Aug. 23, 1955 H. R. SMITH 2,716,163

ELECTRICAL SWITCH ASSEMBLY

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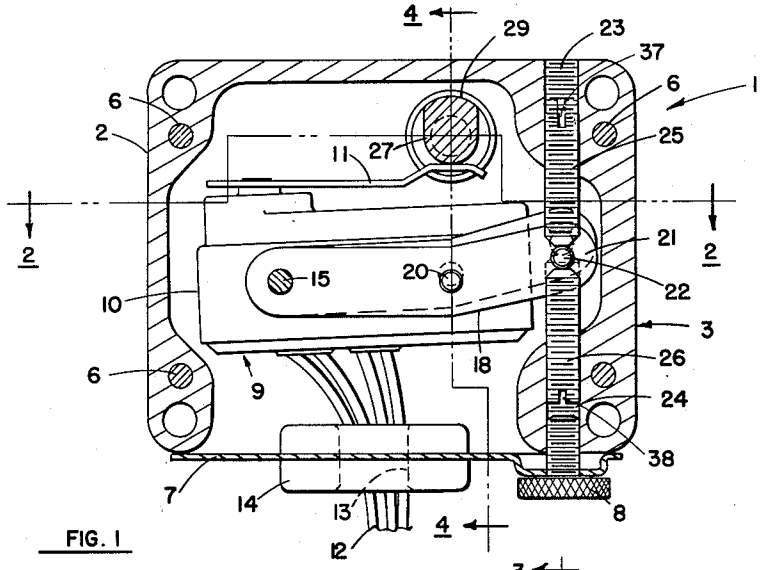


FIG. 1

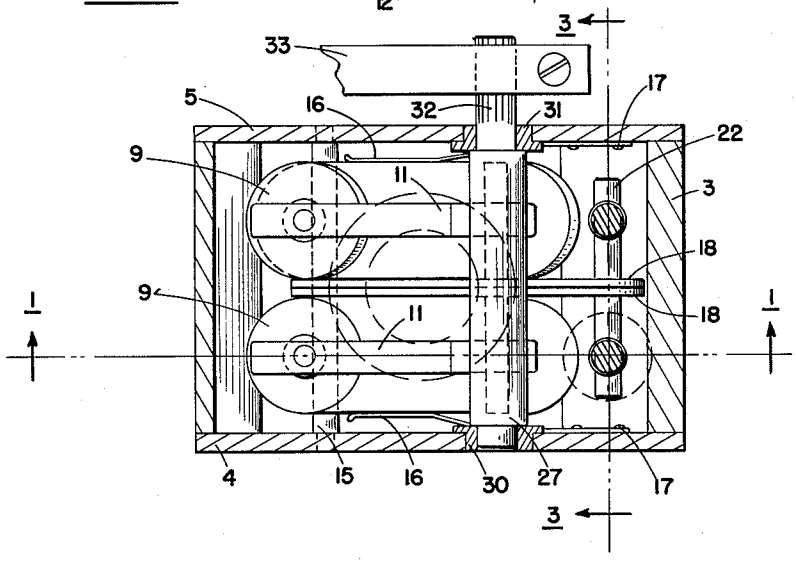


FIG. 2

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ELECTRICAL SWITCH ASSEMBLY

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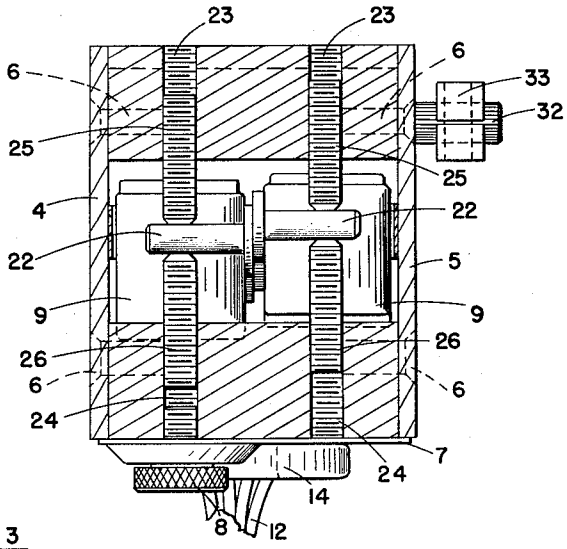


FIG. 3

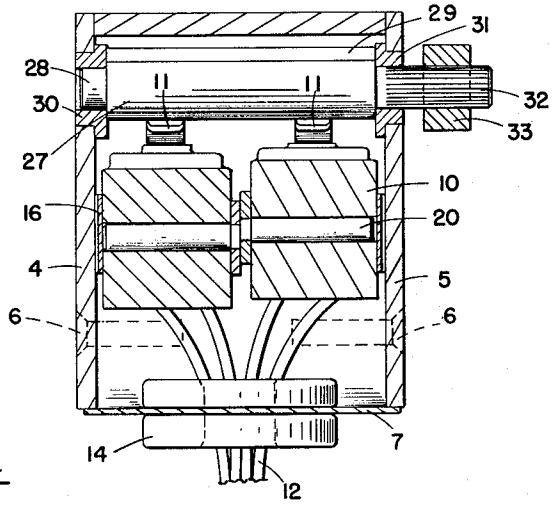


FIG. 4

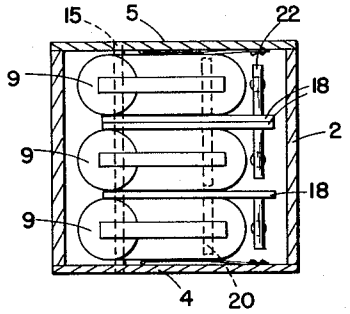


FIG. 5

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ELECTRICAL SWITCH ASSEMBLY

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4 Claims. (Cl. 200—6)

This invention relates to an electrical switch assembly and more particularly to an adjustable switch assembly adaptable for accommodating a plurality of switches.

Ordinary electrical switch assemblies have the undesirable feature of lack of adjustability. When a plurality of switch units are provided for operation by a single actuating means it has been impossible to satisfactorily adjust these switches so that they will trip simultaneously. This is because it was necessary to dispose a coil spring unit between the common actuating means and the actuating arm of each switch. This spring was required so that a cam rotating to actuate the switches would not contact the bodies of the switches thereby damaging them. Tolerances build up in construction of these units to where the only feasible construction from a production standpoint has necessitated the use of this spring to absorb any overtravel by the cam and thus protect the switches. This resilient connection between the cam and the switch has prohibited any fine adjustment of the switches relative to each other. A further disadvantage with this type of switch assembly may be encountered in formation of ice around the springs which precludes their proper operation and results in damage to the switch assembly. In addition, these switches are bulky, require an excess number of parts and necessitate a large operating force.

It is therefore an object of this invention to provide a switch assembly adaptable to actuating a plurality of switches.

Another object of this invention is to provide a switch assembly in which each of a plurality of switches is adjustable relative to the other switches.

A further object of this invention is to provide a switch assembly that may be manufactured to normal tolerances and adjusted on assembly for providing synchronous operation of switch elements and avoiding damage to the switches.

An additional object of this invention is to provide a switch assembly that will utilize a positive drive cam operation of the switches.

Still another object of this invention is to provide a switch assembly that is not subject to icing conditions.

A still further object of this invention is to provide a switch assembly that is light in weight, provides a minimum resistance to operation of the switches, is rugged in its construction, and simple and economical to construct.

These and other objects will become apparent from the following detailed description taken in connection with the accompanying drawings in which

Fig. 1 is a side elevation, partly in section, taken along line 1—1 of Fig. 2, with one switch removed to illustrate the switch mounting arrangement,

Fig. 2 is a top plan view, partly in section, taken along line 2—2 of Fig. 1,

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2,

Fig. 4 is a sectional view taken along line 4—4 of Fig. 1, and

Fig. 5 is a top plan view of a modification of this invention.

The switch assembly 1 of this invention may, in the preferred embodiment, comprise a suitable housing 2 constructed of aluminum or other desired material. Housing 2 may be comprised of an extruded section 3 to which end plates 4 and 5 are attached by means of screws 6 and to which a readily removable bottom plate 7 is held in place by knurled screw 8. Housing 2 is adapted to receive one or more switches 9, which may be any conventional type such as the hermetically sealed switch illustrated, each of which includes body portion 10 and is provided with an actuating arm 11. Such switches are well known in the art and are operated by depressing the actuating arm. When arm 11 is moved downwardly a certain distance relative to the switch body the switch will trip as one contact is broken and another made within the switch body. The exact position of arm 11 relative to switch body 10 where this internal action will take place will vary slightly with each switch due to manufacturing tolerances. Arm 11 is biased upwardly so that it will return to the position illustrated when a force depressing the arm is released.

An installation for two switches is illustrated in Figs. 1–4 but almost any number can be accommodated. Fig. 5 shows a modification in which three switches are included. These switches are received within the housing 2 in a side by side abutting relationship with all of the actuating arms 11 along the same side. Lead wires 12 of the switches pass out of the housing through opening 13 in bottom plate 7 in which insulating grommet 14 is inserted.

The mounting arrangement for the switches provides for individual adjustment of each switch. To accomplish this, a shaft 15 is journalled in end plates 4 and 5 and extends transversely through the housing passing through each switch 9. In this manner, each switch is made to be pivotal about shaft 15. Leaf spring elements 16 are secured to end plates 4 and 5 by suitable means such as rivets 17 and engage the side of the switch body adjacent the end plates for holding the switches in engagement with each other along shaft 15 without exerting an excessive force on the switches and allowing pivotal movement of all of the switches.

Each switch is provided with an arm 18 along one side which is rigidly attached thereto by a suitable means. For example, each arm 18 may include an opening for receiving shaft 15 and may be further provided with a pin 20 attached thereto and extending into the body of the switch. Pin 20 is best illustrated in Fig. 4 and the arrangement of arm 18 is also clearly shown in Fig. 1 where one switch has been removed and the arm may be seen in elevation. It can readily be seen that movement of arm 18 will cause the switch to which it is attached by pin 20 to pivot about shaft 15. End 21 of each arm is provided with a cross pin 22 which extends perpendicularly therefrom inwardly towards the body of the switch so as to not interfere with the abutting arrangement of the switches.

Section 3 of housing 2 is provided with two opposite threaded openings 23 and 24 for each switch, which openings are adapted to receive adjusting screws 25 and 26. Two screws 25 and 26 thus extend through the housing and engage opposite sides of cross pin 22 of each of the switches. Adjusting screws 25 and 26 are provided with slotted or recessed ends 37 and 38 whereby they are rotatable from outside the housing. Rotation of a set of two adjusting screws 25 and 26 in engagement with a cross pin 22 will thus position that cross pin and hence the switch to which it is attached relative

to shaft 15 independently of the other switches. When the adjusting screws are tightened down upon cross pins 22 the switches are rigidly secured in place against any pivotal movement within the housing.

A cam 27, which may be integral with cam shaft 28 and includes a lobe 29, is rotatably carried within the housing in engagement with all of the actuators 11. Thus cam 27 is disposed substantially parallel to shaft 15, and cam shaft 28 is journalled in end plates 4 and 5 by means of bearings 30 and 31. It is thus apparent that rotation of the cam shaft will cause the lobe 29 of cam 27 to depress actuating arms 11 and cause the switches to trip. This rotation may be effected by end portion 32 of shaft 28 which projects through end plate 5 and may be splined to receive arm 33.

When the switches are installed in the housing, they normally will not trip at exactly the same moment upon rotation of cam 27. In addition, some of the switches may be so positioned that lobe 29 of the cam would mash the actuator 11 into the body of the switch and thereby damage the switch. These conditions can be remedied by proper adjustment of the switch positions by means of adjusting screws 25 and 26. For example, a switch may be pivoted downwardly about shaft 15 to a position where actuator 11 will remain free of switch body 10 when depressed by the cam so that no damage to the switch will take place. Lowering the switch also means that it will take additional rotation of cam 27 before lobe 29 can depress actuator 11 to a position where the switch will trip and the time of operation of that switch is thereby delayed. Similarly, raising of the switch will cause it to trip sooner as the cam rotates. The switches may be individually lowered or raised, as required, until all trip simultaneously and none is damaged by action of the cam. As illustrated in the drawings, this may result in the switches being disposed in different positions within the housing which is, of course, of no consequence as long as the desired operating characteristics are obtained. It is of course possible to adjust these switches so that a desired interval between time of tripping for the various switches is obtained. After obtaining the correct setting of the switches, it may be desirable to pour sealing wax into openings 23 and 24 so that the adjustment of screws 25 and 26 will not be tampered with.

It can thus be readily seen that I have provided an electrical switch device that may utilize a direct cam drive without damage to the switches, that provides for adjustment of the time of operation of each individual switch relative to the other switches, that contains no springs or other elements subject to icing conditions, that is light in weight, and simple and rugged in its construction.

Although the preferred embodiment of this invention has been described in detail, it is to be clearly understood that this is by way of illustration only and is not to be taken by way of limitation, the spirit and scope of this invention being limited only by the appended claims.

I claim:

1. A switch device comprising a housing; a plurality of switches disposed therein in abutting side by side relationship; a shaft journalled in opposite walls in said housing and engaging said switches whereby said switches are pivotal thereabout, each switch being provided with an actuating arm on the upper side thereof and with a second arm projecting therefrom; a cam shaft rotatably carried by said housing with its axis substantially in parallelism with said mounting shaft; a pair of adjusting screws received in said housing for each of said switches and engaging said second arm for pivoting said switch about said shaft for vertical adjustment relative to said cam shaft, and for retaining said switch in said vertical adjustment, whereby said switches may be caused to trip simultaneously upon rotation of said cam shaft.

2. A device as recited in claim 1 in which said adjusting screws are accessible from the exterior of said housing, and including in addition resilient means for retaining said switches in lateral position within said housing with freedom for vertical adjustment relative thereto.

3. A switch device comprising a housing; a plurality of switches disposed therein in abutting relationship; a mounting shaft journaled in said housing and engaging said switches whereby said switches are pivotal thereabout, each switch being provided with an actuating arm on one side thereof; a cam shaft rotatably carried by said housing substantially in parallelism with said mounting shaft, and in engagement with said actuating arms; and a pair of adjusting screws received in said housing for each of said switches and engaging each switch remote from said mounting shaft for independently pivoting each switch about said mounting shaft for adjustment thereof relative to said cam shaft, and for retaining said switch in vertical adjustment, whereby said switches may be caused to trip simultaneously upon rotation of said cam shaft.

4. A switch device comprising a housing; a plurality of switches in said housing, each of which includes an actuating arm projecting therefrom; a shaft journaled in said housing and pivotally carrying said switches in side-by-side relationship; a cam in said housing engaging said actuating arms whereby rotation of said cam effects operation of said switches; and an opposed screw threaded means engaging each of said switches remote from said shaft whereby rotation of a screw threaded means independently pivots about said shaft the switch engaged thereby and rigidly retains said switch so positioned whereby said switches may be adjusted relative to said cam and the sequence of operation thereof controlled.

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