

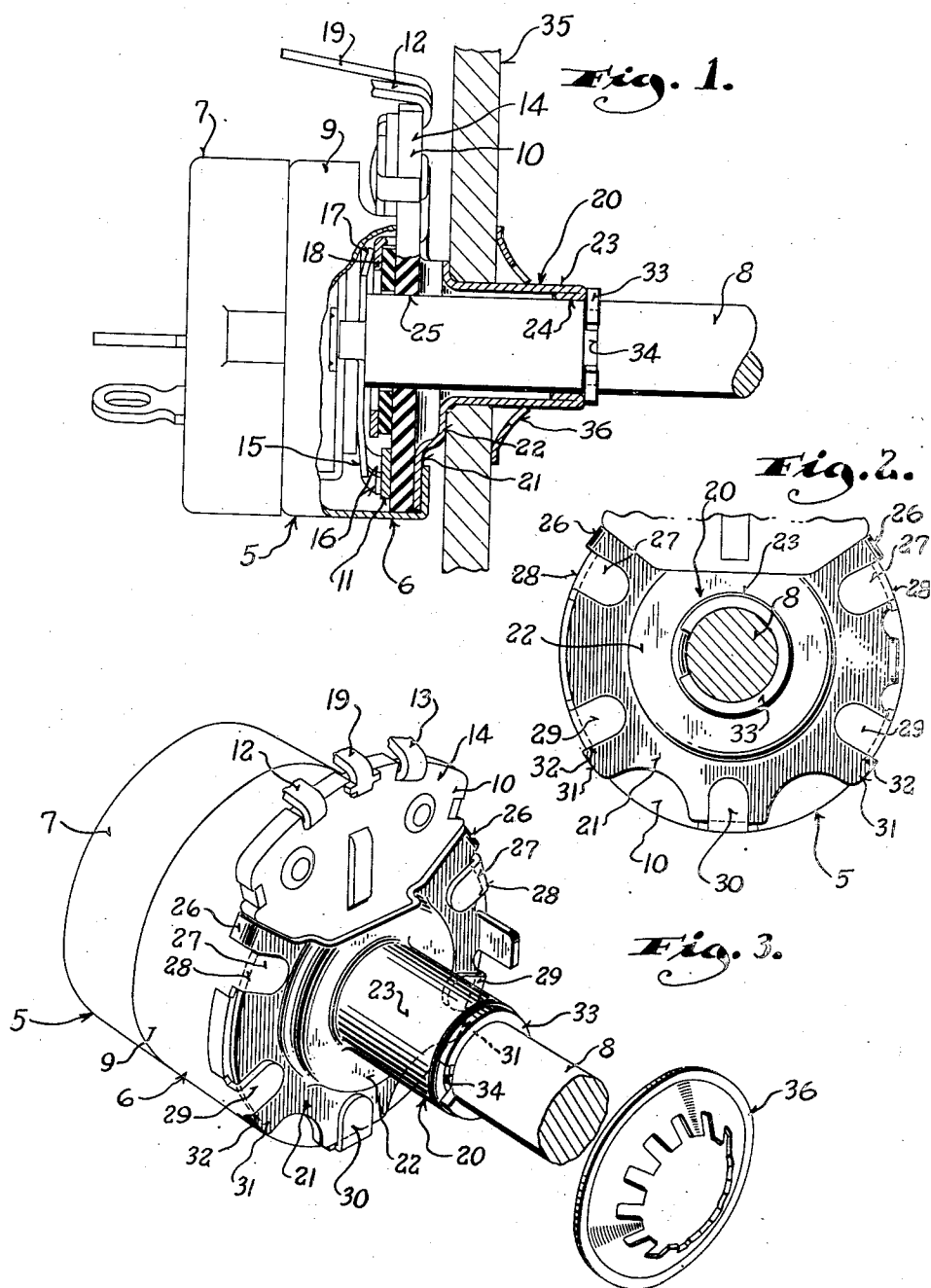
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ELECTRICAL CONTROL DEVICE

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ELECTRICAL CONTROL DEVICE

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This invention relates to electrical control devices and refers particularly to variable resistors used in radio and television apparatus.

Such controls ordinarily include a cup-like housing stamped from sheet metal and closed by a flat base of insulating material upon which the stationary parts of the control and the terminals therefor are mounted. The movable part of the control is mounted upon a shaft which enters the housing through a hole in the base, and in the case of a variable resistor consists of an arm secured to the inner end of the control shaft and arranged to traverse a resistance strip mounted upon the base within the housing. The base is secured to the housing by ears or tangs extending from the housing side walls and bent over the outer face of the base.

Heretofore it has been the practice to provide such controls with a so-called ground plate which was positioned across the outer face of the base and to which a separate bushing was secured to provide a bearing for the control shaft. The bushing was ordinarily made as a screw machine part while the ground plate was a stamping. These two pieces had to be assembled with each other and mounted upon the base in a predetermined fixed relation thereto so as to assure proper relationship between the control shaft journaled in the bushing and the resistance strip mounted on the inside face of the base.

Various schemes were employed to hold the bushing, ground plate and base assembled as, for instance, by having the bushing extend through the ground plate and the base and be rolled over the inner face of the base. While this manner of assembling the parts satisfactorily held them together, it had the objection of exposing part of the bushing at the inner face of the base, but the major objection to the use of a separate ground plate and bushing for mounting the housing and shaft lies in the expense of producing the costly screw machine part and the cost of its assembly with the ground plate and base.

It is, therefore, the purpose of this invention to provide an improved manner of mounting the housing and journaled the shaft of an electrical control device such as a variable resistor.

More specifically it is an object of this invention to provide a one piece ground plate and shaft mounting which can be easily and quickly assembled with the base and when in position provides an outboard bearing for the control shaft accurately coaxial with a hole in the base so that the shaft is jointly supported by the hole in the base and the outboard bearing.

Another object of this invention is to provide a combined one piece ground plate and shaft mounting of the character described which may

be held in place by the same ears or tangs used to hold the housing assembled with the base.

Another object of this invention is to simplify the actual mounting of controls of this type upon their supporting panels by the substitution of a simple friction washer for the large clamping nut heretofore necessary.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel 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.

The accompanying drawing illustrates one complete example of the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side elevational view of a control embodying this invention, parts thereof being broken away and in section;

Figure 2 is a front end view thereof; and

Figure 3 is a perspective view of the entire control device shown separated from its mounting panel.

Referring now particularly to the accompanying drawing the numeral 5 designates generally a control of the type with which this invention is concerned and which in the present instance consists of a variable resistor 6 and a switch 7 mounted in tandem and both controlled from a common control shaft 8.

The switch 7 is mounted upon the back of the resistor in the customary manner and the variable resistor has its instrumentalities contained within a stamped sheet metal housing 9, the open front end of which is closed by a flat base 10 of insulating material. The usual resistance strip 11 is mounted upon the inner face of the base concentrically to the shaft 8 with its ends electrically connected to terminals 12 and 13 mounted upon a lateral extension 14 of the base.

Mounted upon the inner end of the control shaft is a contactor arm indicated generally by the numeral 15. The arm 15 includes the customary contact fingers 16 which ride upon the resistance strip and traverse the same as the control shaft is turned and other radially shorter contact fingers 17 which ride upon a collector ring 18 which forms part of a central terminal stamping 19.

The manner in which the switch is actuated by rotation of the control shaft, of course, forms no part of this invention nor does the specific

construction of the resistance strip and the rotatable contact arm with its contact fingers. These parts have been defined to the extent they have only to point out that it is essential for proper contact between the contact fingers and the elements upon which they ride that the control shaft turn on an axis which is maintained accurately normal to the plane of the resistance strip 11 and the collector ring 13, and since both these elements are located by the inner face of the base 10 it follows that the shaft 8 must be held accurately perpendicular to the flat base 10.

This requirement is achieved by the present invention with the simple one piece ground plate and shaft mounting unit indicated generally by the numeral 20. This member 20 is stamped and formed from sheet metal and comprises a flange 21 roughly of a size to overlie the outer face of the base and extend to the outer periphery of its circular portion. At its center the flange is pressed outwardly to provide a raised boss or shoulder 22, the center of which is drawn out to provide a cylindrical hub 23.

The inside diameter of the cylindrical hub 23 is substantially larger than the diameter of the control shaft which is received therein but the outer end portion of the hub is turned in as at 24 to provide a smooth, close-fitting bearing for the shaft. This bearing end is produced by a forming operation, and its inside diameter may therefore be accurately controlled to reduce the amount of shaft play to the absolute minimum, thereby precluding any disturbance of the contact pressures between the arm 15, the resistance strip 11 and the collector ring 13 resulting from displacements of the shaft from perpendicularity to the latter elements.

Thus by locating the member 20 on the base 10 with its bearing portion 24 accurately coaxial with the hole 25 in the base, the shaft will be accurately held with respect to the base and the control instrumentalities mounted thereon, it being understood that the axis of the hole is normal to the base and that the hole is of a size to provide a close-fitting smooth bearing for the shaft.

Accurate location of the member 20 upon the base is assured by the engagement of locating tongues 26 on the flange 21 in position to engage the opposite sides of the base extension 14, and the sides of tongues or ears 27 extended from the edge of the housing and bent over the flange as at 28. The locating tongues 26 are thus held between the sides of the projection 14 and the edges of the tongues 27 extended from the housing.

Other tongues 29 and 30 extend from the side wall of the housing and overlie the flange 21 to coact with the tongues 27 in holding the flange, base and housing together, and accurate location of the member 20 upon the base is further assured by locating lugs 31 projecting radially from the flange 21 to engage locating shoulders 32 provided by the adjacent side edges of the tongues 29. In this manner the one piece ground plate and shaft mounting is accurately and firmly held assembled with the base.

To retain the shaft and the rotating control instrumentalities carried thereby in position an ordinary C washer 33 is engaged in an annular groove 34 in the shaft in juxtaposition to the end of the bearing 24. This washer thus serves to hold the parts assembled in the manner heretofore generally employed for this purpose, and it will be seen that the rounded edge at the end

of the hub 23 provides a smooth thrust bearing surface for the C washer and serves to keep the shaft accurately located axially with respect to the remainder of the structure.

The mounting of the entire control upon a panel 35 is also facilitated by this invention since it obviates the large clamping nut heretofore required. To this end a spring-type friction retaining washer 36 is provided. This washer is merely slipped over the smooth outer face of the hub and pressed against the panel 35 as shown in Figure 1 thereby clamping the panel between it and the raised boss or shoulder 22.

From the foregoing description taken in connection with the accompanying drawing it will be readily apparent that this invention materially simplifies the mounting of controls such as small volume controls and variable resistors used in radio and television sets, and that it substantially reduces the cost of such controls by eliminating the costly screw machine part heretofore necessary and the cost of its assembly with other parts, and at the same time assures smoother operation of the control by improving its shaft bearing construction.

What we claim as our invention is:

1. In an adjustable control device: a housing containing cooperating stationary and rotatable control instrumentalities; a flat base closing the housing and having the stationary part of the control instrumentalities mounted thereon; a rotatable control shaft entering the housing through a hole in the base and carrying the rotatable part of the control instrumentalities; proper coaction between said parts of the control instrumentalities requiring the control shaft to turn on an axis accurately normal to the base; the axis of the hole in the base being normal to the base and the hole being of a size to provide a smooth, close-fitting bearing for the shaft; a stamped and formed mounting member for the control device having a flange overlying the outer face of the base, a cylindrical hub integral with the flange and surrounding the shaft, the outside diameter of the hub being uniform and the inside diameter of the hub being larger than the shaft diameter and spaced from the shaft, and an intumed portion on the outer end of the hub, the internal diameter of said intumed portion being of a size to provide a smooth, close-fitting bearing for the rotatable shaft, the axis of the bearing thus provided being accurately normal to the plane of the flange; and means securing the flange to the base with the bearing at the outer end of the hub accurately coaxial with the hole in the base so that said bearing coacts with the hole to hold the control shaft in the position required for proper coaction between the stationary and rotatable parts of the control instrumentalities.

2. The structure set forth in claim 1 further characterized by the fact that the flange has a part thereof at the base of the hub pressed outwardly to provide a raised boss normal to the hub axis; and a friction locking washer pressed onto the hub and having spring blades biting into the hub to coact with the raised boss in holding the control device to a panel by clamping the panel between the boss and the friction washer with the hub passing through a hole in the panel.

3. In an electrical control device of the type having a flat base of insulating material and a rotatable control shaft passing through a hole in the base, smooth and satisfactory operation

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of the control device requiring the shaft to be accurately perpendicular to the flat base, means for mounting the device and accurately holding the shaft perpendicular to the base, comprising: a metal ground plate overlying the flat base; a cylindrical bearing support integral with the group plate and projecting therefrom, the outside diameter of the cylindrical bearing support being uniform and the inside diameter of said cylindrical bearing support being substantially larger than the shaft; an outboard shaft bearing on the outer end of said bearing support, the axis of which is accurately normal to the plane of the ground plate; and means holding the ground plate to the flat base with the outboard shaft bearing accurately coaxial with the hole in the base, whereby said outboard bearing coacts with the hole in the base to constrain the shaft to rotation about an axis accurately normal to the flat base.

4. In a variable electrical resistor: a flat base of insulating material having a hole therethrough, the axis of which is normal to the flat base; a resistance strip mounted upon the base around the hole therein; a rotatable shaft journaled in the hole in the base; an arm fixed to the shaft and arranged to transverse the resistance strip upon rotation of the shaft; and a single sheet metal stamping secured to the base, said stamping having a part thereof providing a ground plate overlying a substantial portion of the outer face of the base and another part providing an outboard cylindrical bearing support of uniform outside diameter and an outboard shaft bearing thereon; the hole in the base and the outboard bearing being accurately coaxial so that the shaft journaled therein will be constrained to rotation about an axis normal to the flat base; and ears on the housing extending beyond the base and overlying the ground plate, said ears holding the ground plate securely to the base in a position at which the bearing provided by the outer end of the hub is accurately coaxial with the bearing provided by the hole in the base.

5. In a control of the character described: a flat base of insulating material having a hole therethrough, the axis of which is perpendicular to the base; a rotatable control shaft passing through said hole and receiving bearing support therefrom, said control including a housing covering one face of the base, a one piece stamped and formed mounting member for the control and the shaft of the control including a flange overlying the other face of the base, and a cylindrical hub of uniform outside diameter extending outwardly from the flange and having the shaft received therein, the inside diameter of the hub being larger than the diameter of the shaft and spaced therefrom throughout the major portion of the length of the hub but the outer end portion of the hub having a reduced diameter to provide a second bearing for the shaft; and interengaging abutments on the housing, the flange and the base for securing the housing and the flange to one another and to the base, said abutments automatically locating the flange and consequently the hub thereon in proper relation to the base, with the bearing provided by the outer end portion of the hub accurately coaxial with the hole in the base so that said bearing and the hole coact to rotatably mount the shaft in proper relation to the base and the control instrumentalities carried thereby.

6. The control device described in claim 5 fur-

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ther characterized by the fact that the flange has a central portion thereof at the root of the hub pressed outwardly to provide a raised boss engageable with one face of a mounting panel upon which the control device is to be mounted with the cylindrical hub passing through a hole in the panel, said hole being of a size to snugly receive the cylindrical hub; and a friction retaining washer pressed onto the hub to coact with the raised boss to clamp a mounting panel therebetween.

7. In an electrical control device of the type having a housing, a flat base of insulating material in the housing, a control element fixed on one face of the base, and a cooperating movable control element carried by a rotatable shaft, a unitary sheet metal stamping comprising: a flat flange overlying a substantial part of the other face of the base and providing a part of the housing; a cylindrical hub of uniform outside diameter extending outwardly, away from the base, a sufficient distance to project through and beyond a panel upon which the device is to be mounted, said hub having a uniform inside diameter substantially greater than the diameter of the shaft; an inturned portion on the outer end of the hub to provide a smooth outboard bearing for the shaft cooperating with a closely fitting hole in the base which provides an inboard bearing for the shaft; and tongues on the marginal edge portion of the flange engaging fixed portions on the device to hold the stamping on the device with the inturned portion on the hub accurately coaxial with the hole in the base.

8. In an electrical control of the type having a flat base of insulative material on which a stationary control element is mounted, a rotatable shaft carrying a movable control element cooperable with said stationary control element, and a housing enclosing the stationary and movable control elements, unitary means providing a bearing for the shaft, a mounting for the control, and a portion of the housing, said unitary means comprising: a stamping having a flat flange overlying a substantial portion of one face of the insulative base and comprising a portion of the housing; a cylindrical hub of uniform outside diameter extending away from the flange at the side thereof remote from said insulative base a distance sufficient to project through and beyond a panel upon which the control is to be mounted; a portion on the outer end of the hub having a reduced inside diameter to provide an outboard bearing for the shaft cooperating with a substantially closely fitting hole in the base to rotatably journal the shaft; and tongues on the marginal edge portion of the flange engaging fixed portions on the device to hold the stamping with the inturned portion of the hub accurately coaxial with the hole in the base.

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