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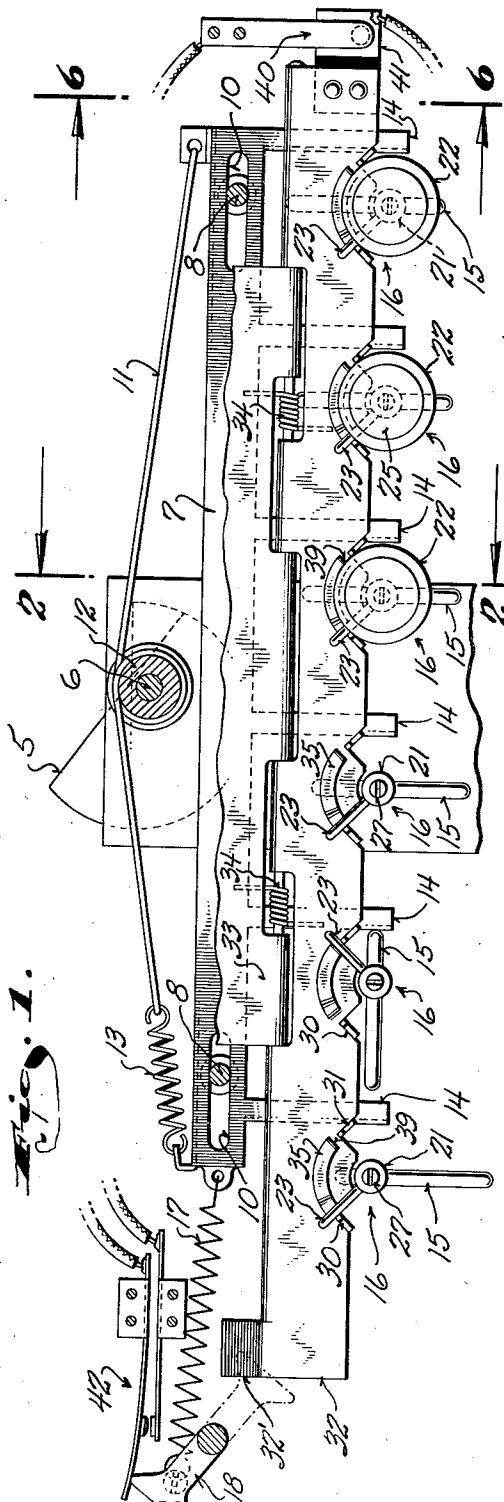
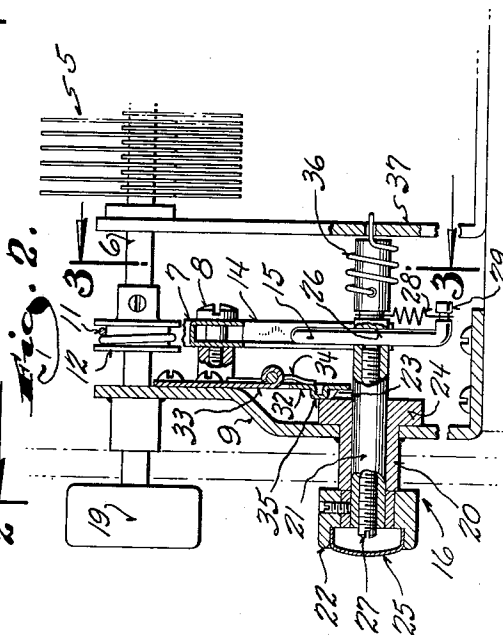
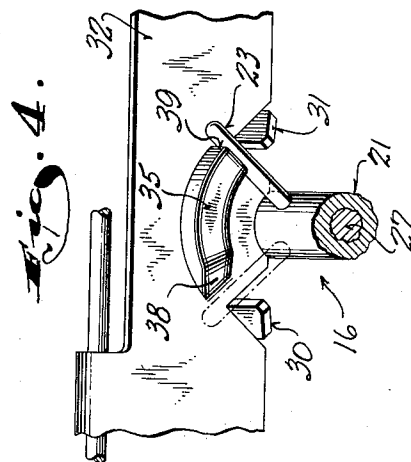
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2,211,539

TUNING DIAL

Filed Aug. 15, 1938

3 Sheets-Sheet 1



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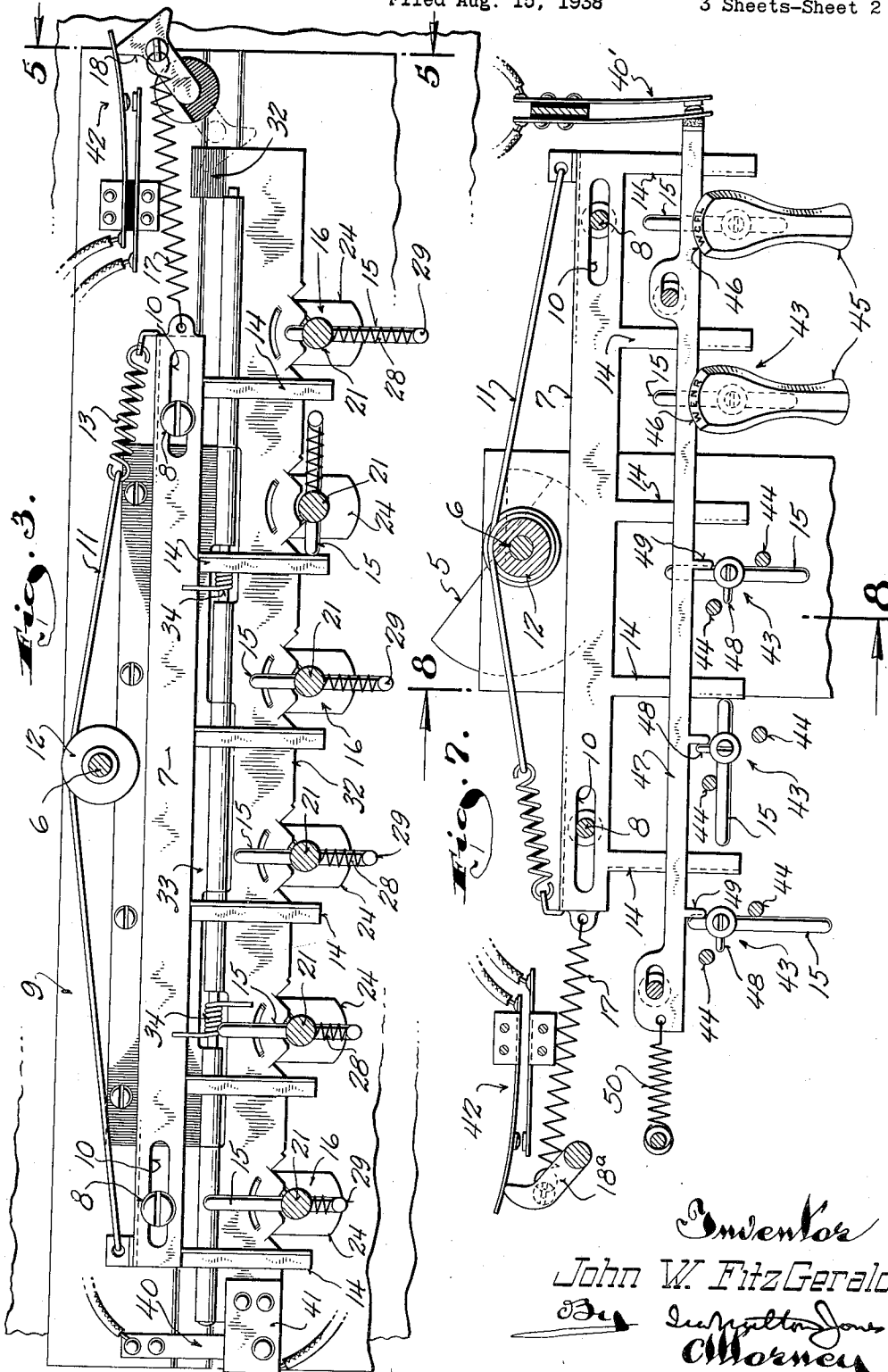
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TUNING DIAL

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3 Sheets-Sheet 2



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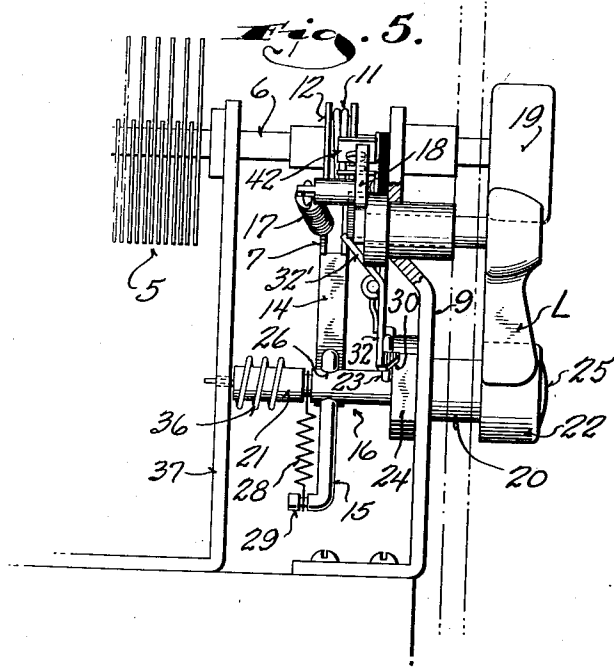
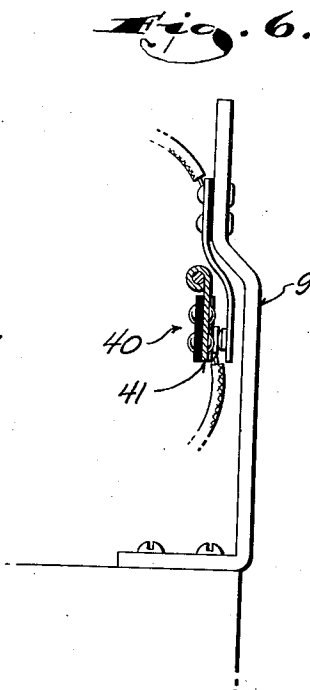
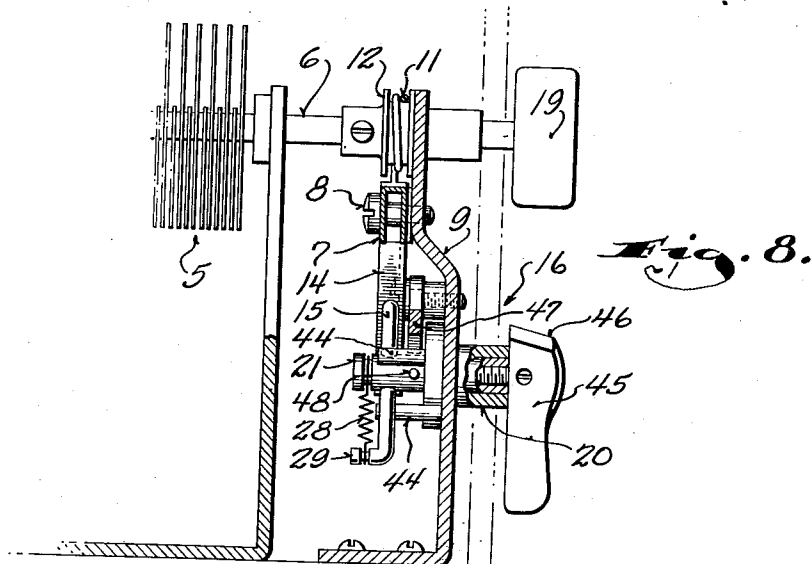
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TUNING DIAL

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3 Sheets-Sheet 3



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TUNING DIAL

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13 Claims. (Cl. 250—20)

This invention relates to tuning devices for radio receivers, and refers particularly to the so-called automatic tuning whereby a radio receiver may be quickly and accurately tuned to any one of a predetermined number of broadcasting stations.

Heretofore, several different types of automatic tuning apparatuses have been proposed and used, but in nearly all instances, the mechanism has been complicated and consequently, the tuning devices were so costly as to preclude their use on the less expensive receivers.

It is therefore an object of this invention to provide an automatic tuning device for radio receivers which is sufficiently simple in construction to permit its being used on cheaper sets.

Another object of this invention is to provide a tuning device of the character described which is permanently accurate, and in which the individual station selectors may be quickly and easily adjusted.

Another object of this invention is to provide a tuning device of the character described wherein a uniform manual adjustment of any one of a number of station selectors, such as a partial turn through the same number of degrees of rotation of individual station selector buttons or knobs, at all times quickly and accurately tunes the receiver to the station which the chosen button or knob represents.

Another object of this invention is to provide means for automatically effecting the return of any previously actuated station selector to its inoperative position during actuation of any one chosen selector.

Another object of this invention is to provide a so-called automatic tuning device for radio receivers that may be easily and quickly rendered ineffective to permit normal and customary manual control of the receiver.

Another object of this invention is to provide means whereby the receiver is rendered inaudible during each setting of the receiver.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiment of the invention constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a front view of a tuning apparatus constructed in accordance with this invention,

parts thereof being broken away and in section;

Figure 2 is a cross sectional view taken through Figure 1 on the plane of the line 2—2;

Figure 3 is a back view of the tuning apparatus;

Figure 4 is a detail perspective view, illustrating the manner in which the individual station selectors are held in their operative positions and have their limits of motion defined;

Figure 5 is a cross sectional view taken through Figure 3 on the plane of the line 5—5;

Figure 6 is a cross sectional view taken through Figure 1 on the plane of the line 6—6;

Figure 7 is a view similar to Figure 1, illustrating a slightly modified embodiment of the invention; and

Figure 8 is a cross sectional view taken through Figure 7 on the plane of the line 8—8.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts, the numeral 5 designates the tuning element of a radio receiver, such as a variable condenser, which, as is customary, has a movable element mounted on a rotatable shaft 6.

Mounted in juxtaposition to the rotatable shaft 6 and guided for linear movement transversely of the axis of the shaft is a comb-like member 7. This comb-like member 7 preferably is formed as a sheet metal stamping and is guided for linear movement along a fixed path by screws or studs 8 threaded in a supporting plate 9 and disposed in longitudinal slots 10 formed in the comb-like member.

A cable 11, having its medial portion coiled about a pulley or friction wheel 12 fixed to the shaft 6, and having its ends attached to the ends of the comb-like member 7, provides a driving connection between the shaft 6 and the member 7 whereby linear movement of the member 7 is translated into tuning rotation of the shaft 6. A tension spring 13 interposed between one end of the cable and the adjacent end of the member 7 holds the cable taut.

The teeth 14 of the comb-like member 7 have substantial space therebetween and provide abutments against which pushers 15 carried by the station selectors 16 press to move the member 7 in one direction. A spring 17 yieldingly draws the member 7 in its opposite direction and normally holds the same in a predetermined position at which the tuning element 5 is at one limit of its adjustment.

The spring 17 has one end attached to the member 7 and its other end connected to a manually swingable arm 18 which, as best shown in Figure 3, has two diametrically opposite positions of adjustment. A lever L provides means for actuating the arm 18.

In the full line position of this arm, shown in Figures 1 and 3, it holds the spring 17 under

tension so that the tuning device is set for automatic control. In its dotted line positions shown in Figures 1 and 3, the arm 18 releases the tension on the spring 17 so that manual adjustment of the tuning element by means of a knob 19 or its equivalent may be effected without interference from the automatic control.

The manually operable station selectors 16 are all supported from the plate 9, and each comprises a fixed bushing 20 carried by the plate 9, in which a shaft 21 is rotatably mounted. On the outer end of the shaft 21, a button 22 is secured, which bears against the front of the bushing 20 and holds the shaft 21 against inward movement. Outward movement of the shaft 21 is prevented by the engagement of a pin 23 fixed radially in the shaft 21 with the inner face 24 of the bushing 20.

The knob or button 22 has its front hollowed out to receive a removable cap or insert 25 on which the call letters of a broadcasting station may be delineated directly, or it may be transparent to permit a disc bearing the call letters and positioned inside the cap or insert to be visible.

The pusher 15 consists of a pin mounted in a hole 26 passing diametrically through the inner end portion of the shaft 21. It is held in any desired position of adjustment by a screw 27 threaded in a bore through the shaft 21 and having its inner end bearing against the pin which constitutes the pusher.

A light spring 28 having one end attached to the shaft 21 and its other end connected to a lateral extension 29 on one end of the pusher pin 15 yieldingly draws the pusher pin at all times to a position of maximum throw.

The pusher pins 15, as stated hereinbefore, are arranged to bear against the teeth 14 of the comb-like member. In setting any station selector, the tuning element is first manually turned to its limit of rotation opposite that toward which the spring 17 tends to turn the tuning element to carry the comb-like member to its position at which its teeth are spaced the maximum distance from their respective selectors. The chosen selector is then turned to its operative position where it is releasably held by means to be later described, and at which position its pusher pin lies perpendicular to the comb tooth. The set screw 27 is then loosened, which permits the pusher pin to be propelled into engagement with the comb tooth by its spring 28.

The station desired is then tuned in manually by means of the knob 19 which moves the comb-like member in the direction it is urged by the spring 17 and thus causes the pin 15 to be carried to its proper position of adjustment by the tooth, where it is then secured by the set screw 27 while firmly holding the knob 19.

Hence, it will be seen that as the pusher pin 15 is moved against the action of its spring 28 when turning the manual tuning means to the desired setting, the pusher pin 15 will be exactly in its correct position and upon tightening of the screw 27, all subsequent actuations of that part of its spring 17 a distance necessary to turn the tuning element to the position at which the desired station is tuned in.

One of the advantages of this construction is that all lost motion and play between the station selectors and the tuning element is at all times taken up so that the optimum of accuracy will move the comb member 7 against the action

is assured. Likewise, in setting the various station selectors, the springs which yieldingly urge their respective pusher pins toward one position act to take up all play between the parts and thus assure accuracy in the setting of the various station selectors.

The station selectors move through substantially ninety degrees of rotation in their actuation from inoperative positions at which their pusher pins stand parallel to the comb teeth 14, to operative positions at which their pusher pins are perpendicular to and engage their respective comb teeth. To define these limits of movement of the station selectors, the pin 23 of each selector is arranged to contact stops 30 and 31 struck forwardly from a latch plate 32. The distance between these stationary stops 30 and 31 is just sufficient to permit the desired ninety degrees of rotation of the station selectors.

A hinge 33 mounts the latch plate 32 from the supporting plate 9, and torsion springs 34 coiled about the pin of the hinge 33 urge the plate forwardly. This forward flatwise motion of the latch plate 32 is limited by the engagement of raised cam portions 35 thereon with the rear faces 24 of the bushings 20.

It is desirable to effect the return of any previously actuated station selector to its normally inoperative position during actuation of any one other station selector, and to this end, each station selector is biased to its inoperative position by a torsion spring 36 coiled about the inner end of its shaft 21 with one end hooked thereto and its other end anchored to a fixed support 37. The springs 36 thus hold their respective station selectors in inoperative positions defined by the engagement of their pins 23 with the stops 30 on the latch plate 32.

It is, of course, also desirable to secure an actuated station selector in its operative position. For this purpose, the end of the cam projection 35 adjacent to the stop 31 is abrupt and the raised cam portion 35 is of less height than the stops 30 and 31. Hence, it follows that during actuation of a station selector, its pin 23 swinging in a fixed plane pushes the latch plate 32 back against the tension of the torsion springs 34 by virtue of the inclined forward end 38 of the raised cam portion 35, until the pin 23 strikes the stop 31, whereupon the springs 34 in pressing the latch plate 32 forwardly engage the abrupt end 39 of the cam portion 35 with the pin 23.

In this manner, the actuated station selector is releasably held in its operative position where it remains until a subsequent actuation of any other station selector. During such subsequent actuation of another station selector, the latch plate is again pushed backwardly by the pin 23 of the then actuated station selector pushing against the adjacent incline 38 to disengage the shoulder 39 from the pin 23 of the previously actuated station selector and releases it for return by its spring 36 to normal inoperative position.

Inasmuch as it is desirable to render the receiver inaudible during its adjustment by different station selectors, a switch 40 is provided. This switch may be connected in any suitable circuit of the receiver, or it may control the power supply to the receiver so that whenever it is opened, the receiver is rendered inaudible.

The movable contactor 41 of this switch is carried by the hinged latch plate 32 so that whenever the latch plate is pushed back, as during

the actuation of any one station selector, the switch 40 is opened.

Inasmuch as the switch 40 may be used to control the connection of the receiver to a power supply, it is desirable to have another switch 42 in parallel therewith to be controlled by the arm 18. This switch 42 is opened whenever the tuning device is set for automatic actuation, and closed whenever it is set for manual adjustment.

When the arm 18 swings to its dotted line position shown in Figures 1 and 3, it strikes a tongue 32' on the hinged latch plate 32 to swing the same rearwardly and automatically release any station selector for return to its inoperative position. This motion of the latch plate 32 produced by the arm 18 also opens the switch 40.

A modified and somewhat simplified embodiment of the invention is illustrated in Figures 7 and 8. In this instance, the rotation of the manually operative station selectors 43 is defined by fixed stops 44 which engage the pusher pins 15. No provision is made in this construction, however, for automatically returning the station selectors to their inoperative positions, and consequently, previously actuated station selectors must be manually returned to their inoperative positions before other station selectors are actuated.

It is to be observed that in this embodiment, the shafts of the station selectors are operable by levers 45, as distinguished from the buttons shown in the embodiment illustrated in Figures 1 to 6, inclusive. These levers may have inclined upper surfaces 46 upon which the call letters of the desired broadcasting stations may be directly delineated.

The switch 40' which renders the receiver inaudible during tuning adjustment thereof in this construction is actuated by a bar 47 slidably mounted for movement parallel to the comb-like member 7 and actuated during the latter degrees of rotation of the station selectors by short radial pins 48 extending from their shafts and striking lugs 49 depending from the bar 47. A spring 50 yieldingly retracts the bar 47.

In all other respects, including a manually operable arm 13a slightly different in construction than the arm 13 but serving the same purpose, the construction illustrated in Figures 7 and 8 follows substantially along the lines of the previously described embodiment.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention provides a simple and practical tuning apparatus for radio receivers which permits the application of so-called automatic tuning to the less expensive sets.

What I claim as my invention is:

1. Means for tuning a radio receiver comprising: a rotatable tuning element; a member mounted for linear motion; a driving connection between the member and the tuning element, whereby linear motion of said member transmits rotation to the tuning element; a spring yieldingly urging said member to one limit of its linear motion; a plurality of manually rotatable station selectors; a radial arm carried by each station selector; and abutments carried by said member engageable by the radial arms of the station selectors upon rotation of the station selectors, whereby said member is movable against the force of its spring a distance dependent upon the extent of throw which the radial arm of the chosen selector has.

2. Means for tuning a radio receiver comprising: a rotatable tuning element; a member mounted for linear motion; a driving connection between the tuning element and the member, whereby linear motion of said member imparts rotation to the tuning element; a plurality of longitudinally spaced abutments on said member; a spring yieldingly urging the member in one direction; a plurality of manually operable station selectors, one adjacent each of said abutments; and pusher members adjustably connected with said station selectors and operable upon actuation of the station selectors to engage their respective abutments to move said member a distance dependent upon the adjustment of the pusher members.

3. Means for tuning a radio receiver comprising: a rotatable tuning element; a member mounted for linear motion; a driving connection between the tuning element and the member, whereby linear motion of said member imparts rotation to the tuning element; a plurality of longitudinally spaced abutments on said member; a spring yieldingly urging the member in one direction; a plurality of manually operable station selectors, one adjacent each of said abutments; pusher members adjustably connected with said station selectors and operable upon actuation of the station selectors to engage their respective abutments to move said member a distance dependent upon the adjustment of the pusher members; and means for automatically effecting the return of any previously actuated station selector to its inoperative position during actuation of any other station selector.

4. In a radio tuning apparatus of the character described: a manually operable station selector movable between operative and inoperative positions; a spring yieldingly maintaining the station selector in its inoperative position; and releasable means for defining the limits of movement of the station selector and for releasably holding the same in its operative position, said last named means comprising a member movable in a fixed path with the station selector and a cooperating movable member biased to operative position and having stop abutments thereon engageable by the member movable with the station selector.

5. In a radio tuning apparatus of the character described: a plurality of manually operable station selectors, each movable between a normally inoperative position and an operative position; yieldable means holding each of said station selectors normally in its inoperative position; a unitary member biased to operative position and having stops thereon for defining the limits of movement of said station selectors and releasably holding the same in their operative positions; and means operable during actuation of any one station selector to its operative position for moving said unitary member out of operative position to release a previously actuated station selector for return to its inoperative position.

6. In a radio tuning apparatus of the character described: a plurality of manually operable station selectors, each movable between a normally inoperative position and an operative position; yieldable means holding each of said station selectors normally in its inoperative position; a unitary member biased to operative position and having stops thereon for defining the limits of movement of said station selectors and

for releasably holding the same in their operative positions; means movable with the station selectors and cooperable with said stops; and means operable during actuation of one station selector to its operative position for releasing a previously actuated station selector for return to its inoperative position, said last named means comprising, cams on said unitary member engageable by said means which move with the station selectors to move the unitary member out of its operative position.

7. In a radio tuning apparatus of the character described: a comb mounted for linear movement; a spring yieldingly urging the comb in one direction; a plurality of manually movable station selectors arranged in a row substantially between the teeth of the comb; means operable upon actuation of the station selectors for pushing against the teeth of the comb to move the same in opposition to the spring a distance depending upon the station selector chosen; and means for translating motion of the comb thus produced into adjustment of a tuning element of a radio receiver.

8. In a radio tuning device of the character described: a tuning element movable between limits; biasing means yieldingly urging the tuning element toward one limit of motion; a plurality of station selectors, each capable of moving the tuning element in opposition to its biasing means to adjust the receiver to a predetermined frequency, said station selectors including, adjustable motion transmitting elements through which motion produced by manual actuation of the station selectors is transmitted for adjusting the tuning element; means for selectively securing said motion transmitting elements in any position of adjustment within limits; and means for yieldingly urging said motion transmitting elements toward one limit so that during adjustment of said motion transmitting elements all play is taken up.

9. In combination with a rotatable tuning element of a radio receiver: a member mounted for linear movement; means connecting said member with the rotatable tuning element so that linear movement thereof is translated into rotation of said tuning element; a plurality of abutments on said member spaced along the length thereof; an equivalent number of manually rotatable station selectors arranged along the length of said member, each independently rotatable to and from an operative position; and radial arms mounted to be swung through arcs in line with said abutments by rotation of said selectors to effect engagement between said arms and the abutments for propelling said linearly movable member a distance determined by the throw of the actuated arm.

10. In combination with a rotatable tuning element of a radio receiver: a member mounted for translating motion; means connecting the member with the tuning element so that translating motion thereof imparts rotation to the tuning element; a plurality of abutments fixed with respect to said member and spaced along the length thereof; a plurality of independently rotatable station selectors, one for each of said abutments; a radial arm carried by each of said rotatable station selectors and readily adjustable as to the length thereof, said radial arms being aligned with the abutments so that rotation of

the selectors swings the arms into engagement with the abutments to move said member a distance determined by the setting of the actuated arm; means for releasably holding each station selector in its operative position; means for yieldingly urging each station selector to its inoperative position; and means operable by rotation of any one station selector for releasing a previously actuated selector for return to its inoperative position.

11. In combination with a rotatable tuning element of a radio receiver: a member mounted for translating motion; abutments carried by said member and spaced along the length thereof; independently rotatable station selectors arranged in a row along the length of said member; means for translating rotation of said selectors into translating motion of said member; a radial abutment movable with each of said selectors; a stop member movable substantially at right angles to the axes of the selectors; abutments on said stop member with which the radial abutments of the selectors engage to hold the selectors in operative positions; cams on said stop member engageable by the radial abutments for moving said stop member to release the radial abutment of a previously actuated selector; and means for yieldingly urging the individual station selectors to their inoperative positions.

12. In an apparatus for tuning radio receivers, the combination of: a plurality of independently rotatable station selectors; means for translating rotation of each station selector into tuning adjustment of a tuning element of a receiver; a radial arm for each station selector arranged to swing through an arc upon rotation of its selector; a stop member common to all of said selectors and having portions over which said radial arms swing; means mounting said stop member for movement substantially parallel with the axes of the selectors; means yieldingly urging said stop member toward the radial arms; abutments on said stop member engageable by the radial arms to define the limits of rotation of the selectors; means yieldingly urging each selector to its inoperative position; abutments on said stop member engageable with the radial arms to releasably hold the selectors in their operative positions; and cams on the stop member engageable by said arms to move said stop member and effect disengagement of the radial arm of any previously actuated selector from its associated last named abutment.

13. In a radio tuning apparatus: a plurality of individually rotatable station selectors; means for translating rotation of the station selectors into tuning adjustment of a tuning element of a radio receiver; a radial abutment carried by each station selector; a movable stop member having abutments cooperable with the radial abutments for limiting rotation of the station selectors and for releasably holding the station selectors in predetermined positions of adjustment; means yieldingly urging the station selectors to other positions of adjustment; means on the stop member coacting with the radial abutments for moving the stop member to release a previously actuated station selector; and a switch for rendering the receiver inaudible during tuning adjustment, including a movable contactor operated by said motion of the stop member.

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