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ROTARY SWITCH CONSTRUCTION

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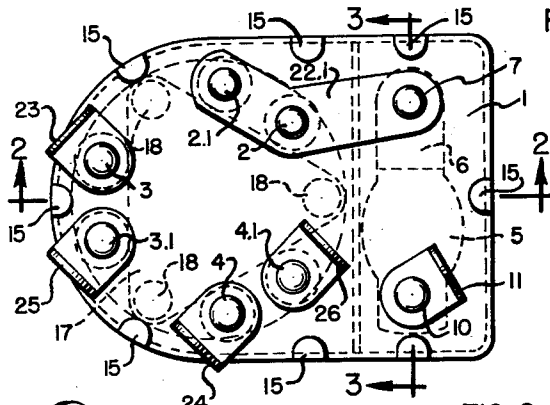


FIG. 1

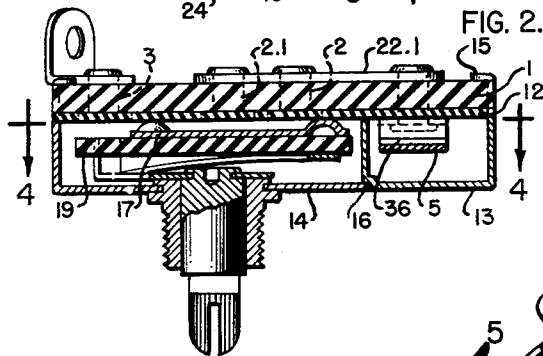


FIG. 2

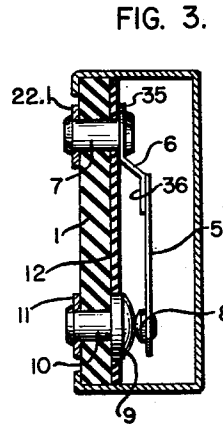


FIG. 3

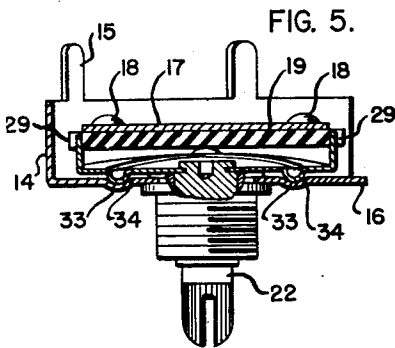


FIG. 5

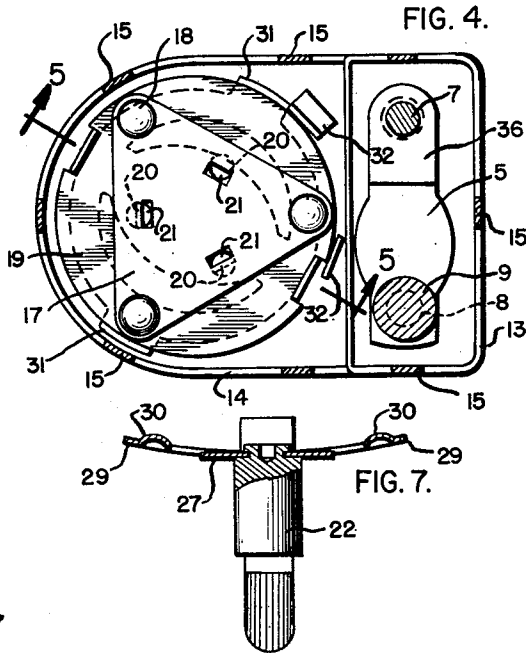


FIG. 4

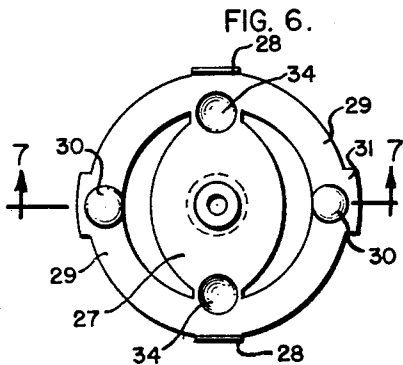


FIG. 6

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ROTARY SWITCH CONSTRUCTION

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5 Claims. (Cl. 200—11)

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This invention relates to rotary switches and particularly to such devices as may be employed on the control panels of motor vehicles for controlling the operation of electrical apparatus such as lights, windshield wipers, and other electrically operated means wherein overload protection is desired.

Particularly, this invention is an improvement on and a continuation of the invention disclosed in my copending application, Serial #637,655, filed December 28, 1946, now Patent No. 2,459,998, granted January 25, 1949.

The main objects of this invention are to provide an improved rotary switch construction for electrical apparatus; to provide such a device having an enclosed and built in circuit breaker; to provide such a device having a simplified circuit breaker construction and arrangement; to provide an improved rotary switch having an internal circuit breaker and in which the insulating base or back of the switch serves as a common mounting board for the switch and circuit breaker contacts; to provide an improved floating contact construction for rotary switches; to provide an improved electric switch having a simplified internal circuit breaker arrangement; and to provide an improved internal circuit breaker mounting bracket to facilitate adjustment or calibration of the circuit breaker.

A specific embodiment of this invention is shown in the accompanying drawings in which:

Figure 1 is a rear plan view of an improved switch embodying the invention and showing the general arrangement and disposition of the contact terminals.

Fig. 2 is a sectional view of the improved switch as taken on line 2—2 of Fig. 1 and showing the internal arrangement of the switch mechanism and circuit breaker.

Fig. 3 is a sectional view as taken on line 3—3 of Fig. 1 showing the circuit breaker mounting arrangement.

Fig. 4 is a sectional plan view as taken on line 4—4 of Fig. 2 to show the arrangement of the switch mechanism.

Fig. 5 is a sectional view as taken on line 5—5 of Fig. 4 showing the arrangement for driving the insulating contact arm carrier.

Fig. 6 is a plan view of the contact arm carrier bracket or driving element; and

Fig. 7 is a side view partly in section of the contact arm carrier bracket showing its attachment to the operating shaft and the arrangement of its spring arms for tensioning the contact carrier.

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In the form shown in the drawings, the improved switch construction comprises a base or mounting board 1 made of suitable insulating or dielectric material and on which a plurality of angularly spaced switching contacts are mounted. These contacts are in the form of rivets extending through the base 1 and each has a flat head on the inner side of the base and a suitable terminal on the outer or back side of the base. The terminals connected to the contacts in any suitable manner, as by riveting—over the outer ends of the contact shanks. As shown, the contacts are arranged in three groups of two contacts each, the contacts 2 and 2.1 of the first group being the hot contacts and being bridged by a common connector. The contacts 3 and 3.1 of the second group and 4 and 4.1 of the third group are independent of each other for providing high and low connections to two separate circuits to be controlled.

Also, a thermal-overload circuit breaker 5 of the bi-metal self-returning type is mounted on the insulating base 1 on the same side thereof as the contact heads and this circuit breaker is located to one side of the annular series of contacts.

As shown in Fig. 3, the circuit breaker 5 is carried on a free arm of a supporter bracket 6, which is fastened to the base 1 by means of a rivet 7, and the circuit breaker carries a contact 8 positioned to engage a fixed contact 9 having a shank 10 extending through the base 1 to the rear or outside thereof where a suitable terminal 11 is secured by peening or riveting over the outer end of the shank 10.

Preferably, and as shown in Figs. 2 and 3, a spacer strip 12 of suitable insulating material, having the same thickness as the contact heads, is disposed against the inner face of the base or mounting board 1 and is provided with openings aligned with the several contact heads and into which the contact heads are received, so that their end surfaces will be flush with the exposed surface of the spacing strip 12. Finally the switch is completed by means of a housing comprising a pair of cup-like metal covers 13 and 14 formed to enclose the circuit breaker and the switch contacts respectively. The covers 13 and 14 have their side walls resting upon the margins of the insulating strip 12, as shown in Fig. 3, and are secured to the base 1 by means of a plurality of ears or lugs 15 which extend through suitable grooves in the edge of the base to the back side thereof where the lugs or ears are bent inwardly to hold the covers 13 and 14 to the base.

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As indicated in Fig. 2, the cover 13 is provided with four side walls which completely enclose the circuit breaker 5 and is arranged for attachment to the base 1 independently of the cover 14, the purpose being to provide a secure housing for the circuit breaker mechanism which is usually mounted on the base 1 and calibrated before assembly of the remainder of the switch mechanism. The cover 13 thus protects the relatively delicate circuit breaker mechanism from being inadvertently knocked out of adjustment either during shipment of the partially assembled bases or during the assembly of the remainder of the switch mechanism.

The cover 14 is a three-walled construction arranged to enclose the contact heads and, as shown in Fig. 2, the open side of the cover 14 is provided with a lip 16 which rests in a shoulder formed on the inside corner of the cover 13 so as to provide a dust-tight enclosure for the switch mechanism when the same is assembled.

The switching mechanism shown comprises a contact plate 17 made of suitable conducting material and having three angularly spaced bosses 18 adapted to engage the heads of the several contacts selectively, when the plate 17 is rotated, and this contact plate 17 is carried by an angular washer-like carrier 19 which is made of a suitable insulating or dielectric material. The contact plate 17 rests loosely against the inner side of the carrier 19, adjacent the fixed contacts in the base, and is connected to the carrier by means of lugs 20 which are pressed out of the body of the contact plate and extend normal thereto into suitable apertures 21 formed in the carrier body. The carrier 19 is in turn connected to an operating shaft 22, in a manner which will be hereafter described, whereby the carrier 19 is rotated to bring the contact embossments 18 into engagement with contact heads selectively.

In the particular switch illustrated in the drawings, the contact arrangement and the switch mechanism are designed for three positions, off, low and high, and the contacts and terminals are arranged to control two separate circuits each having a high and low position as would be the case for dual windshield wipers having independent two-speed motors.

Thus, in the form shown, there are six fixed contacts spaced angularly about the axis of rotation of the operating shaft 22 and there are three contacting embossments 18 on the contact plate 17.

As shown in Fig. 1, the contact plate 17 is indicated in its "off" position and upon rotation counterclockwise, the contact plate embossments will be brought into engagement first with one set of three contacts and then with a second set of three contacts, so as to complete a circuit leading serially from the terminal 11 through the circuit breaker 5 to the circuit breaker mounting rivet 7 and thence through a connector 22.1 to the hot or first pair of contacts 2 and 2.1 with which the connector 22.1 is common. The circuit from the hot contacts is completed through the contact plate 17 to the outgoing switch terminals leading to the separate circuits to be controlled.

In the first position of the switch, the contact plate embossments 18 engage the hot contact 2 and the outgoing contacts 3 and 4. In the second position of the switch, the contact plate 17 completes a circuit between the hot contact 2.1 and the contacts 3.1 and 4.1.

Thus the terminals 23 and 24 leading from the

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contacts 3 and 4 respectively may provide a "low" connection for the circuits of two independent devices and the terminals 25 and 26 connected to the contacts 3.1 and 4.1 respectively may provide the "high" connection for each of the two devices.

As shown in Fig. 5, rotation of the carrier 19 is had by means of a carrier bracket or driving means 27 which is fixedly attached to the inner end of the shaft 22 and which has a pair of upstanding lugs 28 adapted to engage in suitable notches 29 in the periphery of the carrier 19, the lugs 28 being disposed on diametrically opposite sides of the carrier bracket 27 and slidable axially in the said notches. Thus as the carrier bracket is rotated by means of the shaft 22, the carrier 19 and the contact plate 17 are likewise turned.

Also, as shown in Fig. 6, the carrier bracket 27 is provided with a pair of spring arms 29, one on each side, extending arcuately between the ends of the carrier bracket. These spring arms 29 are each provided with a bearing boss 30 and are bent upwardly so as to resiliently engage against the carrier 19 and urge the same axially away from the operating shaft 22. Thus, when these parts are assembled in the switch, the carrier 19, together with the contact plate 17, is constantly urged toward the contact heads mounted in the base 1 and lying flush with the surface of the spacer 12, and the carrier has a floating action which provides certainty of contact engagement.

As shown in Fig. 6, the bosses 30 on the spring arms 29 are diametrically disposed relative to each other and are located midway, angularly, between the carrier engaging lugs 28 so as to maintain a balanced pressure or tension against the carrier. Also, at the location of each of the bosses 30, the spring arms are each provided with an outwardly projecting lug 31 adapted to engage limit stops 32 projecting inwardly from the cover 14 and positioned to limit the rotary movement of the carrier 19, as shown in Fig. 4. The cover 14 may be provided with detents 33 adapted to be engaged by bosses 34 on the underside of the carrier bracket in order to indicate the several switch positions.

As shown in Fig. 3, the bracket 6 on which the circuit-breaker blade 5 is mounted is a somewhat Z-shaped member having one leg 35 held fast by the rivet 7 and a second or free arm 36 disposed to hold the circuit breaker blade 5 in a position spaced outwardly away from the base or mounting board 1.

The circuit breaker blade 5 is a thermal-overload, snap-acting device, preferably of the self-returning type which, upon being heated by an overload current, springs outwardly to separate the contacts 8 and 9 and which, upon cooling, springs inwardly to engage the contacts 8 and 9. The particular mounting bracket 6 for this circuit breaker blade admits of easy and quick adjustment of the position of the blade 5 so that the circuit breaking action can occur at precisely the desired amount of overload, and such adjustment may be had by merely bending the mounting bracket 6 between the arms 35 and 36.

The main advantages of this invention reside in combination of an overload protecting device and a switch mechanism on a common insulating base or terminal board whereby the construction of the assembly is simplified and made more compact; and in the arrangement of parts whereby the device can be made of relatively smaller size and at a considerably lesser cost.

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Further advantages lie in the construction whereby all contacts are enclosed and protected by covers; and in the arrangement of separate covers for the overload device and the switch mechanism whereby the circuit breaker is fully protected during assembly of the switching elements, and during shipment of the terminal board sub-assemblies between processors.

Still further advantages are to be found in the improved mounting of the overload circuit breaker whereby easy adjustment and calibration may be made; and in the simple construction of the rotary switch parts whereby a positive connection between several spaced contacts is had through a single shiftable contacting element that is floating with respect to the fixed driving means.

Although but one specific embodiment of this invention is herein shown and described it will be understood that details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims:

I claim:

1. In an electric switch assembly comprising a base having a plurality of angularly spaced contacts on one face and cover means mounted on said base and enclosing said contacts, a switch mechanism comprising a shaft rotatably mounted in said cover means and projecting outwardly therefrom, the inner end of said shaft terminating adjacent the inner face of said cover, a floating disc-like dielectric carrier disposed within said cover means beyond the inner end of said shaft and facing said contacts, a contact plate mounted on said carrier and positioned to engage said contacts selectively upon rotation of said carrier, a driving means for said carrier mounted fast on the inner end of said shaft and having radially disposed angularly spaced axially projecting lugs in driving engagement with said carrier, said carrier being axially slidable on said lugs, and a resilient arm on said driving means bearing axially inward against said carrier to urge the same toward said contacts, said arm being disposed in an intermediate angular position relative to said lugs.

2. In an electric switch assembly comprising a base having a plurality of angularly spaced contacts on one face and cover means mounted on said base and enclosing said contacts, a switch mechanism comprising a shaft rotatably mounted in said cover means and projecting outwardly therefrom on an axis common to said contacts, the inner end of said shaft terminating adjacent the inner face of said cover, an annular dielectric carrier disposed within said cover means beyond the inner end of said shaft and facing said contacts, a contact plate mounted on said carrier and adapted to engage said contacts selectively upon rotation of said carrier, a driving means for said carrier mounted fast on the inner end of said shaft and having diametrically spaced axially projecting lugs in driving engagement with said carrier, said carrier being axially slidable on said lugs, and a pair of diametrically opposed resilient arms on said driving means adapted to bear axially inward against said carrier to urge the same toward said contacts, said arms being positioned angularly midway between said lugs and terminating outwardly in bearing portions adapted to provide rocking engagement with said carrier.

3. In an electric switch assembly comprising a base having a plurality of contacts on one

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face spaced angularly about a common central axis, and a cover means mounted on said base and enclosing said contacts, said cover having an opening aligned with the central axis of said contacts and a bushing in said opening, a switch means mounted within said cover and comprising a rotatable shaft extending through said bushing and terminating inwardly adjacent the inner face of said cover, a carrier bracket mounted fast on the inner end of said shaft and having a plurality of axially projecting lugs spaced radially from the axis of said shaft and directed inwardly from said cover, a pair of diametrically opposed resilient arms integral on said carrier bracket and formed to normally project inwardly beyond the end of said shaft, a dielectric carrier disposed against said resilient arms in spaced relation with the end of said shaft and having apertures positioned to slidably receive said lugs in the axial direction, and a contact plate mounted on the inner face of said carrier and adapted to engage said contacts selectively upon rotation of said carrier, said resilient arms normally urging said carrier toward said contacts.

4. In an electric switch assembly comprising a base having a plurality of contacts on one face spaced angularly about a common central axis, and a cover means mounted on said base and enclosing said contacts, said cover having an opening aligned with the central axis of said contacts and a bushing in said opening, a switch means mounted within said cover and comprising a rotatable shaft extending through said bushing and terminating inwardly adjacent the inner face of said cover, a carrier bracket mounted fast on the inner end of said shaft and having a plurality of axially projecting lugs spaced radially from the axis of said shaft and directed inwardly from said cover, a dielectric carrier disposed inwardly beyond the end of said shaft and lying in a plane normal to the axis thereof, said carrier having spaced apertures disposed to receive said lugs in axially slidable engagement, a contact plate mounted on the inner face of said carrier and adapted to engage said contacts selectively upon rotation of said carrier, and resilient means bearing between said carrier bracket and said carrier and normally urging said carrier toward said contacts, said resilient means being adapted to permit lateral rocking of said carrier.

5. In an electric switch assembly comprising a base having a plurality of contacts on one face spaced angularly about a common central axis, and a cover means mounted on said base and enclosing said contacts, said cover having an opening aligned with the central axis of said contacts and a bushing in said opening, a switch means mounted within said cover and comprising a rotatable shaft extending through said bushing and terminating inwardly adjacent the inner face of said cover, a carrier bracket mounted fast on the inner end of said shaft and having a plurality of axially projecting lugs spaced radially from the axis of said shaft and directed inwardly from said cover, a dielectric carrier disposed inwardly beyond the end of said shaft and lying in a plane normal to the axis thereof, said carrier having spaced apertures disposed to receive said lugs in axially slidable engagement, a contact plate mounted on the inner face of said carrier and adapted to engage said contacts selectively upon rotation of said carrier, and resilient means fixed to the inner end of said shaft and bearing against said carrier to normally urge

said carrier toward said contacts, said resilient means being adapted to permit lateral rocking of said carrier.

GILBERT S. ELLITHORPE.

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