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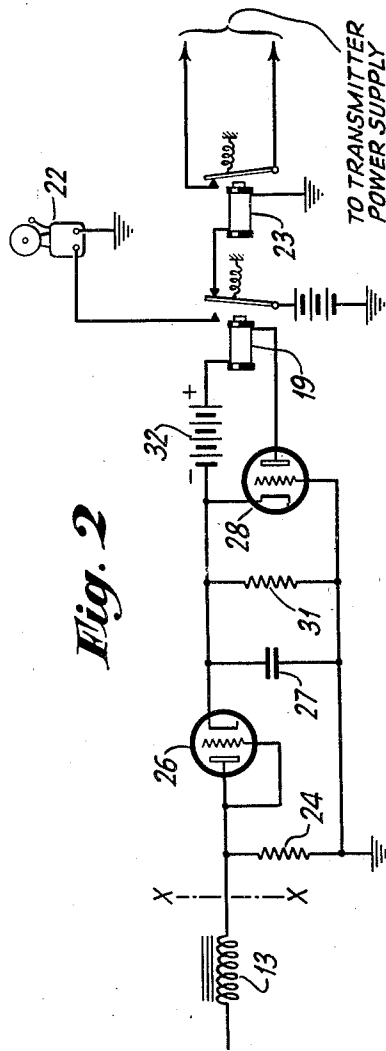
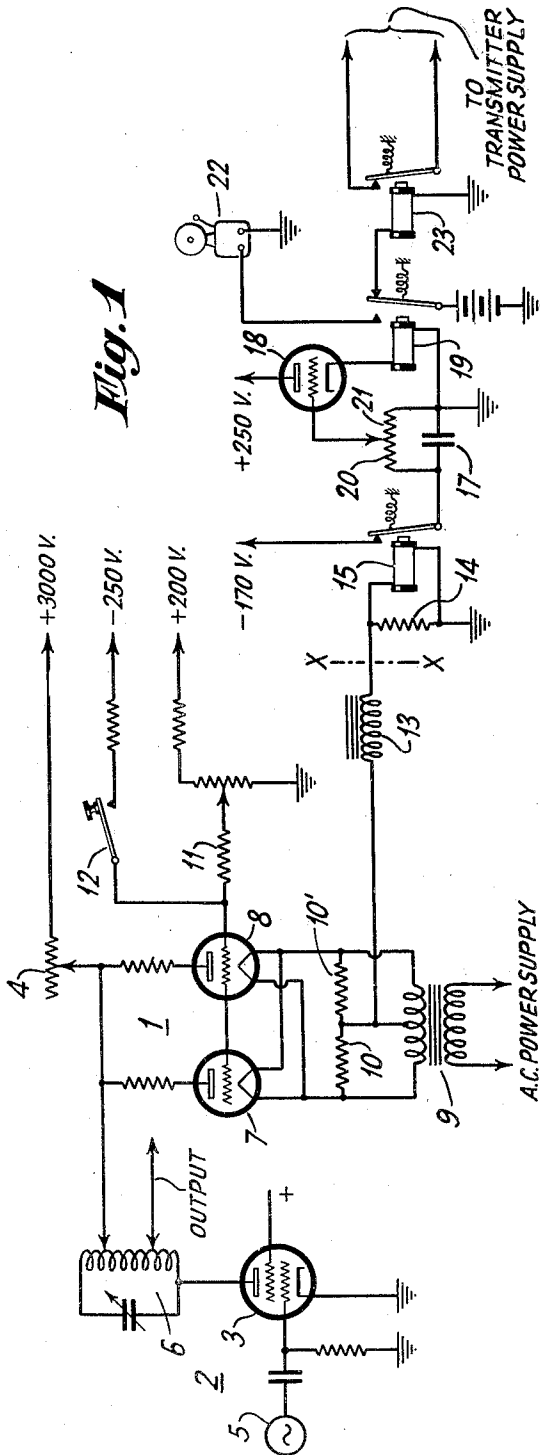
C. H. BACKUS ET AL

2,275,940

ALARM SYSTEM

Filed April 22, 1939

2 Sheets-Sheet 1



BY

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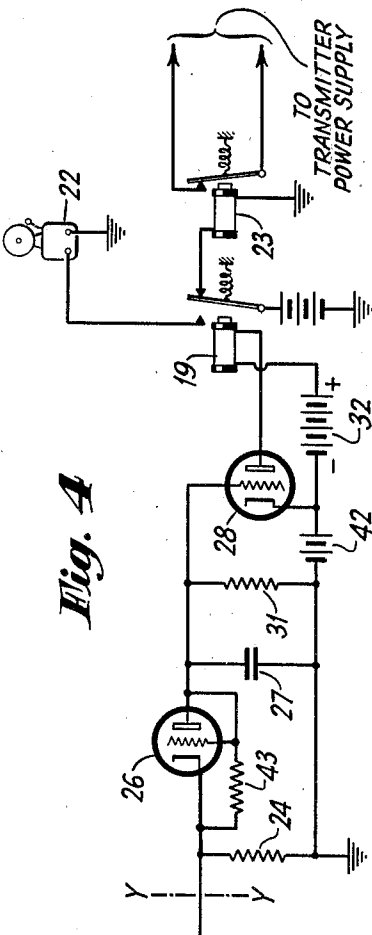
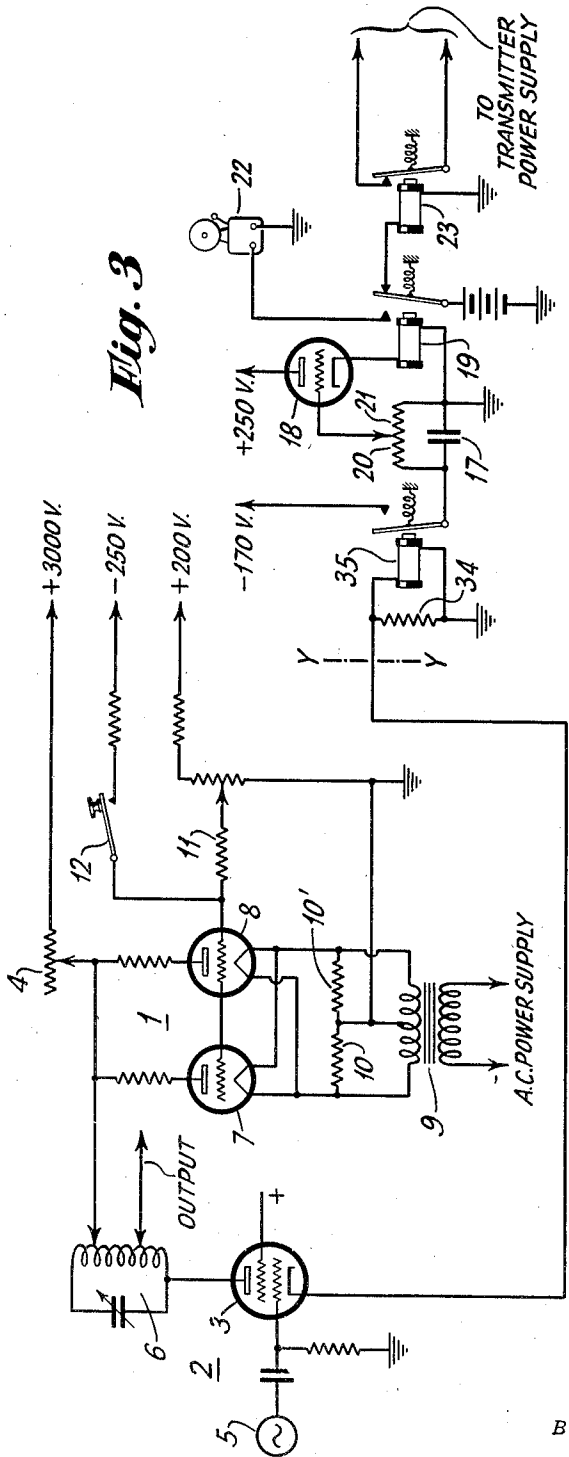
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UNITED STATES PATENT OFFICE

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ALARM SYSTEM

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5 Claims. (Cl. 178—66)

The present invention relates to radio telegraph transmitters and, more particularly, to means for preventing damage thereto due to the transmission of long dashes.

Since a radio telegraph transmitter, even when operating, is not continuously radiating due to the presence of spacing intervals between code elements, letters and words, the present practice is to operate a telegraph transmitter at considerably greater power ratings than would be permissible for continuous radiation such as used in radio telephone service. This is perfectly satisfactory under normal circumstances but due to various reasons the keying circuit for the transmitter may occasionally be maintained in a closed position for longer periods of time than is desirable for long tube life.

An object, therefore, of the present invention is to prevent the transmission of long marking intervals in a transmitter constructed according to the principles described above.

A further object of the present invention is to provide means for giving an alarm when a radio telegraph transmitter, as heretofore described, is keyed for intervals above a predetermined maximum.

Still another object is to provide a means for shutting down a radio telegraph transmitter, as heretofore described, when a dash of greater than predetermined length is transmitted.

Briefly, the present invention provides a means connected to a radio telegraph transmitter for charging a condenser during the time of transmission of spacing intervals only and for disconnecting the charging source during marking intervals. Means are provided across said condenser for continuously discharging the condenser at a slow rate. If the charging means remains disconnected from a condenser for a greater than predetermined time the charge leaks off the condenser and a cut-off bias is removed from the grid of a vacuum tube. The resultant plate current operates a relay to sound an alarm. The relay may also be arranged to break the plate circuit of the transmitter or to break one of the other interlock circuits associated with the transmitter.

Reference will now be had for a more complete understanding of our invention to the following detailed description which is accompanied by drawings in which Figure 1 shows schematically a device according to the present invention connected to a portion of a radio transmitter, Figure 2 shows a modification of the form of invention shown in Figure 1 and Figures 3 and 4 show fur-

ther modifications of Figure 1 which may in some cases be desirable.

Referring, now, to Figure 1, reference numeral 1 indicates a keying unit which is connected to a frequency doubler stage 2, or a power amplifier stage or a radio transmitter. The frequency doubler stage 2 includes a thermionic discharge tube 3 having a source of carrier energy 5 connected to the input thereof and a tuned output circuit 6. The output circuit 6 is connected to further doubler or amplifier stages as indicated by the arrow labeled "output." Plate energy is supplied from a source which, in the drawing, is indicated by +3000 v. Also fed through the resistor 4 is the keying stage 1 which may comprise a pair of vacuum tubes 7 and 8 connected in parallel. In some cases a single tube may be used. Filaments of vacuum tubes 7 and 8 are energized through a filament transformer 9. The filament circuit of the vacuum tubes 7 and 8 has a pair of serially connected resistors 10 and 10' connected thereacross in order to provide an electrical center tap which is ordinarily grounded. The grids of tubes 7 and 8 are connected in parallel and connected to the keying circuit 11. During the spacing intervals when the key is up a positive potential is placed on the grids of tubes 7 and 8 from the source +200 v. The tubes therefore, draw a heavy plate current and causes a large voltage drop through resistance 4. This effectively reduces the plate potential supplied to tube 3 to such an extent that the resultant output is insufficient to energize the succeeding stages of the transmitter and thus no signal is radiated. When key 12 is closed a negative potential is applied to the grids of tubes 7 and 8 from the source -250 v., thus biasing the tubes to a point beyond cut-off and substantially no current is drawn through resistor 4 by tubes 7 and 8. Under these conditions there is very little voltage drop through the resistor 4 and substantially the entire plate potential from +3000 v. is applied to tube 3, thus providing a maximum marking output. In accordance with my invention the connection from the midpoint between resistors 10 and 10' to ground is completed through a key click choke 13 and a resistor 14. During the operation of the transmitter with the key up and tubes 7 and 8 drawing a heavy current there may be, to take a concrete example, approximately 200 milliamperes flowing from the center tap of the filament through choke 13 and resistor 14 to ground. The voltage drop across resistor 14 as a result of the 200 milliamperes flowing therethrough is sufficient to hold relay 15

in its operated position, thus applying from a potential source —170 v. a negative potential to the ungrounded plate of condenser 17. The resultant charge across condenser 17 is sufficient to bias tube 13 beyond cut-off and no current flows in the plate circuit of tube 13. The relay 19 connected between the cathode of tube 13 and ground is, therefore, maintained in a released position. With the transmitter in a key down position for transmitting a marking impulse there is normally very little current flowing in the circuit including choke 13 and resistor 14. This allows relay 15 to open and the condenser 17 to gradually discharge through the resistors 20 and 21. The bias on the grid of tube 18 is thus slowly released and when it becomes low enough the tube begins to draw plate current. The gradually increasing plate current, if the key 12 is held down long enough, actuates relay 19 thus applying a potential to the actuating circuit for bell 22 and giving an alarm. Simultaneously, the relay 19 may be arranged to break an energizing circuit for relay 23 which is connected in series with the transmitter power supply or connected in one of the interlock circuits associated therewith. The de-energization of relay 23 opens the power supply circuit or the interlock circuit, as the case may be, and shuts down the transmitter. If desired, relay 23 may be made slow to release or a mechanical delay may be interposed so as to allow a short interval of time to elapse between the actuation of the alarm and disabling the transmitter. This arrangement will give the operator time to clear the trouble before the transmitter closes down. Obviously, of course, the transmission of dots and short dashes, while actuating relay 15, does not open the charging circuit for condenser 17 long enough to allow the condenser to discharge completely enough to remove the negative bias on tube 13.

By varying the capacity of condenser 17 and/or the resistance of the shunt composed of resistors 20 and 21, the discharge interval can be varied up to a minute or more but for most applications the discharge interval should be about four seconds.

In Figure 2 we have shown a modification of the device shown in Figure 1 in which the portion to the right of the dotted line in Figure 2 is supposed to be substituted for the portion to the right of the dotted line in Figure 1.

In this modification with the transmitter in the key-up or spacing position as heretofore assumed, the 200 milliamperes current flow through resistor 14 causes a potential of about 30 volts to be applied to the plate and grid of tube 25. While tube 25 is shown with the grid and plate connected together, obviously, of course a two element rectifier may be used, if desired. Tube 26 acting as a rectifier permits condenser 27 to charge and also current to flow through the resistor 31 thus holding a blocking bias on tube 23. As tube 23 is biased well beyond cut-off no current flows in this plate circuit and relay 19 remains unactuated. With the key down and the transmitter radiating a marking impulse, there is, as previously explained, very little current flowing through resistor 14. This removes the 30 volt charging source for condenser 27 which therefore discharges through resistor 31. Tube 26 prevents a rapid discharge through resistor 24 as its cathode is now positive with respect to its plate. When the condenser 27 has discharged to below the voltage required to block tube 23,

plate current flows through relay 19 and, as described with respect to Figure 1, bell 22 is actuated and relay 23 in the plate circuit of the transmitter is de-energized thus shutting down the transmitter.

The modification shown in Figure 2 using a rectifier tube for charging a condenser instead of a relay, as shown in Figure 1, results in higher permissible keying speeds and eliminates one moving and expensive part but necessitates the grid of tube 23 instead of the cathode being grounded in order to obtain proper grid polarity. This requires an ungrounded plate supply for tube 23. A separate plate supply source 32 must therefore be used in this modification instead of the regular transmitter power supply. However, operation with the separate power supply may, in some cases, be considered somewhat better as regulation due to keying is eliminated and the entire unit is self-contained. If desired, the resistor 31 may be a potentiometer with the movable arm connected to the cathode of tube 23 instead of using a fixed resistor. With this type of construction the delay period may be easily adjusted by moving the movable arm of the potentiometer.

In Figure 2 we have shown a modification in which the plate current flow in tube 3 is used to actuate the alarm. Resistor 34 is placed in the cathode circuit of tube 3 and relay 15 is substituted by relay 35 which has a normally closed contact. With this modification relay 35 stands unactuated during spacing intervals, and permits condenser 17 to charge as previously described. During marking intervals relay 35 is actuated, thus allowing condenser 17 to discharge as before.

The circuit shown in Figure 3 to the right of dotted line Y—Y. With the transmitter in the key-up position battery 42 biases tube 23 beyond cut-off so that no current flows in the plate circuit of tube 23 and relay 19 stays in the back or idle position. With the transmitter in the key-down position current flows in resistor 24 causing a positive potential to appear at the ungrounded end. This positive potential causes current to flow in resistor 43, part of which charges condenser 27 and part goes to ground through resistor 31. Values of resistors 42 and 31 are chosen such that condenser 27 slowly charges up and changes the bias on the grid of tube 23 in the positive direction until tube 23 becomes conductive. Relay 19 is then actuated, since its coil is in the plate circuit of tube 23. When the transmitter goes to the key-up position any positive charge on condenser 31 rapidly discharges through tube 26 and resistor 24. Resistor 24 being of a low value in comparison to resistor 43 this discharge is very rapid. The discharge of condenser 31 allows the bias on the grid of tube 23 to swing negative beyond cut-off thus allowing relay 19 to go to its back or idle position.

While we have shown and particularly described several embodiments of our invention, it is to be distinctly understood that our invention is not limited thereto but that modifications within the scope of our invention may be made.

We claim:

1. In a radio telegraph transmitter, a keying circuit for said transmitter, said circuit including a resistor which carries current during spacing intervals only, means responsive to a voltage drop through said resistor for charging a condenser in short pulses, means for continuously discharging said condenser at a slow rate, a ther-

thermionic discharge tube having an anode, a cathode and a grid, a source of potential and a relay connected between said anode and cathode, said grid and cathode being so connected to said condenser that the charge in said condenser biases said tube beyond cut-off, and means responsive to an energization of said relay for actuating an alarm and disabling said transmitter, each single pulse being sufficient to charge said condenser beyond the cut-off potential of said tube.

2. In a radio telegraph transmitter, a keying circuit for said transmitter, said circuit including a resistor which carries current during spacing intervals only, a relay having a winding energized by the potential drop through said resistor, a condenser, a source of potential, said relay when energized connecting said source to said condenser, each energization of said relay charging said condenser to a potential substantially equal to that of said source, means for continuously discharging said condenser at a slow rate, and means responsive to a diminution of the charge in said condenser below a predetermined value for actuating an alarm.

3. In a radio telegraph transmitter, a keying circuit for said transmitter, said circuit including a resistor which carries current during spacing intervals only, a relay having a winding energized by the potential drop through said resistor, a condenser, a source of potential, said relay when energized connecting said source to said condenser each energization of said relay charging said condenser to a potential substantially equal to that of said source, means for continuously discharging said condenser at a slow rate, and means responsive to a diminution of the charge in said condenser below a predetermined value for actuating an alarm and disabling said transmitter.

4. In a radio telegraph transmitter, a keying circuit for said transmitter, said circuit including a resistor which carries current during spacing intervals only, a relay having a winding en-

ergized by the potential drop through said resistor, a condenser, a source of potential, said relay when energized connecting said source to said condenser, means for continuously discharging said condenser at a slow rate, a thermionic discharge tube having an anode, a cathode and a grid, a source of potential and a relay connected between said anode and cathode, said grid and cathode being so connected to said condenser that the charge in said condenser biases said tube beyond cut-off, said tube being responsive to a diminution of the charge in said condenser below a predetermined value to actuate said relay, and means responsive to an actuation of said relay for operating an alarm, each operation of said relay charging said condenser beyond the cut-off potential of said tube.

5. In a radio telegraph transmitter, a keying circuit for said transmitter, said circuit including a resistor which carries current during spacing intervals only, a condenser having one terminal connected to one end of said resistor, a rectifier so connected between the other terminal of said condenser and the other end of said resistor that a voltage drop through said resistor charges said condenser, means for continuously discharging said condenser at a slow rate, a thermionic discharge tube having an anode, a cathode and a grid, a source of potential and a relay connected between said anode and cathode, said grid and cathode being so connected to said condenser that the charge in said condenser biases said tube beyond cut-off, said tube being responsive to a diminution of the charge in said condenser below a predetermined value to actuate said relay, and means responsive to an actuation of said relay for operating an alarm, the charge on said condenser due to each single spacing interval being sufficient to bias said tube beyond cut-off.

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