

DESCRIPTION

Title of Invention: ABSORBENT ARTICLE

Technical Field

[0001]

The present invention relates to absorbent articles, such as sanitary napkins and incontinence pads.

Background Art

[0002]

A conventional personal absorbent article, such as a sanitary napkin or a disposable diaper, can allow leaks during daily activities when a large quantity of a body fluid is discharged. Hence, it has been proposed to provide an absorbent core of an absorbent article with a raised portion having an increased basis weight in the central portion thereof so that a body fluid may be absorbed over an increased range of area (see, e.g., Patent Literatures 1 and 2 below).

[0003]

Patent Literature 1 describes an absorbent article the absorbent core of which has a central portion with a larger thickness and a higher density than other portions, the central portion being evenly provided over the width of the absorbent core.

[0004]

Patent Literature 2 discloses an absorbent article the absorbent core of which includes an upper absorbent layer and a lower absorbent layer, the upper absorbent layer being superposed on the lower absorbent layer and having the same width as the lower absorbent layer.

[0005]

Separately from these techniques, with a view to improving conformability to the wearer's body, Applicant has previously proposed an absorbent article the absorbent member of which includes an absorbent core, a lateral central portion of the absorbent

core projecting in the target zone (where a body fluid will be located) toward the backsheet (see Patent Literature 3 below).

Citation List

Patent Literature

[0006]

Patent Literature 1: JP S61-602A

Patent Literature 2: JP 2012-81246A

Patent Literature 3: JP 2016-86872A

Summary of Invention

[0007]

The invention relates to an absorbent article including an absorbent member having an absorbent core oblong in a longitudinal direction corresponding to the front-to-back direction of a wearer, a topsheet covering the skin-facing side of the absorbent member, and a backsheet covering the non-skin-facing side of the absorbent member. The absorbent article has a front section and a rear section. The absorbent core has a first portion located in the side of the front section, a second portion located in the side of the rear section, and a middle portion intermediate between the first and second portions. The middle portion has a protruded portion thicker than the first and second portions. The protruded portion protrudes toward the backsheet and is flat on the skin-facing side thereof. In plan view, the protruded portion includes a widest part that is the widest in a lateral direction perpendicular to the longitudinal direction, the widest part having the same lateral width as the absorbent core.

Brief Description of Drawings

[0008]

[Fig. 1] Fig. 1 is a plan view of a sanitary napkin as a preferred embodiment of the absorbent article of the invention, seen from the skin facing side, i.e., the topsheet side.

[Fig. 2] Fig. 2 is a plan view of the absorbent core of the sanitary napkin shown in Fig. 1, seen from the non-skin-facing side.

[Fig. 3] Fig. 3 is a schematic cross-section taken along line III-III of Fig. 2.

[Fig. 4] Fig. 4 is a schematic cross-section taken along line IV-IV of Fig. 1.

- [Fig. 5] Fig. 5 is a schematic cross-section taken along line IV-IV of Fig. 1.
- [Fig. 6] Fig. 6(a) and Fig. 6(b) illustrate the process for making the absorbent core of the sanitary napkin shown in Fig. 1.
- [Fig. 7] Fig. 7 is a plan view of a sanitary napkin as another preferred embodiment of the absorbent article of the invention, seen from the skin facing side, i.e., the topsheet side.
- [Fig. 8] Fig. 8 is a plan view of a sanitary napkin as still another preferred embodiment of the absorbent article of the invention, seen from the skin facing side, i.e., the topsheet side.

Description of Embodiments

[0009]

Although Patent Literatures 1 and 2 disclose techniques for improving absorption capacity by providing a raised portion having an increased basis weight in the central part of the absorbent core, they mention nothing about a raised portion raised or protruded toward the backsheet side. According to the techniques of Patent Literatures 1 and 2, a gap is created between the topsheet and the bevel of the raised portion. The gap can inhibit rapid spread of a discharged fluid in the absorbent member to result in leakage, or the level difference of the raised portion can cause a wearer discomfort. Patent Literature 3 describes an absorbent article the absorbent core of which has its central portion in the target zone protruded toward the backsheet. The absorbent article of Patent Literature 3 provides an improved conforming fit to a wearer. However, the central protruded portion does not extend over the whole width of the absorbent core, so that there is a risk of leak when the central protruded portion is or gets out of alignment with a wearer's point of fluid discharge when put on a wearer or during wear.

[0010]

The invention provides an absorbent article that eliminates the disadvantages of the aforementioned conventional techniques.

[0011]

The absorbent article of the invention will be illustrated on the basis of a sanitary napkin 1 as a preferred embodiment of the invention (hereinafter simply referred to as the

napkin 1) with reference to the accompanying drawings. Fig. 1 is a plan view of the napkin 1 of the embodiment viewed from the topsheet 2 side. As illustrated, the napkin 1 includes an absorbent member 4 containing an absorbent core 41 that is oblong in a longitudinal direction X corresponding to the front-to-back direction of a wearer, a topsheet 2 covering the skin facing side of the absorbent member 4, and a backsheet 3 covering the non-skin facing side of the absorbent member 4. The napkin 1 has a front section A and a rear section C. As illustrated, the napkin 1 is sectioned into a target section B that is to be located to face a wearer's point of fluid discharge and the front and rear section A and C that are located forward and rearward, respectively, of the target section B in a longitudinal direction X.

[0012]

Herein, the longitudinal direction X corresponds to the wearer's front-to-back direction and is coincident with the longitudinal direction of the absorbent article (napkin 1). The lateral direction Y corresponds to the transverse direction (perpendicular to the longitudinal direction) of the absorbent article (napkin 1). Accordingly, unless otherwise specified, the term "length" in the longitudinal direction X is a dimension measured in the longitudinal direction X, and the term "width" in the lateral direction Y is a dimension measured in the lateral direction Y. The napkin 1 is symmetrical about the centerline CL extending in the longitudinal direction X (hereinafter, referred to as "longitudinal centerline CL" or simply "centerline CL"). The longitudinal direction X is parallel with the longitudinal centerline CL. As used herein, the term "skin facing side" refers to the side of the absorbent article (napkin 1) or a member constituting the absorbent article that faces the wearer's skin while worn. The term "non-skin facing side" refers to the side of the absorbent article (napkin 1) or a member constituting the absorbent article that faces the wearer's garment away from the wearer's skin while worn.

[0013]

The napkin 1 has the target section B that is to face the wearer's point of fluid discharge (e.g., the vagina opening) while worn, the front section A located forward of the target section B, and the rear section C located rearward of the target section B. That is, the napkin 1 is sectioned into the front section A, the target section B, and the rear section C in that order along the longitudinal direction X.

[0014]

In the case where the absorbent article of the invention has a pair of wings 1W as in the embodiment, the target section B corresponds to the winged area, i.e., the area laterally sandwiched between the longitudinally extending root of one of the wings 1W and the longitudinally extending root of the other wing 1W. In the case of a wingless absorbent article, the target section B corresponds to an area longitudinally sandwiched between unshown two transverse fold lines (a first fold line closer to the longitudinal front end of the absorbent article and a second fold line closer to the longitudinal rear end of the absorbent article) extending in the lateral direction Y that are created when the absorbent article is tri-folded for packaging.

[0015]

As illustrated in Fig. 1, the napkin 1 of the embodiment has a liquid permeable topsheet 2 providing the skin facing side, a backsheet 3 providing the non-skin facing side, and an absorbent member 4 interposed between these sheets 2 and 3. The absorbent member 4 is composed of an absorbent core 41 and a core wrap sheet (not shown).

[0016]

As illustrated in Fig. 1, the topsheet 2 of the napkin 1 covers the entire area of the skin facing side of the absorbent member 4 and further extends outward in the laterally direction Y from both edges extending in the longitudinal direction X (hereinafter, side edges) of the absorbent member 4. The backsheet 3 covers the entire area of the non-skin facing side of the absorbent member 4, further extends outward in the laterally direction Y from both side edges of the topsheet 2, and forms a pair of side flaps 1S together with a side sheet 5 hereinafter described. The backsheet 3 and the side sheet 5 are bonded to each other in their extensions from the side edges of the absorbent member 4 by a known bonding means, such as adhesive bonding, heat sealing, or ultrasonic sealing. Each of the topsheet 2 and the backsheet 3 may be bonded to the absorbent member 4 with adhesive.

[0017]

As illustrated in Fig. 1, a pair of side sheets 5 of the napkin 1 are disposed on both lateral side portions of the skin facing side of the topsheet 2 in the longitudinal

direction X. It is preferable that each side sheet 5 be disposed to extend over the whole length of the topsheet 2 in the longitudinal direction X in an overlapping relation with the lateral side portions of the topsheet 2 along the longitudinal direction X in plan view.

[0018]

As illustrated, each side sheet 5 in the napkin 1 is bonded to the topsheet 2 at a joint 6. The joint 6 has a plan view shape of a wavy line composed of laterally outward convexities and laterally inward concavities alternately arranged and connected to each other in the longitudinal direction X. The two joints 6 are laterally symmetrical about the centerline CL in plan view. The side sheet 5 being so joined to the topsheet 2 at the wavy joint 6, there are provided pockets defined by the side sheet 5 and the topsheet 2 inward of the wavy line of the joint 6. Because the pockets are open to the centerline CL, discharged body fluids, such as menstrual blood, running laterally outward from the lateral middle of the napkin 1 is received and contained by the pockets, thereby to prevent leakage effectively.

[0019]

As shown in Fig. 1, in the napkin 1, the side flaps 1S largely widen outward in the lateral direction Y in the target section B to form the pair of wings 1W on the lateral sides along the longitudinal direction X of the napkin 1. Each wing W1 is designed to be folded onto the non-skin facing side (underside) of the crotch portion of a wearer's undergarment, such as a pair of panties. As illustrated in Fig. 1, the topsheet 2 and the backsheet 3 extend outward in the longitudinal direction X from both the longitudinal front and rear ends of the absorbent member 4 and are bonded to each other at their extending parts by a known bonding means, such as adhesive bonding, heat sealing or ultrasonic sealing, to form end seals.

[0020]

As illustrated in Fig. 1, the napkin 1 has a linear groove 7 formed on the skin facing side of the topsheet 2 by integrally compressing the topsheet 2 and the absorbent member 4 toward the backsheet 3. As used herein, the term "linear" for the linear groove 7 is intended to mean not only straight linear but also curved linear in plan view of the groove (depression). The linear groove may run either continuously or

discontinuously, for example, in the form a broken line. The linear groove 7 of the napkin 1 is a discontinuous line constituted of a large number of debossed dots. The fibers constituting the topsheet 2 and the absorbent member 4 are densified in the linear groove 7 to have a higher density than the density of the region surrounding the groove 7. The linear groove 7 includes a first lateral groove 71 that runs in the lateral direction Y in each of the front and rear sections A and C of the absorbent member 4 and a longitudinal groove 73 that extends in the longitudinal direction X in each side portion of the target section B of the absorbent member 4. In the napkin 1, the first lateral groove 71 is outwardly convex in the longitudinal direction X, and the longitudinal groove 73 is outwardly convex in the laterally direction Y in the target section B. The first lateral groove 71 extends in the lateral direction Y between the pair of longitudinal grooves 73 to link to the pair of the longitudinal grooves 73. In the napkin 1, the first lateral groove 71 in the front section A, one of the longitudinal grooves 73, the first lateral groove 71 in the rear section C, and the other longitudinal groove 73 connect in that order to form an annular groove. The thus formed linear groove 7 serves to reduce the spread of a body fluid in planar directions of the absorbent member 4 thereby to effectively prevent leakage out of the perimeter of the napkin 1.

[0021]

As illustrated in Fig. 2, the absorbent core 41 of the absorbent member 4 of the napkin 1 has a first portion 41F located in the side of the front section A, a second portion 41R located in the side of the rear section C, and a middle portion 41M intermediate between the first portion 41F and the second portion 41R. The middle portion 41M has a protruded portion 42 that is thicker than the first portion 41F and the second portion 41R. In the case of the napkin 1, the middle portion 41M is located in the area of the target section B. The longitudinal location of the middle portion 41M of the absorbent core 41 may or may not be coincident with that of the target section B. In the napkin 1, the middle portion 41M having the protruded portion 42 not only extends over the whole length of the target section B but further extends to a part of the front section A and a part of the rear section C in the longitudinal direction X. In a plan view as illustrated in Fig. 2, the napkin 1 has the first portion 41F of the absorbent core 41 located within the area of the front section A and the second portion 41R of the absorbent core 41 located within the area of the rear section C.

[0022]

As illustrated in Fig. 1, the absorbent core 41 of the napkin 1 is oblong in the same direction as the longitudinal direction X of the napkin 1. Therefore, the longitudinal direction of the absorbent core 41 is coincident with the longitudinal direction X of the napkin 1, and the transverse (lateral) direction of the absorbent core 41 is coincident with the lateral direction Y of the napkin 1.

[0023]

The protruded portion 42 of the middle portion 41M protrudes toward the backsheet 3 as illustrated in Figs. 3 through 5 and, in the napkin 1, is flat on the skin-facing side thereof. The protruded portion 42 is formed with a larger thickness than the first portion 41F located forward of the middle portion 41M and the second portion 41R located rearward of the middle portion 41M as illustrated in Fig. 4. It is preferred that the protruded portion 42 in the napkin 1 be formed with not only a larger thickness but also a larger basis weight than the first portion 41F of the absorbent core 41. It is also preferred that the protruded portion 42 in the napkin 1 be formed with not only a larger thickness but also a larger basis weight than the second portion 41R of the absorbent core 41. In the case where the first portion 41F and the second portion 41R have a groove portion 45 as will be described later, note that the thickness and basis weight of each of the first portion 41F and the second portion 41R which are to be compared with those of the protruded portion 42 are the thickness and basis weight of the parts where no groove portions 45 are formed. Because the absorbent core 41 of the napkin 1 has a thickness difference made by varying the basis weight of the core material, it is soft as a whole unlike when a thickness difference is made by compressing a part of an absorbent core having a uniform basis weight.

[0024]

As stated earlier, the protruded portion 42 is flat on the skin facing side thereof. The expression “flat on the skin facing side” as used herein is intended to include not only “dead flat” but also having localized unevenness on the skin facing side of about 5 mm in width and about 2 mm in depth that may result from localized non-uniform fiber deposition, deformation by pressing, or otherwise during the production process. Thus, the protruded portion 42 of the napkin 1 has on its skin facing side no depressions where the basis weight is lower than that of the first portion 41F and the second portion 41R.

In the case where the first portion 41F and the second portion 41R have a groove portion 45, note that the basis weight of each of the first portion 41F and the second portion 41R as referred to above is the basis weight of the parts except the groove portion 45. A depression with a lower basis weight on the skin facing side of the protruded portion 42, if any, would not only impede rapid spread of discharged fluids in a longitudinally or laterally planar direction, leading to reduction in amount or rate of absorption, thereby tending to cause rewet, but also tend to cause an unexpected crease or bend in the napkin 1. If, for example, the skin facing side of the protruded portion 42 has a longitudinally running depression with a lower basis weight like a longitudinal groove extending in the protruded portion 42 in the longitudinal direction X, the protruded portion 42 is liable to be divided longitudinally along the longitudinal groove. As a result, a crease running in the longitudinal direction can form in the napkin 1 easily along the longitudinal groove during wear, and the absorbent core could be split along the longitudinal groove by the wearer's movement. Should the absorbent core be split, a gap easily forms between the napkin 1 and the wearer's body, and the absorption capacity decreases considerably, causing leakage. Later on, leak prevention will further be ensured by forming the linear groove 7 on the absorbent core 41 having a flat skin facing surface by compressing the topsheet 2 and the absorbent member 4 integrally toward the backsheet 3.

[0025]

As illustrated in Fig. 4, the absorbent core 41 of the napkin 1 has a continuous layer RS with a uniform thickness that extends continuously from the first portion 41F through the middle portion 41M to the second portion 41R on its skin facing side. In the napkin 1, the continuous layer RS is formed on the surface of the skin facing side of the absorbent core 41. The thickness of the continuous layer RS is equal to the thickness of a hereinafter described protrusion-defining groove portion 43 of the absorbent core 41 or the thickness of a protrusion-defining groove portion 43 of the absorbent core 41.

[0026]

The thickness of the protruded portion 42 is preferably 120% or more (i.e., 1.2 times or more), more preferably 140% or more, of the thickness of the first portion 41F and the second portion 41R of the absorbent core 41, and preferably 700% or less, more preferably 500% or less, in view of sufficiently protruding the portion 42 toward the backsheet 3, i.e., the non-skin facing side, thereby securing absorption capacity of the

absorbent core 41. Specifically, in view of securing conformability to the body of a wearer during use and minimizing wearer discomfort, the thickness of the protruded portion 42 is preferably 120% to 700%, more preferably 140% to 500%. The height of the protrusion, being defined to be the difference between the thickness of the protruded portion 42 and the thickness of the first portion 41F or the second portion 41R (the former minus the latter), is preferably 1.0 mm or greater, more preferably 2.0 mm or greater, preferably 8.0 mm or smaller, more preferably 6.0 mm or smaller, preferably 1.0 to 8.0 mm, more preferably 2.0 mm to 6.0 mm. The above described structure is particularly effective when the protruded portion 42 is provided in the target section B as in the napkin 1 of the embodiment.

[0027]

The thickness of the protruded portion 42 is preferably 2.0 mm or greater, more preferably 3.0 mm or greater, preferably 10.0 mm or smaller, more preferably 7.0 mm or smaller, preferably 2.0 to 10.0 mm, more preferably 3.0 to 7.0 mm. It is preferred that the above described thickness relationship be satisfied over the entire area of the protruded portion 42. When the thickness of the protruded portion 42 varies with location, the above thickness relationship may be satisfied in the thickest part of the protruded portion 42.

While it is preferred that the above described thickness relationship be satisfied over the entire area of the protruded portion 42, the above thickness relationship may be satisfied in the thickest part of the protruded portion 42 when the thickness of the protruded portion 42 varies gradually along the lateral direction Y and/or the longitudinal direction X.

[0028]

The thickness of the first portion 41F or the second portion 41R is preferably 0.5 mm or greater, more preferably 1.0 mm or greater, preferably 7.0 mm or smaller, more preferably 3.5 mm or smaller, preferably 0.5 to 7.0 mm, more preferably 1.0 to 3.5 mm.

The first portion 41F or the second portion 41R of the napkin 1 preferably has an almost uniform thickness in the part where no groove portions 45 described later are formed. In cases where the thickness of the first portion 41F or the second portion 41R varies gradually along the lateral direction Y or the longitudinal direction X, the above thickness relationship may be satisfied in the thickest part thereof.

The thicknesses of various portions of the absorbent core 41, including the protruded portion 42, the first portion 41F, the second portion 41R, and a hereinafter described protrusion adjacent portion 44, are measured as follows.

[0029]

Method for measuring thicknesses of portions of absorbent core 41:

An absorbent core is laid flat with no creases nor bends on a flat surface, and a portion to be measured (the protruded portion 42, first portion 41F, second portion 41R, etc.) is cut out. The thickness of the cut out portion is measured under a load of 5 cN/cm^2 . Specifically, the thickness measurement is taken using, for example, PEACOCK DIAL UPRIGHT GAUGES R5-C (FROM OZAKI MFG. CO., LTD.). A circular or square plate (acrylic resin plate of about 5 mm in thickness) which has been sized so as to apply a load of 5 cN/cm^2 is placed between the portion being measured and the contact point of the thickness gauge, and the thickness is measured. In measuring the thickness of the first portion 41F or the second portion 41R of the absorbent core 41, care should be taken such that the part to be measured has no groove portions 45 described later.

[0030]

The basis weight of the protruded portion 42 of the absorbent core 41 of the napkin 1 is preferably 100 g/m^2 or higher, more preferably 200 g/m^2 or higher, and preferably 1500 g/m^2 or lower, more preferably 1200 g/m^2 or lower, in view of sufficiently protruding the portion 42 toward the backsheet 3, i.e., the non-skin facing side, thereby securing absorption capacity of the absorbent core 41. Specifically, the basis weight of the protruded portion 42 is preferably 100 to 1500 g/m^2 , more preferably 200 to 1200 g/m^2 . The basis weight of the first portion 41F and the second portion 41R of the absorbent core 41 is preferably 50 g/m^2 or greater, more preferably 100 g/m^2 or higher, preferably 1000 g/m^2 or lower, more preferably 900 g/m^2 or lower, specifically preferably 50 to 1000 g/m^2 , specifically more preferably 100 to 900 g/m^2 . The basis weight of the first portion 41F or the second portion 41R is obtained by dividing the mass of the cut out sample of the protruded portion 42, the first portion 41F, or the second portion 41R as described for the method for measuring thicknesses of portions of absorbent core 41 by the area of the skin facing side of the sample. In measuring the basis weight of the first portion 41F or the second portion 41R of the absorbent core 41, care should be taken such

that the part to be measured has no groove portions 45 described later.

[0031]

In a plan view of the absorbent core 41 of the napkin 1, the protruded portion 42 has a widest part in which the dimension (width) in the lateral direction Y perpendicular to the longitudinal direction X of the absorbent core 41 reaches the maximum. The width of the widest part is the same as that of the absorbent core 41. Preferably, the protruded portion 42 includes, in plan view of the absorbent core 41, a central subportion 421 defined by extending the widest part of the protruded portion 42 in the longitudinal direction X over a predetermined length along its opposite side edges extending in the longitudinal direction X of the absorbent core 41, as shown in Fig. 2. In other words, the central subportion 421 extends in a belt-like shape between the opposite side edges 41s extending in the longitudinal direction X of the absorbent core 41 and has the above identified widest part over the whole length thereof in the longitudinal direction X of the central subportion 421. The dimension (width) of the widest part of the central subportion 421 in the lateral direction Y is equal to the maximum width of the middle portion 41M of the absorbent core 41. As used herein, the term “width” of the absorbent core 41 means the width of the absorbent core 41 inclusive of the protruded portion 42. That is, in a transverse cross-section of the protruded portion 42, when the width of the protruded portion 42 measured on its non-skin facing side (hereinafter, “non-skin side width”), which is located nearer the non-skin facing side of the napkin than the level of the surface on the non-skin facing side of the adjacent first portion 41F and second portion 41R, is equal to or greater than the width of the protruded portion 42 measured on the skin facing side (hereinafter, “skin side width”), which is located nearer the skin facing side of the napkin than the level, the maximum width of the protruded portion 42 is equal to the width of the absorbent core 41. Nevertheless, it is desirable that the skin side width and the non-skin side width of the widest part of the protruded portion 42 be substantially equal. It is more desirable that the width of the widest part of the protruded portion 42 be substantially uniform in the thickness direction.

[0032]

It is desirable that the central subportion 421 be formed in the target section B and have as much area as possible within the target section B as illustrated in Fig. 2 so that the absorbent core 41 may have sufficient absorbency even when the absorbent

article is more or less out of proper position in use. It is preferable from this viewpoint that the distance between the opposite side edges 41s extending in the longitudinal direction X of the absorbent core 41 be constant in the widest part of the central subportion 421. It is more preferable that the side edges 41s be straight linear and parallel to each other in the longitudinal direction X. It should be noted that the width of the protruded portion 42 and the width of the absorbent core 41 can vary slightly as a result of production conditions, such as an offset of the protruded portion 42 of the absorbent core 41 in the lateral direction Y, deficiency of the protruded portion 42, a draft angle that depends on the production method, and rounding or beveling of edges. With such a variation being slight, for example, a difference of about 5% of the width of the widest part, the width of the protruded portion 42 and the width of the absorbent core 41 are regarded to be equal. The term “maximum width” means the distance at the widest position in the lateral direction Y. In the napkin 1, the width of the widest part of the protruded portion 42 in the lateral direction Y is equal to the maximum width of the middle portion 41M of the absorbent core 41 in the lateral direction Y and at the same time equal to the maximum width of the absorbent core 41 in the lateral direction Y. With such a structure, sufficient absorption capacity is secured, and thus leaks are less likely to occur even when the napkin 1 is slightly out of proper position in use.

[0033]

The central subportion 421 of the protruded portion 42 of the napkin 1 has a decreasing thickness from its lateral center toward both side edges as shown in the cross-section of Fig. 3. That is, the central subportion 421 is thickest in its lateral middle part extending along the longitudinal centerline CL extending in the longitudinal direction X. The central subportion 421 being so contoured, absorption capacity of the target section B is sufficiently secured.

[0034]

The central subportion 421 of the protruded portion 42 of the napkin 1 has a decreasing basis weight from its lateral center toward both side edges as shown in the cross-section of Fig. 3. That is, the central subportion 421 has the highest basis weight in its lateral middle part extending along the longitudinal centerline CL in the longitudinal direction X. The central subportion 421 being so configured, performance properties, including absorbency, in the target section B are improved.

[0035]

In a cross-sectional view as illustrated in Fig. 3, the central subportion 421 of the napkin 1 preferably has a ratio of the thickness (T1) of its middle part formed along the longitudinal centerline CL to the smallest thickness (T2) at its side edges 41s, $T1/T2$, of 1.1 or greater, more preferably 1.3 or greater, so that the protruded portion may be snugly fitted to the wearer's point of discharge with as small a gap as possible. In view of minimizing wearer discomfort, the ratio is preferably 4 or smaller, more preferably 3 or smaller. Specifically, the ratio is preferably 1.1 to 4, more preferably 1.3 to 3.

[0036]

The protruded portion 42 further includes a front subportion 422 or a rear subportion 423 having its width (dimension in the lateral direction Y) decreasing from the width of the widest part of the protruded portion 42 toward the side of the front section A or the side of the rear section C, respectively. That is, as illustrated in Fig. 2, the protruded portion 42 includes at least one of a front subportion 422 that projects, in plan view of the absorbent core 41, from the front end of the central subportion 421 toward the first portion 41F and a rear subportion 423 that projects, in plan view of the absorbent core 41, from the rear end of the central subportion toward the second portion 41R. The protruded portion 42 of the napkin 1 of the embodiment has both the front subportion 422 and the rear subportion 423. Namely, the protruded portion 42 of the napkin 1 is divided into the front subportion 422, the central subportion 421, and the rear subportion 423.

[0037]

As illustrated in Fig. 2, the napkin 1 has one front subportion 422 located forwardly adjacent to the central subportion 421 and one rear subportion 423 located rearwardly adjacent to the central subportion 422 in the absorbent core 41. In plan view, the front subportion 422 has its vertex 422t positioned on the longitudinal centerline CL extending in the longitudinal direction X, and a pair of lateral sides 422s, which define the front subportion 422, each extend straight from the vertex 422t to the lateral side edge 41s of the absorbent core 41. Similarly to the front subportion 422, the rear subportion 423 has its vertex 423t positioned on the longitudinal centerline CL extending in the longitudinal direction X, and a pair of lateral sides 423s, which define the rear subportion 423, each extend straight from the vertex 423t to the lateral side edge 41s of the absorbent core 41.

[0038]

As illustrated in Fig. 2, the front subportion 422 and the rear subportion 423 of the absorbent core 41 of the napkin 1 have their width d decreased gradually from the opposite sides along the longitudinal direction X to their respective vertices 422t and 423t positioned at their lateral middle. Preferably, in the front subportion 422 of the absorbent core 41 of the napkin 1, the distance between lateral sides 422s (i.e., the width d) decreases gradually from the lateral side edges 41s of the absorbent core 41, which extend in the longitudinal direction X , to the vertex 422t. Similarly, in the rear subportion 423 of the absorbent core 41 of the napkin 1, the distance between lateral sides 423s (i.e., the width d) decreases gradually from the lateral side edges 41s of the absorbent core 41, which extend in the longitudinal direction X , to the vertex 423t. As used herein, the term “decrease gradually” means that the width d is decreased to the vertex 422t or 423t continuously.

[0039]

The geometry of the front subportion 422 and the rear subportion 423 of the absorbent core 41 of the napkin 1 will further be described generally with reference to the front subportion 422. As illustrated in Fig. 2, the both sides 422s extend straight with no bends. Each of the sides 422s makes an angle α with the longitudinal centerline CL. The angle α is preferably 20° or greater, more preferably 30° or greater, preferably 75° or smaller, more preferably 60° or smaller, in the interests of the improvements on fit to the body and conformability to the wearer's movement. Specifically, the angle α is preferably 20° to 75° , more preferably 30° to 60° . These preferred angle ranges also apply to the rear subportion 423.

[0040]

The longitudinal overall length $L2$ (see Fig. 2) of the protruded portion 42 is preferably 25% or more, more preferably 30% or more, preferably 80% or less, more preferably 75% or less, preferably 25% to 80%, more preferably 30% to 75%, of the longitudinal whole length $L1$ of the absorbent core 41 of the napkin 1, in view of securing body fluid absorption capacity as well as good fit when in use.

The whole length $L1$ is the distance between the farthest ends of the absorbent core 41 in the longitudinal direction X . The overall length $L2$ of the protruded portion 42 is the distance between the farthest ends of the protruded portion 42 in the longitudinal

direction X.

[0041]

In order to sufficiently secure absorption capacity, the longitudinal length L3 (see Fig. 2) of the central subportion 421 of the protruded portion 42 is preferably 20% or more, more preferably 30% or more, preferably 80% or less, more preferably 70% or less, preferably 20% to 80%, more preferably 30% to 70%, of the overall length L2 of the protruded portion 42.

[0042]

The longitudinal length L4 (see Fig. 2) of the front subportion 422 of the protruded portion 42 is preferably 5% or more, more preferably 10% or more, preferably 50% or less, more preferably 30% or less, preferably 5% to 50%, more preferably 10% to 30%, of the overall length L2 of the protruded portion 42. The same preference applies to the longitudinal length of the rear subportion 423 of the protruded portion 42. The length L4 is the maximum distance between the farthest ends of the front subportion 422 in the longitudinal direction X.

[0043]

As illustrated in Figs. 2, 4, and 5, the absorbent core 41 of the napkin 1 has, in the middle portion 41M, a protrusion-defining groove portion 43 that delineates the boundary between the protruded portion 42 and the other part. The protrusion-defining groove portion 43 is formed by making a groove in the absorbent core 41 from the non-skin facing side toward the skin facing side. The protrusion-defining groove portion 43 is formed by making a groove in the absorbent core 41 from the non-skin facing side of the backsheet 3 toward the side of the topsheet 2 so that the ceiling portion of the space of the groove (or the bottom portion of the groove) is provided on the side of the topsheet 2. Such a configuration allows the absorbent member 4 to bend easily along the protrusion-defining groove portion 43 according to the force applied to the absorbent core 41 laterally inward by the wearer's thighs, whereby the napkin 1 easily provides a more three-dimensional fit to contour of the wearer's body.

[0044]

As illustrated in Fig. 2, the protrusion-defining groove portion 43 of the napkin 1 includes a front protrusion-defining groove portion 43a that extends along the two sides 422s delineating the front subportion 422 of the protruded portion 42 and a rear protrusion-defining groove portion 43c that extends along the two sides 423s delineating the rear subportion 423. The front protrusion-defining groove portion 43a and the rear protrusion-defining groove portion 43c each extend the whole width of the absorbent core 41. This configuration allows the absorbent core 41 to resist creating a crease running in the longitudinal direction X according to the force applied thereto laterally inward by the wearer's thighs, whereby the napkin 1 easily provides a more three-dimensional fit to the wearer's body. The protruded portion 42 of the absorbent core 41 is thus defined by the front protrusion-defining groove portion 43a and the rear protrusion-defining groove portion 43c.

[0045]

The groove width of the protrusion-defining groove portion 43 of the absorbent core 41 of the napkin 1 is preferably 0.1 mm or more, more preferably 0.5 mm or more, preferably 5.0 mm or less, more preferably 3.0 mm or less, preferably 0.1 to 5.0 mm, more preferably 0.5 to 3.0 mm, with the view of improving absorbency and other performance in the target section B. The groove width of the protrusion-defining groove portion 43 and the hereinafter described thickness of the protrusion-defining groove portion 43 are measured on a photograph of a cross-section taken along a direction perpendicular to the extending direction of the protrusion-defining groove portion 43.

The thickness of the protrusion-defining groove portion 43 of the absorbent core 41 of the napkin 1, being defined to be the thickness of the absorbent core 41 measured at the bottom of the groove, is preferably 0.08 mm or more, more preferably 0.15 mm or more, preferably 7.0 mm or less, more preferably 3.5 mm or less, preferably 0.08 to 7.0 mm, more preferably 0.15 to 3.5 mm, with the view of improving absorbency and other performance in the target section B.

[0046]

In the napkin 1, the basis weight of the protrusion-defining groove portion 43 is lower than that of the protruded portion 42 and also lower than those of the first portion 41F and the second portion 41R of the absorbent core 41. In the case where the first portion 41F and the second portion 41R have a groove portion 45 as will be described

later, note that the basis weight of each of the first portion 41F and the second portion 41R is the basis weight of the parts where no groove portions 45 are formed. The basis weight of the protrusion-defining groove portion 43 is preferably 10 g/cm^2 or more, more preferably 20 g/cm^2 or more, preferably 350 g/cm^2 or less, more preferably 250 g/cm^2 or less, specifically preferably 10 to 350 g/cm^2 , specifically more preferably 20 to 250 g/cm^2 . The basis weight of the protrusion-defining groove portion 43 is obtained by dividing the mass of a sample cut out of the protrusion-defining groove portion 43 by the area of the skin facing side of the sample, as has been described with respect to the measurement of the thickness of various portions of the absorbent core 41.

[0047]

As illustrated in Fig. 2, the absorbent core 41 of the napkin 1 has a protrusion adjacent portion 44 in a region of the middle portion 41M exclusive of the protruded portion 42 and exclusive of the protrusion-defining groove portion 43. In the napkin 1, the middle portion 41M is composed of the protruded portion 42, the protrusion-defining groove portions 43, and the protrusion adjacent portion 44. The protrusion adjacent portion 44 includes a front protrusion adjacent portion 44a located adjacent to the front subportion 422 on the first portion 41F side, which front subportion 422 composes part of the protruded portion 42, and a rear protrusion adjacent portion 44c located adjacent to the rear subportion 423 on the second portion 41R side, which rear subportion 423 composes part of the protruded portion 42. The front protrusion adjacent portion 44a is laterally symmetric about the centerline CL extending in the longitudinal direction X. In a half of the front protrusion adjacent portion 44a divided by the centerline CL and located on the side of one of the side edges 41s of the absorbent core 41 along the longitudinal direction X, its length in the longitudinal direction X gradually decreases from the side edge 41s to the centerline CL. Similarly to the front protrusion adjacent portion 44a, the rear protrusion adjacent portion 44c is laterally symmetric about the longitudinal centerline CL. In a half of the rear protrusion adjacent portion 44c divided by the centerline CL and located on the side of one of the side edges 41s of the absorbent core 41 along the longitudinal direction X, its length in the longitudinal direction X gradually decreases from the side edge 41s to the centerline CL.

[0048]

As illustrated in Figs. 4 and 5, the protrusion adjacent portion 44 of the napkin 1

protrudes toward the backsheet 3 beyond the ceiling of the space (groove) of the protrusion-defining groove portion 43, i.e., beyond the surface on the topsheet 2 side of the protrusion-defining groove portion 43. The protrusion adjacent portion 44 is flat on its skin facing side. The thickness of the protrusion adjacent portion 44 is greater than that of the protrusion-defining groove portion 43 and smaller than that of the protruded portion 42 of the absorbent core 41. With the view of improving conformability to the wearer's movement, the thickness of the protrusion adjacent portion 44 is preferably equal to or smaller than that of the first portion 41F and the second portion 41R. However, the protrusion adjacent portion 44 may be thicker than the first portion 41F and the second portion 41R, taking into consideration the strength of the absorbent core 41 against repeated deformation with the wearer's movement.

The thickness of the protrusion adjacent portion 44 is preferably 0.5 mm or more, more preferably 1.0 mm or more, preferably 10.0 mm or less, more preferably 7.0 mm or less, preferably 0.5 to 10.0 mm, more preferably 1.0 to 7.0 mm.

The thickness of the protrusion adjacent portion 44 is measured in accordance with the above described method for measuring the thicknesses of various portions of the absorbent core 41.

[0049]

The protrusion adjacent portion 44 of the napkin 1 has a lower basis weight than the protruded portion 42 of the absorbent core 41 and a higher basis weight than the protrusion-defining groove portion 43. The basis weight of the protrusion adjacent portion 44 is preferably equal to or lower than that of the first portion 41F and that of the second portion 41R in the interests of conformability to the movement of the wearer's body. However, the protrusion adjacent portion 44 may have a higher basis weight than the first portion 41F and the second portion 41R, taking into consideration the strength of the absorbent core 41 against repeated deformation with the wearer's movement. In the case where the first portion 41F and the second portion 41R have a groove portion 45, note that the basis weight of each of the first portion 41F and the second portion 41R as referred to above is the basis weight of the parts except the groove portion 45. The basis weight of the protrusion adjacent portion 44 is preferably 20 g/cm^2 or more, more preferably 50 g/cm^2 or more, preferably 800 g/cm^2 or less, more preferably 700 g/cm^2 or less, specifically preferably 20 to 800 g/cm^2 , specifically more preferably 50 to 700 g/cm^2 . The basis weight of the protrusion adjacent portion 44 is obtained by dividing the mass of

a sample cut out of the part of the protrusion adjacent portion 44 by the area of the skin facing side of the sample, as has been described with respect to the measurement of the thicknesses of various portions of the absorbent core 41.

[0050]

The first portion 41F and the second portion 41R of the absorbent core 41 of the napkin 1 each have groove portions 45 having a relatively low basis weight and small absorptive portions 46 having a relatively high basis weight as illustrated in Fig. 2. Preferably, the groove portions 45 include longitudinal groove portions 45X extending in the longitudinal direction X and lateral groove portions 45Y extending in the lateral direction Y. Thus, the first portion 41F and the second portion 41R each have grooves running in the lateral direction Y (lateral grooves 45Y) and grooves running in the longitudinal direction X (longitudinal grooves 45X). The longitudinal grooves 45X running in the longitudinal direction X are arranged at a regular interval in the lateral direction Y, and the lateral grooves 45Y running in the lateral direction Y are arranged in the longitudinal direction X at a regular interval. The small absorptive portions 46 are located at the cells of the grid formed by the longitudinal grooves 44Y and the lateral grooves 44X. The thickness and basis weight of each of the first portion 41F and the second portion 41R as referred to above are the thickness and basis weight of the small absorptive portions 46. The groove portions 45 having the longitudinal groove 45X or the lateral groove 45Y have a smaller basis weight of the material for forming the absorbent core than the small absorptive portions 46, which are portions of the first portion 41F and the second portion 41R other than the groove portions 45.

[0051]

The absorbent core 41 of the napkin 1, which has the groove portions 45 and the small absorptive portions 46 in the first portion 41F and the second portion 41R and the protruded portion 42, the protrusion-defining groove portions 43, and the protrusion adjacent portions 44 in the middle portion 41M, is an integrally formed single member. As used herein, the expression “integrally formed” means that the absorbent core 41 is not composed of separately prepared parts joined together by adhesive bonding, compression, or a like means but formed integrally of a material in a single process.

[0052]

The absorbent core 41 of the napkin 1 can be formed by using, for example, an airlaying apparatus shown in Fig. 6(a) which includes an airlaying drum 54 having formation cavities 55 on its peripheral surface and rotating in one direction R and an unshown duct that feeds a core material in a fluidized form onto the periphery of the airlaying drum 54.

The formation cavities 55 are provided on the peripheral surface of the airlaying drum 54 at a regular spacing in the circumferential direction. Each formation cavity has a bottom 56 formed of a member having a large number of pores serving as suction holes therethrough, such as a mesh plate.

[0053]

As illustrated in Fig. 6(a), each formation cavity 55 has one sub-cavity 56b formed of part of its bottom 56, the sub-cavity 56b being for the formation of the middle portion 41M of the absorbent core 41. On the bottom of the sub-cavity 56b, there are disposed first sparingly air-permeable members 57 for the formation of the protrusion-defining groove portions 43 that separate the protruded portion 42 from the protrusion adjacent portions 44. The first sparingly air-permeable members 57 are fixed to stick out of the bottom of the sub-cavity 56b at positions corresponding to the protrusion-defining groove portions 43. On the bottom 56, there are disposed second sparingly air-permeable members 58 for the formation of the groove portions 45 at the upstream and downstream (in the rotation direction R) position adjacent to the sub-cavity 56b. The second sparingly air-permeable members 58 are fixed to stick out of the bottom 56 of the formation cavity 55 at positions corresponding to the longitudinal grooves 44Y and the transverse grooves 44X. The first sparingly air-permeable members 57 and the second sparingly air-permeable members 58 may be air-impermeable members made of, e.g., metals, plastics, or ceramics.

[0054]

In the same manner as with a known drum-type airlaying apparatus, a core material (a mixture of an absorbent polymer and pulp fiber) is fed to the duct while evacuating the formation cavity 55 through the bottom, whereby the core material is deposited in the formation cavity 55 to provide a prescribed shape as shown in Fig. 6(b). The airlaid fiber layer 40 is removed from the formation cavity 55 to give a precursor of

the absorbent core 41. The precursor of the absorbent core 41 is wrapped in an core wrap sheet (unshown), cut to size using, for example, a rotary cutter, and transported in a transport direction by a transport unit, such as a conveyor belt, to thereby obtain the absorbent core 41. The resulting absorbent core 41 wrapped in an unshown core wrap sheet is then compressed to an appropriate degree by applying pressure either entirely or in parts by, for example, passing between a pair of rollers once or more. Thus, the portion deposited in the sub-cavity 56b becomes the protruded portion 42 with relatively larger basis weight and thickness, while the portions formed of the core material and deposited in the upstream and downstream regions adjacent to the sub-cavity 56b become the first portion 41F and the second portion 41R with relatively small basis weight. On the other hand, the portions formed of the core material deposited on the first sparingly air-permeable members 57 of the sub-cavity 56b become the ceiling portion of the space of the protrusion-defining groove portions 43 having a relatively small basis weight compared with the first portion 41F and the second portion 41R, and the portions formed of the core material deposited on the second sparingly air-permeable members 58 in the upstream and downstream regions adjacent to the sub-cavity 56b become the ceiling portion of the space of the groove portions 45 having a relatively small basis weight compared with the small absorptive portions 46. The portion formed over the first sparingly air-permeable members 57 and the second sparingly air-permeable members 58 and continuously extending from the upstream side to the downstream side adjacent to the sub-cavity 56b, including the protrusion-defining groove portions 43 and the groove portions 45, provide the continuous layer RS with a uniform thickness.

[0055]

Materials forming various members making up the napkin 1 of the embodiment described above will then be described.

The topsheet 2 providing the skin facing surface may be made of a material having liquid permeability and containing a thermoplastic synthetic resin. For example, nonwoven fabrics, such as air-through nonwoven, spun-bonded nonwoven, and point-bonded nonwoven, are suitably used. The thermoplastic resin is exemplified by, but not limited to, a polymer of olefins, such as ethylene and propylene, and polyethylene terephthalate. The topsheet 2 preferably has, for example, a basis weight of 10 to 100 g/m² and a thickness of 0.5 to 5.0 mm. Any other materials conventionally used in the art may be used with no particular limitation, such as perforated film.

[0056]

The backsheet 3 may be made of a sparingly liquid permeable or liquid impermeable material containing a thermoplastic resin, and examples thereof include, but not limited to, synthetic resin film, a composite of synthetic resin film and nonwoven fabric, and water pressure-resistant, water-repellent nonwoven fabrics, such as spun-bonded/melt-blown/spun-bonded complex nonwoven, air-through nonwoven, point-bonded nonwoven, and spun-bonded nonwoven. Any other materials conventionally used in the art also may be used with no particular limitation. The backsheet 3 preferably has, for example, a basis weight of 10 to 50 g/m² and a thickness of 8 to 200 μ m.

[0057]

The core material of the absorbent core 41 includes a fiber aggregate made up of a fibrous material, such as pulp fiber. Any kinds of fibrous materials that have been conventionally used in absorbent members of absorbent articles, such as sanitary napkins, panty liners, and disposable diapers, may be used with no particular limitation. Examples of useful fibrous materials include cellulosic staple fibers, such as pulp fiber, rayon fiber, and cotton fiber, and synthetic resin staple fibers, such as polyethylene fiber. These fibrous materials may be used either individually or in combination of two or more thereof. Pulp fiber preferably accounts for all or a part of the fibrous material. The proportion of pulp fiber in the fibrous material is preferably 50 to 100 mass%, more preferably 80 to 100 mass%, even more preferably 100 mass%.

The absorbent core 41 may contain an absorbent polymer. Examples of useful absorbent polymers include sodium polyacrylate, acrylic acid-vinyl alcohol copolymers, crosslinked sodium polyacrylate, starch-acrylic acid graft copolymers, isobutylene-maleic anhydride copolymers and their saponification products, and polyaspartic acid. The absorbent core 41 containing the absorbent polymer is capable of quickly absorbing and retaining a large quantity of a discharged body fluid such as blood more stably.

If desired, the absorbent core 41 may contain a deodorant, an antimicrobial agent, and the like.

[0058]

The core wrap sheet (unshown) covering the absorbent core 41 may be a tissue sheet or water permeable nonwoven fabric. The absorbent member 4 is formed by

covering the upper and lower sides of the absorbent core 41 with a core wrap sheet (unshown). The unshown core wrap sheet is used to prevent leaks of the material forming the absorbent core 41 and to improve shape retention of the absorbent core 41. The unshown core wrap sheet covering the skin facing side of the absorbent core 41 and the unshown core wrap sheet covering the non-skin facing side of the absorbent core 41 are preferably bonded to topsheet 2 and the backsheet 3, respectively, with adhesive applied in a dot, spiral, stripe, or a like pattern.

[0059]

The side sheet 5 may be made of any materials conventionally used in the art with no particular limitation. For example, liquid impermeable or water repellent resin film or a composite of resin film and nonwoven fabric may be used. Water repellent (hydrophobic) nonwoven fabrics are also useful, including spun-bonded nonwoven, composite nonwoven fabrics composed of spun-bonded nonwoven (S) and melt-blown nonwoven (M), e.g., SM, SMS, or SMMS, heat-rolled nonwoven, and air-through nonwoven.

[0060]

The bond 6 at which the side sheet 5 and the topsheet 2 are bonded to each other may be formed by heat sealing in a usual manner.

The linear groove 7, inclusive of the first lateral groove 71, second lateral groove 72, and longitudinal groove 73, may be formed by compressive embossing with or without heat, ultrasonic embossing, or a like embossing technique.

[0061]

The advantageous effects of the napkin 1 of the embodiment will next be described.

As illustrated in Figs. 1 and 2, the absorbent core 41 of the napkin 1 has the protruded portion 42 in its middle portion 41M, the protruded portion 42 protruding toward the backsheet 3. In plan view of the absorbent core 41 as shown in Fig.2, the protruded portion 42 has a widest part that is the widest in the lateral direction Y of the absorbent core 41, the widest part having the same width (dimension in the lateral direction Y) as the middle portion 41M of the absorbent core 41. Therefore, a sufficient

absorption capacity is secured even when the napkin 1, an absorbent article, is applied slightly out of proper position in use. Since the protruded portion 42 is flat on its skin facing side, the skin facing surface of the protruded portion 42 of the absorbent core 41 is easily brought into close contact with the unshown core wrap sheet wrapping the absorbent core 41 and, consequently, the absorbent member 4 is easily brought into close contact with the topsheet 2 on its skin facing side at the location corresponding to the protruded portion 42. As a result, a discharged fluid having reached the skin facing side of the absorbent core 41 is allowed to spread quickly in planar directions, bringing about further improvements on absorption capacity and absorption rate, so that a rewet is prevented from occurring. Because a gap is less likely to be formed between the wearer's skin and the napkin 1, the napkin 1 provides a good fit to the wearer's body, causing little wearer discomfort. In particular, since the absorbent core 41 of the napkin 1 has on its skin facing side the continuous layer RS extending from the first portion 41F, through the middle portion 41M, to the second portion 41R with a uniform thickness, a gap is still less likely to be formed between the wearer's skin and the napkin 1, giving a further improved fit to the contour of the wearer's body. Since the protruded portion 42 of the middle portion 41M of the absorbent core 41 is thicker than the first portion 41F and the second portion 41R of the absorbent core 41, a space K (see Figs. 4 and 5) is easily provided between the skin facing side of the absorbent core 41 and the backsheet 3 or the unshown core wrap sheet in the regions forward and rearward of the protruded portion 42. The space K allows the napkin 1 to be deformed in the longitudinal direction X with good cushioning properties, thereby providing a further improved fit.

[0062]

In particular, the napkin 1 has the central subportion 421 formed by the extension of the widest part over a predetermined length in the longitudinal direction X along the opposite side edges of the absorbent core 41. This configuration secures increased absorption capacity for discharged fluids and also provides sufficient absorbing performance even when the napkin 1, an absorbent article, is applied slightly out of proper position or regardless of the movement or sleeping position of the wearer in use. Because of no gap formation between the topsheet 2 and the absorbent core 41, a discharged fluid is wicked into the absorbent core 41 so quickly that the fluid is prevented from leaking laterally through the gaps between the topsheet 2 and the absorbent core 41. The protruded portion 42 includes the central subportion 421 and at least one of the front

subportion 422 and the rear subportion 423. In a plan view as illustrated in Fig. 2, the front subportion 422 projects from the front end of the central portion 421 toward the first portion 41F, and the rear subportion 423 projects from the rear end of the central subportion 421 toward the second portion 41R. By the provision of at least one of the front subportion 422 and the rear subportion 423, the protruded portion 42 exhibits excellent conformability to the contour of the wearer to cause no or little wear discomfort even when the napkin is worn slightly out of proper position, because the front subportion 422 and/or the rear subportion 423 are deformed according to the force applied to the napkin 1 laterally inward by the wearer's thighs. In particular, the protruded portion 42 of the napkin 1 has both the front subportion 422 and the rear subportion 423, the above mentioned effect is more pronounced.

[0063]

As illustrated in Fig. 2, the front subportion 422 and the rear subportion 423 of the napkin 1 have their width d decreased gradually from opposite lateral sides of the absorbent core 41 toward their respective vertices 422t and 423t that are located at the lateral middle of the absorbent core 41. By this configuration, the napkin 1 is highly conformable to the contour of the body of a wearer and still less likely to cause a wearer discomfort in use even when the napkin 1 is worn slightly out of proper position.

[0064]

As illustrated in Fig. 2, the absorbent core 41 of the napkin 1 has the protrusion-defining groove portions 43 in the middle portion 41M, the protrusion-defining groove portions 43 separating the protruded portion 42 and the other part. As illustrated in Figs. 4 and 5, the protrusion-defining groove portion 43 is formed by making a groove in the absorbent core 41 from the non-skin facing side toward the skin facing side. Therefore, the napkin 1 easily bends along the protrusion-defining groove portion 43 to reduce a wearer discomfort. Particularly, in the napkin 1, the protrusion-defining groove portion 43 has a lower basis weight than the first portion 41F and the second portion 41R of the absorbent core 41. This further helps the napkin 1 to bend easily along the protrusion-defining groove portion 43 to further reduce a wearer discomfort. Furthermore, the protrusion-defining groove portion 43 extends the whole width of the absorbent core 41. This also helps the absorbent core 41 to bend easily at the lateral side portions according to the contour or movement of the wearer to provide a better fit.

[0065]

As illustrated in Fig. 2, the absorbent core 41 of the napkin 1 has, in the middle portion 41M, the front protrusion adjacent portion 44a located adjacent to the front subportion 422 on the first portion 41F side, which front subportion 422 composes part of the protruded portion 42, and the rear protrusion adjacent portion 44c located adjacent to the rear subportion 423 on the second portion 41R side, which rear subportion 423 composes the protruded portion 42. As shown in Figs. 4 and 5, the protrusion adjacent portion 44 protrudes downward toward the backsheet 3 beyond the ceiling portion of the space at the protrusion-defining groove portion 43 while being flat on its skin facing side similarly to the skin facing side of the protruded portion 42. Therefore, a gap is less likely to be formed between the wearer's skin and the napkin 1 even at the position corresponding to the protrusion-defining groove portion 43, thereby providing a good fit to the wearer's body with little wearer discomfort. Since the protrusion adjacent portion 44 has a lower basis weight than the first portion 41F and the second portion 41R of the absorbent core 41 and a higher basis weight than the protrusion-defining groove portion 43, sufficient absorbing performance is exhibited even when the napkin 1 is applied slightly out of proper position.

[0066]

As illustrated in Fig. 2, the absorbent core 41 of the napkin 1 has small absorptive portions 46 having a relatively high basis weight and groove portions 45 having a relatively low basis weight in the first portion 41F and the second portion 41R. This configuration allows the absorbent core 41 to bend easily along the groove portions 45 to reduce wearer discomfort. The absorbent core 41 of the napkin 1, which has the groove portions 45 and the small absorptive portions 46 in the first portion 41F and the second portion 41R and also has the protruded portion 42, the protrusion-defining groove portions 43, and the protrusion adjacent portions 44 in the middle portion 41M, is an integrally formed single member. Therefore, the napkin 1 provides a good fit to the wearer's body, causing little wearer discomfort.

[0067]

While the invention has been described with reference to its preferred embodiment, the absorbent article according to the invention is not limited to the napkin 1 of the embodiment, and various modifications can be made therein as illustrated below.

[0068]

While, as shown in Figs. 1 and 2, the absorbent core 41 has its middle portion 41M formed in the area of the target section B of the napkin 1 with the borders of the middle portion 41M of the absorbent core 41 not coinciding with the borders of the target section B of the napkin 1, the middle portion 41M and the target section B may coincide with each other. That is, in the case of a winged absorbent article like the napkin 1, which has a pair of wings 1W on its lateral sides, the middle portion 41M may be formed between the longitudinally spaced front and rear ends of the root of each wing 1W. More specifically, the middle portion 41M of the napkin 1 may be formed so as to extend between the longitudinally spaced front and rear ends of the root of each wing 1W. In the case where the front section A of the napkin 1 and the first portion 41F of the absorbent core 41 are almost equal in size and also where the rear section C of the napkin 1 and the second portion 41R of the absorbent core 41 are almost equal in size, the longitudinal length of the middle portion 41M of the napkin 1 is equal to the distance between the longitudinally spaced front and rear ends of the root of each wing 1W. The thus modified configuration provides the same effects as the napkin 1.

[0069]

The napkin 1 of the embodiment is preferably a sanitary napkin for night use having a longitudinal overall length of 30 cm or longer, which requires a sufficient absorption capacity.

[0070]

While in the embodiment the lateral sides 422s of the front subportion 422 of the absorbent core 41 each extend straight without any bends from the respective lateral side edge 41s of the absorbent core 41 to the vertex 422t with a gradually and continuously decreasing width d, the decrease of the width d of the front subportion 422 may be stepwise as long as it is gradual. It is preferred, though, that the front subportion 422 extends straight toward the vertex 422t with a gradually and continuously decreasing width d from the respective lateral side edge 41s of the absorbent core 41 toward the vertex 422t, with a view to improving the fit to the body and the ease of removal of the airlaid fiber layer from the formation cavity 55 of the airlaying apparatus. The above described modification and preference equally applies to the rear subportion 423.

[0071]

While the first portion 41F and the second portion 41R of the napkin 1 have the same thickness, they may differ in thickness as long as they are thinner than the protruded portion 42. While the first portion 41F and the second portion 41R of the napkin 1 have the same basis weight, they may differ in basis weight as long as they have lower basis weights than the protruded portion 42. While the first portion 41F and the second portion 41R of the napkin 1 have the groove portions 45 and the small absorptive portions 46, they may not have the groove portions 45 and the small absorptive portions 46, or the arrangement of the groove portions 45 and the small absorptive portions 46 may differ between these portions.

[0072]

While the absorbent core 41 of the napkin 1 is integrally formed as a single member, it may not be an integral member. For example, the absorbent core 41 may be made by forming a main absorbent layer of a core material so as to have a constant thickness from the first portion 41F to the second portion 41R and superposing a separately formed absorbent layer of a core material on the main absorbent layer to form the protruded portion 42.

[0073]

The napkin 1 has the side sheet 5 disposed on each lateral side portion of the skin facing side of the topsheet 2 to extend in the longitudinal direction X as illustrated in Fig. 1. With the view of preventing lateral leakage of body fluids, an elastic member may be disposed in a stretched state along the longitudinally extending free edge of each side sheet 5 to form a pair of leak-proof cuffs capable of rising toward the wearer.

[0074]

While the napkin 1 has the pair of wings 1W along the lateral sides of the target section B as illustrated in Fig. 1, the napkin 1 may be wingless or may additionally have a pair of rear flaps along the lateral sides of the rear section C.

[0075]

The napkin 1 illustrated in Fig. 1 has the pair of longitudinal grooves 73

extending in the longitudinal direction X of the absorbent core 41, which are linear grooves formed by integrally compressing the topsheet 2 and the absorbent core 41. With a view to ensuring leak prevention, each longitudinal groove 73 of the napkin 1 illustrated in Fig. 1 extends in the longitudinal direction X across the protruded portion 42, the protrusion-defining groove portion 43, and the protrusion adjacent portion 44. As illustrated in Fig. 7, the napkin 1 may further have a pair of second lateral grooves 72, each second lateral groove 72 being located at the front or rear end of the target section B of the absorbent member 4 and extending in the lateral direction Y longitudinally inward of the pair of the longitudinal grooves 73 and laterally inward of the pair of the first lateral grooves 71. The provision of the second lateral grooves 72 at such inward positions allows the napkin 1 to bend along the second lateral grooves 72 to further improve the fit to the body of a wearer.

[0076]

As illustrated in Fig. 8, the napkin 1 may further have a pair of second longitudinal grooves 73A positioned laterally outward of the pair of longitudinal grooves 73 in the target section B. The provision of the pair of second longitudinal grooves 73A prevents bunching or crinkling of the target section while maintaining the absorptivity and flexibility of the first portion 41F and the second portion 41R. The second longitudinal grooves 73A are preferably formed in the middle portion 41M in view of bunching or crinkling prevention and fit improvement.

[0077]

The absorbent core 41 of the napkin 1 may have the groove portions 45 on the skin facing side thereof, thereby to improve fluid distribution and retention characteristics.

[0078]

While the front section A of the napkin 1 and the first portion 41F of the absorbent core 41 are almost equal in size as shown in Fig. 1, they may not be equal in size. Likewise, while the rear section C of the napkin 1 and the second portion 41R of the absorbent core 41 are almost equal in size, they may not be equal in size.

[0079]

The absorbent article of the invention may be a panty liner (absorbent sheet for vaginal discharges), an incontinence pad, and the like as well as a sanitary napkin.

[0080]

The following clauses are further disclosed with respect to the aforementioned embodiment of the invention.

[0081]

<1> An absorbent article comprising an absorbent member, a topsheet covering the skin facing side of the absorbent member, and a backsheet covering the non-skin facing side of the absorbent member, the absorbent article having a front section and a rear section, the absorbent member comprising an oblong absorbent core having a longitudinal direction corresponding to the front-to-back direction of a wearer,

the absorbent core having a first portion located in the side of the front section, a second portion located in the side of the rear section, and a middle portion intermediate between the first and second portions, the middle portion having a protruded portion thicker than the first and second portions,

the protruded portion protruding toward the backsheet, and,

in a plan view of the absorbent core, the protruded portion having a widest part that is the widest in a lateral direction perpendicular to the longitudinal direction of the absorbent core, the widest part having the same width as the absorbent core.

[0082]

<2> The absorbent article as set forth in clause <1>, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core.

<3> The absorbent article as set forth in clause <2>, wherein the protruded portion further comprises a front or a rear subportion projecting from the central subportion forward or rearward, respectively, and the dimension of the front or rear subportion in the lateral direction decreases from the width of the widest part in the forward or rearward direction, respectively.

<4> The absorbent article as set forth in any one of clauses <1> to <3>, wherein the middle portion of the absorbent core has a protrusion-defining groove portion delineating the boundary between the protruded portion and the other part of the absorbent core,

the protrusion-defining groove portion extending the whole width of the absorbent core in the lateral direction.

<5> The absorbent article as set forth in clause <4>, wherein the protrusion-defining groove portion is a portion formed by making a groove in the absorbent core from the non-skin facing side toward the skin facing side.

<6> The absorbent article as set forth in clause <4> or <5>, wherein the protrusion-defining groove portion has a lower basis weight than the first portion and the second portion of the absorbent core.

<7> The absorbent article as set forth in any one of clauses <1> to <6>, wherein the middle portion of the absorbent core has a protrusion-defining groove portion delineating the boundary between the protruded portion and the other part of the absorbent core and has a protrusion adjacent portion in a region exclusive of the protruded portion and the protrusion-defining groove portion, and

a basis weight of the protrusion adjacent portion is lower than that of the protruded portion and equal to or lower than that of the first and second portions of the absorbent core.

<8> The absorbent article as set forth in clause <7>, wherein the protrusion adjacent portion protrudes toward the backsheet beyond a ceiling portion of a space at the protrusion-defining groove portion and has a flat surface on its skin facing side.

<9> The absorbent article as set forth in any one of clauses <1> to <8>, wherein the protruded portion has on its skin facing side no depressions where the basis weight is lower than that of the first portion and the second portion of the absorbent core.

<10> The absorbent article as set forth in any one of clauses <1> to <9>, wherein the absorbent core has on its skin facing side a continuous layer with a uniform thickness extending continuously from the first portion through the middle portion to the second portion.

[0083]

<11> The absorbent article as set forth in any one of clauses <1> to <10>, wherein the absorbent core is an integrally formed single member.

<12> The absorbent article as set forth in any one of clauses <1> to <11>, wherein the

protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core, and a front and a rear subportion projecting from the central subportion forward and rearward, respectively, wherein the dimension of the front or rear subportion in the lateral direction decreases from the width of the widest part in the forward or rearward direction, respectively,

the front subportion being one subportion forwardly adjacent to the central subportion, the rear subportion being one subportion rearwardly adjacent to the central subportion, and

each of the front subportion and the rear subportion having a vertex positioned at the lateral middle of the absorbent core and having a width decreasing gradually from the laterally opposite sides toward the vertex.

<13> The absorbent article as set forth in any one of clauses <1> to <12>, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core,

the central subportion having, in cross-sectional view, a decreasing thickness from its lateral center toward both side edges.

<14> The absorbent article as set forth in any one of clauses <1> to <13>, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core,

the central subportion having, in cross-sectional view, a decreasing basis weight from its lateral center toward both side edges.

<15> The absorbent article as set forth in any one of clauses <1> to <14>, wherein the middle portion of the absorbent core has a protrusion-defining groove portion delineating the boundary between the protruded portion and the other part of the absorbent core and has a protrusion adjacent portion in a region exclusive of the protruded portion and the protrusion-defining groove portion, and

a basis weight of the protrusion adjacent portion is lower than that of the protruded portion and higher than that of the protrusion-defining groove portion.

<16> The absorbent article as set forth in clause <15>, wherein the protrusion adjacent portion has a thickness equal to or smaller than that of the first portion and the second portion of the absorbent core.

<17> The absorbent article as set forth in any one of clauses <1> to <16>, wherein the protruded portion has a longitudinal overall length of 25% to 80% of the longitudinal overall length of the absorbent core.

<18> The absorbent article as set forth in any one of clauses <1> to <17>, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core,

the central subportion having a longitudinal overall length of 20% to 80% of the longitudinal overall length of the protruded portion.

<19> The absorbent article as set forth in any one of clauses <1> to <18>, wherein the middle portion of the absorbent core has a protrusion-defining groove portion delineating the boundary between the protruded portion and the other part of the absorbent core and has a protrusion adjacent portion in a region exclusive of the protruded portion and the protrusion-defining groove portion,

the absorbent article having a linear groove formed by integrally compressing the topsheet and the absorbent core, the linear groove comprising a pair of longitudinal grooves extending in the longitudinal direction of the absorbent core,

the longitudinal grooves extending in the longitudinal direction across the protruded portion, the protrusion-defining groove portion, and the protrusion adjacent portion.

[0084]

<20> The absorbent article as set forth in clause <19>, wherein the linear groove formed by integrally compressing the topsheet and the absorbent core further comprises a lateral groove extending in the lateral direction between the pair of longitudinal grooves.

<21> The absorbent article as set forth in clause <19> or <20>, wherein the linear groove further comprises a pair of second longitudinal grooves positioned laterally outward of the pair of longitudinal grooves in the middle portion.

<22> The absorbent article as set forth in any one of clauses <1> to <21>, wherein the first portion and the second portion of the absorbent core each have a laterally running groove portion, the groove portion having a lower basis weight of the material for forming the absorbent core than the other parts of the first and the second portion.

<23> The absorbent article as set forth in any one of clauses <1> to <22>, wherein the first portion and the second portion of the absorbent core each have a longitudinally

running groove portion, the groove portion having a lower basis weight of the material for forming the absorbent core than the other parts of the first and the second portion.

<24> The absorbent article as set forth in any one of clauses <1> to <23>, comprising a pair of wings, one on each lateral side thereof, the middle portion being located between the longitudinally spaced front and rear ends of the root of each wing.

<25> The absorbent article as set forth in clause <24>, wherein the middle portion longitudinally extends the distance between the longitudinally spaced front and rear ends of the root of each wing.

<26> The absorbent article as set forth in clause <24> or <25>, wherein the longitudinal length of the middle portion of the absorbent core is equal to the distance between the longitudinally spaced front and rear ends of the root of each wing.

<27> The absorbent article as set forth in any one of clauses <1> to <26>, further comprising a leak-proof cuffs capable of rising toward a wearer along each lateral side thereof.

<28> The absorbent article as set forth in any one of clauses <1> to <27>, being a sanitary napkin having a total length of 30 cm or longer.

Industrial Applicability

[0085]

The absorbent article according to the invention secures sufficient absorption capacity and provides a good fit to the wearer's body thereby causing little wearer discomfort even when it is worn slightly out of proper position.

CLAIMS

1. An absorbent article comprising an absorbent member, a topsheet covering the skin facing side of the absorbent member, and a backsheet covering the non-skin facing side of the absorbent member, the absorbent article having a front section and a rear section, the absorbent member comprising an oblong absorbent core having a longitudinal direction corresponding to the front-to-back direction of a wearer,

the absorbent core having a first portion located in the side of the front section, a second portion located in the side of the rear section, and a middle portion intermediate between the first and second portions, the middle portion having a protruded portion thicker than the first and second portions,

the protruded portion protruding toward the backsheet, and,

in plan view of the absorbent core, the protruded portion having a widest part that is the widest in a lateral direction perpendicular to the longitudinal direction of the absorbent core, the widest part having the same width as the absorbent core.

2. The absorbent article according to claim 1, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core.

3. The absorbent article according to claim 2, wherein the protruded portion further comprises a front or rear subportion projecting from the central subportion forward or rearward, respectively, and the dimension of the front or rear subportion in the lateral direction decreases from the width of the widest part in the forward or rearward direction, respectively.

4. The absorbent article according to any one of claims 1 to 3, wherein the middle portion of the absorbent core has a protrusion-defining groove portion delineating the boundary between the protruded portion and the other part of the absorbent core,

the protrusion-defining groove portion extending the whole width of the absorbent core in the lateral direction.

5. The absorbent article according to claim 4, wherein the protrusion-defining groove portion is a portion formed by making a groove in the absorbent core from the non-skin facing side toward the skin facing side.
6. The absorbent article according to claim 4 or 5, wherein the protrusion-defining groove portion has a lower basis weight than the first portion and the second portion of the absorbent core.
7. The absorbent article according to any one of claims 1 to 6, wherein the middle portion of the absorbent core has a protrusion-defining groove portion delineating the boundary between the protruded portion and the other part of the absorbent core and has a protrusion adjacent portion in a region exclusive of the protruded portion and the protrusion-defining groove portion, and
a basis weight of the protrusion adjacent portion is lower than that of the protruded portion and equal to or lower than that of the first and second portions of the absorbent core.
8. The absorbent article according to claim 7, wherein the protrusion adjacent portion protrudes toward the backsheet beyond a ceiling portion of a space at the protrusion-defining groove portion and has a flat surface on its skin facing side.
9. The absorbent article according to any one of claims 1 to 8, wherein the protruded portion has on its skin facing side no depressions where the basis weight is lower than that of the first portion and the second portion of the absorbent core.
10. The absorbent article according to any one of claims 1 to 9, wherein the absorbent core has on its skin facing side a continuous layer with a uniform thickness extending continuously from the first portion through the middle portion to the second portion.
11. The absorbent article according to any one of claims 1 to 10, wherein the absorbent core is an integrally formed single member.

12. The absorbent article according to any one of claims 1 to 11, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core, and a front and a rear subportion projecting from the central subportion forward and rearward, respectively, wherein the dimension of the front or rear subportion in the lateral direction decreases from the width of the widest part in the forward or rearward direction, respectively,

the front subportion being one subportion forwardly adjacent to the central subportion, the rear subportion being one subportion rearwardly adjacent to the central subportion, and

each of the front subportion and the rear subportion having a vertex positioned at the lateral middle of the absorbent core and having a width decreasing gradually from the laterally opposite sides toward the vertex.

13. The absorbent article according to any one of claims 1 to 12, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core,

the central subportion having, in cross-sectional view, a decreasing thickness from its lateral center toward both side edges.

14. The absorbent article according to any one of claims 1 to 13, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core,

the central subportion having, in cross-sectional view, a decreasing basis weight from its lateral center toward both side edges.

15. The absorbent article according to any one of claims 1 to 14, wherein the middle portion of the absorbent core has a protrusion-defining groove portion delineating the boundary between the protruded portion and the other part of the absorbent core and has a protrusion adjacent portion in a region exclusive of the protruded portion and the protrusion-defining groove portion, and

a basis weight of the protrusion adjacent portion is lower than that of the protruded portion and higher than that of the protrusion-defining groove portion.

16. The absorbent article according to claim 15, wherein the protrusion adjacent portion has a thickness equal to or smaller than that of the first portion and the second portion of the absorbent core.

17. The absorbent article according to any one of claims 1 to 16, wherein the protruded portion has a longitudinal overall length of 25% to 80% of the longitudinal overall length of the absorbent core.

18. The absorbent article according to any one of claims 1 to 17, wherein the protruded portion comprises a central subportion defined by extending the widest part in the longitudinal direction over a predetermined length along the opposite side edges extending in the longitudinal direction of the absorbent core,

the central subportion having a longitudinal overall length of 20% to 80% of the longitudinal overall length of the protruded portion.

19. The absorbent article according to any one of claims 1 to 18, wherein the middle portion of the absorbent core has a protrusion-defining groove portion delineating the boundary between the protruded portion and the other part of the absorbent core and has a protrusion adjacent portion in a region exclusive of the protruded portion and the protrusion-defining groove portion,

the absorbent article having a linear groove formed by integrally compressing the topsheet and the absorbent core, the linear groove comprising a pair of longitudinal grooves extending in the longitudinal direction of the absorbent core,

the longitudinal grooves extending in the longitudinal direction across the protruded portion, the protrusion-defining groove portion, and the protrusion adjacent portion.

20. The absorbent article according to claim 19, wherein the linear groove formed by integrally compressing the topsheet and the absorbent core further comprises a lateral groove extending in the lateral direction between the pair of longitudinal grooves.

21. The absorbent article according to claim 19 or 20, wherein the linear groove further comprises a pair of second longitudinal grooves positioned laterally outward of the pair of longitudinal grooves in the middle portion.
22. The absorbent article according to any one of claims 1 to 21, wherein the first portion and the second portion of the absorbent core each have a laterally running groove portion, the groove portion having a lower basis weight of the material for forming the absorbent core than the other parts of the first and the second portion.
23. The absorbent article according to any one of claims 1 to 22, wherein the first portion and the second portion of the absorbent core each have a longitudinally running groove portion, the groove portion having a lower basis weight of the material for forming the absorbent core than the other parts of the first and the second portion.
24. The absorbent article according to any one of claims 1 to 23, comprising a pair of wings, one on each lateral side thereof, the middle portion being located between the longitudinally spaced front and rear ends of the root of each wing.
25. The absorbent article according to claim 24, wherein the middle portion longitudinally extends the distance between the longitudinally spaced front and rear ends of the root of each wing.
26. The absorbent article according to claim 24 or 25, wherein the longitudinal length of the middle portion of the absorbent core is equal to the distance between the longitudinally spaced front and rear ends of the root of each wing.
27. The absorbent article according to any one of claims 1 to 26, further comprising a leak-proof cuffs capable of rising toward a wearer along each lateral side thereof.
28. The absorbent article according to any one of claims 1 to 27, being a sanitary napkin having a total length of 30 cm or longer.