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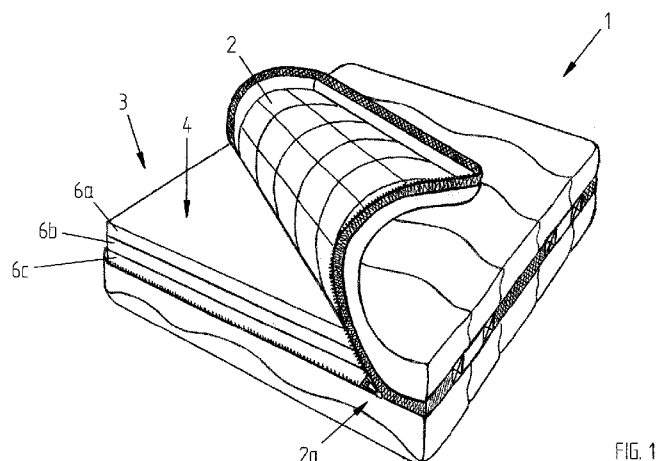


FIG. 1

(57) Abstract: The invention is a mattress (1) having a first side (4) suited to be positioned towards the user and a second side (5) suited to be rested on a supporting surface. Said mattress comprises a plurality of layers (6a, 6b, 6c, 6d) arranged between the first side (4) and the second side (5), at least one first layer of the plurality of layers (6a, 6b, 6c, 6d) comprising one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) and at least one second layer of the plurality of layers (6a, 6b, 6c, 6d) comprising one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D), the one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of the first layer and the one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of the second layer comprising a containment envelope (39) provided with connection means (12) suited to removably connect two or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of the first layer or of the second layer, wherein the position of the one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) can be exchanged so that they can be arranged in different positions between the first side (4) and the second side (5). The invention furthermore concerns a method for configuring a mattress (1) having a first side (4) suited to be positioned towards the user and a second side (5) suited to be rested on a supporting surface.

MULTI-LAYER MATTRESS.

TECHNICAL FIELD OF THE INVENTION

The present invention concerns the technical field of production of mattresses for beds.

- 5 In particular, the present invention concerns the production of bed mattresses of the multi-layer type.

The present invention concerns also a method for the configuration of this type of mattress.

DESCRIPTION OF THE STATE OF THE ART

- 10 The evolution of the mattress production techniques has led to the more or less complex variants presently available on the market.

The evolution of mattresses over time has mainly involved the filling materials, for example passing from straw fillings to fillings made with horsehair, sheep wool or other soft materials.

- 15 The modern mattresses available on the market still are of various types and include versions with springs covered by thicker or thinner layers of wool or other soft materials, or more recent versions constituted by layers of natural (for example, latex) or artificial materials coupled together so as to form a compact structure suited to be rested on the bed base.

- 20 Therefore, it is possible to find various types of mattresses made up of layers, up to five layers or even more, properly glued to one another and possibly configured so as to include areas having different characteristics, for example more or less firm/soft or more or less comfortable areas, so that they can suit the user's needs and/or tastes from time to time.

- 25 For this purpose, mattress manufacturers combine, through a glueing operation, different superimposed layers of materials having specific mechanical characteristics. In particular, the density of the material and its impact resistance characteristics are taken in consideration. It is known, for example, that layers are used which are made of foam materials with high, medium or low density, as
30 well as layers made of the so-called memory foam materials, possibly even these with high, medium or low density.

Typically the upper layer, meaning the layer that is in direct contact with the user's body, is of the memory foam type, preferably with high density.

- The particular arrangement of the various layers gives the user a corresponding
35 level of comfort and a specific degree of firmness/softness that influences the

mattress selection process at the moment when it is purchased.

A soft layer typically has the function to mould to the body shape, while a more rigid layer typically has the function to support it.

Reference is often made also to the load bearing capacity of the mattress, wherein
5 the load bearing capacity is generally intended as a measurement of the load resistance. The higher the value of the load bearing capacity, the harder the mattress.

The user, therefore, can choose from within a wide range of mattresses, each one having its own characteristics, in particular offering different degrees of comfort
10 and/or different degrees of firmness/softness.

However, the mattresses made according to the known technique pose some drawbacks.

A first drawback posed by the mattresses of the known type lies in that at the moment of purchase it is difficult for the user to choose the model offering the
15 most suitable degree of firmness. At the moment of purchase, in fact, the user who is in front of the seller and of the different models available, even if he/she receives advice, will always doubt whether the choice he/she is making is the right one, the most suitable for his/her body structure and/or for his/her needs, since he/she does not have the chance to properly test the mattress, meaning the
20 chance to sleep on the same for one night, if not even more.

It is evident that the time available for the choice, independently of how long, will never be sufficient to eliminate the buyer's fear to make a wrong choice.

Another drawback posed by the mattresses of the known type concerns the operations necessary to clean them and the consequent hygienic conditions. A
25 first problem in this regard derives from the fact that humidity can remain trapped within the filling material that makes up the material, and in particular between the various glued layers which, as already explained, typically make up said filling. Another hygienic problem is related to the accumulation of sweat and/or to accidental stains, in particular in the upper part of the mattress exposed
30 towards the user's body.

A reduced degree of hygiene increases the risk of allergies due to mites, dust and bacteria originating from the mattress itself.

Even the cleaning or sanitization of the mattress, for example by washing the filling, is especially complicated due to the overall dimensions of the filling
35 itself.

The size of the mattress and of its filling leads to a further drawback represented by the fact that it is difficult to handle it when it must be moved or, in the worst case, disposed of.

A further drawback is related to the permanent deformation and/or deterioration and/or wear of the mattress, in particular of the upper part of the mattress, on which the user's body rests. In particular, the upper part (winter/summer side) tends to sink at the level of the areas on which the user's body rests during sleep. Due to this deterioration, it often becomes necessary to purchase a new mattress.

Another drawback related in particular to the manufacture of mattresses with multi-layer filling is represented by the need to use glues and/or other specific substances to fix the various layers that make up the filling.

Therefore, it is the main object of the present invention to eliminate or at least partially overcome the drawbacks mentioned above.

In particular, it is one object of the present invention to provide a solution that makes it possible to eliminate any doubt for the user at the moment of purchase, when he/she has to choose the right mattress, suitable for his/her needs.

It is another object of the present invention to provide a solution that makes it possible to facilitate the mattress cleaning operations and to increase the degree of hygiene compared to the mattresses of the known type.

It is a further object of the present invention to provide a solution that makes it easier to handle the mattress when it has to be moved or disposed of.

It is another object of the present invention to provide a solution that makes it possible to reduce the expenses related to the replacement of the mattress and to the purchase of a new one over time.

It is a further object of the present invention to provide a solution that makes it possible to limit/eliminate the use of glues and/or other similar substances to make the filling.

SUMMARY OF THE PRESENT INVENTION

The present invention is based on the general consideration that the problems found in the state of the art can be at least partially overcome through the manufacture of a multi-layer mattress comprising one or more removable portions whose position can be exchanged, so that it is possible to modify the characteristics of the mattress as preferred, even at home, with no inconvenience.

According to a first aspect of the present invention, the subject of the same is thus a mattress having a first side suited to be positioned towards the user and a

second side suited to be rested on a supporting surface, wherein the mattress comprises a plurality of layers arranged between said first side and said second side, at least one first layer of said plurality of layers comprising one or more removable portions and at least one second layer of said plurality of layers comprising one or more removable portions, said one or more removable portions of said first layer and said one or more removable portions of said second layer comprising a containment envelope provided with connection means suited to removably connect two or more removable portions of said first layer or of said second layer, wherein it is possible to exchange the position of said one or more removable portions so that they can be arranged in different positions between said first side and said second side.

In a preferred embodiment of the invention, the first layer comprises only one removable portion and a corresponding containment envelope and the second layer comprises only one removable portion and a corresponding containment envelope, said removable portion of said first layer and said removable portion of said second layer being such that their position can be exchanged so that they can be arranged in different positions between the first side and the second side.

More preferably, the first layer is constituted by only one removable portion and the second layer is constituted by only one removable portion, the removable portion of the first layer and the removable portion of the second layer being such that their position can be exchanged so that they can be arranged in different positions between the first side and the second side.

In a preferred embodiment of the invention, the mattress comprises at least three layers arranged between the first side and the second side, at least one first layer of said plurality of layers comprising one or more removable portions and at least one second layer of said plurality of layers comprising one or more removable portions, said one or more removable portions of the first layer and said one or more removable portions of the second layer being such that their position can be exchanged so that they can be placed in different positions between the first side and the second side of the mattress.

Preferably, said one or more removable portions of the first layer have characteristics that are different from those of said one or more removable portions of the second layer.

The expression “characteristics of the portions” preferably means one or more of the following characteristics: type of material of which the portion is made,

density of the material of which the portion is made, geometric shape of the material of which the portion is made.

According to a preferred embodiment of the present invention, the connection means constitute anti-translation means suited to prevent any translation of two layers of the plurality of layers resting on each other.

More preferably, the connection means constitute anti-translation means suited to prevent any translation of said one or more removable portions of the first layer with respect to said one or more removable portions of the second layer and vice versa when the first layer rests on the second layer.

According to preferred embodiments of the present invention, the connection means comprise one of the following means: connection means of the Velcro® type; connection means comprising one or more snap fasteners; connection means comprising one or more zip fasteners.

In a preferred embodiment of the invention, the mattress comprises connection means suited to removably connect two or more removable portions of the first layer or of the second layer.

Said connection means preferably comprise one or more shapes areas suited to allow the removable portions to be fixed therein. More preferably, the connection means comprise a further removable connection element arranged between the removable portions.

In a preferred embodiment, the mattress made according to the invention is provided with one or more layers with springs.

Preferably, containment means are provided that are suited to contain the plurality of layers. In a preferred embodiment, the containment means that contain the plurality of layers can be opened so as to allow access to said plurality of layers.

According to a preferred embodiment of the invention, the containment means comprise a lateral portion suited to contain the filling, a first closing layer suited to be associated with the lateral portion and suited to be arranged externally to the first side and a second closing layer suited to be associated with the lateral portion and suited to be arranged externally to the second side.

In a preferred embodiment, the mattress comprises stiffening means. The stiffening means preferably comprise one or more elements interposed between two layers of the mattress resting on each other.

According to a preferred embodiment of the invention, the mattress comprises a

containment envelope suited to contain said one or more removable portions.

According to another aspect of the present invention, the subject of the same is a method for the configuration of a mattress having a first side suited to be positioned towards the user and a second side suited to be rested on a supporting surface, wherein the mattress comprises a plurality of layers arranged between said first side and said second side, at least one first layer of said plurality of layers comprising one or more removable portions and at least one second layer of said plurality of layers comprising one or more removable portions, said one or more removable portions comprising a containment envelope provided with connection means suited to removably connect two or more removable portions together, wherein said configuration method comprises a step in which said one or more removable portions of said first layer are exchanged with said one or more removable portions of said second layer.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages, objects and characteristics, as well as further embodiments of the present invention are defined in the claims and will be illustrated in greater detail below through the following description, with reference to the attached drawings; in the drawings, corresponding or equivalent characteristics and/or component parts of the present invention are identified by the same reference numbers. In particular:

- Figure 1 shows an axonometric view of a partially opened mattress carried out according to a first preferred embodiment of the invention;
- Figure 2 shows an axonometric view of the filling of the mattress of Figure 1 according to a preferred embodiment of the invention;
- Figure 3 shows an exploded view of the filling of Figure 2;
- Figures from 4 to 7 show an enlarged view of a detail of Figure 2 belonging to possible embodiments of the filling of the mattress according to a first preferred embodiment of the invention;
- Figures from 8 to 44 show variant embodiments or different uses of the mattress and/or of the filling of the present invention.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

Even though the present invention is described here below with reference to its embodiments represented in the drawings, the present invention is not limited to the embodiments described below and represented in the drawings. On the contrary, the embodiments described below and represented in the drawings

clarify some aspects of the present invention, the scope of which is defined in the claims.

The present invention can be especially, but not exclusively applied in the field of production of multi-layer mattresses for beds, wherein each layer is preferably made with foam or memory foam materials.

It should however be noted that the possible applications of the present invention are not limited to this type of solution; on the contrary, the present invention can be advantageously applied for the production of a multi-layer mattress in which one or more layers can be of any type, according to the details that are explained in the following description.

A mattress 1 made according to a first preferred embodiment of the invention is described here below with reference to Figures from 1 to 7.

In the first embodiment of the present invention, the mattress 1 substantially comprises containment means 2 and a filling 3 contained in said containment means 2.

The mattress according to the present invention, and as described in greater detail below, can also be made without said containment means and in this case it will coincide with the structure constituted by the filling.

The mattress 1 illustrated and described herein is, in particular, a king size mattress that is rectangular in shape and has a standard size of 190x160 cm. However, the description provided below with reference to the inventive concept introduced by the present invention can be applied to any type of mattress, for example to single size mattresses, queen size mattresses etc., and to mattresses having any shape, for example a round shape or a different shape.

The containment means 2 constitute the external cover of the filling 3. The term "cover" will be used here below to indicate said containment means 2.

In the embodiment illustrated herein, the cover 2 is preferably of the opening type, so as to allow easy access to the filling 3. For this purpose, the cover 2 is provided with a zip fastener 2a that extends at least along a perimeter section of the filling 3. In variant embodiments, the cover can be made in such a way that it can be opened through equivalent means, such as Velcro, buttons etc. In further embodiments, even though less advantageous, the cover may also be of the closed type, for example entirely sewn. The filling can however be accessed by undoing part of the stitches, and the assembly can be successively restored with a new seam. In further embodiments, moreover, the cover, once opened in order to

access the filling, can be replaced with a new one, which means that substantially it can be a cover of the disposable type.

Regarding the material for making the cover 2, this can be of any type typically used in the field of mattresses, for example it can be a fabric of various types, such as cotton, satin, wool and possibly it can be provided with padding elements and/or openwork and/or open areas for aerating the filling 3.

Furthermore, preferably, the cover 2 can have a particular ornamental appearance, for example it can be printed with suitable ornamental patterns.

The filling 3 comprises, as is known, two sides 4, 5. A first one of said sides 4, which will be conventionally indicated as upper side 4, constitutes the side on which the user's body rests, and the second one of said sides 5, which will be conventionally indicated as lower side 5, constitutes the side suited to be rested on a supporting surface that is not illustrated herein and is typically constituted by a bed base.

The filling 3, according to the drawings of Figures 2 and 3 and according to an aspect of the present invention, comprises a plurality of layers 6a, 6b, 6c and 6d that are arranged between the upper side 4 and the lower side 5.

In the embodiment illustrated and described herein there are 4 layers. In variant embodiments, however, the number of layers may be different, there may even be only three layers.

According to the invention, the layers 6a, 6b, 6c and 6d are removably associated with one another. The term "removably" means that two layers can be positioned on top of each other, in such a way that successively they can be easily separated without being damaged, as explained in the description provided here below.

In the designed embodiments, therefore, there are no permanent joining means that serve to glue the layers to each other, such as glues or equivalent substances.

In the embodiment illustrated and described herein, preferably, the various layers 6a, 6b, 6c and 6d are all separate layers, simply resting on one another.

The layers 6a, 6b, 6c and 6d used to make the filling 3 preferably have different characteristics, or at least one of them has characteristics that are different from those of the other layers.

The term "characteristic" preferably means the degree of softness or firmness of the layer. A soft layer typically has the function of moulding to the shape of the body; a less soft, or more rigid layer typically serves to support the body.

The term "characteristic" of the mattress can also mean, preferably, the load

bearing capacity of the mattress, wherein the load bearing capacity is generically related to a measurement of the load resistance.

The higher the value of the load bearing capacity, the harder the mattress.

These characteristics of the layer depend on the type of material used and/or on the shape of the layer itself.

In particular, assuming that the same quantity of material is used, the characteristics of the material depend on its density, that is, by the weight of the material per unit of volume (expressed, for example, in Kg per cu.m.).

Obviously, also the type of material used and its production technique affect said characteristics, as is also illustrated here below.

Last but not least, also the thickness of the layer affects its characteristics. Layers having different thicknesses, even if they are made of the same material, can obviously have a different degree of softness/firmness and/or a different load bearing capacity.

In the embodiment illustrated and described herein, the layers 6a, 6b, 6c and 6d are different from one another and are positioned on top of one another, so as to define a first configuration, as shown in Figure 4. The term "configuration", therefore, refers to the mutual positions of the various layers between the upper side 4 and the lower side 5. The mattress 1 with the layers 6a, 6b, 6c and 6d arranged according to said first configuration actually represents the product that can be purchased by the user.

The configuration illustrated in Figure 4 preferably comprises:

- a first layer 6a, or upper layer, positioned towards the upper side 4 and made of a memory foam (viscoelastic) material with density equal to 52Kg/m³;
- a second layer 6b made of a foam material, or polyurethane foam, with density equal to 25Kg/m³;
- a third layer 6c made of a foam material, or polyurethane foam, with density equal to 30Kg/m³;
- a fourth layer 6d, or lower layer, positioned towards the lower side 5, made of a foam material, or polyurethane foam, with density equal to 35Kg/m³.

Preferably, all of the layers have the same thickness, for example 5cm.

In variant embodiments, however, each layer can have a specific thickness and/or density.

The first configuration of the mattress, as described and illustrated in Figure 4, offers the user a first corresponding feeling of comfort, intended as the feeling of

maximum softness obtainable using said layers 6a, 6b, 6c and 6d. A mattress with said first configuration can be particularly suitable for users weighing between 50kg and 80kg.

Thanks to the inventive aspect of the present invention, meaning the fact that the layers 6a, 6b, 6c and 6d are removably associated with one another, the mattress can however be configured in a different manner by simply changing the mutual position of the various layers, that is, by simply moving the layers themselves. This may be due to a need of the user, who requires a different feeling of comfort, that is, not the maximum softness, or to the fact that the user has a sturdier physical structure and a weight not included between 50kg and 80Kg. The user can advantageously obtain said new configuration and choose the configuration which is most suitable for his/her needs, for example one of those described here below, after purchasing the mattress, at home and after possible test periods, that is, after using the mattress for one or more nights.

Typically, the first memory foam layer 6a is maintained as upper layer in contact with the body, exactly owing to the intrinsic characteristics of the memory foam material and the feeling of extreme adaptation to the different body parts offered. Therefore, preferably, the different further configurations that can be obtained are defined by moving the three underlying layers 6b, 6c and 6d, as illustrated and described here below with reference to Figures from 5 to 7.

However, there is no indication against moving all of the four layers 6a, 6b, 6c, 6d with the possibility to obtain 24 different configurations, each one suited to offer its own specific feeling different from the others.

The embodiment illustrated and described with reference to Figure 5, therefore, has a second configuration in which the mutual position of the third and fourth layer has been inverted. The result is thus the following configuration:

- a first layer 6a, or upper layer, positioned towards the upper side 4 and made of a memory foam (viscoelastic) material with density equal to 52Kg/m³;
- a second layer 6b made of a foam material, or polyurethane foam, with density equal to 25Kg/m³;
- a third layer 6d made of a foam material, or polyurethane foam, with density equal to 35Kg/m³;
- a fourth layer 6c, or lower layer, positioned towards the lower side 5 and made of a foam material, or polyurethane foam, with density equal to 30Kg/m³.

The second configuration of the mattress, as described and illustrated in Figure 5,

defines for the user a first corresponding feeling of slightly stronger support in the reaction thrust, but still of great softness. A mattress with said second configuration can be particularly suitable for users weighing between 70kg and 90kg.

5 The embodiment illustrated and described herein with reference to Figure 6 has a third configuration, in which the mutual position of the second and of the third layer has been inverted with respect to the first configuration. The result is thus the following configuration:

- a first layer 6a, or upper layer, positioned towards the upper side 4 and made of
10 a memory foam (viscoelastic) material with density equal to 52Kg/m³;
- a second layer 6c made of a foam material, or polyurethane foam, with density equal to 30Kg/m³;
- a third layer 6b made of a foam material, or polyurethane foam, with density equal to 25Kg/m³;
- 15 - a fourth layer 6d, or lower layer, positioned towards the lower side 5 and made of a foam material, or polyurethane foam, with density equal to 35Kg/m³.

The third configuration of the mattress, as described and illustrated in Figure 6, defines for the user a feeling of even greater support, resulting from the fact that the firmer foam layer is moved near the first memory foam layer 6a. A mattress
20 with such third configuration can be particularly suitable for users weighing between 80kg and 110kg.

The embodiment illustrated and described with reference to Figure 7 has a fourth configuration, in which the mutual position of the second and of the fourth layer has been inverted with respect to the first configuration. The result is thus the
25 following configuration:

- a first layer 6a, or upper layer, positioned towards the upper side 4 and made of a memory foam (viscoelastic) material with density equal to 52Kg/m³;
- a second layer 6d made of a foam material, or polyurethane foam, with density equal to 35Kg/m³;
- 30 - a third layer 6c made of a foam material, or polyurethane foam, with density equal to 30Kg/m³;
- a fourth layer 6b, or lower layer, positioned towards the lower side 5 and made of a foam material, or polyurethane foam, with density equal to 25Kg/m³.

The fourth configuration of the mattress, as described and illustrated in Figure 7,
35 defines for the user a feeling of great support, obtained on purpose and intended

for people who prefer a feeling of firmness. A mattress with such fourth configuration can be particularly suitable for users weighing between 80kg and 120kg.

According to the above, therefore, by simply changing the position of the layers, which can be made after the purchase, at home, it is possible to choose from a wide range of configurations, offering different feelings, the one that is most suitable for one's needs. The user, even the most demanding one, can thus find the configuration that most suits him/her, without the nuisance of having to choose the right mattress exactly at the moment of purchase.

Furthermore, the configuration and the feeling obtained therewith can be changed at any moment during the life of the mattress itself, with no need for the user to purchase a new mattress.

For example, it may be useful to adapt the configuration following a variation in the user's weight, be it a weight gain or a weight loss, over time, which makes the mattress extremely versatile.

Advantageously, the mattress according to the invention is easy to clean. In fact, since the mattress, in particular its filling, can be completely disassembled by separating its layers (which are not glued together), it is easy to completely clean each one of its layers individually.

Furthermore, if machine washable materials are used, for example foam, memory foam, hemp, latex, cotton-wool, cotton, feather, the mattress can be completely and easily washed in the washing machine.

The mattress that is the subject of the invention thus facilitates the cleaning operations and offers an increased degree of hygiene compared to the mattresses of the known type, in particular reducing considerably the risk of allergies due to mites, dust, bacteria, humidity mould etc.

Advantageously, the mattress carried out according to the invention can be easily disassembled by separating its layers, and is thus easy to handle when it is necessary to move it or even to transport it towards a disposal centre. It will be sufficient to transport one layer at a time, if necessary by rolling it up in rolls with reduced overall dimensions, possibly introduced in vacuum envelopes, as illustrated and described with reference to Figure 42.

Still advantageously, the mattress carried out according to the invention allows one or more of its layers to be replaced, with no need to replace the entire mattress.

In a first case, it is possible to replace one or more layers, usually the most worn out ones, in order to restore the ideal initial conditions.

In another case, it is possible to replace one or more layers, or to add one or more layers, in order to benefit from further configurations offering further new
5 feelings.

This, furthermore, reduces the expenses related to the purchase of a new mattress capable of satisfying new needs or simply related to the repair of the mattress itself.

Still advantageously, it will be possible to replace one or more layers over time in
10 the case where technological progress should offer new types of materials, thus making it possible to update a mattress with the last technological innovations introduced in the market.

According to an advantageous aspect, the mattress carried out according to the invention does not require the use of glues and/or other similar substances for the
15 filling.

The mattress production costs and steps are thus reduced.

Figures from 8 to 43 show some variant embodiments of the invention. In the drawings, corresponding or equivalent characteristics and/or component parts are identified by the same reference numbers.

20 In particular, the figures show variant embodiments of the filling 11 of the mattress according to the invention. The cover, which sometimes is not shown, if provided can preferably assume one of the shapes described above.

Said variant embodiments highlight a further aspect of the present invention, which concerns the coupling between adjacent layers making up the filling 11 of
25 the mattress.

In fact, in the first embodiment described above with reference to Figures from 1 to 7, the various layers 6a, 6b, 6c, 6d making up the filling 11 are superimposed to one another and introduced in the cover 2 that keeps them in position in order to define the final shape of the mattress, substantially the shape of a
30 parallelepiped in the case at hand.

According to the variant embodiments illustrated and described here below, the filling 11 is provided with anti-translation or anti-slip means 12, which ensure that two adjacent layers, once in contact with each other, do not slide with respect to each other, thus guaranteeing the compactness and the desired shape of the
35 filling 11.

With reference to the embodiment shown in Figures from 8 to 11, the anti-translation means 12 preferably comprise a projecting portion or rib 13 located on the upper contact surface 16a of a first layer 16 and a recessed portion or recess 14 located on the lower contact surface 16b of a second layer 16 arranged so that it rests on the first layer 16.

The same reference numbers are used for the two layers, since they are advantageously identical and therefore advantageously interchangeable according to the teaching of the present invention.

Preferably, the rib 13 and the recess 14 have matching profiles, so as to produce a precise or substantially precise coupling when the two layers are superimposed to each other.

Furthermore, the presence of ribs accommodated in corresponding recesses is not perceived by the user.

Furthermore, preferably, each layer has its upper contact surface 16a provided with said rib 13 and its lower contact surface 16b provided with said recess 14.

In the preferred embodiment illustrated herein, the rib 13 and the recess 14 are made in such a way as to define a network. The rib 13 comprises three portions 13a that develop according to a first direction and a portion 13b that develops according to a different direction, preferably perpendicular to the first direction.

The recess 14, in a matching shape, analogously comprises three portions 14a that develop according to a first direction and a portion 14b that develops according to a different direction, preferably perpendicular to the first direction.

The particular network configuration makes it possible to avoid any mutual translation movements of the two layers when they are resting on each other.

In the preferred embodiment of the invention illustrated herein, the cross section of the rib 13 and the recess 14 is in the shape of a "V" or an upturned "V" and their height/depth is preferably equal to 0.5mm.

In variant embodiments of the invention, the height of the rib can be different. Preferably, the height of the rib is maintained at values lower than half the thickness of the layers in which they are provided.

The upper and lower contact surfaces of each layer actually have the same shape and therefore they can be easily moved according to the desired configuration while at the same time maintaining the desired anti-translation/anti-slip effect.

It should be noted that, preferably, in the filling 11 illustrated herein, the upper layer 18 is different from the others and its upper surface is preferably smooth to

the touch and to the sight, as it is intended to be placed towards the body of the user. As already explained, however, said layer is preferably made of a memory foam material and is preferably maintained always in the upper position, even in possible different configurations of the mattress.

- 5 The shape, number and arrangement of said projecting portions and of the recessed portions that define the anti-translation means can be different from those described and illustrated herein.

For this purpose, variant embodiments of the anti-translation means 12 are illustrated here below.

- 10 Figures from 12 to 14 show possible alternative embodiments of the ribs 13 and the recesses 14 that respectively have a round profile, a rectangular profile and a profile in the shape of a half hexagon. It is evident that any other shape can be used.

- Figures from 15 to 17 show possible alternative embodiments of the projecting portions 13 and of the respective recessed portions (not visible, but advantageously in a shape matching that of the projecting portions 13).

The projecting portions 13 of Figure 15 comprise localized raised parallelepipeds corresponding to matching recessed parallelepipeds for the recessed portions.

- 20 The projecting portions 13 shown in Figure 16 comprise localized raised cylinders corresponding to matching recessed cylinders for the recessed portions.

The projecting portions 13 of Figure 17 comprise localized raised triangle-based prisms corresponding to matching recessed triangular-based prisms for the recessed portions.

- 25 Preferably, the projecting or recessed geometric shapes used are slightly tapered, so that they can more easily fit into each other. For example, a raised truncated pyramid is preferable to a parallelepiped.

- 30 In all of the embodiments, and as shown in particular for the embodiments illustrated in Figures 16 and 17, one or more layers making up the filling can be preferably provided with holes 17, more preferably through holes. Said holes can be preferably made at the level of areas of the mattress that are intended to receive the protruding parts of the body, such as the shoulders or the hips, in order to offer more comfort. Furthermore, advantageously, said holes increase the breathability of the mattress, reducing the possibility of humidity accumulation, and thus ensuring an improvement from the hygienic point of view.

Figures from 18 to 20 show other possible embodiments of anti-translation or anti-slip systems for the layers that make up the filling.

In this case the anti-translation means 12 are preferably defined by the properly shaped contact surfaces 16a, 16b of the two layers 16 resting on each other.

- 5 In Figure 18 the contact surfaces 16a, 16b have a saw-toothed shape. In Figure 19 the contact surfaces 16a, 16b are provided with half spheres. In Figure 20 the contact surfaces 16a, 16b are crenel-shaped.

- Figure 21 shows a possible embodiment of the padding 11 in which some layers have an undulated shape. In particular, the inner layers are completely undulated/curved, preferably all in the same way, so that they can be moved in order to obtain the different configurations of the mattress. The external surface of the upper and lower outer layers is substantially smooth and therefore they preferably remain in this position in all of the various possible configurations. The undulated shape ensures more comfort as it moulds to the body shape ergonomically. Furthermore, said undulated shape serves to prevent translation movements between the layers.
- 10
- 15

- Preferably, each one of said undulated layers is obtained from a single (solid) block of material, for example foam material, through a cutting operation performed with techniques of the known type, for example laser cutting, hot wire cutting, etc. Alternatively, said undulated layers can be obtained directly by moulding/forming the special material in apposite moulds.
- 20

Figure 22 shows, by way of example, the behaviour of a filling 11 with two undulated layers when under the weight of the user's body.

- Figure 23 shows a possible embodiment of a filling 11 made up of various layers, illustrated separately in Figure 24.
- 25

The configurations that can be obtained with such a number of layers are innumerable.

- The first upper layer 50 preferably comprises a layer in low density memory foam, intended to ensure softness, adaptability and a good perception of the sequence of the other layers.
- 30

The first upper layer 50 comprises an upper surface that is not smooth, is provided with grooves and is intended to make the layer itself softer and more flexible.

- The second layer 51 is an undulated layer provided with square holes. The second layer 51 preferably comprises a low density foam material that facilitates
- 35

the gradual adaptation of the mattress to the most protruding parts of the body, such as the shoulders and the hips, but creates a slight resistance on the area corresponding to the side, which instead must be supported.

The third layer 52 is a layer with deep recesses on both sides. The projecting parts are smooth at the top but the cuts obtained ensure great adaptability to thrusts and high breathability.

The fourth layer 53 is a layer with longer, larger and uniform waves, which create a homogeneous contact surface having wide areas where there is no contact that provide high aeration, breathability and consequently coolness. The holes are provided at the level of the most sensitive areas of the body, but can have variable shapes and sizes depending on the model and the function.

The fifth layer 54 comprises a saw-toothed surface and is provided with holes. Also this surface is breathable and allows the weight to be distributed homogeneously.

The sixth layer 55 is made of a more rigid foam material that distributes all the overlying weights correctly and at the same time supports the layers providing a more decided thrust.

The fourth, fifth and sixth layers 4, 5 and 6 are firmer than the first three overlying layers.

The double "S" shape of each plate is suited to follow the natural human anatomy in the two main rest positions: supine and on one side. All the various waves, cuts, recess and all the holes serve for two specific purposes at the same time: for ensuring the passage of a large quantity of air and for lightening the material, with a consequent higher versatility in the combination of the layers.

Figures 25 and 26 show a variant embodiment of the anti-translation or anti-slip means 12 of the layers that make up the filling 11.

The anti-translation means 12 comprise one or more pins 30, in the embodiment illustrated herein preferably 4 and substantially arranged at the vertices of the filling 11, which are inserted in corresponding holes 31 made in each layer, preferably at the level of its vertices.

Each pin 30 preferably comprises a stem 32, preferably cylindrical in shape and with a diameter of 2cm, and an enlarged head 33 with a larger diameter, for example of 3cm (as shown in Figure 26).

Each hole 31 preferably comprises a cylindrical portion 34 suited to accommodate the stem 32 of the pin 30 and, preferably, an enlarged portion 35

suitied to accommodate the head 33 of the pin 30. In this way, the pin 30 inserted in a locked position remains flush with the last layer in which it is inserted.

The length of the pin 30 will obviously depend on the number of layers making up the filling 11.

5 The pin 30 is preferably made of semi-rigid foam polyurethane that reduces to a minimum the risk of injuries in case of accidental impacts against the pin itself.

In variant embodiments, the number and/or position and/or shape of the pins and of the corresponding holes can be any and they can be suitable for mutually locking the layers of the filling.

10 The anti-translation means 12 with the pins 30 and the holes 31 allow easy disassembly and assembly, so that the desired configuration of the mattress can be obtained, as previously described according to the inventive aspect of the present invention.

Figure 27 shows a variant embodiment of the anti translation or anti-slip means with which the layers making up the filling 11 are provided.

The anti-translation means 12 comprise, in this case, an anti-slip element 60 interposed between two layers of the filling 11.

The anti-slip element 60 preferably comprises a thin and flexible sheet with anti-slip and gripping properties. Said sheet 60 may comprise, for example:

- 20 - a thin sheet (for example, 0.5 mm thick) in neoprene, preferably perforated so as to allow the passage of air;
- a thin sheet in soft rubber, perforated so as to allow the passage of air, provided on both sides with rubber projections (spikes) that penetrate the material of the layers without perforating or damaging it, but creating a gripping system
- 25 obtained only through the weight of the layers;
- a thin sheet in recycled felt, with thickness included between 2 and 10 mm;
- a sheet in Scotch-Brite®;
- any other material equivalent to those listed above.

30 Figures 28 and 29 illustrate another variant embodiment of the anti-translation or anti-slip means 12 with which the layers making up the filling 11 are provided.

The anti-translation means 12 comprise one or more Velcro® strips 35 properly arranged on the contact surfaces of the various layers.

According to an inventive aspect of the present invention, the Velcro® strips are properly applied to an envelope 39 that encloses each layer.

35 The envelope 39 can preferably be made of cotton, viscose, wool, silk, cashmere,

linen, etc., or of a combination of said materials.

Furthermore, preferably, the envelope 39 can have a particular ornamental appearance, for example it may be printed with suitable ornamental patterns.

According to said inventive aspect of the present invention, therefore, the anti-translation means 12 actually constitute connection means 12 among the various layers making up the filling.

Always according to said inventive aspect of the present invention, therefore, the connection means 12 associated with the envelope 39 of each layer guarantee the mutual connection of the various layers and thus the formation of a compact structure for the filling 11. The mattress, therefore, may also be without cover and be defined by the filling 11 itself.

In an embodiment of the invention, however, said cover may be provided.

In the embodiment illustrated herein, the upper contact surfaces of the envelope 39 are provided with Velcro® strips, preferably male 36, and the lower contact surfaces of the envelope 39 are provided with Velcro® strips, preferably female 37.

Said male-female Velcro® strips 36, 37 allow the superimposed layers to be fixed to one another and also allow them to be easily disassembled and assembled to obtain the desired configuration of the mattress, as previously described according to the inventive aspect of the present invention.

In addition to said Velcro® strips arranged on the upper and lower contact surfaces of the envelopes 39, side strips 40 are preferably provided. Said male or female side strips 40 can be fixed to corresponding female or male strips present on the additional cover (not illustrated), if present, in order to ensure a more effective locking action and prevent any further movements of the layers once they have been inserted in the additional cover. Moreover, said side strips 38 can allow two layers that are placed side by side to be fixed to each other laterally, for example in order to obtain a king size mattress with two single fillings.

Figures 30 and 31 illustrate another variant embodiment of the connection means 12 that serve also as anti-translation or anti-slip means for the layers making up the filling 11.

The connection means 12 comprise one or more snap fasteners 41 properly applied to an envelope 39 that encloses each layer.

As explained above, the envelope 39 can be preferably made of cotton, viscose, wool, silk, cashmere, linen, etc., or of a combination of said materials, and

preferably comprise suitable ornamental patterns.

In the embodiment illustrated herein, male parts 41a and female parts 41b of said snap fasteners are properly distributed on the upper and lower contact surfaces of the layers, as well as on their sides. The snap fasteners allow the superimposed layers to be fixed to one another and also allow them to be easily disassembled and assembled in order to obtain the desired configuration of the mattress, in addition to allowing two layers positioned side by side to be fixed to each other laterally, in order to obtain a king size mattress with two single fillings, or to be fixed to a cover, if present.

Figures 32 and 33 show a further variant embodiment of the connection means 12 that serve also as anti-translation or anti-slip means of the layers making up the filling 11.

The connection means 12 comprise a fixing system with one or more zip fasteners 42 properly applied to an envelope 39 that encloses each layer.

As explained above, the envelope 39 can be preferably made of cotton, viscose, wool, silk, cashmere, linen, etc. or of a combination of said materials, and it may preferably comprise suitable ornamental patterns.

In the embodiment illustrated herein, the system includes zip fasteners applied along the long sides of each layer, in order to allow two layers positioned side by side to be fixed to each other laterally, as shown in Figure 32, for example in order to obtain a king size mattress.

The zip fasteners can also be preferably associated with the short sides of each layer, in order to allow two superimposed layers to be fixed to each other, according to the concept on which the present invention is based.

The zip fasteners, therefore, allow the superimposed layers to be fixed to each other and also allow them to be easily disassembled and assembled in order to obtain the desired configuration of the mattress, in addition to allowing two layers positioned side by side to be fixed to each other laterally or to be fixed to a cover, if present.

It should be noted that in the embodiments described above with reference to Figures from 28 to 32 and according to the inventive aspect of the present invention, the various layers that make up the filling include, as already explained, the use of a corresponding envelope 39 that encloses each layer and connection means 12 for said envelopes. The envelope 39 can be preferably made of cotton, viscose, wool, silk, cashmere, linen, etc., or of a combination of

said materials.

Furthermore, preferably, the envelope 39 can have a particular ornamental appearance, for example it may be printed with suitable ornamental patterns.

Said inventive concept that includes the use of an envelope enclosing each layer and of corresponding connection means, even if expressly illustrated with reference to Figures from 28 to 32, can be extended to the various embodiments described in the present invention with reference to the various layers or to the parts making up each layer of the filling.

Figure 34 shows a variant embodiment of the invention related to the possible production of a layer that makes up the filling.

The layer 70 is preferably obtained by joining several parts 71 that are properly shaped so that they can be coupled together by snap fitting and/or by means of joining elements 72, preferably made of the same material as the parts 71 that make up the layer 70.

The layer 70 is substantially defined by a combination of said parts 71.

The joining element 72 can assume a suitable shape, preferably the shape of an "8", in order to be able to be snap-fitted in corresponding substantially circular recesses provided in the adjacent parts 71 that make up the layer 70. It is evident that in variant embodiments the shape of said joining element and of the corresponding recesses can be different, as shown for example in Figures 34A and 34B.

Figures from 35 to 37 show a further variant embodiment of the filling 11 according to the present invention.

In the embodiment illustrated herein, reference is made to the production of a filling 11 for a king size bed, constituted by two single fillings 111 placed side by side, meaning two single mattresses placed side by side.

Each single filling is constituted by four superimposed layers. Each layer is in turn divided in four removable portions. A single filling is thus made up of sixteen removable portions, wherein each portion is preferably made of a specific material.

According to the inventive aspect of the present invention, each portion is enveloped by an envelope and there are connection means suited to connect the various portions, as described above.

Figure 36 shows a first possible combination of said portions, wherein A, B, C, D indicate the use of different materials, for example materials with different

density.

According to the inventive aspect of the present invention, the portions of said initial configuration can be mutually moved in order to obtain a different combination, depending on the user's will. Figure 37 shows such possible new configuration, obtained by simply exchanging the mutual position of said portions.

This exchange involves a variation in the degree of density in that area and said variation is perceived by the user in term of more and/or less comfort and/or rigidity. Said area can, for example, correspond to the shoulder, side, hip, that is, the most important parts of the body exactly because they are the heaviest, the most projecting or the most recessed.

With this system customization allows innumerable combinations and any user can find the type of comfort that most suits him/her for every part of his/her body.

The figure showing the king size mattress highlights a further advantage deriving from the fact that it is possible to customize a king bed in such a way that each user can customize his/her filling independently of the other user.

It is evident that the above advantageously applies also to single beds.

In the embodiment illustrated and described herein there are 4 layers for each single filling. In variant embodiments, however, the number of layers may be different, there may even be only two layers.

Figure 38 shows a further aspect of the present invention, related to the possibility to use for each layer a particular material or a more or less complex solution. In particular, the figure shows a layer 80 comprising springs.

Figures from 38A to 38D show a possible configuration of a filling 11 in which the layer with springs 80 shown in Figure 38 can be used inside other layers, for example three layers made of a foam material and different from one another.

The layer with springs 80 may comprise, for example, traditional springs, pocket springs, independent or micro springs.

The layer with springs 80 that can be used in the filling according to the present invention can be a much thinner layer compared to the other layers used in the spring mattresses of the traditional type.

In fact, said layer is one of the layers that make up the filling 11 and therefore the springs have a different thickness and a different reaction than those present in a classic spring mattress. The feeling, however, does not change. The layer with

springs 80 is preferably one of the lower layers of the filling 11, as shown in Figures 38A, 38B and 38C. However, for traditional users who prefer the classical feeling of the springs in contact with the body, it is sufficient to place the layer with springs 80 on top, as shown in Figure 38D.

- 5 The layer with springs may comprise a specific number of springs that may vary according to the size of each one of them.

Preferably, the springs are not placed in direct contact with other materials, for example the foam material, in order to prevent the deterioration of said layers in contact with the springs (typically made of iron). For this purpose, the layer with
10 springs comprises its own envelope 81, preferably comprising felt.

Figures 39 and 40 show a variant embodiment of the containment means or cover 2' that can be used to cover the filling 11 that is the subject of the present invention.

The cover 2' preferably comprises a lateral containment structure 2a' and two
15 upper 2b' and lower 2c' closing structures.

The lateral containment structure 2a' is preferably made of a semi-rigid foam material and can be put together, for example, through a dovetail joint as shown in Figure 40.

The two upper 2b' and lower 2c' closing structures preferably comprise two
20 layers made of a stretch material that can be removably associated with the lateral containment structure 2a', preferably through suitable connection means such as Velcro® strips or zip fasteners or snap fasteners.

Figure 41 shows a variant embodiment of the containment means 2'' for the filling/mattress 11 that is the subject of the present invention.

- 25 The cover 2'' preferably comprises an elastic band that encloses the filling 11 laterally and peripherally 11.

The cover 2'' preferably comprises a breathable 3D elastic mesh fabric.

Figure 42 shows a king size mattress 1 according to the present invention. Said variant embodiment differs from the variant embodiment of Figure 1 due to the
30 fact that the filling 11 is constituted by two single fillings 111 placed side by side, for example in the standard size 190x80, placed inside the cover 2.

Figure 43 shows one of the advantages obtainable from the manufacture of a mattress according to the present invention. The layers making up the filling 11 are easy to transport and/or to store. Each layer can be comfortably rolled up
35 (Figure 43A), then tied with belts (Figure 43B) and if desired vacuum packed in

a suitable envelope (Figure 43C).

Figure 44 shows a variant embodiment of the filling 11 that is the subject of the present invention.

Said filling is provided with a system for stiffening the area of the filling, and therefore of the mattress, that should provide more support.

The stiffening system comprises one or more stiffening elements 90 inserted between the layers of the filling 11. Preferably, the stiffening element 90 comprises a slat that is inserted between two layers of the filling. The slat is preferably made of wood or plastic or a rigid foam material or another rigid material.

Thanks to the fact that the layers are not glued to one another, it is not necessary to make holes in order to introduce said stiffening elements 90 in the filling 11.

The shape and thickness of the stiffening elements 90 are such that they do not affect the thickness of the filling considerably. In particular, the stiffening element 90 has a rounded shape, as shown in Figure 44A, so that it does not mark the layers with which it comes into contact.

It has thus been proven that the mattress according to the present invention allows the set objects to be achieved. In particular, the present invention makes it possible to configure the mattress according to one's needs, eliminating any doubt regarding the choice of the most suitable mattress at the moment of purchase.

If on the one hand the present invention has been described with reference to the particular embodiments illustrated in the figures, it should be noted that the present invention is not limited to the particular embodiments illustrated and described herein; on the contrary, further variants of the shapes and materials described herein fall within the scope of the present invention, which is defined in the claims.

CLAIMS

- 1) Mattress (1) having a first side (4) suited to be positioned towards the user and a second side (5) suited to be rested on a supporting surface, **characterized in that** it comprises a plurality of layers (6a, 6b, 6c, 6d) arranged between said first side (4) and said second side (5), at least one first layer of said plurality of layers (6a, 6b, 6c, 6d) comprising one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) and at least one second layer of said plurality of layers (6a, 6b, 6c, 6d) comprising one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D), said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said first layer and said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said second layer comprising a containment envelope (39) provided with connection means (12) suited to removably connect two or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said first layer or of said second layer, said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) being such that their position can be exchanged so that they can be arranged in different positions between said first side (4) and said second side (5).
- 2) Mattress (1) according to claim 1, **characterized in that** said first layer comprises only one removable portion and a corresponding containment envelope (39) and said second layer comprises only one removable portion and a corresponding containment envelope (39), said removable portion of said first layer and said removable portion of said second layer being such that their position can be exchanged so that they can be arranged in different positions between said first side (4) and said second side (5).
- 3) Mattress (1) according to any of the preceding claims, **characterized in that** said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said first layer has/have characteristics that are different from those of said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said second layer.
- 4) Mattress (1) according to claim 3, **characterized in that** said characteristics comprise one or more of the following characteristics: type of material making up the portion, density of the material making up the portion, geometric shape of the material making up the portion.
- 5) Mattress (1) according to any of the preceding claims, **characterized in that** said connection means (12) constitute anti-translation means suited to prevent any mutual translation of two layers of said plurality of layers (6a, 6b, 6c, 6d) resting on each other.

6) Mattress (1) according to any of the preceding claims, **characterized in that** said connection means (12) constitute anti-translation means suited to prevent any mutual translation of said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said first layer and said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said second layer, when said first layer rests on said second layer.

7) Mattress (1) according to any of the preceding claims, **characterized in that** said connection means (12) comprise one among the following means: connection means of the Velcro® type (36, 37); connection means comprising one or more snap fasteners (41); connection means comprising one or more hinges (42).

8) Mattress (1) according to any of the preceding claims, **characterized in that** it comprises further connection means suited to removably connect two or more removable portions inside said first layer or inside said second layer.

9) Mattress (1) according to claim 8, **characterized in that** said further connection means comprise one or more shaped areas suited to allow said two or more removable portions (71) to be fixed into each other.

10) Mattress (1) according to claim 8 or 9, **characterized in that** said further connection means comprise at least one removable connection element (72) arranged between said two or more removable portions (71).

11) Mattress (1) according to any of the preceding claims, **characterized in that** at least one of said plurality of layers comprises a spring layer (80).

12) Mattress (1) according to any of the preceding claims, **characterized in that** it comprises containment means (2) suited to contain said plurality of layers (6a, 6b, 6c, 6d).

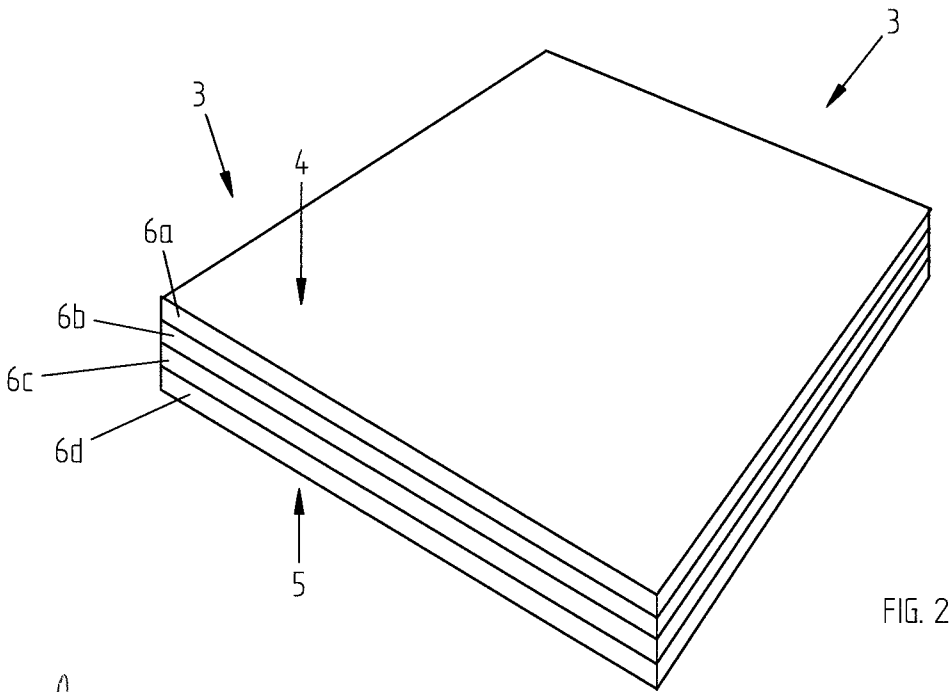
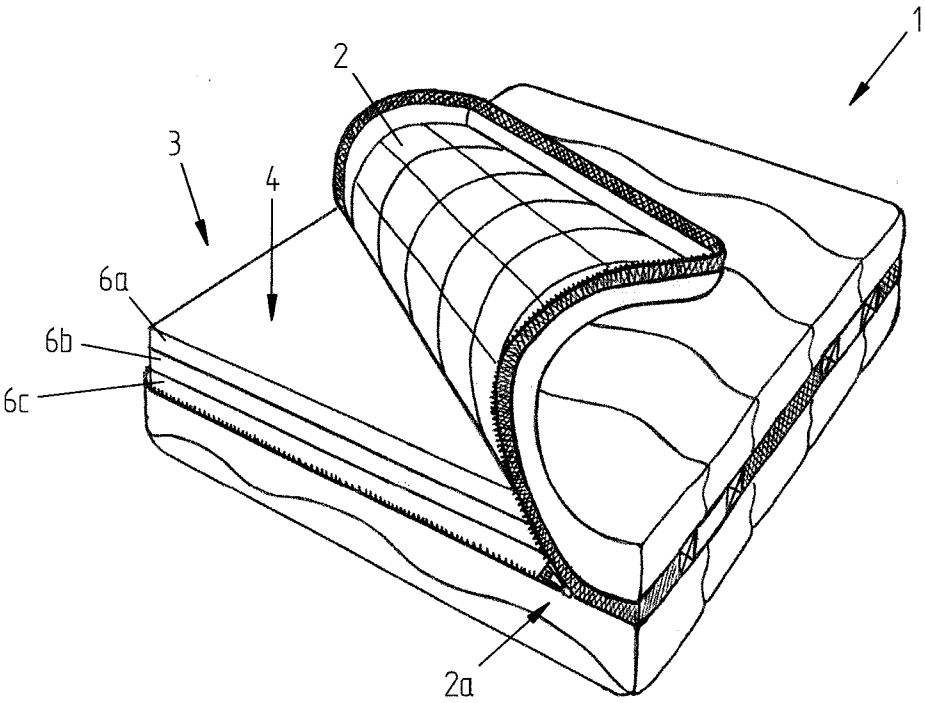
13) Mattress (1) according to claim 12, **characterized in that** said containment means (2) suited to contain said plurality of layers (6a, 6b, 6c, 6d) can be opened in order to ensure access to said plurality of layers (6a, 6b, 6c, 6d).

14) Mattress (1) according to claim 12 or 13, **characterized in that** said containment means (2') comprise a lateral portion (2a') suited to contain said plurality of layers (6a, 6b, 6c, 6d), a first closing layer (2b') suited to be associated with said lateral portion (2a') and suited to be arranged outside said first side (4) and a second closing layer (2c') suited to be associated with said lateral portion (2a') and suited to be arranged outside said second side (5).

15) Method for the configuration of a mattress (1) having a first side (4) suited to

be positioned towards the user and a second side (5) suited to be rested on a supporting surface, **characterized in that** it comprises a plurality of layers (6a, 6b, 6c, 6d) arranged between said first side (4) and said second side (5), at least one first layer of said plurality of layers (6a, 6b, 6c, 6d) comprising one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) and at least one second layer of said plurality of layers (6a, 6b, 6c, 6d) comprising one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D), said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) comprising a containment envelope (39) provided with connection means (12) suited to removably connect two or more removable portions with each other, wherein said configuration method comprises a step in which said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said first layer are exchanged with said one or more removable portions (6a, 6b, 6c, 6d; A, B, C, D) of said second layer.

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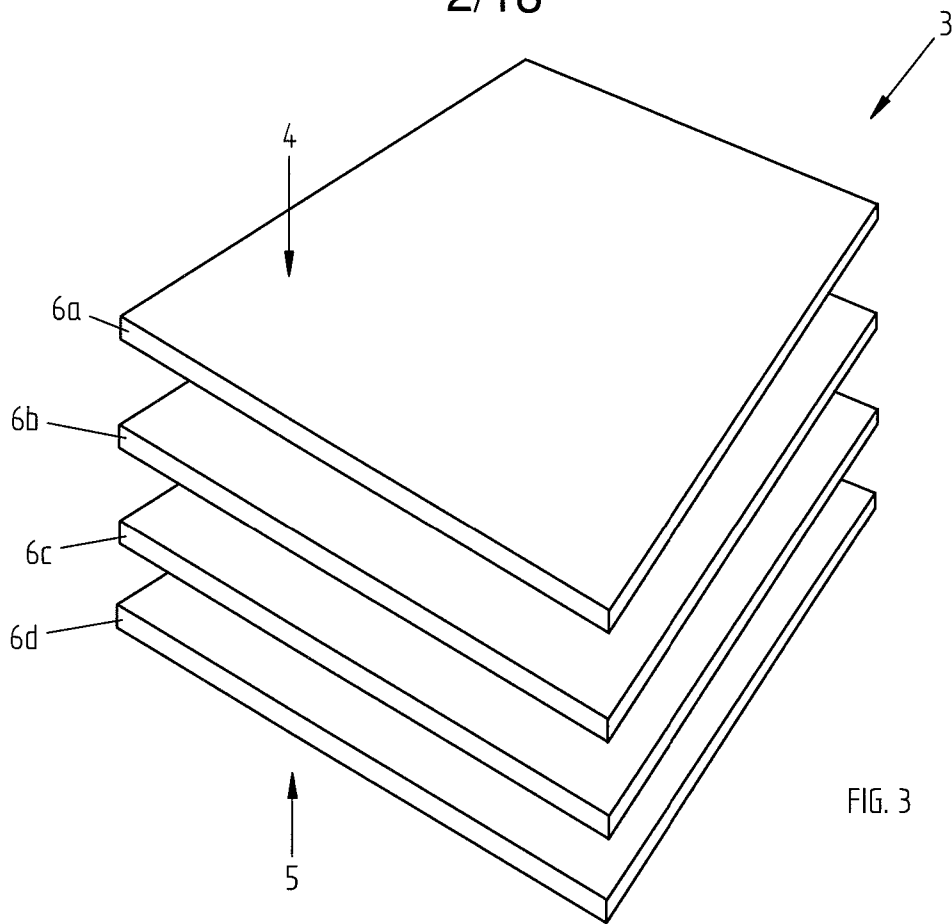


FIG. 3

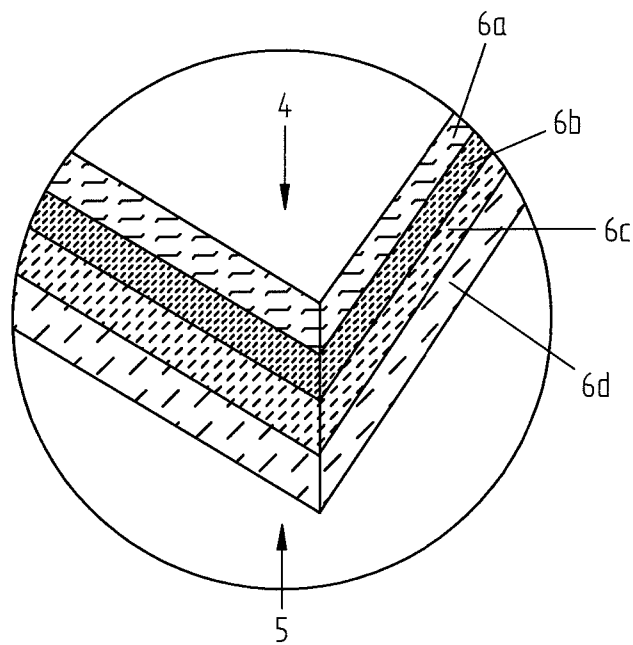


FIG. 4

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FIG. 5

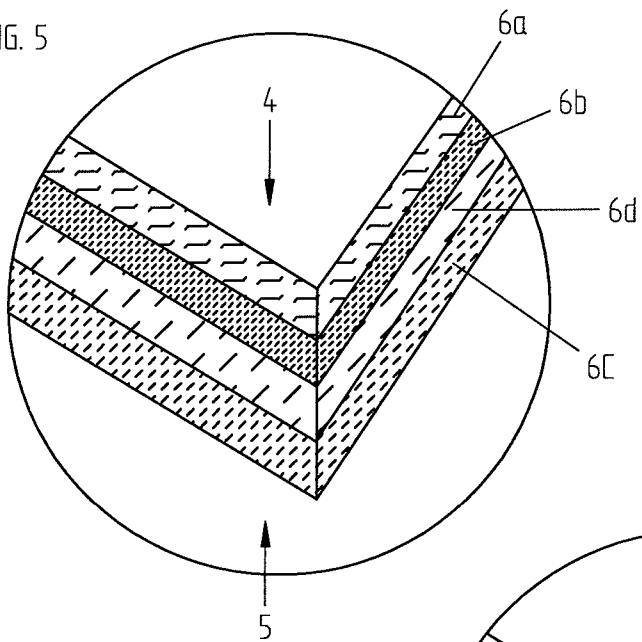


FIG. 6

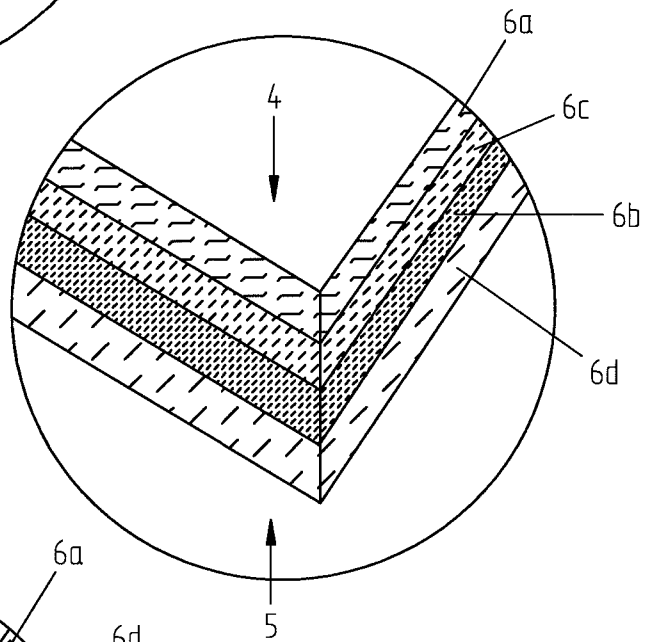
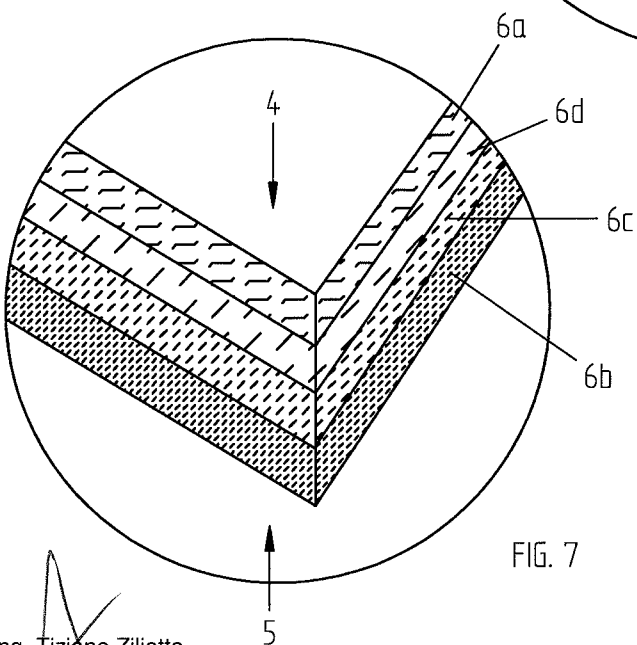


FIG. 7



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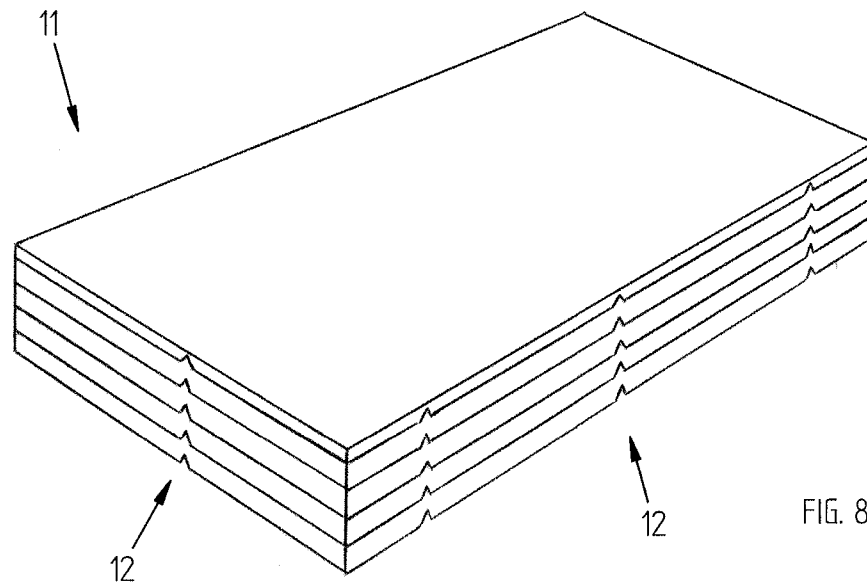


FIG. 8

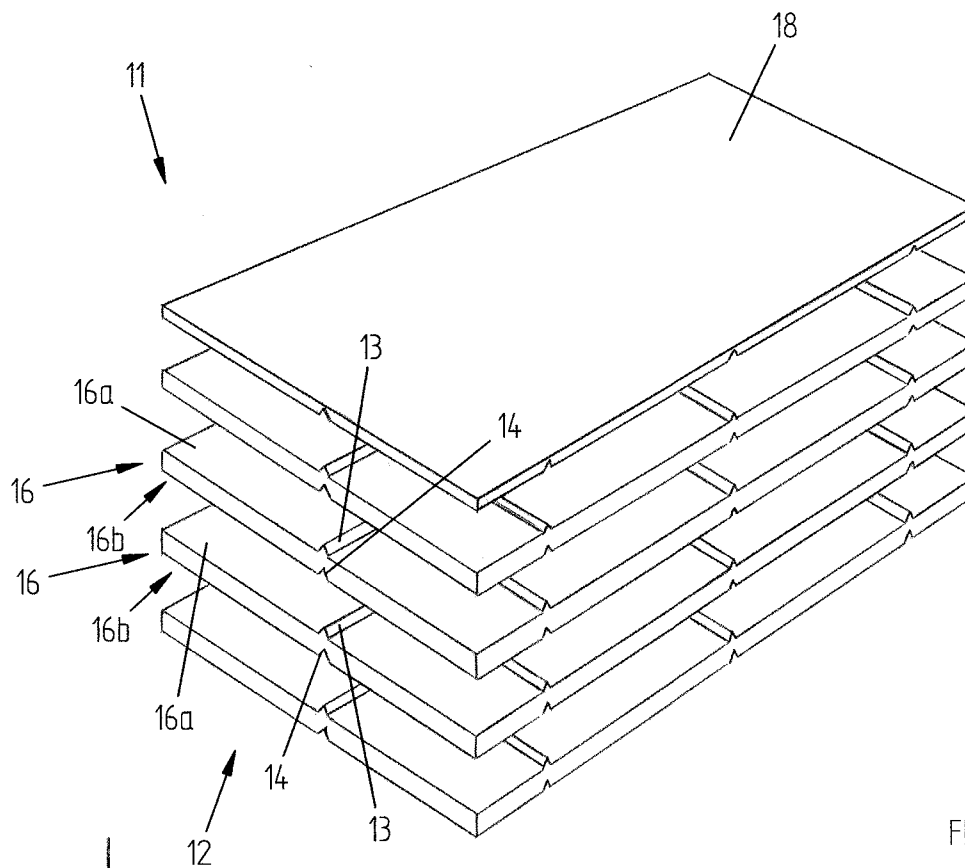


FIG. 9

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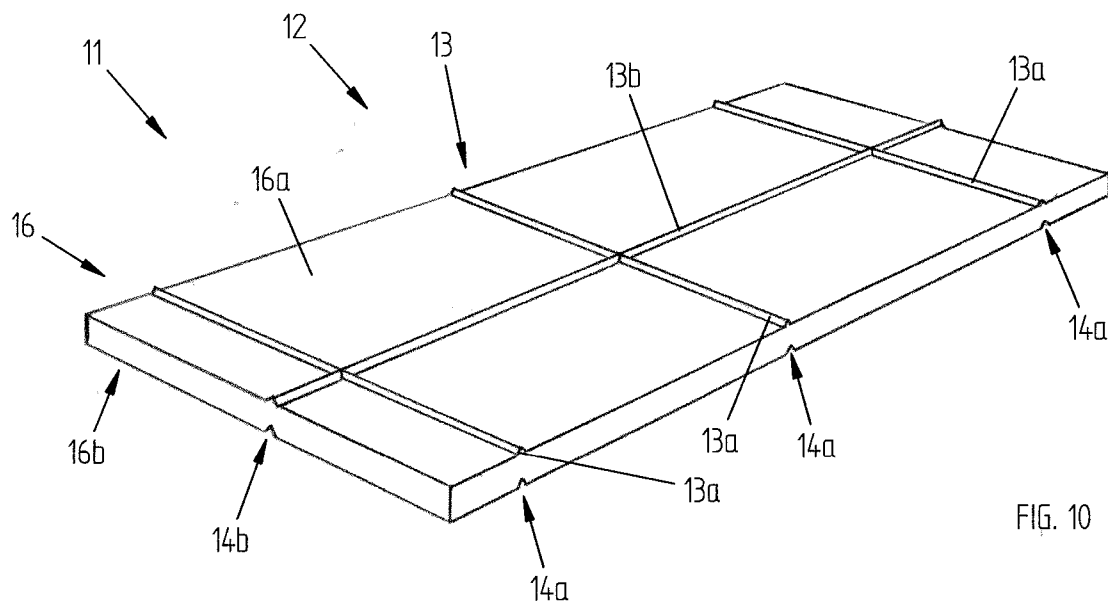


FIG. 10

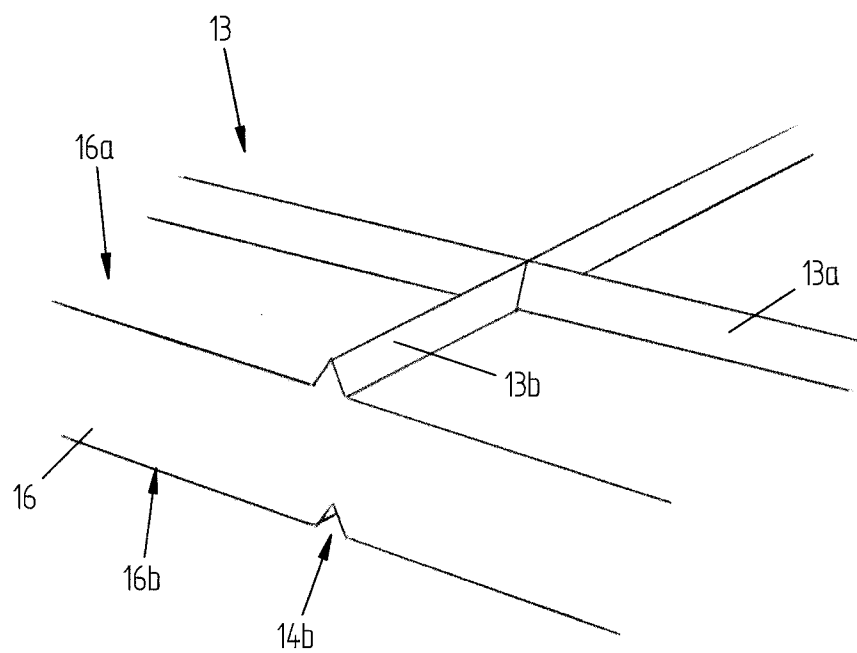


FIG. 11

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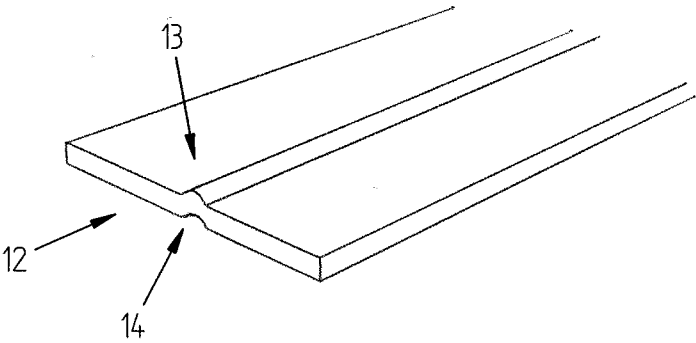


FIG. 12

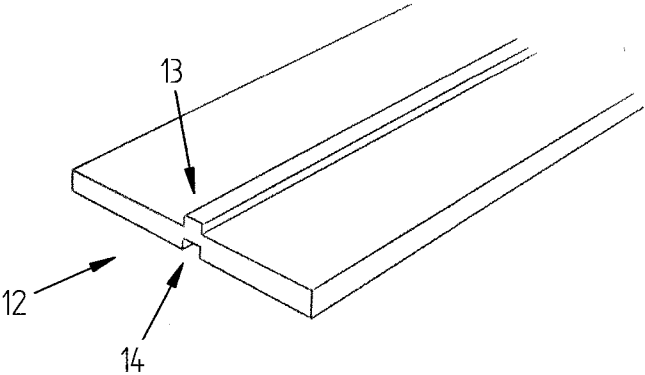


FIG. 13

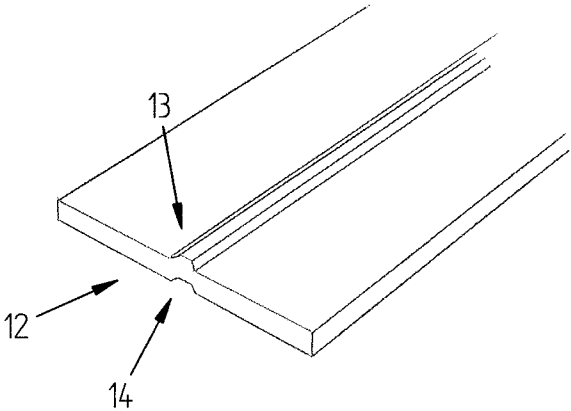


FIG. 14

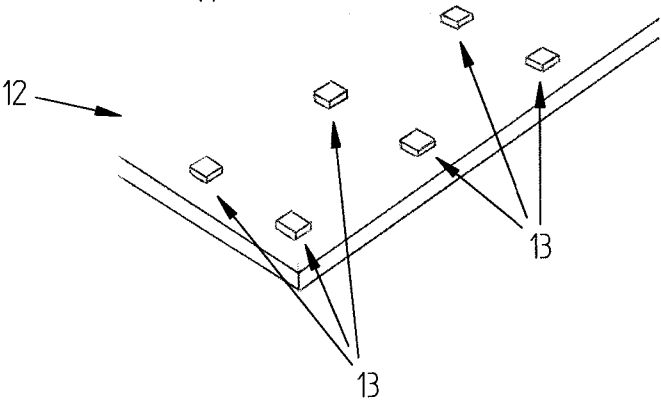


FIG. 15

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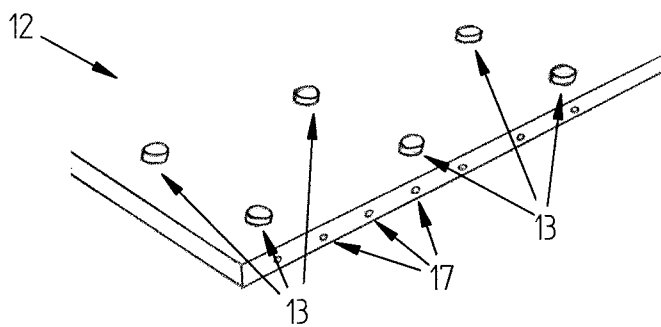


FIG. 16

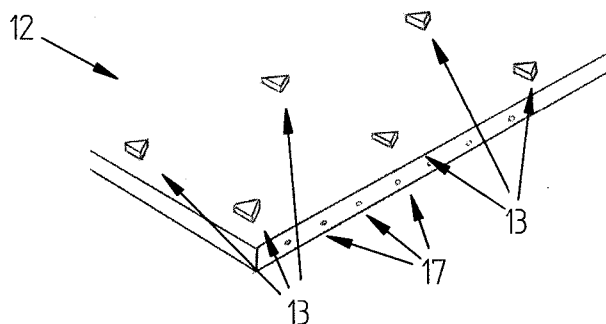


FIG. 17

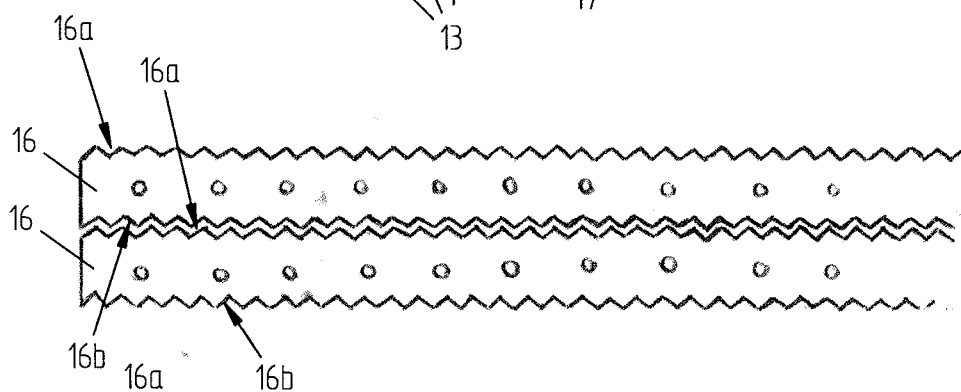


FIG. 18

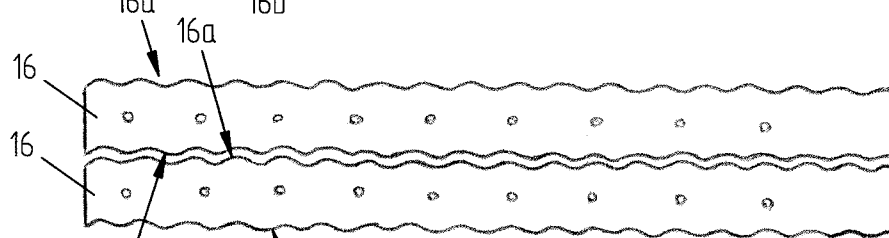


FIG. 19

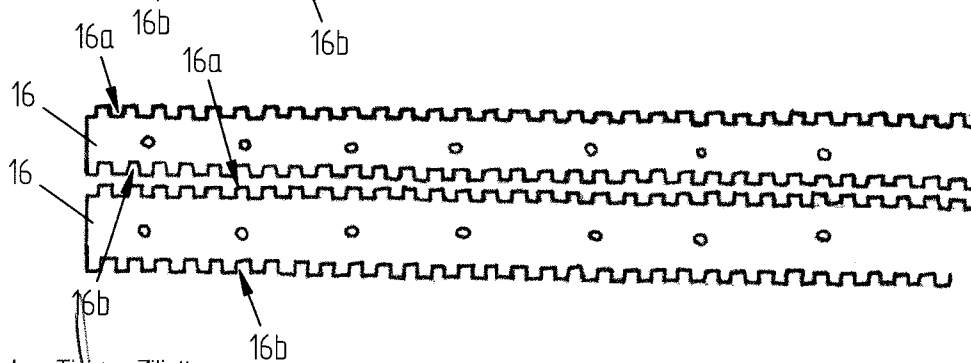


FIG. 20

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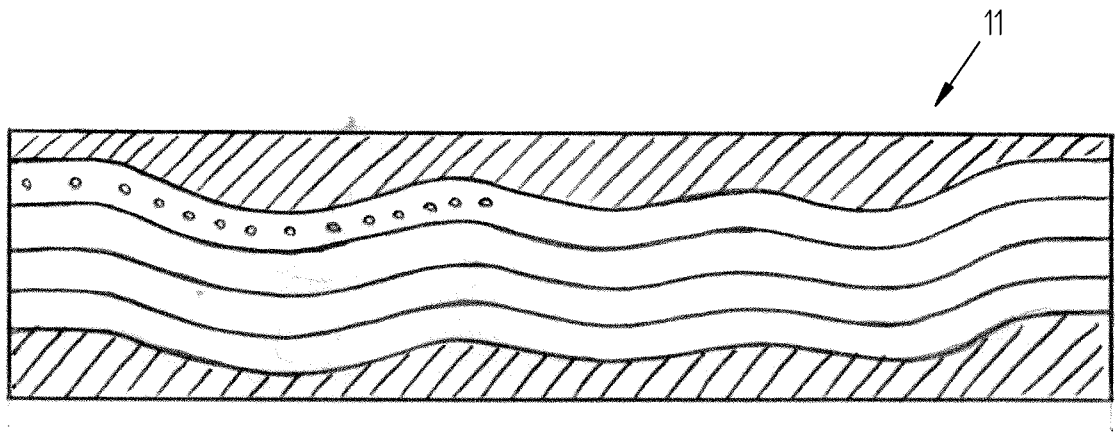


FIG. 21

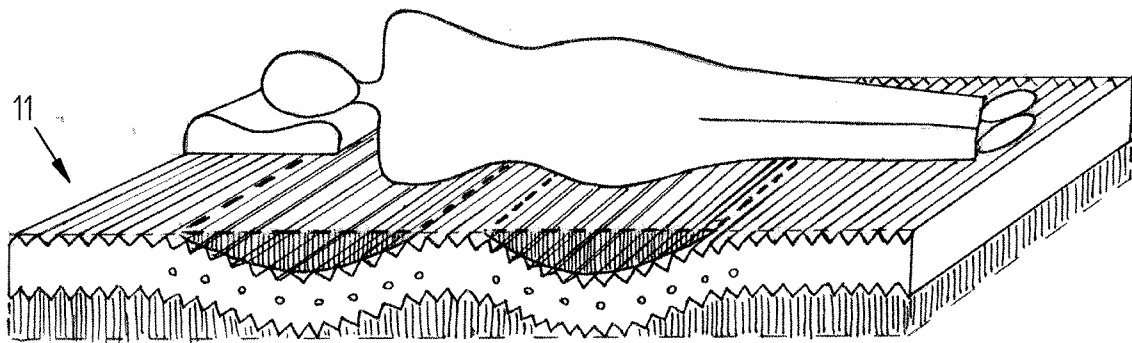


FIG. 22

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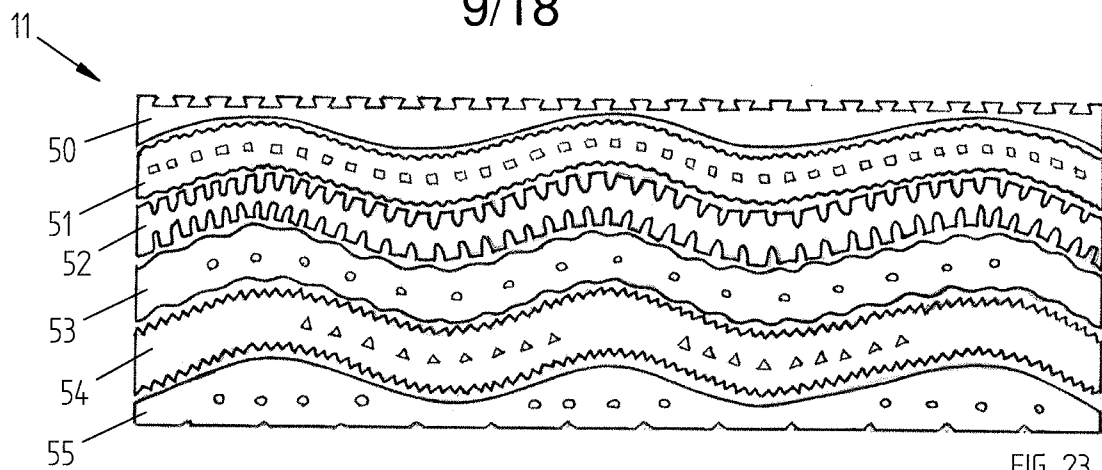


FIG. 23

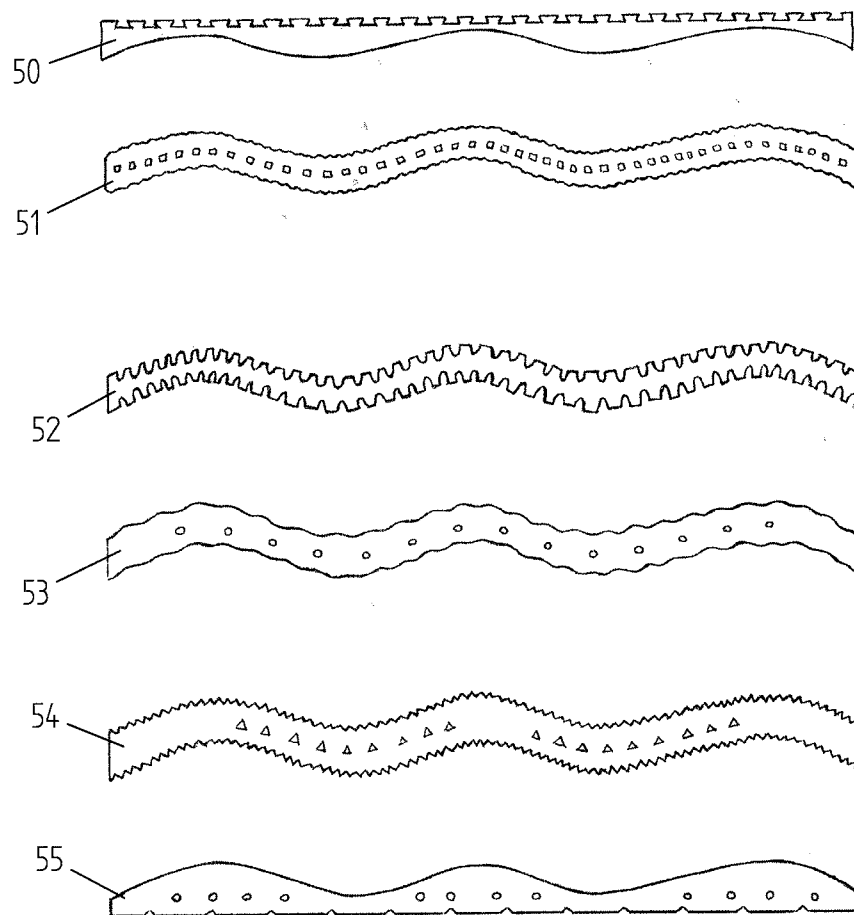


FIG. 24

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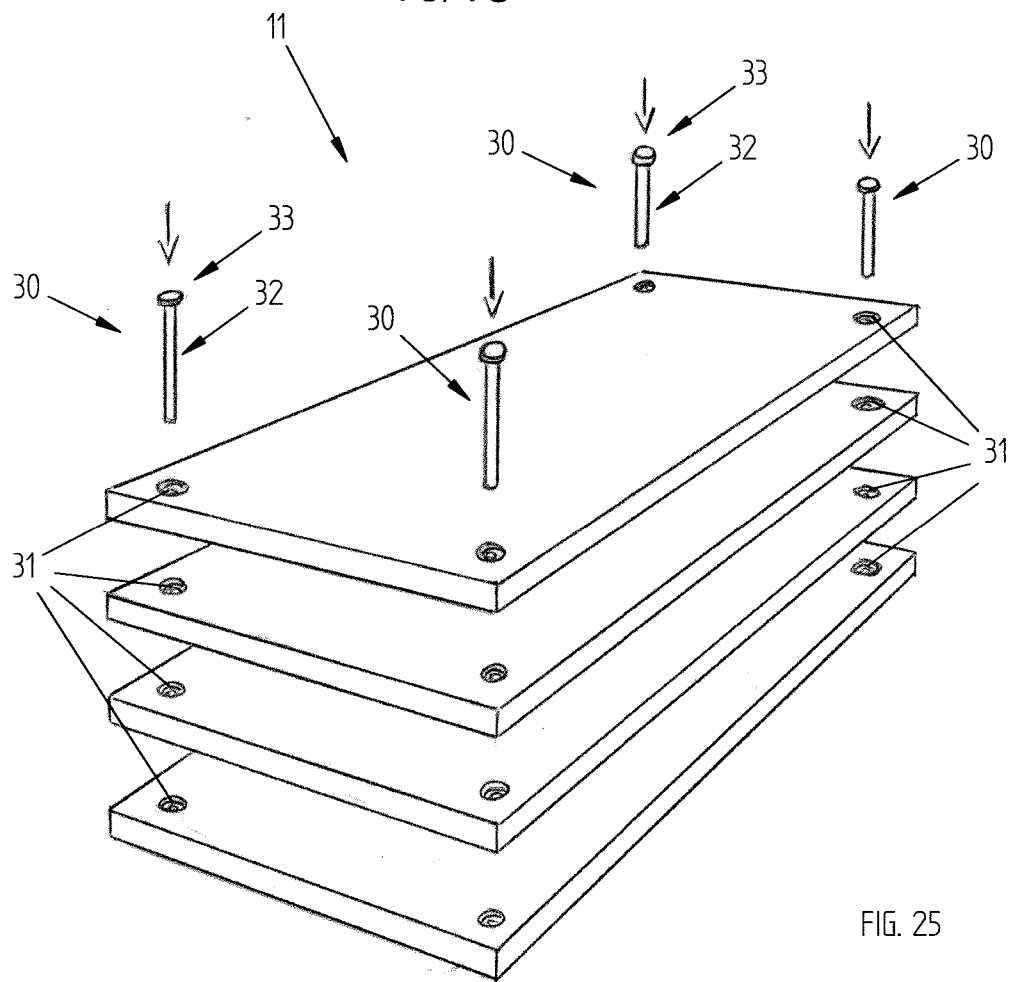


FIG. 25

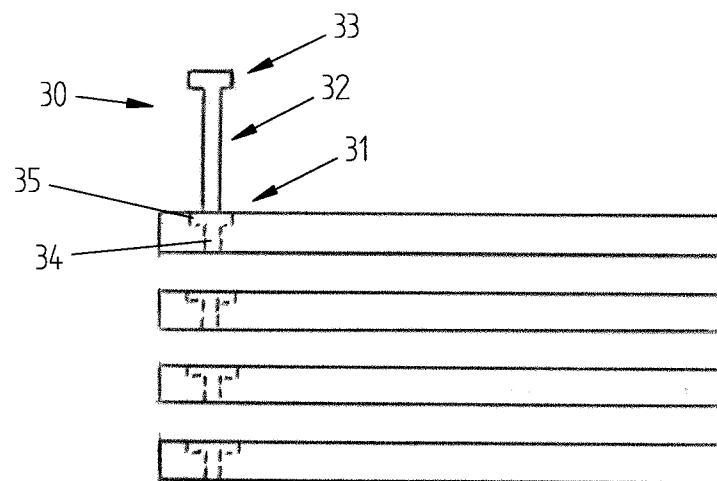
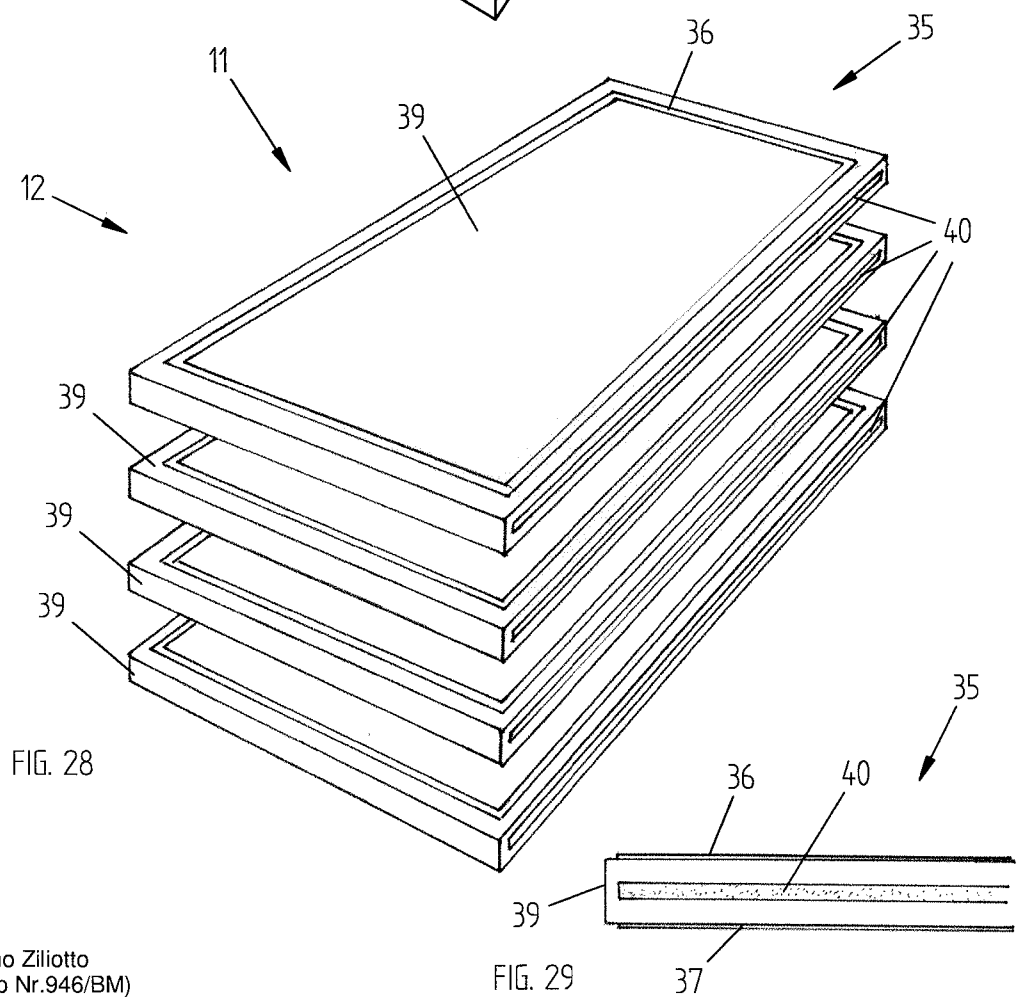
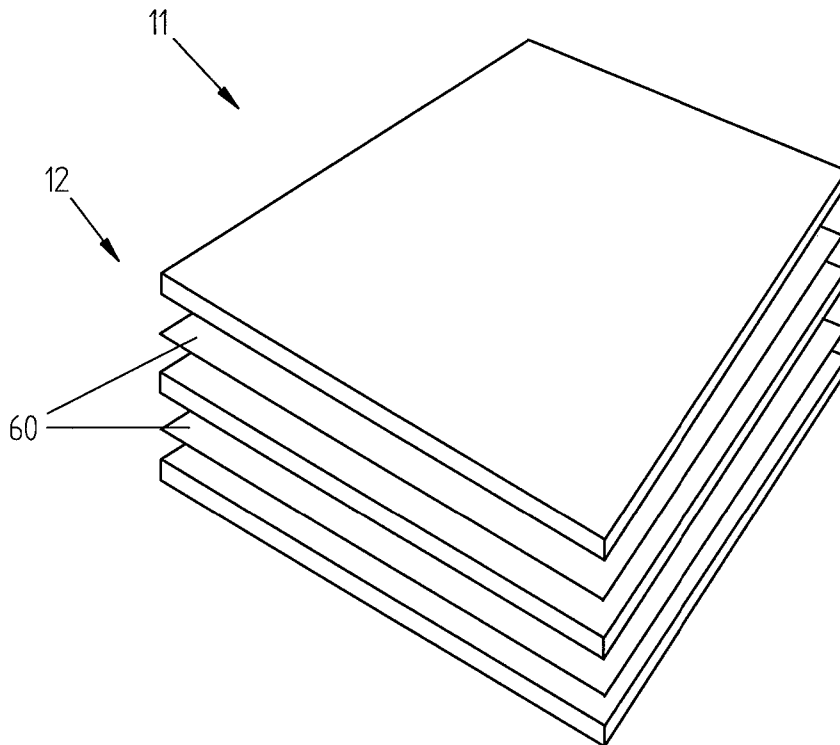


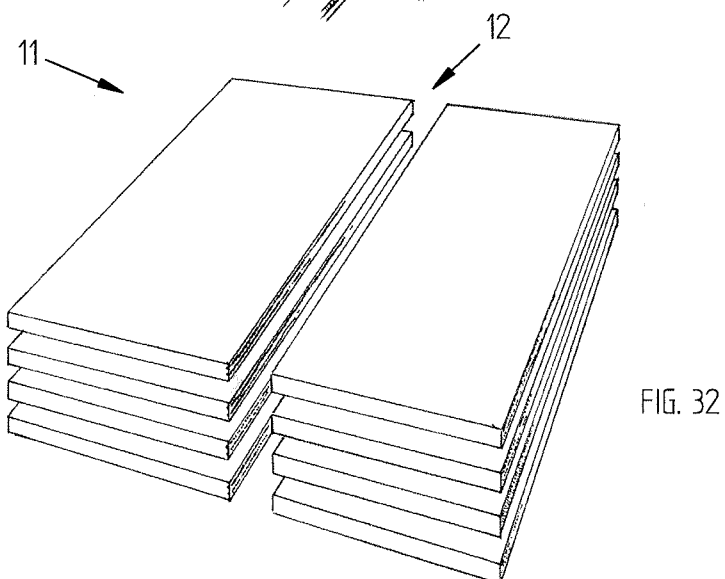
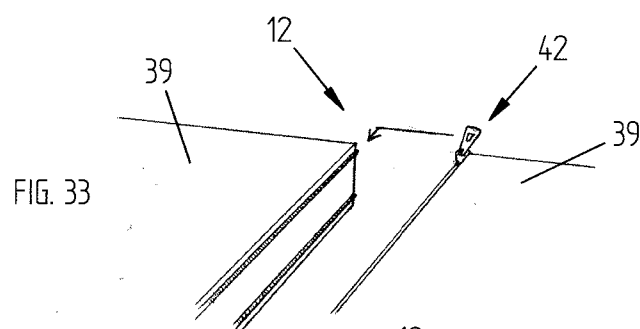
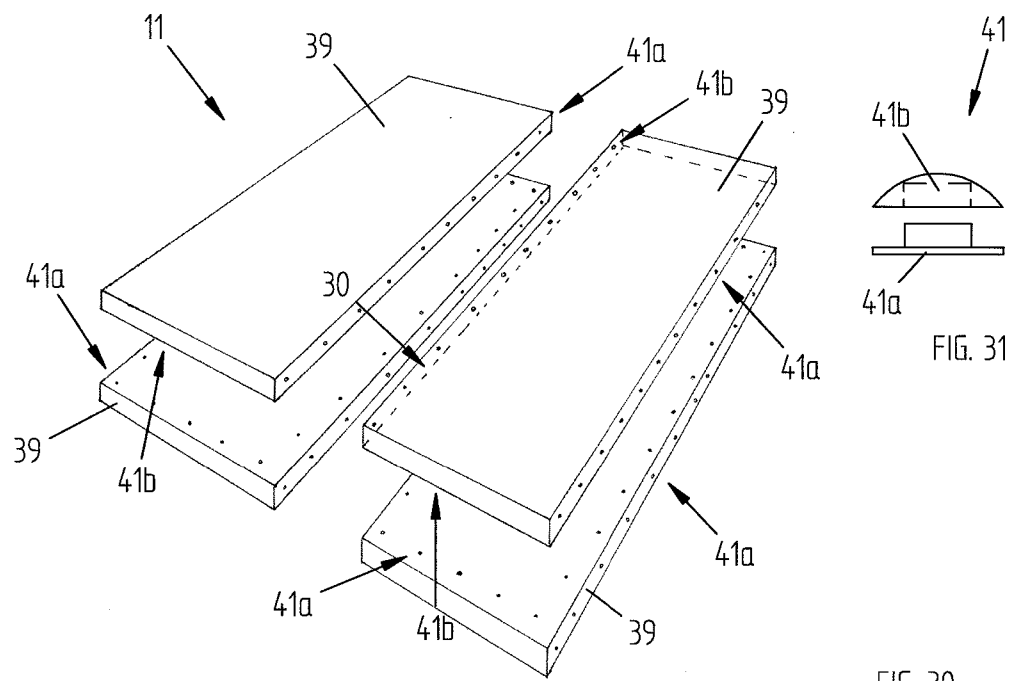
FIG. 26

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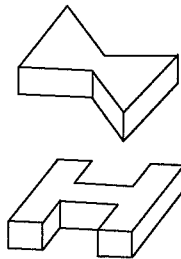
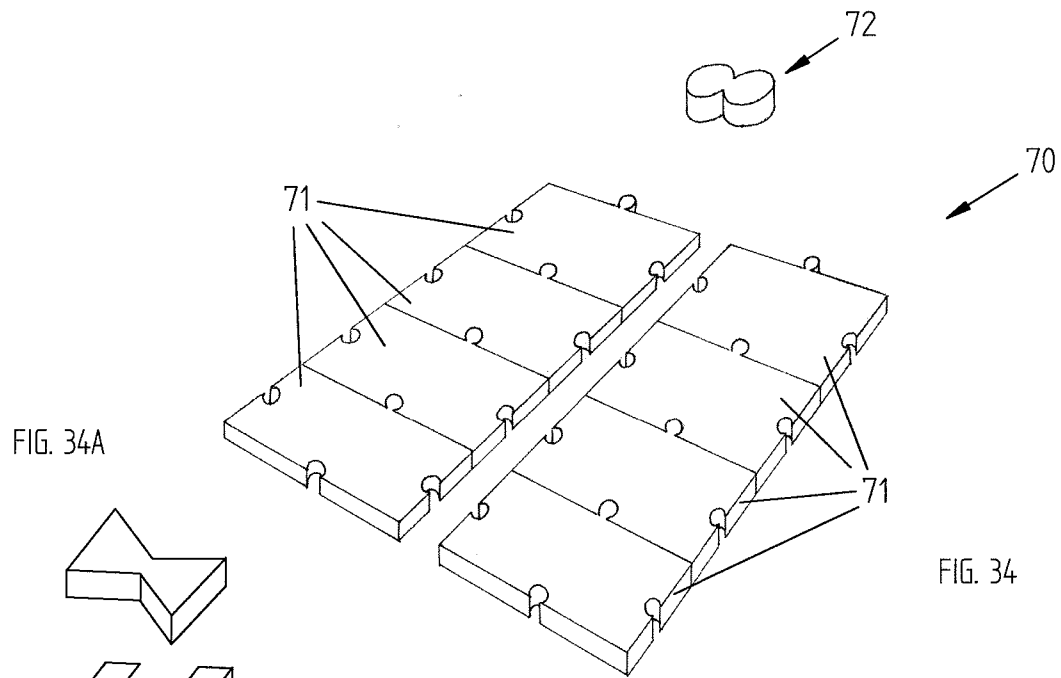


FIG. 34B

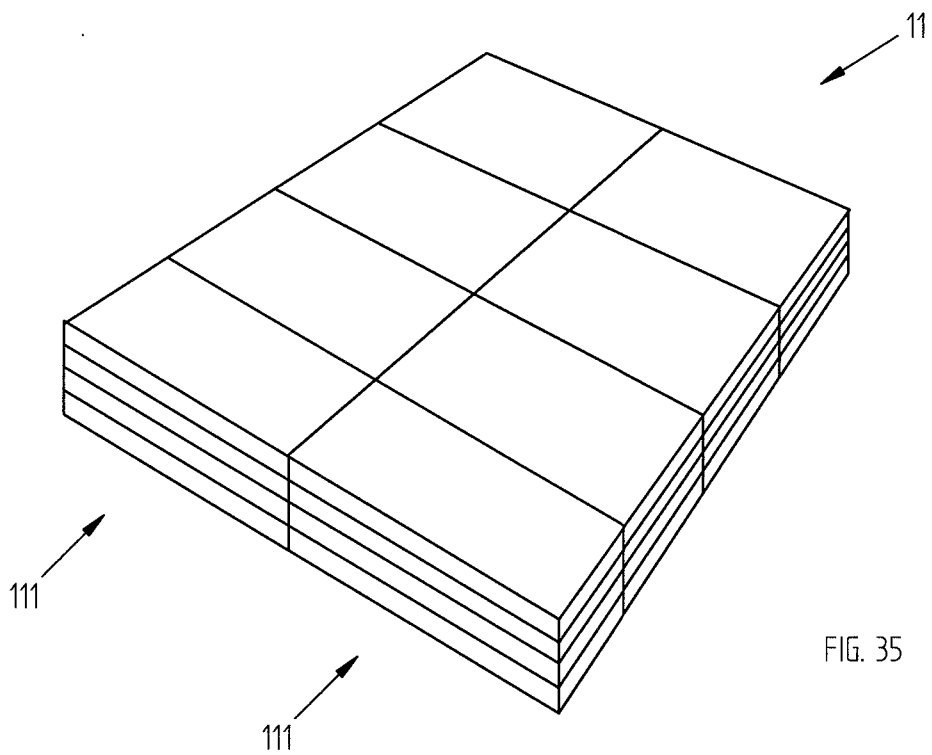


FIG. 35

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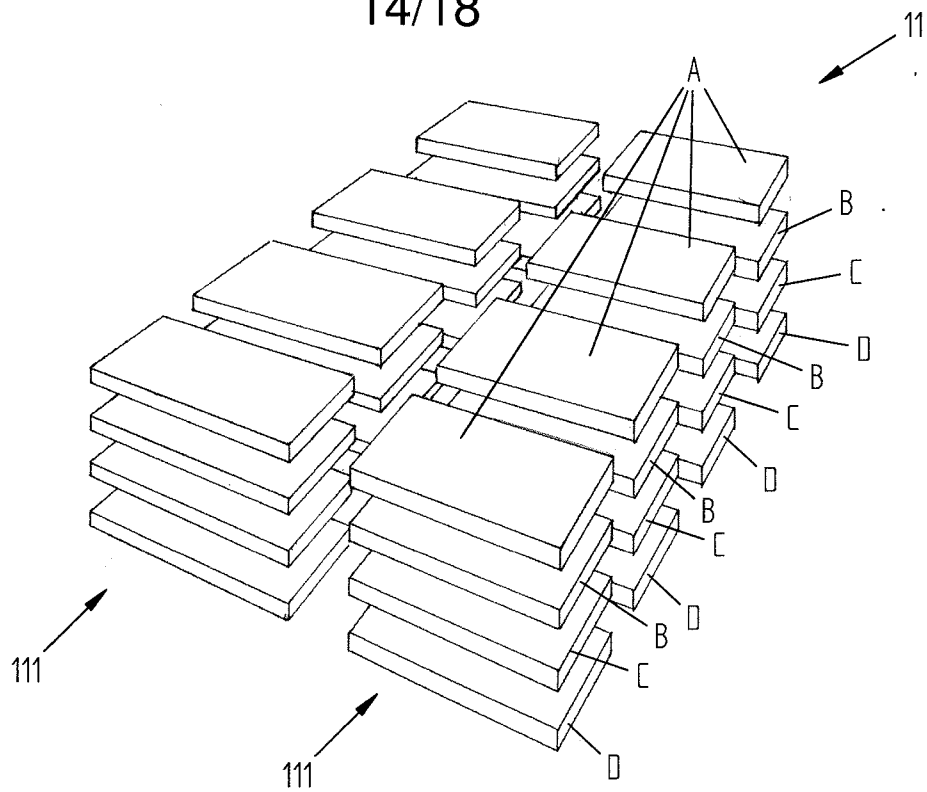


FIG. 36

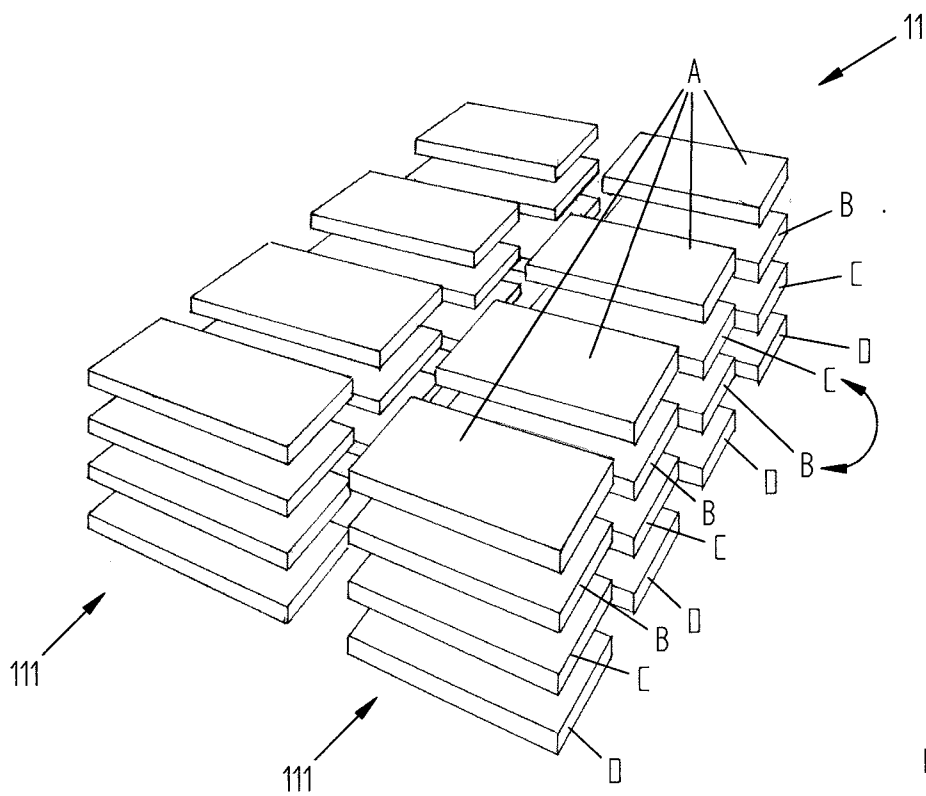
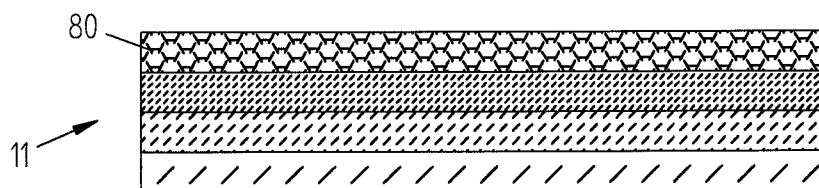
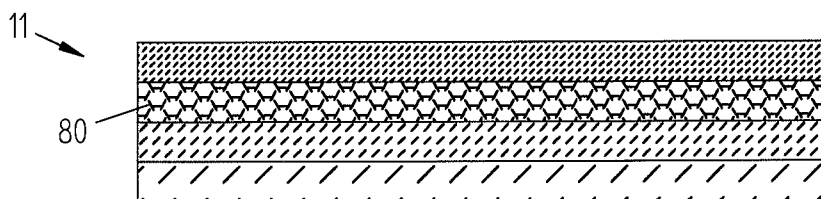
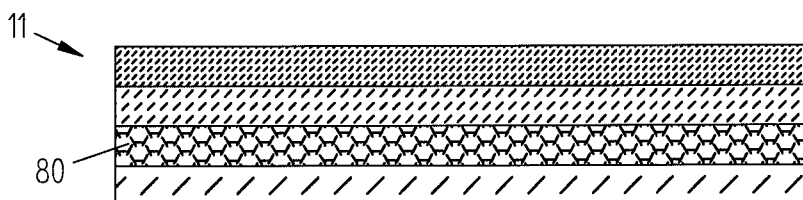
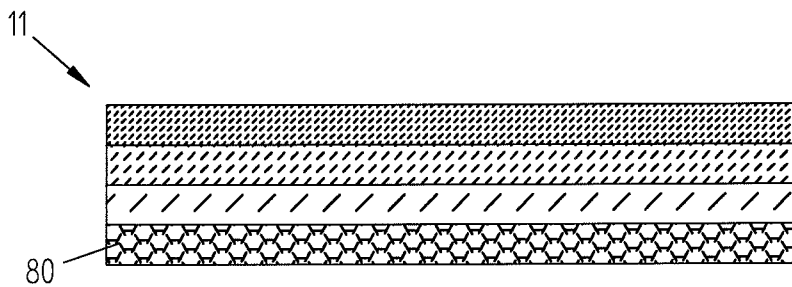
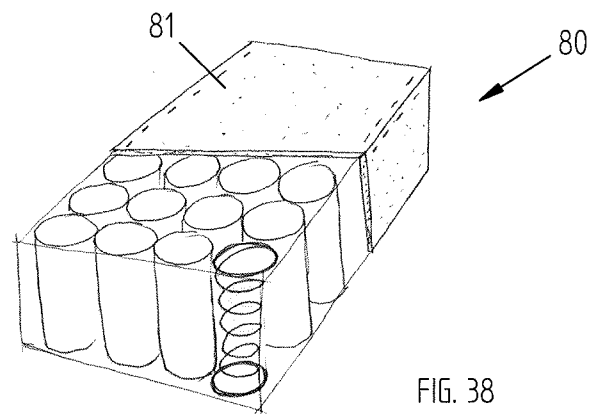
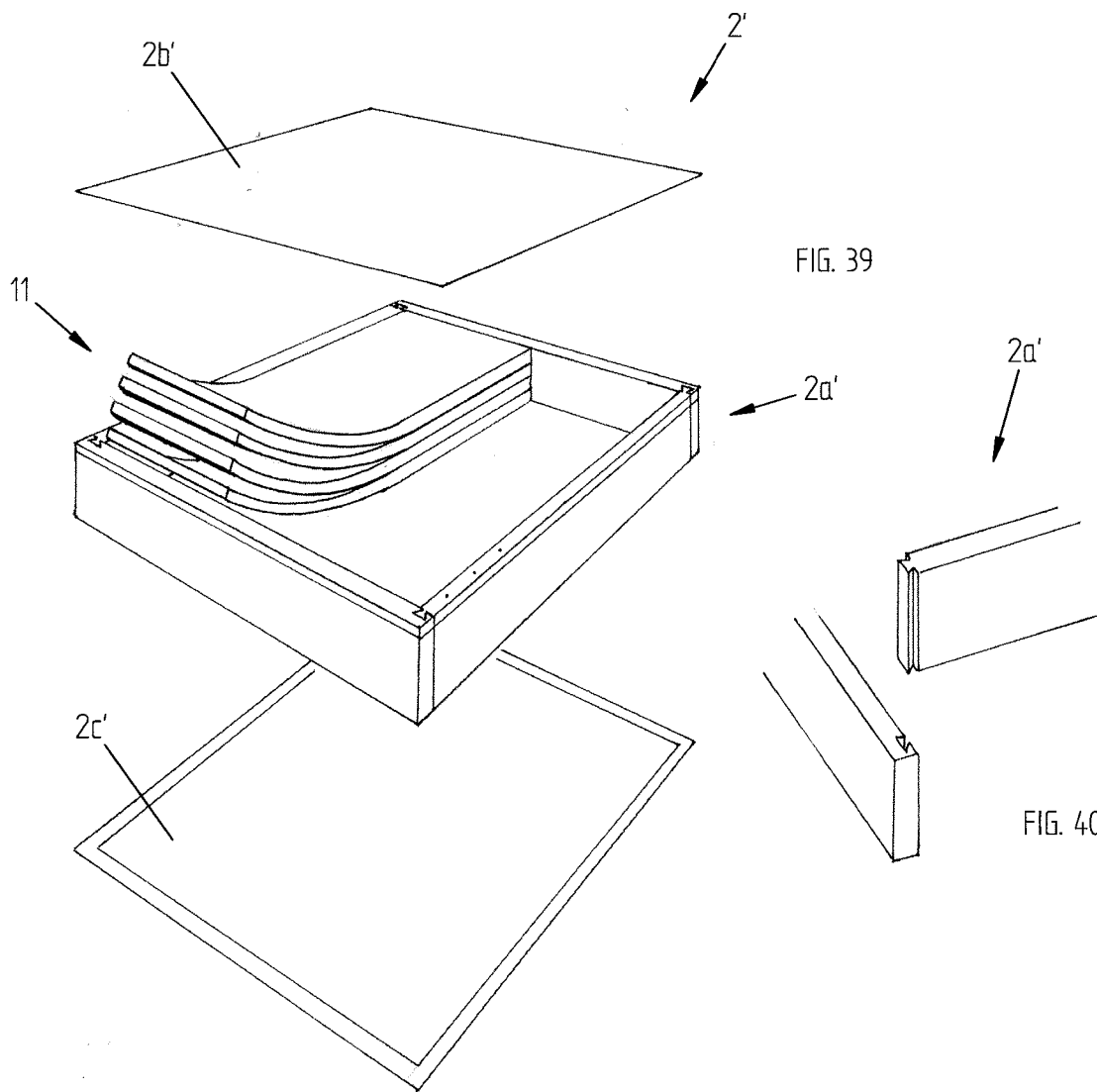


FIG. 37

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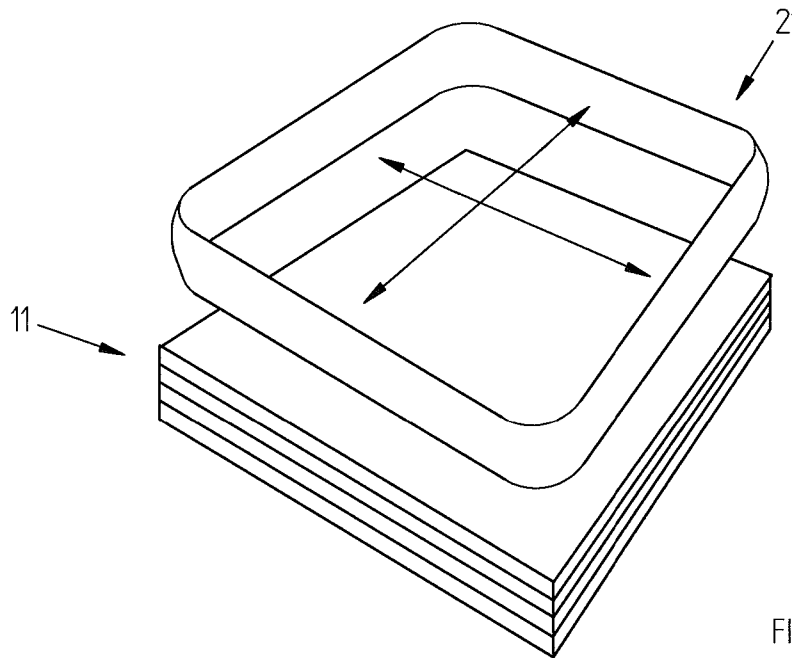


FIG. 41

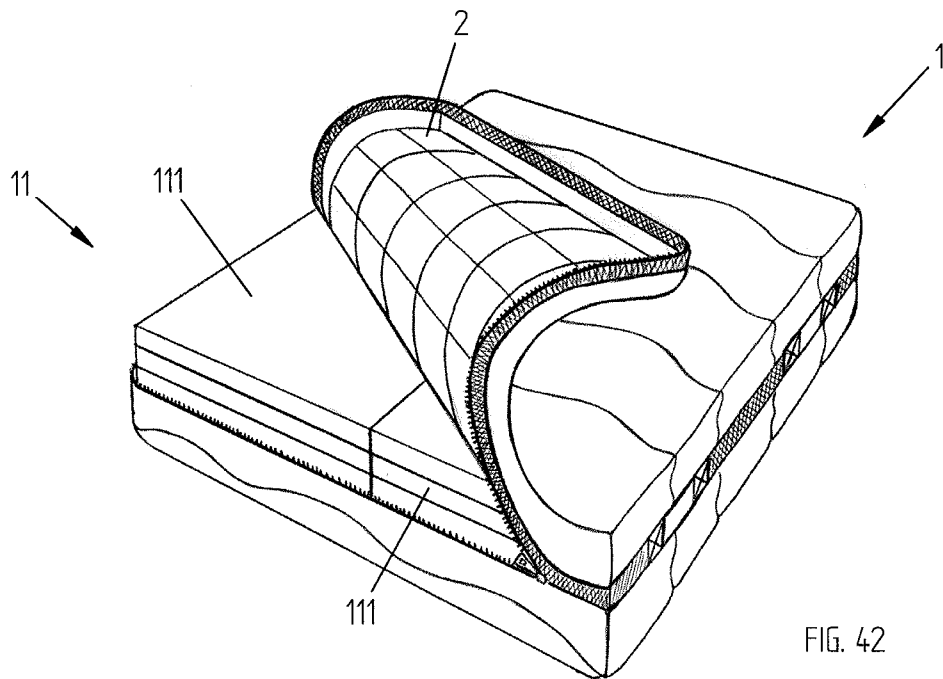


FIG. 42

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FIG. 43

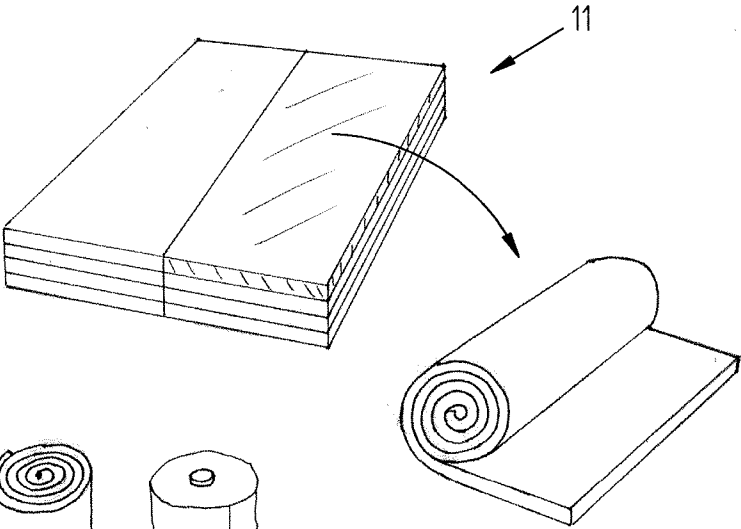


FIG. 43A

FIG. 43B

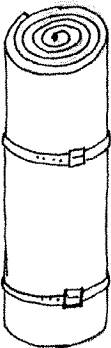


FIG. 43C

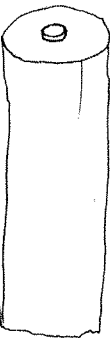
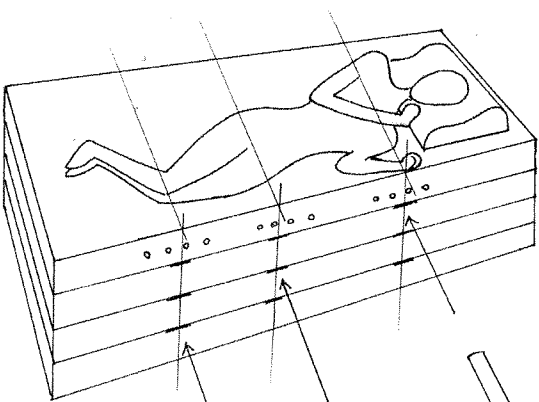


FIG. 44



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FIG. 43A

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/060029

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47C27/00 A47C27/05 A47C27/14 A47C27/15 A47C31/10
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47C

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

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

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 197 171 A2 (BAERISWYL FLORIN D LI) 17 April 2002 (2002-04-17) abstract; figures 1-9 column 10, paragraphs 38,39 column 11, paragraph 40 column 12, paragraph 43 -----	1-9,15
X	US 2 154 910 A (IRVING MAGARIL) 18 April 1939 (1939-04-18) figures 1,2,5 column 1, lines 2-3,53-55 column 2, lines 1-5,32-39 column 3, lines 1-32 -----	1,11-15
X	AT 411 724 B (SCHÖBER RUDOLF) 25 May 2004 (2004-05-25) abstract; figures 1-3 -----	1,15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

16 February 2016

Date of mailing of the international search report

22/02/2016

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Authorized officer

Tempels, Marco

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2015/060029

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1197171	A2	17-04-2002	CH 694548 A5 31-03-2005 EP 1197171 A2 17-04-2002
US 2154910	A	18-04-1939	NONE
AT 411724	B	25-05-2004	NONE