Jan. 17, 1933. A. M. TROGNER 1,894,646

REMOTE CONTROL FOR SPACE AND WIRED RADIO SYSTEMS

Filed June 3, 1931 4 Sheets-Sheet 1

Fig. 1

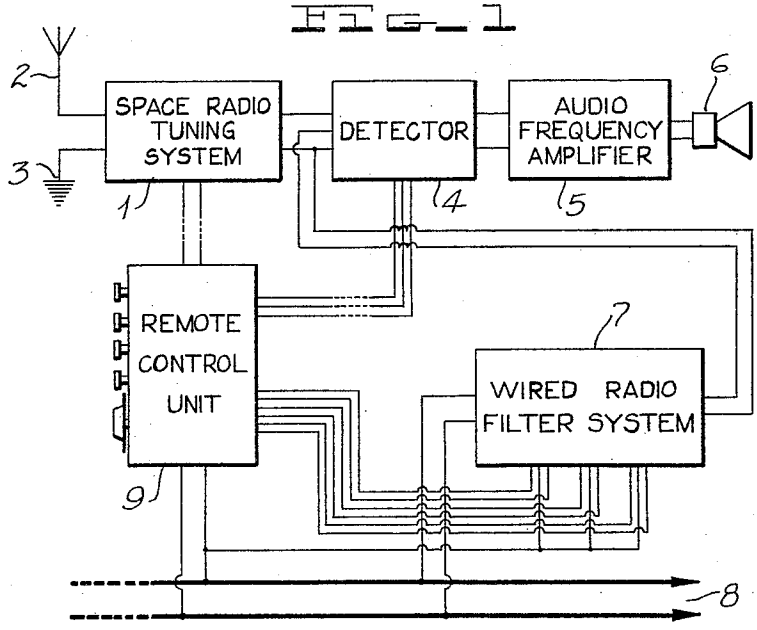
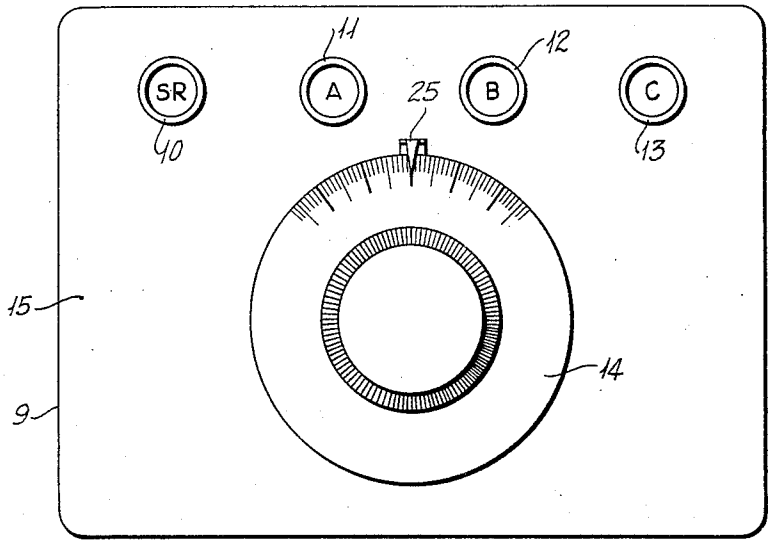


Fig. 2



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Filed June 3, 1931 4 Sheets-Sheet 2

FIG. 3

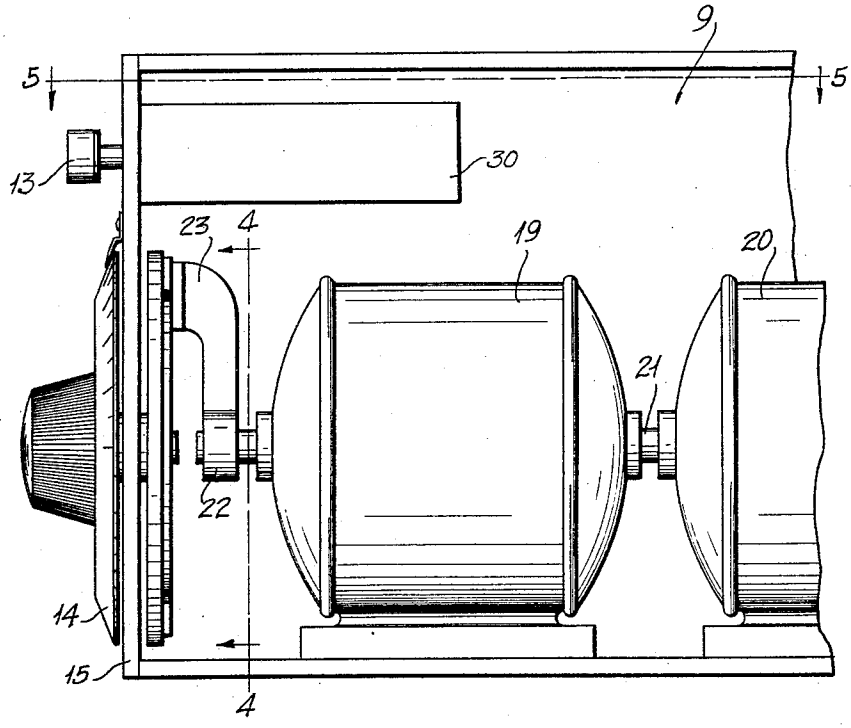
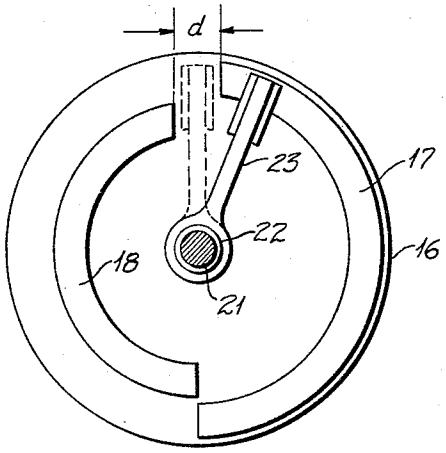


FIG. 4



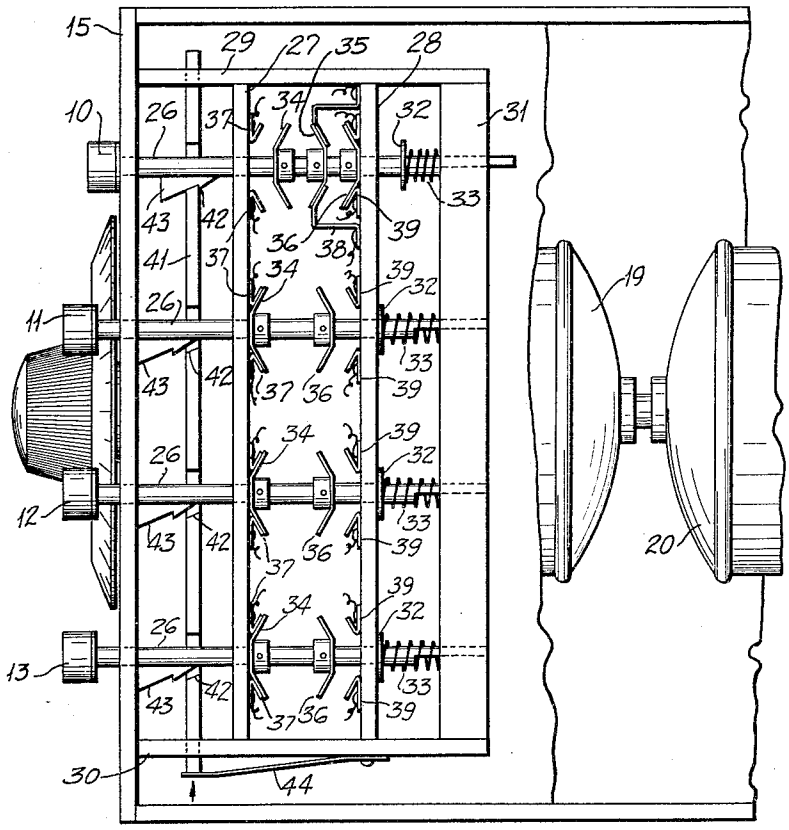
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Fig. 5



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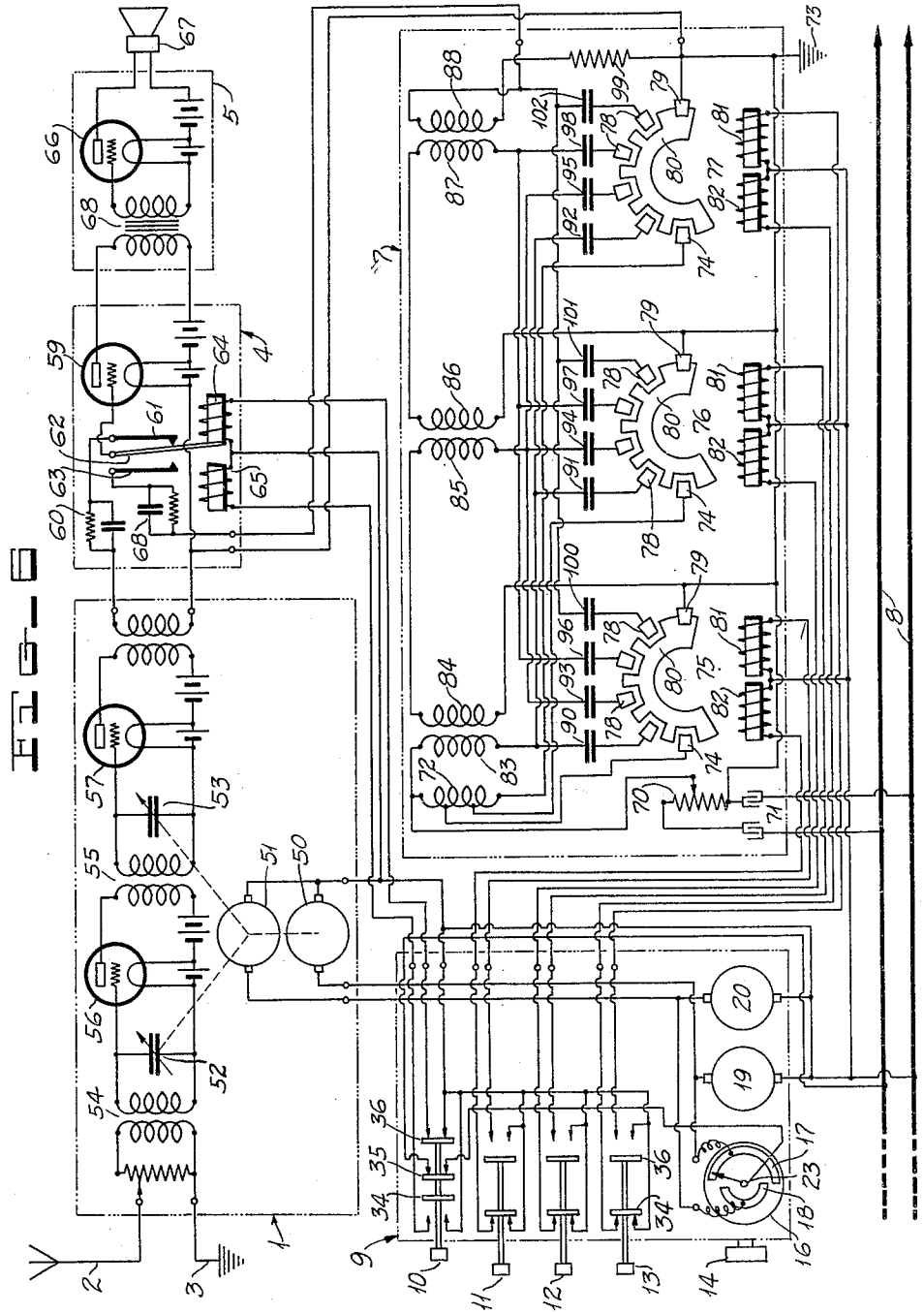


FIG. 6

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UNITED STATES PATENT OFFICE

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REMOTE CONTROL FOR SPACE AND WIRED RADIO SYSTEMS

Application filed June 3, 1931. Serial No. 541,781.

My invention pertains in general to radio receiving systems and specifically relates to a remotely controlled radio receiving system for selectively receiving wired radio signals and space radio signals.

One of the objects of my invention consists in producing a radio receiving system which can be controlled from a distance for selective reception of wired radio or space radio signals.

A further object comprises providing a radio receiving system for receiving wired radio and space radio signals in which space radio tuning circuits can be continuously varied from a distance in predetermined steps.

A further object comprises providing a radio receiving organization for receiving either wired radio or spaced radio signals in which remote control means are provided for rendering the organization effective to receive either wired radio or space radio signals and for controlling the tuning circuits for either space radio or wired radio reception.

I accomplish the above desirable objects in a novel remote control system for receiving space radio and wired radio signals in which a remotely controlled wired radio filter and a remotely controlled space radio tuning system can be selectively connected to a detector and audio frequency amplifying system by a remotely controlled electromagnetic adapter associated with the detector tube.

In the drawings which accompany and form a part of this specification and in which like reference numerals designate corresponding parts throughout:

Fig. 1 is a schematic represenation of one embodiment of the remote control system of my invention;

Fig. 2 is a front elevation of the control panel employed in my remote control system;

Fig. 3 is a longitudinal sectional view of the controlling unit employed in my remote control system;

Fig. 4 is a fragmentary sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a horizontal sectional view taken along the line 5—5 of Fig. 3; and

Fig. 6 is a diagrammatic representation in detail of the remote control system schematically depicted in Fig. 1.

My invention contemplates providing a remotely controlled space radio tuning system and a remotely controlled wired radio filter system, both of which are connected to a common detector and audio frequency amplifier. The circuit constants of the space radio tuning system are adapted to be varied by small increments in order that the space radio tuning system can be made responsive to signals at a great many different frequencies, such as are transmitted by the multiplicity of space radio broadcast stations now extent. The circuit constants of the wired radio filter system are adapted to be varied by predetermined steps inasmuch as it is desirable to make the wired radio filter system responsive to the several carrier frequency programs which are transmitted at discrete carrier frequencies. The detector system of my remotely controlled radio receiving system is provided with switching means whereby either the space radio tuning system or the wired radio filter system can be connected to the detector for demodulation of the high frequency signaling energy. The output of this detector is directed into an audio frequency amplifier and thence to a translating device for reproduction of either the space radio or wired radio programs.

Referring to Fig. 1 of the drawings, the space radio tuning system 1 is connected to an antenna 2 and ground 3. The output of the space radio tuning system is directed to a detector 4 which is connected to the audio frequency amplifier 5 and translating device or loud speaker 6. The wired radio filter system 7 is connected to power lines 8 for the reception of wired radio signals. The output of the wired radio filter system 7 is directed to the input of the detector 4. A remote control unit 9 has connections to the space radio tuning system 1, the detector 4, and the wired radio filter system 7. Other connections are provided to the power lines 8 for deriving operating energy to drive the remote control apparatus.

Referring to Fig. 2, the remote control unit 9 comprises a housing having keys 10, 11, 12,

and 13 extending through a front panel 15 and provided with suitable push-buttons designated "SR," "A," "B," and "C" respectively. A dial 14 is provided on the panel 15 of the remote control unit 9 directly below the keys 10, 11, 12, and 13. An index 25 is positioned above the dial 14. The dial 14 is secured to a spindle which is rotatably mounted through the panel 15 and rigidly connected with an insulating disk 16 parallel with the dial 14. (See Fig. 3.) Two semi-circular contact sectors 17 and 18 are provided on opposite sides of the disk 16 as shown in Fig. 4. These sectors are displaced from each other by a distance indicated as "*d*" in Fig. 4.

Referring to Fig. 3, a pair of synchronous motors 19 and 20 are mounted within the control unit housing 9 and have a common armature shaft 21 disposed along the axis of the disk 16. The motor 19 is adapted to rotate the armature shaft 21 in a clockwise direction, while the motor 20 is adapted to rotate the armature shaft 21 in a counter-clockwise direction. An insulating bushing 22 is provided on the end of the armature shaft 21 and supports a wiping contact 23. As the shaft 21 is rotated, the wiping contact 23 will engage with one of the contact sectors 17 or 18. When the wiping contact 23 is in the space "*d*" between the sectors 17 and 18, as indicated by the dotted line position in Fig. 4, there will be no electrical connection between the contact 23 and the contacts 17 and 18. According to my invention, the dial 14 may be manually rotated to any desired position, while the motors 19 and 20 rotate the wiping contact 23 to follow the movement of the dial in a manner more fully explained hereinafter.

The key 10 includes a push rod 26 which is slidably mounted through the panel 15 and transverse insulating bars 27 and 28. The transverse insulating bars 27 and 28 are mounted between two end supports 29 and 30 perpendicularly secured to the panel 15. Another transverse bar 31 is positioned between the end supports 29 and 30 and is provided with an aperture through which a reduced portion of push-rod 26 can slide. The push-rod 26 is provided with a flange 32 and a helical compression spring interposed between the flange 32 and the bar 31. Three spring contacts 34, 35, and 36 are secured to the push-rod 26 by ferrules displaced from each other but positioned between the bars 27 and 28. Each of the spring contacts 34, 35, and 36 are adapted to engage with pairs of contact terminal 37, 38, and 39 positioned upon the bars 27 and 28, as shown.

The key 11 includes a push-rod 26 having contacts similar in all respects to key 10 with the exception that the spring contact 35 and the contact pin 38 are omitted. The keys 12 and 13 are connected to push-rods 26 and are similar, in construction, to key 11.

An interlock bar 41 is slidably positioned between the end supports 29 and 30. The bar 41 is provided with four notched apertures 42 through which the push-rods 26 extend. The push-rods 26 each have a wedged-shaped toothed projection 43 which is adapted to engage with the notched portions 42 of the bar 41. A spring 44 is provided upon the end support 30 for exerting a lateral pressure against the bar 41 in the direction of the arrow.

In a normal position, before being depressed, all of the push-rods 26 of the keys 10, 11, 12, and 13 will be in a position such that the contact springs 34 will complete electrical circuits between the contact pairs 37 associated with each push-rod. When one of the push-rods is depressed into a position such as that of key 10 in Fig. 5, the toothed projection 43 will engage with the bar 41 and thereby be retained in a depressed position. In such a position the spring contact 35 completes an electrical circuit between the contact pair 38, while the spring contact 36 completes an electrical circuit between the contact pair 39. Depression of another push-rod 26, of key 11, will bring about the release of the toothed projection 43 of key 10 from the interlock bar 41 inasmuch as the wedged-shaped formation of the toothed projections 43 cause the bar 41 to be laterally displaced as the push-rods are depressed. Consequently, it will be obvious that the depression of any one of the push-rods will release any one of the other previously depressed keys. Therefore, only one key will be in a lower contacting position at a time.

Consideration will now be given to the electrical organization of my remote control system.

Referring to Fig. 6, two motors 50 and 51 are provided in the space radio tuning system 1 and are similar to the motors 19 and 20, respectively. The motors 50 and 51 have their common armature shaft mechanically coupled, by any arrangement, to two variable condensers 52 and 53 which are respectively in parallel with the inductances 54 and 55 and comprise the high frequency tuning circuits of the space radio tuning system 1. These circuits are associated with space discharge amplifier tubes 56 and 57.

The motors 19, 20, 50, and 51 have a common connection to one of the power lines 8. The other power line 8 has a connection through contact spring 35 to the wiping contact 23 which is adapted to engage with either of contacts 17 or 18. The contact 17 completes the circuit to motors 19 and 50, while the contact sector 18 completes the circuit to motors 20 and 51. When the key 10 is in a depressed position, the contact spring 35 will complete the circuit to the wiping contact 23 whereby

the motors 51 and 50 in the tuning system 1 can be remotely controlled from the control unit 9. The wiping contact 23 is normally in the space "d" between the contact sectors 17 and 18, as shown in Fig. 4. In such a position, there will be no current flowing to any of the motors. When the dial 14 is rotated to some desired position, the disk 16 will be correspondingly rotated whereby one of the contact sectors 17 or 18 will be moved into engagement with the wiping contact 23, depending upon the direction of rotation of the dial 14. For example, if the contact sector 17 is rotated into engagement with the wiping contact 23, the motors 19 and 50 will be energized from the alternating current power lines 8 so as to rotate in synchronism with each other. When the motor 19 rotates the wiping contact 23 into the position "d" the circuit to both of the motors 19 and 50 will be broken and the motors will come to rest. At the same time, the motor 50 will have rotated the condensers 52 and 53 to the desired position as indicated by the dial 14. The dial 14 may be further moved to any other desired position in either direction for correspondingly moving the variable condensers 52 and 53 by small increments to effect the tuning of the tuning system 1 to any desired broadcast frequency.

A potentiometer resistance 70, in the wired radio filter system 7, is coupled to the power lines 8 through condensers 71 for deriving the carrier frequency energy transmitted over the power lines 8. An auto-transformer 72 is provided having a connection through an adjustable contact to the potentiometer 70. A connection is also provided from potentiometer 71 to ground 73. The auto-transformer 72 has tapped connections to contact terminals 74 of three different switches 75, 76, and 77. These switches are provided with other contacts 78 and 79 all of which are radially disposed about rotor contacts 80. A pair of electromagnets 81 and 82 are provided with each of the switches 75, 76, and 77. When the electromagnet 81 in any one of the switches 75, 76, or 77, is energized, the rotor contact 80 of that switch will be moved into a position to simultaneously engage the contacts 74, 78, 79. When the electromagnet 82 is energized the rotor contact 80 will be moved to a position out of engagement with the rdially disposed contact 74, 78, and 79.

An inductance 83, electromagnetically coupled to an inductance 84, is connected to capacitances 90, 91, and 92 of related values. The inductance 84 has a connection to contact 79 and thence to ground. The inductance 85, electromagnetically coupled to inductance 86, is connected to capacitances 93, 94, and 95 of related values. The inductance 86 has a connection to another contact 79 and thence to ground. The inductance 87, electromagnetically coupled to inductance 88, is connected to capacitances 96, 97, and 98, of related values, while the inductance 88 is connected to a terminating impedance 99 of the proper value and thence to ground. The inductance 84 is also connected to inductance 85, and inductance 86 is also connected to the inductance 87. The inductance 88 has a connection to capacitances 100, 101, and 102 of related values.

When the switch 75 is closed, the capacitances connected thereto are rendered effective in circuit with the inductances of the filter system whereby the filter system as a whole becomes responsive to a particular band of carrier frequencies. The switches 76 and 77 each can be similarly closed for rendering the filter system as a whole responsive to other predetermined bands of carrier frequencies. Such a switching arrangement for a band-pass filter system is described in detail in my co-pending application, Serial Number 540,035, filed May 26, 1931. A similar filter system in conjunction with key controlled electromagnets is described in detail in my co-pending application, Serial Number 515,430, filed February 13, 1931.

The output connection of the selective filter system 7 from the inductance 88 is directed through a grid leak and condenser 68 to a switch contact 63. The other output connection of the filter system 7 from the terminating impedance 99 is connected to the cathode of the space discharge detector tube 59. A pivoted contacting armature 62 is postioned between electromagnets 64 and 65 for engagement with either of the contacts 61 or 63 for connecting the space discharge detector tube 59 to the space radio tuning system or to the wired radio filter system 7. When the key 10 is in a depressed position the contact 36 thereof will complete a circuit from the power lines 8 to the electromagnet 64 thereby causing the armature 62 to engage contact 61 to complete a circuit from the space radio tuning system 1 to the space discharge detector tube 59. When the key 10 is in an upper contacting position, the spring contact 34 will complete a circuit from the power lines 8 to the electromagnet 65 whereby the armature 62 will be moved into engagement with contact 63 to complete a circuit from the wired radio filter system 7 to the space discharge detector tube 59.

The spring contact 34 of key 11 has connections for establishing a circuit with the electromagnet 82 of switch 75 when the key 11 is in an upper contacting position, while the spring contact 36 of key 11 has connections for completing a circuit to electromagnet 81 of switch 75 when the key 11 is in a lower contacting position. The spring contact 34 of key 12 has connections for completing a circuit to electromagnet 82 of switch 76 when the key 12 is in an upper contacting position, while the spring contact 36 has connections for completing a circuit to the electromagnet

81 when the key 12 is in a lower contacting position. The spring contact 34 of key 13 has connections for completing a circuit to electromagnet 82 of switch 77 when the key 13 is in an upper contacting position, while the spring contact 36 has connections for completing a circuit to electromagnet 81 of switch 77 when the key 13 is in a lower contacting position.

When it is desired to remotely control the space radio tuning system 1 for reception of space radio signals over translating device 67, the key 10, designated "SR" is depressed thereby rendering the dial 14 effective for controlling the condensers 52 and 53, through the agency of the intermediate motors, and simultaneously energizing electromagnet 64 to complete a circuit from the space radio tuning system 1 to the space discharge detector tube 59. When such circuit conditions prevail the dial 14 can be rotated to any desired position by small increments whereby the motors 51 and 50 will operate to control the variable condensers 52 and 53 for rendering the space radio tuning system responsive to any desired space radio broadcast frequencies as indicated by the dial 14.

When it is desired to change over from space radio reception to wired radio reception, and to remotely control the wired radio filter system 7, any one of the keys 11, 12, or 13 may be depressed depending upon which wired radio program channel is desired. That is, each of the keys 11, 12, and 13, designated "A", "B", "C", correspond to three discrete carrier frequencies which transmit three different programs over the power lines 8. For example, if key 11 is depressed, the mechanical interlock bar 41 (see Fig. 5) automatically releases the depressed key 10 whereby the circuit to wiping contact 23 is broken and a circuit established to electromagnet 65 for moving the armature 62 to contact 63 to connect the wired radio filter system 7 to the space discharge detector tube 59. Simultaneously, the key 11 establishes a connection through spring contact 36 to electro magnet 81 of switch 75 thereby moving the rotor contact 80 into engagement with the contact terminals 74, 78, and 79. In such a position the switch 75 renders the filter system 7 responsive to a certain band of frequencies corresponding to a predetermined wired radio program channel. When it is desired to remotely select a different wired radio program channel another of the keys in the remote control unit 9 can be depressed. For example, key 13 may be depressed whereby the mechanical interlock bar 41 will cause the previously depressed key 11 to be released thereby breaking the circuit to electromagnet 81 and completing a circuit to electromagnet 82 for moving the rotor contact 80 of switch 75 into an open position. Simulaneouly, the contact spring 36 of key 13, now depressed, will establish a circuit to electromagnet 81 of switch 77 for moving the rotor contact 80 thereof into a contacting position to render the filter system 7 responsive to another predetermined carrier frequency band and a correspondingly different program channel.

It will now be apparent that my invention provides a unified remote control system for controlling a radio receiving system from a distance for the selective reception of wired radio and space radio signals. It will be seen that any one of the keys 11, 12, and 13 can be depressed as desired for the reception of different wired radio program channels. It is, of course, to be understood that I am not to be limited to the exact number of keys shown. When it is desired to operate for the reception of space radio signals the key 10 can be depressed whereby the radio system, as a whole, is automatically rendered effective for the reception of space radio signals. Although I have shown a preferred embodiment of my remote control system of my invention it will, of course, be understood that changes can be made therein without departing from the intended scope of my invention. I do not, therefore, desire to limit myself to the foregoing except insofar as may be pointed out in the appended claims.

What I claim as new and original and desire to secure by Letters Patent of the United States is:

1. A remote control system comprising, a tuning system connected to a space radio energy collecting system, motors for varying the values of the circuit constants of said tuning system, a selective filter system connected to wire lines carrying high frequency signaling energy, a plurality of switches in said filter system, a plurality of electromagnets for actuating said switches, a source of electrical energy, a plurality of depressible keys each of which is adapted to complete a circuit from said source of electrical energy to one of said electromagnets for actuating a selected one of said switches, a demodulation circuit, a switch for connecting said demodulation circuit to said space radio tuning system or to said selective filter system, electromagnetic means for actuating said switch, a depressible key for controlling said electromagnetic means, and means operable by the depression of any one of said keys for releasing any previously depressed key.

2. A remote control system comprising, a tuning system connected to a space radio energy collecting system, motors for varying the values of the circuit constants of said tuning system, a rotatable contact for selectively engaging with contacts respectively connected to said motors, a selective filter system connected to wire lines carrying high frequency signaling energy, a plurality of switches in said filter system, a plurality of

electromagnets for actuating said switches, a source of electrical energy, a plurality of depressible keys each of which is adapted to complete a circuit from said source of electrical energy to one of said electromagnets for actuating a selected one of said switches, a space discharge detector tube, a switch for connecting said detector tube to said space radio tuning system or to said selective filter system, electromagnetic means for actuating said switch, a depressible key for controlling said electromagnetic means and for controlling the circuit to said rotatable contact, and means operable by the depression of any one of said keys for releasing any previously depressed key.

3. A remote control system comprising, a high frequency current reception circuit having variable circuit constants, motors for varying the values of said circuit constants, a second high frequency current reception circuit having a plurality of predetermined circuit constants, switches for rendering said circuit constants selectively effective in said second reception circuit, electromagnets for actuating said switches, a source of electrical energy, manually operated means for determining the action of said motors to control said first mentioned reception circuit, a utilization circuit, switching means for connecting said utilization circuit effectively in circuit with either of said reception circuits, a plurality of depressible keys, one of said keys controlling said switching means for connecting said utilization circuit to either of said reception circuits and for rendering said motors effectively in circuit with said source of electrical energy for controlling said first mentioned reception circuit, and the others of said keys having connections for individually establishing circuits from said source of electrical energy to said electromagnets for causing the operation of said switches to render said second mentioned reception circuit receptive to currents at various high frequencies depending upon the selection of the values of the predetermined circuit constants thereof, and means operated by the depression of any one of said keys for releasing any previously depressed key.

4. A remote control system comprising a high frequency current reception circuit having variable circuit constants, motors for varying the values of said circuit constants, a selector for selectively establishing circuits with said motors, a second high frequency current reception circuit having a plurality of predetermined circuit constants, switches for rendering said circuit constants selectively effective in said second reception circuit, electromagnets for actuating said switches, a source of electrical energy, a utilization circuit, switching means for connecting said utilization circuit effectively in circuit with either of said reception circuits, electromagnetic means for operating said switching means, manually operated means for controlling the electromagnetic means of said switching means for connecting said utilization circuit to either of said reception circuits, and a plurality of depressible keys having connections for individually establishing circuits from said source of electrical energy to said electromagnets for causing the operation of said switches to render said second mentioned reception circuit receptive to currents at various high frequencies depending upon the selection of values of the predetermined circuit constants thereof, and means operated by the depression of any one of said keys for affecting the operation of said last mentioned means to insure the connection of said utilization circuit to said second mentioned reception circuit when any one of said keys is depressed.

5. A remote control system comprising, a high frequency current reception circuit having variable circuit constants, motors for varying the values of said circuit constants, contacts respectively connected with said motors, a rotatable contact for selectively engaging with said contacts, other motors for moving said rotatable contact, said other motors being adapted to move respectively in unison with said first mentioned motors, said contacts being manually movable with respect to said rotatable contact for determining the rotation of said first mentioned motors, a second high frequency current reception circuit having a plurality of predetermined circuit constants, switches for rendering said circuit constants selectively effective in said second reception circuit, electromagnets for actuating said switches, a source of electrical energy, a plurality of depressible keys each of which is adapted to complete a circuit from said source of electrical energy to one of said electromagnets for actuating a selected one of said switches, a utilization circuit, a switch for connecting said utilization circuit to either of said reception circuits, electromagnetic means for actuating said switch, a further depressible key for controlling said electromagnetic means and for controlling the circuit to said rotatable contact, and means operable by the depression of any one of all of said keys for releasing any previously depressed key.

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