United States Patent

Schaar

[15] **3,658,063**

[45] **Apr. 25, 1972**

[54] DISPOSABLE DIAPER

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[73] Assignee: **The Kendall Company,** Boston, Mass.

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[21] Appl. No.: **40,904**

[52] **U.S. Cl.** **128/287**

[51] **Int. Cl.** **A61f 13/16**

[58] **Field of Search** 128/284, 286, 287

[56] **References Cited**

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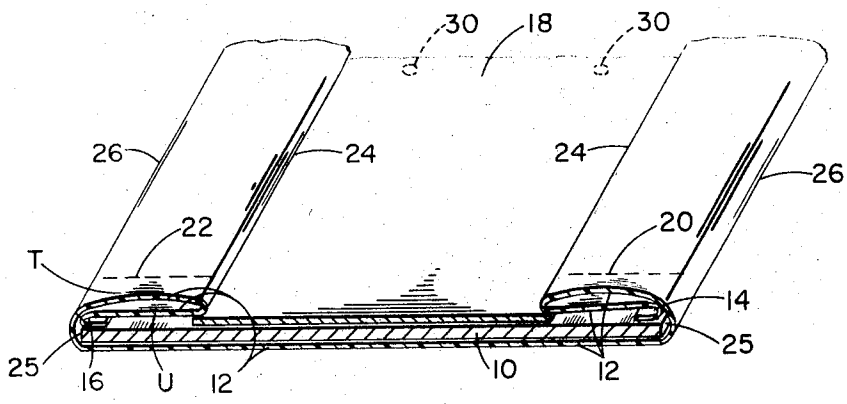
Primary Examiner—Charles F. Rosenbaum

Attorney—Rowland V. Patrick

[57] **ABSTRACT**

A contoured disposable diaper comprising an absorbent pad having front and back waistline portions with a crotch portion therebetween and having a water pervious front surface and a water impervious back surface, and pair of restraining means each having a first portion adhered to the water pervious surface of the pad in the crotch portion at a location spaced inward of a lateral pad edge and a second portion arranged to restrain the respective lateral edge from fully opening to its unrestrained configuration, whereby a taper of the diaper is achieved in the crotch portion.

7 Claims, 17 Drawing Figures



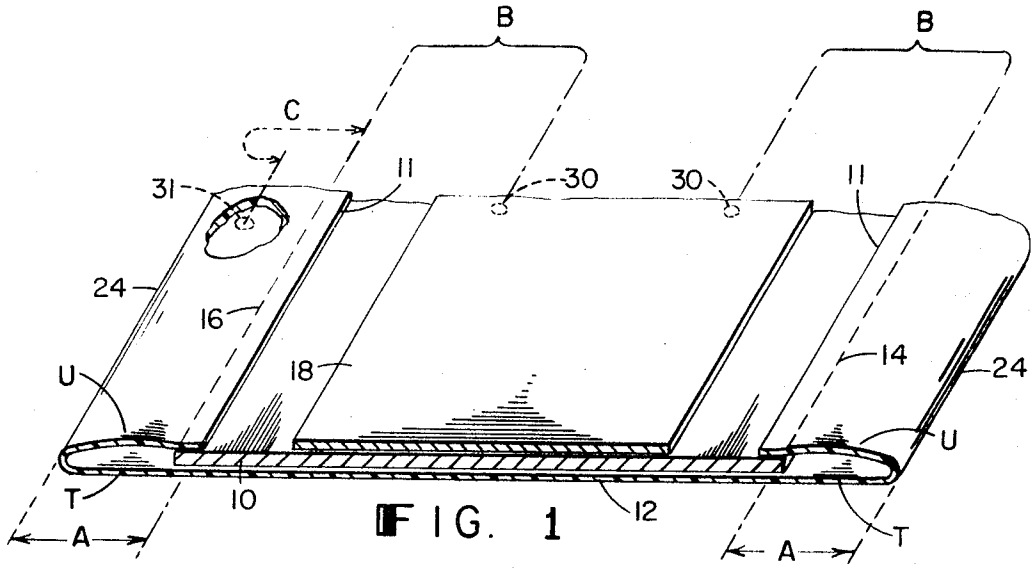


FIG. 1

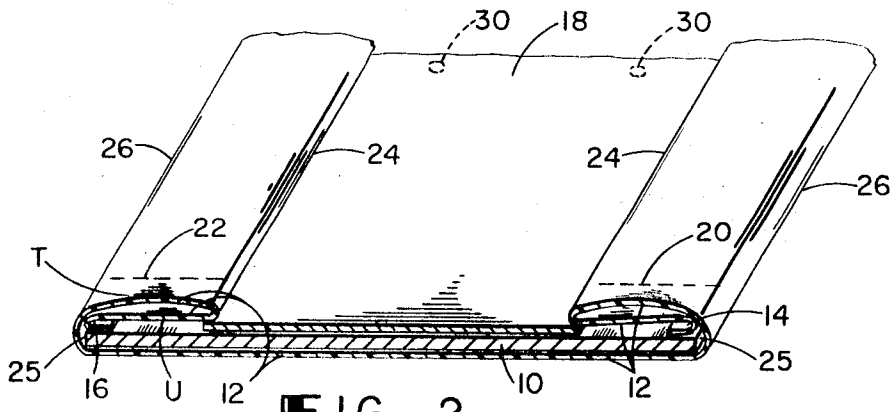


FIG. 2

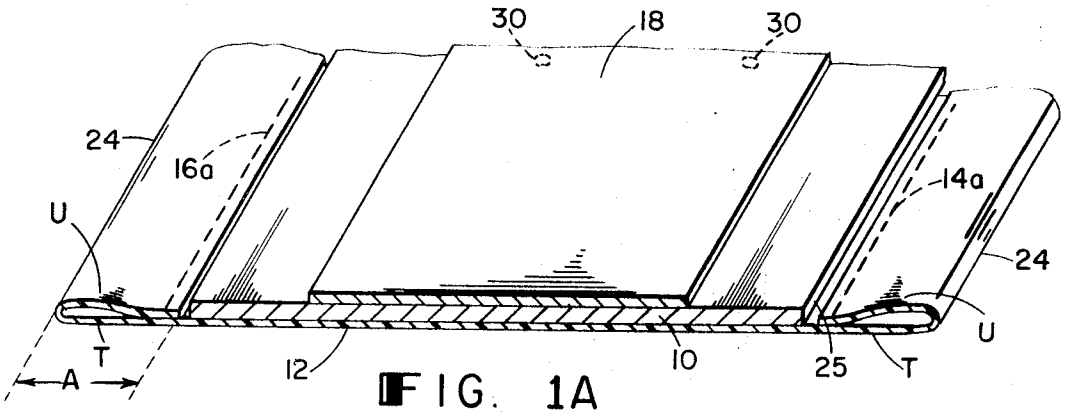


FIG. 1A

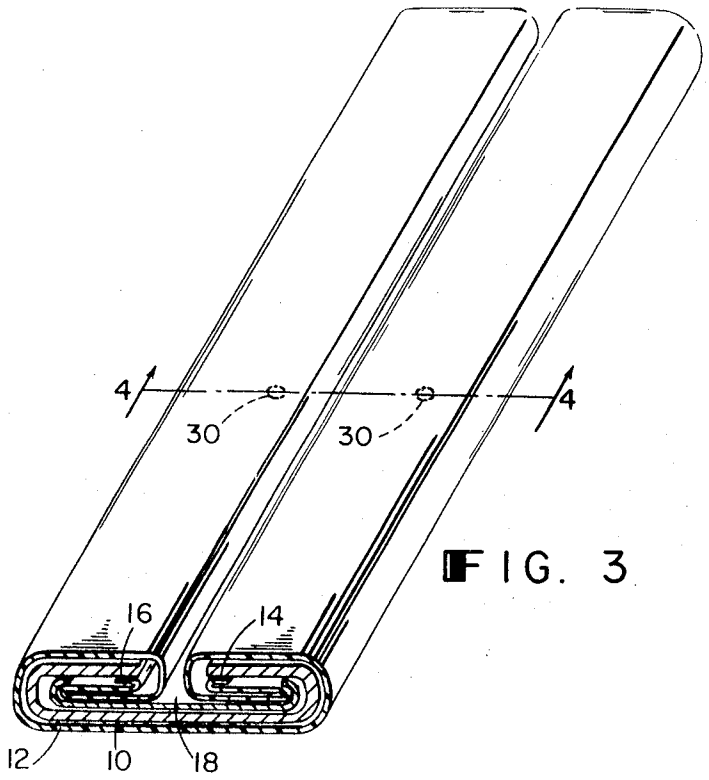


FIG. 3

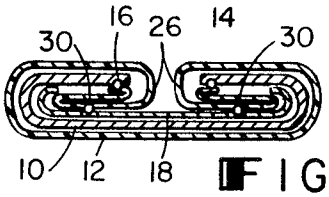


FIG. 4

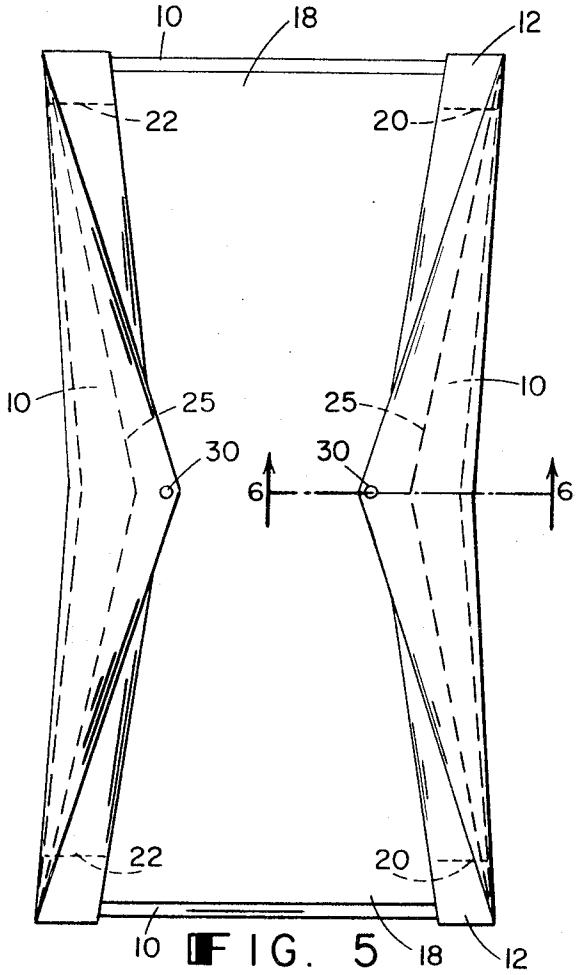

10
18
12
22
20
10
25
25
10
30
30
6
6
22
20
10
18
12

FIG. 5

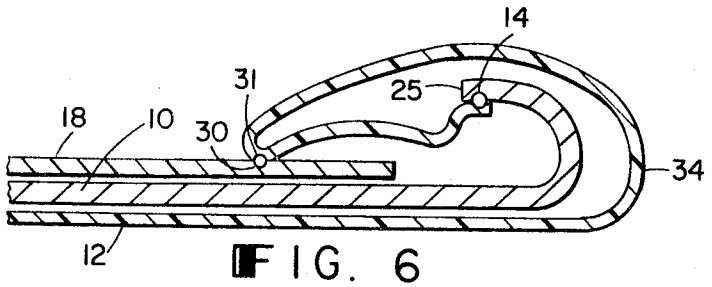

14
31
25
18
10
30
34
12

FIG. 6

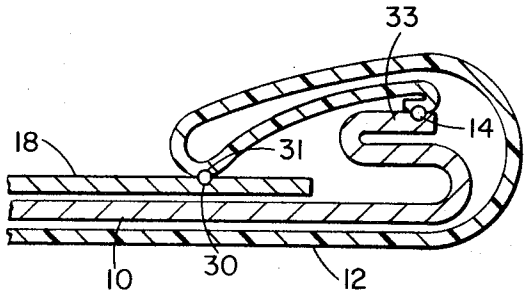


FIG. 7

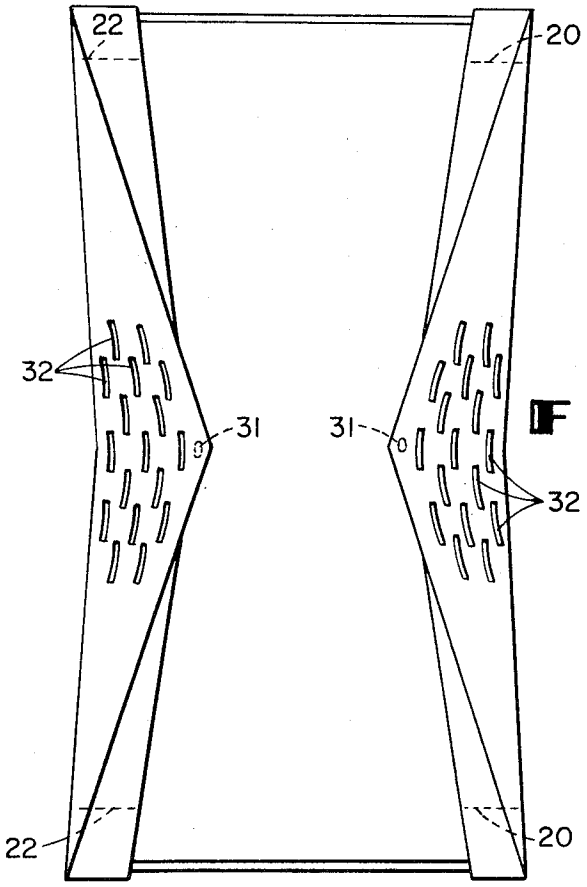


FIG. 8

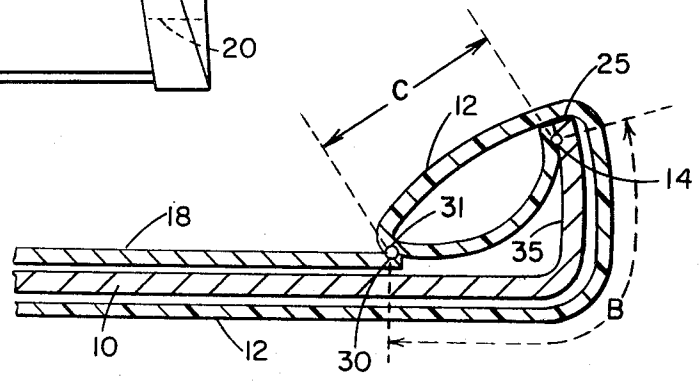


FIG. 9

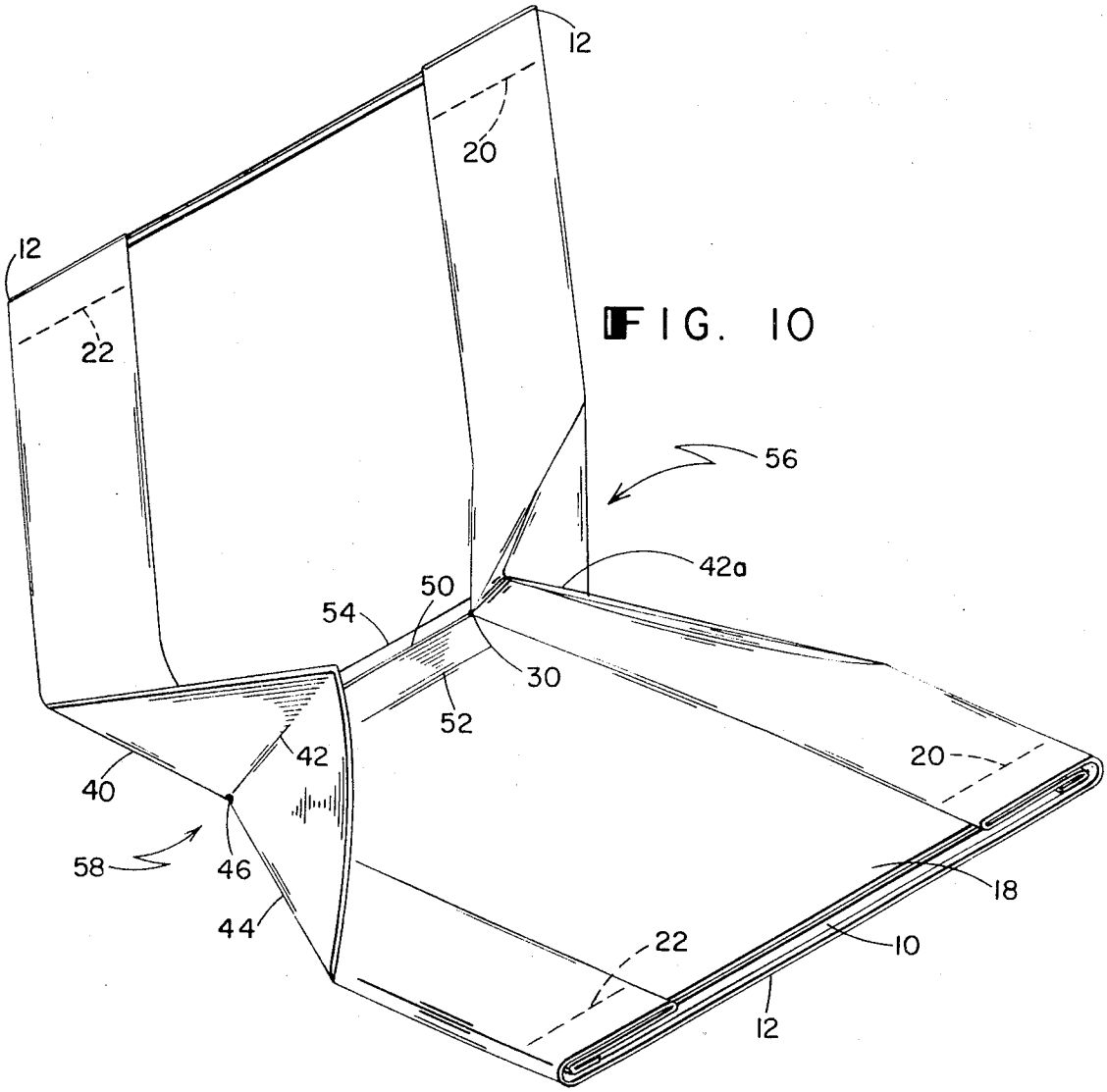

12
20
12
22
56
42a
50
54
30
52
42
40
20
58
46
18
44
22
10
12

FIG. 10

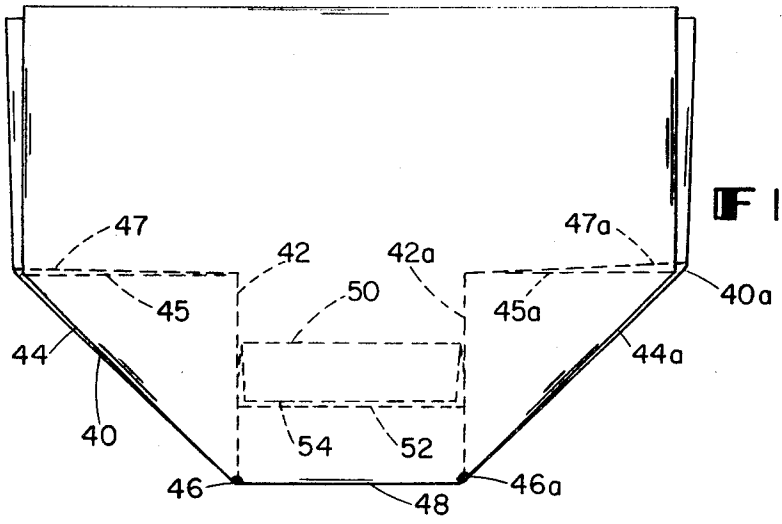

47
47a
42
42a
45
50
45a
40a
44
44a
40
54
52
46
46a
48

FIG. 11

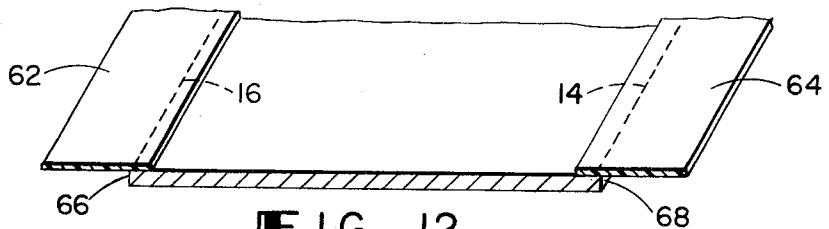


FIG. 12

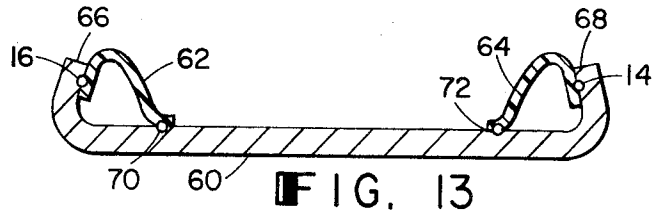


FIG. 13

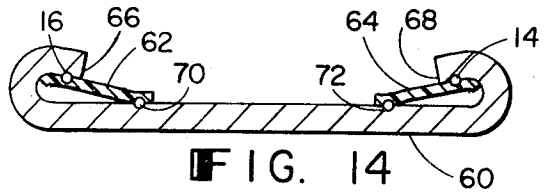


FIG. 14

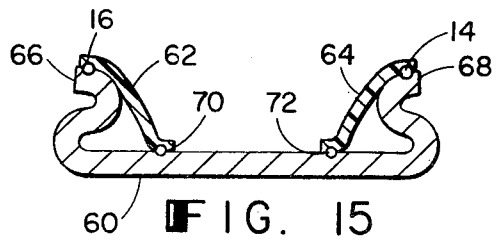


FIG. 15

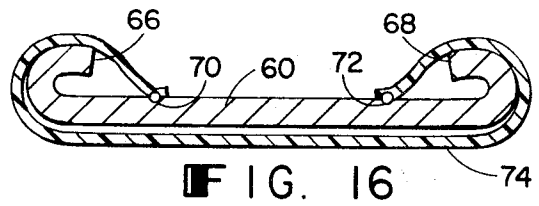


FIG. 16

DISPOSABLE DIAPER

This invention relates to disposable diapers.

It is an object of the invention to provide a disposable diaper which, when applied to an infant, will have a taper in the crotch portion whereby a better fit is achieved to provide both more efficient performance and better appearance.

According to one aspect of the invention there is provided a disposable diaper comprising an absorbent pad having a water pervious front surface and a water impervious back surface and a pair of restraining means which have a first portion thereof adhered to the diaper's water pervious surface in the crotch portion at a location spaced inward of a lateral edge. Each restraining means also has a second portion arranged to restrain the respective lateral edge of the pad, in the crotch portion, from fully opening to its unrestrained configuration, whereby a taper is achieved in the crotch portion of the diaper. In preferred embodiments of such a diaper each restraining means is a plastic sheet which is adhered to the pad (in the crotch portion) at a lateral edge thereof and at a location spaced inward of that lateral edge and is of such length that the lateral edges of the pad are bent upward or inward from the unconstrained configuration.

According to a further aspect of the invention there is provided a disposable diaper in which an absorbent body having a fluid pervious surface on its front side has a sheet supple, fluid impervious material covering at least a portion of its backside. Restraining means are provided comprising overlap panels which have inner and outer edges extending between front and back waistline portions through an intermediate crotch portion and which comprise at least one layer of the sheet which is folded back over a single thickness of the absorbent body. Only sheet material of each overlap panel is adhered, at an attachment location in the crotch portion of the overlap panel, to an attachment location in the crotch portion of the absorbent body spaced inward of its lateral edge.

Other objects, features, and advantages will appear from the following description of a preferred embodiment taken together with the attached drawings thereof, in which:

FIGS. **1**, **2**, and **3** are partial perspective views illustrating steps in the construction of one embodiment of a disposable diaper according to the invention;

FIG. **1A** illustrates an alternative construction to that of FIG. **1**;

FIG. **4** is a section taken at **4**—**4** of FIG. **3**;

FIG. **5** is a plan view of the disposable diaper of FIGS. **1**, **2**, and **3** which illustrates the contour achieved when the diaper is applied to an infant;

FIG. **6** is a section taken at **6**—**6** of FIG. **5**;

FIG. **7** is a view analogous to the section of FIG. **6** illustrating an alternative configuration;

FIG. **8** is a plan view analogous to FIG. **5** illustrating an alternative construction of the diaper of FIG. **5**;

FIG. **9** is a sectional view, analogous to FIG. **6**, of the crotch portion of an alternative diaper embodiment;

FIG. **10** is a perspective view illustrating a folded configuration of the diaper of FIG. **9**;

FIG. **11** is a plan view of the diaper of FIG. **10**;

FIG. **12** is a partial perspective view illustrating a preliminary configuration of further alternative embodiments of diapers according to the invention;

FIGS. **13**, **14**, and **15** are sectional views, analogous to FIG. **6**, illustrating embodiments constructed from the preliminary configuration of FIG. **12**; and

FIG. **16** is a sectional view, analogous to FIG. **6**, illustrating yet another diaper construction according to the invention.

FIG. **1** illustrates the initial step in the construction of one embodiment of a diaper according to the invention, wherein a conventional absorbent body **10** is placed over a plastic sheet **12** having a width substantially greater than that of the absorbent body. The plastic sheet **12** has been folded back upon itself at the sides of the absorbent body **10** such that the edges **11** of the plastic sheet **12** overlap the absorbent body by a small amount. The plastic sheet **12** is sealed to the absorbent

body **10** by conventional heat sealing methods along the lines of overlap as indicated at **14** and **16** respectively.

(Alternatively, as shown in FIG. **1A**, the folded over portions of the sheet **12** may be sealed directly to the sheet itself as at lines **14***a* and **16***a*. This construction achieves the major benefits sought by the invention and in some circumstances may simplify the manufacture of the diaper.)

In the configuration of each FIG. **1** or FIG. **1A**, a pair of tubular structures of plastic sheet material are formed each of which comprises panels U and T. Each panel is of width A.

A conventional non-woven sheet **18** overlies the absorbent body **10**. Although it is customary that non-woven **18** be coextensive with absorbent body **10** (and, of course, this is an alternative in the present diaper construction), the non-woven **18** preferably falls short of the edges of absorbent body **10** by approximately the distance A at both sides, thereby conserving materials and affording other advantages, as discussed below. The absorbent body **10** and non-woven layer **18** may be considered together as the diaper's "absorbent pad."

The construction proceeds, as shown in FIG. **2**, with the further folding over of the plastic sheet **12** so that the portions which previously extended beyond the absorbent body **10** now overlies the outer portions thereof. In this configuration, with panel T now on top, the folded over plastic sheet **12** will just overlap non-woven **18** as well. Heat sealing is then initiated in the end regions of panel T, and the underlying layers, to provide a unit construction to the separate plastic sheet, absorbent body, and non-woven material pieces. In the embodiment illustrated, the sealing occurs along lines **20** and **22**. In this configuration the portions of plastic sheet **12** which overlie the absorbent body **10** (i.e., both panels T and U) may be termed "overlap panels." These overlap panels have inner edges **24** and outer edges **26** and extend the entire length of the diaper from one waistline portion through the crotch portion to the other waistline portion.

With the diaper as shown in FIG. **2** adhesive is applied to locations **30** of the absorbent pad which are spaced inward of the lateral edges **25** of the pad in the crotch portion of the diaper. Certain parameters may be defined, with reference to FIG. **1**, whose interrelations may be varied to form alternative embodiments of a diaper constructed according to the invention. The width, A, of panels T and U has already been introduced. The distance along the absorbent pad (i.e., absorbent body **10** and non-woven **18**) from seal line **14** or **16** to the respective area **30** will be denoted B (see FIG. **1**). The perpendicular distance across a panel U from line **14** or **16** to the area **31** of the sheet **12** which is ultimately brought into contact with the adhesive at location **30** is denoted C. If the areas **31** are on panels T, C is the width of panel U (i.e., A) plus the perpendicular distance from edge **24** to area **31** on panel T, as shown in FIG. **1**.

An easily constructed embodiment results where $B < 2A$ and $C > A$ and thus the area **31** is located on panel T. This embodiment may be described with reference to FIGS. **3** through **6**.

With the diaper as shown in FIG. **2**, a further folding then takes place, as shown in FIG. **3**, by folding inwardly the outermost portions of the configuration shown in FIG. **2**. The fold lines will be substantially along the side edges of the nonwoven material **18**. The adhesive previously applied to areas **30** will thus bond the overlap panels to the absorbent pad at areas **31** on panel T. FIG. **4**, a section taken at **4**—**4** of FIG. **3** which passes through the locations **30**, further illustrates the diaper construction.

The plan view of FIG. **5** illustrates how this diaper construction results in a disposable diaper having a contour such that the diaper tapers in the crotch region. The configuration of FIG. **5** results from the configuration of FIG. **3** when the front and back waistline portions (the ends of the diaper as shown in FIG. **5**) are unfolded, these waistline portions thereby reverting to the configuration shown in FIG. **2**. The crotch portion does not revert to the configuration shown in FIG. **2**, but assumes a cross-sectional configuration as shown in FIG. **6**, due

to the limiting affects of the adhesive at locations **30** upon the unfolding influence exerted by the unfolded waistline portions. It will be apparent from FIG. **6** that the overlap panel (i.e., the portion of the plastic sheet **12** extending from seal line **14** to at least location **34**) has a first portion (i.e., area **31**) adhered to the water pervious surface of material **18** and a second portion (i.e., the sheet material extending from area **31** to location **34**) which restrains lateral edge **25** of the absorbent pad from fully opening.

As also can be seen in FIG. **6**, although the bent back portion of the absorbent body **10** in the crotch portion of the diaper is not directly available for absorption of fluids, the absorptive capacity of this portion of the diaper is available by means of wicking from the nearby exposed crotch portion of the absorbent body **10**.

FIG. **7** illustrates an alternative configuration to that of FIG. **6**. Here the user has caused the absorbent body **10** to be bent back upon itself (as at **33**) thereby forming a "box pleat" in the crotch portion of the diaper.

Collective packaging of a number of these diapers may be conveniently achieved by merely folding the diaper as shown in FIG. **3** end-to-end about the line **4—4** and stacking a number of diapers so folded. Alternatively, the diaper in the opened configuration of FIG. **5** may be folded end-to-end with the fold line in the crotch region to provide a folded diaper which is convenient for packaging.

In an alternative embodiment illustrated in FIG. **8** the plastic sheet **12**, at least in the crotch portion, has a number of apertures **32** in the region of the sheet between the areas **31** and the outermost region (see FIG. **6**) of the sheet. This provides direct access for fluid to reach the portion of the absorbent body which would otherwise be available only through wicking. In this form of the diaper the sheet may also have apertures between the point **31** and the seal line **14**. While the apertures **32** may be of any configuration, a preferred form is, as shown in FIG. **8**, a slit of crescent shape in which the rows of crescents are staggered with respect to each other and run generally parallel to the longitudinal axis of the diaper.

As will be apparent from the following descriptions, any embodiment of a diaper according to the invention, and not just that illustrated in FIGS. **1–7**, may advantageously have apertures in the crotch portion of the sheet which effects the contouring of the diaper.

An alternative configuration to that illustrated in FIGS. **3–6** is shown in FIGS. **9–11**. Referring more particularly to FIG. **9** (which is a view analogous to that of FIG. **6**), it can be seen that in this embodiment the outermost portion **35** of the absorbent body **10** assume a vertical (or, at most, only slightly bending in) configuration. This condition is facilitated by the choice of the distance, C, as measured along the plastic sheet **12**, between the edge **14** and the point **31** and the distance, B, as measured along the absorbent pad, between the location **30** and lateral edge **25** of the pad.

The pouching effect in the crotch portion of a diaper constructed according to the invention is even more pronounced in this embodiment, as can be seen from FIG. **9**.

This embodiment is especially suited to a particular folded configuration which is desirable both for ease of packaging and for ease of application of the diaper to an infant. This folded configuration according to the invention, illustrated in FIGS. **10** and **11**, also more clearly emphasizes to the consumer the tapered and pouch-like nature of the diaper.

As shown in FIG. **10**, crease lines **40**, **42**, and **44** radiate from a point **46** which lies on the transverse medial line of the diaper inward of the diaper edge. The analogous crease lines on the opposite side of the diaper are designated **40***a*, **42***a*, and **44***a* which radiate from the point **46***a*. As shown in FIG. **11** there is a crease line **48** extending between points **46** and **46***a* and coincident with the medial line of the diaper between those points.

All of the crease lines mentioned above define folds in both the fluid impervious sheet **12** and the absorbent pad. The constraint imposed upon the non-woven material **18** by the points of adhesion (i.e., locations **30**) to the overlapped sheet **12**, produces crease lines **50**, **52**, and **54** where the non-woven material bunches in the crotch of the diaper upon folding in this configuration. The diaper as fully folded is shown in FIG. **11**. As can be seen there are two pairs of adjacent, in-folded, triangular portions in this configuration. (One pair being the triangles defined by lines **40**, **42**, **45** and by lines **44**, **42**, **47**.)

The partially unfolded diaper is illustrated in FIG. **10**. As shown, upon partial unfolding the user is presented with a contoured diaper having neatly folded dips **56** and **58** in the crotch portion of the diaper thereby facilitating efficient placement about the infant's legs. (The partially unfolded view of FIG. **10** also emphasized the pouch formed in the crotch region when the diaper is applied to the infant.)

It should be noted that in the diaper structures according to the invention, by securing only supple sheet material **12** to the absorbent body at the locations **30** in the crotch region, a pocket-like space is created under the overlap panels (see, e.g., FIGS. **6**, **7**, **9**) which is available to catch and retain hard solids. Furthermore, when the non-woven sheet **18** is of less width than the absorbent body **10**, these hard solids may also become trapped between the absorbent body **10** and the non-woven sheet **18**.

The diaper embodiments thus far described have each employed a construction comprising separate absorbent bodies and water impervious sheets. As will now be described, however, the invention herein is not limited to such a construction, but comprehends any disposable diaper structure with means adhered to a point spaced inward of each lateral edge of the absorbent body at least in the crotch portion of the diaper and arranged to restrain those lateral edges from assuming their unrestrained configuration, thereby producing a taper of the diaper in the crotch portion.

In FIG. **12** a disposable diaper **60** is provided which has a water pervious upper surface and water impervious lower surface. Restraining means in the form of panels **62** and **64** are adhered to the lateral edges **66**, **68** of the diaper **60**. Although FIG. **12** shows panel **62** and **64** as extending for the full length of the diaper **60** it will be apparent from the following that in an alternative construction the panel would be limited to the crotch portion of the diaper.

FIGS. **13**, **14**, and **15** illustrate various ways in which the panels **62** and **64** may be adhered to the diaper **60** in the crotch portion to produce a tapered and pouched configuration. FIGS. **13**, **14**, and **15** are sectional views through the crotch portion and are, respectively analogous to FIGS. **9**, **6**, and **7**. The varying configurations of FIGS. **13**, **14**, and **15** are obtained by varying the length, as measured transversely across the panels **62** and **64**, of material between the diaper edges **66** and **68** and the points **70** and **72** at which the panels **62** and **64** are adhered to the diaper material.

Since in FIGS. **13–15** the diaper **60** is assumed to have a water impervious back surface and the panels **62** and **64** provide no substantial waterproofing function, the range of materials suitable for panels **62** and **64** is wide indeed. The constraints placed upon the choice of materials are simply that the material be easy to bond to the diaper **60** and that it retain its structural integrity when wetted. A suitable choice is simply the plastic sheeting customarily employed as the water impervious backing sheet in a conventional disposable diaper.

FIG. **16** is a sectional view (through the crotch portion) of another diaper embodiment according to the invention in which the diaper is restrained in the crotch portion by a single sheet **74** of suitable material, which is adhered to the diaper at locations **70**, **72** which a spaced inward of the lateral edges **66**, **68** of the diaper **60**. As with FIGS. **13**, **14**, and **15**, the sheet **74** may extend the full length of diaper **60** (although adhered thereto only at locations **70**, **72** in the crotch portion) or may be limited to a narrow band in the crotch portion thereof.

Other diaper constructions will occur to those skilled in the art which are within the scope of the invention as defined in the following claims.

What is claimed is:

1. A disposable diaper comprising an absorbent pad having front and back waistline portions with a crotch portion therebetween and having a water pervious front surface and a water impervious back surface, and a pair of restraining means each having a first portion thereof adhered to said water pervious surface in said crotch portion at a location spaced inward of a lateral edge of said absorbent pad and each having a second portion thereof arranged to restrain the respective lateral edge of said absorbent pad in said crotch portion from fully opening to its unrestrained configuration, whereby a taper of said diaper is achieved in said crotch portion.

2. The diaper as claimed in claim 1 wherein said second portion of each said restraining means is adhered to said respective lateral edge of said absorbent pad.

3. A disposable diaper comprising an absorbent pad having front and back waistline portions with a crotch portion therebetween and having a water pervious front surface and a water impervious back surface, and a restraining band having its end portions adhered to said water pervious surface in said crotch portion at locations spaced inward of the respective lateral edges of said absorbent pad and extending across said water impervious surface and the lateral portions of said water pervious surface; said band being sized to restrain said pad in said crotch portion from fully opening to its unrestrained configuration, whereby a taper of said diaper is achieved in said crotch portion.

4. A disposable diaper comprising:

an absorbent body having a fluid pervious surface on its front side and having back and front waistline portions joined by an intermediate crotch portion;

a sheet supple, fluid impervious material covering at least a portion of the backside of said absorbent body;

restraining means comprising a pair of overlap panels having inner and outer edges extending between front and back waistline portions to an intermediate crotch portion and comprising at least one layer of said sheet which is folded back over a single thickness of said absorbent body;

wherein only said sheet material of each said overlap panel is adhered, at an attachment location in said crotch portion of said overlap panel, to an attachment location in said crotch portion of said absorbent body spaced inward of the respective lateral edge thereof.

5. The diaper of claim 4 wherein at least said inner edges of said overlap panels are attached to said absorbent body in the front and back waistline portions thereof.

6. The diaper of claim 5 wherein each said overlap panel is attached along its entire width, from said inner to said outer edge, to said absorbent body in the front and back waistline portions thereof.

7. The diaper of claim 4 further folded for packaging along crease lines in the crotch portion of said diaper so that when the diaper is folded back upon itself along the transverse medial line thereof there are two adjacent, in-folded, triangular portions in side-by-side relation on each side of said diaper.

* * * * *