July 9, 1963 SHIGEO MAMIYA ETAL 3,097,274

MINIATURE ELECTRIC SWITCH

Filed Dec. 14, 1961

Fig. 1

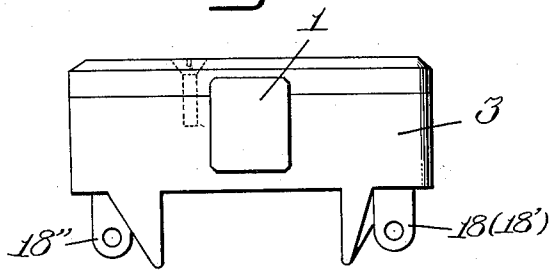


Fig. 2

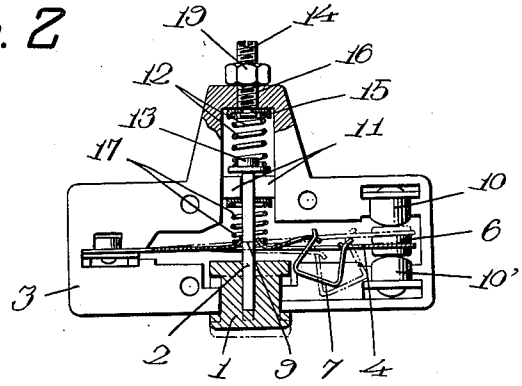
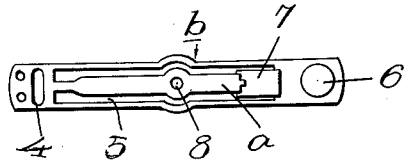


Fig. 3



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MINIATURE ELECTRIC SWITCH

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The present invention is related to a miniature electric switch which is capable of switching contact position promptly and with certainty by pushing and releasing an operating rod thereof.

It is an object of the present invention to provide a miniature electric switch which can be used for multiple purposes by varying the working load required for making and breaking the electric circuit.

It is another object of the present invention to provide a miniature electric switch which is capable of switching contact positions promptly and to hold the differential pressure between the push and release of a push button of the switch by means of an auxiliary spring.

It is a further object of the present invention to provide a miniature electric switch in which the pressure to be exerted on a push button to operate the switch can be varied by means of an auxiliary spring, the tension of which can be varied by adjustment.

With the above recited and other objects in view, reference is had to the following specification and drawing in which there is exhibited an embodiment of the present invention which is in no way intended as a limitation upon the scope of the appended claims. It is to be clearly understood that variations and modifications which fairly fall within the true scope of said claims may be resorted to when found expedient.

In the accompanying drawing forming a part of this specification, a preferred form and manner are shown in which the invention may be embodied and practised, without limiting the claimed invention to such illustration instance.

FIG. 1 is a front view of a miniature electric switch of the present invention;

FIG. 2 represents a plan view of the miniature electric switch as shown in FIG. 1, partly in a vertical section; and

FIG. 3 is a front view of a switching plate of the switch according to the present invention.

Now explaining the details of the present with reference to the attached drawing in which like numerals denote like parts, the numerals **1** represents a push button attached to an operating rod **2**, with a part thereof appearing above a case **3**. **4** is a contact switching plate, of which one end is fixed to the body of the case **3**. By a cut-out **5** provided on the contact switching plate **4**, a central switching plate *a* and an outside switching plate *b* are formed thereon and on the outside switching plate *b*, there is provided a movable contactor **6**. Between the central and outside switch plates *a* and *b*, there is provided a quick-acting spring **7** the side view of which is in the shape of a reversed letter U. Furthermore, on the central switching plate *a*, there is provided a hole **8** at the center thereof through which the operating rod **2** is inserted and fastened to the central switching plate *a* by means of a groove provided around the operating rod **2**. **10** and **10''** are fixed contact points with which the movable contactor **6** comes into contact. On guide **11** of the operating rod **2** for its vertical movement there is mounted a saucer **13** of an insulating material which supports auxiliary helical spring **12**. The other end of the auxiliary helical spring **12** is supported by another saucer **15** provided on an adjusting bolt **14**, which is screwed in a tapped hole **16** provided in the case **3**. **17** is a helical spring encircling the operating

rod **2** mounted with one end to contact the central switching plate *a* and with the other end to contact the guide **11** of the operating rod **2**. **18**, **18'** and **18''** are terminals and **19** is a lock nut.

When no pressure is exerted on the push button **1**, the fixed contact point **10** and the movable contactor **6** are kept in contact as shown in the dotted line in FIG. 2. In operation, by the tension of the quick-acting spring **7** and the helical spring **17**, the contact switching plate **4** pushes the push button **1** to the position shown in the dotted line and the movable contactor **6** is made to contact with the fixed contact point **10**. When pressure is exerted the push button **1**, the operating rod **2** pushes the central switching plate *a* of the contact switching plate **4** against the tension of the helical spring **17** and moves the contact switching plate **4** close to the dead point of the quick-acting spring **7** and as soon as the tip of the operating rod **2** is brought into contact with the saucer **13** through the guide **11**, the operating rod **2** comes under the influence of the auxiliary helical spring **12**. When further pressure is exerted the push button **1** overcoming the tension of the auxiliary helical spring **12**, the movable contactor **6** is switched from the fixed contact point **10** to the fixed contact point **10'** by means of the quick-acting spring **7**. Accordingly, as the pressure required for switching the movable contactor **6** is regulated by the auxiliary helical spring **12**, by regulating the adjusting bolt **14**, the time of operation of the contact switching plate **4** can be varied.

When the central switching plate **4** is restored from the position shown in solid line to that shown in the dotted line in FIG. 2, the auxiliary helical spring **12** becomes separated from the tip of the operating rod **2** by means of the guide **11** freed from the influence of the auxiliary helical spring **12** and the contact switching plate **4** is pushed by the constant tension of the helical spring **17** thereafter.

The above function is further explained as follows: If the auxiliary spring **12** is set by means of the adjusting bolt **14** so that contact switching plate **4** is operated and the movable contactor **6** is caused to contact the fixed contact point **10'** when a pressure of, for an example, 10 kgs. is exerted on the push button **1** and the helical spring **17** is preset so that it may push back the contact switching plate **4** by the tension of 5 kgs., when the pressure exerted on the push button **1** is decreased to 5 kgs., the movable contactor **6** and the fixed contact point **10** are brought into contact with each other. Thus, the working load required for making and breaking of the switch in the above example is:

10 kgs.—5 kgs.=5 kgs.

Furthermore, when the resisting pressure of the auxiliary helical spring **12** is increased to 15 kgs. by rotating the adjusting bolt **14**, as the tension of the helical spring **17** is of constant value, the working load required for making and breaking of the switch in this case is:

15 kgs.—5 kgs.=10 kgs.

Since according to the present invention, the working load which is required for making and breaking an electric circuit can be varied to any desired value as described above, a single electric switch according to the present invention can be used for multiple purposes.

While we have illustrated and described the preferred embodiment of our invention, it is to be understood that we do not limit ourselves to the precise construction herein disclosed but that protection is to be extended to all changes and modifications coming within the scope of the invention as set forth in the appended claims.

We claim:

1. A miniature electric switch comprising a pair of fixed contact points that face each other, a contact switch-

ing plate having a movable contactor and a central operating plate for making and breaking contact with said fixed contact points, an operating rod having a helical spring around it, said rod being fastened to the central operating plate of said contact switching plate, and an auxiliary helical spring which comes into contact with the tip of the operating rod when pressure is exerted on the operating rod and is separated from the tip when the pressure is released.

2. A miniature electric switch comprising a pair of fixed contact points that face each other, a contact switching plate having a movable contactor and a central switching plate for making and breaking contact with said fixed contact points, an operating rod having a helical spring around it, said rod being fastened to the central switching plate of the contact switching plate, an auxiliary helical spring which comes into contact with the tip of the operating rod when pressure is exerted on the operating rod and is separated from the tip when the pressure is released and an adjusting bolt provided at one end of the auxiliary helical spring and a saucer between the other end of the auxiliary helical spring and said adjusting bolt for changing the resisting pressure of said auxiliary helical spring.

3. A miniature electric switch comprising a pair of fixed contact points that face each other, a contact switching plate having a movable contactor and a central switching plate for making and breaking contact with said fixed contact points, an operating rod having a helical spring around it, said rod being fastened to the central switching plate of the contact switching plate, an auxiliary helical

spring which comes into contact with the tip of the operating rod when pressure is exerted on the operating rod and is separated from the tip when the pressure is released, and a guide on the operating rod for guiding vertical movement of said rod, said guide holding the tension of the auxiliary helical spring, when the pressure is released from the operating rod.

4. A miniature electric switch comprising a pair of fixed contact points that face each other, a contact switching plate having a movable contactor that has a central switching plate and an outside switching plate for making and breaking contact with said fixed contact points, quick acting spring means between the central and outside switching plates, second spring means for biasing said movable contactor into engagement with one of said fixed contact points, an operating member fastened to said central switching plate for pushing the central switching plate against the tension of said second spring means to actuate said quick acting spring means for switching said movable contactor from said one to the other of said fixed contact points, and third spring means for adding tension to said operating member prior to switching of said movable contactor and following movement of said operating member upon being pushed with a pressure that overcomes the tension of said second spring means, said additional tension being removed from said operating member at the moment said pressure is released.

5. The switch set forth in claim 4, further including means for adjusting the tension of said third spring means to vary the switching time of said movable contactor.

No references cited.