

[54] **DISPOSABLE DIAPER WITH INTEGRAL ABHESIVE REINFORCING AREAS**

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[56] **References Cited**

UNITED STATES PATENTS

2,788,786 4/1957 Dexter 128/284

3,620,217	11/1971	Gellert	128/284
3,638,651	2/1972	Torr	128/284
3,646,936	3/1972	Marsan	128/283
3,646,937	3/1972	Gellert	128/287

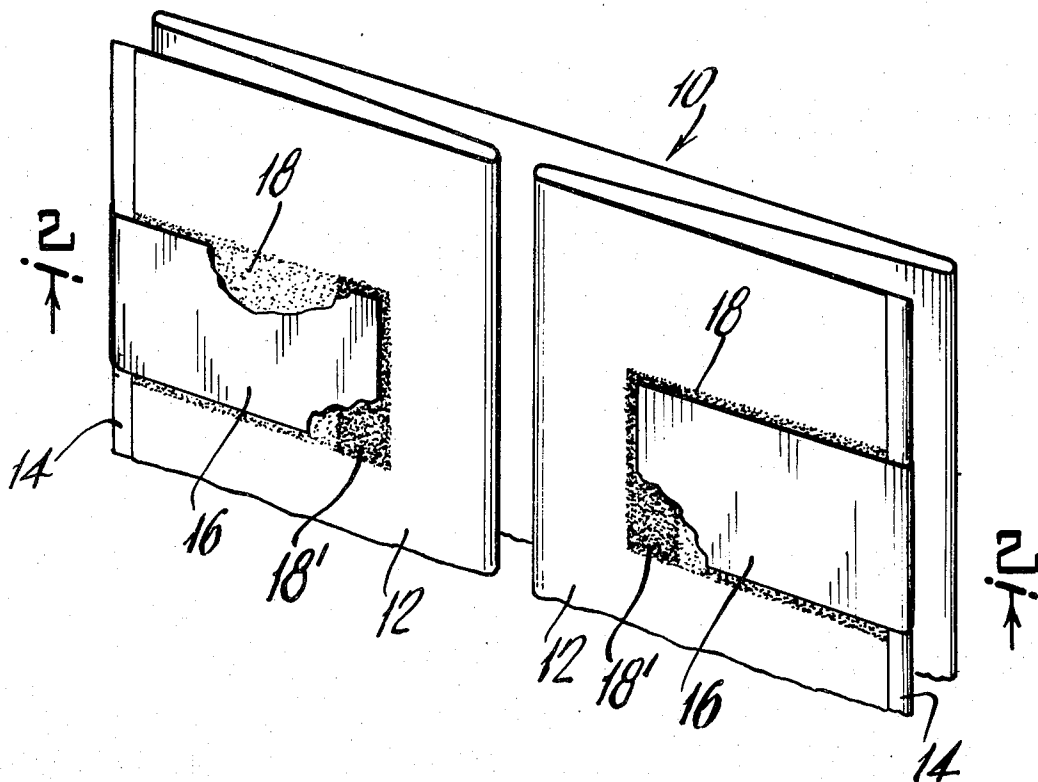
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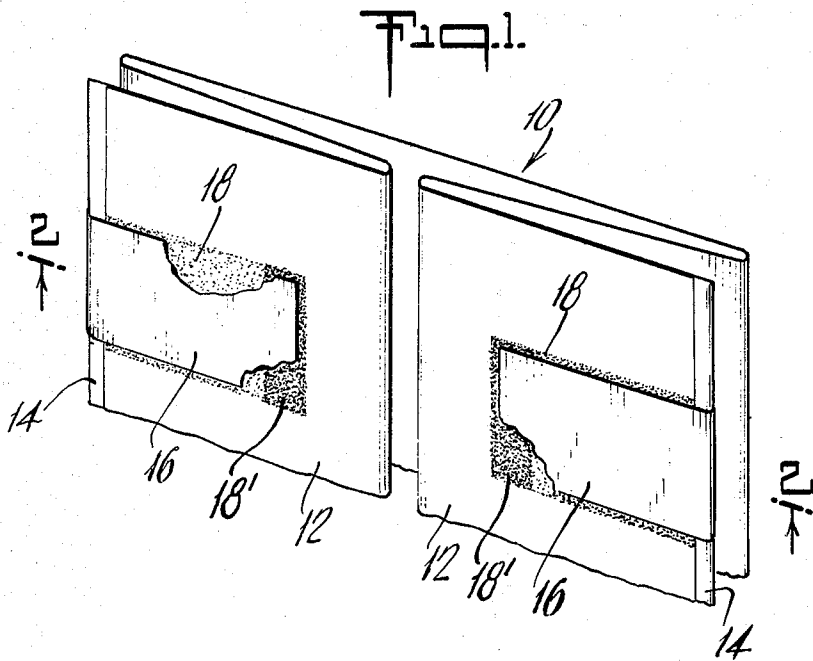
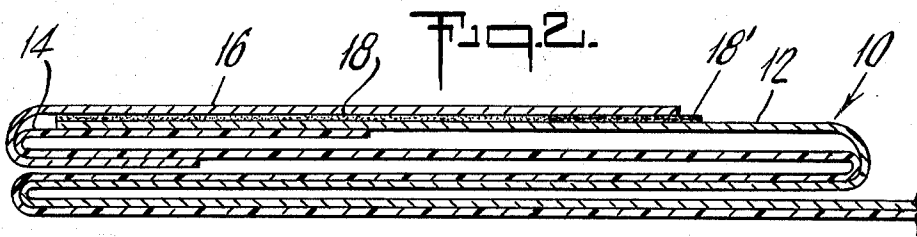
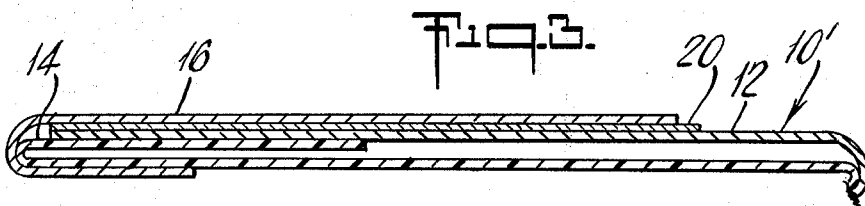
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ABSTRACT

A disposable diaper normally made from a backing sheet of water-impermeable material, a facing sheet of water-permeable material, a filling of absorbent material, pressure-sensitive tape fastening strips at the waist portion, is hereby provided with the improvement which consists of adhesive and/or reinforcing areas on the facing sheet serving as an underlayment for the adhesive tape strip prior to use.

2 Claims, 3 Drawing Figures





DISPOSABLE DIAPER WITH INTEGRAL ADHESIVE REINFORCING AREAS

BACKGROUND OF THE INVENTION

This invention was first filed in the Patent Office under the Disclosure Document program as Disclosure Document No. 015025.

Pressure sensitive tape fastening strips are generally known and used as means for securing the corners of a disposable diaper. These tapes are inextensible, as known in the art, or extensible as described in my co-pending application No. 243,751, now abandoned. Inextensible tapes are described in U.S. Classes 128/267, 284, 286, & 156, and recently in RE 26,151 and U.S. Pat. No. 3,646,937.

The present invention eliminates the need for a discardable strip of release liner to protect the adherable surface of the pressure-sensitive tape strip prior to its being used. In effect it uses substantially the facing sheet of the diaper itself as a release liner. It achieves this end by converting the facing sheet, or at least areas thereof underlying the tape, into an adhesive product, on which the tape rests, and from which the tape is easily releasable and removable when the tape is called upon to fasten the corners of diaper when the diaper is swathed around the baby's lower torso.

In this invention, the facing sheet can be converted into an adhesive product in a variety of ways, some of which also provide added reinforcement to the facing sheet. The added reinforcement serves as a tear-resisting spot through which the diaper may be pinned should the tape break or be inoperable.

SUMMARY OF THE INVENTION

Expatiating firstly on the invented feature of converting the facing sheet or parts thereof into an adhesive product, thus eliminating the need for a discardable strip of release paper, it has been found, with the increasing use of disposable diapers, that the discarded strips pose a serious hazard to the baby. These hard, sharp strips are found by the baby, and swallowed. Stiffer labeling requirements underscoring the great danger in these discarded strips is under consideration prodded by the Food and Drugs Administration's Bureau of Product Safety, in its "Product Safety Letter" (1080 National Press Building Washington D.C. 20004). A warning will soon be mandatory on the label of such disposable diapers stating that "the backing (meaning the release paper strip in the context of this Specification) on the pull tabs should be disposed of properly to protect against infants ingesting or choking on them." The American Academy of Pediatrics (AAP) has suggested a "keep out of reach of children" warning label to the current four large disposable diaper manufacturers in the U.S.—namely Chicopee Mills (Chux) Draper Products (Daffy Downs) Kimberly-Clark (Kimbies) and Proctor and Gamble (Pampers). In addition to eliminating fatal and near-fatal accidents to babies who find and swallow these hard sharp strips, this invention in eliminating the need for such discardable strips dramatically helps erase a deep ecological threat. At the present time these discarded, insoluble, curled pieces of release liner pack sewage conduits, and block them in intertwined fashion to form plugs of mechanically strong, immovable blocks. The burden of disposing of more than a billion of these little strips annually, aggregating about ten million square yards of

release liner material is amplified greatly because it compounds the burden of the already difficult disposal problem of soiled disposable diapers. Municipal and private sewage systems are blocked by the packed and intertwined accretion of release paper strips, strips which are chemically inert and resistant, water resistant, non-biodegradable. These semi-permanent plugs cause the arrest and back-up of masses of soiled diapers within the sewer pipes. Because the U.S. Dept. of Commerce Industry Report predicts a growth in the use of disposable diapers by 15 percent per annum, compounded, the threat to the ecology and environment, already at an alarming level, is rushing headlong to disaster proportions. Therefore request has been made to the Commissioner of Patents to expedite the examination of the subject Patent Application.

Expanding now on the second summarized feature of this invention in paragraph 2 of page 2, the conversion of the facing sheet or parts thereof into adhesive material may be coupled with the added attribute of mechanical reinforcement of the facing sheet to provide a tear-resisting spot through which the diaper may be pinned, if the tapes should fail. It has been pointed out in published literature as in "Consumers Reports" Vol. 36 No. 2 Feb. 1971 that pressure sensitive fastening devices are unreliable. The tape may have deteriorated, turned hard or gooey on storage, or have been badly made and badly stored. However, even if the tape is of excellent quality, of excellent cohesion and adhesion, and in fresh condition, it is often adhered under conditions which are adverse to adhesion, such as where the surface of the adherent is fouled by baby oils, unguents, lotions, powders, medications, wetness and perhaps body wastes. The cited publication states that the diaper can be re-fastened with pins around the baby's waist, when the tape fails. On page 82, op. cit. it says "Pins offer a stronger attachment. But the tape fasteners were judged adequate, and they can always be reinforced with pins if the baby gets too active". When pinning is done, however, the facing sheet of the diaper, being exceedingly weak mechanically, is easily torn by the penetrating pin. This tear grows in length very rapidly. When this happens, the filling of the diaper, which is generally cellulose fibers, escapes and spreads out as a potential irritant and as an unsightly exudate deposited on the baby's body. Such escape of the diaper absorbent filling through the rent in the facing sheet caused by the penetration of the pin, will also, by reason of said escape and loss, lower the total absorbency of the diaper, rendering it functionally inadequate. The present invention, although pertaining largely to tape-fastenable diapers, also provides the capability of being fastened by pins in lieu of, or in addition to fastening by pressure sensitive tape fastening strips.

Objects of the Invention

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| First Object: | To convert at least parts of the permeable facing sheet of a disposable diaper into a release area which area shall function as a non-discardable release liner for the strip of pressure-sensitive tape resting thereon with its adhesive side in contact therewith. |
| Second Object: | To provide reinforcing areas on the permeable facing sheet of a disposable diaper so that the latter is strong enough to be |

Objects of the Invention-Continued

	attached around the waist of the baby by pinning through said reinforcing areas.
Third Object:	To provide a reinforcing applique on the facing sheet of a disposable diaper, said applique being adhesive in nature with reference to one surface thereof and upon which surface shall rest, releasably, a fastening strip of pressure-sensitive adhesive tape, with its bare adhesive surface in contact with said reinforcing adhesive applique.
Fourth Object:	To provide reinforcing adhesive applique spots on the facing sheet of a disposable diaper, which spots being in constant contact with the skin of the baby after the diaper has been taped or pinned on, will be softened by the moisture in the baby's waste product or by the baby's skin moisture.
Fifth Object:	To provide reinforcing adhesive applique spots on the facing sheet of a disposable diaper, which spot shall be slowly dissolved by moisture from the material within the diaper or perspiration from the baby's skin, and after solution be slowly absorbed into the absorbent material within the diaper in contact with the facing sheet.
Sixth Object:	To provide a pressure-sensitive tape of novel construction, especially for the diaper art.
All objects:	The above objects and others will be apparent in the descriptions of the embodiments and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1, is a perspective view of the upper portion of a disposable diaper to which the invention has been applied and represents a preferred embodiment of the invention. The Disposable Diaper 10, consists of a permeable facing sheet 12. This sheet is permeable to the transmission of liquids, and is generally of a paper-like nature. There is then the backing sheet 14 of impermeable plastic, generally a waterproof polyethylene. In between the facing sheet 12 and the backing sheet 14 there is an absorbent filling, generally of fibrous cellulose. Filling is not visible and is not numbered or described in this drawing. On facing 12 there is an applique 18 on which rests a strip of pressure sensitive tape 16. In this figure only the distal portion of the strip 16 is visible, the proximal portion being permanently attached to the plastic backing sheet 14, and visible only in FIGS. 2 and 3. Applique 18 serves as a bed or underlayment for the tape strip 16 to lie on. This drawing is a preferred embodiment of applique 18 and it shows a section 18¹ which underlies the terminal portion of the strip 16 at the distal end thereof.

Applique 18 is adhesive in nature with reference to the pressure sensitive adhesive coating of strip 16 which is lying upon it. Section 18¹ of the adhesive area 18 has a greater amount and nature of adhesiveness than the rest of area 18, and serves to offer the utmost convenience and ease in releasing the distal extremity of strip 16, said distal end thereby serving as an easily-grasped tab for lifting up the tape strip and then using it to fasten the diaper at the baby's waist. Of course this preferred embodiment 18¹ of the applique 18 is not

necessary to the operation of the invention, and the applique 18 may have a more uniform adhesiveness, not a varied adhesiveness, towards the strip 16 lying thereon.

FIG. 2 is a cross sectional view taken along the line 2 of FIG. 1. The diaper 10 has a porous facing sheet 12 and a plastic impermeable backing sheet 14. The invention which is involved substantially with the facing sheet 12, is more clearly understood here. On the facing sheet 12, is the applique 18 which, in this preferred embodiment, has an end section 18¹. End section 18¹ is adhesive like the rest of applique 18, but moreso, with respect to the overlying pressure sensitive adhesive coating of the strip 16. The end section of applique 18 extends beyond the distal end of strip 16, whether or not the applique 18 has the added adhesive area 18¹. Of course the applique 18 might also be smaller in area than the strip of adhesive tape, and in this case the margins of the adhesive tape will, on any one or all three sides of the tape strip, be adhered to the facing sheet 12 around the margin or margins of the adhesive applique. Thus the strip 16 will be lightly adhered and tacked down on to 12, and will be held down lightly but firmly. This holding down of the strip prevents the distal end getting tangled in the fast production line or in the fast packaging machine, providing thereby an added convenience in the manufacturing operations. Of course this marginal attachment of the tape strip to the facing 12 is a temporary and very slight affixing thereof, the distal end of strip 16 being releasably held on the comparatively large adhesive area 18 before the diaper is put in service. The proximal portion of strip 16, which was not visible in FIG. 1, is here visible attached permanently to the plastic backing sheet 14. Thus it is easily understood that the attachment of the pressure-sensitive tape strip is permanent with reference to the backing sheet 14, and is temporary with reference to the presently invented adhesively prepared facing sheet 12 right up to the time when the diaper is to be used on the baby, and this is the essence of the present invention.

FIG. 3 shows another embodiment of the invention wherein the adhesive applique 20 serving as a releasing underlayment for pressure sensitive adhesive tape strip 16 is a silicone coated or otherwise made release liner permanently adhered to the facing sheet 12 of diaper 10¹. Adhesive underlayment 20 extends past the distal end of the strip 16. Proximal end of strip 16 is permanently adhered to the plastic backing sheet 14. Applique 20 can also be understood as a transferred separable part or layer, originally existing as an uppermost layer on the pressure sensitive adhesive of tape 16, and donated to the facing sheet of the diaper, by an improved tape. This improved diaper tape may be considered an invention in itself, though related to the present invention. It is described in the next section.

DETAILED DESCRIPTION OF THE INVENTION AND THE EMBODIMENTS

Appliques 18 and 20 in FIGS. 1, 2, and 3 respectively perform the dual function of reinforcing the paper facing sheet 12 and of providing an adhesive underlayment for the pressuresensitive adhesive coating of tape strip 16. The reinforcing provided by 18 or 20 is such that when pierced by a pin which is usually used to fasten a diaper, facing sheet 12 will exhibit resistance to tearing as compared with the untreated part of sheet

12. Tear resistance can be tested qualitatively by grasping the pin in one hand and pulling away from it while holding, in the other hand, any part of the abhesive-reinforcing areas 18 or 20. Where the reinforcing area is as shown in 20, the added thickness of the release paper 20 contributes substantially to the tear resistance, since it adds, in effect, another additional ply of sheet material on to the material of the facing sheet 12. Where the reinforcing area is as shown in the embodiment 18, then the added presence of the coating will also contribute to the tear resistance of the facing sheet 12.

Different varieties of reinforcing appliques 20 have been used in this invention and are detailed here. They are all permanently affixed to the facing sheet 12 in the designated areas in a manner and in size sufficient to provide an underlayment for the particular size of the distal end of the tape 16 in the disposable diaper 10 or 10'. Appliques 20 may be made of silicone-coated release paper, silicone-coated plastic film, polyvinyl alcohol film, or gelatin film, or plastic films generally which are abhesive by themselves without the need for silicone coating, such as plastic films of Teflon, Nylon, cellophane, polyvinyl chloride, polyethylene, and the like. Reinforcing appliques 20 can be made from a great many sheet materials composed of plastics or fibers or combinations thereof, the sole criterion for selection being its tear-resistance, and this only as compared with the tear resistance of the facing sheet 12.

The added requirement for the reinforcing applique 20 is abhesiveness with relation to the distal end of the pressure-sensitive tape which is to rest thereon. Again, this measure of abhesiveness is relative, and cannot be quantified, since the composition of the adhesive and its adhesive strength may be a trade secret of the manufacturer of the tape, and the abhesiveness of this applique 20, is only to be understood as the relative ease of removal of the superposed adhesive tape. This relative ease of removal is, for the purposes of this invention, defined as the ease of removal of the tape in question from the applique 20 as compared with the ease of removal of the tape from the facing sheet 12, the adhesive surface of the tape after removal from said facing sheet in this test, being in its pristine state, its adhesion unimpaired, and the surface of the tape uncontaminated by picked-up fibers, powders, and other surface contaminants. For example, a strip of pressure-sensitive tape was adhered to the facing sheet 12 of a diaper widely sold in the U.S.A. under the name of "Pampers". The tape was thereafter fairly easy to remove, indicating at first that the facing sheet 12 could by itself serve as a releasing underlayment for the strip of tape, thus rendering this invention unnecessary. Upon examination it was seen that the tape had adhered to the fibrous surface of the facing sheet 12, and had peeled off a layer of fibers which was now permanently adhered to the adhesive surface of the tape strip. The tape strip had actually been contaminated by the material adhered to it and it would no longer have sufficient adhesion remaining to be used as a tape fastener for the adhesive attachment of the diaper around the baby's torso. As a comparison, an applique 20, of silicone coated 50-pound release paper sold by the Weyerhaeuser Co, Tacoma, Wash., was adhered to the surface of the facing sheet 12 so that the coated side was on top and uncoated side was adhered to the facing 12, permanently by the use an adhesive. The adhered

applique not only served as a strengthening patch for the underlying material of the diaper but also served very effectively as a releasing underlayment for the distal end of the pressure sensitive tape strip 16. Without this patch or reinforcing applique the strength of the facing sheet 12 is negligible, and its abhesiveness to pressure-sensitive tape is near zero. Even if the facing sheet 12 were to be made of an extremely strong material with good resistance, in itself, to tearing, my invention will still have utility not only as added reinforcement, but also would provide the abhesive underlayment which this invention teaches. The attachment of the applique 20 is by any means suitable to the wishes of the diaper manufacturer, such as adhesive bonding, heat-bonding, mechanical bonding, and the like. According to present requirements of high-speed diaper making machines, a most suitable and economical way of attaching the abhesive area to the diaper is by way of a new pressure sensitive tape, and it is one of the objects of this invention to provide such a diaper tape, which also has general utility as a new article of manufacture in the pressure-sensitive tape area of the art. This new tape is in effect, two strips of pressure sensitive tape plied one on top of the other. The top layer makes intimate adhesive contact with the diaper surface, and is not removable easily therefrom, whereas the tape plied above it is easily removable and serves the purpose of the usual adhesive tape for fastening a diaper. Thus the top ply of the new tape serves as the abhesive area taught by the present invention. The new tape is made by plying a strip of pressure sensitive tape on top of the fastening strip of tape as explained. It is also made by coating a releasing substance on to a layer of tape on its adhesive surface, then coating thereupon a pressure sensitive layer, or a layer otherwise adherable such as by remoistening or subsequent adhesive attachment to the diaper. The material coated upon the fastening strip of tape is thus transferred to the diaper, and serves as an abhesive underlayment for the superposed fastening tape. All abhesive materials mentioned in this specification, whether as fluid coatings or as pre-fabricated sheet material can be used for the purposes of this new tape, and all methods of attachment of this abhesive layer to the diaper can be used. A simple embodiment of this tape is to coat the adhesive surface of a pressure sensitive tape with a solution of gelatin, dry to a dry film of gelatin. This tape is attached to the diaper layer during manufacture by remoistening the gelatin layer. The gelatin layer now serves as the abhesive applique. This tape is specially suited for disposable diapers. It requires no release liner strip which will later have to be discarded. It effects a cost saving of three to seven cents per case of 244 diapers and will induce the Diaper manufacturers to stop using the discardable liner strips which can choke a baby and a sewage system.

Now as to the preferred embodiments shown in FIGS. 1 & 2. A coating 18 is used in place of the separate piece of release paper which was shown as the applique 20 in FIG. 3. The coating 18 is preferably applied in patterned configuration on the facing sheet 12, the pattern covering an area larger than the superposed strip 16, and extending beyond the margins of strip 16. Alternatively, the patterned release coating 18 might be made slightly under-sized compared with the dimensions of the superposed strip 16, and in this modification the sticky margins of tape extending beyond the

boundaries of the adhesive under-layment can effectively adhere to the facing sheet and tack down the tape strip to the facing sheet of the diaper for ease in folding and packing the diaper in the production line; the tacking down of the tape strip to the diaper facing sheet is very light and the tape is easily removed without tearing the facing sheet subjacent the exposed adhesive margins of the tape.

The coatings useful for the applique 18 are the many plastic coatings available on the open market, but it must be understood that such plastic coatings must be adhesive to the adhesive coating of the tape strip. A suitable tape strip for disposable diaper applications is obtainable from the 3M Company Minneapolis, Minn. and bears the catalog number of "Y 9429". A suitable adhesive coating 18 to use against this tape is Silicone coating available from the General Electric Co Waterford N.Y. and from many others including the Dow Corning Corp, Midland Mich. General Electric Co. "RTV" Silicone is preferred. G.E. Silicone Emulsion 2054 with catalyst SM 2055C in the ratio of 5 to 1 was satisfactory. Dow-Corning No. 235 Dispersion with DC 1200 mixed as directed on the label was also satisfactory. Silicone-based release coatings 18 are most useful against a wide variety of pressure sensitive tapes and do not contaminate or lower the adhesion capability of the strip 16 when used as directed by the manufacturer with careful weighing and addition of the catalysts where used. The silicone coating deposited on facing 12 as an applique 18 strengthens the facing in those parts where it is applied. While facing sheet 12 can easily be torn with very slight tugging against the inserted diaper pin, where a pin is used, the same facing sheet suitably reinforced by the applique 18, cannot easily be torn and is somewhat stronger. The deposited applique 18 will be in contact with the skin of the baby after it has been diapered, and therefore the material chosen for the purpose of manufacturing the applique must be non-irritating to the skin. The Silicones are generally satisfactory. A hot-Melt composition containing olefin polymers or co-polymers, silicone polymers with waxes may be used for economy and speed of application to the facing sheet, and any hot melt composition may be used if it happens to be adhesive to the particular tape used in the manufacture of the diaper, and is also non-irritating to the skin.

As a new and useful feature of the applique 18, I prefer to apply the release material in such a manner that the tape can more easily be removed at its distal end from the underlayment of adhesive material. Therefore I prefer to embody terminal section 18¹ in applique 18. Terminal section 18¹ offers readier removal of the tape from it as compared with the rest of the applique 18 and this is achieved by making the coating heavier in weight or rougher in texture than the coating of applique 18, or a different material can be used for 18¹ which has chemically different properties and greater adhesiveness than coating in 18. Thus 18¹ could be made of G.E. RTV Silicone whereas the rest of applique 18 could be made of a mixture of Geon 552 and Geon 352 from the B.F. Goodrich Company. A considerable cost saving is achieved since the Silicone is much more expensive than the "GEON."

As a further desirable feature in applique 18 it is preferred to make the applique water sensitive so that it is very soft against the skin of the baby. It is also preferred to make the applique water-soluble so that it is dis-

solved by the liquid wastes in the diaper and is absorbed therein, the diaper being at this stage ready to be discarded, and there being no further need at this stage, for the reinforcing action or for the adhesive action of applique 18. It is more desirable that the adhesive applique should disappear by being dissolved into the diaper so that there is no disposal problem of the soiled diaper.

Examples of water sensitive coating materials suitable for applique 18 are polyvinyl alcohol plasticized with a polyhydric alcohol which has humectant properties such as glycerine and propylene Glycol. A suitable formula is:

15	Polyvinyl alcohol No. 350 (Airco, N.Y.C. N.Y.)	100 gm.
	Glycerine U.S.P.	50 gm.

This formulation has very good reinforcing as well as adhesive properties. It is dissolved in water and applied as solution or hot-melt.

20 Examples of water-soluble applique 18 are film-formers suitably plasticized with water-sensitive to water-soluble plasticizers such as corn syrup, glycerine, polyglycols and Sorbitol. A suitable formula is:

25	Gelatine, U.S.P.	100 grams
	Glycerine, U.S.P.	50 grams
	Corn Syrup	5 grams
	Water	Sufficient for solvation.

30 The methods of application are, for example, coating the entire facing sheet 12, all over, thus ensuring that the tape can rest anywhere on the facing sheet, and find an adhesive bed for itself, or for example, by applying the coating in selected patterned areas directly under the tape area.

35 My improved diaper is used as follows: The mother lifts the distal end of the tape strips from the reinforcing adhesive underlayment 18 or 18 plus 18¹ or 20. The baby is placed on the diaper so that the end where the tapes plus releasing underlayments are positioned, is placed near the waist of the baby and behind the baby. 40 The diaper is then brought up over the nether parts of the baby, past the abdomen and to the waist. The tapes are now lifted off the facing sheet. They then are brought from the back portion of the diaper to the front portion and then adhered thereto. This is the usual way of fastening a diaper with pressure sensitive tape strips, but the invented feature of the diaper is the direct release of the tape strip from the facing sheet of the diaper without the necessity for the interposition of an added strip of release liner to protect the surface of the pressure-sensitive tape strip.

50 What is claimed is:

1. In a tape-fastenable disposable diaper comprising a facing sheet of water permeable material, a backing sheet of water-impermeable material, a filling therebetween of absorbent fibrous cellulose material, a pair of pressure-sensitive adhesive tape fastening strips, the improvement which comprises the addition of water-sensitive adhesive areas on the facing sheet underlying the tape strips, terminal sections of said tape strips resting releasably upon said adhesive areas.

60 2. In a tape fastenable disposable diaper comprising a facing sheet of water permeable material, a backing sheet of water-impermeable material, a filling therebetween of absorbent fibrous cellulose material, a pair of pressure-sensitive adhesive tape fastening strips, the improvement which comprises the addition of water-soluble adhesive areas on the facing sheet underlying the tape strips, terminal sections of said tape strips resting releasably upon said adhesive areas.

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