June 1, 1943. B. A. SCHWARZ ET AL 2,320,893

AUTOMATIC TUNER

Filed Dec. 11, 1939 2 Sheets-Sheet 1

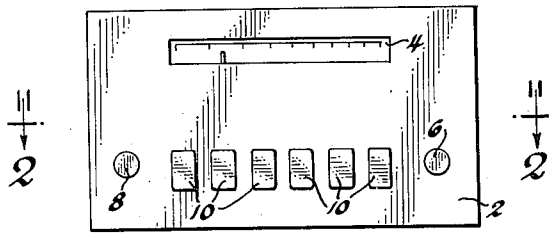


Fig. 1

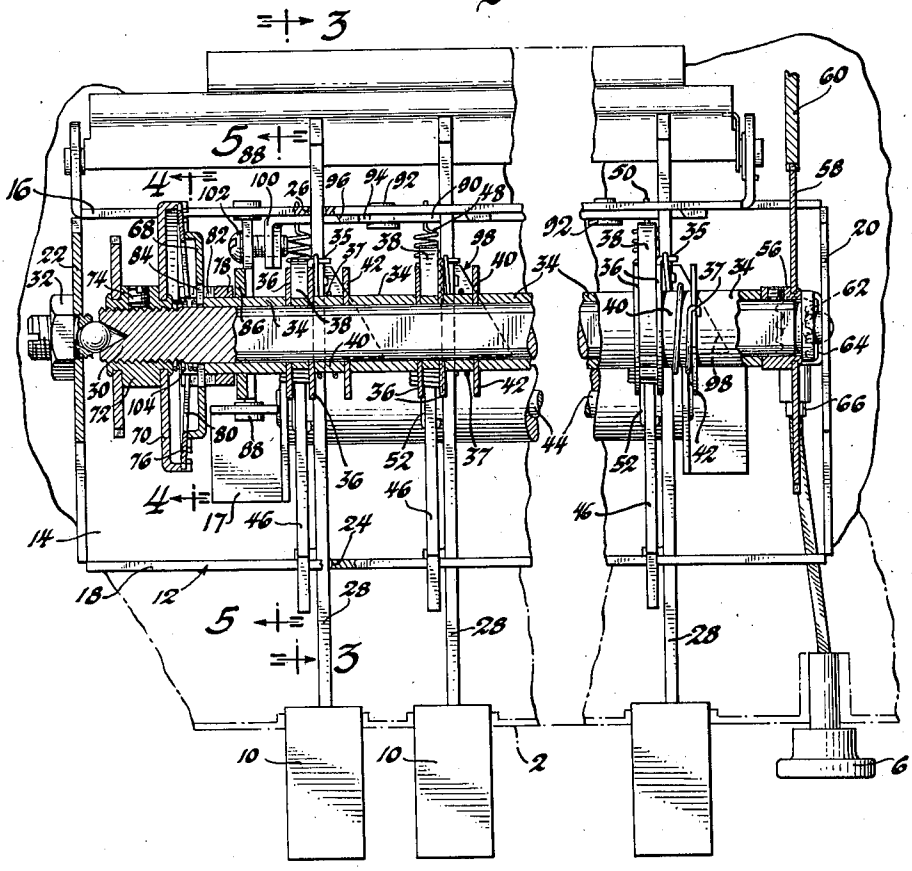


Fig. 2

Inventors
Bertram A. Schwartz &
Ludwig Fichter
By
Blackwood, Spencer & Fleck
Attorneys

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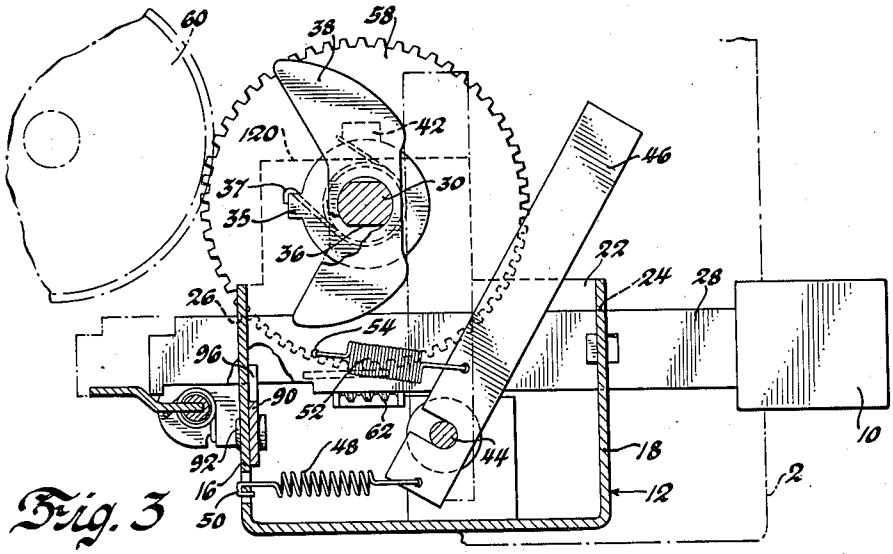


Fig. 3

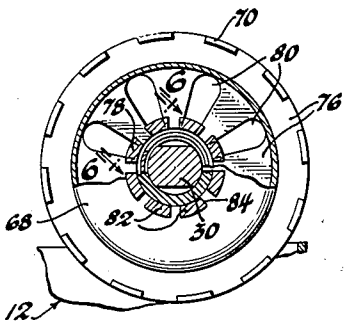


Fig. 4

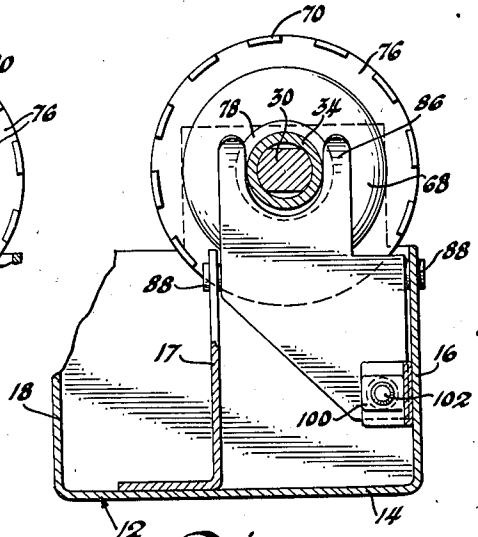


Fig. 5

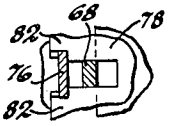


Fig. 6

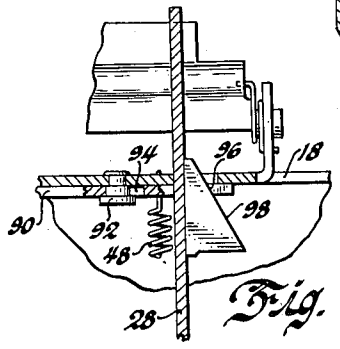


Fig. 7

Inventors
Bertram A. Schwartz &
Ludwig Fichter
By Brecknor, Spencer & Flint
Attorneys

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UNITED STATES PATENT OFFICE

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AUTOMATIC TUNER

Bertram A. Schwarz and Ludwig Fichter, Kokomo, Ind., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application December 11, 1939, Serial No. 308,527

8 Claims. (Cl. 74—10)

This invention relates to devices for indexing a rotatable shaft to certain predetermined desired positions and more particularly to means for automatically tuning a radio receiving set to certain desired stations by moving a lever a short distance.

It has recently become very popular to tune in certain of the most used stations receivable on a radio receiving set by depressing any one of a series of buttons extending through the forward panel carried by the set. It is thus only necessary to known which station is identified with the button and then merely press it and that station will be automatically tuned in on the set. These devices are a particular advantage when utilized in automotive receivers as it allows the driver to tune the set to one of his favorite stations without taking his eyes from the road. However, it is often necessary or desirable to adjust the angular locked position and change the station which is ordinarily tuned in by one button and its attendant rod to another when the location in which the car is operated is changed or for perhaps some other reason and therefore it is necessary to be able to adjust the locked setting of the means indexing the shaft to different angular positions.

In order to provide the necessary adjustability, cams have been clamped to the index shaft by various means and then locked thereto, or followers have been locked to associated lever means for indexing. In all these means it has been necessary to remove a button or unscrew a locking device before the shaft could be set to a new indexing position.

It is the object of the present invention to provide means for indexing a shaft and also unlocking the indexing means for resetting without the necessity of any additional manual unlocking means or movements.

It is also an object of our invention to provide means which during different periods of travel will index the shaft and unlock the indexing means whereby it is only necessary for the operator to depress one member through different degrees of travel to accomplish one or the other desired action.

It is a still further object of our invention to provide a simple, sturdy and foolproof means for unlocking the adjustable cams for resetting purposes.

It is a further object to provide spring friction locking means to maintain the indexing means.

With these and other objects in view, the embodiments of our invention will best be shown by referring to the following specification and claims and the illustrations in the accompanying drawings, in which:

Figure 1 is a front elevation of a conventional push button tuned set;

Figure 2 is an enlarged horizontal section of the tuning portion of the set taken on line 2—2 of Figure 1;

Figure 3 is a sectional view taken on line 3—3 of Figure 2;

Figure 4 is a sectional view taken on line 4—4 of Figure 2;

Figure 5 is a sectional view taken on line 5—5 of Figure 2;

Figure 6 is a sectional view taken on line 6—6 of Figure 4; and

Figure 7 is a view similar to Figure 2 of a portion of the apparatus, parts being broken away and shown in section to better illustrate our construction.

In the front panel 2 of a radio receiver there are provided a number of openings, such as a long rectangular one 4, through which the indicating means is visible to show to what frequency the set is tuned. Below, in the present showing, though their position is immaterial, are two knobs 6 and 8 which are connected to rotatable means for controlling the set manually and a series of buttons 10 for depression and automatic tuning which of course may be pivotally mounted, the present design being by way of illustration only.

Within the casing, which is only shown partially, there is mounted a frame work 12 of roughly rectangular form having a lower portion 14 and two upstanding vertical portions 16 and 18 forming a hollow box. The end portions too are bent upwardly to form two vertical end walls 20 and 22. The two vertical side walls 16 and 18 have cut therein a plurality of pairs of aligned slots such as 24 and 26, in each pair of which there is adapted to be supported a longitudinally movable bar 28 which extends through the front panel 2 and supports the push button 10. Thus as pressure is applied to the front face of the push button, the bar 28 may be slid longitudinally through the frame to carry out certain desired operations.

Rotatably supported between the two end walls 20 and 22 by suitable adjustable ball bearing supports such as 32 is a shaft 30. Carried on this shaft are a recurrent number of assemblies, each assembly including a cam 38 which is loosely mounted on the shaft for rotation with respect thereto and maintained in position between two spaced washers 36 which are keyed to the

shaft to rotate therewith but may move axially as best shown in Figure 3. Adjacent one of the washers is a sleeve 34 which also may rotate with respect to the shaft and may move longitudinally thereof. Adjacent the opposite washer pressing against one face of the cam 38 is a shorter sleeve 40 which presses against the washer and also against a second spaced washer 42 similar to 36 and also keyed to the shaft. One of the washers, the one shown in the drawings adjacent the right hand surface of the cam 38, carries a tab 35 against which one end of a spiral spring 37 is adapted to press, the opposite end of said spiral spring under compression pressing against a similar tab on a spaced washer 42. The pressure brought by this spring against the cam is to maintain the cam in a given position against too free rotation if there is no other pressure brought axially to prevent it from turning.

Adjacent the opposite face of the washer 42 is the first member of the recurrent series of parts, namely the sleeve 34, and these assemblies are duplicated as we progress across the shaft, thereby providing an equal number of these cam assemblies as there are longitudinally movable levers operated by push buttons.

Mounted below the shaft 30 is a second shaft 44 upon which are pivotally mounted a series of levers such as 46, one end of which is connected to a spring 48, the opposite end of the spring being secured to the frame at 50 to spring bias the lever clockwise, as shown in Figure 3, about the shaft 44. At a point slightly above the point where the lever is trunnioned to the shaft 44 there is connected one end of a second tension spring 52 whose opposite end is connected through an opening 54 in the longitudinally movable bar 28 whereby as the bar 28 is reciprocated the spring 52, being stronger than the spring 48, will cause the lever 46 to move about its pivot and contact the cam faces of the associated cam 38 rotating it to a point where the flat portion of the cam 38 meets with the surface of the arm 46, thus indexing the shaft 30 to a certain predetermined position.

Secured to one end of the shaft 30 by a suitable set screw is a collar 56 which carries a large spur gear 58 adapted to drive the necessary gear 60 which is connected to the tuning mechanism of the set. Rotatably mounted directly below the shaft 30 and at the lower point of the gear 58 is a small worm wheel 62 supported in a suitable bracket 64 secured to the end wall 20. This worm wheel is directly connected to a flexible driving connection 66 which is driven by operation of the rotatable knob 6, which, as before mentioned, extends through the front panel 2. Thus if it is desired to manually tune the set the knob 6 is rotated and drives through its worm gear 62, gears 58 and 60, and the tuning parts of the set and if it is desired to automatically tune the same through the operation of one of the push buttons 10, the same, upon being depressed, will operate its lever 46 against the cam surface 38 which of course brings the shaft 30 to a predetermined indexing position and through the gear train 58—60 tunes the set to a certain predetermined station.

In order to be able to set each one of the cams 38 to a desired point with respect to the shaft and then maintain it at that point until such time as it is desired to alter the push button setting, it will be seen that it is neecssary to provide thrust against the two opposite washers adjacent each cam which will then lock the assembly to the shaft to rotate therewith. The means for accomplishing this locking is, in this case, the assembly as shown on the left hand portion of the shaft 30 in Figure 2 and comprises a flanged disc 68 which is mounted around the shaft 30 and adapted to force the sleeve 34 to the right under certain conditions. Mounted in complementary relation to said first flanged disc is a similar disc 70 of larger diameter and spaced slightly from the first disc, said second disc 70 being secured to a threaded collar 72 which is screw-threaded on the end of the shaft and then locked thereto by set screw 74.

Between the two flanged complementary discs 70 and 68 there is mounted a bowed circular snap spring 76 on a collar 78 which is itself mounted loosely on the outer surface of one of the sleeves 34. The bowed spring disc 76 is made with a series of elongated openings 80 therein which allow the disc to have a desired snap spring action from one position to another as it passes the over center position when the inner or smaller diameter portion is moved axially. Said spring disc brings pressure to bear on the flange of the disc 68 at a portion spaced from its periphery and its periphery bears against the flange of the member 70, it being cut out and complementary to the portions on the periphery of the spring washer and in the flange of the member 70 respectively so that the two act as a driving connection when in engagement and the two rotate together.

The member 78, which, as above stated, is axially movable, has one end formed of a series of elongated fingers, such as 82, which extend through a series of circular openings 84 in the disc 68 adjacent the mounting portion on the shaft and these fingers are rigidly secured to support the inner periphery of the spring washer 76.

Thus it will be evident that as the member 78 is moved to the left in Figure 2 that through the fingers 82 the spring washer, or Belleville washer, will have its central portion pushed to the left, and after a certain travel this will snap over and relieve any pressure brought to bear on the flange 68 so that the cams will be free to be rotated to any desired position for indexing. However, when this member 78 is allowed to return so that the spring snaps over in the opposite direction, then the spring 76 will force against both the flange of the member 70 and the flange of the member 68 causing pressure axially of the members 34 and clamp the cam members 38 between the adjacent washers so that the same will stay in the given set position until such time as the spring pressure is again removed.

In order to vary this spring pressure of the member 76 therefore it is necessary to cause longitudinal or axial movement of the collar 78 and bearing thereagainst is a pivoted member 86 which is supported in suitable trunnions 88 in the frame 16 and a bracket support 17, respectively.

Mounted parallel with and in juxtaposition to the rear wall of the casing 18 is a long rod 90 by suitable rivets 92 which pass through elongated slots 94 in the rod 90 so that the same may be moved relative to the back wall a certain desired amount. The rod 90 is provided with cam surfaces 96 which extend upwardly from the upper surface adjacent the side of each of the reciprocable bars 28 and are adapted to cooperate

with a tapered cam surface 98 rigidly secured to the side wall of each bar member 28 so that as any reciprocable member 28 advances the cam 98 engages its associated cam surface 96 and since the former is tapered will, as the member 28 proceeds inwardly, force the rod 90 to the right, thus allowing the pivoted member 86 to be rotated about its pivot which will move the member 78 to the left in Figure 2, causing the spring 76 to snap over and release any spring tension on the sides of the cams.

The rod 90 is flanged, as shown at 100, and has an opening therein which is tapped for a machine screw 102 which extends through the pivoted member 86 to allow adjustment for the necessary reciprocable travel of the rod 90 for certain spring adjustments. Also maintaining a certain amount of axial pressure on the sleeves 34 is a compression spring 104 between the collar 72 and flanged member 68 to bias the assembly to the right in Figure 2.

It will thus be evident that to manually tune or index the shaft 30 to any desired position the push button 10 is operated which causes the bar 28 to be reciprocated and force the pivoted lever 46 against the cam 38 to set it in a predetermined position. Since different stations are desired, by pressing the different buttons all of the cams 38 may have different angular positions to tune the set to different stations. If it is desired to reset one of these cams to another angular position, it is only necessary to depress the push button 10 to its normal inward position and then give an added pressure and further travel which is allowed by spring 52 which causes the cam surface 98 to act against its associated opening in the rod 90, releasing the spring pressure of the member 76 and allowing the cam 38 to be relatively free to turn on the shaft 30. The desired station is then tuned in by rotation of the manual knob 6 and when this has been accomplished the push button 10 is released, the spring 76 snapping back and clamping the cam in its set position which is upon the desired station. This may be repeated for any and all of the push buttons and their relative position may of course be altered as often as it is desired.

The advantages of this particular construction are very evident, that it is only necessary to further depress the push button in order to release the cam for a change in setting, said operation being a mere further forcing of a button which it is necessary to press at any event to tune and does not require any locking of screws or removing of portions of the apparatus before any cam may be released for further setting. It is therefore a very simple, quick and efficient way of automatically setting up a new station on a tuning device.

It is desired also to point out that the invention is not limited to the specific structure disclosed which is only illustrative, but lies in the broad field of providing common means for tuning and unlocking for reset.

We claim:

1. In a tuning mechanism, a rotatable shaft that it is desired to index to a number of different angular positions, manual means for rotating said shaft, a plurality of cam means axially spaced upon said shaft, frictional means for mounting the cam means whereby the cams may be rotated with respect to said shaft, movable means cooperating with each said cam means whereby certain indexing positions are obtained and means operated by the movable means during a certain portion of its travel for varying the strength of the frictional mounting means for all cams for resetting purposes.

2. In a tuning mechanism, a frame, a shaft rotatably supported in the frame, a plurality of cam means frictionally supported on the shaft, means for varying the strength of the friction of the cams with respect to the shaft, a plurality of reciprocating members for camming the cams, and means operated by the reciprocating action of any cam operator over a certain portion of its movement for varying the friction-varying means on all the cams.

3. In a tuning mechanism, a rotatable shaft that it is desired to index to a plurality of different angular positions, a plurality of axially spaced cams loosely mounted upon said shaft, means secured to the shaft to rotate therewith adjacent opposite faces of each cam and spring means adapted to force said last named means against the sides of the cams to cause rotation of the same with the shaft when a certain force is applied, spring means mounted upon the shaft to cause such axial pressure, movable means adapted to cooperate with each of said cams to cause indexing and means operated by the movable means during a portion of its movement to cause variation in the spring pressure which will reduce the side pressure against the cams and allow them to be moved with respect to the shaft for altering the angular indexing position of each.

4. In a tuning mechanism, a frame, a shaft rotatably mounted in said frame, a plurality of recurrent assemblies axially slidable on said shaft, said assemblies including a cam rotatable with respect to the shaft, members adjacent said cams keyed to the shaft and spacing means, resilient means mounted adjacent one end of the shaft to cause the assemblies to be crowded together whereby the cams will be caused to rotate with the shaft, levers mounted to contact the cam surfaces, means to move said levers, and means actuated over a certain period of travel of the last named means to vary the pressure of the resilient means to permit a change in the setting of the cams.

5. In a tuning mechanism, a casing, a shaft rotatably mounted within the casing, a plurality of cam assemblies mounted in axially spaced positions upon the shaft, each assembly comprising a cam, means secured to rotate with the shaft adjacent the cam, and spacing means, all of these members being axially movable on the shaft, means for applying pressure axially to one end of these assemblies whereby the means adjacent each cam will bear thereagainst and cause it to rotate with the shaft and also when said pressure is released to allow the cam to be rotated with respect thereto, cam operating means movable toward and away from the same to cause the same to rotate the shaft to different angular positions and additional means operated by said cam operating means to vary the pressure means at one point of its travel so that the pressure on the cam sides may be varied for resetting purposes.

6. In a tuning mechanism, a frame, a rotatable shaft mounted in the frame, gears secured to the shaft, manual means connected to said gears for rotating the same and the shaft, a plurality of cams frictionally mounted upon the shaft whereby with a variance in the friction the same may be rotated with respect thereto, a pluarlity of reciprocating means mounted in the frame,

pivoted cam followers adjacent each cam, springs connecting the reciprocating means and the cam followers whereby as the reciprocating means is actuated the followers will be forced into juxtaposition with the cams for indexing, means for varying the frictional engagement between the shaft and cams comprising spring means mounted upon one end of the shaft, a second reciprocating means supported by the frame at right angles to the first reciprocating means and cooperating therewith in camming action whereby as the first named reciprocating means is forced inwardly beyond a certain point the second named reciprocating means will be cause to be moved and means connecting said last named reciprocating means with the spring means whereby the spring tension is varied to cause the cam means to be unlocked from the shaft for resetting purposes.

7. In a tuning mechanism, a frame, a shaft rotatably mounted in the frame, manual means for rotating said shaft, a plurality of cams frictionally mounted on said shaft, spring means mounted adjacent one end of said shaft and adapted to apply friction locking to the cams, a reciprocating member mounted adjacent each cam, a pivoted lever, a spring connecting the pivoted lever with the reciprocating member, said pivoted lever cooperating with the cam to cause indexing, a transversely reciprocating member mounted upon the frame, means on each reciprocating member adapted to engage a portion of the transversely reciprocating lever whereby over certain periods of travel of any of the reciprocating members the lever will be forced to one side and means connecting said transversely reciprocating lever with said spring biasing means whereby after the pivoted lever has cammed the index cam any further travel will cause an unlocking of the spring biasing means to permit the cams to be rotated with respect to the shaft and the shaft may be manually rotated by the manual means to change the position of index.

8. In a tuning mechanism, a frame, a shaft rotatably supported in the frame, a plurality of cam means frictionally supported on the shaft, means for varying the axial pressure on the cams to change the friction of the same with respect to the shaft, a plurality of longitudinally reciprocating members for camming said cams, and means operated by the reciprocating action of any cam operator over a certain portion of its movement to change the axial pressure.

BERTRAM A. SCHWARZ.
LUDWIG FICHTER.