

June 16, 1959

E. C. LÖNBERG-HOLM

2,890,700

DISPOSABLE DIAPER

Filed Feb. 18, 1954

3 Sheets-Sheet 1

Fig. 2.

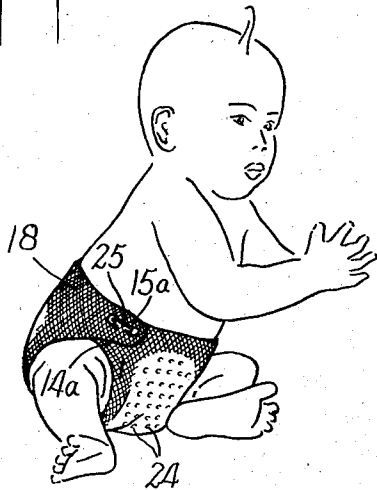


Fig. 1.

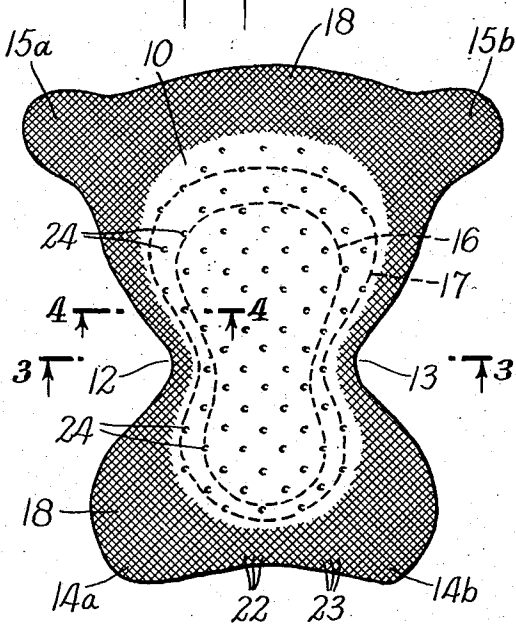


Fig. 3.

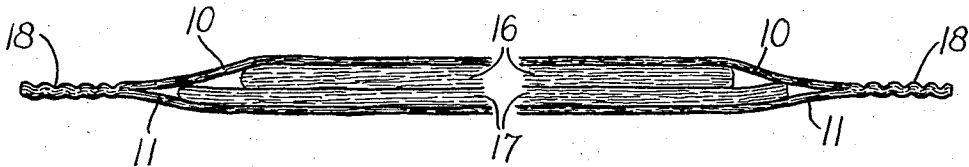
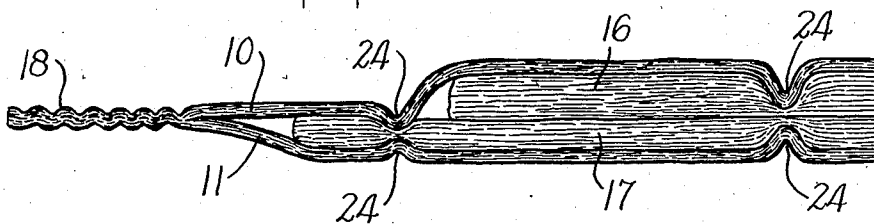


Fig. 4.



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Fig. 5.

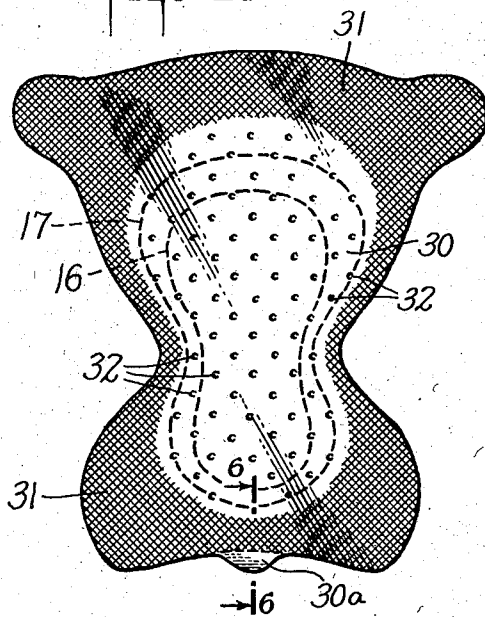


Fig. 6.

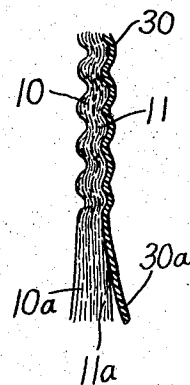


Fig. 7.

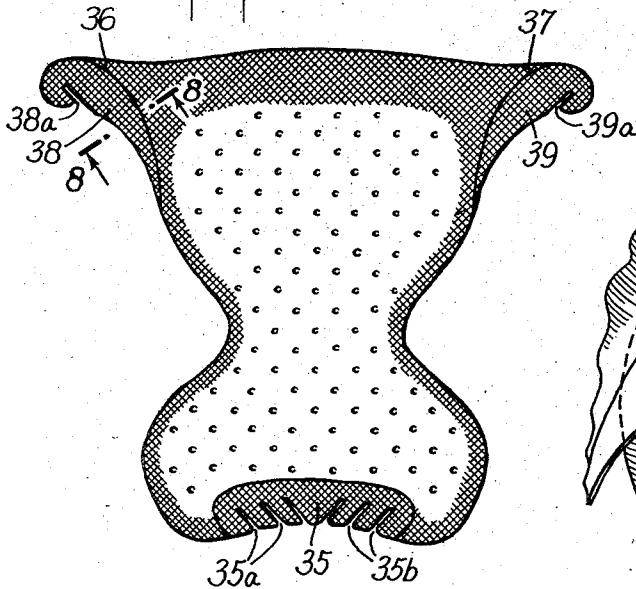


Fig. 9.

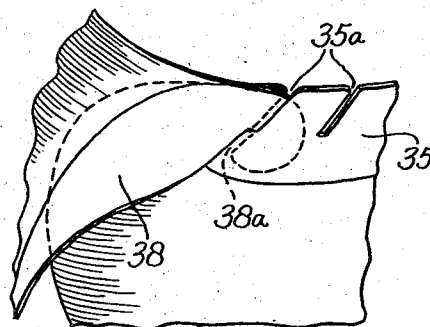
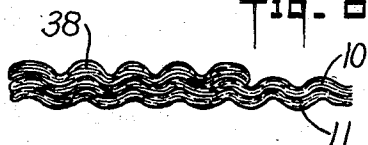


Fig. 8.



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Fig. 10.

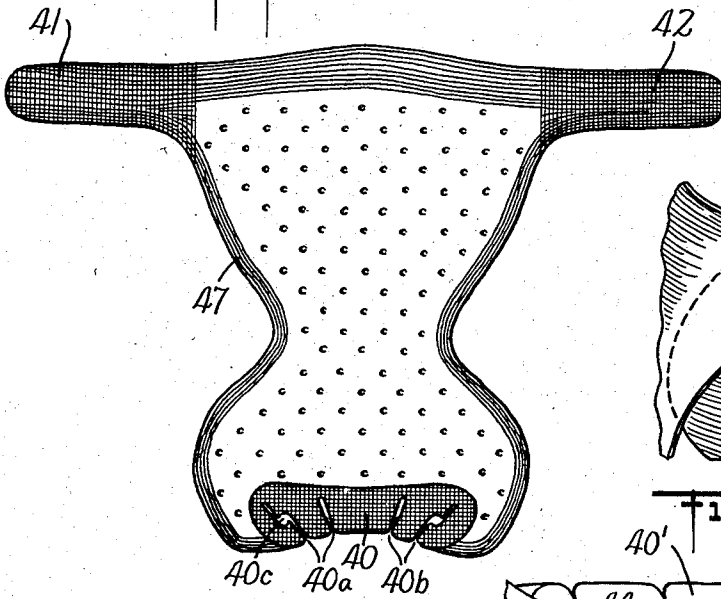


Fig. 11.

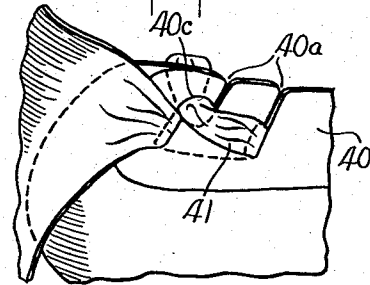


Fig. 11A.

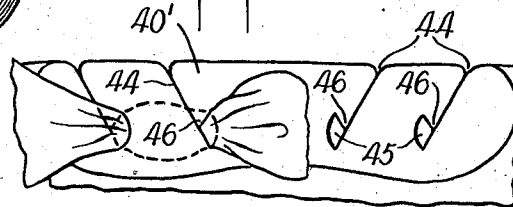


Fig. 12.

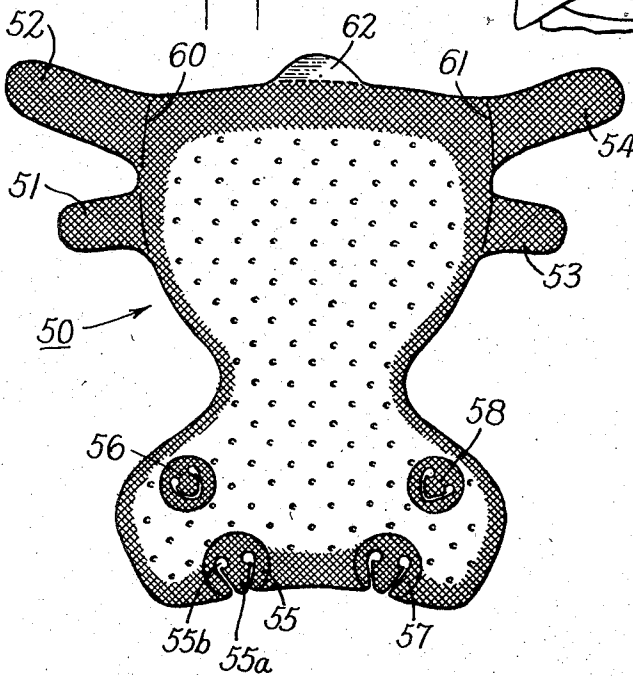
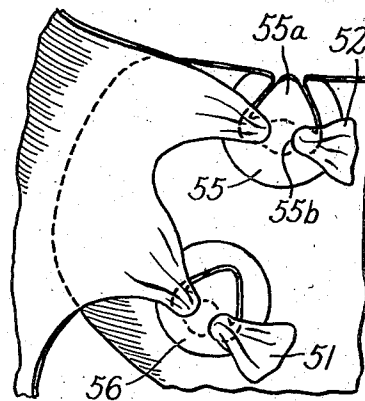


Fig. 13.



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2,890,700

DISPOSABLE DIAPER

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Application February 18, 1954, Serial No. 411,179

14 Claims. (Cl. 128—284)

The invention relates to a disposable diaper particularly of a character adapted to be disposed of in a flushing bowl.

The diaper is adapted to meet conflicting requirements of providing adequate absorbent capacity but at the same time maintain sufficient strength while on the infant, and then be capable of disposal in ordinary flushing bowls without interference with the plumbing circuits.

The diaper embodies a selection and association of kinds of materials, a shaping of the parts and a distribution of the material all cooperating to result in a garment unusually well adapted for the purpose and convenient in use but relatively simple in construction and employing a minimum of material and generally economical to produce. The kind of materials and their arrangement are such that they may be effectively bonded together by simple economical embossing operations which provide the further advantages of enabling the laminations readily to soften and separate when the diaper is immersed in water in the disposal thereof.

In its more detailed and preferred forms the diaper embodies self-contained integral fastening means of a simple but effective and convenient type and which are compatible with and do not interfere with the disposition of the used diapers by flushing away in the plumbing systems.

The invention accordingly comprises a garment possessing the features, properties, relation of elements, and method of assembly exemplified by the representative embodiments of the garment and the procedural steps herein-after described and the scope of the invention will be indicated in the claims.

Reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 is a plan view of an assembled diaper incorporating the basic principles of the invention;

Fig. 2 depicts an infant with the diaper of Figure 1 applied;

Fig. 3 is a cross sectional view on an enlarged scale taken on the line 3—3 of Figure 1;

Fig. 4 is a fragmentary cross sectional view on an enlarged scale taken on the line 4—4 of Figure 1;

Fig. 5 is a plan view of a diaper similar basically to that of Figure 1 but incorporating a waterproof outer sheet and a tab means;

Fig. 6 is a fragmentary cross sectional view on the line 6—6 of Figure 5 showing particularly the tab for peeling away the outer waterproof sheet;

Fig. 7 is a plan view of a diaper embodying the same principles but including a built in integral fastening means;

Fig. 8 is a fragmentary cross sectional view on the line 8—8 of Figure 7;

Fig. 9 is a fragmentary detailed view showing the fastening means engaged;

Fig. 10 is a plan view of a diaper showing a different form of built in fastening means;

Fig. 11 is a fragmentary view showing the manner of

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securing the fastening means of the diaper of Figure 10; Fig. 11a is a fragmentary view showing an alternative simplified variation in the fastening means for the diaper of Figure 10;

Fig. 12 is a plan view of a diaper showing a different type of built in fastening means and including in particular a double fastening means arrangement for closer fitting and more secure fastening of the diaper; and

Fig. 13 is an enlarged fragmentary view showing the fastening means of Figure 12 enlarged.

The more general principles of the diaper construction will be described in connection with the relatively simple form of garment depicted in Figures 1 to 4. It includes inner and outer sheets 10 and 11 respectively, each sheet being composed of several plies of thin tissue loosely laminated together in the initial form, the number of which may be varied in accordance with the circumstances and the particular paper selected but as an example each sheet may comprise three or four such plies. Each ply is individually creped before assembly into the sheet whereby it has greater flexibility and resiliency and more readily lends itself to the joining of the materials together by an embossing step, as will be described below. Materials of the type employed have a grain or direction of fiber and for added strength the sheets may be arranged with the grain in one sheet at right angles to that in the adjacent sheet.

The material of the sheets 10 and 11 is of the type having "wet strength." Such materials are well known commercially and in general are comprised of paper tissue impregnated with a suitable resin. The degree of wet strength may, of course, be varied within a limited range but for the present purposes the material will preferably be substantially of the type now embodied in wet strength facial tissues. The material of sheets 10 and 11 in the assembled diaper must be absorbent of moisture and pervious thereto and be capable of reducing to a soft mass when deposited in water and thereby flushable.

The sheets 10 and 11 and thereby the over-all shape are appropriately contoured. In general the shape is that of an hour glass with the sides having recesses 12 and 13 at the mid portion resulting in a shape having corners or ears 14a and 14b at one end and longer ears 15a and 15b at the opposite end for overlap fastening toward the front side of the infant.

Sandwiched between the two sheets 10 and 11 are filler sections of highly absorbent material. The filler material is appropriately contour shaped and thickness distributed in accordance with the normal requirements. It is essential to provide adequate absorbent capacity with a minimum of bulk and material. Within such objectives the arrangement may vary to some extent but Figure 1 typifies one practical construction in which the main absorbent material comprises two superposed sections 16 and 17 of selected different thicknesses and each of a shape which is generally that of an hour glass somewhat similar to the outer sheets but of smaller dimension so as to be spaced from the edge all around and leave a marginal area 18 where the two outer sheets 10 and 11 are in direct contact. For the most effective distribution of the material it may initially be formed in a plurality of sections of a different thickness, shape and area, comprising in the present case the larger section 17 and the smaller thicker superposed section 16, each section however having front and rear lobe portions with the rear lobe portions larger and in general the filler material being three-way contoured to provide the most efficient absorptive capacity.

The character and kind of material employed for the inner filler parts 16 and 17 may vary, but in general it will be composed of highly absorbent tissue or pulp and in the present case comprises several plies of tissue each

of which is pre-creped to enhance the fluffiness and the absorbent capacity and enable it to disintegrate quickly in a toilet bowl. The sections designated 16 and 17 of different area as disclosed in the specific embodiment shown may be referred to jointly as an insert or pad and it should be understood that when layers or plies are mentioned it is intended to include a mass of fibrous material uniform in character of varying thickness and that the layers need not be physically distinct.

In the formation and assembly of the diaper, with the various laminations arranged as indicated in Figure 3, for example, the sheets and plies are joined and welded together to a sufficient degree to maintain the shape and relation in handling and normal use. A particularly important feature of the invention resides in the selection and arrangement of the materials and the method of joining them. Specifically the marginal area 18 is subjected to an embossing operation between dies having a fine pattern of ridges and depressions which, if desirable, may comprise cross-ridging running in both directions, that is transversely to each other, as indicated by the lines 22 and 23 in Figure 1. Compression between the die plates or rollers, accompanied preferably by heat, employed for the purpose serves to join and weld together the several plies and also the two sheets 10 and 11. In addition to maintaining the assembled relation the embossing imparts greater strength.

The area within the margin 18 is also joined by an embossing operation, but in this case the die means have formations designed to effect "scatter-point" joining or spot welding at relatively widely spaced points only as indicated by the numeral 24. All of the operations may be performed in a single continuous process, i.e. the various plies in continuous strip form with the pads arranged on the bottom sheet are led to a point where the embossing and die cutting are performed in a single simultaneous operation. In the application of heat and pressure at the localized spaced areas 24 the fibers are interlocked and sufficiently welded together at such points as to maintain the assembled relation of the parts but without substantial interference with the absorptive capacity when the diaper is being worn. Also it enables water more quickly to penetrate throughout and the parts to disintegrate in a flushing bowl in the disposal thereof.

The diaper may have incorporated therein means for fastening it on the child, but in the simplified form of Figure 1 the fastening means is intended to comprise auxiliary pins or like devices. Figure 2 shows the diaper of Figure 1 applied to a child and it will be seen that it is appropriately contoured to provide a relatively close fit, particularly around the leg openings, and to cover snugly the small of the back and also to enable the diaper to be fastened in place by overlapping the ear 15a onto the ear 14a and securing the parts together by a safety pin 25, the ears 14b and 15b being similarly joined at the opposite side. It will be noted that the diaper may be applied and fastening effected toward the front without the necessity of twisting the infant, and that the extended reinforced pinning area provides a variation in adjustment for variation in the size of the infant. Also a plurality of pins may be employed.

The used diaper may be disposed of by folding it over along the longer axis, tearing it into halves through the narrowed part at the recesses 12 and 13 by grasping the ear parts 14a and 14b in one hand and the ear parts 15a and 15b in the other hand, and depositing the torn halves in a flushing bowl. In a relatively short time the materials either completely disintegrate, particularly the filler parts, or at least soften into flushable masses. Since the sheets 10 and 11 and the plies thereof are joined only by embossing, when the materials soften the laminations will readily separate.

Figures 5 and 6 show a form of diaper which in general is similar to that of Figure 1 having similar outer sheets 10 and 11 and inner sections 16 and 17, but having in-

corporated an outer layer of waterproof material 30 corresponding in shape to the sheets 10 and 11. This outer sheet may vary to some extent in type, thickness and material but materials particularly useful for the purpose comprise, for example, a tensilized Pliofilm or polyethylene film. Such materials are not only strong and substantially impervious to water but are also chemically inert and harmless to an infant's skin. If desired the film may be suitably colored. The material may be obtained and used in very thin and therefore economical sheets and still be effective. Polyethylene, for example, may be employed for the purpose comprising a preformed film having a thickness of about .00075 inches. As a manufacturing economy the polyethylene may be extrusion laminated directly onto the paper in a continuous process. Advantageously the waterproof sheet may be joined to the diaper in the single embossing operation of joining the other plies and sheets together, such embossing being indicated in Figure 5 at 31 for the marginal portions and at 32 for the inner spot embossing. The joining of the various layers will be effected usually by the simultaneous application of heat and pressure.

The diaper shown in Figures 5 and 6 incorporates a further feature of advantage in connection with the waterproof sheet 30 such feature comprising the tab portions 10a, 11a and 30a for the respective sheets 10, 11 and 30. The tab portion 30a is not embossed to the adjacent sheet 11a but is left free whereby, in disposing of the diaper, the tab 30a may be grasped and the waterproof sheet 30 peeled away from the adjoining sheet and the remaining diaper thereupon may be disposed of in a toilet bowl in the manner previously described in connection with the diaper of Figure 1.

Figures 7, 8 and 9 show a diaper with a built in fastening means which renders unnecessary the use of auxiliary devices, the fastening means being of a character which does not interfere with the ready disposition of the diaper in a flushing bowl. The diaper, as to the various main layers of material, is substantially like that of the preceding figures in the drawings, but the lower end of the diaper in Figure 7, corresponding to the front of the diaper when applied to an infant, is provided with a reinforced area 35 and the opposite corners 36 and 37 at the other end of the diaper are provided with complementary reinforced areas 38 and 39. The reinforcement may be effected in various ways. In some cases, with the proper thickness and selection of materials, the main sheets of the diaper may be directly impregnated with a stiffening material such as a starch which readily dissolves in water. Such a stiffening material may be either a natural vegetable starch or what is known as a synthetic plastic starch. Preferably, and in order to insure adequate reinforcement and stiffness at the areas in question, it may be desirable to form the areas 35, 38 and 39 by applying patches of material thereto. The patches may be composed of several plies of tissue similar, for example, to that employed for the sheets 10 and 11 comprising the outer layers, or composed of several layers of coarse gauze, the patches being impregnated with a soluble material such as a starch as described. In the embossing operation the patches are compressed and welded to the adjoining sheet in a manner similar to and concurrently with the joining of the main sheets together. Other types of material may be employed for the patches and bonded to the other sheets in a modified manner such as by inlay-embossing, or by employing patches having a surface coating of heat-sensitive material such as a resin of a suitable type, and the patches being applied by the use concurrently of heat and pressure. If desired the patches may be easily peeled off before flushing the used diaper. The diaper of Figure 7 may embody an outer sheet of waterproof material similar to that described in connection with Figures 5 and 6. In that connection the diaper may include the refinement that the patches described are applied to the outer surface of the waterproof sheet and are removed

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therefore with the waterproof sheet when the latter is peeled off. In the form in which the patches are removable either separately or with the waterproof sheet, the patches need not necessarily be of a character which will soften materially when immersed in water.

The reinforced areas are provided with interlocking parts which may vary in character or shape and specific location, but in the particular diaper of Figure 7 the reinforced area 35 is provided with a series of slots 35a and 35b and the reinforced tongues 38 and 39 are provided with slits 38a and 39a respectively thereby forming hook portions which may be selectively engaged in the respective slits 35a or 35b as the case may be, as specifically illustrated in Figure 9. The provision of a series of notches in the reinforced area 35 enables the diaper to be adjusted as to size. No harsh uncomfortable part contacts the skin of the infant.

A further form of diaper fastening means is shown in Figures 10, 11 and 11a in which the lower end corresponding to the front of the diaper is provided with a reinforced area 40 which may be produced in a manner similar to that described for the area 35 in Figure 7, and the opposite end of the diaper is provided with a pair of flexible, embossed tongues 41 and 42 adapted to be interlaced in notches in the reinforced area 40 such as the notches 40a and 40b respectively shown in Figure 10 in any suitable manner to hold securely such as by the laced arrangement shown in Figure 11 in which the tongue 41 is laced down through one notch 40a and up through the next notch 40a and then may be hooked around into and through the enlarged opening area 40c as shown. Figure 11a shows an alternative arrangement of simple form resulting in a smooth thin fastening in which the reinforcement 40¹ has slots 44 and openings 45 providing pointed tips 46. The tongue 41, or 42, may be slid edgewise into the slots as shown and the points 46 grasp and hold the tongue. In Figure 10 the marginal embossing is shown as merely closely arranged ridges or undulations 47 extending parallel to the edge throughout which may in some cases result in adequate bonding together of the sheets and layers. If added strength and bonding are desired at the tongue portions 41 and 42, however, they may be compressed by a closer pattern of embossing as by means of ridges extending in two directions arranged transversely to each other.

Figures 12 and 13 show a somewhat similar construction embodying additional or more complete fastening means. The diaper 50 there shown has at the upper end corresponding to the back portion of the diaper two tongues 51 and 52 at the left and similar tongues 53 and 54 at the right in Figure 12. The opposite or front end of the diaper is provided with reinforced areas 55, 56, 57 and 58 which may be obtained by compressing thereon in the embossing operation patches of reinforcing material or otherwise reinforced in accordance with the procedure described in connection with Figure 7. The specific means for receiving the tongue portions 51 to 54 may be varied in type and shape. An effective arrangement is shown comprising the formation of an arrow or tongue, as indicated for example at 55a, with side slits and enlarged openings 55b communicating with the side slits whereby the respective tongues 51 to 54 may be interlaced in the respective openings in a manner as indicated in Figure 13. Preferably the tongues 51 to 54 are strengthened by criss-cross embossing.

Each of the various forms of diapers described and illustrated in the drawings may be provided with an outer sheet of waterproof material similar to that indicated at 30 in Figures 5 and 6. In the diaper of Figure 12 it is not necessary that such a waterproof sheet extend over all of the reinforced tongue areas and, as indicated by lines 60 and 61 the waterproof sheet extends from the body portion outwardly only to the base of the tongues 51 to 54. Desirably the waterproof sheet may have a tab suitably located such as indicated at 62 in Figure 12,

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the tab being free and unbonded to the underlying sheets whereby it may be readily peeled away in the disposing of the diaper after use.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in carrying out the above method and in the article set forth without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A contoured disposable diaper comprising inner and outer sheets of material absorptive of moisture but having substantial wet strength the side edges being recessed inwardly to provide leg openings, and a plurality of layers of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets of lesser extent than the outer sheets to provide an encircling marginal area of direct contact between said sheets, said sheets being sealed together by a close pattern embossing throughout said marginal area, and the various layers of material within said margin being joined together by spot embossing.

2. A disposable diaper having in combination inner and outer sheets each composed of a plurality of plies of creped tissue absorbent of moisture but having substantial wet strength, and superposed layers of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets the respective layers being selectively contoured as to area and thickness and differing in area from each other to provide a selectively varied thickness of absorbent material and all of said layers being of lesser extent than the outer sheets to provide an encircling marginal area of direct contact between said sheets, said sheets being joined and sealed together by a close pattern embossing around said marginal area, and the successive layers of material including said sheets within said margin being joined together by an interrupted pattern of spaced spot embossing.

3. A disposable flushable diaper having in combination inner and outer sheets each composed of a plurality of plies of creped tissue absorbent of moisture but having substantial wet strength and superposed selectively contoured sections of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets each of said sections being generally oblong with the longer dimension front to back but narrowed transversely at the mid point, but one section being of lesser area than the adjacent section thereby to provide through a variation in thickness of the material a selective distribution of the absorbent material in accordance with the requirements and all of said sections being of lesser extent than the outer sheets to provide an encircling marginal area of direct contact between said sheets, said sheets being sealed together by a close pattern embossing around said marginal area, and the successive layers of material including said sheet within said margin being joined together by spot embossing.

4. A disposable diaper comprising a pair of sheets of light material absorbent of moisture but having substantial wet strength, an outer sheet of thin waterproof material, and superposed sections of material highly absorbent of moisture and readily disintegrable in water sandwiched between said pair of sheets the sections being of different extent of a character to provide a variation in thickness of the absorbent material appropriate to the normal requirements in use of the diaper, and the edges of all of said sections being spaced inwardly from the corresponding edges of said pair of sheets to provide an encircling marginal area of direct contact between said pair of sheets, all of said sheets being bound together around said marginal area by a close pattern embossing, and the successive layers of material in-

cluding all of said sheets being joined together by spaced spot embossing in the area within said margin, said sheet of waterproof material being peelable from the adjacent sheet to enable the remaining diaper to be disposed of in a flushing bowl.

5. A disposable diaper comprising a pair of sheets each composed of a plurality of plies of creped tissue absorbent of moisture but having substantial wet strength, an outer sheet of thin waterproof material, and superposed sections of highly moisture absorbent material readily disintegrable in water sandwiched between said pair of sheets the sections being of different extent of a character to provide a variation in thickness of the absorbent material appropriately contoured to the normal requirements in use of the diaper, and the edges of all of said sections being spaced inwardly from the corresponding edges of said pair of sheets to provide an encircling marginal area of direct contact between said pair of sheets, all of said sheets being bound together around said marginal area by a close pattern embossing, and the successive layers of material including all of said sheets being joined together by spaced spot embossing in the area within said margin, said sheet of waterproof material having a projecting tab at its edge free of the other sheets whereby it may be readily peeled from the adjacent sheet.

6. A disposable flushable diaper comprising a pair of contoured sheets of material absorbent of moisture but having substantial wet strength, and superposed contoured sections of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets of lesser extent than the outer sheets to provide an encircling marginal area of direct contact between said sheets, said sheets being joined and sealed together by a close pattern of embossing around said marginal area and the successive layers of material including said sheets within said margin being joined together by spaced spot embossing, and said diaper having built in integral fastening means comprising areas adjacent the outer edge reinforced and stiffened by means including an impregnant soluble in water, said areas including slotted openings adapted to cooperate with complementary parts to form an interlock.

7. A disposable flushable diaper comprising a pair of contoured sheets of material absorbent of moisture but having substantial wet strength, and superposed contoured sections of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets of lesser extent than said outer sheets to provide an encircling marginal area of direct contact between said sheets, said sheets being joined and sealed together by a close pattern of embossing around said marginal area and the successive layers of material including said sheets within said margin being joined together by spaced spot embossing, and said diaper having built in integral fastening means comprising areas at the margin having auxiliary patches thereover of material adapted to stiffen the areas but being of a character to soften in water said areas being slotted openings, and complementary ear parts at an edge opposite to said areas adapted to engage in the slotted openings.

8. A three-way contoured disposable diaper comprising a pair of sheets of material absorbent of moisture but having substantial wet strength the side edges being centrally recessed inwardly to provide leg openings and four corner ear portions, and superposed contoured sections of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets of lesser extent than the outer sheets to provide an encircling marginal area of direct contact between said sheets, said sheets being joined directly together by a close pattern embossing at said marginal area and the successive layers of material including said sheets within said margin being joined together by spaced-spot em-

bossing, and said diaper having built in integral fastening means comprising a pair of projecting tongue portions at each of the corner portions at one end spaced from each other in the direction away from the corresponding recess and complementary similarly spaced slotted openings at the opposite corners adapted to receive said tongues the areas around the slotted openings being reinforced and stiffened by means including an impregnant soluble in water.

9. A contoured disposable diaper comprising inner and outer shaped sheets of material absorptive of moisture but having substantial wet strength, and an insert of lesser area and extent comprised of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets with a marginal area of direct contact between said sheets, said sheets being fastened together by a close pattern embossing at the marginal area to provide substantial strength, and the various layers of material within said margin being joined by a wide pattern spaced spot embossing to preserve the high moisture absorbent capacity and permit ready dispersion of moisture.

10. A disposable diaper comprising an outer shaped sheet and an inner shaped sheet the latter having substantial wet strength, and an insert of lesser area and extent of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets said insert being shaped in plan and of variable thickness appropriate to the normal variation in required absorptive capacity in use, said diaper having marginal areas beyond said insert joined by a relatively close pattern embossing, and inner areas joined by spaced spot embossing through said insert to permit ready dispersion of moisture and preserve the high moisture absorbent capacity.

11. A disposable diaper having in combination inner and outer sheets each composed of a plurality of plies of creped tissue absorbent of moisture but having substantial wet strength, and an insert pad of lesser area and extent of highly moisture absorbent material readily disintegrable in water sandwiched between said sheets said pad being shaped in plan and of variable thickness appropriate to the normal variation in required absorptive capacity at different areas in use, the outer sheets at areas beyond said pad being joined together by a close pattern embossing, and the central area of the diaper embodying said pad being joined together by an interrupted pattern of widely spaced embossing adapted to permit ready dispersion of moisture.

12. A disposable diaper comprising inner and outer sheet layers of material said inner layer being pervious to moisture and said outer layer embodying an outer surface film of substantial waterproof material, and an insert pad sandwiched between said layers of highly moisture absorbent material readily disintegrable in water said pad being of lesser extent and area than said layers, and said waterproof film being normally secured to the outer layer solely by embossing and readily peelable manually therefrom whereby the remaining diaper part may be disposed of in a flushing vessel.

13. A disposable diaper comprising inner and outer sheet layers of material said inner layer being pervious to moisture and said outer layer embodying an outer surface film of substantially waterproof material, and an insert pad sandwiched between said layers of highly moisture absorbent material readily disintegrable in water said insert being of lesser extent and area than said layers, said layers being joined together in marginal areas solely by embossing whereby said waterproof film is normally secured to the diaper but is readily peelable manually therefrom enabling the remaining diaper part to be disposed of in a flushing vessel.

14. A disposable diaper comprising an outer shaped sheet and an inner shaped sheet, and an insert of lesser area and extent of highly moisture absorbent material readily disintegrable in water sandwiched between said

5 sheets, said insert being of variable length, width and thickness providing a three way contouring and a distribution of absorptive material in accordance with and proportional to the normal required absorptive functional needs in use, said diaper having marginal areas beyond said insert joined by a relatively close pattern embossing, and inner areas joined by a spaced spot embossing through said insert to permit ready dispersion of moisture and preserve the high moisture absorbent capacity.

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