

DESCRIPTION

Title of Invention

CUSHION BODY

5 Technical Field

[0001] The present disclosure relates to a cushion body.

Priority is claimed on Japanese Patent Application No. 2021-133944, filed on August 19, 2021, the entire content of which is incorporated herein by reference.

10 Background Art

[0002] In the related art, various cushion bodies have been known. Japanese Unexamined Patent Publication No. 2002-306285 describes a cushion body in which a front surface-side elastic foam body and a back surface-side elastic foam body are integrated. The cushion body has an uneven shape having projections formed on a front side, and a planar shape formed on a back surface side.

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[0003] The front surface-side elastic foam body includes a plurality of first plate-shaped bodies facing a front side. The back surface-side elastic foam body includes a plurality of second plate-shaped bodies facing a back side. The first plate-shaped body includes three rows of the protrusions aligned along a lateral direction of the cushion body in a plan view. A gap extending in an up-down direction of the cushion body in a plan view is formed between two first plate-shaped bodies aligned along the lateral direction of the cushion body in a plan view. An innermost portion of the gap formed in the front side elastic foam body is a conduit portion with a diameter larger than a width of the gap.

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[0004] A plurality of the second plate-shaped bodies are aligned along the up-down direction of the cushion body in a plan view. A gap extending along the lateral direction of the cushion body in a plan view is formed between two second plate-shaped bodies aligned along the up-down direction of the cushion body in a plan view. Similarly to described above, an innermost portion of the gap formed in the back side elastic foam body is a conduit portion with a diameter larger than a width of the gap.

[0005] The cushion body includes a plurality of the gaps extending in the up-down direction of the cushion body in a plan view on the front side, and a plurality of the gaps extending in the lateral direction of the cushion body in a plan view on the back side. The gaps on the front side and the gaps on the back side intersect each other. In such a manner, by providing the gaps intersecting each other on the front side and the back side, an improvement in air permeability and an improvement in cushioning are achieved.

Citation List

Patent Literature

[0006] Patent Literature 1: Japanese Unexamined Patent Publication No. 2002-306285

Summary of Invention

Technical Problem

[0007] The cushion body described above includes the plurality of gaps extending in the up-down direction of the cushion body in a plan view on the front side, and the plurality of gaps extending in the lateral direction of the cushion body in a plan view on the back side. However, since the

front side of the cushion body is a portion on which the body of a user or the like is placed, body pressure dispersion can be further required.

[0008] It is known that body pressure applied to the cushion body in a supine posture and body pressure applied to the cushion body in a lateral recumbent posture are different from each other. However, in the cushion body described above, only the plurality of gaps extending in the up-down direction in a plan view are formed on the front side. Therefore, there is room for improvement in body pressure dispersion and ease of turning in bed in coping with both a supine posture and a lateral recumbent posture. Therefore, the development of a cushion body which is more versatile such that the cushion body can be adapted to more users while improving body pressure dispersion and ease of turning in bed is required.

[0009] An object of the present disclosure is to provide a cushion body that is high in body pressure dispersion, ease of turning in bed, and versatility.

Solution to Problem

[0010] (1) A cushion body according to one aspect of the present disclosure includes long sides extending along a first direction; short sides extending along a second direction intersecting the first direction; a front surface facing vertically upward; and a back surface facing vertically downward. The cushion body includes a plurality of protrusions arranged in a grid pattern on the front surface to be aligned along each of the first direction and the second direction; first front side slits, each extending in the first direction between two protrusions aligned along the second direction; and second front side slits, each extending in

the second direction between two protrusions aligned along the first direction. The cushion body includes a plurality of protrusion groups, each being made up of a plurality of the protrusions surrounded by two first front side slits aligned along the second direction and two second front side slits aligned along the first direction. A depth of the second front side slits is less than or equal to a depth of the first front side slits.

[0011] The cushion body includes the plurality of protrusions arranged in a grid pattern on the front surface to be aligned along each of the first direction and the second direction. A plurality of the first front side slits extending in the first direction and a plurality of the second front side slits extending in the second direction are formed on the front surface. The protrusion group made up of the plurality of protrusions is provided in a region surrounded by two first front side slits aligned along the second direction and two second front side slits aligned along the first direction.

The cushion body includes the plurality of protrusion groups, each being made up of the plurality of protrusions. Since each protrusion group is provided in a region surrounded by the first front side slits and the second front side slits, when the body of a user is placed on the front surface, the cushion body can be deformed for each protrusion group instead of in its entirety. Namely, only the protrusion groups of the cushion body to which body pressure is applied can be deformed. The cushion body can be deformed along the body of the user, and the contact area of the body with the cushion body can be increased, so that body pressure dispersion can be improved. The depth of the second front side slits is less than or equal to the depth of the first front side slits. Since the depth of the second front side slits extending in the second direction is less than or

equal to the depth of the first front side slits extending in the first direction,
body pressure dispersion and ease of turning in bed for both a supine
posture and a lateral recumbent posture can be improved. As a result,
versatility can be improved such that the cushion body can be adapted to
5 more users.

[0012] (2) In (1) described above, the cushion body may further include
a lower layer constituting the back surface, and the lower layer may be
made of a harder material than layers other than the lower layer. In this
case, the lower layer can more firmly support the body of the user, and
10 high pressure from the shoulder of the user in a lateral recumbent posture
can be dispersed by the lower layer. Therefore, the sleeping posture of
the user can be maintained by the lower layer, and sleeping comfort in a
lateral recumbent posture can be further improved.

[0013] (3) In (2) described above, the lower layer may be made of a
15 lighter material than the layers other than the lower layer. In this case,
since the lower layer is made of a harder and lighter material than the
other layers, the weight of the entirety of the cushion body can be reduced.

[0014] (4) In any one of (1) to (3) described above, the cushion body may
further include an upper layer including a top portion of the protrusion,
20 and the upper layer may be made of a material with higher elasticity than
layers other than the upper layer. In this case, since the upper layer is
made of a high-elasticity material, a sense of touch when the user touches
the front surface of the cushion body can be further improved.

[0015] (5) In any one of (1) to (4) described above, at least one of the
25 number of the protrusions aligned along the first direction in the
protrusion group and the number of the protrusions aligned along the

second direction in the protrusion group may be 3 or more. In this case, three or more protrusions aligned in the first direction and three or more protrusions aligned in the second direction can be depressed at once by body pressure.

5 **Advantageous Effects of Invention**

[0016] According to the present disclosure, it is possible to provide the cushioning material that is high in body pressure dispersion, ease of turning in bed, and versatility.

Brief Description of Drawings

10 [0017] FIG. 1 is a perspective view showing a cushion body according to an embodiment.

FIG. 2 is a partial enlarged perspective view of the cushion body in FIG. 1.

15 FIG. 3 is a plan view schematically showing a front surface of the cushion body in FIG. 1.

FIG. 4 is a bottom view schematically showing a back surface of the cushion body in FIG. 1.

FIG. 5 is a side view showing a layer structure of the cushion body in FIG. 1 when viewed in a second direction.

20 FIG. 6 is a side view showing a layer structure of the cushion body in FIG. 1 when viewed in a first direction.

25 Part (a) of FIG. 7 is a view showing actual measurement data of body pressure when a user is in a supine posture on a cushion body according to a comparative example. Part (b) of FIG. 7 is a view showing actual measurement data of body pressure when a user is in a supine posture on a cushion body according to an example.

Part (a) of FIG. 8 is a view showing actual measurement data of body pressure when a user is in a lateral recumbent posture on the cushion body according to the comparative example. Part (b) of FIG. 8 is a view showing actual measurement data of body pressure when a user is in a lateral recumbent posture on the cushion body according to the example.

Part (a) of FIG. 9 is a view showing actual measurement data of the shape of a body placed on the cushion body according to the comparative example. Part (b) of FIG. 9 is a view showing actual measurement data of the shape of a body placed on the cushion body according to the example.

FIG. 10 is a graph showing the results of experiments performed to verify sinking into cushion bodies according to examples and a comparative example.

Parts (a), (b) and (c) of FIG 11 are graphs showing results when a sphere rolling test is performed on the cushion bodies according to the examples and the comparative example.

Description of Embodiments

[0018] Hereinafter, an embodiment of a cushion body according to the present disclosure will be described with reference to the drawings. In the description of the drawings, the same or corresponding elements are denoted by the same reference signs, and duplicate descriptions will be omitted as appropriate. For ease of understanding, the drawings may be depicted in a partially simplified or exaggerated manner, and dimensional ratios and the like are not limited to those shown in the drawings.

[0019] FIG. 1 is a perspective view showing a cushion body 1 according to the present embodiment. As shown in FIG. 1, the cushion body 1 has

a rectangular shape having a plurality of long sides 1b extending in a first direction D1 and a plurality of short sides 1c extending in a second direction D2 intersecting the first direction D1. The cushion body 1 has a thickness in a third direction D3 intersecting both the first direction D1 and the second direction D2.

[0020] The first direction D1 corresponds to a longitudinal direction of the cushion body 1, and the second direction D2 corresponds to a width direction of the cushion body 1. The third direction D3 corresponds to a height direction (thickness direction) of the cushion body 1. For example, the first direction D1, the second direction D2, and the third direction D3 are orthogonal to each other. As one example, the cushion body 1 is a core material of a mattress. For example, the cushion body 1 is used with the cushion body 1 housed in a cover for preventing dirt.

[0021] The cushion body 1 is used, for example, as a seat against which the back of a user rests. The cushion body 1 is used as a cushion or a bedding against which the body of a user rests, and is used to improve cushioning and thus to improve seating comfort or sleeping comfort. The cushion body 1 is, as a whole, made of a highly flexible material.

[0022] Therefore, when the body of a user is placed on the cushion body 1, the cushion body 1 deforms according to the load of the body. As one example, the cushion body 1 is made of urethane foam. The cushion body 1 has a front surface 2 facing vertically upward, and a back surface 3 facing vertically downward.

[0023] The cushion body 1 includes a plurality of protrusions 4 formed on the front surface 2. The plurality of protrusions 4 are formed to be aligned along the first direction D1 and to be aligned along the second

direction D2. The plurality of protrusions 4 are arranged in a grid pattern on the front surface 2. When viewed in the third direction D3 (in a plan view), for example, each protrusion 4 has a square shape.

[0024] A length of one side of the protrusion 4 when viewed in the third direction D3 is, for example, 2 cm or more and 5 cm or less (as one example, 3.0 cm or more and 3.5 cm or less). A portion between a pair of the protrusions 4 is a recess 9 that is depressed relative to the pair of protrusions 4. The cushion body 1 includes a plurality of the recesses 9, and the plurality of recesses 9 are arranged in a grid pattern on the front surface 2.

[0025] FIG. 2 is an enlarged perspective view of a corner of the cushion body 1. As shown in FIGS. 1 and 2, the cushion body 1 has a first side surface 5 located at an end portion in the first direction D1, and a second side surface 6 located at an end portion in the second direction D2. The cushion body 1 has a pair of the first side surfaces 5 and a pair of the second side surfaces 6. The first side surfaces 5 extend in both the second direction D2 and the third direction D3, and the second side surfaces 6 extend in both the first direction D1 and the third direction D3.

[0026] The cushion body 1 includes a first recess 7 formed on each first side surface 5, and a second recess 8 formed on each second side surface 6. The first recess 7 is depressed toward the inside of the cushion body 1 (in a plan view, a center side of the cushion body 1) on the first side surface 5, and the second recess 8 is depressed toward the inside of the cushion body 1 on the second side surface 6. For example, each of the first recess 7 and the second recess 8 has a curved surface.

[0027] A thickness T of the cushion body 1 (length in the third direction

D3) is, for example, 4 cm or more and 14 cm or less. In this case, the cushion body 1 exhibits more suitable cushioning. However, the thickness T may be 5 cm or more, 7 cm or more, or 9 cm or more and 13 cm or less, 12 cm or less, or 10 cm or less. The thickness T may be set to a value other than the above values, and is not particularly limited.

[0028] FIG. 3 is a plan view of the cushion body 1, which shows the front surface 2. FIG. 3 schematically shows the protrusions 4. As shown in FIGS. 2 and 3, the cushion body 1 includes a first front side slit 11 and a second front side slit 12. The first front side slit 11 extends in the first direction D1 between two protrusions 4 aligned along the second direction D2. The second front side slit 12 extends in the second direction D2 between two protrusions 4 aligned along the first direction D1.

[0029] The cushion body 1 includes a plurality of the first front side slits 11 and a plurality of the second front side slits 12. The cushion body 1 includes a plurality of protrusion groups G. Each protrusion group G is made up of a plurality of the protrusions 4 surrounded by two first front side slits 11 aligned along the second direction D2 and two second front side slits 12 aligned along the first direction D1. In the protrusion group G, the protrusions 4 and the recesses 9 are arranged in a grid pattern.

[0030] The plurality of protrusion groups G are arranged in a grid pattern on the front surface 2. The plurality of protrusion groups G are arranged to be aligned along the first direction D1 and to be aligned along the second direction D2. At least one of the number of the protrusions 4 aligned along the first direction D1 in each protrusion group G and the number of the protrusions 4 aligned along the second direction D2 in each

protrusion group G is 3 or more.

[0031] FIG. 3 shows an example in which the number of the protrusions 4 aligned along the first direction D1 in each protrusion group G and the number of the protrusions 4 aligned along the second direction D2 in each protrusion group G are 3. In this case, $3 \times 3 (= 9)$ protrusions 4 are arranged in each protrusion group G. However, the number of the protrusions 4 in each protrusion group G is not limited to the above example, and for example, $3 \times 2 (= 6)$, $4 \times 3 (= 12)$, or $4 \times 4 (= 16)$ protrusions 4 may be arranged in each protrusion group G.

[0032] Each protrusion group G is provided inside a rectangular region defined by two first front side slits 11 extending in the first direction D1 and two second front side slits 12 extending in the second direction D2. Therefore, the cushion body 1 can be deformed for each protrusion group G according to the body pressure of a user placed on the front surface 2. Therefore, the contact area of the body of the user with the cushion body 1 is increased, so that body pressure dispersion of the body can be improved.

[0033] FIG. 4 is a bottom view of the cushion body 1, which shows the back surface 3. As shown in FIGS. 2 and 4, the cushion body 1 includes a back side slit 13. For example, the cushion body 1 includes a plurality of the back side slits 13. The back side slits 13 extend along the second direction D2. The plurality of back side slits 13 are disposed to be aligned along the first direction D1.

[0034] FIG. 5 is a side view of the cushion body 1 when viewed in the second direction D2 (the width direction of the cushion body 1, a lateral direction of the cushion body 1 in a plan view). FIG. 6 is a side view of

the cushion body 1 when viewed in the first direction D1 (the longitudinal direction of the cushion body 1, an up-down direction of the cushion body 1 in a plan view). As shown in FIGS. 5 and 6, the cushion body 1 includes an upper layer 21, a first intermediate layer 22, a second intermediate layer 23, and a lower layer 24. The upper layer 21 includes a top portion 4b of the protrusion 4. The first intermediate layer 22 is located below the upper layer 21. The second intermediate layer 23 is located below the first intermediate layer 22. The lower layer 24 constitutes the back surface 3.

[0035] The cushion body 1 has a four-layer structure including the upper layer 21, the first intermediate layer 22, the second intermediate layer 23, and the lower layer 24. For example, the material of the upper layer 21 is different from the materials of the layers (the first intermediate layer 22, the second intermediate layer 23, and the lower layer 24) other than the upper layer 21. The material of the lower layer 24 is different from the materials of the layers (the upper layer 21, the first intermediate layer 22, and the second intermediate layer 23) other than the lower layer 24. The material of the first intermediate layer 22 may be the same as or different from the material of the second intermediate layer 23. The first intermediate layer 22 and the second intermediate layer 23 are made of, for example, foamed urethane (urethane foam).

[0036] The upper layer 21 is a layer including the top portion 4b of the protrusion 4. For example, the shape of the upper layer 21 when viewed along the third direction D3 (in a plan view) is a quadrilateral shape (as one example, a rectangular shape). The shape of the upper layer 21 when viewed along the first direction D1 or the second direction D2 is,

for example, a curved shape (as one example, a parabolic shape or an arc shape). The shape of the upper layer 21 when viewed along the first direction D1 or the second direction D2 may be an elliptical shape, and is not particularly limited.

5 [0037] The cushion body 1 includes a plurality of the upper layers 21, and the plurality of upper layers 21 are aligned along both the first direction D1 and the second direction D2. In the cushion body 1, the upper layers 21 are arranged in a grid pattern. The upper layers 21 are made of a material with higher elasticity than the layers other than the
10 upper layers 21.

[0038] The upper layers 21 are pressure-receiving layers that receive the body pressure of the body of a user. The upper layers 21 are made of, for example, a high-elasticity material. As one example, the upper layers 21 are made of urethane foam with high resilience (high-resilience
15 foam or high-elasticity foam). For example, a rebound resilience of the upper layers 21 is 45% or more. However, the rebound resilience of the upper layers 21 is more preferably 50% or more or 55% or more. The upper layers 21 are made of a material with higher rebound resilience (higher resilience) than the layers other than the upper layers 21. The
20 upper layers 21 may be made of Somniform (registered trademark). A hardness of the upper layers 21 is, for example, 100 N or more and 210 N or less (as one example, 150 N). A 40% hardness of the upper layers 21 is, for example, 80 N or more and 200 N or less, more preferably 100 N or more and 180 N or less.

25 [0039] The upper layers 21 may be made of a softer material than the layers other than the upper layers 21. The upper layers 21 may be made

of filmless urethane. In this case, air permeability of the upper layers 21 can be improved. However, from the perspective of odor reduction, the upper layers 21 made of a high-elasticity material are more advantageous than the upper layers 21 made of filmless urethane. Further, the upper layers 21 provide a good sense of touch.

[0040] The first intermediate layer 22 is a layer located below the upper layers 21. The first intermediate layer 22 is a dispersion layer that disperses the body pressure of a user. For example, a 40% hardness of the first intermediate layer 22 is 160 N or more and 330 N or less. However, the 40% hardness of the first intermediate layer 22 may be 190 N or more or 240 N or more and 250 N or less or 280 N or less. A rebound resilience of the first intermediate layer 22 is, for example, 35% or more. However, the rebound resilience of the first intermediate layer 22 is more preferably 45% or more. However, the hardness and rebound resilience of the first intermediate layer 22 are not limited to the above examples. The first intermediate layer 22 includes the recesses 9, the first front side slits 11, and the second front side slits 12. The first intermediate layer 22 includes the first front side slits 11 extending in the first direction D1 and the second front side slits 12 extending in the second direction D2 in addition to the recesses 9.

[0041] The cushion body 1 includes a plurality of the first intermediate layers 22, and the protrusion group G is formed on each first intermediate layer 22. The position of the first intermediate layer 22 in a plan view is the same as the position of the protrusion group G in a plan view. Similarly to the protrusion groups G, the first intermediate layers 22 are arranged in a grid pattern to be aligned along each of the first direction

D1 and the second direction D2 in the cushion body 1. Accordingly, a plural number $\times$ a plural number (for example, 3×3) protrusions 4 (protrusion group G) deform independently. As a result, the body pressure of the body can be more efficiently dispersed in each protrusion group G.

[0042] A depth H1 from the top portion 4b of the protrusion 4 to a bottom portion of the recess 9 is shallower than a depth H2 from the top portion 4b to a bottom portion of the first front side slit 11 and a depth H3 from the top portion 4b to a bottom portion of the second front side slit 12. The depth H3 of the second front side slit 12 is less than or equal to the depth H2 of the first front side slit 11.

[0043] The recess 9 has, for example, an arc shape between lower ends of a pair of the protrusions 4. The first front side slit 11 includes a first portion 11b and an expanded portion 11c. The first portion 11b extends linearly in the third direction D3. The expanded portion 11c expands from a lower end of the first portion 11b such that the width of the first front side slit 11 becomes wider. The expanded portion 11c is, for example, curved in an arc shape. The expanded portion 11c allows the protrusion group G to be more easily deformed locally.

[0044] Similarly to the first front side slit 11 described above, the second front side slit 12 includes, for example, a first portion 12b extending linearly in the third direction D3, and an expanded portion 12c that expands from a lower end of the first portion 12b such that the width of the second front side slit 12 becomes wider. As described above, the first front side slit 11 and the second front side slit 12 are different in depth from each other. A lower end of the second front side slit 12

reaches the first intermediate layer 22. A lower end of the first front side slit 11 reaches the second intermediate layer 23 below the first intermediate layer 22.

[0045] For example, a hardness of the lower layer 24 may be higher than a hardness of the first intermediate layer 22 and a hardness of the second intermediate layer 23. A 40% hardness of the lower layer 24 is, for example, 200 N or more and 350 N or less. However, the 40% hardness of the lower layer 24 may be 230 N or more or 260 N or more and 320 N or less or 290 N or less. A rebound resilience of the lower layer 24 is, for example, 20% or more. However, the rebound resilience of the lower layer 24 is more preferably 25% or more. However, the values of the hardness and rebound resilience of the lower layer 24 are not limited to the above examples.

[0046] The lower layer 24 is a holding layer that holds the upper layers 21, the first intermediate layers 22, and the second intermediate layer 23. The second intermediate layer 23 is an adjustment layer that adjusts the function of the upper layers 21 and the first intermediate layers 22 as body pressure dispersion layers and the function of the lower layer 24 as a holding layer. The back side slits 13 are formed in the second intermediate layer 23 and the lower layer 24.

[0047] The position of each back side slit 13 in the first direction D1 is different from the position of each second front side slit 12 in the first direction D1. The back side slits 13 and the second front side slits 12 are alternately disposed along the first direction D1. For example, the back side slit 13 is provided at an intermediate portion between two second front side slits 12 aligned along the first direction D1.

[0048] The back side slit 13 extends from the back surface 3 to the second intermediate layer 23 through the lower layer 24. The back side slit 13 includes a first portion 13b having a linear shape and located in the lower layer 24, and an expanded portion 13c that expands from an upper end of the first portion 13b such that the width of the back side slit 13 becomes wider. For example, the expanded portion 13c is formed in the second intermediate layer 23. As one example, the expanded portion 13c is curved in an arc shape.

[0049] For example, the lower layer 24 is made of a harder material than the layers other than the lower layer 24. As one example, the lower layer 24 is made of high-hardness urethane foam. The lower layer 24 may be made of a lighter material than the layers other than the lower layer 24. More specifically, the lower layer 24 may be made of lightweight urethane foam. Further, the lower layer 24 may be made of a material that is lighter and has higher hardness than those of the layers other than the lower layer 24. More specifically, the lower layer 24 may be made of lightweight and high-hardness urethane foam. When the lower layer 24 is made of lightweight urethane foam or lightweight and high-hardness urethane foam, the cushion body 1 can be made lighter by approximately 300 to 400 g compared to when the lower layer 24 is made of a material other than lightweight urethane foam or lightweight and high-hardness urethane foam.

[0050] Actions and effects obtained from the cushion body 1 according to the present embodiment will be described. The cushion body 1 includes the plurality of protrusions 4 arranged in a grid pattern on the front surface 2 to be aligned along each of the first direction D1 and the

second direction D2. The plurality of first front side slits 11 extending in the first direction D1 and the plurality of second front side slits 12 extending in the second direction D2 are formed on the front surface 2.

[0051] The protrusion group G made up of the plurality of protrusions 4 is provided in a region surrounded by two first front side slits 11 aligned along the second direction D2 and two second front side slits 12 aligned along the first direction D1. The cushion body 1 includes the plurality of protrusion groups G, each being made up of the plurality of protrusions 4. Each protrusion group G is provided in the region surrounded by the first front side slits 11 and the second front side slits 12. Therefore, when the body of a user is placed on the front surface 2, the cushion body 1 can be deformed for each protrusion group G instead of in its entirety.

[0052] Only the protrusion groups G of the cushion body 1 to which the body pressure is applied can be deformed. Therefore, the cushion body 1 can be deformed along the body of the user, and the contact area of the body with the cushion body 1 can be increased, so that body pressure dispersion can be improved. The depth H3 of the second front side slit 12 is less than or equal to the depth H2 of the first front side slit 11. In the present embodiment, the depth H3 of the second front side slit 12 is shallower than the depth H2 of the first front side slit 11. The depth H3 of the second front side slit 12 extending in the second direction D2 is less than or equal to the depth H2 of the first front side slit 11 extending in the first direction D1. Therefore, body pressure dispersion and ease of turning in bed for both a supine posture and a lateral recumbent posture can be improved, and versatility can be improved such that the cushion body 1 can be adapted to more users.

[0053] The cushion body 1 according to the present embodiment includes the lower layer 24 constituting the back surface 3, and the lower layer 24 may be made of a harder material than the layers other than the lower layer 24. In this case, the body of a user can be more firmly supported by the lower layer 24, and high pressure from the shoulder of the user in a lateral recumbent posture can be dispersed by the lower layer 24. Therefore, the sleeping posture of the user can be maintained by the lower layer 24, and sleeping comfort in a lateral recumbent posture can be further improved.

[0054] In the present embodiment, the lower layer 24 may be made of a lighter material than the layers other than the lower layer 24. In this case, since the lower layer 24 is made of a harder and lighter material than the other layers, the weight of the entirety of the cushion body 1 can be reduced.

[0055] The cushion body 1 according to the present embodiment includes the upper layers 21, each including the top portion 4b of the protrusion 4, and the upper layers 21 may be made of a material with higher elasticity than the layers other than the upper layers 21. In this case, since the upper layers 21 are made of a high-elasticity material, a sense of touch when a user touches the front surface 2 of the cushion body 1 can be further improved.

[0056] At least one of the number of the protrusions 4 aligned along the first direction D1 in each protrusion group G and the number of the protrusions 4 aligned along the second direction D2 in each protrusion group G may be 3 or more. In this case, three or more protrusions 4 aligned in the first direction D1 and three or more protrusions 4 aligned

in the second direction D2 can be depressed at once by the body pressure.

[0057] The cushion body 1 includes the plurality of protrusions 4 arranged in a grid pattern. The cushion body 1 includes the upper layers 21, each including the top portion 4b of the protrusion 4, and the lower layer 24 facing opposite to the upper layers 21. The upper layers 21 are made of a material with higher elasticity than the layers other than the upper layers 21. Therefore, a sense of touch when a user touches the front surface 2 of the cushion body 1 can be improved, and body pressure dispersion and versatility can be improved.

[0058] The lower layer 24 is made of a harder and lighter material than the layers other than the lower layer 24. Since the lower layer 24 is made of a harder material than the other layers, the body of a user can be firmly supported by the lower layer 24, and high pressure from the shoulder of the user in a lateral recumbent posture can be dispersed by the lower layer 24. Therefore, the sleeping posture of the user can be maintained by the lower layer 24, so that ease of turning in bed can be improved, and sleeping comfort in a lateral recumbent posture can be improved. Since the lower layer 24 is made of a lighter material than the other layers, the weight of the entirety of the cushion body 1 can be reduced.

[0059] Experiments were performed on the cushion body 1 according to an example and a cushion body according to a comparative example, and the experiments will be described. Similarly to the cushion body 1 of the embodiment described above, the cushion body 1 according to the example is the cushion body 1 in which the first front side slits 11 and the second front side slits 12 are formed in the first intermediate layers 22

and which includes the lower layer 24 that has high hardness and is lightweight. The cushion body according to the comparative example is a cushion body including only the first front side slits 11 extending in the first direction D1 in the first intermediate layers 22 and not including the second front side slits 12.

[0060] Part (a) of FIG. 7 is an experimental result (actual measurement data) showing a body pressure distribution in a state where a user lies in a supine posture on the cushion body according to the comparative example. Part (b) of FIG. 7 is an experimental result (actual measurement data) showing a body pressure distribution in a state where a user lies in a supine posture on the cushion body 1 according to the example.

[0061] The actual measurement data in Parts (a) and (b) of FIG. 7 in Parts (a) and (b) of FIG. 8 to be described later shows that the left side is a head side of the cushion body and the right side is a leg side of the cushion body, and shows that the darker the color of a location is, the higher the applied body pressure is. As shown in Parts (a) and (b) of FIG. 7, regarding body pressure applied in a supine posture, it is found that the body pressure of the waist can be better dispersed on the cushion body 1 according to the example than on the cushion body according to the comparative example.

[0062] Part (a) of FIG. 8 is an experimental result (actual measurement data) showing a body pressure distribution in a state where a user lies in a lateral recumbent posture on the cushion body according to the comparative example. Part (b) of FIG. 8 is an experimental result (actual measurement data) showing a body pressure distribution in a state

where a user lies in a lateral recumbent posture on the cushion body 1 according to the example. As shown in Parts (a) and (b) of FIG. 8, regarding body pressure applied in a lateral recumbent posture, it is found that high body pressure of the shoulders can be better dispersed on the cushion body 1 according to the example than on the cushion body according to the comparative example.

[0063] Incidentally, as the cushion body 1 according to the example, the cushion body 1 with a thickness of 9 cm and the overlay type cushion body 1 with a thickness of 4 cm were prepared, and the above experiments were performed on each sample. In all of these experiments, results similar to those shown in Part (b) of FIG. 7 and Part (b) of FIG. 8 were obtained. Even in a cushion body (cushion body including the first front side slits 11 and the second front side slits 12) obtained by removing the lower layer 24, which has high hardness and is lightweight, from the cushion body 1 according to the example, results similar to those shown in Part (b) of FIG. 7 and Part (b) of FIG. 8 described above are obtained.

[0064] Part (a) of FIG. 9 is an experimental result (actual measurement data) showing the result of measuring the sleeping posture of a user on the cushion body according to the comparative example. Part (b) of FIG. 9 is an experimental result (actual measurement data) showing the result of measuring the sleeping posture of a user on the cushion body 1 according to the example. The sleeping posture of the user was measured using a bedding shape measurement device. A spine fitter (registered trademark) was used as the bedding shape measurement device.

[0065] As shown in Parts (a) and (b) of FIG. 9, it is found that in the cushion body 1 according to the example, a sinking X at the buttocks of the user can be more reduced than in the cushion body according to the comparative example. It is considered that since the cushion body 1 includes the lower layer 24 with high hardness, the lower layer 24 more firmly supports the buttocks, thereby being able to reduce the sinking X.

[0066] FIG. 10 shows the results of measuring the amount of sinking at each of the shoulders, an upper part of the waist, and a lower part of the waist of a user in a lateral recumbent posture by disposing a bedding shape measurement device having a sheet shape (tape shape) so as to extend in the width direction of the cushion bodies (average values of three measurement results). The user (subject) in this experiment is a large man with a height of 176 cm and a weight of 90 kg. A sheet tracer was used as the bedding shape measurement device. As shown in FIG.

10, in a cushion body of Example 2 including the first front side slits 11 and the second front side slits 12 and not including the lower layer 24 that had high hardness and was lightweight, the amounts of sinking at the shoulders, the upper part of the waist, and the lower part of the waist were larger than in a cushion body of a comparative example. On the other hand, in a cushion body of Example 1 including the lower layer 24 that had high hardness and was lightweight, the amounts of sinking at the shoulders, the upper part of the waist, and the lower part of the waist were smaller than in the cushion body of the comparative example. Accordingly, it was found that in the cushion body 1 of Example 1, the lower layer 24 could reduce sinking and ease of turning in bed when a large man was in a lateral recumbent posture could be further improved.

[0067] Parts (a), (b) and (c) of FIG. 11 show the results of measuring torque values when a sphere is placed on the front surface of each cushion body and the sphere is pulled and rolled in the first direction D1 and the second direction D2. Part (a) of FIG. 11 shows torque values when a pressure exerted by the sphere is 35 N, Part (b) of FIG. 11 shows torque values when a pressure exerted by the sphere is 88 N, and Part (c) of FIG. 11 shows torque values when a pressure exerted by sphere is 113 N. As shown in Parts (a), (b) and (c) of FIG. 11, it was found that the torque values were smaller in the cushion body 1 according to Example 1 and the cushion body according to Example 2 than in the cushion body according to the comparative example. Particularly, it was found that the torque values could be reduced when the sphere was moved in the first direction D1 and the pressure exerted by the sphere was large (113 N). As described above, it was found that in Example 1 and Example 2, body pressure dispersion and ease of turning in bed could be further improved than in the comparative example.

[0068] The embodiment and examples of the cushion body according to the present disclosure have been described above. However, the cushion body according to the present disclosure is not limited to the embodiment or examples described above, and changes can be made as appropriate without departing from the concept described in the claims. The shape, size, number, material, and disposition mode of each part of the cushion body are not limited to the embodiment or examples described above, and can be changed as appropriate.

[0069] For example, in the embodiment described above, the cushion body 1 that is a core material of a mattress has been described.

However, the cushion body according to the present disclosure may be a core material of a bedding other than a mattress, such as a futon, or a core material of a pillow. Further, the cushion body according to the present disclosure may be used as a cushion, a seat for a vehicle such as an automobile or a train, a seat for a transport other than a vehicle, such as an aircraft, a seat for a nursing chair other than a transport, and the like. In the embodiment described above, an example in which the cushion body 1 is used to improve sleeping comfort has been described. However, the cushioning material according to the present disclosure may be used to mitigate impact, and can be used for various purposes.

Reference Signs List

[0070] 1: cushion body, 1b: long side, 1c: short side, 2: front surface, 3: back surface, 4: protrusion, 4b: top portion, 5: first side surface, 6: second side surface, 7: first recess, 8: second recess, 9: recess, 11: first front side slit, 11b: first portion, 11c: expanded portion, 12: second front side slit, 12b: first portion, 12c: expanded portion, 13: back side slit, 13b: first portion, 13c: expanded portion, 21: upper layer, 22: first intermediate layer, 23: second intermediate layer, 24: lower layer, D1: first direction, D2: second direction, D3: third direction, G: protrusion group.

CLAIMS

[Claim 1] A cushion body comprising:

long sides extending along a first direction;

short sides extending along a second direction intersecting the
first direction;

a front surface facing vertically upward;

a back surface facing vertically downward;

a plurality of protrusions arranged in a grid pattern on the front
surface to be aligned along each of the first direction and the second
direction;

first front side slits, each extending in the first direction between
two protrusions aligned along the second direction;

second front side slits, each extending in the second direction
between two protrusions aligned along the first direction; and

a plurality of protrusion groups, each being made up of a plurality
of the protrusions surrounded by two first front side slits aligned along
the second direction and two second front side slits aligned along the first
direction,

wherein a depth of the second front side slits is less than or equal
to a depth of the first front side slits.

[Claim 2] The cushion body according to claim 1, further
comprising:

a lower layer constituting the back surface,

wherein the lower layer is made of a harder material than layers
other than the lower layer.

[Claim 3] The cushion body according to claim 2,

wherein the lower layer is made of a lighter material than the layers other than the lower layer.

[Claim 4] The cushion body according to claim 1 or 2, further comprising:

- 5 an upper layer including a top portion of the protrusion,
 wherein the upper layer is made of a material with higher elasticity than layers other than the upper layer.

[Claim 5] The cushion body according to claim 1 or 2,

- 10 wherein at least one of the number of the protrusions aligned along the first direction in the protrusion group and the number of the protrusions aligned along the second direction in the protrusion group is 3 or more.