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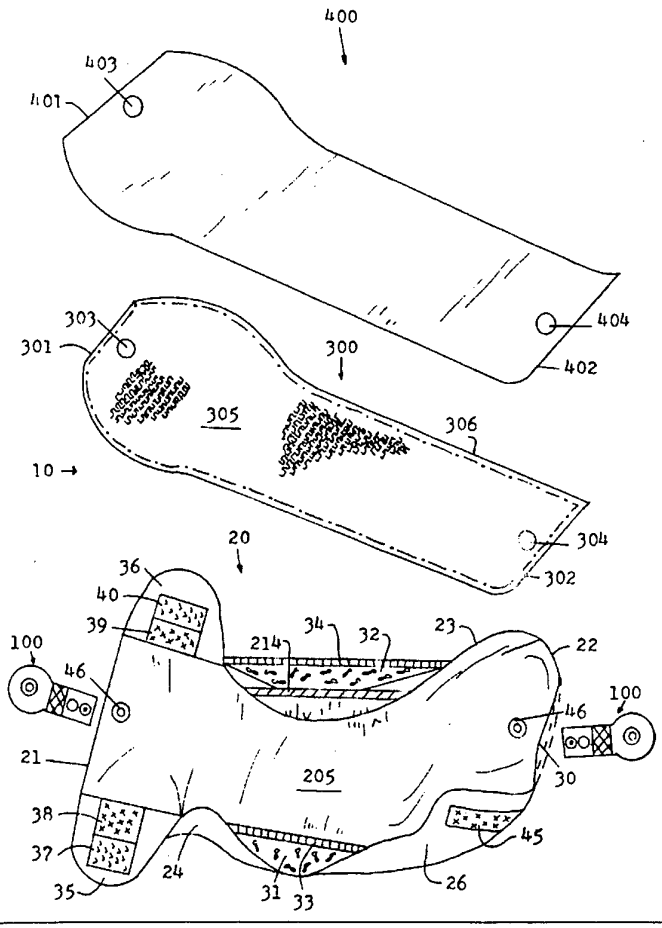
(54) Title: DIAPER LINER WITH ADAPTOR

(57) Abstract

A diaper assembly including a washable over-garment (20) having opposite side edges and two opposite ends, an inner and outer surfaces. A reusable moisture proof sheet (200) is positioned on the inner surface side of the garment. There is a detachable, washable absorbent liner (300) adapted for positioning on the inner surface side (205) of the moisture proof sheet. This liner also has a hole (303, 304) at opposite ends, and inner and outer surfaces. There is a separate disposable, non-absorbent inner sheet or cover member (400) adapted to cover the inner surface of the liner and having opposite ends (401, 402). Preferably the garment has elasticized breathable triangular pieces (31, 32) located centrally on the side edges. Preferably the over-garment has protruding ear pieces (35, 36) secured at the rear end of the garment. Preferably a liner adapter (100) comprising snap fasteners (106, 107, 117) is positioned at opposite ends of the over-garment for detachably connecting the opposite ends of the over-garment to respective opposite ends of the absorbent liner and the inner sheet.



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DIAPER LINER WITH ADAPTOR

BACKGROUND OF THE INVENTION

The invention describe here is an improvement to the waste-containment garment for both the infants and adults granted to us in April 16, 1991 of the Canadian patent 1,282,904, and U.S.A. patent 5,217,447 granted in June 8, 1993.

Both the existing Canada and U.S.A. Patent presented a diaper assembly that was easy to clean and launder. This simple diaper structure was great in the residential market, but was not suitable in the hospital environment or other institutions where commercial laundry facilities are used, since the force of the water from these washers and the centrifugal force from these dryers, along with the weight of the wet clothes being caught between the waterproof sheet and the over-garment consisting of a single fabric piece makes the threads of the over-garment becoming loose from the constant pulling of the moisture proof sheet and the fabric at the joining point, thus reducing the life expectancy of the over-garment.

One feature in the Canada and U.S.A. patent that was issued to us is the diaper system operating as a whole unit. There are three components to the diaper assembly, the over-garment, the absorbent liner and the cover member or inner sheet. There is little laundry needed in the over-garment since the moisture proof sheet is easy to wash and dry. The cover member hardly needs to be clean since it can be dispose of, thus the absorbent liner needs to be washed the most because it absorbs the urine frequently and often gets soiled. The material used for snap fasteners on the liner is either metal or plastic. A minor problem could exist during the washing of the absorbent liner. If the liner having metal snap fasteners are wash using detergent containing bleach, then corrosion on the metal fasteners could develop if the liner is not rinsed properly. This situation usually would occur more in hospital institution and diaper services because they tend to use bleach for killing diseases and making the cotton diapers white. The alternative is to use plastic snap fasteners which would not corrode, but would melt when exposed to high temperature in some dryers. Most institutions use compressor dryers to squeeze and compress the water out when drying which could lead to the cracking

of the plastic snap fasteners. Another problem arises if either metal or plastic snap fastener is used for the absorbent liner is that both materials produces noises when placed in the dryers. The noises are made by the snap fasteners hitting against the metal drums inside the dryer. To overcome the noise barrier, Velcro (trademark) hook and loop fasteners can replace the metal or plastic snap fasteners, but encounters an obstacle during laundry, since other fabric, lints and clothes will become caught in the hook and loop fasteners preventing a clean wash. Adhesive glue or tape could replace the hook and loop fasteners, however the adhesive property will no longer hold it together after using once, also the chemicals in the adhesive is usually harmful to the infant when the child accidently consumes it.

Another feature in the diaper system is the stay-dry system. The double layers from the non-absorbent cover member and the non-absorbent outer layers of the liner creates the stay-dry effect. To assist the stay-dry system, the liner have to be absorbent enough to draw the moisture away from the surface of the liner, thus keeping the wearer dry. The combination of the polypropylene material used for the cover member and the polyester material used for the outer layers on the absorbent liner and consisting of a single layer of high absorbency cloth produces the stay-dry effect. There is a slight disadvantage of having the stay-dry system since the high absorbency cloth takes longer to dry because it consists of one single thick absorbent layer, and although the polyester material is non-absorbent, the moisture could still be caught in the wicking action of the polyester fibres since it is knitted. The efficiency of the stay-dry system also depends on how the non-absorbent outer layer is secured to the absorbent inner layer. In the patents issued to us, there are two continuous threads that holds the inner and outer layers together. Although this manner provides the necessary strength, the effect of the stay-dry is reduced since the non-absorbent outer layer comes into contact with the absorbent inner layer, thus the wearer feels very moist.

Still another feature in both the existing Canadian and U.S. patent employs a disposable topsheet or sleeve for use with the diaper assembly. The topsheet or sleeve could be slipped out of place and therefore the it is difficult to position and there is no assurance that it will remain in the appropriate position.

SUMMARY OF THE INVENTION

According to one aspect of the invention, a diaper assembly comprises a washable over-garment having opposite contour side edges and two opposite ends and an inner and outer surface. The inner and outer surface comprising of different materials are secured together by stitching around its perimeter. A breathable triangular shape piece is position centrally at side edges on the inner surface of the garment. The top base of the triangular piece are elasticized which tends to pull opposite ends of the garment towards one another. There is a rear end consisting of a protruding ear shape piece secured by lines of stitches between the over-garment and the protruding piece dispose at the opposite sides on the rear portion of the garment. The connecting means comprising of hook and loop fasteners are positioned at each of the inner surface of the protruding piece located at the rear portion of the garment and at the front portion on the outer surface of the over-garment. There is a reusable waterproof sheet with elasticized side edges disposed on the inner surface of the garment and having a length substantially equal to that of the garment with two opposite side edges and two opposite ends. The opposite ends and a small portion of the side edges is permanently attached to respective opposite ends and side edges of the garment, while the opposite side edges are substantially free from attachment of the garment. There are snap fasteners located at transverse centres on opposite ends of the over-garment. There is a short elastic strip disposed across centrally at the rear portion of the garment below the snap fastener. There is also an elongate absorbent liner adapted for positioning on the inner surface of the waterproof sheet and having a hole dispose at transverse centres of opposite ends and having an inner and outer layer. There is a elongate, separate, disposable, non-absorbent, liquid pervious, thin, flexible inner sheet, contoured to that of an absorbent liner adapted to cover the outer layer of the liner and having opposite ends and inner and outer surfaces. There are holes dispose at transverse centres on opposite ends. The perimeter of the inner sheet exceeds the perimeter of the liner. The inner sheet being completely detachable from the liner and the over-garment to be dispose of after the use of the diaper assembly. There are means for detachably connecting

the opposite ends of the absorbent liner and inner sheet to respective opposite ends of the over-garment with the connecting means being the liner adaptor attached at opposite ends of the over-garment. The liner adaptor have snap fasteners secured to the holes of the absorbent liner and inner sheet in order to position the liner and inner sheet onto the over-garment.

Because the preferred over-garment having an inner and outer surface that comprise of two different materials. These two layers adds strength and durability to the garment which are secured together by sewing around its perimeter.

Since the preferred over-garment have contour side edges, then the garment is more sturdier compare to a garment having a rectangular shape. This contour diaper assembly also gives the garment good looks.

Because the preferred over-garment have separate protruding ear piece dispose at the opposite sides on the rear portion of the garment with hook and loop fasteners being positioned at each of the inner surface of the protruding piece located at the rear portion of the garment and at the front portion on the outer surface of the over-garment. The hook and loop fasteners have a stronger hold onto the over-garment provided by the protruding pieces which makes the over-garment more durable. Besides the added strength and durability, the shape of the over-garment gives it an attractive appearance. The over-garment having separate ear pieces also reduces the amount of disposable wastes, since the ear pieces could be produced from the residual material left behind by the cutting of the over-garment.

According to a second aspect of the invention, a diaper assembly comprising of a washable garment having opposite side edges, two opposite ends, and inner and outer surfaces. A reusable waterproof sheet having opposite side edges positioned on the inner surface of the garment, having a length substantially equal to that of the garment. The opposite ends along with a portion of the side edges are attached permanently to respective opposite ends and side edges of the garment while the opposite side edges is substantially free of attachment to the garment and having an inner and outer surface. The side edges are elasticized which are covered by waterproof material and folded inwards towards the inner surface of waterproof sheet and secured into position by stitches forming

a hammock shape. There is a reusable liner adapted for positioning on the inner surface of the waterproof sheet, and means for detachably connecting the liner to the waterproof sheet. The side edges of the waterproof sheet are located at sufficient distance apart that the liner can be positioned at least substantially between the side edges of the waterproof sheet and having the elasticized side edges tending to pull the opposite ends of the waterproof sheet towards one another.

Because the preferred waterproof sheet having opposite ends and a portion of opposite side edges attached permanently to respective opposite ends and side edges of the garment. This attachment gives a stronger support to the waterproof sheet onto the garment. The elasticized side edges being inwardly folded towards the inner surface of the waterproof sheet provides a better hammock shape which helps to hold the over-garment together. The elasticized breathable triangular piece also tends to pull the opposite ends of the garment towards one another. All these combinations along with the garment having double layers, having contour side edges, having separate protruding pieces, having a triangular piece gives the necessary strength, integrity and durability to the over-garment.

According to a third aspect of the invention, a diaper assembly comprising of a reusable garment having opposite side edges, two opposite ends and inner and outer surfaces. A moisture proof sheet disposed on the inner surface of the garment and having two opposite side edges and two opposite ends, the latter ends and a portion of side edges being attached to respective opposite ends and side edges of the garment. There is a detachable, absorbent liner made of washable, reusable cloth and adapted for positioning on the waterproof sheet. The liner having opposite ends and narrower and wider sections in which the narrower section extends from one end thereof and through a central portion thereof and terminating at the wider section forming the other end thereof. There is an inner and outer layer with the outer layer being made of hydrophobic material while the inner layer comprise of several layers of highly absorbent material. There is also an independent, washable, non-absorbent, liquid pervious, flexible cover member, contoured to that of an absorbent liner, having opposite ends and inner and outer surface covering the surfaces of the absorbent

liner located furthest from the over-garment. There are holes located at transverse centres on opposite ends of the absorbent liner and the cover member. The holes are adapted to fit onto the liner adaptor which secures the liner and/or the cover member onto the over-garment. The liner adaptors detachably connects the opposite ends of the cover member and the liner to the opposite ends on the inner surface of the waterproof sheet which is reusable a number of times and washable with the garment. The wider section of the absorbent liner can be placed selectively at either end of the waterproof sheet and secured onto the waterproof sheet by the liner adapter. The side edges of the waterproof sheet are located at sufficient distance apart that the liner can be positioned at least substantially between the side edges of the waterproof sheet. The elasticized side edges of the waterproof sheet tending to pull the opposite ends of the waterproof sheet towards one another.

Because the preferred absorbent liner having holes disposed at transverse centres on opposite ends and not having other means of attachments. This permits easy removal and replacement of liners for laundry purpose, without having to worry about corrosion on metal snap fasteners, cracking or melting from plastic snap fasteners, clothes or lint being caught by hook and loop fasteners, and dangerous chemicals found in adhesive fasteners. Since the liner is primarily made of cloth and there are no other means of attachments, then the liners last longer under normal usage.

Because the preferred absorbent liner having an inner layer consisting of several high absorbency cloth layers instead of one single layer. These thin layers tend to dry quicker than one thick layer since more air flows between these layers, thus the liquid evaporate much quicker. It also tends to absorb more since the wicking action between the layers acts as a reservoir which holds some liquid along with its normal absorbency from the original layers, thus the overall absorbency is greater than a single thick layer.

According to a fourth aspect of the invention, a diaper assembly comprising of a reusable, washable over-garment having opposite side edges, two opposite ends and inner and outer surfaces. The waterproof sheet having two opposite side edges position on the inner surface of the garment and having opposite ends. The opposite ends and a portion of side edges are attached

to respective opposite ends and side edges of the garment while the opposite side edges are substantially free of attachment to the over-garment and having an inner and outer surface. There is a detachable, elongate, washable absorbent liner made of several layers of cloth-like material adapted for positioning on the inner surface of the waterproof sheet and having opposite ends and inner and outer surfaces. There is an elongate, independent, washable, non-absorbent, liquid pervious, flexible cover member, contoured to that of an absorbent liner in a sleeve form, having a wide end and narrow end allowing insertion of the absorbent liner into the cover member only one way, and having length of the inner surface exceeding the liner while the outer surface having length equal to that of the liner. The inner surface of the cover member can be folded back over the absorbent liner covering the inner and outer surface of the liner. The cover member being completely detachable from the liner and the over-garment to permit laundry or dispose of after use of the diaper assembly. There are means for detachably connecting the opposite ends of the liner and the cover member to respective opposite ends on the inner surface of the over-garment. The connecting means being snap fasteners and reusable a number of times and washable with the cover member. The inner surface of the cover member have a stud fastener disposed at the wider end, while the outer surface have a stud fastener disposed at the narrower end of the cover member. These stud fasteners fits into the respective holes of the absorbent liner and engages with the co-operating socket fasteners positioned on opposite ends of the over-garment, securing the absorbent liner and the cover member to the over-garment.

Further features and advantages of the present diaper assembly will be apparent from the following detailed description of preferred embodiments taken in conjunction with the accompanying drawings.

The invention is illustrated in particular and preferred embodiments by reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded perspective view of an exemplary waste-containment garment constructed in accordance with the invention which comprises a washable, reusable over-garment with a moisture proof sheet positioned on the inner surface of the over-garment; a detachable washable, reusable liner adaptor positioned onto the opposite ends of the over-garment; a detachable, washable, reusable, absorbent liner positioned on the inner surface of the over-garment; and a washable, reusable, liquid pervious non-absorbent inner sheet or cover member adapted to cover the inner surface of the absorbent liner;

Figure 2 is a plan view of a washable, reusable liner adaptor;

Figure 3 is a side view of a liner adaptor from Figure 2 taken along the line I-I;

Figure 4 is a side view portion of a liner adaptor from Figure 12 taken along the line II-II;

Figure 5 is a plan view of a washable, reusable garment showing the sewing attachments for the inner and outer surface, the protruding ear pieces at the rear, the short elastic piece at the rear, and the elasticized triangular shape piece disposed at the side edges of the garment;

Figure 6 is a plan view similar to Figure 5 and showing the sewing attachments of a moisture proof sheet , hook and loop fasteners, and snap fasteners onto the garment;

Figure 7 is a plan view showing the connections of the moisture proof sheet and a major portion of side edges being free of attachment from the garment.

Figure 8 is a plan view of the over-garment showing the liner adaptor positioned on opposite ends of the garment.

Figure 9 is a top view of the over-garment;

Figure 10 is a front view of the over-garment;

Figure 11 is a back view of the over-garment;

Figure 12 is a plan view of a waste-containment garment constructed in accordance with the invention, the view shows the inside of the garment with the absorbent liner shown in dashed lines, and a non-absorbent inner sheet or cover member placed therein;

Figure 13 is a longitudinal edge view of a detachable absorbent liner showing the manner in which the washable, reusable non-absorbent inner sheet is placed therein;

Figure 14 is a longitudinal edge view of a detachable liner showing the manner in which the washable, reusable non-absorbent cover member in a sleeve form is placed therein;

Figure 15 is a plan view of an absorbent liner that is washable and reusable;

Figure 16 is a plan view of a washable, reusable, absorbent liner that is constructed another way;

Figure 17 is a plan view of an absorbent liner that is disposable after use;

Figure 18 is a cross-sectional view of a liner from Figure 15 taken along III-III;

Figure 19 is a cross-sectional view of a liner from Figure 16 taken along IV-IV;

Figure 20 is a cross-sectional view of a liner from Figure 17 taken along V-V;

Figure 21 is a plan view similar to Figure 12 but showing the absorbent liner without an inner sheet covering same and showing the absorbent liner with an expanded end located at the rear of the garment;

Figure 22 is a plan view similar to Figure 21 but showing the expanded end of the absorbent liner positioned at the front of the garment;

Figure 23 is a plan view similar to Figure 21 but showing the expanded end of two absorbent liner on top of each other at the rear of the garment for night time use or heavy wetter, providing maximum absorbency at one end.

Figure 24 is a plan view similar to Figure 23 but showing the expanded end of two absorbent liner on top of each other at the front of the garment for night time use or heavy wetter, providing maximum absorbency at one end;

Figure 25 is a plan view similar to Figure 21 but showing the expanded end of two absorbent liner with the wider end facing opposite to each other. This arrangement allows the wearer to be position on its stomach or its back providing maximum absorbency at either end. This set-up also allows one size absorbent liner to be used in a larger size garment;

Figure 26 is a perspective view of an alternate form of cover member in the shape of a sleeve and contoured to that of an absorbent liner having the wider end open and the narrower end closed;

Figure 27 is a front view of a cover member;

Figure 28 is a side view of a cover member containing the absorbent liner;

Figure 29 is a plan view of a cover member having the wider end folding over the absorbent liner;

Figure 30 is a cross-sectional view similar to Figure 18 but showing the placement of the cover member of Figure 26 around the washable, reusable absorbent liner.

Figure 31 is one alternative form of the liner adaptor.

Figure 32 is another way of designing the liner adaptor.

Figure 33 is another method to create the liner adaptor.

Figure 34 is still another model of the liner adaptor.

DETAIL DESCRIPTION OF PREFERRED EMBODIMENTS

A preferred composite diaper assembly 10 is shown in Figure 1 with reference to Figure 2, 3, 4, 5, 6, 7, 8 and 12. The diaper assembly includes a washable, reusable garment 20 having opposite side edges 23 and 24, two opposite ends 21 and 22 and inner and outer surfaces 25 and 26; a washable, reusable moisture proof sheet 200 having opposite side edges 201 and 202, and inner and outer surfaces 205 and 206; a detachable liner adaptor 100 having opposite ends 113 and 114 and opposite side edges 118 and 119; a detachable absorbent liner 300 having opposite ends 301 and 302 and inner and outer layers 306 and 305; and a separate, washable or disposable, non-absorbent, liquid pervious inner sheet 400, which is flexible, is also referred to herein as a cover member.

The preferred construction of the garment 20 will be described with reference to Figure 1 and 5 of the drawings. The outer surface 26 of the garment 20 can be a cotton weave material either patterned or decorated as desired. The material for the inner surface 25 of the garment 20 can be a cotton or wool which is connected by stitching 47 onto the outer surface 26 around its perimeter. The double cloth layers 25 and 26 used in the garment

provides strength and durability. These layers also controls the temperature since wool is consider to be the most breathable material. If the diaper gets warm, the air circulating through the wool becomes cool which cools off the diaper. If the diaper gets cold, the wool trapping the air would warm up the diaper. Thus constant temperature is maintained which prevents diaper rash from developing. The front end 22 and rear end 21 are straight edges and gradually becomes contour at side edges 23 and 24 as shown in Figure 5 so as to form a narrower central section 27 and wider, front section 28 and a much wider rear section 29. When the diaper is in place, a comfortable fit is provided to the user at the leg openings created by the contour shape of the garment. The over-garment has a option of having a cut-out notch in the shape of a semi-circle 30 positioned centrally at the top front end for a newborn or infant over-garment. This cut-out notch 30 is designed to accommodate the umbilical cord of the newborn or infant. The side edges 23 and 24 of the garment 20 has a breathable triangular shape piece 31 and 32 attached at the centre edge of the garment 20. The preferred material used for the breathable piece 31 and 32 is nylon-polyester which permits quick passage of air flow providing a stable temperature control thus reducing the chance of a diaper from developing. Other breathable materials can be used provided that it have enough strength to resist normal stretching and have some elasticity to maintain its original form. The preferred shape for the breathable piece is triangular, since triangular shapes provides the most support, strength and integrity to a structure with the least amount of material. For example, bicycle frames and house rooftops, other shapes can be used such as a crescent shape or a bridge type shape. The top of the breathable piece 31 and 32 are elasticized 33 and 34 and covered by the same material used in the breathable pieces 31 and 32. The elasticized breathable piece 31 and 32 tend to pull the opposite ends 21 and 22 of the garment 20 towards one another. This creates a hammock-like effect which supports the over-garment shape when the diaper is in place on the wearer and gives an attractive appearance as well. A protruding piece 35 and 36 in the shape of an elliptical ear is attached at the rear section 29 of the garment 20. Across the front end 22 on the outer surface 26 of the over-garment is a strip of loop type fastener 45 along with a socket

type snap fastener 46 disposed centrally onto loop fastener 45 shown in Figure 1 and 10. It will be readily seen that the hook fasteners 37 and 40 can be engaged with the respective sides of the loop fasteners 45 when the over-garment has been put in place on the user. The hook and loop fasteners 37, 38 and 39, 40 are disposed on the inner surface of each of the corresponding protruding ear piece 35 and 36 in order to assist in the washing of the over-garment. It is easy to engage each hook fastener 37 and 40 with its respective loop fastener 38 and 39 in order that the hook fasteners 37 and 40 will not be exposed during washing. At the rear end 29 of the garment, a strip of elastic piece 50 is inserted and secure into place by threads shown in Figure 5 and 11. This elastic strip increases adjustment capability and improves comfort to the wearer. Preferably the garment is stitch around its perimeter to provide stability, strength and durability.

In the preferred embodiment, a moisture proof sheet 200 is position on the inner surface of the garment 20 illustrated in Figure 6 and 7. This moisture proof sheet has two opposite ends 203 and 204 attached to respective opposite ends 22 and 21 of the garment. The portion of the moisture sheet side edges 208, 209, 210, 211 is secured to respective side edges 41, 42, 43, 44 of the garment. When the diaper is assemble, the side edge 208 engages with the corresponding side edge 210, and side edge 209 engages with respective side edge 211 as shown in Figure 9 and 10. In this arrangement, the corresponding portion of the side edges encloses off and prevents possible leakage or excrement from escaping out of the over-garment, since the urine or excrement will tend to slide down the moisture sheet and gets absorb by the liner. The excess waste is capture by the hammock shape and is re-absorb back into the liner until it becomes full. The moisture proof sheet could be rectangular but contour to that of the garment having a width approximately equal to the width of the garment in its central section 207. The moisture proof sheet is held together by stitches 212 and 213 onto the garment. The middle portion 207 from the side edges of the moisture proof sheet is substantially free of attachment from the garment shown in Figure 7, which permits air circulation to maintain control in the temperature in order to reduce diaper rash. This configuration allows easy cleaning to the over-garment and drys faster.

Both contoured side edges of the moisture proof sheet 200 are elasticized as shown at 214 and 215. In this way the moisture proof sheet fits snugly around the upper thighs of the user, helping to prevent any leakage or escape of any human excrement. The elasticized edges 214 and 215 are covered by the same material used in the moisture proof sheet which prevents the elastic pieces from becoming soiled. The elasticized edges of the moisture proof sheet forms a hammock shape and also assist the garment forming itself into a hammock shape as indicated in Figure 1. Thus these elasticized edges tend to pull up or raise up the ends 21 and 22 of the garment. The elasticized edges 214 and 215 themselves tend to rise up above the central section 207 of the moisture proof sheet and the garment. This desirable shape for the over-garment helps to locate and position the absorbent liner 300. There are snap fasteners 46 dispose at transverse centres on opposite ends 21 and 22 of the over-garment. The preferred snap fasteners is of the socket type which engages with either the liner adaptor or the cover member consisting of the stud type snap fastener. The socket fastener is preferred over the stud fastener because the socket types are simply a flat surface and would not hurt the wearer if the over-garment is used as a cover pant. Other cloth liners or diapers could be placed into the over-garment without the stud fastener being in the way. Thus the over-garment acts like a waterproof cover pant.

The preferred construction of the liner adapter (herein after called the adaptor) 100 will be described with particular reference to Figure 1, 2, 3 and 4 of the drawings. As shown, the adaptor is a key-hole shape contoured that of the absorbent liner used in the diaper assembly illustrated in Figure 1 so as to form a narrower central section 110 and a wider section 111. The material used in the adaptor 100 is a combination of waterproof material 101, 102, 103, 104 and an elastic piece 105. The elastic piece 105 is secured into position between the narrower section 110 and the wider section 111. The narrower section 110 is comprise of two separate waterproof pieces 101 and 103 aligned on top of each other and secured to one end of the elastic piece 105 by a line of stitch 108. The wider section 111 also comprising of two separate waterproof pieces 102 and 104 aligned on top of one another and secured to the other end of the elastic piece 105 by a line of

stitch 109. Two layers of the waterproof pieces 101, 103 and 102, 104 are used at each end of the adaptor sections 110 and 111 respectively in order to provide the necessary strength to resist from the tearing created by the elastic piece 105 from the constant stretching of the adaptor at each end 113 and 114. The adaptor 100 could be a single piece made of moisture proof material as shown in Figure 31. Other contoured shape could be used as well illustrated in Figure 32, 33, 34. There are connecting means which comprises of snap fasteners located at opposite ends 113 and 114 of the adaptor and dispose at transverse centres. The snap fasteners of the stud type 106 and 117 is position at the narrower end 110 and adjacent to each other. The positioning of the stud type 106 and 117 is very critical. The engaging part of stud fastener 106 faces on the inner surface 115 of the adaptor while the engaging part of stud fastener 117 faces on the outer surface 116. The snap fastener of the socket type 107 is position at the wider end 111 with the engaging part of socket fastener facing on the inner surface 115. The assembly of the adaptor is shown clearly in Figure 2 and 3. One can easy see that the socket fastener 107 engages with the stud fastener 106 illustrated in Figure 4. The stud fastener 117 engages with the socket fastener 46. In this preferred arrangement, the contoured shape allows easy access to the detachability of the snap fasteners 106 and 107. The wider end 111 of the waterproof piece 102 and 104 have sufficient distance away from the socket fastener 107 creating a lip which allows the user's fingers to easily engage and disengage the snap fasteners 106 and 107. The lip is long enough which allows the end portion of the lip to fold back covering the snap fastener 107 from exposing itself onto the skin of the wearer and also provides more comfort shown in Figure 4. If a material of various thickness is available such as a liner is placed between the engaging snap fasteners, the elastic piece can adapt to the different thickness of the liner providing a secure fit onto the over-garment.

Preferably the waterproof piece 101, 102, 103, 104 is made from treated plastic, vinyl or nylon which is not only moisture proof but resists cracking and tearing.

The preferred diaper assembly with two adaptors located at each ends 21 and 22 of the garment is shown in Figure 4, 8, 12 and 13. The narrower portion 110 of the adaptor consisting stud fastener 117 engages either ends 21 or 22 of the over-garment consisting of the socket fastener 46. The use of snap fasteners allows detachability for easy cleaning. Other means of securing the adaptor to the over-garment could be used such as a line of stitch securing around the perimeter of the narrow end 110 of the adaptor onto the over-garment. Another similar method is the use of adhesive glue on the outer surface 116 of the narrower portion 114 of the adaptor and adhesive glue on the inner surface 205 of moisture proof sheet. These two methods of securing of the adaptor provides a stronger hold onto over-garment and eliminates the need of stud fastener 117 but it does not allow easy removal for laundry purpose. Also adhesive or non-adhesive hook and loop fasteners could be used instead of sewing or using adhesive glue. An advantage in using the hook and loop type fasteners is the fact that the adaptors could be attached and detached easily for laundry purpose.

If the user have existing waterproof cover pants, cloth diapers or over-garments and wants a better absorbency pad without having to purchase additional diaper pants. The liner adapter can be adapted to these garments easily and substitutes the existing pad with a higher absorbent pad.

The preferred construction of the absorbent liner 300 will now be described with particular reference to Figure 15, 16, 17, 18, 19 and 20 of the drawings. The liner in Figure 15 and 16 is washable and reusable. Both holes 303 and 304 with a size of the stud type snap fastener is located at transverse centres on opposite ends 301 and 302 of the liner. The preferred method used in creating the holes 303 and 304 of the absorbent liner is a hole-punch tool. There are other means of making a hole such as a button-sewing stitch or hole reinforced-rings after a hole is created. The order of placement for the absorbent liner is unique. The liner holes 303 and 304 is placed onto the stud fastener 106 which engages into the co-operating socket fastener 107. This arrangement shown in Figure 4, 12, 13 allows the user to easily find the holes 303 and 304 on the absorbent liner to be secured into place by the snap fasteners 106 and 107. The outer layer 305

is a moisture repellant layer that is sewn about its perimeter to secure the top and bottom surfaces 313 and 314 shown in Figure 18 and 19.

The preferred material for these top and bottom layers is a light knit-like hydrophobic silk material having numerous holes 307 formed therein for the quick passage of fluid to the absorbent layer or pad 306. The silk-like material is unlike other hydrophobic cloth-like material because silk cools and drys at a fast rate. These characteristics of silk is needed for the wearer to heal quickly if diaper rash exists or reduces the rash from developing. The inner pad has a high capacity for absorbing liquids, thereby reducing the likelihood of any leakage from the assembled diaper since the outer layers are highly porous, liquid will pass quickly into the absorbent inner pad and this will help to keep the user dry. The inner pad 306 is comprise of several layers of thin absorbent material instead of a single thick layer. Several thin layers tend to dry quicker than one thick layer due to the fact that there are more air flowing between the layers, thus the urine evaporate much quicker. It also tends to absorb more because the wicking action between the layers acts as a reservoir which holds extra urine along with its normal absorbency from the original layers, thus the overall absorbency is greater than one thick layer. A preferred material for the inner pad 306 is recycled cloth or an absorbent cloth-like material.

Preferably the outer layer 305 used on the absorbent liner 300 are selected to have low capillary action in order to assist in containment of fluids passing into the inner pad 306 and to prevent the liner from becoming unduly damp.

Preferably the inner layers are connected together by a line of stitch 308 shown in Figure 18. This stitch allows less restraint on the inner pad 306 giving maximum absorbency needed and adds stability to the liner, forms moisture banks to contain the spread of liquid, and greatly increases the comfort of the over-garment for the wearer. Preferably the outer layers are connected together around its perimeter by a continuous stitch indicated at 309. Since the inner layer 306 is free of attachment from the outer layer 305, the outer layer 305 tends to bounce off the surface of the inner layer 306. This air gap creates a better stay-dry effect because the skin is not expose to the soaked inner core 306. An alternative

method of securing the inner layer 306 onto the outer layer 305 is illustrated in Figure 16 and 19 in which a line of stitch 310 runs at opposite ends at transverse centres to restrain the inner layer 306 from moving freely and bunching up at the centre during laundry.

With the present diaper assembly, it is also possible to have the absorbent liner constructed in such a manner that it is disposable after a single use shown in Figure 17. The disposable liner can have outer layers made from a thin, liquid pervious, flexible, non-absorbent polypropylene material 359. These layers 355 and 356 cover the front and back and is sealed together at the side edges of the liner as illustrated in Figure 20. Between these outer layers is wood pulp combined with a super absorbent polymer powders 357 enclosed by a lightweight paper such as tissue paper 358 having adequate structural integrity to contain the polymer fibres. The holes 353 and 354 is disposed at respective opposite ends 351 and 352 of the disposable pad 350 as shown in Figure 17. The physical and functional characteristics of the disposable liner is similar to the liner 300 in Figure 15 and 16.

The diaper assembly can adapt to any absorbent liner provided that the transverse centres at the opposite ends of the liner have sufficient room for a hole to exist and fits within the bounds of the moisture proof sheet 200. The hole being the size of the stud fastener 106 and the thickness of the absorbent liner can not exceed the length of the stud fastener 106.

Because the detachable, washable, reusable, absorbent liner 300 is of the above configuration in which a larger surface area is located at the wider section 311 could be rounded as shown, it can selectively be placed either at the rear or the front of the assembly as illustrated in Figures 21 and 22 of the drawings. The orientation of the absorbent liner 300 will depend upon whether the diaper is being used on a male or female person. The arrangement of Figure 21 with the wider section 311 at the rear 21 of the diaper accommodates the normal urine flow for a female user. In this arrangement maximum capacity for absorbing fluid is located at the rear of a diaper. The arrangement of Figure 22 wherein the wider section 311 is at the front 22 of a diaper assembly accommodates the normal urine flow for a male. The preferred choice for night time or for heavy wetters is shown in Figure 23, 24 and

Figure 25. The arrangement of Figure 23 and 24 wherein two absorbent liners placed on top of one another with the top absorbent liner being larger than the bottom absorbent liner and both wider ends 311 of the absorbent liners facing the same direction. The opposite ends 301 and 302 of the top larger absorbent liner 300 is secured to respective opposite ends of the waterproof sheet 200, while the bottom absorbent liner 300 fits snugly in place between the top absorbent liner 300 and the bottom side edges 201 and 202 of the waterproof sheet 200. Placing the wider section 311 at the front 22 of the over-garment 20 accommodates the heavy urine flow accumulated at night for the male user, providing maximum capacity for absorbing fluid which is located at the front 22 of the over-garment 20. Placing the wider section 311 at the rear 21 of the over-garment 20 accommodates the heavy urine flow accumulated at night for the female user, providing maximum capacity for absorbing fluid which is located at the rear 21 of the over-garment 20. The positioning of the absorbent liner 300 may also depend upon the positioning of the infant in the crib or bed. For example if the infant normally lies on its stomach when sleeping the wider section 316 can be placed at the front 22 of a diaper assembly. On the other hand if the infant or child is lying on its back, the wider section 311 can be placed at the rear 21 of the diaper where maximum absorbency may be required. However, if the infant or child lies on its stomach then switches to lying on its back and vice versa, then the arrangement shown in Figure 25 is preferred wherein two absorbent liners 300 of the same size are placed on top of one another having the wider section 311 of the top absorbent liner securing to one end of the waterproof sheet 200 while the wider section 311 of the bottom absorbent liner is secured to the other end of the moisture proof sheet 200. In this arrangement, maximum absorbency could be utilized at both ends of the absorbent liner 300 and still maintaining the comfort fit around the leg opening that is provided by the narrower portion 312 of the absorbent liner 300. The snap fastener used in the diaper assembly can be made of cheaper, metal material, rather than plastic, in order to reduce the cost of the absorbent liner.

A feature in the diaper assembly 10 is the provision of a non-absorbent, washable, reusable, liquid pervious cover member which is identified by reference 450 in Figures 14, 26, 27, 28, 29 and 30 having a sleeve shape and contoured that of an absorbent liner 300, having opposite ends 451 and 452, and a top surface 455 and bottom surface 456. The wider end 451 could be sealed up while the narrower end 452 is open for insertion, but preferably the narrower end 452 is sealed up or closed off and the wider end 451 being open allowing the preferred liner 300 to fit into cover member 450 only one way when assembled for use, which reduces the chances of the liner 300 from soiling and having easy access to removing the soiled cover member 450 from the liner 300 as shown in Figure 28 and 29. The length of the wider end 451 and the narrower end 452 of the top surface 455 exceeds the length of the absorbent liner 300. The length of the bottom surface 456 having the narrower end being the same length as the narrower end on the top surface while the length of the wider end is similar to the length of the absorbent liner 300. The cover member 450 have stud fasteners located at 453 and 454 with stud fastener 453 positioned at the ends 451 centrally with the engaging part facing the top surface 455, and stud fastener 454 positioned at the ends 452 centrally with the stud part facing the bottom surface 456. The wider end 451 containing stud fastener 453 of the top surface 455 can be folded over the bottom surface 456 shown in Figure 28 and 29. The use of cover member 450 allows the outer surface 305 of the liner 300 to become covered. The liner 300 is protected by the preferred cover member 450 by inserting the narrower section 312 of the liner 300 into the wider opening end 451 of the cover member 450. The liner 300 is properly placed when the wider section 311 converges towards the narrower section 312 and stop by the narrower section illustrated in Figure 28. The cover member 450 is secured in place by the use of snap fasteners of the stud type 453 and 454 through the holes 303 and 304 of the liner 300 or 353 and 354 of the disposable liner which engages to the co-operating snap fasteners of the socket type 46 at opposite ends of the over-garment as shown in Figure 14. When assembling the cover member containing the liner onto the over-garment, the wider end of both the cover member and liner should be secured in first, then secure the narrower end later. This procedure will ensure that the cover member of the

wider end protects and covers the exposed wider end of the liner. The configuration of the cover member 450 also helps substantially in maintaining the proper position of the cover member 450. It is prevented from bunching up in the centre of the diaper and exposing the absorbent liner 300. Since the cover member is washable and reusable, it is made to last longer and designed to have stud fastener disposed on its opposite ends. The liner would not be secured properly onto the over-garment without the cover member since the cover member contains the stud fastener. Thus the liner adaptor is not needed. Other absorbent pad could substitute the absorbent liner such as cloth or cloth-like material which can be inserted into the cover member provided that the maximum width of the insert does not exceed the width of the narrower portion of the cover member.

The preferred material for the cover member 450 is made from a hydrophobic heavy knit-like cotton jersey material such as polyester having numerous holes 307 formed therein for the quick passage of fluid to the absorbent liner 300. In addition to help keep the skin of the infant or other user dry, the washable, reusable cover member 450 has an advantage that arises from the fact that it can be removed from the rest of the diaper and be launder. Quite often the cover member 450 will become soiled in use and will need to be launder while the rest of the diaper assembly 10 is still clean and dry. In such cases it is not necessary to wash the remainder of the diaper assembly 10, there being only the need to wash the cover member 450. It will be appreciated that this arrangement tends to leave the absorbent liner 300 cleaner so that it is left in a more desirable condition for laundering.

Another feature of the present diaper assembly 10 is the provision of a disposable inner sheet 400 made of tissue paper or materials that is commonly used in disposable diapers or bleached wood pulp shown in Figure 1, 4, 12 and 13. In addition to help keep the skin of the infant or other user dry, the disposable inner sheet 400 has an advantage that arises from the fact that it can be removed from the rest of the diaper and dispose of. Usually the inner sheet 400 frequently becomes soiled in use and will only need to replace the inner sheet 400 while the rest of the diaper assembly 10 is remains dry and clean. The inner sheet can easily be flushed down a toilet whereupon it will quickly disintegrate and

disappear in the sewage system. In this manner of disposal, the inner sheet should be made of a readily biodegradable material. The perimeter of this inner sheet 400 is slightly larger than the perimeter of the absorbent liner 300 which can cover the liner to protect it from being soiled. Because the opposite ends 401 and 402 of the inner sheet has punctured-out holes 403 and 404 located centrally and sized to that of stud fastener 106. The holes 403 and 404 of the inner sheet fits onto the stud fastener 106 of the adaptor located at opposite ends 21 and 22 of the over-garment. In this way not only do the snap fasteners secure the absorbent liner 300 in place but they also secure opposite ends 401 and 402 of the inner sheet 400 in place as shown in Figure 4, 12 and 13. The inner sheet is design for the user who is too tired to change the diaper or for travel convenience. Since the inner sheet is made to be dispose of, it should be inexpensive to produce and purchase, thus the inner sheet has holes instead of snap fasteners located centrally on opposite ends. In this case, the liner can not be properly secure to the over-garment without the liner adaptor, since the adaptor contains the stud fastener.

The diaper system can be used without having to use either the cover member or inner sheet. However, the absorbent liner will get soiled easily and the stay-dry effect would not be as good.

It will be clear to those skilled in the construction and use of diapers that various modifications and changes can be made to the diaper assembly described herein. All such modifications and changes as fall within the scope of the appended claims are intended to be part of this invention.

I therefore claim:

1. A diaper assembly comprising:

a detachable, washable, reusable liner adaptor having an inner and outer surface and having two opposite ends wherein an elasticized piece is dispose between the narrower and wider sections, said narrower section extending from one end thereof and through an elasticized central portion thereof and terminating at said wider section which forms the other end thereof, said narrower section comprise of two separate layers of moisture proof material aligned on top of one another and secure at one end of the elastic piece by stitching around its perimeter, said wider section comprise of two separate layers of moisture proof material aligned on top of one another and secure at the other end of the elastic piece by stitching around its perimeter, and

connecting means are positioned at opposite ends of said liner adaptor, said connecting means comprising plastic snap fasteners disposed at transverse centres along the length of said liner adaptor, wherein two snap fasteners of the stud type is position at the end of said narrower section and aligned adjacent to one another , having the engaging part of one stud fastener facing on said inner surface and disposed at said narrower end of said liner adaptor while the engaging part of the adjacent stud fastener facing on said outer surface, and having the snap fastener of the socket type position at transverse centre on said wider end section, said socket fastener with the engaging part facing on said inner surface and dispose at sufficient distance from said wider end section having a length and sized to permit folding over said socket fastener and covering said socket fastener from exposing onto the skin of the wearer and providing easy removal and longer life wear.

2. A diaper assembly according to claim 1 wherein said liner adaptor having opposite ends and having inner and outer surface, said inner surface distinguishable from the outer surface by the engaging part of said snap fasteners therein.

3. A diaper assembly according to claim 1 wherein said narrower and wider sections comprise two layers of moisture proof material, said moisture proof material is made of nylon which can resist in cracking and tearing. The double layers of said moisture proof material provides strength and durability to said liner adaptor.

4. A diaper assembly according to claim 1 wherein said elasticized piece is dispose between said narrower and wider sections, said elastic piece is washable and reusable a number of times and provides adjustability to said liner adaptor.

5. A diaper assembly comprising:

a washable, reusable garment having opposite contoured side edges and two opposite ends and an inner and outer surface, having a breathable piece position centrally at side edges on said inner surface of said garment, said breathable piece having a top portion elasticized which tends to pull opposite ends of said garment towards one another, and having the rear portion of said diaper assembly consisting of a protruding piece disposed at said opposite side edges, and

connecting means are positioned at each of said inner surface of said protruding piece located at said rear portion of said garment and at the front end on said outer surface of said garment, said connecting means comprising hook and loop fasteners;

a washable, reusable waterproof sheet with elasticized side edges disposed on said inner surface of said garment and having a length substantially equal to that of said garment, and having two opposite sides edges and two opposite ends, said opposite ends and a small portion of said side edges being permanently attached to respective opposite ends and side edges of said garment while said opposite side edges are substantially free of attachment from said garment;

an elongate, washable, reusable, absorbent liner adapted for positioning on the inner surface of said waterproof sheet and having opposite ends and inner and outer layers, said opposite ends have a hole disposed at transverse centres;

an elongate, separate, disposable, liquid pervious, thin, flexible inner sheet, contoured to that of an absorbent liner adapted to cover said outer layer of said liner and having opposite ends and inner and outer surface, having a hole dispose at transverse centres, and having the perimeter of said inner sheet being slightly larger than the perimeter of said liner, said inner sheet being completely detachable from said liner, and said over-garment to permit disposable of said inner sheet after the use of said diaper assembly, and

means for detachably connecting said opposite ends of said liner and inner sheet to respective opposite ends of said over-garment, said connecting means being said detachable liner adaptor attached at opposite ends of said over-garment,

wherein said liner adaptor of said over-garment having snap fasteners to secure the holes of said liner and inner sheet in order to position said liner and inner sheet onto the over-garment.

6. A diaper assembly according to claim 5 wherein said garment having an inner and outer surface, said outer surface is made of polyester-cotton, while said inner surface is made of wool, said inner and outer surface are held together by connecting means.

7. A diaper assembly according to claim 6 wherein said inner and outer surface are secured together by connecting means, said connecting means being a continuous line of stitch sewn about its perimeter to give the necessary strength and durability to said over-garment.

8. A diaper assembly according to claim 5 wherein said breathable piece is in a triangular shape made of polyester-nylon for quick passage of air flow providing a stable temperature control thus reducing the possibility of a diaper rash from developing and gives strength to the over-garment.

9. A diaper assembly according to claim 5 wherein said protruding piece is in the shape of an elliptical ear and is made of cotton, said protruding piece secured onto said garment by connecting means.

10. A diaper assembly according to claim 9 wherein said protruding piece secured at said rear portion on said opposite side edges of said over-garment by connecting means, said connecting means being a line of stitch sewn between said protruding piece and said over-garment.

11. A diaper assembly according to claim 5 wherein said protruding piece have connecting means comprising of reusable hook and loop type fasteners disposed on the inner surface of said protruding piece for laundry purpose.

12. A diaper assembly according to claim 5 wherein a washable hook and loop type fasteners attached to said opposite ends of said over-garment for securing said over-garment in place on a wearer.

13. A diaper assembly according to claim 5 wherein said side edges of said waterproof sheet are located a sufficient distance apart that said absorbent liner can be positioned at least substantially between said side edges of said waterproof sheet, said side edges of said waterproof sheet tending to pull said opposite ends of said over-garment towards one another.

14. A diaper assembly according to claim 5 wherein said waterproof sheet having said side edges elasticized, said elasticized side edges are covered by waterproof material and having said elasticized side edges folded inwards towards said inner surface of said waterproof sheet and secured therein by stitches forming a hammock-like shape.

15. A diaper assembly according to claim 5 wherein said opposite ends of said over-garment have connecting means disposed at transverse centres, connecting means comprise of snap fasteners of the socket type.

16. A diaper assembly according to claim 5 wherein said diaper assembly having a front portion and rear portion, said rear portion having a elastic strip of short length disposed horizontally and centrally above said snap fastener and secured between said inner and outer surface of said over-garment by a continuous line of stitch about its perimeter.

17. A diaper assembly according to claim 5 wherein said absorbent liner having opposite ends and a narrower and wider sections, said narrower section extending from one end thereof and through a central portion thereof and terminating at said wider section which forms the other end thereof.

18. A diaper assembly according to claim 5 wherein said absorbent liner comprises top and bottom layers of washable, reusable, hydrophobic silk separated by a highly absorbent inner layer of cloth.

19. A diaper assembly according to claim 18 wherein said top and bottom layer have numerous holes formed therein for quick passage of fluid therethrough.

20. A diaper assembly according to claim 5 wherein said absorbent liner having an inner and outer layer, said inner layer comprise of
several thin layers of highly absorbent cloth material secured together by a continuous line of stitch, while the outer layer is secured together by stitching around its perimeter.

21. A diaper assembly according to claim 5 wherein said opposite ends of said over-garment having said liner adapter located at transverse centre, said liner adapter is secured to said over-garment by connecting means being comprise of plastic snap fasteners.

22. A diaper assembly according to claim 21 wherein said narrower portion of said liner adapter having snap fastener of the stud type engages with the socket type snap fastener of said over-garment, while the wider end of said adapter having snap fastener of the socket type is free of attachment from said over-garment.

23. A diaper assembly according to claim 5 wherein said inner sheet is made of tissue-like paper.

24. A diaper assembly according to claim 5 wherein said inner sheet having the surface area slightly larger than the surface area of said absorbent liner covering the outer layer of said absorbent liner from being soiled and leaving the rest of said diaper assembly clean.

25. A diaper assembly according to claim 5 wherein said inner sheet contoured to that of an absorbent liner and having a hole disposed at opposite ends on transverse centres, said inner sheet is adapted to fit onto said outer layer of said liner and secured into place by said liner adaptor.

26. A diaper assembly according to claim 5 wherein said liner adaptor having a stud fastener located on said inner surface and disposed at said narrower portion fits into said holes of said absorbent liner and said holes of said inner sheet which engages with the socket fastener disposed at said wider portion of said liner adaptor securing the opposite ends of said inner sheet and said absorbent liner to opposite ends of said over-garment.

27. A diaper assembly comprising:

a washable garment having opposite contoured side edges, two opposite ends, and inner and outer surfaces;

a reusable waterproof sheet having opposite side edges positioned on said inner surface of said garment, having a length substantially equal to that of said garment, and having two opposite ends and a portion of said side edges attached permanently to respective opposite ends and portion of said side edges of said garment while a major portion of the opposite side edges are substantially free of attachment to said garment and having an inner and outer surface, having said side edges elasticized, said elasticized side edges covered by waterproof material and folded inwards towards said inner surface of waterproof sheet and secured into position by stitches therein forming a hammock-like shape;

an elongate absorbent liner adapted for positioning on said waterproof sheet and having an inner and outer layers and two opposite ends, said latter ends have a hole disposed at transverse centres, and

means for detachably connecting said liner to said over-garment,

wherein said side edges of said waterproof sheet are located at sufficient distance apart that said absorbent liner can be positioned at least substantially between said side edges of said waterproof sheet, having said elasticized side edges tending to pull said opposite ends of said waterproof sheet towards one another.

28. A diaper assembly according to claim 27 wherein said outer surface of said garment is made of light-knit polyester-cotton material, while said inner surface of said garment is made of wool-like material, said outer and inner surface is secured together by connecting means.

29. A diaper assembly according to claim 28 wherein said outer and inner surface are held together by connecting means, said connecting means being a line of stitch sewn about its perimeter to provide durability and strength to said over-garment.

30. A diaper assembly according to claim 27 wherein said garment having a breathable piece in a triangular shape is disposed centrally at side edges on said inner surface of said garment which supports and holds said over-garment together, and providing air circulation to reduce the development of diaper rash.

31. A diaper assembly according to claim 30 wherein said breathable piece having a top portion being elasticized with combination of said side edges tending to pull opposite ends of said over-garment towards one another.

32. A diaper assembly according to claim 30 wherein said breathable piece is made of woven polyester-nylon material.

33. A diaper assembly according to claim 27 wherein said protruding piece is an elliptical ear shape and is made of cotton-like material, said protruding piece secured onto said garment by connecting means.

34. A diaper assembly according to claim 33 wherein said protruding piece secured at said rear portion on said opposite side edges of said over-garment by connecting means, said connecting means being a line of stitch sewn between said protruding piece and said over-garment.

35. A diaper assembly according to claim 33 wherein said inner surface of said protruding piece have connecting means comprising of washable hook and loop type fasteners to prevent hook fasteners from being exposed during washing.

36. A diaper assembly according to claim 27 wherein a reusable hook and loop type fasteners attached to said opposite ends of said over-garment for securing said over-garment in place on a wearer.

37. A diaper assembly according to claim 27 wherein said diaper assembly has a rear portion and a front portion for placement at a rear and a front of a user respectively, said absorbent liner has a narrower section of uniform width extending from one end thereof and through a central portion thereof and terminating at a wider section forming an end portion thereof and said wider section can be placed selectively either at the rear portion or the front portion of the assembly.

38. A diaper assembly according to claim 27 wherein said absorbent liner comprises top and bottom layers of washable, reusable, hydrophobic silk-like material separated by an inner layer made of highly absorbent cloth-like material.

39. A diaper assembly according to claim 27 wherein said top and bottom layer of silk material has numerous holes formed therein for quick passage of fluid therethrough.

40. A diaper assembly according to claim 27 wherein said absorbent liner having an inner and outer layer, said inner layer comprise of several thin layers of highly absorbent cloth secure together by a line of stitch, while the outer layer is held together by sewing around its perimeter.

41. A diaper assembly comprising:

a reusable garment having opposite ends, two contoured side edges and inner and outer surfaces;

a washable moisture proof sheet disposed on the inner surface of said garment and having two opposite side edges and two opposite ends, the latter ends and a portion of side edges being permanently attached to respective opposite ends and side edges of said garment;

a detachable, reusable, absorbent liner made of washable cloth and adapted for positioning on said moisture proof sheet, said absorbent liner having opposite ends and narrower and wider sections, said narrower section extends from one end thereof and through a central portion thereof and terminating at said wider section forming the other end thereof, having an inner and outer layer, said outer layer comprise of hydrophobic material while the inner layer comprise of several layers of highly absorbent material, said inner layer is secured together by a line of stitch at transverse centre and having said inner layer free of attachment from said outer layer of said absorbent liner, and having a hole dispose at transverse centres on said opposite ends of said absorbent liner;

a separate, non-absorbent, liquid pervious, thin, flexible inner sheet or cover member, contoured to that of an absorbent liner, having opposite ends and inner and outer surface covering the surfaces of said absorbent liner located furthest from said over-garment, and

means for detachably connecting said opposite ends of said inner sheet or cover member and said absorbent liner to said opposite ends on the inner surface of said over-garment, said connecting means being snap fasteners disposed on the liner adaptor or disposed on opposite ends of said cover member in a sleeve form which is reusable a number of times and washable with said over-garment,

wherein said wider section of said absorbent liner can be placed selectively at either end of said moisture proof sheet and secured to said over-garment by said snap fasteners, and

wherein said side edges of said moisture proof sheet are located at sufficient distance apart that said absorbent liner can be positioned at least substantially between said side edges of

said moisture proof sheet, said elasticized side edges of said moisture proof sheet tending to pull said opposite ends of said moisture proof sheet towards one another.

42. A diaper assembly according to claim 41 wherein garment having an inner and outer surface, said inner and outer surface is held 7together by stitching around its perimeter.

43. A diaper assembly according to claim 41 wherein a breathable triangular piece disposed centrally at side edges on the said inner surface of said garment, the top base of said breathable piece are elasticized which tends to pull said opposite ends of said garment towards one another.

44. A diaper assembly according to claim 41 wherein the rear end of said garment consists of a protruding cloth-like ear piece disposed at opposite side edges.

45. A diaper assembly according to claim 41 wherein said absorbent liner comprises of several thin layers of high absorbency cloth-like material secured together by a continuous line of stitch and covered by a washable, reusable layer of hydrophobic silk having a large number of openings distributed over its surface.

46. A diaper assembly according to claim 41 wherein said top and bottom layer made of silk-like material having numerous holes formed therein for quick passage of fluid therethrough.

47. A diaper assembly according to claim 41 wherein said absorbent liner having an inner and outer layer, said inner layer secure together by a line of stitch, while the outer layer is held together by sewing around its perimeter.

48. A diaper assembly according to claim 41 wherein said diaper assembly has a rear portion and a front portion for placement at a rear and a front of a user respectively, said absorbent liner can be placed selectively either at the rear portion or the front portion of the assembly.

49. A diaper assembly according to claim 41 wherein said absorbent liner can have two different sizes placed on top of one another and having said top liner being larger than the bottom liner with the wider end of both liners facing the same direction and secured at either the front or rear portion of said assembly to permit optimum absorbency during different times of the day.

50. A diaper assembly according to claim 41 wherein two absorbent liners of the same size can be placed on top of each other having the wider end of both liners facing opposite to one another and secured at opposite ends of said over-garment allowing the greatest absorbency at both ends of said over-garment.

51. A diaper assembly according to claim 41 wherein said absorbent liner is disposable after use.

52. A diaper assembly according to claim 41 wherein said liner adapter dispose at transverse centre on opposite ends of said over-garment is used when said inner sheet is used, said liner adapter is secured to said over-garment by stud fasteners located on the outer surface of said liner adaptor and engages with the socket fastener located at opposite ends of said over-garment.

53. A diaper assembly according to claim 52 wherein said liner adaptor having stud fastener dispose on the narrower portion of the inner surface fits into holes of said absorbent liner and holes of said inner sheet which engages with socket fastener disposed at wider portion on the inner surface of said same adaptor, in order to position said absorbent liner and said inner sheet onto said over-garment.

54. A diaper assembly according to claim 52 wherein said inner sheet is made of woven, light-knit polyester material.

55. A diaper assembly according to claim 41 wherein said cover member is made of polyester-like material.

56. A diaper assembly according to claim 41 wherein said cover member contoured to that of an absorbent liner in the form of a sleeve and said absorbent liner is inserted into said cover member.

57. A diaper assembly according to claim 41 wherein said cover member having the wider end open and a narrower end closed allowing said absorbent liner to fit into said cover member only one way.

58. A diaper assembly according to claim 41 wherein said cover member having the length of the inner surface from said narrower and wider end exceeding the length of said absorbent liner, while the narrower end on said outer surface have length equal to that of said narrower end on the inner surface of said cover member, said wider end on the outer surface is equal to that of said liner and said wider end on the inner surface can be folded back over said wider end on said outer surface covering said absorbent liner.

59. A diaper assembly according to claim 41 wherein said cover member having inner and outer surface and having a narrower and wider end, said inner surface have a stud fastener disposed at said wider end, while said outer surface have a stud fastener disposed at the narrower end.

60. A diaper assembly according to claim 41 wherein said cover member having said wider and narrower end and having said stud fastener disposed at corresponding opposite ends of said cover member, said stud fastener fits into the respective holes of said absorbent liner and engages with the co-operating socket fasteners positioned on opposite ends of said over-garment.

61. A diaper assembly comprising:

a washable garment having opposite contoured side edges, two opposite ends and inner and outer surfaces,

a waterproof sheet having opposite side edges position on said inner surface of said garment having two opposite elasticized side edges and two opposite ends, said opposite ends and a portion of side edges are attached to respective opposite ends and side edges while said opposite side edges are substantially free of attachment to said garment and having an inner and outer surface, and

a detachable, elongate, washable absorbent liner adapted for positioning on said inner surface of said moisture proof sheet and having opposite ends and inner and outer surfaces, and

an elongate, separate, reusable, non-absorbent, liquid pervious, flexible cover member, contoured to that of an absorbent liner in a sleeve form, having an inner and outer surface and having a wider end open and narrower end close allowing insertion of said liner into said cover member only one way, and having the length of said inner surface from said narrower and wider end exceeding the length of said liner, while said narrower end on said outer surface have length equal to that of said narrower end on said inner surface of said cover member, said wider end on said outer surface is equal to that of said liner, said wider end on said inner surface can be folded back over said wider end on said outer surface covering said absorbent liner, and having said cover member being completely detachable from said liner and said over-garment to permit laundry or dispose of after use of said diaper assembly, and

means for detachably connecting said opposite ends of said absorbent liner and said cover member to respective opposite ends on the inner surface of said over-garment, said connecting means being snap fastener and reusable a number of times and washable with said cover member, and

wherein said inner surface have a stud fastener disposed at the wider end of said cover member, while the outer surface have a stud fastener disposed at the narrower end of said cover member, said stud fastener fits into the respective holes of said absorbent liner and engages with the co-operating socket fasteners positioned on opposite ends of said moisture proof-garment, securing said absorbent liner and said cover member onto said over-garment.

62. A diaper assembly according to claim 61 wherein said liner adapter dispose at transverse centre on opposite ends of said over-garment is used when said inner sheet is used, said liner adapter is secured to said over-garment by stud fasteners located on the outer surface of said adaptor and engages with the socket fastener located at opposite ends of said over-garment.

63. A diaper assembly according to claim 62 wherein said liner adaptor having stud fastener dispose on the narrower portion of the inner surface fits into holes of said absorbent liner and holes of said inner sheet which engages with socket fastener disposed at wider portion on the inner surface of said same adaptor, in order to position said liner and inner sheet onto said over-garment.

64. A diaper assembly according to claim 62 wherein said inner sheet is disposable after use.

65. A diaper assembly according to claim 61 wherein said outer surface of said absorbent liner comprises of washable, reusable, hydrophobic material separated by a highly absorbent inner layer of cloth-like material.

66. A diaper assembly according to claim 61 wherein said absorbent liner comprises of several thin layers of high absorbency cloth secured together by a continuous line of stitch, said inner layer being free of attachment from said outer layer, said outer layer is covered by a washable, reusable layer of hydrophobic silk having a large number of openings distributed over its surface, and held together by sewing around its perimeter.

67. A diaper assembly according to claim 61 wherein at least said top layer of hydrophobic silk-like material has numerous holes formed therein for quick passage of fluid therethrough.

68. A diaper assembly according to claim 61 wherein said absorbent liner can be arranged to have at least two absorbent liner placed on top of one another and secured in such a manner as to permit maximum absorbency during different times of the day.

69. A diaper assembly according to claim 61 wherein said cover member is made of light-knitted polyester.

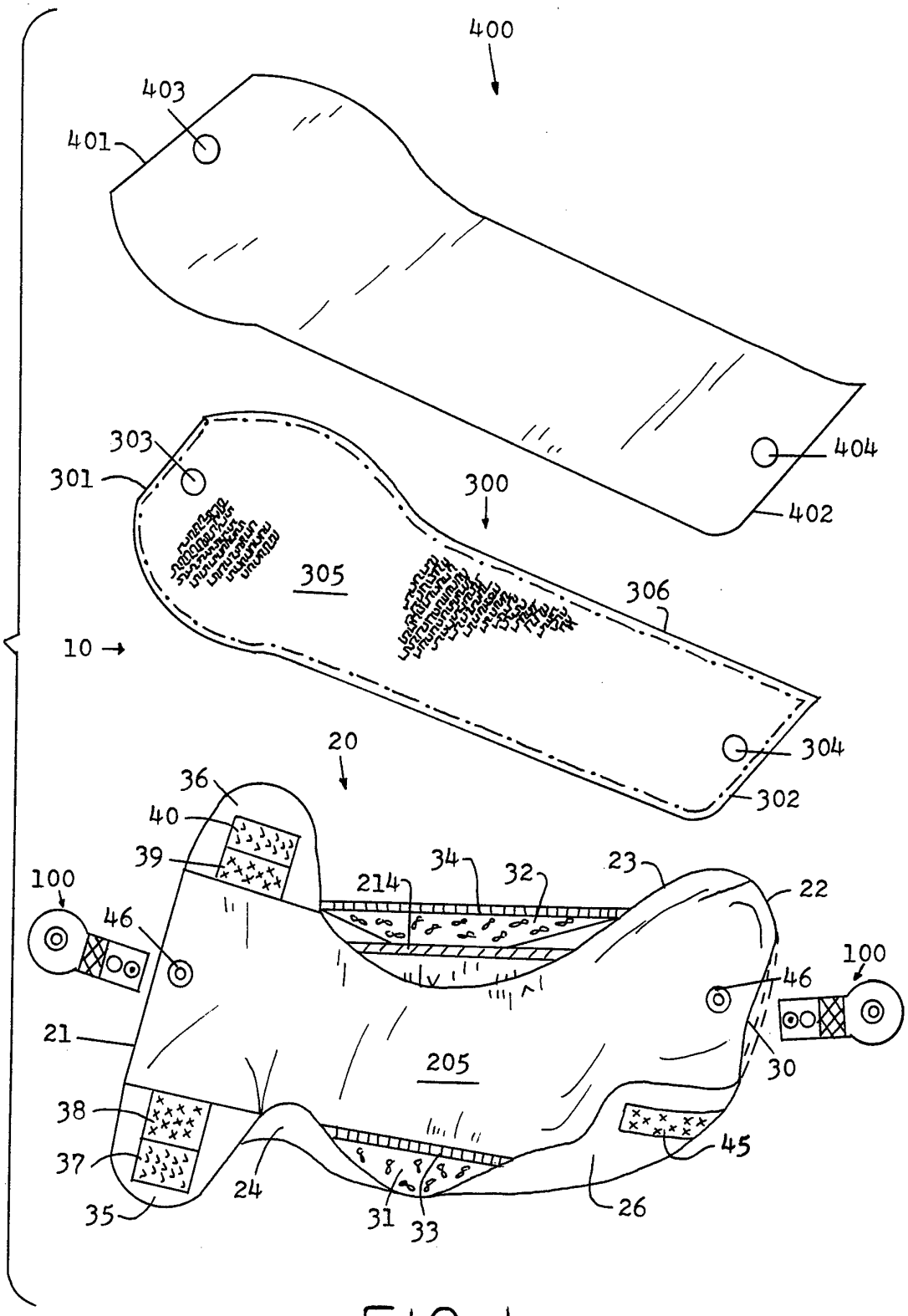
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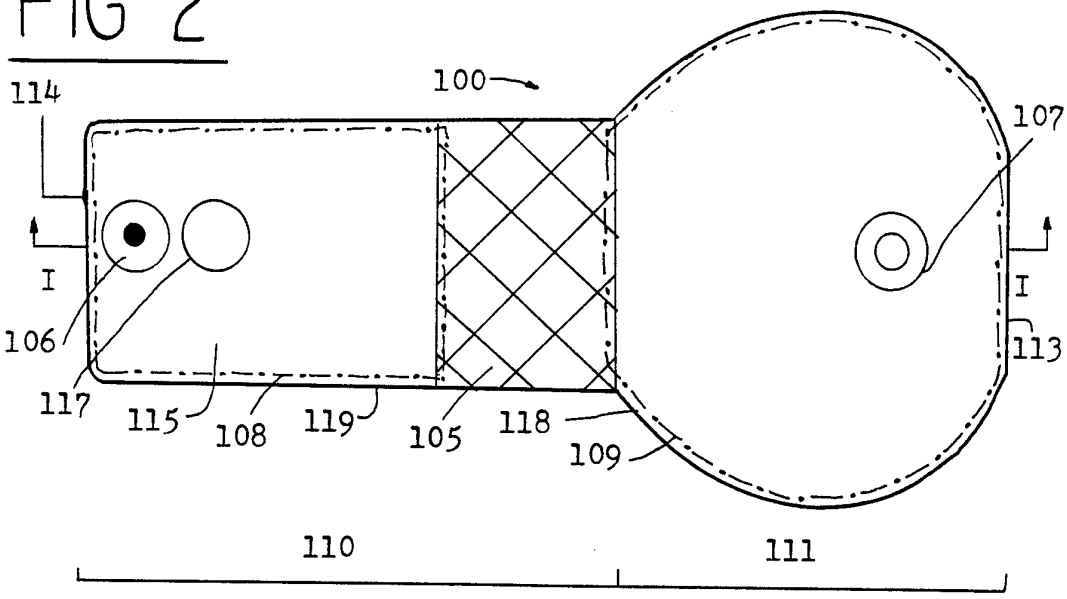
FIG 1

FIG 2



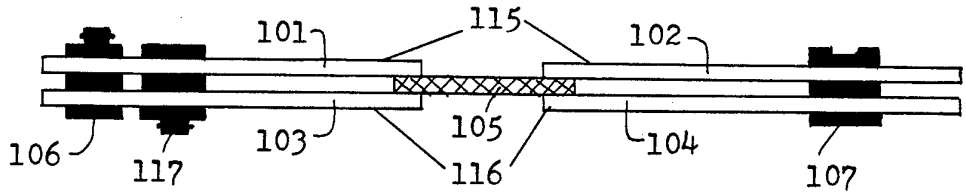


FIG 3

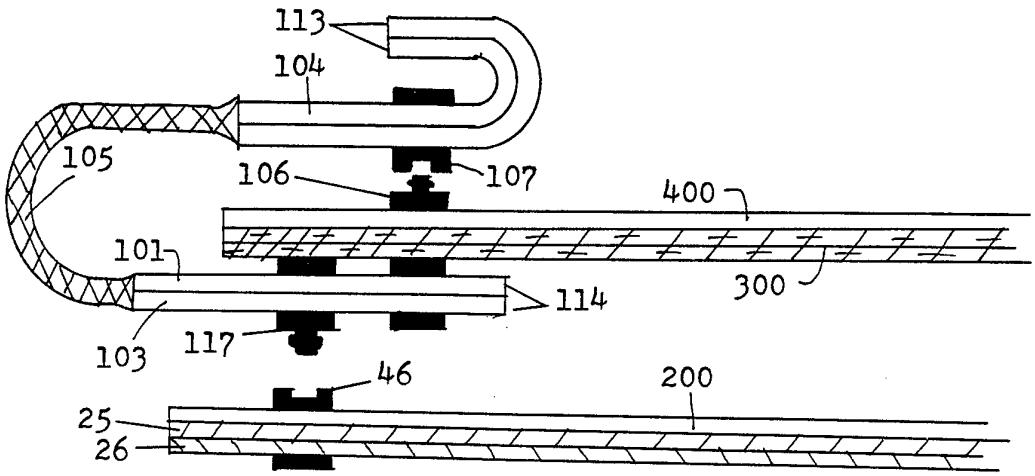


FIG 4

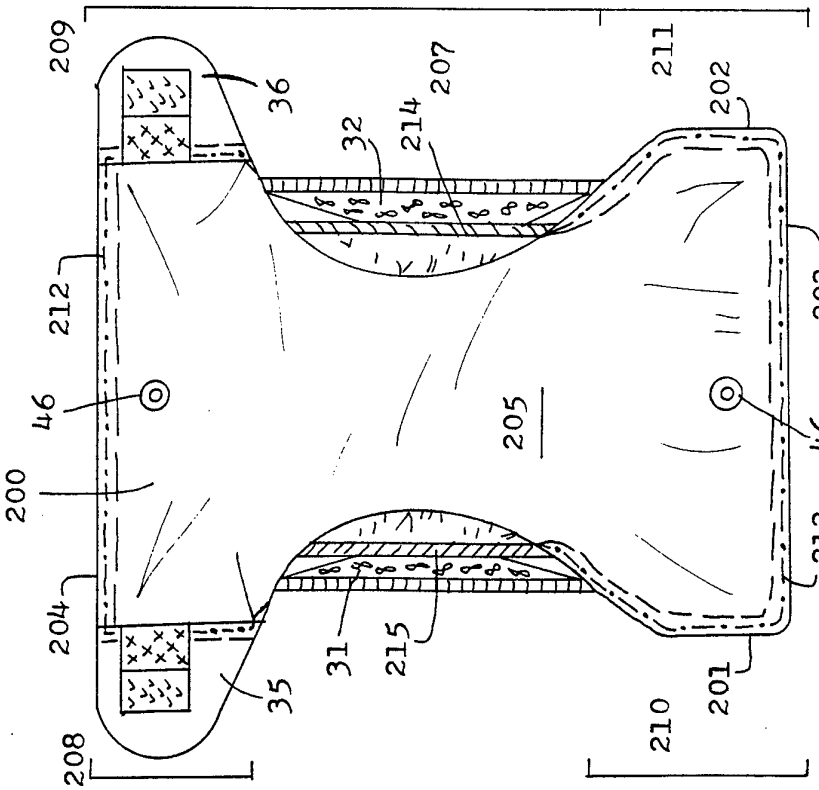

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FIG 6

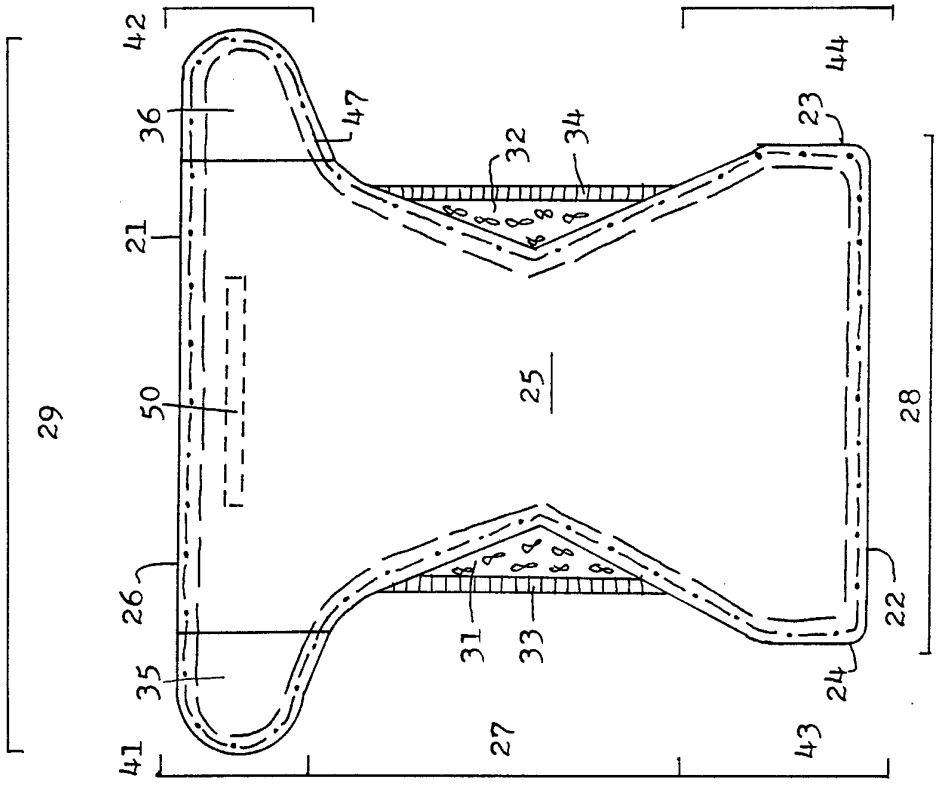
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FIG 5

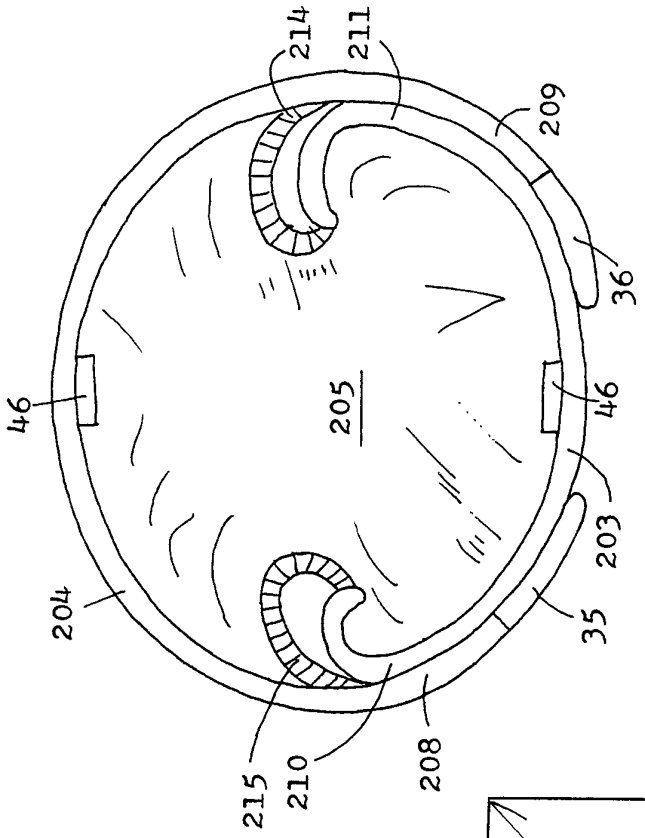


FIG 9

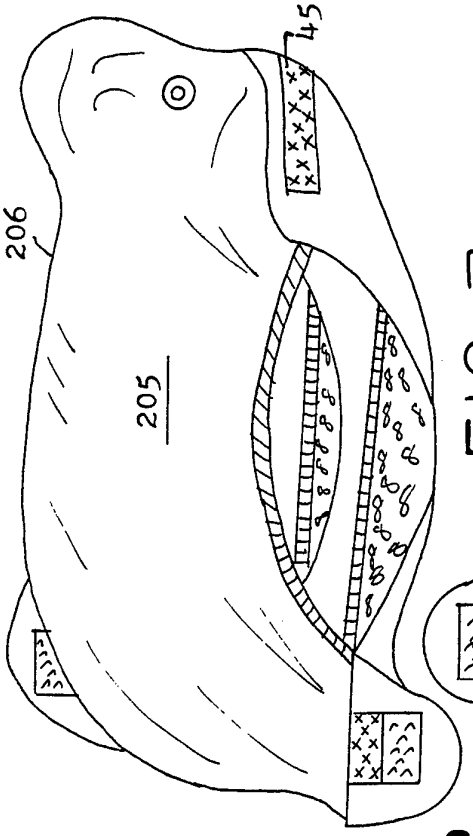


FIG 7

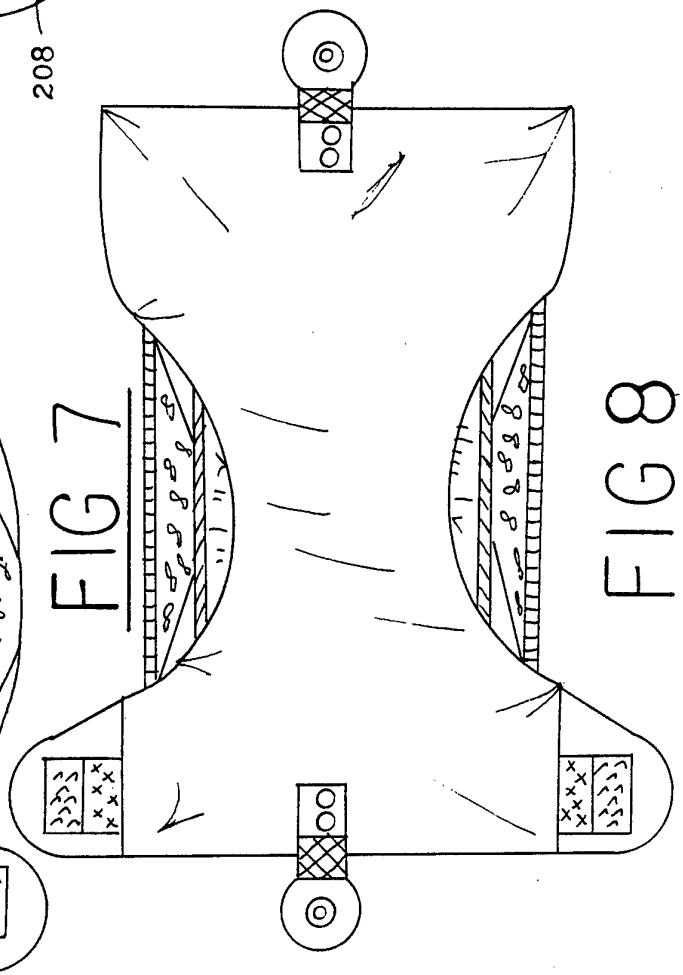


FIG 8

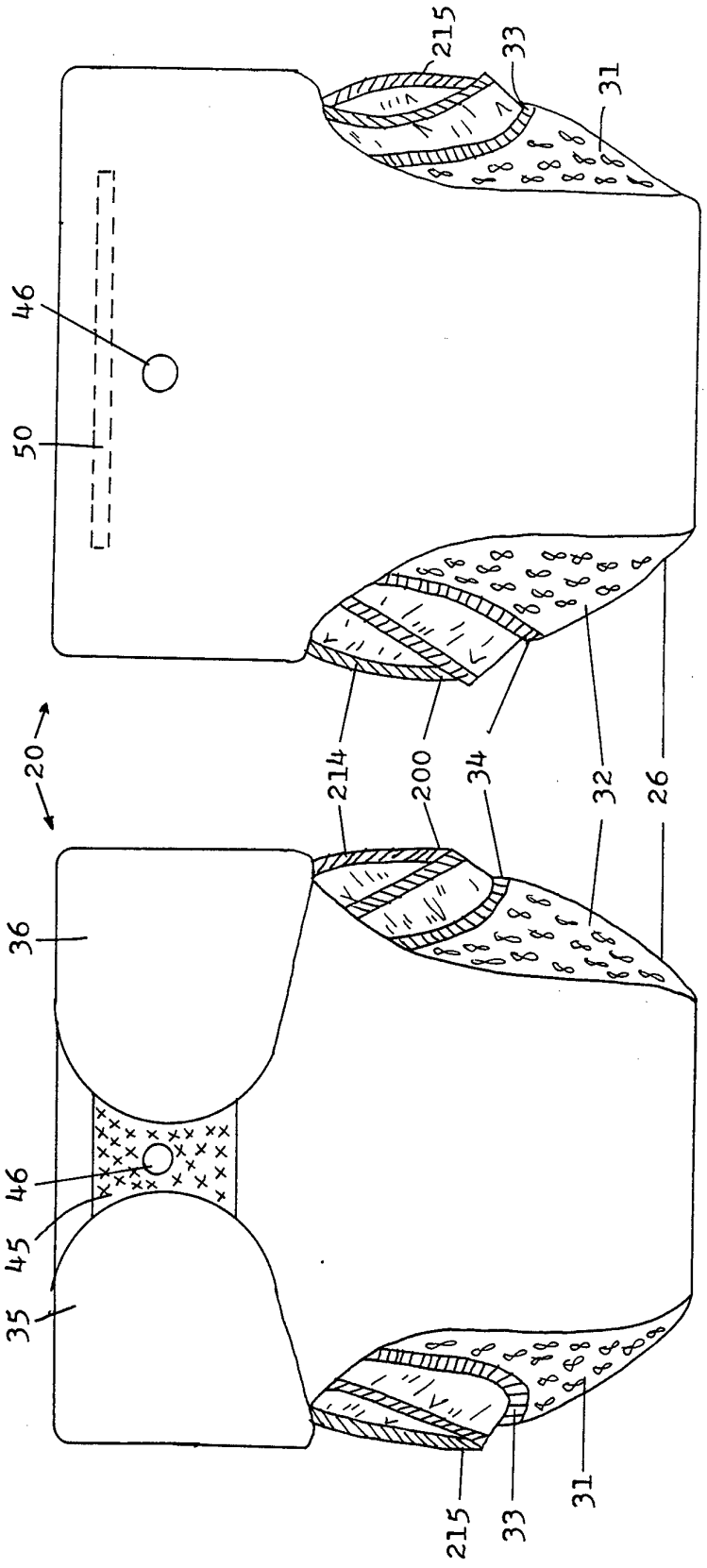


FIG 11

FIG 10

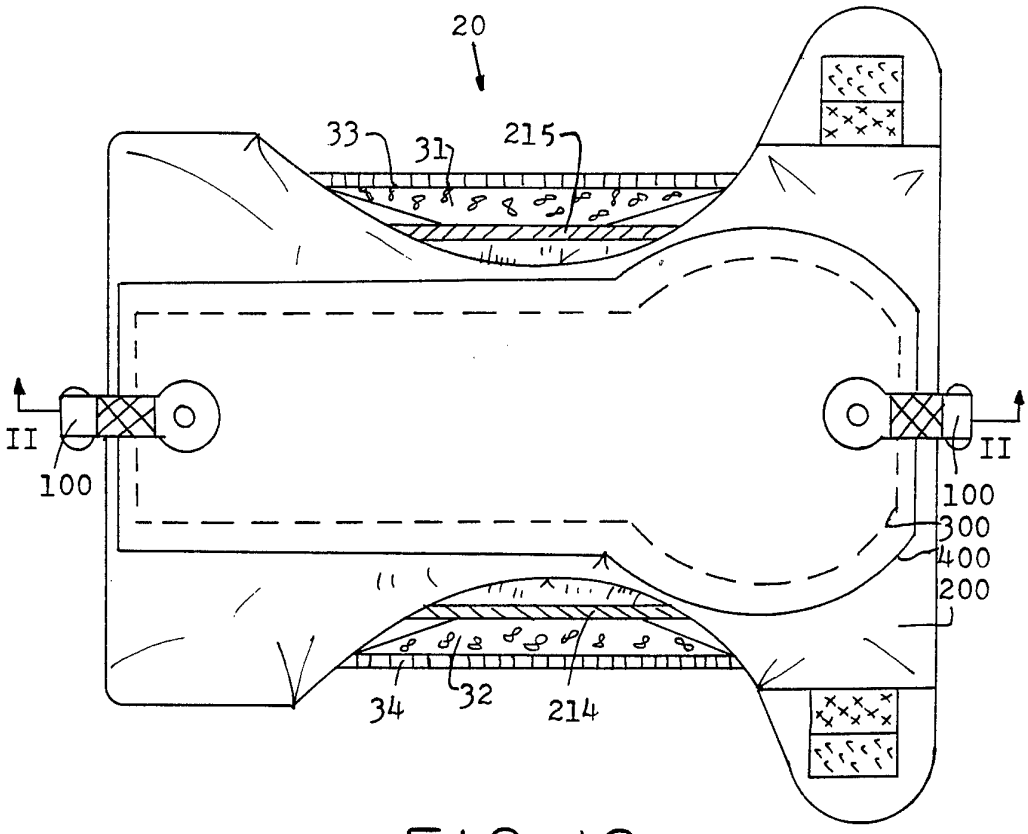


FIG 12

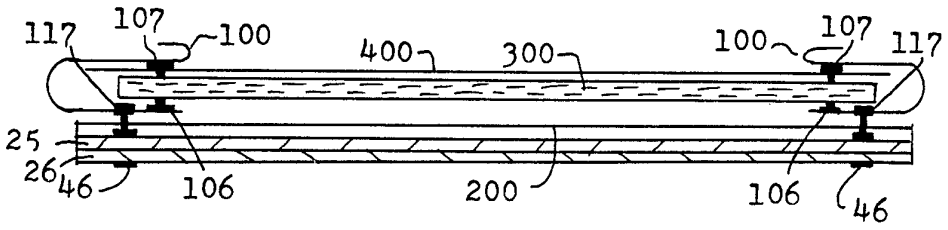
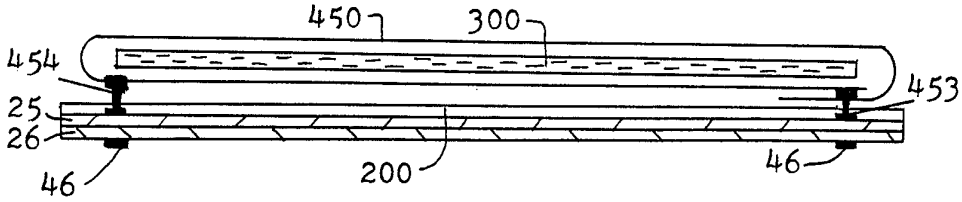


FIG 13



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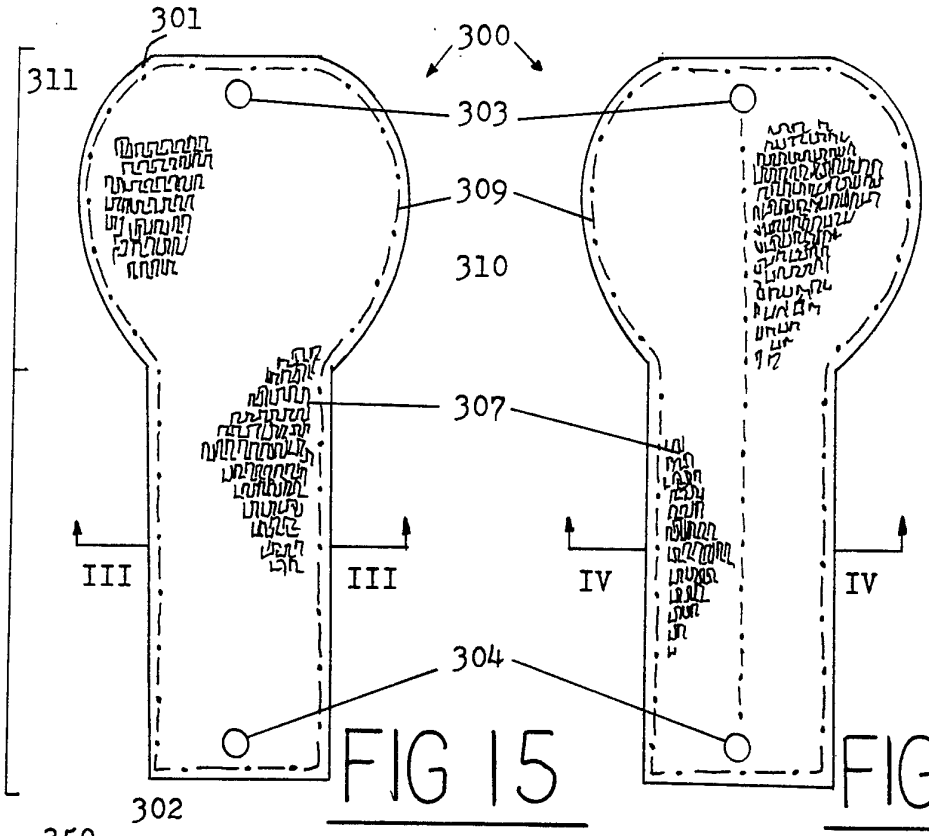

FIG 15

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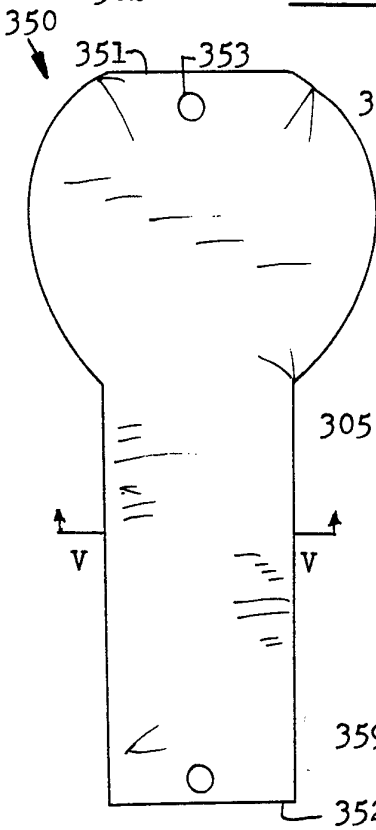


FIG 17

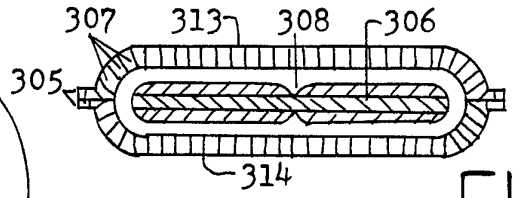


FIG 18

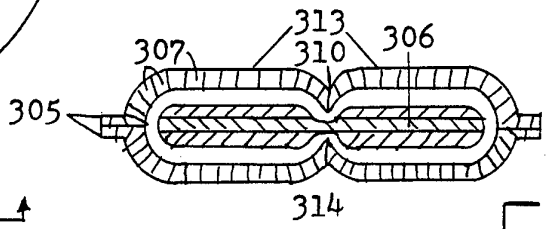


FIG 19

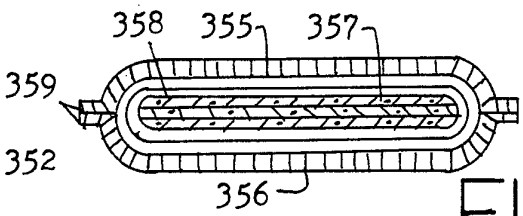


FIG 20

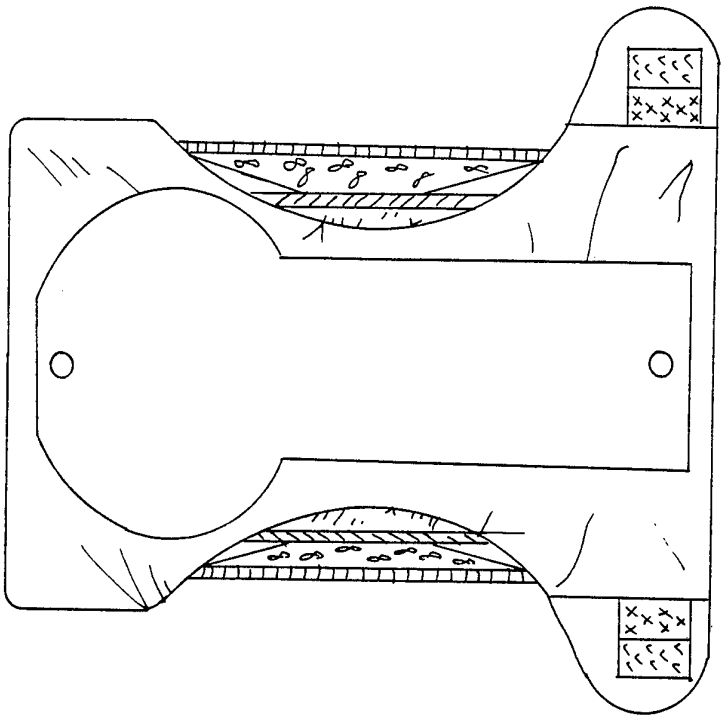


FIG 22

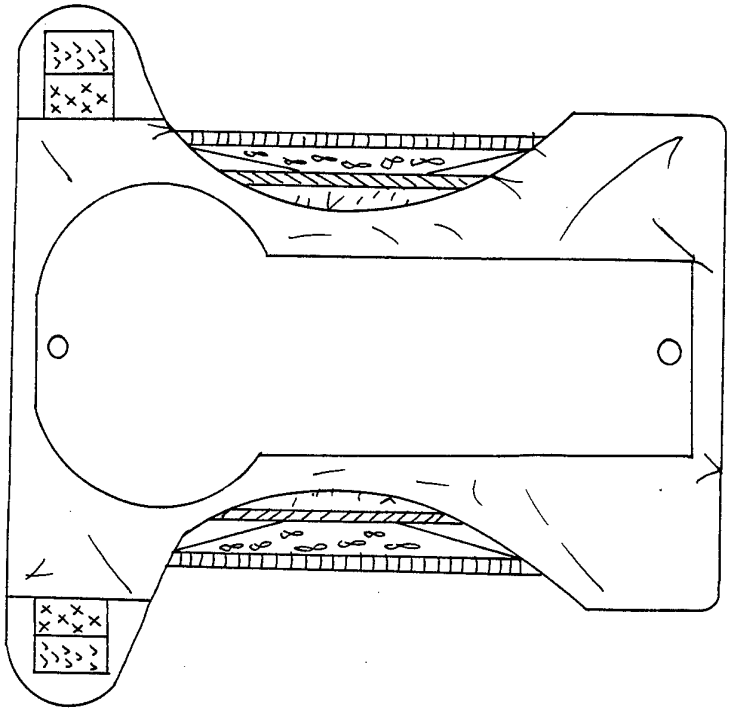
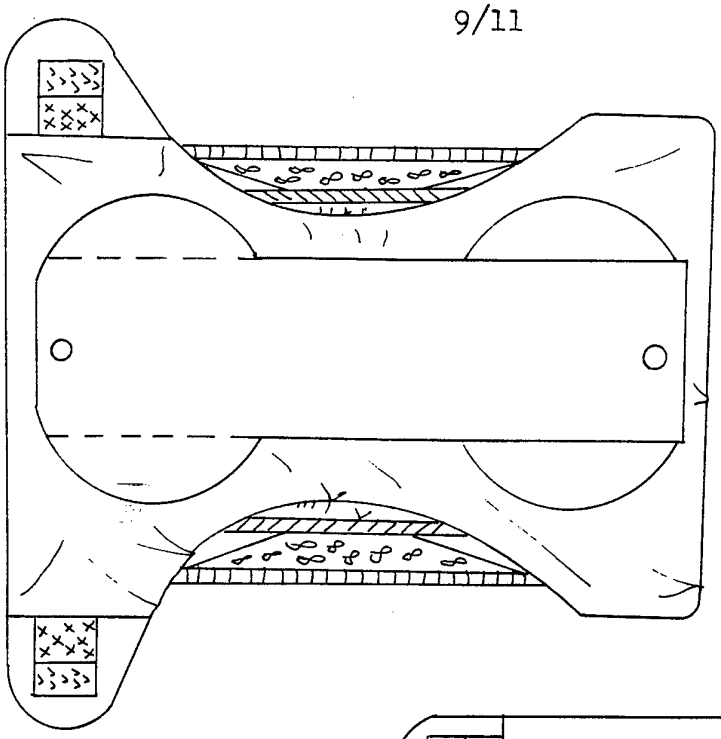


FIG 21



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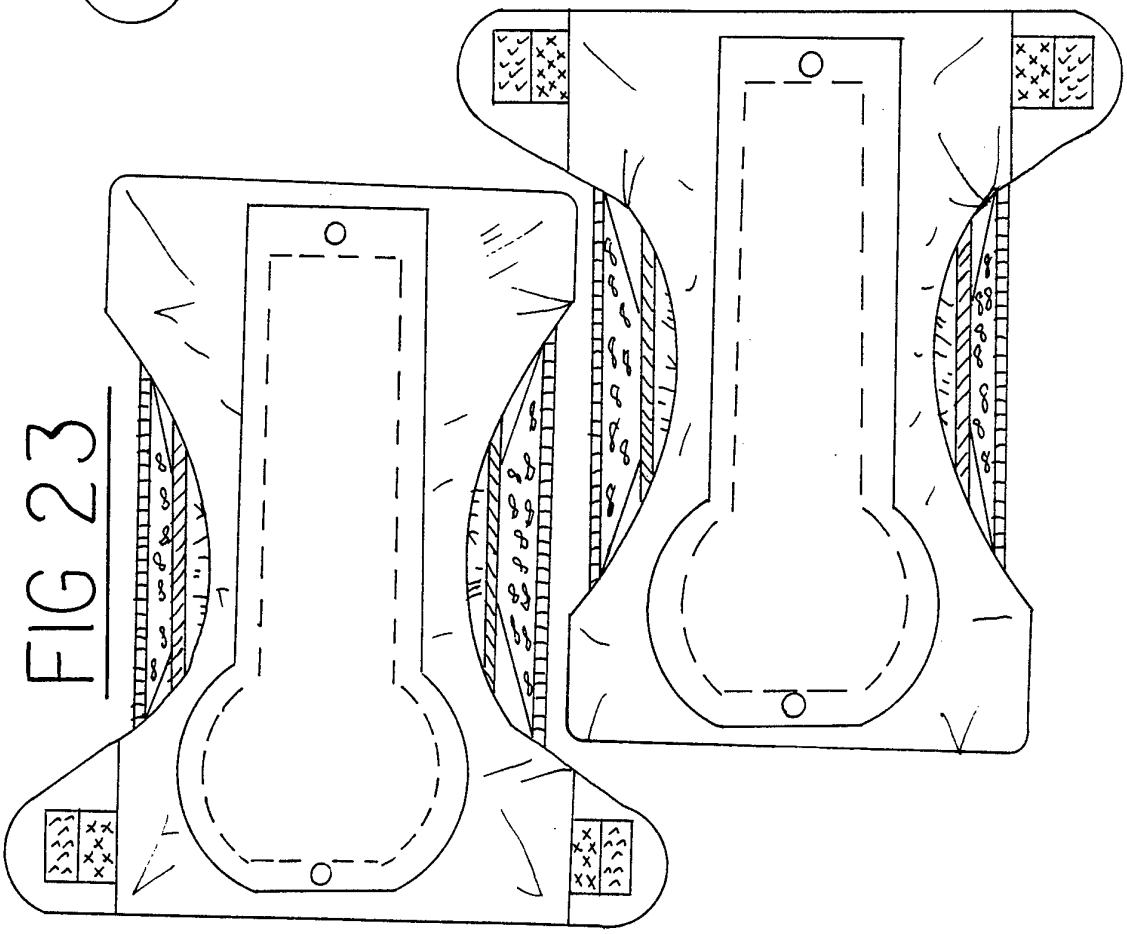


FIG 23

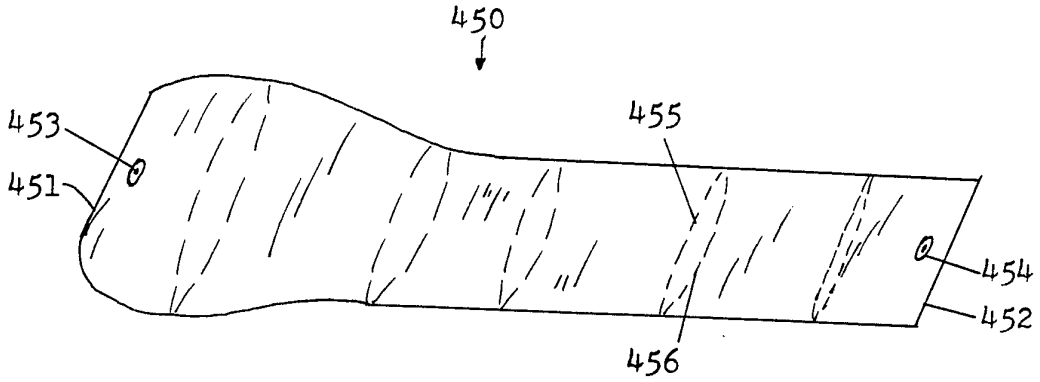


FIG 26

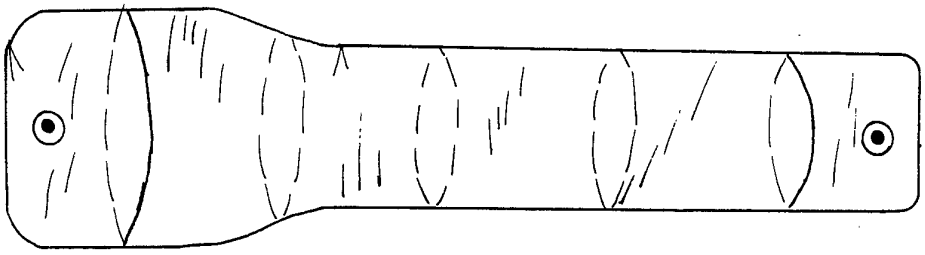


FIG 27

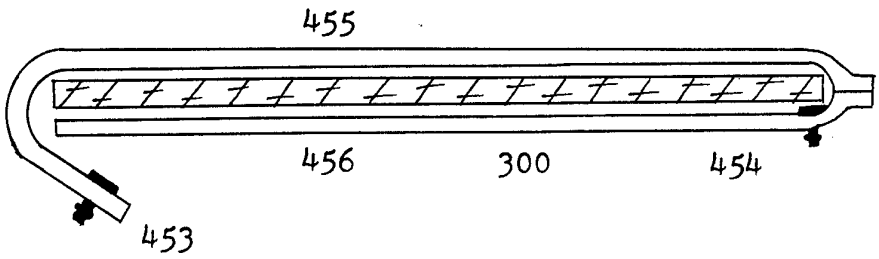


FIG 28

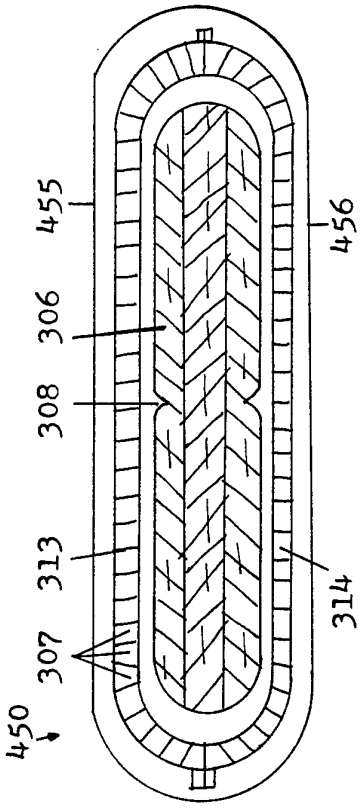
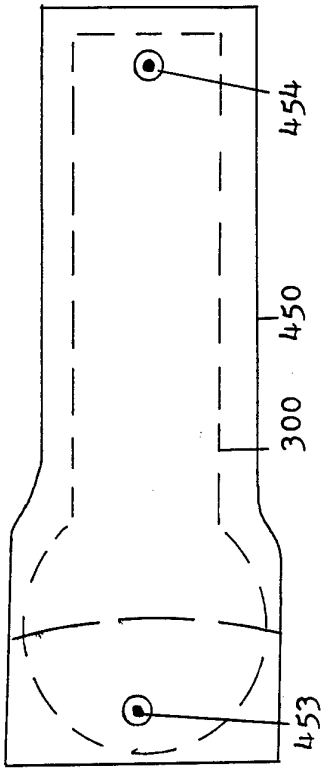


FIG 30



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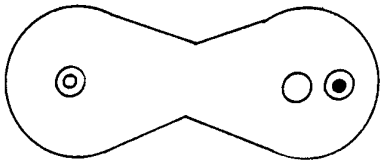

FIG 33

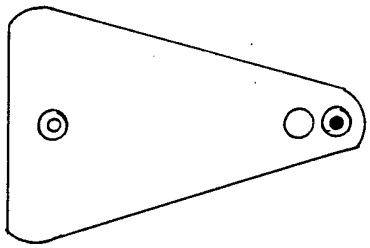

FIG 32

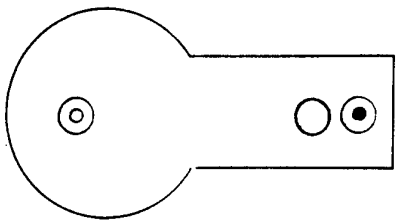

FIG 31

INTERNATIONAL SEARCH REPORT

Interna l Application No
PCT/CA 93/00427

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61F13/15 A61F13/78

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	CA,A,1 282 904 (M.E.FEDRYNA AND P.H.T.LEE) 16 April 1991 cited in the application see claims	27-29, 36-42, 45-69 5-20,23, 24, 30-35, 43,44
A	---	1-4
Y	DE,A,23 22 492 (T.TANIGUCHI) 14 November 1974 see page 3, line 26 - page 4, line 1 see page 5, line 4 - page 6, line 5 see page 6, line 19 - line 25 see figure 1	5-20,23, 24, 30-35, 43,44

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 August 1994	2 0. 09. 94
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	**Authorized officer** Nice, P

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Intern: al Application No
PCT/CA 93/00427

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 338 939 (H.DAVILLE) 13 July 1982 see column 4, line 33 - line 49; figure 8	1-4
A	FR,A,1 227 935 (COSETTE) 7 March 1960 see page 1, right column, line 7 - line 14; figures 1-2	1-4
A	US,A,4 842 596 (D.P.KIELPIKOWSKI AND D.G.UITENBROEK) 27 June 1989 see column 9, line 49 - line 57 see column 9, line 63 - column 10, line 1 see figure 4	5,30,31, 43
A	EP,A,0 109 126 (PROCTER & GAMBLE) 23 May 1984 see claims 1,9-11; figures 5,10	5,30,31, 43
A	GB,A,1 482 677 (PROCTER & GAMBLE) 10 August 1977 see page 3, line 49 - line 57 see page 5, line 75 - line 76; figure 1	30,31,43

INTERNATIONAL SEARCH REPORT

Inter...tional application No.
PCT/CA93/00427

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims: 1-4,27-29,36-42,45-69: Diaper comprising detachable reusable and disposable components, with a liner adaptor

2. Claims: 5-26,30-35,43-44: Diaper comprising detachable reusable and disposable components, incorporating protruding pieces and elasticised breathable pieces

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searches without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Interna .l Application No
PCT/CA 93/00427

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA-A-1282904	16-04-91	US-A- 5217447	08-06-93
DE-A-2322492	14-11-74	NONE	
US-A-4338939	13-07-82	NONE	
FR-A-1227935		NONE	
US-A-4842596	27-06-89	NONE	
EP-A-0109126	23-05-84	US-A,B 4636207	13-01-87
		AU-B- 560129	02-04-87
		AU-A- 2133283	24-05-84
		GB-A,B 2130491	06-06-84
		JP-B- 5032063	14-05-93
		JP-A- 59146651	22-08-84
		KR-B- 9401370	21-02-94
		US-A- 4900317	13-02-90
		US-A- 5085654	04-02-92
GB-A-1482677	10-08-77	NONE	