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Kellogg et al.

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[54] **SWITCH OPERATOR WITH SPLIT CAM**

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[73] Assignee: **Westinghouse Electric Corporation,** Pittsburgh, Pa.

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[52] **U.S. Cl.** ..... **200/330;** 200/16 A; 200/18; 200/153 L; 74/568

[51] **Int. Cl.** **H01h 3/42;** F16h 53/00

[58] **Field of Search** ..... 200/4, 14, 16 A, 153 L, 200/153 LA, 153 LB, 290, 291, 307, 314, 329–332; 74/567, 568 R, 99 R, 99 A, 107

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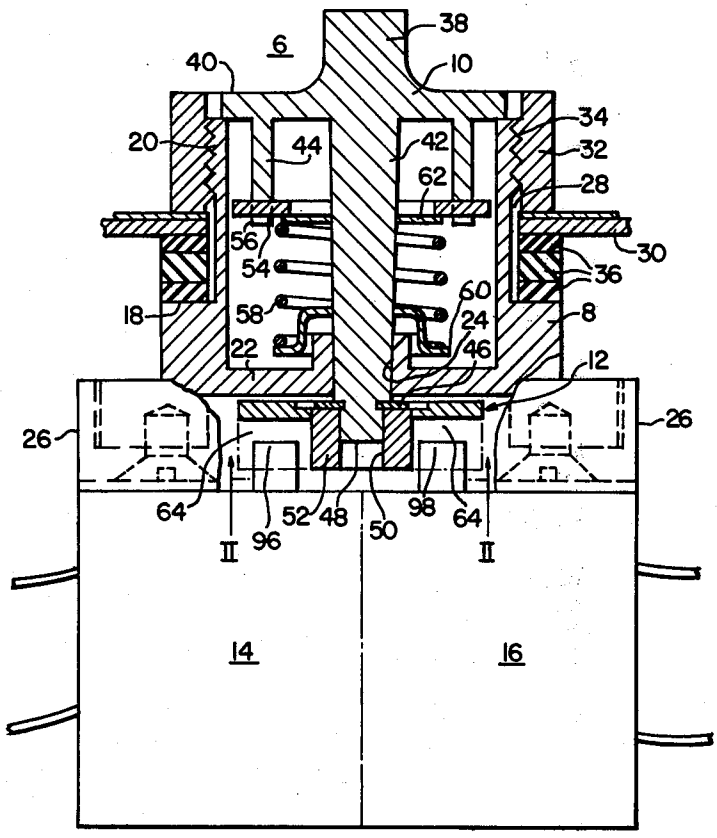
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[57] **ABSTRACT**

A switch operator characterized by a cylindrical cam comprising two separable cam portions each cam portion including a camming surface structure, each camming surface structure being operable with a contact operator for a corresponding switch unit, and the camming portions being separable at interfitting parting surfaces of said portions.

5 Claims, 5 Drawing Figures



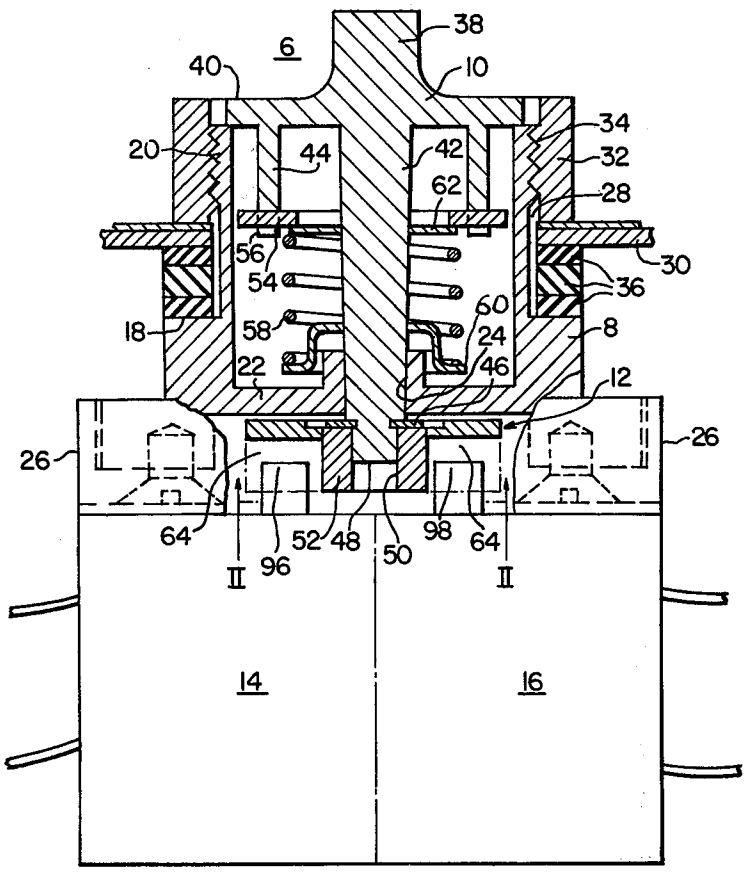


FIG. 1.

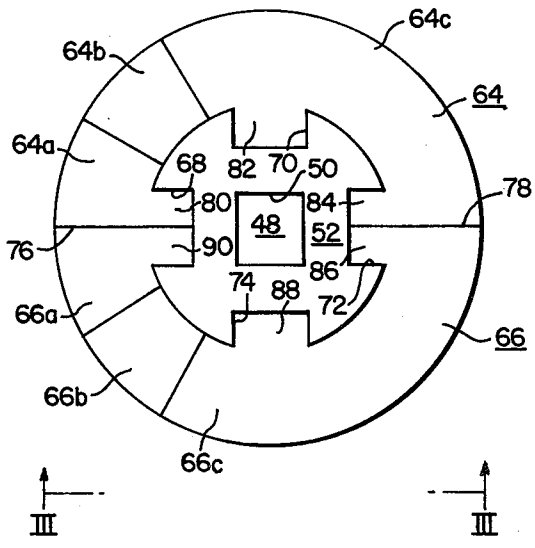


FIG. 2.

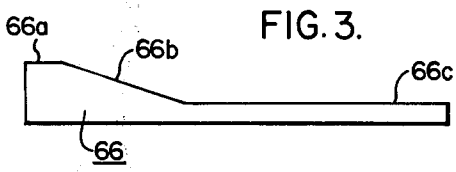


FIG. 3.



FIG. 4.

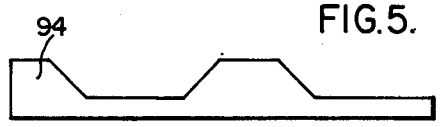


FIG. 5.

SWITCH OPERATOR WITH SPLIT CAM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to switch operators and more particularly to switch operators having detachable cam portions.

2. Description of the Prior Art

In the switch art, it is often desirable to provide a contact block and switch operator as separate structures. With this arrangement, the contact block can be mounted within an enclosure and the switch operator can be mounted for external operation on the enclosure cover to cooperate with the contact block when the cover is moved in the closed position. Most switch operators include a cam for each combination of four positions for a particular contact block. In order to eliminate the need for manufacturing and stocking different types of cams as well as to provide a structure with increased utility, it is advantageous to provide a switch operator with split cams that can be interchanged to provide different numbers of operating positions. For example, it is desirable for certain switches to provide a switch operator that can be converted between two-positioned and three-positioned operations.

SUMMARY OF THE INVENTION

It has been found in accordance with this invention that the foregoing advantage may be obtained by providing a switch operator for a plurality of reciprocable switch operating members, comprising a movable selector member, a housing mounting said member, a cam comprising at least two camming surface structures, means mounting said cam and said member to effect rotation of the cam upon movement of the member, the cam also comprising at least two camming separable portions each embodying one of the camming surface structures, the mounting means mounting the cam comprising a tubular member in one end of which the cam portions are seated and at the other end of which the movable selector member is mounted, the assembled cam portions comprising a cylindrical cam, and the cam portions comprising interfitting parting surfaces.

The advantage of the device of this invention is that it provides for a selector switch operator for use with contact blocks which operator includes cams in a back-to-back or side-by-side assembly, wherein each contact block is actuated independently of the other. The cams are so assembled in back-to-back or side-by-side arrangement that they are placed into the housing of the operator which is keyed to enable installation of the cams in only one position. Thus, a minimum number of cams are required to operate the contact blocks in two, three, or four positions.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view through a switch operator;

FIG. 2 is a bottom plan view taken on the line II—II of FIG. 1;

FIG. 3 is an enlarged elevation view taken on the line III—III of FIG. 2; and

FIGS. 4 and 5 are elevation views of alternate cam surfaces.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 a switch operator is generally indicated at 6 and it comprises a housing 8, an operating member or handle 10, a cam assembly 12, and a pair of contact blocks or switches 14 and 16. The housing 8 is a tubular member including an annular shoulder 18 and a sleeve 20. The housing 8 also includes a web portion 22 having a central hole 24 and out-turned projections 26 at diametrically opposite sides thereof by which the contact blocks 14 and 16 are secured to the switch operator 6.

As shown in FIG. 1 the sleeve 20 extends through an aperture 28 in a panel 30 of an enclosure (not shown) where it is retained in place by a clamping ring 32 which is detachably mounted on the outer surface of the sleeve in a suitable manner such as by threads 34. An annular seal 36 is disposed between the shoulder 18 and the panel 30 to prevent leakage of oil from one side of the panel to the other.

The operating member or handle 10 is mounted within the housing 8 and includes a manual knob 38, a flange 40, a shaft 42, and an annular cam 44. The knob 38 and the flange 40 are disposed above the opened end of the housing 8 and the peripheral portion of the flange preferably overlaps the outer end of the sleeve 20. The shaft 42 extends through the opening 24 where it is retained by a snap ring 46 and includes a non-circular or square end portion 48 which is seated in an opening 50 of a cam retainer 52.

The annular cam 44 is used in conjunction with a pin 54 having an intermediate portion extending around the shaft 42 and having opposite end portions seated in camming notches 56 which are diametrically disposed with respect to the shaft 42. The number and spacing of the opposed notches correspond to those of positions on the cam assembly as set forth below. As the knob 38 is rotated, the pin 54 rides into and out of the notches 56 to avoid any neutral or nonoperative position of the cam assembly. A coil spring 58 has a lower end seated on a mounting ring 60 and an upper end which urges against a washer 62 that bears against the pin 54, thereby holding the pin 54 in place within the notches 56.

The cam assembly 12 comprises the cam retainer 52 and a pair of split cams 64 and 66 (FIG. 2). The cam retainer 52 is a substantially circular member having spaced peripheral notches 68, 70, 72 and 74 as well as the square central opening 50. The cams 64 and 66 comprise two half portions of a complete annular cam and as such are semi-annular members having parting surfaces 76 and 78 as shown in FIG. 2. The split cams 64 and 66 may have similar or dissimilar camming surfaces, depending upon the particular condition or sequence of operation of the contact blocks or switches 14 and 16.

The split cams 64 and 66 are detachably mounted by inserting diametrically opposite in-turned cam members into the diametrically disposed notches 68–74. Thus, the split cam 64 is inserted in place by fitting projections 80, 82, and 84 into the notches 68, 70, and 72, respectively. Similarly, the split cam 66 comprises projections 86, 88, and 90 fit into the notches 72, 74, and 68, respectively. For simplicity of description, both cams 64 and 66 have similar cam surfaces including raised surfaces 64*a* and 66*a*, sloped surfaces 64*b* and

66*b*, as well as lower surfaces 64*c* and 66*c*. The elevational profile of the split cam 66 is shown more particularly in FIG. 3 which includes the cam surfaces 66*a*, 66*b*, and 66*c*.

In FIGS. 4 and 5 split cams 92 and 94 are shown as examples of other cam profiles which may be used in conjunction with other similar split cams or combinations. Where two switches 14 and 16 are provided there are seven different cam portions with four positions each which can be used interchangeably to provide 28 possible cam combinations. By providing the split cams in various combinations it is noted that the switches 14 and 16 may be actuated in various combinations as desired.

In operation, when the knob 38 is rotated the cam assembly 12 comprising the split cams 64 and 66 engaged buttons 96 and 98 which extend from the contact blocks or switches 14 and 16, respectively. The particular construction of the contact blocks or switches 14 and 16 comprises a pair of separable contacts which may be normally closed or normally opened, for example as shown in U.S. Pat. No. 3,511,955. Each button 96 and 98 actuates contacts to the opened or closed position in a conventional manner.

Finally, it is noted that the switch operator 6 may be used with two or more switches, such as switches 14 and 16, where two or more split cams such as split cams 64 and 66 are provided. For example, the three or four split cams may be used where the cam surfaces are reduced in size in proportion to the degree of rotation of the operating member 10.

Accordingly, the device of this invention provides for the use of various combinations of cam sectors which are keyed together in a number of desired combinations as required.

What is claimed is:

1. A switch operator for operating a plurality of reciprocable switch operating elements, comprising a rotatable selector member, a housing mounting said member, a cam comprising at least two separable camming surface structures, means detachably mounting said camming surface structures on said member to effect rotation of the cam upon movement of the member, the camming surfaces facing directions parallel to the axis of rotation of the selector member, at least two switch units on the housing and each unit comprising a contact operator including a reciprocable switch operating element adjacent to a corresponding camming surface structure, and said camming structures comprise parting surfaces which are retained together when mounted on the mounting means.

2. The switch operator of claim 1 in which the assembled cam comprise a cylindrical cam.

3. The switch operator of claim 2 in which the means mounting said cam comprises a tubular member having circumferentially spaced notches, and each camming surface structure having circumferentially spaced projections seated in said notches.

4. The switch operator of claim 3 in which the notches and projections comprise interfitting members for holding the camming surface structures together.

5. The switch operator of claim 4 in which the notches are peripherally spaced and the projections are located on an inner surface of each camming structure.

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