May 4, 1965 G. M. BEARDOW ETAL 3,182,158

MANUALLY ACTUATED ELECTRICAL SWITCH DEVICE
WITH CONTACT RESTRAINING MEANS
Filed Aug. 21, 1963

Fig. 4

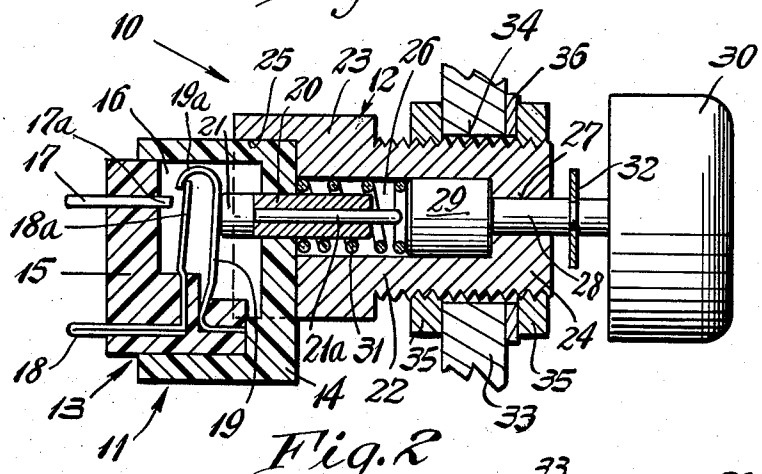


Fig. 2

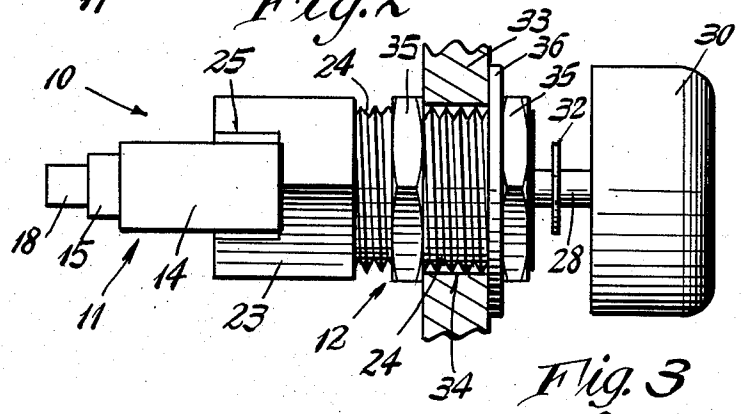


Fig. 3

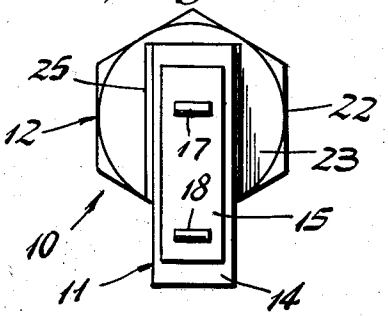
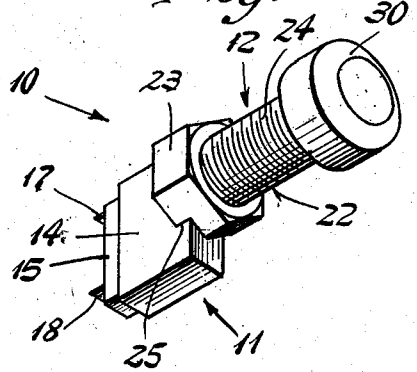


Fig. 1



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MANUALLY ACTUATED ELECTRICAL SWITCH DEVICE WITH CONTACT RESTRAINING MEANS

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10 Claims. (Cl. 200—159)

This invention relates to an electrical switch device.

More specifically, it pertains to a manually actuated low level switch, wherein the switch contacts, in closed circuit position, are maintained free of any vibration and electrical noise that may be generated by the operating or actuating means therefor.

It is an object of the invention to provide a push button type electrical switch wherein the switch contacts, which are biased into closed circuit position, are normally retained in open circuit position, yet on being actuated manually to closed circuit position are relieved of and maintained free of the operating and actuating means so that vibration and electrical noise are not transmitted to the contacts.

It is also an object of the invention to provide a manually operated electrical switch wherein actuation of the switch is controlled so that a predetermined movement is imparted to the movable contact of the switch and thereafter the movable and stationary contacts are completely relieved of and maintained free of all engagement with the switch actuating or operating means.

Another object of the invention is to provide a low level electrical switch having actuating means for imparting movement to the operating means for the movable contact so that the latter engages the stationary contact in closed circuit position and the operating means disengages the movable contact, the actuating means including limiting means for predeterminately controlling the movement imparted to the operating means so that the latter is retained in disengaged relationship with the contacts while they are in closed circuit position.

Still another object of the invention is to provide a manually operated electrical switch for switching extremely low voltages wherein the contacts are normally urged into closed circuit position but are held in open circuit position by a tensioned operator which, when actuated, moves the contacts to closed circuit position and thereafter relieves the operator from engagement with the movable contact, the switch including actuating means resiliently biased away from the operator, but movable thereagainst for actuating the same and means for predeterminately limiting the movement of the actuating means whereby movement imparted to the operator is limited to maintain the contacts free of the operator after it is relieved of the movable contact.

A further object of the invention is to provide a manually operated or "push button" type electrical switch for switching very low voltages, with a minimum of contact vibration and substantial elimination of electrical noise generation, which is of simple construction, readily manufactured by quantity production mehods and of such rugged character it will function over a long period of time with freedom from all difficulties.

An important advantage of the switch of the instant

invention is its capability of eliminating human error in the manual operation of the actuating means, which act directly on the operator for the switch contacts, by the provision of means associated with the actuating means and coordinated with the movement of the operator for limiting the movement that can be imparted to the actuating means manually.

Other objects and advantages of the invention will be apparent from the specification and claims, when considered in connection with the attached sheet of drawings illustrating one form of the invention, wherein like characters represent like parts and in which:

FIGURE 1 is a perspective view of the switch device of the invention;

FIG. 2 is a side view of the switch device of FIG. 1 shown mounted on an instrument panel or the like;

FIG. 3 is an end view of the switch device of FIG. 1; and

FIG. 4 is a plan view, in section, of the switch device of FIG. 1 shown mounted on an instrument panel or the like.

Referring now to the drawings for a more detailed description of the invention, a manually operated electrical switch device 10 is shown including a switch portion 11 and a switch actuating portion 12 rigidly connected thereto.

As illustrated, the switch portion 11 includes a housing 13 of electrical insulating material. While the housing 13 may be formed as a unitary member, in the illustrated and preferred form of the invention it comprises a frame 14 adapted to receive and house a contact block 15, the frame and contact block cooperating to form the housing and providing a recess 16 into which the contacts and other switch elements extend, as will be hereinafter discussed.

The contact block 15, which is adapted to be assembled with the contacts and other switch elements prior to its insertion in the frame 14, mounts a stationary contact member 17 and a movable contact member 18, the contact members 17 and 18 including, respectively, contact portions 17*a* and 18*a* adapted to extend into the recess 16 when the contact block is inserted in the frame. Lead wires (not shown) may be connected to the contacts 17 and 18 externally of the housing for connecting the switch into a desired circuit.

The movable contact member 18 is normally urged toward the stationary contact member 17 into closed circuit position therewith, and, while this may be achieved by means of a separate spring or the like, in the illustrated embodiment of the invention it is accomplished by the resilient nature and predetermined set of the movable contact member itself.

The contact block, in addition to mounting the contacts 17 and 18, also mounts a contact restraining member 19, which is separate from the contact members and is positioned adjacent the movable contact member on the side thereof directed away from the stationary contact member. The contact restraining member, which is formed of resilient material and has a predetermined normal set operably directed away from the stationary contact member, includes a portion 19*a* overlying the contact portion 18*a* of the movable contact member and forming the sole operating connection therewith for holding the movable contact member out of engagement with the stationary member, in open circuit position.

According to the invention, operating means are provided for moving the restraining member **19** from its normal set toward the stationary contact member to enable the movable contact member **18** to engage the stationary contact member **17** in closed circuit position. As illustrated, the operating means includes a bushing **20**, carried by the housing frame **14** substantially normal to the restraining member **19**, and a plunger member **21** slidably carried in the bushing for engaging the restraining member. It will be seen that as a result of this construction longitudinal movement, inwardly of the housing, imparted to the plunger member **21** will move the restraining member **19** toward the stationary contact member so that the contact members engage in closed circuit position.

It should here be noted that it is essential to the concepts of the invention that the restraining member **19** disengage the movable contact **18** when the contacts are in closed circuit position, so that the contacts are free of any vibration or electrical noise which might be imparted to them, by the restraining member or the operator therefor, and subsequently passed on into the circuit to which the switch is connected.

In order to actuate the operating means for the restraining member, that is to impart longitudinal movement to the plunger member **21**, the switch actuating portion **12** is provided. As illustrated, the actuating portion **12** includes a body **22** rigidly connected to the switch housing **13**. The body comprises an enlarged head portion **23** and integral externally threaded stem portion **24** of smaller diameter. The head portion **23** of the body **22**, which is here shown as being polygonal in cross section to facilitate mounting the device **10**, as will be hereinafter explained, is formed with a transverse slot **25** for receiving the switch housing **13**. The housing may be cemented or otherwise rigidly secured within the slot.

The body **22** is formed with a longitudinal bore **26** opening into slot **25** and extending only partially through the body, the bore being axially aligned with the bushing **20** of the operating means. A second bore **27**, of smaller diameter than the bore **26** and in axial alignment therewith, opens into bore **26** and extends the remaining way through the body **22**.

Slidably mounted in the bore **27** is a push rod **28** having an enlarged head **29** at one end thereof, disposed in bore **26**, and a push button **30** at the opposite end, outwardly of body **22**. A coil spring or similar resilient means **31** is disposed in bore **26** to bear against enlarged head **29** and the frame **14** of switch housing **13** for biasing the enlarged head and its push rod **28** outwardly of body **22** and away from the switch operating plunger **21**.

It will be seen that by means of the switch actuating construction just described that the switch may be operated by applying pressure to push button **30** for shifting push rod **28** and enlarged head **29** against spring **31** so that the enlarged head engages the stem **21***a* of operating plunger **21** for moving the plunger against the restraining means to enable the switch contacts to engage.

As was earlier stated, it is essential to the invention that once the contacts have engaged in closed circuit position the restraining member **19** be disengaged from the contacts and maintained in such disengaged relationship. According to the invention, in order to insure that continued pressure on push button **30** will not result in the restraining means being moved to such a position that it again engages the contacts, a split washer or stop member **32** is provided on push rod **28** for predeterminately limiting the longitudinal movement of the push rod and consequently the head **29** inwardly of the body **22**. Thus it will be seen the desired operation of the switch device is obtained and the restraining member **19** is prevented from such continued movement in the direction of the stationary contact as might result in a reengagement of the restraining member with one or both of the contacts.

The switch device is designed to be mounted on an instrument panel **33** or the like by inserting it through an opening **34** therein and locking it in position, as is well known to the art, by means of lock nuts **35** and a washer **36**.

Thus, among others, the several objects and advantages of the invention as aforenoted are achieved. Obviously numerous changes in the structure may be resorted to without departing from the spirit of the invention as defined by the claims.

We claim:

1. A manually operated electrical switch comprising a stationary contact and a movable contact, the latter being normally resiliently biased toward the former into closed circuit position therewith and being disengageably held in open circuit position by a separate restraining means resiliently biased away from said stationary contact, said restraining means having a portion disengageably engaging said movable contact and forming the sole connection therewith for holding the movable contact in open circuit position, and a manually operated operating means for imparting movement to said restraining means in the direction of said stationary contact to enable said movable contact to engage the stationary contact in closed circuit position under the force of its resilient bias and the said portion of the restraining means to thereafter disengage the movable contact on continued movement of the restraining means, said operating means including longitudinally movable means engaging with said restraining means and movable in the direction of said stationary contact and means for limiting the movement of said longitudinally movable means in the direction of the stationary contact so that said restraining means, on disengaging said movable contact, is prevented from further continued movement toward the stationary contact, whereby the contacts are maintained free of said restraining means.

2. An electrical switch comprising a stationary contact and a movable contact, the latter being normally resiliently biased toward the former into closed circuit position therewith and being disengageably held in open circuit position by a separate restraining means resiliently biased away from said stationary contact, said restraining means having a portion overlying said movable contact and forming the sole connection therewith for holding the movable contact in open circuit position, an operating means movable against said restraining means in the direction of said stationary contact to enable said movable contact to engage the stationary contact in closed circuit position under the force of its resilient bias and the overlying portion of said restraining means to thereafter disengage the movable contact on the continued movement of the restraining means, and a movable actuating means rigidly positioned to engage said operating means for imparting said movement thereto, said actuating means including stop means for preventing further continued movement of said operating means after the said disengagement of said restraining means and movable contact so that the contacts are maintained free of the restraining means.

3. An electrical switch comprising a stationary contact and a movable contact, the latter being normally resiliently biased toward the former into closed circuit position therewith and being disengageably held in open circuit position by a separate restraining means resiliently biased away from said stationary contact, said restraining means being disposed at the side of the movable contact directed away from the stationary contact and having a portion overlying said movable contact and forming the sole connection therewith for holding the movable contact in open circuit position, an operating plunger movable longitudinally against said restraining means in the direction of said stationary contact to enable said movable contact to engage the stationary contact in closed circuit position under the force of its normal bias and the overlying portion of the restraining means to thereafter disengage the movable contact on the continued move-

ment of the restraining means, and a longitudinal movable actuating means rigidly positioned to engage said operating means for imparting said longitudinal movement thereto, said actuating means including stop means for predeterminately controlling the longitudinal movement of said actuating means, whereby continued movement of said operating means, after the said disengagement of said restraining means and movable contact, is prevented so that the contacts are maintained free of the restraining means.

4. An electrical switch comprising a housing, a stationary contact member mounted on the housing, a movable contact member mounted on the housing and normally resiliently biased toward said stationary contact member into closed circuit position therewith, central restraining means mounted on the housing and resiliently biased away from the stationary contact member, said restraining means being separate from said contact members and having a portion releasably engageable with the movable contact member and forming the sole connection therewith for holding the latter in open circuit position relative to the stationary contact member, operating means carried by said housing and movable for moving said restraining means toward said stationary contact member so that said movable contact member is enabled to engage said stationary contact member under the force of its resilient bias and is thereafter disengaged from said portion of said restraining means on the continued movement thereof, and an actuating means for imparting movement to said operating means, said actuating means being rigidly connected to said housing and including means for limiting the movement of said operating means, whereby, on said portion of said restraining means disengaging said movable contact member, said operating means discontinues moving said restraining means in the direction of said stationary contact member.

5. An electrical switch comprising a housing, a stationary contact member mounted on the housing, a movable contact member mounted on the housing and normally resiliently biased toward said stationary contact member into closed circuit position therewith, contact restraining means mounted on the housing and resiliently biased away from the stationary contact member, said restraining means being separate from said contact members and having a portion releasably engageable with the movable contact member and forming the sole connection therewith for holding the latter in open circuit position relative to the stationary contact member, operating means carried by said housing and movable for moving said restraining means toward said stationary contact member so that said movable contact member is enabled to engage said stationary contact member under the force of its normal bias and is thereafter disengaged from said portion of said restraining means on the continued movement thereof, and an actuating means for imparting movement to said operating means, said actuating means including a body portion rigidly connected to said housing, an actuating member movably carried by said body portion and operably engageable with said operating means for moving the same in the direction of said stationary contact member and means cooperating between said body portion and said actuating member for limiting the movement of the latter, whereby, on said portion of said restraining means disengaging said movable contact member, said operating means is prevented from imparting continued movement to said restraining means in the direction of said stationary contact member for maintaining said contact members free of said restraining means.

6. An electrical switch comprising a housing, a stationary contact member mounted on the housing, a movable contact member mounted on the housing and normally resiliently biased toward said stationary contact member into closed circuit position therewith, contact restraining means mounted on the housing and resiliently biased away from the stationary contact member, said restraining means being separate from said contact members and having a portion releasably engageable with the movable contact member and forming the sole connection therewith for holding the latter in open circuit position relative to the stationary contact member, longitudinally movable operating means carried by said housing for moving said restraining means toward said stationary contact member so that said movable contact member is enabled to engage said stationary contact member under the force of its normal bias and is thereafter disengaged from said portion of said restraining means on the continued movement thereof, and an actuating means for imparting said longitudinal movement to said operating means, said actuating means including a body portion rigidly connected to said housing and having a recess therein in alignment with said operating means, an actuating member slidably carried by said body portion and extending into said recess for longitudinal movement therein into engagement with said operating means for moving the latter toward said stationary contact member and means cooperating between said body portion and said actuating member for limiting the movement of the latter toward said stationary contact member, whereby, on said portion of said restraining means disengaging said movable contact member, said operating means is prevented from imparting continued movement to said restraining means in the direction of said stationary contact member for maintaining said contact members free of said restraining means.

7. An electrical switch comprising a housing, a stationary contact member mounted on the housing, a movable contact member mounted on the housing substantially perpendicular to said stationary contact member and normally resiliently biased toward said stationary contact member into closed circuit position therewith, contact restraining means mounted on the housing substantially parallel with said movable contact member at the side thereof directed away from said stationary contact member and resiliently biased away from the stationary contact member, said restraining means being separate from said contact members and having a portion overlying the movable contact member and releasably engageable member therewith for holding the latter in open circuit position relative to the stationary contact member, an operating rod slidably carried by the housing substantially perpendicular to said restraining means and movable longitudinally into engagement therewith for moving said restraining means toward said stationary contact member so that said movable contact member is enabled to engage said stationary contact member under the force of its normal resilient bias and is thereafter disengaged from said overlying portion of said restraining means on the continued movement thereof, and an actuating means for imparting movement to said operating rod, said actuating means including a body portion rigidly connected to said housing and having a recess therein in alignment with said operating rod, an actuating rod slidably carried by said body portion and having an end thereof disposed in said recess in substantial axial alignment with said operating rod and the opposite end extending outside said body portion, said actuating rod being longitudinally movable through said recess into engagement with said operating rod for moving the latter toward said stationary contact member and means cooperating between said body portion and said actuating rod for limiting movement of the latter through said recess, whereby, on said overlying portion of said restraining means disengaging said movable contact member, said operating rod is prevented from imparting continued movement to said restraining means in the direction of said stationary contact member for maintaining said contact members free of said restraining means.

8. An electrical switch as defined in claim 7, and

resilient means disposed in said recess for normally biasing said actuating rod away from said operating rod, said actuating rod being manually movable against said resilient means.

9. An electrical switch as defined in claim 7, wherein said means cooperating between said body portion and said actuating rod comprises means predeterminately positioned and connected to said actuating rod external of said body portion for abutting said body portion as said actuating rod is moved longitudinally through said recess into engagement with said operating rod.

10. An electrical switch as defined in claim 7, and means forming part of said body portion for facilitating the rigid mounting of said electrical switch.

References Cited by the Examiner

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BERNARD A. GILHEANY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,182,158 May 4, 1965

George M. Beardow et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 61, for "mehods" read -- methods --; column 5, line 1, for "longitudinal" read -- longitudinally --; line 15, for "central" read -- contact --; column 6, line 44, strike out "member".

Signed and sealed this 28th day of September 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents