Jan. 21, 1969 S. J. JAMISON 3,422,815

PREFOLDED WOVEN DIAPER WITH SINGLE PLY WIDTHWISE EDGE PORTIONS

Filed Feb. 17, 1966 Sheet 1 of 2

Fig. 1.

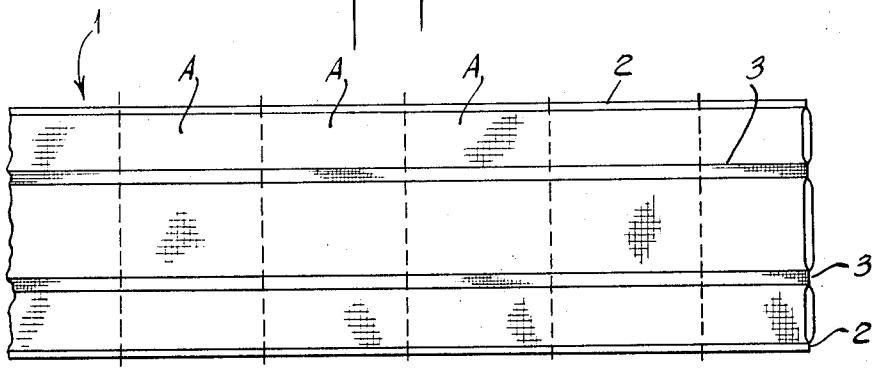


Fig. 2a.

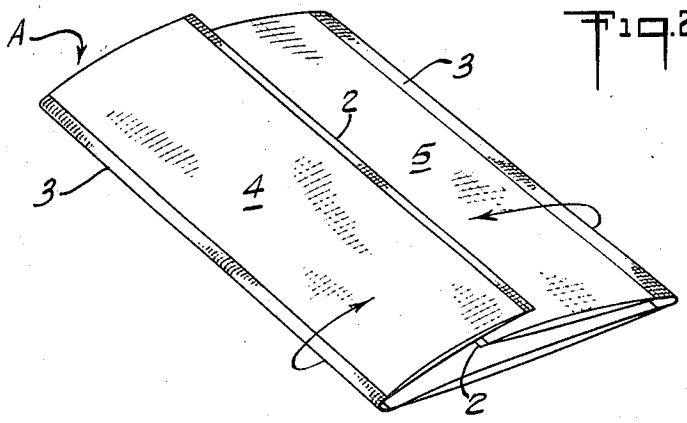


Fig. 2b.

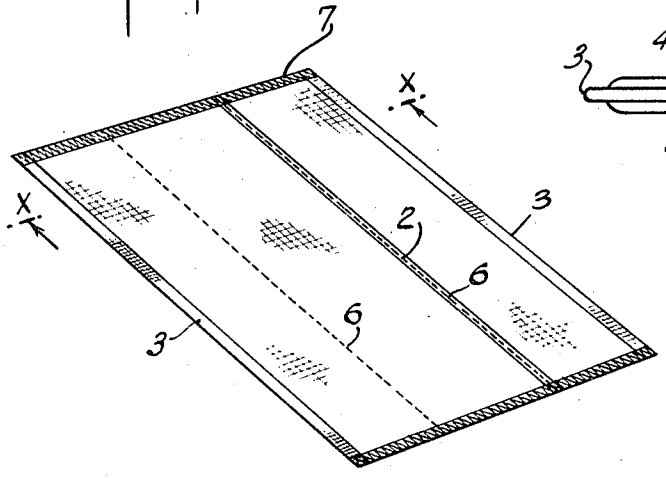
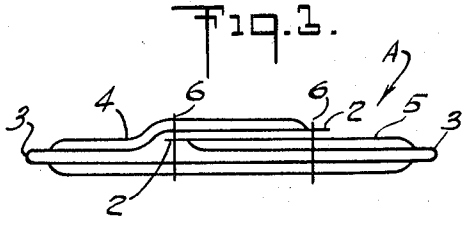


Fig. 3.



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Fig. 4.

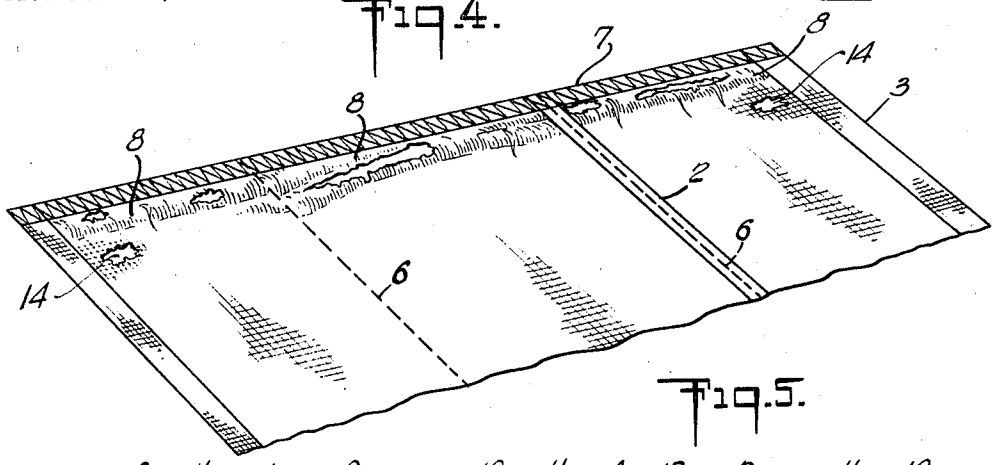


Fig. 5.

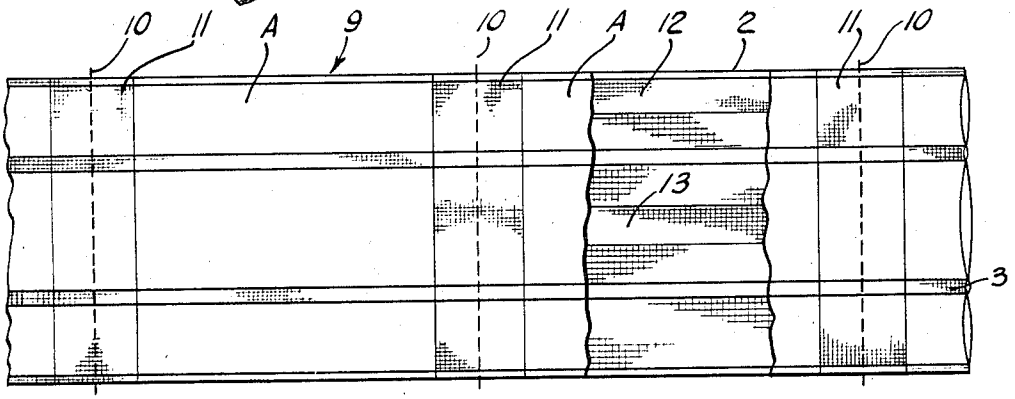


Fig. 6.

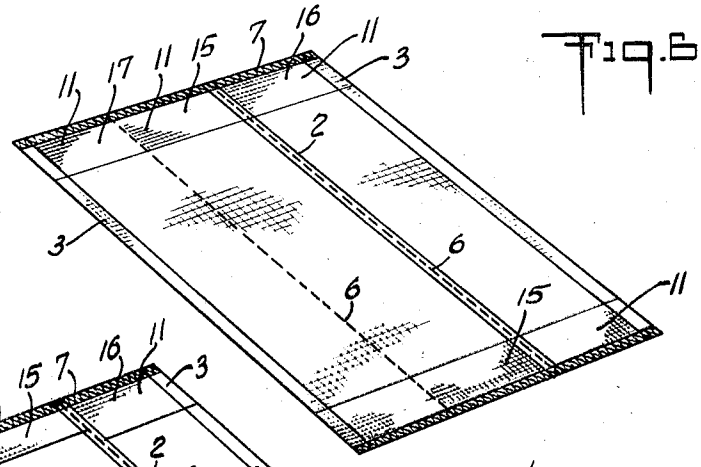
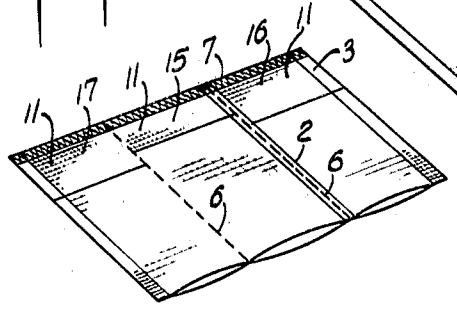


Fig. 7.



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United States Patent Office 3,422,815 Patented Jan. 21, 1969

3,422,815

PREFOLDED WOVEN DIAPER WITH SINGLE PLY WIDTHWISE EDGE PORTIONS

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Filed Feb. 17, 1966, Ser. No. 528,218
U.S. Cl. 128—284 2 Claims
Int. Cl. A61f 13/00; D03d 11/02

ABSTRACT OF THE DISCLOSURE

A gauze rectangular diaper blank having widthwise single-ply edge portions to provide increased pinning strength and to preclude premature wear.

The art has developed methods of diaper production such as to provide prefolded diapers, whereby diaper fabric is folded over on itself and secured in position to provide a substantially rectangular diaper ever ready for use without folding, e.g., U.S. 2,600,634, U.S. 2,845,069 and U.S. 3,072,124. It has been noted that areas of undue wear develop along the area of the lateral edges of the prefolded gauze diaper. This is due to the internal bunching of fabric in that area which results in high spots which receive the brunt of abrasion to the fabric during use and during repeated laundering. Because this area wears out well in advance of the remainder of the fabric, the useful life of the diaper is, as a result, dramatically and prematurely reduced.

The instant invention solves this difficulty by providing a substantially rectangular gauze blank having single-ply panels extending along each longitudinal edge from one widthwise edge of said diaper to the other and each extending from about 1" to about 4" toward the opposite longitudinal edge, said blank being disposed in at least a substantially rectangular prefolded condition with said single-ply panels defining the lateral edges of said prefolded diaper and thus characterizing said diaper as being substantially free of fabric bunching or localized fabric massing and resultant premature wear along said lateral edge areas.

The term "diaper blank" as used herein is meant to define a given length of diaper cloth cut from the running length of diaper cloth, as it comes from the loom. This "diaper blank" then is substantially synonymous with a diaper as a unit, and this diaper may be used in either an unfolded or in a prefolded and secured state.

As used herein the term "longitudinal edge" shall refer to the lengthwise edge of the diaper blank and the term "lateral edge" shall refer to the widthwise edge or edges of the prefolded diaper; therefore, the two edges are one in the same, only the form of the diaper blank has changed.

The term "single ply" as used herein is meant to define not only a cloth construction wherein filling and warp yarns are interwoven in the same plane, but also a cloth construction having two planes, each of interwoven filling and warp yarns, wherein the warp or filling yarns of either one or both of said two planes interlace the yarns of the other of said two planes, either in a regular or in an irregular pattern, over the entire section, etc., which is termed "single ply."

The single-ply panels or sections which are the crux of this invention will be described in greater detail with reference to the drawings; however, such panels are constructed in the diaper blank fabric such that after the prefolding of the diaper, one such panel will extend along the area of each of the lateral edges of the diaper and in each instance from about 1" to about 4" from one lateral edge toward the other. The single-ply panels of this invention will have a maximum end count of about 140 and a maximum pick count of about 80. With end or pick counts greater than this, harshness begins to appear and undesirable loss of absorbency occurs. Additionally, the cost involved becomes almost prohibitive. The minimum end and pick count should be at about 60 and 30 respectively, since below either of these, the fabric becomes too open, with resultant undesirable loss in absorbency and strength, along with an increase in abrasion.

These single-ply panels forming the crux of this invention will preferably extend along the lateral edges of the prefolded diaper from one longitudinal edge to the other, and toward the opposite lateral edges substantially uniformly a distance of at least about 1". This precludes inner fabric bunchup, or localized massing of fabric, which would lead to the formation of high spots. These high spots would receive the brunt of most of the abrasive forces applied to the diaper. These single-ply panels or sections should not extend more than about 4" from one lateral edge toward the opposite lateral edge, since beyond that distance substantially no additional benefits are gained and since they are each a one-ply section they do not possess the absorbency of the normal two-ply or multi-ply gauze fabric. Thus the absorbency of the diaper as a whole would be sacrificed somewhat if these panels extend a greater distance toward each other in the diaper.

It is stated that this added panel must be single ply. This not only precludes fabric bunching but also provides increased pinning strength in that lateral area. It also substantially fixedly adjusts and ties down the inner plies of the prefolded diaper to prevent fabric bunching in the diaper, which is in evidence with the substitution of two ply or more in the area of the panel or panels in question. A plain weave employing an end count greater than normally used in gauze diaper construction can not be used in these single-ply panels or sections because a very tight construction would result evidencing an undesirable decrease in absorbency and softness. If the end count of the plain weave is reduced to conform to that of normal gauze diaper fabric, the plain weave could be used provided this change does not detract from the acceptable pinning strength of the diaper. However, it is preferred that a weave which floats the warp or filling yarns be used, or, in the alternative, a single-ply weave of two planes with warp or filling yarns of one or both of the planes interwoven into the other plane.

Gauze diaper fabric is usually a low count woven fabric constructed of warp and filling yarns wherein the warp yarns extend substantially parallel to the length of the fabric, i.e., in the machine direction as the fabric runs on the loom, and the filling yarns extend in the widthwise direction of the fabric, which is more usually produced in continuous lengths of specified widths woven in such a manner as to be joined along the longitudinal edges in common selvages. The fabric may be single or multi-ply; however, this invention is directed to a multi-ply diaper fabric and preferably to a two-ply diaper fabric.

From the continuous gauze diaper fabric woven on the loom, diaper blanks are cut. These blanks are usually rectangular in shape, therefore, they are said to have two longitudinal and two widthwise edges or sides. The size of the diaper blank may vary from the normal 40 x 20" to a smaller or larger size. The blank may be constructed of one or more of the weaves normally utilized in diaper construction, e.g., plain, twill, rib, satin, etc.

The fabric of the diaper of this invention is that which is considered and known by the art as gauze diaper fabric which is defined in U.S. 2,845,069 and U.S. 3,072,124. Thus, within this definition, and considering the appropriate yarn sizes, the fabric will only be so open as is acceptable for diaper fabric measured in terms of accept-

able absorbency, strength, softness, corrugation and abrasion resistance.

Diaper blanks may normally range in width from about 28" to 40" and from about 15" to 40" in length. A two-ply diaper fabric usually has a end count in each layer ranging from 32 to 48 ends per inch and from about 28 to about 45 picks per inch. The yarn size in any instance will range from 10's to 40's and this would apply equally as well to the warp as to the filling. The weight range of the diaper would normally be from about 42 to about 80 grams. These are general features and are provided only in the interest of a thorough understanding. Other features and advantages of the invention will be apparent from the following description taken along with the accompanying drawings wherein:

FIG. 1 is a plan view of a portion of a running length of woven diaper fabric.

FIGS. 2*a* and 2*b* depict the folding of, and folded diapers taken from, the fabric of FIG. 1,

FIG. 3 is a cross section taken along line X—X of FIG. 2*b*,

FIG. 4 is a fragmentary end view of a diaper constructed and folded in accordance with the diaper shown in FIGS. 1, 2*a*, and 2*b*,

FIG. 5 depicts a plan view of a running length of diaper fabric bearing the single-ply panel construction of the improvement offered by this invention,

FIG. 6 shows a prefolded diaper blank taken from the fabric of FIG. 5, and

FIG. 7 depicts a prefolded diaper blank bearing another embodiment of this invention.

Referring to FIG. 1, there is shown a fabric **1** woven in a continuous sheet approximately 40" wide. The fabric is a two-ply gauze diaper cloth with a single-ply selvage **2** positioned along each lengthwise edge (in the machine or warp direction) of the fabric as it is woven. Thus the warp yarns run the length of the fabric and the filling yarns extend transverse to the fabric **1**.

Intermediate and parallel to the selvage edges **2** are a pair of spaced wearing strips **3** woven integral with the two-ply diaper cloth. The wearing strips **3** are reinforced areas in accordance with the teachings of U.S. 2,845,069 and they may be single-ply or multi-ply. They are positioned so as to present convenient lines of fold for a prefolded diaper (see FIG. 2*a* and FIG. 2*b*). In such a prefolded diaper the wearing strips **3** are located along the folded edges and will, because of the presence of the reinforcement, possess greater abrasion resistance during use.

In practice, the gauze diaper fabric **1** is cut transversely along the dotted lines to provide diaper blanks A. A diaper blank A defines the sum total of the cloth which is the diaper. In many instances the blank A, without the wearing strips **3**, are sold as such to be folded by the mother; however, manufacturers of the diaper cloth depicted here, prefold these diaper blanks and secure them in that prefolded position for the benefit of the mother.

FIG. 2*a* depicts a gauze diaper blank A taken from the diaper fabric **1** shown in FIG. 1. The diaper blank A is shown partially prefolded so that it can be seen that it is folded along each of the wearing strips **3**, to place the end panels **4** and **5** one over the other. The prefolded diaper is then sewn to secure this positioning (see FIG. 2*b* and stitching **6**). The lateral edges of the prefolded diaper are then overedged or otherwise treated to prevent raveling. Overedging may be accomplished in accordance with the teachings of U.S. 3,123,035. FIG. 3 shows the cross section of the prefolded diaper taken along line X—X of FIG. 2*b*.

Prefolded diapers are constructed substantially in accordance with the above; however, while the weaves used may vary and the presence of wearing strips and selvages is optional, the prefolded tubular gauze diaper does have one common disadvantage which will be seen. The prefolded diaper of FIG. 2*b* is shown in FIG. 4 after many washings. Note the bunching of the fabric **8** termed "high spotting" and the resultant wear in that specific area which

is the lateral edge area of the prefolded diaper. This represents the accumulation of the inner plies of fabric which, after repeated laundering, have migrated to either lateral edge of the diaper. The diaper is thicker along these areas because of the non-uniform distribution of fabric. These high spots rise above the plane of the diaper, and for this reason they become the points which receive the brunt of the abrasive and other wearing forces that act on the diaper during use and laundering. As a result these high spots **8** wear prematurely causing fabric failure and the life of the diaper is prematurely curtailed. Note also that areas of wear **14** have resulted from continued pinning.

With reference to FIG. 1 again, it is necessary to explain that in manufacture, the diaper fabric, being two-ply gauze in the normal case, must be tied together along a line by interweaving warp and filling yarn in one plane for a given short distance. This tying is accomplished in order to attempt to provide a substantially superimposed positioning of each of the plies throughout the fabric. This is important in the prevention of fabric or ply sagging, as well as transverse misalignment or shifting of the plies in the fabric.

In the effecting of ties along the length of the diaper fabric, the two plies of diaper fabric are tied along a transverse line having a width of but a few ends; however, one warp end usually runs loose at the tie because when the harnesses pull the ends up to provide the top and bottom layers of the shed, greater tension is put on the warp end at the point of the tie. To further explain, the warp ends come off the beam at a constant rate and the harnesses raise and lower a certain number of given ends to effect the production of two-ply gauze diaper fabric. When a tie is made, greater tension is put on these ends since the tends normally forming the top ply are pulled down and the ends normally forming the bottom ply are pulled up in order that a fabric tie can be made. The end next to the tie runs looser then the rest because of the relaxation in the tension that was needed to provide the shed for the tie. This slack increases progressively as successive ply ties are produced.

Looms are constructed with warp stop motion means for stopping the loom when a warp thread breaks or becomes very loose, and drop wires are the means by which this is accomplished. Thus with the creation of progressive slack in the warp yarn by the repeated tying together of the two-ply fabric, periodic loom stoppage occurs.

The instant invention thus obviates the need of the fabric tying described above, therefore, loom efficiency is increased as a direct result of this invention.

With reference to FIG. 5, a diaper fabric **9** is woven such that single-ply selvages **2** extend along the lengthwise edges of the cloth, i.e., in the warp direction, and parallel tubular reinforced wearing strips **3** extend in the fill direction. The diaper fabric would normally be cut along the dotted lines **10** to provide a plurality of diaper blanks of diaper cloth which is shown to be of a tubular or two-ply construction; however, in this instance sections **11** of single-ply cloth extending from one selvage to the other, interrupt the cloth in regular repeating intervals. These single layer areas **11** have a width of from about 2" to about 8", and they are woven in other than a plain weave in order to preserve absorbency; however, they are woven to have at least the sum of the ends of the adjacent two-ply construction. The width of from about 2" to about 8" insures that when severed substantially along the midpoint, each blank will have a minimum of at least about 1" single-ply cloth along each cut end or a maximum of about 4". Note should be taken of the detailed section of weaves running from selvage **2** to opposite selvage **2** in the fabric **9** of FIG. 5. This is in accordance with the invention disclosed and claimed in U.S. 3,072,124, where areas of panel reinforcement having an increase of at least about 1½ times the yarn count are strategically located in panels **12** and **13** to provide areas of increased abrasion resistance. Thus the diaper

of the instant invention is readily adapted for such a construction.

The diaper blanks A, taken from the continuous fabric **9** of FIG. 5 by cuting along the dotted lines **10**, are prefolded and secured in position in accordance with the discussion had with reference to FIGS. 2*a*, 2*b* and 3, with the result that the prefolded diaper in FIG. 6 is produced. The single ply of specially woven sections **11** in the diaper of FIG. 6 precludes the formation of fabric bunching and resultant high spotting since the internal plies are kept in the same relative superimposed position that they were given during manufacture and that they were also given by the initial prefolding, and this positioning is not substantially disturbed during use and during repeated laundering. Therefore, the bunching of plies at the lateral end areas of the prefolded diapers is eliminated. Pinning strength of the diaper is also greatly enhanced. As a matter of fact, the provision of single-ply construction, in accordance with this invention, along the lateral edges of just the side panels **16** and **17** would provide increased pinning strength and eliminate fabric massing in these areas, as well as, reducing, somewhat, fabric bunching along the lateral edges of the center panel **15**.

Another embodiment of the instant invention is given via FIG. 7 which shows a cutaway portion of a scaled down near copy of the prefolded diaper depicted in FIG. 6. The only difference is that the depth or width of the single-ply weave in the center panel **15** is less than that in each of the side panels **16** and **17**. This is provided in order to insure both the elimination of fabric massing along the lateral edges of the side panels **16** and **17** and the increase of pinning strength, i.e., an increase in the resistance in wear or yarn severance in the area of the diaper which receives the pins, along the lateral edge areas of the side panels **16** and **17**. The lessened width or depth of the single-ply area in the center panel is sufficient to preclude bunching along the lateral edge of the center panel since it is at least one inch in depth or width.

This invention has been described in connection with its preferred embodiments but many modifications may be included without departing from the inventing concept which is limited only by the scope of the appended claims.

I claim:

1. A multi-ply rectangular diaper blank constructed of gauze diaper fabric having an end count of from about 60 to about 140, a fill count of from about 30 to about 80, a single-ply selvedge defining each longitudinal edge thereof and both widthwise edges defined by continuous single-ply construction extending substantially uniformly from at least about 1 inch to about 4 inches toward the center of said blank to provide improved pinning strength and to preclude localized internal fabric bunching and resultant high spotting within said longitudinal edged area, said diaper blank being adapted to fold along two substantially parallel spaced widthwise lines, each spaced from the widthwise edge of said blank, and said blank having each widthwise edge of the diaper blank folded in the form of a U along the nearest of said widthwise lines to position each widthwise edge contiguous to the opposite widthwise edge portion of the diaper blank along its length.

2. The diaper of claim **1** of two-ply construction.

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