April 6, 1943. L. R. WILLITS 2,315,758

DIAPHRAGM AND SUPPORT

Filed Aug. 12, 1939

Fig. 1.

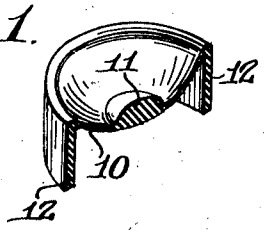


Fig. 2.

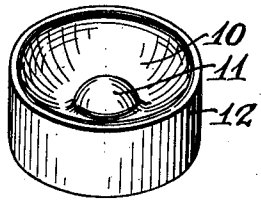


Fig. 3.

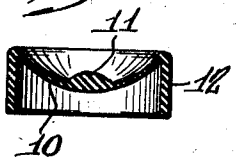


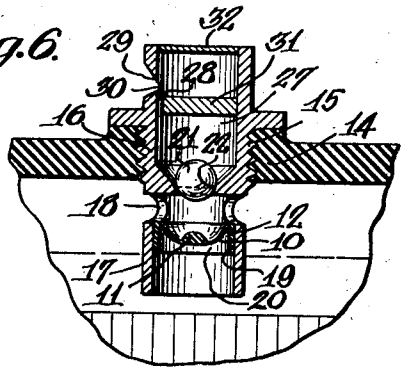
Fig. 4.



Fig. 5.



Fig. 6.



Witness:
Walter Chum

Inventor:
Leland R. Willits.
by Wm. Stuart Jackson and Son
Attorneys.

Patented Apr. 6, 1943 2,315,758

UNITED STATES PATENT OFFICE

2,315,758

DIAPHRAGM AND SUPPORT

Leland Ross Willits, Atlantic City, N. J., assignor, by mesne assignments, to Edw. K. Tryon Company, a corporation

Application August 12, 1939, Serial No. 289,938

1 Claim. (Cl. 137—153)

My invention relates to diaphragm membranes and to supports by which the membranes may be held in position for service.

A purpose of the invention is to secure a diaphragm membrane of great sensitiveness free from injury by acids and particularly free from injury by sulphuric acid.

A further purpose is to provide a diaphragm membrane which is extremely thin and not only quite flexible but also of light weight, subject to lifting and/or distension by minute pressure variations. It may be normally collapsed and lifted into position without stretching or may be substantially plane and subject to lifting with little or no stretching, or may be initially convex toward its duty with or without stretching of the diaphragm into engagement with the object to be moved.

A further purpose is to provide a diaphragm of rubber substantially free from reclaimed rubber and filler and preferably having a nub at its center to distribute the pressure met by the diaphragm.

A further purpose is to support a substantially rubber diaphragm upon a preferably pure rubber ring support and to hold the diaphragm to its duty by compressing the ring support within the space for the diaphragm, holding it in place by outwardly pressing frictional engagement.

Further purposes will appear in the specification and in the claim.

I have preferred to illustrate my invention by a few modifications of a single form only, selecting a form which is practical, effective and highly useful and which at the same time well illustrates the principles of the invention.

Figure 1 is a sectional perspective and Figure 2 is a perspective of a diaphragm and its support.

Figures 3, 4 and 5 are vertical central sections through three forms of the same type of diaphragm membrane and diaphragm support.

Figure 6 is a cross-section of a battery signal shown for the purpose only of illustrating one use for the diaphragm.

In the drawing similar numerals indicate like parts.

My diaphragm is of general utility and it is the intention to claim it for use wherever its qualifications fit it.

The diaphragms in the figures are thin membranes of which many have been used successfully with thickness as small as three-thousandths of an inch. They have had membrane diameters of approximately five-eighths of an inch.

The membrane **10** is shown as provided with a nub **11** which may be integral with it as in Figures 1 and 2, or may be attached to it, as in Figure 3.

I make my diaphragm out of pure rubber. By this I mean latex which has been vulcanized but is substantially free from other ingredients of a diluent or adulterant character. It may be used in any location where it is protected against contact with oxygen. It has special advantage in locations where the conditions of use cover it with a moist protecting coating substantially free from oxygen. Such as location is shown in Figure 6 where gases from a secondary battery deposit a moist coating upon the diaphragm. The diaphragm is substantially free from reclaimed rubber and from filler. This is true whatever the character of its support. In the figures it is supported by a resilient ring **12**. The ring may be integral with the support as in Figures 1, 2, 3 and 4 or may be attached to it as at **13** in Figure 5.

The best results which I have obtained have been with a pure rubber ring of so-called latex rubber substantially free from reclaimed rubber and from filler, integral with and permissibly cast in one piece with the diaphragm membrane and the nub **11**.

In the form shown in Figures 1, 2, 3, 4 and 5 the ring, if of good quality of rubber, can be sprung over the end of a tube or can be compressed within the body of a tube. In the latter case it will stay by friction in any position of adjustment to which it is set at the same time permitting quick and easy adjustment to a new position.

Two factors which are highly important are lightness of weight and flexibility. With a very thin membrane they go together and in pure rubber the thin membrane stretches easily and thus permits distention of the diaphrgam axially with very slight pressure.

With a preference for the form of Figure 3, in which the diaphragm is lifted and reversed from a re-entrant position at no pressure to a projecting position shown in dotted lines in the figure with pressure beneath the diaphragm, no stretching of the membrane of the diaphragm is required.

In Figure 4 the diaphragm is normally raised and is adapted to lift more fully or to stretch with pressure beneath it.

In Figure 5 the membrane is substantially transverse to the holder with the result that slight lifting of the diaphragm will take place without need for stretching with very low pressures.

In order that utility may be seen for the dia-

phragm one intended use for it among many is illustrated and described, in connection with sound indicators for secondary batteries.

In Figure 6 the diaphragm membrane 10 is sagged or concaved beneath the level of the ring support 12 with which it is united at its edges. With very thin diaphragms the weight of the nub is sufficient to cause this sagging when there is no pressure beneath the diaphragm.

In the upper wall 14 of the battery is secured as by threads 15, a plug closure for the battery having a body 16 and a depending skirt 17 adapted to fit into the electrolyte and apertured at the top at 18 below the position of the diaphragm. The diaphragm support 12 is compressed into the interior 19 of the skirt and is held in any suitable position by the friction of the rubber against the interior skirt wall.

The parts are shown in position so that with the diaphragm closing the upper end of the skirt, pressure will be developed within the compartment 20 when the skirt is immersed within the electrolyte of the battery. This pressure is due in part to confined air trapped within and in part to gas (largely hydrogen) liberated from the electrolyte over its whole surface when the battery is being charged, particularly if it is being charged too rapidly or has been overcharged and is being further charged. The pressure lifts or tends to lift the diaphragm so that the diaphragm nub engages a ball valve 21 resting within a valve seat 22 in the body of the plug. With any considerable immersion of the skirt in the electrolyte the ball is therefore lifted, giving passage for any gases emitted from the surface of the electrolyte. These gases pass out through the upper compartment 27 of the plug by way of a passage 28 adjacent to the effective edge 29 of the whistle opening 30. The passage 28 represents the space between a flat in washer 31 and the adjacent wall of the whistle. The top is closed in a suitable manner as at 32.

If gas be given off by the electrolyte during charging when the skirt is not immersed within the electrolyte, due to low electrolyte level, or if the immersion be so little that the pressure will not lift the ball the outlet previously provided for the gases—largely hydrogen gas—given off from the electrolyte is closed and remains closed until pressure is accumulated to an extent sufficient to lift the ball. When the ball is lifted a slight puff of gas is discharged beneath it with sufficient quantity and force to operate the whistle.

It will be seen that any of the forms of diaphragm shown could be used beneath such a ball valve as is seen in Figure 6, offering one use for the diaphragms. The diaphragms are intended to serve in other uses for which they prove to be suited.

Where I refer to pure rubber herein I do not mean to suggest that the latex has not been vulcanized but do intend that it shall be substantially free from diluents and adulterants such as reclaimed rubber and filler.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of my invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

A diaphragm membrane of vulcanized latex rubber substantially free from reclaimed rubber and filler or other adulterant, a thickened rubber center nub carried by the diaphragm and of the same composition as the diaphragm, a ring support for the diaphragm integral with the diaphragm holding the edges of the diaphragm, a valve seat in proximity to the diaphragm and a gravity valve for the seat operated by the nub of the diaphragm.

LELAND ROSS WILLITS.