(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 607 027 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.12.2005 Bulletin 2005/51

(51) Int Cl.[7]: **A47C 27/08**

(21) Application number: **05447138.8**

(22) Date of filing: **16.06.2005**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR LV MK YU

(30) Priority: **16.06.2004 BE 200400294**

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(54) Waterbed matras

(57) The invention relates to a waterbed mattress (1) comprising a lying surface providing an top wall (10), a bottom wall (11) and a number of side walls (12, 13, 14, 15), which walls together form a closable storage volume (2) for receiving a liquid, characterised in that the storage volume comprises at least one spacer fabric (12), which spacer fabric (12) mainly consists of two fabrics positioned at a distance from each other and running mainly parallel to each other (120, 121), which fabrics are connected to each other by means of a plurality of fibres (122, 123) bridging the mutual distance.

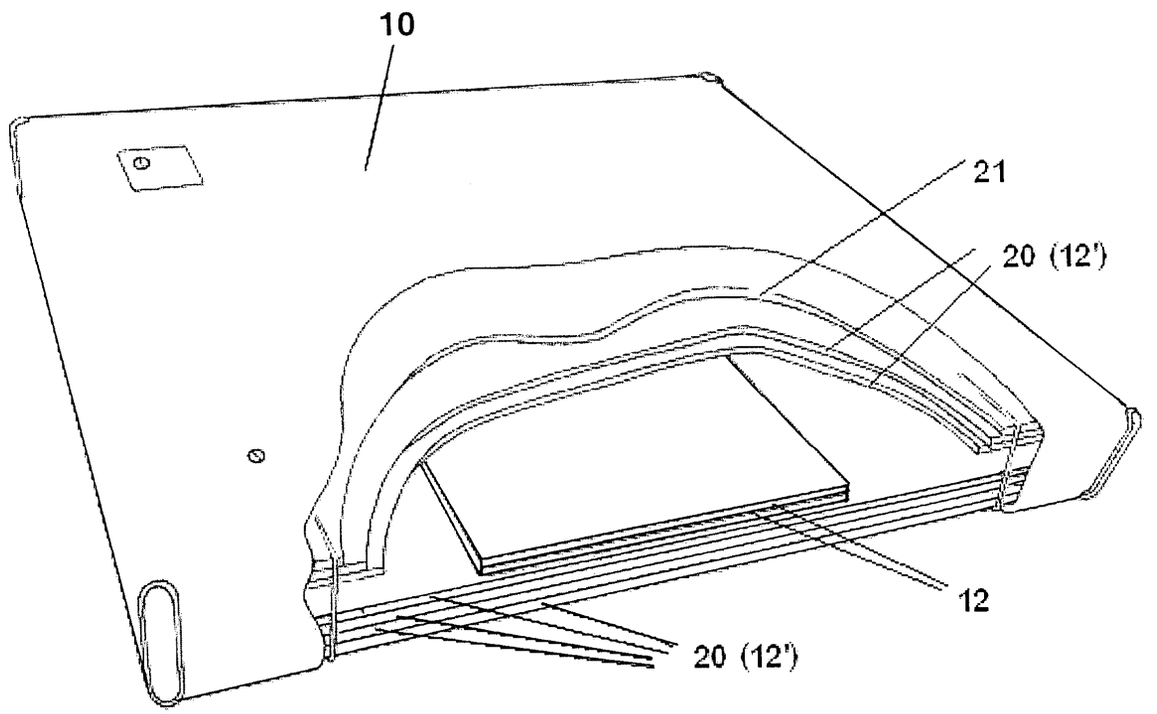

Fig. 2

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Description

[0001] The invention relates to a waterbed mattress according to the preamble of the first claim.

[0002] The known waterbed mattress usually comprises a cover comprising at least one top wall, a bottom wall and sidewalls. The cover is mostly produced of a suitable plastic material, such as for example polyvinyl chloride or polyethylene. The walls of the mattress enclose a storage volume for receiving a liquid, usually water. Typical heights of a waterbed mattress may for example vary between 15 and 30 cm, a height of 21 cm often being applied.

[0003] To provide an optimum counter pressure to a body lying on the waterbed mattress, the storage volume is usually virtually completely filled with water, the filling degree being variable in function of the desired stiffness of the support provided by the mattress. The larger the filling degree, the stiffer the sensed support will be. Within the framework of this invention, filling degree means the ratio of the water volume in the mattress with respect to the total available storage volume.

[0004] Another important factor with respect to the sleeping comfort provided by the mattress, is the stability of the mattress. The stability is defined as the degree in which the mattress continues to move following a former loading or movement of a body on top of the mattress. The stability may for example be measured by means of a simple practise test according to which a load is exerted to the waterbed mattress by positioning a person on the mattress, to permit the bed to equilibrate, to thereafter exerting a load to the mattress using a second person and thereafter measuring the time needed to permit the bed to equilibrate. The stability of a waterbed increases with decreasing equilibration time.

[0005] With respect to the stability of a waterbed mattress it is of utmost importance to find a compromise between on the one hand providing sufficient stability to avoid too long after movement, and on the other hand to not increase the stability too much as this does not improve the sleeping comfort as the bed in that case feels hard and sturdy and does not provide ergonomic lying. Within the framework of this application, ergonomic lying means a lying of the body on the mattress wherein the backbone is not substantially deformed, but maintains its natural, mainly straight extending shape.

[0006] In the known waterbed mattress, the storage volume is usually provided with stabilising means, amongst others to control the stability of the bed. The known means comprise at least one layer of a fibrous material contained in the storage volume. Such a layer of fibrous material may for example take the form of a fibre mat with polyester fibres, which extend randomly in different directions of the mat (a so-called 'random mat'). The fibrous material extends over at least part of the height of the storage volume and ensures that at least a part of the water is as if it were confined in the part of the storage volume below or on top of the stabilising layer, which stabilises the waterbed mattress. Besides this stabilising action, such fibre mats also provide a counter pressure for the body. The flow of at least a part of the water volume may be further controlled by receiving more mats in the storage volume, the stability increasing with increasing number of mats.

[0007] Besides fibre mats, the storage volume of the known waterbed mattress preferably contains a series of, more or less adjacently positioned elastic bodies, which are reversibly compressible in height direction of the mattress. These coil shaped bodies, known to the person skilled in the art as 'coils', ensure that an upward elastic force is exerted to the body, preferably at those positions where an additional support of the body is desirable, such as for example at the position of the hips. In the known waterbed mattress, these fibre mats may be positioned below and/or on top of the 'coils', depending on the desired stability and elasticity.

[0008] A disadvantage of the known mattress is that, in order to obtain the desired combination of elasticity and stability, severai means have to be used in the form of the 'coils' and fibre mats described above. A further important disadvantage is that the fibre mats loose their elastic and stabilising action after having been used for some time. This shortens the lifetime of the known mattress, whereby a continuing deterioration of the sleeping comfort occurs, amongst others of the elasticity and the stability, and no ergonomic lying comfort is provided any more.

[0009] From DE-U-203.15.148, it is known to improve the lying comfort of conventional mattresses with a core of latex or plastic foam, by improving moisture transport in the mattress and promoting convection of air from and to the mattress. Thereto, the mattress is produced of a top and bottom core, having a moisture transport promoting spacer fabric in between.

[0010] From US-A-5.077.848 a waterbed mattress with an improved stability is known, which is built up of a plurality of parallel adjacent tubes, which extend from the head to the foot end. Each tube comprises a first insert and a second insert fastened to the first insert, which together occupy a substantial part of the height of the tube. The second insert is built up of so-called open cell foam. The second layer is positioned mainly at the position of the lower back and hips and is made of foam or fibres. The mattress shows an improved wave damping in longitudinal direction and an improved firmness at the position of the lower back.

[0011] From US-A-5.159.725 a waterbed mattress is known which comprises a plurality of bellows compressible in height direction, resilient, cylindrically shaped, comprising an open bottom, a top face and side face and at least one hole through which water contained in the bellows may leave the bellows. Positioning takes place by co-operation with a panel in which holes are provided for receiving the bellows. The upper part of the bellows is covered with a fabric of fibres, with the aim of

mechanically isolating a body lying on the mattress from the topside of the bellows. In use, the local load exerted to the waterbed mattress is equilibrated because the fabric is compressed, and the lower part of the bellows is pushed onto the panel and is closed. A part of the water present in the bellows flows away through the at least one hole. Impressing of the top face of the mattress is counteracted by the inherent resiliency of the sidewall of the bellows.

[0012] The invention aims at providing a waterbed mattress with an improved sleeping comfort, which moreover persist for a longer time than known hitherto.

[0013] This aim is achieved according to the present invention with the characterizing part of the first claim. The waterbed mattress of the present invention is characterized in that the storage volume comprises at least one spacer fabric, which spacer fabric mainly consists of two fabrics positioned at a distance from each other and running mainly parallel to each other, which fabrics are connected to each other by means of a plurality of fibres bridging the mutual distance.

[0014] By providing the waterbed mattress of this invention with a spacer fabric, it is surprisingly achieved that, in comparison with the known mattress, not only a waterbed mattress is obtained with an improved elasticity and stability, but moreover a waterbed mattress, which is capable of maintaining its elasticity and stability for a longer period of time. As a consequence, the waterbed mattress of this invention Is capable of maintaining its ergonomic lying for a longer period, in particular also when the body is turned onto its side and the pressure exerted by the body per cm^2 is higher.

[0015] A further advantage of the waterbed mattress of the invention is that to achieve the above-described object, no additional elastic and/or stabilising means are required. In that way it is possible to dispense with the above described 'coils' required in the known mattress, and to nevertheless achieve a comparable or improved elasticity. Coils indeed present the disadvantage of only providing an elastic support at the location of the coils, but not at the positions between the coils. Providing a plurality of coils with small dimensions, at a very small distance from each other, to improve the point elasticity would be expensive. The so-called point elasticity is thus limited. A good point elasticity is achieved in case an elastic support is provided which is in essence equally distributed over the surface of the upper wall of the mattress. By applying a spacer fabric of the present invention, a highly improved point elasticity is obtained.

[0016] The fibre mats in the known waterbed mattress ensure a stabilising action as well as an elastic support by the mattress. It is surprising that the spacer fabric according to the invention shows a comparable short-term stabilising action as the known fibre mats, and a strongly improved stabilising action on long term, because the original stabilising action is largely maintained. Also the elastic support provided by the spacer fabric is maintained much longer than with the known fibre mats.

[0017] Spacer fabric as such is known, but its use in a waterbed mattress has not yet been disclosed. A particular embodiment of a spacer fabric is for example known and has already been commercially available for some time under the registered trade name of Aerosleep®. This type of spacer fabric has in the past been used as a separate cover layer of normal mattresses and/or pillows. Such a cover layer is usually fastened to a mattress by means of 4 elastic strips, which are torn over the edges of the mattress. Such cover layers provide a cooling action when sleeping because they permit a free airflow between the mattress and the body. Suitable spacer fabrics for such application usually have a limited thickness of a few mm at maximum, to avoid that the fibres, which extend mainly perpendicular to the plane of both fabrics and/or braidings positioned at a distance from each other, buckle out under the influence of the weight of the body. Because both fabric layers contact each other in such a case, the cooling action is destroyed.

[0018] Suitable spacer fabrics for use with the waterbed mattress of the present invention may be produced of all fibres known to the person skilled in the art. In that way it is possible to use metal fibres, wood fibres, jute fibres, cotton fibres, wool fibres and the like. Preferably, organic fibres are used since they may be easily produced and are relatively non-sensible to corrosion by the aqueous medium of the storage container of the mattress. Suitable organic fibres are for example polyester, polyalkylene, such as polyethylene and polypropylene, elasthane and/or polyamide fibres. It is also possible to use elastic fibres. It is further possible to add specific additives to the fibrous material, such as for example fire retardants, anti-bacterial products, colorants and/or anti odour products. The fibres in the spacer fabric may be mono- and/or multifilament yarns, and may be textured if so desired. The density of the spacer fabric, within the framework of this invention defined as the number of fibres per surface unity, bridging the mutual distance, may in principle be chosen within wide ranges, depending on the specifically desired support properties of the mattress and the desired stability. Preferred densities range between 10 and 200 fibres per cm^2. More preferred this is between 20 and 100 fibres per cm^2, mostly preferred between 30 and 70 fibres per cm^2. The hardness of the chosen spacer fabric may be selected by the person skilled in the art, taking account of the body weight and building of the user of the mattress, so that he mattress of this invention provides an ergonomic support independent of the body weight and building of the user.

[0019] Advantages are presented by characterising the waterbed mattress of this invention in that the spacer fabric extends mainly over the total length and width of the mattress. Because of this, a good sleeping comfort is attained and the mattress of this invention may be produced in a fast manner.

[0020] If so desired, a plurality of spacer fabrics may be positioned in the storage volume. Preferably the waterbed mattress of this invention has a storage volume, which comprises at least a first and a second spacer fabric having a thickness of respectively 1-4 cm, and 4-12 cm.

[0021] This combination appears to provide the optimum sleeping comfort and simultaneously the best stability and long term stability. Even more preferred, the storage volume comprises at least a first and a second spacer fabric, with thicknesses of respectively 1.5-2.5 cm and 5-7 cm.

[0022] A further improvement is achieved in that the first spacer fabric extends mainly over the total length of the mattress, and in that the second spacer fabric extends over the part of the length of the mattress provided to support pelvis and back.

[0023] Although not necessary within the framework of the present invention, it has advantages to characterise the mattress in that the storage volume also comprises an elastic body located at least at a position of the part of the waterbed mattress provided to support pelvis and back, which body mainly consists of a number of adjacent elastic structures, which are reversibly compressible in height direction of the mattress. By the presence of the compressible elastic structures, an upward pressure is developed when the back and hips rest on the mattress, as a consequence of which the cerebral column may be supported in such a way that it extends mainly horizontally with the body turned onto its side.

[0024] By combining such an elastic body with the spacer fabric according to the invention, an economically feasible mattress is obtained which fully meets the envisaged objects.

[0025] The elastic body preferably contains a plurality of adjacent elastic structures, which are reversibly compressible in height direction of the mattress. Each elastic structure mainly consists of a coil of a plastic material, which coil comprises a volume delimited by a wall, wherein the wall extends mainly in height direction of the mattress and comprises a plurality of piled and mutually connected bulges, at least one of the bulges comprising an outlet to permit moving the water contained in the mattress into and from the volume.

[0026] According to the invention it is also possible to provide the storage volume of the waterbed mattress of this invention with at least one layer of a fibrous material, on top of and/or beneath the at least one spacer fabric.

[0027] The top wall of the mattress of this invention is preferably made of an elastic material. The top wall may have a smooth surface. Preferably however, in the top wall a plurality of stretchable plies are provided, in such a way that in longitudinal direction of the mattress, parts are provided with a different elasticity. In that way it is for example possible to provide at least three parts, wherein a first part corresponds to a surface part provided for head and shoulder, a second part provided for hip and back and a third part provided for the legs. Thereby, advantages are presented when giving the highest elasticity to the shoulder part to provide maximum comfort when lying on the side, when giving the second part a lower elasticity for maximum support and the third part an intermediate elasticity there between.

[0028] Because the length of the hip and back part of a body is usually smaller than the length of the shoulder and head part, which in turn is smaller than the length of the leg part, the lengths L1, L2 and L3 of respectively the first, second and third part are preferably chosen such that L2 is smaller than L1, and L1 is smaller than or equal to L3.

[0029] The elasticity of the top wall, i.e. the ability of the top wall to stretch, may for example be controlled by providing the top wall with a plurality of over folded wall parts in the shape of ovals, circles and the like. When stretching the top wall, the upright walls of these over folded wall parts will be turned gradually in the plane of the top wall, which promotes additional stretching and thus provides elasticity.

[0030] Figure 1 is a perspective view to a mattress in general.

[0031] Figure 2 is a perspective view to a preferred embodiment of the waterbed mattress of this invention, wherein one of the sidewalls is left out.

[0032] Figure 3 is a perspective view of another preferred embodiment of ht waterbed mattress of the invention, wherein again one of the sidewalls is left out.

[0033] Figure 4 is a detailed view to the spacer fabric of this invention.

[0034] Figure 5 shows a detail of an elastic structure for use in the waterbed mattress of this invention.

[0035] The waterbed mattress shown in figure 1, comprises a cover of a plastic material, with a top wall 10 providing a lying surface, a bottom wall 11 and four side walls 12-15, which together form a closable storage volume 2 for receiving a suitable liquid, usually water.

[0036] The waterbed mattress shown in figure 2 has an elastic top wall 10 and further, in this preferred embodiment at the position of the hip zone of the mattress, one or more layers of a spacer fabric 12. Further, in the storage volume 2 at least one, preferably more fibre mat layers 20 are received, which also provide elasticity and control the stability of the mattress, by controlling the flowing of the water present in the mattress. If so desired, at least one, but also all layers 20 may be replaced by three dimensional spacer fabrics 12. Preferably a spacer fabric 12 is applied with a layer thickness of 2 cm. It is also possible to add stabilised fibre mat layers 21. These layers 21 are usually built of the same material as layers 20, but are provided with an enclosing net, for example of polyamide fibres. The net adds a further reinforcement to the layers 21, because the net functions to confine the fibres of the layers 21. It is an additional advantage of the waterbed mattress of this invention, that the layers 12 do not need a further stabilisation.

[0037] Preferably at least a part of the layers 20, 21 and/or 12 are, at the side pointing to the bottom wall of

the waterbed mattress, provided with a plurality of strips made of a suitable plastic foam, for example polypropylene. Such strips ensure that the layers concerned are pressed towards the top wall of the waterbed mattress, by the upward pressure action of the air enclosed in the foam strips. Such strips thus function as drivers for the layers concerned.

[0038] A preferred embodiment of the spacer fabric 12 is shown in figure 2, a spacer fabric with a thickness of 60 mm, which if so desired may be provided with stitchings. This three-dimensional space fabric is for example available under the trade name Pressless ®, with the company Bodet & Horst GmbH, 3-mesh of Müller Textil, both in Germany. Spacer fabric 12 reacts to every type of loading and weight with exceptionally high point elasticity. After load change, the spacer fabric 12 virtually immediately returns in its original position before loading. It appeared that this exceptional elastic behaviour is also present in the aqueous medium of a waterbed mattress and this for a long period of time. The sleeping person may thus enjoy this good elasticity and ergonomic support for a long period of time.

[0039] As is indicated in figures 4a, 4b and 4c, the spacer fabric 12 comprises two mainly flat textile structures 120 and 121, which mainly extend parallel to each other. It is however possible to bend the structures 120 and 121 over a certain angle, so that a bent fibre layer 12 is obtained. Between the two structures 120 and 121 no fibres are provided which bridge the mutual distance between structures 120 and 121. The bridging fibres 122, 123 usually integrally form part of the textile structures 120 and 121. In that way it is for example possible that a fibre of the textile structure 120, leaves the plane of structure 120 at a certain position, bridges the mutual distance between the planes and intrudes the oppositely positioned structure 121 where this fibre further forms part of the structure 121. Such a construction can be easily produced by the person skilled in the art using existing techniques. The fibres 122, 123 extend mainly in a straight line between the two structures 120, 121. Herewith is meant that the fibres are preferably not exhaustively curled or do not exhaustively show loops, but bridge the distance along the virtually shortest way. This does not mean that the fibres may not show a slight bending as is shown in figure 4b. In figure 4c is shown that the fibres may cross each other under a certain angle, although it is also possible that they run more or less parallel to each other. From the side view shown in figure 4b, it becomes clear that the average direction of the bridging fibres may differ over the distance between the structures 120 and 121, but may also differ between longitudinal and transverse direction. Figure 4a shows a preferred textile structure for the two fibre layers 120 and 121. This structure is mainly in the form of a honeycomb. The top layer 120 is hereby shifted with respect to the lower layer 121 in the XX' direction. The side legs 130, 131 of the honeycomb comprise twined filaments, which start from the legs 130 virtually every mm, to bridge the distance and join the opposite legs 131. Of course, the density of the bridging fibres per cm^2 may be amended, by varying the distance between two subsequent leaving fibres.

[0040] As is shown in figure 3, a first part 16 of the top wall 10 also corresponds to the part provided for head and shoulders of the person resting on the mattress. This part 16 is mostly produced in such a way (for example due to the material choice and/or the fibre mats 20, 21 and /or 12 present below this part in the storage volume) that the highest elasticity is achieved here.

[0041] The second part 17 mainly corresponds to he part provided for the back and hips of the person resting on the mattress. This part usually has a lower elasticity as here a higher weight is to be supported as compared to part 16.

[0042] The third part 16 corresponds to that part of the mattress provided for supporting the legs and feet. This part usually has an elasticity, which is between that of the parts 16 and 17 because a certain elasticity is also required here to maintain the cerebral column in the correct, mainly horizontal non-loaded position, in all positions.

[0043] Preferably the storage volume 2 is provided with at least one layer of a spacer fabric 12, at least at eh position of the second part and possibly also at eth position of a part of the third part, preferably with a thickness between 4 and 10 cm, for example 6 cm.

[0044] If so desired, in combination herewith at least one other layer of spacer fabric 12 may be provided over the whole length of the waterbed mattress. Preferably such layers 12 have a thickness of between 1 and 4 cm, for example 2 cm.

[0045] It is also possible, as is shown in figure 3, to provide the storage volume 2 of the mattress with an elastic body consisting of elastic structures 7, as a consequence of which an improved control of the local elasticity may be achieved and a better support of the body at that position. Such an elastic body may if so desired be exclusively provided at the position of the second part 17 of the top wall 10 and/or may also be provided at the position of the first and/or third part 16, 18. The addition of such an elastic body is for example preferred for extremely heavy bodies, or for persons desiring a stiffer mattress.

[0046] As is shown in figure 3, the elastic body comprises a number of adjacent elastic structures 7, which are compressible in height direction of the mattress 1. In particular the compressible elastic structures 7 consist of a coil of a plastic material, which coil encloses a space 21 and a plurality of stacked and mutually connected bulges 9, wherein at least one of the bulges 9 comprises an outlet 19 along which the water enclosed in the mattress may be displaced, so that the intrusion and again expansion of the coils may be facilitated. The wall thickness and/or the height of the coils 7 may be adapted if so desired, depending on whether more or less elasticity is required, or adapted to the body con-

struction of the person concerned.

[0047] The first part 16 of the mattress has a length L1, a second part 17 has a length L2 and the third part 18 has a length L3, wherein preferably L2 <L1 ≤ L3. In a preferred embodiment the length L2 is chosen between 40-55 cm, more preferably between 45-50 cm, L1 between 45-55 cm; more preferably between 50-55 cm, and L3 between 50-100 cm, more preferably between 60-80 cm.

Claims

1. Waterbed mattress (1) comprising a lying surface providing an top wall (10), a bottom wall (11) and a number of side walls (12, 13, 14, 15), which walls together form a closable storage volume (2) for receiving a liquid, **characterised in that** the storage volume comprises at least one spacer fabric (12), which spacer fabric (12) mainly consists of two fabrics positioned at a distance from each other and running mainly parallel to each other (120, 121), which fabrics are connected to each other by means of a plurality of fibres (122, 123) bridging the mutual distance.

2. Waterbed mattress (1) according to claim 1, **characterised in that** the spacer fabric (12) extends mainly over the total length and width of the mattress.

3. Waterbed mattress (1) according to claim 1 or 2, **characterised in that** the storage volume (2) comprises at least a first and a second spacer fabric (12, 12'), the first spacer fabric having a thickness of 1-4 cm, the second spacer fabric having a thickness of 4-12 cm.

4. Waterbed mattress (1) according to claim 1 or 2, **characterised in that** the storage volume (2) comprises at least a first and a second spacer fabric (12, 12'), the first spacer fabric having a thickness of 1.5-2.5 cm, the second spacer fabric having a thickness of 5-7 cm.

5. Waterbed mattress (1) according to claim 3 or 4, **characterised in that** the first spacer fabric (12) extends over the part of the length of the mattress provided to support pelvis and back, and **in that** the second spacer fabric (12') extends mainly over the total length of the mattress.

6. Waterbed mattress (1) according to any one of claims 1-5, **characterised in that** the storage volume (2) also comprises an elastic body at a position at least at a position of the part of the waterbed mattress provided to support pelvis and back, which body mainly consists of a number of adjacent elastic structures (7, 8), which are reversibly compressible in height direction of the mattress (1).

7. Waterbed mattress (1) as claimed in claim 6, **characterised in that** the elastic structure mainly consists of a coil of a plastic material, which coil comprises a volume delimited by a wall (21), wherein the wall extends mainly in height direction of the mattress and comprises a plurality of piled and mutually connected bulges (9), at least one of the bulges (9) comprising an outlet (19) to permit that the water contained in the mattress is displaced into and from the volume (21).

8. Waterbed mattress as claimed in claim 6 or 7, **characterised in that** the storage volume (2) of the waterbed mattress is also provided with at least one layer of a fibrous material (20) positioned on top and/or beneath the elastic body and/or the at least one spacer fabric (12, 12').

9. Waterbed mattress as claimed in claim 8, **characterised in that** the at least one layer of fibrous material (2) is held in a net.

10. Waterbed mattress as claimed in any one of claims 1-9, **characterised in that** the spacer fabric has a density of between 10 and 200 fibres per cm^2, preferably between 20 and 100 fibres per cm^2, more preferably between 30 and 70 fibres per cm^2.

11. Waterbed mattress as claimed in any one of claims 1-10, **characterised in that** the spacer fabric is made of organic fibres, preferably polyester, polyalkylene, polyethylene and polypropylene and/or polyamide fibres.

12. Waterbed mattress as claimed in any one of claims 1-11, **characterised in that** the spacer fabric is made of elastic fibres.

13. Waterbed mattress as claimed in any one of claims 8-11, **characterised in that** at least part of the layers of the spacer fabric (12) and the at least one layer of fibrous material (20) at a side pointing towards the bottom wall of the waterbed mattress, is provided with a plurality of strips of a foamed plastic material, preferably polypropylene.

14. Waterbed mattress as claimed in any one of claims 1-13, **characterised in that** the top wall of the mattress is made of an elastic material.

15. Waterbed mattress as claimed in any one of claims 1-14, **characterised in that** the top wall comprises a plurality of stretchable plies, in such a way that in longitudinal direction of the mattress, parts are provided with a different elasticity.

16. Waterbed mattress as claimed in any one of claims 1-15, **characterised in that** a first part of the mattress provided for supporting of shoulder and head part has a length L1, and a second part provided for supporting back and hip part has a length L2, and a third part provided for supporting the legs has a length L3, L2 being smaller than L1, and L1 being smaller than or equal to L3.

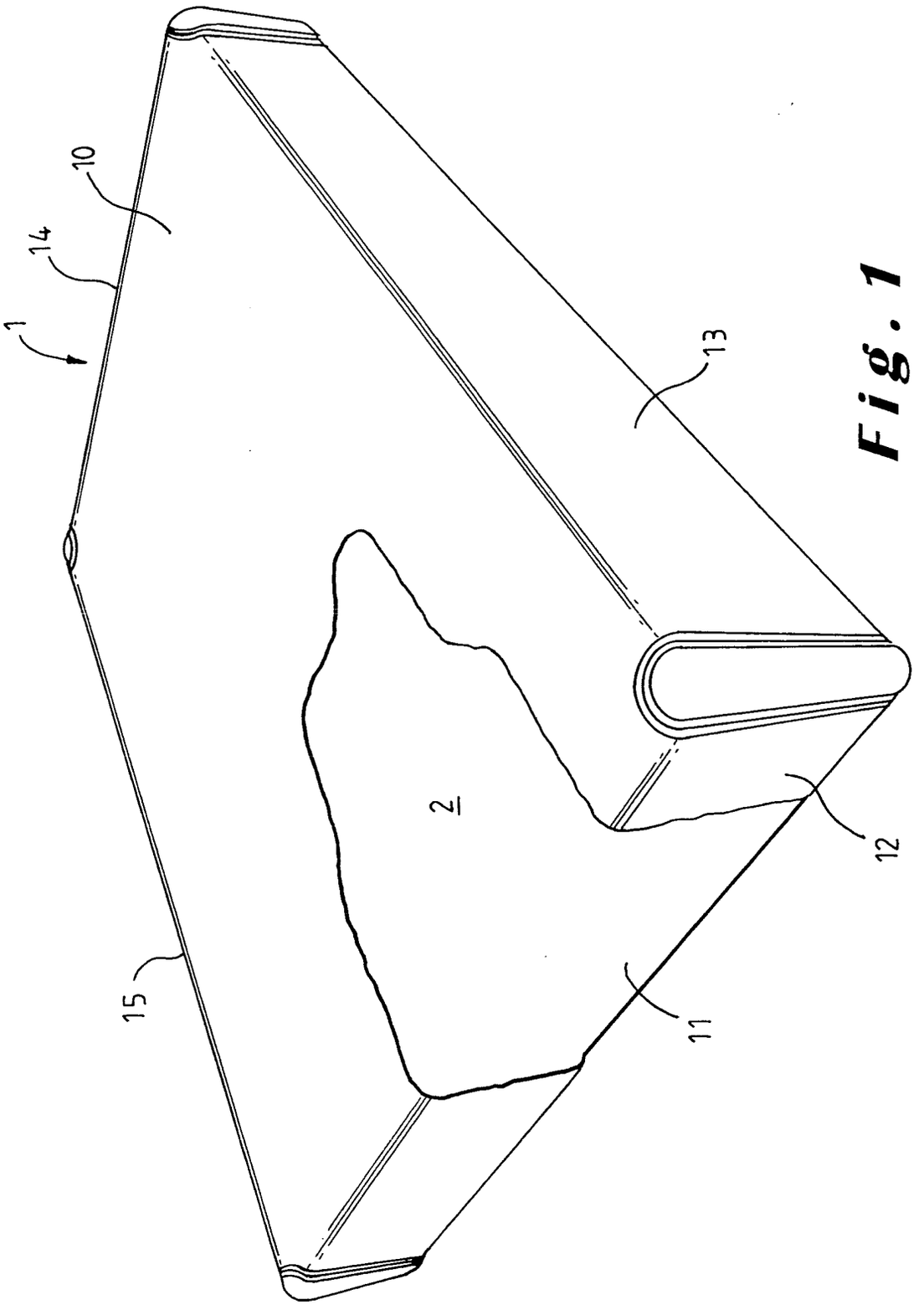

Fig. 1

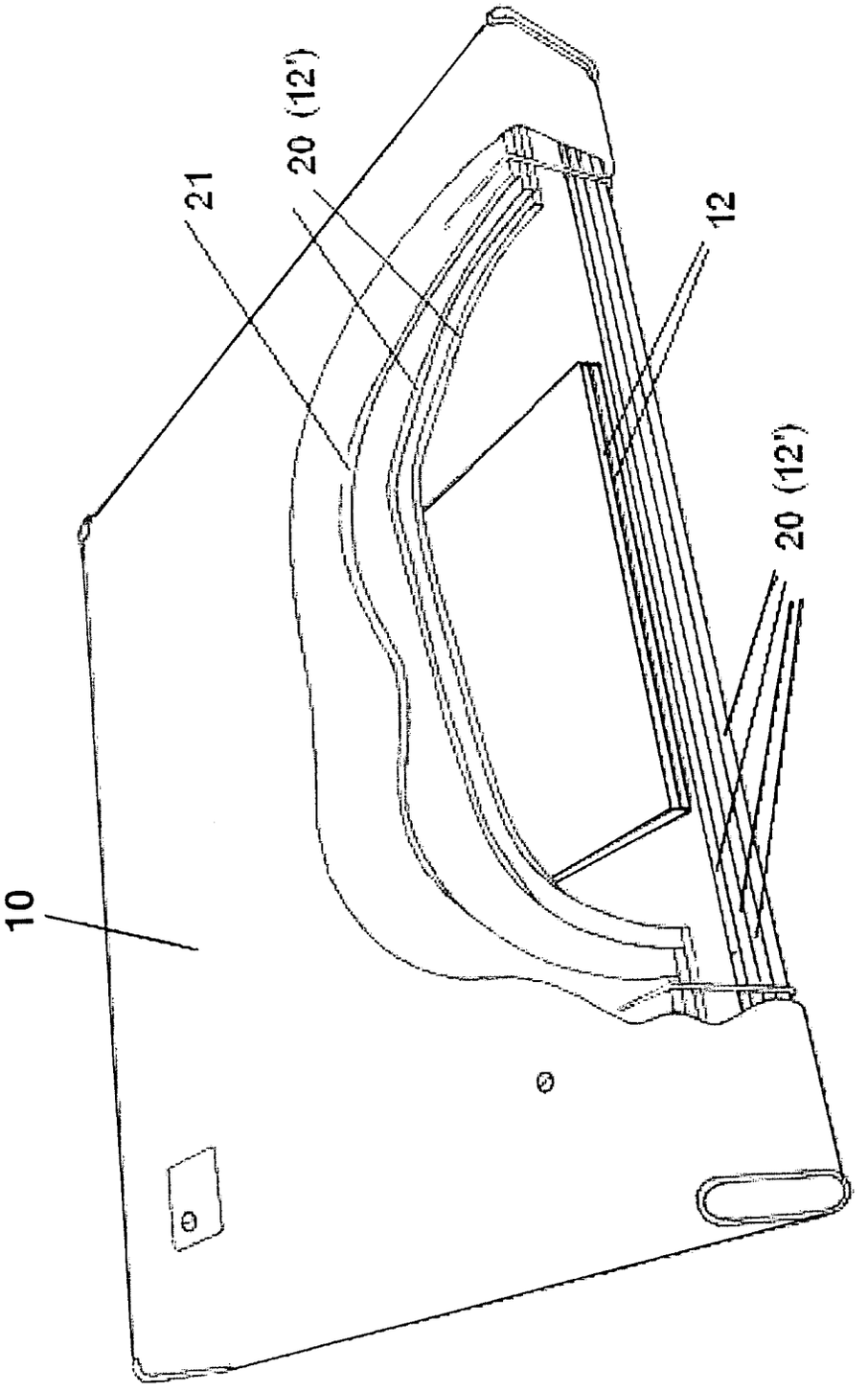

Fig. 2

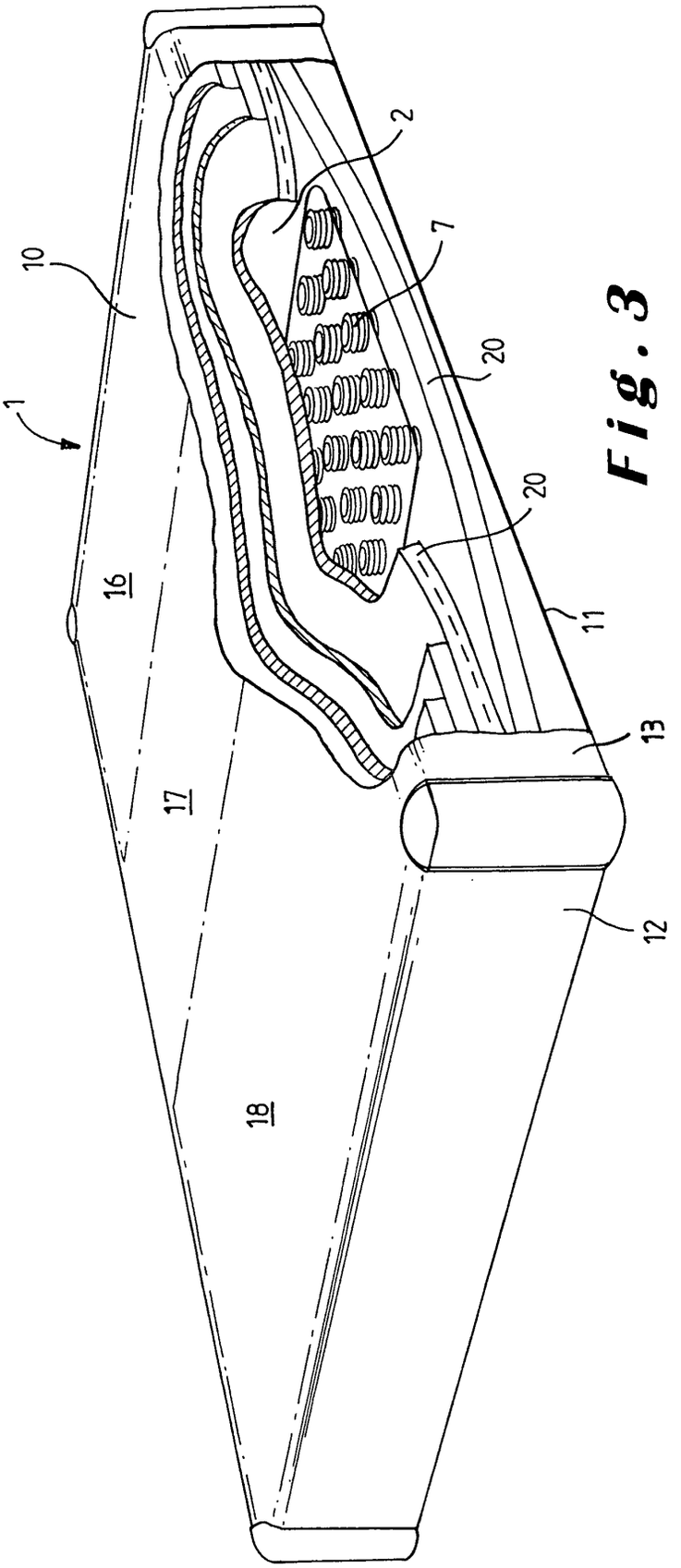

Fig. 3

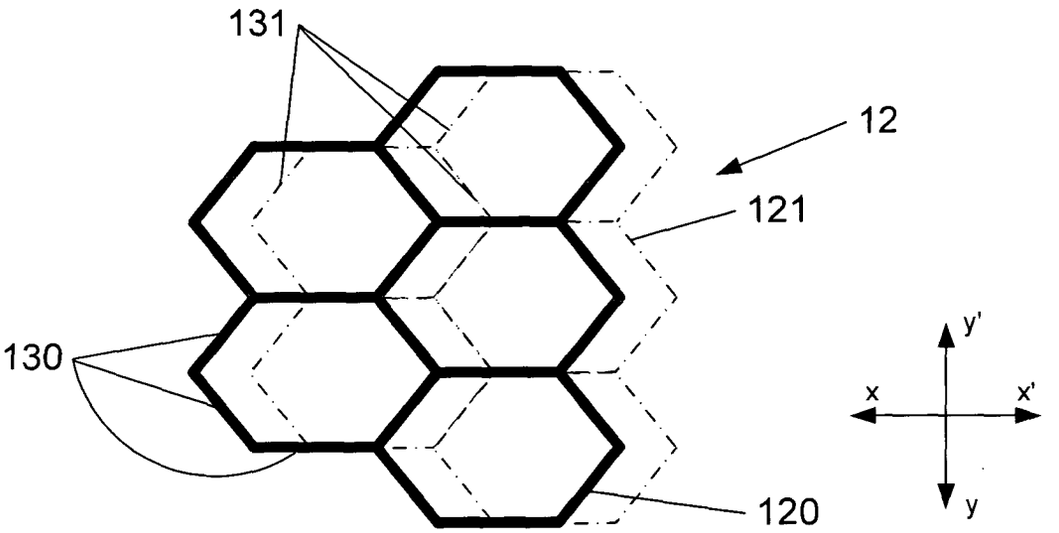

Fig. 4a

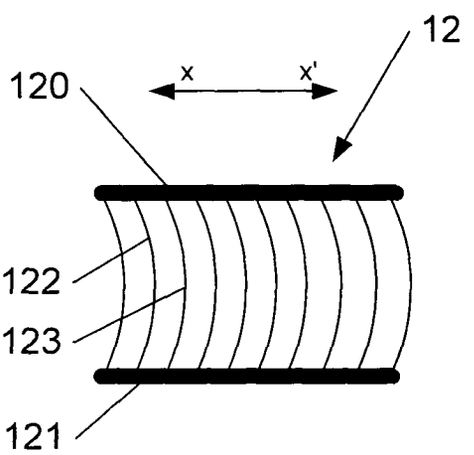

Fig. 4b

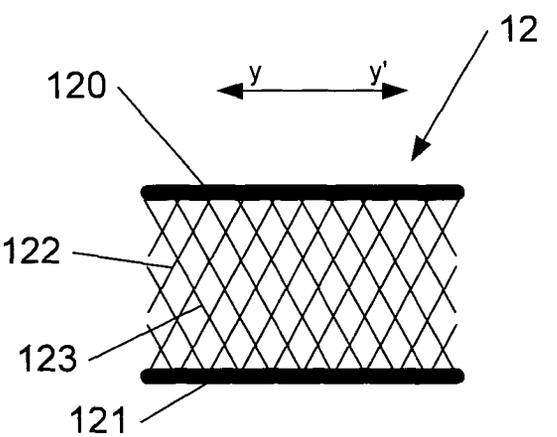

Fig. 4c

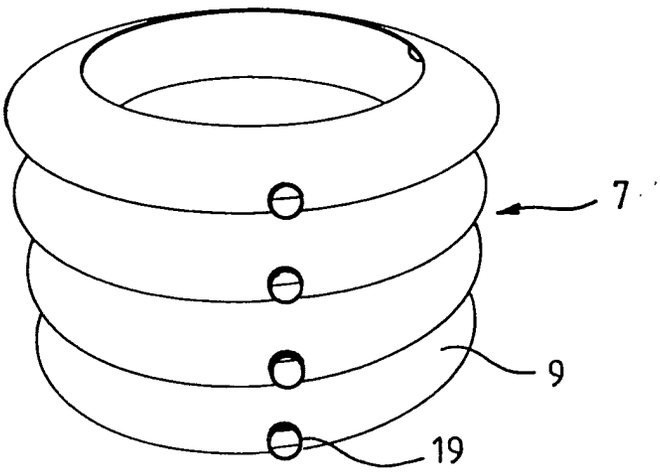

Fig. 5a

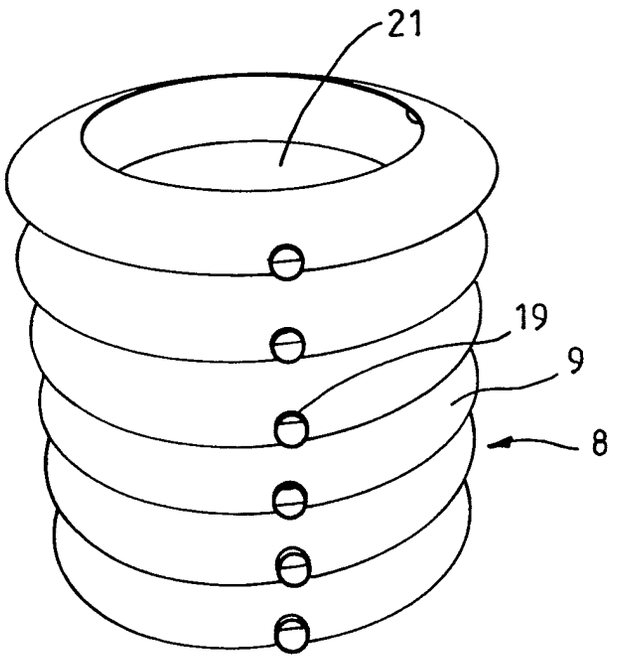

Fig. 5b

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 44 7138

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)
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