United States Patent

Lockard et al.

[15] **3,699,279**

[45] **Oct. 17, 1972**

[54] **ROTARY SWITCH WITH IMPROVED PRINTED CIRCUIT CONTACT AND TERMINAL CONNECTION ARRAY**

[72] Inventors: **Joseph L. Lockard; William Henry Rose,** both of Harrisburg, Pa.

[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

[22] Filed: **Feb. 26, 1971**

[21] Appl. No.: **119,273**

[52] **U.S. Cl.**.....**200/11 G,** 200/11 DA, 200/166 CT

[51] **Int. Cl.**.....**H01h 1/58,** H01h 19/58

[58] **Field of Search**..200/11 C, 11 DA, 11 E, 11 EA, 200/11 G, 166 PC, 11 TW, 166 CT

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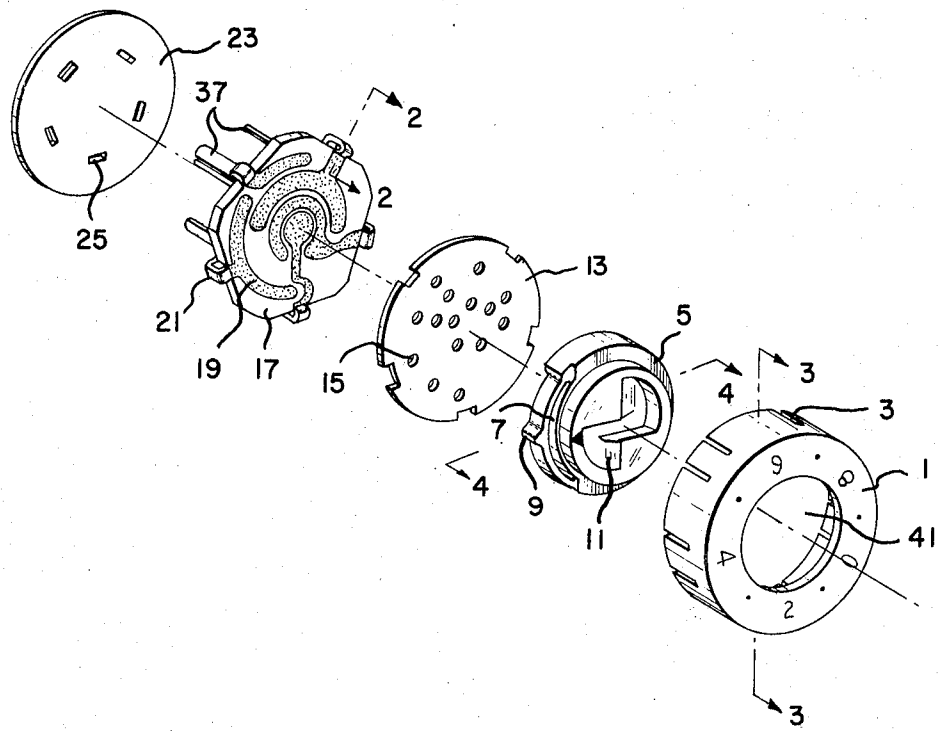
Primary Examiner—J. R. Scott

Attorney—William J. Keating, Ronald D. Grefe, Gerald K. Kita, Frederic W. Raring, Jay Seitchik, John R. Flanagan and Allan B. Osborne

[57] **ABSTRACT**

The disclosure relates to a rotary switch wherein a brush is rotatable to a predetermined number of discrete positions, each position setting up a coded output through a printed circuit by means of brushes and a code disc. The construction provides a very compact switch which is easily operated by a coin, key, finger or the like.

9 Claims, 9 Drawing Figures



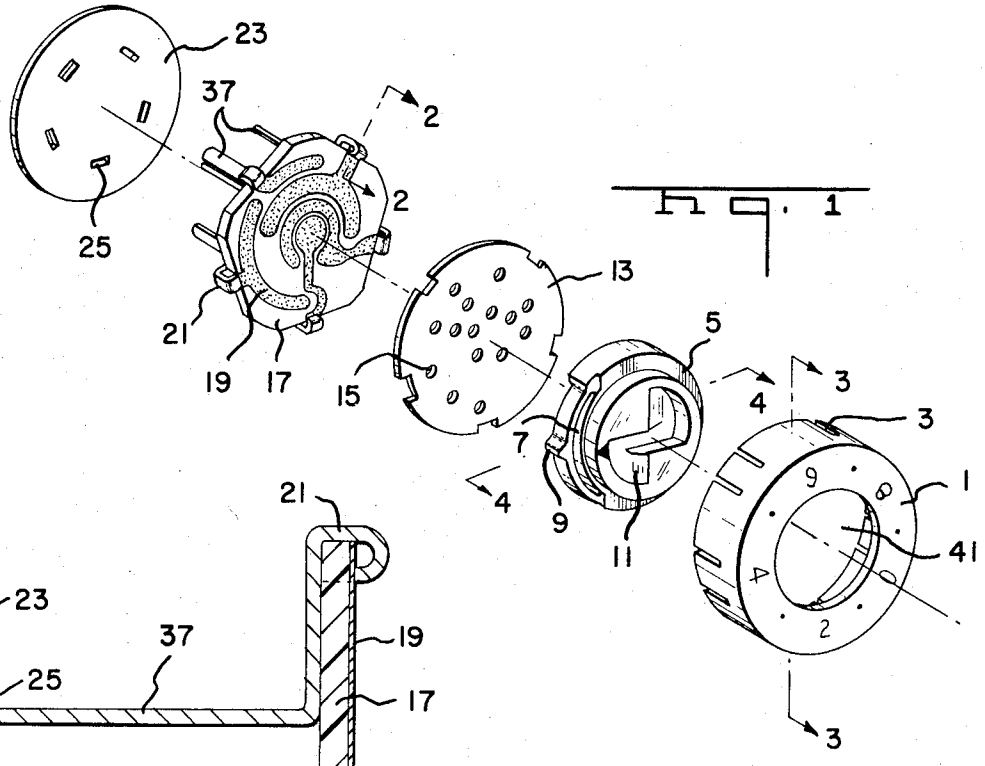


Fig. 1

Fig. 2

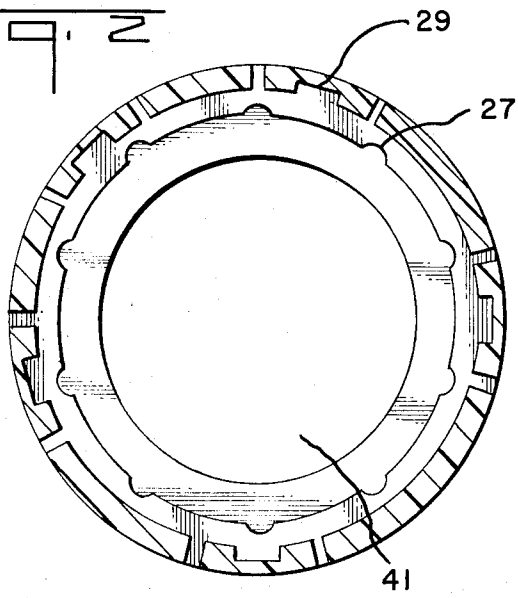


Fig. 3

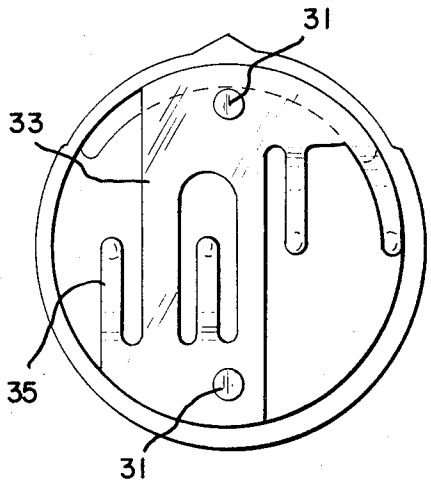


Fig. 4

Fig. 5

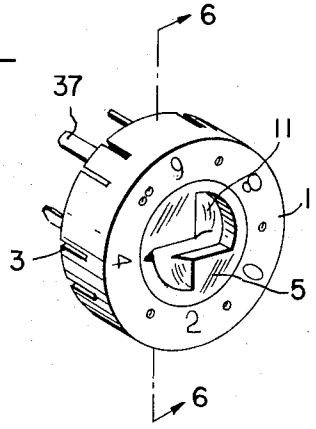


Fig. 6

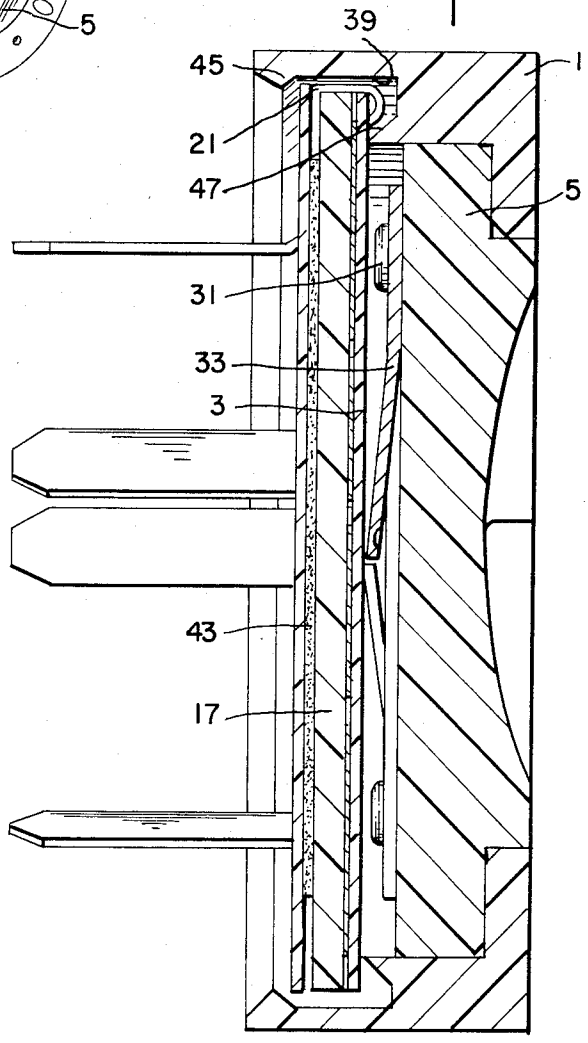


Fig. 7

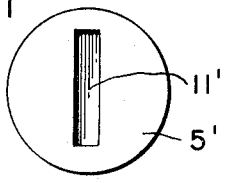
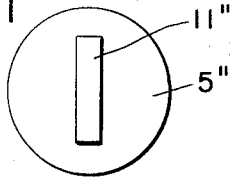


Fig. 8



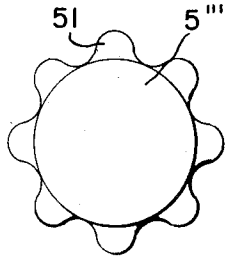


Fig. 9

ROTARY SWITCH WITH IMPROVED PRINTED CIRCUIT CONTACT AND TERMINAL CONNECTION ARRAY

This invention relates to a rotary switch and more particularly to a rotary switch capable of providing a unique coded output in response to individual rotary settings of a brush housing.

Rotary switches which are capable of providing a coded output, indicative of the rotary setting of the switch are well known in the art. However, there has been a problem in attempting to use such switches, especially in conjunction with printed circuit boards in that the rotary switches have been of relatively large profile and difficult to operate, especially where space is at a premium.

In accordance with the present invention, the above noted problems of prior art rotary switches is materially reduced by provision of a rotary switch having a low profile. The rotary switch in accordance with the present invention can be no higher than other components mounted on a printed circuit board.

Briefly, the above is accomplished by utilizing a printed circuit having a center common conductive region and curved region therearound indicative of values "1," "2," "4" and "8." By use of a coded disc over the printed circuit, a brush having spring fingers can be rotated over the coded disc to provide the desired output. The rotary switch is ideally suited for programming logic functions in machine tools, test equipment, computers, input terminals and the like.

It is therefore an object of this invention to provide a rotary switch having low profile relative to prior art rotary switches.

It is a further object of this invention to provide a rotary to binary code conversion switch which has low profile relative to prior art switches.

It is a yet further object of this invention to provide a relatively economical rotary switch converter of low profile.

The above objects and still further objects of the invention will immediately become apparent to those skilled in the art after consideration of the following preferred embodiments thereof, which are provided by way of example and not by way of limitation, wherein:

FIG. 1 is an exploded view of the switch in accordance with one embodiment of the invention;

FIG. 2 is a view taken along the line 2—2 of FIG. 1;

FIG. 3 is a view taken along the line 3—3 of FIG. 1;

FIG. 4 is a view taken along the line 4—4 of FIG. 1;

FIG. 5 is a view of the switch of FIG. 1 in assembled condition;

FIG. 6 is a view taken along the line 6—6 of FIG. 5;

FIG. 7 is a front view of a second embodiment of the switch in accordance with the present invention;

FIG. 8 is a front view of the switch in accordance with a third embodiment of the invention; and

FIG. 9 is a front view in accordance with a fourth embodiment of the invention.

Referring first to FIG. 1, there is shown an exploded view of the rotary switch in accordance with the present invention. The switch includes a case 1 having a plurality of slits 3 spaced therearound to provide a spring action to the sides of the case 1 and allow the switch components to be easily snapped therein. At the interior of the case 1 are a plurality of notches 27 (FIG. 3) for receiving the detent 9 of the rotary brush housing 5 that will be explained hereinbelow. The case 1 also includes a plurality of notches 29 therein for orienting a printed circuit board 17 and preventing rotation thereof in the case as will be explained in more detail hereinbelow. The rotary brush housing 5 includes the detent 9 and an annular aperture 7 which provides a spring action to the detent member 9. Also provided in the rotary brush housing is a groove 11 for receiving a coin or the like for rotating the housing 5 during operation. The rear of the housing 5 includes a pair of posts 31 integral with the housing upon which a brush 33 having fingers 35 is staked.

The switch also includes a coded sheet 13 of insulating material such as Mylar, having apertures 15 therein in predetermined locations to provide the desired coding. Also included in this switch is a printed circuit board 17 having a printed circuit conductive path 19 thereon and a plurality of printed circuit connectors 21 attached to the several portions of the printed circuit 19 in spring like manner. This eliminates the necessity of bringing the paths 19 to the edge of the printed circuit board 17 for mating with an edge connector. Referring more specifically to FIG. 2 the printed circuit connector 21 is mounted over the printed circuit boards 17 in a spring like action and abuts the conductive path 19. The finger portion 37 of the printed circuit connector 21 extends through a plurality of aligned apertures 25 formed in the connector support 23 which fits over the printed circuit connector 21 as will be explained in more detail hereinbelow.

Referring now to FIGS. 5 and 6, there is shown the rotary switch in accordance with the present invention in assembled state. It can be seen that the case 1 includes an annular region 39 which receives the assembled portions of the switch as will be explained. The rotary brush housing 5 abuts against the front surface of the case 1 and extends partially through the aperture 41 (FIG. 3) formed in the case 1. The brush 33 can be seen secured thereto as shown in greater detail in FIG. 4. The code sheet 3 abuts the brush 33 and also abuts the printed circuit board 17. The rear of the printed circuit board 17 is secured to the connector support 23 by an epoxy material 43 to provide extra mechanical strength to the printed circuit connectors 21. It can be seen with reference to FIG. 6 that each of the coded sheet 13, printed circuit board 17 and connector support 23 are secured in the annular region 39 of the case 1 between the flange 45 and the flange 47, thereby locking these elements within the case 1 for operation. This locking action is enhanced by the slits 3.

In operation, the rotary switch of FIGS. 5 and 6 will be placed into a printed circuit board or the like wherein the fingers 37 can be placed into apertures of the board for connection for electrical connection therewith. Various coded numeric configurations can now be provided by rotation of the rotary brush housing 5 within the case 1. The rotary brush housing 5 rotates within the case 1, the detent 9 continually locking within notches 27 in the case 1, each of said notches 27 representing a different one of the numbers located in the front of the case 1. It can be seen that, as the rotary brush housing 5 rotates, the brush and the fingers 35 thereon will mate with preselected ones of the apertures 15 in the coded sheet 13, thereby providing a potential to only predetermined ones of the con-

ductive segments 19 on the printed circuit board 17. Thereby, in well known manner, a coded signals will be provided indicative of the number selected on the rotary switch.

With reference now to FIG. 7, there is shown a second embodiment of a rotary brush housing 5'. This housing 5' includes a notch 11' for use with a coin, screwdriver or the like for rotation thereof.

Referring now to FIG. 8 there is shown a third embodiment of a rotary brush housing 5'' having a raised blade portion 11'' which can be grasped with the fingers and rotated for operation of the rotary switch.

Referring now to FIG. 9 there is shown a rotary brush housing 5''' wherein a thumb wheel 51 is secured around the periphery of the housing 5'''. Rotation of the thumb wheel 51 by means of the fingers or the like will rotate the rotary brush housing 5''' in the manner above described.

It can be seen that a relatively inexpensive and very compact and low profile rotary switch is provided which is capable of providing coded output signals indicative of the numeral or character selected on the face of the switch.

Though the invention has been described with respect to specific preferred embodiments thereof, many variations and modifications thereof will immediately become apparent to those skilled in the art. It is therefore the intention that the appended claims be interpreted as broadly as possible in view of the prior art to include all such variations and modifications.

What is claimed is:

1. A rotary switch which comprises a housing, rotatable means positioned and rotatable in said housing, means responsive to rotation of said rotatable means to provide a coded output, said means comprising a printed circuit board having discrete conductive paths thereon and conductive fingers secured to said rotatable means for contacting preselected ones of said conductive paths, wherein said rotatable means comprises a substantially disc-shaped member defining an annular aperture closely paralleling the outer edge thereof extending partially therearound to provide a spring member, wherein said housing includes plural spaced notches abutting the outer edge of said rotatable member and an outwardly extending detent on said spring member for mating with said notches, further including conductive spring means frictionally connected to both sides of said printed circuit board and positioned over one of said discrete conductive paths, wherein said housing includes a plurality of slits extending to one edge thereof and parallel to the axis thereof to provide a spring action thereto and means in said housing for locking said rotatable means, and said means to provide a coded output therein, further including an insulating sheet positioned between said conductive paths and said conductive fingers, said sheet having apertures therein in preselected locations to permit contact of said conductive fingers with preselected ones of said conductive paths.

2. A rotary switch as set forth in claim 1 further including an insulating support secured to the side of said printed circuit board opposite said conductive paths, said support having apertures therein, said conductive spring means extending through said apertures in said support.

3. A rotary switch, comprising: a housing of insulation material, said housing being generally cylindrical and provided thereon with a circumferentially protruding detent and a protruding rotary portion, said housing further being provided with a brush of conducting material, said brush being provided with a plurality of conducting fingers, a printed circuit board provided thereon with a plurality of conducting circuit paths selectively engageable by said conductive fingers, each of said paths terminating adjacent a peripheral edge of said printed circuit board, a plurality of electrical contacts, each of said electrical contacts being fabricated from an electrically conducting material and provided with a hook portion and a finger portion, the hooked portions of said contacts being received over said peripheral edge of said printed circuit board and electrically engaging a corresponding conducting circuit path, a plate-shaped connector support of insulation material overlying said printed circuit board and provided with a plurality of apertures respectively receiving therethrough said finger portions of said electrical contacts, a generally cylindrical case of insulation material having a first recessed portion receiving said housing therein, said first recessed portion being provided with a plurality of circumferentially spaced first notches selectively receiving said detent therein, said case being provided with a central aperture receiving therethrough said protruding portion of said housing, said case including a second recessed portion receiving said printed circuit board therein, said case further receiving said connector support therein, said case further including flange means latchably overlying said connector support and retaining said connector support and said printed circuit board and said housing internally of said case.

4. The structure as recited in claim 3, and further including a sheet of insulation material having a plurality of apertures therethrough, said sheet being interposed between said contact fingers of said brush and said printed circuit board, said apertures provided in said sheet selectively overlying respectively said conducting paths on said printed circuit board and selectively receiving respectively said fingers of said brush therein to allow electrical contact between said fingers and said conducting paths.

5. The structure as recited in claim 3, wherein said case is further provided with a plurality of slits which are circumferentially spaced on said case together with said second notch portions, said flange means includes a plurality of flange portions respectively located between a pair of said slits and adjacent to at least one of said second notch portions for latchably overlying said connector support adjacent said second notch portions.

6. The structure as recited in claim 5, wherein said flange portions are provided integrally on said case.

7. The structure as recited in claim 3, wherein said case is further provided with a flange protruding toward said flange means and located between said first recess portion and said second recessed portion of said case, said printed circuit board and said connector support being secured in said case between said flange and said flange means.

8. The structure as recited in claim 3, wherein said first recessed portion of said case communicates with

said second recessed portion of said case, and said aperture of said case communicates with said first recessed portion of said case.

9. The structure as recited in claim 3, wherein, said second recess of said case includes a plurality of second notches for orienting said printed circuit board and preventing rotation thereof in said case.

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