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ABSORBENT ARTICLES WITH INTEGRAL RELEASE
SYSTEM AND METHODS OF MAKING SAME

5 The present invention relates to improved absorbent articles. More particularly, the present invention relates to sanitary napkins, panty liners and the like having integral adhesives for affixing the absorbent article to a user's undergarment.

10 ~~CROSS REFERENCES TO RELATED APPLICATIONS~~

This application is related to U.S. Serial No. _____, filed concurrently herewith, entitled "Absorbent Articles With Integral Release System and Methods Of Making Same", (William B. Mattingly III) attorney docket No. PPC 325, U.S. Serial No. _____ "Absorbent Article Having Optional Side Panel Usage" (Frank Glaug) attorney docket No. PPC 346, and U.S. Serial No. _____ "Absorbent Articles With Integral Release System", (Deborah Parr) attorney docket No. PPC 359.

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BACKGROUND OF THE INVENTION

Absorbent articles such as panty liners and sanitary napkins are well known throughout the art. Generally, these articles have an absorbent, body facing side and a garment facing side. In many instances, the garment facing side is comprised of a fluid impermeable barrier film. A preferred method of securing these articles so that there is close, direct contact between the perineal area and the user's undergarment is to apply an adhesive to the garment facing side. The adhesive is chosen to provide sufficient anchoring strength to hold the article firmly in place while the user moves.

35 Inherent in absorbent articles of the above-described construction is the requirement to have release paper applied

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to the adhesive. The release paper allows the article to be manufactured, packaged, stored, and otherwise handled without the adhesive adhering to itself or any other object. Release paper also serves to prevent oxidation, dust or dirt
5 contamination of the adhesive and evaporation of tackifying resins. Unfortunately, the use of release paper is undesirable for several reasons. First, before the absorbent article can be used, the paper must be removed and discarded. This presents disposal problems and reduces the discretion with
10 which the absorbent articles may be used. Second, release paper adds significantly to product cost. This is particularly true for low cost panty liners and the like which use very little absorbent material. Extra costs due to the release paper are incurred by both the additional material costs and
15 the additional processing time and labor required to apply the release paper.

~~Related patent application U.S. Serial No. _____~~
entitled "Absorbent Articles Having Integral Release Means and
20 Methods of Making Same", W. B. Mattingly (Attorney Docket No. PPC 325) describes products without release paper and methods of making such products. ~~The products described therein may be folded in many ways.~~ However, consumers generally desire that such sanitary protection products be stored such that the
25 body-facing layer is protected from the environment and maintained in a clean condition prior to use. Also, consumers prefer to have adhesive applied not only to the center of the pad but to areas as close as possible to the transverse ends of the pad in order to fasten the pad securely in place. Also,
30 consumers prefer to have adhesive applied not only in the center of the pad but also as close to both ends of the pad as possible to securely fasten the pad in place.

Thus, it would be desirable to eliminate the need for
35 release paper while still retaining the adhesive applied to the



garment facing side of an absorbent article so that it can be used to adhere the absorbent article to the undergarment during use but will not stick to itself or an inappropriate surface before use. It would further be desirable to apply such adhesive to the garment facing side of an absorbent article such that a major portion of the body-facing side of the article is protected during storage and such that the adhesive may be applied not only to the central position of the pad but as close as possible to the transverse ends of the pad.

SUMMARY OF THE INVENTION

Accordingly, it has now been found, in accordance with this invention ~~and with co-pending patent application Serial~~ No. ~~_____ (Mattingly)~~, that the need for release paper may be eliminated using the method and products of this invention. More particularly, the elimination of release paper may be accomplished by creating release zones and attachment zones at the extreme longitudinal ends of the undergarment-facing side of the products of this invention in such a pattern that the release zones and attachment zones alternate in placement on the undergarment-facing side. Within the attachment zones are located attachment means. Within the release zones are located release means. The attachment and release means are placed such that when the subject absorbent article is folded along a fold line adjacent the longitudinal ends of the undergarment-facing side of the pad, the attachment means meet with the release means.

In accordance with this invention, absorbent articles, such as panty liners and the like, are provided which are capable of being stored in a folded configuration prior to use. These absorbent articles have a body-facing side and a garment-facing side. Preferably, attachment zones and release zones are created on the garment facing side of the article. Release



means may be created by depositing a release agent within the release zone, e.g., by coating at least a portion of the release zone with a release agent. Most preferably, the release agent is silicone, although it may be any of a number of chemical release agents known to those skilled in the art. However, a release agent need not be deposited to create the release means. Alternatively, the release means may simply constitute designated areas of the garment-facing side of the absorbent article when the garment-facing side of the absorbent article is made of an appropriate material which can act as a release means.

Attachment means are preferably created on the garment facing side of the article by delineating attachment zones and depositing attachment or adhesive means to at least a portion of the attachment zones. These attachment zones may be treated to make them more receptive to the attachment means. The attachment means may consist of any means of releasably attaching the absorbent article known to those skilled in the art, for example, pressure-sensitive adhesives, Velcro® hook and loop attachment means or non-slip materials or the like. For the sake of clarity, the following descriptions will exemplify embodiments employing pressure-sensitive adhesive attachment means, however, the description will apply equally to other attachment means.

The patterns in which the adhesive and release means are applied are chosen so that when the article is folded, the attachment means contact the release means, eliminating the need for release paper, but allowing the article to be unfolded and used. The garment facing side of the products of this invention on which the attachment and release zones are located may be polyolefin (e.g., polyethylene or polypropylene) films, non-wovens or the like.



Regardless of the type of attachment means used, the attachment means must bond more strongly to the attachment zone than to the user's undergarment and/or to the release means; the release means must bond more strongly to the release zone than it does to the attachment means and/or to the undergarment; and the attachment means must not bond so strongly to the undergarment that it rips or damages the undergarment by depositing adhesive means on the undergarment.

According to the method of making the products of this invention, there is provided an absorbent article which may be folded along three fold lines adjacent the longitudinal ends of the product, which remains in the folded position during storage, opens upon demand and which can be attached to the crotch portion of an undergarment. Furthermore, the method and products of this invention permit the wearer to disengage the article from the undergarment without depositing attachment means on the undergarment or tearing the undergarment or the absorbent article.

The ability to accomplish this objective is achieved by controlling the differential "bond strength" with respect to each surface to which the attachment means and the release means are adhered and by placement of the attachment and release means on the undergarment-facing side of the pad. "Peel strength" is a measurement of the strength of an adherent bond. Peel strength is measured in force per unit of width, i.e., the force required to separate adherently joined materials per unit of width. Preferably, a high peel or bond strength should be present between the attachment means and the attachment zones on the garment facing side of the articles of this invention. Likewise, a high peel or bond strength should be present between the release means and the release zones on the garment facing side of the articles of this invention.



A relatively lower peel strength should be present between the release means and the attachment means such that they may be separated prior to use. The differential peel strengths permit the articles of this invention to be stored in a folded position, opened at will without damaging the absorbent article and adhered to an undergarment without damaging the undergarment or absorbent article upon removal.

BRIEF DESCRIPTION OF THE DRAWINGS

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FIG. 1 is a perspective view of a folded panty liner made in accordance with the present invention.

FIG. 2 is a perspective view of the panty liner of Fig. 1 which has been partially opened.

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FIG. 3 is a perspective view of the garment-facing side of the panty liner depicted in FIG 1 after having been fully opened.

FIG. 4 is a plan view of the garment-facing side of a panty liner made in accordance with the present invention.

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FIG. 5 is a plan view of the panty liner of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention eliminates the need for release paper by providing release means and attachment means in the respective release and attachment zones delineated on the garment-facing side of an absorbent article. The placement of the attachment zones at the extreme longitudinal ends of the undergarment-facing side of the pad permits the symmetrical attachment of the pad in use. Alternating the attachment and release zones transversely across the pad allows placement of attachment means at both extreme ends of the pad, thus providing attachment utility at both ends in the undergarment. The pad will not therefore, disengage itself from the undergarment at either end during use. The folding of the



product along selected fold lines in an accordion fashion permits attachment means to be located close to both of the transverse ends of the product while maintaining registry with the release zones when folded.

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According to one preferred embodiment, the attachment means are in the form of an adhesive coating. In this embodiment, the release means should have a low enough peel strength with respect to the adhesive coat so as to separate from the
10 adhesive coat without causing damage by stripping adhesive from the attachment zones. The adhesive coat used should have a high enough peel strength with respect to the attachment zone of the garment facing side of the absorbent article to provide sufficient anchorage to prevent adhesive transfer from the
15 article to the undergarment when removing the product from the undergarment after use.

Most preferably, the zones of release and attachment are chosen so that when the product is folded, the adhesive means
20 applied in an attachment zone is covered by the release means within a release zone.

A number of methods may be used to impart the required peel strength characteristics to different zones on the garment
25 facing side of an absorbent article. One method is to use a coating of silicone release agent as the release means applied in the release zones. The attachment zones are left untreated with the silicone coat, and adhesive is applied to at least a portion of the untreated areas. Preferably, the release means
30 are larger in area than the adhesive means such that the adhesive means and release means have a tolerance available for slight folding errors or means placement errors. Preferably, an area of the attachment zones peripherally surrounding the area to which the adhesive is applied may be left uncovered by
35 adhesive. This creates a space around the adhesive such that



when the panty liner is folded, there is some tolerance within which the areas of adhesive can avoid contacting the other adhesive means. Furthermore, this provides tolerance for slight errors in adhesive placement within the attachment zone.

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Many types of barrier films may be used on the undergarment-facing side of the absorbent to create or allow the creation of attachment and/or release means on that side of the absorbent. For example, the barrier film may be made of
10 polypropylene, high density polyethylene, low density polyethylene, linear low density polyethylene, cellophane, Polyvinyl acetate, polyvinyl alcohol, polycaprolactan, polyester, polytetrafluoroethylene (Teflon®), or mixtures or coextrusions of one or more of these materials. Additionally,
15 films made of materials synthesized to facilitate high moisture vapor transmission could also be used. Highly calendered paper or nonwoven material may also be substituted for films. Further, additives may be combined with the film
20 resin to control the peel or bond strength of the film-to-adhesive bond.

In addition to the above, certain materials, such as Teflon®, produce inherently low adhesive-to-film peel
25 strengths. For these materials, a release coating may not be required in the release zones. Instead, treatment may be necessary to increase the adhesive-film bond in the zones to which adhesive is to be applied. A low-peel strength substrate may be embossed to provide more anchorage surface for the
30 adhesive, or selectively corona treated. The zones to which adhesive will be applied could be either chemically etched or altered to otherwise impart a stronger adhesive-film bond in the attachment zone. In certain embodiments, the adhesive can be applied at a temperature high enough to partially melt the

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film and produce a "weld" between the film and the adhesive, thereby obviating the need for a separate treatment.

5 A preferred method of surface treatment is corona treatment of the barrier film which forms the garment facing side of the absorbent article. Corona treatment involves the application of a large voltage across the surface of the film. The resulting treated surface is very reactive and permits the film to form chemical, as well as mechanical, bonds with coatings applied to the surface of the treated article. This provides
10 firmer attachment of both the adhesive and the silicone release coating to the barrier film.

15 For purposes of securing the absorbent product to the user's undergarment, a wide variety of positioning adhesives are available, pressure sensitive hot melt adhesives being the most widely used and most preferred. These adhesives may be A-B-A block copolymers or the like, such as styrene-ethylene-butylene-styrene block copolymer, e.g.,
20 Stereon, or a diblock AB styrene butadiene adhesive. Hot melt adhesives such as HM-6513 or 1972 from H.B. Fuller (St. Paul, Minnesota) or N.S. 34-5509 from National Starch (Bridgewater, New Jersey) are good candidates. Of course, adhesives other than hot melt adhesives may also be used and
25 should be chosen based on the numerous factors such as the compatibility of the adhesives with the other materials being used and the end use of the absorbent product.

30 The products of this invention may also be made by providing a roll of film which is coated with silicon on one side and adhesive on the other. Strips of this silicone-coated "tape" may be placed on one side of another film which has adhesive on both sides. The tape can be placed in an appropriate pattern (silicone side exposed) against the double
35 adhesive coated film so that the adhesive of one side meets



adhesive of the other. This will bond the tape to the film and produce areas of silicone release on the film, i.e., release means. The areas not covered with the tape become the attachment means. Patterns of release and attachment means can be configured such that, when folded, the attachment means is covered by release means.

FIGURE 1 illustrates one of the preferred embodiments of the products of this invention. Panty liner 10 has garment-facing side 20 and body-facing side 30. Release means 50 releasably adhere to adhesive means 40. In the folded condition, as depicted in FIGURE 1, panty liner 10 is about one-quarter its fully-opened length and is easy to carry and store.

FIGURE 2 depicts the panty liner of FIGURE 1 being partially opened. This illustrates the manner in which adhesive means 40 engages release means 50. Central release means 55 is symmetric about the central axis of panty liner 10 and releasably engages adhesive means 40 and 45 which are disposed at the longitudinal ends of panty liner 10.

FIGURE 3 is a perspective view of panty liner 10 after being fully opened. FIGURE 3 illustrates the symmetry of the release and adhesive patterns about central axis 60 of panty liner 10. Central release means 55 extends symmetrically about central axis 60 and adhesive means 45, 46, 42 and 40 are arranged symmetrically about central axis 60 as well. Release means 52 and 50 are also symmetrically patterned about central axis 60. Release means and adhesive means are arranged such that they are in registry when folded.

Any odd number of folds greater than one may be made symmetrically about the central axis of a pad in order to



provide a compact discreet absorbent article according to this invention.

Other embodiments of the products of this invention may be contemplated. For example, an absorbent article may be shaped as a parallelogram with oblique angles at its transverse ends. When folded, the angular ends protrude and become finger tabs that facilitate unfolding the product.

FIGURE 4 is a plan view of panty liner 10 and FIGURE 5 is a side view of panty liner 10, both illustrating the manner in which the adhesive and release means are arranged symmetrically about the central axis of the pad.

Although one embodiment of the present invention has been illustrated and described in detail, the present invention is in no way so limited. One of ordinary skill will immediately appreciate that the present invention has application to numerous other absorbent articles in addition to the panty liner illustrated.

There are a variety of methods by which the absorbent products of this invention may be made. Preferably, an appropriate barrier film is first printed with a silicone release coating in the release zone. The release coating is cured and adhesive is applied to the attachment zones disposed on the same side as the silicone. Adhesive is also coated on the absorbent facing side of the barrier film to help laminate the film to the absorbent. The adhesive in the attachment zones is preferably applied so as not to occupy the entire surface area of the attachment zones. This provides a tolerance for slight errors in placement of the attachment means in the attachment zone while still substantially guaranteeing the attachment means will lie entirely within the attachment zone. The attachment means is preferably smaller i



area than the release means. This allows a tolerance for slight errors in folding the product while substantially guaranteeing the attachment means will be covered by the release means.

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The latter side is then affixed to an absorbent substrate, leaving the release coating and adhesive exposed to form the garment facing side of the absorbent article. The finished article is then folded along at least one fold line. The release means and adhesive means contact each other so that the article may be unfolded prior to use without the adhesive means bonding to itself or to the barrier film. The release means may overlap, but the adhesive means must substantially contact only the release means.

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For many barriers, treatment is preferred in most cases to impart a low-peel strength surface in the release zones. Silicone-based release agents are excellent for this purpose; these compounds can be applied using many processes other than the screen print/ultraviolet cure set forth below in the Example. In addition to silicon-based release agents, other types of release coats may be used including paraffin waxes, non-stick coatings, varnishes and others known to those of skill in the art. Some types of adhesives become non-tacky when dried or cooled (such as non-pressure sensitive hot melt adhesives or cold glues) and may make suitable release means used as a coating in the release zone.

Various silicone curing methods may be used, including in addition to ultraviolet curing, heat curing or electron beam curing. The release coating may be applied using a wide variety of coating equipment. Direct and reverse gravure coaters, three-roll offset coaters, smooth five-roll coaters, or ink jet printing are just a few of the possible equipment types contemplated for use in the present invention.



The following Example further illustrates the preferred embodiments of the present invention:

EXAMPLE

5 A panty liner according to this invention was made as follows. A roll of barrier film of 38.1 μ m (1.5 mil) white microembossed polyethylene film Type # EMB533 available from Exxon Corporation, was first slit to about a 155.6 mm (6.125") width. The film was then corona
10 treated to have a surface energy of about 0.0038 N/cm (38 dynes/cm) on the side which was to be coated. Silicone was then printed on the corona-treated side in the configuration shown in FIGURE 1. The silicone was printed using a screen printer manufactured by Kraemer Koating, Inc. (Serial No. 1036, Toms
15 River, New Jersey).

An ultraviolet (UV) curable type silicone release agent which is made by the General Electric Corporation was used. The formula is as follows:

20

<u>Percent</u>	<u>Product#</u>	<u>Description</u>
98%	UV9300*	UV-curable silicone
2%	UV9310C*	UV-activated catalyst

*General Electric Product Designations

25 The silicone release agent was added behind a doctor blade inside the printing screen. The variable speed pump manufactured by Ismatec (Model No. 7617-60, made in Switzerland by ISMATEC SA, Zurich, Switzerland) was used to add the release
30 agent, although any low volume metering pump may be used. The printing screen used is made by New England Rotary Screen, Inc (Fall River, Massachusetts). A 125 mesh Pantene screen was found to produce an even coating. The coat weight of the silicone was about 3.4 grams/meter² (g/m²). It should be
35 noted, however, that the added coating weight can be reduced



greatly with more carefully designed equipment. Ideally, only enough silicone should be applied to impart consistent release characteristics to the coated area.

5 The silicone release material was then cured using the Mini-Conveyorized UV Curing System from American Ultraviolet Company (Murray Hill, New Jersey). A lamp setting of 118.11 W/cm (300 watts/inch) provided adequate curing over a wide range of speeds, up to almost 121.92 m/min (400 feet/minute). The optimum machine speed
10 using the materials and equipment of this Example is about 60.96 m/min (200 feet/min). The curing step fixed the silicone in the release zone thereby preventing transfer of silicone to the adhesive means.

15 After the silicone was printed and cured onto the barrier film, adhesive was applied. The adhesive was applied within the attachment zones. Preferably the adhesive is not applied to the entire area of the attachment zones. Applying adhesive means onto a smaller area than the whole of the attachment
20 zone, makes registration of the adhesive means easier within the attachment zone. Generally, creating release means which is larger than the adhesive means area is preferred, because this allows for folding error tolerance.

25 In this Example, the adhesive was applied after the silicone coating, on a separate adhesive coating apparatus. Yet, both the silicone release coating and adhesive could be applied in sequence on the same machine. The adhesive used in this example was HM-1972 hot melt adhesive from H.B. Fuller
30 Company (St. Paul, Minnesota). The adhesive was applied at a coating weight of about 11.0 mg/cm² (71 mg/inch²) in four zones. Lower coating weights may also be used as long as there is an amount of adhesive sufficient to hold the product in place during use. For the application of this Example, these adhesive strips
35 were about 9.53 mm (three-eighth inches) wide and about 40.64 mm (1.6 inches)

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long. There was a space of about 38.1 mm (1.5 inches) between the two innermost adhesive strips while there was a 22.225 mm (0.875 inch) space between the outermost adhesive strips. The adhesive was applied to release paper and transferred to the film, the release paper being left in place to aid in rewinding the coated film. The head of the adhesive nozzle was fashioned to produce all adhesive areas at once. The head was alternately turned on and off to provide enough space between the sets of adhesive areas to fashion individual products.

In order to affix the barrier film to an absorbent core or substrate, the same adhesive was sprayed onto the absorbent-facing side of the barrier film to be used as a laminating adhesive. The adhesive may also be extruded onto the absorbent-facing side of the barrier film. Release papers were used to cover the laminating adhesive as well to aid winding the barrier film into rolls. The release papers were discarded when the product was assembled. Release papers were needed here only by virtue of the manual process herein described. No processing release paper would be required if all the steps of the process are performed on the same machine.

The laminating adhesive was then exposed by removing the release paper and an absorbent batt was placed against the laminating adhesive. For this Example, the absorbent core or substrate was a co-form of pulp and thermoplastic fiber substantially similar to that used in the CAREFREE PANTY SHIELDS® brand of panty liners manufactured by Personal Products Company of Milltown, NJ. The absorbent was fashioned as a 107.95 mm (4.25") width material C-folded around a 45.72 mm (1.8 inch) insert of the same material. The final width dimension of the absorbent was approximately 50.8 mm (2.0"). The composite of barrier and absorbent was then crimped on the ends using a knurled block which was hot pressed into the product ends. The product ends were then cut to provide a rounded tab end.

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The remaining release paper which covered the adhesive applied to the garment facing side was then removed and the article folded in half along the central fold-line aligned transversely across the napkin such that the body-facing sides come into contact with each other. The transverse ends were folded again such that the release and attachment means meet. The adhesive means contact the spots of release coating, allowing the product to be easily unfolded without damage or the need to discard a release paper.

The present invention is not limited to the Example and embodiments set forth above. As will be understood by those of ordinary skill in the art, alternate embodiments, variations and modifications of the present invention are possible.

Accordingly, reference should be made to the appended claims to ascertain the full scope of the present invention.

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CLAIMS

1. An absorbent article (10), having a body facing side and a garment facing side (20), transverse ends (25) and longitudinal edges, wherein the body facing side (30) comprises an absorbent body and the garment facing side (20) comprises at least two attachment zones comprising attachment means (40; 42; 45; 46) and at least one release zone comprising release means (50; 55; 57), and an odd number fold line; greater than one fold line along which said article may be folded such that the attachment means (40; 42; 45; 46) contacts the release means (50; 55; 57), said release means being releasably attached to the attachment means.
2. An absorbent article according to claim 1 wherein said the peel strength of the bond between said release means and said garment facing side is greater than the peel strength of the bond between the release means and said attachment means.
3. An absorbent article according to claim 1 wherein said attachment means are completely covered by said release means.
4. The absorbent article of claim 1, wherein the article has the shape of a rectangle.
5. The absorbent article of claim 1, wherein the transverse ends of said article are fashioned such that a portion of each transverse end extends beyond the edge of the opposite transverse end so as to form a finger tab.





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6. The absorbent article of claim 1, wherein one of said fold lines is a central transverse fold line (60).
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7. The absorbent article of claim 1, wherein said attachment means is an adhesive.
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8. The absorbent article of claim 7, wherein the adhesive means retain the article in a folded configuration and the release means releases the adhesive means without causing transfer of adhesive from the attachment zone, and leaving the adhesive in such a condition to secure the absorbent article to a user's undergarment.
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9. The absorbent article of claim 1, wherein the release means comprises silicone.
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10. The absorbent article of claim 1, wherein the garment facing side comprises a fluid impermeable barrier film means.

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