Jan. 27, 1953 M. L. JEFFREY 2,627,000

SWITCH

Filed Nov. 4, 1949

Fig. 1

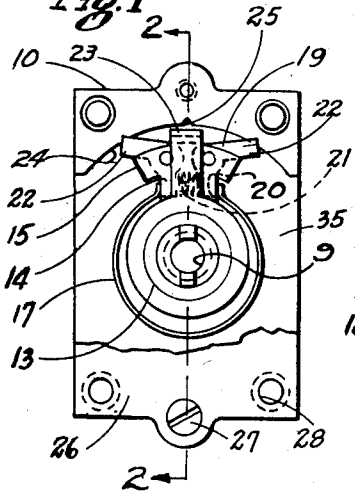


Fig. 2

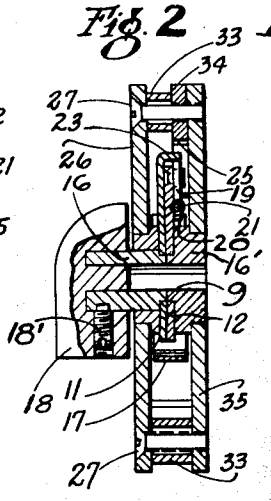


Fig. 5

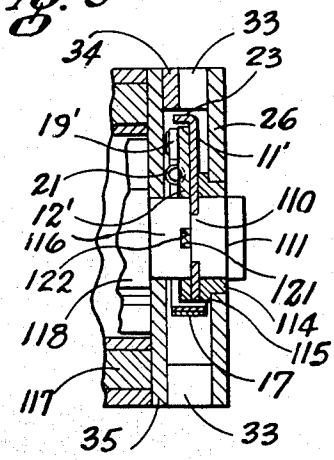


Fig. 3

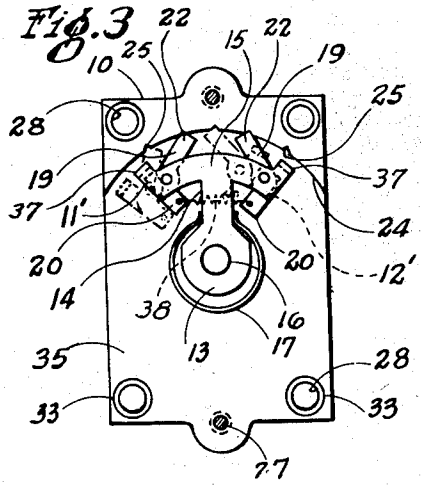


Fig. 4

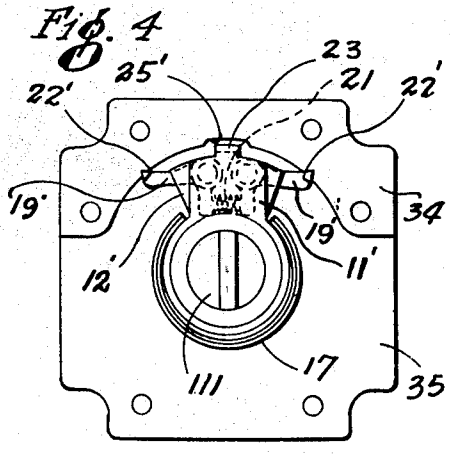


Fig. 6

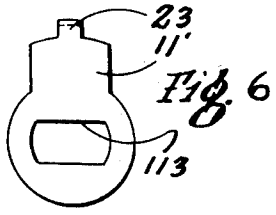
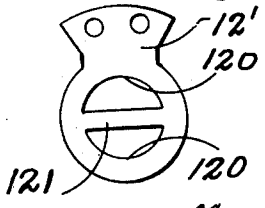


Fig. 7



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UNITED STATES PATENT OFFICE

2,627,000

SWITCH

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Application November 4, 1949, Serial No. 125,467

5 Claims. (Cl. 200—70)

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This invention relates to improvements in snap action switches.

Previous snap action switches have been, in general, two-position switches; that is, they have been either simple "off-on" switches or else have had a "double-throw" action with no neutral or "off" position. Thus, the use of these devices was rather strictly limited. In addition, such switches have often been bulky devices of complex structure so that they were extravagant of space in an installation and were costly to construct. Therefore, my invention is directed toward making a device which will occupy a smaller space and at the same time be strong enough to withstand hard usage. This is accomplished by my invention while, at the same time, providing a less complex structure which is less expensive to manufacture than former switches.

My invention may be adapted for use in single-throw or double-throw switches of the old type but has the additional advantage that it is not limited thereto but may also be used in double throw switches having a neutral position or in multi-position selector-type switches. This is made possible by having the latch rotate with the contacts instead of being carried on the housing as was done in prior switches. It is, therefore, much more flexible in its uses than were prior devices.

In addition, I provide a sliding type switch operable by a snap action embodying the same principles as the rotary snap actions.

Further advantages of my invention, and the invention itself, will become apparent from the following description and the accompanying drawings thereof which form a part of this specification.

In the drawings:

Fig. 1 is an end view of my improved snap action as applied to a three position switch;

Fig. 2 is a sectional view along line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 of a modification of the snap action;

Fig. 4 is a view similar to Fig. 1 of still another embodiment of my invention;

Fig. 5 is a medial sectional view of the embodiment of Fig. 4 attached to a switch;

Fig. 6 is a plan view of the flanged member of Fig. 4 showing the shaft coupling means;

Fig. 7 is a plan view of the latch member of Fig. 4 showing the shaft coupling means.

Briefly, my invention comprises an improved type of snap action for a switch which is capable of many embodiments as is demonstrated by the several forms which I have shown. The snap

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action is very compact and can be constructed cheaply from sheet metal stampings, requiring only two or three main stampings and a pair of latch members.

In detail, and with reference to the drawings, throughout which like parts are designated by like reference characters, my invention comprises a switch having a plate 10 on which is mounted the snap action. This snap action as illustrated in one of its simplest forms in Figs. 1 and 2 consists of two principal members, a flanged or latch releasing member 11 and a holding or latch carrying member 12. These two members are of similar formation, each having a body portion 13, and a necked down portion 14. The latch member 12 also has a head portion 15. The body portion of the flanged member 11 is fixed, preferably by sweating, to a driving coupling 16 which is adapted to be operated from one side of the plate by a knob 18. The body portion of the holding member may be fixed to the shaft of a switch which either carries or operates movable contacts of the switch or is preferably secured to a coupling 16' journalled in the plates 10. In order to provide additional support for the couplings 16 and 16', they may be provided with a central hole 9 which also provides a journal for the end of a switch shaft, not shown. Thus the couplings 16 and 16' will be free to rotate on the switch shaft and still be supported thereby. Surrounding the body portions 13 is a C-shaped spring 17 similar to that described in my Patent No. 2,270,951 which engages the necked down parts 14 of the two members and resists angular displacement therebetween.

The head 15 of the holding member 12 extends arcuately outward from the necked portion 13 and carries small latches 19 that are pivotally mounted on the extremities thereof. These latches may be in the form of a bell crank, and each is engaged at one end 20 by a small compression spring 21 which urges the lower latch ends 20 outwardly from the central shaft. The member 11 is formed with a flange 23 extending over the head portion 15 of the holding member 12. This flange is of such shape that it will engage the ends 22 of the latches upon sufficient relative movement between the members 11 and 12.

Immediately above the head portion of the holding member 12 of the snap action, the plate 10 has secured to it a second plate provided with an arcuate surface 24 in which notches 25 are formed to correspond to the switch positions. The plate 10 and the second plate could be made in one piece if desired. I have shown notches

for a three position switch, but it will be recognized that more or fewer notches would be provided depending upon the desired operation of the device. It will also be appreciated that the plate 10 could be a wall of a housing if desired. In this instance, however, the plates are provided since it is contemplated mounting the same in another housing where it is used in conjunction with other mechanisms not shown.

A second plate 26 is provided (Fig. 2) which may be fastened to the plate 10 conveniently by screws 27 and is held in spaced relation therefrom by spacers 33. Mounting holes 28 are also provided to fasten the snap action to a switch. These holes may, of course, be changed as may the entire exterior of the plates, dependent on the type of switch with which it is desired to use the snap action.

The coupling 16' is provided with a shoulder and is journalled in an opening in the plate 10. As stated above, the switch shaft may extend into the coupling 16 and 16' and be journalled therein, thus providing additional support for both couplings. It will be recognized that a handle or lever or any other operating mechanism might be substituted for the knob 18 if desired, which knob may be held on the end of the coupling 16 in any well known manner, such as by the set screw 18'.

The operation of the device is comparatively simple. As the knob 18 is turned, the coupling 16 and flanged member 11 turn with it. The holding member 12, however, is held against angular movement by the engagement of the latch ends 22 in the notches 25. Thus there is an angular displacement of the member 11 relative to the member 12 with a consequent storing up of energy in the spring 17 due to the movement of the necks 14 out of alignment. As the knob 18 is turned further, however, the flange 23 engages latch end 22 which is then obstructing the motion of the holding member 12 and with a slight further movement, the latch end 22 is pushed downward and becomes disengaged from its notch, releasing the latch or holding member 12 which is then free to move. This it will do with considerable speed because of the force of the spring 17 on its necked portion 14, thus snapping the coupling 16' to another position. In the embodiment of Figs. 1 and 2, the device connected to the coupling 16' and being operated is relied on to stop the holding member at the proper position and yet allow the latch end 22 of the appropriate latch to engage a notch and resist the return movement. When the operated part is a switch, the contacts may be of the type shown in my Patent No. 2,416,626 issued February 25, 1947, which may be coupled to the present device by a coupling similar to that shown and described in my copending application, Ser. No. 742,578, filed April 19, 1947, now Patent No. 2,588,632. The operation in reverse is the same, except that the motion from either side, or "on," position to the central, or "off" or neutral, position is stopped by a latch end 22 engaging a notch 25 instead of my contacts becoming engaged. It will be readily apparent that the neutral position could be dispensed with by proper spacing of the notches 25 and of the contacts within the switch body.

A very similar embodiment of my snap action is shown in Fig. 3. This embodiment also requires the use of two principal members, a flanged member 11' and a latch carrying or holding member 12' similar to those of the prior described form. The holding member 12' may be of exactly similar formation to the one used in the former embodiment but is preferably formed with a somewhat wider head allowing the latches to be pivoted with a wider spacing of the pivot points. In this embodiment, the flanged member 11' instead of single central flange 23 of the prior described device, is formed with a head portion 15 similar to that of the holding member. a flange 37 is bent from this head portion at each end beyond the latches 19. The latches are reversed in this embodiment so that the latch ends 22 point toward the center of the switch, but the latches are of the same formation as in the prior described embodiment. A tension spring 38 is used to keep the latch ends 22 in contact with the surface 24 and thus to hold the driven coupling 16' from movement.

This embodiment has the advantage of having a positive stop at each position. As shown by the dashed lines (Fig. 3), both latch ends 22 are engaged as well in the left hand position as in the central position. This will also be true of the right hand position. It is, therefore, apparent that as the latch member travels from the central position to one of the side positions, a latch end will engage a notch to stop the member at its next position. It is therefore envisioned that this type of snap action could be used on multiposition switches similarly to the embodiment next described.

It is apparent that the operation of the present embodiment is the same as that of Figs. 1 and 2. As the knob 18 is turned, one of the flanges 37, dependent on the direction of rotation, will approach its adjacent latch and will eventually engage and release the latch. The spring 17, because of its stored energy, will then snap the latch member 12 over to the next notch 25 carrying the contacts along with it.

A somewhat different form of shaft and a different means for fastening the moving members to the shaft is illustrated in Figs. 4–7. The snap action shown there is a modification of the embodiment of Figs. 1 and 2. The flanged member 11'' is formed very much the same as in the prior embodiment. The holding member 12'' is shown in somewhat different form, although its action is exactly the same. The latches 19' are formed slightly different at the ends 22', having an acute angle at the point for better engagement with the notches 25'.

The driving shaft or coupling 110 is formed with an outer face 111 adapted for engagement with a mating coupling of the type described in my copending application, Pat. No. 2,588,632. At its other end, the shaft is formed with a pair of shoulders 112 or flattened sides. This end extends into a corresponding opening 113 in the flanged member 11' (Fig. 6). The flanged member 11' thus may be sweated or staked to fasten it to the shaft 110, or the shaft may merely extend loosely into the opening 113. In the former case, the shaft may be journalled in a bushing 114 as shown, while in the latter case, the bushing is preferably formed as an integral part of the shaft so that there may be a shoulder 115 preventing the shaft from dropping out.

The driven shaft 116 may be either a coupling shaft formed complementary to a shaft on a switch as shown in my aforesaid Patent No. 2,588,632, or it may be the shaft of the switch itself as shown. The switch shown comprises a housing 117 carrying fixed contacts and a drum

118 carrying movable contacts and driven by the shaft 116. The details of the switch are not shown, since they comprise no part of my invention.

The mode of attachment of the latch member 12'' is somewhat different from the others described. The member 12'' is formed with a pair of semi-circular openings 120 (Fig. 7) forming, in effect, a circular hole with a bar 121 extending diametrically across the circle. The switch shaft 116 is formed with a groove 122 across its end and is therefore adapted to extend loosely into the openings 120 and be driven by the member 12'' through the bar 121. Since the switch drum 118 is journalled at both ends, the shaft 116 will be firmly supported. And, since the members 11'' and 12'' are held in close sliding juxtaposition at their meeting surfaces which are fairly broad, the shaft 110 will be supported by the sliding surfaces and its bushing 114 and, therefore, will not require a pin 8 as has been previously described.

The operation of the three previously described embodiments is exactly the same. As the knob 18 or other controlling device is turned, the flange or release member 11 is angularly displaced from the holding member 12. This displacement at the necked portions of these members stores up energy in the C spring 17 until the flange 23 or 37 engages the holding latch of the particular embodiment and causes it to become disengaged from its notch as previously described. At that time the stored energy in the spring 17 is released, and the carrier member 12 snaps to the next position, carrying with it the switch contacts or other controlled device (not shown) to their alternate positions.

Having thus described my invention, I am aware that numerous and extensive departures may be made therefrom without departing from the spirit or scope of the invention.

I claim:

1. A snap action mechanism for a switch comprising a driving member having a body portion, a necked down portion and a flange portion, a driven member having a body portion, a necked down portion and a head portion having laterally extending parts, resilient means surrounding said body portions and engaging both of said necked down portions adapted to store up energy upon relative displacement between said driving and driven members, a pair of latch means pivotally supported on said head portion, one of said latch means adapted to resist movement in one direction and the other to resist movement in the opposite direction, said switch having a part extending over said latch means and having an arcuate surface with notches therein to be engaged by said latch means, each of said latch means comprising a bell crank lever, one part of which is disposed for engagement in said notches and the other parts of which extend in opposite relation to each other and spring

means seated between said last ends to engage said ends and hold the first ends in engagement with said overhanging part, said flange portion adapted to release said latch means from said notches upon a predetermined amount of displacement between said driving and said driven member.

2. A snap action mechanism for a switch comprising a driving member having a body portion, a necked down portion and a flange portion, a driven member having a body portion, a necked down portion and a head portion having laterally extending parts, resilient means surrounding said body portions and engaging both of said necked down portions adapted to store up energy upon relative displacement between said driving and driven members, a pair of latch means pivotally supported on said head portion, one of said latch means adapted to resist movement in one direction and the other to resist movement in the opposite direction, said switch having a part extending over said latch means and having an arcuate surface with notches to provide latch engaging seats for engagement with the latches, each of said latch means comprising a bell crank lever, one part of which is disposed for engagement in said notches and the other parts of which extend in spaced relation to each other and spring means connected between said last ends to engage said ends and hold the first ends in engagement with said overhanging part, said flange portion being disposed beyond and movable over said latches and adapted to engage said latch means upon a predetermined amount of displacement between said driving and said driven member to move said latch means from engagement with the notches.

3. An apparatus as set forth in claim 2 wherein the latch ends of the bell crank levers extend in opposite directions.

4. An apparatus as set forth in claim 2 wherein the latch ends of the bell crank levers extend in opposite directions toward each other.

5. An apparatus as set forth in claim 2 wherein the latch ends of the bell crank levers extend in opposite directions away from each other.

MAX L. JEFFREY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,459,077	Jeffrey	Jan. 11, 1949
2,461,707	Szerlip et al.	Feb. 15, 1949

FOREIGN PATENTS

Number	Country	Date
50,727	Denmark	Oct. 7, 1935
287,364	Great Britain	Mar. 22, 1928
602,081	Germany	Sept. 4, 1934