May 14, 1968 E. V. MANDEL 3,383,478

ROTARY SWITCH WITH RADIALLY DISPLACED PRESSURE CONTACT POINTS

Filed Feb. 28, 1966

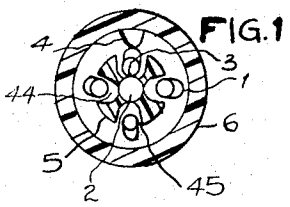


FIG.1

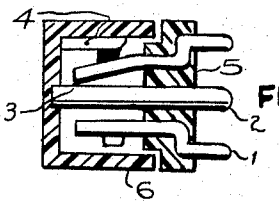


FIG.2

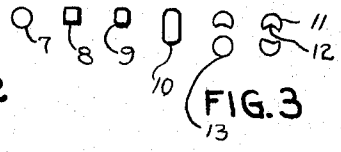


FIG.3

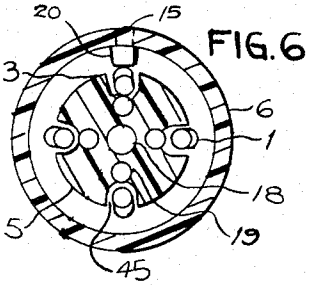


FIG.6

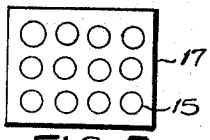


FIG. 5

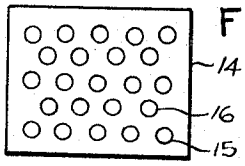


FIG.4

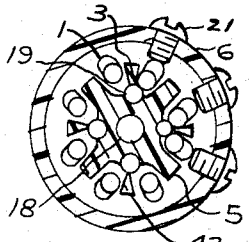


FIG. 7

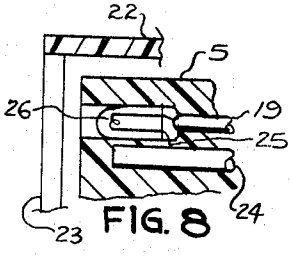


FIG. 8

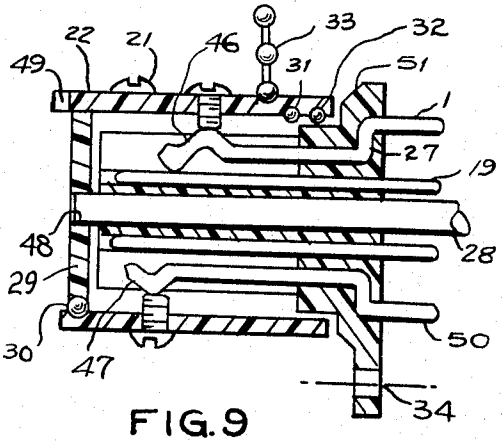


FIG.9

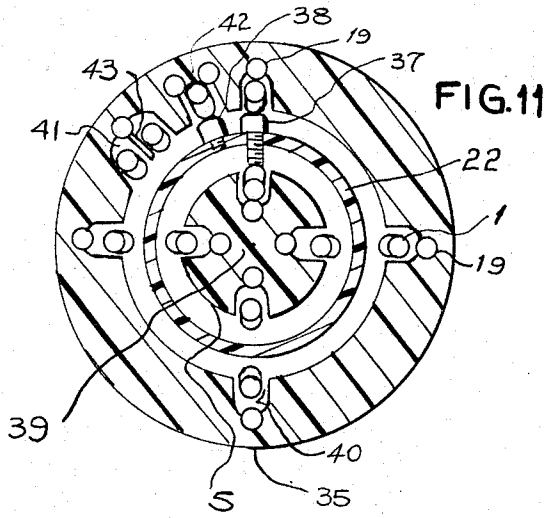
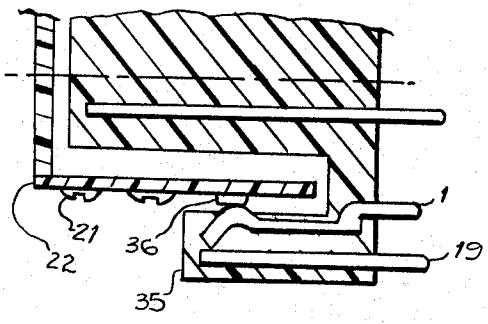


FIG.11

FIG. 10



INVENTOR.

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ROTARY SWITCH WITH RADIALLY DISPLACED PRESSURE CONTACT POINTS

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34 Claims. (Cl. 200—8)

ABSTRACT OF THE DISCLOSURE

A rotary multiple switch having an external pressure-pip-carrying-drum programmable for selectively actuating the individual switches.

This invention relates to multiple pole electrical switches and in particular to a switch capable of being readily mounted and connected to multiple electrical circuits, and in which the sequencing of switching may be altered, and to contain all this, for many applications, within the normal sized control knobs in common use.

Plug in construction for mounting and electrical connection reduces labor requirements and permits interchangeable units for repair or for function change.

Further improvements in switches will be apparent from the verbal and graphic illustrations and claims.

This multiple switch provides a high level of insulation between adjacent switches. For compact installations this multiple switch provides high switch density and occupies no more space than a control knob. This multiple switch is capable of being programmed. The programming may be changed while the switch is in use or other program drums may be readily substituted.

In the attached drawings which illustrate some particular embodiments without restrictive limitations, like reference characters designate like parts throughout the several views. Unless specifically so described, shapes as shown on drawings are representational only and not geometrically restrictive.

FIGURE 1 shows a radial cross section of a common central element switch.

FIGURE 2 shows an axial cross section of a common central element switch with an integral pressure pip.

FIGURE 3 shows several shapes of wire.

FIGURE 4 shows a developed layout of a staggered pattern pressure pip carrying drum.

FIGURE 5 shows a developed layout of a pressure pip carrying drum.

FIGURE 6 shows a radial cross section of four switches.

FIGURE 7 shows a radial cross section of four double throw switches.

FIGURE 8 shows a partial axial cross section to show an indicating light.

FIGURE 9 shows an axial cross section of a multiple programmable switch.

FIGURE 10 shows a partial axial cross section showing external and internal switches.

FIGURE 11 shows a radial cross section showing external and internal switches.

In FIGURES 4 and 5, the circles shown could be square or any other shape.

The term "pressure pip" as here used in functionally equivalent to a cam surface and may be geometrically specified. A pressure pipe may be an integral or otherwise

permanent part of a drum, a semi-permanent part such as a rivet, or a removeable and replaceable part such as a screw. The staggered pattern pressure pip layout shown permits of more programming positions.

Two typical switch embodiments will now be described. A rotary selector switch with a common central element and a single pressure pip on the inside of a rotatable cylindrical drum, such as is shown in FIGURES 1 and 2. This switch comprises a fixed block **5** mounting several straight **2** or offset bent **1** elements and a rotatable drum **6**.

A rotary field programmable switch with several electrically separate switches and many pressure pips on the inside of a rotatable cylindrical drum such as is shown in FIGURES 7 and 9. For easy insertion and removal of pressure pips, common machine screws may be used. This switch differs from the one described above by having more conductive elements arranged in a different pattern and a bigger drum with many pressure pips in several planes.

Rotatable drum **6**, **14**, **22** is indexed, thereby bringing a new point on the drum adjacent to the moveable conductive element. If a pressure pip is present at that point on the drum, the moveable element will be radially deflected into contact with the fixed element, thereby closing the switch and completing the electrical circuit.

The stationary switching elements **2** and **19** are contacted by the moving element **1** at points **3** when depressed by the integral pressure pip **4** or rivet head **20** or screw point **21** or **37** or screw head **38** mounted in holes **15** of rotatable drums **6**, **14**, **17**, **22**, said pressure pips being located in single planes as **4** or in multiple planes as **14**, **17** and FIGURE 9. The switching position or sequence is changed by rotating the drum **6**, **22** on the stationary insulating block **5** or the bearings **32** or the shaft or axle **28** and its surface **48** with or without slip clutch **30**. The drum may be indexed manually or by screwdriver slots **49** or by a motor or solenoid via shaft **28** or by belt or chain such as bead chain **33** or by meshing gears or by a crank linkage, or a geneva or other known drives with positive indexed location by detent **31**. For convenience, a central grounding lead **18** or a through hole for wiring **18** can be provided in the insulating block **5**. The switch can be mounted to a panel or chassis in various known ways: by plugging into a printed circuit board or an electrical connector, or by attaching by screws or rivets through holes **34**, or by a big nut and thread. Electrical connections to external circuits can be effected by plug in, by pushing contacts onto the ends **50** of the contact elements **1**, **2**, and **19**; by wire wrapping ends **50**, by soldering to ends **50**, or by any other known method of wiring and connecting. The variously shaped wires shown in FIGURE 3 can be used for convenience in plug in, in wire wrapping and the concave wire **11** will improve electrical contacting action. The drum end may be closed as in FIGURE 2 or open as **23** or closed with a separate piece as **29**. When using indicating lights **26** which may be electrically attached to common lead **24** and to switch element **19**, the end **23** of the drum **22** may be open or transparent or at the least translucent. Drum and switch positions can also be easily read by marking the end **29** or circumference **22** of the drum and the bezel **51** on the insulating block **5**.

In FIGURE 9, **46** and **47** show different locations of

pressure pads on conductive elements 1 which are therefore depressed by pressure points in different planes. The individual switches are variously shown as single pole with common element in FIGURE 1, single pole in FIGURE 6, double throw in FIGURE 7, and the above plus double pole 42 in FIGURE 11. In FIGURE 7, the outer layer contains more conductive elements 1 than the inner layer 19. The limited clearance on the side of the slot is shown at 40 and the air gap between elements at 41 and the insulator between the elements of a double throw switch at 43. It should be noted in FIGURE 10 that the drum 22 may be extended past the encircling insulating block 35 if desired for manual operation. Otherwise the drum may be indexed as discussed above. In FIGURE 10, the outer layers of conductive elements are shorter than the inner layers to permit of access. The pressure pips may be made in various ways: as integral parts of the drum, as permanent riveted attachments, as removable screws, with heads shaped as desired or no heads at all or in any other manner. The indicating lights where used can have symbols or designations as desired and either the light itself or the front of the switch drum can have an optical magnifier. The conductive elements can be straight as 19 or offset as 27 on 1, the offset being for convenience in mating dimensions with standard electrical connectors and printed circuit boards and for convenience in wiring and to secure the element in insulating block 5. The switch element itself can be bent as at 46 and 47 or can have contacts and pressure pads welded or otherwise attached. The terminations 1, 2, 19, 28, 50 may be of variable thicknesses and lengths.

As can be seen, there are many variations possible by combining known concepts of the prior art with this basic switch construction. The essence of this switch is a small programmable plug in device.

Of course, various generally known methods of manufacture and established accepted mechanisms can be used. It is not believed necessary to list all possible methods based upon applications of the prior art within the spirit and scope of this invention.

It is not intended to be limited to the exact embodiments shown, because the various parts may be changed in size, shape and arrangement without deviating from the spirit of the invention as included in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A multiple switch comprising:
a block,
one or more switches affixed to the block so that they are insulated from each other and arranged in an approximately arcular and parallel configuration; each of said switches having at least two electrically conductive elements, at least one of which is movable,
a rotor having a surface of revolution and being constrained to arcular motion by a surface of revolution in the block, said rotor carrying a pressure pip moving tangentially about the outside of said switches, said pressure pip upon contacting a movable switch element causing it by cam action to move approximately radially thereby opening or closing the circuit.

2. A switch according to claim 1 with a pressure pip traversing a circular path and successively closing or opening various switches.

3. A switch according to claim 1 in which some of the switches are terminated in leads capable of being inserted into connectors.

4. A switch according to claim 1 in which some of the switches have a single common electrically conductive element.

5. A switch according to claim 1 in which the motion of the moving contact element is restricted by radial walls on each side of the element.

6. A switch according to claim 1 in which the current carrying elements are mounted in an insulating block.

7. A switch according to claim 1 in which the electrical contacts have concave surfaces.

8. A switch according to claim 1 such that all electrical conductive elements are separated from all other conductive elements by insulating surfaces except at contact areas.

9. A switch according to claim 1 including a double pole three element switch such that one element is capable of moving radially to electrically contact both the other elements.

10. A switch according to claim 1 including a double throw three element switch such that two elements are separately capable of approximately radial motion to electrically contact the third element.

11. A switch according to claim 2 in which there are a series of pressure pips permitting simultaneous closing or opening of several switches.

12. A switch according to claim 2 in which some of the switches are located outside of the circular path.

13. A switch according to claim 2 in which some of the individual switches are double throw switches.

14. A switch according to claim 2 in which some of the switches are double pole switches.

15. A switch according to claim 2 in which the switch contact points are substantially in a plane perpendicular to the central axis of the switch.

16. A switch according to claim 2 in which the switch contact points are in several planes perpendicular to the central axis of the switch.

17. A switch according to claim 6 in which indicating lights are mounted in the end of the insulating block, suitably wired to the particular individual switch.

18. A switch according to claim 2 comprising an insulated mounting block, electrically conductive elements, and a rotatable indexing drum carrying cam-like pressure pips.

19. A switch according to claim 3 in which some of the element terminations known as leads have been joggled and offset any desired distance and the leads are substantial.

20. A switch according to claim 2 in which the electrically conductive elements are arranged in concentric layers with increasing numbers of elements in outer layers.

21. A switch according to claim 2 in which the electrically conductive elements in the inner layers are longer than in the outer layers.

22. A switch according to claim 11 in which the pressure pips are in several planes perpendicular to the central axis of the switch.

23. A switch according to claim 11 in which the pressure points are carried by a cylindrical drum.

24. A switch according to claim 17 in which indicating lights are mounted in holes parallel to the switch element.

25. A switch according to claim 23 in which the holes for mounting the pressure pips are made in a flat plate, which is then rolled up into a cylindrical drum.

26. A switch according to claim 23 in which the pressure pips are in parallel planes both axially and radially, an orthogonal pattern.

27. A switch according to claim 23 in which the pressure pips are in a staggered pattern.

28. A switch according to claim 23 in which the drums can be readily installed and removed.

29. A switch according to claim 23 in which the drum, pressure pips thereupon and stationary insulating block are made of or coated with insulating material.

30. A switch according to claim 23 in the drum of which the pressure points can be readily installed and removed, to permit readily changeable programming.

31. A switch according to claim 23 in which the pressure pips are integral parts of the drum.

32. A switch according to claim 31 in which the pressure pip carrying surface is first fabricated as an open shape and then rolled up into a drum.

33. A switch according to claim 28 in which removal

and replacing of the rotatable drum does not require removal of any of the other parts.

34. A switch according to claim **33** in which the rotatable drum has at least one open end.

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J. R. SCOTT, *Assistant Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

May 14, 1968

Patent No. 3,383,478

Eugene V. Mandel

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 62, "in" should read -- is --; line 64, "pipe" should read -- pip --. Column 4, line 20, claim reference numeral "2" should read -- 1 --.

Signed and sealed this 9th day of December 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents