Feb. 27, 1945. E. P. MEYER 2,370,479

SWITCH MECHANISM

Filed Jan. 28, 1944

Fig. 1

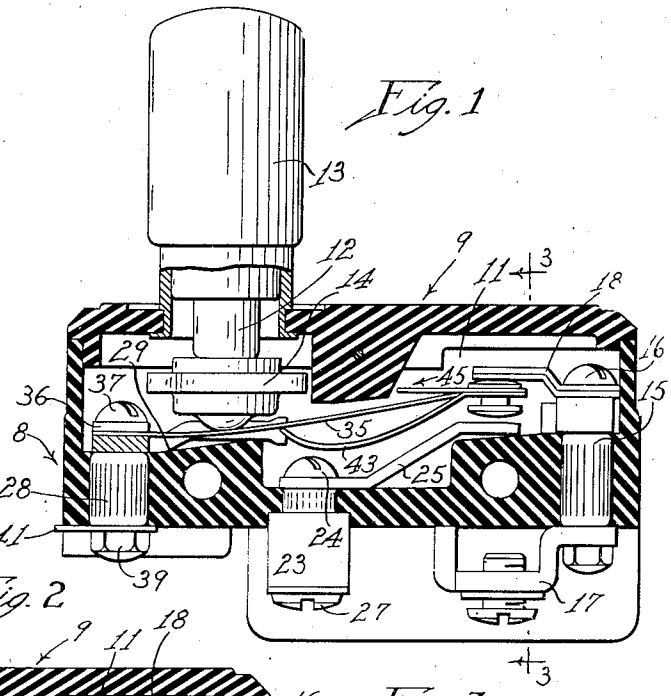


Fig. 2

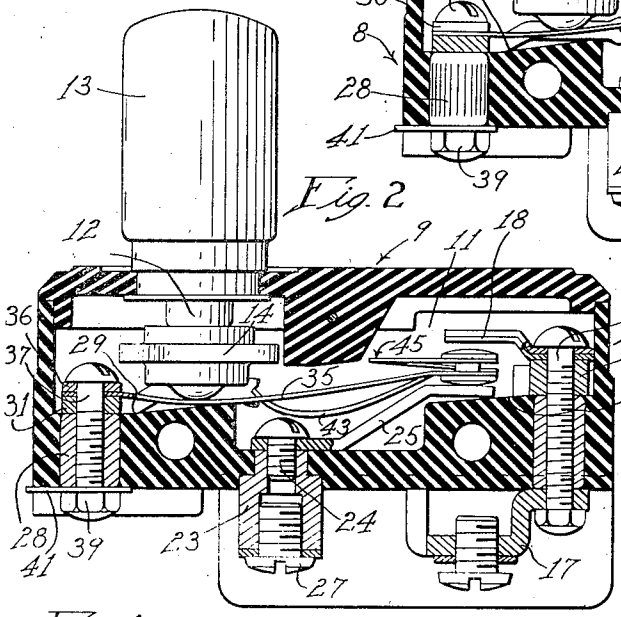


Fig. 3

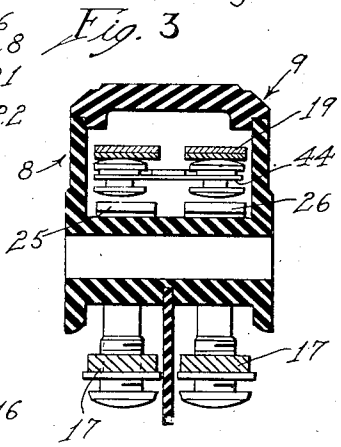


Fig. 4

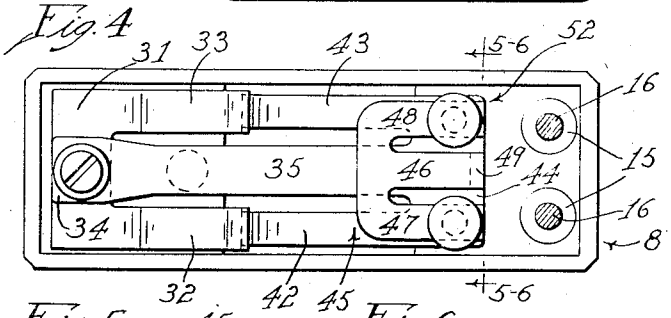


Fig. 5

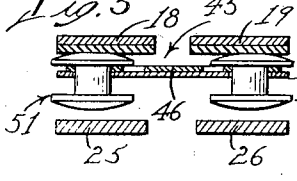
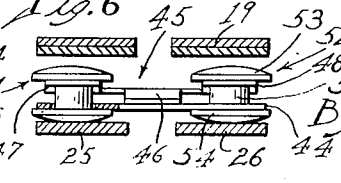


Fig. 6



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2,370,479

SWITCH MECHANISM

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Application January 28, 1944, Serial No. 519,985

3 Claims. (Cl. 200—67)

This invention relates to switch mechanisms and more particularly to switches of the precision type having low operating pressure and a small operating movement.

With switches of this type a serious problem is that of producing a sharp and clean break of the contacts without bounce and with an unwavering and direct movement of the parts. This is particularly difficult in switches of the type having a switch spring mounted at one end in cantilever fashion with the other end moving through an arc with snap movement.

An important object of the invention is the provision of a switch of the character described wherein the main mobile switch contacts are carried on the main switch spring for movement independently thereof and are supported on an auxiliary spring support imparting a secondary movement to the contacts to maintain the mobile contacts in engagement with the stationary contacts a short interval after the start of movement of the main switch spring, and likewise to bring the contacts into engagement a short interval before the main switch spring completes its movement, and wherein the resilient mounting of the mobile contact is such that the auxiliary spring is completely unloaded at the time contact is made with either an upper or a lower contact.

Other objects and advantages will appear from the description and the accompanying drawing, in which—

Figure 1 is a longitudinal section through a switch embodying my invention showing the mobile contacts engaging the upper contacts of the switch;

Fig. 2 is a view similar to Figure 1 showing the mobile contacts engaging the lower contacts of the switch;

Fig. 3 is a section substantially on the line 3—3 of Figure 1;

Fig. 4 is a top view of the switch showing the cover and the upper stationary contacts removed; and

Figs. 5 and 6 are enlarged views partly in section taken through the stationary and mobile contacts showing the relative positions of the mobile contacts and the switch springs in the two positions of Figs. 1 and 2.

The invention as herein shown is embodied in a molded plastic case having a body 8 and a cover 9 seated over the body in interfitting relationship to provide an enclosed switch chamber 11 effectively enclosed against extraneous solid material such as dust, which might interfere with the operation of the switch mechanism. Carried in the cover is an actuating plunger 12 operated from an actuator button 13, in this instance an over-travel mechanism being disposed therein but forming no part of the present invention. The actuating pin 12 carries a plunger head 14 preferably of insulating material adapted to engage and operate the switch spring, as will presently be described. Fitted into the opposite end of the housing 8 are ferrules 15 adapted for the reception of screws 16 arranged at their lower ends to retain electrical connector brackets 17 against the bottom of the body 8 and at their upper ends to secure stationary or fixed upper contacts 18 and 19 in position against spacers 21 disposed within the chamber 11 against an abutting surface 22. The screws 16 thus serve to secure the upper stationary contacts in position, to hold the brackets 17 in position and to form an electrical connection therebetween.

Likewise molded or otherwise suitably secured in the bottom of the body 8 are ferrules 23 spaced transversely of the housing adapted to receive screws 24 which hold lower stationary or fixed contact members 25 and 26 in position, these lower stationary contact elements extending upwardly and outwardly into spaced relation with the upper stationary contacts 18 and 19. The ferrules 26 are also provided with screws 27 adapted for the connection thereto of electrical conductors for connecting the switch into the desired electrical circuits.

A ferrule 28 is molded into the body 8 adjacent the end thereof opposite the ferrules 15, the upper end of the ferrule being flush with a shoulder 29 of the body. Seated on the upper end of the ferrule and against the shoulder 29 is an anchor plate indicated generally by the numeral 31 having spaced anchor legs 32 and 33 extending toward the center of the chamber 11 along opposite sides of the body, as will be apparent from Fig. 4. Positioned on the top of the anchor plate 31 is an end 34 of a tension member 35 presently to be more fully described, a washer 36 being disposed above the end 34 and a screw or bolt 37 passing therethrough, through the ferrule 28 and a nut 39, a tab 41 being disposed between the nut 39 and the ferrule, the screw thus serving to hold these parts in fixed relationship with respect to each other and the bottom of the body 8. The tab 41 serves for connection of the tension member 35 into an electric circuit if desired.

The tension member 35 forms part of a main snap spring such as that described in McGall

Patent 1,960,020, mounted in cantilever fashion, this spring being formed of suitable metal such, for example, as beryllium copper and having in addition to the tension member **35**, spaced compression members **42** and **43** of somewhat lesser length than the tension member **35**, the compression members and the tension member being interconnected at the free end of the spring as shown at **44**. The opposite ends of the compression members **42** and **43** are pivotally supported in notches in the ends of the anchor legs **32** and **33**, as described in said McGall patent.

It will be seen that with this construction, when the button **13** is depressed so as to force the head **14** downward and move the tension member **35** through the axis of maximum compression of the spring system and beyond the point at which the compression members **42** and **43** are carried in the anchors, the free end **44** of this main spring system will snap from the position shown in Figure 1 to the position shown in Fig. 2.

As will be seen from Figs. 1 and 2, the free end **44** of the main spring is disposed between the stationary contacts **18** and **19** and the stationary contacts **25** and **26**, so that when the plunger is depressed the free end snaps toward the contacts **25** and **26**, and when the plunger is released the free end snaps back toward stationary contacts **18** and **19**. Carried on the free end **44** of the main snap spring is a trifurcated or W-shaped auxiliary spring designated generally by the numeral **45** having a central leg **46** and spaced side legs **47** and **48**, the auxiliary spring extending backward in superimposed relationship over the main spring, as will be apparent from the drawing. The free end of the central leg **46** is welded, brazed or otherwise attached to the central portion of the free end **44** as shown at **49**, this connection being the sole means of connecting the auxiliary spring to the main spring. Carried on the free ends of the side legs **47** and **48** are mobile contacts **51** and **52**, these contacts being fixed to the legs and each of the contacts comprising spaced heads **53** and **54** (Fig. 6) interconnected by a shank **55**, the free end **44** of the main spring having openings of such size as to permit the free passage of the shanks but of insufficient size to permit the passage of the heads. It will thus be seen that the contacts **51** and **52** are supported on the main spring through the resilient side arms **47** and **48** and the central arm **46** so that the contacts have restrained movement with respect to the free end **44** and with respect to each other.

The auxiliary spring **45** is so arranged and mounted that in its unstressed condition the free end **44** occupies a position substantially midway between the contact heads **53** and **54** and such that the auxiliary spring is completely unloaded at the time contact is made with either the upper or lower stationary contacts or stops. It will be seen that the upper and lower stationary contacts form stops to limit the movement of the free end **44**. As the plunger is depressed beyond the tension center line and the main spring moves out of the position shown in Figure 1, the free end **44** first leaves the back of the contact heads **53** and continues to move with a continuous action during the snap, the auxiliary spring maintaining the heads in engagement substantially until the auxiliary spring is unstressed. Upon continued movement the mobile contacts approach the stationary contacts **25** and **26** and as they reach these contacts the auxiliary spring is gradually stressed until the main spring seats against the back of the heads **54**. The modulus of elasticity of the auxiliary spring is so related with respect to that of the main switch spring that when the contacts come into engagement, the auxiliary spring will flex sufficiently to maintain the contacts in engagement in spite of the rebound of the free end of the main spring. The precise value cannot be given because it will vary considerably with different switch designs and should be determined for each design by sample tests well known in the art. Thus, any bounce which may occur as a result of action in the main switch spring will result simply in the main spring leaving contact with the back of the heads **54** and its vibration will occur without the face of the mobile contacts being disengaged from the stationary contacts. The electrical circuit is maintained through any such movement by way of the auxiliary spring. Where double contacts are used so that the heads **53** and **54** function to bridge between two contacts in each position (a contact construction well known in the art) the auxiliary spring mounting of the mobile contacts functions to compensate for small irregularities in the level of the fixed contacts and insures substantially simultaneous break on the two sides. Likewise it will be seen that the auxiliary spring compensates for differences in the level of the contacts **25** and **26** or the contacts **18** and **19** by flexing about a longitudinal axis through the switch, and likewise insures a substantially simultaneous break as between the two mobile contacts and their respective stationary contacts.

I claim:

1. The combination in an electric switch of a main switch spring mounted at one end in cantilever fashion having a free end, means for flexing said spring to cause said free end to move between opposed positions with a snap action, an auxiliary spring having a central leg fixed to said free end and side legs disposed on opposite sides thereof, said legs being interconnected, mobile contacts carried on said side legs, said mobile contacts each having spaced heads and a shank interconnecting said heads having passage through said free end and having a length greater than the thickness of said free end, one of said heads being connected to its corresponding leg, and fixed upper and lower contacts defining the aforesaid positions of said switch spring, said auxiliary spring being shaped in unstressed condition to support said heads in spaced relation to said free end for movement of said mobile contacts into engagement with said fixed contacts while the auxiliary spring is unstressed.

2. The combination in an electric switch of a main switch spring mounted at one end in cantilever fashion and having a free end, means for flexing said spring to cause the free end to move between opposed positions with a snap action, spaced fixed contacts adjacent said free end defining opposed positions of said free end, a forked auxiliary spring overlying said free end having a plurality of legs interconnected at one end, the unconnected end of one leg being attached to said free end, at least one mobile contact carried on the unconnected end of the other of said legs, said mobile contact having spaced heads and a shank of greater length than the thickness of said free end passing freely through said free end and interconnecting said heads, said auxiliary spring being shaped, in unstressed condition, to support said heads in spaced relation to opposite sides of said free end, for engagement

and disengagement of said mobile contact with said fixed contacts at points in the travel of said main spring at which said auxiliary spring is unstressed, in response to movement of said main spring to either of said positions, and means for actuating said main spring to cause said free end to move to said opposed positions bearing against the heads of said contacts to stress the auxiliary spring and hold the mobile and fixed contacts in engagement.

3. The combination in an electric switch of a main switch spring mounted at one end in cantilever fashion having a free end, means for flexing said spring to cause said free end to move between opposed positions with a snap action, an auxiliary spring having a central leg fixed to said free end and side legs disposed on opposite sides thereof, said legs being interconnected, mobile contacts carried on said side legs, said mobile contacts each having spaced heads and a shank interconnecting said heads having passage through said free end and having a length greater than the thickness of said free end, one of said heads being connected to its corresponding leg, and fixed upper and lower contacts defining the aforesaid positions of said switch spring, said auxiliary spring being shaped in unstressed condition to support said heads in spaced relation to said free end for movement of said mobile contacts into engagement with said fixed contacts while the auxiliary spring is unstressed, said auxiliary spring having a modulus of elasticity to flex and thereby maintain said mobile contact in engagement with the fixed contact upon rebound of said free end incidental to snap movement of said end into said opposed positions.

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