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H. L. BRADLEY ET AL

2,098,273

RHEOSTAT

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2 Sheets-Sheet 1

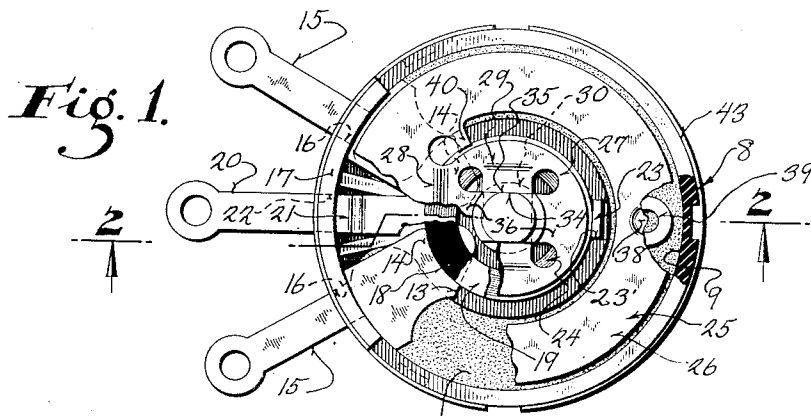
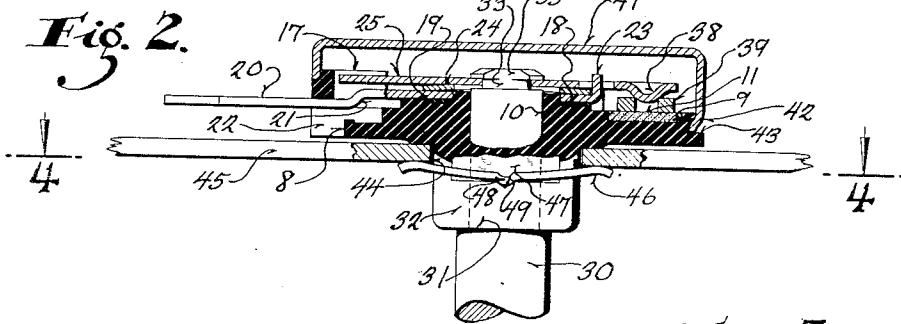
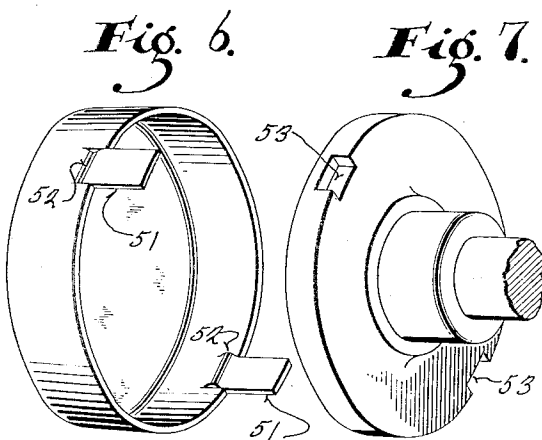
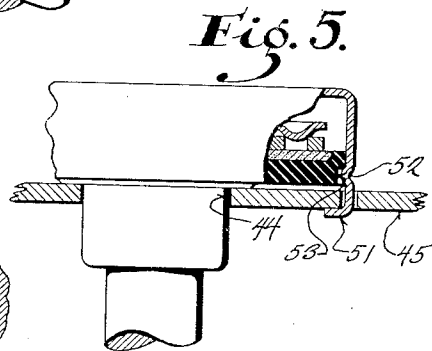


Fig. 7.



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2 Sheets-Sheet 2

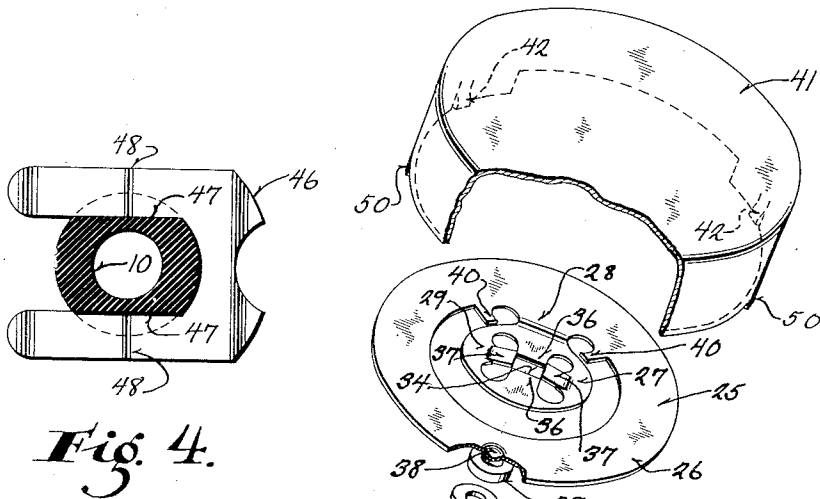


Fig. 4.

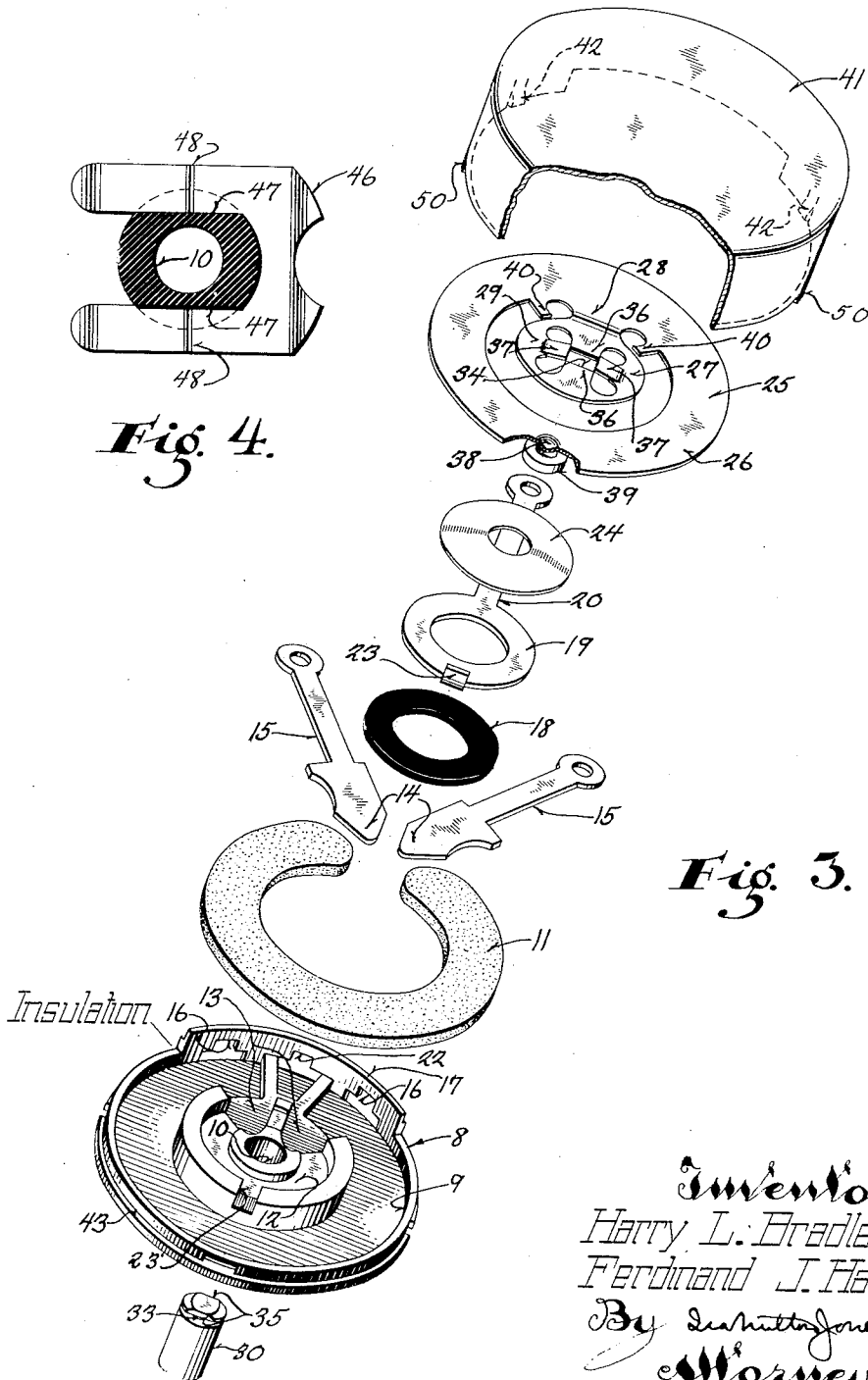


Fig. 3.

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UNITED STATES PATENT OFFICE

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RHEOSTAT

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Application June 9, 1933, Serial No. 675,006

20 Claims. (Cl. 201—55)

This invention relates to improvements in variable resistance devices and more particularly to rheostats and potentiometers for use with radio apparatus.

The device of this invention is particularly designed to meet an existing and ever increasing demand for rheostats and potentiometers of smaller size and greater efficiency.

It is, therefore, a primary object of this invention to provide a variable resistance device and especially a potentiometer or rheostat which is compact and which will operate more efficiently than similar devices now available.

Another object of this invention is to provide a rheostat or potentiometer so constructed as to afford an improved method of assembly and permit a reduction in the cost of manufacture of its parts.

Another object of this invention is to effect a reduction in the number of parts entering into the construction of a potentiometer or rheostat by assigning multiple functions to certain of the elements.

Another object of this invention is to provide a resistance device so designed and constructed that the entire assembly thereof is accomplished without the use of rivets or screws and in which all the constituent elements are secured in proper assembled relationship merely by the attachment of the contactor to its actuating stem or shaft.

It is also an object of this invention to provide a resistance device of the character described which may be quickly and easily attached to a supporting panel without the use of screws or nuts.

A further object of this invention is to provide a resistance device of the character described, wherein the cover for the instrumentalities of the unit has means to hold the device in position on a supporting panel.

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

In the accompanying drawings, we have illustrated two complete examples of the physical embodiment of our invention constructed according to the best modes we have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a plan view of a potentiometer embodying this invention with its cover removed and parts thereof broken away and in section to show structural details;

Figure 2 is a transverse section view taken through Figure 1 on the plane of the line 2—2;

Figure 3 is a perspective view illustrating the constituent elements of the potentiometer disassembled but in their proper order of assembly;

Figure 4 is a detail section view taken on the plane of the line 4—4 of Figure 2;

Figure 5 is a detail view partly in side elevation and partly in section illustrating an alternate manner of mounting the unit on a supporting panel; and

Figures 6 and 7 are perspective detail views showing the cover and base respectively of the modification illustrated in Figure 5.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 8 designates the base of the resistance device which in the present instance is illustrated as a potentiometer. The base is formed of suitable insulating material with one face thereof provided with an annular channel 9 concentrically arranged about a central bore 10 which extends through the base.

Disposed in the channel 9 is a segmental flat resistor strip 11. The resistor strip is of a size to be freely though snugly received in the channel with one face exposed.

The central portion of the base circumscribed by the resistor is raised or projected above the plane of the exposed face of the resistor and has an annular channel or recess 12, the bottom of which adjacent the two ends of the resistor strip is increased in depth to the plane of the exposed surface of the resistor to form two substantially V-shaped notches or recesses 13. These notches or recesses 13 receive the inner end portions 14 of flat sheet metal terminals 15, which extend radially over the resistor end portions in direct contact therewith. The depth of the recesses or notches 13 is substantially equal to the thickness of the terminals so that the outer face of the terminals is flush with or slightly above the bottom of the channel 12.

The outer ends of the terminals project through openings 16 in an arcuate wall 17 forming a projection of the outer wall of the channel 9. The openings 16 are of sufficient size to permit the outer enlarged ends of the terminals to pass therethrough and are so located that when the terminals are in position, upward or flatwise

movement of the terminal ends is positively precluded, the only flatwise movement permitted the terminals being that incidental to lifting or raising of their inner end portions 14 out of the recesses or notches 13.

It is observed that the abrupt increase in width between the outer and inner end portions of the terminals forms shoulders which engage the inner surface of the arcuate wall projection 17, and inasmuch as the length of the inner end portions of the terminals is equal to the distance from the inner surface of the arcuate wall projection 17 to the innermost extremities of the recesses or notches 13, it is evident that when the terminals are in position, they are positively held against lateral motion with respect to the base or the resistor.

Disposed within the central annular channel or recess 12 and overlying the extreme inner ends of the terminal ends 14 or those portions of the terminal ends embedded in the recesses or notches 13, is a washer 18 of fiber or other suitable insulating material. Also disposed within the central channel 12, but outwardly of the insulating washer 18 is the inner ring shaped end 19 of a central terminal 20. This inner end of the terminal 20 snugly fits within the central channel 12 and its extended outer end, which is stepped downwardly or inwardly as at 21, passes through an opening 22 similar to the openings 16 in the arcuate wall projection 17.

The engagement of the intermediate portion of the terminal 20 in the opening 22, together with its snug reception of its inner ring shaped end 19 in the central channel 12, firmly holds the central terminal against any possible lateral movement with respect to the base, and by reason of the insulating washer 18, it is held out of electrical contact with the inner ends 14 of the terminals 15.

Diametrically opposite its outer extended end, the inner end 19 of the central terminal has a tongue 23 bent upwardly therefrom for a purpose to be later described.

Overlying the inner end portion 19 of the central terminal 20 is a spring washer 24 which is clamped down onto the terminal portion 19 by a contactor indicated generally by the numeral 25. The contactor 25 is stamped from sheet metal, such as phosphor bronze and has an outer annular portion 26 and a central hub 27 connected as at 28. The hub 27 has a snap connection 29, to be later described, with the inner end of a shaft 30 journaled in the bore 10.

The shaft 30 is shouldered as at 31 to abut the outer end of a boss 32 formed on the base 8 so that inward axial movement of the shaft with respect to the bore 10 is precluded. Consequently, when the contactor is connected to the inner end of the shaft by means of the connection 29, the terminals and also the resistor strip will be firmly held down in the channels or recesses in which they are received, the spring washer 24 providing a spring tension to insure a firm assembly.

The snap connection 29 comprises a groove 33 in the outer end of the shaft and a square hole 34 in the hub of the contactor. The extreme end of the shaft outwardly of the groove 33 has two opposite sides flattened to the bottom of the groove 33, as at 35. Two opposite sides 36 of the square hole, which is of a size equal to the root diameter or the groove 33, lie in the plane of the central hub 27, while the opposite two sides 37

are bent outwardly so that when the sides 36 are engaged in the groove 33, the outstruck sides 37 engage the flat faces 35 of the shaft. In this manner, the contactor is secured on the shaft against rotation.

At a point opposite the connection 28 between the hub and annular portion 26 of the contactor, the annular portion has a tit 38 formed thereon to project toward the resistor. Engaged with the tit 38 is a button 39 arranged for sliding engagement with the exposed face of the resistor to traverse the same upon rotation of the contactor.

To provide contact pressure, the annular portion of the contactor is sprung inwardly with respect to its hub.

Rotation of the contactor is limited by the engagement of stop abutments 40 formed on the contactor adjacent the connecting portion 28, with the tongue 23, which projects upwardly through the annular space between the hub and outer portion of the contactor, in the path of the stop abutments 40.

It is to be noted that the tongue 23 is nested in a notch 23' in the base and is thereby mechanically strengthened to permit its being bent by forced engagement of the stop abutments 40 therewith.

The resistor and its associated elements are enclosed by a cover or cap 41 disposed over the outer face of the base and attached to the base by means of snap fastenings 42. The edge of the cover engages an annular shoulder 43 encircling the base, and to accommodate the arcuate wall 17, the cover is suitably cut away.

The attachment of the potentiometer to a supporting panel involves merely the projection of the boss 32 through an aperture 44 in a supporting panel 45 and the engagement of a clip 46 with the boss. The clip 46 is a U-shaped spring member having its arms engaged with notches 47 formed in opposite sides of the boss.

The clip is formed of spring metal and is curved as best illustrated in Figure 2 so that its medial portion bears against the outer walls of the notches 47 and its ends engage against the face of the panel. Projections 48 formed on the clip snap into depressions 49 in the walls of the notches 47 to hold the clip in position. This manner of mounting the potentiometer from the supporting panel does away with clamping nuts and screws and affords a secure mounting in an exceedingly simple manner.

To secure the unit against rotation about the axis of its mounting, one or more tangs 50 project from the edge of the cover to enter apertures formed in the panel.

A modified manner of mounting the unit on the supporting panel is illustrated in Figures 5, 6, and 7. In this construction, the clip 46 is omitted and tangs 51 similar to the tangs 50 serve to mount the unit. For this purpose, the tangs 51, which also provide the means for securing the cover on the base, are merely struck over the face of the panel as clearly shown in Figure 5. To secure the cover on the base, the inner portions of the tangs 51 are crimped as at 52 to snap into notches 53 in the base.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention affords a substantial improvement in the construction of rheostats and potentiometers, and that the novel manner of assembling its various parts permits not only a very compact construction, but also provides a more

efficient and less expensive unit than has heretofore been possible.

What we claim as our invention is:

1. A rheostat comprising a base, a resistor embedded in the base with one surface exposed, a terminal for the resistor partially embedded in the base and having a part overlying and contacting the exposed surface of the resistor, a shaft journaled in the base, a contactor to traverse the resistor, a terminal for the contactor in electrical engagement therewith and partially embedded in the base, the embedded portions of said terminals being disposed under the contactor, and means to attach the contactor to the shaft in a position bearing down on said embedded portion of the terminals whereby the contactor secures the resistor and both terminals assembled with the base.

2. A rheostat comprising a base of insulating material having a central bore and provided with an annular channel concentric with the bore and a terminal receiving recess, a resistor disposed within said channel with one surface thereof exposed, a resistor terminal having a portion thereof received in said recess and overlying and contacting the exposed surface of the resistor, a shaft rotatable in the bore, a contactor to traverse the exposed surface of the resistor, a contactor terminal electrically connected with said contactor and having an interfitting engagement with the base so as to be held against lateral displacement, the contactor having a part overlying the terminals but insulated from the first mentioned resistor terminal, and means to attach the contactor to the shaft in a position with its said part bearing down on the terminals at all times so that the contactor holds the first mentioned terminal down on the resistor and secures the resistor in the channel and the first mentioned terminal in its recess and in electrical contact with the resistor and maintains the interfitting engagement between the contactor terminal and the base.

3. In a rheostat, a base of insulating material having a channeled and recessed surface, a resistor disposed in said channel with one surface exposed, a terminal for the resistor partially received in the recess and having a part overlying and contacting the resistor, a contactor to traverse the exposed surface of the resistor, and means to mount said contactor with a portion thereof overlying and bearing down on said terminal at all times but insulated therefrom so that the contactor alone upon being mounted secures the resistor and terminal in position.

4. In a rheostat, a base having a circular channel and a radial recess opening to the inner edge of the channel, the channel being deeper than the recess, a resistor disposed within the channel with a surface thereof exposed and substantially flush with the bottom of the recess, a terminal having a part snugly received in said recess and extending out over the exposed surface of the resistor in electrical contact therewith, and means disposed over the terminal part which is seated in said recess to bear down on the terminal and hold the terminal and the resistor assembled with the base.

5. A variable resistance device comprising a base, a resistor disposed in an open recess in the base, a terminal for the resistor having a part received in an open recess in the base and a part overlying and directly engaging the resistor to have electrical contact therewith, a contactor terminal having a part disposed in another open recess in the base and bearing down on the first mentioned terminal but electrically insulated

therefrom, a contactor mounted to traverse the resistor, and pressure means confined between the contactor and said contactor terminal, whereby mounting of the contactor firmly holds the resistor and terminals down in their respective recesses.

6. A variable resistance device comprising a base of insulating material having a central bore, an annular channel concentric to the axis of said bore and opening to one face of the base and recesses also opening to said side of the base, a resistor segment disposed within said channel with one surface exposed, a terminal having a part received in one of said recesses of the base and having another part directly overlying the exposed surface of the resistor, a contactor terminal having a part disposed in another recess of the base and bearing down on the first mentioned terminal but electrically insulated therefrom, a contactor, a shaft journaled in said bore and held against axial movement toward the face of the base on which the resistor and terminals are assembled, and a connection between the contactor and the shaft whereby the contactor is movable by rotation of the shaft to traverse the resistor and whereby the attachment of the contactor to the shaft secures the resistor and terminals in position.

7. A variable resistance device comprising a base of insulating material having a bore there-through, a resistor, a contactor to traverse the resistor, a terminal having a part overlying the resistor in electrical contact therewith, the base being formed to hold the terminal and the resistor against lateral shifting, an operating shaft rotatable in said bore, and a connection between the shaft and the contactor, the contactor being disposed outwardly of the resistor and said terminal and having a part bearing down on the terminal at all times to hold the terminal and the resistor in electrical contact and secure them on the base whereby the contactor upon effecting said connection between the contactor and shaft secures all elements of the device assembled with the base.

8. In a rheostat, a base having a circular channel and a radial recess opening to the inner edge of the channel, a resistor disposed in the channel with a surface thereof exposed, a terminal having a part seated in said recess and extending out over the exposed surface of the resistor in electrical contact therewith, and means disposed over the terminal part which is seated in said recess but insulated therefrom to bear down on the terminal and hold the terminal and resistor in good electrical contact with each other and properly assembled with the base.

9. In a rheostat, a base having a circular channel and a radial recess opening to the inner edge of the channel and radially in line with an opening through the outer wall of the channel, a resistor disposed within the channel with a surface thereof exposed, a terminal having an inner end portion snugly fitted in said recess and an outer end portion projecting out through the opening in the outer wall of the channel with its medial portion positioned over and in electrical contact with the exposed surface of the resistor, and means disposed over the terminal part seated in the recess to bear down on the terminal and hold the terminal and resistor in good electrical contact and properly assembled with the base.

10. In a rheostat, a base having a central bore and having a circular channel concentric to the bore and a radial recess opening to the inner edge of the channel and radially in line with an open-

ing through the outer wall of the channel, a resistor snugly fitted in the channel and held against lateral or rotational movements therein, a shaft rotatable in the bore, a terminal having an inner end portion seated in said recess and an outer end portion projecting through the opening in the outer wall of the channel with its medial portion disposed over and in electrical contact with the resistor, and means mounted on said shaft and bearing down on the terminal to hold the terminal and the resistor in firm electrical contact with each other and properly assembled with the base.

11. In a rheostat, a base of insulating material having a circular channel and a radial recess opening to the inner edge of the channel and having a plurality of radial openings in the outer wall of the channel, a resistor disposed in the channel, a resistor terminal having an inner end portion seated in said recess and an outer portion projecting out through one of said openings with its medial portion positioned over and in electrical contact with the resistor, a contactor terminal having an outer end portion projecting through another of said radial openings and an inner apertured portion disposed over the resistor terminal but insulated therefrom, the base being formed to have interfitting engagement with said inner apertured portion of the contactor terminal, an operating shaft journaled in the base, and means for securing the contactor to the shaft with a portion thereof pressing down on its terminal to hold it and the resistor and resistor terminal in proper assembled relationship on the base.

12. In a variable resistance device, a rotatable operating shaft having a shoulder intermediate its ends, a movable contactor, a readily detachable non-rotatable connection between the contactor and one end portion of the shaft, a base of insulating material bored to rotatably receive said end portion of the shaft and engaging the shoulder thereon so that said base is disposed between the shoulder on the shaft and the movable contactor, a resistor overlying that side of the base which faces the contactor, said resistor being a self supporting composition unit independent of the base and readily separable therefrom and having one surface exposed for engagement therewith by the movable contactor, a metal terminal for the resistor entirely separate from the resistor and overlying the exposed surface thereof, and resilient means confined between the contactor and said terminal to press the terminal against the resistor and the resistor against the base, and said base having a surface formation to hold the resistor and terminal against lateral shifting.

13. A variable resistance device comprising a base of insulating material having an inner face and an outer face and provided with a bore, a shaft having an outer end portion adapted to receive an actuating knob and an inner end portion rotatable in the bore with its extremity projecting from the end of the bore at the inner face of the base, means to limit inward longitudinal movement of the shaft, a substantially annular resistor overlying the inner face of the base and having an interfitting engagement with the base whereby said resistor is held against lateral shifting with respect to the base, a terminal for the resistor entirely separate therefrom with a portion thereof overlying part of the resistor to confine the resistor between it and the inner face of the base, said terminal having an interfitting

engagement with the base whereby the terminal is held against lateral displacement with respect to the base and the resistor, and means attached to the inner end portion of the shaft and bearing down on the terminal to hold the terminal in engagement with the resistor and to hold the terminal and resistor against the inner face of the base.

14. A variable resistance device comprising a base of insulating material having a central bore and provided with an annular channel concentric to the bore and a radial recess opening to the inner edge of the channel and having radial openings through the outer wall of the channel, one of which is radially in line with said recess, a resistor seated in said channel and held against lateral and rotational movements therein, a terminal having an inner end portion seated in said recess and an outer end portion projecting out through the aligned opening in the outer wall of the channel with its medial portion positioned over and in electrical contact with the exposed surface of the resistor, a contactor terminal having an inner apertured end portion disposed coaxially with the bore and an outer end portion extending through another of said radial openings in the outer wall of the channel, the base being formed to have an interfitting engagement with the apertured inner end portion of said contactor, an insulating barrier between the terminals, a contactor to traverse the exposed surface of the resistor, and an operating shaft journaled in the base and to which said contactor is attached, said contactor overlying the contactor terminal and pressing down on the contactor terminal to afford good electrical connection between it and said contactor terminal and to hold said resistor and its terminal in good electrical contact and properly assembled with the base.

15. In a rheostat, a base of insulating material, a composition resistor readily removably embedded in the base, a metal terminal readily removably embedded in the base with a portion thereof overlying the resistor in electrical contact therewith, a shaft journaled in the base, and means carried by the shaft and pressing down on the terminal to hold the same in electrical engagement with the resistor and to maintain the resistor and terminal properly embedded in the base.

16. In a rheostat, a base of insulating material having a bore therethrough, a ring-like resistor readily removably embedded in the base with one surface exposed, a terminal for the resistor likewise readily removably embedded in the base, a part overlying the exposed surface of the resistor in electrical contact therewith and extending radially therebeyond, a shaft journaled in the bore, means carried by said shaft to at all times press down onto the terminal to hold the terminal in good electrical contact with the resistor and maintain the terminal and resistor embedded in the base, and a contactor movable with the shaft to traverse the resistor.

17. In a rheostat, a base of insulating material, a flat ring-like resistor with one side in flat engagement with the base and its other side exposed, a sheet metal terminal extending radially out over the exposed side of the resistor in electrical contact therewith, the base being formed to engage the resistor and terminal so as to secure these parts against lateral movement with respect to the base, a shaft journaled in the base coaxially with the ring-like resistor, an insulating mem-

ber overlying the terminal, a contactor mounted on the shaft and arranged to traverse the resistor, and yieldable means between the contactor and said insulating member to press the insulating member down onto the terminal at all times and thereby hold the terminal in good electrical contact with the resistor and secure these parts to the base.

18. In a manual control device for radio apparatus and the like adapted to be mounted on one side of a supporting panel, a base of insulating material, a boss formed integrally with and projecting from one face of the base for reception in an aperture in the panel, there being a bore through the base and boss, instrumentalities mounted on the opposite face of the base, an operating shaft for the instrumentalities journaled in said bore with one end projecting from the boss to be disposed at the side of the panel opposite that at which the device is mounted, a cup-shaped sheet metal cover telescoped over the base so as to enclose the instrumentalities thereon, and common means on the side wall of the cup-shaped cover to coact with a shoulder on the base for releasably holding the cover in position and for coacting with the boss in mounting the device on the panel.

19. In a manual control device for radio apparatus and the like adapted to be mounted on one side of a supporting panel, a base of insulating material, a boss formed integrally with and projecting from one face of the base for reception in an aperture in the panel, there being a bore through the base and boss, instrumentalities

mounted on the opposite face of the base, an operating shaft for the instrumentalities journaled in said bore with one end projecting from the boss to be disposed at the side of the panel opposite that at which the device is mounted, a cup-shaped sheet metal cover telescoped over the base so as to enclose the instrumentalities thereon, a plurality of tangs projecting from the peripheral edge of the cover side wall to extend beyond the base for reception in openings in the supporting panel other than the aperture in which the boss is received so as to coact with the boss in mounting the device on the supporting panel, and means on said tangs having a detent connection with the base for releasably holding the cover thereon.

20. In a manual control device for radio apparatus and the like adapted to be mounted on a supporting panel, a base, instrumentalities mounted on the base, an actuating shaft journaled in and supported entirely by the base for actuating said instrumentalities, a cup-shaped metal cover disposed over said instrumentalities with its side wall telescoped over the base, a tongue integral with and extended from the edge of the cover side wall beyond the base for engagement in an aperture in the supporting panel to position the device thereon, and a detent on the tongue engaging the base to hold the cover on the base, said detent being retained in proper engagement with the base by inherent spring tension of the tongue.

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