Feb. 3, 1942. A. L. RICHE 2,272,021

SNAP SWITCH

Original Filed Nov. 30, 1938

Fig. 1

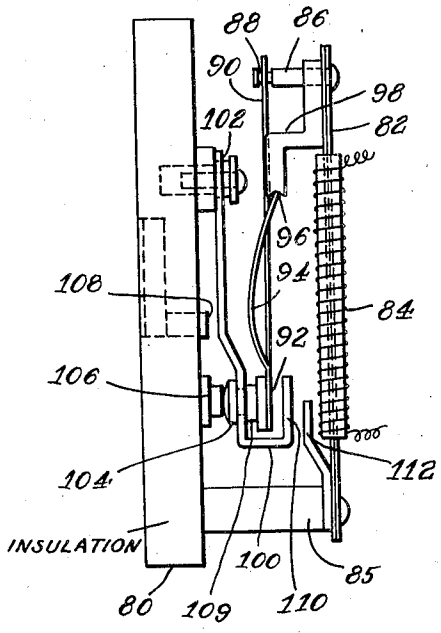
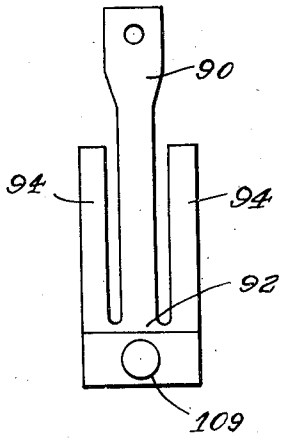


Fig. 2



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SNAP SWITCH

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Original application November 30, 1938, Serial No. 243,286, now Patent No. 2,236,699, dated April 1, 1941. Divided and this application August 3, 1940, Serial No. 350,306

7 Claims. (Cl. 200—138)

This invention relates to improvements in snap switches and more particularly to improvements in the snap switch forming the subject matter of McGall Patent No. 1,960,020, issued May 22, 1934.

This application is a division of my application Serial No. 243,286, filed November 30, 1938, now Patent No. 2,236,699, issued April 1, 1941, which in turn constituted a continuation in part of my application Serial No. 52,778, filed December 4, 1935.

It is an object of this invention to provide a compact and serviceable snap switch of the McGall type especially adapted for use in conjunction with thermostatic metal.

The specification is to be read in conjunction with the appended drawing which illustrates a specific embodiment of my invention, and in which:

Fig. 1 shows a specific type of switch including my invention; and,

Fig. 2 is a view of the combined compression and tension element of Fig. 1.

In the thermostatic switch construction of Fig. 1, the entire mechanism is supported upon an insulating base 80. A thermostatic metal strip 82, subject to the heating effect of a coil 84 is mounted in cantilever fashion on post 85 which in turn is supported on the base 80. Attached to the unmounted end of the thermostatic member 82 is a stud 86 which is provided with a necked portion 88, and also an anchor bracket 98 having a notched portion 96. The spring snap element comprises a tension member 90 and a pair of bowed compression springs 94, which are pivotally supported on the necked part of stud 86 and the notch 96 of the anchor bracket 98.

The tension and compression members 90 and 94 may conveniently be stamped out of one piece of thin sheet spring material such as phosphor-bronze, beryllium bronze or the like, so that the tension and compression members constitute spring strips connected together at their movable end 92. The relative lengths of the respective tension and compression strips are such that when the spring is mounted on the stud 86 and bracket 98, the compression springs 94 are bowed in compression as shown so that the spring, with its tension and compression members 90 and 94, constitutes a snap acting spring toggle. This toggle spring carries a weight 109 at the movable end 92.

A loosely mounted iron or other magnetic pendulum like member 100 is suspended from a suitable stud support 102 which is mounted on the base 80. The pendulum like member 100 is turned back on itself at its lower end to provide a U-shaped portion, the legs of which constitute spaced apart stops for the toggle spring with its weight 109. Attached to the bottom part of the pendulum like member 100 is a contact 104 which bridges a pair of stationary electric contacts 106, only one of which is shown in the drawing. A magnet 108 is mounted on the base and spaced from the pendulum 100. The magnet tends to attract the pendulum and thus it insures good electrical connection of the bridging contact 104 with the two stationary contacts 106. It is obvious that the magnet may be mounted on the pendulum and that member 108 may be attracted thereby. When heated by the coil 84, the thermostatic metal strip 82 bows outwardly so that the tension center line of the tension strip 90 is carried across the axis of the pivot 96 of the compression springs 94 to thereby cause the connected end 92 with its attached weight 109 to snap over and hit a hammer like blow on the backwardly turned part 110 of the pendulum 100. This blow, in combination with the decrease in magnetic pull resulting from the increased separation of the iron pendulum 100 from the magnet 108, quickly separates the bridging contact 104 from the two stationary contacts 106 to break the electrical circuit. This break is rapid enough to permit handling of heavy currents. The spring action of compression spring 94 keeps part 110 lying against the stop 112 thereby holding the contacts apart until the thermostatic strip 82 cools and the switch thereupon returns with a snap action to the original position so that electrical contact is restored.

When the switch operates, the relative positions of the combined mounting points of the compression and tension members change with respect to the stops, the change of relative positions of both mounting points with respect to the stops being in the same general direction. Furthermore, the change of relative position of the stops with respect to the mounting points of the tension member is at least as great as the change of the relative position of the stops with respect to the mounting points of the compression members. While this change of relative positions of the mounting points and stops is described in connection with thermostatic metal as the actuating force, it is obvious that the same mode of operation may be obtained by mechanical means aside from temperature actuated devices.

The compression springs preferably are supported in a pivotal fashion as shown at 96 but

under certain conditions modified constructions may be employed, whereby the substantial equivalent of a pivot action is obtained. However, when reference is made in the claims to the snapping of the switch when the pivot point passes through the tension center line, it is intended to include modified constructions, wherein substantially that action takes place although a small deviation therefrom may occur.

Various modifications may be made of the construction described herein without departing from the scope of the appended claims.

I claim:

1. A snap switch comprising in combination, a tension member and an adjacent compression member each operatively mounted at one end and connected together at their opposite ends which are free to move, a loosely mounted magnetic pendulum like member having a U shaped end portion with the inner surfaces of the legs of the U constituting stops between which said connected end parts move, at least one of said tension and compression members comprising spring means, said compression member being mounted operatively at a point whereby it has a different radius of action than said tension member, said mounting point of said compression member and tension center line of said tension member being movable with respect to each other, a stationary electric contact, an electrical contact on the exterior side of one leg of said U shaped portion of said pendulum like member pressing against the stationary electrical contact, a magnet contiguous to and in such relation to said pendulum like member as to tend to hold said two contacts together, said connected end portion of said tension and compression members pressing against the electrical contact leg of said U shaped part when said two contacts are in engagement, the relative position of the combined mounting points of said tension and compression members and of said stops with respect to each other being changeable, the change of relative position of both said mounting points with respect to said stops being in the same general direction, said change of relative position of said stops with respect to said mounting point of the tension member being at least as great as the change of relative position of said stops with respect to said mounting point of said compression member, said tension and compression members and the switch as a whole being so constructed and arranged that the change of the relative position of the tension and compression member mounting points with respect to said stops causes the tension center line to move across the compression member mounting point and thereby causes said connected end portion of said tension and compression members to snap over with sufficient force against the opposite leg or stop of said U-shaped portion so that the pull of said magnet on said pendulum like member is overcome and said contacts are separated, thereby breaking the electrical circuit controlled thereby.

2. A thermostatically operated snap switch comprising in combination a strip of multilayered thermostatic metal mounted at one end thereof with the other end free to move with changes in temperature thereof, a tension member operatively mounted at the free end of said thermostatic strip with its opposite end free to move and extending toward the mounted end of said strip, a spring compression member adjacent said tension member and connected to the free end thereof and pivotally mounted at its other end between the mounted and connected ends of said tension member and at the free end of said thermostatic strip, the mounted ends of both said tension and compression members being so connected to the free end of said strip as to move therewith as the temperature thereof changes, stops between which said connected end portion of said compression and tension members moves, said members being so constructed and arranged that said connected end portion moves with a snap action between said stops as said compression member mounting point and said tension member center line cross, said stops being formed by the inner surfaces of the legs of a U-shaped end portion of a loosely-mounted magnetic pendulum-like member, an electrical contact on the exterior side of one leg of said U-shaped end portion and pressing against stationary electrical contacts, said stationary contacts controlling an electrical circuit, a magnet contiguous to and in such relation to said pendulum-like member as to tend to hold said contacts together, said connected end portion pressing against the electrical contact leg of said U-shaped part when said contacts abut each other, said switch being so constructed and arranged that when said compression member mounting point crosses said tension center line said connected end portion snaps over with sufficient force against the opposite leg or stop that the pull of said magnet on said pendulum-like member is overcome and said contacts are separated thereby breaking the electrical circuit through said stationary contacts.

3. A snap switch comprising in combination, a tension member and an adjacent compression member, each operatively mounted at one end and connected together at their opposite ends which are free to move, stops between which said connected end part moves, said stops themselves being movable in the direction of movement of said connected end portion, at least one of said tension and compression members comprising spring means, said compression member being mounted operatively at a point whereby it has a different radius of action than said tension member, said mounting point of said compression member and the tension center line of said tension member being movable with respect to each other, said tension and compression members being so constructed and arranged that said connected end portion moves with a snap action as said compression member mounting point and said tension member tension center line cross, the relative position of the combined mounting points of said tension and compression members and of said stops with respect to each other being changeable, the change of relative position of both said mounting points with respect to said stops being in the same general direction, said change of relative position of said stops with respect to said mounting point of said tension member being at least as great as the change of relative position of said stops with respect to said mounting point of said compression member, one of said stops comprising magnetic material, a magnet contiguous to said magnetic material in one position and tending to hold the stop associated therewith in said position, said connected end portion also pressing against said stop to urge it toward said magnet and being of sufficient weight and said snap switch being so constructed that a hammer-blow is directed against the opposite stop when said switch snaps over, the force of the blow being sufficient to overcome the magnetic attraction between said contigous magnetic members.

4. In an electric contactor, fixed and movable contacts, a carrier on which the movable contact is mounted, the carrier being movable between two extreme positions in one of which the contacts are engaged to complete a circuit and in the other of which the contacts are separated to break the circuit, a portion of the carrier serving as an armature, a magnet positioned to attract the armature and tend to hold the contacts in engagement with one another, and a snap-spring mechanism having limited freedom of movement with respect to the carrier but adapted to engage the carrier after the snap-spring mechanism has passed a substantial distance beyond its dead-center position in either direction and thereafter shift the carrier from one to the other of its extreme positions.

5. In an electric contactor, fixed and movable contacts, a carrier on which the movable contact is mounted, the carrier being movable between two extreme positions in one of which the contacts are engaged to complete a circuit and in the other of which the contacts are separated to break the circuit, a portion of the carrier serving as an armature, a magnet positioned to attract the armature and tend to hold the contacts in engagement with one another, and a snap-spring mechanism having a free end portion adapted to snap to one or another of two opposed positions when moved past a dead-center position, said end portion being movable between a pair of spaced apart portions of the carrier so as to forcibly engage one of these portions and move the carrier to one or the other of its extreme positions after the said end portion of the snap-spring mechanism has passed its dead-center position.

6. In an electric contactor, fixed and movable contacts, a magnetic detent normally tending to hold the contacts in engagement to complete a circuit, and a snap-spring mechanism having a lost-motion connection with one of the contacts whereby the snap-spring mechanism may be moved a substantial distance beyond its dead-center position and will thereafter engage and move the contact to break the circuit.

7. A snap switch comprising, in combination, an elongated member operatively mounted at one end with the opposite end free to move, stops between which said free end moves, said switch being so constructed that said free end moves from one stop to the other with a snap action, said stops being movable in the direction of movement of said free end portion, one of said stops comprising magnetic material, a magnet contiguous to said magnetic material in one position and tending to hold the stop associated therewith in said position, said free end portion also pressing against said stop to urge it toward said magnet and being of sufficient weight and said snap switch being so constructed that a hammer-blow is directed against the opposite stop when said switch snaps over, the force of the blow being sufficient to overcome the magnetic attraction between said contiguous magnetic members.

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