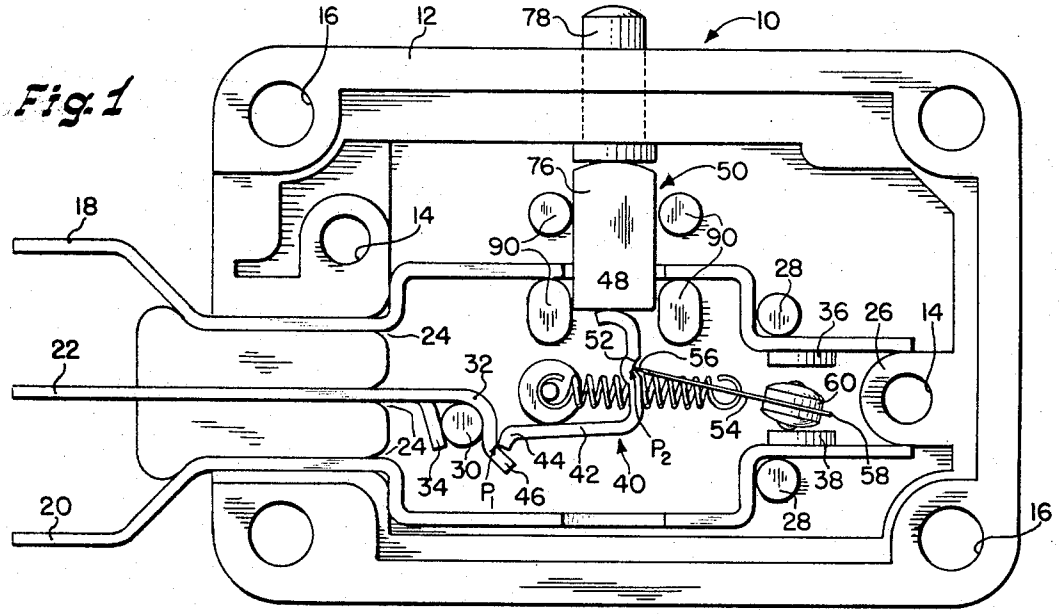
Oct. 22, 1968 J. R. PESCETTO 3,407,276

SNAP ACTION SWITCH HAVING IMPROVED TERMINAL CONSTRUCTION

Filed Nov. 23, 1966

Fig. 1



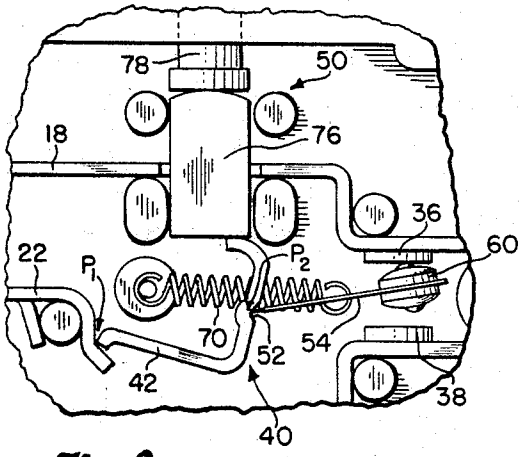


Fig. 2

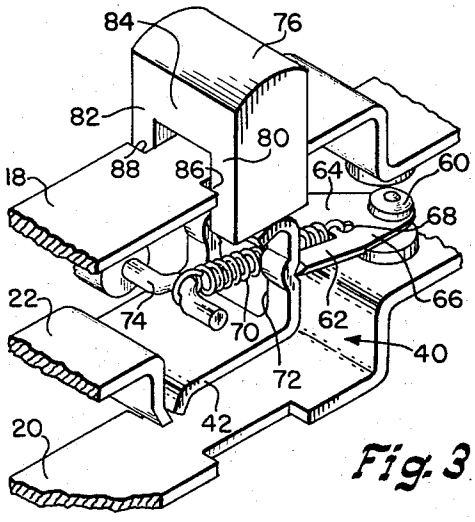


Fig. 3

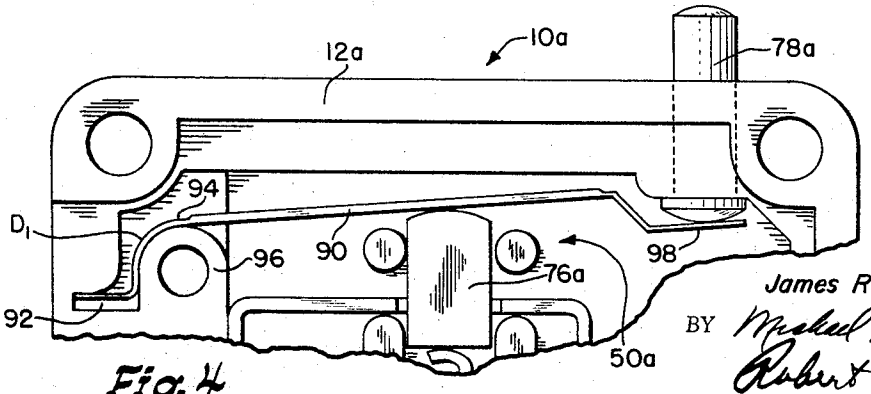


Fig. 4

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SNAP ACTION SWITCH HAVING IMPROVED TERMINAL CONSTRUCTION

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ABSTRACT OF THE DISCLOSURE

Snap action switch having a pivoted rocking element which in turn pivotally supports an over center spring biased movable contact element. A pushbutton actuator is notched so as to permit the actuator to pass by one of the fixed terminal elements and contact the rocking element.

The present invention relates to a new and improved snap action switch device, and more particularly, to a single pole double throw snap action switch device having improved operating and current carrying capabilities.

The primary object of the present invention is the provision of a snap action switch device having excellent contact wiping action with high current carrying capabilities.

Other objects and advantages of the present invention relate to a snap action switch device which is capable of undergoing a large number of switching operations, has a wide range of operating characteristics, offers freedom of design, is made of a minimum number of parts, requires low operating forces, has a short movement differential or travel of operating parts, is easy and economical to fabricate, and is otherwise well adapted for the purposes intended.

The above and other objects of the present invention are attained by the provision of a snap action switch device which includes a movable contact assembly positioned within the switch housing, the movable contact assembly including a pivotally mounted rocking element which, in turn, pivotally mounts a movable contact blade thereto, both of said rocking element and movable contact blade being biased in one direction by spring means, the arrangement of the above components being such that both a horizontal and vertical component of movement is given to the movable contact blade as the movable contact assembly is moved between first and second position to effect the switching operation desired without employing the spring means as a current carrying member in the switch circuitry.

Reference is now made to the drawing:

FIG. 1 is a side elevational view of a snap action switch device incorporating the features of the present invention;

FIG. 2 is a fragmentary side elevational view showing the position of the movable contact assembly after being moved to its second position from that illustrated in FIG. 1;

FIG. 3 is an enlarged fragmentary perspective view of the operating parts of components of the snap action switch device; and

FIG. 4 is a fragmentary side elevational view illustrating a modified form of the herein disclosed snap action switch device.

Referring now to the drawing, and first to FIG. 1, there will be seen a snap action switch device **10** which can be characterized as being of the single pole double throw variety. The switch **10** includes a switch housing **12** molded from a suitable plastic material to provide the desired insulating characteristics, and a suitable cover element (not shown) is provided to cover or close the concavity of the switch housing **12**. Housing **12** includes apertures **14** for receiving complementary configured lugs associated with the cover element to retain the cover element to the housing **12**, and apertures **16** through which may pass suitable means for mounting a plurality of switch devices **10** is juxtaposed relationship.

A plurality of terminal elements are frictionally mounted to the switch housing **12**, and include first and second spaced terminal elements **18**, **20** and a common terminal element **22** which is located generally intermediate thereof. Each of the terminal elements **18**, **20** and **22** are positioned adjacent one end thereof within suitably configured elongated slots **24** of the switch housing **12** and are held in predetermined attitudes with respect to one another by projections which are integrally molded to the housing **12**. In the case of the first and second spaced terminals **18**, **20**, an inwardly directed ear **26** integrally molded to the housing **12** engages one end of the terminal elements **18**, **20** within the concavity of the housing **12** and cooperates with the elongated slots **24** receiving the terminal elements **18**, **20** to maintain them in the position shown in FIG. 1 of the drawing. Lug elements **28** also integrally molded to the housing **12** may be used as an added means in maintaining the terminal elements **18**, **20** in the desired predetermined attitude. As to the common terminal element **22**, the upstanding lug portion **30** integrally molded to the housing **12** within its concavity is adapted to be received within an opening defined by the curved end portion **32** and the tab element **34** struck from the common terminal element adjacent one end thereof to maintain the terminal element **22** in the position shown in FIG. 1 of the drawing.

The terminal elements **18**, **20** carry a fixed contact element **36**, **38** respectively which are located within the concavity of the switch housing **12** and disposed in spaced and aligned position with respect to one another. The fixed contact elements **36**, **38** are adapted to be engaged by a movable contact assrembly **40** which is electrically connected to the common terminal element **22** to complete a circuit through either the terminal element **18**, the movable contact assembly **40** and the common terminal element **22** or the terminal element **20**, the movable contact assembly **40** and the common terminal element **22**. In the form of switch shown in the drawing, the terminal element **18** is normally open, the circuit being normally closed through the terminal element **20**, the movable contact assembly **40** and the common terminal element **22**. In the discussion above, it is assumed that each of the terminal elements **18**, **20** and **22** are connected to conductors which complete the circuits described above.

The movable contact assembly **40** includes an L-shaped rocking element **42**, one end **44** of which is adapted to be received by the angularly offset end portion **46** of the common terminal element **22** to permit pivoting or rocking movement of element **42** about a point designated P_1 in the drawing. As will be discussed hereafter, the arrangement of the parts comprising the movable contact assembly **40** is such that the element **42** may pivot or rock about the point P_1 without becoming disengaged or displaced from the angularly offset end portion **46** of the common terminal element **22**.

The other free end **48** of the L-shaped rocking element **42** is curvilinear in configuration and is adapted to be engaged by pushbutton means **50** to displace or rock the L-shaped rocking element **42** about the point P_1 as will become apparent from the discussion that is to follow.

The L-shaped rocking element includes a groove **52** along its vertically extending leg as shown in FIG. 1 for pivotally mounting a movable contact blade **54**. The blade **54** is sharpened at one of its ends **56** to seat in the groove **52** of the L-shaped rocking element, the other end **58** carrying a contact element **60** which is located between

the fixed contacts **36**, **38** of the terminal elements **18**, **20** to perform the desired switching operation.

As best seen in FIG. 3 of the drawing, the contact blade **54** is bifurcated and includes a pair of spaced arms **62**, **64** and a bight end portion **66** which carries the contact element or button **60**. An aperture **68** is formed in the bight end portion **60** for anchoring one end of a coil spring **70** which is generally disposed intermediate the spaced arms **62**, **64** of the contact blade **54**. The coil spring **70** extends through an aperture **72** provided in the L-shaped rocking element **42** and is anchored at its other end to a spring pivot pin **74** which is fixedly mounted to the housing **12**. The coil spring **70** is tensioned between the bight end portion **66** of the movable contact blade and the spring pivot pin **74** to maintain the various parts of the movable contact assembly **40** in the position shown in FIG. 1. Specifically, the arrangement of the parts in the movable contact assembly **40** is such that the coil spring **70** imparts both a horizontal and a vertical component upon the L-shaped rocking element **42** holding the end **48** of the L-shaped rocking element **42** in contact with the pushbutton means **50** as well as positioning the end **44** of the L-shaped rocking element relative to the angularly offset end portion **46** of the common terminal element **22** to permit movement thereof about the point P_1. In addition, the coil spring **70** is located beneath the groove **52** of the L-shaped rocking element which defines the second pivot point P_2 of the movable contact assembly, causing the contact element or button **60** to engage the fixed contact element **38** of the terminal element **20**.

When the push button means **50** is depressed against the vertical component of force of the spring **70**, the L-shaped locking element is engaged and moved downwardly causing pivoting or rocking thereof about the point P_1. Downward movement of the L-shaped rocking element **42** also causes downward movement of the groove **52** and the movable contact blade **54** mounted with respect thereto. As soon as the groove **52** passes a dead center position relative to the axis of the coil spring **70**, the vertical upwardly directed component of the coil spring **70** will reverse direction causing the contact blade **54** to pivot at point P_2 creating an engagement between the contact element or button **60** and the fixed contact element **36** of the terminal element **18**. The relative position of the parts when this occurs is illustrated in FIG. 2 of the drawing, and will continue as long as the force is great enough to overcome the vertical component of the coil spring at point P_2.

When the parts are in the position shown in FIG. 2, the circuit between terminals **20** and **22** will be opened with a corresponding closing of the circuit between terminals **18** and **22**. When the pushbutton means **50** is released, the vertical force acting upon the L-shaped rocking element **42** at point P_2 causes the element **42** to pivot counterclockwise carrying blade pivot P_2 back across the dead center position of the spring axis and transferring the movable contact blade **54** and its contact element or button **60** back to its normally closed position depicted in FIG. 1.

It is important to note that during the aforementioned movement of the movable contact assembly **40**, a wiping action is imparted to the contact element or button **60** as it moves between the fixed contacts **36** and **38**. The wiping or sliding action of the movable contact element or button **60** relative to the fixed elements **36**, **38** serves to keep the contact surfaces clean and insures breaking loose of stuck or welded contacts. The present construction provides an excellent contact wiping action due to the horizontal component of force which is imparted to the blade **54** not only as a result of its passing dead center position of the coil spring **70**, but also due to the pivoting or rocking of the L-shaped rocking element **42**. In other words, as the L-shaped rocking element pivots about point P_1, the blade pivot P_2 will describe an arc about point P_1, and this will permit a horizontal component or force to be derived both from the rocking or pivoting action of the L-shaped rocking element **42** as well as the movement of the contact blade **54** as it passes the dead center position of the coil spring **70**.

As another important feature of the present invention, it will be noted that the coil spring **70** is not a current carrying element in the switch construction. While one end of the coil spring is anchored to the bight end portion **66** of the contact blade **54**, the other end is anchored to the spring pivot pin **74** which is mounted to the insulated housing **12**. Therefore, any current which is carried through the coil spring **70** will be insulated by the housing **12**. Current will thus be carried through the movable contact blade **54** and the L-shaped rocking element **42** to the common terminal element **22** which will have the effect of increasing the current rating of the instant switch.

The aperture **72** of the L-shaped rocking element **42** is sufficiently large to permit freedom of movement of the coil spring **70** throughout its entire range of positions to preclude the possibility of mechanical or electrical interference between the spring and the L-shaped rocking element **42**. This is important in insuring the intended performance of the various switch components such as the biasing characteristics of the coil spring **70** without causing any arcing or interruption of the current carried by the L-shaped rocking element.

In the embodiment shown in FIGS. 1–3, the pushbutton means **50** comprises an actuator button **76** and a manually depressible plunger element **78** which extends through the housing **12** of the switch **10**. The lower face of the actuator button **76** rests atop the curvilinear portion **48** of the L-shaped rocking element **42** while the upper face supports the manually depressible plunger element **78**. It will be understood, of course, that the actuator button **76** and the plunger element **78** may be formed integrally with one another to provide a one-piece pushbutton means if this is desired.

As best seen in FIG. 3 of the drawing, the actuator button **76** comprises a U-shaped member having spaced leg portions **80**, **82** which depend from a connecting end portion **84**. The distance between the spaced leg portions **80**, **82** of the actuator button **76** is such that they may be readily received within notched areas **86**, **88** respectively provided on opposite sides of the terminal element **18** for guiding the actuator button in a predetermined path as it is moved in the fashion previously described between its uppermost and lowermost positions. The primary guide means is, however, in the form of suitable lug elements **90** which may be integrally molded in the switch housing **12** in the vicinity of the actuator button **76** to guide it as it is moved between its uppermost and lowermost positions. The connecting end portion **84** of the actuator button is designed to function as an overtravel limit stop to prevent L-shaped rocking element **42** from traveling too far in a downward direction which would cause it to lose its reset moment. In this respect, it will be noted that the relationship of the connecting end portion **84** to the terminal element **18** when the parts are in the position shown in FIG. 1 is such that the connecting end portion **84** will engage the terminal element **18** to prevent further downward movement of the L-shaped rocking element **42** after the movable contact assembly has been moved to the position in FIG. 2 of the drawing.

Reference is now made to FIG. 4 of the drawing for a slightly modified form of the present invention. In this figure, similar reference numerals are employed with the suffix *a* used to designate corresponding elements of the FIGS. 1–3 embodiment. The switch **10***a* is identical with the switch previously described with the exception of the means for initiating or causing movement of the movable switch components. Specifically, it will be noted that the plunger element **78***a* is offset to one side of the switch housing **12***a* with the lower surface thereof engag-

ing the free end of a spring lever **90** mounted to the housing **12***a*. The spring lever **90** is received within a slot **92** of the housing **12***a* and conforms in configuration at **94** to the curvilinear ear portion **96** integrally molded to the housing **12***a* to permit pivoting movement or deflection of the spring lever at a point generally designated D_1. The spring lever **90** extends across the concavity of the housing **12***a* and engages the upper face of the actuator button **76***a*, the free end **98** of the housing being in turn engaged by the lower face of the depressible plunger element **78***a*. It will be apparent that upon depressing the plunger element **78***a*, the spring lever **90** will deflect or pivot abouth point D_1 causing the actuator button **76***a* to move downwardly to operate the movable contact assembly **40***a* in the same manner as previously described. A certain amount of additional reset force is produced as this lever is deflected or moved about point D_1 which enhances the use of this particular embodiment for very light force applications.

From the foregoing, it will now be appreciated that the present invention provides a snap action switch device which promotes excellent contact wiping action while also having high current carrying capability. The switch device can be operated in a reliable fashion by either of the actuators illustrated in the drawing to provide the desired switching operations for a variety of commercial uses.

Various embodiments of the invention have been shown herein, and it will be understood that these are for illustrative purposes only. Various changes in structure will no doubt occur to those skilled in the art, and will be understood as forming a part of the invention insofar as they fall within the spirit and scope of the appended claims.

I claim:

1. A single pole double throw snap action switch device comprising, a switch housing having pushbutton means mounted for movement from a normal to a second position, a movable contact assembly engaged by said pushbutton means and including a generally L-hsaped rocking element pivotally mounted at a first portion thereof to a common terminal element and having a second portion thereof positioned for engagement with said pushbutton means, a movable contact blade pivotally mounted at one end thereof to said generally L-shaped rocking element and carrying at its other end a contact element disposed between a spaced pair of fixed contact elements each being electrically connected to a separate terminal element, each of said terminal elements being supported by said housing and positioned so that the common terminal element is intermediate the other terminal elements, spring means fixed at one end within said switch housing and at its other end to the movable contact blade for normally biasing the contact element of said movable contact blade against one of said fixed contact elements and for yieldably urging said second portion of said generally L-shaped rocking element against said pushbutton to hold it in its normal position, said pushbutton means capable of being manually depressed for movement to its second position causing substantially simultaneous pivotal movement of said L-shaped rocking element and said movable contact blade for overcoming the biasing effect of said spring means to provide a wiping effect of the contact element on said movable contact blade as it is moved with a snap action between said fixed contacts, release of said pushbutton means causing return of the switch components to their normal position, one of said terminal members which are electrically connected to a fixed contact element having at least one notched area for cooperating with at least one notched portion of said pushbutton to permit portions of said pushbutton to move past said one terminal member during the actuation and release of said pushbutton.

2. The switch device as defined in claim **1** wherein said pushbutton means comprises a pair of spaced leg portions, each of which contacts said generally L-shaped rocking element.

3. The switch device as defined in claim **1** wherein the one end of the spring means which is fixed within the housing is insulated from all of said contact elements and the spring is engaged only at its ends.

4. The switch device as defined in claim **1** wherein all of said terminal elements extend externally of the same wall of the switch housing.

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