May 19, 1942. R. H. HILL 2,283,630

DIMMER SWITCH

Filed Nov. 18, 1939

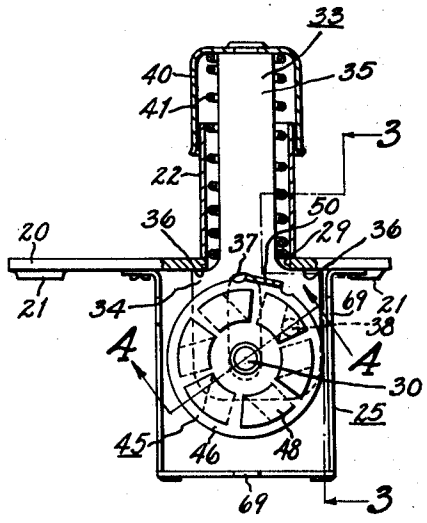


Fig. 2

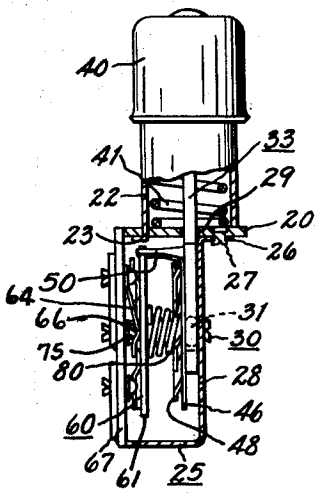


Fig. 3

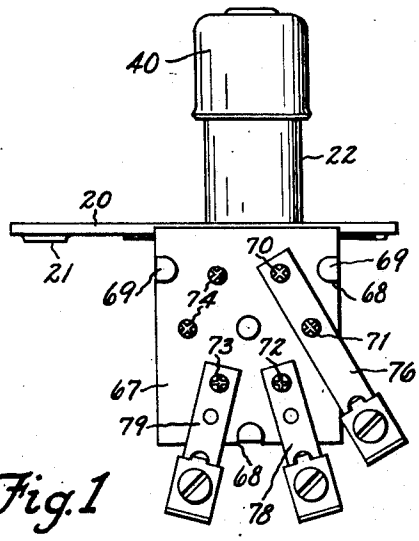


Fig. 1

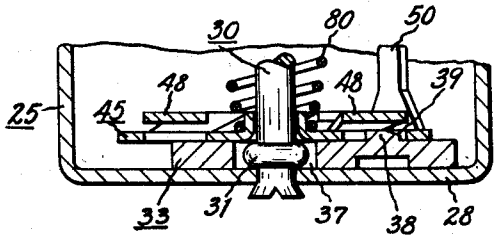


Fig. 4

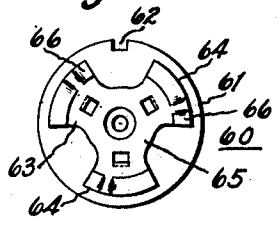


Fig. 5

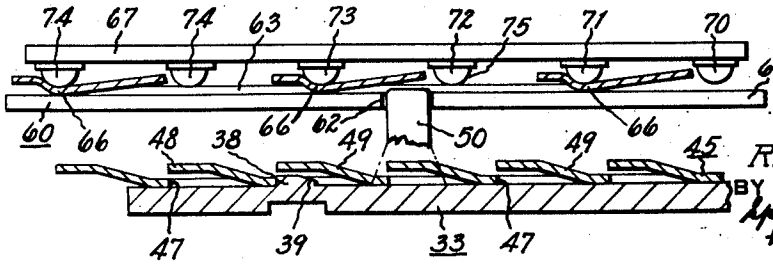


Fig. 6

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DIMMER SWITCH

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6 Claims. (Cl. 200—11)

This invention relates to improvements in electric switches, and more particularly to switches of the ratchet type which may be operated by foot pressure.

An object of the invention is to simplify the switch structure, to reduce the number of parts, to facilitate the manufacure of the individual parts and their assembly.

Another object of the invention is the provision of a relatively cheap and economical switch structure of the ratchet type operated by a plunger which may be readily assembled, and the parts of which are almost entirely formed from sheet metal stampings, requiring no machining or finishing operations.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is an elevational view of the switch structure of the present invention.

Fig. 2 is a view corresponding to Fig. 1 and partly in section with the terminal plate and the movable contact of the switch mechanism removed.

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 2 with the terminal plate and the movable contact assembled with the switch housing.

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 2.

Fig. 5 is a plan view of the movable contact assembly.

Fig. 6 is a development view of the switch elements, shown in elevation and the elements of actuating mechanism in section, the elements being projected upon a single plane to illustrate the relation of the cooperating parts.

Referring to the drawing, the switch embodying the present invention comprises a mounting plate 20 provided with extruded openings 21, preferably threaded to receive means for attaching the plate 21 to a floor board, not shown, of a vehicle. The plate 20 supports a tubular member or sleeve 22 on the upper surface thereof. The sleeve 22 is provided with a plurality of depending tongues 23 which are adapted to extend through openings formed in the plate and then bent over against the bottom side of the plate 20 to attach the sleeve to the plate, see Fig. 3.

The plate 20 supports a switch housing 25 on the lower surface thereof. The housing 25 is provided with a plurality of angular ears 26, each ear having an opening to receive a projection 27 struck from the plate 20. The projections are pieced over to attach the housing 25 to the plate 20. The housing 25 is provided with a flat back wall 28 which is flush with a rear wall of a rectangular opening 29 formed in the mounting plate 20.

A pivot stud or post 30 is attached at one end to the back wall 28. The stud 30 has an enlarged portion or collar 31. In this instance the collar is adjacent the flat wall 28. A plunger 33 stamped from heavy sheet metal, is formed with an enlarged portion 34 and a reduced portion 35 to form shoulders 36. The enlarged portion 34 of the plunger is provided with an elongated slot 37 and a projection 38 on one side of the slot. The free end of the projection is tapered as at 39, see Figs. 4 and 6. The plunger 33 is guided by the housing 25 for straight line movement. This is accomplished partly by the collar 31 of the stud 30 and partly by the reduced portion 35 passing through the rectangular opening 29 of the mounting plate 20. The reduced portion 35 of the plunger 33 is attached at its upper end to a cap 40 and the plunger 33 is maintained in its normal position, shown in the drawing, by a spring 41 surrounding the reduced portion 35 and located between the plate 20 and the cap 40. The shoulders 36 which limit the outward movement of the plunger are maintained normally against the under side of the plate owing to the compression put upon the spring 41.

A driving ratchet member 45 adapted to be driven by the plunger is mounted upon the stud 30. The driving ratchet member comprises a metal disc or plate 46 stamped from sheet metal. In the present instance the disc is formed with six straight edges 47 which serve as ratchet teeth. The straight edges are formed by striking out sections of the disc outwardly from the general plane of the disc to form tongues 48. The tongues 48 are arranged in a circular row and are provided each with a tapered portion 49 that is complementary to the tapered portion 39 of the projection 38. The disc 45 is also provided at its periphery with an ear 50 bent at right angles to the general plane of the disc. When the disc is mounted upon the shaft the projection 38 will extend into one of the openings formed by the struck-out tongues 48 of the disc, with the projection 38 engaging one of the straight edges 47. The tapered portion 39 of the projection 38 will be in parallelism with the tapered portion 49 of a struck-out tongue 48.

A contact assembly 60 is mounted on the stud 30. This assembly 60 comprises a disc 61 of insulating material having a notch 62 on its periphery to receive the tongue 50 of the driving ratchet member 45. The front face of the disc 61 supports a movable contact plate 63 having three arms 64 extending radially from a central portion 65. Each arm 64 is deformed to provide a channel 66 which operates as a ratchet tooth.

The open end of the housing is closed by a non-conducting cover or terminal block 67 which is provided with notches 68 for receiving tangs 69 extending from the housing 25. As shown in Fig. 1, these tangs 69 may be bent against the outer surface of the block 67 in order to attach the block to the housing 25. The block supports four live terminals 70, 71, 72 and 73 and two dummy terminals 74, each terminal having a rounded head 75 which is adapted to fit into each of the deformations or channels 66 of the arms 64. The terminals are arranged in a circular row and spaced 60° apart. The rounded heads 75 cooperate with the channels 66 to restrain movement of the movable contact assembly to the right as illustrated in the development view, Fig. 6.

The terminals 70 and 71 are connected by a single strap 76; and the terminals 72 and 73 are connected to straps 78 and 79, respectively. This type switch is especially adapted for dimming head lights of an automotive vehicle. When the switch is so used, the strap 76 is connected with a current source, and one of the straps 78 and 79 is connected directly with a bright lamp filament and the other is connected to a dim lamp filament. It is therefore apparent that the bright and dim lamp filaments will burn alternately, due to successive operations of the plunger 33.

A compression spring 80 interposed between the disc 45 and the plate 61 operates in two directions. When the block 67 is assembled to the housing 25 the spring 80 will be compressed. The spring 80 urges the metal disc 45 and the enlarged portion 34 of the plunger 33 toward the back wall 28 of the housing, the back side of the plunger having a sliding engagement with the front face of the back wall 28. The spring 80 also urges the contact assembly 60 toward the closure 67. The spring 80 furnishes the necessary pressure to effect a good contact engagement between the contact arms 64 and the rounded terminal heads 75 and yet permits of relative axial movement yieldingly between the contact assembly 60 and the driving ratchet member 45. The contact assembly 60 will move toward the member 45 when the contact assembly 60 and disc 45 are actuated by the plunger, the round heads 75 forcing the contact assembly 60 axially toward the disc 45. When the plunger 33 is returned to its normal position the contact assembly 60 will remain stationary but the projection 38, through its tapered portion 39, will urge the disc 45 toward the contact assembly until the projection 38 registers with the next opening formed by a struck-out tongue 48. The pressure exerted by the spring 80 is sufficient to hold the contact assembly against the rounded heads of the stationary terminals and prevent backward movement thereof, due to the fact that three of the rounded heads 75 of the stationary contacts are located in three channels 66.

The operation of the switch is as follows: When pressure is applied to the cap 40 the plunger 33 will be moved downwardly in a straight line. The projection 38 which engages one of the straight edges 47 will drive the disc 45 in a clockwise direction as viewed in Fig. 2. The disc 45 through the tongue 50 simultaneously drives the contact assembly 60 in the same direction. This clockwise direction is continued until the plunger has reached its extreme downward movement. When this occurs the contact arms 64 will have been moved substantially 60° to bridge terminals 71, 73 and 74, see Fig. 6. When pressure is removed from the cap 40, the plunger 33 will move upwardly by the spring 41 but the disc 45 and the contact assembly 60 will remain stationary. As the plunger is returning to its normal position disc 45 is caused to move axially on the stud 30. This is caused by the projection 38. Projection 38 urges the disc 45 to the left as viewed in Fig. 3 until the projection 38 registers with another opening formed by a struck-out tongue portion 48 of the disc 45. When this happens the spring 80 will force the disc 45 against the plunger 33. When the plunger is again actuated downwardly the contact arms 64 will be moved another 60° to bridge terminals 70, 72 and 74.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A switch comprising a housing having an aperture; a shaft anchored at one end to the housing and having its other end free; a plunger reciprocable through the aperture and guided in a straight line movement by the stud, said plunger carrying a projection having an inclined surface on its free end; a rotatable and axially movable disc supported upon the shaft and having a plurality of equally spaced struck-out portions bent out of the plane of the disc to provide a series of abutments arranged in a concentric circle and successively engageable by the projection whereby said disc is rotated in one direction only by the projection upon movement of the plunger in one direction, said struck-out portions being bent at an angle with reference to the incline on the projection so as to move the disc axially away from the plunger upon retraction of the plunger; a spring surrounding the shaft to maintain the disc in operative relation to the projection; a set of relatively fixed contacts and a movable contact rotatively supported by the shaft, said contacts having cooperating provisions whereby the movable contact can rotate only in one direction; and means for transmitting movement from the disc to the movable contact in said one direction of rotation.

2. In an electric switch the combination of a plurality of fixed contacts; a rotatable and axially movable bridging member, said fixed contacts and bridging member having provisions cooperating with each other to restrain rotary movement of the bridging member in one direction; a rotatable and axially movable disc spaced from the bridging member and supported in axial alignment with respect to the bridging member, said disc having a series of spaced abutments; resilient means disposed between the bridging member and the disc; a slidable driving connection between the bridging member and the disc; a reciprocable member guided for straight line movement; a projection carried by the reciprocable member and engageable successively with the abutments for rotating the disc in one direction of rotation only when the reciprocable member is moved from the normal position, said projection having provisions to move the disc axially in one direction compressing the spring to hold firmly the restraining relation between the bridging member and the fixed contacts as the reciprocable member returns towards its normal position, said resilient means expanding after predetermined movement of the reciprocable member toward its normal position to move axially the disc in the opposite direction so that an-

other abutment will be in operative relation with the projecting means.

3. In an electric switch the combination of a housing having a wall provided with a bearing surface; a stud carried by the wall; a reciprocable plunger slidably supported by the housing and having its rear face in contact engagement with the bearing surface wall and guided in a straight line movement by the stud; a lug carried by the front face of the plunger and having an inclined surface on its free end; a rotatable and axially movable disc supported by the stud, said disc having a series of spaced depressions providing shoulders and inclined surfaces complementary to the inclined surface on the lug, said shoulders adapted to be successively engaged by the lug; a plurality of fixed contacts; a rotatable and axially movable contact supported by the shaft; resilient means disposed between the movable contact and the disc, said resilient means urging the movable contact toward the fixed contacts and maintaining an operative relation between the lug and one of the shoulders holding the plunger in contact engagement with the bearing surface wall, the movable contact and fixed contacts having provisions co-acting to restrain rotary movement of movable contact in one direction but permitting the movable contact to move axially on the stud and rotate in another direction; a slidable drive connection between the movable contact and the disc; means for actuating the plunger in one direction from its normal position causing the lug to rotate the disc in one direction; and spring means for returning the plunger to its normal position whereby the inclined surfaces on the lug and disc respectively cooperate to move the disc axially on the stud compressing the resilient means to hold firmly the movable contact in engagement with the stationary contacts to restrain rotation of the movable contact and the disc as the plunger moves toward its normal position, said resilient means then expanding when the plunger has moved a certain distance toward its normal position to move the disc axially toward the plunger to place another shoulder in operative relation with the lug.

4. In an electric switch the combination of a plurality of fixed contacts; a rotatable and axially movable carrier; a bridging member drivingly supported on one face of the carrier, said bridging member and contacts having provisions cooperating with each other to restrain rotary movement of the carrier in one direction; a rotatable and axially movable disc spaced from the carrier having a plurality of spaced abutments, means carried by the disc having a slidably driving connection with the carrier whereby the disc and carrier rotate together; a spring disposed between the disc and carrier for urging the disc and carrier in opposite directions; and a spring-retracted plunger having camming means provided with a shoulder adapted to engage successively the abutments to rotate the disc step-by-step in one direction upon a forward movement of the plunger, said camming means being operative on the return movement of the plunger for moving the disc axially to compress the spring to hold firmly the retaining relation between the bridging member and the contacts.

5. In an electric switch the combination of a plurality of fixed contacts provided with headed portions; a contact carrier rotatable and axially movable with respect to the contacts; a contact plate supported on one face of the carrier and having a plurality of spaced radial arms each provided with a shouldered portion adapted to engage the headed portion of the contacts to restrain rotary movement of the carrier in one direction while permitting the arms to slide over the head in the opposite direction; a rotatable and axially movable plate supported in axial alignment with the carrier; a series of abutments and a series of cams carried by the plate; resilient means supported between the carrier and plate for urging same axially in opposite directions, said spring permitting the carrier to move axially to allow the arms to slide over the head when the carrier is rotated in one direction; means carried by the plate having a slidable driving connection with the carrier whereby the carrier and plate rotate together but permitting axial movement relative to each other; a spring-retracted plunger supported relative to the plate; a projection carried by the plunger, said projection engaging the abutments successively to drive the plate step-by-step in one direction of rotation upon movement of the plunger in one direction, said radial arms sliding over the headed portion of the contacts and moving the carrier axially to compress the spring to maintain firmly the driving relation between the projection and the abutment so engaging, said projection cooperating with one of the cams upon return movement of the plunger to move the plate axially toward the carrier to compress the spring to hold firmly the shoulder of the arms against some of the terminal heads.

6. In an electric switch the combination of a plurality of fixed headed contacts; a contact carrier rotatable and axially movable with respect to the contacts; a contact plate supported on one face of the carrier and having a plurality of spaced radial arms adapted to slide over the heads of the contacts in one direction of rotation, said arms each having a shoulder portion cooperating with the heads of the contacts to restrain rotary movement of the carrier in the opposite direction; a rotatable and axially movable plate supported in axial alignment with the carrier; a series of abutments and a series of cams carried by the plate; means associated with the plate having a slidable driving connection with the carrier whereby the carrier and plate rotate together while permitting axial movement relative to each other; a spring supported between the carrier and plate for urging them axially in opposite directions; a spring-retracted plunger supported relative to the plate having a projection engageable successively with the abutments to drive the plate step-by-step in one direction upon movement of the plunger in one direction with the arms of the contact moving the carrier axially to compress the spring in one direction to maintain the driving relation between the projection and the abutment engaged thereby, said projection engaging one of the cams upon return movement of the plunger to move axially the plate to compress the spring in the opposite direction to hold firmly the shoulder of the arms against certain of the contact heads, thus preventing the carrier and the plate from rotating in the opposite direction as the plunger moves in its opposite direction.

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