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R. M. SANDERS

REMOTE CONTROL FOR RADIO SETS

Filed Sept. 2, 1925

Fig. 1.

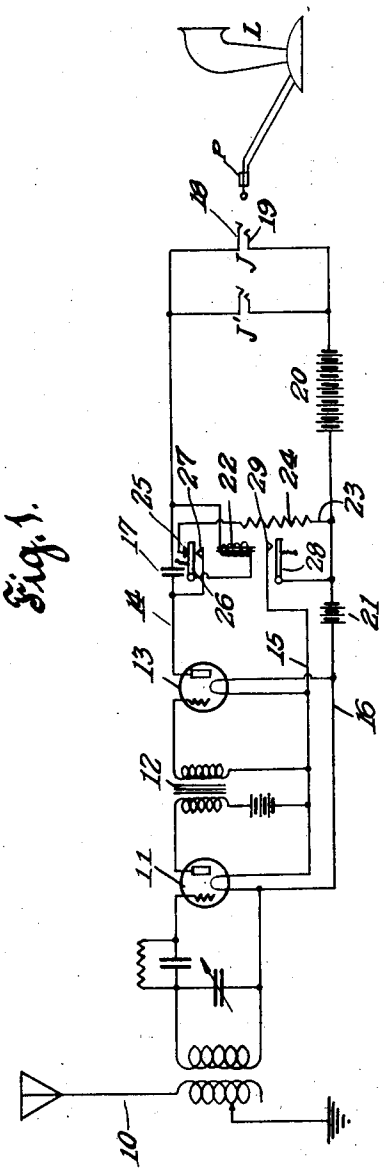



Fig. 3.

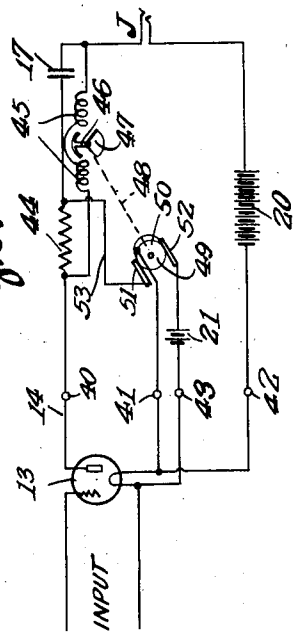
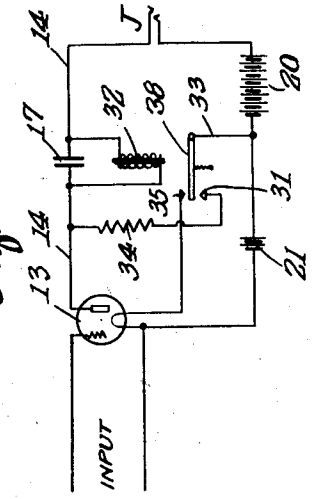



Fig. 2.




INVENTOR
Rudolph M. Sanders
BY
Warren S. Oston
ATTORNEY

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# UNITED STATES PATENT OFFICE.

RUDOLPH M. SANDERS, OF NEW YORK, N. Y., ASSIGNOR TO EDWARD R. TOLFREE, OF NEW YORK, N. Y.

## REMOTE CONTROL FOR RADIO SETS.

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*To all whom it may concern:*

Be it known that I, RUDOLPH M. SANDERS, a citizen of the United States, and resident of New York city, in the county of Kings and State of New York, have invented certain new and useful Improvements in Remote Control for Radio Sets, of which the following is a specification.

This invention relates to remote control devices for radio receiving sets, and has more particularly in view the control of a receiver from any of a number of remote points, each of which may have mounted thereat a loud speaker or other reproducer.

One of the objects of this invention is to provide an apparatus and a circuit by which a single pair of conductors are enabled both not only to deliver the varying current of a radio receiving set to the remote point, but also to function as a control for the closing and interrupting of this circuit at the will of the operator at the remote point.

A further object is to provide means by which the operation of plugging in an instrument at the remote point will occasion the operation of the radio receiving set; and in particular, this control is without deleterious effect upon the connecting circuit.

Another object is to provide a relay device which effects the control, and is actuated by the currents from the sources employed in the radio receiving set.

With these and other objects in view, as will appear in the course of the following specification and claims, a number of different forms of execution of this invention have been illustrated on the accompanying drawing, in which:

Figure 1 is a diagram of a remote control circuit.

Figure 2 is a similar diagram of a modified form of circuit and apparatus.

Figure 3 is a similar diagram of a further modified form of circuit and apparatus.

In the apparatus and circuit according to Fig. 1, the antenna circuit 10 is coupled through a detector 11 and an audio frequency transformer 12 with the audio frequency amplifying tube 13. This circuit has been shown as illustrative of any radio circuit capable of delivering, under proper conditions, audio frequency oscillations into the output wire 14 and having the bus wires 15 and 16 for the filament heating battery and anode return connections.

The output wire 14 is connected through a stopping condenser 17 with one element 18 of a jack J. The other element 19 of the jack J is connected through a plate battery 20 and the filament battery 21 with the filament bus wire 16. A loud speaker L or other indicator may be connected by a suitable plug P, to the jack J; and the circuit for audio frequency oscillations then is as follows: from the anode of the amplifying tube 13, by wire 14 to the condenser 17, jack element 18, plug P, loud speaker L, plug P, element 19, plate battery 20, filament battery 21, back to the filament of the tube 13. It is therefore clear that when the filament of the tube 13 is energized, the loud speaker will repeat the incoming signals.

Since when the filament is not lighted, no current will be flowing in this circuit, and it is desired that the plugging in of a loud speaker L at any station, J or J′, a shunt circuit is provided around the amplifier tube 13, consisting of a wire 23 leading from the negative terminal of the anode battery through a resistance 24 to a contact 25. When no current is flowing in the circuits, i. e. when all of the jacks are unoccupied, an armature 26 of a solenoid 22 rests against this contact 25; this armature 26 is electrically connected to one end of the solenoid 22, which at the opposite terminal is connected to the wire 14 between the stopping condenser 17 and the jacks J, J′, so that when a circuit is closed by plugging in the loud speaker, a starting circuit is established from the respective jack to the plate battery 20, thence by wire 23, resistance 24, contact 25, armature 26, solenoid 22, wire 14, back to the jack: this effects the energization of the solenoid 22, which attracts a further contact 27 into circuit closing relation with a contact 29 which is electrically connected with the filament bus wire 15. The armature 28 is connected to the filament bus wire 16. In this way a circuit is established from the positive pole of the filament battery 21, by armature 28, wire 15, the filaments of the tubes, and back by wire 16 to the battery 21 thus lighting the filaments, and permitting the signal waves to which the set is tuned to pass through the apparatus and produce currents in the output wire 14 and the return wire 16; and the loud speaker L will respond thereto.

At the time that the armature 28 is moved,

the solenoid 22 will also cause the armature 26 to be pulled away from the contact 25, and against another contact 27, which is connected to the wire 14 between the stopping condenser 17 and the tube 13. This opens the former starting circuit through the resistance 24 in shunt of the tube 13, and closes a holding circuit from the jack J, to batteries 20 and 21, wire 16, the filament of tube 13, anode of tube 13, wire 14, contact 27, armature 26, solenoid 22, back to the wire 14 on the opposite side of the stopping condenser 17, to the jack again; so that the armature 26 is thereafter held against the contact 27.

The stopping condenser 20 serves to permit the passage of audio frequency oscillations without compelling them to traverse the solenoid 22; and at the same time prevents the flow of direct currents except through the solenoid.

A large number of jacks may be disposed in any part or parts of a building, and any person may plug in his loud speaker, and receive from the station to which the set is tuned. A number of such jacks are indicated as J, J', and since they are simply in parallel to each other, no further description of the operation is necessary.

When the listener desires to interrupt the program, it is only necessary to withdraw the loud speaker plug from the jack. The above circuits from battery 20 are then all interrupted, if no other subscriber has his loud speaker plugged in. As a result of this opening of the anode battery circuits, the solenoid 22 becomes de-energized, and the armatures 26 and 28 return by their springs to the original position, thus opening the filament circuit again. The apparatus is now ready to be started again in the same way.

The resistance 24 serves to keep down the anode battery current to the minimum required for the operation of the solenoid 22.

In the modified form according to Fig. 2, the input circuit of the tube 13 is represented generally. The output wire 14 leads as before through a stopping condenser 17 to the plug J, with a return through the anode battery 20 and the filament battery 21 to the filament of the tube 13. The stopping condenser is shunted directly by the solenoid 32, which acts upon an armature 38 which has two opposed contacts 31 and 35; the contact 35 is connected to the other filament terminal, and the contact 31 is connected through a resistance 34 to the wire 14 between the tube 13 and the stopping condenser 17: The armature 38 itself is connected to the negative terminal of the anode battery. With this circuit, when the loud speaker is plugged in as before, a starting circuit is established from the jack J to the batery 20, thence by wire 33 to armature 38, cotact 31, resistance 34, wire 14, solenoid 32, back to wire 14 on the other side of the stopping condenser 17, back to the jack J: and the solenoid 32 is energized from battery 20 as before. This energization of the solenoid causes it to attract its armature against the other contact 35 to break the former starting circuit and establish a holding circuit from jack J, through batteries 20 and 21, tube 13, wire 14, solenoid 32, back to wire 14 and the jack J. At the same time, current is delivered into this circuit from the tube 13, because the filament circuit is closed from battery 21, by wire 33, contact 35, the filament of the tube 13, back to the battery 21.

When the plug is withdrawn from jack J, the circuits from the anode battery are interrupted, and the solenoid 32 de-energized, so that its armature returns to the original position, ready for re-use.

In the form according to Fig. 3, the output circuit of the tube 13 is by wire 14, output terminal 40, resistance 44, stopping condenser 17, the jack and the loud speaker connected thereto, returning by battery 20 to the filament of tube 13. When this circuit is closed by plugging in a loud speaker, a circuit is also established from the jack J by battery 20, terminal 42, filament of tube 13, terminal 41, the conductive plate 50, brush 51, by the wire 53 to the resistance 44, thence to the field coils 45, which are connected in series, back to the jack J; thus energizing these field coils, and rotating the armature 46. This armature 46 by its shaft 48 causes rotation of the insulating disk 49 to which plate 50 is fastened, until this plate is drawn from under brush 51 and moved under the brush 52. A current is thus permitted to flow from battery 21 to brush 52, plate 50, terminal 41, the filament of tube 13, back through terminal 43 to the battery 21. At the same time the starting circuit from battery 20 is interrupted, so that all direct current from this battery must now pass through the tube 13 and the field coils 45.

When the plug is withdrawn from the jack J, the circuits from battery 20 are interrupted, and the field coils 45 release the rotary armature 46, which under the action of its weighted end 47 returns to its original position, opening the filament circuit by the return of the contact plate 50, and restoring the starting circuit through the brush 51.

In each of these forms of execution, it will be seen that no current is flowing in the circuit when a loud speaker is not plugged in, but that as soon as a loud speaker is plugged into any one of a large number of jacks, a circuit is closed from the anode battery through a relay which closes the filament circuit and permits heating of the filament, and at the same time interrupts

the former starting circuit, and establishes a holding circuit through or across the tube itself. This circuit continues so long as a loud speaker is plugged in; but upon withdrawal of all of the latter, in each case the circuit from the anode battery is interrupted, causing the restoration of the control relay to original position, and the opening of the filament circuit.

These forms have been presented as illustrating the method of operation according to this invention, but it will be understood that the invention is not limited thereto, but may be changed within the scope of the appended claims.

Having thus described my invention, I claim:—

1. In a remote control system, for a radio receiving set including an electron discharge tube, means to excite the cathode of said tube, and means to produce a current in said tube, and a pair of conductors leading to a remote point connected to the output of said tube, a blocking condenser in said conductors, a solenoid connected in shunt of said condenser and the tube, and in series with a resistance, an armature for said solenoid, contacts controlled by said armature and circuits associated with said contacts, whereby upon energization of said solenoid by closure of the output circuit at the remote point said armature will open said circuit including said solenoid in shunt of said tube and through said resistance, and close a circuit including said solenoid and in series with said tube.

2. In a remote control system for a radio receiving set including an electron discharge tube having an anode circuit extending to such remote point, a source of anode current for said tube and included in said anode circuit, a solenoid, a starting circuit connected to said anode circuit and in shunt of said tube, and including said closing means, said source and said solenoid, an armature for said solenoid, circuit controlling means actuated by said armature in its attracted and normal positions, a circuit closed through said circuit controlling means in the attracted position to heat the filament of the tube, said starting circuit being connected through said circuit controlling means in the normal position thereof.

3. In a remote control system for a radio set having an electron discharge tube with an output circuit from its anode extending to the remote point, a jack in said output circuit held open in the unoccupied condition, a loud speaker and a plug connected thereto and adapted to occupy said jack and close said output circuit at such remote point, a circuit controlling device for the filament circuit of the tube, a starting circuit including said closing device, said jack, and the source of anode current for the tube, and means associated with said circuit closing device to open said starting circuit.

4. In a remote control system for a radio set having a vacuum tube, a circuit closing device at the remote point, a circuit controlling device for the filament circuit of the tube, and a circuit including both of said devices and the source of anode current for the tube.

5. In a remote control system for a radio set having a vacuum tube, a circuit closing device at the remote point, a relay having closed position contacts, and a circuit including said circuit closing device, said relay and the source of anode current for said tube, and a filament heating circuit for the tube passing through the closed position contacts of said relay, whereby the closure of said circuit closing device at the remote point will effect the closing of the filament heating circuit.

6. In a remote control system for a radio set having a vacuum tube, a circuit closing device at the remote point, a relay having open and closed position contacts, a resistance, a circuit including said circuit closing device, said relay, said resistance, and the source of anode current for said tube, and passing through the open position contact of said relay, and a filament heating circuit passing through the closed position contact of said relay, and means to deliver anode current through said relay during the operation of the tube, whereby the closure of said circuit closing device at the remote point will effect the closing of the filament heating circuit and the operation of the tube, and the opening of the said circuit through said resistance so that the holding current for said relay is independent thereof.

7. In a remote control system for a radio set having a discharge tube, a plurality of jacks located at points remote from the set, an output circuit for the tube including said jacks in multiple and maintained open so long as all of said jacks are unoccupied, a loud speaker and a plug therefor to occupy any one of said jacks and thereby close said circuit, a relay in said circuit, an audio frequency condenser in shunt of said relay, and means controlled by said relay in the closed condition of said output circuit to close the filament heating circuit of the tube.

8. In a remote control system for a radio set having a discharge tube, and connecting circuits therefor, the output circuit of the tube extending through an audio frequency condenser to a remote point, a jack connected in said output circuit at such remote point, a plug and circuit closing means adapted to occupy said jack and close the output circuit, a relay in shunt of said condenser and having open and closed posi-

tion in contact, a resistance, a circuit including said resistance, said relay, and the source of anode current for the tube passing through the open position contact of said relay, a circuit including the tube, the source of anode current of the tube, and said relay passing through the closed position contact of said relay, and the filament heating circuit for said tube passing through a closed position contact of said relay.

Signed at New York, in the county of New York and State of New York, this 31st day of August A. D. 1925.

RUDOLPH M. SANDERS.