

Nov. 23, 1965

N. TORUK ETAL
SLIDING CONTACT SWITCH

3,219,784

Filed Dec. 30, 1963

2 Sheets-Sheet 1

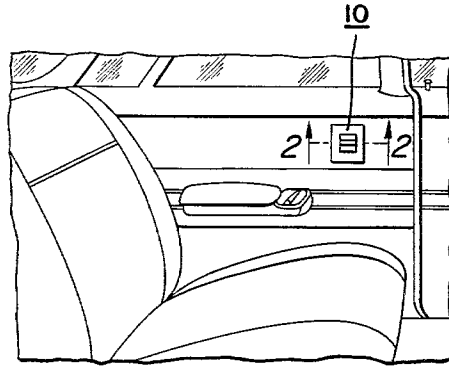


Fig. 1

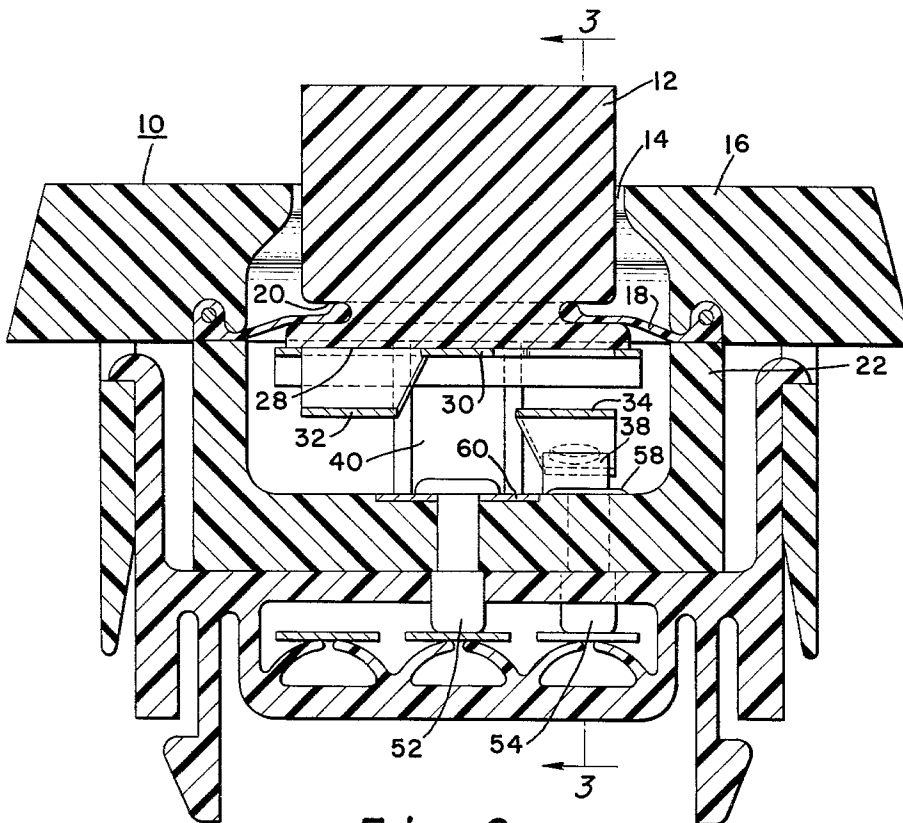


Fig. 2

INVENTORS
Nicholas Toruk
Jerome B. Olson
BY *C. R. Meland*
Their Attorney

Nov. 23, 1965

N. TORUK ETAL

3,219,784

SLIDING CONTACT SWITCH

Filed Dec. 30, 1963

2 Sheets-Sheet 2

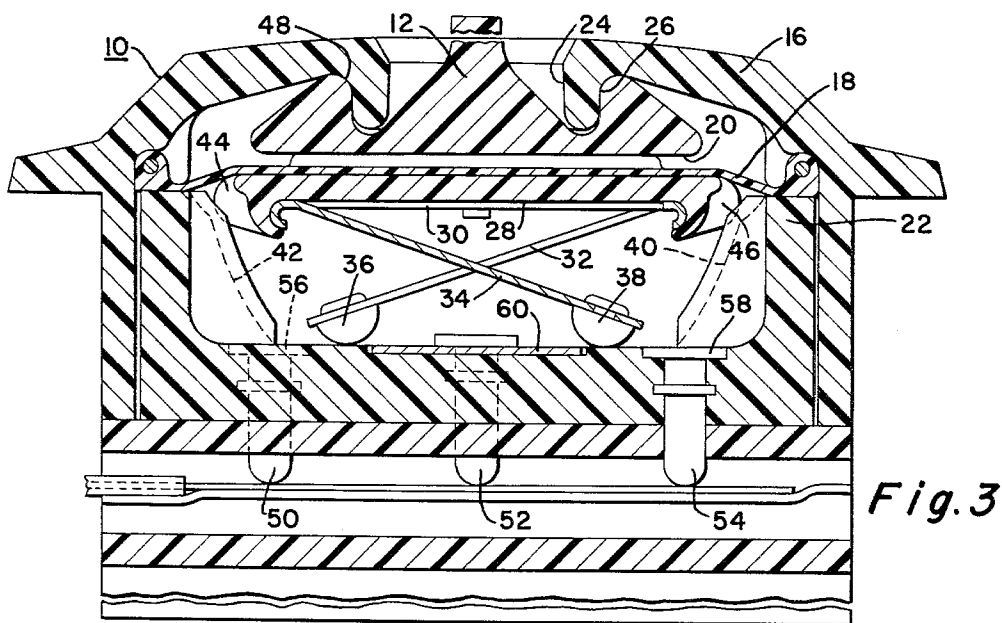


Fig. 3

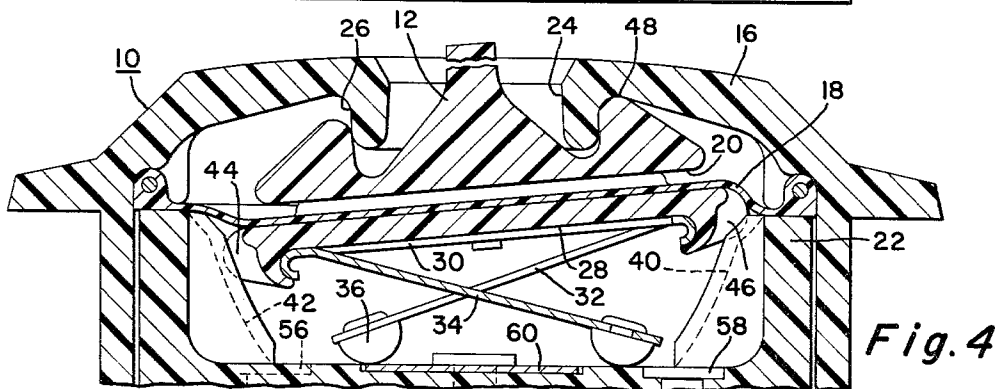


Fig. 4

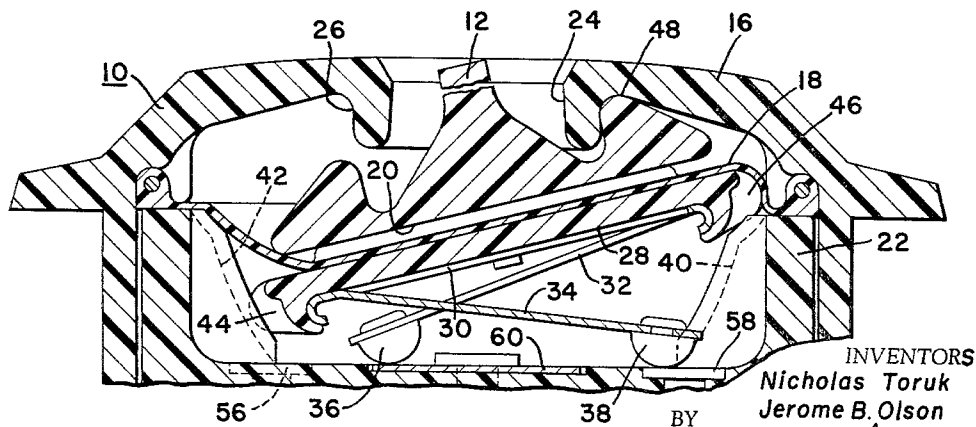


Fig. 5

INVENTORS
Nicholas Toruk
Jerome B. Olson

BY

C. R. Omland

Their Attorney

1

3,219,784

SLIDING CONTACT SWITCH

Nicholas Toruk, Allen Park, and Jerome B. Olson, Detroit, Mich., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware
Filed Dec. 30, 1963, Ser. No. 334,392
5 Claims. (Cl. 200—153)

This invention relates to electrical switches and more particularly to a type of switch which is arranged to minimize the transfer of metal or the formation of oxides on the contacting surfaces.

The problem of oxide formation and the pitting of contacts for electrical switches is well known in the art. Generally speaking, certain types of materials, by their nature, tend to form oxides at the point of metal contact during the switching action. Metals, such as silver cadmium alloys, are used to minimize oxide formation between the switching members. However, the use of alloys, such as silver cadmium, can involve the transfer of metal from the opposed surface which coats the contact composed of silver cadmium or transfers the silver cadmium to an opposed surface. Either of the foregoing are caused by a sudden transfer of electrons between the two surfaces as the switching action takes place. The metal which is transferred in any given installation is dependent upon the direction of current flow. For example, if the current flow during a switching action is from the silver cadmium to copper, the transfer problem will be minimized due to the natural inhibition of silver cadmium to transfer to copper. If the flow is from the copper to the silver cadmium, the transfer will take place, so the only remedy is to decrease the number of actual circuit breaks, that is, avoid contact bounce or, when two contacts make a circuit, to energize one before the other.

It is an object of the present invention to provide an improved electrical switch which is so constructed as to control the number of times a current flow is established and broken during a switching action.

It is another object of the present invention to provide a switch having contacts of well-known alloys which minimizes the metal transfer between the contacts during a switching action.

It is still another object of the present invention to provide a sliding contact switch which is self-cleansing and which sequentially energizes a power contact and an output contact.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 illustrates the subject invention in an operative environment controlling electric windows on an automobile;

FIGURE 2 is a sectional view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 2, the switch shown in a neutral position;

FIGURE 4 is a partial sectional view taken along line 3—3 of FIGURE 2, the switch being shown partially actuated;

FIGURE 5 is a partial sectional view taken along line 3—3 of FIGURE 2, the switch being shown in the actuated position.

Referring now to FIGURE 1, an electric switch, generally designated by the numeral 10, is shown mounted on a door panel of an automobile, in which environment it is adapted to control electrical apparatus for raising or lowering the window.

2

Referring to FIGURE 2, an actuator lever 12 is disposed through an aperture 14 in a switch cover 16. A dust cover or boot 18 peripherally engages a slot 20 on one end and is held between cooperating portions of the switch cover 16 and a contact carrier 22.

Referring to FIGURE 3, the switch cover 16 has a downwardly projecting flange 24 engaging a cam portion 26 of the actuator lever 12. A lower portion 28 of the actuator lever 12 is formed as a recess arranged to receive a conductive member 30 which is sprung into place. The member 30 has struck out from its surface a series of resilient leg portions 32 and 34. The conductive member 30 is composed of any well-known resilient conductive metal. A contact head 36, composed of a silver cadmium alloy, for example, is carried by the resilient leg 32. A contact head 38 is identical to the contact head 36 and is carried by the resilient leg 34. A slot 40 and a slot 42 are formed in side wall portions of the contact carrier 22 and are arranged to cooperate with projections 44 and 46 of the actuator lever to guide the actuator lever during pivotal movement thereof. A cam surface 48 formed on the underside of the switch cover 16 is adapted to cooperate with the cam 26 formed as a portion of the actuator lever 12 during pivotal movement of the actuator.

The contact carrier 22 has disposed therethrough a series of terminals 50, 52 and 54. The terminals 50 and 54 are firmly held in the contact carrier 22 and have flat head portions 56 and 58, respectively, disposed in counter-bored portions of the contact carrier 22 to form a substantially flat surface thereon. These contact heads can be formed of copper or any conductive metal lower in cost than silver cadmium. The terminal 52 which may be referred to as the hot lead terminal is of slightly greater length than the terminals 50 and 54 and serves to retain a conductive plate 60 against the surface of the contact carrier 22 in which the flat head portions 56 and 58 are disposed. Therefore, it is apparent that the conductive area available to the power terminal 52 is substantially greater than the conductive area available to the terminals 50 and 54.

In operation, the electrical switch 10 could be connected through well-known electrical apparatus which controls the upward and downward motion of an automobile window, such as that shown in FIGURE 1.

Referring now to FIGURE 3, the actuator lever 12 can be pivoted in either of two directions. In the example given, the lever 12 will be pushed towards the left as viewed in FIGURE 3. It should be noted that the resilient legs 32 and 34 serve to bias the actuator 12 against the downturned flange 24.

Referring now to FIGURE 4, the movement of the actuator lever 12 to the left as viewed therein will result in a pivoting of the cam portion 26 against the cam surface 48. In FIGURE 4, the contact head 36 is shown as contacting the conductive plate 60 while the contact head 38 has not yet engaged the flat head portion 58 of the terminal 54. This is due, in part, to the deflection distance built into the resilient legs 32 and 34 and, in part, to the size of the conductive plate 60 which is adapted to be engaged earlier by the contacts 36 and 38 during a pivotal movement of the actuator lever 12. As previously mentioned, the conductive plate 60 is held in its operative position by a portion of the terminal 52, designated as the hot lead terminal. Therefore, as the switching mechanism assumes the position as illustrated in FIGURE 4, electrical power energizes the contact head 38 through the resilient legs 32 and 34 formed as a portion of the conductive member 30.

Referring now to FIGURE 5, as the actuator lever 12 is pivoted further in a counterclockwise direction as viewed in FIGURE 5, the contact head 38 finally makes

3

contact with the flat head portion 58 of the terminal 54. Due to the prior energization of the conductive member 30, the current flow is from the contact head 38 to the flat head portion 58. As previously mentioned, the contact heads 36 and 38 are composed of a transfer resistant alloy, such as silver cadmium and the engagement of the contact head 38 with the flat head portion 58 of the terminal 54 will result in a minimum of transfer of metal from the contact head 38.

It is understood that the same action described in a pivoting of the actuator lever toward the left, as viewed in FIGURE 5, can be duplicated in an opposite direction by pivoting the actuator lever 12 in a clockwise direction from the position illustrated in FIGURE 3.

The utility of the present invention becomes apparent in an application where a switching action takes place in which a relatively high amperage is involved. Switches of this type found in the prior art may spark or transfer metal from two heads, but this invention makes a transfer possible only from a single head during a given switch actuation. This switch finds particular utility in the environment where high amperage loads are involved, but a long life expectancy is realized in any environment where a switching contact is made and there is likely to be a transfer of metals between the switching surfaces.

Another advantage of the present invention is the resilient boot 18 which keeps the switching area substantially free of moisture and, therefore, helps to minimize an oxide build-up on any of the contacting surfaces. Any minor oxide build-up that does take place is removed as the contact heads 36 and 38 slide along the surface in which the terminals 50, 52 and 54 are disposed.

It should also be noted that the slots 40 and 42 guides the actuator lever 12 in its pivotal movement and, therefore, insure a consistency in the sequential contacting of the surfaces 56 and 58 relative to the conductive plate 60.

While the embodiment of the present invention, as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. An electrical switch comprising; a housing including a cover therefor, pivotable actuator means having a portion extending through the cover, movable conductor means including deflectable resilient legs slidable on said housing at different rates of speed during deflection and carried by said actuator means, and fixed contact means of varying exposed area adapted to be engaged sequentially by said deflectable resilient legs in response to movement of said actuator means whereby said fixed contact means is energized sequentially for minimizing sparking between the fixed contact means and the movable conductor means.

2. An electrical switch for energizing either of two circuits from a neutral position comprising; a switch housing including a cover therefor, the cover having an aperture therein with downturned edges, actuator means adapted to pivot on the downturned edges, resilient conductive means carried by said actuator means and having resilient legs carrying contact heads thereon, said resilient legs being deflectable and biasing said actuator means against the downturned edges of the aperture in the cover in the neutral position and during pivoting movement of the actuator means, said resilient legs laterally movable on said switch housing while deflecting at different rates, guide means carried by said housing and arranged to engage said actuator means during pivoting movement thereof, and a plurality of fixed contact means having different exposed areas arranged to be selectively and sequentially engaged by the resilient leg carried contact heads in response to movement of said actuator means, said fixed contacts being composed of a copper alloy and said contact heads being formed of a silver alloy.

4

3. An electrical switch of the type described in claim 1 wherein the movable conductor means includes a resilient metal plate having a plurality of struck out portions forming said resilient legs and carrying contacts thereon, said resilient legs being slidable on said housing at varying rates depending on the direction of movement of said actuator means.

4. An electrical switch for raising and lowering windows of an automobile comprising; a switch housing including a cover portion and a base portion, the cover portion having an aperture therein with downturned edges, actuator means having a lever portion extending through the aperture in the cover and having portions engaging the downturned edges for pivotal movement therearound, conductive means including two downwardly projecting resilient legs deflectable and slidable on said base portion at different rates when pivoted in either of two directions and being carried by said actuator means for biasing said actuator means against the downturned edges of the cover during pivotal movement of the actuator and while the actuator is at rest, a plurality of fixed contact means carried by the base portion of the switch housing, at least one of which has a greater exposed conductive portion than the others, said conductive means carrying a plurality of movable contact means adapted to be deflected and slidable on said base portion to selectively engage the fixed contact means having a larger exposed portion before engagement is made with any of the other fixed contact means thereby providing a controlled path for current flow to minimize metal transfer between the contacts.

5. An electrical switch for controlling the electrical apparatus which moves an automobile window in either of two directions, said switch comprising; a switch housing including a cover and a base portion, actuator means having a lever portion extending through the cover of said housing and adapted to be manually operated by an operator of an automobile, the cover having an aperture therein with downturned flanges arranged to cooperate with cam surfaces of the actuator means, two resilient legs carrying contacts thereon biasing said actuator means into engagement with the cover, said resilient legs being pivotable at different rates of speed when said actuator means is pivoted in either direction, guide means carried by the switch base portion including grooves arranged to guide the actuator means during pivotal movement thereof, and conductive elements carried by the switch base portion and having contact areas extending into the switch housing, at least one of said conductive elements providing a larger contact area than the other conductive elements, said actuator means adapted to be pivoted in either of two directions thereby initially driving one of the resilient leg carried contacts into engagement with the conductive element having a larger contact area and later driving another of the resilient leg carrying contacts into engagement with one of the remaining conductive elements, the conductive element providing the greater contact area being in conductive relationship with a source of power, the sequential energization of the resilient legs before engaging the output conductive elements causing a controlled direction of current flow to minimize the transfer of metal between the contact heads and the conductive elements.

References Cited by the Examiner

UNITED STATES PATENTS

1,740,535	12/1929	Bramming	200—16
2,751,468	6/1956	Brown et al.	200—16 X
2,926,225	2/1960	Aquillon	200—67

KATHLEEN H. CLAFFY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*