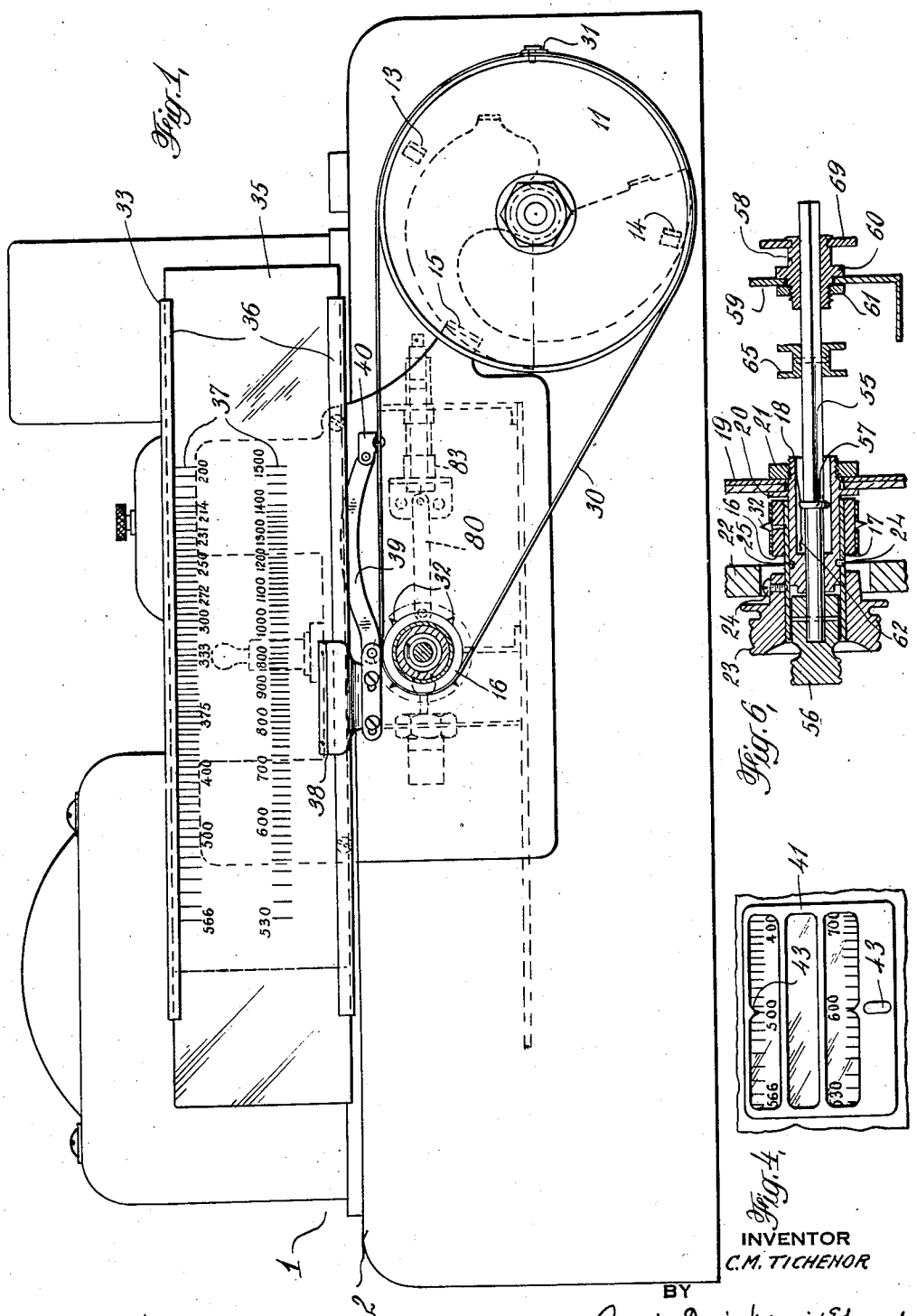
Dec. 5, 1933. C. M. TICHENOR 1,937,996

RADIO TUNING CONTROL

Filed June 18, 1930 3 Sheets-Sheet 1



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Fig. 3.

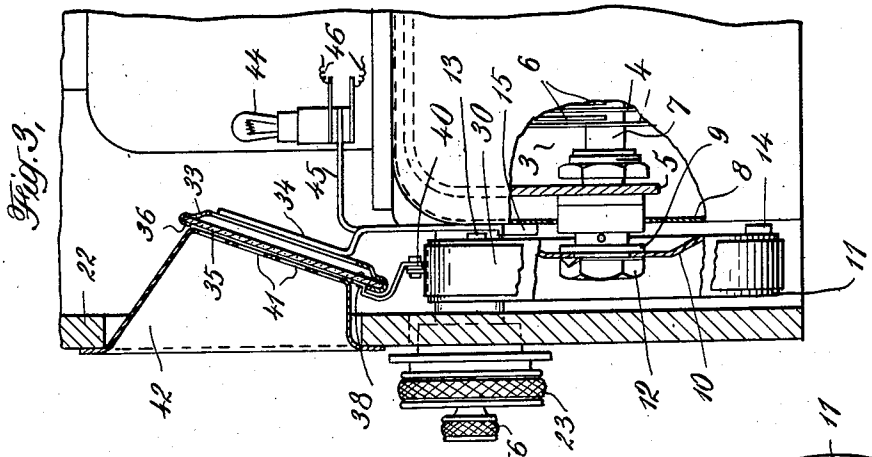


Fig. 2.

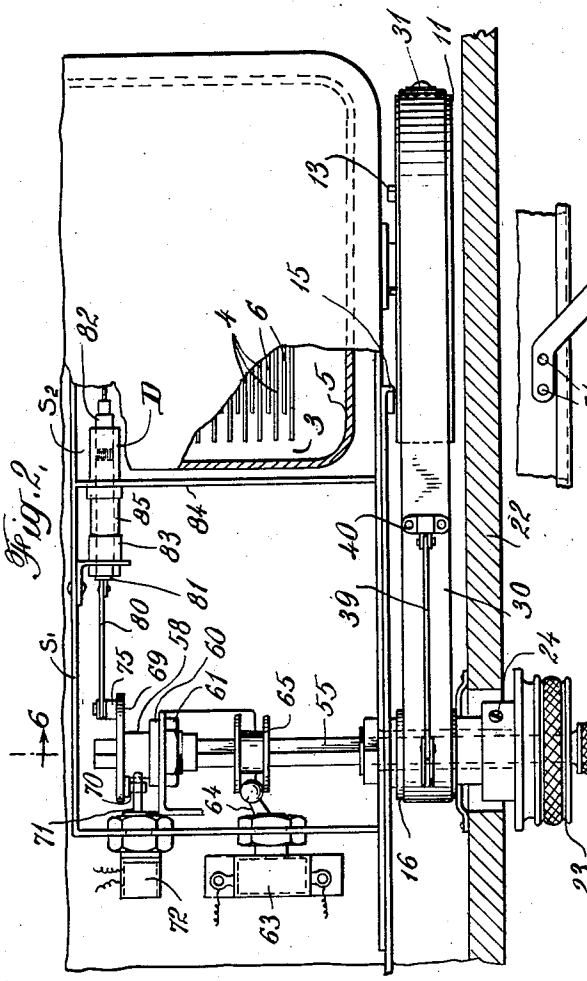
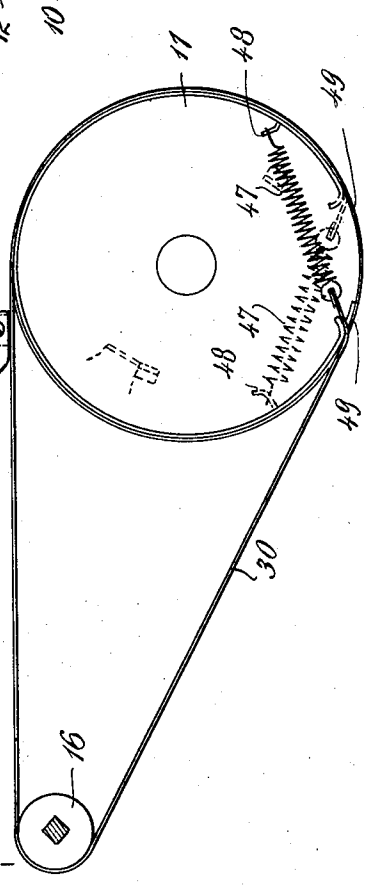


Fig. 5.



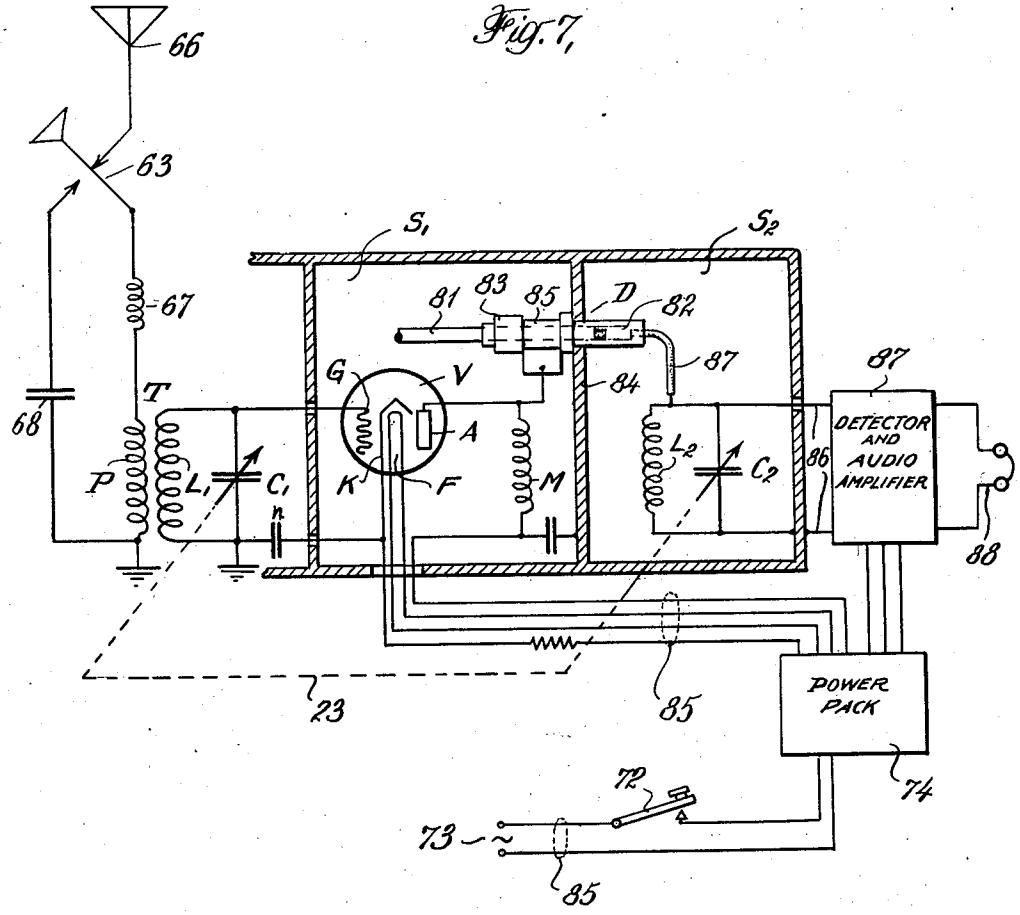
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Fig. 7.



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RADIO TUNING CONTROL

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Application June 18, 1930. Serial No. 461,955

6 Claims. (Cl. 116—124.1)

This invention relates to radio receivers, more especially to receivers of the broadcast type tunable over a range in frequency and adapted for reception of programs transmitted within the usual broadcast frequency band.

A primary object of the invention is to provide an improved form of unitary tuning control and indicating device for simultaneously adjusting the tuning of the receiver to a desired frequency and for indicating the position of adjustment thereof.

A further object is to provide in unitary assembly a compact form of receiver control mechanism adapted to perform the functions of volume control, tuning adjustment, power supply connection, and arrangement of antenna connection for best reception of powerful or weak signals.

The specific form of volume control set forth herein is disclosed more fully and claimed in a copending application of E. F. Carter and H. F. Schwartz, Serial No. 465,352, filed July 2, 1930.

Other objects will appear more fully in the subsequent detailed description.

It is almost universal practice in the present-day construction of radio broadcast receivers, to equip the receiver with a uni-control tuning element such as a gang condenser, and to mechanically associate with such tuning element a suitable adjusting knob and graduated indicator mounted upon the panel of the receiver cabinet, whereby adjustment of the knob serves to vary the tuning and simultaneously therewith cause the position of adjustment of the tuning element to be suitably indicated.

In the present invention the receiver tuning control comprises a pulley mounted upon the shaft of a gang condenser serving to tune the receiver. A second and smaller pulley to provide the necessary tuning reduction ratio is mounted upon a separate shaft spaced some distance from and parallel to the condenser shaft and extending through the front panel of the receiver cabinet, the projecting portion of the shaft being provided with an adjusting knob. A flexible belt or band extends about the two pulleys, means being provided for preventing slipping between the drums and the belt to insure a positive drive.

Positioned adjacent a portion of the belt spanning the pulleys is a flanged bracket or guide adapted to slidably support, for movement in a direction parallel to said spanning portion, a rectangular graduated indicator card linearly displaceable with respect to a stationary marker. The flanged portions of the guide are bent or curled over parallel to the main portion thereof to a sufficient extent to maintain the indicator card in position while at the same time clearly exposing the graduations thereon to view. A connecting link or rod extending between a clamp affixed to the indicator card and a lug affixed to a portion of the belt parallel thereto, serves to mechanically associate the indicator with the tuning control.

As a result of this arrangement, it will be obvious that rotation of the knob will adjust the tuning element of the receiver through the driving medium consisting of the two pulleys and interconnecting belt, and at the same time the rectilinear movement of the portion of the belt mechanically linked to the indicator card will cause the latter to slide in its support. The indicator card is viewed through a window formed in an escutcheon mounted within an aperture in the receiver panel, the window casing being provided with stationary markers adapted to cooperate with the graduations upon the indicator card to show the position of adjustment of the tuning element. The indicator card is of translucent material and is indirectly illuminated by means of a pilot lamp positioned behind the same in the well-known manner.

Positioned within a bore of the tuning knob but projecting beyond the same in order to be easily grasped is a second and independently operable smaller knob which serves the triple function of adjusting the antenna circuit for best reception of powerful or weak stations, of controlling the connection of power to the set, and of continuously adjusting the volume of the received signal between minimum and maximum limits. The smaller knob is mounted upon a shaft which is slidable as well as rotatable within a sleeve, the latter serving to mount the tuning knob and smaller drum in integral assembly.

The smaller knob upon being grasped and pulled out to a limiting position serves to operate a switch which disconnects the antenna from the receiver and substitutes therefor a fixed capacity connected across the receiver input. This substitution serves to reduce the received signal intensity for a local or powerful station which comes in too strongly for satisfactory volume levels when the antenna connection is utilized. In its extended as well as its normal position, rotation of the smaller knob serves to operate a second switch to connect the power supply to the receiver, and thereafter the continued rotation of the small knob in the same direction adjusts the signal intensity impressed upon the acoustical unit of the

receiver from a minimum to a maximum value.

A concrete conception of the manner in which the above multiplicity of objects are accomplished will now be given with reference to the drawings of which:

Figure 1 shows in front elevation a radio receiver chassis embodying the present invention;

Figure 2 shows a partial plan view of the chassis with the indicator card and its support omitted for purposes of clarity in illustration;

Fig. 3 shows a partial side elevation partly in section as viewed from the right in Figure 2.

Figure 4 is a detail disclosing the construction of the indicator card window mounted within an escutcheon of the receiver panel.

Figure 5 is a modified form of drive for the receiver tuning element and indicator card.

Figure 6 is a sectional view along the line 6—6 of Figure 1, disclosing the details of the unitary control knob and switching assembly referred to.

Figure 7 is a circuit diagram drawing disclosing the electrical elements adjustable by means of the unitary control mechanism.

Like elements are similarly designated in the several views.

Referring to the drawings, there is shown a receiver chassis 1 including a metal frame 2 serving to house a complete radio receiving unit and to electrically shield certain portions thereof from each other. Mounted within a compartment of the frame 1 is a gang condenser 3, a portion only of which is shown, and which serves to adjust the tuning of the receiver. The condenser is of the rotary interleaving plate type comprising sets of stator plates 4 insulatedly mounted on a frame 5, and sets of rotor plates 6 mounted upon a shaft 7 journaled through the condenser frame 5 and projecting through a portion 8 of the chassis frame 2, the projecting portion being provided with a collar 9 against which the web 10 of a pulley 11 is held in frictional engagement by means of a nut 12 screw-threaded onto the end of the shaft. The drum is provided with stops 13 and 14 adapted to cooperate with a projecting lug 15 formed on the frame of the receiver chassis, to set suitable extreme limits of movement of the condenser shaft corresponding to the maximum and minimum capacity settings of the condenser units.

Spaced some distance from pulley 11 is a second and smaller pulley 16 having its axis parallel to that of pulley 11, the smaller pulley being keyed to a sleeve 17, which is rotatably supported upon a second sleeve 18, the latter having an end portion projecting through an aperture in a portion 19 of the frame of the chassis, and being provided with a collar 20 held in frictional engagement with the frame by a nut 21 screw-threaded onto the end of the sleeve. The sleeve 17 which rotatably supports the drum extends through an aperture in the panel 22 forming a portion of the cabinet housing the receiver, a knob 23 being fitted to the projecting portion of the sleeve and affixed thereto by means of a screw 24. Longitudinal movement of sleeve 17 being prevented by means of pins 24 projecting from the inner surface thereof riding within a recess 25 formed in the outer surface of sleeve 18 as shown.

A flexible endless belt 30 extends about pulleys 11 and 16 being positively connected to drum 11 by means of a screw 31, slippage between pulley 16 and the belt 30 being prevented by teeth 32 formed thereon engaging suitable apertures in the belt. Thus rotation of knob 23 will rotate pulley 16 to drive the rotor element of the condenser through the medium of the connecting belt 30 and pulley 11. Pulley 16 is smaller than pulley 11 to provide the usual reduction ratio between adjustment of the tuning knob 23 and corresponding adjustment of the condenser unit. The axis of the smaller drum 16 is elevated with respect to that of the larger drum 11 in order that the upper portion of the belt extending between the drums will lie in a substantially horizontal plane.

Elevated with respect to the horizontally extending portion of the belt 30 is a flanged bracket or guide 33 affixed to the projecting member 34 constituting a part of the frame of the chassis, the bracket 33 being adapted to slidably support for movement in a horizontal direction a rectangular indicator card 35, the edges 36 of the bracket being bent or curled over sufficiently to slidably maintain the indicator card in position while at the same time permitting exposure of graduations 37 marked on the outer surface thereof. Rigidly affixed to the lower edge of the indicator card is a clamp 38 to which a link or rod 39 is pin-connected at one end, the other end of the rod being similarly pin-connected to a lug 40 affixed to the upper surface of the horizontally extending portion of the belt.

The guide 33 is so positioned as to support the indicator card 35 behind a window 41 formed in an escutcheon 42 mounted within a suitable aperture in the front panel 22 of the receiver cabinet. The details of the window construction are shown more clearly in Figure 4. The window casing is provided with stationary pointers 43 cooperating with the graduations 37 of the indicator card to show at all times the position of adjustment of the condenser 3. The indicator card is of translucent material in order that the indicator may be indirectly illuminated by means of a pilot lamp 44 placed behind the same mounted upon a projecting portion 45 of the chassis frame, the lamp being illuminated by a suitable source of energy, not shown, connected to the terminals 46 thereof.

As a result of the assembly described, rotation of the knob 23 will not only adjust the capacity of the gang condenser 3 through the driving medium consisting of the pulleys and the interconnecting belt, but at the same time movement of the horizontally extending portion of the belt will linearly displace the indicator card along its slidable support through the medium of the interconnecting link 39, the position of adjustment of the tuning element being indicated by cooperation between the graduations on the indicator card and the stationary pointers on the window casing.

In the modified construction of Figure 5, the flexible belt 30 terminates in springs 47 affixed to lugs 48 provided upon the inner periphery of the drum 11. To this end the drum has formed on opposite edges of the rim thereof a pair of slots 49 the edge of each of which is curled under on one side as shown to permit the end of the belt to extend thereover for fastening to its spring. In this modification the indicator card is affixed to the belt by means of a single bar 50, one end of which is clamped to the card by means of the rivets 51, the other end being pin connected to the lug 40 affixed to the belt. In both modifications the horizontally positioned portion of the belt is of sufficient expense and the indicator is connected thereto at such a point that the card may be displaced to extreme positions in either direction corresponding to the limiting positions of adjustment of the rotor shaft of condenser 3.

The mechanical features for accomplishing the remaining control operations mentioned above

may best be explained by referring more specifically to Figures 1, 2 and 6, particularly the latter. In these figures there is shown a shaft 55, one end of which is journaled through the stationary sleeve 18 and projects beyond the panel 22, the projecting end being fitted with a small knob 56, a portion whereof is rotatable within sleeve 17. The opposi e end of the shaft comprising the portion extending beyond a collar 57 turned thereon is of rectangular cross-section being slidably supported adjacent the end thereof within a sleeve 58 having an inner bore conforming to the rectangular shaft, the sleeve 58 being rotatably supported wi hin an aperture of a portion 59 of the chassis frame, longitudinal movement of the sleeve being substantially prevented by means of the collar 60 formed thereon and the nut 61 screw-threaded thereto positioned on opposite sides of the frame respectively. The sleeve is threaded to a limi ed extent only in order to prevent tightening the nut to such an extent as to prevent rotation of the sleeve within the frame. The stationary sleeve 18 affixed to the frame portion 19 is internally recessed for a considerable distance, the inner surface being provided with an elongated U-shaped spring strip 62, one shoulder of which normally bears against the collar 57 to maintain the shaft in the position shown. Upon pulling outwardly upon knob 56 the shaft is correspondingly displaced against the resilient action of the spring un'il the collar rests against the inner end of the recess in sleeve 18, whereupon the opposite shoulder of the spring 62 bearing against the collar 57 will maintain the shaft in its new position of adjustment.

The purpose of having the shaft longitudinally adjustable in this manner is to control the operation of a toggle switch 63 from a non-operated position to an operated position. To this end the arm 64 of the switch 63 is provided with a spherical termination permanently housed between the sides of a flanged drum 65 mounted upon and keyed to the shaft 55, so that as the shaft is pulled out carrying with it the drum 65, the switch will be operated as indicated.

The switch 63 may, of course, be utilized to perform any desired function, but in the specific embodiment its purpose is to disconnect the antenna and replace it by a condenser connected across the receiver input in order to reduce the signal intensity for local or powerful stations. The electrical effect produced by the operation of this switch is shown more clearly in Figure 7 where it is seen that with the switch in the normal position shown an antenna 66 is connected through the switch contacts and through a choke coil 67 to the primary winding P of a transformer T comprising the input to a radio receiver circuit, the opposite terminal of winding P being grounded. With the switch arm operated against its opposite contact the antenna 66 is disconnected and in its place a capacity 68 is bridged across the series connection comprising inductance 67 and primary transformer windings P.

Referring again to Figures 1, 2 and 6, there is affixed to the outer end of sleeve 58 a transverse member 69 having arms extending in diametrically opposite directions. One arm is provided at its end with a projecting lug 70 adapted during rotation of the shaft to engage the prongs of a U-shaped arm 71 operating a toggle switch 72. As the shaft is rotated in one direction by means of knob 56, the lug 70 engages one prong of the switch arm 71 to operate the switch to one position after which lug 70 swings free of the prong. Thereafter as the shaft is rotated in the opposite direction the lug 70 engages the opposite prong of the switch arm 71 to operate the switch to its opposite position whereupon upon continued rotation of the shaft the lug swings free of the prong. In the specific embodiment of the present invention the switch 72 serves to control the connection of the power supply 73 to the power pack 74 of the receiver as shown in Figure 7.

Affixed to the opposite arm of member 69 is a second lug 75 which is pin-connected to one end of a rod 80, the other end of which is pin-connected to a piston 81 having an insulated conductive end portion 82, the piston being slidably positioned within an insulating sleeve 83 mounted within an aperture in the conductive partition 84 partially housing the gang condenser 3. A conductive collar 85 is positioned about the insulating sleeve on the side of the partition opposite to that in which the gang condenser is located. The conductive end portion 82 and the collar 85 form the plates of a variable condenser D, the capacity of which is adjustable from a low minimum value to a maximum value as the knob 56 is rotated withdrawing the piston until the conductive end portion 82 moves from a position on the side of the partition opposite the collar 85 to a position directly beneath the collar. In the specific embodiment of the present invention the variable capacity serves to adjust the volume of the receiver. The manner in which this is accomplished is fully set forth in the aforementioned copending application, serial number 465,352, but for completeness will be briefly discussed herein with reference to Figure 7.

Referring to Figure 7, there is shown the aforementioned antenna 66 connected through the radio-frequency choke coil 67 and the primary winding P of an input transformer T to ground. The secondary winding L_1 of the transformer shunted by the variable capacity C_1 forming one of the units of the gang condenser 3, has one terminal connected to the grid G and the other terminal connected through a by-passing condenser n to the cathode K of a heater-type vacuum tube V heated by means of a filament F. The anode A of the tube is connected through a choke coil M to the power pack 74, as are also the cathode and the filament, by means of conductors 85. The power pack serves to transform the alternating current supplied from the power source 73 over conductors 85 through the switch 72 into suitable current for operating the receiver. The vacuum tube V together with the choke coil M is enclosed within a shielding compartment S_1 comprising a portion of the frame of the receiver chassis. In a separate shielding compartment S_2 of the chassis is situated an inductance L_2 shunted by a variable capacity C_2 forming one of the units of the gang condenser 3, the capacity C_2 and inductance L_2 forming a tunable resonant circuit connected by means of conductors 86 to the input to the detector and audio-frequency amplifier 87 of the receiver, the output of which contains an acoustical element 88. The output section of tube V is capacitively coupled to the tunable circuit L_2C_2 constituting the input section to the next succeeding tube by means of the above described special condenser D. This is accomplished by connecting the conductive collar 85 to the anode A and the conductive end portion 82 of the piston by means of a flexible lead 87 to the high potential side of the tuned circuit L_2C_2.

It will thus be seen that as the capacity is adjusted by rotation of the knob 56, there results a

variation in signal intensity impressed from the output section of tube V upon the input section of the remaining portion of the receiver, in this way controlling the volume of signal intensity received in the acoustical element 88 connected in the receiver output. The mounting of the condenser D in the shielding partition 84 makes it possible to have a very low minimum coupling capacity since with the collar 85 and conductive end portion 84 situated on opposite sides of partition 84, the latter constitutes a shield in effect electrically isolating one element from the other so there is very little capacity between the two.

In the operation of the device rotation of the knob 56 in one direction first operates switch 72 to turn on the power to the receiver and thereafter the continued rotation of the knob by withdrawing the piston until the conductive end portion 84 is situated beneath the collar 85 gradually increases the signal volume heard in element 88 from a minimum to a maximum value. Subsequently when the set is to be turned off the rotation of the knob 56 in the opposite direction will first reduce the volume to a minimum value by displacing the conductive end portion to the opposite side to the shield 85 from the collar and thereafter operate the switch 72 to disconnect the power from the receiver.

I claim:

1. The combination in a radio receiver of a rotatably adjustable tuning element, an indicator card slidably supported in a guide therefor and cooperating with a stationary marker to indicate the adjustment of said tuning element, a rotatable control, and flexible means mechanically coupling said tuning element and indicator card to said control for simultaneous adjustment thereby.

2. The combination in a radio receiver of a rotatably adjustable tuning element therefor, a slidably supported graduated indicator linearly displaceable relative to a stationary marker comprising a short escutcheon plate having a view opening and a central pointer for indicating the position of adjustment of said tuning element, a rotatably supported control displaced from said tuning element and flexible means mechanically coupling said tuning element and indicator thereto, whereby rotation of said control simultaneously adjusts said tuning element and linearly displaces said indicator relative to said marker.

3. The combination in a radio circuit of a rotatably adjustable tuning element therefor having a pulley keyed to the shaft thereof, a rotatable control including a second pulley keyed to a shaft displaced from and parallel to the first, a flexible belt positively coupling said pulleys, a slidably supported graduated indicator displaceable substantially parallel to a portion of said belt spanning said pulleys, said indicator cooperating with a stationary marker to indicate the adjustment of said tuning element, and a link mechanically coupling said indicator to said spanning portion of the belt whereby rotation of said control simultaneously rotates said tuning shaft and linearly displaces said indicator.

4. The combination in a radio receiver of a cabinet having a front panel, an escutcheon plate mounted thereon, penetrating therethrough, having a sloping index surface with a sight opening and pointer, slide members cooperating therewith, and a slidable scale member greater in length than said escutcheon plate, and parallel to the sloping surface thereof, a control knob below said escutcheon plate, a circuit adjusting member adjacent thereto, a connecting member therebetween, and a link member coupling said scale to said connecting member.

5. The combination in a radio receiver of an adjustable tuning element, means for moving said element, a flat slidable member having a plurality of scales connected thereto, and an escutcheon plate having a plurality of sight openings and pointers cooperating therewith.

6. The combination in a radio receiver of an adjustable tuning element, means for moving said element, a flat slidable member having a plurality of scales connected thereto, and an escutcheon plate having a plurality of sight openings and pointers cooperating therewith.

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