March 24, 1964 H. O. SCHWARTZ 3,126,466

MODULAR LEAF SWITCH

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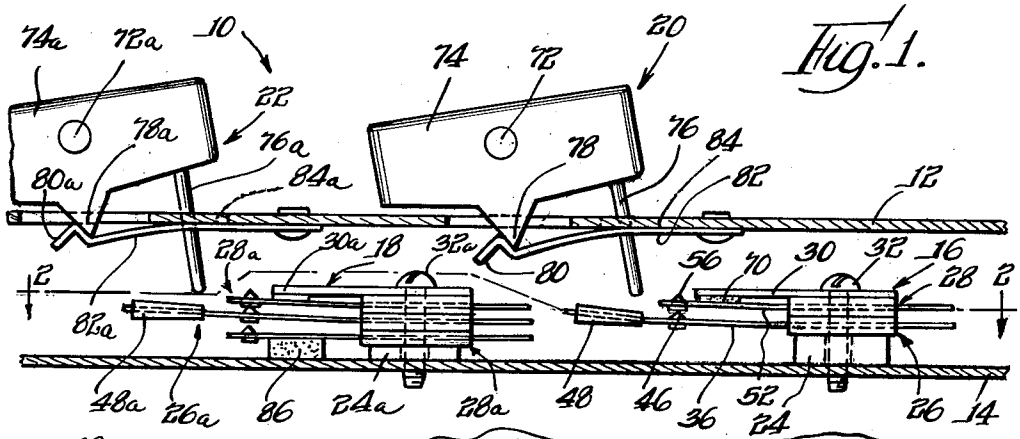


Fig. 1.

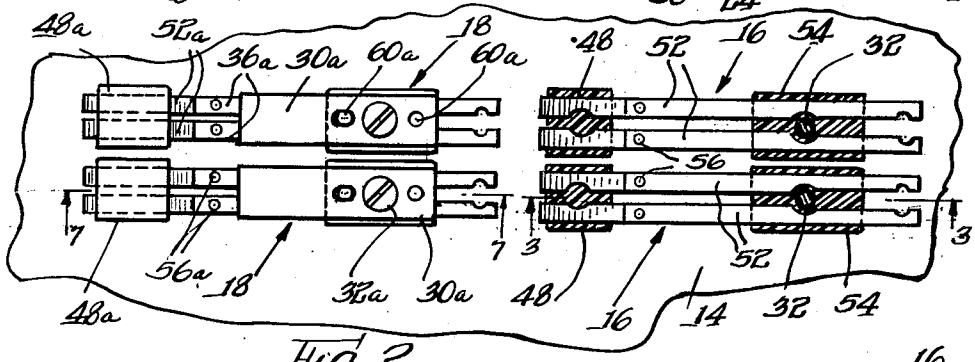


Fig. 2.

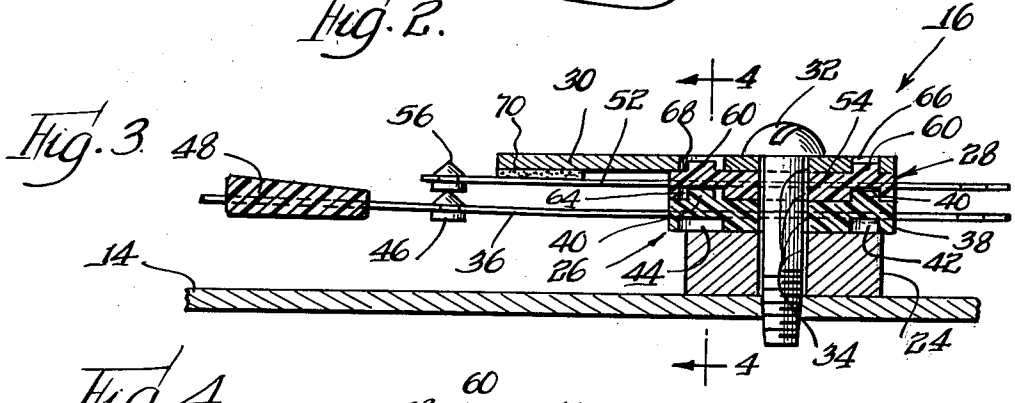


Fig. 3.

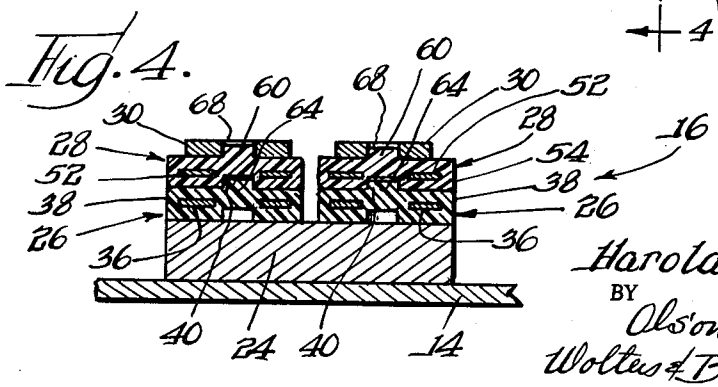


Fig. 4.

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Fig. 5.

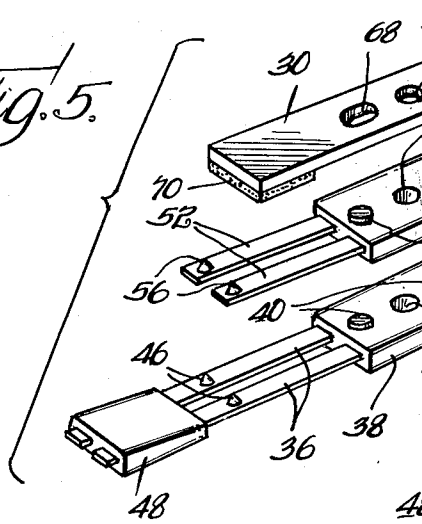


Fig. 6.

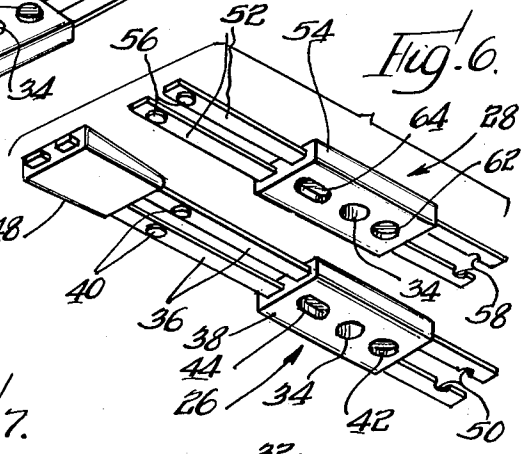


Fig. 7.

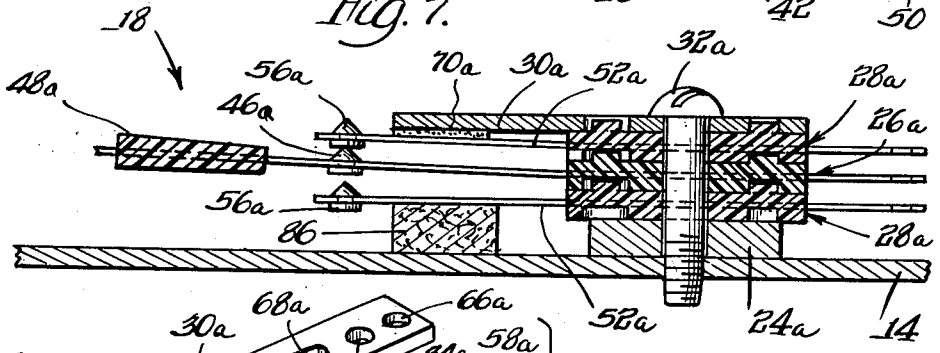
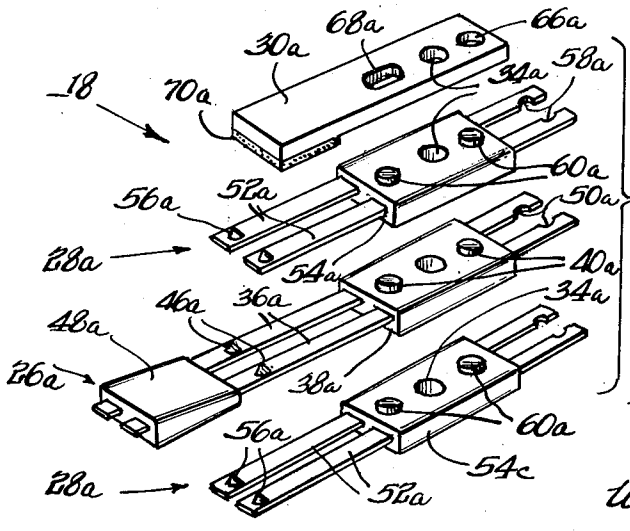


Fig. 8.



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MODULAR LEAF SWITCH

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2 Claims. (Cl. 200—166)

This invention relates generally to electric switches and more particularly to electric switches which are arranged to be actuated mechanically.

According to one system of classification, electric switches are characterized by their mode of actuation; and one common class of switch employs electromagnetic actuation. When such a switch is arranged in the form of a leaf switch, it is necessary to fashion one of the leaves in dogleg-shape in order to expose it to the reciprocable actuator; and the positioning of such an irregular leaf is a problem especially when the leaves are to be molded into a body of insulating material to form a modular switch. In addition, the inventorying advantages of a single type of switch leaf and the economies resulting therefrom are not present in such an arrangement.

Accordingly, a general object of the present invention is to provide a new and improved electric switch arrangement.

Another object of the invention is to provide an electric switch which is both easy and economical to produce.

Still another object of the invention is to provide a modular type of electric switch which incorporates straight leaves exclusively.

Yet another object of the invention is to provide a modular type of electric switch in which the modules are positively positioned with respect to each other.

A further object of the invention is to provide a mechanically actuated, leaf switch which employs a novel actuator arrangement.

A still further object of the invention is to provide electric switch arrangements in which the fixed leaves are resiliently supported against the kinetic force of the moveable leaves.

Additional objects and features of the invention pertain to the particular structure and arrangements whereby the above objects are attained.

An electric switch in accord with the invention includes a first module comprising a resilient leaf adapted to flex in a path transverse to its principal plane, an electric contact on the leaf, a first body of electrically insulating material encompassing a portion of the leaf and defining male and female elements respectively on opposite faces transverse to the principal plane of the leaf, and a second body of electrically insulating material encompassing a portion of the leaf spaced-apart from the first body to define an actuator member; and a second module comprising a leaf, an electric contact on the leaf and a body of electrically insulating material encompassing a portion of the leaf and defining male and female elements respectively on opposite faces, the second module being stacked with the first module aligning the contacts in confronting relationship, the male elements of one body interfitting with the female elements of the other body positively to position the modules with respect to each other.

The invention, both to its structure and mode of operation, will be better understood by reference to the following disclosure and drawings forming a part thereof, wherein:

FIG. 1 is a side elevational view of an electric switch arrangement constructed in accordance with the principles of the present invention;

FIG. 2 is a view taken along the section 2—2 of

FIG. 1;

FIG. 3 is an enlarged view taken through the section 3—3 of FIG. 2;

FIG. 4 is a view taken through the section 4—4 of FIG. 3;

FIG. 5 is a top perspective view of the switch component incorporated in the arrangement of FIG. 3;

FIG. 6 is a bottom perspective view of two of the components shown in FIG. 5;

FIG. 7 is an enlarged view taken through the section 7—7 of FIG. 2;

FIG. 8 is a top perspective view of the switch components incorporated in the arrangement of FIG. 7.

Referring now in detail to the drawings, specifically to FIG. 1, a switch arrangement indicated generally by the numeral 10 will be seen to include a structural member 12 and a structural member 14, fashioned for example from sheet steel and spaced-apart to define a switch housing. Within the switch housing which is defined between structural members 12 and 14, there is mounted a switch 16 and a switch 18 which are actuated respectively by switch operators 20 and 22. As is indicated in FIG. 2, the switches 16 and 18 may be provided in banks in which the individual switches are disposed in parallel rows.

In accordance with an important feature of the invention, the switches 16 and 18 are of modular construction; and turning to a consideration of FIGS. 3–6, the switch 16 will be seen to comprise a spacer member 24 disposed against the structural member 14 in the space between the members 12 and 14. The switch 16 also includes a switch module 26, a switch module 28 and a rigid arm 30 which components are stacked over the spacer 24 in the order named. The spacer 24, the modules 26 and 28 and the rigid arm 30 are mounted to the structural member 14 by means of a self-tapping screw 32 which advantageously passes through aligned bores 34 fashioned respectively in the several components.

With specific reference to FIGS. 5 and 6, the switch module 26 will be noted as comprising a pair of laterally spaced apart, parallel disposed leaves 36 which are fabricated from a resilient, electrically conductive material. Moreover, the leaves 36 are arranged in the form of elongated rectangular parallelepipeds adapted to flex in a path transverse to their principal plane. The relative position of the leaves 36 is preserved by molding the leaves as inserts in a body 38 of electrically insulating material, such as for example nylon. The body 38 is formed with studs or male elements 40 protruding from its upper surface, as is shown in FIG. 5, and with a circular recess 42 and an oval recess 44 comprising female elements penetrating into its opposite face, as is shown in FIG. 6. The body 38 encompasses a medial portion of the leaves 36, and the male and female elements are disposed transversely of the principal plane of the leaves in accordance with the illustrated embodiment. The purpose of the male elements 40 and the female elements 42 and 44 will become apparent shortly.

The module 26 also comprises a rivet-type electric contact 46 fixed to each of the leaves after molding of the body 38. The module 26 also includes a body 48 of electrically insulating material molded about terminal portions of the leaves 36 to define an actuator member. The body 48 is, in accordance with the invention, selected to be of wedge-shape with the narrow edge of the wedge facing the body 38 whereby to cooperate with an operator movable in an arcuate path intercepting the plane of one face of the wedge-shaped body. If desired, the opposite terminal portions of leaves 36 may be provided with lateral notches 50 for facility in attaching electrical leads thereto.

Continuing with reference to FIGS. 5 and 6, the module

28 will be seen to include a pair of leaves 52 fabricated of a resilient, electrically conductive material and disposed in parallel, laterally spaced-apart relationship, medial portions of the leaves 52 being molded into a body 54 of electrically insulating material. Electric contacts 56 of the rivet-type are fixed to terminal portions of the leaves 52, and the opposite terminal portions of the leaves are provided with confronting, lateral notches 58 to facilitate attachment of electric leads not shown. The leaves 52, like the leaves 36, are fashioned in the shape of substantially elongated rectangular parallelepipeds; and the body 54, like the body 38, incorporates abbreviated, cylindrical studs or male elements 60 extending from one face, as well as a circular recess 62 and an oval recess 64 comprising female elements penetrating into the opposite face of the body.

When the modules 26 and 28 are stacked together to form a switch, the male elements 40 interfit with the female elements 62 and 64, the oval character of element 64 accommodating slight imperfections in the orientation of the several interfitting elements. With reference to FIGS. 3 and 4, the interfitting of the male elements of module 26 and the female elements of module 28 will be seen to position the modules positively with respect to each other, thus aligning and preserving the relative position of the contacts 46 and 56.

The rigid arm 30 is also advantageously positioned in a positive manner with respect to the switch modules 26 and 28. Accordingly, and with reference to FIG. 5, the rigid arm 30 will be seen fashioned with a circular aperture 66 and an oval aperture 68 disposed on opposite sides of the bore 34 in order cooperatively to receive the male elements 60 of module 28 as is well shown in FIGS. 3 and 4.

With the arm 30 and the modules 26 and 28 positively positioned with respect to each other and with this relationship preserved by means of clamping these components against the spacer 24 using screw 32, a pad 70 of soft, resilient material, such as felt, is secured to the end of arm 30 to act between the arm and the leaves 52 of module 28 as is shown in FIG. 3. Pad 70 supports the leaves 52 against the kinetic force imposed thereon by the flexing of leaves 36 so as to cause interengagement between the contacts 46 and 56. Proper positioning of the contact 56 results.

Returning to FIG. 1, the operator 20 will be seen pivotally mounted on the structural member 12 by means of a shaft 72 which is supported in brackets, not shown. The operator 20 specifically includes a rockable body 74 adapted for manual manipulation, a leg 76 depending from the body 74 into actuatable relationship with the body 48 of module 26, and a triangular formation 78 which cooperates with a deflected end 80 of a leaf spring 82 which is riveted or otherwise suitably fastened to the structural member 12. The structural member 12 is fashioned with a slot 84 which passes the leg 76 into actuatable relationship with the body 48; and upon rockable movement of the body 74 between the two extreme positions established by the cooperation of formation 78 and spring 82, the tip of leg 76 will move through an arcuate path intercepting the plane of the upper face of body 48. Continued movement of the tip of leg 76 in a generally clockwise direction as viewed in FIG. 1 will cause the leaves 36 to flex downwardly because of the inclination of the upper face of the body 48 whereupon to separate the normally closed contacts 56 and 46. It is to be recognized that rocking of the body 74 so as to cause the tip of leg 76 to move in a counterclockwise direction as viewed in FIG. 1 will eventually separate the leg 76 and the body 48 whereby to release the leaves 36 to the resiliency thereof whereby to return the contacts 46 and 56 to their normally closed configuration.

Switch 18 is constructed in a manner similar to switch 16. Accordingly, like numerals have been used to designate like parts in the two switches, the suffix letter "*a*" being employed to distinguish the elements associated with switch 18.

Switch 18 differs from switch 16 primarily in that the module 26*a* is sandwiched between two of the modules 28*a* as is well shown in FIGS. 7 and 8. Thus, switch 18 is arranged to be a double-pole, double-throw switch whereas switch 16 is arranged to be a double-pole, single-throw switch. From a comparison of the switches 16 and 18, it will become apparent that the switch modules of the present invention may be stacked in numerous configurations to define different kinds of switches for different circumstances.

Whereas a pad of resilient material 70*a* supports the leaves 52*a* of the module 28*a* which is disposed between module 26*a* and arm 30*a*, a pad 86 of soft, resilient material, such as felt, acts between structural member 14 and the blades 52*a* of the module 28*a* which is disposed abutting the spacer 24*a*. Thus, both of the blades carrying fixed contacts are supported against the kinetic force of the movable leaves 52*a*.

As will be recognized, manipulation of the operator 22 results in leg 76*a* controlling the flexing of leaves 36*a* and a resultant selective engagement of contacts 46*a* with either of the upper or the lower contacts 56*a*. In other respects, operation of the switch 18 is similar to the operation to switch 16.

The specific examples herein shown and described are illustrative only. Various changes in structure may appear to those skilled in the art; and these changes are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. An electric switch comprising: a first module including a resilient leaf of electrically conductive material adapted to flex in a path transverse to its principal plane, an electric contact on said leaf, a first body of electrically insulating material encompassing a portion of said leaf and defining male and female elements respectively on opposite faces transverse to the principal plane of said leaf, and a second body of electrically insulating material encompassing a portion of said leaf spaced-apart from said first body to define an actuator member, said second body of insulating material being wedge-shaped whereby to cooperate with an operator movable in an arcuate path intersecting the plane of one face of said wedge-shaped body; and a second module including a leaf of electrically conductive material, an electric contact on said last mentioned leaf and a body of electrically insulating material encompassing a portion of said last mentioned leaf and defining male and female elements respectively on opposite faces, said last mentioned body being stacked with said first mentioned body aligning said contacts in confronting relationship, the male elements of one body interfitting with the female elements of the other body positively to position said modules with respect to each other.

2. An electric switch arrangement comprising: first and second structural members spaced-apart to define a switch housing; a first switch module including a resilient leaf of electrically conductive material adapted to flex in a path transverse its principal plane, an electric contact on said leaf, a first body of electrically insulating material encompassing a portion of said leaf and defining male and female elements respectively on opposite faces transverse the principal plane of said leaf, and a second body of electrically insulating material encompassing a portion of said leaf spaced-apart from first body to define an actuator member, said second body of insulating material being wedge-shaped; a second switch module including a leaf of electrically conductive material, an electric contact on said last mentioned leaf and defining male and female elements respectively on opposite faces, said last mentioned body being stacked with said first mentioned body aligning said contacts in confronting relationship, the male elements of one body interfitting with the female

elements of the other body positively to position said modules with respect to each other; fastening means mounting said switch modules to said first structural member; and switch operator means pivotally mounted on said second structural member, including a leg extending into actuatable relationship with the second insulating body of said first switch module and mounted to pivot in an arcuate path intersecting the plane of said second insulating body, said leg being reversibly pivotable from a position of disengagement spaced from said second body, toward the narrow end of said second body and into engagement with progressively thicker sections of said second body

whereby to flex the leaf of said first switch module for selectively opening and closing said contacts.

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