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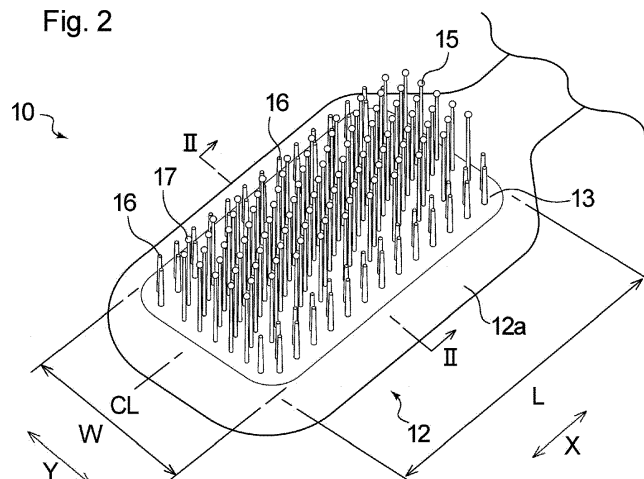
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(54) **HAIRBRUSH**

(57) A hairbrush (10) includes: a head portion (12) having a brush surface (13) on which rod-like protrusions are provided in a standing manner; and a handle (12c). The brush surface (13) has a longitudinal direction (X) and a width direction (Y) orthogonal to the longitudinal direction. The hairbrush (10) includes a first protrusion region (A) provided in a central portion in the width direction (Y), the first protrusion region including first protrusions (15 and 17) spaced apart from one another, each

first protrusion being provided singly and independently. One or more second protrusion rows (J3) are provided on each of both sides sandwiching the first protrusion region (A) in the width direction (Y), each second protrusion row including a plurality of second protrusions (16) formed along the longitudinal direction (X), each second protrusion (16) having a greater cross-sectional area than the first protrusion (15 and 17) and having a shorter length than the first protrusion.

Fig. 2



Description

Technical Field

5 [0001] The present invention relates to a hairbrush.

Background Art

10 [0002] Some known hairbrushes used for hair care have, on a brush surface, protrusion rows each including a plurality of protrusions lined up in one direction, wherein the protrusions have different lengths and/or thicknesses depending on the protrusion rows or regions on the brush surface. For example, Patent Literature 1 discloses a hairbrush having, on a brush base, short brush bristles in a central region and long brush bristles in an outer peripheral region surrounding the central region, the brush bristles being spaced apart from one another.

15 [0003] Patent Literature 2 discloses a hairbrush including: a hair treatment liquid-retaining member in a central area in the width direction, the retaining member being constituted by bristle groups consisting of fine bristles; and implanted bristle rows on both sides of the hair treatment liquid-retaining member, the implanted bristle rows consisting of brush bristles having a greater height than the fine bristles.

20 [0004] Patent Literature 3 discloses a hairbrush including a plurality of bristle rows, the rows being formed by lining up bristle sets along one direction, each bristle set being constituted by two pairs of long and short bristles which are formed by folding two monofilaments into two.

[0005] Patent Literature 4 discloses a hairbrush including, in combination, a plurality of combs each constituted by teeth aligned in the longitudinal direction, wherein the length of the teeth in a comb located in the center of the brush surface is long, whereas the length of the teeth in a comb located on the outer side of the brush surface is short.

25 [0006] Patent Literature 5 discloses a hairbrush including a plurality of bristles, each having a tapered shape that narrows toward the tip end, wherein the bristles are lined up in predetermined rows, and all of the bristles have the same length and thickness.

Citation List

30 Patent Literature

[0007]

35 Patent Literature 1: Japanese Utility Model Laid-Open Publication S61-192730U
 Patent Literature 2: Japanese Utility Model Laid-Open Publication S61-202239U
 Patent Literature 3: Japanese Patent Application Laid-Open Publication 2003-245131A
 Patent Literature 4: US Patent Application Publication No. 2004/0250831A1
 Patent Literature 5: US Patent Application Publication No. 2018/0228277A1

40 Summary of Invention

[0008] The present invention relates to a hairbrush including: a head portion having a brush surface on which rod-like protrusions are provided in a standing manner; and a handle. The brush surface has a longitudinal direction and a width direction orthogonal to the longitudinal direction. Preferably, the hairbrush has a first protrusion region provided in a central portion, in the width direction, of the brush surface, the first protrusion region including first protrusions spaced apart from one another, each of the first protrusions being provided singly and independently. Preferably, the hairbrush has one or more second protrusion rows provided on each of both sides sandwiching the first protrusion region in the width direction, each of the second protrusion rows including a plurality of second protrusions formed along the longitudinal direction, each of the second protrusions having a greater cross-sectional area than the first protrusion and having a shorter length than the first protrusion.

Brief Description of Drawings

[0009]

55 [Fig. 1] Fig. 1 is a perspective view of a hairbrush according to an embodiment of the present invention.
 [Fig. 2] Fig. 2 is a perspective view illustrating a brush surface of the hairbrush illustrated in Fig. 1.
 [Fig. 3] Fig. 3 is a plan view schematically illustrating a region in which protrusions are provided in a standing manner

in the hairbrush illustrated in Fig. 1.

[Fig. 4] Fig. 4 is a cross-sectional view taken along line II-II of Fig. 2 (a cross-sectional view along the width direction of the brush surface).

[Fig. 5] Fig. 5 is a schematic diagram for explaining a method for measuring the flexural rigidity of a protrusion.

[Fig. 6] Fig. 6 is a plan view schematically illustrating an arrangement of first protrusions illustrated in Fig. 3.

[Fig. 7] Figs. 7(a) to 7(c) are cross-sectional views illustrating configurations for providing a first protrusion of the present invention in a standing manner.

[Fig. 8] Figs. 8(a) and 8(b) are cross-sectional views, taken along the longitudinal direction of the brush surface, illustrating a configuration for providing second protrusions of the present invention in a standing manner.

[Fig. 9] Fig. 9 is a diagram, corresponding to Fig. 4, of a hairbrush according to another embodiment of the present invention.

[Fig. 10] Fig. 10 is a diagram, corresponding to Fig. 4, of a hairbrush according to yet another embodiment of the present invention.

[Fig. 11] Fig. 11 is a diagram, corresponding to Fig. 4, of a hairbrush according to yet another embodiment of the present invention.

Description of Embodiments

[0010] At the time of brushing wet hair with a hairbrush after shampooing, it is desired to detangle the hair easily while reducing damage to the hair caused by brushing. Hair in a wet state, however, is likely to get caught by the protrusions on a hairbrush, and this may result in brushing with excessive force and thereby damaging the hair. The hairbrushes disclosed in Patent Literatures 1 to 5 give no consideration to damage to the hair during brushing.

[0011] The present invention relates to providing a hairbrush capable of solving the various problems of conventional art.

[0012] The present invention will be described below according to preferred embodiments thereof with reference to the drawings. Fig. 1 illustrates an embodiment of a hairbrush according to the present invention. The hairbrush 10 according to the present embodiment is a hairbrush used for brushing the hair on the head of a human, and as illustrated in Figs. 1 and 2, includes a handle 12c, and a head portion 12 having a brush surface 13. As illustrated in Fig. 2, a plurality of rod-like protrusions 15-17 are provided in a standing manner on the brush surface 13 of the head portion 12. "Provided in a standing manner" means that the protrusions are provided in a standing state. In the present embodiment, the brush surface 13 is a portion of a later-described brush base portion 13a that is exposed from a later-described attachment opening 12b in the head portion 12 in a state where the brush base portion 13a is fitted to the head portion 12 so as to close the attachment opening 12b.

[0013] When the hairbrush 10 is used for hair care, the handle 12c is held with the hand, and the hairbrush 10 is moved from the root of the hair toward the end to brush the hair with the protrusions 15-17 provided in a standing manner on the brush surface 13.

[0014] The brush surface 13 of the hairbrush 10 has a longitudinal direction X and a width direction Y orthogonal to the longitudinal direction X. The longitudinal direction X of the brush surface 13 is a direction corresponding to the longitudinal direction of the handle 12c. The width direction Y of the brush surface 13 is a direction orthogonal to the longitudinal direction X of the brush surface.

[0015] The length of the brush surface 13 in the longitudinal direction X is equal to or longer than the length of the brush surface 13 in the width direction Y; typically, it is preferable that the length in the longitudinal direction X is longer than the length in the width direction Y, as illustrated in Fig. 2.

[0016] The hairbrush 10 includes a first protrusion region A provided in a central portion, in the width direction Y, of the brush surface 13, the first protrusion region A including first protrusions spaced apart from one another, each of the first protrusions being provided singly and independently. The hairbrush 10 of the present embodiment includes, as the first protrusions, two types of first protrusions 15 and 17 having mutually different cross-sectional areas. The first protrusions 15 and 17 have the same length. Hereinbelow, among the first protrusions of the present embodiment, the protrusions with the smaller cross-sectional area are referred to as first small protrusions 15, and the protrusions with the larger cross-sectional area are referred to as first large protrusions 17. As illustrated in Fig. 3, the plurality of first protrusions 15 and 17 are spaced apart from one another and provided, one by one, in an independent state. More specifically, the plurality of first protrusions 15 and 17 are in a scattered state, and are spaced apart from one another in the longitudinal direction X and the width direction Y. In the hairbrush 10 of the present embodiment, a single protrusion is provided in a respective one of implantation holes 18 provided in the brush surface 13.

[0017] The first protrusion region A is a region in which the first protrusions 15 and 17 are provided spaced apart from one another. In the first protrusion region A of the present embodiment, the plurality of first protrusions 15 and 17 are provided spaced apart from one another in the longitudinal direction X and the width direction Y. The first protrusion region A includes a plurality of first small protrusion rows J1 lined up in the width direction Y, each first small protrusion row including a plurality of the first small protrusions arranged in a line in the longitudinal direction X. The plurality of first

small protrusion rows J1 are arranged in a manner misaligned from one another in the longitudinal direction X such that the positional arrangement of the first small protrusions 15 in each first small protrusion row J1 becomes identical for every other row. Alternatively, the plurality of first small protrusion rows J1 may be arranged in a manner misaligned from one another in the longitudinal direction X such that the positional arrangement of the first small protrusions 15 in each first small protrusion row J1 becomes identical for every three rows. On each of both sides, in the width direction Y, of the first protrusion region A, a first large protrusion row J5 is formed more toward outside in the width direction Y than the respective first small protrusion rows J1.

[0018] As illustrated in Fig. 3, the hairbrush 10 includes second protrusion rows J3 provided on each of both sides sandwiching the first protrusion region A in the width direction Y of the brush surface 13, each of the second protrusion rows including a plurality of second protrusions 16 formed along the longitudinal direction X, each of the second protrusions 16 having a greater cross-sectional area than the first protrusions 15 and 17 and having a shorter length than the first protrusions.

[0019] The second protrusions 16 have a greater cross-sectional area than the first protrusions 15 and 17. In the present Description, the "cross-sectional area of a protrusion" refers to the area of a cross section orthogonal to the protruding direction of the protrusion. In the present embodiment, the cross-sectional area is the area of a cross section along a planar direction that is parallel to the brush surface. The "protruding direction of a protrusion" refers to the direction corresponding to the thickness direction Z of the hairbrush. In cases where the protrusion's cross-sectional area changes along the protruding direction of the protrusion, the maximum value of the cross-sectional area is considered the "cross-sectional area of the protrusion". Further, in cases where each first protrusion 15 and 17 has a spherical member 15a at the tip end thereof as in the present embodiment, the cross-sectional area of the protrusion is the cross-sectional area of the rod-like portion, excluding the spherical member 15a.

[0020] In cases of providing the spherical member 15a, from the viewpoint of further improving the feel on the scalp, it is preferable that the cross-sectional area of the spherical member 15a at its maximum-diameter portion is preferably from 110% to 400%, more preferably from 120% to 250%, with respect to the cross-sectional area of the protrusion.

[0021] The second protrusions 16 have a shorter length than the first protrusions 15 and 17. In the present Description, the lengths L3, L5, and L7 of the respective protrusions 15, 16, and 17 refer to the protruding height of each protrusion, and refer to the length of the protrusion from the brush surface 13 to its tip end (see Fig. 4).

[0022] The hairbrush 10 is used for brushing hair that has been dried with a hairdryer or the like, or for brushing hair in a wet state after being towel-dried. Hair in a wet state tends to gather together without the flow of hair being aligned. If the hair is brushed in this state, the hair may tangle up and get caught easily by the protrusions on the hairbrush.

[0023] The present hairbrush 10 is less likely to apply excessive force to hair during brushing, even to hair in a wet state, and thus damage to hair during brushing can be reduced. Thus, hair brushing can be achieved smoothly. More specifically, by sandwiching the first protrusion region A by the second protrusion rows J3 in the width direction Y, the second protrusions 16, which have a higher rigidity than the first protrusions 15 and 17, can effectively detangle the hair, while reducing resistance caused by contact between the second protrusions 16 and the hair because the second protrusions 16 have a shorter length than the first protrusions 15 and 17. The plurality of second protrusions 16 are formed along the longitudinal direction X at positions more toward outside in the width direction Y of the brush surface 13, and thus come into contact with the tangles in the hair before the first protrusions 15 and 17 during brushing. Thus, these second protrusions 16 can easily get rid of the tangles in the hair, so that the hair can be combed smoothly. Further, in the first protrusion region A, which has the widest area of contact with hair, the load applied to the hair can be reduced, because the first protrusions 15 and 17 have a smaller cross-sectional area than the second protrusions and also have lower rigidity. In this way, the hairbrush 10 can reduce damage to hair in a wet state during brushing. Thus, the hairbrush 10 is effective particularly in cases of brushing the hair of Caucasoids, who tend to have fine, wavy hair.

[0024] In contrast, a hairbrush with no first protrusion region A may apply excessive load to hair in a wet state and may thus cause significant damage to the hair. On the other hand, a hairbrush with no second protrusion row J3 may have difficulty in smoothly combing out hair in a wet state.

[0025] The rigidity of each protrusion can be expressed in terms of flexural rigidity. From the viewpoint of further reducing resistance force caused by contact between the protrusions and the hair during brushing, it is preferable that the second protrusions 16 have a higher flexural rigidity than the first protrusions 15 and 17.

[0026] From the viewpoint of achieving the aforementioned effect more reliably, it is preferable that the flexural rigidity of the second protrusion 16 is preferably 200% or greater, more preferably 250% or greater, and preferably 450% or less, more preferably 350% or less, and preferably from 200% to 450%, more preferably from 250% to 350%, with respect to the flexural rigidity of the first protrusions 15 and 17. In cases where there are a plurality of types of first protrusions having different flexural rigidities as in the hairbrush of the present embodiment, it is preferable that the flexural rigidity of the second protrusion 16 is within the aforementioned range with respect to the flexural rigidity of the first protrusion having the greatest flexural rigidity.

[0027] The flexural rigidity of the second protrusion 16 is preferably 0.1 N or greater, more preferably 0.12 N or greater, and preferably 0.3 N or less, more preferably 0.25 N or less, and preferably from 0.1 to 0.3 N, more preferably from 0.12

to 0.25 N.

[0028] From the viewpoint of further reducing resistance force during brushing and improving brushing performance, it is preferable that the flexural rigidity of the first large protrusion 17 is preferably 130% or greater, more preferably 150% or greater, and preferably 230% or less, more preferably 200% or less, and preferably from 130% to 230%, more preferably from 150% to 200%, with respect to the flexural rigidity of the first small protrusion 15.

[0029] The flexural rigidity (N) of the protrusion can be measured according to the following method using a force gauge (from Nidec-Shimpo Corporation).

[0030] Method for Measuring Flexural Rigidity:

Using a force gauge (from Nidec-Shimpo Corporation; Model No. FGP-5), a 6-mm-dia. contact is placed in contact with the tip end of a single protrusion Pr. In a measurement environment of 20°C, 65% RH, the protrusion Pr is bent by applying a load in the horizontal direction at a speed of 30 mm/min such that the protrusion Pr bends relative to the protruding direction (see Fig. 5). At this time, the maximum intensity is measured while the load is being applied to the protrusion Pr until the tip end of the protrusion Pr moves over a distance of 10 mm in the horizontal direction. The maximum intensity is measured for three protrusions Pr, and the average value is considered the flexural rigidity.

[0031] From the viewpoint of ensuring brushing performance for aligning the flow of hair and also further reducing the rigidity of the first protrusions 15 and 17, it is preferable that the cross-sectional area of the first protrusions 15 and 17 is preferably 0.1 mm² or greater, more preferably 0.12 mm² or greater, even more preferably 0.15 mm² or greater, and preferably 0.3 mm² or less, more preferably 0.28 mm² or less, even more preferably 0.27 mm² or less, and preferably from 0.1 to 0.3 mm², more preferably from 0.12 to 0.28 mm², even more preferably from 0.15 to 0.27 mm². In cases where the cross-sectional area of the first protrusions 15 and 17 changes along the protruding direction of the protrusion, it is preferable that the cross-sectional area is within the aforementioned range.

[0032] From the viewpoint of improving brushing performance by the second protrusions 16, it is preferable that the cross-sectional area of the second protrusion 16 is preferably 300% or greater, more preferably 500% or greater, and preferably 1000% or less, more preferably 900% or less, and preferably from 300% to 1000%, more preferably from 500% to 900%, with respect to the cross-sectional area of the first protrusion 15 and 17. From the same viewpoint, it is preferable that the cross-sectional area of the second protrusion 16 is greater than 0.3 mm². In cases where there are a plurality of types of first protrusions having different cross-sectional areas as in the present embodiment, it is preferable that the percentage (%) of the cross-sectional area of the second protrusion 16 with respect to the cross-sectional area of the protrusion with the smallest cross-sectional area, among the plurality of types of first protrusions, is within the aforementioned range. In cases where the cross-sectional area of the second protrusion 16 changes along the protruding direction of the protrusion, the maximum value is considered the cross-sectional area of the protrusion.

[0033] The cross-sectional area of the first large protrusion 17 is larger than that of the first small protrusion and smaller than that of the second protrusion. From the viewpoint of improving brushing performance by the first large protrusions 17, it is preferable that the cross-sectional area of the first large protrusion 17 is preferably 110% or greater, more preferably 130% or greater, and preferably 180% or less, more preferably 150% or less, and preferably from 110% to 180%, more preferably from 130% to 180%, with respect to the cross-sectional area of the first small protrusion 15. In cases where the cross-sectional area of the first large protrusion 17 changes along the protruding direction of the protrusion, the maximum value is considered the cross-sectional area of the protrusion.

[0034] In the present embodiment, each of the protrusions 15, 16, and 17 is provided in a standing manner substantially perpendicular to the brush surface 13. With this configuration, the load applied to the hair during brushing can be further reduced.

[0035] From the viewpoint of increasing the rigidity of the second protrusions 16, it is preferable that the length L5 (see Fig. 4) of the second protrusion 16 is preferably 40% or greater, more preferably 50% or greater, and preferably 80% or less, more preferably 75% or less, and preferably from 40% to 80%, more preferably from 50% to 75%, with respect to the respective lengths L3, L7 (see Fig. 4) of the first protrusions 15, 17.

[0036] From the viewpoint of performing brushing efficiently, it is preferable that the length L5 of the second protrusion is shorter than the length L7 of the first large protrusion 17. Stated differently, it is preferable that the length L7 of the first large protrusion 17 is longer than the length L5 of the second protrusion. With this configuration, the second protrusions can remove intense tangles in the hair when inserting the protrusions into the hair and combing the hair with the hairbrush 10. Further, the first large protrusions 17, which have a higher rigidity than the first small protrusions 15, can efficiently remove weak tangles in the hair on the tip-end side of the protrusions and can also effectively align the flow of hair. The length L7 (see Fig. 4) of the first large protrusion 17 is preferably 85% or greater, more preferably 95% or greater, and preferably 100% or less, more preferably 100% or less, and preferably from 85% to 100%, more preferably from 95% to 100%, with respect to the length L3 (see Fig. 4) of the first small protrusion 15.

[0037] From the viewpoint of further reducing resistance force caused by contact between the protrusions and the hair during brushing and also improving brushing performance, it is preferable that the length L3 (see Fig. 4) of the first small protrusion 15 is preferably 14 mm or greater, more preferably 16 mm or greater, even more preferably 18 mm or greater, and preferably 22 mm or less, more preferably 21 mm or less, even more preferably 20 mm or less, and preferably

from 14 to 22 mm, more preferably from 16 to 21 mm, even more preferably from 18 to 20 mm.

[0038] The hairbrush 10 of the present embodiment includes: a base body 11 in which a head base portion 12a and a handle 12c are integrally molded; and a brush base portion 13a to be fixed to the head base portion 12a. In the base body 11, the handle 12c extends from one end, in the longitudinal direction X, of the head base portion 12a, and the head base portion 12a and the handle 12c are continuous. As illustrated in Fig. 4, the head portion 12 includes: the brush base portion 13a having the brush surface 13; and the head base portion 12a having a rectangular attachment opening 12b. The attachment opening 12b is formed in one surface of the head base portion 12a, and the brush base portion 13a is fitted into and fixed to the attachment opening 12b so as to close the opening.

[0039] The base body 11 and the brush base portion 13a are plastic-made molded products made from synthetic resin. Examples of the synthetic resin may include polyester resins such as polybutylene terephthalate or polyethylene terephthalate, ABS (acrylonitrile-butadiene-styrene copolymer) resin, PBT (polybutylene terephthalate) resin, PP (polypropylene) resin, PE (polyethylene) resin, PET (polyethylene terephthalate) resin, PCTA (polycyclohexane dimethylene terephthalate) resin, POM (polyacetal) resin, acrylic resin, AS (acrylonitrile-styrene copolymer) resin, PS (polystyrene) resin, and thermoplastic elastomer resins. Examples of thermoplastic elastomer resins may include styrenic elastomers (TPS) such as SBS, SIS, SEBS and SEPS, olefinic elastomers (TPO), ester elastomers (TPC), urethane elastomers (TPU), amide thermoplastic elastomers (TPA), and thermoplastic rubber vulcanizates (TPV). One type of the aforementioned elastomer may be used singly, or two or more types may be used in combination.

[0040] It is preferable that the protrusions 15, 16, and 17 are each made from synthetic resin. Examples of synthetic resins for forming the protrusions may include the various synthetic resins described above that are usable for forming the base body 11 and the brush base portion 13a, and polyamide resins such as nylon or nylon 6. From the viewpoint of lowering rigidity and further reducing the load applied to the hair during brushing, it is preferable that the material for forming the first protrusions 15 and 17 is nylon. From the viewpoint of increasing the rigidity of the second protrusions 16, it is preferable that the material for forming the second protrusions 16 is a thermoplastic elastomer resin, as described above, or a linear low-density polyethylene resin.

[0041] It is preferable that a thermoplastic elastomer resin usable as a material for forming the second protrusions has a Shore D hardness (according to a rubber hardness tester (GS709N Type D) from Teclock Co., Ltd.) of preferably 40 or greater, more preferably 50 or greater, and preferably 65 or less, and preferably from 40 to 65, more preferably from 50 to 65. With this hardness, the second protrusions can detangle the hair more easily, and hair snagging can also be further suppressed.

[0042] The method for measuring Shore D hardness is as follows.

[0043] Method for Measuring Shore D Hardness:

A sample is placed on a flat surface. The pressurizing face of a rubber hardness tester held with both hands is pressed perpendicularly against a surface of the sample from immediately above at a constant speed, and the value found within 1 second after tight contact is considered the "hardness." The sample's measurement locations are at least 12 mm inward from the ends of the sample, and the distance between measurement points is at least 6 mm. The sample to be used for the measurement is plate-shaped, with a length and width of at least 25 mm and a thickness of at least 6 mm. The test environment is 23 ± 2 degrees in temperature and $50 \pm 5\%$ in humidity. The median value or average value of five points is employed as the measurement value. For example, if the rubber hardness tester (from Teclock Co., Ltd.; GS709N Type D) indicates "50", then the Shore D hardness is 50 ("D50").

[0044] In the first protrusion region A of the present embodiment, the first protrusions 15 and 17 are implanted protrusions that are implanted, one by one, respectively to each of implantation holes 18 in a standing manner. With this configuration, it is possible to further suppress hair from getting caught between the protrusions during brushing.

[0045] A plurality of implantation holes 18, into which the first protrusions 15 and 17 are to be implanted respectively, are formed on the brush surface 13 of the brush base portion 13a in a dispersed state in the longitudinal direction X and the width direction Y. The protrusions 15 protrude respectively from the implantation holes 18. As illustrated in Fig. 7(a), each implantation hole 18 formed in the brush surface 13 may be a recess that has a bottom. Alternatively, the implantation hole may be a through hole that penetrates the brush base portion 13a in the thickness direction, as illustrated in Figs. 7(b) and 7(c). In cases where the implantation hole 18 is a recess, a protrusion formed by folding a rod-like member into two with a flat wire 19 may be provided in a standing manner in the recess, as illustrated in Fig. 7(a). From the viewpoint of further suppressing hair from getting caught, it is preferable that the protrusion is formed from a rod-like member that is fixed with a flat wire such that only one side of the folded portions protrudes from the implantation hole 18. The flat wire 19 may be made, for example, from a metal such as brass. In cases where the implantation hole 18 is a through hole, the protrusion may be provided in a standing manner by inserting a rod-like member through the through hole. In this case, the protrusion may be fixed by forming a fastening portion 21 on the protrusion's end on the opposite side from the brush surface 13, as illustrated in Fig. 7(b). Alternatively, the protrusion's end on the opposite side from the brush surface 13 may be fixed by a fixing part 23, as illustrated in Fig. 7(c). It is preferable that the fastening portion 21 and the fixing part 23 are made by using the same material as that for forming the protrusions.

[0046] The second protrusions 16 may be implanted protrusions that are implanted in a standing manner respectively

to each of the implantation holes formed in the brush surface, like the first protrusions 15 and 17, or may be molded protrusions that are integrally molded with the brush surface 13 or with a continuous portion to be arranged beneath the brush surface 13. As illustrated in Fig. 8(a), the continuous portion 25 to be arranged beneath the brush surface 13 is a member for connecting the respective ends, on one side, of the plurality of protrusions, and is provided beneath the brush base portion 13a having through holes 24. The through holes 24 correspond respectively to the molded protrusions. The protrusions integrally molded with the continuous portion 25 are provided by being inserted through the respective through holes formed in the brush base portion 13a, as illustrated in Fig. 8(b). From the viewpoint of effectively detangling hair and improving brushing performance, it is preferable that the second protrusions 16 are molded protrusions.

[0047] From the viewpoint of further reducing the load applied to the hair during brushing, in cases where the second protrusions 16 are molded protrusions, it is preferable that the second protrusions 16 and the brush surface 13 or the continuous portion 25 integrally molded with the second protrusions 16 are formed from a soft resin.

[0048] Examples of the soft resin may include olefinic elastomer resins, styrenic elastomer resins, polyester elastomer resins, urethane elastomer resins, acrylic elastomer resins, and low-density polyethylene resin.

[0049] From the viewpoint of suppressing electrostatic buildup that may occur during brushing, it is preferable that the second protrusions 16 and the handle 12c are formed from an electroconductive resin, and the second protrusions 16 and the handle 12c are electrically connected. With this configuration, the handle 12c and the user will be in contact and be electrically connected during use, and thus, electrostatic buildup can be suppressed effectively. An example of a configuration for electrically connecting the second protrusions 16 and the handle 12c may be to mold the brush base portion 13a, on which the second protrusions 16 are provided in a standing manner, from the same electroconductive resin as the base body 11, and form the hairbrush 10 in a state where the brush base portion 13a and the base body 11 are in contact with one another. From the viewpoint of achieving this configuration, it is preferable that the second protrusions 16 are molded protrusions. From the viewpoint of suppressing electrostatic buildup that may occur during brushing, for example, it is possible to use, for the electroconductive resin, an acrylonitrile-butadiene-styrene copolymer synthetic resin, a polyolefin, nylon 6, a polycarbonate resin, or the like, kneaded together with at least one type of component selected from carbon fibers, stainless-steel fibers, and antistatic agents.

[0050] From the viewpoint of further suppressing hair from getting caught during brushing and further facilitating brushing, it is preferable that a bisector that bisects the length W1, in the width direction Y, of the first protrusion region A matches the bisector CL that bisects the entire length W, in the width direction Y, of the brush surface 13.

[0051] From the viewpoint of further reducing the load applied to the hair during brushing, it is preferable that the first protrusion region A is provided over a range of preferably 20 mm or less, more preferably 15 mm or less, on both sides from the bisector CL, which bisects the entire length W, in the width direction Y, of the brush surface 13.

[0052] As illustrated in Fig. 3, the hairbrush 10 of the present embodiment includes protrusions having mutually different cross-sectional areas between: a central region M in the width direction Y of the brush surface 13; and a pair of side regions S and S sandwiching the central region M. More specifically, the central region M constitutes the first protrusion region A, and the plurality of first protrusions 15 are arranged in rows in the longitudinal direction X and the width direction Y. Each of the side regions S and S includes: the second protrusion rows J3; and the first large protrusion rows J5 in which the first large protrusions 17 are lined up along the longitudinal direction X. As illustrated, in each of the side regions S and S, the plurality of second protrusions 16 are formed along the longitudinal direction X, thereby forming rows. The first large protrusion row J5 is located between the first small protrusion rows J1 and the second protrusion row J3.

[0053] As in the present embodiment, it is preferable to include, on both sides sandwiching the central region M on the brush surface 13, respective thick protrusion regions B including protrusions 16 having a greater cross-sectional area than the first protrusions 15 and 17 and having a shorter length than the first protrusions 15 and 17. Each thick protrusion region B is a region located outside the first protrusion region A in the width direction Y and is a region defined by: a side (line) formed by connecting respective centers of the first protrusions 15 and 17 located most outward in the width direction Y; and a side (line) formed by connecting respective centers of protrusions other than the first protrusions. "Protrusions other than the first protrusions" are, for example, the second protrusions 16 located most outward in the longitudinal direction X or the width direction Y. Providing the second protrusions 16—which have a higher rigidity than the first protrusions 15 and 17—in the side regions S and S can further facilitate detangling of hair during brushing.

[0054] Preferably, the first protrusion region A includes the first protrusions 15 and 17 at an existing density of preferably from 5 to 10 protrusions, more preferably from 6 to 9 protrusions, per 10 mm square. The existing density of the first protrusions 15 and 17 in the first protrusion region A is found according to the method below.

[0055] First, in a region of the brush surface 13 in which the plurality of first protrusions 15 and 17 are formed, a region A is defined by connecting respective centers of the first protrusions 15 and 17 located most outward in the longitudinal direction X and the width direction Y. This region A is the first protrusion region. Next, a 10-by-10-mm square region a is set such that one of its vertices corresponds to an arbitrary first protrusion within the first protrusion region A. The number of first protrusions 15 and 17 included within the square region a is counted. Note that, in cases where the outer edge of the square region a overlaps one of the first protrusions 15 and 17 in a planar view, then that first protrusion 15

and 17 overlapping the outer edge of the square region *a* is not counted as a first protrusion 15 and 17 included within the square region *a*. This measurement is performed at three arbitrary locations within the first protrusion region A, and the average value is considered the existing density of the first protrusions 15 and 17.

[0056] In the brush surface 13 of the present embodiment, the first protrusion region A is continuous over an area of 100 mm² or greater in the planar direction. From the viewpoint of further reducing the load applied to the hair during brushing, it is preferable that the area of the first protrusion region A in the brush surface 13 is preferably 20% or greater, more preferably 35% or greater, and preferably 80% or less, more preferably 70% or less, and preferably from 20% to 80%, more preferably from 35% to 70%, with respect to the area of a provisional region F. Herein, "provisional region F" is a region formed by connecting respective centers of protrusions located most outward in the longitudinal direction X and the width direction Y within the brush surface 13. Herein, the protrusions forming the outer edges of the provisional region F are not limited to the first protrusions 15 and 17.

[0057] From the same viewpoint, it is preferable that the area of the first protrusion region A in the brush surface 13 is preferably 1000 mm² or greater, more preferably 1300 mm² or greater, even more preferably 1500 mm² or greater, and preferably 3500 mm² or less, more preferably 3000 mm² or less, even more preferably 2500 mm² or less, and preferably from 1000 to 3500 mm², more preferably from 1300 to 3000 mm², even more preferably from 1500 to 2500 mm².

[0058] From the viewpoint of further facilitating combing of hair in the first protrusion region A during brushing, it is preferable that the percentage of the total cross-sectional area of the first protrusions 15 and 17 within the first protrusion region A is preferably 0.8% or greater, more preferably 1% or greater, and preferably 3% or less, more preferably 2.5% or less, and preferably from 0.8% to 3%, more preferably from 1% to 2.5%. The total cross-sectional area of the first protrusions 15 and 17 in the first protrusion region A is found according to the method below.

[0059] An arbitrary 10-by-10-mm square region *a* is set at three locations within the first protrusion region A. As described above, the first protrusion region A is a region in which the first protrusions 15 and 17 are provided, and is a region formed by connecting respective centers of the first protrusions 15 and 17 located most outward in the longitudinal direction X and the width direction Y. Next, the total cross-sectional area of the first protrusions 15 and 17 included within the square region *a* is determined. In cases where the outer edge of the square region *a* overlaps one of the first protrusions 15 and 17 in a planar view, half the cross-sectional area of that first protrusion 15 and 17 is included in the total cross-sectional area of the first protrusions 15 and 17 included within the square region *a*. In cases where the cross-sectional area of the first protrusion 15 and 17 changes along the protruding direction of the protrusion, the maximum value is considered the cross-sectional area of the first protrusion 15 and 17. Next, the percentage of the total cross-sectional area of the first protrusions 15 and 17 with respect to the area of the square region *a* is calculated for each of the three square regions *a*, and then the average value calculated therefrom is considered the percentage of the total cross-sectional area of the first protrusions 15 and 17 in the first protrusion region A.

[0060] As illustrated in Fig. 3, the first protrusion region A of the present embodiment is formed extending in the longitudinal direction X in the central region M in the width direction Y. With this configuration, it is possible to further suppress hair from getting caught during brushing.

[0061] From the viewpoint of further improving the aforementioned effect, it is preferable that the length L1 (see Fig. 3), in the longitudinal direction X, of the first protrusion region A is preferably 70 or greater, more preferably 80% or greater, and preferably 95% or less, more preferably 93% or less, and preferably from 70% to 95%, more preferably from 80% to 93%, with respect to the entire length L (see Fig. 2), in the longitudinal direction X, of the brush surface 13. The length L1, in the longitudinal direction X, of the first protrusion region A is the length, in the longitudinal direction X, of the region in which the first protrusions 15 and 17 are provided and that is formed by connecting respective centers of the first protrusions 15 and 17 located most outward in the longitudinal direction X and the width direction Y.

[0062] From the viewpoint of further suppressing hair from getting caught during brushing, it is preferable that the length W1 (see Fig. 3), in the width direction Y, of the first protrusion region A is preferably 20% or greater, more preferably 30% or greater, and preferably 85% or less, more preferably 75% or less, and preferably from 20% to 85%, more preferably from 30% to 75%, with respect to the entire length W (see Fig. 2), in the width direction Y, of the brush surface 13. The length W1, in the width direction Y, of the first protrusion region A is the length, in the width direction Y, of the region in which the first protrusions 15 and 17 are provided and that is formed by connecting respective centers of the first protrusions 15 and 17 located most outward in the longitudinal direction X and the width direction Y.

[0063] From the viewpoint of further reducing the load applied to the hair during brushing, it is preferable that the first protrusion region A includes a thin protrusion region A1 including the first protrusions 15 and 17 at an existing density of from 5 to 10 protrusions per 10 mm square. In the hairbrush 10 of the present embodiment, the thin protrusion region A1 is continuous over an area of 100 mm² or greater in the planar direction. The thin protrusion region A1 may be continuous in the planar direction, or a plurality of thin protrusion regions A1 may exist in a plurality of locations on the brush surface 13.

[0064] From the same viewpoint, it is preferable that the area of the thin protrusion region A1 on the brush surface 13 is preferably 20% or greater, more preferably 30% or greater, even more preferably 35% or greater, and preferably 100% or less, more preferably 90% or less, even more preferably 80% or less, and preferably from 20% to 100%, more

preferably from 30% to 90%, even more preferably from 35% to 80%, with respect to the area of the first protrusion region A. If the area of the thin protrusion region A1 occupies 100% of the area of the first protrusion region A, this means that the thin protrusion region A1 is formed over the entire range of the first protrusion region A.

[0065] From the same viewpoint, it is preferable that the area of the thin protrusion region A1 in the brush surface 13 is preferably 1000 mm² or greater, more preferably 1300 mm² or greater, even more preferably 1500 mm² or greater, and preferably 3500 mm² or less, more preferably 3000 mm² or less, even more preferably 2500 mm² or less, and preferably from 1000 to 3500 mm², more preferably from 1300 to 3000 mm², even more preferably from 1500 to 2500 mm².

[0066] The aforementioned thin protrusion region is determined according to the method below.

[0067] Method for Determining Thin Protrusion Region:

First, in a region of the brush surface 13 in which the plurality of first protrusions are formed, a region A is defined as the first protrusion region A by connecting respective centers of the first protrusions located most outward in the longitudinal direction X and the width direction Y. Next, a 10-by-10-mm square region a is set such that one of its vertices corresponds to each of the first protrusions within the first protrusion region A. If the number of first protrusions 15 and 17 included within the square region a is from 5 to 10, then that square region a is determined as a thin protrusion region A1 or a portion of the thin protrusion region A1. In cases where the outer edge of the square region a overlaps one of the first protrusions 15 and 17 in a planar view, then that first protrusion 15 and 17 overlapping the outer edge of the square region a is not counted as a first protrusion 15 and 17 included within the square region a. If a protrusion having a greater cross-sectional area than the first protrusions 15 and 17 is included within the square region a, then it is determined that that square region a is not a thin protrusion region A1. This determination is performed sequentially while shifting the one vertex of the square region a to an adjacent first protrusion in the longitudinal direction X or the width direction Y. More specifically, one of the four vertices of the square region a is selected, and the selected vertex is matched against every first protrusion within the first protrusion region A, to perform the aforementioned determination. If square regions a, each including from 5 to 10 first protrusions 15 and 17, exist continuously in the longitudinal direction X and/or the width direction, then the entire continuous region is considered as constituting the thin protrusion region.

[0068] In the present embodiment, the thin protrusion region A1 is formed in a central area, in the width direction Y, of the brush surface 13, and more specifically, in a central area, in the width direction Y, of the first protrusion region A. With this configuration, it is possible to further suppress hair from getting caught during brushing. In the present embodiment, the thin protrusion region A1 is formed over the entire range of the first protrusion region A.

[0069] From the viewpoint of further improving the aforementioned effect, it is preferable that the length, in the longitudinal direction X, of the thin protrusion region A1 is preferably 70% or greater, more preferably 80% or greater, and preferably 95% or less, more preferably 93% or less, and preferably from 70% to 95%, more preferably from 80% to 93%, with respect to the entire length L, in the longitudinal direction X, of the brush surface 13. The length, in the longitudinal direction X, of the thin protrusion region A1 is the length between the front end and the rear end, in the longitudinal direction X, of the thin protrusion region A1 as determined according to the aforementioned "Method for Determining Thin Protrusion Region." The front end in the longitudinal direction X is the end on the opposite side from the handle 12c in the direction X. The rear end in the longitudinal direction X is the end on the side of the handle 12c in the direction X.

[0070] From the viewpoint of further suppressing hair from getting caught during brushing, it is preferable that the length, in the width direction Y, of the thin protrusion region A1 is preferably 20% or greater, more preferably 30% or greater, and preferably 85% or less, more preferably 75% or less, and preferably from 20% to 85%, more preferably from 30% to 75%, with respect to the entire length W (see Fig. 2), in the width direction Y, of the brush surface 13. The length, in the width direction Y, of the thin protrusion region A1 is the length between one end and the other end, in the width direction Y, of the thin protrusion region A1 as determined according to the aforementioned "Method for Determining Thin Protrusion Region."

[0071] In the present embodiment, as illustrated in Fig. 3, the first small protrusions 15 are arranged so as to form: first small protrusion rows J1, in each of which a plurality of the first small protrusions 15 are arranged in a line along the longitudinal direction X at given intervals; and width-direction first small protrusion rows J2, in each of which a plurality of the first small protrusions 15 are arranged in a line along the width direction Y at given intervals. In the first small protrusion rows J1 adjacent to one another in the width direction Y, the respective first small protrusions 15 are arranged at positions misaligned from one another by half-pitch in the longitudinal direction X. In the width-direction first small protrusion rows J2 adjacent to one another in the longitudinal direction X, the respective first small protrusions 15 are arranged at positions misaligned from one another by half-pitch in the width direction Y. It is preferable that, in this way, the first small protrusions 15 in the first protrusion region A are arranged in a staggered arrangement. Another configuration for arranging the first small protrusions 15 in a staggered arrangement may be a pattern wherein: in the first small protrusion rows J1 adjacent to one another in the width direction Y, the respective first small protrusions 15 are arranged at positions misaligned from one another by one-third pitch in the longitudinal direction X; and in the width-direction first small protrusion rows J2 adjacent to one another in the longitudinal direction X, the respective first small protrusions 15 are arranged at positions misaligned from one another by one-third pitch in the width direction Y.

[0072] As regards the first large protrusion row J5, the first large protrusions 17 are arranged at positions misaligned, by half-pitch in the longitudinal direction X, from the first small protrusions in the first small protrusion row J1 adjacent thereto in the width direction Y. It is preferable that, in this way, the first protrusions in the first protrusion region A are arranged in a staggered arrangement, including the first large protrusions 17.

[0073] From the viewpoint of further reducing the load applied to the hair during brushing, the total number of first protrusion rows J1 and J5 in the first protrusion region A is not particularly limited, but may preferably be from 4 to 10 rows, more preferably from 6 to 8 rows.

[0074] From the viewpoint of performing brushing effectively, it is preferable that the arrangement pitch P1 (see Fig. 6) between the first small protrusion rows J1 is preferably 2 mm or greater, more preferably 2.5 mm or greater, and preferably 5 mm or less, more preferably 4 mm or less, and preferably from 2 to 5 mm, more preferably from 2.5 to 4 mm. The arrangement pitch P1 between the first small protrusion rows J1 is the separation distance between two first small protrusion rows J1 adjacent to one another in the width direction Y, and is the shortest distance, in the width direction Y, between respective centers of first small protrusions 15 constituting those first small protrusion rows J1.

[0075] From the same viewpoint, it is preferable that the arrangement pitch P3 (see Fig. 6) between the first small protrusions 15 in the first small protrusion row J1 is preferably 3 mm or greater, more preferably 4 mm or greater, and preferably 7 mm or less, more preferably 6.5 mm or less, and preferably from 3 to 7 mm, more preferably from 4 to 6.5 mm. The arrangement pitch P3 between the first small protrusions 15 in the first small protrusion row J1 is the center-to-center distance between the first small protrusions 15, within the first small protrusion row J1, adjacent to one another in the longitudinal direction X. The separation distance between the first small protrusion row J1 and the first large protrusion row J5 is preferably the same as the arrangement pitch P1 between the first small protrusion rows J1. In cases where the hairbrush includes a plurality of first large protrusion rows J5, it is preferable that the arrangement pitch between the first large protrusion rows J5-i.e., the separation distance between first large protrusion rows J5 adjacent to one another in the width direction Y-is the same as the arrangement pitch P1 between the first small protrusion rows J1. Preferably, the arrangement pitch between the first large protrusions 17 in the first large protrusion row J5 is within the same range as the arrangement pitch P3 between the first small protrusions 15 in the first small protrusion row J1. The arrangement pitch between the first large protrusions 17 in the first large protrusion row J5 is the center-to-center distance between the first large protrusions 17, within the first large protrusion row J5, adjacent to one another in the longitudinal direction X.

[0076] Note that the arrangement pitch P1 between the first small protrusion rows J1, as well as the arrangement pitch P3 between the first small protrusions 15 in the first small protrusion rows J1, is the center-to-center separation distance between respective tip ends of the first small protrusions 15 in a planar view of the brush surface 13.

[0077] In the present embodiment, the second protrusions 16 are located more toward outside, in the width direction Y, than the first large protrusions 17. Thus, the second protrusion row J3 is located more toward outside, in the width direction Y, than the first small protrusion rows J1 and the first large protrusion row J5, and is located adjacent to and outside the first large protrusion row J5 in the width direction Y. From the viewpoint of further facilitating detangling of hair and further suppressing the hair from getting caught, it is preferable that the cross-sectional area of the protrusions 16 located most outward in the width direction Y in the side region S is greater than the cross-sectional area of the protrusions 17 located most outward in the width direction Y in the first protrusion region A.

[0078] Each thick protrusion region B in the present embodiment includes two second protrusion rows J3. The number of protrusion rows constituted by protrusions having a greater cross-sectional area than the first protrusions 15 and 17 is not particularly limited, but from the viewpoint of reducing resistance force during brushing and facilitating detangling of hair, it is preferable that the number of second protrusion rows J3, which sandwich the first protrusion region A, is preferably from 2 to 5 rows, more preferably from 2 to 4 rows.

[0079] From the viewpoint of facilitating detangling of hair, it is preferable that the thick protrusion region B is formed extending in the longitudinal direction X, and it is more preferable that the length thereof in the longitudinal direction X is longer than the length thereof in the width direction Y. From the same viewpoint, it is preferable that the length L2 (see Fig. 3), in the longitudinal direction X, of the thick protrusion region B is preferably 70% or greater, more preferably 80% or greater, and preferably 95% or less, more preferably 93% or less, and preferably from 70% to 95%, more preferably from 80% to 93%, with respect to the entire length L (see Fig. 2), in the longitudinal direction X, of the brush surface 13.

[0080] From the same viewpoint, it is preferable that the thick protrusion region B is formed extending in the longitudinal direction X. From the same viewpoint, it is preferable that the length W2 (see Fig. 3), in the width direction Y, of the thick protrusion region B is preferably 5% or greater, more preferably 10% or greater, and preferably 30% or less, more preferably 25% or less, and preferably from 5% to 30%, more preferably from 10% to 25%, with respect to the entire length W (see Fig. 2), in the width direction Y, of the brush surface 13.

[0081] As illustrated in Fig. 3, the first protrusion region A includes a plurality of first large protrusions 17 formed along the longitudinal direction X. More specifically, a first large protrusion row J5, including a plurality of first large protrusions 17 arranged in a line in the longitudinal direction X, is formed on each of both sides of the first protrusion region A in the

width direction Y-i.e., on each side more outward in the width direction Y than the region in which the first small protrusion rows J1 are formed. With this configuration, it is possible to detangle hair more effectively. In the first protrusion region A, only a single first large protrusion row J5 may be formed, or a plurality of rows may be formed. From the viewpoint of improving brushing performance, it is preferable that the number of rows of the first large protrusion rows J5, each

extending in a line along the longitudinal direction X in the first protrusion region A, is preferably from 1 to 3 rows.
[0082] The shape of each protrusion is not particularly limited, and it may have a tapered shape that narrows toward the tip end, or may have a shape that has the same cross-sectional area along the protruding direction of the protrusion. From the viewpoint of further reducing resistance force caused by contact between the hair and the protrusions during brushing, it is preferable that the first protrusions 15 and 17 have a shape that has the same cross-sectional area along the protruding direction of the protrusion. Examples of such shapes may include a circular cylinder, an elliptic cylinder, or a rectangular prism.

[0083] From the viewpoint of further increasing rigidity, it is preferable that the second protrusions 16 have a tapered shape that narrows toward the tip end. Examples of such shapes may include a truncated circular cone or a truncated pyramid.

[0084] Each protrusion may or may not have a spherical member at the tip end thereof. The first protrusions 15 and 17 of the present embodiment each have a spherical member 15a and 17a at the tip end thereof. Providing a spherical member at the tip end of the protrusions makes the feel against the scalp soft.

[0085] The head base portion 12a of the base body 11 may be formed in a rectangular shape in a planar view, wherein, for example, the length in the longitudinal direction X is around 70 to 130 mm and the length in the width direction Y is around 30 to 90 mm. The handle 12c of the base body 11 may be formed in a trapezoidal shape in a planar view, with the width gradually increasing with the distance from the head base portion 12a in the longitudinal direction X. More specifically, the handle 12c may be formed in a trapezoidal shape, wherein the length in the longitudinal direction X is around 70 to 130 mm, the short side in the width direction Y is around 15 to 25 mm, and the long side in the width direction Y is around 20 to 35 mm.

[0086] The brush base portion 13a may be formed in a rectangular shape in a planar view that substantially matches the shape of the attachment opening 12b in the head base portion 12a.

[0087] According to a preferred method for manufacturing the hairbrush 10, the base body 11 including the head base portion 12a, the brush base portion 13a, and the protrusions 15, 16, and 17 are each formed by injection molding or the like. In molding the brush base portion 13a, the second protrusions 16 may be molded integrally on the brush surface of the brush base portion 13a. Implantation holes 18 for implanting the protrusions 15 in a standing manner are formed in the brush surface 13 of the obtained brush base portion 13a by any known method such as cutting/machining. The protrusions are implanted respectively into the implantation holes 18. Then, the brush base portion 13a, on which the protrusions 15 have been provided in a standing manner on the brush surface 13, is fitted into and fixed to the attachment opening 12b in the head base portion 12a.

[0088] Any known method may be employed for implanting the protrusions respectively into the implantation holes 18. Examples may include: a method of hammering in a rod-like member into the implantation hole while folding the rod-like member into two with a flat wire; a method of inserting a rod-like member into a through hole serving as an implantation hole, and heating one end of the rod-like member protruding from the through hole, to thereby form a fastening portion 21 at the one end and fix the rod-like member; or a method of inserting a rod-like member into a through hole serving as an implantation hole, placing one end of each rod-like member protruding from the through hole into a mold, injecting a molten resin into the mold, and forming a fixing part 23 by setting the molten resin, to thereby fix the rod-like member. When employing the aforementioned method of hammering in a rod-like member into the implantation hole while folding the rod-like member into two with a flat wire, it is preferable that one of the folded portions, formed by folding the rod-like member into two, does not protrude from the brush surface 13, in order to inhibit the hair from getting caught near the root of the protrusion. With this configuration, a single protrusion can be provided per each implantation hole.

[0089] The present invention is not limited to the foregoing embodiments, and may be modified in various ways.

[0090] For example, the brush surface 13 is flat in the foregoing embodiment, but as in the hairbrush 10a illustrated in Fig. 9, the brush surface 13 may be curved such that, in a cross section along the width direction Y, the brush surface projects outward in the protruding direction of the protrusions.

[0091] In the foregoing embodiment, the first protrusions 15 and 17 are each provided with a spherical member 15a and 17a at the tip end thereof, but as illustrated in Fig. 9, the first protrusions 15 and 17 do not need to have a spherical member 15a and 17a at the tip end thereof.

[0092] In the foregoing embodiment, the second protrusions 16 do not have a spherical member 16a at the tip end thereof, but as illustrated in Fig. 9, the second protrusions 16 may each have a spherical member 16a at the tip end thereof.

[0093] In the foregoing embodiment, the hairbrush 10 includes the first small protrusions 15 and first large protrusions 17 having mutually different cross-sectional areas as the first protrusions, and includes the second protrusions 16 on the outer side of the first large protrusion row J5 in the width direction Y. However, as in the hairbrush 10b illustrated in

Fig. 10, the hairbrush may include only the first small protrusions 15 as the first protrusions.

[0094] In the foregoing embodiment, the hairbrush 10 includes a plurality of second protrusions 16 all having the same cross-sectional area. However, the hairbrush may include second protrusions having mutually different cross-sectional areas, or second protrusions having mutually different lengths, or second protrusions having mutually different cross-sectional areas and lengths.

[0095] The hairbrush 10b illustrated in Fig. 10 includes thick protrusion regions B, each including two second protrusion rows in which second protrusions 16, all having the same cross-sectional area and length, are lined up along the longitudinal direction X. The hairbrush 10c illustrated in Fig. 11 includes two types of second protrusions 16r and 16s having mutually different lengths, and includes: two second protrusion rows in which the second protrusions 16r with the longer length are lined up along the longitudinal direction X; and one second protrusion row in which the second protrusions 16s with the shorter length are lined up along the longitudinal direction X. In cases where there are a plurality of types of second protrusions having mutually different lengths, it is preferable that, in the hairbrush, the second protrusions with the shorter length are located more toward outside, in the width direction Y, than the second protrusions with the longer length, as illustrated in Fig. 11, from the viewpoint of further reducing resistance during brushing and further facilitating detangling of hair. In cases where the hairbrush includes a plurality of types of second protrusions having mutually different lengths, the "second protrusions" are found as follows. If a reference protrusion is defined as the protrusion located closest to the bisector CL that bisects the entire length W, in the width direction Y, of the brush surface 13, then the "second protrusions" are defined as protrusions having a larger cross-sectional area and shorter length than the reference protrusion when sequentially comparing the cross-sectional area and the length of each of the protrusions in order from the bisector CL toward the outer side in the width direction Y.

[0096] Each thick protrusion region B may include two or more second protrusion rows as illustrated in Figs. 10 and 11; for example, there may be three rows.

[0097] The hairbrush of the present invention is mainly used for brushing human hair, but the hairbrush may be used for taking care of the body and/or hair of pets, livestock, or the like.

[0098] In relation to the foregoing embodiments, the present invention further discloses the following hairbrushes.

{1} A hairbrush comprising:

a head portion having a brush surface on which rod-like protrusions are provided in a standing manner; and a handle, wherein:

the brush surface has a longitudinal direction and a width direction orthogonal to the longitudinal direction; a first protrusion region is provided in a central portion, in the width direction, of the brush surface, the first protrusion region including first protrusions spaced apart from one another, each of the first protrusions being provided singly and independently; and one or more second protrusion rows are provided on each of both sides sandwiching the first protrusion region in the width direction, each of the second protrusion rows including a plurality of second protrusions formed along the longitudinal direction, each of the second protrusions having a greater cross-sectional area than the first protrusion and having a shorter length than the first protrusion.

{2} The hairbrush as set forth in clause {1}, wherein the second protrusion has a higher flexural rigidity than the first protrusion.

{3} The hairbrush as set forth in clause {1} or {2}, wherein the flexural rigidity of the second protrusion is 200% or greater, preferably 250% or greater, and 450% or less, preferably 350% or less, and from 200% to 450%, preferably from 250% to 350%, with respect to the flexural rigidity of the first protrusion.

{4} The hairbrush as set forth in any one of clauses {1} to {3}, wherein the flexural rigidity of the second protrusion is 0.1 N or greater, preferably 0.12 N or greater, and 0.3 N or less, preferably 0.25 N or less, and from 0.1 to 0.3 N, more preferably from 0.12 to 0.25 N.

{5} The hairbrush as set forth in any one of clauses {1} to {4}, wherein the cross-sectional area of the second protrusion is 300% or greater, preferably 500% or greater, and 1000% or less, preferably 900% or less, and from 300% to 1000%, preferably from 500% to 900%, with respect to the cross-sectional area of the first protrusion.

{6} The hairbrush as set forth in any one of clauses {1} to {5}, wherein the cross-sectional area of the first protrusion is 0.1 mm² or greater, preferably 0.12 mm² or greater, more preferably 0.15 mm² or greater, and 0.3 mm² or less, preferably 0.28 mm² or less, more preferably 0.27 mm² or less, and from 0.1 to 0.3 mm², preferably from 0.12 to 0.28 mm², more preferably from 0.15 to 0.27 mm².

{7} The hairbrush as set forth in any one of clauses {1} to {6}, wherein the length of the second protrusion is from 40% to 80% with respect to the length of the first protrusion.

{8} The hairbrush as set forth in any one of clauses {1} to {7}, wherein the length of the second protrusion is 40% or greater, preferably 50% or greater, and 80% or less, preferably 75% or less, and from 40% to 80%, preferably

from 50% to 75%, with respect to the length of the first protrusion.

{9} The hairbrush as set forth in any one of clauses {1} to {8}, wherein the first protrusions and the second protrusions are each made from synthetic resin.

{10} The hairbrush as set forth in clause {9}, wherein the synthetic resin is a polyamide resin, and the polyamide resin is nylon or nylon 6.

{11} The hairbrush as set forth in clause {10}, wherein a material forming the first protrusions is nylon.

{12} The hairbrush as set forth in any one of clauses {9} to {11}, wherein a material forming the second protrusions is a thermoplastic elastomer resin or a linear low-density polyethylene resin.

{13} The hairbrush as set forth in any one of clauses {1} to {12}, wherein:

the first protrusion region has a plurality of implantation holes formed in a dispersed state in the longitudinal direction and the width direction; and

the first protrusions are implanted protrusions that are implanted, one by one, respectively to each of the implantation holes in a standing manner.

{14} The hairbrush as set forth in any one of clauses {1} to {13}, wherein the second protrusions are molded protrusions that are integrally molded with the brush surface or with a continuous portion to be arranged beneath the brush surface.

{15} The hairbrush as set forth in clause {14}, wherein the second protrusions and the brush surface or the continuous portion integrally molded with the second protrusions are formed from a soft resin.

{16} The hairbrush as set forth in any one of clauses {1} to {15}, wherein the second protrusions and the handle are formed from an electroconductive resin, and the second protrusions and the handle are electrically connected.

{17} The hairbrush as set forth in any one of clauses {1} to {16}, wherein:

the first protrusions comprise first small protrusions and first large protrusions having mutually different cross-sectional areas, the cross-sectional area of the first large protrusion being larger than the cross-sectional area of the first small protrusion and smaller than the cross-sectional area of the second protrusion; and

the first protrusion region includes a plurality of the first large protrusions formed along the longitudinal direction.

{18} The hairbrush as set forth in clause {17}, wherein the flexural rigidity of the first large protrusion is 130% or greater, preferably 150% or greater, and 230% or less, preferably 200% or less, and from 130% to 230%, preferably from 150% to 200%, with respect to the flexural rigidity of the first small protrusion.

{19} The hairbrush as set forth in clause {17} or {18}, wherein the first small protrusion and the first large protrusion have the same length.

{20} The hairbrush as set forth in any one of clauses {17} to {19}, wherein:

the first protrusion region includes first small protrusion rows each including a plurality of the first small protrusions arranged in a line in the longitudinal direction X; and

a first large protrusion row, including a plurality of the first large protrusions arranged in a line in the longitudinal direction, is formed more toward outside in the width direction Y than a region where the first small protrusion rows are formed.

{21} The hairbrush as set forth in clause {20}, wherein the first large protrusion row is located between the first small protrusion row and the second protrusion row.

{22} The hairbrush as set forth in clause {20} or {21}, wherein an arrangement pitch P1 between the first small protrusion rows in the width direction is 2 mm or greater, preferably 2.5 mm or greater, and 5 mm or less, preferably 4 mm or less, and from 2 to 5 mm, preferably from 2.5 to 4 mm.

{23} The hairbrush as set forth in any one of clauses {20} to {22}, wherein an arrangement pitch P3 between the first small protrusions in the first small protrusion row is 3 mm or greater, preferably 4 mm or greater, and 7 mm or less, preferably 6.5 mm or less, and from 3 to 7 mm, preferably from 4 to 6.5 mm.

{24} The hairbrush as set forth in any one of clauses {17} to {23}, wherein the cross-sectional area of the first large protrusion is 110% or greater, preferably 130% or greater, and 180% or less, preferably 150% or less, and from 110% to 180%, preferably from 130% to 180%, with respect to the cross-sectional area of the first small protrusion.

{25} The hairbrush as set forth in any one of clauses {17} to {24}, wherein a length L7 of the first large protrusion is 85% or greater, preferably 95% or greater, and 100% or less, preferably 100% or less, and from 85% to 100%, preferably from 95% to 100%, with respect to a length L3 of the first small protrusion.

{26} The hairbrush as set forth in any one of clauses {1} to {25}, wherein the first protrusion comprises a spherical member at a tip end thereof.

{27} The hairbrush as set forth in clause {26}, wherein a cross-sectional area of the spherical member at its maximum-

diameter portion is from 110% to 400%, preferably from 120% to 250%, with respect to the cross-sectional area of the protrusion.

{28} The hairbrush as set forth in any one of clauses {1} to {27}, wherein the first protrusion region includes the first protrusions at an existing density of from 5 to 10 protrusions, preferably from 6 to 9 protrusions, per 10 mm square.

{29} The hairbrush as set forth in any one of clauses {1} to {28}, wherein, when a provisional region is defined as a region formed by connecting respective centers of the protrusions located most outward in the longitudinal direction and the width direction within the brush surface, an area of the first protrusion region is 20% or greater, preferably 35% or greater, and 80% or less, preferably 60% or less, and from 20% to 80%, preferably from 35% to 60%, with respect to an area of the provisional region.

{30} The hairbrush as set forth in any one of clauses {1} to {29}, wherein the percentage of the total cross-sectional area of the first protrusions is 0.8% or greater, preferably 1% or greater, and 3% or less, preferably 2.5% or less, and from 0.8% to 3%, preferably from 1% to 2.5%, of the first protrusion region.

{31} The hairbrush as set forth in any one of clauses {1} to {30}, wherein a length L1, in the longitudinal direction, of the first protrusion region is 70 or greater, preferably 80% or greater, and 95% or less, preferably 93% or less, and from 70% to 95%, preferably from 80% to 93%, with respect to an entire length L, in the longitudinal direction, of the brush surface.

{32} The hairbrush as set forth in any one of clauses {1} to {31}, wherein a length W1, in the width direction, of the first protrusion region is 80% or greater, preferably 85% or greater, and 95% or less, preferably 93% or less, and from 80% to 95%, preferably from 85% to 93%, with respect to an entire length W, in the width direction, of the brush surface.

{33} The hairbrush as set forth in any one of clauses {1} to {32}, wherein:

the first protrusion region includes a thin protrusion region including the first protrusions at an existing density of from 5 to 10 protrusions per 10 mm square; and

the thin protrusion region is continuous over an area of 100 mm² or greater in a planar direction.

{34} The hairbrush as set forth in clause {33}, wherein the area of the thin protrusion region is 20% or greater, preferably 30% or greater, more preferably 35% or greater, and 100% or less, preferably 90% or less, more preferably 80% or less, and from 20% to 100%, preferably from 30% to 90%, more preferably from 35% to 80%, with respect to the area of the first protrusion region.

{35} The hairbrush as set forth in clause {33} or {34}, wherein:

the thin protrusion region is formed in a central area, in the width direction, of the brush surface; and

a length, in the width direction, of the thin protrusion region is 20% or greater, preferably 30% or greater, and 85% or less, preferably 75% or less, and from 20% to 85%, preferably from 30% to 75%, with respect to the entire length, in the width direction, of the brush surface.

{36} The hairbrush as set forth in any one of clauses {33} to {35}, wherein:

the thin protrusion region includes a plurality of first protrusion rows in the width direction, each of the first protrusion rows including a plurality of the first protrusions arranged in a line in the longitudinal direction;

an arrangement pitch between the first protrusion rows is from 2 to 5 mm;

an arrangement pitch P3 between the first protrusions in the first protrusion row is from 3 to 7 mm; and

in the first protrusion rows adjacent to one another in the width direction, the first protrusions are arranged at positions misaligned from one another by half-pitch in the longitudinal direction.

{37} The hairbrush as set forth in any one of clauses {1} to {36}, wherein the first protrusion region is formed extending in the longitudinal direction.

{38} The hairbrush as set forth in any one of clauses {1} to {37}, wherein the cross-sectional area of the second protrusion is greater than 0.3 mm².

{39} The hairbrush as set forth in any one of clauses {1} to {38}, wherein there are from 2 to 5 rows, preferably from 2 to 4 rows, of the second protrusion rows.

{40} The hairbrush as set forth in any one of clauses {1} to {39}, wherein:

the hairbrush comprises two types of the second protrusions having mutually different lengths; and

the second protrusions with the shorter length are located more toward outside, in the width direction, than the second protrusions with the longer length.

Examples

[0099] The present invention will be described in further detail below by way of Examples. The scope of the present invention, however, is not limited to the following Examples.

Example 1:

[0100] As Example 1, a hairbrush was manufactured, including: a brush surface on which rod-like protrusions (shown in Table 3 below) are provided in a standing manner; a head portion having the brush surface; and a handle. The length, in the width direction, of the brush surface was 60 mm, and the length thereof in the longitudinal direction was 60 mm. The rod-like protrusions were provided in a staggered arrangement so as to be separated from one another in the longitudinal direction and the width direction. The arrangement pitch P1 between the first small protrusions in the width direction and the arrangement pitch P3 between the first small protrusions in the longitudinal direction are shown in Table 3 below. The number of first small protrusions in each first small protrusion row and the number of first small protrusion rows are also shown in Table 3 below. The brush surface included eight rows of first small protrusion rows, each row including nine first small protrusions arranged in a line in the hairbrush's longitudinal direction. Further, a single first large protrusion row, including nine first large protrusions arranged in a line in the hairbrush's longitudinal direction, was provided on each of both sides located outside, in the width direction, of the region in which the eight rows of first small protrusion rows were lined up. As second protrusions, there were two types of protrusions having mutually different lengths; three rows of second protrusion rows, each including nine second protrusions arranged in a line in the hairbrush's longitudinal direction, were provided on each of both sides located outside, in the width direction, of the first protrusion region-i.e., located more toward outside, in the width direction, than the respective first large protrusion row. More specifically, two rows of second protrusion rows, each including the longer second protrusions (also referred to as "second long protrusions") arranged in a line, were arranged outside the first large protrusion row in the width direction Y; and further, a single second protrusion row, including the shorter second protrusions (also referred to as "second short protrusions") arranged in a line, was arranged outside the aforementioned two rows in the width direction Y. In this Example, "second protrusions" refer to both the second long protrusions and the second short protrusions. The first large protrusion row was located between, in the width direction, the first small protrusion row and the second long protrusion row including the second long protrusions arranged in a line. The protrusions were arranged so as to form: a first protrusion region in which the plurality of first small protrusion rows and the respective first large protrusion rows are lined up in the width direction; and respective thick protrusion regions provided outside the first protrusion region in the width direction, each thick protrusion region including the plurality of second protrusion rows lined up in the width direction. The separation distance between the first small protrusion row and the first large protrusion row in the width direction was 3 mm, the separation distance between the first large protrusion row and the second protrusion row in the width direction was 6 mm, and the separation distance between the second protrusion rows in the width direction was 3 mm. The length (mm), cross-sectional area (mm²) and flexural rigidity (N) of each of the protrusions are shown in Table 3 below. The first small protrusions and the first large protrusions were made using a nylon resin, and the second protrusions were made by injection molding using a polyester elastomer resin. The base body and the brush base portion of the hairbrush were made by injection molding using an acrylic resin. Like the protrusions illustrated in Fig. 7(b), each of the rod-like protrusions was fixed by inserting a rod-like member into a through hole serving as an implantation hole, and forming a fastening portion by heating the rod-like member's end on the opposite side from the brush surface.

Example 2:

[0101] A hairbrush was produced according to the same method as in Example 1, except that there was only a single second long protrusion row including the second long protrusions arranged in a line in the longitudinal direction. In Example 2, since the number of second protrusion rows was smaller than in Example 1, the length W2, in the width direction, of the thick protrusion region was 9 mm.

Example 3:

[0102] A hairbrush was produced according to the same method as in Example 1, except that no second long protrusion was provided. In Example 3, since the number of second protrusion rows was smaller than in Example 1, the length W2, in the width direction, of the thick protrusion region was 6 mm.

Example 4:

[0103] A hairbrush was produced according to the same method as in Example 3, except that the cross-sectional area

of the second short protrusion was 0.26 mm² and the flexural rigidity thereof was 0.25 N. The second protrusions were made using a nylon resin.

Example 5:

[0104] A hairbrush was produced according to the same method as in Example 1, except that no first large protrusion was provided.

Comparative Example 1:

[0105] A hairbrush was produced according to the same method as in Example 2, except that the length of the second long protrusion was 18 mm, the cross-sectional area thereof was 2.70 mm², and the flexural rigidity thereof was 0.16 N.

Comparative Example 2:

[0106] A hairbrush was produced according to the same method as in Example 1, except that no second protrusion was provided.

Comparative Example 3:

[0107] A hairbrush was produced according to the same method as in Comparative Example 2, except that no first large protrusion was provided.

Comparative Example 4:

[0108] A hairbrush was produced according to the same method as in Example 4, except that the length of the second short protrusion was 12 mm, the cross-sectional area thereof was 0.18 mm², and the flexural rigidity thereof was 0.11 N.

Comparative Example 5:

[0109] A hairbrush was produced according to the same method as in Comparative Example 3, except that the cross-sectional area of the first small protrusion was 0.27 mm² and the flexural rigidity thereof was 0.12 N.

[0110] The respective configurations of the hairbrushes according to the Examples and Comparative Examples are shown in Table 3 below. In Table 3, the aforementioned methods were employed to find: the cross-sectional area and length of the rod-like protrusions; the number of first protrusions per 10 mm square in the first protrusion region; the total number of first protrusions in the first protrusion region; the length W1, in the width direction, of the first protrusion region with respect to the entire length W, in the width direction, of the brush surface; and the total cross-sectional area of the first protrusions in the first protrusion region. Herein, "first protrusions" refer to the first small protrusions and the first large protrusions. In Table 3, the number of second protrusion rows, the length W2, in the width direction, of the thick protrusion region, and the total number of second protrusions indicate numbers for only one of the thick protrusion regions, which are respectively provided on both sides of the first protrusion region. In Table 3, the number of first large protrusion rows indicates the number of rows on only one side, among both sides, in the width direction, of the region in which the first small protrusion rows are lined up.

Evaluation Hair Strand:

[0111] A 35-cm-long, 5.5-cm-wide hair strand (tress) weighing 40 g was prepared from straight black hair having no history of chemical treatment and taken from a Japanese person, and the hair strand was subjected to a bleaching treatment with a commercially available bleach ("Foaming Color High Bleach" from Kao Corporation; the mixing ratio between the first preparation and the second preparation was 1:2). For the bleaching treatment, the following steps 1 to 3 were performed.

[0112] Step 1: The bleach, having the same mass as the hair strand, was applied to the hair strand, to treat the hair strand for 30 minutes at room temperature, and then rinsed off with 40°C tap water for 30 seconds.

[0113] Step 2: Next, 3.0 g of a model shampoo having the formula shown in Table 1 below was applied to the hair strand, and the hair strand was cleansed while lathering for 30 seconds, and then the hair strand was rinsed with 40°C tap water for 1 minute.

[0114] Step 3: Next, the water on the hair strand was squeezed out lightly with the fingers, and then the hair strand was towel-dried for 30 seconds with a pile face towel.

[0115] A hair strand having been subjected to the aforementioned bleaching treatment three times was employed as an evaluation hair strand, to evaluate resistance during brushing and hair entanglement as described below.

[Table 1]

Composition of model shampoo	Mass%
Sodium polyoxyethylene (2.0) lauryl ether sulfate	15.5
Lauramide diethanolamide	2.28
Disodium edetate	0.15
Sodium benzoate	0.175
Oxybenzone	0.03
Dibutylhydroxytoluene	0.01
Sodium chloride	0.8
Phosphoric acid	Moderate amount
Perfume	Trace amount
Coloring agent	Trace amount
Purified water	Balance

Evaluation of Resistance during Brushing and Hair Entanglement:

[0116] The evaluation hair strand was wetted under 40°C running water (tap water) for 30 seconds, and was then cleansed, while lathering, for 30 seconds by applying 3.0 g of the model shampoo shown in Table 1, and was further rinsed under 40°C running water for 1 minute. Then, 3.0 g of a model conditioner having the formula shown in Table 2 was applied to the evaluation hair strand and was left thereon for 30 seconds, and was then rinsed off under 40°C running water for 1 minute. Then, the water on the hair strand was squeezed out lightly with the fingers, and then the hair strand was towel-dried for 30 seconds with a pile face towel. This hair strand was employed as a wet-state evaluation hair strand.

[Table 2]

Composition of model conditioner	Mass%
Distearyl dimethylammonium chloride	3.6
Stearyl trimethylammonium chloride	2.7
Cetearyl alcohol	2
Propylene glycol	5
Methyl p-hydroxybenzoate	0.1
Purified water	Balance

[0117] Using each of the hairbrushes obtained by the Examples and Comparative Examples, the wet-state evaluation hair strand was brushed 10 times, to evaluate the resistance during brushing. Also, hair entanglement remaining in the evaluation hair strand after brushing was evaluated.

[0118] Evaluation of resistance during brushing was made by three expert panelists on a scale of 1 to 5 as described below, and the average score was calculated as the evaluation score. The respective evaluation scores are shown in Table 3 below.

- 5: Small resistance during brushing.
- 4: Rather small resistance during brushing.
- 3: Resistance is felt during brushing.
- 2: Rather strong resistance during brushing.
- 1: Strong resistance during brushing.

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[0119] Evaluation of hair entanglement after brushing was made by three expert panelists based on finger combability at the time of combing the fingers through the evaluation hair strand after being brushed as described above. The evaluation was made on a scale of 1 to 5 as described below, and the average score was calculated as the evaluation score. The respective evaluation scores are shown in Table 3 below.

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5: Excellent finger combability, with no tangles remaining in hair.

4: Rather good finger combability, with almost no tangles remaining in hair.

3: Some tangles remain in hair to an extent that there is a slight sensation of hair getting caught.

2: Tangles remain in hair to an extent that there is sensation of hair getting caught.

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1: Tangles remain in hair to an extent that there is a strong sensation of hair getting caught.

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[Table 3]

	Example 1	Example 2	Example 3	Example 4	Example 5	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4	Comparative Example 5
	Length (mm)	18	18	18	18	18	18	18	18	18
	Cross(sectional area (mm ²))	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.180.27
	Flexural rigidity (N)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.12
	Arrangement pitch P1 between first small protrusion rows (mm)	3	3	3	3	3	3	3	3	3
	Arrangement pitch P3 between first protrusions in first small protrusion row (mm)	6	6	6	6	6	6	6	6	6
	Number of first small protrusions in first small protrusion row	9	9	9	9	9	9	9	9	9
	Number of first small protrusion rows	8	8	8	8	8	8	8	8	8

(continued)

	Example 1	Example 2	Example 3	Example 4	Example 5	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4	Comparative Example 5
Length (mm)	18	18	18	18	-	18	18	-	18	-
Cross(sectional area (mm ²))	0.26	0.26	0.26	0.26	-	0.26	0.26	-	0.26	-
Flexural rigidity (N)	0.1	0.1	0.1	0.1	-	0.1	0.1	-	0.1	-
Number of first large protrusions in first large protrusion row	9	9	9	9	-	9	9	-	9	-
Number of first large protrusion rows	1	1	1	1	-	1	1	-	1	-
Number of first protrusions per 10 mm square	8	8	8	8	8	8	8	8	8	8
Length W1 of first protrusion region in width direction (mm)	27	27	27	27	21	27	27	21	27	21
Total number of first protrusions	90	90	90	90	72	90	90	72	90	72
Percentage of total cross-sectional area of first protrusions in first protrusion region (%)	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
First large protrusion										
First protrusion region										

(continued)

	Example 1	Example 2	Example 3	Example 4	Example 5	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4	Comparative Example 5
Length (mm)	12	12	-	-	12	18	-	-	-	-
Cross-sectional area (mm ²)	1.3	1.3	-	-	1.3	2.7	-	-	-	-
Flexural rigidity (N)	0.15	0.15	-	-	0.15	0.16	-	-	-	-
Number of second protrusions in second protrusion row	9	9	-	-	9	9	-	-	-	-
Number of second protrusion rows	2	1	-	-	2	2	-	-	-	-
Length (mm)	9	9	9	9	9	-	-	-	12	-
Cross-sectional area (mm ²)	0.89	0.89	0.89	0.26	0.89	-	-	-	0.18	-
Flexural rigidity (N)	0.22	0.22	0.22	0.25	0.22	-	-	-	0.11	-
Number of second protrusions in second protrusion row	9	9	9	9	9	-	-	-	9	-
Number of second protrusion rows	1	1	1	1	1	-	-	-	1	-

(continued)

	Example 1	Example 2	Example 3	Example 4	Example 5	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4	Comparative Example 5
Lenght W2 of thick protrusion region in width direction (mm)	12	9	6	6	15	9	-	-	9	-
Total number of second protrusions	27	18	9	9	27	18	-	-	9	1
Resistance during brushing	5	4	3.7	.3.	3.7	.3.	3.7	4.7	2	1
Hair enganglement after brushing	4.7	4.7	4	4.3	3.7	2.7	1.7	1.3	1.3	1.7

[0120] Table 3 shows that the hairbrushes of Examples 1 to 5 all have evaluation scores of 3.3 or higher in terms of resistance during brushing, and have evaluation scores of 3.5 or higher in terms of hair entanglement after brushing. In contrast, the hairbrushes of Comparative Examples 1 to 5 have an evaluation score below 3.0 for either or both the resistance during brushing and/or hair entanglement after brushing. These results show that the hairbrushes of Examples 1 to 5 were capable of detangling hair while suppressing resistance with respect to hair in a wet state. Stated differently, wet hair can be brushed effectively under a light load, and thus, damage to hair during brushing can be reduced.

[0121] A comparison between Example 1 and Example 5 in Table 3 shows that the provision of a first large protrusion row in the first protrusion region can further improve both the effect of reducing resistance during brushing and the effect of detangling hair.

Industrial Applicability

[0122] The hairbrush of the present invention can reduce damage to hair in a wet state during brushing.

Claims

1. A hairbrush comprising:

a head portion having a brush surface on which rod-like protrusions are provided in a standing manner; and a handle, wherein:

the brush surface has a longitudinal direction and a width direction orthogonal to the longitudinal direction; a first protrusion region is provided in a central portion, in the width direction, of the brush surface, the first protrusion region including first protrusions spaced apart from one another, each of the first protrusions being provided singly and independently; and

one or more second protrusion rows are provided on each of both sides sandwiching the first protrusion region in the width direction, each of the second protrusion rows including a plurality of second protrusions formed along the longitudinal direction, each of the second protrusions having a greater cross-sectional area than the first protrusion and having a shorter length than the first protrusion.

2. The hairbrush according to claim 1, wherein the second protrusion has a higher flexural rigidity than the first protrusion.

3. The hairbrush according to claim 1 or 2, wherein the flexural rigidity of the second protrusion is from 200% to 450% with respect to the flexural rigidity of the first protrusion.

4. The hairbrush according to any one of claims 1 to 3, wherein the flexural rigidity of the second protrusion is from 0.1 to 0.3 N.

5. The hairbrush according to any one of claims 1 to 4, wherein the cross-sectional area of the second protrusion is from 300% to 1000% with respect to the cross-sectional area of the first protrusion.

6. The hairbrush according to any one of claims 1 to 5, wherein the cross-sectional area of the first protrusion is from 0.1 to 0.3 mm².

7. The hairbrush according to any one of claims 1 to 6, wherein the length of the second protrusion is from 40% to 80% with respect to the length of the first protrusion.

8. The hairbrush according to any one of claims 1 to 7, wherein:

the hairbrush comprises two types of the second protrusions having mutually different lengths; and the second protrusions with the shorter length are located more toward outside, in the width direction, than the second protrusions with the longer length.

9. The hairbrush according to any one of claims 1 to 8, wherein the first protrusions and the second protrusions are each made from synthetic resin.

10. The hairbrush according to claim 9, wherein the synthetic resin is a polyamide resin, and the polyamide resin is

nylon or nylon 6.

11. The hairbrush according to claim 10, wherein a material forming the first protrusions is nylon.

12. The hairbrush according to any one of claims 9 to 11, wherein a material forming the second protrusions is a thermoplastic elastomer resin or a linear low-density polyethylene resin.

13. The hairbrush according to any one of claims 1 to 12, wherein:

the first protrusion region has a plurality of implantation holes formed in a dispersed state in the longitudinal direction and the width direction; and
the first protrusions are implanted protrusions that are implanted, one by one, respectively to each of the implantation holes in a standing manner.

14. The hairbrush according to any one of claims 1 to 13, wherein the second protrusions are molded protrusions that are integrally molded with the brush surface or with a continuous portion to be arranged beneath the brush surface.

15. The hairbrush according to claim 14, wherein the second protrusions and the brush surface or the continuous portion integrally molded with the second protrusions are formed from a soft resin.

16. The hairbrush according to any one of claims 1 to 15, wherein the second protrusions and the handle are formed from an electroconductive resin, and the second protrusions and the handle are electrically connected.

17. The hairbrush according to any one of claims 1 to 16, wherein:

the first protrusions comprise first small protrusions and first large protrusions having mutually different cross-sectional areas, the cross-sectional area of the first large protrusion being larger than the cross-sectional area of the first small protrusion and smaller than the cross-sectional area of the second protrusion; and
the first protrusion region includes a plurality of the first large protrusions formed along the longitudinal direction.

18. The hairbrush according to claim 17, wherein the flexural rigidity of the first large protrusion is from 130% to 230% with respect to the flexural rigidity of the first small protrusion.

19. The hairbrush according to claim 17 or 18, wherein the first small protrusion and the first large protrusion have the same length.

20. The hairbrush according to any one of claims 17 to 19, wherein:

the first protrusion region includes first small protrusion rows each including a plurality of the first small protrusions arranged in a line in the longitudinal direction X; and
a first large protrusion row, including a plurality of the first large protrusions arranged in a line in the longitudinal direction, is formed more toward outside in the width direction Y than a region where the first small protrusion rows are formed.

21. The hairbrush according to claim 20, wherein the first large protrusion row is located between the first small protrusion row and the second protrusion row.

22. The hairbrush according to claim 20 or 21, wherein an arrangement pitch P1 between the first small protrusion rows in the width direction is from 2 to 5 mm.

23. The hairbrush according to any one of claims 20 to 22, wherein an arrangement pitch P3 between the first small protrusions in the first small protrusion row is from 3 to 7 mm.

24. The hairbrush according to any one of claims 17 to 23, wherein the cross-sectional area of the first large protrusion is from 110% to 180% with respect to the cross-sectional area of the first small protrusion.

25. The hairbrush according to any one of claims 17 to 24, wherein a length L7 of the first large protrusion is from 85% to 100% with respect to a length L3 of the first small protrusion.

26. The hairbrush according to any one of claims 1 to 25, wherein the first protrusion comprises a spherical member at a tip end thereof.
- 5 27. The hairbrush according to claim 26, wherein a cross-sectional area of the spherical member at its maximum-diameter portion is from 110% to 400% with respect to the cross-sectional area of the protrusion.
28. The hairbrush according to any one of claims 1 to 27, wherein the first protrusion region includes the first protrusions at an existing density of from 5 to 10 protrusions per 10 mm square.
- 10 29. The hairbrush according to any one of claims 1 to 28, wherein, when a provisional region is defined as a region formed by connecting respective centers of the protrusions located most outward in the longitudinal direction and the width direction within the brush surface, an area of the first protrusion region is from 20% to 80% with respect to an area of the provisional region.
- 15 30. The hairbrush according to any one of claims 1 to 29, wherein the percentage of the total cross-sectional area of the first protrusions is from 0.8% to 3% of the first protrusion region.
- 20 31. The hairbrush according to any one of claims 1 to 30, wherein a length L1, in the longitudinal direction, of the first protrusion region is from 70% to 95% with respect to an entire length L, in the longitudinal direction, of the brush surface.
32. The hairbrush according to any one of claims 1 to 31, wherein a length W1, in the width direction, of the first protrusion region is from 80% to 95% with respect to an entire length W, in the width direction, of the brush surface.
- 25 33. The hairbrush according to any one of claims 1 to 32, wherein:
the first protrusion region includes a thin protrusion region including the first protrusions at an existing density of from 5 to 10 protrusions per 10 mm square; and
the thin protrusion region is continuous over an area of 100 mm² or greater in a planar direction.
- 30 34. The hairbrush according to claim 33, wherein the area of the thin protrusion region is from 20% to 100% with respect to the area of the first protrusion region.
- 35 35. The hairbrush according to claim 33 or 34, wherein:
the thin protrusion region is formed in a central area, in the width direction, of the brush surface; and
a length, in the width direction, of the thin protrusion region is from 20% to 85% with respect to the entire length, in the width direction, of the brush surface.
- 40 36. The hairbrush according to any one of claims 33 to 35, wherein:
the thin protrusion region includes a plurality of first protrusion rows in the width direction, each of the first protrusion rows including a plurality of the first protrusions arranged in a line in the longitudinal direction;
an arrangement pitch between the first protrusion rows is from 2 to 5 mm;
45 an arrangement pitch P3 between the first protrusions in the first protrusion row is from 3 to 7 mm; and
in the first protrusion rows adjacent to one another in the width direction, the first protrusions are arranged at positions misaligned from one another by half-pitch in the longitudinal direction.
- 50 37. The hairbrush according to any one of claims 1 to 36, wherein the first protrusion region is formed extending in the longitudinal direction.
38. The hairbrush according to any one of claims 1 to 37, wherein the cross-sectional area of the second protrusion is greater than 0.3 mm².
- 55 39. The hairbrush according to any one of claims 1 to 38, wherein there are from 2 to 5 rows of the second protrusion rows.

Fig. 1

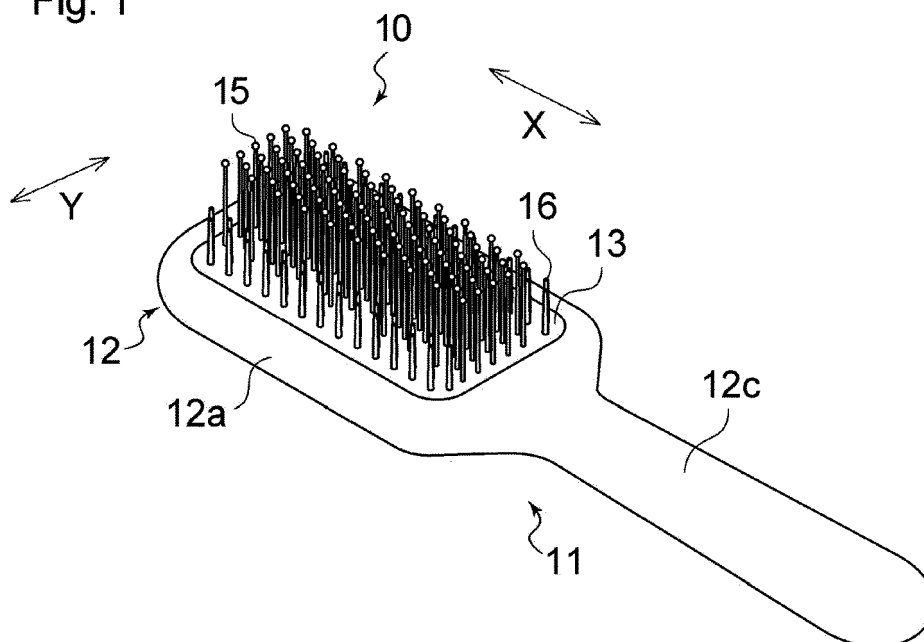


Fig. 2

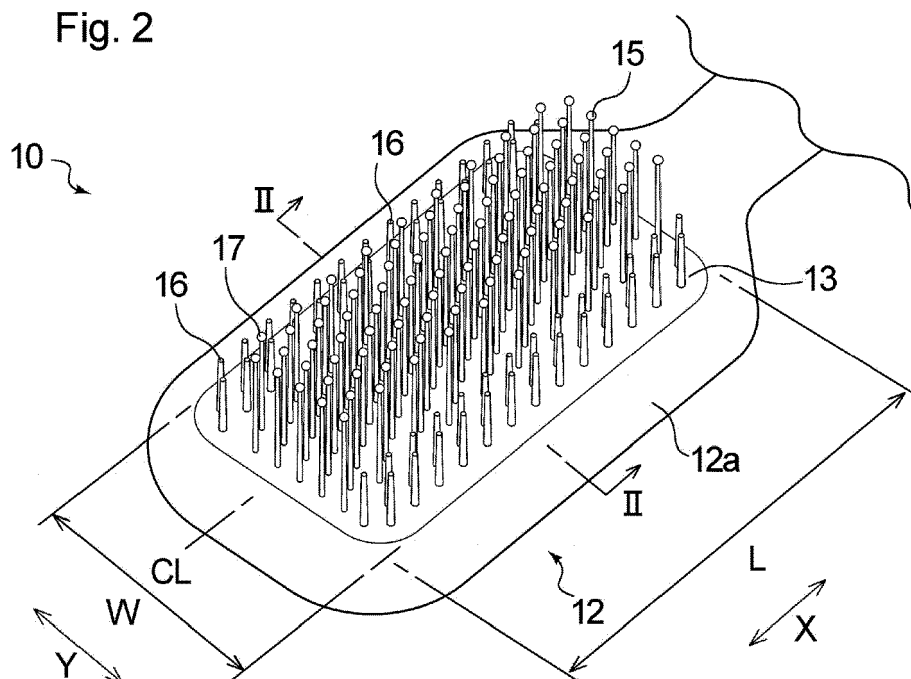


Fig. 3

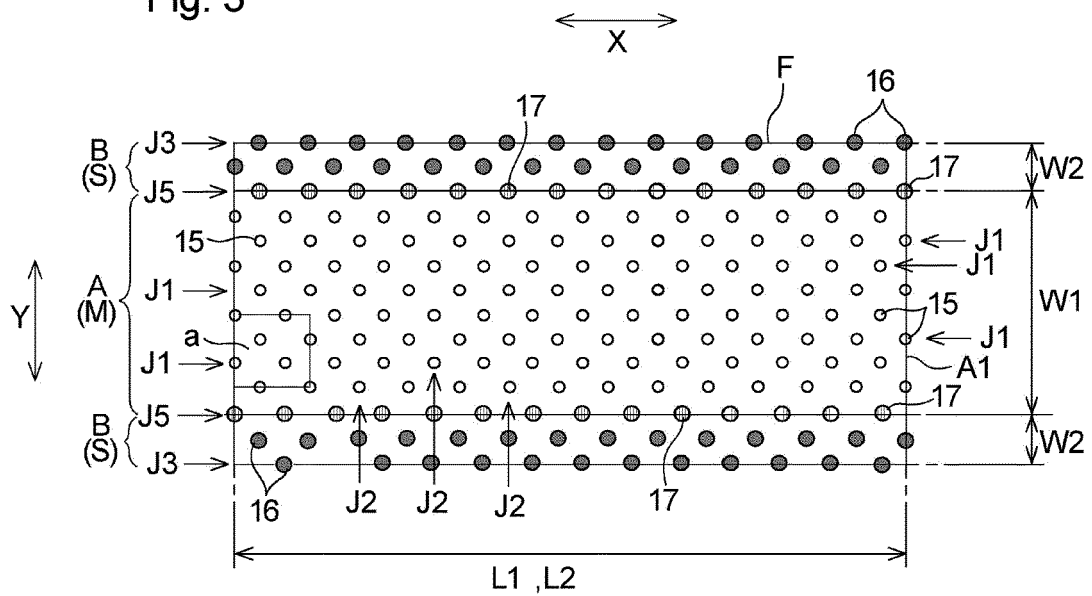


Fig. 4

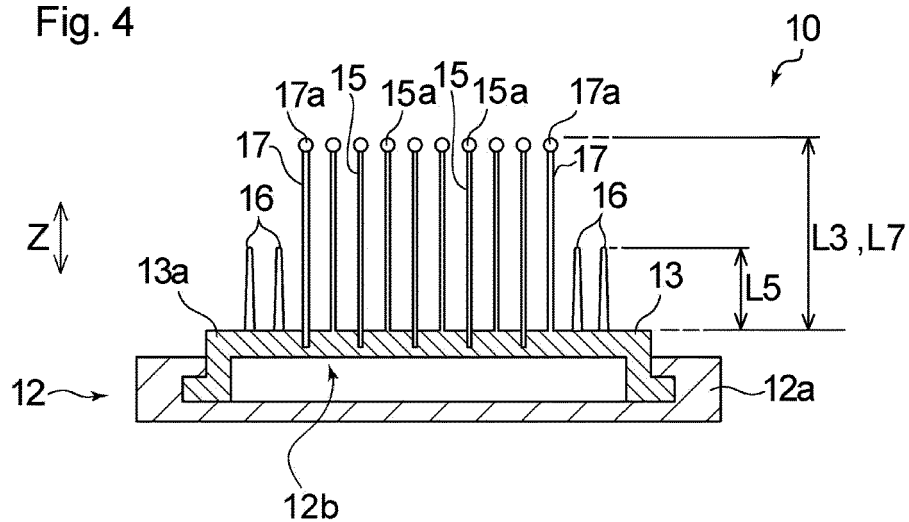
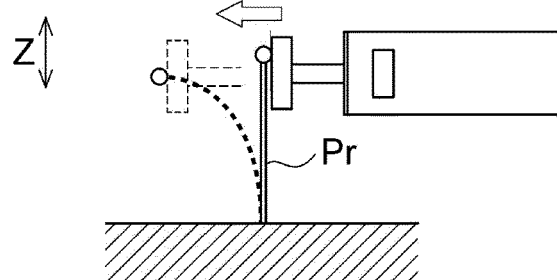


Fig. 5



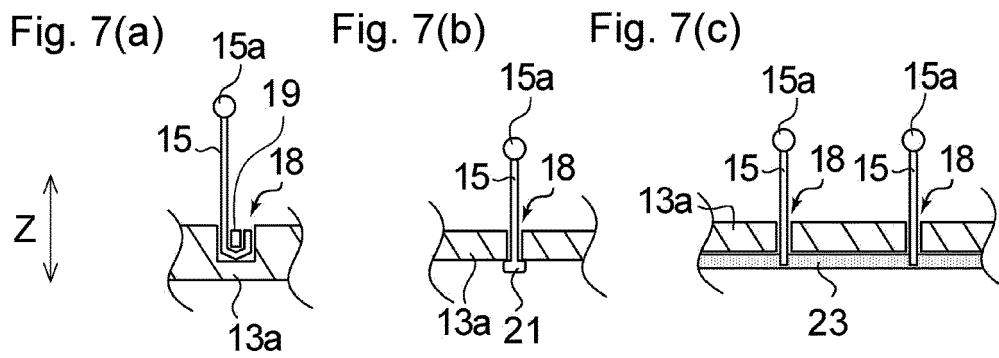
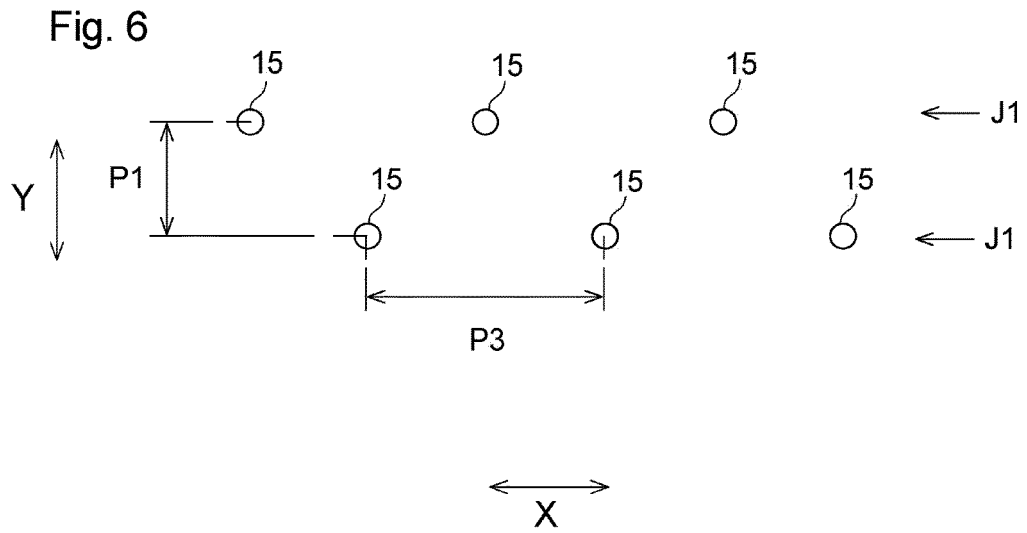


Fig. 8(a)

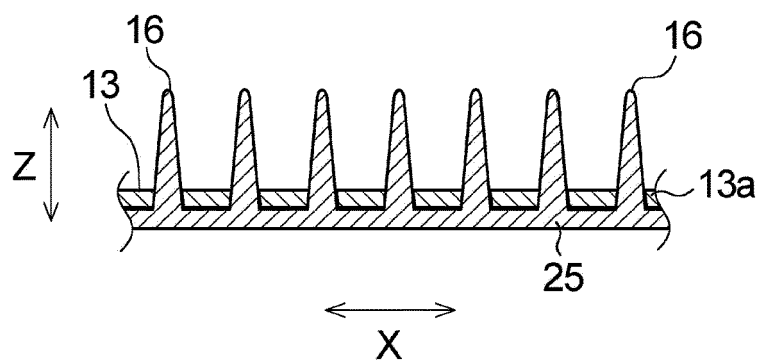


Fig. 8(b)

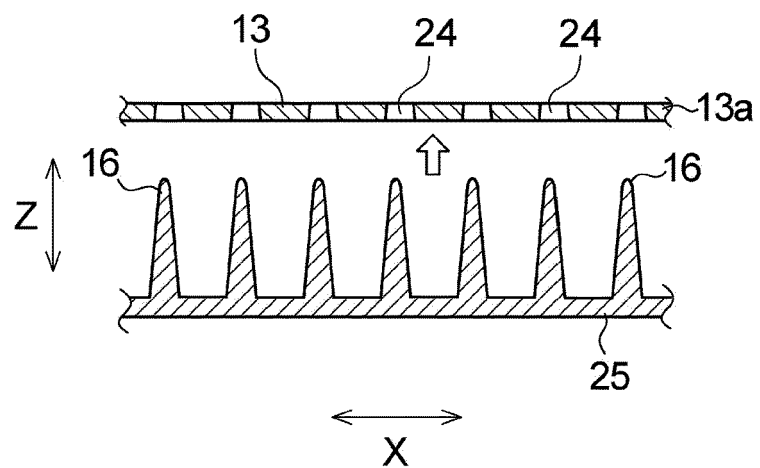


Fig. 9

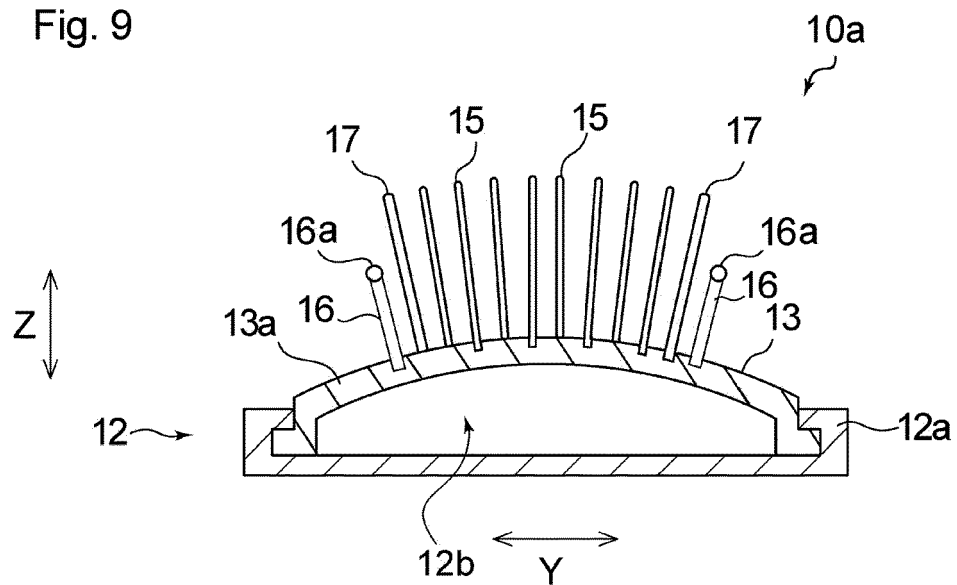


Fig. 10

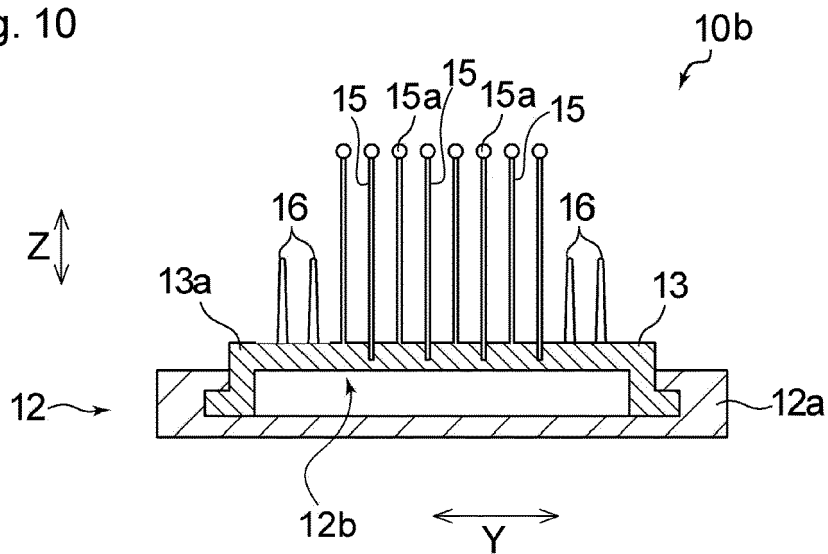
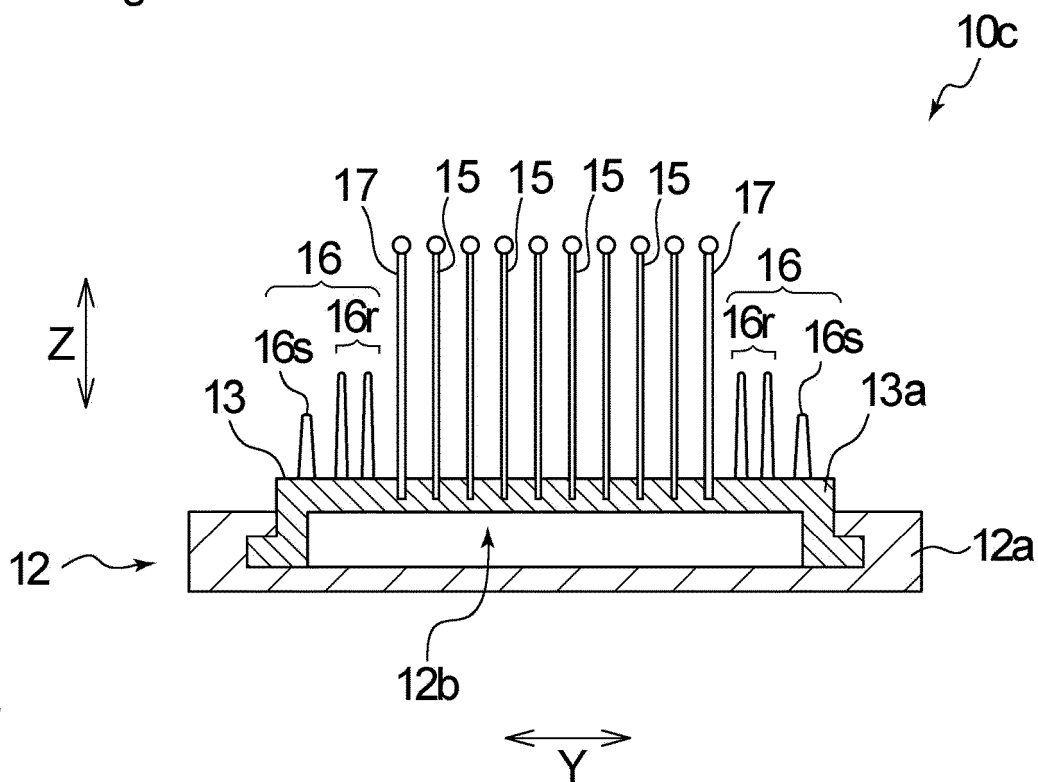


Fig. 11



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/034267

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. A46B9/02 (2006.01) i

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)

Int. Cl. A46B9/02

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 1971-2019

Registered utility model specifications of Japan 1996-2019

Published registered utility model applications of Japan 1994-2019

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.
X	JP 2011-45612 A (DARIYA KK) 10 March 2011, paragraphs [0024]-[0058], fig. 1-25, in particular, paragraphs [0056]-[0058], fig. 20-25 (Family: none)	1-7, 9, 14-15, 17, 37
Y	JP 2011-5127 A (PANASONIC ELECTRIC WORKS CO., LTD.) 13 January 2011, paragraphs [0021]-[0063], fig. 1-12 & CN 101933710 A	10-12, 17-25, 28-36, 38
Y	JP 2011-5127 A (PANASONIC ELECTRIC WORKS CO., LTD.) 13 January 2011, paragraphs [0021]-[0063], fig. 1-12 & CN 101933710 A	1-7, 9-16, 26-38
Y	KR 10-2016-0047289 A (MOON WOONG TAE) 02 May 2016, paragraphs [0025]-[0047], fig. 2-4 (Family: none)	1-15, 26-36, 37-39



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search
12.11.2019Date of mailing of the international search report
26.11.2019Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/034267

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 094829/1978 (Laid-open No. 13879/1980) (KAO SOAP COMPANY) 29 January 1980, description, page 2, line 8 to page 10, line 14, fig. 1-7 (Family: none)	1-16, 26-39
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 047428/1980 (Laid-open No. 148227/1981) (KAO SOAP COMPANY) 07 November 1981, description, page 2, lines 12-18 (Family: none)	10-12, 17-25, 28-36, 38
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 044163/1977 (Laid-open No. 141179/1978) (HIRANUMA, Goro) 08 November 1978, entire text, all drawings (Family: none)	1-39
A	US 2005/0210614 A1 (CHANG, Tianyi) 29 September 2005, entire text, all drawings & GB 2412302 A	1-39

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REFERENCES CITED IN THE DESCRIPTION

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- JP S61192730 U [0007]
- JP S61202239 U [0007]
- JP 2003245131 A [0007]
- US 20040250831 A1 [0007]
- US 20180228277 A1 [0007]