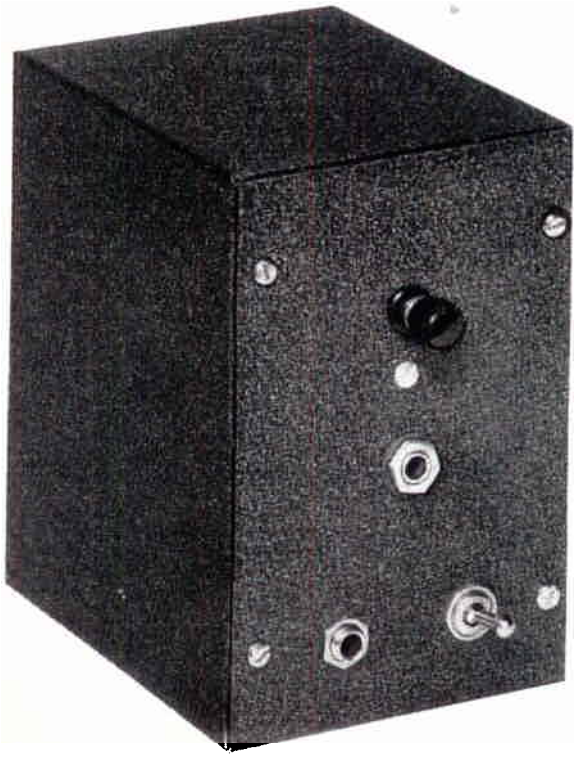

Fig. 3. Front view of the Oscillator-Monitor

CIRCUIT CONSTANTS

(All resistors and capacitors ± 20% tolerance unless specified otherwise)

C_1	10 mf 50 volt electrolytic (Sprague TA 510)
C_2	1000 mmf mica or ceramic or paper
C_3	6000 mmf mica (see text)
C_4	0.05 mf paper
G	Crystal diode (G-E 1N48)
J_1, J_2	Open-circuit phone jack
R_1, R_5	0.1 megohm, ½ watt
R_2	0.47 megohm, ½ watt
R_3	500 ohm potentiometer
R_4	33,000 ohm, ½ watt (see text)
R_6	22,000 ohm, 2 watt (see text)
RFC	2.5 mh r-f choke (Millen No. 34100)
S	SPST toggle switch
T	Universal output transformer (Stancor A-3823)