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ELECTRIC CALL APPARATUS

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Fig. 1

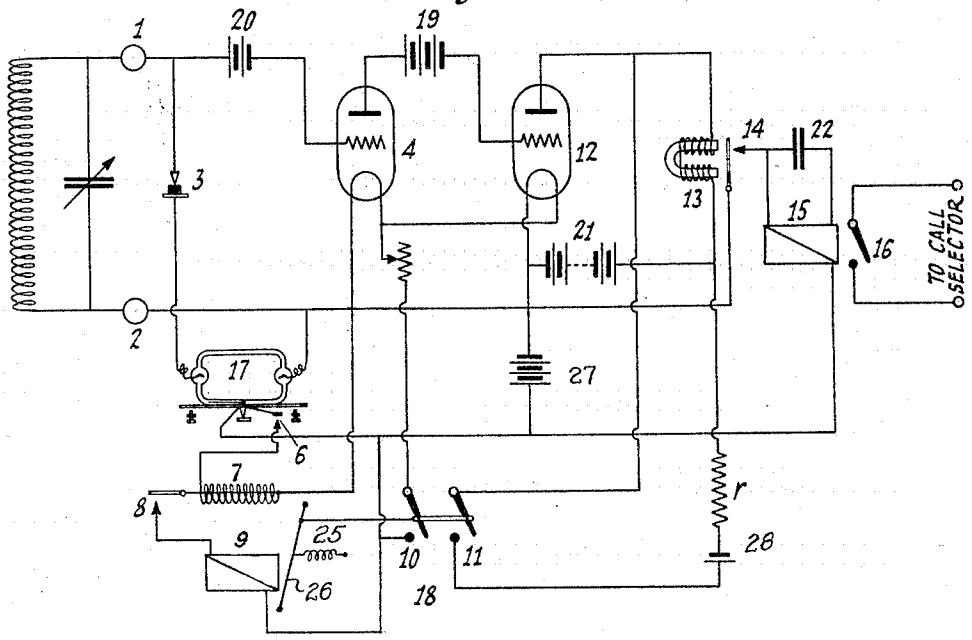
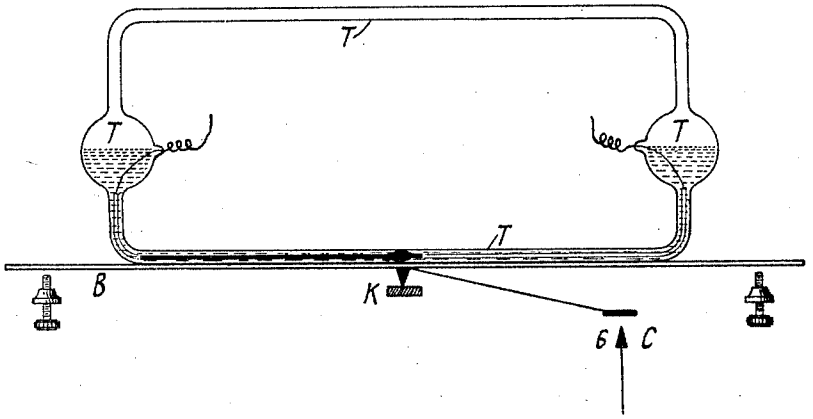


Fig. 2



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ELECTRIC CALL APPARATUS

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This invention relates to call apparatus adapted to be operated by high frequency oscillations and to give an alarm on the receipt of a predetermined series of signals.

In such apparatus it is frequently necessary to employ valves to amplify the currents due to the signals and so to operate the final selecting device, responsive only to the predetermined series. If such apparatus be in an inaccessible position, as happens, for instance, in the case of apparatus for actuating fog guns or the like, it is difficult to keep the valves lighted for a long time.

The object of this invention is to provide means whereby the lighting circuit of a valve or valves in such apparatus can be completed by means of high frequency oscillations, so that the battery current may be supplied to the filament or filaments just before the predetermined series of signals is transmitted and thus the battery will be prevented from running down.

According to my invention a receiving circuit is connected in parallel to the grid and filament of an amplifying valve, and also to a relay adapted to be actuated by the passage through it of a prolonged though weak current, and this relay is so arranged that it shall complete the lighting circuit, and also if necessary then disconnect the relay circuit from the valve.

In order also that the valve may remain alight for a time sufficient for the predetermined series of signals to be received, this relay preferably controls a delay or other timing device so that when once this relay has been actuated the device will cause the lighting circuit to remain complete for a certain definite time.

At the first relay there is preferably employed an electrocapillary balance relay of the type disclosed in U. S. Patent No. 848,083, comprising a sealed electrocapillary tube containing mercury and mounted on a tipping beam, so that a flow of current causes movement of the mercury which in turn causes the beam to tip and establish a contact.

In order that the current due to the signals and passing through this relay shall be rectified, a crystal may be interposed in this circuit. The column of mercury may be restored to its normal position, either by the action of gravity or by allowing the current to charge a condenser, the charge from which, leaking back through a high resistance, restores the mercury column.

Thus when it is desired to actuate the apparatus a long signal is first sent. The cumulative effect of this causes the relay to act and thus the valve (or valves) is lighted. The predetermined series of signals is then transmitted.

After a sufficient interval of time, the timing device interrupts the circuit. Preferably the timing device completes the circuit of a relay having two pairs of contacts, one of which is in the lighting circuit, whilst the other is in a circuit connected with a relay connected to the output circuit of the valve or of the last valve of the series if more than one be employed, the whole being so arranged that on the receipt of a signal the last named relay closes its contacts. Since these are delicate, the closing of them is caused to complete the circuit of a more robust relay which on operating allows current to pass to the actual selective device which may consist of timed balance wheels.

The invention is illustrated by the accompanying drawings in which Figure 1 is a diagrammtic showing of the associated apparatus and Figure 2 is a detailed view of the electrocapillary relay.

The incoming signal at the terminals 1 and 2 is taken to the rectifying crystal 3 and the grid of the valve 4 in parallel as shown. The valve being unlighted the circuit is not robbed of any power by it, and when lighter the sensitiveness is so much greater that the effect of the crystal in parallel is negligible.

The preliminary long dash signal rectified by the crystal 3 moves the mercury column in the electrocapillary tube of the relay 17 by an amount proportional to the coulombs of electricity passed and eventually tips the balance beam on which the tube is mounted, closing the contact 6. This closes the circuit of the heater 7.

This contact can be made to actuate a relay

directly, but for the sake of having a definite minimum duration of activity it may close the circuit of the heater of the thermostrip 7 (which may be of the ordinary telephone exchange type). This thermostrip, bending under the influence of the heat, closes the contacts 8 for a definite minimum time and thus energizes the magnet 9 of the relay 18. The armature 26 of relay 18 is linked to the two pairs of contacts of which one pair 10 switches on the filaments of the valves 4 and 12 and the other pair 11 closes the circuit of battery 28 connected with the sensitive relay 13. As explained above the strip 7 gives a minimum duration of activity and even though contact may be broken at 6, the switches 10 and 11 will remain closed until the strip 7 cools sufficiently to break the contact at 8. When contact is broken at 8 the switches 10 and 11 are opened again by means of spring 25. The circuit of relay 13 is conveniently made up of one dry cell 28 and a high resistance r.

The circuit of battery 28 is not essential, as the relay 13 can be made to close under the influence of its own spring, but for certainty and precision of working it is preferable to include it as shown.

The valves 4 and 12 are now alight and active.

An insulated battery of dry cells 19 is connected only between the grid of 12 and the anode of 4 the positive pole to the latter. Small insulated dry cells 20 (or equivalent insulated potentiometer) are connected in the circuit as shown, so as to apply a negative potential to the grid of valve 4. This potential is adjusted so that there is no anode current flowing in valve 4, that is, it is non-conductive.

The anode of valve 12 is connected through the relay 13 to the usual high tension anode battery 21.

The normal anode current will flow through valve 12 as though its grid were insulated, and will hold off the tongue of relay 13.

The arrival of a signal impulse renders the grid of valve 4 momentarily more positive and a stream of electrons therefore migrates from the cathode to the anode of valve 4. The normal potential of 19 is chosen to permit a constant current to flow in the anode circuit of tube 12 and the tongue or relay 13 is held away from contact 14. When, however, electrons have passed from the cathode to the anode of 4 as explained above, they accumulate on the grid of tube 12. This accumulation of electrons renders the grid of 12 more negative and reduces the anode current of 12, which permits the tongue of relay 13, under the influence of its own spring for example, to close the contact 14. The piling up of electrons on the grid of 12 is not permanent for, they will leak away across the glass or through the ionized gases in the tube, in a manner well known in the vacuum tube art. The operation of a system similar to the two tubes 4 and 12 is more fully described in U. S. Patent No. 1,112,655. Thus it will be seen that the anode current in tube 12 may be varied in accordance with received signals and the call selector operated thereby.

The values of 19 and 20, although not critical, should be adjusted to the characteristics of the particular type of valve employed. With ordinary receiving valves 19 may conveniently be three or four dry cells. The value of 20 will of course determine the threshold sensitiveness of valve 4 and should be as small as is necessary just to prevent an appreciable anode current flowing in valve 4.

The contacts 14, being of a delicate nature, are not used directly but are made to actuate the relay 15, whose inductive winding is preferably shunted by a condenser 22 to minimize sparking, which relay closes the robust contacts 16, to which can be connected any appropriate mechanically selective system.

To briefly point out the operation of the device, first a sustained signal is sent. This has no material effect on the tubes, the filaments of which are cold. The relay 17 responds, however, and closes 6 which puts 7 in circuit with the battery 27 and closes 8 for a predetermined time. 8 puts the magnet of 18 in circuit with the battery 27 and closes 10 and 11 by means of armature 26 for a predetermined time. The filaments of the tubes are now in circuit with battery 27. The apparatus is now ready for the signal predetermined to actuate the selector and which must be sent before the delay at 7 allows the contact at 8 to reopen. The predetermined signal is sent and set up in the input circuit of tube 4 the filament of which is heated. This results in a current in the plate of 12 which varies in accordance with the impulses of the received signal, and operates the armature of 13 in accordance with said variations. This puts the magnet 15 alternately in and out of circuit with the battery 27 to operate the call selector.

After the signal is sent the thermostrip at 7 opens the contact 8 switches off the valve filaments at 10 and the circuit through 11 and the device is ready for another call.

Having described my invention what I claim is:—

1. The method of operating a selective vacuum tube calling system which consists in receiving prolonged high frequency oscillations, operating a relay with said oscillation, operating a delay with said relay, closing the lighting circuit of the tubes with said delay and then receiving oscillations for energizing the calling system.

2. The method of operating a selective vacuum tube calling system which consists in receiving high frequency oscillations clos-

ing the lighting circuit of the tubes for a definite time with said high frequency oscillations, receiving oscillations for energizing the calling system, and automatically deenergizing the lighting circuit upon the lapse of a predetermined time.

3. In an electric call apparatus adapted to be operated by high frequency oscillations, a receiving system, including a call selector, a vacuum tube relay associated therewith for actuating the call selector and means including a relay responsive to the high frequency oscillations for controlling the lighting circuit of said relay.

4. In an electric call apparatus adapted to be operated by high frequency oscillations, a receiving system, including a call selector, a vacuum tube relay associated therewith for actuating the call selector and means responsive to high frequency oscillations for controlling the lighting circuit of said relay, said means being connected to said receiving system, and adapted to energize said lighting circuit for a predetermined period of time.

5. In an electric call apparatus adapted to be operated by high frequency oscillations, a receiving circuit, an amplifying valve having its input connected across the receiving circuit, a lighting circuit for the filament of the valve, a relay in parallel to the input of said valve adapted to be actuated by accumulation of received current and a delay operated by said relay and arranged to close the lighting circuit of the valve, a predetermined length of time.

6. In an electric call apparatus adapted to be operated by high frequency oscillations, a receiving circuit, an amplifying valve having its input connected across the receiving circuit, a lighting circuit for the filament of the valve and a relay in parallel to the input of said valve adapted to be actuated by accumulation of received current said relay being arranged to close the lighting circuit of the valve and having automatic restoring means for disconnecting it from the lighting circuit.

7. In an electric call apparatus adapted to be operated by high frequency oscillations, a receiving circuit, an amplifying valve having its input connected across the receiving circuit, a lighting circuit for the filament of the valve, a relay in parallel to the input of said valve adapted to be actuated by accumulation of received current said relay being arranged to close the lighting circuit of the valve and having restoring means for disconnecting it from the lighting circuit and means in said circuit for interrupting the lighting circuit after the lapse of a predetermined time.

8. In an electric call apparatus adapted to be operated by high frequency oscillations, a receiving circuit, including a call selector, an amplifying valve having its input connected across the receiving circuit, a lighting circuit for the filament of the valve, a relay in parallel to the input of said valve adapted to be actuated by accumulation of received current said relay being arranged to close the lighting circuit of the valve and having restoring means for disconnecting it from the lighting circuit, means in said circuit for interrupting the lighting circuit after the lapse of a predetermined time and a relay actuated by said valve connected to the call selector.

9. In an electric call apparatus adapted to be operated by high frequency oscillations, a closed receiving circuit connected in parallel to the grid and filament of an amplifying valve and a relay in shunt with said receiving circuit adapted to be actuated by the cumulative effect of the passage through it of a prolonged though weak current to complete the circuit for lighting the filament of the valve.

10. Apparatus according to claim 9 in which the relay on completing the lighting circuit restores itself to normal position.

11. Apparatus according to claim 9 in which the relay controls a device whereby the lighting circuit is interrupted after the lapse of a predetermined time.

12. An electric call apparatus adapted to be operated by high frequency oscillations and comprising a valve, a lighting circuit for said valve, means whereby the lighting circuit of the valve can be completed by means of high frequency oscillations, and means whereby said lighting circuit is automatically interrupted after a pre-determined time interval.

13. In an electric call apparatus adapted to be operated by high frequency oscillations, a closed receiving circuit connected in parallel to the grid and filament of an amplifying valve, a relay in shunt with said receiving circuit adapted to be actuated by the cumulative effect of the passage through it of a sustained weak current, and means including a second relay actuated by said first named relay, to complete the circuit for lighting the filament of the valve.

14. The method of operating a selective vacuum tube calling system which consists in receiving high frequency impulses of relative long duration, rectifying said impulses, operating a relay with said rectified impulses, actuating a delay, with said first named relay, closing the filament lighting circuit of said tube, and operating a third relay with said delay, and receiving oscillations for operating the calling system.

15. In an electric call apparatus adapted to be operated by high frequency oscillations to control a call selector, a vacuum tube receiving circuit, a relay in parallel with said receiving circuit, and adapted to be actuated

by said high frequency oscillations, and means actuated by said relay to close the filament circuit of said valve for a pre-determined time interval.

16. In an electric call apparatus adapted to be operated by high frequency oscillations to control a call selector, a receiving circuit, a vacuum tube amplifying system, the input circuit of which is connected across said receiving circuit, a relay including a rectifier in parallel with said tube and said receiving circuit adapted to be actuated by accumulation of received current, a delay including a heater element operated by said relay, a magnet energized for a predetermined time by said delay, a pair of switches actuated by said magnet, a relay in the output circuit of said amplifier actuated by one of said switches, and a lighting circuit for the filament of said vacuum tube closed by the other of said switches.

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