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RADIO STARTING AND CONTROL SWITCH CIRCUIT

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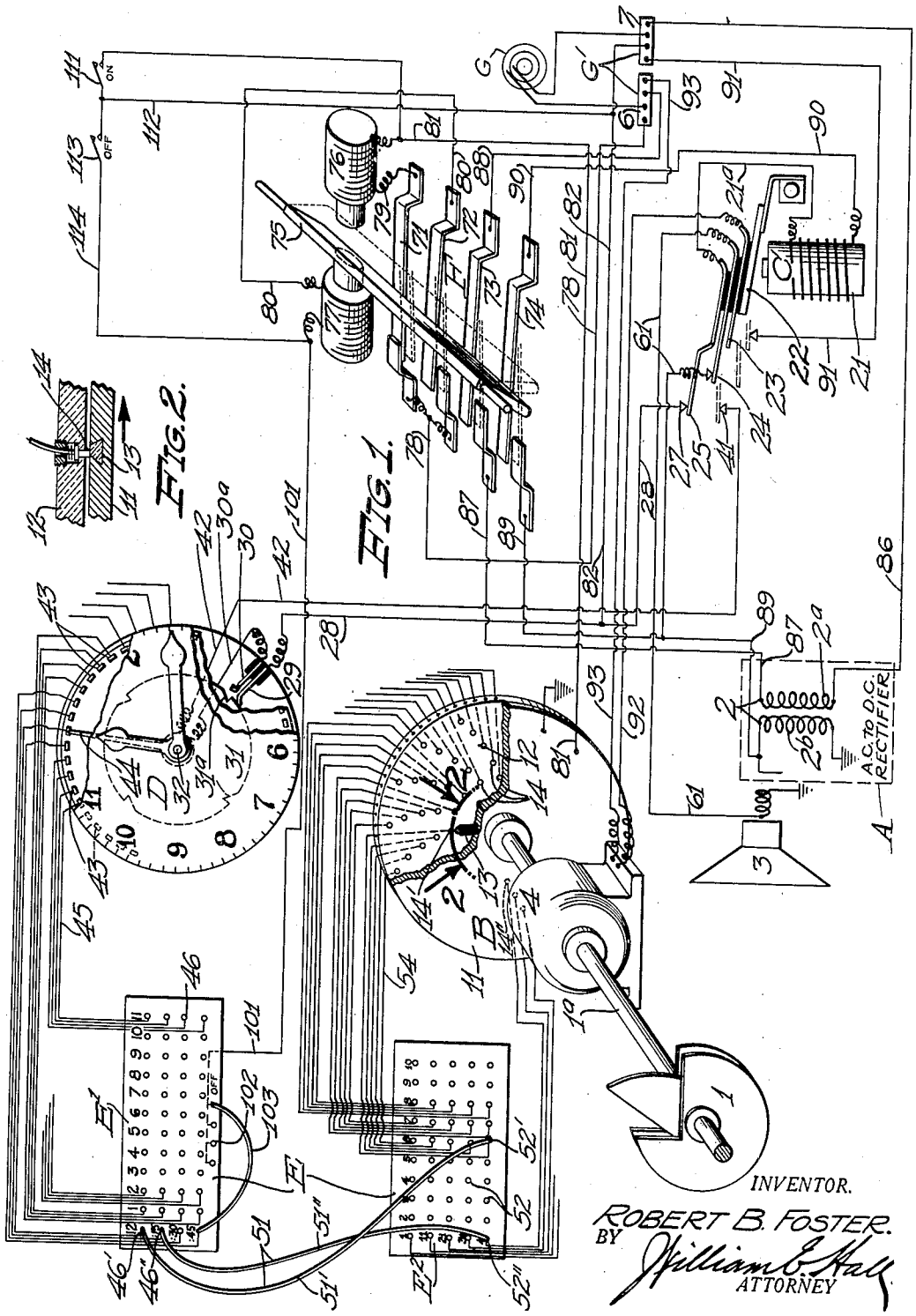



FIG. 1.

FIG. 2.

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## RADIO STARTING AND CONTROL SWITCH CIRCUIT

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13 Claims. (Cl. 250—20)

My present invention relates to a starting and control switch apparatus, and particularly to improvements over Patent No. 2,075,809, issued April 6, 1937, for Control apparatus for radio receiving sets, and improvements over my copending patent application, Serial No. 120,016, filed January 11, 1937, for Time control switch mechanism.

One of the principal objects of this invention is to provide a starting and control switch circuit or apparatus for radio receiving sets, whereby the set may be automatically started by ordinary house current, or direct or alternating current, and whereby, when the set is started, said current is immediately converted into the desired direct current and utilized for energizing the set, and whereby the set is also automatically adjusted to the predetermined station.

Another important object of this invention is the provision of an alternating current operated set, which provides at the designated time, direct current for a station finder switch circuit for closing the circuit to an alternating current motor for operating the switch and the condenser of the set.

Still another important object is to provide an apparatus of this class whereby a radio receiver, by only one setting, or by the plugging in of only one cord, and when connected to either alternating or direct current, may be automatically started and adjusted to the desired or predetermined broadcast station, the radio receiver operated until automatically or manually shut off, or the operation for the same or other broadcast station continued or repeated as often as desired or predetermined before or at the time of the original reception or setting.

A further important object of this invention is the provision of manual switches whereby the set may be manually controlled and adjusted, as desired.

An object of this invention also is the provision of a relatively simple and economical apparatus and hook-up for performing these functions or in obtaining these results and such an apparatus and hook-up which is positive in its action, and one which will not readily get out of order.

With these and other objects in view, as will appear hereinafter, I have devised an apparatus of this class having certain novel features of construction, combination, and arrangement of parts and portions as will be hereinafter described in detail, and particularly set forth in the appended claims, reference being had to the accompanying drawing and to the characters of reference thereon, which form a part of this application; in which:

Fig. 1 is a diagrammatic view of my apparatus, showing some of the parts fragmentarily in elevation, and showing other parts in perspective and partly broken away to facilitate the illustration; and,

Fig. 2 is an enlarged fragmentary sectional view of the station finder switch, the section being taken at 2—2 of Fig. 1.

My automatic starting and control apparatus, which I have termed a circuit, is applied in this instance to a conventional radio receiving set A, showing, for the purpose of illustration, only a rotary variable condenser 1, an alternating current transformer 2, and a dynamic or loud speaker 3. The shaft 1a of the condenser is connected, as diagrammatically illustrated, directly to an alternating current motor 4, which operates a selective tuning means or station finder switch B. The switch B and the condenser, if desired, may be axially aligned and connected, while the motor may be connected thereto through suitable gearing, as shown in U. S. Patent No. 2,075,809.

The motor is controlled primarily by an electromagnetic switch C at predetermined periods in accordance with a time switch element or control clock D, as indicated, designated, or directed by a switch or jack board E. The starting and control of the set or receiver, although initiated by the time switch element or control clock D, is effected primarily by a multiple switch mechanism F.

The radio receiving set, shown and described, may be connected to and operated by either alternating or direct current, but I have described the same as operated by ordinary alternating electric current, such as the conventional 110 volt domestic electric current. I have shown the two leads from an alternating current generator G connected to a multiple block G', these leads being referred to, for convenience, as leads 6 and 7.

The selective tuning means or station finder switch B illustrated, consists essentially of a rotary disc 11 and a concentric stationary disc 12, the rotary disc 11 carrying an insulating strip 13 and the latter a plurality of electric contacts 14 insulated from each other by the disc 12 and arcuately spaced to correspond to the broadcast station spaces on the dial (not shown) of the tuning condenser 1. Consecutive contacts are also radially spaced, for convenience of location

on the disc 12. The contacts 14 normally and resiliently contact the disc 11, but are sequentially insulated therefrom by the insulating strip 13 as the disc 11 is rotated. The portion of the strip 13 adapted to engage the contacts 14 is narrow, presenting in substance, an edge or hairline, but it is slightly wider than the engaging ends of the contacts 14. Thus a break in the electric circuit between a particular contact 14 and the plate 11 is made, but a contact is again made by only slight rotation of the disc 11, produced by the momentum of the disc 11.

The electro-magnetic switch mechanism C comprises a magnet or coil 21 and an armature 22 which carries a plurality of three flexible switch members 23, 24, and 25, insulated from each other and from the armature. The latter switch member is permanently electrically connected, that is, when the switch 74 is closed, through the coil with a source of energy, which consists, in this instance, of the transformer 2. When the coil is deenergized, the leaf or member 25 normally engages a contact 27 which is connected by wire 28 with a brush 29 which normally engages the periphery of an insulating member, such as a fibre disc 31, mounted on the minute shaft 32 of a time switch or control clock D. This disc has four equal-arcuately spaced notches $31^a$ into which the free end of the brush 29 may drop during the rotation of the disc. When the brush drops into a notch it engages a grounded finger 30. The grounding of the finger 30, however, is effected only at predetermined periods, as will be described hereafter. For this purpose, it is connected, by a wire $30^a$, to an arm 44, mounted on but insulated (not shown) from the hour shaft of the clock D. Thus the circuit to the coil 21 is completed and the armature attracted, but energizing of the magnet, instantly breaks the aforementioned circuit. Such energizing of the magnet causes the switch member 25 to engage another contact 41 which is connected by wire 42 to the switch arm 44, above mentioned.

The clock D carries a plurality of contacts 43 circumferentially elongated and circumferentially spaced about the axis of the clock, and spaced at fifteen minute intervals with respect to each other. These contacts 43 form, with the contact arm 44, holding switches. Each of the contacts 43 is connected by a wire 45 to a separate jack 46 in the portion $E^1$ of the jack board E. This board is shown provided with one jack for each 15-minute interval during a 12-hour period.

The jacks 46 may be connected by cables or cords 51 with jacks 52 on the portion $E^2$ of the panel or board E. Each of the latter jacks is connected by a wire 54 to a separate contact 14 on the stationary disc 12. The disc 11 is grounded, and effects the ground previously referred to in connection with the finger 30. The other terminal of the transformer 2 is also grounded. Thus, at the designated time, and with the proper connections by the cords 51, the circuit will be continued through the magnet, holding the armature 22 in the attracted or dotted line position.

As the armature is attracted by the magnet the dynamic or loudspeaker 3 is disconnected by the switch member 24, which breaks the circuit 61 to the loudspeaker. At the same time the circuit from the generator G to the motor 4 is closed, as will be described hereafter. This rotates the disc 11 until the insulating strip 13 engages the contact 14 which corresponds to the broadcast station or tuning condenser marking desired and to which the condenser is moved by the motor.

The multiple switch mechanism F, illustrated, consists of spring switches 71, 72, 73, and 74, in which, when the radio receiver is off, the switch 71 is normally closed while the other switches are normally open. The condition of these switches is simultaneously reversed, that is, switch 71 is opened while the others are closed, by an operating device or rocking bar 75 which is pivoted at the opposite ends of its upper edge and is adapted to engage with its lower edge the free end portions of the movable members of the above switches. The bar is rocked to opposite positions by an on-magnet 76 and an off-magnet 77. The former, when the radio receiver is turned on, reverses the switches from their normal positions, that is, it opens the switch 71 and closes switches 72, 73, and 74. The latter magnet 77 is the off-magnet and returns the switches, or as shown, allows the switches to return, to their normal positions.

One end of both switches 71 and 72 is connected by wire 78 to lead 6. The other ends of both switches are connected by wires 79 and 80 respectively to one end of magnets 76 and 77. The other end of magnet 76 is connected by wire 81 to the revoluble disc 11 of the station finder switch B. Since the two discs are in constant electrical connection, except as hereinafter described, a circuit will be established through the station finder switch B and the time switch D at the time predetermined by the time switch. This circuit with the time switch D to the other lead 7 is completed by the wire 82 connected to the flexible finger 29 of the clock D.

The energized magnet 76, by the alternating current circuit just described, operates or reverses all of the switches, breaking such circuit through the switch 71 and the magnet 76. The closing of the switch 73 completes an alternating current circuit through wires 86, 87, and 88, energizing the primary $2^a$ of the transformer 2, which excites the secondary $2^b$.

The secondary is connected by wire 89 to the switch 74. Closing of the switch 74 also completes the circuit through the secondary and establishes a direct current through the wire 90, and, as described above, through the coil 21, wire $21^a$, flexible switch member 25, contact 27, of the magnetic switch C, wire 28, switch members 29 and 30 and the arm 44 and a contact 43 of the time switch D, one of each of the wires 45, jacks 46, cables 51, jacks 52, wires 54, and contacts 14, the latter on the stationary disc 12 of the station finder switch B, and thence to the revoluble disc 11 which is grounded. The other direct current terminal of the transformer is also grounded, as described.

It will be here noted that the current between the two discs 11 and 12 is broken or remains broken only for an instant. The slight momentum of the motor and connected moving parts carries the movable disc sufficiently far that the circuit, broken by insulating strip, is again completed by the engagement of the particular contact with the plate 11.

When the coil 21 is energized the switch member 25 engages the contact 41, sending a direct current through wire 42 to the arm 44, also through the switch 74, and thereby holding the armature 22 of magnetic switch C.

The attraction of the armature 22 causes the

switch member 24 to break the circuit through the wire 61 to the loud speaker 3, while the switch member 23 completes an alternating current circuit through the wires 91, 92 and 93 to the motor 4 which operates the condenser and the disc 11 of the station finder switch B. The loud speaker 3 and motor 4 are effected only indirectly by the switch 74 of the multiple switch F.

The return of the armature 22 breaks the motor circuit and again establishes the circuit through the loud speaker 3.

When the switch 72 is closed, a circuit is established between lead 6, wire 78, and wire 80 to the off-magnet 77. This magnet is connected by a wire 101 to a plurality of sockets or jacks 102, one or more of which are connected by cables 103 to the desired jack 46, which is connected to one of the contacts 43 of the timing switch D. At the desired or predetermined time, an alternating current is established through the clock, wire 82, and the alternating current lead 7.

In the drawing, I have shown the variable tuning condenser 1 adjusted to correspond to the position in which the insulating strip 13 engages the contact 14'. Such adjustment is shown as having taken place at 12 o'clock. Assuming the radio set as having been turned off, say manually by means of switch 113, and set to be turned on again automatically at 12:15, a circuit will be reestablished through the wire 82, time switch or clock D, station finder switch B and wire 81, energizing magnet 76 and rocking bar 75, closing switches 72, 73, and 74. The closing of the switches 73 and 74 will cause a direct current to pass through the magnet 21, break the loud speaker circuit, and direct an alternating current through the motor, which will rotate the condenser 1 and the disc 11 of the station finder switch B until the insulating strip 13 engages the contact 14'' connected to the jack 32'' which has been connected by a cable 51'' to a jack 46'' connected to a contact 43 designating 12:15 on the clock D. If the radio receiver has not been turned off at 12:15, switch 71 remains open, and magnet 76 cannot be operated, but switches 73 and 74 remain closed, permitting only the coil 21 to be energized, the armature 22 to be attracted, the dynamic speaker 3 to be disconnected, and the motor 4 to be operated the predetermined amount. The breaking of the circuit by the insulating strip 13 breaks the circuit through the wire 42 and allows the armature 22 to assume its original off-position. Because the switch 73 is closed, the receiving set is energized and continues to receive a program over the designated broadcast station. When the reception is continued to the predetermined time designated by a cable 103, connecting one of the jacks 102 with the designated jack 46, connected to the clock, the off-magnet 77 is energized, reversing the condition of the multiple or cooperating switches and returning them to their normal off-positions, which breaks the switch 73 and deenergizes the receiving set.

If it is desired to dispense with the automatic feature applied to the radio receiving set, I have provided a button 111 which connects by a wire 112, the lead 7 with the on-magnet 76. By an instant depression of the button, the on-magnet 76 is energized throwing the multiple switches to their on or reverse positions, and connecting the receiving set to the current.

If it is desired to diespense with the automatic shut-off, or if it is desired to turn off the radio receiving set at any time, a button 113 is depressed. This closes a circuit, through wires 114, off-magnet 77, and wire 78, to the alternating current line, rocking the bar 75 and returning the multiple switches to their normal off-positions, as shown by solid lines in Fig. 1.

Though I have shown and described a particular construction, combination, and arrangement of parts and portions, I do not wish to be limited to the same, but desire to include in the scope of my invention the construction, combination, and arrangement, substantially as set forth in the appended claims.

I claim:

1. In a circuit of the class described, the combination with an alternating current source, of an electro-magnetically controlled switch mechanism comprising a plurality of cooperating switches, the first normally closed and the others normally open, means for shifting the switches to their normal off positions, and a second means for shifting the switches to their reverse or on-positions, one lead of the current source connected through the first switch to the second means, a radio receiving set, an alternating current transformer for the receiving set, a circuit connecting the transformer to the current source through one of said other switches, a condenser for the set, a station-selecting switch synchronized with the condenser, a motor for operating the condenser and the station-selecting switch, a time control switch, a magnetic switch having a control magnet, an automatically variable circuit connecting said second means, through the station-selecting switch and time control switch, to said other lead of said current source, for operating said second means and shifting said other switches to their "on" positions, and thereby energizing the magnet of the magnetic switch through said transformer and through another of said other switches of said mechanism, and a circuit for the motor, the latter circuit being closed when the latter magnet is energized.

2. In a circuit of the class described, the combination, with an alternating current source, of an electro-magnetically controlled switch mechanism comprising a plurality of cooperating switches, the first normally closed and the others normally open, means for shifting the switches to their normal off-positions, and a second means for shifting the switches to their reverse or on-positions, one lead of the current source connected through the first switch to the second means, a radio receiving set, an alternating current transformer for the receiving set, a circuit connecting the transformer to the current source through one of said other switches, a condenser for the set, a station-selecting switch synchronized with the condenser, a motor for operating the condenser and the station-selecting switch, a time control switch, an automatically variable circuit connecting said second means through the station-selecting switch and time control switch, to said other lead of said current source, for operating said second means and shifting said other switches to their "on" positions, a magnetic switch having a control magnet, a circuit for said control magnet, the latter circuit being connected through another of said other switches to said transformer and said time control switch, the magnetic switch closing when the former circuit becomes energized, and a circuit for the motor, the latter circuit being closed when the latter magnet is energized.

3. In an apparatus of the class described, the combination with a current source and a radio

receiver having a tuning means, of a station finder switch and a motor synchronized with the tuning means, a time switch, a multiple switch comprising a plurality of cooperating switches, the first normally closed and the others normally open, an electromagnetic switch, an automatically variable circuit connecting the time switch, through the first switch, to the current source and thereby reversing the multiple switch and closing the electro-magnetic switch through one of the other switches, a motor circuit for connecting the motor to said source through the magnetic switch, said motor, when the motor circuit is closed, rotating the tuning means and station finder switch, said station finder switch being connected in series with the electro-magnetic switch when the last mentioned switch of the multiple switch is closed, said station finder switch, when operated a predetermined amount, opening the electro-magnetic switch and disconnecting the motor from said source said radio receiver being connected to said source through another of said other switches of the multiple switch when the latter is reversed.

4. In an apparatus of the class described, the combination with a current source and a radio receiver having a tuning means and a transformer for energizing the receiver through said source, of a time control switch, a multiple switch comprising a plurality of cooperating switches, one normally closed and the others normally open, means for shifting the switches of the multiple switch to their normal off-positions in which the first switch of the multiple switch is closed and the others are open, said means operating through one of said other switches, a second means for shifting the switches of the multiple switch to their reverse or "on" positions, said time control switch being adapted to connect the second means to said source through the first switch of the multiple switch for reversing the switches, a magnetic switch, a motor synchronized with the tuning means, a motor circuit closed by said magnetic switch, and a circuit for the magnetic switch adapted to be closed through another of the other switches of the multiple switch when the latter is reversed and thereby closing the motor circuit.

5. In an apparatus of the class described, the combination with a current source and a radio receiver having a tuning means and a transformer for energizing the receiver through said source, of a time control switch, a multiple switch comprising a plurality of cooperating switches, one normally closed and the others normally open, means for shifting the switches of the multiple switch to their normal off-positions in which the first switch of the multiple switch is closed and the others are open, said means operating through one of said other switches, a second means for shifting the switches of the multiple switch to their reverse or "on" positions, said time control switch being adapted to connect the second means to said source through the first switch of the multiple switch for reversing the switches, a magnetic switch, a station finder switch and a motor synchronized with the tuning means, a motor circuit through the magnetic switch, and a circuit for the magnetic switch through the station finder switch adapted to be closed through another of the other switches of the multiple switch when the latter is reversed, thereby closing the motor circuit, the circuit for the magnetic switch being broken by the station finder switch when the latter is operated a predetermined amount by the motor.

6. In a circuit of the class described, the combination with an alternating current source and a radio receiving set having a variable condenser and an alternating current transformer, of a station finder switch and motor synchronized with the condenser, a time switch, a multiple switch, comprising a plurality of cooperating switches, the first normally closed and the others normally open, a magnetic switch, a motor circuit closed by said magnetic switch and an automatically variable circuit connecting the current source through the first switch of said multiple switch to said time switch and thereby reversing the multiple switch and causing the current source to be connected through a second switch of the multiple switch to said radio receiving set and thereby causing the transformer to be connected through a third switch of said multiple switch to said time switch for operating the magnetic switch and thereby connecting the motor to said current source.

7. In an apparatus of the class described, the combination with a current source and a radio receiver having a tuning means, of a station finder switch and a motor synchronized with the tuning means, a plurality of on-switches, a multiple switch comprising a plurality of cooperating switches, the first normally closed and the others normally open, an electromagnetic switch said on-switches being adapted to be connected through the first switch to the current source, thereby reversing the multiple switch and closing the electromagnetic switch through one of the other switches, a motor circuit for connecting the motor to said source through the magnetic switch, said motor, when the motor circuit is closed, rotating the tuning means and station finder switch, said station finder switch being connected in series with the electromagnetic switch when the last mentioned switch of the multiple switch is closed, said station finder switch, when operated a predetermined amount, opening the electromagnetic switch and disconnecting the motor from said source, said radio receiver being connected to said source through another of said other switches of the multiple switch when the latter is reversed.

8. In an apparatus of the class described, the combination with a current source and a radio receiver having a tuning means, a transformer adapted to be connected to said source, a plurality of on-switches, a multiple switch comprising a plurality of cooperating switches, one normally closed and the others normally open, means for shifting the switches of the multiple switch to their normal off-positions in which the first switch of the multiple switch is closed and the others are open, said means operating through one of said other switches, a second means for shifting the switches of the multiple switch to their reverse or "on" positions, said on-switches being adapted to connect the second means to said source through the first switch of the multiple switch for reversing the switches, a magnetic switch, a motor synchronized with the tuning means, a motor circuit closed by said magnetic switch, and a circuit for connecting the transformer to the magnetic switch and adapted to be closed through another of the other switches of the multiple switch when the latter is reversed and thereby closing the motor circuit.

9. In an apparatus of the class described, the combination with a current source and a radio

receiver having a tuning means, a transformer adapted to be connected to said source, a plurality of on-switches, a multiple switch comprising a plurality of cooperating switches, one normally closed and the others normally open, means for shifting the switches of the multiple switch to their normal off-positions in which the first switch of the multiple switch is closed and the others are open, said means operating through one of said other switches, a second means for shifting the switches of the multiple switch to their reverse or "on" positions, said on-switches being adapted to connect the second means to said source through the first switch of the multiple switch for reversing the switches, a magnetic switch, a station finder switch and a motor synchronized with the tuning means, a motor circuit through the magnetic switch, and a circuit for connecting the transformer to the magnetic switch through the station finder switch and adapted to be closed through another of the other switches of the multiple switch when the latter is reversed, thereby closing the motor circuit, the circuit for the magnetic switch being broken by the station finder switch when the latter is operated a predetermined amount by the motor.

10. In an apparatus of the class described, the combination with a current source and a radio receiver having a tuning means, a plurality of on-switches, a multiple switch comprising a plurality of cooperating switches, the first normally closed and a second, third, and fourth switch normally open, means for shifting the switches of the multiple switch to their normal off-positions in which the first switch of the multiple switch is closed and the others are open, said means operating through the second switch, a second means for shifting the switches of the multiple switch to their reverse or "on" positions, said on-switches being adapted to connect the second means to said source through the first switch for reversing the switches, said radio receiver being connected to said source through the third switch when the multiple switch is reversed, a magnetic switch, a motor synchronized with the tuning means, a motor circuit closed by said magnetic switch, and a circuit for the magnetic switch adapted to be closed through the fourth switch when the multiple switch is reversed, thereby closing the motor circuit.

11. In an apparatus of the class described, the combination with a current source and a radio receiver having a tuning means and a transformer for energizing the receiver through said source, a plurality of on-switches, a multiple switch comprising a plurality of cooperating switches, the first normally closed and a second, third, and fourth switch normally open, means, connected to the source ahead of the transformer, for shifting the switches of the multiple switch to their normal off-positions in which the first switch of the multiple switch is closed and the others are open, said means operating through the second switch, a second means, also connected to the source ahead of the transformer, for shifting the switches of the multiple switch to their reverse or on-positions, said on-switches being adapted to connect the second means to said source through the first switch for reversing the switches, said transformer being connected to said source through the third switch when the multiple switch is reversed, and thereby energizing the radio receiver, a magnetic switch, a motor synchronized with the tuning means, a motor circuit closed by said magnetic switch, and a circuit for connecting the magnetic switch to the transformer through the fourth switch when the multiple switch is reversed, thereby closing the motor circuit.

12. In an apparatus of the class described, the combination with a current source and a radio receiver having a tuning means, a time control switch, a multiple switch comprising a plurality of cooperating switches, the first normally closed and a second, third, and fourth switch normally open, means for shifting the switches of the multiple switch to their normal off-positions in which the first switch of the multiple switch is closed and the others are open, said means operating through the second switch, a second means for shifting the switches of the multiple switch to their reverse or "on" positions, said time control switch being adapted to connect the second means to said source through the first switch for reversing the switches, said radio receiver being connected to said source through the third switch when the multiple switch is reversed. a magnetic switch, a motor synchronized with the tuning means, a motor circuit closed by said magnetic switch, and a circuit for the magnetic switch adapted to be closed through the fourth switch when the multiple switch is reversed, thereby closing the motor circuit.

13. In an apparatus of the class described, the combination with a current source and a radio receiver having a tuning means and a transformer for energizing the receiver through said source, a time control switch, a multiple switch comprising a plurality of cooperating switches, the first normally closed and a second, third, and fourth switch normally open, means, connected to the source ahead of the transformer, for shifting the switches of the multiple switch to their normal off-positions in which the first switch of the multiple switch is closed and the others are open, said means operating through the second switch, a second means, also connected to the source ahead of the transformer, for shifting the switches of the multiple switch to their reverse or "on" positions, said time control switch being adapted to connect the second means to said source through the first switch for reversing the switches, said transformer being connected to said source through the third switch when the multiple switch is reversed, and thereby energizing the radio receiver, a magnetic switch, a motor synchronized with the tuning means, a motor circuit closed by said magnetic switch, and a circuit for connecting the magnetic switch to the transformer through the fourth switch when the multiple switch is reversed, thereby closing the motor circuit.

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