Oct. 25, 1949. S. G. RANSOME 2,486,061

SNAP ACTION MECHANISM

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Fig. 1

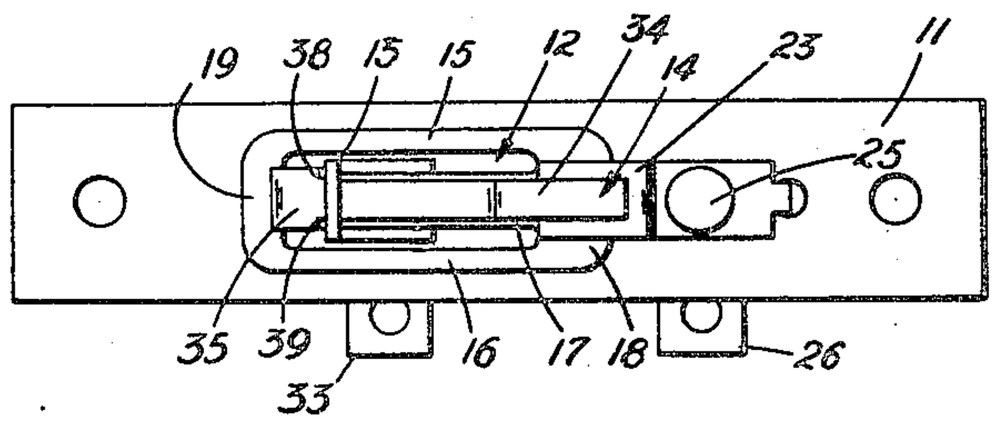


Fig. 2

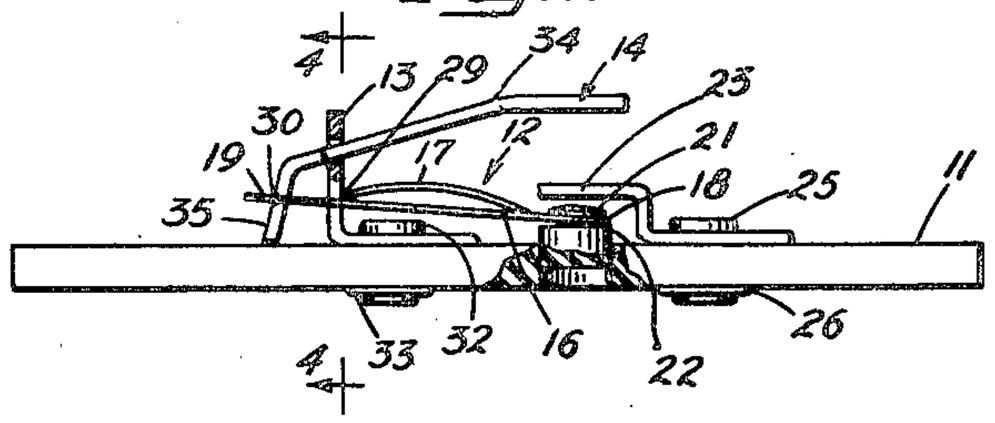
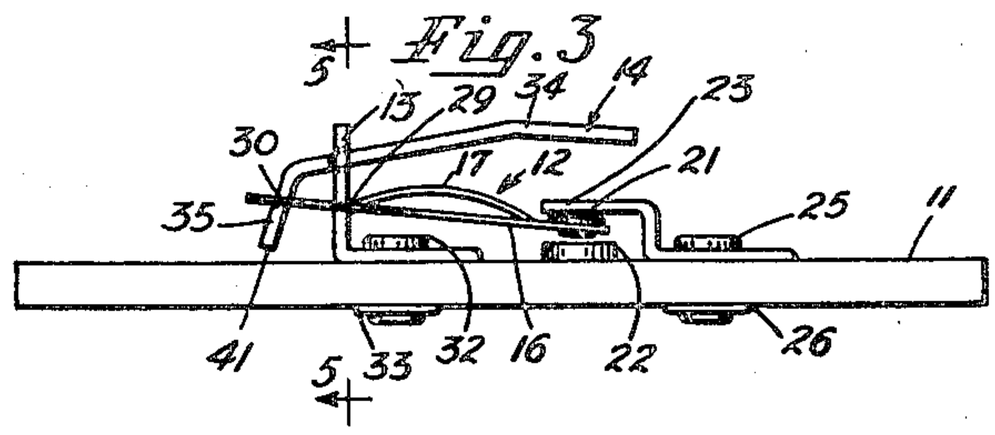


Fig. 3



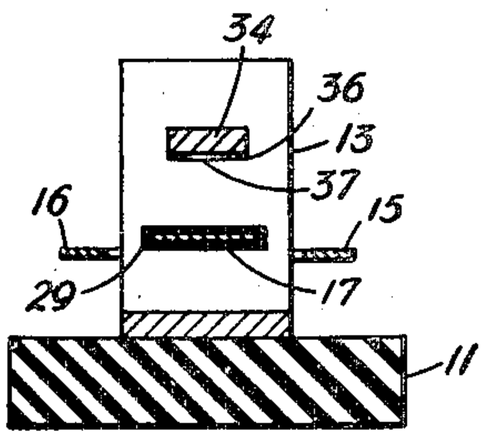


Fig. 4

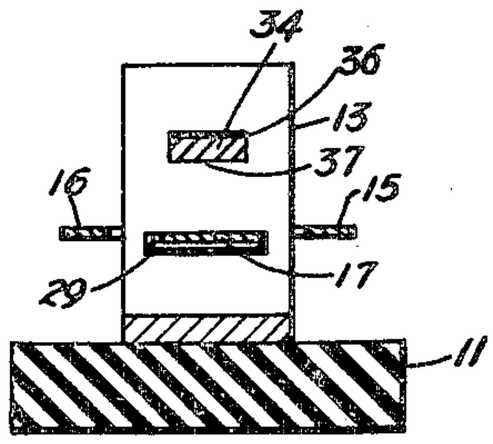


Fig. 5

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SNAP ACTION MECHANISM

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9 Claims. (Cl. 200—67)

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This invention relates to snap action devices and more particularly to an electrical switch utilizing an overcenter snap action spring system.

An object of the invention is to provide a switch of the above character with novel means for supporting and actuating the overcenter snap action spring system.

Another object of the invention is to provide a switch of the foregoing character which is of rigid and sturdy construction, which is compact, and which is simple to construct.

A further object of the invention is to provide a switch of the foregoing character which is positive and dependable in operation and which is relatively inexpensive to manufacture.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which—

Figure 1 is a plan view of a switch embodying my invention;

Fig. 2 is a side elevational view of the switch with the parts in their normal position;

Fig. 3 is a side elevational view similar to Fig. 2 with the parts in another position;

Fig. 4 is a transverse sectional view taken substantially along the line 4—4 of Fig. 2; and

Fig. 5 is a transverse sectional view taken along the line 5—5 of Fig. 3.

For purposes of illustration, the invention is shown embodied in a snap action switch mechanism supported on an elongated base 11 formed from suitable insulating material. In general, the switch mechanism comprises an overcenter snap spring system 12 supported by a bracket 13 mounted on the base 11 and a pivotally mounted lever 14. The latter is shaped and arranged so that movement of the lever 14 about its pivot actuates the snap spring system 12.

The overcenter snap spring system 12, in the illustrated embodiment of the invention, is in spaced relation with and overlies the base 11. The spring system comprises (see Figs. 1, 4, and 5) spaced tension members 15 and 16 respectively and a compression member 17 intermediate the tension members. The tension members are interconnected at opposite ends 18 and 19 respectively. The end 18 is formed to support a contact 21 movable between opposed stops 22 and 23 respectively with a snap action upon actuation of the overcenter snap spring system 12. The opposite end 19 interconnecting the tension members 15 and 16 is supported by the lever 14. The stops 22 and 23, as shown in Fig. 2,

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are in a spaced relation with the stop 23 overlying stop 22. The lower stop 22 herein is fashioned by pressing a portion of the base 11 to one side thereof while the stop 23 is formed by a Z-shaped metallic element rigidly secured to the base as by a rivet 25 or the like. The latter herein forms an electrical connection between the metallic element and the terminal 26 secured to the underside of the base 11. It is readily apparent that either stop may be formed from insulating material or that either or both stops may be fashioned to form electrical contacts depending upon the particular type of switch required for a given installation.

One end of the compression member 17 is integrally connected with the contact carrying end 18. The opposite end of the compression member is received in a notch 29 formed on the bracket 13 and opening toward the contact 21. The bracket 13 is in the form of an L-shaped member fashioned from conducting metal. The bracket 13 is secured to the base 11 as by a rivet 32 and is electrically connected to terminal 33 secured to the underside of the base 11 in spaced relation with terminal 26.

My invention is directed to a construction in which the lever 14 is utilized not only for supporting stressed members forming the snap spring system but is also utilized for actuating the snap spring system. In this embodiment of the invention the lever 14 is shaped to support the end 19 interconnecting the tension members 15 and 16; and, intermediate its ends, the lever 14 is provided with a fulcrum positioned between the end 19 and the supported end of the compression member 17 so that by swinging the lever about the fulcrum the tension members 15 and 16 are moved longitudinally and laterally relative to the compression member 17. When the tension members move past the supported end of the compression member the snap spring system goes overcenter or passes through its axis of maximum stress, whereupon the contact 21 is moved from engagement with the stop 22 into engagement with the contact or stop 23 with a snap action. The longitudinal component of movement is effective to produce a pronounced and rather extensive wiping action between the contacts.

The bracket 13 as shown in Figs. 2 and 3 in the present embodiment of the invention forms the fulcrum for the lever 14. The lever 14 is a rigid member and comprises a narrow elongated portion 34, and an enlarged portion 35. The narrow elongated portion 34 extends through an aperture 36 formed as a rectangular opening on

the bracket 13 spaced from the notch 29, receiving the end of the compression member 17. As shown, the lever 14 rests on the lower side wall 37 (see Figs. 4 and 5) of the opening 36 and this side wall forms a fulcrum or pivot point about which the enlarged end 35 of the lever 14 is swingable. The enlarged end 35 is shaped to support the end 19 interconnecting the tension members. For this purpose, the end 35 is formed with a notch 30 extending transversely across the lever and opening in a direction away from the contact 21 for the reception of the end 19 of the interconnected tension members.

As shown in Figs. 2 and 3, the narrow elongated portion 34 is spaced from and shaped to overlie the snap spring 12. To position the lever at all times the enlarged portion 35 of the lever is provided with shoulders 38 and 39 on opposite sides of the lever 14 that engage the side of the bracket 13 away from the contact 21. The extreme end 41 of the lever portion 35 may engage the base 11 to limit movement of the lever in one direction. Extreme movement of the lever 14 in the opposite direction is limited by engagement of the outer end of the narrow elongated portion 34 with the top side of the stop 23.

The lever 14, the fulcrum therefor, and the means for limiting the movements of the lever may assume different shapes and forms. The particular construction shown herein is representative only. In this embodiment of the invention the relation of the fulcrum to the notches 29 and 30 supporting the respective ends of the tension and compression members (the fulcrum point is spaced from the notches and the notch 29 is disposed to the upper side of the plane of the tension members 15 and 16 when in their normal positions), is such that when the operating force is removed from the portion 34, the latter and the contact 21 assume the position shown in Figure 1 so that the switch as shown is of the self-return type.

The operation of the switch is readily apparent from the foregoing but may be summarized as follows:

Assume that the terminal 26 and the terminal 33 of the switch are connected to an electrical circuit and it is desired to close that circuit. The end 34 of the lever 14 is moved in a direction toward the base 11. Since the lever 14 is a rigid member, the enlarged end 35 of the lever 14 simultaneously swings about the fulcrum point formed by the bracket 13. As a result, the end 19 of the tension members, supported by the lever 14, is simultaneously moved laterally and longitudinally relative to the support of the compression member thereby causing the overcenter spring system to pass through its axis of maximum stress. At the instant of passing through this axis of maximum stress the contact 21 is snapped from engagement with the insulated stop 22 to a position where the contact 21 engages the opposed stop or contact 23 thereby closing the electrical circuit. Upon release of the lever 14 the contact 21 returns to its normal position.

I claim:

1. In a snap action switch, the combination of, a base, opposed stops mounted on said base, a bracket mounted on said base in spaced relation with said stops, a lever pivotally supported on said bracket comprising a portion on one side of said bracket having a notch thereon opening away from said stops, and an elongated portion on the opposite side of said bracket overlying said base and movable toward and away therefrom,

spaced tension members interconnected at opposite ends and disposed adjacent each side of said bracket and lever, one of said interconnected ends being free to move between said stops, a compression member having an end interconnected with said free end, the opposite end of said tension members being received by said notch on the lever and the opposite end of the compression member being supported by said bracket to form a snap spring system whereby movement of said lever about its pivot moves the end of the tension members received in the notch on the lever laterally past the supported end of the compression member to move said free end between said stops with a snap action.

2. A snap switch having in combination, a base, opposed stops mounted on said base, a bracket having a notch and an aperture spaced therefrom, said bracket being mounted on said base in spaced relation with said stops, a swingably mounted lever extending through said aperture and having shoulders thereon engaging the side of said bracket away from the stops, said lever having an end shaped to engage the base adjacent the bracket to limit the movement of the lever in one direction and an end engageable with one of said stops to limit movement of the lever in the opposite direction, spaced tension members interconnected at opposite ends and disposed adjacent each side of said bracket, one of said interconnected ends being free to move between said stops, a compression member having an end connected to said free end, the opposite end thereof being received in said notch on the bracket, the other interconnected end of the tension members being supported by said lever intermediate said end engageable with the base and said shoulders, said tension and compression members being shaped and positioned to form a snap spring system having an axis of maximum stress so that swinging movement of said lever simultaneously moves said tension member longitudinally and laterally through said axis of maximum stress to move said free end between said stops with a snap action.

3. A snap switch comprising, a base, opposed stops mounted on said base, a bracket having a notch thereon and having an aperture spaced therefrom, said bracket being mounted on said base in spaced relation with said stops, a lever extending through said aperture and having shoulders thereon engaging the side of said bracket away from the stops to position said lever and an end shaped to engage the base adjacent the bracket to limit the movement of the lever in one direction, said bracket forming a fulcrum for said lever, a tension member adjacent said bracket, one end of said tension member being free to move between said stops, a compression member having an end connected to said free end of the tension member and having the opposite end received by said notch on the bracket, said opposite end of the tension member being supported by said lever intermediate the end of said lever and said shoulders, said tension and compression members shaped and positioned to form a snap spring system having an axis of maximum stress whereby movement of said lever about said fulcrum moves said tension member laterally relative to said compression member through the axis of maximum stress to move said free end between said stops with a snap action.

4. In a snap action switch, the combination of, a base, an overcenter snap spring system having an axis of maximum stress formed by spaced ten-

sion members interconnected at a first and a second end thereof and a compression member intermediate said tension members and integral with said first interconnected end, a bracket mounted on said base intermediate said tension members, a lever having ends extending on opposite sides of said bracket and pivotally supported thereby, said compression member being supported by said bracket, and said second end of the tension members supported by one of said ends of said lever, said lever being shaped and positioned so that movement thereof about its pivotal support simultaneously moves said second end of the tension member laterally and longitudinally relative to the compression member through said axis of maximum stress to move said first end between preselected positions with a snap action.

5. In a snap action switch, the combination of, a base, an overcenter snap spring system overlying said base comprising spaced tension members interconnected at opposite ends and a compression member between said tension members connected with one of said interconnected ends, said latter end being free to move between preselected positions, an upstanding bracket mounted on said base intermediate said tension members and shaped to support said compression member, an elongated lever pivotally mounted intermediate its ends on said bracket having one end shaped to support the interconnected end of said tension member remote from said free end, and said lever having its opposite end spaced adjacent and overlying said base so that movement of said opposite end overlying said base moves said tension members laterally past the supported end of the compression members and thereby moves said free end between the preselected positions with a snap action.

6. In a snap action switch, the combination of, a base, an overcenter snap spring system having an axis of maximum stress overlying said base comprising a tension member and a compression member, one end of each of said tension and compression members being free to move between preselected positions, an upstanding bracket mounted on said base adjacent said tension member and shaped to support the end of the compression member opposite the free end, a lever pivotally mounted intermediate its ends having one end shaped to support the end of said tension member opposite the free end, and said lever having its opposite end spaced adjacent and overlying said snap spring so that movement of said opposite end overlying said snap spring moves said tension member through the axis of maximum stress whereby said free end moves between the preselected positions with a snap action.

7. In a snap action switch, the combination of, a base, opposed stops mounted on said base, a bracket mounted on said base, a lever swingably mounted on said bracket, said lever having means abutting one side of said bracket and means abutting said base to position said lever, and a snap spring system comprising a first stressed member and a second stressed member, one end of each said stressed members being interconnected and movable between said opposed stops, the opposite end of said first stressed member supported by said bracket and the opposite end of said second stressed member engaged by said lever whereby movement of said lever shifts said second stressed member relative to said first stressed member to move said free ends between the opposed stops with a snap action.

8. In a snap action switch, the combination of, a base, an overcenter snap spring system spaced in side by side relation with the base comprising spaced tension members interconnected at opposite ends and a compression member intermediate said tension members, one of said interconnected ends being free to move between preselected positions, a rigid bracket mounted on said base intermediate said tension members to support said compression member in a position to be passed by the tension members, a lever pivotally mounted intermediate its ends on said bracket having one end on one side of the bracket shaped to support the end of said tension members remote from said free end and said lever having its opposite end on the opposite side of the bracket in spaced side by side relation with said free end whereby movement of said latter end of the lever moves said tension members past said compression member to move said free end between the preselected positions with a snap action.

9. In a snap action switch, the combination of, a base, a bracket mounted on said base, a lever swingably mounted, intermediate its ends, on said bracket, and a snap spring system comprising a first and a second stressed member, one end of each of said stressed members interconnected and free to move between preselected positions, the opposite end of said first stressed member supported by said bracket and the opposite end of the second stressed member engaged by said lever whereby movement of said lever shifts said second stressed member relative to said first stressed member to move said free ends between the preselected positions with a snap action.

STAFFORD G. RANSOME.

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