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METHOD OF MAKING A DIAPER

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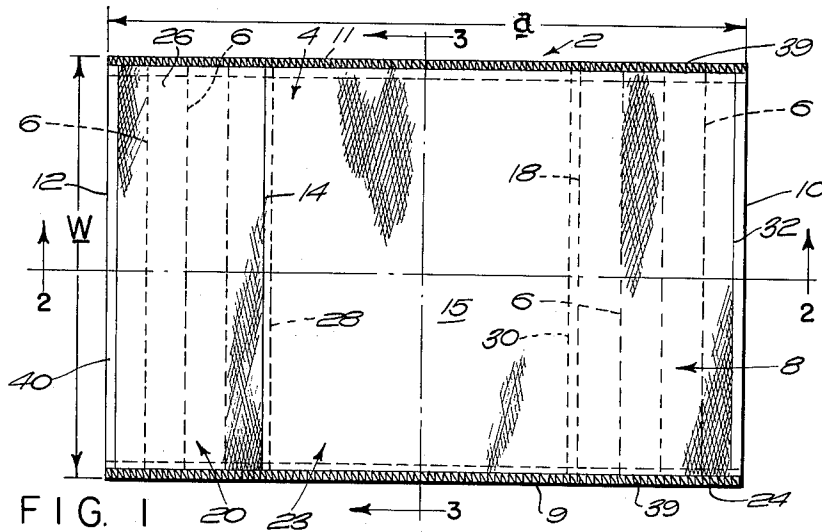


FIG. 1

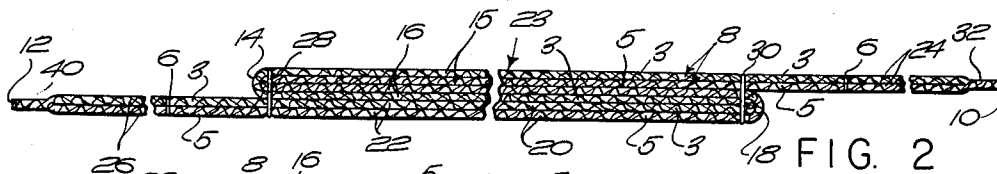


FIG. 2

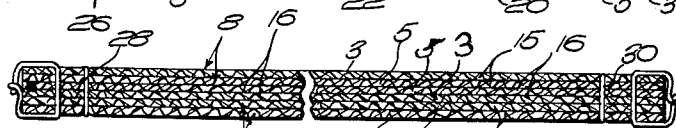


FIG. 3

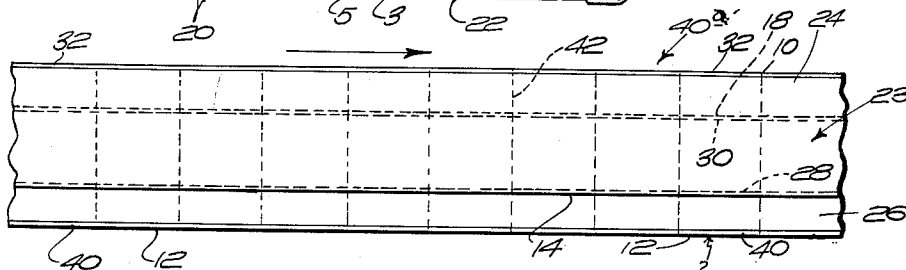


FIG. 5

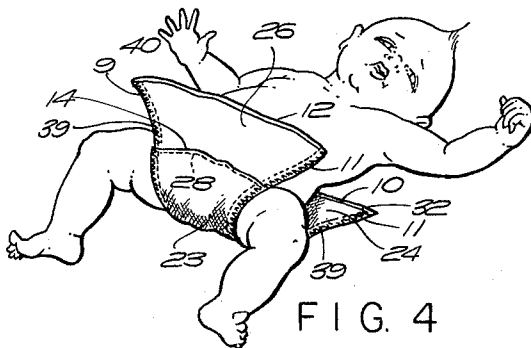


FIG. 4

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METHOD OF MAKING A DIAPER

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The present invention relates to diapers and methods for making the same.

Conventional diapers are greater in length from end to end than they are in width from side to side and are folded to provide a pair of side panels adjacent the sides of the diaper and a central panel therebetween having a greater number of thicknesses than the side panels. The panels and folds extend from end to end of the diaper across the longest dimension which is the length. In applying the diaper to the child the length of the diaper and hence the central panel extends from the front to the back of the child around his crotch with the width thereof being transverse to the longitudinal center axis of the child.

An object of the present invention is to provide a diaper which requires substantially less material than conventional diapers and hence is substantially lower in cost without sacrificing the absorption qualities of the diaper.

Another object is to provide such a diaper in which such lesser amount of material is more efficiently distributed for purposes of absorption and comfort to thereby improve the overall absorption characteristics and comfort of the diaper over such conventional diapers.

Another object is to provide such a diaper which is stitched in a pre-folded condition and which can be made by simple, continuous, mass-production methods which are less expensive than conventional methods used to manufacture conventional pre-folded diapers stitched in a pre-folded condition so that the cost of the diaper is still further reduced.

Another object is to provide such a diaper which is not only more comfortable than conventional diapers, especially in warm weather, but which also reduces the likelihood of rashes and other irritations on the front and back of the child.

The diaper of the present invention is more comfortable than conventional diapers also because it is lighter in weight, due to the lesser amount of material, while at the same time it has a wear resistance and durability which is at least equal to that of conventional diapers.

Another object is to provide an improved method for manufacturing such diapers.

Another object is to provide an improved diaper, especially an improved diaper which is stitched in a pre-folded condition, and an improved method for making the same.

These objects are accomplished in accordance with the present invention by providing a diaper in which the length from end to end is greater than the width from side to side and which is folded to provide a pair of end panels adjacent the ends of the diaper and a central panel between the end panels, intermediate the ends of the diaper and having a greater number of thicknesses of material than the end panels, the thicker central panel and folds extending from side to side of the diaper across the smaller dimension of the diaper.

In applying the diaper to the child the length thereof extends from the back to the front of the child around the crotch and the central panel and folds extend laterally to the longitudinal center axis of the child rather than from the back to the front of the child as is true with conventional diapers.

Preferably the diaper is stitched in folded position and is folded to provide a first section which extends from

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one end of the diaper toward the opposite end and is folded back on itself before it reaches the opposite end to form a first fold and a second section which extends from the first fold along the first section toward such one end of the diaper and is folded back on itself before it reaches such one end of the diaper to form a second fold and a third section which extends from the second fold along the second section and beyond the first fold to the opposite end of the diaper. The overlapping portions of the sections form the central panel of the diaper and the non-overlapping end portions form the end panels.

Diapers of this construction can be made continuously or semi-continuously and automatically or semi-automatically in accordance with the present invention from a length or web of material which is greater in length than in width from side to side by (1) folding the material by hand or by machine to provide a central panel running in a lengthwise direction and located intermediate the sides of the material and a pair of marginal side panels on either side of the central panel and adjacent the sides of the material, with the fold lines and side panels also running lengthwise of the material and the central panel having a greater number of thicknesses than the side panels, (2) stitching the material in folded position by hand or by machine and (3) cutting the length of material into a plurality of diapers by cutting by hand or machine along cutting lines extending from side to side of the material and spaced from each other in the lengthwise direction of the material a distance which is substantially less than the width of the material from side to side so that the thick central panel and folds of each diaper extend in the direction of the shorter dimension of the diaper. In the finished diaper the sides of the material become the ends of the diaper and the cut edges become the sides of the diaper with the folds and the central panel extending from side to side of the diaper and the length of the diaper from end to end being greater than the width from side to side. The length or web of material may be an endless length or web of material continuously fed to the diaper making machine, or to the diaper making personnel if the diapers are made by hand, and when it is stated herein that the material from which the diaper is made is greater in length than in width from side to side, such an endless length or web is included as well as materials of definite length.

Other objects and advantages of the present invention will be apparent from the following description taken in conjunction with the accompanying drawings describing and showing for illustrative purposes a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a plan view of a diaper embodying the present invention, the hidden fold line and the rows of stitching being shown in broken lines.

FIG. 2 is an enlarged section taken along the line 2—2 of FIG. 1.

FIG. 3 is an enlarged section taken along the line 3—3 of FIG. 1.

FIG. 4 shows how the diaper of FIGS. 1 to 3 is applied to the child so that the thicker central panel is positioned where it is most needed for absorbing purposes and does not extend to the front and back areas of the body where it is not needed.

FIG. 5 shows the diaper of FIGS. 1 to 4 in the process of manufacture in accordance with a method of the present invention and is a plan view of the length or web of material from which the diapers are made after it has been folded but before it has been cut into individual diapers, the cutting lines being shown in dot-

dash lines to distinguish from the hidden fold lines and rows of stitches.

With reference to the figures, 2 represents a diaper embodying the present invention. It is made from a piece of two ply cotton diaper material 4, the two plys 3 and 5 (see FIGS. 2 and 3) of which are weaved together at equi-distantly spaced intervals as shown in FIGS. 1 and 2 by parallel rows 6 of warp threads. The material may be one ply or three ply or more.

The length a (see FIG. 1) of the diaper 2 from one end 10 to the other opposite end 12 is substantially greater than the width w of the diaper from one side 9 to the other opposite side 11 thereof.

The rows 6 of warp threads run from side to side of the diaper. The piece of material 4 is folded into a first section 8 which extends from one end 10 of the diaper towards the opposite end 12 and which is folded back on itself at 14 before it reaches end 12 to form a first fold 14 and a second section 16 which extends from first fold 14 along a portion 15 of the first section 8 back toward end 10 and which is folded back on itself at 18 before it reaches end 10 to form a second fold 18 and a third section 20 which extends from the second fold 18 along the second section 16 beyond the first fold 14 to the opposite end 12 of the diaper, as shown in FIGS. 1 and 2.

The folds 14 and 18 are located intermediate the ends of the diaper and are spaced from each other and from the ends of the diaper, as shown, and extend across the shorter dimension or width w of the diaper from one side 9 of the diaper to the other side 11. They are substantially parallel to the ends 10 and 12.

The portions 15 and 22 of the first and third sections 8 and 20 respectively which overlap with the second section 16, together with the overlapping section 16 form a central panel 23 intermediate the ends 10 and 12 of the diaper and extending across the shorter dimension or width w of the diaper from one side 9 to the other side 11 in a direction substantially parallel to the ends 10 and 12. This central panel comprises 6 thicknesses of material. Portions 24 and 26 of sections 8 and 20 respectively located adjacent ends 10 and 12 respectively form a pair of end panels 24 and 26 located on either side of central panel 23 and adjacent the ends 10 and 12 respectively. These end panels 24 and 26 each comprise 2 thicknesses of material. The central panel is about twice as wide as each end panel 24 and 26 in a direction from one end 10 to the other end 12 so that the central panel occupies about $\frac{1}{2}$ the total length of the diaper and the two end panels occupy the other half, each end panel occupying about $\frac{1}{4}$ of the total length.

The diaper is stitched in the folded position shown by two rows of stitches 28 and 30 extending along the folds 14 and 18 respectively from one side of the diaper to the other. The rows of stitches are located inwardly of the folds and extend through the six thicknesses of material forming the central panel 23, as shown in FIGS. 1 to 3. The rows of stitches, like the folds and the panels extend across the shorter dimension or width w of the diaper and are parallel to the ends 10 and 12.

The ends of the two plys of material 3 and 5 forming the ends 10 and 12 of the diaper are weaved or selvaged together at 32 and 40 respectively and the side edges of the two plys of material forming the sides 9 and 11 of the diaper and which are cut during the manufacture of the diaper as set forth below, are provided with an over-cast stitch 39 to prevent the cloth from unravelling and to hold the sides of the plys 3 and 5 together.

The diaper is applied to the child as shown in FIG. 4 with the length a thereof extending from the back of the child to the front around the crotch and with the folds 14 and 18, stitches 28 and 30 and central panel 23 extending laterally to the longitudinal center axis of the child as shown. Note that the padded or thicker central portion 23 covers only that part of the body where greater

absorbing capacity is required and does not cover as much of the stomach and back where greater absorbing capacity is not required, as is true of conventional diapers in which the thicker central portion and folds extend lengthwise across the longest dimension of the diaper from one end to the other and hence from the back of the child to the front around the crotch. This makes the diaper of the present invention more comfortable, especially in warm weather, than conventional diapers while at the same time providing adequate absorbing capacity where it is needed. Furthermore, since the thicker area of the diaper does not contact as much of the stomach and back of the child where it is not needed, the air can get at these areas of the body more easily (they are covered only by a single layer of two ply material) and consequently they are not so subject to rashes and other irritations caused by contact with the thicker areas of the diaper.

Note in FIG. 4 that the thick central panel of the diaper is concentrated where it will absorb the maximum amount in the shortest time. When the diaper is on the child the portion between and closely adjacent to his legs where the greatest amount of absorption is required becomes bunched. Consequently, by extending the thick central panel completely across this area the bunching is increased so that there is a greater amount of material located where greater absorption is required. Consequently, the thick central panel is concentrated where it will do the most good so that the same total area of material when so positioned will absorb more in a quicker time than when it extends across the longer length of the diaper from the back of the child to the front as is true of conventional diapers.

The diaper shown in FIGS. 1 to 4 lends itself to being made by continuous or semi-continuous and automatic or semi-automatic, mass production methods. According to one such method the diaper is made from a long length or web 40a of two ply material (see FIG. 5), which is selvaged at its sides 10 and 12 [these sides 10 and 12 (FIG. 5) become the ends 10 and 12 (FIGS. 1 to 4) of the finished diaper], the selvages being indicated in FIG. 5 as 32 and 40 [these selvages 32 and 40 (FIG. 5) become selvages 32 and 40 (FIGS. 1 to 4) of the finished diaper]. The length or web of material 40a may be an endless one fed continuously in a lengthwise direction, as shown by the arrow in FIG. 5, to the diaper making machine, or to the diaper making personnel if the diapers are made by hand, or it may be a long length of material. It is moved to a conventional folding machine (not shown) which folds it in the manner shown in FIGS. 2 and 3 along its length at 14 and 18 (see FIG. 5) intermediate the sides 10 and 12 as the web moves lengthwise in the direction of the arrow [these folds 14 and 18 (FIG. 5) become folds 14 and 16 (FIGS. 1 to 4) in the finished diaper] to provide a central portion or panel 23 [this central panel 23 (FIG. 5) becomes central panel 23 (see FIGS. 1 to 4) in the finished diaper] intermediate the sides 10 and 12, extending lengthwise of the material and having six thicknesses of material, and a pair of side panels 24 and 26 [these panels (FIG. 5) become end panels 24 and 26 respectively (see FIGS. 1 to 4) in the finished diaper] located on either side of central panel 23 and adjacent the sides 10 and 12 and comprising two thicknesses of material. The folded web then passes to a conventional stitching machine which stitches the folds in the material by means of two rows of stitches 28 and 30 [these rows of stitches 28 and 30 (FIG. 5) become rows of stitches 28 and 30 (see FIGS. 1 to 4) in the finished diaper] extending lengthwise of the material along and inside the folds 14 and 18 respectively and through the six layers of material forming the central panel 23. Stitches 28 and 30 are continuously stitched into the material as the folded web continues to move in the direction of the arrow. Thereafter the web moves to a conventional cutting machine which automatically cuts the

web along the cutting lines 42 into a plurality of diapers 2, as the folded, stitched material continues to move in the direction of the arrow. The cut edges become the sides 9 and 11 (see FIGS. 1 to 4) of the finished diaper. The cut edges 9 and 11 of the diapers are then provided with overcast stitching 39 to provide the finished diapers 2.

Note that the width of the web 40a (FIG. 5) from side to side is equal to the length a (FIG. 1) of the finished diaper 2 and the distance between cut lines 42 is equal to the width w of the finished diaper. Also note that the distance between cut lines is substantially less than the width of the web 40a from side to side so that the dimension w of the finished diaper is substantially less than the dimension a .

Either the folding or the stitching or the cutting, or all of them may be done by hand and the material need not be fed continuously.

The total amount, and hence the total cost, of material required to make the diaper of the present invention is substantially less than that required to make conventional diapers, two of which are disclosed in U.S. Patent Nos. 2,600,634 and 2,845,069. Yet the absorption characteristics of the diaper of the present invention are better than those of conventional diapers for the reasons set forth above. This savings in material is brought about mainly because the central panel having the larger number of thicknesses of material runs across the smaller dimension of the diaper extending transversely to the longitudinal center axis of the child when the diaper is applied, rather than across the longer dimension of the diaper extending from the back to the front of the child around the crotch. Thus, the central thicker panel is located only at and closely adjacent the crotch where it is needed to provide an increased absorbing function and does not extend over so much of the front and back of the child where greater absorbing capacity is not required. The savings in material over conventional diapers as shown in the above mentioned patents may be as high as 40%. Put in another way, such conventional diapers require as much as 60% more material than the diapers of the present invention.

This is demonstrated as follows: the starting material from which conventional diapers are made by conventional methods is the same as that used to make the diapers of the present invention and comprises the length of material 40a (see FIG. 5) which is conventionally 40 inches wide before it is folded as shown in FIG. 5. The material comes with the selvaged sides 32 and 40. In the method described above, after the material 40a has been folded as shown in FIG. 5, the width from 9 to 11 (see FIG. 5) is 20 inches, which is the length a in the finished diaper. The distance between cut lines is about $13\frac{1}{4}$ inches (hereinafter referred to as 13 inches for purposes of simplification) in a preferred embodiment. Thus, the total area of two ply material of each diaper is 40 times 13 or 520 square inches or 1,040 square inches of 1 ply material. However, in conventional methods of making conventional pre-stitched, pre-folded diapers the length of material 40a is cut at 20 inch intervals, the 20 inch dimension being the length of the diaper. The 40 inch width dimension is reduced by folding the material along its 20 inch dimension with the fold lines and panels extending in the direction of the 20 inch dimension and across the longer length of the diaper to provide four overlapping layers of two ply material which form the central panel and are about 5 inches wide measured in the direction perpendicular to the direction (length) in which the panels and fold lines run. The side panels comprise two thicknesses of two ply material and are about five inches wide to provide a diaper which is twenty inches long and about fifteen inches wide. The central thicker panel extends across the 20 inch length of the diaper rather than across the shorter fifteen inch width. The net result is that each diaper comprises 40 times 20 or 800 square inches of two ply material or 1600 inches of one

ply material, as compared to the 1040 square inches used in applicant's diaper and yet the absorption characteristics are not as good for the reasons given above. Thus, such conventional diapers requires 60% more material than the diaper of the present invention. Accordingly, the diaper of the present invention makes possible a substantial savings in material and hence in cost while at the same time having overall absorbing characteristics which are as good or better than such conventional diapers because the padded or thicker area is located only where it is needed for high absorption and where it is more efficiently utilized to absorb more in a quicker time. Actually the four layers of two ply material or eight layers of one ply material forming the central panel of the conventional diapers referred to above are each five inches wide and twenty inches long or 100 square inches. Multiplied by eight this amounts to 800 square inches of material in the central panel, which is about the same area of material comprising the central panel of the diaper of the present invention ($13\frac{1}{4}$ times 10 times 6). However, its location does not permit it to be utilized as efficiently as the thick central portion of the diaper of the present invention.

Furthermore, in conventional diapers the end portions of the side panels which cover the stomach and back of the child where increased absorption is not needed comprise two layers of two ply material rather than one layer, which further increases the amount of material which is not efficiently utilized to provide maximum absorption where it is most needed and which is more apt to cause rashes or other irritations.

The diaper of the present invention is also easier to pin on the child than conventional diapers because there is not so much material at the ends thereof where the pins are inserted and where the diaper has to be tightened around the trunk of the child.

Not only does the diaper of the present invention provide a substantial savings in material and permit mass production, continuous methods and also provide greater comfort for the baby as well as more efficient absorption for the above reasons, but also because the diaper utilizes much less material it is lighter in total weight than conventional diapers and for this reason too it is more comfortable.

Another advantage of the diaper of the present invention is that the selvaged edges of the fabric do not form a part of the folded central thicker panel and are not stitched to overlapping sections of the fabric and hence puckering due to uneven shrinkage of the selvages as compared with the rest of the fabric is eliminated.

Although specific dimensions have been discussed above in discussing the amount of material which can be saved by the diaper construction of the present invention the invention is not limited to any specific dimension except to the extent that the diaper is greater in length from end to end than it is in width from side to side and the thick central panel extends from side to side across the smaller dimension. It is this construction which makes possible many of the above mentioned advantages.

While the illustrated examples constitute practical embodiments of the present invention the invention is not limited to the details of such examples since they may be considerably varied without departing from the spirit of the invention which is limited only by the appended claims and their equivalents.

I claim:

A method of making a diaper comprising folding a length of material which is substantially greater in length than in width and the sides of which are substantially parallel as follows: first folding said material along a first fold line spaced from a side edge of the length of material and parallel to said side edge and to the longitudinal length of the material back on itself, the material from said side edge to said first fold line forming a first layer and the material folded back on itself forming a

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second layer extending along said first layer back toward said side edge, folding said second layer back on itself along a second fold line parallel to said first-mentioned fold line before it reaches said side edge to form a third layer, said third layer extending along said second layer away from said side edge and beyond said first fold and terminating in the opposite side edge of said material, said three overlying layers forming a central panel located between said fold lines, the portion of said first layer between said second fold line and said first-mentioned side edge forming a first side panel and the portion of said third layer between said first fold line and said opposite side edge forming a second side panel, said center panel being located between said side panels and being at least as wide as either of said side panels, stitching said material in said folded position by rows of stitches along and substantially parallel to said fold lines

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and extending in the lengthwise direction of said material, and cutting said folded stitched length of material into a plurality of diapers by cutting along lines extending from side to side of said material and spaced from each other in the lengthwise direction of said material, the distance between adjacent cut lines being substantially less than the width of said folded material from side edge to side edge, whereby said central panel of each diaper extends in the direction of and across the short dimension of said diaper.

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