

Sept. 10, 1957

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2,806,114

HERMETICALLY SEALED SNAP SWITCHES

Filed Sept. 27, 1954

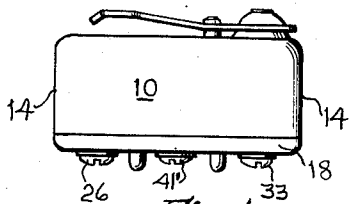


Fig. 1.

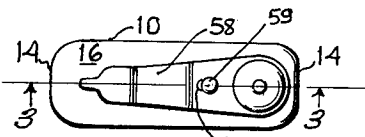


Fig. 2.

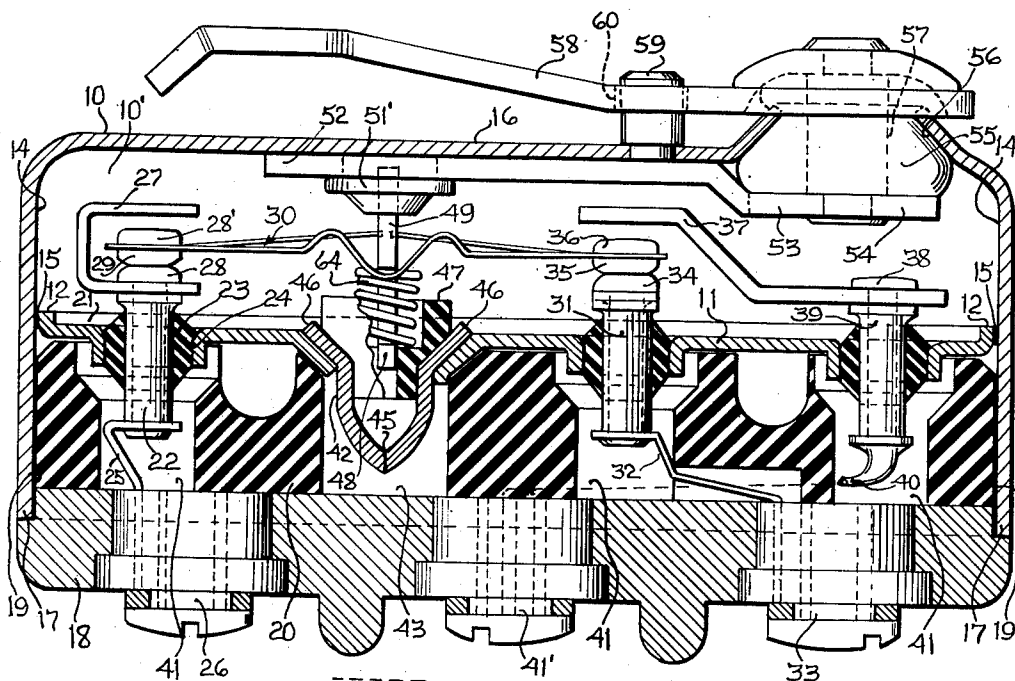


Fig. 3.

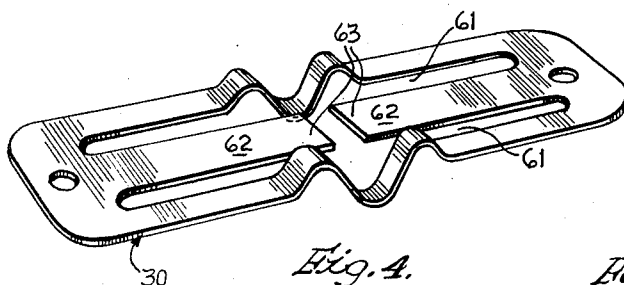


Fig. 4.

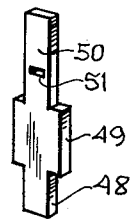


Fig. 5.

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HERMETICALLY SEALED SNAP SWITCHES

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Application September 27, 1954, Serial No. 458,305

5 Claims. (Cl. 200-168)

This invention relates to hermetically sealed snap action switches and has for its principal object the provision of an approved construction of this character which will be simple, reliable, comprising a minimum number of parts affording inexpensive manufacture.

Another object of the invention is to provide an improved and novel switch of the character hereinafter described which is sealed in an enclosure under pressure in a dry inert gas to prevent the leakage therein of water when submerged or the "breathing" in of moisture which would later freeze.

Another and equally important object of my invention is to provide a switch of the snap action type in a completely hermetically sealed enclosure to protect the switch mechanism from dust, dirt, oil, water and other foreign elements, thereby assuring at all times positive operation as well as preventing tampering therewith.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

Fig. 1 is a typical side elevational view of the switch embodying my invention showing its actual size;

Fig. 2 is the top plan view of the same;

Fig. 3 is an enlarged (four to one) sectional detail view of the same taken substantially on line 3-3 of Fig. 2;

Fig. 4 is a perspective view of a switch member embodied in the invention; and

Fig. 5 is a perspective view of a pilot plate embodied in the invention.

The several objects of my invention are preferably accomplished by the preferred form of construction shown in the accompanying drawings and in which 10 indicates a box-like shell providing part of an enclosure. Within this shell 10 is a mounting plate 11 having its edges 12 securely connected to the walls 14 of the shell 10 by welding or the like as indicated at 15. This plate 11 is located midway between a long wall 16 and the open side 17 of the shell 10 to provide a chamber 10'. The open end 17 is closed by a terminal block 18 formed of suitable non-conductive material and effectively sealed at its junction 19 with the walls 14 of the shell 10 by a suitable silicone rubber or the like. Between the terminal block 18 and the mounting plate 11 is arranged a filler block 20 formed of non-absorbent nonconductive material.

The mounting plate 11 at one end 21 thereof carries a conductor shank 22 arranged in a sleeve 23 mounted in an opening 24 formed in the plate 11, the sleeve 23 being of nonconductive material. From the lower end portion of the shank 22 extends a conductor lead 25 having connection to a terminal post 26 carried by the terminal block 18. The shank 22 at its opposite or upper end portion (as viewed in Fig. 3) carries a contact in the form of a U-shaped plate 27, one end of which carries a contact head 28 and adapted to be engaged by a contact 29 carried by a spring plate 30 to be presently described. The plate 11 carries a terminal shank 31 spaced from the terminal shank 22 and like the latter provided with a conductor lead 32 having connection with a terminal post 33 carried by the terminal block 18. The shank 31 at its

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upper end portion, as viewed in Fig. 3, carries a contact 34 which is adapted to be engaged by a contact 35 carried by the spring plate 30 opposite the contact 29. A contact head 36 is carried by the plate 30 opposite the contact 35. This head 36 is adapted to contact a conductor plate 37 connected as at 38 to a terminal shank 39 in turn connected by a lead 40 to a terminal post 41' carried by the plate 18. The filler block 20 is provided with cavities 41 to accommodate the leads 25, 32 and 40 as well as their respective terminal shanks 22, 31 and 39. Adjacent the terminal shanks 22 and 31 and substantially midway therebetween is a tube 42, which normally projects through an opening 43 formed in the block 20 and extends a substantial distance beyond the open side 17 of the shell 10 as indicated by dotted lines 44. The purpose of this tube 42 is to permit the evacuation of air and moisture from the chamber 10' within the shell between the mounting plate 11 and the long wall 16 and to permit the introduction under pressure of a dry inert gas preferably consisting of 90 percent nitrogen and 10 percent helium.

After the introduction of this dry inert gas, the tube is cut off a short distance from its inner end and then swaged together and effectively sealed as at 45.

The end of the tube 42 opposite its sealed end is flared outwardly as at 46 to provide a seat for a bushing 47 of nonconductive material and providing a guide for the shank 48 of a pilot plate 49. This plate 49 is illustrated in Fig. 5 and includes a reduced stud portion 50, the opposite sides of which are provided with notches 51. This stud 50 is secured in a nonconductive button 51' in turn carried by the outer end portion 52 of an actuating arm 53. The end 54 of the arm 53 is secured to a body 55 formed of silicone rubber. The body 55 is compressed within a flared opening 56 provided by the wall 16 with the outer end portion of the body 55 overlapping the edges of the flared opening to provide a substantial seal between the body 55 and the shell 10. Projected through the body 55 is a connecting bolt 57 which provides a connection between the end 54 of actuating arm 53 and exterior actuating arm 58 which extends in parallel relation with respect to the arm 53. On the wall 16 is provided a guide stud 59 which extends through an enlarged opening 60 formed in the arm 58 to maintain the arm 58 against lateral movement.

The spring plate 30 is illustrated in Fig. 4. This plate is provided with parallel slots 61 to provide opposite arms 62, the ends 63 of which are substantially spaced from each other. The plate 30 midway between its opposite end portions is crimped laterally to contract the plate to shorten its length and to dispose the end portions 63 of the arms 62 in a position for engagement in the notches 51 whereby when such arms 62 are thus engaged, they will be flexed to the upper side of the plate 30. Surrounding the shank 48 is a spring 64 which resists the movement of the pilot plate 49 by action of the actuating arm 58.

When the arm 58 is pivoted by pressure applied to its free end portion, the rigid connection between this arm 58 and the arm 53 will pivotally move the arm 53 to move the pilot plate 49 against the action of the spring 64, with the result that the plate 30 will be biased to snap the contact 36 against the conductor plate 37 and to snap the contact head 28' against the adjacent limb of the V-shaped plate 27. Upon release of the pressure against the arm 58, the spring 64 will return the parts to their starting position as shown in Fig. 3.

From the foregoing description, I have provided a snap action switch which will be effectively protected from the deposits on the interior thereof of moisture and one which will be particularly rapid in its operation. The switch comprises relatively few parts en-

abling it to be manufactured at an economical cost. My improved switch will be especially useful in the field of aviation and in shops where timing is essential in the operation of various machinery.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A snap action switch comprising a box like shell having an open long side, a mounting plate arranged in the shell between the open side and a top wall thereof to provide a chamber from which the air has been evacuated in a dry inert gas consisting of 90 percent nitrogen and 10 percent helium substituted therefor under pressure, a terminal plate closing the open side, a filler block disposed between the terminal plate and the mounting plate, switch mechanism arranged in the chamber and carried by the mounting plate, means exterior of the shell for actuating the switch mechanism, said last means comprising an actuating arm exterior of said shell, an actuating arm interior of said shell, a fixed stud connection between opposite ends of said arms, said shell adjacent said connection of said arms providing a restricted opening the sides of which are flared outwardly from said shell and in converging direction with respect to each other, a yieldable sealing member in said restricted opening and compressed between said opposite ends of said arms so as to over-lap said flared sides of the restricted opening, and means for preventing lateral movement of said exterior actuating means with respect to said shell.

2. A snap action switch comprising a box like shell having an open side, a mounting plate arranged in the shell between the open side and a top wall thereof to provide a chamber from which air has been evacuated and a dry inert gas consisting of 90 percent nitrogen and 10 percent helium substituted therefor under pressure, a terminal plate closing the open side, a filler block disposed between the terminal plate and the mounting plate, switch mechanism arranged in the chamber and carried by the mounting plate, means exterior of said shell for actuating the switch mechanism, said last means comprising an actuating arm extending in parallel relation with respect to the longitudinal plane of said shell, an actuating arm interior of said shell, a connection between opposite ends of said arms, said shell adjacent said connection of said arms providing a restricted opening the sides of which are flared laterally from said shell and in converging direction with respect to each other, a yieldable sealing member in said restricted opening and compressed between said opposite ends of said arms so as to over-lap said flared sides of the restricted opening, and a guide pin carried by said shell and journaled through said exterior actuating arm for preventing lateral movement of said arm with respect to said shell.

3. A snap action switch comprising a box like shell having an open side, a mounting arranged in the shell between the open side and a top wall thereof to provide a chamber from which the air has been evacuated and a dry inert gas consisting of 90 percent nitrogen and 10 percent helium substituted therefor under pressure, a terminal plate closing the open side, a filler block disposed between the terminal plate and the mounting plate, switch mechanism arranged in the chamber and carried by the mounting plate, means exterior of the shell for actuating the switch mechanism, said last means comprising an actuating arm extending in parallel relation with respect to the longitudinal plane of said shell, an actuating arm interior of said shell, a connection between opposite ends of said arms, said shell adjacent

said connection of said arms providing a restricted opening the sides of which are flared laterally from said shell and in converging direction with respect to each other, a yieldable sealing member in said restricted opening compressed between said opposite ends of said arms into facial abutment with the flared sides of said opening and in an over-lapping abutment with the ends of said flared sides of said shell, a bolt connecting said arms and compressing said member for effecting an overlapping connection between said member and said flared opening of said shell, and a guide pin carried by said shell and journaled through said exterior actuating arm for preventing lateral movement of said arm with respect to said shell.

4. A snap-action switch comprising a box-like shell having an open long side, a mounting plate arranged in the shell between the open side and a top wall thereof to provide a chamber from which the air has been evacuated and a dry inert gas consisting of 90 percent nitrogen and 10 percent helium substituted therefor under pressure, a terminal plate closing the open side, a filler block disposed between the terminal plate and the mounting plate, switch mechanism arranged in the chamber and carried by the mounting plate, means exterior of the shell for actuating the switch mechanism, said shell adjacent one end of the top wall thereof providing an opening the sides of which are flared laterally with respect to said top wall and in converging direction with respect to each other, said switch actuating means comprising an exterior actuating arm having formed in one end thereof a circular boss into which projects said flared sides of the opening, an actuating arm interior of said shell, a fixed connection between opposite ends of said arms, a yieldable sealing member in said opening and compressed between said opposite ends of said arms into facial abutment with said circular boss and with the flared sides of the opening and in an over-lapping abutment with the ends of said flared sides of said shell, and means for preventing lateral movement of said exterior actuating arm with respect to said shell.

5. A snap-action switch comprising a box-like shell having an open side, a mounting plate arranged in the shell between the open side and a top wall thereof to provide a chamber from which air has been evacuated and a dry inert gas consisting of 90 percent nitrogen and 10 percent helium substituted therefor under pressure, a terminal plate closing the open side, a filler block disposed between the terminal plate and the mounting plate, switch mechanism arranged in the chamber and carried by the mounting plate, said shell adjacent one end of the top wall thereof providing an opening the sides of which are flared laterally with respect to said top wall and in converging direction with respect to each other, said switch actuating means comprising an exterior actuating arm having formed in one end thereof a circular boss into which projects said flared sides of the opening, an actuating arm interior of said shell, a fixed connection between opposite ends of said arms, a yieldable sealing member in said opening and compressed between said opposite ends of said arms into facial abutment with said circular boss and with the flared sides of the opening and in an over-lapping abutment with the ends of said flared sides of said shell, and means for preventing lateral movement of said exterior actuating arm with respect to said shell, said last named means including a guide pin carried by said shell and journaled through said exterior actuating arm for preventing lateral movement of said arm with respect to said shell.

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