

- [54] **ALTERNATE MAKE AND BREAK TYPE OPERATING MEANS FOR PUSHBUTTON SWITCH ASSEMBLIES**
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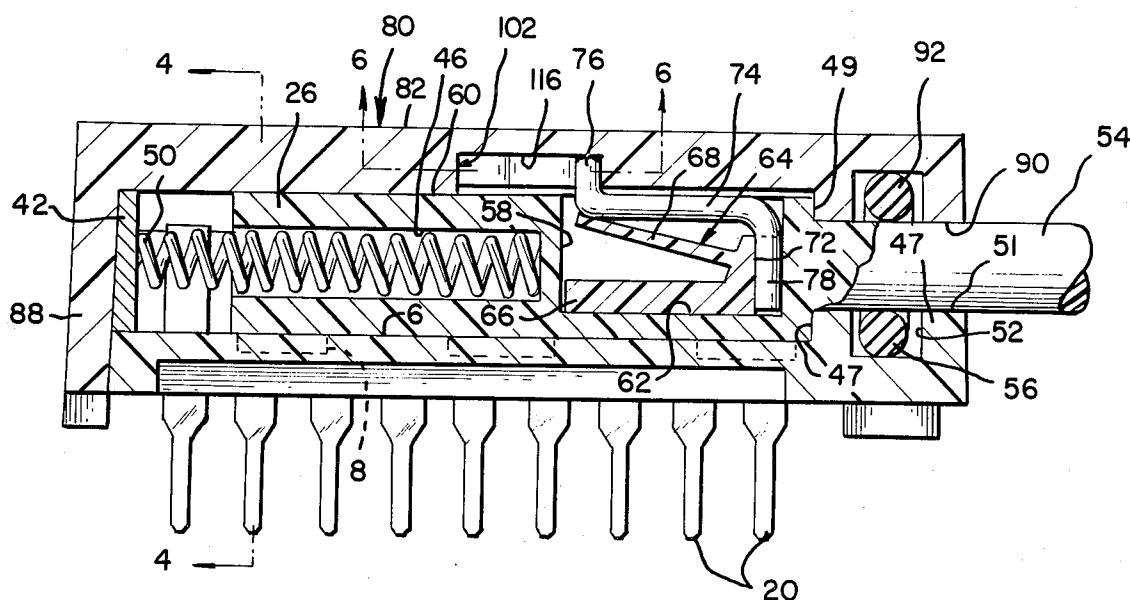
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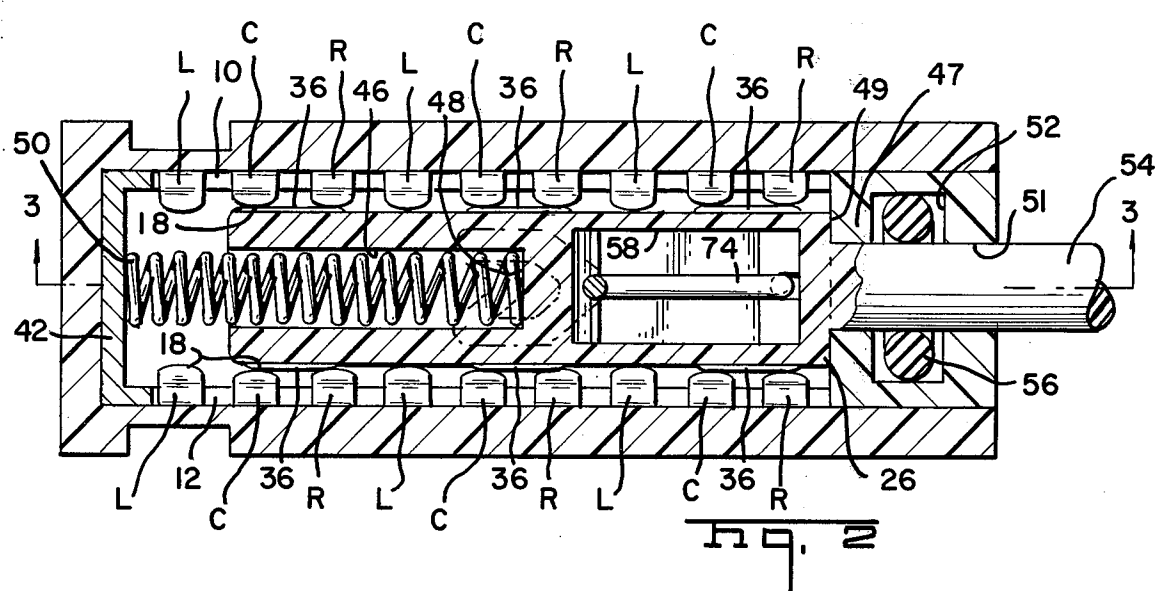
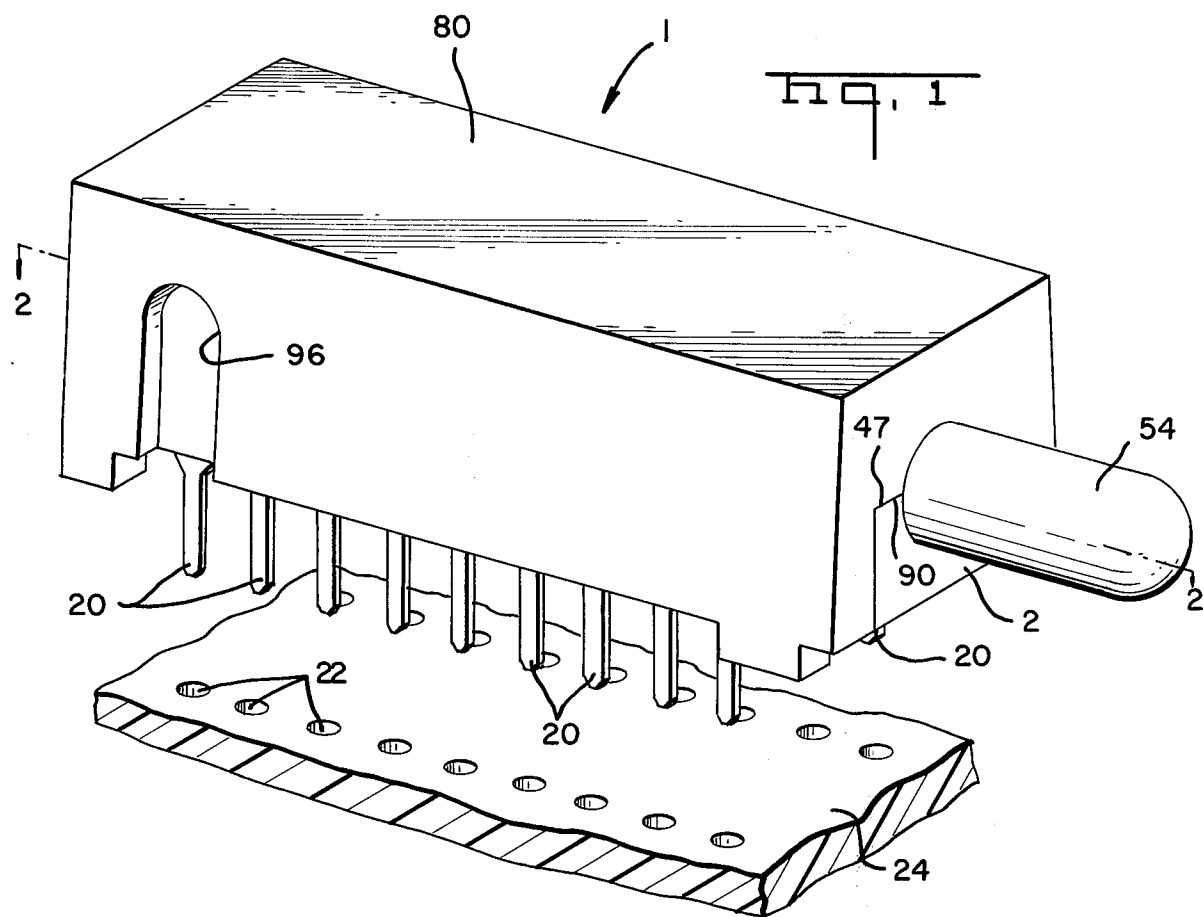
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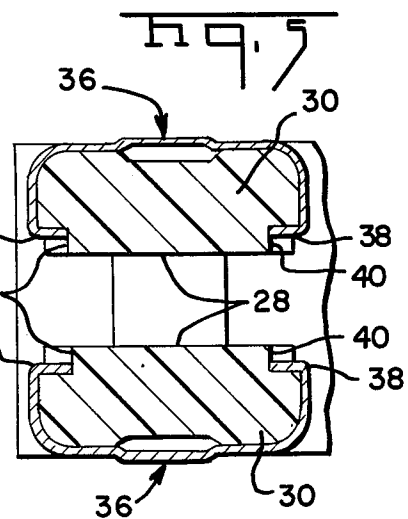
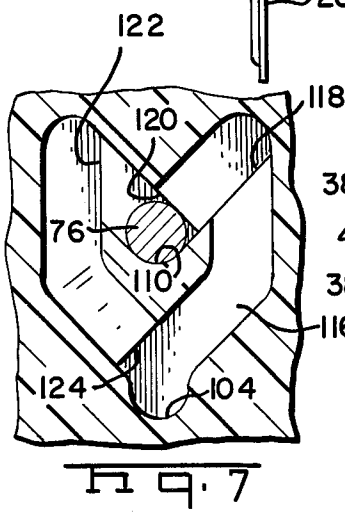
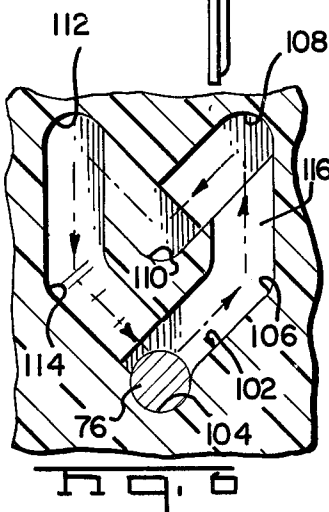
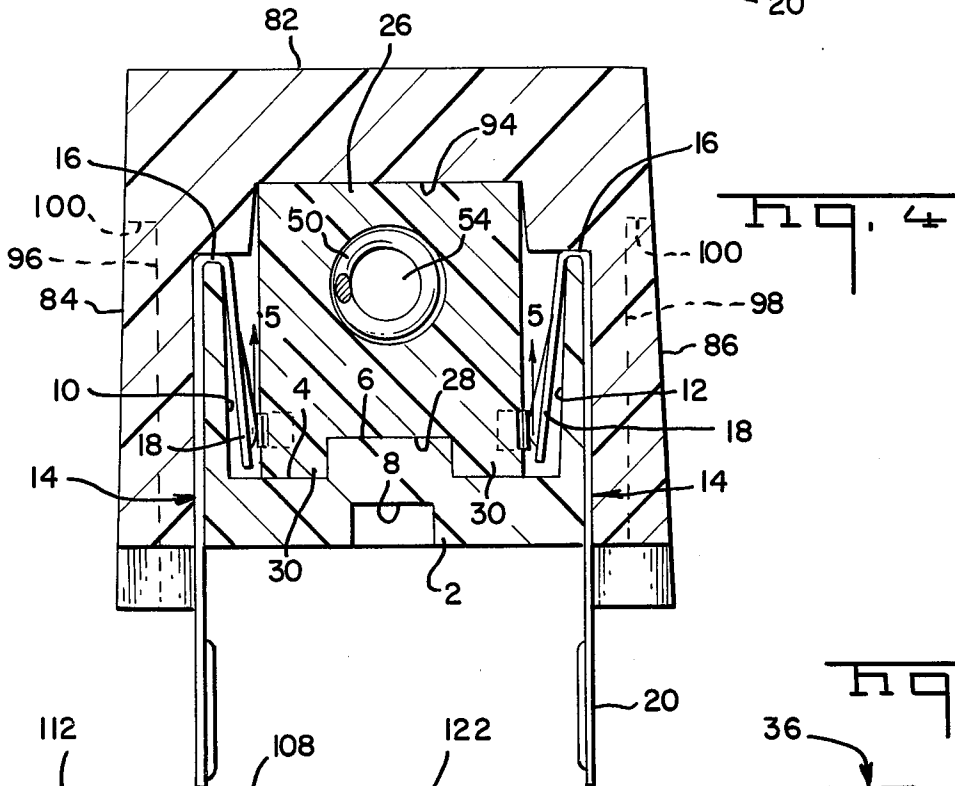
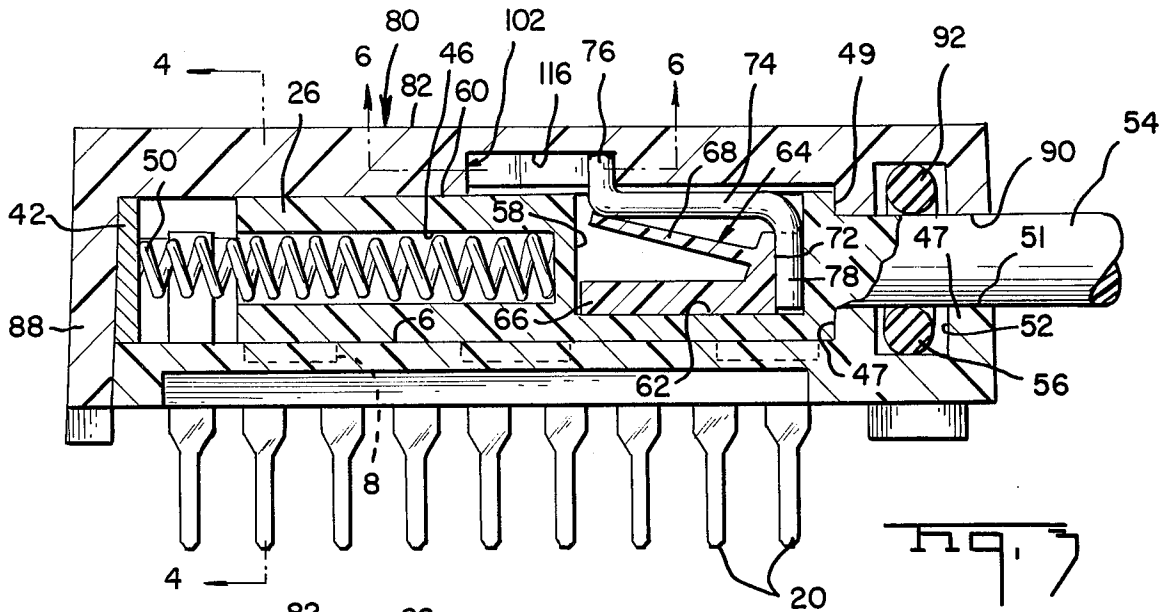
[57] **ABSTRACT**

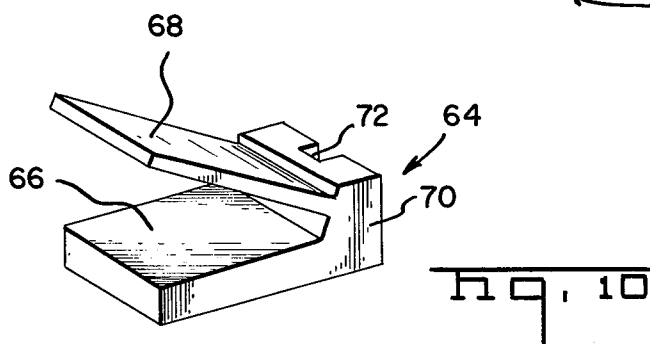
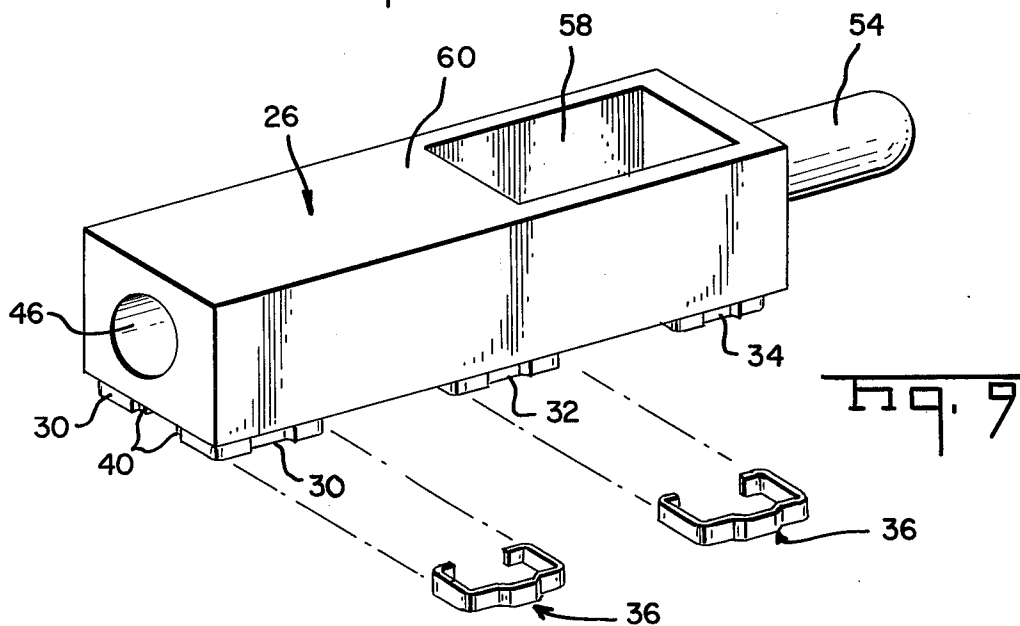
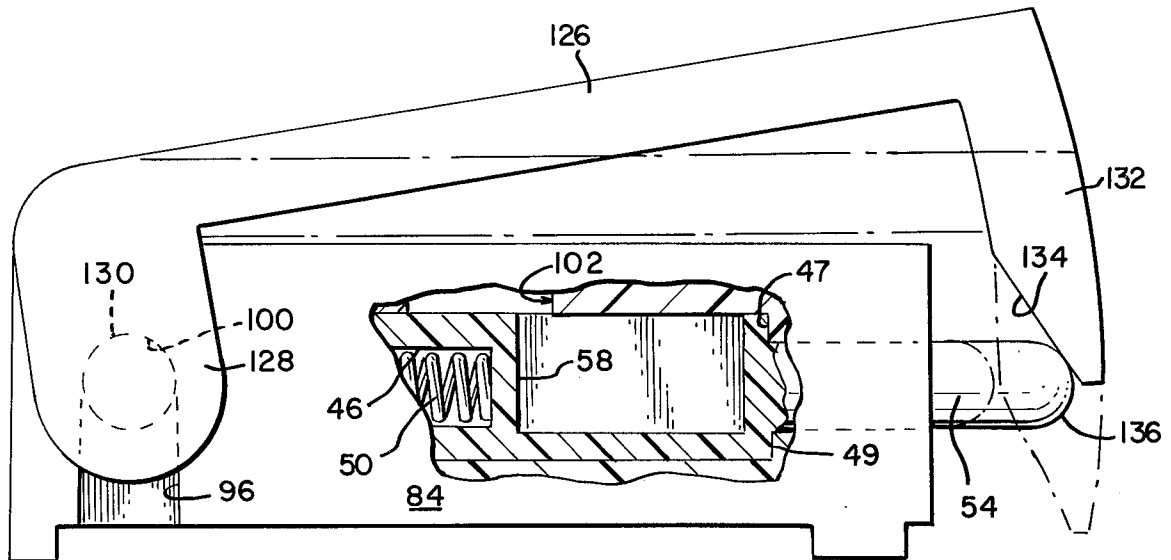
A bi-stable switch having a plurality of spaced electrical terminals depending from the housing of the switch and adapted for plugging into a printed circuit board. The switch includes a carriage which is traversable within the housing to either of two stable throw positions. Electrical contacts mounted on the carriage bridge across selected terminals to complete an electrical circuit path between the selected terminals when the carriage is positioned in either of its two stable positions. A resilient spring in compression between the carriage and the housing seats the carriage against one end of the housing thereby retaining the carriage in its first stable position. An extension on the carriage protrudes through the one end of the carriage and is adapted for retraction in telescoping relationship within the housing. Upon such retraction the switch is traversed within the housing to its second stable position resiliently collapsing the spring. The carriage is maintained in its second stable position, either by a lever arm which is pivoted to overlie the end of the extension and retain it in telescoped position, or by a projection on the carriage which is received removably in a detent provided on the housing.

4 Claims, 10 Drawing Figures









ALTERNATE MAKE AND BREAK TYPE OPERATING MEANS FOR PUSHBUTTON SWITCH ASSEMBLIES

The present invention relates generally to a bi-stable double throw switch wherein the electrical poles of the switch are spaced along longitudinal sides of the switch giving the switch a dual-in-line package (DIP) configuration. The switch thereby is of miniature size permitting it to be plugged into a printed circuit board together with LSI and other MOS components of DIP configurations. The switch according to the present invention is of the double-throw type using a displaceable carriage to provide the double-throw switching functions. The carriage is slidably mounted in a housing and is traversable to each of its two throw positions in order that electrical contacts mounted on the carriage bridge across selected poles of the switch. The switch is stable in one throw position by using a resilient coil spring which seats the carriage against one end of the housing. The switch includes an extension in the form of a plunger. Upon depression of the plunger, causing it to retract in telescoping fashion within the housing, the carriage will be slidably traversed within the housing to its second throw position causing resilient collapse of the coil spring.

In one embodiment of the present invention, a lever arm, pivotally mounted externally in the housing, is forcibly depressed on the end of the plunger to retract the same into the housing and to retain it in its retracted position, thereby stabilizing the carriage in its second throw position. In another embodiment of the present invention, a projection is provided on the carriage which is forced to traverse along a grooved path provided on the housing. The grooved path is provided with a detent portion into which the projection becomes seated to stabilize the carriage in its second throw position. The lever arm of the first embodiment can thereby be omitted in the second embodiment. Upon removal of the lever arm from the end of the plunger, or upon unseating of the projection from the detent, the carriage will automatically be traversed within the housing to its first throw position upon resilient expansion of the coil spring.

In the first preferred embodiment the present invention includes a pair of inverted recesses on opposite sides of the housing into which the pivotal connections of the lever arm are captured. In the second preferred embodiment, the inverted recesses provide inverted shoulders on opposite sides of the housing to admit tweezers or other tooling which may be utilized to aid in plugging or unplugging the switch.

Also in the second preferred embodiment the detent may be in the form of two bights provided in a closed loop passageway in which the projection of the carriage is forced to traverse as the carriage is traversed back and forth between its two stable throw positions. The coil spring resiliently urges the carriage projection to seat in registration within one of the bight or detent portions when the switch is in its one stable throw position. When the carriage is displaced to its second throw position, the detent is forced to unseat and traverse along the closed loop passageway to the second detent portion, whereupon the coil spring again resiliently urges the projection to seat in registration within the second detent portion. Again the carriage may be slidably displaced in compression against the coil spring to unseat the projection thereof from registration in the

second detent portion and to forcibly traverse the projection along the passageway to the second bight portion.

Accordingly, it is an object of the present invention to provide a double-throw switch which is bi-stable in its two throw position.

Another object of the present invention is to provide a slide switch having a plurality of switch poles in the form of spaced electrical terminals depending from the switch in two parallel rows to provide a dual-in-line package.

Another object of the present invention is to provide a slide switch having a plurality of electrical poles, with a carriage displaceable within the switch to either of two stable throw positions in order to bridge electrical contacts carried by the carriage across selected switch poles.

Another object of the present invention is to provide a DIP configuration switch wherein the switch poles provide two parallel rows of spaced electrical terminals or leads, and wherein the opposite external surfaces of the switch are provided with recesses therein to receive the prongs of a tweezer type tool.

Another object of the present invention is to provide a slide switch having, two rows of spaced electrical terminals depending to form electrical leads for plugging into a printed circuit board, a carriage slidably displaceable internally of the switch in order to electrically switch a plurality of electrical contacts carried on the carriage between selected terminals, a coil spring for resiliently urging the carriage into seating registration against one end of the switch, a plunger extending from the carriage through the switch housing, such that depression of the plunger slidably displaces the carriage in compression on the coil spring, and a structural means for retaining the carriage in its second position in compression on the coil spring, wherein such means includes either a lever arm pivoted to overlie the end of the plunger and retain it in telescoped retracted relationship within the switch housing, or wherein such means includes a projection on the carriage slidably traversable along a passageway in the switch housing for registration within a detent portion of the passageway when the carriage is in its second position.

Other objects and many attendant advantages of the present invention will become apparent upon perusal of the following detailed description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is an enlarged perspective of a switch according to the present invention illustrated together with a fragmentary portion of a printed circuit board to receive the electrical terminals of the switch which also advantageously provide electrical poles for the switch,

FIG. 2 is an enlarged section taken along line 2—2 of FIG. 1, further illustrating the interior details of a preferred embodiment of the switch;

FIG. 3 is an enlarged section taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged section taken along line 4—4 of FIG. 3;

FIG. 5 is a fragmentary enlarged section taken along the line 5—5 of FIG. 4;

FIG. 6 is an enlarged fragmentary section taken along the line 6—6 of FIG. 3 and illustrating one mode of operation of the switch in a first stable throw position;

FIG. 7 is an enlarged fragmentary section similar to that of FIG. 6 and illustrating another mode of opera-

tion with the switch in its second stable throw position;

FIG. 8 is an enlarged elevation of another preferred embodiment of the present invention illustrating a lever arm advantageously pivotally mounted within the two receiving recesses of the housing;

FIG. 9 is an enlarged perspective of a carriage according to the present invention; and

FIG. 10 is an enlarged perspective of a resilient hinge according to the present invention.

With more particular reference to the drawings, there is shown generally at 1 in FIG. 1 a preferred embodiment of a switch according to the present invention. The switch includes a dielectric housing generally of rectangular configuration. The housing includes a base portion 2 which, as shown in FIGS. 2, 3 and 4, is provided with a bottom wall portion 4 having a projecting and generally rectangular ridge or spine 6 extending generally the length of the bottom wall portion 4. To reduce the cross-sectional thickness of the bottom wall portion 4 under the ridge 6, a generally inverted channel 8 is provided to run substantially the length of the bottom wall portion 4. Integral with the bottom wall portion 4 are a pair of sidewalls 10 and 12 providing the base portion 2 with a generally channel-shaped configuration, the cross-section of which is more particularly illustrated in FIG. 4. As more particularly shown in FIGS. 2 and 4, a plurality of elongated electrical terminals of strip metal form, generally shown at 14, are provided in spaced relationship along the sidewalls 10 and 12. More particularly, each elongated terminal 14 is advantageously stamped and formed from metal strip and bent into an inverted U-shape at 16 to overlie the corresponding side 10 or 12. One end portion 18 adjacent to the inverted U-shaped portion 16 protrudes internally of the base portion 2 of the housing 1. The remaining end portions 20 of the terminals 14 project in depending relationship from the bottom wall portion 4 of the housing 2 to provide electrical leads or terminals protruding externally of the housing 1. As more particularly shown in FIGS. 1, 3 and 4, the end portions 20 of the terminals are spaced apart and arranged in two parallel rows of electrical leads or terminals in correspondence with the lead spacings and rows of a standard prior art dual-in-line package (DIP). The depending leads 20 thus are adapted to be plugged into corresponding arranged apertures 22 of a substrate such as a printed circuit board 24 or a dip header (not shown) of any type well known in the prior art.

The switch further includes a generally elongated rectangular carriage 26 having an enlarged rectangular inverted groove 28 received over the rectangular ridge 6 therein, with the surfaces of the groove 28 and the surfaces of the ridge 6 providing sliding bearing surfaces to allow for slidable traverse or displacement of the carriage 26 back and forth within the housing 1 of the switch, with the spine or ridge 6 providing a track to restrict the carriage displacement to rectilinear movement.

As more particularly shown in FIGS. 5 and 9, the carriage 26 is provided with a first opposed pair of feet 30 which receive the ridge 6 therebetween. In addition, similar opposed pairs of feet 32 and 34 are provided on the carriage similar in configuration to the feet 30. The feet are more particularly shown in section in FIG. 5 and are adapted to receive elongated strip form contacts 36 which are bent generally into a C-shape. The ends of the C-shaped contact are bent into tabs 38

received in corresponding recesses 40 provided in each of the feet 30, 32 and 34, with the recesses 40 communicating with the groove 28. Each contact 36 therefore partially encircles a corresponding foot 30, 32 or 34.

As shown more particularly in FIGS. 2 and 4, the carriage when mounted in the housing compresses the strip form contacts 36 in engagement against selected terminal portions 18 of the terminals 14. More particularly, as shown in FIG. 2, certain terminal portions 18 form a center switch pole C, while adjacent terminal portions 18 provide left and right switch poles L and R on either side of the central switch pole C. Although three groups of switch poles L, C, R are illustrated on each sidewall 10 and 8, any number of groups may be provided as desired. With the carriage in its position as shown in FIG. 2, the contacts 36 engage across corresponding poles C and R to provide electrical circuit paths between the poles. It is to be understood that the carriage 26 is displaceable from right to left in the drawing to transfer or throw the corresponding contacts 36 into bridging relationship between corresponding poles C and L to complete electrical circuit paths therebetween. Thus reciprocating the carriage back and forth between two throws completes electrical circuit paths between the corresponding poles C and either of the poles L or R as desired, in accordance with a double-throw switching function.

As more particularly shown in FIGS. 2 and 3, the housing face 2 is provided with a sidewall 42 which projects from the bottom wall 4 and is connected integrally with the sidewalls 10 and 12. A first end 44 of the carriage 26 which opposes the sidewall 42 is provided with an elongated cylindrical recess 46 terminating in a bottom wall 48. A resilient coil spring 50 is received internally of the recess 46. The ends of the spring 50 are engaged against the bottom wall 48 and the sidewall 42 and is maintained in at least partial resilient compression as shown in FIG. 2. The base portion 2 is further provided with a relatively thickened sidewall 44 which projects from the bottom wall 4 and is integral with the sidewalls 10 and 12. The other end 48 of the carriage 26 engages against the sidewall 46 of the base portion 2 and is seated thereagainst by the resilient urging of the slightly compressed coil spring 50. The relatively thickened sidewall 46 has a semi-cylindrical channel 51 extending longitudinally parallel to the sidewalls 10 and 12. In addition, the sidewall 46 is provided with an interior cavity 52 communicating with the channel 51. The carriage 26 has an elongated extension or plunger 54 generally of elongated cylindrical configuration which is slidably received in the channel 51. A sealing ring 56 is provided in compressed encircling relationship around the plunger 54. The ring 56 is also compressibly received internally within the recess 52. Accordingly, the presence of the compressed ring prevents contaminants from leaking through the channel 51 of the housing past the sealing ring 56.

As shown more particularly in FIGS. 2 and 3, the resilient coil spring 50 is in partial compression to resiliently urge the end 48 of the carriage 26 in seating engagement against the end wall 46. The carriage 26 is thereby in a first stable throw position bridging the contacts 36 between corresponding poles C and R.

More particularly, with reference to FIGS. 2, 3, 6 and 7, the carriage is provided with a generally rectangular recess 58 communicating with a top surface 60 of the carriage 26. The rectangular recess has a bottom wall

62 which receives thereon a resilient dielectric hinge generally indicated at 64. The hinge 64 includes a pair of rectangular plates 66 and 68 integral with each other and intersecting at a relatively wide V configuration as shown in FIG. 10. The intersection of the plates 66 and 68 is relatively thickened as shown at 70 which reinforces the intersection. The thickened portion 70 is provided with a vertical recess 72. The hinge 64 is received within the recess 58 of the carriage 26 with the plate 66 thereof against the bottom wall 62.

As shown more particularly in FIGS. 2 and 3, the carriage further includes a section of metal rod 74 which is of circular cross-section. The medial central portion of the length of rod is substantially straight, with the end portions thereof being bent generally at right angles to the straight portion. The length of rod 74 is assembled in overlying relationship over the hinge plate 68, with the end portion 78, which is slightly longer than the projecting end portion 76, being rotatably received within the vertical recess 72 of the hinge 64. The straight medial portion of the length of rod 74 thus extends or overlies the hinge plate 68, with the end portion 76 of the rod projecting generally vertically outward from the medial portion of the length of rod. It is more particularly shown in FIG. 3 that the end portion 76 of the length of wire provides a projection for the carriage 26 which extends or projects vertically outward of the carriage 26 for a purpose to be described.

To complete the assembly of a preferred embodiment of the switch according to the present invention, there is shown an inverted cover 80 having a planar wall portion 82 having integral projecting sides or sidewalls 84 and 86 integral therewith. The wall 82 further includes projecting sides 88 and 90 bridging between the sides 84 and 86. When the cover is inverted and assembled over the base, the walls 84, 86 and 88 respectively overlie the sidewalls 10, 12 and 42, enclosing the sidewalls of the base portion 2 of the housing internally within the inverted cover. As shown in FIG. 4, a substantial length of the terminals 14 are compressed between the sides 84 and 86 of the cover portion of the housing and the sidewalls 10 and 12 of the base portion of the housing. This substantially rigidizes the terminals 14 along their lengths thereof and retains them in compressed and fixed positions along the sidewalls 10 and 12 as desired. If the cover portion and the base portions are molded from a dielectric material which is slightly resilient the two parts will be force-fitted together in assembled relationship. In addition, the sidewalls 10, 12 and 42 may be provided with a relatively small amount of adhesive which further joins the two parts together to provide a seal at their intersections therebetween. The relatively large surfaces of contact between the cover sides 84, 86 and 88 and the corresponding sidewalls 10, 12 and 42 provide a relatively long barrier path along the intersections of the two parts which prevents contaminants from leaking into the housing along the intersections. In addition, the relatively long barrier paths prevent any adhesive applied in small quantities from being extruded or otherwise forced into the housing. Although the adhesives will flow along the intersections when the two parts are assembled together, such flow will distribute itself thinly along the relatively large surface areas of contact between the two parts and will thereby dissipate such flow before leaking into the housing.

Also shown in FIG. 3, the side 90 of the inverted cover is similar in configuration to the sidewall 46 at the end of the base portion. More particularly the side 90 is of relatively thickened configuration and provided with a recess 92 which is inverted and communicates with a recess 52 provided in the side 46. The recess 92 receives at least a portion of the sealing ring 56, with the ring 56 being retained in compression between the shaft 54 and the internal dimensions of the recess 92 to provide a good seal encircling the shaft 54 and sealing the interior of the housing from contaminant flow along the shaft 54.

As more particularly shown in FIG. 4, the inverted cover portion has the wall 82 thereof forming a top enclosing wall for the switch, with an enlarged inverted groove 94 being provided therein to receive the top portion of the carriage 26 therein. The groove 94 is in elongated alignment with the ridge 6 and serves to provide a track to guide the back and forth displacement of the carriage within the housing limiting such displacement to rectilinear displacement. Accordingly, the surfaces of the recess 94 provide sliding bearing surfaces for the top surface 26 of the carriage. As shown the groove 94 has its sides outwardly flared so as not to engage the opposite sides of the carriage 26. This feature reduces the sliding friction experienced between the carriage 26 and the surfaces of the recess 94.

As shown in FIG. 4, the opposite sides 84 and 86 of the cover portion are inclined to provide a tapered configuration for the housing. Often DIP type packages are mounted in relatively closely spaced relationship to one another. The tapered configuration of the housing accordingly allows for some clearance between adjacent packages such that the prongs of a tool such as a pair of tweezers may be inserted between adjacent packages so as to grip on the housing of a switch according to the present invention during either insertion or removal from its mounted position on a printed circuit board. In addition, the opposite sidewalls 84 and 86 are provided with inverted recesses 96 and 98 such that the prongs or the tweezers may be registered therein to provide a better grip on the housing when handling the housing with the tweezers. The recesses 96 and 98 terminate in inverted shoulders 100 against which the prongs or tweezers may register to aid in lifting the housing in order to remove it from a printed circuit board.

As more particularly shown in FIGS. 3, 6 and 7, the enclosing wall 82 of the cover portion is further provided with an inverted continuous groove or passageway which is continuous upon itself to form a groove or passageway of closed loop configuration. More particularly, the passageway 102 is generally of polyhedral configuration forming a first bight portion 104 at a generally convex intersection of the polyhedron. A second bight portion 106 is provided at another convex intersection of the polyhedron passageway. A third bight portion 108 is provided at another convex intersection of the polyhedron passageway. A fourth bight portion 110 is provided at another convex intersection of the bight configuration. Another bight portion 112 is provided at another convex intersection of the polyhedron configuration passageway. And another bight 114 is provided at another convex intersection of the polyhedron bight configuration. The bottom surface or bottom wall 116 of the passageway is provided with a series of inclined ramps. More particularly, the bight por-

tion 104 is relatively deeply recessed. The bottom surface 116 forms an inclined ramp from the bight portion 104 continuously to the bight portion 108, where the ramp terminates in a generally vertical shoulder 118. The bottom surface 116 is relatively deeply recessed at the bight portion 108 adjacent to the shoulder 118 and forms a continuous inclined ramp from the bight portion 108 to the bight portion 110, where it terminates in a vertical shoulder 120. At the bight portion 110 the bottom surface 116 of the passageway is relatively deeply recessed adjacent to the shoulder 120 and forms a continuous inclined ramp from the bight portion 110 to the bight portion 112 where it terminates in a vertical shoulder 122. The bottom surface 116 at the bight portion 112 is relatively deeply recessed and forms a continuous inclined ramp from the bight portion 112 to the bight portion 104, where it terminates in a vertical shoulder 124 immediately adjacent to the relatively deeply recessed bight portion 104. Thus a series of ramps are formed along each side of the polyhedron passageway.

With the carriage 26 in its position shown in FIG. 3, the projection 76 provided on the carriage will register within the bight portion 104. The coil spring 50 resiliently urges the projection 76 to positively seat in registration within the bight portion 104, which also operates to positively stabilize the carriage in its position shown in FIG. 3.

The plunger 54 is designed to be manually engaged and pushed to retract it into the housing.

Upon depression of the plunger 54 telescopically to retract it within the housing, the switch will be forced to traverse from right to left as shown in FIGS. 2 and 3, in opposition to the coil spring. The coil spring will thereby be resiliently compressed to enable displacement of the carriage to a second stable position (not shown) whereby the bridging contacts 36 mounted on the carriage will be compressed against, connected to and bridged across the switch poles L and C as described.

The hinge plates 66 and 68 are partially deflected resilient toward one another when the cover portion 80 is assembled over the base portion, and with the projection 76 being received internally within the groove or passageway 102. The plates 66 and 68 will thereby have stored spring energy in its integral hinge portion which resiliently biases the projection 76 to positively register continuously against the bottom surface 116 of the passageway 102.

As shown in FIG. 6, when the carriage is displaced from right to left as shown in FIG. 3 to its second stable position, the projection 76 will be forced to traverse internally of the passageway 102 along the direction indicated by the arrows. More particularly, the projection 76 will be forcibly traversed over the inclined ramp formed by the bottom surface 116 from the bight portion 102 to the bight portion 108. The hinge 64 will be resiliently compressed to permit the projection to follow along the surface of the ramp. Upon reaching the first vertical shoulder 118, the projection 76 will drop off the shoulder 118 to register within the relatively deeply recessed bight portion 108. The hinge 64 will expand resiliently to urge the projection into the bight portion. Since the bight portion 108 is at a convex intersection which defines the end of traverse of the projection in a direction from right to left as shown in FIG. 3, further depression of the plunger 54 is prevented,

with the projection providing a stop against further depression of the plunger when registering within the bight portion 108. Accordingly, the plunger may be released, thereby allowing the compressed coil spring 50 to expand partially, causing the projection 76 to traverse from the bight portion 108 to the bight portion 110 in the direction of the arrow shown in FIG. 6. The projection 76 will tend to engage against the shoulder 118 which will thereby prevent a positive stop or barrier against displacement of the projection in a reverse direction along the passageway in opposition to the direction of the arrows. Upon reaching the shoulder 120, the projection 76 will fall into the relatively deeply recessed bight portion 110. The resilient hinge 64 will partially open in resilient action to insure registration of the projection 76 into the relatively deeply recessed bight portion 110. As shown in FIG. 7, the bight portion 110 is in a convex intersection of the polyhedron configuration path, defining an end of motion from left to right as shown in FIG. 3, thereby preventing further expansion of the coil spring 50. The carriage thereby will be stabilized in its second throw position (not shown) to bridge the contacts 36 thereof between the switch poles L and C. The partially compressed coil spring 50 will resiliently seat the projection 76 in registration within the bight portion 110.

To return the carriage to its first stable position, the plunger is again manually depressed in telescoping retraction within the housing. The projection 76 will then be forced to traverse along the passageway from the bight portion 110 to the bight portion 112 in the direction of the arrows shown in FIG. 6. upon reaching the vertical shoulder 122, the projection 76 will drop into the relatively deeply recessed bight portion 112, with resilient expansion of the hinge 64 insuring such registration. The projection 76 is prevented from traversing along the passageway in a direction opposite to the arrows since to do so it will engage against the shoulder 120 adjacent to the bight portion 110 which provides a positive stop for displacement of the projection in the reverse direction. The bight portion 112 is at a convex intersection and thereby provides a stop to further retraction of the plunger 54. Thus when then the plunger 54 is manually released, the coil spring 50 will be allowed to resiliently expand and force the projection 76 to traverse along passageway from the bight portion 112 to the bight portion 104, thereby returning the carriage 26 to its first stable position as shown in FIG. 3. The switch may be actuated repeatedly to perform its switching functions, with the carriage being stable in either of its two throw positions. The bight portions 104 and 110 thus provide detents which latch the carriage in either of its two throw positions.

According to another preferred embodiment of the present invention, reference will be made to FIG. 8, wherein the hinge 64 and the rod 74 is omitted from the recess 58 of the carriage 26. As shown in the drawings, the coil spring 50 is utilized to positively seat the end wall 48 of the carriage against the sidewall 48 of the housing to maintain the carriage in its first stable throw position. Also as shown in FIG. 8, the switch further includes an elongated lever arm 126 having depending pivot links, one of which is shown at 128 adapted to be received over opposite sides 84 and 86. Inwardly projecting cylindrical pivots 130 are brought into registration within the inward recess 96 and 98 and registration against the inverted shoulders 100 of the recesses. The

other end of the lever arm 26 is provided with a depending flange portion 132 having an inclined surface 134 adapted for sliding engagement over a generally semi-circle end 136 of plunger 54. Upon pivoting the lever arm 126 clockwise as shown about the pivots 130 thereof, the flange portion 132 will be forcibly traversed over the end 136 of the plunger 54, causing it to retract to its phantom outline position as shown in FIG. 8. The flange 132 will then overlie the end of the plunger 54, retaining it in its retracted position. Upon such retraction of the plunger 54 the carriage 26 will be displaced to its second throw position (not shown) to bridge the contact 36 thereof across the corresponding switch poles L and C. The flange 132 will maintain against the end of the plunger 54 to stabilize the carriage in its second throw position.

Although preferred embodiments and modifications of the present invention have been described in detail, other modifications and embodiments thereof are to be covered by the spirit and scope of the appended claims.

What is claimed is:

1. A bi-stable switch, comprising:

a housing defined by a plurality of enclosing walls, a pair of said walls having spaced grooves therein, a plurality of electrical terminals in said grooves and maintained thereby in spaced relationship in said housing, a carriage displaceable back and forth in said housing, a pair of strip form terminals mounted on said carriage for electrically engaging selected terminals upon displacement of said carriage, an extension portion on said carriage protruding from said housing, said housing having a passageway in one of said enclosing walls arranged in a closed loop path, said carriage having a projection having one end received rotatably in said carriage and another end received in said passageway and forced to traverse along said passageway as said carriage is displaceable back and forth in said housing, said passageway having two spaced detent portions, said projection second end initially in seating engagement in a first detent portion,

a spring in resilient compression between said carriage and said housing and being resiliently compressible and expansible in response to traverse of said carriage back and forth in said housing, said carriage being displaceable in a first direction to traverse said projection second end along said passageway out of seating engagement in said first detent portion,

said carriage subsequently being displaceable in a second direction to traverse said projection second end along said passageway into engagement in a second detent portion of said passageway, and means on said carriage continuously and resiliently urging said projections to project said second end thereof into said passageway.

2. The structure as recited in claim 1, wherein, said passageway includes a bottom surface formed with a series of inclined ramps, with a shoulder defined between each adjacent pair of ramps, said projection second end being forced to traverse along said passageway in one direction as said carriage is displaced back and forth in said housing, said projection second end upon traverse along said passageway in a direction opposite to said one direction being stopped against one of said shoulders, which shoulder provides a barrier blocking the traverse of said projection second end in said direction opposite to said one direction, and

said means comprises a resilient hinge on said carriage continuously and resiliently engaging and biasing said projection to project the second end thereof into receipt within said passageway.

3. The structure as recited in claim 2, wherein, said carriage includes a recess receiving said hinge therein, said hinge having a recess rotatably receiving said projection first end therein.

4. The structure as recited in claim 1, and further including:

a lever pivotally mounted on said housing and having a flange portion pivotable by said lever to engage and overlie an end of said carriage extension portion.

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