

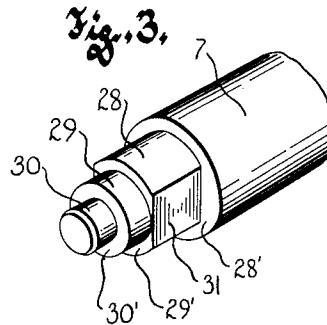
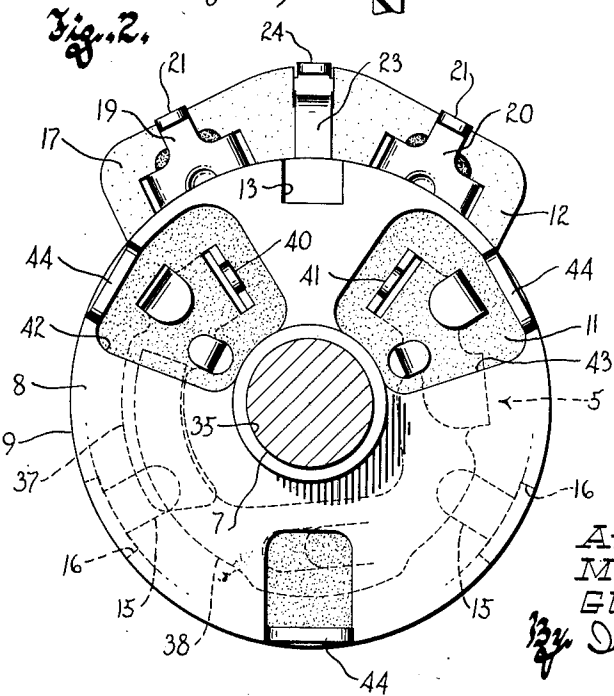
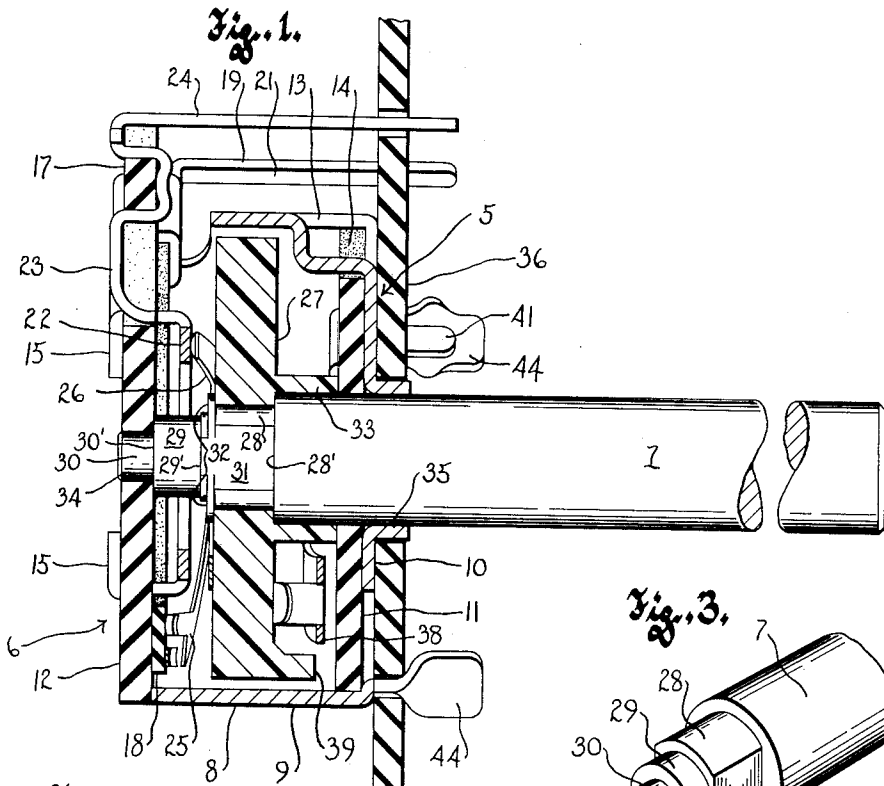
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COMBINATION ELECTRIC SWITCH AND VARIABLE RESISTOR

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COMBINATION ELECTRIC SWITCH AND VARIABLE RESISTOR

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9 Claims. (Cl. 201—55)

This invention relates to a combination electric switch and variable resistor of the type commonly used in radio and television receivers and has as its general purpose to provide a combined switch and variable resistor especially adapted for use with printed circuits. In many respects this invention is closely related to the subject matter of the copending application, Serial No. 396,295, filed December 4, 1953, but is an improvement thereover since, without entailing any increase in overall dimensions, it permits the switch mechanism and the variable resistance element to be full size as distinguished from the miniaturized switch and resistance element necessitated in the aforesaid invention.

To this end it is an object of the present invention to provide a combined electric switch and variable resistor wherein both of its components or units are located within a single housing.

Another object of this invention is to provide a combination variable resistor and electric switch device of the character described wherein the switch is located at the front of the combined control so as to be closely adjacent to a panel, for instance a printed circuit panel, upon which the control is mounted so that relatively short switch terminals projecting straight out from the front of the control may protrude through the panel.

Another object of this invention is to provide a combined electric switch and variable resistance device of the character described wherein the terminals of both component units project forwardly beyond the front end of the combined control to enter holes in a printed circuit panel upon which the control is mounted with its shaft passing therethrough, and wherein the terminals for the variable resistor though extending alongside the exterior of the housing for the combined unit are quite rigid because of their reduced length made possible by the unusual compactness this invention achieves.

Still another object of this invention resides in the provision of a combined switch and variable resistor of the character described which utilizes to advantage the sequentially closing switch of Patent No. 2,646,484 issued July 21, 1953.

A still further object of this invention is to provide increased support for the operating shaft of the control by mounting the same in bearings located in the front and back end walls of the housing and supporting the shaft against inward end thrust by a thrust bearing in the rear wall of the housing.

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 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

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

Figure 1 is a longitudinal sectional view through a combined electric switch and variable resistance device embodying this invention, illustrating the same mounted upon a panel which may have wiring printed thereon as is customary in printed circuitry;

Figure 2 is a front end view of the combination control device; and

Figure 3 is a perspective view of the control shaft prior to its assembly with the rotating mechanism of the device.

Referring now particularly to the accompanying drawing, the numeral 5 designates generally an electric switch which is preferably of the type fully described in Patent No. 2,646,484, and the numeral 6 designates generally a variable resistor of more or less conventional design. These two components are operated by a common rotatable control shaft 7 and are enclosed within a common housing 8.

The housing 8 consists of a stamped cup-shaped metal shell having a cylindrical side wall 9 and a flat end wall 10, and two discs of insulating material 11 and 12. The disc 11 is received within the cup-shaped shell and covers the end wall 10 thereof where it is held against rotation by an indentation 13 at the junction of the side and end walls of the shell which is received in a notch 14 in the periphery of the disc.

The other disc 12 has a diameter equal to the outside diameter of the side wall 9 and is seated on the edge of the side wall to close the open end of the shell, being held in place by tangs 15 extending from the side wall. To properly locate the disc 12 on the shell the inner end portions of the tangs 15 are received in notches 16 in the edge of the disc; and as is customary the disc has a radially outwardly projecting portion 17 to provide a support for the terminals of the resistor.

The variable resistor, of course, includes a resistance element 18 in the form of a flat split ring overlying the inner face of the disc 12 concentrically to the control shaft 7 where it is held in place by its end terminals 19 and 20. These terminals are preferably of the type illustrated in the copending application, Serial No. 379,912, filed September 14, 1953, now Patent No. 2,736,783. Accordingly, the terminals 19 and 20 are fixed to the terminal support 17 and their end portions 21 project forwardly from the support 17 alongside the cylindrical side wall 9 of the housing with their extremities a substantial distance beyond the front wall of the housing.

The variable resistor also has a collector ring 22 concentric to the operating shaft 7 and provided with an integral terminal 23 which, like the terminals 19 and 20, is also fixed to the support 17 and has an end portion 24 extending forwardly therefrom in parallel relation to the end portions 21 of the terminals 19 and 20.

The contact fingers 25 and 26 of the variable resistor which ride respectively upon the resistance element 18 and the collector ring 22 are mounted upon the rear face of an insulated driver 27 fixed to the control shaft 7. As best shown in Figure 3, the end of the control shaft 7 to which the driver 27 is secured is reduced in diameter in three steps 28, 29 and 30. This results in three shoulders 28', 29' and 30'. The first of these portions of reduced diameter, which is designated by the numeral 23, is non-circular in cross section and preferably has opposite flat faces 31, and the hole in the driver 27 is of a size and shape to fit this non-circular portion 23 of the shaft. The driver is held assembled with the shaft and against the shoulder 28' by swaging down a part of the step 29 to form a retaining flange 32.

Attention is directed to the fact that the driver 27, which is preferably molded of a suitable insulating material, has a skirt 33 in which the adjacent end portion of the shaft 7 is received. The end of this skirt 33 rides upon the inner face of the disc 11 and thus transmits the end thrust imposed upon the rotating assembly by the spring tension of the contact arms 25 and 26 onto the disc 11 and against the end wall 10 of the metal shell.

End thrust in the opposite direction which might be applied to the shaft 7 is carried by the disc 12 against which the shoulder 30' bears. The portion of the disc 12 against which the shoulder 30' bears thus constitutes an end thrust bearing for the shaft at its extreme end, and the reception of the smallest end portion 30 of the shaft in a hole 34 in the disc 12 provides a side thrust bearing for the extreme end of the shaft. A second side thrust bearing 35 is extruded from the end wall 10 of the metal shell. As shown in Figure 1, when the device is mounted upon the back of a panel 36, which may have printed wiring (not shown) on its front face, the extruded bearing 35 is received in the hole through which the control shaft passes.

The switch 5, being of the type covered by Patent No. 2,646,484, has a stationary contact 37 seated firmly on the inner face of the disc 11 and a contactor 38 which is in the form of an arcuate resilient finger having one end portion fixed to the disc 11 and its opposite free end portion overlying the contact 37. The normal resiliency of the contactor arm 38 holds its free end out of engagement with the contact 37 as long as the driver 27 is in its switch open position of rotation.

Upon rotation of the shaft and driver 27 out of its switch open position a ridge or lug 39 on the driver cams the free end of the contactor down into switch closing engagement with the contact 37 but this engagement involves a sequential closing of two sets of contacts in the manner described in the aforesaid patent. For this invention it is sufficient to note that the contact 37 and contactor 38 have terminals 40 and 41 integral with and projecting through the disc 11. To permit these terminals 40 and 41 to project beyond the front wall of the housing formed jointly by the disc 11 and the end wall 10 of the shell, the end wall of the shell is cut away to provide two relatively large openings 42 and 43 through which the terminals 40 and 41 project.

The extent the terminals 40 and 41 project is such that their extremities lie substantially on a plane common with the extremities of the variable resistor terminals, and all of the terminals project far enough beyond the front wall of the housing to protrude through the panel upon which the instrument may be mounted, it being understood that the panel is provided with appropriately located holes to receive the terminals. It will also be understood that such protrusion of the terminals through the panel enables them to be readily soldered to the adjacent wiring printed on the front of the panel.

To hold the instrument upon such a panel attaching ears 44 project forwardly from the metal shell to pass through holes in the panel. These ears may be twisted as shown or struck over the front face of the panel. At least two of the ears are conveniently formed by part of the metal cut out of the end wall 10 to provide the openings 42 and 43.

From the foregoing description taken in connection with the accompanying drawing, it will be readily apparent to those skilled in this art that this invention provides a combined electric switch and variable resistor which is exceptionally compact and by virtue of its novel construction is well adapted for use with printed circuitry, especially since the mounting thereof upon a printed circuit panel automatically locates all of its terminals in juxtaposition to the printed wiring on the panel and also because all of its terminals are firmly held in

definite relationship to one another and the operating shaft which also passes through the panel.

What we claim as our invention is:

1. A combination electric switch and variable resistance device of the type wherein each of said components has cooperating stationary and movable elements and the movable elements of both components are operated by a single control shaft, characterized by the fact that: the instrumentalities of both components are located within the same housing, which housing is formed by spaced apart substantially flat end walls connected by a substantially cylindrical side wall, one of said end walls having the control shaft passing therethrough with a part of the shaft exposed outside the housing to enable manual manipulation thereof; the stationary element of the variable resistance device being mounted upon the opposite end wall of the housing; and the entire switch mechanism being located between the resistance device and the first designated end wall through which the shaft passes.
2. A combination electric switch and variable resistance device of the type wherein each of said components has cooperating stationary and movable elements and the movable elements of both components are driven by a single operating shaft, characterized by the fact that: the instrumentalities of both components are located within one housing formed by spaced apart substantially flat front and rear end walls connected by a substantially cylindrical side wall, the operating shaft passing through the front wall and being exposed at the front of the housing to enable manual manipulation of the shaft; the stationary element of the variable resistance device being mounted upon the rear wall of the housing; the switch mechanism being located between the resistance device and the front wall of the housing; and terminals for the switch projecting forwardly through the front wall of the housing.
3. The combination electric switch and variable resistance device of claim 2 further characterized by the fact that: the housing comprises a cup-shaped metal shell having a substantially cylindrical side wall and a substantially flat bottom wall, and flat discs of insulating material, one of which overlies the inside surface of said bottom wall of the cup-shaped metal shell so that said bottom wall and the disc overlying it together form the front wall of the housing, the other disc being connected to the outer edge of said shell to close the open end thereof and provide the rear wall of the housing; and further characterized by the fact that the disc which overlies the bottom wall of the cup-shaped shell has the stationary parts of the switch instrumentalities and the forwardly projecting switch terminals mounted thereon so that said disc provides the base of the switch, the bottom wall of the cup-shaped metal shell being cut out to provide electrical clearance holes through which the switch terminals pass.
4. The combination electric switch and variable resistance device of claim 3 further characterized by the fact that the bottom wall of the cup-shaped metal shell has a bearing for the shaft extruded therefrom.
5. The combination electric switch and variable resistance device of claim 4 further characterized by the fact that the shaft has an end portion thereof journaled in a hole in the disc of insulating material which closes the open end of the shell.
6. The combination electric switch and variable resistance device of claim 3 further characterized by the fact that part of the metal of the bottom wall of the shell which is removed to provide said holes forms attaching ears which project forwardly from the front of the housing.
7. A combination electric switch and variable resistance device of the type wherein said components are arranged in tandem and are enclosed within a housing means including a front wall and both components are operated by a single shaft and wherein the variable resistance device has a rotatable contactor assembly, characterized by the fact that: the shaft passes through the front wall of the housing means and entirely through the switch from front

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to back and has operative switch actuating connection with the movable contactor of the switch; by the fact that the variable resistance device is located in back of the switch and has its rotatable contactor assembly drivingly connected to the adjacent rear end portion of the shaft; and by the fact that the terminals for the switch and also the terminals of the variable resistance device project forwardly beyond the front wall and are substantially parallel to the shaft.

8. A combination electric switch and variable resistance device of the type wherein both of said components are operated by a single shaft and wherein the variable resistance device has a rotatable contactor assembly, characterized by: a housing for the switch having a front wall provided with a hole through which the shaft passes; a movable switch contactor assembly inside the housing and drivingly connected to the shaft; the shaft passing entirely

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through the switch and having its rear end portion extending rearwardly beyond the movable contactor assembly of the switch; means rigidly connecting the variable resistance device with the switch housing and mounting the variable resistance device rearwardly of the switch; and a driving connection between the rear end portion of the shaft and the rotatable contactor assembly of the variable resistance device.

9. The combination electric switch and variable resistance device of claim 8, further characterized by the fact that the switch has terminals projecting through and forwardly from the front wall of its housing.

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