

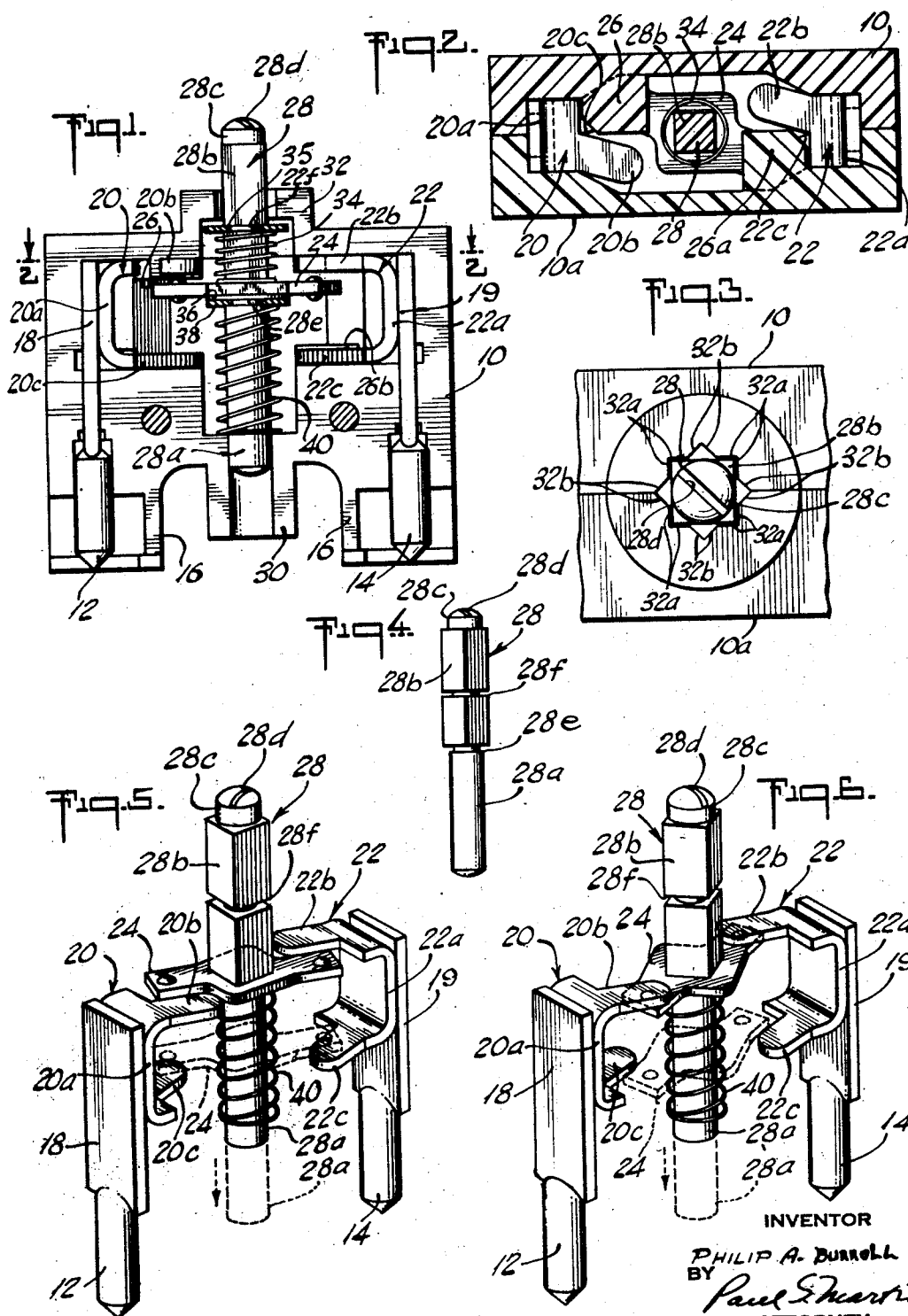
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SELECTIVE SWITCHES

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## SELECTIVE SWITCHES

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The present invention relates to electric switches and more particularly to selective switches operable in different fashions for different switching effects.

An object of the present invention is to provide a novel form of switch which is adjustable for two different forms of operation, such that the switch is operable from a first or normal position to a second or operated position to accomplish one switching result when the switch is in one adjusted configuration; and the same switch structure is adjustable to a different configuration in which it is operable from the first or normal position to the second or operated position to accomplish a different switching result. In another aspect this invention relates to novel switches having a switch operating member movable from a first or normal position to another position to a second or operated position, wherein the circuit-making and circuit-breaking effects resulting from operation of the switch may be readily altered in a new and simple matter.

In the illustrative embodiment of the invention described in detail below, a switch actuator in the form of a slidable support carrying a movable contact member is normally spring biased to a first or normal position, and that contact member is movable to a second or operated position. Evidently the movable contact member could be arranged to engage a fixed contact element at each extremity of its stroke, and multiple movable contact members may be utilized, arranged to move in unison to achieve their respective switching effects. In the illustrative embodiment, a single movable contact member engages a pair of fixed contacts at one end of its stroke and at the other end of its stroke it is arrested without engaging any contact element, in one adjustment or configuration. Keyed guide means is provided between the slidable support and the insulating housing of the switch so that the movable contact member moves in a selected invariable path between the first position and the second operated position. The keyed guide means can be readjusted to establish a different selected invariable path for the movable contact member in which it moves between different points at the limits of its operating stroke. In the illustrative arrangement it is possible to have a transversely extending movable contact member reciprocate with a slide guide from a rest position to a moved position in either of two indexed configurations, differing in each adjustment of the slide guide in respect to the circuits broken or completed. The slide guide may be adjusted so that when at rest the switch is open-circuited and when operated the switch completes a circuit; and with the guide readjusted in a different, indexed configuration, the movable switch arm can be arranged to be normally in condition to complete a circuit, and to break the circuit when operated.

A further object of the present invention is to devise new and useful forms of selectively operable switches which may be readily and reliably converted from one character of operation to another; and in further particular, an object of the invention is to provide a novel form

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of switch of the bridging-contact type which may be selectively adjusted to the normally closed-circuit type or normally open-circuit type and converted from either type to the other without in any way removing switch parts for reassembly to achieve the changed character of operation.

The nature of this invention and its various further features of novelty will be apparent from the following detailed description of an illustrative presently preferred form of switch embodying both the various aspects of the invention. In this description reference is made to the accompanying drawings which form part of this disclosure. In the drawings:

Fig. 1 is a lateral view of the illustrative novel switch, with one-half of the two-part housing removed to reveal the internal switch mechanism;

Fig. 2 is a transverse cross-sectional view along the line 2—2 in Fig. 1;

Fig. 3 is the plan view of a portion of the device in Fig. 1 drawn to larger scale;

Fig. 4 is an elevation of the slide member of the switch in Figs. 1 to 3; and

Figs. 5 and 6 are perspective views of the operative mechanism of the switch of Figs. 1 to 4, omitting the housing and showing the operated position of the movable switch parts in dotted lines.

Referring now to the drawings, a two-part switch housing 10 of molded insulation is shown, the front position 10a of which (Fig. 3) has been removed from Fig. 1 to reveal the internal mechanism. A pair of external terminals 12 and 14 project from the bottom of the switch for plugging into a suitable receptacle or panel for supporting the switch and in which the switch is to function. The plug-in terminals are protected by integral extensions 16 of the enclosure 10 of insulation.

A pair of flat metal bars 18 and 19 extend from terminals 12 and 14 respectively, and U-shaped metal members 20 and 22 are united to these members 18 and 19. Member 20 includes a connecting portion 20a which joins a pair of skew leg portions 20b and 20c. Member 22 similarly includes a connecting central portion 22a and skew leg portions 22b and 22c. Portions 20b and 22b constitute contact elements that are disposed in one plane, the "at-rest" plane or upper, normal contact plane of the switch shown in the drawings, while fixed contact elements 20c and 22c are disposed in the lower or operated contact plane of the switch, parallel to the "at-rest" position and spaced therefrom.

A moving contact in the form of bridging contact member 24 extends across the switch and is mounted for movement from one contact plane to the other. Bridging contact member 24 can move from a first, normal position in which the bridging contact member leaves the switch open-circuited to a second, operated position in which the switch is closed (Fig. 5); or bridging contact member 24 may be arranged to be movable from a first, normal closed-circuit condition when at rest to an open-circuit condition when operated (Fig. 6).

In Figs. 1 and 2 the switch is illustrated as being in its at-rest position, and in that position the movable switch member 24 is arrested by fixed elements 26 and 26a. If it were desired, one or both of these could be fixed contact elements; but in the illustrative switch shown in these figures, elements 26 and 26a are of insulating material formed as integral extensions from the two-part housing or enclosure 10, 10a.

Movable switch member 24 is carried by slide member 28, here formed of insulating material. As seen in Fig. 4 member 28 has a lower cylindrical guide portion 28a, a middle portion 28b that is square in cross-section, and a top cylindrical portion 28c. A slot 28d, suitable for receiving the blade of a screwdriver, is formed in portion

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28c. A groove 28e is formed in slide member 28 where portions 28a and 28b meet, and another groove 28f is formed in portion 28b.

Housing 10, 10a has a cylindrical bearing portion 30 formed to slidably receive portion 28a of member 28, and the upper portion 32 of the insulating housing is formed with keyed guide means for the middle portion 28b of member 28. Portion 32, as seen in Fig. 3, will receive and guide portion 28b in either of two configurations, displaced 45° from each other. Naturally, if additional switching positions were needed, additional configurations would be utilized. Portion 28b of member 28 is of sufficient length so that, when member 28 is shifted for carrying member 24 from the normal position shown in Fig. 1 to the operated position, represented in dotted lines in Figs. 5 and 6, portion 28b will remain in four of the right-angle grooves 32a in the housing; or portion 28b would remain keyed in another set of right-angle grooves 32b, depending upon which orientation of portion 28b has been selected.

A first compression coil spring 34 is confined between a split washer 35 in groove 28f and the top of bridging contact member 24. That contact member has a square hole formed to receive and slide along portion 28b of member 28, but to move with member 28 when the latter is indexed. A washer 36, supported by a split washer 38 in groove 28e, prevents member 24 from moving down along member 28 below the point illustrated. A second compression coil spring 40 is confined between guide portion 30 of the housing and washer 38. The latter spring biases the moving contact member 24 upward into the normal, at-rest, elevated position shown. Clearance is provided between washer 35 and the housing portion 32.

In order to operate the switch, it is only necessary to depress slide member 28 by pushing the externally projecting portion of that member, and bridging contact member 24 is thereby pressed to its lower or operated position. During this operating stroke, spring 34 biases moving contact 24 to move with member 28, but only until the contact member reaches its lower limit of operation. After that point, member 28 may be moved further downward while moving contact member 24 is arrested. During the whole operating stroke, the square cross-sectioned portion 23b of member 28 remains keyed or interlocked with the keying guide portion 32 of the housing.

In order to change the operative condition of the switch from that represented in Fig. 5 to that represented in Fig. 6, it is only necessary to apply a screwdriver to the slot 28b in member 28, and depress member 28 far enough for portion 28b to pass down below housing guide portion 32, with portion 28c remaining within guide portion 32. Thereafter, counterclockwise rotation of the screwdriver (viewed from above) will index member 28, in changing from the configuration in Fig. 5 to that in Fig. 6, after which member 28 may be released to rise again in the other keying grooves 32b. It is apparent that the slide member 28b could be formed with as many corners or ribs as there are grooves 28a and 28b. The dimensions of the housing 10 and of the sliding guide member 28 are preferably related so that the keyed guiding relationship is maintained until portion 28c is pressed into a recessed position, as a safety feature guarding against accidental change of switch configuration.

It has been mentioned that in the upper position of member 24, the contact member engages fixed elements 26 and 26a. A similar pair of elements is provided for engagement by contact member 24 in the lower position of that member, when that member is out of engagement with contact elements 20c and 22c. Element 26b is provided as an integral extension of enclosure part 10, with the contact-engaging surface of element 26b disposed substantially in the same plane as contact elements 20c and 22c. Similarly, another element (not shown) is formed in enclosure 10a for engagement by the opposite

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arm of movable member 24 when member 24 is in its lowermost position and indexed out of contact with fixed contact elements 20c and 22c. In the drawing, portion 26b (Fig. 1) appears somewhat higher than element 22c, but this is only for purposes of illustration. Element 26b, and the corresponding insulating portion of enclosure element 10a against which member 24 is depressed, serves the useful function of enabling member 24 to be indexed from one configuration to another (Fig. 5 to Fig. 6 or conversely) when member 28 is depressed for changing the switch configuration. It is evident, as was previously mentioned in connection with portions 26 and 26a, that portion 26b, and the companion insulating element in housing part 10b might be replaced by fixed metal contacts if switching requirements so dictate.

The construction and operation of the illustrated switch has been sufficiently described so that the details of operation need not here be reviewed. It is evident that the particular form of switch shown represents a simple construction which enables operation from a normally open-circuit condition to an operated closed-circuit condition, with one selected configuration of the switch parts; and the same switch is readily altered to another selective switch configuration in which the switch is normally closed and is shifted to an operated open-circuit condition. This selective change is accomplished without removal of any part of the switch and without need for disassembly or reassembly of any portion of it.

Additional indexed configurations beyond the two here involved may be provided for wider selection of switching circuits to be made or broken. In broad concept, furthermore, the selective contact shown as a bridging contact in the exemplary switch described may be a contact arm extending from a metal support forming a return circuit. To those skilled in the art it is evident that further units of like construction (with modified terminals) may be stacked for operation in unison, and further changes may be made without departing from the spirit of the invention. Therefore it is appropriate that the invention should be broadly construed, consistent with the spirit and scope of the invention.

I claim:

1. A selective switch including a housing having an endwise reciprocal contact-supporting shaft, a bridging contact member carried by said shaft and two groups of stop elements in parallel planes between which said bridging contact member may be operated, one of said groups of fixed elements including a pair of fixed contact elements diametrically opposite each other relative to said shaft, and the other of said groups of contacts similarly including a pair of fixed contact elements diametrically opposite each other relative to said shaft, said shaft being selectively keyed to the housing for reciprocation of said contact member between said planes in a selected one of plural angularly related paths.

2. A selective switch including a housing having an endwise reciprocable contact-supporting member, a selective bridging contact member carried by said supporting member and fixed against angular shift relative to said supporting member, and two groups of stop elements in parallel planes between which said bridging contact member may be operated, one of said groups of fixed elements including a pair of fixed contact elements at diametrically opposite sides of said supporting member, and the other of said groups of contacts including a pair of fixed contact elements at diametrically opposite sides of said supporting member, said pairs of fixed contact elements being endwise out of line with each other, and selective interengaging keyed guide means on said supporting member and said housing constraining said supporting member and said movable bridging contact member thereon to reciprocate between said planes in each selective adjustment thereof for bridging the fixed contact elements of only one of said planes for any particular adjustment

of said supporting member relative to said keyed guide means.

3. A selective switch, including first and second duplicate roughly U-shaped metal members each having a connecting portion and a pair of skew legs, an insulating supporting means holding said members in spaced opposition with the connecting portions of said U-shaped members parallel to each other and with the respective legs of said members fixed in parallel planes, and a bridging contact member mounted on a shaft for angularly selective operation of the bridging contact member and the shaft in the space between said members and between said planes.

4. A selective switch, including first and second duplicate roughly U-shaped metal members each having a connecting portion and a pair of skew legs, an insulating housing supporting said members in spaced opposition, the connecting portions of said U-shaped members being parallel to each other and each of the legs of said members being in a plane containing a leg of the other of said members and the legs of said members being disposed in parallel planes, a movable unit including a bridging contact member mounted for bodily reciprocation in a space between said U-shaped members and between said planes, and selective keyed guide means constraining said bridging member for reciprocation between said planes for interconnecting respective legs of said U-shaped members at only one of said planes when said keyed guide means is in a selected adjustment, and for interconnecting respective legs of said U-shaped member only at the other of said planes when said keyed guide means is in a different selected adjustment.

5. A selective switch, including first and second duplicate U-shaped metal members each having a connecting portion and a pair of skew legs, an insulating housing supporting said members in spaced opposition with the connecting portions of said U-shaped members parallel to each other and with the respective legs of said members fixed in parallel planes, a bridging contact member mounted for bodily reciprocation in a space between said members and between said planes, and selective adjustable keyed guide means constraining said bridging member to reciprocation in a selected one of two angularly related paths for interconnecting respective legs of said U-shaped members at either one of said planes but not at both planes for any selective adjustment of the keyed guide means.

6. A selective switch, including first and second duplicate roughly U-shaped metal members each having a connecting portion and a pair of skew legs, an insulating housing supporting said members in spaced opposition with the connecting portions of said U-shaped members parallel to each other and with the respective legs of said members fixed in parallel planes, a bridging contact member mounted for bodily reciprocation in a space between said members and between said planes, a slide guide member supporting said bridging contact member for reciprocation between said planes and selectively adjustable interengaging keying means in said housing and on said guide member constraining said bridging member to reciprocate in a selected one of two angularly related paths for interconnecting respective legs of said U-shaped members at only one of said planes but not both for any selected adjustment of the keying means.

7. A selective switch including first and second duplicate roughly U-shaped metal members each having a connecting portion and a pair of skew legs, an insulating housing supporting said members in spaced opposition with the connecting portions of said U-shaped members parallel to each other, and with the respective legs of said members fixed in parallel planes, a bridging contact member, a slide guide member supporting said bridging contact member for reciprocation between said planes, said bridging contact and said slide guide member being keyed together for conjoint indexing operation, and se-

lectively adjustable interengaging keying means between said housing and said slide guide member constraining said bridging member to interconnect respective legs of said U-shaped members at only one of said planes but not both, for any selected adjustment of the keying means, spring bias and stop means constraining said bridging contact member to reciprocate with its supporting slide guide member until the bridging contact member is arrested at one of said planes and thereafter allowing further operation of said slide guide member therebeyond in one direction of reciprocation, said interengaging keying means moving out of keyed interengagement with said housing during said further operation and thereby allowing selective adjustment thereof.

8. A selective switch including first and second duplicate generally U-shaped metal members each having a connecting portion and a pair of skew legs, an insulating housing supporting said members in spaced opposition with the connecting portions of said U-shaped members parallel to each other and with the respective legs of said members fixed in parallel planes, a bridging contact member, a slide guide member supporting said bridging contact member for reciprocation between said planes, selectively adjustable interengaging keying means in said housing and on said guide member for constraining said bridging contact member to interconnect respective legs of said U-shaped members at only one of said planes but not at both of said planes for any selected adjustment of the keying means, spring bias and stop means constraining said bridging contact member to reciprocate with its supporting slide guide member until the bridging contact member is arrested at one of said planes and thereafter allowing further operation of said slide guide member in one direction of reciprocation therebeyond, said interengaging keying means moving out of interengagement during said further operation and thereby allowing selective adjustment thereof.

9. A selective switch including first and second groups of mutually confronting elements disposed in parallel planes and including a pair of contact elements at each plane, an insulating housing supporting said elements, a bridging contact member, a slide guide member supporting said bridging contact member for reciprocation between said planes, selectively adjustable interengaging keying means in said housing and on said guide member for constraining said bridging contact member to reciprocation between selected confronting elements in said planes for any selected adjustment of the keying means, spring bias and stop means constraining such bridging contact member to reciprocate with its supporting slide guide member until the bridging contact member is arrested at one of said planes and thereafter allowing further operation of said slide guide member therebeyond, said interengaging keying means moving out of interengagement during said further operation and thereby allowing selective adjustment thereof.

10. A selective switch including first and second duplicate generally U-shaped metal members each having a connecting portion and a pair of skew legs, an insulating housing supporting said members in spaced opposition with the connecting portions of said U-shaped members parallel to each other and with the respective legs of said members fixed in parallel planes, a bridging contact member, a slide guide member supporting said bridging contact member for reciprocation between said planes, means securing said bridging contact member against angular shift about said slide guide member, selectively adjustable interengaging keying means in said housing and on said guide member for constraining said bridging contact member to interconnect respective legs of said U-shaped members at only one of said planes but not at both of said planes for any selected adjustment of the keying means, spring bias and stop means constraining said bridging contact member to reciprocate with its supporting slide guide member until the bridging contact

member is arrested at one of said planes and thereafter allowing further operation of said slide guide member therebeyond, said interengaging keying means moving out of interengagement during said further operation and thereby allowing selective angular adjustment thereof, said guide means having an operating portion projecting out of said housing when the bridging member is disposed at one of said planes and said operating portion being movable into a depressed position within said housing for disengagement of said keying means.

11. A selective switch including a housing of insulation, a movable contact member within said housing, a slide guide member supporting said movable contact member for reciprocation between a pair of parallel planes, and said contact member being fixed against relative rotation on said supporting member, fixed contact and stop elements at said planes selectively engageable by said movable contact member, selectively angularly adjustable interengaging keying means in said housing and on said guide member constraining said movable contact member to operate only between an element at one of said planes and an element at the other of said planes, said interengaging keying means being selectively adjustable for causing said movable contact member to operate between another pair of opposite fixed elements in said pair of planes.

12. A selective switch having a housing of insulation, a movable contact member within said housing, a slide guide member supporting said movable contact member for reciprocation between a pair of parallel planes, confronting fixed elements including fixed contact elements at said planes respectively engageable by said movable contact member, interengaging keying means in said housing and on said guide member constraining said movable contact member to operate only between a particular element at one of said planes and the confronting element at the other of said planes, said interengaging keying means being selectively adjustable for causing said movable contact member to operate between another pair of confronting fixed elements in said pair of planes, spring bias and stop means constraining said movable contact member to reciprocate with its slide guide member until the contact member is arrested at one of said planes and thereafter allowing further operation of said slide guide member therebeyond, said interengaging keying means moving out of interengagement during said further operation and thereby allowing selective adjustment thereof.

13. A selective switch including a housing, a movable contact member within said housing, a slide member supporting said movable contact member for reciprocation between a pair of parallel planes and said members being keyed against relative rotation, fixed contact means at said planes selectively engageable by said movable contact member, selectively adjustable interengaging keying means in said housing and on said guide member constraining said movable contact member to operate only between an element at one of said planes and an opposite element at the other of said planes, said interengaging keying means being selectively adjustable for causing said movable contact member to operate between another pair of opposite fixed elements in said pair of planes, spring bias and stop means constraining said movable contact member to reciprocate with its slide guide member until the contact member is arrested at one of said planes and thereafter allowing further operation of said slide guide member therebeyond, said interengaging keying means moving out of interengagement during said further operation and thereby allowing selective indexing adjustment thereof, said guide means having an operating portion projecting out of said housing when the movable contact member is disposed at one of said planes and being substantially flush with said housing when said contact member is disposed at the other of said planes, and said operating portion being movable into a de-

pressed position within said housing for adjustment of the interengagement of said keying means.

14. A selective switch including a housing, a supporting slide member, a movable contact member carried by said slide member for movement of the movable contact member between two planes, interengaging means on said members preventing rotation of one relative to the other fixed contact elements located respectively at said planes, and selectively adjustable interengaging keying means in said housing and on said guide member constraining said movable contact member to move from a contact in one path between said planes for any selected adjustment of the keying means so that the movable contact member will engage only a predetermined fixed contact element in one of said planes or the other of said planes to the exclusion of other fixed elements in said planes.

15. A selective switch in accordance with claim 14 wherein said keying means includes longitudinal ribs on said slide member for a portion of its length and grooves in said housing receiving said ribs throughout the travel of said movable contact member between said planes, said slide member being movable longitudinally relative to said movable contact member when the movable contact member is arrested at one of said planes, said ribs moving out of contact with said grooves during longitudinal operation of said slide member after the movable contact member is arrested at one of said planes to permit changing from said selected adjustment to another selected adjustment.

16. A selective switch in accordance with claim 14, wherein said keying means is interrupted at a limited axial zone of the slide member to enable indexing of the slide and the contact member carried thereby relative to the housing and to said fixed contact elements.

17. A selective switch including a housing, plural first elements at one plane in the housing, at least one of said first elements being a fixed contact element, plural second elements at another plane in the housing, at least one of said second elements being a fixed contact element, a selective movable contact member, and an indexable and reciprocable support for said movable contact member, said support and said movable contact member being assembled in a manner-preventing relative angular motion, said support and said housing having interengaging selective keying means to guide the support and the contact member carried thereby in any selected one of plural angularly related paths of reciprocation for carrying said contact member into engagement with selected elements at said planes.

18. A selective switch, including a housing, a first pair of fixed elements at one plane in the housing, one of said first elements being a fixed contact element, a second pair of fixed elements at another plane in the housing, one of said second elements being a fixed contact element, a selective movable contact member, and an indexable and reciprocable support for said movable contact member, said support and said movable contact member being assembled to each other in a manner to prevent relative angular motion, said support and said housing having interengaging selective keying means to guide the support for endwise reciprocation thereof and for reciprocation of the contact member carried thereby in any selected one of plural angularly related paths of reciprocation for carrying said contact member into engagement with opposite selected elements at said planes.

19. A selective switch including a pair of fixed elements at a first plane and a pair of fixed elements at a second parallel plane, one of said fixed elements at each of said planes being a fixed contact element, a selective movable contact member, a reciprocable and indexable support on which said contact member is fixed against relative angular motion, said supporting means being effective to carry the selective movable contact member into engagement with an element at either plane, and se-

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lective keying means to said support effective to constrain said movable contact member for motion in any selected one of plural angularly related paths of reciprocation between a selected one of said fixed elements in one of said planes and the opposite fixed element in the other plane. 5

20. A selective switch having normally open and normally closed contacts, including first and second duplicate generally U-shaped metal members each having a connecting portion and a pair of skew legs, an insulating housing supporting said members in spaced opposition, the connecting portions of said U-shaped members being parallel to each other and each of the legs of said members being in a plane containing a leg of the other of said members and the respective coplanar legs of said members being disposed in parallel planes, a movable unit including a bridging contact member mounted for bodily reciprocation in the space between said U-shaped members and between said planes, means biasing said 10 15

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bridging contact member to one of said planes, and selective keyed guide means constraining said bridging member for reciprocation between said planes for interconnecting a selected leg of each of said U-shaped members at only one of said planes when the keyed guide means is in a selected adjustment, and for interconnecting a selected leg of each of said U-shaped members only at the other of said planes when said keyed guide means is in a different selected adjustment.

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