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W. H. BUDD ET AL

2,639,358

SHAFTLESS ELECTRICAL CONTROL INSTRUMENTALITY

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Fig. 1.

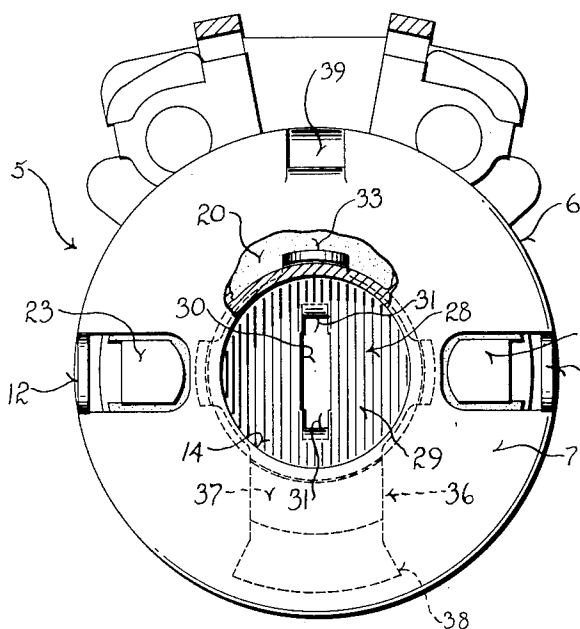


Fig. 2.

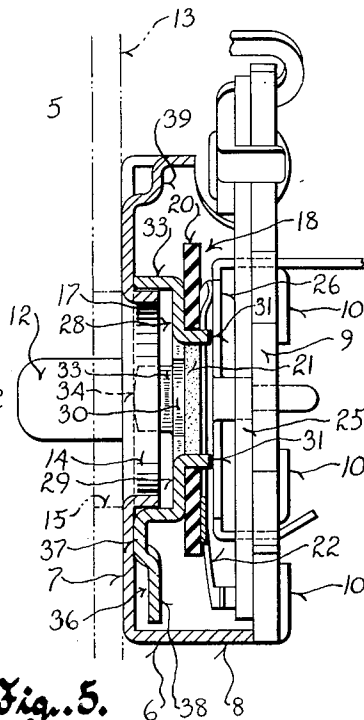


Fig. 3.

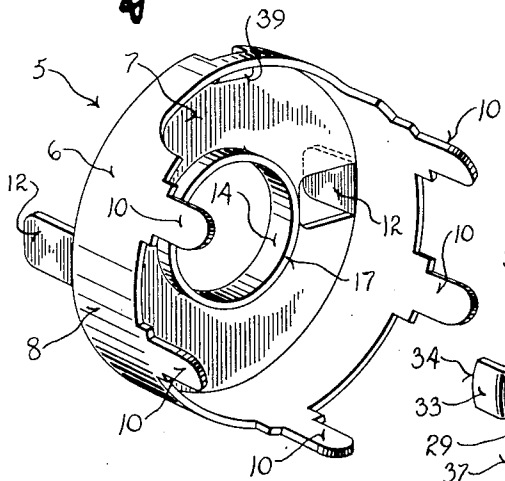


Fig. 4.

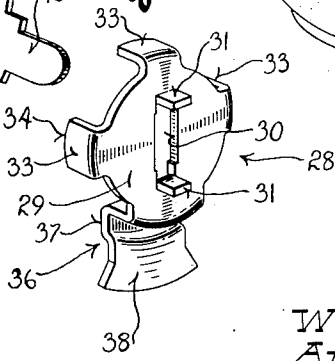
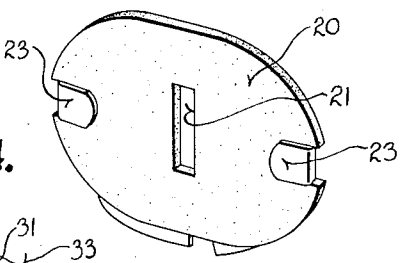


Fig. 5.



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## UNITED STATES PATENT OFFICE

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SHAFTLESS ELECTRICAL CONTROL  
INSTRUMENTALITY

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9 Claims. (Cl. 201—55)

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This invention relates to electrical control instrumentalities, and has more particular reference to variable resistance controls of the shaftless type adapted for operation by a screw driver or the like inserted through a hole in the housing of the control device into a drive slot in the contactor assembly to rotate the same.

Variable resistance control devices of this nature generally comprise a housing having spaced apart parallel front and rear walls and a contact assembly inside the housing having a resilient contactor cooperable with a resistance strip and collector ring stationarily mounted in the housing. Because there is no housing journaled operating shaft to support and drive the contactor assembly, its mounting in the housing for rotation relative to the resistance strip and collector ring along with the support of the contactor assembly against the axial thrust of the resilient contactor thereon have constituted problems which hitherto have not been solved without resorting to complicated and costly constructions. Moreover, these problems have been aggravated by the ever increasing demand for greater compactness of such control instrumentalities.

It is the object of this invention, therefore, to provide a shaftless resistance control device of the character described with unusually simple and compact means for supporting the contactor assembly for rotation in the housing of the device and against the axial thrust of the resilient contactor carried thereby.

More specifically, it is the object of this invention to provide a novel thrust bearing for the contactor assembly of a shaftless resistance control device of the character described, which not only supports the contactor assembly against the thrust of the resilient contactor thereon but which also serves to mount the contactor assembly on the housing for rotation within defined limits therein. According to this invention, low cost is also achieved by fabricating the thrust bearing from sheet metal, as a stamping.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction 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 herein-  
after disclosed 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

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best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a front elevation view of a resistance control device constructed in accordance with this invention, portions thereof being broken away and shown in section;

Figure 2 is a side view of the device shown in Figure 1 but with the front portions of the housing and the parts in its interior shown in section;

Figure 3 is a perspective view of the housing with the rear wall removed and looking at the inner side of the front wall of the housing;

Figure 4 is a perspective view of the thrust bearing per se; and

Figure 5 is a perspective view of the contactor assembly, looking at the front side thereof.

Referring now more particularly to the accompanying drawing, the numeral 5 generally designates the housing of a variable resistance control device of the shaftless type. The housing comprises a cup-like housing part 6 stamped from sheet metal and having a bottom wall 7 which provides the front wall of the housing, and a cylindrical side wall 8 projecting rearwardly therefrom. The open rear of the housing is closed by a disc 9, of insulating material, which forms the rear wall of the housing.

The rear wall 9, of course, abuts the rim of the cup-like housing part 6 and is fixed thereto in any suitable manner as by attaching tabs 10 extending from the side wall 8 rearwardly through peripheral notches (not shown) in the rear wall and bent inwardly over its rear face, as shown best in Figure 2.

Diametrically opposite forwardly extending tabs 12 struck from the front wall 7 provide for mounting the control device upon the back of a panel 13 (see Figure 2) with registering holes 14 and 15 in the front wall of the housing and the panel, respectively, affording access to the control device from the front of the panel for operation of the device by a screw driver or the like.

The hole 14 is located centrally of the front wall of the housing and is defined by the inner surface of an annular flange 17 integral with the front wall 7 and extending a short distance rearwardly therefrom. As will appear hereinafter, the flange 17 preferably has a cylindrical periphery and provides a bearing to rotatably support the contactor assembly 18 of the device.

The contactor assembly 18 comprises a contact carrier 20 in the form of a disc of insulating material, as seen best in Figure 5, having a

central elongated drive slot 21 therein; and a resilient contactor 22 overlying the rear face of the carrier 20 and fixed thereto as by means of tabs 23 in a more or less conventional manner. The contactor, of course, cooperates with an arcuate resistance strip 25 and a collector ring 26 inside the housing, fixed to the rear wall thereof in any suitable manner. Consequently, rotation of the contactor assembly carries the contactor in one direction or the other along the surface of the resistance strip and the collector ring to effect variation in resistance in a circuit in which the control device may be connected.

Inasmuch as the contactor 22 is of resilient material, and must be kept engaged with the resistance strip and collector ring comprising the stationary elements of the control device under a predetermined degree of spring tension, it will be apparent that the contactor exerts a forward thrust on the carrier 20 tending to move the same forwardly toward the front wall 7 of the housing, in a direction tending to lessen the pressure with which the contactor engages the resistance strip and collector ring.

According to this invention this forward thrust of the resilient contactor is transmitted to the front wall 7 of the housing by means of a novel thrust bearing 28 which may be considered part of the contactor assembly since it is non-rotatably connected to the carrier disc in a manner now about to be described.

The thrust bearing 28 is a relatively simple sheet metal stamping having a disc-like body portion 29 which provides a wall having flat engagement with the front side of the contactor disc 23. The central portion of the wall 29 is formed with an elongated slot 30 of a size and shape to substantially register with the drive slot 21 in the contactor disc, and tabs or prongs 31 struck rearwardly from the body portion 29 at the remote ends of the slot 30 project into the adjacent ends of the drive slot 21 in the contactor disc to mount the contactor assembly on the thrust bearing with the contactor assembly non-rotatably connected thereto. Since the tabs 31 engage in the extremities of the drive slot 21, the contactor assembly is held against all motion relative to the thrust bearing except flatwise motion in a direction to separate the same therefrom.

As shown best in Figure 4, the thrust bearing 28 is provided with a series of lobes 33, bent forwardly from the periphery of the body portion 29 and extending endwise toward the front wall of the housing to have their rounded extremities 34 abut the inner surface of the front wall 7. The lobes 33 are substantially circumferentially equi-spaced and are curved to substantially conform to the periphery of the annular flange 17 on the front wall of the housing to loosely slidably embrace said flange so that the thrust bearing and the contactor assembly carried thereby are rotatably journaled on the bearing provided by the flange.

Consequently, it will be seen that the lobes 33 provide spacing means to hold the contactor assembly in a predetermined axial position inside the housing such as will maintain the required contact pressure between the resilient contactor and the arcuate resistance strip and collector ring engaged thereby; and that the forward thrust of the contactor is transmitted through the lobes to the front wall of the housing directly adjacent to the flange 17 thereon.

This manner of rotatably mounting the con-

tactor assembly on the housing of the control device also has the advantage of utilizing the energy stored in the contactor to maintain the contactor assembly drivingly connected with the thrust bearing, since the contactor disc 20 is pressed against the rear side of the body portion 29 of the thrust bearing and thus held against rearward displacement off of the drive tabs 31.

Inasmuch as the extremities of the lobes 33 are rounded and the corners thereof preferably slightly broken or chamfered to avoid burr thereon, the contactor assembly may be rotated with as little resistance as possible to edgewise travel of the lobes across the rear face of the front wall 7. The provision of four lobes, or in other words two diametrically opposite pairs of lobes with all of the lobes equi-spaced circumferentially also assures ease of rotation of the contactor assembly as by means of a screw driver inserted through the registering holes 15 and 14 in the panel and the front wall of the housing, respectively, with the tip of the screw driver received in the driving slots 21 and 30 in the contactor disc and thrust bearing, respectively.

Attention is directed to the fact that one of the lobes 36 is longer than the others and has its outer end portion bent radially outwardly to provide a foot 37 which has flatwise engagement with the adjacent surface of the front wall of the housing, and a stop lug 38 extending radially beyond the foot 37 but offset slightly rearwardly from the plane thereof. The stop lug 38, of course, is cooperable with a fixed stop 39 provided by an indentation in the housing part 6 to define the limits of rotation of the contactor assembly.

With the construction described, the body portion 29 of the thrust bearing substantially closes the access hole 14 in the front wall of the housing, although this hole affords the necessary access to the drive slots 21 and 30 of the contactor assembly. It will be apparent also that while the cooperating bearing forming parts on the front wall of the housing and the thrust bearing have been described as comprising an annular flange on the housing and lobes on the thrust bearing, a reversal of these parts to provide a cylindrical rim on the thrust bearing and circumferentially spaced inwardly directed lobes on the front wall 7 will suffice equally well for the purposes of rotatably mounting the thrust bearing and contactor assembly on the housing.

From the foregoing description taken together with the accompanying drawing, it will be readily apparent to those skilled in the art that this invention provides an unusually simple and inexpensive manner of utilizing a thrust bearing for the contact assembly of a shaftless resistance control device to rotatably mount the contactor assembly on the housing of the device.

What we claim as our invention is:

1. In an electrical control instrumentality of the character described: a housing having a front wall provided with a central access hole; stationary means in the housing remote from the front wall thereof; a rotor assembly in the housing comprising a rotatable rotor supporting part having a wall portion adjacent to the front of the housing and extending at least partway across said access hole, and an element carried by the rotor supporting part and rotatable therewith, said element cooperating with the stationary means in the housing; and radially overlapping flange means on the front wall of the housing and said wall portion of the rotor supporting part hav-

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ing cooperating contiguous substantially cylindrically shaped bearing surfaces thereon to mount the rotor assembly on the housing for rotation about an axis normal to the front wall of the housing.

2. In an electrical control instrumentality of the character described: a housing having opposite front and rear walls in fixed spaced apart relationship, the front wall having a central hole therein affording access to the housing interior, said hole being defined by an inwardly directed annular flange formed on the front wall of the housing; stationary means in the housing fixed to the rear wall thereof; a movable element in the housing intermediate the front and rear walls thereof and cooperable with said stationary means; means holding said movable element in cooperating relationship with said stationary means and against forward motion away from the same, comprising a member having a relatively flat wall overlying the front of the movable element, and a number of legs projecting forwardly from said relatively flat wall and engaging the front wall of the housing, said legs being spaced about the axis of the annular flange and slidably embracing the same to mount said member on the front wall of the housing for rotation about the flange axis; a rotation transmitting connection between said member and the movable element whereby the latter rotates with said member; and means on said flat wall of the member accessible through the hole in the front wall of the housing to provide for the transmission of rotation to said member, and consequently to the movable element of the control instrumentality, from the exterior of the housing.

3. In an electrical control instrumentality of the character described: a housing having a front wall provided with a central hole therein affording access to the interior of the housing; an annular flange on said front wall extending inwardly into the housing from the edge portions of said hole, said annular flange providing a bearing; a rotatable contact assembly inside the housing including a disc-like contact carrier; means mounting said carrier on the front wall of the housing for rotation about the axis of the annular flange thereon, comprising a member having a wall portion overlying the front of the carrier and non-rotatably connected thereto, and a series of circumferentially spaced lobes on said wall portion projecting forwardly therefrom and slidably embracing said annular flange, said lobes having endwise abutting engagement with the front wall of the housing to hold the contact assembly spaced a predetermined distance rearwardly thereof; and means on said member accessible through the hole in the front wall of the housing to provide for the transmission of rotation to the contact assembly.

4. In an electrical control instrumentality of the character described: a housing having opposing front and rear walls in fixed spaced apart relationship, the front wall having a central hole therein affording access to the interior of the housing; an annular flange on said front wall extending inwardly into the housing from the edge portions of said hole, said annular flange providing a bearing coaxial with said hole; stationary means in the housing fixed to the rear wall thereof; and a contact assembly rotatably carried by the bearing provided by said annular flange, said contact assembly including a contactor cooperable with said stationary means, and a contact carrier having a drive slot therein ac-

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cessible through the hole in the front wall of the housing; and spacer means extending between said carrier and the front wall of the housing to preclude forward motion of the contact assembly in the housing and thus hold the contactor in cooperative relationship with said stationary means.

5. The electrical control instrumentality set forth in claim 4 wherein said contact assembly further includes a thrust bearing comprising a metallic stamping having a relatively flat body portion overlying the front of the contact carrier and non-rotatably connected thereto, said spacer means being formed integrally with the body portion of the thrust bearing and comprising a number of circumferentially spaced lobes bent forwardly from the body portion and slidably embracing said annular flange to mount the contact assembly thereon for rotation about the axis of the flange; and said body portion of the thrust bearing having a slot therein registering with the drive slot in the carrier.

6. In an electrical control instrumentality of the character described; a housing having opposing front and rear walls in fixed spaced apart relationship, the front wall having a central hole therein affording access to the interior of the housing; flange means on said front wall extending inwardly into the housing from the edge portions of said hole, said flange means having a cylindrical bearing surface thereon to provide a bearing coaxial with said hole; stationary means in the housing fixed to the rear wall thereof; and a contactor assembly rotatably carried by the bearing provided by said flange means, said contactor assembly including a resilient contactor cooperable with said stationary means and tending to urge the contactor assembly forwardly in the housing, and a contact carrier having a drive slot therein accessible through the hole in the front wall of the housing; and cooperating means on the contactor assembly and the housing for precluding motion of the contactor assembly toward the front wall of the housing under the influence of the contactor so as to thereby hold the contactor assembly in cooperative relationship with said stationary means.

7. In an electrical control instrumentality of the character described: a housing having opposite front and rear walls in fixed spaced apart relationship, the front wall having a central hole therein providing access to the interior of the housing; cooperating movable and stationary elements in the housing, the latter overlying the inner face of the rear wall of the housing, and the movable element including a resilient contactor exerting a force on the movable element tending to move the same forwardly in the housing; a thrust bearing in the housing for transmitting the forward thrust of the contactor to the front wall of the housing, said thrust bearing comprising a body portion engaged with the front of the movable element and substantially closing said access hole in the front wall, and spacer means extending forwardly from the body portion of the thrust bearing into engagement with the front wall of the housing; an inwardly extending annular flange on the front wall of the housing adjacent to the edge of the hole therein and coaxial with said hole, said flange cooperating with the spacer means to support the thrust bearing from the front wall of the housing for rotation about the axis of the access hole therein; means on the body portion of the thrust bearing accessible through the hole in the front wall of the housing to provide for the transmission of rotation to the

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thrust bearing from the exterior of the housing; and a rotation transmitting connection between the thrust bearing and the movable element whereby the latter rotates with the thrust bearing.

8. The electrical control instrumentality set forth in claim 7 wherein said spacer means comprises a number of circumferentially spaced lobes on the body portion of the thrust bearing embracing and rotatably received on said flange to mount the thrust bearing on the flange for rotation about the axis of the hole in the front wall of the housing, said lobes being bent from the body portion and having endwise abutting engagement with the front wall of the housing directly adjacent to the flange thereon.

9. The electrical control instrumentality set

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forth in claim 8 wherein the thrust bearing is provided with at least three such lobes, one of said lobes having its end portion adjacent to the front wall of the housing extended and bent radially outwardly to provide a foot flatwise engaging the adjacent surface of the front wall of the housing; and a stop lug on the outer end of said foot engageable with an abutment on the housing to define the limits of rotation of the movable element.

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