July 14, 1953 G. M. NEFF 2,645,685

MULTIPOSITION SWITCH

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Fig. 1.

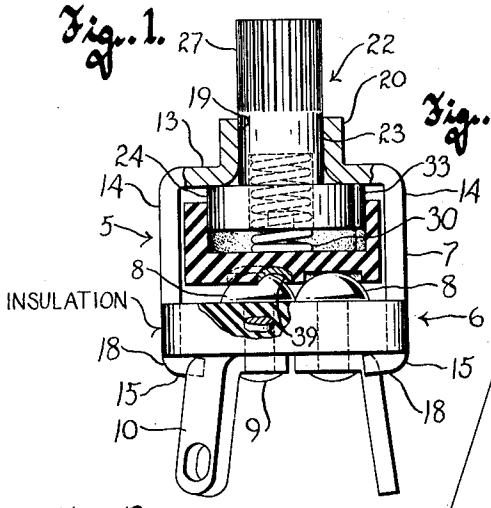
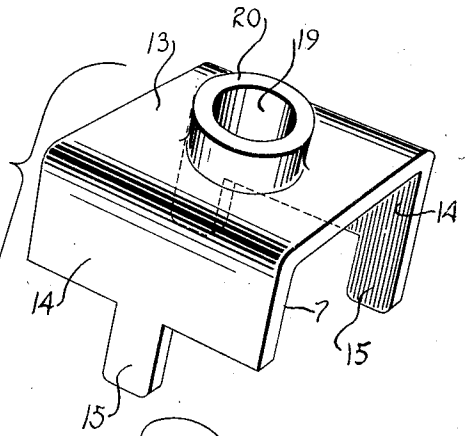


Fig. 2.



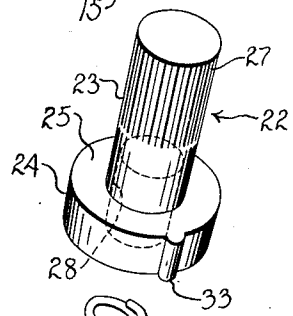
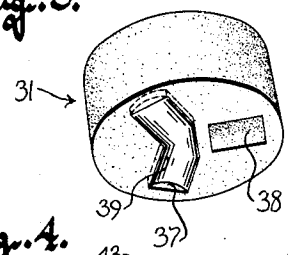


Fig. 3.



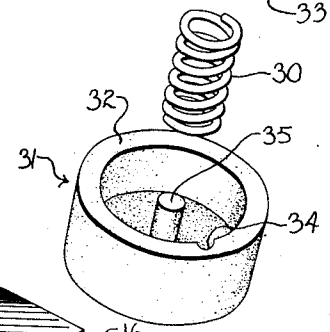


Fig. 4.

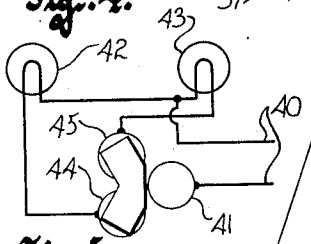
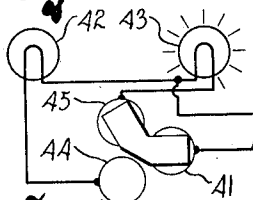


Fig. 5.



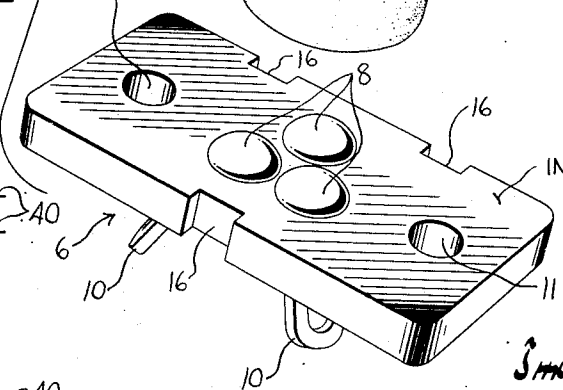
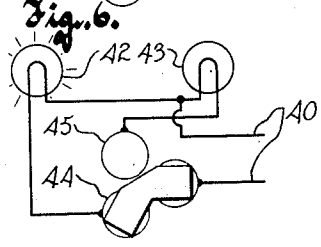


Fig. 6.



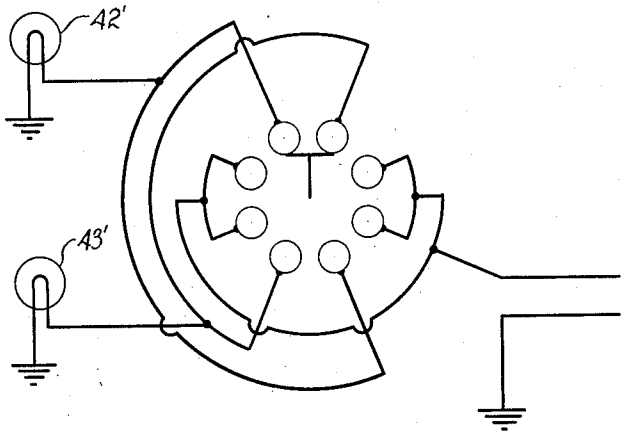
Inventor
Gene M. Neff
By Swanson & Swanson
Attorneys

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MULTIPOSITION SWITCH

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Fig. 7.



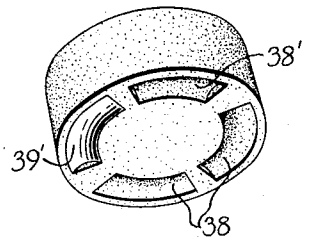
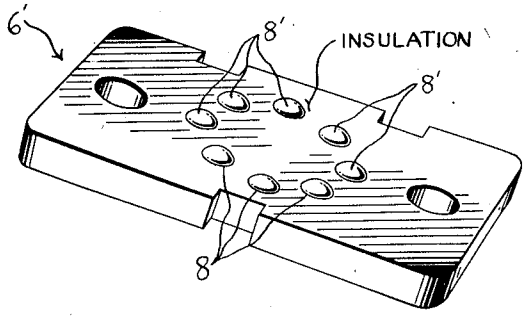


Fig. 8.



Inventor
Gene M. Neff
By Dewitt & Jones
Attorneys

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2,645,685

MULTIPOSITION SWITCH

Gene M. Neff, Racine, Wis., assignor to John Oster Manufacturing Company, Racine, Wis., a corporation of Wisconsin

Application January 10, 1952, Serial No. 265,755

4 Claims. (Cl. 200—11)

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This invention relates to electrical switches and refers more particularly to a multiple-position switch for controlling a plurality of electrical circuits.

It is a particular object of this invention to provide a small and very compact multiple-position electric switch of the type which may be used to connect any one of a number of different electrical load circuits with a source of current and which is especially adapted for inexpensive production in relatively small quantities.

Another object of this invention is to provide a multiple-position switch of the character described which can be manufactured by means of relatively inexpensive stamping dies and plastic molding dies.

Still another object of this invention resides in the provision of a multiple-position switch of the character described which will be unusually compact and which will require only the simplest of assembly operations so that it may be entirely assembled by unskilled labor.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiments of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiments of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is an end elevational view of the multiple-position switch of this invention, portions being shown cut away to illustrate detail;

Figure 2 is a group perspective view of the components of the switch of this invention;

Figure 3 is a perspective view of the contact carrier of the switch of this invention showing the contact engaging face thereof;

Figures 4, 5 and 6 are circuit diagrams illustrating the operation of the multiple-position switch of this invention;

Figure 7 is a circuit diagram illustrating the operation of a modified embodiment of the switch of this invention; and

Figure 8 is a group perspective diagram of the terminal head and contactor of the modified switch of Figure 7.

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Referring now more particularly to the accompanying drawings in which like numerals designate like parts throughout the several views, the multiple-position switch of this invention has a body designated generally by 5, comprising an insulative base 6, which constitutes a terminal head, and a substantially U-shaped housing or cover 7. The base 6 is substantially rectangular in outline and may be formed of phenolic or other insulative material, and it has exposed on its upper surface three stationary contacts 8. These are preferably the dome shaped heads of rivets 9 which, at their lower ends, secure suitable terminal connectors 10 to the underside of the base. There may be more than three stationary contacts, if desired, but in any case they are disposed at equal radial distances from a common center and at equal circumferential distances from one another. The insulative base has a hole 11 near each of its ends through which mounting bolts or rivets may be passed to facilitate mounting the switch on an electrical appliance or other device (not shown).

The cover or housing 7 is a substantially U-shaped stamping of metal strip material having a top wall 13 which, in the assembled position of the cover, is spaced above and substantially parallel to the upper surface of the base, and a pair of side walls 14 extending downwardly from the top wall and having their bottom edges resting on the top surface of the base. Lugs 15, extending downwardly from the bottom edges of the side walls, are received in notches 16 in the side edges of the base and are clenched under the bottom surface of the base, as at 18, so that the base is in effect clamped between the bottom edges of the side walls and the inwardly turned portions 18 of the lugs. Since the switch is intended for the control of relatively low currents, the housing will not normally require end walls.

A hole 19 surrounded by an upwardly extending annular flange 20, extruded from the top wall 13 of the housing, provides a bearing in which a substantially mushroom shaped actuator 22 has its stem portion 23 rotatably journaled coaxially with the common center of the stationary contacts. The enlarged head 24 of the actuator is situated below the top cover wall, and the upper surface 25 of the enlarged head of the actuator provides a shoulder which engages the underside of said wall around the bearing hole. The upper portion of the actuator stem is knurled or longitudinally ribbed, as at 27, to facilitate rotating it. The actuator has

a downwardly opening well 28 therein in which a coiled compression spring 30 is recessed to react between the actuator and a contact carrier 31. The spring 30 urges the actuator upwardly, to thereby bring the shoulder 25 on the actuator into firm engagement with the underside of the top wall of the housing, thus restraining the actuator against tilting displacement, and it also urges the contact carrier downwardly into firm contact-making engagement with the stationary contacts on the terminal head.

The contact carrier, like the actuator, is preferably molded of insulative plastic and comprises a cup-like member which is circular in outline and has an upwardly extending circumferential flange 32 encircling the periphery of the enlarged head portion 24 of the actuator. In other words, the head of the actuator is received in an upwardly-opening well in the contact carrier. A vertical rib 33 on the peripheral surface of the head of the actuator engages in a corresponding vertical slot 34 on the inside surface of the flange on the contact carrier to thus provide a splined driving connection between the actuator and the contact carrier. An integral spindle-like pilot 35 projects upwardly from the center of the contact carrier and extends into the coiled compression spring to hold the same centered.

The lower surface of the contact carrier is generally flat, but it has two recesses 37 and 38, respectively, which cooperate with the dome-like rivet heads to provide detents defining each of the positions of the switch. A conductive metal contact insert 39, of a size and shape to engage two stationary contacts simultaneously, and arcuate in transverse cross section, is molded into one recess 37, and the other recess 38 is merely a dimple or depression which fits over the third dome-like rivet head so that when the contact carrier is seated on the rivet heads its flat bottom surface will be held parallel to the upper surface of the terminal plate. The detents defined by the cooperating rivet heads and recesses are, of course, rendered operative by bias of the compression spring 30 against the contact carrier.

Assembly of the switch of this invention is very readily accomplished even by the most unskilled labor. The compression spring is inserted into its recess in the actuator, and the contact carrier fitted over the head of the latter. Holding these members against the terminal head, with the stationary contacts assembled thereon, the housing is fitted into place, with the stem of the actuator projecting through the bearing aperture in the top housing wall. Clenching the lugs 15 on the housing around the bottom of the terminal plate completes the assembly.

In connecting the switch of this invention in a circuit, one of the three stationary contacts 41 (in the Figures 1–6 embodiment) is connected with one side of a current supply line 40, while each of the other two contacts 44 and 45 is connected with one of the loads 42 and 43, respectively. When the actuator is so positioned that the conductive insert 39 thereon engages the two contacts 44 and 45 which are connected with the loads 42 and 43, respectively, the switch will obviously be in its "off" position, illustrated in Figure 4, and current will not flow to either load.

However, upon rotating the actuator one step clockwise to the position shown in Figure 5, the contact on the contact carrier will engage the power source contact 41 and one of the two load contacts 45 so that current will flow to the load

43 connected with said contact 45. Obviously, the other load 42 will not be energized. Upon rotation of the switch a further step clockwise to the position shown in Figure 6, the contactor will bridge the power contact 41 and the other load contactor 44, completing the circuit to the load 42, the load 43 now being unenergized. Rotation of the switch another step clockwise will, of course, return it to the Figure 4 position.

In the embodiment of the invention illustrated in Figures 7 and 8, the terminal head 6' is provided with eight stationary contacts 8' disposed at equal circumferential distances around a circle, and alternate pairs of these contacts are connected to the line and to the loads, one contact of each load pair being connected with the one load 42' and another with the other load 43'. If desired, of course, the load contacts of this embodiment might be connected with four different loads.

In this modified embodiment, as in that previously described, the recessed contact insert 39' has a size and shape to engage two stationary contacts simultaneously. Obviously, if the contactor bridges two adjacent line contacts or two adjacent load contacts, all of the load circuits will be "off"; but if the contactor is positioned to simultaneously engage a line contact and a load contact, current will flow to the load.

In the modified embodiment the recesses 38' in which the unengaged contact heads are received may be formed as a number of elongated arcuate slots (as shown), each capable of receiving a number of contact heads, or as a series of dimples or recesses similar to the recess 38 in the first described embodiment. In either event, of course, all of the contacts not engaged by the conductive metal insert 39' must be seated in recesses molded in the face of the contact carrier in order that the carrier be seated level in each operative position of the switch.

From the foregoing description, taken together with the accompanying drawings, it will be apparent that this invention provides a simple, compact and inexpensive multiple-position switch for controlling any one of a number of electrical circuits, which switch is particularly adapted for inexpensive manufacture in relatively small quantities by reason of the fact that the component parts thereof may be formed with very simple stamping and plastic molding dies and may be assembled by unskilled labor.

What I claim as my invention is:

1. A multi-position electrical switch for controlling any one of a plurality of circuits comprising: an insulative terminal plate having a flat upper surface; a plurality of fixed contacts on said terminal plate exposed at its upper surface and spaced at equal radial distances from a common center and at equal circumferential distances from one another; a housing having a top wall spaced above and substantially parallel to said terminal plate and a pair of side walls extending downwardly from said top wall and secured at their bottoms to said terminal plate; a substantially mushroom shaped actuator having its stem portion extending upwardly through a hole in said top wall of the housing and rotatably journaled therein and having its enlarged head at the underside of said wall of the housing, said actuator having a downwardly opening coaxial well; an insulative contact carrier between the head of the actuator and the upper surface of the terminal plate, said contact carrier having a conductive strip on its under surface

of a size and shape to engage two of said stationary contacts simultaneously; means providing a splined connection between the actuator and the contact carrier; and a coiled compression spring in said well in the actuator reacting against the contact carrier to bias the contact carrier downwardly and thus carry the upper surface of its enlarged head into engagement with the underside of the top wall of the housing so that such engagement steadies the actuator against tilting displacement.

2. The electric switch of claim 1 further characterized by the fact that said fixed contacts are dome shaped and raised above the upper surface of the terminal plate; and by the fact that said conductive strip on the contact carrier is recessed and the contact carrier has another depression in its said face, the conductive strip recess and the depression receiving the raised contacts in each of the operative positions of the switch, to thereby define a detent at each of said positions.

3. A multi-position electrical switch for closing any one of a plurality of circuits comprising: a flat insulative terminal plate; a substantially U-shaped housing providing a top wall spaced from and parallel to the upper face of the terminal plate and side walls extending downwardly from said top wall to the terminal plate; fixed contacts on the upper face of the terminal plate spaced at equal radial distances from a common center and at equal circumferential distances from one another; a rotatable actuator having a stem portion rotatably journaled coaxially with the common center of said fixed contacts in a hole in the top wall of the housing and having an enlarged head portion between said top wall and the terminal plate; a rotatable contact carrier between the head of the actuator and the terminal plate having a surface which flatwise opposes said face of the terminal plate; means providing a splined connection between said head of the actuator and the contact carrier; a conductive contactor fixed on said surface of the contact carrier and engageable with two circumferentially adjacent fixed contacts simultaneously; and spring means reacting between said contact carrier and the actuator to bias the contact carrier downwardly into firm contact-making engagement with the terminal head and to

bias the enlarged head of the actuator upwardly into engagement with the top wall of the housing to thereby steady the actuator against tilting displacement.

4. A multi-position electrical switch for controlling any one of a plurality of circuits comprising: an insulative terminal plate having a flat upper surface; a plurality of fixed contacts on said terminal plate exposed at its upper surface and spaced at equal radial distances from a common center and at equal circumferential distances from one another; a substantially U-shaped housing having a top wall spaced above and substantially parallel to said terminal plate and side walls extending downwardly from said top wall and secured to said terminal plate at their lower edges; a substantially mushroom shaped actuator having its stem portion extending upwardly through a hole in the top wall of the housing and rotatably journaled therein and having its enlarged head at the underside of said top wall, said actuator having a downwardly opening coaxial well; an insulative contact carrier between the head of the actuator and the upper surface of the terminal plate, said contact carrier having a conductive strip on its under surface of a size and shape to engage two of said stationary contacts simultaneously, said contact carrier having an upwardly extending circumferential flange surrounding the head of the actuator; cooperating abutments on the head of the actuator and on the contact carrier providing a splined connection between the actuator and contact carrier; and a coiled compression spring in said well in the actuator reacting against the upper surface of the contact carrier to bias the contact carrier downwardly toward the terminal head and to bias the actuator upwardly and thus carry the upper surface of its enlarged head into engagement with the underside of the top wall of the housing to thus constrain the actuator against tilting displacement.

GENE M. NEFF.

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UNITED STATES PATENTS

Number	Name	Date
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