

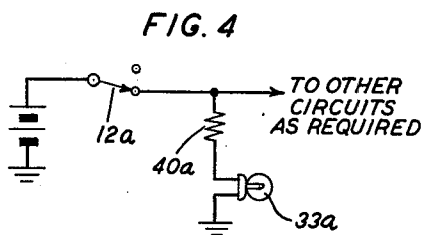
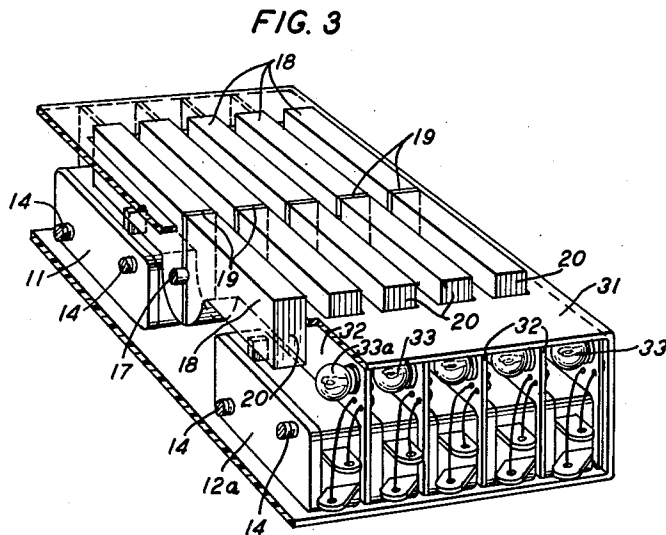
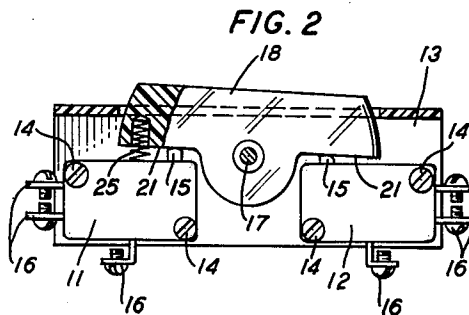
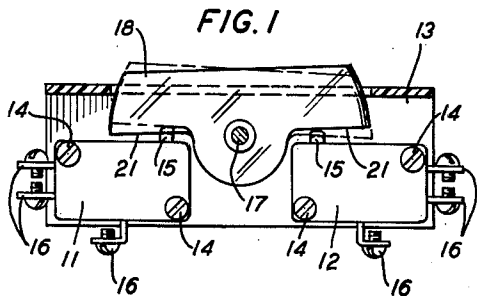
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ROCKER SWITCH ASSEMBLY

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ROCKER SWITCH ASSEMBLY

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1 Claim. (Cl. 200-167)

This invention relates to electrical switches, and more particularly to a switch assembly embodying a pair of "over-center" electrical switches which are selectively actuated by a common actuator.

The typical over-center type electrical switch comprises a push button or plunger, spring means of some sort for resiliently urging the plunger to an outwardly extending position, and an over-center spring, sometimes formed integrally with the said spring means. The over-center spring is "stable" in either one of two positions (i.e., when the plunger is fully extended or depressed), but "unstable" intermediate thereof. Thus, as the plunger is moved downward by the operator the condition of the over-center spring is changed from one of stability to one of increasing instability, until at the intermediate position it snaps, at a very high speed, to its other over-center stable condition. As pressure is released, the aforementioned spring means forces the plunger back to the normal extended position and the snap action of the over-center spring is thus repeated. The patents to G. M. Hausler, 2,332,911, issued October 26, 1943; W. A. Martin, 2,476,056, issued July 12, 1949; and A. P. Charbonneau, 2,526,850, issued October 24, 1950; and, for example, the commercially available "V3" switches of Micro Switch, a division of Minneapolis-Honeywell Regulator Company, exemplify the abovedescribed operation.

Over-center type electrical switches are very popular. They are simple, compact and rugged in construction, fast and reliable in operation, and they can be readily manufactured and assembled at low cost.

As exemplified by the cited patents, over-center type electrical switches include spring means for resiliently urging, and thereby returning, the plunger to the outwardly extended position. In the absence of such a spring means, it would be necessary to grasp the depressed button between the fingers and pull the same back to the said extended position; or, alternatively, some form of manual return means would have to be provided. However, while the addition of such a spring means readily solves the problem of plunger return, it prevents a bistable type of operation. That is, the depressed condition of the plunger is retained only so long as the operator exerts physical pressure on the same.

It is an object of the present invention to achieve an efficient bistable operation with snap-action over-center electrical switches.

A further object is to achieve a bistable rocker switch operation in electrical switches without the use of holding devices such as holding magnets, spring loaded ball detents, offset cam surfaces, and the like.

A still further object is to simplify the means and mode of operation of electrical switches, whereby such switches may not only be economically manufactured, but will be more efficient and satisfactory in use and adaptable to a wide variety of applications.

These and other objects are attained in accordance with the present invention wherein a pair of over-center type electrical switches are mounted on a mounting frame in proximity to each other. A rocker arm is pivotally mounted on said frame at a point equidistant between the push buttons of said electrical switches with the push buttons urged into resilient contact engagement with opposite ends of said rocker arm. The rocker arm is

capable of limited rotation in either direction about said pivot whereby either one of the push buttons may be depressed. The depressed push button is then retained in this position by the resilient force exerted against the opposite end of said rocker arm by the other push button. Since either button may be depressed and so retained, a bistable switching arrangement is thereby achieved.

In accordance with a feature of the present invention, the contact engaging surfaces of said rocker arm can be effectively shifted with respect to said push buttons to thereby achieve a "make" before "break" or a "break" before "make" mode of switch operation.

In accordance with another feature, an additional spring means is added to the switch assembly to normally bias the rocker arm in a predetermined direction. The actuation of the switch pair occurs as heretofore described, but the switch assembly is now monostable, i.e., a predetermined one of the pair of switches is normally in the actuated or depressed condition.

In a further embodiment of the present invention the rocker arm comprises ends of transparent material integrally joined to an intermediate section of opaque material. A light is mounted adjacent each of the ends of the rocker arm and an electrical energizing circuit for the same is completed through the associated switch adjacent each end. If a switch is in the "make" condition the associated light is energized and the light from the same is diffused in the adjacent end of the rocker arm to thereby provide a visual indication of the state of the rocker switch assembly.

Other features and advantages of the invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing in which:

FIG. 1 is a side elevational view of a bistable rocker switch assembly constructed in accordance with the principles of the present invention;

FIG. 2 is a side elevational view, partly in section, of a monostable rocker switch assembly in accordance with the invention;

FIG. 3 is a perspective view of a plurality of rocker switch assemblies and visual indicating means therefor; and

FIG. 4 is a circuit diagram useful in the explanation of the operation of the FIG. 3 embodiment of the invention.

Referring now to FIG. 1 of the drawing, a pair of over-center type electrical switches 11 and 12 are attached to a mounting frame 13 by screws or bolts 14 which extend through the switches and into the frame. The switches each include an operating plunger or push button 15 and connecting terminals 16 which are adapted to be suitably connected to external electrical circuits. While the switches illustrated are of the single-pole double-throw type, any other switch contact arrangement may be utilized herein.

The switches 11 and 12 can comprises any of the various types of over-center electrical switches known to those in the art. Typically, any of the above-cited patented switches can be advantageously utilized herein.

A characteristic common to over-center type electrical switches, and one that is utilized to advantage herein in accordance with the present invention, is the differential in the force exerted on the plunger by the internal spring means of the switch. That is, the total outward urging force that is exerted on the plunger is different for the two positions of the latter. The said force exerted on the plunger in its extended position exceeds that exerted in its depressed position. This force differential results from the action of the over-center spring. With the

plunger in its extended position, the over-center spring of the switch coacts with the plunger return spring means in urging the plunger to said extended position. However, when the plunger is depressed and the over-center spring is thereby snapped to the other over-center condition, the spring force exerted by the latter opposes that of the plunger return spring means. The spring force of the plunger return spring means must, of course, be the greater of the two so as to insure plunger return. This characteristic of over-center type switches is familiar to those skilled in the electrical switch art.

The over-center electrical switches 11 and 12 are disposed in proximity to each other on opposite sides of the pivot point 17 of rocker arm 18. The rocker arm is capable of limited rotational movement in either direction about the pivot point to thereby selectively depress either of the plungers 15. The rocker arm 18 is preferably formed of insulating material and it can be of any given configuration.

The internal spring means of the over-center electrical switches 11 and 12 urge the plungers of the latter into resilient contact engagement with opposite ends of the rocker arm 18. Either of the electrical switches can be actuated (i.e., the plunger can be depressed) by applying pressure against the appropriate end of the rocker arm 18. And the depressed plunger is then retained in this condition by the resilient force exerted against the opposite end of said rocker arm by the other plunger. The said other plunger, being extended, exerts a greater force against the rocker arm than the plunger that has been depressed. Accordingly, since either plunger may be depressed and so retained, a bistable switching arrangement is thereby achieved.

The switches 11 and 12 are preferably aligned with each other and equidistant from the pivot point 17. Further, the point in the travel of each plunger at which the aforementioned over-center snap action occurs should correspond to that of the other. That is, the said points should preferably lie in substantially the same horizontal plane. Now if, in the intermediate position of said rocker arm, the contact engaging surfaces 21 of said arm lie in substantially the same horizontal plane as that which includes the aforementioned points of snap action operation, the actuation of one switch will occur simultaneously with the release of the other and vice versa. Hence, a simultaneous "make" and "break" mode of operation is thereby achieved.

Alternatively, if in the intermediate position of said rocker arm the contact engaging surfaces 21 lie in a plane offset with respect to that which includes the aforementioned points of snap action operation, the actuation of one switch and the release of the other will not occur simultaneously. Accordingly, a "make" before "break" or "break" before "make" mode of switch operation can thus be achieved. For example, in FIG. 1, if in the intermediate position of the rocker arm the surfaces 21 lie in a horizontal plane somewhat above that which includes the said points of over-center snap action, both switches will be released for a finite period. Thus, as the rocker arm is rocked from one position to the other, the depressed plunger will be released prior to the actuation of the other. Thus, depending upon the particular internal electrical switch contact arrangement, a "make" before "break" or "break" before "make" mode of switch operation can be achieved.

The specific plane occupied by the contact engaging surfaces 21, for the aforementioned intermediate position of the rocker arm, can be determined most readily by appropriately locating the pivot point 17.

In the FIG. 2 embodiment of the invention, an additional spring means is added to the switch assembly to normally bias the rocker arm in a predetermined direction. Thus, the switch assembly is made monostable, i.e., a predetermined one of the pair of switches is normally in the actuated or depressed condition. The additional

spring means in this instance comprises a coil spring 25 which is disposed in a recess in one end of the rocker arm 18. The coil spring extends beyond the recess to resiliently engage the outer casing of the electrical switch 11. Accordingly, the rocker arm is biased in the illustrated manner to thereby depress the plunger of switch 12. Pressure applied to the recessed end of the rocker arm will, of course, reverse the switch conditions, but as this pressure is subsequently released the switch assembly will revert to the "normal" illustrated state.

Turning now to FIG. 3 of the drawing, a plurality of switch assemblies, such as shown in FIG. 1, are mounted side by side within a casing 31 formed preferably of insulating material, portions of said casing being cut away for purposes of illustration. The mounting bolts or rods 14 extend through the juxtaposed switches as shown. A thin sheet of opaque material 32 is disposed between each of the juxtaposed assemblies, and small light bulbs 33 are mounted on the same adjacent each of the ends of each rocker arm.

The rocker arms each comprise end portions formed of transparent insulating material (e.g., methyl methacrylate) integrally joined to an intermediate section 19 of opaque insulating material. The end surfaces 20 of the rocker arms are preferably glossed.

An electrical circuit, such as shown in FIG. 4, serves to energize a given light bulb when the electrical switch adjacent the same end as said bulb is switched to a predetermined (e.g., "make") condition. Thus, for example, if the switch 12a of FIG. 3 is in its "make" condition part of the energizing current that is thereby delivered to external circuits is coupled to the light bulb 33a via a current limiting resistor 40a. The light from the energized bulb passes into the adjacent end of the associated rocker arm and is diffused therein to thus provide a visual indication of the position of the same. The opaque section 19, of course, prevents passage of the light to the other end of this rocker arm.

A plurality of juxtaposed assemblies, such as shown in FIG. 3, can be utilized to manually set up a binary number or "word" input to computer memories and the like. The binary number or word input will be visually indicated from a front panel by respective illuminated halves of each rocker arm.

It is to be understood, therefore, that the above-described embodiments are merely illustrative of the principles and application of the present invention. Numerous other arrangements and modifications may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

A switch assembly comprising a casing of insulation material, a plurality of electrical switches within said casing juxtaposed in two rows with each switch having its match in the opposite row so as to constitute a plurality of opposed switch pairs, each of said electrical switches including a plunger and means for resiliently urging said plunger to an outwardly extending position, said resilient means including over-center spring means which adds to the outward urging force exerted on said plunger when the same is in its extended position and subtracts from said force when the plunger is depressed whereby the said force exerted on said plunger in its extended position exceeds that exerted in its depressed condition, sheets of opaque material disposed between said switch pairs so as to optically isolate each of said switch pairs from adjacent switch pairs, bolts extending through the juxtaposed switches for the purpose of fixing the position of said switches and said sheets of opaque material within said casing, a plurality of rocker arms equal in number to said switch pairs, each of said rocker arms comprising ends of transparent material integrally joined to an intermediate section of opaque material, a single rod passing through said rocker arms at a point equidistant between the plungers of said switch pairs, the plungers

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of said switch pairs being urged into resilient contact engagement with respective ends of said rocker arms irrespective of the positions assumed by the same, said casing having apertures therein which permit each of said rocker arms to protrude from said casing thereby allowing each of said rocker arms to be manually rotated in either direction about said rod in order to depress either of said plungers in any one of said switch pairs, a depressed plunger being retained in this condition by the resilient force exerted against the opposite end of the rotated rocker arm by the other plunger of the switch

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pair, a light mounted adjacent each end of each rocker arm, and electrical circuit means for energizing a light when the plunger of the electrical switch adjacent the same end as said light is depressed.

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