June 17, 1941. F. A. MITCHELL 2,245,804

TUNING MECHANISM FOR RADIO APPARATUS

Filed Sept. 13, 1938 2 Sheets-Sheet 1

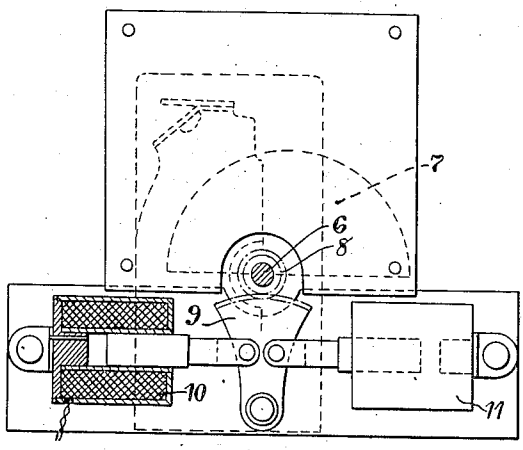


Fig. 1.

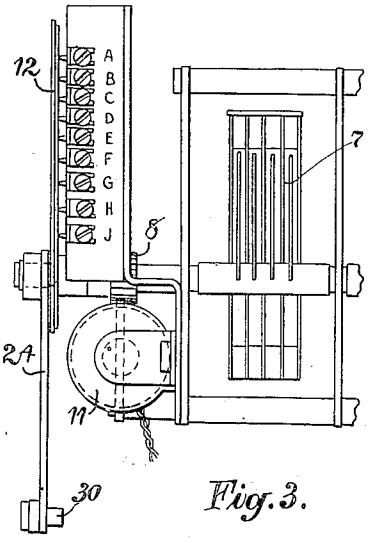


Fig. 3.

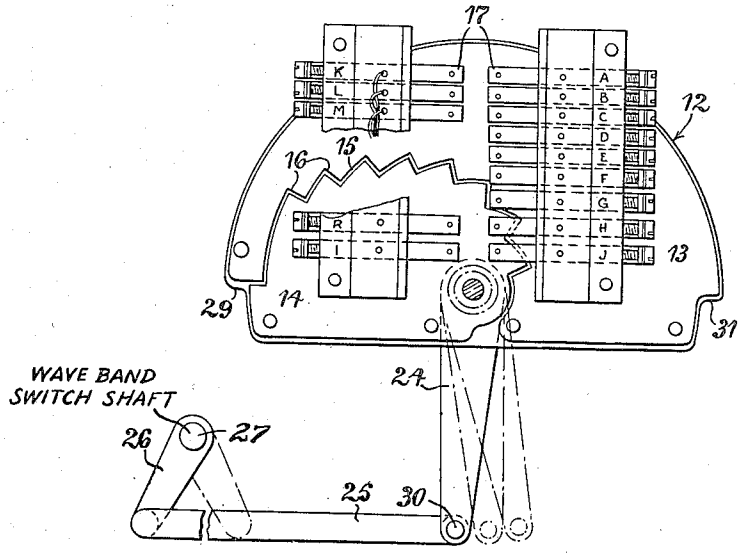


Fig. 2.

INVENTOR
FRANK ALLEN MITCHELL
BY H. S. Grover
ATTORNEY

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TUNING MECHANISM FOR RADIO APPARATUS

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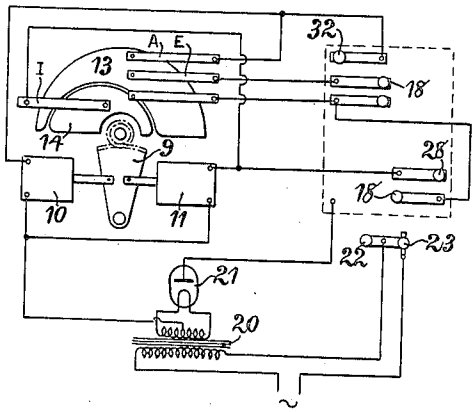


Fig. 4.

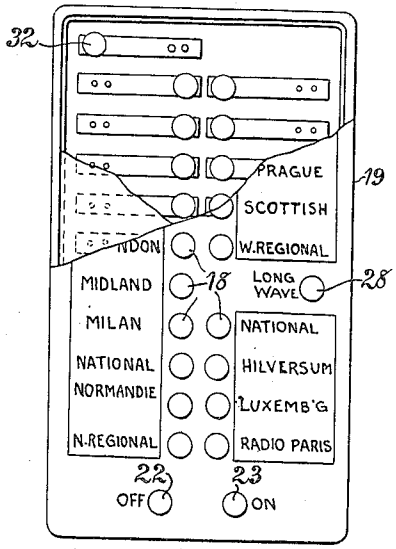


Fig. 5.

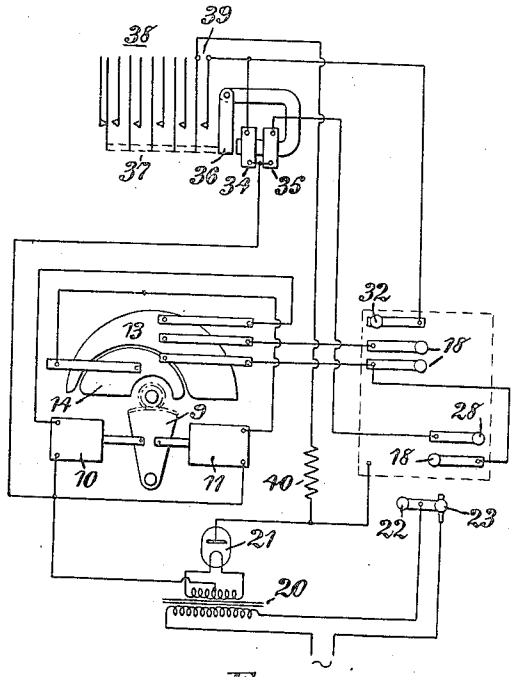


Fig. 6.

INVENTOR
FRANK ALLEN MITCHELL
BY H. S. Grover
ATTORNEY

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UNITED STATES PATENT OFFICE

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TUNING MECHANISM FOR RADIO APPARATUS

Frank Allen Mitchell, London, England, assignor to Electric & Musical Industries Limited, Hayes, Middlesex, England, a company of Great Britain

Application September 13, 1938, Serial No. 229,642
In Great Britain September 13, 1937

2 Claims. (Cl. 250—40)

This invention relates to tuning mechanism for radio receiving apparatus and is particularly concerned with mechanism whereby a radio receiver can be selectively tuned for the reception of one or other of a plurality of transmitting stations either at the receiver or from a remote point.

Proposals have heretofore been made whereby a radio receiving apparatus may be tuned mechanically under the control of the operator as, for example, by depressing one of a plurality of push buttons which causes rotation of a tuning condenser by energizing an electric motor, the tuning condenser being rotated by a predetermined amount after which it is brought to rest in the desired station receiving position.

Other proposals have also been made but most of these are not satisfactory owing to the complication of the mechanism employed resulting in large manufacturing costs, service difficulties and uncertainty and sluggishness in operation.

It is one object of the present invention to provide an improved tuning control for automatically rotating a tuning device, for example, a tuning condenser, into a plurality of station-receiving positions under the control of the operator either at the receiver or from a remote point.

A further object of the invention is to provide a radio receiver having press button tuning with mechanism for changing the wave range of the receiver so as to enable the receiver to be tuned to stations in the different wave bands.

According to one feature of the invention a radio receiver is provided having means whereby it can be tuned for the reception of a plurality of different stations by the operation of a plurality of push buttons and wherein, in order that the stations can be selected in different wave bands, wave range changing mechanism is provided also operated by one or more push buttons.

According to another feature of the invention tuning mechanism for a radio receiver is provided comprising a tuning element which is adjustable automatically under the control of the operator to one or other of a plurality of predetermined positions, the position to which the tuning element is adjusted being determined by the provision of a station selector device comprising a selector member having conducting and insulating zones co-operating with contacts under the control of the operator, said selector member moving with the tuning element, the tuning element being brought to rest according to the position of a selected contact relatively to the conducting and insulating zones of said selector member, the selected contact and selector member serving to energise one or more electro-magnets or solenoids coupled to the tuning element to cause one or more electro-magnets or solenoids to adjust the said tuning element to a predetermined position.

According to a further feature of the invention tuning mechanism for a radio receiver is provided having automatic station selecting mechanism for adjusting a tuning element to predetermined station receiving positions, said tuning element being adjusted to either direction by the provision of electro-magnets or solenoids coupled to the tuning element, one of said electro-magnets or solenoids serving to adjust the tuning element in one direction, whilst another electro-magnet or solenoid serves to adjust the tuning element in the opposite direction.

In the preferred form of the invention the selector member is provided with two conducting zones which are spaced apart and contact members are arranged to engage one or other of the conducting zones and a pair of solenoids or electro-magnets is provided, one electro-magnet being in circuit with the contacts associated with one zone and the other in circuit with the contacts associated with the other zone, the solenoids being so coupled to the tuning device, which in most cases would be a variable condenser, whereby one solenoid serves to rotate the tuning condenser in one direction and the other solenoid in the opposite direction according to the particular contact member selected. The contact members are preferably in circuit with a number of push buttons and each contact member serves to rotate the tuning condenser to a predetermined position according to the push button depressed. The wave range changing mechanism preferably comprises a wave range changing switch of any suitable and known form which serves to change the wave range of the receiver, the switch being arranged to be operated by causing the selector member to be rotated to either of its extreme positions of rotation.

In order that the said invention may be clearly understood and readily carried into effect it will now be more fully described with reference to the accompanying drawings in which:

Figure 1 is a front elevation of the electro-magnets or solenoids for rotating the tuning device,

Figure 2 is a front elevation of the selector member and associated contacts,

Figure 3 is a side elevation of the mechanism shown in Figures 1 and 2.

Figure 4 is a partial wiring diagram,

Figure 5 is a plan view partially broken away of a selector panel or box in which the push buttons are arranged, and

Figure 6 is a wiring diagram similar to Figure 4 but illustrating a modified form of wave range changing mechanism.

In the embodiment of the invention shown in the drawings, the shaft 6 of a tuning condenser 7 has a pinion 8 which meshes with a pivoted gear sector 9 to which angular movement is imparted from one or other of a pair of solenoids 10 and 11. The tuning condenser 7 is rotated in a clockwise direction by the solenoid 10 and in an anti-clockwise direction by the solenoid 11. Current for the operation of either solenoid is selectively applied through the medium of a selector member 12 (Fig. 2). The selector member is arranged for rotation with the shaft 6 of the condenser for 180° and comprises two conducting zones 13 and 14 separated by insulation 15 or by an air gap. The adjacent edges of the zones 13 and 14 are of serrated form, as shown, providing edges 16 which are adapted to move past a plurality of contact fingers 17, the contact elements of which are in engagement with the selector member 12. The tuning condenser 7 occupies a different angular position as each edge 16 moves into engagement with its associated contact member 17. Two banks of nine contact fingers 17 are provided arranged vertically on either side of the vertical plane containing the axis of the shaft 6 the contact fingers being lettered A . . . R. Each of the contact fingers B—H and J—R is in electrical connection with one of a plurality of push buttons 18 arranged in a panel 19 on the radio receiving apparatus by conductors whereby the receiving apparatus may be tuned from a remote point. Each of the contacts 17, with the exception of the contacts A and I, serve as station selector contacts and when a push button 18 connected to these contacts is depressed the condenser is rotated to a predetermined position.

Figure 4 of the drawings shows a simplified wiring diagram in which only a few of the station selector contacts are shown. Current for the operation of the mechanism is supplied from a secondary winding of a mains transformer 20 which may be the transformer supplying current to the radio receiving apparatus. The current is rectified by a rectifier 21 the output electrode of which is connected to a common conducting base plate of the selector panel or box 19. The circuit to the primary winding of the transformer in the example shown is closed or opened by depressing one or other of push buttons 22, 23 or, alternatively, the circuit may be made or broken at the receiver or on depressing one of the push buttons 18. Assuming that it is desired to tune the apparatus for the reception of a station corresponding to contact E, then the push button associated with this contact is depressed into engagement with the base plate and current then flows from the rectifier 21 through the contact E, conducting zone 13, the contact A and the solenoid 10. Energy is thus supplied to the solenoid 10 causing the condenser and the selector member to rotate in clockwise direction until an edge 16 moves beneath the contact E. The circuit to the solenoid 10 is then broken and owing to the momentum of the condenser and associated parts the other contact zone 14 is moved into engagement with the contact E so that the solenoid 11 is energised to rotate the condenser in an anti-clockwise direction. The alternate energisation of the solenoids finally brings the parts to rest with the contact E in engagement with the insulating zone or in the gap, the circuits to the solenoids then being broken. In this position the receiver is tuned for the reception of a predetermined station. The push button 18 associated with the contact E is then released and the apparatus is then in a condition for the selection of another station in the manner described. If the contact member associated with a particular press button is in engagement with the conducting zone 14 the reverse action occurs, current being supplied to the solenoid 11 through contact I. The insulating zones in Figure 4 and Figure 6 hereinafter to be described are shown in arcuate form although it is preferred to construct the zone as shown in Figure 2.

It is preferred to arrange for the operation of a wave change switch when it is desired to receive either a long wave or a medium wave station and such operation is conveniently effected by the mechanism according to the invention by causing a wave change switch to be actuated in either of the extreme clockwise or anti-clockwise positions of the selector member 12. As shown in the drawings, a lever 24 is loosely mounted at one end on the shaft 6 and its other end is connected by a link 25 to a lever 26 connected to a shaft 27 associated with a wave change switch. If the desired station is in the long wave band then before operating the push button 18 associated with that station a further press button 28 is depressed this button 28 completing a circuit to the solenoid 11 causing the selector member 12 to rotate to its extreme anti-clockwise position causing a shoulder 29 on the member 12 to engage a pin 30 projecting from the lever 24 moving the lever in an anticlockwise direction to operate the wave change switch. If a medium wave station is required then a further press button 32 associated with the contact A is depressed to energise the solenoid 10 to cause the selector member 12 to rotate to its extreme position of clockwise movement when a shoulder 31 engages the pin 30 to move the wave change switch in the opposite direction. If desired, rotational movement of the member 12 can be stopped in a position intermediate the extreme positions of the lever 24 and in these intermediate positions the apparatus may be set for the reception of short wave stations or to place the receiver in a condition for the playing of Gramophone records or for television reception.

The press buttons 28 and 32 in Figure 5 may be connected to operate a magnetic wave-change switch similar to that described in U. S. Patent No. 2,100,609. A suitable circuit arrangement being as follows: The selector panel may be as previously described with reference to Figure 5, for example, with the connections arranged as shown in Figure 6 in which the button 18 functions to select a station in the manner already described, while wave-change buttons 28 and 32 are connected to operate a magnetic switch 37 arranged in place of or parallel to the usual wave-change switch on the wireless receiver in such a manner that when the polarized armature 36 is closed, all the contacts 38 place the radio circuit in condition for medium-wave reception for example, and when the armature 36 is open, the radio circuit is in condition for long-wave reception. The operation is as follows: when

a station is required in the medium wave band, the button 32 is depressed and this allows current to flow from the rectifier 21 through the magnet coil 34 and back to the rectifier to attract polarised armature 36 and close all the contacts 38 and 39. Current then flows from the rectifier through contacts 39 and resistance 40 to maintain the armature closed after the press button 32 has been manually released. When it is desired to change to long-wave band the button 28 is pressed and current flows from the rectifier 21 through magnet coil 35 to oppose strongly the coil 34 and release the polarised armature 36 to allow the contacts 38 and 39 to open, and when manual pressure is released from the button 28 so that no current flows, the switch 37 will remain open until again energised by the press button 32. It is obvious that the wave-change buttons 28 and 32 may be depressed concurrently with or by the station selecting press button 18, or that the selector panel 19 with wave-change switch may be used with selecting mechanism of other types, such as for example the arrangement described in U. S. patent application Serial No. 227,881, filed September 1, 1938.

Instead of constructing the selector member 12 in the manner shown in the drawings with banks of contact fingers mounted on either side of the shaft 6, the selector member may be in the form of a disc with edges 16 arranged diametrically of the disc and the two banks of contacts 17 may then be arranged diametrically similar to the arrangement disclosed in said copending application. Alternatively, the selector disc may comprise conducting and insulating zones as described in the said co-pending specification. Also, instead of employing a disc or semi-circular member, a cylinder may be employed and furthermore, several discs or semi-circular members or cylinders may be used. Instead of coupling the armatures of the solenoids directly to the gear sector 9, as shown, they may be coupled to the condenser spindle through levers, chains or gearing, in order to afford an extended movement of the shaft 6 for a short stroke of the solenoid.

If desired, the selector panel may be of the form described in said U. S. Patent No. 2,100,609 or it may be in the form of a sliding contacting device or a number of push buttons may be provided with holding relays and the like similar to the arrangement disclosed in the specification of the above-mentioned co-pending application.

Each solenoid may be associated with a suitable dash-pot for controlling its movement or the armatures of the solenoids may be arranged to slide in closely fitting housings so that they themselves constitute the said dash-pots.

It will be appreciated that the distance between adjacent edges 16 of the selector member 12 corresponds to a range of adjustment of the tuning condenser and consequently by adjusting the positions of the contacts 17 relatively to the member 12 it is possible for the operator to select what stations he may require to be selected on operation of the push buttons. To enable the operator to adjust the station selector contacts, it is preferred to mount the station selector contacts in such manner that vertical positions can be adjusted. For this purpose the station selector contacts may be held in grooves or slots in an insulating block and screws may be provided in engagement with the contacts so that on rotating the screws the positions of the station selector contacts can be adjusted.

In order to prevent sparking or "flash-over" at the solenoids when the respective circuits are broken, condensers or other means may be employed.

In order to overcome any inaccuracy in the setting of the tuning condenser the circuit of the receiver may be associated with any suitable form of "pull-in" tuning circuit.

I claim:

1. In a tuning control means for radio apparatus and the like, a rotor shaft for operating the tuning means, a selector disc mounted for rotation with said shaft, said selector disc comprising two conducting zones separated by an insulation zone, said conducting zones being arranged so that the insulation zone appears on the surface of said selector disc as a spiral relative to the rotor shaft, a plurality of laterally adjustable contacting fingers mounted so as to make contact with the surface of the selector disc, motor means for rotating said shaft, a motor circuit including selectively operable means cooperating with said contact fingers for controlling the operation of said motor to thereby provide for adjusting said tuning means to any one of a plurality of positions, a wave change switch for said radio apparatus and means on said disc for controlling the operation of said switch upon operation of said shaft to one of said positions.

2. In a tuning control means for radio apparatus and the like, a rotor shaft for operating the tuning means, a selector disc mounted for rotation with said shaft, said selector disc comprising two conducting zones separated by an insulation zone, said conducting and insulation zones being arranged with respect to each other so that the insulation zone appears on the surface of said selector disc as a spiral relative to the rotor shaft, a plurality of contacting fingers mounted so as to make contact with the surface of the selector disc, motor means for rotating said shaft between two extreme positions, a motor circuit including selectively operable means cooperating with said contact fingers for controlling the operation of said motor to thereby provide for adjusting said tuning means to any one of a plurality of positions between said two extreme positions, a wave change switch for said radio apparatus and means on said disc for controlling the operation of said switch upon adjustment of said shaft to one of said positions.

FRANK ALLEN MITCHELL.