

March 20, 1945.

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2,372,099

TUNING MECHANISM FOR RADIO RECEIVERS AND THE LIKE

Filed Aug. 3, 1940

6 Sheets-Sheet 1

Fig. 1.

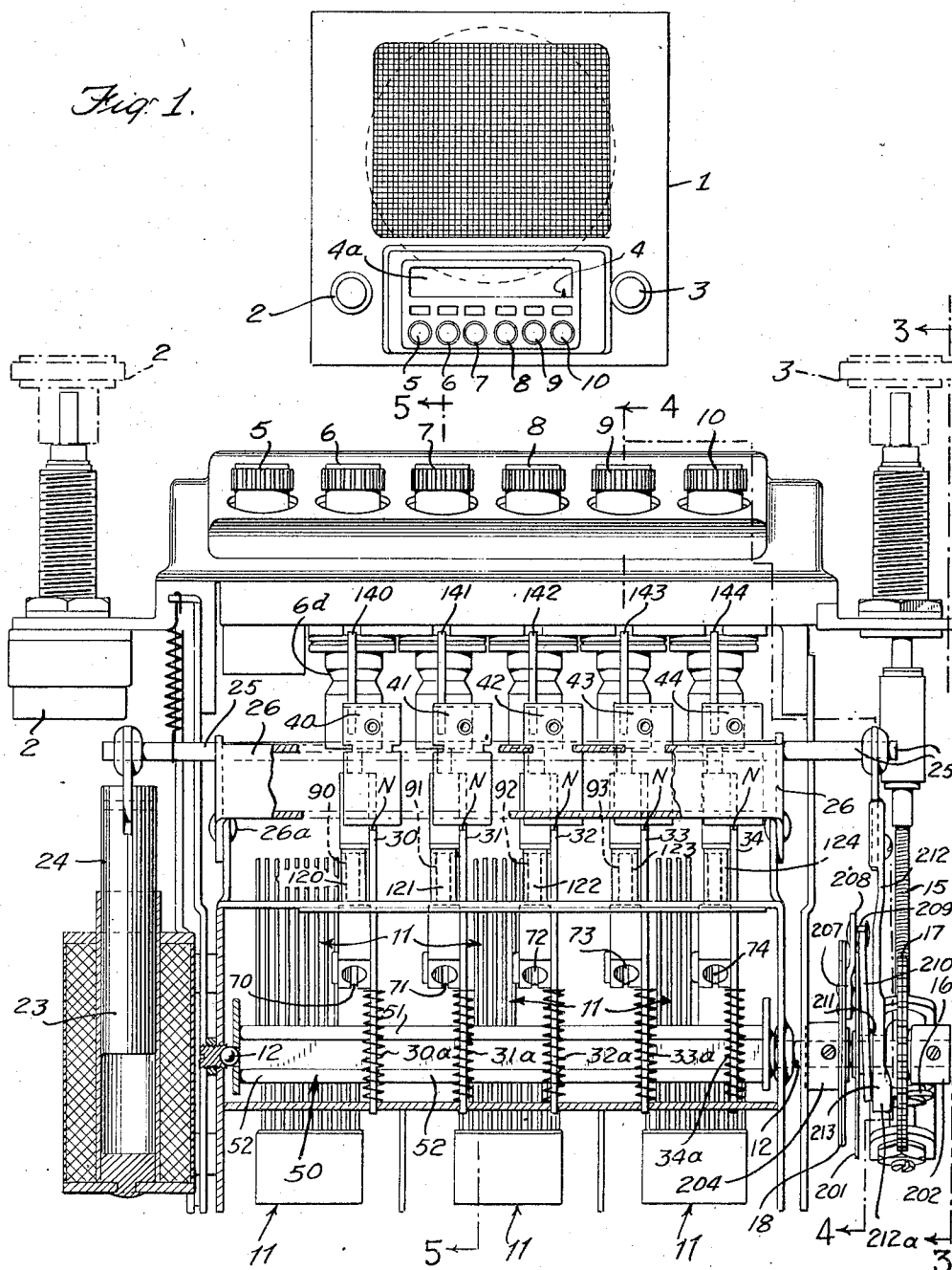


Fig. 2.

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Fig. 3.

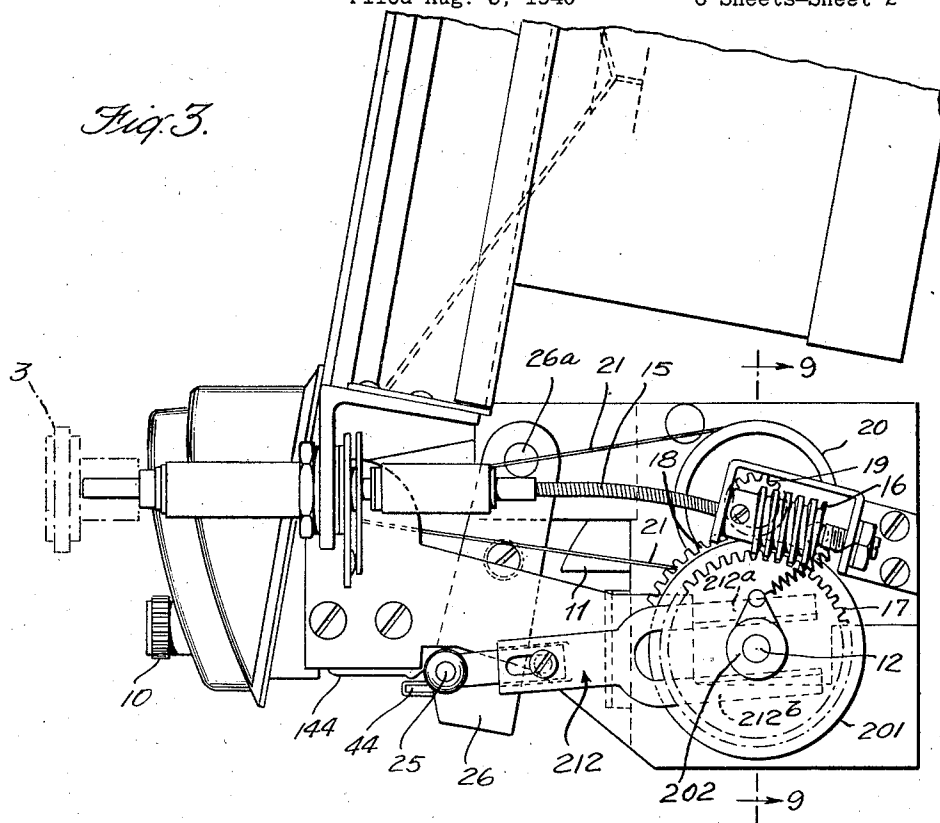
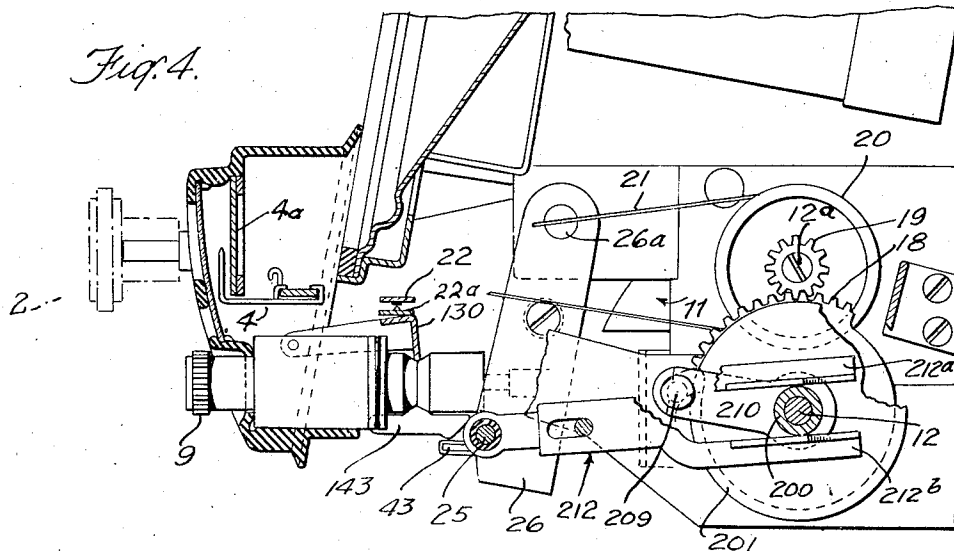


Fig. 4.



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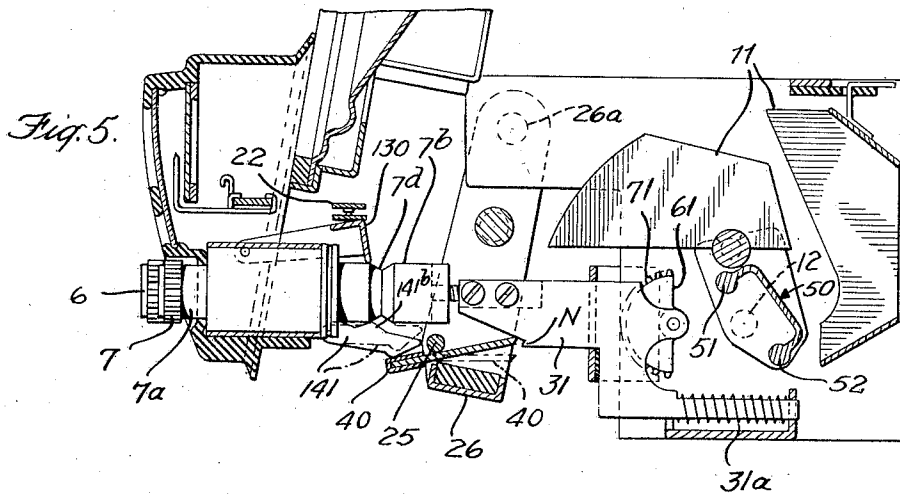
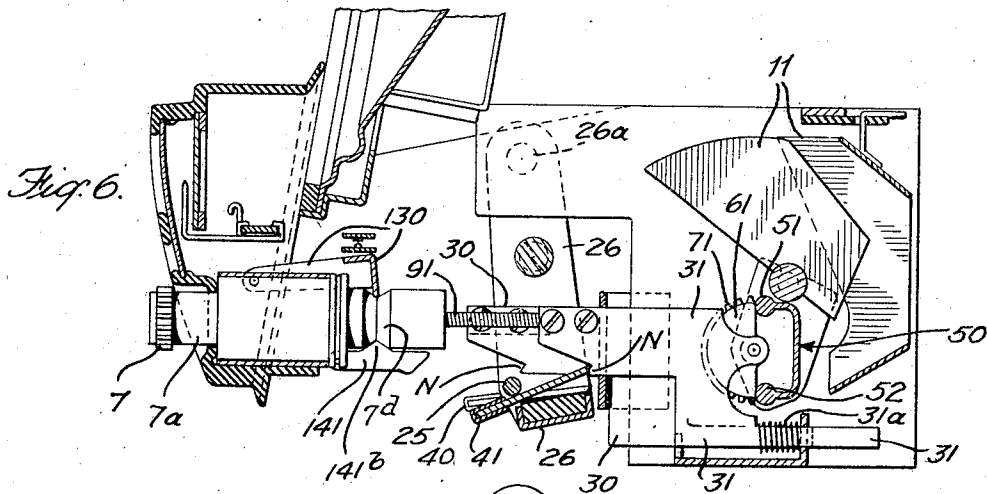
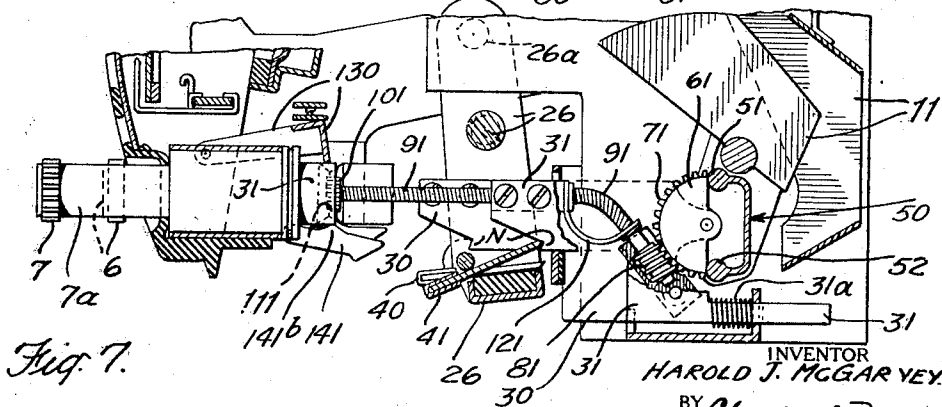
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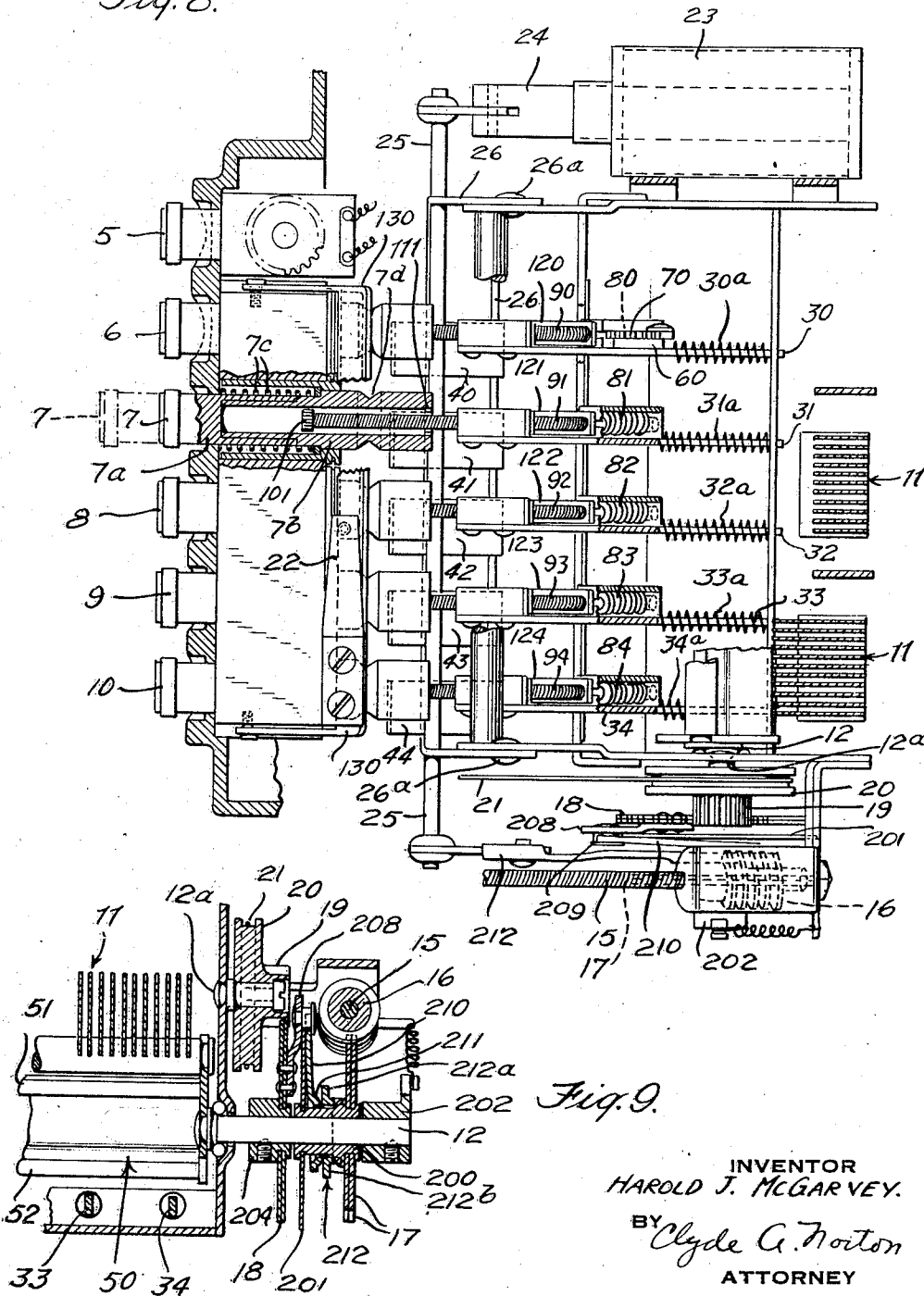
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Fig. 8.



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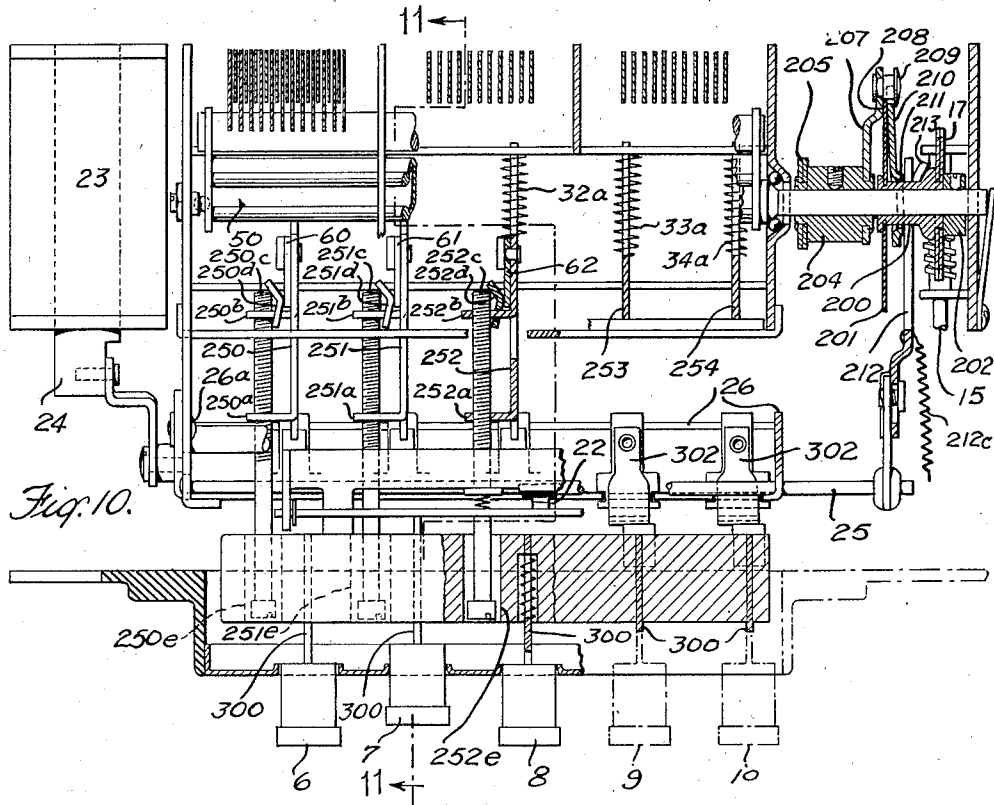
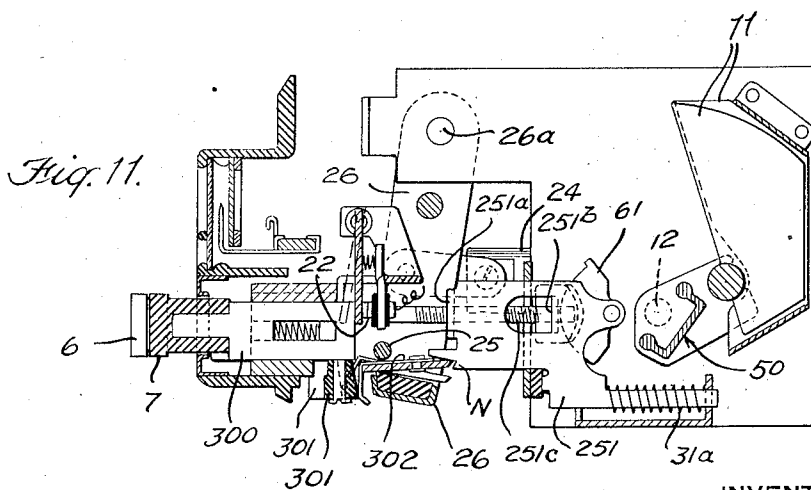
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TUNING MECHANISM FOR RADIO RECEIVERS AND THE LIKE

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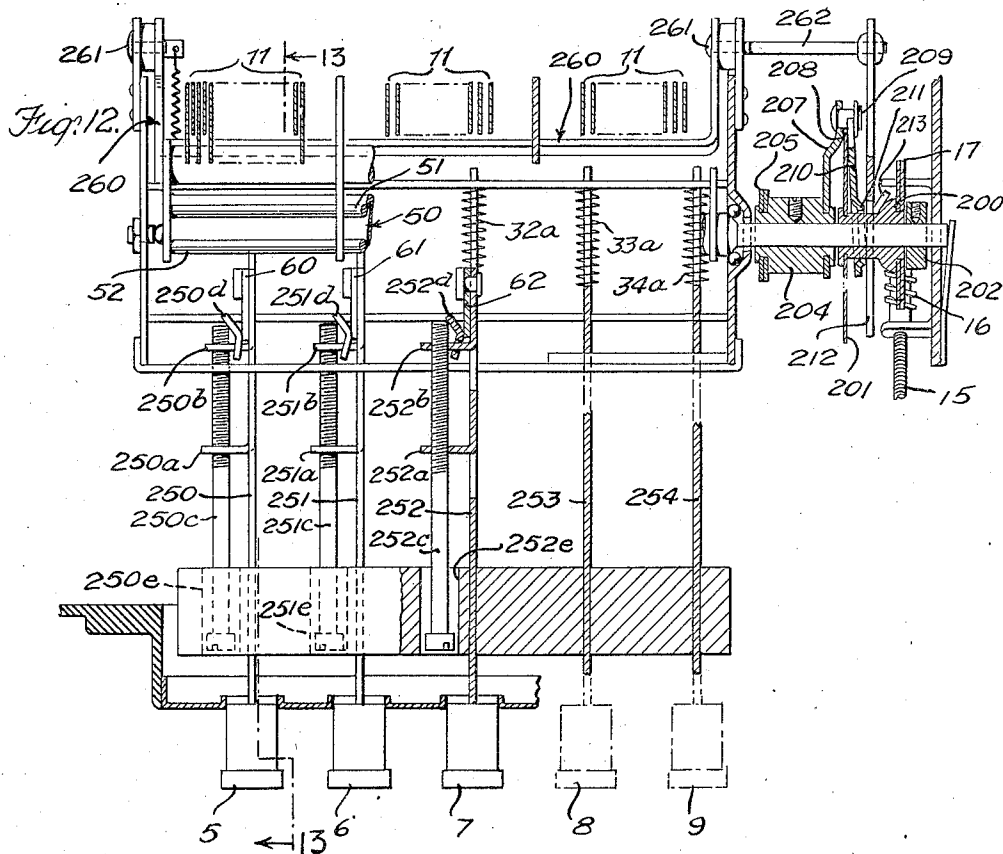
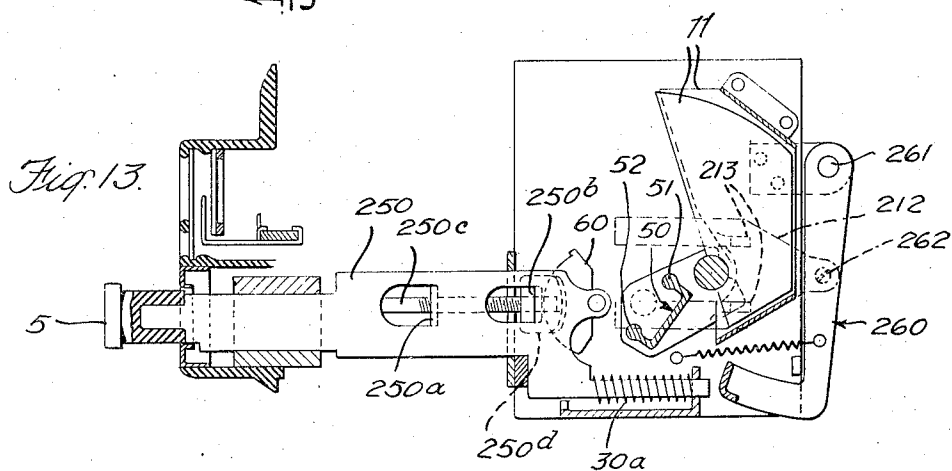
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TUNING MECHANISM FOR RADIO RECEIVERS AND THE LIKE

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UNITED STATES PATENT OFFICE

2,372,099

TUNING MECHANISM FOR RADIO
RECEIVERS AND THE LIKEHarold J. McGarvey, Buffalo, N. Y., assignor to
Colonial Radio Corporation, Buffalo, N. Y.

Application August 3, 1940, Serial No. 350,420

4 Claims. (Cl. 74-10)

This invention relates to tuning mechanisms for radio receivers and the like, that is to say, to means by which the radio receiver may be quickly and accurately tuned to a particular station for which the apparatus has previously been set or calibrated. In the particular embodiment herein disclosed, the tuning mechanism is of the so-called electrically operated push button type, by means of which the operator may push a button and the apparatus will be electrically adjusted to the particular station for which that push button has been set or calibrated.

My apparatus also contemplates manual means for selecting the desired stations which may be operated independently of and without interference with the push buttons, and for this, there is interposed between the manual drive and the tuning element per se a clutch which operates to disconnect the manual control selector mechanism from the tuning apparatus when any push button is operated. Immediately after the operation of the push button, the clutch is again connected so that the apparatus may be tuned manually.

While I have shown and described my apparatus as embodying a so-called gang condenser for this purpose, it will be understood that my invention is applicable to receivers which are tuned by other means, for example by the variation of inductance.

Among the objects of my invention may be mentioned:

To provide apparatus which is relatively simple and economical to manufacture consisting practically entirely of punch press and screw machine parts, involving a minimum of material and requiring a minimum of labor in assembly;

To provide electrically actuated apparatus which may be operated with very little current drain, particularly adapted for use on automobiles, boats and the like, where it may be operated from the storage battery usually provided for other purposes;

To provide apparatus which is simple and reliable in operation, which will require no effort or careful manipulation by the operator to select desired stations, which is not likely to give incorrect setting because of wear of parts and the like, and generally to provide a compact, inexpensive, reliable apparatus for selecting the desired stations;

To provide apparatus in which the particular buttons may be easily and quickly pre-set or calibrated without the use of tools; that is to say, to provide apparatus in which the calibration of

particular buttons to particular frequencies may be easily and quickly made without tools and without requiring the disassembly of the set, or removal of buttons, cover plates, or other parts, and in which the buttons may be re-calibrated whenever desired in a similar manner.

To provide apparatus in which the manual knob drive may be disconnected from the tuning shaft whenever any push button is operated;

To provide such apparatus in which the normal operation of the buttons to select stations can not accidentally disturb the calibrations previously made;

To provide such apparatus in which the selection of a previously calibrated station may be achieved by simply pushing the button in and in which re-calibration of the button may be achieved simply by pulling the button out and rotating it;

To provide such apparatus in which rotation of the button in any but the calibrating position will not disturb the calibration already made.

Still other objects and advantages of my invention will be apparent from the specification.

In this application I have particularly pointed out and distinctly claimed the part, improvement or combination which I claim as my invention or discovery and I have explained the principles thereof and the best mode in which I have contemplated applying those principles, so as to distinguish my invention from other inventions.

In the drawings:

Fig. 1 is a front elevation view of a radio receiver according to my invention;

Fig. 2 is a bottom plan view partly in section and partly broken away thereof;

Fig. 3 is a partial sectional elevation on lines 3-3 of Fig. 2;

Fig. 4 is a similar view on lines 4-4 of Fig. 2;

Fig. 5 is a similar view on lines 5-5 of Fig. 2, the mechanism being in an intermediate position in process of selecting a station;

Fig. 6 is a view on the same lines as Fig. 5, but showing the mechanism in final position in selecting a station;

Fig. 7 is a view on the same lines as Fig. 5, but showing the mechanism in position to calibrate a button;

Fig. 8 is a top plan view partly in section;

Fig. 9 is a section on lines 9-9 of Fig. 3;

Fig. 10 is a top plan view of a modified form of apparatus with certain parts in section and part broken away;

Fig. 11 is a section on lines 11-11 of Fig. 10;

Fig. 12 is a top plan view partly in section of still another modification; and

Fig. 13 is a section on lines 13—13 of Fig. 12.

Referring now more particularly to Fig. 1, 1 designates the casing or container of the radio receiver, which may have manual rotary knobs 2 and 3 positioned on opposite sides of the front face thereof, 2, designating the knob which may operate the on-off switch and volume control, and 3 the knob operating the tuning mechanism manually to carry the pointer 4 across the dial 4a, 5, 6, 7, 8, 9 and 10 may represent the push buttons, which may be calibrated or pre-set so that when a particular button is pushed, a particular station is tuned in as indicated by the station call letter tabs.

The actual syntonizing of the circuit may be done by any suitable means, such for instance as the variable gang condenser 11 having a series of stators into and out of which rotors may swing about axis 12. Such condensers are well-known in the art, and since the particular condenser construction per se is not a part of this invention, the same is not described in detail. It will be understood that other tuning instrumentalities, such as variometers or the like may be employed in place of or in addition to the variable condenser shown.

In selecting a station manually by means of knob 3, rotation of the knob 3 rotates the shaft 15 (see Fig. 3) which may be a flexible shaft connected to knob 3 which in turn rotates worm 16, this worm 16 engaging a gear 17 which is normally connected to a second gear 18 through the medium of a clutch which will be described hereafter more in detail. Ordinarily, the clutch directly connects gear 17 to gear 18 so that gear 18 rotates with gear 17 at the same speed. Gear 18 may engage a gear 19 mounted on the stud shaft 12a of the variable condenser and a pulley 20 may also be mounted on stud shaft 12a, the pulley carrying cord 21 which in any suitable and well-known manner carries the pointer 4 across the dial. Thus, rotating knob 3 normally rotates condenser 11 and tunes the receiver.

Pushing any of the buttons 5 to 10 forward, first causes closure of switch 22 in a manner which will be described hereafter. Closure of switch 22 serves to energize the solenoid 23 which then draws in its core 24. Connected to the core 24 there is provided a rod 25 mounted in a cradle or bail 26 pivoted at 26a so that when 24 moves into the coil, the cradle or bail is swung downwardly as seen in Fig. 2, counter-clockwise, as in Figs. 5 and 6.

Corresponding to each of the push buttons 6—10 inclusive, there may be provided a plunger 30, 31, 32, 33 and 34 respectively although for simplicity of illustration some of these have been omitted from the drawings. The plungers may be spring biased to forward position, as by springs 30a, 31a, etc., and are selectively driven by the forward motion of the cradle.

For this purpose the cradle carries a pivoted latch for each plunger, the latches being 40, 41, 42, 43, and 44 and these latches are mounted on the cradle in such a manner that they may be rocked counter-clockwise in the cradle through a small angle, but are normally biased to full clockwise position. When in the latter position they clear the plungers and the cradle may swing without moving any plungers. However, when a button is pressed, at the same time that the solenoid is energized, the corresponding latch is tipped counter-clockwise by mechanism which

will be described later, into such a position that when the cradle swings, the right hand end of the latch engages a notch N on the lower face of its corresponding plunger and moves the said plunger to the full length of its downward motion in Fig. 2 (to the right in Figs. 5 and 6).

When any plunger is moved to the full extent of its movement, it engages the tilt bar 50 and turns it to a greater or less extent, the amount of the turning being dependent upon the angular position of the contact-making sectors 60, 61, 62, 63 and 64 located on the plungers 30, 31, 32, 33 and 34 respectively. This sector and tilt bar engagement and the resultant rotation of the tilt bar is best seen in Figs. 5 and 6, in which sector 61 is shown pivotally mounted upon the end of its corresponding plunger 31 and normally secured against rotation. When the plunger 31 moves to the right in Fig. 5, it will be seen that the sector will strike one or the other of the faces 51 and 52 of the tilt bar, and the tilt bar will be turned so that said faces are in alignment with the edge of the sector as shown in Fig. 6.

Since the tilt bar shaft is the rotor shaft, rotation of the tilt bar will rotate the condenser rotors, and for any particular position of the condenser corresponding to any particular wave length or frequency, there is a corresponding angular position of the tilt bar and also a corresponding angular position of the sector. Once any particular sector has been rotated to the proper angular position corresponding to the desired station and secured in such position, repeated operation of its particular push button will always cause the tilt bar to return to the proper position to set the condenser for that particular station.

In apparatus of this general nature, it has heretofore been necessary to use special tools, and sometimes disassemble the receiver at least partially in order to adjust the various sectors in order to calibrate the receiver for particular stations. According to this invention, it is possible to adjust or calibrate any button without the use of any tools and without disassembling or partially disassembling the apparatus in any way. This is accomplished by providing gear teeth on the arcuate face of the sector, the gear teeth being respectively indicated at 70, 71, 72, 73, and 74. The gear teeth of each respective sector are engaged by a corresponding worm 80, 81, 82, 83, and 84 respectively, mounted on the corresponding plunger and each worm may be driven by a corresponding flexible shaft 90, 91, 92, 93 and 94, mounted on its particular plunger and extending forwardly beyond the end of the plunger into its particular button assembly as best seen in Figs. 7 and 8.

Each of these flexible shafts terminates in a small spline 100 to 104 and the splined end of the shaft projects into the rear end of the push button itself which is hollow. The rear end of each button is provided with an internal spline 110—114 to engage the spline upon the end of the flexible shaft. Normally the splines 100 and 110 are disengaged, and sufficient clearance is provided so that the button may be rotated without rotating shaft 91, but when the button is pulled out, the splines engage and rotation of the button rotates shaft 91, worm 81 and sector 71.

It will now be understood that in order to pre-set or calibrate any particular push button to a particular station it is only necessary to grasp the button desired and pull it out until the internal spline on the inner end of the button engages

the spline on the flexible shaft. This motion closes the solenoid switch and trips the latch corresponding to that particular button in a manner which will be described hereafter, and the particular plunger corresponding to the button pulled out is moved until its sector engages the tilt bar and turns the tilt bar to the angular position corresponding to that for which the sector happens to be set. So long as the push button remains out of neutral position, the solenoid switch is closed and the plunger is held in position with the sector engaging the tilt bar. Now by rotation of the button, the flexible shaft from the button to the sector is rotated and the sector is rotated through the action of its worm, thus rotating the tilt bar and changing the tuning of the set. In order to select the desired station, one need only to continue to rotate the button until the desired station is heard at its best position, whereupon the button is pushed back to neutral position, the solenoid switch opens and all apparatus returns to neutral position except the sector which remains in the position to which it was turned by the operating of its worm, and the condenser, which remains in the angular position to which it was turned.

To eliminate the possibility of the sectors working out of adjustment, the worm may be spring loaded as indicated at 120 to 124, this spring loading serving to prevent any play between the worm and gear and thereby holding the sector firmly in adjusted position. The pitch of the worm is preferably made such that the worm and gear connection is irreversible, the worm acting as a latch to hold the sector rigidly in adjusted position even when in engagement with the tilt bar and exerting sufficient pressure upon it to move the tuning apparatus. The buttons as already indicated are in the form of sleeves and preferably they may be made in the form of two telescoping parts, 1a and 1b respectively having a reduced center section on the outside so that a spring 7c may be positioned within the housing to bias the buttons to neutral position, best seen in Fig. 8.

The rearwardly extending portion of the button is preferably provided with a V-shaped circumferential groove 1d. Normally resting in this groove in the upper side thereof is the switch actuating bar 130 which is in the form of a bail pivoted about a horizontal axis forward of switch 22, and may be under the movable switch contact 22a of solenoid switch 22. This switch actuating bar extends across all of the buttons and normally lies within the groove in each button so that upon movement of any push button, either in or out, the switch bar will be displaced and the solenoid switch will be closed, this providing for the energizing of the solenoid either when the button is pushed in to select a station or pulled out to change the calibration of the button.

For the purpose of tripping the latch when a button is moved, each button is preferably provided with a finger 140 to 144, pivotally mounted at its outer end as at 141a on the button housing, just under the button, and having a projection on its upper side 141b normally riding in the groove in the button. The rear end of the finger projects backwardly and normally lies above its corresponding latch, as will be seen more clearly in Fig. 4. When the button is either pushed in or pulled out, the movement of the button carries the V-shaped groove to one side or the other of the projection on the finger, and the finger is accordingly tilted clockwise, and engages its corresponding latch and swings the same counter-

clockwise as will be seen in Fig. 5. When the cradle begins to swing, the latch first engages the notch on its corresponding plunger and then passes out of engagement with the finger, but the latch is prevented from falling back to initial position by its engagement with the undercut notch N in the plunger, and the latch will not return to initial position until the solenoid switch is de-energized and the cradle returned to initial position.

It has already been stated that I preferably provide a clutch interposed between the manual tuning means and the condenser shaft. A preferred manner of constructing the clutch mechanism will now be explained, and is best seen in Figs. 9 and 10. Referring to Figs. 3 and 4, it has been stated that rotation of the manual tuning knob drives worm 16 through shaft 15, the worm 16 engaging and rotating gear 17. Gear 17 may be secured to bushing 200 suitably mounted on condenser shaft 12 free to rotate, but fixed axially by collars 202 and 204. Sleeve 200 also carries at one extremity the clutch disc 201, consisting preferably of a thin sheet metal disc. Discs 201, sleeve 200 and gear 17 are all rigidly secured together in a manner to rotate as a unit, but are free to rotate with respect to the condenser shaft. Secured to condenser shaft 12 to rotate therewith, there is preferably provided sleeve or collar 204 mentioned above, carrying at its inner side gear 18 which engages gear 19 already described for the purpose of moving the dial indicator. Mounted on gear 18 and extending radially outward therefrom, I may provide an arm 207 terminating at its outer extremity in an offset portion 208 to which there may be secured as by rivet 209 the pinch bar 210 having its inner end terminating in a collar surrounding the shaft 12 and slightly offset as at 211.

The arm 207 and bar 210 and the disc 201 form the actual clutch itself. Bar 210 is biased by its own inherent resiliency away from disc 201 and when permitted to take such position, there is sufficient clearance to permit the periphery of disc 201 to pass between arm 207 and pinch bar 210.

When, however, the lower end of pinch bar 210 is pressed in the direction of sleeve 204, it will be seen that the periphery of disc 201 will be pinched between arm 207 and pinch bar 210 and that rotation of the disc 201 by connection through sleeve 200 and gear 17 to the driving knob will cause rotation of sleeve 204 and thereby of the condenser shaft 12 and the condenser.

Normally this clutch mechanism is maintained in engaged position by rod 212 having its outer end bifurcated as at 212a and 212b, the bifurcated end passing between sleeve 200 and pinch bar 210. The outer end of the bifurcated portion may be split and slightly offset or bent as at 213, so that when rod 212 is biased to its normal or rest position as by spring 212c, the wedging action of rod 212 serves to hold the pinch bar 210 against arm 207 and thereby clamp the periphery of disc 201, keeping the clutch engaged. The forward end of rod 212 is connected in any suitable manner and preferably by a slot adjustment (providing for a certain amount of tolerance in setting up the apparatus) to rod 25 which is carried on bail 26; thus when any push button is operated and the solenoid switch closed as already described, the bail moves downwardly, as seen in Fig. 2 pushing rod 212 downwardly in that figure, releasing the pressure on pinch bar 210

permitting it to move to the right and free the periphery of disc 201, whereby continued movement of the ball may operate one of the plungers as already described and thus rotate the tuning condenser to the previously calibrated position, but without rotating disc 201, gear 17 and worm 18.

In this connection it will be noted that the dial and indicator are connected through gearing already described to the condenser shaft at a point beyond the clutch mechanism; that is to say, at a point between the clutch mechanism and the condenser, so that operation of the clutch mechanism does not interfere with operation of the dial and pointer, which is always connected to the condenser shaft itself and must move with any movement of the condenser shaft.

The modified forms of apparatus shown in Figs. 10 and 11 and 12 and 13 respectively differ very little from the form shown in Figs. 1-9 and the difference principally is that in the apparatus of Figs. 10 and 11, the worm and gear drive from the individual push buttons to the corresponding sector has been eliminated, this difference resulting in mechanism which while not as conveniently adjustable for calibrating as the previously described form is possibly somewhat less expensive to manufacture.

In this modification, which is electrically operated by means of the solenoid and bail as before, the plungers 250, 251, 252, 253, and 254 are provided with a pair of laterally extending ears, one behind the other, 250a, 250b, 251a, 251b, etc., and one or both of the front and back ears on each plunger may be threaded to receive bolts 250c, 251c, etc. The sectors 60, 61, etc., in this instance do not need to be provided with gear teeth around their periphery, but each is held by means of a clamp strip 250d, 251d, etc., which may take the form of a small disc slightly bent, as indicated and having a slot therein to receive the respective ear 250b, 251b, etc., when the respective bolts 250c, 251c, etc., are retracted. The head of the respective bolts may extend through openings 250e, 251e, etc., in the front of the casing and may be covered by an escutcheon plate which may be removable for the purpose of calibrating the particular buttons.

This may be done by first tuning the desired station by the manual tuning knob, then backing off on the clamping bolt for the particular button, then operating that button, which will rotate the sector to the angular position which the tilt bar then has the sector being free to turn, and then while still holding the button in depressed position, tightening the clamp bolt to clamp the sector in position. Another difference which may be pointed out is that since the push buttons do not need to be rotated, a very simple plunger structure in the form of a flat stamping may be utilized for each button, as indicated by reference numeral 300. As before, depressing any of the push buttons closes the solenoid switch 22 and rotates the corresponding latch to counter-clockwise position, so that when the solenoid swings the bail inwardly or counter-clockwise, as seen in Fig. 11, the latch engages the notch and in its corresponding plunger and said plunger is carried forward to engage its sector with the tilt bar. In this instance each plunger may carry at its inner end and extending downwardly from it a block of insulating material 301, the inner face of which engages the turned-down end of a spring 302 secured to each latch. In this case, the

switch 23 may be arranged slightly differently, the movable contact 22a being mounted on a bar 22b pivoted at opposite ends and normally extending vertically downward behind the plungers, so that movement of a plunger rotates it counter-clockwise in Fig. 11 to close switch 22.

Referring now more particularly to Figs. 12 and 13, there are shown still further simplified forms of apparatus in which the operation of the push buttons is manual, the solenoid, bail and latches all being eliminated and the necessary force required to operate the tuner being applied by the user in pushing the buttons.

The adjustment of the sectors, both as to the means for clamping them in position and the manner of adjusting them, is the same as already described with reference to Fig. 10 and the clutch mechanism is substantially the same as that already described, with the single exception that since the solenoid driven bail is no longer present, the clutch engagement and dis-engagement lever 212 is now pivotally connected to a bail 260 pivoted as at 261 and having the operating rod 212 pivotally attached as at 262. The bail extends across the path of motion of all of the plungers so that on pushing any push button, the bail 260 is engaged by the depressed plunger and rotated counter-clockwise as in Fig. 13, thereby declutching the condenser shaft from gear 17 and permitting easier operation of the button.

Since the power for moving the tuner is applied by the finger of the operator, the plungers in this instance extend forward and terminate in the push buttons instead of just back of the bail 26 as in the forms previously described.

While I have shown and described certain preferred embodiments of my invention, it will be understood that modifications and changes may be made, without departing from the scope of my invention, as will be clear to those skilled in the art.

I claim:

1. In push button tuning mechanism, in combination, a tilt bar, tuning means connected thereto to be driven thereby, a plurality of plungers for selectively operating said tilt bar, each of said plungers having a sector rotatably mounted thereon for engaging said tilt bar and determining the angular position thereof, a plurality of push buttons each corresponding to a plunger, said push buttons being arranged to be pushed inwardly and pulled outwardly from neutral position, and means operatively connecting each push button with the sector on its corresponding plunger for rotation when said button is outwardly displaced from neutral, whereby each push button may be preset without the use of tools.

2. In push button tuning mechanism, in combination, a tilt bar, tuning means connected thereto to be driven thereby, a plurality of plungers for selectively operating said tilt bar, each of said plungers having a sector rotatably mounted thereon for engaging said tilt bar, a plurality of push buttons, each corresponding to a plunger, a worm mounted on each plunger and engaging the corresponding sector for rotation thereof, a shaft for driving each worm and means for connecting each push button to its corresponding shaft for rotation thereof, whereby rotation of said push button may rotate its corresponding sector.

3. In push button tuning mechanism, in combination, a tilt bar, tuning means connected thereto to be driven thereby, a plurality of plunger

ers for selectively operating said tilt bar, each of said plungers having a sector rotatably mounted thereon for engaging said tilt bar, a worm engaging each of said sectors for adjusting and holding the same in adjusted position, a shaft extending from each worm into its corresponding push button, but normally disengaged for rotation, said shaft and said push button being arranged to be engaged for rotation together on outward displacement of said push button.

4. In push button tuning mechanism, in combination, a tilt bar, tuning means connected thereto to be driven thereby, a plurality of plung-

ers for selectively operating said tilt bar, each of said plungers having a sector rotatably mounted thereon for engaging said tilt bar, a worm engaging each of said sectors for adjusting and holding the same in adjusted position, a shaft extending from each worm into its corresponding push button, but normally disengaged therefrom for rotation, a spline on the end of said shaft, and an internal spline on the inner end of said push button, whereby pulling said push button outwardly engages said splines for rotation of said shaft by said push button.

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