May 28, 1957 R. E. THOMPSON 2,793,531

TUNING APPARATUS

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Fig. 1.

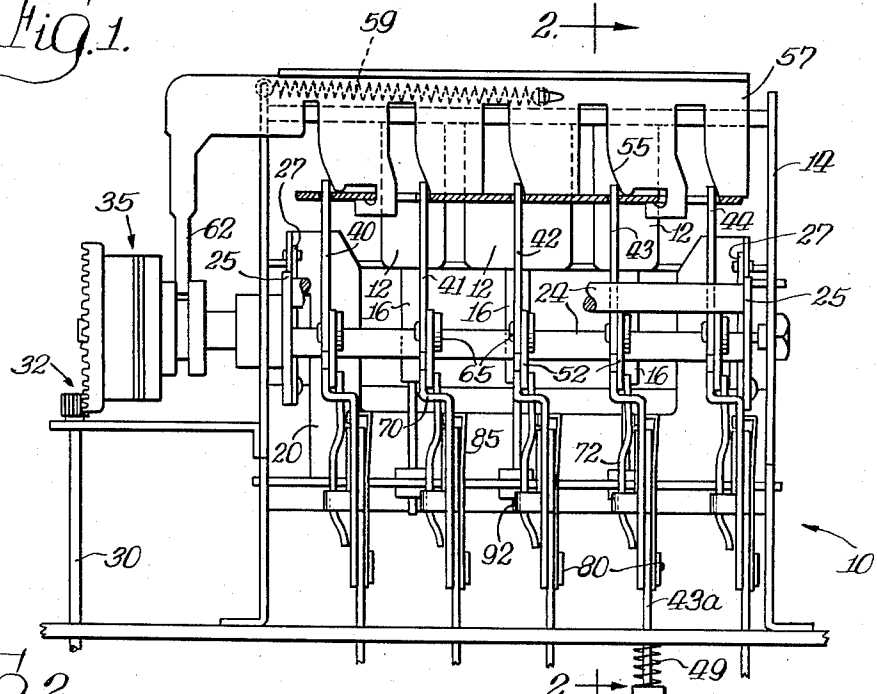


Fig. 2.

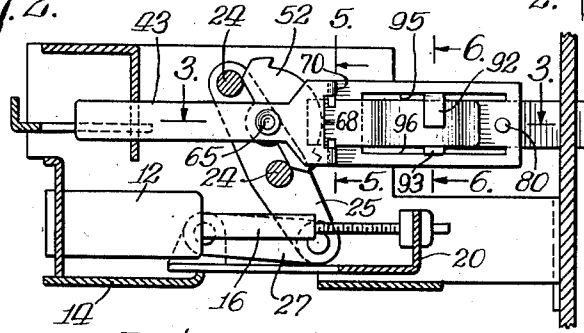


Fig. 5.

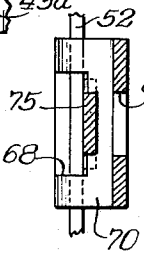


Fig. 6.

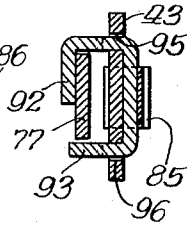


Fig. 3.

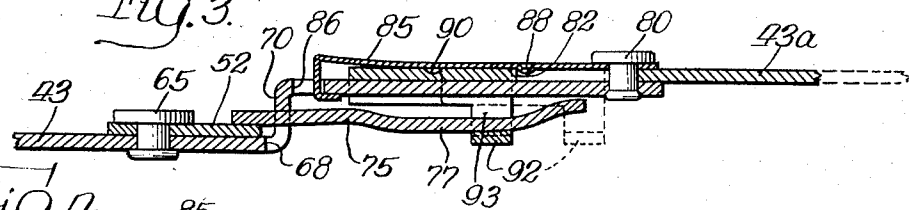
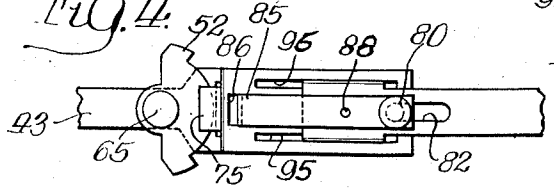


Fig. 4.



INVENTOR.

Reynald E. Thompson,

BY

Mueller & Aichele

Attys.

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2,793,531

TUNING APPARATUS

Reynald E. Thompson, Mount Prospect, Ill., assignor to Motorola, Inc., Chicago, Ill., a corporation of Illinois

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6 Claims. (Cl. 74—10.33)

This invention relates to push button tuning mechanisms for radio receivers, and more particularly to a device for presetting an adjustable push button structure to permit repeated selection of a given station.

The locking device of the present invention is particularly designed for use in connection with radio tuners wherein a cam member supported on a slidably mounted plunger rod may engage a treadle bar structure including a pair of parallel members mounted on a rotatable carriage coupled to tuning elements associated with resonant circuits. In such mechanisms, it is common for the cam member to be fixed at a certain angle with respect to its supporting plunger rod so that as the rod is moved with respect to the parallel members, the cam may bring the members into alignment with the surface thereof, thus setting the carriage and the resonant circuits to the proper adjustment for reception of the desired station. It is obviously advantageous to have the position of the cam firmly fixed so that exact tuning may be obtained upon each operation of the plunger rod. Furthermore, it is desirable to incorporate provision for easily changing the setting of the cam so that the receiver may be tuned to any desired frequency by operation of a plunger rod.

An object of this invention is to provide an improved compact locking mechanism for a cam supported on a plunger rod of a push button tuner, which mechanism furnishes smooth and positive automatic release and locking of the cam by movement of the rod which provides station selecting.

Another object is to provide a cam locking mechanism for a push button tuning plunger requiring but few component parts and which locking mechanism may be unlocked and locked by mere manipulation of the push buttons, and in which operating force applied thereto is substantially along the axis of the plunger to minimize any tendency for lateral movement of the mechanism.

A feature of the invention is the provision of a push button tuner including a plunger rod and a cam clamping bar pivotally mounted in an aperture in the rod, with one end of the bar adapted to lock the cam in position on one side of the plunger rod and the other end of the bar having an arcuate section which may be drawn or constrained toward the other side of the rod to pivot the bar in the aperture for locking of the cam.

A further object of the invention is the provision of such clamping mechanism in which a rod actuator member is slidably mounted on the plunger rod and has an encircling loop to engage the arcuate spring section of the clamping bar as the actuator member is moved. The plunger rod may also have a stepped portion in which is located the aperture for pivotally supporting the clamping bar so that the unit is compact and force applied to the actuator member is substantially along the axis of the plunger rod.

Further objects, features and the attending advantages of the invention may be appreciated upon consideration

of the following description when taken in conjunction with the accompanying drawing in which:

Fig. 1 is a top view of radio tuning apparatus employing the invention;

Fig. 2 is a sectional view of the apparatus along the lines 2—2 of Fig. 1;

Fig. 3 is a sectional view along the lines 3—3 of Fig. 2;

Fig. 4 is a view of the plunger rod mechanism from the side opposite to that of Fig. 2; and

Figs. 5 and 6 are sectional views of the apparatus along lines 5—5 and 6—6 respectively, of Fig. 2.

This invention provides mechanism for releasing and locking a cam member on a plunger rod in push button tuning apparatus for a radio by further movement of the rod in the direction which also provides station selection. The plunger rod is slidably mounted and carries a cam member rotatably affixed thereto for engaging and setting a pair of parallel bar members of a treadle bar structure which is part of a carriage linked to variable tuning elements of resonant circuits in the radio receiver. An aperture in the plunger rod supports a clamping bar in pivotal relation, one end of which may clamp the cam in fixed position on one side of the rod and the other end of which is arched forming a section which may be drawn toward the plunger rod by a slidable extension of the rod to lock the mechanism. The slidable extension supports a push button and has an encircling loop which engages the arched section of the clamping bar when the plunger rod is pushed inwardly at the same time the cam is moved against the parallel bar members for tuning purposes. However, when pulled outwardly, the slidable extension disengages the arched section of the clamping bar to free this bar and thus free the cam so that it may be set at a position for tuning the resonant circuits to a desired station. The above mentioned aperture in the plunger rod for support of the clamping bar may be in a stepped portion thereof, in which case the mechanism is very compact and an operating force applied thereto has little tendency for bending or jamming the device, since the force is substantially along the axis of the plunger rod.

Reference is now made to the drawings, in connection with which a detailed explanation of the invention will be given. In the tuning apparatus **10**, there is included a plurality of slug tuned coil units **12** which are supported by frame **14**. The units **12** are incorporated in resonant circuits of a radio receiver circuit as is familiar to those in the art, and the movable slugs **16** thereof are fastened to a slidable portion of carriage **20**. Carriage **20** also includes a treadle bar structure having a a pair of parallel bar members **24** which are mounted on a rotatable arm **25** about an axis midway between the bar members. Link sections **27** connect the slidable portion of carriage **20** to an extension of the arm **25** so that as members **24** are rotated about their axis, carriage **20** and the slugs **16** attached thereto are moved to effect tuning of the coil units.

For continuous tuning of the apparatus, a shaft **30** may be turned by a suitable knob affixed thereto in order to move the carriage **20**. A gear system **32** mechanically joins the shaft **30** through a clutch system **35** to the arm **25** in order to apply the rotary motion of shaft **30** to carriage **20** by what is effectively a vernier arrangement. In order to accomplish rapid tuning to particular predetermined frequencies, a series of plunger rods **40–44** is provided. These plunger rods are all of similar construction, and only the details of rods **43** will be explained.

Manual pushing of button **48** inwardly against spring **49** moves cam member **52** to the left in Fig. 2 and moves the bars **24** into alignment with the surface of the cam

member, thus tuning the apparatus to a certain frequency. Fig. 2 illustrates the position of maximum inward travel of plunger rod 43 where cam 52 has aligned the bar members 24. In order to facilitate the push button operation, clutch mechanism 35 is used to disengage the continuous tuning shaft 30 and the gear reduction system 32. This is accomplished when the end of plunger rod 43 moves against an inclined surface 55 of the release bar 57, which shifts this bar to the right in Fig. 1 against spring 59 so that arm 62 of the release bar opens the clutch mechanism 35. When push button 48 has been released, the spring 49 returns the plunger rod 43 to its position as shown in Fig. 1, and spring 59 re-engages the clutch mechanism 35 so that manual tuning by adjustment of shaft 30 is again possible.

The locking mechanism of the invention will now be described in connection with Figs. 2–6. This mechanism is concerned with locking cam 52 in a certain angular relation with respect to plunger rod 43 so that operation of this rod adjusts the tuning slug 16 to tune to a desired frequency. Cam 52 is rotatably mounted on plunger rod 43 by beans of a rivet 65. An aperture 68 in an offset or stepped portion 70 of the plunger rod 43 supports clamping bar 75 in pivotal relation. It may be noted that one end of clamping bar 75 bears against the cam member 52 (Fig. 3) and at the other end of clamping bar 75 has an arcuate section 77.

A slidable actuating member 43*a* constitutes an extension of the plunger rod 43 and is secured thereto by means of the rivet 80 positioned in a slot 82 in the member 43*a*. Member 43*a* is slidable in respect to the plunger rod 43 but the movement thereof is restricted by the slot 82 in which the rivet is secured. A spring member 85 is also secured to the device by means of rivet 80 as well as by a bent-over end portion thereof which engages plunger rod 43 through an aperture 86 therein. A small deformed portion 88 in the spring member 85 is adapted to engage the end of slot 82 with the device in locked position, as shown in Fig. 3. When slidable actuating member 43*a* is moved to the dotted line position of Fig. 3, which will be explained in detail below, the deformed portion 88 of spring member 85 engages a small dent 90 in member 43*a* to secure the plunger rod 43 and the actuating member 43*a* in restraining relation. A pair of lugs 92 and 93 extend respectively through slot 95 and 96 in the plunger rod 43 and serve as guides for slidable motion of actuating member 43*a* with respect to the plunger rod. A part of lug 92 serves as an encircling portion or loop for the arcuate section 77 of the clamping bar 75 as shown in Figs. 3 and 6.

In order to lock the cam member 52 in a desired position, the mechanism is positioned as shown in the solid lines of Fig. 3. Therefore, lug 92 constrains the arcuate section 77 toward one side of plunger rod 43 so that clamping bar 75 is pivoted in the aperture 78 and the end of clamping bar 75 secures member 52 to the other side of the plunger rod 43. It may also be seen that pushing plunger rod 43 inwardly in order to tune the apparatus would not tend to change the locked condition of the mechanism since member 43*a* is stopped when rivet 80 engages the end of slot 82.

In order to change the setting of the cam member 52, the following operations are carried out. First, the manual tuning shaft 30 is operated to select a desired frequency to which the apparatus is to be tuned through operation of the push button which is being adjusted. Then, actuating member 43*a* is pulled outwardly to the dotted position of Fig. 3 so that the raised portion 88 engages the dent 90 and loop 92 disengages the arcuate section 77 of the clamping bar 75. This then releases the clamping bar, and the cam member 52 may turn freely. The final step is to push inwardly on the button 48 to bring the cam member 52 against the previously set parallel bar members 24 and thereby to allow the freely turning cam member 52 to assume a desired position. Further pushing with greater force would move the actuating member 43*a* with respect to plunger rod 43 and bring the apparatus to the position shown in the solid lines of Fig. 3. Thus, loop 92 will engage the arcuate section 77 and lock the clamping bar against the cam member 52 in the desired position. The action of spring 85 when portion 88 engages dent 90 insures that locking will not commence until cam 52 has been properly positioned against bar members 24.

This invention provides, therefore, a locking mechanism especially adapted for securing a cam member on a plunger rod in a desired angular relation therewith. The device may be easily set by merely pulling outwardly on the actuating member, after tuning to a desired station, and then operating the associated plunger rod in the usual fashion, which locks the mechanism so that it may be used for rapidly retuning to that selected station. It may be seen that the apparatus is compact, and that the stepped portion of the plunger rod leaves space on both sides of the rod in which other parts of the mechanism may be disposed. Furthermore, since the apparatus is confined to a rather small cross-section, force upon the actuator member 43*a* will be largely applied along the axis of the plunger rod so that there will be little tendency to cause lateral movement. Accordingly the mechanism is of sturdy construction and provides smooth positive operation.

I claim:

1. In mechanism for locking one member with respect to another, the combination of an elongated member having an aperture therein, a member to be locked supported on said elongated member adjacent said aperture, a clamping bar pivotally supported in said aperture and having a first end on one side of said elongated member adapted to engage said member to be locked for fixedly clamping the same to said elongated member, said clamping bar also having a second end on the other side of said elongated member including a portion spaced from said elongated member, and slidable means for drawing said second end toward said elongated member to pivot said bar in said aperture into engagement with said member to be locked for fixing the same with respect to said elongated member.

2. In mechanism for locking one member with respect to another, the combination of an elongated member having an aperture therein, a cam member rotatably mounted on said elongated member with a surface thereof adjacent said aperture, a clamping bar pivotally supported in said aperture and having a first end on one side of said elongated member adapted to engage said surface of said cam member for clamping the same to said elongated member, said clamping bar also having a second end on the other side of said elongated member comprising an arched portion spaced from said elongated member, and slidable means supported on said one side of said elongated member having a loop portion encircling said arched portion for drawing the same toward said elongated member to pivot said bar in said aperture and bring the same into engagement with said cam member for locking the same with respect to said elongated member.

3. In mechanism for locking one member with respect to another, the combination of a plunger rod having a stepped section therein and an aperture in said stepped section, a cam member rotatably mounted on said plunger rod adjacent said stepped section and having a first surface contiguous to said plunger rod and a second surface opposite and parallel to said first surface, a clamping bar pivotally supported in said aperture with portions extending on opposite sides of said plunger rod, said clamping bar having a first end adapted to engage said second surface for clamping said cam member to one side of said plunger rod, said clamping bar also having a second end comprising an arched portion spaced from the other side of said plunger rod, and slidable means supported by

said plunger rod for drawing said arched portion thereto to pivot said clamping bar into engagement with said cam member for locking the same with respect to said plunger rod.

4. In radio tuning means including a push rod structure carrying a cam thereon for controlling the position of tuning elements, with the cam being rotatably mounted on the push rod structure and adapted to be locked in position and released therefrom in response to relative movement between first and second parts of the push rod structure; the combination including an elongated member having an intermediate transverse portion with an aperture therein, said elongated member forming the first part of the push rod structure, a cam rotatably mounted on said member adjacent said transverse portion, a clamping bar pivotally supported on said elongated member and extending through said aperture therein, said clamping bar having first and second ends extending on opposite sides of said member, said first end of said clamping bar being positioned to engage said cam, said second end of said clamping bar being spaced from said elongated member, and a slide member forming the second part of the push rod structure and being slidably mounted with respect to said elongated member, said slide member having a portion adapted to engage said second end of said clamping bar to draw the same toward said elongated member and thereby press said first end of said clamping bar against said cam to hold the same with respect to said elongated member.

5. In radio tuning means including a push rod structure carrying a cam thereon for controlling the position of tuning elements, with the cam being rotatably mounted on the push rod structure and locked in position and released therefrom in response to relative movement between first and second parts of the push rod structure, an elongated member having first and second parallel portions connected by an intermediate off-set portion, said elongated member forming the first part of the push rod structure, a cam rotatably mounted on said first portion on the side thereof toward said second portion, said off-set portion of said member having an aperture therein, a

clamping bar pivotally supported on said elongated member and extending through said aperture thereof, said clamping bar extending between said first and second parallel portions and having first and second ends extending on opposite sides of said member, said first end of said clamping bar being positioned to engage said cam, and a slide member forming the second part of the push rod structure slidably mounted on said second portion of said elongated member, said slide member having a portion adapted to engage said second end of said clamping bar to draw the same toward said elongated member and thereby press said first end of said clamping bar against said cam to hold the same with respect to said elongated member.

6. In mechanism for locking one member with respect to another, the combination of an elongated member having an off-set portion therein with an aperture in said off-set portion, said off-set portion forming first and second stepped sections of said elongated member, a member to be locked with respect to said elongated member supported adjacent said aperture, a clamping bar pivotally supported in said aperture and having a first end extending along said first stepped section of said elongated member and being engageable with said member to be locked, said clamping bar also having a second end extending along said second stepped section of said elongated member, said second end being spaced from said elongated member, and slidable means supported on said elongated member and having an encircling portion adapted to draw said second end of said clamping bar toward said elongated member upon operations to a first position for clamping said member to be locked by pivotal movement of said clamping bar in said aperture, with operation of said slidable means to a second position causing disengagement of said encircling portion from said second end of said clamping bar for releasing said member to be locked.

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