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 [33] Japan
 [31] 43/84,280

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[54] CAM SWITCH UNIT
 5 Claims, 7 Drawing Figs.

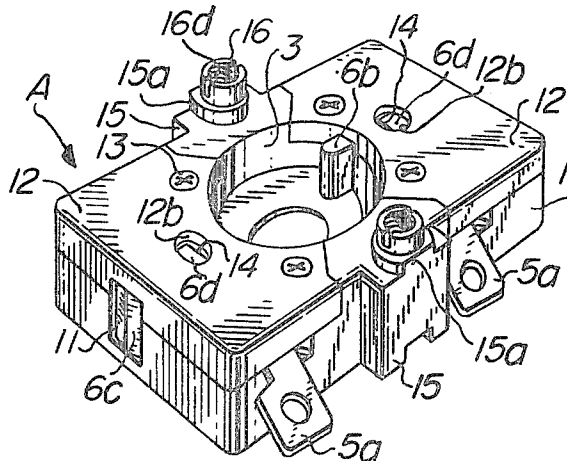
[52] U.S. Cl. 200/168 A,
 200/168 K
 [51] Int. Cl. H01h 9/02
 [50] Field of Search 200/6, 14,
 153, 13, 168 S, 168 A, 166 B, 167, 166.1

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ABSTRACT: A cam switch unit that can be used singly or in multiples operated by a common actuating means. Each cam switch unit comprises an operating cam mounted centrally in a casing, and a pair of switch housing cavities, one on each side of the operating cam. The cavities each contain a fixed contactor and a movable contactor operated by the cam. Each cavity is closed by a cover, and each switch unit further comprises an upright cylindrical portion on the top of the casing and a cavity in the bottom of each casing for receiving the upright cylindrical portion of an adjacent unit to align and interlock adjacent units in a multiple switch assembly. Adjacent units are attached together by screw means having an externally threaded stem and a head having an externally threaded cavity for receiving the stem of an adjacent unit. These screw means also attach the switch cavity covers to the switch casing on each individual unit.



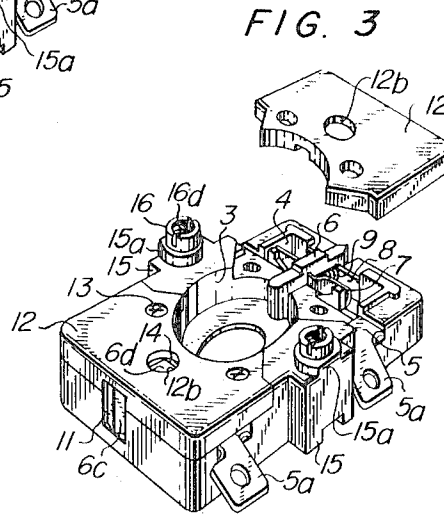
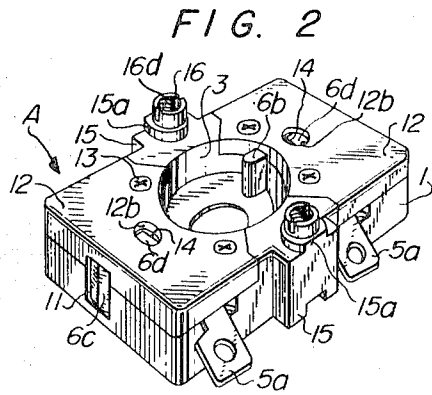
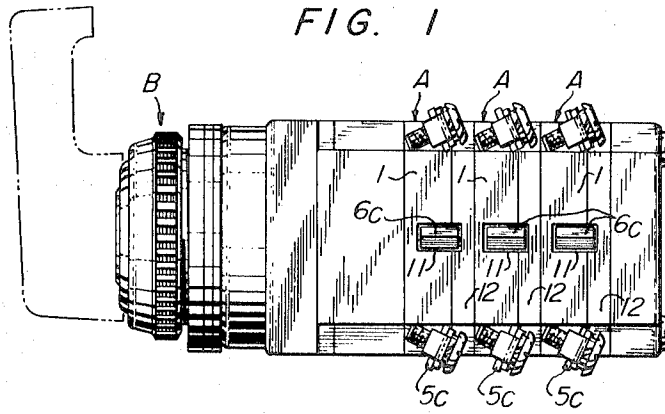


FIG. 4

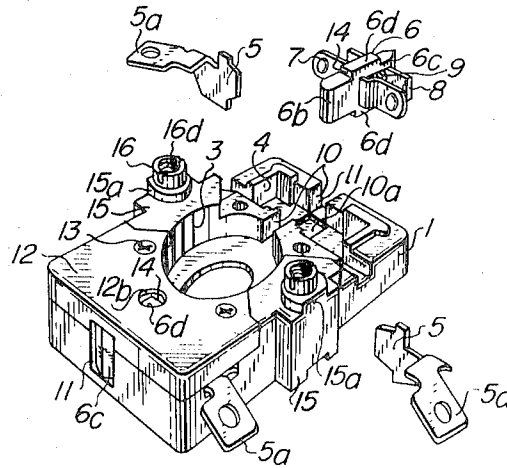


FIG. 5

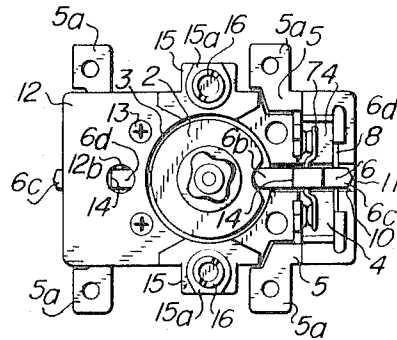


FIG. 6

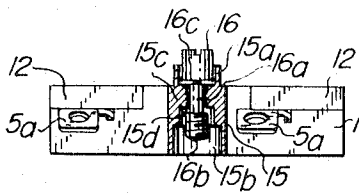
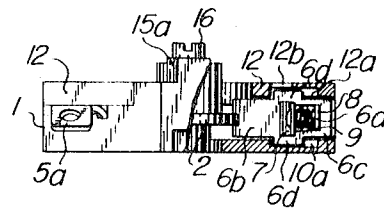


FIG. 7



CAM SWITCH UNIT

The present invention relates to a cam switch unit used for switching an operation.

The present invention has for its object the provision of a cam switch unit of the type which comprises a casing, an operating cam mounted centrally in said casing, a movable member received in each of cavities formed in said casing on both sides of said operating cam, a movable contactor carried by said movable member and a fixed contactor disposed in each of said cavities for cooperation with said movable contactor, characterized in that each of said cavities is closed by a cover with said respective members disposed therein.

According to the present invention, control, assembly, maintenance and inspection of the unit switch can be effected easily.

FIG. 1 is a front elevation of a cam switch assembly composed of a plurality of unit cam switches arranged in juxtaposed relation;

FIG. 2 is a perspective view of a unit cam switch;

FIG. 3 is a perspective view of the unit cam switch with a cover of one of switching members accommodating cavities removed;

FIG. 4 is a perspective view of the unit cam switch showing the switching members in one of the cavities in an exploded state;

FIG. 5 is a top plan view of the unit cam switch, with an operating cam mounted, showing the relative positions of said operation cam and the switching members; and

FIGS. 6 and 7 are side elevations of the unit cam switch with a portion thereof shown in section respectively.

A preferred embodiment of the present invention will be described in detail hereinafter with reference to the accompanying drawings:

An elongate box-shaped switch casing 1, molded of a suitable material, is formed with a stepped hole 3 in the center thereof for mounting an operating cam 2, and with cavities 4 in the longitudinally opposed end portions on both sides of said stepped hole 3. In each cavity 4 is mounted a fixed contactor 5 with a connecting terminal end 5a extending outwardly through the casing. A movable member 6 made of an insulating material has a through-hole 6a formed therein, through which a movable contactor 7 and a stopper plate 8 extends with the former located closer to an end 6b of said movable member, which end is to be operated by the operating cam, and with the latter located closer to the other end 6c of said movable member, which end is to indicate the operational position of the cam switch, said movable contactor and said stopper plate 8 being secured in said through-hole 6a by means of a spring 9 interposed therebetween. A channel 10 is formed extending from the outside surface of the casing 1 to the central stepped hole 3 across the cavity 4 to provide for a reciprocal sliding movement of the movable member 6 therein said channel forming a window 11 in the sidewall of the casing. In mounting the movable member 6 in the channel 10, the movable contactor 7 and the stopper plate 8 are first passed through the through-hole 6a in said movable member after compressing said movable contactor and said stopper plate with the spring 9 interposed therebetween, and then, after mounting the movable member 6 in the channel 10, the compressive force is removed, whereby the stopper plate 8 is pressed against the inside surface of the casing and the movable contactor 7 against the fixed contactor 5 under the biasing force of the spring 9. In this case, the end 6b of the movable member 6 extends into the stepped hole 3 but the other end 6c does not project outwardly through the window 11.

Covers 12 to close the respective cavities 4 are fixed to the casing 1 by means of screws 13 to prevent the movable member 6 and other switching members disposed in each cavity 4 from coming off therefrom, whereby a unit switch A is formed. The undersurface of the cover 12 and the bottom surface of the channel 10 are formed with grooves 12a and 10a respectively for receiving projections 6d therein, which projections 6d are formed at the top and bottom surfaces of the

movable member 6. Thus, it will be seen that the movable member 6 makes a reciprocatory movement in the cavity, with the projections 6d being guided by the grooves 12a and 10a respectively. Reference numeral 14 designates one of the shoulders defined by the upper projection 6d, which is located closer to the end 6b of the movable member 6, and a through-hole 12b is formed in the cover 12 at a location corresponding to said shoulder 14 so that said shoulder 14 is visible from the outside of the cam switch.

Each sidewall of the casing 1 has a portion thereof projected outwardly as at 15 so as to provide means for connecting the unit cam switch A with another unit cam switch. Namely, an upright cylindrical portion 15a is formed on the upper surface of the projecting wall portion, while a cylindrical cavity 15b is formed in the undersurface thereof in alignment with said upright cylindrical portion 15a for engagement with a cylindrical portion 15a of another unit cam switch. Between the hollow in the cylindrical portion 15a and the cylindrical cavity 15b is formed a barrier wall 15c. A connecting screw 16 consists of a head 16c, a stem portion 16a and an externally threaded portion 16b formed at the lower end extremity of said stem portion, said stem portion 16a being slightly smaller in diameter than the outer diameter of the threaded portion 16b. The head 16c of the connecting screw 16 is provided with an internal thread 16d for engagement with the externally threaded portion 16b of the connecting screw of another unit cam switch. The connecting screw 16 is inserted from the upright cylindrical portion 15a and screw threaded through the barrier wall 15c, with the externally threaded end portion 16b located within the cylindrical cavity 15b. Therefore, the stem portion 16a of the connecting screw 16 extends loosely through the tapped hole 15d formed in the barrier wall 15c as a result of tapping operation of the externally threaded end portion 16b. Since the connecting screw 16 is mounted in the projecting wall portion 15 of the casing in the manner described, it cannot be removed from the casing unless it is lifted upwardly while screw threading the same through the tapped hole 15d formed in the barrier wall 15c, and, therefore, said connecting screw is disengageably retained by the casing. In connecting a plurality of unit cam switches A with each other in a juxtaposed relation, the upright cylindrical portion 15a of one unit cam switch is inserted into the corresponding cylindrical cavity 15b of the adjacent unit cam switch and then the externally threaded end portion 16b of the connecting screw 16 of the former is screw threaded into the internally threaded hole 16d in the head of the connecting screw 16 of the latter. Therefore, it is not necessary to provide separate connecting means.

A juxtaposed cam switch assembly obtained by connecting a desired number of unit cam switches A, each constructed as described above and having the operating cam 2 mounted in the stepped hole 3, in a juxtaposed relation, can be connected to an operating element B in the manner as shown in FIG. 1.

In operation, when the end 6b of the movable member 6 is pushed by the rotating cam 2, the movable member 6 is caused to slide outwardly in the channel 10, so that the movable contactor 7 is disengaged from the fixed contactor 5 to open the associated circuit and the end 6c of said movable member projects outwardly through the casing 1 indicating the state of the interior circuit. In this case, the spring 9 is compressed with one end thereof bearing against the stopper plate 8 which is secured in pressure contact with the inside surface of the casing 1, and thereby a force is retained in said spring for the return movement of the movable member 6. Then, the pressure is removed from the movable member 6 upon further rotation of the operating cam 2, whereupon the movable member 6 returns to its original position under the biasing force of the spring 9, so that the movable contactor 7 is again brought into contact with the fixed contactor 5 to close the circuit and accordingly the end 6c of the movable member 6 is retracted into the window 11.

Therefore, when the unit cam switches A are assembled in a juxtaposed relation as shown in FIG. 1, the positions of the

respective unit cam switches can be individually readily known from the outside and this is highly effective and convenient from the standpoint of operational control. In addition, since the operation of the interior circuit can be directly indicated by the movable member 6, a positive operation can be assured and the possibility of erroneous indication can completely be avoided.

It is also to be noted that according to the present invention the cavities 4 in the casing 1 of each unit switch A are individually closed by the cover 12 when the plurality of the unit switches are assembled in a juxtaposed relation and connected to the operating element B as shown in FIG. 1, so that there is no fear of the movable member 6 and the fixed contactor 5, accommodated in the cavity 4, being slipping off therefrom, which facilitates the assembly work. By the same reason, the component parts disposed in each cavity 4 can be maintained in the orderly arrangement even when the unit switch is left to stand singly and, therefore, handling of the unit switch is very easy.

Moreover, according to the present invention the movable member 6 is formed with the through-hole 6a therein, and the movable contactor 7 and the stopper plate 8 are supported in said through-hole 6a, with the spring 9 interposed therebetween. In assembling the unit switch, therefore, the operation of mounting these members in each cavity 4 in the casing 1 can be accomplished in a single step and accordingly the operation of assembling the unit switch can be much simplified as a whole. Such an arrangement is also advantageous in preventing scattering and loss of the component parts during assembly, which have been experienced in assembling a conventional switch of this type by mounting the movable member 6, the spring 9, the movable contactor 7, etc. one after another individually.

In the present invention, since each cavity 4 is closed by the cover 12, it may be possible depending upon the shape of the operating cam 2 that the end 6b of the movable member 6 projecting into the stepped hole 3 from the cavity 4 has to be cleared away from said stepped hole to provide for mounting of the operation cam in said stepped hole. This can be attained very easily by inserting a small driver or other small tool, readily available to the workmen, into the hole 12b in the cover 12 at its tip end and moving the movable member 6 against the spring 9 by pushing the wall of the shoulder 14 formed on the top surface of said movable member. Thus, the operating cam 2 can be mounted in the stepped hole 3 very simply and easily.

The operation of juxtaposing the unit switches A can also be accomplished simply by means of the connecting screws 16 provided on the casing 1 of each unit switch, without requiring any additional fitting.

Although in the embodiment shown use is made of the elongate box-shaped casing having two switching members accommodating cavities formed therein, it is to be understood that the present invention is not restricted only thereto.

What is claimed is:

1. A cam switch unit of the type comprising a casing, an operating cam mounted centrally in said casing, a movable member received in each of cavities formed in said casing on both sides of said operation cam, a movable contactor carried by said movable member and a fixed contactor disposed in each of said cavities for cooperation with said movable contactor, characterized in that each of said cavities is closed by a cover with said respective movable members disposed therein.

2. A cam switch unit of the type comprising a casing, an

operating cam mounted in a hole formed centrally in said casing, and a fixed contactor and a movable contactor and a movable member disposed in each of cavities formed in said casing on both sides of said operation cam, characterized in that said movable member is assembled with said movable contactor and a stopper plate by inserting the latter through a through-hole formed in the former with a spring interposed between said movable contactor and said stopper plate, and is slidably fitted in a channel formed across each of said cavities in communication with said operating cam mounting hole together with said movable contactor and said stopper plate upon compressing said spring, whereby said stopper plate is held in pressure contact with the wall of the cavity, while said movable contactor is held in contact with said fixed contactor in opposed relation thereto.

3. A cam switch unit of the type in which each switching member accommodating cavity is closed by a cover, characterized in that a movable member disposed in said cavity and carrying a movable contactor is formed with a shoulder and a through-hole is formed in said cover at a location corresponding to said shoulder.

4. A cam switch unit comprising a casing having switching member 13 accommodating cavities formed therein, and operating cam mounted centrally in said casing, a movable member disposed in each of said cavities to be operated by said operating cam, a movable contactor carried by said movable member and a fixed contactor cooperating with said movable contactor for effecting a switching operation, said movable member extending across said cavity with one end thereof confronting said operating cam and the other end projecting into an opening formed in the wall of said casing so as to be visible from the outside.

5. A cam switch assembly comprising

a plurality of cam switch units, each of said cam switch units comprising a casing, an operating cam mounted centrally in said casing, a movable member received in each of cavities formed in said casing on both sides of said operating cam, a movable contactor carried by said movable member and a fixed contactor disposed in each said cavities for cooperation with said movable contactor, each of said cavities being closed by a cover,

connecting means for attaching adjacent of said cam switch units together, said connecting means comprising an upright cylindrical portion formed on the top surface of said casing projecting upwardly therefrom, a cylindrical cavity formed in the bottom surface of said casing for engagement of the upright cylindrical portion of said adjacent cam switch unit, a barrier wall separating the hollow of said upright cylindrical portion and said cylindrical cavity,

a connecting screw consisting of a head, a stem portion and an externally threaded portion formed at the free end of said stem portion and having an outer diameter slightly larger than the diameter of said stem portion, said head being provided with an internally threaded hole therein for engagement with the externally threaded stem portion of the corresponding connecting screw of another cam switch unit and said connecting screw being screw threaded through said barrier wall into said cylindrical cavity and retained in position with the stem portion thereof extending in the tapped hole formed through said barrier walls, and

common operating means operatively connected to each of said cams for operating said cams concurrently.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,614,363

Dated October 19, 1971

Inventor(s) Teizo Fujita

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 3, l. 60, "operation" should read "operating".

Col. 4, l. 4, "operation" should read "operating".

Col. 4, l. 23, "13" should be deleted.

Signed and sealed this 11th day of July 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents