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A. DEUTSCHMANN

2,300,489

SWITCH

Filed March 1, 1940

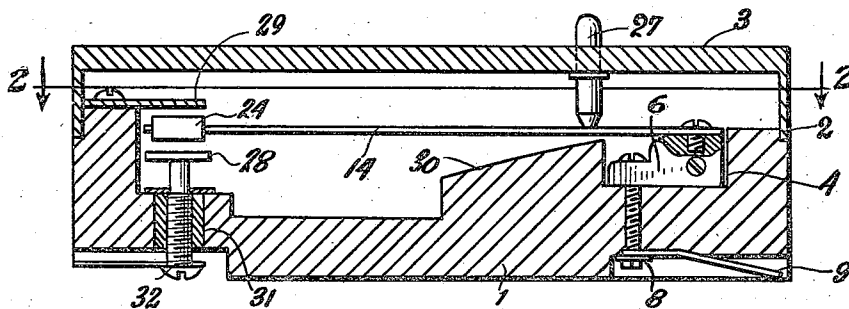


Fig. 1

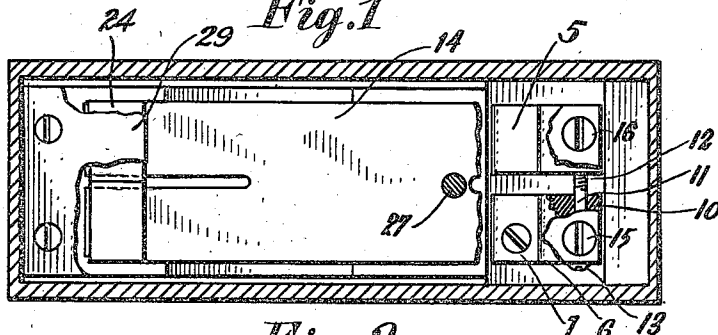


Fig. 2

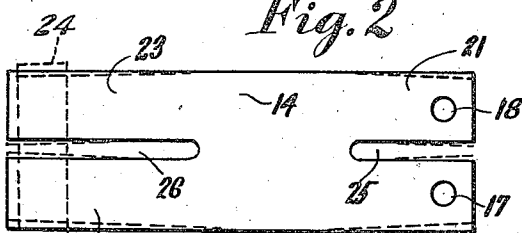


Fig. 3

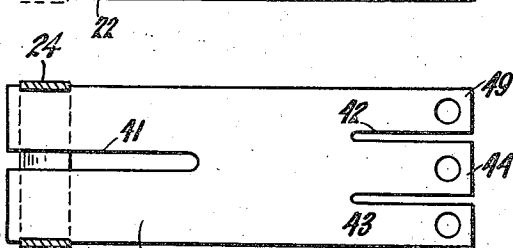


Fig. 4

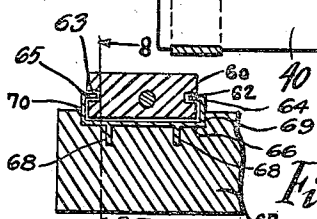


Fig. 5

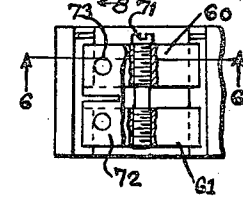


Fig. 6

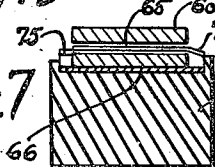


Fig. 7

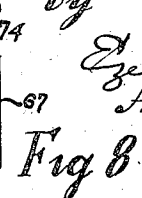
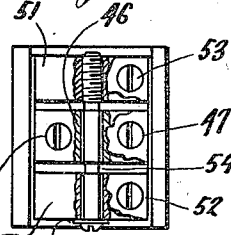


Fig. 8

Fig. 5



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SWITCH

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10 Claims. (Cl. 200-67)

The present invention relates to electric switches and in particular to the type of switch which operates with a small motion and with desired regulated pressure. Such devices of electric switches are commonly in use and usually comprise a flexible leaf spring in which a strain is placed upon the spring in such a way that a slight motion of the spring by pressure at one point will cause the spring to snap and assume another position. A common type of spring leaf used for this purpose is a flat leaf spring of phosphor bronze or other spring material which has a slot along the middle and bowed slightly inward on either side to give the spring a definite inclination from an unstrained level plane. The leaf spring is usually fixed at its unstrained end and positioned with the inclination from a level plane downward. A slight pressure on the top of the leaf spring in its center near its fixed end will cause the other end of the spring to snap upwards with a sudden snap action.

The present invention relates to this type of switch and is an improvement in the construction of the leaf spring and in its mounting and operation.

In most of the prior construction of switches of the type described, it is not easy to regulate the amount of motion necessary for making the leaf spring operate from the pressure on the point of the sensitive area. In the present invention this is accomplished by mounting the leaf spring in a practically free and unrestrained condition and then after the spring has been mounted, to apply the strain gradually until the desired pressure and movement has been attained.

This is accomplished in the present invention by adjusting the strain on the leaf spring from substantially zero force to the desired final force. In this way the switch may be accurately adjusted and readjusted if necessary after the first adjustment has been made. The switch may even be adjusted after it has been installed in the unit in which it is operated. The adjustment may then be made in accordance with the desired or necessary condition of operation.

The invention will be more fully explained and understood from the description given below when taken in connection with the drawing showing an embodiment of the invention, in which:

Figure 1 shows a section through the switch with some elements left in full.

Figure 2 shows a top section taken on the line 2-2 of Figure 1.

Figure 3 shows a detail of the leaf spring.

Figure 4 shows a modification of the leaf spring shown in Fig. 3.

Figure 5 shows a detail of the support for the leaf spring of Figure 4.

Figure 6 shows a modification of a detail on the line 6-6 of Figure 7, and,

Figure 7 shows a plan view of the detail, and,

Figure 8 shows a section of the detail on the line 8-8 of Fig. 6.

In Figure 1, 1 indicates a base support which is provided with a shoulder 2 upon which the cover 3 rests. The base and cover are preferably made of insulating material such as hard rubber, Bakelite or other suitable material. The base 1 is provided with a slot 4 upon which is positioned plates 5 and 6. These plates may be of conducting material if desired and are of such dimensions that they ride freely in the slot or groove section 4. As indicated in Figs. 1 and 2 one of these plates or blocks 6 is fixed to the base 1 by means of the screw 7 which may be terminated in a nut 8 and support the terminal lug 9. The plate 6 is also provided with a perforation extending through the plate 10 from one side to the other side in which is positioned a stud 11 threaded at its end 12 where it enters the side of the block 5. The block 5 is similarly threaded and is free from the base 1. When therefore the stud 11 is turned at its screw head 13, the plate 5 is drawn towards the plate 6. Each block 5 and 6 holds one side of the leaf spring 14. This is preferably accomplished by means of the machine screws 15 and 16 screwing into the blocks 6 and 5 respectively, through the holes 17 and 18. Therefore as the stud 11 is turned, a tension is placed between the legs 20 and 21 at the supported end of the spring. The other ends 22 and 23 of the spring may be initially bowed together and held in place by means of the band 24 which fastens around the end of the spring as indicated in Figure 2 and which may be riveted to the spring legs. Any other method of bowing in the free end of the spring may of course be used. Since both ends of the spring are slotted as indicated at 25 and 26, the bowing in of the end 26 relieves the strain which might be put on the other end of the spring. However this initial bowing in as indicated by the dotted lines of Figure 3, makes it possible to regulate the tension for the operation of the spring at the other end with very little adjustment or bowing in of the fixed end of the spring. In addition to this it localizes the point of appli-

cation of the pressure so that the spring may be very efficiently operated.

In the assembly of the unit as shown in Figures 1, 2 and 3, the wrapper 24 is first placed around the free end of the spring 14. The spring is then put in position by being fastened to the plates 5 and 6 by means of the screws 16 and 15 in such a way that no tension will be imposed upon the spring. A pressure device may then be applied to the pin 27 as the head 13 of the stud 11 is carefully turned until the spring will snap from its bowed down position with the end 24 in contact with the contact plate 28 to its upward position in contact with the contact plate 29. The base 1 may be shaped with a supporting extension 30 to limit the throw of the spring 14. This motion may be regulated to the order of $\frac{1}{1000}$ of an inch with slight pressures of the order of ounces or fractions of an ounce. After the desired pressure is obtained by adjustment of the stud 11 this may be locked in position if desired so that no further adjustment should be made.

In Figure 1 is should be noted that the contact plate 28 may be adjusted vertically in the threaded bushing 31 by turning the screw 32 up or down, so that in the lower contact position of the wrapper 24 the desired pressure against the plate 28 may be obtained after the adjustment of the moveable plate or block 5 has been made which controls the action of the end of the spring. The pin 27 operates in the sensitive area. Usually this is an area which is concaved upwards so that a slight pressure downward on the pin 27 will snap a free end of the spring 14 up against the contact plate 29. The slots 25 and 26 may be made of any desired length and their comparative lengths will regulate the position of the point at which the pin 27 should operate. If a more gradual adjustment is desired, the slot 25 is usually made shorter than the slot 26.

In Figures 4 and 5 is shown a modification of the invention indicated in the other figures.

In Figure 4 the leaf spring 40 is provided with one slot 41 at its free end and two slot 42, 43 at its fixed ends. The center forked member 44 in this case is attached to the plate 46 by means of the screw 47 and the plate 46 is fixed to the base by means of the screw 45. The end forked elements 48 and 49 are screwed to the blocks 50 and 51 by means of the screws 52 and 53. The blocks 50, 46 and 51 have an aligned hole with the hole in the block 51 threaded to receive the screw 54. As the head of the screw 54 is turned, the blocks 50 and 51 are drawn together thus exerting a tension which is located just beyond the slots 42 and 43 in line approximately with the center section 44 of the leaf spring. A lock washer 55 may be provided so that the screw 54 will be held in position after it is adjusted.

In the operation of the switch mechanism after the leaf spring has been mounted in place the screw 54 will be tightened producing a sensitive area beneath the pin 27. This action will produce a strain in the spring under the pin 27 and bend the spring slightly downward to the contact plate 28. If the free end of the spring has been tensioned, this will also produce a sensitive area underneath the pin 27 and these two sensitive areas may be so regulated to produce a stable equilibrium but one will cause the spring to snap quickly upon slight pressure under the point 27. If the blocks 5 and 6 had been moved away from one another, a sensitive area would still be produced under the point 27 which would cause an inclination upwards of the end of the

leaf spring 14 so that in this case the snapping action of the spring downward would be accomplished by pressure on the underneath side of the spring.

In the modification of Figures 6, 7 and 8, the blocks or plates 60 and 61 corresponding to the plates 50 and 51 of Figure 5 are grooved or slotted on their ends as indicated at 62 and 63 (Figure 6) to receive the projecting flanges 64 and 65 of the support member 66 which is anchored in the base 67 by the pins 68, 68, or in any other suitable way. The support 66 has upwardly extending sides 69 and 70 from which the flanges 64 and 65 project.

Initially the adjusting screw 71 is put in place in the plates 60 and 61 with the plates spaced apart so that the rivet holes 72 and 73 in the plates align with those in the spring in their untensioned position. The plates are then slid on the flanges as tracks until they are centered on the base 67. The plates may then be locked in, on one side by the downward inclination of the flanges 64 and 65 as indicated at 74 (Figure 8) and on the other side by the punching of the flange down as indicated at 75, which of course is done after the plates are put in position. When the plates are put in position, the spring assembly with the spring, the plates and adjusting screw have already been put together. After this assembly is put in place, the adjusting screw can be adjusted for the desired pressure and throw. The advantage of this modification is rapid assembly.

Having now described my invention, I claim:

1. An electric switch comprising a leaf spring having a free end and a fixed end, said spring being bifurcated at both ends, means mounting said fixed end of the spring, comprising independent mounting elements for each bifurcated end, and means for adjusting the position of said mounting means to strain said leaf spring whereby a set is provided for said leaf spring inclining the free end of the spring away from its normal level position and means for exerting a pressure on the convex side of the spring at a point of balance whereby a slight movement at the point of pressure will cause the free end of the spring to snap in the other direction.

2. An electric switch comprising a base insulating element having a transverse guideway, a plurality of block elements positioned in said guideway, means for adjustably positioning said block elements in spaced relation in said guideway, a leaf spring having bifurcated members at each end, means mounting said bifurcated elements at one end, one on each block, a contact element mounted at the other end of said leaf spring and exerting a towing-in effect of the bifurcated ends of said last elements whereby said leaf spring is bowed normally in the direction away from the original level of said spring and means for applying pressure on the side of said spring from which the free end of the spring is bowed.

3. An electric switch comprising a base insulating element, a leaf spring having one end slotted, means fixing the slotted end of the spring including means for drawing together the means fixing said slotted end of said spring whereby the leaf spring at its other end is drawn away from its normal plane position and a sensitive area created in the vicinity of the spring at the end of the slot, contact means arranged opposite the free end of the spring, and means for exerting a pressure on said spring in said sensitive area for causing the

spring to snap in a direction to its normal plane at its free end.

4. An electric switch comprising a base insulating element, a leaf spring having slotted ends, means fixedly towing in said leaf spring at one end and means adjustably towing in said spring at the other end including means mounting each slotted portion of said spring at one of said spring ends, said towing in means creating a sensitive area in said spring whereby pressure on one surface will cause the spring to snap at its free end in the opposite direction and means for exerting pressure on said spring in said sensitive area.

5. An electric switch comprising a base insulating element, a leaf spring having slotted ends, means for towing in one of said slotted ends, means for mounting the other of said slotted ends, means for adjustably towing-in the mounted slotted ends of said spring whereby a sensitive area is created in the vicinity of the spring between said slotted ends, contact means arranged opposite the free end of the spring and means for exerting a pressure on said spring in said sensitive area for causing the spring to snap in a direction to its normal plane at its free end.

6. An electric switch comprising a base insulating element, a leaf spring having slotted ends, contact means mounted on one of said slotted ends and exerting a straining action on the legs adjacent the slot, means mounting the other slotted end of the spring including means for adjustably exerting a strain on the sections of the spring on either side of the slot whereby a sensitive area is created in the vicinity of the spring between the ends of the slots drawing the spring away from its normal plane position, contact means arranged opposite the free ends of the spring and adapted to complete an electrical circuit with the contact means on said spring, and means for exerting a pressure on said spring in the said sensitive area for causing the spring to snap in a direction to its normal plane at its free ends.

7. An electric switch comprising a base insulating element, a leaf spring having one end slotted, means for mounting the slotted end of said spring including a plurality of blocks, one for mounting each slotted section of said spring, means for adjustably drawing together said mounting blocks whereby the leaf spring at its other end is drawn away from its normal plane position and a sensitive area created in the vicinity of the slot end of said spring, contact means arranged opposite the free end of the spring and means for exerting a pressure on said spring in said sensitive area for causing the spring to snap in a direction to its normal plane at its free end.

8. An electric switch comprising a base insulating element, a leaf spring having both ends

slotted, means for straining one end of said slotted spring in a permanent fixed position, means for adjustably straining the other end of said slotted spring including means for mounting the slotted end of said spring comprising a plurality of block elements, one for mounting each slotted section, and means for adjustably positioning the relative position of said blocks in a direction transversely to said spring whereby the leaf spring at its other end is drawn away from its normal plane position and a sensitive area created in the vicinity between the slotted ends of said spring, contact means arranged opposite the free end of the spring and means for exerting a pressure on said spring in said sensitive area for causing the spring to snap in a direction to its normal plane at its free end.

9. An electric switch comprising a base insulating element, a leaf spring having both ends slotted, means for fixedly towing in one end of the slotted spring, means for adjustably towing in the other end of said slotted spring comprising means mounting each slotted section of the spring, means permanently fixing one of said mounted sections to the insulated base and screw means passing through said mounted section and threading into another of said mounting means for adjustably positioning said mounting means relative to each other whereby the leaf spring at its other end is drawn away from its normal plane position and a sensitive area created in the vicinity of the spring between the ends of the slots, contact means arranged opposite the free end of the spring and means for exerting a pressure on said spring in said sensitive area for causing the spring to snap in a direction to its normal plane at its free end.

10. An electric switch comprising a base insulating element, a leaf spring having a plurality of slots at each end thereof, means for permanently straining the sections of said spring adjacent said slots at one end thereof, means for adjustably straining the sections of said spring adjacent said slots at the other end thereof including block means for independently mounting each section of said spring formed by said slots, means permanently fixing one of said block sections to said insulating elements and screw means for adjustably moving the other of said blocks relative to the fixed block whereby the spring at its other end is drawn away from its normal plane position and a sensitive area created in the vicinity of the spring at the end of the slot, contact means arranged opposite the free end of the spring and means for exerting a pressure in said spring in said sensitive area for causing the spring to snap in a direction to its normal plane at its free end.

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