Nov. 26, 1940. W. C. TREGONING 2,222,963

SNAP ACTUATOR AND SWITCH

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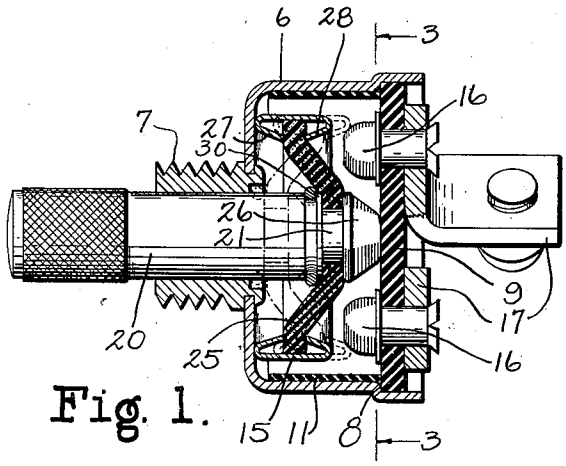


Fig. 1.

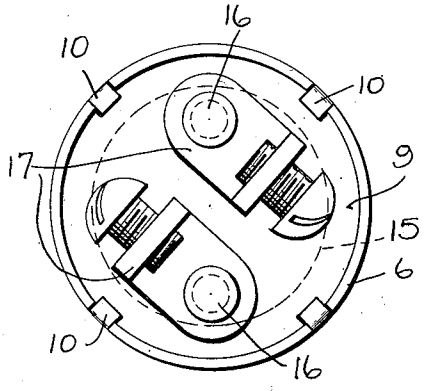


Fig. 2.

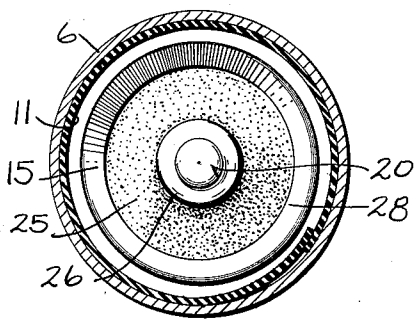


Fig. 3.

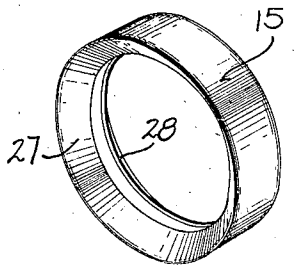


Fig. 4.

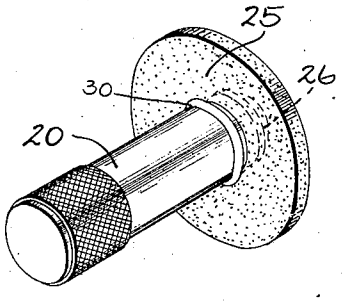


Fig. 5.

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SNAP ACTUATOR AND SWITCH

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8 Claims. (Cl. 200—76)

This invention relates to improvements in a snap actuator and switch.

It is the object of the invention to provide an improved, simplified and inexpensive snap actuator, preferably embodied in a switch, which will have an exceedingly long life and in which a full floating member is snapped between two extreme positions in opposition to the movement of the operating handle. For switch purposes it is a further objective of the present invention to employ, as a means of connecting the actuating member with the handle, an elastic diaphragm which not only serves to provide the snap movement of the actuated member, but also is sufficiently dielectric to provide for the preferred insulation of the actuated member from the handle.

In the drawing:

Fig. 1 is a view in axial section of a device showing my invention as embodied in a switch.

Fig. 2 shows a rear elevation of the device illustrated in Fig. 1.

Fig. 3 is a view taken in section on the line 3—3 of Fig. 1.

Fig. 4 is a view in perspective showing the actuator member of the device.

Fig. 5 is a view in perspective showing the handle and the resilient dielectric diaphragm preferably employed.

Like parts are identified by the same reference characters throughout the several views.

It will be understood from the foregoing that while the device is illustratively described in its preferred embodiment in a switch, it may, as a snap actuator, be used for a variety of differing purposes wherever snap movement is required.

The casing 6 has the form of a cup provided in its closed end with a threaded mounting bushing 7 and shouldered at 8 near its opposite end to provide a seat for a terminal head 9 which, in the switch, serves as a closure for the casing. Lugs at 10 hold the terminal head in place. The terminal head confines within the casing an annular piece of fiber 11 which serves as a dielectric liner to prevent the actuated member of contact 15 from striking the wall of the casing when such member is engaged with the contacts 16 mounted in the terminal head 9. These contacts preferably take the form of rivets or other fastening means for holding the wire terminals 17 to the terminal head.

The threaded bushing at 7 not only serves as a single hole mounting for the entire device, but it provides a bearing for the handle 20 which is reciprocable axially of the switch case. This handle is channeled at 21 and engaged in the channel is the inner periphery of the centrally apertured disk or diaphragm 25. This disk or diaphragm is made of elastic material, preferably such dielectric material as rubber, natural or artificial. It may either be molded into the channel 21 or it may be elastically distorted to be received over the head portion 26 of the handle, or the head portion 26 may be made by deforming the handle after the elastic diaphragm is in position thereon.

The actuated member 15 comprises a sheet metal annulus having its side margins 27 and 28 folded in toward each other into engagement with the outer periphery of the elastic diaphragm 25. The inwardly turned and mutually convergent side margins 27 and 28 of the sheet metal annulus engage the cupped rubber diaphragm 25 slightly inwardly of its extreme periphery and provide a hollow interior space within which such periphery is disposed. Since the extreme periphery or the diaphragm is not rigidly confined within this hollow space there is less tendency for the diaphragm to crack in the course of its reversal of concavity than would otherwise be the case.

It will be noted that all of the parts of this device are simple and well adapted to manufacture on automatic machinery. The actuated member 15 floats within the casing. In this embodiment of the invention it is not guided in its movement save by the diaphragm 25 which induces such movement.

The diaphragm is of such dimensions that when the handle is in the position shown in full lines in Fig. 1, the diaphragm will necessarily assume a form cupped toward the closed end of the casing, thus holding the actuated member or contact 15 sharply to the closed casing end.

When the handle is pulled to the left as viewed in Fig. 1, the diaphragm 25 becomes distorted. Being elastic, it stores up energy in opposition to its distortion, and about the time that the handle is moved to a position where the inner periphery of the diaphragm is in the same plane as the outer periphery thereof, the cup-shaped diaphragm 25 will turn itself inside out, thereby snapping the actuated member 15 to the limit of its movement in the opposite direction and concurrently forcing the handle to its extreme of outward movement.

In this instance the movement of the actuated member 15 to the right, as viewed in Fig. 1,

will be limited by engagement of the actuated member 15 with the contacts 16. The movable parts will occupy the positions shown in dotted lines in Fig. 1. In this position of the actuated member or contactor 15, the contactor will establish a metallic path between the contacts 16, thus closing the circuit between the terminals 17. A stop collar 30 is preferably mounted on the handle 20 for engagement with the bushing 7 to absorb the impact resulting from the reaction thrust of the elastic diaphragm which snaps the handle to the left as viewed in Figure 1. Unless such collar is provided there might be some tendency to shear the elastic diaphragm upon the impact thereof against the bushing.

When the switch handle is moved inwardly or toward the right as viewed in Fig. 1, it will again reach a position where its center will pass the plane occupied by its periphery. Again its elastic pressure will cause it to reverse its concavity, the action snapping the member 15 to the closed end of the casing and the handle 20 toward the terminal head 9.

Although the device herein disclosed is exceptionally easy to manufacture and exceptionally inexpensive, it is also exceptionally durable and dependable in its operation.

I claim:

1. A device of the character described, comprising the combination with an actuating handle and an actuated member surrounding the handle and means limiting the opposite movements of the handle and member, of an elastically deformable sheet of dielectric material intervening between and connecting the handle and the member, said sheet being normally concave and adapted to reverse its concavity in the manipulation of the handle, whereby to effect an opposite movement of the member.

2 In a device of the character described, the combination with an actuating handle and a floating actuated conductor member, and means limiting the opposite movements of the handle and member, of means guiding the handle for reciprocation, and an elastically deformable concave rubber disk connecting the handle and member, and constituting a means for guiding the member and for snapping said member in a direction opposite to the movement of the handle when said disk is deformed by manipulation of the handle respecting the member.

3. A snap actuator assembly comprising the subcombination of a central handle, a concentric floating, electrically conductive annulus spaced therefrom, and a reversibly deformable cupped rubber disk centrally connected to the handle and peripherally connected to the annulus and upon which said annulus is wholly dependent for lateral positioning.

4. A snap actuator assembly comprising the subcombination of a central handle, a concentric annulus and a reversibly deformable cupped rubber disk centrally connected to the handle and peripherally connected to the annulus, said annulus comprising internally projecting flanges in retaining engagement with opposite faces of said disk.

5. In a device of the character described, the combination with a terminal head provided with spaced contacts of a mounting provided with a handle bearing opposite a point between said contacts, a handle reciprocable in said bearing to and from said head, an annular floating contactor substantially co-axial with said handle in spaced relation thereto and reciprocable to and from circuit closing engagement with said contacts, said contactor having a tapering inner peripheral bearing surface engageable with the outside of the respective contacts, and an elastically reversibly cupped dielectric disk centrally connected with the handle and peripherally connected with the annulus at a point such that the movement of the handle toward the terminal head will first press the contactor toward the contacts and subsequently will reverse the concavity of the disk, whereby to snap the contactor from the contacts.

6. In a device of the character described, the subcombination of an annular contactor comprising a peripheral conductive band, and marginal flanges integral with said band and folded inwardly upon said band toward each other, together with a reversibly deformable concave rubber mounting element engaged between the opposing flanges of said contactor and extending across the center thereof, said flanges engaging said rubber element on its opposing faces along a line spaced inwardly from its extreme periphery, said periphery being disposed in the space between said flanges and said band.

7. A device of the character described, comprising the combination with an inner member, of an outer member surrounding the inner member and spaced therefrom, and an elastically deformable sheet of rubber concavely cupped and connected respectively with the inner member and the outer member, together with stop means restricting the movements of the respective members in directions tending to reverse the concavity of said rubber sheet, whereby pressure on one of said members in a direction tending to flatten said sheet will form a reverse fold in said sheet and continued pressure will reverse the concavity of the sheet and throw the other member in the opposite direction against said stop means.

8. A device of the character described, comprising the combination with a central rod and an annulus surrounding the rod in spaced relation thereto, of a cupped rubber disk having its central portion connected with the rod and its outer periphery connected with the annulus, said disk being elastically deformable to reverse its concavity and said annulus being non-elastic whereby to subject said disk to compression strains when either said rod or said annulus is manipulated with respect to the other, and means limiting the axial movement of said rod and said annulus and providing stops in either direction of relative movement against which said rod and said annulus are maintained oppositely and interchangeably by the elastic deformation of said disk.

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