Nov. 18, 1941. H. Z. BENTON ET AL 2,263,434

PUSH BUTTON RADIO TUNER

Filed Nov. 13, 1939 2 Sheets-Sheet 1

Fig. 1.

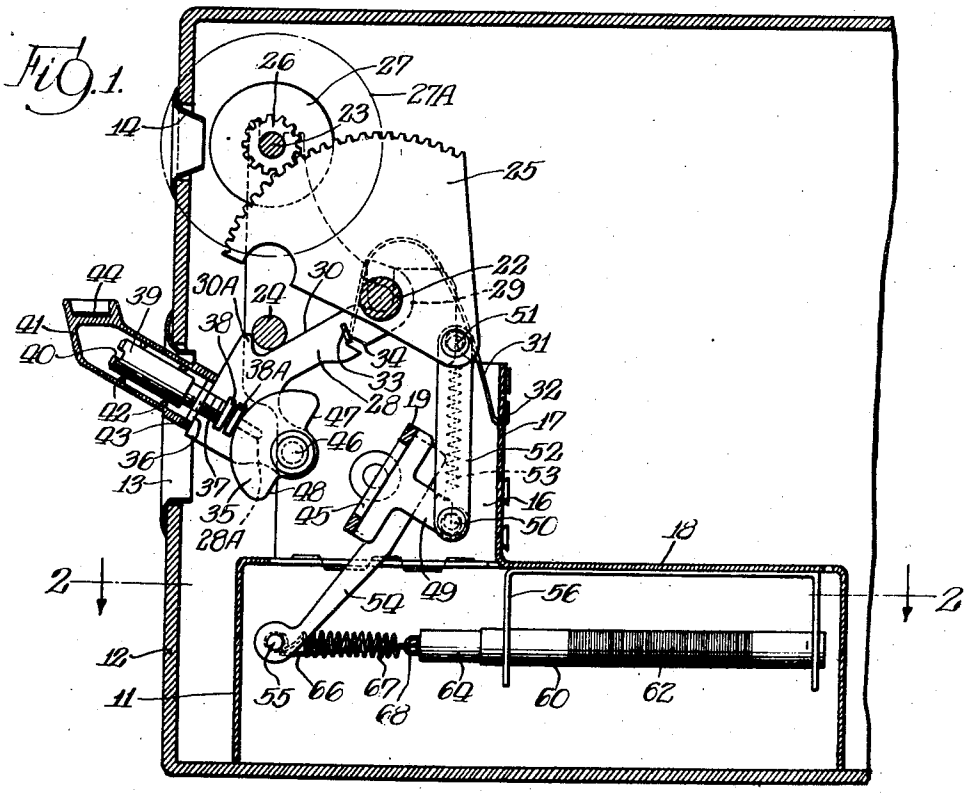
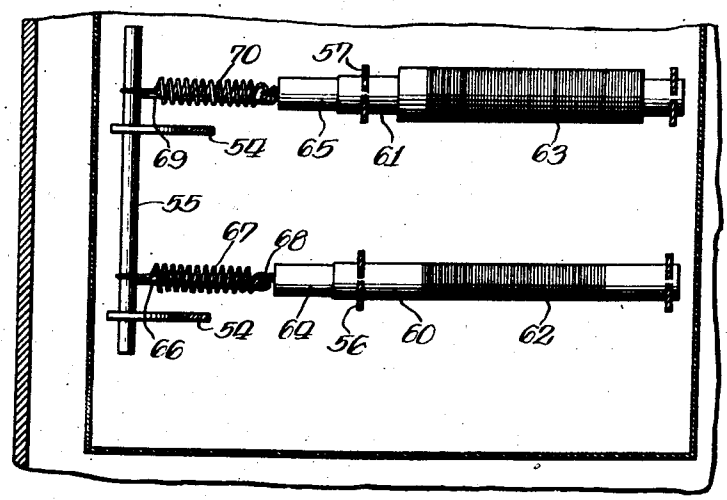


Fig. 2.



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Fig. 3.

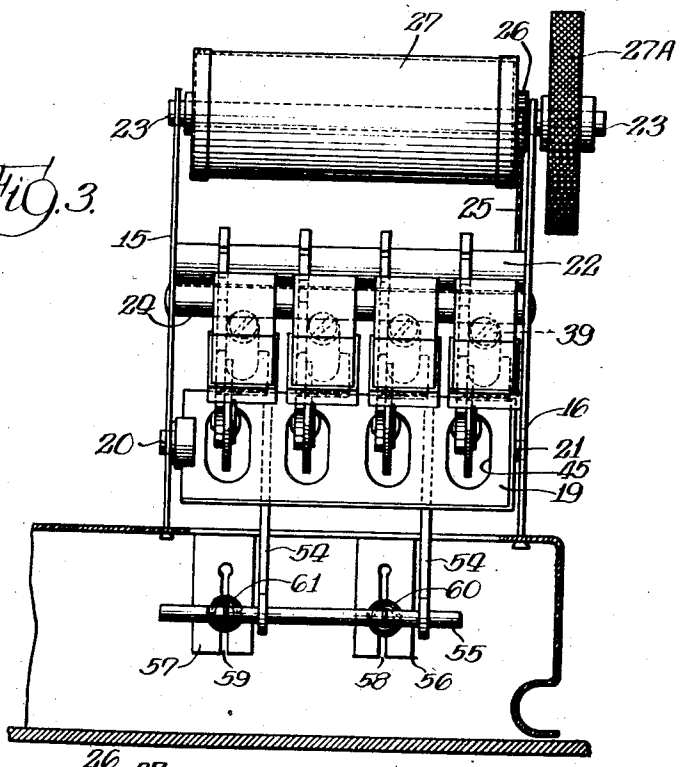
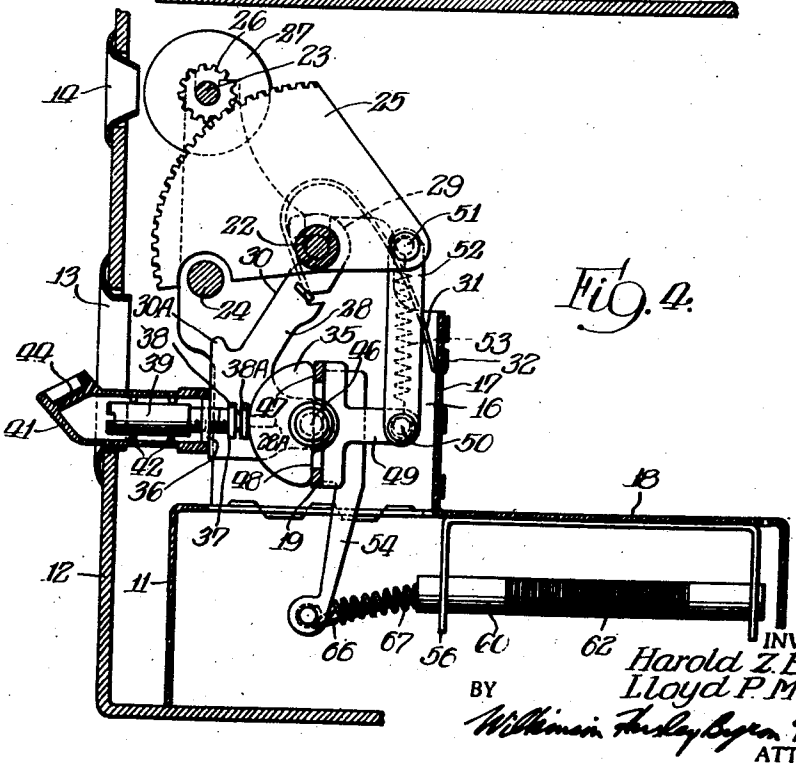


Fig. 4.



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Patented Nov. 18, 1941

2,263,434

UNITED STATES PATENT OFFICE

2,263,434

PUSH BUTTON RADIO TUNER

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Application November 13, 1939, Serial No. 304,203

7 Claims. (Cl. 74—10)

This invention relates to a new and improved push button radio tuner and more particularly to a tuner of this character adapted for use with permeability tuning or with a tuning condenser.

While the present construction is suitable for use with usual types of gang condensers which are operated by a rotary movement, it is particularly adapted for use in connection with permeability tuning of the type where a core is given a linear movement relative to an associated coil. Permeability tuning of this type is normally used with a plurality of coils, as for example, antenna coils and oscillator coils in superheterodyne circuits and antenna coils and radio frequency coils in tuned radio frequency circuits. Each coil has associated therewith a magnetic core which is usually formed of finely divided iron to reduce hysteresis and eddy current losses. The core is moved into and out of the field of the coil to vary the inductance of the coil and consequently to vary the frequency response of the circuit. This requires a linear movement of the cores, which movement must be exactly maintained for any given adjustment of the manual or push button tuning apparatus. While the push buttons are manually operable, it is customary to refer to manual tuning as a continuously variable tuning adjustment usually independent of the push button tuning.

With small compact sets it is important that push button operation require relatively light pressure, as otherwise pressure on the push buttons may move the set rather than operate the tuning device unless the set is held down. This is particularly true in portable sets where push buttons are to be moved horizontally in the front of the set. In the present construction only a light pressure is required and the buttons are given a downward swinging movement rather than a linear horizontal movement.

It is an object of the present invention to provide a new and improved push button tuner construction.

It is a further object to provide such a construction adapted for use with either condenser or permeability tuning.

It is an additional object to provide a construction operated by a downward swinging movement of the push buttons.

It is also an object to provide a construction of this character which requires low operating pressures and provides an extended movement of the indicating means.

It is another object to provide a device including push button and manual tuning mechanism and associated coils and movable cores in a single compact unit.

It is a further object to provide a construction which is simple in design, comprises a minimum number of parts, and is adapted for commercial production and use.

Other and further objects will appear as the description proceeds.

Certain preferred embodiments of the invention are shown in the accompanying drawings, in which—

Figure 1 is a vertical cross-section through the device, with the parts in normal position;

Figure 2 is a transverse section taken on line 2—2 of Figure 1;

Figure 3 is a front elevation of the device with the chassis cut away to show the parts more clearly; and

Figure 4 is a view similar to Figure 1 but showing the parts with a push button depressed.

Referring first to Figures 1 and 3, the chassis 11 is shown as located in a cabinet 12 having the push button escutcheon 13 and the dial escutcheon 14 fitted in openings therein. The tuning device frame comprises the end plates 15 and 16 which are secured to the chassis 11, and a back plate 17 which is secured to the end plates 15 and 16 and has a rearwardly horizontally extending portion 18. The treadle bar 19 is pivotally supported at 20 and 21 in the end plates 15 and 16. The push button pivot shaft 22 is supported in notches formed in the end plates 15 and 16, and the dial shaft 23 is rotatably supported at an upper portion of the end plates.

The stop rod 24 extends between the end plates 15 and 16 and is positively secured to those plates to brace the front ends of the plates and form a rigid structure. The gear sector 25 is pivotally mounted on the cross shaft 22 and meshes with the gear 26 which is positively secured to the dial shaft 23. The dial shaft 23, as best shown in Figure 3, carries the dial drum 27 and the knurled disc 27A which is used for manual operation of the device. The swinging arms 28 are provided with the hooked end portions 29 adapted to seat in circumferential grooves formed in the shaft 22. The upper faces 30 of the arms 28 are normally held against the under face of the brace rod 24 by the springs 31 which have their fixed ends 32 hooked through openings in the back plate 17, and have their opposite ends 33 hooked in slots 34 in the arms 28. The upper faces 30 of the arms 28 are provided with hooked portions 30A which fit in front

of the stop rod 24 to prevent a straight horizontal push from disengaging the hooked end portions 29 from the shaft 22.

Each arm 28 has pivotally secured thereto a half-circular cam 35. The forward portion of the arm 28 is provided with a rectangular extension 36 which is bent at right angles to the plane of the arm and has an opening to receive the clamping screw 37. The two wedge and locking members 38 and 38A are carried by the arm 28, each member having a reduced portion fitting in a slot or guiding opening 28A formed in the member 28. The members 38 and 38A are provided with enlarged ends bearing against the opposite face of member 28 adjacent the slot 28A. The member 38 has a threaded opening therein for the clamping screw 37 and the inner end of the screw bears against the adjacent face of member 38A. This screw 37 thus serves to force member 38A away from member 38 and, as its movement is limited and guided by slot 28A, it is forced against the arcuate face of the cam 35 to clamp it in adjusted position. The clamping screw 37 is provided with an enlarged head 39 having a cross slot 40 formed therein, so that the screw may be adjusted by means of a screw driver. The push button 41 is fitted over the end of the screw 39 and is provided with fins 42 to bear against the enlarged head 39 of the screw. The open end 43 of the push button 41 is rectangular in shape and fits closely over the rectangular extension 36 of the lever arm. The push button member 41 has a recess adapted to receive a tab 44 which may receive removable indicia, such as the call letters of the station to which the button is adapted to tune the radio receiver.

The treadle bar 19 is provided with a plurality of openings 45 located opposite the swinging arms 28 and adapted to receive the pivot portion 46 of the arm 28 and the adjacent portion of the half-circular cam member 35. The flat faces 47 and 48 of the cam are adapted to engage the face of the treadle bar 19 upon opposite sides of the corresponding opening 45. The treadle bar 19 is provided with a rearwardly extending arm 49 which carries a pin 50. The gear sector 25 carries a similar pin 51 and a connecting link 52 is fitted upon these pins. A coil spring 53 has its ends hooked over the pins 50 and 51 to hold the pins tightly against the link 52 and eliminate any back lash or lost motion in the connection. The treadle bar 19 is also provided with spaced arms 54 which are connected by rod 55.

The rearwardly extending portion 18 of the back plate 17 carries upon its under face a plurality of downturned U-shaped members 56 and 57, which members, as shown in Figure 3, have their downturned legs provided with slots 58 and 59. A tubular member 60 is supported in U-member 56, and a similar tubular member 61 is supported in U-member 57.

The tubular members 60 and 61 have the coils 62 and 63 wound upon them, respectively, which coils may be the antenna and oscillator coils of a superheterodyne circuit or may be coils for other purposes in other types of circuits. It will be understood that the present construction may be used with a variety of circuits and is independent of the particular circuit used. There may be any desired number of coil and core combinations operated by the tuning means.

The tubular member 60 has a core 64 slidably fitted therein, and the tubular member 61 is similarly provided with the core 65. The core 64 has associated therewith a link member on thrust rod 66 having one end bearing against the rod 55 and the other end bearing against the eye hook 68 in the end of the core 64. It is further provided with the tension coil spring 67, one end of which is hooked over the rod 55 and the other end of which is hooked into an eye 68 fastened to the core 64. This combination of spring and thrust rod affords a flexible connection between the rod 55 and core 64, which connection, however, does not allow any slack or play between the parts. The core 65 is similarly connected to the bar 55 by the rod 69 and spring 70. This type of connection is covered in the copending application, Serial No. 352,692, filed August 15, 1940, in the names of Harold Z. Benton and Lloyd P. Morris.

The parts are constructed so that they may be assembled rapidly and without additional securing means. The end plates 15 and 16 are secured to the back plate 17. The treadle bar 19 has its pivots 20 and 21 inserted in the openings in the end plates, after which the tie rod 24 may be put in place and its ends deformed against the outer faces of the end plates to hold the parts in assembled relation. The gear sector 25 is placed on the shaft 22, after which the shaft may be placed in its bearings in the end plates. Each push button arm 28 is put in place by hooking its portion 29 into the corresponding groove in the shaft 22, and it is then held in place by the spring 31, which swings the arm up against the stop rod 24. It will be understood that the cam 35 will have been assembled upon the arm 28 and the screw 37 also put in place before the arm is assembled on its shaft. The link 52 is assembled on pins 50 and 51 and the coil spring 53 then put in place. The dial member 27 may next be put in place, with its gear 26 meshing with the gear 25. The desired coils wound on the tubes 60 and 61 are slipped into the round portions of the slots in the U-members 56 and 57. The cores 64 and 65 are inserted and connected to the bars 55 by means of the links and springs. The push button 41 is placed on each push button arm 28 and is frictionally held in position. The square shape of the arm portion 36 closely interfits with the end of the bore in the push button 41 and prevents its rotation. It will be apparent that the assembly affords a complete radio frequency end for a radio receiver. The coils 62 and 63 may be located in any desired position relative to each other, and the rod 55 may be extended, if desired, to permit further spacing between coils as may be required by the electrical requirements of the circuit or by the mechanical assembly of the associated circuit parts. The entire assembly may be mounted upon a chassis, such as the chassis 11 of the drawings, by any desired means as having portions of the end plates extend through slots in the chassis, after which they are deformed to hold the assembly rigidly in place on the chassis.

In originally aligning the coils in the receiver, the tubes 60 and 61 may be moved back and forth as desired in their supporting U-members and retained in adjusted position by the frictional grip of the U-members or by placing wax or similar material upon the coils where they pass through the U-members. It will be understood that the coils may be enclosed in shield cans or shielded in any usual manner, if desired or required because of the location of other elements of the circuit.

In setting up stations upon the push buttons,

the push button proper is removed from the associated screw 39 by merely pulling it off, since it is only held in place frictionally. It will be noted that it is so held as to prevent movement relative to the screw, and that a thrust downwardly upon the end of the push button has a tendency to force it more firmly in place and not to loosen it. The screw 39 is turned to loosen the clamping action of the clamp assembly 38 and 38A upon the half-circular cam 35, so that the cam is free to turn on its support. The screw 39 is then pushed inwardly to bring the flat faces 47 and 48 of the cam member 35 against the treadle bar 19.

The manual tuning wheel 27A is then rotated until the desired station is tuned in. This rotation of the wheel 27A is transmitted through gear 26, gear sector 25 and link 52 to the treadle bar 19. The movement of the treadle bar 19 causes a corresponding movement of the cam 35, since the cam is free to turn about its pivot 46. When the desired station is satisfactorily tuned in, the screw 39 is tightened and the clamp 38A is clamped against the cam 35 to maintain it in adjusted position. The push button 41 is replaced and the process repeated with the other push buttons. This same process may be used when it is desired to change any push button to operate a different station than that for which it had previously been adjusted.

The core moving arms are rigidly fastened to the treadle bar and are connected with means preventing back lash between the arms and cores. Consequently, when the coils are properly adjusted the relative positions of the coil and core at the different angular positions of the treadle bar will remain constant. The coils may be spaced apart as desired and it will be understood that the length of the arms 54 may be varied when initially constructing the device, to give any reasonable length of core travel within the limits of the size of the device.

The entire assembly is mounted upon a single plate which can be mounted upon a chassis, thus providing a completely contained radio frequency unit which may be made and assembled independently of the remainder of the set and applied to the chassis as desired during the assembly of the other parts of the set.

Certain preferred embodiments of the invention have been shown by way of example, but they are capable of modification and change to meet varying conditions and requirements. Therefore such variations are contemplated as come within the spirit and scope of the appended claims.

What is claimed is:

1. Apparatus for operating radio tuning means comprising a rotatable treadle bar, manually operable means for rotating said treadle bar, tuning means operating connections extending from said treadle bar for operation by rotation thereof, a rotatable indicating member, a gear fixed to said indicating member, a gear sector meshing with said gear and pivotally mounted adjacent the indicating member, and means comprising an arm on the treadle bar and a link connecting the gear sector and treadle bar whereby the sector is rotated to rotate the indicating means upon rotation of the treadle bar, said rotation of the indicating means extending through a substantially greater arc than the rotation of the treadle bar.

2. Apparatus for operating radio tuning means comprising a supporting frame, a treadle bar pivotally mounted in the frame, an operative connection extending from said treadle bar for actuating tuning means, a cross shaft supported in the frame parallel to the treadle bar, a push button arm having a hooked end fitted about the cross shaft, a spring having one end connected to the housing and the other end engaging the arm to maintain the hooked end in engagement with the cross shaft, and adjustable cam means carried by the arm and adapted to engage and operate the treadle bar.

3. Apparatus for operating radio tuning means comprising a supporting frame, a treadle bar pivotally mounted in the frame, an operative connection extending from said treadle bar for actuating tuning means, a push button arm pivotally supported in the frame adjacent the treadle bar, adjustable cam means carried by the arm adapted to engage and operate the treadle bar, a non-circular extension on the arm, a clamping screw for the cam means fitted in said extension, and a push button fitted on the screw and having a portion closely fitting the non-circular extension on the push button arm.

4. An operator for a radio tuner, comprising in combination, a rotatably mounted treadle bar, connections from said treadle bar for effecting adjustments of a radio tuner, a manually operable push button, a cam adjustably mounted on said push button for coaction with said treadle bar to effect rotary adjustment of said treadle bar in accordance with the setting of said adjustable cam, a gear sector actuated by said treadle bar, a dial, a pinion connected with said dial in mesh with said gear sector and whereby said dial will be operated in accordance with actuation of the treadle bar from said push button and a tuning knob connected with said pinion for effecting independent adjustments of the treadle bar through said gear segment, independently of and apart from actuation of the treadle bar from said push button.

5. An operator for a radio tuner, comprising in combination, a supporting shaft and a stop shaft in front of the same, downwardly operating push button arms having hooked inner ends engaged upwardly about said supporting shaft, upwardly acting spring means holding said hooked inner ends so engaged about said supporting shaft and yieldingly supporting said push button arms engaged with said stop shaft, hook projections on said arms engageable with said stop shaft to prevent direct movement of said arms which would free the hooked ends from the supporting shaft, a rotatably mounted treadle bar for effecting operation of a radio tuner and cooperatively engageable actuating connections between said push button arms and treadle bar.

6. An operator for a radio tuner, comprising in combination, a treadle bar in the form of a flat plate having pivots at the ends of the same offset from the plane of the plate and said plate having a transverse opening therethrough, leaving solid portions at the longitudinal edges of the plate, connections from said plate for effecting operation of a radio tuner, a push button member having movement toward and away from said plate, a cam pivotally mounted on said member in line with the opening through the plate and having shoulders at opposite sides of the pivotal mounting for engagement with the solid longitudinal edge portions of the plate, clamp means on said member for securing said cam in various positions of adjustment and a hollow push button removably engaged over said clamp means.

7. An operator for a radio tuner, comprising a pivotally mounted treadle bar, a push button having a cam engageable with said treadle bar, means operated by said treadle bar for effecting adjustments of a radio tuner, an arm projecting angularly from said treadle bar, a pivotally mounted gear segment, a link connection between said angularly projecting arm and gear segment, including means for preventing backlash, a pinion in mesh with said gear segment, a dial operated by said pinion and a tuning knob connected with said pinion and by which said treadle bar may be adjusted for tuning purposes, independently of said push button.

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