

Jan. 8, 1963

S. J. JAMISON

3,072,124

DIAPER

Original Filed Oct. 28, 1959

2 Sheets-Sheet 1

Fig. 1.

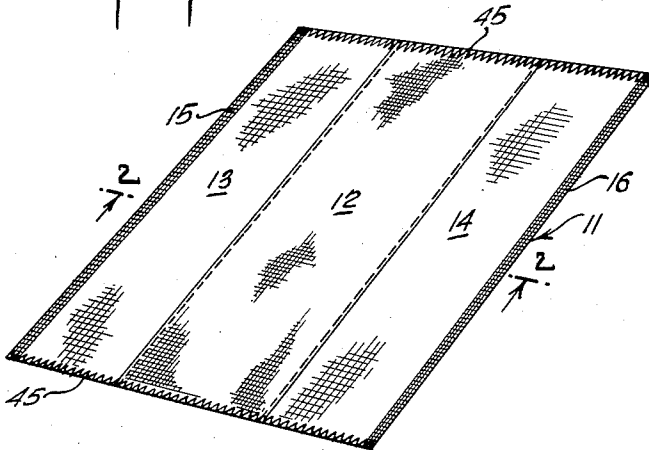


Fig. 2.

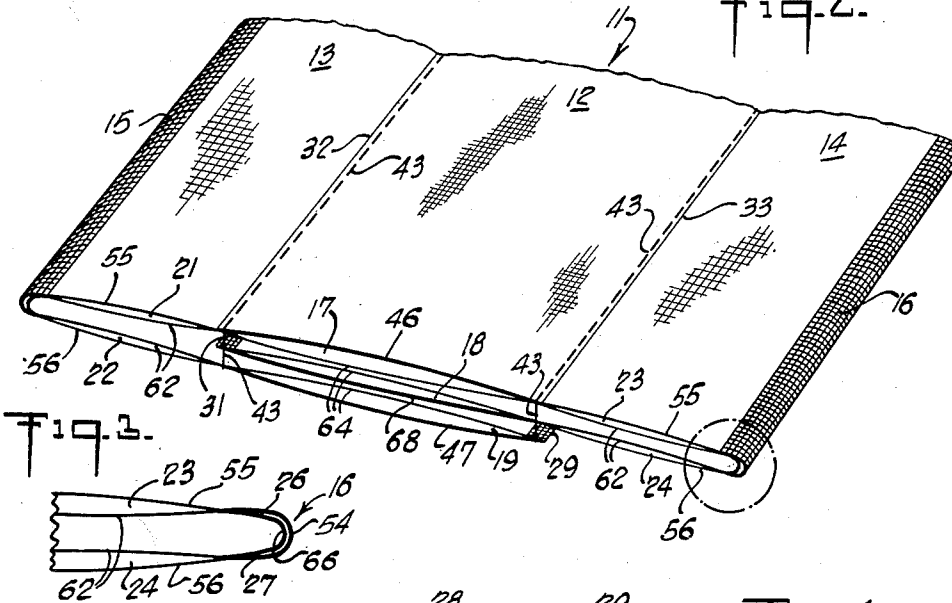


Fig. 3.

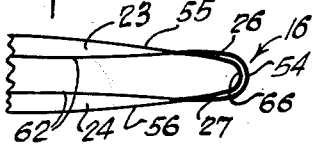
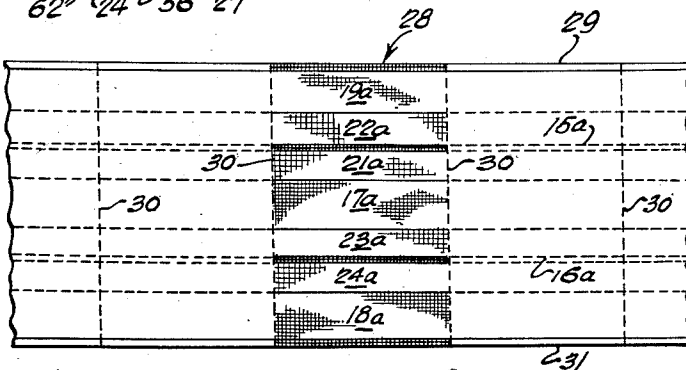


Fig. 4.



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Fig. 5.

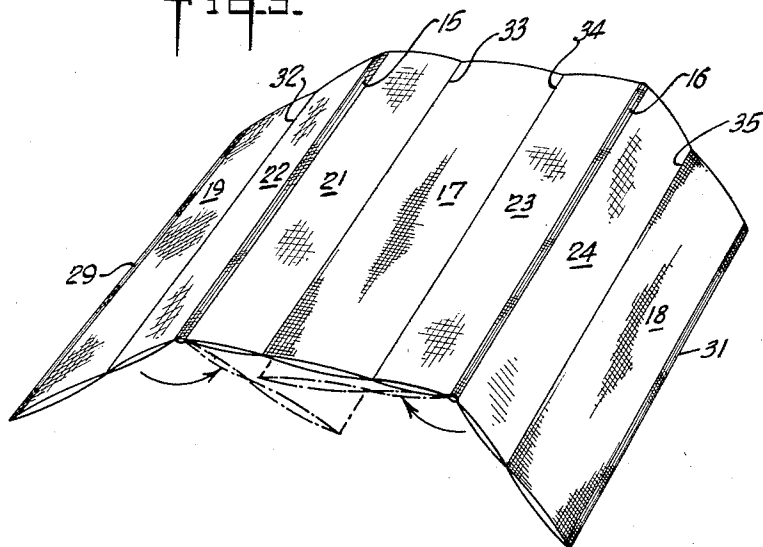


Fig. 6.

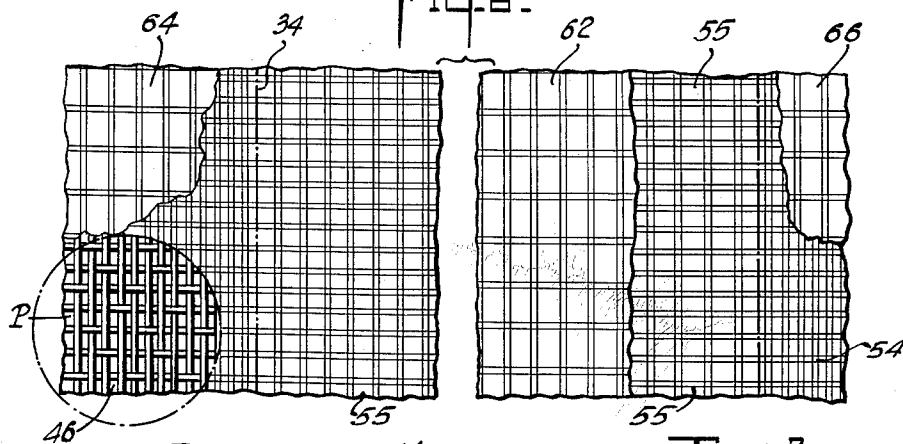
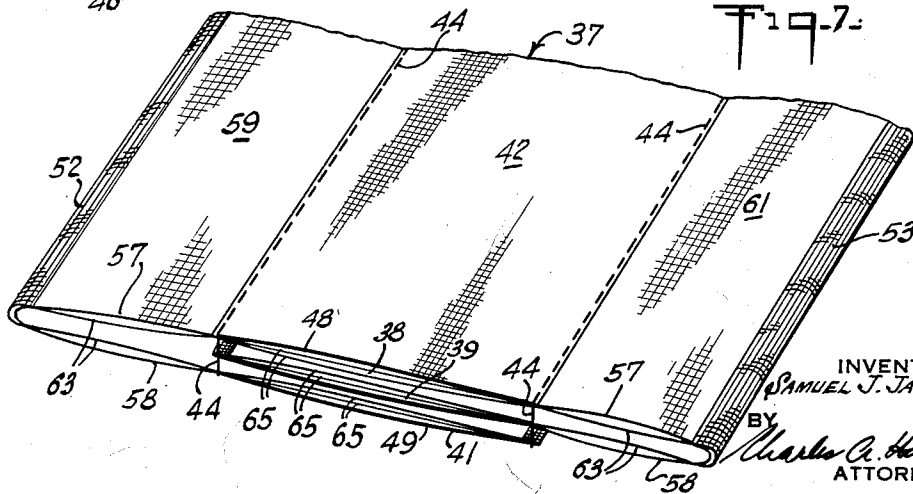


Fig. 7.



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3,072,124
DIAPER

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Continuation of application Ser. No. 849,414, Oct. 28,
1959. This application Mar. 5, 1962, Ser. No. 179,273
13 Claims. (Cl. 128—284)

The present invention relates to prefolded woven di-
apers, more particularly to prefolded diapers in the form
of multiple layers of absorbent diaper cloth of a ma-
terial such as cotton.

This application is a continuation of my copending ap-
plication Serial Number 849,414, filed October 28, 1959
and now abandoned, which, in turn, in a continuation-in-
part of my application Serial Number 732,875, filed May
5, 1958, and now abandoned.

Woven diapers for infants are sold in a variety of
forms and in various weaves. They are available mainly
in two forms, i.e., as a single or multiple layer blank
adapted to be folded into a pad to be fitted on an infant
or child, and in a prefolded or shaped pad form which
already is adapted to fit the child. These diapers pres-
ently are available mainly in three types, heavyweight
bird's-eye, single layer flannel, and multiple layer gauze
diaper cloth. Rectangular multiple layer diapers, such
as those formed from gauze diaper cloth, are relatively
new and have been introduced in quantities only in the
last ten years. However, due to their superior perform-
ance characteristics, as compared with the heavyweight
bird's-eye and flannel diapers, they now supply over 50
percent of the total woven diaper market, and it is ex-
pected that such multiple layer diapers eventually may
supplant the "old fashioned" single layer diapers.

The multiple layer diaper, as woven, is in the form of
an elongated rectangular blank which is folded to form
a smaller rectangular pad for application to babies and
young children. For instance, the diaper blank may be
folded transversely to superimpose thirds of its area and
form a diaper pad having a length corresponding to the
width of the blank prior to folding. When a two layer
gauze diaper of this type is folded in thirds, as described
above, a six layer diaper pad is formed which possesses
superior softness, absorbency, drying characteristics, pin-
ability, and the like, as compared with pads formed from
the above-described single layer diapers.

In order to facilitate diapering as well as handling and
washing by diaper services and consumers, gauze diapers
have been folded by diaper manufacturers and sewn or
otherwise secured in the folded position to provide a pre-
folded diaper or diaper pad which is ready to be applied
to a baby or child. The prefolded gauze diapers possess
all the advantages that are mentioned above for the folded
multiple layer gauze diaper blank. However, when a
prefolded diaper is formed merely by folding a two layer
gauze diaper blank into thirds to form a six layer diaper
pad, as described above, the material of the diaper is dis-
tributed more or less uniformly throughout the pad and
not centrally of the diaper where it is most needed.
Gannon Patent 2,600,634, granted June 17, 1952, de-
scribed a prefolded diaper which solves this problem. In
the Gannon structure the blank is folded in such a way
that a heavier multiple layer panel is formed in the center
of the diaper extending along its longitudinal center line.
According to Gannon, side panels are created on both
sides of the central panel and if the sheet, or blank 10, of
Gannon is assumed to be a two layer gauze diaper fabric,
then there will be eight layers of gauze diaper fabric in
the central panel of Gannon and four layers in each of
the side panels. This concentrates the absorbency and
bulk of the diaper along its longitudinal center line where

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it is most needed. Because its bulk is so located, the
Gannon diaper may be fitted much more easily on babies
or children of various sizes, and because of the relatively
low bulk in the side panels, it may be pinned, or secured,
more readily than comparable prefolded diapers. Thus,
a prefolded gauze diaper according to Gannon possesses,
not only all the superior performance characteristics of
gauze diapers in general, but the advantages of prefolded
diapers and the unique qualities of Gannon, i.e., the con-
centration of absorbency where needed, capacity for
easier fitting on babies or children of various sizes, and
improved pinability.

Prefolded diapers have one general disadvantage, i.e.,
a tendency to abrade and wear out in the center of the
diaper and along its longitudinal edges. Generally speak-
ing, the relatively soft gauze diaper cloth will wear more
easily than the above-mentioned heavyweight bird's-eye
and flannel diaper fabrics. In addition, however, when
gauze diaper cloth is folded and sewn so that certain por-
tions of the diaper fabric are held in a fixed position at
the points of maximum wear, their vulnerability is in-
creased and wear becomes more of a problem.

Gauze diapers conventionally are sold in two classes:
lightweight and heavyweight. The over-all, or total, ab-
sorbing capacity of a prefolded gauze diaper is governed
by the total amount by weight of cotton in the diaper.
For this reason, to assure adequate absorbing capacity,
a minimum practical absorbing capacity for prefolded
gauze diapers has become established at approximately
45 grams of cotton before washing. Any change in con-
struction that would reduce the total weight of the diaper
below about 45 grams, therefore, would be unacceptable
for even lightweight gauze diapers. On the other hand,
gauze diapers above a certain weight, say about 65 grams,
before washing, would be prohibitively expensive because
of the great amount of cotton they contain.

It is common for one set of diapers to be used on an
infant from birth until the end of the diapering age. For
this reason, a standard size for the diaper pad, i.e., the
diaper in prefolded form, has become established. This
standard size ranges between about 13.5 inches in width
and 20.5 inches in length and 15.5 inches in width and
22.5 inches in length, prior to washing. Size is consid-
erably reduced after several washings, due to shrinkage.
For instance, a 14 x 21 inch prefolded gauze diaper may
be reduced to a 12 x 18 diaper after, say, 10 washes, and
this would be considered good from the standpoint of
shrinkage.

The present invention contemplates a prefolded, rec-
tangular multiple layer woven diaper comprising a longi-
tudinally extending central panel and a side panel on
each side of the central panel between the central panel
and each longitudinal edge portion of the diaper. Each
of the side panels, in turn, comprises a top and bottom
half of diaper fabric. The longitudinal edge portions
of the diaper are folded in the shape of a U having one
of its legs connected to the top half of the adjacent side
panel and the other of its legs connected to the other
half of the adjacent side panel, and the central panel
comprises superimposed top, middle and bottom sections
of diaper fabric, each of which connects with one or
more of the halves of the side panels.

According to one embodiment of the invention, a wear-
resistant prefolded rectangular multiple layer diaper is
provided which is completely balanced. The diaper is
woven as a unit with its warp yarns extending longitu-
dinally thereof and its filling yarns extending transversely
and with selvages along its warpwise edges. The longi-
tudinal edge portions and the side and central panels are
located and folded with respect to one another in such
a way that one of the selvages extends along one of the
longitudinal edges of the central panel and the other of

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the selvages extends along the other of the longitudinal edges of the central panel with the result that the only permanent folds in the diaper are along its opposite longitudinal edges, thereby providing a prefolded diaper which is completely symmetrical about its longitudinal center line and therefore completely balanced from a shrinkage point of view. To accomplish this, the top section of the central panel is woven integral with the top halves of the side panels, the middle half of the central panel is woven integral with the bottom half of one of the side panels, and the bottom section of the central panel is woven integral with the bottom half of the other of the side panels. To provide the desired wear resistance, the fabric densities of the individual top and bottom layers of the central panel and the individual U-shaped outer layers of the longitudinal edge portions are substantially greater than a fabric density in the range of conventional gauze diaper cloth. In one form, the warp end count of the individual top and bottom layers of the central panel and the outer layer of the U-shaped longitudinal edge portion is at least about $1\frac{1}{2}$ times a warp end count in the range of conventional gauze diaper cloth. In this form the multiple layer central panel is heavier and possesses greater absorptive capacity than either of the multiple layer side panels.

According to another embodiment of the invention, each of the longitudinal edge portions and each of the sections of the central panel comprises at least two layers of diaper fabric, and the fabric densities of the individual top and bottom layers of the central panel and the individual U-shaped outer layers of the longitudinal edge portions is substantially greater than a fabric density in the range of conventional gauze diaper cloth to provide wear-resistant surfaces in those portions of the diaper which are most vulnerable to wearing forces. Ordinarily, also, the fabric density of the individual top and bottom layers of the central panel and the individual U-shaped outer layers of the longitudinal edge portions is substantially greater than that of the outer layers of the top and bottom halves of the side panels. Normally, the warp end count of the former is approximately $1\frac{1}{2}$ times that of the latter.

According to still another embodiment of the invention, each of the sections of the central panel comprises at least two layers of diaper fabric and either the U-shaped edge portions of the diaper or the top and bottom halves of the side panels also comprise two layers of diaper fabric; and the two layers of diaper fabric of each of the sections of the central panel and each of the longitudinal edge portions or each of the top and bottom halves of the side panels, as the case may be, are woven together along the edges of each panel and/or each longitudinal edge portion by at least one interlacing yarn to form lines of interlacing which define the longitudinal edges of each of the sections or halves of the panels and each of the longitudinal edge portions.

According to a preferred embodiment of the invention, a prefolded, rectangular multiple layer woven diaper is provided wherein the outer layers of the diaper possess substantially higher fabric density than the inner layers of the diaper in corresponding panels or edge portions thereof, thereby facilitating provision for increased wear resistance without detracting from the total weight of the diaper. This may be accomplished by increasing the warp end count in the outer layers of the central panels and the U-shaped edge portions and decreasing the warp count of the immediately adjacent individual interior layers of the central panel and the edge portions while maintaining the outer layers of the side panels within the range of fabric density for conventional gauze diaper cloth. The filling count of the inner layers of the side panels may be considerably less than that of the outer layers. The same is true of the immediately adjacent interior layers of the central panels. Thus the density of all of the exterior layers of the diaper may be increased

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considerably without adding anything to the total weight of the diaper.

Other and further objects of the invention will be apparent from the following description and claims taken together with the drawings wherein:

FIG. 1 is a view in perspective of a prefolded diaper according to one embodiment of the invention;

FIG. 2 is an enlarged view partly in section and partly in perspective taken along the line 2—2 of FIG. 1;

FIG. 3 is a still further enlarged view of the portion in the circle of FIG. 2 showing the relationship between one of the folded longitudinal edges of the diaper and the top and bottom halves of the adjacent side panel;

FIG. 4 is a somewhat reduced fragmental schematic plan view of a strip of diaper blanks according to the embodiment of FIG. 1, as they are woven;

FIG. 5 is a view in perspective of the diaper of FIG. 1 as its ends are being folded over the center of the diaper to superimpose the respective portions of the central and side panels of the diaper;

FIG. 6 is a greatly enlarged fragmental plan view of a portion of the diaper of FIG. 1 showing variations in fabric density and end count between various portions of the diaper; and

FIG. 7 is a view, similar to FIG. 2, showing a diaper according to still a different embodiment of this invention.

Referring to FIGS. 1-3 of the drawings, there is shown a prefolded rectangular multiple layer woven diaper 11 which comprises a longitudinally extending central panel 12 and side panels 13 and 14 on each side of the central panel between the central panel 12 and the longitudinal edging portions 15 and 16 of the diaper. The central panel 12 of the diaper comprises superimposed top, middle, and bottom sections 17, 18, and 19, respectively, while the side panels 13 and 14 comprise top and bottom halves 21 and 22 and 23 and 24, respectively. Each of the sections of the central panel and the top and bottom halves of the side panels is made up of two layers of diaper fabric. There are only two permanent folds in the diaper of FIGS. 1-2 and these form the longitudinal edging portions 15 and 16 of the diaper. Each of these longitudinal edges is folded in the shape of a U and is connected to the adjacent side panel in the same way. Referring to the edge portion 16 in FIGS. 2 and 3, for example, one of its legs 26 is connected to the top half 23 of the adjacent side panel and the other of its legs 27 is connected to the bottom half 24 of this panel. The individual U-shaped edging portions 15 and 16 of the diaper also comprise two layers of diaper cloth.

The diaper 11 is woven as a unit with its warp yarns extending longitudinally of the diaper pad of FIGS. 1-3, or parallel to the edge portions 15 and 16, and its filling yarns extending transversely thereof. It is folded from an elongated rectangular blank and then sewn together. As shown in FIG. 4, the diaper blanks are woven in a continuous strip 28 having selvages 29 and 31 along its edges. The blanks are formed by cutting the strip fillingwise from selvage to selvage along transversely extending lines 30 which are spaced warpwise at intervals along the strip 28 corresponding to the desired diaper pad length. The top, middle, and bottom sections 17, 18, and 19 of the central panel 12 and the top and bottom halves 21 and 22 and 23 and 24 of the side panels 13 and 14, respectively, are woven as bands 17a, 18a, and 19a, 21a, and 22a, and 23a, and 24a, respectively, extending warpwise of the strip in spaced relation fillingwise thereof. In addition, the edging portions 15 and 16 of the diaper, i.e., those which, in the pad, are folded in the shape of a U, are woven in the strip as narrow spaced bands 15a and 16a respectively which also extend warpwise of the strip. The respective bands are spaced in such a way that when a blank is cut from the strip 28, the bands, representing the top, middle, and bottom sections of the central panel and the top and bottom halves of the side panels, are

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superimposed in their proper relation merely by folding the blank about the narrow edging portions 15 and 16. This is illustrated in FIG. 5 wherein the diaper blank corresponding to the prefolded diaper pad 11 of FIG. 1 is shown after it has been cut from the strip 28 and the operation of folding the ends of the blank about the edging portions 15 and 16 has just begun. Referring in particular to FIGS. 2 and 5 of the drawings, the order of occurrence of the various portions of the blank, beginning at one selvage 29 of the blank is as follows: the bottom section 19 of the central panel, the bottom half 22 of the first side panel, the first edging portion 15, the top half 21 of the first side panel, the top section 17 of the central panel, the top half 23 of the second side panel, the second edging portion 16, the bottom half 24 of the second side panel, the middle section 18 of the central panel, and finally, the other selvage 31. Each of the halves 21 through 24 of the side panels 13 and 14 and the sections 17 through 19 of the central panel 12 is woven in two layers which are woven together along their longitudinal edges at 32, 33, 34, and 35 where they join each other by at least one interlacing yarn to form lines of interlacing defining the longitudinal edges of their respective panels. They also are woven together in this way along the longitudinal edges of the reinforcing portions 15 and 16 adjacent the longitudinal edges of the diaper. The top sections 17 of the central panel 12 is woven integral with and adjoins the top halves 21 and 23 of the side panels 13 and 14, the middle section 18 of the central panel is woven integral with and adjoins the bottom half 24 of the second side panel 14, and the bottom section 19 of the central panel 12 is woven integral with and adjoins the bottom half 22 of the first side panel 13. Referring to FIG. 5, it will be seen that the various sections of the central panel 12 and the top and bottom halves of the side panels 13 and 14 are so spaced that when the ends of the blank are folded about the warwise extending edging portions 15 and 16, they will be superimposed in their proper relation to form the central panel and the side panels, respectively. The edging portions 15 and 16, in turn, will form the U-shaped longitudinal edges of the diaper, as shown in FIGS. 2 and 3. As shown in FIG. 2, one of the selvages 31, of the diaper fabric is in the middle section 18 of the central panel 12 extending along one of the longitudinal edges of the central panel and the other selvage 29 is in the bottom section 19 of the central panel extending along the other longitudinal edge of this panel.

In FIG. 7 there is shown a diaper 37 according to a somewhat different embodiment of the invention which is exactly the same in its general construction as the diaper of FIGS. 1-3, with the exception that the top, middle, and bottom sections 38, 39, and 41, respectively, of the central panel 42 of the diaper of FIG. 7 each comprises three layers of diaper fabric as compared with the two layer sections of FIGS. 1-3; thereby providing a nine layer central panel as compared with a six layer central panel for the diaper of FIG. 1-3. In addition, as will be brought out hereinafter in the specification, the relationships between the fabric density, or weights, of the various layers in the central and side panels of the diaper of FIG. 7 may be somewhat different from those of FIGS. 1-3.

Normally, diapers of the type described are woven of cotton fibers in a conventional manner. However, this invention is not limited to any particular kind of material, as long as the material used is at least the equivalent of the cotton fibers normally employed for this purpose in absorbency, hand, strength, etc. All data given for yarn size and the like in this specification is in the cotton system.

As shown in FIGS. 2 and 7, the different portions of the three panels of these diapers are fixed in their proper relationship to one another by lines of stitching 43 and 44, respectively extending through the diaper adjacent the longitudinal edges of the central panels 12 and 42, respectively. In the embodiment of FIGS. 1-5 the ends

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of the various layers of the diaper are secured together, as shown in FIG. 1, by overseaming 45 along the transverse edges of the diaper. In another form of the invention, not shown, the various layers of diaper fabric may be woven together in such a way as to form narrow single layer pinking bands, or bars, of denser fabric extending transversely of the strip 28 along the cutting lines 30. Then, the diaper blanks are cut from the strip by pinning along the pinking bars, as is well known in the art, thereby providing single layer pinked edges extending perpendicular to the selvages of the blank. When such a diaper is folded and sewn together along the aforesaid lines of stitching 43, for instance, it is not necessary that the ends of the diaper be secured by overseaming since the denser single layer pinked edges will not unravel or pull and are quite wear resistant.

The prefolded rectangular multiple layer woven diapers in FIGS. 1-3 and 7 are similar in characteristics and performance to the prefolded gauze diapers of the prior art, but possess improved characteristics over prior art diapers of the same type. These improved characteristics include improved abrasion resistance at the points of maximum wear, i.e., in the top and bottom layers 46 and 47 and 48 and 49 of the central panels 12 and 42 in FIGS. 3 and 7, respectively, and along the exterior surfaces of the U-shaped folded edging portions 15 and 16 in FIG. 2, and 52 and 53 in FIG. 7, respectively, and a simplified construction which allows them to be "put-up" in a single operation, thereby effecting an appreciable savings in cost. These improved characteristics are obtained without sacrificing any of the advantages of the prior art prefolded gauze diapers which are woven of gauze diaper fabric throughout their structure. Thus, total diaper weight and the size of the resulting diaper pad of FIGS. 1-3 and/or FIG. 7 may be kept within acceptable limits for prefolded gauze diapers. The abrasion resistance of the top and bottom layers of the central panels 12 and 42 and the individual outside layers of the U-shaped edging portions 15, 16, 52 and 53 is increased by increasing the fabric density of these layers without decreasing the smoothness, softness, or abrasion resistance of the other exposed surfaces of the diaper appreciably. This is accomplished by increasing the cover or fabric density of the individual top and bottom layers of the central panels 12 and 42 and the outside layers of the edging portions 15, 16, 52 and 53 to a point where it is substantially greater than a fabric density in the range of conventional gauze diaper cloth. When the end counts of the individual top and bottom layers 55 and 56, in FIG. 2, and 57 and 58, in FIG. 7, of the side panels 13 and 14, in FIG. 2, and 59 and 61 in FIG. 7, respectively, are in the range of gauze diaper cloth, the end counts of the top and bottom layers of the central panels 12 and 42 and the outside layers of the edging portions 15, 16, 52 and 53 may be increased to a point where they are substantially greater than the end counts of the layers 55 and 56 to establish this relationship.

In the preferred form of the invention shown in the drawings, the weight of the inner layers 62 in FIG. 2 and 63 in FIG. 7 of the respective side panels and at least some of the inner layers 64 and 65, respectively, of the individual central panels of the diapers of these figures is reduced to provide material for the increased density in the top and bottom layers 46 and 47 in FIG. 2 and 48 and 49 in FIG. 7 of the individual central panels 12 and 42, respectively. Thus, the weight, or density of the side panels is reduced as compared with a prefolded diaper folded according to Gannon 2,600,634 from a multiple layer blank completely woven of gauze diaper cloth.

In the diapers of FIGS. 1-3 and 7, the central panels 12 and 42 are much greater in weight than either of their respective side panels 13 and 14 and 59 and 61 and preferably the weight of each of the central panels is

at least about as great as the weight of the remainder of the individual diapers. Thus, the absorbing capacity and bulk of each of these diapers is concentrated in the central panel and the side panels have relatively low bulk, even less than is possessed by the best of the prior art prefolded gauze diapers, thereby allowing the diapers to be fitted easily on babies or children of various sizes and pinned in position with even greater facility.

To assure acceptable softness, smoothness and wear resistance in the exposed surfaces of the side panels, they preferably are woven of a relatively light and open, gauze-like, gauze diaper fabric which normally, is either plain woven, or dobby woven in a "bird's-eye" pattern. Gauze diaper fabric according to this invention may be woven with an end count of between about 32-48 in the warp and 32-52 in the filling from yarns of about 20s-30s in the warp and 25s-45s in the filling. Normally, in such fabrics, the twist multiplier of both the warp and the filling yarns is less than about 4.75.

Referring to the embodiment of FIGURE 2, for example, to provide a fabric density in the top and bottom layers 46 and 47 of the central panel 12 and in the outside layers, 54 in FIG. 3, of the edging portions 15 and 16 of the diaper which is substantially greater than that of the top and bottom layers 55 and 56 of the side panels 13 and 14, the warp and count of the former, i.e., the layers 46 and 47 is at least about one and one-half (1½) times greater than that of the latter. The filling end count in the top and bottom layers 46 and 47 of the central panel 12 and the outside layers 54 of the edging portions 15 and 16 may be approximately equal to that of the top and bottom layers of the side panels 13 and 14. However, it normally is not desirable that the filling end count in the top and bottom layers of the central panel and the outside layer of the edging portions be any greater than that of the top and bottom layers of the side panels. To provide additional weight in the central panel 12 and reduce the weight of the side panels 13 and 14 in the preferred form of this invention shown, the filling end count of the inner or remaining layers 62 of the side panels, is reduced so that the filling count of the individual top and bottom layers 55 and 56 of the side panels is substantially greater than that of the remaining layers 62, as mentioned above, preferably, at least about twice that of the individual inner layers 62. Similarly, it is preferred that the warp end count of the individual top and bottom layers 46 and 47 of the central panel 12 and the individual outside layers 54 of the U-shaped edging portions 15 and 16 be approximately twice that of the immediately adjacent inner layers 64 and 66 of the central panel and the edging portions, respectively.

FIG. 6 illustrates a preferred density and end count relationship between the various layers of the diaper of FIGS. 1-3, as well as a desirable weave for the most abrasion resistant portion of the diaper. In FIG. 6 all of the warp yarns and all of the filling yarns are of the same size, or number. In diapers of this type, which normally are not woven on box looms, it is a practical necessity that all of the filling yarns be of the same size. Similarly, it is impractical to use different size warp yarns in any regular pattern in the same diaper since this would require the use of multiple beams, a costly arrangement in an operation where cost is of the utmost importance. As shown in FIG. 6, the warp end count of the individual top layer 46 of the central panel 12 and the warp end count of the individual outside layer 54 of the edging portion 16 each is approximately twice that of either the top layer 55 of the side panel 12 or either of the immediately adjacent interior layers 64 or 66 of the central panel 12 or the edging portion 16, respectively. The filling end count in the top layer 55 of the side panel 14 is approximately twice that of the filling end count of the inner layer 62 in the panel 14 and of the aforementioned inner layer 64 of the central panel

12. Referring to FIGURE 2, the bottom layer 47 and one of the inner layers 63 of the central panel 12 is of the same construction, as far as end count and yarn size are concerned, as the top layer 46 thereof. The inner layer 63 is the third one from the bottom of the central panel 12, or the bottom layer of the middle section 18 of the central panel. This arrangement provides a conveniently balanced structure for weaving and "put-up" and is helpful in distributing the weight of the diaper between the central and side panels. The other layer in the middle section 18 of the central panel is of the same warp and filling end count as the inner layers of the central panel 12 which are immediately adjacent the top and bottom layers 46 and 47. Similarly, the warp and filling counts of the individual bottom layers 56 of the side panels 13 and 14 are the same as for the individual top layers 55 shown in FIG. 6. The counts for the remaining inner layer 62 of the side panels 13 and 14 and the interior layer 66 of the edging portions 15 and 16 of the diaper also are the same as shown for the layers 62 and 66 in FIGURE 6. The warp and filling yarns in the top and bottom layers 46 and 47 of the central panel 12 and in the outside layer 54 of the edging portions 15 and 16 are interwoven in a 3/1 broken twill as shown in the encircled portion P of FIG. 6 for the top layer 46. All of the other layers in the diaper are woven in a plain weave.

According to this preferred embodiment, the fabric density of the individual top and bottom layers 46 and 47 of the central panel 12 is substantially greater than that of the individual top and bottom layers 55 and 56 of the side panels 13 and 14; the fabric density of the top and bottom layers 15 and 16 of the side panels is at another value which, in turn, is substantially greater than that of the remaining layers in the diaper with the exception of the bottom layer 63 of the middle section 18 of the central panel, this section being of the same construction as the top and bottom layers of the central panel; and the remaining layers of the diaper, i.e., the interior layers of the edging portions, the side panels, and the central panel, with the exception of the middle layer 63 in the central panel, are all of the same construction which is substantially lighter and more open than the rest of the diaper and somewhat below the normal range for gauze diaper fabric. The above-described relationships between the fabric densities and the end counts of the various layers of the diaper of FIGS. 1-6 is illustrative. These relationships can be varied and still allow the provision of an improved diaper in accordance with this invention. This will be apparent from the following examples.

Example 1

A prefolded cotton diaper is woven in strip form, as shown in FIG. 4. Diaper blanks are cut from the strip, folded, and sewn together as shown in FIGS. 1-5 to form a prefolded diaper having the following characteristics:

Finished weight	64.8 grams
Put-up width	15.5 in.
Put-up length	21.1 in.
Warp yarns No.	25s
Filling yarns No.	34.3s

Diaper Layer	End Counts in Yarns/Inch		Weave
	Warp	Filling	
(a) Top and bottom layers of central panel and outside layers of edging portions (as well as bottom layer of middle section of central panel).	80	44	3/1 Satin.
(b) Top and bottom layers of side panels.	40	44	Plain.
(c) All other interior layers.	40	22	Plain.

The resulting diaper pad is soft and smooth on all of its surfaces and possesses excellent absorbency. The top

and bottom layers of the central panel of this diaper and the outside layers of the U-shaped edging portions thereof possess excellent abrasion resistance. This diaper, due to its simple folded construction, may be cut, folded, and sewn more easily than prior art prefolded diapers of comparable absorbency and weight distribution and therefore can be "put-up" with savings in cost.

Example II

A prefolded cotton diaper formed as described in Example I from a diaper blank having the same weight and size and with yarns having the same yarn numbers as the blank of Example I. The end count and weave arrangement is as follows:

Diaper Layer	End Counts in Yarns/Inch		Weave
	Warp	Filling	
(a) Top and bottom layers of central panel and outside layers of edging portions (as well as bottom layer of middle section of central panel).	80	36	3/1 Twill.
(b) Other interior layers of central panel.	40	36	Plain.
(c) Top and bottom layers of side panels.	40	48	Plain.
(d) Interior layers of side panels.	40	24	Plain.

This diaper also is smooth and soft and possesses superior absorbency. Its abrasion resistance in the areas of maximum wear, i.e., the top and bottom layers of the central panel and in the outside layers of the edging portions, is excellent. As for the diaper of Example I, the simplified construction of this diaper allows it to be cut, folded, and sewn more easily in a single operation thereby reducing its cost appreciably.

Example III

A prefolded cotton diaper according to the embodiment of FIG. 7 is formed in the same way as described in connection with Example I, the major difference between the diaper of this example and that of Example I being in the number of layers, three in this example and two in Example I, in each of the sections of the central panel. The resulting prefolded diaper has the following construction characteristics:

Finished weight	64 grams
Put-up width	15 in.
Put-up length	22 in.
Warp yarns No.	25s
Filling yarns No.	41s

Diaper Layer	End Counts in Yarns/Inch		Weave
	Warp	Filling	
(a) Top and bottom layers of central panel and outside layers of edging portions (as well as bottom layer of middle section of central panel).	60	36	2/1 Broken Twill.
(b) Other interior layers of central panel.	30	18	Plain.
(c) Top and bottom layers of side panels.	40	48	Plain.
(d) Interior layers of side panels.	40	24	Plain.

Again, the top and bottom layers of the central panel and the outside layers of the edging portions possess excellent abrasion resistance and the "put-up" of the resulting diaper is relatively simple thereby enabling savings in cost. The surfaces of the diaper are relatively soft and smooth and its absorbency is even somewhat higher than the diapers of Examples I and II due to the greater number of layers, i.e., nine it possesses as compared with the diapers of Examples I and II, each of which have six layers in the central panel.

Example IV

A prefolded cotton diaper formed as described in Example I from a diaper blank having the same weight and size and with yarns having the same yarn numbers as the blank of Example I. The end count and weave arrangement is as follows:

Diaper Layer	End Counts in Yarns/Inch		Weave
	Warp	Filling	
(a) All layers of central panel and edging portions.	60	35	2/1 Broken Twill.
(b) All layers of side panels.	40	35	Plain.

The top and bottom layers of the central panel and the outside layers of the edging portions possess excellent abrasion resistance and the "put-up" of the resulting diaper is relatively simple thereby enabling savings in cost as in the foregoing examples.

Having now described the invention in specific detail and exemplified the manner in which it may be carried into practice, it will be readily apparent to those skilled in the art that innumerable variations, applications, modifications, and extensions of the basic principles involved may be made without departing from its spirit and scope.

The invention claimed is:

1. A prefolded, rectangular multiple layer woven diaper weighing between about 45 and 65 grams and being between about 13.5 inches wide and 20.5 inches long and 15.5 inches wide and 22.5 inches long, before washing, and which comprises a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at least 2 layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the warp end count in the individual top and bottom layers of the central panel being substantially greater than the warp end count in the individual top and bottom layers of said side panels and at least the immediately adjacent interior layers of said central panel, the filling end count in the individual top and bottom layers of said side panels being substantially greater than the filling end count of the individual remaining layers in said side panels, and the end count being between about 32 and 48 in the warp and 32 and 52 in the filling, and the yarns being between about 20s and 30s in the warp and 25s and 45s in the filling in size in the individual top and bottom layers of said side panels.

2. A prefolded diaper according to claim 1 wherein the warp end count in the individual top and bottom layers of the central panel is at least about one and a half (1½) times that of the individual top and bottom layers of the side panels.

3. A prefolded diaper according to claim 1 wherein the warp end count in the outer fabric layer of each of said U-shaped edges is substantially greater than the warp end count in the individual top and bottom layers of said side panels.

4. A prefolded, rectangular multiple layer woven diaper comprising a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least

2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, said central panel comprising superimposed top, middle and bottom sections and each of said sections comprising at least 2 layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the fabric density of the individual top and bottom layers of the central panel being substantially greater than the fabric density of the individual top and bottom layers of said side panels, the fabric density of the individual top and bottom layers of said side panels being substantially greater than the fabric density of the individual remaining layers in said side panels, and the individual top and the bottom layers of said side panels having a fabric density in the range of conventional gauze diaper cloth.

5. A prefolded diaper according to claim 4 wherein the fabric density in the outer fabric layer of each of said U-shaped edges is substantially greater than the fabric density of each of the individual top and bottom layers of said side panels.

6. A prefolded, rectangular multiple layer woven gauze diaper comprising a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, the warp end count in the outer fabric layer of each of said U-shaped edges being at least about one and one half ($1\frac{1}{2}$) times the warp end count in the individual top and bottom layers of said side panels, said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at least 2 layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the warp end count in the individual top and bottom layers of the central panel being at least about one and one half ($1\frac{1}{2}$) times greater than the warp end count of the individual top and bottom layers of said side panels, the filling end count in the individual top and bottom layers of said side panels being substantially greater than the filling end count of the individual remaining layers in said side panels, and the warp and filling end counts and yarn sizes in the individual top and bottom layers of said side panels being in the range of conventional gauze diaper cloth.

7. A prefolded, rectangular multiple layer woven gauze diaper comprising a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, the warp end count in the outer fabric layer of each of said U-shaped edges being at least about one and one half ($1\frac{1}{2}$) times the warp end count in the individual top and bottom layers of said side panels, said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at least 2 layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the top section of the central panel being woven integral with the top halves of said side panels, the middle sec-

tion of the central panel being woven integral with the bottom half of one of said side panels, and the bottom section of said central panel being woven integral with the bottom half of the other of said side panels, the warp end count in the individual top and bottom layers of the central panel being at least about one and one half ($1\frac{1}{2}$) times greater than the warp end count of the individual top and bottom layers of said side panels, the filling end count in the individual top and bottom layers of said side panels being substantially greater than the filling end count of the individual remaining layers in said side panels, and the warp and filling end counts and yarn sizes in the individual top and bottom layers of said side panels being in the range of conventional gauze diaper cloth.

8. A prefolded, rectangular multiple layer woven gauze diaper comprising a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, the warp end count in the outer fabric layer of each of said U-shaped edges being at least about one and one half ($1\frac{1}{2}$) times the warp end count in the individual top and bottom layers of said side panels, said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at least 2 layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the top section of the central panel being woven integral with the top halves of said side panels, the middle section of the central panel being woven integral with the bottom half of one of said side panels, and the bottom section of said central panel being woven integral with the bottom half of the other of said side panels, one of the selvages of the diaper fabric being in the middle section of the central panel and extending along one of the longitudinal edges of the central panel, the other selvege being in the bottom section of the central panel and extending along the other of the longitudinal edges of the central panel, the only permanent folds in the diaper being along its opposite longitudinal edges, the warp end count in the individual top and bottom layers of the central panel being at least about one and one half ($1\frac{1}{2}$) times greater than the warp end count of the individual top and bottom layers of said side panels, the filling end count in the individual top and bottom layers of said side panels being substantially greater than the filling end count of the individual remaining layers in said side panels, and the warp and filling end counts and yarn size in the individual top and bottom layers of said side panels being in the range of conventional gauze diaper cloth.

9. A prefolded, rectangular multiple layer woven gauze diaper weighing between about 45 and 65 grams and being between about 13.5 inches wide and 20.5 inches long and 15.5 inches wide and 22.5 inches long and which comprises a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, the warp end count in the outer fabric layer of each of said U-shaped edges being at least about one and one half ($1\frac{1}{2}$) times the warp end count in the individual top and bottom layers of said side panels, said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at least 2

layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the top section of the central panel being woven integral with the top halves of said side panels, the middle section of the central panel being woven integral with the bottom half of one of said side panels, and the bottom section of said central panel being woven integral with the bottom half of the other of said side panels, one of the selvages of the diaper fabric being in the middle section of the central panel and extending along one of the longitudinal edges of the central panel, the other selvage being in the bottom section of the central panel and extending along the other of the longitudinal edges of the central panel, the only permanent folds in the diaper being along its opposite longitudinal edges, the warp end count in the individual top and bottom layers of the central panel being at least about one and one half ($1\frac{1}{2}$) times greater than the warp end count of the individual top and bottom layers of said side panels, the filling end count in the individual top and bottom layers of said side panels being substantially greater than the filling end count of the individual remaining layers in said side panels, and the end count being between about 32 and 48 in the warp and 32 and 52 in the filling, and the yarns being between about 20s and 30s in the warp and 25s and 45s in the filling in size in the individual top and bottom layers of said side panels.

10. A prefolded, rectangular multiple layer woven gauze diaper comprising a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, the warp end count in the outer fabric layer of each of said U-shaped edges being at least about one and one half ($1\frac{1}{2}$) times the warp end count in the individual top and bottom layers of said side panels, said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at least 2 layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the top section of the central panel being woven integral with the top halves of said side panels, the middle section of the central panel being woven integral with the bottom half of one of said side panels, and the bottom section of said central panel being woven integral with the bottom half of the other said side panels, the warp end count in the individual top and bottom layers of the central panel being at least about one and one half ($1\frac{1}{2}$) times greater than the warp end count of the individual top and bottom layers of said side panels, and the warp and filling end counts and yarn sizes in the individual top and bottom layers of said side panels being in the range of conventional gauze diaper cloth.

11. A prefolded, rectangular multiple layer woven gauze diaper comprising a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, the warp end count in the outer fabric layer of each of said U-shaped edges being at least about one and one half ($1\frac{1}{2}$) times the warp end count in the individual top and bottom layers of said side panels, said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at

least 2 layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the top section of the central panel being woven integral with the top halves of said side panels, the middle section of the central panel being woven integral with the bottom half of one of said side panels, and the bottom section of said central panel being woven integral with the bottom half of the other of said side panels, one of the selvages of the diaper fabric being in the middle section of the central panel and extending along one of the longitudinal edges of the central panel, the other selvage being in the bottom section of the central panel and extending along the other of the longitudinal edges of the central panel, the only permanent folds in the diaper being along its opposite longitudinal edges, the warp end count in the individual top and bottom layers of the central panel being at least about one and one half ($1\frac{1}{2}$) times greater than the warp end count of the individual top and bottom layers of said side panels, and the warp and filling end counts and yarn size in the individual top and bottom layers of said side panels being in the range of conventional gauze diaper cloth.

12. A prefolded, rectangular multiple layer woven diaper weighing between about 45 and 65 grams and being between about 13.5 inches wide and 20.5 inches long and 15.5 inches wide and 22.5 inches long, before washing, and which comprises a longitudinally extending central panel and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper, each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric, each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at least 2 layers of diaper fabric, said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof, the warp end count in the individual top and bottom layers of the central panel being substantially greater than the warp end count in the individual top and bottom layers of said side panels and at least the immediately adjacent interior layers of said central panel, and the end count being between about 32 and 48 in the warp and 32 and 52 in the filling, and the yarns being between about 20s and 30s in the warp and 25s and 45s in the filling in size in the individual top and bottom layers of said side panels.

13. A prefolded, rectangular multiple layer woven gauze diaper comprising a longitudinally extending central panel; and a side panel on each side of the central panel between the central panel and each longitudinal edge of the diaper; each of said side panels comprising a top and bottom half and each of said halves comprising at least 2 layers of diaper fabric; each of said longitudinal edges being folded in the shape of a U having one of its legs connected to the top half of the adjacent side panel and the other of its legs connected to the bottom half of the adjacent panel, the warp end count in the outer fabric layer of each of said U-shaped edges being substantially greater than the warp end count in the individual top and bottom layers of said side panels; said central panel comprising superimposed top, middle, and bottom sections and each of said sections comprising at least 2 layers of diaper fabric; said diaper being woven as a unit with its warp yarns extending longitudinally of the diaper and its filling yarns extending transversely thereof; the top section of the central panel being woven integral with the top halves of said side panels, the middle section of the central panel being woven integral with the bottom half of one of said side panels, and the bottom section of said central panel being woven integral with the bottom half of

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the other of said side panels; one of the selvages of the diaper fabric being in the middle section of the central panel and extending along one of the longitudinal edges of the central panel, the other selvaige being in the bottom section of the central panel and extending along the other of the longitudinal edges of the central panel; the only permanent folds in the diaper being along its opposite longitudinal edges; the warp end count in the individual top and bottom layers of the central panel being substantially greater than the warp end count of the individual top and bottom layers of said side panels; and the warp end count in the individual top and bottom layers of said side panels being between about 32 and 48 and the

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filling end count and the warp and filling yarn size, in the individual top and bottom layers of said side panels, being in the range of conventional gauze diaper cloth.

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