May 27, 1952 W. F. DAVENPORT ET AL 2,597,924

SELF-SEALING VALVE FOR INFLATABLE PNEUMATIC BLADDERS OR THE LIKE

Filed Oct. 4, 1950

Fig. 1.

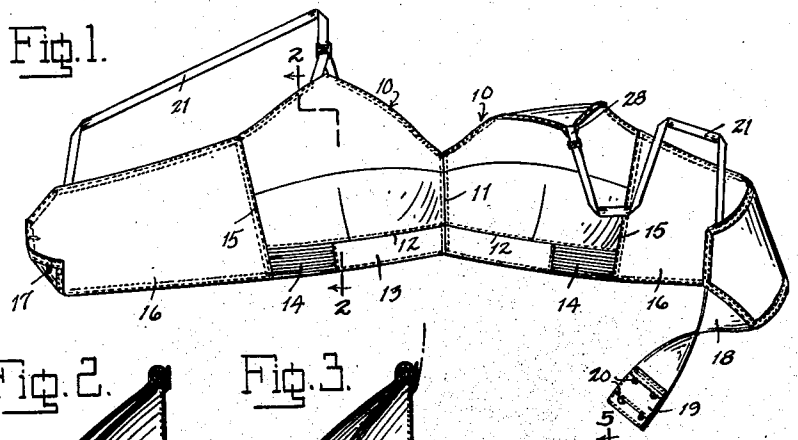


Fig. 2.

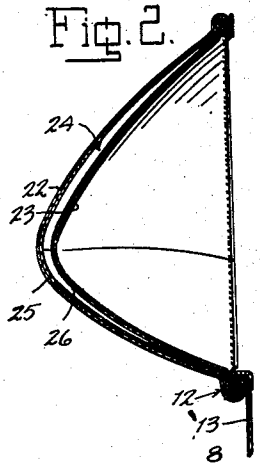


Fig. 3.

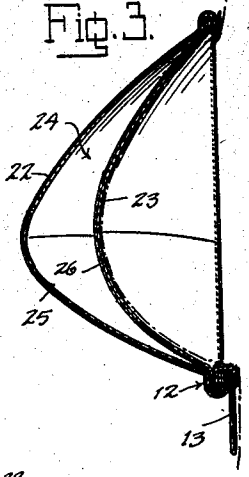


Fig. 4.

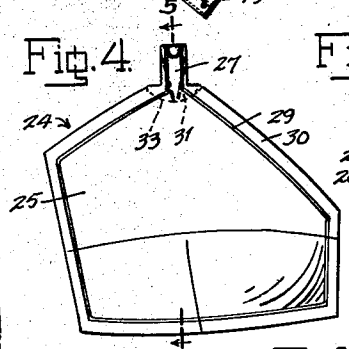


Fig. 5.

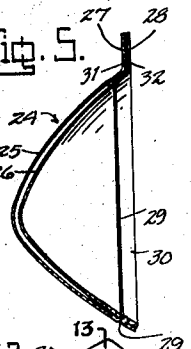


Fig. 6.

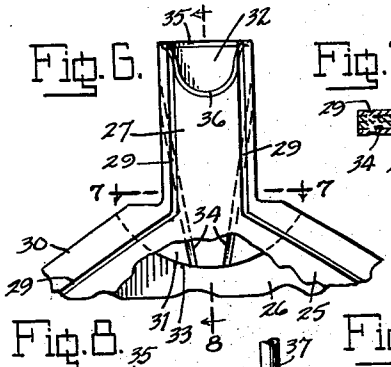


Fig. 7.

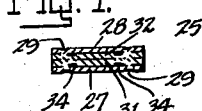


Fig. 11.

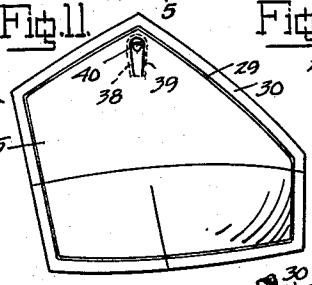


Fig. 12.

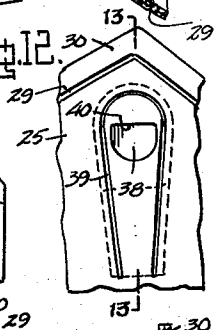


Fig. 8.

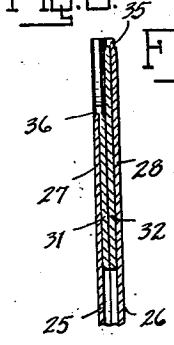


Fig. 9.

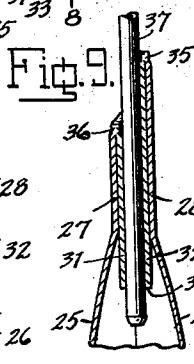


Fig. 10.

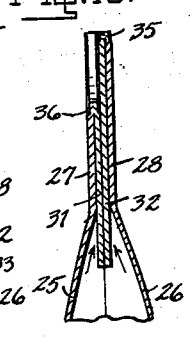


Fig. 13.

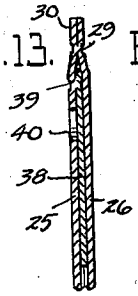


Fig. 14.

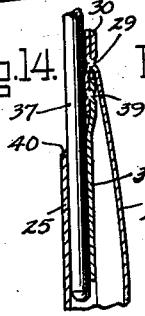
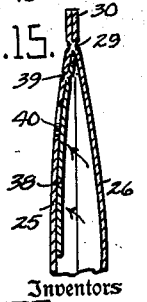


Fig. 15.



Inventors

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By Thomas Matthews

Attorney

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SELF-SEALING VALVE FOR INFLATABLE PNEUMATIC BLADDERS OR THE LIKE

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Howard A. Smith, Fairfield, Conn.

Application October 4, 1950, Serial No. 188,328

8 Claims. (Cl. 2—267)

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The present invention relates to a self-sealing valve for inflatable pneumatic bladders or the like, an object of the invention being to provide a valve which may be constructed of flexible plastic sheet material either similar or identical with the material making up the bladder, and which will be inconspicuous, free of projections or bulges, and capable of having a small tube inserted therein for the purpose of inflating the bladder, the valve being automatically self-sealing upon removal of the tube. It is well known that plastic sheet material, such for example as one of the well known vinyl film plastics, may be provided with highly polished or pressed surfaces, and that when two such polished surfaces are pressed together molecular adhesion will take place between them and separation of the adhered surfaces will be resisted to a substantial degree. A suitable commercial vinyl film is produced by the Bakelite Company of New York, N. Y., under the name "Vinylite", this material being a copolymer of vinyl chloride and vinyl acetate. It is proposed in the present invention to utilize this phenomena to provide a self-sealing valve, and further to arrange the surfaces of the valve so that air pressure within the bladder will exert force tending to maintain the adhered surfaces together.

While the invention is capable of incorporation in pneumatic bladders of different types and for various uses, it is especially desirable, because of the inconspicuous form of the valve and its freedom from projections or bulges, for incorporation in a pneumatic bladder for use in brassières of the type disclosed in the U. S. Letters Patent to William F. Davenport and Howard A. Smith for Brassière, No. 2,544,300, granted March 6, 1951. For convenience of description, the invention will be illustrated in connection with a brassière of this type. It is pointed out that this improved brassière is particularly intended for women having a bust which is under-developed, flat, unsymmetrical or otherwise lacking in normal or natural configuration, it being proposed in said brassière to provide a predetermined external shape designed to give an accepted ideal contour for a given size, and provided with pneumatic form-filling bladder means whereby the wearer of such given size may adapt such brassière to her individual form with complete comfort and with the same appearance as if the wearer naturally possessed such ideal contour. The valve of the present invention lends itself particularly to this use because of its ability to enable the bladder to be easily inflated

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to the desired extent by the wearer of the brassière and to thereupon automatically seal itself so that the desired amount of air pressure will be effectually maintained. Because of the flexible form of the valve and its construction of similar or identical material with the bladder it may be assembled in the brassière by the usual manufacturing procedure of machine stitching the component parts of the brassière together.

With the above and other objects in view, embodiments of the invention are shown in the accompanying drawings, and these embodiments will be hereinafter more fully described with reference thereto, and the invention will be finally pointed out in the claims.

In the drawings:

Fig. 1 is a front elevation of a brassière in which the pneumatic bladders having valve means according to the invention are incorporated.

Fig. 2 is a vertical sectional view on an enlarged scale taken along the line 2—2 of Fig. 1.

Fig. 3 is a similar view showing the brassière in place upon the wearer.

Fig. 4 is a front elevation of a pneumatic bladder member adapted for incorporation in the brassière and provided with valve means according to one embodiment of the invention.

Fig. 5 is a vertical sectional view taken along the line 5—5 of Fig. 4.

Fig. 6 is a fragmentary enlarged front elevation of the valve portion of the bladder.

Fig. 7 is a horizontal sectional view taken along the line 7—7 of Fig. 6.

Fig. 8 is a vertical sectional view taken along the line 8—8 of Fig. 6, the bladder being deflated.

Fig. 9 is a similar view showing the tubes inserted in the valve for inflating the bladder.

Fig. 10 is a similar view showing the bladder inflated and the valve in self-sealing relation.

Fig. 11 is a front elevation of a bladder adapted for incorporation in the brassière and provided with a modified form of valve means according to the invention.

Fig 12 is a fragmentary enlarged front elevation showing the valve portion of the bladder.

Fig. 13 is a vertical sectional view taken along the line 13—13 of Fig. 12, the bladder being deflated.

Fig. 14 is a similar view showing the tube inserted in the valve for inflating the bladder.

Fig. 15 is a similar view showing the valve inflated and the valve in self-sealing relation.

Similar reference characters indicate corre-

sponding parts throughout the several figures of the drawings.

Referring to the drawings, the brassière, in which the valve means of the present invention is incorporated by way of example, comprises a pair of bust-receiving pockets 10—10 joined together along a center seam 11 and secured along their lower edges 12 to a diaphragm band 13 provided with horizontal elastic inserts 14—14, the side edges of the bust pocket and the end edges of the elastic inserts being connected by seams 15—15 to the forward edges of the back strap sections 16—16, one of which is provided at its free ends with hook fasteners 17 while the other is provided at its ends with a tab 19 having eye fasteners 20 for engagement by the hook fasteners. Shoulder straps 21—21 are connected between the upper edges of the bust pockets and the back strap sections.

The bust pockets 10 are preformed before sewing into the brassière, and each consists of an outer fabric layer 22 of full-fashioned form and an inner fabric layer 23, conforming to the outer layer at its peripheral edge, but having less rounded projection so as to provide a narrow space between them in their assembled relation, this space converging at the margins where the edges of the layers are brought together. The fabric of the outer layer 22 may be of any suitable material as for instance marquisette, satin, cotton, nylon or the like, which material is relatively thin and flexible but is substantially non-stretchable, so that the predetermined form given to the outer layer will be the external form of the brassière. The inner layer 23 may be of the same material as the outer layer, or it may be of a different material suited for soft engagement of the skin.

Between the layers 22 and 23 there is secured the pneumatic bladder, indicated generally as 24, and in which the valve means, according to the invention, is incorporated. This bladder is formed of an air impervious, very thin lightweight flexible sheet material. While latex and similar elastic materials may be employed it is preferred to use a material either substantially non-elastic or having a low degree of elasticity. A suitable material is thin sheet plastic, such as one of the vinyl film plastics, which is capable of having two layers seamed together by the application of heat to form an airtight bond between them and is also capable of having woven fabric secured to it by machine stitching. This material, which is also preferably employed for forming the components of the valve means, as will presently more fully appear, is also capable of being produced with either one or both surfaces highly polished.

The bladder 24 is formed of two layers 25 and 26, full-fashioned in a similar manner to the fabric layers 22 and 23 and of substantially the same outline shape, the patterns for forming the layers of the bladder being substantially similar to the patterns of the fabric layers, so that the cup shape of the bladder layers substantially conforms to the cup shape of the fabric layers. At the apex of the upper edge of the layers 25 and 26, and at a point substantially coinciding with the point of attachment of the shoulder straps to the bust pockets there are provided tongue extensions 27 and 28 for the purpose of providing an air injection nozzle in which the valve is incorporated, as will presently more fully appear. The two layers 25 and 26 are adhered together along their marginal portions by heat produced seams 29, which cause a homogeneous cohesion of the two layers together to form an air tight seal between them, this seam extending in parallel inwardly spaced relation to the peripheral edges of the layers so as to provide a relatively wide fin-like margin 30 for attachment within the edge seams of the bust pockets by folding the margin into such seams and securing it by machine stitching.

Prior to the securing together of the nozzle portion of the bladder by the heat produced seam 29 the valve means according to the invention is incorporated in the bladder structure. This valve means comprises a pair of layers 31 and 32 of thin flexible air-impervious plastic sheet material, such as one of the well-known vinyl film plastics, and having their contacting surfaces of a highly polished or glossy smoothness. This smoothness is of such high degree that the contacting surfaces are capable of adhering to each other through molecular adhesion of the material alone, that is, such adhesion will take place without maintaining extraneous pressure on the contacting surfaces other than would exist, for instance, in free atmosphere. The outline shape of these corresponds to the outline shape of the nozzle portion of the bladder and their lower edges are convexly curved as at 33 so as to extend partially into the air space within the bladder. The two layers are first secured together by a pair of heat produced seams 34—34 which converge downwardly to provide a tapered passage for receiving the tube for inflating the bladder, as will presently more fully appear. In order to facilitate insertion of the tube for inflating the bladder the upper edge of the layer 32 is straight while the upper edge of the layer 31 is curved downwardly. The upper edges of the tongue extensions 27 and 28 are correspondingly shaped. The two layers 31 and 32, secured together by the seams 34, are assembled in the nozzle portion of the bladder by first securing the upper straight edge of the layer 32 to the upper straight edge of the tongue extension 28 by a heat produced seam 35 and thereupon securing the upper curved edge of the layer 31 to the upper curved edge of the tongue extension 27 by a heat produced seam 36. The heat produced marginal seam 29 is thereupon extended along each side of the nozzle portion to secure the several layers together. The seams 29 intersect the seams 34 and thus provide a homogeneous adherence of the layers together at each side of the tube receiving passage, and this in addition to the upper edge seams 35 and 36 effectually prevents escape of air from the bladder between the surfaces of the inner and outer layers. As seen in Fig. 1 the bladder when incorporated in the brassière has the nozzle portion projected from the upper edge of the bust pocket at the apex point in concealed relation behind the end of the shoulder strap and in a convenient location for conveniently inflating the bladder.

The inflating operation is carried out by employing a small tube 37, which may be provided with a mouth piece for blowing by the mouth or it may be attached to a suitable bulb type pump, the tube being inserted in the passage through the valve, as shown in Fig. 9, so that its end is below the edge 33. Thereupon the desired amount of air is blown into the bladder and the tube is withdrawn. Upon withdrawing the tube the nozzle end is pressed flat by the fingers to insure complete contact of the polished inner

surfaces of the layers **31** and **32**, although such contact will take place automatically through the action of the air pressure within the bladder pressing upon the sides of the lower portion of the layers extending into the air space as seen in Fig. 10. The valve is thus sealed by molecular adhesion caused by the contact of the polished surfaces of the layers. If it is desired to partially or wholly deflate the bladder it is only necessary to insert the tube in the valve, as seen in Fig. 9, whereupon the air within the bladder will be allowed to escape to the desired degree. Because of the absence of any metal parts or other projections or bulges, and the fact that the valve portion of the bladder is in the form of a soft flexible structure similar to the material making up the bladder and the brassière, the valve is especially suitable for its use in the brassière, being entirely free of any hard projecting structure that might irritate the skin of the wearer.

The bladders are not inflated to any great extent but are simply intended to have enough air placed therein to compensate for the difference in form of the wearer and the predetermined form of the bust pocket outer layer **22**. In the position of the brassière upon the body, as shown in Fig. 3, the inner layer **26** of the bladder member and the inner fabric layer **23** are simply pressed inwardly to the body, the softness and flexibility of the material allowing this to take place without any appreciable discomfort from the slight wrinkling that takes place in the preformed material as it is pressed inwardly from the normal position, as shown in Fig. 11, to the body-conforming position, as shown in Fig. 3. In this latter position the spacing of the inner layers from the outer layers will be entirely dependent upon the particular form of the wearer, that is the inner layers will not tend to change or distort the form of the wearer but will conform thereto with an even all-over pressure, and at the same time the outer layer **25** of the bladder will be pressed by the entrapped air into conforming relation to the outer layer **22** of the bust pocket.

In Figs. 11 to 15 there is shown a modified form of the invention in which the nozzle structure as shown in the first embodiment is dispensed with and the valve structure is incorporated in the outer layer of the bladder at a point within its margin, this outer layer having a polished inner surface and constituting one component of the valve structure. The other component consists of a patch like layer of similar sheet material **38** having its polished surface in contact with the inner polished surface of the layer **25** and secured thereto by heat produced seam **39** of substantially inverted U-shape with the sides of the U converging downwardly to provide a tapered air passage opening into the bladder at the lower edge of the layer **38**. An entrance opening **40** for receiving the tube **37** is provided in the bladder layer **25** in proximity to the upper end of the air passage, its upper edge being straight and its lower edge being curved to facilitate insertion of the tube. The bladder is inflated as shown in Fig. 14 by inserting the tube **37** through the opening **40** into the air passage to a point below the lower edge of the layer **38**. When inflated to the desired degree the tube is withdrawn and the air pressure within the bladder will press the member **38** against the layer **25** so that their polished surfaces are in firm contact as shown in Fig. 15, thereby establishing an effectual seal through molecular adhesion to prevent escape of air from the bladder.

We have illustrated and described preferred and satisfactory embodiments of the invention, but it will be understood that changes may be made therein, within the spirit and scope thereof, as defined in the appended claims.

What is claimed is:

1. In a pneumatic bladder or the like, a self-sealing valve comprising a pair of valve layers of flexible air-impervious plastic sheet material superimposed one upon the other, air-impervious seams permanently securing said layers together at opposed spaced points, the portions of said layers between their secured together portions being unsecured to provide upon forceable separation of said layers an air injection and ejection passage having an end exteriorly of the bladder and an end interiorly of the bladder, and the contacting surfaces of said layers each having such a high degree of smoothness and flexibility that they are capable of adhering to each other through molecular adhesion of the material alone.

2. In a pneumatic bladder or the like, a self-sealing valve comprising a pair of valve layers of flexible air-impervious plastic sheet material superimposed one upon the other, air-impervious seams permanently securing said layers together at opposed spaced points, the portions of said layers between their secured together portions being unsecured to provide upon forceable separation of said layers an air injection and ejection passage having an end exteriorly of the bladder and an end interiorly of the bladder, and the contacting surfaces of said layers each having such a high degree of smoothness and flexibility that they are capable of adhering to each other through molecular adhesion of the material in free atmosphere.

3. In a pneumatic bladder or the like, a pair of bladder layers of flexible air impervious sheet material superimposed one upon the other with their peripheral edges in register, an air-impervious sealing seam permanently securing said layers together continuously around their edges except for an unsecured portion of said edges constituting an opening to the bladder formed by said layers, and a self-sealing valve comprising a pair of superimposed valve layers of flexible air-impervious plastic sheet material disposed between said bladder-layers at each side of said unsecured portion and permanently secured to each other jointly with said secured edges at each side of said unsecured portion, air-impervious sealing seams permanently securing the outer edges of said valve layers entirely along said unsecured portions of said edges of said bladder layers, said valve layers between their secured together portions being unsecured to each other to provide upon forceable separation of said valve layers an air injection and ejection passage having an end exteriorly of the bladder and an end interiorly of the bladder, and the contacting surfaces of said valve layers each having such a high degree of smoothness and flexibility that they are capable of adhering to each other through molecular adhesion of the material alone.

4. The invention as defined in claim 3, further characterized by a pair of spaced inwardly converging seam lines securing said valve layers together and defining said passage.

5. In a pneumatic bladder or the like, a pair of bladder layers of flexible air-impervious sheet

material each having a tongue extension projecting from its edge and superimposed one upon the other with their peripheral edges and the side edges of said tongue extensions in register, an air-impervious sealing seam permanently securing said layers together continuously around their edges and along the side edges of said extensions to form a bladder, the outer ends of said extensions being unsecured to each other between their secured side edges to constitute an opening to the bladder formed by said layers, and a self-sealing valve comprising a pair of superimposed valve layers of flexible air-impervious plastic sheet material disposed between said extensions and permanently secured together along their side edges jointly with said secured side edges of said tongue extensions, air-impervious sealing seams permanently securing the outer edges of said valve layers to said extensions entirely along said outer ends of said extensions, and said valve layers between said secured side edges being unsecured to each other to provide upon forceable separation of said valve layers an air injection and ejection passage having an end exteriorly of the bladder and an end interiorly of the bladder, and the contacting surfaces of said valve layers each having such a high degree of smoothness and flexibility that they are capable of adhering to each other through molecular adhesion of the material alone.

6. The invention as defined in claim 5, further characterized in that said pair of valve layers extends inwardly beyond the inner ends of said tongue extensions.

7. The invention as defined in claim 1, further

characterized in that at least one of said valve layers is a part of the material of the bladder.

8. In a pneumatic bladder formed of flexible air-impervious plastic sheet material, a self-sealing valve comprising a layer consisting of a portion of said sheet material of said bladder and a layer of flexible air-impervious plastic sheet material secured thereto along spaced seam lines, the portions of said layers between their secured together portions being unsecured to provide upon forceable separation of said layers an air injection and ejection passage having an end exteriorly of the bladder and an end interiorly of the bladder, and the contacting surfaces of said layers each having such a high degree of smoothness and flexibility that they are capable of adhering to each other through molecular adhesion of the material alone.

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