

United States Patent

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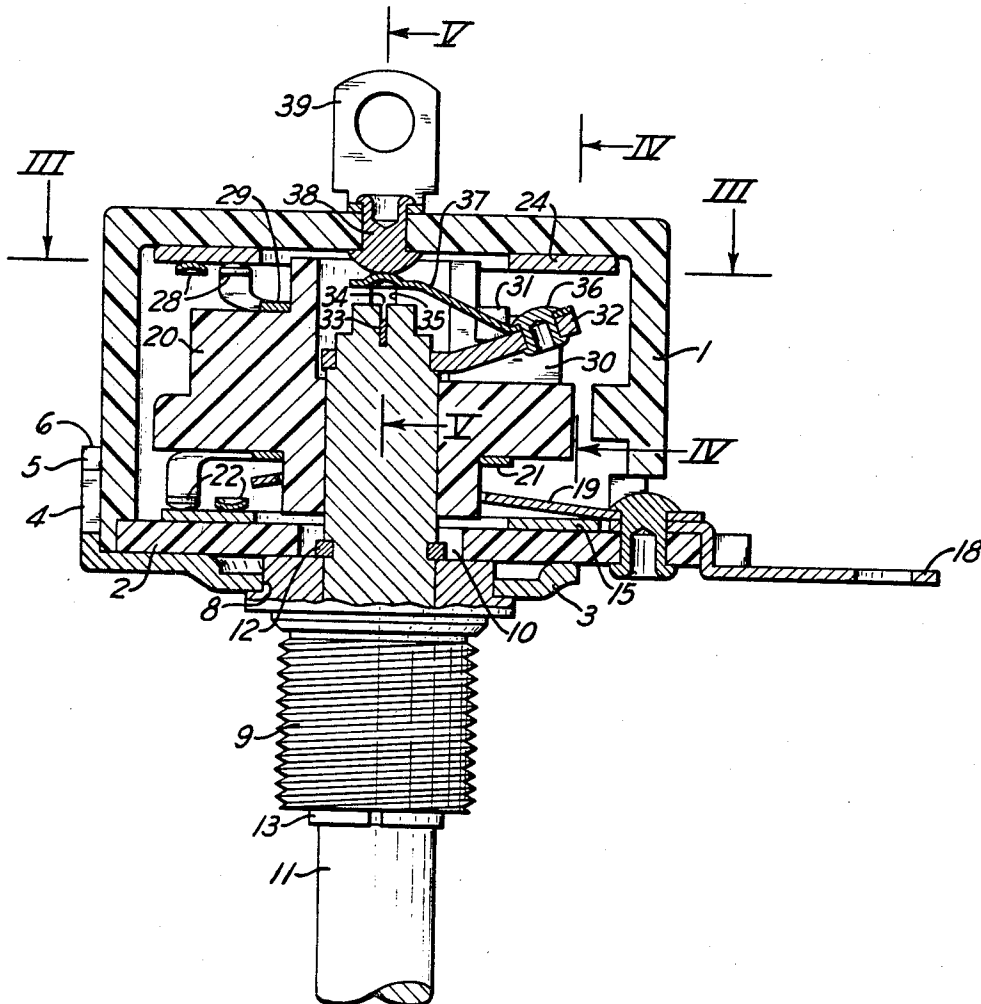
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[54] COMBINATION ELECTRIC SWITCH AND VARIABLE RESISTOR 6 Claims, 5 Drawing Figs.

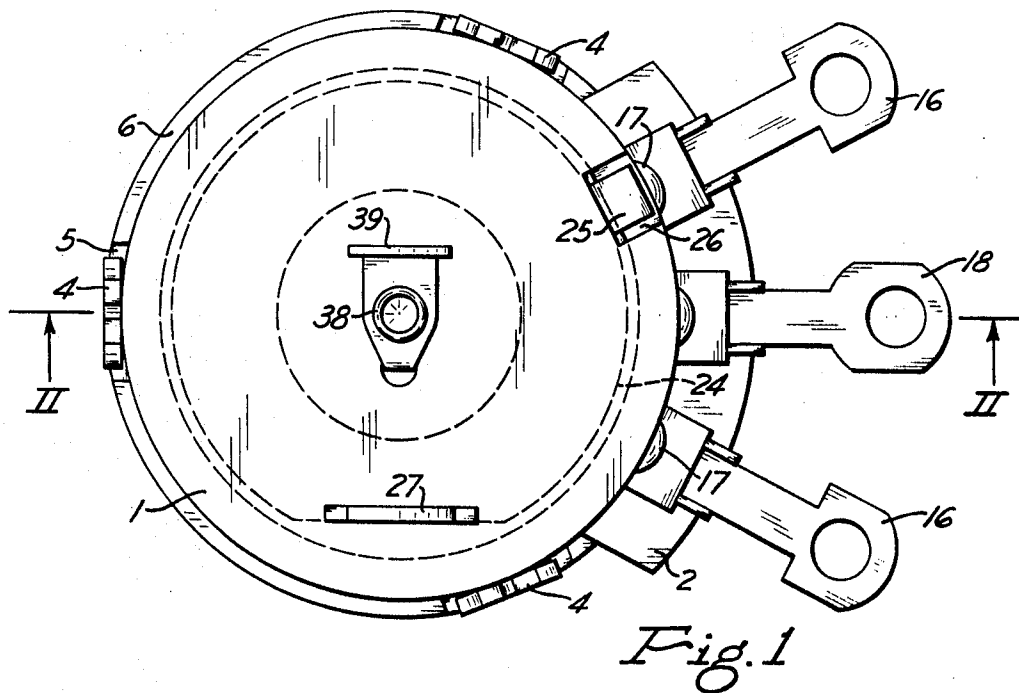
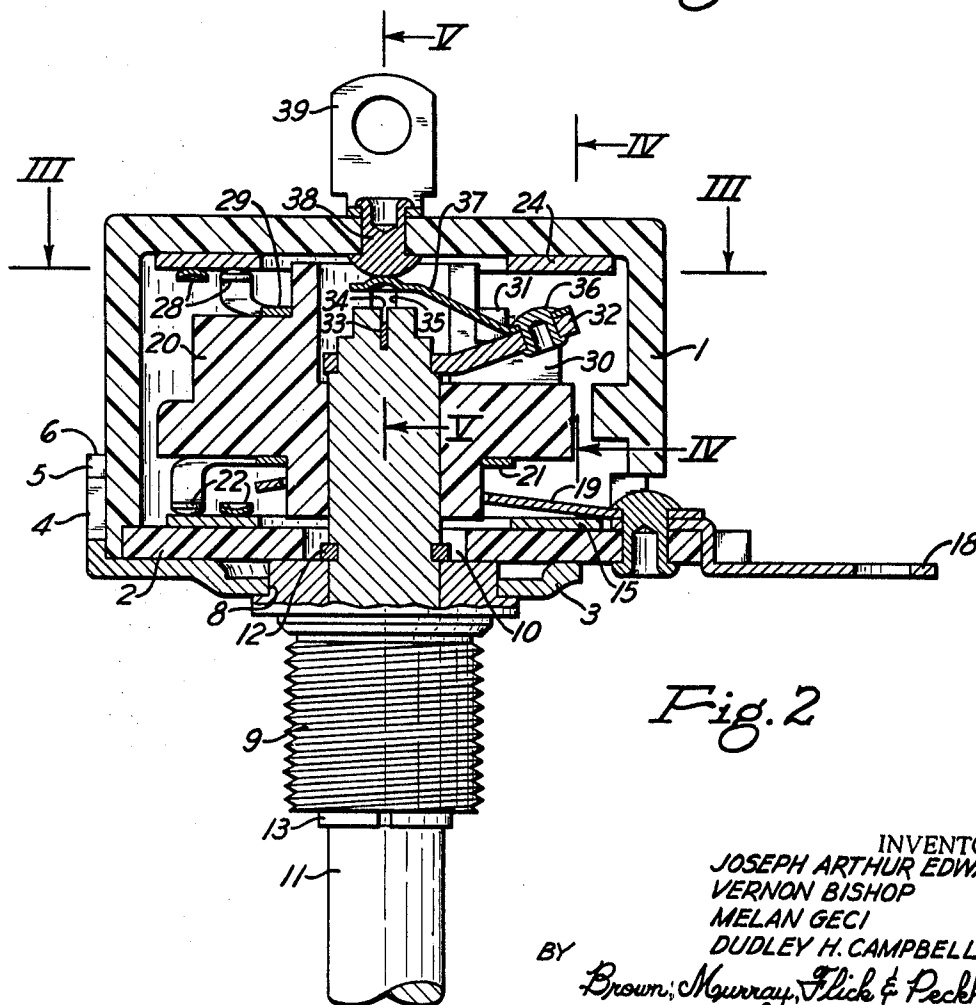
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ABSTRACT: A rotor in a housing is provided with an axial passage, in which a control shaft is rotatably mounted. A first electric contact carried by the rotor engages a resistance element in the housing. A second electric contact carried by the rotor engages an electrical collector inside the housing and has ends facing each other at one side of the rotor to form fixed contacts. A movable switch contact fastened to the shaft extends laterally between the fixed contacts, where it is normally held centered between them by a spring connecting the shaft and rotor. The frictional resistance of the rotor to being turned is greater than the resistance that the spring offers to turning of the shaft in the rotor, so when the shaft is rotated it will swing the movable switch contact into engagement with one of the fixed contacts to turn the rotor. When the shaft is released, the spring will center the movable contact between the fixed contacts again.



2 Sheets-Sheet 1



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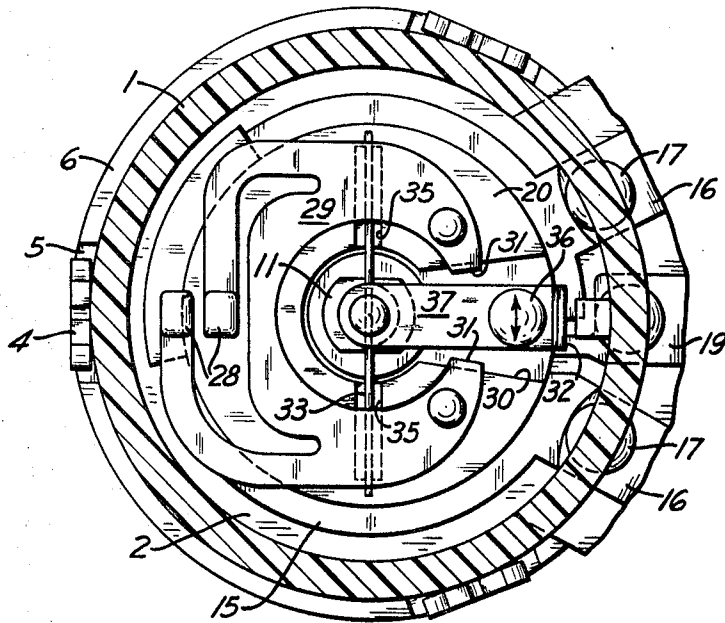


Fig. 3

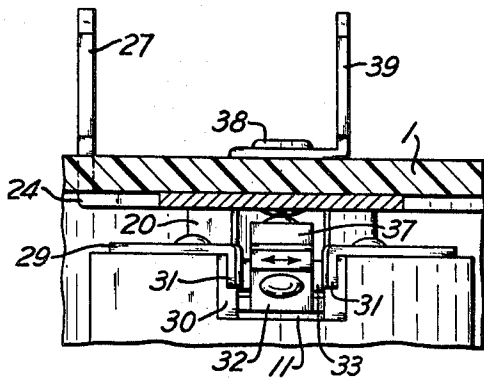


Fig. 4

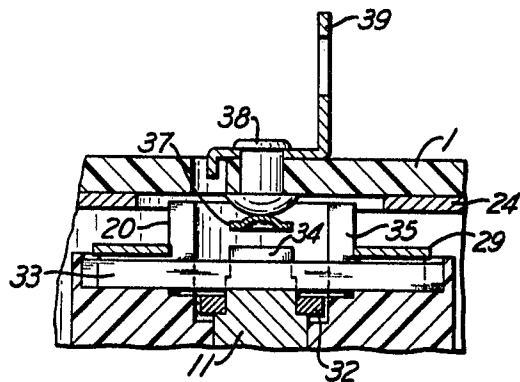


Fig. 5

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COMBINATION ELECTRIC SWITCH AND VARIABLE RESISTOR

It is among the objects of this invention to provide a combination electric switch and variable resistor, in which the switch is closed only while the resistance is being varied, in which the switch opens automatically whenever a control shaft is released, and which has a simple construction and is dependable in operation.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a plan or end view of the combination unit;

FIG. 2 is a cross section taken on the line II-II of FIG. 1;

FIG. 3 is a cross section taken on the line III-III of FIG. 2; and

FIGS. 4 and 5 are fragmentary sections taken on the lines IV-IV and V-V, respectively, of FIG. 2.

Referring to the drawings, a cuplike housing 1 of metal or insulating material has its open end closed by an insulating base 2 that seats against a metal mounting plate 3 (FIG. 2) provided with circumferentially spaced split ears 4 extending through notches 5 in an integral rib 6 encircling the base of the housing. The ears are spread to connect the three parts just mentioned rigidly together. The mounting plate is provided with an opening 8, in which the inner end of a threaded bushing 9 is mounted. The center of the base is provided with an opening 10 aligned with the bushing, and a rotatable control shaft 11 extends through this opening and the bushing. The shaft is held against axial movement by means of snap rings 12 and 13 mounted on it at opposite ends of the bushing. The inner end of the shaft extends most of the way through the housing, but is spaced from its end wall.

Mounted on the base inside the housing there is a circular electrical resistance element 15, the ends of which are secured to laterally projecting terminals 16 by means of rivets 17 piercing the base. Between these terminals there is a third terminal 18, which is secured to a spring ring 19 that encircles the shaft and a reduced end portion of an insulating rotor 20 that is rotatably mounted on the shaft. The rotor also can move lengthwise of the shaft, although it is not necessary. The spring ring presses against an electric contact member 21 rigidly mounted on the rotor and having spring fingers 22 slidably engaging the resistance element. At the opposite end of the housing an electrical collector is disposed against the end wall concentrically with the shaft axis. This collector may be a ring 24 provided with a small ear 25 (FIG. 1) that extends through the end wall of the housing and is bent over into a notch 26 to help hold the ring in place. The ring has a second and larger ear that also extends through the housing end wall and away from it to form a terminal 27. Slidably engaging the collector are the spring fingers 28 of an electric contact member 29 that is mounted on the rotor around its reduced inner end portion. As shown in FIG. 3 it is a feature of this invention that the rotor-engaging portion of this contact member has at the side of the rotor opposite to its spring fingers spaced ends that face each other. These ends are bent down against the opposite sidewalls of a radial slot 30 in the rotor, which has its open side facing the housing end wall. The bent contact ends form a pair of fixed contacts 31, as shown in FIG. 4.

The inner end portion of the shaft beside the rotor slot is reduced in diameter as shown in FIG. 2, and preferably the rotor passage is enlarged around this reduced end. Pressed onto the shaft within the enlarged portion of the passage is the circular inner end of a movable switch contact 32 that extends laterally out through the rotor slot between the fixed contacts therein. This movable contact is normally centered in the slot where, in accordance with this invention, it is spaced from both fixed contacts by means of a spring 33 fastened to the control shaft and to the rotor. Preferably, the spring is a substantially straight member extending through a diametric slot 34 (FIG. 2) in the end of the shaft and then across the space between the shaft and the wall of the rotor passage and into wide radial slots 35 (FIG. 3) in that wall that extends nearly through the rotor. The spring fits tightly in the shaft slot, and

its ends fit snugly in notches in the outer ends of the slots, so there is a considerable unrestricted length of spring between the shaft and the ends of the spring. The spring may be a wire, or a flat strip as shown. Secured to the outer end of the movable contact by means of a rivet 36 is a leaf spring 37 that extends inwardly into the space between the end of the shaft and the end wall of the housing and presses against the inner end of a central rivet 38 that holds a terminal 39 against the outside of the housing.

OPERATION

When the control shaft is turned in either direction, the frictional resistance of the spring contact fingers 22 and 28 against the resistance element and the collector is sufficient to prevent the rotor from turning until the movable switch contact 32 has been swung by the shaft against one or the other of the fixed contact 31, depending upon which direction the shaft is turned. The portions of the spring 33 between the shaft and the spring ends anchored in the rotor flexes as the shaft is turned, as the spring is not strong enough to turn the rotor. Continued turning of the shaft causes the movable switch contact to turn the rotor. As soon as the spring fingers 22 have been moved along the resistance element to the desired point, the shaft is released and the flexed spring immediately turns the control shaft in the opposite direction in the rotor to return it to their normal relative positions. This reversal of the shaft moves the movable switch contact 32 out of engagement with the adjoining fixed contact and centers it in the rotor slot again. It will therefore be seen that the switch is closed only while the movable switch contact is forcing the rotor to turn and vary the electrical resistance. The moment the control shaft is released, the rotor stops turning and the switch opens.

We claim:

1. A combination electric switch and variable resistor, comprising a base provided with an axial opening, a housing mounted on the base and having an end wall opposite thereto, a rotor in the housing provided with an axial passage therethrough, a control shaft rotatably mounted in said base opening and rotor passage, a spring having a central portion secured to the inner end of the shaft and having ends held by the rotor, a resistance element in the housing mounted on said base around the shaft, a first electric contact member secured to the rotor and slidably engaging said element, terminals connected with said element and contact, an electrical collector inside the housing mounted on said end wall, a terminal connected to the collector and extending out the housing, a second electric contact member secured to the rotor and slidably engaging said collector, the second contact member having ends facing each other at one side of the rotor in spaced relation and forming fixed contacts, a movable switch contact rigidly fastened to the shaft and extending laterally therefrom between said fixed contacts, the spring normally holding the movable contact centered between the fixed contacts and spaced therefrom, and a terminal outside the housing electrically connected with said movable contact, the frictional resistance of the rotor to being turned being greater than the resistance that said spring offers to turning of the shaft in the rotor, whereby the shaft being rotated will swing said movable contact into engagement with one of said adjacent fixed contacts to turn the rotor and when the shaft is released the spring will center the movable contact between the fixed contacts again.

2. The combination recited in claim 1, in which said collector extends around the center of said housing end wall, and said last-mentioned terminal is mounted at the center of said wall.

3. The combination recited in claim 2, including a leaf spring fastened at one end to said movable switch contact, the opposite end of the leaf spring pressing against said center terminal.

4. The combination recited in claim 1, in which said rotor is provided with a radial slot open toward said housing end wall,

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said ends of said second contact member extend into said slot beside its sidewalls, and said movable switch contact extends from the control shaft laterally into said slot.

5. The combination recited in claim 1, in which the inner end portion of the control shaft is spaced from the encircling wall of the rotor passage, and said spring extends from the

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shaft radially across the space between the shaft and rotor.

6. The combination recited in claim 5, in which said spring is substantially straight, and said shaft and rotor are provided with slots snugly receiving the spring.

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