Oct. 31, 1939. H. Z. BENTON 2,177,683

TUNER

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Fig. 2.

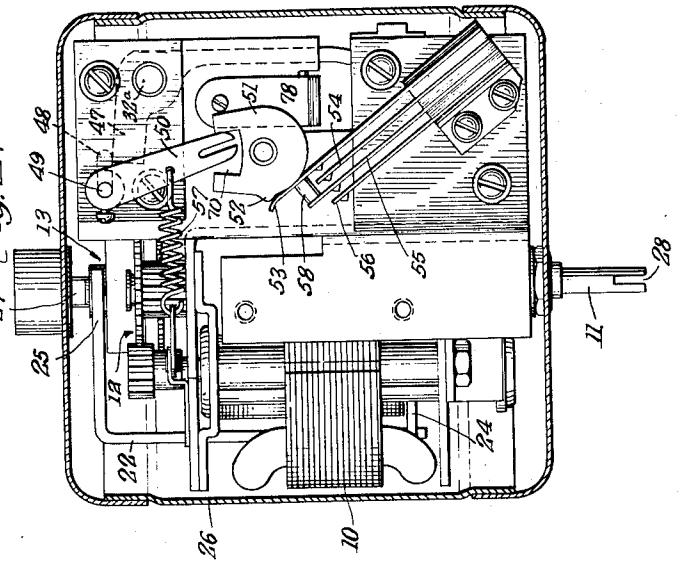
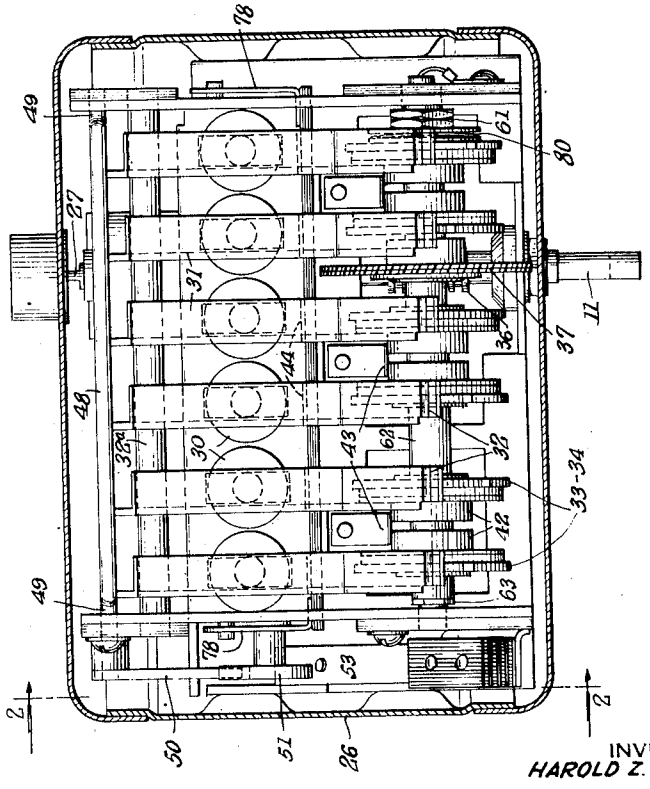


Fig. 1.



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Fig. 4.

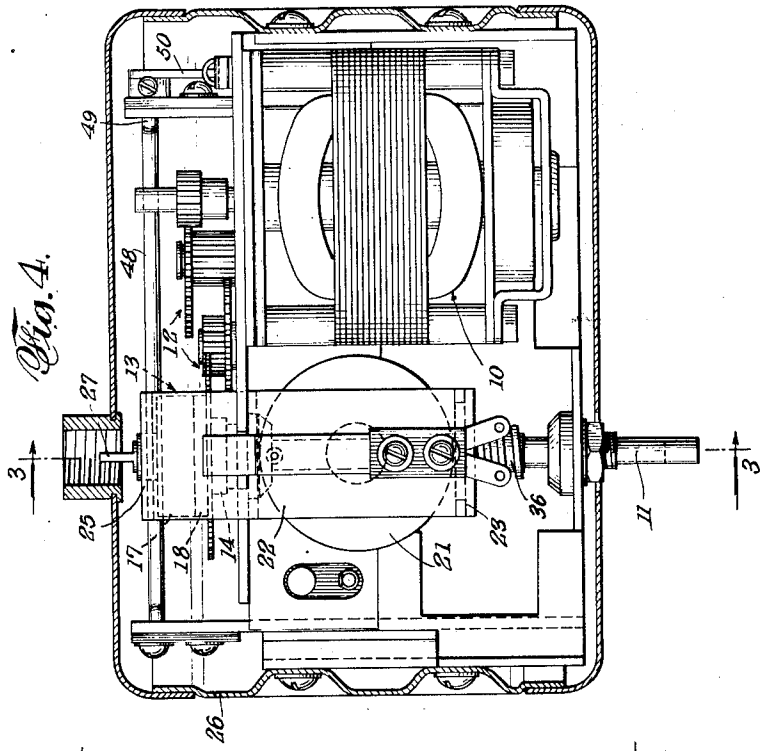
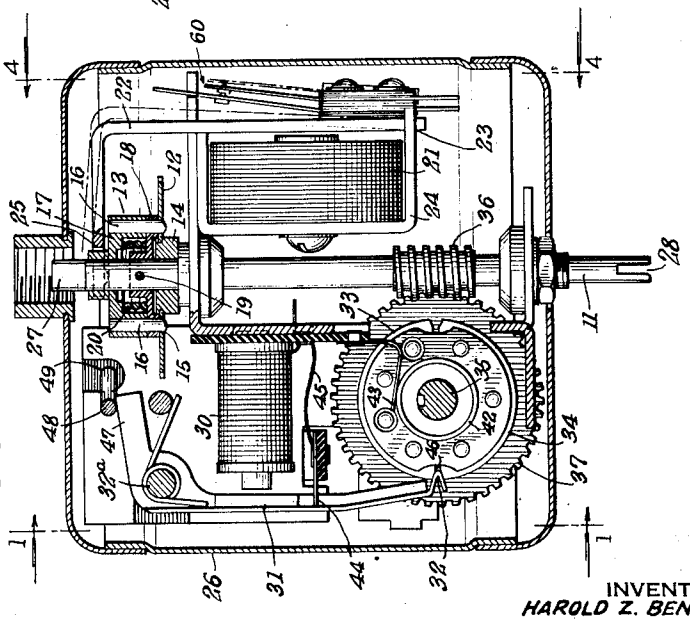


Fig. 3.



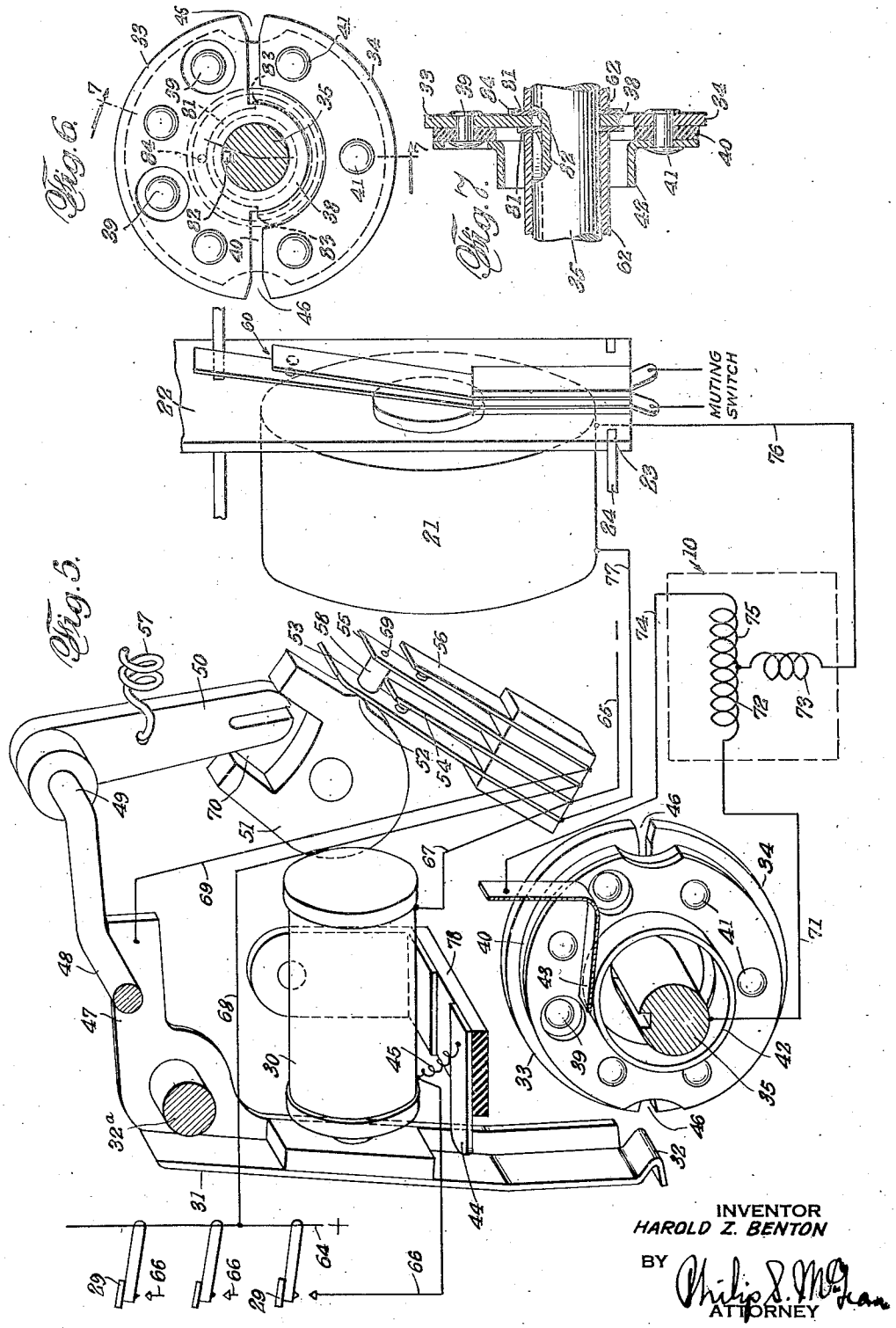
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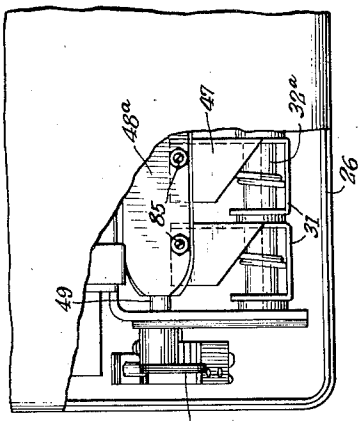


Fig. 11.

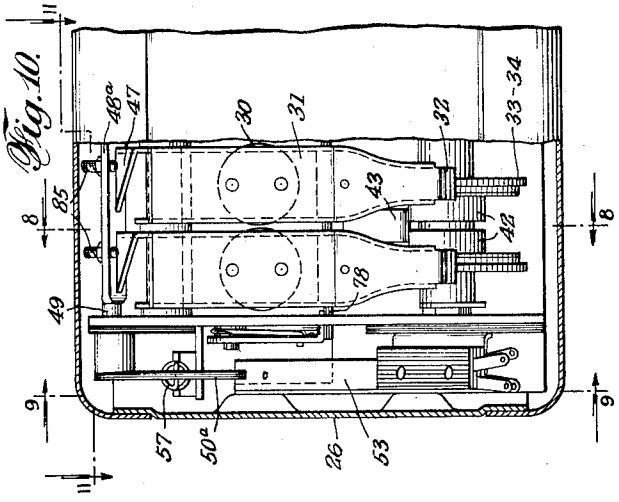


Fig. 10.

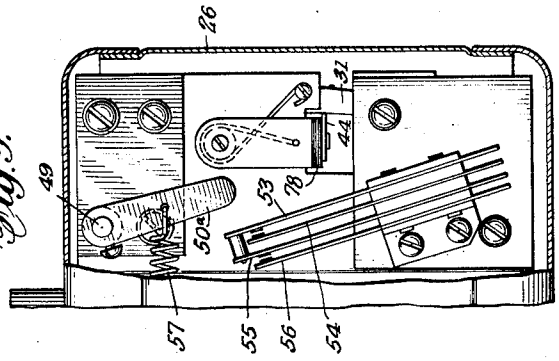


Fig. 9.

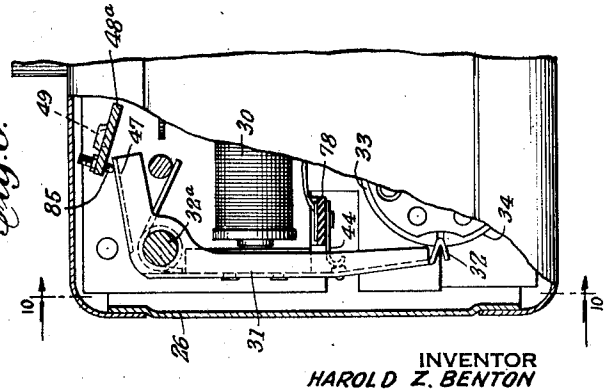


Fig. 8.

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2,177,683

TUNER

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Application June 7, 1938, Serial No. 212,311

10 Claims. (Cl. 172—239)

The invention herein disclosed relates to tuners for radio receiving sets.

Objects of the invention are to provide mechanism in the form of a small compact unit, which will instantly and accurately tune a radio receiving set to a desired, selected station and which mechanism will be relatively inexpensive, readily manufactured and assembled and readily connected with the set which it is to tune.

The foregoing and other desirable objects are attained by the novel features of construction, combinations and relations of parts hereinafter described, illustrated in the accompanying drawings and broadly covered in the claims.

The drawings show by way of illustration one practical commercial embodiment of the invention. The structure however may be modified and changed in various ways, all within the true intent and broad scope of the claims.

Fig. 1 is a plan view of the unit, with the casing shown in section, as on substantially the plane of line 1—1 of Fig. 3.

Fig. 2 is an end elevation and part sectional view taken as on substantially the line 2—2 of Fig. 1.

Fig. 3 is a cross-sectional view on substantially the plane of line 3—3 of Fig. 4.

Fig. 4 is a longitudinal sectional view as on substantially the plane of line 4—4 of Fig. 3.

Fig. 5 is a diagrammatic and broken sectional representation of the electrical circuits of the device.

Fig. 6 is a face view of one of the segmental contact wheels, with the mounting shaft appearing in section.

Fig. 7 is a broken part sectional detail as on line 7—7 of Fig. 6.

Figs. 8, 9, 10, 11, are broken part sectional views of a slightly modified embodiment, Fig. 8 being taken on line 8—8 of Fig. 10; Fig. 9 on line 9—9 of Fig. 10; Fig. 10 as on line 10—10 of Fig. 8 and Fig. 11 as on line 11—11 of Fig. 10.

In the several views, 10 designates a motor of the reversing type connected to drive the tuning shaft 11, through a set of reduction gears 12, and a clutch 13. In Fig. 3, the last of the gears 12 is shown having a hub 14, loosely sleeved on the shaft and as pierced at 15, to receive the clutch pins 16, carried by the loose sleeve 17, and operating through guide openings in a flanged member 18, pinned to the shaft at 19. A spring 20 interposed between this fixed member and the loose pin carrying member 17 tends to shift the latter upwardly in Fig. 3, to retract the pins from openings 15, in the final gear 12, to thus open the clutch. The reverse clutch closing movement is effected by a magnet 21, having an armature 22, pivoted at 23, on the magnet supporting bracket 24, and having a bent end portion forked at 25, to engage over the hub portion of the pin carrying sleeve, thus to close the clutch when the magnet is energized, substantially as indicated in Fig. 3.

The tuning shaft is shown as having its ends exposed at the opposite sides of the enclosing casing 26, so that it may readily be connected at one end with the radio receiver and at the other end be connected to or provided with means for manually adjusting the same. In the illustration, the upper end of the shaft is shown flattened at 27, to form a key for engagement by a flexible drive shaft or other connection from the tuning mechanism of a radio set and the other end of the shaft is shown as slotted at 28, for engagement by the end of a flexible shaft from a manually actuated tuning dial or knob. Such construction enables this motor unit to be located at any convenient point, irrespective of the particular mounting of the radio set or the tuning dial and hence renders the device particularly suitable for installation in motor vehicles, where often the tuning mechanism is located at one point as on the instrument panel of the car, while the radio set is located at some more or less remote point.

The unit shown is designed for tuning to six different stations and is controlled by a set of six different push buttons, indicated schematically at 29, in Fig. 5. The extent of rotation of the tuning shaft is regulated by magnets connected with the buttons and operating circuit closers partly carried by the tuning shaft.

The control magnets are designated 30, and each of these has an armature 31, pivoted at 32, and having at its free end a V-shaped contact 32, adapted to engage contact segments 33, 34, on a shaft 35, driven by worm and worm gear 36, 37, from the tuning shaft 11.

Figs. 6 and 7 show in detail the construction of the segmental contact members illustrating the segments 33, 34, as substantially semi-circular in arcuate extent and the first segment as having a hub portion 38, directly engaged on shaft 35, and having secured to it by rivets 39, an insulating disc 40, to which the second segment 34 is secured by rivets 41. These latter fastenings also secure a slip ring 42, Figs. 5 and 7, by which current is conducted to the second, insulated segment 34, by a brush 43.

A sustaining circuit is provided to maintain the motor circuit after pressure is removed from a

push button, the same being shown in Figs. 3 and 5, as consisting of yielding contacts 44, connected at 45, in the respective push-button magnet circuits and engageable by the individual armatures when attracted by the magnets.

The contact segments 33, 34, are shown as separated at their adjoining ends by V-shaped notches 46, which when they receive the V-shaped contact tips 32, permit a slight further movement of the armatures, that is to the position indicated in Fig. 3. This additional movement is taken advantage of to effect a definite break of the motor circuit. The structure for the purpose is shown as consisting of lugs or angularly extending arms 47, at the pivot ends of the armatures engaging the cranked portion 48 of a rock shaft 49, carrying at one end a rock arm 50, engaging in the fork of a pivoted rocker 51, having a cam portion 52, controlling circuit contacts 53, 54, 55, 56. Spring 57, is shown connected with the rock arm 50, to normally hold the rocker 51, turned to the position indicated at Fig. 5, where the high portion of the cam 52, will force spring contact 53, into engagement with the second spring contact 54, and cause the insulating spacer 58, attached at 59, to contact 55, to thrust contact 55, into circuit closing engagement with contact 56. Fig. 2 shows the reverse relation as with the cooperating parts in the Fig. 3 position, the armature fully drawn into one of the notches in the contact wheel and lifting the cranked portion 48 of the rock shaft to its upper limit, to thereby turn the high point of the cam off spring 53, to open circuit between contacts 53, 54, and between contacts 55 and 56.

The armature 22 of the clutch closing magnet is shown as carrying a muting switch 60, on the back of the same, adapted to be closed as indicated in Fig. 3, when the armature is attracted to the clutch closing position.

The segmental contactors rotate with the shaft 35, on which they are mounted, for station selecting purposes, but are angularly adjustable on that shaft for the purpose of setting them to different stations. These results are attained in the illustration by lock nuts 61, Fig. 1, on one end of the shaft, which clamp the selectors and intermediate spacing sleeves 62, against an abutment 63, at the far end of the shaft. An interposed spring washer 80, provides the necessary spring holding force and washers 81, Figs. 6 and 7, keyed on the shaft at 82, and engaging opposite faces of the shaft encircling portion 38, frictionally retain the selectors and further serve to limit angular adjustment by having shoulders 83, spaced approximately 180 degrees apart, engageable by a pin or extrusion 84, on one side of the part 38.

Operation

With opposite sides of an electrical source connected with the push buttons and with the spring contacts 54, as indicated at 64, 65, Fig. 5, when a selected button 29 is depressed, current will flow from that button through a connection 66, to one of the selector magnets 30, and return by connections 67, 65, to the opposite side of the line. As this magnet attracts its armature 31, the latter by engagement with spring contact 44, will close a sustaining circuit through the magnet, independent of the push button, said circuit starting from the source at 64, including connection 68, to spring contact 55, and the companion contact 56, with which it is then held engaged by cam 52, connection 69 to armature 31, the back contact 44, connection 45 to magnet 30 and return connections 67, 65. Sufficient lost motion is provided between rock arm 50 and the fork 70 in the cam rocker 51, so that inward movement of the armature limited by engagement of the tip 32, of the same with the surface of one of the control segments 33, 34, will not be sufficient to rock the high point of the cam 52, off the contact spring 53, and hence this holding circuit for the selector magnet will be maintained until the motor has completed its station tuning movement, that is until the selector is rotated to the position where the armature tip 32 will drop into one of the notches 46, between the control segments and which additional movement of the armature will take up the lost motion at 70, and turn the rocker to the position indicated in Fig. 2, where the high point of the cam 52, is off the spring 53, to interrupt circuit between springs 53, 54 and 55, 56.

If the station selected is already tuned in and one of the notches 46 is then directly opposite the tip of the armature, as actually is the condition illustrated in Fig. 5, the magnet will simply pull the armature all the way in as in Fig. 3, turning the rocker to the left from the condition illustrated in Fig. 5, to that shown in Fig. 2, to open the circuits between the spring contacts.

If however, the selected station is not already tuned in, as is ordinarily the case, the selector magnet can only draw the armature in to the extent permitted by engagement of the tip 32, with the rim of one of the segments 33, 34. When this occurs, the motor circuit is completed from source 64, through line 68, to contact spring 55, in engagement then with spring 56, and through connection 69 to armature 31, and the tip 32 of the latter then acting as a brush in engagement with one of the control segments; if engaged with segment 33, which encircles at 38 (Fig. 6) and thereby contacts shaft 35, the current flow will be by way of connection 71, through one winding 72, and common return connections 73, to effect rotation of the motor in one direction; if the armature brush 32 engages the other insulated segment 34, the circuit from that point will be by slip ring 42 and brush 43, and by way of connection 74 to the other, reversing winding 75, and common connections 73, to effect rotation of the motor in the opposite direction. The return connections from the motor in each instance, include wiring 76, to the clutch magnet 21, and from that through connection 77, to contact spring 53, and the spring 54, with which it is engaged, to connection 65, back to the other side of source.

Thus the motor is cut into circuit and caused to rotate one way or the other, for the shortest extent of travel, to bring in the desired station and at the end of such travel, the armature tip drops into one of the notches 46, rocking the cam 52, to open all circuits, including that of the clutch magnet which has been maintained closed during the tuning operation. With declutching accomplished by de-energization of clutch magnet 21, the motor is free to coast without disturbing the tuning. In entering the notch 46, at the end of the tuning movement, the V-shaped armature brush 32, has a tendency to and may actually momentarily cut in both the forward and reverse windings 72, 75, providing thereby a magnetic braking action to promptly stop the motor. This need not however actually bring the motor to a dead stop, since the clutch

is opened immediately the tuning is accomplished. Immediately following the opening of circuits to clear the unit, the momentary condition indicated in Fig. 2, the spring **57**, acting on rock lever **50**, will shift the latter to turn the cam rocker back to the position indicated in Fig. 5, to hold the spring contacts **53**, **54**, **55**, **56**, engaged in readiness for the next tuning operation.

To set the unit for any particular station, it is only necessary to depress the button which is to be used for selecting that station and to hold it so, to maintain the tip **32**, of that particular selector magnet armature in notch **46**, and thus hold that selector stationary on shaft **35**, while tuning in the station through manual adjustment of the tuning shaft **11**.

The cranked portion **48** of rock shaft **49**, bearing as it does on the angled ends of the armatures and biased by spring **57**, serves as a common means for clearing the armatures of the selector magnets. By placing the selectors as shown in Fig. 1, with the slip rings **42**, of adjoining selectors directly opposite, a single brush **43**, may be used for each pair of slip rings.

The yielding contacts **44**, for the magnet sustaining circuits are shown as all mounted on an insulated swinging yoke **78**, allowing the necessary movement for the action described.

In the somewhat simplified form of the invention illustrated in Figs. 8 to 11, the heels **47** of the armatures **31**, engage adjustable set screws **85**, on the universal bar portion **48***a*, of rock shaft **49**, and the latter carries at one end an insulating lever, **50***a*, directly engageable with the upper spring contact **53**, for closing the two control circuits. The elimination of the rocking cam **51** (Fig. 5), in this construction, renders the action more simple and direct and eliminates possibility of the cam slipping or shifting out of position. Also, this construction has the advantage of enabling adjustment of the lost motion at each armature desirable for the best operation of the unit.

All parts of the unit are of simple sturdy construction and the action is rapid and accurate. While the structure illustrated constitutes a present practical and preferred embodiment, it will be realized from the scope of the claims that many changes may be made, all within the intent of the invention. Also it should be understood that terms employed have been used in a descriptive rather than in a limiting sense, except as the intent plainly appears or state of the prior art may require.

What is claimed is:

1. A tuning unit of the character disclosed, comprising in combination a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments separated at their ends, electrical connections from said selector segments to said motor, selector magnets, armatures actuated by said magnets and having contact making ends engageable with said segments and adapted to drop into the intervening spaces between the segments to permit further movement of said armatures, selector switches for said magnets and circuit controlling means for said motor operable by said further movement permitted said armatures.

2. A tuning unit of the character disclosed, comprising in combination a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments separated at their ends, electrical connections from said selector segments to said motor, selector magnets, armatures actuated by said magnets and having contact making ends engageable with said segments and adapted to drop into the intervening spaces between the segments to permit further movement of said armatures, selector switches for said magnets and circuit controlling means for said motor operable by said further movement permitted said armatures and sustaining circuit contacts for said magnets engageable by said armatures and yieldable to permit said further movement thereof.

3. A tuning unit of the character disclosed, comprising in combination a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments separated at their ends, electrical connections from said selector segments to said motor, selector magnets, armatures actuated by said magnets and having contact making ends engageable with said segments and adapted to drop into the intervening spaces between the segments to permit further movement of said armatures, selector switches for said magnets and circuit controlling means for said motor operable by said further movement permitted said armatures, drive means from said motor to said selectors, including a clutch and a magnet for closing the same and under control of said motor circuit control means.

4. A tuning unit of the character disclosed, comprising in combination a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments separated at their ends, electrical connections from said selector segments to said motor, selector magnets, armatures actuated by said magnets and having contact making ends engageable with said segments and adapted to drop into the intervening spaces between the segments to permit further movement of said armatures, selector switches for said magnets and circuit controlling means for said motor operable by said further movement permitted said armatures, said circuit controlling means including relatively separable contacts, a rocker controlling engagement and separation of said contacts and operating connections from said armatures to said rocker.

5. A tuning unit of the character disclosed, comprising in combination a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments separated at their ends, electrical connections from said selector segments to said motor, selector magnets, armatures actuated by said magnets and having contact making ends engageable with said segments and adapted to drop into the intervening spaces between the segments to permit further movement of said armatures, selector switches for said magnets and circuit controlling means for said motor operable by said further movement permitted said armatures, said circuit controlling means including relatively separable contacts, a rocker controlling engagement and separation of said contacts and operating connections fron said armatures to said rocker, said operating connections including a rock shaft actuable by any one of the armatures and having a lost motion driving engagement with the contact actuating rocker.

6. A tuning unit of the character disclosed, comprising in combination a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments separated at their ends, electrical connections from said selector segments to said motor, selector magnets,

armatures actuated by said magnets and having contact making ends engageable with said segments and adapted to drop into the intervening spaces between the segments to permit further movement of said armatures, selector switches for said magnets and circuit controlling means for said motor operable by said further movement permitted said armatures, said circuit controlling means including contacts, a cam for controlling the same, a rock shaft having a cranked portion engaging the armatures, a rock arm carried by said shaft and engaging said cam and a spring acting on said rock shaft to turn the same in a direction to clear the armatures of the selector magnets.

7. A tuning unit, comprising in combination, selector magnets, means for individually energizing the same, armature levers operable by said magnets and provided with contact tips, selectors having relatively insulated segments engageable by said contact tips and notches between the segments for entry of the armature tips to permit further final movement of said armatures, a motor having reversing windings connected with said relatively insulated segments, a tuning shaft operated by said motor and speed reduction gearing between said tuning shaft and selectors, a rock shaft engaging the armatures and biased to shift said armatures away from the selector magnets and a circuit controller for the motor actuated from said rock shaft.

8. A tuning unit of the character disclosed, comprising in combination, a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments, electrical connections between said selector segments and reversing motor, selector magnets, armatures actuated by said magnets and having contacts engageable with said segments, a rocking universal bar operable by said armatures, a rock lever operable by said universal bar, circuit controlling means for said motor including circuit controlling contacts operable by said rock lever and selector switches for said magnets.

9. A tuning unit of the character disclosed, comprising in combination, a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments, electrical connections between said selector segments and reversing motor, selector magnets, armatures actuated by said magnets and having contacts engageable with said segments, a rocking universal bar operable by said armatures, a rock lever operable by said universal bar, circuit controlling means for said motor including circuit controlling contacts operable by said rock lever and selector switches for said magnets and independently adjustable set screws for regulating lost motion and engagement between the individual armatures and said universal bar.

10. A tuning unit of the character disclosed, comprising in combination, a reversing motor, selectors rotatable by said motor and having relatively insulated contact segments, electrical connections between said selector segments and reversing motor, selector magnets, armatures actuated by said magnets and having contacts engageable with said segments, a rocking universal bar operable by said armatures, a rock lever operable by said universal bar, circuit controlling means for said motor, including circuit controlling contacts operable by said rock lever and selector switches for said magnets and sustaining circuit means for said magnets including a spring biased universal bar provided with contacts engageable by the individual armatures.

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