Feb. 27, 1962 J. DI GIROLAMO ETAL 3,023,388

COMPOSITE ELECTRICAL CONTROL DEVICE FOR RADIO RECEIVERS

Filed Sept. 22, 1960 3 Sheets-Sheet 1

Fig. 1.

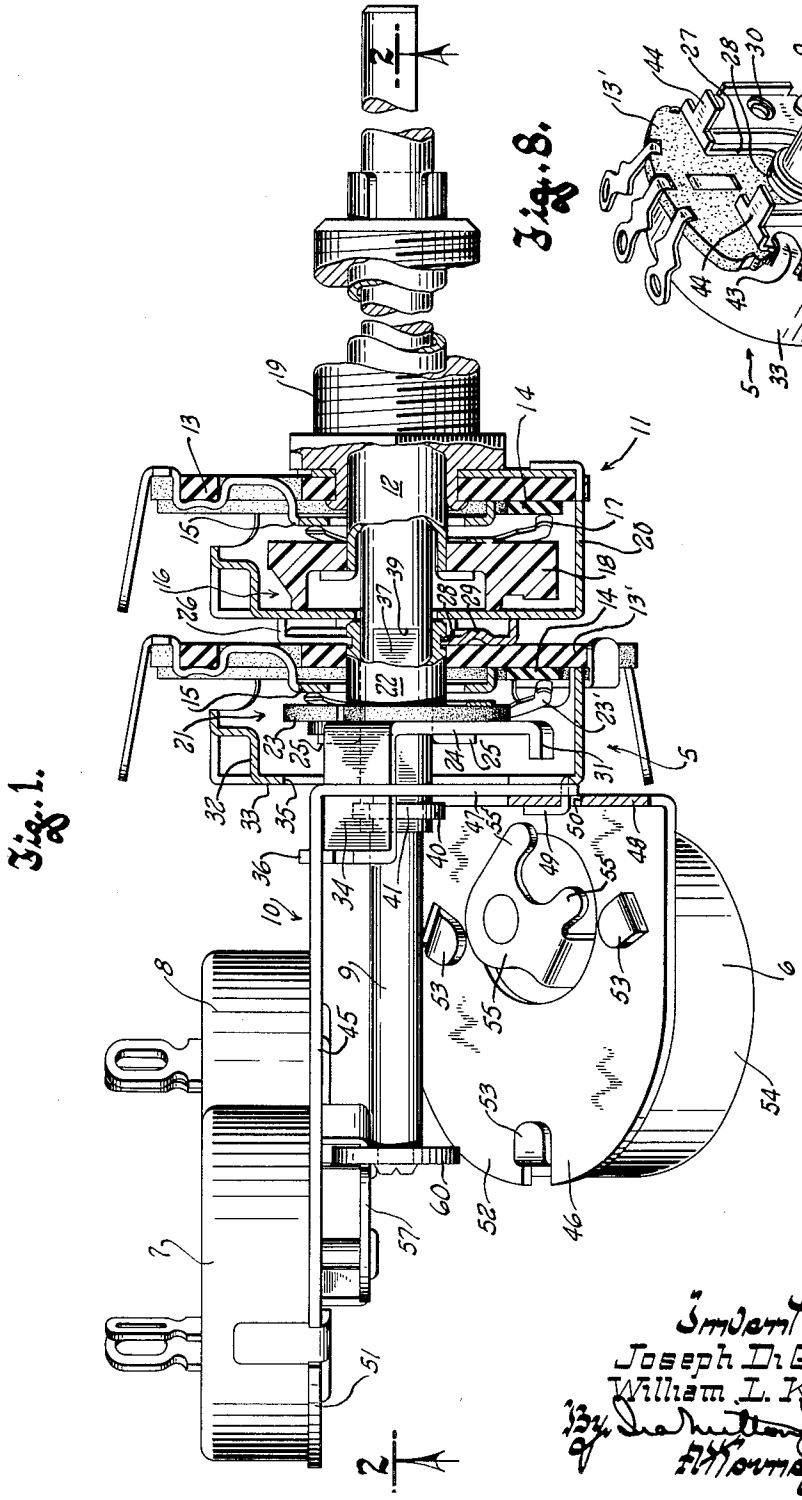


Fig. 8.

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COMPOSITE ELECTRICAL CONTROL DEVICE FOR RADIO RECEIVERS

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Fig. 1.

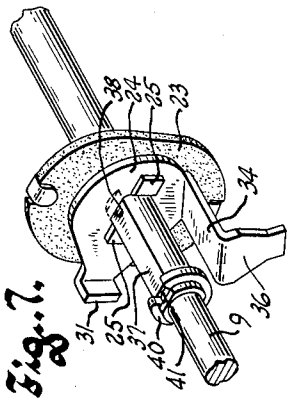


Fig. 4.

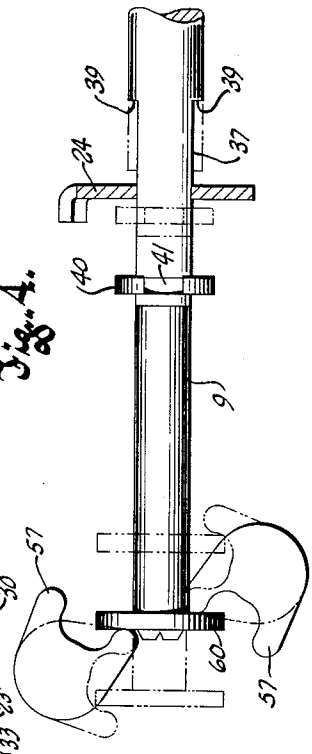


Fig. 2.

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COMPOSITE ELECTRICAL CONTROL DEVICE FOR RADIO RECEIVERS

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Fig. 5.

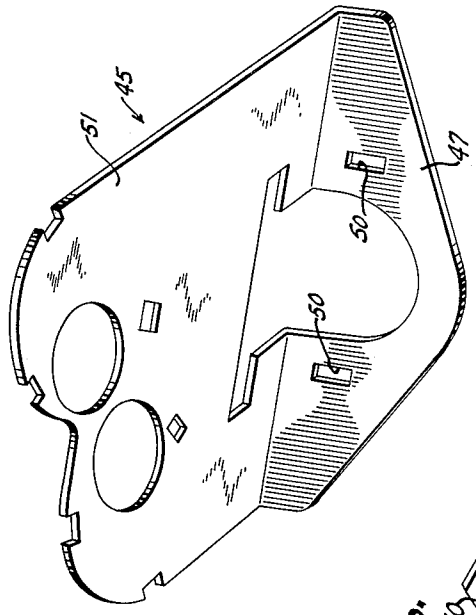


Fig. 6.

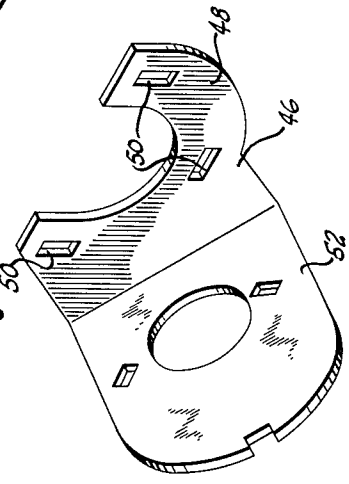
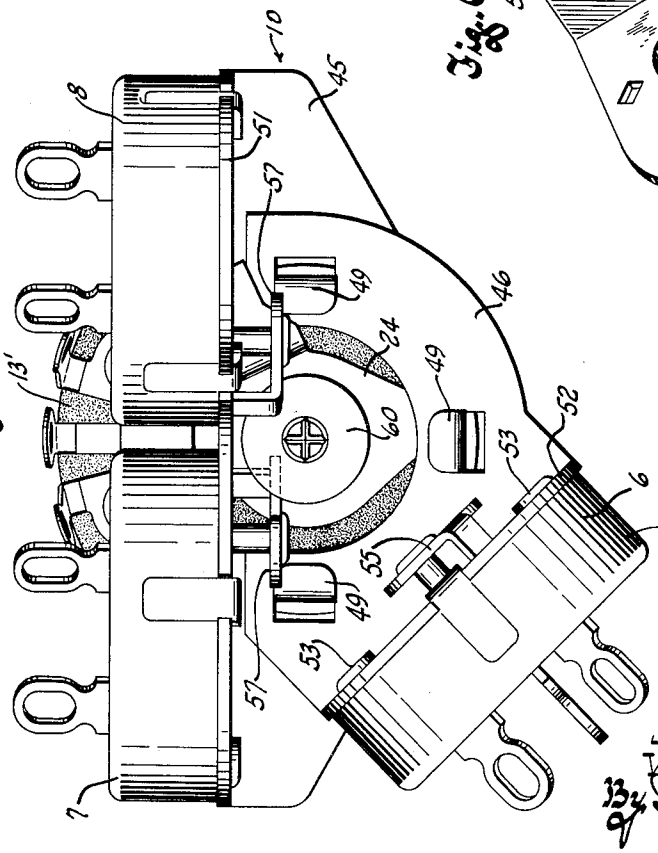


Fig. 3.



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3,023,388

COMPOSITE ELECTRICAL CONTROL DEVICE FOR RADIO RECEIVERS

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This invention relates to electrical control devices for radio and television apparatus and refers more particularly to a composite multipurpose control device which combines a variable resistor having an adjustable rotor with a plurality of electric switches and enables all of these control units to be actuated by a single operating shaft.

Specifically it is an object of this invention to provide a composite multipurpose control device especially adapted for use in car radios, and wherein a single actuating shaft which is both rotatable and endwise movable actuates the on-off switch and adjusts the volume control of the receiver by rotation of the shaft, while endwise movement of the shaft in opposite direction from a neutral position, selectively actuates one or the other of two switches to effect power produced raising or lowering of the antenna.

Another object of this invention is to provide a composite multi-purpose control device of the character described, which utilizes standard components and combines them into one rugged assembly, easily assembled into the chassis of the radio receiver.

With the above and other objects in view, which will appear as the description proceeds, this 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 invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete embodiment of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

FIGURE 1 is a side view of the composite control device of this invention, with parts broken away and in section;

FIGURE 2 is a longitudinal sectional view of the composite control device, taken on the plane of the line 2—2 in FIGURE 1;

FIGURE 3 is a rear view of the control device;

FIGURE 4 is a fragmentary detail side view of the common actuating shaft, and more or less diagrammatically illustrating how endwise shifting of the shaft actuates the two switches which control the raising and lowering of the antenna;

FIGURES 5 and 6 are perspective views of the two parts of the frame or bracket by which the several control units are secured in definite fixed relationship;

FIGURE 7 is a fragmentary perspective view of part of the variable resistor which serves as the volume control, and illustrating especially the splined torque transmitting connection between the rotor of this variable resistor and the common actuating shaft; and

FIGURE 8 is a fragmentary perspective view of another portion of the same variable resistor to show how its rotor and stator are held assembled.

Referring now particularly to the accompanying drawings, in which like numerals designate like parts throughout the several views, the composite control device shown as illustrative of the invention basically comprises a variable resistor **5**, an on-off switch **6** and a pair of accessory switches **7** and **8**. These four components or units are all actuatable by a common shaft **9**, the variable resistor and the on-off switch by rotation of the shaft, and the pair of accessory switches by endwise movement thereof, a push on the shaft actuating the accessory switch **7** and a pull actuating the accessory switch **8**.

To enable the four components or units to be actuated by the one shaft **9**, they must be secured in predetermined fixed relation to one another and to the shaft; and to this end all of the components are secured to a rigid frame structure or bracket **10**.

If desired, a second variable resistor **11** may be mounted in front of the variable resistor **5** in tandem relation thereto, in which event a second control shaft **12** is provided, this second shaft being hollow and having the front end portion of the main shaft **9** passing therethrough, as is customary in tandem mounted variable resistors.

When the composite control device is thus equipped with two variable resistors, it is especially adapted for use in automobile radios, since it then provides volume control, tone control, one-off switching, and the means to effect raising and lowering of the antenna—all at one control station.

Each of the variable resistors **5** and **11**, as is customary, includes a stator and a rotor. The stator consists of a flat base of insulating material, designated **13** in the front resistor **11**, and **13'** in the rear resistor **5**. Each base has an arcuate resistance element **14** and a metal collector ring **15**, provided with the customary terminals, mounted on its inner face.

The rotor **16** of the front variable resistor **11** comprises a bridging contactor **17** with resilient contact fingers to ride upon the resistance element and the collector ring, fixed to a drive arm or disc **18** which is molded from suitable insulating material and is secured to the hollow shaft **12**. A mounting bushing **19** fixed to the base **13** has the hollow shaft **12** journalled therein and provides means by which the entire composite control device may be mounted in the chassis of a radio receiver.

A cup-shaped cover **20** fitted over the back of the base **13** encloses the instrumentalities of the front variable resistor **11**, and completes this unit.

In the variable resistor **5** which of the two resistors illustrated constitutes the essential one from the standpoint of this invention, the rotor **21** comprises a hollow stub shaft or dummy shaft **22**, a drive arm or disc **23**, which in this case is a stamping of insulating sheet material, a stamped metal stop plate **24**, and a bridging contactor **23'** with resilient contact fingers, fixed to the drive arm. The shaft **22**, like the bridging contactor **23'** projects from the front face of the drive arm or disc **23** and is journalled in a bearing hole in the base **13'**. The hollow stub shaft **22**, the drive arm or disc **23**, and the stop plate **24** are secured together with the drive arm clamped between the rear end of the shaft and the stop plate, by diametrically opposite tongues **25** that project rearwardly from the hollow shaft through notches in the drive arm or disc and the stop plate, and are clinched over the latter.

The rotor **21** is held assembled with the stator of the variable resistor **5** by what might be regarded as a combined C washer and mounting and ground plate **26**, which overlies the front of the base **13'** and has the inner edge of a U-shaped notch **27** therein engaging in an annular groove **28** in the front end of the dummy shaft **22**. Obviously, this interengagement between the plate **26** and the dummy shaft supports the rotor **21** against rearward displacement by the thrust of the spring contact fingers of its contactor **23'**, against the resistance ele-

ment and collector ring upon which they bear, and thereby establishes correct contact pressure.

As best seen in FIGURE 8, the plate 26 is reinforced by a pressed-in U-shaped rib 29 which parallels the edge of its notch 27, and is held against rotation with respect to the base 13' by rearwardly projecting bosses 30 which enter appropriately located holes in the base.

The stop plate 24 has a rearwardly projecting finger 31 which cooperates with a fixed stop 32 pressed inwardly from the cup-shaped cover 33 of the variable resistor 5, to define the limits of rotation of the rotor 21. It also has a much longer arm 34 which projects rearwardly through a relatively large hole 35 in the back wall of the cover to provide means for actuating the on-off switch 6. To do so, the arm 34 has a radially extending actuating finger 36 on its extremity to travel in a circular orbit in unison with the rotor 21.

Torque is imparted to the rotor 21 and consequently also to the actuating finger 36, from the shaft 9 by virtue of a splined driving connection between the shaft and the rotor consisting of a non-circular shaft portion 37 formed by slabbing off diametrically opposite portions of the shaft, which engages in a correspondingly shaped hole 38 in the stop plate 24. Since the bore of the dummy shaft 22 is round and freely slidably receives the portion of the shaft 9 disposed therein, rearward endwise or axial movement of the shaft with respect to the rotor 21 is limited by the engagement of the shoulders 39 formed at the front end of the non-circular shaft portion 37 with the front face of the stop plate. Forward axial movement of the shaft with respect to the rotor 21 is limited by a C washer 40 engaged in a groove 41 in the portion of the shaft contiguous to the rear end of its non-circular portion 37.

If the front variable resistor 11 is omitted, the plate 26 can be equipped with means to mount the composite control device on the panel of the receiver chassis, but where the front variable resistor is employed, as it is in this case, the plate 26 provides the means by which the two variable resistors are secured together. For this purpose, the cover 33 of the rear variable resistor has tangs 43 projecting from its front edge and struck over the adjacent marginal edge portions of the plate 26, as best seen in FIGURE 8, and the plate 26 has tangs 44 which project forwardly therefrom through slits in the rear wall to the cover 20 of the front variable resistor and are then clinched thereof.

The frame structure or bracket 10 comprises two stampings 45 and 46, the former being larger than the latter. Each of these stampings has right-angularly disposed flanges, two of which—47 and 48—overlie one another and the rear face of the cover 33 to which they are secured by tangs 49 struck from the rear wall of the cover 33 and projecting through openings 50 in the flanges 47 and 48 over which they are clinched, as clearly shown in FIGURES 1 and 2.

In view of the right-angular formation of the stampings 45 and 46, their flanges 51 and 52 occupy planes parallel to the axis of the actuating shaft.

The on-off switch 6 is fixed to the mounting flange 52 by tangs 53 struck from the edge of its cover 54, and is so placed thereon that the operating lever 55 of the on-off switch swings or pivots about an axis which is normal to the flange 52 and perpendicularly intersects the axis of the shaft 9. The switch 6 may be of any conventional construction, but preferably is like that of Patent No. 2,286,162. Hence, its contactor mechanism (not shown) is of the overcenter type and its operating lever 55 which has a bifurcated outer end, always occupies one of two positions corresponding to the "on" and "off" conditions of the switch.

With the switch 6 secured to the frame or bracket 10 as it is, the operating lever 55 is so positioned that one of its arms 55' always lies in the path of the actuating finger 36 which rotates with the rotor 21. Thus, as the variable resistor 5 is adjusted by rotation of the shaft 9, the on-off switch is either opened or closed, as in the customary combination volume control and on-off switch.

The two accessory switches 7 and 8 are preferably identical and each has a contactor carrier or arm 56 mounted to swing about a fixed axis to and from switch closed position, and an operating lever 57 mounted to swing about the same axis. The lever 57 is biased to one of two positions by a spring 58 and an overcenter spring 59 connects the lever with the contactor carrier to snap the same back and forth as the lever 57 is rocked.

Both of the switches 7 and 8 are fixed to the flange 51 of the frame or bracket 10, one at each side of the shaft 9, with the axes of their operating levers normal to the flange and, hence, normal to the axis of the shaft, and with the free ends of their operating levers facing each other and biased in opposite directions to bear against opposite sides of an abutment 60 fixed to the rear end of the shaft.

The abutment 60 is simply a disc or washer clamped against a shoulder on the shaft by swedging or upsetting the end of the shaft, and the parts are so disposed and arranged that the bias upon the two operating levers 55 acting in opposite directions and against opposite sides of the abutment, yieldingly holds the shaft in a neutral position from which it may be pushed to close the switch 7, or pulled to close the switch 8.

As shown in FIGURE 4, the range of motion permitted the actuating shaft is, of course, sufficient to effect selective closure of either of the two switches 7 and 8 in the manner described, and as will be readily understood, actuation of the shaft to close one or the other of the two switches, does not distrub the setting of the variable resistors or the on-off switch; and, of course, rotation of the shaft 9 to adjust the variable resistor 5 or actuate the on-off switch, does not affect the switches 7 and 8.

From the foregoing description, taken in connection with the accompanying drawings, it will be readily apparent to those skilled in this art, that this invention provides a composite electrical control device especially well adapted for use in automobile radios, since it provides an on-off switch, a volume control, a tone control and "up" and "down" switches to adjust the height of the antenna—all in one unitary structure.

What is claimed as our invention is:

1. In combination: a pair of electric switches each having a pivoted actuating lever; means mounting and securing said switches in fixed relation to one another with the axes about which their pivoted actuating levers swing parallel and said levers projecting toward one another; spring means acting upon each of said pivoted levers and biasing the same in opposite directions; a common actuating shaft for said two switches; means mounting the actuating shaft for endwise movement along an axis which is fixed with respect to the switches, normal to the axes about which the operating levers swing and passes between the pivot axes of the operating levers; and an abutment fixed to the shaft and having the free ends of the actuating levers bearing against opposite sides thereof, so that the bias on said operating levers yieldingly holds the actuating shaft in a neutral position from which it may be pulled or pushed to actuate one or the other of said switches.

2. A composite electrical control device comprising: a pair of electric switches each having a pivoted actuating lever; means mounting and securing said switches in fixed relation to one another with the axes about which their pivoted actuating levers swing parallel and said levers projecting toward one another; spring means acting upon each of said pivoted levers and biasing the same in opposite directions; a common actuating shaft for said two switches; means mounting the actuating shaft for rotation and endwise movement about an axis which is fixed with respect to the switches, normal to the axes about which the operating levers swing and passes between the pivot axes of the operating levers; an abut-

ment fixed to the shaft and having the free ends of the actuating levers bearing against opposite sides thereof, so that the bias on said operating levers yieldingly holds the actuating shaft in a neutral position from which it may be pulled or pushed to actuate one or the other of said switches; and a control unit having a rotor and mounted in fixed relation to said switches with the actuating shaft, passing axially through the rotor and being slidably splined thereto so that the rotor of said control unit is adjustable by rotation of the shaft without interfering with the switches, while actuation of the switches by a push or pull on the shaft may be effected without disturbing the setting of the rotor.

3. The composite electrical control device of claim 2, further characterized by a third switch having a pivoted operating lever exposed on the exterior thereof; means mounting the third switch in fixed relation to the first two switches and the control unit, with the axis of its pivoted operating lever normal to the axis of the shaft; and an actuating arm fixed with respect to the rotor of the control unit and traveling in a circular orbit which brings the actuating arm transiently into driving engagement with the pivoted control lever of said third switch.

4. In combination: a variable resistor having a rotor; an on-off switch having an overcenter contact mechanism and a pivoted operating lever therefor; a pair of accessory switches each having a contactor mechanism and an operating lever therefor biased to one of its two positions; a common actuating shaft for the variable resistor and said three switches, said shaft passing coaxially through the rotor of the variable resistor and being slidably splined thereto; an actuator for the pivoted operating lever of the on-off switch fixed with respect to the rotor to turn therewith as the shaft is turned; an abutment on the shaft; and means securing the variable resistor and the three switches in fixed relationship with the actuator positioned to have transient driving engagement with the pivoted operating lever of the on-off switch as the shaft is turned, and with the operating levers of the two accessory switches bearing against opposite sides of the abutment on the shaft, so that the bias upon said levers holds the shaft in a neutral position from which it may be pulled or pushed to selectively actuate one or the other of said two accessory switches, without disturbing the variable resistor or the on-off switch.

5. In a composite multi-purpose electrical control device, a single actuating shaft mounted for limited endwise movement and rotation: a first control unit having a rotor slidably splined to the shaft to be adjustable by rotation of the shaft; a second control unit having an operating lever pivoted to swing about an axis substantially normal to that of the shaft; an actuator for said operating lever constrained to move in a circular orbit as the rotor is turned; a third control unit having an operating lever pivoted to swing about an axis substantially normal to that of the actuating shaft; an abutment on the actuating shaft; and means securing the three control units in fixed relationship with the actuator positioned to have transient driving engagement with the pivoted operating lever of the second control unit as the shaft is turned, and with the pivoted operating lever of the third control unit contiguous to the abutment on the shaft, so that by endwise movement of the shaft the controlling function of the third control unit may be effected without disturbing either the second or the first control unit.

6. In a composite multi-purpose electrical control device: a single actuating shaft mounted for limited endwise movement and rotation; a first control unit having a rotor slidably splined to the shaft to be adjustable by rotation of the shaft; a second control unit having an operating lever pivoted to swing about an axis substantially normal to the shaft axis; an actuator for said operating lever; means fixedly connecting the actuator to the rotor so that the actuator moves in a circular orbit as the rotor is turned; third and fourth control units each having an

operating lever movable between defined positions and biased to one of those positions; an abuement on the shaft; and means securing the four control units in fixed relationship with the actuator positioned to have transient driving engagement with the pivoted control lever of the second control unit as the shaft is turned, and with the operating levers of the third and fourth control units bearing against opposite sides of the abutment on the shaft so that the bias upon said operating levers holds the shaft in a neutral position from which the shaft may be pushed or pulled to selectively actuate one or the other of said third and fourth control units.

7. A composite multi-purpose electrical control device comprising: a first control unit having a rotor which upon being turned effects the controlling function of said unit; a second control unit having a pivoted actuating lever movable between defined limits to effect the controlling function of said second unit; a third control unit having an operating lever movable between defined positions to effect the controlling function of said third unit; means biasing the operating lever of the third control unit to one of its defined positions; a common actuating shaft for the three control units, said shaft passing coaxially through the rotor of the first control unit and being slidably splined thereto, the shaft having front and rear end portions, the former being accessible for manual manipulation in front of the first control unit, and the latter projecting rearwardly of said first control unit; an abutment on the rear end portion of the shaft; an actuator for the pivoted operating lever of the second control unit connected to the rotor of the first control unit to turn therewith; and means connecting the three control units and securing them in fixed relationship with the actuator movable in an orbit which brings the same transiently into driving engagement with the pivoted lever of the second control unit, and with the abutment on the rear end portion of the shaft in alignment with the pivoted operating lever of the third control unit so that endwise movement of the shaft in one direction actuates the third control unit without interfering with either the first or second control unit.

8. A multi-purpose electrical control device comprising: a bracket having substantially right-angularly disposed substantially flat flanges; a variable resistor having an adjustable rotor, fixed to one of said flanges with its rotor axis parallel to and spaced above the other flange; an actuating shaft slidably splined to the rotor and having a portion thereof overlying said other flange of the bracket, the splined driving connection between the shaft and the rotor enabling the shaft to be moved endwise without disturbing the setting of the rotor effected by rotation of the shaft; a pair of electric switches fixed to said other flange of the bracket at the side thereof opposite that which the shaft overlies; an operating lever for each of said switches projecting therefrom and through a hole in the said other flange, said operating levers being pivoted to swing about a parallel axes which are normal to said other flange of the bracket, the switches being at opposite sides of the shaft axis and the pivoted operating levers of the switches having arms at the side of said flange which the shaft overlies, and projecting toward one another; means biasing the operating levers of the two switches to turn in directions causing the arms thereof to move towards one another; and an abutment fixed on the shaft and interposed between the free ends of the arms on the pivoted operating levers so that the bias on said levers holds the shaft in a neutral position of endwise movement from which it may be pushed or pulled to actuate one or the other of said switches without disturbing the setting of the variable resistor.

9. The multi-purpose electrical control device of claim 8, further characterized by an on-off switch having an overcenter contactor mechanism and a pivoted operating lever therefor; means mounting said on-off switch on said bracket with the axis of its pivoted operating lever

normal to the shaft axis; and an actuator fixed with respect to the rotor of the variable resistor and overlying the first designated flange of the bracket to travel in a circular orbit which intersects the pivoted operating lever of the on-off switch so that said actuator has transient driving engagement therewith to actuate the on-off switch as the shaft is turned.

10. In a variable resistor: a stator comprising a base having a bearing hole therein and arcuate resistance and conductor paths on the rear side of the base concentric to the bearing hole; a rotor comprising a hollow shaft journalled in the hole, a drive arm fixed to the hollow shaft and overlying the rear side of the base, and a bridging contactor fixed to the drive arm and interposed between it and the base, said contactor having resilient fingers bearing against the resistance and conductor paths and thereby placing a rearward axial thrust upon the rotor; means to resist said rearward axial thrust and hold the rotor assembled with the stator with the proper degree of contact pressure between the spring fingers of the contactor and said resistance and conductor paths, said means comprising an annular groove in the hollow shaft, and a U-shaped retaining plate lying against the front side of the base and embracing the grooved portion of the hollow shaft with the inner edges of the legs of the U engaging in the groove; an actuating shaft for the rotor projecting into said hollow shaft; and means forming a torque transmitting connection between the rotor and said actuating shaft.

11. In a variable resistor, the structure set forth in claim 10, wherein the rotor has a metal stop plate fixed to the rear of the drive arm; and wherein the torque transmitting connection between the actuating shaft and the rotor comprises a non-circular portion on the actuating shaft slidably received in a correspondingly shaped hole in the metal stop plate so that the actuating shaft is slidably splined to the rotor.

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