

DESCRIPTION

CUSHION

TECHNICAL FIELD

5 [0001]

The present invention relates to a cushion(pillow). To be more specific, the present invention relates to, for example, a cushion(pillow) that, when mounted by a person, is capable of changing into various shapes along an outer contour of the person or in accordance with the person's wishes.

10 **BACKGROUND ART**

[0002]

There are known cushion bodies, including pillows, which have various shapes.

For example, Japanese Unexamined Patent Publication No. 2004-223002 (Patent document 1) proposes "A cushion body characterized in that foam resin particles are sealed as a filler material in a stretchable bag body, a volume of the foam resin particles being 1.1 to 3.5 times greater than a content volume of the bag body."

15 In addition, Japanese Unexamined Patent Publication No. 2005-230137 (Patent document 2) proposes a cushion body that can be used to prevent a bed sore.

PRIOR ART DOCUMENTS

20 **PATENT DOCUMENT**

[0003]

Patent document 1: Japanese Unexamined Patent Application Publication No. 2004-223002

25 Patent document 2: Japanese Unexamined Patent Application Publication No. 2005-230137

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004]

30 In the cushion body described in patent document 1, an excess filler material is sealed (overfilled), relative to the content volume of the bag body. The filler material, which is overfilled, does not easily move in the bag body, resulting in a hard feel of the cushion body.

In recent years, there are cases in which portable information terminals, such as smartphones, are used in a prone or supine position. In this mode of use, for example, when the cushion body with the hard feel is mounted by a person, the cushion body does not easily change its shape along the outer contour of the person, and applies a local pressure to the person. Thus, it cannot be said that the cushion body is suitable for long-time use in a prone or supine state.

In particular, when the portable information terminal is used in the prone position, the backbone is warp backward and a burden acts on the lower back. In order to reduce the burden, the cushion body needs to change its shape along the outer contour of the person such that a local pressure does not act on the part from the breast to the front side of the thighs. However, such a change cannot be desired for the cushion body with the hard feel.

Furthermore, patent document 2 describes that in the case of a cushion body in which bottom-reaching occurs, a bedsore occurs at a part of the bottom-reaching. A cushion body that presupposes bottom-reaching is not suggested.

SOLUTIONS TO THE PROBLEMS

[0005]

Thus, according to the present invention, there is provided a pillow comprises at least a bag body, at least a part of which is stretchable, and a filler material in the bag body,

wherein the pillow is used by a person,

the filler material includes foam beads,

a space, in which the filler material is absent, is formed in a top section of the pillow at a length of $1/10$ to $2/3$ of a maximum length of the pillow, when the pillow is placed upright on a floor such that a maximum length direction of the pillow becomes parallel to a direction of gravity and a peak section of the pillow is extended upward such that an area of contact between the floor and the pillow is invariable, and

buttocks reach to a bottom of the pillow when the person lies down such that at least the buttocks reach to the pillow that is placed on the floor such that the maximum length direction becomes parallel.

In addition, according to the present invention, there is provided a pillow comprising at least a bag body, at least a part of which is stretchable, and a filler

material in the bag body,

the pillow is used by a person,

the filler material includes foam beads,

a space, in which the filler material is absent, is formed in a top section of the pillow at a length of $1/10$ to $2/3$ of a maximum length of the pillow, when the pillow is placed upright on a floor such that a maximum length direction of the pillow becomes parallel to a direction of gravity and a peak section of the pillow is extended upward such that an area of contact between the floor and the pillow is invariable,

buttocks reach to a bottom of the pillow when the person lies down such that at least the buttocks reach to the pillow that is placed on the floor such that the maximum length direction becomes parallel, and

when the person rolls over on the pillow, the foam beads being present under the buttocks serve as rolling elements, thereby enabling the person to roll over easily.

Furthermore, according to the present invention, there is provided a pillow comprising at least a bag body, at least a part of which is stretchable, and a filler material in the bag body,

a space, in which the filler material is absent, is formed in a top section of the pillow at a length of $1/10$ to $2/3$ of a maximum length of the pillow, when the pillow is placed upright on a floor such that a maximum length direction of the pillow becomes parallel to a direction of gravity and a peak section of the pillow is extended upward such that an area of contact between the floor and the pillow is invariable, and

when a disc with a diameter of 20 cm is placed on the pillow and a force of 1 to 20 kg is applied to the disc in the direction of gravity, the disc reaches to the bottom of the pillow.

EFFECTS OF THE INVENTION

[0006]

The pillow of the present invention is capable of changing into various shapes by bottom-reaching of a proper range.

Thus, for example, in the case of use in a prone or supine position, the shape of the pillow changes along the outer contour of the person. Accordingly, the pillow of the present invention can be used for a long time in a prone or supine state. In addition, by moving the filler material, the pillow can be deformed into a desired shape.

Besides, when sitting on the pillow, since the pillow largely deforms in such a manner as to wrap the body, a great healing effect (a feeling of such an image as getting on a cloud) can be obtained.

Moreover, when a person rolls over on the pillow, the form beads being present under the buttocks serve as rolling elements, and thereby the person can easily roll over.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

[FIG. 1]

FIG. 1 shows a schematic view for describing a state in which a force is applied to a pillow.

[FIG. 2]

FIG. 2 shows a schematic view for describing a state in which a force is applied to the pillow.

[FIG. 3]

FIG. 3 shows a schematic view for describing a state in which a force is applied to the pillow.

[FIG. 4]

FIG. 4 shows a schematic view of a pillow of Embodiment 1.

[FIG. 5]

FIG. 5 shows a schematic view of the pillow of Embodiment 1.

[FIG. 6]

FIG. 6 shows a schematic view of the pillow of Embodiment 1.

[FIG. 7]

FIG. 7 shows a schematic view of the pillow of Embodiment 1.

[FIG. 8]

FIG. 8 shows a schematic view of the pillow of Embodiment 1.

[FIG. 9]

FIG. 9 shows a schematic view of the pillow of Embodiment 1.

[FIG. 10]

FIG. 10 shows a schematic view of the pillow of Embodiment 1.

[FIG. 11]

FIG. 11 shows a schematic view of a pillow of Embodiment 2.

[FIG. 12]

FIG. 12 shows a schematic view of the pillow of Embodiment 2.

[FIG. 13]

FIG. 13 shows a schematic view of the pillow of Embodiment 2.

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[FIG. 14]

FIG. 14 shows a schematic view of the pillow of Embodiment 2.

[FIG. 15]

FIG. 15 shows a schematic view of the pillow of Embodiment 2.

[FIG. 16]

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FIG. 16 shows a schematic view of the pillow of Embodiment 2.

[FIG. 17]

FIG. 17 shows a schematic view of the pillow of Embodiment 2.

[FIG. 18]

FIG. 18 shows a schematic view of a pillow of Embodiment 3.

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[FIG. 19]

FIG. 19 shows a schematic view of the pillow of Embodiment 3.

[FIG. 20]

FIG. 20 shows a schematic view of the pillow of Embodiment 3.

[FIG. 21]

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FIG. 21 shows a schematic view of a pillow of Embodiment 4.

EMBODIMENTS OF THE INVENTION

[0008]

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Hereinafter, a pillow (cushion body) of the present invention is described by assuming that the pillow is used mainly by persons (an adult, a child, a female, a male, and the like), but the pillow of the present invention may be used by pets (for example, a dog, a cat, and the like) other than the persons.

The pillow of the present invention has the following properties (i) to (iii).

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(i) A space, in which a filler material is absent, is formed in a top section of the pillow at a length of $1/10$ to $2/3$ of a maximum length of the pillow, when the pillow is placed upright on a floor such that a maximum length direction of the pillow becomes parallel to a direction of gravity and a peak section of the pillow is extended upward such that an area of contact between the floor and the pillow is invariable.

(ii) Buttocks reach to a bottom of the pillow when the person lies down (the person uses the pillow in a supine position) such that at least the buttocks reach to the pillow that is placed on the floor such that the maximum length direction becomes parallel.

(iii) When the person rolls over on the pillow, the form beads being present under the buttocks serve as rolling elements, and thereby the person can easily roll over.

Thus, the pillow can change into various shapes. For example, when the pillow is used in a prone or supine position, the shape of the pillow changes along the outer contour of the person. As a result, the pillow of the present invention can be used for a long time in a prone or supine state. In addition, by moving the filler material by the hand or foot, the pillow can be deformed into a desired shape. Moreover, when sitting on the pillow, since the pillow largely deforms in such a manner as to wrap the body, a great healing effect can be obtained.

Furthermore, when the person rolls over on the pillow, the form beads being present under the buttocks serve as rolling elements, and thereby the person can easily roll over.

That the buttocks reach to the bottom of the pillow (bottom-reaching) means that an inner surface of that part in the bag body, which is in contact with the buttocks, is in substantial contact with an inner surface of the part that is in contact with the floor. The meaning of "in substantial contact with" includes not only a case where the inner surface of that part of the bag body, which is in contact with the buttocks, is in complete contact with the inner surface of the part in contact with the floor and no filler material is present therebetween, but also a case where parts of the inner surfaces are in direct contact, and a filler material is present between the other parts.

[0009]

Property (i)

Since the space, in which the filler material is absent, is formed in the top section of the pillow at the length of $1/10$ to $2/3$ of the maximum length of the pillow, the pillow can be largely deformed in such a manner as to wrap the body, in each of the case of the use in the prone position, the case of the use in the supine position, and the case of sitting.

Examples of the method of measuring the length of a space include methods illustrated in FIG. 1(a) to FIG. 1(c). FIG. 1(a) and FIG. 1(b) illustrate a state in which a

pillow is placed on a floor, with no external force, except gravity, being applied. FIG. 1(a) is a side view, and FIG. 1(b) is a top view. In FIG. 1(a) and FIG. 1(b), "a" denotes a contact portion between the floor and the pillow. FIG. 1(c) illustrates a state in which a peak section of the pillow is extended upward such that an area of contact between the floor and the pillow is invariable. In FIG. 1(c), X denotes a maximum length of the pillow, and X1 denotes a maximum length of the space.

The length of the space is preferably $1/7$ to $1/2$, and more preferably $1/5$ to $1/3$, of the maximum length of the pillow. A lower limit of the length of the space may be selected from among $1/10$, $1/9$, $1/8$, $1/7$, $1/6$, and $1/5$ of the maximum length of the pillow, and an upper limit of the length of the space may be selected from among $2/3$, $3/5$, $11/20$, $1/2$, $9/20$, $2/5$, and $1/3$.

The maximum length of the pillow can be set as appropriate within a range of, for example, 10 cm to 3 m, in accordance with the purpose of use of the pillow. The maximum length may be set at 20 cm, 30 cm, 40 cm, 50 cm, 60 cm, 70 cm, 80 cm, 90 cm, 1 m, 1.25 m, 1.5 m, 1.75 m, or 2 m.

When the pillow is placed such that the maximum length direction becomes parallel to the floor surface, the pillow may have an average thickness of 5 to 100 cm. The average thickness may be set at 10 cm, 20 cm, 30 cm, 40 cm, 50 cm, 60 cm, 70 cm, 80 cm, or 90 cm. The average thickness means a thickness in a case where the pillow is leveled such that the thickness of the placed pillow becomes as uniform as possible. The average thickness may be set at $1/2$ to $1/10$ of the maximum length.

The area of contact between the floor and the pillow in the pillow that is placed upright such that the maximum length direction of the pillow becomes parallel to the direction of gravity is not particularly limited, and may be set as appropriate within a range of 0.005 m^2 to 5 m^2 in accordance with the purpose of use of the pillow. The range of the area of contact of the pillow can be set to a range expressed by a combination of an upper limit value and a lower limit value that are freely selected from among 0.005 m^2 , 0.0075 m^2 , 0.01 m^2 , 0.015 m^2 , 0.02 m^2 , 0.025 m^2 , 0.03 m^2 , 0.035 m^2 , 0.04 m^2 , 0.05 m^2 , 0.075 m^2 , 0.1 m^2 , 0.125 m^2 , 0.15 m^2 , 0.2 m^2 , 0.25 m^2 , 0.3 m^2 , 0.4 m^2 , 0.5 m^2 , 0.6 m^2 , 0.7 m^2 , 0.75 m^2 , 0.8 m^2 , 0.9 m^2 , 1.0 m^2 , 1.25 m^2 , 1.5 m^2 , 1.75 m^2 , 2.0 m^2 , 2.5 m^2 , 3.0 m^2 , 3.5 m^2 , 4.0 m^2 , 4.5 m^2 , and 5.0 m^2 .

[0010]

Property (ii)

The buttocks reach to the bottom (touch the bottom) of the pillow when the person lies down (the person uses the pillow in a supine position) such that at least the buttocks reach to the pillow that is placed on the floor such that the maximum length direction becomes parallel, and thereby the pillow can be largely deformed in such a manner as to wrap the body, in each of the case of the use in the prone position, the case of the use in the supine position, and the case of sitting. The person in this case is, for example, a person having a body weight of 40 kg or more, and an adult is assumed. In the case of an adult, it is assumed that the weight acting on the part of the bottom-reaching is about 44% of the body weight, which is the weight of the part of buttocks.

For example, in the case of use in the supine position, the buttocks, at which the center of gravity of the whole body (center of gravity for human body) is located, reach to the bottom in the pillow. On the other hand, the part from the shoulders to the head and the lower parts of the thighs can be set in a raised state, since the filler material is present in these parts. In this state, such a posture occurs that the lower back is properly bent. Conventionally, as regards a mat for bedding, it has been considered that the deformation of the mat along the outer contour of a person in such a manner to keep the erect posture (S-posture of the back) is effective to improve the healing-providing property and the quality of sleep. However, taking into account that a human evolved from a quadrupedal-walking animal, a posture close to a fetal posture (a posture in which the knees are slightly pulled to the breast, and the back is slightly hunched) is more effective to improve the healing-providing property and the quality of sleep. Like a baby stopping crying by taking the fetal posture, a pillow has an effect of relaxing tension of the body and mind of even an adult, and putting the adult at ease. In addition, it can be said that the posture obtained by the pillow corresponds to a neutral body posture. The neutral body posture means a posture in which the least burden acts on an astronaut in a state of weightlessness. In other words, it is known that in a state of weightlessness, such a posture occurs that the back is slightly hunched and the thighs are lifted, and tension of muscles and the burden on the backbone become minimum. This neutral body posture can be taken by lying on the pillow.

Property (iii)

When a person rolls over on the pillow, the form beads being present under the

buttocks serve as rolling elements, and thereby the person can easily roll over.

Even during the roll-over, the filler material (foam beads) flows (serves as rolling elements) while the bag body is stretching and contracting, and thereby the pillow 1 can easily deform in accordance with a change of the body. Specifically, at a part of contact between the pillow and the body (for example, buttocks), the body (buttocks) reach to the bottom of the pillow, and at a part neighboring the part of contact, the filler material flows and thereby the pillow swells along the outer contour of the body. Thus, the body pressure can appropriately be dispersed such that the body pressure does not concentrate at one point in any of postures. Therefore, the body can be wrapped in each of the case of the use in the prone position, the case of the use in the supine position, and the case of sitting.

Other properties

The pillow may include a recess that is formed by the filler material moving such that the buttocks reach to the bottom of the pillow and the upper half of the body and the thighs do not reach to the bottom in the state in which the person lies down such that at least the buttocks reach to the pillow. With the recess being provided, the above-described fetal posture and/or neutral body posture can easily be taken. Since the recess is formed by the movement of the filler material, the size of the recess can vary in accordance with various kinds of changes of the physical constitution of the person.

The pillow may have such a property that when a disc with a diameter of 20 cm is placed on the pillow and a force of 1 to 20 kg is applied to the disc in the direction of gravity, the disc reaches to the bottom of the pillow.

A position where the disc is placed on the pillow is not particularly limited. In addition, the disc may reach to the bottom of the entire pillow, or may reach to the bottom of only a part thereof.

The position of the pillow, at which the disc is placed, may be near the center of a top surface of the pillow that is placed upright such that the maximum length direction of the pillow becomes parallel to the direction of gravity. If this position is adopted, the pillow can be largely deformed in such a manner as to wrap the body, in each of the case of the use in the prone position, the case of the use in the supine position, and the case of sitting.

The reason why the diameter of the disc is set at 20 cm is described below.

From the viewpoint that the lower back reach to the pillow at a time of measurement, the diameter of 20 cm is set by assuming the diameter of a circle on the supposition that an area of contact between the buttocks and the floor is circular. When the buttocks are in contact with the floor, the body pressure concentrates at two ischial tuberosities of the bottom of the pelvis. In addition, the diameter of the circle needs to be measured by including a region near the ischial tuberosities where a relatively high body pressure is indicated, by taking the condition of bottom-reaching into account. Here, according to a literature relating to the study of force acting on the buttocks (the Nihon Gishi Sougu Gakkaishi journal [Bulletin of the Japanese Society of Prosthetics and Orthotics) Vol. 29, No. 3, pp. 168-174, 2013], it is known that the distance between the two ischial tuberosities is 8 to 15 cm in adults. When the buttocks are in contact with the floor, the area around the two ischial tuberosities is also in contact with the floor, and thus, in consideration of this area, the diameter of the disc is set at 20 cm.

Aside from 20 cm, the diameter of the disc may be selected from among 30 cm, 40 cm, 50 cm, and 60 cm. In the case of a disc with a large diameter, since the pillow can deform more greatly, the pillow can be used for a longer time in the prone or supine state and can be more largely deformed in such a manner as to wrap the body in the case of sitting.

The applied force can be selected within a range of 1 to 20 kg in accordance with the purpose of use of the pillow. For example, in the case of a pillow on which to sit, a relatively large force can be selected, and in the case of a pillow on which to lie down, a relatively small force can be selected. The applied force may be set at 2 kg, 3 kg, 4 kg, 5 kg, 6 kg, 7 kg, 8 kg, 9 kg, 10 kg, or 15 kg.

The reason why the upper limit of the applied force is set at 20 kg is described.

The upper limit of 20 kg of the force is determined with reference to the weight of the part of buttocks, from the view point that the lower back reach to the pillow. For example, according to a literature published in 2007 from the Sangyo Gijutsu Sogo Kenkyu-jyo (National Institute of Advanced Industrial Science and Technology), the average body weight of females of 16 or older is about 53 kg, and, according to a literature published from NISHIKAWA Co., LTD. in 2019 (Research relating to problem analysis for formulating criteria of evaluation methods on sleep optimization of bedding and the like), it is stated that the body pressure dispersion ratio of the lower

back and buttock part is about 44%. In other words, a force of about 23 kg (53×0.44) acts on the buttocks bottom part of the pillow. By setting the upper limit of the force at 20 kg, even an adult female can achieve bottom-reaching.

As regards adult males, since the average weight of adult males is greater than that of adult females, bottom-reaching can surely be achieved by the upper limit of 20 kg of the force.

As regards children in the lower grades (6-7 year old) of primary schools, who are assumed to positively use pillows, when the child lies on the pillow, his/her legs also lie on the pillow, and it is thus assumed that all body weight acts on the bottom part of buttocks. Here, according to the Handbook of Health and Welfare Statistics (2019) of the Ministry of Health, Labor and Welfare, vol. 2, Health and Hygiene, Chapter 1, Table 2-6 of Health, "Average values of body height and body weight, by gender/year $\times$ age", it is stated that the body weight of children of these ages is about 23 kg. In these ages, the upper limit of 20 kg of the force is appropriate in order to achieve the bottom-reaching.

[0011]

There is the following method of adding the force of 1 to 20 kg. To begin with, as illustrated in FIG. 2, a disc 2 is placed on a pillow 1. Then, as illustrated in FIG. 3, a weight 3 is placed on the disc 2. The weight 3 is adjusted such that a predetermined force is produced by the total weight of the weight 3 and the disc 2. After the weight 3 is placed, the disc 2 is rotated for about one minute while the disc 2 is lightly held down. That the disc 2 reaches the bottom of the pillow 1 means that the filler material is substantially absent in the bag body immediately below the disc 2. The concept of "substantially absent" includes not only a case where the filler material is completely absent, but also a case where parts of cloth forming the bag body are in direct contact and, in other parts, the filler material is present.

FIG. 2(a) and FIG. 3(a) are side views, and FIG. 2(b) and FIG. 3(b) are top views.

In addition, a force of 3 g or more per unit area (cm^2) of the bottom part of the disc may be applied.

In the cross section in the direction of gravity of the pillow in the state in which the disc reaches the bottom, as indicated by dotted-line parts in FIG. 3(a), left and right

top sections of the pillow may have taper shapes stretching upward from below. By virtue of the taper shapes, the pillow can be deformed in a more appropriate state. In the taper shapes, the degree of tapering is not particularly limited, and may vary depending on the size of the pillow, the volume of the filler material, the content volume of the bag body, and the like. The top section means a part of about 1/3 of the maximum length in the direction of gravity from the top of the pillow.

[0012]

When the position of the pillow, at which the disc is placed, is near the center of the top surface of the pillow that is placed upright such that the maximum length direction of the pillow becomes parallel to the direction of gravity, it is preferable that the disc reaches the bottom only near the center, and the height of the pillow before applying the force to the disc is substantially equal to the height of the pillow in the state in which the disc reaches the bottom. By the height being substantially equal, the pillow can be deformed in a more appropriate state.

The size of the pillow is not particularly limited. For example, when the pillow is placed on the floor such that the maximum length direction is parallel to the floor, and a person (for example, an adult: the body height of 150 to 170 cm is assumed) lies on the pillow in the supine position, the pillow may have such a size as to be capable of placing on the pillow only the head, only the shoulders, only the back, only the buttocks, only the thighs, the part from the head to the shoulders, the part from the head to the back, the part from the head to the buttocks, the part from the head to the thighs, the part from the shoulders to the back, the part from the shoulders to the buttocks, the part from the shoulders to the thighs, the part from the back to the buttocks, the part from the back to the thighs, or the part from the buttocks to the thighs.

The shape of the pillow is not particularly limited. Examples of the shape include various shapes such as a cylindrical shape, an egg shape, a spherical shape, a pyramidal shape, a rectangular parallelepipedic shape, a cubic shape, a rugby-ball shape, a sheet shape, an oval shape, and a character shape (for example, an animal, or a character in animation or a comic).

The pillow is suitable for use on a relatively soft member, such as a bed, a futon, a sofa, a rag, or a tatami.

[0013]

(1) Bag body and filler material

The pillow includes at least a bag body, at least a part of which is stretchable, and a filler material in the bag body. The materials for forming the bag body and filler material are not particularly limited, if the materials can provide the pillow with such a property that a disc reach to the bottom of the pillow by a force being applied via the disc.

(1a) Bag body

It suffices that at least a part of the bag body is stretchable. In other words, the bag body may include a non-stretchable part and a stretchable part. From the standpoint of deformability in more various shapes, it is preferable that the entirety of the bag body has stretchability.

The bag body may be formed of cloth material such as woven cloth, knitted cloth, nonwoven cloth or plastic sheet. The thickness of the cloth material is not particularly limited, if proper stretchability is given to the bag body. The material for forming the bag body may be cotton, linen, silk, wool, or synthetic fabric (for example, Spandex: polyurethane elastic fiber), or may be blended fabric.

It is preferable that the bag body has a stretchability of 10 to 500%. The stretchability is preferably 50 to 400%, and is more preferably 100 to 300%. Here, the stretchability means, for example, a value measured in the following manner. A test piece of a tensile distance of 10 cm × a width of 2.5 cm is cut out of the bag body. The test piece is stretched at a rate of 30 cm/minute by a general tensile tester, and a ductility at a time of a load of 9.8 N is calculated by the equation below. The measurement is conducted with respect to the longitudinal direction and transverse direction of the test piece. An average value of ductilities in the longitudinal direction and transverse direction is defined as the stretchability.

$$\text{Ductility (\%)} = \{\text{test piece length (cm) at time of 9.8 N load} - 10\} / 10 \times 100$$

[0014]

(1b) Filler material

The filler material is not particularly limited, and examples of the filler material include foam beads, urethane foam, cotton, nonwoven fabric, resin pipe, a three-dimensional coupled body of resin fibers, a gel, rubber, sand, air, and the like. These filler materials may be used singly, or may be used as a mixture. It is preferable that the

filler material includes foam beads (for example, 50 weight% or more, 55 weight% or more, 60 weight% or more, 65 weight% or more, 70 weight% or more, 75 weight% or more, 80 weight% or more, 85 weight% or more, 90 weight% or more, or 95 weight% or more), and the entirety of the filler material may be foam beads.

5 The form beads being present under the buttocks serve as rolling elements like a ball bearing, when the person rolls over on the pillow, and thereby such an advantageous effect that the person can easily roll over can be obtained. This advantageous effect is more greatly exhibited when the person lies down such that at least the buttocks reach to the pillow that is placed on the floor such that the maximum
10 length direction becomes parallel, and the buttocks reach to the bottom of the pillow. Since the foam beads tend to be easily charged with static electricity and tend to easily adhere to the bag body, the foam beads are not easily completely removed in the bottom-reaching part. Therefore, since some of the foam beads remain in the bottom-reaching part, such foam beads tend to easily serve as rolling elements.

15 Among the foam beads, polystyrene foam beads having surfaces, to which a flow-accelerator adheres, and having an average particle size in the range of 200 to 2000 μm , are preferable. Since the fluidity of the polystyrene foam beads is high, a pillow that is deformable in more various shapes can be provided. The average particle size is more preferably in the range of 400 to 1500 μm , and is still more preferably in
20 the range of 400 to 1000 μm .

 The average particle size can be measured by performing classification by stacking sieves of predetermined apertures and vibrating the sieves. For example, the average particle size can be measured as follows. Classification is performed by JIS
25 standard sieves with apertures of 4.00 mm (4000 μm), apertures of 3.35 mm, apertures of 2.80 mm, apertures of 2.36 mm, apertures of 2.00 mm, apertures of 1.70 mm, apertures of 1.40 mm, apertures of 1.18 mm, apertures of 1.00 mm, apertures of 0.85 mm, apertures of 0.71 mm, apertures of 0.60 mm, apertures of 0.50 mm, apertures of 0.425 mm, apertures of 0.355 mm, apertures of 0.300 mm, apertures of 0.250 mm, apertures of 0.212 mm, and apertures of 0.180 mm (180 μm). Based on a cumulative
30 weight distribution curve obtained from this result, a particle size (median size) at which the cumulative weight becomes 50% is set as an average particle size. Alternatively, classification may be performed by stacking all the sieves having the above aperture

values from the sieve with the smallest aperture value, in the order from the apertures of 0.180 mm, apertures of 0.212 mm, apertures of 0.250 mm, apertures of 0.300 mm, apertures of 0.355 mm, apertures of 0.425 mm, apertures of 0.50 mm, apertures of 0.60 mm, apertures of 0.71 mm, apertures of 0.85 mm, apertures of 1.00 mm, apertures of 1.18 mm, apertures of 1.40 mm, apertures of 1.70 mm, apertures of 2.00 mm, apertures of 2.36 mm, apertures of 2.80 mm, apertures of 3.35 mm and apertures of 4.00 mm, and, based on the obtained cumulative weight distribution curve, a particle size (median size) at which the cumulative weight becomes 50% may be set as an average particle size.

[0015]

(2) Others

The pillow may be covered with a cover. The size of the cover may be equal to, or larger than, the size of the pillow. On the other hand, the content volume of the bag body can be substituted for the size of the pillow. The size of the cover can be set to be one to three times the size of the pillow (content volume ratio). A bag body and a cover, which are equal in size, may be formed of non-stretchable films, and the amount of air filled in the cover can be substituted for the content volume.

The same cloth material and forming material as the bag body can be used for the cover. The cloth material and forming material for the cover may be identical to or different from those for the bag body. It is preferable that the stretchability of the cover is substantially equal to, or higher than, the stretchability of the bag body.

[0016]

(Embodiment 1)

FIG. 4 to FIG. 10 illustrate a pillow of Embodiment 1. The bag body, which constitutes the pillow, is formed of Spandex fabric (polyester 85%, polyurethane 15%) with a stretchability of about 250%, and the filler material is polystyrene foam beads having an average particle size in the range of about 400 to 1500 μm .

FIG. 4(a) and FIG. 4(b) are photographs illustrating a state in which the pillow 1 is placed on the floor such that the maximum length direction of the bag body becomes parallel to the direction of gravity. FIG. 4(a) is a side photograph, and FIG. 4(b) is a top photograph.

As illustrated in FIG. 4, since the filler material is not overfilled in the pillow 1, the peak section is recessed in the inside of the pillow 1. In this state, for example, as

illustrated in a photograph of FIG. 5(a), the pillow 1 can be used such that a person sits on the peak section. By sitting on the peak section, the pillow 1 largely deforms in such a manner as to wrap the body by the movement of the filler material and the stretching of the bag body, and thus a great healing effect can be obtained. As illustrated in a photograph of FIG. 5(b), the pillow 1 can be used in a prone position. In this mode of use, the warping of the lower back in the prone state can be relaxed. A long-time prone posture, in some cases, may hurt the lower back due to the warping of the lower back. As illustrated in FIG. 5(b), by deforming the pillow 1, the warping of the lower back can be reduced, and therefore the pillow 1 has such an advantageous effect that the lower back is less easily hurt by the long-time prone posture.

As illustrated in FIG. 4(c), if the peak section of the pillow 1 is extended upward, a space (margin), in which the filler material is absent, can be formed in the top section of the pillow 1 at a length (X1) of 1/3 to 1/5 of the maximum length (X) of the pillow 1. The maximum length of the pillow 1 is about 1 m.

It was confirmed that when a disc with a diameter of 20 cm is placed on the pillow 1 and a force of 1 to 20 kg is applied to the disc in the direction of gravity, the disc reaches to the bottom of the pillow.

[0017]

FIG. 6(a) and FIG. 6(b) are photographs illustrating a state in which the pillow 1 is placed on the floor such that the maximum length direction of the bag body becomes parallel to the floor surface. FIG. 6(a) is a side photograph, and FIG. 6(b) is a top photograph. The maximum length in this state is about 1.5 m, and an average thickness is about 40 cm.

As illustrated in FIG. 6, since the filler material is not overfilled in the pillow 1, the pillow 1 spreads in parallel to the floor surface. In this state, for example, as illustrated in photographs of FIG. 7(a) and FIG. 7(b), the pillow 1 can be used in the supine or prone position. The pillow 1 has such a size that the part from the head to the buttocks can be mounted thereon. With the use in the supine or prone position, the pillow 1 stretches to the front and rear and to the left and right relative to the floor surface, by the movement of the filler material and the stretching of the bag body, and largely deforms in such a manner as to wrap the body, and therefore a great healing effect can be obtained.

In the case of the use in the supine position, the buttocks, at which the center of gravity of the whole body (center of gravity for human body) is located, reach to the bottom in the pillow 1. On the other hand, the part from the shoulders to the head and the lower parts of the thighs can be set in a raised state, since the filler material is present in these parts. In this state, the recess is formed by the movement of the filler material, and such a posture occurs that the lower back is properly bent. Conventionally, as regards a mat for bedding, it has been considered that the deformation of the mat along the outer contour of a person in such a manner to keep the erect posture (S-posture of the back) is effective to improve the healing-providing property and the quality of sleep. However, taking into account that a human evolved from a quadrupedal-walking animal, a posture close to a fetal posture (a posture in which the knees are slightly pulled to the breast, and the back is slightly hunched) is more effective to improve the healing-providing property and the quality of sleep. Like a baby stopping crying by taking the fetal posture, the pillow has an effect of relaxing tension of the body and mind of even an adult, and putting the adult at ease. In addition, it can be said that the posture obtained by the pillow 1 corresponds to a neutral body posture. The neutral body posture means a posture in which the least burden acts on an astronaut in a state of weightlessness. In other words, it is known that in a state of weightlessness, such a posture occurs that the back is slightly hunched and the thighs are lifted, and tension of muscles and the burden on the backbone become minimum. This neutral body posture can be taken by lying on the pillow 1.

Furthermore, by lifting the upper half of the body, there is a possibility of improving the symptoms of various diseases, such as reflux esophagitis, diseases of circulatory organs and respiratory organs (for example, sleep-apnea syndrome), diabetes, Alzheimer's disease, Parkinson's disease, multiple sclerosis, spinal injury, cerebral palsy, varix, chronic venous insufficiency, leg ulcer, psoriasis, arrhythmia, insomnia, migraine, dropsy, frequency urination, and the like.

In the case of use in the prone position, the filler material can be moved such that the pillow 1 has a desired shape. For example, by moving the filler material from under the lower back to under the shoulders, the warping of the lower back in the prone state can be relaxed. If the prone position is taken for a long time, in some cases, the lower back is hurt due to the warping of the lower back. Since the warping of the lower

back can be reduced by deforming the pillow 1, the pillow 1 has such an advantageous effect that even if the prone position is taken for a long time, the lower back is less easily hurt.

[0018]

5 As illustrated in FIG. 8(a) to FIG. 8(c), it is possible to easily roller over on the pillow 1. In particular, if the buttocks, at which the center of gravity of the whole body (center of gravity for human body) is located, are used as a fulcrum, it is easy to roller over. FIG. 8(a) illustrates a photograph of a supine position before roll-over, FIG. 8(b) illustrates a photograph of a lateral position during roll-over, and FIG. 8(c) illustrates a
10 photograph of a prone position after roll-over.

Even during the roll-over, the filler material (foam beads) flows (serves as rolling elements) while the bag body is stretching and contracting, and thereby the pillow 1 can easily deform in accordance with a change of the body. Specifically, at a part of contact between the pillow and the body (for example, buttocks), the body
15 (buttocks) reach to the bottom of the pillow, and at a part neighboring the part of contact, the filler material flows and thereby the pillow swells along the outer contour of the body. Thus, the body pressure can appropriately be dispersed such that the body pressure does not concentrate at one point in any of postures.

It was successfully confirmed by a body pressure dispersion meter that, by
20 using the pillow, the body pressure from the head to the legs disperses substantially uniformly in any of postures, compared to the case of not using the pillow.

In addition, when rolling over, the left and right swells are maintained, and a plan position of the body (buttocks) can be made substantially identical before and after the roll-over. This is because of both the stretchability of the bag body and the role of
25 the foam beads as rolling elements. Here, that the left and right swells are maintained does not have a strict meaning, and means that the numerical value of any of the width, height, area in plan view, an area in side view, volume, and the like of the left and right swells becomes substantially equal as the pillow 1. For example, it is allowed that these values vary within the range of $\pm 50\%$, $\pm 40\%$, $\pm 30\%$, $\pm 20\%$, or $\pm 10\%$. On the other
30 hand, in order that the plan position can be made substantially identical, it is allowed that the front, rear, left and right positions of the buttocks in plan view vary before and after the roll-over in the range of $\pm 30\text{cm}$, $\pm 20\text{cm}$, $\pm 15\text{cm}$, $\pm 10\text{cm}$, or $\pm 5\text{cm}$.

Moreover, as illustrated in FIG. 9(a) and FIG. 9(b), the pillow 1 has such an advantageous effect that, when a person lies on the pillow 1 via cloth (for example, cloth with low stretchability) 4 in the supine or prone position, and then a carer (someone else) pulls the cloth 4, it becomes easier to change the body posture with a smaller force (than in the case of lying directly on the cloth without the pillow). FIG. 9(a) illustrates a photograph of a case of lying on the pillow 1 in the supine position via the cloth 4, and FIG. 9(b) illustrates a photograph of a case where the body posture is changed to the lateral position by pulling the cloth 4. It becomes easier to change the body posture, by the mechanism in which the filler material being present under the cloth serves as rolling elements between the floor and the cloth 4. The pillow 1, which makes it easier to change the body posture with a smaller force, has such an advantageous effect that a person with difficulty in rolling over can prevent a bed sore occurring on a contact surface with the pillow 1 due to taking the same posture. In addition, the force of the carer, which is necessary for changing the body posture of a person requiring nursing care, can be reduced, there is also an advantageous effect that the occurrence of a backache of the carer can be suppressed. Besides, from FIG. 9(a) and FIG. 9(b), it is understood that the position in plan view of the buttocks is substantially identical before and after the pulling.

[0019]

The pillow 1 is also suitable for use on a sofa. For example, the pillow 1 can be used as illustrated in FIG. 10(a) and FIG. 10(b).

FIG. 10(a) illustrates a state of sitting, from the buttocks, on the pillow 1 placed on a sofa 5. In this state, the pillow 1 largely deforms along the shape of the back side from the thighs to the neck, and armrests are formed on sides of the body by the movement of the filler material. Thus, since a feeling of wrapping of the whole body is obtained, it is possible to sit on the sofa more relaxedly.

FIG. 10(b) illustrates a state of sitting such that the back reach to the pillow 1 placed along a side surface of the sofa 5. By pressing the back against the side surface of the sofa 5, the pillow 1 largely deforms along the shape of the back side, and armrests are formed by the movement of the filler material to the sides of the body. Since the amount of the pillow 1 on the back side is greater than the case of the sitting from the buttocks, the feeling of wrapping of the body on the back side can be made greater than

in the case of FIG. 10(a).

[0020]

(Embodiment 2)

FIG. 11 to FIG. 17 illustrate a pillow of Embodiment 2. In this pillow, the same
5 Spandex fabric (bag body) and polystyrene foam beads (filler material) as in
Embodiment 1 are used. In Embodiment 2, the use mainly as a pillow is assumed.

FIG. 11(a) and FIG. 11(b) are photographs illustrating a state in which the
pillow 1 is placed on the floor surface such that the maximum length direction of the
bag body becomes parallel to the direction of gravity. FIG. 11(a) is a side photograph,
10 and FIG. 11(b) is a top photograph.

If a peak section of the pillow 1 is extended upward, as illustrated in FIG.
11(c), a space (margin), in which the filler material is absent, can be formed in a top
section of the pillow 1 at a length (X1) of $1/3$ to $1/5$ of a maximum length (X) of the
pillow 1. The maximum length of the pillow 1 is about 90 cm.

15 It was confirmed that when a disc with a diameter of 20 cm is placed on the
pillow 1 and a force of 1 to 20 kg is applied to the disc in the direction of gravity, the
disc reaches to the bottom of the pillow.

[0021]

FIG. 12(a) and FIG. 12(b) are photographs illustrating a state in which the
20 pillow 1 is placed on the floor surface such that the maximum length direction of the
bag body becomes parallel to the floor surface. FIG. 12(a) is a side photograph, and
FIG. 12(b) is a top photograph. The maximum length in this state is about 1 m, and an
average thickness is about 20 cm.

As illustrated in FIG. 12, since the filler material is not overfilled in the pillow
25 1, the pillow 1 spreads in parallel to the floor surface. In this state, for example, as
illustrated in photographs of FIG. 13(a) and FIG. 13(b), the pillow 1 can be used in the
supine or prone position. The pillow 1 has such a size that the part from the head to the
buttocks can be mounted thereon. With the use in the supine or prone position, the
pillow 1 stretches to the front and rear and to the left and right relative to the floor
30 surface, by the movement of the filler material and the stretching of the bag body, and
largely deforms in such a manner as to wrap the part from the head to the buttocks, and
therefore a great healing effect can be obtained.

In addition, at a part of contact between the pillow and the part from the head to buttocks, the buttocks reach to the bottom of the pillow, and at a part neighboring the part of contact, the filler material flows and thereby the pillow 1 swells along the outer contour of the part from the head to buttocks. Thus, the body pressure can appropriately be dispersed such that the body pressure does not concentrate at one point in any of postures.

Moreover, even during the roll-over, the filler material flows (serves as rolling elements) while the bag body is stretching and contracting, and thereby the pillow 1 can easily deform in accordance with a change of the upper half of the body. For example, a photograph of FIG. 13(c) illustrates a state of a lateral position during a transition from the supine position to the prone position.

It was successfully confirmed by a body pressure dispersion meter that, by using the pillow, the body pressure from the head to the legs disperses substantially uniformly in any of postures, compared to the case of not using the pillow.

Also, with the pillow of Embodiment 2, like Embodiment 1, it is confirmed that the roll-over can easily be performed because (i) the buttocks reach to the bottom of the pillow and (ii) the foam beads being present under the buttocks serve as rolling elements, when rolling over on the pillow.

In addition, in the case of the use in the supine position, the buttocks reach the bottom of the pillow 1. On the other hand, the part from the shoulders to the head is set in a raised state since the filler material moved from the part of the buttocks is present under the part from the shoulders to the head. In this state, the part from the head to the buttocks is wrapped in the pillow 1, and the lower back takes such a posture as being properly bent. By taking this posture, an improvement of a healing-providing property and an improvement of the quality of sleep can be expected.

Moreover, a cover 1a illustrated in a plan view of FIG. 14(a), a back-surface view of FIG. 14(b) and a side view of FIG. 14(c) can be put on the pillow 1. The cover 1a, like the pillow 1, is formed of stretchable cloth. It is preferable that the cover 1a has a stretchability that is equal to or greater than that of the bag body. The cover 1a may be formed of the same fabric as the bag body, or may be formed of a different fabric (for example, fabric of polyester and polyurethane).

Like Embodiment 1, the pillow 1 is suitable for the use by sitting on the peak

section and the use in the prone position, as illustrated in FIG. 15(a) and FIG. 15(b), and is also suitable for the use on a sofa, as illustrated in FIG. 16(a) and FIG. 16(b). In addition, like Embodiment 1, as illustrated in FIG. 17(a) and FIG. 17(b), the body posture can easily be changed with a small force via the cloth 4 with low stretchability.

[0022]

(Embodiment 3)

FIG. 18 to FIG. 20 illustrate a pillow of Embodiment 3. In this pillow, the same Spandex fabric (bag body) and polystyrene foam beads (filler material) as in Embodiment 1 are used. Embodiment 3 illustrates a pillow that is assumed to be used for the part from the head to shoulders.

FIG. 18(a) and FIG. 18(b) are photographs illustrating a state in which the pillow 1 is placed on the floor surface such that the maximum length direction of the bag body becomes parallel to the direction of gravity. FIG. 18(a) is a side photograph, and FIG. 18(b) is a top photograph.

If a peak section of the pillow 1 is extended upward, as illustrated in FIG. 18(c), a space (margin), in which the filler material is absent, can be formed in a top section of the pillow 1 at a length (X1) of $1/3$ to $1/5$ of a maximum length (X) of the pillow 1. The maximum length of the pillow 1 is about 55 cm.

It was confirmed that when a disc with a diameter of 20 cm is placed on the pillow 1 and a force of 1 to 20 kg is applied to the disc in the direction of gravity, the disc reaches to the bottom of the pillow.

[0023]

FIG. 19(a) and FIG. 19(b) are photographs illustrating a state in which the pillow 1 is placed on the floor surface such that the maximum length direction of the bag body becomes parallel to the floor surface. FIG. 19(a) is a side photograph, and FIG. 19(b) is a top photograph. The maximum length in this state is about 1 m, and an average thickness is about 30 cm.

As illustrated in FIG. 19, since the filler material is not overfilled in the pillow 1, the pillow 1 spreads in parallel to the floor surface. In this state, for example, as illustrated in photographs of FIG. 20(a) and FIG. 20(b), the pillow 1 can be used in the supine or prone position. The pillow 1 has such a size that the part from the head to shoulders (the upper half of the body) can be mounted thereon. With the use in the

supine or prone position, the pillow 1 stretches to the front and rear and to the left and right relative to the floor surface, by the movement of the filler material and the stretching of the bag body, and largely deforms in such a manner as to wrap the upper half of the body, and therefore a great healing effect can be obtained.

5 In addition, at a part of contact between the pillow and the upper half of the body, the upper half of the body reach to the bottom of the pillow, and at a part neighboring the part of contact, the filler material flows and thereby the pillow 1 swells along the outer contour of the upper half of the body. Thus, the body pressure can appropriately be dispersed such that the body pressure does not concentrate at one point
10 in any of postures.

It was successfully confirmed by a body pressure dispersion meter that, by using the pillow, the body pressure from the head to the legs disperses substantially uniformly in any of postures, compared to the case of not using the pillow.

Moreover, even during the roll-over, the filler material flows (serves as rolling
15 elements) while the bag body is stretching and contracting, and thereby the pillow 1 can easily deform in accordance with a change of the upper half of the body. For example, a photograph of FIG. 20(c) illustrates a state of a lateral position during a transition from the supine position to the prone position.

Also, with the pillow of Embodiment 3, like Embodiment 1, it is confirmed
20 that the roll-over can easily be performed because, when lying down on the buttocks, (i) the buttocks reach to the bottom of the pillow and (ii) the foam beads being present under the buttocks serve as rolling elements, when rolling over on the pillow.

[0024]

(Embodiment 4)

25 Embodiments 1 to 3 exemplarily illustrate the pillows, in each of which the bag body includes one air chamber. The pillow of the present invention may be configured such that the bag body is divided by a partition wall into a plurality chambers, which are two or more air chambers. It suffices that at least one of the air chambers has the above-described properties (i) and (ii). The other air chambers may have, or may not have, the
30 properties (i) and (ii). The partition wall may be formed by attaching another cloth within the bag body, or may be formed by directly attaching a bag body. When a plurality of air chambers is provided, the kind of filler material may be changed, or may

not be changed, from air chamber to air chamber. Moreover, the filling ratio may be changed from air chamber to air chamber.

FIG. 21 is a schematic plan view illustrating a state in which the pillow 1 including two air chambers is placed on the floor surface such that the maximum length direction thereof becomes parallel to the floor surface. The pillow of FIG. 21 is divided into two air chambers by directly sewing a bag body thereon. In the Figure, 6 denotes a sewing portion, 7a denotes a small air chamber, and 7b denotes a large air chamber.

For example, the small air chamber 7a is overfilled, and the large air chamber 7b is provided with the above-described properties (i) and (ii), and thereby the small air chamber 7a can be used as a pillow, and the large air chamber 7b can be used as a bottom mattress. This pillow that is integrated with a pillow has such advantageous effects that a person can very easily roll over and the head can be kept at a proper height.

REFERENCE SIGNS LIST

[0025]

1: Pillow

1a: Cover

2: Disc

3: Weight

4: Cloth

5: Sofa

6: Sewing portion

7a: Small air chamber

7b: Large air chamber.

CLAIMS

1. A pillow comprising at least a bag body, at least a part of which is stretchable,
and a filler material in the bag body,
wherein the pillow is used by a person,
5 the filler material includes foam beads,
a space, in which the filler material is absent, is formed in a top section of the
pillow at a length of $1/10$ to $2/3$ of a maximum length of the pillow, when the pillow is
placed upright on a floor such that a maximum length direction of the pillow becomes
parallel to a direction of gravity and a peak section of the pillow is extended upward
10 such that an area of contact between the floor and the pillow is invariable, and
buttocks reach to a bottom of the pillow when the person lies down such that at
least the buttocks reach to the pillow that is placed on the floor such that the maximum
length direction becomes parallel.

15 2. The pillow of Claim 1,
wherein the pillow comprises at least a bag body, at least a part of which is
stretchable, and a filler material in the bag body,
wherein the pillow is used by a person,
the filler material includes foam beads,
20 a space, in which the filler material is absent, is formed in a top section of the
pillow at a length of $1/10$ to $2/3$ of a maximum length of the pillow, when the pillow is
placed upright on a floor such that a maximum length direction of the pillow becomes
parallel to a direction of gravity and a peak section of the pillow is extended upward
such that an area of contact between the floor and the pillow is invariable,
25 buttocks reach to a bottom of the pillow when the person lies down such that at
least the buttocks reach to the pillow that is placed on the floor such that the maximum
length direction becomes parallel, and
when the person rolls over on the pillow, the foam beads being present under
the buttocks serve as rolling elements, thereby enabling the person to roll over easily.

30 3. The pillow of Claim 1 or 2,
wherein the pillow placed on the floor swells on a left and a right of the

buttocks by a movement of the foam beads, and

when the person rolls over, left and right swells are maintained and a position in plan view of the buttocks is substantially identical before and after the person rolls over, by stretchability of the bag body and a role of the foam beads as the rolling elements.

4. The pillow of any one of Claims 1 to 3, wherein when the person lies on the pillow via cloth in a supine or prone position and then a someone else pulls the cloth, the filler material being present under the cloth serves as the rolling elements, and thereby a body posture is easily changed with a small force and a plan position of the buttocks is substantially identical before and after the pulling.

5. The pillow of any one of Claims 1 to 4, further comprising a recess formed by the filler material moving such that the buttocks reach to the bottom of the pillow and an upper half of a body and thighs do not reach to the bottom in a state in which the person lies down such that at least the buttocks reach to the pillow.

6. The pillow of any one of Claims 1 to 5, wherein the maximum length of the pillow is 20 cm to 3 m.

7. The pillow of any one of Claims 1 to 6, wherein when the pillow is placed on a floor surface such that the maximum length direction becomes parallel to the floor surface and the person lies on the pillow in a supine position, the pillow has such a size as to be capable of mounting thereon a part from a head to the buttocks.

8. The pillow of any one of Claims 1 to 7, wherein the bag body has a stretchability of 10 to 500%.

9. The pillow of any one of Claims 1 to 8, wherein the person is an adult.

10. The pillow of any one of Claims 1 to 9, wherein the pillow being a pillow comprises at least a bag body, at least a part

of which is stretchable, and a filler material in the bag body,

a space, in which the filler material is absent, is formed in a top section of the pillow at a length of $1/10$ to $2/3$ of a maximum length of the pillow, when the pillow is placed upright on a floor such that a maximum length direction of the pillow becomes parallel to a direction of gravity and a peak section of the pillow is extended upward such that an area of contact between the floor and the pillow is invariable, and

when a disc with a diameter of 20 cm is placed on the pillow and a force of 1 to 20 kg is applied to the disc in the direction of gravity, the disc reaches to the bottom of the pillow.