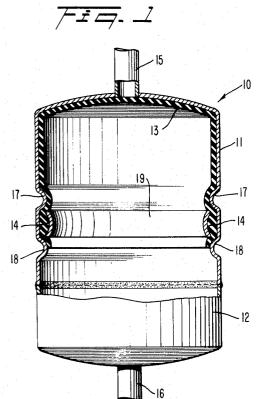
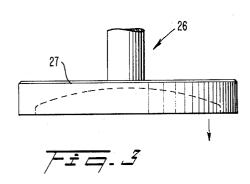
## Feb. 22, 1966

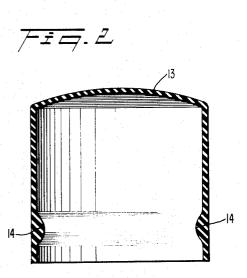
J. A. LANDER ETAL EXPANSION TANK

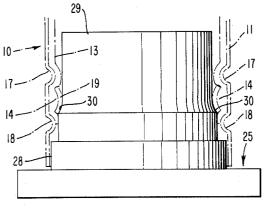
3,236,411

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# United States Patent Office

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### 3,236,411 Patented Feb. 22, 1966

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#### 3,236,411 EXPANSION TANK

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This invention is directed to an improved expansion tank and the method of producing the same.

One object of the present invention is to provide an 10 improved expansion type tank having a flexible diaphragm which divides the tank into two separate compartments whereby air under pressure is separated from a liquid under pressure.

Another object is to provide an improved seal between 15 the peripheral portion of a flexible diaphragm and the wall of the expansion tank.

Another object is to provide an improved expansion tank having a diaphragm secured to the wall of the tank in an improved manner to prevent endwise movement of 20 the peripheral portions of the diaphragm while permitting free movement of the central portion of the diaphragm.

Another object is to provide an improved seal between the peripheral portion of a diaphragm and the side wall 25 of an expansion tank wherein the sealing pressure is directed at right angles to the surface of the diaphragm peripheral portion.

Another object is to provide an improved method of assembling a diaphragm in an expansion tank whereby 30 no additional reshaping of the tank walls is necessary after the diaphragm has been moved into position.

A still further object is to provide an improved method of making a seal between the peripheral portion of a diaphragm and the side wall of an expansion tank. 35

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

FIG. 1 is a vertical sectional view of a portion of the expansion tank showing the improved seal;

FIG. 2 is a sectional view of the diaphragm before it  $^{45}$  is inserted into the expansion tank; and

FIGS. 3 and 4 are side views of the apparatus for securing the peripheral portion of the diaphragm to the wall of the expansion tank.

50The expansion tank 10 comprises a pair of opposed dome-shaped hollow shell members 11 and 12 having the edges of their open ends joined together by conventional means, preferably by welding, to form the hollow expansion tank. The diaphragm 13 is made of a flexible material, preferably rubber, and is dome-shaped and sized to fit into the dome-shaped shell 11. The diaphragm is formed with an integral bead 14 extending inwardly and adjacent its periphery as shown in FIG. 2. Openings 15 and 16 are provided through the end walls 60 of shells 11 and 12 whereby different pressures and different fluids may be admitted to each end of the tank and on opposite sides of the diaphragm. Opening 16 has a conventional valve assembly connected to it whereby a predetermined pressure may be maintained on one side of the diaphragm. Opening 15 is connected to any conventional pressure system. A pair of spaced apart and inwardly extending rib members 17 and 18 are formed in the wall of shell 11 and serve as an integral part of the diaphragm sealing means. A ring 19 having a width slightly less than the distance between ribs 17 and 18 serves to complete the seal structure. The ring

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19 has a concave cross sectional shape to give it additional strength and has a maximum outside diameter slightly greater than the minimum inside diameter of ribs 17 and 18. When diaphragm 13 is fully seated the bead 14 is positioned in the area between ribs 17 and 18. Thus, when ring 19 is fully seated in its position between ribs 17 and 18, it compresses bead 14 against the wall of shell 11 and between ribs 17 and 18, and it compresses the diaphragm material between each edge of the ring and the adjacent wall of each of the ribs. Ring 19 thus is securely anchored between ribs 17 and 18 against endwise movement and there is provided a triple seal between the peripheral portion of the diaphragm and the wall of shell 11. Furthermore, any tendency of the ring to move endwise is directed into the broad extent of one of the rib members 17 or 18 which results in the application of a greater compressive force on that portion of the diaphragm which extends between the ring and the rib member.

It has been found that in making the above-described expansion tank it is essential that the seal be assembled so that the parts are in tight relationship with each other and that no part of the shell wall be weakened. In FIGS. 3 and 4 is shown an apparatus for carrying out this method comprising a mandrel 25 mounted to any suitable base and a ram 26 mounted for movement toward and away from the mandrel. Secured to ram 26 and movable therewith is a ram bonnet 27 having a concave inner surface of the same shape and size as the end wall of the shell 11. The mandrel has several stepped diameters with diameter 28 equal to the diameter of the open end of the shell 11. Mandrel diameter 29 is equal to the inside diameter of ring 19. Shoulder 30 provides a seat for ring 19 as the shell 11 is moved downwardly. In operation, the ribs 17 and 18 are formed in the side wall of shell 11 by conventional means. Ring 19 is next placed within diaphragm 13, with bead 14 in alignment with the ring and these assembled portions are inserted into shell 11. The entire assembly is then mounted over mandrel 25 and ram 26 is actuated by conventional means, not shown, such as hydraulic means, to move the shell 11 downwardly onto the mandrel. As the assembly is moved downwardly, the diameter of ring 19 is trued up by the mandrel portion 29 and at the same time it is squared in relation to the side walls of shell 11. Movement of ring 19 into shell 11 is stopped when it abuts shoulder 30. Continued downward movement of the ram causes shell 11 to move downwardly and causes the rib 18 to expand slightly to permit the ring 19 to slide over said rib until the ring is seated in the area between ribs 17 and 18. If desired, the downward movement of the shell 11, after the ring 19 has been abutted against the mandrel shoulder 30, can be con-55 trolled so that the ring is seated in a position straddling rib 18 rather than being fully seated between ribs 17 and 18. In such position the diaphragm bead 14 is further compressed between the rib and the concave surface of the ring member and forming a seal therebetween.

While there has been shown and described what is considered to be the preferred embodiment of the improved expansion tank, various changes and modifications may be made in the design and arrangement of the parts without departing from the spirit and scope of the invention. For example, the rib members may be formed separate and secured to the inner surface of the wall of member 11 rather than to be formed from the wall itself. The shape and width of the ring may be varied without departing from the scope of this invention. For a definition of the limits of the invention, reference is had primarily to the appended claims.

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1. An expansion tank having side walls and end walls to form a hollow body member, a diaphragm of flexible material extending across said body member whereby said body is divided into two compartments, a sealing 5 means between the walls of said body member and the peripheral edge portion of said diaphragm, said sealing means comprising a pair of spaced apart and inwardly extending rib members formed in said side wall, a continuous retaining ring engaging the peripheral edge por-10 tion of said diaphragm and compressing the same between the ring and said side wall and between the ring and each of said rib members whereby the peripheral edge portion of said diaphragm is sealed to said side wall.

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2. An expansion tank having side and end walls form- 15 ing a hollow body member, a flexible diaphragm member spanning said side walls and dividing said tank into separated compartments, means for sealing the peripheral edge of said diaphragm to said side wall, said sealing means comprising a pair of spaced apart inwardly extending rib members formed in said side wall, a continuous ring spaced between said rib members and compressing a portion of the peripheral margin of said diaphragm against said side wall and compressing other portions of said peripheral margin between the edges of 25 said ring and each of said rib members whereby said diaphragm peripheral margin is sealed against the passage of fluid and is secured against movement.

3. In an expansion tank having side and end walls and a diaphragm spanning said side walls, means for securing and sealing the marginal portion of the periphery of said diaphragm to said side wall comprising first and second annular members secured to the inside surface of said side wall, said first and second members being spaced apart, a continuous ring member positioned between said first and second members and compressing said marginal portion of the periphery of said diaphragm between it and the side wall and simultaneously compressing said marginal portion of the diaphragm periph- 40

ery between each edge of said ring member and said first and second members.

4. An expansion tank as defined in claim 3 wherein each of said first and second members is an annular internal rib forming an integral part of said side wall.

5. An expansion tank as defined in claim 3 wherein the outer peripheral surface of said ring member is arcuately concave.

6. An expansion tank as defined in claim 5 comprising an annular rib on said marginal portion of the diaphragm periphery between said side wall and said concave surface of the ring member.

7. An expansion tank having side and end walls forming a hollow body member, a flexible diaphragm member spanning said side walls and dividing said tank into separated compartments, means for sealing the peripheral margin of said diaphragm to said side wall comprising first and second spaced apart and inwardly extending rib members formed in said side wall, a retaining ring having first and second edge portions and a con-20 necting surface extending between said edge portions, said first edge portion being parallel to and adjacent said first rib member and compressing a portion of said diaphragm therebetween, said second edge portion being parallel to and adjacent said second rib member and compressing a portion of said diaphragm therebetween, and said connecting surface being adjacent said side wall and compressing a portion of said diaphragm therebetween.

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