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(54) **PILLOW**

(57) A main supporter of a pillow has surface contact with and applies pressure on, at least, first and second regions between superior and inferior nuchal lines on an occipital bone of a supine person. The first region ranges from a left end of a portion of a trapezius muscle to a portion of a left sternocleidomastoid muscle; both the portions attach to the occipital bone. The second region ranges from a right end of the portion of the trapezius muscle to a portion of a right sternocleidomastoid muscle attaching to the occipital bone. A sub-supporter of the pillow, which is lower than the main supporter, applies pressure on the head on a superior side of the superior nuchal line. The pillow lacks members under, at least, a region from the first to second cervical vertebrae and a region of the temporal muscle; the members apply pressure on the regions.

FIG.2A

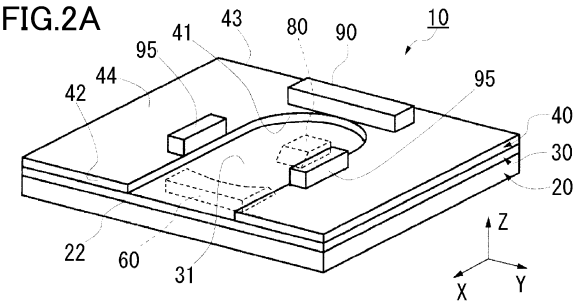
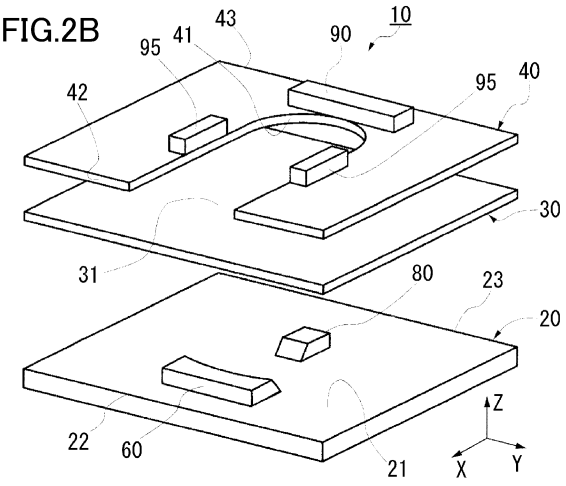


FIG.2B



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Description

TECHNICAL FIELD

[0001] The invention relates to pillows, in particular, their function of making their users breathe comfortably.

BACKGROUND ART

[0002] Breathing comfortably in any sleeping posture is necessary for quality of sleep. Accordingly, pillows are required to have the function of making their users breathe comfortably. In particular, to ease breathing of a supine person, a pillow needs to keep his/her head at an appropriate angle. If the head bends too forward, i.e. the chin is excessively lowered, the compressed airway can cause the person to be short of breath. If the head bends too backward, i.e. the chin is excessively lifted, the root of tongue falling in the throat can cause the person to suffer from sleep apnea. For example, Patent Literature 1 discloses a pillow supporting a region ranging from the neck to the back of the head to decrease stress on the back of the head and prevent the chin from being lowered.

CITATION LIST

[Patent Literature]

[0003] Patent Literature 1: JP 2020-081248 A

SUMMARY OF INVENTION

[Technical Problem]

[0004] A pillow such as one disclosed in Patent Literature 1 distributes pressure over a broad region ranging from the back of the head to the neck, and thus, the pillow allows the head to be easily displaced. Especially when the head moves in a longitudinal direction of the pillow, i.e. the superior-inferior direction of the human body, the center of the pressure distribution can easily and significantly deviate from the gravity center of the head in the longitudinal direction of the pillow. This causes torque to tilt the head largely and prevent breathing.

[0005] An object of the invention is to solve the above-mentioned problems. Focusing on the head easily displaced in a longitudinal direction of an ordinary pillow, the invention aims to provide a pillow that effectively prevents the displacement of the head at the start of the motion thereof, thus keeping the head stable to prevent it from being largely tilted. The pillow, in addition, does not have any negative effect on breathing of the person; on the contrary, the pillow enables the person to breathe comfortably.

[Solution to Problem]

[0006] A pillow according to the invention includes a main supporter and a sub-supporter. The main supporter is an elastic member protruding upward and configured to support, at least, first and second regions between superior and inferior nuchal lines on an occipital bone of a supine person by having surface contact with and applying pressure on the first and second regions. The first region ranges from a left end of a portion of a trapezius muscle of the person to a portion of a left sternocleidomastoid muscle of the person; both the portions attach to the occipital bone. The second region ranges from a right end of the portion of the trapezius muscle to a portion of a right sternocleidomastoid muscle of the person attaching to the occipital bone. The sub-supporter is an elastic member designed to be lower in supporting position than the main supporter. The sub-supporter is configured to support a portion of a head of the person on a superior side of the superior nuchal line by applying pressure on the portion of the head. The pillow is characterized by lacking members under, at least, a region ranging from the first to the second cervical vertebra of the person and a region of a temporal muscle of the person; the members are configured to support the regions by applying pressure thereon. Hereinafter, the first region is referred to as a "left fixed region," and the second region is as a "right fixed region." Although typical pillows include pillow covers, the pillow according to the invention may include no pillow cover.

[0007] In this disclosure, the "occipital bone" means a dished bone SA defining the back and the bottom of the skull (cf. FIGS. 1A and 1B). An "external occipital protuberance" means a convex portion SA1 at the center of the outer surface of the occipital bone SA. The "superior nuchal line" means an arching line SA4 extending in the left-right direction from a point immediately inferior to the external occipital protuberance SA1 to the root of a mastoid process SC1, as shown in FIG. 1B. The "inferior nuchal line" means an arching line SA5 located on the inferior side of the superior nuchal line and extending in the left-right direction between the tip (or inferior) ends of the left and right mastoid processes SC1, as shown in FIG. 1B. "Parietal bones" mean a pair of rectangular bones SB defining the vertex and the left- and right-superior portions of the skull. "Temporal bones" mean a pair of trapezoidal bones SC defining the left- and right-inferior portions of the skull. As shown in FIG. 1A, an attaching portion MB 1 of the sternocleidomastoid muscle MB ranges from a portion of the superior nuchal line SA4 on the occipital bone SA to another portion of the superior nuchal line SA4 on the temporal bone SC, further reaching the mastoid process SC1 of the temporal bone SC.

[0008] In this disclosure, "the sub-supporter is designed to be lower in supporting position than the main supporter" means that the sub-supporter is designed to become lower than the main supporter when the sub and main supporters receive corresponding portions of the head of a supine person and reduce their heights.

[0009] "To support a portion of a supine person by

applying pressure on the portion" means to apply an elastically repulsive force on the portion and support the portion at a desired height. The elastically repulsive force is a reaction force when the pillow receives the weight of the portion (or the body pressure thereof), i.e. elastic pressure that the pillow pushes back against the portion. If the pillow merely contacts the portion, or the elastically repulsive force is negligibly weak, the pillow does not support the portion at a desired height by applying pressure on the portion. "To support the portion by having surface contact with and applying pressure on the portion" means to have surface contact with the portion while supporting the portion at a desired height by the elastically repulsive force. If a linear region of the pillow pushes only a linear region of the portion, the pillow does not have surface contact with the portion since it cannot support the portion stably. In contrast, to have surface contact with the portion includes to support the portion by a matrix of many protrusions each having point contact with the portion. Although each point contact has a significantly smaller contact area than surface contact, the entirety of the matrix can support the portion as stably as when the pillow has surface contact with the portion.

[0010] "The pillow lacks a member configured to support, at least, the region ranging from the first to the second cervical vertebra by applying pressure on the region" means that the pillow lacks a supporting member that actively applies an elastically repulsive force on the region to impose a significantly negative effect on the main supporter on which the weight of the head is to be focused. "The pillow lacks a member configured to support the region of the temporal muscle by applying pressure on the region" means that the pillow lacks a supporting member that actively applies an elastically repulsive force on the region to firmly compress the temporal muscle and easily cause interruption of blood flow. The phrase "the pillow lacks a member configured to apply pressure at a place" means that the pillow has a void at the place, or the pillow has a modified structure not to actively apply pressure at the place. However, the phrase is not limited to such meanings, and it also means that, even if a member is present at the place, the member is enormously soft so that it neither imposes any significantly negative effect on the main supporter nor firmly compresses the temporal muscle to easily cause interruption of blood flow.

[Advantageous Effect of Invention]

[0011] The pillow according to the invention focuses the weight of the head on the main supporter, for example, for the following reasons: The sub-supporter is designed to be lower in supporting position than the main supporter; The main supporter supports left and right fixed regions SA7 of the occipital bone SA (cf. FIG. 1B), which are located at obliquely upward positions with respect to the main supporter, by having surface contact with and applying pressure on the fixed regions; The left and right fixed regions SA7 are near the gravity center G of the head (cf. FIG. 4B); The weight of the head is not distributed over the regions under the first cervical vertebra C1, the second cervical vertebra C2, and the temporal muscle MA. Focusing the weight of the head on the main supporter can prevent the head from easily starting to move in the longitudinal direction of the pillow, thus effectively preventing the significant displacement of the head and keeping the angle of the head more stable. In other words, the pillow can effectively prevent an easy and large tilt of the head, which has been considered as being difficult to prevent. Since the pillow according to the invention causes the main supporter to have surface contact with and apply pressure on the left and right fixed regions SA7 of the occipital bone SA, the pillow provides the user with no stress due to compression and imposes no negative effects on breathing of the user.

[0012] Since the pillow according to the invention lacks, at least, under the region ranging from the first cervical vertebra C1 to the second cervical vertebra C2 of the supine person, a member that supports the region by applying pressure thereon, the entirety of the cervical vertebrae C1-C7 naturally maintains a curved form similar to that when the person stands, so that the pillow does not compress the airway and muscles of the neck, esp. breathing muscles such as sternocleidomastoid muscles MB, anterior scalene muscle, middle scalene muscle, and posterior scalene muscle (not shown). As a result, the airway of the supine person can be cleared equally with that of a standing person, and thus, the supine person can breathe comfortably.

[0013] The supine person not always keeps his/her face directed upward during sleep, but he/she often turns the head slightly. Under the supine person in such a sleeping posture, the pillow according to the invention lacks a member supporting the temporal muscle MA by applying pressure thereon, and thus, the pillow does not cause the person to suffer from interruption of blood flow due to compression of the temporal muscle MA. Accordingly, the person cannot suffer from tension of the temporal muscle MA and other muscles in the neck and shoulder, dizzy spells, headache, and autonomic imbalance, and in addition, the person can breathe comfortably.

[0014] Preferably, the main supporter includes left- and right-sternocleidomastoid-muscle supporting portions 66 (cf. FIGS. 3 and 4A). The left-sternocleidomastoid-muscle supporting portion 66 supports a portion MB1 of the left sternocleidomastoid muscle MB by applying pressure thereon; the portion MB1 attaches to a region on the left temporal bone SC of the supine person, and the region ranges from the superior nuchal line S4 to the mastoid process SC1 (cf. FIGS. 1B and 4A). The right-sternocleidomastoid-muscle supporting portion 66 supports a portion MB1 of the right sternocleidomastoid muscle by applying pressure thereon; the portion MB1 attaches to a region on the right temporal bone SC of the supine person, and the region ranges from the superior

nuchal line S4 to the mastoid process. When applying upward pressure on the attaching portions MB1 of the left and right sternocleidomastoid muscles MB, the left- and right-sternocleidomastoid-muscle supporting portions 66 alleviate tension of the entire lengths of both the sternocleidomastoid muscles MB as well as the attaching portions MB1 thereof, thus improving movements of the sternocleidomastoid muscles MB during breathing, which smooths both expiration and inspiration to ease breathing.

[0015] When including the left- and right-sternocleidomastoid-muscle supporting portions 66, the main supporter is preferably formed into a tilted, arcuate, or stepwise shape such that the left- and right-sternocleidomastoid-muscle supporting portions 66 are higher than the center portion of the main supporter in the left-right direction, i.e. lateral portions of the main supporter is higher than the center portion thereof. This can effectively make up for shortage of the elastically repulsive forces of the left- and right-sternocleidomastoid-muscle supporting portions 66 at the attaching portions MB1 of the left and right sternocleidomastoid muscles MB.

[0016] Although the pillow according to the invention can effectively prevent from the displacement of the head in the longitudinal direction of the pillow as described above, a main limiter may be provided to reliably stop more forceful movement of the head in the superior direction. The main limiter is a protrusion located on the opposite side of the sub-supporter from the main supporter and higher than the sub-supporter (cf. the reference number 90 in FIGS. 4A, 6, and 8). The main limiter can be formed separately from or integrally with the sub-supporter.

[0017] The main supporter may be formed to be tilted or curved such that lateral portions thereof further away from a center portion thereof in the left-right direction of the person are nearer to the shoulder of the person (cf. the reference number 660 in FIG. 5A).

BRIEF DESCRIPTION OF DRAWINGS

[0018]

FIG. 1A is a perspective view of the skull of a person;
FIG. 1B is a view of the back of the head of the person;
FIG. 2A is a perspective view of a pillow according to a first embodiment of the invention;
FIG. 2B is an exploded view of the pillow shown in FIG. 2A;
FIG. 3 is a perspective view of the base shown in FIGS. 2A and 2B;
FIG. 4A is a top plan view of the pillow shown in FIGS. 2A and 2B;
FIG. 4B is a cross-section view along the center line CL shown in FIG. 4A;
FIG. 5A is a perspective view of a base according to a variation of the first embodiment of the invention;
FIG. 5B is a top plan view of the base shown in FIG. 5A;
FIG. 6 is an exploded view of a pillow according to a second embodiment of the invention;
FIG. 7 is a cross-section view of the pillow according to the second embodiment along a center line in the left-right direction;
FIG. 8 is an exploded view of a pillow according to a third embodiment of the invention;
FIG. 9A is a perspective view of a base according to another variation of the first embodiment of the invention; and
FIG. 9B is a top plan view of the base shown in FIG. 9A.

DESCRIPTION OF EMBODIMENTS

[First Embodiment]

[0019] FIG. 2A is a top perspective view of a pillow 10 according to a first embodiment of the invention, and FIG. 2B is an exploded view of the pillow 10. The pillow 10 is formed as a flat rectangular plate, and it includes three layers: a base (bottom layer) 20, a middle layer 30, and a surface layer 40. All the layers 20-40 are made of soft foam resin, formed as elastic and flat rectangular plates, and bonded with each other. The layers 20-40 have a longer edge extending in the left-right direction of the pillow 10 and a shorter edge extending in the longitudinal direction of the pillow 10. Among the layers 20-40, their longer edges have a common length, and their shorter edges have a common length. On the other hand, the base 20 has the largest thickness (height), and the middle layer 30 and the surface layer 40 have similar thicknesses.

[0020] FIG. 3 is a perspective view of the base 20. The top surface 21 of the base 20 is flat, and from it, only a main supporter 60 and a sub-supporter 80 protrude upward. Both the supporters 60 and 80 are made of soft foam resin harder than the layers 20-40 and bonded on the top surface 21 of the base 20. The main supporter 60 is formed as an elongated cuboid and located adjacent to a longer edge 22 of the base 20 (on the positive side of the X axis in the figures). The longer direction of the main supporter 60 is parallel to the longer edge 22 of the base 20. The sub-supporter 80 is formed as a cuboid shorter than the main supporter 60, located adjacent to another longer edge 23 of the main supporter 60 (on the negative side of the X axis in the figures), and separated from the main supporter 60. The longer direction of the sub-supporter 80 is parallel to the longer edge 23 of the base 20. Both the top surface 61 of the main supporter 60 and the top surface 81 of the sub-supporter 80 are rectangular planes parallel to the top surface 21 of the base 20 when they do not receive downward pressure.

[0021] As shown in FIGS. 2A and 2B, the surface layer 40 has an opening 41 above the main supporter 60 and the sub-supporter 80 (in the positive direction of the Z

axis). The opening 41 ranges from a longer edge 42 of the surface layer 40 (on the positive side of the X axis in the figures) to the center portion of the pillow 10, and the opening 41 exposes a portion 31 of the middle layer 30 covering the main supporter 60 and the sub-supporter 80. A main limiter 90 is provided between the opening 41 and another longer edge 43 of the surface layer 40 (on the negative side of the X axis in the figures), and a sub-limiter 95 is provided on each side of the opening 41 in the lateral direction of the pillow 10 (in the Y-axis direction in the figures). All the limiters 90 and 95 are made of soft foam resin, such as soft urethane foam, formed as elongated cuboids, and bonded on the top surface 44 of the surface layer 40. The main limiter 90 extends parallel to the left-right direction of the pillow 10 (the Y-axis direction in the figures), and the sub-limiters 95 extend parallel to the longitudinal direction of the pillow 10 (the X-axis direction in the figures).

[0022] FIG. 4A is a top plan view of the pillow 10, and FIG. 4B is a cross-section view of the pillow 10 along the center line CL shown in FIG. 4A. The head HD of a supine person is housed inside the opening 41 of the surface layer 40 and placed on the top surface 61 of the main supporter 60 and the top surface 81 of the sub-supporter 80. Since the middle layer 30, which is made of soft elastic sheet material, covers the main supporter 60 and the sub-supporter 80, the person hardly feels presence of corners of the supporters 60 and 80 in contact with the head HD. On the contrary, the person feels that the supporters 60 and 80 are softer than when the person directly contacts them. In addition, the main limiter 90 and the sub-limiters 95 are designed to restrict movement of the head HD immediately before it goes beyond an acceptable level. In other words, the side surface 91 of the main limiter 90 blocks displacement of the head HD from the opening 41 of the surface layer 40 toward the longer edge 43 of the surface layer 40 (in the negative direction of the X axis in the figures), and the side surfaces of the sub-limiters 95 block displacement of the head HD from the opening 41 toward the shorter edges of the surface layer 40 (in the Y-axis direction in the figures).

[Details of Main and Sub-Supporters]

[0023] As shown in FIGS. 3 and 4A, both the top surface 61 of the main supporter 60 and the top surface 81 of the sub-supporter 80 are symmetric with respect to their center line CL in the left-right direction (in the Y-axis direction in the figures).

[0024] As shown in FIG. 3, the width W1 of the top surface 61 of the main supporter 60 in the left-right direction of the pillow 10 (in the Y-axis direction in the figures) is larger than the width W2 of the top surface 81 of the sub-supporter 80. As shown in FIG. 4A, the width W1 is smaller than the width of the head HD; more specifically, the width W1 is slightly smaller than the width between the left and right ears. The top surface 61 of the main supporter 60 is designed such that its superior edge has the center in the left-right direction at the center of the superior nuchal line SA4 of the supine person shown in FIG. 1B, and its inferior edge has the center in the left-right direction on the inferior side of the center of the inferior nuchal line SA5 of the person shown in FIG. 1B and adjacent to the inferior edge of the occipital bone SA. The top surface 61 of the main supporter 60 has lateral portions in the left-right direction, whose superior edges are curved in the longitudinal direction of the pillow 10 (the X-axis direction in the figures) such that portions further away from the center in the left-right direction are more largely displaced in the superior direction, thus causing the top surface 61 to have a larger area. As a result, the top surface 61 of the main supporter 60 supports left and right fixed regions SA7 of the supine person (cf. FIG. 1B) by having surface contact with and apply pressure on the fixed regions. The left fixed region SA7 ranges from the left edge TR1 of a portion of the trapezius muscle TR to a portion MBP of the left sternocleidomastoid muscle. Both the portions attach to the occipital bone SA. The right fixed region SA7 ranges from the right edge TR2 of the portion of the trapezius muscle TR to a portion MBP of the right sternocleidomastoid muscle attaching to the occipital bone SA. In addition, each lateral end of the main supporter 60 is integrated with one of sternocleidomastoid-muscle supporting portions 66 that extend from the lateral ends in the left-right direction (cf. FIGS. 3 and 4A). The sternocleidomastoid-muscle supporting portions 66 use their top surfaces to apply upward pressure on the portions MB1 of the left and right sternocleidomastoid muscles attaching to the regions on the temporal bones SC, which range from the superior nuchal line S4 to the mastoid processes SC1.

[0025] As shown in FIG. 3, the height H1 of the top surface 61 of the main supporter 60 from the top surface 21 of the base 20 is larger than the height H2 of the top surface 81 of the sub-supporter 80. For example, the height H1 of the top surface 61 of the main supporter 60 falls within the range from 3 cm to 9 cm, while the height H2 of the top surface 81 of the sub-supporter 80 falls within the range from 1 cm to 5 cm. For the design of the heights H1 and H2, supporting positions of the supporters 60 and 80 when the weight of the head HD is applied to the supporters 60 and 80 to decrease their heights are more important than the original heights H1 and H2 of the supporters 60 and 80 when the weight of the head HD is not applied to the supporters 60 and 80. In this embodiment, the supporting position of the main supporter 60 is designed to be higher than that of the sub-supporter 80 as shown in FIG. 4B.

[0026] As shown in FIGS. 4A and 4B, the main supporter 60 is located on the superior side of the first cervical vertebra C1 of the supine person, and the pillow 10 lacks any member that supports, at least, the region ranging from the first cervical vertebra C1 to the second cervical vertebra C2 by applying upward pressure on the region. The pillow 10 also lacks any member that supports the temporal muscles MA by applying upward pressure

thereon. Accordingly, neither the region ranging from the first cervical vertebra C1 to the second cervical vertebra C2 nor the temporal muscles MA receive upward pressure from the pillow 10.

[Variations of First Embodiment]

[0027]

(A) The above-described shapes, sizes, and hardnesses of the base 20, middle layer 30, and surface layer 40 are mere examples, and thus, they may be changed in various manners. In particular, the middle layer 30 and the surface layer 40 may have quite different thicknesses, the three layers 20, 30, and 40 may have quite different hardnesses.

(B) Neither the top surface 61 of the main supporter 60 nor the top surface 81 of the sub-supporter 80 is limited to a plane parallel to the top surface 21 of the base 20. The top surface 61 of the main supporter 60 may be formed into a tilted, arcuate, or stepwise shape such that the left- and right-sternocleidomastoid-muscle supporting portions 66 are higher than the center portion of the main supporter 60. Both the top surface 61 of the main supporter 60 and the top surface 81 of the sub-supporter 80 have angular circumferences, but this is not necessary for the invention. One or both of the top surfaces 61 and 81 may have a circumference without corners by chamfering or rounding.

(C) In the pillow 10, the base 20, middle layer 30, and surface layer 40 are bonded with each other. The pillow according to the invention is, however, not limited to such a laminated structure. All the layers may be integrally formed. The middle layer 30 and the surface layer 40 are not necessary for the invention, and thus, one or both of them may be omitted. Instead of the middle layer 30 covering the entirety of the top surface 21 of the base 20, a film or sheet softer than any of the main supporter 60 and the sub-supporter 80 may cover only the supporters 60 and 80. Stuffing such as cotton, which is so flexible that its elastically repulsive force is negligibly weak, may fill a gap between the base 20 and the middle layer 30 and/or a gap between the middle layer 30 and the neck; the gaps are shown in FIG. 4B. When the middle layer 30 itself is as flexible as the stuffing, the middle layer 30 may be so thick that it can prevent opening of a gap between the base 20 and the middle layer 30 and a gap between the middle layer 30 and the neck.

(D) As shown in FIGS. 2A and 2B, the main limiter 90 is provided on the top surface 44 of the surface layer 40. When the surface layer 40 is omitted, the main limiter may be provided on the top surface 21 of the base 20. In this case, the main limiter should be located on an opposite side of the sub-supporter 80 from the main supporter 60 (on the negative side of the X axis in FIG. 3), and the main limiter should be higher than the sub-supporter 80. With the side surface facing the sub-supporter 80, the main limiter can firmly block superior movement of the head HD in the longitudinal direction of the pillow 10 from the position shown in FIG. 4A, thus preventing the head HD from moving out of an acceptable range.

(E) As shown in FIGS. 2A, 2B, and 4A, the side surface 91 of the main limiter 90 facing the sub-supporter 80 is as wide as the opening 41 of the surface layer 40 in the left-right direction of the pillow 10 (in the Y-axis direction in the figures). Alternatively, the side surface of the main limiter may be narrow to be located inside the attaching portions MB1 of the sternocleidomastoid muscles MB in the left-right direction of the head HD (in the Y-axis direction in the figures), like the top surface 81 of the sub-supporter 80 shown in FIG. 4A.

(F) As shown in FIGS. 3 and 4A, the side surface 63 of the main supporter 60 is curved. The side surface 82 of the sub-supporter 80 facing the main supporter 60 may be curved such that its portions further away from its center line CL in the left-right direction of the pillow 10 (in the Y-axis direction in the figures) are nearer to the main supporter 60.

(G) As shown in FIGS. 3 and 4B, the side surface 63 of the main supporter 60 facing the sub-supporter 80 is tilted, and the side surface 82 of the sub-supporter 80 facing the main supporter 60 is tilted. However, both the tilted surfaces are not necessary for the invention, and one or both of the side surfaces 63 and 82 may be vertical to the top surface 21 of the base 20.

(H) As shown in FIG. 4B, the side surface 62 of the main supporter 60 not facing the sub-supporter 80 is vertical to the top surface 21 of the base 20. However, the side surface 62 may be tilted such that its portions nearer to the top surface 21 of the base 20 are shifted more largely in the inferior direction (i.e. in the positive direction of the X axis in the figures), as long as the main supporter 60 is located not to apply pressure on the first cervical vertebra C1. In this case, a tilt angle and shape of the side surface 62 may be designed such that the side surface 62 does not apply pressure on the first cervical vertebra C1.

(I) As shown in FIG. 4A, the side surface 62 of the main supporter 60 not facing the sub-supporter 80 is parallel to the left-right direction of the pillow 10 (the Y-axis direction in the figures). Alternatively, the side surface of the main supporter not facing the sub-supporter may be bent or curved in the following manner.

FIG. 5A is a perspective view of a base 200 according to a variation of the first embodiment of the invention, and FIG. 5B is a top plan view of the base 200. The base 200 is different from the base 20 shown in FIG. 3 only in the following point. The side surface 620 of the main supporter 60 not facing the

sub-supporter 80 is curved such that its portions further away from the cervical vertebrae C1-C7 in the left-right direction of the supine person (in the Y-axis direction in the figures) are nearer to the shoulders SH of the person.

The portion of the side surface 620 of the main supporter 60 at the same position as the first cervical vertebra C1 in the left-right direction of the supine person (in the Y-axis direction in the figures) is located on the superior side of the first cervical vertebra C1 (on the negative side of the X axis in the figures). As shown in FIG. 5B, at least the region ranging from the first cervical vertebra C1 to the second cervical vertebra C2 does not weigh on the portions of the middle layer 30 and the base 20 under the region, and thus, there is no member that applies upward pressure on the region. Accordingly, the entirety of the cervical vertebrae C1-C7 naturally keeps a curved shape, like that of a standing person. In addition, even if an involuntary fluctuation of the posture of the supine person displaces the first cervical vertebra C1 in the superior direction (in the negative direction of the X axis in the figures), the first cervical vertebra C1 hardly reaches a space above the center portion 67 of the main supporter 60 shown in FIGS. 5A and 5B, and thus, pressure of the main supporter 60 hardly compresses the airway. Even if the first cervical vertebra C1 is displaced in the inferior direction (in the positive direction of the X axis in the figures), the lateral portions 660 of the main supporter 60 can apply upward pressure on all the portions MB1 of the sternocleidomastoid muscles MB attaching to the mastoid process SC1, without letting the inferior sides of the portions MB1 escape, since the lateral portions 660 further away from the cervical vertebrae C1-C7 extend for longer distances toward the inferior side of the occipital bone SA (toward the positive side of the X axis in the figures).

(J) The main supporter may have a notch at the same position in the left-right direction of the supine person as the cervical vertebrae of the person. For example, from the main supporter 60 shown in FIGS. 5A and 5B, a part of its center portion 67 including the side surface 620 or the entirety of the center portion 67 may be eliminated. In this case, the first cervical vertebra C1 displaced in the superior direction cannot reach the space above the main supporter 60, and thus, the pressure of the main supporter 60 cannot compress the airway.

[Second Embodiment]

[0028] The following will describe a second embodiment of the invention. FIG. 6 is an exploded view of a pillow 100 according to the second embodiment, and FIG. 7 is a cross-section view of the pillow 100 along the center line in the left-right direction of the pillow 100. Note that, hereinafter, members of the second embodiment equal to or corresponding to members of the first embodiment will be referred to as the same names as those of the members of the first embodiment and marked with the same reference numbers as those with which the members of the first embodiment are marked. Descriptions about the members of the second embodiment are omitted.

[0029] The pillow 100 according to the second embodiment includes a bottom layer 50 under the base 20. The base 20 and the bottom layer 50 are made of material substantially the same as material of the layers 20-40 of the first embodiment, which may be soft foam resin formed as a flat rectangular plate, such as soft urethane foam whose 25% indentation hardness is less than 60 N. The base 20 and the bottom layer 50 are bonded with each other.

[0030] From the top surface 21 of the base 20, main supporters 60 and 60 protrude upward. The main supporters 60 and 60 of the second embodiment are separate members formed by cutting out, from a block, its center portion in the left-right direction. Between the main supporters 60 and 60, the external occipital protuberance SA1 can be placed. More specifically, the main supporters 60 and 60 are symmetrically aligned in the left-right direction such that they are opposed across a void 70. The main supporters 60 and 60 have the same characteristics except that they are a mirror image of each other. The void 70 is an extension of the cervical vertebrae of the supine person and is wider in the left-right direction than the external occipital protuberance SA1 of the person. In the second embodiment, the main supporters 60 has a bottom end on the top surface 21 of the base 20, while its top end is the top surface 61. The top surface 61 includes a slope portion 64 along its edge on the negative side of the X axis, i.e. on the side nearer to the sub-supporter 80 as described below. The slope portion 64 is formed as a chamfered corner of the main supporter 60, and thus, its parts nearer to the sub-supporter 80 are placed lower. The side surface 62 of the main supporter 60 on the positive side of the X axis, i.e. on the side not facing the sub-supporter 80, is tilted with respect to the left-right direction of the supine person (the Y-axis direction in the figures) such that its portions further away from the same position as the cervical vertebrae C1-C7 are nearer to the shoulder SH.

[0031] The sub-supporter 80 of the second embodiment is formed as a flat part of the base 20. More specifically, the base 20 of the second embodiment has through holes 110 at left-right symmetric positions under the temporal muscles MA of the supine person. A bridge portion 120 of the base 20 between the through holes 110 is designed to receive a back portion of the head on the superior side of the superior nuchal line SA4, e.g. the superior region SA3 of the occipital bone SA in the second embodiment. The part of the bridge portion 120 that actually contacts the head corresponds to the sub-supporter 80 of the second embodiment. The bottom

end of the sub-supporter 80 in its thickness direction, i.e. the bottom end of the bridge portion 120, is the bottom surface of the base 20, and the top end of the sub-supporter 80, i.e. the top end of the bridge portion 120, is the top surface 21 of the base 20.

[0032] As shown in FIG. 6, the width of the bridge portion 120 in the left-right direction (the Y-axis direction in the figures) is designed to be smaller than the distance between the attaching portions MB1 of the left and right sternocleidomastoid muscles MB of the supine person.

[0033] On the top surface 21 of the base 20, a vertex-side limiter 130 and temporal-side limiters 95 are provided. The vertex-side limiter 130 protrudes upward from the top surface 21 of the base 20. The surface of the vertex-side limiter 130 on the positive side of the X axis, i.e. on the side facing the vertex of the supine person, includes a convex portion 90 protruding in the positive direction of the X axis. The side surface 91 of the convex portion 90 nearest to the vertex, i.e. the convex tip surface 91 in the positive direction of the X axis, is narrower in the left-right direction than the bridge portion 120. The convex portion 90 is designed to restrict displacement of the head HD in the negative direction of the X axis. In the second embodiment, the convex portion 90 corresponds to the "main limiter."

[0034] The left and right temporal-side limiters 95 are located outside the left and right main supporters 60, respectively, and protrude upward from the top surface 21 of the base 20 in the same configuration. The height of the left and right temporal-side limiters 95, i.e. the length thereof from the top surface of the base in the positive direction of the Z axis, is designed to be larger than the height of the main supporters 60. The left and right temporal-side limiters 95 restrict displacement of the head HD in the left-right direction (in the Y-axis direction in the figures) such that the head HD does not move out of an acceptable range. In the second embodiment, the temporal-side limiters 95 correspond to the "sub-limiters."

[Third Embodiment]

[0035] The following will describe a third embodiment of the invention. FIG. 8 is an exploded view of a pillow 300 according to the third embodiment. Note that, hereinafter, members of the third embodiment equal to or corresponding to members of the first and second embodiments will be referred to as the same names as those of the members of the first and second embodiments and marked with the same reference numbers as those with which the members of the first and second embodiments are marked. Descriptions about the members of the third embodiment are omitted.

[0036] The pillow 300 according to the third embodiment is different from the pillow 100 according to the second embodiment only in having a through hole 140 on the side of the bridge portion 120 nearer to the main supporters 60. The through hole 140 is formed as a slot extending in the X-axis direction from the void 70 between the left and right main supporters 60 to a position immediately inferior to the region corresponding to the sub-supporter 80. The through hole 140 is located under the external occipital protuberance SA1 of the supine person, who places, on the main supporters 60, the region SA2 of the occipital bone SA between the superior nuchal line SA4 and the inferior nuchal line SA5. The through hole 140 is designed to be wider in the left-right direction than the external occipital protuberance SA1. Accordingly, the external occipital protuberance SA1 can be housed within the through hole 140 when the head is seen from up above.

[0037] The pillow 300 according to the third embodiment with the above-described configuration has substantially the same effect as the pillow 100 according to the second embodiment. Since the pillow 300 has the through hole 140 within which the external occipital protuberance SA1 can be housed, the pillow 300 can further avoid pressure applied on the external occipital protuberance SA1 of the supine person. Since the through hole 140 is the slot extending in the X-axis direction, the external occipital protuberance SA1 cannot receive pressure even if the head HD is displaced in the X-axis direction.

[Variations of Second and Third Embodiments]

[0038] (K) The invention does not require the through holes 110 of the second and third embodiments to penetrate the base. The through holes 110 may be replaced by holes with bottoms, or any type of depressions regardless of whether they have bottoms or not. The same is true for the through hole 140 of the third embodiment, which may be replaced by any type of depressions regardless of whether they have bottoms or not. In addition, the insides of the depressions are not limited to a complete void. For example, the insides may be filled with stuffing that is greatly softer than surrounding members, thus applying less or no repulsive force even when receiving the weight of an external object.

[0039] (L) The through hole 140 of the third embodiment is formed as a slot, i.e. an oval when viewed from up above, but this is not necessary for the invention. The through hole 140 may be replaced by a depression formed into another shape, such as a circle.

[Variations of First, Second, and Third Embodiments]

[0040] (M) The pillows according to the first, second, and third embodiments apply pressure on the region terminating near the inferior nuchal line SA5, but this is not necessary for the invention. The region may further extend beyond the inferior nuchal line SA5 and reach the inferior end SA6 of the occipital bone SA (cf. FIG. 1B). Note that the main supporter 60 of the first embodiment shown in FIGS. 5A and 5B, the main supporters 60 of the second embodiment shown in FIG. 6, and the main

supporters 60 of the third embodiment shown in FIG. 8 have the structure whose portions further away from its center portion in the left-right direction extend longer in the longitudinal direction of the pillow toward the shoulders, i.e. the inferior direction, and thus, all the main supporters can also apply pressure on the region extending beyond the inferior nuchal line SA5 and reaching the inferior end SA6 of the occipital bone SA (cf. FIG. 1B). In addition, the sternocleidomastoid-muscle supporting portions 66 can apply pressure on the inferior ends of the portions of the sternocleidomastoid muscles MB attaching to the mastoid processes SC1.

[0041] (N) Although the main supporters 60 of the first, second, and third embodiments use their flat surfaces to apply pressure on the head, the main supporters may be formed into a matrix of small protrusions while they do not receive the weight of the head. When receiving the weight of the head, the small protrusions are collapsed, and the main supporters are changed to a state that can have surface contact with the head. Such a structure falls within the scope of the invention since it does not impose any negative effect on the concept of the invention.

[0042] (O) In the first embodiment, the surface of the main limiter 90 on the side nearer to the sub-supporter 80 is formed to be parallel to the left-right direction. In the second and third embodiments, the surface of the main limiter on the side nearer to the sub-supporter 80 includes the convex portion 90 narrower in the left-right direction than the bridge portion 120. The invention is not limited to such structures. For example, the side of the main supporter nearer to the sub-supporter may have a concave depression narrower in the left-right direction than the parietal bone of the supine person.

[0043] FIG. 9A is a perspective view of a base 2000 according to another variation of the first embodiment of the invention, and FIG. 9B is a top plan view of the base 2000. When a supine person places, on the main supporter 60, the region SA2 of the occipital bone SA between the superior nuchal line SA4 and the inferior nuchal line SA5, the pillows according to the first, second, and third embodiments lack not only members that apply upward pressure on the region ranging from the first cervical vertebra C1 to the second cervical vertebra C2 but also members that apply upward pressure on the region ranging from the third cervical vertebra C3 to the seventh cervical vertebra C7. However, the invention does not inhibit presence of any member that supports a part or the entirety of the region ranging from the third cervical vertebra C3 to the seventh cervical vertebra C7 by applying upward pressure thereon since the invention focuses the weight of the head on the main supporter 60 due to absence of any member that supports the region ranging from the first cervical vertebra C1 to the second cervical vertebra C2 by applying upward pressure thereon. Such a structure will be described as a variation of the first embodiment of the invention.

[0044] The base 2000 shown in FIGS. 9A and 9B is different from the base 20 shown in FIG. 3 in the following regions shown by the phantom lines shown in FIGS. 9A and 9B. The base 2000 is located under the supine person (on the negative side of the Z axis in the figures) and extends in the longitudinal direction of the pillow 10 (in the positive direction of the X axis in the figures) beyond the region ranging from the first cervical vertebra C1 to the second cervical vertebra C2 (i.e. the superior cervical vertebrae) and reaches the region ranging from the third cervical vertebra C3 to the seventh cervical vertebra C7 (i.e. the inferior cervical vertebrae). In addition, the top surface 2001 of the base 2000 includes a neck supporting potion 150 on the opposite side of the main supporter 60 from the sub-supporter 80 (on the positive side of the X axis in the figures). The neck supporting portion 150 supports a part or the entirety of the region ranging from the third cervical vertebra C3 to the seventh cervical vertebra C7 by applying upward pressure thereon.

[0045] More specifically, the neck supporting portion 150 shown in FIGS. 9A and 9B supports a part of the region ranging from the third cervical vertebra C3 to the seventh cervical vertebra C7 (i.e. the inferior cervical vertebrae) by applying upward pressure thereon; the part ranges from the third cervical vertebra C3 to the fourth cervical vertebra C4. The neck supporting portion 150 is made of soft foam resin equal to that of the main supporter 60 and the sub-supporter 80. The neck supporting portion 150 is formed as a rectangular plate or a cuboid with a flat rectangular top surface 151. The neck supporting portion 150 is placed on the top surface 2001 of the base 2000 such that its top surface 151, when having its longer direction corresponding to the left-right direction of the pillow 10 (the Y-axis direction in the figures) and being left-right symmetric with respect to the center line CL of the pillow 10 in the left-right direction (the Y-axis direction in the figures), passes under the region ranging from the third cervical vertebra C3 to the fourth cervical vertebra C4. In such a configuration, the bottom surface of the neck supporting portion 150 is bonded on the top surface 2001 of the base 2000.

[0046] By having appropriately adjusted length and position in the longitudinal direction of the pillow 10 (in the X-axis direction in the figures), the neck supporting portion 150 can support any selected part of the region ranging from the third cervical vertebra C3 to the seventh cervical vertebra C7 by applying upward pressure thereon; the selected part may be, instead of the region ranging from the third cervical vertebra C3 to the fourth cervical vertebra C4, the region ranging from the third cervical vertebra C3 to the fifth cervical vertebra C5, from the fourth cervical vertebra C4 to the fifth cervical vertebra C5, from the third cervical vertebra C3 to the sixth cervical vertebra C6, or from the third cervical vertebra C3 to the seventh cervical vertebra C7. Alternatively, two or more neck supporting portions 150 may be arranged in the longitudinal direction of the pillow 10 (in the X-axis direction in the figures) to support any of the third cervical vertebra C3 through the seventh cervical vertebra C7 by

applying upward pressure thereon; for example, the neck supporting portions 150 may support a pair of the third cervical vertebra C3 and the fifth cervical vertebra C5, a group of the third cervical vertebra C3, the fifth cervical vertebra C5, and the seventh cervical vertebra C7, or a pair of the fourth cervical vertebra C4 and the sixth cervical vertebra C6.

[List of Reference Numbers]

[0047] 60 main supporter, 66 sternocleidomastoid-muscle supporting portion, 80 sub-supporter, 90 main limiter.

Claims

1. A pillow (10) comprising:

a main supporter (60) being an elastic member protruding upward and configured to support, at least, first and second regions (SA7) between superior and inferior nuchal lines (SA4, SA5) on an occipital bone (SA) of a supine person by having surface contact with and applying pressure on the first and second regions (SA7),

the first region (SA7) ranging from a left end (TR1) of a portion of a trapezius muscle (TR) of the person to a portion (MB1) of a left sternocleidomastoid muscle (MB) of the person, both the portions attaching to the occipital bone (SA),
the second region (SA7) ranging from a right end (TR2) of the portion of the trapezius muscle (TR) to a portion of a right sternocleidomastoid muscle (MB) of the person attaching to the occipital bone (SA); and

a sub-supporter (80) being an elastic member designed to be lower in supporting position than the main supporter (60), the sub-supporter (80) configured to support a portion of a head (HD) of the person on a superior side of the superior nuchal line (SA4) by applying pressure on the portion of the head (HD), wherein
the pillow (10) lacks members under, at least, a region ranging from the first to the second cervical vertebra (C1, C2) of the person and a region of a temporal muscle (MB) of the person, the members configured to support the regions by applying pressure thereon.

2. The pillow (10) according to claim 1, wherein
the main supporter (60) includes:

a left-sternocleidomastoid-muscle supporting portion (66) configured to support a portion (MB1) of the left sternocleidomastoid muscle (MB) by applying upward pressure thereon, the portion (MB1) of the left sternocleidomastoid muscle (MB) attaching to a region on a left temporal bone (SC) of the person, the region ranging from the superior nuchal line (SA4) to a mastoid process (SC1); and
a right-sternocleidomastoid-muscle supporting portion (66) configured to support a portion of the right sternocleidomastoid muscle by applying upward pressure thereon, the portion of the right sternocleidomastoid muscle attaching to a region on a right temporal bone (SC) of the person, the region ranging from the superior nuchal line (SA4) to a mastoid process (SC1).

3. The pillow according to claim 2, wherein
the main supporter (60) is formed such that the left- and right-sternocleidomastoid-muscle supporting portions (66) are higher in supporting position than a center portion of the main supporter (60).

4. The pillow (10) according to any one of claims 1 to 3, further comprising
a main limiter (90) being a protrusion located on an opposite side of the sub-supporter (80) from the main supporter (60) and higher than the sub-supporter (80), the main limiter (90) configured to prevent superior displacement of the head (HD).

5. The pillow according to any one of claims 1 to 3, wherein
the main supporter (60) is tilted or curved such that lateral portions (660) thereof further away from a center portion (67) thereof in a left-right direction of the person are nearer to a shoulder (SH) of the person.

FIG.1A

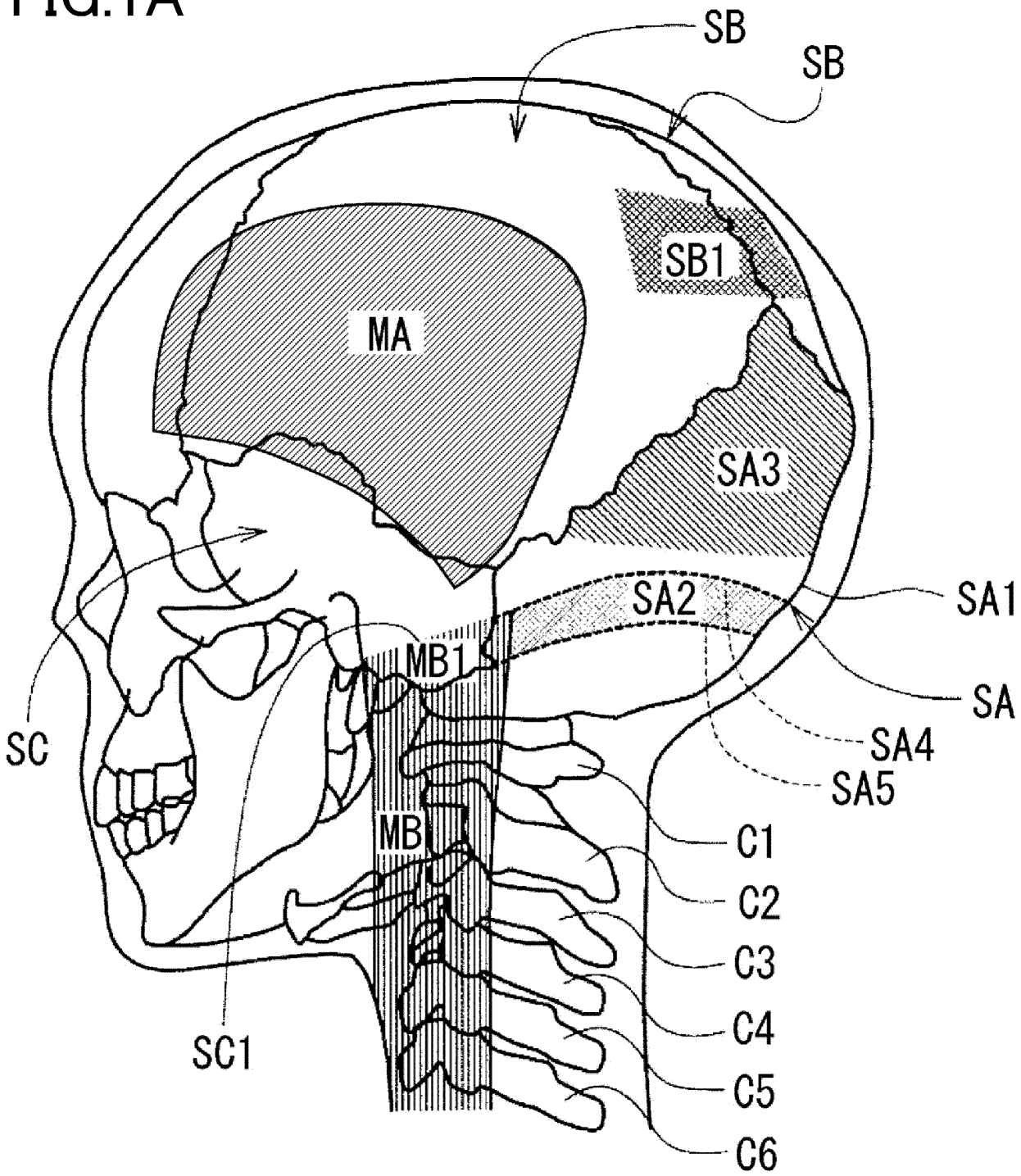
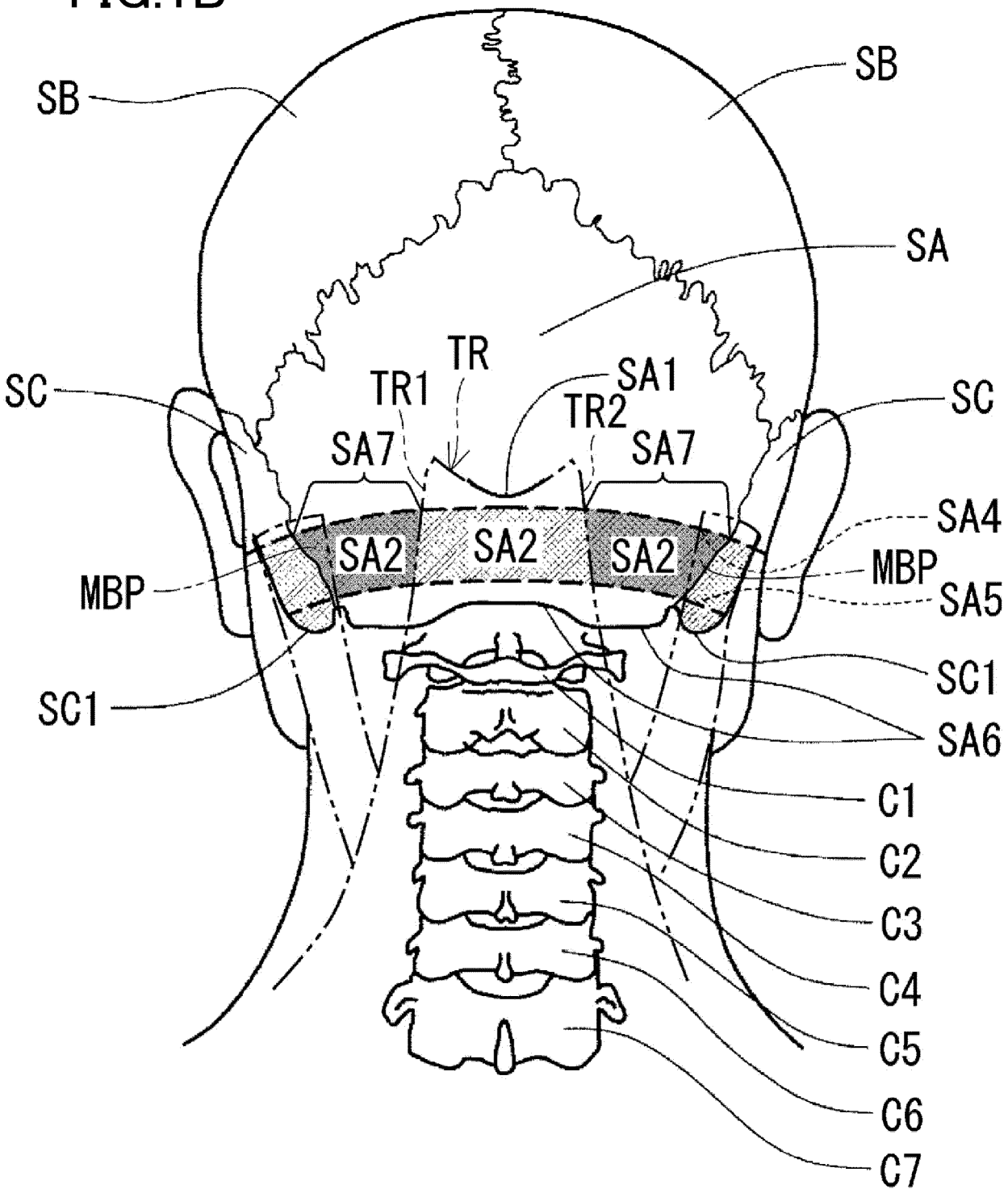


FIG.1B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SB
SA
TR
TR1
SA1
TR2
SC
SC
SA7
SA7
SA4
SA2
SA2
SA2
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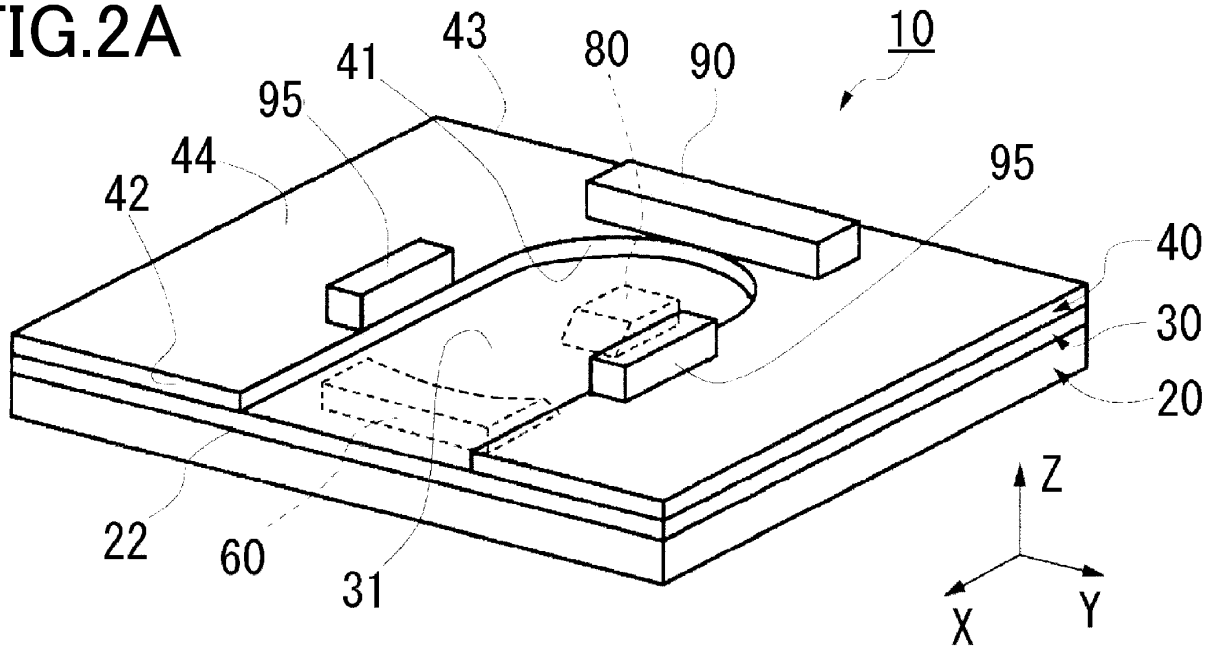
SA6
C1
C2
C3
C4
C5
C6
C7

FIG.2A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22
60
31
Z
X
Y

FIG.2B

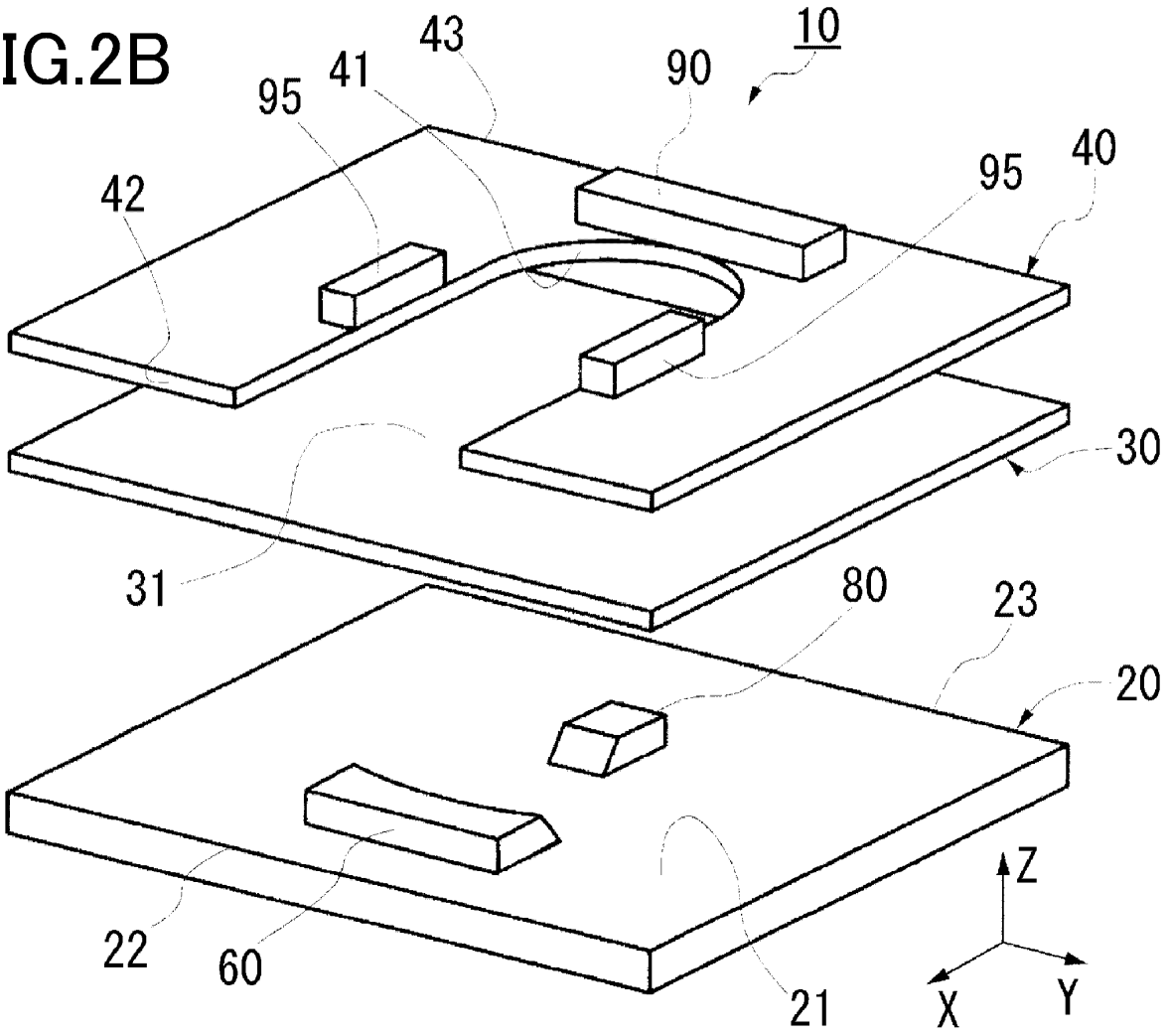
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FIG.3

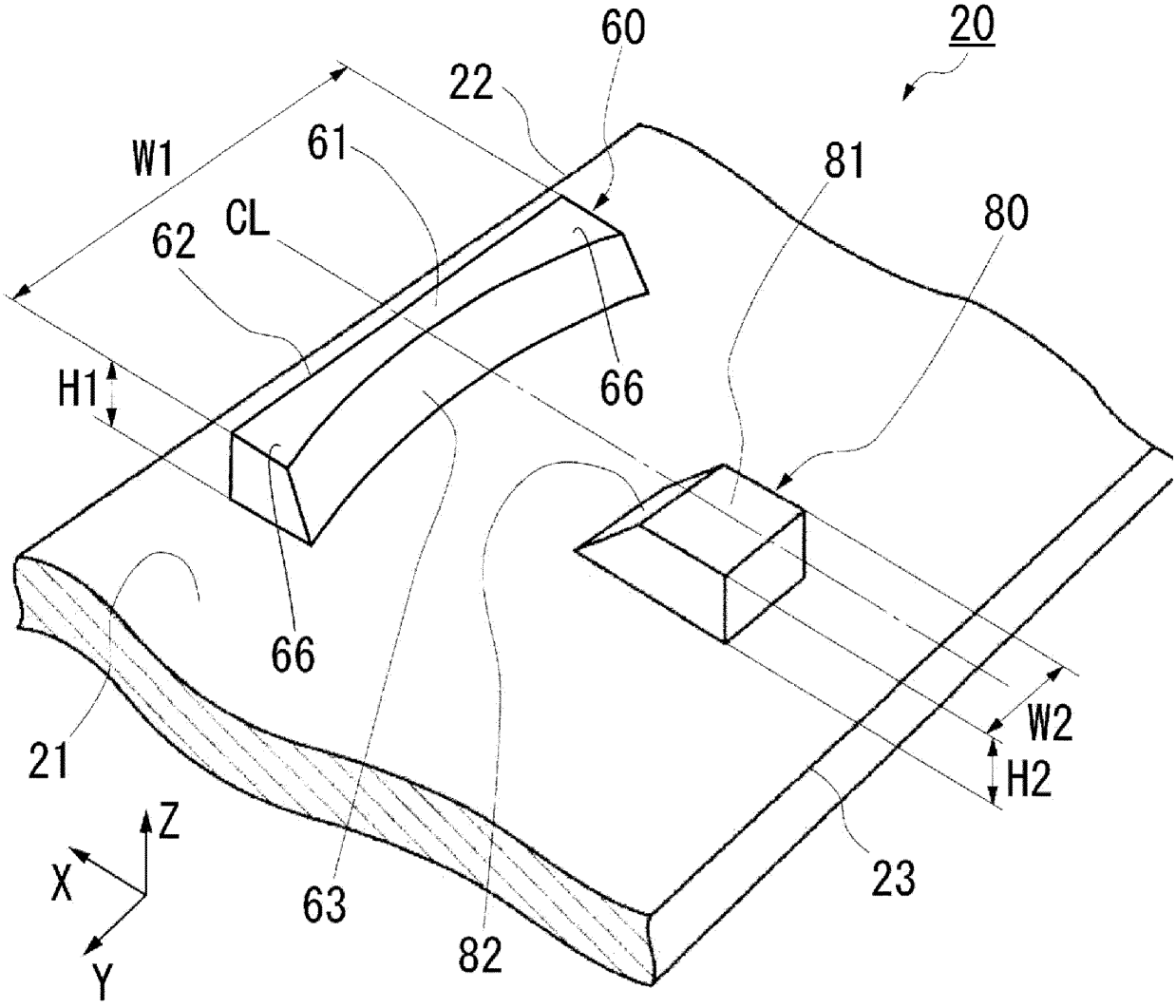
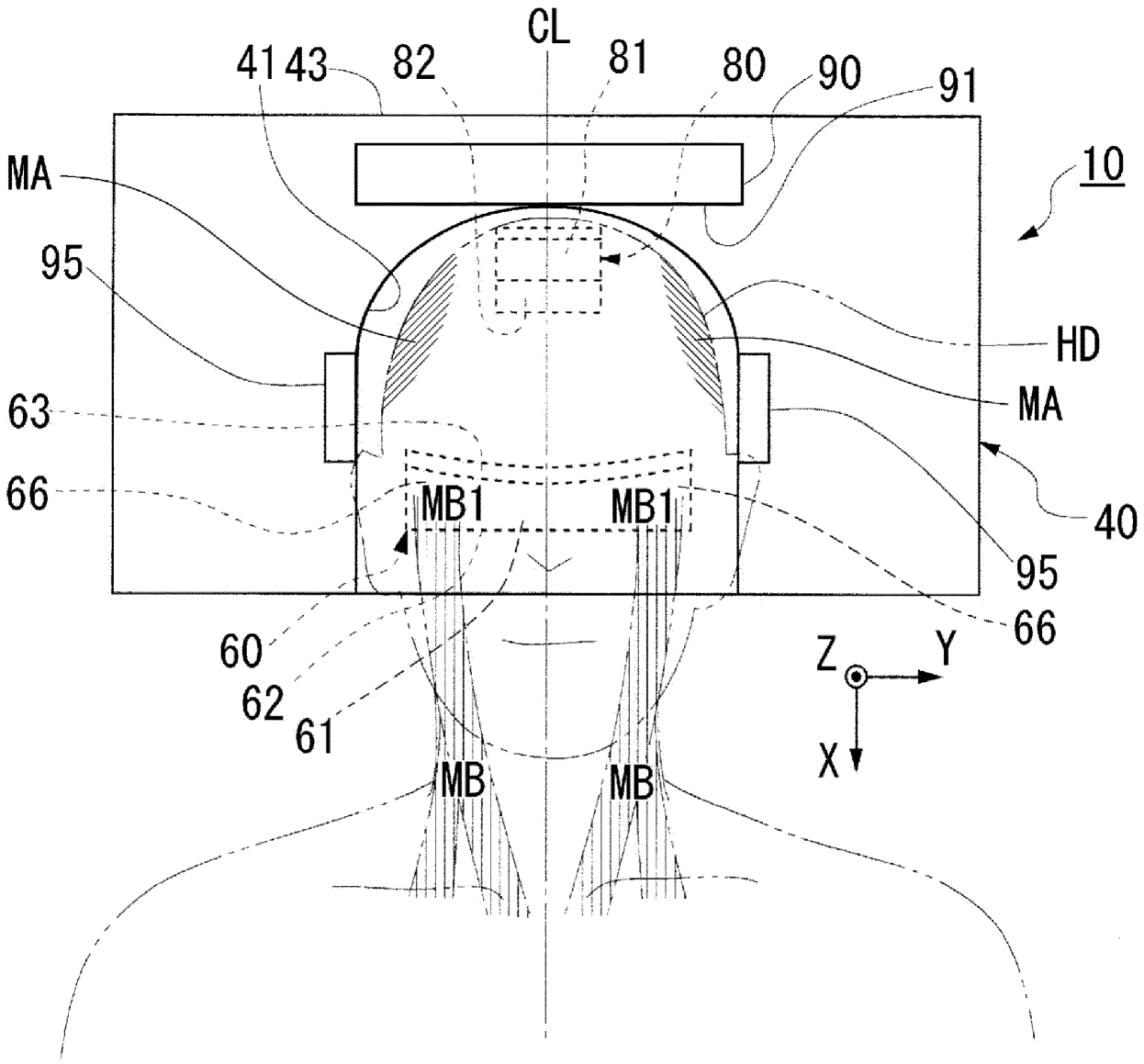


FIG.4A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91
10
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95
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MB1
MB1
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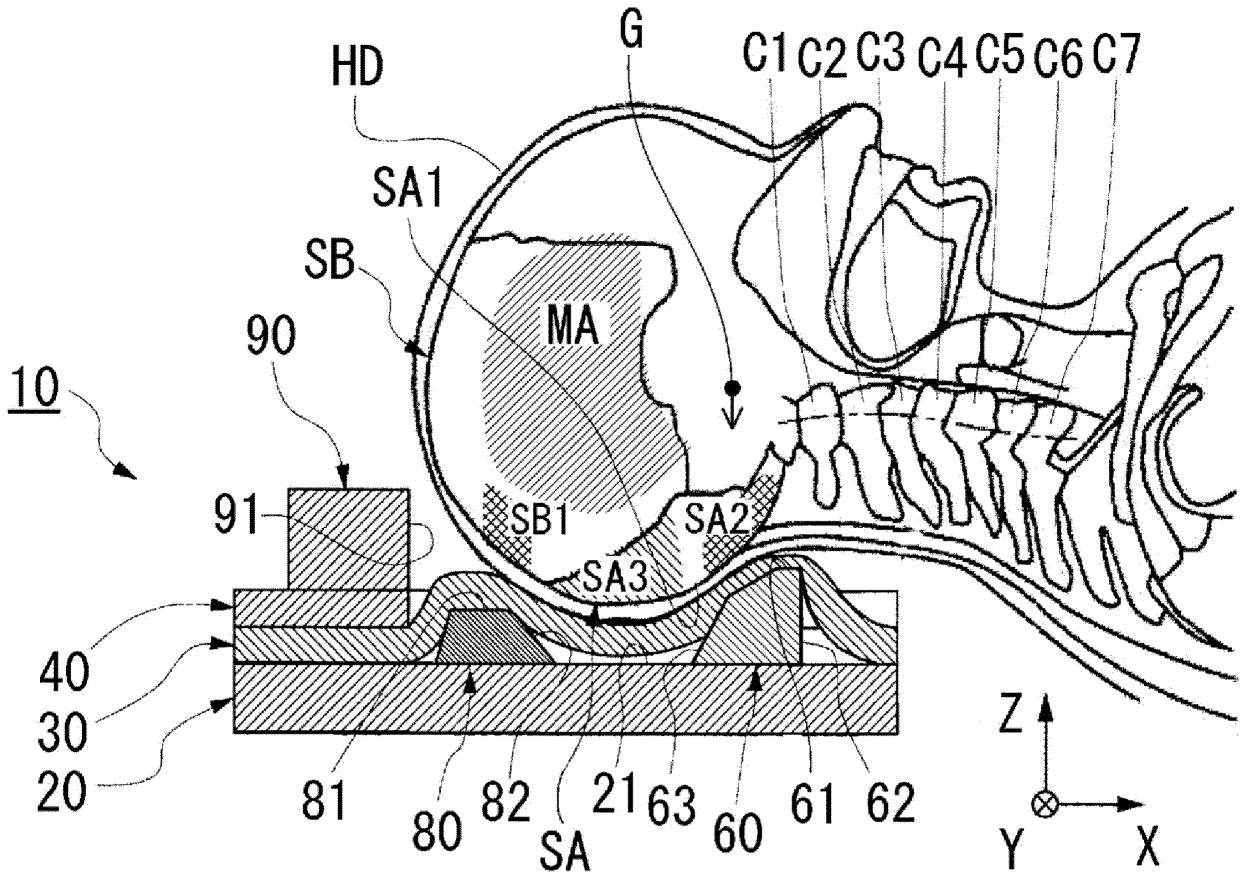
61
Z
Y
X
MB
MB

FIG.4B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82
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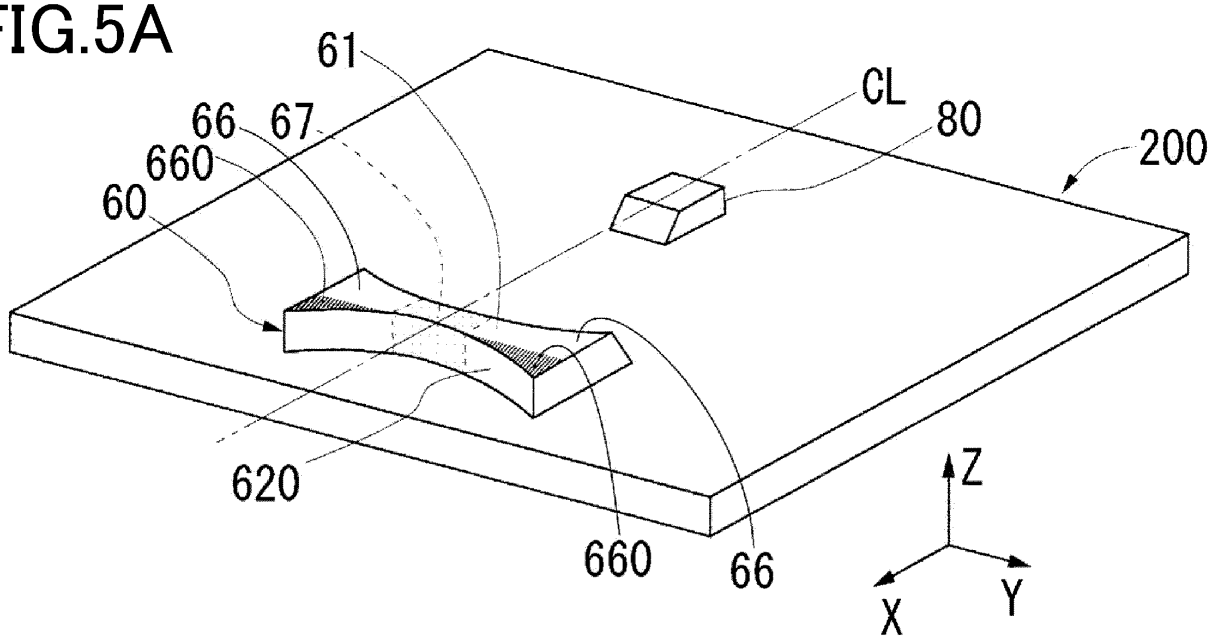
60
61
62
Z
Y
X

FIG.5A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66
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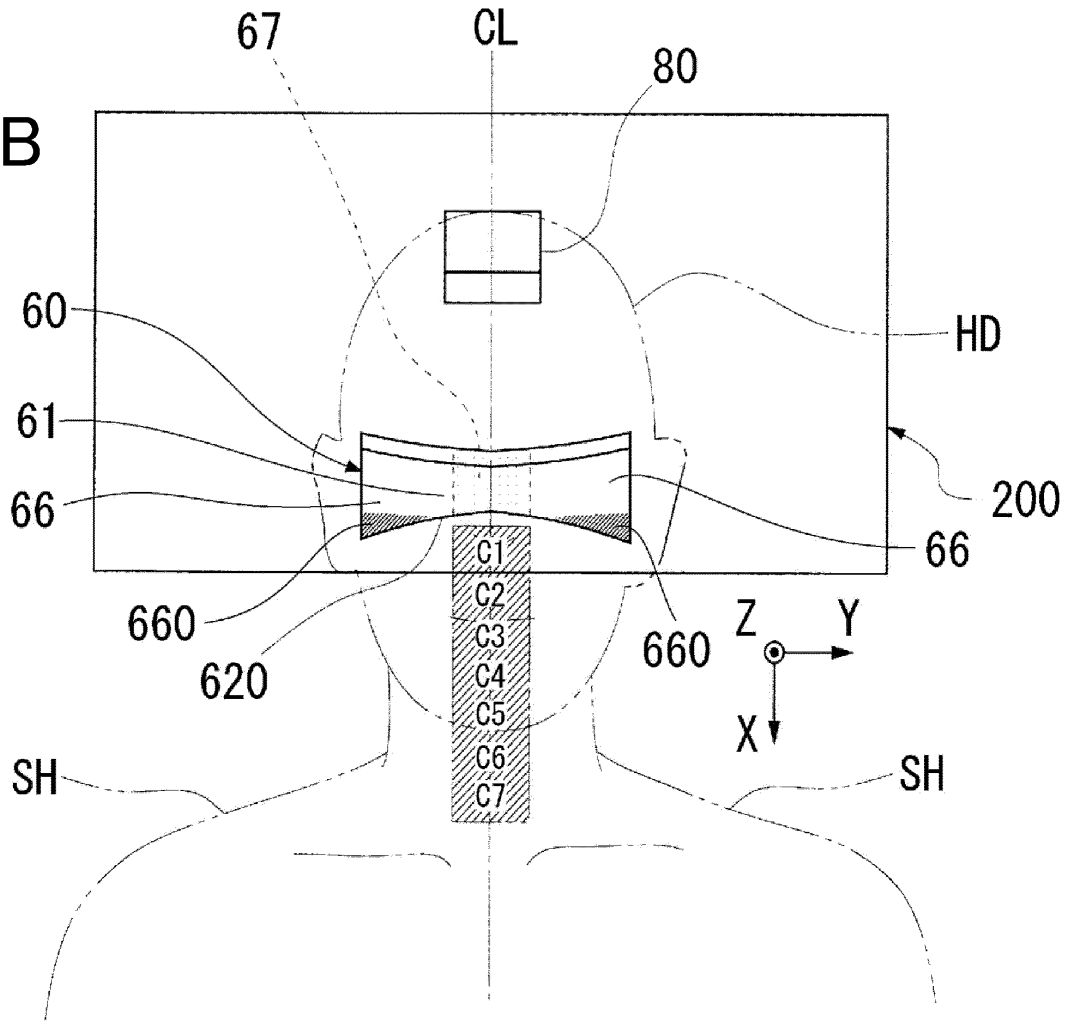
FIG.5B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61
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200
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C2
C3
C4
C5
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620
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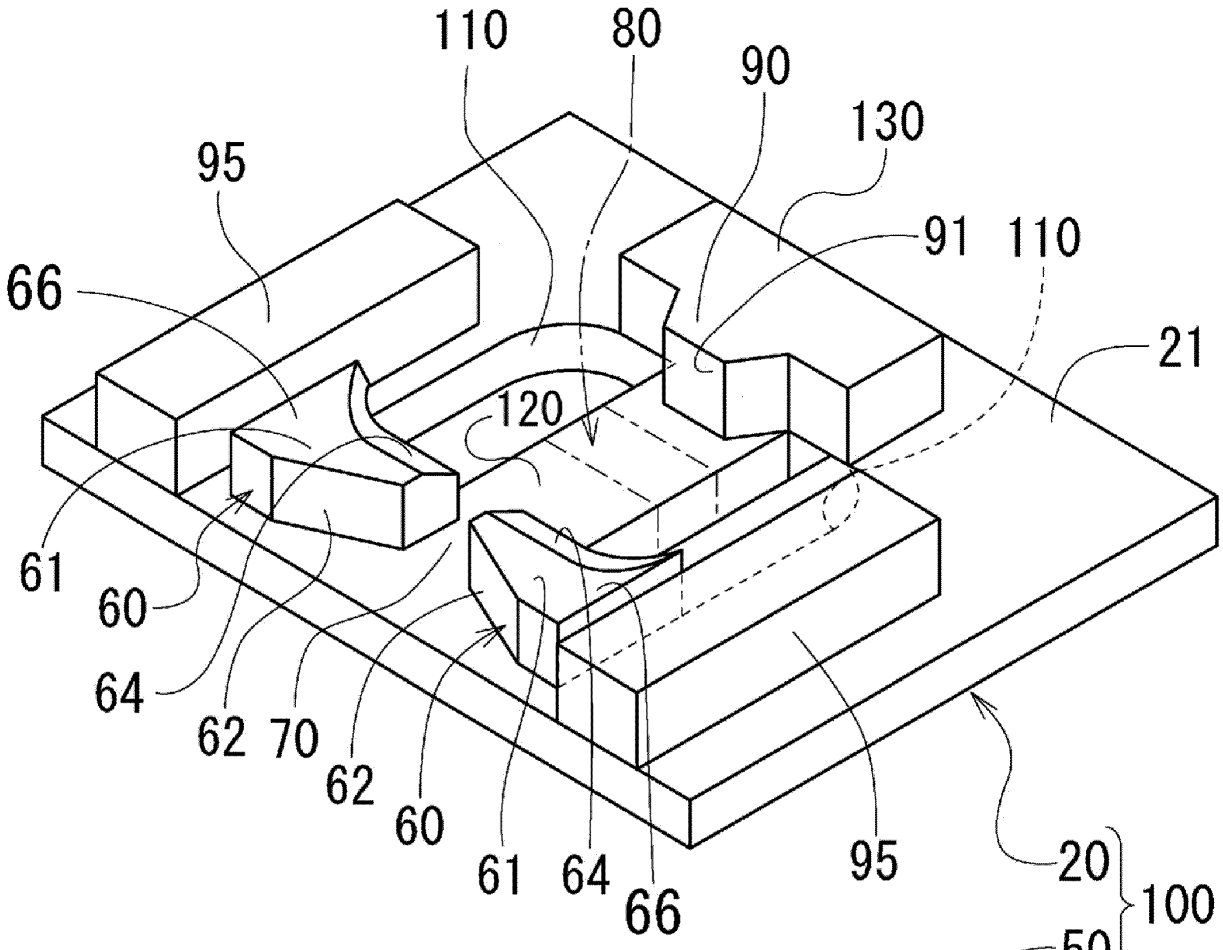
X
SH
SH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66
95
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100
50

FIG.6

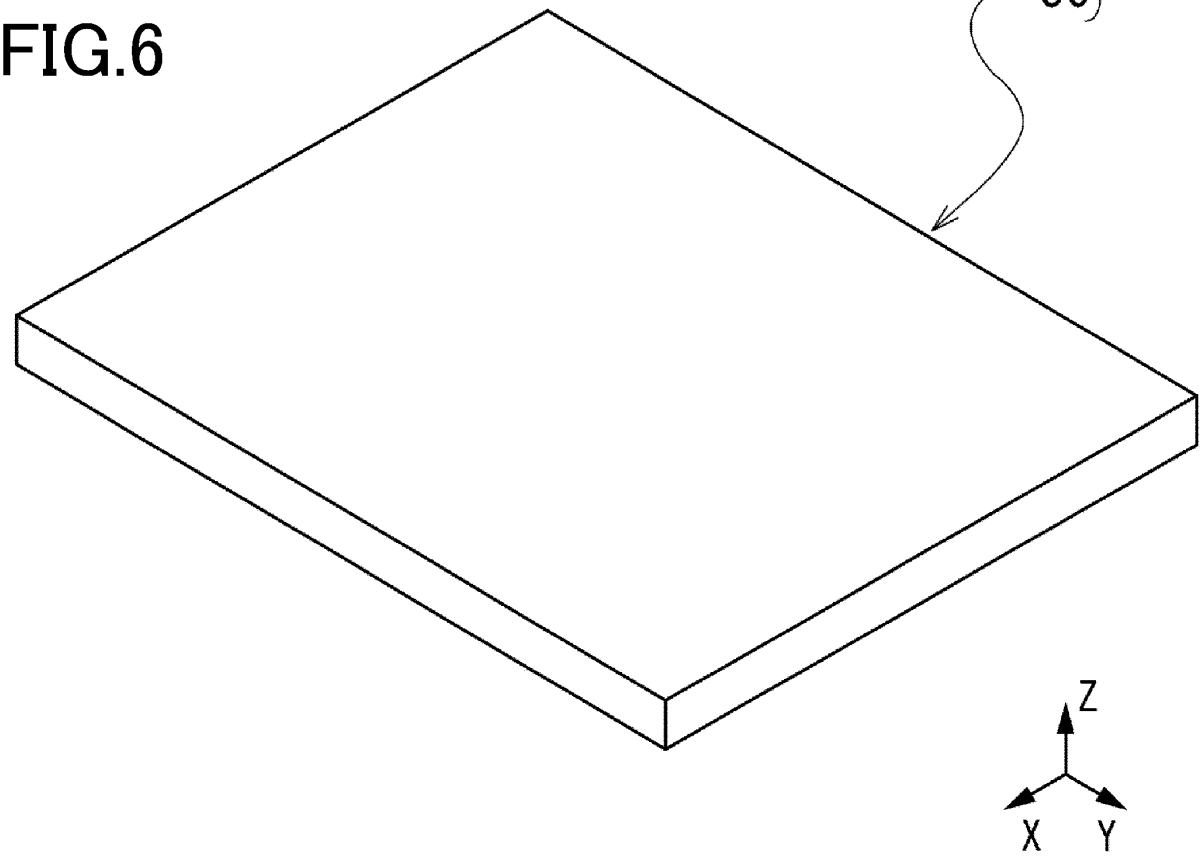
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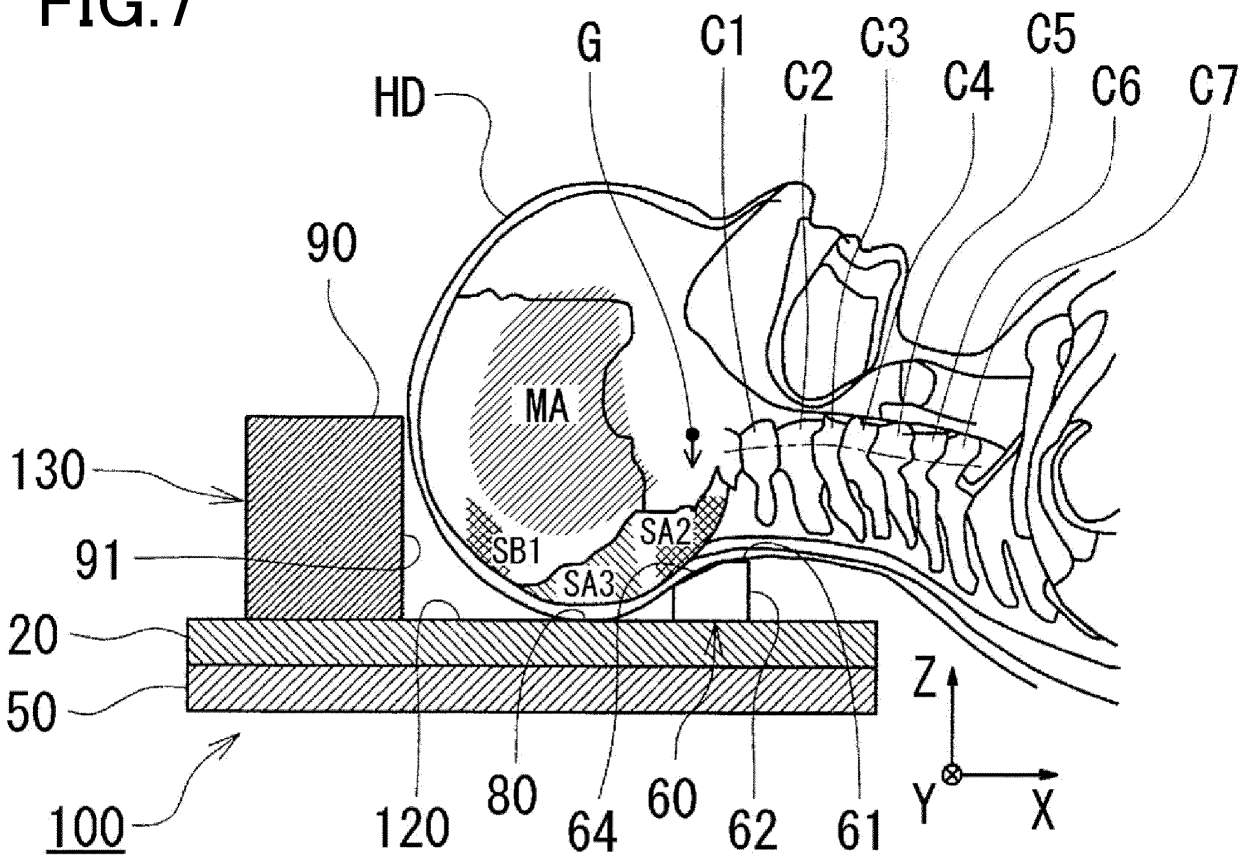
FIG.7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C1
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C3
C4
C5
C6
C7
HD
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MA
130
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SA3
20
50
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120
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62
61
Z
Y
X

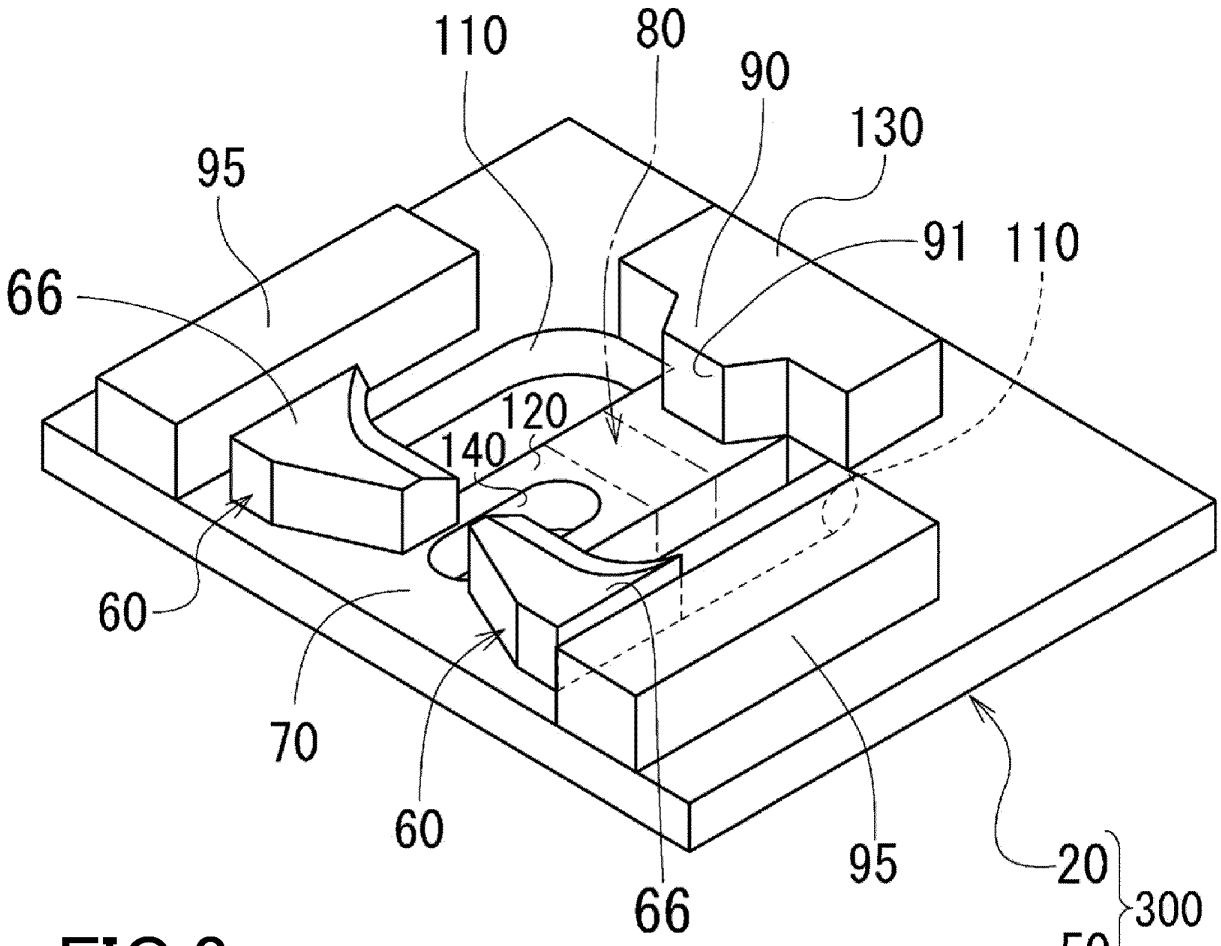


FIG.8

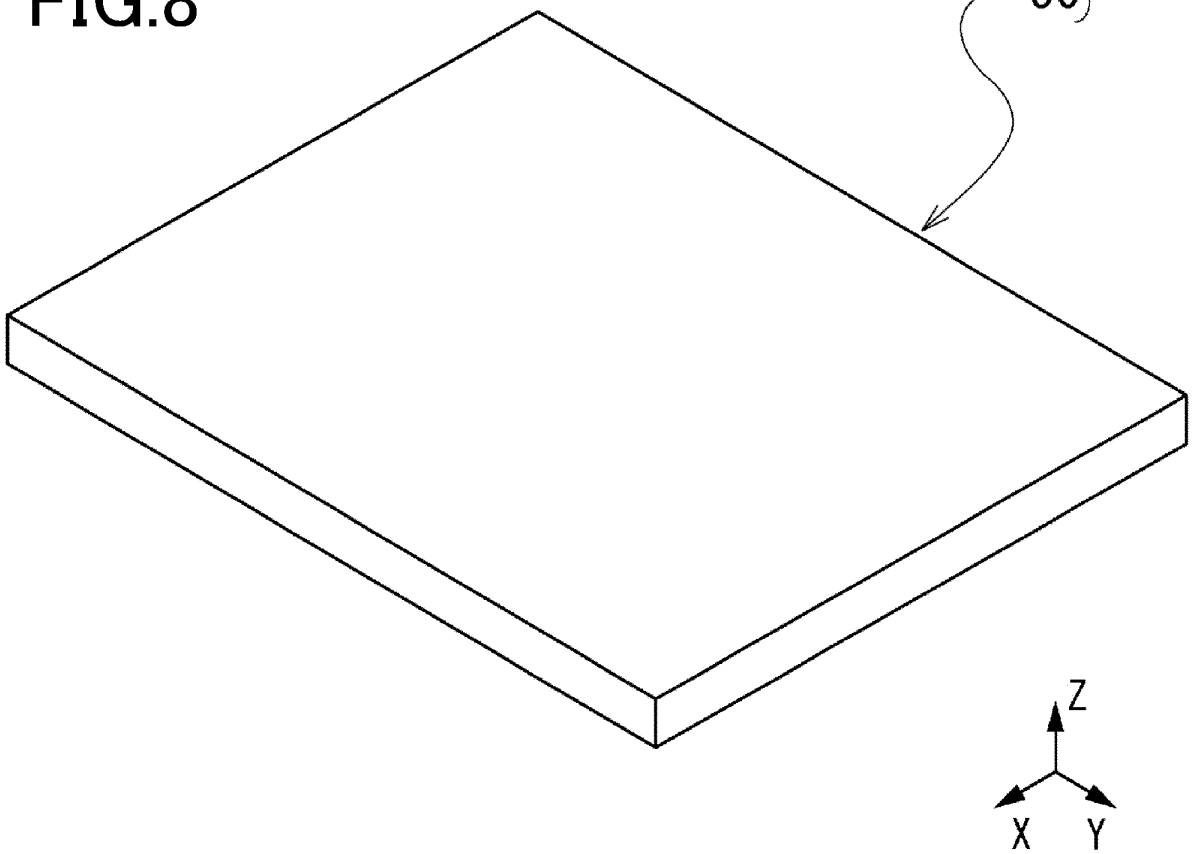
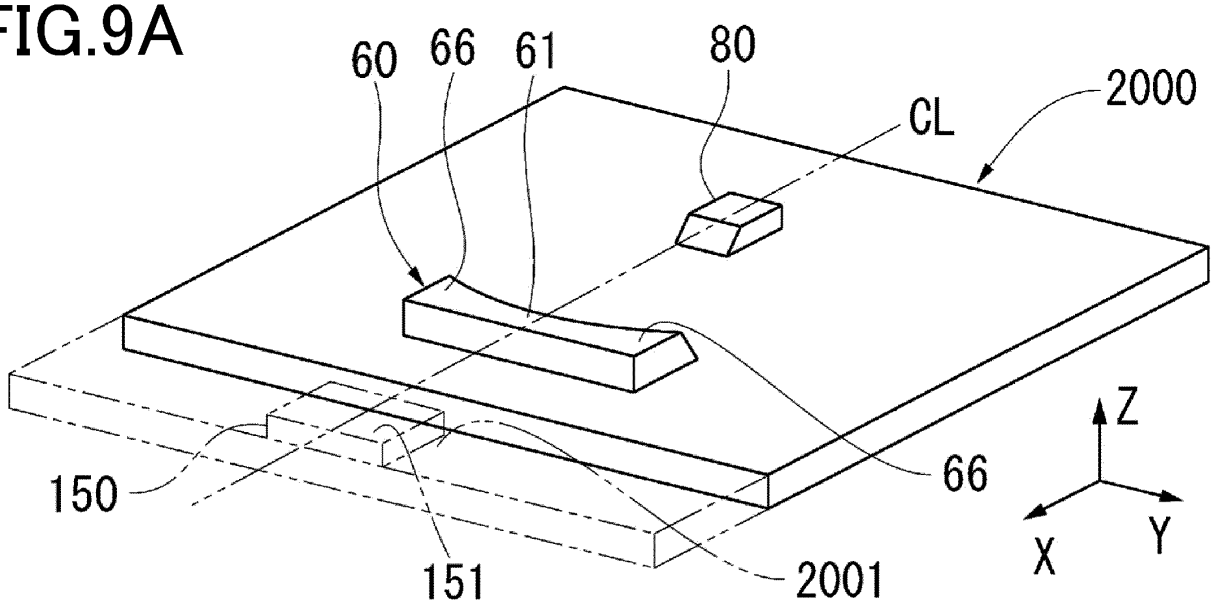


FIG.9A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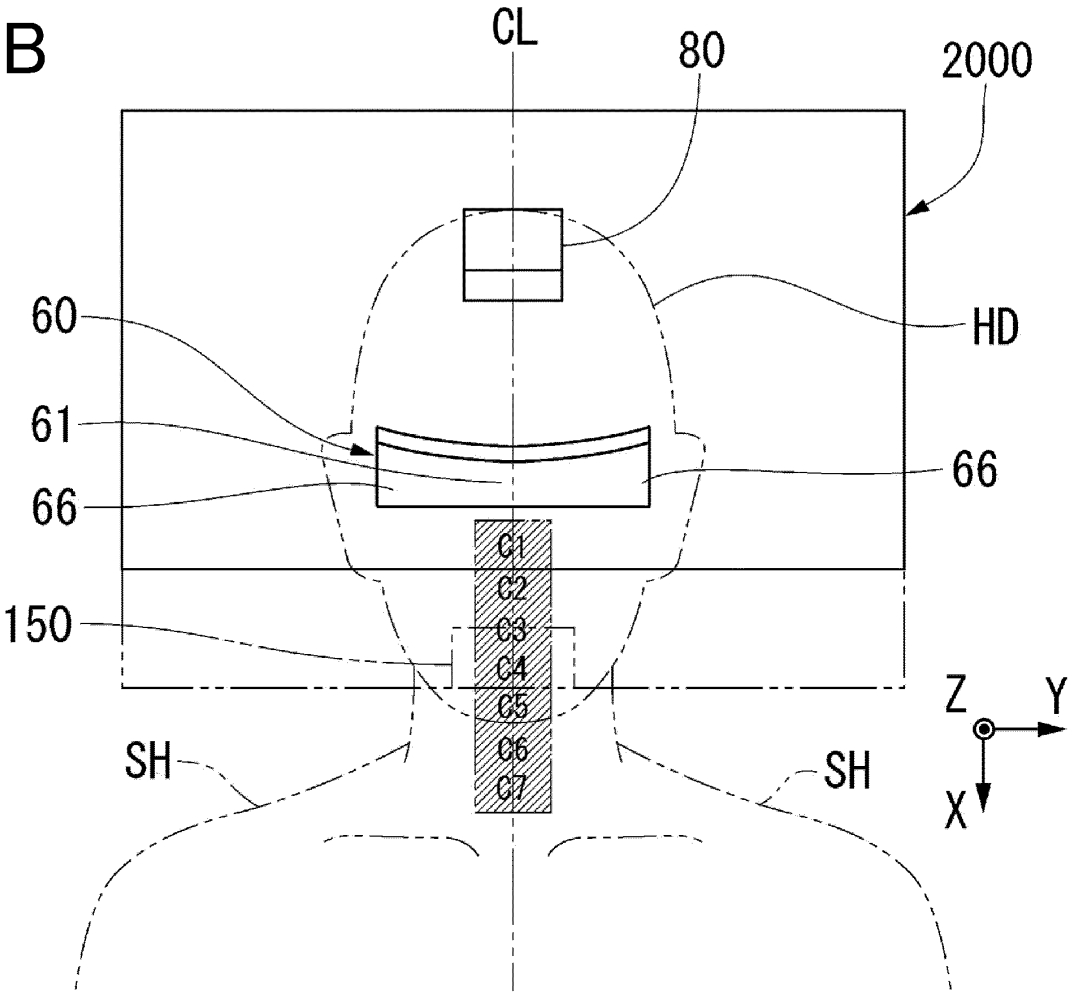
Y

FIG.9B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HD
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C1
C2
C3
C4
C5
C6
C7
SH
SH
Z
Y
X

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2022/042203

A. CLASSIFICATION OF SUBJECT MATTER

A47G 9/10(2006.01)i
FI: A47G9/10 A

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47G9/10

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 203749064 U (YANG, Ping) 06 August 2014 (2014-08-06) entire text, all drawings	1-5
A	JP 1433215 S (EBINE, Kazuo) 06 February 2012 (2012-02-06) entire text, all drawings	1-5
A	JP 2017-221480 A (KORITOREELE KK) 21 December 2017 (2017-12-21) entire text, all drawings	1-5
A	JP 2004-209099 A (YAMADA, Akari) 29 July 2004 (2004-07-29) entire text, all drawings	1-5
A	CN 202760811 U (PENG, Yu) 06 March 2013 (2013-03-06) entire text, all drawings	1-5

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 December 2022	**13 December 2022**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2022/042203

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
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