May 28, 1929. E. M. SORENG 1,715,015

SWITCH STRUCTURE

Filed July 21, 1927

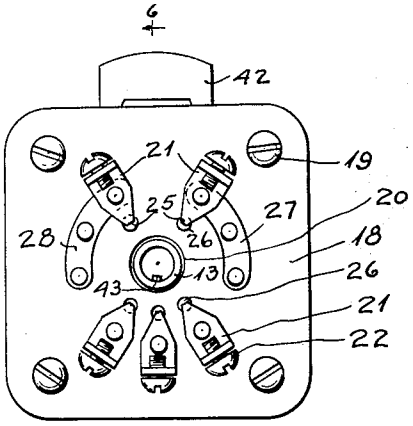


Fig. 1.

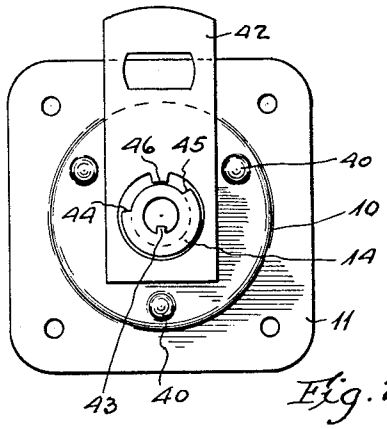


Fig. 2.

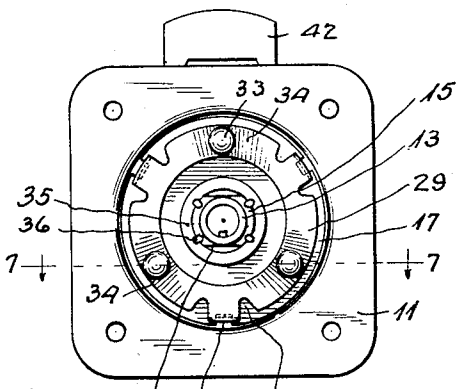


Fig. 3.

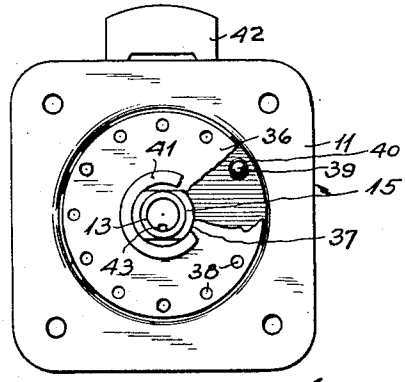


Fig. 4.

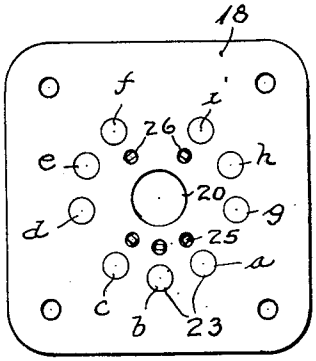


Fig. 5.

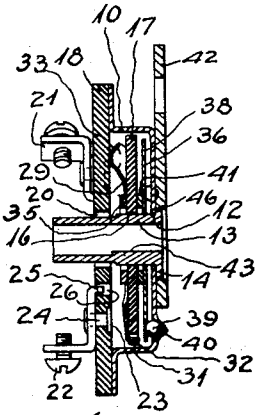


Fig. 6.

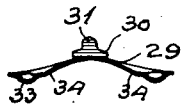


Fig. 7.

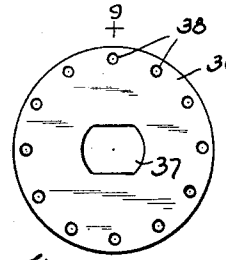


Fig. 8.

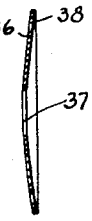


Fig. 9.

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ATTORNEYS.

Patented May 28, 1929. 1,715,015

UNITED STATES PATENT OFFICE.

EDGAR M. SORENG, OF CHICAGO, ILLINOIS, ASSIGNOR TO SORENG-MANEGOLD COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SWITCH STRUCTURE.

Application filed July 21, 1927. Serial No. 207,398.

My invention relates to switch structures which are particularly adaptable for use in automotive vehicles for controlling the electrical circuits such as the lighting circuits. The object of the invention is to simplify and reduce the cost of manufacture by reducing the operative parts to a minimum and making them of sheet material by means of simple, inexpensive dies.

On the drawing Fig. 1 is a front elevational view of the switch structure;

Fig. 2 is a rear elevational view;

Fig. 3 is a front elevational view with the terminal supporting cover removed;

Fig. 4 is a front elevational view with the cover, the contact ring and its supporting disc removed;

Fig. 5 is an inner side view of the terminal supporting covers;

Fig. 6 is a sectional view on plane 6—6 of Fig. 1;

Fig. 7 is a sectional view of the switching member on plane 7—7 of Fig. 3;

Fig. 8 is an elevational view of the spring locking disc; and

Fig. 9 is a sectional view on plane 9—9 of Fig. 8.

The switch structure shown is adapted particularly for support at the lower end of a steering column although it is evident that by slight modifications it can be adapted for support elsewhere, as for example, on the dash board of an automotive vehicle. Referring to the drawing the body structure is bent from a single piece of sheet metal to form the cylindrical housing or container 10, and the surrounding flange 11 of generally rectangular contour. The rear wall of the housing has the axial opening 12 through which is inserted the tubular hub 13 which forms the support for various switching and controlling elements. At its rear end the hub has the circular flange 14 which engages against the outer face of the housing back and limits the inward movement of the hub. Within the housing 10 the hub has the oblong enlargement 16 which receives the similarly shaped axial opening 16 of the supporting disc 17 of insulating material such as fibre, the oblong enlargement forming a driving connection between the hub and the disc.

The housing 10 is adapted to be closed by a cover plate 18 of some suitable electrical insulating material or composition, this cover plate being secured as by means of screws 19 and having preferably the same contour as the flange 11. The cover plate has the opening 20 through which the hub 13 may extend, and concentric with the hub the cover supports a plurality of terminal structures and contacts. The terminals shown are in the form of L-shaped brackets 21 in which thread the terminal binding screws 22 and which electrically connect with terminal buttons 23. The buttons are on the inside of the cover plate while the terminal structures are on the outside and the buttons are provided with shanks 24 which extend through the cover plate and the respective terminal structures and are riveted over against the terminal structures as clearly shown in Fig. 6. To prevent turning of the terminal structures and to more securely anchor them the ends 25 of their bases are deflected to extend into holes 26 formed in the cover plate.

On the arrangement shown the terminal plate has three terminal buttons *a*, *b* and *c* connected each to one of the terminal structures 21. There are also two sets of buttons *d*, *e*, *f* and *g*, *h*, *i*, electrically connected together by the plates 27 and 28 to each of which is secured a terminal structure 21.

Between the cover plate and the supporting disc 17 is the contact connecting or switching member 29 which moves with the disc 17 to co-operate with the contact buttons on the cover plate to establish the various desired circuit connections. This switching member is bent from springy sheet metal such as bronze and is of annular shape. At circumferentially spaced points this switching member has the axially extending deflections forming feet 30 which have the anchoring extensions or toes 31. At its periphery the supporting disc 17 has notches 32 spaced in accordance with and to receive the toes 31 to thereby hold the switching member concentric with the disc and to rotate it with the disc. The edges of the deflections or feet 30 engage with the supporting disc and transmit the pressure on the switching member to the disc.

The contact connecting or switching member has contact points or projections 33 deflected therefrom, three such projections being shown, and these projections are properly spaced relative to the terminal buttons and their radial displacement from the axis of the hub 13 is the same as that of the terminal buttons. I preferably provide as

many supporting feet 30 on the switching member as there are contact points or projections and I place the feet midway between the points. The sections of the switching member between the feet are then deflected axially to form spring arches or bow sections 34 whose ends are at the feet 30 and at the crest of each of which is one of the contact points 33 referred to.

On the front end of the enlargement 15 on the hub 13 and in front of the disc 17 is a washer 35 which abuts against the retaining projections 35′ which may be formed on the hub by prickpunching. Behind the disc 17 is a spring disc 36 which may be of bronze and which has the oblong axial opening 37 for receiving the hub enlargement 15, so that the disc is locked to the hub to rotate therewith. The disc 36 has the holes 38 which receive the balls 39 journaled in the bearing pockets 40 deflected in the rear wall of the housing 10. Between the spring disc 36 and the supporting disc 17 is interposed the washer 41. The spring disc 36 is primarily dished as shown in Fig. 9, and its crest is engaged by the washer 41. When the parts are assembled the spring disc is first applied to the hub 13, then the washer 41, then the supporting disc 17, and then the washer 35, pressure being applied until the washer 35 is inside of the outer end of the hub enlargement 15 and then the hub is burred or punched over at its end to form the locking projections 35′ which will then lock the washer 35 and the parts behind it in operative positions. The pressure exerted against the spring disc 36 during assembly of the parts will flatten and tense the disc. The holes 38 and the detent balls 39 are so spaced relative to the contact buttons 23 and the contact points 33 of the switching element, that the detent balls will engage in detent openings 38 after each operation at the switch structure to then spring lock the switching member 29 in adjusted position. In other words the spring disc 36 produces a sort of snap switch operation.

When these parts are assembled the switching member 29 will be under axial compression between the supporting disc 17 and the cover plate 18. The bow or arch spring supports of the contact points 33 will produce long spring action having a large operating range. The structure as a whole possesses great flexibility, the engaging surfaces of the feet 30 being rounded and the toes 31 being sufficiently free in the slots 32 so that the entire switching member may flex and rock as its points 33 travel along the back of the cover plate and the points will therefore at all times make secure and accurate electrical engagement with the terminal buttons. The switching member therefore, by its own flexibility, eliminates the need of separate springs for holding the switching member in proper electrical engagement with the terminal buttons.

In order to assure proper positioning of the switching member on the disc 17, the spacing between the feet of the member and the notches 32 in the supporting disc is not quite uniform so that the switching member will be set in the notches in only one, that is, the correct relative position. The switching structure shown is adapted particularly for application at the lower end of a steering post, and I have shown a bracket 42 secured to the back of the housing 10 by means of which the structure may be secured. When thus secured the hub 13 will be disposed axially of the steering post and through it a rod (not shown) may be inserted and provided at its lower end with a key-way for receiving the key 43 in the hollow hub. The rod which is thus keyed into the hub has, at the upper end of the steering post a suitable lever (not shown) by means of which it may be turned to turn the hub and the switch members connected therewith to establish the desired electrical circuit. To limit the turning movement of the hub its flange 14 is cut away to leave abutment shoulders 44 and 45 into the path of which extends the abutment tooth 46 on the bracket 42.

To increase the flexibility of the switching member 29, it may be cut away adjacent to its feet 30 as indicated at 47 (Fig. 3).

Practically all the parts of my improved structure can be readily and inexpensively stamped from sheet material, and being thus formed they can be made accurate and uniform. As before stated the structure, instead of being adapted for mounting at the end of the steering post, may be adapted for support on the dash board of the vehicle and a key or lever applied to the hub for controlling the turning thereof. Other changes and modifications may be made without departing from the scope and the spirit of the invention which I claim as follows.

I claim:

1. In a switch structure of the class described, the combination of a housing, a rotatable hub journaled in said housing, a supporting disc of insulating material mounted on said hub to rotate therewith, a cover for said housing having terminal contacts thereon adapted for connection with electrical circuits, and a switching member between said supporting disc and cover, said member being in the form of a continuous ring of springy metal, said ring being deflected at intervals in axial direction to form a circumferential series of spring arch sections, a contact point at the crest of each spring section, said contact points engaging with the terminal contacts on said cover plate and said ring seating against said supporting disc only at the junctures of its arch spring sections, and means for causing said ring to turn with said

supporting disc, said ring being compressed between said disc and cover plate when said cover plate is applied.

2. In a switch structure the combination of a terminal plate having circuit terminals thereon, a supporting disc opposed to said terminal plate, and a switching element between said disc and plate, said switching element being a ring of springy sheet metal deflected axially alternately in opposite directions to form spaced seating points and spring arch sections between such seating points spaced away from said disc, contact points at the crest of said spring arch sections for engaging with said circuit terminals, said feet points engaging said supporting disc, means for holding said switch member concentric with said disc and for causing it to turn therewith, and means for turning said disc.

3. In a switch structure of the class described, the combination of a terminal member and a supporting member adapted to be relatively rotated, said terminal member having terminal contacts thereon, and a switching element between said members, said element being in the form of a ring of spring sheet metal having spaced engaging feet and being deflected in axial direction away from said supporting member intermediate its feet to form spring arch sections, contact points at the crests of said spring sections for engaging with said terminal contacts, said supporting member having notches, and projections on the feet of said ring for engaging in said notches to yieldably lock said ring to said supporting member during relative turning of said members.

4. In a switch structure of the class described, the combination of a terminal member and a supporting member having relative rotation, circuit terminals on said terminal member, and a switching element between said members, said element being in the form of a ring of spring sheet metal having spaced seating points engaging said supporting member and being axially deflected away from said supporting member intermediate said seating points to form arch spring sections engaging at their crests with said terminals, and means for detachably and yieldably anchoring said ring to said supporting member.

5. In a switch structure of the class described, the combination of a stationary terminal frame having circuit terminals thereon, a housing, a hub rotatable in said housing, a supporting disc on said hub secured to rotate therewith, a switching element within said housing positioned between said supporting disc and said terminal frame, said element being in the form of a ring of spring sheet metal and having arched sections for engaging at their crests with said terminals on said terminal frame, means yieldably anchoring said ring to said supporting disc to rotate therewith, a spring disc behind said supporting disc having depressions, detent balls journaled in the back wall of said housing and engaging in said depressions, said spring disc being secured to the hub for rotation therewith, the engagement of said depressions with said balls causing said spring disc and hub to be yieldably locked when said hub has been rotated to carry said switching element into an operative position.

In witness whereof, I hereunto subscribe my name this 19th day of July, 1927.

EDGAR M. SORENG.