United States Patent

[11] 3,611,219

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[33] **Japan**
[31] **43/87,430, 43/104,129 and 43/104,130**

[54] **ELECTRIC SNAP SWITCH**
13 Claims, 14 Drawing Figs.

[52] **U.S. Cl.** ..... **335/205,** 200/67 F
[51] **Int. Cl.** **H01h 5/02,** H01h 5/04, H01h 51/28
[50] **Field of Search** ..... 200/67 F; 335/188, 205–207, 153

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ABSTRACT: An electric snap switch having a snap-acting mechanism for shifting a permanent magnet to operate a reed switch which is always positioned within the effective magnetic flux of the magnet so as to open the reed switch by applying vertically generated magnetic flux and to close reed switch by applying the horizontally generated magnetic flux upon displacement of the magnet by means of the snap action of the snap-acting mechanism, resulting in that the shifting stroke of the magnet is reduced to improve the sensitivity and endurance of the switch.

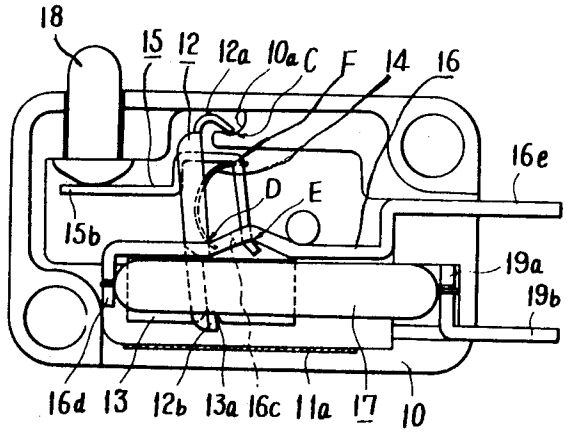

FIG. 1(A) PRIOR ART

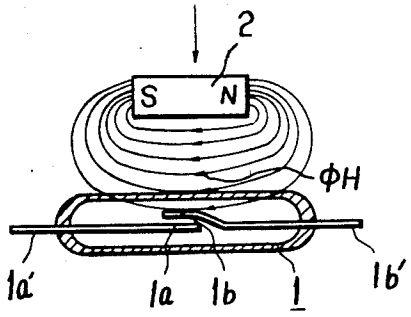

FIG. 1(B) PRIOR ART

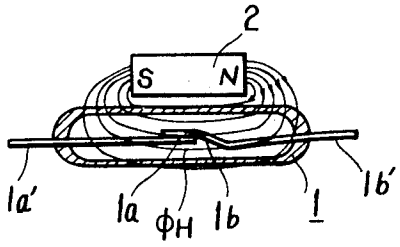

FIG. 2(A)

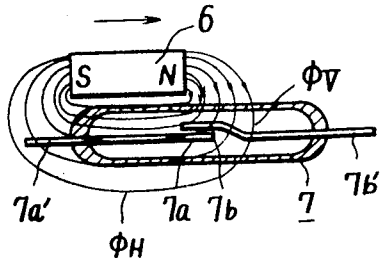

FIG. 2(B)

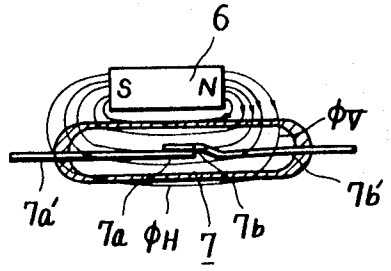

FIG. 3

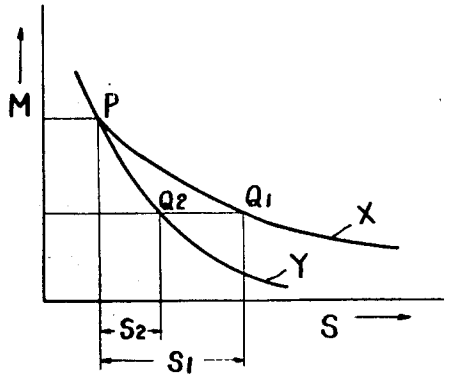

FIG. 4

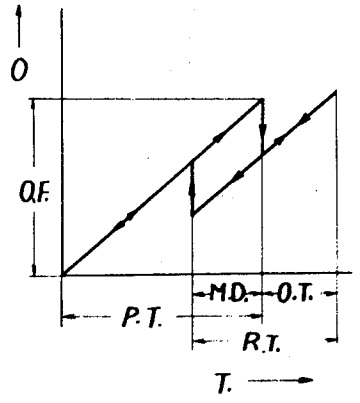

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FIG. 5

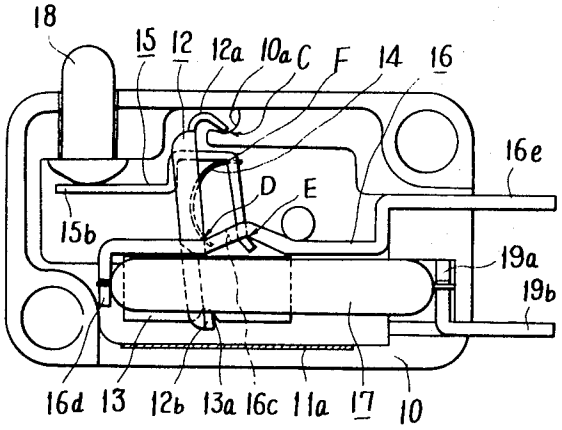

FIG. 6

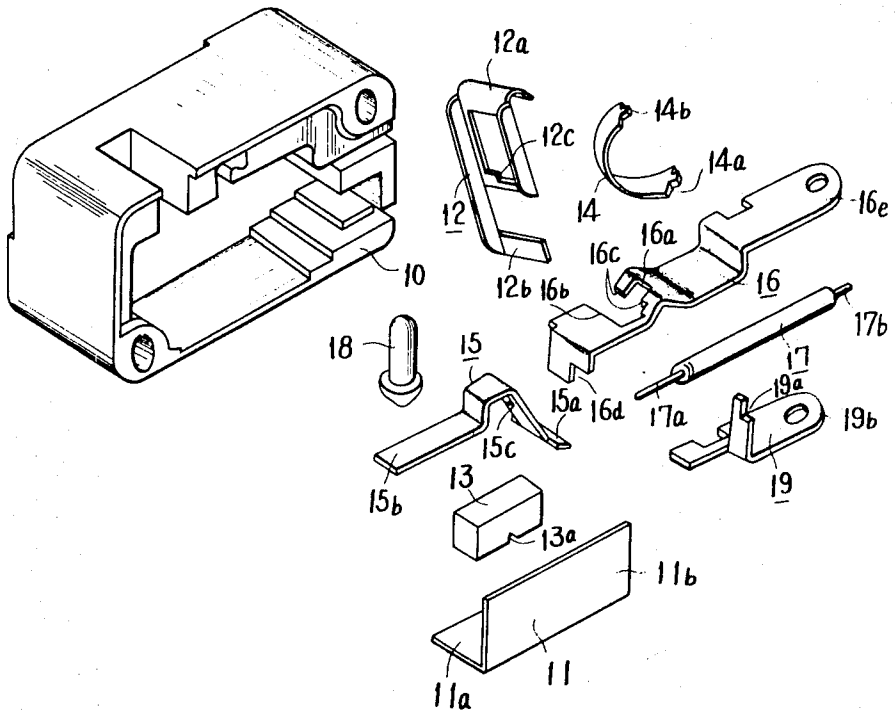

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FIG. 7(A)

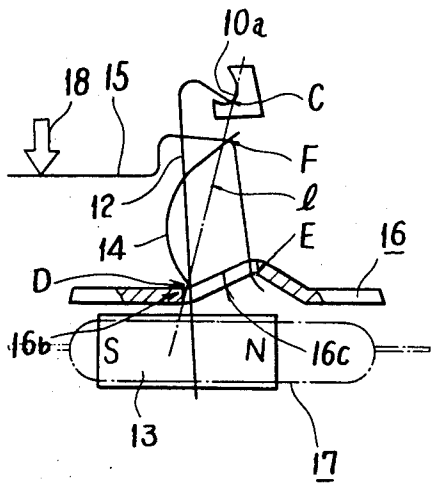

FIG. 7(B)

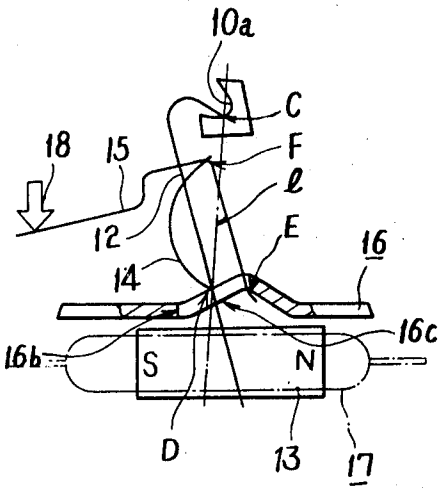

FIG. 8

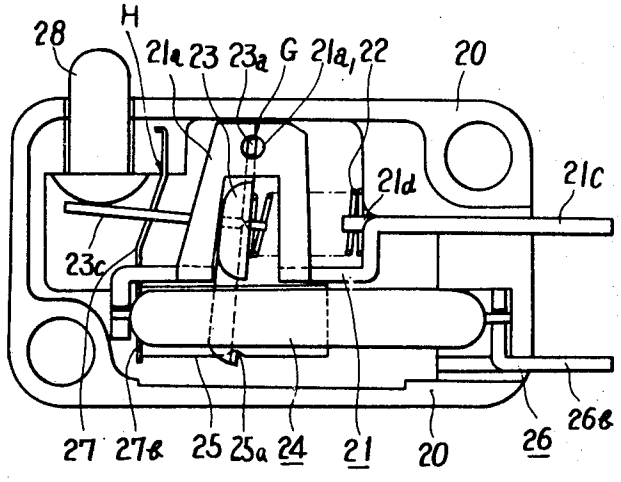

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FIG. 9

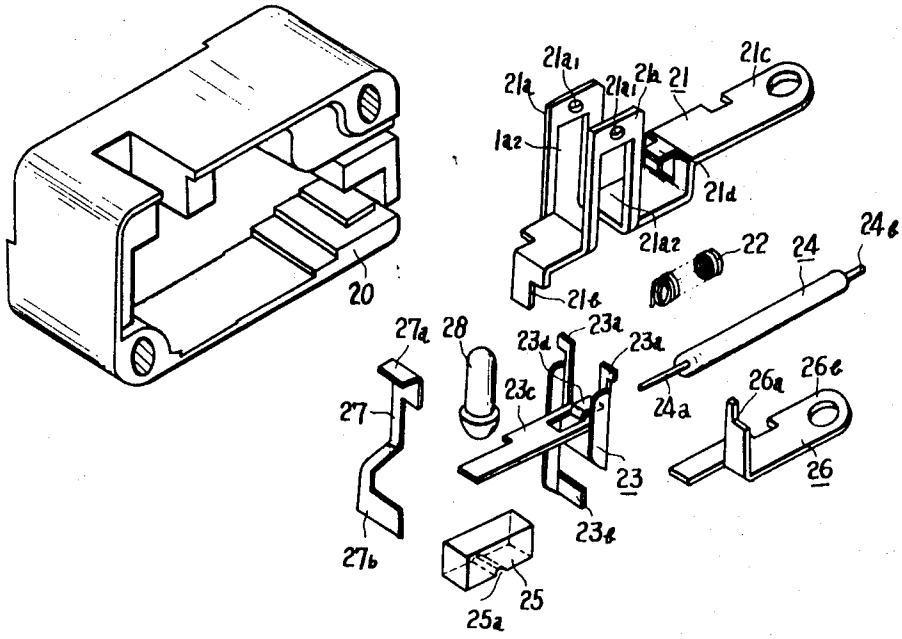


FIG. 10(A)

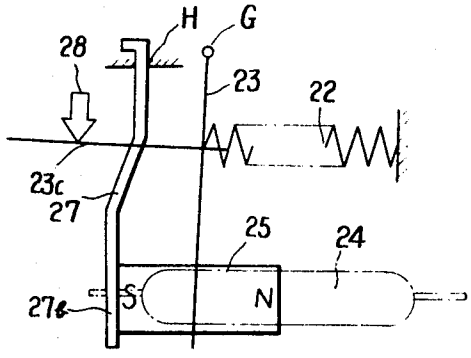
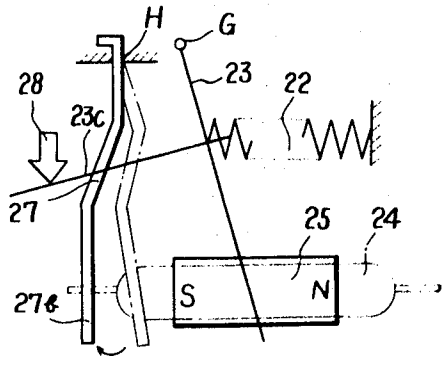


FIG. 10(B)



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ELECTRIC SNAP SWITCH

The present invention relates to an electric snap switch and, more particularly, to a magnetically operated reed switch having a snap-acting mechanism for rapidly shifting a permanent magnet to instantly open and close the reed switch.

It has been well known that an improved switch with respect to performance and endurance should be used in control function of the switch mechanism is an important factor. For this reason, of various switches heretofore developed a reed switch has been employed in the art because of its satisfaction of the requirement. As is well known, a reed switch is provided with switching contacts disposed within a glass tube filled with an inert gas, and has the advantage that the service life of the contacts is substantially improved.

Such a reed switch now employed in the art has a function characterized in that, a pair of contacts thereof in the open condition are formed into magnetic poles of opposite polarity respectively, when a magnetic field is generated about said contacts by means of a permanent magnet or an electromagnet, and subsequently, commence to attract each other to establish the closed condition in said switch.

The present invention and the prior art will be hereinafter fully described with reference to the accompanying drawings, showing some embodiments of the present invention only for the purpose of explanation thereof, and wherein:

FIG. 1(A) and (B) are schematic diagrams showing a conventional magnetically operated reed switch;

FIG. 2(A) and (B) are schematic diagrams showing a magnetically operated reed switch according to the present invention;

FIG. 3 is a graph illustrating a magnetic characteristic as function of the magnetic flux density M in a reed switch and the stroke K of a permanent magnet;

FIG. 4 is a graph illustrating the operational characteristic of a snap-acting mechanism relating the stroke T to the operating force 0 of the movable member;

FIG. 5 is a side view, constituting a plane section through the cover-housing interface, of an electric snap switch showing one modification of the present invention;

FIG. 6 is an isometric view of parts of the electric snap switch shown in FIG. 5;

FIG. 7(A) and (B) are schematic diagrams illustrating the operation of the electric snap switch of FIG. 5;

FIG. 8 is a side view constituting a plane section through the cover-housing interface, of an electric snap switch showing another modification of the present invention;

FIG. 9 is an isometric view of parts of the electric snap switch shown in FIG. 8; and

FIG. 10(A) and (B) are schematic diagrams illustrating the operation of the electric snap switch of FIG. 8.

In order to make the most of such a function of the reed switch, a conventional type of reed switch has been designed as illustrated in FIG. 1 with a vertically movable permanent magnet 2 being positioned just above the reed switch 1 of which a glass tube has a pair of horizontally elongated reeds 1*a'* and 1*b'* provided with contacts 1*a*and 1*b*at the oppositely adjacent ends thereof, so that the contacts 1*a* and 1*b* are engaged together to make the circuit when the permanent magnet 2 is brought close downwardly to the reeds 1*a'* and 1*b'*, to such an extent that the magnetic flux produced by said permanent magnet 2 effects said reeds 1*a'* and 1*b'*, and, on the other hand, when the magnet 2 is displaced upwardly from said reeds 1*a'* and 1*b'* to such an extent that said magnetic flux which has been effecting the reeds 1*a'* and 1*b'* extinguishes, the contacts 1*a* and 1*b* are disengaged from each other to break the circuit.

However, in such a type of reed switch as described above, there has been found a defect that a relatively greater stroke is necessary to shift the permanent magnet 2 from a position close to the horizontally laid switch 1, so as to cause its contacts 1*a* and 1*b* to be engaged by means of the effective magnetic flux Φ_H produced by the magnet 2 in the horizontal direction, to another position away from said switch 1 so as to cause its contacts 1*a* and 1*b* to be disengaged by means of the effective resilience force possessed in the reeds 1*a'* and 1*b'*, and vice versa, resulting in that the switching operation of the contacts 1*a* and 1*b* tends to become loose. FIG. 3 shows the magnetic characteristic of the magnetic flux density M in relation to the stroke K in which the permanent magnet is moved in the transverse direction substantially at a right angle to the lengthwise direction of the reed switch. In FIG. 3 a curve of comparatively small inclination as indicated by X designates the stroke of a conventional type of the reed switch 1. As is apparent from the characteristic curve X, the stroke S of the magnet from the position P representing a value of the magnetic flux density necessary to close the reed switch 1, to another position Q_1 representing a value of the magnetic flux density necessary to open the reed switch 1 is of comparatively great value as indicated by S_1.

As one method to eliminate the above-mentioned defect, it has been contemplated to provide a snap-acting mechanism to the reed switch wherein the permanent magnet is fitted to a quick motion member of the snap-acting mechanism so that a snap action of the snap-acting mechanism may be applied to shift the permanent magnet from the position P to the position Q_1. A shifting stroke of the quick motion member of such snap-acting mechanism, that is, the stroke of the permanent magnet, depends upon the operational characteristic of the snap-acting mechanism relating to the stroke T and the operating force O of the quick motion member as shown in FIG. 4.

In the construction of the reed switch thus provided with the snap-acting mechanism the magnitude of the shifting stroke of the quick motion member necessary to operate the reed switch corresponds to the hereinbefore described value S_1. Since it is apparent that the distance of travel of the quick motion member from the free position to the operating position (which distance being hereinafter referred to as "P.T.") and the value S_1 of the shifting stroke of the permanent magnet are in the proportional relationship, the magnitude of P.T. should be sufficient to correspond to the value S_1. In addition thereto, the distance of return travel of the quick motion member from the operating position to the free position (which distance being hereinafter referred to as "R.T.") should be of a value approximate to that of P.T. Therefore, this results in the increase of a the value of the distance of movement difference of the quick motion member from the operating position to the release position (which distance being hereinafter referred to as "M.D.").

Accordingly, in the reed switch of such construction, without permitting an increase in the distance M.D. of the snap-acting mechanism it is impossible to operate the reed switch. However, increase of the distance M.D. may result in that a rapid switching operation of the reed switch cannot be performed by means of the snap action of the snap-acting mechanism. Furthermore, an operating force of large magnitude, (which force being hereinafter referred to as "O.P.") necessary to cause contact snap action to operate the reed switch, in accordance with increase of the distances P.T. and M.D. will be necessary and subsequently constitute a cause for fatigue of the switching mechanism of the reed switch due to the amplitude of stress developed. Therefore, the life of service of the reed switch of such construction may be shortened and, because of the great stroke required in connection with the quick motion member of the snap-acting mechanism, the size thereof must be increased in order to accommodate said mechanism in the reed switch assembly.

These and other defects of the conventional reed switch as hereinbefore described have been eliminated in the present invention.

A primary object of the present invention is to provide an electric snap switch of the above character having the snap-acting mechanism, whereby the permanent magnet is horizontally moved in the lengthwise direction of the reed switch, that is, the same direction of horizontally elongated reeds 1*a'* and 1*b'*, by means of the snap action of said mechanism to operate rapidly said reed switch in an improved manner.

In the electric snap switch of the present invention, shown in FIGS. 2 (A) and 2 (B), a reed switch 7 is always positioned within an effective magnetic flux path formed by a permanent magnet 6, so that switching contacts 7*a* and 7*b* of the horizontally laid reed switch 7 are disengaged each other to break the circuit, by applying the vertically generated effective magnetic flux Φ_V thereto, and, when the permanent magnet 6 is snapped by means of the snap-acting mechanism, until the horizontally generated effective magnetic flux Φ_H is applied to the switching contacts 7*a* and 7*b*, the contacts 7*a* and 7*b* are engaged to make the circuit by said flux Φ_H.

In other words, referring to FIG. 2 showing such a magnetically operated reed switch, the permanent magnet 6 is disposed at one position, for example, at the left-hand position of the reed switch 7 in FIG. 2(A) to apply the vertically generated effective magnetic flux Φ_V to the switching contacts 7*a* and 7*b* and the permanent magnet 6 may be displaced in the lengthwise direction of and in the parallel relation to the reed switch 7 to another position, for example, just above the switch 7 in FIG. 2(B) where the horizontally generated effective magnetic flux Φ_H is applied to the switching contacts 7*a* and 7*b*. Such reciprocation of the permanent magnet 6 for operating the reed switch 7 can be rapidly performed by means of the snap-acting mechanism with substantial reduction of a value of the shifting stroke of the permanent magnet 6.

According to the reed switch hereinbefore described with reference to FIG. 2(A), the characteristic curve of the magnetic flux density relative to the stroke of the permanent magnet 6 to be moved in the horizontal direction in substantially parallel relation to the lengthwise direction of the reed switch 7 is shown by Y in FIG. 3. It is apparent from the characteristic curve Y, of comparatively large inclination, that the stroke of the permanent magnet 6 from a position P, representing a value of the magnetic flux density necessary to close the reed switch 7, to another position Q_2 representing a value of the magnetic flux density necessary to open the operation of the reed switch 7, has a reduced value as indicated by S_2, in comparison with the above-mentioned stroke S_1 of the curve X. Therefore, the shifting stroke of the quick motion member of the snap-acting mechanism fitted with the permanent magnet 6 can be determined to a corresponding value of a small stroke of the permanent magnet 6. In proportion thereto, a value of the distances P.T. and R.T. of the snap-acting mechanism can be respectively reduced, so that a value of the distance M.D. can be subsequently reduced, to perform a rapid switching operation of the reed switch 7, resulting in the improved sensitivity and endurance of the electric snap switch having the snap-acting mechanism, for rapidly shifting a permanent magnet to instantly open and close the reed switch 7.

The heretofore described snap-acting mechanism to be used with a magnetically operated reed switch of the present invention is generally provided with a tension element and a compression element which are arranged to moved quickly at dead-center connection therebetween and includes a so-called semisnap-acting mechanism, which is provided with a quick motion member to be moved merely by presenting it. Said quick motion member is also represented as one of the movable members of said snap-acting mechanism and includes another acting means associated with said quick motion members.

The shifting direction of the permanent magnet to be moved by the snap-acting mechanism in parallel relation to the lengthwise direction of the reed switch may be alternatively in the direction of arc, but horizontally in parallel relation thereto. The reed switch of the type having a pair of reeds provided with a contact may include a reed switch of the transfer type, having three reeds of which the movable contact engages always one of other contacts.

Another object of the present invention is to provide an electric snap switch having a snap-acting mechanism, comprising a quick motion member of which one end is pivotally engaged to a fitting position and the other end is pivotally provided with a permanent magnet opposed to the reed switch, a compression element connected with a free end of said quick motion member, an actuator member of which one end is free to operate and the other end is pivotally engaged to a fitting position, said actuator member being engaged at its predetermined position with the other end of said compression elements, and a plunger member disposed adjacent to the free end of said actuator member, said quick motion member, compression element and actuator member being constituted a snap-acting mechanism to be performed a snap action by which said magnet is quickly moved in the lengthwise direction of and in parallel to the reed switch so as to operate said switch. By achieving this object, the size of the magnetically operated reed switch of the present invention can be reduced because the magnet can be quickly moved by the snap acting mechanism in a small spacing.

A further object of the present invention is to provide a magnetically operated reed switch having means for operating the magnet to open and close the reed switch, that is, the quick motion member, wherein said magnet is supported by said means through the magnetic attraction acting between said magnet and a plate member of magnetic material effective to shield the reed switch from the influence of na external magnetic field. With this provision, the magnet can be reliably supported by said simple supporting means to be effected with an operating force of the plunger member.

A still further object of the present invention is to provide an electric snap switch having a magnet to open and close the reed switch comprising a resilient member of magnetic material which one end is fixed and the other end is a free end opposed to one pole of said magnet in such a manner that said free end is attracted or released from the attraction of said magnet to provide the semiquickness of operation of the reed switch.

With this resilient member of magnetic material and the magnet, the electric snap switch having a means for suggesting a sensory representation of the switching condition to the operator can be obtained. In addition thereto, a novel construction of the magnetically operated reed switch operable in a semiquick action can be obtained. In connection with one embodiment as illustrated in FIG. 5 to FIG. 7, a housing 10 is accommodated with a snap-acting mechanism and a reed switch assembly to be operated thereby.

A quick motion member 12 of the snap-acting mechanism is formed roughly with the shape of E, an top end 12*a* of which is pivotally engaged in a recessed portion 10*a* formed on the housing 10 at a position C while the bottom end 12*b* thereof is pivotally engaged in a notched groove 13*a* formed at the bottom of a permanent magnet 13 and the middle end 12*c* is pivotally connected to one end 14*a* of a compression element 14 made of a leaf spring at a position D.

An actuator member 15 of the snap-acting mechanism is formed roughly in the shape of an L, one end 15*a* of which is pivotally engaged at a position E to a notch 16*a* on a first stationary member 16 while the other end 15*b* thereof is free to operate. The other end 14*b* of the compression element 14 is engaged at a position F to a notch 15*c* formed about an intermediate position between the opposite ends 15*a* and 15*b*.

The first stationary member 16 fixed in the housing 10 is provided with stopper portions 16*b* and 16*c* for defining a movement range of the quick motion member 12, one end 16*d* being formed as a supporting end for supporting a reed 17*a* extending from one end of a reed switch 17 while the other end 16*e* thereof being formed as a terminal an outside electric connection.

Both the compression element 14 and the actuator member 15 form a snap-acting mechanism of which the dead line L exists between the engagement positions C and D respectively on the quick motion member 12 and the compression element 14 as shown in FIG. 7.

A plunger member 18 having a head portion at one end thereof in contact with the free end 15*b* of the actuator member 15 within the housing is reciprocable through the

aperture of the housing and is operable by pressing the outer portion of its other end. One end **19***a* of a second stationary member **19** is formed in an upright position to serve as a supporting end for supporting a reed **17***b* extending from the other end of the reed switch **17** while the other end **19***b* thereof is formed as a terminal for an outside electric connection.

Although in this first embodiment of the present invention the compression element **14** is formed independently of the other elements or members and engaged at its end **14***a* to the engagement portion **12***c* on the quick motion member **12**, said compression element **14** may be integrally formed with the quick motion member **12** in such a manner as to elongate the engagement portion **12***c* in the form of a tongue. Therefore, if the compression element **14** is the form of the tongue integrally elongated from the engagement portion **12***c* of the quick motion member **12** is employed, engagement of the compression element **14** to the quick motion member **12** will be an integral connection which may be employed.

The magnet **13** is provided at its bottom side with a notched groove **13***a* to which the L-shaped end **12***b* of the quick motion member **12** is pivotally engaged. A fixed plate **11** of magnetic material shaped in the L-form is provided with a bottom side **11***a* in contact with the bottom wall of the housing **10** and a lateral side **11***a* adjacent to a side wall of the housing **10** and serves to shield the reed switch **17** from the influence of an external magnetic force and also to support the magnet **13** in the desired posture by means of the magnetic attraction acting between the magnet **13** and the bottom side **11***a* lateral side **11***b* while the magnet **13** is carried by the L-shaped end **12***b* of the quick motion member **12** engaging in its notched groove **13***a*. Therefore, no special provision for supporting the magnet **13** is required in this instance. In addition thereto, said fixed plate also serves as a means for shielding the reed switch assembly form the influence of an external magnetic force and no additional provision for the same purpose is required.

The operation of the reed switch assembly of the above construction is as follows: Referring now to FIG. **7**(A) and (B), when in the nonoperated condition, the magnet **13** is positioned to the left side of the reed switch **17** and the magnetic flux Φ generated by said magnet **13** as illustrated in FIG. **2**(A) is at this time set up vertically in the reeds **17***a* and **17***b* of the reed switch **17** so as to open the circuit.

When the plunger member **18** is depressed by the pressing force of a operator as shown in FIG. **7**(B), the actuator member **15** is swung in the counterclockwise direction around the engagement position E which, at this time, serves as a fulcrum of the notch **16***a* of the first stationary member **16**. At the same time as the actuator member **15** is swung in said direction, the engagement position F engaged to the compression element **14** travels upwardly to the left to cause the compression element **14** to accumulate a resilient force therein, the value of said resilient force arriving at its maximum value when the engagement position F is positioned on the dead line L passing between the engagement positions C and D.

As the plunger member **18** is depressed until the engagement position F pass beyond the dead line L, the resilient force accumulated in the compression element **14** is instantly released accompanying a rapid swing of the quick motion member **12** in the counterclockwise direction around the engagement position C in a recessed portion **10***a* of the housing **10**. Thus the magnet **13** is moved to the right to position it in the center of the reed switch **17**, as shown in FIG. **7**(B) to establish the condition of the magnet **13** as illustrated in FIG. **2**(B) in which the magnetic flux by said magnet **13** is at this time set up horizontally in the reeds **17***a* and **17***b* and thereby to close the circuit.

When the plunger member **18** is released from the depressed condition, the arrangement of the parts is returned to the initial condition in the reverse manner to open the circuit by means of the self-restoring force of the snap-acting mechanism.

It is apparent from the foregoing description of the electric snap switch of the present invention in connection with the first embodiment thereof that the distance M.D. is substantially reduced with improved sensitivity and endurance. Therefore, by incorporating various features of the present invention, the size of the switch can also be reduced.

Now, to the second embodiment of the present invention with reference to FIG. **8** to FIG. **10**, a housing **20** is accommodated with a semisnap-acting mechanism and a reed switch assembly to be operated thereby. A stationary member **21** fixed in the housing **20** is provided with an end portion **21***c* formed as a terminal for outside electric connection. The other end portion of said stationary member **21** is, as shown in FIG. **9**, provided with a pair of supporting holes $21a_1$, an open slot $21a_2$ for defining a movement range of a quick motion member **23**, leglike portions **21***a* defining said open slot $21a_2$, and a supporter lug **21***b* for supporting a reed **24***a* extending from one end of a reed switch **24**. Provided between the leglike portions **21***a* and the terminal end **21***c* is a hooklike lug **21***d* for retaining one end of a tension spring **22**.

A quick motion member **23** of the semiquick-acting mechanism is provided with a pair of lugs **23***a* which are in turn pivotally engaged at a position G to the corresponding supporting holes $21a_1$ disposed on the leglike portion **21***a* of the stationary member **21**. The opposite end **23***b* formed in the L-shape of the quick motion member **23** is pivotally engaged to a notched groove **25***a* formed on the bottom side of the magnet **25** in the same manner as in the first embodiment so as to carry the magnet **25** by the quick motion member **23**. The magnet **25** is disposed so as to render its lengthwise direction in parallel relation to that of the reed switch **24** having a pair of reeds **24***a* and **24***b*.

The quick motion member **23** is also provided with an operating element **23***c* formed by bending an intermediate portion thereof at right angle as shown in FIG. **9**, one end of which is free end to be depressed by means of a plunger member **28** while the other end thereof is provided with a hooklike lug **23***d* for retaining the other end of the tension spring **22**. One end **26***a* of a second stationary member **26** fixed in the housing **20** is formed in an upright position to serve as a supporting end for supporting a reed **24***b* extending from the reed switch **24**, while the other end **26***b* thereof is formed as a terminal for an outside electric connection. The reed switch **24** is supported between the end **26***a* of the second stationary member **26** and the supporting lug **21***b* of the first mentioned stationary member **21** in such a manner that the reed **24***a* is connected to the supporting lug **21***b* and the reed **24***b* is connected to the supporting end **26***b* by soldering or suitable means.

A resilient member **27**, made of magnetic material, of the semiquick-acting mechanism is provided with an end **27***a* secured at a position H to the top wall of the housing **20** and a free end **27***b* shaped in the L-form. The free end **27***b* of said resilient element **27** is normally attracted to one pole of the magnet **25**, and said resilient element **27** acts in cooperation with the magnet **25** as an element for suggesting a sensory representation of the switching condition to the operator.

Both the tension spring **22** and the quick motion member **23** and the resilient member **27** form a semisnap-acting mechanism of which the dead point exists, at the moment the attracted relationship between said member **27** and magnet **25** is released in connection with the pushing force of said spring **22** as shown in FIG. **10**.

A plunger member **28** having a head portion at one end thereof in contact with the free end of the operating element **23***c* of the quick motion member **23** within the housing **20** is reciprocable through the aperture of the housing to operate by pressing the outer portion of its other end.

The operation of the reed switch assembly of the above construction is as follows. Referring now to FIG. **10**, when in the nonoperated condition, the free end **27***b* of the resilient member **27** is, as shown in FIG. **10**(A), in the attracted condition to one pole of the magnet **25** and the magnetic flux Φ,

generated by said magnet **25** as illustrated in FIG. **2**(A) is at this time set up vertically in the reeds **24***a* and **24***b* of the reed switch **24** so as to open the circuit.

When the plunger member **29** is depressed by the pressing force of a operator against the resilient force of the tension spring **22** as shown in FIG. **10**(B), the quick motion member **23** is swung in the counterclockwise direction around the engagement position G which, at this time serves as a fulcrum, thereby to move the magnet **25** to the right in parallel to the lengthwise direction of the reed switch **24**. During the movement of the quick motion member **23** and subsequently the magnet **25** to the right, the resilient member **27** is also swung in the counterclockwise direction around the fixed position H while being attracted by one pole of the magnet **25**. However, as the intrinsic resilient force of the resilient element **27** bears against the attracting force of the magnet **25**, the attracted relationship between said element **27** and magnet **25** is released in a semiquick action whereby a retaining force of the quick motion member **23** effected on the plunger member **29** is reduced while the magnet **29** further moves to the right until the magnetic flux Φ generated thereby is set up horizontally in the reeds **24***a* and **24***b* of the reed switch **24**, and thereby to close the circuit as shown in FIG. **10**(B).

When the plunger member **29** is released from the depressed condition, the quick motion member **23** is returned by the resilient force of the tension spring **22** to the position in which, in addition to said resilient force of the spring **22**, the one pole of the magnet **25** commences to attract the resilient element **27**, resulting in that the arrangement of the semisnap-acting mechanism is substantially returned to the initial condition in the reverse manner to open the circuit. Even at this time, the semiquick action of the switch can obtained.

Although the present invention has been heretofore fully described in connection with the first and second embodiments thereof with reference to the accompanying drawings, it is understood that the same is not limited thereto but is susceptible to numerous changes and modifications as known to a person skilled in the art and we, therefore, do not wish to be limited to the details shown and described herein, but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

What is claimed is:

1. An electric snap switch comprising

an overcenter snap-acting mechanism, having a quick motion member, one end of which is supported by a tension member and the other end of which is supported by a compression member,

a permanent magnet being engaged to move together with said quick motion member by means of the magnetic attraction of a fixed magnetic plate effective to shield said reed switch from the influence of an external magnetic field, and

a reed switch having a pair of elongated reed-type switching contacts operated by the magnetic flux of said magnet, and wherein

said magnet is moved in parallel to the longitudinal direction of said reeds from a position in which the flux of said magnet is set up vertically on said contacts to open said contacts to the position in which the flux of said magnet is set up horizontally on said contacts to close said contacts.

2. An electric snap switch comprising

an overcenter snap-acting mechanism having a magnetic resilient member of which one end is fixed at a first position and the other end is opposed to one pole of a permanent magnet, said magnet being moved quickly by means for suddenly removing magnetic attraction between said resilience member and magnet,

a reed switch having a pair of elongated reed-type switching contacts operated by the magnetic flux of said magnet, and wherein

said magnet is moved in parallel to the longitudinal direction of said reeds.

3. An electric switch comprising:

a reed switch having a plurality of elongated reed switching contacts which close in response to the application of a magnetic field thereto;

a permanent magnet, displaceable with respect to said reed switch in a direction parallel to the longitudinal direction of the elongated reed contacts thereof; and

an overcenter snap-acting mechanism connected to said magnet for rapidly displacing said magnet with respect to said reed switch contacts so as to open and close said contacts.

4. A switch in accordance with claim **3**, wherein said magnet occupies a first position in said switch with respect to said reed contacts, whereby the flux produced by said magnet passes substantially transversely with respect to the longitudinal direction of said contacts, and upon displacement with respect to said reed contacts, occupies a second position with respect to said reed contacts, whereby the flux produced by said magnet passes substantially parallel with respect to the longitudinal direction of said contacts.

5. A switch in accordance with claim **4**, wherein said switch further includes a housing, and said overcenter snap-acting mechanism includes a quick motion member, one end of which is pivoted about a first position within said housing and the other end of which is engaged with said magnet, an actuator member, one end of which is pivoted about a second position within said housing, while the other end is freely displaceable, a compression member, one end of which is pivotally engaged at an intermediate portion of said quick motion member and the other end of which is pivotally engaged at an intermediate portion of said actuator member.

6. An electric switch comprising:

a housing;

a reed switch supported within said housing and having a plurality of elongated reed switching contacts which close and open in response to the application and removal, respectively, of a magnetic field thereto;

a permanent magnet, supported within said housing and being displaceable with respect to said reed switch in a direction parallel to the longitudinal direction of said elongated contacts of said reed switch; and

an overcenter snap-acting mechanism connected to said magnet for rapidly displacing said magnet with respect to said reed switch contacts, so as to open and close said contacts, said overcenter snap acting mechanism comprising

a quick motion member having a first end, an interior portion and a second end, said quick motion member being pivoted at its first end about a first position within said housing and being engaged at its second end, with said magnet;

an actuator member having a first end, an interior portion and a second end, said actuator member being pivoted at its first end at a second position within said housing and having its second end reciprocally displaceable by a plunger member disposed within said housing;

a compression member having a first end and a second end, said compression member being pivotally engaged at its first end with the intermediate portion of said quick motion member and being pivotally engaged to the intermediate portion of said actuator member at its second end.

7. A switch in accordance with claim **6**, further including a first stationary member disposed within said housing for supporting one end of said reed switch and for pivotally supporting the second end of said actuator member, and a second stationary member for supporting the other end of said reed switch, each of said first and second stationary members being conductive and formed to provide external electrical connections for said reed switch.

8. An electric switch comprising:

a snap-acting mechanism having a quick motion member quickly displaceable in one direction;

a reed switch having a pair of elongated reed contacts, the closure of which is effected by the application of a magnetic field thereto; and

means for effecting the application of a magnetic field to said reed contacts, while shielding said contacts from the influence of a magnetic field external to said switch, including a permanent magnet pivotally supported by said quick motion member and being displaceable in a direction parallel to the longitudinal direction of said elongated reed contacts, and a fixed magnetic plated supported adjacent said magnet, whereby, the magnetic flux for closing said contacts emanates from said plate in cooperation with said magnet.

9. An electric switch comprising:

a housing;

a reed switch supported within said housing and having a plurality of elongated reed switching contacts which close and open in response to the application and removal, respectively, of a magnetic field thereto;

a permanent magnet supported within said housing and being displaceable with respect to said reed switch in a direction parallel to the longitudinal direction of said elongated contacts of said reed switch; and

an overcenter snap-acting mechanism connected to said magnet for rapidly displacing said magnet with respect to said reed switch contacts, so as to open and close said contacts, said overcenter snap-acting mechanism comprising:

a quick motion member having a first portion and an operating second portion;

a resilience member, coupled to said quick motion member and being pivotally engaged at one end thereof with said housing, and being magnetically coupled to one end of said magnet at the other end thereof; and

means, engaged with said quick motion member and said housing, for suddenly removing the magnetic coupling between said resilient member and said magnet.

10. A switch in accordance with claim **9**, wherein said means for suddenly removing the magnetic coupling includes a tension spring connected at one end thereof to said housing and at the other end thereof to said second portion of said quick motion member, and a plunger element engagingly coupled to said first portion of said quick motion member.

11. A switch in accordance with claim **10**, further including a first stationary member disposed within said housing for conductively engaging one end of said reed switch and for pivotally supporting said quick motion member and a second stationary member for supporting the other end of said reed switch, each of said first and second stationary members being conductively formed to provide the external electrical connections for said reed switch.

12. A switch in accordance with claim **6**, wherein said quick motion member is substantially E-shaped.

13. A switch in accordance with claim **12**, wherein said actuator member is substantially L-shaped.