

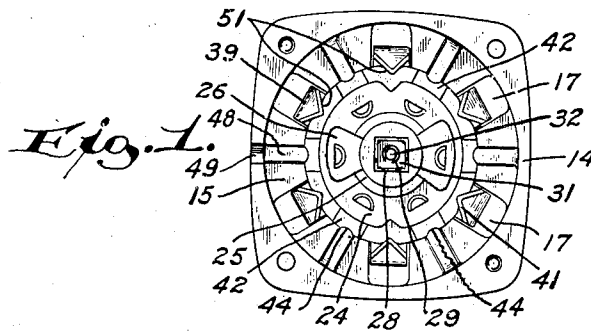
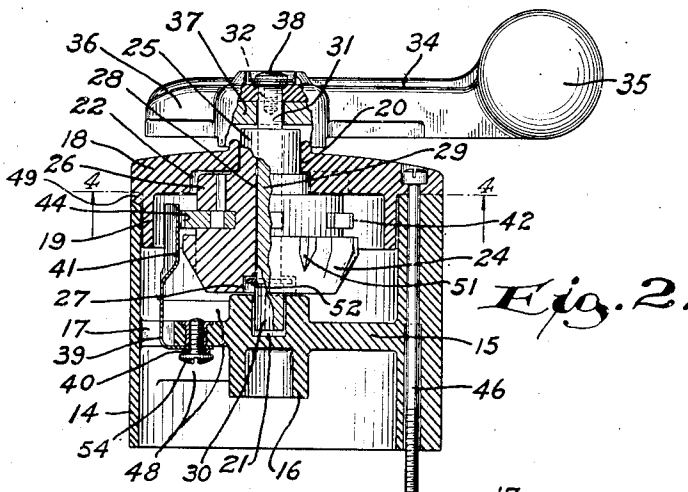
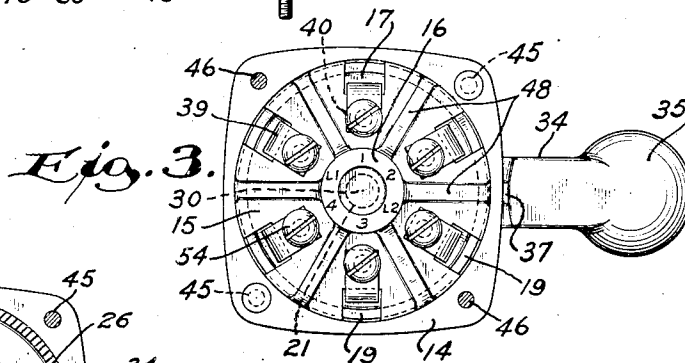
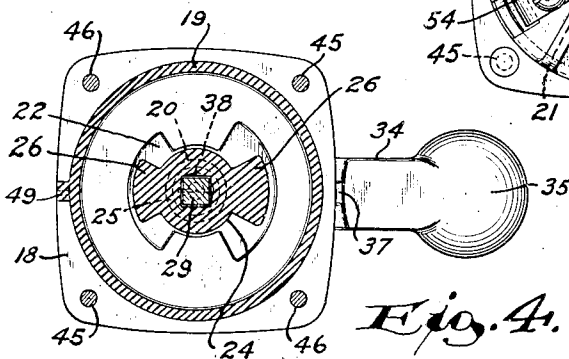
Aug. 9, 1949.

W. C. FURNAS ET AL
ROTARY REVERSING SWITCH

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2 Sheets-Sheet 1



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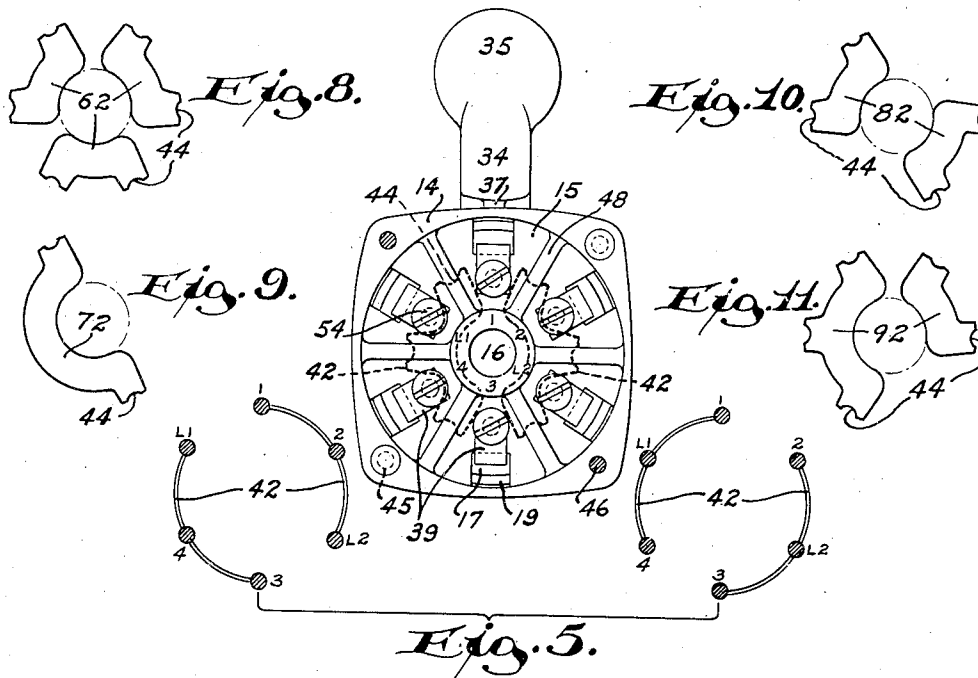
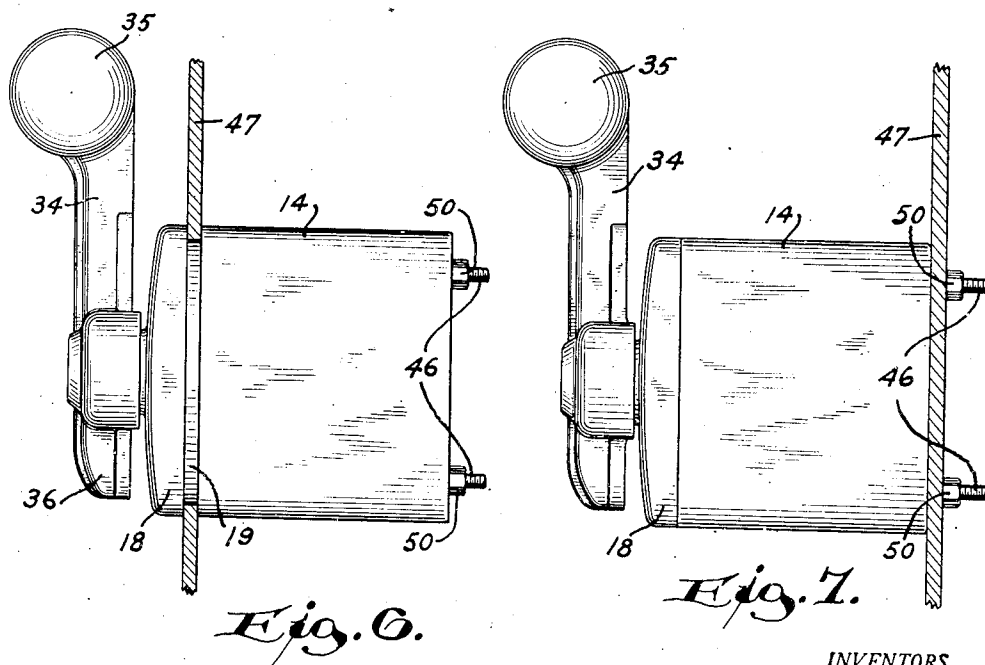
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UNITED STATES PATENT OFFICE

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ROTARY REVERSING SWITCH

William C. Furnas, Batavia, and Edward L. Rucks, Aurora, Ill., assignors to Furnas Electric Company, Batavia, Ill., a corporation of Illinois

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4 Claims. (Cl. 200—11)

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Our invention relates generally to improvements in the manufacture of electric switches, and relates more specifically to improvements in the construction and operation of rotary reversing switches for controlling various types of electrical equipment.

The primary object of the present invention is to provide an improved rotary reversing switch which is simple in construction, highly efficient in operation, and flexible in its adaptations.

Some of the more important specific objects of the invention are as follows:

To provide an exceedingly compact and durable rotary reversing switch assemblage which is adapted for diverse uses to control either direct or alternating current electrical apparatus.

To provide an improved reversing switch unit in which the fixed and movable contacts are most effectively insulated against possible short circuiting, and which may be conveniently mounted in various positions so as to meet varying conditions.

To provide a sturdy rotary switch wherein the contacts are quickly and effectively engaged and disconnected with a wiping snap action, and which may be operated for a long period of time without necessitating renewal of parts.

To provide a simple switch assembly of the rotary reversing type, all parts of which are readily accessible for inspection, and which may also be quickly assembled or dismantled.

To provide an attractive rotary reversing switch which may be manufactured of durable materials and sold at moderate cost, and which is especially adapted for use in controlling the operation of various types of electric motors and other equipment.

To provide an improved electric switch assemblage comprising relatively few simple but sturdy parts which may be readily associated with each other to produce a safely manipulable switch.

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

A clear conception of the features constituting our present improvement, and of the mode of constructing and of utilizing a typical rotary reversing switch embodying the invention, may be had by referring to the drawings accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a top plan view of a typical rotary reversing switch having the contacts open and upper parts removed, this switch being adapted

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for either direct current, or one, two or three phase usage;

Fig. 2 is a longitudinal partial section through the entire rotary reversing switch assemblage of Fig. 1, showing two cooperating fixed and movable contacts in closed position and also having most of the fixed contacts omitted for the sake of clearness, and the section having been taken rather irregularly through one set of contacts on one side of the casing axis and through a corner of the casing on the opposite side of this axis;

Fig. 3 is a bottom view of the improved switch unit of Figs. 1 and 2;

Fig. 4 is a transverse section through the same switch assembly, taken along the line 4—4 of Fig. 2;

Fig. 5 is a combined bottom view and internal connection diagram showing forward and reverse positions of the connections at the left and right sides beneath the bottom view, and also showing the switch in open position between the diagrams;

Fig. 6 is a side elevation of the assembled switch showing one method of mounting the same upon a panel;

Fig. 7 is another side elevation of the switch unit showing a different mode of mounting;

Fig. 8 is a modified arrangement of movable contacts adapted to be utilized in the switch;

Fig. 9 is a further modified movable contact structure;

Fig. 10 is another modified type of movable contact assemblage; and

Fig. 11 is still another modified arrangement of the movable contacts.

While the invention has been shown and described herein as being advantageously applicable to a relatively small and compact rotary reversing switch, it is not our desire or intention to unnecessarily restrict the scope or utility of the improved features by virtue of this limited typical embodiment.

Referring to the drawings, the typical rotary reversing switch shown therein, comprises in general a unitary main body or casing 14 having approximately square transverse external cross-section and being provided with a hollow circular interior spanned by a fixed contact supporting web 15 having a central bearing hub 16 and also having an annular series of six openings 17 adjacent to the casing wall; a closure cover 18 acting with an end of the casing 14 and having an annular flange 19 snugly fitting the circular casing interior, while its central portion is provided with a bearing bore 20 disposed in axial

alignment with a bearing socket 21 formed in the fixed casing hub 16, the cover 18 also having therein a lobular pocket 22 adjoining the bore 29; a unitary movable contact supporting rotor 24 confined between the casing hub 16 and cover 18 and having a cylindrical projection 25 at one end journaled for rotation in the cover bore 29 and also having radial lobes 26 oscillatable within the pocket 22, while its opposite end is provided with a circular recess 27 and the center of the rotor 24 is pierced by a square hole 28; a rotor supporting shaft 29 having a square medial portion snugly fitting the hole 28 while one of its protruding ends 30 is cylindrical and is journaled for rotation in the fixed hub socket 21, and its opposite protruding end 31 is square and provided with a threaded socket 32; a manipulating handle 34 having a grip knob 35 and a pointer 36 radiating from opposite sides of a central hub provided with a reinforcing plate 37 and which is secured to the square shaft end 31 by means of a screw 38 coacting with the socket 32; a series of six resilient fixed contacts 39 secured to the casing web 15 by bushings 40 and each having a V-shaped contact portion 41 extending through and beyond an adjacent web opening 17; arcuate sets of rigid movable contacts 42 firmly embedded in the rotor 24 and being provided with contact notches 44 cooperable with the V-shaped rigid top portions 41 of the adjacent fixed contacts 39; and two pairs of screws 45, 46 for interconnecting the casing 14 and cover 18 and for attaching the switch assembly to a panel 47 or other support.

The main casing or body 14 is preferably formed of molded electrical insulation such as plastic and has the contact supporting web 15 formed integral with its outer wall while the central rotor supporting hub 16 is also formed integral with the web 15; and the web 15 and hub 16 may also be reinforced by radial ribs 48 formed integral therewith and disposed between the openings 17 of the web. The closure cap or cover 18 together with its integral annular flange 19 is also preferably formed of molded electrical insulating material, and this cover 18 may be provided on its outer exposed surface with suitable indicia with which the handle pointer 36 is cooperable to designate off, forward and reverse settings of the handle 34, in a well known manner. The cover 18 may also be provided with a small peripheral projection 49 adapted to coact with a similarly shaped notch formed in the adjacent end of the casing 14, in order to insure proper initial assembly of the casing and cover; and the cover flange 19 should be of sufficient length to permit panels 47 of varied and considerable thickness to be inserted between the casing 14 and cover 18 as shown in Fig. 6 without openly exposing the contacts, and to also maintain safe electrical spacing between the contacts and the panel 47. The two diagonally opposite fastening screws 45 which directly unite the cover and casing, are of less length than the other two screws 46, and the latter should be long enough to project outwardly beyond the end of the casing 14 remote from the cover 18 a considerable distance as clearly indicated in Figs. 6 and 7. The protruding ends of the long screws 46 are threaded for the reception of clamping nuts 50, but these threaded projecting screw ends may also be utilized to clamp the casing 14 and cover 18 to any other type of support such as another casing or housing, or the like.

The switch rotor 24 together with its bearing portion 25 and lobes 26, are likewise preferably molded of electrical insulating plastic material

or the like, so as to provide a unitary structure, and the arcuate movable contacts 42 are formed of metal being firmly embedded within the rotor during the molding operation with their notched portions 44 accurately centralized relative to the rotor axis and projecting slightly from the rotor periphery, as depicted in Figs. 1 and 2. The integral lobes 26 of the rotor 24 are adapted to lie and oscillate within the cover pocket 22 when the parts have been properly assembled; and the portion of the rotor 24 nearest the casing web 15 is enlarged in diameter and provided with a series of indexing notches 51 located midway between the successive movable contact notches 44 and with which the resilient V-shaped portions 41 of the adjacent fixed contacts 39 are engageable when the handle 34 is in off or neutral position, see Figs. 1 and 2. These indexing notches 51 are preferably located considerable distance away from the zone of engagement of the contact portions 41 and notches 44 in order to avoid destruction of the indexes by possible arcing and wearing of the contacts. The central rotor supporting shaft 29 is preferably formed of durable metal, and should be pressed into the square central rotor hole 28, and a C-shaped washer 52 snugly engages the shaft 29 adjacent to the cylindrical bearing portion 30 and within the recess 27 in a manner whereby the rotor body is maintained properly spaced from the supporting or bearing end of the shaft 29. It is to be noted that the rotor 24 is thus journaled for rotation or oscillation in two ample bearings located at opposite ends of the rotor, one bearing being provided by the cover bore 29 and the other being likewise provided by the casing socket 21.

The rotor manipulating handle 34 is again preferably formed of electrical insulating plastic or the like, except for the reinforcing bar or plate 37 which is preferably formed of metal and firmly embedded within the handle during the molding operation, and the handle hub has a pocket therein in which is cooperable with an annular lip on the cover 18 to provide a close-fitting labyrinth seal. This plate 37 is provided with a square opening which is snugly cooperable with the square end portion 31 of the shaft 29, and the screw 38 serves to detachably attach the handle 34 to the shaft end 31 in an obvious manner. Due to the square formation of the shaft end 31, the manipulating handle 34 may be applied thereto in various positions relative to the shaft axis; and the radial rotor lobes 26 which coact with the cover pocket 22 serve to limit the extent of oscillation or swinging of the handle 34 so as to positively stop the rotor 24 in forward and reverse positions. When the rotor 24 is positioned as shown in Figs. 1, 4 and 5, the movable contact projections 42 are disposed between the V-shaped rigid top portions 41 of the adjacent fixed contacts 39, and the switch is then in neutral or off position; but when the handle 34 is swung into either forward or reverse position as determined by the lobes 26, then the movable contact projection notches 44 will be snugly engaged by the adjacent V-shaped portions 41 of the fixed contacts 39 as clearly indicated in Fig. 2 and in the diagrams of Fig. 5. The fixed contacts 39 which are fastened to the casing web 15 by means of the threaded bushings 40, are adapted to be connected to various types of electrical equipment and apparatus by means of conductor attaching screws 54, and the conductors may be conveniently introduced into the switch casing through the open end thereof remote from the closure cover 18.

The mounting of the resilient fixed contacts 39 and the elongated formation of the V-shaped end portions 41 thereof so that these ends will engage both the movable contact notches 44 and the intervening rotor notches 51 positively and with a snap action, while still preserving desirable wiping action at the contacts, is an important feature of our invention. The elongation of these V-shaped fixed contact portions 41 also enables them to function effectively even in cases where panels 47 of different thickness are inserted between the main casing 14 and cover 18; and the resilient portions of the stationary contacts 39 which connect the V-shaped portions 41 with the bushings 40, are of sufficient length and resiliency to maintain the contact portions 41 approximately parallel and to constantly resiliently urge these portions against the rotor 24 at all times with considerable pressure.

While the arcuate movable contacts 42 shown in Figs. 1 to 5 inclusive, are especially adapted for use in ordinary electrical systems in order to obtain forward and reverse movement of a motor or the like, various other movable contact arrangements for special systems are also made possible with our improved switch assembly, by merely substituting rotors 24 having other formations of movable contacts embedded therein, as shown in Figs. 8, 9, 10 and 11. In Fig. 8, the movable contact assembly consists of three identical arcuate movable contacts 62 each having two contact notches 44; while in Fig. 9 a single arcuate movable contact 72 having two diametrically opposite contact notches 44 is illustrated. In Fig. 10 the movable contact assemblage comprises two identical movable contacts 82 disposed diametrically opposite each other and each provided with two contact notches 44; whereas in Fig. 11 two movable contacts 92 of different length are utilized, one of these having only two contact notches 44 while the other has three such notches. These various movable contacts 42, 62, 72, 82, 92 may be employed in standard rotors 24 which are cooperable with all other elements of the improved switch assemblage previously described, thus providing extreme flexibility in adaptation and use of the improved unit in connection with both standard and special alternating and direct current electrical systems.

The normal use of the improved switch should be clearly apparent to those skilled in the art, from the foregoing description of its specific construction, and it should be noted that the present invention provides an improved rotary reversing switch which is in fact simple in construction, efficient in operation, and adapted for diverse uses to control various types of electrical equipment and apparatus. The improved switch assembly while being exceedingly compact and durable, has all parts thereof effectively insulated against short circuiting and possible danger, and the various insulating elements may be readily molded of attractive plastic insulating material to produce a highly aesthetic but practical assemblage. The various parts of the mechanism are also sturdily constructed with ample supporting bearings for the rotor, but the parts may be quickly and conveniently assembled or dismantled and mounted upon panels or other supports in diverse positions so as to meet varying conditions. The improved formation of the handle 34 with an annular pocket snugly cooperating with an annular lip on the adjacent cover 18, protects the internal mechanism against possible oil or water seepage, by providing a labyrinth packing around the rotor

supporting shaft 29, and the typical switch unit shown is adapted to be utilized in either direct current, or alternating current single or multiple phase electric circuits. All parts of the switch unit are also readily accessible for inspection and installation, and may be manufactured at moderate cost; and the improved rotary reversing switch has proven highly satisfactory and successful in actual use.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise mode of use, herein shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art; and it is further contemplated that various specific descriptive terms used herein be given the broadest possible interpretation consistent with the disclosure.

We claim:

1. An electric switch comprising, a tubular casing formed of insulating material and being divided by an integral internal web into two segregated end chambers, an annular series of fixed contacts secured to said web entirely within one of said chambers and projecting through restricted openings in the web into the other chamber, a closure cover for said other chamber formed of insulating material and having an integral tubular flange slip-fitting the interior of said casing, and a rotor formed of insulating material and being journaled for rotation in said cover while confined within said other chamber, said rotor having movable contacts embedded therein and cooperable with said fixed contacts within said cover flange and also having indexing notches cooperable with said fixed contacts remote from said movable contacts.

2. An electric switch comprising, a casing, an annular series of resilient fixed contacts mounted within said casing and each having a V-shaped contact portion, a rotor mounted within said casing and having an annular series of rigid movable contacts each provided with a similarly V-shaped notch formed for extensive surface engagement with only one of said V-shaped fixed contact portions during establishment of each successive electric circuit, and means for effecting step-by-step rotation of said rotor relative to said casing.

3. An electric switch comprising, a casing, an annular series of resilient fixed contacts mounted within said casing and each having a V-shaped contact portion, a rotor mounted within said casing and having an annular series of rigid movable contacts each provided with a central similarly V-shaped notch and arcuate contact portions on opposite sides of each notch, said arcuate movable contact portions being engageable with the V-shaped portions of said fixed contacts before the latter enter into extensive surface engagement with the V-shaped notches, and means for effecting step-by-step rotation of said rotor relative to said casing.

4. An electric switch comprising, a casing, an annular series of resilient fixed contacts mounted within said casing and each having a V-shaped contact portion, a rotor mounted within said casing and having an annular series of rigid movable contacts each provided with a similarly V-shaped notch engageable with only one of said V-shaped fixed contact portions during establishment of each successive electric circuit, said rotor also having thereon an annular series of insulated indexing V-notches spaced laterally

away from said movable contacts a considerable distance and cooperable with said fixed contacts when inactive, and means for effecting step-by-step rotation of said rotor relative to said casing.

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