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SWITCH

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FIG. 1

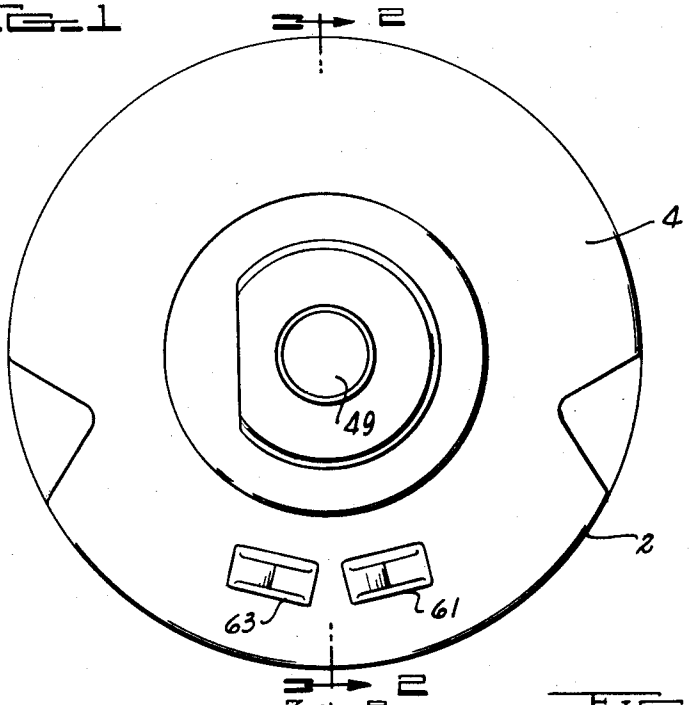

FIG. 2

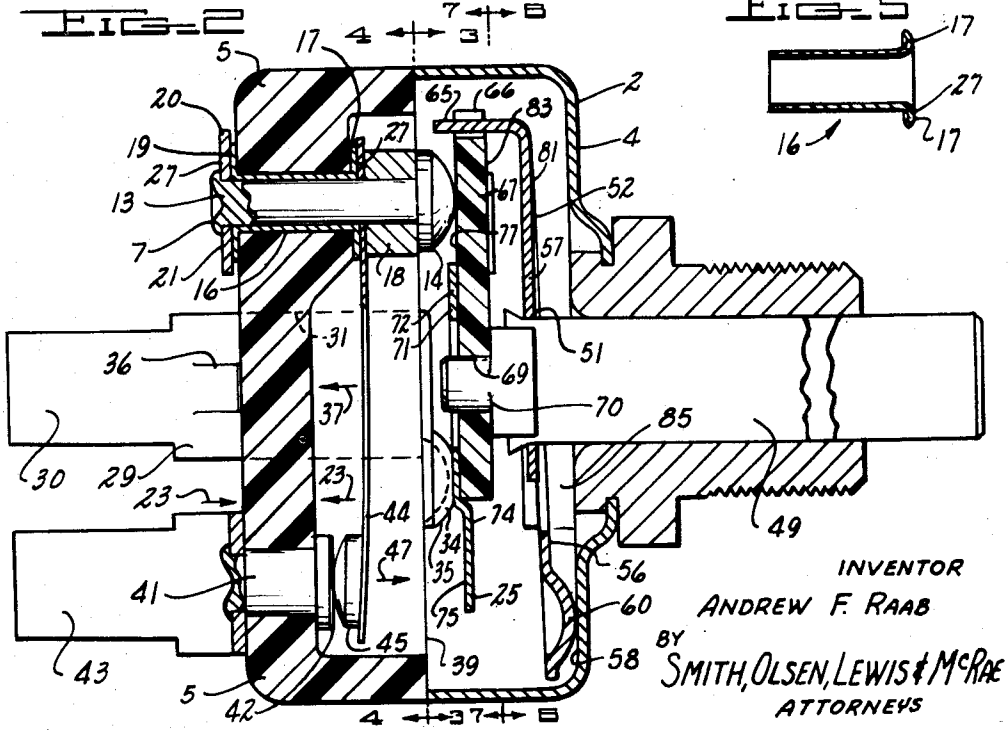

FIG. 5

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FIG-3

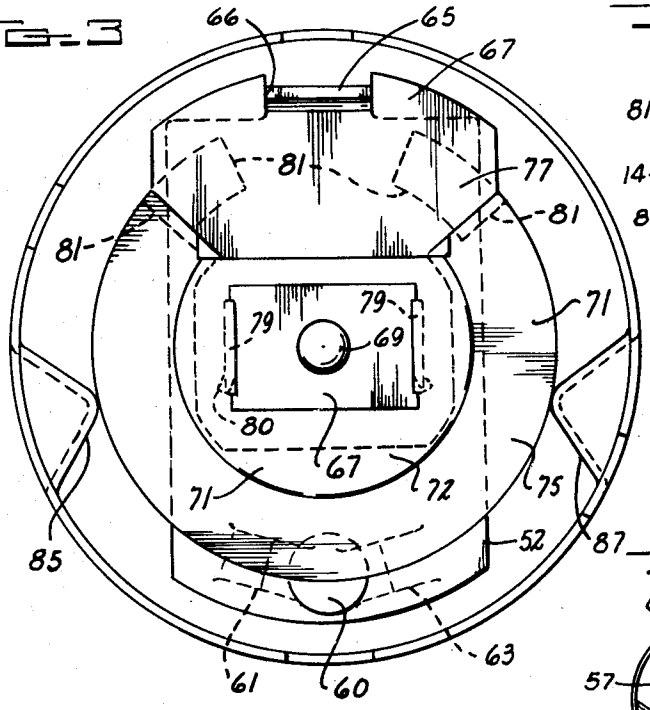


FIG-7

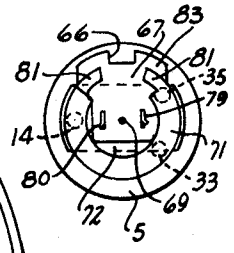


FIG-6

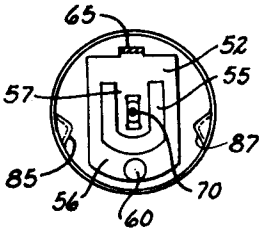
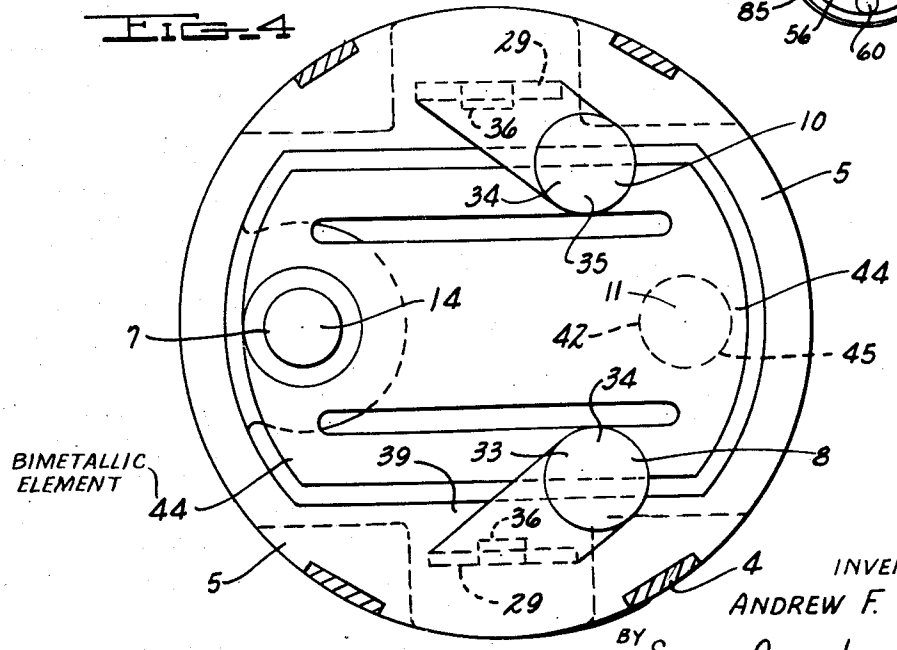


FIG-4



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2,901,574

SWITCH

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Application September 27, 1956, Serial No. 612,529

5 Claims. (Cl. 200—114)

This invention relates to a rotary switch, useful for example in the control of an automobile windshield wiper or automobile instrument lamp switch.

Objects of the invention are singly and collectively to provide a switch wherein:

(1) The number of controlled circuits can be varied economically by making relatively minor changes in the switch structure;

(2) Current overload through the switch is eliminated by incorporating a simple low cost circuit breaker into the switch structure;

(3) Millivolt drop throuugh the switch is at a minimum;

(4) The rotary actuator for the switch is prevented from axial movement thereby providing for firm wiping engagement between the contacts, less wear on the moving parts, and less possibility that the actuator knob will become disengaged from the actuator shaft;

(5) The switch contact plate is securely but economically fastened to its dielectric mounting member, thereby preventing "parts shifting" or "parts jamming";

(6) Movement of the switch actuator to its various different positions is smooth, and there is no danger that the switch parts may become locked in undesired "out of position" locations;

(7) The switch is of low cost construction by reason of small size, minimum number of parts, minimum number of assembly operations, lack of molded inserts, reduction in the number of rivets required, lack of small springs required to be untangled, and economical terminal construction cost.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a front elevational view of one embodiment of the invention.

Fig. 2 is a sectional view on line 2—2 in Fig. 1.

Fig. 3 is a view on the parting line as shown by the arrows 3—3 in Fig. 2.

Fig. 4 is a view on the parting line as shown by the arrows 4—4 in Fig. 2.

Fig. 5 is a view through a sleeve used in the Fig. 1 embodiment.

Fig. 6 is a view on parting line 6—6 in Fig. 2.

Fig. 7 is a view on parting line 7—7 in Fig. 2.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways, Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawings there is shown a switch including a housing 2. Housing 2 includes a metallic cup-shaped member 4 and a phenolic or other plastic terminal board

5. There are mounted in board 5 a contact member 7 and three terminals 8, 10, and 11.

Member 7 comprises a shaft 13 having a head 14 which serves as a contact element. An electrically conductive spacer 18 is provided adjacent head 14. Encircling shaft 13 is an electrically conductive sleeve 16 which is provided with annular flanges 17 and 19. As shown in Fig. 5 flange 17 is bowed in radial directions prior to installation of sleeve 16. Flange 19 is formed after sleeve 16 is in position within board 5. Preferably flange 19 is bowed by suitable tools (not shown) to the same configuration as flange 17. After formation of flange 19 a washer member 20 is positioned on the outer end of shaft 13, and end portions of the shaft are turned over into clamping engagement against surface 21 of member 20.

The "bowing" of flanges 17 and 19 causes them to pressuringly engage against the surfaces of plastic board 5, even if the board should subsequently shrink in the arrow 23 direction; it being appreciated that phenolic materials and other plastic materials shrink as they "age" in use. If flanges 17 and/or 19 were not bowed shaft 13 and its head 14 might shift in an axial direction so as to make loose electrical contact with circuit breaker blade 44 and contact plate 25 (to be described later). If board 5 should shrink in the arrow 23 direction the outer ends of flanges 17 and 19 maintain constant pressure contact with the surfaces of board 5, and the central "humped" portions 27 of flanges 17 and 19 maintain pressure contact with the adjacent annular elements. The illustrated construction insures a good electrical conductivity and low millivolt drop.

Each of terminals 8 and 10 includes a flat wall portion 29 having an end portion 30 adapted to receive a lead wire (not shown). Wall portion 29 extends through a slot 31 in board 5, and the inner end of wall portion 29 is turned at right angles to form contact elements 33 and 35. The contact surfaces of elements 33 and 35 are provided by "humped" portions 34.

Installation of terminals 8 and 10 is effected before housing members 4 and 5 are assembled together. Wall portion 29 includes a spring arm 36, and in the installation operation wall portion 29 is forced through slot 31 in the arrow 37 direction until arm 36 snaps out of the plane of portion 29 into locking engagement against the exterior face of board 5; simultaneously contact 33 (or 35) abuts against a shoulder 39 formed on board 5 so as to prevent further movement of wall portion 29 in the arrow 37 direction. The "one piece" construction of terminals 8 and 10 insures good electrical conductivity and low millivolt drop.

Terminal 11 includes a shaft 41, a contact element 42, and a lead wire-mounting element 44. If desired terminal 11 could be formed in the manner of terminals 8 and 10.

Between contact element 42 and contact element 14 there is provided a circuit breaker blade 44 which is preferably constructed in the manner shown in copending application, Serial No. 522,103, filed on July 14, 1955. The characteristics of the blade are such that when current flow through the blade is below a predetermined value the blade-carried contact 45 is in pressure contact with contact element 42; when current flow through the blade tends to rise above the predetermined value the blade heats up so as to flex away from contact element 42 in the arrow 47 direction. Thus, the switch is provided with its own built-in protection against current overload.

In order to selectively interconnect contact member 7 with terminals 8 and 10 there is provided a contact plate 25 which is indirectly rotated by means of a rotary actuator shaft 49. A manually engageable knob (not shown) is preferably provided on the outer end of shaft 49.

Shaft 49 includes a non-circular section 51 which fixedly accommodates a combination "drive and detent" member 52; portions of section 51 being flanged out as at 54 to retain member 52 in fixed position on the shaft.

Member 52 is provided with a U-shaped slot 55 so as to form an outer section 56 and an inner central section 57. Section 56 is deformed away from the plane of section 57 so as to pressuringly engage against interior surface 58 of member 2. Section 56 is provided with a detent-forming projection 60; and cooperating detents 61, 63 are formed in surface 58. Detents 60, 61 and 63 coact to hold member 52 and shaft 49 in a fixed intermediate position except when a sufficient manual turning force is exerted on the outer end of shaft 49 to cause detent 60 to ride over detents 61 and 63 against the "deformation" force of section 56.

Member 52 is formed with an ear 65 which extends through a notch 66 in a dielectric member 67. Member 67 is provided with a central opening 69 which receives the reduced end portion 70 of an insert in shaft 49. Member 67 is supported partially by member 52 (through ear 65) and partially by shaft 49 (through end portion 70). The placement of ear 65 away from shaft 49 insures that member 67 will not rotate out of fixed relationship with shaft 49 after a period of usage; in this sense ear 65 serves as a "drive means" between members 52 and 67.

There is fixedly secured on member 67 an electrically conductive contact plate 71. Plate 71 includes a central portion 72 in facial engagement with member 67 and an annular portion 74 offset in the direction of member 67, whereby to put annular surface 75 in contiguous aligned relationship with surface 77 of member 67. The term "contiguous" is used herein to mean that there is no break or "gap" between surfaces 75 and 77.

Plate 71 is locked onto member 67 by means of two right angularly directed flanges 79 extending through preformed slots in member 67. The ends of flanges 79 are bent over as at 80 to prevent separation of members 67 and 71. Cooperating with flanges 79 in the fixed retention of member 71 are two ear portions 81 which extend right angularly from the ends of annular portion 74 across edge portions of member 67 and then right angularly again into facial engagement with surface 83 of member 67. The action of flanges 79 and ear portions 81 is such as to securely lock member 71 on member 67.

Surfaces 75 and 77 of members 71 and 67 are selectively engageable with contact elements 14, 33 and 35. When member 52 is in an intermediate position (with detent 60 between detents 61 and 63) contact elements 14, 33 and 35 are all engaged with contact surface 75; plate 71 acts to close the circuits between elements 14 and 33, and between elements 14 and 35. When member 52 is rotated to a position in engagement with shoulder 85, contact elements 33 and 35 are engaged with contact surface 75, and contact element 14 is engaged with dielectric surface 77. When member 52 is rotated to a position in engagement with shoulder 87, contact elements 14 and 35 are engaged with contact surface 75 and contact element 33 is engaged with dielectric surface 77; the circuit from element 14 to element 35 is closed while the circuit from element 14 to element 33 is open.

During rotary movement of shaft 49 contact elements 14, 33 and 35 are constantly engaged with contiguous aligned surfaces 75 and 77. The "contiguous aligned" character of surfaces 75 and 77 prevents the various contact elements from striking the edge of plate 71 (at ear portions 81) when said edge is moving over the contact element; if surface 77 were positioned to the left of surface 75 in Fig. 3 the contact element might jam against the edge of plate 71 or provide an obstruction to smooth operation of the switch.

It will be understood that variations in the circuitry may be made by varying the number and position of the contact elements and/or the size and shape of elements 52 and 67.

I claim:

1. A switch comprising a housing, a rotary shaft extending through one wall into the interior of the housing, a drive-detent member having a slot of U-shaped configuration forming a central wall portion fixedly attached to said shaft and an outer spring arm portion with two parallel leg portions and an interconnecting web portion, said web portion being urged into engagement with said one wall of the housing, cooperating detents in said housing and said web portion releasably holding said shaft in selected rotated positions, said shaft carrying on its inner end a dielectric member, said drive-detent member having an ear extending through the dielectric member to retain the latter in fixed position on said shaft, a contact plate carried by the dielectric member, and spaced contact elements carried by the housing in the path of movement of said contact plate so that rotary movement of the shaft is effective to put different contact elements into engagement with said contact plate and said spring arm portion is effective to bias the contact plate into electrical engagement with the contact elements.

2. A switch comprising a housing, a rotary shaft extending through one wall into the interior of the housing, a drive-detent member having a central wall portion fixedly attached to said shaft and an outer spring arm portion biased against said one wall of the housing, cooperating detents in said housing and said spring arm portion releasably holding the shaft in selected rotated positions, a dielectric member with a flat surface on one side carried on the inner end of said shaft, a contact plate carried by said dielectric member and having a central portion in flush engagement with the flat surface of said dielectric member, said central portion terminating in angularly turned flanges extending through the dielectric member, the ends of said flanges being bent to lock the contact plate onto the dielectric member, said contact plate having an annular portion offset from the central portion by the thickness of the contact plate so as to put a surface of the annular portion in contiguous alignment with a surface of the dielectric member permitting a smooth uninterrupted travel therebetween, and spaced contact elements carried by the housing in the path of movement of the annular portion of said contact plate and the associated aligned surface of the dielectric member so that rotary movement of the shaft is effective to put different contact elements selectively into engagement with said contact plate and said associated aligned surface of the dielectric member.

3. The combination of claim 2 wherein said annular portion has ear portions extending across edge portions of the dielectric member and into engagement with the other side of said dielectric member to hold the contact plate against wobble on the dielectric member.

4. A switch comprising a housing, a rotary shaft extending through one wall into the interior of the housing, a drive-detent member having a central wall portion fixedly attached to said shaft and an outer spring arm portion biased against said one wall of the housing, cooperating detents in said housing and said spring arm portion releasably holding the shaft in selected rotated positions, said shaft carrying on its inner end a dielectric member, said drive-detent member having an ear extending through the dielectric member to retain the latter in fixed position on said shaft, a contact plate carried by the dielectric member, and spaced contact elements carried by the housing in the path of movement of said contact plate, one of said contact elements having a terminal portion extending through a wall of said housing said one contact element and terminal portion being formed from a flat strip of electrically conductive material bent through ninety degrees so as to position the contact flat against the interior surface of the housing wall, said contact element having a humped contact surface, and a section of

said terminal portion being bent out of the plane of the terminal portion to form a spring arm for locking engagement with the exterior surface of the housing wall.

5. A switch comprising a housing, a rotary shaft extending through one wall into the interior of the housing, a drive-detent member having a slot of U-shaped configuration forming a central wall portion fixedly attached to said shaft and an outer spring arm portion with two parallel leg portions and an interconnecting web portion, said web portion being urged into engagement with said one wall of the housing, cooperating detents in said drive-detent member and said housing releasably holding said shaft in selected rotated positions, said shaft carrying on its inner end a dielectric member, said drive-detent member and dielectric member having interlocking parts to retain the latter in a fixed position on said shaft, a contact plate carried by the dielectric member, and spaced contact elements carried by the housing in the path of movement of said contact plate so that rotary movement of the shaft is effective to put different contact elements into engagement with said contact plate and said spring arm portion is effective to bias the contact plate into electrical engagement with the contact elements, said housing carrying an additional contact element located within said housing, and a flexible thermally responsive current-carrying blade extending between one of said contact elements and said additional contact element so that when a predetermined current flows through the blade, said blade flexes to interrupt current flow through said additional contact element and said one contact element.

References Cited in the file of this patent

UNITED STATES PATENTS

2,459,998	Ellithorpe	Jan. 25, 1949
2,465,654	Millard	Mar. 29, 1949
2,471,925	Bolesky	May 31, 1949
2,475,300	Webb	July 5, 1949
2,511,069	Lawson et al.	June 13, 1950
2,530,006	Ellithorpe	Nov. 14, 1950
2,555,420	Richardson	June 5, 1951
2,585,068	Wood	Feb. 12, 1952
2,681,395	Malone	June 15, 1954
2,707,741	Collura	May 3, 1955
2,715,661	Miller	Aug. 16, 1955
2,724,758	Brown	Nov. 22, 1955
2,736,875	Protz	Feb. 28, 1956