May 1, 1951 J. A. CHYBA 2,550,672

DIAPHRAGM ANCHORING MEANS

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Fig. 1.

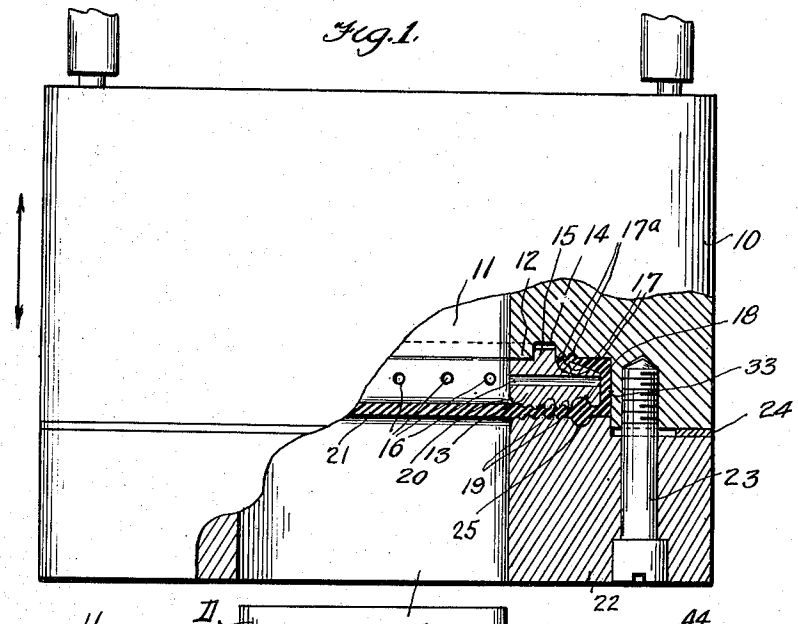


Fig. 6.

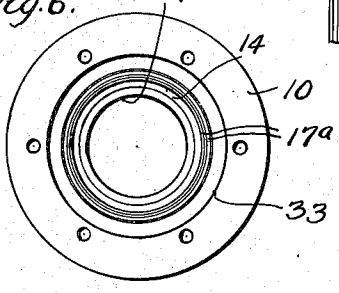


Fig. 9.

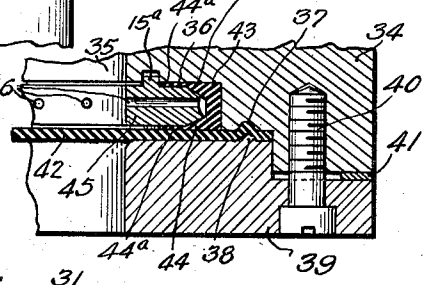


Fig. 2.

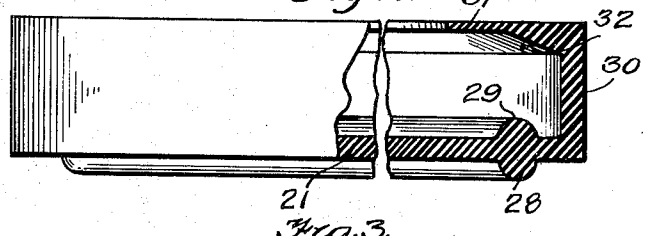


Fig. 3.

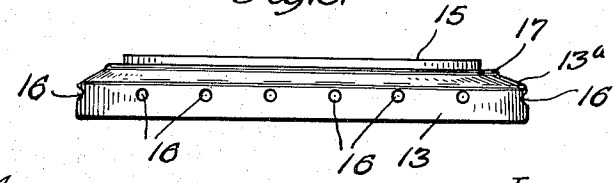
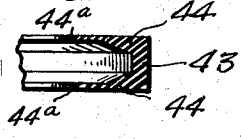


Fig. 10.



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DIAPHRAGM ANCHORING MEANS

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Fig. 4.

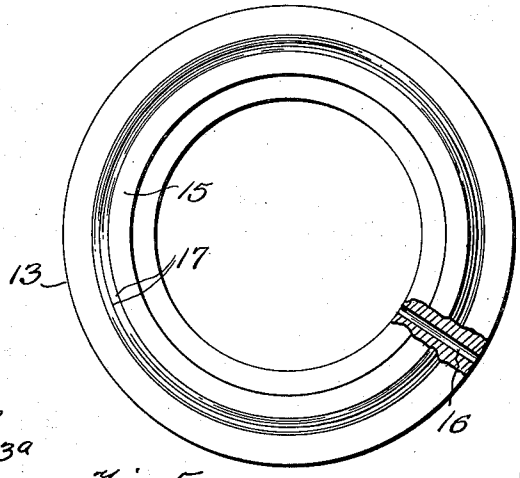


Fig. 7.

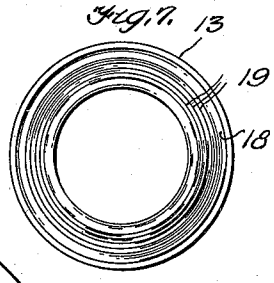


Fig. 8.

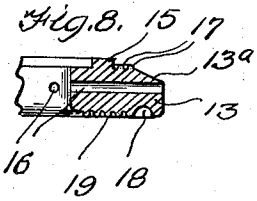


Fig. 5.

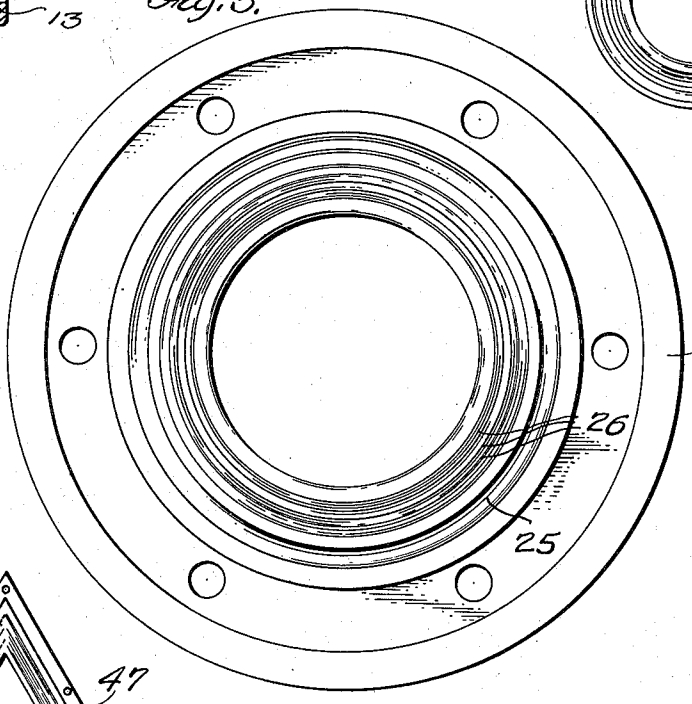
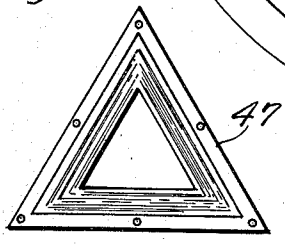


Fig. 11.



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DIAPHRAGM ANCHORING MEANS

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Application March 3, 1948, Serial No. 12,871

4 Claims. (Cl. 137—157)

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This invention relates to a shape-forming device, and has for one of its objects the production of a simple and efficient means for anchoring the flexible diaphragm thereof in place and against accidental displacement from its support.

A further object of this invention is the production of a simple and efficient diaphragm-anchoring means for securely fastening or anchoring a flexible diaphragm within a shape-forming device.

Other objects and advantages of the present invention will appear throughout the following specification and claims.

In the drawings:

Figure 1 is a side elevational view of the shape-forming device, certain parts being shown in section to illustrate the diaphragm-anchoring means;

Figure 2 is a side elevational view partly in section, of the diaphragm before it is placed in the shape-forming device;

Figure 3 is a side elevational view of the diaphragm-retaining ring;

Figure 4 is a top plan view of the diaphragm-retaining ring, partly in section and illustrating one of the pressure ports;

Figure 5 is a top plan view of the lower retaining ring of the shape-forming device;

Figure 6 is a bottom plan view of the dome, reduced in size;

Figure 7 is a bottom plan view of the diaphragm-retaining ring reduced in size;

Figure 8 is a fragmentary transverse sectional view of the diaphragm-retaining ring;

Figure 9 is a fragmentary sectional view illustrating a modified form of the diaphragm-anchoring means;

Figure 10 is a fragmentary sectional view of the sealing gasket shown in Figure 9;

Figure 11 is a bottom plan view of a dome of a different shape from that shown in Figure 5.

By referring to the drawings, 10 designates the dome which is provided with a pressure compartment 11. The dome 10 is provided with a recess 12 into which fits a removable diaphragm-retaining ring 13. The upper wall of the recess 12 is provided with an annular channel 14 for receiving the annular tongue 15 which is carried by the upper face of the ring 13. This ring 13 is provided with radiating pressure ports 16 extending from the inner through the outer face or periphery of the ring 13—see Figures 1, 3 and 4. The ring 13 is provided with a plurality of annular beads 17 upon the upper face thereof exteriorly of the tongue. The ring 13 is provided

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with an enlarged annular channel 18 in its lower face and also a plurality of inwardly spaced concentric beads 19 upon the under face thereof. The inner lower edge 20 is preferably rounded to prevent the cutting of the flexible diaphragm 21 as the diaphragm flexes. As shown in Figure 1, the diaphragm 21 closes the lower end of the pressure compartment 11.

A lower retaining ring 22 is clamped upon the bottom of the dome 10 by means of bolts 23, and a spacer 24 is preferably interposed between the abutting faces of the dome 10 and the ring 22. The ring 22 is provided with an annular channel 25 upon its upper face in opposed relation to the channel 18 of the ring 13, as shown in Figure 1. The ring 22 is also provided with a series of concentric inwardly spaced beads 26 inwardly of the channel 25 and in opposed relation to the beads 19 of the ring 13. The ring 22 is provided with a central opening 27 for receiving the die member D.

A specially formed flexible diaphragm or flexible shape-forming member 21, preferably of rubber or other suitable material, is anchored in position by the rings 13 and 22. This diaphragm 21 is provided with a depending annular bead 28 which fits into the channel 25 of the ring 22 and is also provided with an upstanding bead 29 which fits in the channel 18 of the ring 13, as shown in Figure 1. The beads 17 and 26 grip the flexible and compressible diaphragm 21 therebetween to provide a tooth-like or interfitting serrated gripping action upon the diaphragm 21. The diaphragm 21 is provided with an upstanding peripheral flange 30 which terminates in an inturned annular flange 31 having an inclined lower wall 32 which wall 32 fits snugly upon the inclined face 13a of the ring 13. The inwardly protruding end of the flange 31 fits snugly between the beads 17 of the ring 13 and the anchoring beads 17a of the dome 10 which are arranged in opposed relation to the beads 17 to provide a tooth-like grip upon the flange 31 located therebetween. The flange 31 is arranged in spaced relation to the body of the diaphragm thereby defining a diaphragm which is substantially U-shaped in cross-section along its periphery, the flange 31 providing an inwardly extending overhanging ledge.

Pressure from the compartment 11 will pass through the ports 16 during operation, and by contacting the inner face of the flange 30 this pressure will force the flange 30 tightly against the vertical wall 33 of the dome 10 to provide a further efficient seal. As shown in Figure 1, a

die-carrying member D of the conventional type, is properly supported adjacent the movable dome 10, for the purpose of shaping articles of metal and the like in conjunction with the diaphragm 21.

It should be noted that the spacer 24 is of a developed or pre-computed thickness to control pressure on the diaphragm 21 as the ring 22 is clamped against the dome 10 and the diaphragm 21.

Figures 9 and 10 illustrate a modified form of the diaphragm-anchoring means wherein 34 designates the dome having a pressure compartment 35. The dome 34 is provided with a suitably formed recess 36 in its under face arranged laterally of the compartment 35. The dome 34 is also provided with a bead-receiving channel 37 which is located in opposed relation to the bead 38 carried by the upper face of the lower diaphragm-retaining ring 39. The ring 39 is clamped in position by bolts 40 similar to the bolts 33 and a spacer 41 similar to the spacer 24 is interposed between the dome 34 and ring 39 at the periphery thereof. The flexible diaphragm 42, preferably of rubber, closes the open end of the compartment 35 and the periphery of the diaphragm 42 is clamped between the dome 34 and the ring 39. The bead 38 forces the adjacent portion of the diaphragm 42 into the channel 37 in the manner shown in Figure 9 to provide a tongue-and-groove lock to anchor the diaphragm in place. A sealing gasket 43, preferably of rubber, having tapering inwardly-extending flanges 44 and substantially parallel lips 44^a fits within the channel 36 and snugly engages the upper face of the diaphragm 42. A spacer ring 45 fits in the recess 36 and between the lips 44^a and the sealing gasket 43. The spacer ring 45 is provided with ports 46 which provide communication between the pressure compartment 35 and the channel 36, in a manner whereby the pressure from the compartment 35 will force the gasket tightly against the walls of the channel 36 and in sealing contact with the diaphragm 42. The spacer ring 45 is provided with an annular tongue 15^a similar to the tongue 15 shown in Figure 1, and this tongue 15^a fits in the annular groove 14^a formed in the top wall of the recess 36, similar to the channel 14 in the recess 12 shown in Figure 1. The spacer 41 is of a developed or pre-computed thickness to control pressure on the diaphragm 42 as the ring 39 is clamped against the dome 31 and the diaphragm 42.

It should be noted that the rigid spaced ring or member 13 will exert constant pressure upon the flange 31 when clamped in position, and that variable pressure will pass through the ports 16 against the upstanding flange 30 to seal the diaphragm against pressure escaping from the pressure compartment. This also is true with respect to the structure shown in Figure 9.

The spacer ring 45 is also of a pre-computed thickness so as to compress the lips 44^a a definite amount to efficiently seal these lips 44^a against the top wall of the recess 36 and the top face of the diaphragm 42. These lips 44^a when so compressed will prevent any leakage of liquid at the time of each cycle of operation. When no pressure is present, the seal becomes relaxed. This spacer ring 45 retains just the amount of pressure to hold the lips 44^a in a proper position, one against the dome, and the other against the diaphragm and to thereby prevent leakage of oil.

In Figure 11, I have shown a dome 47 which is similarly constructed to the dome 10. The dome 47 and its associated parts are similarly designed as to shape to properly interfit. It is not desired to limit the invention as to shape or design, since various shapes may be employed without departing from the spirit of the invention, to produce the desired shaped articles which are formed thereby.

Having described the invention, what is claimed as new is:

1. A diaphragm-anchoring means of the class described comprising opposed diaphragm-engaging members, means securing the members together, one member having a pressure compartment, a diaphragm-retaining ring carried by one member, a flexible diaphragm closing said compartment and having an inwardly extending flange arranged in spaced relation relative to the body of the diaphragm thereby defining a spaced inwardly extending overhanging ledge, said ring fitting upon the diaphragm and under the flange and overhanging ledge, and said diaphragm-engaging members and said diaphragm-retaining ring having opposed interfitting serrated diaphragm-gripping means to engage the diaphragm and flange to hold the diaphragm in an anchored position.

2. A diaphragm anchoring means of the class described comprising opposed diaphragm-engaging members, means securing the members together, one member having a pressure compartment, a diaphragm-retaining ring carried by one member, a flexible diaphragm closing said compartment and having an inwardly extending flange arranged in spaced relation relative to the body of the diaphragm thereby defining a spaced inwardly extending overhanging ledge, said ring fitting upon the diaphragm and under the flange and overhanging ledge, said diaphragm-engaging members and said diaphragm-retaining ring having opposed interfitting serrated diaphragm-gripping means to engage the diaphragm and flange to hold the diaphragm in an anchored position, opposed beads formed upon the upper and lower faces of said diaphragm, and said ring and one of the members having opposed channels for receiving said beads to provide a tongue and groove gripping action.

3. A diaphragm anchoring means of the class described comprising opposed diaphragm-engaging members, means securing the members together, one member having a pressure compartment, a diaphragm-retaining ring carried by one member, a flexible diaphragm closing said compartment and having an inwardly extending flange arranged in spaced relation relative to the body of the diaphragm thereby defining a spaced inwardly extending overhanging ledge, said ring fitting upon the diaphragm and under the flange and overhanging ledge, said diaphragm-engaging members and said diaphragm-retaining ring having opposed interfitting serrated diaphragm-gripping means to engage the diaphragm and flange to hold the diaphragm in an anchored position, opposed beads formed upon the upper and lower faces of said diaphragm, said ring and one of the members having opposed channels for receiving said beads to provide a tongue and groove gripping action, the first mentioned member having a channel, and said ring having an upstanding flange fitting in said chanel.

4. A diaphragm-anchoring means comprising a plurality of opposed gripping members, one of the members having a pressure compartment, a flexible diaphragm closing said pressure compart-

ment, a flexible sealing element for said diaphragm, a rigid spacer engaging said sealing element and exerting constant pressure against one portion of the sealing element to bind the sealing element against one of the gripping members, means for directing variable pressure from the pressure compartment against another portion of said sealing element to seal the flexible sealing element and the diaphragm against the escape of pressure from the pressure compartment, means for securing the gripping members together, and a second spacer of developed thickness interposed between the gripping members to maintain constant clamping pressure on the diaphragm.

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