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(54) Disposable, moisture vapour permeable, liquid impermeable mattress cover assembly having an improved structure

(57) The present invention relates to a disposable mattress cover assembly for the formation of a protective cover capable of completely encasing a mattress. The disposable mattress cover assembly comprises a first and a second layer that are combined together by means of cooperating joining means in order to form the protective mattress cover. The disposable mattress cover assembly of the present invention can find a variety of applications wherein moisture vapour permeability combined with liquid imperviousness are desirable, combined with easy of use.

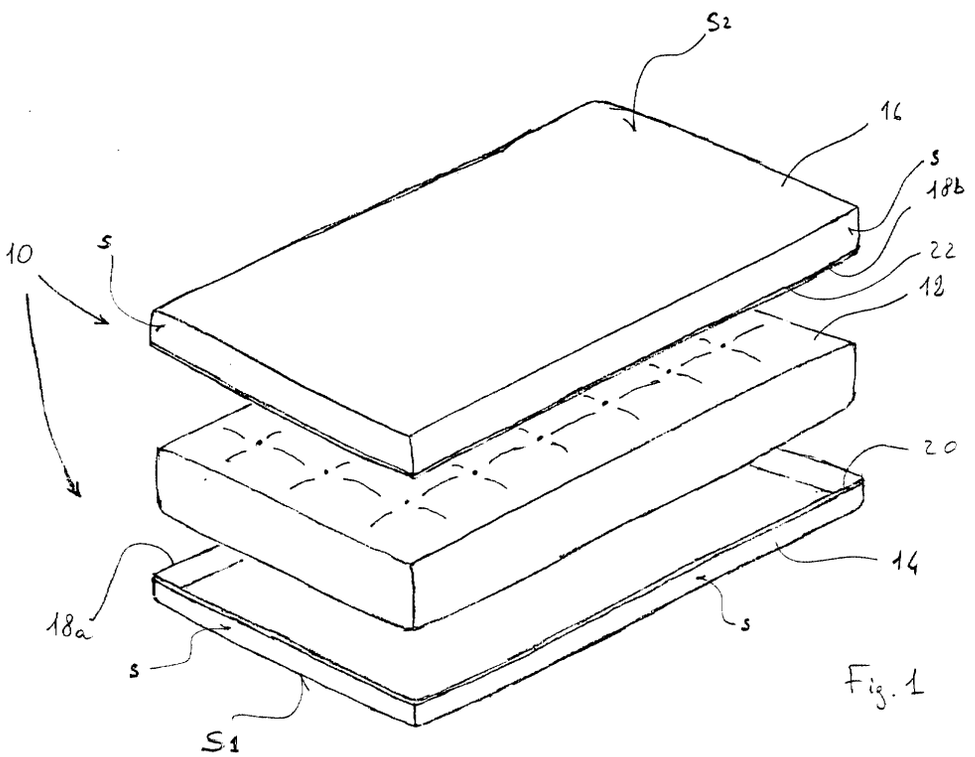

Fig. 1

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Description

Field of the Invention

[0001] The present invention relates to protective disposable mattress covers which are moisture vapour permeable and liquid impermeable and comprise an improved structure. The protective mattress covers of the present invention can find a variety of applications wherein moisture vapour permeability combined with liquid imperviousness are desirable.

Background of the Invention

[0002] Mattress covers, particularly bed mattress covers, are known in the art. A primary use of these articles is to protect mattresses, particularly bed mattresses, but also pillows, cushions, duvets, upholstery, from contaminants, e.g. from dust, liquids, or bodily fluids, for example in environments where a mattress is intended to be used by different users, such as in hospitals, hotels, or rental houses. Known mattress covers are either provided as structures that completely encase a mattress, or as layers covering at least the portion of the external surface of the mattress that has to be protected, typically at least a portion of the surface of the mattress which is intended, in use, to go in direct or indirect contact with the user, corresponding to the upper surface in a bed mattress, a cushion or a pillow. Such mattress covers are provided so that a user can use them in order to provide a mattress with a protective covering, which accordingly can be a partial covering, e.g. substantially limited to an upper surface as explained above, or a total encasing of the mattress.

[0003] More recently mattress covers have been also proposed to act as an allergen barrier to control house mites that live in the dust, typically on and within mattresses where they can find favourable environmental conditions in terms of temperature and nourishment.

[0004] It has long been established that house mites, also known as dust mites, are a source of house dust allergens that not only cause allergies, but also adversely contribute to other pathologies, such as asthma. It has also been established that use of allergen control measures is effective in controlling these conditions. Allergen-proof encasing to contain mites to prevent allergen egress has long been used in mattresses, such as bed mattresses, pillows, cushions, duvets, upholstery. Mattress covers to be used as allergen barrier against dust mites must therefore completely encase the mattress in order to separate the user from dust mites and related allergens.

[0005] Mattress covers come in direct or indirect (i.e. through further intermediate layers, e.g. bed sheets, or pillowcases) contact with the human body, therefore it is important that such covers are moisture vapour permeable for comfort reasons, in addition to being liquid impermeable in order to provide the mattress with the desired protection against external agents. When used as a barrier against dust mites they must also have an allergen barrier capability.

[0006] It is also preferred that mattress covers are disposable, that is, they can be discarded after use with no need of washing them.

[0007] Various examples of disposable mattress covers which are at the same time liquid impermeable and breathable, i.e. moisture vapour permeable, or at least capable of allowing a certain degree of air circulation without being truly breathable, are known in the art.

[0008] For example US 5727266 describes a cover for completely encasing a pillow or a cushion, which is made of liquid and moisture vapour impermeable material having vent holes, and also comprising a facing layer of an air permeable material located on the upper surface of the cover.

[0009] A disposable protective garment or bedding article constituted of a two-layer laminated structure is also described in CA 2083630, which is breathable and particularly soft.

[0010] FR 2747899 also discloses a breathable disposable laminated bed cover in the form of a sheet for covering typically the upper surface of a bed mattress.

[0011] US 5950264 describes a breathable, elastic, reusable encasing for bedding articles having barrier capability against dust mites and the related allergens. The encasing comprises a laminated structure made of an elastic stretch knit fabric laminated to an elastic, breathable polymeric film.

[0012] Therefore the mattress covers known from the prior art, such as those mentioned above, either comprise disposable, lightweight, cheap structures which are liquid impervious and moisture vapour permeable, and owing to their intrinsic relative weakness are usually intended for partial encasing of a mattress, typically covering the upper surface thereof, or alternatively structures capable of completely encasing a mattress. In this latter case, however, the known covers are not truly moisture vapour permeable, such as those described in the above mentioned US 5727266, or they comprise rather complex reusable structures such as those mentioned in US 5950264, which are sufficiently strong in order to withstand their intended use, and are also in turn rather expensive. Not disposable structures also imply the need of being washed or sanitised on a regular basis during their life. Mattress covers intended for complete encasing of a mattress, such as those described in US 5950264, are also difficult to use, owing to the rather large dimensions of the mattresses of known conventional sizes, particularly in the case of bed mattresses.

[0013] There is therefore the need for mattress covers which are disposable, therefore of cheap and simple construction, liquid impermeable and moisture vapour permeable, and which can also be easily used in order to provide conventional mattresses, e.g. bed mattresses, with a complete encasing, so combining the advan-

tages of lightweight disposable structures in terms of cost, user comfort, ease of manufacture and of use, with the increased protection provided by covers which completely encase a mattress.

[0014] Preferably such structures should also provide a barrier against dust mites and the related allergens.

[0015] It is therefore an object of the present invention to provide a disposable mattress cover assembly for forming a disposable, liquid impervious and moisture vapour permeable protecting mattress cover for completely encasing a mattress, which owing to an improved structure overcomes the above mentioned problems.

[0016] It is a further object of the present invention to provide a disposable mattress cover assembly for forming a disposable protective mattress cover for totally encasing a mattress, which is liquid impermeable and is further provided with moisture vapour permeability where it is most desired.

Summary of the Invention

[0017] The present invention relates to a disposable mattress cover assembly for forming a protective cover to completely encase a mattress. The disposable mattress cover assembly comprises a first layer and a second layer which are separate until use, wherein the first layer and the second layer have an outer periphery;

[0018] The first layer comprises joining means for cooperation with cooperating joining means of the second layer, in order to form a cover to completely encase a mattress, and at least one of the first layer or of the second layer comprises a moisture vapour permeable, liquid impermeable material.

[0019] The present invention further relates to the single layers forming a mattress cover assembly.

Brief Description of the Drawings

[0020]

FIG. 1 is an exploded perspective view of a preferred embodiment of the disposable mattress cover assembly of the present invention showing the disposable mattress cover layers before they are combined together to form the cover, and a bed mattress comprised therebetween;

FIG. 2 is a perspective view of the disposable mattress cover assembly of FIG. 1 after formation of the mattress cover, seen from the side thereof that is intended to face the user.

Detailed Description of the Invention

[0021] According to the present invention, a disposable mattress cover assembly is provided which comprises a first and a second layer that are separate until use, and that can be combined together by a user in order to form a protective cover to completely encase a mattress comprised therebetween. At least one of the layers comprises a moisture vapour permeable, liquid impermeable material, therefore providing the resulting mattress cover with liquid imperviousness and moisture vapour permeability, at least on part of its surface.

[0022] The term "mattress", as used herein, refers to a fabric case filled with resilient material, such as for example cotton, hair, feathers, foam rubber, or an arrangement of coil springs, and therefore comprises particularly bed mattresses, but also pillows, cushions, comforters, duvets, upholstered portions of beds (such as headboards), or of sofas or armchairs.

[0023] In the context of the present invention the term "assembly" indicates the collection of individual elements which are separate until use, and which are to be put together by a user in order to form a mattress cover for completely encasing a mattress. The term "kit" can also be used as an alternative to "assembly" in the context of the present invention, and having the same meaning as explained above.

[0024] The term "use", as used herein, refers to the period of time that starts when the disposable mattress cover assembly, i.e., the individual elements forming this assembly, is taken by a user and combined in order to form a mattress cover for completely encasing a mattress.

[0025] As used herein, the term "separate until use" refers to individual elements, namely a first and a second layer of the disposable mattress cover assembly, which can be positioned substantially independently of each other in order to be combined to form a mattress cover to completely encase a mattress. This comprises the preferred case of two layers which are distinct and separate from each other before use, i.e. in the disposable mattress cover assembly of the present invention, before they are combined together in order to form the mattress cover.

[0026] This also comprises the case in which the two layers are partially joined together before use along a minor portion of the respective outer periphery, in a way which allows a first layer to be first laid on a surface, with subsequent positioning of a mattress thereupon with no need of touching or moving the second layer, and with final positioning of the second layer over the mattress, and complete joining of the two layers by means of cooperating joining means, e.g. along the remaining major portion of the respective outer periphery, in order to form a mattress cover to completely encase a mattress. For example, the first and the second layer of the disposable mattress cover assembly of the present invention can be two substantially identical rectangular flat layers joined together along a common edge corresponding to a side of the rectangle before use. The first layer can be laid on a surface with the second layer spread open aside, the mattress can be put onto the first layer, and finally the second layer can be folded over the mattress and joined to the first layer by means of the cooperating

joining means along the remaining three sides of the rectangle formed by the outer peripheries thereof.

[0027] This also comprises the case when a first and a second layer which are distinct and separate from each other are provided together to the user, for example being sold in a single package where they are in contact with each other, since they must in any case be first separated in order to be subsequently combined to form the mattress cover.

[0028] The terms "joined" or "affixed" or "attached", as used herein, encompasses configurations where a first member is directly connected to a second member and configurations where a first member is indirectly connected to a second member by connecting the first member to an intermediate member or members which in turn are connected to the second member.

[0029] FIG. 1 is an exploded view of a preferred embodiment of the disposable mattress cover assembly 10 of the present invention before they are combined to form the mattress cover 24 of FIG. 2. FIG. 1 also shows a mattress 12, which in the preferred embodiment illustrated herein is a bed mattress having a known parallelepipedal form, and which is intended to be completely encased in the mattress cover 24 formed from the mattress cover assembly 10. The mattress cover assembly 10, which is a bed mattress cover assembly in the illustrated preferred embodiment, comprises a first layer 14 and a second layer 16 which are distinct and separate until use, and both layers 14 and 16 comprise an outer periphery 18a, 18b respectively.

[0030] While in principle both the first and the second layer can be flat, planar layers, which owing to their inherent flexibility are capable of assuming a suitable three dimensional shape when combined by the user into a mattress cover for completely encasing a mattress, it is preferred that at least one of said first or of said second layer is provided in the disposable mattress cover assembly already formed into a three dimensional shape such that, when the layers are combined together, they can form a mattress cover to completely encase a mattress, which cover has an overall shape which more suitably approximates the particular shape of the mattress. Said "pre formed" three dimensional shape of the first and/or of the second layer is however such that it does not imply that a mattress has to be actually inserted within a first or a second layer, e.g. shaped similarly to a sack, a bag, or a tube, i.e. said preferred pre formed three dimensional shape only has one major surface or portion.

[0031] Of course, as it is known to the man skilled in the art, by saying "already formed into a three dimensional shape", with reference to the first and the second layer of the disposable mattress cover assembly of the present invention, it is meant that the layers are rather predisposed to form this shape, e.g. by means of suitably bonding, stitching, gluing a sheet of material forming the layer in a way known in the art, or by the inclusion of elastics or strings in the layer, e.g. along at least part of the outer periphery of a planar layer, etc., without necessarily actually showing said shape when they are taken alone, since they are typically made of flexible material which is not per se capable of maintaining a three dimensional shape.

[0032] In the preferred embodiment of the present invention illustrated in FIG. 1 both the first layer 14 and the second layer 16 are provided in the bed mattress cover assembly 10 as being already formed into a three dimensional shape roughly corresponding to each of the two halves of a parallelepipedal box which in turn approximates the known parallelepipedal shape of the bed mattress 12, and is therefore suitable for completely encasing the bed mattress 12. Each layer 14, 16 comprises a major portion or surface S1, S2 corresponding to a respective major face of the box, and four minor portions s, each one corresponding approximately to one half of each of the four minor faces of the box adjacent to the major faces, as shown in FIG. 1, wherein when these two layers are combined together they form a mattress cover 24 having a parallelepipedal box shape, as better shown in FIG. 2.

[0033] Alternatively, other embodiments of the first and second layers of a disposable mattress cover assembly are possible according to the present invention. For example, in the context of a bed mattress cover assembly capable of forming a bed mattress cover having a final "box shape" similar to that illustrated in FIGS. 1 and 2, a first layer can substantially comprise only a major portion S1 corresponding to a major face of the box, while a second layer substantially comprises a major portion S2 corresponding to the second major face of the box, and four minor portions s corresponding to the entire four minor faces of the box adjacent to both major faces. Of course other combinations are also possible to provide a disposable mattress cover assembly for forming a mattress cover to completely encase a mattress, in order to better accommodate mattresses of various shapes.

[0034] The first layer 14 comprises joining means 20 which, in the preferred embodiment of FIG. 1, are located along the respective outer periphery 18a, and are intended for cooperation with cooperating joining means 22 of the second layer 16, which in the preferred embodiment of FIG. 1 are also comprised along the respective outer periphery 18b of said second layer 16. Of course the terms "joining means" and "cooperating joining means", respectively referred to elements 20 and 22 in FIG. 1, are interchangeable, and means 20 and 22 can also be referred to collectively as "cooperating joining means".

[0035] When the first and the second layers 14 and 16 of the disposable mattress cover assembly 10 of the present invention are combined together by a user, by joining the joining means 20 of the first layer 14 to the cooperating joining means 22 of the second layer 16, the two layers are actually bonded together along a common periphery 18, and form a cover 24 which com-

pletely encases a mattress, e.g. a bed mattress 12, as shown in FIG. 2.

[0036] According to the present invention, in order to form a cover to completely encase a mattress, particularly a bed mattress 12 in the embodiment illustrated in FIGS. 1 and 2, the user takes the first layer 14 of the disposable mattress cover assembly 10 and typically lays it on a surface, preferably a flat surface. In the case illustrated in FIG. 1, where the mattress is actually a bed mattress, this surface can advantageously correspond to the bed structure where the bed mattress is to be positioned, usually the bed frame, but it may be different for different types of mattresses. The user then positions the bed mattress 12 over the first layer 14, and centered with respect to it, duly positioning the side portions s of the first layer 14 along the side faces of the mattress 12 and parallel to them. The second layer 16 is subsequently positioned over the mattress 12 with the respective side portions s so disposed that the joining means 22 along the respective outer perimeter 18b are put in contact with the cooperating joining means 20 along the outer perimeter 18a of the first layer 14. The user finally bonds together the first layer 14 to the second layer 16 by means of the cooperating joining means 20 and 22, therefore forming a disposable bed mattress cover 24 which completely encases the bed mattress 12.

[0037] The cooperating joining means 20, 22 can be any type of suitable joining means known in the art, which can provide a safe and effective bonding of the first and second layer in order to form the mattress cover to completely encase a mattress.

[0038] Preferably, the cooperating joining means 20, 22 in the first and second layer 14, 16 of the disposable mattress cover assembly 10 of the present invention are releasable, in that they allow the seal between cooperating joining means 20, 22 to be released without destroying or damaging the cooperating joining means 20, 22 themselves, or the structure of the first and second layers 14, 16 where said cooperating joining means are positioned. Even more preferably the cooperating joining means 20, 22 are also refastenable, in order to allow the seal to be released and subsequently reconstituted between the same first and second layers 14, 16, or alternatively after replacement of one of the layers.

[0039] Even more preferably, the cooperating joining means 20, 22 are such that they provide a tight seal.

[0040] Such cooperating joining means 20, 22 can for example comprise adhesive areas, e.g. in a continuos or discontinuous pattern, in one of the layers, and a target zone in the other layer where the adhesive is intended to adhere. Adhesive areas can be protected until use by a removable release paper in order to prevent the adhesive from drying out or adhering prematurely to another surface than the target zone. Any suitable adhesive or glue known in the art can be used herein, for example pressure sensitive adhesives. The cooperating joining means can also comprise, on both the first and the second layer, areas of an adhesive that is capable of adhering only on itself, and this would avoid the use of a protective release paper. Alternatively, mechanical fastening means, such as hook and loop fasteners such as those marketed under the tradename VELCRO, zip fasteners, snaps or holders, buttons, strings or laces can be used. Plastic fasteners such as those marketed under the tradename ZIPLOK are also particularly preferred.

[0041] At least one of the first layer 14 or of the second layer 16 comprises a material which is liquid impermeable and moisture vapour permeable, preferably air permeable, in order to provide the disposable mattress cover 24 formed from the disposable mattress cover assembly 10 of the present invention with breathability combined with liquid imperviousness. Liquid imperviousness of the layers 14, 16 forming the disposable bed mattress assembly 10 is beneficial since it provides the encased mattress with protection from contaminants, e. g. dust, liquids, or typically bodily fluids. Moisture vapour permeability is important for comfort reasons, to the extent that such mattress covers come in direct or indirect contact with the human body.

[0042] Preferably, the layers of the disposable mattress cover assembly of the present invention are such that they also provide a barrier against dust mites and the related allergens, preventing their egress from within the mattress cover. In this case the cooperating joining means shall preferably provide a tight seal.

[0043] Suitable materials for the layers of the disposable mattress cover assembly of the present invention are also preferably pleasant to the touch, soft, and have a good drape.

[0044] An advantage of the disposable mattress cover assembly 10 of the present invention is that it allows a simplified formation of a mattress cover 24 for completely encasing a mattress, which is particularly beneficial when the mattress has rather large dimensions and weight, such as for example for the bed mattress 12 illustrated in FIGS. 1 and 2. It is in fact not necessary to introduce a mattress into an already partially or totally formed mattress cover through an aperture, which is particularly difficult in case of large and heavy mattresses, such as bed mattresses, and moreover in any case requires that the material forming the cover is rather strong in order to withstand the stresses implied in this operation.

[0045] On the contrary, the disposable mattress cover assembly of the present invention allows the use of materials for the first and the second layer of the assembly which can be lighter and cheaper, which is beneficial in the context of a disposable mattress cover assembly. Moreover, since the materials for the first and the second layer of the mattress cover assembly of the present invention need to resist to a lesser stress during the use, they can be thinner, and therefore provide a better moisture vapour permeability in addition to liquid imperviousness, and preferably also to a barrier effect for dust mites and related allergens, while being also softer and

more comfortable for the user. The disposal of the mattress cover components after use also implies a lesser waste of materials.

[0046] In the disposable mattress cover assembly of the present invention the first and the second layer can also comprise different materials. For example, only the layer that is intended, in use, to come in direct or indirect contact with a user can be liquid impermeable and also moisture vapour permeable, for example the second layer 16 in the embodiment illustrated in FIGS. 1 and 2, while the other layer, namely the first layer 14 in the illustrated embodiment, can comprise a cheaper liquid impermeable material which is not provided with moisture vapour permeability. Both layers can be generally thin and soft as explained above and still provide the required function.

[0047] Another advantage of the disposable mattress cover assembly of the present invention is that, while both the first and the second layers are disposable, hence are not intended to be washed or refurbished after use, but are intended to be disposed of, one of the two layers can nevertheless be changed more often than the other. For example, in the embodiment of the present invention illustrated in FIGS. 1 and 2 which relates to a bed mattress cover assembly and to the respective bed mattress cover, the second layer 16, which is typically intended to come in direct or indirect contact with the human body, can be disposed of and changed more often than the first layer 14. Of course in this preferred embodiment the cooperating joining means 20, 22 are refastenable, in order to allow a safe breaking of the bond between the first layer 14 and the second layer 16, and subsequent formation of a new bond between a new second layer 16 and the first layer 14 still kept in its original position. This allows less waste of material, which is particularly beneficial when both layers 14 and 16 comprise a material which is liquid impervious and moisture vapour permeable, and an even increased ease of use.

[0048] In the preferred embodiment of the present invention illustrated in FIGS. 1 and 2 the cooperating joining means 20, 22 of the first and second layer 14 and 16 are positioned along the respective outer peripheries 18a and 18b. However, they can be also positioned elsewhere, provided that the layers can be joined together to form a mattress cover to completely encase a mattress, preferably with a tight seal in case the cover must provide a barrier against dust mites and related allergens. For example, in the preferred case of a bed mattress cover assembly similar to that illustrated in FIG. 1, each of the first and of the second layer can have a construction similar to that of known bed mattress covers constituted by a substantially rectangular sheet with elasticised corners. Each of the first and of the second layer can be independently applied in a known way to a respective upper and lower major surface of a bed mattress, also covering the side faces of the mattress and part of the opposite major surface with the elasticised corners; this also provides, as it is known in the art, a stable and releasable connection to the mattress. The first and the second layer are superimposed to each other in correspondence to at least part of the side faces of the mattress, and together completely encase the mattress. The joining means of one layer can be positioned e.g. along the respective outer periphery, or also somewhat inboard of such periphery, with the cooperating joining means of the other layer suitably positioned in order to create the bond between the layers and form the bed mattress cover to completely encase a bed mattress. For example the cooperating joining means can be respectively positioned on the first and second layer along a line corresponding to the position of the common periphery 18 illustrated in FIG. 2.

[0049] The first and second layer 14, 16 of the disposable mattress cover assembly of the present invention can comprise any suitable known material or structure which is capable of providing a liquid barrier, and preferably also a barrier against dust mites and related allergens, in addition to providing moisture vapour permeability, preferably air permeability, and also having the required characteristics in terms of softness, thickness and strength. Such structures or materials can comprise a single layer, or multiple layers, typically of different materials, laminated together to form a composite. An example are structures comprising thermoplastic microporous films, e.g. laminated to fibrous layers such as nonwoven layers.

[0050] Particularly preferred materials are hydrophilic continuous films, also known as "monolithic films", that do not allow the flow of moisture vapour through open pores or apertures in the material, but do transfer substantial amounts of moisture vapour through the film by absorbing water on one side of the film where the moisture vapour concentration is higher, and desorbing or evaporating it on the opposite side of the film where the moisture vapour concentration is lower. Monolithic films also can be used as such, or preferably in combination with one or more other moisture vapour permeable materials in order to form composite structures to be comprised in the first and/or second layer of the disposable mattress cover assembly of the present invention.

[0051] Such other moisture vapour permeable materials include, but are not limited to: fibres, fibrous batts, non-wovens, wovens, papers, micro-porous or porous membranes, films such as polymeric films, perforated or apertured films and papers, macroscopically expanded films, cloth, etc.

[0052] Said other components may be non-absorbent, absorbent, liquid-containing, etc.

[0053] Preferably the composite structures described above have a moisture vapour transfer rate of at least 100g/m^2·24h, more preferably at least 300 g/m^2·24h, and most preferably at least 500 g/m^2·24h.

[0054] Examples of known liquid impervious, moisture vapour permeable materials or composites that can be used in the first and second layers of the disposable

mattress cover assembly of the present invention are as those disclosed in the documents referred to below.

[0055] WO 95/16746 discloses films prepared from mixtures of a) block copolyether ester, block copolyether amides (e.g. Pebax™) and or polyurethane and b) thermoplastic polymer which is incompatible with a, and c) a compatibiliser. The films are liquid impermeable and have moisture vapour permeability of about 700 g/m^2·day. Also, US 5,447,783 discloses a vapour permeable water resistant multi component film structure having at least three layers. The outer layers are hydrophobic copolyetherester elastomers having a thickness of 1.3-7.6 micrometers and a WVTR of 400-2500 g/m^2·24h and the inner layer is a hydrophilic copolyetherester elastomer having a thickness of 7.6-152 micrometers and a WVTR of at least 3500 g/m^2·24h.

[0056] US 5,445,875 discloses a waterproof, bloodproof and virusproof breathable laminate. The laminate comprises a woven/nonwoven fabric and an extruded film such as Hytrel™ having a thickness of about 1 mil (25.4 micrometers).

[0057] Other composite laminates are described for example in US 5,599,610 which discloses tri-laminated fabric for surgical gowns comprising outer layers of woven fabric and an inner layer of a microporous polyurethane membrane. The microporous film has a thickness of 12-55 micrometers and a MVTR of 1100 g/m^2·24h upright and 5500 g/m^2·24h inverted (ASTM E96-B). Polyetherpolyurethane adhesive is used to join the layers.

[0058] Similarly, US 5,532,053 discloses a high moisture transmission medical film which can be laminated onto a nonwoven material. The laminate film comprises a first layer of polyetherester copolymer and second and third layers selected from a specified group of polymers. The film has a MVTR of greater than 750 g/m^2·24h (ASTM F1249) and a thickness of less than 1 mil (25.4 micrometer) preferably 0.6 mil to 0.75 mil (15 - 19 micrometers).

[0059] US 4,938,752 discloses absorbent articles comprising films of copolyether esters which have reduced water permeability, a water vapour permeability of 500 g/m^2·24h (as measured in a specified described test) and a thickness of 5-35 micrometers. There is no disclosure of a supportive substrate.

[0060] US 4,493,870 discloses a flexible layered waterproof product comprising a textile material covered with a film of a copolyetherester having an MVTR of at least 1000 g/m^2·24h (ASTM E96- 66) having a thickness of 5 to 35 micrometers.

[0061] GB 2024100 discloses a flexible layered water resistant article comprising a microporous hydrophobic outer layer which is moisture vapour permeable but resist liquids and a hydrophilic inner layer of polyetherpolyurethane having a MVTR of above 1000 g/m^2·24h.

[0062] Especially preferred materials to be comprised in the first and second layers 14, 16 of the disposable mattress cover assembly of the present invention are thermoplastic compositions described in our patent applications EP 98110597.6 and EP 98110596.8, and composite structures comprising said thermoplastic compositions, also described herein.

[0063] In our patent application EP 98110597.6 entitled "Low viscosity thermoplastic compositions for moisture vapour permeable structures and the utilisation thereof in absorbent articles", filed on 9 June 1998, thermoplastic compositions are disclosed for making hydrophilic continuous moisture vapour permeable, liquid impermeable layers or films ("monolithic films") having preferred characteristics of moisture vapour permeability and liquid imperviousness. The thermoplastic compositions comprise preferred thermoplastic polymers such as polyurethanes, poly-ether-amides block copolymers, polyethylene-acrylic acid copolymers, polyethylene oxide and its copolymers, poly lactide and copolymers, polyamides, polyester block copolymers, sulfonated polyesters, poly-ether-ester block copolymers, poly-ether-ester-amide block copolymers, polyacrylates, polyacrylic acids and derivatives, ionomers, polyethylene-vinyl acetate with a vinyl acetate content of more than 28 weight %, polyvinyl alcohol and its copolymers, polyvinyl ethers and their copolymers, poly-2-ethyl-oxazoline and derivatives, polyvinyl pyrrolidone and its copolymers, thermoplastic cellulose derivatives, or mixtures thereof.

[0064] Particularly preferred thermoplastic polymers are thermoplastic poly-ether-amide block copolymers (e.g. Pebax™), thermoplastic poly-ether-ester-amide block copolymers, thermoplastic polyester block copolymers (e.g. Hytrel™), thermoplastic polyurethanes (e. g. Estane™), or mixtures thereof.

[0065] Such thermoplastic polymers or mixture of polymers can be typically highly viscous in the melted state at the process conditions that are typical of the known processes of film or layer formation, e.g. an extrusion process involving a high power screw extruder. For example they may have a viscosity higher than 5000 poise at a temperature of 20°C above the DSC (Differential Scanning Calorimetry) melting point, which is the temperature identified as that corresponding to the DSC peak, or corresponding to the highest DSC peak in case of a mixture of polymers showing more than one peak, and at a frequency of 1 rad/sec.

[0066] The viscosity of the preferred thermoplastic polymers or mixture of polymers can be preferably adjusted by including in the thermoplastic composition a suitable plasticiser, or blend of plasticisers, that is compatible with the thermoplastic polymers and that lowers the viscosity of the thermoplastic polymer or mixture of polymers in the melted state.

[0067] The thermoplastic compositions according to EP 98110597.6 comprising the suitable plasticiser or blend of plasticisers have the following complex viscosities (η^*):

50 poise < η^* < 4000 poise, preferably 100 poise < η^* < 2000 poise, more preferably 100 poise < η^* <

1000 poise, at a frequency of 1 rad/s at a temperature of 210°C or less and $\eta^* < 2000$ pose, preferably $\eta^* <$ 1000 poise, more preferably $\eta^* < 500$ poise, at a frequency of 1000 rad/s at a process temperature (T) of 210°C or less, wherein η^* represents the complex viscosity of the thermoplastic polymeric composition. Preferably the temperature T is 200°C or less and more preferably 180°C or less and most preferably from 200°C to 50°C.

[0068] The thermoplastic compositions having the complex viscosity described allow for a film or layer to be coated onto a substrate using typical coating conditions and apparatuses known in the art for the coating of low viscosities hot melt compositions in a layer having a required thickness onto a substrate, while also keeping the advantageous characteristics of the preferred thermoplastic polymers in providing hydrophilic continuous moisture vapour permeable, liquid impermeable layers or films.

[0069] Thermoplastic compositions having such viscosities can also provide very thin films or layers.

[0070] Suitable plasticisers or blend of plasticisers for adjusting such viscosity can be selected from the group consisting of citric acid esters, tartaric acid esters, glycerol and its esters, adipates, sebacates, sorbitol, epoxidized vegetal oils, polymerised vegetal oils, polyols, phthalates, liquid polyesters, glycolates, p-toluene sulfonamide and derivatives, glycols and polyglycols, sorbitan esters, phosphates, monocarboxylic fatty acids (C_8-C_{22}) and their derivatives, and mixtures thereof. This allows to utilise with these preferred compositions typical process conditions known in the art for the direct coating of low viscosity hot melts onto a substrate in order to form a moisture vapour permeable, liquid impervious film or layer.

[0071] It has also been found according to our patent application EP 98110596.8 entitled "Low viscosity thermoplastic compositions for structures with enhanced moisture vapour permeability and the utilisation thereof in absorbent articles", filed on 9 June 1998, that by further selecting the plasticiser or blend of plasticisers to be comprised in the thermoplastic composition from the group of hydrophilic plasticisers consisting of acids, esters, amides, alcohols, polyalcohols, or mixtures thereof, the advantage of an enhanced moisture vapour permeability of the resulting layer or film formed from the thermoplastic composition is also achieved, when compared to a corresponding film or layer formed from a thermoplastic composition comprising the same thermoplastic polymer, but without the plasticiser.

[0072] The preferred hydrophilic plasticiser or blend of hydrophilic plasticisers can also adjust the viscosity of the thermoplastic composition to the preferred values in order to make it processable by coating said thermoplastic composition onto a substrate in a layer or film having a desired thickness.

[0073] Preferred hydrophilic plasticisers according to EP 98110596.8 are citric acid esters, tartaric acid esters, glycerol and its esters, sorbitol, glycolates, and mixtures thereof.

[0074] Preferably the thermoplastic compositions according to EP 98110597.6 and EP 98110596.8 comprises from 10% to 80%, more preferably from 25% to 70% by weight of the thermoplastic composition, of the thermoplastic polymer or mixture of polymers, and from 20% to 90%, preferably from 30% to 75% by weight of the thermoplastic composition, of the suitable plasticiser or blend of plasticisers.

[0075] The thermoplastic compositions according to EP 98110597.6 and EP 98110596.8 may in addition comprise additional optional components to further improve the processibility of the compositions and also the mechanical characteristics as well as other characteristics as tackiness, resistance to ageing by light and oxygen, visual appearance etc., of the films or layers formed from such thermoplastic compositions.

[0076] Such optional components include tackifying resins or blends of tackifying resins having a softening point of 125°C or less. According to EP 98110597.6 and EP 98110596.8 preferred resins, which may be present by up to 50% by weight of the thermoplastic composition, may be selected from rosins and rosin esters, hydrocarbon resins, aliphatic resins, terpene and terpene-phenolic resins, aromatic resins, synthetic C_5 resins, mixtures of synthetic C_5-C_9 resins, and mixtures thereof. Other optional components of said thermoplastic compositions include anti-oxidants, anti-ultraviolets, pigments and mixtures thereof, which may be present within the composition at a level of up to 10% by weight of the composition.

[0077] A thermoplastic composition according to EP 98110597.6 or EP 98110596.8 can be manufactured with a process that will typically comprise the steps of providing the thermoplastic polymer or mixture of polymers and the suitable plasticiser or blend of plasticisers, heating the components and compounding them, e.g. with a known suitable mixer to form the thermoplastic composition in the molten state having the desired complex viscosity η^*.

[0078] According to EP 98110597.6 or EP 98110596.8 a moisture vapour permeable, liquid impervious layer can be formed from the thermoplastic composition of the present invention by coating said thermoplastic composition onto a substrate. The films or layers formed from the thermoplastic compositions of the present invention preferably have a moisture vapour transport rate of at least 100 g/m^2·24h, preferably at least 300 g/m^2·24h, most preferably at least 500 g/m^2·24h with a thickness of the layer of at least 0.5 μm.

[0079] A process for making a layer or film from a thermoplastic composition according to EP 98110597.6 or EP 98110596.8 typically comprises the steps of providing said composition, heating it to make it flowable, and coating said composition in the molten state onto a substrate in a layer having the desired thickness. While said substrate can be simply a formation substrate, onto

which the thermoplastic composition is coated in order to form a film or layer of the desired thickness which is subsequently separated from said substrate and used as such, in a preferred embodiment of the present invention a moisture vapour permeable, water impervious composite is formed which comprises the thermoplastic composition and a substrate onto which said thermoplastic composition is coated, wherein the substrate is also preferably moisture vapour permeable.

[0080] Such embodiment provides a moisture vapour permeable, liquid impervious composite structure wherein the contribution of the layer formed from the thermoplastic composition of the present invention to the performance of the composite material resides only in the provision of a liquid barrier and hence could be advantageously provided as thinly as possible. The remaining performance physical criterion being preferably provided by the provided substrate, that therefore preferably acts also as a support layer. Typical thicknesses of the layer of the thermoplastic composition applied onto a suitable substrate to form a composite structure according to the present invention range from 2 μm to 200 μm.

[0081] The substrate, or support layer may be any useful layer which is preferably also moisture vapour permeable, preferably having a moisture vapour permeability of at least 100 g/m^2·24h, more preferably at least 300 g/m^2·24h, and most preferably at least 500 g/m^2·24h.

[0082] Suitable substrates for use herein as support layers include two dimensional, planar micro and macro-porous films; macroscopically expanded films; formed apertured films; nonwoven and woven layers. According to EP 98110597.6 and EP 98110596.8 the apertures in said layer may be of any configuration, but are preferably spherical or oblong and may also be of varying dimensions. The apertures preferably are evenly distributed across the entire surface of the layer, however layers having only certain regions of the surface having apertures are also envisioned.

[0083] Suitable two dimensional porous planar layers may be made of any material known in the art, but are preferably manufactured from commonly available polymeric materials. Suitable materials are for example Goretex™ or Sympatex™ type materials well known in the art for their application in so-called breathable clothing. Other suitable materials include XMP-1001 of Minnesota Mining and Manufacturing Company, St. Paul, Minnesota, USA and Exxaire XBF-101W, supplied by the Exxon Chemical Company. As used herein the term two dimensional planar layer refers to layers having a depth of less than 1 mm, preferably less than 0.5 mm, wherein the apertures have an average uniform diameter along their length and which do not protrude out of the plane of the layer. The apertured materials for use as a backsheet in the present invention may be produced using any of the methods known in the art such as described in EPO 293 482 and the references therein. In addition the dimensions of the apertures produced by this method may be increased by applying a force across the plane of the backsheet layer (i.e. stretching the layer).

[0084] Suitable apertured formed films include films which have discrete apertures which extend beyond the horizontal plane of the garment facing surface of the layer towards the core thereby forming protuberances. The protuberances have an orifice located at its terminating end. Preferably said protuberances are of a funnel shape, similar to those described in US 3,929,135. The apertures located within the plane and the orifices located at the terminating end of protuberance themselves maybe circular or non circular provided the cross sectional dimension or area of the orifice at the termination of the protuberance is smaller than the cross sectional dimension or area of the aperture located within the garment facing surface of the layer. Preferably said apertured performed films are uni directional such that they have at least substantially, if not complete one directional fluid transport towards the core.

[0085] Suitable macroscopically expanded films for use herein include films as described in for example in US 4,637,819 and US 4,591,523.

[0086] Preferred support layers for use herein include woven and nonwoven layers, most preferably hydrophobic fibrous layers such as hydrophobic nonwoven.

[0087] The composites of this preferred embodiment according to EP 98110597.6 and EP 98110596.8 are particularly advantageous as they allow the possibility of providing a composite wherein the thermoplastic composition may be coated onto the support substrate as a layer with the desired thickness. Typical coating conditions and apparatuses known in the art for the direct coating of low viscosities hot melts can be readily utilised in order to provide the thermoplastic composition at the desired thickness.

[0088] A possible method for forming a composite laminate by coating the thermoplastic composition onto a substrate acting as a support layer is described in PCT application WO 96/25902.

[0089] At least at the coating temperature, the preferred thermoplastic compositions according to EP 98110597.6 or EP 98110596.8 in form of a layer preferably exhibits adhesive properties on the supportive substrate in order to form the preferred composite such that no additional adhesive is required to achieve a permanent attachment between the thermoplastic composition and the substrate.

[0090] Preferably the moisture vapour permeable, liquid impervious layers and composites formed from the thermoplastic compositions according to EP 98110597.6 or EP 98110596.8 have an overall moisture vapour transfer rate of at least 100 g/m^2·24h, more preferably at least 300 g/m^2·24h, and most preferably at least 500 g/m^2·24h.

[0091] A moisture vapour permeable, liquid impervious composite structure formed by coating the thermo-

plastic composition according to EP 98110597.6 or EP 98110596.8 onto a suitable substrate, e.g. a nonwoven substrate, finds particular utility as the material for forming the first and second layer of a disposable mattress cover assembly according to the present invention. Preferably the first and second layer of a disposable mattress cover assembly according to the present invention comprise a laminated structure as those disclosed above with the thermoplastic composition intended to face inwardly of the formed disposable mattress cover, and therefore to come in contact with the mattress comprised therebetween.

[0092] It is also particularly preferred that, in this latter case, the preferred thermoplastic composition provides an increased friction with the surface of the mattress with which said composition is intended to come in contact. According to our patent application entitled "Disposable, moisture vapour permeable, liquid impermeable mattress cover having an improved structure for increased stability" filed on the same day as the present application (P&G Case CM2250F), it has been discovered that by suitably further selecting the tackifier resin, or blend of tackifier resins, to be added to the thermoplastic composition, it is possible to adjust the residual tackiness of said thermoplastic composition at room temperature, i.e. in the solidified thermoplastic composition constituting the layer of the moisture vapour permeable, liquid impermeable laminated structure comprised in the first and/or second layer of the mattress cover assembly of the present invention, which layer is intended to directly contact the mattress in use. This in turn allows an adjustment of the friction that is established, in the use conditions, between the layer of said thermoplastic composition comprised in the disposable mattress cover assembly of the present invention, and the mattress surface, when the mattress cover formed from the mattress cover assembly is typically subjected to compression against the mattress itself. An increased friction provides in fact a better stability of the liquid impermeable, moisture vapour permeable mattress cover formed from the assembly of the present invention with respect to the mattress, avoiding or at least reducing the relative movements between mattress cover and mattress which can be induced in use, for example by the user's movements, e.g. during the sleep, when the mattress is a bed mattress or a pillow, and the mattress cover is a bed mattress cover or a pillow cover. Risk of misplacement of the mattress cover during the use is therefore greatly reduced. This also reduces the stress applied in use to the cooperating joining means which connect the first and the second layers forming the mattress cover. Moreover, this in turn allows the use of lighter and cheaper materials for the disposable mattress cover layers of the assembly of the present invention, which is beneficial in the context of a disposable structure. Since said materials, preferably comprising the preferred thermoplastic compositions layered onto a fibrous substrate to form a composite moisture vapour permeable, liquid impermeable structure, comprised in the mattress cover layers of the assembly of the present invention need to resist to a lesser stress during the use, they can be thinner, and therefore provide a better moisture vapour permeability in addition to liquid imperviousness, while being also softer and more comfortable for the user. The disposal of the mattress cover layers after use also implies a lesser waste of materials.

[0093] By suitably selecting the tackifier resin or blend of tackifier resins according to the above mentioned application it is possible to adjust the residual tackiness at room temperature of the thermoplastic composition, and therefore of the layer formed from said thermoplastic composition, to the extent that it has the typical characteristics of a pressure sensitive adhesive. In other words, the friction between the layer of thermoplastic composition comprised in the mattress cover layers of the assembly of the present invention and the mattress can be increased such that the mattress cover layers can actually stick to the mattress, owing to the thermoplastic composition which can be formulated in order to behave like a pressure sensitive adhesive. Residual tackiness of the thermoplastic composition at room temperature can be suitably tailored according to the present invention since a smooth transition exists between increasing friction and actual adhesiveness.

[0094] Preferred tackifier resins, or blend of tackifier resins according to the present invention still have a softening point of 125°C or less, and are selected from the group consisting of rosin and rosin esters, terpene-phenolic resins, aromatic resins, and mixtures thereof.

[0095] More preferably, the thermoplastic compositions according to the above mentioned application comprise a blend of tackifier resins, selected as described above, wherein moreover from 0% to 20%, preferably from 2% to 15%, by weight of said blend of tackifier resins comprises a resin or blend of resins having a softening point of less than 25°C, and from 80% to 100%, preferably from 85% to 98%, by weight of said blend of tackifier resins comprises a resin or blend of resins having a softening point of at least 70°C.

[0096] The presence in the blend of tackifier resins of a certain amount of one or more tackifier resins which are liquid at room temperature is preferred since said resin or resins, in addition to adjusting the residual tackiness of the layer formed from the resulting thermoplastic composition, also contribute to lower the viscosity of the composition itself at the process conditions, in combination with the selected suitable plasticiser or blend of plasticisers as disclosed in EP 98110597.6 or EP 98110596.8.

[0097] Said preferred blend of tackifier resins therefore provides a thermoplastic composition, to be comprised in a first and/or a second layer of the disposable, moisture vapour permeable, liquid impermeable mattress cover assembly of the present invention, which is easily processable. Moreover the preferred blend of tackifier resins allows to adjust the residual tackiness of

the resulting thermoplastic layer made from the thermoplastic composition, and therefore ultimately the friction between the mattress cover formed from the mattress cover assembly of the present invention and the mattress in use conditions, i.e. when the thermoplastic composition is coated preferably onto a nonwoven substrate to form a composite structure comprised in the first and/or second layer of the disposable mattress cover assembly of the present invention, with the layer of thermoplastic composition intended to come in direct contact with the mattress. This is beneficial as explained above.

[0098] The particularly preferred tackifier resins, or blend of tackifier resins, can be comprised in the same thermoplastic compositions according to EP 98110597.6 or EP 98110596.8, but with a different percentage ranging from 2% to 60%, preferably from 5% to 50%, more preferably from 10% to 40%, by weight of said thermoplastic composition, of a tackifier resin or blend of tackifier resins.

[0099] Of course, it is not necessary that both the first and the second layer of the disposable mattress cover assembly according to the present invention provide moisture vapour permeability, in addition to liquid imperviousness and preferably barrier to dust mites and related allergens. Therefore one of the layers, for example the first layer 14 in the embodiment illustrated in FIGS. 1 and 2, can be only liquid impervious and not moisture vapour permeable, and therefore typically also provide a barrier to dust mites and related allergens. Any know suitable material, such as for example known thermoplastic films, can be selected for a layer which is only liquid impervious. Alternatively, only selected portions of the first or of the second layers of the disposable mattress cover assembly of the present invention can be provided with known means with moisture vapour permeability, in addition to liquid imperviousness.

[0100] According to the present invention the complex viscosity $\eta*$ is measured using a Rheometer RDA-II available from Rheometrics Co. Moisture vapour permeability is measured as Water Vapour Transmission Rate (WVTR) at 23°C according to the ASTM E-96 "Upright Cup" method. The softening point of the resins is measured according to the Ring and Ball ASTM E28 method.

Claims

1. A disposable mattress cover assembly for forming a protective cover to completely encase a mattress, said disposable mattress cover assembly comprising a first layer and a second layer which are separate until use, said first layer and said second layer having an outer periphery, wherein said first layer comprises joining means for cooperation with cooperating joining means of said second layer, in order to form said cover to completely encase a mattress, at least one of said first layer or of said second layer comprises a moisture vapour permeable, liquid impermeable material.

2. A disposable mattress cover assembly according to claim 1, wherein said first layer comprises said joining means along said outer periphery thereof.

3. A disposable mattress cover assembly according to claim 1 or 2, wherein said second layer comprises said cooperating joining means along said outer periphery thereof.

4. A disposable mattress cover assembly according to any preceding claim, wherein said first layer and said second layer comprise different materials.

5. A disposable mattress cover assembly according to any preceding claim, wherein said first layer comprises a moisture vapour and liquid impermeable material, and said second layer comprises a moisture vapour permeable, liquid impermeable material.

6. A disposable mattress cover first layer for use in the disposable mattress cover assembly of claim 1, wherein said first layer comprises joining means for cooperation with cooperating joining means of a second layer, said first layer comprising a moisture vapour permeable, liquid impermeable material.

7. A disposable mattress cover second layer for use in the disposable mattress cover assembly of claim 1, wherein said second layer comprises joining means for cooperation with cooperating joining means of a first layer, said second layer comprising a moisture vapour permeable, liquid impermeable material.

8. A disposable mattress cover first or second layer according to claim 6 or 7, wherein said moisture vapour permeable, liquid impermeable material has a water vapour transmission rate (WVTR) of at least 300 $g/m^2 \cdot 24h$.

9. A disposable mattress cover obtained from the disposable mattress cover assembly of claim 1.

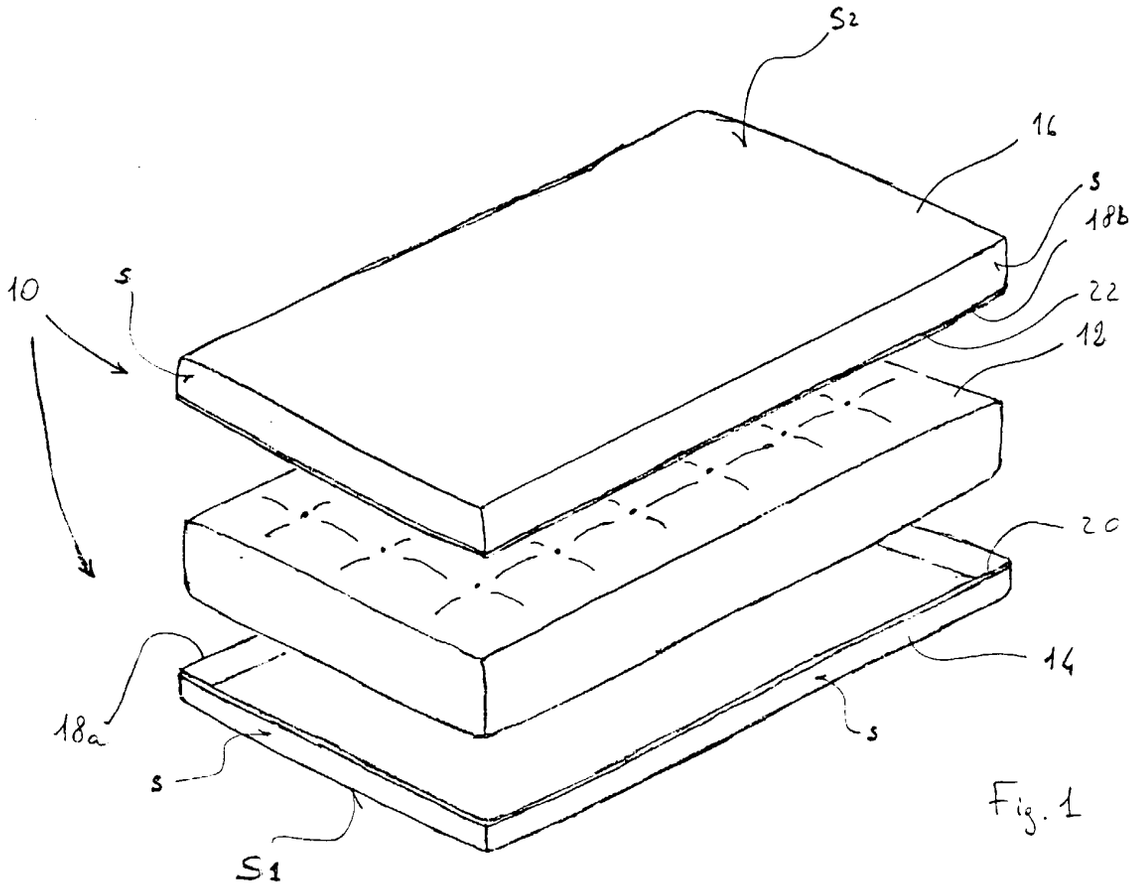

Fig. 1

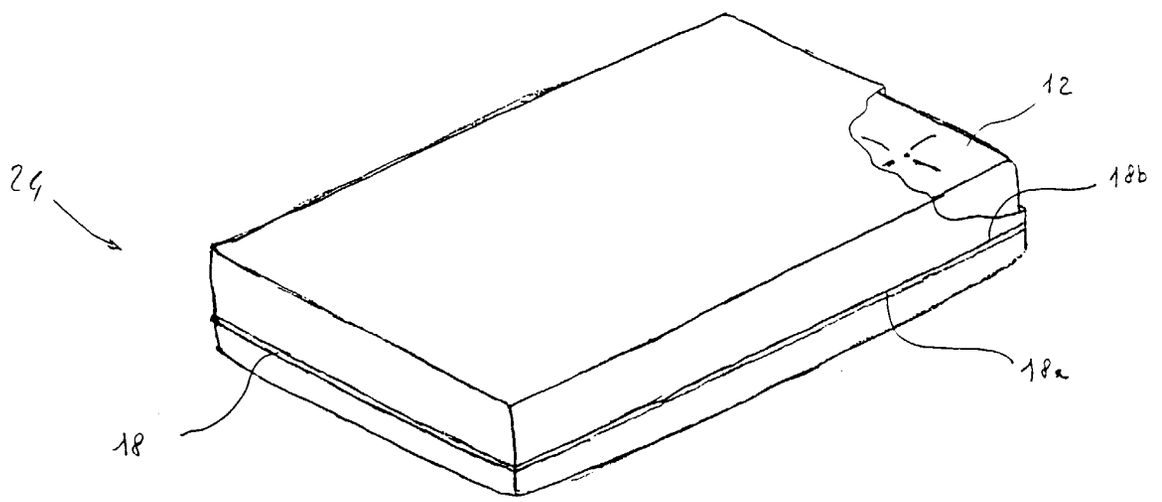

Fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 12 4536

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 090 074 A (BARTON JOHN ET AL) 25 February 1992 (1992-02-25) * column 5, line 1-37; claims 1,8; figures * ---	1-9	A47C21/06 A47G9/02
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A	GB 2 254 251 A (FALAISE CHRISTINE DE) 7 October 1992 (1992-10-07) * claims 1,8; figures * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

A47C
A47G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 May 2000	Amghar, N

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 12 4536

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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11-05-2000

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