AUSTRALIA

Patents Act 1990

NOTICE OF ENTITLEMENT

I/We. Stefan Olsson

authorised by SCA Mölnlycke AB

of S-405 03 Göteborg, Sweden

the applicant and nominated person in respect of an application for a patent for an invention entitled:

" A method for producing an absorbent structure which includes a layer of superabsorbent material"

filed under Australian Application No. ..... state the following:

PART 1 - *Must be completed for all applications*

The person(s) nominated for the grant of the patent

☐ is (are) the actual inventor(s)

or

☒ has, for the following reasons, gained entitlement from the actual inventor(s)

The nominated person is the assignee of the invention from the said actual inventor

PART 2 - *Must be completed if the application is a Convention application.*

The person(s) nominated for the grant of the patent is (are):

☐ the applicant(s) of the basic application(s) listed on the patent request form

or

☐ entitled to rely on the basic application(s) listed on the patent request form by reason of the following:

PART 3 - *Must be completed if the application was made under the PCT and claims priority.*

The person(s) nominated for the grant of the patent is (are):

☒ the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT

or

☐ entitled to rely on the application(s) listed in the declaration under Article 8 of the PCT by reason of the following:

Dated this 12th day of September 1996

Signature .....

Signatory's Name Stefan Olsson

AU9524579

(12) PATENT ABRIDGMENT (11) Document No. AU-B-24579/95
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 684029

(54) Title
A METHOD FOR PRODUCING AN ABSORBENT STRUCTURE WHICH INCLUDES A LAYER OF SUPERABSORBENT MATERIAL

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(56) Prior Art Documents
US 4186165
US 4537590

(57) Claim

1. A method for producing an absorbent structure in an absorbent article such as a diaper, sanitary napkin, panty guard, incontinence guard and like article, characterized in that the absorbent structure is produced by laying an intermediate layer containing essentially superabsorbent material between an upper absorbing layer and a bottom absorbing layer of defibered cellulose pulp moisturized to at least 10%, or tissue moisturized to at least 20%, calculated on the weight of the cellulose pulp or the tissue in a dry state, and thereafter compressing the composite structure between one or more heated pairs of rolls, wherewith the moisture in the immediate proximity of the heated rolls is vapourized by the heat and condensed in the colder intermediate layer of superabsorbent material located further down in the material, and wherein this intermediate layer is bound in itself to form a stable layer and also binds to the surrounding cellulose pulp layers or tissue layers.

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(54) Title: A METHOD FOR PRODUCING AN ABSORBENT STRUCTURE WHICH INCLUDES A LAYER OF SUPERABSORBENT MATERIAL

(57) Abstract

A method for producing an absorbent structure intended for use in an absorbent article, such as a sanitary napkin, incontinence guard, diaper, wherein the absorbent structure in produced by laying a layer of essentially superabsorbent material between two layers of defibered and moisturized cellulose pulp or tissue, whereafter the composite structure is calendared between one or more pairs of heated rolls, wherewith the layer of superabsorbent material binds in itself and forms a stable layer, which binds to the surrounding cellulose pulp layers or tissue layers. The absorbent structure exhibits excellent absorption properties and can be made very thin. The structure can be manufactured without superabsorbent material being spread around the manufacturing machine during the production process, or escaping from the finished absorbent article when packaging, transporting or using the article.

A METHOD FOR PRODUCING AN ABSORBENT STRUCTURE WHICH INCLUDES A LAYER OF SUPERABSORBENT MATERIAL

Background

The present invention relates to a method for producing an absorbent structure for use in an absorbent article, such as a sanitary napkin, incontinence guard, diaper and like articles.

Many different types of absorbent articles of this kind are known to the art. The absorbent body of such articles is produced conventionally by dry-defibering cellulose pulp contained, for instance, in reels, bales or sheets, and converting the cellulose pulp in a fluff state to a pulp mat, sometimes while mixing so-called superabsorbents in the pulp mat, these superabsorbents being polymers which are capable of absorbing many times their own weight in liquid or body fluid.

EP 0,122,042 describes a method of manufacturing an absorbent structure which includes superabsorbent material. The cellulose pulp is first defibered to form cellulose fibres, so-called fluff pulp, whereafter a mixture of these fibres and water-insoluble hydrogel particles are air-laid to form a web from which the absorbent structure is formed and subsequently compressed to a density of 0.15-1.0 g/cm^3.

The pulp body is compressed with the intention of reducing its bulk and also with the intention of enhancing its liquid wicking properties. With the majority of sanitary products a thin article is desired so that the article can be worn as discretely as possible.

Superabsorbent material is normally used in the form of granules or small particles. It may be found difficult to bind these small particles satisfactorily in the absorbent structure, which is one problem associated with the use of superabsorbent material. The method described, for instance, in EP 0,122,042 involves the risk of superabsorbent material being spread in and around the manufacturing plant, and also involves the risk of particles

of superabsorbent material escaping from the finished pulp core when packaging, transporting or using the core. When manufacturing products which include superabsorbent material, the aforesaid problems become greater with thinner products.

Superabsorbent particles often have sharp edges and are therefore at times able to perforate the liquid-impermeable sheets of absorbent articles, unless preventative measures are taken. It is also important to obtain intimate contact between fibres and superabsorbent material, in order to achieve effective transference of liquid between the two materials.

Furthermore, the absorbent body may include other ingredients that are intended, for instance, to improve its ability to take-up or disperse liquid, or to increase its coherency and its ability to resist deformation while in use.

A very large part of the production plant used by the manufacturers of the aforesaid sanitary articles is comprised of defibrating equipment, pneumatic conveyor systems and mat-forming equipment. This production plant is often followed by equipment for compressing the finished pulp mat or the finished sanitary product.

It is known from US-A 3,017,304 that a surface sheet containing paper bonds and having a higher density and greater strength than the original cellulose pulp mat can be obtained, by spraying water onto a cellulose pulp mat and then compressing the mat. Such a layer is sometimes called a "Burgeni layer". It is also known from US-A 4,186,165 to compress a cellulose pulp mat that contains superabsorbent material with the aid of heated rolls and without adding water, and therewith obtain in the cellulose pulp mat an inner layer which has a higher density and greater strength than in the original pulp mat. The particles of superabsorbent material are bound to the structure in this layer, and the layer can also be obtained at a desired level in the structure by varying the temperature difference between the rolls. However, when practicing this method, the particles of superabsorbent material that are present in remaining parts of

the pulp mat remain only loosely bound in the structure. Neither is it possible with this method to obtain a structure in which only one layer contains superabsorbent material and where this layer is surrounded by one or more layers which are free from such material, which is desired in some product applications.

Summary of the Invention

An object of the present invention is to provide a thin absorbent structure which includes a layer which contains bound superabsorbent material and which can be included in an absorbent article of the kind defined in the introduction. The absorbent structure shall exhibit very good absorption properties and it shall be possible to produce the structure without spreading superabsorbent material around the manufacturing plant during the production process, or without the superabsorbent material escaping from the finished absorbent article when packaging, transporting or using the article.

This object is achieved by means of the present invention, in that the absorbent structure is produced by placing a layer that contains essentially superabsorbent material between two layers of defibered and moistened cellulose pulp or tissue, and then calendaring the composite structure between one or more heated pairs of rolls, wherein the moisture in the immediate proximity of the heated rolls is vapourized by the heat emitted therefrom and then condensed in the colder layer of superabsorbent material located further down in the material, and wherein said layer is self-binding and able to form a stable layer; and in that said layer is bound to the surrounding cellulose pulp layers or tissue layers.

Brief Description of the Drawing

Figure 1 illustrates schematically equipment for manufacturing an absorbent structure in accordance with the inventive method; and

Figure 2 illustrates schematically an exemplifying embodiment of an absorbent article produced in accordance with the invention.

Description of the Invention

The object of the present invention is to provide an absorbent structure which includes superabsorbent material and which can be included in an absorbent article, such as a sanitary napkin, panty guard, incontinence guard, diaper and like articles. The liquids concerned are primarily urine and blood. The absorbent structure shall exhibit very good absorption properties, both with regard to its ability to quickly take-up liquid and its ability to disperse the liquid throughout the material. Certain layers of the absorbent structure will preferably contain no superabsorbent material, and it shall be possible to produce a very thin structure. It shall also be possible to produce the structure without spreading superabsorbent material in and around the manufacturing machine during the manufacturing process and without articles of superabsorbent material escaping from the finished pulp core or from the absorbent article when packaging, transporting or using the article.

This object has been achieved in accordance with the invention by producing the absorbent structure in accordance with a method in which a layer that contains essentially superabsorbent material is placed between two layers of defibered and moistened cellulose pulp or moistened tissue, and then calendaring the composite structure by compressing the structure between one or more heated pairs of rolls. The moisture in the immediate proximity of the heated rolls is vapourized by the heat emitted therefrom and is then condensed in the colder layer of superabsorbent material located deeper in the material. This layer is herewith bound in its self and formed into a stable layer, and the layer is bound to the surrounding cellulose pulp layers or tissue layers. The cellulose pulp or the tissue used may be moist from the outset or may be moistened at an early stage of the manufacturing process, although the outer surfaces of the cellulose pulp or the tissue may advantageously be sprayed with moisture immediately prior to calendaring the pulp, which sim-

plifies the manufacturing process while still enabling moisture to be transported in- to the layer of superabsorbent material in the compression and heating stage. When an upper or lower layer is constituted of cellulose pulp, the moisture content of this layer shall be 10-40 %, preferably 15-30 % and more preferably 20-25 %, calculated on the dry weight of the cellulose pulp. When an upper or lower layer is constituted of tissue, the moisture content of this layer shall be 20-70%, preferably 40-60% and more preferably 45-55%, calculated on the dry weight of the tissue layer.

The properties of the different layers in the structure can be controlled to suit different product applications, by using as the starting materials for the absorbent structure, two separate fluff pulp layers or tissue layers between which the layer of superabsorbent material is placed. One or both of the fluff pulp layers may, for instance, be free from superabsorbent material. The various fluff pulp layers may be comprised of different cellulose pulps or may be the same type of cellulose pulp, for instance fibres of chemithermomechanically produced pulp (CTMP) or a corresponding product produced from sulphite or sulphate pulp, so-called chemical cellulose pulp. Cellulose fibres that have been stiffened chemically or in some other way may also be used in one or in both layers. When fibres of chemithermomechanically produced pulp are used, these fibres may be flash-dried fibres for instance.

Description of Exemplifying Embodiments

Figure 1 schematically illustrates equipment for manufacturing an absorbent structure in accordance with the invention. There is formed on a wire 9 a web 10 that has a surface weight of 100-1,000 gm/m^2 and a density of 0.05-0.2 g/cm^3. The web comprises an upper layer in the form of an upper pulp web 1 having a surface weight of 100-1,000 g/m^2 and a density of 0.05-0.2 g/cm^3, and a lower pulp web 2 having a surface weight of 50-1,000 g/m^2 and a density of 0.05-0.2 g/cm^3, and a layer of essentially superabsorbent material 3 lying between said upper and lower layers and

having a surface weight of 50-500 g/m^2 and a density of 0.4-0.7 g/cm^3. Water is sprayed onto the web 10 with the aid of spray nozzles 4 and 5, to obtain a moisture content of 15-40 percent, calculated on the total weight of the web in a dry state. The web 10 is compressed to a density of 0.1-0.5 g/cm^3 with the aid of the heated rolls 6 and 7, causing the superabsorbent layer 3 to bind to the two layers 1 and 2. The rolls 6 and 7 have a line pressure of 100-200 kg/cm and a temperature of 120-250°C. The compressed pulp mat 8 has a thickness of 1-4 mm.

Figure 2 illustrates a diaper manufactured by the method according to one embodiment of the invention. The diaper typically comprises an absorbent body 11 enclosed between a liquid-permeable top sheet 12, which is suitably comprised of a soft non-woven material, a perforated plastic film or the like, and which lies proximal to the wearer in use, and a liquid-impermeable bottom or backing sheet 13. The sheets 12 and 13 have parts which extend beyond the absorbent body 11 and are joined together at these parts. The bottom sheet 13 is comprised of a suitable plastic material, for instance polyethylene. It will be understood that the top and the bottom sheets may be comprised of other known materials, within the scope of the invention. The absorbent body 11 may be manufactured totally of the inventive material, or with a combination of inventive material and other material.

If the absorbent structure is manufactured totally from an inventive material, it may have the following construction comprising the various layers of different properties obtained in accordance with the invention. The absorbent structure will then have an upper liquid or fluid entry layer 14, an intermediate layer 15 and a bottom layer 16.

The purpose of the entry layer 14 is to take-up and disperse a given quantity of liquid quickly. The liquid shall be held loosely in the fibre structure and drained rapidly therefrom. The entry layer 14 is preferably comprised of an upper layer of inventive material and is composed of relatively stiff or rigid

fibres which provide a relatively open fibre structure, even after compression and wetting. For instance, the entry layer 14 may be comprised of chemically stiffened cellulose fibres and will preferably contain less than 10 percent superabsorbent material, calculated on the weight of the structure in a dry state.

The purpose of the intermediate layer 15 is to bind absorbed liquid in the interior of the absorbent structure, so as to prevent liquid returning and wetting the wearer's skin. The intermediate layer 15 contains a high percentage of superabsorbent material, a suitable percentage in this respect being 60-90 percent by weight calculated on the weight of the structure in a dry state.

The purpose of the bottom layer 16 is to disperse the liquid that penetrates through the intermediate layer 15 to parts of the absorbent body 1 that have not yet been utilized. Another purpose of the bottom layer 16 is to protect the liquid-impermeable bottom sheet 13 against perforation by particles of superabsorbent material. The bottom layer 16 is preferably comprised of the bottom layer of a material that has been constructed in accordance with the invention, and may be comprised of chemical fluff pulp and contain 5-20 percent superabsorbent material calculated on the weight of the structure in a dry state.

The various layers may have different shapes and sizes. The absorbent structure is normally combined with some type of elastication, among other things in the crotch region, so as to improve the fit and the function of the product.

It will be understood that the invention is not restricted to the illustrated exemplifying embodiment thereof and that other embodiments are conceivable within the scope of the following Claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for producing an absorbent structure in an absorbent article such as a diaper, sanitary napkin, panty guard, incontinence guard and like article, characterized in that the absorbent structure is produced by laying an intermediate layer containing essentially superabsorbent material between an upper absorbing layer and a bottom absorbing layer of defibered cellulose pulp moisturized to at least 10%, or tissue moisturized to at least 20%, calculated on the weight of the cellulose pulp or the tissue in a dry state, and thereafter compressing the composite structure between one or more heated pairs of rolls, wherewith the moisture in the immediate proximity of the heated rolls is vapourized by the heat and condensed in the colder intermediate layer of superabsorbent material located further down in the material, and wherein this intermediate layer is bound in itself to form a stable layer and also binds to the surrounding cellulose pulp layers or tissue layers.

2. A method for producing an absorbent structure according to claim 1, characterized in that at least one upper or one bottom layer is constituted of defibered cellulose pulp, and by moisturizing this defibered cellulose pulp to a moisture content of 10-40% calculated on the weight of the cellulose pulp or the tissue in a dry state.

3. A method for producing an absorbent structure according to claim 1 wherein the defibered cellulose pulp is moisturized to a moisture content of 15-30% calculated on the weight of the cellulose pulp or the tissue in a dry state.

4. A method for producing an absorbent structure according to claim 1 wherein the defibered cellulose pulp is moisturized to a moisture content of 20-25% calculated on the weight of the cellulose pulp or the tissue in a dry state.

AUSTRALIAN PATENT OFFICE

5. A method for producing an absorbent structure according to claim 1, characterised in that at least one upper or one bottom layer is constituted of tissue, and by moisturizing this tissue to a moisture content of 20-70% calculated on the weight of the cellulose pulp or the tissue in a dry state.

6. A method for producing an absorbent structure according to claim 1, wherein the tissue is moisturized to a moisture content of 40-60% calculated on the weight of the cellulose pulp or the tissue in a dry state.

7. A method for producing an absorbent structure according to claim 1, wherein the tissue is moisturized to a moisture content of 45-55% calculated on the weight of the cellulose pulp or the tissue in a dry state.

8. A method for producing an absorbent structure according to any one of claims 1 to 7, characterized in that the intermediate layer that contains superabsorbent material originally contains at least 60 percent by weight superabsorbent material, calculated on the weight of the cellulose pulp or the tissue in a dry state.

9. A method for producing an absorbent structure according to any one of claims 1 to 7, characterised in that the intermediate layer that contains superabsorbent material originally contains at least 80% by weight superabsorbent material, calculated on the weight of the cellulose pulp or the tissue in a dry state.

10. A method for producing an absorbent structure according to any one of claims 1 to 7, characterised in that the intermediate layer that contains superabsorbent material originally contains at least 90% by weight superabsorbent material, calculated on the weight of the cellulose pulp or the tissue in a dry state.

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11. An absorbent structure, characterized in that the structure has been produced in accordance with the method according to any one of claims 1 to 10.

12. An absorbent structure according to claim 11, characterized in that the density of the intermediate layer that contains superabsorbent material is 0.2-1.0 g/cm^3.

13. An absorbent structure according to claim 11, characterized in that the density of the intermediate layer that contains superabsorbent material is 0.3-0.7 g/cm^3.

14. An absorbent structure according to claim 11, characterized in that the uppermost absorbing layer has a density of 0.05-0.4 g/cm^3.

15. An absorbent structure according to claim 11, characterized in that the uppermost layer has a density of 0.1-0.3 g/cm^3.

16. An absorbent structure according to claim 11, characterized in that the uppermost absorbing layer has a density of 0.15-0.25 g/cm^3.

17. An absorbent structure according to claim 11, characterized in that the bottom absorbing layer has a density between 0.1-0.5 g/cm^3.

18. An absorbent structure according to claim 11, characterized in that the bottom absorbing layer has a density between 0.15-0.4 g/cm^3.

19. An absorbent structure according to claim 11, characterized in that the bottom absorbing layer has a density between 0.2-0.3 g/cm^3.

20. An absorbent structure according to any one of claims 11 to 19, characterized in that the surface weight is 50-1,500 g/m^2.

AUSTRALIAN PATENT OFFICE

21. An absorbent structure according to any one of claims 11 to 19, characterized in that the surface weight is 100-1,000 g/m^2.

22. An absorbent structure according to any one of claims 11 to 19, characterized in that the surface weight is 200-600 g/m^2.

23. An absorbent structure according to any one of claims 11 to 22, characterized in that the cellulose fibres in the upper absorbing layer and/or the bottom absorbing layer are comprised essentially of fibres of chemithermomechanically produced pulp.

24. An absorbent structure according to claim 23, characterized in that the chemithermomechanical pulp fibres have a curl value of 0.20-0.40.

25. An absorbent structure according to claim 23 or 24, characterized in that the cellulose fibres are comprised essentially of flash-dried cellulose fibres.

26. An absorbent structure according to any one of claims 11 to 22, characterized in that the cellulose fibres in the upper absorbing layer and/or the bottom absorbing layer are comprised essentially of fibres of chemically produced pulp.

27. An absorbent structure according to any one of the preceding claims, characterized in that at least some of the fibres are stiffened cellulose fibres.

28. An absorbent structure according to any one of the preceding claims, characterized in that the percentage of superabsorbent material in the intermediate layer is at least 60 percent by weight calculated on the total weight of the structure in a dry state.

AUSTRALIAN PATENT OFFICE

29. An absorbent structure according to any one of the preceding claims, characterized in that the percentage of superabsorbent material in the intermediate layer is at least 80 percent by weight calculated on the total weight of the structure in the dry state.

30. An absorbent structure according to any one of the preceding claims, characterized in that the percentage of superabsorbent material in the intermediate layer is at least 90 percent by weight calculated on the total weight of the structure in the dry state.

31. An absorbent structure according to any one of the preceding claims, characterized in that the percentage of superabsorbent material in the upper absorbing layer is lower than 10 percent by weight, calculated on the total weight of the structure in a dry state.

32. An absorbent structure according to any one of the preceding claims, characterized in that the percentage of superabsorbent material in the bottom absorbing layer is at most 20 percent by weight calculated on the total weight of the structure in a dry state.

33. An absorbent structure according to any one of the preceding claims, characterized in that the percentage of superabsorbent material in the bottom layer is at most 10 percent by weight calculated on the total weight of the structure in a dry state.

34. An absorbent structure according to any one of the preceding claims, characterized in that the finished structure has a moisture content of 3-20 percent by weight calculated on the total weight of the structure.

35. An absorbent structure according to any one of the preceding claims, characterized in that the finished structure has a moisture content of 4-18 percent by weight calculated on the total weight of the structure.

AUSTRALIAN PATENT OFFICE

36. An absorbent structure according to any one of the preceding claims, characterized in that the finished structure has a moisture content of 8-12 percent by weight calculated on the total weight of the structure.

37. An absorbent article, such as a diaper, sanitary napkin, panty guard, incontinence guard and like article comprising a liquid-permeable top sheet, a generally liquid-impermeable bottom sheet or backing sheet and an absorbent body placed therebetween, characterized in that the absorbent body includes an absorbent structure according to any one of claims 11 to 36.

DATED this 21st day of August 1997

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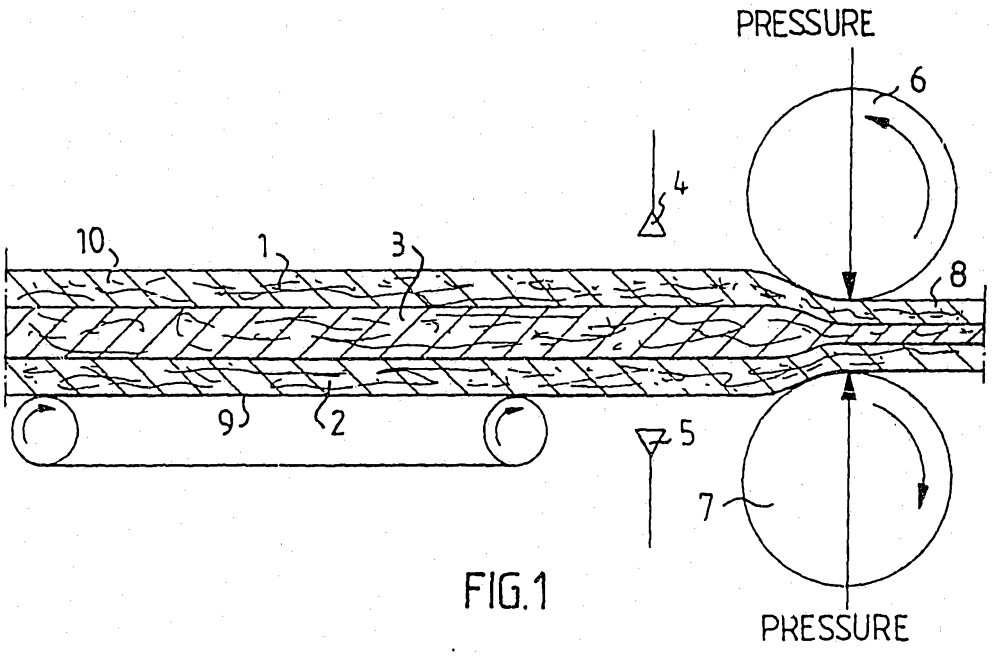


FIG.1

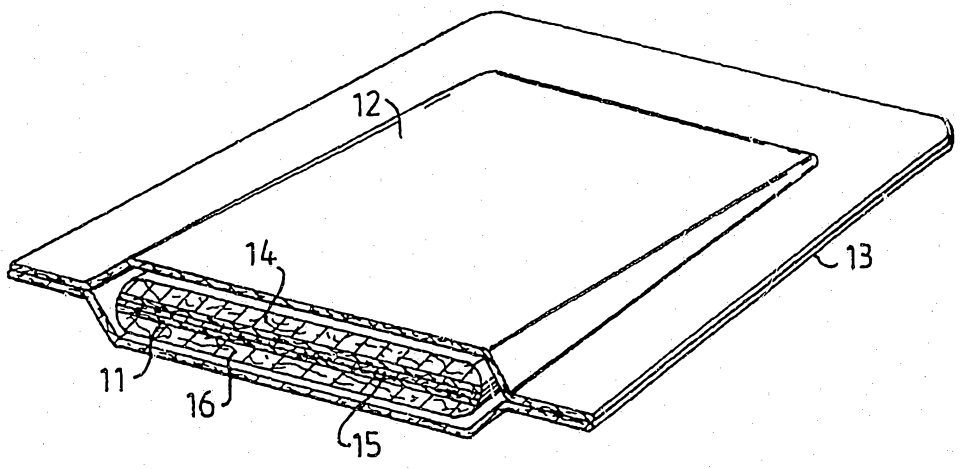


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/00383

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61F 13/48
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)

IPC6: A61F

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, 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.
X	US 4186165 A (G. M. ABERSON ET AL), 29 January 1980 (29.01.80) --	1-19
X	US 4537590 A (H. A. PIENIAK ET AL), 27 August 1985 (27.08.85) --	1-19
X	DK 153066 B (MÖLLER & JOCHUMSEN A/S), 13 June 1988 (13.06.88) --	1-19

☐ Further documents are listed in the continuation of Box C. ☒ See patent family 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" erlier 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	Date of mailing of the international search report
28 July 1995	03 -08- 1995
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Göran Karlsson Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

29/05/95

International application No.
PCT/SE 95/00383

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4186165	29/01/80	BE-A,A- 869988	18/12/78
		US-A- 4103062	25/07/78
US-A- 4537590	27/08/85	AU-B- 558202	22/01/87
		AU-A- 2104283	17/05/84
		CA-A- 1209752	19/08/86
		EP-A,A,A 0108637	16/05/84
		SE-T3- 0108637	
		GB-A,B- 2131346	20/06/84
		JP-C- 1586799	19/11/90
		JP-B- 2009823	05/03/90
		JP-A- 59135149	03/08/84
		JP-A- 61029350	10/02/86
		US-A- 4500315	19/02/85
		US-A- 4540454	10/09/85
		US-A- 4573988	04/03/86
DK-B- 153066	13/06/88	NONE	