

July 19, 1966

B. E. SCHLESINGER, JR
 RECIPROCATABLE LEAF-TYPE SWITCH WITH ROTATABLE AND COMPRESSIBLE
 LEAF SPRING CONTACTS

3,261,928

Filed Oct. 4, 1965

3 Sheets-Sheet 1

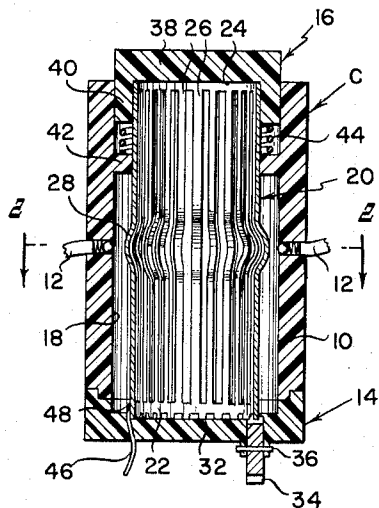


Fig. 1

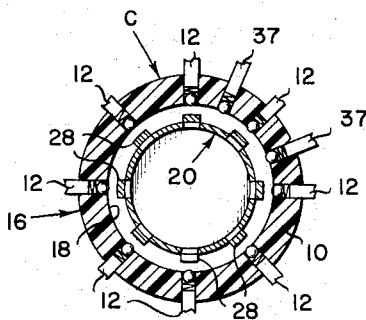


Fig. 2

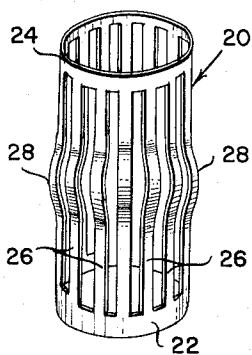


Fig. 3

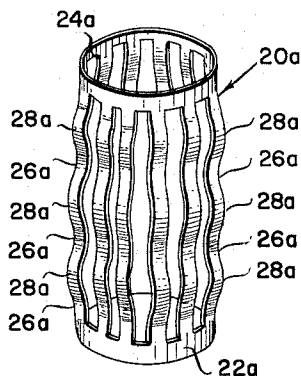


Fig. 4

Fig. 5

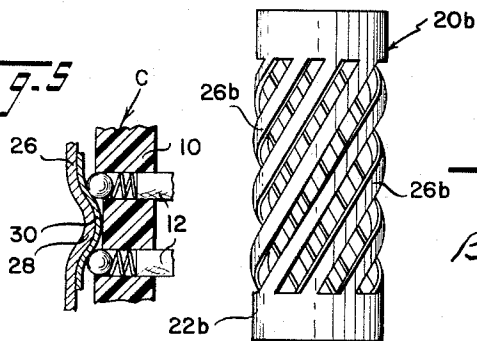


Fig. 6

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3 Sheets-Sheet 2

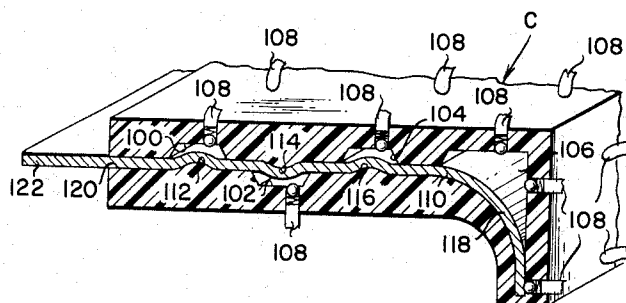


Fig. 9

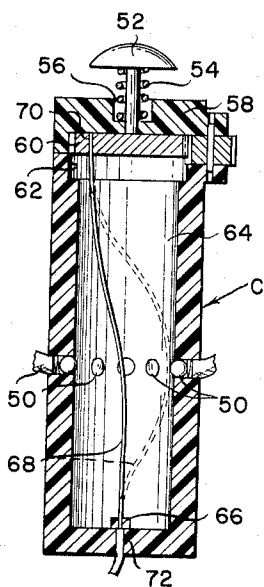


Fig. 1

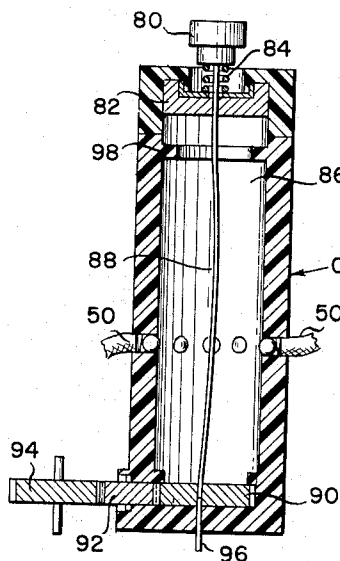


Fig. 2

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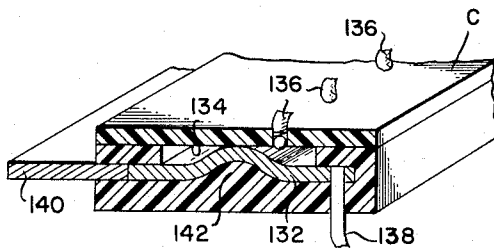
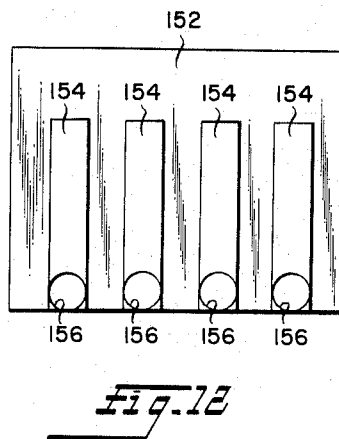
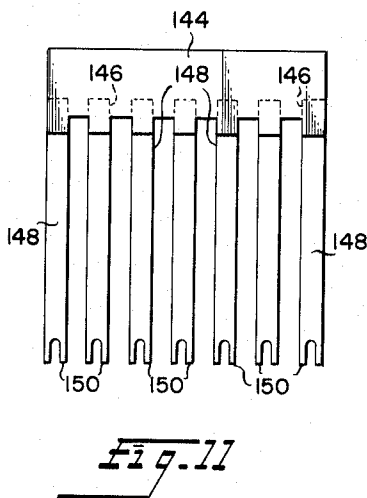
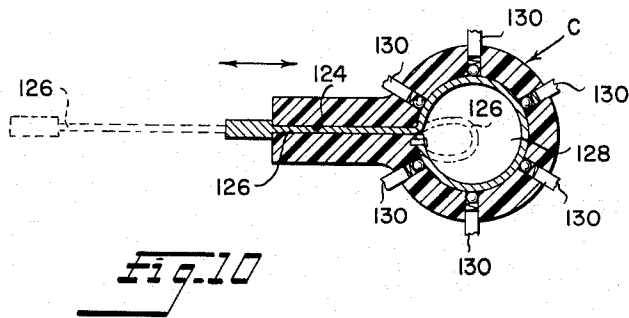
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RECIPROCATABLE LEAF-TYPE SWITCH WITH ROTATABLE AND COMPRESSIBLE
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3 Sheets-Sheet 3



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3,261,928 RECIPROCABLE LEAF-TYPE SWITCH WITH ROTATABLE AND COMPRESSIBLE LEAF SPRING CONTACTS

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19 Claims. (Cl. 200—8)

This invention pertains to reciprocable type switches and more particularly to switches having a flat leaf spring contact member. This invention further relates to multiple as well as individual contact type switches.

In general, leaf type switches operate by means of a pressure being applied transverse to the axis of the leaf so as to deflect one leaf against another to complete an electrical circuit. Flynt 2,320,774 is an early development showing pressure applied directly to a bow in a spring member. In this particular development, the spring is flattened in order to make contact. In Gardineer, 3,196,219 the corrugated spring is stretched in order to break contact.

General summary

This invention contemplates the use of a flat contact member which has one end free and the other end movable. When the spring contact member is compressed endwise, it bows against a contact surface to make an electrical circuit operable. Similarly, if a flat leaf spring with a bow therein is flattened so as to eliminate the bow, pressure initially against a contact surface is withdrawn so as to open an electrical circuit.

Objects

It is an object of this invention to provide a switch of the leaf type, which is simple and inexpensive to manufacture.

Another object of this invention is to provide a multiple contact switch which may be used in programming operations.

A further object of this invention is to provide a reciprocable switch with a plurality of contact members operating on a series of contacts which can be controlled by a single plunger.

Still another object of this invention is to provide a contact switch which is compact and reliable.

Still a further object of this invention is to provide a multiple contact switch which will not bind or jam during operation; a further object of this invention is to provide a contact switch which is adaptable to many types of switching systems.

These and other objects of this invention will be apparent from the following description and claims.

In the accompanying drawings which illustrate by way of example various embodiments of this invention:

FIGURE 1 is a cross sectional view of a sleeve type switch utilizing the teachings of this invention.

FIGURE 2 is a cross sectional view along the lines 2—2 of FIGURE 1 and viewed in the direction of the arrows;

FIGURES 3, 4 and 5 illustrate three types of sleeves adaptable for use with this invention;

FIGURE 6 is an enlarged fragmentary side elevational view showing a printed circuit on the leaf and in the direction of the contacts.

FIGURES 7 and 8 are side elevational views showing further embodiments of this invention including rotary features;

FIGURE 9 is a perspective view of yet another embodiment of this invention;

FIGURE 10 is a cross sectional view of still another embodiment of this invention with the conductor shown

in a first position by solid line and in a second position by dotted lines.

FIGURES 11 and 12 are plan views showing two different modifications of the conductors per se as would be utilized in the device illustrated for example in FIGURE 10.

FIGURE 13 is a fragmentary perspective view showing yet another modification of this invention.

FIGURES 1 through 6

In FIGURE 1, a casing C is provided generally of non-conductive material such as plastic or the like. The casing C as illustrated in FIGURE 2 has a cylindrical shape but may for reasons which will be obvious upon further reading, have other configurations such as elliptical, rectangular, etc.

Within the sidewalls 10 of the casing C are a series of contacts 12 which are annularly spaced as illustrated in FIGURE 2. The contacts 12 are shown as being set in the same plane but they may be spaced vertically one from the other as desired. The contacts 12 may be of any standard type contact and may be spring loaded balls as illustrated or solid bar members embedded in the wall 10.

The base 14 and the top 16 of the casing form together with the sidewalls 10 a chamber 18 in which is positioned a spring contact member 20. The spring contact member 20 as illustrated in FIGURE 3 for example includes a bottom rim 22 and an upper rim 24. Extending between the rims 22 and 24 in circular fashion are a series of contact slats 26 having slightly bowed portions 28. The contact sleeve 20 may be formed from a tube or from a flat piece of stock which is welded into a tubular shape. The sleeve 20 may be nonconductive and coated in specific areas with conductive material or the rims 22 and 24 may be non-conductive with the slats 26 conductive as desired.

FIGURE 4 illustrates a slightly different type of sleeve 20a having a lower rim 22a and an upper rim 24a and slats 26a each having a series of slightly bowed sections 28a.

FIGURE 5 shows another sleeve 20b having rims 22b and 24b and connecting slats 26b. The slats 26b are spirally positioned as illustrated in FIGURE 5.

FIGURE 6 shows the wall 10 of the casing C having contacts 12 and illustrating how a slat 26 with a conductive coating 30 in the area of the bow 28 would close the circuit between the conductors 12.

Referring back to FIGURE 1, the base portion of the sleeve 20 may be provided with an annular rim 32 having cogs or gear teeth projecting from the bottom thereof. The sleeve would rest upon a pinion 34 which is set in the base 14 so that one side of the gear 34 engages the teeth 32 and the other side is in contact with a driving mechanism not shown. It will be obvious that rotating the pinion 34 about its shaft 36, the sleeve 20 will be rotated within the chamber 18. This is done for positioning the slats as desired to give different switching combinations as for example for permitting the connection of contacts 37 illustrated in FIGURE 2.

The top 16 of the casing C is shown as comprising a reciprocating plunger or button 38 having skirt portions 40 which reciprocate within the chamber 18. An annular stop member 42 is provided for limiting the travel of the push button 38. Spring means 44 may be provided if the spring action of the sleeve 20 is not sufficient to return the sleeve to normal position upon pushing of the plunger or button 38.

Operation of the device illustrated in FIGURES 1 through 6

It will now be seen that upon depression of plunger 38, the sleeve 20 will be collapsed causing the slats 26 to

increasingly bow outwardly in the direction of the slight bows 28 and into contact engagement with the wall contacts 12.

The construction in FIGURE 4 allows for additional contact arrangements as will be obvious since the contact bow areas 28 each provide a contact surface when they engage with the wall 18 of the casing C.

In FIGURE 5, the slight bow is automatically set into the slot 26b due to the spiral effect. As pressure is exerted on the sleeve 20b, the slats expand outwardly into contact engagement as heretofore described.

It is obvious that the sleeve 20 as illustrated in FIGURE 1 may be electrically connected to a lead 46 by means of a wiping contactor 48 engaging the bottom rim 32.

It will be obvious that without some slight outward bow 28 in the slats 26 of the sleeve 20, inward deflection of the slats may occur thereby preventing proper operation of the switch.

FIGURES 7 and 8

FIGURE 7 shows a casing C having contacts 50 in the wall thereof. A plunger 52 is spring biased by means of a spring 54 resting in a recess 56 in the cover 58 of the casing C. The plunger 52 is secured to a piston 60 which travels in an annular groove 62 in the chamber 64 of the casing C. In the bottom of the casing C is a bearing 66 which supports a spring contact member 68. The spring contact member 68 is journaled as at 70 in the piston 60. The journal 70 is offset from the central axis of the piston 60. It is to be noted that the spring contact 68 has a slight bow due to the offset of the bearing 66 from the journal 70. Connected to the spring contact member 68 is an electrical lead 72. The plunger 60 may be provided with gear teeth which engage a pinion 74 mounted on a shaft 76 in the casing C. The pinion 74 may be driven by a gear not shown. It will now be obvious that by rotation of the plunger 60 in the housing or casing C, the spring contact 68 will be positioned selectively for actuation against various contacts 50 as desired.

FIGURE 8 shows the casing C with a plunger 80 connected to a piston 82. A spring 84 maintains pressure against the plunger 80. Within the chamber 86 is a spring contact rod or the like 88 which is bowed slightly as illustrated in FIGURE 8. The rod 88 is connected to the piston 82 at the top and to a rotating gear 90 which rests in the base of the casing C. A pinion 92 meshes with the gear 90. A driving gear 94 drives the pinion and in turn drives the gear 90 to which the rod contact member 88 is journaled. A conductor 96 makes contact with the rod 88.

Stop members 98 are provided to limit the travel of the piston 82 in the chamber 86.

Operation of FIGURES 7 and 8

It will now be obvious that by depression of the plungers illustrated in FIGURES 7 and 8, the rod shaped contact members 68 and 88 will deflect outwardly in the direction of the bow to make contact with their respective contact members 50 in the casing C. The amount of deflection of the rods 68 and 88 will determine the number of contacts vertically which can be interconnected when the rods 68 and 88 contact the sidewalls of the casing C. Rotation of the rod members through the gearing arrangements illustrated in FIGURES 7 and 8 will permit changing of the circuitry as desired.

FIGURES 9 through 13

In FIGURE 9, a casing C is provided with a series of recesses 100, 102, 104 and 106 in which there are contacts 108. The recesses or chambers 100 through 106 may be discontinuous in the casing C or continuous through the width of the casing C. In other words, a number of similar chambers can be provided with a wall-like partition therebetween as desired.

Extending into the casing C is a contact member 110 which is flat and nonconfigured. Opposite the area of

the chambers 100 through 106, the casing C has curved surfaces such as 112, 114, 116 and 118. These surfaces tend to deflect slightly the contact member 110 in the direction of the contacts 108 in the block or casing C. It will be obvious that when the spring contact member 110 is pushed inwardly into the passageway 120 by means of a plunger operator 122, the spring-like nature of the contact member 110 will cause deflection into the recesses 100 to 106 thereby making contact with the contacts 108 to operate circuits as desired.

In FIGURE 10, the casing C is provided with a passageway 124 in which a spring contact member 126 enters and loops about a central chamber 128. Contacts 130 in the wall of the casing or housing C are shown in engagement with the spring contact member 126. In FIGURES 9 and 10 the ends of the spring contact members 110 and 126 respectively are fixed to the casing C so as to prevent the ends from moving linearly or in an axial direction. When in FIGURE 10 the spring contact member 26 is moved outwardly from the passageway 124, it moves away from the wall of the chamber 128 and out of contact engagement with the contacts 130. The dotted line position shows the actual position after a withdrawal of the contact spring member 126.

FIGURE 13 illustrates a simple casing C having a flexible spring-like conductor 132 mounted in a chamber 134 for engagement with a series of contacts 136. The leaf spring member 132 is electrically connected as at 138. When the plunger 140 is moved inwardly, the raised portion 142 of the casing C causes deflection of the normally flat spring member 132 upwardly and into contact engagement with the conductors 136.

FIGURES 11 and 12 show two types of spring contact members which may be utilized. FIGURE 11 shows a bar member 144 which may be nonconductive and which has recesses or holes therein 146 for receipt of the bases of the slats or spring leaf members 148. The normally stationary ends of the slats 148 contain U-shaped slots 150 which are used to engage set screws or the like (not shown) for positioning the spring contact members positively within the casing C. FIGURE 12 merely shows a flat strip 152 having printed circuits 154 thereon. The member 152 is provided with holes 156 for receipt of said screws (not shown) to position the contact member 152 within the casing or housing C.

It will be obvious that in general, one end of the contact members will be axially movable whereas the other end will be stationary in order to obtain deflexing action desired.

General operation of FIGURES 9 through 13

It will now be obvious that either a push or a pull action may be employed against the spring contact members 110, 126, 144, 152 and 132 as desired in order to make or break a series of circuits. It will also be obvious that whole batteries of switches such as illustrated in FIGURES 1 through 6; 7 through 8; or 9 through 13 may be provided for obtaining many types of switching operations.

While the invention has been described in connection with different embodiments thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as may be applied to the essential features hereinbefore set forth and fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention what I claim is:

1. A reciprocable type switch comprising

(a) a housing,

(b) said housing including a plurality of chambers in connected series having at least one electrical contact member mounted in the wall of each chamber,

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- (c) a flexible spring contact member extending through each chamber in said series and having one end relatively stationary and the other end movable in a longitudinal direction only with respect to said relatively stationary end,
- (d) said flexible spring contact member being substantially flat throughout its operating length,
- (e) said flexible spring contact member when positioned in said housing having a contact bow in each series chamber in the direction of the electrical contact member in each series chamber, and
- (f) an operator engaging the movable end of said spring contact member whereby when the movable end of such spring contact member is moved by said operator, the contact bows of said spring contact member expand or contract until said spring contact member engages or disengages said electrical contact members thereby to operate electrical circuits.
- 2. A reciprocable type switch comprising
 - (a) a housing,
 - (b) said housing including a plurality of nonconnected parallel chambers each having at least one electrical contact member in each chamber,
 - (c) a flexible spring contact member for each parallel chamber extending through each parallel chamber and having one end relatively stationary and the other end movable in a longitudinal direction only with respect to said relatively stationary end,
 - (d) said flexible spring contact members being substantially flat throughout their operating lengths,
 - (e) said flexible spring contact members when positioned in said housing having a contact bow in each parallel chamber in the direction of the electrical contact member in each parallel chamber, and
 - (f) an operator engaging the movable end of said spring contact members whereby when the movable end of said spring contact members are moved by said operator, the contact bows of each of said spring contact members expand or contract until said spring contact members engage or disengage said electrical contact members thereby to operate electrical circuits.
- 3. A reciprocable type switch as in claim 1 and wherein:
 - (a) said housing includes a plurality of non-connected parallel chambers each having at least one electrical contact member in each chamber, and including
 - (b) a separate spring contact member for each parallel chamber and including
 - (c) a contact bow in each parallel chamber.
- 4. A reciprocable type switch comprising:
 - (a) a tubular shaped housing,
 - (b) said housing including bottom wall and side walls,
 - (c) stationary electrical contact members in said side walls,
 - (d) a contact sleeve mounted centrally within said housing,
 - (e) said sleeve including a plurality of individual slats of equal height extending between the top and bottom of said sleeve,
 - (f) the bottom of said sleeve being mounted on the bottom wall of said housing,
 - (g) an operator connected to the top of said sleeve,
 - (h) said sleeve being linearly compressible,
 - (i) said slats being flat contact bars each having at least one contact bow projecting outwardly and normally spaced from said electrical contact members, whereby
 - (j) when said operator is pushed, said sleeve is compressed causing said slats to bow outwardly until said slats engage said electrical contact members thereby operating selected electrical circuits.
- 5. A reciprocable type switch as in claim 4 and wherein:
 - (a) said slats are electrically disconnected.

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- 6. A reciprocable type switch as in claim 4 and wherein:
 - (a) said slats are electrically connected.
- 7. A reciprocable type switch as in claim 4 and wherein:
 - (a) said slats each include a plurality of spaced convex bows, and
 - (b) said electrical contact members are spaced to cooperate each with one of said bows when said operator is pushed.
- 8. A reciprocable type switch as in claim 4 and wherein:
 - (a) said sleeve is non-conductive, and
 - (b) said sleeve is coated with conductive material in the area of said slats.
- 9. A reciprocable type switch as in claim 4 and wherein:
 - (a) said slats are helically shaped.
- 10. A reciprocable type switch as in claim 4 and wherein:
 - (a) said slats are axially aligned with said sleeve axis in circular fashion about said sleeve axis.
- 11. A reciprocable type switch as in claim 4 and wherein:
 - (a) at least some of said slats each contain a plurality of contact bows.
- 12. A reciprocable type switch as in claim 4 and wherein:
 - (a) said sleeve is rotatable in said housing.
- 13. A reciprocable type switch comprising:
 - (a) a cylindrical housing forming a chamber,
 - (b) said chamber including top, bottom and side walls,
 - (c) electrical contact members in said side walls,
 - (d) a rod like flexible spring contact member spaced from said chamber side walls,
 - (e) said rod shaped spring contact member extending vertically from the bottom to the top wall in said chamber,
 - (f) said contact member having a contact bow in that portion of said contact member lying within said chamber,
 - (g) said top wall of said chamber including a plunger for said rod like member reciprocable in said housing whereby,
 - (h) when said rod like spring contact member is actuated by said plunger, said contact bow expands until said contact member engages with said electrical contact member thereby opening or closing a selected circuit.
- 14. A reciprocable type switch as in claim 13 and wherein:
 - (a) said rod shaped member is rotatively supported in said housing, and including
 - (b) means for rotating said rod shaped member.
- 15. A reciprocable type switch as in claim 14 and wherein:
 - (a) said one end of said rod shaped member is offset axially within said chamber from said other end of said rod shaped member.
- 16. A reciprocable type switch comprising
 - (a) a housing,
 - (b) said housing including a chamber,
 - (c) an electrical contact member mounted in the wall of said chamber,
 - (d) a flexible spring contact member within said chamber and having one end relatively stationary and the other end movable in a longitudinal direction only with respect to said relatively stationary end,
 - (e) said flexible spring contact member being substantially flat throughout its operating length and having portions thereof non-conductive,
 - (f) said flexible spring contact member when positioned in said housing having a contact bow in the direction of said electrical contact in the portion of

said spring contact member lying within the confines of said chamber,

- (g) an operator engaging the movable end of said spring contact member whereby when the movable end of said spring contact member is moved by said operator, the contact bow of said spring contact member expands or contracts until such spring contact member engages or disengages said electrical contact member thereby to operate an electrical circuit.
17. A reciprocable type switch comprising
- (a) a housing,
 - (b) said housing including a single chamber,
 - (c) a plurality of electrical contact members mounted in the wall of said chamber,
 - (d) a plurality of flexible spring contact members in spaced, side by side relation in said chamber and each of said flexible contact members cooperating with at least one of said electrical contact members,
 - (e) said flexible spring contact members having one end relatively stationary and the other end movable in a longitudinal direction only with respect to said relatively stationary end,
 - (f) said flexible spring contact members being substantially flat throughout their operating length,
 - (g) said flexible spring contact members when positioned in said housing each having a contact bow in the direction of its respective electrical contact and in the portions of the spring contact members lying within the confines of said chamber, and
 - (h) an operator engaging the movable ends of said spring contact members whereby when the movable ends of said spring contact members are moved by said operator, the contact bows of said spring contact members expand or contract until said spring contact members engage or disengage said electrical contact members thereby to operate electrical circuits.

18. A reciprocable type switch as in claim 17 and wherein:

- (a) said electrical spring contact members are mounted in side by side relation in a support bar.

19. A reciprocable type switch comprising

- (a) a housing,
- (b) said housing including a chamber,
- (c) an electrical contact member mounted in the wall of said chamber,
- (d) a flexible spring contact member within said chamber having one end relatively stationary and the other end movable in a longitudinal direction only with respect to said relatively stationary end,
- (e) said flexible spring contact member being of non-conductive material and substantially flat throughout its operating length and having a printed circuit thereon,
- (f) said flexible spring contact member when positioned in said housing having a contact bow in the direction of said electrical contact in the portion of said spring contact member lying within the confines of said chamber, and
- (g) an operator engaging the movable end of said spring contact member whereby when the movable end of said spring contact member is moved by said operator, the contact bow of said spring contact member expands or contracts until said spring contact member engages or disengages said electrical contact member thereby to operate an electrical circuit.

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