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(54) **Ergonomic mattress**

(57) A mattress to support a human body (18) comprises a portion (60) having two lying surfaces (51, 52) substantially parallel to each other, which define a resting plane (r), on which the human body (18) rests, and in which the lying surfaces (51, 52) comprise a convex part (28, 31) which extends in height with respect to the resting plane (r).

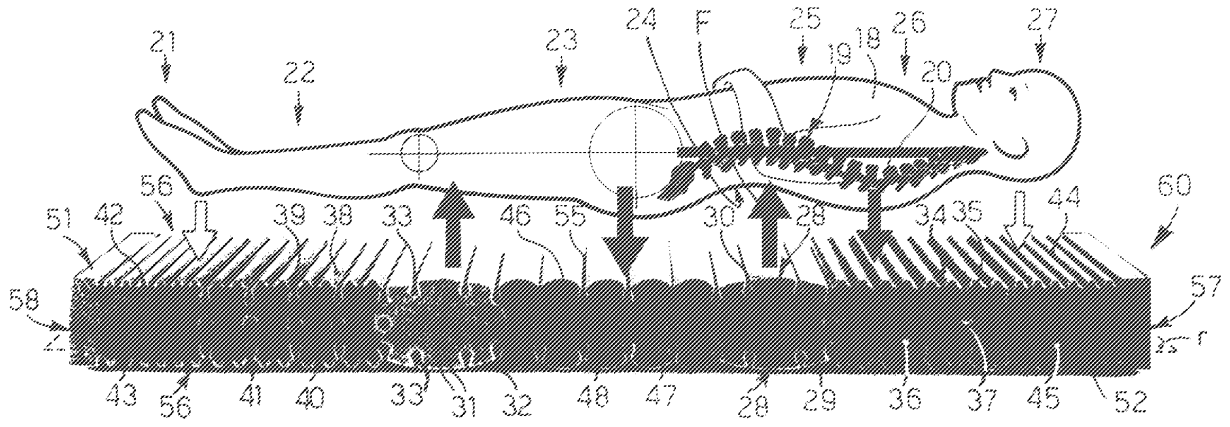


fig. 3

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## Description

### FIELD OF THE INVENTION

**[0001]** The present invention concerns an ergonomic mattress, comprising an inner part, or block, having a plurality of sectors made with a structure that confers on each of them a different degree of resistance to the compression and load of the backbone.

### BACKGROUND OF THE INVENTION

**[0002]** Mattresses of various material and structure are known, for example of the type with springs, or made of latex, having plane surfaces with various degrees of resistance to compression. However, known mattresses do not adapt in an optimum manner to the anatomical forms of the user, and do not give good support to the backbone, in any position whatsoever of the user on the mattress.

**[0003]** In fact, the mattress is often too rigid, so that it is impossible to maintain the correct S-shaped position of the backbone, or it is too soft, and the back is bent in a V shape, with consequent difficulty of movement and total lack of relaxation. Moreover, these known mattresses do not create the greatest supporting surface possible between the body and the mattress, and cause harmful compressions to the body, excessive pressures on the different zones of the body, and stimulate the impulse to turn, which also causes the user to wake up from sleep.

**[0004]** Therefore, known mattresses do not prevent or reduce the impulse to turn, nor support the body in an optimum manner, or support it effectively only in certain positions.

**[0005]** One purpose of the present invention is to achieve a mattress that has a structure that adapts in any position to the body of the sleeper and the local variations in pressure, maximizing the contact surface between the user's body and the mattress, and correctly supporting the backbone; it also postpones the impulse to turn over during sleep and, in any case, supports the sleeper's body in any position whatsoever to which he turns and puts himself during sleep.

**[0006]** The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

### SUMMARY OF THE INVENTION

**[0007]** The present invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

**[0008]** In accordance with the above purpose, a mattress comprises a portion or block that develops in a main longitudinal direction that advantageously coincides with the direction assumed during the user's sleep, supine or on the side.

**[0009]** The block has two opposite bigger surfaces and comprises a plurality of transverse sectors, with different structure and degree of compression.

**[0010]** The sectors have different degrees of resistance to compression or flexion, in order to adapt to corresponding zones of the user's body.

**[0011]** According to a characteristic feature of the present invention, at least one sector of the block, called the lumbar sector, has at least a convex part, extending towards the outside, so as to be advantageously complementary to the lumbar zone of the user and able to come into contact with the lumbar zone of the user's body.

**[0012]** According to a characteristic feature of the present invention, the convex part has a high degree of resistance to compression.

**[0013]** The convex part completely fills the lumbar cavity, allowing a comfortable ergonomic position and correctly supporting the backbone.

**[0014]** Moreover, at least the other sectors of the block adjacent to the lumbar sector having the convex part have a resistance to compression lower than that of the convex part, that is, a greater degree of yielding, thus allowing the user's shoulders and pelvis to sink correctly into the mattress.

**[0015]** Thanks to the three-dimensional effect shown, the backbone keeps its natural shape during sleep. Advantageously, the present invention is effective for people who practice sport, since the particular shape with sectors allows a natural and delicate stretching during rest.

**[0016]** Advantageously, by means of the present invention, the contact surface between the mattress and the sleeper's body is also maximized, reducing the pressure on the body and hence postponing the impulse to turn over during sleep.

**[0017]** In fact, the mattress according to the present invention is advantageously made for persons suffering from back pains caused by compression and overweight; indeed, it supports the backbone in a soft yet decisive manner, and supports the natural movements of the body without compressing the joints and the intervertebral disks. In this way we have a lightening of the pressure exerted on the nerve ends and the blood vessels, creating the preconditions for a regenerating and relaxed sleep.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0018]** These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of a part of an ergonomic mattress;
- fig. 2 is a partly sectioned perspective view of an ergonomic mattress;

- fig. 3 is a schematic perspective view of the functioning of the ergonomic mattress in fig. 2;
- fig. 4 is a detailed view of fig. 3; and
- fig. 5 is a schematic view of the functioning of the ergonomic mattress in fig. 2.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

**[0019]** According to the present invention, in fig. 1 the reference number 10 denotes generally a mattress, comprising an inner part or block 60, having transverse sectors 11, 12, 13, 14, 15, 16, 17 with different degrees of resistance to compression.

**[0020]** The block 60 has a first lying surface 51 and a second lying surface 52, opposite and parallel to the first, both defining a resting plane r (fig. 3). The surfaces 51, 52 are able to accommodate the sleeper's body 18, selectively, for example according to the season and/or ambient temperature, defining a so-called "winter side" 53 or a "summer side" 54, depending on the material with which the cover and padding 49 are made.

**[0021]** The block 60 has a front edge 57 and a rear edge 58, advantageously parallel to each other, between which the lying surfaces 51, 52 are comprised. A central body 59, able to support the human body 18, is comprised between the front edge 57 and the rear edge 58, in a longitudinal direction s of the main development of the block 60.

**[0022]** According to one embodiment of the present invention, the sectors 11, 12, 13, 14, 15, 16, 17 develop transversely, advantageously perpendicularly, to the longitudinal direction s of the mattress 10 (figs. 1 and 3). Advantageously the sectors 11-17 are made on the central body 59 and are parallel at least to the front edge 57.

**[0023]** According to one embodiment of the present invention, the block 60 has the sectors 11-17 on the first lying surface 51 and on the second lying surface 52, so that they are symmetrical and usable without distinction on the two sides, maintaining the desired ergonomic characteristics (fig. 3).

**[0024]** In this case, the block 60 is divided transversely into a foot sector 11, a following and adjacent tibia sector 12, a following femoral sector 13, a pelvic sector 14, a lumbar sector 15, a shoulder sector 16 and a head sector 17, disposed in the order in which they were introduced (figs. 3 and 5). In fact, said sectors 11, 12, 13, 14, 15, 16, 17 are advantageously made in correspondence with pre-defined zones of the user's body 18, that is to say, respectively and in succession, a zone for the feet 21, a tibia zone 22, a femoral zone 23, a lumbar region 24, a pelvic zone 25, a shoulder zone 26 and a head zone 27 (fig. 3).

**[0025]** Since the mattress 10 is advantageously made symmetrical, the sectors 13, 15 perform the same function, as do the sectors 12, 16 and the sectors 11, 17, according to the direction in which the user lies down.

**[0026]** Therefore, the following description will illustrate the characteristics of the pelvic sector 14 and the sectors 15, 16, 17, taking into account that the same considerations apply to the symmetrical sectors 11, 12, 13 (fig. 1).

**[0027]** According to the present invention, the lumbar sector 15 (figs. 1 and 2) is able to cooperate with a lumber region 24 of the user (fig. 3).

**[0028]** According to a characteristic feature of the present invention, the block 60 has at least a convex part or rounded region 28, 31, able to advantageously cooperate with the lumbar region 24 of the user's body.

**[0029]** Advantageously, the convex part 28, 31 extends in height with respect to the resting plane r from at least one of the surfaces 51, 52.

**[0030]** According to a characteristic feature of the present invention, the convex part 28, 31 has the maximum resistance to compression of the block, denominated in this case maximum resistance RM. The desired degree of resistance to compression of the convex part 28, 31 can be obtained, for example, by means of a suitable choice of the material and the density of the material.

**[0031]** Advantageously, to obtain a desired value of resistance to compression, first notches, or transverse channels 30 are also made, of various depth, for example but not only comprised between 2 and 3 cm.

**[0032]** According to the present invention, the convex part 28, 31 is made in a position at a pre-defined distance from the front and rear edges 57, 58, advantageously in correspondence with the expected lumbar region 24 of the user's body. To this end, the convex part 28 is comprised in the lumbar sector 15 of the block 60. Since the mattress 10 is advantageously made symmetrically, the convex part 31 is comprised in the femoral sector 13 of the block 60.

**[0033]** According to the present invention, the convex part 28, and hence the lumbar sector 15, is adjacent at its sides to at least a sector 14, 15 of the mattress with different degrees of resistance to compression, preferably a degree of compression lower than that of the convex part 28. Similarly, the convex part 31 and hence the femoral sector 13 is adjacent at its sides to at least a sector 12, 14 of the mattress with a different degree of resistance to compression, preferably a degree of compression lower than that of the convex part 31. In fact, the convex parts 28, 31 and hence the sectors 13, 15 have the maximum degree of resistance to compression with respect to the other sectors of the block 60.

**[0034]** Advantageously the convex parts 28, 31 are comprised respectively between the sectors 12 and 14 and 14 and 16. In fact, it is clear that, since the mattress 10 is symmetrical, the user can lie on it and rest his shoulders, without distinction, on sector 12 or 16.

**[0035]** The sectors 12, 14 and 16 have a resistance to compression lower than the convex part 28, 31; advantageously, the difference in resistance to compression is obtained by varying the geometric shape of the sectors 12, 14 and 16 with respect to the convex part 28, 31, for example making them substantially plane, or by making

fissures 35, notches 33 and outlet holes 37, 48, or again by varying the material and/or density with which the sectors 12, 14 and 16 are made, or a combination of these strategies.

**[0036]** Therefore, when the user lies on the mattress 10 according to the present invention, as shown in this case in fig. 3, the convex part 28 cooperates with his lumbar region 24, supporting it, while the sectors 14 and 16 allow the respective zones of the body to sink into the mattress 10, allowing the correct posture during sleep (fig. 5). Moreover, the convex part 28, due to the effect of its elasticity, when it is compressed by the body of the user, applies a reaction force upwardly (arrow F in fig. 3), i.e. towards the lumbar region 24 of the same user.

**[0037]** According to an advantageous embodiment of the invention, at least one of said lying surfaces 51, 52 comprises the aforesaid two convex parts 28, 31, that is, a first convex part 28 and a second convex part 31, distanced from each other and positioned in determinate zones, equidistant respectively from said front edge 57 and said rear edge 58.

**[0038]** The block 60, seen laterally, substantially defines an overall curvilinear development or profile 50, with at least a concave part facing towards the inside of the block 60 (figs. 3 and 5).

**[0039]** The lumber sector 15 has a first solid region 29, internal, with a thickness suitable to define an appropriate degree of rigidity and resistance to compression and from which the first convex part 28 extends, advantageously on both lying surfaces 51, 52. According to the present invention, a plurality of first notches 30 pass through the first convex part 28, and extend along the whole width of the block 60, perpendicularly to the longitudinal direction s and in depth, towards the inside of the block 60.

**[0040]** Similarly, the femoral sector 13 is identical to the lumber sector 15, for an inverse use of the mattress 10, and is equipped with a second convex part 31, on both lying surfaces 51, 52, identical to the first convex part 18. The second convex part 31 is also equipped with a second solid region 32, provided with second transverse notches 33, along the width of the block 60.

**[0041]** Between the femoral sector 12 and the lumbar sector 15, therefore centrally to the block 60, the pelvic sector 14 is made, equipped with a central region 47 from which a plurality of protuberances 46 extend, on both lying surfaces 51, 52. Advantageously the protuberances 46 are convex and rounded and separated by central notches 55, advantageously of a depth comprised between 4 and 6 cm, which define an undulating profile 56. The protuberances 46 have an extension in height less than that of the first convex part 28, so that the latter adequately matches the backbone 19 of the user's body 18 when he is lying down (figs. 3, 4 and 5). The central region 47 is also provided with central outlet holes 48, for example of a diameter comprised between 1 and 3 cm and which extend transversely, advantageously in a through manner, through the whole width of the block 60, in order to confer to the pelvic sector 14 a rigidity such as to allow the correct support and simultaneously a suitable yielding of the pelvic sector 14, for the desired "sinking" of the corresponding pelvic zone 14; the energy freed by this sinking is effectively employed to support, by means of the lumbar sector 15, the lumbar vertebrae 20 themselves.

**[0042]** According to one embodiment of the present invention, the shoulder sector 16 and the tibia sector 12 are made respectively at the outer sides of the lumbar 15 and femoral sector 13.

**[0043]** The shoulder sector 16 and the tibia sector 12 are substantially identical and are equipped with respective first and second corrugations or transverse waves 34, 38, of a height equal to or less than the protuberances 46, and in greater number, which extend from respective first and second inner regions 36, 40.

**[0044]** The corrugations 34, 38 are separated in alternating manner by first and second outlet fissures 35, 39, similar to the transverse notches 30, 33 and the central notches 55, although in greater number with respect thereto, while the first and second inner regions 36, 40 are equipped with first and second outlet holes 37, 41, transverse to the block 60, advantageously with a section greater than the central outlet holes 48. The outlet holes 37, 41 and the fissures 35, 39 allow a greater flexion and lesser resistance to compression of the block 60 in the sectors 11, 16 concerned, and therefore, advantageously, a greater sinking of the body 18 into the block 60.

**[0045]** In fact, the choice of the number and size of the outlet holes 37, 41 allows to make the desired variation in section resistant and yielding along the thickness of the block 60, variable in turn along the longitudinal direction s, so as to adapt the block 60 ergonomically both to the supine position (fig. 5) and also to the lateral position.

**[0046]** According to another advantageous embodiment of the present invention, the foot sector 11 and head sector 17 are made at the ends of the block 60, each having a first and second inner rigid portion, 43, 45, of solid section, from which first and second fold-type profiles 42, 44 extend, or waves transverse to the longitudinal direction s, and of limited height, and less than the extension in height of the first convex part 28, and hence able to support the feet and head of the body 18 of the sleeper.

**[0047]** According to the present invention, the corrugations 34, 38, the fold-type profiles 42, 44 and the rounded protuberances 46 define crests which extend from the mattress 10, while the notches 30, 33, 55 and the fissures 35, 39 define depressions which extend towards the inside of the mattress 10.

**[0048]** Therefore, the overall profile 50 is substantially curvilinear and, more or less regularly, with an undulating or sinuous development, following the development of the backbone 19 in the longitudinal direction s, and has, in alternate succession, ridges or crests 34, 38, 42, 44, 46, and recesses or depressions 30, 33, 35, 39, 55, also including the convex part 28 which extends from the lying surface 51, 52 to cooperate with the lumbar zone 24 of

the body 18.

**[0049]** Applicant has carefully studied the optimum values of degree of resistance to compression for the sectors of the block 60 and therefore of the mattress 10.

**[0050]** By degree of resistance to compression or flexion, we mean the elastic capacity or property of the mattress and of the sectors of the mattress to react, yielding, or deforming to a greater or lesser extent, under the influence of the weight of the body resting on the mattress. The characteristic lines of elasticity are determined according to DIN 53576, while the rigidity test of the mattress is carried out according to DIN 53577. To be more exact, the following are evaluated:

- the elasticity of the springs, evaluated according to DIN 53576 by means of flat and circular punches, which describes the behavior of the mattress when it has to adapt to bigger and bigger supporting surfaces, and has to support them;
- the flexion elasticity, analyzed by means of arched punches, which concerns the capacity of the mattress to adapt to the profile of every backbone and the profile of the base, exerting a bodily support, starting from the base, to personalized support zones; and
- the point-by-point elasticity, evaluated by means of particular punches simulating the human heel, which describes the capacity of the mattress to adapt to small surfaces, reacting elastically only in the zone affected by pressure.

**[0051]** The technical-physical evaluations of elasticity are integrated with evaluations of combined elastic properties, in order to evaluate the behavior of the mattress with the resting of the shoulder zone and the support of the remaining zones of the body and the respective sinking into the mattress, also as the user's constitution varies.

**[0052]** According to an advantageous embodiment of the present invention, given the value of maximum resistance RM equal to the resistance to compression of the convex part 28, and hence of the lumbar sector 15, the resistance to compression of the pelvic sector 14 is optimum when it is comprised between about 90 and 95% of the RM value. The preferred value of resistance to compression of the shoulder sector 16 is comprised between 85 and 90% of the RM value, while the resistance to compression of the head sector 17 is about 95% of the RM value.

**[0053]** By means of the present invention, and the division of the degree of resistance to compression in the transverse sectors shown above, an optimum support is obtained of the body 18 on the block 60 and hence on the mattress 10, with limited and smaller compressions of the backbone 19, by means of a division in the sectors described having, as we said, each a suitable degree of flexibility and compression; Applicant has carried out experimental studies in which, for example, for a person 1.70 m tall and weighing 58 kg, the pressure of the lumbar sector 15 is about 13 mmHg, the pressure of the pelvic sector 14 is about 18 mmHg and the pressure of the shoulder sector is about 15 mmHg. Therefore, the critical zones all have an optimized degree of resistance to compression, less on the backbone 19, preventing the creation of muscular tension and the impulse to turn over. Advantageously, the pressure of the head sector 17 is about 7 mmHg, and also the femoral sector 13, while the foot sector 11 causes a compression of about 6 mmHg, and in the tibia sector the compression is about 12 mmHg. Advantageously, by disposing the sectors and their structure as described, there is an optimum support of the body 18, indicated by the greater compression on the shoulder zone 26 and the lumbo-sacral zone 25, which sink into the block 60, discharging the tension of the limbs and the backbone 19.

**[0054]** According to the present invention, Applicant has also developed an optimum size for the sectors of the block 60, based on the study of the average sizes of the backbone of an adult, equal to about 60 cm. To be more exact, the head sector 17 is advantageously about 30 cm, the shoulder sector 16 is about 30 cm long, the lumbar sector 13 is about 20 cm, while the pelvic sector 14 is about 40 cm. The other possible sectors 11, 12, 13 are symmetrical.

**[0055]** It is clear that modifications and/or additions of parts may be made to the mattress 10 as described heretofore, without departing from the scope of the present invention.

**[0056]** In fact, the block 60 can be made as a block or single piece, in an elastic material, like natural sponge, with a plurality of micro-pores or cells for the passage of air and humidity, and consisting of a mix of polymeric materials treated, during production, with water, of the AQUATECH® type or suchlike.

**[0057]** Alternatively, the block 60 can be made in portions that can be assembled with different materials, according to the degree of resistance to compression desired. The block 60 is advantageously subjected to mangling, in order to further dilate the cells, making them more permeable to air, softer and at the same time more elastic and ergonomic. By means of this material, advantageously recyclable, without substances noxious for the environment and the ozone, and anti-allergic, a block 60 is obtained which maintains over time the required shape and comfort.

**[0058]** The block 60 is wrapped with a padding, for example made of cotton flakes, a quilt and a cover, in order to make the mattress. The lying surfaces 51, 52 are advantageously associated with different paddings and can thus be used according to the different season and/or ambient temperature, defining a winter side and a summer side. The block 60 is made in the shape of a rectangular parallelepiped, so as to be usable for generic mattresses; alternatively, the overall shape of the mattress 10 can be of the most disparate, in order to adapt to contingent environmental spaces and needs. Accord-

ing to a variant, the block 60 can itself be used as a mattress, for example in the field of camping equipment.

**[0059]** It is also clear that a person of skill in the art shall certainly be able to achieve other forms of mattress, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

## Claims

1. Mattress to support a human body (18), said mattress comprising a portion (60) having two lying surfaces (51, 52) substantially parallel to each other, wherein each of said lying surfaces (51, 52) is comprised between a front edge (57) and a rear edge (58) and defines a resting plane (r), on which said human body (18) is selectively able to rest, **characterized in that** at least one of said lying surfaces (51, 52) comprises two convex parts (28, 31) distanced from each other and positioned in determinate zones substantially equidistant from said front edge (57) and said rear edge (58), and **in that** each of said convex parts (28, 31) has a rounded surface which extends in height with respect to said resting plane (r).

2. Mattress as in claim 1, **characterized in that** it comprises one or more sectors (11, 12, 14, 16, 17) with different degrees of resistance to compression with respect to said convex parts (28, 31).

3. Mattress as in claim 2, **characterized in that** said convex parts (28, 31) has a maximum degree of resistance to compression at least with respect to said sectors adjacent thereto (12, 14, 16).

4. Mattress as in claim 5, wherein said two lying surfaces (51, 52) comprise a first lying surface (51) and a second lying surface (52), **characterized in that** each of said first and second lying surfaces (51, 52) comprises two convex parts (28, 31), in such a manner that two first of said convex parts (28, 31) are disposed on said first lying surface (51) symmetrically with respect to two seconds of said convex parts (28, 31) disposed on said second lying surface (52).

5. Mattress as in claim 1, wherein a central body (59) is disposed between said front edge (57) and said rear edge (58) in a longitudinal direction (s), **characterized in that** it further comprises a plurality of sectors (11, 12, 13, 14, 15, 16, 17), substantially perpendicular to said longitudinal direction (s) and having, along said central body (59), different degrees of resistance to compression in order to adapt to the different parts of said human body (18) which during use rest on said sectors (11, 12, 13, 14, 15, 16, 17).

6. Mattress as in claim 5, **characterized in that** said sectors (11, 12, 13, 14, 15, 16, 17) are made from a single substantially elastic block of material and **in that** said different resistance to compression is obtained by means of at least the presence of a plurality of notches (30, 33, 55) on at least one of said lying surfaces (51, 52) and/or outlet holes (37, 41, 48) and/or fissures (35, 39) made in said block of elastic material.

7. Mattress as in any claim hereinbefore, **characterized in that** said lying surfaces (51, 52) have an overall profile (50) with a substantially curvilinear development, said overall profile (50) including, in alternate succession, a plurality of depressions (30, 33, 35, 39, 55) and crests (34, 38, 42, 44, 46).

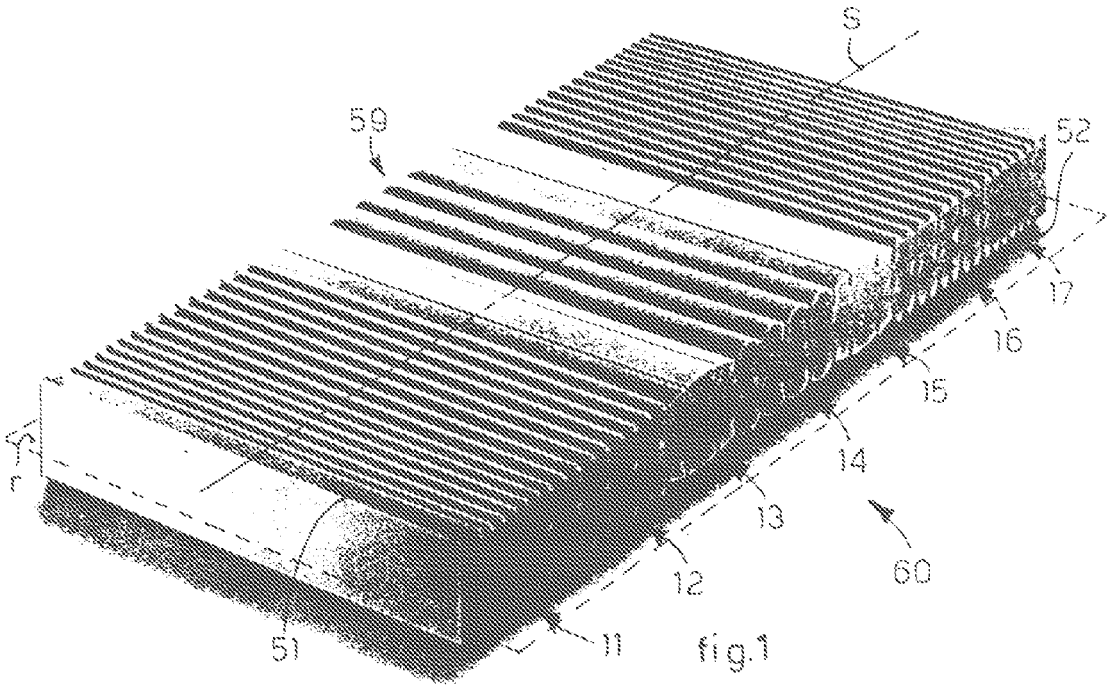


fig.1

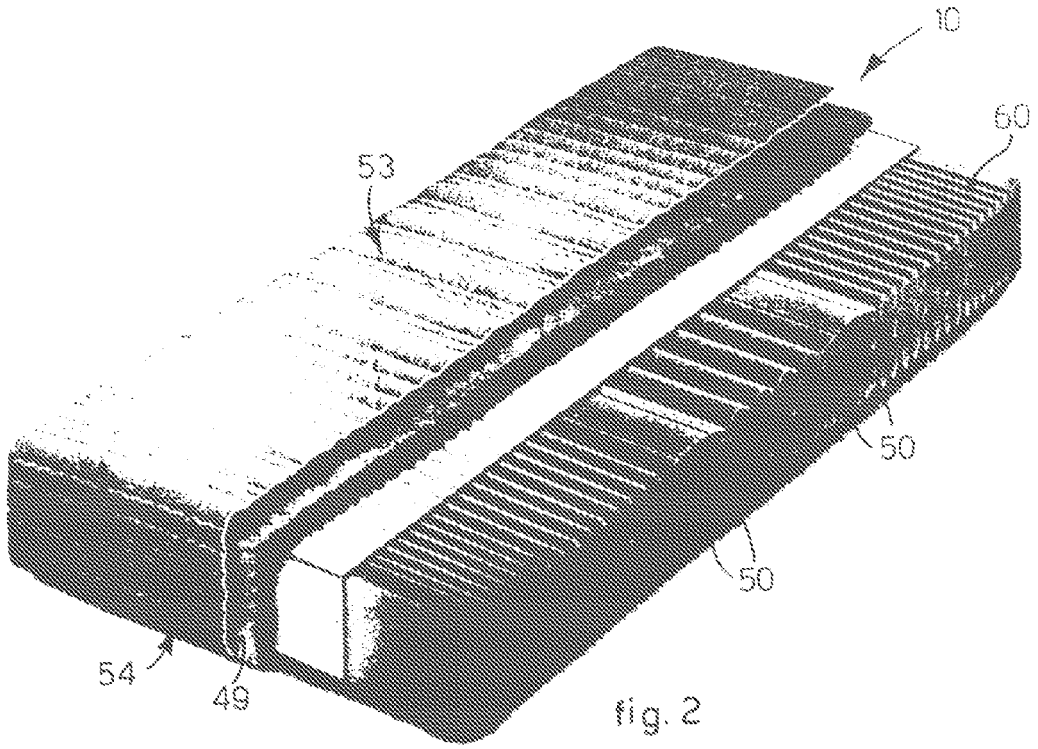


fig. 2

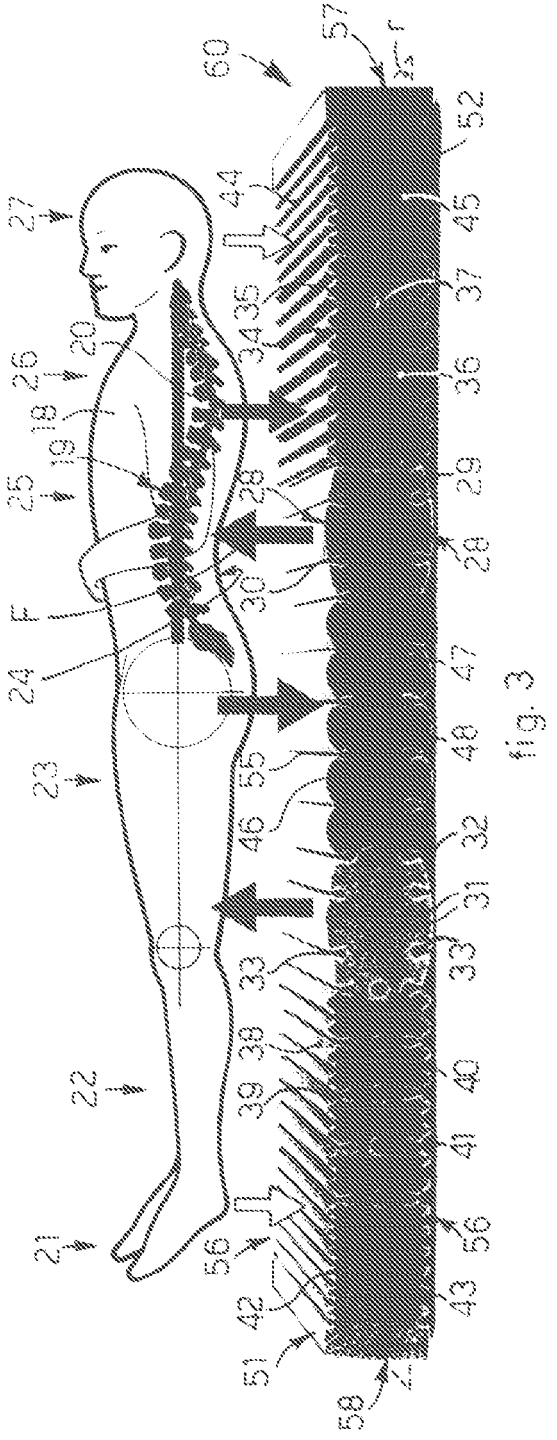


fig. 3

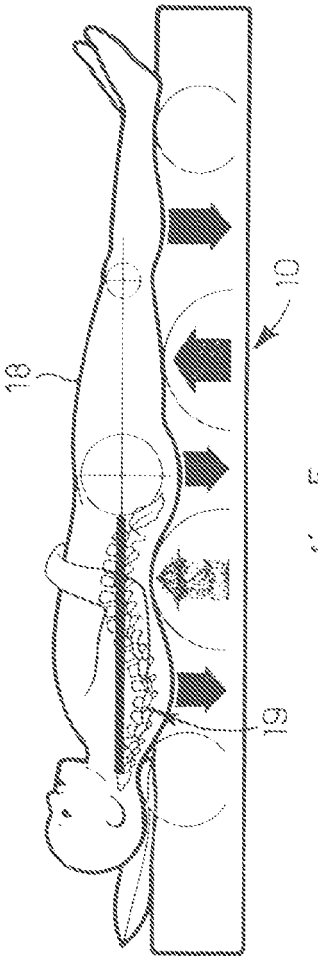


fig. 5

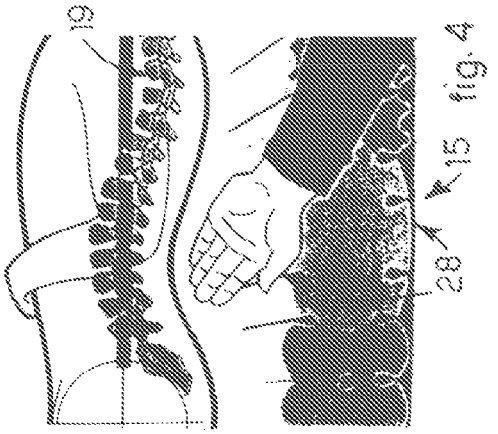


fig. 4