May 9, 1967 W. M. PITTENDREIGH ET AL 3,318,310

DIAPER

Filed April 8, 1965 3 Sheets-Sheet 1

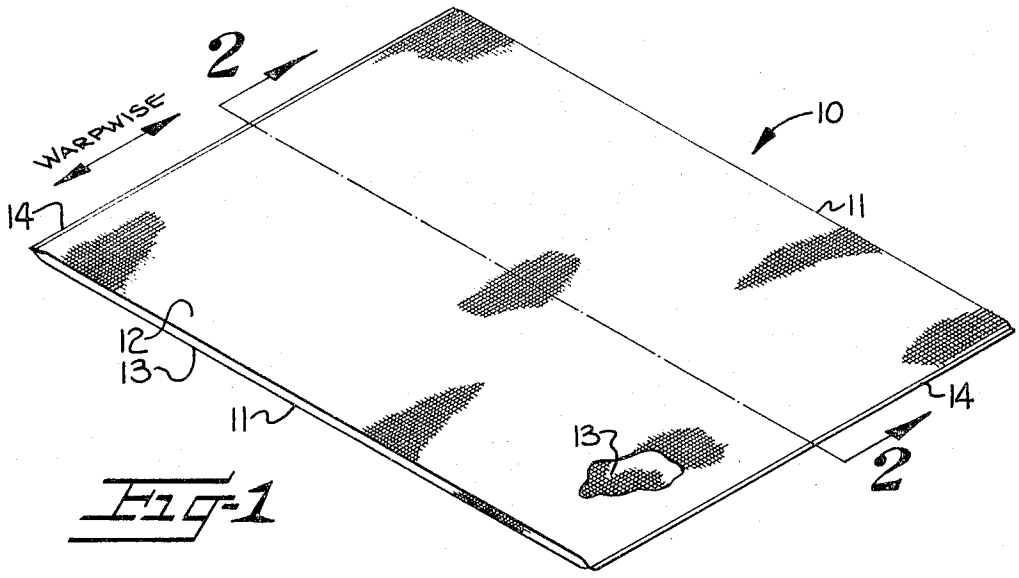


Fig-1

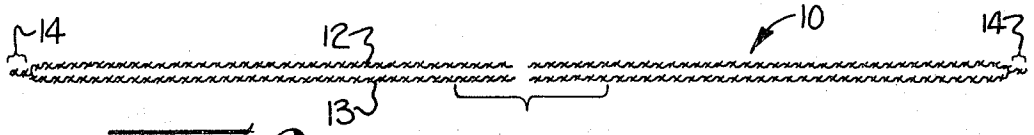


Fig-2

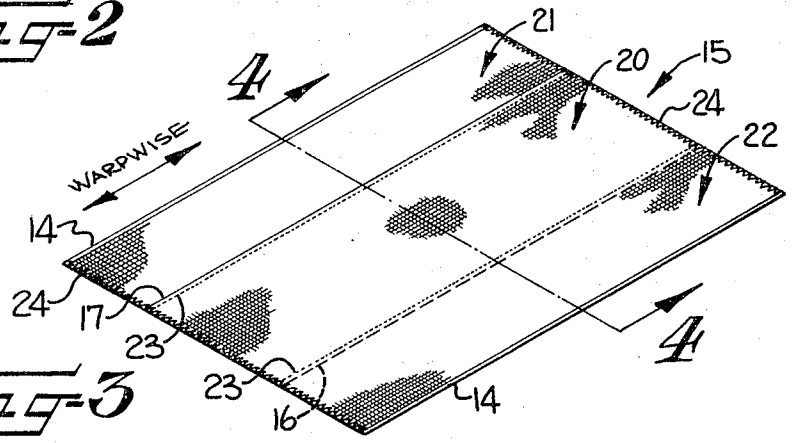


Fig-3

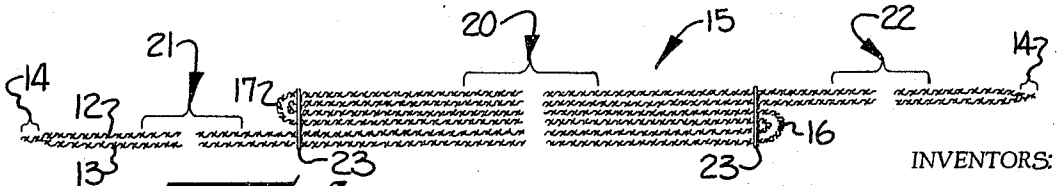


Fig-4

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May 9, 1967 W. M. PITTENDREIGH ET AL 3,318,310

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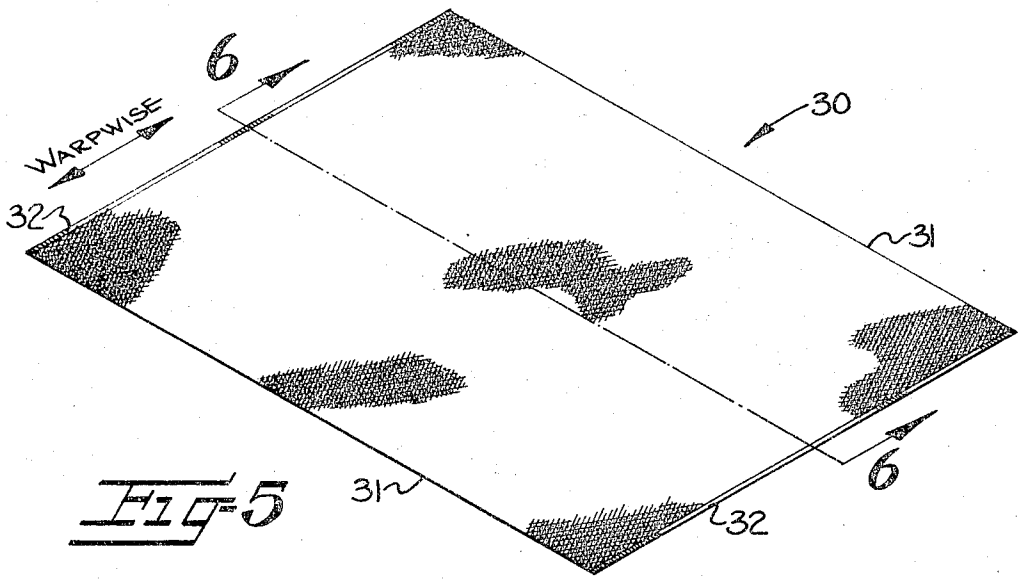


Fig-5

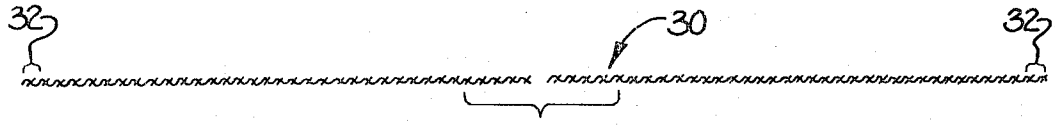


Fig-6

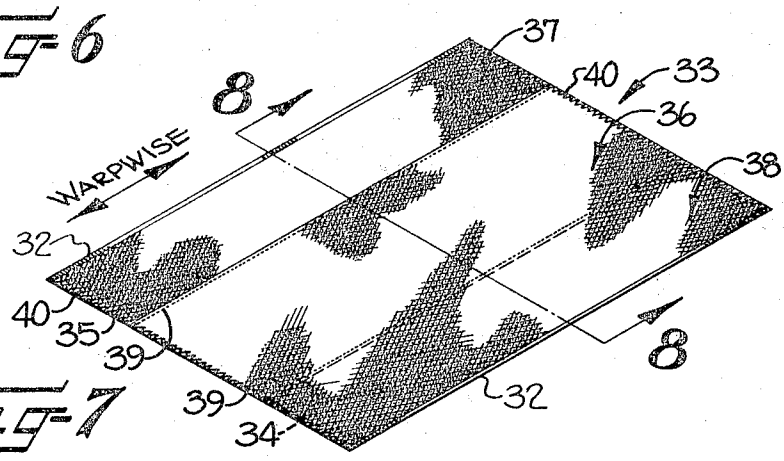


Fig-7

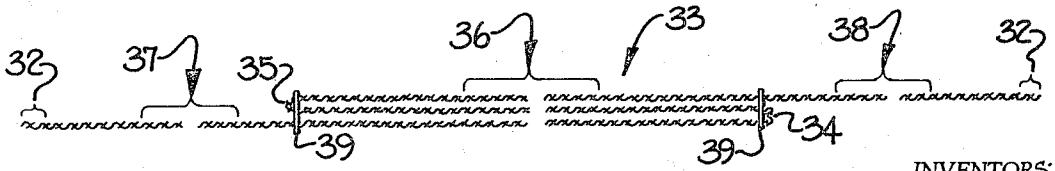


Fig-8

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May 9, 1967 W. M. PITTENDREIGH ET AL 3,318,310

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Filed April 8, 1965 3 Sheets-Sheet 3

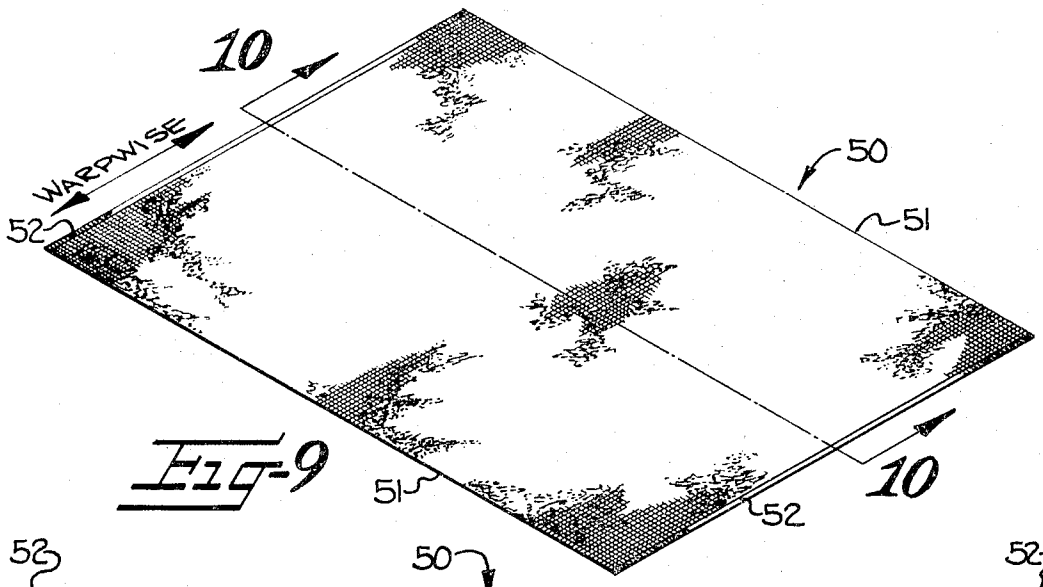


Fig-9

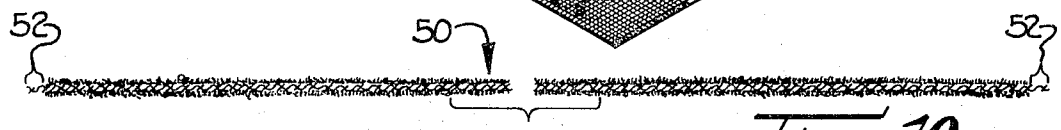


Fig-10

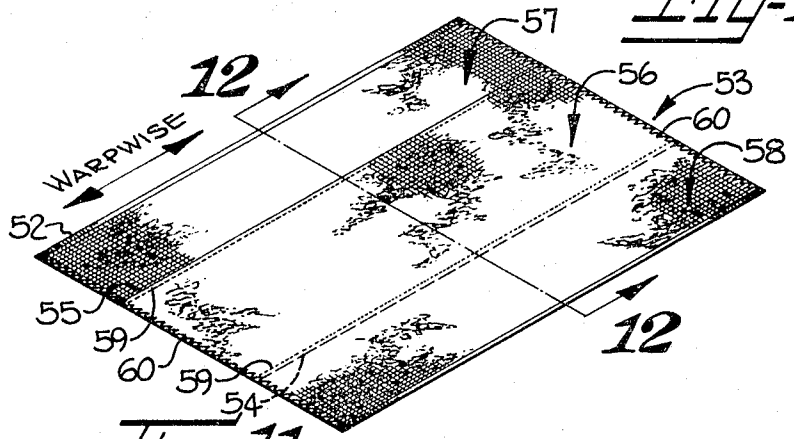


Fig-11

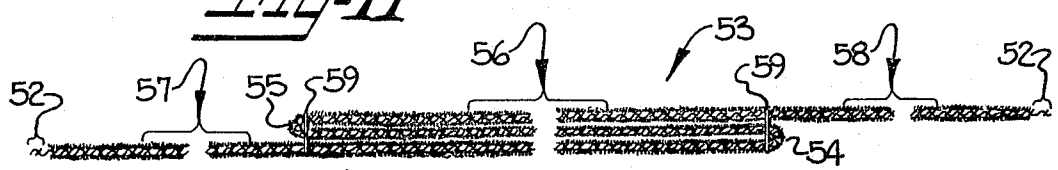


Fig-12

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United States Patent Office 3,318,310 Patented May 9, 1967

3,318,310

DIAPER

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Filed Apr. 8, 1965, Ser. No. 446,688
7 Claims. (Cl. 128—284)

This is a continuation-in-part of application Ser. No. 334,694, filed Dec. 31, 1963.

This invention relates to prefolded diapers and more particularly to prefolded diapers folded in such a manner so that the outer longitudinal edges thereof will resist wear and so that a conventional size prefolded diaper with a wider than normal center panel may be formed from a narrower than normal diaper material.

Heretofore, diapers have been woven in the form of a plurality of plies of a relatively light and open gauze diaper material or from single plies of heavier diaper material utilizing special weave constructions to obtain the absorbency of the multi-ply diaper material. These diapers are normally applied to infants in the form of a folded rectangular pad which is folded from a longer rectangular diaper. Normally, the diaper is folded transversely to superimpose portions of its area to form a folded diaper pad having a longer dimension corresponding to the shorter dimension of the diaper prior to folding and comprised of three separate panels extending longitudinally of the folded diaper pad in which the center panel has a greater thickness than the side panels. Depending upon the size of the infant, the folded diaper pad may have to be folded additionally to fit the infant.

When a multi-ply or single-ply diaper of this type is folded into three panels, as described above, a folded diaper pad is formed which has the characteristics of excellent softness and hand, high absorbency, superior drying characteristics and the like. These characteristics are made possible by greater porosity, openness, fiber exposure, fluffiness, bulk and capillary storage capacity provided by the multi-layer panels.

In order to provide better diapering, handling and laundering by the consumers and diaper services, diapers of this type are often folded and sewn or otherwise secured in the folded position by the diaper manufacturer to provide a prefolded diaper which is ready for use.

One of the major disadvantages and problems presented by this type of prefolded and sewn diaper is wear along the outer longitudinal edges of the prefolded diaper. Heretofore, in folding a diaper into a prefolded diaper having three separate panels, as described above, it was normal practice to fold the prefolded diaper in such a manner as to have the above mentioned outer longitudinal edges thereof formed of folded over diaper material, as is shown in the Gannon U.S. Patent No. 2,600,634, issued June 17, 1952. The exposed, folded over, thin layers of diaper material forming these longitudinal edges wear out and fray very rapidly during laundering because the layers are fixed in position due to the prefolding and sewing and the woven yarns bending around the folds are exposed to concentrated wear.

This undesirable wear has been combatted by the weaving of wear strips across the diaper material formed by the interweaving of two plies of diaper material, as shown in the Jamison et al. U.S. Patent No. 2,845,069, issued July 29, 1958. These wear strips were positioned at the folded longitudinal edges of the prefolded and sewn diaper. While this construction provided increased wear resistance at these longitudinal edges, it presented the additional problems of added manufacturing steps which are costly to the manufacturer, and lack of dimensional flexibility in prefolding the diapers to a variety of prefolded diaper

sizes and in varying the size of the absorbent center panel since the wear strips by necessity had to be positioned at the outer exposed longitudinal edges of the prefolded and sewn diaper.

Moreover, in utilizing the type of fold illustrated in both of the above mentioned patents, it is not possible to obtain a conventional size prefolded diaper with a wider than normal center panel without using wider than normal diaper material. This limits the size of the center panel of the prefolded diaper and therefore the area of greatest absorbency in the prefolded diaper.

It is therefore an object of this invention to provide an improved prefolded and secured diaper and the method of forming the same which will provide wear resistance at the exposed longitudinal edges of the prefolded and secured diaper and which will allow a conventional size prefolded diaper with a wider than normal center panel to be formed from narrower than normal diaper material.

To provide the desired wear resistance at the exposed longitudinal edges of the prefolded and secured diaper and to obtain a conventional size diaper with a wider than normal center panel from a narrower than normal diaper material, this invention provides a novel prefolded construction which is folded in a novel manner.

In the weaving of gauze material for diaper purposes, it is the usual procedure to weave two or more separate plies of material joined together or interwoven at each of the selvage edges. It is also the usual procedure in single ply diaper materials to form selvage edges thereon. It is axiomatic that the strongest portion of these woven diapers is at each of these selvage edges since at these selvage edges the ends per inch, weight and density are greater than the remaining portions. Heretofore, these selvage edges were normally folded over and secured intermediate the thickened center panel of the prefolded diapers, as may be seen in the above mentioned patents.

It has been found by this invention that a prefolded diaper may be folded in a multiple reverse fold so that these selvage edges will be located at each of the longitudinal edges of the prefolded and sewn diaper to provide the necessary wear resistance at these edges. This type of fold also allows the thickened center panel to be formed wider than normal in conventional size prefolded diaper from narrower than normal diaper material. This novel prefolded diaper construction and method of forming same eliminates the necessity of weaving additional wear strips in the length of the unfolded diaper and reduces the amount of diaper material necessary.

In utilizing these selvage edges as the longitudinal edges of the prefolded and sewn diaper, a problem arose of turning over of the selvages or unevenness of the longitudinal edges of the prefolded diaper following laundering due to the failure of these selvage edges to lie flat in the same plane as the adjacent diaper material. In the conventional manner of weaving selvages, the density of the selvage edges is much greater than the density in the adjacent material. This construction results in a rather harsh break in density or ends per inch at the line connecting the selvage to the adjacent material, since at this line or break the ends per inch and the density are substantially reduced. This additional weight and density in the selvage edges results in a tendency for the selvage edges to turn over or displace themselves from the plane of the adjacent layers following laundering. This is objectionable to the consumer in the use of the diaper on an infant.

It is, therefore, a further object of this invention to provide a prefolded diaper, constructed as described above, which eliminates the undesirable feature of turning over of the selvage edges and unevenness along the longitudinal edges of the prefolded diaper.

It has been found by this invention that this objectionable turning over of the selvage edges forming the longitudinal edges of the prefolded diaper may be cured by weaving the selvage edges narrower than normal. This narrowed selvage will provide less area of the densier, heavier material and, therefore, will not turn over as readily as the normally wider selvage edges.

Further features of this invention will be understood from the following description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a perspective view of multi-ply gauze daper material cut from a continuous web of such material;

FIGURE 2 is a cross-sectional view of the diaper material of FIGURE 1 taken substantially along the line **2—2** of FIGURE 1;

FIGURE 3 is a perspective view of a prefolded and sewn diaper formed from the diaper material of FIGURE 1;

FIGURE 4 is a cross-sectional view of the prefolded and sewn diaper of FIGURE 3 taken substantially along the line **4—4** of FIGURE 3;

FIGURE 5 is a perspective view of single-ply diaper material woven with a birdeye weave and cut from a continuous web of such material;

FIGURE 6 is a cross-sectional view of the diaper material of FIGURE 5 taken substantially along the line **6—6** of FIGURE 5;

FIGURE 7 is a perspective view of a prefolded and sewn diaper formed from the diaper material of FIGURE 5;

FIGURE 8 is a cross-sectional view of the prefolded and sewn diaper of FIGURE 7 taken substantially along the line **8—8** of FIGURE 7;

FIGURE 9 is a perspective view of single-ply of woven flannel diaper material cut from a continuous web of such material;

FIGURE 10 is a cross sectional-view of the diaper material of FIGURE 9 taken substantially along the line **10—10** of FIGURE 9;

FIGURE 11 is a perspective view of a prefolded and sewn diaper formed from the diaper material of FIGURE 9; and

FIGURE 12 is a cross-sectional view of the prefolded and sewn diaper of FIGURE 11 taken substantially along the line **12—12** of FIGURE 11.

Referring now to FIGURES 1 and 2, there is shown diaper material **10** which has been cut in a desired length from a continuous web of such material along cut edges **11**. This diaper material **10** comprises two plies **12** and **13** of gauze diaper material which are interwoven at the selvages **14** to prevent raveling. These selvages **14** will be the strongest portion of the diaper material **10** and will therefore resist wear better than any other portion of the diaper material **10**.

The diaper material **10** is folded and secured to form the prefolded and secured diaper **15**, shown in FIGURES 3 and 4. The prefolded and secured diaper **15** is formed from the diaper material **10** by first folding the diaper material **10** back upon itself in a reverse fold along a first fold line **16** which is spaced from and parallel to the left selvage edge **14**, as viewed in FIGURES 3 and 4. The diaper material extending from the left selvage edge **14** to the first fold line **16** defines a first double ply layer and the material folded back on itself from the first fold line **15** defines a second double ply layer extending therefrom toward the left selvage edge **14**. This second layer is then folded back upon itself to form a second reverse fold along a second fold line line **17** parallel to the first fold line **16** and extending inwardly from the left selvage edge **14** between the selvage edge **14** and the fold line **16**. The last mentioned folded over material forms a third double ply layer extending to the right from the second fold line **17**, and beyond the first fold line **16** to the right selvage edge **14**, as viewed in FIGURES 3 and 4.

In the thus folded diaper, the three folded over double ply layers form a center panel **20** located between fold lines **16** and **17**. The portion of the first double ply layer extending from the left selvage edge **14** to the second fold line **17** forms a first side panel **21** and the portion of the third double ply layer extending from the right selvage edge **14** to the first fold line **16** forms a second side panel **22**. These panels **20**, **21** and **22** and the prefolded diaper **15** now have a longer dimension corresponding to the cut length of the diaper material **10** and the side panels **21** and **22** extend transversely outwardly from the center panel **20**.

While the novel fold of this invention has been described to contain two reverse folds, it may be pointed out that additional reverse folds could be utilized to increase the thickness of the center panel as long as the selvage edges are disposed as described.

The above described prefolded diaper is permanently secured together by lines of stitching **23** parallel with and closely adjacent to the first and second fold lines **16** and **17**. The cut edges **11** may be provided with overedge stitching **24** to prevent any raveling at these cut edges.

As illustrated in FIGURE 1, the diaper material **10** was cut from a continuous web prior to folding and sewing for convenience in illustration. However, it is to be understood that the folding and sewing operation could be performed before cutting of the desired length of diaper material and this would probably be the sequence in automatic machines.

The thus formed prefolded and secured diaper **15** provides longitudinal side edges comprised of selvages **14** which will satisfactorily resist wear imparted to these side edges by normal laundering of the prefolded and secured diaper **15**. By this novel fold, the center panel **20** may be formed wider than normal for a conventional size prefolded diaper **15** from narrower than normal diaper material **10**.

The latter is possible because the thickened center portion or center panel **20** is the only portion of the diaper **15** which has a plurality of layers of diaper material therein and an increase in the width of this portion may be accomplished over that obtained from a wider conventional size diaper material folded in the manner shown in the above mentioned Gannon and Jamison et al. patents.

For example, in utilizing the fold illustrated in the above identified Gannon and Jamison et al. patents it would require diaper material of 40″ in width (from selvage to selvage) to form a conventional size prefolded diaper of about 14½″ in width having a center panel of 5½″ in width. With diaper material of 28″ in width (from selvage to selvage), a prefolded diaper utilizing a double reverse fold according to this invention may be formed of about 14½″ in width having a center panel of 6½″ in width. It may be pointed out that the center panel of a prefolded and secured diaper is the place where additional absorbency and thickness is required and the diaper is no less efficient for having side panels of only a single layer of material and is actually a reduction in unneeded bulk.

The selvages **14** of the diaper material **10** which form the longitudinal edges of the prefolded diaper **15** are woven narrower than normal to prevent turning over and unevenness along these selvage edges following laundering of the prefolded diaper **15**. It has been found that a narrow selvage will not allow sufficient area in these selvage portions for any appreciable turning over and will normally present an even longitudinal edge which will sufficiently reduce wear at these edges. A normal selvage for this type of woven diaper material is approximately ¼ of an inch and it has been found that a narrowed selvage of approximately 1/32 of an inch will prevent this turning over and unevenness.

Referring now to FIGURES 5–8, there is shown an alternate form of diaper material **30** which has been cut

in a desired length from a continuous web of diaper material along cut edges **31**. This diaper material **30** comprises a single ply of diaper material woven in a birdseye weave and having selvages **32** thereon to prevent raveling. These selvages **32** are of a more dense and heavier construction than the remaining portion of the diaper and, therefore, will be the strongest portion of the diaper material **30** and will resist wear better than any other portion of the diaper material **30**.

The diaper material **30** is folded and secured to form the prefolded and secured diaper **33**, shown in FIGURES 7 and 8. The prefolded and secured diaper **33** is formed from the diaper material **30**, in the same manner as the above described prefolded and secured diaper **15** is formed, by first folding the diaper material **30** back upon itself in a reverse fold along a first fold line **34** which is spaced from and parallel to the left selvage edge **32**, as viewed in FIGURES 7 and 8. The diaper material extending from the left selvage edge **32** to the first fold line **34** defines a first layer and the material folded back on itself from the first fold **34** defines a second layer extending therefrom toward the left selvage edge **32**. This second layer is then folded back upon itself to form a second reverse fold along a second line **35** parallel to the first fold line **34** and extending inwardly from the left selvage edge **32** between the selvage edge **32** and the fold line **34**. The last mentioned folded over material forms a third layer extending to the right from the second fold line **35** past the first fold line **34** to the right selvage edge **32**, as viewed in FIGURES 7 and 8.

In the thus folded diaper, the three folded over layers form a center panel **36** located between fold lines **34** and **35**. The portion of the first layer extending from the left selvage edge **32** to the second fold line **35** forms a first side panel **37** and the portion of the third layer extending from the right selvage edge **32** to the first fold line **34** forms a second side panel **38**. These panels **36**, **37** and **38** and the prefolded diaper **33** now have a longer dimension corresponding to the cut length of the diaper material **30** and the side panels **37** and **38** extend transversely outwardly from the center panel **36**.

The above described prefolded diaper **33** is permanently secured together by lines of stitching **39** parallel with and closely adjacent to the first and second fold lines **34** and **35**. The cut edges **31** may be provided with overedge stitching **40** to prevent any raveling at these cut edges.

As illustrated in FIGURE 5, the diaper material **30** was cut from a continuous web prior to folding and sewing for convenience in illustration. However, it is to be understood that the folding and sewing operations could be performed before cutting of the desired length of diaper material and this would probably be the sequence in automatic machines.

The thus formed prefolded and secured diaper provides longitudinal side edges comprised of selvages **32** which will satisfactorily resist wear imparted to these side edges by normal laundering of the prefolded and secured diaper **33**. By this novel fold, the center panel **36** may be formed wider than normal, for a conventional size prefolded diaper **33**, from narrower than normal diaper material **30**. The latter is possible for the reasons given above in connection with the prefolded diaper **15**. Also, the selvages **32** forming the longitudinal edges of this prefolded diaper **33** are woven narrower than normal to prevent turning over and unevenness for the same reasons as discussed above in connection with the prefolded diaper **15**. The examples of diaper dimensions given above in connection with the prefolded diaper **15** also apply to this prefolded diaper **33** and will not be repeated.

Referring now to FIGURES 9–12, there is shown another form of diaper material **50** which has been cut from a continuous web of diaper material along cut edges **51**. This diaper material **50** comprises a single ply of diaper material woven in a plain weave and having selvages **52** thereon to prevent raveling. These selvages **52** are of a more dense and heavier construction than the remaining portions of the diaper material and therefore will be the strongest portions of the diaper material **50** and will resist wear better than any other portion of the diaper material **50**. The diaper material **50** further has each of its surfaces napped to provide a flannel diaper material.

The flannel diaper material **50** is folded and secured to form the prefolded and secured diaper **53**, shown in FIGURES 11 and 12. The prefolded and secured diaper **53** is formed from the diaper material **50**, in the same manner as the above described prefolded and secured diapers **15** and **30** are formed, by first folding the diaper material **50** back upon itself in a reverse fold along a first fold line **54** which is spaced from and parallel to the left selvage edge **32**, as viewed in FIGURES 11 and 12. The diaper material extending from the left selvage edge **52** to the first fold line **54** defines a first layer and the material folded back on itself from the first fold line **54** defines a second layer extending therefrom toward the left selvage edge **52**. This second layer is folded back upon itself to form a second reverse fold along a second fold line **55** parallel to the first fold line **54** and extending inwardly from the left selvage edge **52** between the selvage edge **52** and the fold line **54**. The last mentioned folded over material forms a third layer extending to the right from the second fold line **55** past the first fold line **54** to the right selvage edge **52**, as viewed in FIGURES 11 and 12.

In the thus folded flannel diaper, the three folded over layers form a center panel **56** located between fold lines **54** and **55**. The portion of the first layer extending from the left selvage edge **52** to the second fold line **55** forms a first side panel **57** and the portion of the third layer extending from the right selvage edge **52** to the first fold line **54** forms a second side panel **58**. These panels **56**, **57** and **58** and the prefolded flannel diaper **53** now have a longer dimension corresponding to the cut length of the diaper material **50** and the side panels **57** and **58** extend transversely outwardly from the center panel **56**.

The above described prefolded diaper **53** is permanently secured together by lines of stitching **59** parallel with and closely adjacent to the first and second fold lines **54** and **55**. The cut edges **51** may be provided with overedge stitching **60** to prevent any raveling at these cut edges.

As illustrated in FIGURE 9, the diaper material **50** was cut from a continuous web prior to folding and sewing for convenience in illustration. However, it is to be understood that the folding and sewing operation could be performed before cutting of the desired length of diaper material and this would probably be the sequence in automatic machines.

The thus formed prefolded and secured flannel diaper provides longitudinal side edges comprised of selvages **52** which will satisfactorily resist wear imparted to these side edges by normal laundering of the prefolded and secured diaper **53**. By this novel fold, the center panel **56** may be formed wider than normal for a conventional size prefolded diaper **53** from narrower than normal diaper material **50**. The latter is possible for the reasons given above in connection with the prefolded diapers **15** and **33**. Also, the selvanges **52** forming the longitudinal edges of this prefolded diaper **53** are woven narrower than normal to prevent turning over and unevenness for the same reasons as discussed above in connection with the prefolded diapers **15** and **33**. The examples of diaper dimensions given above in connection with the prefolded diaper **15** also applied to this prefolded flannel diaper **53** and will not be repeated.

From this description it may be seen that a prefolded and secured diaper may be formed from a double ply gauze diaper material or from a single ply birdseye or flannel woven diaper material. These diaper constructions, when formed in the novel manner set out above, provide a thickened center panel which can be formed wider than normal with narrower than normal diaper

material to provide greater absorbency in the center portion of the diaper and which will utilize the selvages of the diaper material as the longitudinal edges of the prefolded diaper to prevent wear therealong. These selvages are woven narrower than normal to prevent turning over and unevenness along the longitudinal edges of the prefolded diaper.

This invention has been described in detail above for purposes of illustration only and is not intended to be limited by this description or otherwise except as defined in the appended claims.

What is claimed is:

1. A generally rectangular prefolded diaper having a long dimension and a short dimension and formed from diaper material having selvage edges, said prefolded diaper comprising an absorbent center panel formed of a plurality of layers of diaper material and side panels extending transversely outwardly from said center panel and having outer longitudinal edges, said panels extending along the long dimension of said diaper in a generally parallel relationship, said prefolded diaper being permanently secured together in the prefolded condition, and said prefolded diaper being folded with a multiple reverse fold so that said outer longitudinal edges thereof extend along the long dimension of said diaper and are formed by said selvage edges to resist wear along said outer longitudinal edges and provide maximum wear resistance and so that a conventional size prefolded diaper with a wider-than-normal center panel may be formed from narrower-than-normal diaper material.

2. A prefolded diaper, as set forth in claim 1, in which said selvage edges are woven narrower-than-normal to prevent turning over and unevenness along said longitudinal edges.

3. A prefolded diaper, as set forth in claim 2, in which said selvage edges are approximately 1/32 of an inch wide.

4. A prefolded diaper, as set forth in claim 1, in which said diaper material is approximately 28 inches wide, said prefolded diaper is approximately 14½ wide, and said center panel is approximately 6½ wide.

5. A prefolded diaper, as set forth in claim 1, in which said diaper material comprises a woven gauze material.

6. A prefolded diaper, as set forth in claim 1, in which said diaper material comprises a birdseye woven material.

7. A prefolded diaper, as set forth in claim 1, in which said diaper material is woven in a plain weave and has at least one nap surface thereon to provide an absorbent flannel diaper material.

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