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RADIO CONTROL APPARATUS

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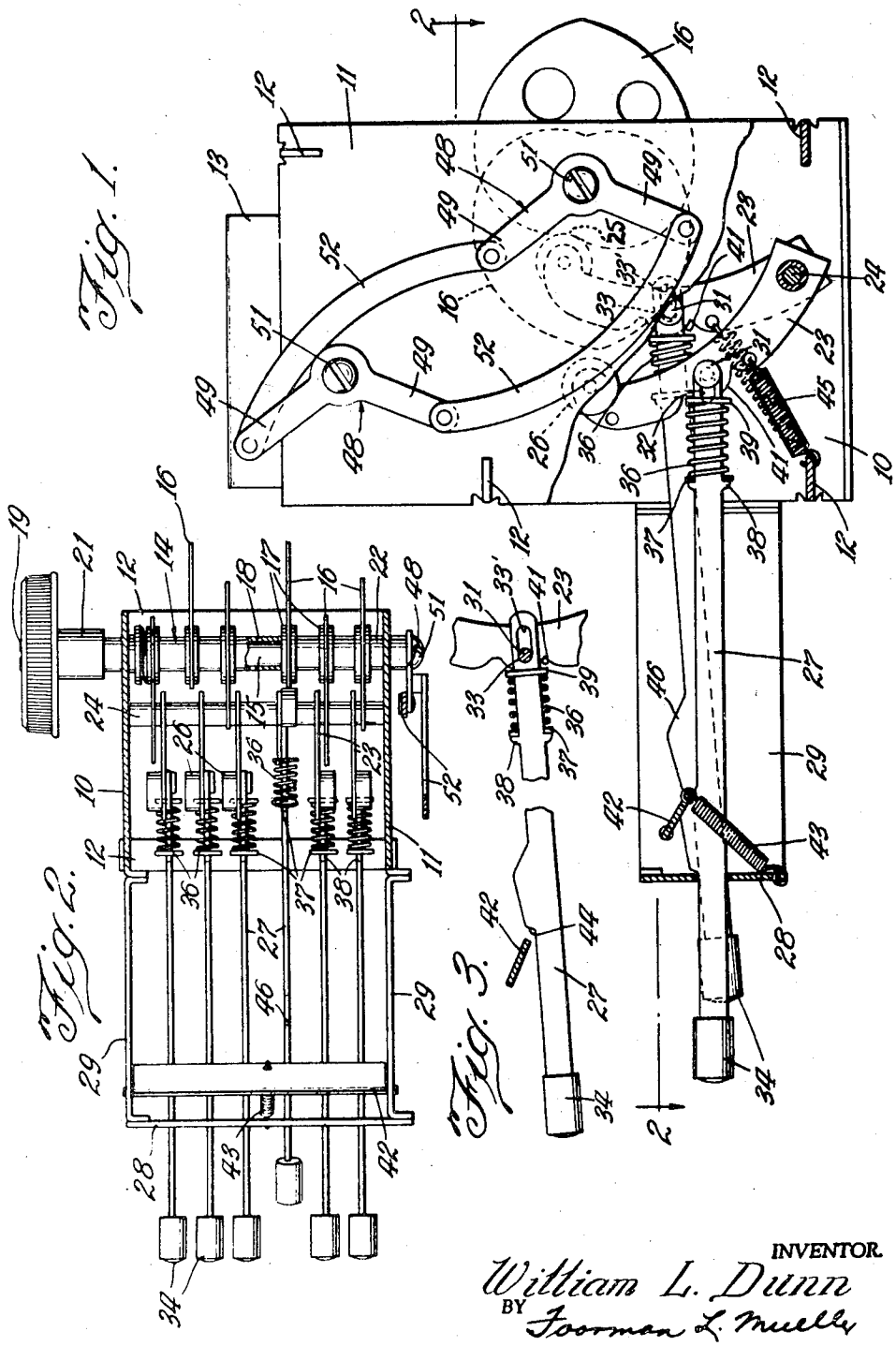


Fig. 1.

Fig. 2.

Fig. 3.

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RADIO CONTROL APPARATUS

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11 Claims. (Cl. 74—10)

1

My invention relates in general to control apparatus and more in particular to a manually operated tuning device for a radio receiver, sometimes called a manually operated automatic tuner.

An object of my invention is to provide an improved radio tuning device.

A further object of my invention is to provide a simplified manually operated radio tuner which is actuated by a push-button operating in a linear stroke.

Another object of my invention is to provide a radio tuner with a cushioned actuating structure having a pleasant "feel" during manual operation, and acting when in latched position to absorb shocks, jars, and other undesired movements in the tuner and thereby prevent injury thereto.

A still further object of my invention is to provide a tuning device for a radio receiver including resonant frequency changing apparatus and control apparatus therefor with a sturdy link connection therebetween.

One of the features of my invention which includes, in one embodiment, a rotary control assembly and an actuating unit therefor, is the provision of a manually operated actuating unit having a yielding portion therein to provide a more pleasant "feeling" structure when operating the same, and permit play in the complete structure intermediate the rotary control assembly and actuating unit when in operated position without ultimately disturbing the tuned position of the control assembly.

Other objects and features of my invention will be apparent from the following description taken with the drawings in which:

Fig. 1 is a side elevation of the complete tuning device with a portion of the frame therefor broken away.

Fig. 2 is a plan and sectional view of the structure of Fig. 1 on a smaller scale, taken along the line 2—2 thereof.

Fig. 3 is a fragmentary detail view showing the actuating unit in an intermediate operating position.

In practicing my invention I provide a manually operated automatic tuning device which includes resonant frequency changing means for a radio receiver, and means for moving such resonant frequency changing means to predetermined tuning positions. The latter means includes a rotary shaft, a plurality of control members mounted on the shaft and normally retained against rotation thereon, and actuating units corresponding to the control members. Each actuating unit includes a pivoted lever for directly engaging and moving a corresponding control member, and a substantially linearly movable actuator having a push-button on one end for finger engagement to operate the actuating unit and hence the control device, and being operatively connected at its other end with the pivoted lever. The connection between the actuator and lever includes a guide pin on the lever riding in a corresponding slot in the actuator adjacent the end thereof, and a spring supported on the actuator at a fixed retaining portion at one end of the spring, and with the other end of the spring bearing directly or indirectly against the lever. In idle position the spring normally maintains the actuator and lever at extreme positions as limited by the guide pin in the slot. On at least one portion of the operating stroke for the actuator, the operating connection between the actuator and the lever is normally accomplished by the spring, and the connection is transferred to the pin and slot when the tension in the spring is overcome by the force of the push-button necessary to move a control member by its associated actuating unit. A pivoted latch is provided to act on each operated actuator and hold the same in an operated or tuning position. As a result of the spring connection between an actuator and its associated lever, there is sufficient cushion between them, and hence sufficient cushion in the actuating unit as a whole to absorb any severe shock or jar applied to the control members to move them to thus prevent any damage in the complete tuning mechanism. At the same time the operated position of a control member is retained as soon as the movement is absorbed. The cushioning for the control apparatus when in operated position, results from the fact that the pin on the lever is spaced slightly, or is out of direct engagement with either end of the guide slot in the actuator, and the spring holds the lever in operated position in engagement with a control member. A sturdy link connection is provided intermediate the rotary control shaft and the resonant frequency changing means to accurately and efficiently transmit motion from one to the other.

2

Referring now to the drawings, the control or tuner apparatus includes a frame having a pair of side plates 10 and 11 which may desirably be preassembled and secured together as a unit by means of a plurality of tie-bars 12. A variable condenser 13 is rigidly mounted at the top of the frame for electrical connection with a radio receiver to tune the receiver in the usual manner.

It is understood that I may employ resonant frequency changing means other than a variable condenser.

The condenser 13 is adjusted to predetermined tuning positions by means of control apparatus therefor, which includes a rotary shaft assembly 14 rotatably supported in the frame plates 10 and 11 and carrying thereon a plurality of cams or control members 16 which may also be designated more broadly as control means. The cams are supported on the shaft 15 of the rotary assembly 14 and normally held against rotation by means of friction washers 17 and associated spacing collars 18. The friction is varied by a unit including a cap-screw 19 and a knob 21 acting with the shaft 15 to move the control members and associated washers and collars axially relative to the shaft until all of these elements are held tightly together against a rigid stop 22 on the rotary shaft. This structure and operation is all fully described and claimed in Patent No. 2,130,153, issued September 13, 1938. When the friction is removed from the control members 16 they may be adjusted to angular positions with reference to the rotary shaft, which correspond to predetermined tuning positions for the condenser 13, and after the friction is applied to the control members and they are frictionally retained in the adjusted angular positions, the condenser is automatically adjusted to a position corresponding to that of a selected control member when such control member is rotated by actuating mechanism as will be described.

The actuating mechanism for the rotary assembly 14 including the control members 16 includes a plurality of actuator units corresponding in number to the control members 16 and all adapted to be selectively operated from an accessible outside position on a radio receiver or other apparatus to which the control unit is applied. Each actuator unit, includes a lever 23 pivotally supported upon a stationary shaft or frame member 24 secured in the frame plates 10 and 11. Each lever 23 is pivotally supported at one end, and at the other end includes an engaging portion in the form of a roller 26 or the like for operating engagement with a corresponding cam or control member 16, as shown in Figs. 1 and 2. Each lever 23 is pivoted by a corresponding actuator or selector member 27 slidably supported at one end by a frame plate 28, which in turn is supported on frame members 29 rigidly secured to the frame plates 10 and 11 of the frame for the control unit. Each actuator 27 is connected to its corresponding lever by means of a guide pin 31 on the lever riding in a corresponding guide slot 32 in the actuator. Relative movement between the lever 23 and the actuator 27 is permitted by virtue of the length of the slot 32 and this relative movement is limited by the ends or shoulders 33 and 33' at the front and back ends respectively of the slot.

As is evident from the above description and a consideration of the drawings, a rather harsh, metallic "feel" could be evident at the push-button 34 on the actuator when the engaging portion 26 of a lever is brought into contact with a corresponding control member 16 to move the latter to an adjusted position. This is generally true of the manually operated automatic tuners of the prior art for radio receivers. I have overcome this difficulty and substituted a cushioned, pleasant "feel" at the push-button 34 by including a spring in the connection between the lever and its associated actuator. This general structure has additional advantages as will be hereinafter more fully described. As to the spring connection itself, however, this includes a coiled spring 36, which in the illustrated embodiment of the invention is of the compression type. The spring 38 is supported upon the end of the actuator and rests at one end against a washer 37 which in turn is retained against longitudinal movement in one direction with reference to the actuator 27 by means of shoulders 38 on such actuator. The other end of the spring rests against a similar washer 39 which in turn bears against a rounded portion 41 on the lever. The compression in the spring 36 is sufficient to normally press the actuator 27 to a retracted position with reference to the lever 23 with the pin 31 at the end 33' of the guide slot 32 (shown in full lines in Fig. 1). Although there is a connection between the lever and actuator through the pin and corresponding guide slot, the effective operating connection in a longitudinal direction for some portion of the operating stroke is normally made through the spring 36.

In order to retain a selected control member 16 in its adjusted position with a roller 26 in a corresponding stopping cavity 25, such as shown in the partially-dotted-line control member 16 in Fig. 1, a pivoted latch 42 is employed to releasably retain the selected actuator 27. The latch 42 is pivotally supported in the frame members 29, is common to all of the actuator units, and is maintained under tension by the spring 43, shown in Fig. 1. Each actuator 27 is provided with a combination latching and stop shoulder 44 positioned at one end of a cam-like projection 46 which acts to raise the latch 42 as an actuator is pushed inwardly to operated position. When an actuator is in idle position the shoulder 44 engages the back of the frame plate 28 to limit the outward movement of the actuator and its associated lever. The spring 45 between each lever 23, and a tie bar member 12 acts to pull an entire actuating unit to idle position.

To operate the variable condenser 13 a selected push button 34 is pushed inwardly. Its associated actuating structure including an actuator or selector member 27 moves through a substantially longitudinal path, and with the shoulders 38 pressing against the washer 37 for the spring 36, the latter exerts a force against the washer 39 and an engaging portion 41 on the lever to move the latter into engagement with a corresponding control member 16. Until the operating force on the button 34 is sufficient to overcome the compression forces in the spring 36, the operating force is applied to the lever through the spring, providing a yielding, cushioned "feel" at the button. As the operating force overcomes the force of the spring, the shoulder 33 in the guide slot 32 engages the pin 31 (Fig. 3) and the lever and control member are pushed into set position such as shown in dotted lines in Fig. 1. The spring 36 being under compression may act on the lever and assist in accomplishing the final movement of the control member to bring the roller 26 into the stopping cavity in the control member or cam 16.

The position of the shoulder 44 on the actuator is such with reference to the operating stroke as a whole that it is pressed inwardly beyond the latching edge of the latch 42, as shown in Fig. 3, when the lever and control member are originally pressed into a set position. The compression of spring 36, when the operator releases his finger from the button 34, urges the actuator and lever

in opposite directions and acts to retain the lever and control member in set position and at the same time press the latching shoulder 44 against the edge of the latch 42. The actuator and lever are spread apart so that the pin 31 is out of direct engagement with its adjacent shoulder 33 in the guide slot as shown in dotted lines in Fig. 1. With the actuator 27 latched in this position, the connection between the lever 23 and actuator in a substantially longitudinal direction is, so far as holding effectiveness is concerned, through the spring 36 which is under compression. In case of a shock, a jar, or actual manipulation of the condenser 13 or rotary control assembly 14, the linear space between the shoulders 33 and 33' and pin 31 will take up the movement of any of this structure and it will be absorbed in the spring 36 without injury to any of such structure or parts thereof. At the same time, however, the actuator remains stationary and latched and the force of the spring acting on the lever returns the control member to the dotted line set position.

The spring 36 is also important in the resetting operation for the control member 16. Resetting is accomplished by loosening the screw 19 and releasing some of pressure on the control member 16 so that relative movement between the members and the shaft 15 is possible. A selected actuator unit is operated to latched, set position, meanwhile, moving the corresponding control member 16 to a position as shown in dotted lines. Watching a dial scale (not shown) operatively connected to the shaft 15, such shaft is manually rotated until it is at a position corresponding to a desired station setting. The spring in the meantime maintains a force on the held control member, and urges the actuator against the latch. The friction is applied to the control members after the resetting is entirely accomplished.

The rotary movement of the shaft 15 is transmitted to the resonant frequency changing means or condenser 13 by structure including a supporting unit 48 mounted on the rotary shaft and keyed against rotation thereon and a similar unit on the shaft for the condenser 13. Each unit includes a pair of radial arms 49 extending in different angular directions from its associated shaft and is held thereon by a screw 51. A curved link 52 is pivotally connected to each pair of corresponding radial arms 49 on the two units 48 to provide a sturdy connection for accuratey and efficiently transmitting the movement of the rotary control shaft to the controlled resonant frequency changing means.

With an actuator 27 retained in latched position such as shown in the back in Fig. 1 and the third from the bottom in Fig. 2, the particular station to which the receiver is tuned is readily discernible for indicating tabs can be supplied for each button. Upon pressing another button 34 inwardly the latch 42 is pivoted upwardly to release the previously latched actuator, and then pulled downwardly again by the spring 43 to latch the actuator being operated.

In the present invention, therefore, I provide a simple, inexpensive, yet efficient control unit for a radio receiver which operates by linearly movable push-buttons. The two part actuating structure for the control unit includes a yielding portion which provides a cushioned, pleasant "feel" in operating a push-button, and permits some amount of play in the actuating and control structure to absorb shocks, jars and the like, while the control device is in an operated tuning

position without in any way disturbing the tuning position thereof.

Although I have illustrated and described my invention in its preferred embodiment, it is understood that my invention is not limited thereby, but is limited only by the scope of the appended claims.

I claim:

1. A radio tuner including in combination a selector member, rotary control means having an engageable edge, a pivoted lever operatively connected to said selector member and movable therewith, means including a spring on the selector member applying a force to an edge of said lever intermediate the ends thereof for yieldably connecting said lever and selector member, with said lever engaging said control means on the edge thereof to directly move said control means to a predetermnied stop position upon movement of the selector member.

2. In a radio tuner, the combination of rotatable control means, and means for rotating said control means, said means including a lever adapted to be moved about a pivot point and pivoting toward said control means to engage and directly move the same, a selector member slidable toward said control means to move said lever about its pivot point, means for supporting said selector member, and a yieldable member on the selector member applying a force to an edge of said lever intermediate the ends thereof, yieldably operatively connecting said selector member and said lever and acting upon movement of said selector member toward said control member to thereby pivot said lever and cause said lever to rotate said control means.

3. In a radio tuner having a frame and a control member rotatably supported thereon, the combination of an actuator supported upon the frame for actuating movement thereon, a lever pivotally mounted at one end upon said frame having an engaging portion at the other end for engagement with the rotary control member to directly move the same, and means operatively connecting said actuator with said pivoted lever intermediate the ends of the lever including spring means mounted at one end on said actuator and applying a force at its other end to said lever intermediate the ends of said lever to move said lever upon movement of said actuator through at least a portion of the substantially linear travel thereof.

4. Control apparatus for a radio receiver including a substantially linearly movable actuator having an engaging shoulder intermediate the ends thereof, a pivotally supported lever operatively connected with said actuator, and means for operatively connecting said actuator and said lever including a spring in operative connection at one end with a corresponding stop portion on said actuator, and in operative connection with said lever at the other end of the spring, with said spring normally acting to drive said lever upon movement of said actuator through a portion of its actuating stroke, and a stop portion on said lever for engagement by said actuator shoulder during the remaining portion of the actuating stroke of said actuator to move said lever therewith.

5. In radio control apparatus having rotary control means, actuating means for rotating the control means including a movable selector member having an engaging shoulder intermediate the ends thereof, a second selector member for operative connection with said rotary control

means having an engaging portion thereon for engagement by said engaging shoulder of the movable selector member, and means for maintaining said engaging portion and said engaging shoulder out of engagement during at least a portion of the operating stroke of the movable selector member.

6. In a radio tuner having a frame and a rotary control shaft mounted in said frame, the combination of a plurality of actuating units for operative connection with said rotary shaft to rotate the same, each of said actuating units including a pair of actuating members with one of said members having a push-button on one end thereof and a latching shoulder intermediate the ends thereof, with said other member having an engaging portion for operative connection with the rotary shaft, means operatively connecting said two actuating members including a compression spring supported at one end of one member and operatively connected at the other end with the other member, a latch pivotally supported upon said frame for latching engagement with the latching shoulder on said one actuating member, with said latching shoulder being positioned on said one actuating member with reference to the length of the operating stroke of the actuating unit such that said shoulder is pressed beyond said latch in completing an operating stroke of the actuating unit and returned for latching engagement with said latch under pressure of said compression spring, with one of said actuating members being movable with respect to the other actuating member when the latched actuating member is in latched position.

7. Tuning apparatus for a radio receiver including in combination a rotary control member having a pair of substantially oppositely disposed control portions each in a cam shape, a lever pivotally mounted at one of its ends independently of the axis for the rotary control member having a part for originally engaging one cam-shaped control portion or the other of the control member to move said control member to tuning position, a slidable actuator operatively connected with said lever at a point intermediate the pivoted end thereof and said engaging part, means guidably supporting said actuator on said lever and means for mounting said actuator to support the same on an actuating stroke.

8. In radio tuning apparatus having frame means and movable frequency changing means, the means for tuning said changing means including a lever, an actuator supported adjacent one end on said frame means and supported at its other end on said lever intermediate the ends of the lever, a spring on said actuator operatively connected with said lever to transmit operating force from said actuator to said lever, and a latch on said frame means releasably engaging said actuator intermediate the ends thereof.

9. In radio tuning apparatus having control means for determining a change in frequency, the means for operating the control means including in combination a lever-part mounted at one end portion and adapted for engaging the control means at its other end portion, a longitudinally movable actuator-part operatively connected with said lever-part intermediate said end portions, and a spring on said actuator-part applying a force on said lever-part intermediate said end portions during at least a portion of the operating movement of the actuator-part.

10. In the tuning apparatus of claim 9, one of said two parts having an elongated guide aperture therein and the other part having a pin in said aperture, said pin and the edge of said aperture acting to permit but limit independent movement of one part relative to the other, and said spring applying a force on each part during said independent movement.

11. In radio tuning apparatus having control means for determining a change in frequency, the means for operating the control means including in combination a lever mounted at one end portion and adapted for engaging the control means at its other end portion, an actuator supported in said apparatus in a position extending longitudinally in the apparatus and intermediate the two end portions of the lever and operatively connected with said lever, and a spring acting on said lever and actuator at the operative connection thereof intermediate said two end portions of the lever.

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