April 8, 1941. H. O. PETERSON 2,237,631

TONE KEYER WITH COMMON SOURCE OF ENERGY

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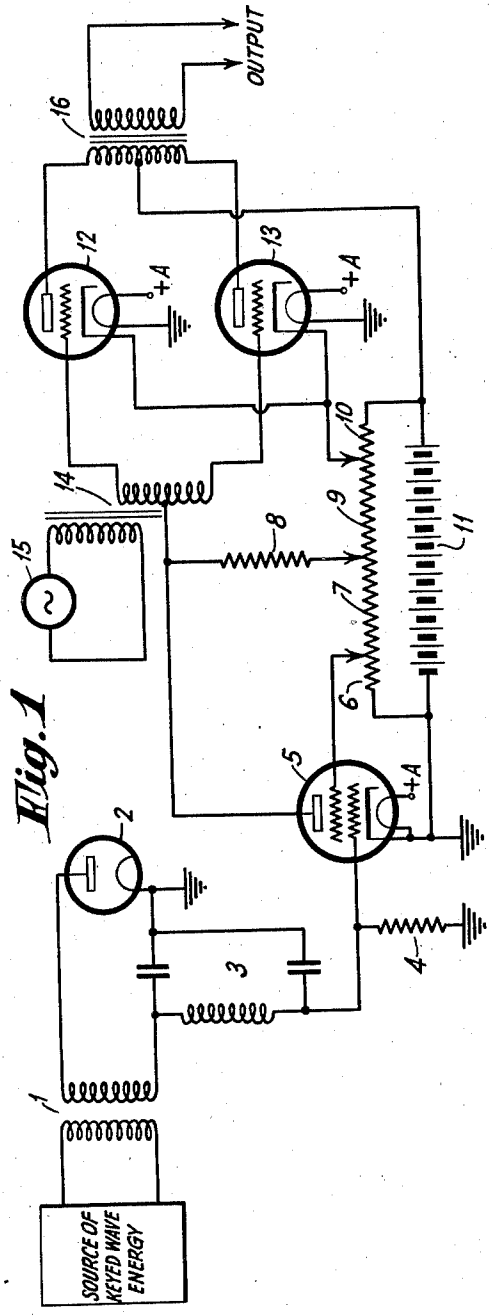



Fig. 1

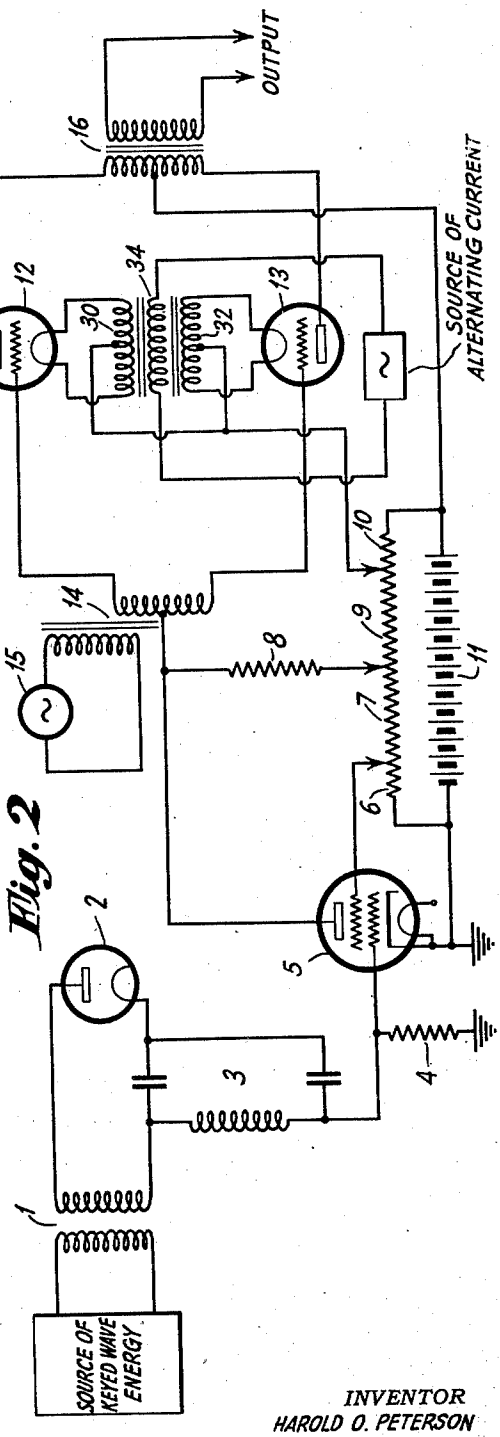



Fig. 2

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## TONE KEYER WITH COMMON SOURCE OF ENERGY

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3 Claims. (Cl. 178—66)

It is the object of this invention to describe a tone keyer of such design as to make it suitable for common battery operation. The function of a tone keyer is to act as a form of repeater on telegraphic signals. In its operation, the incoming signal is selected, amplified, and rectified. This rectified signal is then caused to control energy fed from a local oscillator into the output circuit. In the past a considerable number of tone keyers in which various voltages were supplied from isolated dry cell batteries have been used. Each receiver in a station therefore required its own set of tone keyer batteries. The tone keyer circuit herein described will operate from a common battery source such as is usually available in a large receiving station.

In describing my invention reference will be made to the attached drawing wherein—

Figure 1 illustrates one embodiment of my tone keyer arrangement by means of which a plurality of tone keyers similar to the one shown may be energized by a single common source of potential; while

Figure 2 illustrates a modification of the arrangement of Figure 1.

In Figure 1 the final stage utilizes tubes of the indirectly heated cathode type in order that the cathodes may be readily raised above ground potential. The modification in Figure 2 is the same as the modification in Figure 1 except that directly heated cathodes or filaments are used in the arrangement of Figure 2, the filaments or cathodes being heated by way of transformer windings which may be insulated with respect to ground.

Figure 1 will be used in describing the operation of this circuit. The received signal is fed through transformer 1 into a rectifier 2, the output of which passes through filter circuit 3 and load circuit 4. Across this load circuit is connected the input side of electronic device 5. During the transmission of a mark impulse, current will flow through resistor 4 and biases electronic device 5 to cut off, in which condition no current flows through resistor 8 and, consequently, the grid to cathode bias of electronic devices 12 and 13 is equal to the IR drop in resistor 9, which is adjusted to such a value as to allow 12 and 13 to pass an output through transformer 16 in accordance with the alternating current excitation supplied from tone frequency oscillator 15. During a "space" element of signalling no rectified current flows through resistor 4, allowing plate current to be drawn by 5 through resistor 8. This produces an IR drop in resistor 8 sufficient to bias 12 and 13 to past cut off. Hence, no energy appears in the output circuit during a "space" element of signalling.

It will be noted that the biases and plate voltages for 5, 12, and 13 are all supplied by the common battery 11. The isolation of cathodes in 12 and 13 is made possible by the use of indirect heating of these cathodes, the heaters being energized by a common source of supply. It would also be possible to isolate these cathodes by using alternating current energy supplied through transformers with isolated secondaries.

The modification shown in Figure 2 is substantially similar in many respects to that shown in Figure 1 except as indicated otherwise hereinafter. In Figure 1 the tubes 12 and 13 are of the indirectly heated cathode type and the cathodes are connected to a point on the potentiometer resistance intermediate 9 and 10. In Figure 2 I have used tubes 12 and 13 of the directly heated cathode or filament type. In order that the cathodes or filaments may be raised above ground potential by being connected to the potentiometer resistance I heat the said filaments or cathodes by way of transformer secondary windings 30, and 32 which may be sufficiently insulated from primary winding 34.

Although I have shown in each modification a single tone keyer, that is, a source of keyed wave energy, a source of tone energy and means controlled by a source of keyed wave energy for interrupting flow of the tone over an outgoing channel in accordance with the keyed wave energy obviously the purpose of my invention is to permit a plurality of tone keyers as shown to be utilized and to be energized from the single source 11 and potentiometer resistance 6, 7, 8, and 10. In the sake of simplicity the several stages which are duplicates of the stages shown, have not been shown in the drawing.

I claim:

1. A tone keying system to be supplied by current from a single source of direct current which supplies other similar tone keying systems comprising, a source of wave energy of tone frequency, a pair of electron discharge tubes each having input electrodes including a control grid and cathode coupled to said source of wave energy and output electrodes including an anode coupled to a load circuit, a source of direct current, means connecting a point on said source of direct current to said anode, resistive means connecting said control grids and cathodes to different points on said

source of direct current, to bias said control grids relative to said cathodes so that said discharge systems are normally biased to permit passage of tone frequency energy from said source to said output circuit, an additional electron discharge tube having a control grid, a cathode, and an anode, a resistance connecting said control grid of said additional tube to the cathode of said additional tube to bias said control grid relative to said cathode, a potential such that said additional tube is conductive, a connection between the anode and cathode of said additional tube and said resistive means whereby current flows in said resistance when said additional tube is conductive to bias said first tubes to cut-off, means responsive to markings on keyed wave energy for increasing current flow through said last named resistance to change the bias between said grid and cathodes of said additional tube to bias said additional tube to cut off and reduce the current flow through said resistive means and thereby reduce the bias on said pair of tubes and cause the same to pass wave energy from said wave energy source to said output.

2. A tone keying system to be supplied by current from a source of direct current which supplies other similar tone keying systems comprising, a source of wave energy of tone frequency, an electron discharge tube having input electrodes including a control grid and indirectly heated cathode coupled to said source of wave energy and output electrodes including an anode coupled to a load circuit, a source of direct current, a potentiometer resistance in shunt to said source of direct current, a connection between said cathode and a point on said potentiometer resistance, resistive means connecting said control grid to a point on said potentiometer resistance to apply a potential to said control grid such that said discharge tube is biased to pass tone frequency energy from said source to said output circuit, a coupling tube having a control grid, a cathode, and an anode, means connecting the anode and cathode of said coupling tube to said resistive means so that said coupling tube draws space current through said resistive means, means connecting the control grid and cathode of said coupling tube to points on said potentiometer resistance such that said coupling tube is normally biased to pass current and produce additional bias in said resistance means to bias said electron discharge tube to cut off, and means responsive to signal markings on wave energy to produce a different bias on the control grid of said coupling tube and make said coupling tube non-conductive to thereby reduce the current flow in said resistive means and remove bias from the control grid of said discharge tube so that the latter may pass wave energy.

3. In a tone keying system to be supplied by current from a source which supplies other similar tone keying systems, a source of wave energy of tone frequency, a plurality of electron discharge tubes each having input electrodes including a control grid and cathode coupled to said source and output electrodes including an anode coupled to a load circuit, a source of direct current, a resistance in shunt to said source of direct current, resistive means connecting said control grids to a point on said first resistance, means connecting said cathodes to a different point on said first resistance, a connection between said anodes and said resistance, a coupling tube having a control grid, a cathode, and an anode, means coupling the anode of said coupling tube to said resistive means, means connecting the cathode of said coupling tube to said first resistance, a resistance connecting the control grid of said coupling tube to said first resistance, a source of keyed wave energy, and a rectifier connecting said source of keyed wave energy to said last named resistance.

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