

June 26, 1934.

H. A. DOUGLAS

1,964,561

ELECTRIC SWITCH

Filed Feb. 20, 1933

2 Sheets-Sheet 1

Fig. 1

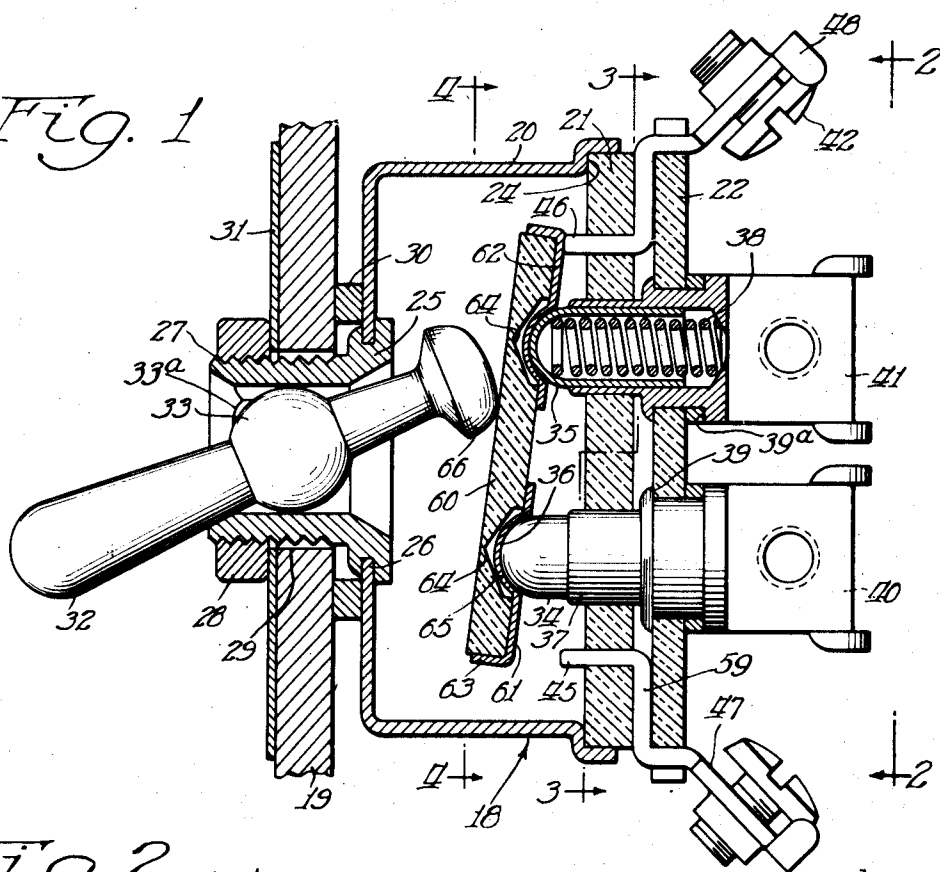


Fig. 2

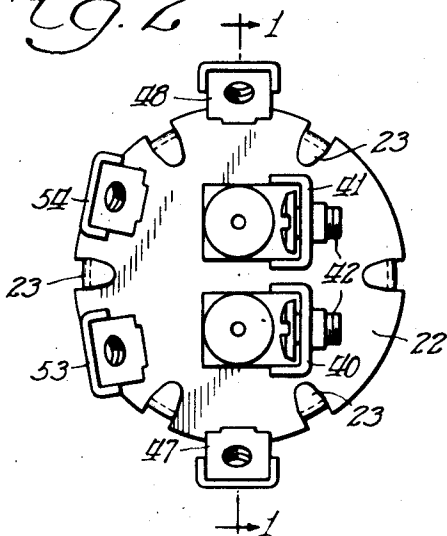
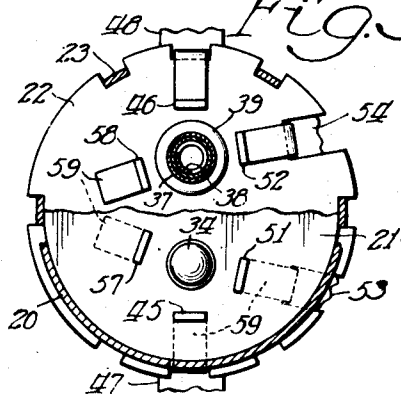


Fig. 3



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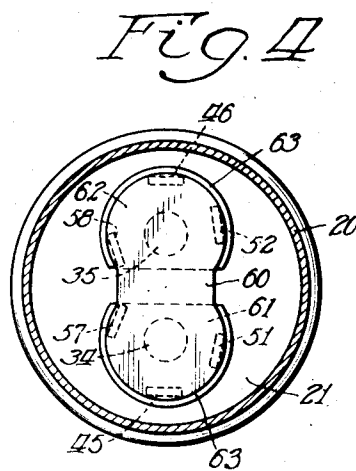
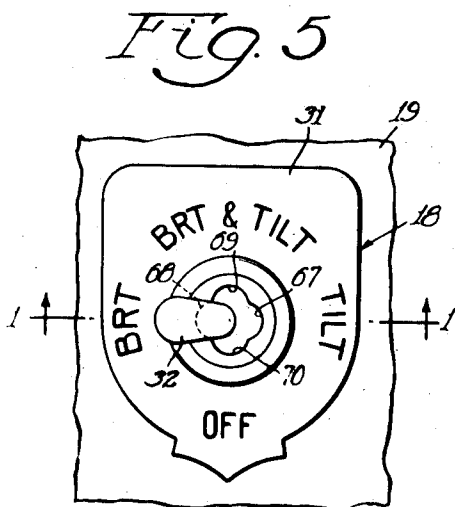
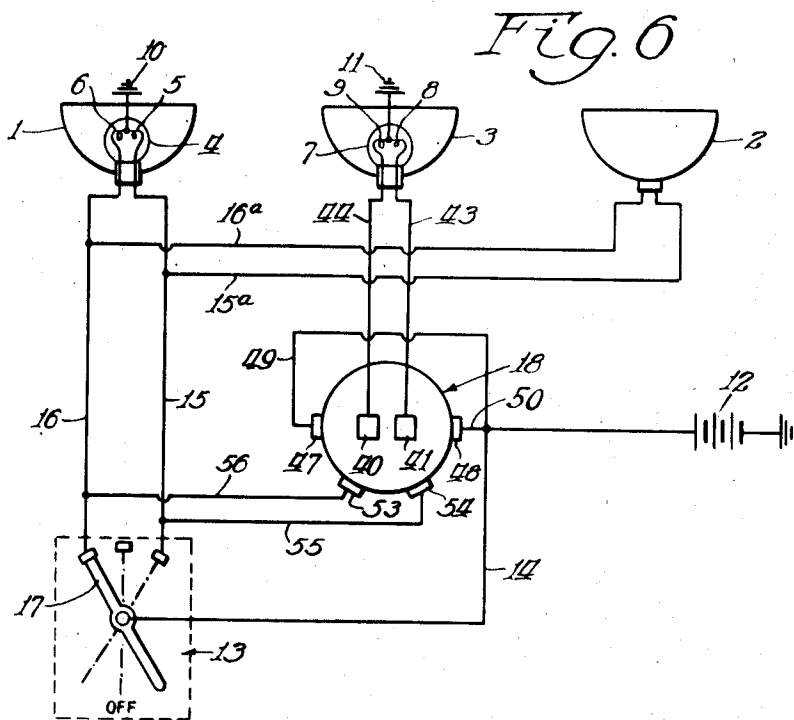
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

1,964,561

ELECTRIC SWITCH

Harry A. Douglas, Bronson, Mich.

Application February 20, 1933, Serial No. 657,552

8 Claims. (Cl. 200-6)

This invention relates to electric switches for controlling a plurality of electric circuits, and among other objects, aims to provide a unitary switch by means of which a plurality of pairs of electrical conductors may be placed in electrical connection while maintained insulated one from the other, and also by means of which a single pair of electrical conductors may be placed in electrical connection.

10 The invention is of particular utility when embodied in a four-position toggle switch for controlling the "bright" and "tilt" filaments of an automobile driving light, in which use the invention is here specifically described.

15 Other objects and advantages will be apparent from the following description taken together with the accompanying drawings, in which—

Figure 1 is an axial section of a switch embodying my invention and being a section on a somewhat larger scale taken on the line 1-1 of Figure 2;

Figure 2 is an end view of the structure of Figure 1 on a somewhat smaller scale taken on the line 2-2 of Figure 1;

25 Figure 3 is a broken cross-section taken on the line 3-3 of Figure 1 on a scale corresponding to Figure 2;

Figure 4 is a cross-section taken on the line 4-4 of Figure 1 on a scale corresponding to Figures 2 and 3;

30 Figure 5 is an end view of the structure of Figure 1 taken from the left hand side and showing on a somewhat smaller scale the actuator and legend plate for the switch; and

35 Figure 6 is a circuit diagram illustrating the specific application of the switch here described.

Referring in detail to the figures of the drawings and particularly to Figure 6, the illustrative circuit diagram shows a conventional arrangement of two automobile headlights 1 and 2 and a driving light 3. In this instance, the headlights 1 and 2 carry a single incandescent electric bulb 4 provided with a "bright" filament 5, which may be located in the focus of the reflector of the headlight, and a "tilt" filament 6, which may be located slightly above the focus of the reflector so as when energized, to direct its rays downwardly upon the road. Similarly, the driving light 3 may also have a single incandescent bulb 7 carrying a "bright" filament 8 and a "tilt" filament 9. The filaments 5 and 6 may be connected to a common ground 10 and the filaments 8 and 9 to a common ground 11, which ground may be the metallic frame of the vehicle to provide a return path for the electric current to the grounded battery 12,

all in accordance with conventional automotive lighting practice.

The "bright" filaments 5 and the "tilt" filaments 6 of the headlights may be controlled by any suitable switching mechanism such as that illustrated diagrammatically at 13, which is in series with the battery 12 by means of the insulated conductor 14 and which is shown in series with the conductors 15 and 16, leading to the "bright" and "tilt" filaments respectively of the headlight 1, the conductors 15a and 16a being branched from the conductors 15 and 16, respectively, to the other headlight 2. By means of the movable contact 17, either the "bright" filaments of both headlights or the "tilt" filaments of both headlights may be energized, or all these filaments may have a circuit therethrough discontinued in the "off" position of the switching mechanism 13. As shown in full lines in Figure 6, the movable contact 17 is in position to energize the "tilt" filaments 6 of the headlights 1 and 2, the other operative positions of the movable contact 17 being indicated by dotted lines.

In accordance with my present invention, I provide the auxiliary switching mechanism 18 for causing the driving light 3 to be controlled either by the switching mechanism 13 or, independently of the switching mechanism 13, by the switch 18 itself. For convenience the switching mechanism 13 is usually mounted on the steering column (not shown), and the switch 18 of my present invention, may be conveniently mounted on the instrument panel 19 (Figs. 1 and 5).

The switch 18 preferably comprises a metallic cup-shaped casing 20 closed at one end by an insulating closure including in this instance an inner bakelite disc 21 and an outer fiber disc 22, the casing 20 having prong continuations 23 which are bent over the fiber disc to hold the discs in place, an annular shoulder 24 in the casing 20 limiting inwardly movement of the inner disc 21. At its opposite end the casing 20 carries centrally thereof a bearing member 25 firmly riveted to the casing as at 26 and which may be externally threaded as at 27. By means of the clamping nut 28, in cooperation with the threads 27, the switch 18 may be secured to the instrument panel 19, the bearing member 25 passing through a suitable aperture 29 in the panel, and the nut 28 being then screwed on the bearing member. A spring washer 30 may be interposed between the panel and the casing 20 to guard against jarring loose of the nut 28, and this nut may also clamp to the panel 19, about the bearing member 25, the legend plate 31. As shown in Figure 5,

the legend plate indicates the respective operative positions of the actuator 32 for the switch. The actuator 32 has a spherical portion 33 which has universal movement in the bearing member 25, about the axis of the casing 20, a shoulder 33a in the bearing limiting forward movement of the actuator.

In accordance with my invention, the insulating closure of the switch 18 carries two current conducting abutments 34 and 35 disposed centrally of the closure, but equally spaced apart on either side of the axis of the casing, which passes medially between the abutments. The abutments 34 and 35 are desirably produced in the form of hollow metallic tubes having dome-shaped terminations 36 and telescoping within metallic sleeves 37 secured to the disc 22 and passing through the disc 21. The tube and the sleeve together houses a compression coil spring 38 which presses the abutments 34, 35, as the case may be, inwardly of the casing 20. The sleeves 37 may be riveted to the disc 22 as at 39, and may also clamp to themselves and to the disc (between the riveted shoulder 39 and a shoulder 39a) a terminal 40 for the abutment 34 and a terminal 41 for the abutment 35. By means of the usual binding screws, such as the binding screw 42, the terminal 41 may have electrically and mechanically connected thereto the insulated conductor 43 which is in series with the "bright" filament of the driving light 3. Similarly, the terminal 40 may have connected thereto the insulated conductor 44, which is in series with the "tilt" filament 9 of the driving light.

The insulating closures 21 and 22 also carry a plurality of abutments elliptically disposed about the spring pressed abutments 34 and 35, as best shown in Figure 3. In this instance, these elliptically disposed abutments include the abutments 45 and 46 which are in the form of contact continuations of terminals 47 and 48, respectively, which, by means of the insulated conductors 49 and 50 are each electrically connected with the battery 12. The elliptically disposed abutments also include two other current conducting abutments 51 and 52 which are in the form of contact continuations of the terminals 53 and 54, respectively. The terminal 54, by means of the insulated conductor 55, is in parallel with the conductor 15 for the "bright" filaments of the headlights, and the terminal 53, by means of the conductor 56, is in parallel with the conductor 16 for the "tilt" filaments of the headlights. The elliptically disposed abutments may also advantageously include two non-current conducting abutments 57 and 58. These elliptically disposed abutments may be firmly secured to the insulating closure by having a flat portion 59 which is clamped between the discs 21 and 22, the abutments themselves passing through the disc 21 to be projected into the interior of the casing slightly beyond the inner surface of the disc 21 to a less distance than the abutments 34 and 35.

Floating on the spring pressed abutments 34 and 35 is an insulating plate 60 which, as best shown in Figure 4, is advantageously in the form of a figure-8. The insulating plate 60 is provided with two spaced apart metallic surfaces 61 and 62 which are in abutment with the spring pressed abutments 34 and 35, respectively. As here shown, the metallic surfaces are provided by thin metallic sheets of partially circular form and having an arcuate flanged margin 63 which extends for more than one-hundred eighty degrees of a circle to snugly lap the edges of one

branch of the figure-8 of the plate 60. So constructed the metallic sheets providing the surfaces 61 and 62 constitute somewhat spring clips which grip themselves to the plate 60. To fix the position of the plate 60 with respect to the abutments 34 and 35 and to provide a ball and socket engagement between the plate and these abutments, the plate is recessed or depressed as at 64 at substantially the center of each branch of the figure-8 and the thin sheets constituting the metallic surfaces 61 and 62 have each a spheroidal indentation therein, as at 65, which is received in the recess 64 in the plate 60, the dome-shaped terminations 36 of the abutments 34 and 35 being received in the spheroidal indentations 65.

The floating insulating plate 60 is maintained in engagement with the abutments 34 and 35 by means of the nose 66 of the actuator 32. It may be said also that both the actuator and the floating plate are maintained in position by the abutments 34 and 35 in cooperation with the bearing member 25, it being understood that the actuator may be inserted from the rear of the switch before the closures 21 and 22 are clamped thereon.

In this instance, the actuator 32 is conveniently made of metal and is insulated from the current conducting abutments of the switch by the body of the insulating plate 60 against which the nose of the actuator has frictional engagement and upon which the nose 66 is movable in a generally circular path concentric with the axis of the casing 20 and coinciding with the median line between the abutments 34 and 35. It will be understood that the nose is also movable diametrically of the circular path referred to. The nose 66 of the actuator is of sufficient length so that the insulating plate 60 is depressed by the actuator in the region of the plate against which the nose 66 bears, at any given time, one or more of the springs 38 being then compressed to permit the abutment 34 or 35 adjacent thereto, as the case may be, to be also depressed. Normally, the resilient abutments 34-35 maintain the metallic surfaces 61-62 of the floating plate 60 out of contact with the elliptically disposed abutments 45, 46, 51, 52, 57 and 58, but when the plate 60 is depressed as just described, and as shown in Figure 1, the metallic surface 62 is brought into contact with the abutment 46, thus forming an electrical bridge between the current conducting abutment 35 and the current conducting abutment 46 and placing the "bright" filament of the driving light 3 in circuit with the battery to energize this filament, independently of the switching mechanism 13. It will be understood that at this time, while the abutment 35 yields to permit the plate 60 to be directly depressed by the nose of the actuator, the abutment 34 also tends to tilt the plate further in the direction of the abutment 46 to make contact therewith, the nose of the actuator acting as a fulcrum. Furthermore, the abutment 34 acts at this time as a resilient means for determining the selected position of the actuator 32, the actuator being then disposed in a circumferential notch 68 (Fig. 5) formed in the bore of the bearing 25 to further assist in determining the position of the actuator.

Similarly, when the actuator is moved to the position diametrically opposite to that shown in Figure 1, with the actuator in the notch 67, the metallic surface 61 is brought into contact with the abutment 45 and an electrical bridge is formed between the abutment 34 and the abutment 45 to place only the "tilt" filament 9 of the

driving light 3 in series with the battery and energizing this filament independently of the switching mechanism 13. Thus the abutments 45 and 46 being on opposite sides of and outwardly disposed with respect to the central abutments 34 and 35 are respectively complementary to these abutments, but are not complementary to each other, because of the spaced apart relationship of the metallic surfaces 61 and 62 preventing any electrical contact between these two groups of abutments.

These two groups of abutments may also include respectively the abutment 51 and the abutment 52, the abutment 51 being complementary to the central abutment 34 and the abutment 52 being complementary to the central abutment 35, the abutments 51 and 52 being disposed somewhat at right angles to the other complementary abutments 45 and 46. Thus when the actuator 32 is moved to a position at right angles to the two positions last described and is received in the notch 69, the plate 60 is depressed by the nose of the actuator in the region of the abutments 51 and 52 and upon a line medially between these abutments so as to cause the metallic surface 61 to form an electrical bridge between the central abutment 34 and the abutment 51 and also to cause the metallic surface 62 to form an electrical bridge between the central abutment 35 and the abutment 52. The resiliency of these central abutments 34, 35 also assists in tilting the plate into this position with the nose of the actuator as a fulcrum. At this time the filaments of the driving light are under control of the switching mechanism 11. That is, the "bright" filament 8 of the driving light is in parallel with the conductor 15 for the "bright" filaments of the headlights through the conductor 43, terminal 41, central abutment 35, complementary abutment 52, terminal 54, and conductor 55. At the same time the "tilt" filament 9 of the driving light is in parallel with the conductor 16 for the "tilt" filaments of the headlights through the conductor 44, terminal 40, central abutment 34, complementary abutment 51, terminal 53 and conductor 56. Thus when the switching mechanism 13 is in the position shown in full lines in Figure 6, the "tilt" filament of the driving light, as well as the "tilt" filaments of the headlights is energized. When the switching mechanism 13 is placed in the positions shown in dotted lines either the filaments of all of these lights are deenergized or the "bright" filament of the driving light is energized at the same time as the "bright" filaments of the headlights. Thus by placing the actuator 32 of the switching mechanism 18 in the notch 69, the operator of the vehicle may, if he desires, ignore this switching mechanism 18 and nevertheless have the driving light the same as the headlights at all times, or by moving the actuator 32 into the notches 67 or 68 as desired, he may control the driving light independently of the headlights.

If the operator wishes to extinguish the driving light entirely regardless of whether the headlights are "on" or "off", he may move the actuator 32 into the notch 70 at which time the insulating plate 60 will be tilted into abutment with the non-current conducting abutments 57 and 58, at which time the central abutments 34 and 35 are entirely out of circuit.

Having described an embodiment of my invention, I claim:

1. An electric switch comprising a plurality of resilient current conducting abutments, complementary current conducting abutments adja-

cent to each of the resilient abutments, an insulating member having a plurality of spaced apart metallic surfaces each abutting one of the resilient abutments, said resilient abutments normally yieldingly maintaining the metallic surfaces out of contact with the complementary abutments, and means for selectively depressing the insulating member in the region of one of the resilient abutments to cause the metallic surface abutting the last mentioned abutment to also engage the complementary abutment adjacent thereto.

2. An electric switch comprising a plurality of spring pressed current conducting abutments, complementary current conducting abutments adjacent to each of the spring pressed abutments, an insulating member having a plurality of spaced apart metallic surfaces each abutting one of the spring pressed abutments, said spring pressed abutments normally yieldingly maintaining the metallic surfaces out of contact with the complementary abutments, and means for selectively depressing the insulating member in the region of one of the spring pressed abutments to cause the metallic surface abutting the last mentioned abutment to also engage the complementary abutment adjacent thereto.

3. An electric switch comprising two spring pressed current conducting abutments; a complementary current conducting abutment adjacent each of the spring pressed abutments; an insulating member having two spaced apart metallic surfaces each abutting one of the spring pressed abutments, said spring pressed abutments normally yieldingly maintaining the metallic surfaces out of contact with the complementary abutments; and a universally movable actuator maintaining the insulating member in floating engagement with the spring pressed abutments, and selectively movable to depress the insulating member in the region of one of the spring pressed abutments to cause the metallic surface abutting the last mentioned abutment to also engage the complementary abutment adjacent thereto.

4. An electric switch comprising a metallic cup-shaped casing; an insulating closure for one end thereof; two spaced apart current conducting abutments disposed centrally of the closure, said abutments being spring pressed inwardly of the casing; a plurality of abutments including a plurality of current conducting abutments carried by the closure and disposed elliptically about the spring pressed abutments; a bearing at the opposite end of the casing; a metallic actuator having universal movement in the bearing about a center line passing medially between the spring pressed abutments; an insulating plate floating on the spring pressed abutments having spaced apart metallic surfaces each abutting one of the spring pressed abutments by a ball and socket engagement, said plate being held in floating engagement with the spring pressed abutments by said actuator, the actuator having a nose in frictional engagement with the plate and movable to at least three points in an arc of a circle on the plate, whereby the plate is tilted by the spring pressed abutments with the nose of the actuator as a fulcrum to cause the metallic surfaces of the plate to selectively engage the complementary contacts.

5. The structure of claim 4 wherein the insulating plate is of figure-8 shape having a depression at substantially the center of each branch of the 8 and the metallic surfaces are provided by thin metallic sheets of partially circular form and having an arcuate flanged margin of more

than one-hundred eighty degrees snugly lapping the edges of the plate to retain the sheets thereon, wherein each of the sheets has a spheroidal indentation received in one of the indentations of the plate, and wherein the spring pressed abutments have dome-shaped terminations received in said indentations to provide the ball and socket engagement.

6. The structure of claim 4 wherein the elliptically disposed abutments comprise two current conducting abutments, complementary respectively to each of the spring pressed abutments.

7. The structure of claim 4 wherein the elliptically disposed abutments comprise two current conducting abutments, complementary respectively to each of the spring pressed abutments and a non-conducting current abutment complementary to each spring pressed abutment.

8. The structure of claim 4 wherein the bearing has at least three circumferential notches therein receiving the actuator to determine its respective positions.

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