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(54) **ANTI-SNORE MATTRESS LAYER AND MODULAR LAYERED ANTI-SNORE MATTRESS**

(57) Anti snore mattress layer comprising a stimulation arrangement 20 which in its first position I has a shape and orientation, which with a person P to be rested on the mattress layer 1 forms a labile equilibrium that stimulates the person P to be rested on the mattress layer 1 to rotate around its longitudinal axis LP and at the same time moves from the first position I into the second position II, in which the stimulation arrangement 20 together with a person after rotation resting on the mattress layer 10 forms a meta stable equilibrium.

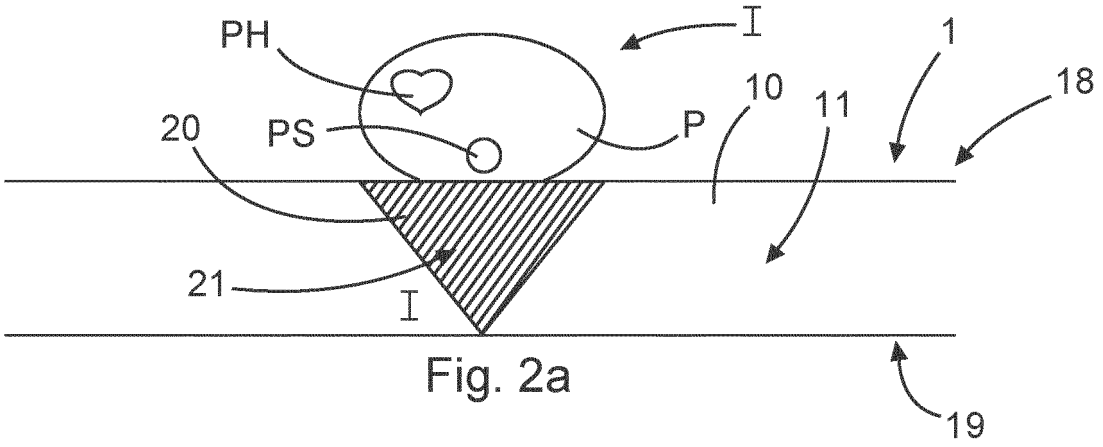

Fig. 2a

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Description

Field of the Invention

[0001] The present invention relates to a a mattress layer and a modular layered mattress which provide better sleeping comfort and healthier sleeping periods, and in particular avoids snoring of a person to be rested on the mattress layer and mattress, respectively.

Background of the Invention

[0002] Relaxing and comfortably sleeping is a utmost important requirement for a healthy life. A permanent present phenomenon of sleeping people is snoring. Snoring often is a reason for a bad oxygen supply for a sleeping person, as snoring indicates obstacles in the air way. In many cases the snoring only occurs when people lay on the back. In many cases snoring stops when the snoring person rotates to the side, so that the air way is no longer blocked of effected by the throat anatomy.

[0003] In the past a lot of attempts were made to avoid snoring, in particular snoring when laying on the back. Cloths are available which have implemented un-comfortable items when laying on the back, i.e. pyjamas or vests having implemented hard inlays at the back or mid-shoulder area which should stimulate the sleeping person to rotate to a side sleeping position, or due to the inlays avoid to rotate back to a back laying position. However, such cloths are expensive, as a larger number is required, are not comfortable, and often useless, as the inlay may shift to the side if the pyjama or vest is not tight enough.

[0004] As further alternative a lot of sensor-based devices have been developed, which operate based on acoustic signals or vibrational signals. Based on the sensed signals actuators are activated, be it by a separate device standing beside the bed or by actuators being implemented in the bed. These approaches are quite complex, require an electric power and often are useless, as they do not work.

[0005] Based on these findings, the present invention provides for a mattress layer and a modular and layered mattress, which may provide lesser snoring without a complex sensor technology.

Summary of the Invention

[0006] The present invention provides a mattress layer and a mattress which avoids snoring of a person to be rested on the mattress layer and mattress, respectively, and in particular a mattress layer and mattress, which provides a solution which does not require a complex sensor and actuator arrangement.

[0007] According to an embodiment of the invention, there is provided an anti-snore mattress layer comprising a mattress layer body having a longitudinal extension corresponding to a longitudinal extension of a person to be rested on the mattress layer, a transversal extension corresponding to a transversal extension of a person to be rested on the mattress layer, and a thickness extension; a stimulation arrangement being elastically movably arranged within the mattress layer body between a first position and a second position, wherein the first position is a position if no person rests on the mattress layer; wherein the stimulation arrangement in its first position has a shape and orientation, which with a person to be rested on the mattress layer forms a labile equilibrium that stimulates the person to be rested on the mattress layer to rotate around its longitudinal axis and at the same time moves from the first position into the second position, in which the stimulation arrangement together with a person after rotation resting on the mattress layer forms a meta stable equilibrium, wherein the mattress layer body has a mattress layer body structure and the stimulation arrangement has stimulation arrangement structure having a hardness, which is higher than a hardness of the body volume structure of the mattress layer body.

[0008] Thus, a mattress layer can be provided, which stimulates a sleeping person without complex sensor technology to change its sleeping position. Based on a mechanical solution the sleeping person when laying on the mattress layer together with the mattress layer forms a labile equilibrium which results in a change of the sleeping position from a back laying to a side laying position in which a lot of sleeping persons stop snoring. The stimulating arrangement in the labile equilibrium changes from a first position into a second position where the sleeping person rotates and the stimulating arrangement follows this rotation and keeps the person in the side position. Movably arranged means that in particular the orientation of the stimulation arrangement can change with respect to an envelope shape of the mattress layer. Even if the stimulation arrangement may be fixed within a foam layer of the mattress layer, the elasticity of the foam allows changing in particular the orientation of the stimulation arrangement with respect to the outer dimensions or envelope shape of the mattress layer. In other words, it is not necessary that the stimulation arrangement is movable over the immediate environment, in particular the boundary layer where the stimulation arrangement is coupled to the body material of the mattress layer.

[0009] According to an embodiment of the invention, the stimulation arrangement has a longitudinal extension which extends along the longitudinal extension of the mattress layer body

[0010] Thus, the stimulating arrangement extends along the relevant anatomy, which is the spine line, the neck, the shoulder, the back and the pelvis, and in particular supports along this anatomy the changing from the snoring sleeping position into a side laying and non-snoring sleeping position.

[0011] According to an embodiment of the invention, the body volume structure is a first foam material, in particular a cold-cure foam, and the stimulation arrangement structure is a second foam material, in particular a cold-

cure foam.

[0012] Thus, a mattress layer can be manufactures with the same materials which were used in the past for manufacturing mattress layers. Different foam materials may provide different mechanical properties so that a stimulating structure can be established by only using different foam materials, which may have different physical and mechanical properties. The foam material is to be understood as the chemical composition of the foam. The foam structure is made from a foam material. The foam structure may have a varying hardness, which can be modified by modifying the foam density of the foam structure. Although different foam structures may have a different hardness, the different foam structures may be made of the same foam material. In other words, the hardness can be modified by modifying the foaming parameters while maintaining the foam material, in particular its chemical composition. It should be noted that a modified concentration of chemical agents in the foam responsible for a foaming density are not considered as parts of a different foam composition.

[0013] According to an embodiment of the invention, the body volume structure may also be formed by a sprung mattress or inner spring mattress structure, by a wood-based mattress body structure, a fiberglass mattress structure, a fiber wool structure, a nonwoven fabric structure, or any combination thereof.

[0014] Thus, the stimulation arrangement may also be combined by other types of mattress layer bodies, which may be adapted to receive a stimulation arrangement being elastically movably arranged within the mattress layer body between a first position and a second position, as described above, wherein the stimulation arrangement in its first position has a shape and orientation, which with a person to be rested on the mattress layer forms a labile equilibrium that stimulates the person to be rested on the mattress layer to rotate around its longitudinal axis and at the same time moves from the first position into the second position, in which the stimulation arrangement together with a person after rotation resting on the mattress layer forms a meta stable equilibrium.

[0015] According to an embodiment of the invention, the stimulation arrangement structure has a higher foam density than the body volume structure.

[0016] Thus, the different properties of the mattress layer body and the stimulation arrangement may be stablished by applying different foam densities which may lead to different hardness and different resilient properties, which allow the desired effect of moving the stimulating arrangement from a first into a second position and back.

[0017] According to an embodiment of the invention, the first foam material and the second foam material are the same.

[0018] Thus, it is not required to handle different foam materials, bot to only choose different densities of the foam. This simplifies the manufacturing process and may also allow reliable and material boundaries between the mattress layer body and the stimulating arrangement.

[0019] According to an embodiment of the invention, the stimulation arrangement may be formed of a sprung structure, by a wood-based structure, a fiberglass structure, a fiber wool structure, a nonwoven fabric structure, or any combination thereof.

[0020] Thus, alternatively the stimulation arrangement may be formed by materials other than foam. In particular the stimulation arrangement may be formed by the other materials in combination with a foamed mattress body layer.

[0021] According to an embodiment of the invention, the stimulation arrangement traverse to its longitudinal extension has a triangular cross section part, in particular an isosceles triangle cross section part, wherein one tip of the triangular cross section part points away from a top surface of the mattress body layer on which a person is to be rested.

[0022] Thus, the triangle with the tip pointing toward the bottom surface of the mattress layer provides a geometry, which upon the weight of the sleeping person constitutes a labile equilibrium and inclines either to the one side or the other side and consequently turns the person laying on the back to either the one side laying position or the other side laying position, so that in very case the snoring position is avoided. The dimension of the triangle depends on the thickness of the mattress layer on a mattress, a part of which is the mattress layer.

[0023] According to an embodiment of the invention, the stimulation arrangement traverse to the longitudinal direction has a diamond cross section wherein one tip of the diamond cross section points away from a top surface of the mattress body layer on which a person is to be rested.

[0024] Thus, an alternative geometry for the stimulating arrangement can be provided. A diamond here means that a triangle with a tip pointing to the bottom side has the other tips chamfered, similar to a diamond. This may avoid hard edges at the boundary between the stimulating arrangement and the mattress layer body, in particular in case the upper side of the simulating arrangement is part of the laying surface of the mattress layer, so that the transit is smoother and more comfortable.

[0025] According to an embodiment of the invention, the stimulation arrangement traverse to its longitudinal direction has an hour glass cross section wherein a top line and bottom line of the hour glass are substantially parallel to a top surface and a bottom surface of the mattress layer body, wherein a waist of the hour glass is designed to operate as a flexible hinge.

[0026] Thus, a mattress layer can be provided, which can be used from both sides. An hour glass can be defined as two opposing triangles one tip of each of which are oriented toward each other. The hour glass can also be defined by two diamond shapes having phased edges on a line parallel to a surface of the mattress layer body, one tip of each of the diamonds are oriented toward each

other. The transit between the both triangles can be only a tip, or may be a broader area. The width of this waist of the hour glass may be used to define the characteristic of the hinge along which the upper triangle inclines over the lower triangle and the bottom surface of the mattress layer. The hour glass may also be composed of two opposing diamonds as described above. The details for the transit apply mutually.

[0027] According to an embodiment of the invention, the stimulation arrangement traverse to its longitudinal direction has an hour glass cross section wherein hour glass cross section is asymmetrical with the larger part allocated to the top and the smaller part allocated to the bottom. In particular, the top line is longer than the bottom line of the hour glass, wherein a waist of the hour glass is designed to operate as a flexible hinge.

[0028] Thus, dominant properties of a triangular cross section can be achieved, while providing a base on the bottom side, which together stabilizes the hinged hour glass cross section.

[0029] According to an embodiment of the invention, the stimulation arrangement has a cage structure defining a volume, which in its first position has a shape and orientation, which with a person to be rested on the mattress layer forms a labile equilibrium that stimulates the person to be rested on the mattress layer to rotate around its longitudinal axis and at the same time moves from the first position into the second position, in which the stimulation arrangement together with a person after rotation resting on the mattress layer forms a meta stable equilibrium.

[0030] Thus, the stimulation arrangement can be provided by including a more rigid structure into the mattress layer body. The cage provides the harder stimulation structure. The material, in particular the foam within the cage may be the same as that of the mattress layer body. However, also a combination of a cage and different foams, e.g. different foam densities can be used to provide the desired effect.

[0031] According to an embodiment of the invention, the cage structure extends along the longitudinal extension of the mattress layer body and defines a volume that traverse to its longitudinal extension has a triangular, diamond or hour glass cross section, wherein the cage structure comprises rods being oriented to the longitudinal extension of the mattress layer body, wherein the rods run along edges defined by the tips of triangular, diamond and hour glass cross section, respectively.

[0032] Thus, a stimulating arrangement with a cage may have a similar shape than a stimulation arrangement which is made from foams of different properties. The cage in the selected form can be positioned into the mold and the remaining foam material can be filled in so as to fill the space with the foam material. The dimensioning of the hinge, if an hour glass geometry is selected, can be set by either the design of the cage or the selection of the foam properties or both.

[0033] According to an embodiment of the invention, the rods a defining a triangular cross section are connected to each other by spacers.

[0034] Thus, the position of the rods can be maintained while keeping the weight and material need for the cage low. The spacers can be used for the triangle, the diamond and also for the hour glass geometry.

[0035] According to an embodiment of the invention, a rod defining the waist of the hour glass cross section is designed to operate as a hinge between the rods allocated to the top surface of the mattress layer body and the rods allocated to the bottom surface of the mattress layer body.

[0036] Thus, the cage in the hour glass design may be designed as a moveable geometry. The hinge can be designed by using the spacers and forming a hinge by the central rod at the waist of the hour glass, as well as the spacers of the upper triangle or diamond and the spacers of the lower triangle or diamond.

[0037] According to an embodiment of the invention, the stimulation arrangement is formed by hollow spaces, in particular hollow channels along the boundaries between the stimulation arrangement and the mattress layer body. The shape, the density and/or the size of the hollow space or spaces may be used to define the hardness of the mattress layer body structure.

[0038] Thus, the flexibility and the responsiveness of the stimulating structure can be improved. Different hardness thus can be achieved by only providing the spaces without modification mattress body layer structure, e.g. the foam properties, like the foam density etc. Nevertheless, providing the spaces may also be combined with the modification of the mattress body layer structure, e. g. the foam densities etc.

[0039] According to an embodiment of the invention, the longitudinal extension of the stimulation arrangement structure corresponds to a longitudinal extension of a torso of a person to be rested on the mattress layer body.

[0040] Thus, the stimulation for rotating the person can be provided along the entire torso, i.e. from neck via the shoulder and the back, and then down to the pelvis.

[0041] According to an embodiment of the invention, the longitudinal extension of the stimulation arrangement structure is limited to substantially a longitudinal length of a torso of a person to be rested on the mattress layer body.

[0042] Thus. the stimulation arrangement can be limited to those passages which allow an impact to the laying person. If it is not required to provide stimulation to the head and the legs, the entire length of the stimulation arrangement can be reduced which saved material and costs.

[0043] According to an embodiment of the invention, the stimulating arrangement with its longitudinal extension is offset from a center line of the mattress layer body along the longitudinal extension of the mattress layer body.

[0044] Thus, it can be controlled to which side a person rotates, and the effective usable width of the mattress

layer may be increased.

[0045] According to an embodiment of the invention, the stimulating arrangement with its longitudinal extension is offset to the left from a center line of the mattress layer body along the longitudinal extension of the mattress layer body, when seen onto the top surface of the mattress layer body and from a foot end to a head end of the mattress layer body.

[0046] Thus, it can be controlled that the person rotates to the side where the heart is on the bottom side, which is considered as leading to a healthier sleeping. For this embodiment the effective usable width of the mattress layer may be increased over a centrally arranged stimulation arrangement. It should be noted that for abnormal anatomy where the heart is on the right side of a person, the offset may be made to the right side.

[0047] According to an embodiment of the invention, the stimulation arrangement traverse to its longitudinal extension has a cross section which corresponds to the center-sided part of a divided shape divided along a shape symmetry line orthogonal from a top surface to a bottom surface of the mattress layer body, wherein the shape is selected out of a group consisting of an isosceles triangle, a diamond and an hour glass.

[0048] Thus, in particular for, but not limited to the embodiments where the stimulating arrangement is offset from a center line, the stimulation arrangement only needs to stimulate the rotation into one direction, so that only that half portion of the stimulation device is required. It should be noted that the lever of this "half' geometries can be increased by making the "half' geometries broader while maintain the half geometry characteristic.

[0049] According to an embodiment of the invention, the mattress layer further comprises a stabilizer arrangement extending along the longitudinal extension of the mattress layer body and parallel to the longitudinal extension of the stimulating structure, wherein the stabilizer arrangement has a stabilizer arrangement structure having a higher hardness than the mattress layer body structure.

[0050] Thus, the stabilizer arrangement may avoid that a person intentionally leaves the mattress layer on the side to which the stimulation arrangement has stimulated the person to roll. This is particularly relevant, as in some cases the usable width of the mattress layer is smaller, so that a sleeping person may feel safer when recognizing a stabilizing arrangement on the opposing side of the stimulation arrangement.

[0051] According to an embodiment of the invention, the stabilizer arrangement is arranged at at least one longitudinal side of the mattress layer body.

[0052] Thus, a maximum usable width of the mattress layer can be provided. Stabilizing arrangements can of course be provided on both sides of the mattress layer.

[0053] According to an embodiment of the invention, the stabilizer structure is a foam material which is the same as the second foam material of the stimulating arrangement structure, and having a cross section, one side of which corresponds to one side of the cross section of the stimulating arrangement structure.

[0054] Thus, the stimulation arrangement and the stabilizing arrangement can be cut out from se same block of material, e.g. foam, so that a single cut provides both, the side of the stabilizing arrangement and the opposing side of the stimulation device. If providing e.g. an hour glass shaped stimulation arrangement, with two cuts out of a squared block three pieces can be cut the center hour glass and the sided stabilizing arrangements.

[0055] According to an embodiment of the invention, the corresponding sides are oriented toward each other.

[0056] Thus, the usable width of the mattress layer is more comfortable and usable for both sides.

[0057] According to an embodiment of the invention, there is provides an anti-snore mattress having a plurality of exchangeable layers, at least one layer thereof is an anti-snore mattress layer as described herein above.

[0058] Thus, not only a mattress layer but also a modular and layers mattress can be provided. The mattress layer with the stimulation arrangement can be provided as a topper, i.e. a top laying mattress layer, or as an intermediate layer. In the latter case the top layer should not be so high in order to keep the stimulation effect.

Brief description of the Figures

[0059] The following figures illustrate exemplary embodiments of the invention, in which

Fig. 1	illustrates a schematic overview and definitions on the dimensional directions of a mattress layer;
Fig. 2a/2b	illustrate an exemplary embodiment of a mattress layer with a triangle stimulation arrangement in a first and second position;
Fig. 3a/3b	illustrate an exemplary embodiment of a mattress layer with an hour glass stimulation arrangement in a first and second position;
Fig. 4a/4b	illustrate an exemplary embodiment with a triangle cage type stimulation arrangement in a first and second position;
Fig. 5	illustrates an exemplary embodiment of a triangle cage type stimulation arrangement in detail;
Fig. 6a/6b	illustrate an exemplary embodiment with an hour glass cage type stimulation arrangement in a first and second position;
Fig. 7	illustrates an exemplary embodiment of an hour glass cage type stimulation arrangement in detail;
Fig. 8a/8b	illustrate an exemplary embodiment with a triangle "half geometry" stimulation arrangement in a first and second position;

Fig. 9a/9b illustrate an exemplary embodiment with an hour glass "half geometry" stimulation arrangement in a first and second position;

Fig. 10a-10e illustrate vis á vis cross sections of exemplary embodiments of "full" triangle type, "half' triangle type, "full" hour glass type, "half' hour glass type and asymmetric hour glass type stimulation arrangements;

Fig. 11a-11e illustrate vis á vis cross sections of exemplary embodiments of "full" concave triangle type, "half' concave triangle type, "full" concave hour glass type "half' concave hour glass type and concave asymmetric hour glass type stimulation arrangements;

Fig. 12a-12e illustrate vis á vis cross sections of exemplary embodiments of "full" diamond type, "half' diamond type, "full" diamond hour glass type, "half' diamond hour glass type and asymmetric diamond hour glass type stimulation arrangements;

Fig. 13a/13b illustrate an exemplary embodiment with a triangle stimulation arrangement with sided stabilizing arrangements in a first and second position;

Fig. 14 illustrates an exemplary embodiment of an hour glass type stimulation arrangement with stabilizing arrangements with corresponding opposing surfaces;

Fig. 15 illustrates an exemplary embodiment of a concave hour glass type stimulation arrangement with stabilizing arrangements with corresponding opposing surfaces;

Fig. 16 illustrates a top view of a mattress layer according to an exemplary embodiment with a stimulation arrangement along a central axis of the mattress layer;

Fig. 17 illustrates a top view of a mattress layer according to an exemplary embodiment with a shorter stimulation arrangement along a central axis of the mattress layer;

Fig. 18 illustrates a top view of a mattress layer according to an exemplary embodiment with a stimulation arrangement along a central axis of the mattress layer and sided stabilizing arrangements;

Fig. 19 illustrates a top view of a mattress layer according to an exemplary embodiment with a shorter stimulation arrangement offset from a central axis of the mattress layer;

Fig. 20 illustrates an exemplary embodiment of a modular layered mattress with two layers comprising a mattress layer of the invention;

Fig. 21 illustrates an exemplary embodiment of a modular layered mattress with three layers comprising a mattress layer of the invention; and

Fig. 22a/22b illustrate exemplary embodiments of a stimulation arrangement embedded in a mattress layer body with hollow spacer structure.

[0060] The illustrated embodiments will be described in detail in the following, where same items and elements are references with same or corresponding reference numbers.

Detailed Description of Exemplary Embodiments

[0061] Figure 1 illustrates a schematic overview and definitions on the dimensional directions of a mattress layer 1. L defines the longitudinal extension of the mattress layer, along which a person P rests on the mattress layer 1. This dimension often is the largest extension of a mattress layer 1 and a mattress layer body 10. T defines the transversal extension of the mattress layer 1. D defines the thickness of the mattress layer 1. LP is the rotational axis around which a person P rotates when changing the sleeping position. LP more or less corresponds to the longitudinal extension of the mattress layer 1. The mattress layer 1 has a top surface 18 onto which a sleeping person rests, and an opposing bottom surface 19.

[0062] Figures 2a and 2b illustrate an exemplary embodiment of a mattress layer 1 with a triangle stimulation arrangement 10 in a first position I and a second position II. Figure 2a illustrates a cross section view along the longitudinal extension L with a situation where a person P lays on its back on the top surface 18 of the mattress layer 1. The laying position of the person P is expressed by the position of its spine or back bone PS which is in a position close to the top surface. The person's heart PH is located left and above the spine PS in a cross-sectional view. The mattress layer 1 has a mattress layer body 10 with a mattress layer body structure 11. The mattress layer body structure may be a foam structure, but also a spring structure, and is not limited here. The mattress layer 1 further comprises stimulating arrangement 20 with a stimulating arrangement structure 21, which may also be a foam structure. The stimulating arrangement extends along the longitudinal extension of the mattress layer 1 which reaches here into the illustration plane. The stimulation arrangement 20 in this embodiment has a triangular cross section. The triangle here is an isosceles triangle the symmetry line extends from the top surface 18 to the bottom surface 19 along the thickness extension D of the mattress layer 1. One tip of the triangle points toward the bottom surface 19, so that the triangle stands upside down. This triangular stimu-

lating arrangement is embedded into a mattress layer body 10. In this embodiment the triangle side opposed to the downward tip is part of the surface 18 and aligns with the upper outer boundary of mattress layer body 10. However, the triangle may also be "buried", so that a small layer of the mattress layer body 10 extends over the triangle, which is not illustrated here. Figure 2a illustrates the situation in a first position I, where the person P laying on the stimulating arrangement 20 in a labile equilibrium like on a labile seesaw.

[0063] Figure 2b illustrates the situation in a second position, where the person P together with the stimulating arrangement 20 tilts to the left side and rotates from its back-laying position to a side laying position. This can be identified by the position of the person's spine PS and the person's heart PH. The situation in Fig. 2b is a stable or meta stable equilibrium. As the triangular stimulating arrangement 20 is embedded into the mattress layer body 10, tilting of the stimulating arrangement 20 also leads to a deformation of the mattress layer body 10, thus forming a sink on the top surface 18 left of the stimulating arrangement 20 into which the person P rolls.

[0064] Figures 3a and 3b illustrate a further exemplary embodiment of a mattress layer with a stimulation arrangement having an hour glass shape in the cross-sectional view. Figure 3 a illustrates the situation in a first position I, where no person rests on the mattress layer 1. The hour glass can be interpreted as two opposing triangles, the upper one of which corresponds to the triangle described with respect to Figures 2a and 2b. The upper line 28 and the lower line 29 of the hour glass are aligned with the top surface 18 and the bottom surface 19, respectively. In the embodiment illustrated here the lines 28 and 29 are at the same time part of the surfaces 18 and 19, respectively. However the hour glass may also be buried, so that parts of the mattress layer body 10 extends over the lines 28 and 29. In this (not illustrated) case, the lines 28 and 29 may be parallel to the surfaces 18 and 19. The hour glass has a waist 27, where the both triangle join. Here the waist 27 is very narrow, rather a tip, however, the waist may also be broader. The waist 27 may serve as a flexible hinge. The resilience of the hinge can be defined by the dimension of the waist 27.

[0065] Figure 3b illustrates the situation where the stimulation arrangement 20 is in the second position II, where a person P already rotated from the labile position I (not illustrated) into the stable or meta stable position II. The upper triangle of the hour glass tilted around the waist 27 as a hinge under the pressure of the person's body. It should be noted that the illustrations here consider the stimulating arrangement structure 21 as not compressible. However, it should be noted that when using a foam, the structure 21 of the stimulating arrangement may also deform. In case the foam density of the stimulating arrangement 20 is higher than the foam density of the mattress layer body 10, the deformation of the stimulating arrangement 20 will be lower than that of the mattress layer body 10, and the upper triangle will tilt over the lower triangle. The dimension of the upper triangle in Figures 3a and 3b may be the same as that of Figures 2a and 2b. In this case the mattress layer 1 of Figures 3a and 3b is about twice of that of Figures 2a and 2b. However, the thickness of both mattress layers in Figures 2a and 2b on the one hand and Figures 3a and 3b on the other hand may be the same. In this case the total height of the hour glass corresponds to the total height of the triangle in Figures 2a and 2b.

[0066] Figures 4a and 4b illustrate an exemplary embodiment of a mattress layer 1 with a triangle stimulation arrangement 10 in form of a cage in a first position I and a second position II. Figure 4a illustrates a cross section view along the longitudinal extension L with a situation where a person P (not illustrated here) lays on its back on the top surface 18 of the mattress layer 1. The mattress layer body structure 11 of the mattress layer 10 may be a foam structure. The mattress layer 1 in this embodiment further comprises stimulating arrangement 20 in form of a cage 25. The cage 25 may be formed by rods 25a extending along the longitudinal extension of the mattress layer 1. The entire stimulating arrangement extends along the longitudinal extension of the mattress layer 1 which reaches here into the illustration plane. The stimulation arrangement 20 in this embodiment has a cage 25 with triangular cross section. The triangle here is an isosceles triangle the symmetry line extends from the top surface 18 to the bottom surface 19 along the thickness extension D of the mattress layer 1. One tip of the triangle points toward the bottom surface 19, so that the triangle stands upside down. This triangular stimulating arrangement is embedded into a mattress layer body 10. The triangular cage 25 here is "buried", so that a small layer of the mattress layer body 10 extends over the triangular cage. Figure 2a illustrates the situation in a first position I, where the person P (not illustrated here) laying on the stimulating arrangement 20 in a labile equilibrium like on a labile seesaw.

[0067] Figure 4b illustrates the situation in a second position, where the person P together with the cage shaped stimulating arrangement 20 tilts to the left side and rotates from its back-laying position to a side laying position. This can be identified by the position of the person's spine PS and the person's heart PH. The situation in Fig. 4b is a stable or meta stable equilibrium. As the triangular cage 25 is embedded into the mattress layer body 10, tilting of the stimulating arrangement 20 also leads to a deformation of the mattress layer body 10, thus forming a sink on the top surface 18 left of the stimulating arrangement 20 into which the person P rolls.

[0068] Figure 5 illustrates an exemplary embodiment of a triangle cage type stimulation arrangement 20 in detail. The cage 25 is formed by rods 25a forming the edges of the triangular stimulation arrangement 20. The rods are maintained in relative position to each other by spacers 25b, being connected to the rods 25a at joints 25d. The spacers may have a concave edge or may have a star form so that the intermediate portions can be filled

with material of the mattress layer body structure 21.

[0069] Figures 6a and 6b illustrate a further exemplary embodiment of a mattress layer with a cage shaped stimulation arrangement 20 having an hour glass shape in the cross-sectional view. Figure 6a illustrates the situation in a first position I, where no person rests on the mattress layer 1. The hour glass with the two opposing triangles is formed by rods 25a, the upper triangle corresponds to the triangle described with respect to Figures 4a and 4b. The upper line 28 and the lower line 29 of the hour glass are aligned with the top surface 18 and the bottom surface 19, respectively. In the embodiment illustrated here the hour glass is buried, so that parts of the mattress layer body 10 extends over the lines 28 and 29 of the cage 25. The lines 28 and 29 are parallel to the surfaces 18 and 19. The hour glass cage 25 has a waist 27, where the both triangles join. Here the waist 27 is formed by a rod 25a. The rod 25 as the waist 27 may serve as a flexible hinge.

[0070] Figure 6b illustrates the situation where the cage shaped stimulation arrangement 20 is in the second position II, where a person P already rotated from the labile position I (not illustrated) into the stable or meta stable position II. The upper triangle of the hour glass cage 25 tilted around the waist 27 as a hinge under the pressure of the person's body. The dimension of the upper triangle cage part 25 in Figures 6a and 6b may be the same than that of Figures 4a and 4b. In this case the mattress layer 1 of Figures 6a and 6b is about twice of that of Figures 4a and 4b. However, the thickness of both mattress layers in Figures 4a and 4b on the one hand and Figures 6a and 6b on the other hand may be the same. In this case the total height of the hour glass cage 25 corresponds to the total height of the triangle cage 25 in Figures 4a and 4b.

[0071] Figure 7 illustrates an exemplary embodiment of an hour glass cage type stimulation arrangement in detail. As described with respect to Figure 5, the rods 25a of the cage 25 are coupled and positioned with spacers 25b. The both spacers 25b may tilt with respect to each other around the center rod 25a. For this purpose, the spacers may have sleeves toward the center rod 25a though which the center rod 25a runs to form a hinge 25c of the cage 25.

[0072] Figures 8a and 8b illustrate an exemplary embodiment with a triangle "half geometry" stimulation arrangement 20 in a first and second position. In case the stimulating arrangement 20 is offset from the center, which is described later in detail, an asymmetric geometry of the stimulation arrangement may be sufficient, as rotation to only one side is expected. The functional principle is the same as that described with respect to Figures 2a and 2b, which allows rotation to the left and to the right, whereas the stimulation arrangement of Figures 8a and 8b allow a rotation to the left. Figure 8a illustrates the situation in a first position without a person resting on the mattress layer body 10, whereas Figure 8b illustrates the situation in the second position II, where a person P already rotated and now rests in a healthier, non-snoring stable or meta stable position II.

[0073] Figures 9a and 9b illustrate an exemplary embodiment with an hour glass "half geometry" stimulation arrangement in a first and second position. With respect to the offset position of the stimulating arrangement 20 Figures 9a and 9b correspond to Figures 8a and 8b. With respect to the hour glass shape, Figures 9a and 9b correspond to Figures 3a and 3b, with the modification that the hour glass is a half hour glass divided along the thickness direction of the mattress layer 1.

[0074] It should be noted that the structure of Figures 4a and 4b, as well as 6a and 6b can also be designed as half structures with rods at the edges of the half structures, corresponding to the illustrations of Figure 8a and 8b, as well as Figure 9a and 9b.

[0075] Figures 10a, 10b, 10c, 10d and 10e illustrate vis á vis cross sections of exemplary embodiments of a "full" triangle type, a "half' triangle type, a "full" hour glass type, a "half' hour glass type and an asymmetric hour glass type stimulation arrangement 20. These embodiments have been described with respect to Figures 2a and 2b, 3a and 2b, 8a and 8b, as well as 9a and 9b.

[0076] Figures 11a, 11b, 11c, 11d and 11e illustrate vis á vis cross sections of exemplary embodiments of a concave shaped stimulation arrangement 20. With the concave structure the tilting properties may be designed and the gaps can be filled with material of the mattress layer body 10. Figure 11a illustrates a "full" concave triangle type, figure 11b a "half' concave triangle type, Figure 11c a "full" concave hour glass type and Figure 11d a "half' concave hour glass type stimulation arrangement 20. Figure 11e illustrates a concave asymmetric hour glass type stimulation arrangement 20. The operation of the stimulation arrangements 20 in Figures 11a to 11b corresponds to that of Figures 11a to 10b.

[0077] Figure 12a, 12b, 12c, 12d and 12e illustrate vis á vis cross sections of exemplary embodiments of a "full" diamond type, a "half' diamond type, a "full" diamond hour glass type, a "half' diamond hour glass type and an asymmetric diamond hour glass type stimulation arrangement. The diamond shape stimulation arrangement 20 is a modified triangle type of Figures 10a to 10e. The difference is that the edges toward the top surface are chamfered. This avoids sharp edges, in particular if harder e.g. foam material is used for manufacturing the stimulation arrangement 20. The transit from the stimulation arrangement to the mattress layer body is smoother. The edges can be provided with a sharp chamfer, as illustrated, but also with a rounded chamfer (not illustrated). In the same way, the bottom edge can be chamfered or rounded, although not illustrated. For the hour glass diamond type, with respect to the waist the same applies compared to what was described with respect to Figures 3a and 3b as well as Figures 9a and 9b.

[0078] The asymmetric hour glass cross sections as shown in Figures 10e, 11e and 12e allow for providing a larger upper triangle for improving the tilting effect, while

maintaining a certain base, which is formed by the smaller bottom triangle. The inclination of the side faces of the upper triangle may be the same or similar to the inclination of the side faces of the lower triangle, as shown in Figure 10e. In this case, the top line is longer than the bottom line of the hour glass, wherein a waist of the hour glass is designed to operate as a flexible hinge. As an alternative, the inclination of the side faces of the upper triangle may be steeper than the inclination of the side faces of the lower triangle, as exemplarily shown in Figures 11e and 12e. In this case, the top line may also be as long as the bottom line of the hour glass. The different inclinations of Figure 11e may also apply to the non-concave hour glass type of Figure 10e and vice versa.

[0079] Figures 13a and 13b illustrate an exemplary embodiment with a triangle stimulation arrangement 20 with sided stabilizing arrangements 30 in a first and second position, here the outer edges of the mattress layer body 10 along the longitudinal extension thereof.

[0080] With respect to the function of the stimulation arrangement 20 for Figures 13a and 13b the same applies as what was described with respect to Figures 2a and 2b. The additional stabilizing arrangement 30 in the illustrated embodiment has sections, which have a harder stabilizing arrangement structures 31 than the mattress layer body 10 and the mattress layer body structure 11. Although Figures 13a and 13b illustrate a stabilizing arrangement 30 on both lateral sides of the mattress layer 1, fo embodiments, where the stimulating arrangement 20 is offset from a center line of the mattress layer, it may be sufficient to provide a stabilizing arrangement 30 only on that side to which the rotation is expected, i.e. the side opposed to the offsetting side.

[0081] Fig. 14 illustrates an exemplary embodiment of an hour glass type stimulation arrangement 20 with stabilizing arrangements 30 with corresponding opposing surfaces. As can be seen the side surfaces 23 of the stimulation arrangement 20 correspond to the side surface 33 of the stabilizing arrangement 30, here this applies for both sides. If manufacturing the stimulation arrangement 20, the shape thereof may be cut from a squared or rectangular cross sectioned block of e.g. foam. As a consequence, if cutting an hour glass shape 20 out of a rectangular shape, the remainders may directly be used as stabilizing arrangements 30. This applies for different shapes of stimulation arrangements 20, as it is illustrated in Figure 15, for which the same applies mutatis mutandis.

[0082] Fig. 16 illustrates a top view of a mattress layer according to an exemplary embodiment with a stimulation arrangement 20 along a central axis C of the mattress layer 1 and the mattress layer body 10. The stimulation arrangement 20 may extend over the entire length of the mattress, as illustrated here, or may also extend only over the extension of a torso of a person resting on the mattress layer. It should be understood that a person's torso may vary in length, so that a length and the longitudinal position can be selected based on e.g. a 95 percentile of persons. The limitation of the length may avoid any reduction for the head rest or the knee rest, and only stimulate the torso, i.e. from the neck via the shoulder and the back down to the pelvis.

[0083] Figure 17 illustrates a top view of a mattress layer according to an exemplary embodiment with a shorter stimulation arrangement 20 along a central axis C of the mattress layer 1. The shorter stimulation arrangement 30 may be in one piece, as illustrated for the offset embodiment in Figure 19, or may be composed of a plurality of single units which together form the stimulation arrangement 20. Each of the units may have a shape as illustrated in the figures before. In particular different units may have different cross-sectional shapes depending on the configuration of the mattress layer 1. This may be of particular relevance if customizing a mattress layer upon customers wishes and needs.

[0084] Figure 18 illustrates a top view of a mattress layer 1 according to an exemplary embodiment with a stimulation arrangement 20 along a central axis C of the mattress layer body 10 and sided stabilizing arrangements 30. Here the stabilizing arrangements extend along both lateral edges of the mattress layer body 10. This avoids that a person falls from the mattress layer 1 when rotating from the back-rest position to the side-rest position.

[0085] Figure 19 illustrates a top view of a mattress layer 1 according to an exemplary embodiment with a shorter stimulation arrangement 20 offset from a central axis C of the mattress layer body 10. In this embodiment, the particular shapes of a stimulation arrangement 20 may be used, which were described with respect to Figures 8a, 8b, 9a, and 9b. It should be noted that the "cutting line along which the full structure is divided is on the respective outer side, here the left side, so that the tilting effect takes place to rotate the resting person toward the center line C. The embodiment illustrated here also comprises a stabilizing arrangement 30 on the opposing side of the offset stimulating arrangement 20. It should be noted that the length of the stabilizing arrangement can be different to the length of the stimulation arrangement 20, and can also extend over the entire length as illustrated in Figure 18. The offset stimulating arrangement 20 can also extend over the entire length of the mattress layer 1, as illustrated in Figures 16 and 18, and may also be divided into different units, as illustrated in Figure 17, regardless whether it extends over the entire length of the mattress layer 1 or only over a part of it.

[0086] Figure 20 illustrates an exemplary embodiment of a modular layered mattress 100 with two layers 1 and 2, one of which is a mattress layer 1 of the invention as described above. Figure 20 illustrates the inventive mattress layer 1 as a top layer. It should be noted that the shape and dimension of the stimulating arrangement 20 here represents all different kinds of shapes and embodiments as described above and is not limited to that described in Figures 2a and 2b.

[0087] Figure 21 illustrates an exemplary embodiment

of a modular layered mattress 100 with three layers 1, 2 and 3, one of which is a mattress layer 1 of the invention as described above. Figure 21 illustrates the inventive mattress layer 1 as am intermediate layer. It should be noted that the shape and dimension of the stimulating arrangement 20 here represents all different kinds of shapes and embodiments as described above and is not limited to that described in Figures 3a and 3b. In the embodiment illustrated in Figure 21, the intermediate mattress layer 1 according to the invention should be designed according to the thickness dimensions of the top layer 3, in order maintain the function of the inventive mattress layer 1 as an intermediate layer. It should also be noted that, although not illustrated here, the inventive mattress layer 1 in a two-layer mattress can be used as lower layer. Further, the inventive mattress layer can also be used in combination with more than two or three layers.

[0088] Figures 22a and 22b illustrate exemplary embodiments of a stimulation arrangement 20 embedded in a mattress layer body 10 with hollow spacer structure 40. The hollow spacer structure 40 may be provided beside the stimulation arrangement 20 and lead to a lower hardness in the area adjacent the stimulating structure. The hollow spacer 40 structure may be formed by hollow spaces, in particular hollow channels along the boundaries between the stimulation arrangement 20 and the mattress layer body 10. The shape, the density and/or the size of the hollow space or spaces may be used to define the hardness of the mattress layer body structure. Although figures 22a and 22b illustrate two different embodiments of hollow spacers on the left and right side, only for illustrative purposes, however on the left and right side the same hollow spacer structure 40 may be provided.

Reference Numbers

[0089]

1	mattress layer
2	top layer of a layered/modular mattress
3	bottom layer of a layered/modular mattress
10	mattress layer body
11	mattress layer body structure
16	head end of the mattress layer/mattress layer body
17	foot end of the mattress layer/mattress layer body
18	top surface of the mattress body layer on which a person is to be rested
19	bottom surface of the mattress body layer on which the mattress layer rests
20	stimulation arrangement
21	stimulation arrangement structure
23	side contour of a cross section of the stimulating arrangement
25	cage structure of a stimulation arrangement
25a	rods of the cage structure
25b	spacers of the cage structure
25c	hinges connections of the cage structure at the waist of the hour glass
25d	connecting points between rods and spacers
27	waist of an hour glass
28	top line of a triangle, diamond and/or hour glass
29	bottom line of an hour glass
30	stabilizer arrangement
31	stabilizer arrangement structure
33	side contour of a cross section of the stabilizing arrangement
40	hollow spacer structure
100	mattress, layered/modular mattress
I	first position of stimulation arrangement
II	second position of stimulation arrangement
C	center line of the mattress layer body
D	thickness extension of the mattress layer body
L	longitudinal extension of mattress layer body
P	person
PH	person's heart
PS	person's spine (back bone)
T	transversal extension of mattress layer body

Claims

1. Anti-snore mattress layer comprising:

a mattress layer body (10) having a longitudinal extension (L) corresponding to a longitudinal extension of a person (P) to be rested on the mattress layer (1), a transversal extension (T) corresponding to a transversal extension of a person (P) to be rested on the mattress layer (1), and a thickness extension (D);

a stimulation arrangement (20) being elastically movably arranged within the mattress layer body (10) between a first position (I) and a second position (II), wherein the first position is a position when no person rests on the mattress layer;

wherein the stimulation arrangement (20) in its first position (I) has a shape and orientation, which with a person (P) to be rested on the mattress layer (1) forms a labile equilibrium that stimulates the person (P) to be rested on the mattress layer (1) to rotate around its longitudinal axis (LP) and at the same time moves from the first position (I) into the second position (II), in which the stimulation arrangement (20) together with a person after rotation resting on the mattress layer (10) forms a meta stable equilibrium,

wherein the mattress layer body has a mattress layer body structure (11) having a first hardness and the stimulation arrangement (20) has stimulation arrangement structure (21) having a second hardness, which is higher than the first hard-

ness of the body volume structure (11) of the mattress layer body (10).

2. Anti-snore mattress layer of claim 1, wherein the stimulation arrangement (20) has a longitudinal extension which extends along the longitudinal extension (L) of the mattress layer body (10)

3. Anti-snore mattress layer of any of claims 1 and 2, wherein the body volume structure (11) is a first foam material with the first hardness, in particular a cold-cure foam, and the stimulation arrangement structure (21) is a second foam material with the second hardness, in particular a cold-cure foam.

4. Anti-snore mattress layer of claim 3, wherein the stimulation arrangement structure (21) has a higher foam density than the body volume structure (11).

5. Anti-snore mattress layer of any of claims 1 to 4, wherein the stimulation arrangement (20) traverse to its longitudinal extension (L) has a triangular cross section part, in particular an isosceles triangle cross section part, wherein one tip of the triangular cross section part points away from a top surface (18) of the mattress body layer (10) on which a person is to be rested.

6. Anti-snore mattress layer of any of claims 1 to 5, wherein the stimulation arrangement (20) traverse to its longitudinal direction (L) has an hour glass cross section wherein a top line (28) and bottom line (29) of the hour glass are substantially parallel to a top surface (18) and a bottom surface (19) of the mattress layer body (10), wherein a waist (27) of the hour glass is designed to operate as a flexible hinge.

7. Anti-snore mattress layer of any of claims 1 to 6, wherein the stimulation arrangement (20) has a cage structure (25) defining a volume, which in its first position (I) has a shape and orientation, which with a person (P) to be rested on the mattress layer (1) forms a labile equilibrium that stimulates the person (P) to be rested on the mattress layer (1) to rotate around its longitudinal axis (LP) and at the same time moves from the first position (I) into the second position (II), in which the stimulation arrangement (20) together with a person after rotation resting on the mattress layer (10) forms a meta stable equilibrium.

8. Anti-snore mattress layer of claim 7, wherein the cage structure (25) extends along the longitudinal extension of the mattress layer body (10) and defines a volume that traverse to its longitudinal extension (L) has a triangular, diamond or hour glass cross section, wherein the cage structure (25) comprises rods (25a) being oriented to the longitudinal extension (L) of the mattress layer body (10), wherein the rods (25a) run along edges defined by the tips of triangular, diamond and hour glass cross section, respectively.

9. Anti-snore mattress layer of claim 8, wherein a rod (25a) defining the waist (27) of the hour glass cross section is designed to operate as a hinge between the rods (25a) allocated to the top surface (18) of the mattress layer body (10) and the rods (25a) allocated to the bottom surface (19) of the mattress layer body (10).

10. Anti-snore mattress layer of any of claims 1 to 9, wherein the longitudinal extension of the stimulation arrangement structure (20) corresponds to a longitudinal extension (LP) of a torso of a person (P) to be rested on the mattress layer body (10), and in particular is limited to a longitudinal length of a torso of a person (P) to be rested on the mattress layer body (10).

11. Anti-snore mattress layer of any of claims 1 to 10, wherein the stimulating arrangement (20) with its longitudinal extension is offset from a center line (C) of the mattress layer body (10) along the longitudinal extension (L) of the mattress layer body (10), in particular offset to the left, when seen onto the top surface (18) of the mattress layer body (10) and from a foot end (17) to a head end (16) of the mattress layer body (10).

12. Anti-snore mattress layer of claim 11, wherein the stimulation arrangement (20) traverse to its longitudinal extension has a cross section which corresponds to the center-sided part of a divided shape divided along a shape symmetry line orthogonal from a top surface (18) to a bottom surface of the mattress layer body (10), wherein the shape is selected out of a group consisting of an isosceles triangle, a diamond and an hour glass.

13. Anti-snore mattress layer of any of claims 1 to 12, wherein the mattress layer (1) further comprises a stabilizer arrangement (30) extending along the longitudinal extension (L) of the mattress layer body (10) and parallel to the longitudinal extension of the stimulating structure (20), wherein the stabilizer arrangement (30) has a stabilizer arrangement structure (31) having a higher hardness than the mattress layer body structure (11), and preferably is arranged at at least one longitudinal side of the mattress layer body (10).

14. Anti-snore mattress layer of any of claims 1 to 13, wherein the stabilizer structure (31) is a foam material which is the same as the second foam material of the stimulating arrangement structure (21), and having a cross section, one side of which (33) cor-

responds to one side (23) of the cross section of the stimulating arrangement structure (21), wherein in particular the corresponding sides (23, 33) are oriented toward each other.

15. An anti-snore mattress having a plurality of exchangeable layers (1, 2, 3), at least one layer thereof is an anti-snore mattress layer (1) according to any of the previous claims.

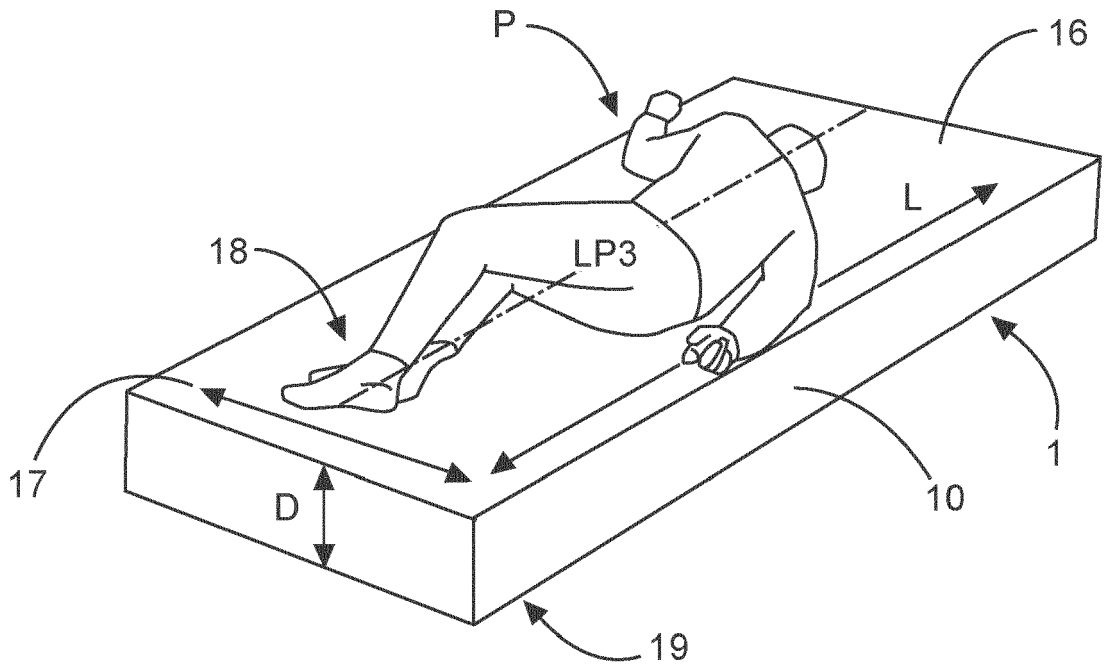

Fig. 1

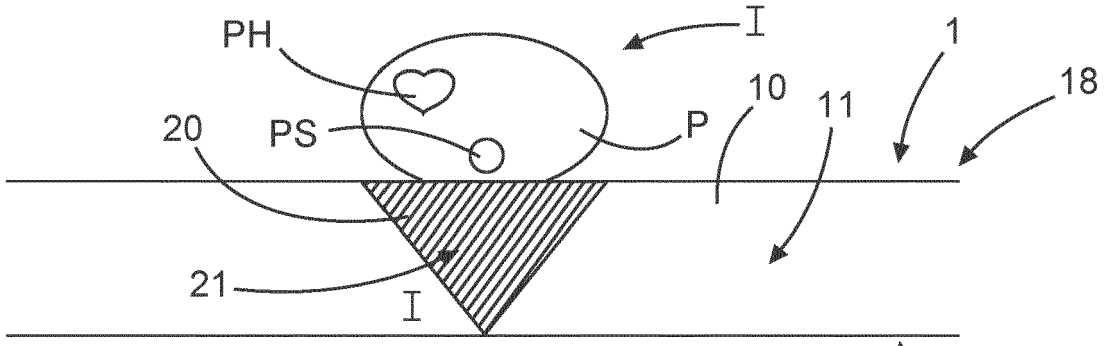

Fig. 2a

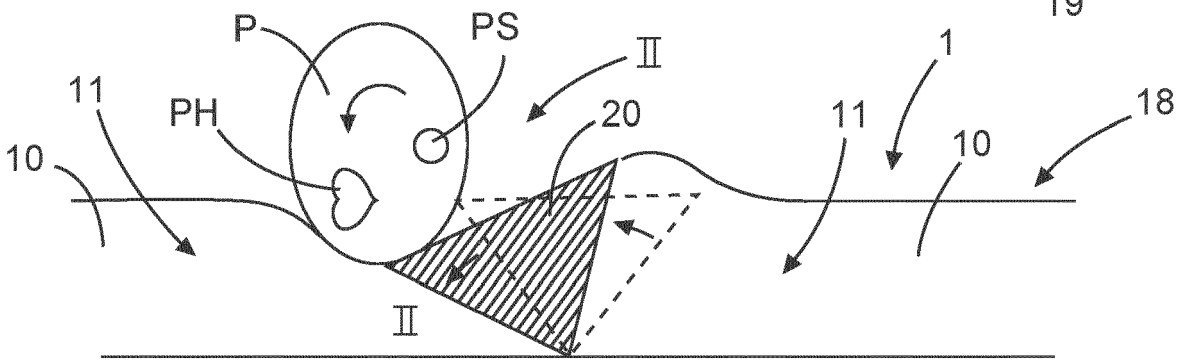

Fig. 2b

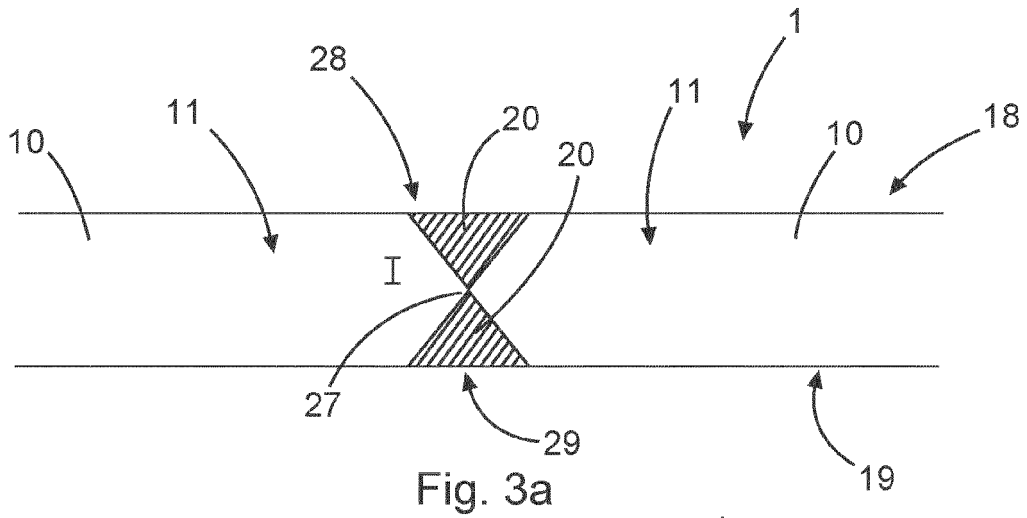

Fig. 3a

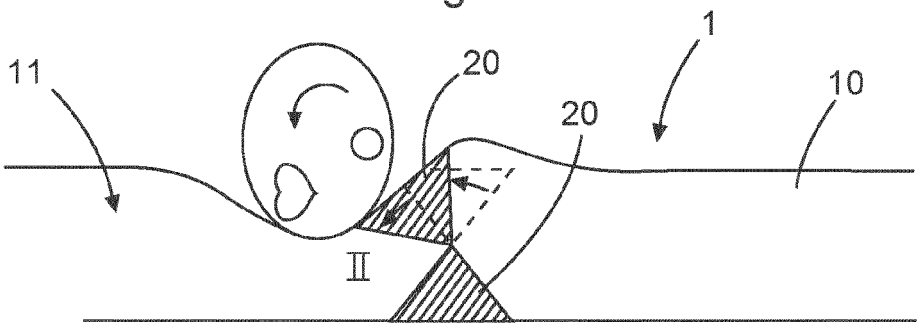

Fig. 3b

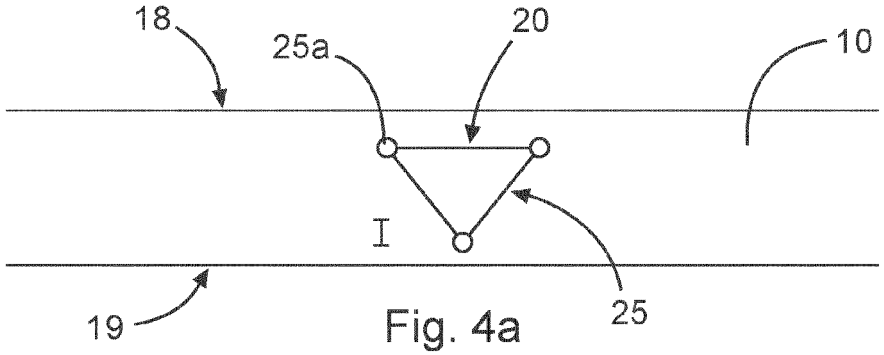

Fig. 4a

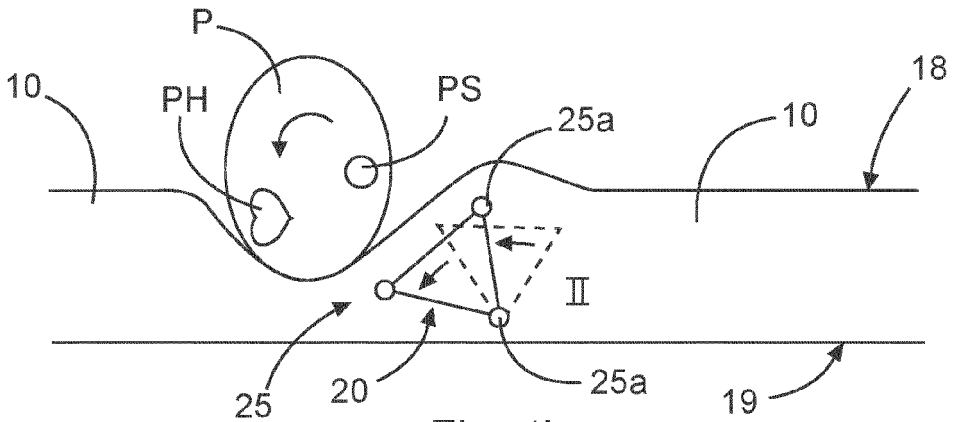

Fig. 4b

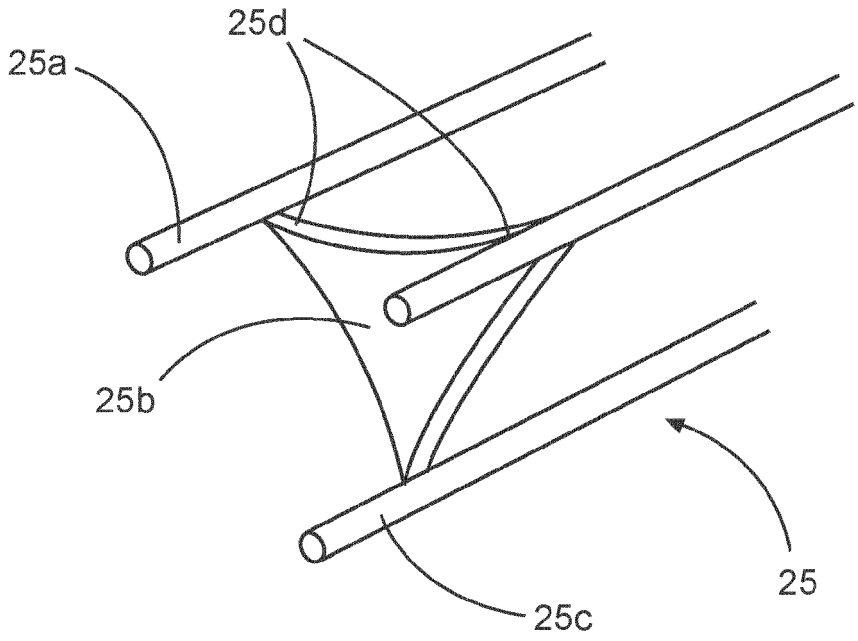

Fig. 5

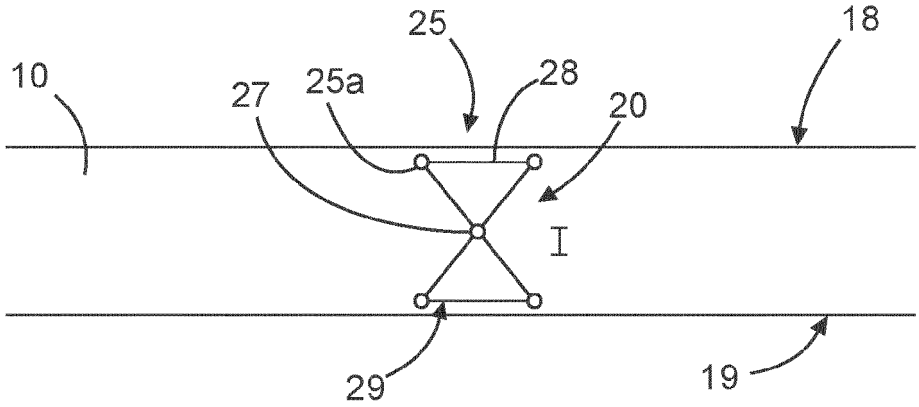

Fig. 6a

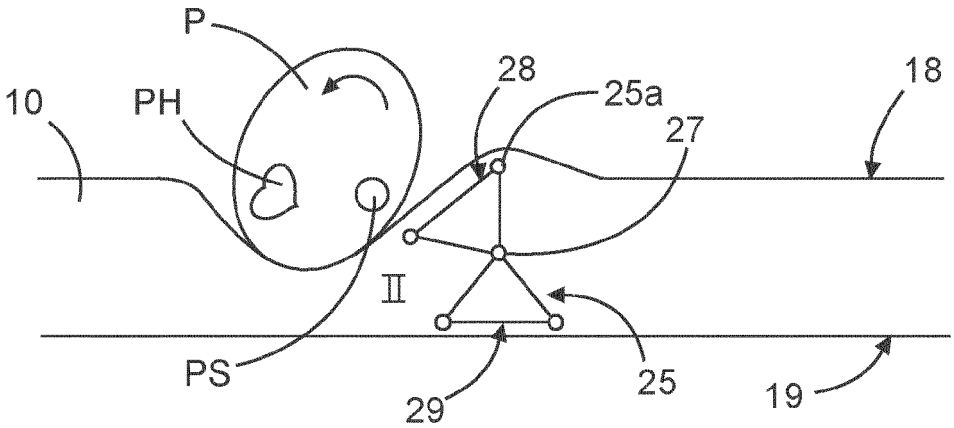

Fig. 6b

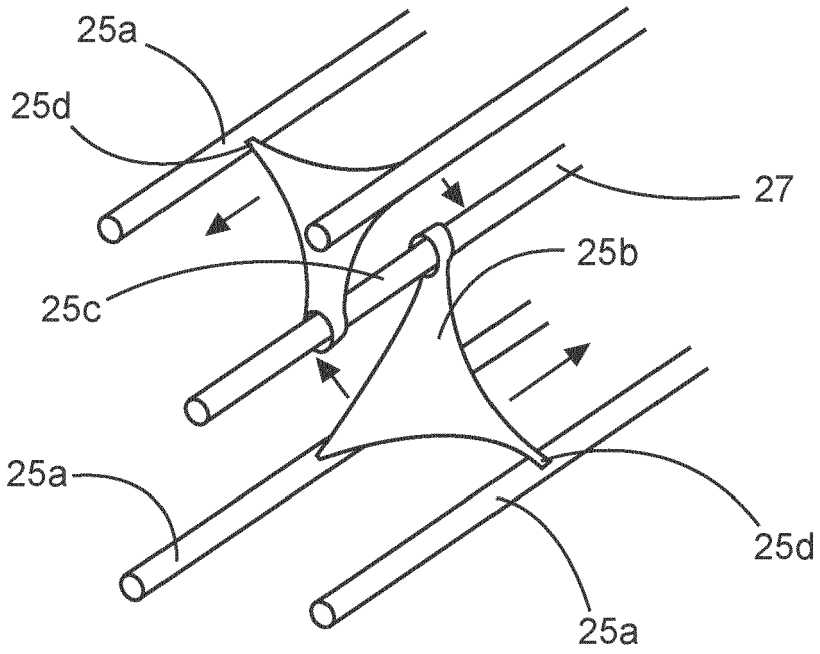

Fig. 7

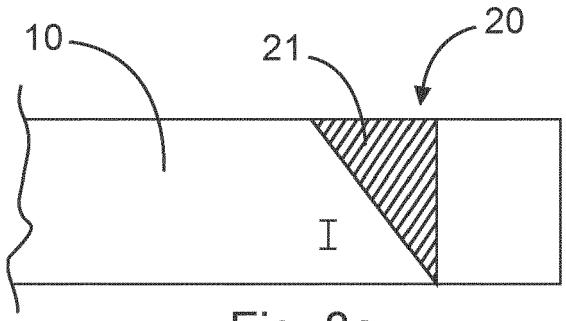

Fig. 8a

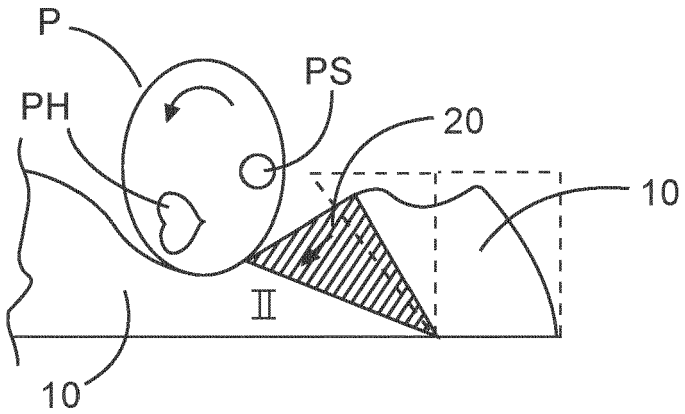

Fig. 8b

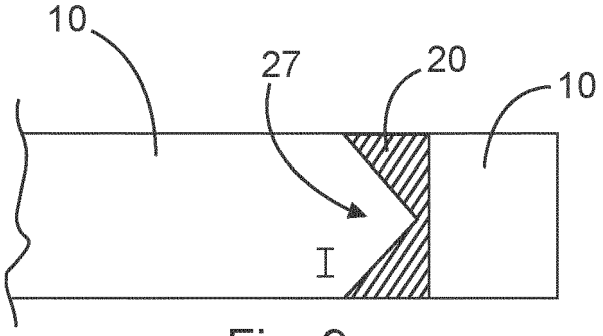

Fig. 9a

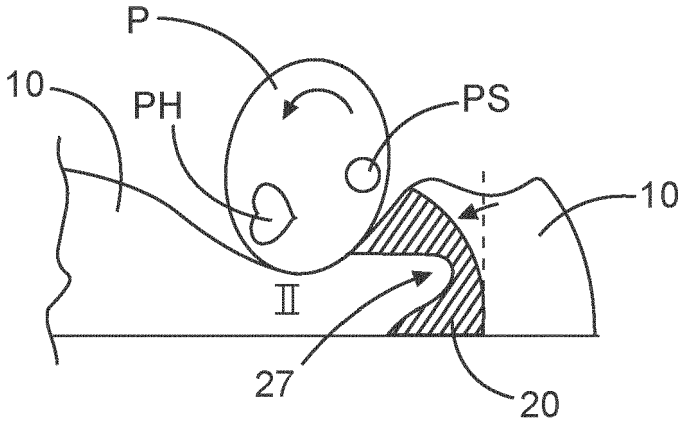

Fig. 9b

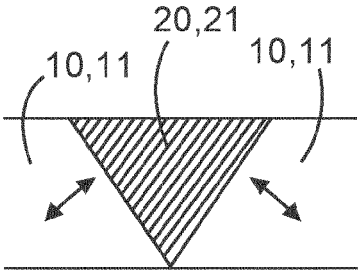

Fig.10a

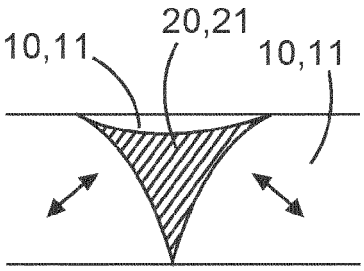

Fig.11a

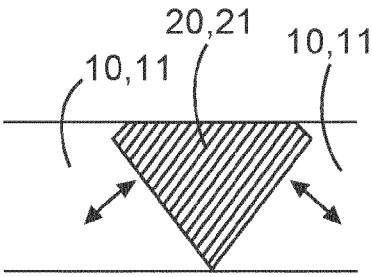

Fig.12a

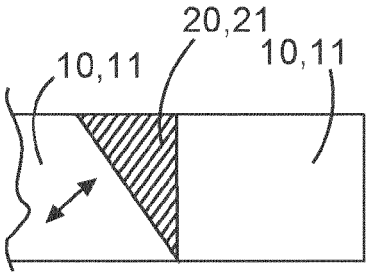

Fig.10b

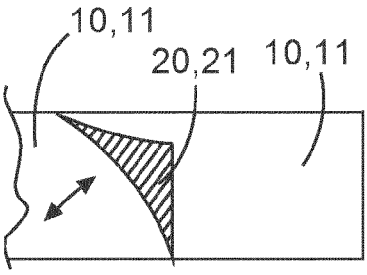

Fig.11b

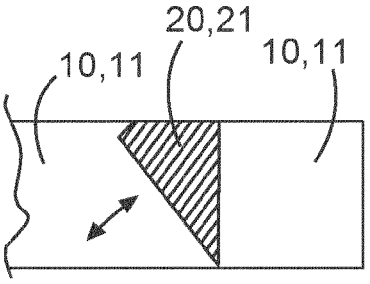

Fig.12b

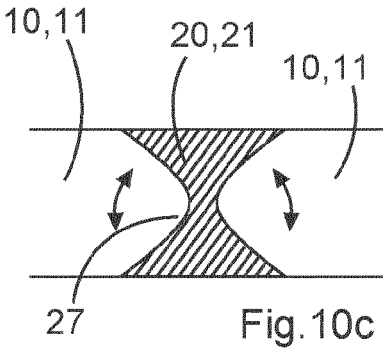

Fig.10c

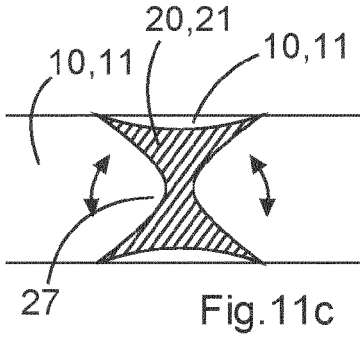

Fig.11c

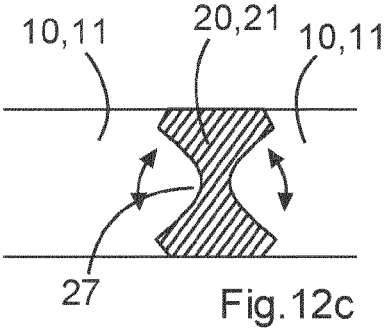

Fig.12c

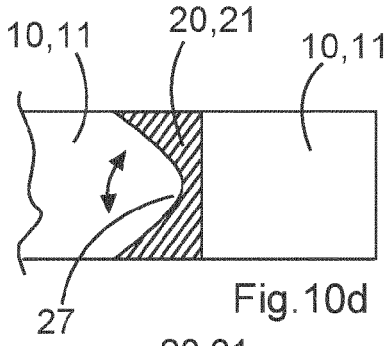

Fig.10d

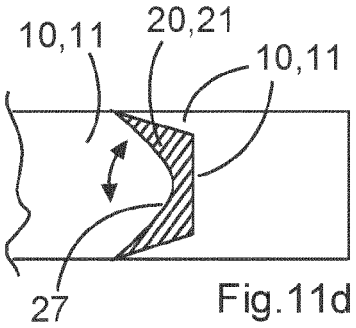

Fig.11d

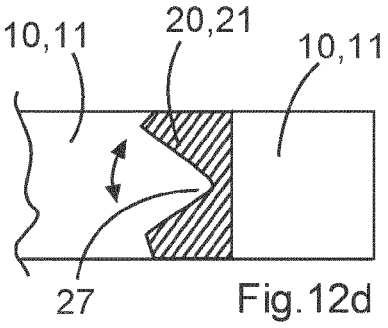

Fig.12d

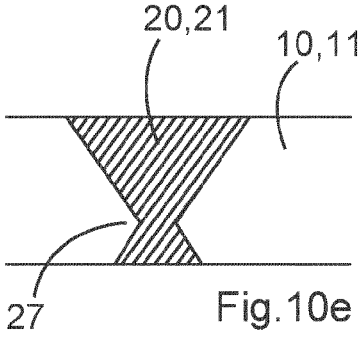

Fig.10e

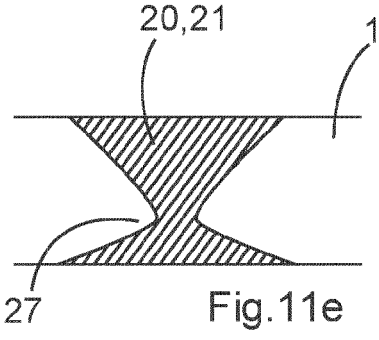

Fig.11e

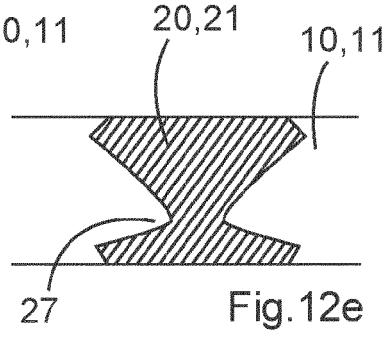

Fig.12e

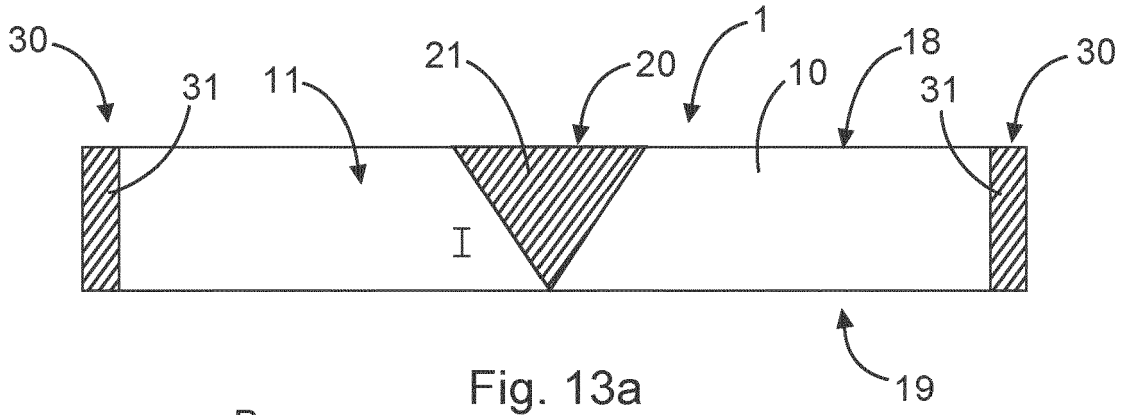

Fig. 13a

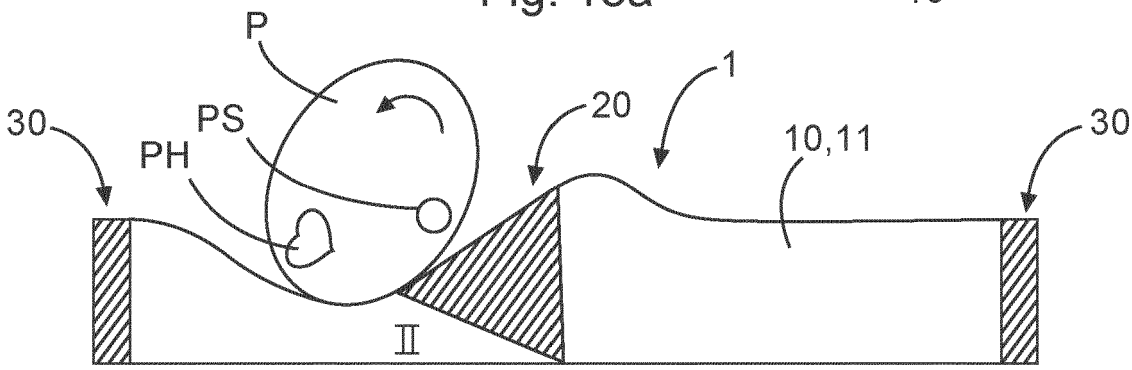

Fig. 13b

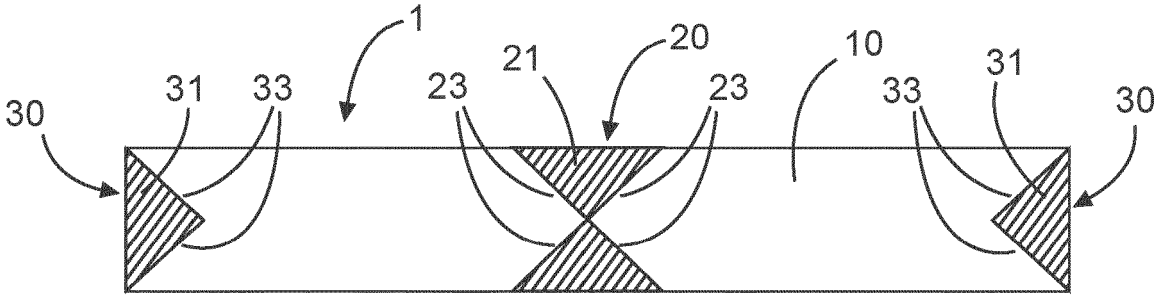

Fig. 14

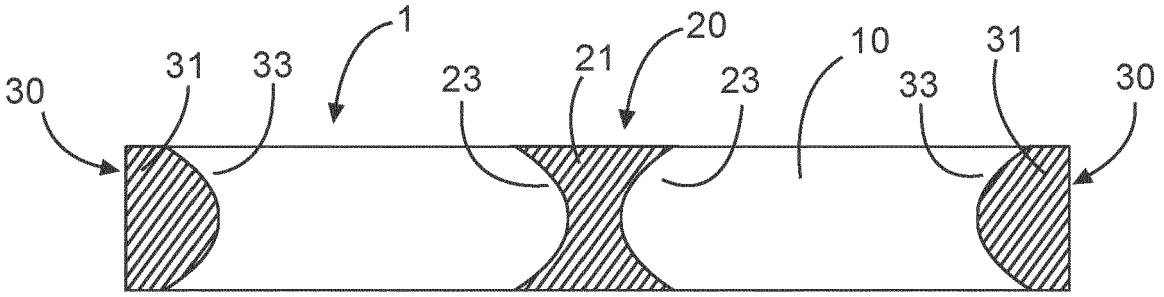

Fig. 15

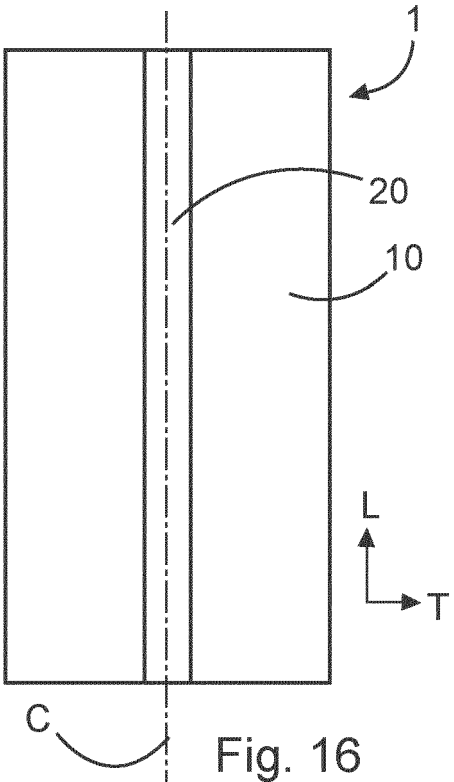

Fig. 16

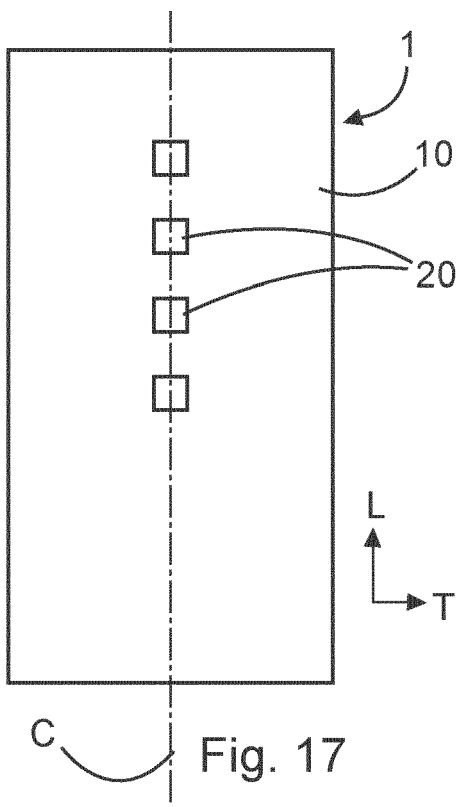

Fig. 17

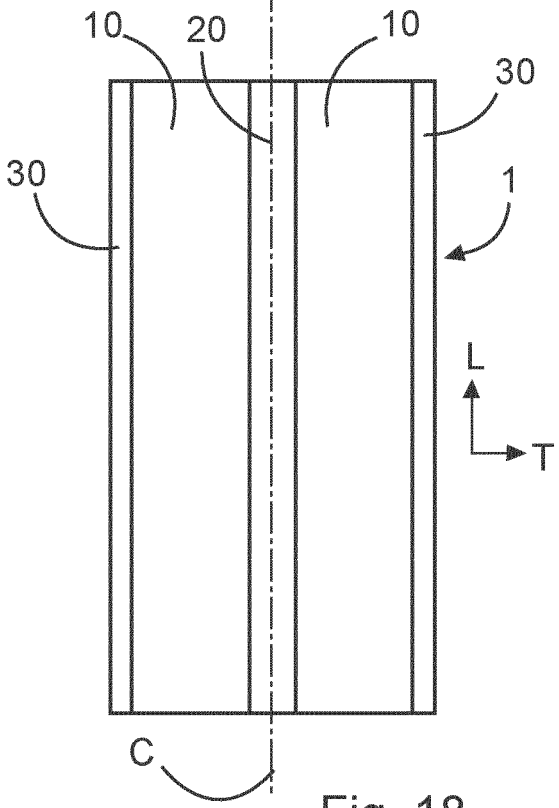

Fig. 18

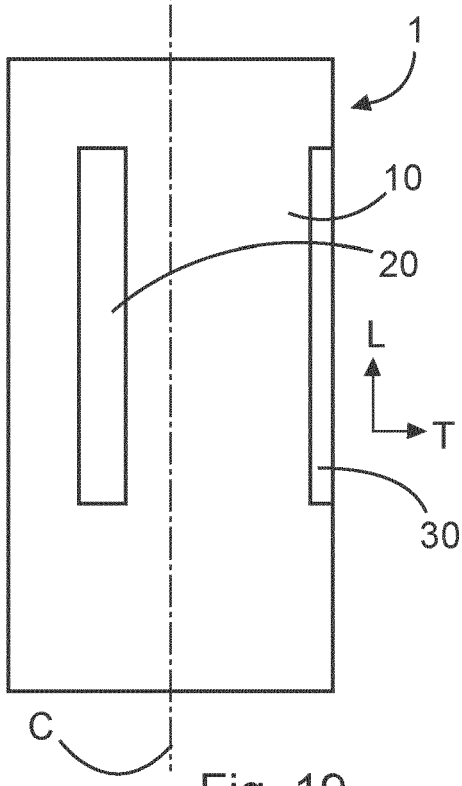

Fig. 19

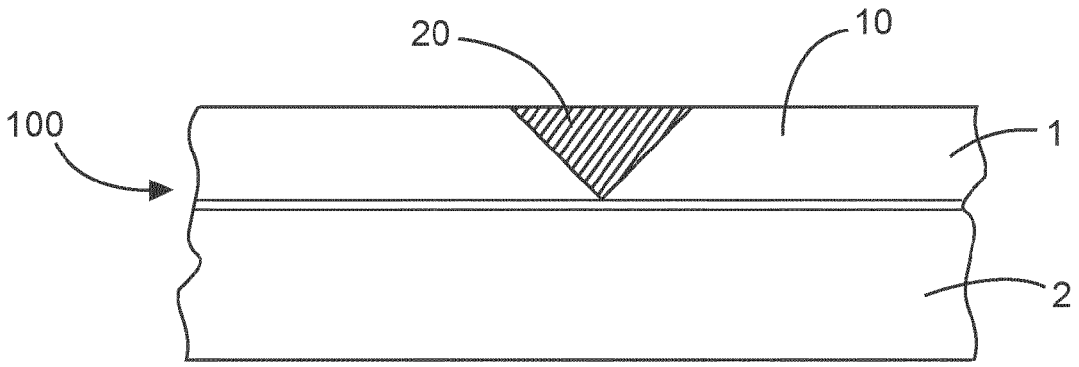

Fig. 20

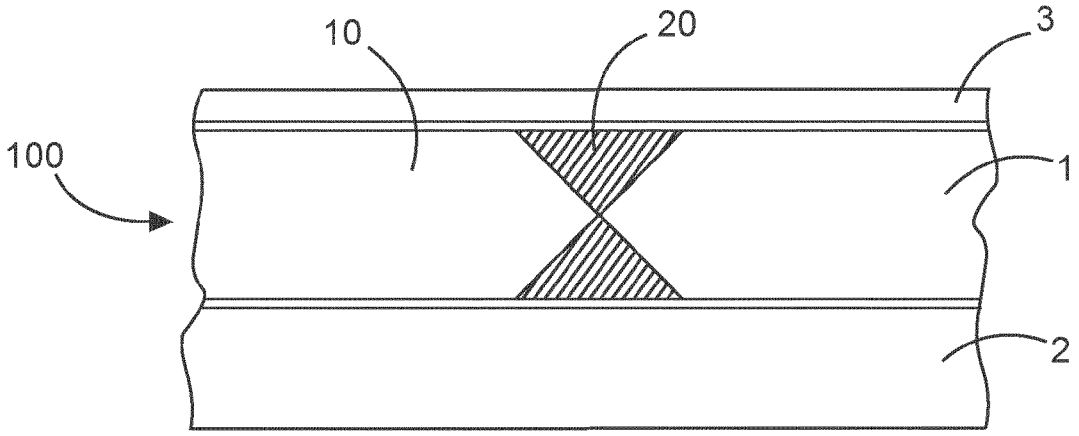

Fig. 21

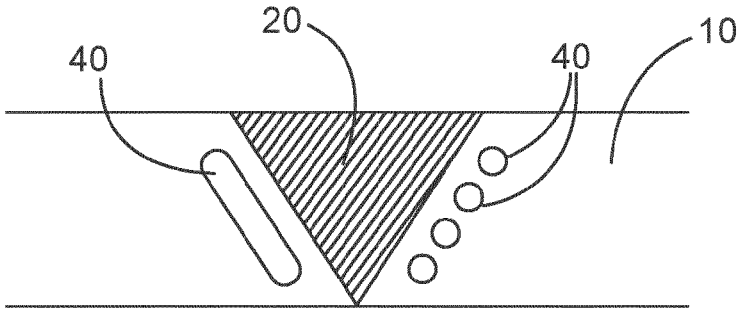

Fig. 22a

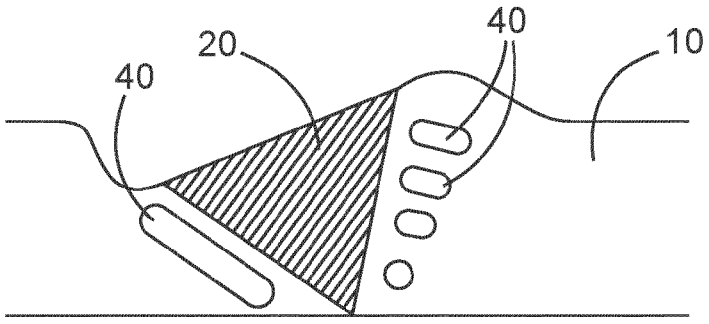

Fig. 22b

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 6148

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 462 777 A (LUTSKY SIDNEY) 26 August 1969 (1969-08-26) * column 2, line 3 - column 3, line 56; figures 1-5 * -----	1-5,7,8, 10,12, 13,15	INV. A47C27/14 A47C27/16

TECHNICAL FIELDS SEARCHED (IPC)

A47C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 September 2020	Kus, Slawomir

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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14-09-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3462777 A	26-08-1969	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82