

Aug. 22, 1939.

A. L. RICHE

2,170,767

SNAP SWITCH

Filed Jan. 27, 1937

2 Sheets-Sheet 1

Fig. 1.

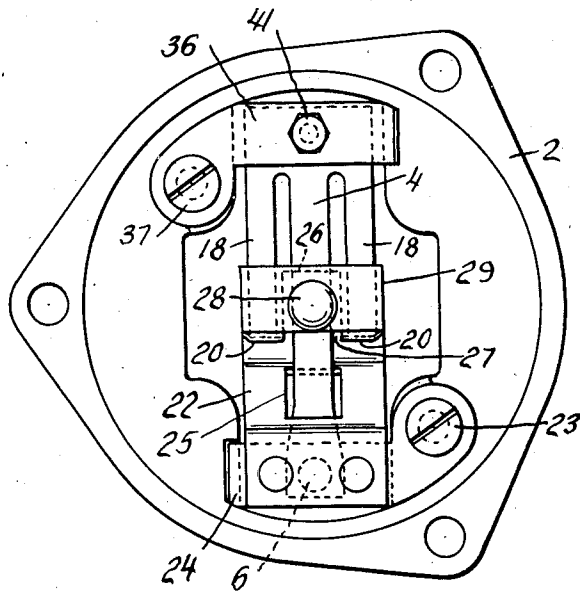


Fig. 2.

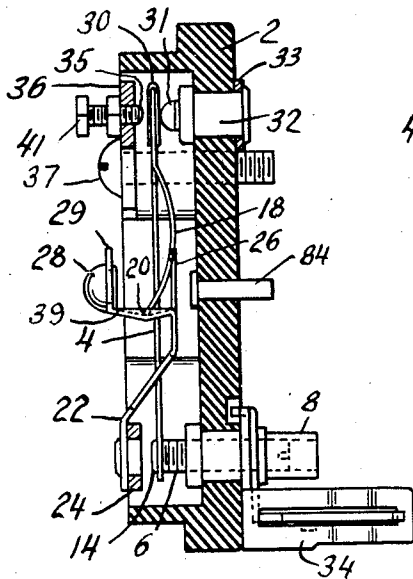


Fig. 3.

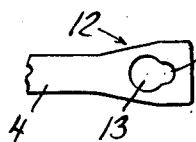


Fig. 4.

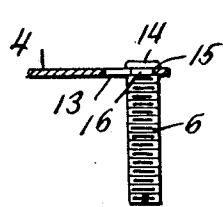


Fig. 5.

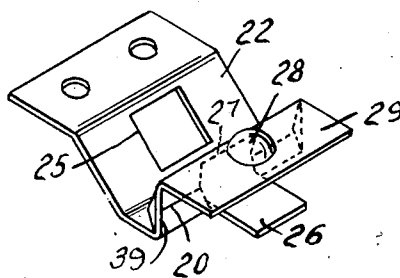
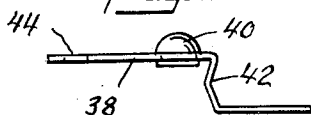


Fig. 6.



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2 Sheets-Sheet 2

Fig. 7.

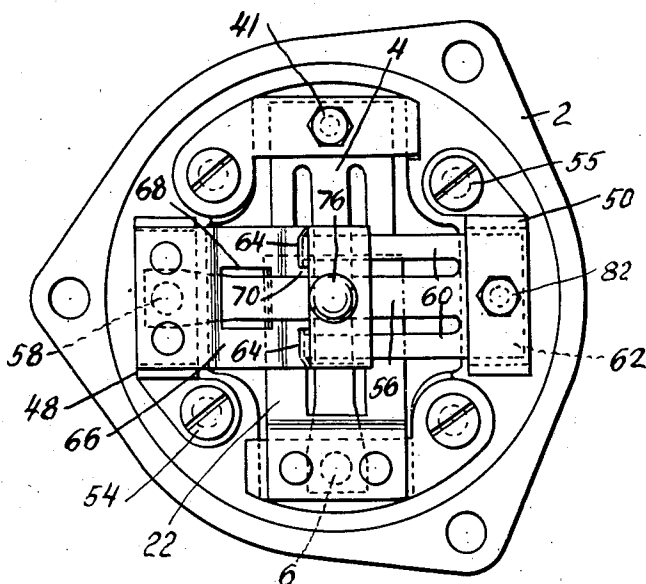
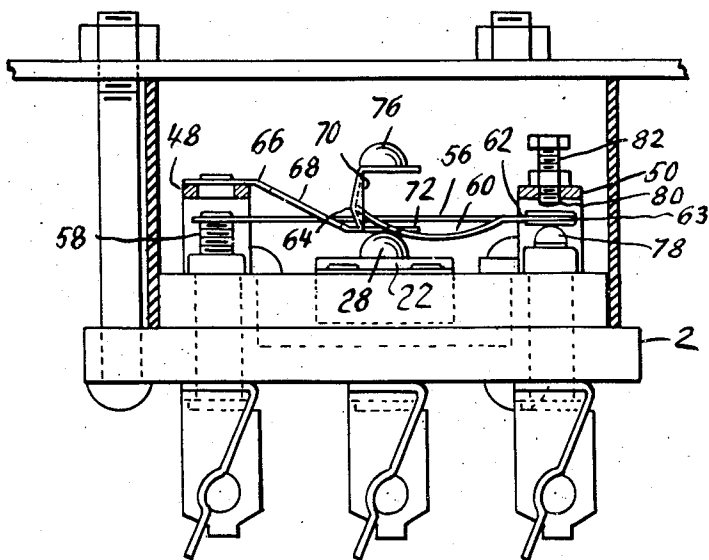


Fig. 8.



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SNAP SWITCH

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tion, Freeport, Ill., a corporation of Illinois

Application January 27, 1937, Serial No. 122,488

4 Claims. (Cl. 200—67)

This invention relates to snap switches, and more particularly to improvements in the type of snap switch which is described in McGall Patent No. 1,960,020, issued May 22, 1934.

The object of the invention is to provide an improved snap switch of the type mentioned above which has superior operating characteristics and which may be economically constructed; that may be used to control a number of independent electrical circuits; and that is susceptible of ready adjustment to permit complete control of all operating characteristics of the switch.

The following description is to be read in conjunction with the accompanying drawings, in which specific embodiments of my invention are disclosed. In the drawings:

Fig. 1 is a plan view of a snap switch assembly constructed in accordance with the invention;

Fig. 2 is a cross sectional elevation of the switch shown in Fig. 1;

Figs. 3 and 4 are detail views showing the tension member mounting construction;

Fig. 5 is a perspective view of the preferred operating lever;

Fig. 6 is an elevation of another form of operating lever;

Fig. 7 is a plan view of a multiple snap switch assembly; and

Fig. 8 is a cross sectional elevation of the switch shown in Fig. 7.

The snap switch mechanism is mounted in a suitable housing or base 2 of "Bakelite" or other suitable insulating material. Tension member 4, which may be in the form of a metallic strip as shown, is mounted at a point on base 2 by means of adjustable screw 5 threaded into post 8 which is rigidly riveted in base 2. The details of a garter-fastener type of joint which is preferably used in mounting tension member 4 to screw 6 are shown in Figs. 3 and 4. A keyhole shaped eye 12 in the anchored end of tension member 4 has a receiving portion 13 sufficiently large to admit head 14 of screw 6. The part 15 of eye 12 nearest the end of tension member 4 is smaller and is adapted to fit snugly around neck portion 16 of screw 6 when member 4 is under tensile stress. This construction prevents twisting of the tension strip and provides a comparatively large bearing surface. Danger of change in the length of tension strip 4 due to wear or bending of the bearing edge is thereby eliminated. Compression spring strips 18 are connected to the free end of tension member 4 and are bowed with their other ends arranged in grooves 20 provided on an actuating spring lever 22 to form a pivot at this point.

This actuating lever may be mounted cantilever fashion on base 2 by means of bracket 24 and screw 23. While lever 22 may be mounted either at a point on the base opposite from the anchorage of strip 4 or in proximity to the anchorage, the latter construction is preferable. With such arrangement, the effective mounting points of the tension and compression members are not separated by any considerable length of moulded material which is susceptible of irregularities in manufacture and changes due to temperature. Uniformity in manufacture and operation is thereby promoted. Lever 22 is provided with openings 25 and 27 to allow strip 4 to pass through it. Opening 27 may be made by punching the metal on three sides only and bending the metal on the fourth side to form a tongue 26. Button 28 may be fixed on portion 29 of lever 22 at the point of application of the switch actuating force. An electrical contact block 30 is secured to the free end of strip 4. A stationary contact 31 is mounted on post 32, in base 2, and when contact block 30 engages this stationary contact, an electric circuit operated by the switch is closed. Contact 31 and block 30 preferably are made of silver to minimize sparking and terminal corrosion. A ground strip 33 may be connected to contact post 32 or the usual terminal assembly, shown at 34, may be used. In the double throw switch shown in Figs. 1 and 2, a combined stop and contact 35 is provided on a bracket 36 to limit the movement of the free end of strip 4 when the switch is in open position and to connect the switch in another circuit. Any suitable stop may be used in place of contact 35 in a single acting switch. As shown, this stop may be made adjustable, or it may be a stationary member. Adjustability is sometimes desirable to control the air gap between the two contacts in open switch position and to secure certain switch characteristics as hereinafter more fully described.

Tension member 4 and compression strips 18 may be punched from a single sheet of spring material, such as beryllium copper or phosphor bronze. Although any number of tension and compression strips may be used, I prefer to use a single tension strip and a compression strip on each side thereof.

The switch is so constructed that contacts 30 and 31 are together, as shown in Fig. 2, when pivot point 20 is above the tension center line of tension member 4. This tension center line is not necessarily the physical center line of member 4. Actuating pressure exerted downwardly on button 28 of lever 22 causes pivot point 20

of compression strips 18 to move downwardly until it crosses the tension center line of tension strip 4 whereupon the free end of tension strip 4 is caused to move upwardly to stop 35 with a snap action, thereby opening the electric circuit. When the actuating pressure is released and lever 22 springs back to its normal position, pivot point 20 again crosses the tension center line, thereby causing contact to be resumed between electrical contacts 30 and 31.

Assuming that the actuating force applied to button 28 is exerted at this point in a direction substantially perpendicular to the plane of the tension strip 4 of the snap action mechanism, an appreciable bending occurs in cantilever spring member 22, especially in turned-up portion 39, in such a manner that pivot point 20 moves outwardly as well as downwardly, this movement operating to increase the compressive stress in compression members 18 before the switch snaps over. Although lever 22 is mounted at a point above the groove 20 (see Fig. 5), it is mounted in cantilever fashion and therefore portion 39, when it is depressed, rotates not around the point of cantilever support but about some point well down on the two flexible portions which flank the opening 25. The outward movement of the groove 20 (to increase the compression of bowed spring 18) results from an effective rotation of the turned-up portion 39 about a point below the groove 20. It has been found that the snap action of the switch is more positive when the increase in compressive stress in strips 18 accompanies vertical movement of pivot point 20 in the actuation of the switch, and that sizzling and flickering of the switch are decreased.

Concentric location of button 28 with respect to base 2 is highly desirable for certain purposes, for example, in governor applications. In certain cases operation of the switch by a small force moving through a relatively great distance may be desirable. By extending out-turned portion 29 of lever 22 and moving button 28 outwardly to shift the point of application of actuating force away from the support of lever 22, the operating modulus of the switch may be decreased. The switch may also be adapted for actuation by a relatively large force and little motion. To effect this mode of operation, the actuation spring lever 38 in Fig. 6 may be substituted for lever 22, operating button 40 being placed at any point on the lever arm intermediate the pivot point 42 and the point of support 44.

A valuable advantage of the invention lies in its adaptability to multiple switch construction by means of which a series of electric circuits may be controlled, contacts being made in a predetermined succession. Figs. 7 and 8 show two views of a multiple switch in which two switching mechanisms similar in construction to that shown in Figs. 1 and 2 are used, one switch being superimposed upon the other and arranged at an angle to the other. The switch mechanisms may be placed at right angle as shown, for convenience, or a different angle may be used advantageously where the switch is made up of more than two switching mechanisms. The superimposed switch structure is supported by means of bridges 48 and 50 fastened to base 2 by screws 54 and 55. The superimposed switch comprises spring tension strip 56 operatively mounted on post 58 and conveniently positioned crosswise to a like member of the lower switch.

Compression springs 60 are attached to the free end 62 of tension strip 56 and are pivotally mounted in notches 64 of cantilever spring lever 66 which is mounted on bridge 48. Tension strip 56 passes through openings 68 and 70 corresponding to openings 25 and 27 of Fig. 5, the metal removed to form opening 70 being bent downwardly to provide tongue 72 extending toward the free end of tension strip 56. The two switches are so arranged and mounted with respect to each other that tongue 72 is in close proximity to button 28 of the lower switch mechanism, whereby the downward movement of lever 66 caused by the application of pressure to button 76 may be used to operate the lower switch.

The free end 62 of tension strip 56 has a contact block 63 mounted thereon which operates between lower stationary contact 78 and upper stop 80. Upper stop 80 may be adjustable by means of an adjusting stud 82 mounted in bridge 50. Levers 66 and 22, adjusting screws 58 and 6, and studs 82 and 41 may be so adjusted that both switch mechanisms operate at exactly the same instant or the upper switch may be made to operate either before or after the lower switch operates. If desired, the sequence of operation resulting from depression of lever 66 may be altered so that upon partial release of the operating pressure any one of the switch mechanisms may be caused to operate first; i. e., the switch operating last on depression of lever 66 need not necessarily be the first to operate on the return movement of the lever. Any desired predetermined succession of operation is obtainable by proper adjustment of the air gaps of the individual switches and position of the mounting point of the individual tension members to adjust the distance through which each individual pivot point must be moved before crossing the tension center line of the tension strip, at which point the switch operates. It is obvious that the superimposition of individual units into a unitary structure may be extended to include additional switch mechanisms to operate a corresponding number of electric circuits in predetermined relation without necessitating more than minor modifications of the constructions shown in Figs. 1 and 2, as exemplified by the construction of Figs. 7 and 8. Each switch mechanism may be made double acting.

A switch of the contact sustaining type may be constructed by providing a suitable plunger 84 (Fig. 2) in base 2 operating against tongue 26, and properly adjusting stud 41 and screw 6 so that when contact 30 touches stop 35, spring lever 22 is prevented from returning to its normal position by the vertical component of the force exerted by compression members 18; pivot point 20 is not carried above the tension center line of tension member 4. This switch may be operated to open one circuit by the application of pressure on button 28, and will remain in the open position after the actuating pressure is released. To close this circuit the switch lever 22 is pushed upwardly by means of plunger 84, thereby moving pivot point 20 upwardly across the tension center line.

While I have shown the preferred embodiment of my invention, a number of modifications may be made without departing from the spirit thereof. For example, the operating lever may be mounted on the switch base near the free end of the tension member, if desired, although I have shown member 22 mounted at the point of anchorage

of the tension strip. It will be seen that such an arrangement would cause the desired increase in stress in the compression members as the switch is actuated as above described.

A switch constructed as described has an unusually long operating life since the operating element is nowhere subject to short radius stresses. The switch provides its own resilient overtravel, the cantilever spring member being free to move through the whole distance traveled by the external member applying the actuating force to the switch. Although the numerous adjusting facilities are simple in construction, they permit complete control over all switch operating characteristics. The operating mechanism is readily accessible for adjustment during manufacture or use, and the particular construction is readily adaptable to multiple circuit control.

I claim:

1. A snap switch comprising, in combination, a base, an elongated tension member having one end operatively mounted on the base, a cantilever spring member mounted upon the base in proximity to the mounting point of the tension member, said cantilever member comprising a flexible portion extending to a point under the tension member, said cantilever spring member having an up-turned portion having an opening therein through which the tension member passes and a turned-out portion extending along the top side of the tension member, spring strips bowed in longitudinal compression between the free end of the tension member and pivot points on the free end of the cantilever spring member, and a pair of stops between which the free end of the tension member moves, the members being so arranged that the free end of the tension member moves with a snap action as the cantilever spring member is depressed to move the pivot point across the tension center line of the tension member.

2. A snap switch, a base of insulating material, a metallic strip extending across the base, means mounted on said base for supporting one end of said metallic strip, a leaf spring member mounted cantilever fashion on the base, metallic compression strips between the free end of the spring member and the free end of the metallic strip, an electrical contact mounted in the base in proximity to the free end of the metallic strip, a stop mounted on said base in proximity to the free end of the metallic strip and limiting movement thereof, a second metallic strip extending across the base in a plane above the plane of said first-mentioned metallic strip and at an angle to said strip, means mounted on said base for supporting one end of said second metallic strip, a second leaf spring member mounted cantilever fashion on the base, a metallic compression strip between the free end of said second spring member and the free end of said second metallic strip,

a second electrical contact mounted in the base in proximity to the free end of said second metallic strip, and a second stop mounted on the base in proximity to the free end of said second metallic strip and limiting movement thereof, the first leaf spring member having a portion extending above said first-mentioned metallic strip and the second leaf spring member having a portion extending below said second metallic strip in proximity to the extended portion of said first leaf spring member whereby depression of the second spring member causes depression of the first spring member.

3. A snap switch comprising in combination, a base, an elongated tension member having one end operatively mounted on said base, a cantilever spring member mounted upon said base in proximity to the mounting point of the tension member and extending along the tension member, a spring strip bowed in longitudinal compression between a pivot point on the free end of the cantilever spring member and a point on the free end of the tension member, and a pair of stops between which the free end of the tension member moves, said cantilever spring member comprising a supporting portion, a turned up portion, a groove in said turned up portion adapted to receive the pivot end of the compression spring strip, a flexible portion between said supporting portion and said turned up portion, and a turned out portion extending along the tension member away from said supporting portion and adapted to receive the applied actuating force, the arrangement and construction of said members being such that the cantilever spring member is adapted to be depressed to move the pivot point of the spring strip across the tension center line of the tension member, to cause the free end of the tension member to move with a snap action between its stops.

4. In combination in a snap switch construction, a base of insulating material having a recess therein, a metallic strip extending across said recess, means mounted on said base for supporting one end of said metallic strip, a bracket mounted on the base, a cantilever leaf spring member mounted on said bracket, said cantilever leaf spring member extending from its point of support to a point under said first mentioned metallic strip, thence upwardly to a point above the first mentioned strip, and thence outwardly along said first mentioned strip, the upwardly extending portion having a hole therein through which said first mentioned strip passes, metallic strips extending between said cantilever spring member and the free end of said first mentioned strip, and a pair of stops mounted on said base between which the free end of said first mentioned strip moves, at least one of said stops constituting an electric contact.

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