April 30, 1957 W. L. CHERRY, JR 2,790,866

SNAP-ACTION SWITCHES

Filed Feb. 2, 1955 2 Sheets-Sheet 1

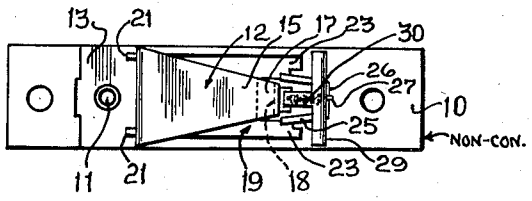


Fig. 1.

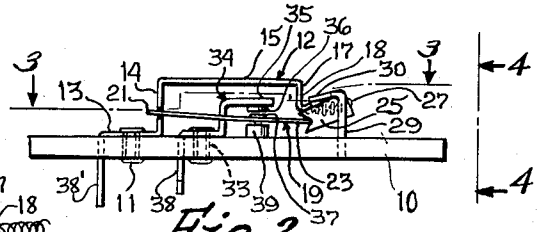


Fig. 2.

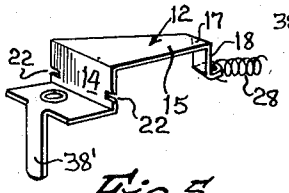


Fig. 5.

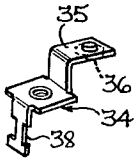


Fig. 6.

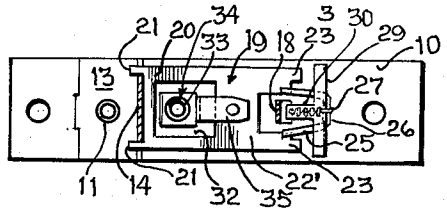


Fig. 3.

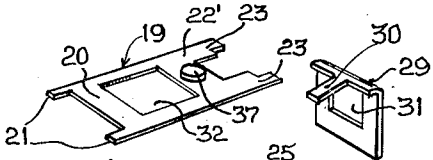


Fig. 7.

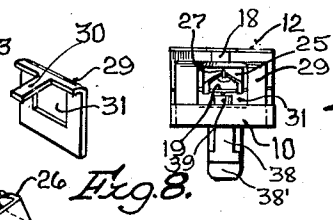


Fig. 8.

Fig. 4.

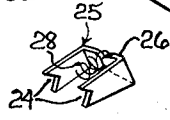


Fig. 9.

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SNAP-ACTION SWITCHES

Filed Feb. 2, 1955 2 Sheets-Sheet 2

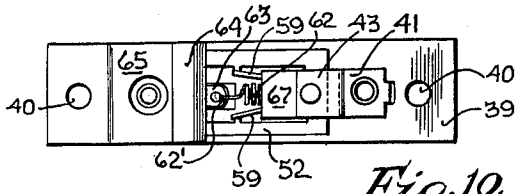


Fig. 10.

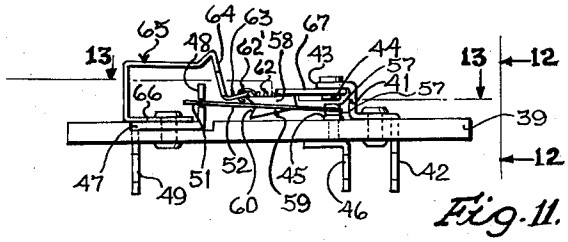


Fig. 11.

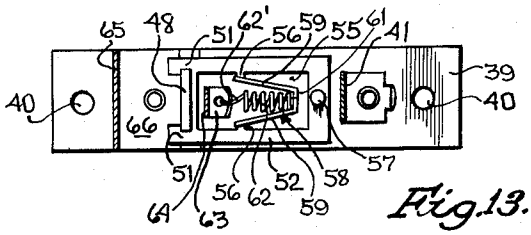


Fig. 13.

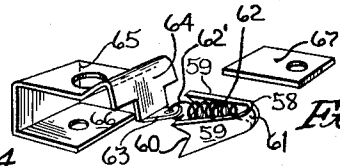


Fig. 14.

Fig. 15.

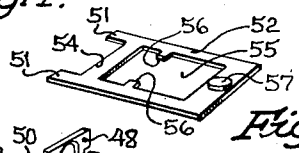


Fig. 16.

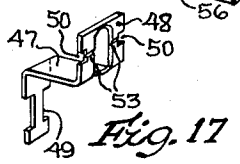


Fig. 17

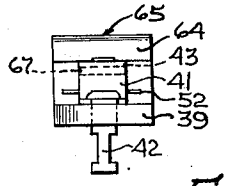


Fig. 12.

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SNAP-ACTION SWITCHES

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Application February 2, 1955, Serial No. 485,709

3 Claims. (Cl. 200—67)

This invention relates to snap-action switches of the type in which quick snap action of the switch blade is desirable by the minimum movement of an actuator therefor.

Viewed from this aspect, the invention contemplates a snap-action switch in which the contact pressure between confronting contact heads remains substantially constant while the actuator approaches the tripping point, thereby to prevent overheating of the contact heads due to intimate mating and to further eliminate chatter therebetween due to vibration.

Another and equally important object of the invention is the provision of a snap-action switch wherein once the same is in motion, the moving contact blade moves at a predetermined rate of speed in one direction independently of any further movement of the actuator, thereby providing what is known in the art as a "tease-proof" switch.

Yet another and equally important object of the invention is to provide a snap-action switch simple in construction, economical in manufacture, and highly efficient in use.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

Fig. 1 is a plan view of the invention;

Fig. 2 is a typical side elevational view of the same;

Fig. 3 is a sectional detail view taken substantially on line 3—3 of Fig. 2;

Fig. 4 is an end elevational view of the invention as viewed in the direction of line 4—4 of Fig. 2;

Fig. 5 is a perspective view of the actuator embodied in the invention;

Fig. 6 is a perspective view of a contact-bearing post embodied in the invention;

Fig. 7 is a perspective view of the switch blade embodied in the invention;

Fig. 8 is a perspective view of a mounting bracket embodied in the invention;

Fig. 9 is a perspective view of an actuating link embodied in the invention;

Fig. 10 is a plan view of a modified form of the invention;

Fig. 11 is a typical side elevational view of the same;

Fig. 12 is an end elevational view thereof as viewed in the direction of line 12—12 of Fig. 11;

Fig. 13 is a sectional detail view taken substantially on line 13—13 of Fig. 11;

Fig. 14 is a perspective view of the actuator embodied in the invention shown in Fig. 10, with one end of the tension spring connected thereto and the opposite end of such spring connected to a link;

Fig. 15 is a perspective view of a non-conductive plate embodied in the invention shown in Fig. 10;

Fig. 16 is a perspective view of the switch blade embodied in the invention shown in Fig. 10;

Fig. 17 is a perspective view of the bracket which provides a seat for the switch blade shown in Fig. 16.

Preferably I accomplish the several objects of my invention by the form of construction shown in the accompanying drawings. In this connection, 10 indicates a mounting plate formed of any suitable non-conductive material. On this mounting plate 10 at one end thereof is secured as at 11 one end of an actuator 12. This actuator 12 is formed of spring material and bent to provide a flange 13 which is secured to the plate 10 as at 11. Extending upwardly from the flange 13 is an upright portion 14, from which extends the free end portion 15 of the actuator. The upright portion 14 supports the free end portion of the actuator in a plane substantially parallel with and in spaced relation with respect to the plate 10. The end 17 of the actuator is bent downwardly and then outwardly as at 18.

The switch blade is indicated at 19 and is likewise formed of such material as will best serve the purpose. One end portion 20 of the blade 19 provides spaced parallel fingers 21 which project into notches or slots 22 formed in the upright portion 14 of the actuator 12 adjacent the flange 13.

The opposite end portion 22' of the blade 19 provides parallelly extending fingers 23 which engage in V-shaped notches 24 formed in a substantially U-shaped actuating link 25.

Secured to the bight 26 of this link 25 is one end portion 27 of a spring 28, the opposite end portion of the spring being connected to the extension 18 of the actuator 12 at a point below the plane of the portion 15 thereof.

On the plate 10 is secured a stop 29 having at its outer end portion an angularly bent extension 30 overlying the spring 28 and arranged to engage the extension 18, whereby to limit upward movement of the actuator 12 as seen in Fig. 2. This stop 29 is provided with a cut-out portion 31 within which operates the bight portion 26 of the link 25 and serving to limit the pivotal action of the link 25 in an anti-clockwise direction, as viewed in Fig. 2, under the action of the actuator 12. The stop 29 also serves to limit return movement of the actuator 12.

The switch blade 19 provides a rectangularly shaped opening 32. Positioned in this opening 32 beneath the free end portion 15 of the actuator and connected to the plate 10 as at 33 in any suitable manner, is an arm 34, one end 35 of which overlies the switch blade 19 and carries a contact head 36. This head is adapted to have bearing engagement with a companion contact head 37 carried by the blade. The arm 34 provides a terminal 38, as does the flange 13 of the actuator. To these terminals 38 and 38' are connected the ends of a conductor wire (not shown).

The switch blade 19, when in the position shown in Fig. 2, bears against a non-conductive stud 39, thereby limiting its pivotal movement in a downward direction as viewed in Fig. 2. Substituted for this stud 39 may be a contact head similar to the head 36, for engagement with the switch blade 19, thereby to convert the switch into a double-throw switch, if desired.

The switch blade 19 and the actuator link 25 form together a toggle normally under compression and in which the link 25 under the action of the spring 28 causes the blade to flex downwardly in snap-action contact with the stud 39. The spring 28 under tension bears the link against the stop 30.

When pressure is applied to the free end portion 15 of the actuator 12, it will be flexed against its own resistance. The flexing of such actuator will cause the

spring 28 to exert an overthrow pull on the link 25, pivoting the same about its point of pivotal connection with the blade 19. As the link 25 approaches a straight line position with respect to the blade 19, such blade will be compressed against the upright 14 at the point of pivotal connection therewith, so that as soon as the link crosses such straight line, the blade will flex in snap action, bringing the contact head 37 into engagement with the contact head 36. Such contacts will remain in engagement until the pressure is relieved from the actuator, at which time the actuator 12 will return to its starting or initial position, causing the spring 28 to exert an overthrow pull on the link 25 in an opposite direction to flex the blade 19 in an opposite direction in snap-like action to disengage the contact heads 36 and 37. The stud 39 serves to limit the movement of the blade in this latter direction.

The contact pressure between the contact heads 36 and 37 increases as the actuator 12 approaches the terminus of its movement from starting position. Such an arrangement prevents overheating of the contact heads due to lack of intimate mating and also eliminates chatter due to vibration or the like.

In Figs. 10 to 17 inclusive I have shown a modified form of construction for accomplishing the several objects of my invention. In this connection, the mounting plate is of non-conductive material and is indicated at 39. The mounting plate 39 is provided with suitable openings 40 for mounting screws, bolts or the like. At one end portion of the mounting plate is mounted a rigid bracket 41 having a terminal 42 to which an electric wire (not shown) may be attached. The bracket 41 has a horizontal portion 43 which extends in parallel spaced relation with the plate 39. This portion 43 carries a contact head 44 in spaced relation with respect to a contact head 45 carried by the plate 39 and connected in a suitable manner to a terminal 46 to which a conductor wire (not shown) may be attached.

At the opposite end portion of the plate 39 is a rigid bracket 47 having a vertically extending portion 48 extending at substantitally a right angle with respect to the plate 39. This bracket 47 also provides a terminal 49 to which an electric wire may be attached. The bracket 47 as illustrated in Fig. 17 in its portion 48 provides spaced notches 50 into which fingers 51 of a switch blade 52 project. The bracket provides a V-shaped seat 53 into which the edge 54 of the blade 52 is seated. The blade 52 in the modified form of construction is formed of spring material and is substantially elongated in plan view and is provided with an opening 55 into which project lateral fingers 56. On opposite sides of the blade 52 are carried contact heads 57 for alternate engagement with the contact heads 44 and 45.

A substantially U-shaped rigid link 58 has in its arm portions 59 V-shaped notches 60 into which the fingers 56 engage to provide a pivotal connection between the link 58 and the blade 52. To the bight portion 61 of the link is connected in any suitable manner, one end portion of a tension spring 62, the opposite end portion 62' of the spring being connected to an extension 63 formed on a depending arm 64 of an actuator 65 formed of spring material, or such material as will best serve the purpose. This actuator has a reversely bent end portion 66 to provide a flange connected to the plate 39 at the point of connection between the plate 39 and the bracket 47.

To complete the invention, I provide a suitable plate of non-conductive material carried by the horizontally extending portion 43 of the bracket 41 and extending in the path of movement of the link 58 to provide a stop therefor limiting the pivotal movement of the link in an anticlockwise direction as viewed in Fig. 11.

The operation of the switch in its modified form of construction, as shown in Figs. 10 to 17, is substantially the same as the operation of the switch shown in Figs. 1 to 9 inclusive, both switches accomplishing substantially the same objects and results.

In the modified form, the pressure of the actuator exerted to flex the switch blade is at a point intermediate the end portions of the blade, whereas in the form shown in Figs. 1 to 9 inclusive, such pressure is at the free end portion of the blade. As in the case of the form of the switch shown in Figs. 1 to 9, as the actuator 65 of the modified form of construction approaches its terminus of movement, the pressure between the engaging contact heads is increased, thus assuring proper contact and eliminating arcing, overheating, and the like.

It will be apparent that I provide a snap-action switch capable of accomplishing the several objects of the invention by a construction which comprises the minimum number of parts, with the result that the same can be manufactured at an economical cost, resulting in a switch which will be highly efficient in use.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A snap-action switch comprising a non-conductive mounting plate, a flexible elongated actuator having one end portion bent to provide a flange secured to the plate for supporting an opposite free end portion of the actuator in parallel spaced relation with respect to the plate, an arm secured to the plate beneath the free end portion of the actuator and having an end portion extending in parallel spaced relation with respect to the plate, an elongated switch blade arranged between the plate and the free end portion of the actuator and extending in parallel relation with respect thereto, said actuator at its bent end portion and said switch blade at one end thereof, having cooperative means for supporting said switch blade in parallel relation with respect to the free end portion of the actuator and the plate, a substantially U-shaped link in length-wise relation with respect to the opposite end portion of the switch blade and having one end portion in pivotal abutment with respect to said opposite end portion of the switch blade, a stop carried by the plate and over-lying the end portion of the link opposite the end portion thereof in abutment with the switch blade to limit pivotal movement of the link in one direction with respect to the blade, a spring member having one end portion connected to the end of the free end portion of the actuator and an opposite end portion connected to the end portion of the link beneath said stop, a contact member carried by the plate beneath the end portion of the arm extending in parallel relation to the plate, and a contact member carried by the switch blade intermediate its end portions and in confronting relation with respect to the contact member carried by the plate.

2. A snap-action switch comprising a mounting plate, an actuator having one end portion secured to the plate and having an elongated flexible free end portion extending in parallel spaced relation with respect to said plate, an elongated switch blade extending in parallel relation with respect to and between the free end portion of the actuator and the plate, a contact member adjacent one end portion of the blade, means providing pivotal connection between the actuator and the opposite end of the blade at a point between the plate and the free end portion of the actuator, a link having one end portion in end abutment with and extending from said one end portion of the blade, means providing pivotal connection between the link and the blade at their point of abutment with respect to each other, said actuator hav-

ing at its free end portion a right angular extension extending toward said plate and disposed to bisect the long axis of the blade when the actuator is flexed in one direction, a spring member connected to said extension and to the link at a point opposite the latter's abutment with respect to the blade to pivot the blade in a direction opposite to the pivotal movement of the link when the latter is pivoted by flexing of the actuator in said one direction, stop means carried by the plate and cooperating with the extension of said actuator to limit the pivotal movement of said link in one direction relative to the blade by action of said spring member, and a fixed contact carried by said plate in position to be engaged by the contact of said blade.

3. The device defined by claim 2 in which the means providing the pivotal connection between the actuator and the blade comprises opposite slots formed in the actuator adjacent the end portion thereof secured to the

plate and opposite fingers provided by the blade and engaging in said slots.

References Cited in the file of this patent

UNITED STATES PATENTS

1,743,073	Simmons	Jan. 7, 1930
1,762,075	Petersen	June 3, 1930
2,157,156	Abendroth	May 9, 1939
2,313,341	Holmes	Mar. 9, 1943
2,405,014	Caparone	July 30, 1946
2,446,307	Shaw	Aug. 3, 1948
2,487,374	Riche et al.	Nov. 8, 1949
2,515,528	Rothwell	July 18, 1950
2,601,152	Kmiecik	June 17, 1952
2,631,205	Millard	Mar. 10, 1953
2,651,690	Raney	Sept. 8, 1953
2,728,826	Lauder	Dec. 27, 1955