June 23, 1959 H. Y. FISHER 2,892,050

OVERCENTER SNAP ACTING MECHANISM

Filed Nov. 30, 1955

Fig. 1.

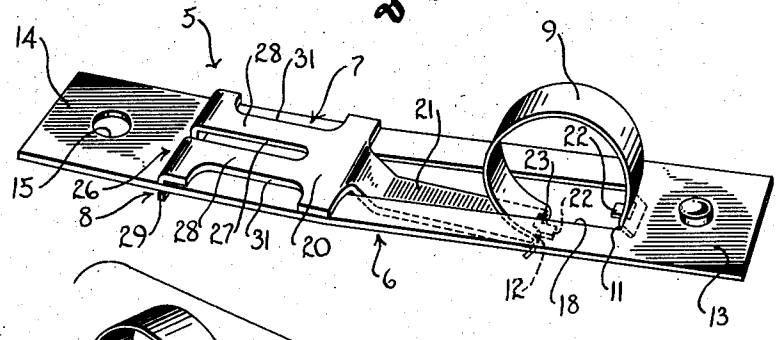


Fig. 2.

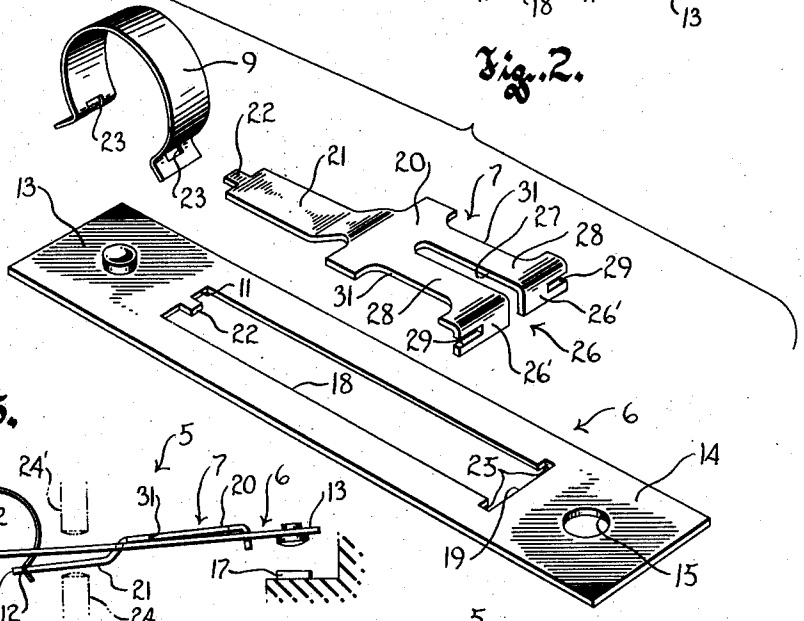


Fig. 5.

Fig. 3.

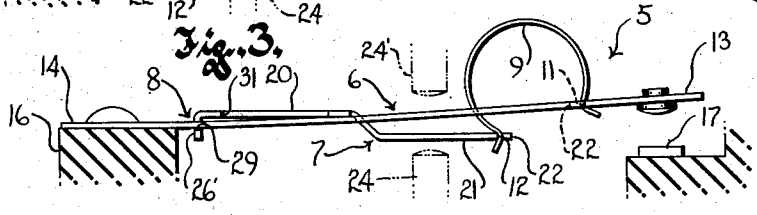
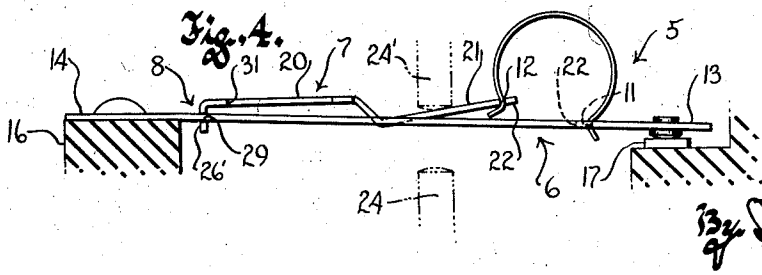


Fig. 4.



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OVERCENTER SNAP ACTING MECHANISM

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Application November 30, 1955, Serial No. 549,961

7 Claims. (Cl. 200—67)

This invention relates to overcenter snap acting mechanisms of a type commonly used in electrical switches, and refers more particularly to improvements in such mechanisms by which their manufacture and assembly is facilitated.

Snap acting mechanisms of this type generally comprise a pair of flatwise adjacent blade members connected in overcenter relation by means including an overcenter spring confined under compression between spaced abutments providing spring seats on opposing end portions of the members, the spring being operable to effect snap actuation of one of the members in one direction in consequence of motion of the other member in the opposite direction to and beyond a critical position. For use as a snap switch one of these members usually comprises an elongated flatwise flexible contact blade, one end portion of which is adapted to be anchored to a support and the opposite end portion of which is movable back and forth to and from engagement with one or more stationary contacts. The other blade member is ordinarily referred to as an actuating member or lever and has a supported end adjacent to the anchored end of the contact blade and a free end portion movable back and forth through an elongated opening in the contact blade intermediate the mounting and contact end portions of the latter. The overcenter spring is usually confined between the free end portion of the actuating lever and the contact portion at the free end of the contact blade.

In some cases the actuating member or lever is also flexible and may be permanently connected to the mounting end of the contact blade either as an integral part thereof or by rivets which may comprise those provided for anchoring the mounting portion of the contact blade to its support. Alternatively, as is the case in the snap acting mechanism of this invention, the actuating lever may be formed separately of the contact blade and loosely hingedly connected thereto for back and forth motion of the free end portion of the lever through the opening in the contact blade. In this respect, the snap acting mechanism of this invention is similar to that disclosed in the copending application of Robert W. Bachi, Serial No. 372,862, filed August 7, 1953.

While advantageous in many respects, all past overcenter snap acting mechanisms of the type comprising separate loosely hingedly connected blade members have had one serious disadvantage, namely, the impossibility of sub-assembly of their blade members in a commercially practicable way, to say nothing of the difficulty of attaching their overcenter springs prior to installation of the mechanism into a switch. As a result, a tedious and costly assembly practice was inevitable, involving separate securement of the contact blade to a support in the switch housing, followed by connection of the actuating blade to the contact blade and, finally, insertion of the overcenter spring while the actuating blade was held against displacement. After piecemeal assembly in this fashion, stops or abutments carried by the switch housing to limit the separating motion of the blade members under the influence of the overcenter spring were largely relied upon to prevent detachment of the spring, while the latter, in turn, served to hold the actuating blade against displacement off of its pivot.

With these objections in mind, it is a primary purpose of this invention to provide an overcenter snap acting mechanism which, though comprised of loosely hingedly connected blade members with an overcenter spring connected therebetween, can be sub-assembled for installation in a switch as a unit, without entailing permanent connections between any of the components of the mechanism.

More specifically, this invention has as one of its objectives the provision of a unique hinge connection between the two blade members of an overcenter snap acting mechanism of the character described, which hinge connection can be easily established without the use of rivets, hinge pins, or tools of any kind and, moreover, can be relied upon to hold the blade members in a securely sub-assembled condition, despite rough handling prior to installation in a switch.

A further object of this invention resides in the provision of an overcenter snap acting mechanism of the type having loosely hingedly connected blade members and an overcenter compression spring loosely connected between them and tending to urge them apart in opposite directions, wherein relative hinging motion of the blade members in one direction is limited by substantially flatwise engagement of portions of the blade members at a zone substantially remote from their hinge connection, to thus preclude such a degree of separation of the blade members as would ordinarily result in detachment of the overcenter spring therefrom.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates two complete examples of the physical embodiments of the invention constructed according to the best modes so far devised for the practical application of the principles thereof and in which:

Figure 1 is a perspective view of the overcenter snap acting mechanism of this invention, showing its components sub-assembled prior to installation in a switch;

Figure 2 is a group perspective view showing the components of the mechanism detached from one another;

Figures 3 and 4 are similar side elevational views of the snap acting mechanism seen in Figure 1, and more or less diagrammatically illustrating the manner in which it may be installed in a switch; and

Figure 5 is a side elevational view similar to Figure 3, but illustrating a slightly modified embodiment of the invention.

Referring now more particularly to the accompanying drawings, in which like numerals indicate like parts throughout the several views, the numeral 5 generally designates the snap acting mechanism of this invention. It comprises a pair of flatwise adjacent blade members 6 and 7 loosely hingedly connected at one end, as at 8, and having an overcenter spring 9 confined under compression between the opposite end portions of the blade members.

The snap acting mechanism of this invention is similar to that disclosed in the copending application of Robert W. Bachi, Serial No. 372,862, filed August 7, 1953, in that the two blade members are separate parts loosely hingedly connected to one another near one end of the

assembly, while the overcenter spring bears upon opposing abutments or spring seats **11** and **12** on the free end portions of the blade members.

One of the blade members **6** is longer than the other blade member **7** and provides a contact blade preferably made of resilient stock so as to enable flatwise back and forth flexing motion of its free end or contact portion **13** relative to its opposite end portion **14**. The latter may be provided with an aperture **15** to enable the contact blade to be anchored to a support **16**, usually formed as part of the housing (not shown) of a switch in which the overcenter snap acting mechanism is to be employed. As suggested in Figures 3 and 4, therefore, the outer end or contact portion **13** of the contact blade is free to flex up and down toward and from engagement with a stationary contact **17** on the switch housing.

The contact blade is also formed with an elongated central slot **18** at an intermediate portion of the blade. One transverse edge **11** of this slot provides one of the seats for the overcenter spring **9** and the opposite transverse edge **19** provides a bearing or fulcrum upon which the blade member **7** rocks during operation of the mechanism.

The shorter blade member **7**, which may be termed an actuating blade or lever, may be made of either stiff or flexible stock as desired. It comprises a substantially wide body portion **20** flatwise overlying the upper face of the contact blade near the mounting end portion **14** of the latter, and a narrow arm **21** integrally joined to the body portion and extending forwardly therefrom toward the contact portion **13** of the contact blade.

The arm **21** is slender enough to pass readily back and forth through the slot **18** in the contact blade during actuation of the mechanism, and it is offset downwardly out of the plane of the body portion **20** of the lever. The arm occupies a position spaced a distance beneath the under side of the contact blade when the overcenter spring holds the actuating lever in one limit of swinging motion defined by the substantially flatwise engagement of the wide body portion **20** of the lever adjacent to the base of the arm **21** with the upper face of the contact blade, as shown in Figures 1 and 3.

With this relative disposition of the contact and actuating blades, the overcenter spring **9** tends to flatwise separate the free end portions of the two blades by imposing an upward force on the outer end of the contact blade and a downward force on the outer end of the arm **21** of the actuating lever, and the contact portion **13** of the contact blade is held spaced from its cooperating stationary contact **17** when the mechanism is in place in a switch, as seen in Figure 3. Inasmuch as the two blades cannot be separated any greater distance than is permitted by the substantially flatwise engagement of the two blades at a zone adjacent to the base of the arm **21** and substantially remote from the bearing edge **19** on the contact blade, there will be little or no tendency for the overcenter spring **9** to become detached from the tongues **22** which pass through apertures **23** in the ends of the spring and extend from the spring seats to hold the spring operatively assembled with the two blade members.

As is well known to those familiar with snap acting mechanism, the switch may be actuated to closed position by exerting an upward force on the arm **21** of the actuating lever as by means of a button indicated at **24** to swing the same upwardly relative to the contact blade to and beyond a critical position at which the arm is substantially coplanar with the contact blade, or at which the overcenter spring is subjected to maximum stress. When this critical position is passed, the spring force suddenly reverses and snaps the contact portion of the contact blade downwardly into engagement with the stationary contact and simultaneously swings the actuating lever upwardly on its pivot so that its arm **21** assumes a position above the plane of the contact blade as seen in Figure 4.

Unless a separate biasing force acting upon the actuating lever, for instance in the manner disclosed in the aforesaid copending application of Robert W. Bachi, is employed to effect return of the contact blade to its original position seen in Figure 3, the return actuating of the switch may be effected by means of a second button **24'** disposed above the arm **21** and depressable to swing the lever downwardly on its pivot. As is well understood in the art, these buttons may comprise the two jaws of a single pivoted lever mounted on the switch housing to effect snap actuation of the switch.

One of the outstanding features of the snap acting mechanism of this invention resides in the unique hinge connection **8** which is provided between the contact and actuating members. This hinge connection, as seen best in Figure 2, comprises a pair of transversely opposing notches **25** in the contact blade adjacent to the bearing edge **19** of the slot **18** and opening inwardly toward one another, to the slot. Preferably, the bearing edge **19** provides an edge common to both of the notches **25**, facing in a direction away from the mounting end portion **14** of the contact blade.

At its rear end, the actuating lever **7** is formed with a substantially short flange **26** bent substantially at right angles to the body portion **20** of the lever and to the same side thereof as the offset arm **21** of the lever. In addition, a substantially elongated slot **27** is cut in the rear or inner end portion of the lever so as to define opposite bifurcations **28** each of which has a downwardly depending flange portion **26'** at the rear extremity of the lever. The outer side edges of these flange portions **26'** are provided with notches **29** of such depth that their bottom to bottom dimension measured transversely across the rear of the actuating lever is substantially equal to the bottom to bottom dimension of the notches **25** in the contact blade.

The hinge connection between the two blades is thus defined by the mating and interlocking engagement between the notched side edge portions of the flanges **26'** on the lever bifurcations and the notched portions **25** of the contact blade, it being understood that the notches are so dimensioned as to substantially loosely interconnect the parts while substantially constraining the actuating lever to pivotal motion upon the fulcrum provided by the bearing edge **19**, with the pivot axis passing transversely through the mating notches.

It will be understood, of course, that the notches **25** in the contact blade loosely embrace portions of the flanges **26'** adjacent to the bottoms of the notches **29** therein, and that the latter notches define jaws on the rear of the actuating lever which loosely embrace portions of the contact blade adjacent to the bottoms of the notches **25** thereof. The side edges of the notches **25** thus substantially preclude both forward and rearward motion of the actuating lever relative to the contact blade, while the side edges of the notches **29** in the lever substantially preclude up and down motion of the lever relative to the contact blade.

The purpose of the slot **27** in the rear end portion of the actuating lever **7** is to facilitate sub-assembly of the two blade members. The slit, of course, renders the bifurcations **28** sufficiently resilient in the edgewise direction as to enable flexure of the bifurcations toward one another an extent sufficient to reduce the bottom to bottom dimensions of the notches **29** an amount substantially equal to the depth of one of the notches **25** in the contact blade. Using the arm **21** of the lever as a handle, therefore, the lever may be assembled to the contact blade by inserting the flanged end of the lever into the slot **18** in the contact blade with the flange extending somewhat diagonally across the notched end of the slot and with the notches **29** of the flanges in registry with the inner edges of the slot in the contact blade. In this

attitude, the notch in the flange 26' nearest the bearing edge 19 may be easily slid into mating relationship with the adjacent notch 25 of the contact blade, and the remote notched flange can then be sprung into the opposite notch 25 by twisting the lever arm edgewise into alignment with the slot 18.

During such twisting assembly motion of the lever, of course, the edge of the slot 18 leading toward the unoccupied notch 25 acts as an "up hill" cam surface along which the bottom of the notch 29 on the adjacent bifurcation 28 rides, whereby the latter is progressively cammed inwardly toward the other bifurcation until its notch 29 is brought into registry with the adjacent notch 25 in the contact blade, at which time it snaps edgewise outwardly into mating or interlocking engagement therein.

The lever is thus readily subassembled with the contact blade without necessarily resorting to the use of tools of any sort, and without any danger of accidental detachment of the two blades as a result of rough handling prior to installation in a switch.

It is important to note that the notches of the interlocking hinge connection thus established permit free hinging motion of the lever relative to the contact blade, though when properly proportioned, the sides of the notches also serve to preclude excessive relative hinging motion between the blades and thus assure against accidental displacement of the overcenter spring 9 from the tongues 22 on the blades.

If desired, the widths of the bifurcations 28 may be reduced by notches 31 cut in the opposite side edges of the body portion 20 of the actuating lever to increase the edgewise flexibility of the bifurcations and thus facilitate subassembly of the lever with the contact blade.

It will also be appreciated that the same hinge connection between the lever 7 and the contact blade can be effected at the contact end portion of the contact blade, as suggested in Figure 5, rather than at the mounting end portion of the contact blade as described previously. All that is necessary in that event, is to reverse the locations of the tongue 22 and the notches 25 on the contact blade.

From the foregoing description, together with the accompanying drawing, it will be readily apparent to those skilled in the art that this invention provides an overcenter snap acting mechanism comprising separate blade members which may be hingedly connected as a subassembly, entirely without the use of rivets or tools of any kind, and an overcenter spring which may also be assembled with the mechanism to enable its installation in a switch as a unit.

What I claim as my invention is:

1. A snap acting mechanism of the type having separate substantially flatwise adjacent contact and actuating blade members connected in overcenter relation by means including an overcenter spring confined under compression between spaced abutments on opposing end portions of the members and operable to effect snap actuation of the contact member in one direction as a consequence of motion of the actuating member in the opposite direction to and beyond a critical position, characterized by: the provision of an elongated slot in one of said members through which the abutment end portion of the other of said members may pass during actuation of the mechanism, one transverse edge of the slot providing said abutment on said one member, and said one member having transversely opposite notches therein opening inwardly to said slot adjacent to the other transverse edge thereof; and by the provision of a connection between said members providing for relative pivotal motion thereof in said directions, said connection comprising a part on the opposite end portion of said other member loosely received in said notches, said part having opposite notches therein opening outwardly and mating with the inwardly opening notches in said one member and defining jaws which loosely embrace portions of said one member adjoining the bottoms of the notches thereof whereby said other member is constrained substantially only to pivotal motion about a transverse axis passing through said notches.

2. The snap acting mechanism set forth in claim 1 wherein the bottom to bottom dimension of the notches in said part on said other member is greater than the transverse dimension of the slot in said one member; and further characterized by the fact that said opposite end portion of said other member is bifurcated lengthwise of the slot in said one member and has each of its jaws on one of the bifurcations, said bifurcations having sufficient resiliency as to enable flexure of one of the bifurcations toward the other the extent necessary to carry the bottom of the notch in said one bifurcation out of its mating notch at least as far as the mouth of said mating notch to thus provide for disconnection and/or connection of said members.

3. The snap acting mechanism set forth in claim 1 further characterized by the fact that said other transverse edge of the slot provides a bearing edge common to the notches of said one member and affords a fulcrum upon which said part on said other member rocks during actuation of the mechanism.

4. A snap acting mechanism of the type having separate substantially flatwise adjacent contact and actuating blades connected in overcenter relation by means including an overcenter spring confined under compression between spring seats on opposing end portions of the blades and operable to effect snap actuation of the contact blade in one direction as a consequence of motion of the actuating blade in the opposite direction to and beyond a critical position, characterized by: the fact that the contact blade is flatwise flexible and has a mounting portion at one end, a movable contact portion at its opposite end, and an elongated slot in an intermediate portion thereof providing opposing transverse edges spaced from the ends of the contact blade, the transverse edge of said slot adjacent to the contact portion of the blade providing one of said spring seats, and the contact blade having transversely opposite notches therein opening to said slot adjacent to the other transverse edge of the slot; and further characterized by the fact that the actuating blade is shorter than the contact blade and has a body portion wider than the transverse dimension of said slot and flatwise overlying one face of the contact blade at a zone intermediate said end portions thereof, said actuating blade having an arm projecting from said body portion thereof toward the contact portion of the contact blade and narrow enough to pass through said slot therein during actuation of the mechanism, the outer end of said arm providing the other spring seat; and by the provision of a connection between the contact blade and the body portion of the actuating blade comprising a flange on the latter passing through said slot in the contact blade and having notched portions loosely interconnected but interlocked with the adjacent notched portions of the contact blade to constrain the actuating blade to pivotal motion relative to the contact blade about a transverse axis passing through said notches thereof.

5. The snap acting mechanism set forth in claim 4 wherein the transverse edge of said slot adjacent to the mounting portion of the contact blade provides a bearing edge common to said opposing notches thereof upon which said flange on the actuating blade bears and upon which the actuating blade rocks during actuation of the mechanism.

6. The snap acting mechanism set forth in claim 5 further characterized by the fact that the flanged body portion of the actuating blade is bifurcated lengthwise of the slot in the contact blade, and wherein the resulting bifurcations have sufficient resiliency as to enable flexure of one of the bifurcations toward the other the extent necessary to disrupt the interlocking connection between

said flange on the actuating blade and one of the notches of the contact blade to thus provide for disconnection and/or connection of said blades.

7. The snap acting mechanism set forth in claim 4 further charcterized by the fact that said body portion of the actuating blade is adapted to have engagement with one face of the contact blade in one position of the mechanism to preclude swinging motion of the lever in one direction under the influence of the overcenter spring beyond a position at which the overcenter spring may become detached from the blades.

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