Dec. 29, 1936. W. T. BOLTON 2,066,246

SELECTIVE TUNER FOR RADIO RECEIVERS

Filed Oct. 13, 1934 2 Sheets-Sheet 1

Fig. 1

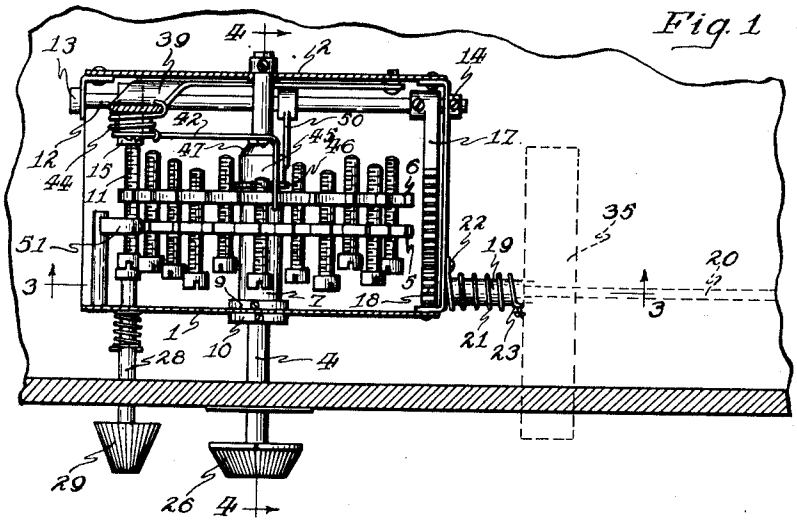


Fig. 2

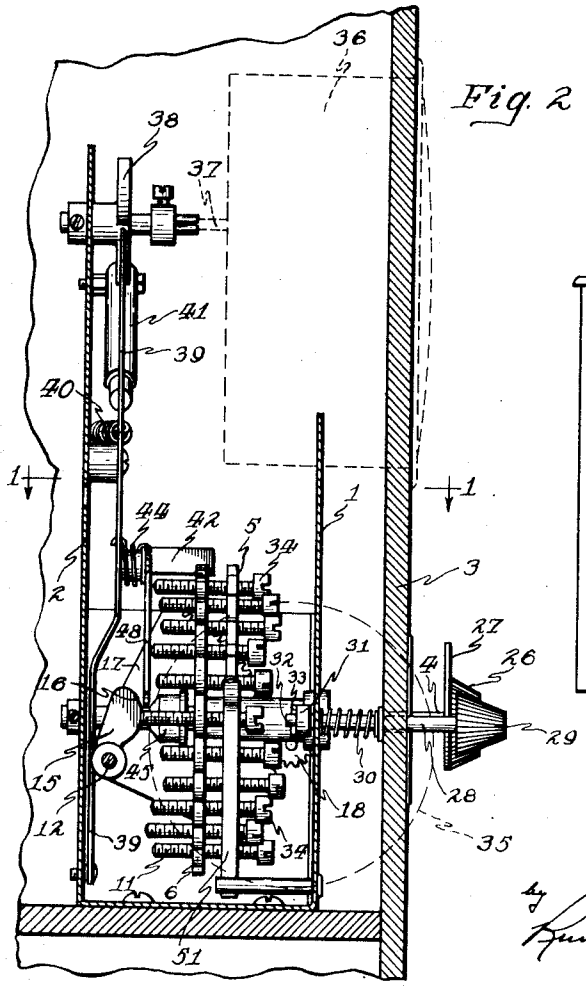
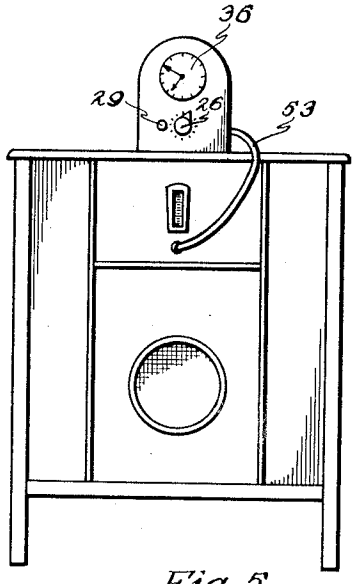


Fig. 5



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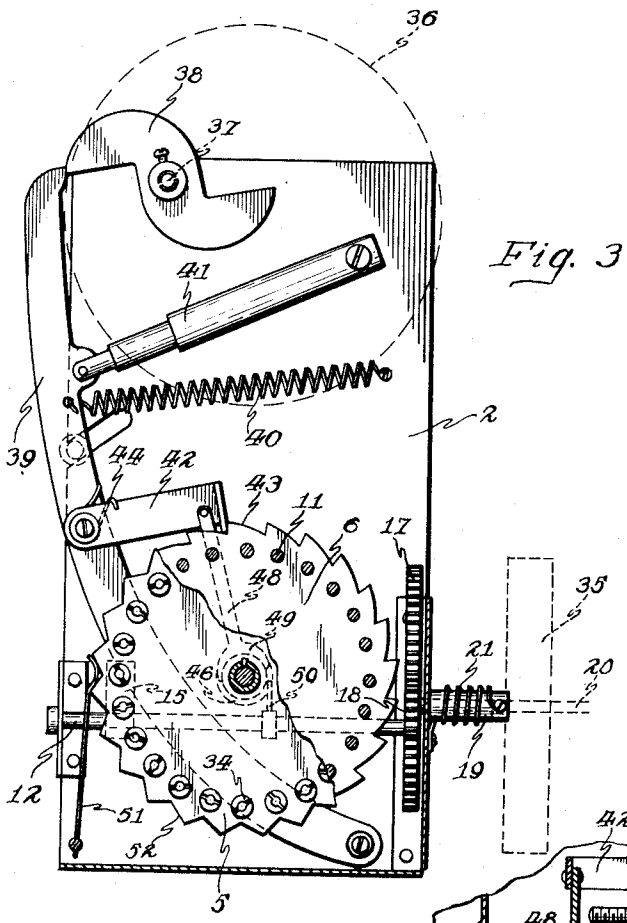
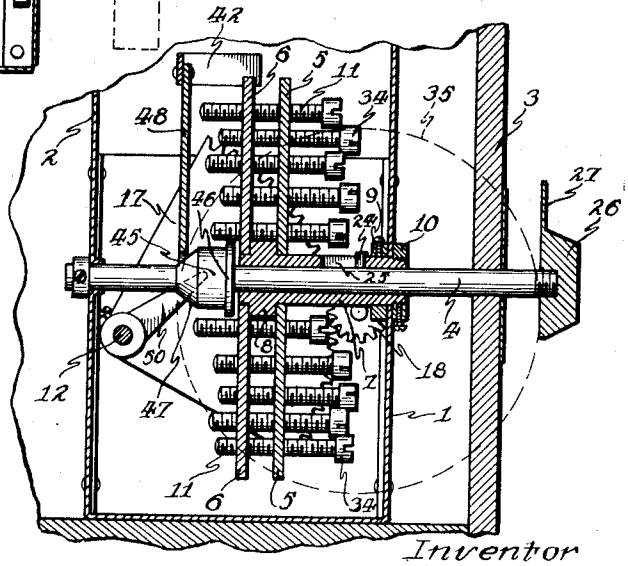


Fig. 3

Fig. 4



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UNITED STATES PATENT OFFICE

2,066,246

SELECTIVE TUNER FOR RADIO RECEIVERS

William T. Bolton, Chicago, Ill.

Application October 13, 1934, Serial No. 748,186

7 Claims. (Cl. 250—20)

This invention relates to automatic selective control apparatus and particularly to a time controlled selecting device arranged to automatically adjust a radio set tuning mechanism through a series of predetermined station positions in accordance with a predetermined time and position schedule.

The main objects of this invention are to provide an improved and simplified selecting device for automatically setting a radio set tuning mechanism at a predetermined station position at the beginning of a predetermined time period; to provide such a device that will automatically function at predetermined time intervals to shift a radio set tuning mechanism to the next successive one of a predetermined series of station positions; to provide such a device in which the automatic selecting apparatus is entirely mechanical; to provide an improved selecting mechanism in which the automatic setting operation is positive and accurate; to provide an improved automatic radio set tuning device arranged for manual adjustment of the radio set tuning mechanism without alteration or effect on any time and station schedule that may have been prearranged; to provide an automatically selective radio set tuning device arranged to be readily adjusted for either fully automatic or fully manual operation of the radio set tuning mechanism without interference with continuous functioning of the timing mechanism; and to provide an improved automatic selecting mechanism.

An illustrative embodiment of this invention is shown in the accompanying drawings in which:

Fig. 1 is a sectional plan view of the selecting mechanism taken on line 1—1 of Fig. 2.

Fig. 2 is a side view of the same.

Fig. 3 is a sectional view of the same taken on line 3—3 of Fig. 1.

Fig. 4 is an enlarged fragmentary view taken on line 4—4 of Fig. 1 showing details of the selector, and

Fig. 5 is a view illustrative of a selecting mechanism arranged as an auxiliary unit for a radio receiver.

In the embodiment herein shown and described my improved device for selectively setting the tuning element of a radio set comprises driving means for shifting the said element, controlled by a following device arranged to be actuated by a series of adjustable detent or camming elements, which detent or camming elements are shifted successively into and out of the path of the following device by a time controlled mechanism arranged to shift the said elements at predetermined time intervals. Thus the tuning element of a radio set may be automatically controlled to tune in successively a predetermined series of stations or programs in accordance with a pre-arranged time and station schedule, shifting automatically to the next station or program of the series at the end of each time interval or predetermined period.

In the form shown in the drawings the selecting mechanism is housed in a metal frame having upstanding portions providing a front plate 1 and a back plate 2, which frame may be positioned just behind the front panel 3 of a casing or radio set cabinet, and comprises a rotatable control member supported on a shaft 4 which extends through and is journaled in the front plate 1 and the back plate 2; the control member being positioned between the plates 1 and 2. The control member as shown comprises a pair of disk-like plates 5 and 6 which are fixedly mounted on a hub 7 and spaced apart by a hub shoulder 8, the hub 7 being in the form of a sleeve on the shaft 4. The hub 7 extends through the front plate 1 and is rotatably secured thereto by means of a pair of collars 9 and 10 disposed one on each side of the plate 1 and locked to the hub 7.

The disk-like plates 5 and 6 of the control member are arranged to carry a plurality of adjustable detents 11 arranged in an annular series adjacent the outer margin of the plates 5 and 6, which detents are in the form of screws extending through and having threaded engagement with the plates 5 and 6, the detents 11 being disposed parallel with the axis of the control member. The detents 11 are arranged to project beyond the outer face of the plate 6 and because of their threaded engagement with the plates 5 and 6 are adjustable so as to vary the amount that they will project beyond the face of the plate 6.

A controlled shaft or element 12 is disposed horizontally between the control member and the back plate 2 of the housing, and is journaled on the housing frame as at 13 and 14 in Fig. 1, where the ends of the shaft 12 are supported and locked against axial movement by means of collars. Fixedly mounted on the shaft 12 so as to be rotatable therewith is a follower arm 15, which is also considered herein as a cam arm or follower means, and this follower means is disposed in the path of the adjustable detents 11 so as to be successively engaged by the project-

ing ends of the same, the follower 15 being provided with a cam-like surface 16 so that the follower may readily ride on the projecting ends of the detents 11 and be shifted angularly according to the amount that each engaged detent projects beyond the plate 6. Thus, as the control member is rotated and the detents 11 are brought successively into engagement with the follower means, the same, together with the shaft 12, is shifted or rotated angularly on the axis of the shaft 12 and its position changed according to the extent of projection of the engaging detent 11.

Motion of the shaft 12 may be transferred in any suitable manner to the tuning element of a radio set. However, in the form shown such transfer of motion from the shaft 12 is accomplished through a segment gear 17 fixedly mounted on the shaft 12, and a pinion 18 which is secured to a shaft 19 directly connected with a shaft 20 which may control operation of the radio set variable condensers or tuning element which are not shown.

As shown in Fig. 1 motor means comprising a helical spring 21 mounted on the shaft 19 is provided for shifting or driving the radio set tuning element, the spring 21 being secured to the selector casing at 22 and to the shaft 19 at 23, and this spring driving element or motor means is arranged to constantly urge the shaft 19 to rotate in one direction, that is such a direction that will rotate the shaft 12 so as to urge the follower means toward the detents 11.

Thus rotation or shifting of the shaft 19, which is connected to the radio set tuning element, is controlled by the follower means 15 through coaction with the detents 11 which serve to limit the motion derived from the motor means 21 and to shift or rotate the follower means and the shaft 19 backwardly against the action of the motor means 21.

In order to provide for adjustment of the detents 11 and manual operation of the control member, the hub 7 of the control member is keyed to the shaft 4 by means of a pin 24 fixed to and projecting from the shaft 4 and engaging a slot 25 in the hub 7, and the shaft 4 is extended forwardly through the casing 3 where it is terminated by a knob 26 having a pointer or index 27. Rotation of the knob 26 to turn the shaft 4 will, through engagement of the pin 24 and the slot 25, rotate the hub 7 and the control member, and cause the detents 11 to shift into and out of the path of the follower means 15.

Manual turning of the knob 26 and the shaft 4 serves to bring the detents 11 respectively into engagement with the follower means 15, and in order to provide for axial adjustment of the detents 11 a tuning shaft 28 is provided which is arranged to be manually engaged with the detents. The tuning shaft 28 is disposed so as to be axially in line with the respective detent that is positioned in engagement with the follower means 15 and is arranged to extend through the casing 3, carrying on its outer end a knob 29. The tuning shaft 28 is also provided with a spring 30 which normally urges the same outwardly away from engagement with the detent 11, which outward movement is limited by engagement of a head 31 with the front frame plate 1.

In the form shown the head 31 is provided with a pin-like centering portion 32 having a pair of radially extending wings 33, which are shaped to engage in a transverse slot in a counterbored screw head 34 provided on each of the detents or projecting elements 11. By such an arrangement adjustment of any particular detent may be effected by turning the knob 26 to rotate the control member so as to bring that particular detent into engagement with the follower means 15, which position may be indicated by means of the index 27 in coaction with a scale not shown, and then shifting the tuning shaft 28 by means of its knob 29 inwardly against the action of the spring 30 so as to engage the head 31 with the screw head 34 of the respective detent 11 and turning the knob 29 to screw the detent inwardly or outwardly to shift the angular position of the follower means 15. The resultant angular or rotary motion imparted to the shaft 12 is transferred to the radio set tuning element through the aforementioned transfer mechanism and the shifting of the tuning element is indicated by a change of position of the usual tuning dial which is operatively connected with the tuning element and indicated in the drawings by the numeral 35.

Automatic timed rotation of the control member is accomplished through suitable mechanism preferably driven by an electric clock indicated at 36 and such mechanism, in the form shown, is arranged to impart a predetermined angular or rotary motion intermittently to the control member.

As shown in the drawings the electric clock 36 is provided with a shaft 37 driven thereby and connected to a trip cam 38. The shaft 37 is preferably arranged to make one revolution per hour and the trip cam 38 is preferably shaped to cam a lever 39 outwardly from the axis of the trip cam 38 and at each half revolution release the lever 39 whereby the same under the action of a spring 40 will shift back toward the axis of the trip cam 38. The spring actuated shifting of the lever 39 may be cushioned in any suitable manner as by the dashpot 41 as shown in Figs. 2 and 3.

The intermittent half-hourly motion of the arm 39 upon being released by the trip cam 38 is transferred to the control member by means of a pawl 42 arranged to coact with a ratchet 43 formed on the periphery of the plate 6, the pawl 42 being constantly urged toward engagement with the ratchet 43 by means of a spring 44. The ratchet 43 is arranged to provide one tooth for each detent carried by the control member and the spacing of the ratchet teeth is such that each movement of the arm 39 and the pawl 42 will bring the next successive detent into engagement with the follower 15.

In the arrangement for adjustment of the control member for the automatic selection of a series of predetermined radio tuning element positions, it is preferable that a means be provided to disengage the time controlled driving mechanism from the control member and in the embodiment shown herein such disengagement is accomplished through manipulation of the control member shaft 4.

The shaft 4 is arranged to be axially slidable through the hollow sleeve comprising the control member hub 7, as shown in Fig. 4, and adjacent the inner end of the shaft 4 between the frame plate 2 and the control member is a cylindrical cam 45 which is secured on the shaft 4. The cam 45 is formed as an annular collar having an annular flange 46 at the side adjacent the control member and a cone-shaped portion 47 at its opposite end. A downwardly extending arm 48 is provided on the pawl 42 and is positioned so that its lower end may be engaged by the cone-shaped portion 47 of the cam 45, the cam 45 being

disposed between the arm 48 and the control member and normally out of engagement with the arm 48, and the arm 48 is provided with a fork-like cam engaging portion 49 arranged to extend on both sides of the cam axis so that the cam engaging end of the arm 48 will always be held substantially concentric with the axis of the cam 45 regardless of any pivotal movement due to its connection through the pawl 42 with the arm 39.

Thus by shifting the shaft 4 inwardly the cone-shaped portion 47 of the cam 45 is brought into engagement with the arm 49 and lifts the same upwardly due to cam action between the surface 47 and the forked end of the arm 48, which lifting movement elevates the pawl 42 so that the same is moved out of engagement with the ratchet 43.

The control member may then be turned by means of the knob 26 and the shaft 4 in either clockwise or counter-clockwise direction so as to bring any particular detent 11 into engagement with the arm 15.

The cam 45 is also arranged so as to cause a shifting of the arm 15 to a neutral position where the same will not be engaged by any of the detents 11 and this action is accomplished by means of coaction between the collar 46 on the cam 45 and a crank arm 50 secured on the shaft 12. The crank arm 50 is so positioned that upon further inward axial movement of the shaft 4, after the cone-shaped portion 47 of the cam 45 has coacted with the arm 48 to elevate the pawl 42, the flange 46 will come into engagement with the arm 50 and force the same backward so as to turn the shaft 12 and carry the cam 15 to a position completely disengaged from any of the detents 11, the forked portion 49 of the pawl arm 48 riding on the cylindrical portion of the cam 45.

It is understood that the arrangement of the cam 45 and its collar 46 relative to the crank arm 50 and the pawl arm 48 is such that maximum axial movement of the shaft 4 will not bring the collar 46 into engagement with the pawl arm 48, a suitable arrangement being provided that will limit the axial movement of the shaft 4. For example the slot 25 in the hollow shaft or hub 7 may be of such predetermined length as to accomplish such a limiting action.

As shown in Figs. 1, 2 and 3 of the drawings, a spring detent 51 arranged to engage a toothed surface 52 on the control member plate 5 is provided to effect exact centering of the detents 11 relative to the arm 15, the toothed surface 52 being so formed that there will be a notch on the periphery of the plate 5 for each of the detents 11 that is provided. Thus, as the control member is rotated, either manually or by means of the time-controlled mechanism, the detent 11 engaging the arm 15 will always be properly centered. The spring detent 51 also serves to prevent a detent 11 from being carried beyond its properly alined position relative to the arm 15 through the effect of inertia in the control member during its automatic actuation by the time-controlled mechanism.

From the foregoing it will be readily understood how any shifting of the arm 15 will impart angular motion to the shaft 12 which motion will be transferred directly to the radio tuning element or mechanism. However, it will be apparent that the means for transferring motion of the shaft 12 to the tuning element must be arranged so that such motion is multiplied during the course of its transference to the radio set tuning element, because of the fact that the angular or rotary motion that can be imparted to the arm 15 and the shaft 12 can only be a fraction of the total angular motion that must be had in the tuning element shaft, indicated herein as shaft 20, in order to accomplish a full scale adjustment of the tuning element and its positon indicating means 35.

As shown herein the increase or multiplication of the angular motion of the shaft 12 is brought about through the relationship of the segment gear 17 and the pinion 18. In the arrangement shown the cam 15 is capable of approximately 30° of angular motion.

Thus, if it is necessary that the tuning element of the radio set, represented hereby by the shaft 20 and the indicator 35, requires 180° of angular or rotary motion to accomplish full scale adjustment, the relationship of the teeth on the segment gear 17 and the pinion 18 will be in a ratio of 6 to 1. Thus, it will be seen that by proper proportioning of the transfer mechanism between the controlled shaft 12 and the radio set tuning element, substantially any extent of motion that may be required to bring about full scale adjustment of the tuning element may be had. It is of course understood that there are numerous arrangements for transferring motion from the shaft 12 to the radio set tuning element that may be employed other than the particular arrangement herein illustrated.

The mechanism herein described is shown as arranged to be built in as an assembled part of a radio device. However, it is to be understood that the mechanism might be housed in its own individual casing, and employed as an auxiliary unit for an ordinary manually controlled radio set, and in such case the shaft 19 of the control mechanism may be connected by means of a flexible shaft 53 to the usual dialing knob shaft of the manually operated radio set. In such an arrangement the elements employed for multiplying the motion between the shaft 12 and the shaft 19 would be so proportioned as to impart sufficient angular motion to the dialing knob shaft of the manually controlled radio set to accomplish full scale adjustment of the radio set tuning element.

Fig. 5 illustrates an arrangement wherein my improved control mechanism is utilized as an auxiliary unit for the usual manually controlled radio set.

In operation of my improved automatically selective radio set tuning device the detents of the control member are adjusted for the desired stations or programs by first shifting the shaft 4 inwardly to disengage the time controlled driving mechanism and shift the follower 15 to its neutral position. Then by turning the knob 26 the control member is rotated to bring the respective detents into the path of the follower 15. A scale having indices corresponding to predetermined periods of time and arranged in chronological order is provided on the panel 3, but not shown herein, for coaction with the pointer or index 27 of the knob 26. One detent is provided on the control member for each time period, and the knob 26 being fixed on the shaft 4, each detent is identified by the position of the indicator 27 on the time or period scale.

By turning the knob 26 until the pointer 27 indicates the period on the time scale at which a desired station or program is to be heard the particular detent for that period is brought into the path of the follower 15. Then the follower is released by partially withdrawing the shaft 4 and the tuning shaft 28 is pressed inwardly to

engage the detent. Turning of the tuning shaft 28 by means of the knob 29 then adjusts the detent inwardly or outwardly according to the direction the knob 29 is rotated and as the detent is adjusted the follower is changed accordingly. Motion of the follower is transferred directly to the radio set tuning mechanism and indicated on the radio set tuning dial so that by turning the knob 29 until the desired station is indicated, by frequency values or otherwise, the detent is adjusted so that when it again comes into the follower path the station for which it is set will be automatically tuned in, motion of the follower being exactly controlled by the detent.

After the detent corresponding with the first desired period has been adjusted for the desired station or program, the follower 15 is again released by manipulation of the shaft 4, and the detent representing the next period is shifted into the follower path and adjusted for the desired station or program. In this manner successive detents each respectively representing a definite time period are adjusted for predetermined stations or programs respectively and after a sequence of programs has been thus arranged the radio set is placed in operation by turning the control member until the pointer 27 is opposite the index on the time scale corresponding to the time indicated by the electric clock 36, which clock operates continuously and indicates the correct time of the day, and shifting the control shaft 4 outwardly to bring the follower into engagement with the detents 11 and the pawl 42 into engagement with the ratchet 43.

At each time interval, for example each half-hour, the time controlled mechanism will automatically function to shift the control member and bring the next successive detent into engagement with the follower 15, thus changing the position of the follower and controlling the shifting of the radio set tuning element to tune in the station for which that detent has been set.

If at any time a preselected program should be found to be undesirable a new program may be tuned in without disturbing the setting or time sequence of remaining preselected stations by simply manipulating the tuning shaft 28 to change the adjustment of the particular detent then engaged with the follower, no change of position of the control member being necessary since the tuning shaft 28 is positioned in line with the follower engaging detent. Also the radio apparatus may at any time be converted from automatic to manual control by shifting the shaft 4 inwardly to disengage the time controlled driving mechanism. This in no way affects the normal operation of the clock 36 and manual dialing or tuning of the radio is accomplished by manipulation of the tuning shaft 28.

Although but one specific embodiment of this invention is herein shown and described it will be understood that details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. Means for tuning radio receivers comprising a rotary shaft having means for coupling it to the tuning element of a receiver and yieldingly impelled in one direction to retain the tuning element in one of its extreme positions, a carrier provided with a peripheral series of ratchet teeth, a pivotally mounted lever spring impelled in one direction and having a pawl engageable with said teeth, a time mechanism actuated cam engageable with the free end of said lever to move the latter against the tension of said spring, a series of detents carried by the carrier, a rock shaft having limited angular movement but operatively connected to the first shaft to impart full tuning element movement to the latter, and a follower carried by the rock shaft and successively engaged by the detents to impart varied movements to the rock shaft upon movement of the carrier, the carrier having means for manual adjustment, said means comprising elements disengaging the pawl from the ratchet teeth and moving the rock shaft to shift the follower out of the path of movement of the detents.

2. Means for tuning radio receivers comprising a rotary shaft having means for coupling it to the tuning element of a receiver and yieldingly impelled in one direction to retain the tuning element in one of its extreme positions, a carrier provided with a peripheral series of ratchet teeth, a pivotally mounted lever spring impelled in one direction and having a pawl engageable with said teeth, a time mechanism actuated cam engageable with the free end of said lever to move the latter against the tension of its spring, a series of detents carried by the carrier and axially adjustable in the latter to vary the degree of their projection from one face thereof, a rock shaft for limited angular movement but operatively connected to the first shaft to impart full tuning element movement to the latter, a follower carried by the rock shaft and successively engaged by the detents to impart varied angular movements to the rock shaft upon movement of the carrier, the carrier consisting of spaced disks on the periphery of one of which the said ratchet teeth are formed, the other disk being formed on its periphery with a series of uniformly spaced notches equal in number to the number of the detents and a spring pawl yieldably engageable in any of said notches to retain a selected position of the carrier.

3. Means for tuning radio receivers comprising a rotary shaft having means for coupling it to the tuning element of a receiver and yieldingly impelled in one direction to retain the tuning element in one of its extreme positions, a carrier provided with a peripheral series of ratchet teeth, a pivotally mounted lever spring impelled in one direction and having a pawl engageable with said teeth, a time mechanism actuated cam engageable with the free end of said lever to move the latter against the tension of said spring, a series of detents carried by the carrier, a rock shaft having limited angular movement but operatively connected to the first shaft to impart full tuning element movement to the latter, and a follower carried by the rock shaft and successively engaged by the detents to impart varied movements to the rock shaft upon movement of the carrier, the lever having a dashpot operatively connected therewith to impart a time element into its period of operation when released by the time mechanism actuated cam.

4. Means for tuning radio receivers comprising a rotary shaft having means for coupling it to the tuning element of a receiver and yieldingly impelled in one direction to retain the tuning element in one of its extreme positions, a carrier, a pivotally mounted lever spring impelled in one direction and operatively engageable with the carrier to impart a step by step movement to the latter, a time mechanism actuated cam engageable with the free end of the lever to move the latter against the tension of its spring, a

series of detents carried by the carrier and projecting from the latter in varying degrees of extent, a rock shaft having a limited angular movement but operatively connected to the first shaft to impart full tuning element movement to the latter, a follower carried by the rock shaft and successively engaged by the detents to move the rock shaft a distance corresponding to the projection of the detents, manual means for rotating the carrier, and means actuated by the manual means for releasing the operative connections between the lever and the carrier.

5. Means for tuning radio receivers comprising a rotary shaft having means for coupling it to the tuning element of a receiver and yieldingly impelled in one direction to retain the tuning element in one of its extreme positions, a carrier, a pivotally mounted lever spring impelled in one direction and operatively engageable with the carrier to impart a step by step movement to the latter, a time mechanism actuated cam engageable with the free end of the lever to move the latter against the tension of its spring, a series of detents carried by the carrier and projecting from the latter in varying degrees of extent, a rock shaft having a limited angular movement but operatively connected to the first shaft to impart full tuning element movement to the latter, a follower carried by the rock shaft and successively engaged by the detents to move the rock shaft a distance corresponding to the projection of the detents, manual means for rotating the carrier, means actuated by the manual means for releasing the operative connections between the lever and the carrier, the detents being adjustable to vary their degree of projection from the carrier, and a member selectively engageable with the detents to adjust the latter.

6. Means for tuning radio receivers comprising a rotary shaft having means for coupling it to the tuning element of a receiver and yieldingly impelled in one direction to retain the tuning element in one of its extreme positions, a carrier provided with a peripheral series of ratchet teeth, a pivotally mounted lever spring impelled in one direction and having a pawl engageable with said teeth, a time mechanism actuated cam engageable with the free end of said lever to move the latter against the tension of its spring, a series of detents carried by the carrier and axially adjustable in the latter to vary the degree of their projection from one face thereof, a rock shaft for limited angular movement but operatively connected to the first shaft to impart full tuning element movement to the latter, a follower carried by the rock shaft and successively engaged by the detents to impart varied angular movements to the rock shaft upon movement of the carrier, a shaft on which the carrier is mounted, the shaft being axially movable but angularly stationary with respect to the carrier, a hand knob mounted on said shaft to provide for manual rotation of the carrier, and means actuated on axial movement of the shaft to disengage the pawl from the ratchet teeth during manual rotation of the carrier.

7. Means for tuning radio receivers comprising a rotary shaft having means for coupling it to the tuning element of a receiver and yieldingly impelled in one direction to retain the tuning element in one of its extreme positions, a carrier provided with a peripheral series of ratchet teeth, a pivotally mounted lever spring impelled in one direction and having a pawl engageable with said teeth, a time mechanism actuated cam engageable with the free end of said lever to move the latter against the tension of its spring, a series of detents carried by the carrier and axially adjustable in the latter to vary the degree of their projection from one face thereof, a rock shaft for limited angular movement but operatively connected to the first shaft to impart full tuning element movement to the latter, a follower carried by the rock shaft and successively engaged by the detents to impart varied angular movements to the rock shaft upon movement of the carrier, a shaft on which the carrier is mounted, the shaft being axially movable but angularly stationary with respect to the carrier, a hand knob mounted on said shaft to provide for manual rotation of the carrier, and means actuated on axial movement of the shaft to elevate the pawl out of engagement with the ratchet teeth and move the rock shaft to dispose the follower out of the path of movement of the detents when the carrier is being manually actuated.

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