ADHESIVELY SUPPORTED SANITARY NAPKINS

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Field of Search 128/290 R, 290 W; 156/291, 156/283, 578 X; 161/146, 129

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ABSTRACT

A sanitary napkin is provided with adhesive means which, while providing great in-use tenacity, is readily releaseable, both from the protective release strip and the undergarment. The adhesive means comprises an elongated band of pressure-sensitive adhesive extending longitudinally on the bottom surface of the napkin and disposed centrally thereon. The band of adhesive terminates in at least one peak.

6 Claims, 8 Drawing Figures
ADHESIVELY SUPPORTED SANITARY NAPKINS

BACKGROUND OF THE INVENTION

This invention relates to sanitary napkins and more specifically to sanitary napkins employing adhesive means for supporting the napkin when in use. The prior art is now replete with suggestions for sanitary napkins comprising an absorbent core encased in a soft liquid pervious cover and having, on one surface of the cover, pressure-sensitive adhesive means provided for attaching the napkin to the crotch portion of an undergarment so as to support the napkin in use and maintain it in the proper in-use position. Generally, these napkins are provided with a protective release strip overlying the pressure-sensitive adhesive and protecting it from dirt and unintentional adhesion when packaged, stored and handled, prior to use. At the time of use, the strip is peeled from the adhesive means and the napkin is positioned and adhered to the undergarment. After use, the napkin is peeled from the undergarment and disposed of.

The adhesive system employed in such products must meet several, sometimes conflicting, criteria. In use, it is important that the napkin adhere tenaciously to the undergarment at all times and so the adhesive system must resist moisture, the sudden torques exerted by movements of the body and the frictional shearing forces exerted by the movements of the various layers of clothing worn by the user. Notwithstanding the adherence tenacity required of the adhesive system during use, it is important that the protective release strip be easily peeled from the adhesive prior to use without tearing the napkin cover which, for reasons of economy, is generally a thin, soft, non-woven material exhibiting little resistance to tearing. After use, it is essential that the napkin release from the undergarment without tearing the napkin cover or the fabric of the undergarment.

Prior art adhesive systems generally represent a compromise between these conflicting criteria. For example, a broad, generally rectangular, band of adhesive running longitudinally along the surface of the napkin provides excellent in-use adhesive tenacity. Unfortunately, the forces required to peel the protective release strip from such an adhesive band are relatively large and account for a high incidence of napkin cover tearing, particularly at the leading edge of the adhesive band.

An alternative system is disclosed in U.S. Pat. No. 3,672,371, issued on June 27, 1972 to Robert J. Roeder. As disclosed therein, the broad adhesive band is replaced by two parallel, narrow, spaced apart lines of adhesive. Such a system provides excellent release characteristics with respect to peeling the release strip from the napkin and peeling the napkin from the undergarment. Unfortunately, adhesion in use has been sacrificed and, as is to be expected, this system provides less in-use adhesion than a broad band of adhesive of the same length.

Still another problem is associated with the narrow two-line configuration when the in-use conditions are considered. The napkin is then subject to a series of forces resulting from body and clothing movements which, while of sufficient magnitude to detach at least portions of any adhesive system, are also of short duration. Accordingly, an adhesion system depending on two thin lines of adhesive is more likely to become completely detached, even by a force applied thereto for a short duration, than a system having a single broad band where only a portion of the band will become detached over the same short duration. While it is true that body pressure will generally result in reattachment of the two-line napkin, the napkin is subject to being reattached out of position. On the other hand, a napkin having only a partially detached broad adhesive band will at all times remain in the proper position and hence, will reattach in the proper position.

For the above reasons, a completely satisfactory adhesive system has not, heretofore, been available.

SUMMARY OF THE INVENTION

A sanitary napkin is now provided with adhesive means which, while providing great in-use tenacity, is also readily releasable, both from the protective release strip and the undergarment. The napkin may comprise the usual elongated absorbent core enclosed in a fluid pervious wrapper. In accordance with this invention, adhesive means are provided on the bottom surface of the napkin (the side facing away from the body in use) which comprise an elongate band of pressure-sensitive adhesive extending longitudinally on said bottom surface and disposed centrally thereon, the band of adhesive terminating at least one end thereof in at least one peak. It has been discovered that, provided that at least one end of the longitudinally extending adhesive terminates in at least one peak, the adhesive band may be as wide or as long as is desirable or necessary in providing sufficient in-use tenacity and, in contrast to the prior art, there will be no concomitant degradation in release characteristics such as tearing of the napkin cover.

When a napkin is provided in accordance with the teachings of this invention, a releasable protective strip may be provided to overlie the adhesive and when this strip is peeled from the peak of the adhesive band substantially less initial peeling force is required than the conventional blunt-ended adhesive systems. Accordingly, less stress is initially applied to the napkin cover precluding failure of the cover. Similarly, when the napkin is peeled from the undergarment after use, the initial peeling force applied is substantially less, insuring that the napkin cover will not fail.

While it is preferable, in the present invention, it is desirable that the longitudinally extending adhesive band terminate in at least one peak at each end thereof to provide the convenience of peeling from either end of the napkin. It is also contemplated that the terminal end of the band have more than one peak as the advantages which accrue to this invention are equally applicable to multi-peaked bands.

The invention may be advantageously applied to all adhesively attached sanitary napkins. However, modifications in the napkins may be made to take specific advantage of the low initial peeling forces associated with the invention. For example, a thinner wrapper may be employed, i.e., one which is water dispersible for easy disposability in a water closet and the fact that this wrapper is less resistant to tearing may be overcome by employing the adhesive system of this invention. As another example, a pressure-sensitive adhesive having less adhesive tenacity per unit area may be employed since the constraint as to the adhesive band size has been relaxed by the methods of this invention, i.e., a greater area may be employed rather than a tackier ad-
hesive without concomitantly degrading the release characteristics of the napkin. In another aspect, the invention also contemplates a method of applying a flowable pressure-sensitive adhesive band to the bottom surface of the napkin to obtain the peaked ends prescribed herein. The bottom surface is passed under an adhesive applicator having a wiping surface in contact with the bottom surface. The wiping surface of the applicator is provided with an undercut portion, essentially the same width as that of the desired adhesive band. A feed hole is provided in this undercut portion and means are provided for intermittently supplying adhesive through the feed hole to the bottom surface of the napkin. The napkin is passed under the applicator and adhesive flow is commenced. As the undercut begins to fill, and then is filled, with adhesive, the wiping action of the bottom surface of the napkin against the wiping surface of the applicator produces an adhesive pattern of first increasing, and then essentially uniform, width on the bottom surface, i.e., a peak at the leading end of the adhesive band and then a portion of essentially uniform width. After the desired length of the essentially uniform portion has passed under the applicator, flow of adhesive is terminated and the undercut portion begins to empty. The wiping action of the bottom surface which continues to move under and in contact with the wiping surface of the applicator results in a band of decreasing width, i.e., a peak at the trailing end of the adhesive band. In a similar manner, an applicator may be provided with multiple feed holes to produce multiple peaks at each end of the adhesive band.

BRIEF DESCRIPTION OF THE DRAWING

Referring to the drawing:

FIG. 1 is a perspective view looking down on the bottom surface of a sanitary napkin embodying the teachings of this invention and showing the release strip partially peeled therefrom;

FIG. 2 is a sectional view of the napkin of FIG. 1 taken along line 2—2;

FIG. 3 is a perspective view of a portion of a prior art napkin illustrating schematically the forces required for peeling off the release strip;

FIG. 3a is a perspective view of a napkin embodying this invention and illustrating schematically the forces required for peeling off the release strip;

FIG. 4a is a schematic, cross-section of a machine line for producing the napkins of this invention;

FIG. 4b is a schematic cross-sectional plan view of the machine line of FIG. 4a, for making a first embodiment of this invention;

FIG. 4c is a schematic cross-sectional plan view of the machine line of FIG. 4a, for making a second embodiment of this invention; and

FIG. 4d is a schematic cross-sectional plan view of the machine line of FIG. 4a, for making a third embodiment of this invention.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1 and 2 illustrate an embodiment of the invention and specifically depict a sanitary napkin 10, with its bottom surface 12 facing upward in the drawing. The napkin 10 comprises an absorbent core 14 which may be made up of any suitable absorbent material such as, for example, comminuted wood pulp fibers, cotton linters, rayon fibers, cotton staple, bleached sulfite creped wadding and the like. The core 14 is surrounded by a fluid pervious cover 16 having longitudinal edges 18 and 20 overlapping and secured on the bottom surface 12 of the napkin. The ends 22 and 24 of the cover 16 extend beyond the core 14 and are sealed to hold the core fully enclosed.

The cover may be any of the commonly used covers such as gauze, non-woven materials reinforced with adhesive binders, or the newly developed flushable non-woven fabrics designed to be readily dispersed in water and be easily disposed of by flushing away in a water closet. An example of this latter non-woven cover is provided in U.S. Pat. No. 3,554,788 issued on Jan. 12, 1971 to M. R. Fechillas. A band of pressure-sensitive adhesive 26 is applied to the bottom surface of the napkin and is located thereon to extend longitudinally and centrally thereeto. Advantageously, the adhesive penetrated the cover of the napkin and aids in sealing the overlapped longitudinal edges 18 and 20 in place. The adhesive band may comprise any of a large number of pressure-sensitive adhesives available on the market, including, for example, the so-called cold pressure-sensitive adhesives such as the acrylate adhesives, for example, vinyl acetate-2 ethyl hexyl acrylate copolymer which is generally combined with tackifiers such as, for example, ethylene amine. Alternatively, the adhesive may comprise the rapid-setting thermoplastic (hot melt) adhesives such as block copolymers exemplified by styrene and butadiene styrene copolymers. The adhesive band may also comprise a two-sides adhesive tape and the advantages of this invention will accrue equally well to this configuration. As will be more fully discussed hereinafter, there is particular advantage in employing an adhesive which may be applied in a flowable state. However, the invention is not limited to any specific adhesive but applies as well to the use of non-flowable adhesive systems although some inconvenience in production may thereby be incurred.

The adhesive band may be of any width or length sufficient to provide satisfactory adhesion, when the napkin is applied to an undergarment in use. While the choice of band dimensions are, to an extent, governed by such factors as the particular adhesive used, and the nature of the undergarment to which it is being attached, generally the adhesive should be of a width of more than one-fourth-inch. The band may extend longitudinally for a length corresponding to the full length of the core or even longer (extending onto the sealed ends of the cover), if desired. Generally, however, because of the unique features of this invention which allow a wider band to be used, it is unnecessary for the band to extend beyond the length of the core and, in fact, the band may be substantially less than this length. The band is protected by a releasable strip 32, illustrated in FIG. 1 in a partially peeled off position, and provided to protect the adhesive during storage and handling prior to use. In accordance with the teachings of this invention, the adhesive band terminates in at least one peak, two such peaks, 28 and 30, being shown in FIG. 1.

While it is sufficient that only one end of the band terminates in at least one peak, it is advantageous that both ends be provided with such a peaked pattern so as to facilitate peeling from either end.

The advantage of the peaked adhesive configuration are best illustrated in FIGS. 3 and 3a. In FIG. 3, a broad blunt-ended adhesive band 34, such as is found in some
prior art products, is illustrated with the releasable strip 36 being initially peeled. The wide blunt end of the adhesive band 34 requires a substantial force, shown schematically by the arrow labeled F in the drawing, to be applied to the releasable strip 36 in order to initiate peeling. It is believed that, while this force tends to be fairly well-distributed at the adhesive edge/cover interface, because the napkin cover tends to lift away from the core and crease or pucker when the peeling force is applied to the strip, the forces designated as F' in the drawing, transmitted to a point forward of the interface, are again consolidated and approach a substantial portion of the total force F applied to the strip. This substantial consolidated force F', acting on a point on the napkin cover, is believed to be the cause of napkin tearing. In contrast thereto, FIG. 3a illustrates a portion of a napkin having a peaked adhesive band 38 in accordance with the teachings of this invention. Here, because of the unique peaked design of the terminal end of the adhesive band 38, a substantially lower initial peeling force, designated by the arrow labeled f in the drawing, is required to be applied to the release strip 40. Also, the forces transmitted to the napkin cover are concomitantly less, shown as f' in the drawing, and preclude napkin cover tearing. Of course, once the releasable strip 40 has been peeled beyond the peaked portion of the adhesive pattern, the forces which must be applied are the same as those applied to the prior art product. This does not create a problem, however, because these forces are then resisted by the portion of the cover which has the adhesive band applied thereto and so the adhesive acts as reinforcement for the cover at this point in the peeling process, again precluding cover tearing. It will be understood by one skilled in the art that the foregoing analysis applies equally well to the removal of the napkin from the undergarment after use.

In view of this analysis, it becomes apparent then that the forces exerted on the napkin cover in the prior art configuration are, to a large measure, a function of the width of the adhesive band. Said in other words, the width of the adhesive band applied to the napkin in accordance with prior methods is limited by the resistance of the napkin cover to tearing. In contrast thereto, the adhesive pattern of this instant invention is essentially unlimited by the napkin tearing resistance and so may be as wide as is necessary and desirable in providing satisfactory in-use adhesion.

Numerous variations in the design of conventional adhesively attached napkins will become apparent in view of the teachings of this invention. For example, a less tear resistant napkin cover may now be employed, and particularly, a napkin cover which is more readily dispersible in a water closet and hence, more easily disposed of. Also, a less tenacious adhesive may be employed, as the total adhesive strength of a given adhesive may be increased by increasing the width of the adhesive band. Further still, a shorter band may be employed by increasing the width. Other variations will occur to those skilled in the art in view of the teachings herein.

Referring now to FIG. 4a, illustrated therein, is a method for producing the product of this invention and specifically depicted, in schematic vertical cross section, is a machine line for applying the adhesive patterns prescribed herein. FIGS. 4b-d depict a horizontal cross-sectional view of the same machine line as shown in FIG. 4a and further illustrate several embodiments of the present invention.

As shown in these figures, an assembly comprising napkin cores 44, wrapped in a non-woven cover 46 but not yet cut into individual napkins, is moving from right to left in the drawings, past an adhesive applicator 48. The assembly may be moved by an endlessly rotating belt or by another carrier means. It is also possible that the adhesive applicator may move and the assembly remain stationary.

The applicator 48 comprises a bottom wiping surface 50 which is in wiping contact with the surface of the moving assembly on which the adhesive pattern is to be applied. The wiping surface of the applicator is provided with an undercut portion 52, of a width essentially corresponding to the desired width of the uniform portion of the adhesive band. A feed hole is provided for delivering adhesive to the wiping surface 50, through the undercut 52. Means, not shown in the drawing, are provided for intermittently delivering adhesive through the feed hole. Such means may comprise a gravity or pressure feed adhesive system flowing through a feed control valve which is opened and closed by an electrically timed switch, the timing of which is coordinated with the relative speed of the web, with respect to the wiping surface of the applicator, to deliver adhesive in the proper sequence. Alternatively, the adhesive may be forced to flow through the feed hole by the action of a pump which is likewise activated by a timed electrical control system. Many other variations for sequentially delivering a flowable material to a moving assembly may be employed as the adhesive delivery means.

In accordance with this invention, the flow of adhesive is begun at the point in time when the napkin assembly is positioned under the applicator so that the desired position for the leading end of the peak of the adhesive pattern is directly under the feed hole. As adhesive feed is continued, the adhesive tends to spread in a direction corresponding to the width of the undercut, and gradually fills the undercut. A pattern is then wiped onto the surface of the napkin assembly which has an increasing width until a point in time is reached when the flow of adhesive has completely filled the undercut. Thereafter, the pattern wiped onto the surface of the assembly is of an essentially uniform width. A point in time is reached when the assembly has traveled a sufficient distance past the applicator so that the position on the surface of the assembly where it is desired to begin to apply a peak to the lagging edge of the adhesive band is directly under the undercut portion. The feed to the undercut portion is then terminated and the undercut begins to empty, wiping an adhesive pattern onto the assembly surface which has a decreasing width, thus forming the terminal peak. The sequence of starting and stopping the flow of adhesive is then repeated as the next portion of the assembly passes the applicator.

As can be best seen by an inspection of FIG. 4b-d, the width of the adhesive band can be controlled by properly selecting the width of the undercut 52. The length of the band can be controlled by selecting the proper timing sequence. The number of peaks at each end of the adhesive band is directly related to the number of feed holes provided in the applicator, i.e., in FIG. 4b, one feed hole produces a single peak at each end;
in FIG. 4c, two holes produce two peaks; and in FIG. 4d, three holes produce three peaks.

As aforesaid, the novel napkin having a peaked adhesive band greatly reduces the initial peeling force required to remove the releasable protective strip from the napkin without a concomitant loss of in-use adhesion. The following example illustrates this advantage.

EXAMPLE

Samples are prepared by applying an adhesive band to an elongated 1-inch wide strip of non-woven material as described in the aforementioned U.S. Pat. No. 3,554,788 issued to M. R. Fehchillas. The adhesive is an acrylate copolymer of vinyl acetate and 2-ethyl hexyl acrylate. Three samples are provided with an elongated band of adhesive, three-eighths inch wide, centrally located on the strip, and having a blunt leading edge as illustrated in FIG. 3 of the drawing. A second three samples are provided with an elongated band of adhesive, again three-eighths inch wide and centrally located but, however, having the ends of the adhesive band terminating in three peaks as are illustrated in FIG. 4d of the drawings. The distance between the ends of the peaks and the uniform portion of the adhesive band in these peaked samples is about three-fourths inch. Each sample is placed on a clean stainless steel plate, adhesive face down and adhered to the plate by moving a 10 lb. roller weight across the sample at a rate of 12 inches per minute. The samples are then peeled from the plate at an angle of 180°C. by gripping the leading edge of the fabric in the jaws of an Instron tester operating at a peeling rate of 6 inches per minute. The Instron tester is equipped with a recorder-plotter which plots the force-distance function of each peel test. The peeling is carried out on each sample for a peeled distance of three-fourths inch, corresponding to the peak length of the peaked samples. The force-distance function of each peel test is integrated by use of a planimeter to obtain the work required to peel each of the samples the initial three-fourths inch. The results are reported in the Table below.

WORK IN PEELING ADHESIVE FROM STAINLESS STEEL PLATE

<table>
<thead>
<tr>
<th>Blunt Sample (in.-lbs.)</th>
<th>Peaked Sample (in.-lbs.)</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.23</td>
<td>3.17</td>
<td>25</td>
</tr>
<tr>
<td>3.37</td>
<td>1.99</td>
<td>39.4</td>
</tr>
</tbody>
</table>

Average: 3.63 2.74 24.4

What is claimed is:

1. In an elongate sanitary napkin provided with pressure-sensitive adhesive disposed on the bottom surface thereof for attaching said napkin to a supporting garment, the improvement wherein there is provided means for insuring ready releasability of the napkin and garment, said means comprising providing said pressure-sensitive adhesive in the form of a single band extending longitudinally of said bottom surface and being centrally disposed thereon with respect to the longitudinal sides thereof, said band of adhesive terminating at at least one end thereof in at least one peak.

2. The napkin of claim 1 wherein said adhesive band terminates at each end in at least one peak.

3. The napkin of claim 1 wherein said band of adhesive terminates at at least one end in a plurality of peaks.

4. The napkin of claim 3 wherein said band terminates at each end in a plurality of said peaks.

5. The napkin of claim 1 wherein said band is more than one-fourth inch wide.

6. A method of applying the adhesive band of claim 1 comprising:

   passing the bottom surface under an adhesive applicator, said applicator having a wiping surface in contact with said bottom surface, an undercut portion in said wiping surface with at least one feed hole in said undercut portion and means for intermittently supplying adhesive through said feed hole to said bottom surface;

   starting the flow of adhesive through said feed hole to form an adhesive pattern on said bottom surface of increasing and then essentially uniform width as said adhesive, respectively, begins to fill, then fully fills the undercut portion; and

   stopping the flow of adhesive to form an adhesive pattern of decreasing width as said undercut portion is emptied;

   whereby at least one peak is formed at each end of the adhesive band.

* * * * *