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DIAPHRAGM ASSEMBLY

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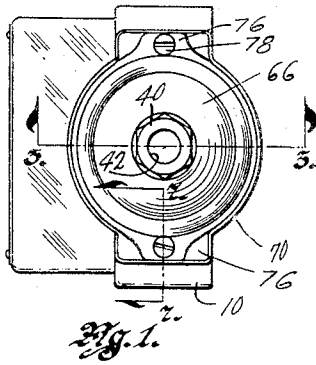
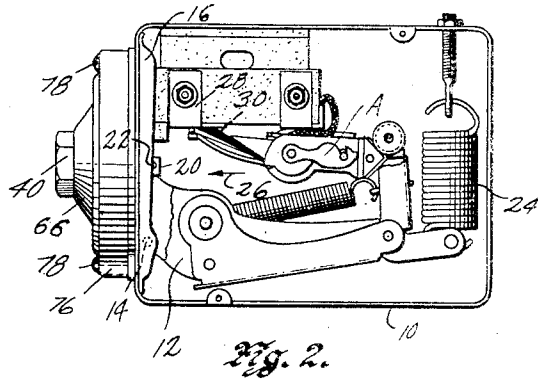
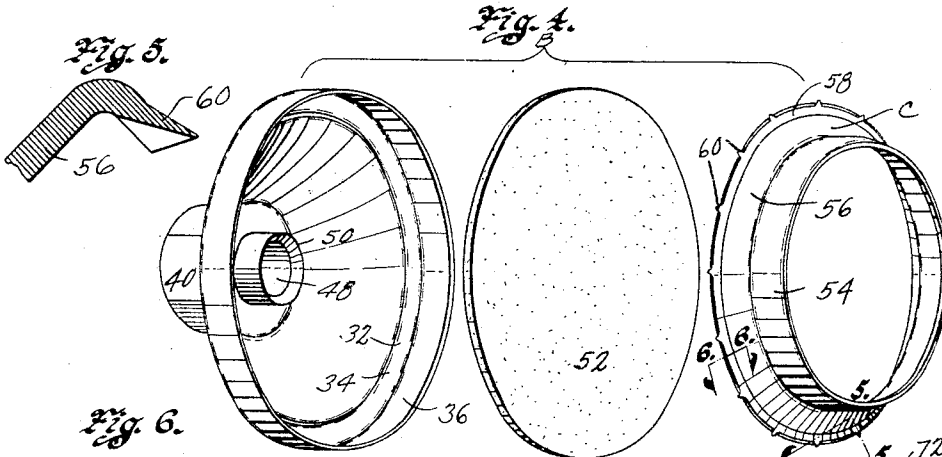
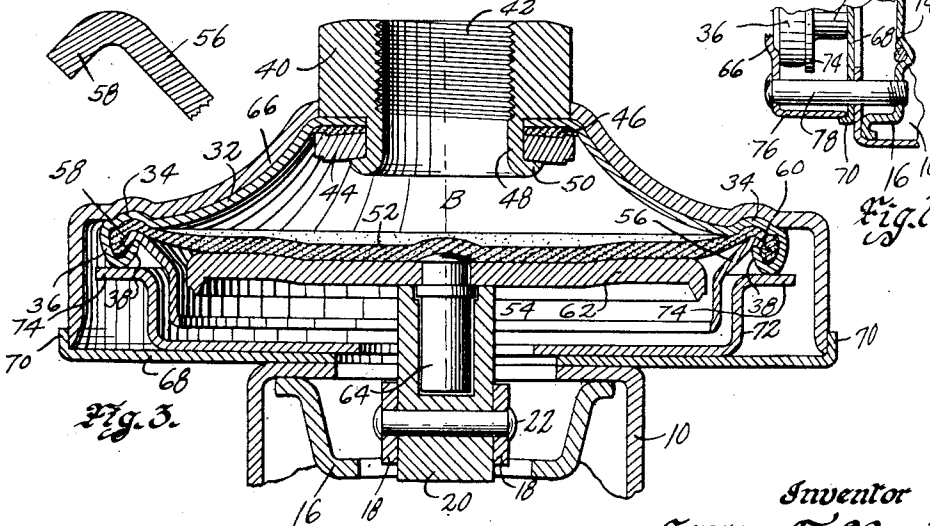


Fig. 6.



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DIAPHRAGM ASSEMBLY

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The object of my invention is to provide a diaphragm assembly of simple, durable and comparatively inexpensive construction.

More particularly my invention relates to a diaphragm assembly for use in connection with switch structures, the diaphragm structure being assembled from a number of parts formed from stampings, the entire assembly being arranged in a unit so that when the unit is mounted upon the casing or other support to which it is related, all of the parts are held in position by the mere mounting of the entire unit in its operative position to the end that the parts may be quickly assembled and easily disassembled.

Still a further object is to provide a diaphragm chamber comprising a funnel shaped plate having an outturned marginal flange with a ring shaped retaining member arranged to be mounted within the portion of the plate forming the flange for holding the diaphragm element therebetween and for retaining the diaphragm element in proper locked position, the retaining means or ring being provided with spaced outturned prongs arranged to engage and pierce the material of the diaphragm element so that the material adjacent the periphery of the diaphragm element is not only wedged in position but also pierced by the prongs of the diaphragm ring for holding it against any possible disassociation from the remaining parts.

With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:—

Figure 1 is an end view of the diaphragm housing mounted upon a switch casing.

Figure 2 is a plan view of the switch casing and the diaphragm assembly mounted thereon.

Figure 3 is a central horizontal sectional view taken on the line 3—3 of Figure 1, showing the entire diaphragm assembly in section.

Figure 4 is a perspective view of three parts of the diaphragm assembly which when con-

nected together form the diaphragm chamber.

Figure 5 is a detail sectional view taken on the line 5—5 of Figure 4, illustrating one of the piercing prongs on the diaphragm ring.

Figure 6 is a sectional view taken on the line 6—6 of Figure 4.

Figure 7 is a detail sectional view taken on the line 7—7 of Figure 1, illustrating the fastening means for retaining the entire diaphragm assembly in association with the casing upon which it is mounted.

In the accompanying drawings, I have shown my diaphragm assembly especially adapted for use in connection with a switch structure for making and breaking an electric circuit. The switch structure is here briefly described for purposes of disclosing the association thereof with the diaphragm assembly structure.

A casing 10 is provided having a lever 12 mounted therein upon a pivot pin 14. The pivot pin 14 is carried by a metal plate 16 formed of stampings. The plate 16 is mounted on the inside of the casing 10. The lever 12 is of the bell crank type and is provided with a foot 18 which is pivotally connected to a block 20 by means of the pivot pin 22. The bell crank 12 is formed of stampings and is substantially channel shaped in construction so that the foot 20 is actually formed of two spaced parts as clearly shown in Figure 3 of the drawings.

The parts of the foot 18 straddle the block 20. An adjustable spring 24 is connected to the casing 10 at one end and to the free end of the bell crank lever 12 for normally throwing or tending to move the foot 18 of the bell crank 12 in the direction indicated by the arrow 26. A fixed contact 28 and a movable contact 30 are arranged in the casing 10 and are adapted to be brought into and out of engagement by an operating or actuating mechanism A shown in Figure 2 of the drawings.

The making and breaking of an electric circuit by means of the contacts 28 and 30, are shown as incidental to the diaphragm assembly. The diaphragm assembly includes a chamber B formed of a funnel shaped diaphragm plate 32 which has a circumferential

groove 34 and an outwardly extending circumferential flange 36 which is adapted to be rolled up and inturned as at 38 for providing an inturned edge, the purpose of which will be hereinafter more fully set forth.

The plate 32 is clearly illustrated in Figure 6 of the drawings. A nipple 40 which is provided with a central screw threaded opening 42 is connected to the funnel shaped diaphragm plate 32 by means of a washer 44. Between the washer 44 and a portion of the diaphragm plate 32, I provide a packing 46. The nipple 40 carries a neck 48 which is arranged to be spun over the washer 44 as at 50 for retaining the nipple and washer 44 in association with the diaphragm plate 32 and for providing an air tight connection therebetween, as clearly disclosed in Figure 3 of the drawings.

A diaphragm element 52 of rubber-fabric composition is arranged to be received within the diaphragm plate 32 and is of a slightly larger diameter than the diaphragm plate 32 so that when the element 52 is placed within the flange 36 of the plate 32, a portion of the material will rest against the inner surface of the flange 36.

A diaphragm retaining ring C is arranged to fit within the flange 36 of the diaphragm plate 32. The ring C includes an annular rim 54 having an outwardly directed peripheral flange 56. The flange 56 has its extreme outer edge slightly inclined as at 58 and is formed with a number of sharpened projections 60. The retaining ring C is formed of a metal stamping and is arranged to rest against one side of the diaphragm element 52.

The inclined portion 58 of the retaining ring C is arranged to substantially register with the circumferential groove 34 formed in the plate 32, the diaphragm element 52 conforming to the contour of the groove 34 of the plate 32 and the inclined portion 58 of the ring C. When the parts are placed one within another as just described, then the flange 36 of the plate 32 is spun over or bent over so that the free edge thereof comes in contact with the underside of the ring C adjacent the inclined portion 58 thereof. The bending over of the edge of the flange 38 causes the inwardly directed portion 38 thereof to lock against the inclined portion 58 of the ring C for wedging the diaphragm element 52 between the inclined portion 58 and the groove 34.

The groove 34 provides for a receiving pocket in the diaphragm plate 15 to receive the diaphragm element 52 and at the same time by forming the parts from a stamping, provides a rib near the periphery of the plate 32 which materially strengthens and reinforces it. The plate 32 being funnel shaped and formed from a stamping enables the plate to be made of comparatively light material

and yet of great strength when completely formed up.

The diaphragm element 52 is thus wedged between parts of the ring C and the plate 32 and at the same time, the outer edge of the diaphragm element 52 will be pierced by the projections 60. These projections 60 are projected outwardly or towards the inner surface of the flange 36 so that when the parts are once assembled, the diaphragm element is held, first, by the inclined portion 58 of the ring C and second, by the projections 60 of the ring C.

It may be said that the diaphragm element is retained by the ring C and engaged thereby in two different planes one substantially at right angles to the other. It will thus be noted that the parts 32, 52 and C form a complete diaphragm chamber. An enlarged diaphragm button 62 is connected to a controlling pin 64 arranged to loosely fit into an opening formed in the member 20. The member 20 is connected to the bell crank lever 12 so that any movement of the bell crank lever 12 will impart movement to the diaphragm button 62 and it in turn, bears against the outer side of the diaphragm element 52.

The rim 54 of the ring C is of sufficient diameter to allow the diaphragm button to be inserted therein and at the same time, the diaphragm button is guidingly held within the ring C. The entire diaphragm chamber assembly is mounted within a casing formed of two parts, an outer shell 66 and a closure plate 68. The closure plate 68 is formed with an outturned flange 70 against which a portion of the outer shell 66 rests. The shell 66 is of substantially the same outline as the plate 32 and rests thereagainst.

An abutment or spacer 72 is mounted within the housing formed by the parts 66 and 68 and has a flange 74 resting against the bent over edge of the flange 36 of the diaphragm chamber assembly. The spacer or abutment 72 is provided with a central opening as is the plate 68 and one wall of the casing 102 so that the block 20 may project therethrough and be free to operate relative to and with the diaphragm button 62 without any interference therefrom.

The shell 66 is provided with a pair of slight extensions 76 which receive fastening screws 78. The fastening screws 78 project through the plate 68, through the wall of the casing 10 and connect to the plate 16 within the casing 10. There are two fastening screws or bolts 78 provided and when they are in operative position they retain the entire diaphragm assembly in mounted position upon the casing 10 and at the same time, they retain the plate 16 in operative position relative to the casing 10.

The plate 16 carries the entire bell crank lever 12 and the materials mounted thereon. It will be noted therefore, that the mount-

ing of the diaphragm assembly upon the casing 10, serves to also retain the plate 16 and the bell crank structure in proper position. The diaphragm chamber B is placed within the shell 66 and due to the fact that the parts conform in general outline to the shell 66, it results in the diaphragm chamber remaining in proper operating position.

The spacer 72 holds the diaphragm chamber against the shell 66. The parts when all assembled may be quickly disassembled by removing the two screws 78. When this has been done, the shell 66 may be removed from the plate 68 and thereafter the diaphragm button 62 and spacer 72 removed from association with the diaphragm chamber structure. The pin 64 on the button 62 is in loose connection with the member 20 so that the diaphragm button may be disconnected from the bell crank lever structure and the block 20 carried thereby.

In the actual use to which my diaphragm assembly has been subjected, I find that a great amount of pressure may be carried within the diaphragm chamber and that the diaphragm element will stand up under a tremendous pressure and not be pulled from its points of anchorage between the plate 32 and the retaining ring C because of the ring C and its continuous contact with the element 52 and at the same time its points of piercing contact with the element 52.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. A diaphragm assembly structure comprising a funnel shaped plate having an out-turned peripheral flange and a circumferential groove adjacent the flange, a retaining ring having a rib adapted to register with said groove, a diaphragm element interposed between a portion of said plate and said ring and received with said flange, said rib on the ring wedging the diaphragm element into said groove and means on said ring for engaging and piercing said element near its periphery and forcing it against the inner surface of said flange as and for the purposes stated.

2. A diaphragm assembly structure comprising a funnel shaped plate having an out-turned peripheral flange and a circumferential groove adjacent the flange, a retaining ring having a rib adapted to register with said groove, a diaphragm element interposed between a portion of said plate and said ring and received with said flange, said rib on the ring wedging the diaphragm element into said groove and piercing means on said ring

at spaced points for engaging said element near its periphery and forcing it against the inner surface of said flange as and for the purposes stated.

3. A diaphragm assembly structure comprising a funnel shaped plate having an out-turned peripheral flange and a circumferential groove adjacent the flange, a retaining ring having a rib adapted to register with said groove, a diaphragm element interposed between a portion of said plate and said ring and receiving with said flange, said rib on the ring wedging the diaphragm element into said groove and a two part housing for said assembly, said housing having a groove for coaction with said groove for aligning said diaphragm assembly structure relative to said housing.

4. A diaphragm assembly structure comprising a funnel shaped plate having an out-turned peripheral flange and a circumferential groove adjacent the flange, a retaining ring having a rib adapted to register with said groove, a diaphragm element interposed between a portion of said plate and said ring and received with said flange, said rib on the ring wedging the diaphragm element into said groove, a two part housing for said assembly and a spacer element within said housing for retaining the assembly against one side of the housing.

5. A diaphragm assembly comprising a plate member and a retaining ring member, one of said members having a circumferential rib and the other a circumferential groove, one of said members having a peripheral flange, a diaphragm element interposed between said members and received within said flange with said rib wedging said element into said groove and means on one of said members extending outward from the center for piercing said element near its periphery and forcing it against the inner surface of said flange.

6. A diaphragm assembly comprising a plate member and a retaining ring member, one of said members having a peripheral flange, a diaphragm element interposed between said members and received within said flange and piercing means on the other of said members extending outward for engaging said element near its periphery and forcing it against the inner surface of said flange.

7. A diaphragm assembly comprising a plate member and a retaining ring member, one of said members having a peripheral flange, a diaphragm element interposed between said members, and received within said flange and spaced prong means on the other of said members for engaging said element near its periphery and forcing it against the inner surface of said flange.

8. A diaphragm assembly comprising a plate member and a retaining ring member, one of said members having a circumferential

rib and the other a circumferential groove,
one of said members having a peripheral
flange, a diaphragm element interposed be-
tween said members and received within said
5 flange with said rib wedging said element
into said groove and circumferentially
spaced, radially extending prong means on
said ring for engaging said element near its
periphery and forcing it against the inner
10 surface of said flange, said prong means af-
fecting the element substantially at right an-
gles to the engagement of the element between
said rib and said groove whereby any tend-
ency for the element to pull from between
15 said plate and ring will be resisted by two
forces substantially at right angles to each
other.

Des Moines, Iowa, May 16, 1928.

GEORGE A. KNAAK.

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