Aug. 21, 1945. W. E. NEWMAN 2,383,338

REMOTE CONTROL SYSTEM FOR RADIO RECEIVERS

Filed Jan. 8, 1944

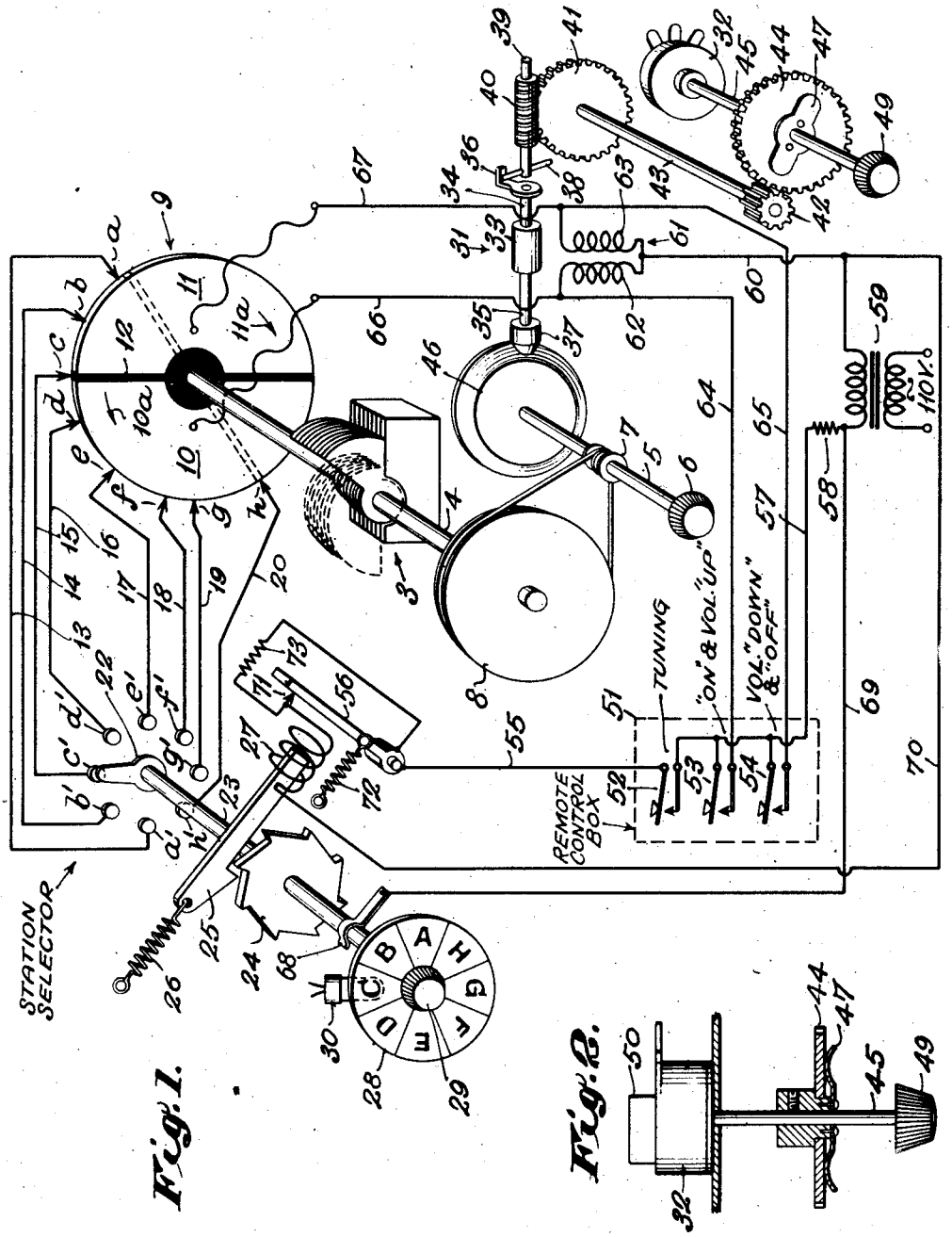


Fig. 1.



Fig. 2.

INVENTOR
William E. Newman
BY H. S. Grover
ATTORNEY

# UNITED STATES PATENT OFFICE

2,383,338

## REMOTE CONTROL SYSTEM FOR RADIO RECEIVERS

William E. Newman, Moorestown, N. J., assignor to Radio Corporation of America, a corporation of Delaware

Application January 8, 1944, Serial No. 517,585

3 Claims. (Cl. 250—20)

My present invention relates to a radio receiver control system and more particularly to mechanism for effecting the automatic tuning and adjustment of volume of a radio receiver from a remote control point.

Various arrangements are known in the prior art for the automatic tuning of radio receivers. Some of these require a separate push-button for each station desired to be tuned in, and still others require a separate motor for accomplishing each of the functions of tuning and volume adjustment. According to the present invention, a single motor is employed to accomplish both functions, and only a single push-button or control switch is utilized to change from one predetermined station to another. A second push-button is utilized to turn the receiver "on" and to increase the volume, and a third push-button serves to turn the receiver "off" and to decrease the volume.

It is, therefore, one of the objects of this invention to provide simple and efficient mechanism for effecting selective adjustment of both the tuning and the volume of a radio receiver from a remote point.

Another object of the invention is to effect the tuning adjustment of the receiver to a plurality of predetermined stations by means of a single push-button or control switch, which is adapted upon successive actuations to cause the tuning in of the several stations in a predetermined order. For that reason, I prefer to call the tuning system disclosed herein a "sequence tuner."

A further object of the invention is to provide an electric motor controlled by selective means at a remote point for effecting the tuning adjustment of the receiver, the volume adjustment, and the switching of the receiver "on" and "off."

The novel features characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and mode of operation together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawing in which Fig. 1 discloses schematically the control system according to the invention, and Fig. 2 is a view, partly in section, of the coupling means associated with the volume control device.

Referring now to Fig. 1 of the drawing, the tuning device of the receiver is shown at 3 in the form of an adjustable condenser, the variable element of which is mounted on a control shaft 4. For effecting manual tuning of the receiver, suitable means may be provided such as, for example, a second shaft 5, a tuning knob 6 mounted at one end of said shaft, a pulley 7 also mounted on said shaft, a second pulley mounted on control shaft 4, and a cord 8 entrained about the two pulleys.

The condenser tuning shaft 4 also carries a selector disc 9 of known construction provided with two conductive commutator segments 10 and 11 which are separated by a strip 12 of insulation. Disposed around the selector disc and in contact with the periphery thereof are a plurality of adjustable brush contacts $a$ to $h$, each corresponding to a predetermined one of the broadcasting stations which are desired to be tuned in automatically.

The manner of making the initial adjustment of each brush contact is as follows: the tuning device 3 is manually adjusted by control knob 6 to tune the receiver to one of the predetermined broadcasting stations. This adjustment of the tuning device will also cause the insulating strip 12 of the selector disc to assume a particular angular position. The brush contact corresponding to the above manually tuned-in station is then moved around the disc periphery until said contact is in registry with the insulating strip 12, at which position the contact is fixedly set. The same procedure is followed for the remaining brush contacts.

The several selector-disc brush contacts $a$ to $h$ are individually connected by way of conductors 13 to 20 to contacts $a'$ to $h'$ of a station selector switch 21, the movable arm 22 of which is mounted on a conductive shaft 23. For the purpose of actuating the switch arm 22 so that contact will be made successively with contacts $a'$ to $h'$, there is affixed to the switch shaft a ratchet gear 24 which is adapted for step-by-step movement by means of an electrically operated pawl 25. A spring 26 serves to bias the pawl to its inoperative position as shown in Fig. 1, and a solenoid 27 is adapted, upon energization, to force the pawl to coact with the ratchet gear. With each stroke of the pawl the ratchet gear is stepped around one notch at a time and switch arm 22 being movable therewith is also stepped along from one contact to another of the station selector switch 21.

A station indicator dial 28 and a station selector knob 29 are carried by the switch shaft 23 at its forward end. The dial is marked with the letters A to H to correspond with the brush

contacts *a* to *h* and the switch contacts *a'* to *h'*, which in turn correspond with the several predetermined stations selected for automatic tuning. If desired, the various sections of the dial may be differently colored or imprinted with the station call letters or both. A pilot light **30** located directly behind the dial serves to illuminate the section of the dial corresponding to the station that is being received. Also, the indicator could be so arranged that only one color or call letter at a time is visible through an escutcheon opening.

An electric motor **31** of the reversible type serves as the actuating means for the tuning device **3** and the receiver volume control device indicated at **32**. The armature **33** of the motor is mounted on a shaft having oppositely extending portions **34** and **35** which carry on their respective ends a clutch part **36** and a driving wheel **37**. The cooperating clutch part **38** is carried on a shaft **39** on which there is mounted a worm **40** which, through gear **41** and pinion **42** on a shaft **43** and a gear **44** on a shaft **45**, serves to adjust the volume control device **32**.

The motor armature **33** is capable of slight axial movement, being constrained to assume the position shown in Fig. 1 by spring means, not shown. In the indicated position, the clutch parts **36**, **38** will engage one another so that upon application to the motor of a certain voltage less than the rated maximum, power will be transmitted through the gear train above described to effect movement of the volume control shaft **45**. Upon application of the maximum voltage, however, the motor armature **33** will be moved to the left, as viewed in Fig. 1, in opposition to the spring means to effect a coupling relation between the driving friction wheel **37** and a driven wheel **46** affixed to the tuning control shaft **5**.

As shown more clearly in Fig. 2, the gear **44** is adapted to drive control shaft **45** by way of a slip clutch **47**. The gear **44** is loosely mounted on a bushing **48** keyed to the shaft and bearing against the gear is the clutch **47** in the form of a spring plate which is affixed to the bushing. The slip clutch permits of manual adjustment of the volume control by means of the control knob **49** without driving the gear train between the motor and the control shaft. The volume control device **32** has associated with it an "on-off" switch **50**, a construction well known in the art, which operates upon rotation of control shaft **45** in one direction from an initial position to first effect closure of the switch to turn the receiver "on" and then to cause gradual increase of volume upon continued shaft rotation in the same direction, and upon rotation of the control shaft in the reverse direction the volume is gradually decreased until the aforementioned initial position is reached when the switch **50** is opened to turn the receiver "off."

At the remote point there is provided a control box **51** which contains three push buttons or switches **52**, **53** and **54**. On an escutcheon plate provided for that purpose switch **52** may be designated "Tuning," **53** may be designated "On & vol. up," and **54** may be designated "Vol. down & off." One terminal of switch **52** is connected by conductor **55** to an armature **56** associated with the solenoid **27**, and the other terminal of said switch is connected through conductor **57** and a voltage dropping resistor **58** to one side of a source of power **59** which is constituted by a step-down transformer which steps down the 110 volts obtained from the house current power supply means to about 24 volts necessary for operating the motor **31** and solenoid **27**. The other side of the power source is connected through conductor **60** to the common terminal **61** to which motor field windings **62** and **63** are connected. The opposite terminal of winding **62** is connected through conductor **64** to a terminal of switch **53** and the corresponding terminal of winding **63** is connected through conductor **65** to a terminal of switch **54**. The other terminals of switches **53**, **54** are connected to conductor **57** which leads to the power supply source.

The latter terminals of field windings **62**, **63** are also connected, respectively, by way of conductors **66**, **67** to the commutator segments **10**, **11** of the selector disc **9**, and to complete the motor circuit the conductive shaft **23** of the station selector switch **21** is connected to the other terminal of the power supply source **59** by way of a brush contact **68** and a conductor **69**.

The stepping solenoid **27** is connected at one end to power source **59** through conductor **70**. The other end of the solenoid is provided with a contact **71** which normally is in contact with armature **56** when the solenoid is in the deenergized stage. A spring **72** serves to maintain such contact relation. A resistance **73** is connected between contact **71** and armature **56** for reducing the voltage across the solenoid when contact between **56** and **71** is broken.

The system above described operates in the following manner: Assuming that the receiver is in the inoperative state, switch or push button **53**, marked "On & vol. up," will first be actuated. This will complete a circuit as follows: one side of source **59**, resistor **58**, conductor **57**, switch **53** in the closed position, conductor **64**, field winding **62**, and conductor **60** back to the other side of the source. As a result, the motor will begin to operate and, being energized with a reduced voltage due to the resistor **58** being in circuit, the armature **33** will be in its axially displaced position as shown and the clutch parts **36**, **38** will be in engagement to cause the motor to drive shaft **45** which in the first instance actuates the receiver on-off switch **50**. The actuated switch **53** need only be held down long enough to cause switch **50** to be snapped on. The pilot light **30** will now light up to indicate the station to which the receiver happens to be tuned. If this is not the desired station, the push button or switch **52** marked "Tuning" will be pulsed one or more times until the desired station does appear on the indicator.

With each pulse of the "Tuning" switch or push-button **52** a circuit will be completed through the stepping solenoid **27** as follows: one side of source **59**, resistor **58**, conductor **57**, the contacts of closed switch **52**, conductor **55**, armature **56**, contact **71**, solenoid **27**, and conductor **70** back to the other side of the power source. As a result, the solenoid will be energized, and each time it is so energized the pawl **25** will coact with the ratchet gear **24** to cause the switch arm **22** to be stepped from one contact to the next in the direction indicated by the arrow. When the pawl is pulled into the solenoid coil it forces the armature to break contact with **71** and simultaneously introduces the resistor **73** in series with the coil, since in that position very little magnetizing current is required to keep the solenoid energized, at the same time reducing hum as well as excessive heating.

Assume now that the "Tuning" switch **52** has been pulsed twice for the purpose of tuning in

station E, station C being the previously tuned-in station. After the second pulse the section of the indicator dial marked "E" will appear in front of pilot light **30** and switch arm **22** will have moved to contact with contact *e'*. This will cause the following circuit to be completed through the motor: one side of source **59**, conductor **69**, brush **68**, shaft **23**, switch arm **22**, contact *e'*, conductor **17**, brush contact *e*, commutator segment **10**, conductor **66**, motor field winding **62**, and conductor **60** back to the other side of the power source. Since the entire voltage of the source (24 volts) is now effective, the motor armature will be shifted to the left to bring **37** into driving relation with **46** and thereby cause rotation of the tuning device **3**. Rotation of the tuning device, and incidentally of selector disc **9**, will be continued until the insulating strip **12** of the selector disc arrives underneath the brush contact *e* at which point the motor circuit will be broken. The motor will then be deenergized and the tuning device will be stopped in the position initially adjusted for station E. It has been assumed above that inclusion of field winding **62** in the motor circuit effects rotation of the selector disc in the direction of arrow **10***a*.

It will be clear from the above that by actuating the pulsing switch **52**, the several preselected stations A to H, as determined by the respective angular adjustments of the brush contacts *a* to *h*, will be tuned-in in that sequence, with the first station A following the last station H to begin the next cycle. The dotted line position of the rotor of the tuning condenser **3** represents station H and may be close to or at one of its limits of travel. In that position of the rotor, the insulating strip **12** assumes the angular position shown by the dotted lines, having moved to that position in the direction of arrow **10***a*, or counterclockwise. Also, the switch arm **22** will be on contact *h'*. With the next pulse arm **22** is moved to contact *a'*, and since brush contact *a* connected thereto continues to remain in contact with commutator segment **11** during the entire cycle or sequence, the motor circuit will now be closed through field winding **63**, causing operation of the motor in the reverse direction to return the rotor to its other limit of travel or nearly so. At the same time, the selector disc is rotated in the direction of arrow **11***a*, or clockwise, until the insulating strip comes into registry with contact *a* when the motor circuit will be broken.

If reception of a tuned-in station is not of the desired volume, one or the other of switches **53**, **54** is held down until reception comes in at the desired volume. In either case, one or the other of the field windings **62**, **63** will be effective to cause operation of the motor in one direction or the other to increase or decrease the volume to the desired extent. Such motor operation will not interfere with the tuning adjustment, since the motor tuning circuit is open at switch **52** and also at the brush contact of the tuned-in station, and further because of the decoupling between **35** and **46**.

When it is desired to turn the receiver "off," the push-button or switch **54**, marked "Vol. down & off" will be held down for a sufficient length of time until the power switch **50** trips and turns the receiver off. To change stations when the volume is already adjusted to a suitable level, it is only necessary to pulse the remote control "Tuning" station button **52**, or to rotate manually either of the station selector knobs **6** and **29** at the receiver. The volume control knob **49** at the receiver or the volume control buttons **53**, **54** at the remote control box may be readjusted at either location without interfering one with the other. The manual tuning knob **6** at the receiver may also be used without operating any other controls or disturbing their settings should it be desirable to later tune in a station by the station selector at the remote control box.

When pulsing the remote control station selector button **52**, it is not necessary for the motor at the receiver to keep up with the pulses rotating the station selector switch arm **22**. These pulses, therefore, may be transmitted as fast as possible and the motor-operated selector disc **9** will eventually catch up with the position of the station selector switch arm and come to rest at a position corresponding to the selected station.

At the receiver, in addition to manual tuning by means of control knob **6**, it is possible to provide automatic, selective tuning to any of the predetermined stations, but not necessarily in the sequence through which the receiver is tuned from the remote point. This may be accomplished by manipulation of control knob **29** in either direction, seeing that ratchet wheel **24** is not constrained against movement by pawl **25** which is normally in the inoperative position, as shown. Depending, therefore, upon the setting of the switch arm **21**, whether moved to that setting by clockwise or counter-clockwise rotation of knob **29**, the motor will be actuated in one direction or the other, as will now be understood from the above description, to adjust the tuning device **3** to the desired predetermined station corresponding to the above switch arm setting.

While I have shown a particular embodiment of my invention, it will of course be understood that I do not wish to be limited thereto, since various modifications may be made both in the circuit arrangement, in the instrumentalities, and in the mechanical construction employed without departing from the spirit and scope of my invention as set forth in the appended claims, and I contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim is:

1. A control system for a radio receiver provided with tuning mechanism and a combined on-off switch and volume control device, comprising means including an electric motor for selectively actuating the tuning mechanism or the volume control device, a first manually-operable member so constructed and arranged that upon operation thereof the actuating means performs only the function of first turning the receiver on and then increasing the volume, a second manually-operable member so constructed and arranged that upon operation thereof the actuating means performs only the function of adjusting the tuning mechanism, and a third manually-operable member so constructed and arranged that upon operation thereof turning the actuating means performs only the function of first decreasing the volume and then turning the receiver off.

2. A control system for a radio receiver provided with tuning mechanism and a combined on-off switch and volume control device, comprising an electric motor whose armature is adapted to assume one or the other of two axial positions and to rotate in opposite directions in each of said positions, means including a first

manually-operable member so constructed and arranged that upon actuation of said first member the motor armature assumes one axial position and rotates in one direction whereby the switch is first turned on and the volume control device then adjusted to increase the volume, means including a second manually-operable member so constructed and arranged that upon actuation of said second member the motor armature assumes said one axial position and rotates in the opposite direction whereby the volume control device is first actuated to decrease the volume and then turn the switch off, and means including a third manually-operable member so constructed and arranged that upon actuation of said third member the motor armature assumes said other axial position and rotates in either direction to effect a desired adjustment of the tuning mechanism.

3. Control mechanism for a radio receiver provided with a tuning device and a combined on-off switch and volume control device for effecting automatic adjustment of the tuning device to positions corresponding each to one of a plurality of predetermined broadcasting stations and for turning the receiver on or off and adjusting its volume, comprising a motor for actuating the tuning device, said motor having an armature adapted to assume one or the other of two axial positions and to rotate in opposite directions in each of said positions, a selector disc movable with the tuning device and electrically associated with the motor for determining the position to which the tuning device is actuated by the motor before the latter is stopped, a plurality of adjustably set brush contacts cooperatively associated with the selector disc and each corresponding to one of the predetermined stations, a selector switch having a movable arm and a plurality of contacts which are connected each to a respective one of the brush contacts, means for moving said switch arm step-by-step to effect successive contact thereof with the switch contacts, a first manually-operable member adapted upon each operation to actuate the stepping means one step, cause the motor armature to assume one axial position and rotate in either direction to effect adjustment of the tuning device to a position corresponding to the stepped position of the switch, a second manually-operable member adapted upon operation to cause the motor armature to assume the other axial position and to rotate in one direction whereby the switch is first turned on and the volume control device then adjusted to increase the volume, and a third manually-operable member adapted upon operation to cause the motor armature to assume said other axial position and to rotate in the opposite direction whereby the volume control device is first actuated to decrease the volume and then to turn the switch off.

WILLIAM E. NEWMAN.