Dec. 2, 1952 H. E. COBB ET AL 2,620,409

SINGLE POLE DOUBLE THROW SWITCH

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FIG. 1.

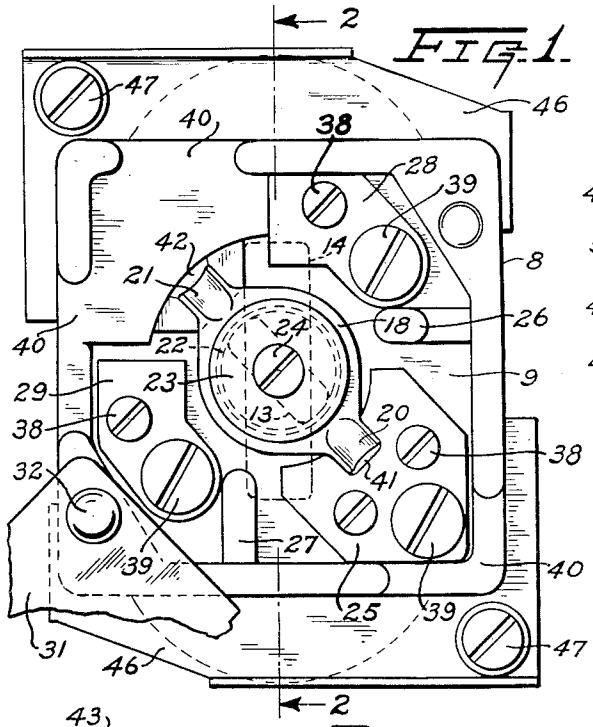


FIG. 3.

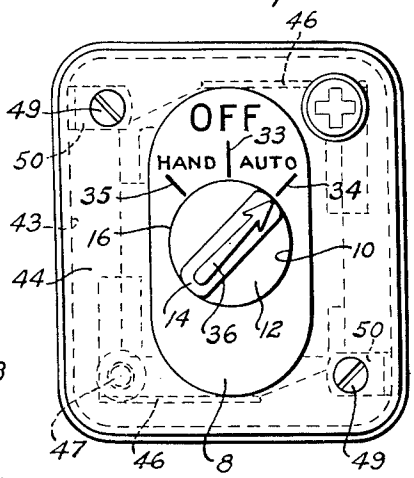


FIG. 2.

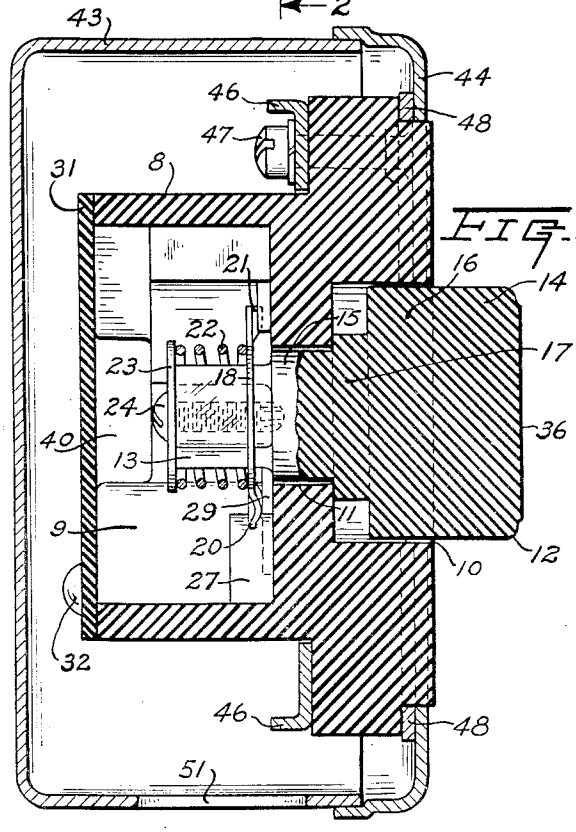


FIG. 4.

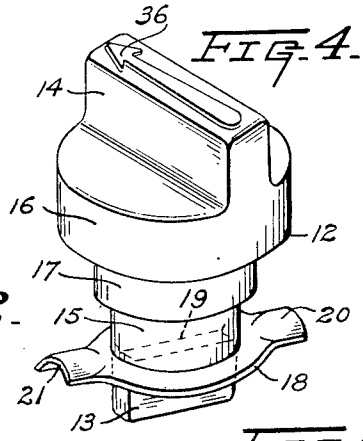
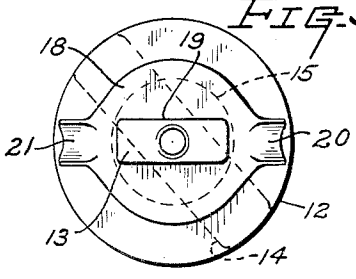


FIG. 5.



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SINGLE POLE DOUBLE THROW SWITCH

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2 Claims. (Cl. 200—11)

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The present invention relates generally to improvements in the art of controlling the operation of electrical machines and equipment, and relates more particularly to improvements in the construction and operation of double throw electric switches or selector switch stations for selectively controlling the actuation of electrical devices.

The primary object of our invention is to provide an improved single pole double throw electric switch unit, which is simple, durable and compact in structure, and which is also highly efficient in operation and flexible in adaptation.

It is frequently desirable during operation of various types of electrical machines, equipment and systems, to enable the attendant to selectively change over from automatic to manual control or to entirely interrupt the electric circuit. This type of control should preferably be effected from a common conveniently located selector switch station at which the nature of the control should also be plainly visible, so that the desired functioning of the system will result and accidents may be avoided. The use of such selector control switches is often desirable in connection with the operation of devices such as magnetic, thermostat or fluid pressure actuated controllers cooperating with motors for operating air conditioning, refrigeration and other types of machinery and equipment, and such use is also desirable in order to permit a service man or other attendant to quickly and positively either effect normal automatic functioning of the system, or to control actuation thereof by hand, or to stop the machinery entirely.

It is therefore an important object of our present invention to provide various improvements in the construction and operation of selector switch stations which will fulfill all of the above mentioned requirements in a most effective manner, and which is also applicable for diverse purposes.

Another important object of the present invention is to provide an improved double throw electric switch composed of relatively few compactly assembled parts cooperable to effectively control several electric circuits having a common terminal.

A further important object of this invention is to provide a relatively inexpensive but extremely rugged and durable rotary switch unit wherein a single movable contact is effectively cooperable with three fixed contacts to selectively control several electric circuits.

Still another object of the invention is to provide an improved single pole double throw electric switch assembly in which terminal connections can be readily made, and wherein the electrical conductors and contacts are well insulated thus insuring maximum safety.

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An additional object of our invention is to provide an improved rotary electric switch in which the position of the contacts is plainly visible at all times, and all parts of which are quickly and conveniently accessible for inspection.

Another object of this invention is to provide an improved electric switch assemblage embodying both non-metallic and metal parts the latter of which can be produced at moderate cost with the aid of simple punches and dies, and wherein at least some of the terminals and other parts are interchangeably similar thereby reducing the manufacturing cost to a minimum.

These and other more specific objects and advantages of the invention will be apparent from the following detailed description.

A clear conception of the features constituting our present invention, and of the construction and operation of a typical single pole double throw switch embodying the same, may be had by referring to the drawing accompanying and forming part of this specification and in which like reference characters have been used to designate similar parts in the various views.

Fig. 1 is a rather large rear view of one of our improved rotary double throw switches with the housing removed and showing the movable contact in inactive or "off" position;

Fig. 2 is a central vertical section through the same switch assemblage taken along the line 2—2 of Fig. 1, but showing the movable contact in elevation and also showing the switch housing;

Fig. 3 is a front view of the improved switch unit drawn to reduced approximately commercial size;

Fig. 4 is an enlarged perspective view of the movable contact and rotor plug of the switch, but with the spring and spring reaction plate omitted; and

Fig. 5 is a bottom view of the parts shown in Fig. 4.

While the invention has been shown and described as having been embodied in a typical single pole double throw rotary switch adapted to be normally enclosed within a housing, it is not our desire or intention to unnecessarily restrict the utility of the improvements by virtue of this limited showing; and it is furthermore contemplated that descriptive terms employed herein be given the broadest possible interpretation consistent with the disclosure.

Referring to the drawing, the typical double

throw rotary switch or selector switch station illustrated therein, comprises in general, a rigid unitary body 8 having therein a relatively large rear recess 9 and a smaller front circular socket 10 connected with the recess 9 by a still smaller bore 11; an actuating rotor plug 12 having rear and front approximately rectangular transverse portions 13, 14 respectively disposed at an angle of 45° relative to each other with respect to the rotor axis, the plug 12 also having a cylindrical portion 15 adjoining the rear rectangular portion 13 and normally journalled in the bore 11, another larger cylindrical portion 16 adjoining the front rectangular portion 14 and rotatable in the socket 10, and an intervening abutment portion 17 located between the cylindrical portions 15, 16; a movable contact plate 18 having a central rectangular opening 19 slidably embracing the rear plug portion 13 and also having radial diametrically opposite contacts 20, 21 formed integral therewith; a helical compression spring 22 surrounding the plug portion 13 and having one end coacting with the contact plate 18 while its opposite end reacts against a retainer disk 23 secured to the inner end of the plug 12 by a screw 24; a single common stationary contact plate 25 firmly secured to the body 8 within the rear recess 9 midway between stop lugs 26, 27 formed integral with the body 8, and with which the movable contact 20 coacts; and a pair of similar stationary contact plates 28, 29 likewise secured to the body 8 within the recess 9 and with which the other movable contact 21 is alternately selectively engageable.

The switch body 8 and the plug 12 are preferably formed of hard and durable insulating material, and the rear of the body recess 9 is preferably provided with a closure plate 31 formed of similar material and which is pivotally attached to the body 8 by a pivot pin 32, as shown in Figs. 1 and 2. The front face of the body 8 is provided with indicia or markings 33, 34, 35 and the rectangular actuating portion 14 of the rotary plug 12 is provided with a prominent arrow 36 which is cooperable with the fixed markings 33, 34, 35 to indicate setting of the contacts 20, 21 to either "off" position, or to automatic control position, or to manual or hand control position, see Fig. 3. The knob portion 14 of the plug 12 also projects outwardly beyond the front face of the body 8 in order to facilitate manipulation of the switch, and the cylindrical portions 15, 16 of the plug 12 should preferably fit the bore 11 and socket 10 of the body 8 but should also be freely rotatable therein.

The movable contact plate 18, the spring retainer disk 23, and all of the fixed contact plates 25, 28, 29 may be formed of sheet metal with the aid of simple punches and dies, and the integral contacts 20, 21 of the plate 18 are dished forwardly as shown in Figs. 4 and 5. The stationary contact plates 28, 29 are interchangeably similar, and all of the fixed contact plates 25, 28, 29 are firmly secured to the body 8 within the recess 9 by means of self-locking fasteners such as screws 38 while each of these plates is also provided with a terminal attaching screw 39, as illustrated in Fig. 1. The wall of the body 8 which surrounds the rear recess 9 is provided with several cut-outs 40 near the fixed terminal plates 25, 28, 29 for permitting electrical conductors to be attached to the terminal screws 39 and thereafter passed through the insulated body while the closure plate 31 is swung to open position as depicted in Fig. 1, thus facilitating application of the switch unit to an electrical system.

The helical compression spring 22 which is interposed between the movable contact plate 18 and the retainer disk 23, tends to constantly urge the movable contacts 20, 21 toward the front of the switch assembly, and in order to index or retain the plug 12 and movable contacts 20, 21 in "off" or neutral position, the common contact plate 25 is provided with a central notch 41 with which the dished front face of the movable contact 20 is cooperable as in Fig. 1, while the body 8 within the recess 9 at the opposite side of the rotor is provided with a similar notch 42 adapted to coact with the dished front face of the other movable contact 21. When the actuating plug 12 is rotated in a clockwise direction as viewed in Fig. 1, to swing the movable contact 20 toward the fixed stop lug 27, the plate 18 will be forced rearwardly to compress the spring 22, and as the contact 20 engages this lug the moving contact will snap into the gap between the lug 27 and the adjacent edge of the plate 25 while the opposite movable contact 21 will simultaneously engage the fixed contact plate 28, thus establishing electrical connection between the stationary contact plates 25, 28 and also indexing or retaining the rotor plug in "hand" or manual control position. If the plug 12 is rotated in a counterclockwise direction so as to swing the movable contact 20 from the position shown in Fig. 1, toward the other fixed stop lug 26, the plate 18 will likewise be forced back to compress the spring 22, and when the contact 20 engages this lug this movable contact will likewise snap into the gap between the lug 26 and the adjacent edge of the plate 25, while the opposite movable contact 21 will simultaneously engage the fixed contact plate 29, thus establishing electrical connection between the stationary contact plates 25, 29 and also indexing or retaining the rotor plug in "auto" or automatic control position. An effective indexing system is thus provided for all three positions of the movable contact actuating plug 12.

The improved switch unit may be utilized either without or with an enclosing casing, and when complete enclosure is desired, the body 8 may be provided with a cup-shaped housing 43 and a closure cover 44 as shown in Figs. 2 and 3. The body 8 is preferably firmly secured to the cover 44 by means of a pair of similar clamps 46 and clamping screws 47 which coact with a reenforcing plate 48 attached to the cover, and the latter is removably secured to the housing 43 by screws 49 coacting with brackets 50 attached to the interior of the housing. The housing 43 may also be provided with an opening 51 for the electrical conductors, and the housing 43, cover 44, clamps 46, plate 48, and brackets 50 may all be formed of sheet metal with the aid of punches and dies. With such an enclosure, the housing 43 may be permanently secured to a support in any suitable manner, and the switch assemblage can be readily removed for inspection and re-attached to the housing by merely manipulating the two screws 49 which coact with the cover 44 and brackets 50.

The normal functioning of the improved selector switch station or single pole double throw switch unit, should be clearly apparent from the foregoing detailed description, and when the device has been properly assembled and connected to an electrical system, it may obviously be conveniently manipulated to either interrupt the circuit entirely, or to effect either automatic or man-

ual control, by merely setting the plug 12 to the desired position. When the arrow 36 is set to "off" position, the contacts 20, 21 will be frictionally retained within the notches 41, 42, and when the plug 12 is rotated to "hand" position the lug 27 will stop its movement while rotation of the rotor in the opposite direction to "auto" position will be arrested by the lug 26. In either of these active positions, the compression spring 22 functions to insure effective electrical connections between the common fixed contact 25 and the respective stationary contacts 28, 29, and whenever the switch is being manipulated the movable contact plate 18 will slide along the rectangular plug portion 13 and will be positively revolved thereby.

From the foregoing detailed description of the construction and operation of our improved switch, it should be apparent that we have in fact provided a simple, compact and durable switch unit which is also highly efficient in operation and may be utilized for diverse purposes. By forming the body 8, plug 12, and plate 31 of insulating material, the electrical contacts and conductors are effectively protected and insulated, and safe manipulation is assured; and by forming the contacts and other enclosures and supports of metal stampings, the cost of production is minimized. This cost of production is also reduced by making the contact plates 28, 29 interchangeably similar, and by doing likewise with the clamps 46 when a complete enclosure for the switch is provided. The switch unit may however be utilized without a housing 43, since the closure plate 31 normally closes the recess 9. The compression spring 22 which provides the desired pressure on the contacts, also functions to index the plug 12 in all three positions of possible adjustment thereof; and the portion 17 of the rotor plug 12 is constantly maintained in contact with the bottom of the cylindrical socket 10 of the body 8 by this spring, while the circular portions 16, 19 provide large bearings for the plug within the body 8. The plug 12 is however readily removable from the body 8 by merely removing the screw 24, and the arrow 36 formed on the plug portion 14 makes the setting of the contacts plainly visible at all times. The unitary movable contact plate 18 with its integral contacts 20, 21 cooperates with only three fixed contact plates 25, 28, 29 to accommodate all three settings of the switch thereby providing an exceedingly compact and simple double throw switch assemblage.

It should be understood that it is not desired to limit this invention to the exact details of construction and operation of the switch unit herein shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art.

We claim:

1. A double throw rotary electric switch comprising, a unitary body having therein a relatively large rear recess provided with spaced stop lugs and also having therein a smaller cylindrical front socket connected with the recess by a still

smaller bore, a rotary actuating plug having integral rear and front rectangular transverse end portions disposed at an angle of approximately 45° relative to each other with respect to the rotor axis, the plug also having a small cylindrical portion journalled in said bore and another larger cylindrical portion journalled in said socket and separated from the small cylindrical portion by a cylindrical abutment cooperable only with the bottom of said socket, a movable contact plate having a rectangular central opening slidably embracing said rear rectangular plug portion and also having radial diametrically opposed integral contacts, a retainer disk secured to the extreme free end of said rear rectangular portion, a helical compression spring surrounding said rear plug portion between and coacting with said movable contact plate and with said disk, a single common fixed contact secured to said body within said recess midway between said lugs and being cooperable with one of said movable contacts, and a pair of other fixed contacts also secured to said body within said recess and being alternately cooperable with the other of said movable contacts.

2. A double throw rotary electric switch comprising, a unitary body having therein a relatively large rear recess and a smaller cylindrical socket connected with the recess by a still smaller bore, a rotary actuating plug having integral rear and front rectangular transverse end portions and being provided with a small rear cylindrical portion journalled in said bore and a larger cylindrical portion journalled in said socket and with an intervening abutment portion connecting said small and large cylindrical portions and coacting only with the socket bottom, a rotary contact plate having a rectangular central opening slidably embracing said rear rectangular plug portion and being provided with opposed radial movable contacts, a disk secured to the free end of said rear rectangular plug portion, a helical compression spring embracing said rear plug portion and coacting with said plate and said disk, a common fixed contact secured to said body and being cooperable with one of said movable contacts, and a pair of other fixed contacts also secured to said body and being alternately cooperable with the other of said movable contacts.

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