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2,215,816

SNAP SWITCH

Original Filed Jan. 7, 1937

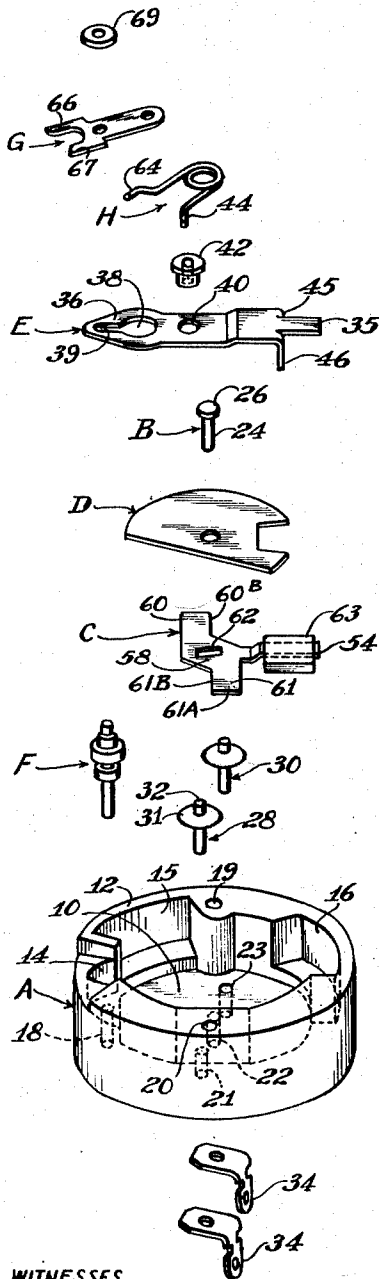


FIG. 3.

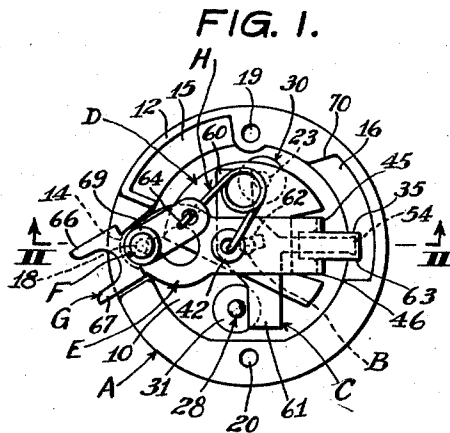


FIG. 1.

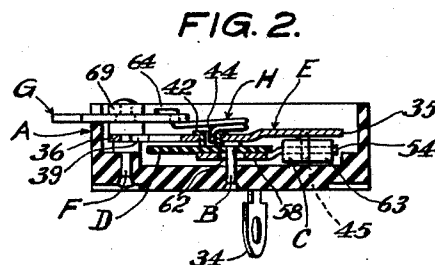


FIG. 2.

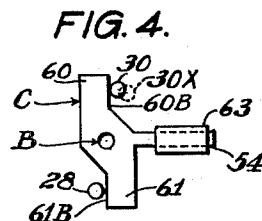


FIG. 4.

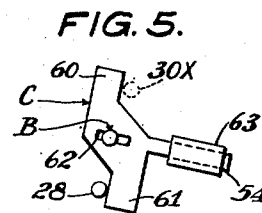


FIG. 5.

WITNESSES

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UNITED STATES PATENT OFFICE

2,215,816

SNAP SWITCH

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Original application January 7, 1937, Serial No.
119,375, now Patent No. 2,127,686, dated Au-
gust 23, 1938. Divided and this application July
22, 1938, Serial No. 220,675

7 Claims. (Cl. 200—67)

My invention relates to a control for an elec-
tric circuit and relates particularly to a snap
switch for completing or interrupting the elec-
trical circuit at the option of the operator. This
invention is a division of that disclosed in my
copending application, Serial No. 119,375, filed
January 7, 1937, now Patent No. 2,127,686, issued
August 23, 1938.

In my prior patent application Serial No.
701,802, filed December 11, 1933, now Patent No.
2,141,907, issued December 27, 1938, I have dis-
closed a pivoted bridging member which makes
a good contact with the stationary contact ter-
minals even though there is a slight variation
of the throw arm or the fixed contacts from their
predetermined correct position.

In certain switches where the circuit is com-
pleted by the bridging of two fixed or stationary
contacts by a non-pivotal bridging member, the
incorrect positioning of one or both of the fixed
contacts may result in one portion of the bridg-
ing member being spaced a small distance from
one of the contacts. This spacing of the bridg-
ing element from the live contact results in an
arc being established between the separated live
elements with its destructive result of eroding
of pitting of the electrical contact surfaces which
establishes a high resistance and also reduces
the effective life of the switch, since the contacts
and/or the bridging member will be burned away.

Further, in switches where the throw arm is
pivotally mounted and where the bridging mem-
ber is pivotally rotated into bridging position,
the force or torque imparted to the bridging
member by the throw arm is normal to an imag-
inary radius drawn between the point of appli-
cation of the force and the pivot point. How-
ever, if the pintle or pivot for the bridging mem-
ber is comparatively near to the turning force
(that is the throw arm), then a freezing or
sticking of the electrical bridging member makes
the device inoperative.

Therefore, an object of my invention is to con-
struct a snap switch which will not stick and
which will be effective in operation even though
some elements may be improperly aligned during
the course of manufacture.

It is a further object of my invention to mini-
mize the sparking or arcing between the con-
tacts and their cooperative bridging member.

It is another object of my invention to provide
a frictional or sliding or wiping contact between
the stationary electrical contacts and the mov-
able electrical bridging member whereby the
contacts will always be kept clean or will of

themselves brush aside any dust or dirt that may
collect thereon.

Another object of my invention is to obtain a
very low contact resistance between the bridging
member and the contacts. As a corollary, an
object of my invention is to minimize the heating
of the elements of the switch by reducing the
contact resistance.

A still further object of my invention is to
simplify the construction of the device so that
it may be manufactured in quantity lots at a low
cost.

A still further object of my invention is to con-
struct an interfitting elongated recess or opening
on a bridging member which is cooperative with
a pin whereby the pressure of each side of the
bridging member may be equalized or evenly
distributed when the bridging member is in
closed circuit position.

Other objects of my invention are to provide
an improved device of the character described,
which is simple and economical in construction,
and which possesses a maximum amount of
serviceability and of strength.

With the above and related objects in view, my
invention consists in the details of construction
and the combination of parts that will hereinafter
be fully described when the description is
read in conjunction with the accompanying
drawing in which Fig. 1 is a plan view of a snap
switch embodying my invention; Fig. 2 is a sec-
tional view taken on the line II—II of Fig. 1;
Fig. 3 is an exploded view of the elements com-
prising the snap switch; Fig. 4 is a diagrammatic
view of a bridging member which can only be
oscillated and wherein a contact shown in dotted
lines is incorrectly located. The diagram shows
a main contact surface of the bridging member
being spaced from the incorrectly aligned sta-
tionary contact; and Fig. 5 is a diagrammatic
view of a bridging member which can be oscil-
lated and which also can be moved in a linear
direction to properly engage fixed contacts, one
of said contacts being improperly aligned.

Referring now in greater detail to the drawing,
in Fig. 1 is shown, by way of example, a type
of snap switch wherein the overall diameter of
the switch is approximately $1\frac{1}{8}$ inches and the
overall thickness of the base is approximately
 $\frac{1}{4}$ inch. The switch mechanism hereinafter
further described is mounted within a chamber
of an insulated base, generally designated A,
which is preferably comprised of a molded
phenolic condensation product. A body portion
of the base is substantially flat and from its

periphery extends a flange 12 which is substantially circular on its outer bounding surface. The flange has a plurality of recesses or notches 14, 15 and 16 on its inner curved portion, and the recesses or notches communicate directly with the central chamber of the base. The function of the notches 14, 15 and 16 will be hereinafter described in conjunction with the various elements which they complement.

A plurality of small openings 18, 19, 20, 21, 22 and 23 are formed in the base. The surface defining the opening 22, centrally located in the base, serves as a bearing for a freely longitudinally movable insulating pin or pintle, generally designated as B. The insulating pintle B comprises a cylindrical shaft 24 and an enlarged head 26. An electrical bridging member or blade, generally designated as C, oscillates about the shaft of the equalizing pintle B as its pivot, and it also supports an insulating washer, generally designated as D.

The enlarged head 26 is pressed downwardly by an actuating throw arm, generally designated as E, which presses on the upper surface of the head 26, thus preventing the bridging member from falling out of position. The washer D serves as an electrical insulator between the metal throw arm E and the spring H, which is on one side, and the metallic bridging member which is on the other side.

Openings 21 and 23 are spaced from one another on the circumference of an imaginary circle which has its center substantially in the central axis of the opening 22, and the openings 21 and 23 receive the shanks of the electrical conducting rivets 28 and 30.

Each of the electrical conducting rivets 28 and 30 are similarly constructed so that a description of one rivet or contact will suffice as the description of all the rivets or terminals. Rivet 28 has an enlarged intermediate portion 31 which is flat on one side and abuts against the base, and its upper surface (the auxiliary or arcing stationary contact) is formed in the shape of a truncated cone, and from the smaller diameter of the truncated cone extends the bridging member contact portion 32 (the main stationary contact). The purpose and function of this structure is more fully set forth in my prior patent application Serial No. 701,802, filed December 11, 1933, which I have already mentioned.

The outside of the shank of the rivet 28 is expanded to hold a terminal 34 to which a flexible electrical lead wire may be soldered or otherwise suitably attached thereto, and also to establish a good electrical contact between the rivet and the terminal. The openings 19 and 20 serve as openings for rivets which connect the snap switch to a volume control or rheostat which forms a combined volume control and snap switch unit, both devices usually being operated by a single control shaft. The switch is usually operated after a predetermined portion of movement of the control shaft.

A trigger and throw arm pivot or pintle, generally designated at F, is located within the recess 14 and is of the type described in my prior Patent No. 2,057,829, granted October 20, 1936. Upon the pintle F is pivotally mounted the metallic throw arm E as well as a trigger, generally designated as G, the latter being the actuated element of the snap switch whereby the switch is operated to open or to closed circuit positions. The throw arm E is located between the trigger G and the base, and the metallic arm

E has its free end 35 slightly offset from its pivotally held end 36.

An opening 38 on the longitudinal axis and adjacent one end of the throw arm is substantially circular and is of a diameter to readily fit over the largest diameter of the pintle in order to expedite the assembly of the throw arm and the pintle during the steps in assembling the elements of my snap switch. The circular opening 38 merges with an elongated slot 39 which is of a width whereby it may oscillate or pivot about the bearing F. A small central opening 40 in the longitudinal axis of the throw arm receives a bushing 42, the bushing in turn receiving the tip 44 of one leg of the torsional spring, generally designated as H.

The free end of the throw arm is provided with a pair of laterally spaced depending ears 45 and 46 stamped therefrom. These ears straddle lever arm 54 projecting laterally from bridging member C which has a substantially flat central portion 58 and offset contacting arms 60 and 61. It is preferred to insulate throw arm E from bridging member C, which may be done by slipping an insulating bushing 63 over lever arm 54 that is offset relative to central portion 58 to provide room for the bushing between the throw arm and the switch base 10.

The movable arm 61 has an auxiliary or arcing surface 61A, which surface first engages the auxiliary stationary contact 31 where the arc is made, and the vertically extending front or main contact surface 61B engages the main stationary contact 32. When the contacts are separated, the auxiliary stationary contact 31 and the arcing surface 61A are the last surfaces to separate thus taking the arc, hence preserving the main contact surfaces. An arrangement similar to the above is made for the stationary contact 30 and the movable arm 60.

From the central portion 58 of the electrical blade C extends the lever arm 54 which is at right angles to the contact arms 60 and 61. An elongated rectangular-like slot or opening 62 cooperatively receives the insulating pintle B, and the length of the slot 62 is longer than the diameter of the pintle shank 24. This is for the purpose of having the blade move in a linear direction. The elongated slot 62 has its longitudinal axis disposed at an acute angle with respect to the line joining the main contact surfaces 60B and 61B of the blade C. This angular construction of the slot 62 prevents any sticking of the pintle B and the surfaces defining the slot 62.

It is to be observed at this point that the stationary terminals 28 and 30 limit the movement of the bridging member C in a clockwise direction which also is the position of the bridging member when the circuit is closed, and the free end 35 of the throw arm E and wall 70 limit movement of the bridging member C when it is moved in a counterclockwise direction. The bridging element C may not only oscillate about pintle B, but it may move in a linear direction with respect to the pintle B.

The above-described construction and function of the bridging member is important in the following respect: Assume that the holes 21 and 23 are not located properly with respect to the pintle B in the base A so that contacts 28 and 30 will be located in the position 28 and 30X, diagrammatically illustrated in Fig. 4. If a slight space existed between the bridging member and one of the contacts in the base, then one of the contacts would not receive the full movable contact pres-

sure since the other contact would prevent movement of the throw arm in a rotary direction, and when current flows, an arc would exist in the space, hence pitting the contacts. However, with an equalizing arrangement such as the elongated angularly disposed slot 62, illustrated diagrammatically in Fig. 5, then the bridging member C is not constrained by its pintle or the lever arm but is free to move in a linear direction because of elongated slot 62 and the sliding connection between bushing 63 and ears 45 and 46.

By the above structure, it is readily seen that errors committed in assembling the unit or in constructing the elements of the switch will not result in excessive pitting of the contacts or the bridging member with its detrimental effects of creating high resistance and shortening the life of the switch.

A flat torsional expansion spring H, having a central portion coiled, has one tip 44 enter the bushing 42, and the other tip 64 enter an opening in one end of the trigger G. The torsional spring not only imparts rapid movement or snap action to the throw arm when the trigger G is moved to a point whereby the dead center position of the spring is reached, but the torsional spring H tends to press the throw arm in a direction towards the base. This dual effect of the spring keeps the throw arm pressed upon the head of the pintle B. The trigger G has outwardly projecting arms 66 and 67 lying in the plane of the trigger and which are adapted to be engaged and moved sideways by an eccentrically positioned pin (not shown) carried by an adjoining volume control in a well known manner.

A washer 69 is placed adjacent the metallic trigger G, and the upper end of the trigger pin F is peened over to hold the trigger and throw arm in position.

It is to be observed that the coiled portion of the spring H, which tends to exert an expansive force, freely moves in the recess 15. The tip 35 of the throw arm moves in the recess 16, and wall 70, partially defining the recess 16 and engaged by tip 35 when the switch is in open circuit position, limits the movement of the throw arm when it is moved in a counterclockwise direction (Fig. 1).

Although my invention has been described in considerable detail, such description is intended as illustrative rather than limiting, since the invention may be variously embodied, and the scope of the invention is to be determined as claimed.

I claim as my invention:

1. An electrical switch comprising a base member, a pair of spaced contact elements connected to said base member and projecting upwardly therefrom, a current conducting bridging member between said contacts for engaging the sides of both of said contacts at the same time, one of said members being provided between said contacts with a pivot and the other of said members being provided with an enlarged opening receiving said pivot whereby the bridging member can oscillate on said pivot and also move laterally to insure abutting engagement of its opposite edges with both of said contacts at the same time, and actuating means, said bridging member being connected to said actuating means by interfitting portions whereby the bridging member is oscillated by said actuating means.

2. An electrical switch comprising a base member, a pair of spaced upright contact elements connected to said base member, a current con-

ducting bridging member between said contacts for engaging the sides of both of said contacts at the same time, one of said members being provided between said contacts with a pivot parallel to the bridging member engaging surfaces of said terminals the other of said members being provided with an elongate opening extending crossways of the bridging member and receiving said pivot whereby the bridging member is adapted to oscillate on the pivot and also move laterally to insure abutting engagement of its opposite edges with both of said contacts at the same time, said bridging member being provided with a lever projecting laterally therefrom, and actuating means, said lever and actuating means being provided with interfitting portions whereby the bridging member is oscillated by said actuating means.

3. An electrical switch comprising a base member, a pair of spaced vertical contacts connected to said base member, a current conducting bridging member for engaging both of said contacts at the same time, a vertical pivot secured to said base between said contacts, the bridging member being provided with an elongate opening extending crossways thereof and receiving said pivot whereby the bridging member is adapted to oscillate on the pivot and also move laterally to insure engagement with the vertical sides of both of said contacts at the same time, said bridging member being provided with a lever projecting laterally therefrom, actuating means, said lever and actuating means being provided with interfitting portions whereby the bridging member is oscillated by said actuating means, and means for insulating said interfitting portions from each other.

4. An electrical switch comprising a base member, a pair of spaced vertical contacts connected to said base member, a current conducting bridging member for engaging both of said contacts at the same time, one of said members being provided between said contacts with a vertical pivot and the other of said members being provided with an enlarged opening receiving said pivot whereby the bridging member can oscillate on said pivot and also move laterally to insure engagement with the vertical sides of both of said contacts at the same time, and a throw arm pivotally mounted on said base and provided at one end with laterally spaced substantially vertical ears, said bridging member being provided with a lever projecting laterally and slidably disposed between said ears whereby movement of said throw arm oscillates said bridging member about said pivot.

5. A snap switch comprising an insulating base, a forked trigger pivotally mounted, a throw arm pivotally mounted, a spring connected between said trigger and said throw arm for pressing said throw arm in a direction towards the base and also for imparting rapid movement from the throw arm when the trigger is moved to a predetermined point, a plurality of fixed vertical electrical contacts, a vertical pintle on said base positioned between said contacts, an electrical bridging blade for engaging the vertical sides of said terminals to close the circuit or to be disengaged from said contacts to open said circuit, said throw arm being provided with a pair of laterally spaced ears substantially perpendicular to it, said bridging blade having an enlarged opening for receiving said pintle, and a lever arm connected to said bridging blade, said lever arm being substantially parallel to said throw arm and project-

ing between said depending ears whereby movement of said throw arm will oscillate said bridging blade about said pintle.

- 5 6. A switch comprising a throw arm and an electrical bridging member, a lever on said bridging member whereby said bridging member may be moved, said lever extending substantially parallel to the plane of movement of the bridging member, means whereby said throw arm may be
10 pivoted at one end, a forked trigger, a torsional spring operably connected to said trigger and said throw arm, and spaced arms adjacent the other end of said throw arm and extending substantially perpendicular to said plane of movement
15 where by one or the other of said spaced arms may move said lever whereby said bridging member will be moved to open or closed circuit position.

7. In an electrical switch, an electrical conducting bridging member having electrical contact arms, an elongated rectangular-like opening in the center of said bridging member, an integrally formed lever arm on said bridging member, manually operable means in engagement with said lever arm for actuating it, a pivot interfitting loosely with said rectangular-like opening, said bridging member being adapted to be oscillated and moved in a linear direction transversely of said pivot, and stationary electrical pin-like contact elements substantially parallel to said pivot and arranged to be bridged by said bridging member to form an electrical connection from one of said contact elements to the other.

CLARENCE J. HATHORN.