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(54) **Method of manufacturing outer cutter of rotary electric shaver**

Verfahren zur Herstellung der äußeren Klinge eines elektrischen Rotationsrasierers

Procédé de fabrication de lame extérieure de rasoir électrique rotatif

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a method of manufacturing an outer cutter of a rotary electric shaver, more specifically a method of manufacturing an outer cutter of a rotary electric shaver that has round hole-shaped hair introduction openings on a circular shaving surface of the outer cutter. In a second aspect it relates to the manufacture of a rotary shaver including such a cutter.

BACKGROUND

[0002] A rotary electric shaver that includes an outer cutter which has a circular shaving surface as a top surface where numerous hair introduction openings are formed; an inner cutter which has a small cutter slidingly in contact with a bottom surface of the outer cutter from below the shaving surface and rotates, and in which a plurality of circular shaving surfaces are integrally formed on the outer cutter in a concentric manner has been known (refer to PTL 1 and PTL 2).

Citation List

Patent Literature

[0003]

PTL 1: JP-A-2012-100728
PTL 2: JP-A-2010-528801

[0004] Here, since an outer cutter of a rotary electric shaver that is described in JP-A-2012-100728 is configured to include slit-shaped hair introduction openings only which are provided side by side at small intervals, there is a small plane surface area (hereinafter, referred to as a "sliding surface portion") including no hair introduction opening, thereby having a problem of leaving unpleasant feeling on skin.

[0005] Meanwhile, since an outer cutter of a rotary electric shaver that is described in JP-A-2010-528801 is provided with the round hole-shaped hair introduction openings in addition to the slit-shaped hair introduction openings, the sliding surface portion can be expected to be widened as an effect. However, in the related art, the aforementioned outer cutter that includes the round hole-shaped hair introduction openings is essentially manufactured by an electric discharging method, an electrolytic processing method, a laser processing method, and an etching method. Therefore, a manufacturing method is upgraded and complicated, and a period in a manufacturing step is prolonged, thereby having a problem of an increase in manufacturing cost.

[0006] The present invention has been made in consideration of the above-describe circumstances. A preferred embodiment may provide a manufacturing method in which an outer cutter of a rotary electric shaver that has round hole-shaped hair introduction openings on a circular shaving surface can be easily and inexpensively formed. Preferably an outer cutter that feels pleasant on skin can be formed.

SUMMARY OF THE INVENTION

[0007] As an exemplary embodiment, a below-disclosed means may solve or ameliorate the problems.

[0008] A disclosed method of manufacturing an outer cutter of a rotary electric shaver includes the outer cutter which has a circular shaving surface as a top surface where numerous hair introduction openings are formed and includes an inner cutter which has a small cutter slidingly in contact with a bottom surface of the outer cutter from below of the shaving surface and rotates, in which a plurality of circular shaving surfaces are integrally formed in the outer cutter in a concentric manner, and round hole-shaped hair introduction openings are formed in at least one of the circular shaving surfaces includes (a) a step of grinding or polishing a predetermined position where the round hole-shaped hair introduction openings are formed on the circular shaving surface to obtain a thickness size smaller than an inner diameter size of the round hole; and (b) a step of forming the round hole-shaped hair introduction openings in the position where the grinding or the polishing is performed by pressing, after the step (a).

Advantageous Effects of Invention

[0009] According to the disclosed method of manufacturing an outer cutter of a rotary electric shaver, it is possible to easily and inexpensively form round hole-shaped hair introduction openings on a circular shaving surface of the outer cutter of the rotary electric shaver. Since a sliding surface portion can be widened by forming the round hole-shaped hair introduction openings in the circular shaving surface, it is possible to form an outer cutter that feels pleasant on skin.

BRIEF DESCRIPTION OF DRAWINGS

[0010]

[Fig. 1] Fig. 1 is a schematic view (perspective view) illustrating an example of a rotary electric shaver according to an embodiment of the present invention.
[Fig. 2] Fig. 2 is a schematic view (plan view) illustrating an example of the rotary electric shaver illustrated in Fig. 1.
[Fig. 3] Fig. 3 is a schematic view (cross-sectional view of a side surface) illustrating an example of the rotary electric shaver illustrated in Fig. 2.
[Fig. 4] Fig. 4 is an explanatory diagram that describes a method of manufacturing the outer cutter

of the rotary electric shaver illustrated in Fig. 2.

[Fig. 5] Fig. 5 is an explanatory diagram that describes the method of manufacturing the outer cutter of the rotary electric shaver illustrated in Fig. 2.

[Fig. 6] Fig. 6 is an explanatory diagram that describes the method of manufacturing the outer cutter of the rotary electric shaver illustrated in Fig. 2.

[Fig. 7] Fig. 7 is the explanatory diagram that describes the method of manufacturing the outer cutter of the rotary electric shaver illustrated in Fig. 2.

[Figs. 8A and 8B] Figs. 8A and 8B are explanatory diagrams to describe the method of manufacturing the outer cutter of the rotary electric shaver illustrated in Fig. 2.

[Fig. 9] Fig. 9 is an explanatory diagram to describe the method of manufacturing the outer cutter of the rotary electric shaver illustrated in Fig. 2.

[Fig. 10] Fig. 10 is an explanatory diagram to describe the method of manufacturing the outer cutter of the rotary electric shaver illustrated in Fig. 2.

[Fig. 11] Fig. 11 is a schematic view (plane view) illustrating another example of the outer cutter of the rotary electric shaver according to the embodiment of the invention.

DESCRIPTION OF EMBODIMENTS

[0011] Hereinafter, referring to views, an embodiment of the present invention will be described in detail. Fig. 1 is a perspective view (schematic view) illustrating an example of a rotary electric shaver 1 according to an embodiment of the invention. Fig. 2 is a plan view (schematic view) of an outer cutter 10A of the rotary electric shaver 1. Fig. 3 is a cross-sectional view of a side surface (schematic view) of the outer cutter 10A. In all views for describing the embodiment, the same reference numerals are applied the members that have the same functions, and descriptions thereof may not be repeated.

[0012] According to an aspect of the invention, as illustrated in Figs. 1 to 3, there is provided the rotary electric shaver 1 that includes the outer cutter 10A which has a shaving surface (below-described circular shaving surface) as a top surface where numerous hair introduction openings are formed and includes an inner cutter 12A which has a small cutter slidingly contacting a bottom surface of the outer cutter 10A from below of the shaving surface and rotates. The rotary electric shaver cuts hair that enters hair introduction openings with the outer cutter 10A and the inner cutter 12A. The rotary electric shaver that has three sets of a combination of the outer cutter 10A and the inner cutter 12A will be exemplified for description, without being limited thereto.

[0013] In Fig. 1, the reference numeral 50 is a main body portion that has a case 54 of which an upper portion of a substantially cylindrical-shaped grip portion 52 is bent in an obliquely front-upward manner. The case 54 is split into two, and a rechargeable battery, an electric motor, and a control circuit substrate (not illustrated) are contained inside thereof. A power switch 56 is attached to a front surface of the case 54, and a display portion (not illustrated) that is configured to have an LED lamp illustrating a remaining capacity of the battery and an operation state is provided below the switch 56.

[0014] A head portion 58 is openably and detachably attached in an upper portion of the case 54. The head portion 58 is tilted with respect to the grip portion 52 of the case 54 so as to direct the shaving surface (below described top surface of cutter frame body 60) thereof in the obliquely front-upward manner. A rotation output shaft of the electric motor protrudes from the upper portion of the case 54 toward an inside of the head portion 58 to rotationally drive the inner cutter 12A, and elastically pushes the inner cutter 12A upward, thereby appropriately maintaining contact pressure with respect to a bottom surface of shaving surfaces 16A and 18A of small cutters 22A and 24A.

[0015] The head portion 58 has a configuration in which three sets of a cutter assembly body 62 are installed in the cutter frame body 60 that is openably attached to the top surface of the case 54. The cutter frame body 60 has a substantially triangle shape in a plan view and of which a peripheral edge is in a shape that is smoothly curved downward. Three circular mounting ports are formed in the cutter frame body 60, and the cutter assembly bodies 62 are respectively and tiltably held upward with a resetting habit in a movable manner.

[0016] That is, the cutter assembly body 62 includes the substantially disc-shaped outer cutter 10A of which a peripheral edge is bent downward, an outer cutter rim 64 into which the outer periphery of the outer cutter 10A is fit (refer to Fig. 1), and the inner cutter 12A that is slidingly in contact with the outer cutter 10A from below (refer to Fig. 3). The inner cutter 12A is rotatably held in the cutter assembly body 62 so as not to fall off downward, thereby being rotatably driven by the electric motor as described above.

[0017] Here, a plurality of circular shaving surfaces are integrally formed in the outer cutter 10A in a concentric manner. In the embodiment, as illustrated in Figs. 2 and 3, two (dual) of the circular shaving surfaces 16A and 18A that are concentric with a center shaft 20A, and a circular concave groove 14A that is located therebetween are formed on the outer cutter 10A. However, without being limited to the configuration, the configuration may have three or more of the circular shaving surfaces and two or more of the circular concave grooves (not illustrated).

[0018] As an example, in the circular shaving surfaces 16A and 18A, the circular shaving surface 18A on an inner side is higher than the circular shaving surface 16A on an outer side, that is, the closer to the center shaft 20A, the higher in a height. The circular shaving surfaces 16A and 18A are configured to be located on a horizontal plane with respect to the center shaft 20A (refer to Fig. 3). However, without being limited thereto, the circular shaving surfaces 16A and 18A may be formed to be the

same in height.

[0019] In addition, the numerous hair introduction openings are formed in the circular shaving surfaces 16A and 18A to have a configuration in which the top surface thereof protrudes farther than the outer cutter rim 64. In the embodiment, round hole-shaped hair introduction openings 30 (30a and 30b) and slit-shaped hair introduction openings 32 are included as hair introduction openings. Here, the round hole-shaped hair introduction openings (round holes) 30 are not limited to a true circular shape, and other circular shapes such as an elliptical shape and the like are also included. Meanwhile, the slit-shaped hair introduction openings (slits) 32 are not limited to an oblong shape, and other rectangular shapes such as a trapezoidal shape and the like are also included.

[0020] More specifically, only the slit-shaped hair introduction openings 32 are provided in the circular shaving surface 16A at the outermost periphery. In this way, since the circular shaving surface 16A at the outermost periphery normally and mostly exhibits an action of capturing and cutting of hair, it is possible to increase an effect of the capturing and the cutting of hair by arranging only the slit-shaped hair introduction openings 32 that are highly effective in the capturing of hair.

[0021] In the circular shaving surface other than the outermost periphery (that is, the circular shaving surface 18A on an inner periphery side in the embodiment), the round hole-shaped hair introduction openings 30 and the slit-shaped hair introduction openings 32 are provided side by side. In the embodiment, along a peripheral direction of the circular shaving surface 18A on the inner periphery side, a round hole forming area 31 that consists of a predetermined number of round hole-shaped hair introduction openings 30 (30a and 30b) and a slit forming area 33 that consists of a predetermined number of slit-shaped hair introduction openings 32 are configured to be alternately provided. As an example, as illustrated in Fig. 2, in the circular shaving surface 18A on the inner periphery side, three round hole forming areas 31 and three slit forming areas 33 are configured to be alternately provided. However, without being limited thereto, three or more, for example, five round hole forming areas 31 and five slit forming areas 33 may be configured to be alternately provided as illustrated in a modification example of Fig. 11. Furthermore, it is not limited to a case in which the round hole forming area 31 and the slit forming area 33 are not the same in number.

[0022] The slit-shaped hair introduction openings 32 are highly effective in the capturing and the cutting of hair. On the other hand, there is a problem of leaving unpleasant feeling on skin. However, as in the embodiment, if a configuration is obtained in which only the slit-shaped hair introduction openings 32 are provided in the circular shaving surface 16A at the outermost periphery, and the round hole-shaped hair introduction openings 30 (30a and 30b) and the slit-shaped hair introduction openings 32 are provided side by side in the circular shaving surface 18A other than at the outermost periphery, the area of the sliding surface portion 34 can be increased without being deteriorated in a function of the capturing hair. Accordingly, it is possible to realize the outer cutter that feels pleasant on skin. Furthermore, it is possible to enhance the intent to purchase by providing a novel design to a user through the configuration that can be found in the related art, that is, the round hole forming area 31 and the slit forming area 33 are alternately disposed.

[0023] Here, the round hole-shaped hair introduction openings 30 are formed to have the round holes 30a at the inner periphery side and the round holes 30b at the outer periphery side that are alternately disposed in a zigzag manner along the peripheral direction of the circular shaving surface 18A. In the embodiment, as illustrated in Fig. 2, in one round hole forming area 31, the round holes 30a at the inner periphery side and the round holes 30b at the outer periphery side that are formed to be alternately disposed in a zigzag manner along the peripheral direction of the circular shaving surface 18A, such as the round hole-shaped hair introduction opening (round hole at the outer periphery side) 30b, the round hole-shaped hair introduction opening (round hole at the inner periphery side) 30a, the round hole-shaped hair introduction opening (round hole at the outer periphery side) 30b, the round hole-shaped hair introduction opening (round hole at the inner periphery side) 30a, and so forth to the round hole-shaped hair introduction opening (round hole at the outer periphery side) 30b.

[0024] In this way, it is possible to form the round hole-shaped hair introduction openings 30 (30a and 30b) by a shearing press processing that has been difficult hitherto. That is, when the round hole-shaped hair introduction openings are provided side by side on the same radius, in order to improve the function of the capturing hair, it is required to make intervals of the adjacent round hole-shaped hair introduction openings be close to each other at a predetermined distance (for example, clearance of approximately 0.2 mm). However, if the round hole-shaped hair introduction openings are set in the aforementioned intervals, pins of a punch for the shearing press processing are too close to each other, and a pin diameter becomes too thin, thereby being difficult to perform the shearing press processing. In contrast, as in the embodiment, through the configuration in which the round holes 30a at the inner periphery side and the round holes 30b at the outer periphery side are formed to be alternately disposed in a zigzag manner, a processing method can be employed in which the shearing press processing is performed on a plurality of round holes (that is, either one of only the round hole 30a at the inner periphery side or only the round hole 30b at the outer periphery side in one round hole formation area 31) that are disposed at one of the inner periphery side or the outer periphery side by a single press, and then, the shearing press processing is performed to the round holes (that is, the other one of only the round hole 30a at the inner periphery side or only the round hole 30b at the outer

periphery side in one round hole formation area 31) that are disposed at the other one of the inner periphery side or the outer periphery side by the single press. In this way, it is possible to make the round hole-shaped hair introduction openings (round holes at the inner periphery side) 30a and the round hole-shaped hair introduction openings (round holes at the outer periphery side) 30b that are adjacent in the zigzag manner be close to each other at a predetermined distance (for example, clearance of approximately 0.2 mm). In addition, the intervals of the round hole-shaped hair introduction openings that are side by side in the same radius (interval between one round hole 30a and a round hole 30a next thereto, and interval between one round hole 30b and a round hole 30b next thereto) can be separated by a distance (for example, clearance of approximately 0.3 mm to 0.4 mm) that allows the shearing press processing. That is, regarding the punch for forming the round hole-shaped hair introduction openings 30 (30a and 30b), two types of punches, one for round hole processing of the inner periphery side and another for the round hole processing of the outer periphery side, are prepared. Therefore, in each punch, it is possible to separate apart the distance between the adjacent pins in the same radius farther than a predetermined distance, and it is possible to secure strength by having the pin diameter at a predetermined thickness, and the round hole-shaped hair introduction openings 30 (30a and 30b) can be formed through the shearing press processing.

[0025] Meanwhile, as illustrated in Fig. 3, the inner cutter 12A has a configuration in which the small cutters 22A and 24A that are slidingly in contact with the bottom surfaces (inner cutter sliding surfaces) 16B and 18B of the shaving surfaces 16A and 18A are integrally formed with a common metal plate 12B. Since the upper end edge of the small cutters 22A and 24A are slidingly in contact with the bottom surfaces 16B and 18B that respectively become the inner cutter sliding surfaces, and cuts hair that enters the round hole-shaped hair introduction openings 30 (30a and 30b) and the slit-shaped hair introduction openings 32, it is necessary that the upper end edge has a uniform height as the height of the inner cutter sliding surfaces 16B and 18B and the upper end edge is polished to be improved in sharpness of a cutter.

[0026] Subsequently, the method of manufacturing the outer cutter of the rotary electric shaver 1 will be described according to the embodiment.

[0027] Firstly, as illustrated in Fig. 4, a flat plate sheet material made of stainless steel (as an example, with a thickness of 0.6 mm) is prepared, and punching of a circular plate-shaped member 10Aa having a predetermined diameter is performed by performing the punch against a front surface side through the shearing press processing. At the same time, a central opening portion 8 is formed by the punching.

[0028] Next, as illustrated in Fig. 5, a drawing press processing is performed to the punched circular plate-shaped member 10Aa to press out the area of the circular shaving surfaces 16A and 18A that are arranged on a circular shape and obtain a stereoscopic shaped member 10Ab by forming the circular concave groove 14A. The circular shaving surfaces 16A and 18A become a so-called cutting edge portion. The circular shaving surfaces 16A and 18A can be employed either in a case where a height of each top surface is the same or in a case where the height of each upper surface is different.

[0029] Here, a cutout portion (hereinafter, referred to as a "D-shaped cut portion") 9 is formed at the outer periphery edge of a predetermined position of the outer cutter (in this case, stereoscopic shaped member 10Ab) by punching at the same time with the drawing press processing or thereafter. The D-shaped cut portion 9 is used as a position mark described below.

[0030] Next, a thickness reduction is performed to the circular shaving surfaces 16A and 18A of the stereoscopic shaped member 10Ab. More specifically, at this moment, since portions that become the circular shaving surfaces 16A and 18A have a thickness of a metal plate in their integrity (as an example, with a thickness of 0.6 mm), the thickness reduction of the circular shaving surfaces 16A and 18A is performed until a predetermined thickness is obtained by performing the grinding or the polishing of the parts that become the circular shaving surfaces 16A and 18A. In the embodiment, the grinding or the polishing of the circular shaving surfaces 16A and 18A is performed so as to obtain a value in thickness size (as an example, with a thickness of 0.2 mm) smaller than an inner diameter size (as an example, inner diameter of 0.3 mm to 0.6 mm) of the round hole-shaped hair introduction openings (described below) that are formed on the circular shaving surfaces 16A and 18A during a post-processing. By including the processing in the post-processing, it is possible to form the round hole-shaped hair introduction openings that have a suitable inner diameter (as an example, inner diameter 0.3 mm to 0.6 mm) for capturing hair on the circular shaving surfaces 16A and 18A by the shearing press processing. However, in consideration of the thickness reduction, it is important to employ the shearing press processing method described below.

[0031] Here, as illustrated in Fig. 6, the thickness reduction can be performed by rotating a grinding tool 72 such as a turning tool or a polishing tool such as a whetstone (here, both may be collectively referred to as a grinding/polishing tool) of which the top surface corresponds to the height of the circular shaving surfaces 16A and 18A about the center shaft 20A.

[0032] Similarly, the bottom surface of the circular shaving surfaces 16A and 18A use a grinding/polishing tool 74 that corresponds to the heights thereof to be rotated about the center shaft 20A, thereby enabling the processing. The reference numerals 16A and 18A that are illustrated with dashed lines in Fig. 6 denote the top surface of the shaving surfaces (surfaces contacting skin), and the reference numerals 16B and 18B denote the bottom surface of the shaving surfaces (surface

where the small cutters 22A and 24A of the inner cutter 12A slides, inner cutter sliding surface). In place of rotating the grinding/polishing tools 72 and 74 or together with the rotating of the same, as a matter of course, the outer cutter 10A may be rotated.

[0033] Next, as illustrated in Fig. 7, forming of the round hole-shaped hair introduction openings 30 is performed at a position where the thickness reduction (grinding or polishing) is performed on the circular shaving surfaces 16A and 18A by the shearing press processing. More specifically, with respect to the circular shaving surfaces 16A and 18A of the stereoscopic shaped member 10Ab, a rear surface side (surface to be the bottom surface side)is supported by a die, the punch is pressed against the front surface side (surface to be the top surface), a drilling is performed from the front surface side toward the rear surface side by the shearing press processing, and then, the plurality of round hole-shaped hair introduction openings (round holes) 30 (30a and 30b) are formed. At this time, the D-shaped cut portion 9 is used as the position mark that becomes a standard position for a processing to perform the processing of the stereoscopic shaped member 10Ab, thereby performing the shearing press processing. Accordingly, the round hole-shaped hair introduction openings (round holes) 30 (30a and 30b) can be formed in a predetermined position of the circular shaving surfaces 16A and 18A which have the D-shaped cut portion 9 as the standard.

[0034] According to the above-described step, it is possible to form the round hole-shaped hair introduction openings (round holes) 30 (30a and 30b) that have a suitable size (as an example, inner diameter of 0.3 mm to 0.6 mm) for capturing hair by the shearing press processing. Therefore, compared to a drilling method by the electric discharging method, the electrolytic processing method, a laser processing method, and the etching method in the related art, the manufacturing method becomes easy, the manufacturing period can be shortened, and the manufacturing cost can be reduced. Furthermore, since the bottom surface of the outer cutter 10A (more specifically, a lower edge portion of the round hole 30) that is slidingly in contact with the inner cutter 12A can be sharply formed by performing the shearing press processing from the front surface side (top surface side) toward the rear surface side (bottom surface side), it is possible to obtain the sharpness of the cutter for hair.

[0035] In addition, a method of performing the shearing press processing from the rear surface side (bottom surface side) toward the front surface side (top surface side) may be employed. In this way, it is possible to cause burrs in the shearing press processing to be generated on the front surface side (top surface side), not on the rear surface side (bottom surface side) where it is difficult for the burrs to be removed. In this way, it is possible to remove the burrs by an easy surface treating. In addition, since the bottom surface of the outer cutter 10A (more specifically, lower end portion of the round hole 30) that is slidingly in contact with the inner cutter 12A can be formed in a burr-less shape, it is possible to obtain the sharpness of the cutter for hair.

[0036] Here, in the embodiment, the round hole-shaped hair introduction openings 30 are formed in the zigzag manner in which the round holes 30a at the inner periphery side and the round holes 30b at the outer periphery side are alternately disposed along the peripheral direction of the circular shaving surface 18A. To be specific, in a description referring to Fig. 8 that is an enlarged view of the C portion in Fig. 7, as the processing at this moment, the shearing press processing is performed to the plurality of round holes (as an example, as illustrated in Fig. 8A, only the round hole 30a at the inner periphery side in one round hole formation area 31) that are disposed at one of the inner periphery side or the outer periphery side by a single press, and then, the shearing press processing is performed to the round holes (as an example, as illustrated in Fig. 8B, only the round hole 30b at the outer periphery side in one round hole formation area 31) that are disposed at the other one of the inner periphery side or the outer periphery side by the single press. In this way, as described above, two types of punches, one for the round hole processing of the inner periphery side and another for the round hole processing of the outer periphery side, are prepared. Therefore, in each punch, it is possible to separate the distance between the adjacent pins in the same radius farther than a predetermined distance, and it is possible to secure the strength by having the pin diameter at a predetermined thickness, and the round hole-shaped hair introduction openings 30 (30a and 30b) can be formed through the shearing press processing.

[0037] Thereafter, it is suitable to perform a quenching to the stereoscopic shaped member 10Ab.

[0038] Next, as illustrated in Fig. 9, a step is performed in which the slit-shaped hair introduction openings 32 are formed at a predetermined position of the circular shaving surface by grinding. At this time, the D-shaped cut portion 9 is used as the position mark that becomes the standard position for a processing to perform the processing of the stereoscopic shaped member 10Ab, thereby performing the grinding. Accordingly, the slit-shaped hair introduction openings (slits) 32 can be formed in a predetermined position of the circular shaving surfaces 16A and 18A which have the D-shaped cut portion 9 as the standard. That is, since the D-shaped cut portion 9 is used as the common processing standard position in the above-described shearing press processing and the grinding, the round hole-shaped hair introduction openings (round holes) 30 and the slit-shaped hair introduction openings (slits) 32 that are respectively formed in different steps can be formed in a predetermined position without occurrence of a position gap.

[0039] Here, the grinding of the slit-shaped hair introduction openings 32 are performed using a rotation disc whetstone 66 as illustrated in Fig. 10. That is, with respect to the stereoscopic shaped member 10Ab that becomes the outer cutter 10A, the rotation disc whetstone 66 is

rotated from above having the outer periphery thereof vertically oriented and moved in a substantially radial direction, thereby providing cuts in a portion that becomes the circular shaving surfaces 16A and 18A excluding the circular concave groove 14A. The rotation disc whetstone 66 is a thin circular disc-shaped tool that is made of wear resistant particles such as diamond particles which are dispersed in abrasive grains to be cured.

[0040] More specifically, the processing is firstly performed to both the circular shaving surfaces 16A and 18A at the same time, a processing in a depth along a first processing line 68 in Fig. 10 by the rotation disc whetstone 66 is performed. That is, a rotational center A of the rotation disc whetstone 66 is moved in a substantially radial direction (movement line 68a direction in Fig. 10) such that an outer periphery (cutting edge) of the rotation disc whetstone 66 moves along the first processing line 68. In addition, in order to selectively and deeply perform processing only to the slits 32 of the circular shaving surface 16A on the outside, the rotational center A is moved to a position of B such that the outer periphery of the rotation disc whetstone 66 is moved along a second processing line 70 that is illustrated in Fig. 10, and then, the center B is moved in the substantially radial direction along a movement line 70a that is parallel to the second processing line 70.

[0041] Next, a thickness reduction for finishing is performed to the circular shaving surfaces 16A and 18A of the stereoscopic shaped member 10Ab. In the embodiment, the thickness reduction is performed in the previous step up to the circular shaving surfaces 16A and 18A to obtain a value in thickness size (as an example, with a thickness of 0.2 mm) smaller than an inner diameter size (as an example, inner diameter of 0.3 mm to 0.6 mm) of the round hole-shaped hair introduction openings (described below). The grinding or the polishing is further performed in the present step, and the processing is performed until the circular shaving surfaces 16A and 18A obtain a predetermined thickness size (as an example, with a thickness of 0.08 mm). Accordingly, the stereoscopic shaped member 10Ab is formed as the outer cutter 10A. The outer cutter 10A obtains the sharpness in cutting which can perform deep shaving.

[0042] As described above, in the method of manufacturing the outer cutter of the rotary electric shaver according to an aspect of the invention, it is possible to easily and inexpensively form the round hole-shaped hair introduction openings 30 on the circular shaving surface 18A of the outer cutter 10A by the shearing press processing. In addition, since the sliding surface portion 34 can be widened by forming the round hole-shaped hair introduction openings 30 on the circular shaving surface 18A, it is possible to form the outer cutter 10A that feels pleasant on skin.

[0043] The invention is not limited to the embodiment described above, and various modifications and changes can be made without departing from the scope of the invention. Particularly, the rotary electric shaver that has three sets of the combination of the outer cutter and the inner cutter is exemplified for description. However, the invention is not limited thereto and can also be applied to the rotary electric shaver that has one set, two sets, four sets or more sets of the combination of the outer cutter and the inner cutter.

Claims

1. A method of manufacturing an outer cutter (10A) of a rotary electric shaver (1) which has a circular shaving surface (16A, 18A) as a top surface where numerous hair introduction openings are formed, the circular shaving surface (16A, 18A) having a plurality of integrally formed concentric shaving surface portions (16A, 18A) with round hole-shaped hair introduction openings (30) formed in at least one of the circular shaving surface portions (18A), the method comprising:

   (a) a step of grinding or polishing a predetermined position where the round hole-shaped hair introduction openings (30) are formed on the circular shaving surface (18A) to obtain a thickness size smaller than an inner diameter size of the round hole (30); and
   (b) a step of forming the round hole-shaped hair introduction openings (30) in the position where the grinding or the polishing is performed by pressing, after the step (a).

2. The method of manufacturing an outer cutter (10A) of a rotary electric shaver (1) according to Claim 1, wherein the step (b) is performed so as to form a first plurality of inner round hole-shaped hair introduction openings (30a) at an inner periphery side and a second plurality of outer round hole-shaped hair introduction openings (30b) at an outer periphery side so that the inner and outer openings (30a, 30b) are alternately disposed in a zigzag manner along a peripheral direction of the circular shaving surface (18A).

3. The method of manufacturing an outer cutter (10A) of a rotary electric shaver (1) according to Claim 2, wherein, in the step (b), a first pressing is performed to form either the first or second plurality (30a, 30b) by a single press, and then, a second pressing is performed to form the other plurality (30a, 30b) by a single press.

4. The method of manufacturing an outer cutter (10A) of a rotary electric shaver(1) according to any one of Claims 1 to 3, further comprising:

   (c) a step of forming slit-shaped hair introduction openings (32) in a predetermined position of the

circular shaving surface (18A) by the grinding, after the step (b).

5. The method of manufacturing an outer cutter (10A) of a rotary electric shaver (1) according to Claim 4, further comprising:

a step of forming a position mark in a predetermined position of the outer cutter (10A) before the step (b),
wherein processing is performed in each of the steps (b) and (c) taking the position mark as a common processing standard position.

6. The method of manufacturing an outer cutter (10A) of a rotary electric shaver (1) according to Claim 5, wherein the position mark is a D-shaped cut portion (9) that is formed at an outer periphery edge of the outer cutter (10A).

7. The method of manufacturing an outer cutter (10A) of a rotary electric shaver (1) according to any one of Claims 4 to 6,
wherein the round hole-shaped hair introduction openings (30) and the slit-shaped hair introduction openings (32) are formed to alternately provide a round hole area (31) that is configured to have a predetermined number of round hole-shaped hair introduction openings (30) and a slit area (33) that is configured to have a predetermined number of slit-shaped hair introduction openings (32) along the peripheral direction on a predetermined circular shaving surface (18A) by performing the steps (b) and (c).

8. The method of manufacturing an outer cutter (10A) of a rotary electric shaver (1) according to any one of Claims 1 to 7,
wherein the round hole-shaped hair introduction openings (30) are formed in the circular shaving surface (18A) other than a outermost periphery.

9. A method of manufacturing a rotary electric shaver (1) that includes manufacturing an outer cutter (10A) by the method of any preceding claim, and also includes providing an inner cutter (12A) which has one or more small cutter portions (22A, 24A), the cutters (10A, 12A) being mounted so that said small cutter portion(s) (22A, 24A) are slidingly in contact with a bottom surface of the outer cutter (10A) from below the shaving surface (16A, 18A) and relatively rotatable.

Patentansprüche

1. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1), welcher eine kreisförmige Rasieroberfläche (16A, 18A) als eine obere Oberfläche aufweist, in der zahlreiche Haareinführungsöffnungen ausgebildet sind, wobei die kreisförmige Rasieroberfläche (16A, 18A) eine Vielzahl von einstückig ausgebildeten, konzentrischen Rasieroberflächenabschnitten (16A, 18A) mit runden, lochförmigen Haareinführungsöffnungen (30) aufweist, die in zumindest einer der kreisförmigen Rasieroberflächenabschnitten (18A) ausgebildet sind, wobei das Verfahren umfasst:

(a) einen Schritt des Schleifens oder Polierens einer vorgegebenen Position, wobei die runden, lochförmigen Haareinführungsöffnungen (30) auf der kreisförmigen Rasieroberfläche (18A) ausgebildet sind, um eine Größe der Dicke zu erhalten, die geringer als eine Größe des inneren Durchmessers des runden Loches (30) ist; und
(b) einen Schritt des Ausbildens der runden, lochförmigen Haareinführungsöffnungen (30) in der Position, in der das Schleifen oder Polieren durchgeführt wird, durch Stanzen nach dem Schritt (a).

2. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1) nach Anspruch 1,
worin der Schritt (b) so durchgeführt wird, dass eine erste Vielzahl innerer, runder, lochförmiger Haareinführungsöffnungen (30A) an einer inneren Umfangsseite und eine zweite Vielzahl äußerer, runder, lochförmiger Haareinführungsöffnungen (30b) an einer äußeren Umfangsseite ausgebildet werden, sodass die inneren und äußeren Öffnungen (30a, 30b) abwechseln in einem Zickzackmuster entlang einer Umfangsrichtung der kreisförmigen Rasieroberfläche (18A) angeordnet sind.

3. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1) nach Anspruch 2,
worin im Schritt (b) ein erstes Stanzen durchgeführt wird, um entweder die erste oder zweite Vielzahl (30a, 30b) durch eine einzige Stanzung auszubilden, und danach ein zweites Pressen durchgeführt wird, um die zweite Vielzahl (30a, 30b) durch eine einzige Stanzung auszubilden.

4. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1) nach einem der Ansprüche 1 bis 3, welches ferner umfasst:

(c) einen Schritt des Ausbildens von schlitzförmigen Haareinführungsöffnungen (32) an einer vorgegebenen Position der kreisförmigen Rasieroberfläche (18A) durch das Schleifen nach dem Schritt (b).

5. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1) nach Anspruch 4, welches ferner umfasst:

einen Schritt des Ausbildens einer Positionsmarkierung an einer vorgegebenen Position der äußeren Klinge (10A) vor dem Schritt (b),
worin das Verarbeiten in jedem der Schritte (b) und (c) durchgeführt wird, indem die Positionsmarkierung als eine gemeinsame Verarbeitungsstandardposition übernommen wird.

6. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1) nach Anspruch 5,
worin die Positionsmarkierung ein d-förmig ausgeschnittener Abschnitt (9) ist, der an einem Rand des äußeren Umfangs der äußeren Klinge (10A) ausgebildet wird.

7. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1) nach einem der Ansprüche 4 bis 6,
worin die runden, lochförmigen Haareinführungsöffnungen (30) und die schlitzförmigen Haareinführungsöffnungen (32) so ausgebildet werden, dass sie abwechselnd einen Bereich (31) mit runden Löchern, der so konfiguriert ist, dass er eine vorgegebene Anzahl von runden, lochförmigen Haareinführungsöffnungen (30) aufweist, und einen Bereich (33) mit Schlitzen bereitstellen, der so konfiguriert ist, dass er eine vorgegebene Anzahl von schlitzförmigen Haareinführungsöffnungen (32) entlang der Umfangsrichtung auf einer vorgegebenen, kreisförmigen Rasieroberfläche (18A) aufweist, indem die Schritte (b) und (c) durchgeführt werden.

8. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1) nach einem der Ansprüche 1 bis 7,
worin die runden, lochförmigen Haareinführungsöffnungen (30) in einer kreisförmigen Rasieroberfläche (18A) ausgebildet sind, die nicht ein äußerster Umfang ist.

9. Herstellungsverfahren für eine äußere Klinge (10A) eines elektrischen Rotationsrasierers (1) nach einem der vorangehenden Ansprüche, das auch das Bereitstellen einer inneren Klinge (12A) umfasst, die eine oder mehrere kleine Klingenabschnitte (22A, 24A) aufweist, wobei die Klingen (10A, 12A) so montiert sind, dass der kleine / die kleinen Schneideabschnitt(e) (22A, 24A) gleitend mit einer Bodenoberfläche der äußeren Klinge (10A) unterhalb der Rasieroberfläche (16A, 18A) in Kontakt stehen und relativ zu dieser drehbar sind.

Revendications

1. Procédé pour fabriquer un dispositif de coupe externe (10A) d'un rasoir électrique rotatif (1) qui a une surface de rasage circulaire (16A, 18A) en tant que surface supérieure où de nombreuses ouvertures d'introduction de poil sont formées, la surface de rasage circulaire (16A, 18A) ayant une pluralité de parties de surface de rasage concentriques (16A, 18A) formées de manière solidaire avec des ouvertures d'introduction de poil (30) en forme de trou rond formées dans au moins l'une des parties de surface de rasage circulaire (18A), le procédé comprenant :

(a) une étape consistant à meuler ou polir une position prédéterminée où les ouvertures d'introduction de poil (30) en forme de trou rond sont formées sur la surface de rasage circulaire (18A) afin d'obtenir une dimension d'épaisseur inférieure à une dimension de diamètre interne du trou rond (30) ; et
(b) une étape consistant à former les ouvertures d'introduction de poil (30) en forme de trou rond dans la position dans laquelle le meulage ou le polissage est réalisé par compression, après l'étape (a).

2. Procédé pour fabriquer un dispositif de coupe externe (10A) d'un rasoir électrique rotatif (1) selon la revendication 1,
dans lequel l'étape (b) est réalisée afin de former une première pluralité d'ouvertures d'introduction de poil internes (30a) en forme de trou rond au niveau d'un côté périphérique interne et une seconde pluralité d'ouvertures d'introduction de poil externes (30b) en forme de trou rond au niveau d'un côté périphérique externe de sorte que les ouvertures internes et externes (30a, 30b) sont disposées de manière alternée en zigzag le long d'une direction périphérique de la surface de rasage circulaire (18A).

3. Procédé pour fabriquer un dispositif de coupe externe (10A) d'un rasoir électrique rotatif (1) selon la revendication 2,
dans lequel, à l'étape (b), une première pression est réalisée afin de former la première ou la seconde pluralité (30a, 30b) par une seule presse et ensuite une seconde pression est réalisée pour former l'autre pluralité (30a, 30b) par une seule presse.

4. Procédé pour fabriquer un dispositif de coupe externe (10A) d'un rasoir électrique rotatif (1) selon l'une quelconque des revendications 1 à 3, comprenant en outre :

(c) une étape consistant à former des ouvertures d'introduction de poil (32) en forme de fente dans une position prédéterminée de la surface

de rasage circulaire (18A) par le meulage, après l'étape (b).

5. Procédé pour fabriquer un dispositif de coupe externe (10A) d'un rasoir électrique rotatif (1) selon la revendication 4, comprenant en outre :

une étape consistant à former une marque de position dans une position prédéterminée du dispositif de coupe externe (10A) avant l'étape (b),
dans lequel le traitement est réalisé dans chacune des étapes (b) et (c) en prenant la marque de position en tant que position standard de traitement commune.

6. Procédé pour fabriquer un dispositif de coupe externe (10A) d'un rasoir électrique rotatif (1) selon la revendication 5,
dans lequel la marque de position est une partie découpée en forme de D (9) qui est formée au niveau d'un bord périphérique externe du dispositif de coupe externe (10A).

7. Procédé pour fabriquer un dispositif de coupe externe (10A) d'un rasoir électrique rotatif (1) selon l'une quelconque des revendications 4 à 6,
dans lequel les ouvertures d'introduction de poil (30) en forme de trou rond et les ouvertures d'introduction de poil (32) en forme de fente sont formées pour fournir, de manière alternée, une zone de trou rond (31) qui est configurée pour avoir un nombre prédéterminé d'ouvertures d'introduction de poil (30) en forme de trou rond et une zone de fente (33) qui est configurée pour avoir un nombre prédéterminé d'ouvertures d'introduction de poil (32) en forme de fente le long de la direction périphérique sur une surface de rasage circulaire (18A) prédéterminée en réalisant les étapes (b) et (c).

8. Procédé pour fabriquer un dispositif de coupe externe (10A) d'un rasoir électrique rotatif (1) selon l'une quelconque des revendications 1 à 7,
dans lequel les ouvertures d'introduction de poil (30) en forme de trou rond sont formées dans la surface de rasage circulaire (18A) différente de la périphérie située le plus à l'extérieur.

9. Procédé pour fabriquer un rasoir électrique rotatif (1) qui comprend l'étape consistant à fabriquer un dispositif de coupe externe (10A) par le procédé selon l'une quelconque des revendications précédentes, et comprend également l'étape consistant à fournir un dispositif de coupe interne (12A) qui a une ou plusieurs petites parties de dispositif de coupe (22A, 24A), les dispositifs de coupe (10A, 12A) étant montés de sorte que ladite (lesdites) petite(s) partie(s) de dispositif de coupe (22A, 24A) est (sont) en contact coulissant avec une surface inférieure du dispositif de coupe externe (10A) depuis le dessous de la surface de rasage (16A, 18A) et relativement rotative(s).

FIG.1

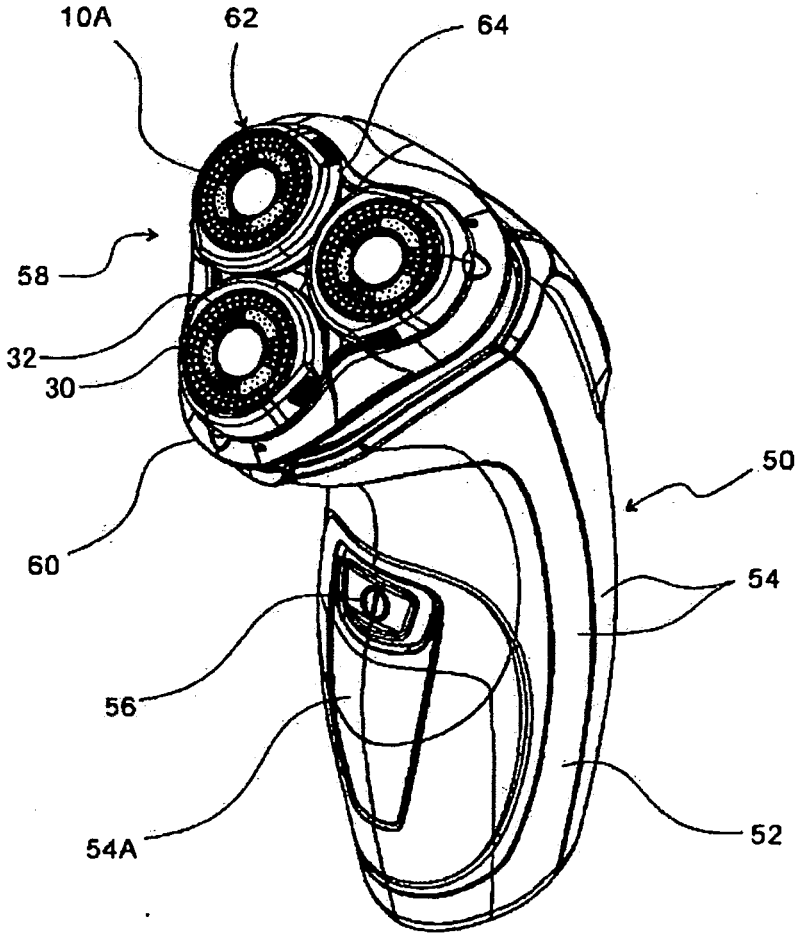


FIG.2

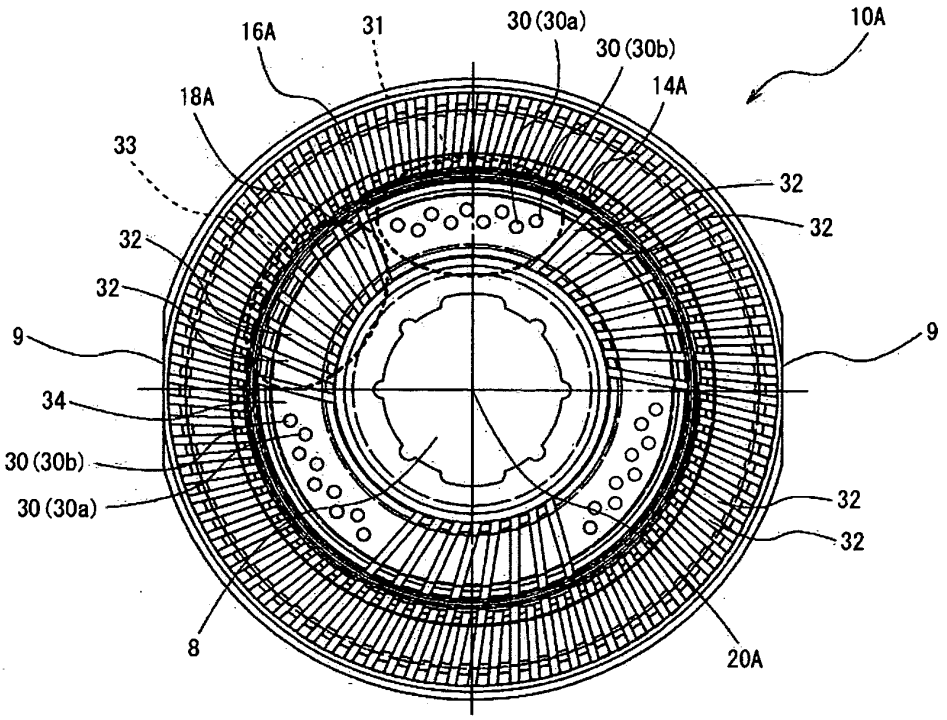

16A
31
30 (30a)
30 (30b)
10A
14A
18A
33
32
32
32
32
9
9
34
30 (30b)
30 (30a)
32
32
8
20A

FIG.3

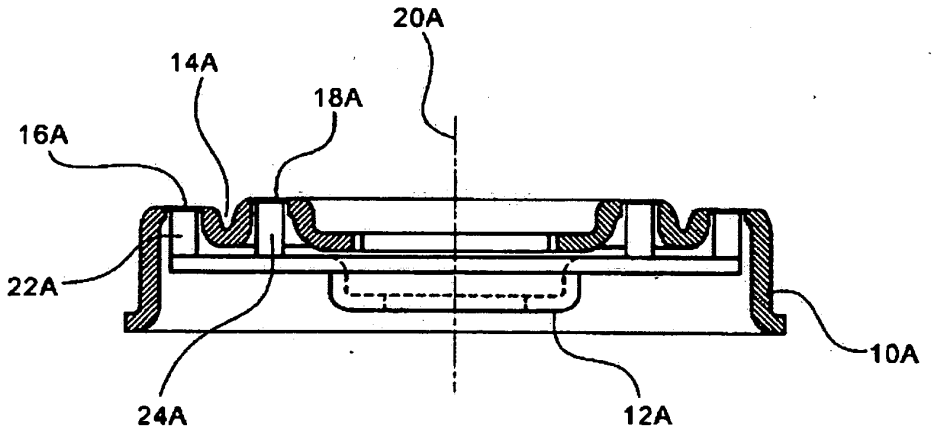

20A
14A
18A
16A
22A
10A
24A
12A

FIG.4

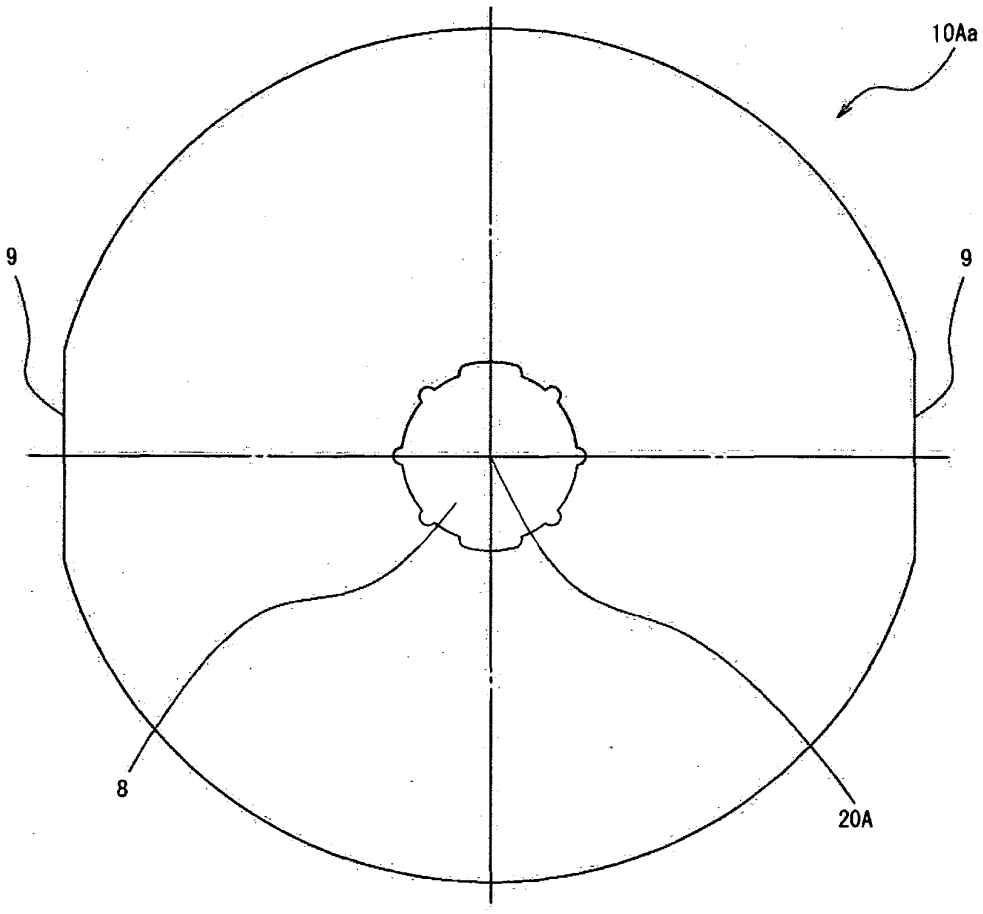


FIG.5

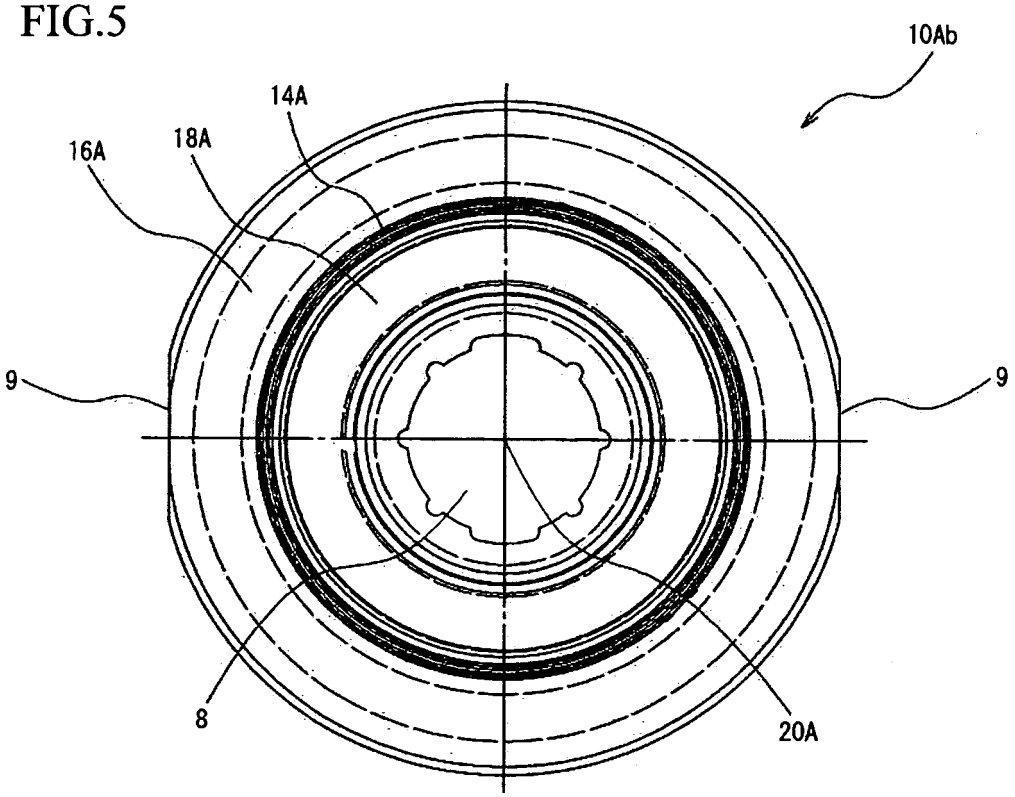


FIG.6

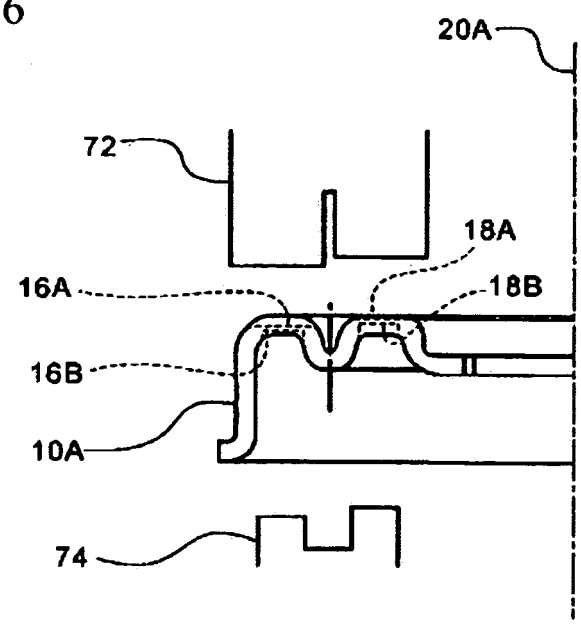


FIG.7

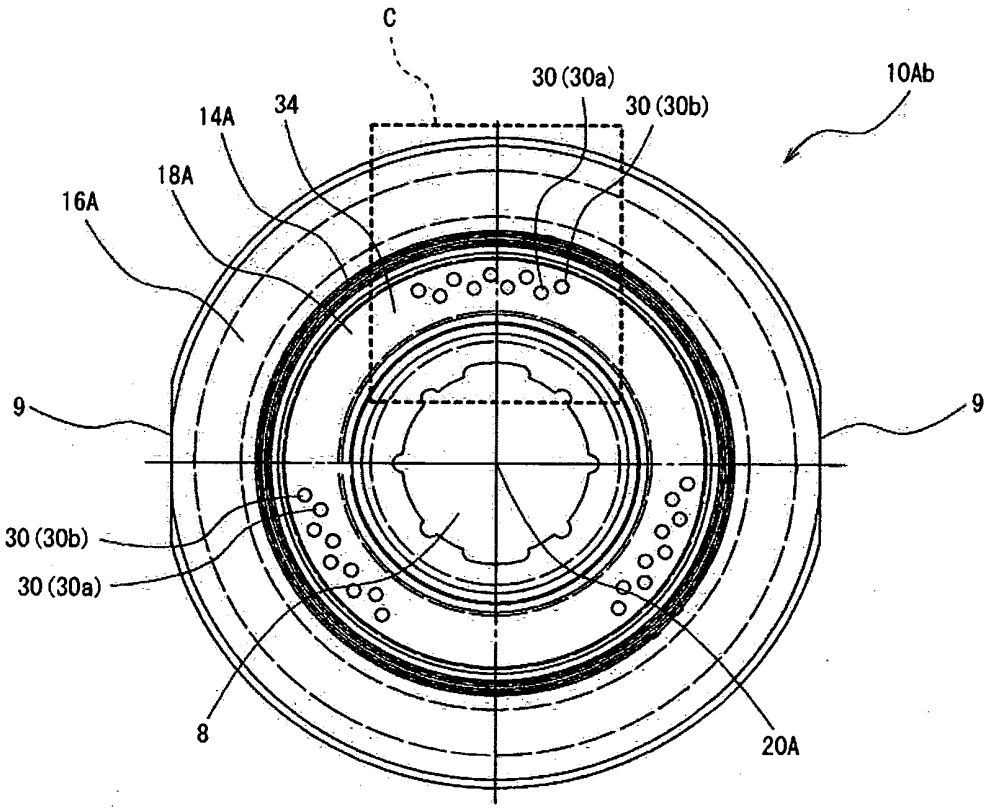


FIG.8A

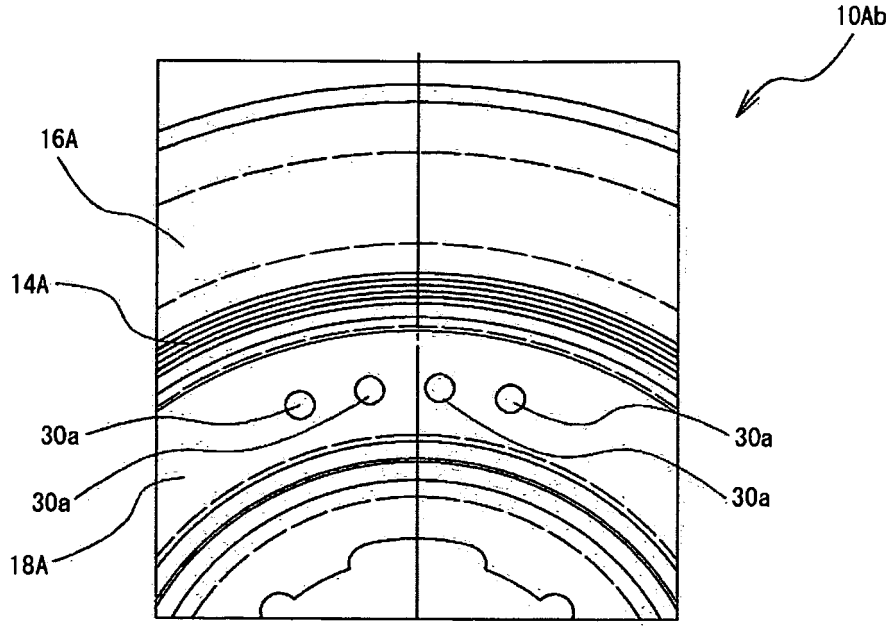

10Ab
16A
14A
30a
30a
18A
30a
30a

FIG.8B

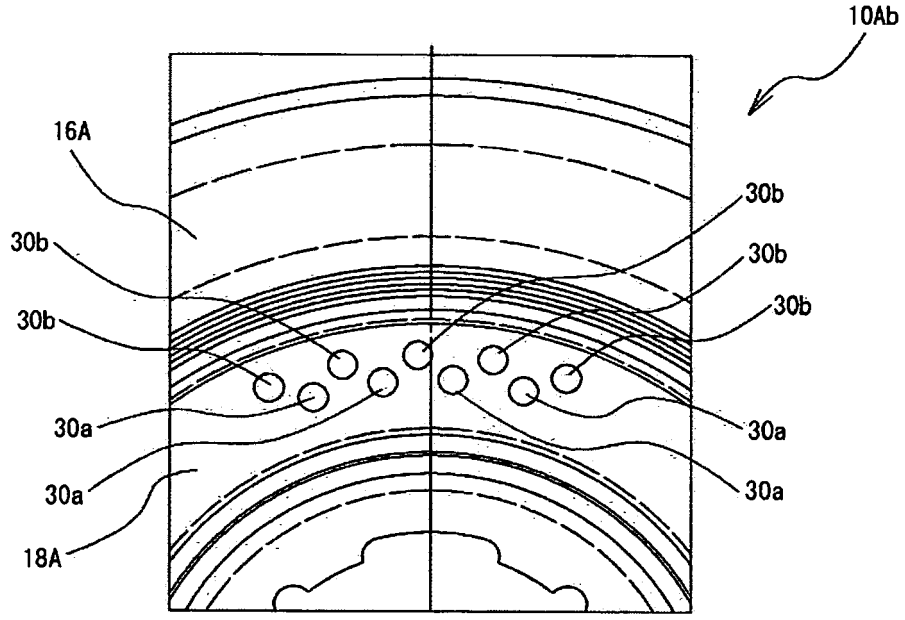

10Ab
16A
30b
30b
30b
30b
30b
30a
30a
30a
30a
18A

FIG.9

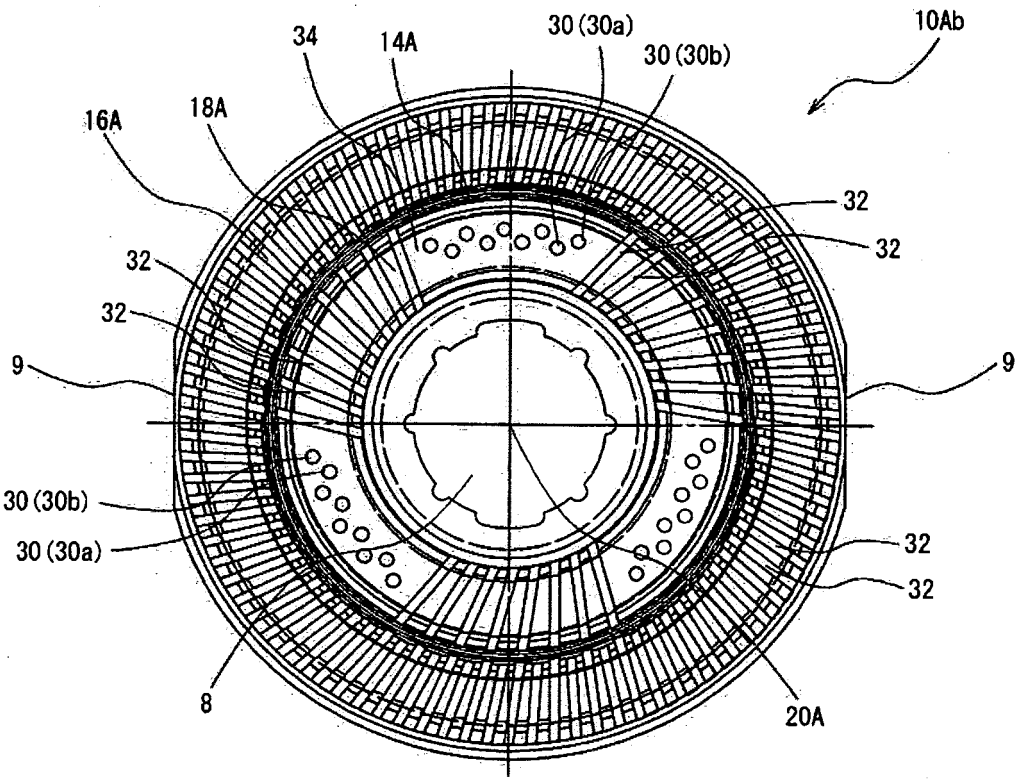

10Ab
34
14A
30 (30a)
30 (30b)
16A
18A
32
32
32
32
9
9
30 (30b)
30 (30a)
32
32
8
20A

FIG.10

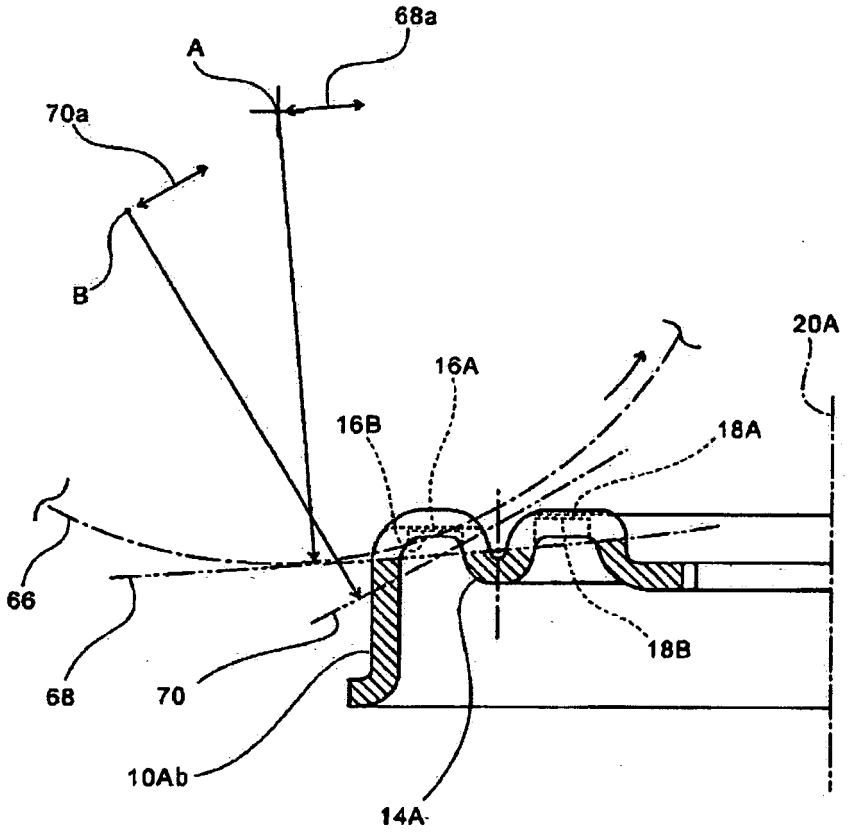
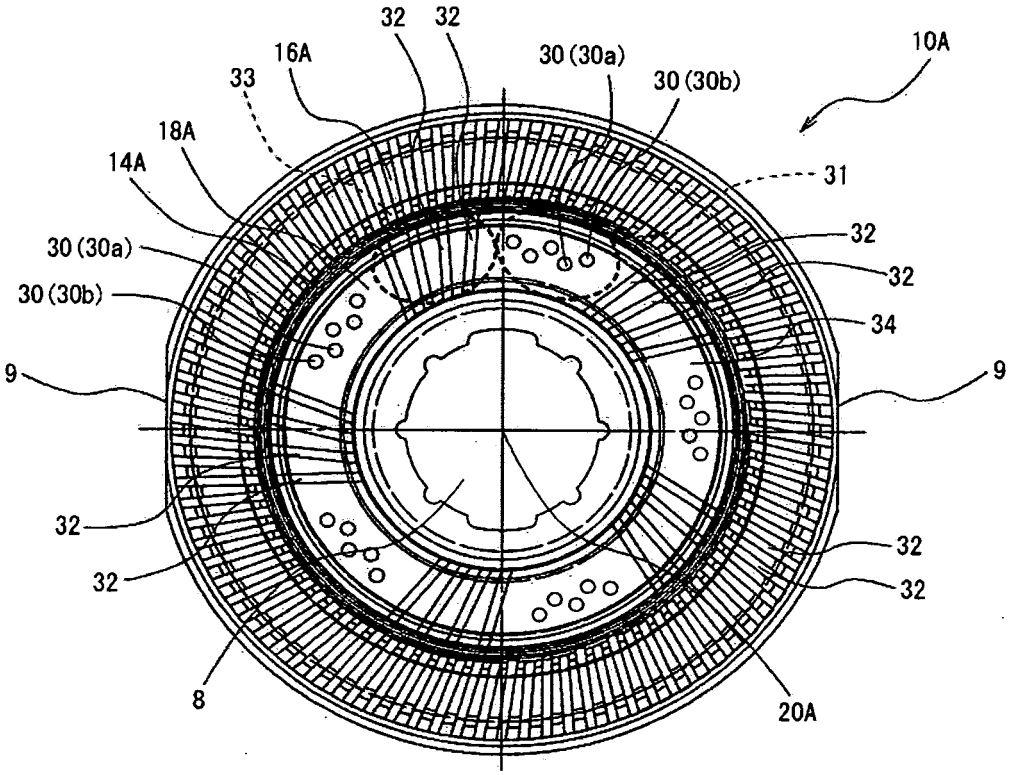


FIG.11


32
32
16A
33
30 (30a)
30 (30b)
10A
18A
14A
31
30 (30a)
32
32
30 (30b)
34
9
9
32
32
32
32
8
20A

REFERENCES CITED IN THE DESCRIPTION

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- JP 2010528801 A **[0003] [0005]**