



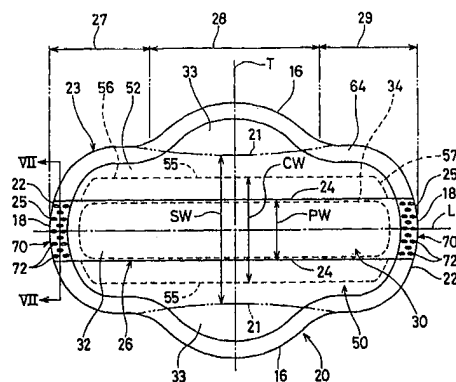
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(54) Title: A METHOD FOR ASSEMBLING BODY FITTING COMPOUND SANITARY NAPKIN

(57) Abstract

A method of manufacturing a compound sanitary napkin (20) comprising a primary absorbent member (30) and a secondary absorbent member (50) is provided. The primary absorbent member (30) comprises a primary absorbent element (34) and a fluid pervious cover superimposed on the primary absorbent element (34). The secondary absorbent member (50) comprises a fluid pervious body-facing sheet, a fluid impervious garment-facing sheet joined to the fluid pervious body-facing sheet and a secondary absorbent element (56) positioned between the fluid pervious body-facing sheet and the fluid impervious garment-facing sheet. The method comprises the steps of: wrapping a discrete primary absorbent element (34) by a continuous fluid pervious cover web to make a continuous primary absorbent member web, the discrete primary absorbent element (34) arranged to provide a first predetermined interval, forwarding the continuous primary absorbent member web toward a combining section, feeding a continuous fluid pervious body-facing sheet web, a continuous fluid impervious garment-facing sheet web and a discrete secondary absorbent element (56) toward the combining section, the discrete secondary absorbent element (56) arranged to provide a second predetermined interval, such that the discrete secondary absorbent element (56) superposes the discrete primary absorbent element (34) and such that at least a portion of each of the first and the second predetermined intervals is overlapping, combining the continuous primary absorbent member web and the continuous fluid pervious body-facing sheet web to make a continuous composite web, and cutting the continuous composite web into the discrete compound sanitary napkin (20).



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A METHOD FOR ASSEMBLING
BODY FITTING COMPOUND SANITARY NAPKIN

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FIELD OF THE INVENTION

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The present invention relates to a method for manufacturing disposable sanitary napkins. More particularly, the invention related to a method for manufacturing a compound sanitary napkin comprising a primary absorbent member and a base member, wherein the primary absorbent member comprises a primary absorbent element.

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BACKGROUND

In their simplest form, disposable sanitary napkins comprise an absorbent element (sometimes referred to as an absorbent core) interposed between a fluid pervious body-facing sheet (sometimes referred to as a topsheet) and a fluid impervious garment-facing sheet (sometimes referred to as a backsheet). The absorbent element is, of course, intended to receive and contain menses and other vaginal discharges. The body-facing sheet is intended to provide more or less comfortable and dry-feeling contact with body surfaces while allowing free passage of fluids therethrough into the absorbent element. The garment-facing sheet is intended to prevent menses or other vaginal discharges which are expelled or which escape from the absorbent element from soiling the user's garments. In addition to the three functional elements mentioned above, disposable sanitary napkins are generally provided with means for supporting the device adjacent the user's crotch area, even as the user moves, where it can most effectively perform its intended function.

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Typically, sanitary napkins are provided with an adhesive attachment means for securing the device to the inner crotch area of the user's undergarments.

While previously known sanitary napkins do perform their intended function, each conventional design suffers from certain deficiencies in one or more of absorbency of
5 body fluids, protection of the user's garments from soiling, and/or physical comfort to the user.

With respect to disposable sanitary napkins, at least two general classes presently exist. One such class is identified as being intended for the absorption of medium to high menstrual flows. These sanitary napkins offer a relatively high absorptive capacity.
10 Absorptive capacity is commonly achieved by providing the sanitary napkin with a relatively thick and bulky absorbent member. While having a relatively high absorptive capacity, the bulkiness of the absorbent member may cause a certain degree of wearing discomfort. A second class of sanitary napkins are intended for light or low menstrual flows and are commonly referred to as pantliners or pantishields. Sanitary napkins of
15 this class, as a group, are thinner, somewhat more flexible and generally more comfortable than those of the first class. However, sanitary napkins of the second class typically lack the absorptive capacity of sanitary napkins of the first class.

One attempt to provide the benefits of the previously described two classes of sanitary napkins into a single compound sanitary napkin is disclosed in commonly
20 assigned U.S. Patent No. 4,425,130 issued to DesMarais on January 10, 1984. The compound sanitary napkin of DesMarais comprises a primary menstrual pad and a panty protector joined to one another at their corresponding ends in such a manner that the two constituents are free to move relative to one another along essentially their entire common length. In use, the relative freedom of movement between the primary menstrual pad and
25 the panty protector serves to maintain the primary menstrual pad adjacent the user's crotch region while the panty protector remains associated with the user's undergarment. While the relative freedom of movement between the primary menstrual pad and the panty protector serves to maintain the primary menstrual pad near the user's crotch region, this freedom of movement may lead to a lack of stability if the primary menstrual pad
30 moves laterally beyond the side edges of the panty protector, providing an opportunity for soiling the user's undergarment.

While prior art absorbent articles such as sanitary napkins have addressed some of the problems of achieving a compound sanitary napkin, they have not addressed a method for manufacturing compound sanitary napkins in the manner of the present invention.

Therefore, a primary object of the present invention is to provide a method for manufacturing compound sanitary napkins.

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SUMMARY

The present invention relates to a method of manufacturing a compound sanitary napkin comprising a primary absorbent member and a secondary absorbent member. The primary absorbent member comprises a primary absorbent element and a fluid pervious cover superimposed on the primary absorbent element. The secondary absorbent member comprises a fluid pervious body-facing sheet, a fluid impervious garment-facing sheet joined to the fluid pervious body-facing sheet and a secondary absorbent element positioned between the fluid pervious body-facing sheet and the fluid impervious garment-facing sheet. The method comprises the steps of : wrapping a discrete primary absorbent element by a continuous fluid pervious cover web to make a continuous primary absorbent member web, the discrete primary absorbent element arranged to provide a first predetermined interval, forwarding the continuous primary absorbent member web toward a combining section, feeding a continuous fluid pervious body-facing sheet web, a continuous fluid impervious garment-facing sheet web and a discrete secondary absorbent element toward the combining section, the discrete secondary absorbent element arranged to provide a second predetermined interval, such that the discrete secondary absorbent element superposes the discrete primary absorbent element and such that at least a portion of each of the first and the second predetermined intervals is overlapping, combining the continuous primary absorbent member web and the continuous fluid pervious body-facing sheet web to make a continuous composite web, and cutting the continuous composite web into the discrete compound sanitary napkin.

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BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the present invention, it is believed that the present invention will be better understood from the following description in conjunction with the following drawings, in which like reference numbers identify identical elements and wherein:

FIG. 1 is a top plan view of one embodiment of the compound sanitary napkin produced by the present invention;

FIG. 2 is a cross-sectional view taken along the longitudinal centerline L of the compound sanitary napkin shown in FIG. 1;

5 FIG. 3 is a cross-sectional view taken along the transverse centerline T of the compound sanitary napkin shown in FIG. 1.;

FIG. 4 is a cross-sectional view of another embodiment of a compound sanitary napkin produced by the present invention;

10 FIG. 5 is a top plan view of a unfolded fluid pervious cover with a primary absorbent element of a primary absorbent member;

FIG. 6 is a top plan view a compound sanitary napkin comprising union means;

FIG. 7 is a cross-sectional view taken along VII - VII line shown in FIG. 1;

FIG. 8 is a cross-sectional view of another embodiment of a compound sanitary napkin produced by the present invention;

15 FIG. 9 is a cross-sectional view of another embodiment of a compound sanitary napkin produced by the present invention;

FIG. 10 is a top plan view of another embodiment of a compound sanitary napkin of the present invention;

20 FIG. 11 is a top plan view of another embodiment of a compound sanitary napkin of the present invention;

FIG. 12 is a fragmentary view showing the sectioned sanitary napkin and panty in place on a user;

FIG. 13 is a schematic side elevational view of an exemplary process embodiment of the present invention;

25 FIG. 14 is a fragmentary, schematic side elevational view of the patterned cylinder of the joining unit shown in FIG. 13;

FIG. 15 is a fragmentary, schematic side elevational view of the patterned cylinder of the pressure applying unit shown in FIG. 13;

30 FIG. 16 is a first fragmentary plan view of the assembling process of the sanitary napkin produced by the process shown in FIG. 13;

FIG. 17 is a second fragmentary plan view of the assembling process of the sanitary napkin produced by the process shown in FIG. 13;

FIG. 18 is a schematic side elevational view of another exemplary process embodiment of the present invention;

FIG. 19 is a first fragmentary plan view of the assembling process of the sanitary napkin produced by the process shown in FIG. 18;

FIG. 20 is a second fragmentary plan view of the assembling process of the sanitary napkin produced by the process shown in FIG. 18;

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DETAILED DESCRIPTION OF THE INVENTION

This invention is of a method for manufacturing a body fitting compound sanitary
10 napkin which exhibits absorbency for bodily fluids, the protection of the user's garments
from soiling, and physical comfort to the user. The term "sanitary napkin", as used
herein, refers to an article which is worn by females adjacent to the pudendal region and
which is intended to absorb and contain the various exudates which are discharged from
the body (e.g., blood, menses, and urine) and which is intended to be discarded after a
15 single use (i.e., it is not intended to be laundered or otherwise restored or reused). The
term "compound sanitary napkin", as used herein, refers to a sanitary napkin comprised of
separate constituents joined to one another to form a unitary structure. Interlabial devices
which reside partially within and partially external of the wearer's vestibule are also
within the scope of this invention. As used herein, the term "pudendal" refers to the
20 externally visible female genitalia and is limited to the labia majora, the labia minora, the
clitoris, and the vestibule.

Before explaining the method, a preferred embodiment of a compound sanitary
napkin is described. Referring now to FIGS. 1 - 3, there is shown one preferred
embodiment of a compound sanitary napkin 20. The compound sanitary napkin 20 has
25 two surfaces, a body contacting or facing surface 20A, and a garment contacting or facing
surface 20B. The compound sanitary napkin 20 has a first end region 27, a central region
28, a second end region 29, longitudinal sides 16 and transverse ends 18. The compound
sanitary napkin 20 has two centerlines, a longitudinal centerline L and a transverse
centerline T. The term "longitudinal", as used herein, refers to a line, axis or direction in
30 the plane of the compound sanitary napkin that is generally aligned with (e.g.,
approximately parallel to) a vertical plane which bisects a standing wearer into left and
right body halves when the compound sanitary napkin is worn. The terms "transverse" or
"lateral", as used herein, are interchangeable, and refer, to a line, axis, or direction which
lies within the plane of the compound sanitary napkin that is generally perpendicular to
35 the longitudinal direction.

As can be seen in FIGS. 1 - 3, the compound sanitary napkin 20 comprises a primary absorbent member 30 and a secondary absorbent member (base member) 50 joined together by union means 70. The primary and secondary absorbent members each have corresponding body facing and garment facing surfaces. The primary absorbent member 30 has longitudinal sides 24 and transverse ends 25 which together form the periphery 26 of the primary absorbent member 30. The primary absorbent member 30 also has a longitudinal length PL and a transverse width PW, and a thickness PT. The secondary absorbent member 50 has longitudinal sides 21 and transverse ends 22 which together form the periphery 23 of the secondary absorbent member 50 and the compound sanitary napkin 20. The secondary absorbent member 50 has a longitudinal length SL and a transverse width SW, and a thickness ST. As shown in FIG. 1, preferably, the compound sanitary napkin 20 has flaps 33 extending from the longitudinal sides 21 of the secondary absorbent member 50 in the central region 28 of the compound sanitary napkin 20.

The primary absorbent member 30 is, as its name implies, that constitute of the compound sanitary napkin 20 intended to absorb the bulk of bodily fluids discharged by the user. The primary absorbent member 30 has generally rectangular shape extending in the longitudinal direction along the longitudinal centerline L. In a preferred embodiment, the longitudinal length PL may be generally equal to the longitudinal length SL of the secondary absorbent member 50. The transverse width PW may be generally narrower than the transverse width SW of the secondary absorbent member 50. The primary absorbent member 30 comprises a primary absorbent element such as an absorbent core 34, a fluid pervious cover such as fluid pervious topsheet 32 superimposed on the absorbent core 34.

The topsheet 32 is preferably compliant, of feeling, and non-irritating to the wearer's skin. Further, the topsheet 32 is fluid pervious, permitting fluid to readily penetrate through its thickness. A suitable topsheet 32 may be manufactured from a wide range of materials such as woven and nonwoven materials; polymeric materials such as apertured formed thermoplastic films, apertured plastic films, and hydroformed thermoplastic films; porous foams; reticulated thermoplastic films; and thermoplastic scrim. Suitable woven and nonwoven materials can be comprised of natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polymeric fibers such as polyester, polypropylene, or polyethylene fibers); or from a combination of natural and synthetic fibers. A preferred topsheet comprises an apertured formed film. Apertured formed films are preferred for the topsheet because they are pervious to body exudates and yet non-

absorbent and have a reduced tendency to allow fluids to pass back through and rewet the wearer's skin. Thus, the surface of the formed film which is in contact with the body remains dry, thereby reducing body soiling and creating a more comfortable feel for the wearer. Suitable formed films are described in U.S. Patent No. 3,929,135 issued to
5 Thompson, on December 30, 1975; U.S. Patent No. 4,324,246 issued to Mullane et al., on April 13, 1982; U.S. Patent No. 4,342,314 issued to Radel, et al., on August 3, 1982; U.S. Patent No. 4,463,045, issued to Ahr, et al., on July 31, 1984 and U.S. Pat. No. 5,006,394 issued to Baird, on April 9, 1991. Each of these patents are incorporated herein by
10 reference. The preferred topsheet for the primary absorbent member is a formed film described in one or more of the above patents and marketed on sanitary napkins by The Procter & Gamble Company of Cincinnati, Ohio as "DRI-WEAVE".

The body or exposed surface of the formed film topsheet may be hydrophilic so as to help fluid transfer through the topsheet faster than if the body surface was not hydrophilic so as to diminish the likelihood that menstrual fluid will flow off the topsheet
15 rather than flowing into and being absorbed by the absorbent core. In a preferred embodiment, surfactant may be incorporated into the polymeric materials of the formed film topsheet such as is described in PCT Publication No. WO93/09741 published on May 23, 1993 in the name of Aziz, et al., which is incorporated herein by reference. Alternatively, the body surface of the topsheet can be made hydrophilic by treating it with
20 a surfactant such as described in U.S. Patent No. 4,950,264 issued to Osborn, on August 21, 1990 and which is incorporated herein by reference.

In a preferred embodiment, as shown in FIG. 4, the topsheet 32 may comprises a nonwoven 37 and a formed film 36 superposed on the nonwoven 37. The formed film 36 has a first surface 38 facing outwardly, a second surface 39 facing the nonwoven 37 and
25 the absorbent core 34, and apertures 42 extending from the first surface 38 to the second surface 39. The area of the apertures 42 in the second surface 39 adjacent to the absorbent core 34 is generally smaller than the area of the apertures 42 in the first surface 38. Because the aperture area of the first surface 38 is generally greater than the aperture area of the second surface 39, fluid can easily penetrate the topsheet 32 toward the
30 absorbent core 34. However, it inhibits fluid acquired in the absorbent core 34 from transferring from the absorbent core 34 toward the outside and from rewetting the wearer's skin. The nonwoven 37 is superposed to the second surface 39 of the formed film. The formed film 36 and the nonwoven 37 each has rectangular shape when the formed film 36 and the nonwoven 37 are unfolded as shown in FIG. 5. The topsheet 32
35 has longitudinal sides 45 and transverse ends 46. The formed film 36 has corresponding

longitudinal sides 43 and transverse ends 44 and the nonwoven 37 has corresponding longitudinal sides 47 and the transverse ends 48. The formed film 36 and the nonwoven 37 may be superposed by any suitable manner. Preferably, the formed film 36 and the nonwoven 37 may be joined to one another along the longitudinal sides 45 by a plurality of discrete dots 49. The discrete dots may be formed by applying pressure, heat, pressure and heat, and/or adhesive. Alternatively, the formed film 36 and the nonwoven 37 may be joined to one another along the entire length of the longitudinal sides 45.

The absorbent core 34 may be any absorbent means which is generally compressible, conformable, resilient, non-irritating to the wearer's skin and capable of absorbing and containing body exudates. The absorbent core 34 may be manufactured from a wide variety of fluid absorbent materials commonly used in disposable sanitary napkins, and other disposable absorbent articles. Examples of suitable absorbent materials include comminuted wood pulp (which is generally referred to as airfelt), creped cellulose wadding, modified cross-linked cellulose fibers (such as those described in U.S. Patent No. 5,217,445 issued to Young, et al., on June 8, 1993), capillary channel fibers (that is, fibers having intra-fiber capillary channels such as those described in U.S. Patent No. 5,200,248 issued to Thompson, et al., on April 6, 1993), absorbent foams (such as those described in U.S. Patent No. 5,260,345 issued to DesMarais, et al., on November 9, 1993 and U.S. Patent No. 5,268,244 issued to DesMarais, et al., on December 7, 1993), thermally bonded airlay materials (such as those material described in U.S. Patent No. 5,607,414 issued to Richards, et al., on March 4, 1997), hydrogel-forming polymer gelling agents (such as those material described in U.S. Patent No. 4,673,402 issued to Weisman, et al., on June 16, 1987 and U.S. Patent No. 4,935,022 issued to Lash et al., on June 19, 1990), absorbent sponges, synthetic staple fibers, polymeric fibers, peat moss, or any equivalent materials or combinations of materials. Suitable absorbent cores comprising foams are described in U.S. Patent No. 5,260,345 issued to DesMarais, et al., on Nov. 9, 1993; U.S. Patent No. 5,147,345 issued to Young, et al., on Sep. 15, 1992; U.S. Pat No. 5,194,720 issued to DesMarais, et al., on Sep. 22, 1992; U.S. Patent No. 5,198,472 issued DesMarais, et al., on Mar 30, 1993 and U.S. Patent No. 5,250,576 issued DesMarais, et al., on Oct. 5, 1993. Additional cores comprising foams are described in European Application 0 293 208 B1. Absorbent cores comprising sponges are described in U.S. Patent Nos. 3,512,530 and 3,954,493 and French Patent 2,203, 827.

Materials selected for use as the absorbent core 34 are preferably compliant, soft, comfortable, compressible and resilient to enhance body fit and comfort of the primary

absorbent member 30. Preferably, the absorbent core 34 is compressible such that the primary absorbent member 30 will deform under relatively small forces that are experienced during normal use. In addition to being compressible, the materials comprising the absorbent core 34 are preferably conformable such that the primary absorbent member 30 is able to provide improved fit into and around the labia and perineum. While being generally compressible and conformable under relatively small forces, those forces exerted by the external female genitalia during use, it is also important that the primary absorbent member 30 be sufficiently resilient such that when subjected to normal wearing forces it does not permanently collapse. Preferably, the primary absorbent member 30 will be sufficiently resilient that it will conform to the contours of the body to provide intimate contact with the exposed genitalia of the female use. Intimate contact with the exposed female genitalia helps provide better fluid transfer from the user into the primary absorbent member without allowing fluid to bypass and/or run-off the primary absorbent member. While the resilient characteristics of the absorbent core 34 allow for improved fit, they must be balanced against the need for the product to be both soft and comfortable for the wearer.

In a preferred embodiment, the absorbent core 34 comprises hydrogel-forming polymers and hydrophilic fibers such as airfelt. Preferably, the absorbent core 34 comprises hydrogel-forming polymers of between 10 % and 60 %. More preferably, the absorbent core 34 comprises hydrogel-forming polymers of between 15 % and 50 %. The absorbent core 34 may include airfelt of between 40 % and 90 %. Preferably, the absorbent core 34 may include airfelt of between 50 % and 85 %. If necessary, the absorbent core 34 may further include hydrophobic fibers. As shown in FIG. 3, the absorbent core 34 is manufactured in a generally cylindrical shape to provide the primary absorbent member 30 with a generally cylindrical shape. While the absorbent core 34 shown in FIG. 3 has a generally circular cross-section, the absorbent core may be manufactured in a wide variety of shapes such as rectangular, triangular, oval, square, pentagonal, U-shaped, Z-folded, etc.

The topsheet 32 may encircle the absorbent core 34 as shown in FIGS. 2 and 3. The topsheet 32 has longer length and wider width than the absorbent core 34 (shown in FIG. 5). The transverse width of the topsheet 32 is more than twice of the transverse width of the absorbent core 34. This allows the longitudinal sides 45 of the topsheet 32 to overlap underneath the absorbent core 34 to encircle the absorbent core 34 as shown in FIG. 3. The longitudinal sides 45 of the topsheet 32 may be secured by any suitable manner to keep the encircled shape. Suitable manners include, but are not limited to

adhesives such as line adhesive, spiral adhesive, or spot adhesive. In a preferred embodiment shown in FIGS. 3 and 5, line adhesive 51 is applied to one of the longitudinal sides 45 of the topsheet 32 along the entire length of the longitudinal length. Alternatively, intermittent line adhesive may be applied along the entire length of the
5 longitudinal length.

The topsheet 32 may be associated with the absorbent core 34 in any suitable manner. Suitable manners include, but are not limited to associating the topsheet 32 with the absorbent core 34 with adhesives such as by spray adhesive, line adhesives or spot adhesive between the topsheet 32 and the absorbent core 34. Alternatively, or
10 additionally, the topsheet 32 may be associated with the absorbent core 34 by entangling the fibers of the absorbent core 34 with the topsheet 32, by fusing the topsheet 32 to the absorbent core 34 with a plurality of discrete individual fusion bonds, or by any means known in the art. To insure proper fluid transfer between the topsheet 32 and the
15 absorbent core 34, it is preferred that the topsheet 32 be substantially continuously secured to the underlying absorbent core 34 throughout their common association or interface. By substantially continuously securing the topsheet 32 to the underlying absorbent core 34, the topsheet 32 will have a reduced tendency to separate from the absorbent core 34 during use. Separation of the absorbent core from the topsheet 32 may inhibit fluid transfer from the topsheet 32 into the underlying absorbent core 34.
20 Therefore, the body-facing side of the absorbent core 34 may be secured to the topsheet 32 by, i.e., adhesive while the body-facing side of the absorbent core 34 may not be secured to the topsheet 32 so as to delay fluid transfer from the absorbent core 34 into the secondary absorbent member 50.

The primary absorbent member 30 is preferably circular or oval in cross-section
25 while the primary absorbent member 30 can be generally of any cross-sectional shape in its unstressed condition. The length PL, the width PW and the thickness PT of the primary absorbent member 30 can be of any convenient dimension. The length PL is preferably from about 2 to 35 cm, more preferably from about 10 to 35 cm, and most preferably from about 20 to 35 cm. Preferably, the length PL of the primary absorbent
30 member 30 may be generally equal to the length SL of the secondary absorbent member 50. The width PW is preferably from about 0.5 to 5 cm, more preferably from about 1 to about 5 cm, and most preferably from about 2 to about 4 cm. The width PW of the primary absorbent member 30 may be less than the width SW of the secondary absorbent member 50. The thickness PT is preferably from about 0.2 to 2.0 cm, more preferably
35 from about 0.2 to 1.5 cm, and most preferably from about 0.4 to 1.2 cm. Preferably, the

thickness PT of the primary absorbent member 30 may be greater than the thickness ST of the secondary absorbent member 50. A ratio of the thickness PT to the width PW, or the ratio (PT/PW) may be between 0.05 and 1.5. Preferably, the ratio may be between 0.08 and 1.00. More preferably, the ratio may be between 0.08 and 0.5.

5 The caliper of the primary absorbent member 30 is determined by the following test. A comparator gauge, and specifically the Peacock Gage Model No. 307, available from Ozaki Manufacturing Co., LTD. is needed. The comparator gauge should have a circular comparator foot made of aluminum and having a weight of 9.0 grams and a contact surface of 16 square centimeters. The comparator gauge is zeroed. An 60.0
10 grams stainless steel weight is placed on the spindle extending above the comparator dial. The comparator foot is raised and the primary absorbent member and the primary absorbent member is placed garment surface down on the base plate. The primary absorbent member is positioned on the base plate so that when the foot is lowered it is in the region of the primary absorbent member for which the measurement is desired. Try to
15 smooth out or avoid any wrinkled in the primary absorbent member. Gently lower the foot onto the primary absorbent member. Determine the primary absorbent member caliper by reading the comparator dial 5 to 10 seconds after the foot comes in contact with the primary absorbent member.

The primary absorbent member 30 is preferably relatively conformable. It is
20 preferred to keep the primary absorbent member relatively conformable so that it will readily fit into the labial groove during use. It has been found that a primary absorbent member having the width and/or thickness is able to comfortably fit next to the labial area. While primary absorbent members have been described above as having width or thickness greater than the above width or thickness, they too may fit within the labial
25 groove if they are sufficiently conformable. It is not necessary that all of the primary absorbent member fit within the labial groove, however, a portion of the primary absorbent member is preferably capable of fitting within the labial groove.

The primary absorbent member 30 may include optional elements. The primary absorbent member 30 may optionally comprise a resilient member with the absorbent
30 core 34. The resilient member may comprise a single member or a plurality of individual members. Suitable materials which may be used as the resilient member include, but are not limited to, nylon, polypropylene, polyurethane, polyethylene, polyester synthetic rubber, and other synthetic materials such as formed films, or natural materials such as rubber, sponges, and the like or any suitable material which is capable of resisting
35 collapse under normal wearing conditions of sanitary napkins during use. The resilient

member may be manufactured in a wide variety of shapes such as rectangular, triangular, oval, square, pentagonal, U-shaped, Z-folded, etc. The resilient member may extend throughout the entire length of the primary absorbent member 30. The resilient member may only extend through a portion of the length of the primary absorbent member 30.

5 The resilient member may be positioned within the first end region 27, the central region 28, the second end region 29 or any combination of the above. For example, the resilient member may be positioned in either the first end region 27 or the second end region 29 of the primary absorbent member, in both the first end region 27 and the second end region 29 of the primary absorbent member 30, in the central region 28 of the primary absorbent
10 member, or in the central region 28 and the end regions 27, 29 of the primary absorbent member 30.

Optionally, the primary absorbent member 30 may comprise an acquisition layer positioned between the topsheet 32 and the absorbent core 34. The acquisition layer may serve several functions including improving wicking of exudates over and into the
15 absorbent core 34. By improving the wicking of exudates, the acquisition layer provides a more even distribution of the exudates throughout the absorbent core. The acquisition layer may be comprised of several different materials including nonwoven or woven webs of synthetic fibers including polyester, polypropylene, or polyethylene; natural fibers including cotton or cellulose; blends of such fibers; or any equivalent materials or
20 combinations of materials. Examples of sanitary napkins having an acquisition layer and a topsheet are more fully described in U.S. Patent No. 4,950,264 issued to Osborn and PCT Publication No. WO93/11725 published, on Jun. 24, 1993 in the names of Cree, et al. Each of these references are incorporated herein by reference. In a preferred embodiment, the acquisition layer may be joined with the topsheet by any of the
25 conventional means for joining webs together, most preferably by fusion bonds as is more fully described in the above-referenced Cree application.

Referring to FIGS. 1-3A, the second necessary constituent of the compound sanitary napkin 20 is the secondary absorbent member (base member) 50. The secondary absorbent member 50 has generally rectangular shape extending in the longitudinal
30 direction along the longitudinal centerline L. In a preferred embodiment, the longitudinal length SL may be generally equal to the longitudinal length PL of the primary absorbent member 30. The transverse width SW may be generally broader than the transverse width PW of the primary absorbent member 30. The secondary absorbent member 50 has the longitudinal sides 21 and the transverse ends 22. In a preferred embodiment shown in
35 FIG. 1, a pair of flaps 33 extends outwardly from the longitudinal sides 21 in the central

region 28. The secondary absorbent member 50 preferably comprises a fluid pervious body-facing sheet or fluid pervious topsheet 52, a fluid impervious garment-facing sheet or fluid impervious backsheet 54 joined with the topsheet 52, and a secondary absorbent element 56 positioned between the topsheet 52 and the backsheet 54.

5 The topsheet 52 can be any fluid pervious material commonly used in sanitary napkins, disposable diapers, and the like. It can be any of the materials described above as being useful in the topsheet 32 of the primary absorbent member 30. A preferred
10 topsheet 52 comprises an apertured formed film. Apertured formed films are preferred for the topsheet because they are pervious to body exudates and yet non-absorbent and have a reduced tendency to allow fluids to pass back through and re-wet the wearer's skin. Thus, the surface of the formed film which is in contact with the body remains dry, thereby reducing body soiling and creating a more comfortable feel for the wearer. Suitable formed films are described in U.S. Patent No. 3,929,135 issued to Thompson, on
15 December 30, 1975; U.S. Patent No. 4,324,246 issued to Mullane, et al., on April 13, 1982; U.S. Patent No. 4,342,314, issued to Radel, et al., on August 3, 1982; U.S. Patent No. 4,463,045 issued to Ahr, et al., on July 31, 1984 and U.S. Patent No. 5,006,394 issued to Baird, on April 9, 1991. Each of these patents are incorporated herein by reference. The preferred topsheet for the primary absorbent member is a formed film described in one or more of the above patents and marketed on sanitary napkins by The
20 Procter & Gamble Company of Cincinnati, Ohio as "DRI-WEAVE".

The absorbent element 56 can be any absorbent material commonly used in sanitary napkins, disposable diapers and the like. It can be any of the materials described above as being useful in the absorbent core 34 of the primary absorbent member 30. As a
25 practical matter, most of the bodily fluids are absorbed by and are contained within the absorbent core 34 of the primary absorbent member 30. One major function of the secondary absorbent member 50 is to protect the user's garments from soiling by absorbed fluids which may be expelled from the primary absorbent member 30 or which may inadvertently bypass the primary absorbent member 30. The overall absorptive capacity of the absorbent element 56 may be, therefore, somewhat less than that of the absorbent
30 core 34. Because the absorbent core 34 is preferably intended to absorb most or substantially all of the bodily fluids during use, its absorptive capacity will be somewhat if not significantly greater than that of the absorbent element 56. Because the absorbent element 56 of the secondary absorbent member 50 performs a different function from that of the absorbent core 34, the absorbent element 56 can be, and most preferably is,
35 somewhat thinner and less bulky than the absorbent core 34.

Because the absorbent element 56 has different requirements than does the absorbent core 34, it can be formed of different materials. For example, single or multiple plies of paper tissue as commonly used in paper toweling or toilet tissue can be used to form the absorbent element 56. Preferably, the absorbent element 56 is formed of
5 from about 1 to about 5 plies of paper tissue. Paper tissue comprising one or more plies having a basis weight of from about 24 to about 48 grams per square meter and an apparent density of from about 0.10 to about 0.12 grams per cubic centimeter as made by the process described in U.S. Patent No. 3,301,746 issued to Sanford and Sisson, on Jan. 31, 1967 and which patent is hereby incorporated herein by reference has been found to
10 be quite satisfactory for use as the absorbent element 56. Wet strength resins and latex binders can be, and preferably are, used to provide additional strength to the paper tissue used in the absorbent element. Paper tissue made by the process described in U.S. Patent No. 3,994,771 issued to Morgan et al., on Nov. 30, 1976, and which patent is hereby incorporated herein by reference, can also be used to good advantage as the absorbent
15 element 56.

The absorbent element 56 may have any suitable shape including, but are not limited to, oval, hourglass, dog-bone, asymmetric, etc. In a preferred embodiment shown in FIG. 1, the absorbent element 56 has generally rectangle shape encompassed by longitudinal sides 55 and transverse edges 57. The absorbent element 56 also has a
20 longitudinal length CL, a transverse width CW and a thickness CT. The longitudinal length CL may be shorter than the longitudinal length PL and SL. The length CL may be from about 10 to about 33 cm, preferably from about 15 to about 33 cm. The transverse width CW may be wider than the transverse width PW of the primary absorbent member 30 at least in the central region 28 (i.e., the crotch region corresponding to the crotch
25 region of the undergarment when the compound sanitary napkin is used). More preferably, the transverse width CW may be wider than the transverse width PW of the primary absorbent member 30 throughout the entire length. The width CW may be from about 3 to about 12 cm, preferably from about 4 to about 10 cm, more preferably from about 5 to about 8 cm. FIGS. 10 and 11 show alternative shape of the compound sanitary
30 napkin and the secondary absorbent element. The compound sanitary napkin 90 shown in FIG. 10 has a narrowest portion (i.e., the crotch region) at the center in the longitudinal direction, and does not have flaps on both longitudinal sides. The secondary absorbent member 95 of the compound sanitary napkin 90 may have a patch type absorbent element 91 positioned generally in the crotch region as shown in FIG. 10. The patch type
35 absorbent element 91 may have an oval shape which has the widest portion at the center

in the longitudinal direction. The widest portion of the absorbent element 91 preferably may coincide with the narrowest crotch region of the compound sanitary napkin 90. The compound sanitary napkin 92 shown in FIG. 11 has back flaps 94 in addition to the flaps 33 positioned on the crotch region. The secondary absorbent member 96 of the compound sanitary napkin 92 shown in FIG. 11 may have a shaped absorbent element 93 having the narrowest portion in the crotch region of the compound sanitary napkin 92. The narrowest portion of the shaped absorbent element 93 preferably may coincide with the crotch region of the compound sanitary napkin 92. In both embodiment, the transverse width CW is preferably wider than the transverse width PW of the primary absorbent member 30 in the crotch region of the compound sanitary napkin. Preferably, the width PW may be less than about 80 % of the width CW. More preferably, the width PW may be less than about 70 % of the width CW.

The backsheet 54 is impervious to fluids (e.g., menses and/or urine) and is preferably manufactured from a thin plastic film, although other flexible fluid impervious materials may also be used. As used herein, the term "flexible" refers to materials which are compliant and will readily conform to the general shape and contours of the human body. In use, the backsheet 54 is interposed between the absorbent element 56 and the user's undergarments. The function of the backsheet 54 is to prevent exudates which may be expelled from or which inadvertently bypass the primary absorbent element 30 and exudates absorbed and contained in the absorbent element 56 from contacting and soiling the user's undergarments. The backsheet 54 may thus comprise a woven or nonwoven material, polymeric films such as thermoplastic films of polyethylene or polypropylene, or composite materials such as a film-coated nonwoven material. Preferably, the backsheet is a polyethylene film having a thickness of from about 0.012 mm(0.5 mil) to about 0.015 mm (2.0 mil). Exemplary polyethylene films are manufactured by Clopay Corporation of Cincinnati, Ohio under the designation P18-0401 and by Ethyl Corporation, Visqueen Division, of Terre Haute, Indiana, under the designation XP-39385. The backsheet is preferably embossed and/or matte finished to provide a more cloth like appearance. Further, the backsheet may permit vapors to escape from the absorbent element 56 (i.e., breathable) while still preventing exudates from passing through the backsheet 54.

The shape of the secondary absorbent member 50 can be of generally rectangular encompassed by the longitudinal sides 21 and the transverse ends 22. Other suitable shapes include but are not limited to oval, hourglass, dog-bone, asymmetric, etc. The secondary absorbent member 50 may have flaps 33 each of which are adjacent to and

extend laterally from the longitudinal sides 21 of the secondary absorbent member 50 in the central region 28 as shown in FIG. 1. The flaps 33 are configured to drape over the edges of the wearer's panties in the crotch region so that the flaps are disposed between the edges of the wearer's panties and the wearer's thighs. The flaps 33 serve at least two purposes. First, the flaps 33 help serve to prevent soiling of the wearer's body and panties by menstrual fluid, preferably by forming a double wall barrier along the edges of the panty. Second, the flaps 33 are preferably provided with attachment means, as described hereinafter, on their garment facing surface so that the flaps 33 can be folded back under the panty and attached to the garment facing side of the panty. In this way, the flaps 33 serve to keep the sanitary napkin 20 properly positioned in the panty.

In a preferred embodiment, the flaps 33 are comprised of a topsheet and a backsheet. Further, the flaps 33 are preferably unitary to the laminae of the secondary absorbent element 50. In other words, the topsheet 52 of the secondary absorbent member 50 and the backsheet 54 of the secondary absorbent member may simply extend laterally outward from the longitudinal sides 21 to form the flaps 33. However, the flaps 33 need not be unitary with the secondary absorbent member 50, but can be separate elements which are affixed to the secondary absorbent member 50. Further, the flaps 33 can be comprised of a single substrate or other laminae configurations. It is preferable, however, that the flaps 33 have a fluid impervious backsheet to prevent exudates which reach the flaps from soiling the edges of the wearer's panties.

Further, it is preferable that the flaps 33 may be provided with an absorbent member, at least to a point beyond the edges of the wearer's panties. Theoretically, only a relatively small amount of menses should reach the flaps 33, therefore, only a relatively small amount of absorbent material is desirable in the flaps. However, the flaps 33 preferably have at least some absorbent material in order to prevent any exudates that reach the flaps 33 from being able to flow further to unprotected areas. The absorbent material may be a tissue, or an extension of the absorbent element 56. Preferably, the absorbent material in the flaps 33 is relatively highly flexible.

A number of sanitary napkins having flaps suitable or adaptable for use with the secondary absorbent member 50 of the compound sanitary napkin 20 are disclosed in U.S. Patent No. 4,687,478 issued to Van Tilburg, on Aug. 18, 1987; U.S. Patent No. 4,589,876 issued to Van Tilburg, on May 20, 1986; and U.S. Patent No. 4,608,047 issued to Mattingly, on Aug. 26, 1986. Each of these patents are incorporated herein by reference. Optionally, the secondary absorbent member 50 may comprise components that naturally wrap the sides of a wearer's panties. A sanitary napkin having components

that naturally wrap the sides of a wearer's panties suitable for use with the secondary absorbent member 50 of the compound sanitary napkin 20 are disclosed in U.S. Patent No. 5,584,829 issued to Lavash et al., on Dec. 17, 1996 and U.S. Patent No. 5,558,663 issued to Weinberger et al., on Sep. 24, 1996. The disclosures of the preceding publications are incorporated herein by reference.

Preferably, the secondary absorbent member 50 is provided with a support means or attachment means, such as adhesive attachment means 58 and 62. The adhesive attachment means 58 provides a means for securing the compound sanitary napkin 20 in the crotch portion of the user's undergarment or panty. The adhesive attachment means 62 provides a means for securing the flaps 33 of the compound sanitary napkin 20 to the garment facing side of the panty so that the flaps 33 can be folded back under the panty. Thus, a portion or all of the outer or garment surface of the backsheet 54 may be coated with adhesive. In a preferred embodiment, at least a portion of the adhesive 58 may be positioned on the garment surface of the backsheet 54 along the longitudinal direction of the secondary absorbent member 50 and may have, but not limited to, a line-shape along the longitudinal direction. The adhesive 62 may be positioned on the garment surface of the backsheet 54 of the flaps 33 and may have, but not limited to, a rectangle-shape. Any adhesive or glue used in the art for such purposes can be used for the adhesive herein, with pressure-sensitive adhesives being preferred. Suitable adhesives are Century A-305-IV manufactured by the Century Adhesives Corporation of Columbus, Ohio, and Instant Lock 34-2823 manufactured by the National Starch and Chemical Company of Bridgewater, NJ. Suitable adhesive fasteners are also described in U.S. Patent No. 4,917,697.

The pressure-sensitive adhesive is typically covered with a removable release liners 59 and 63 in order to keep the adhesive from drying out or adhering to a surface other than the crotch portion of the panty prior to use. Suitable release liners are also described in the above referenced U.S. Patent No. 4,917,697. Any commercially available release liners commonly used for such purposes can be utilized herein. Non-limiting examples of suitable release liners are BL30MG-A Silox E1/0 and BL30MG-A Silox 4P/0 both of which are manufactured by the Akrosil Corporation of Menasha, WI. The compound sanitary napkin 20 is used by removing the release liner 59 and 63 and thereafter placing the sanitary napkin 20 in a panty so that the adhesive 58 and the adhesive 62 contacts the panty. The adhesives 58 and 62 maintains the sanitary napkin in its position within the panty during use.

The topsheet 52 and the backsheet 54 of the secondary absorbent member 50 may be joined to one another by any suitable manner. The topsheet 52 may be joined to the backsheet 54 along the periphery 64 or may be joined to the backsheet in all the region excluding the region where the absorbent element 56 exists. In the region where the absorbent element 56 exists, the topsheet 52 and the backsheet 54 each may be joined to the absorbent element 56. Suitable manners include, but are not limited to applying pressure, heat, heat and pressure, or adhesives such as line adhesive, spiral adhesive, or spot adhesive. In a preferred embodiment shown in FIG. 1, the topsheet 52 and the backsheet 54 may be joined by applying heat along the periphery 64 of the sanitary napkin 20.

The length SL, the width SW and the thickness ST of the secondary absorbent member 50 can be of any convenient dimension. The length SL is preferably from about 5 to 35 cm, more preferably from about 10 to 35 cm, and most preferably from about 20 to 35 cm. Preferably, the length SL of the secondary absorbent member 50 may be generally equal to the length PL of the primary absorbent member 30. The width SW is preferably from about 4 to 13 cm, more preferably from about 5 to about 11 cm, and most preferably from about 6 to about 9 cm. The secondary absorbent member 50 is preferably relatively thin and flexible. The thickness ST is preferably from about 0.1 to 2.0 cm, more preferably from about 0.1 to 1.0 cm, and most preferably from about 0.1 to 0.4 cm. Preferably, the thickness ST of the secondary absorbent member 50 may be less than the thickness PT of the primary absorbent member 30.

The secondary absorbent member (base member) 50 optionally may be manufactured without an absorbent element 56. Since most if not all of the bodily fluids are preferably absorbed by and are contained within the absorbent core 34 of the primary absorbent member 30, the base member 50 need only to protect the user's garments from soiling by relatively small amounts of fluids which may be expelled from the primary absorbent member 30 or which may inadvertently bypass the primary absorbent member 30. Accordingly, since the expected amounts of fluids which may come into contact with the base member are relatively small, an base element may not be necessary to contain the fluids within the base member 50 and prevent them from soiling the user's garments.

To form the compound sanitary napkin 20, the primary absorbent member 30 and the secondary absorbent member 50 are joined by union means generally indicated as 70 in FIGS. 1 - 3, 6 and 7. The union means 70 serves to join the primary absorbent member 30 and the secondary absorbent member 50 into the compound sanitary napkin 20 with sufficient tenacity that the primary absorbent member 30 and the secondary absorbent

member 50 are not disconnected during use. Any suitable union means such as adhesive attachment, pressure attachment, heat attachment, or ultrasonic attachment can be used. The primary absorbent member 30 may be affixed to said secondary absorbent member 50 by the union means 70 along the entire common length. Alternatively, the primary
5 absorbent member 30 may be affixed to said secondary absorbent member 50 intermittently along the common length.

In a preferred embodiment shown in FIGS. 1 - 3, 6 and 7, the primary absorbent member 30 is affixed to the secondary absorbent member 50 by the union means 70 including a first union means 72 and the second union means 74.

10 The first union means 72 includes applying pressure to the overlapped transverse ends 22 and 25 in plurality of discrete dots. By applying pressure at the overlapped transverse ends 22 and 25, the topsheet 32 of the primary absorbent member 30, the topsheet 52 and the backsheet 54 of the secondary absorbent member 50 are affixed to each other at the overlapped transverse ends 22 and 25. Alternatively, the first union
15 means 72 can include applying heat in a plurality of discrete dots, lines or area. While applying heat works well to join mullet-layers, heat transfer between the layers to join the layers may become worse as the layers becomes thick. In the preferred embodiment shown in FIG. 2, since the longitudinal sides 45 of the topsheet 32 of the primary absorbent member 30 are overlapped to one another underneath the absorbent core 34,
20 five layers comprising three layers of topsheet 32, one layer of the topsheet 52 and one layer of the backsheet 54 are joined. If the topsheet 32 comprises two layers having the formed film 36 and the nonwoven 37, eight layers must be joined to each other as shown in FIG. 7. As the layers becomes thick, it becomes preferable to apply pressure, or pressure and heat to join the layers. Alternatively, the first union means 72 may include
25 applying adhesive between the layers, or applying combination of pressure, heat, and adhesive.

The second union means 74 includes applying adhesive such as spiral adhesive, line adhesive, or spot adhesive between the primary absorbent member 30 and the secondary absorbent member 50. As shown in FIG. 6, in a preferred embodiment, spiral
30 adhesive 74 as the second union means is applied continuously between the primary absorbent member 30 and the secondary absorbent member 50. When the primary absorbent member 30 and the secondary absorbent member 50 are desired to affix to one another along the entire common length, it is preferable to use spiral adhesive since applying spiral adhesive prevents the absorbent member 30 and 50 from affixing
35 intermittently. The primary absorbent member 30 and the secondary absorbent member

50 are preferably affixed at the narrower width AW than the transverse width PW of the primary absorbent member 30. Preferably, the width AW may be less than 70 % of the width PW. This allows the primary absorbent member 30 to conform with the female body shape and movement of the female body.

5 The compound sanitary napkin 20 may include a variety of alternatives and/or options. The primary absorbent member 30 can comprise a fluid barrier 35 as shown in FIG. 8. The fluid barrier 35 may position on the half bottom side of the absorbent core 34 to inhibit fluid from transferring the absorbent core toward the secondary absorbent member 50. The fluid barrier 35 tends to contain absorbed fluids within the absorbent
10 core 34 and can be constructed from materials having the same properties as the fluid impervious backsheet on the secondary absorbent member 50 described hereinafter. The fluid barrier 35 may extend along the entire length of the primary absorbent member 30 or may extend only in the central region 28 of the primary absorbent member 30, or in the first end region 27 and the second end region 29.

15 Alternatively, the topsheet 32 of the primary absorbent member 30 may comprise a sheet having a fluid pervious zone 76 and fluid impervious zone 78. When the topsheet 32 comprises a formed film, the fluid pervious zone 76 may be apertured zone and the fluid impervious zone 78 may be non-apertured zone. As shown in FIG. 9, the fluid
20 pervious zone 76 of the topsheet 32 may position on the half bottom side of the absorbent core 34 to inhibit fluid from transferring the absorbent core toward the secondary absorbent member 50. The fluid pervious zone 76 tends to contain absorbed fluids within the absorbent core 34.

 The compound sanitary napkin 20 may be extensible. The individual components of the primary absorbent member 30 and the secondary absorbent member 50 may be
25 comprised of components that are extensible (preferably, capable of stretching) particularly in the longitudinal direction when the compound sanitary napkin 20 is worn. Preferably, the compound sanitary napkin 20 is capable of elongating in the longitudinal direction between about 15 % and about 40% of its unstretched length. This extensibility provide better in-use fit, comfort, and decreased staining when the compound sanitary
30 napkin is affixed to the wearer's undergarments. Preferably, the secondary absorbent member 50 is comprised of components that are also extensible in the lateral direction when the compound sanitary napkin 20 is worn. Preferably, the compound sanitary napkin 20 is capable of elongating in the lateral direction between about 15% and about 40% of its unstretched length. The topsheet 32 for both the primary absorbent member 30
35 and the secondary absorbent member 50 may comprise an elastic, three-dimensional,

fluid pervious, polymeric web as disclosed in U.S. Patent No. 5,366,782 issued to Curro et al., on Nov. 22, 1994 and which is incorporated herein by reference. A particularly preferred extensible backsheet is an extended adhesive film known as Formula #198-388 manufactured by the Findley Adhesives Company of Wauwatosa, Wisconsin. Sanitary napkins having extensible components are described in U.S. Pat No. 5,611,790 issued to Osborn, et al., on Mar. 18, 1997 and PCT Publication No. WO93/01786 published Feb. 4, 1993 in the names of Osborn, et al. The disclosures of the preceding publications are incorporated herein by reference.

The compound sanitary napkin 20 can conform with the female body. Because the primary absorbent member 30 is preferably sized and shaped such that it will fit next to the labia area, the primary absorbent member 30 will reside at least partially within the labia. As shown in FIG. 10, when the compound sanitary napkin 20 is worn by female and supported by a undergarment 82, a portion of the primary absorbent member 30 will preferably fit next to the labia area during use. In contrast, one major function of the secondary absorbent member 50 is to protect the user's garments from soiling by absorbed fluids which may be expelled from the primary absorbent member 30 or which may inadvertently bypass the primary absorbent member 30. The secondary absorbent member 50 is preferably remote from the body such that the secondary absorbent member 50 does not touch the body. The shape of the primary absorbent member 30 is sized and shaped to be remote the secondary absorbent member 50 from the body and to ensure space 80 between the body and the secondary absorbent member 50. This allows the longitudinal sides of the secondary absorbent member 50 to remain white.

The compound sanitary napkin 20 can absorb body fluids. The total absorbent capacity of the primary absorbent member 30 should be compatible with the intended exudate loading for the compound sanitary napkin 20. Further, the absorbent capacity of the absorbent core 30 may be varied to accommodate wearers ranging in the expected amount of exudate fluid. Typically, exudate fluid of between 2 and 20 grams is expected during a normal period of wearing a sanitary napkin. When the compound sanitary napkin 20 is exposed to such fluid loading of between 2 and 20 grams, the primary absorbent member 30 can absorb 80 % of the fluid of between 2 and 20 grams in an actual wear situation. Further, when the compound sanitary napkin 20 is exposed to fluid loading of between 20 and 30 grams exceeding the normal amount, the primary absorbent member 30 can absorb 70 % of the fluid of between 20 and 30 grams. Because the primary absorbent member 30 has capacity of absorbing at least 70 % of loaded fluid of between 2 and 30 grams when the sanitary napkin is applied to female body and used, the

primary absorbent member 30 having such capacity allows the longitudinal sides of the secondary absorbent member 50 to remain white. This provides consumers with a visual signal that boosts their confidence in the absorbency and leakage-proof performance of the sanitary napkin product.

5 The primary absorbent member 30 preferably comprises hydrogel-forming polymers to enhance absorbing capacity of the primary absorbent member 30. The more hydrogel-forming polymers the primary absorbent member 30 contains, the more absorbing capacity the primary absorbent member 30 has. Because the hydrogel-forming polymers get swelled after the polymers absorbing fluid, the primary absorbent member
10 30 expands in the transverse and thickness direction. This expansion of the primary absorbent member 30 gives more conformity and fitness between the primary absorbent member 30 and the female body. However, too much hydrogel-forming polymers causes gel-blocking problems resulting in diminishing absorbing ability. More importantly, too much hydrogel-forming polymers, when absorbing fluid, makes the primary absorbent
15 member 30 a straight cylindrical shape that won't bend easily without high bending force. When this occurs, the primary absorbent member 30 may not fit the curvature shape of female body because the transverse ends of the compound sanitary napkin 20 tends to be remote from the body. Therefore, appropriate amount of hydrogel-forming polymers is preferable from standpoints of absorbing ability, conformity and fitness of the compound
20 sanitary napkin having the primary absorbent member.

It may be desirable to provide a compound sanitary napkin having a primary absorbent member with varying degrees of width or caliper throughout its length. For example, the primary absorbent member may be relatively thicker in the central region as opposed to the end regions. Alternatively, the primary absorbent member may be
25 relatively thinner in the central region as opposed to the end regions.

Now, referring to FIGS. 13 - 17, there is one of preferred, simplified process flow
200 illustrating the assembly of the compound sanitary napkin 20 shown in FIG. 4. As shown in FIG. 13, the process 200 for manufacturing the compound sanitary napkin 20 may include several steps; a primary absorbent member making process (primary
30 absorbent member making section) 202, a secondary absorbent member making process (secondary absorbent making section) 204, a combining process of the primary absorbent member and the secondary absorbent member (combining section) 206, and a cutting process (cutting section) 208.

The primary absorbent member making process 202 further may include a
35 topsheet material feeding process (feeding section) 210, a primary absorbent element

providing process (providing section) 212, a wrapping process (wrapping section) 214 and a forwarding process (forwarding section) 216.

In the feeding section 210, a formed film web 220 and a nonwoven web 222 are continuously fed from feed rolls 224 and 226 respectively toward a topsheet joining unit 228, such that the nonwoven web 222 superposes on the formed film web 220. The continuous formed film web 220 and the continuous nonwoven web 222 are joined by the joining unit 228 to make the continuous topsheet web 230. As shown in FIG. 14, the joining unit 228 has a patterned roll 232 and an anvil roll 234. The patterned roll 232 has a series of patterned protrusions 236 on the surface of the patterned roll 232. One of or both of the patterned roll 232 and/or the anvil roll 234 are biased toward each other with a predetermined pattern-element loading at the nip between the rolls 232 and 234. By feeding the continuous formed film web 220 and the continuous nonwoven web 222 to the nip of the joining unit 228 as shown in FIG. 14, the two webs are joined at the discrete dots 49 (refer to FIGS. 5 and 16) along the longitudinal sides 45 of the continuous topsheet web 230 by being applied pressure. A pattern of the discrete dots 49 corresponds to the pattern of the protrusions 236 of the roll 232. This joint between the continuous formed film web 220 and the continuous nonwoven web 222 allows stable transfer of the joined web. Alternatively, adhesive such as line adhesive, spiral adhesive or spot adhesive, ultrasonic bonding or heat bonding may be used to join the formed film web 220 and the nonwoven web 222. The continuous topsheet web 230 is then fed toward a first adhesive applying section 238 where an intermittent spiral adhesive 240 is applied onto the absorbent core facing side of the continuous topsheet web 230, as shown in FIG. 16, prior to provide the continuous topsheet web 230 with a discrete absorbent core 242. Alternatively, the adhesive applied to the continuous topsheet web 230 may be substituted by spot adhesive, spray adhesive, line adhesive, or any known method as long as that can provide the preferred adhesive dimension in the adhesive width and length wise. Preferably, the adhesive width is preferred to keep the narrower dimension compared to the width of the absorbent core 242.

The continuous topsheet web 230 is fed to the primary absorbent element providing section 212 by changing the direction upwardly. The providing section 212 includes a cloud chamber 246 and a lay down drum 244 to make the discrete absorbent core 242 comprising hydrogel-forming polymers and fibers. The mixture of the hydrogel-forming polymers and fibers transferred from the cloud chamber 246 to the lay down drum 244 forms a discrete shape of the absorbent core 242 by means of vacuum 248 in the lay down drum 244 which has designed number of discrete pockets 250 on its

surface. As each discrete absorbent core 242 on the lay down drum 244 reaches to a contact point with the continuous topsheet web 230, the discrete absorbent core 242 is transferred from the lay down drum 244 onto the surface of the continuous topsheet web 230, as shown in FIGS. 13 and 16, where the intermittent spiral adhesive 240 is pre-applied. The discrete absorbent core 242 is transferred such that the body facing side of the discrete absorbent core 242 faces the continuous topsheet web 230 and such that the secondary absorbent member facing side 243 (refer to FIG. 16) of the discrete absorbent-core 242 faces upwardly. This transfer is accomplished by means of vacuum 252 in the transfer drum 254 and blow off air 256 in the lay down drum 248 as the continuous topsheet web 230 with the spiral adhesive 240 travels around the surface of the transfer drum 254. In addition, as the continuous topsheet web 230 travels around the surface of the transfer drum 254, the continuous topsheet web 230 changes the direction generally horizontally so that the discrete absorbent core 242 easily keeps staying on the surface of the continuous topsheet web 230 by its weight. When the discrete absorbent core 24 transfers onto the continuous topsheet web 230, a first interval S is provided between the preceding discrete absorbent core 242 and the succeeding discrete absorbent core 242. The discrete absorbent core 242 secured to and carried by the continuous topsheet web 230 then goes through a calender rolls 260 that has a fixed clearance. The discrete absorbent core 242 is compressed by the calender rolls 260 to a uniform caliper prior to the wrapping process 214.

Alternatively, the continuous topsheet web 230 may be fed to the point between the calender rolls 260 and the second adhesive applying section 262 after it is applied adhesive at the first adhesive applying section 238. In such a case, the continuous topsheet web 230 may not go through the primary absorbent element providing section 212. The discrete absorbent core 242 may be forwarded toward the calender rolls 260, and then meet the continuous topsheet web 230 at the point after the calender rolls 260 to be transferred.

The cloud chamber 246 may feed only fibers onto the lay down drum 244 to make the discrete absorbent core 242 including only fibers. Alternatively, if necessary, hydrogel-forming polymers may be added to the discrete absorbent core 242 including only fibers after the primary absorbent element providing section 212. Hydrogel-forming polymers may be added before the wrapping process 214 (e.g., before the folding section 264).

After the discrete absorbent core 242 is compressed, in the wrapping process the continuous topsheet web 230 with the discrete absorbent core 24 is fed toward a second

adhesive applying section 262. At the second adhesive applying section 262, a continuous line adhesive 51 (refer to FIGS. 4, 5 and 16) is applied onto one of the longitudinal side 45 of the continuous topsheet web 230. The continuous topsheet web 230 is then fed to a conventional folding section 264. In the folding section 264, and where the longitudinal sides 45 of the continuous topsheet web 230 is upwardly folded onto the base member facing side 243 of the discrete absorbent core 242 such that each longitudinal sides 45 overlaps to one another. Thereby the continuous topsheet web 230 wraps the discrete absorbent core 242. At the exit of the folding section 264, the continuous line adhesive 51 allows the folded continuous topsheet web 230 to create and maintain the permanent attachment by attaching the both longitudinal sides 45 of the continuous topsheet web 230 with having the discrete core 24 inside, and to make a continuous primary absorbent member web 266 as shown in FIG. 16. The permanent attachment is preferable for this process to keep the stable dimension of the continuous primary absorbent member web 266 while it is being transferred to the downstream. Alternatively, any known attaching method such as spot adhesive, spray adhesive, or spiral adhesive may be used.

The continuous primary absorbent member web 266 is then transferred to the downstream by means of horizontal drive conveyors 216 (i.e., forwarding section). These drive conveyors 216 can be substituted by the vacuum drive conveyors or dead plate as long as the tube web strain is maintained stable. If the distance between the wrapping section 214 and the combining section 206 is short, the forwarding section 216 may not be necessary. In such a case, the wrapping section 214 may include a forwarding section to forward the continuous primary absorbent member web 266 to the combining section 206.

The secondary absorbent member (base member) making process 204 further may include a secondary absorbent member material feeding process (material feeding section) 270 and a joining process (joining section) 272.

In the material feeding section 270, a topsheet web 274, a secondary absorbent element web 276, and a backsheet web 278 are continuously fed from feed rolls 280, 282 and 284 respectively toward the joining section 272. The continuous backsheet web 278 is fed toward a third adhesive applying section 286 where an intermittent line adhesive is applied onto the secondary absorbent element facing side of the continuous backsheet web 278 prior to provide the continuous backsheet web 278 with the secondary absorbent element 276. Alternatively, the adhesive applied to the continuous backsheet web 278 may be substituted by spot adhesive, spray adhesive, spiral adhesive, or any known

method. As explained hereinabove, in one of the preferred embodiment, the secondary absorbent element 276 may be a tissue layer. In the preferred embodiment in FIG. 13, the secondary absorbent element 276 may be prepared as a rolled continuous web. Alternatively, the secondary absorbent element 276 may be fed as a discrete absorbent element. As shown FIG. 13, the secondary absorbent element web 276 is fed to a conventional cut and space section 290. At the cut and space section, the secondary absorbent element web 276 is cut into the discrete secondary absorbent element 290 with providing a second interval T (refer to FIG. 16) between the preceding discrete secondary absorbent element 290 and the succeeding discrete secondary absorbent element 288. The discrete secondary absorbent element 288 is then put on the continuous backsheet web 278 and is secured to the continuous backsheet web 278 by the applied line adhesive. The discrete secondary absorbent element 288 is then interposed between the continuous topsheet web 274 and the continuous backsheet web 278 to make a continuous laminate web 292 comprising the continuous topsheet web 274, the continuous backsheet web 278 and the discrete secondary absorbent element 288. Preferably, the continuous topsheet web 274 may be applied adhesive such as line adhesive, spot adhesive, spray adhesive, or spiral adhesive before the discrete secondary absorbent element 288 is interposed between the continuous topsheet web 274 and the continuous backsheet web 278.

After making the continuous laminate web 292, it passes through the joining section 272. The joining section 272 makes a permanent joint between the continuous topsheet web 274 and the continuous backsheet web 278 to make a continuous secondary absorbent member web 293. The joining process here may be used any known method, such as heat bonding 291, as shown in FIG. 16, by applying heat along the periphery of the secondary absorbent member 50. Alternatively, the method may include applying pressure, or heat and pressure. Further, adhesive may be applied to the continuous topsheet web 274 and/or the continuous backsheet web 278 as joining method. The continuous secondary absorbent member web 293 is then transferred to the downstream by means of, e.g., vacuum drive conveyors. As shown in FIG. 13, the continuous secondary absorbent member web 293 is forwarded toward the continuous primary absorbent member web 266 from the top with respect to the machine direction conveying the web 266 since the continuous primary absorbent member web 266 runs such that the secondary absorbent member facing side of the continuous primary absorbent member web 266 faces generally upward. Thereby, the continuous secondary absorbent member web 293 covers the attached longitudinal sides 45 of the continuous primary absorbent web 266.

After the joining section 272, the release liners 59 and 63 shown in FIG. 4 may be applied onto the continuous backsheet web 278 of the secondary absorbent member web 293. The release liners 59 and 63 may have adhesive such as line adhesive on the surface facing the continuous backsheet web 278. The adhesive stays with the backsheet when the release liners 59 and 63 are removed for use.

The combining process 206 further may include an adhesive applying process (adhesive applying section) 294 and a pressure applying process (pressure applying section) 296.

In the adhesive applying process 294, a continuous spiral adhesive 74 is applied by a fourth adhesive applying section 294 onto the continuous primary absorbent member web 266 while the continuous primary absorbent member web 266 is being transferred by an upwardly inclined drive vacuum conveyor 295. Alternatively, any known method such as line adhesive, spot adhesive, or spray adhesive, may be used. Preferably, the spiral adhesive 74 is applied such that the adhesive is sandwiched by the continuous primary absorbent member web 266 and the continuous secondary absorbent member web 293. Preferably, the width of the spiral adhesive 74 does not extend beyond the width PW of the continuous primary absorbent member web 266. Alternatively, the adhesive 74 may be applied underneath (i.e., the topsheet side) of the continuous secondary absorbent member web 293.

The continuous primary absorbent member web 266 and the continuous secondary absorbent member web 293 are then forwarded toward nip rolls 298, where both webs 266 and 293 are joined to one another by the spiral adhesive 74 to make a continuous compound sanitary napkin web 300. When the webs 266 and 293 meet each other at the nip rolls 298, it is arranged that at least a portion of the first interval S between the discrete primary absorbent core 242 and the second interval T of the discrete secondary absorbent element 288 overlaps to each other as shown in FIG. 16. Arranging the overlapped portion X allows the continuous compound sanitary napkin web 300 to have a region where no absorbent element exists to give the compound sanitary napkin 20 the transverse ends 18.

The continuous compound sanitary napkin web 300 is then fed toward a pressure applying section 296 as shown in FIG. 13. The pressure applying section 296 applies pressure at the discrete dots 72 to the overlapped portion X along a transverse direction such that the continuous primary absorbent member web 266 and the continuous secondary absorbent member web 293 are combined. As shown in FIG. 15, the pressure applying section 296 has a patterned roll 302 and an anvil roll 304. The patterned roll

302 has a series of patterned protrusions 306 on the surface of the patterned roll 302. One of or both of the patterned roll 302 and/or the anvil roll 304 are biased toward each other with a predetermined pattern-element loading at the nip between the rolls 302 and 304. By feeding the continuous compound sanitary napkin web 300 to the nip of the pressure
5 applying section 296, the two webs 266 and 296 are combined at the discrete dots 72 by being applied pressure. A pattern of the discrete dots 72 corresponds to the pattern of the protrusions 306 of the roll 302. This combine at the transverse ends 18 (i.e., the overlapped portion X) preferably has sufficient peel strength (e.g., the nonwoven 222 to nonwoven 222 surface). Preferably such peel strength may be more than 100 grams per
10 inch. This can be achieved by an operation of (1) at least 60,000 psi per nip area pressure, 2) surface temperature of the rolls of 70°C - 90°C, and 3) interference of the two rolls of 0.05mm - 0.08m. It is also preferred that the velocity of the continuous compound sanitary napkin web 300 is controlled at 110m/min - 155m/min or more. Optionally, the roll surface velocity of the patterned roll 302 and the anvil roll 304 may be different from
15 each other. Further, the roll surface velocity of the patterned roll 302 and the anvil roll 304 may be a little faster (e.g., 0 % - 3 %) than the velocity of the continuous compound sanitary napkin web 300. Optionally, adhesive 241 may be applied at the first interval S in order to enhance the peel strength between the nonwoven 222 to nonwoven 222 surface as shown in FIG. 16. This adhesive may be applied at the same point as the second
20 adhesive applying section 262 before the continuous topsheet web 230 is folded. Because both the continuous primary absorbent member web 266 and the continuous secondary absorbent member web 293 are arranged to have the same strain by being forwarded continuously before combining, the compound sanitary napkin does not get curved even after being cut into a discrete sanitary napkin. Alternatively, if desired, it may get curved
25 by the webs 266 and 293 having different strain from each other.

The cutting process 208 may includes a cutter 302. The continuous compound sanitary napkin web 300 is forwarded to the cutter 302 and is cut into a discrete segment having a final shape (i.e., discrete compound sanitary napkin 20). The cutter 302 may be a conventional cutter having a die cutter. Alternatively, any other known method to cut
30 may be used.

Many alternative methods for the above described process may be used. The joining process 272 may be done after the combining process 206 and before cutting process 208. In such a case, the topsheet web 274, the secondary absorbent element 288 and the backsheet web 278 may be joined by any suitable means, such as adhesive before
35 the combining process 206. The discrete secondary absorbent member 288 may be

provided onto the topsheet web 274, instead of being provided onto the backsheet web 278.

Referring to FIGS. 18 - 20, there is another preferred, simplified process flow 400 illustrating the assembly of the compound sanitary napkin 20. As shown in FIG. 18, the process 400 for manufacturing the compound sanitary napkin 20 may include several steps; a primary absorbent member making process (primary absorbent member making section) 202, a secondary absorbent member material feeding process (secondary absorbent feeding section) 402, a combining process (combining section) 404, and a cutting process (cutting section) 208. The primary absorbent member making process 202 may include the generally same process as described in FIG. 13, such as the topsheet material feeding process (feeding section) 210, a primary absorbent element providing process (providing section) 212, a wrapping process (wrapping section) 214 and a forwarding process (forwarding section) 216. Because the function of these process may be the same as the above described corresponding process, a detailed description may be referred to the above description. The combining section 404 may include the adhesive applying process (adhesive applying section) 294 and a pressure applying process (pressure applying section) 406.

In the secondary absorbent feeding process 402, the continuous backsheet web 278 is fed from the feed roll 284 and then applied the intermittent line adhesive at the third adhesive applying section 286. The continuous secondary absorbent element web 276 is fed from the feed roll 282 and then cut into the discrete secondary absorbent element 288 by the cut and space section 290. The discrete secondary absorbent element 288 is provided onto the continuous backsheet web 278 with the second interval T and secured thereon by the line adhesive. The continuous topsheet web 274 is fed from the feed roll 280. The continuous topsheet web 274 and the continuous backsheet web 278 with the discrete secondary absorbent element 288 are then separately forwarded to the combining section 404 as shown in FIG. 18. On the other hand, the primary absorbent member web 266, after being applied the spiral adhesive 74 by the fourth adhesive applying section 294, is also forwarded toward the combining section 404. The continuous topsheet web 274, the continuous backsheet web 278 with the discrete secondary absorbent element 288 and the continuous primary absorbent member web 266 meet at the pressure applying section 406. It is arranged that at least a portion of the first interval S and the second interval T overlaps to each other at the pressure applying section 406 as shown in FIG. 19.

All the continuous webs 274, 278 and 266 may be combined by applying pressure at the discrete dots 72 in the overlapped portion X along the transverse direction. In addition, the continuous topsheet web 274 and the continuous backsheet web 278 may be joined at the pressure applying section 406 to make the continuous compound sanitary
5 napkin web 300. In such a case, the pressure applying section 406 may include applying heat along the periphery of the secondary absorbent member 50 to make heat bonding 291. Alternatively, the periphery of the secondary absorbent member 50 may be joined by applying only pressure by the pressure applying section 406. The continuous compound sanitary napkin web 300 may be then forwarded to the cutting process 208 and
10 cut into the discrete segment having a final shape (i.e., discrete compound sanitary napkin 20).

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention.
15 It is therefore intended to cover the appended claims all such changes and modifications that are within the scope of this invention.

WHAT IS CLAIMED IS:

1. A method of manufacturing a compound sanitary napkin comprising a primary absorbent member and a secondary absorbent member, the primary absorbent member comprising a primary absorbent element and a fluid pervious cover superimposed on the primary absorbent element, the secondary absorbent member comprising a fluid pervious body-facing sheet, a fluid impervious garment-facing sheet joined to the fluid pervious body-facing sheet and a secondary absorbent element positioned between the fluid pervious body-facing sheet and the fluid impervious garment-facing sheet, the method comprising the steps of:
 - (a) wrapping a discrete primary absorbent element by a continuous fluid pervious cover web to make a continuous primary absorbent member web, the discrete primary absorbent element arranged to provide a first predetermined interval,
 - (b) forwarding the continuous primary absorbent member web toward a combining section,
 - (c) feeding a continuous fluid pervious body-facing sheet web, a continuous fluid impervious garment-facing sheet web and a discrete secondary absorbent element toward the combining section, the discrete secondary absorbent element arranged to provide a second predetermined interval, such that the discrete secondary absorbent element superposes the discrete primary absorbent element and such that at least a portion of each of the first and the second predetermined intervals is overlapping,
 - (d) combining the continuous primary absorbent member web and the continuous fluid pervious body-facing sheet web to make a continuous composite web, and
 - (e) cutting the continuous composite web into the discrete compound sanitary napkin.
2. The method of Claim 1 wherein the wrapping step includes the steps of applying adhesive along at least one of longitudinal sides of the continuous fluid pervious cover web, folding each of the longitudinal sides such that the continuous fluid pervious cover web wraps the discrete primary absorbent element, and attaching the longitudinal sides to one another by the adhesive.

3. The method of Claim 1 further includes the step of joining the continuous fluid pervious body-facing sheet web and the continuous fluid impervious garment-facing sheet web to interpose the discrete secondary absorbent element therebetween.
4. The method of Claim 3 wherein the joining step includes the step of applying at least heat to the continuous fluid pervious body-facing sheet web and the continuous fluid impervious garment-facing sheet web at least along a periphery of the shape of the secondary absorbent member.
5. The method of Claim 3 wherein the joining step includes the step of applying at least adhesive between the continuous fluid pervious body-facing sheet web and the continuous fluid impervious garment-facing sheet web.
6. The method of Claim 1 wherein the feeding step includes the step of joining the continuous fluid pervious body-facing sheet web and the continuous fluid impervious garment-facing sheet web to interpose the discrete secondary absorbent element therebetween.
7. The method of Claim 1 wherein the combining step includes the step of applying at least pressure to the overlapping portion of each of the first and the second predetermined interval.
8. The method of Claim 7 wherein the combining step further includes the step of applying at least adhesive between the continuous primary absorbent member web and the continuous secondary absorbent member web, before applying the pressure.
9. The method of Claim 7 wherein the applying step further includes the step of applying heat.

10. The method of Claim 1 wherein the combining step includes the steps of joining the continuous fluid pervious body-facing sheet web and the continuous fluid impervious garment-facing sheet web to interpose the discrete secondary absorbent element therebetween, and the combining step further includes the step of applying at least pressure to the overlapping portion of each of the first and the second predetermined interval.
- 5

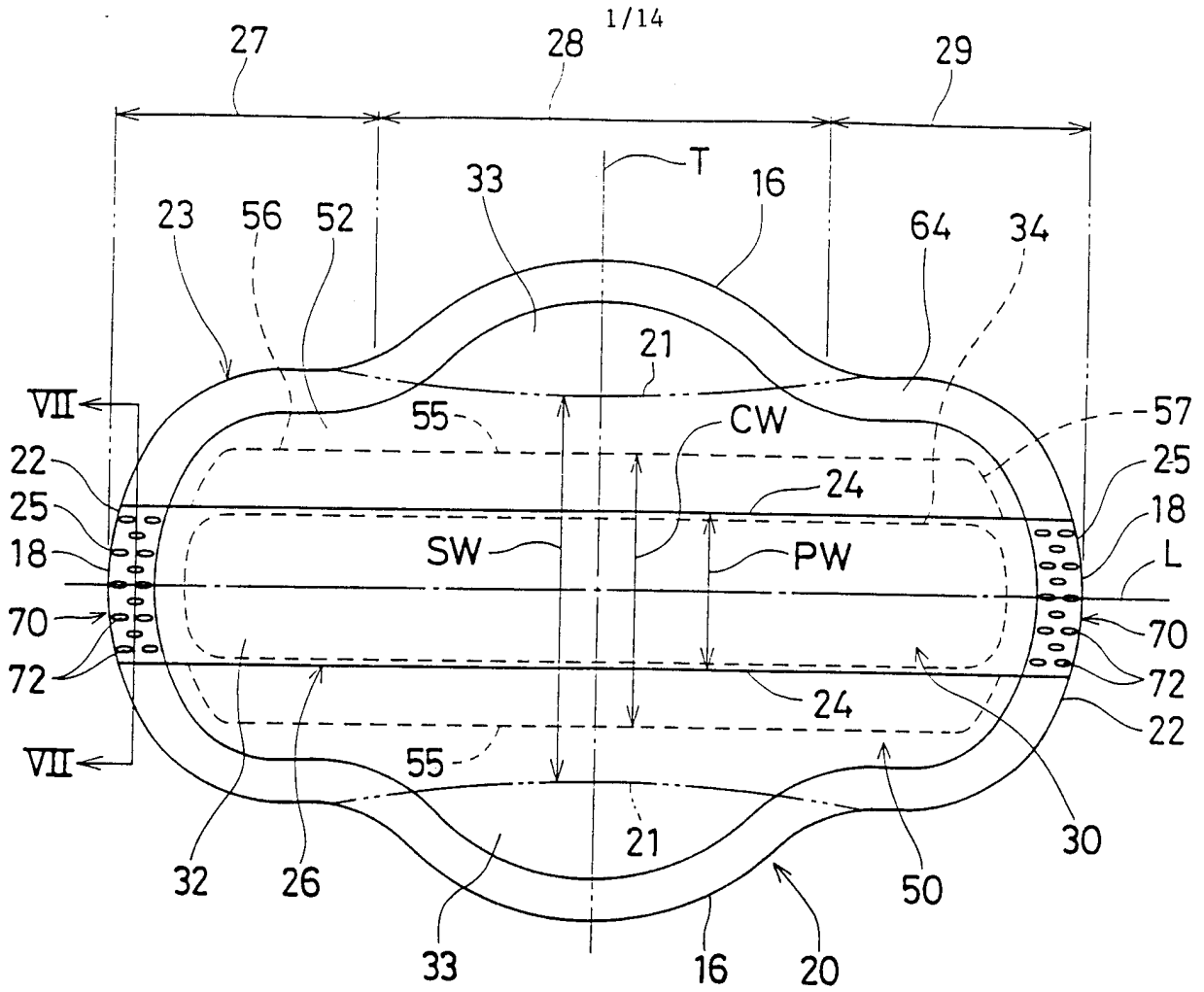


FIG. 1

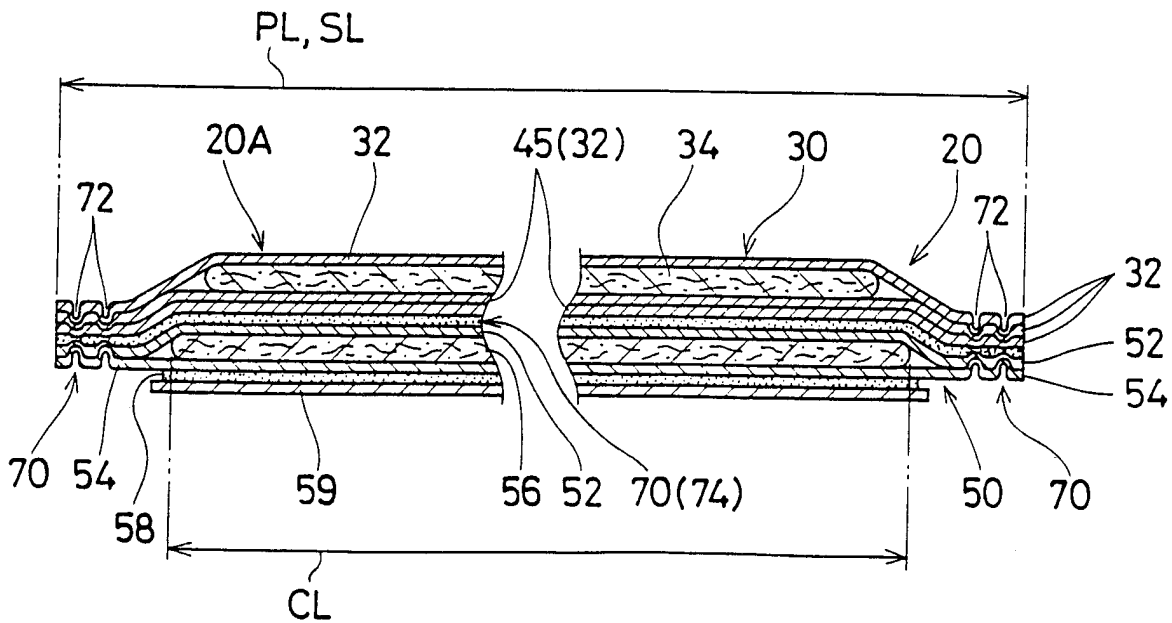


FIG. 2

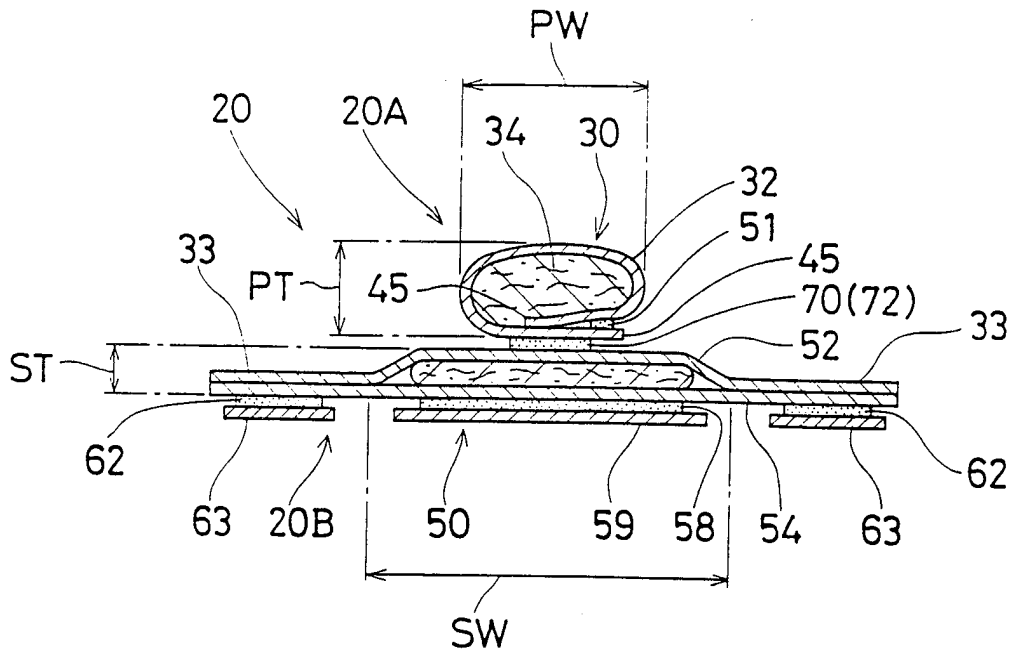


FIG. 3

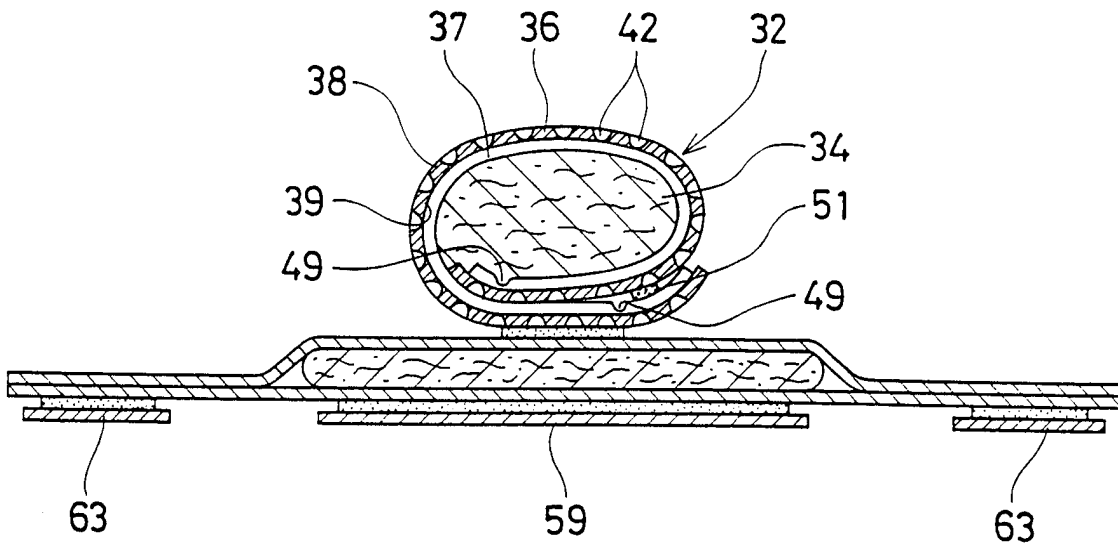


FIG. 4

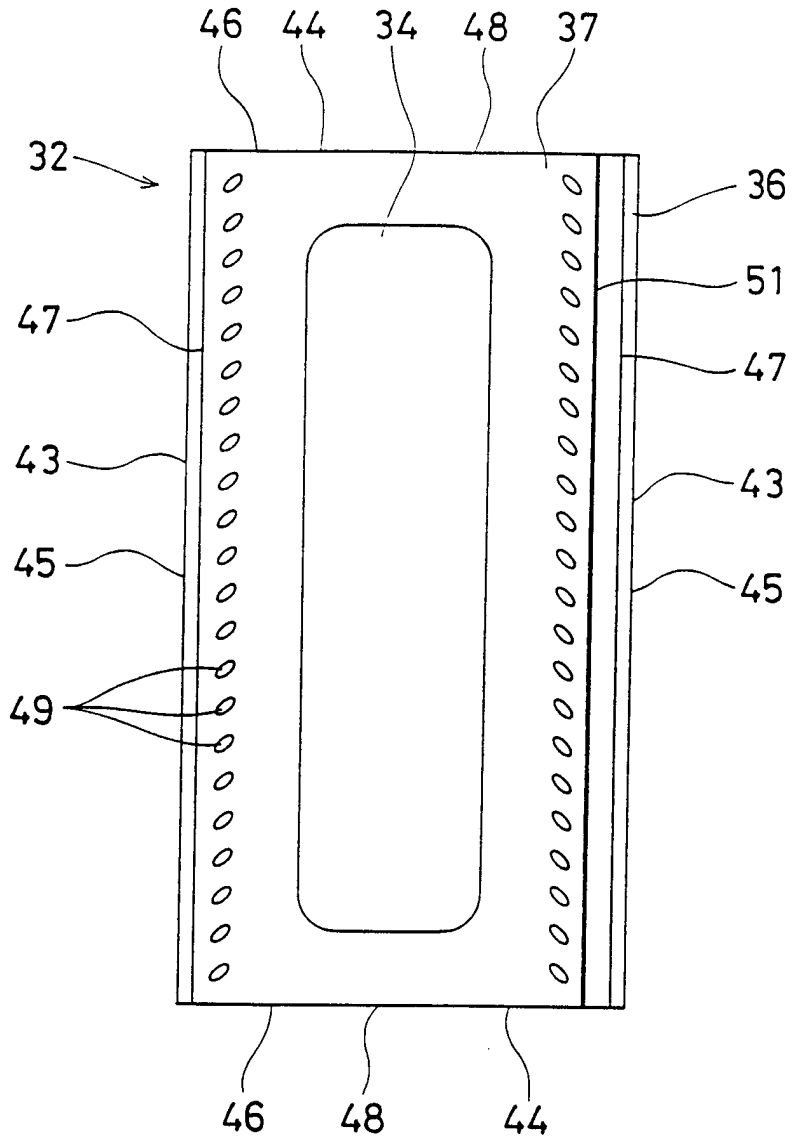


FIG. 5

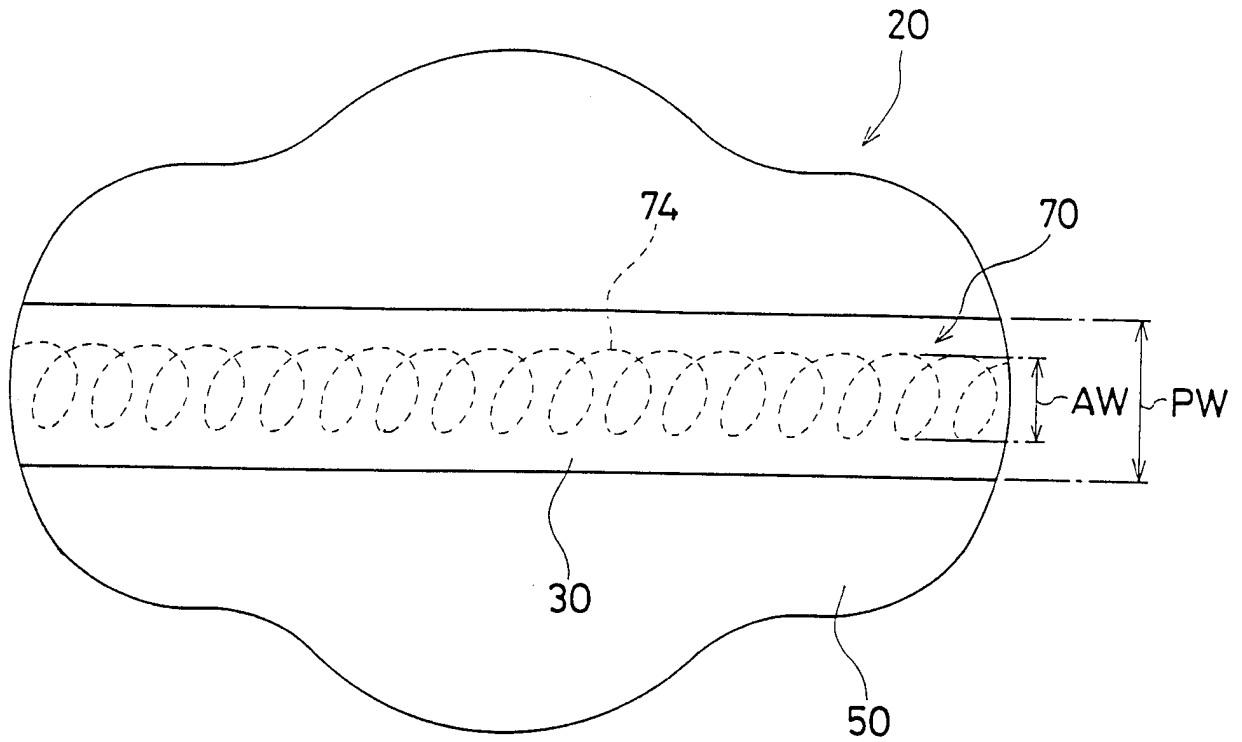


FIG. 6

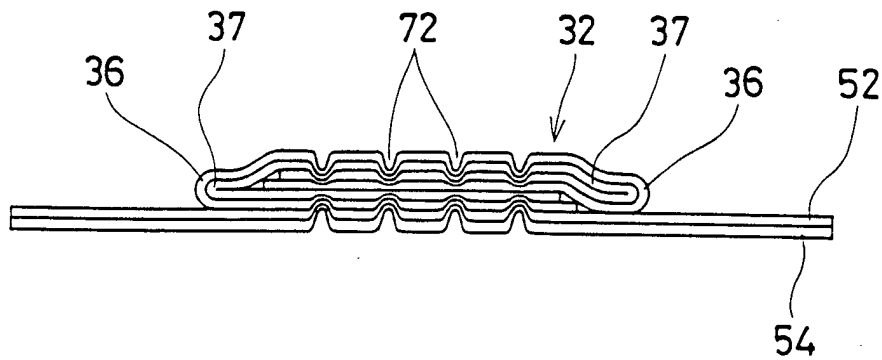


FIG. 7

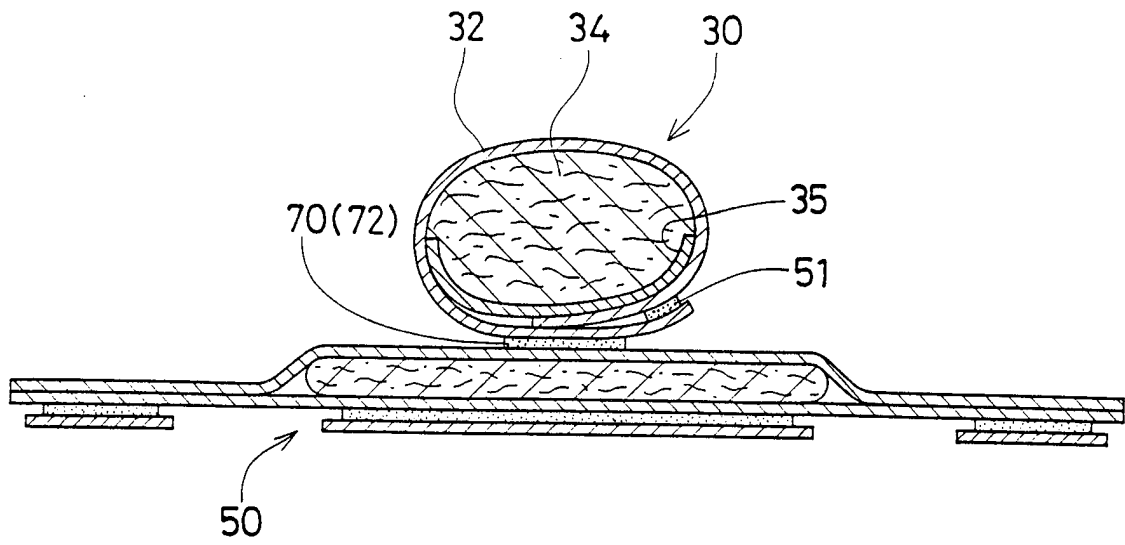


FIG. 8

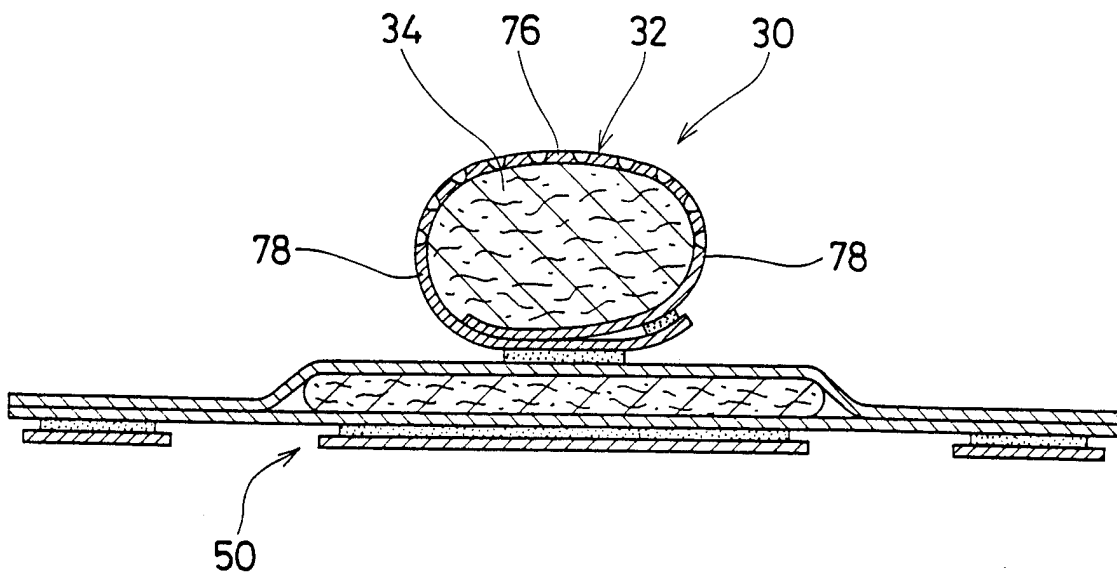


FIG. 9

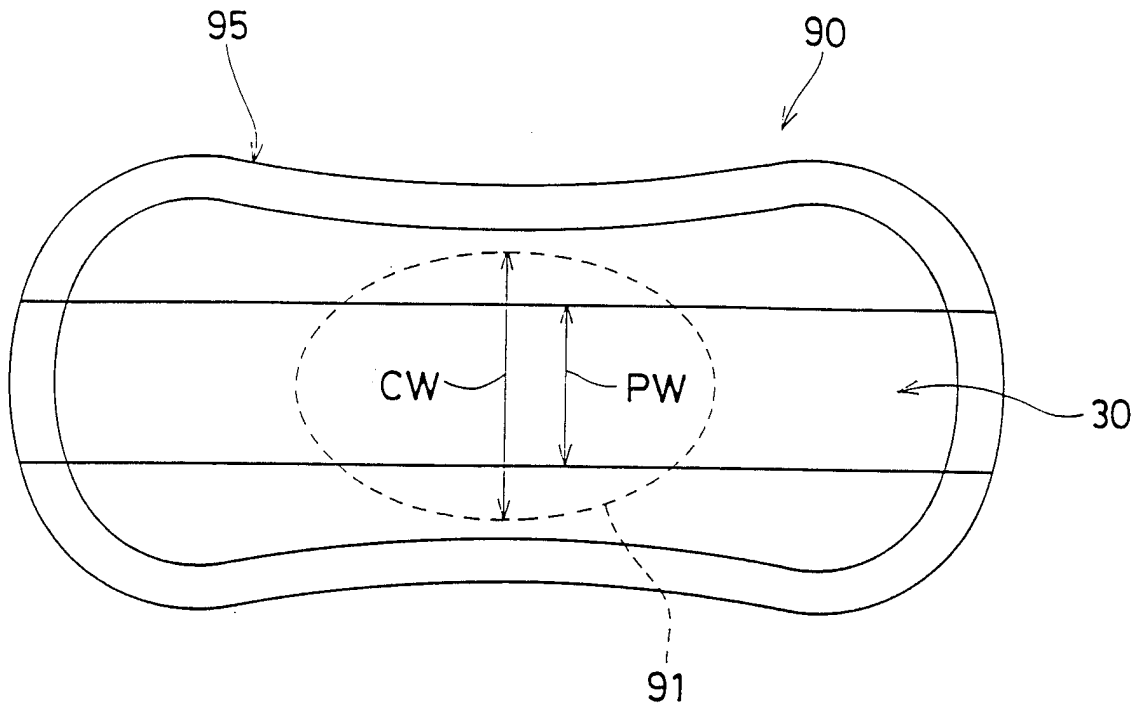


FIG. 10

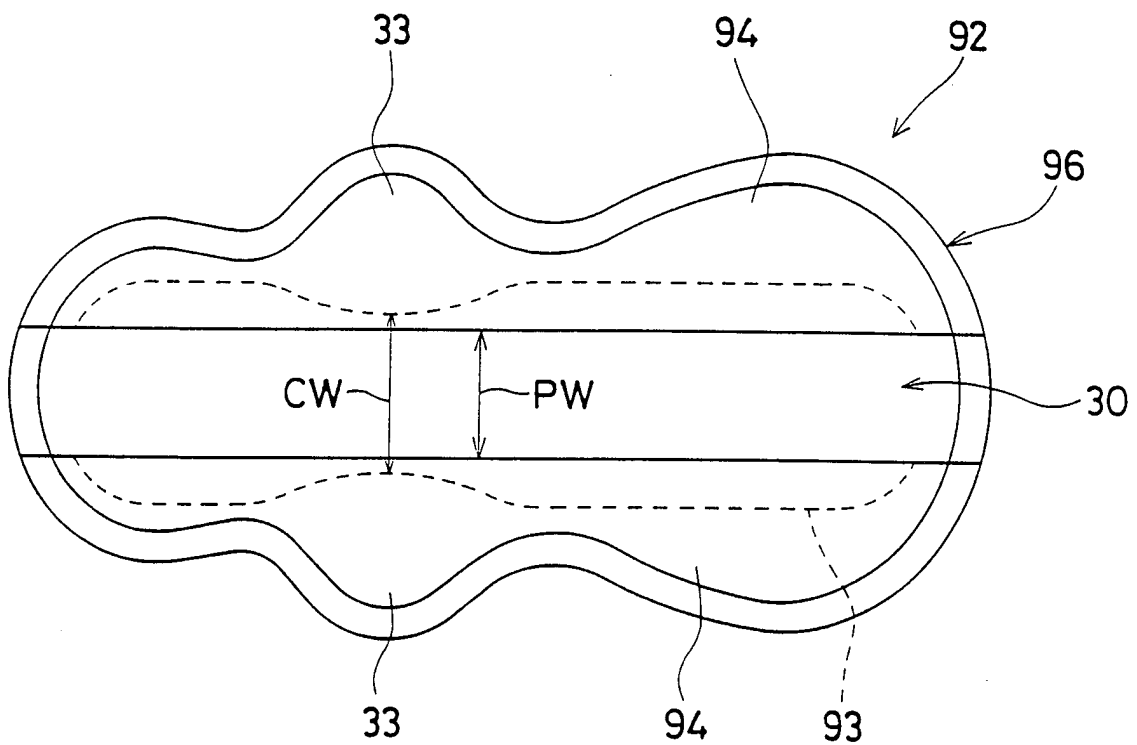


FIG. 11

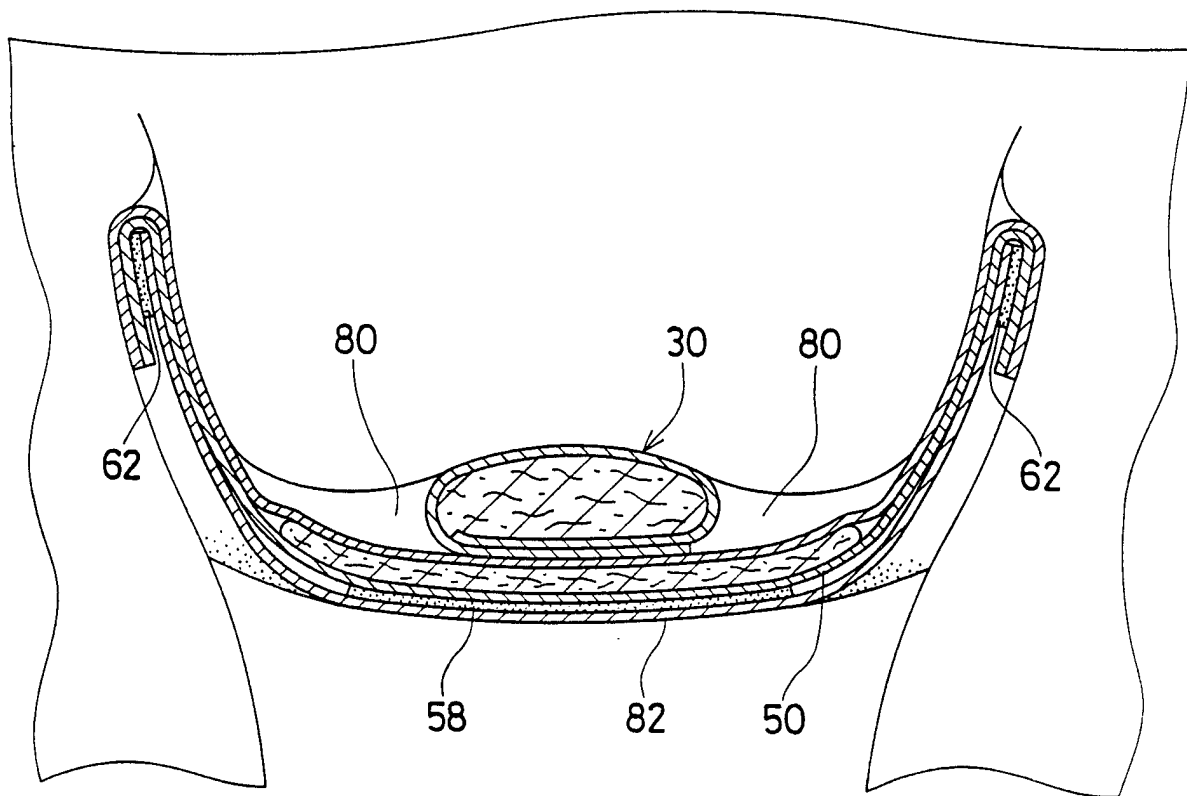


FIG. 12

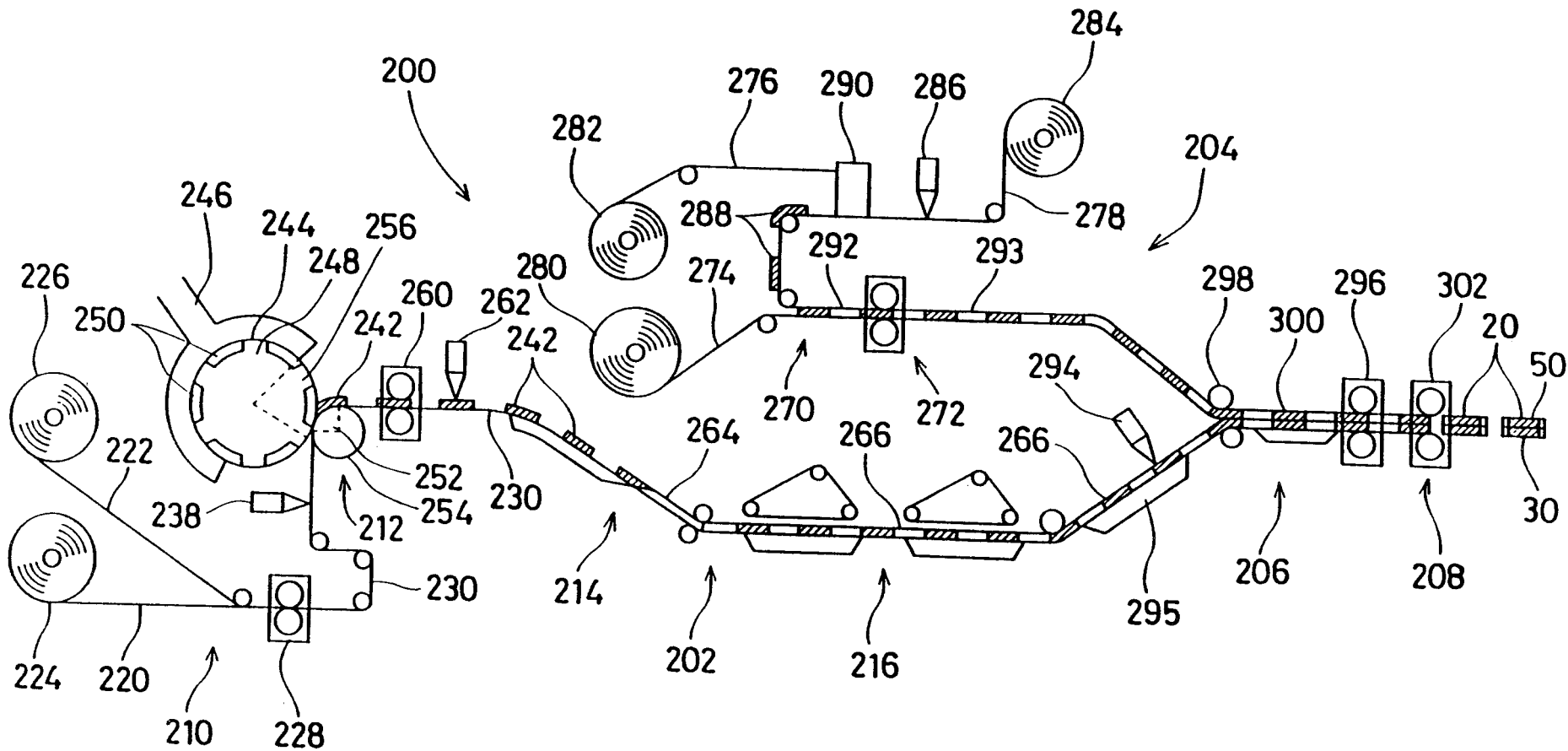


FIG. 13

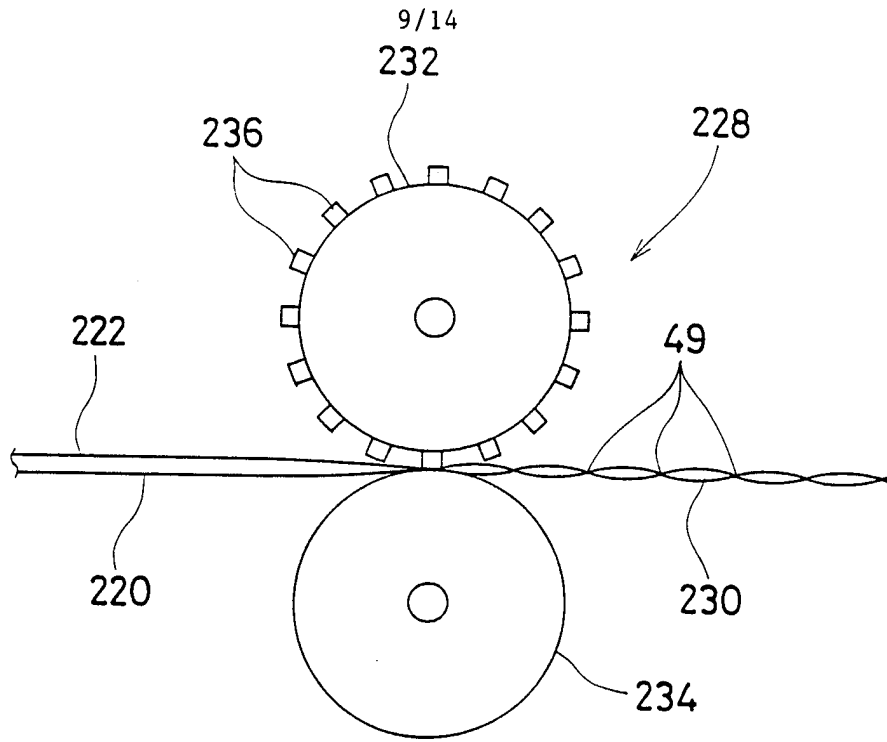


FIG. 14

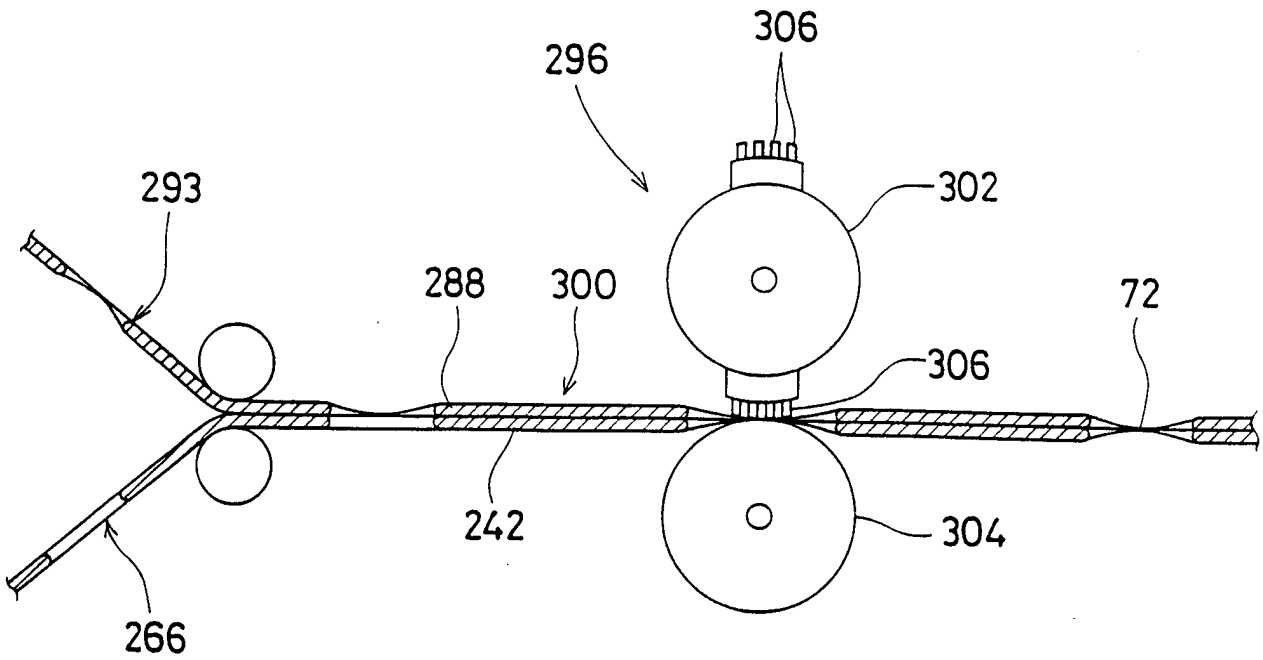


FIG. 15

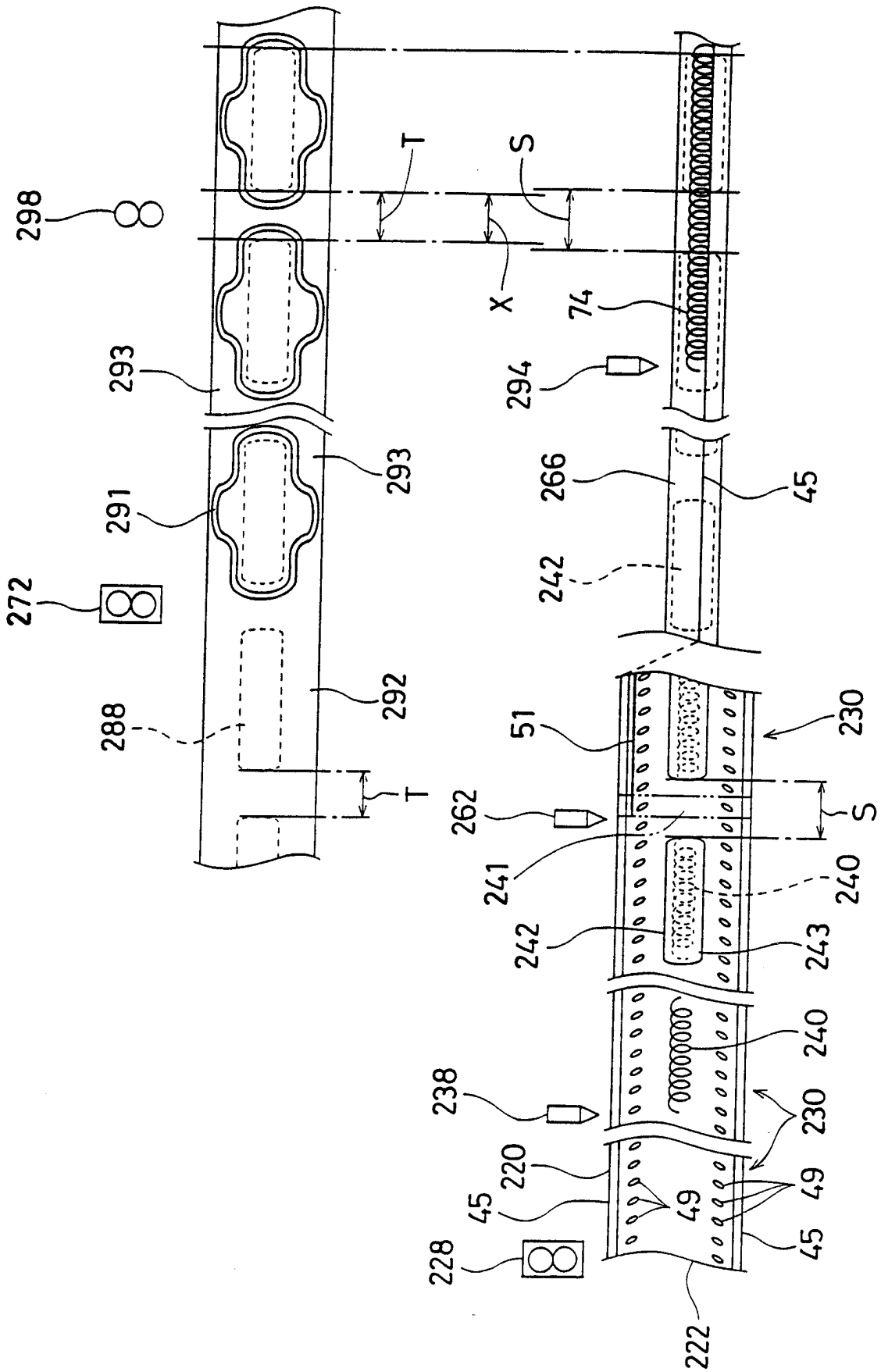


FIG. 16

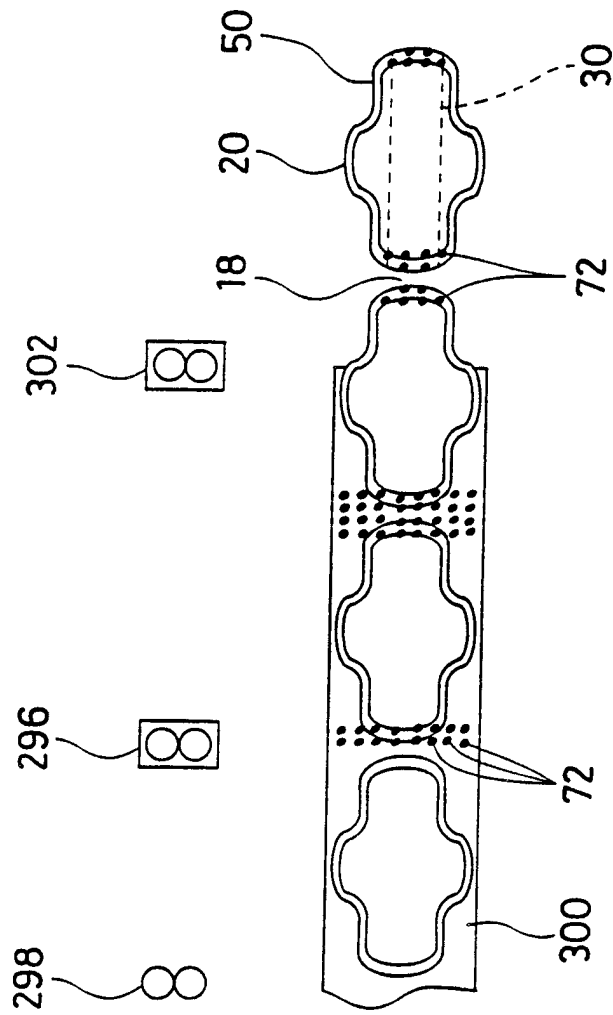


FIG. 17

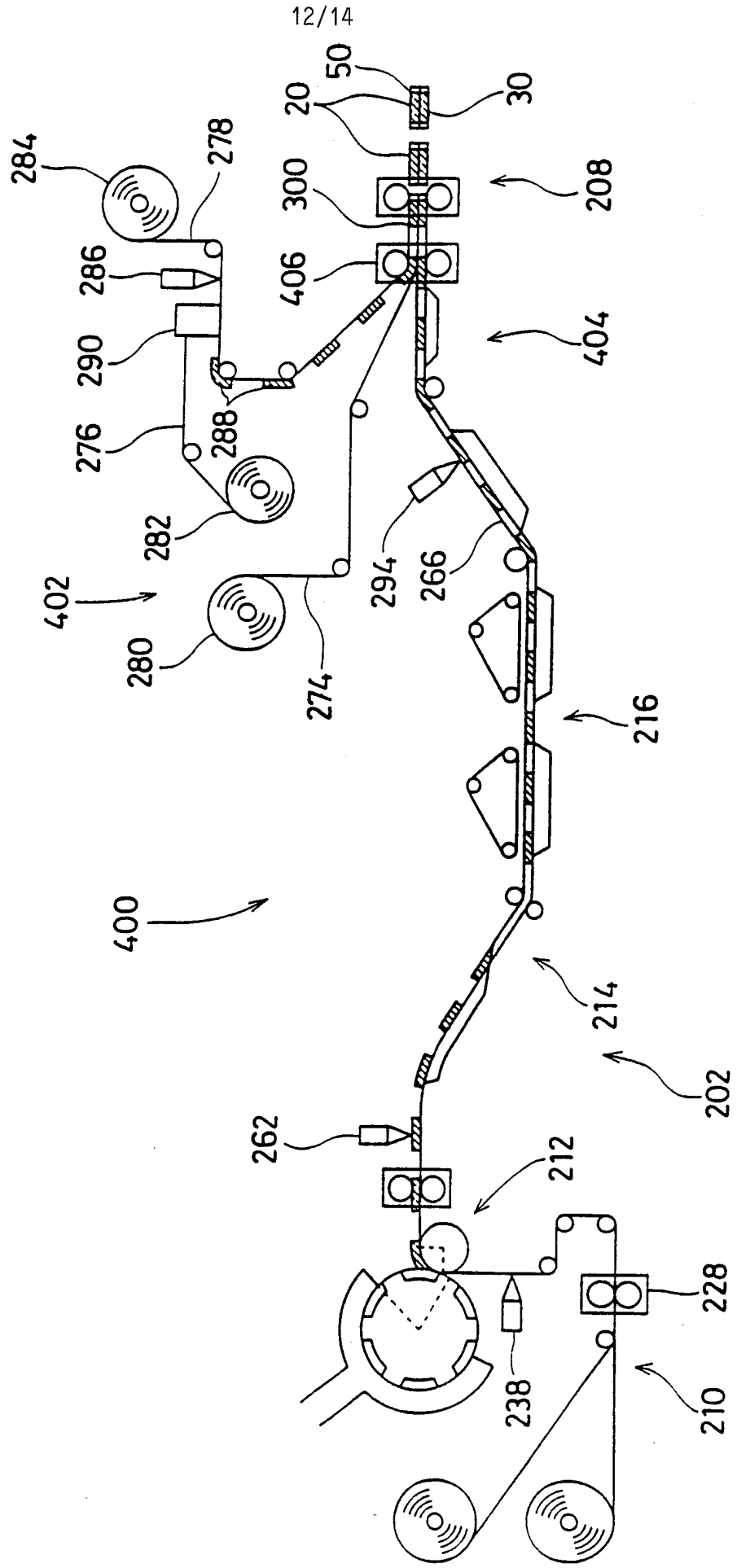


FIG. 18

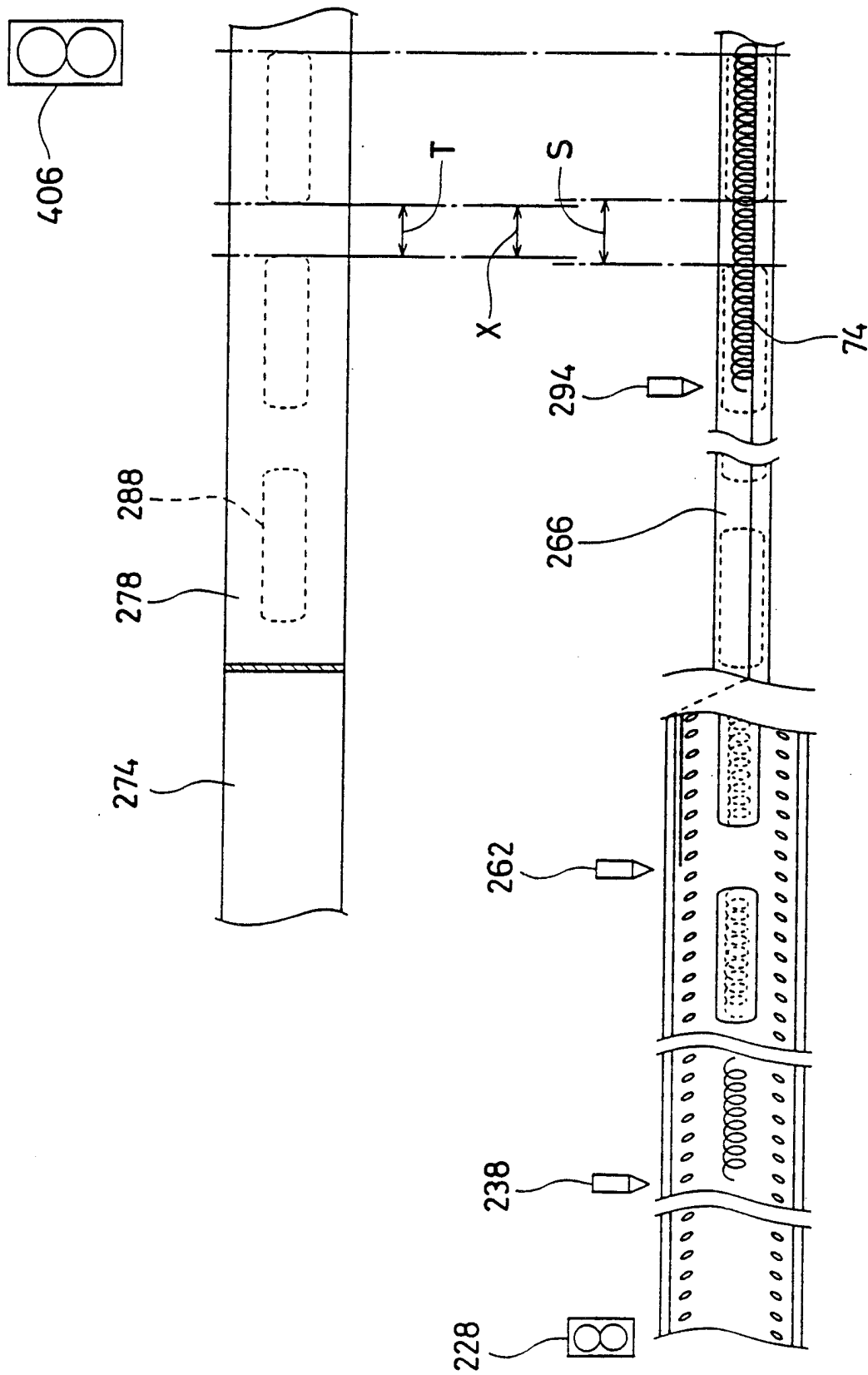


FIG. 19

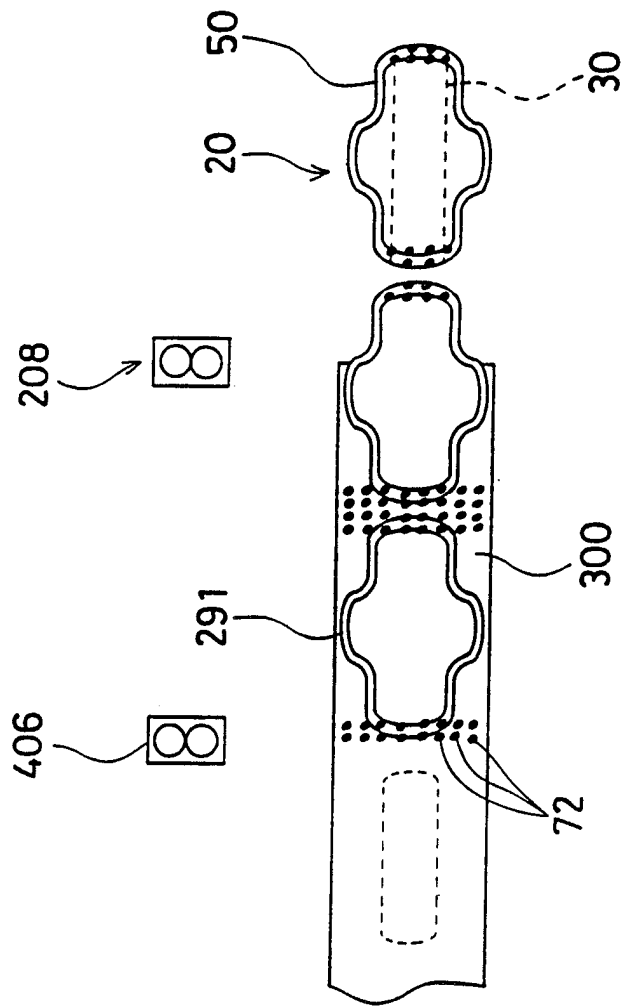


FIG. 20

INTERNATIONAL SEARCH REPORT

In. tional Application No

PCT/US 97/05250

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61F13/15

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 575 047 A (GERSTENBERGER ROLAND W ET AL) 19 November 1996 see abstract; claims; figures ---	1-10
A	EP 0 685 212 A (MCNEIL PPC INC) 6 December 1995 ---	
A	WO 96 25903 A (PROCTER & GAMBLE) 29 August 1996 ---	
A	US 4 425 130 A (DESMARAIS THOMAS A) 10 January 1984 cited in the application ---	
A	US 5 342 334 A (THOMPSON HUGH A ET AL) 30 August 1994 -----	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

19 November 1997

Date of mailing of the international search report

28/11/1997

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INTERNATIONAL SEARCH REPORT

Information on patent family members

in International Application No

PCT/US 97/05250

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