

LIQUID-PERVIOUS COMPOSITE SHEET FOR DISPOSABLE BODY
FLUID ABSORBENT SANITARY ARTICLE AND PROCESS FOR MAKING
THE SAME

This invention relates to a liquid-pervious composite sheet suitable as stock material for disposable body fluid absorbent sanitary article such as disposable diaper or sanitary napkin.

Fig. 7 in the accompanying drawings is a perspective view showing a finely perforated and soft touch presenting plastic sheet 110 described in Japanese Patent Application Disclosure No. 1987-57551. This plastic sheet 110 described therein to be suitable as stock material for the topsheet of disposable diaper or the like is formed on its top surface with a plurality of cylindrical projections 120 which are formed, in turn, on their tops with fine pores 125. Such sheet 110 is claimed to present a cloth-like soft touch.

Fig. 8 in the accompanying drawings is a perspective view showing a sanitary napkin 200 described in Japanese Patent Application Disclosure No. 1995-328061. This napkin 200 includes a topsheet 210 comprising nonwoven fabric 211 and a plurality of ribbon-like plastic sheets 212 bonded to top surface of the nonwoven fabric 211. These ribbon-like

plastic sheets 212 extending in parallel one to another longitudinally of the napkin 200. The presence of these ribbon-like plastic sheets 212 function to conceal blot left on the topsheet 210 due to menstrual discharge.

The Gazette No. 1987-57551 proposes a method for concealing any conspicuous blot left on the liquid-absorbent core underlying the topsheet of sanitary napkin when the finely perforated plastic sheet 110 of prior art is used as the topsheet. According to the method proposed by the Gazette No. 1987-57551, the sheet 110 is filled with inorganic grains such as grains of calcium carbonate or barium sulfate. Such concealing ability may be enhanced by increasing the amount of the grains with which the sheet 110 is filled. However, increasing the amount of such filler will correspondingly decrease the sheet's strength and correspondingly increase a deviation in the sheet's thickness in the course of the process for making the sheet unless any effective countermeasure is taken to compensate the affection by the filler. While these problems may be solved by increasing the sheet's thickness, it is apprehended that this countermeasure might unacceptably stiffen not only the flat regions of the sheet but also the cylindrical projections 120. With a consequence, it might become hard for the sheet to present

the desired cloth-like soft touch.

While the Japanese Patent Application Disclosure Gazette No. 1995-328061 describes that the ribbon-like plastic sheets 212 may be bonded to the top surface of the relatively flat topsheet 210 formed by nonwoven fabric in order to improve the concealing ability, no description can be found in this Gazette which suggests how to use said ribbon-like plastic sheets 212 with the plastic sheet having the cylindrical projections 120 to achieve the desired concealing ability.

This invention aims to provide a liquid-pervious sheet used, for example, as stock material for the topsheet of disposable body fluid absorbent sanitary article improved so as to present a comfortably soft touch as well as a high blot concealing ability in the light of the prior art as has been described above.

Specifically, this invention aiming to achieve the object set forth above consists of a first invention relating to a liquid-pervious composite sheet suitable as stock material for disposable body fluid absorbent sanitary article and a second invention relating to a process for making the composite sheet.

The object set forth above is achieved, according to the first invention, by an improvement in the liquid-pervious composite sheet used for the body fluid absorbent sanitary article and comprising a layer of plastic sheet defining a top side of the sheet and a layer fibrous assembly defining a bottom side of the sheet and bonded to the layer of plastic sheet.

The improvement by the first invention is characterized by that the layer of plastic sheet comprises a plurality of ribbon-like components extending in parallel one to another in one direction and a film-like component bonded to the ribbon-like components and covering substantially entire top surface of the fibrous assembly wherein the film-like component is formed between each pair of adjacent ribbon-like components with a plurality of liquid-pervious pores arranged intermittently in the one direction.

The first invention includes preferred embodiments as follow:

(1) The film-like component is formed along edges of the pores with a plurality of rising regions extending upward from top surface of the composite sheet and undulating along the edges.

(2) The ribbon-like components are disposed between

the film-like component and the layer of fibrous assembly and bonded to the layer of fibrous assembly.

(3) The film-like component is disposed between the ribbon-like components and the layer of fibrous assembly and bonded to the layer of fibrous assembly.

(4) The layer of plastic sheet contains inorganic filler and a content of the filler per unit area in the ribbon-like components is higher than in the film-like component.

The object set forth above is achieved, according to the second invention, by a process for making liquid-pervious composite sheet used for the body fluid absorbent sanitary article and comprising a layer of plastic sheet defining a top side of the sheet and a layer fibrous assembly defining a bottom side of the sheet and bonded to the layer of plastic sheet, said process comprising steps of:

a. continuously feeding fibrous web destined to form the layer of fibrous assembly in one direction;

b. extruding first thermoplastic material destined to form a part of the layer of plastic sheet in the form of a plural ribbons;

c. extruding second thermoplastic material destined to form a part of the layer of plastic sheet in the form of a

single film;

d. bonding one of the ribbons and the film being extruded to top surface of the fibrous web to obtain first composite web and bonding the other to the top surface of the fibrous web and/or the one of the first composite web to obtain second composite web to be continuously fed in the one direction; and

e. discharging high pressure columnar water streams against the second composite web being continuously fed in the one direction from at least the side of the fibrous web of the second composite web so that the film is pierced between each pair of adjacent ribbons so as to form a plurality of pores along edges of which a plurality of sawtoothed rising regions extending upward on the top surface of the film and undulating in the one direction.

The second invention includes preferred embodiments as follow:

(1) The second composite web is subjected to the high pressure columnar water streams discharged from the side of the film before the second composite web is subjected to the high pressure columnar water streams discharged from the side of the fibrous web to partially pierce the film and thereby to form a plurality of the pores.

(2) The layer of plastic sheet and the layer of fibrous assembly are bonded using heat-sealing technique.

Fig. 1 is a perspective view showing a sanitary napkin using the composite sheet according to this invention as partially broken away;

Fig. 2 is a scale-enlarged diagram illustrating a part of Fig. 1;

Fig. 3 is a sectional view taken along line III - III in Fig. 2;

Fig. 4 is a sectional view taken along line IV - IV in Fig. 2;

Fig. 5 is a view similar to Fig. 2 showing an alternate embodiment of this invention;

Fig. 6 is a diagram schematically illustrating a process for making the composite sheet;

Fig. 7 is a scale-enlarged diagram illustrating an embodiment of the conventional composite sheets; and

Fig. 8 is a view similar to Fig. 1 showing a sanitary napkin as still another embodiment of the conventional sanitary napkin.

Details of the liquid-pervious composite sheet used for

the disposable body fluid absorbent sanitary article and the process for making the same will be more fully understood from the description given hereunder in reference with the accompanying drawings.

Fig. 1 is a perspective view showing a sanitary napkin 1 as a specific embodiment of the disposable body fluid absorbent sanitary article as partially broken away. The napkin 1 comprises a liquid-absorbent topsheet 2, a liquid-impervious backsheet 3 and a liquid-absorbent core 4 disposed between these two sheets 2, 3. The top- and backsheets 2, 3 are bonded together along a line 6 defined along and outside the portions of the top- and backsheets 2, 3 extending outward beyond a peripheral edge of the core 4 by means of adhesive or heat-sealing technique. The napkin 1 has a width extending in X-direction and a length extending in Y-direction. Such napkin 1 uses the composite sheet as the topsheet 2.

Fig. 2 is a scale-enlarged diagram illustrating the napkin 1, Fig. 3 is a sectional view taken along line III - III in Fig. 2 and Fig. 4 is a sectional view taken along line IV - IV in Fig. 2. Referring to Fig. 2, the backsheet 3 and the core 4 are indicated by imaginary lines. The topsheet 2 is a composite sheet comprising a layer of plastic sheet

11 defining the sheet and a layer of nonwoven fabric 12 formed by an assembly of fibers 13 bonded to the layer 11 by means of adhesive or heat-sealing technique to define a bottom surface of the sheet 2. The layer of plastic sheet 11 comprises a plurality of ribbon-like components 16 extending in parallel one to another in the X-direction and a film-like component 17 underlying the ribbon-like components 16 and covering a substantially entire top surface of the layer of nonwoven fabric 12. These components 16, 17 are made of thermoplastic material and heat-sealed together in their zones placed one upon another. The film-like component 17 comprises a plurality of substantially flat regions 18 extending in parallel one to another in the Y-direction, a plurality of pores 19 each defined between each pair of the adjacent flat regions 18 and extending in the Y-direction, a plurality of bridge-like regions 20 each extending across the pore 19 between each pair of opposed edges of each pair of the adjacent flat regions 18 and a plurality of rising regions 22 formed along the edges 21 of the respective flat regions 18 so as extend upward as viewed in Fig. 2. The rising regions 22 irregularly undulate in the Y-direction to define substantially sawtoothed undulations.

The layer of nonwoven fabric 12 is bonded to the flat

regions 18 of the film-like component 17 from below as viewed in Fig. 2 so that the layer of nonwoven fabric 12 may be partially exposed in the respective pores 19.

The backsheet 3 may be formed by a thermoplastic sheet, nonwoven fabric made of thermoplastic synthetic fiber, or a laminated sheet consisting of said thermoplastic sheet and the nonwoven fabric.

The core 4 may be formed, for example, by fluff pulp or a mixture of fluff pulp and highly water-absorptive polymer.

Referring to Figs. 3 and 4, the ribbon-like components 16 preferably lie on the respective flat regions 18 of the film-like component 17 and each of these ribbon-like components 16 has a thickness of 0.01 ~ 0.3 mm and a width S_1 of 0.1 ~ 4 mm. The ribbon-like component 16 having a thickness less than 0.01 mm could not effectively improve the concealing ability of the film-like component 17, on one hand, and the ribbon-like component 16 having a thickness larger than 0.3 mm would excessively stiffen the film-like component 17 and thereby stimulate the wearer's skin, on the other hand. The width S_1 is substantially equal to or smaller than a width of the flat region 18. It should be understood here that the width S_1 should be dimensioned to be preferably $1/3$, more

preferably $1/2$ the width W_1 of the flat region 18 or larger in order to improve the concealing effect offered by the flat regions 18. The ribbon-like components 16 are obtained by extruding thermoplastic material onto the film-like component 17 and these components 16 are not limited to those of rectangular cross-section but may be those of the other cross-section such as circular or oval cross-section.

The ribbon-like components 16 should function to improve the concealing effect offered by the topsheet 2 ensuring that any blot due to menstrual discharge having been absorbed by the core 4 of the napkin 1 shown in Fig. 1 can not be seen through the topsheet 2. The ribbon-like components 16 may contain inorganic filler such as titanium oxide or barium sulfate and, if it is desired, pigment or the like. An amount of such filler and/or any other additive may be increased unless properly extrusion of the ribbon-like components 16 is made thereby difficult. Even when an amount of the inorganic filler is relatively large, the narrow and thick ribbon-like components 16 can be more easily extruded than the wider and thinner film-like component 17. In addition, even the ribbon-like components 16 of uneven thickness scarcely affect the desired property of the topsheet 2 and therefore such ribbon-like components 16 may

be used without anxiety to improve the concealing ability of the topsheet 2. As viewed from above the topsheet 2, the content of the inorganic filler per unit area is higher in the ribbon-like components 16 than in the film-like component 17 and preferably the content in the former is at least 1.3 times higher than the content in the latter. The ribbon-like components 16 contribute also to improvement of the tensile strength of the film-like component 17 in the Y-direction.

Of the film-like component 17, each of the flat regions 18 has a thickness of 0.001 ~ 0.05 mm and a width W_1 of 0.3 ~ 5 mm defined between each pair of the adjacent pores 19, 19. Most of the pores 19 are longer in the Y-direction and each of them has a width W_2 of 0.03 ~ 5 mm and a length corresponding to at least 1.5 times of the width W_2 .

Of the film-like component 17, the bridge regions 20 lie between each pair of the pores 19, 19 adjacent each other in the Y-direction and comprise those 20A extending from the flat regions 18 so as to describe circular arcs which are convex upward and those 20B (See Fig. 2) as flat as the flat regions 18. Some of the bridge regions 20A describing the circular arcs have their proximal end portions 25A appearing to extend from the flat regions 18 and the other bridge regions 20A have their proximal end portions 25B appearing to extend

from the apices 27 of the respective rising regions 22 (See Fig. 2). Preferably, the bridge region 20 has a thickness which is same as or less than the thickness of the flat region 18 and a width W_3 in the Y-direction (See Fig. 3) of 0.001 ~ 2 mm in its narrowest area.

Of the film-like component 17, most of the rising regions 22 are formed by portions of the film component 17 extending upward, as viewed in Figs. 3 and 4, from the edges 21 of the flat regions 18. These rising regions 22 have their proximal end portions 26 contiguous with the flat regions 18 and their free end portions 27 extending upward from the respective proximal end portions 26. Top edges 27A of the respective rising regions 22 repeat along the edges 21 substantially in a sawtoothed pattern. While the maximum height of the rising region 22 as measured from the flat region 18 to the top edge 27A is in the order of 5 mm, it is essential to improve a touch of the topsheet 2 that this maximum height does not exceed approximately 1 mm and most of the rising regions 22 normally extend upward beyond the top surfaces of the respective ribbon-like components 16. As has previously been described, some 22B of the rising regions 22 are formed along edges of the bridge regions 20 (See Fig. 2).

The manner in which the top edges 27A of the rising

regions 22 repeat to form the sawtoothed undulation is exemplarily shown in Fig. 3. As will be apparent therefrom, this undulation comprises a plurality of triangular or substantially triangular regions 33 each defined by a substantially rightward ascending oblique 31, a substantially leftward ascending oblique 32 and the proximal end portion 26 extending between these obliques 31, 32 and being contiguous one with another in an irregular pattern. The rising regions 22B also may sometimes repeat to form the sawtoothed undulation. These rising regions 22 inclusive of the rising regions 22B have a thickness which is same as or less than a thickness of the flat regions 18 and flexibly deformable as they come in contact with the article wearer's skin. In this way, the topsheet 2 can give the article wearer's skin a smooth and soft touch like as velvet. While it is not easy to visually identify the individual rising regions 22, a plurality of the rising regions 22 make the surface of the topsheet 2 look as if being napped. Additionally, the rising regions 22 diffusively reflect the light incident upon the topsheet 2 and thereby effectively alleviate the surface luster often presented by the plastic sheet.

In general, addition of a relatively large amount of

inorganic filler makes it difficult to form a film-like stock material such as the film-like component 17. Taking account of this, this invention properly uses these components 16, 17, respectively, in order to obtain the topsheet 2 fulfilling the desired functions. Specifically, the core stained with menstrual discharge is effectively concealed not by the film-like component 17 but by the ribbon-like components 16, on one hand, and appearance as well as touch of the topsheet 2 is improved by the film-like component 17, on the other hand.

The layer of nonwoven fabric 12 may contain thermoplastic synthetic fiber of 70 % by weight or more, and hydrophilic chemical fiber such as rayon fiber as well as hydrophilic natural fiber such as cotton fiber or pulp fiber of 30 % by weight or less. According to one preferred embodiment, the layer of nonwoven fabric 12 is formed by thermoplastic synthetic fiber having a fineness of 0.5 ~ 15 deniers and a basis weight of 5 ~ 50 g/m². A particular type of nonwoven fabric may be selected from a group including not only so-called thermal bond nonwoven fabric such as spun bond nonwoven fabric, point bond nonwoven fabric and air-through nonwoven fabric but also melt blown nonwoven fabric and spun lace nonwoven fabric.

In the sanitary napkin 1 using such topsheet 2,

menstrual discharge flows through the pores 19 and then through the layer of nonwoven fabric 12 before absorbed by the core 4. The core 4 and the layer of nonwoven fabric 12 stained with menstrual discharge are covered with the ribbon-like components 16 having a high concealing ability and the rising regions 22 as well as the bridge regions 20 diffusively reflecting the light incident thereupon so that any blot due to menstrual discharge may be effectively concealed.

Fig. 5 is a view similar to Fig. 4 showing an alternative embodiment of this invention. The topsheet 2 shown herein has its ribbon-like components 16 lying between the layer of nonwoven fabric 12 and the flat regions 18 of the film-like component 17. The ribbon-like components 16 have their bottom surfaces bonded to the layer of nonwoven fabric 12 using adhesive or heat-sealing technique and their top surfaces bonded to the flat regions 18 using adhesive or heat-sealing technique. The film-like component 17 has its bottom surface bonded to the ribbon-like components 16 and the layer of nonwoven fabric 12 using adhesive or heat-sealing technique. The sanitary napkin 1 using such topsheet 2 is distinguished from the napkin 1 shown by Fig. 1 in that the ribbon-like components 16 are not exposed. This feature is effective to

eliminate an apprehension that any amount of menstrual discharge might stay between the rising regions 22 and the ribbon-like components 16 on the top surface of the topsheet 2 or the edges of the ribbon-like components 16 might stimulate the napkin wearer's skin.

Fig. 6 is a diagram schematically illustrating a process for continuously making a composite sheet 108 used as the topsheet 2 of Fig. 2. A second web 102 in the form of fibrous assembly is continuously fed from the left hand as viewed in Fig. 6 to form the layer of nonwoven fabric 12 shown in Fig. 2. A first web 101 of first thermoplastic material discharged from a first extruder 121 is fed in its thermally molten state onto top surface 102A of the second web 102 and fed together with the second web 102 into a nip defined between a pair of compression rolls 173 in which these two webs 101, 102 are heat-sealed with each other to form first composite web 104.

Onto the first web 101 of this first composite web 104, third web 103 of second thermoplastic material discharged from a second extruder 122 is fed in its thermally molten state. The third web 103 in the form of a plurality of ribbons 116 extending in parallel one to another and spaced from one another by a desired distance is then fed together with the

first web 101 into a nip defined between a pair of compression rolls 174 in which these two webs 101, 103 are heat-sealed with each other to form second composite web 106. The ribbons 116 of the third web 103 are destined to form the ribbon-like components 16 of the topsheet 2.

The second composite web 106 then enters a first processing zone 123 in which a nozzle array 123A comprising a plurality of nozzles arranged at a desired pitch transversely of the second composite web 106 discharge high pressure columnar water streams against top surface 101A of the first web 101 and thereby form a third composite web 107. The first web 101 is selectively pierced by the columnar water streams between each pair of the adjacent ribbons 116, 116 to form the pore arrays extending in parallel one to another transversely of the third composite web 107 and arranged intermittently in the direction along which the third composite web 107 travels. If desired in order to form these pore arrays, the first processing zone 123 may be additionally provided with second and third nozzle arrays 123B, 123C, as illustrated, adapted to discharge columnar water streams. These nozzle arrays 123A, 123B, 123C are preferably arranged so that the individual nozzles of the respective arrays 123A, 123B, 123C corresponding to one another as viewed

transversely of the third composite web 107 may be positioned substantially in alignment, i.e., the high pressure water streams discharged from these nozzle arrays 123A, 123B, 123C may have their loci overlapping one another. The first processing zone 123 is provided below the third composite web 107 with a suction mechanism 124 for the water streams.

The third composite web 107 then enters a second processing zone 127. Similarly to the first processing zone 123, the second processing zone 127 also is provided with nozzle arrays 127A, 127B, 127C each comprising a plurality of nozzles arranged transversely of the third composite web 107 and a suction mechanism 128. In the second processing zone 127, the nozzle arrays 127A, 127B, 127C discharge high pressure water streams against bottom surface 102B of the second web 102 constituting the third composite web 107 which is then dried to form a composite sheet 108. In this composite sheet 108, the portions of the first web 101 having previously been pierced in the first processing zone 123 are deformed in accordance with the direction of the columnar water streams in the second processing zones 127 and extending from the bottom surface 101 B to the top surface 101A of the first web 101. It is not essential that the high pressure water streams discharged from the nozzle arrays 127A, 127B, 127C of the

second processing zone 127 should have their loci coinciding with the loci of the high pressure water streams discharged from the nozzle arrays 123A, 123B, 123C of the first processing zone 123. However, if such relationship of position-alignment among three nozzle arrays, the first web 101 can be pierced by the columnar water streams along relatively long dimension and can be formed with the correspondingly longer pores. Most of the pierced portions of the first web 101 extend upwardly of the top surface 101A of the first web 101. In this manner, the process according to this invention ensures the first web 101 to be selectively pierced at the desired regions as viewed transversely of the first web 101 and thereby facilitates a plurality of the pore arrays extending in parallel one to another in the machine direction to be formed.

In the composite sheet 108, the first and second webs 101, 102 bonded together define the plastic layer 17, the pores formed in the first web 101 define the pores 19 and the pierced portions of the first web 101 define the rising regions 22, respectively, of the topsheet 2. The portions of the first web 101 remaining between each pair of the pores adjacent to each other in the machine direction without being pierced by the high pressure columnar water streams define

the bridge regions 20.

Referring to Fig. 6, the individual nozzles in the respective nozzle arrays 123A ~ 123C, 127A ~ 127C are arranged preferably at a pitch of 0.1 ~ 0.5 mm and have a nozzle-diameter preferably of 0.05 ~ 0.15 mm. Preferably, the columnar water streams are discharged at a pressure of 30 ~ 200 kg/cm² and sucked under a suction pressure of 200 ~ 1000 mmH₂O. In the first and second processing zones 123, 127, the webs to be processed are transported in the desired direction on suitable supports 131, 132 such as mesh screen.

The first web 101, the second web 102 and the third web 103 may be bonded together by heat-sealing them as they pass the nip of the heated roll pair or by means of suitable adhesive such as hot melt adhesive so far as these webs 101, 102, 103 are fed at a room temperature.

The first web 101, the second web 102 and the third web 103 may be subjected to any additional surface treatment such as water-repellent treatment, if is necessary, at an appropriate step in the course of the process illustrated by Fig. 6. The first web 101 in the form of film uniaxially stretched in the machine direction may facilitate the pores to be formed by the columnar water streams. The first web 101 has a thickness of 0.001 ~ 0.05 mm, and the third web 103

has a thickness of 0.01 ~ 0.3 mm and a width of 0.1 ~ 4 mm. The second web 102 has a basis weight of 5 ~ 50 g/m². According to the process illustrated by Fig. 6, it is also possible to eliminate the first processing zone 123 and to discharge the high pressure columnar water streams from the second processing zone 127 alone to make the composite sheet 108 from the first composite web 106 without making the second composite web 107. However, such alternative process may often result in unacceptably narrow pores as well as too many bridge regions since it is difficult for the columnar water streams to act directly on the first web 101. The composite sheet 108 is subjected to an appropriate drying step before taken up into a roll. It is also possible to take the second composite web 107 out in the course of the process illustrated by Fig. 6 and to use this composite web 107 as the topsheet 2. In this case, the topsheet 2 is scarcely formed along the edges 21 of the respective pores 19 with the rising regions 22.

The sequence in the process illustrated by Fig. 6 may be altered as will be described: The first extruder 121 discharges the first web 101 in the form of a plural ribbons 116 which are, in turn, bonded to the second web 102 formed by the fibrous assembly and thereby the first composite web

104 is obtained. The second extruder 122 discharges the film-like third web 103 which is, in turn, bonded to the first and second webs 101, 102 constituting the first composite web 104 and thereby the second composite web 106 is obtained. Such second composite web 106 is then processed in the first and second processing zones 123, 127 to form the composite sheet 108 having a cross-section as shown in Fig. 5. This composite sheet 108 also may be used as the topsheet 2.

The composite sheet according to this invention comprises a plurality of ribbon-like components and the film-like component bonded to the ribbon-like components so that a blot of the core may be effectively concealed by the regions in which said ribbon-like components overlap the film-like component when the composite sheet is used as the topsheet of disposable diaper or sanitary napkin. The ribbon-like components contribute also to improvement of the tensile strength presented by the film-like component in its longitudinal direction.

According to the process for making this novel composite sheet, the web destined to form the film-like component can be selectively pierced at desired regions transversely thereof to form the liquid-pervious pores as well as the rising regions functioning to give the sheet a

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comfortably soft touch in a relatively easy manner.

WHAT IS CLAIMED IS:

1. A liquid-pervious composite sheet (2) used for the body fluid absorbent sanitary article and comprising a layer of plastic sheet (11) defining a top side of the sheet and a layer fibrous assembly (12) defining a bottom side of the sheet (2) and bonded to said layer of plastic sheet (11), said liquid-pervious composite sheet (2) being characterized in that:

said layer of plastic sheet (11) comprises a plurality of ribbon-like components (16) extending in parallel one to another in one direction (Y) and a film-like component (17) bonded to said ribbon-like components (16) and covering substantially entire top surface of said fibrous assembly (12) wherein said film-like component (17) is formed between each pair of adjacent said ribbon-like components (16) with a plurality of liquid-pervious pores (19) arranged intermittently in said one direction (Y).

2. The composite sheet (2) according to Claim 1, wherein said film-like component (17) is formed along edges of said pores (19) with a plurality of rising regions (22) extending upward from top surface of said composite sheet (2) and

undulating along said edges.

3. The composite sheet (2) according to Claim 1, wherein said ribbon-like components (16) are disposed between said film-like component (17) and said layer of fibrous assembly (12) and bonded to said layer of fibrous assembly (12).
4. The composite sheet (2) according to Claim 1, wherein said film-like component (17) is disposed between said ribbon-like components (16) and said layer of fibrous assembly (12) and bonded to said layer of fibrous assembly (12).
5. The composite sheet (2) according to Claim 1, wherein said layer of plastic sheet (11) contains inorganic filler and a content of said filler per unit area in said ribbon-like components (16) is higher than in said film-like component (17).
6. A process for making liquid-pervious composite sheet (2) used for the body fluid absorbent sanitary article and comprising a layer of plastic sheet (11) defining a top side of the sheet (2) and a layer fibrous assembly (12) defining a bottom side of the sheet (2) and bonded to said layer of plastic

sheet (11), said process comprising the steps of:

- a. continuously feeding fibrous web (102) destined to form said layer of fibrous assembly (12) in one direction;
- b. extruding first thermoplastic material destined to form a part of said layer of plastic sheet (11) in the form of a plural ribbons;
- c. extruding second thermoplastic material destined to form a part of said layer of plastic sheet (11) in the form of a single film;
- d. bonding one of said ribbons and said film being extruded to top surface (102A) of said fibrous web (102) to obtain first composite web (104) and bonding the other to the top surface of said fibrous web (102) and/or said one of said first composite web (104) to obtain second composite web (106) to be continuously fed in said one direction; and
- e. discharging high pressure columnar water streams against said second composite web (106) being continuously fed in said one direction from at least the side of said fibrous web (102) of said second composite web (106) so that said film is pierced between each pair of adjacent said ribbons so as to form a plurality of pores (19) along edges of which a plurality of sawtoothed rising regions (22) extending upward on the top surface of said film and undulating in said one direction.

7. The process according to Claim 6, wherein said second composite web (106) is subjected to the high pressure columnar water streams discharged from the side of said film before said second composite web (106) is subjected to the high pressure columnar water streams discharged from the side of said fibrous web (102) to partially pierce said film and thereby to form a plurality of said pores.

8. The process according to Claim 6, wherein said layer of plastic sheet (11) and said layer of fibrous assembly (12) are bonded using heat-sealing technique.