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A. P. BOYLAN ET AL

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SWITCH

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FIG. 2

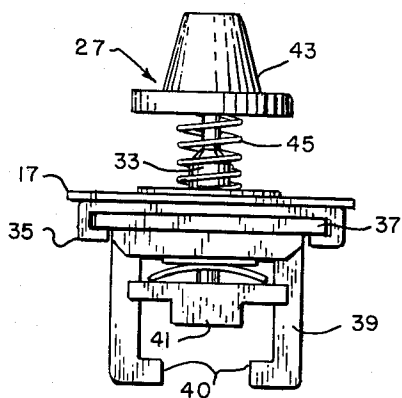


FIG. 3

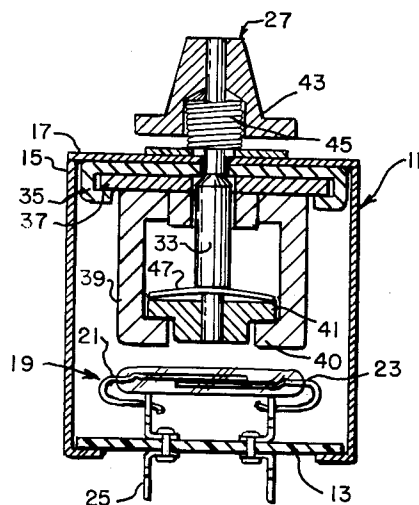
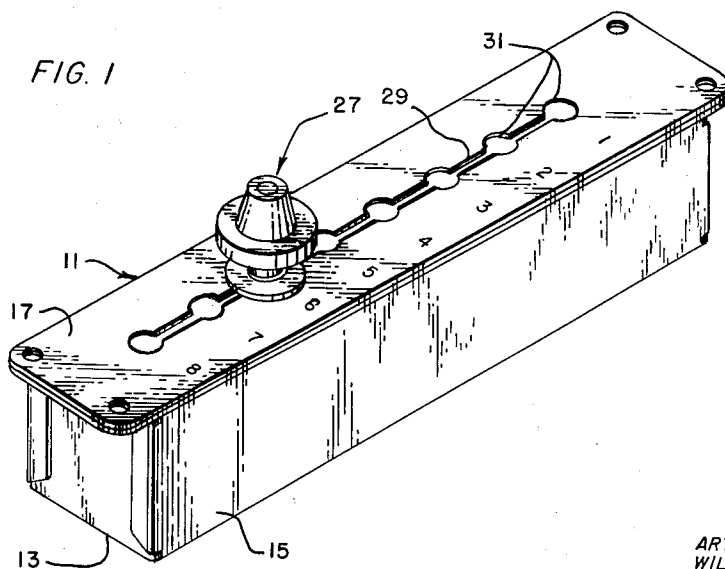


FIG. 1



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3,012,116
SWITCH

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5 Claims. (Cl. 200—87)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to switching devices and more particularly to devices for controlling a plurality of electrical circuits. The circuit controlling device of the present invention utilizes, in part, a pair of overlapping magnetizable electrodes or elements, such as magnetic dry reed elements, sealed in a vessel and having an outside actuating means such as a permanent magnet to effect engagement or disengagement of the magnetic electrodes to effect a switching function. In those instances where a multiplicity of switching devices are to be controlled independently, in instances where a magnet is used to energize the reeds, it has been found that discrete control of each pair of reeds presents a problem.

It is therefore an object of the present invention to provide a selector switch in which switching from one circuit to another, in a closely aligned multi-switching device can be readily accomplished without any possibility of effecting the completion of any undesired circuits.

Another object of the invention is to provide a more versatile magnetic operated switching device which is contained in a single container.

Another feature of the invention pertains to the provision of a movable magnetic element to provide discrete multi-position switching in such manner that positive indexing is assured at all times.

Another feature of this invention pertains to the provision of means for making automatic control of actuation in a multi-position switching arrangement.

The above mentioned objects and features of the invention along with other objects and features of the invention will become more apparent from the following detailed description of the invention to be read in connection with the drawings in which:

FIG. 1 is a view in perspective of the multi-position selector switch incorporating therein magnetic reed contact capsules;

FIG. 2 is a cross sectional view of the switching device showing the actuator assembly in one stage of its operation; and

FIG. 3 is a partial view of the switch, and showing the actuator assembly in its other stage of operation.

A preferred embodiment of the multi-position selector switch is shown in FIG. 1 and includes a housing or container 11 of general rectangular configuration preferably made of non-magnetic material. The container 11 is made up of a U-shaped body portion having a base 13, side walls 15, and a cover plate 17. The base 13 serves as a support means for a plurality of aligned magnetic reed capsules 19. Such capsules are hermetically sealed by the use of a non-magnetic inclosure, such as glass, or potted by the use of an epoxy resin or the like. Within the capsules 19 are opposing magnetic reeds 21, 23. The reeds are plated with any suitable contact metal, as is common in the art, and provided with leads which are extended through the capsule and suitably secured to terminals 25 that are linked to remote electrical circuits. As indicated above, a plurality of capsules 19 are provided in the container 11, and the number of such capsules is limited only by the type of switching arrangement desired, since any number of such capsules can be incorporated.

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For energizing the reeds 21, 23, there is provided a combined index and actuator assembly generally designated as 27 and which is slidably engageable in the cover plate 17 of the compartment 11. To allow such sliding movement of the assembly 27, the cover plate 17 is provided with a longitudinal slot 29 and further characterized by having a series of spaced opposing semi-circular cutouts in the slotted portion of the plate. By this arrangement, as can be seen in FIG. 1, there is provided a continuous slot of a non-uniform width, i.e., having a relatively narrow width throughout most of its length and with circular openings 31 at spaced intervals of greater diameter than the width of the slotted portion.

The assembly 27 includes, in part, a shaft 33 of non-uniform diameter, i.e., having a mid-portion of a diameter that is larger than the remainder portions on either side of said mid-portion as can be seen in FIGS. 2 and 3. The diameter of the widened mid-portion of the shaft 33 is slightly smaller than the diameter of the openings 31 but greater than the width of the slot 29, while the diameter of the upper narrower portion of the shaft is slightly less than the width of the slotted portion 29. By such arrangement it is obvious that the movable slidable shaft 33 is free to ride lengthwise in the slot 29, such as shown when in its position as shown in FIG. 3, and locked or unmovable when the wider portion of the shaft is confined in any of the openings 31, such as shown in its position as portrayed in FIG. 2.

Secured lengthwise to the underside of the cover plate 17 is a channel shaped member that forms guide racks 35 which serves to support the assembly 27 and along which the assembly 27 can be moved.

Forming part of the assembly 27 is a bearing plate 37 which is slidably engageable in the rack 35. Secured to the underside of the plate 37 is a U-shaped permanent magnet 39 characterized in having the ends of its legs bent slightly inwardly as shown at 40 and having a spacing between the ends of said inwardly turned legs as shown in FIG. 2. It is obvious that the member 35, plate 37 and the magnet 39 are provided with bores therein of sufficient diameter to accommodate the wide portion of the shaft 33.

Secured to the bottom of the shaft 33 is a metallic T-shaped keeper 41 which serves as a magnetic flux shorting bar as hereinafter described. The keeper 41 is shaped in the form of the letter H wherein the ends of the arms surround the discrete legs of the magnet 39. The shaft 33 is so positioned within the assembly 27 that when the shaft is in the position shown in FIG. 3 the keeper 41 rests substantially within the spacing between the ends of the legs of the magnet 39. Completing the assembly 27 is an actuator button 43 and a coil spring 45 that partially surrounds the shaft between the plate 17 and the button 43 and which serves to normally urge the shaft upward as shown in FIG. 2.

In the utilization of the switching device of this invention, reference is made to FIG. 1 which shows the actuator and indicator assembly in location No. 6 (shown on the cover plate). At such time the component parts of the assembly are as shown in FIG. 2 with the spring 45 urging the actuator button 43 and its shaft 33 upwardly thereby holding the keeper 41 spaced from the bottom end of the magnet 39. In such position the magnet 39 provides the necessary magnetic field to actuate the reeds 21, 23, within the particular capsule 19 that is positioned below the magnet assembly. It is obvious that the locations 1-8 and their associated capsules should be spaced sufficiently apart so that stray magnetic forces should not be able to actuate any of the capsules adjoining the specific capsule that is desired to be actuated. It is to be further observed that when the actuator assembly 27 is in the position shown in FIG. 2, the wide part of

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the shaft 33 is confined in one of the openings 31. In such position the assembly 27 cannot be moved along the slot 29 as the narrow slot cannot accommodate the wide portion of the shaft. When it is desired to actuate the reeds within another capsule, the button 43 is urged downward thereby moving the wide portion of the shaft out of engagement from the opening 31 and the upper narrow portion of the shaft can be slidably moved through the length of the slot 29. At the moment the button 43 is urged downward, as is shown in FIG. 3, the keeper 41 becomes engaged with the leg portions 40 of the magnet 39. To further aid in centering and positioning the keeper a leaf spring 47, confined between the arms of the magnet, is provided. In such position the magnetic flux circuit is completed through the keeper 41 and accordingly no magnetic force is exerted upon the reeds of the capsules. Obviously no switching of the reed elements is accomplished when the actuator assembly is moved from location to location.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment set forth herein, it is to be understood that all matter hereinbefore set forth or shown in the drawings is to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A magnetically operated switching device comprising in combination a housing, a plurality of spaced aligned discrete pairs of magnetic reed elements in said housing, each of said pairs of reeds being linked to discrete electrical circuits, means for separately magnetizing any one discrete pair of said reeds comprising a slidable permanent magnet within said housing and adapted to be locked in position over any one pair of magnetic reed elements to activate said reeds and its associated electrical circuit, and further including means for short circuiting the magnetic flux produced by said magnet.

2. A magnetically operated multi-position switching device comprising in combination a housing, a plurality of spaced aligned discrete pairs of magnetically operated contacts in said housing, each of said pairs of contacts being linked to discrete electrical circuits, means for separately actuating any one discrete pair of contacts comprising a slidable U-shaped permanent magnet in said housing and adapted to be locked in position over any one pair of contacts to activate said contacts, and further

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including a keeper adapted to become engaged between the open end of said magnet for short circuiting the magnetic flux produced by said magnet.

3. A magnetically operated multi-position switching device comprising in combination a housing having a base portion, side walls and a cover plate having a slotted passageway and spaced openings forming part of said passageway that are of a width greater than said passageway, a plurality of magnetically operated spaced pairs of contacts secured to the base of said housing, each of said pairs of contacts being linked to discrete electrical circuits, means for separately actuating any one discrete pair of contacts comprising a U-shaped permanent magnet affixed to a shaft slidably engageable in the slotted passageway of said cover plate and adapted to activate said contacts when said magnet is locked in position over any one pair of contacts and further including a keeper adapted to become engaged between the open ends of said magnet for short circuiting the magnetic flux produced by said magnet.

4. A magnetically operated multi-position switching device comprising in combination a housing having a base portion, side walls and a cover plate having a slotted passageway and a plurality of spaced openings forming part of said passageway that are of a width greater than said passageway, a plurality of magnetically operated spaced pairs of contacts secured to the base of the housing, each of said pairs of contacts being linked to discrete electrical circuits, a combined actuator and selector means for separately actuating any one discrete pair of contacts comprising a shaft slidably engageable in said passageway having a mid-portion diameter greater than the diameter of said shaft at its ends, a movable bearing plate supported in guide rails in said housing, a U-shaped permanent magnet affixed to said bearing plate and movable therewith adapted to actuate any one pair of contacts when said magnet is positioned directly over said pair of contacts, and means affixed to the confined end of said shaft in said housing for short circuiting the magnetic flux produced by said magnet.

5. A device of the kind set forth in claim 4 and further including spring means for normally urging said short circuiting means away from the magnetic field producing ends of said magnet.

No references cited.