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3,153,130

MOMENTARY CONTACT SWITCH

Filed June 7, 1961

3 Sheets-Sheet 1

FIG. 1

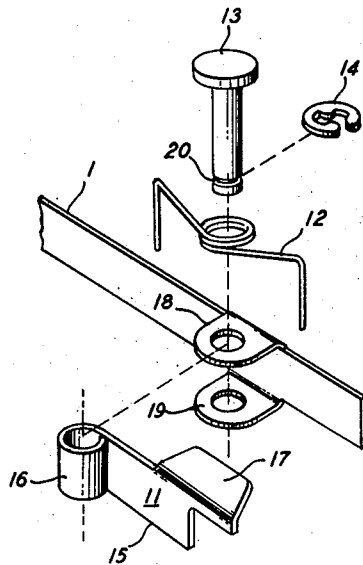
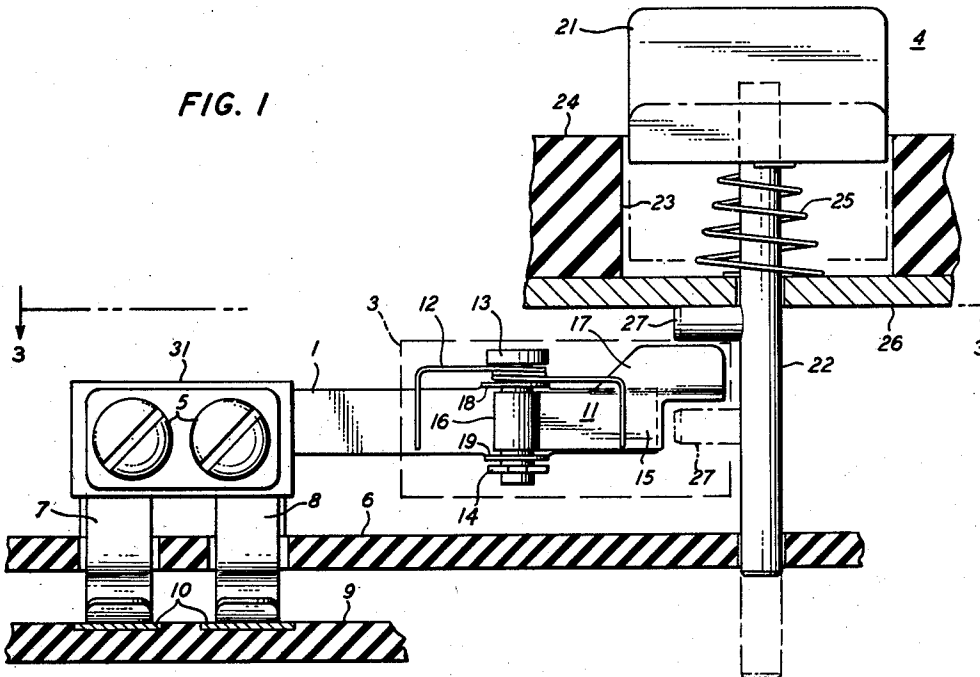


FIG. 2

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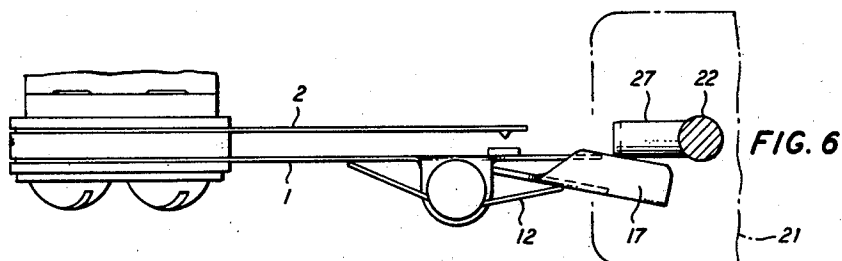
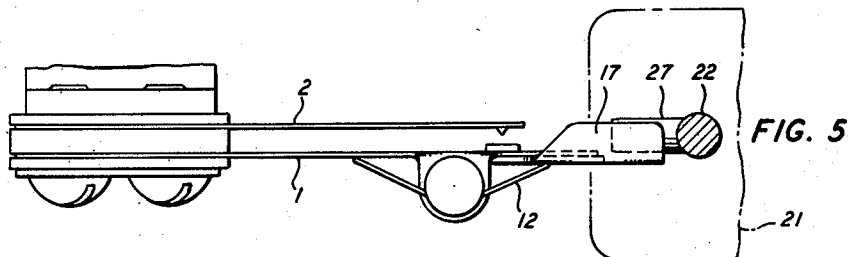
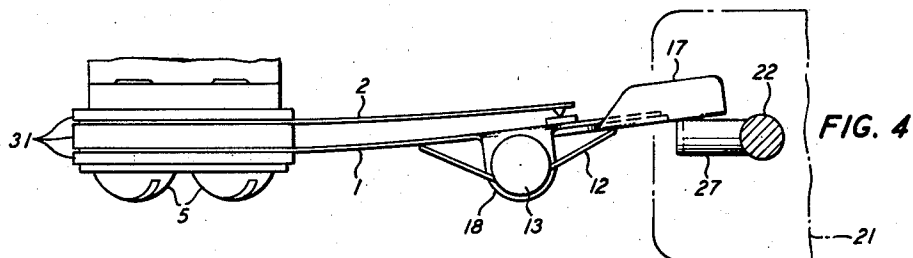
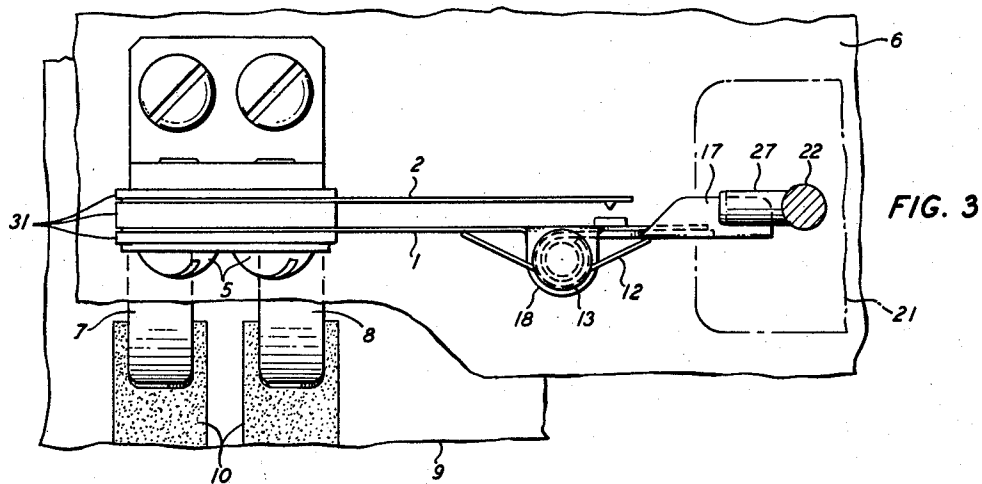
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3 Sheets-Sheet 2



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MOMENTARY CONTACT SWITCH

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5 Claims. (Cl. 200-160)

This invention relates to electrical switches, and more particularly to those of the pushbutton variety characterized in their operation by the momentary closure of an electrical circuit only once per cycle of operation.

Pushbutton actuated momentary contact switches are quite well known in the art, and for the most part are capable of performing their intended function in a highly satisfactory manner. Of the many known configurations in which such switches may be arranged, however, some are burdened with a relatively large space requirement, while others necessitate the inclusion of components which are rather intricate in nature, sometimes involving ball bearings, eccentric elements, ratchet wheels, or other costly machined parts. Although these shortcomings may be tolerated in many of the applications to which such switches are suited, there are other applications in which considerations of size and complexity preclude the successful incorporation of switching mechanisms which are not capable of being both produced at minimum cost and installed in minimum space. Merely by way of example, the replacement of rotary dials in subscriber telephone sets by electronic pulsing circuits activated by an array of pushbutton switches of the type described is a prime illustration of an application to which only small and inexpensive switches are properly suited.

Accordingly, the principal objects of this invention are to simplify, reduce the cost of, and decrease the size of pushbutton actuated mechanisms capable of momentarily closing a circuit only once per cycle of operation.

The objects of the invention are accomplished by providing reciprocating means which successively drive a pin against opposing surfaces of a deflection plate so as to effect momentary closure of a pair of contact members associated with the plate in the course of the pin being driven against one of the surfaces, and separation of the contact members in the course of the pin being driven against the opposing surface.

One feature of the invention resides in the unique combination of a deflection member comprising a pair of angularly disposed flanges and a pair of electrical contact members which are initially separated. One of the contact members is disposed with respect to one of the flanges in such manner that the other of the flanges in angularly suspended facing the pair of contact members.

Another feature of the invention resides in a pushbutton actuated plunger arrangement comprising a shaft, suitably mounted for reciprocal motion, and a pin extending outwardly from the shaft. Both the position of the plunger with respect to the aforementioned deflection member and the extent of the plunger's reciprocal travel are governed in such manner that during one stroke of the plunger, the pin momentarily displaces the deflection member in one lateral direction, while during the reciprocal stroke, the pin displaces the deflection member in the opposite lateral direction.

Another feature of the invention resides in an arrangement for momentarily closing a plurality of pairs of electrical contacts simultaneously under the control of a single pushbutton type mechanism.

Still another feature of the invention resides in a slightly different arrangement whereby a plurality of pairs of electrical contacts, all actuated by a single push-

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button type mechanism, are closed successively and, momentarily thereafter, reopened simultaneously.

The foregoing and other objects and features of the invention will be more thoroughly understood by reference to the following detailed description of an illustrative embodiment of the invention, and the drawings of which:

FIG. 1 depicts, in side view, a basic embodiment of a momentary contact switch constructed in accordance with the principles of the invention;

FIG. 2 shows an unassembled view of a deflector mechanism useful in a switch of the type illustrated in FIG. 1;

FIGS. 3 through 6, from an elevated view, illustrate in time sequence a full operative cycle of the switch in FIG. 1;

FIG. 7 illustrates an elevated view of one adaptation of the invention arranged to momentarily close a plurality of pairs of electrical contacts simultaneously; and

FIG. 8 illustrates an elevated view of another adaptation of the invention in which several pairs of electrical contacts are closed sequentially but opened simultaneously.

With reference to the drawings, FIG. 2 illustrates a switch embodying the invention which comprises as basic components a pair of resilient electrical contact members 1 and 2, member 2 in its position parallel to and directly behind member 1 being invisible from this view, a deflector mechanism 3, shown in detail in FIG. 2, and an actuating device 4 mounted for reciprocating motion. Contact members 1 and 2 are secured in position by insulating laminations 31 which are fastened together by a pair of screws 5. The contact members, together with their securing means 31, are mounted on a supporting plate 6 through which protrude strip leads 7 and 8 adapted to electrically connect the switch in an associated circuit (not shown). As a convenient means for connecting the switch to an external circuit, leads 7 and 8 are angled at their free ends and brought to bear upon a printed circuit plate 9 having conducting strips 10 etched or otherwise embossed on its surface. While it is evident that the switch of FIG. 1 may be coupled to an external circuit in numerous arrangements, the one shown is particularly advantageous in that electrical contact is created by pressure alone, thereby obviating the need for solder joints.

Hinged to contact member 1 is a deflector mechanism 3 shown unassembled in FIG. 2, which comprises a deflection member 11, torsion spring 12, fastening stud 13, and E ring 14. As shown most distinctly in FIG. 2, deflection member 11 is formed of a first flange 15, rectangular in shape and having its near end fashioned into a tubular slot 16, and a second flange 17 which extends slightly beyond the far end of and is disposed in angular relation to flange 15. A pair of wings 18 and 19, essentially annular in form, protrude in alignment with each other from the upper and lower edges of contact member 1. As is evident from FIG. 2, the deflector mechanism is assembled by inserting stud 13 through the twist of torsion spring 12, the aperture of wing 18, slot 16, and lastly the aperture of wing 19, the composite assembly then being secured by snapping E ring 19 into a groove 20 circumferentially furrowed in the lower end of stud 13.

Actuating device 4 comprises a cap 21 secured to the upper extremity of a shaft 22, and is mounted for reciprocation, as shown in FIG. 1 by broken line, in well 23 of housing 24. Cap 21 is biased upward by a partially compressed spring 25 bearing against base plate 26 of housing 24 through which shaft 22 extends, but is restricted in its upward travel by a pin 27, shown situated directly below base plate 26, which extends outwardly from shaft 22. According to the invention, as will be shown below, actuat-

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ing device 4 is positioned with respect to deflector mechanism 3 in such manner that the plane of motion described by pin 27 during reciprocation intersects flange 17 of deflection member 11.

FIGS. 3 through 6 illustrate a full operative cycle of the invention in several progressive steps. In FIG. 3 the switch is shown residing in its relaxed position with pin 27 disposed above flange 17 as in FIG. 1. When cap 21 is depressed, pin 27 is propelled downward, impinging on the upper surface of angular flange 17 so as to drive contact member 1 into closure with contact member 2. At the extremity of its downward travel, shown in FIG. 5 and also by broken line in FIG. 1, pin 27 is situated below flange 17 in which position the contact members are free to reseparate. Upon release of cap 21, pin 27 is forced upward, as illustrated in FIG. 6, and bears against the under surface of flange 17 so as to impart a force directed to pivot the deflection member away from contact member 1. The cycle is completed when pin 27 once again resides above flange 17, as in FIG. 3, and torsion spring 8 has driven the deflection member back to a flush position with respect to contact member 1.

It will be noted from the foregoing operative description that contact members 1 and 2 remain closed only during the momentary interval in which pin 27 bears upon the deflection member. This interval may be conveniently regulated in several ways, for example varying the spring constant of spring 25 (FIG. 1), or varying the position of actuating device 4 with respect to the deflection mechanism 3. Moreover, it is evident that the time of closure is wholly independent of the period during which cap 21 remains fully depressed, since prior to this time the contact members have been reseparated. Finally, the contact members are unaffected by the upward travel of pin 27, deflection member 11 being pivoted away from contact member 1 by this movement.

FIG. 7 depicts an arrangement of the invention in which, as a convenient illustration, three pairs of contact members are momentarily closed, simultaneously, during each reciprocating cycle of an actuating device. As is apparent from the drawings, the basic arrangements of FIG. 1 and FIG. 7 are identical except for the addition to the latter of second and third pairs of contact members 1'-2' and 1''-2'' which are parallel to and secured in horizontal alignment with contact members 1 and 2, and a pair of insulating buttons 28 and 29. As shown, contact members 1, 1' and 1'' extend in length beyond their respective counterparts 2, 2' and 2'' in order to permit buttons 28 and 29 to transmit lateral motion of contact member 1 to contact members 1' and 1''.

In operation, when cap 21 is depressed, pin 27 is brought to bear on the upper surface of angular flange 17, as previously described, so as to laterally drive contact member 1 into closure with contact member 2. The motion of contact member 1 is simultaneously transferred to contact members 1' and 1'' by buttons 28 and 29, respectively, so as to simultaneously effect closure of the other pairs of contact members. When pin 27 arrives below flange 17, contact members 1 and 2 as described above, as well as the other pairs of contact members in similar fashion, spring apart. When cap 21 is released, pin 27 is returned to its initial position above flange 17 in the manner previously set forth so as not to effect reclosure of the contact members.

FIG. 8 illustrates an arrangement of the invention in which several pairs of contact members, two pairs for example, are closed in successive order and, momentarily thereafter, reseparated simultaneously. It will be noted that the basic arrangements of FIG. 1 and FIG. 8 are identical except for the addition to the latter of a second pair of contact members 1''' and 2''' secured parallel to and in horizontal alignment with the original pair, and an insulating tab 30. As shown, tab 30 mechanically links contact member 2 to contact member 1''' so as to transfer the lateral motion of one member to the other. As previ-

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ously described, when cap 21 is depressed, pin 27 bears upon the upper surface of angular flange 17 so as to effect closure between contact members 1 and 2. With actuating device 4 properly positioned with respect to deflector mechanism 3, contact member 1, after closure with contact member 2, imparts sufficient additional lateral displacement of the latter element to effect closure between contact members 1''' and 2'''. As before, when pin 27 arrives below flange 17 both pairs of contact members simultaneously spring apart. Upon the release of cap 21, pin 27 is returned to its original position in such manner as not to effect reclosure of the contact members.

It is to be understood that the embodiments of the invention described herein are only illustrative in nature, and in no way are intended to limit the scope and spirit of the invention.

What is claimed is:

1. A momentary contact switch comprising a deflection member having first and second flanges, said flanges being angularly disposed with respect to each other, said second flange disposed in a first plane, a pair of electrical contact members separably joined together, one of said contact members being spreadably affixed to said second flange, reciprocating means having a reciprocal movement in said first plane, and a pin affixed to said reciprocating means for engaging opposite surfaces of said first flange during reciprocal strokes of operation of said reciprocating means.

2. A momentary contact switch comprising a deflection member having first and second flanges, said flanges being angularly disposed with respect to each other, said second flange disposed in a first plane, a pair of electrical contact members separably joined together at one end thereof, one of said contact members being affixed to said second flange in such manner that a parallelepiped having said first and second flanges included in a pair of adjacent sides thereof would incase said contact members, reciprocating means having a reciprocal movement in said first plane, and a pin responsive to movement of said reciprocating means for engaging one surface of said first flange during one stroke of said reciprocating means and against the surface opposite to said one surface of said first flange during the reciprocal stroke of said reciprocating means.

3. A momentary contact switch comprising a housing, a deflection member having first and second flanges, said flanges being angularly disposed with respect to each other, a pair of electrical contact members pivotally joined together at one end thereof, one of said contact members being affixed to said second flange in such manner that a parallelepiped having said first and second flanges included in a pair of adjacent walls thereof would incase said contact members, a plunger reciprocally mounted in said housing, and a pin extending outwardly from said plunger, said deflection member and said plunger being disposed in such manner that during one reciprocating stroke of said plunger said pin exerts a momentary force on one surface of said first flange directed to effect closure of said contact members and during the reciprocal stroke of said plunger said pin exerts a force on the opposite surface of said first flange directed oppositely from said momentary force.

4. A momentary contact switch comprising a housing, a pair of contact members mounted in said housing, a deflection member pivotally affixed to one of said contact members, said deflection member being mounted to enable lateral movement of said deflection member toward and away from said contact members, a plunger mounted for reciprocal motion in said housing, said plunger and said deflection member being disposed with respect to each other such that the direction of reciprocal motion of said plunger is normal to the direction of lateral movement of said deflection member, and a pin extending outwardly from said plunger, said pin being disposed in such manner that during one reciprocating

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stroke of said plunger said pin momentarily drives said deflection member in one direction of lateral movement and during the reciprocal stroke of said plunger said pin drives said deflection plate in the opposite direction of lateral movement.

5. A momentary contact switch comprising a deflection member having first and second flanges, said flanges being angularly disposed with respect to each other, a plurality of pairs of electrical contact members pivotally joined together at one end thereof, each of said contact members being substantially parallel to each other, said deflection member being connected to an extreme one of said contact members in such manner that said second flange is mounted parallel with respect to said extreme contact member, a plunger mounted for reciprocal motion, a pin extending outwardly from said plunger,

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said deflection member and said plunger being disposed in such manner that during one reciprocal stroke of said plunger said pin exerts a momentary force on one surface of said first flange directed to effect motion of said extreme contact member in one lateral direction and during the reciprocal stroke of said plunger said pin exerts a force on the opposite surface of said flange directed oppositely from said momentary force, and means for transmitting said lateral motion of said extreme contact member to one of said contact members in each of said pairs of contact members.

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