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OSCILLATORY SWITCH WITH IMPROVED ROTOR CAM MECHANISM

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2 Sheets-Sheet 2

FIG. 5

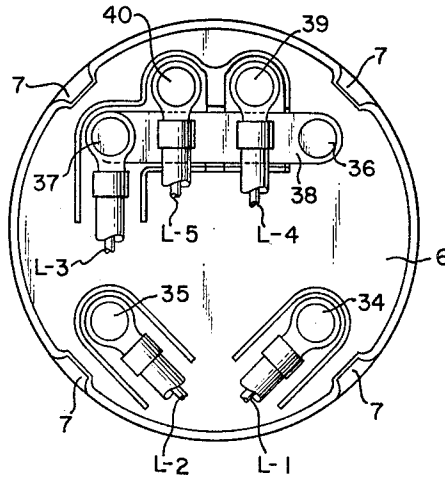


FIG. 4

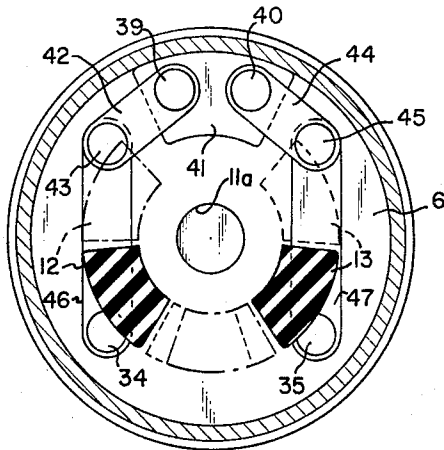


FIG. 6

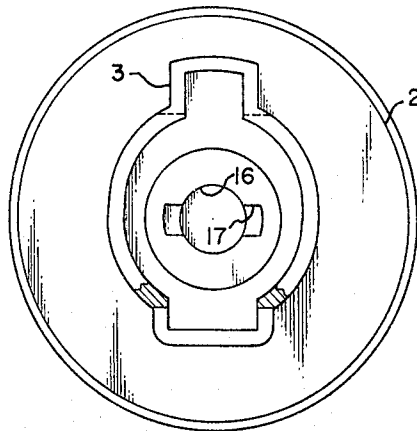
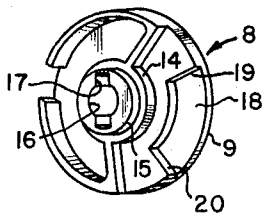


FIG. 8



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3,271,531 OSCILLATORY SWITCH WITH IMPROVED ROTOR CAM MECHANISM

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11 Claims. (Cl. 200—6)

This invention relates to an oscillatory switch construction and more particularly to a switch having selectively engageable and disengageable contacts for multiple circuits and wherein the operation of the several circuits is controlled by an oscillatory operating member.

An object of this invention is to provide an oscillatory switch having shiftable blades and wherein the engagement and disengagement of the blades with selected fixed contacts is effected with a snap action, thereby avoiding or minimizing the deleterious effects of arcing, pitting, and the like.

Another object of the invention is to provide an oscillatory switch having a rockable, multiple circuit operator and in which rocking of the operator in either one of two directions effects operation of a selected circuit without affecting any other circuit.

A further object of the invention is to provide a rotary switch having a rockable operator for multiple circuits and in which movement of the operator to effect operation of a selected circuit isolates the operator from all other circuits, thereby precluding the possibility of a short circuit.

Another object of the invention is to provide a switch having an oscillatable operating member and wherein the operator is positively biased to a centered, neutral position for operating movements in either of two directions.

A further object of the invention is to provide a switch of the kind referred to and which is composed of relatively few parts, thereby facilitating assembly of the switch and minimizing failures.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings, in which:

FIGURE 1 is a transverse sectional view of a switch constructed in accordance with the invention and illustrating the movable parts thereof in an operated or adjusted position;

FIGURE 2 is a view similar to FIGURE 1, but illustrating the movable parts in their neutral or inactive positions;

FIGURE 3 is a sectional view taken on the line 3—3 of FIGURE 2 and illustrating the rotor biasing means;

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 2 and illustrating the several positions of adjustment of the oscillatable operator;

FIGURE 5 is an end elevational view of the switch as it appears when viewed in the direction of the arrow *a* in FIGURE 2;

FIGURE 6 is a view similar to FIGURE 5, but illustrating the opposite end of the switch, certain parts of the apparatus illustrated in FIGURE 2 being omitted from FIGURE 6 in the interests of clarity;

FIGURE 7 is an exploded view of the operating rotor and a portion of the casing; and

FIGURE 8 is an inverted, perspective view of the operating rotor.

A switch constructed in accordance with the invention is especially adapted for use in conjunction with the operation of a reciprocable member such as the rear win-

dow of a station wagon vehicle, for example, wherein the window may be adjusted to any one of a large number of selected positions, but it should be understood that the switch construction is applicable to any other use where a wide range of adjustment of a reciprocable member is desirable.

The disclosed embodiment of the switch comprises a casing 1 formed of metal or any other suitable material and having a generally cylindrical, hollow housing portion 2 and a mounting portion 3 separated from one another by a partition 4 which forms a base for the housing 2. The partition 4 is provided with a cylindrical opening 5 for a purpose presently to be explained. At the end of the housing 2 opposite the partition 4 is supported a disk or cover 6 formed of suitable insulating material, the wall of the housing 2 being staked or otherwise clamped against the cover 6 as is indicated at 7 in FIGURE 5.

Mounted within the housing 2 is an oscillatable rotor or operating member 8 formed of suitable insulating material and having a molded, disk-like body 9 from one side of which extends an upstanding cylindrical post 10 having a reduced end portion 11 which is rotatably received in a socket 11a formed in the inner surface of the cover 6. On the same side of the body 9 as the post 10 is a pair of circumferentially spaced, upstanding abutment members 12 and 13 which preferably are integrally molded with the body 9.

From the opposite side of the rotor body 9 extends a generally cylindrical post 14 having a reduced end portion 15 that is rotatably received in the opening 5 formed in the partition wall 4. The post 14 is provided with a blind bore 16 terminating at its open end in an elongated, transverse slot 17. Adjacent the post 14 the inner surface of the body 9 is provided with an arcuate slot 18 terminating at its ends in substantially radially extending walls 19 and 20. As is best shown in FIGURE 7, the confronting surface of the partition 4 is provided with an arcuate cage 21 having substantially radially extending walls 22 and 23 at its opposite ends.

When the rotor 8 is assembled within the housing 2, the slot 18 should be so arranged as to overlie the cage 21. As is best shown in FIGURE 2, the arrangement is such that the rotor 8 is capable of rotation relative to the housing 2 without interference between the respective ends of the slot 18 and the cage 21.

Means is provided for biasing the rotor member 8 to a centered or neutral position relative to the housing 2 and comprises a cylindrical compression spring 25 which is received within the cage 21 with its opposite ends abutting the walls 22 and 23. The diameter of the spring 25 is greater than the height of the walls of the cage 21, thereby enabling the spring to project into the slot 18 with the opposite ends of the spring abutting the walls 19 and 20. The spring 25, therefore, reacts between the casing 1 and the rotor member 8 so as constantly to urge the latter to a centered position in which the recess 18 overlies the cage 21.

Any one of a number of different kinds of activating devices may be utilized for effecting rocking movements of the rotor member 8. For example, a hollow housing 26 may be fitted into the mounting member 3 and be retained therein by spring pressed bolts 27 accommodated in slots 28, the housing 26 receiving a tubular barrel 29 in which a lock cylinder 30 is rotatably accommodated. The cylinder 30 includes a tang 31 at its inner end that is received in the slot 17. The arrangement may be such that the insertion of a key 32 in the lock cylinder 30 will enable rotation of the latter, whereupon the tang 31 will effect rocking of the rotor 8 in either of two opposite directions from its centered or neutral position.

In the disclosed embodiment, the cover 6 has secured thereto a pair of fixed rivet-like contacts 34 and 35 which

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may be connected by power lines L-1 and L-2, respectively, to a source of electrical energy. Spaced from the contacts 34 and 35 is a second pair of similar fixed contacts 36 and 37 which are co-planar and extend through the cover 6 and are joined to one another externally of the cover by a bus bar 38. Secured to the contact 37 and in electrical engagement therewith is a conductor L-3 which may be connected to a terminal of an electric motor or other device to be operated. Also secured to the cover 6 is another pair of co-planar, fixed rivets or contacts 39 and 40 which respectively may be connected by conductors L-4 and L-5 to other terminals of the motor or other device to be operated.

The inner surface of the cover 6 is provided with a thickened, arcuate portion 41 through which the rivets 39 and 40 extend. Secured by the rivet 39 is a short, electrically conductive bar 42 to the free end of which is secured a contact 43. A similar bar 44 is secured at one end to the rivet 40 and is provided at its free end with a contact 45. The bars 42 and 44 are so arranged that their respective contacts 43 and 45 are substantially in axial alignment with the contacts 36 and 37, but are in spaced planes as is best shown in FIGURES 1 and 2.

Means is provided for bridging the contacts 34 and 35 and selected ones of the other fixed contacts and comprises a pair of flexible bridging members or blades 46 and 47 formed of beryllium copper alloy or other suitable conductive, springy material. One end of the blade 46 is anchored to the inner surface of the cover 6 by the contact 34, the other end of the blade being free and being provided with a contact 48 interposed between the contacts 36 and 43. Between its ends, the blade 46 is provided with an offset cam portion 49 for a purpose presently to be explained.

The blade 47 is similar to the blade 46 and is anchored at one end to the contact 35 and carries at its other end a contact similar to the contact 48 and which is interposed between the contacts 37 and 45. An offset cam portion similar to the part 49 is provided between the ends of the blade 47.

The construction and arrangement of the parts in the disclosed embodiment of the invention are such that, when the rotor member 8 is in its centered or neutral position, the flexible bridging blades 46 and 47 bridge and engage the contacts 34, 43 and 35, 45, respectively. See FIGURE 2. In these positions of the parts, the cams or abutments 12 and 13 on the rotor are free from engagement with the cam surfaces 49 formed on the respective blades 46 and 47. The cam surfaces, however, lie in the path of rocking movement of the abutments.

When it is desired to operate the switch, the rotor 8 may be rocked against the force of the spring 25 in either direction from its centered position by rocking of the key 32 or other actuator. If the rotor 8 is rocked in a clockwise direction, as viewed in FIGURE 4, the abutment 12 will engage the cam surface 49 and shift the blade 46 out of engagement with the contact 43 and into engagement with the contact 36, as is indicated in FIGURE 1. The leading edge of the abutment 12 is fairly sharp and, as is indicated in FIGURES 1 and 2, the cam surface 49 has a rather abrupt rise. Consequently, movement of the blade 46 between the contacts 43 and 36 is effected by a snap action.

As long as the rotor 8 is held in rocked position, the abutment 12 will maintain the contact 48 in forcible engagement with the contact 36. Upon release of the key 32 or other actuator, the spring 25 will restore the rotor to its neutral position, thereby effecting disengagement between the abutment 12 and the blade 46. The springiness of the blade 46, coupled with the abruptness of the cam surface 49 and the leading edge of the abutment 12, will enable the contact 48 to snap into engagement with the contact 43.

Rotation of the rotor 8 counterclockwise, as is viewed in FIGURE 4, will effect shifting of the blade 47 out of

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engagement with the contact 37 and into engagement with the contact 43 in the same manner previously described in connection with the movement of the blade 46.

Regardless of the direction in which the rotor 8 is rocked, only one of the blades 46 or 47 will be shifted. The cam or abutment that effects shifting of the other blade will be rocked in a direction away from the cam 49, thereby precluding simultaneous shifting of the blades 46 and 47.

The disclosed embodiment is representative of a presently preferred form of the invention, but is intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

What is claimed is:

1. A switch construction comprising a casing; a plurality of spaced apart, fixed contacts supported by said casing in spaced planes; at least one bridging contact supported by said casing for movement between said planes to positions in and out of engagement with selected ones of said fixed contacts; a rotor member rotatably mounted in said casing for movement from a first position to any selected one of a plurality of other positions; biasing means reacting between said casing and said rotor member and constantly urging the latter to said first position, said biasing means being yieldable to permit rotation of said rotor member from said first position to any selected one of said other positions; and means carried by said rotor member for engaging said bridging contact and moving the latter from one of said positions to the other in response to movement of said rotor member.

2. A switch construction comprising a casing; a plurality of spaced apart, fixed contacts supported by said casing in spaced planes; a rotor member rotatably mounted in said casing for movement from a first position to any selected one of a plurality of other positions; biasing means reacting between said casing and said rotor member and constantly urging the latter to said first position, said biasing means being yieldable to permit rotation of said rotor member from said first position to any selected one of said other positions; abutment means carried by said rotor member and movable therewith; at least one bridging contact supported by said casing for movements between said planes to positions in and out of engagement with selected ones of said fixed contacts; and means carried by said bridging contact and located in the path of movement of said abutment means for engagement with the latter, engagement between said abutment means and said bridging contact carried means effecting movement of said bridging contact from one of its said positions to the other.

3. A switch construction comprising a casing; a plurality of spaced apart, fixed contacts supported by said casing in spaced planes; a rotor member rotatably mounted in said casing for movement from a first position to any selected one of a plurality of other positions; yieldable means reacting between said casing and said rotor member and urging the latter to said first position; abutment means carried by said rotor member and movable therewith; a flexible bridging contact mounted in said casing for movements between said planes to positions in and out of engagement with selected ones of said fixed contacts; and cam means carried by said bridging contact and located in the path of movement of said abutment means for engagement with the latter in response to movement of said rotor member from said first position to any selected one of said other positions, engagement between said abutment means and said cam means effecting movement of said bridging contact.

4. A switch construction comprising a casing; a plurality of spaced apart, fixed contacts supported by said casing in spaced planes; a rotor member rotatably mounted in said casing for movement from a first position to any selected one of said other positions; yieldable means reacting between said casing and said rotor member biasing the latter to said first position; nonconductive

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abutment means carried by said rotor member and movable therewith; a flexible, resilient, conductive bridging member mounted in said casing for movement from a first position in which it bridges selected ones of said fixed contacts in one plane to a second position in which it bridges selected others thereof in another plane; and cam means carried by said bridging member and located in the path of movement of said abutment means, engagement between said abutment means and said cam means effecting movement of said bridging member from said first position to said second position.

5. A switch construction comprising a casing; a plurality of spaced apart, fixed contacts supported by said casing in spaced planes; a rotor member rockably mounted in said casing for movements in opposite directions from a first position to either of two operating positions located respectively on opposite sides of said neutral position; yieldable means reacting between said casing and said rotor member and constantly biasing the latter to said first position; a pair of abutment members carried by said rotor member and movable therewith; flexible bridging means supported by said casing for movements between said planes to positions in and out of engagement with selected ones of said fixed contacts; and means carried by said bridging means and located in the path of movement of said abutment members for engagement thereby in response to movement of said rotor member from its said first position to either of its said operating positions.

6. A switch construction comprising a casing; a number of fixed contacts supported by said casing in substantially aligned but spaced apart planes; flexible bridging means interposed between selected ones of said contacts for engagement therewith; a rotor member rockably supported by said casing for oscillation; cooperable cam means on said flexible bridging means and on said rotor member operable to effect movement of said bridging means between said selected ones of said contacts in response to oscillation of said rotor member; means for oscillating said rotor member; and yieldable means reacting between said casing and said rotor member and constantly biasing the latter in one direction of its oscillatory movement.

7. The construction set forth in claim 6 wherein said cooperable cam means comprise an abutment supported on said rotor member for oscillation therewith and an offset portion formed in said bridging means in the path of oscillation of said abutment.

8. A switch construction comprising a casing; at least one elongated, flexible bridging member anchored at one end to said casing, the other end of said bridging member being free; a pair of substantially aligned contacts supported by said casing in spaced planes and between which said free end of said bridging member is interposed, said free end of said bridging member normally being in engagement with one of said contacts; a rotor member supported by said casing for rocking move-

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ment from a first position to a second position; cam means on said bridging member and on said rotor member operable in response to movement of said rotor member from said first position to said second position to flex said bridging member and move the free end thereof from engagement with said one of said contacts into engagement with the other of said contacts; means for rocking said rotor member to said second position; and spring means reacting between said casing and said rotor member for biasing the latter to said first position.

9. A switch construction comprising a casing; a pair of elongated, flexible bridging members anchored at corresponding ends to said casing and being free at their other ends; a pair of substantially aligned contacts supported by said casing in spaced planes adjacent the free end of each of said bridging members, the free end of each of said bridging members being interposed between its associated pair of contacts; a rotor member rockably supported by said casing for oscillatory movement in either of two directions from a neutral position; cooperable cam means on each of said flexible bridging members and on said rotor member operable to flex said bridging members between said planes in response to oscillation of said rotor member; means for oscillating said rotor member; and yieldable means reacting between said casing and said rotor member and constantly biasing the latter to said neutral position.

10. The construction set forth in claim 9 wherein the free end of each of said bridging members is in engagement with one contact of its associated pair of contacts when said rotor member is in its said neutral position, and wherein rocking of said rotor member in either direction from said neutral position effects engagement of the free end of one of said bridging members with the other contact of its associated pair of contacts.

11. The construction set forth in claim 9 wherein said cam means comprises a pair of abutments supported on said rotor member for movements therewith, and an offset portion formed on each of said bridging members and respectively located in the path of movement of said abutments.

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