(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
04 July 2019 (04.07.2019)

WIPO | PCT

(10) International Publication Number
WO 2019/132271 A1

(51) International Patent Classification:
A61B 17/54 (2006.01) *A61B 17/32* (2006.01)
A47K 7/02 (2006.01) *A61B 17/00* (2006.01)

(21) International Application Number:
PCT/KR2018/015009

(22) International Filing Date:
29 November 2018 (29.11.2018)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10-2017-0180542 27 December 2017 (27.12.2017) KR
10-2018-0123741 17 October 2018 (17.10.2018) KR

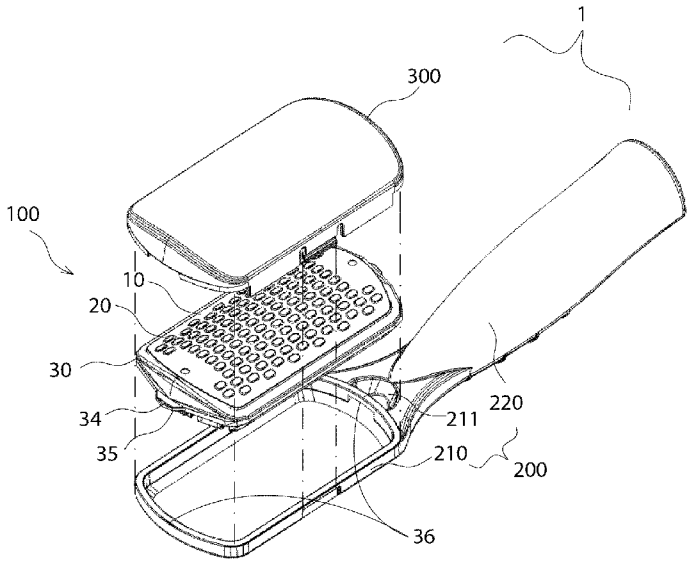
(72) Inventors; and
(71) Applicants: **HAN, Jeong Sik** [KR/KR]; 101dong 2101ho Kaiser, 37, World cup buk-ro 47-gil, Mapo-gu, Seoul, 03911 (KR). **KIM, Gyoung Hee** [KR/KR]; 101dong 2101ho Kaiser, 37, World cup buk-ro 47-gil, Mapo-gu, Seoul, 03911 (KR).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,

WO 2019/132271 A1

(54) **Title:** CALLUS REMOVER WITH CUTTING BLADES



(57) **Abstract:** A callus removing plate arranged with a plurality of micro-cutters is proposed, wherein each micro-cutter has an increased cutting length by a bottom edge to first and second cutting blades having a top edge and a side edge, thereby providing a sharpening effect to remove the callus with ease, wherein the plurality of micro-cutters are formed on a curved-shaped cutter plate, which can minimize a contact area with the user's skin to easily eliminate the callus from the skin with less force even at a concave portion of the foot, and wherein the callus removing plate can be assembled to a callus remover by changing its lengthwise direction to extend its life expectancy by using unworn cutting blades oriented in another direction.

[Continued on next page]

MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

Description

Title of Invention: CALLUS REMOVER WITH CUTTING BLADES

Technical Field

[1] The present invention relates to a callus remover, and more particularly to a callus remover having modified blade shapes capable of easily removing a callus formed on the skin with less force.

Background Art

[2] In general, a callus is a thickened and a dead skin which is formed due to a repeated friction, pressure or irritation. The callus may be most found on feet and generally not be harmful, but seem to be unsightly and sometimes lead to skin ulceration or infection.

[3] Conventionally, there has been known four typical mechanisms for removing or eliminating the callus on the skin. The callus may be sanded down with a pumice stone, filed down with a shaving blade, dissolved with an agent containing salicylic acid and removed or eliminated by a cutting blade. For instance, US Patent Application Publication No., 2005/0061343A1 discloses a callus remover with a pressure plate and a cutting edge, US Patent Application Publication No., 2007/044491A1 describes a skin condition remover with razor blades which is disposable after use. US Patent Application Publication No., 2008/0295855A1 discloses a disposable corn and callus remover tool whose abrasive block can be replaced, and Korean Patent Registration No. 10-1184144 (referred to as "'144 patent" hereinafter) describes a callus remover arranged with a plurality of micro-cutters, which was issued on September 12, 2012 to the applicant of the present invention.

[4] Since the present invention has been designed and developed to improve the callus remover of '144 patent, the latter will be described in detail. The callus remover of '144 patent is arranged with a plurality of substantially circular small blades which are manufactured on the thin metal plate, called a callus removing plate (referred to as "a micro-cutter" hereinafter), and has been popular among customers due to its excellent operability.

[5] Each of the micro-cutters has a planar protrusion plate having a circular or a polygonal shape with a predetermined dimension, which is elevated at a height less than 0.5 mm from the outer surface of the callus removing plate. The elevated protrusion plate is connected to the outer surface of the callus removing plate via a pair of bridges which has a width W smaller than the longitudinal length of the protrusion plate. An opening is formed at both sides of the bridges between the elevated

protrusion plate and the outer surface of the callus removing plate along the periphery of the protrusion plate. The callus being cut or removed passes through the respective openings. The protrusion plate is formed with a cutting blade having an acute angle at its distal end along the periphery of the protrusion plate except a portion the bridges is formed. The cutting blade is configured to cut or eliminate a callus on the skin in any direction thereof.

[6] The callus removing plate of '144 patent is integrally formed with the callus remover, such that the cutting blade is subject to be worn out only in one working direction in the callus remover. For example, a forward direction is defines as a direction away from a handle of the callus remover, while a rearward direction is defined as a direction approaching the handle. In case that in order to remove the callus on feet the user habitually uses the callus remover by pushing or pulling it in just either forward or rearward direction, the cutting blade in one direction is primarily used and then easily worn out, but the cutting blade in the other direction is not hardly worn and still remains as a new one. Hence, there has been a drawback to throw away the callus remover due to its poor cutting ability even though there still exist unworn or nearly new cutting blades in the other direction on it.

[7] Meanwhile, the callus remover of '144 patent needs relatively much forces to remove the callus from the skin. The plurality of micro-cutters is disposed on the same plane, where all the cutting blades, i.e., the protrusion plates of the micro-cutters are elevated at the same height from the planar outer surface of the callus removing plate. Accordingly, almost all of the micro-cutters are arranged to face and contact the skin at the same time when applied onto the feet, so that each and every micro-cutters are configured to simultaneously penetrate into the callus on the feet during the callus removing action, which results in a drawback to need more forces at a time to remove the callus than before.

[8] Further, it is found that the callus remover of '144 patent tends to lose contact with a body portion of the user which has a narrower width than that of the callus remover, for example, a concave or arch portion on the foot, such that it is hard to neatly remove or eliminate the callus thereon.

[9] The protrusion plate of the callus remover of '144 patent is substantially formed in a circle, and the cutting blade formed along the periphery thereof has a smaller radius of curvature than a circle, it is some inconvenient for the user to push or pull the callus remover with more forces in an inclined way against a lengthwise direction of the callus remover.

Disclosure of Invention

Technical Problem

[10] Accordingly, it is an object of the present invention to provide a callus removing plate which is easy to remove the callus on the skin with less force by using a sharpening effect of the micro-cutters.

[11] It is another object of the present invention to provide a callus remover having a callus removing plate which can be assembled in an opposite direction and replaceable when the cutting blades are worn out, thereby maximizing the usage of the micro-cutters and lengthening the life span of the callus remover.

Solution to Problem

[12] To achieve the above objects, in accordance with one aspect of the present invention, there is provided a callus removing plate comprising a cutter plate; and a plurality of micro-cutters arranged on the cutter plate to perform a callus cutting action, each micro-cutter comprises a protrusion plate substantially formed in an elliptical shape and elevated at a predetermined height from an outer surface of the cutter plate; a pair of bridges extended from and oppositely arranged from the cutter plate to support the protrusion plate; a cutting blade formed at a periphery of the protrusion plate with an acute angle to cut the callus on the skin; and an opening formed at both sides of the bridges along the periphery of the protrusion plate to pass the callus removed by the cutting blade, wherein the cutting blade includes a first cutting blade and a second cutting blade substantially formed in a symmetrical shape with the first cutting blade, and wherein the protrusion plate has a shape meeting a conditional expression of $H \geq 2R + W$, where H is a distance in a lengthwise direction between each top portion of the first and second cutting blades, R is a radius of curvature of the first or second cutting blade, and W is a width of the bridge in a lengthwise direction.

[13] In addition, the cutter plate in accordance of the present invention may have a substantially rectangular shape with a curved cross section, wherein each of the first and second cutting blades may comprise a top edge, and an inclined edge extending at both sides of the top edge, and wherein a cutting length of the first and second cutting blades may be increased by the bridge, respectively.

[14] In addition, the first and second cutting blades may further comprise a side edge extending to a distal end of the bridge, and wherein the side edge is configured to increase a cutting length of the first and second cutting blades, respectively.

[15] In addition, the side edge may be formed in a linear or curved shape.

[16] In accordance with another aspect of the present invention, there is provided a callus remover comprising a callus removing plate provided with a cutter plate formed with a plurality of micro-cutters formed as in one aspect of the present invention; a supporting frame which is integrally formed with the cutter plate or detachably coupled with the cutter plate, and a body frame to be coupled with the supporting frame, wherein the

body frame includes a callus receiving portion formed with a space to collect a cut callus; and a handle connected at a distal end of the callus receiving portion and configured to be gripped by the user.

[17] In addition, the callus removing plate may be coupled with the body frame by changing its direction in a lengthwise direction to use unworn cutting blades.

[18] In addition, the callus remover may be formed with a gripping portion each protruded from at opposing distal ends of the supporting frame.

[19] In addition, the callus remover may be provided at the supporting frame below the gripping portion with a locking rib to be coupled with a recess formed at the body frame.

[20] In addition, the handle of the callus remover may have a semi-circular cross section with one side opened and be formed with a plurality of slip prevention walls which is equidistantly protruded outside and provides a cylindrical contour to the handle.

[21] In addition, there is further included a cover coupled with the body frame and enclosing the callus removing plate to protect the micro-cutters from outside collision.

Advantageous Effects of Invention

[22] In a preferred embodiment of the present invention, there is provided a callus removing plate whose callus removing action is neatly performed with ease through a sharpening effect of the cutting blade, thereby remarkably improving utility of a callus remover, which can be obtained through an increased cutting length to the cutting blades of the micro-cutters no matter in which direction the user pushes or pulls the callus remover.

[23] The callus removing plate according to a preferred embodiment of the present invention is severable from the callus remover and is replaceably assembled with the callus remover, such that once the cutting blades oriented in one direction are worn out due to unidirectional use of the callus remover, the callus removing plate can be assembled to the callus remover by changing its lengthwise direction to extend its life expectancy by using unworn cutting blades oriented in another direction.

[24] In a preferred embodiment of the present invention, the callus removing plate is formed with a curved outer surface which can minimize a contact area with the user's skin, thereby reducing a cutting resistance therebetween. Thus, the user is able to easily eliminate the callus from the skin with less force. Furthermore, with help of a curved contour thereof the callus removing plate or the callus remover can be applied with ease to any of body portions, even to a concave or arch portion of the foot in order to remove the callus thereon.

Brief Description of Drawings

[25] Further objects and advantages of the invention can be more fully understood from

the following detailed description taken in conjunction with the accompanying drawings in which:

[26] FIG. 1 is an exploded perspective view illustrating the callus remover having a cover, a callus removing plate and a body frame according to a preferred embodiment of the present invention;

[27] FIG. 2 is a perspective view illustrating the callus removing plate arranged with a plurality of micro-cutters according to a preferred embodiment of the present invention;

[28] FIG. 3 is a side elevation view of the callus removing plate of FIG. 2;

[29] FIG. 4 is a partially enlarged perspective view of one micro-cutter disclosed in FIG. 3;

[30] FIG. 5 is an enlarged plan view of the micro-cutter of FIG. 4;

[31] FIG. 6 (a) is a schematic view illustrating a conventional micro-cutter, and FIG. 6 (b) and (c) schematically illustrate one micro-cutter according to a preferred embodiments of the present invention, respectively;

[32] FIG. 7 is a schematic view illustrating a sharpening effect of the cutting blade according to a preferred embodiment of the present invention;

[33] FIG. 8 (a) is a schematic view illustrating change of a cutting length of the cutting blade shown in FIG. 6 (c) in a working direction, and FIG. 8 (b) and (c) illustrate change of a cross sectional shape and a cutting angle at both sides of the cutting blade in a working direction due to the sharpening effect according to a preferred embodiment of the present invention, respectively;

[34] FIG. 9 (a) to (d) each is a schematic view illustrating change of a role of the cutting blade shown in FIG. 6 (c) depending on a working direction according to a preferred embodiment of the present invention;

[35] FIG. 10 is a perspective view illustrating the assembled callus remover of FIG. 1 omitting the cover to show the callus removing plate having a curved cross section;

[36] FIG. 11 is a perspective bottom view illustrating the callus remover of FIG. 1; and

[37] FIG. 12 is a perspective view illustrating a callus remover according to another preferred embodiment of the present invention to show a callus removing plate having a planar cross section.

Mode for the Invention

[38] Hereinafter, exemplary embodiments of the present invention will be described with reference to the accompanying drawings. The terminology used herein, unless otherwise defined, represents the same meaning as that of the terminology an ordinary person skilled in an art uses, and if the terminology used herein is in conflict with the general terminology, its interpretation is subject to the definition of the present

invention.

[39] The invention described herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. It is noted that the same reference numbers through the specification mean the same components. FIG. 1 is an exploded perspective view illustrating a callus remover 1 according to a preferred embodiment of the present invention. As shown in FIG. 1, the callus remover 1 comprises a callus removing plate 100, a body frame 200 assembled by the callus removing plate 100, and a cover 300 coupled with the body frame 200 while enclosing the callus removing plate 100 to protect it from outside.

[40] As a preferred embodiment of the present invention, configurations and operations of the callus removing plate 100 will be explained hereinafter.

[41] Referring to FIGS. 1 to 5, the callus removing plate (100) according to a preferred embodiment of the present invention comprises, as its main components, a cutter plate 10 arranged with a plurality of micro-cutters 20, and a supporting frame 30 coupled with the cutter plate 10.

[42] The cutter plate 10 has a planar cross section as shown in FIG. 12 or preferably, a curved cross section having a predetermined radius of curvature as illustrated in FIG. 2 or 10. The cutter plate 10 is formed in such a substantially symmetrical structure that can be attached to or detached from the supporting frame 30 even by changing its assembling direction in a lengthwise direction thereof.

[43] Here, the cutter plate 10 is formed substantially in a rectangular shape having a curved outer surface with a metal, preferably a stainless steel, whose cross section is in a convex shape where a center portion is elevated from both lateral side portions. Such a convex shape with the curved outer surface is configured to allow a contact area with the user's skin surface to be as narrow as possible, which makes it possible to concentrate forces at the contact area during the callus removing operation by the callus removing plate 100 and reduces a cutting resistance therebetween. Accordingly, the user is able to easily eliminate the callus from the skin with less force.

[44] Referring to FIGS. 4 and 5, each of the micro-cutters 20 comprises a protrusion plate 21 substantially formed in a planar shape and protruded outside (in an upward direction in FIG. 3) separately from an outer surface of the cutter plate 10 through a pair of brides 22, openings 23 and 24 disposed at both sides of the bridges 22 along the periphery of the protrusion plate 21 to pass a callus being cut, respectively and cutting blades 25 and 26 formed at a periphery of the protrusion plate 21 with an acute angle to cut the callus on the skin.

[45] Here, the protrusion plate 21 is formed in substantially an elliptical shape and elevated at a predetermined height, preferably 0.1mm ~ 0.5mm from the outer surface of the cutter plate 10. The elevated height of the protrusion plate 21 is defined as a

height to decide a thickness of the callus to be cut or eliminated from the skin, which may not exceed over 0.5mm for safety of the user from injury.

[46] The pair of bridges 22 serves to connect the protrusion plate 21 to the cutter plate 10. As illustrated in FIGS. 4 and 5, the pair of bridges 22 is opposingly disposed at two locations, preferably at central linear portions of the protrusion plate 21. The pair of bridges 22 is formed to have a width (W), preferably narrower than that of the protrusion plate 21 in consideration of dimensions of the openings 23 and 24 as well as the cutting blades 25 and 26.

[47] More specifically, the openings 23 and 24 formed at both sides of the bridges 22 may be in an arc shape along the periphery of the protrusion plate 21, respectively, through which the callus removed by the cutting blades 25 and 26 may passes.

[48] For the purpose of explanation, in FIGS. 4 and 5, an opening and a cutting blade located at left side of the bridge 22 is referred to as a first opening 23 and a first cutting blade 25, respectively and each of those at right side of the bridge 22 is referred to as a second opening 24 and a second cutting blade 26, respectively.

[49] The first and second cutting blades 25 and 26 are inclinedly formed with an acute angle relative to a planer upper surface of the protrusion plate 21 to cut or remove the callus on the skin. Here, the first and second cutting blades 25 and 26 are formed along the entire periphery of the protrusion plate 21 except for portions connected by the bridges 22. The protrusion plate 21 has a substantially symmetrical shape where the first and second cutting blades 25 and 26 are correspondingly disposed at both sides of the bridges 22, as shown in FIG. 5. Thus the callus cut by the first cutting blade 25 is discharged through the first opening 23, while the callus removed by the second cutting blade 26 is passed through the second opening 24.

[50] Referring again to FIG. 5, the first cutting blade 25 may comprise any one or more combination of a top edge 25a formed at the summit of a semi-circle shape, a side edge 25b formed in a curved shape at both side of the top edge 25a, and a bottom edge 25c extended from a distal end of the side edge 25b to a distal end of the respective bridges 22. In the same manner, the second cutting blade 26 may comprise any one or more combination of a top edge 26a formed at the summit of a semi-circle shape, a side edge 26b formed in a curved shape at both side of the top edge 26a, and a bottom edge 26c extended from a distal end of the side edge 26b to the respective bridges 22.

[51] The bottom edges 25c and 26c may have a same length or a different length, and may be formed in a linear or a curved shape depending upon a design requirement.

[52] The micro-cutter 20 having the first and second cutter blades 25 and 26 described above are arranged in plural on the curved outer surface of the cutter plate 10 in the horizontal and vertical directions, respectively. Arrangement of the micro-cutter 20 may be accomplished in a row parallel to each other as shown in FIG. 1. However, as

another embodiment, the plurality of micro-cutters 20 may be arranged in a zigzag way to each other on the cutter plate 10.

[53] Features of the configuration and operational effect of the micro-cutter 20 according to a preferred embodiment of the present invention would be described and compared with that of the prior art by referring to FIGS. 6(a) to 6(c).

[54] FIG. 6(a) illustrates a micro-cutter in the prior art, e.g., a micro-cutter disclosed in Korean Patent Registration No. 10-1184144 ('144 patent), whose protrusion plate is formed in a circular shape having a planar surface. Supposing that a distance between opposite summits, i.e., a distance between the opposite top edges is Ha, and a radius of curvature of the top edge, i.e., a radius of curvature of a semi-circular protrusion plate measured from a distal end of the bridge is Ra, while radius of the semi-circular protrusion plate measured from a centerline of the bridge is R, a conditional expression $Ha = 2Ra + W$ is met, where W is a width of the bridge in a lengthwise direction. Here, it is appreciated that a diameter S of the micro-cutter would be equal to 2Ra. In other words, the micro-cutter according to '144 patent has such a shape that the distance between the opposite top edges Ha has the same as or smaller than a diameter of a circle having a radius R from the centerline of the bridge to one of the top edges.

[55] In contrast, the micro-cutter 20 according to the present invention meets a conditional expression of $H \geq 2R + W$, where H is a distance in a lengthwise direction between top edges 25a and 26a of the first and second cutting blades 25 and 26, R is a radius of curvature of the first or second cutting blade 25 or 26 from a distal end of the bridge 22, and W is a width of the bridge 22 in a lengthwise direction.

[56] Referring to FIG. 6(b), which is a schematic plan view of a micro-cutter according to a preferred embodiment of the present invention. The first cutting blade 25 or the second cutting blade 26 is formed as a semi-circle shape having a radius of curvature Rb measured from a distal end of the bridge 22 with a width W in a lengthwise direction. The distance Hb in a lengthwise direction between each top edge 25a and 26a of the first and second cutting blades 25 and 26 meets a conditional expression of $Hb = 2Rb+ W$. Here, the radius of curvature Rb of the micro-cutter in FIG. 6(b) is greater than the radius of curvature Ra of the micro-cutter in FIG. 6(a), such that a sharpening effect of the first and second cutting blades are improved.

[57] FIG.6(c) indicates a schematic plan view of a micro-cutter according to another embodiment of the present invention. As shown in FIG. 6(c), the first cutting blade 25 or the second cutting blade 26 is formed as a semi-circle shape having a radius of curvature Rc measured from a distal end of the bridge 22. Here, each of the first and second cutting blades 25 and 26 has a top edge 25a or 26a, a side edge 25b or 26b formed in a curved shape at both sides of the top edge 25a or 26a, and a bottom edge 25c or 26c with a length L additionally extended from a distal end of the side edge 25b

or 26b to a distal end of the respective bridges 22. Thus, since each of the first and second cutting blades 25 and 26 has a substantially semi-circle shape where a distance Hc in a lengthwise direction between opposites top edges 25a and 26a should be considered by the addition of the width W of the bridge and the length of the bottom edge 25c and 26c in a lengthwise direction. Accordingly, the first and second cutting blades 25 and 26 of FIG. 6(c) meet a conditional expression of $Hc \geq 2Rc+ W$. Here, even though the radius of curvature Rc of the micro-cutter in FIG. 6(c) is the same as the radius of curvature Rb of the micro-cutter in FIG. 6(b), a sharpening effect of the first and second cutting blades 25 and 26 would be remarkably enhanced due to lengthening of the cutting blade by addition of the length L of the bottom edge 25c and 26c.

[58] In other words, it would be noted that each of the first cutting blade 25 and the second cutting blade 26 of the conventional micro-cutter in FIG. 6 (b) is formed as a semi-circle shape which has just a top edge 25a or 26a and a side edge 25b or 26b, not having a bottom edge 25c or 26c as shown in the micro-cutter of FIG. 6 (c).

[59] Here, a sharpening effect is defined as an effect that is obtained when a cutting blade is applied with a force in an inclined direction by pulling or pushing the cutting blade while pressing, the cutting action is easily performed with less force by application of a smaller acute angle than an initial angle of the cutting blade when a force is applied in a vertical direction while pressing. Such a sharpening effect will be explained in detail in FIG. 7.

[60] FIG. 7 is a partial side view of a general kitchen knife having an upper portion UP and a lower portion LP formed with a cutting blade. A hatched area shown in FIG. 7 (a) illustrates a cross section of the knife, wherein the cutting blade has a cutting angle $\theta 1$ and a thickness t1 and three points A, B, and C are marked, respectively. FIG. 7(a) indicates a state when a cutting action is performed through a knife with the cutting angle $\theta 1$ by applying a force P in a vertical direction while pressing.

[61] From the state of FIG. 7 (a), when the knife is pulled by a distance D to the right, each of the three point A, B, and C moves to a new location A', B' and C' with the same distance D. Here, it would be appreciated that a gap among the three points are not changed. However, due to displacement by the distance D a cutting angle $\theta 1$ formed by three points A, B, and C is changed to an effective cutting angle $\theta 2$ formed by three points A', B', and C', where $\theta 2$ is much smaller than $\theta 1$. As such, when the knife is pulled or pushed by some distances, a phenomenon that an effective cutting angle formed at a distal end of the cutting blade becomes by far small or acute due to displacement of the knife is called 'a sharpening effect' in the present invention.

[62] Hereinafter, a sharpening effect of the micro-cutter according to a preferred embodiment of the present invention will be described further with reference to FIG. 8.

[63] FIG. 8 (a) illustrates the protrusion plate 21 of one micro-cutter 20 shown in FIG. 5 or FIG 6(c). The protrusion plate 21 is formed with the first and second cutting blades 25 and 26 in a substantially symmetrical shape relative to the bridge 22 having a width W. For simplicity, explanations are made only to the first blade 25 where Rc is a radius of curvature of the top edge 25a, Hc designates a distance in a lengthwise (vertical) direction between the opposite top edges 25a and 26a, and S indicates a distance in a horizontal direction between the opposite bottom edges 25c of the first cutting blade 25. Each of the first and second cutting blades 25 and 26 is formed to have a same cutting angle at the distal end along the periphery thereof except a portion connected by the bridge 22. From a reference point ① at the center point of the top edge 25a, points ②, ③, ④ and ⑤ are allocated leftward and points ②', ③', ④' and ⑤' are allocated rightward with a regular spacing, respectively.

[64] When a working direction of a callus removing work is set in a lengthwise direction of the micro-cutter, the callus removing plate with micro-cutters is assumed to move upward in FIG. 8 by being pushed to cut the callus. A cross-sectional shape of the cutting blade at each point will be schematically delineated as shown in FIG. 8 (b) and (c), which will serve to perform a cutting action against the callus on the skin. In other words, the further the point is distantly positioned leftward or rightward from the reference point ①, the shaper the effective cutting angle gradually becomes. Thus, at the point ⑤ and point ⑤' the first cutting blade 25 may have the sharpest edge with a minimum effective cutting angle at the distal end thereof and perform the cutting action with much better sharpening effects enhanced by pulling or pushing the callus removing plate.

[65] As a result, the cutting blade may be configured to perform the cutting action with different cutting angles depending upon the location of the point, and further each of such cutting angles becomes much shaper via a sharpening effect by pulling or pushing the callus removing plate while pressing. In this sense, the user is able to easily and neatly remove the callus on the skin with less force by using the callus removing plate which is employed with the plurality of micro-cutters according the present invention as described above.

[66] Referring to FIGS. 9(a) to 9(d), a role of the cutting blade having the micro-cutter 20 as indicated in FIG. 8 will be described, which can be changed according to a working direction of the cutting blade when pulled or pushed by the user.

[67] FIG. 9 (a) illustrates a situation when the user pushes the callus removing plate 100 where the working direction of the micro-cutter 20 is oriented upward in the drawing. Here, the top edge 25a of the first cutting blade 25 becomes a main edge to perform a primary cutting action, while each of the side edges 25b at right and left side acts as a sub edge to perform a secondary cutting action.

[68] FIG. 9 (b) explains a situation when the user pushes the callus removing plate 100 in an oblique angle where the working direction of the micro-cutter 20 is oriented right upward in the drawing. At this time, the top edge 25a and the side edge 25b at the right side each becomes a main edge to perform a primary cutting action, while the top edge 25a and the side edge 25b at the left side each acts as a sub edge to perform a secondary cutting action.

[69] FIG. 9 (c) describes a situation when the user inclinedly pushes the callus removing plate 100 where the working direction of the micro-cutter 20 is oriented left upward in the drawing. Here, the top edge 25a and the side edge 25b at the left side each becomes a main edge to perform a primary cutting action, while the top edge 25a and the side edge 25b at the right side each acts as a sub edge to perform a secondary cutting action.

[70] FIG. 9 (d) illustrates a situation when the user pushes the callus removing plate 100 in a right or left direction where the working direction of the micro-cutter 20 is horizontal in the drawing. Here, each of both bottom edges 25c of the first cutting blade 25 becomes a main edge to perform a primary cutting action, while the top edge 25a acts as a sub edge to perform a secondary cutting action.

[71] Thus, it would be noted that the top edge 25a, the side edge 25b and the bottom edge 25c of the first cutting blade 25 may change its role as a main edge to perform a primary cutting action and/or a sub edge to perform a secondary cutting action in combination thereof according to the working direction of the micro-cutter 20 when the callus removing plate 100 is manipulated by the user.

[72] The same descriptions may be possible to the roles of the top edge 26a, the side edge 26b and the bottom edge 26c of the second cutting blade 26, which will be omitted to avoid redundancy.

[73] Meantime, it would be appreciated that in each of the situations in FIGS. 9 (a) ~ (d), the main blade being used in the primary cutting action may be quickly worn out and become obtuse according to the lapse of time, while the sub blade may be slowly worn or still remain in a good cutting ability. If there is a way to utilize the sub blade being unworn, such as changing a coupling direction of the callus removing plate with the callus remover in order to use the sub blade, it may be possible to extend the life span of the callus remover longer.

[74] As another embodiment of the present invention, configurations and operations of the callus remover 1 will be explained in detail hereunder.

[75] As shown in FIG. 1, the callus remover 1 comprises the callus removing plate 100 arranged with the plurality of micro-cutters 20 on the cutter plate 10, the supporting frame 30 coupled with the cutter plate 10, the body frame 200 assembled by the callus removing plate 100, and the cover 300 enclosing the callus removing plate 100.

[76] The supporting frame 30 may be coupled to the periphery of the cutter plate 10 to fix

the cutter plate 10. The supporting frame 30 may be integrally formed with the cutter plate 10 in an insert injection molding or discretely manufactured and detachably coupled with the cutter plate 10. The cutter plate 10 may have a curved cross section and be configured to be assembled with the body frame 200 of the callus remover 1 as shown in FIG. 10.

[77] Referring back to FIGS. 2 to 3, the supporting frame 30 comprises a rim portion 31 encompassing the entire periphery of the cutter plate 10 and a wall portion 32 extending downwards from the rim portion 31 and press-fitted with the body frame 200 of the callus remover 1. The wall portion 32 is retreatedly formed inward from a bottom surface of the rim portion 31 in a staircase shape. The wall portion 32 may be extended in a predetermined length to be firmly coupled with body frame 200 and preferably formed with at least one press-fitting lug 33 on the outer surface to improve a coupling force with the body frame 200.

[78] Further, the supporting frame 30 may be provided with a pair of gripping portions 34 each of which is protruded, preferably at an opposing distal end of the supporting frame 30 in a lengthwise direction. The gripping portion 34 may be formed like a protrusion with a semi-circular cross section, as shown in FIGS. 1 and 10, which may help the user to hold with ease when decoupling the supporting frame 30 from the body frame 200.

[79] In addition, as shown in FIGS. 1 and 2, there may be formed with a pair of locking ribs 35 to increase a coupling force with the body frame 200. Preferably each of the locking rib 35 is disposed at an opposing distal end of the supporting frame 30 in a lengthwise direction. The locking rib 35 is located below the gripping portion 34 and in a same planar surface of the wall portion 32. Here, each locking rib 35 may be formed in a cantilever type with elasticity and be coupled to one of the pair of recesses 36 in a snap-fit manner, which is concavely and oppositely formed at an inside surface of the body frame 200.

[80] Here, the callus removing plate 100 is severable from the body frame 200 of the callus remover 1 and is replaceably assembled with the body frame 200 of the callus remover 1. Once either of the first and second cutting blades 25 and 26, for example, the first cutting blade 25 oriented in the working direction is worn out due to unidirectional use by the user's habit, the callus removing plate 100 can be assembled to the callus remover 1 by changing its lengthwise direction. Thus, the second cutting blade 26 which is oriented in the opposite direction and is less worn or unworn can be used for a cutting action, which results in extending the life expectancy of the callus remover 1.

[81] The body frame 200 may be detachably assembled with the supporting frame 30 to which the callus removing plate 100 is coupled. More specifically, the body frame 200

includes a callus receiving portion 210 to collect a cut callus from the skin, and a handle 220 connected at a distal end of the callus receiving portion 210.

[82] Referring to FIG. 1, the callus receiving portion 210 is formed with an opening at an upper side, preferably in a substantially rectangular shape, to which the periphery of the supporting frame 30 is press-fitted. The callus receiving portion 210 is formed with a space at the lower side where the removed callus from the skin is accumulated therein and thrown away afterwards by the user.

[83] The handle 220 is formed with a gripping groove 211 at a position corresponding to the gripping portion 34 protruded from the supporting frame 30. The gripping portion 34 is coupled at the gripping groove 211 when the supporting frame 30 is assemble to the body frame 200.

[84] Here, in general, the handle 220 needs to be manufactured in a geometrical shape easy to grip, in a lightweight structure, and with a material leaving less problems in injection or cooling works caused by a thickened portion.

[85] As shown in FIGS. 10 and 11, the handle 220 of the callus remover 1 may have a semi-circular cross section with one side opened and a curved outer surface for easy grip. The handle 220 may be formed with one or more slip prevention walls 221 in an inner space thereof for prevention of slip when the user grips the callus remover 1. As clearly shown in FIG. 11, a distal end of the slip prevention wall 221 may have a curved portion 221a which is protruded outside in a substantially semi-circle shape from an imaginary surface formed by opposite bottom edges 220a of the handle 220.

[86] In case that a plurality of slip prevention walls 221 is needed at the handle 220 for strength, each slip prevention wall 221 may be equidistantly arranged with a spacing in which the user's finger is not inserted into or jammed in. Since the overall contour of the handle 220 added by the curved outer surface of the slip prevention wall 221 may be a substantially cylindrical shape having a smooth curved outline, thereby providing an easy grip to the user.

[87] The cover 300, as shown in FIG. 1, may be detachably assembled with the callus removing plate 100 or with the body frame 200. The cover 300 may enclose the callus removing plate 100 to allow the micro-cutters 20 not to be exposed outside, thereby protecting the cutting blades of the micro-cutters 20 from damage caused by collision with outer objects.

[88] In the present invention, the user may hold the handle 200 of the callus remover 1 and contact the callus removing plate 100 to the skin. By pulling or pushing the callus removing plate 100 against the callus on the skin, the callus is cut or removed from the skin through the cutting blades. For instance, when the user uses the callus remover 1 with the first cutting blade 25 facing upward as a working direction like FIG. 9 (a), the callus is cut by the first cutting blade 25 by pushing the callus removing plate 100,

while the callus is cut by the second cutting blade 26 by pulling the callus removing plate 100.

[89] In accordance with embodiments of the present invention, each of the first and second cutting blades 25 and 26 has a top edge 25a or 26a, a side edge 25b or 26b, and a bottom edge 25c or 26c. In accordance with the user's selection or habit, any one of the top edge 25a or 26a, the side edge 25b or 26b, and the bottom edge 25c or 26c can be a main edge to perform a primary cutting action. Accordingly, it will be appreciated that a callus cutting or removing action may be proceeded at any direction of the callus remover 1 with ease, thereby improving efficiency of the cutting action.

[90] Meantime, in accordance with embodiments of the present invention, the callus remover 1 having a variety of elements with different shapes may be manufactured in an ordinary injection molding process merely by using an upper mold and a lower mold without need of applying a slide mold used in the convention art.

[91] For instance, as shown in FIG. 12, the callus remover 1A may be assembled with a callus removing plate 100A having all the same components as those illustrated in FIGS. 1 to 10 except for the callus removing plate 100A which has a planar cross section, i.e, having cutter plate 10A with a flat outer surface.

[92] Another embodiment of the present invention may be made to arrangement of the micro-cutters 20 on the cutter plate 10. The plurality of micro-cutters 20 may be arranged in a zigzag to each other on the cutter plate 10, where adjacent rows of the micro-cutters 20 are disposed in a crisscross way. In this sense, a callus not cut by the preceding micro-cutter can be eliminated by the subsequent micro-cutter, which providing a continuity to the callus removing work. Thus, it will be possible to remove a large amount of the callus in a single cutting action and to shorten a time for removing the callus from the skin.

[93] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described examples are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the meets and bounds of the claims, or equivalences of such meets and bounds are therefore intended to be embraced by the appended claims.

Claims

[Claim 1] A callus removing plate, comprising:
a cutter plate; and
a plurality of micro-cutters arranged on the cutter plate to perform a callus cutting action,
each micro-cutter of the plurality of micro-cutters comprises a protrusion plate substantially formed in an elliptical shape and elevated at a predetermined height from an outer surface of the cutter plate;
a pair of bridges extended from and oppositely arranged from the cutter plate to support the protrusion plate;
a cutting blade formed at a periphery of the protrusion plate with an acute angle to cut the callus on the skin; and
an opening formed at both sides of the bridges along the periphery of the protrusion plate to pass the callus removed by the cutting blade,
wherein the cutting blade includes a first cutting blade and a second cutting blade substantially formed in a symmetrical shape with the first cutting blade, and
wherein the protrusion plate has a shape meeting a conditional expression of $H \geq 2R + W$, where H is a distance in a lengthwise direction between each top portion of the first and second cutting blades, R is a radius of curvature of the first or second cutting blade, and W is a width of the bridge in a lengthwise direction.

[Claim 2] The callus removing plate of claim 1, wherein the cutter plate has a substantially rectangular shape with a curved cross section, wherein each of the first and second cutting blades comprises a top edge, and an inclined edge extending at both sides of the top edge, and wherein a cutting length of the first and second cutting blades is increased by the bridge, respectively.

[Claim 3] The callus removing plate of claim 1, wherein the first and second cutting blades further comprises a side edge extending to a distal end of the bridge, and wherein the side edge is configured to increase a cutting length of the first and second cutting blades, respectively.

[Claim 4] The callus removing plate of claim 1, wherein the side edge is formed in a linear or curved shape.

[Claim 5] A callus remover, comprising:
a callus removing plate according to claim 1;
a supporting frame which is integrally formed with a cutter plate or de-

tachably coupled with the cutter plate; and

a body frame to be coupled with the supporting frame,

wherein the body frame includes a callus receiving portion formed with a space to collect a cut callus, and a handle connected at a distal end of the callus receiving portion and configured to be gripped by the user.

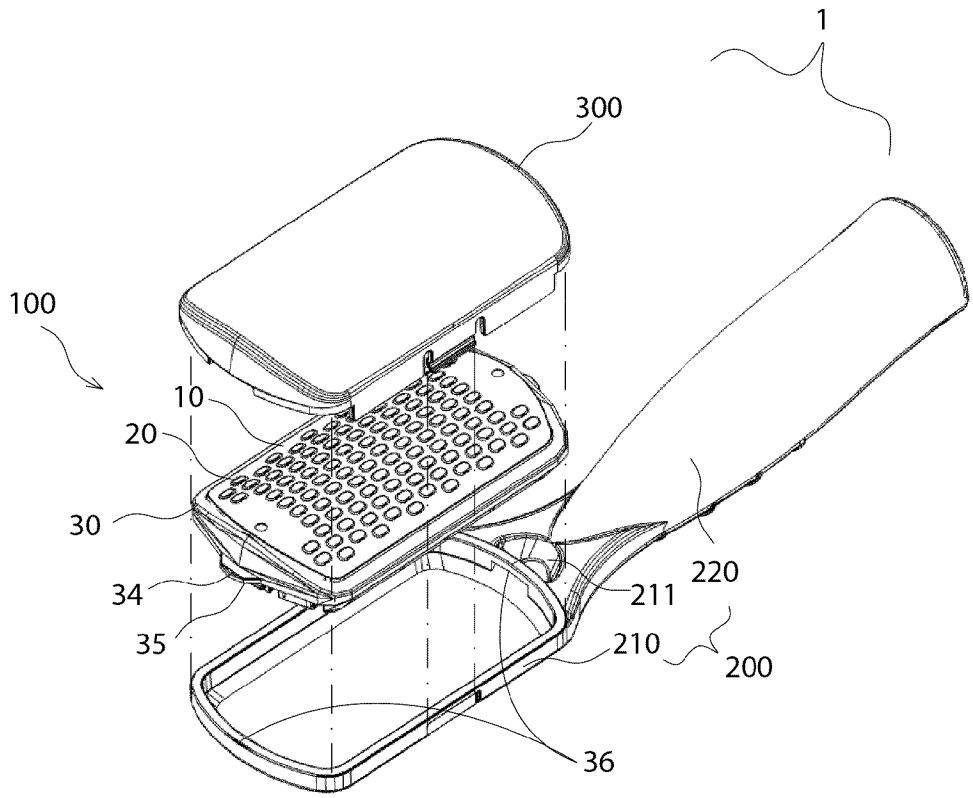
[Claim 6] The callus remover of claim 5, wherein the callus removing plate is coupled with the body frame by changing its direction in a lengthwise direction to use unworn cutting blades.

[Claim 7] The callus remover of claim 5, wherein the callus remover may be formed with a gripping portion each protruded from at opposing distal ends of the supporting frame.

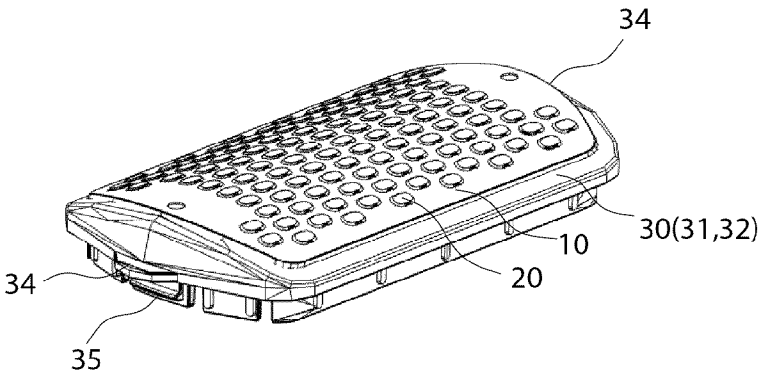
[Claim 8] The callus remover of claim 5, wherein the callus remover is provided at the supporting frame below the gripping portion with a locking rib to be coupled with a recess formed at the body frame.

[Claim 9] The callus remover of claim 5, wherein the handle of the callus remover has a semi-circular cross section with one side opened and be formed with a plurality of slip prevention walls which is equidistantly protruded outside and provides a cylindrical contour to the handle.

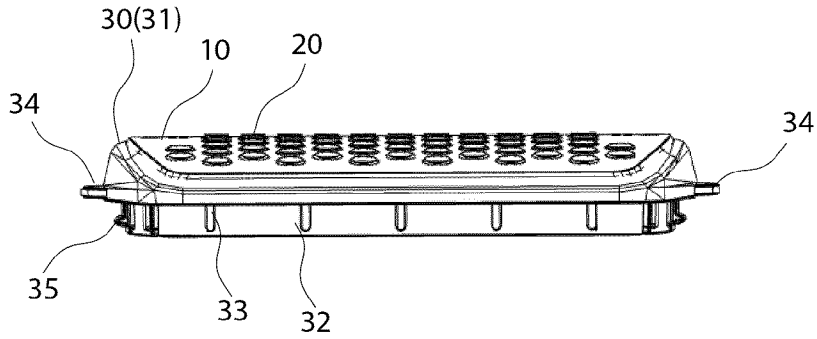
[Fig. 1]



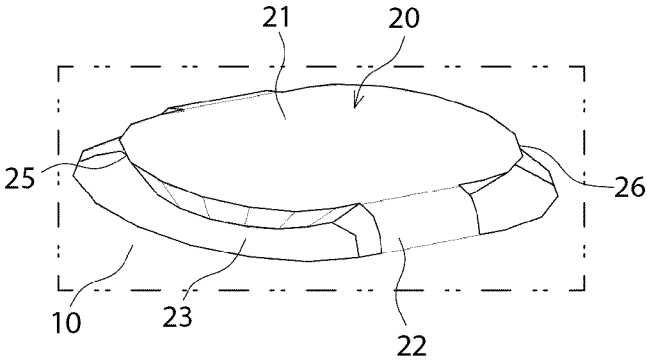
[Fig. 2]



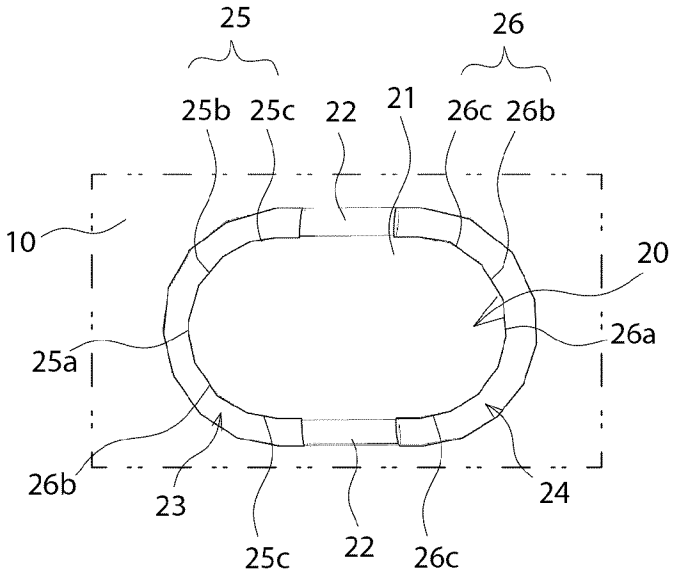
[Fig. 3]



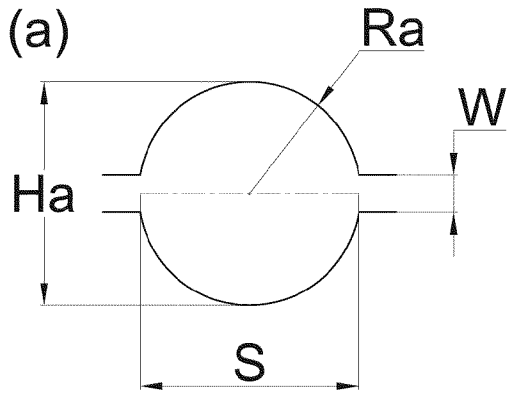
[Fig. 4]



[Fig. 5]



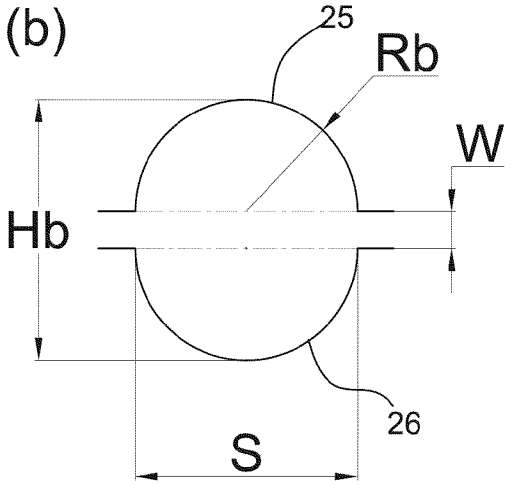
[Fig. 6]



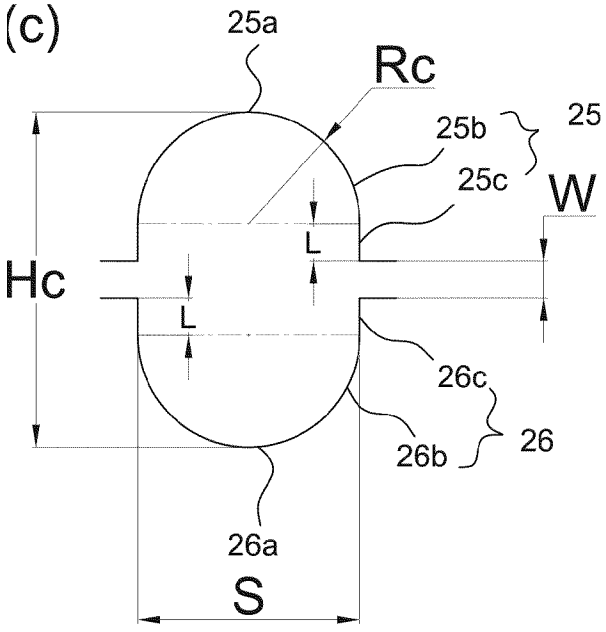
$Ha \leq 2Ra + W$

$Ha \leq 2Ra = S$

Prior art

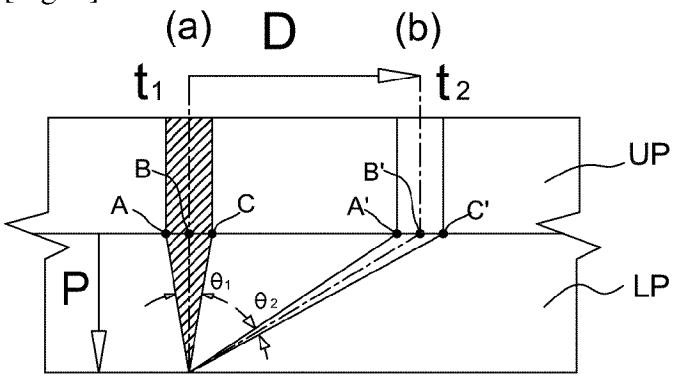


$Hb = 2Rb + W$

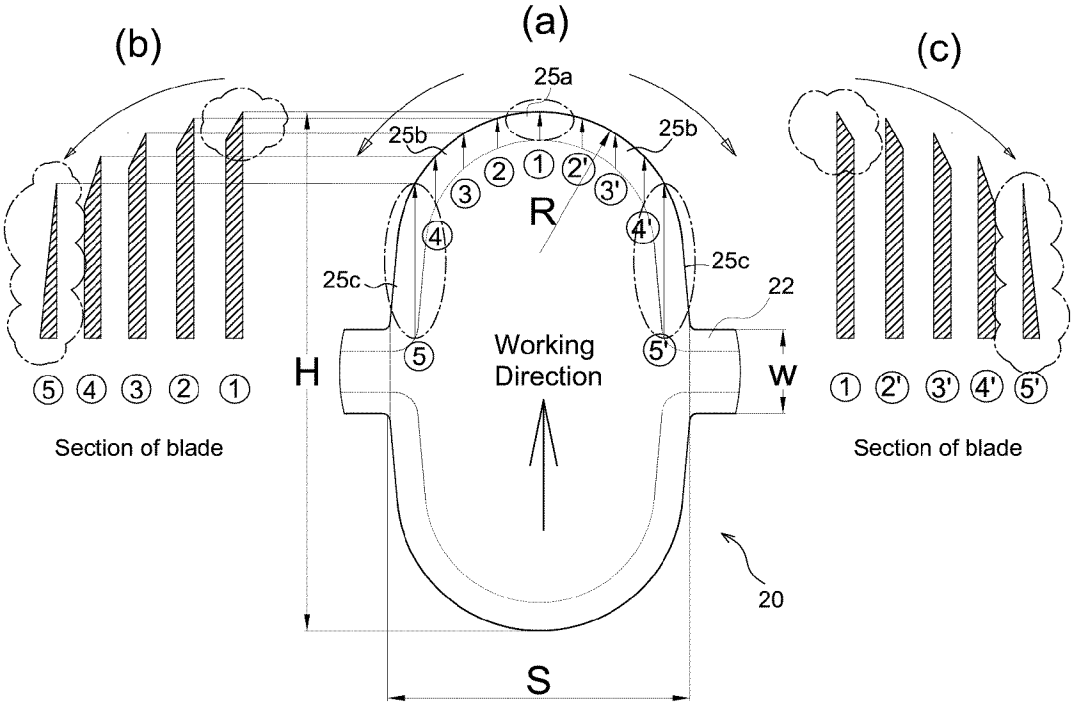


$Hc \geq 2Rc + W$

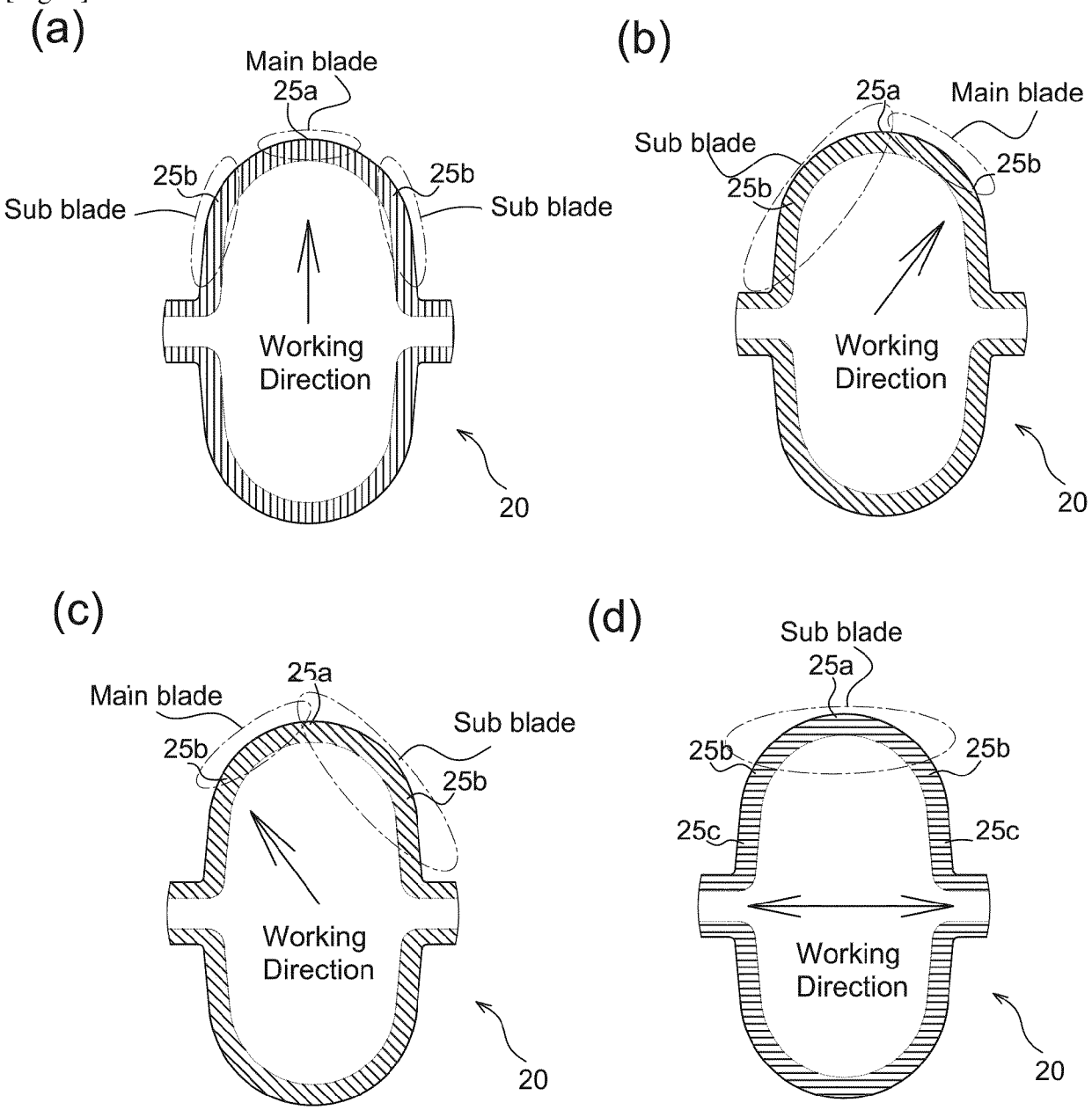
[Fig. 7]


(a)
D
(b)
t1
t2
UP
B
B'
A
C
A'
C'
P
θ1
θ2
LP

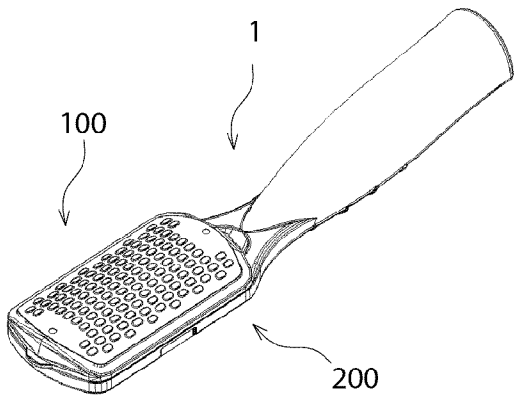
[Fig. 8]


(b)
(a)
(c)
25a
25b
25b
25c
25c
22
R
H
W
Working
Direction
S
20
Section of blade
Section of blade

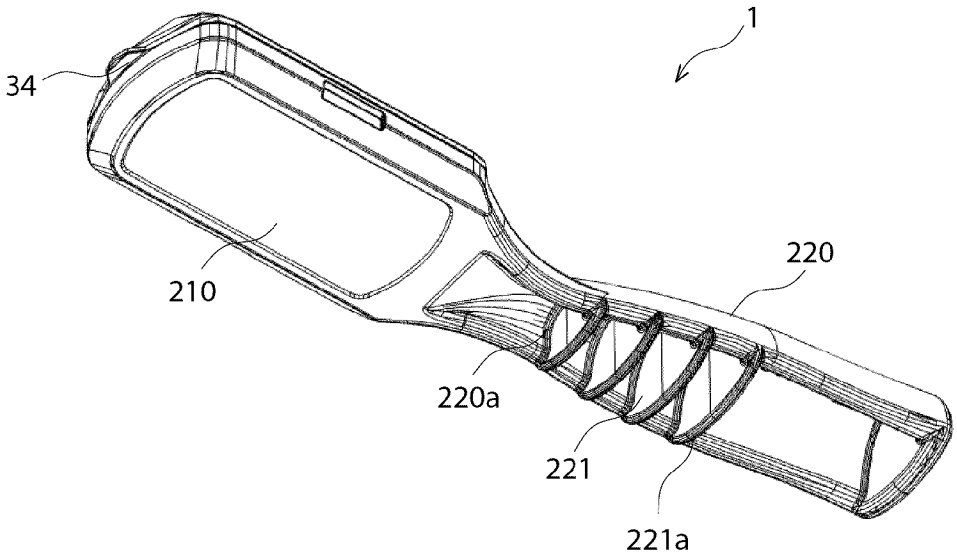
[Fig. 9]


(a)
Main blade
25a
25b
25b
Sub blade
Sub blade
Working Direction
20
(b)
25a
Main blade
Sub blade
25b
25b
Working Direction
20
(c)
25a
Main blade
Sub blade
25b
25b
Working Direction
20
(d)
Sub blade
25a
25b
25b
25c
25c
Working Direction
20

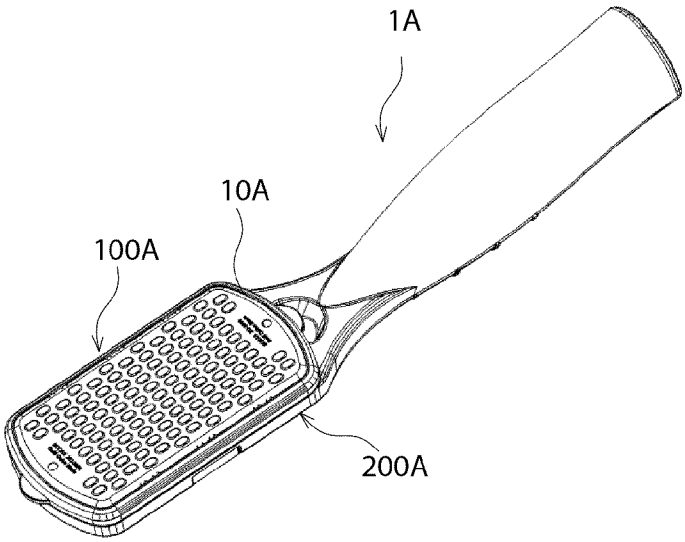
[Fig. 10]


1
100
200

[Fig. 11]



[Fig. 12]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2018/015009

A. CLASSIFICATION OF SUBJECT MATTER

A61B 17/54(2006.01)i, A47K 7/02(2006.01)i, A61B 17/32(2006.01)i, A61B 17/00(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)
A61B 17/54; A45D 44/00; A47K 7/00; A47K 7/02; A47K 7/04; A61B 17/32; A61B 17/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: callus remover, cutter, elliptical shape, blade, plate

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-1184144 B1 (KIM, G. H. et al.) 18 September 2012 See claims 1, 3, 4; figures 1-9.	1-9
A	KR 10-2010-0009371 A (PARK, I. D.) 27 January 2010 See the whole document.	1-9
A	KR 10-2017-0034238 A (HONG, J. I.) 28 March 2017 See the whole document.	1-9
A	KR 20-2008-0003214 U (CHANG, T. K.) 08 August 2008 See the whole document.	1-9
A	US 2008-0091216 A1 (GRACE, C. et al.) 17 April 2008 See the whole document.	1-9

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
04 April 2019 (04.04.2019)	**08 April 2019 (08.04.2019)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea
Facsimile No. +82-42-481-8578

Authorized officer
Kim, Yeonkyung
Telephone No. +82-42-481-3325

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2018/015009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 10-1184144 B1	18/09/2012	None	
KR 10-2010-0009371 A	27/01/2010	KR 10-0981764 B1	10/09/2010
KR 10-2017-0034238 A	28/03/2017	KR 10-1757905 B1	13/07/2017
KR 20-2008-0003214 U	08/08/2008	None	
US 2008-0091216 A1	17/04/2008	CA 2590644 A1	29/06/2006
		CN 101090673 A	19/12/2007
		EP 1843711 A1	17/10/2007
		JP 2008-523887 A	10/07/2008
		US 8888790 B2	18/11/2014
		WO 2006-068638 A1	29/06/2006