

Jan. 23, 1973

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3,712,970

SINGLE SPRING SWITCH WITH WIPING ACTION

Filed July 12, 1971

2 Sheets-Sheet 1

FIG. 1.

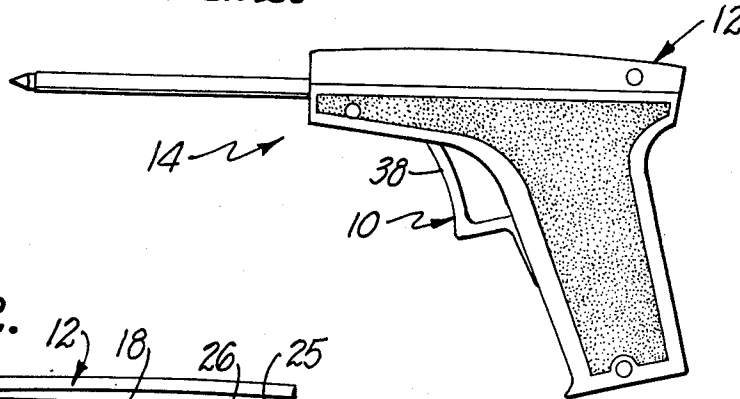


FIG. 2.

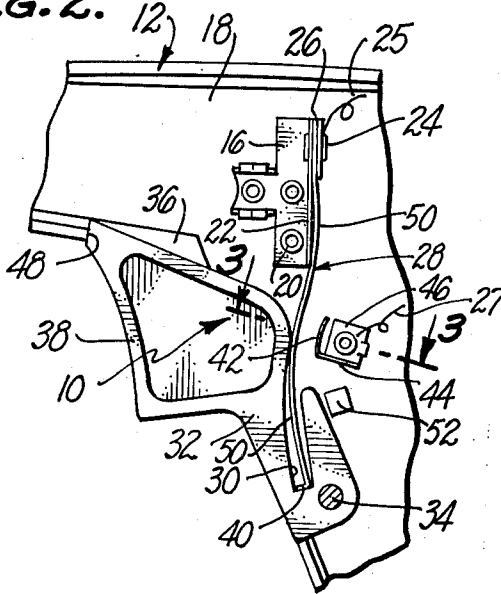


FIG. 3.

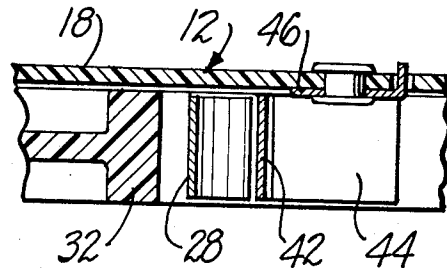
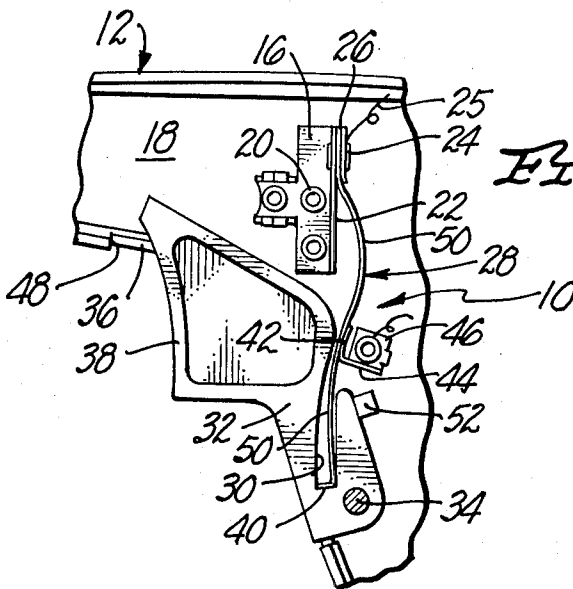


FIG. 4.

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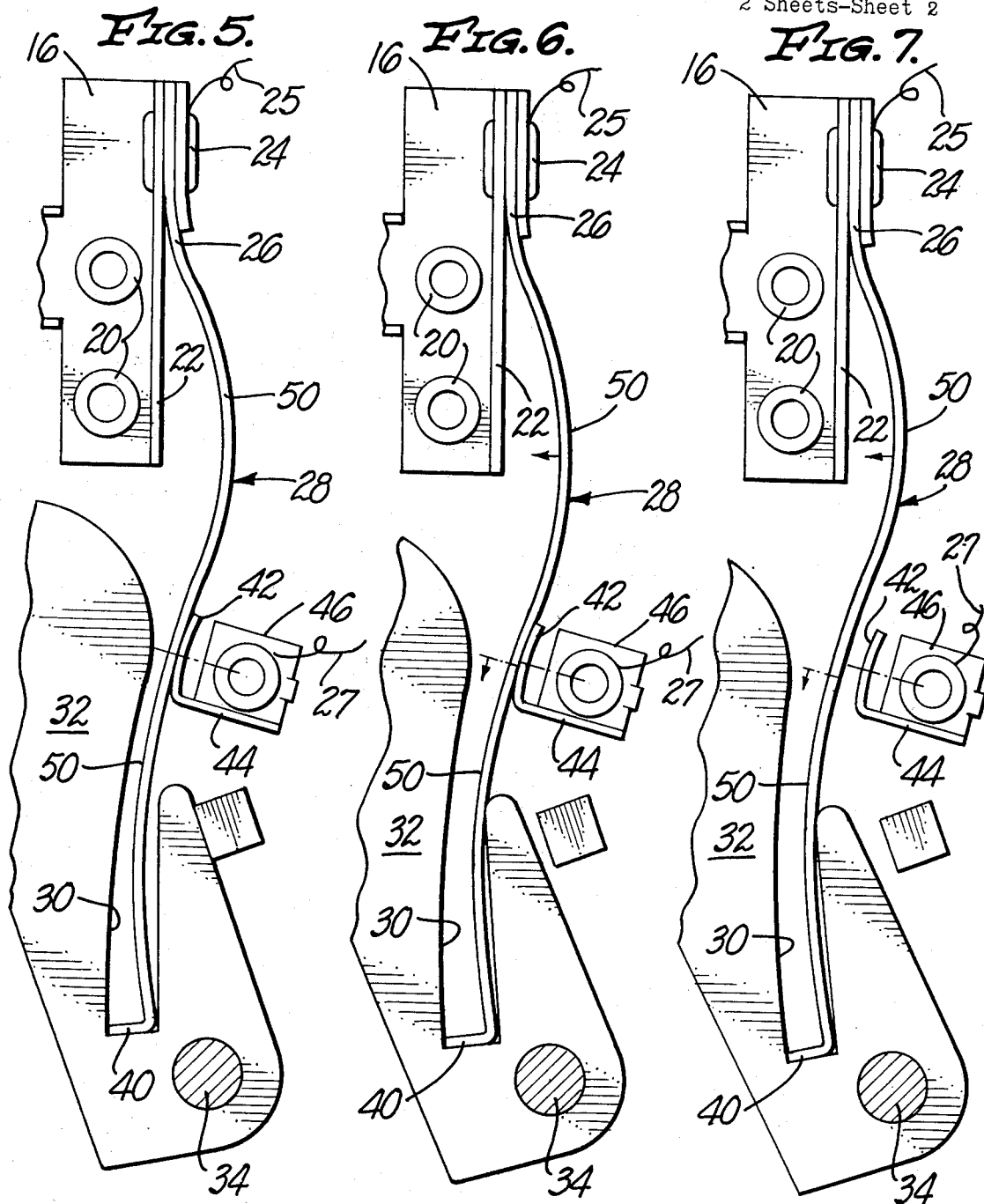
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2 Sheets-Sheet 2



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SINGLE SPRING SWITCH WITH WIPING ACTION
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1 Claim

ABSTRACT OF THE DISCLOSURE

A switch or switch structure may utilize a fixed support and a movable support between which there extends an elongated, resilient, metal movable contact. A fixed contact is located between the two supports. In an initial open position of the switch the movable contact is spaced from the fixed contact. When the switch is closed the movable support is moved so as to apply pressure placing the movable contact under compression. This compression causes deflection of the movable contact so that the movable contact engages the fixed contact.

BACKGROUND OF THE INVENTION

A wide variety of different electric switches or switch structures have been constructed and utilized. Indeed, it would be impossible to effectively utilize electric power in today's modern industrial society if millions and perhaps billions of electric switches were not commonly employed. Such widespread utilization of electric switches is considered to have significantly stimulated research and development work related to the manufacture of switches or switch structures.

In spite of the tremendous amount of money and time which has been devoted to the development of new and improved switches and switch structures, it is considered that there is still a distinct, definite commercial need for new and improved switch structures and in particular for switch structures primarily intended for specialized applications. To fulfill such a need it is considered that any switch structure must be simple, relatively, inexpensive to construct, effective and capable of giving prolonged effective, reliable service.

SUMMARY OF THE INVENTION

An objective of the present invention is to provide new and improved switches or switch structures. A more specific objective of the present invention is to provide switches which satisfy a commercial need as briefly and broadly indicated in the preceding discussion. Further objectives of the present invention are to provide switch structures as indicated which are relatively simple, relatively inexpensive to construct, which on a relative basis are effective and which on comparison to other switch structures may be considered as being capable of giving prolonged, effective reliable service with a minimum of maintenance or repair.

As will be apparent from a detailed consideration of the remainder of this specification these objectives are achieved by providing a switch or switch structure comprising: a fixed support, a movable support located so as to be spaced from the fixed support, an elongated, resilient metal, movable contact located so as to extend between said support and a fixed contact located generally between said supports in a position where said fixed contact can be engaged by a portion of said movable contact. In an initial or open position such contacts are spaced from one another. In closing the switch the movable support is moved so as to apply pressure to the movable contact, placing this contact under compression, this

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compression causing deflection of the movable contact so that the movable contact engages the fixed contact.

BRIEF DESCRIPTION OF THE DRAWINGS

A summary of this type is inherently incapable of clearly indicating all of the details and features of an invention. The nature of the present invention will be fully apparent from a detailed consideration of the remainder of this specification, the appended claim and the accompanying drawings in which:

FIG. 1 is a side-elevation view of a soldering gun employing a presently preferred embodiment or form of a switch of the present invention;

FIG. 2 is an enlarged fragmentary view of the soldering gun shown in FIG. 1 taken in the same direction as FIG. 1 showing a part of the interior of this soldering gun as it appears with a side cover of the soldering gun removed, and showing the illustrated embodiment of the switch in an open position;

FIG. 3 is a partial cross-sectional view taken at line 3—3 of FIG. 2;

FIG. 4 is a view corresponding to FIG. 2 showing the illustrated embodiment of the switch of this invention in a closed position; and

FIGS. 5, 6 and 7 are enlarged fragmentary, diagrammatic type views illustrating the motions involved when the switch of the invention as illustrated in the preceding figures is moved from a closed position as illustrated in FIG. 5 through an intermediate position as indicated in FIG. 6 to another intermediate position as indicated in FIG. 7 which closely approximates an ultimate open position.

From a detailed consideration of the accompanying drawings and the remainder of this specification it will be realized from the accompanying drawings that they do not show the invention itself, but instead show a specific presently preferred structure embodying the intangible concepts of the present invention. Such concepts are defined or summarized by the appended claim. They may be utilized in switch structures having a somewhat different appearance and/or construction than the specific switch structure shown through the use or exercise of routine engineering skill or ability.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings there is shown a switch or switch structure 10 incorporated within the housing 12 of a soldering gun 14. This switch 10 is utilized in order to control the heating of the soldering gun 14 by controlling the flow of current to appropriate circuit components (not shown) in the gun 14. The housing 12 of the soldering gun 14 in effect serves as the housing for the switch 10 since this switch 10 is built into the gun 14 as an integral part of it.

The switch 10 includes a conductive metal terminal plate 16 mounted upon a non-conductive wall 18 of the housing 12 by means of known or conventional fasteners 20. This plate 16 includes an upstanding side 22 which is secured by means of a rivet 24 to one end 26 of an elongated, resilient, metal, curved strip-like movable contact 28. A wire 25 connected to the rivet 24 establishes connection to the contact 28. This contact 28 extends between the plate 16 and an elongated notch 30 formed in a trigger plate 32. This plate 32 is mounted on a pivot pin 34 extending from the side 22 so as to extend generally out from the housing 12 through a slot 36. This plate 32 includes a trigger end 38 adapted to be engaged by a digit of a hand so that it can be moved so as to actuate or close the switch 10.

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During such actuation from an open position so as to close the switch 10 the plate 32 is rotated a short distance in a clock-wise manner as viewed in FIGS. 2 and 4 to 7 of the drawings. During such rotation engagement of a bent end 40 of the movable contact with the base of the notch 30 will cause pressure to be applied to the movable contact 28, placing gradually increasing pressure upon the movable contact 28. As this occurs because of the location of the pivot 34 the effective distance between the bottom of the notch 30 and the rivet 24 will be decreased, and at the same time the distance between the ends of the contact 28 will decrease. This will result in flexure type deformation of the movable contact 28 since the length of the contact 28 is fixed.

As this occurs the movable contact 28 will tend to become bent or curved to a configuration as shown in FIGS. 4 and 5. As the movable contact 28 assumes this configuration it will move against an unsupported end 42 of a generally L-shaped fixed metal contact 44 located upon a mounting projection 46 secured to the side 22. Another wire 27 establishes connection with the contact 44. This motion will be accompanied by a slight sliding type action, which "wipes" a part of the contact 28 along the end 42 so as to tend to dislodge accumulations. It will be noted that this fixed contact 44 is mounted with respect to the projection 46 so that the end 42 is capable of giving slightly or flexing slightly as it is engaged with the contact 28.

When the trigger end 38 is released the inherent internal resiliency within the movable contact 28 will cause this contact to act as a spring, returning the trigger plate 32 to an initial position in which it is restrained against further movement by engagement with the edge 48 of the slot 36. As the movable contact 28 moves to this open position from a closed position as indicated in FIGS. 4 and 5, it will also tend to move with respect to the fixed contact 44 with a short wiping type action involving physical displacement of a short length of the contact 28 with respect to the contact 44. Although the amount of this displacement is relatively small, it is considered adequate to effectively tend to wipe from the mating surfaces of the contacts 28 and 44 at least part of any accumulations which might contaminate such surfaces and in particular at least part of any such accumulations as may result from scintillation or arcing.

In the switch 10 preferably the movable contact 28 is dimensioned so that it will be held under compression between a fixed and a movable support as indicated at all times. When this occurs there is no question but that the movable contact 28 will maintain an initial curvature as shown which will facilitate it assuming a similar, but more pronounced curvature as indicated in FIGS. 4 and 5 so that it will operate properly in the switch 10. Such initial and final curvature is relatively difficult to describe or set forth in words. Such curvature is more or less of an S-type shape involving bowed sections or parts 50 on both sides of an imaginary line drawn between the ends 26 and 40. The degree or amount of bowing is more pronounced when the switch 10 is in a closed position than when it is in an open position.

It is preferred to manufacture the switch 10 so that the movable contact 28 will at all times tend to bias the plate 32 in a counterclockwise direction around the pivot 34. Although it is not necessary it is preferred to locate within the housing 12 on the wall 18, a small stop 52 which will prevent rotation of the plate 32 in a clockwise direction to such an extent that there is direct contact between the plate 32, the movable contact 28 and the fixed contact 44 is the vicinity of this fixed contact 44.

With this preferred construction, the movable contact 28 and the other parts are shaped and positioned so that the movable contact 28 passes through what may be regarded as a center line or metastable position as the plate 32 is rotated from an open position to a closed position for the switch 10. When the various parts indicated are

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formed as shown so that the movable contact 28 will pass through such a center line-type position, this switch 10 will be proportioned so that as the plate 32 abuts against the stop 52 the movable contact 28 will continue to "snap-over" or "snap-past" the center line position so as to abut against the fixed contact 44 in a resilient manner.

When pressure on the plate 32 is released in opening the switch 10 after it has been closed, the inherent characteristics of the movable contact 28 will tend to move the movable contact 28 away from the fixed contact 44 with a snap-type of action as well as with a wiping action as indicated in the preceding. The value of such a snap action in a switch is well established. In the switch 10 it is obtained in the same member—the movable contact 28—which supplies a spring force to move the switch 10 to an open position.

The action involved here is of a toggle or toggle-like character. The movable contact 28 can be regarded as a toggle spring because of the function it serves. By conventional engineering variations the toggle-like action achieved in the switch 10 can be either increased or decreased by minor variations in dimensions and/or spacing. Because of its operation the movable contact 28 may be referred to as a toggle spring. It will be obvious that this contact 28 is electrical from all except a wire 25 when the switch 10 is in an open position.

I claim:

1. A switch structure which comprises:

- a fixed support,
- a movable support located so as to be spaced from said fixed support,
- an elongated, resilient, metal, movable contact located so as to extend between said supports, and
- a fixed contact located generally between said supports in a position where said fixed contact can be engaged by a portion of said movable contact,
- said movable support capable of being moved from an initial open position in which said movable contact is spaced from said fixed contact to a closed position in which said movable support applies pressure to said movable contact, placing said movable contact under compression, such compression causing deflection of said movable contact so that said movable contact engages said fixed contact,
- said movable support being pivotally mounted so as to be capable of being moved by being pivoted, one end of said movable contact being secured to said fixed support and the other end of said movable contact is engaged within a notch in said movable support,
- said movable contact acts as a spring so as to return said movable support to said open position from said closed position,
- said movable support being movable so that said movable contact wipes along said fixed contact when said movable contact is being moved into and out of engagement with said fixed contact,
- said movable contact being held under compression in a curved configuration when said movable support is in said open position, said movable contact assuming a similar but more pronounced curvature when said movable support is moved so as to place said movable contact in said closed position,
- said fixed contact being capable of flexing when contacted by said movable contact,
- said movable contact being positioned between said fixed support and said movable support so as to act as a toggle spring passing through an over center position as said movable support is moved from said open position to said closed position, said movable contact moving through said over center position prior to said movable contact directly engaging said movable contact so as to directly hold said movable contact against said fixed contact.

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U.S. Cl. X.R.

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