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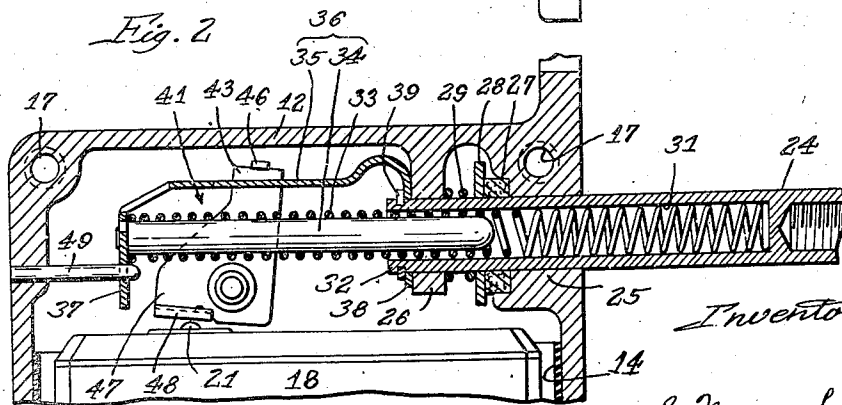
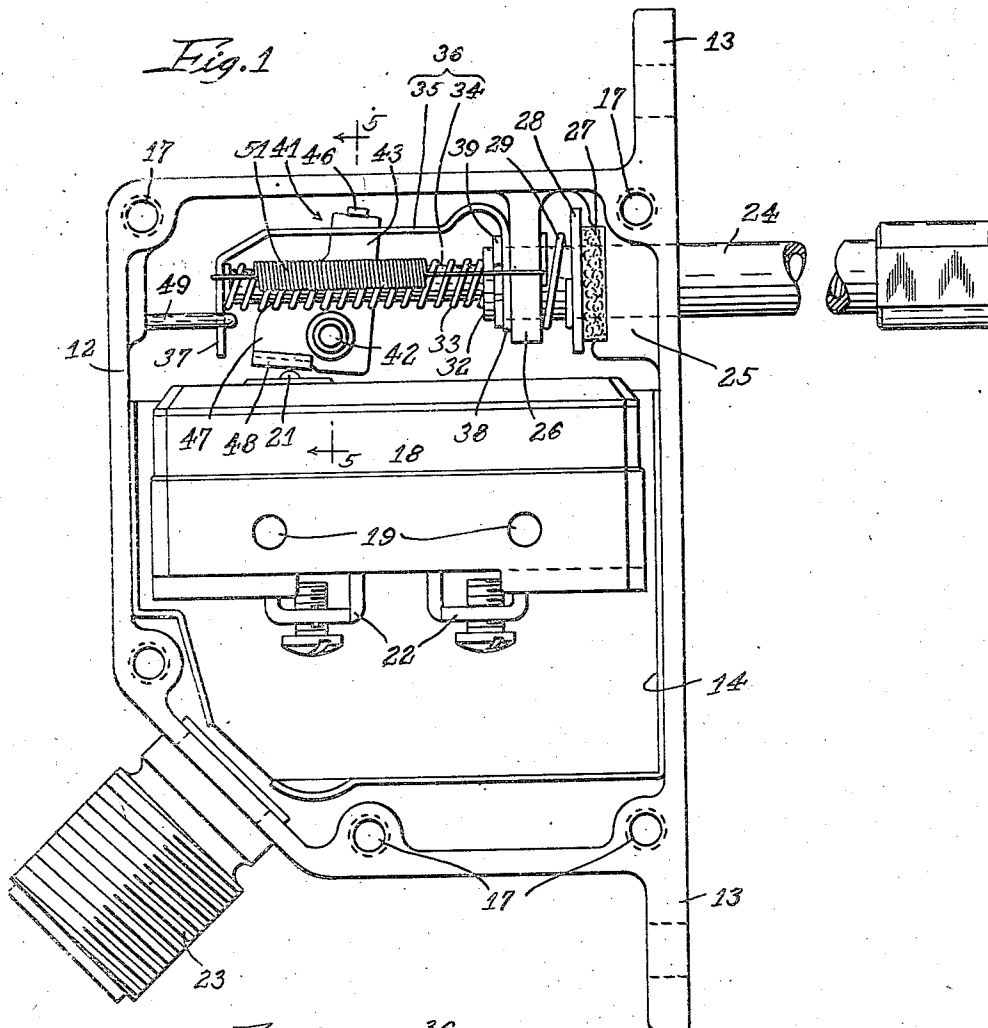
C. B. MENSENKAMP

2,331,997

ELECTRIC SWITCH CONSTRUCTION

Filed July 6, 1942

2 Sheets-Sheet 1



Inventor:

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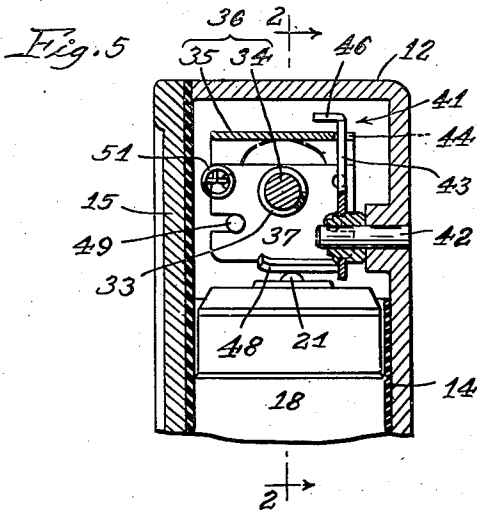
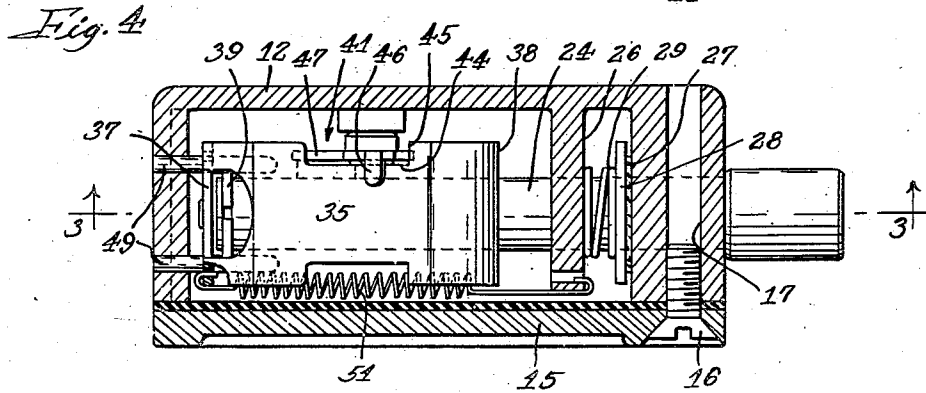
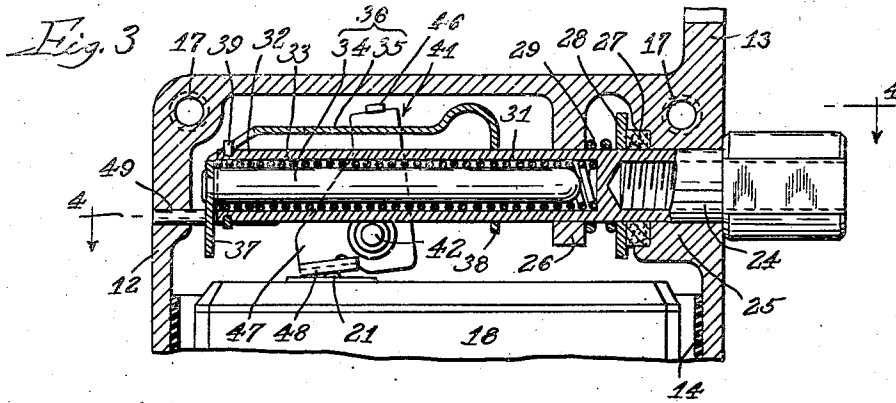
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,331,997

ELECTRIC SWITCH CONSTRUCTION

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poration of Illinois

Application July 6, 1942, Serial No. 449,894

4 Claims. (Cl. 74-503)

The present invention relates to electric switches.

Objects of this invention include the provision of a rugged, compact, low cost electric switch construction, suitable for use as a limit switch or the like, particularly for aircraft, the provision of such a switch which operates in response to a small motion of its actuating member while permitting a substantially greater amount of over-travel of the actuating member beyond the switch operating point thereof than has heretofore been possible with switches of this character without increasing the dimensions of the switch, particularly adapting the switch to certain aircraft requirements, the provision of such a switch requiring a small operating effort and having inherent accuracy and reliability of operation, the provision of an improved switch actuating mechanism wherein space and weight are reduced to a minimum, and the provision of an improved electric switch construction. Other objects of the invention will become apparent from the following description of a specific embodiment thereof which serves by way of example to illustrate the manner in which the invention may be carried out, without thereby limiting the invention to the specific details of the example.

In the drawings:

Figure 1 is a side elevation of a switch embodying my invention, with the cover and gasket removed and the operating plunger in the retracted position;

Fig. 2 is a fragmentary section through the upper portion of the switch taken substantially on the line 2-2 of Fig. 5;

Fig. 3 is a section similar to Fig. 2 showing the position of the parts with the plunger moved inward to the end of its stroke;

Fig. 4 is a section substantially on the line 4-4 of Fig. 3, and

Fig. 5 is a fragmentary section on the line 5-5 of Figure 1.

In the drawings, a shallow die cast metal housing 12 is closed by a gasketed cover 15 (Figs. 4 and 5) held by screws 16 in the tapped holes 17, the housing having flanges 13 for attachment to a support and a lining of insulation material 14 partly covering the inner surface. Within the housing, a unitary elongated rectangular switch 18 fits accurately onto a pair of supporting pins 19 (Figure 1). This switch 18 may, for example, be of the type described in Patent 1,960,020 to P. K. McCall. Switch 18 has a small operating pin 21 that projects vertically from its top and is adapted to be depressed for operating electric contacts

within the switch 18. It also has terminals 22 on its bottom face (Figure 1). An aperture in the side of the housing is fitted with a conduit bushing 23 which opens into the lower portion of the housing to permit conducting wires to be brought in easily for attachment to the terminals 22 of the switch. The unitary switch 18 itself may be lifted off its supporting pins 19 while the circuit wires are being fitted to it and then slipped back into place.

The space in the housing above the unitary switch 18 contains a mechanism for actuating the switch. This mechanism includes a reciprocal plunger 24 extending through the wall of the housing and supported partly in an enlargement or boss 25 in the wall of the housing and partly in an integral bracket 26 spaced slightly from the boss 25. A felt washer 27 held by a metal washer 28 and a spring 29, bearing against the bracket 26 provides a seal against oil and moisture. A bored hole 31 (Figs. 2 and 3) extends into the plunger 24 from its inner end 32 (left end as seen in the drawings). Into this bore fit a compression spring 33 and a pilot rod 34 one within the other. This pilot rod 34 and a strip 35 together constitute a rider 36 that is carried by the plunger 24. The strip 35 has a downturned tab 37 at its extreme forward end to which the pilot rod 34 is riveted, and has another downward extending tab 38 at its rearward end slidably fitting over the plunger 24. With its tab 38 fitting the outer surface of the plunger 24 and its pilot rod 34 telescoping into it, the rider 36 is reciprocable on the plunger 24. The compression spring 33 urges the rider 36 forward on the plunger 24, and a C-shaped key 39 clamped in a circumferential groove near the inner end of the plunger 24 serves as a stop for preventing the rider 36 from sliding forward (to the left as seen in Figs. 1 to 4) off the end of the plunger.

A bell crank 41 rides on a pivot pin 42 which has its axis immediately below the pilot rod 34 and spring 33. The bell crank 41 includes an approximately vertical arm 43 that extends up alongside of the plunger-and-rider assembly and fits into a notch 44 (Figs. 4 and 5) in the side of the strip 35 so that a shoulder 45 (Fig. 4) at the rearward end of the notch is adapted to engage the arm 43 of the bell crank for driving it forward when the plunger 24 is forced inwardly. A tab 46 at the upper end of the arm 43 extends over the top of the rider strip 35 to prevent the arm 43 from dropping out of its engagement with the notch 44. A second arm 47 of the bell crank 41 extends forward and carries a tab 48 for en-

gaging the operating pin 21 of the unitary switch 18. This construction gives the bell crank an effective lever arm that is longer than the slight spacing of the bell crank pivot 42 below the plunger 24.

A pair of pins 49 which fit into perforations in the downward extending forward tab of the strip 35 serve to give lateral support to the extreme forward end of the rider 36 and also prevent its rotation about the axis of the plunger 24 so as to maintain the notch 44 of the strip 35 in proper position for actuating the bell crank 41. A coil spring 51 connected between the bracket 28 and the forward tab 37 of the strip 35 serves to retract the rider 36 and plunger 24 to their normal positions shown in Figs. 1 and 2 upon the release of actuating pressure from the plunger.

When the actuating plunger 24 is moved forward (toward the left) to the position shown in Figs. 3 and 4, the resulting forward motion of the rider 36 drives the bell crank 41 against the operating pin 21 of the switch 18 for operating it, the force transmitted through the spring 33. The resilience of the spring 33 permits the plunger 24 to continue its forward motion beyond the point at which the switch 18 operates simply by telescoping over the spring and pilot rod 34. The considerable "Overtravel" motion of the plunger 24 can be noted in Fig. 3 where the plunger 24, moved to its extreme forward position, has carried the key 39 away from the end 38 of the rider 36 and to a point adjacent the opposite end 37 of the strip 35.

The lower surface of the tab 48 of the bell crank 41 is parallel to the axis of the bell crank pivot 42 which in turn is parallel to each of the two supporting pins 19 of the unitary switch 18. Accordingly, movement of the switch 18 on its two pins will not, by itself, bring the actuating pin 21 into engagement with a higher or lower spot of the bell crank tab 48. That is, movement of unitary switch 18 on its pins 19 cannot effect operation of switch 18 by the plunger 24 and the bell crank 41.

Throughout the specification and claims, directional terms such as above, below, horizontal, vertical, forward, etc., are used for convenience and for indicating relative directions, and are not used in a restrictive sense.

It will be apparent to those skilled in the art that the present invention is capable of numerous modifications and variations, and that the particular embodiment herein shown and described serves simply as an example. Accordingly the invention is to be limited only in accordance with the scope of the appended claims.

I claim:

1. In combination in a compact actuator construction of the class described, a reciprocable actuating plunger having a bore at its forward end for receiving a spring and rod, a rider carried by said plunger and slidable lengthwise thereon, said rider including a rod for entering said bore of said plunger, a coiled compression

spring telescoping within said bore and over said rod for holding said rider forward on said plunger, a stop on said plunger for limiting the forward motion of the rider thereon, a spring opposing the forward motion of said rider and plunger, and a lever supported separately from said plunger and rider abutting said rider to be driven by the forward motion thereof.

2. In combination in a compact actuator construction of the class described, a reciprocable actuating plunger having a bore at its forward end for receiving a spring and rod, a rider carried by said plunger and slidable lengthwise thereon, said rider including a rod for entering said bore of said plunger, a coiled compression spring telescoping within said bore and over said rod for holding said rider forward on said plunger, said rider including also a strip lying approximately parallel to and above said rod and plunger, and having its two ends turned down, the rear turned down end having a perforation that slidably fits over said plunger, the forward turned down end being fixed to said rod, a stop on said plunger for limiting the forward motion of the rider thereon, a bell crank supported separately from said plunger and rider on a pivot lying athwart and below said rod and plunger, said bell crank having an arm extending up alongside said rod and plunger and said strip, said strip having a shoulder at its edge for engaging said upward extending arm of the bell crank for driving it in response to the forward motion of said plunger, said upward extending arm of the bell crank having a tab extending from its upper end out over said strip so as to prevent said upper end of the bell crank from falling below said strip, and means for preventing rotation of said rider about the axis of said plunger and rod.

3. The combination of claim 1 wherein the spring for opposing the forward motion of said rider and plunger acts on said rider and there-through upon said plunger, and wherein said lever is free from the restraint of said spring.

4. In combination in a compact actuator construction of the class described, a reciprocable actuating plunger having a bore at its forward end for receiving a spring and rod, a rider carried by said plunger and slidable lengthwise thereon, said rider including a rod for entering said bore of said plunger, a coiled compression spring telescoping over said rod and into said bore and thereby guiding said rod in said bore, a stop on said plunger for so limiting the forward motion of the rider thereon that said spring and rod telescope smoothly into said bore and insure that said rod cannot jam in the entrance of said bore, a spring urging said rider and plunger rearward, a lever abutting said rider to be driven thereby, and means for guiding and laterally supporting the forward end of said rider as it moves with said plunger.

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