Feb. 10, 1942. E. H. ALLEN 2,272,627

RADIO STATION SELECTOR

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FIG. 1.

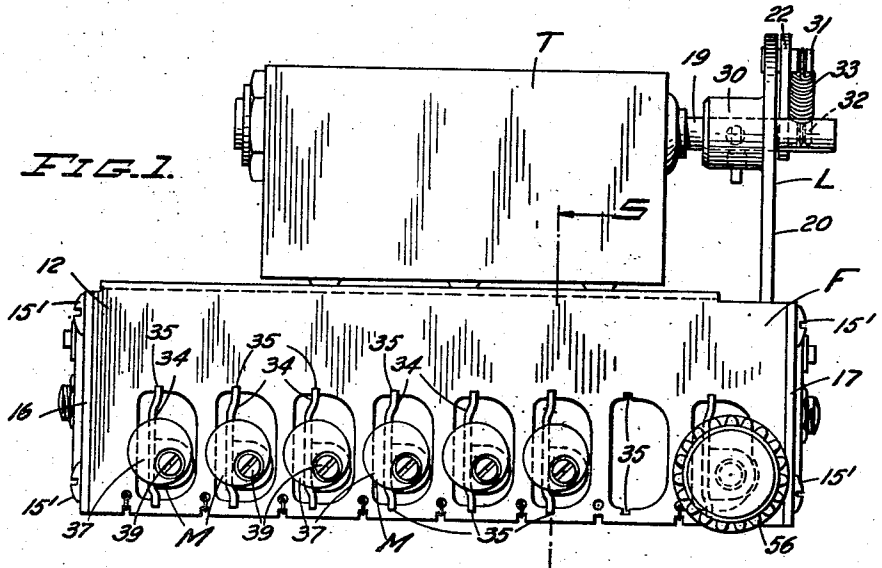
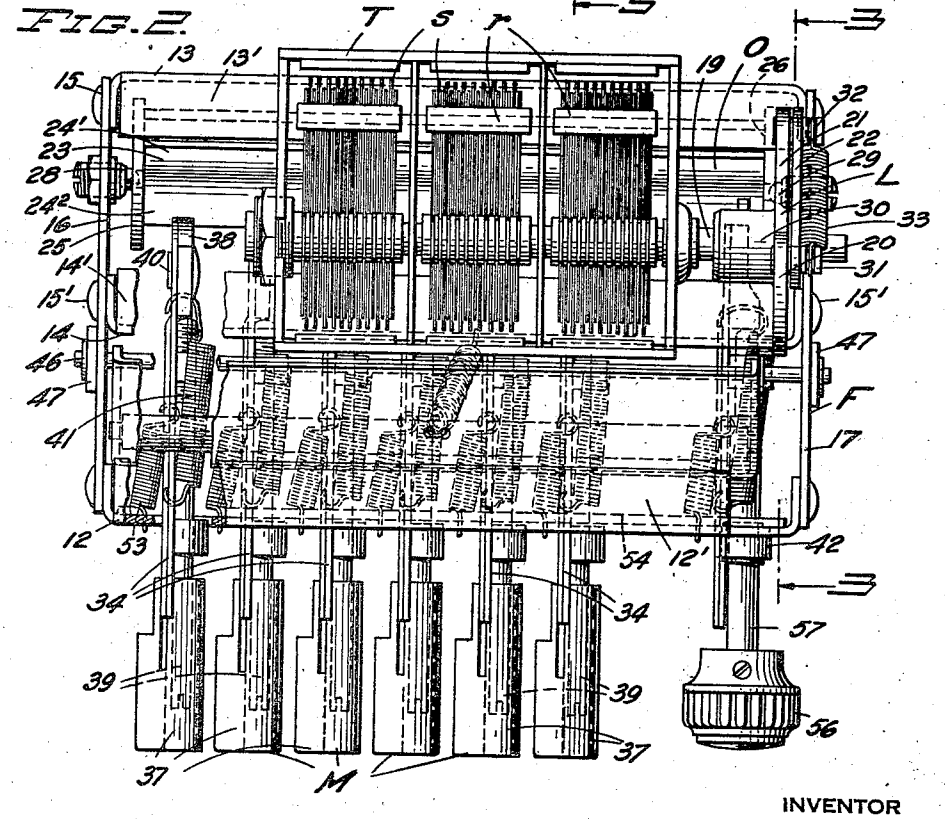


FIG. 2.



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FIG. 3.

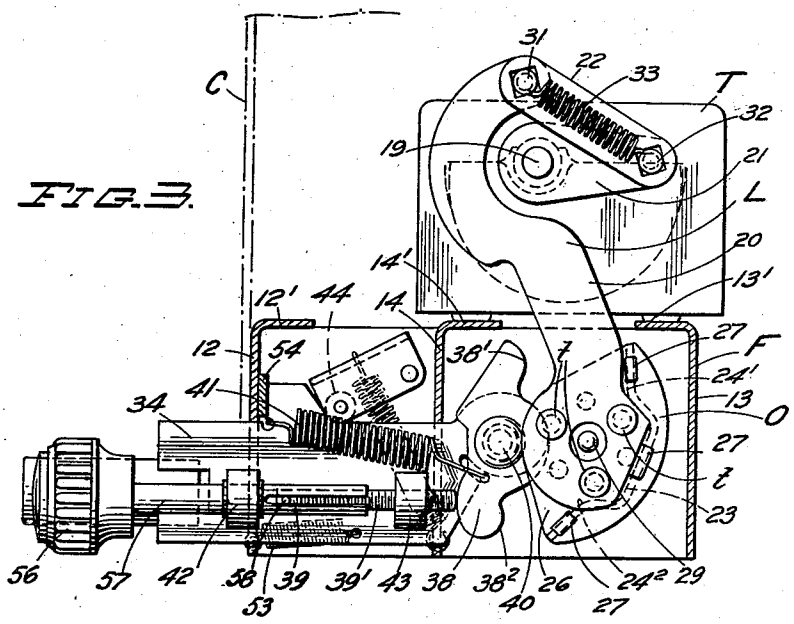
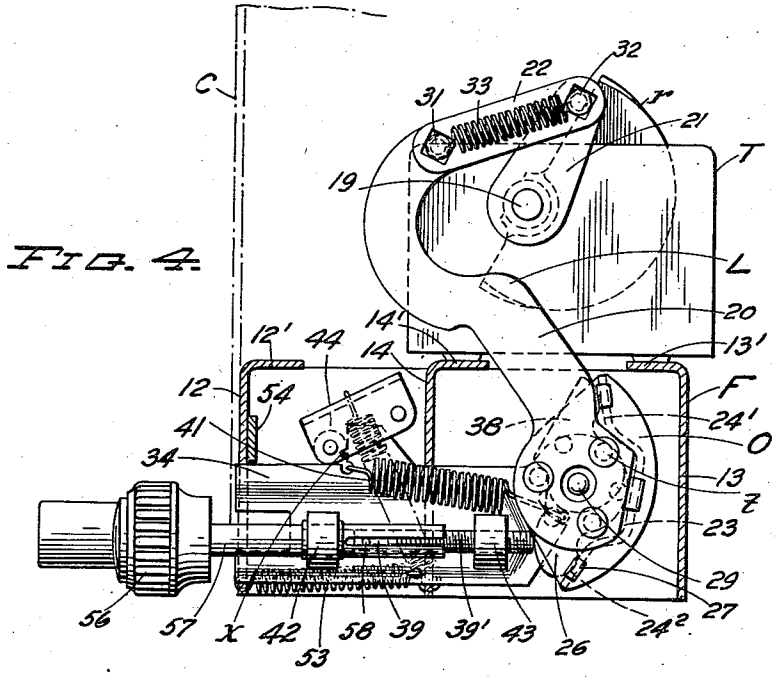


FIG. 4.



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FIG. 5.

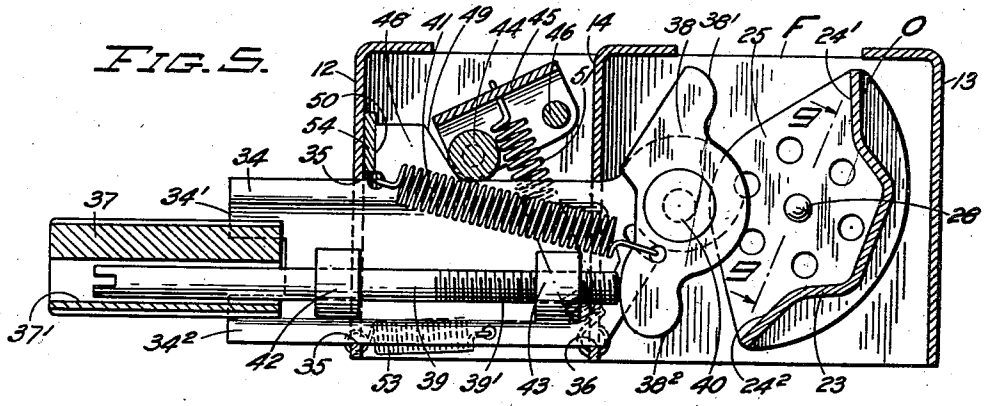


FIG. 7.

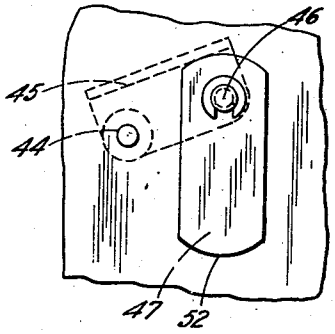


FIG. 8.

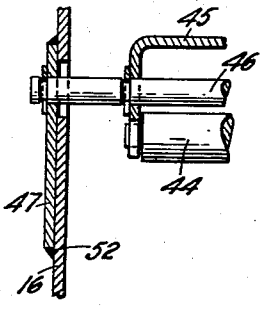


FIG. 9.

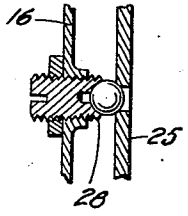
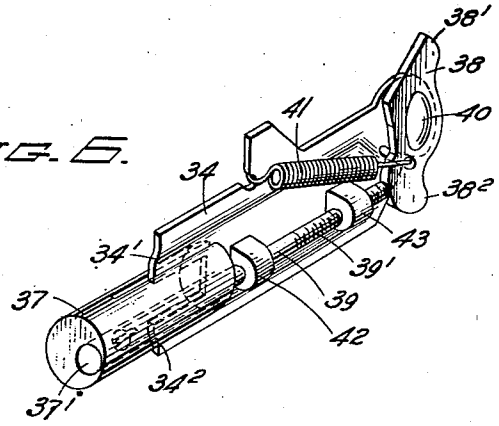


FIG. 6.



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UNITED STATES PATENT OFFICE

2,272,627

RADIO STATION SELECTOR

Earl H. Allen, Fanwood, N. J., assignor, by mesne assignments, to Condenser Development Corporation, Newark, N. J., a corporation of New Jersey

Application March 24, 1938, Serial No. 197,755

5 Claims. (Cl. 74—10)

This invention relates to a radio station selector and more particularly to one in which push-button manuals, each representing a given frequency or station, are selectively operable for actuating the tuning unit of the radio receiver.

The present invention is an improvement on the Radio station selector of the copending application of Samuel Cohen and Earl H. Allen, Serial No. 193,886, filed March 4, 1938.

The broad object of the invention (as set forth in said copending application) centers about the provision of a push-button type of tuning selector for a radio receiver designed to operate mechanically in a way to meet the high accuracy requirements of repeatable tuning selection. A correlary broad object of the invention deals with the provision of such selector which is mechanically simple in construction, capable of being reliably manufactured by quantity production methods and possessing long usage life under severe operating conditions.

The selector of the present invention is intended for use with a variable tuning unit such as a variable condenser, the rotor of which is movable over a relatively large arc such as 180 degrees. This rotor is connected to an operating member which is common to and operable by any of a plurality of push-button manuals (each representing a given frequency or station) translationally movable over relatively short linear paths.

One of the main problems in the design of such a push-button selector is that of converting and multiplying the relatively short linear or translational movement of the push-button manuals or elements into the available 180 degree rotation of the rotor of the tuning unit. This entails the provision of suitable mechanism which will readily convert and multiply short linear movements into a 180 degree rotation and one which can accomplish this, moreover, with that freedom of play and back lash and with that minimum of friction loss in the mechanism, which will permit the obtaining of high accuracy repeatable operations.

Two of the ultimate aims of the invention are to meet the needs of high tuning accuracy and repeat accuracy. The mean value of tolerance for total accuracy (tuning and repeat accuracy) desirable in the push-button selector (as measured at the condenser rotor) is a tuning variation of plus or minus 1 kilocycle (a total of 2 kilocycles). With a modern variable condenser employed as the tuning unit of the system, this means that at an average point in the tuning range, the rotor should be mechanically tunable by the selector over a 1 degree tolerance. Since the mechanism employed functions not only to convert motion but to multiply the same, it becomes apparent that the push-button manuals and the operating member of the mechanism must respond to even a higher degree of mechanical operating refinement than the condenser rotor. By means of the principles underlying the functioning of the apparatus of the present invention, these problems are effectively solved, and in fact it has been ascertained that the tuning accuracy of the selector mechanism is even greater than this described desirable tolerance.

The more important phase of this "total accuracy" is that of "repeat accuracy," which may be defined as the ability to reproduce a predetermined setting or tuning over repeated cycles of movement or operation of the selector mechanism. To effectively accomplish the desired repeat accuracy, the mechanical linkage between a push-button manual and the condenser rotor must be designed to absolutely eliminate play and back lash at all points and with a minimum of friction loss. These requirements are all the more severe due to the motion converting and multiplying functioning of the linkage between any given manual and the condenser rotor, since any error in the mechanical movement (and reproducibility of such movement) of the manual is multiplied at the condenser rotor. By means of the selector structure of the invention, these problems are effectively solved and a high repeat accuracy is obtained. It has been determined that with this selector structure, repeat accuracy of the condenser rotor does not exceed a 400 cycle range. Obviously, the equivalent repeat frequency accuracy of the operating member (and each push-button manual) is even higher and comes within a 100 cycle range.

In a radio station selector, provision must be made to enable the user to initially adjust or subsequently readjust the push-button manuals to desired frequencies or stations. It is highly desirable that such adjustment be made by the user or operator from the outside of the radio cabinet. Also, the adjusting means should desirably be related to the push-button manuals so that besides both being readily accessible to the user exteriorly of the radio cabinet, they be also mechanically associated in an efficient as well as an attractive way, while permitting of action or operation of one independent of the other. Also, since the adjusting means of necessity

forms one of the elements (adjustable) in the linkage between the push-button and the ultimately operated condenser rotor, it is a further requirement of the structural combination that each adjusting means be related to its associated push-button manual, so that the high tuning and repeat accuracies mentioned may nevertheless be achieved. It is, therefore, a further object of the invention to provide an improved selector structure which solves these additional problems.

A further object of the invention centers about the provision of an improved push-button type of radio tuning selector in which at least one of the push-button manuals is designed so as to be capable of being used for operating the tuning unit over its entire tuning range to enable the set to be tuned to any desired frequency. The provision of an improved selector structure in which push-button manuals for preselecting a station is appropriately combined with means for tuning a radio set to any desired frequency or station, is desirably accomplished by the mechanism of the present invention.

In carrying out these objects and principles, the present invention deals particularly with improvements comprising, (1) an operating member which is actuatable positively in either direction of its motion by each of the push-button manuals, (2) an operating member and its linkage to the tuning unit which form a balanced mechanism capable of stably retaining any selected position to which it is operated, (3) a selector mechanism embodying latching means for urging the manual into locking engagement with the operating member and for holding the same in latched position, and (4) an improved push-button manual and adjusting means therefor.

As aforestated, it is desirable that all of these stated problems be solved by means of mechanism simple in construction, capable of being reliably manufactured in quantity, and possessing long usage life under severe operating conditions. The selector structure of the present invention is designed to meet these additional desiderata.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, the invention further consists in the structural combinations hereinafter sought to be defined in the claims and described more in detail hereinbelow in connection with the appended drawings, in which:

Fig. 1 is a vertical elevational view of the radio station selector of the present invention;

Fig. 2 is a top plan view thereof, with some parts broken away;

Fig. 3 is a right end elevational view thereof taken in cross-section in the plane of the line 3—3 of Fig. 2 and showing the parts in an inoperative position;

Fig. 4 is a view similar to Fig. 3 in showing the parts in an operative position;

Fig. 5 is an enlarged view of a part of the selector mechanism taken in cross-section in the plane of the line 5—5 of Fig. 1;

Fig. 6 is a perspective view of one of the push-button manuals; and

Figs. 7 to 9, inclusive, are views of details.

Referring now more in detail to the drawings, the radio station selector of the present invention comprises a unit embodying a supporting frame F with which is fixedly associated the tuning unit T such as a variable condenser, the said frame F supporting all of the elements of the selector system. The essential components of the selector system comprise an operating member O connected by means of a linkage mechanism L to the rotor of the tuning unit T, the said operating member O being common to and being actuatable by any of a plurality of push-button manuals, all collectively designated as M. These components of the selector system are designed as aforesaid to readily convert and multiply short linear movements of the push-button elements into a 180 degree rotation of the rotor of the tuning unit and to do this with that freedom of play and back lash and with that minimum of friction loss which will permit the obtaining of high accuracy repeat operations.

The frame F is built in simple fashion to provide a firm and rigid support. It consists of front and rear walls 12 and 13, an intermediate brace wall 14, all bolted by suitable attaching means such as rivets 15 and screws 15', 15' to the side walls 16 and 17. The rear and intermediate walls 13 and 14 have suitable ledges 13', 14' turned down from the top edges thereof to provide a support for the condenser unit T, which latter may be attached thereto in any approved way (see Figs. 1, 3 and 4). The tuning unit T may be of any modern type; and this is illustrated in Figs. 1 and 2 as a condenser of a three-gang type having a plurality of stator sections *s*, and a plurality of rotor sections *r* united to form a single rotor having an operating shaft 19. The rotor of the condenser is movable over its entire 180 degree tuning range.

One of the important components of the selector mechanism is the means for linking the operating member O to the tuning rotor *r*. The operating member O is designed to be movable over an arc of about 45 degrees, and, therefore, the means for linking the operating member to the tuning rotor is made to comprise a mechanism for multiplying the 45 degree rotation of the operating member O to the 180 degree range of movement of the tuning rotor *r*. To controllably eliminate back lash in this part of the selector and to reduce the friction loss to a minimum, and also to provide for a simplified mechanical structure, the invention at this point includes connecting the operating member O to the condenser rotor *r* by a motion multiplying linkage mechanism embodying three elements, with the relatively movable parts thereof localized to two pivot points at which back lash or play is controllably eliminated. This motion multiplying mechanism comprises a long outer element or arm 20 fixedly joined at its outer end to the operating member O, a short outer element or arm 21 fixedly joined at its outer end to the rotor shaft 19, and a link or intervening element 22 pivotally connected to the outer elements or arms 20 and 21. This three-element linkage mechanism is movable between the extremes of an open link formation (shown partly open in Fig. 4 of the drawings) to a convolute link formation (shown in Fig. 3 of the drawings). This linkage mechanism and this described motion thereof enables the desired conversion of a short (45 degrees) arcuate motion of the operating member, to the full range (180 degrees) arc motion of the condenser rotor.

In detail, the operating member O consists of a contact plate 23 in the form of a cradle having upper and lower cam or contact faces 24^1 and 24^2. The cradle 23 is provided at its opposite ends with the supporting hubs 25 and 26 rigidly

united thereto by the riveting lugs 27, 27 integral with the cradle (see Figs. 3 and 4). The cradle 23 is mounted for rotation in the frame side walls 16 and 17 by means of suitable ball bearings 28 and 29. The long arm 20 of the linkage mechanism L is fixedly joined at its outer end, as by the rivets *t*, to the supporting hub 26 of the operating member (see Figs. 3 and 4). The short arm 21 is fixedly joined to the rotor shaft 19 by any conventional means such as the collar and set screw 30. The link or intervening member 22 is pivotally connected to the arms 20 and 21 by means of the pivot pins 31 and 32. Thus, the operating member O is fixedly united or linked to the condenser rotor *r*, except for the two pivot pins 31 and 32, where all the loose play or back lash may be and is thus localized. The play at these pivot pins 31 and 32 is then eliminated by additionally coupling the outer elements or arms 20 and 21 by means of the tensioning spring 33 arranged in parallel with the middle link 22, the said spring being anchored at its opposite ends to extensions of the pivot pins 31 and 32.

Therefore, by this described means all play or back lash in the linkage mechanism L is localized at two controllable points where such play is then eliminated. This linkage mechanism, eliminating the use of gears and reducing the movable connections to two pivot pins of small diameter, also reduces the friction loss between the operating member and the tunable rotor to a minimum. The desired results are further enhanced by providing line contact (squared) bearings in the link 22 for the pivot pins 31 and 32 (see Figs. 3 and 4). It will be noted that the linkage elements are also exceedingly simple in structure and may be readily assembled for use, thus enabling the manufacture of these parts with uniformity in quantity production.

One of the improvements in the selector of the present invention resides in the design of the operating member O whereby it may be operated positively in either direction of its rotation. It is to this end that the contact plate 23 is made in cradle form, provided with the upper and lower cams or contact faces 24^1 and 24^2. A pushing engagement of the upper cam face 24^1 by a suitable cam or contact member will cause rotation of the cradle 23 in one direction (to cause the condenser rotor *r* to move towards interleaving relation with the condenser stator *s*), while a pushing engagement of the lower cam face 24^2 by a suitable cam or contact member will cause rotation of the cradle 23 in the opposite or reverse direction (to cause the condenser rotor to move out of interleaving relation with the condenser stator). The cam faces 24^1 and 24^2 are also so related that when either cam face serves as the engaged or actuating face, the other cam face serves or acts (in conjunction with its contact member) as a means for stopping the operating member O in its selected position. Elimination of play and minimizing of friction loss in the operation of the member O is obtained by the adjustable ball bearings 28 and 29 aforesaid, one of which is shown in detail in Fig. 9 of the drawings; ball bearing 28 directly supports the hub plate 25 and ball bearing 29 supports the hub plate 26 by way of the lower end of the arm 20 (see Figs. 3 and 4).

This combination of the operating member O (operable positively in either direction of its rotation), the linkage mechanism L and the tuning unit T present a balanced coordinated structure which, when moved (by the push-button manuals) to any selected position in the range, will remain stationary in that position.

The push-button manuals, collectively designated as M, comprise a plurality of push-button elements each representing a given frequency or station and each linearly or translationally movable to actuate the operating member O, which latter is common to all of the push-button elements. In the exemplification of the invention shown in the drawings, seven push-button elements are shown, six of which are employed for preselecting given stations or frequencies, and the remaining one of which (the right end one of Figs. 1 and 2) is employed when it is desired to operate the tuning unit to any point in its tuning range. Since the first six push-button elements are identical in structure and operation, only one of these need be described, such a one being shown in enlarged detail in Figs. 5 and 6 of the drawings. The seventh manual used to cover the full tuning range of the condenser is shown in detail in Figs. 3 and 4 of the drawings.

Referring generally to Figs. 1 and 2, and particularly to Figs. 5 and 6 of the drawings, each push-button manual comprises a key 34 slidable in keyways 35 and 36 cut in the front and brace walls 12 and 14 respectively of the frame F, the said key 34 being provided at its front end with an operating button 37 and at its rear end with a cam or contact member 38, the said cam or contact member being intended for cooperation with the contact or cam faces 24 and 24' of the cradle 23. In the drawings, these keys are shown in their retracted or inoperative position.

The structure and operation of each push-button manual and its relation to the operating member O are so designed that all play is definitely localized and made controllable and then eliminated at the control points. To avoid any perceptible rotational component of play, the push-button manuals are made responsive only to a translational slidable movement. This is preferably accomplished by making each key from sheet material (of relatively thick stock, however), the key having a substantial height or vertical dimension. With this construction, even though there is slight play of the key in the keyways, (enabling the obtaining of a low friction loss) there is substantially no rotational component of this play. By means of this structure, the effective play may be localized in the vertical plane of the key; and the relation between the manual and the operating member of the exemplified structure is made such that the play may be localized, controlled and eliminated at the latching member for the manual at the point indicated at *x* in Fig. 4. This will be explained further hereinbelow in connection with a description of the operation of the latching member.

To actuate positively the operating member O in either direction of its rotation, the contact member 38 is shaped to provide upper and lower cam or contact elements 38^1 and 38^2 positioned to cooperate respectively with the cam or contact faces 24^1 and 24^2 of the cradle 23. When a selected one of the manuals M is actuated (by pushing a push-button 37), and its key is depressed to its operating position, contact element 38^1 will engage contact face 24^1 or contact element 38^2 will engage contact face 24^2, depending upon the then or previously assumed position of the cradle 23 and will accordingly cause the rotation of the cradle 23 and operating member O in either one

direction or the other. If the engagement is that of contact parts 38^1 and 24^1, cradle 23 will be moved clockwise (as shown in Fig. 5) until contact parts 38^2 and 24^2 are caused to meet, at which time the contact element 38 and cradle 23 are locked one within the other, the contact parts 38^2 and 24^2 thereby serving as a stop means for stopping the operating member O in its selected position. Conversely should the engagement be first that of contact parts 38^2 and 24^2, cradle 23 will be moved counter-clockwise until contact parts 38^1 and 24^1 are caused to meet, at which time the contact element 38 and cradle 23 are locked one within the other. Due to the fact that the operating member O will stably remain in any selected position to which it is thus operated, the push-button manual could, if desired, be released and returned to its retracted or inoperative position. It is desired, however, to hold or lock the operating member O in its thus selected position, and to this end the push-button key is latched or locked in its operative position as will be described further hereinafter.

As aforestated, provision is made to enable the user to adjust or readjust the push-button manuals to desired frequencies or stations, and it is an object of the invention to provide a construction in which the adjustment may be made from the outside of the radio cabinet. To accomplish this, each contact member 38 is made adjustable and each manual is provided with an adjusting element 39, the inner end of which controls the position of the contact member 38 and the outer end of which projects from the frame F and from the radio cabinet C (see Figs. 3 and 4) so as to be accessible to the user when adjustment is desired to be made.

The contact member 38 is made adjustable by rotatively mounting the same on the inner end of the key 34, the rivet 40 (see Figs. 2 and 6) forming a pivot shaft and axis for this purpose. The adjusting element 39 specifically consists of a rod-like member having a threaded portion 39^1 which directly engages at its inner end the lower leg of the contact member 38. A strong tension spring 41 anchored at its opposite ends to suitable parts of the key 34 and contact member 38 exerts a pull on the latter to hold the same in engagement with the adjusting rod 39. This adjusting rod 39 is supported on the key 34 for rotation and longitudinal movement. As shown, the key 34 is provided with the spaced lugs 42 and 43, both bored and the latter threaded to carry the adjusting element 39 for the desired movement. The operating button 37 received by the two tines 34^1 and 34^2 of the key 34 is bored at 37', this bore registering with the adjusting element 39. With this described construction, a screw driver may be inserted through the bore 37' of the push-button 37 to engage the head of the adjusting element 39 to rotate the latter and effect incremental longitudinal movements thereof. This will correspondingly incrementally rotate (in one direction or the other) the contact member 38 about the rivet shaft 40. The axis of the rivet shaft 40 is in alignment with the ball bearing axis of the cradle 23 when these elements are locked one within the other, and hence rotation adjustment of the contact member 38 predetermines the selective position to which the operating member O is actuated. Preferably, the adjusting element of each of the manuals is longitudinally movable on the manual over a distance which will cover the full range of adjustment or movement of the rotor of the tuning element.

Although the operating member O and its linkage to the tuning unit will stably retain any position to which it is actuated, it is desired to lock the same by suitable latching means in the position to which it is selectively operated. Such latching means is required for the operation of the push-button manual as shown in Figs. 3 and 4, and is desired for the remaining manuals for the purpose of locking the operating member against vibrating displacement of the kind to which it may be subjected when employed in automobile receivers. In the structure of the present invention, this latch means is related to the push-button manuals to accomplish a number of desired results among which are the elimination of any play in the vertical plane of the latch members and the locking of the actuating member of the manual into the coacting parts of the operating member, the latch member thus serving the function of holding the tuning rotor in its selected position and causing the same to take exactly the same position in repeated operations.

This latch means comprises a roller 44 rotatably mounted in a U-shaped bracket 45 which latter is oscillatably mounted on a shaft 46 journaled in plates 47, 47 attached to the walls 16 and 17 of the frame F. The roller 44 cooperates with a projection or lug 48 formed integrally with each of the slidable keys 34, each lug having an unlatching face 49 and a latching face 50 thereon. The bracket 45 with the latching roller thereon is constantly urged to the positions particularly shown in Figs. 3 to 5 of the drawings by means of a spring 51 which is anchored at its opposite ends to suitable points of the bracket 45 and the brace wall 14, as most clearly shown in Fig. 5 of the drawings.

With this described construction, an inward push applied to the button 37 of any manual produces, first, an engagement between the actuating member 38 of the manual and the cradle portion 23 of the operating member to rotate the latter either in the one direction or the other, depending upon its previously assumed position, the finally assumed position of these parts being determined by the position to which the actuating member 38 of the manual has been adjusted. The initial inward movement of a push-button manual causes the latching roller 44 to ride on the unlatching face 49 of the lug 48 thereby effecting the movement of the latching roller to an elevated position to thereby release any previously operated push-button manual. Upon the continued movement of the operating manual, the latching roller 44 will engage the latching face 50 of the manual lug 48; and when the parts have assumed this position, the spring 51 urges the latching roller into toggle engagement with the said latching face 50, the result being that the manual is forced inwardly sufficiently to firmly lock the actuating member 38 of the manual into engagement with the cam or contact faces of the cradle 23 of the operating member O. This relation of the parts is best illustrated in Fig. 4 of the drawings.

This latch means is thus active on each of the manuals M for urging the same into and for definitely holding the same in engagement with the operating member O by a toggle action which is released or broken by the initial movement of any other manual. The latch means also centers the actuating or contact member 38 of the manual with relation to the operating member and thus controls and eliminates any play in the said

manual. The angle on which the roller **44** operates when in latched position is quite steep with respect to the horizontal motion of the manual and this accomplishes not only an efficient latching of the parts, but also enables the compensation for minor variations in the assembly positions of the different manuals. To adapt the latch means to all the manuals, it is desirable to finally fix the position of the bracket **45** of the latch means after the remaining parts are assembled, and this is accomplished by providing the separate mounting plates **47, 47** for the shaft **46** of the latching means and by soldering these plates as indicated at **52** (see Figs. 7 and 8) to the walls **16** and **17** of the frame F when the position of the shaft **46** is finally determined.

Each manual M is also provided with a return spring **53** anchored at its opposite ends to the brace plate **12** of the frame F and to a suitable part of the key **34** by being received in apertures in these parts, as is most clearly shown in Fig. 5 of the drawings. The latch face **50** of each key **34** may also serve as a stop coacting with a cushion stop plate **54** mounted on the front wall **12** of the frame F (see particularly Fig. 5).

In Figs. 3 and 4 of the drawings, there is depicted the operation of that push-button manual which is employed for manually tuning the condenser to any desired frequency. This push-button manual embodies the same structure as that of the presetting manuals, except that the push-button element is provided with an operating knob for rotating the adjusting element of the manual. The parts of this manual which are similar to those of the manuals shown in Figs. 5 and 6 of the drawings are designated by similar reference characters, and the description thereof given above applies equally thereto, except that the screw-threaded portion **39'** of the adjusting element **39** is preferably made with a larger screw pitch to enable coarse adjustments to be made.

This manual is provided with an operating knob **56** having a tubular shank **57** rotatably (but not slidably) mounted in the bearing lug **42** and the inner end of this tubular shank **57** receives the contiguous end of the screw-threaded rod **39**, the two being joined together by the pin and slot connection **58**. With this construction, rotation of the operating knob **56** will cause the rotation and the longitudinal movement of the adjusting screw element **39**.

It will be understood that to operate this manual, it first has to be pushed (in the same way as the other manuals) from a position shown in Fig. 3 of the drawings to the position shown in Fig. 4 of the drawings. With this manual thus pushed into its operative position and there latched by the latch means, as clearly shown in Fig. 4 of the drawings, rotation of the knob **56** will result in rotating by incremental changes the contact member **38** which, being locked in engagement (at its contact points 38^1 and 38^2) with the operating member O (at its corresponding contact faces 24^1 and 24^2) will correspondingly rotate by incremental changes the operating member O, and thereby move the rotor of the tuning unit to any point of its range so that any desired station may be tuned in by the operator. It will also be apparent that upon operation thereafter of any of the other presetting manuals, the latch **44** will be automatically moved to release the push button manual shown in Figs. 3 and 4 to the retracted or inoperative position.

The structure and operation of the radio station selector of the invention and the various advantages thereof will in the main be fully apparent from the above detailed description. It will be seen that the movement of any push-button manual over a short (about one-half inch) linear or translational movement operates the selector mechanism to rotate the condenser rotor to any preset position within its 180 degree rotation range. This operation is accomplished by simple mechanism inter-related so that there is substantial freedom of play and back lash and a minimum of friction loss, all to the end that there may be obtained a high degree of total accuracy in the repeated operations of the manuals. All but one of the manuals M are operable for preselecting a frequency or station, although any one of these may also be manipulated by operation of its adjusting means to tune the tuning unit to any desired frequency. One of these manuals is set apart from the others and is specially designed for tuning the condenser rotor to any desired station. When the user or operator desires to adjust or readjust the manuals, he may do so from the outside of the cabinet. No gears are employed in the mechanism of the selector; and the elements of the operating mechanism of the selector are so designed by their uniformity and simplicity as to be capable of being manufactured in large quantities and assembled with facility and rapidity. Moreover, all of the operating elements are rugged in construction and are subject to very little wear and tear in the repeated operations to which a selector of this character is normally subjected, thereby affording long usage life. All of the parts are readily accessible for repair or replacement.

It will be understood that one of the preferred forms of the invention has been shown and described to exemplify the principles of the invention and that numerous changes may be made thereto without departing from the spirit of the invention defined by the appended claims.

I claim:

1. In a radio station selector, a rotatable operating member and a translationally movable push-button manual for actuating the same, the operating member comprising a cradle shaped member having two cam or contact faces spaced thereon on opposite sides of the rotational axis thereof, and an actuating member at the operating end of said manual, said actuating member having two cam or contact elements spaced for coaction with the cam or contact faces on the operating member.

2. In a radio station selector, a rotatable operating member having two contact parts spaced on opposite sides of the rotational axis thereof, and a translationally movable push-button manual for actuating the same, a push-button at the outer end of said manual, the said manual having an actuating member at the inner end thereon, the said actuating member being rotatably mounted on said manual for adjustment about an axis which is coincident with the rotational axis of the operating member when the said manual is moved to its operative position, the said actuating member having two contact parts spaced on opposite sides of the said axis thereof and adapted for coaction with the contact parts of said operating member, and means carried by said manual for adjusting the said actuating member about its said axis, the said means having a part projecting into said push-button and accessible therethrough.

3. In a radio station selector, in combination with a tuning device, a frame, a manual for moving the tuning device to a predetermined position, said manual being slidably mounted in said frame, an actuating member at the inner end of said manual, a push-button on the outer end of said manual, the said actuating member being rotatably mounted on said manual for adjustment, the said member having two actuating parts spaced on opposite sides of the rotational axis thereof, and an adjusting screw carried by said manual for adjusting the said actuating member about its said axis, the head of said adjusting screw projecting into said push-button and accessible therethrough.

4. In a radio station selector, in combination with a tuning device, a frame, a manual for moving the tuning device to a predetermined position, said manual being slidably mounted in said frame, an actuating member at the inner end of said mantual, the said actuating member being rotatably mounted on said manual for adjustment, the said member having two actuating parts spaced on opposite sides of the rotational axis thereof, a rotatable element carried by said manual engaging the said actuating member for adjusting the same about its said axis, and a tensioning means on said manual for holding the said member in engagement with the adjusting element.

5. In a radio station selector, in combination with a tuning device, a frame, a manual for moving the tuning device to a predetermined position, said manual being slidably mounted in said frame, an actuating member at the inner end of said manual, a push-button on the outer end of said manual, the said actuating member being rotatably mounted on said manual for adjustment, the said member having two actuating parts spaced on opposite sides of the rotational axis thereof, an adjusting screw carried by said manual having a part engaging the said actuating member for adjusting the same about its said axis, and a spring on said manual for tensioning said member into engagement with the adjusting screw, the head of the adjusting screw projecting into said push-button and accessible therethrough.

EARL H. ALLEN.