

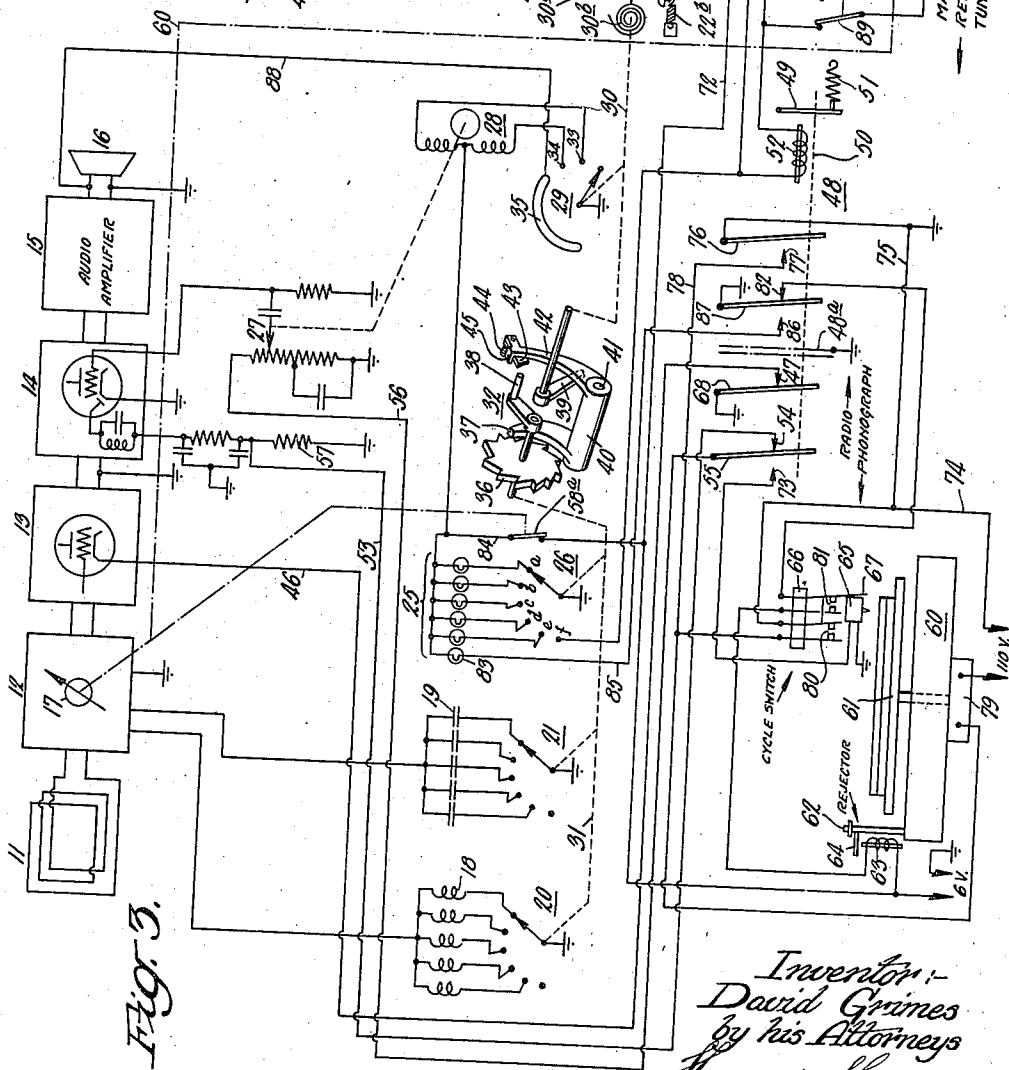
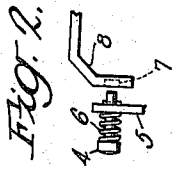
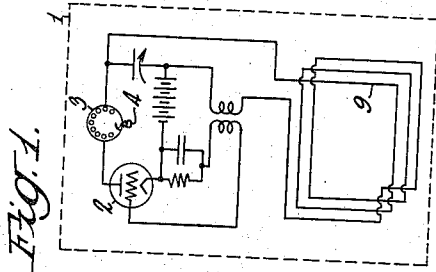
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WIRELESS REMOTE CONTROL SYSTEM FOR RADIO-PHONOGRAPH COMBINATIONS

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## UNITED STATES PATENT OFFICE

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WIRELESS REMOTE CONTROL SYSTEM FOR  
RADIO-PHONOGRAPH COMBINATIONSDavid Grimes, Meadowbrook, Pa., assignor to  
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This invention relates to wireless remote control systems, and more particularly to a novel system for controlling remotely a radio receiver and phonograph combination.

The principal object of the invention is to provide a novel system whereby a radio receiver, a phonograph, or both, may be controlled from a distance by operating a simple portable control unit which enables the operator to operate the radio receiver and the phonograph selectively at will, to select any desired one of a group of predetermined radio broadcasting stations, to start or stop the phonograph, to play successively a plurality of recordings, and to reject any recording at any time during the playing thereof.

A further object is to provide a radio-phonograph combination adapted for selective local or remote control by means of standard devices with which unskilled operators are generally familiar.

More particularly, the object of this invention is to provide a system whereby a radio receiver embodying a remote control system and an automatic phonograph of the type adapted to play successively a number of recordings may be electrically interconnected and interlocked in such manner as to insure that proper selective operation of either the radio or the phonograph may be accomplished with a single simple control device which does not require skill, or the selection and understanding of complex controls, on the part of the operator.

The invention may be clearly understood by reference to the accompanying drawing, in which Fig. 1 is a diagrammatic illustration of the control unit;

Fig. 2 is a detailed illustration of a feature of the impulse sending mechanism; and

Fig. 3 is a diagrammatic illustration of the radio receiver and phonograph combination to be remotely controlled.

The present invention is related generally to the remote control system disclosed and claimed in the copending application of David Grimes and Elmer O. Thompson, Serial No. 220,366, filed July 20, 1938. Such system enables an operator at a remote point to tune a radio receiver to any desired one of a plurality of broadcasting stations and to control the volume level of the receiver output. The present invention utilizes certain principles of the said copending application and extends such principles to the control of a radio-phonograph combination.

*General construction*

Referring to Fig. 1, there is illustrated the portable control device which is of the same general character as that employed in the said Grimes and Thompson application, but in this instance the device has provision for remote control of the phonograph, as described hereinafter. The device 1 comprises a control signal generator which may take the form of a radio frequency oscillator of any well-known type including tube 2 and associated circuits. This signal generator is controlled by a manual control device 3 which may take the form of a dial type circuit closing mechanism such as employed in telephony. By operating the dial mechanism, the generator circuit is intermittently closed to generate a plurality of high frequency wave trains, hereinafter termed signals, spaced apart by a predetermined time interval. The number of such signals depends on the finger opening of the dial employed in any instance, and the duration of the last of signal is controllable as will be described more fully hereinafter.

The volume level of the radio or phonograph reproduction is controlled by signals including one of controllable duration. To this end, there is provided on the dial mechanism 3, a depressible plunger 4 which is adapted to stop the rotation of the dial during the last signal and thus generate a signal of controllable duration. Such a dial may be of the type shown in the copending application of E. O. Thompson, Serial #220,368, filed July 20, 1938. As shown in Fig. 2, the plunger 4 is carried by the stationary frame 5 of the dial mechanism and is urged to its normal inoperative position by spring 6. The inner end of the plunger is adapted to seat in a recess 7 provided in the rotary dial 8. The recess 7 is so arranged that the dial is interrupted during the last signal when the plunger is depressed.

The signal currents in primary inductor 9 at the control unit are transferred inductively to a tuned secondary inductor 10 at the receiver-phonograph combination (Fig. 3). The signal currents in the secondary inductor are utilized to control the radio receiver and phonograph in the manner described hereinafter.

The radio receiver may be of any conventional design having incorporated therein the structure hereinafter described. For illustration, there is shown schematically a superheterodyne receiver which may include a loop antenna 11 for receiving the intelligence signal, a radio frequency amplifier, oscillator and converter stage 12, an

intermediate frequency amplifier 13, a detector and audio frequency amplifier 14, an audio frequency power amplifier 15, and a loud-speaker 16. The receiver may be a multi-wave-band receiver having a conventional wave-band selector switch as indicated at 17. The receiver is also adapted for tuning to predetermined stations in one band, for example the broadcast band, by pretuned circuits comprising the coils 18 and condensers 19 which are adapted to be connected in the circuits of the radio frequency amplifier and oscillator 12 by operation of the wave-band switch. In the present instance, the selection of the proper coil and condenser is effected by means of step-by-step switches 20 and 21 which form part of a stepping mechanism controlled by stepping and homing relays 22 and 23. The latter are energized by an amplifier and rectifier device 24 which forms current pulses in accordance with signal currents induced in the secondary inductor 10. The station indicator lamps 25 are likewise operated by a step-by-step switch 26. The volume control 27, which controls the audio portion of the receiver, is controlled by motor 28 through the operation of step-by-step switch 29.

Considering the stepping mechanism as a whole, the step-by-step switch 29 constitutes a primary section of the mechanism, while the step-by-step switches 20, 21 and 26 constitute a secondary section of the mechanism. The broken-line representation 30 is representative of a rotatable shaft carrying the movable arm of the switch 29, while the similar representation 31 indicates a shaft carrying the movable arms of the switches 20, 21 and 26. The movable arms of the switches are shown in their rest or home positions. The two shafts 30 and 31 are coupled by a device 32 whose construction and purpose will be described presently. The primary shaft 30 carries a ratchet wheel 33a which is actuated by a stepping pawl 22a. The latter is operated by the stepping relay 22 against the action of spring 22b. The holding pawl 23a is moved to operative position by the homing relay 23 against the action of spring 23b. The stepping and homing relays are serially connected so as to be energized simultaneously. The homing relay is slow to release and consequently will not release the holding pawl until after the last control signal has terminated. The homing or return spring is shown at 33b. The switch 29, which is operated by this mechanism, comprises stationary contacts 33 and 34 for controlling the motor 28, and an elongated arcuate contact 35 for muting the radio receiver, as described hereinafter.

The shaft 31 is also provided with a homing spring (not shown) tending to urge the shaft to its home position. This shaft carries a ratchet-wheel 36 with which there is associated a holding pawl 37. At its end, the shaft 31 carries a crank-arm 38 which is engageable by an arm 39 on the shaft 30. The pawl 37 is carried by a member 40 which is rotatable about a pivot 41. The pawl is spring urged to its engaging position so that the shaft 31 is held in the successive positions to which it is moved. On the member 40, there is provided an arm 42, at the end of which there is pivoted a cam plate 43. This cam plate is urged by a spring 44 against stop 45.

The parts are so arranged that when the step-by-step switch 29 moves to its third effective position, the arm 39 engages cam plate 43 and

rotates member 40 sufficiently to release the pawl 37 from the ratchet-wheel 36 thereby permitting the shaft 31 to be homed. During the subsequent movement of switch 29, the arm 39 engages the crank-arm 38, thereby actuating the shaft 31 in tandem with the shaft 30. The switches 20, 21 and 26 are thus stepped to their successive positions until the selected position determined by the number of control impulses is reached. Thereafter, the primary section of the stepping mechanism is homed but the secondary section remains in the selected position until a subsequent control operation takes place. During the homing of the shaft 30, the arm 39 rotates free of the arm 38 and, by virtue of the pivoted mounting of the cam plate 43, the arm 39 brushes the cam plate aside during the homing movement without disturbing the holding pawl 37 of the secondary section.

Thus, the primary section of the stepping mechanism may respond to one or two control impulses without affecting the secondary section; but, when three or more control impulses are received, the primary section effects homing of the secondary section and then operates the said section as above described. This stepping mechanism is of the same type as that employed in the above-mentioned Grimes and Thompson application, wherein the mechanism is illustrated and described in greater detail.

In the specific device illustrated, the step-by-step switches 20, 21 and 26 have six positions designated respectively *a*, *b*, *c*, *d*, *e* and *f* on switch 26. The first five of these positions, that is positions *a* to *e*, are devoted to tuning of the radio receiver to different stations in the broadcast band, while the sixth position *f* is devoted to the phonograph and serves to connect the phonograph for operation, as will be described in detail later. The arcuate contact 35 of the switch 29 is coextensive with the positions of the switches 20, 21 and 26, and serves to mute the radio receiver during actuation of these switches.

At least one cathode lead 46 of a vacuum tube in the intermediate frequency amplifier 13 is connected to contact 47 of a solenoid-operated radio-phonograph switch 48. This switch comprises a plurality of movable contact arms connected together and to the armature 49, as indicated by the broken-line representation 50. The movable contacts of switch 48 are movable between two positions and are associated with various stationary contacts as illustrated. The armature 49 is biased by spring 51 toward the right, thereby normally maintaining the movable contact arms in the right-hand or radio position. The solenoid 52, when energized, attracts the armature 49 against the action of spring 51 and moves the movable switch contacts to the left-hand or phonograph position. Preferably a shield member 48a is provided on the switch 48, as shown, to separate the contacts carrying power currents from those carrying signal currents.

The second detector 14 is shown as comprising a diode triode tube and the diode rectifier circuit is connected by conductor 53 to the contact 54 of switch 48. The associated movable contact 55 is connected by conductor 56 to the volume control potentiometer 27. Thus, when the switch 48 is in the radio position, the voltage across the rectifier load resistor 57 is applied to the potentiometer 27 by means of which a controllable portion of the said voltage is applied to

the input circuit of the triode section of the second detector.

In addition to the solenoid-operated switch 48, there are provided control switches 58 and 59. The switch 58 is a two-position switch which may be mechanically coupled to, or may form a part of, the wave-band switch 17, as indicated by the broken-line representation 60. When the wave-band switch 17 is in position to condition the receiver for remote operation, connecting the coils 18 and condensers 19 to the radio circuit, the switch 58 is in its left-hand position as shown. When the wave-band switch is in the position for manual tuning, the switch 58 is thrown to its right-hand position.

The switch 59 is a two-position manually-operable switch by means of which radio or phonograph operation may be selected manually at the set.

There is also provided a switch 58a connected in the circuit of lamps 25 and operable by the wave-band switch 17 so that the switch 58a is closed, as shown, only when the wave-band switch is in position to condition the receiver for remote operation.

The phonograph may be of any suitable type having incorporated in its construction the features hereinafter discussed. One type of phonograph 60 which would be suitable may comprise a turntable 61 driven by a motor 79. Associated with the turntable and motor there may be a record feeding mechanism adapted to supply successive records to the turntable for playing. Also coupled to the above mechanism, there may be a tone arm control unit adapted to raise, lower, and rotate the tone arm 65 so as to permit the reproduction of the recording on the turntable and, thereafter, remove the tone arm from the recording to permit another recording to be positioned on the turntable. Thus when the phonograph is energized, successive recordings may be automatically reproduced. Such an automatic phonograph is well known, and requires no detailed illustration or description. Associated with the automatic phonograph is a cycle switch 66 which may comprise cooperative spring fingers whose resiliency urges them to closed position. One finger 67 may extend into the path of the tone arm to be engageable thereby when the tone arm is in standby position, clear of the turntable and automatic mechanism, to open the contacts as illustrated. It will be understood that switch 66 is open only when the tone arm is in the standby position, and that the tone arm is adapted to be automatically moved from that position onto the top of a record for the playing thereof, after which the tone arm will be returned to that position. The purpose of switch 66 will be explained more fully presently, but briefly, the purpose of this switch is to maintain the phonograph motor energized until the completion of a cycle of operation of the automatic mechanism which cycle terminates with the movement of the tone arm into the standby position.

The automatic record feeding and control mechanism is also adapted to be actuated at will by a manually depressible rejector plunger 62 to effect the feeding of a new record onto the turntable at any time during the operation of the phonograph. The operation of the rejector 62 will trip the mechanism thereby causing the tone arm to be moved to the standby position. This manual trip feature is also known. In the present instance the rejector 62

is adapted for remote operation by the provision of a solenoid 63 arranged to actuate an armature 64 integral with the rejector 62. The purpose of this will also be fully explained hereinafter.

The general components of the system having been described, the various operations which may be effected will now be described in detail.

#### *Manual radio control*

When it is desired to tune the radio receiver manually by means of the usual manual tuning elements (not shown), the wave-band switch 17 is adjusted to the position for manual tuning, in which case the coils 18 and condensers 19 are disconnected from the receiver circuit, and the switch 58 is thrown to its right-hand position. The manual switch 59 is thrown to its radio position as shown. The solenoid 52 is deenergized in such case and, therefore, the switch 48 is spring-biased to its normal radio position. Consequently, the cathode lead 46 is grounded through the closed contacts 47 and 68, thereby rendering the amplifier 13 operative. Moreover, the conductor 53 is connected to the conductor 56 through the closed contacts 54 and 55, thereby connecting the diode load circuit to the audio amplifier of the receiver. It will be apparent also that the phonograph is disconnected. In this condition of the parts, the radio receiver may be tuned manually in the usual manner.

#### *Manual phonograph operation*

When it is desired to operate the phonograph manually, the wave-band switch 17 is set at its manual tuning position so that the switch 58 is thrown to the right. The manual switch 59 is adjusted to its phonograph position. This closes an energizing circuit for the solenoid 52 which may be traced as follows: from ground through contact arm 69 to switch 58, contact arm 70 of switch 59, the solenoid winding, contact arm 71 of switch 59, conductor 72, and the six volt source indicated to the left of the phonograph, to ground. Accordingly, the switch 48 is actuated to its phonograph position. As a result, the cathode lead 46 is opened to prevent the functioning of the amplifier 13, and the conductor 56 is disconnected from the conductor 53 and is connected to the phonograph pick-up 65 through the closed contacts 55 and 73. Therefore, the output of the phonograph pick-up is applied across the potentiometer 27 and the audio portion of the radio receiver is utilized to amplify and reproduce signals from the pick-up.

The switch 48 also energizes the phonograph motor through a circuit which may be traced as follows: from one side of the 110 volt source indicated, through conductors 74 and 75, closed contacts 76 and 77, conductor 78, and the phonograph motor 79 to the other side of the said source. Upon the starting of the phonograph, the mechanism thereof automatically lowers the tone-arm onto the top record on the turntable in a manner characteristic of this type of phonographic device. Consequently, the tone-arm frees the switch 66, permitting the contacts thereof to close and the phonograph will move through its usual cycle of operation, playing the records successively and discharging them successively. During this operation, the switch 66 will be opened when the tone-arm is in standby position but will be closed during the remainder of the cycle. Preferably a tripping-switch (not shown) will be associated with the tone arm so

as to trip the record feeding mechanism in the event that no record is on the turntable when the tone arm is lowered thereon.

If it is desired to reject any record during the playing thereof, the plunger 62 may be manually depressed to trip the record-rejecting mechanism in the customary manner.

When it is desired to stop the phonograph, the manual switch 59 may be moved to the radio position, thereby deenergizing the switch 48 and opening the above-mentioned circuits controlled thereby. It will be noted that the contacts 80 of cycle switch 66 are in shunt relation with the contacts 76 and 77 of switch 48. Therefore, if switch 48 is deenergized during the operating cycle of the phonograph, the closed contacts 80 will maintain the energization of the phonograph motor until the tone-arm has moved to its standby position to complete the cycle of the automatic mechanism. During the above-described manual operation of the phonograph, the contacts 81 of switch 66 serve no purpose since the circuit connection of these contacts is open at contact 82 of switch 48.

#### *Remote radio operation*

When it is desired to operate the radio receiver by means of the remote control, the wave-band switch 17 is adjusted to its "remote" position, thereby connecting the coils 18 and condensers 19 to the radio circuit, and setting the switch 58 in the position shown. Switch 58a is also closed, rendering the lamp circuit operative. Since the solenoid 52 is deenergized, switch 48 is spring biased to its radio position, thereby conditioning the circuits for radio operation as above described. The phonograph is, of course, disconnected.

Assume first that the radio receiver is to be tuned remotely to a selected one of the several predetermined stations. This is accomplished by manipulating the dial mechanism 3, utilizing the finger opening corresponding to the particular station whose call letters should be indicated on the dial. As a result, a train of impulses is supplied to the stepping mechanism, as described above, the number of impulses corresponding to the particular station selected. Suppose, for example, that the station selected is the second one of those provided. This will necessitate four impulses in order to step the switch 29 to its fourth position and at the same time actuate the switches 20, 21 and 26 to their second position through the coupling device 32. During the actuation of the latter switches, the switch 29 mutes the receiver by maintaining closed the short-circuit connection 88 which places a short-circuit across the audio channel of the receiver. Thus, the receiver is muted during the station-selecting operation. After the control impulses have terminated, the switch 29 is homed, thereby removing the short-circuit, while the switches 20, 21 and 26 remain in the selected position. Thus, the receiver is tuned to the desired station which is indicated by the particular indicator lamp which has been energized by switch 26.

Assume now that it is desired to vary the volume of the radio receiver. This may be effected by dialing one or two impulses depending upon the direction in which the volume is to be changed. Thus, the first two finger openings of the dial 3 may be devoted to volume changes in either direction and suitable indicia should be provided in cooperation with these finger open-

ings. The application of one or two impulses to the stepping mechanism will cause switch 29 to engage either contact 33 or contact 34, thus energizing the motor 28 for operation in the desired direction. At the same time that the dial is manipulated, however, the plunger 4 is depressed so that the impulse, if there be one (or the second impulse if there be two) is prolonged to maintain the motor circuit energized until the plunger 4 is released. Thus, the volume level of the receiver may be decreased or increased by any desired amount. When the plunger 4 is released, the switch 29 is homed. It will be noted that this volume control operation does not affect the secondary section of the stepping mechanism which remains in the position to which it was last adjusted.

When it is desired to tune the receiver to a different station, this is accomplished simply by dialing the proper number of impulses through the medium of the finger opening corresponding to that station. As will be understood from the foregoing description, this will actuate the primary section of the stepping mechanism, which in turn will home the secondary section and then adjust it to the proper position.

Coupled to the receiver volume control, there may be a power supply switch (not shown) adapted to control the power supply for the radio phonograph combination and so arranged as to open the power supply circuit when the volume control is in its lowest position. Such a combination switch and volume control is well known. Thus, to deenergize the receiver by remote control, it is only necessary to dial so as to decrease the receiver output until the volume control reaches its lowest position and turns the receiver off.

#### *Remote phonograph operation*

When it is desired to operate the phonograph remotely, the wave-band switch 17 is set in its remote position so that the switch 58 is in the position shown. The dial mechanism 3 is then operated to effect selection of the phonograph. As pointed out above, in the specific device illustrated, the last position of the switches 20, 21 and 26 is the phonograph position and, accordingly, the last finger opening of the dial 3 corresponds to the phonograph operation and should be so indicated. Accordingly, the necessary number of control impulses are applied to the stepping mechanism to step the switches 20, 21 and 26 to their last position. The engagement of the contact arm of switch 26 with its last contact *f* completes an energizing circuit for solenoid 52 which may be traced as follows: from ground through the six volt source, conductor 72, contact 89 of switch 58, solenoid 52, and contact *f* of switch 26 to ground. The switch 48 is thereby actuated to its phonograph position, thus disconnecting the radio circuits and connecting the phonograph circuits as above described. The phonograph will function thereafter to reproduce the successive records as in the case of manual phonograph operation.

Assume now that it is desired to vary the volume of the phonograph reproduction. This is accomplished in the same manner as described above in connection with the radio receiver, the motor 28 being actuated to operate the potentiometer 27 which controls the magnitude of the signal which is applied to the audio portion of the receiver.

Assume now that it is desired to reject a record

during the playing thereof. This may be accomplished simply by again dialing the phonograph position on the dial mechanism 3. As will be clearly seen from the foregoing description, the effect of the impulses thus transmitted will be to home the switches 20, 21 and 26 and then move them back to the phonograph position. During this operation, the solenoid 52 is de-energized, thereby closing contacts 82 and 87 which energizes the solenoid 63, it being remembered that the contacts 81 of switch 66 are closed during the playing of a record. Consequently, the plunger 62 is actuated by solenoid 63, thus tripping the record-rejecting mechanism. Since the contacts 80 of the cycle switch are also closed, the phonograph motor continues to run even though contacts 76, 77 are open. When the switch 26 is repositioned at the phonograph position, the switch 48 is reenergized and automatic operation is resumed. It will be noted that the audio amplifier is muted by the switch 29 during the movement of switches 20, 21 and 26, thereby preventing the amplifier from operating when the switch 48 is deenergized. No signal will be reproduced by the audio amplifier after the switches have been repositioned until after the completion of the record change, since the tone arm will not be on the turntable.

When it is desired to stop the phonograph operation by remote control, the control signal generator may be operated so as to turn the receiver off as described under remote receiver operation, or the control signal generator may be operated so as to tune a desired radio station. In the latter case, the switches 20, 21 and 26 will be homed and then stepped to the position corresponding to the desired station. Consequently, the relay 48 will be deenergized, thus conditioning the circuits for radio operation. At the same time, the reject solenoid 63 will be energized through switch 82-87 if the playing of a record is in progress, thereby causing the record to be removed, after which the switch 66 will be opened to stop the phonograph motor.

If the phonograph operation is interrupted by actuating the volume control to open the power supply switch, the entire apparatus will be de-energized and, when the power supply switch is again closed, the functioning of the circuits will depend upon the position of the switches 20, 21 and 26, as will be readily understood.

#### *Electro-mechanical interlocks*

In the above-described remote control operations of either the radio receiver or the phonograph, the position of the manual switch 59 is unimportant. This switch is provided solely for the purpose of energizing solenoid 52 through a circuit including switch contacts 69, 70 and 71 in series. Therefore, switch 59 is inoperative unless switch 58 is in the position for manual control of the receiver. Moreover, during manual tuning of the radio receiver, the switch 59 will always be in its right-hand position, and, therefore, the relay 48 will be maintained in deenergized condition unless switch 59 is closed to manually control the phonograph. It is impossible, therefore, for the phonograph to operate even if the switch 26 happened to be in its phonograph position unless all other control switches are properly positioned. For example, if switch 26 happened to be in its phonograph position when the power supply is first turned on, the phonograph might be operated were it not for the series connection of switches 58 and 59.

The cycle switch 66 connected in shunt with contacts of switch 48 forms another important interlock as it will be understood that means must be provided to insure that the mechanical units of the record changing mechanism will complete a cycle of operation before being de-energized. It is obvious that many other interconnections in the above-described apparatus are important to the proper functioning of the system.

From the foregoing description, it will be seen that the invention provides a highly flexible system by means of which any desired control operation may be performed remotely either with respect to the radio receiver or the phonograph. It will be understood, of course, that the invention is not limited to the specific apparatus illustrated but is capable of various modifications within the scope of the appended claims.

I claim:

1. In a remote control system for a phonograph, a self-starting phonograph, an audio amplifier and sound reproducer operatively associated with said phonograph, volume control means associated with said amplifier, means for generating a control signal comprising short impulses, means for generating another control signal including a prolonged impulse of controllable duration, means responsive to said first control signal for operating said phonograph, and means responsive to said last control signal for operating said volume control means.

2. In a control system for a radio-phonograph combination, a radio receiver including an audio amplifier, volume control means associated with said amplifier, a self-starting phonograph, means for generating control signals comprising different numbers of short impulses, means for generating other control signals including a prolonged impulse of controllable duration, means responsive to said first-mentioned signals for selectively operating either the radio receiver or the phonograph in conjunction with said audio amplifier, and means responsive to said last-mentioned signals for operating said volume control means during operation of either the radio receiver or the phonograph.

3. In a remote control system for a phonograph, an automatic phonograph adapted to operate through successive-record reproducing and changing cycles, said phonograph including a record-changing mechanism, means for starting and stopping said phonograph from a remote point, and means operable from said point for actuating said record-changing mechanism at will to reject a record during the playing thereof.

4. In a control system for a phonograph, a self-starting phonograph including record-changing apparatus, an amplifier adapted to be connected to said phonograph, an electro-mechanical relay, means for energizing said phonograph when said relay is in one position, and means for energizing said record-changing apparatus when said relay is in another position.

5. In a control system for a phonograph, a self-starting phonograph including a record-changing apparatus, an audio frequency amplifier, an electromechanical relay, means for energizing said phonograph, means for connecting said phonograph to said amplifier when said relay is in one position, and means for energizing said record-changing apparatus when said relay is in another position.

6. In a control system for a radio-phonograph combination, a radio receiver, a self-starting

phonograph including record-changing apparatus, a radio-phonograph relay, a control signal generator, means responsive to actuation of said generator to actuate said relay, means for energizing said phonograph and connecting the same to an amplifying circuit of said radio receiver when said relay is in one position, and means for energizing said record-changing apparatus when said relay is in another position.

7. In a control system for a radio-phonograph combination, a radio receiver having a radio frequency amplifier and an audio frequency amplifier, a self starting phonograph including record changer, a multi-pole multi-element control switch, means for actuating said switch, and means for connecting said phonograph to said audio frequency amplifier and for disconnecting said radio frequency amplifier therefrom when said switch is in one position, and for disconnecting said phonograph and connecting said radio frequency amplifier to said audio frequency amplifier, and for energizing said record changer when said switch is in another position.

8. In a control system for a radio-phonograph combination, a radio receiver, an automatic phonograph, means for energizing said phonograph, an electrical circuit including two switches in shunt for connecting said energizing means and said phonograph, controllable means including one of said switches for initiating operation of the phonograph, said controllable means including switching means for selectively controlling said radio receiver and said one of said switches, and means on said phonograph for controlling the other of said switches during an operating cycle of the phonograph, whereby the phonograph is maintained energized through a complete cycle irrespective of the condition of said controllable means.

9. In a control system for a radio-phonograph combination, a radio receiver, an automatic phonograph, means for energizing said phonograph, an electrical circuit including two normally-open switches in shunt for connecting said energizing means and said phonograph, controllable switching means for selectively controlling said radio receiver and for closing one of said switches to initiate operation of the phonograph, and means for closing the other of said switches during an operating cycle of the phonograph, whereby the phonograph is maintained operative through a complete cycle irrespective of the condition of the first switch.

10. In a control system for a phonograph, an automatic phonograph adapted to operate through successive record-reproducing and changing cycles, said phonograph including a record-changing mechanism, a first switching means operable at will, a second switching means, means on said phonograph for actuating said second switching means, means including a switch on said first switching means for energizing said phonograph, a switch on said second switching means connected in shunt with said first switch, electrical means for actuating said record-changing mechanism, an additional switch on said first switching means, an additional switch on said second switching means, and means including said last two switches in series for energizing said electrical means.

11. In a control system for a phonograph, an automatic phonograph including a record changer having a predetermined operating cycle, means for energizing said phonograph, an electrical

circuit including two switches in shunt for connecting said energizing means and said phonograph, means associated with said phonograph for closing the first of said switches upon the energization of the phonograph through the second switch, alternate contacts for said second switch, means including a two position relay for operating said second switch, manually controllable means for operating said relay, a third switch ganged to said first switch, and means constructed to trip said record changer connected serially in circuit with said third switch and alternate contacts of said second switch, whereby said record changer may be actuated and said phonograph deenergized when said relay is operated.

12. In a control system for phonographs, an automatic phonograph including a record changer having a predetermined operating cycle, means for energizing said phonograph, an electrical circuit including two switches in shunt for connecting said energizing means and said phonograph, means associated with said phonograph for closing the first of said switches upon the energization of the phonograph through the second switch, alternate contacts for said second switch, means including a two position relay for operating said second switch, a third switch ganged to said first switch, and means constructed to trip said record changer connected serially in circuit with said third switch and said alternate contacts of said second switch, whereby said last named means becomes operative to actuate the record changer and deenergize the phonograph when said second switch is in the alternate position while said record changer remains energized through said first switch until the cycle of said record changer has been completed and said first and third switches are opened.

13. In a control system for a radio phonograph combination, a radio receiver including an audio frequency amplifier, a self starting phonograph including an automatic record changer and a tone arm having a normal standby position, means for generating control signals, a step-by-step switch, a multi-contact relay, means responsive to said signals for actuating said step-by-step switch, said switch being constructed and arranged to tune said receiver to one of a number of predetermined stations when actuated in response to a predetermined number of control signals or to energize said multicontact relay when actuated in response to a different number of control signals, a power supply for said phonograph, said relay when energized connecting said power supply to said phonograph to operate the same and to render said radio receiver inoperative and connecting said tone arm to said audio frequency amplifier, said relay when deenergized actuating said record changer and disconnecting said power supply and said phonograph, a cycle switch connected in shunt with said relay and arranged to connect said power supply to said phonograph, said cycle switch being normally closed when said tone arm is displaced from its standby position, and a pair of contacts actuated by said cycle switch, said pair of contacts being serially connected in circuit with said relay contacts and said record changer to complete said circuit only when said cycle switch is closed whereby complete control of said radio phonograph combination may be accomplished by actuation of said means for generating control signals.



14. In a remote control system for a phonograph, a self-starting phonograph, an audio amplifier and sound reproducer operatively associated with said phonograph, volume control means associated with said amplifier, means for generating a control signal, means for generating another control signal including a prolonged impulse of controllable duration, means responsive to said first control signal for operating said phonograph, and means responsive to said last control signal for operating said volume control means.

15. In a remote control system for a radio-phonograph combination, a radio receiver including a radio frequency amplifier and an audio amplifier, volume control means associated with said audio amplifier, a self-starting phonograph, a step-by-step switch having successive operating positions, means for generating control signals to actuate said switch, means controlled by certain positions of said switch for tuning said radio receiver, means controlled by another position of said switch for operating said phonograph in conjunction with said audio amplifier and for rendering said radio frequency amplifier inoperative, and means controlled by still other positions of said switch for actuating said volume control means during operation of either the radio receiver or the phonograph.

16. In a remote control system for a radio-phonograph combination, a radio receiver including a radio frequency amplifier and an audio amplifier, volume control means associated with said amplifier, a self-starting phonograph, a step-by-step switch comprising primary and secondary sections each having a plurality of operating positions, means for generating control signals to actuate said switch, means controlled by certain positions of the secondary section of said switch for tuning said radio receiver, means controlled by another position of the secondary section of said switch for operating said phonograph in conjunction with said audio amplifier and for rendering said radio frequency amplifier inoperative, and means controlled by the primary section of said switch for actuating said volume control means during operation of either the radio receiver or the phonograph.

17. In a remote control system for a radio-phonograph combination, a radio receiver including an audio amplifier, volume control means associated with said amplifier, a self-starting phonograph, a step-by-step switch comprising primary and secondary sections each having a plurality of operating positions, means for generating control signals to actuate said switch, means controlled by certain positions of the secondary section of said switch for tuning said radio receiver, means controlled by another position of the secondary section of said switch for operating said phonograph in conjunction with said audio amplifier, means controlled by the primary section of said switch for actuating said volume control means during operation of either the radio receiver or the phonograph, and means controlled by said switch for muting the radio-phonograph combination during operation of the secondary section of said switch.

18. In a remote control system for a phonograph, a self-starting phonograph, an audio amplifier and sound reproducer associated with said phonograph, volume control means associated with said amplifier, a step-by-step switch having a plurality of operating positions, means for generating control signals to actuate said switch, means controlled by a certain position of said switch for operating said phonograph, and means controlled by other positions of said switch for operating said volume control means during the operation of said phonograph.

19. In a remote control system for a phonograph, a self-starting phonograph, an audio amplifier and sound reproducer associated with said phonograph, volume control means associated with said amplifier, a step-by-step switch comprising primary and secondary sections, means for generating control signals to actuate said switch, means controlled by the secondary section of said switch for operating said phonograph, and means controlled by the primary section of said switch for operating said volume control means during the operation of said phonograph.

DAVID GRIMES.