March 2, 1954

H. HUBBELL ET AL

2,671,149

ELECTRIC SWITCH

Filed April 30, 1953

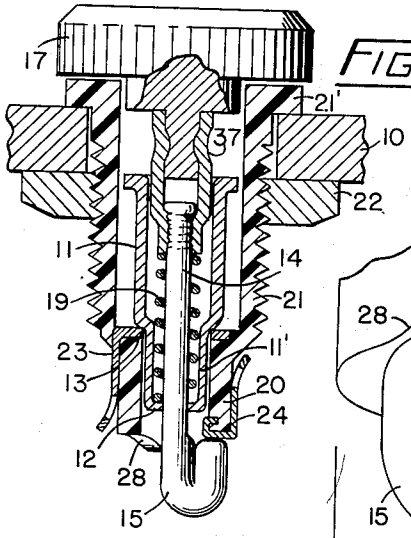


FIG. 1

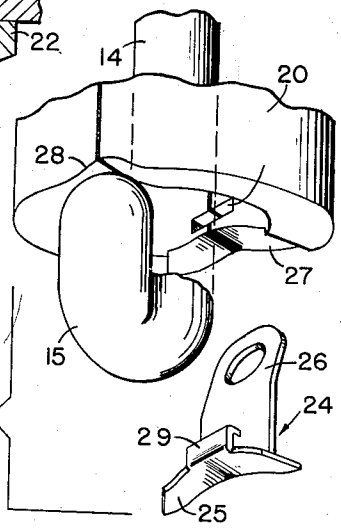


FIG. 2

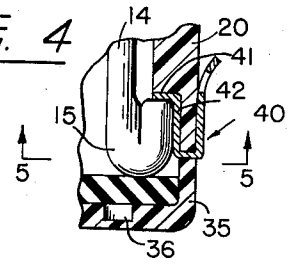


FIG. 4

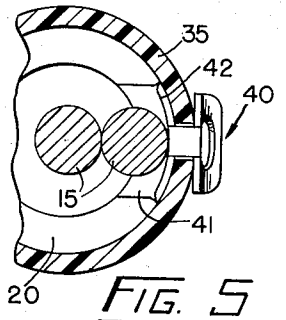


FIG. 5

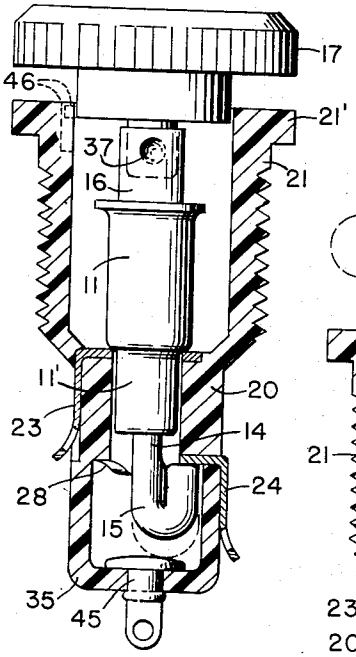


FIG. 6

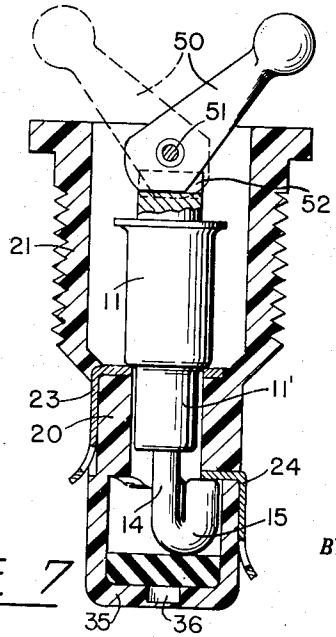


FIG. 7

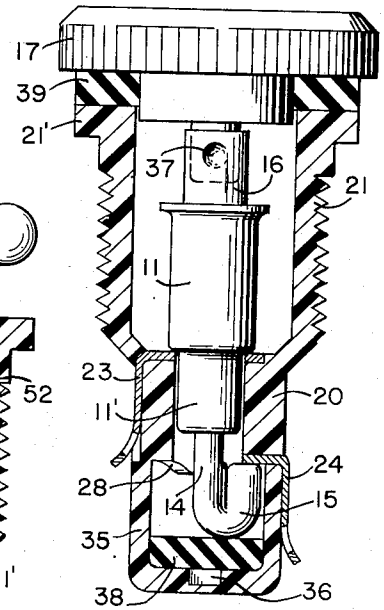


FIG. 3

INVENTORS

HARVEY HUBBELL

BY HENRY J. MODREY

Frederick L. Hamp

ATTORNEY

Patented Mar. 2, 1954

2,671,149

UNITED STATES PATENT OFFICE

2,671,149

ELECTRIC SWITCH

Harvey Hubbell, Long Hill, and Henry J. Modrey, Stamford, Conn., assignors to Interlock Corporation, New York, N. Y.

Application April 30, 1953, Serial No. 352,180

17 Claims. (Cl. 200—155)

1

The present invention relates to electric switches, more particularly to miniaturized switches in which the switch components are held in contact-making engagement by spring pressure.

In switches of the general type above referred to, contact is usually made and maintained by a leaf spring and a rubbing or sliding engagement between the contact elements of the switch. As in miniature switches the leaf spring must necessarily be small and hence weak, the contact quality of such switches is already initially not very satisfactory and deteriorates rather rapidly due to spring fatigue and wear. The use of a stronger leaf spring which of course would improve the contact quality and the useful life of the switch, entails an increase in the dimensions of the spring which in turn results in an undesirable and often impractical increase in the overall dimensions of the switch.

One of the principal objects of the invention is to provide a novel and improved switch design which permits manufacture of a miniature switch affording a good and reasonably constant quality and low resistance at the contacts for a long period of service. Such miniature switches have many useful fields of application for instance in miniaturized and subminiaturized equipment, hearing aids and electronic equipment in general.

Another more specific object of the invention is to provide a novel and improved switch design in which the leaf spring and the rubbing contact elements, conventionally used in miniature switches are replaced by a coil spring and knife edge contact under pressure by said coil spring. Extensive tests have shown that such a contact arrangement results in contact qualities that are far superior to and longer lasting than those obtainable with a contact arrangement of comparable size employing a leaf spring and a rubbing or sliding contact.

The use of a leaf spring and of a rubbing or sliding contact in very small switches creates a further problem in that the contact component of the switch is usually the part that wears out first. With switch designs as hitherto known, a replacement of the contact component is frequently difficult or at least entails a tedious rewiring as does also the installation of a new switch when a replacement of the contact component only is not practical.

Accordingly, another object of the present invention, allied with the preceding ones, is to provide a novel and improved electric switch design which permits a convenient replacement of the contact component without requiring a rewiring of the switch.

Still another object of the invention is an electric switch design which is practically vibration-proof.

2

A further object of the invention is to provide an electric switch design permitting to open and close, permanently or temporarily, a plurality of contact connections by movement of a single replaceable contact member.

Other and further objects, features and advantages of the invention will be pointed out hereinafter and set forth in the appended claims forming part of the application.

In the accompanying drawing, several now preferred embodiments of the invention are shown by way of illustration and not by way of limitation.

In the drawing:

Fig. 1 is a sectional view of an electric switch according to the invention.

Fig. 2 is a fragmentary exploded view of Fig. 1.

Fig. 3 is a sectional view of a modification of the switch according to the invention.

Fig. 4 is a fragmentary sectional view of a modification of the switch according to Fig. 3.

Fig. 5 is a section taken on line 5—5 of Fig. 4 on an enlarged scale.

Fig. 6 is a sectional view of another modification of the switch according to the invention, and

Fig. 7 is a sectional view of still another modification of the switch according to the invention.

Referring first to Figs. 1 and 2 in detail, the switch according to these figures is shown as being mounted in a panel 10 or other suitable support member. The switch comprises a stationary contact means which includes all the contact terminals of the switch and a movable contact means which serves to connect or disconnect the contact terminals. Experience shows that the movable contact means tends to wear out much faster than the stationary contact means, primarily by reason of spring fatigue.

The movable contact means comprises a metal guide sleeve 11 open on one end and closed at the other end by a wall member 12 having an opening therethrough. Sleeve 11 is set off to form a shoulder 13. This shoulder serves as a limit means to limit the depth of insertion of guide sleeve 11 in the stationary contact means as will be more fully explained hereinafter. A metal rod 14 is slidably and rotatably guided in sleeve 11. The end of rod 14 protruding from wall member 12 is bent back to form an enlarged contact head 15 one-sidedly overhanging the peripheral outline of the narrow sleeve portion 11'. The opposite end of rod 14 is fixedly secured to a sleeve 16 guided in sleeve 11. Sleeve 16 supports a switch actuating knob 17. This knob is shown as having a lug fastened to sleeve 16 by any suitable means such as a punched indentation 37. As will be obvious, various other means can be employed to secure knob 17 to rod 14, either permanently or detachably. A compressed coil spring 19 within sleeve 14 biases contact head 15 toward sleeve wall 12.

The movable contact means comprises a receiving sleeve 20. The inner cross-sectional outline of this sleeve fits the outer peripheral outline of sleeve portion 11' and also of contact head 15 and the axial length of the sleeve is slightly in excess of the axial length of sleeve portion 11' for a purpose which will be more fully explained hereinafter. Sleeve 20 is fastened to or, as shown, integral with an externally threaded shell 21. This shell serves to mount the switch in a corresponding opening of panel 10. The shell is secured in its position by means of a flange 21' and a counter-nut 22.

The receiving shell 20 supports the contact elements of the switch. These elements are shown as a contact strip 23 secured to one end face of sleeve 20 and a contact strip 24 secured to the other end face of the sleeve.

Contact element 23 coacts with shoulder 13 of sleeve 11. It may occupy either the entire periphery of sleeve 20 or only part thereof as it will be in contact engagement with shoulder 13 in each rotational position of sleeve 11.

Contact element 24 coacts with the bent back tip of head 15. The switch is designed to interrupt the circuit connections at contact element 24. Accordingly, this contact element should occupy only a part of the periphery of sleeve 20. As can best be seen in Fig. 2, contact element 24 comprises a springy contact strip 25 resting upon the respective end face of sleeve 20, and a tail 26. This figure also shows that the face end of sleeve 20 is formed with two detent notches 27 and 28. The contact element 24 is fitted in one of these notches by bending contact strip 25 accordingly. It is secured to sleeve 20 by means of a hook-shaped nose 29 which engages a corresponding slot 30 in sleeve 20.

As appears from the previous description, the switch is in its "on" position when contact head 15 rests in notch 27 and is in its "off" position when head 15 engages notch 28. The two detent notches are preferably so spaced and shaped that there is no intermediate position for the contact head but that the same always occupies either the "on" position or the "off" position.

To simplify the illustration, only one "on" position and one "off" position are shown but it will be apparent that several "on" and "off" positions may be provided in a similar manner whereby the switch becomes a multi-position switch. It is possible to omit the detent notches 27 and 28 and to provide a flat contact element 24. However, a switch so designed has no clearly defined "on" and "off" positions so that the illustrated arrangement is preferable.

It will be evident that contact elements 23 and 24 must be electrically insulated one from the other. This can be most conveniently accomplished by making sleeve 20 and preferably also its extension shell 21 of insulation material as is shown but it is also possible to employ a metal sleeve in which case contact elements 23 and 24 and the detent notch 28 must be insulated from each other by interposing insulation material.

Sleeve 20 and its extension shell 21 may be made of a single piece but for manufacturing reasons it is generally preferable to make the sleeve and the shell of two halves which are secured together by cementing, clamping or any other suitable means after insertion of the contact components. Fig. 2 shows a sleeve composed of two halves, and slot 30 is so placed that it extends into the two halves.

The assembly and operation of a switch, as hereinbefore described, are as follows:

Shell 21 and with it the receiving sleeve 20 are inserted in the opening of panel 10. The shell is then secured in its position by means of nut 22. As is apparent from Fig. 1, the soldering tails of the contact elements 23 and 24 are so designed that they permit passage of the nut.

The movable contact means of the switch is now mounted by inserting contact head 15 in receiving sleeve 20. During the initial part of this insertion, wall 12 of sleeve portion 11' abuts against contact element 23 so that sleeve 11 is pushed back relative to head 15 and the latter protrudes further from the wall 12. When the head has penetrated sleeve 20 the initially eccentrally disposed sleeve portion 11' can be moved into axial alignment with sleeve 20, the width of sleeve 21 permitting the required lateral displacement of sleeve 11, 11'. The sleeve portion 11' can now enter sleeve 20. Finally, the head and sleeve portion 11' occupy positions as shown in Fig. 1 in which the bent-back tip of head 15 abuts against the outer end face of sleeve 20 and shoulder 13 against contact element 23. By virtue of the aforementioned relative axial length of sleeve 20 and sleeve portion 11', contact head 15 is retained in a protruding position in which spring 19 is stronger than initially compressed. As a result, shoulder 13 is held by the constant pressure of the coil spring against contact element 23 and head 15 is also held by the constant spring pressure against the outer end face of sleeve 20 thereby assuring a good constant contact quality and low resistance between the coacting contact surfaces and engagement of the head with the detent nothes 27 and 28.

The switch is moved into its "on" position by turning knob 17 into the position in which head 15 engages contact strip 25 and into its "off" position by turning the knob into the position in which the contact head occupies detent notch 28.

The movable contact means of the switch may be replaced by removing knob 17 if the knob is detachably fastened to rod 14 or more specifically to sleeve 16, and then lifting guide sleeve 11, for instance by tools specifically designed for this purpose. Sleeve 11 or more specifically sleeve portion 11', when sufficiently lifted, leaves receiving sleeve 20 thereby making space available for withdrawal of the contact head 15. The entire movable contact means can now be withdrawn and a new contact means inserted in the manner previously described. As all the wire connections lead to the contact elements which are mounted on the stationary contact means, no rewiring of any kind is necessary when the switch is rejuvenated by replacement of the movable contact means. As previously mentioned, the useful lifetime of the stationary contact means generally far exceeds the useful lifetime of the movable contact means.

In case knob 17 is fixedly secured to rod 14, the release sleeve 11 is inaccessible. The movable contact means may then be replaced by cutting off contact head 15 for instance by pliers. The entire movable contact means can then be conveniently withdrawn from the stationary contact means. Generally, the spring 19 which is now released will propel rod 14 and the knob out of the switch.

A switch according to Figs. 1 and 2 can be conveniently so manufactured that its overall length is considerably less than an inch and its diameter approximately one-quarter of an inch.

As far as the applicant is aware, it was hitherto impossible to manufacture reliable switches of such small size on a commercial basis. It will be evident that with a very small switch avoidance of a rewiring, whether the entire switch is replaced or only part thereof, is of particular importance.

Fig. 3 shows a switch which is similar in principle to the switch according to Fig. 1. Accordingly, corresponding parts are designated by similar reference numerals.

In contrast to the switch of Fig. 1 the switch of Fig. 3 is designed as a moisture-proof switch. For this purpose, shell 20 is fastened to or integral with a generally cup shaped housing or shell 35 which encloses contact head 15, and a resilient sealing washer 39 is interposed between knob 17 and flange 21. Shell 35 has preferably a knock-out bottom portion indicated at 36 the purpose of which will be subsequently explained.

Due to the presence of shell 35, it is not possible to cut off head 15 for purpose of removing the movable contact means in case it is desired to replace the same. Consequently, it is essential for the design of Fig. 3 that knob 17 is removable. This is accomplished by joining the knob to shell 16 by the punched indentation 37 which joins the two components sufficiently strongly for operational purposes but permits to pull knob 17 out of sleeve 16.

As has been explained in connection with Fig. 1, the loading of spring 19 effects a pressure contact between the contact elements 23 and 24 and shoulder 13 and head 15 respectively. When it is desired to increase the strength of this pressure contact without increasing the strength of spring 19—which is undesirable as it generally entails an increase in the overall dimensions of the switch—a resilient disk-shaped member 38 is placed upon the bottom of shell 35. This member may for instance be a rubber or silicone disk. As is obvious, disk 38 when properly dimensioned presses head 15 against contact element 24 and into detent notch 28. In addition, disk 38 affords the advantage that it counteracts the effect of vibrations to which the switch may be subjected. Such vibrations, if not counteracted, may result in a serious deterioration of the contact qualities of the switch.

As is apparent, rod 14 is in effect supported by two independent spring systems one formed by spring 19 and the other by resilient member 38. These two spring systems have obviously totally different characteristics in regard to auto-vibration and critical amplitudes. Practical tests have shown that in most instances one system will damp out any tendency to auto-vibration of the other system because the critical amplitudes of the two systems do not coincide. As a result, the switch is practically vibration-proof which is most desirable for many fields of application.

The resilient washer 39 between shell 21 and knob 17 is preferably so dimensioned that, in addition to serving as a moisture seal, it coacts with disc 38 to suppress vibrations. It will be apparent that washer 39 also acts as a vibration suppressing component when disc 38 is omitted.

The operation of the switch will be obvious from the previous description of Figs. 1 and 2. It suffices to state that the switch is actuated by rotating knob 17.

With the hereinbefore described switches, the circuit connection is closed by engagement of the spring loaded contact head with contact strip 25 of contact element 24. This contact arrangement is entirely satisfactory for small currents as are generally used in the electronic field. However, if a greater current carrying capacity is wanted larger mating contact surfaces are desirable. Figs. 4 and 5 which should be visualized as a fragmentary view of the switch according to Fig. 3 show a contact element providing larger mating contact surfaces.

According to these figures the contact element 24 is replaced by a contact element generally designated by 40. This contact element comprises in addition to a curved and preferably springy contact strip 41 similar to contact strip 25 a contact strip 42 hugging the inner side wall of shell 35. Contact element 40 is secured to receiving sleeve 20 and shell 35 respectively by any suitable means such as a hook-shaped nose 29 engaging a corresponding slot in sleeve 20 or shell 35.

As a result, contact head 15 when in its "on" position engages with its bent-back end face contact strip 41 and with its side wall contact strip 42 thereby correspondingly increasing the mating contact surfaces and the current carrying capacity of the switch.

Fig. 6 shows a switch which is similar in most respects to the switch according to Fig. 3. Accordingly, the same reference numerals are used to designate corresponding parts. As will be observed, washer 39 is omitted. This has the advantage that by using the same components as for the switch of Fig. 3 the switch of Fig. 6 can be operated by either rotating knob 17 or depressing the same. In other words, the switch becomes a push-button switch. In the embodiment of Fig. 6 the contact recess coacting with the head is preferably deeper than in the embodiment of Fig. 2 to assure that the head always returns into the "on" position even if displaced by nearly one-half circle.

Contact connection between head 15 and contact element 24 can be permanently interrupted by rotating head 15 into its position occupying detent notch 28 or it can be temporarily interrupted by depressing knob 17.

The aforesaid switch arrangement further affords the possibility of controlling additional circuit connections by fitting a third contact element 45 in the bottom of shell 35 by removing the knock-out portion 36 provided in the shell for this purpose.

As a result, the switch can function as a break-and-make switch when the contact head is in the position of Fig. 6 and depressed into engagement with contact element 45 as indicated by dotted lines. It can also function as a make-or-break switch when head 15 is rotated into engagement with detent notch 22 and then depressed into engagement with contact element 45.

As has been mentioned in connection with Fig. 1, several contact elements 24 and several "off" positions 22 may be provided. Accordingly, the simple switch arrangement of Fig. 6 permits to control a plurality of circuit connections by appropriate wiring. A multiple switch of this type is useful in many fields of application for instance in measuring instruments and test circuits.

In case it is desired to move contact head 15 only between its position in engagement with contact element 24 and its position in engagement with contact element 45, knob 17 may be keyed to shell 21 as is indicated at 46 to assure that the head always returns from its position in engagement with contact element 45 into its

position in engagement with contact element 24. In case a circular contact element 24 is provided, guide means such as key 46 may be omitted.

The switch according to Fig. 7 also uses substantially the same components as the switch according to Figs. 3 and 6. Accordingly, corresponding parts are designated by the corresponding reference numerals.

While the switch of Fig. 3 is operated only by rotation of knob 17 and the switch of Fig. 6 either by rotation or depression of the knob, the switch according to Fig. 7 can be only operated by depression of the contact head.

Accordingly, knob 17 is omitted and replaced by an actuating means for effecting the required axial displacement of rod 14. This actuating means is shown as a toggle cam 50 the camming surface of which coacts with the end face of rod 14, preferably enlarged for this purpose. As will be apparent, pivoting of cam 50 from its position shown in full lines into the position shown in dotted lines effects disengagement of contact head 15 from contact element 24 against the action of spring 19 and resilient disk 38. The two spring systems formed by the spring 19 and disk 38 again coact with each other in the manner of a damping device as has been explained in detail in connection with Fig. 3.

To assure that contact head 15 always returns from its depressed or disengaged position into engagement with the contact strip of contact element 24, cam 50 is pivoted to shell 20 by means of a pivot pin 51 and engages a transverse slot 52 in the end face of rod 15 thereby preventing an accidental rotation of the rod and, hence, of head 15. Other suitable means to prevent a rotation of head 15 may of course also be employed, such as guiding the head in a groove in shell 35 but the illustrated arrangement is the preferred one.

While the invention has been described in detail with respect to certain now preferred examples and embodiments of the invention it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended, therefore, to cover all such changes and modifications in the appended claims.

What is claimed as new and desired to be secured by Letters Patent, is:

1. An electric switch comprising a movable contact means including an electrically conductive guide sleeve having limit means on an intermediate part of its outside wall, an electrically conductive rod movably disposed within said sleeve in sliding electric contact therewith, said rod having an enlarged contact head on one end protruding from the sleeve and one-sidedly overhanging the peripheral outline of the sleeve, spring means within the sleeve coacting with the rod so as to bias the head thereof toward said sleeve; and a stationary contact means including a receiving sleeve having an inner configuration permitting passage of said head through the receiving sleeve and insertion of the guide sleeve in the receiving sleeve, one end of the receiving sleeve forming an edge abutment for said limit means and the other an edge abutment for said head, a contact member on one end of said receiving sleeve for contact engagement with said limit means, and a second contact member on the other end of the said sleeve electrically insulated from the first contact member for contact engagement with said head whereby the said head and the said limit means abut against the respective ends of the receiving sleeve and electric connection is established between said contact members and, upon movement of the said head into a position disengaged from the said contact member, said electric connection is interrupted.

2. An electric miniature switch comprising a movable contact means including an electrically conductive guide sleeve having limit means on an intermediate part of its outside wall, an electrically conductive rod movably disposed within said sleeve in sliding electric contact therewith having an enlarged contact head on one end protruding from the sleeve and one-sidedly overhanging the peripheral outline of the sleeve, coil spring means within the sleeve coacting with the rod so as to bias the head thereof toward said sleeve; and a stationary contact means including a receiving sleeve having an inner configuration fitting the outer configuration of said enlarged head and said guide sleeve respectively for passage of said head through the receiving sleeve and insertion of the guide sleeve in the receiving sleeve, one end of the receiving sleeve forming an edge abutment for said limit means and the other an edge abutment for said head, the axial length of said receiving sleeve being slightly in excess of the axial of the guide sleeve portion between said limit means and the sleeve end from which said head protrudes, a contact member on one end of said receiving sleeve for contact engagement with said limit means, and a second contact member on the other end of the said sleeve electrically insulated from the first contact member for contact engagement with said head whereby the said head and the said limit means abut under spring tension against the respective abutment ends of the receiving sleeve and electric connection is established between said contact members and, upon movement of the said head into a position disengaged from the said contact member, said electric connection is interrupted.

3. An electric miniature switch comprising a movable contact means including an electrically conductive guide sleeve having electrically conductive limit means on an intermediate part of its outside wall, an electrically conductive rod axially slidable and rotatable within said sleeve in sliding electric contact therewith having an enlarged contact head on one end protruding from the sleeve and one-sidedly overhanging the peripheral outline of the sleeve, coil spring means within the sleeve coacting with the rod so as to bias the head thereof toward said sleeve; and a stationary contact means including a receiving sleeve having an inner configuration fitting the outer configuration of said enlarged head and said guide sleeve respectively providing for passage of said head through the receiving sleeve and insertion of the guide sleeve in the receiving sleeve, one end of the receiving sleeve forming an edge abutment for said limit means and the other an edge abutment for said head, the axial length of said receiving sleeve being slightly in excess of the axial length of the guide sleeve portion between said limit means and the sleeve end from which said head protrudes, a contact member on one end of said receiving sleeve for contact engagement with said limit means, and a second contact member on the other end of the said sleeve electrically insulated from the first contact member for contact engagement

with said head, said second contact member occupying part of the periphery of the respective sleeve end, whereby the said head and the said limit means abut under spring tension against the respective abutment ends of the receiving sleeve and in one rotational position of the said head electric connection is established between said contact members while in another rotational position of the said head the same is disengaged from the respective contact member and said electric connection is interrupted.

4. An electric miniature switch comprising a movable contact means including an electrically conductive guide sleeve having electrically conductive limit means on an intermediate part of its outside wall, an electrically conductive rod axially slidable and rotatable within said sleeve in sliding electric contact therewith having an enlarged contact head on one end protruding from the sleeve and one-sidedly overhanging the peripheral outline of the sleeve, coil spring means within the sleeve coacting with the rod so as to bias the head thereof toward said sleeve; and a stationary contact means including a receiving sleeve having an inner configuration fitting the outer configuration of said enlarged head and said guide sleeve respectively providing for passage of said head through the receiving sleeve and insertion of the guide sleeve in the receiving sleeve, one end of the receiving sleeve forming an edge abutment for said limit means and the other an edge abutment for said head, the axial length of said receiving sleeve being slightly in excess of the axial length of the guide sleeve portion between said limit means and the sleeve end from which said head protrudes, whereby the said head and the said limit means abut under spring tension against the respective abutment ends of the receiving sleeve, a contact member on one face end of said receiving sleeve for contact engagement with said limit means, and a second contact member on the other face end of the said sleeve electrically insulated from the first contact member for contact engagement with said head, said other face end of the receiving sleeve being formed with two recesses, one of said recesses being occupied by the second contact member, and the said recesses being electrically insulated from each other, engagement of said head with one of said recesses establishing electric connection between said contact members and engagement of said head with the other recess interrupting said electric connection.

5. A switch according to claim 4, wherein the said limit means are in form of an annular shoulder on the outside of the guide sleeve.

6. A switch according to claim 4, wherein the said receiving sleeve is made of insulation material, the said second contact member comprising a contact strip fitted in one of the recesses of the sleeve, the said recess constituting the "on" position and the other the "off" position of the switch.

7. A switch according to claim 6, wherein the said receiving sleeve is continued in an open shell extending from the sleeve end engageable with said limit means and attachable to a support for the switch, said shell housing the part of the guide sleeve between said limit means and the sleeve end opposite to said head.

8. A switch according to claim 7, wherein an actuating member is secured to the rod end opposite to said head, the said member protruding from the shell and covering the open free end of the same.

9. A switch according to claim 4, wherein a generally cup shaped shell is secured to the end of the receiving sleeve engageable with said head for encompassing the same.

10. A switch according to claim 9, wherein the said head is in form of a rod portion bent back against said rod, and wherein the said second contact member is in form of a contact strip having a portion substantially transversely to the rod axis and a portion substantially parallel thereto, the said two strip portions being simultaneously engageable with the face end of the bent back rod portion and a side wall portion of said head.

11. A switch according to claim 1, in combination with actuating means coacting with the rod end oppsite to the head thereon for axially displacing said rod relative to said sleeves thereby disengaging the head from the second contact member.

12. A switch according to claim 11, wherein the said actuating means comprise a toggle cam lever engageable with a groove in the respective end face of the rod, said lever being mounted for pivotal movement in one plane thereby preventing a rotation of the contact head relative to the second contact member, the said contact member occupying part of the periphery of the respective end of the receiving sleeve.

13. A switch according to claim 3, in combination with a third contact member stationarily mounted in alignment with said head spaced therefrom in the position of the head engaging said second contact member, an axial displacement of said rod effecting a disengagement of the head from the second contact member and engagement with the third contact member.

14. A switch according to claim 1, in combination with a stationarily supported resilient member abutting against said contact head transversely to the axis of said rod for forming a cushion damping movements of the said contact head due to vibrations affecting the switch.

15. A switch according to claim 14, wherein a generally cup-shaped shell is secured to the end of the receiving sleeve engageable with said head, said resilient member being in form of a disk placed upon the bottom of said cup-shaped shell.

16. A switch according to claim 15, wherein the said receiving sleeve is continued in an open shell extending from the sleeve end engageable with said limit means and attachable to a support for a switch, said shell housing the part of the guide sleeve between said limit means and the sleeve end opposite to said head, and wherein an actuating member is secured to the rod end opposite to said head, the said member protruding from the shell, and wherein a resilient washer is disposed between said actuating member and the respective end of said shell.

17. A switch according to claim 15, wherein the said receiving sleeve is continued in an open shell extending from the sleeve end engageable with said limit means and attachable to a support for a switch, said shell housing the part of the guide sleeve between said limit means and the sleeve end opposite to said head, and wherein an actuating member is secured to the rod end opposite to said head, the said member protruding from the shell and being in form of a knob mounted on said rod.

HARVEY HUBBELL.
HENRY J. MODREY.

No references cited.