

- [54] **DISPOSABLE DIAPER WITH IMPROVED CONTAINMENT CHARACTERISTICS**
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- [73] Assignee: **The Procter & Gamble Company**, Cincinnati, Ohio
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- [52] U.S. Cl. **128/287**
- [51] Int. Cl. **A61f 13/16**
- [58] Field of Search..... 128/284, 286, 287, 128/290, 296

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Attorney—Fredrick H. Braun and John V. Gorman

[57] **ABSTRACT**

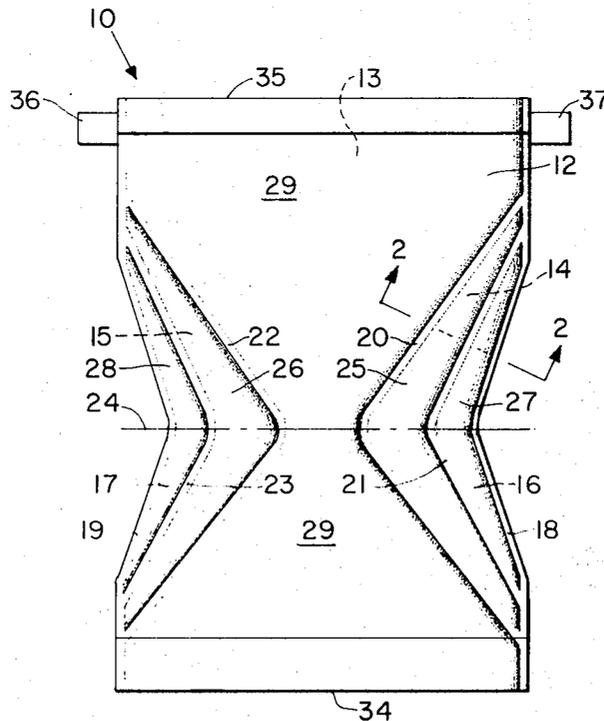
A disposable diaper construction includes a water impervious plastic backing sheet and, preferably, a hydrophobic, moisture-permeable topsheet. An absorbent pad or core is interposed between the backing sheet and the topsheet. Discontinuities in the absorbent core provide lines of isolation between several adjacent but separated core portions. The topsheet and backing sheet are continuous in the relatively narrow areas which form the lines of isolation. The fold lines of the diaper preferably coincide with the lines of isolation. This structure results in improved fluid containment as the lines of isolation between the adjoining core portions provide a barrier to sidewise fluid flow such that liquids tend to flow lengthwise of the diaper. In a preferred configuration, the diaper has excellent fitting characteristics in relation to the contours of the body of the infant, particularly around the legs, and this results in further efficiencies from the standpoint of fluid containment.

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15 Claims, 5 Drawing Figures



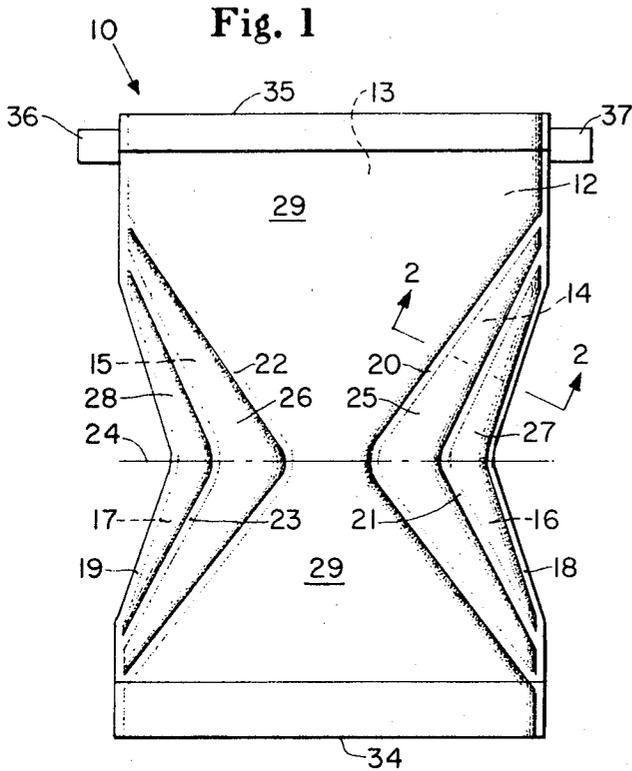


Fig. 1

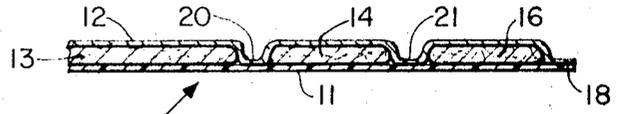


Fig. 2

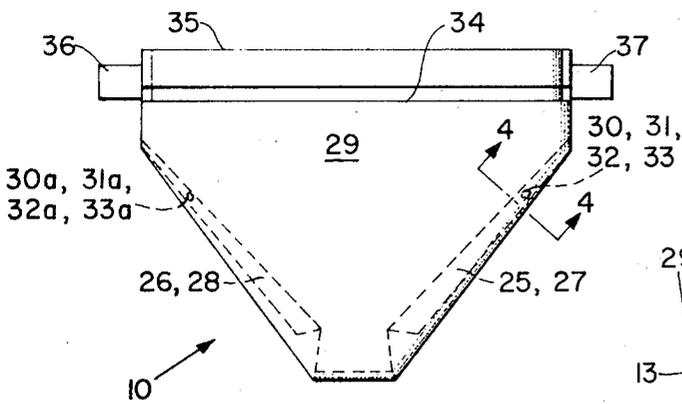


Fig. 3

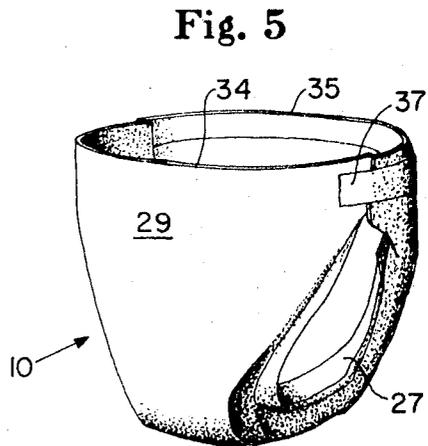


Fig. 5

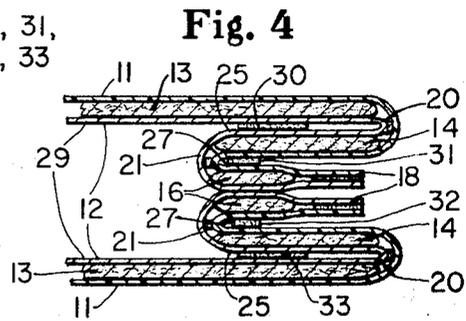


Fig. 4

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DISPOSABLE DIAPER WITH IMPROVED CONTAINMENT CHARACTERISTICS

BACKGROUND OF THE INVENTION

In the field of disposable diapers, there has been an ever present desire to improve the ability of the diaper to contain fluids. This effort has gone hand-in-hand with efforts to improve the fit of the diaper to the body of the infant which brings with it the incidental benefit of providing some improvement in fluid containment. Previous efforts along these lines have sought to achieve these objectives in numerous ways. One of the more common ways has been by extending the plastic backing sheet to provide inner side flaps which overlap the edge surfaces of the topsheet. Another way has been by the provision of a plurality of lines of embossment through the topsheet, absorptive pad and backing sheet with the lines of embossment running in a particular direction and having a predetermined pattern. While each of these approaches have met with some success, there has been a continuing search for even greater improvement and better results than those that have been achieved with any of the prior constructions.

SUMMARY OF THE INVENTION

The nature and substance of the invention will be more readily appreciated after giving consideration to its major aims and purposes. The principal objects of the invention are recited in the ensuing paragraphs in order to provide a better appreciation of its important aspects prior to describing the details of a preferred embodiment in later portions of this description.

A major object of the invention is the provision of an improved structure for disposable diapers which provides substantial improvement in the capacity of the diaper for containing fluids.

Another object of the invention is the provision of an improved diaper structure which incorporates a built-in fluid barrier to inhibit sidewise fluid flow thus encouraging the captured liquids to spread in the long dimension of the diaper.

A further object of the invention is the provision of a diaper of the above character which includes a folding pattern making the diaper fit more snugly to the infant thus providing better fit, particularly around the leg openings, so that ideally the leg areas will be subjected to less direct fluid deposition and thus further enhance the fluid containment characteristics of the diaper itself.

These and other objects are achieved by the provision of a disposable diaper having an absorbent core interposed between a moisture-permeable topsheet and a water impervious backing sheet. The absorbent core is formed with narrow and continuous discontinuities which extend between the edges of the diaper. The topsheet and the backing sheet are continuous in the areas of the discontinuities of the core. The discontinuities in the absorbent core and the continuity of the topsheet and the backing sheet in these areas provide lines of isolation in the diaper structure which provide fluid barriers that inhibit lateral fluid flow in the diaper thereby encouraging fluid flow in the long direction. This results in a substantial improvement in the fluid containment characteristics of the diaper structure particularly when coupled with the improved fit of the preferred structure.

BRIEF DESCRIPTION OF THE DRAWING

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter regarded as forming the present invention, it is believed the invention will be better understood from the following description taken in connection with the accompanying drawing in which:

FIG. 1 is a plan view illustrating a preferred diaper structure incorporating the concept of the invention.

FIG. 2 is a fragmentary cross section, in elevation, taken on the line 2—2 of FIG. 1 illustrating typical discontinuities in the absorbent cord as well as the lines of isolation which also form the folding pattern.

FIG. 3 is a plan view of the diaper of FIG. 1 after it has been folded in half thus illustrating the manner in which the fold lines cooperate to permit such folding for easy storage.

FIG. 4 is a fragmentary plan view, in cross section, taken on the line 4—4 of FIG. 3 illustrating the manner in which the side areas are folded and formed and also showing the placement of spot glue areas for maintaining the side areas in contiguous relationship. The view has been dimensionally exaggerated purely for the sake of better illustration.

FIG. 5 is an isometric view of the diaper after it has been folded into its configuration for use.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and particularly to FIGS. 1 and 2 thereof, a disposable diaper 10 is illustrated. In the preferred construction illustrated in the drawings, the diaper 10 includes a backing sheet 11 which is preferably a plastic material that is relatively thin and flexible and is impervious to the transmission of water, such as polyethylene, polypropylene or the like. The backing sheet 11 forms the surface which is usually furthest removed from the skin of the infant. A topsheet 12 is provided to form the inner surface of the completed diaper or, in other words, the surface which is nearest the skin of the infant. The topsheet preferably has hydrophobic characteristics and is one selected from any number of nonwoven fabric materials having the necessary properties as familiar to those skilled in the art.

An absorbent core is interposed between the backing sheet 11 and the topsheet 12 in order to capture the bulk of the fluid to be contained in the diaper. In the preferred construction of the present embodiment, the absorbent core is separated by discontinuities into a relatively large central pad 13, intermediate lateral pads 14 and 15, respectively, and the smaller lateral pads 16 and 17, respectively. The absorbent core may be selected from any of the well known materials suited for this purpose as will be familiar to persons skilled in the art.

The edges of the backing sheet 11 and the topsheet 12 are preferably shaped so that the overall pad configuration in flat form, as illustrated in FIG. 1, resembles an hour glass. The hour glass shape in the preferred embodiment has been found to provide better fit characteristics as will be apparent in the ensuing description. The peripheral edges of the backing sheet 11 and the topsheet 12 are superposed beyond the side extremities of the absorbent pad portions whereupon side seams 18 and 19 are formed either by the use of an adhesive or

alternatively by heat sealing the material of the plastic backing sheet 11 to the topsheet 12.

The discontinuities between the absorbent pad portions 13, 14, 15, 16 and 17 provide lines of isolation. These lines between the adjacent pad portions permit the backing sheet 11 and the topsheet 12 to be superposed and continuous in these relatively narrow areas. In a preferred construction, the backing sheet 11 and the topsheet 12 may be adhered in the areas forming the lines of isolation as by a suitable adhesive or by heat sealing. An examination of FIG. 2 illustrates lines of isolation 20 and 21 that are formed in this fashion. Similar lines of isolation 22 and 23 are formed on the other side of the diaper. The lines of isolation 20, 21, 22 and 23 are preferably of from about $\frac{1}{4}$ inch to about $\frac{3}{8}$ inch in width.

The lines of isolation can also be formed by adhering the pads 13, 14, 15, 16 and 17 directly to the backing sheet 11 or the topsheet 12, or both. In the latter case it is not necessary to adhere the backing sheet 11 to the topsheet 12 although this may also be done if desired.

The lines of isolation 20, 21, 22 and 23 provide areas of complete separation between the several absorbent core portions 13, 14, 15, 16 and 17 to provide barriers against lateral fluid flow when the diaper is in use. These barriers tend to encourage fluid flow in the long direction of the diaper and thus substantially improve the containment characteristics. The effectiveness of the lines of isolation 20, 21, 22 and 23 is enhanced by the fact of their structure which includes the water impervious backing sheet 11 and the hydrophobic nonwoven topsheet 12.

In the preferred diaper construction as illustrated, the lines of isolation 20, 21, 22 and 23 are formed such that each of them extends from one side edge toward the central axis 24 of the diaper 10 whereupon they are reversely curved and return and terminate at the same side edge. In a most preferred form, the lines of isolation 20, 21, 22 and 23 are of hyperbolic shape such that they isolate intermediate angular areas 25 and 26, respectively, and together with the side seams 18 and 19, respectively, they isolate the outer angular areas 27 and 28, respectively.

When the diaper is folded over on the central axis 24 to the configuration shown in FIG. 3, the lines of isolation 20, 21, 22 and 23 act as fold lines having a high degree of flexibility. Thus, the diaper can be folded such that the portion of the topsheet 12 covering the intermediate angular areas 25 and 26 will fold against the portion of the topsheet 12 covering the central area 29. Similarly, the portion of the backing sheet 11 covering the outer angular areas 27 and 28 will fold over against and be superposed with the portion of the backing sheet 11 covering the intermediate angular areas 25 and 26, respectively. The manner in which the several areas are folded together is illustrated in exaggerated fashion by the cross section of FIG. 4.

Another aspect of a preferred embodiment of the diaper is also illustrated in FIG. 4. In particular, glue spots are provided for holding the folded and superposed areas in place. The glue spot 30 is provided to hold the intermediate area 25 to the central area 29 and the glue spot 31 holds the intermediate area 25 to the outer area 27 in the upper portion of the diaper. Similarly, the glue spots 32 and 33 are provided for the same function in the lower portion of the diaper. FIG. 4 also illustrates

the ease with which folding takes place along the lines of isolation 21 and 21.

It will be understood, that in the preferred construction a similar group of glue spots 30a, 31a, 32a, and 33a (FIG. 3) are provided on the several areas 26, 28 and 29 in forming and folding the other side edge of the diaper. In both cases the glue spots are provided near the extremities of the intermediate angular areas 25, 16, and the outer angular areas 27, 28 as will be apparent from an examination of FIG. 3. The purpose of the glue spots is to assure that the pleating of the intermediate angular areas 25 and 26 and the outer angular areas 27 and 28 is not disturbed at the extremities thereof when the diaper is placed around an infant's legs. The maintenance of the pleats assures a superior snug fit and further increases the containment efficiency of the preferred diaper construction.

Another preferred aspect of the present construction is the off center placement of the central axis 24 with respect to the end extremities 34 and 35 of the diaper. The axis 24 is nearer the extremity 34 which ultimately is placed against the front of the infant. This provides another factor in obtaining a better fit for the leg openings since the legs of an infant child are normally oriented forward.

It will be noted that the diaper is provided with pressure sensitive adhesive tabs 36 and 37 for securement in a preferred form. These tabs may be of any well known form or shape and are usually covered with a suitably treated release paper prior to use. After the diaper is folded around the infant, the release paper is removed and the exposed end of the pressure sensitive tabs 36 and 37 are adhered to the corresponding opposite corner of the diaper as illustrated in FIG. 5.

In the preferred embodiment, as heretofore described, the lines of isolation 20, 21, 22 and 23 each extend continuously from one edge of the diaper and are curved such that they terminate at the same side edge. This, however, is not a prerequisite as a line of isolation could run continuously from one side edge to either an adjoining side edge or an opposite side edge. In fact, in some cases it might be desirable to form a line of isolation parallel to one or both of the end extremities 34 and/or 35 near or at the edge of the absorbent pad for the purpose of containing fluids that have migrated to the end portions of the diaper.

While particular materials have heretofore been described for the manufacture of a preferred form of the diaper, it will be understood that various materials may typically be used including tissue paper, crepe paper, nonwoven fabrics as well as suitable absorbent fillers for the pad such as wadding, cellulosic fluff or airfelt materials in suitable combinations. The backing sheet may be formed from any well known plastic material, e.g., polyethylene, polypropylene or the like, having suitable flexibility and water impervious properties to carry out the desired function of the invention. Thus the selection of materials will be within the skill of the art although in a preferred embodiment materials having the particular characteristics heretofore described will be selected for optimum performance.

While particular embodiments of the invention have been illustrated and described, it will be obvious to those skilled in the art that various changes and modifications can be made without departing from the spirit and scope of the invention and it is intended to cover

in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed as new is:

1. In a disposable diaper having an absorbent core interposed between a moisture-permeable topsheet and a backing sheet, the improvement comprising:

- a. a discontinuity in said absorbent core dividing said absorbent core into separated portions and forming a line of isolation intermediate said separated portions,
- b. the line of isolation extending from one peripheral location to another peripheral location of the absorbent
- c. said backing sheet being continuous in the area of said line of isolation
- d. means in cooperation with said absorbent core for maintaining said line of isolation between adjacent separated portions of the absorbent core,
- e. said line of isolation between the separated portions of the absorbent core providing a fluid barrier for inhibiting fluid flow in the diaper from a portion on one side of the line of isolation to a portion on the other side of the line of isolation.

2. A disposable diaper as claimed in claim 1 wherein the absorbent core is divided by lines of isolation into a central area, an intermediate lateral area on either side thereof and an outer area adjacent each of said intermediate lateral areas.

3. A disposable diaper as claimed in claim 1 including a plurality of lines of isolation and wherein said means comprises a line of attachment between the topsheet and the backing sheet in the areas of the lines of isolation.

4. A disposable diaper as claimed in claim 1 wherein said diaper has a plurality of lines of isolation each having a geometrically hyperbolic characteristic and a central axis intermediate its end extremities, said central axis being nearer the front edge of the diaper than the back edge.

5. A disposable diaper as claimed in claim 1 wherein said line of isolation is from about $\frac{1}{4}$ inch to about $\frac{3}{8}$ inch in width.

6. A disposable diaper as claimed in claim 2 including a plurality of lines of isolation and wherein said means is a line of attachment between the topsheet and the backing sheet in the areas of the lines of isolation.

7. A disposable diaper as claimed in claim 2 wherein said diaper has a plurality of lines of isolation each hav-

ing a geometrically hyperbolic characteristic and a central axis intermediate its end extremities, said central axis being nearer the front edge of the diaper than the back edge.

8. A disposable diaper as claimed in claim 3 wherein said lines of isolation are from about $\frac{1}{4}$ inch to about $\frac{3}{8}$ inch in width.

9. A disposable diaper as claimed in claim 3 wherein said diaper has a plurality of lines of isolation each having a geometrically hyperbolic characteristic and a central axis intermediate its end extremities, said central axis being nearer the front edge of the diaper than the back edge.

10. A disposable diaper as claimed in claim 6 wherein said diaper has a plurality of lines of isolation each having a geometrically hyperbolic characteristic and a central axis intermediate its end extremities, said central axis being nearer the front edge of the diaper than the back edge.

11. In a disposable diaper having an absorbent core interposed between a moisture-permeable topsheet and a backing sheet, an improvement, comprising:

- a said absorbent core being divided into separated portions and having a discontinuity of absorbent material between said portions,
- b said discontinuity forming a line of isolation intermediate said separated portions,
- c said backing sheet being continuous in the area of said line of isolation,
- d. whereby said line of isolation between the separated portions of the absorbent core provides a fluid barrier for inhibiting fluid flow in the diaper from a portion on one side of the line of isolation to a portion on the other side of the line of isolation.

12. A disposable diaper as claimed in claim 11 wherein the width of the line of isolation is substantially uniform along its length.

13. A diaper as claimed in claim 11 including means in cooperation with said absorbent core for maintaining said line of isolation between adjacent separated portions of the absorbent core.

14. A diaper as claimed in claim 13 wherein the width of the line of isolation is substantially uniform along its length.

15. A diaper as claimed in claim 11 wherein the backing sheet is a water impervious layer.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,744,494

Dated July 10, 1973

Inventor(s) Mario S. Marsan

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 8, "16" should read --26--.

Column 5, line 9, "seperated" should read --separated--.

Column 5, line 13, add --core-- after hyphenated "absorbent".

Signed and sealed this 6th day of August 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents