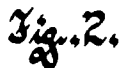
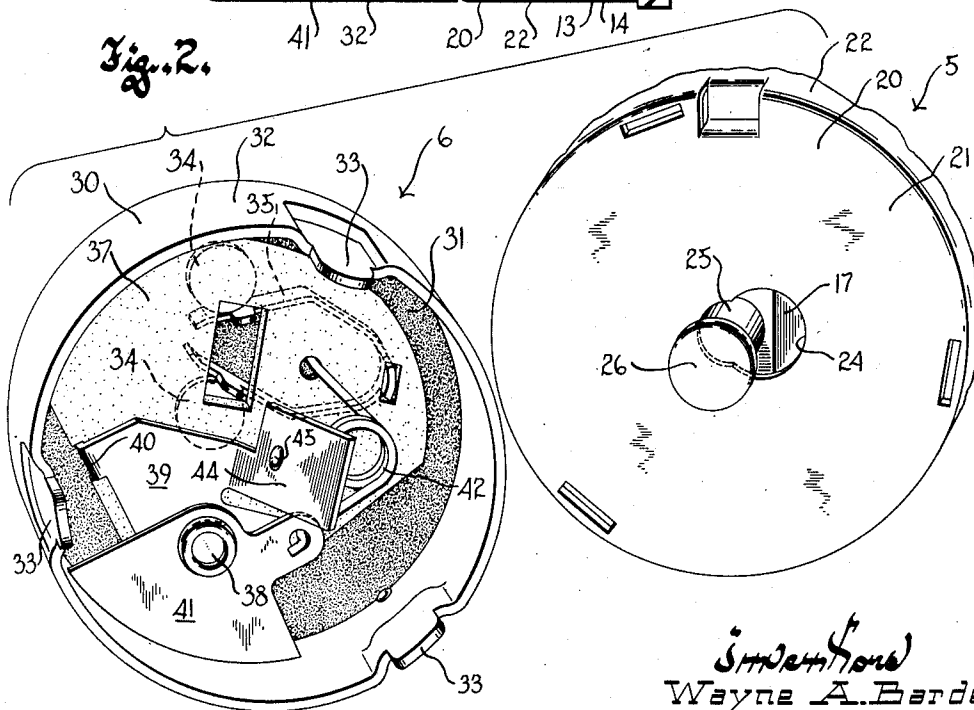


2,836,686

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PUSH-PULL SWITCH AND VARIABLE RESISTOR COMBINATION

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Fig. 3.

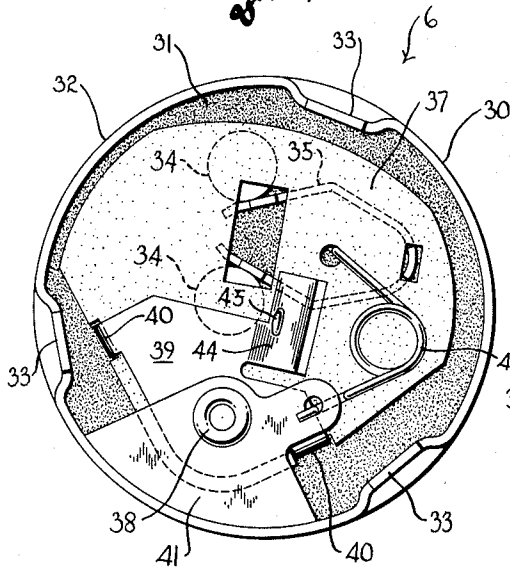


Fig. 4.

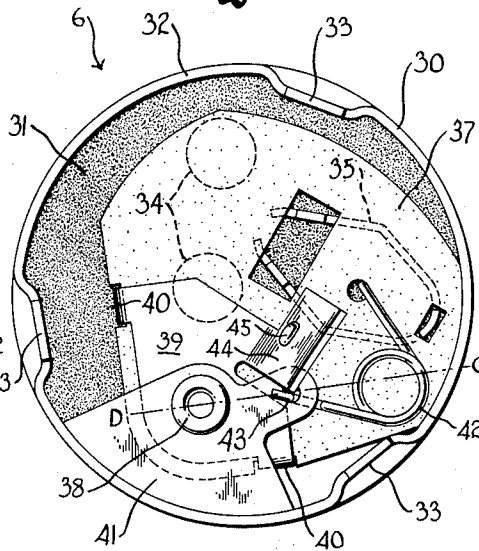


Fig. 5.

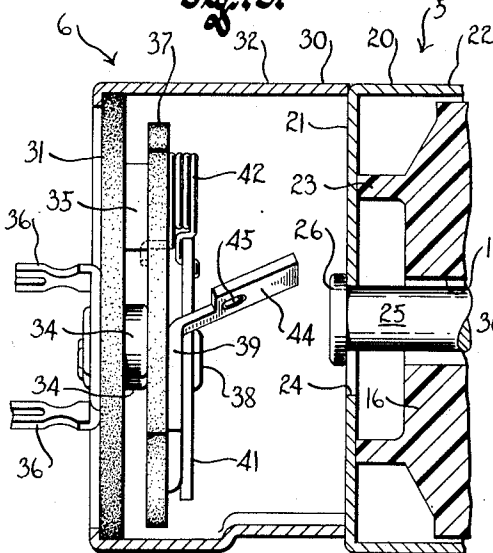


Fig. 6.

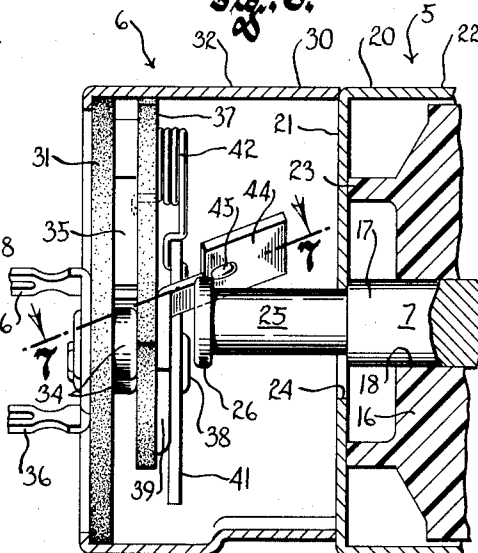
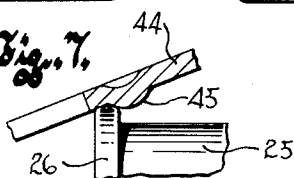


Fig. 7.



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PUSH-PULL SWITCH AND VARIABLE RESISTOR COMBINATION

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3 Claims. (Cl. 200—153)

This invention relates to a combined variable resistor and electric switch of the type suitable for use in radio and television receivers, and has as its general purpose to provide a control of this type having a common operating shaft, and in which the switch may be operated without disturbing the setting of the variable resistor.

In the conventional combination on-off switch and volume control of a radio or television receiver, both components of the combination are operated by rotation of a common drive shaft so that it is impossible to operate the switch without disturbing the setting of the variable resistor. The basic designs of the components of these controls which years of experience have shown to be sound, however, should not be discarded.

Accordingly, it is a specific object of this invention to provide a simple, inexpensive push-pull switch so combined with a variable resistor that the primary objective of this invention, namely, actuation of the switch without disturbing the setting of the variable resistor is achieved without any radical departure from the time-tested designs now used in switch construction and bridging contactors and in variable resistors.

As the art has progressed in the radio and television control industry, many significant economies have been effected. Not the least among these economies has resulted from the use of smaller, lighter parts to conserve the amount of metal and other materials used in controls. This progress has made possible the mass production of small, compact, lightweight table model radios of good quality. A push-pull switch requiring any appreciable force for operation would be out of the question in these lightweight models because operation of such a switch inevitably would move the entire set.

Accordingly, it is another object of this invention to provide a push-pull switch which requires only a relatively small amount of force for its operation.

Still another object of this invention resides in the provision of an electrical control device of the type having a rotatable and axially shiftable operating shaft projecting through the front and rear walls of the variable resistor housing and in which axial in and out motion of the shaft is limited by axially spaced shoulders or abutments at the ends of a reduced diameter rear portion of the shaft which reduced diameter portion is received in the small end of a keyhole shaped aperture in the rear wall so that the shoulders or abutments on the shaft are engageable with the opposite faces of the rear wall.

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 herein described invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention

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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 view partly in side elevation and partly in longitudinal section illustrating a combined variable resistor and switch embodying this invention;

Figure 2 is a perspective view of the front or inside of the switch shown detached from the variable resistor, and of the rear face of the resistor.

Figure 3 is a front view of the switch per se, showing the switch closed;

Figure 4 is a front view of the switch showing the same in its open condition;

Figures 5 and 6 are similar views through the control on the plane of the line 5—5 in Figure 1 illustrating the manner in which axial shifting of the control shaft actuates the switch; and

Figure 7 is a fragmentary sectional view taken through Figure 6 along the plane of the line 7—7.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates generally the variable resistor, and 6, the electric switch of the combined control device. As is customary the switch is mounted in tandem relation with and behind the resistor and both units are operable by a common control shaft 7.

The variable resistor is of generally conventional construction in that it comprises an arcuate resistance element 8 mounted on the back of a base 9 of insulating material and a collector ring 10 also mounted on the back of the base and concentrically disposed within the arcuate resistance element. The customary terminals 11 and 12 are provided for the ends of the resistance element for the collector ring, respectively.

The variable resistor further comprises a rotatable contactor assembly having a contactor 13 provided with contact fingers or paddles 14 and 15 adapted to traverse the resistance element and collector ring respectively. The contactor 13 is mounted on a driver 16 preferably molded of insulating material and connected to the operating shaft 7 in any suitable manner to provide for the transmission of torque from the shaft to the driver and hence to the contactor, while permitting limited relative axial movement between the shaft and the driver. In the present instance this driving connection between the shaft and the driver comprises a flatted or noncircular portion 17 on the shaft slidably received in a noncircular hole 18 in the driver.

The shaft is journaled for rotation about an axis fixed with respect to the base and coaxial with the collector ring and resistance element by means of a thimble or bushing 19 suitably secured to the base and externally threaded to provide means for mounting the entire control device upon a panel, not shown.

A stamped cup-shaped metal cover 20 coacts with the base 9 to provide a housing for the instrumentalities of the variable resistor. This cover is of conventional construction and has a flat end wall 21 and a cylindrical side wall 22 suitably secured at its edge to the base 9. Accordingly, the flat end wall 21 which serves as the rear wall of the resistor housing is held in a definite spaced relationship to the base 9 and may be used to carry the rearward end thrust imposed upon the rotatable contactor assembly by the spring tension in the contact fingers or paddles 14 and 15. For this purpose the driver has a rearwardly projecting circular rim 23 thereon bearing against the inner face of the wall 21. The degree of rotation which may be imparted to the contactor assembly is defined by cooperating stops on the driver and the cover in the conventional manner.

It is to be observed that the rear wall 21 of the resistor cover has a keyhole shaped opening 24 at its center and that the operating shaft has a rear portion 25 of reduced diameter terminating in an enlarged head 26. The large end of the keyhole shaped opening 24 is of a size to permit the head 26 on the end of the shaft to be passed therethrough, but the small end of the keyhole shaped opening 24 is only large enough to accommodate the reduced diameter of the rear shaft portion 25. Accordingly, when the parts are assembled axial or endwise shifting of the control shaft is limited substantially to the length of the reduced diameter portion 25 by engagement or collision of the axially spaced abutments or shoulders provided by the junction of the reduced diameter portion 25 with the rest of the shaft and the head or button 26, with the opposite faces of the end wall 21. Obviously, the large end of the keyhole shaped opening 24 accommodates and permits the head 26 to pass therethrough so that the cover may be applied and properly positioned after the variable resistor parts have been assembled and the shaft is in place.

The permitted axial or endwise motion of the operating shaft is utilized to actuate the switch, to open it in the present case, the switch being biased to its closed position. In its basic design the switch is similar to that of Patent No. 2,286,162. Hence, it is contained within a cylindrical housing 30 having a flat end wall 31 of insulating material which serves as the base for the switch, and a cylindrical metal side wall 32, the latter having tangs 33 by which the switch housing is secured to the back wall 21 of the variable resistor housing. A pair of stationary contacts 34 is mounted on the switch base to be electrically bridged by a contactor 35. The stationary contacts have the usual terminals 36 by which the switch may be connected in the circuit to be controlled.

The contactor 35 is essentially a resilient U-shaped metal bar constrained to slide across the switch base 31 with its open end facing the stationary contacts, to and from a switch closed position at which its legs engage and electrically bridge the stationary contacts. The contactor is constrained to its path of motion by being connected to an insulated drive arm 37, the connection between the contactor and its drive arm permitting the contactor a degree of freedom to enable it to readily adjust itself to the stationary contacts as the switch closes.

The drive arm 37 preferably consists of a substantially segment shaped piece of flat insulating material with a hole in its apex which fits over a pivot post 38 so that the drive arm may swing about the pivot post which is anchored to the switch base 31. In addition to providing pivotal support for the switch arm the post also supports an actuator 39 for the switch arm. This member is a sheet metal stamping overlying the switch arm and drivingly connected thereto by ears 40 which are received in notches in the adjacent edges of the segment shaped arm 37. The actuator 39 and the switch arm of course move in unison about the pivot post. Above the switch arm 37 and its actuator 39 the pivot post 38 passes through a spring holder or anchor 41 which is secured to the pivot post by being clamped between a shoulder (not shown) on the post and a staked or rolled over portion at the end of the post, and to secure the spring holder against turning about the pivot post 38, the holder has an edge thereof bearing against the cylindrical side wall of the switch housing.

A torsion spring 42 connected between the drive arm 37 and the spring holder 41 at all times yieldingly urges or biases the arm and the actuator toward the "switch closed" position, since the point of connection between the spring and the switch arm at no time crosses "dead center" represented by a line D—C extended from the axis of the pivot post 38 and passing through the point of connection 43 between the spring and the spring holder 41. The full range of angular motion permitted

the switch arm 37 and the actuator 39 is approximately 20° and is defined by the engagement of one lobe of the arm 37 with the side wall 36 of the housing as shown in Figure 4, and by the engagement of the contactor 35 with the stationary contacts 34 as shown in Figure 3.

The function of the actuator 39 is to provide means for translating axial motion of the operating shaft into rotary or angular movement of the switch arm and its contactor. To this end the actuator has a flat projection 44 which extends forwardly from the front face of the switch arm at an angle less than perpendicular and is so positioned that it intersects the axis of the control shaft. The front surface of this projection which faces the end of the shaft and more particularly, the button-like enlargement 26, on the rear end of the shaft provides an inclined cam. As shown in Figure 1, when the operating shaft is in its forward position it is disengaged from this inclined cam surface 44, and accordingly, the toggle spring 42 holds the contactor in its switch closed position bridging the stationary contacts 34 as clearly shown in Figure 3.

However, upon rearward longitudinal motion of the operating shaft, its rearmost end 26 engages the inclined cam surface 44 and thereby swings the contact carrying arm about the pivot post 38 against the bias of the spring 42 to open the switch as illustrated in Figure 4.

Although friction between the end of the shaft and the inclined cam surface alone may be sufficient to hold the shaft in its pushed-in, switch open, position, it is preferable to provide releasable detent means to assure the retention of the shaft in this position. Such detent means may consist of a small pimple-like protrusion 45 on the face of the inclined cam surface in position to engage over the edge of the button-like enlargement 26 on the end of the shaft as more particularly shown in Figure 7.

From the foregoing description taken together with the accompanying drawings it will be readily apparent to those skilled in the art that this invention provides a push-pull switch and variable resistor combination with all the attendant advantages of such a combination control unit without discarding the elements of switch and variable resistor design which have been proven satisfactory by the tests of time and wide usage.

What is claimed as our invention is:

1. An electrical control instrumentality of the type having housing means and an operating shaft carried by the front portion of the housing means for axial back and forth motion with the inner end of the shaft projecting into the rear portion of the housing means, said instrumentality comprising: a contact carrying switch arm in the rear portion of the housing means, behind the inner end of the operating shaft; means mounting the switch arm on the housing means for pivotal motion in opposite directions between switch open and switch closed positions about an axis parallel to but spaced from the axis of the operating shaft; means biasing said switch arm to one of said positions; and means providing a motion translating driving connection between the shaft and the switch arm operable to effect pivotal motion of the arm toward the other of said positions thereof as a consequence of inward axial actuation of the operating shaft, said motion translating connection comprising a member fixed to the switch arm to move back and forth therewith and having a cam part thereon which projects forwardly toward the rear end of the shaft, said cam part having an inclined cam surface thereon disposed to be engaged by the inner end of the shaft upon rearward actuation thereof, said cam surface facing in the direction toward which the switch arm is biased, and the foremost portion of said cam surface lying to one side of a plane containing the shaft and switch arm axes.

2. The electrical control instrumentality set forth in

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claim 1 further characterized by the provision of coacting detent means on said cam part and on the inner end of the operating shaft for releasably retaining the shaft in a depressed position at which it holds the switch arm at said other position thereof.

3. An electrical control instrumentality of the type comprising a housing structure, an operating shaft rotatably and axially slidably mounted on the front portion of the housing structure with the inner end of the shaft projecting into the rear portion of the housing structure, electrical control means in the front portion of the housing structure operated by rotary actuation of the operating shaft, and a switch mounted in the rear portion of the housing structure, behind the inner end of the operating shaft; characterized by the fact that the inner extremity of the operating shaft provides an actuator for the switch; and further characterized by the fact that the switch comprises a contact carrying switch arm constrained to pivotal motion in opposite directions between switch open and switch closed positions about an axis parallel to but spaced from the axis of the operating shaft, means biasing the switch arm to said switch closed position thereof, a member fixed to the switch arm to move back and forth therewith and having a cam part

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thereon which projects forwardly toward the inner end of the operating shaft, said cam part having an inclined cam surface thereon facing in the direction toward which the switch arm is biased with the foremost portion of said surface lying to one side of a plane containing the shaft and switch arm axes, said cam surface being disposed to be engaged by the inner extremity of the operating shaft so that the switch arm is cammed to said other position thereof upon inward actuation of the operating shaft.

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