AUTOMATIC TUNER INCLUDING MANUAL ADJUSTMENT MEANS

Filed Sept. 29, 1939

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

INVENTORS.

D. C. MANNING ET AL

2,214,506

Alen & Allen

ATTORNEYS.
AUTOMATIC TUNER INCLUDING MANUAL ADJUSTMENT MEANS

Filed Sept. 29, 1939

INVENTORS.

DANA C. MANNING

AND LEONARD S. DEPWEG.

BY

ALLEN & ALLEN

ATTORNEYS.
Our invention relates to so-called automatic tuning means for radio sets of the character in which a tuning of the radio set to a particular station is effected by manual actuation of a plunger, push button or other means appropriate to the station in question. Our mechanism as herein described is related to the mechanisms of the co-pending cases of Howard J. Tzyzzer, Serial No. 192,258 filed Feb. 24, 1938; Serial No. 226,520 filed Aug. 24, 1938; and Serial No. 226,520, filed Aug. 24, 1938; Julius J. Hobing, Serial No. 275,352, filed May 23, 1939, and Manning and Depweg, Serial No. 218,550 filed July 11, 1938; but departs from the teachings of these cases in certain ways which will be apparent hereinafter.

It is our object to provide an automatic tuning means wherein the setting operation is rendered much more simple, and may be effected by purely manual means as distinguished from tools, and effected during the operation of the set if desired.

It is an object of our invention to provide an automatic tuning means in which when a plunger has been depressed, its setting may be effected or varied by the mere operation of the normally provided manual tuning means for the radio set. It is an object of our invention to provide new types of plunger structures in automatic tuning apparatus.

It is an object of our invention to take care of the problems of frictional resistance especially in connection with the means whereby the setting of the several plungers is effected or changed, as will hereinafter be set forth.

It is an object of our invention to make the provisions outlined above in an apparatus of essentially simple and inexpensive character, without complication of parts and without a construction likely to come out of adjustment or repair.

These and other objects of our invention which will be set forth hereinafter, or will be apparent to one skilled in the art upon reading these specifications, we accomplish by that certain construction and arrangement of parts of which we shall now describe certain exemplary embodiments.

Reference is made to the drawings wherein:

Fig. 1 is a horizontal sectional view of one form of our apparatus, the view being taken below the level of the gang condenser.

Fig. 2 is a perspective view of a type of shaft which we may use.

Fig. 3 is a perspective view of a portion of a plunger.
otherwise. Consequently the manual tuning means can effect setting of the plunger only when the plunger is actuated. The manual tuning means is also connected to the shaft of the condenser gang so that it may be employed in tuning the condenser when the automatic tuning means is not being employed. Means are provided to disconnect the manual tuning means however from the condenser gang when a plunger is actuated. This relieves frictional drag on the condenser gang when automatic tuning means is being used, so that the automatic tuning means neither has to be actuated by the plunger nor is the condenser gang disconnected from the manual tuning means, as will hereinafter be made clear. Also by reason of the structure aforesaid, when it is desired to effect or change a setting of any plunger, the positioning means on the plunger effects the change of the position of the condenser gang, and at that time the condenser gang is disconnected from the manual tuning means.

In the exemplary embodiment of our invention, as most clearly shown in Fig. 6, a condenser gang is mounted upon a base 2, and this base in turn is mounted on the sub-base 3. The shaft 4 of the condenser gang bears a pinion 5 meshing with a gear segment 7, attached by an arm 9 to a plate 10, mounted for rocking or rotary motion longitudinally in the sub-base 3 on suitable pivots, as at 11. It will be clear that if the position of the plate 10 is changed about its pivots, the tuning position of the condenser gang 1 will thereby be altered. The sub-base 3 has rear and front depending extensions 12 and 16 in which the plunger mechanism next to be described is journaled.

The plunger mechanism proper in the embodiment of Figs. 1 to 11 inclusive, comprises a shaft 16 (Fig. 2), a pair of members 17 (Fig. 3), and means for adjusting the position of the members 17 by means of the shaft 16, and shown at 18 (Fig. 9). The shaft 16 is journaled in the rear extension 12, of the sub-base as shown in Fig. 6. One of the members 17 lies on each side of the shaft as clearly shown in Fig. 1. The members 17 are respectively journaled in slots for longitudinal movement in the rear and front extensions 12 and 16 of the sub-base. The members 17 comprise elongated bodies each having a positioning means 19 extending from one side thereof. Each member likewise carries a slot 20 or 20a, to accept a tail of the member 18 (Fig. 4). By forming both slots in each of the members 17, we eliminate the necessity of making the members 17 in rights and lefts.

Considering Figures 1 and 6, it will be noted that one of the members 17 lies on each side of the shaft 16, and that the positioning means 19 on one of the members points upwardly while on the other of the members it points downwardly. The member 18 (Fig. 4), is preferably formed of metal in a U shape, perforated as shown, at least one and preferably both of the perforations being threaded. One of the legs of the U is longer than the other as shown at 21. The shaft 16 has right and left-hand threaded portions shown respectively at 22 and 23. In the assembly one of the members 18 engaging one of the threaded portions of the shaft, engages by means of its longer leg 21, one of the members 17. The other of the members 18 engaging the other threaded portion of the shaft, engages by means of its longer leg, the member 17. The longer leg 21 of the member 18, merely extends into one or the other of the slots 20 or 20a, to which, however, it may be fastened as by riveting. By this arrangement it will be evident that by rotating the shaft 16, the members 17 may be moved equally and in opposite directions producing concurrent relative movement of the positioning projections 19.

These positioning projections are rounded at their ends and are located to contact the plate 10, and when the plunger is drawn to the right in the several figures, these located projections 19 move the plate 10 and thereby tune the condenser to a position appropriate to the adjustment of the position of the projections 18. The end of the shaft 16, where it passes through the depending sub-base portion 12, may be provided with a washer 24, or the like, which, engaging the base projection 15 will limit the movement of the plunger assembly to the right in the several figures. This washer also has another purpose which will be set forth later. In order to draw the plungers to the right and therefore normally keep them in inactive position, we employ a tension spring 25, engaged in some way between the plunger assembly and a stationary framework. It has shown the spring engaged in a perforation in the lower positioning projection 19.

Preferably though not necessarily, we employ in our structure a solenoid actuating means for moving plungers after their movement has been initiated manually. We have shown therefore, a solenoid 26 mounted on the sub-base 3, and having an armature 27, which is connected to a driving plate 28, pivoted at its ends upon brackets or frame extensions 29 and 30. The lower end of the driving plate 28 is provided with actuating fingers 31. The arc of the swinging movement of the plate and therefore of the fingers is shown at A in Figs. 6 and 7; and it will be observed that when the plunger assembly is drawn as far as it will go to the right, the actuating projections 31 on the driving plate 28 meet the washers 24.

However, as in Fig. 7, when the plunger is manually moved slightly to the left, the washer 24 comes into the range of movement of the actuating fingers 31, so that if the plunger is so depressed and the solenoid 26 concurrently actuated, the fingers 31 engage the washers, 24, and, as the armature 27 of the solenoid moves to the right in the several figures, the plunger assembly will be drawn to the left, bringing the positioning projections 19 against the plate 16, and thereby tuning the condenser.

A longitudinally extending plate 32, parallels the depending portion 15 of the sub-base, and is attached to end plates or brackets 33 and 34. A series of meshing gears 35 (as best shown in Fig. 5), is journaled on the plate 32 by means of hollow grommets or the like 36. There is one of these gears for each of the plunger assemblies; and the shaft 16 of each of the plungers passes through one of these grommets. At the end of the train of gears 35 they may be connected by a pinion 37 to another gear 38 on the shaft 39, of a manual tuning arrangement. The shaft 39 extends through the front wall 40 of the radio set and be provided with a suitable knob 41. It will be evident that by turning the shaft 39 by means of the knob 41 the gears 35 may be rotated.

In the train as shown, alternate gears rotate in opposite directions. In order that the manual tuning control may have the same effect on each plunger assembly, it is our practice to reverse the order of the threads on alternate plungers. This is to say: if one plunger has a right hand thread on its left end and a left hand thread on its right end, in the next plunger the order of these parts 75
will be reversed. Thus we provide that an operation of the manual tuning knob 41 in one rotary direction may bring about the same relative movement of the members 17 of any plunger assembly and vice versa.

It will now be clear that if any one of the gears 35 can be connected to the shaft 18 of the plunger appropriate to that gear, the setting of the positioning means so that plunger can be changed merely by rotating the hand tuning device in the usual manner. The shafts however, must be connected to the gears only at the times the plungers respectively are depressed, since otherwise the operation of the hand tuning mechanism would serve to vary the settings of all of the plungers simultaneously. As a consequence we provide clutches serving to connect a shaft of a particular plunger to its gear only when the said plunger is fully retracted. On the faces of the several gears we may provide a friction ring 42, and we may provide a similar co-operating ring 43 on the face of a disk 44 surrounding the shaft 16.

We have shown the front end of the shaft 16 flattened at one side as at 45, and the disk 44 has a correspondingly flattened perforation 46 in it so that while the disk is slidable on the shaft 16, it is non-rotatable with respect thereto. In order to control the position of the disk 44 on the shaft, we provide the disk with a thimble 47 attached to the disk and surrounding the shaft. Within the thimble there may be a washer 48 surrounding the shaft, and a compression cushioning spring 49 may be engaged between the disk and this washer. The flattened portion 45 on the shaft terminates in a shoulder 50, which engages the disk 44 and carries this part of the clutch couple to the right when the plunger assembly is furthest to the right. This separates the clutch elements as shown in Fig. 6. The front end of the shaft 16 is provided with a washer 51, and a compression spring 52 is engaged between this washer and the washer 48. Thus the clutch arrangement will be carried to the left as the plunger moves to the left; but after 55 45 the two friction rings 42 and 43 as shown in Fig. 7, the movable clutch portion will slide on the shaft against the compression of the springs 49 and 52.

We provide a front plate portion 53 in which we mount push buttons 54, one for each plunger assembly. These push buttons are hollow with 58 and in accept the ends of the shaft 16 rotatably. The push buttons preferably contain indicia 55 which may be marked with the call letters of the desired stations. The pressure of a finger on the push button will serve to move the plunger assembly to the left in the several figures sufficiently to permit engagement of the finger 51 on the driving plate with the washer 24 on the shaft. The push button then remains depressed; but the plunger moves further under the influence of the solenoid may be understood. We therefore cause the push buttons to operate a switch for the purpose of energizing the solenoid. This switch comprises an angularly bent plate 56 having a pintle 57, by which it may be pivotedly mounted in ears or brackets 58. One of the angular arms of the plate is provided with projections 59, one of the contact of the push buttons 54. On the other angular arm of the plate we provide a switch contact 60 which, co-acting with another contact suitably mounted and insulated, operates to form a switch. This switch is closed, as shown in Fig. 7, when any push button is depressed; and the switch is located in the circuit of the solenoid.

A spring 61 urges the switch to open position and also urges the push buttons outwardly. The switch plate member serves to retain the push buttons in position. Thus, as will now be clear, when a push button 54 is depressed, its plunger 5 is moved slightly to the left and the switch 60 is closed. Thereupon the solenoid through its driving plate is engaged with the plunger, and is energized, drawing the plunger as far as it will go to the left, and positioning the plate 18. At the same time the clutch appropriate to that plunger connects it with the appropriate gear 35 so that if there is any inaccuracy in the setting of the positioning members 19 on the plunger, or if a new setting is desired, this may be effected by rotating the manual tuning knob 14 while keeping the push button 54 depressed. The rotation of the tuning knob 14 effects rotation of the gear 35 for the plunger, and this through the clutch rotates the shaft of the plunger, changing its setting, through the operation of the right and left-hand threaded portions of the shaft. The set however, remains the same if the manual tuning knob is not actuated, and further when no plunger is actuated, all plungers are disconnected from their gears 35, so that rotation of the manual tuning knob under these circumstances will not alter the setting of the plungers.

We have shown the manual tuning shaft 39 connected by a flexible shaft 62, to a worm 63, suitably mounted on the frame and meshing with a worm gear 64 rotatably mounted upon the condenser shaft 4. At the end of this shaft we have fastened a sheave 65 in a spring rotationally. Between this sheave and the worm gear 64 we provide a friction or other clutch facing 66. We further provide a magnetic clutch comprising a cup shaped core 61, and a central pole 68, both non-rotatably fastened to the shaft 4. A set 69 is located within the cup. An armature 70 is fastened to the worm gear 64 and the compression spring 71 engages between the bottom of the cup and this armature, normally urging the worm gear 64 against the clutch facing 66. Thus rotation of the worm gear 64 will rotate the magnetic condenser shaft 4. Flexible linkage may be employed to the coil 69, because the condenser shaft 4 never rotates through more than a portion of a complete circle. The coil 69 of the magnetic clutch is placed in circuit with the solenoid coil 26, so that when the solenoid is actuated, upon depressing one of the push buttons, the magnetic clutch is likewise actuated pulling the worm gear 64 away from the sheave 65, and effectively disconnecting it from the condenser shaft 4. Thus when automatic tuning is being effected by means of a plunger, the manual tuning means together with its train of gears 35 to 38, is disconnected from the condenser shaft; and the automatic tuning means does not have to drive the manual tuning means and its train of gears. The sheave 65 could in other arrangements be a mere clutch plate. We have as illustrated a sheave in the illustrated embodiment so that we may pass over it a belt or cord 72. This belt is caused to pass over pulleys 73 and 74, by which its position is changed, and then to pass along the length of a dial plate 75 to a return pulley (not shown), at the other end thereof. A pointer, also not shown, is attached to the cord or belt 70 and is caused thereby to move along the dial. It will be evident that a skilled worker in the art can substitute for this arrangement other dial and pointer means known in the art.

The clutch arrangements by which the gears 75...
35 are connected selectively to the respective shafts of the plunger assemblies may be widely varied. We have shown an exemplary variant in Figs. 12 and 14. Here we have a washer 52, non-rotatably but slidably mounted upon the shaft 53. A washer 74 engaged like the other washers, in a suitable groove on the shaft, furnishes an abutment for the washer, and the washer is urged against this abutment by means of a compression spring 76 engaging the end of the washer 51. The spacing of the parts is such that when the plunger is fully retracted the washer 76 will come into substantial contact with its gear 35. The washer may be provided with perforations 78 and the gear 35 may be provided with small studs 80 adapted to engage in these perforations whereby to effect a switching connection.

Variations are likewise possible in a plunger construction, and one such variation is illustrated in Figs. 16 to 19 inclusive. Here the body of the plunger is indicated at 81. At one end it is journaled in a depending back plate 12 of the sub-base. Where journaled it is provided with a tooth or dog 92, which may be engaged by a driving plate 90. At the other end of the body 81 it is turned over as at 83 and perforated to provide a bearing for the shaft 16a. This shaft may be fixed in longitudinal position with respect to the body 81 by a washer 84 and a collar 85 engaging respectively on opposite sides of the turned over portion 93. The shaft passing through the grommet 86 forms a front bearing for the plunger assembly. The shaft is again provided with right and left hand threads as at 22a and 23a.

We provide movable members shown in Figs. 17 and 19, which have bodies 68 and 87 slotted as at 88 and 89. Opposite ends of these members are turned over as at 90 and 91 and are perforated and threaded for engagement respectively with the right and left hand threaded portions of the shaft 16a. Near the left hand end of each of the bodies 86 and 87 we provide the positioning projections 19a extending respectively above and below the bodies. The bodies are mounted in assembled relationship as shown in Fig. 16, the slots 88 and 89 in the bodies being engaged on studs 92 and 93, fastened to the body 81. When the threaded shaft is in engagement with the ears 90 and 91 as shown in Fig. 15, the positioning projections 19a can be moved equally in opposite directions as has heretofore been explained. For the purpose of eliminating lost motion in the structure of Figs. 16 to 19, we have found it advisable to employ spring clips 94 as shown in Fig. 18. Each of these clips has at one end a bent portion 95, to engage one of the ears 90 or 91 (which ears may be notched for the purpose as shown in Fig. 17). At their other ends the clips 94 are bent as at 96 to engage the threaded shaft 16a. The manner of assembly will be clear from Fig. 15. The clips are preferably formed of spring wire.

Modifications may be made in our invention without departing from the spirit of it.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In automatic tuning means for a radio set a positionable member, a series of manuals each having means for positioning said positionable member, means on each manual for adjusting said positioning means, a manual tuning means, and individual friction clutches, one for each manual, operable upon depression of a manual for connecting its adjusting means with the appropriate gear.

2. In automatic tuning means for a radio set a positionable member, a series of manuals each having means for positioning said positionable member, means on each manual for adjusting said positioning means, a manual tuning means, a series of meshing gears connected therewith, and individual friction clutches, one for each manual, operable upon depression of a manual for connecting its adjusting means with the appropriate gear, said adjusting means for said manuals comprising a threaded member rotation of which effects said adjustment.

3. In automatic tuning means for a radio set a positionable member, a series of manuals each having means for positioning said positionable member, means on each manual for adjusting said positioning means, a manual tuning means, a series of meshing gears connected therewith, and individual friction clutches, one for each manual, operable upon depression of a manual for connecting its adjusting means with the appropriate gear, said adjusting means for said manuals comprising a threaded member rotation of which effects said adjustment, the threads of the threaded members of said automatic means being respectively of opposite hand to correspond with the opposite rotation of alternate ones of said meshing gears.

4. In automatic tuning means for a radio set a positionable member, a series of manuals each having means for positioning said positionable member, means on each manual for adjusting said positioning means, a manual tuning means, a series of meshing gears connected therewith, and individual friction clutches, one for each manual, operable upon depression of a manual for connecting its adjusting means with the appropriate gear, said adjusting means for said manuals comprising a threaded member rotation of which effects said adjustment, a member to be tuned, a drive between said manual tuning means and said member to be tuned, and means common to the several manuals for disconnecting said drive.

5. In automatic tuning means for a radio set a positionable member, a series of manuals each having means for positioning said positionable member, means on each manual for adjusting said positioning means, a manual tuning means, a series of meshing gears connected therewith, and individual friction clutches, one for each manual, operable upon depression of a manual for connecting its adjusting means with the appropriate gear, said adjusting means for said manuals comprising a threaded member rotation of which effects said adjustment, a member to be tuned, a drive between said manual tuning means and said member to be tuned, and means common to the several manuals for disconnecting said drive, said means comprising a connection switch, a magnetic clutch in said drive, and a connection between said switch and said clutch.
adjusted, means at one end of each shaft for manually moving the plunger, a power translation means common to all plungers and means at the other end of the shaft of each plunger for engagement with said power translation means upon said movement.

8. In automatic tuning means a frame, a series of plungers slidably journaled in said frame, each said plunger comprising a shaft with right and left hand threads, positioning means on said plungers engaging respectively said right and left hand threads whereby they may be adjusted, means at one end of each shaft for manually moving the plunger, a power translation means common to all plungers and means at the other end of the shaft of each plunger for engagement with said power translation means upon said movement, means for manually moving said plungers comprising manually rotatably engaging the respective shafts whereby said manuals cannot cause rotation of said shafts.

9. In automatic tuning means a frame, a series of plungers slidably journaled in said frame, each said plunger comprising a shaft with right and left hand threads, positioning means on said plungers engaging respectively said right and left hand threads whereby they may be adjusted, means at one end of each shaft for manually moving the plunger, a power translation means common to all plungers and means at the other end of the shaft of each plunger for engagement with said power translation means upon said movement, meshing gears journaled on said frame, one for each shaft and concentric with its shaft, a manual tuning means, a connection between said manual tuning means and said meshing gears, and individual clutches mounted on each shaft for connecting said shaft with its respective gear upon manual movement of the respective plunger.

10. In automatic tuning means a frame, a series of plungers slidably journaled in said frame, each said plunger comprising a shaft with right and left hand threads, positioning means on said plungers engaging respectively said right and left hand threads whereby they may be adjusted, means at one end of each shaft for manually moving the plunger, a power translation means common to all plungers and means at the other end of the shaft of each plunger for engagement with said power translation means upon said movement, meshing gears journaled on said frame, one for each shaft and concentric with its shaft, a manual tuning means, a connection between said manual tuning means and said meshing gears, and individual clutches mounted on each shaft for connecting said shaft with its respective gear upon manual movement of the respective plunger, the order of the right and left hand threads on alternate shafts being reversed to correspond with the opposite rotation of alternate ones of said meshing gears.

11. In automatic tuning means a frame, a series of plungers slidably journaled in said frame, each said plunger comprising a shaft with right and left hand threads, positioning means on said plungers engaging respectively said right and left hand threads whereby they may be adjusted, means at one end of each shaft for manually moving the plunger, a power translation means common to all plungers and means at the other end of the shaft of each plunger for engagement with said power translation means upon said movement, meshing gears journaled on said frame, one for each shaft and concentric with its shaft, a manual tuning means, a connection between said manual tuning means and said meshing gears, and individual clutches mounted on each shaft for connecting said shaft with its respective gear upon manual movement of the respective plunger.

12. In automatic tuning means a frame, a series of plungers slidably journaled in said frame, each said plunger comprising a shaft with right and left hand threads, positioning means on said plungers engaging respectively said right and left hand threads whereby they may be adjusted, means at one end of each shaft for manually moving the plunger, a power translation means common to all plungers and means at the other end of the shaft of each plunger for engagement with said power translation means upon said movement, meshing gears journaled on said frame, one for each shaft and concentric with its shaft, a manual tuning means, a connection between said manual tuning means and said meshing gears, and individual clutches mounted on each shaft for connecting said shaft with its respective gear upon manual movement of the respective plunger, the order of the right and left hand threads on alternate shafts being reversed to correspond with the opposite rotation of alternate ones of said meshing gears.

13. In automatic tuning means a frame, a series of plungers slidably journaled in said frame, each said plunger comprising a shaft with right and left hand threads, positioning means on said plungers engaging respectively said right and left hand threads whereby they may be adjusted, means at one end of each shaft for manually moving the plunger, a power translation means common to all plungers and means at the other end of the shaft of each plunger for engagement with said power translation means upon said movement, meshing gears journaled on said frame, one for each shaft and concentric with its shaft, a manual tuning means, a connection between said manual tuning means and said meshing gears, and individual clutches mounted on each shaft for connecting said shaft with its respective gear upon manual movement of the respective plunger, the order of the right and left hand threads on alternate shafts being reversed to correspond with the opposite rotation of alternate ones of said meshing gears, a means to be tuned, a drive between said manual tuning means and said last mentioned means, a clutch in said drive, and means common to the several plungers for disengaging said clutch.

14. In automatic means a frame, postionable means movably mounted in said frame, and a plunger for positioning said postionable means, said plunger comprising a shaft having right and left hand threaded portions and journaled at one end in said frame, a pair of positioning elements having respective engagement with said right and left hand threaded portions, and non-rotatably engaging said frame, engagement means at one end of the plunger for connecting it to a power drive, and manual means at the other end of the plunger for moving it.

15. In automatic means a frame, positionable
means movably mounted in said frame, and a plunger for positioning said positionable means, said plunger comprising a shaft having right and left hand threaded portions and journaled at one end in said frame, a pair of positioning elements having respective engagement with said right and left hand threaded portions, and non-rotatably engaging said frame, engagement means at one end of the plunger for connecting it to a power drive, and manual means at the other end of the plunger for moving it, a gear concentric with said shaft, and means non-rotatably mounted on said shaft for connecting it to said gear when said shaft is moved.

16. Apparatus as claimed in claim 15 in which said shaft is journaled at both ends in said frame and in which said shaft bears said engagement means.

DANA C. MANNING.
LEONARD S. DEPWEG.