Nov. 17, 1953 A. M. DAILY ET AL 2,659,793

VARIABLE RESISTANCE CONTROL DEVICE

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Fig. 1.

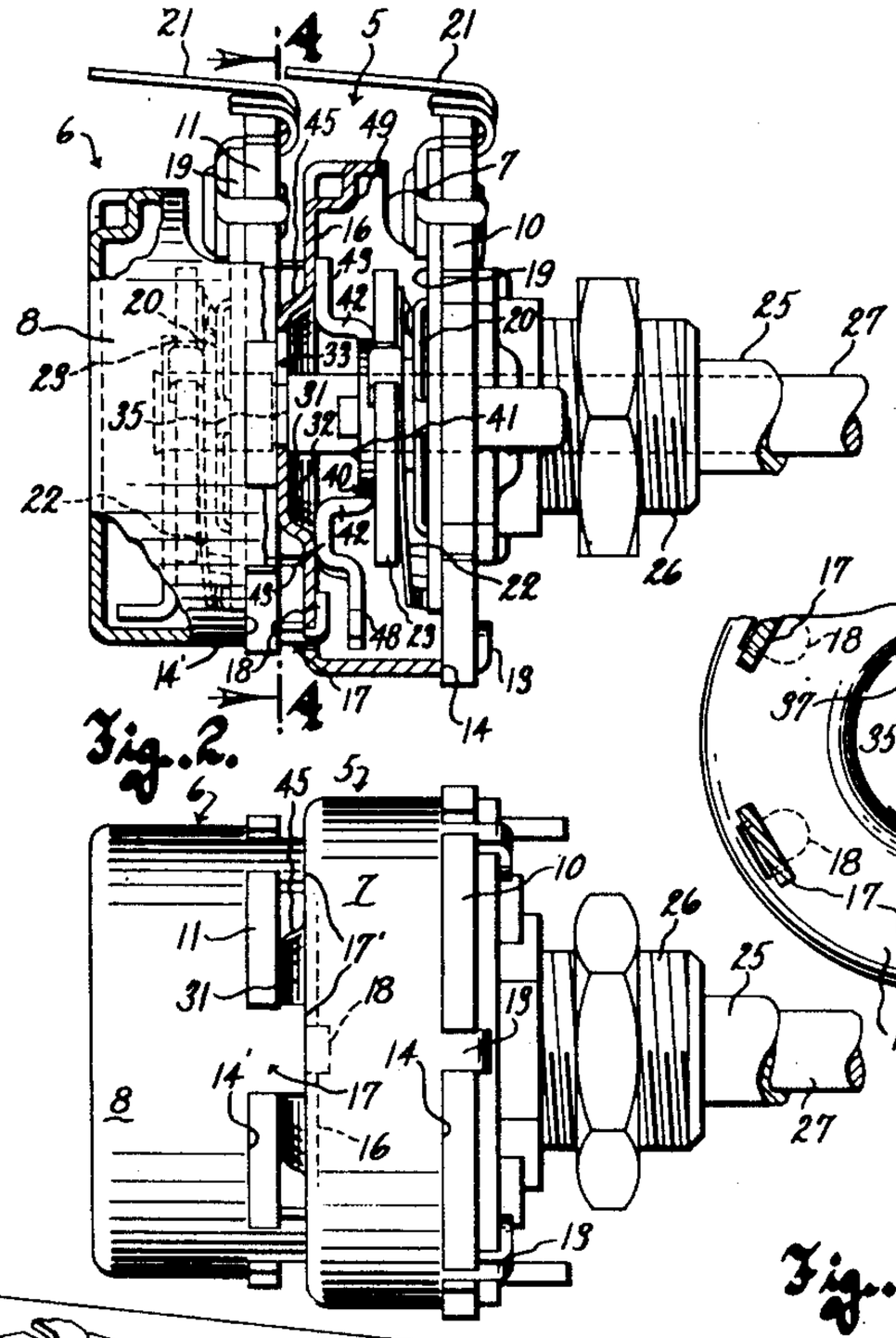


Fig. 5.

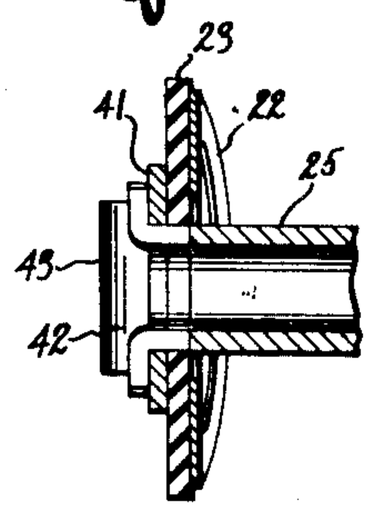


Fig. 4.

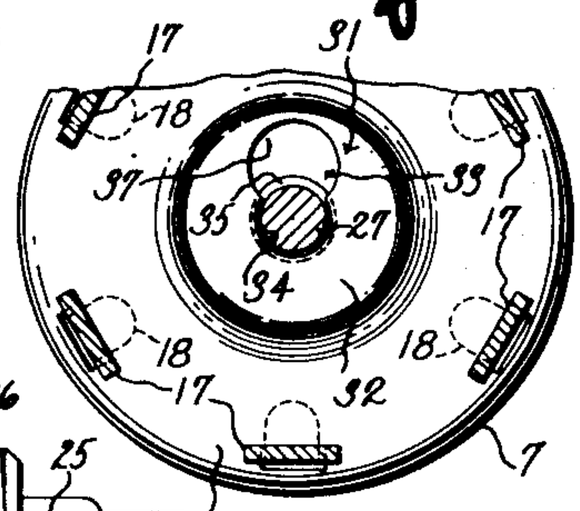
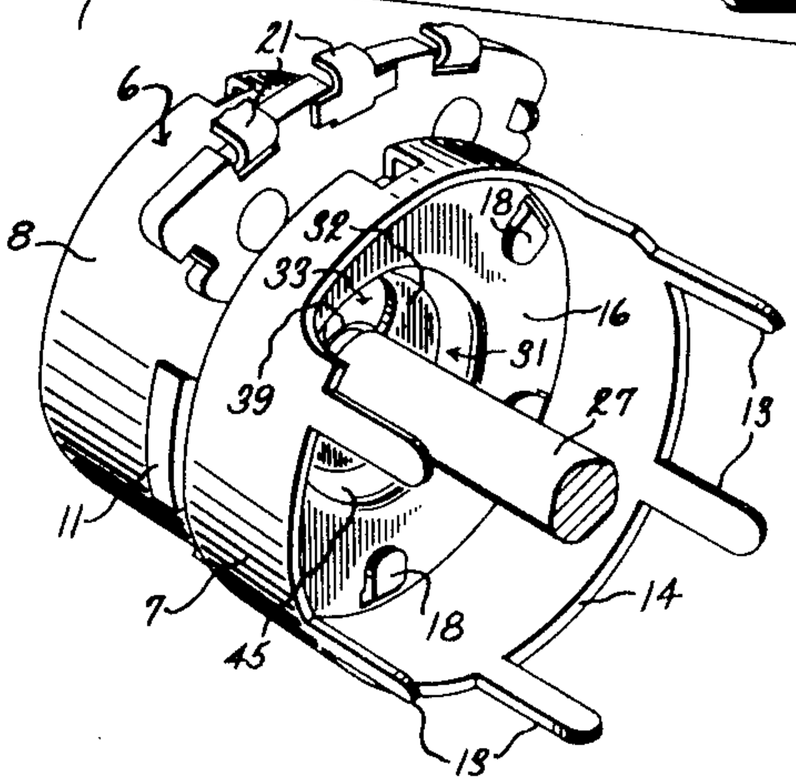
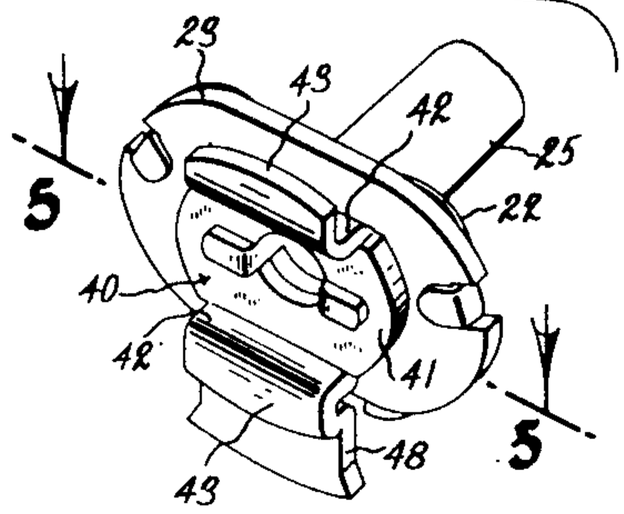


Fig. 2.

Fig. 3.





Inventors
Arthur M. Daily
Mervin B. Arisman
By Dinsmore Shohl Jones
Attorneys

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Fig. 6.

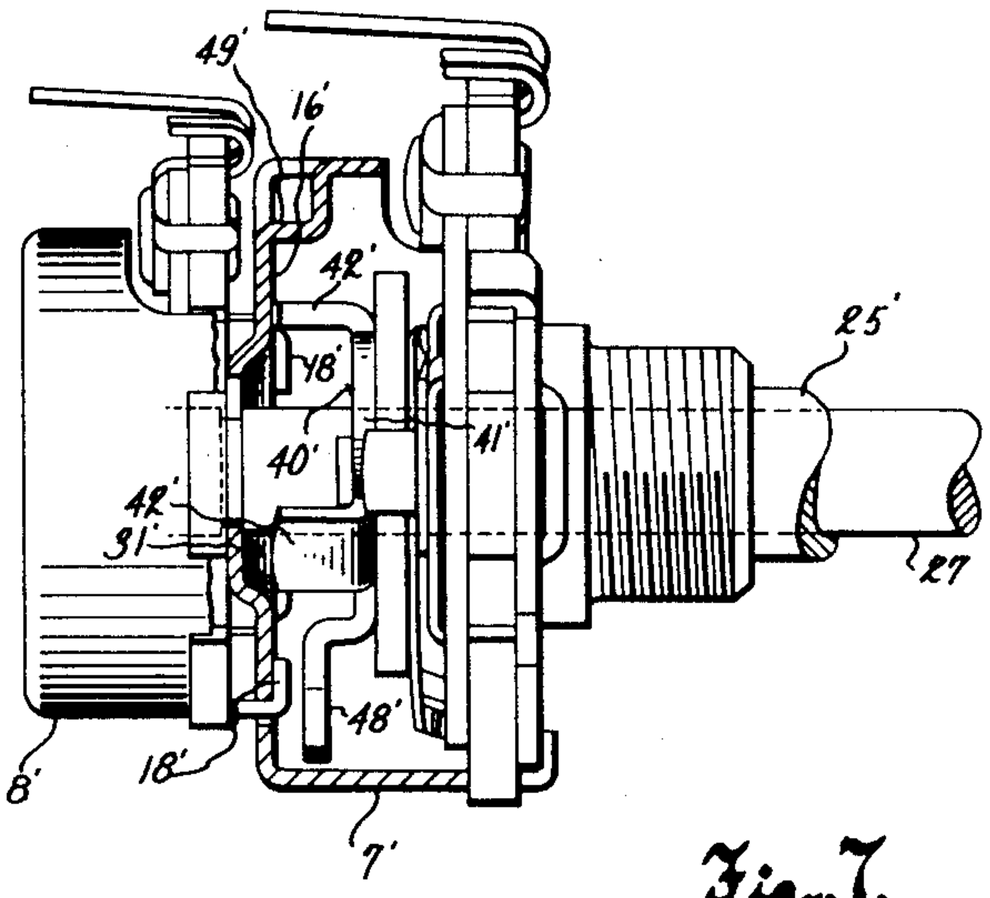
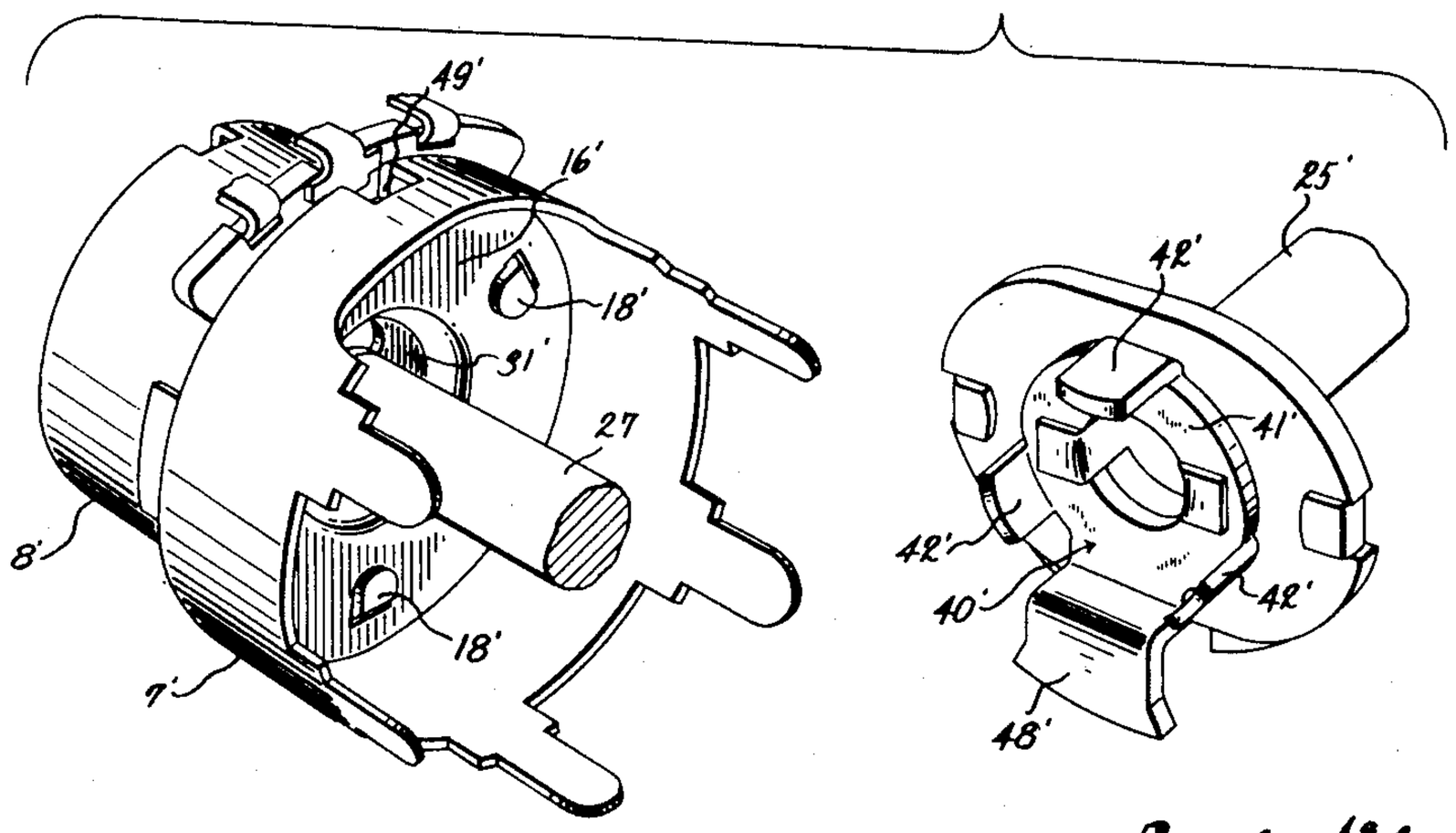


Fig. 7.



Inventors
Arthur M. Daily
Mervin B. Arisman
By [illegible]
Attorney

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VARIABLE RESISTANCE CONTROL DEVICE

Arthur M. Daily and Mervin B. Arisman, Elkhart, Ind., assignors to Chicago Telephone Supply Corporation, Elkhart, Ind., a corporation of Indiana

Application November 30, 1951, Serial No. 259,271

12 Claims. (Cl. 201—55)

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This invention relates to electrical control devices and has more particular reference to dual variable resistance control devices such as that shown and described in Patent No. 2,484,667 issued to Mervin B. Arisman et al., October 11, 1949. Variable resistance devices like these are used in radio and particularly television receivers, and comprise two control units connected together in tandem with the shaft of one hollow and having the shaft of the other rotatable therein.

Previously, the rear control unit of the device was mounted upon the back of the front control unit with a separator plate of the correct thickness interposed therebetween, and the inner control shaft for the rear unit was held against rearward motion thereinto by means of a C-washer engaged in an annular groove in the inner shaft ahead of the spacing plate.

One of the main objects of this invention is to effect a saving in both materials and parts employed in the control device of the type referred to so as to achieve a greater degree of simplicity but without sacrificing ruggedness and high quality workmanship. According to this invention this object is achieved through the elimination of the aforementioned conventional spacing plate and C-washer formerly used with such control devices.

More particularly this invention has as one of its objects the provision of a dual or tandem resistance control device of the character described wherein the back wall of the front unit has a central portion thereof embossed axially outwardly of the plane of the back wall for engagement with the front wall of the rear control unit to hold the latter spaced from the front unit a distance corresponding to the thickness of the spacing plate formerly used to hold the two control units in proper axially spaced relation. Hence, this outwardly embossed rear wall portion of the front control unit eliminates the need for the conventional spacing plate.

Also according to the present invention, the outwardly embossed central portion on the rear wall of the front control unit has a key-hole shaped aperture therein the larger portion of which is capable of accommodating the inner control shaft to enable assembly of the two units, and the smaller portion of which aperture receives an annularly grooved portion of the inner control shaft to lock the same to the housing of the front control device, against rearward motion relative thereto, so as to thereby eliminate the need for the separate C-washer formerly used for this purpose.

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While the inner control shaft is thus supported by the rear wall of the front control unit against rearward end thrust on the shaft in a most effective manner, it is also a purpose of this invention to provide a novel thrust bearing for the front control unit by which the hollow operating shaft thereof is supported against rearward end thrust thereon.

While this may be accomplished in a manner similar to that shown and described in the copending application of W. H. Budd, Serial No. 204,401, filed January 4, 1951, now Patent No. 2,628,298, it is the purpose of this invention to provide an improved end thrust bearing, for the hollow control shaft, which more readily lends itself to the compact design of the control device of this invention.

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 hereinafter disclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiment of the invention constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side view of a dual or tandem variable resistance control device embodying the principles of this invention, parts thereof being broken away and shown in longitudinal section;

Figure 2 is an elevational view of the device shown in Figure 1, viewing the same from the underside;

Figure 3 is a group perspective view of the control device but showing the mechanism removed from the front control unit;

Figure 4 is a cross sectional view taken through Figure 1 along the plane of the line 4—4;

Figure 5 is a detail sectional view taken through a portion of Figure 3 along the plane of the line 5—5;

Figure 6 is a view similar to Figure 1 but illustrating a slightly modified embodiment of the invention; and

Figure 7 is a group perspective view similar to Figure 3 showing the parts of the control device illustrated in Figure 6.

Referring now particularly to the accompanying drawings, the numerals 5 and 6 designate the front and rear control units of a dual or tandem

variable resistance control device, such as that forming the subject of the aforesaid Patent No. 2,484,667, and designed particularly for compactness because of its widespread use in radio and television receivers.

Each of the control units comprises a housing including a cup-like housing part 7 for the front control unit and a similar cup-like housing part 8 for the rear control unit but slightly smaller in diameter than that of the front unit. The open front of the cup-like housing part 5 is closed by a relatively flat base 10 of insulating material and a similar base of insulating material 11 closes the open front of the cup-like housing part 8 of the rear control unit. The insulating base 10 flatwise abuts the rim 14 of the housing part 7 and is fixed thereto by a number of tabs 13 projecting forwardly from the side wall of the housing part through peripheral notches in the base 10, and bent inwardly over the front face of the base to hold the same clamped against the rim 14. This manner of securing the base 10 to the housing part 7, of course, holds the base in spaced parallel relationship to the bottom wall 16 of the housing part 7, which bottom wall provides the back wall of the housing for the front control unit.

The base 11 of the rear control unit 6 also flatwise abuts the rim 14' of the rear housing part 8. The tabs 17 of the rear housing part 8, however, are longer and wider than the tabs 13 previously described, and have forwardly facing shoulders 17' thereon spaced a distance ahead of the front side of the base 11 and abutting the rear wall of the front control unit. Reduced extremities 18 on the tabs 17, however project forwardly through slit-like apertures in the wall 16 of the front unit and are bent over onto the inside face of this wall similarly to the tabs 13, to secure the units together with the back wall 16 of the front unit spaced from the adjacent base of the rear unit by the shoulders 17'.

Stationarily mounted upon the inner face of each of the insulating bases is an arcuate resistance strip 19 and a collector ring 20, and the usual terminals 21 extend from the ends of the strips and rings to be exposed at the exterior of the control device. Cooperating with the resistance strip and collector ring of each control unit is a contactor 22 mounted upon the front face of a contact carrier or driver 23 preferably comprising a disc of insulating material. The driver 23 of the front unit is fixed upon the inner end of a tubular control shaft 25 freely rotatably journalled in a bushing 26 on the base 10, the bushing also serving as the means for mounting the control device upon a panel (not shown) or the like. The driver 23 of the rear unit is fixed to the inner end of a solid control shaft 27 rotatable inside the tubular shaft 25 and projecting axially rearwardly through the front control unit into the interior of the rear control unit.

The construction of the control device described thus far generally follows that shown and described in the copending application of W. H. Budd, Serial No. 204,401 mentioned previously, with the exception that the cup-like housing part 8 of the rear control housing of this invention is smaller in diameter than that of the front control unit. This has the advantage of permitting the attaching tabs 17–18 of the rear unit to project straight forwardly from the side wall of its housing part 8 for connection with the rear wall 16 of the front housing, the tabs 18 being spaced slightly inwardly from the side wall of the front housing part 7.

According to this invention, the customary spacing plate which previously was interposed between the back wall of the front control unit and the insulating base of the rear control unit is eliminated, along with the customary C-washer by which the control shaft of the rear control unit was supported against rearward end thrust thereon. In the present case the proper axial spacing between the two control units is achieved by the shoulders 17' on the attaching tabs 17 in cooperation with a rearwardly embossed central portion 31 on the rear wall 16 of the front control unit. The rearwardly embossed portion 31 has a flat wall portion 32 parallel to the wall 16 but offset rearwardly out of the plane thereof a distance corresponding to the thickness of the conventional spacer plate, and the embossed portion thus provides a pad centrally of the shoulders 17' on the rear attaching tabs which is held engaged with the front side of the base 11 of the rear control unit by the tabs 18 so that the two control units are held securely attached together in coaxial relationship and properly axially spaced from one another.

The flat wall 32 of the embossed portion 31 is provided with a substantially key-hole shaped opening 33. The small diameter end 34 of this opening is coaxial with the bearing provided by the bushing 26 and of a size to receive an annularly grooved portion 35 of the operating shaft 27 for the rear control unit to substantially lock the shaft to the housing of the front control unit against substantially all axial motion relative thereto. It is to be understood, of course, that the location of the annular groove 35 lengthwise of the shaft 27 is such as to hold the contactor of the rear control unit engaged with its cooperating collector ring and resistance strip under the desired degree of spring tension, and that the rear wall 16 and particularly the outwardly embossed center portion 32 thereof receives any rearward thrust upon the shaft 27. Hence the rearwardly facing shoulder on the shaft, defined by the annular groove 35, and which overlies the portions of the wall 32 surrounding the small diameter end 34 of the key-hole shaped opening, provides a thrust bearing on the shaft 27 to transmit rearward end thrust on the shaft to the housing of the front control unit.

The larger end portion 37 of the key-hole shaped aperture 33 has a diameter sufficiently large to slidingly receive the ungrooved portions of the operating shaft 27, and enables attachment of the assembled rear control unit to the bottom wall 16 on the cup-like housing part 7 of the front unit prior to assembly of the parts of the front control unit in the housing 7. In other words, with the rear control unit 6 in a completely assembled condition, and its operating shaft 27 extending forwardly through a hole 39 in the insulating base 11 in which the shaft is loosely rotatably received, the cup-like housing part 7 for the front unit is slipped on over the forward end of the shaft 27 with the shaft received in the enlarged portion 37 of the key-hole shaped opening, and moved rearwardly along the shaft to seat its centrally embossed portion 31 against the base 11 of the rear unit. With the parts in this position, the shaft 27 is drawn forwardly slightly to bring its groove 35 into the plane of the flat wall 32 of the embossure, thereby allowing the housing to be shifted

laterally for engagement of the grooved portion **35** of the shaft in the small diameter end **34** of the key-hole shaped opening **33**.

An end thrust bearing **40** is also provided for the tubular shaft **25** of the front control unit **5**. This thrust bearing is formed as a metallic stamping having a flat body portion **41** received on and fixed to the inner end of the shaft **25** (as shown in Figure 5) rearwardly of but directly flatwise adjacent to the driver **23** so as to be normal to the axis of the operating shaft. At diametrically opposite portions of its periphery the body is provided with lateral extensions bent to provide legs **42** projecting rearwardly toward the back wall **16** of the housing, and the extremities of the legs are bent in opposite directions to provide feet or runners **43** flatwise engaged with the inner surface of the back wall **16**.

Consequently, any rearward end thrust upon the shaft **25** is transmitted through the feet **43** of the thrust bearing **40** directly to the rear wall of the front housing which, therefore, receives any rearward end thrust imposed upon either of the operating shafts **25** or **27**. Attention is directed to the fact that in both instances the portions of the back wall **16** which receive the end thrust are adequately reinforced against deflection or deformation. In the case of the shaft **27** for the rear unit, it will be noted that the end thrust is transmitted directly to the wall **32** of the outward embossure **31** which, of course, is backed up by the insulating base **11** of the rear control unit. In the case of the tubular operating shaft **25** for the front control unit it should be observed that the feet **43** of the thrust bearing **40** engage the rear wall **16** of the front housing directly at its junction with the outward embossure **31**. Consequently, the more or less frusto-conical side wall **45** of the embossure **31** receives such rearward end thrust and is placed in compression between the bearing feet **43** and the insulating base behind it.

As indicated previously the thrust bearing **40** also serves as a rotation stop and for this purpose one of the feet **43** thereof has an extension **48** thereon offset forwardly from the plane of the feet. This extension projects radially outwardly toward the side wall of the front housing for cooperation with an indentation **49** in the wall of the housing to limit rotation of the tubular shaft **25**. Hence, it will be noted that the extension **48** provides a rotation stop spaced a sufficient distance forwardly from the attaching tabs **18** as to avoid any interference with rotation of the operating shaft **25**.

The dual resistance control device of Figures 6 and 7 is even more compact than the device of Figures 1 to 5 inclusive. Consequently, there is considerably less area on the rear wall **16'** of the front control unit housing, between the tabs **18'** and the rotation stop **49'**, for engagement by the thrust bearing **40'**. Feet or runners such as used in the previous embodiment cannot be employed in this instance because they would collide with the attaching tabs **18'** and interfere with proper rotation of the operating shaft **25'** for the front control unit.

A combined thrust bearing and rotation stop **40'**, therefore, is employed in this form of the invention. Instead of feet, the thrust bearing **40'** has three circumferentially equi-spaced legs **42'** extending rearwardly from its body **41'**, and the extremities of the legs have endwise abutting engagement with the flat inner surface of the adjacent rear wall **16'** directly alongside its junction with the central outward embossure **31'** thereon. The extremities of the legs **42'** are slightly rounded to make turning of the tubular control shaft **25'** as smooth and easy as possible.

In this embodiment of the invention also, a radial extension **48'** on the body **41'** projects outwardly toward the side wall of the housing for cooperation with an indentation **49'** in the side wall of the housing to limit rotation of the shaft **25'**. It will be noted that the extension **48'**, though offset rearwardly from the plane of the body **41'**, is nevertheless spaced sufficiently forwardly of the attaching tabs **18'** as to eliminate any possibility of interference with rotation of the control shaft.

From the foregoing description taken together with the accompanying drawings, it will be readily apparent to those skilled in the art that the variable resistance control device of this invention achieves simplicity of construction and lower manufacturing cost through the elimination of parts previously considered essential, and achieves this desired simplicity without sacrificing ruggedness and high quality construction.

What we claim as our invention is:

1. In combination: two electrical control units each having opposite front and rear walls in fixed spaced apart relationship, said units being fixed together in tandem relationship with the front wall of the rear unit in juxtaposition to the rear wall of the front unit; a tubular operating shaft for the front unit rotatably journalled in the front wall of said front unit and projecting rearwardly into the interior of the front unit to have driving engagement therein with mechanism to be actuated; a second operating shaft rotatable inside said tubular shaft and projecting rearwardly through apertures in said juxtaposed walls of the two units into the interior of the rear unit to have driving engagement therein with mechanism to be actuated; and means on each of said operating shafts defining abutments overlying inner surfaces of the rear wall of the front unit and cooperating with said rear wall thereof to support each shaft against rearward end thrust thereon.

2. The combination set forth in claim 1 further characterized by the provision of an axially rearwardly embossed central reinforcing portion on the rear wall of the front control unit engaging the front wall of the rear control unit to hold said units properly spaced apart.

3. The combination set forth in claim 2 further characterized by the provision of shoulders on the rear control unit engaging exterior surfaces of the rear wall of the front unit at areas spaced radially outwardly of said centrally embossed portion and cooperating therewith to hold the attached units properly spaced apart.

4. The combination set forth in claim 2 further characterized by the fact that the abutment defining means on the tubular shaft has engagement with the inner surface of the rear wall of the housing for the front unit at areas directly adjacent to its junction with said rearwardly embossed central portion thereof.

5. The combination set forth in claim 2 wherein said outwardly embossed central portion on the rear wall of the front control unit has a flat wall portion normal to the axis of the operating shafts, and further characterized by the provision of a key-hole shaped opening in said flat wall portion, and an angularly grooved portion on the operating shaft for the rear control unit received in the small diameter end of the keyhole

shaped opening to substantially lock the shaft of the rear control unit to the rear wall of the housing for the front control unit.

6. In an electrical control device: a control unit; a housing for said control unit including opposite front and rear walls in fixed spaced apart relationship; means for operating the control device including a shaft rotatably journalled in a bearing in the front wall of said control unit and extending rearwardly into the housing thereof and through an opening in the rear wall of said housing; said shaft having an annular groove therein lying in the plane of that portion of the housing rear wall through which the shaft projects; and the rear wall of the housing having laterally adjacent, communicated apertures therein, one of which is coaxial with said bearing but smaller in diameter than the adjacent ungrooved portions of the shaft and in which the grooved portion of the shaft is received, whereby the shaft is substantially locked to the rear wall of the housing against axial motion relative thereto, the other aperture being large enough to accommodate the shaft for endwise sliding motion therein.

7. The electrical control device set forth in claim 6 wherein said laterally adjacent communicated apertures are formed in a central portion of the rear wall of the housing which is embossed axially rearwardly, out of the plane of said rear housing wall.

8. In an electrical control device: a control unit having a housing including opposite front and back walls in fixed spaced apart relationship; a stationary element inside said housing secured to the front wall thereof; a rotatable element inside the housing and cooperable with said stationary element; a cup-like housing part secured to said control unit with its bottom wall in juxtaposition to the outer surface of said front wall of the control unit, and the side wall of the housing part projecting forwardly from said front wall; an operating shaft for said control unit loosely rotatably journalled in an aperture in said front wall of the control unit and having its rear end portion inside said rear control unit and fixed to the rotatable element therein to rotate the same, said operating shaft having an annular groove therein adjacent to said bottom wall of the housing part, and projecting through a hole therein coaxial with but smaller than said aperture in the front wall of the control unit and in which the grooved portion of the shaft is received to substantially lock the shaft against endwise motion relative to the control unit, said shaft projecting forwardly through the interior of the cup-like housing part beyond the rim thereof, and said shaft receiving hole being enlarged laterally to a diameter at least as great as that of the ungrooved portion of the shaft, in which the shaft may be projected during assembly of the housing part with the control unit.

9. The electrical control device set forth in claim 8 wherein said coaxial and enlarged holes are located in a central portion of said bottom wall of the housing part which is embossed rearwardly out of the plane thereof and has engagement with the front wall of the control unit housing to hold the cup-like housing part spaced therefrom.

10. In an electrical control device: a housing having opposing spaced apart front and rear end walls; cooperating stationary and rotatable elements inside the housing, the stationary element being carried by the front wall of the housing between the front wall and the rotatable element; an operating shaft rotatably journalled in said front wall and connected to said rotatable element inside the housing to transmit rotation thereto; and a metallic stamping fixed to the operating shaft to rotate therewith, said stamping having a relatively flat body portion fixed to the shaft and substantially normal to its axis, and a number of circumferentially spaced legs extending rearwardly from the peripheral portions of the body and endwise abutting the rear wall of the housing to provide a thrust bearing for supporting the shaft against rearward end thrust thereon.

11. The electrical control device set forth in claim 10, further characterized by the provision of a central rearwardly embossed reinforcing portion on the rear wall of the housing having a flat wall portion parallel to the rear wall of the housing but spaced a distance rearwardly thereof, and a substantially frusto-conical neck joining said flat wall portion with the rear wall of the housing; said legs engaging the rear wall of the housing directly adjacent to said frusto-conical neck.

12. In combination: two electrical control units each having a cylindrical housing including opposite front and rear walls in fixed, spaced apart relationship and a side wall extending between the front and rear walls, the housing for the rear unit being smaller in diameter than that of the front unit; a central embossure on the rear wall of the front control unit projecting axially rearwardly therefrom, the rim of said embossure lying in a plane normal to the axis of the unit and no part of the embossure or rear wall of the front unit extending rearwardly beyond the rim of the embossure; the rear wall of the front control unit having circumferentially spaced slits located radially outwardly of the rim of the embossure and substantially in line with the side wall of the rear unit; forwardly facing shoulders on the side wall of the rear control unit spaced ahead of the front wall of said rear control unit a distance substantially equal to the extent the rim of the embossure lies rearwardly of the slitted portion of the rear wall of the front control unit; and tabs on the side wall of the rear control unit projecting forwardly through the slits in the rear wall of the front control unit into the interior thereof and bent over against the inner surface of its rear wall to clamp said rear wall of the front unit against the forwardly facing shoulders on the rear control unit and at the same time draw the rim of the embossure against the front wall of the rear control unit to thereby securely hold the control units in fixed spaced apart relationship.

ARTHUR M. DAILY.
MERVIN B. ARISMAN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,779,601	Kebler	Oct. 28, 1930
1,926,196	Da Costa	Sept. 12, 1933
2,484,667	Arisman et al.	Oct. 11, 1949