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SINGLE POLE DOUBLE THROW SWITCH WITH A ONE PIECE CONTACT SPRING WITH TWO U-SHAPED SEGMENTS CENTER BIASING THE ACTUATOR

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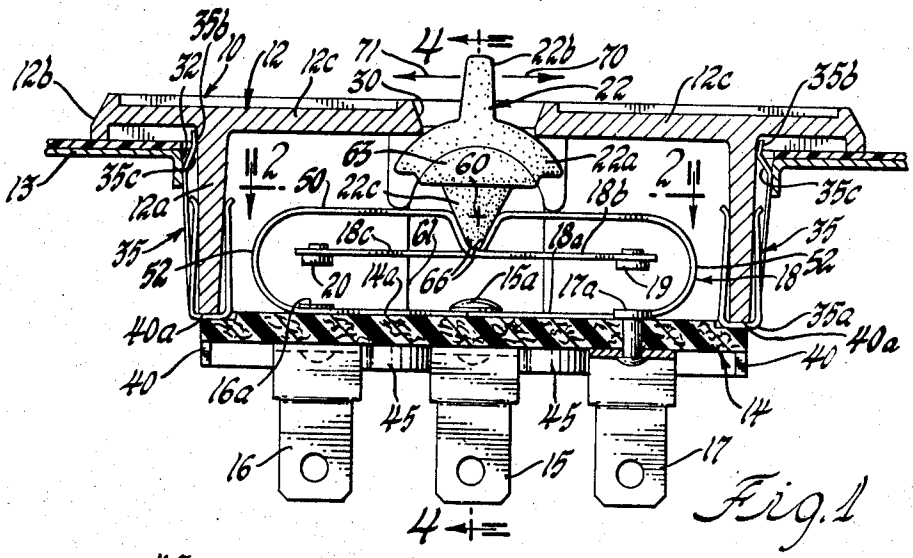


Fig. 1

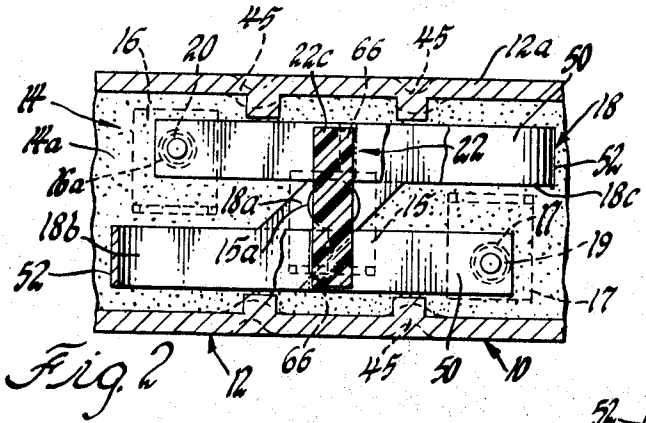


Fig. 2

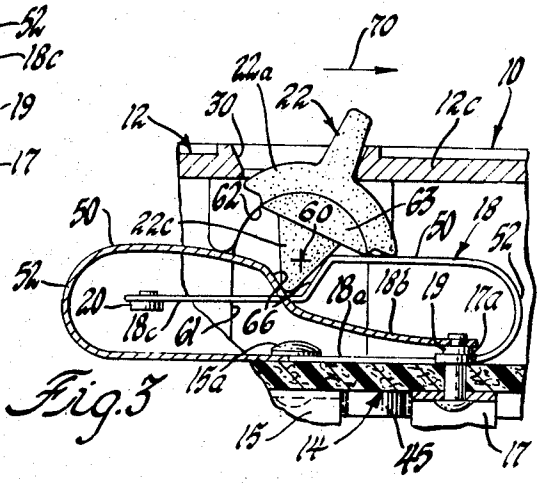


Fig. 3

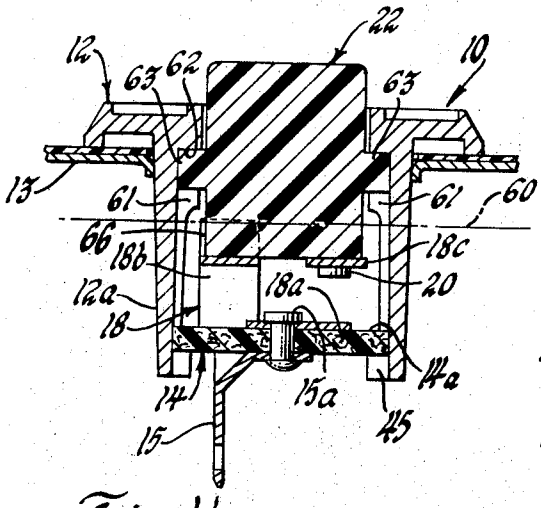


Fig. 4

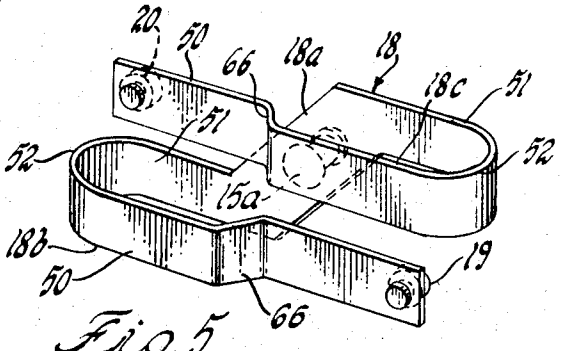


Fig. 5

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SINGLE POLE DOUBLE THROW SWITCH WITH A ONE PIECE CONTACT SPRING WITH TWO U-SHAPED SEGMENTS CENTER BIASING THE ACTUATOR

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U.S. Cl. 200—153 7 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to an electric switch for use in selectively controlling energization of either a first or second electric circuit. The switch includes a base member carrying a plurality of spaced terminals and a mobile contact carrier comprising a one piece member in conductive engagement with one of the terminals and which is normally self biased to a normal position in which the mobile contacts carried thereby are spaced from the other terminals. The switch further includes a switch actuator biased to a normal position by the mobile contact carrier, but which is manually movable in opposite directions from its normal position to selectively move respective ones of the mobile contacts carried thereby into engagement with the associated other terminals to effect energization of either the first or second electric circuit.

The present invention relates to an electric switch for use in selectively controlling energization of either a first or second electric circuit. In particular, the present invention relates to an electric switch of the general type having a switch housing means carrying a plurality of spaced stationary contacts or terminals, a mobile contact carrier means in conductive engagement with one of the stationary contacts and which is biased to a normal position in which the mobile contacts carried thereby are spaced from the other stationary contacts, and a switch actuator which is biased to a normal position by the contact carrier means and which is movable in opposite directions from its normal position to selectively move respective ones of the mobile contacts carried thereby into engagement with the associated other terminals to selectively effect energization of either the first or second electric circuit.

An important object of the present invention is to provide a new and improved electric switch of the general type referred to above and which is of a simple, highly practical and economical construction, and yet provides a reliable switching action.

Another object of the present invention is to provide a new and improved electric switch of the general type referred to above and in which the mobile contact carrier means is a one piece metallic member having a base in conductive engagement with one of the terminals and a pair of U-shaped springs each having one leg integral with the base portion and the other free leg carrying a mobile contact, the U-shaped springs being self-biased to a normal position in which the mobile contacts are spaced from the other terminals and being selectively movable in opposition to their biasing forces to move the mobile contact carried thereby into engagement with the associated other terminals in response to movement of the actuator in opposite directions from its normal position.

Yet another object of the present invention is to provide a new and improved electric switch of the general type referred to above and in which the mobile contact carrier includes resilient leaf spring portions in conductive engagement with one of the terminals and which are self-biased to a normal position in which the mobile contacts carried thereby are spaced from the other terminals, and in which the leaf spring portions and the actuator have portions which cooperably engage one another and in a manner such that the leaf spring portions bias the actuator to a normal position and such that the actuator when moved in opposite directions from its normal position selectively moves or deflects the leaf spring portions toward engagement with respective ones of the other terminals.

A further object of the present invention is to provide a new and improved electric switch, as defined in the next preceding object, and in which the leaf spring portions are laterally spaced from and extend in opposite directions with respect to each other, and in which the leaf spring portions are of a stepped configuration to provide surfaces which cooperably engage the opposite sides of the actuator and bias the latter toward its normal position.

The present invention further resides in various novel constructions and arrangement of parts, and further objects, novel characteristics and advantages of the present invention will be apparent to those skilled in the art to which it relates and from the following detailed description of the illustrated embodiment thereof made with reference to the accompanying drawings forming a part of this specification and in which similar reference numerals or characters are employed to designate corresponding parts throughout the several views, and in which:

FIG. 1 is a longitudinal cross sectional view, with portions shown in elevation, of an electric switch embodying the present invention and showing the same mounted on a panel;

FIG. 2 is a cross sectional view taken approximately along line 2—2 of FIG. 1;

FIG. 3 is a fragmentary sectional view similar to that shown in FIG. 1 but showing certain parts thereof in different positions;

FIG. 4 is a sectional view taken approximately along line 4—4 of FIG. 1; and

FIG. 5 is a perspective view of part of the switch shown in FIG. 1.

The present invention provides a novel electric switch or circuit controller for use in selectively controlling energization of either a first or second electric circuit. Although the novel electric switch of the present invention could be employed in various kinds or types of applications in which it is desired to selectively control energization of either a first or second electric circuit, it is particularly susceptible for use in controlling the direction of rotation of a reversible electric motor for actuating various components of an automotive vehicle or for selectively controlling energization of either a first or second solenoid of an automatic door locking and unlocking system. For the purposes of illustration, the novel switch will be described as being used for the latter purpose.

As representing a preferred embodiment of the present invention, the drawings show an electric switch **10** for use in selectively controlling energization of either a first or second solenoid of an automatic door locking and unlocking system for an automotive vehicle. Since the automatic door locking and unlocking system of the automotive vehicle could be of any suitable construction and since it does not per se form a part of the present invention, it has not been shown in the drawings and will not be described. Suffice it to say that the switch **10** could be used in an automatic door locking and unlocking system such as that shown in application Ser. No. 508,896, now

Pat. No. 3,359,767 issued Dec. 26, 1967, and assigned to the same assignee as the present invention.

The electric switch **10** comprises, in general, an escutcheon or switch housing means **12** which is adapted to be detachably mounted on a suitable panel, such as an interior door panel **13** of the automotive vehicle, a base member **14** carrying a plurality of terminals **15**, **16** and **17** and supported by the escutcheon **12**, a mobile contact carrier **18** supported by the base member **14** and which is self biased toward a normal position in which the mobile contacts **19** and **20** thereof are spaced from the output terminals **16** and **17**, respectively and an actuator **22** which is biased to a normal position by the self biased mobile contact carrier **18**, but which is movable in opposite directions from its normal position to selectively move the mobile contacts **19** and **20** into engagement with the output terminals **16** and **17**, respectively, to selectively effect either a first or second switching function.

The escutcheon **12** comprises the housing portion **12***a* which is of a generally rectangular configuration and a decorative flange portion **12***b* surrounding housing portion **12***a* at one end thereof. The housing portion **12***a* is open at its inner or lower end, as viewed in FIG. 1, and has an end wall portion **12***c* at its outer or upper end provided with an opening **30** through which the actuator **22** extends. The generally rectangularly shaped housing portion **12***a* is adapted to be inserted through a complementary shaped opening **32** in the interior door panel **13**, and with the decorative flange portion **12***b* being positioned against the side of the door panel **13** facing interiorly of the vehicle.

The escutcheon **12** is detachably mounted on the interior door panel **13** by a pair of springs **35** carried by the housing portion **12***a*. The springs **35** have an inner end portion **35***a* in the form of a clip which is suitably secured to the inner end of the housing portion **12***a* and an outer flexible free end portion **35***b*. The transverse distance between the free end portions **35***b* and the two springs **35** is greater than the transverse dimension of the opening **32** in the panel **13** and the outer free end portions **35***b* have tapered shoulders **35***c* extending inwardly toward the housing portion **12***a*.

The escutcheon **12** is mounted on the door panel **13** by inserting the inner end of the housing portion **12***a* through the opening **32** until the flange portion **12***b* engages the door panel **13**. As the housing portion **12***a* is inserted through the opening **32**, the free end portions **35***b* of the springs **35** are deflected inwardly toward the housing portion **12***a* by the side wall of the panel **13** defining the opening **32** until the tapered shoulders **35***c* are in alignment with the side wall of the panel **13** whereupon the free end portions **35***b* will flex outwardly relative to the housing portion **12***a* to position the shoulders **35***c* behind the panel **13**. The escutcheon **12** is securely retained on the panel **13** as a result of the flange portion **12***b* of the escutcheon **12** and the shoulders **35***c* of the springs **35** engaging the opposite sides of the panel **13**.

The base member **14** for supporting the terminals **15**, **16** and **17** and the mobile contact carrier **18** is carried by the housing portion **12***a* at its lower or inner end, as viewed in FIG. 1. The base member **14** is of a generally rectangular shape and is slidably received within oppositely located notches or slots **40** in the inner end of the housing portion **12***a*. The base member **14** at its upper side **14***a* abuttingly engages the bottom surfaces **40***a* of the notches or slots **40**. The base member **14** is retained in abutting engagement with the surfaces **40***a* as a result of the housing portion **12***a* at its inner end being staked or peened inwardly, as indicated by reference numeral **45** in FIG. 1, beneath the bottom side **14***b* of the base member **14**. The base member **14** is made from a suitable electrically insulated material.

The terminals **15**, **16** and **17** are supported by the base member **14** at spaced locations. The terminals **15**, **16** and **17** each comprise an L-shaped metal flange which is secured to the base by suitable rivets and with the upper end of the rivets, as viewed in FIG. 1, providing conductive or stationary contact surfaces **15***a*, **16***a* and **17***a*, respectively, disposed interiorly of the housing portion **12***a*. The terminals **15**, **16** and **17** are spaced from each other such that the leftmost outer terminal **16**, as viewed in FIG. 2, is disposed to the left and upwardly relative to the center terminal **15** and the rightmost terminal **17** is disposed to the right and below the center terminal **15**. The center terminal **15** is adapted to be electrically connected with a power source, such as the battery (not shown) of the automotive vehicle. The outer terminals **16** and **17** are adapted to be electrically connected via lead wires (not shown) to first and second control solenoids (not shown) of an automatic door locking and unlocking system, the control solenoids in turn being connected to a suitable ground.

The mobile contact carrier **18** is supported by the base member **14** and comprises a one piece metallic member having a base **18***a* secured to the base member **14** by the rivet for the center terminal **15** and a pair of U-shaped springs **18***b* and **18***c* integral with the opposite ends of the base **18***a*. The U-shaped springs **18***b* and **18***c* are laterally spaced from each other and extend generally parallel to each other. The U-shaped springs **18***b* and **18***c* each have an upper leg **50**, a lower leg **51** and an intermediate bight portion **52**, as viewed in FIGS. 1 and 5. The lower legs **51** of the springs **18***b* and **18***c* are in engagement with the planer upper surface **14***a* of the base member **14** and their upper legs **50** extend generally parallel to the lower legs **51** and the base member **14**. The upper legs **50** of the springs **18***b* and **18***c* terminate in free end portions and with the mobile contacts **19** and **20** being carried by the free end portions. As best shown in FIGS. 1 and 5, the upper legs **50** extend in opposite directions with respect to each other.

The mobile contact carrier **18** can be stamped and bent to the configuration shown in FIG. 5 from flat metal stock, and with the U-shaped spring portions **18***b* and **18***c* being in the form of elongated, flat, thin, resilient blades. The upper legs **50** of the U-shaped springs **18***b* and **18***c* serve as a flexible blade or leaf spring.

The U-shaped springs **18***b* and **18***c* of the mobile contact carrier **18** are self-biased to a normal position, as shown in FIG. 1, in which the mobile contacts **19** and **20** carried thereby are held in a position which is spaced from the conducting surfaces **16***a* and **17***a* of the outer terminals **16** and **17**. The springs **18***b* and **18***c* also bias the actuator **22** toward a normal or center position, as shown in FIG. 1.

The actuator, as best shown in FIG. 4, is pivotally connected to the housing portion **12***a* for pivotal movement about an axis **60**. To this end, the housing portion **12***a* includes a pair of axially extending channels or grooves **61** which terminate in upper arcuate abutment surfaces **62** and the actuator button has a pair of transversely extending ears or projections **63** having arcuate upper surfaces and which are slidably received within the channels **61**. The actuator is biased upwardly as viewed in FIGS. 1 and 4 and with the projections **63** engaging the abutment surface **62** defining the upper end of the channel by the U-shaped springs **18***b* and **18***c*. The actuator **22** includes an arcuately extending portion **22***a* in close proximity with the end wall **12***c* of the housing defining the opening and a button portion **22***b* which is adapted to be manually grasped by the operator to move the same in opposite directions from its normal position. The arcuately extending portion **22***a* provides a sealing function in that it prevents or minimizes dirt and dust from entering the housing **12***a*.

The upper legs **50** of the U-shaped springs **18***b* and **18***c* are movable or deflectable downwardly in opposition to their self-biasing forces to move the mobile contacts **19** and **20** carried thereby into engagement with the conducting surfaces of the terminals **16** and **17** in response

to pivotal movement of the actuator **22** in first and second directions from its normal position, respectively. To this end, the actuator has a downwardly extending V-shaped cam portion **22***c* and the upper legs of the U-shaped springs **18***b* and **18***c* are of stepped configuration, as viewed in side elevation in FIG. 1, to provide ramp surfaces **66** between the steps. The ramp surfaces **66** between the upper and lower steps of the legs **50** extend parallel to the adjacent side of the V-shaped cam portion **22***c* and with the surfaces **66** engaging the opposite sides of the V-shaped cam portion **22***c* to bias the actuator **22** to its center position, as shown in FIG. 1.

The actuator **22** when pivotally moved from its normal position in the direction of the arrow **70** in FIG. 3 causes the cam portion **22***c* thereof to be moved in the opposite direction in opposition to the biasing force of the upper leg **50** of the U-shaped spring portion **18***b*. The cam portion **22***c* when moved in this direction rides on the ramp surface **66** of the upper leg or free end portion **50** of the U-shaped spring **18***b* and causes the latter to be bowed and deflected to the position shown in FIG. 3. When in this position, the mobile contact **19** engages the conductive surface **17***a* of the terminal **17** to provide a conductive path from the center terminal **15** through the contact carrier **18** to the terminal **17**. When the actuator **22** is moved from its normal position in the direction of the arrow **71** in FIG. 1, the cam portion **22***c* thereof will ride on the ramp surface **66** of the U-shaped spring **18***c* and cause the free end portion thereof to be deflected downwardly and the mobile contact **20** to engage the conducting surface **16***a* of the terminal **16**. This provides a conductive path from the center terminal **15** through the carrier **18** to the outer terminal **16**.

From the foregoing, it should be apparent that the novel switch **10** is of a simple and economical construction. Moreover, it should be apparent that the one piece metallic mobile contact carrier can be readily stamped from thin metal stock and bent to the configuration shown in FIG. 5 and thus, can be readily and economically produced as well as being readily attachable to the base member in conducting relationship with the center terminal.

Although the illustrated embodiment thereof has been described in great detail, it should be apparent that certain modifications, changes, and adaptations may be made in the illustrated embodiment, and that it is intended to cover all such modifications, changes and adaptations which come within the scope of the appended claims.

What is claimed is:

1. An electric switch for use in selectively controlling energization of either a first or second electric circuit comprising a switch housing, a base member carried by said housing, first, second and third switch terminals carried by said base member, said terminals being spaced from each other and having a conducting surface facing interiorly of said housing, first and second mobile contacts disposed adjacent to but normally spaced from said conducting surfaces of said second and third terminals, a contact carrier for carrying said mobile contacts, said contact carrier comprising a one piece member having a base portion secured to said base member and being in conducting engagement with said first terminal and first and second generally U-shaped springs each having one leg thereof integral with the base portion and the other free leg thereof spaced from but extending generally parallel to the base member, said U-shaped springs being oppositely disposed and laterally spaced from each other, said first and second mobile contacts being respectively carried by said other legs of said first and second U-shaped springs, an actuator having a cam portion cooperably engageable with a ramp portion on said other legs of said first and second U-shaped springs and being supported for movement in opposite directions from a normal position to first and second positions, said first and second U-shaped springs biasing said actuator toward said normal position, said cam portion of said actuator when the latter is moved toward said first and second positions from said normal position respectively effecting movement of said other leg of said first and second springs to move the mobile contact carried thereby into engagement with said second and third terminals to provide a conductive path between said first terminal and said second and third terminals, said U-shaped springs returning said actuator toward its normal position when the latter is released upon being moved to said first and second positions.

2. An electric switch as defined in claim **1** wherein said actuator extends through an opening in said housing and has a pair of spaced arcuate bearing surfaces, and wherein said housing has arcuate guide portions at its opposite sides which are slidably engaged by said arcuate bearing surfaces of said actuator, said U-shaped springs biasing said arcuate bearing surfaces of said actuator into engagement with said guide portions at the opposite lateral sides of said housing.

3. An electric switch for use in selectively controlling energization of either a first or second electric circuit comprising a switch housing, a base member carried by said housing, first, second and third terminals carried by said base member, said terminals being spaced from each other and each having a conducting surface facing interiorly of said housing, first and second mobile contacts disposed adjacent to but normally spaced from said conducting surfaces of said second and third terminals, a contact carrier for carrying said mobile contacts, said contact carrier comprising first and second leaf spring portions carried by said base member and which are in conducting engagement with said first terminal, said first and second leaf spring portions being spaced from and extending generally parallel to the base member, said first and second leaf spring portions being laterally spaced from each other and having free ends which carry said first and second mobile contacts, respectively, said first and second leaf spring portions being stepped as viewed in side elevation to define ramp surfaces extending transversely of their longitudinal extent and which respectively face in opposite directions, and an actuator pivotally supported for movement in opposite directions from a normal position and having a cam portion engageable with said ramp surfaces, said first and second leaf spring portions biasing said actuator toward said normal position, said actuator when moved in a first direction from said normal position effecting movement of said first leaf spring portion to move said first mobile contact carried thereby into engagement with said second terminal to provide a conductive path between said first terminal and said second terminal and when moved in a second opposite direction from said normal position effecting movement of said second leaf portion to move the second mobile contact carried thereby into engagement with said third terminal to provide a conductive path between said first terminal and said third terminal, said first and second leaf spring portions respectively returning said actuator toward its normal position when the latter is released upon being moved in said first and second directions from its normal position to effect a switching action.

4. An electric switch as defined in claim **3** wherein said cam portion of said actuator is generally V-shaped and wherein said ramp surfaces extend parallel to the adjacent side of said V-shaped cam portion and are engageable therewith.

5. An electric switch as defined in claim **4** wherein said first and second leaf spring portions are U-shaped and integral with a base portion extending transversely thereof, the base portion being secured to the base member.

6. An electric switch as defined in claim **5** wherein said base portion of said spring means defines an approximately 45° included angle with the U-shaped spring portions.

7. An electric switch as defined in claim 6 wherein said U-shaped springs are the form of elongated, flat, thin, resilient strips of metal.

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