MEANS FOR TUNING RADIO RECEIVERS

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Means for Tuning Radio Receivers

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1 This invention relates to tuning means for radio apparatus and more particularly to combined automatic and manual tuning means, the automatic means being specifically designed to scan the frequency band being received through some driven source. It has been somewhat conventional to provide radio receiving sets which are automatically tuned by being driven through a motor, the motor being controlled in various manners to index the receiver to certain predetermined stations. Obviously there must be a driving connection between the motor and the tuning means and this has in many instances taken the form of gearing. At the same time, it is, of course, useful to provide some manually controlled means for setting the receiver to certain desired stations, which can be operated over and above any automatic operation through the motor drive. It has been somewhat difficult to provide a manual drive, inasmuch as the motor drive comprises a considerable load to be driven by the manual plus the difficulties of tapping into the drive at some predetermined points, and still providing through either source of actuation practical and satisfactory operation. More recently there has come upon the market receiver tuning means which is actuated by the incoming signal itself. These are provided with some source of power for scanning or tuning the receiver over the band and then indexing means for stopping the tuner when a signal is received. Some of these have had manual means in addition for setting the set and some have not.

It is the object of my invention to provide a compound manual and motor driven connection for the tuning means of radio apparatus.

It is a further object of my invention to provide direct mechanical connections between a manually operated knob and motor driven equipment, alternately operable for tuning radio apparatus.

With these and other objects in view, which will become apparent as the specification proceeds, my invention will be best understood by reference to the following specification and claims and the illustrations in the accompanying drawings, in which:

Figure 1 is a top plan view of a tuner embodying my invention.

Figure 2 is an enlarged partial top plan view with parts broken away and shown in section of the gear train and drive embodying my invention.

Figure 3 is a vertical sectional view taken on line 3—3 of Figure 2 in the direction of the arrows.

Figure 4 is a vertical sectional view taken on line 4—4 of Figure 1 in the direction of the arrows.

Figure 5 is a vertical sectional view taken on line 5—5 of Figure 1 in the direction of the arrows.

Figure 6 is a sectional view taken on line 6—6 of Figure 5 in the direction of the arrows.

Referring now more specifically to the drawings, it is, of course, well known that in tuning radio apparatus, it is conventional to vary either the capacity or the inductance in the resonant tuned circuits of the apparatus. There is illustrated in the accompanying drawings a tuner utilizing variable inductance for tuning, but it will be obvious that my invention could be equally as well applied to any other form of tuning, such as condenser tuning, and that the present showing is for illustrative purposes only.

Referring now more specifically to the drawings, there is shown therein a frame 2, upon which are supported a plurality of inductance coils 4, 6 and 8, which are adapted to be connected into the resonant circuits of a radio receiver, and their values are adapted to be changed by the insertion or withdrawal of a series of commutated cores 10, which may be inserted into or withdrawn from the coils. These cores are formed of very highly commutated material and compressed under high pressure, and have slaked into one end thereof a supporting wire or thin rod 12 terminating in a screw threaded end portion 14, which is carried by a transverse bar 16. The threaded ends engage threaded openings in the bar and may be adjusted with respect thereto for alignment purposes. The bar projects through slotted openings 18 in opposite sides of the frame, and may slide back and forth longitudinally thereof to carry the cores. Pivotal links 20 are connected adjacent opposite ends of the bar for driving purposes and in turn are pivotally connected to upstanding arms 22, which are connected to and turn the transverse shaft 24, this shaft being rotatably supported on the frame in any suitable manner.

Mounted on one end of the shaft just inside the frame is a sector driving gear 26, which, when rotated, turns this shaft, and through the links 20 connected to it, turns the core-coil assemblies. Mounted in the wall of the frame is an elongated bearing member 28, which is adapted to rotatably support a stub shaft 30, which carries on its inner end a pinion 32, which engages the sector gear 26 to drive the same. A circular groove in the shaft 30 adjacent the outer end of the bearing member 28
has snapped thereinto a spring member 34, which maintains this shaft against endwise motion. Secured to the outer face of the bearing 28, is a supporting plate 36 which has two spaced upturned ears 38 and 40, in which are aligned openings to rotatably support a drive shaft 42. This shaft 42 is positioned at right angles to and below the stub shaft 30. A collar 44 for driving the tuner is supported to the frame, and its shaft 45 projects through the supporting plate and carries on its outer end a worm gear 48 secured to the shaft by a set screw or other suitable means.

Fixedly secured to the shaft 42, adjacent the right hand end, as viewed in Figures 1 and 2, is a gear 50 adapted to engage the worm 48 and be driven thereby. This provides a drive for the shaft 42. To the left of gear 50 there is secured by a set screw a collar 52 on said shaft 42 which has a pair of projecting tongues 54, extending in an axial direction and adapted to project into slotted openings 56 in a circular clutch member 58, also carried by the shaft. Thus, the clutch member may move to a limited extent axially on the shaft and yet be driven by the same. A friction facing 59 is carried by the clutch face 58, permitting satisfactory drive. The shaft 42 carries loosely on its left hand end a second worm gear 62, which has integrally mounted with one face thereof a cooperating clutch face 64, which is adapted to engage the friction material 59 carried by the opposing clutch face 58. Thus, the motor 44, when energized, will drive the shaft 42, but worm 62 will not be driven unless the clutch is in engagement.

Pivotedly mounted on the plate 36 is a clutch operating arm 66, which has a portion having an opening therefor through which the shaft projects and which provides opposite arms 66 and 70 which extend down around the clutch member 58 and bear against the same to force it into engagement with the opposing clutch face 64 when pressure is applied to the lower end thereof through engagement with either a motor 44, or through manual rotation by means of parts to change from one to the other, and that the drive is completely mechanical for, either through the motor 44 automatically actuated or through manual rotation of the knob 66, and the operation of such drive will now be described.

Let it be assumed first that it is desired to operate the tuner manually and in this case, of course, the motor 44 will remain at rest. Therefore, the worm gear 48 will be stationary and through its engaging gear 50 will lock shaft 42 against rotation. The clutch 58—64, however, is not energized, and, therefore, worm wheel 62 is free to rotate. It, however, is in engagement with gear 10 and tends to act as a lock for the same when energized. This is, of course, the opposite of the normal functioning in which the drive is from worm to gear. This locks gear 78 in position, which in turn locks sun gear 80 and maintains it stationary, inasmuch as the two are mounted on the same collar. Rotation of the manual knob 98 will, therefore, cause the pinion 92 to rotate, turning the crown gear 90 about its axis. This carries the planetary carriage along the axis of the shaft 30, and since planetary gear 102 engages now stationary gear 88, planetary gear 102 will be rotated about its axis through the drive 80—104. Since gear 102 meshes with sun gear 88, it will drive the same, and since gear is rigidly secured to the shaft 30, will cause the shaft to rotate and the drive between gears 32 and 26 will cause the tuner to be moved. In other words, sun gear 88 is now the reaction element about which the planetary system moves.

On the other hand, if it is assumed that it is desired to operate the set automatically through the motor drive, manual knob 98 will remain stationary and through its pinion 92 lock the crown gear 90 so that the latter will not rotate; then the drive from motor 44 to the tuning means will be from the armature shaft 46 through worm 48 to gear 50, which will drive shaft 42. Under automatic operation, clutch solenoid 74 is energized and clutch 58—64 will be closed to drive worm 62 from shaft 42. Rotation of worm 62 will drive, in turn, gear 78, and with it gear 60, which is secured to the same collar. Gear 80, which, as before mentioned, meshes with planetary gear 104, will drive the latter, and the associated planetary gear 102 secured rigidly to gear 104 will now directly drive sun gear 88, secured to shaft 30. In this case the motor will not move and the drive will be a straight gear train all of the way from the motor 44 to the driving pinion 32, which engages the sector gear 26 to turn the set.

It will thus be obvious that either the automatic or the manual drive may be utilized for tuning the set without the necessity of any adjusting of parts to change from one to the other, and that the drive is completely mechanical for either source of power.
I claim:

1. In radio apparatus, movable means for tuning said apparatus over a predetermined band of frequencies, a driving motor, a worm connected to the motor to be driven directly thereby, a countershaft, a worm gear mounted on the countershaft meshing with said worm, a second worm mounted on the countershaft, a second worm gear meshing with the second worm, a sun gear directly connected to the second worm gear, a second sun gear directly connected to the movable means for tuning said apparatus, a planetary gear system mounted to engage both sun gears, and manually driven frictionally loaded means connected to the planetary system to drive the same or lock it as desired.

2. In radio apparatus, movable means for tuning said apparatus over a predetermined band of frequencies, a driving motor, a worm connected to the motor to be driven directly thereby, a countershaft, a worm gear mounted on the countershaft meshing with said worm, a second worm mounted on the countershaft, clutch means interposed between the worm gear and the second worm, magnetic means for actuating said clutch, a second worm gear meshing with the second worm, a sun gear directly connected to the second worm gear to rotate therewith, a second sun gear directly connected to the movable means for tuning said apparatus, a planetary gear system mounted to engage the sun gears, and manually rotatable frictionally loaded means connected to the planetary system to drive the same or lock it against rotation.

3. In radio apparatus, movable means for tuning said radio apparatus over a predetermined band of frequencies, a driving motor, clutch means having a connection to the driving motor, electrical current responsive means for actuating said clutch means, irreversible gear means having a connection to the clutch means, manual drive means, gear means having appreciable resistance to turning connected to the manual drive means, and differential gear means interconnecting the irreversible gear means, the gear means having appreciable resistance to turning and the movable means for tuning said radio apparatus, so that either the driving motor or the manual drive means may independently move the movable means for tuning said radio apparatus with said gear means having appreciable resistance to turning and said irreversible gear means acting as respective reaction points in said differential gear train.

4. In radio apparatus, movable means for tuning said apparatus over a predetermined band of frequencies, a motor drive, a worm driven by said motor, clutch means interposed between the motor drive and the worm, magnetic means for actuating said clutch means, a worm gear meshing with said worm, a manually driven frictionally loaded shaft, reduction gearing connected thereto, gearing connected directly to the movable means for tuning said apparatus, and planetary gearing carried by said reduction gearing and interconnecting the worm gear and gearing connected to the movable means for tuning said apparatus to provide for independent actuation of the last mentioned means by either the motor drive or the manually driven frictionally loaded shaft.

5. In radio apparatus, movable means for tuning said radio apparatus over a predetermined band of frequencies, motor drive means, irreversible worm-gear drive means connected to the motor drive means, manual drive gear means having a constant and appreciable frictional load, and differential gear means interconnecting said irreversible worm-gear drive means, the manual drive gear means, and the movable means for tuning said radio apparatus, so that either the manual drive gear means or the motor drive means may independently move the movable means for tuning said radio apparatus as a result of the inherent resistance offered by the other of said drive means.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,059,366</td>
<td>Kinzie</td>
<td>Nov. 3, 1936</td>
</tr>
<tr>
<td>2,372,099</td>
<td>McGarvey</td>
<td>Mar. 20, 1945</td>
</tr>
<tr>
<td>2,398,349</td>
<td>Anderson</td>
<td>Apr. 16, 1946</td>
</tr>
</tbody>
</table>