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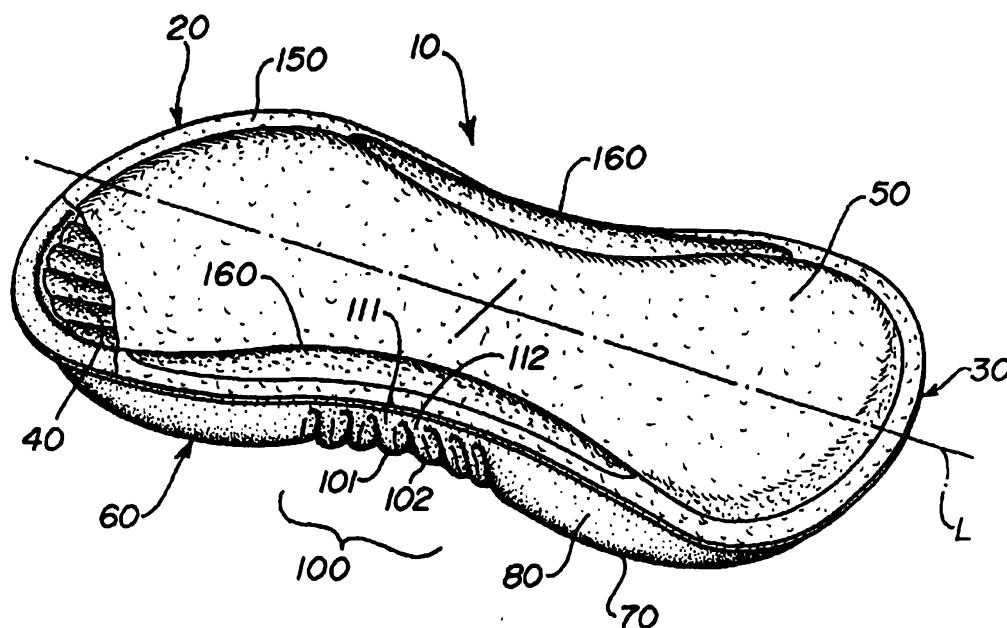
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(54) Title: ARCING AND EXPANDING ABSORBENT ARTICLE



(57) Abstract

An absorbent article useful for wearing in the crotch portion of an undergarment is disclosed. The article has an absorbent structure disposed between a liquid-pervious, body-facing surface and a resilient, liquid-impervious, controlled-deformation shell. The shell has a pair of lateral sides, a garment-facing surface and a peripheral edge. Proximate the peripheral edge of the shell, there is a body-gasketing portion. The shell also has means for adjusting the length of the garment-facing surface and lateral sides. Thus, the garment-facing surface and lateral sides can expand or contract to relieve stresses induced by curving the article while allowing the body-gasketing portion to remain substantially free of folds and gaps.

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ARCING AND EXPANDING ABSORBENT ARTICLEField of the Invention

5 The present invention relates to absorbent articles useful for wearing in the crotch portion of a user's garment. In particular, the invention relates to certain structural features in a controlled-deformation shell which improve the performance of such an article.

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Background of the Invention

 Disposable absorbent articles such as sanitary napkins and adult incontinence pads are generally designed to be worn in the crotch portion of a user's garment and to absorb and to contain body fluids.

15 Incontinence pads require higher liquid capacity as the void volume of incontinent adults is generally greater than menstrual flow. It is also preferable that adult incontinence pads are compact enough to be worn without being noticeable to passers-by.

20

 These requirements as well as others have been substantially met by the incontinence pad of Holtman, U.S. Patent No. 4,685,914. The disposable urinary pad of Holtman includes a liquid-impermeable, deformation-resistant, flexible shell containing a fibrous absorbent structure. This pad has a large liquid capacity, rapidly accepts and retains relatively large gushes of liquids, and is comfortable to wear. However, the Holtman pad has a permanently curved form which makes manufacture challenging and results in bulky packaging and storage.

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 Attempts to form curved sanitary napkins include Mokry, U.S. Patent No. 4,944,735, which uses elastic bands along the side edges to deform an essentially flat structure into a curved absorbent article. However, the

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sanitary napkins of Mokry generally have a lower liquid capacity than incontinence pads, and the barrier film is generally limp and does not provide the resilient structural support that the Holtman shell provides.

Diapers have been formed using pleated barrier films. Examples of these
5 products include Schaar et al., U.S. Patent Nos. 3,776,233 and 3,848,549. Again, the limp barrier film does not provide the structural support of resilient shells.

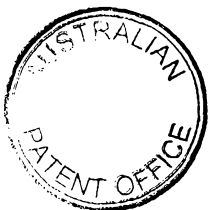
Therefore, there is a need for an absorbent article useful for wearing in the crotch portion of a user's garment which can comfortably curve to fit the user's body while maintaining sufficient resilient structural integrity to resist gapping and resultant side
10 leakage.

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

Summary of the Invention

To this end, the present invention provides an absorbent article useful for
15 wearing in a crotch portion of a user's garment comprising an absorbent structure substantially enclosed by a body-facing liner and a resilient, liquid-impermeable, controlled-deformation shell; wherein the liquid-impermeable shell comprises (a) a peripheral edge, (b) longitudinal ends and lateral sides extending away from the body-facing liner proximate the peripheral edge to a garment-facing surface and (c) means for
20 adjusting the length of the garment-facing surface and lateral sides,

said means comprising a plurality of transversely extending corrugations, which have a terminus on one of the lateral sides, radiate toward the garment-facing surface, traverse the garment-facing surface, and have a second terminus on the opposite lateral



side; wherein when the shell is in a relatively planar position phantom lines extending from the corrugations on the lateral sides, and away from the garment-facing surface, converge in a region beyond the body-facing surface of the article; whereby the garment-facing surface of the shell is capable of articulating from a relatively planar form to a curved form while allowing the body-facing liner to form a substantially smooth curve and to remain substantially free of folds.

Unless the context clearly requires otherwise, throughout the description and the claims, the words 'comprise', 'comprising', and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

The means for expanding the garment-facing surface and lateral sides includes a plurality of expandable corrugations having a terminus on one side, radiate toward the garment-facing surface, traverse the garment-facing surface, and have a second terminus on the opposite lateral side. The expandable corrugations have a unique orientation.

When imaginary lines (hereinafter referred to in the specification and claims as "phantom lines") are extended from the expandable corrugations on the lateral sides of the shell in a direction away from the garment-facing surface, they converge in a region beyond the body-facing surface of the article. These expandable corrugations help to enable the shell to be articulated between a relatively planar form to a curved form, preferably having a radius of curvature from a focal point in the convergence region.

Brief Description of the Drawings

Fig. 1 is a perspective view of an absorbent article of this invention in a generally planar position.



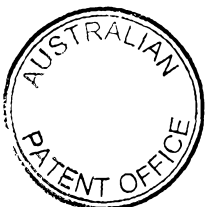
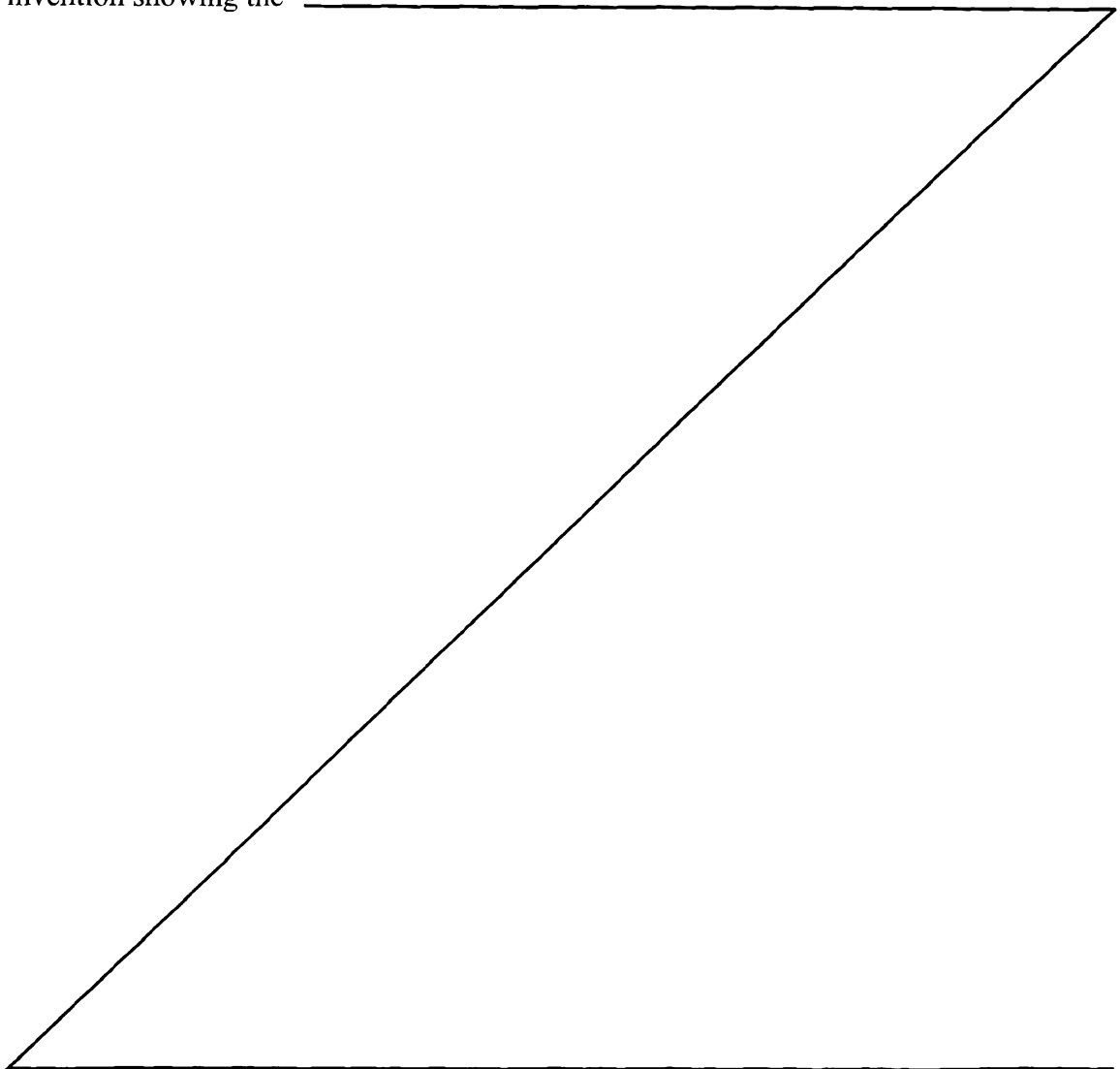
Fig. 2 is a perspective view of an absorbent article of this invention in a curved position.

Fig. 3 is a bottom plan view of an absorbent article of this invention in a generally planar position.

5 Fig. 4 is a bottom plan view of an absorbent article of this invention in a curved position.

Fig. 5 is a side elevational view of an absorbent article of this invention in a generally planar position.

Fig. 6 is a fragmentary cross-sectional view of an absorbent article of this
10 invention showing the



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configuration of transverse expandable corrugations as taken along line 6-6 of Fig. 3.

Fig. 7 is a side elevational view of an absorbent article of this invention in a curved position.

Fig. 8 is a transverse cross-sectional view of an absorbent article of this invention showing in a generally planar position as taken along line 8-8 of Fig. 5.

Fig. 9 is a transverse cross-sectional view of an absorbent article of this invention showing in a curved position as taken along line 9-9 of Fig. 7.

Fig. 10 is a schematic view, similar to Fig. 9, showing an absorbent article of this invention in use.

Detailed Description of the Invention

In accordance with the present invention, Fig. 1 illustrates an absorbent article 10 having first and opposite transverse ends 20 and 30, respectively. Absorbent article 10 also has an absorbent structure 40 disposed between a liquid-permeable, body-facing surface 50 and a liquid-impermeable, controlled-deformation shell 60 which includes a garment-facing surface 70 and a pair of lateral sides 80 and 90, respectively.

The shell 60 is preferably formed of a resilient, thermoformable material. The term "resilient" means spontaneously bouncing or springing back into shape, position, etc., after being stretched or bent and the deforming force is removed. Examples of this type of shell are known in Holtman, U.S. Patent No. 4,685,914, herein incorporated by reference; Baigas, Jr. et al., U.S. Patent No. 5,013,309; Stern et al., U.S. Patent No.

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4,681,577; Korpman, U.S. Patent No. 4,554,191; and Menard et al., U.S. Patent No. 4,740,342. Examples of resilient materials include, without limitation, polymeric foams such as polyethylene foam and
5 polyurethane foam; resilient films; and resilient laminates; and the like. A "controlled-deformation shell" is formed of a resilient material which has structural features to predispose shell deformation when exposed to external forces.

10 The controlled-deformation nature of the shell 60 is influenced by corrugations, hollows, increased thickness regions, grooves, angles, and the like. One controlled-deformation feature of the present invention is a means for adjusting the length of the garment-
15 facing surface and lateral sides of the shell. The adjusting means 100 can take the form of corrugations, pleats, folds, darts, and the like. Preferably, the adjusting means 100 can allow the length to be increased or decreased.

20 In a particularly preferred embodiment, the adjusting means includes a plurality of corrugations 100 which are formed in the shell 60. The corrugations 100 have a terminus 110 on the first lateral side 80, radiate toward the garment-facing surface 70, transverse
25 this surface 70, extend up the opposite side 90, and have a second terminus 120 on the opposite side 90. The preferred corrugations 100 have a unique orientation.

 The longitudinal distance B between the ridges 131 and 132 of adjacent central corrugations 101 and 102 at
30 their first terminus 111 and 112 is less than the longitudinal distance G between the ridges 131 and 132 of adjacent corrugations 101 and 102 traversing the garment-facing surface 70. Therefore, phantom lines 140, extending from the corrugations 100 on the lateral
35 sides 80 and 90 away from the garment-facing surface 70,

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converge in a region R beyond the body-facing surface 50.

Distances between additional corrugations 103 disposed adjacent the central corrugations 101 and 102 are not critical. However, the corrugations 103 are arranged such that their terminus 113 on the lateral side 80 is spaced at a longitudinal distance D_1 from a central plane P, perpendicular to both the longitudinal axis L of the article and the body-facing surface 50, which is less than the longitudinal distance D_2 between the ridge 133 of corrugation 103 at the garment-facing surface 70 and the central plane P.

This is significant, because the garment-facing surface 70 expands and arcs to a greater extent than the body-facing surface 50. Because the longitudinal expansion of the lateral sides 80 and 90 is greater near the garment-facing surface 70 of the shell 60, the chances of the lateral dams 160 buckling and creating side leakage paths is reduced.

The corrugations 100 may have a curvilinear cross section. Examples of such forms include sinusoid, saw-tooth, square wave, or any variation or hybrid of such forms. Of course, these forms may be oriented and focused as described above. The corrugations 100 may be disposed to extend beyond a planar surface defined by the rest of the garment-facing surface 70, or they may be disposed to extend only to that planar surface, or even below the planar surface of the garment-facing surface 70.

While the above discussion and drawings generally refer to the expansion of the corrugations 100, the corrugations 100 may also contract to shorten the garment-facing surface 70. Shortening the garment-facing surface 70 may result in curving the article away from the user's body, at least partially. The

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garment-facing surface 70 may also be simultaneously shortened in one location or orientation and lengthened in another region or orientation to form an article 10 having complex curves.

5 There may be any number of corrugations 100 in the shell 60. While the Figures illustrate an embodiment having an even number of corrugations 100, an odd number of corrugations 100 may also be used. If there is an odd number of corrugations 100, the distances B and G
10 between adjacent central corrugations 101 and 102 can be read to describe the distance between a central corrugation 101 and adjacent corrugations 102 on each side. Preferably, there are between about 3 and 25 corrugations, more preferably, about 5 and 7.

15 When the article 10 is articulated into a curved form, the phantom lines 140 may converge at a focal point F within the convergence region R to provide a radius of curvature for the curved article 10.

 A portion of each lateral side 80 and 90 of the
20 shell 60 extends from the garment-facing surface 70 to beyond the peripheral edge 150 of the shell 60. This portion acts as a dam 160 disposed inward from the peripheral edge 150 to better contain fluids during use. Preferably, the dam 160 is formed in a central region of
25 each lateral side 80 and 90 proximate the peripheral edge 150. Each dam 160 has a first height H_1 when the article 10 is in a relatively planar form as depicted in Fig. 5. When the dam 160 is formed only in the central region of each lateral side 80 and 90, the transition
30 between the dam 160 and the peripheral edge 150, both laterally and longitudinally, should be rather smooth. This provides an effective gasketing surface which can intimately contact and seal against the user's perineum and/or adjacent body surfaces to reduce the likelihood
35 of fluid leakage during use. The dam 160 may also

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extend fully around the body-facing surface 50. The phrase "relatively planar" as used herein the specification and claims means that the described structure is more flat than curved or cupped. When the
5 article 10 is articulated into a cup-like form as illustrated in Fig. 7, the dam 160 acquires a second height H_2 which is greater than the first height H_1 .

The dam 160, peripheral edge 150, gasketing surface, absorbent structure 40, and shell 60 cooperate
10 to provide an absorbent article 10 having a structure which resists side leakage failure. During articulation of the article 10, including curving it into a cup-like configuration, the adjusting means 100 permit the garment-facing surface 70 and lateral sides 80 and 90 to
15 expand or contract to relieve stresses induced by curving the article 10, while allowing the body-gasketing portion to remain substantially free of folds and gaps or other imperfections which can lead to side leakage failure. Thus, the body-gasketing surface
20 maintains an essentially constant perimeter while following body contours, and other portions of the shell 60 adjust to relieve stresses induced by manipulating the article.

Another preferred controlled-deformation feature of
25 the present invention is the use of indentations 170 and 180 in the lateral sides 80 and 90. These indentations 170 and 180 are preferably located proximate the length adjustment means 100. The indentations 170 and 180 allow the shell 60 to deflect in toward the absorbent
30 structure 40 to relieve stresses in the shell 60 without forcing the body-gasketing surface to fold or to gap.

The substantially planar nature of the absorbent article 10 in Fig. 1 allows for ease in manufacturing. It is generally understood in the art that relatively
35 flat articles are easier to cut out, manipulate and

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package than curved articles. In particular, continuous motion cutting operations can be used to remove the absorbent articles from a conveyed web of multiple articles.

5 In use, the absorbent article is placed into a user's undergarment, and may be anchored there by means of a pressure sensitive positioning adhesive or the like. The article is expanded and arced by the force of the user's undergarment and body. In Fig. 2, the arrows
10 pointing to the ends 20 and 30 of the article 10 represent forces articulating the article 10 into a cup-like form. In use, this force is generally supplied by the user's undergarment. The arrows pointing to the peripheral edge 150 proximate the longitudinal center of
15 the article 10 represent forces transversely moving the dams 160 towards each other. This force is generally supplied by the wearer's thighs 200, as illustrated in Fig. 10.

20 The specification and drawings discussed above are presented to aid in the complete and non-limiting understanding of the invention disclosed herein. Since many variations and embodiments of the invention can be made without departing from its spirit and scope, the
25 invention resides in the claims hereinafter appended.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. An absorbent article useful for wearing in a crotch portion of a user's garment comprising an absorbent structure substantially enclosed by a body-facing liner and a resilient, liquid-impermeable, controlled-deformation shell; wherein the liquid-
- 5 impermeable shell comprises (a) a peripheral edge, (b) longitudinal ends and lateral sides extending away from the body-facing liner proximate the peripheral edge to a garment-facing surface and (c) means for adjusting the length of the garment-facing surface and lateral sides,
- said means comprising a plurality of transversely extending corrugations, which
- 10 have a terminus on one of the lateral sides, radiate toward the garment-facing surface, traverse the garment-facing surface, and have a second terminus on the opposite lateral side; wherein when the shell is in a relatively planar position phantom lines extending from the corrugations on the lateral sides, and away from the garment-facing surface, converge in a region beyond the body-facing surface of the article; whereby the garment-
- 15 facing surface of the shell is capable of articulating from a relatively planar form to a curved form while allowing the body-facing liner to form a substantially smooth curve and to remain substantially free of folds.
2. The absorbent article according to claim 1 wherein a longitudinal distance from a terminus of a transverse corrugation to a central plane, perpendicular to the planar form
- 20 of the garment-facing surface and to a longitudinal axis of the article, is less than a longitudinal distance from the central plane to that corrugation at the garment-facing surface of the shell.



3. The absorbent article of claim 1 wherein said curved form has a radius of curvature from a focal point in the convergence region.

4. The absorbent article of claim 3 wherein the phantom lines converge at the focal point of the curved form.

5 5. The absorbent article according to claim 1 wherein a portion of each lateral side of the shell extends from the garment-facing surface above a plane formed by the body-facing liner proximate the peripheral edge to form a dam disposed inward from the peripheral edge.

6. The absorbent article according to claim 5 wherein the dam is formed in a central
10 region of each lateral side proximate the peripheral edge.

7. The absorbent article according to claim 5 wherein the dam has a first height when the absorbent article has a relatively planar form, and the dam acquires a second height, greater than the first height, when the absorbent article is articulated into a curved form.

15 8. The absorbent article according to any one of claims 1 to 7 wherein there is an even number of transverse corrugations.

9. The absorbent article according to any one of claims 1 to 7 wherein there is an odd number of transverse corrugations.

10. The absorbent article according to any one of claims 1 to 9 wherein the
20 controlled-deformation shell comprises a thermoformable material.

11. The absorbent article of claim 10 wherein the thermoformable material comprises a polymeric foam.



12. The absorbent article of claim 10 wherein the thermoformable material comprises a polymeric film structure.

13. The absorbent article according to any one of claims 1 to 12 in the form of a sanitary napkin.

5 14. The absorbent article according to any one of claims 1 to 12 in the form of an adult incontinence article.

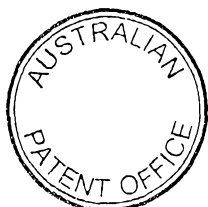
15. An absorbent article useful for wearing in a crotch portion of a user's garment substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

10

DATED this 17th Day of September, 1999
McNEIL-PPC, INC.

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FIG. 3

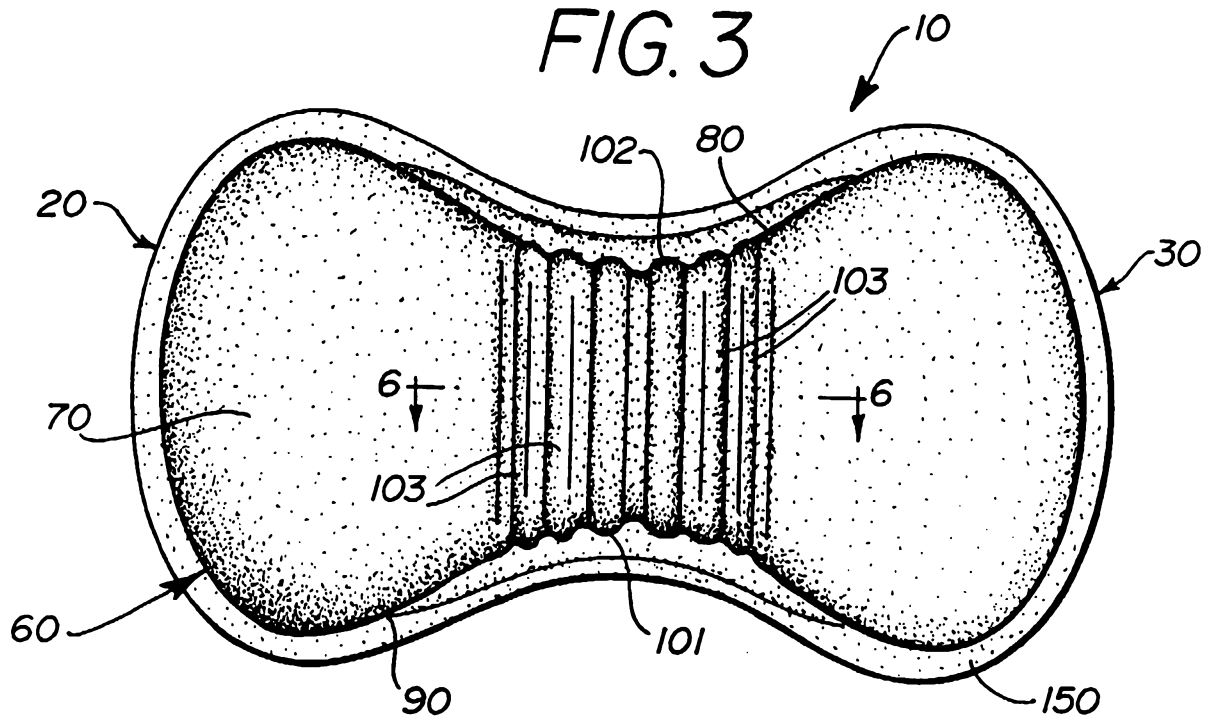


FIG. 4

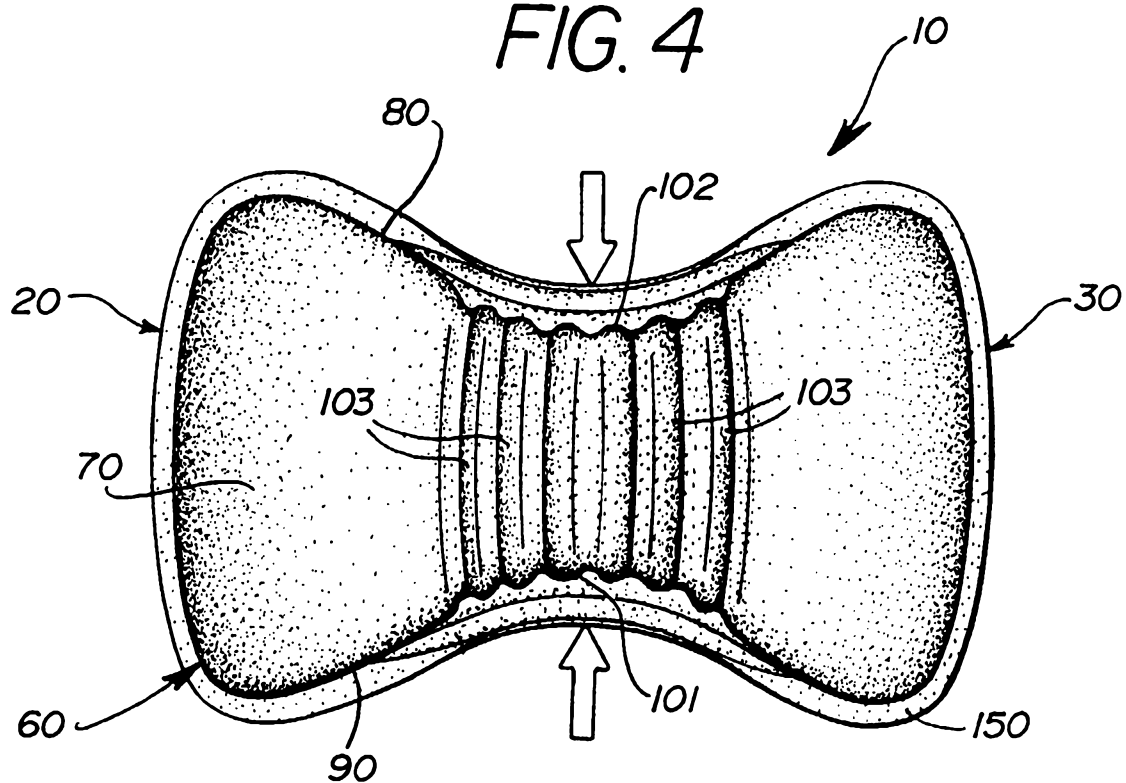


FIG. 5

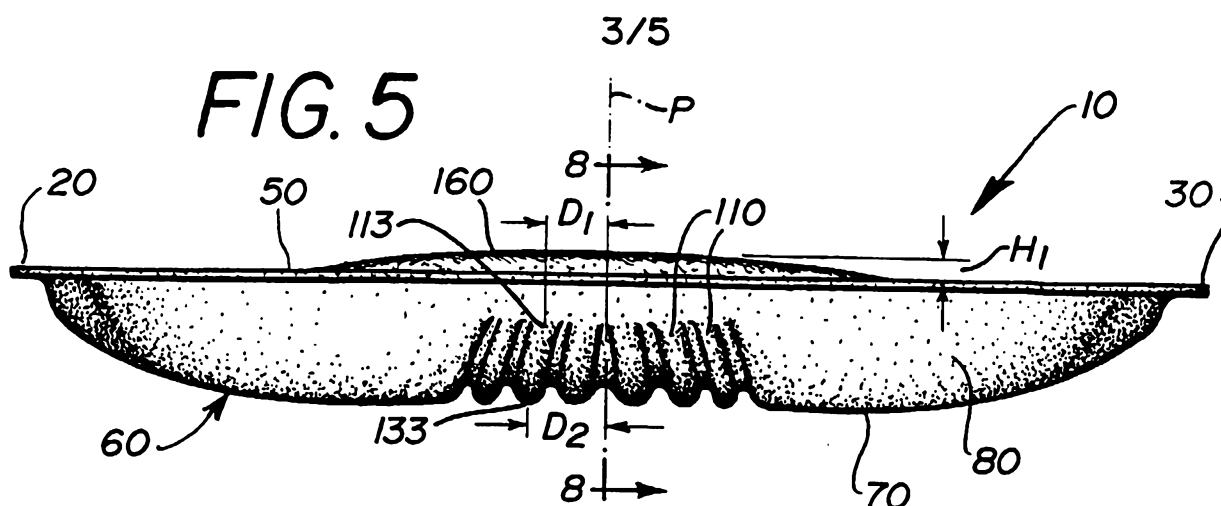


FIG. 6

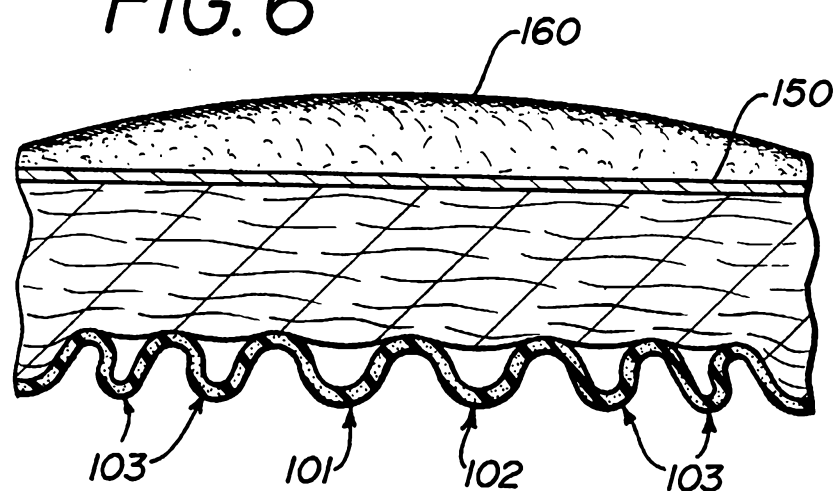


FIG. 7

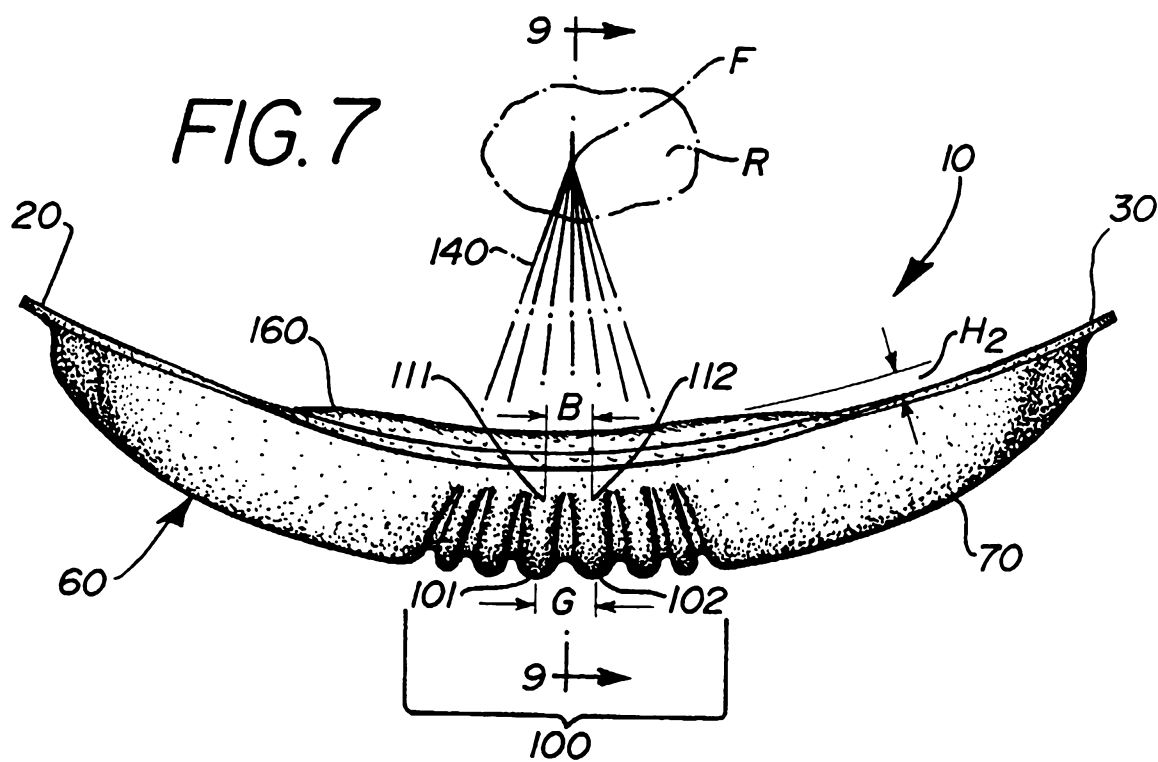


FIG. 8

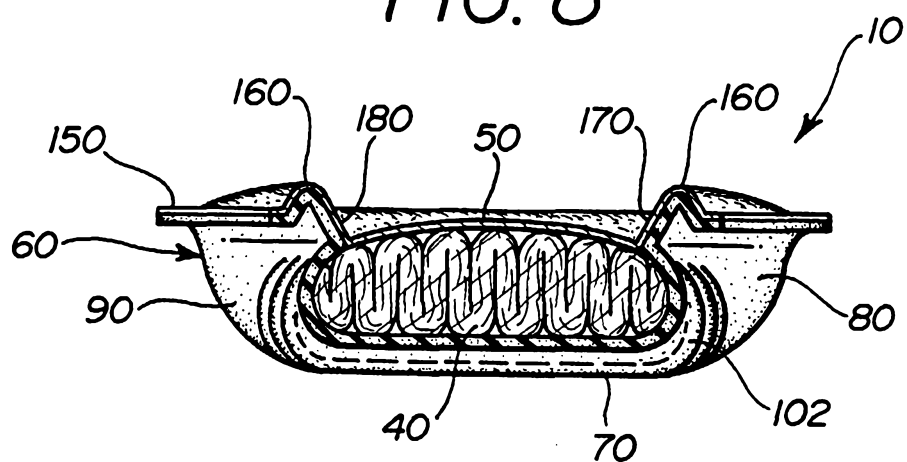


FIG. 9

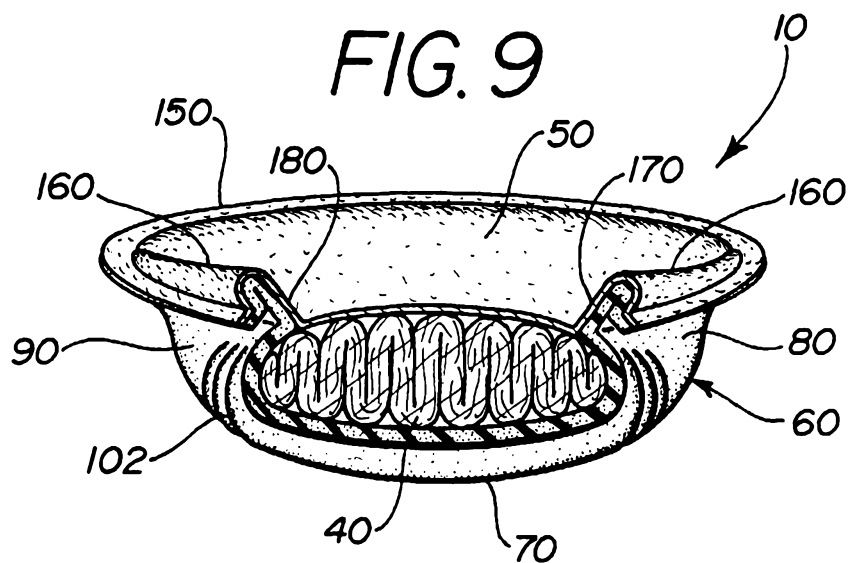


FIG. 10

