(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 318 697 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.05.2018 Bulletin 2018/19

(51) Int Cl.:
E04F 21/00 *(2006.01)*

(21) Application number: **16196881.3**

(22) Date of filing: **02.11.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(54) **DEVICE FOR INSTALLING TILES**

(57) A two part device (1000) is used in leveling and spacing tiles (4100). The device includes two parts, a rotatable portion called a knob-cam (2000) and a fixed portion called hook-base (3000). The hook-base includes ribs (3220) for spacing and separating tiles, and a neck portion (3140) extending through a slot opening in the knob-cam. In use, the hook-base portion is set down and tiles are laid down and spaced by the ribs of the base portion. The neck portion extends upwardly above the tiles, and is adapted to be broken away upon application of sufficient upward force or sideways force. The knob-cam includes two diametral opposed frontal action cam surfaces (2100) that engage portions (3110) of the hook when the knob-cam is rotated. The knob-cam is rotated until the tiles are secured between the knob-cam and the hook-base. This device clamps the corners or edges of the tiles, making coplanar upper surfaces.

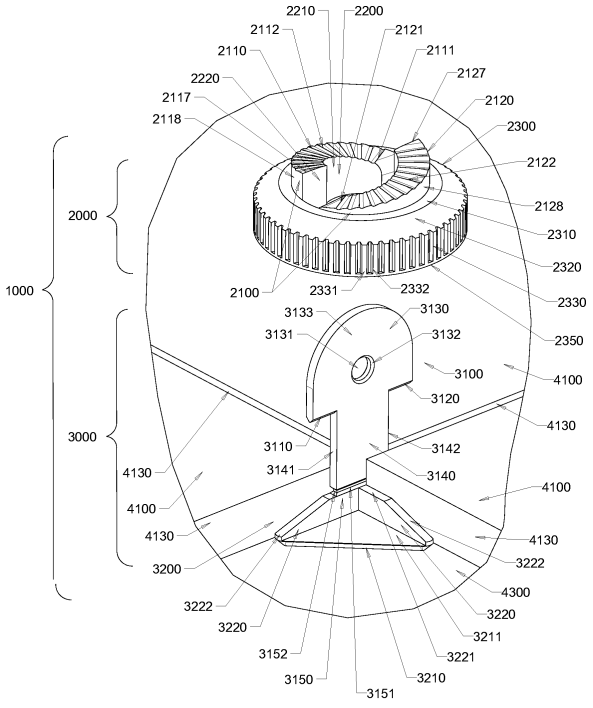

FIG. 1

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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

FIELD OF THE INVENTION

[0003] The present invention relates to a device for leveling and spacing tiles.

BACKGROUND OF THE INVENTION

[0004] It is a problem in the art, when laying tiles on a surface, to equally level the tiles to be coplanar and space evenly the tiles. This is applicable to laying tiles on surfaces in general, including floors, walls, ceilings, and on other surfaces which can support tiles. The term tiles should be understood as including panels, sheets, boards, paving stones, and other materials capable of being laid out in a pattern.

SUMMARY OF THE INVENTION

[0005] From the foregoing, it is seen that it is a problem in the art to provide a device meeting the above requirements. According to the present invention, a device is provided which meets the aforementioned requirements and needs in the prior art. Specifically, the device according to the present invention provides a device for spacing and leveling tiles.

[0006] The present invention provides a two part device for use in leveling and spacing tiles. The device includes two parts, a rotatable portion and a fixed portion. The rotatable portion referred to hereinafter as a knob-cam includes two helical diametral opposed frontal action cams, a domed knob portion, a central opening, a knurled or ribbed portion and an annular surface portion at the bottom. The fixed portion referred to hereinafter as a hook-base includes a base with flat surfaces for seating the tiles and ribs for spacing and separating tiles, a neck portion extending through a slot in the knob-cam and double blades which will engage with the double cam. The installation does not require tools.

[0007] In use, the base portion is inserted from the side underneath the tiles and spaced by the ribs in between the tiles. After insertion of the base portion will be installed all surrounding tiles, and then the knob-cam will be inserted. The neck portion extends upwardly above the tiles, and is adapted to be broken away after the adhesive sets upon application of sufficient upward force or sideways force. The knob-cam is placed against the tiles such that the neck extends through the key opening. The knob-cam includes two diametral opposed frontal action cam surfaces that engage the blades when the knob-cam is rotated. The knob-cam is rotated until the tiles are temporarily secured between the knob-cam and the base. Adhesive is used to permanently secure the tiles on the surface. The device evenly holds the tiles in correct position during the curing process. When the adhesive is set, the neck and hook portions can be removed by breaking them away from the base portion. Clamping is provided from opposite directions, fastening the tiles in such a way that the upper surface of the tiles will be coplanar. Optionally the device may be used in conjunction with regular spacers, wider than the ribs and the device is providing just clamping force.

[0008] Other objects and advantages of the present invention will be more readily apparent from the following detailed description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is a perspective view of a device for use in leveling and spacing tiles, the device having a knob-cam portion and a hook-base portion shown separated prior to assembly, and with some tiles in place with the hook-base portion.

FIG. 2a is a perspective view of the device of FIG. 1, showing an assembly step.

FIG. 2b is a perspective view of the device of FIG. 1, showing another assembly step.

FIG. 2c is a perspective view of the device of FIG. 1, showing an assembled configuration.

FIG. 3a is a perspective section view of the device in the position shown in FIG. 2b wherein the hook from the hook-base portion is inserted through a key opening of the knob-cam portion.

FIG. 3b is a view similar to FIG. 3a, and wherein the knob-cam portion has been rotated and locked into place with the hook-base portion, consequently clamping tiles.

FIG. 4a is a perspective view of the knob-cam portion and the hook-base portion of FIG. 1, prior to assembly, and with the tiles omitted for the sake of clarity.

FIG. 4b is a perspective view of the device having the knob-cam portion and the hook-base portion of FIG. 4a, following assembly and tightening, and with the tiles omitted for the sake of clarity.

FIG. 5a is a front elevational view of the hook-base

portion.

FIG. 5b is a top elevational view of the hook-base portion shown in FIG. 5a.

FIG. 5c is a right side elevational view of the hook-base portion of FIG. 5a.

FIG. 6a is a perspective view of the hook-base portion of FIG. 5a, for use with four tiles.

FIG. 6b is a perspective view of a second embodiment of the hook-base portion, for use with three tiles.

FIG. 6c is a perspective view of a third embodiment of the hook-base portion, for use with two tiles.

FIG. 7a is a front elevational view of the knob-cam portion of FIG. 1.

FIG. 7b is a top elevational view of the knob-cam portion of FIG. 7a.

FIG. 7c is a side elevational view of the knob-cam portion of FIG. 7a as viewed from the right of FIG. 7a.

FIG. 8a is a perspective view of the knob-cam portion of FIG. 1 showing a knurled portion.

FIG. 8b is a perspective view of another embodiment of the knob-cam portion, having a plurality of separated rib portions for manual gripping and turning.

FIG. 9a is a side elevational view of a further embodiment of a knob-cam portion, having a pair of cams, and pairs of radial valleys.

FIG. 9b is a top elevational view of the knob-cam portion of FIG. 9A, showing the pair of cams, together with the pairs of radial valleys.

FIG. 9c is an enlarged section of a portion of one of the cams, showing a close-up view of the radial valleys and teethed stepped profile.

FIG. 9d is an enlarged section view of an assembly formed by a blade and a cam, showing a close-up view of a blade engaging with one of the radial valleys.

FIG. 10 is a perspective view of a further embodiment of a knob-cam portion which can be used in the device of FIG. 1, wherein the cams have textured or smooth surfaces instead of teethed stepped surfaces.

FIG. 11 is a perspective view of a further embodiment of a knob-cam portion which can be used in the device of FIG. 1, wherein the cams are shown, as well as a plurality of spaced ribs for facilitating manual gripping and turning.

FIG. 12a is a side sectional view showing a hook-base portion shown sliding under the tile which is previously disposed on adhesive, and a floor which is covered by the adhesive.

FIG. 12b is an enlarged sectional view of the downward oriented chamfer of the hook-base, wherein for the sake of clarity the hatching has been removed.

DETAILED DESCRIPTION OF THE INVENTION

[0010] A device 1000 according to the present invention is shown in FIG. 1, depicting a knob-cam portion 2000 and a hook-base portion 3000. The hook-base portion 3000 includes a hook 3100 and a base 3200. Three tiles 4100 are shown mounted against the base 3200 of the base portion 3000, and the tiles 4100 are shown as having side walls 4130. There is room for a fourth tile 4100 against the base portion 3200, which has been omitted for the sake of illustration. The device 1000 is provided for use in leveling and spacing tiles. The knob-cam portion 2000 is shown separated from the hook-base portion 3000, prior to assembly.

[0011] As shown in FIG. 1 and in FIGS. 4-6, the knob-cam portion 2000 has a domed knob shape 2300 and includes a pair of frontal cams 2100 (including a left cam 2110 and a right cam 2120, the left cam 2110 having an engaging edge 2111, a helical teethed and stepped cam profile 2112, an uppermost edge 2117, and an outer wall 2118. The right frontal cam 2120 has an engaging edge 2121, a helical teethed and stepped cam profile 2122, an uppermost edge 2127, a central opening 2200, a central key hole 2210, a central key slot 2220, an outer wall 2128, a knurling 2330 formed by alternating raised portions 2331 and recesses 2332, a surface 2310, a surface 2320, and an annular seating bottom surface 2350.

[0012] The hook-base portion 3000 is formed by a hook 3100 and a base 3200. The hook 3100 has a rounded key 3130 formed by a tongue 3133 which has a central hole 3131 with a chamfer 3132, a pair of engaging blades 3110 and 3120, and a neck 3140 which has two side surfaces 3141 and 3142. The neck 3140 is connected to the base 3200 by breakable portions 3150, consisting in the edge 3151 and the corners 3152 which are disposed at a bottom region of the neck 3140, situated under the tiles' upper surface. The base 3200 has a supporting flat wall 3210, a plurality of ribs 3220, each of the ribs 3220 respectively including a slanted portion 3222 and a top portion 3221, and a plurality of flat portions 3211. The plurality of flat portions 3211 respectively receive bottom corner portions of the tiles 4100 which are to be separated by the ribs 3220. The flat portions 3211 are provided between adjacent ones of the ribs 3220. FIG. 2a is a per-

spective view of the device of FIG. 1, showing an assembly step in which the knob-cam portion 2000 is brought toward the upper surfaces 4110 of the tiles 4100 in the direction shown by the dashed arrow D1.

[0013] FIG. 2b is a perspective view of the device of FIG. 1, showing the next assembly step in which the hook 3100 of the hook-base portion 3000 extends through the key opening 2200 of the knob-cam portion 2000 and the blades 3110 and 3120 extend above the cams 2110 and 2120 such that the engaging edges 2111 and 2121 of the cams are below the blades portions 3110 and 3120. The annular surface 2350 is touching the upper portion of tiles 4110. The knob-cam portion 2000 is about to be rotated in the direction shown by the dashed arrow R1, the shown mechanism is unlocked and does not provide residual force.

[0014] FIG. 2c is a perspective view of the device of FIG. 1, the shown assembly mechanism is locked. By rotating the knob-cam 2000, the frontal cams act as circular wedges and will provide the clamping residual force between the knob-cam 2000 and the tiles 4100. When the knob-cam is rotated beyond the first engaging position, the blades 3110 and 3120 will start climbing on the cams' teethed and stepped profiles 2112 and 2122, generating click sounds which can quantify the residual force necessary for proper clamping. It is important that the rotation is stopped after few clicks, to prevent breakage of the neck 3140 along the breakable portions 3151 and 3152. The clamping effect will self level the upper surfaces of the tiles 4110 until they all touch the annular surface 2350 which creates a datum plane for leveling. The clamping effect is similar to the force provided by the jaws from a vice. The self-leveling effect propagates to all adjacent tiles found under the knob-cam 2000. When the adhesive securing the tiles 4100 has been sufficiently set, the hook 3100 is adapted to be broken by fracture and can be removed, either by further rotation of the knob-cam portion 2000 or by striking of the hook 3100 in a sideways direction. The breaking edges 3152 and 3151 will be below the upper surface of tiles 4110 and will be covered later with grout and hidden. The hook portion 3100 can then be removed and the knob-cam portion 2000 can be reused.

[0015] FIG. 3a is a perspective section view of the device 1000 in the position shown in FIG. 2b wherein the hook 3100 of the hook-base portion 3000 is inserted through the key opening 2200 of the knob-cam portion 2000. The mechanism is shown unlocked. Also in this view, the base portion 3200 has a bottom seating wall 3210. The remaining parts are as numbered and described in the foregoing.

[0016] FIG. 3b is a view similar to FIG. 3a, and wherein the knob-cam portion 2000 has been rotated and locked into place between the blades portion 3110 and 3120 and radial valleys 2115 and 2125, consequently clamping surrounding tiles 4100 in place. The mechanism is shown locked.

[0017] FIG. 4a is a perspective view of the device 1000 with the knob-cam portion 2000 and the hook-base portion 3000 of FIG. 1, prior to assembly, and with the tiles 4100 omitted for the sake of clarity. The mechanism is shown unlocked. The remaining parts are as numbered and described in the foregoing.

[0018] FIG. 4b is a perspective view of the device 1000 having the knob-cam portion 2000 and the hook-base portion 3000 of FIG. 4a, following assembly and tightening. The device is shown locked. Here the tiles 4100 have been omitted for the sake of clarity.

[0019] FIG. 5a is a front elevational view of the hook-base portion 3000, showing the hook 3100, the neck 3140, and the base 3200. Here, the base 3200 is shown having a chamfer 3212 and a seating surface 3211. The central neck 3140 is perpendicular to the base's flat seating surfaces 3211. The tongue portion 3130 from the key 3100 is suitable for gripping by the user during the rotation of knob-cam 2000. The ribs 3220 from the base 3200 have continuous material with no gaps in between. The ribs 3220 provide equidistant spacing between adjacent tiles and can be made in a plurality of colors, each color representing a different spacing distance between tiles. The remaining parts are as numbered and described in the foregoing.

[0020] FIG. 5b is a top elevational view of the hook-base portion 3000 having the seatings surfaces 3211 of the base 3200 as shown in FIG. 5a. The remaining parts are as numbered and described in the foregoing.

[0021] FIG. 5c is a right side elevational view of the hook-base portion 3000 having the base 3200 shown in FIG. 5a. The remaining parts are as numbered and described in the foregoing.

[0022] FIG. 6a is a perspective view of the hook-base portion 3000 having the base 3200 shown in FIG. 5a, for use with four tiles.

[0023] FIG. 6b is a perspective view of a second embodiment of the hook-base portion 3000 having the base 3200, for use with three tiles.

[0024] FIG. 6c is a perspective view of a third embodiment of the hook-base portion 3000 having the base 3200, for use with two tiles.

[0025] FIG. 7a is a front elevational view of the knob-cam portion 2000 of FIG. 1, having an annular bottom surface 2350. Here, the cam 2120 is shown having respective engaging edge 2121 and uppermost edge 2127. By providing clamping force, the tiles will be self level guided by the datum plane created by the bottom annular portion 2350 of the knob-cam. The knob-cam 2000 can be reused .The remaining parts are as numbered and described in the foregoing.

[0026] FIG. 7b is a top elevational view of the knob-cam portion 2000 of FIG. 7a. Here, the central key opening 2200 is shown having a central key hole 2210, a central key slot 2220 and two wing-shaped key slot ends 2221 and 2222. The central key hole 2210 has a diameter sufficient to accommodate and guide during rotation the neck portions 3141 and 3142 of hook-base 3000. The two wing-shaped slot ends 2221 and 2222 are sufficiently

wide to accommodate passage of the entire width of the hook 3100 of the hook-base portion 3000.

[0027] FIG. 7c is a side elevational view of the knob-cam portion of FIG. 7a as viewed from the right of FIG. 7a.

[0028] FIG. 8a is a perspective view of the knob-cam portion 2000 of FIG. 1 showing a knurled portion 2330. The remaining parts are as described in the foregoing.

[0029] FIG. 8b is a perspective view of another embodiment of the knob-cam portion 2000, having a plurality of separated rib portions 2340 for ease of gripping and rotating. The remaining parts are as described in the foregoing.

[0030] FIG. 9a is a side elevational view of a further embodiment of a knob-cam portion 2000 of FIG. 1, having an annular bottom surface 2350. Here, the cam 2120 is shown having respective engaging edge 2121 and uppermost edge 2127. By providing clamping force, the tiles will self level guided by the datum plane created by the bottom annular portion 2350 of the knob-cam. The knob-cam 2000 can be reused .The remaining parts are as numbered and described in the foregoing.

[0031] FIG. 9b is a top elevational view of the knob-cam portion 2000 of FIG. 9A, showing the cam 2110 and the cam 2120, together with the pairs of radial valleys 2115 and 2125. The pairs of radial valleys facilitate seating and locking of the blade portions 3110 and 3120 during operation.

[0032] FIG. 9c is an enlarged frontal section of a portion of the cam 2120, showing a close-up view of the teethed stepped radial valleys 2125. Each of the radial valleys 2125 has a generally scalloped shape, and includes the edges 2121 which prevents the blade portion 3110 and blade portion 3120 from unlocking itself; a valley portion 2124 which cooperates with the edge 2121 to prevent the blade portion 3110 and blade portion 3120 from unlocking itself; and a hill portion 2126 which allows a smooth transition to the next edge 2121 and provide residual force. Each of the radial valleys 2125 has an axial pitch h1, measured vertically between two consecutive edges 2121, and a depth h1 a of the valley (which determines the key's sound pitch intensity during turning). Each of the radial valleys 2125 also has a total blade travel h1b from the bottom of a valley to the next edge 2121. Each of the radial valleys 2125 has a perimeter pitch p1 (e.g., a length p1), a distance p1 a between and edge 2121 and the bottom of a valley, and a hill p1 b which is a distance between the bottom of the valley to the next edge 2121, measured transversely. As seen in FIG. 9c, the radial valley 2125 has a concave portion 2124 where the locking ramp of the valley is located and a convex portion 2126 which leads smoothly to the next edge 2121. The cams have axial and frontal action, and the orientation of the edges 2121 from the teethed and stepped profile is in opposite direction from the tiles.

[0033] FIG. 9d is an enlarged section view of an assembly formed by a blade 3120 which looks like a V-Notch and the cam teethed and stepped profile 2122. The tip edge 3122 and two adjacent sidewalls 3121 seats and engages with the locking valley portions 2124 wherein the edge 2121 and the locking ramp 2124 prevent the tip blades 3122 from unlocking themselves. Upon further urging of the blade portion 3110 during rotation of the knob-cam portion 2000, the tip 3122 slides upwardly along the hill portion 2126 which forms a smooth transition to the next edge 2121 whereupon the tip 3122 can slide into the next radial valley portion 2125. In this preferred embodiment, this sharp and central V shape is very effective in engaging with the teethed stepped profile on cams. Because the teeth have a radial pattern, i.e. are radially disposed, the blades 3110, 3120 have to engage in a substantially exactly radial manner, and this determines that the sharp blades tips 3122 will be substantially exactly in the middle of the radial valleys 2125 and 2115.

[0034] FIG. 10 is a perspective view of a further embodiment of a knob-cam portion 2000 which can be used in the device of FIG. 1, wherein the cams 2110 and 2120 have smooth or textured surfaces instead of teethed and stepped surfaces.

[0035] FIG. 11 is a perspective view of a further embodiment of a knob-cam portion 2000 which can be used in the device of FIG. 1, wherein the cams 2110 and 2120 have smooth or textured surfaces instead of teethed and stepped surfaces as well as a plurality of ribs 2340 for facilitating manual gripping and turning.

[0036] In the foregoing description, the frontal cams have specified surfaces. It is contemplated as being within the scope of the present invention that the frontal surfaces of helical cams can have any of: teethed and stepped surfaces; textured surfaces; or smooth surfaces. This includes teethed stepped surfaces as described above.

[0037] FIG. 12a is a frontal sectional view showing a base portion 3200, shown sliding into engagement from the side under the tile 4100 in the direction indicated by an arrow D2. The tile 4100 is disposed on the adhesive 4200 which is covering the floor 4300.

[0038] FIG. 12b is an enlarged view of the chamfer 3212 portion. In this view the seating wall 3210 through the seating surface 3211 of the base 3200 is supporting a tile 4100. The leading edge of the wall 3100 has the downward oriented chamfer 3212, wherein the chamfer 3212 assists in penetrating the adhesive A along with an arrow labeled D2 showing a direction of insertion or movement. That is, the chamfer 3212 in this process will push down the adhesive 4200 so as to help rub and clean the lower seating surface 4120 of tile 4100 from the adhesive 4200 in the location adjacent to the base 3200. In this view, an arrow labeled D3 shows a direction in which the adhesive A is pushed down by the chamfer 3212, such that adhesive is cleaned from underneath the tile 4100, providing a clean supporting surface.

[0039] The invention being thus described, it will be evident that the same may be varied in many ways by a routineer in the applicable arts. Such variations are not to be regarded as a departure from the spirit and scope

of the invention and all such modifications are intended to be included within the scope of the claims.

[0040] The invention has several preferred embodiments but they are not exclusive. The invention is susceptible of many embodiments, all of which are within the scope of the appended claims. All the details may be substituted by other equivalent elements.

Claims

1. A two part device system for installing tiles on flat surfaces, placed between two or more adjacent tiles, providing spacing, clamping and levelling for tiles, comprising:

a knob-cam which is a rotatable top portion around a rotational axis, said knob-cam being adapted for levelling upper tile surfaces; said knob-cam having a body which has a central opening therethrough, said central opening being in a key shape formed by a central circular portion with a first slot and a second slot, wherein said first slot and said second slot extend in opposite directions from said central circular portion, and said knob-cam having a first cam outside of the body with a helically ascending teethed ramp about said central circular portion, said first cam having an upper surface radially extending from said central circular portion, said first cam having a lowermost edge adjacent said first slot; said knob-cam having a second cam outside of the body with a helically ascending teethed ramp about said central circular portion, said second cam having an upper surface radially extending from said central circular portion, said second cam having a lowermost edge adjacent said second slot; said knob-cam including a portion adapted for manual gripping by the user with a said knurled or ribbed gripping portion, and said knob-cam having a bottom seating clamping surface to level said tiles for coplanarity;

said upper surface of said first cam having a succession of teeth which are radially extending on the ascending portions, which are scallop shaped, each of said ascending portions of said upper surface of said first cam having a leading edge, a valley portion, and a hill portion;

said upper surface of said second cam having a succession of teeth which are radially extending on the ascending portions, which are scallop shaped, each of said ascending portions of said upper surface of said first cam having a leading edge, a valley portion, and a hill portion, both cams being diametral on opposite sides;

a hook-base which is a fixed bottom portion having a base with spacing ribs for spacing adjacent tiles, and a said hook having a tongue portion and a neck connecting said tongue portion to said base wherein said neck has a weakened breakable portion at the bottom which in use is disposed adjacent to said base; said hook portion having two engaging locking blades extending in opposite directions from said hook; and an extending from said base which is a bottom portion, said hook-base having a hook extending therefrom, said hook being adapted to pass through said opening in said knob-cam, and said hook having locking blades adapted to be engaged by respective ones of said cams, said hook-base being adapted to space and level the adjacent tiles in conjunction with the knob-cam from opposite sides of the tiles;

wherein said scallop shaped ascending portions of said upper surface of said first cam and said upper surface of said second cam are adapted to seat the lowermost edges of said two engaging locking blades in said valley portions;

whereby when said hook is inserted through said central opening, rotation of said knob-cam causes engagement of said first and second cams with said locking blades of said hook-base, to provide clamping force between said knob-cam and said hook-base such that tiles in between to be spaced, clamped and leveled.

2. The device of claim 1, wherein said knob-cam has a dome shaped body with a said knurled or ribbed gripping portion and said diametral opposed cams and a said central opening and said knob-cam is adapted for rotation to clamp and level tiles.

3. The device of claim 1, wherein each said first and second cams have a relatively high ascending angle and wherein said scallop shaped ascending portions on the upper surfaces of each of said first and second cams are pluralities of radial toothed stepped valleys which facilitate seating and locking of said locking blades providing incremental clamping force increase to level the tiles to a coplanar surface.

4. The device of claim 3, wherein rotation of said knob-cam relative to said hook-base causes audible feedback by clicking sounds which start exclusively after said engaging locking blades engage said teethed cams and generate the clamping force increase, and said clicking sounds serve as measurable indication increment of residual clamping force increase, and wherein each consecutive clicking sound represents a residual clamping force increase increment.

5. The device of claim 3, wherein rotating said knob-cam occurs in four main steps:

(a) Initial rotation of said knob-cam is without

any clicking sounds because the locking blades are not engaging yet the ascending portion of said cams and the device it is not providing any clamping force and clicking sounds yet while the said knob-cam is initially rotating; (b) Further rotation of said knob-cam is with clicking sounds, once the annular bottom surface of said knob-cam is touching the upper surface of the tiles and the said locking blades engage with the said teethed ascending portion of cams, the further rotation of said knob-cam starts providing increasing clamping force as said locking blades from said hooks engage with the ascending profile of the cams and said radially disposed teethed profile cause clicking sounds which provide an audible indication by counting where to stop rotation of said knob-cam in order do not exceed the maximum allowed clamping force and do not break prematurely the said hook-base at the weakened breakable portion, and each consecutive clicking sound provides an audible feedback related exclusively to the residual clamping force increase, and by counting the clicks, said four, the clamping residual force reaches the maximum force allowed and the user knows exactly where to stop rotating the knob-cam, just before reaching the maximum elongation force required breaking the base-hook at the bottom; (c) Stop rotating the said knob-cam once reaching the maximum allowed clamping force measured by the number of clicking sounds, and when the clamping force reaches the maximum allowed at the end of said knob-cam rotation, and said knob-cam is released and left locked in position and the tiles are secured in place with upper surfaces coplanar, and adhesive is started to cure while tiles are spaced, clamped and leveled; (d) Continuing rotation of said knob-cam after the adhesive is cured and the tiles are secured, which will break on purpose the hook-base at the breakable portion from the bottom portion of the said neck and the said key breaks and the supporting base and the ribs remain embedded under the upper surface of tiles and between adjacent tiles and then the top portion of the hook-base is extracted from between tiles after breaking and the gaps will be filled with grout; and there is an alternative method to break the hook-base at the bottom after adhesive cures, by kicking the knob-cam and hook-base clamped assembly from the side without rotating the said knob-cam.

6. The device of claim 3, wherein for each of said cam helically ascending teethed portions, said hill portions allow smooth transitions to the next valley portions, locking the said locking blades in valley portions.

7. The device of claim 1, wherein each said first and second cams have a relatively medium ascending angle and the upper surfaces of each cams are textured, which facilitate seating and locking by friction of said locking blades providing continuous clamping force increase to level the tiles to a coplanar surface.

8. The device of claim 1, wherein a said hook-base is adapted for supporting and clamping adjacent tiles in conjunction with the said knob-cam from opposite sides of the tiles, and it is adapted to also space the adjacent tiles by having ribs which provide spaces between adjacent tiles, and said neck from the said hook-base bottom portion has a weakened breakable portion and the bottom portion remains trapped under the tiles.

9. The device of claim 1, wherein a top portion of said hook-base has a key shape for easy gripping and maintained in position by the user while said knob-cam is rotated by the user, and said key is adapted to pass through said opening in said knob-cam and lock the said knob-cam.

10. The device of claim 1, wherein said hook of said hook-base has a substantially T-shaped body and said locking blades are disposed on an underside of respective arms of said T-shaped body.

11. The device of claim 1, wherein each of said pair of locking blades from said hook-base has a locking profile which narrows to a tipped edge which can engage and lock in the corresponding radial valleys portions or textured surfaces on said cams at the end of rotation of said knob-cam.

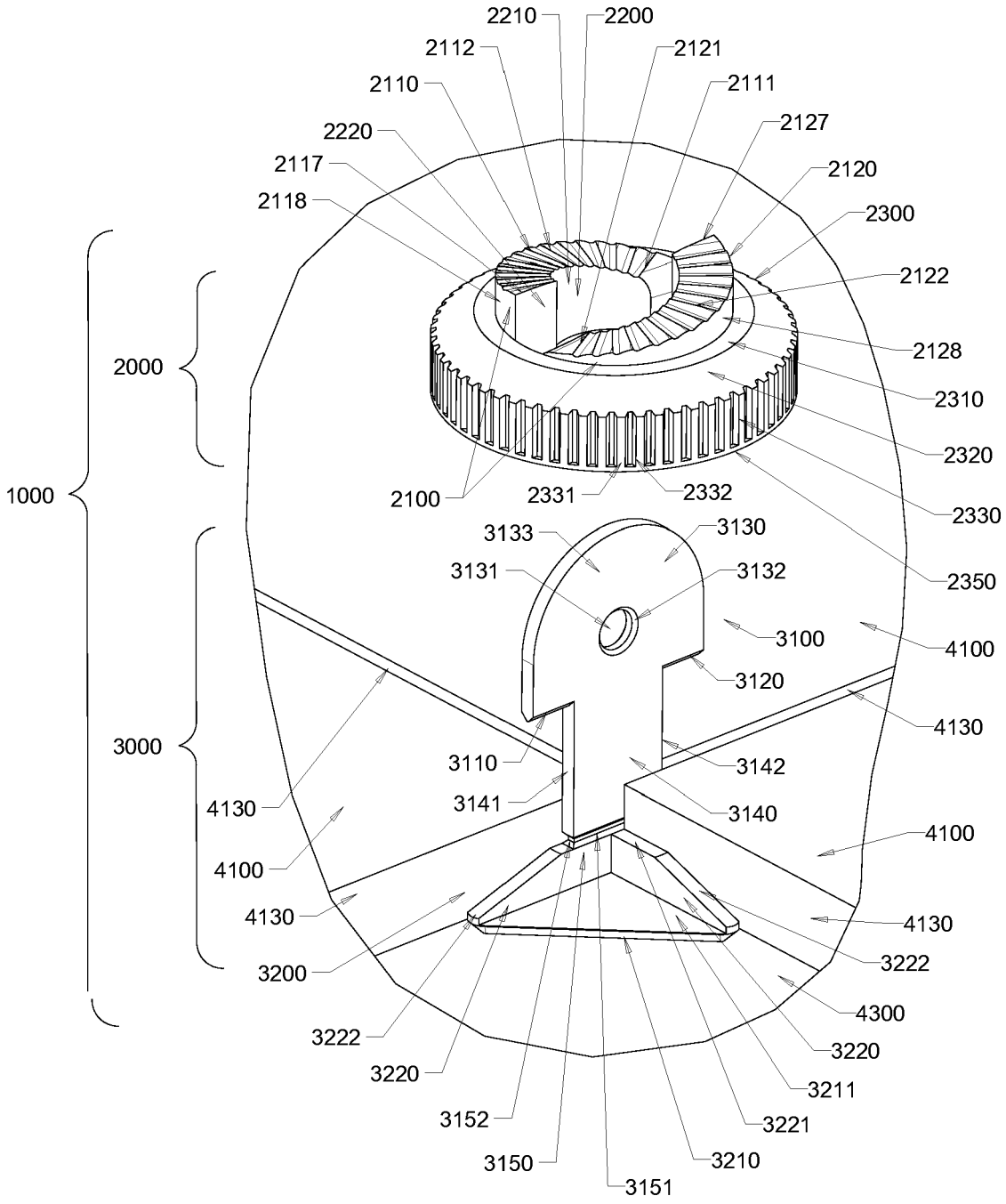
12. The device of claim 1, wherein said hook-base has a square shape at the bottom with V-shaped corners penetrating underneath the said tiles and its bottom surrounding edges of said hook-base are substantially chamfered downwards, and are adapted to facilitate insertion underneath the tiles, which helps removing the adhesive during insertion from the bottom surface of the said tiles, sweeping the bottom surface of said tiles from adhesive and providing a relatively clean seating surface between the upper resting surface of said base and the bottom seating surface of said tiles, offering a better leveling of said tiles.

13. The device of claim 1, wherein said hook-base has the material in different colors, each color representing different ribs spacing thicknesses which will be in between adjacent tiles.

14. The device of claim 1, wherein said hook-base has upstanding rib spacers which have continuous material diagonally across said hook-base, with no

gaps.

15. The device of claim 1, wherein said hook-base can accommodate a specific number of adjacent tiles, said number of tiles being selected from among four, three or two.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3151

FIG. 1

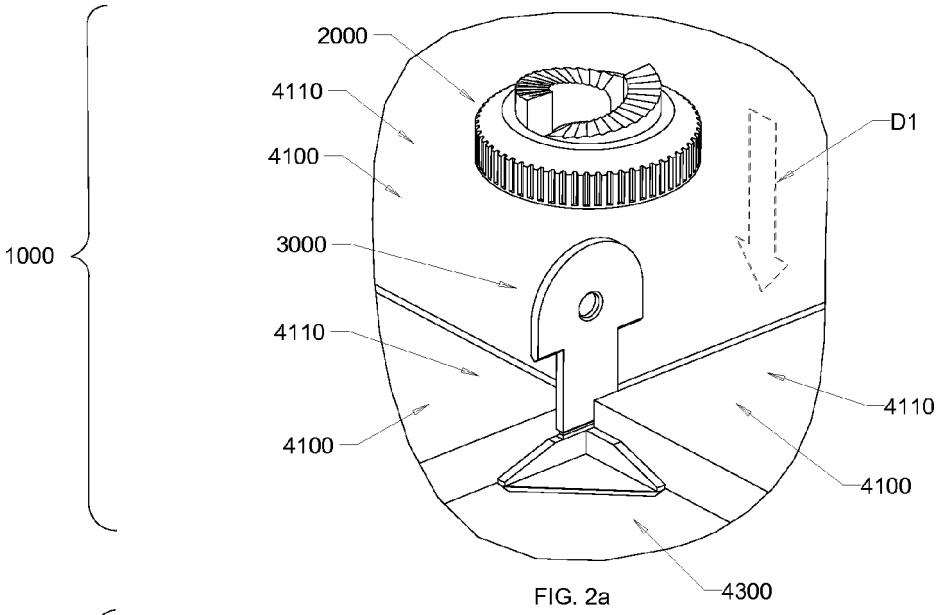


FIG. 2a

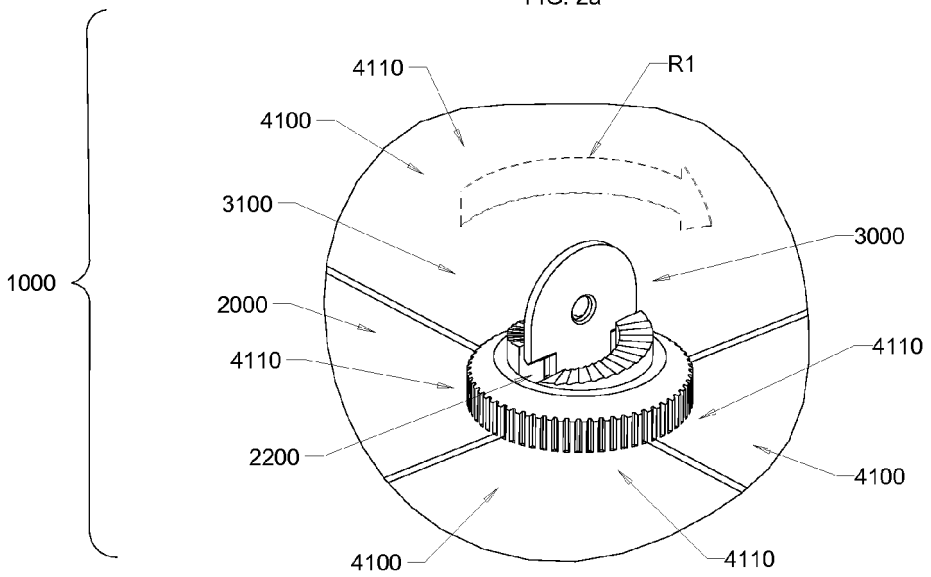


FIG. 2b

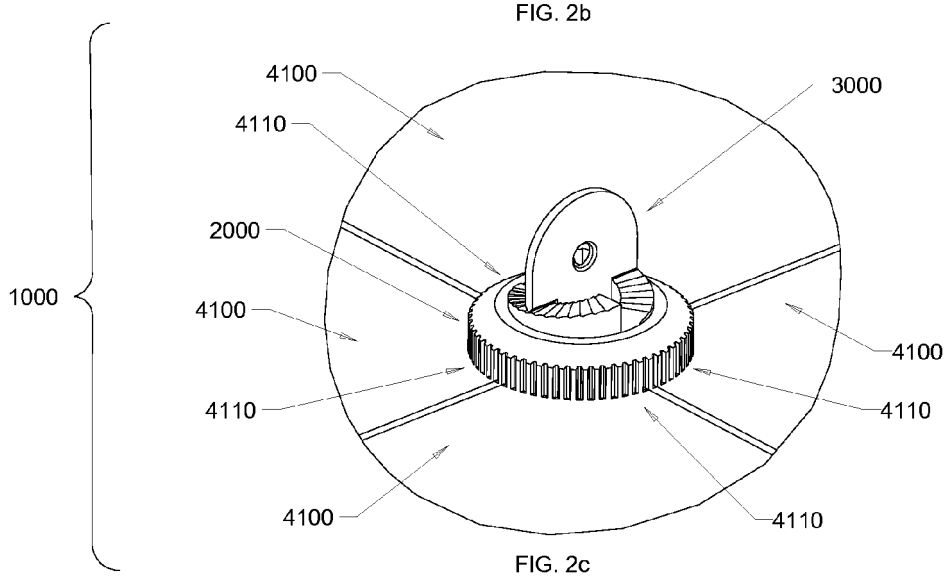
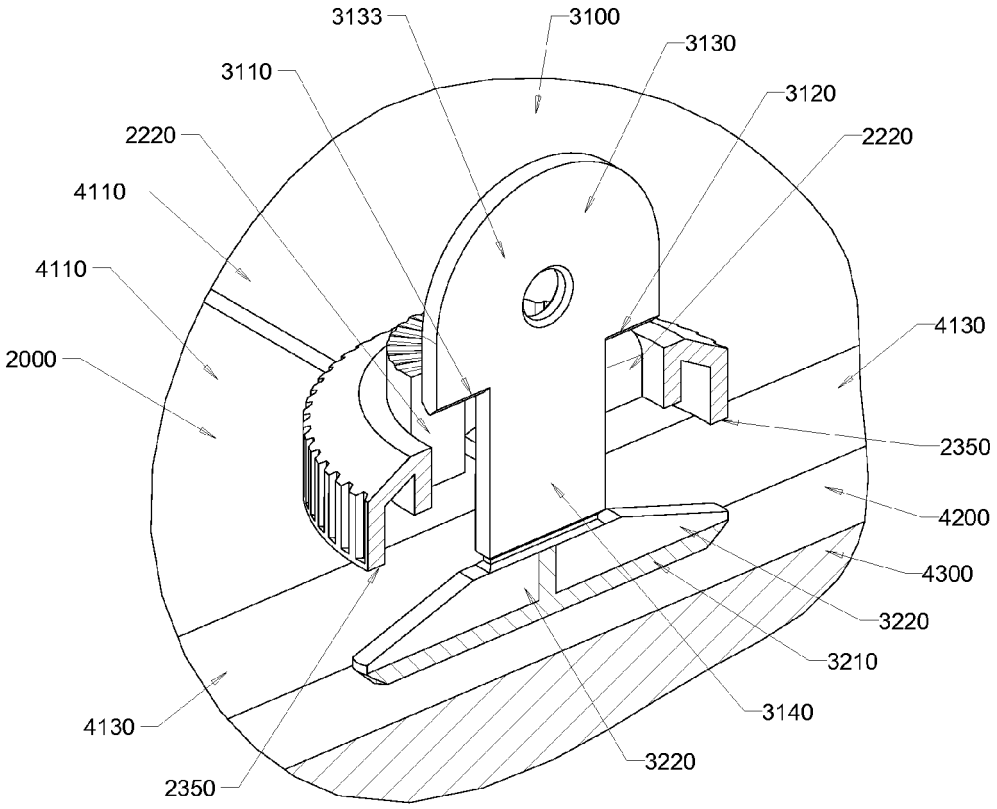
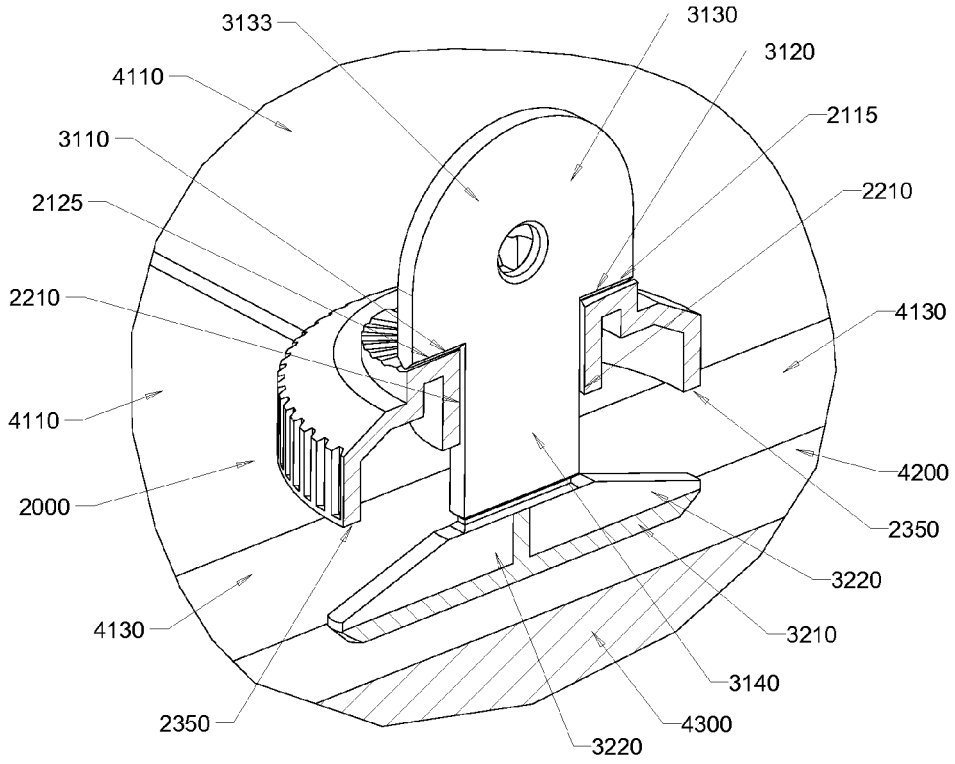


FIG. 2c



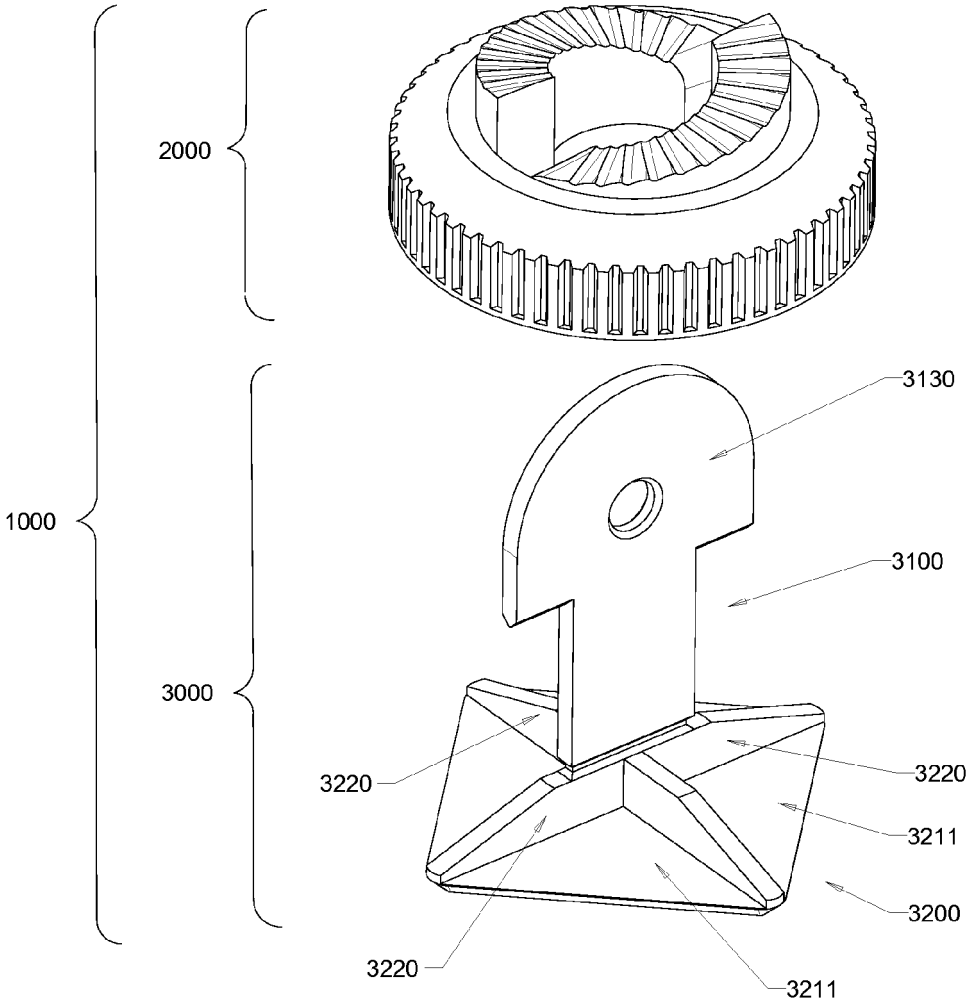
STEP 1 - Knob-Cam inserted through the central slot

FIG. 3a



STEP 2 - Knob-Cam rotated and locked, consequently clamping tiles

FIG. 3b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1000
3000
3130
3100
3220
3220
3211
3200
3220
3211

FIG. 4a

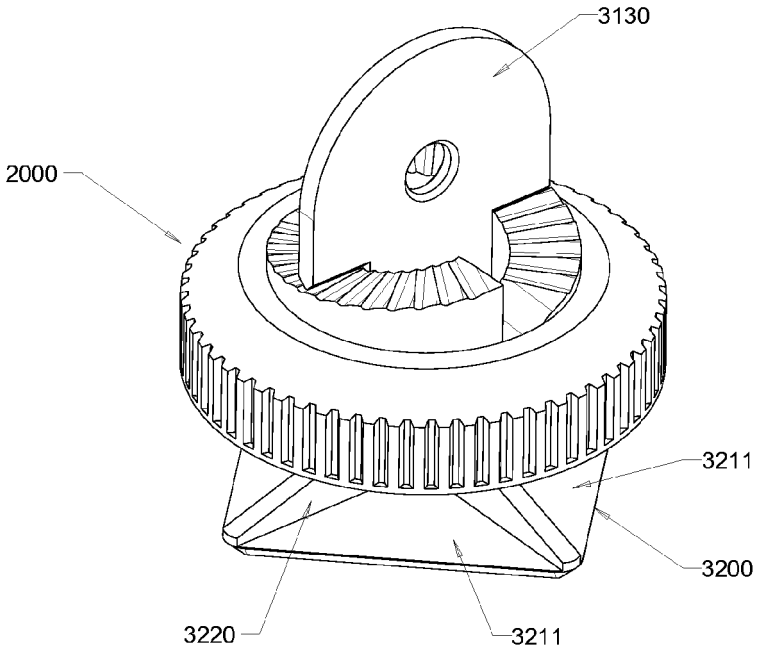
3130
2000
3211
3200
3220
3211

FIG. 4b

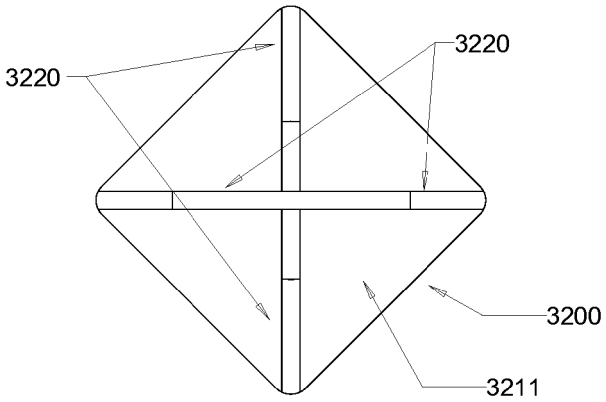

FIG. 5b

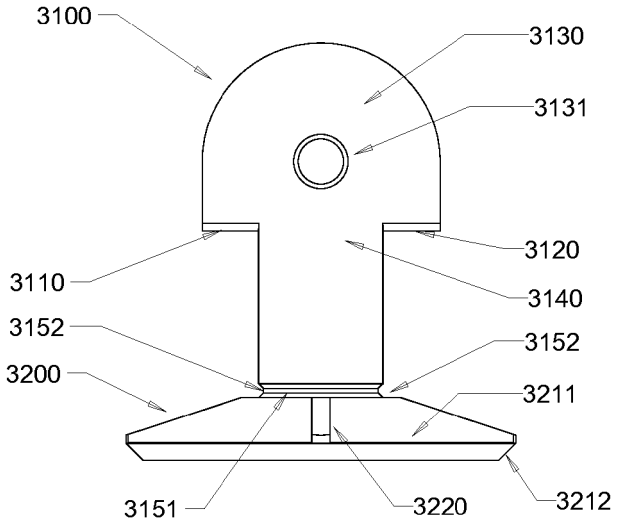

FIG. 5a

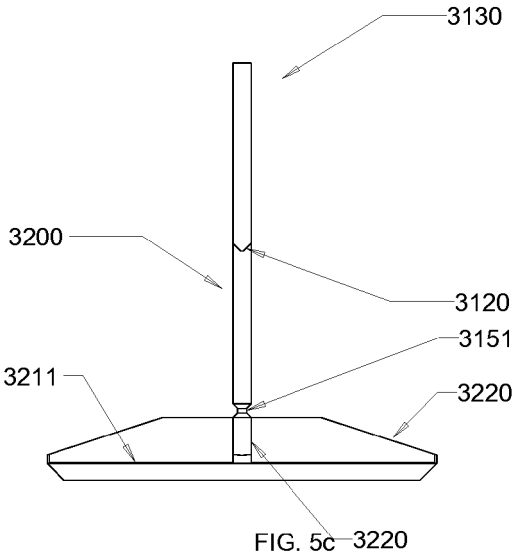

FIG. 5c

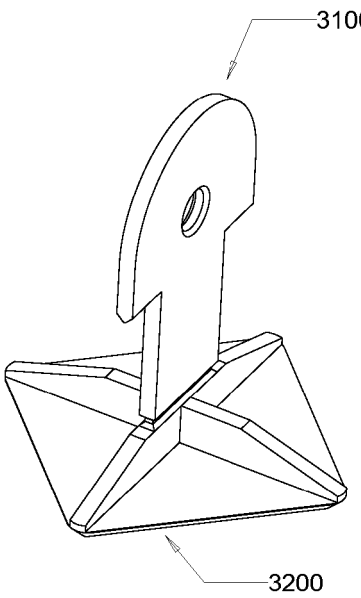

FIG. 6a

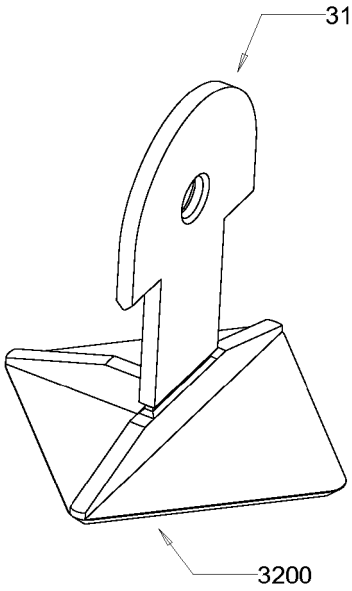

FIG. 6b

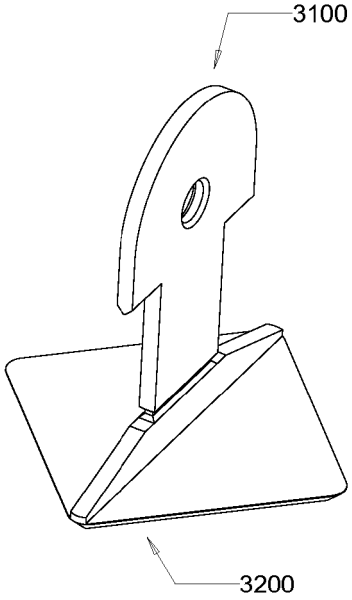

FIG. 6c

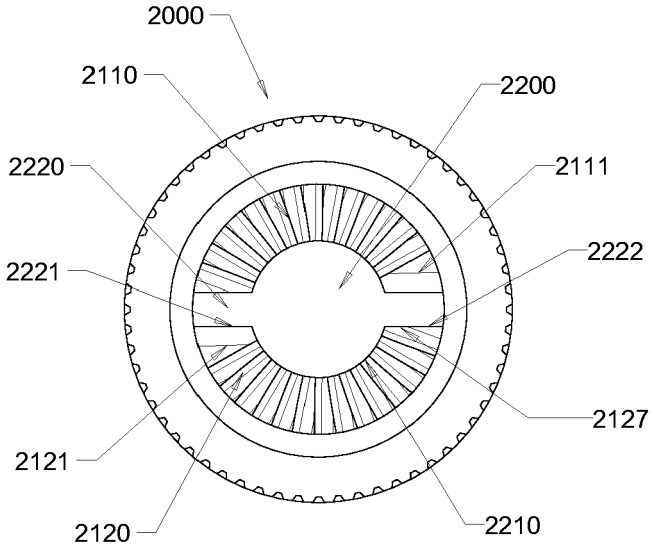

FIG. 7b

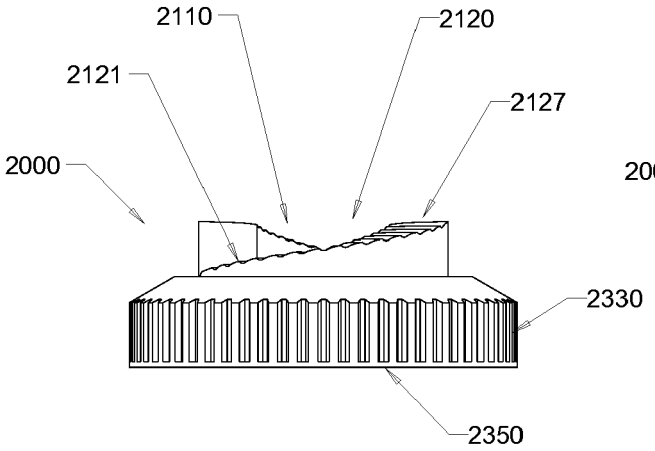

FIG. 7a

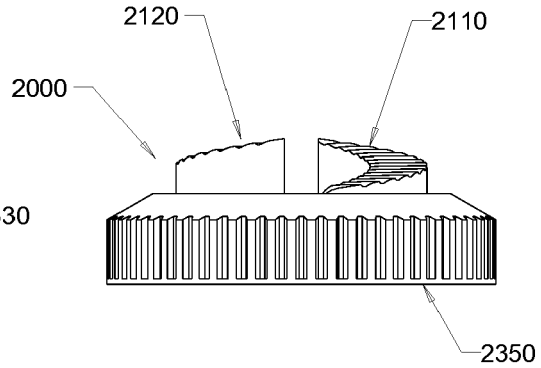

FIG. 7c

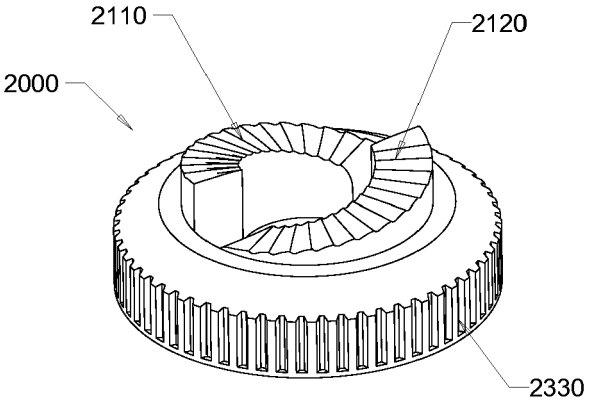

FIG. 8a

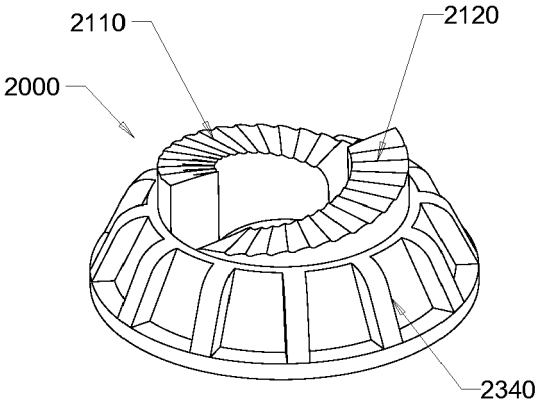

FIG. 8b

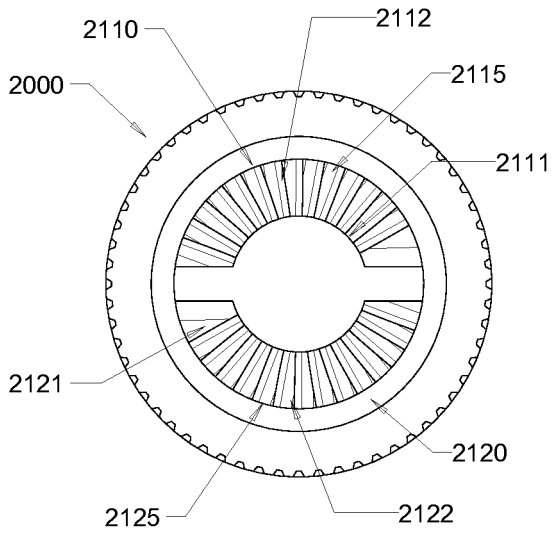

FIG. 9b

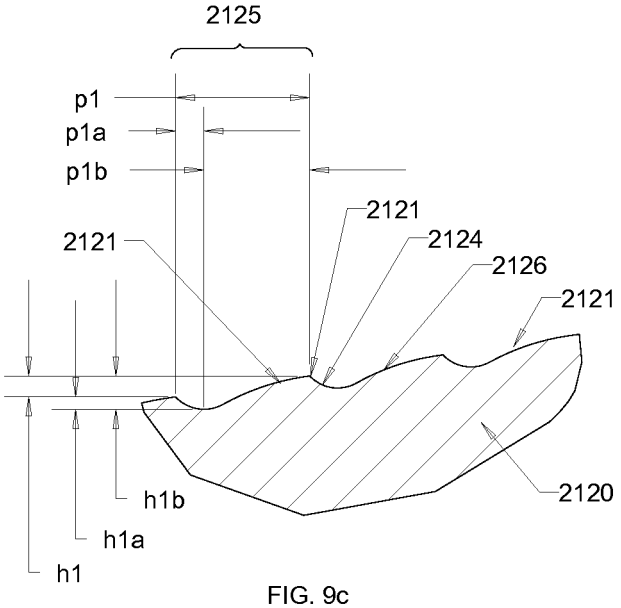

FIG. 9c

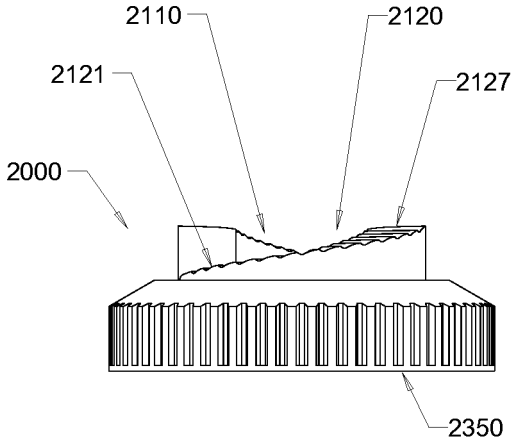

FIG. 9a

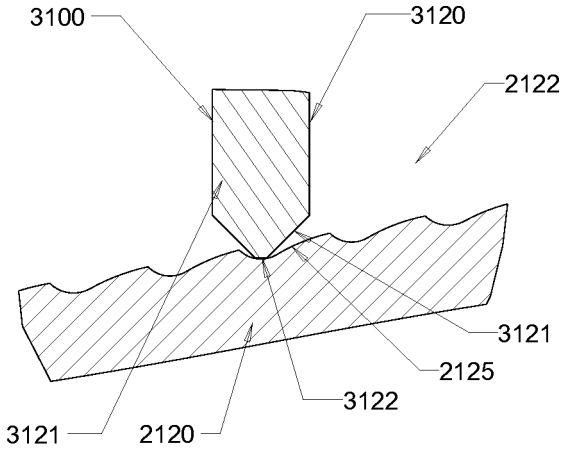

FIG. 9d

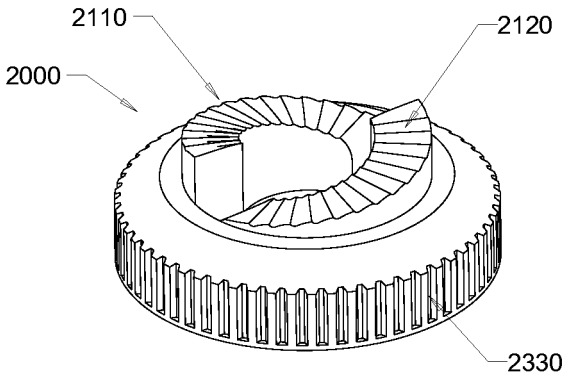

FIG. 10

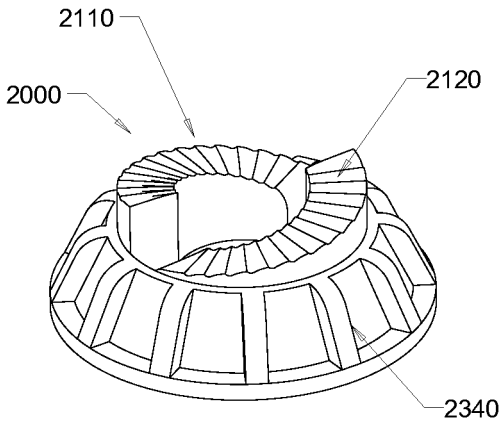

FIG. 11

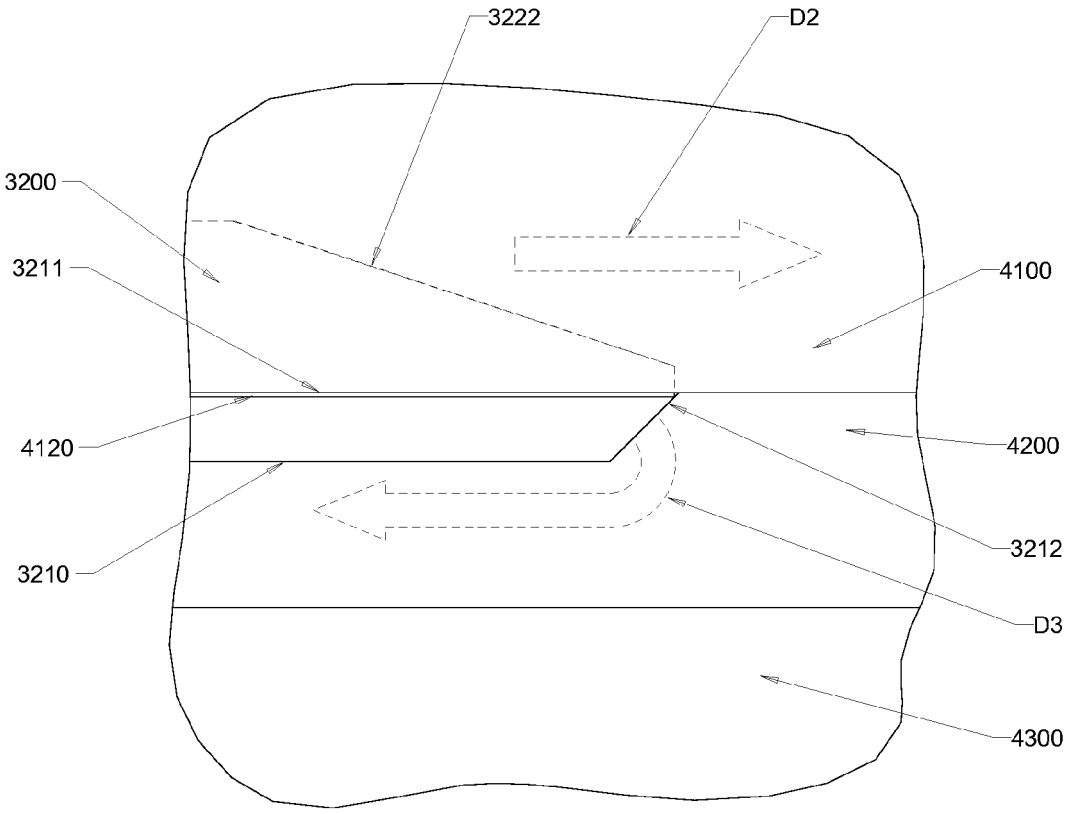

FIG. 12b

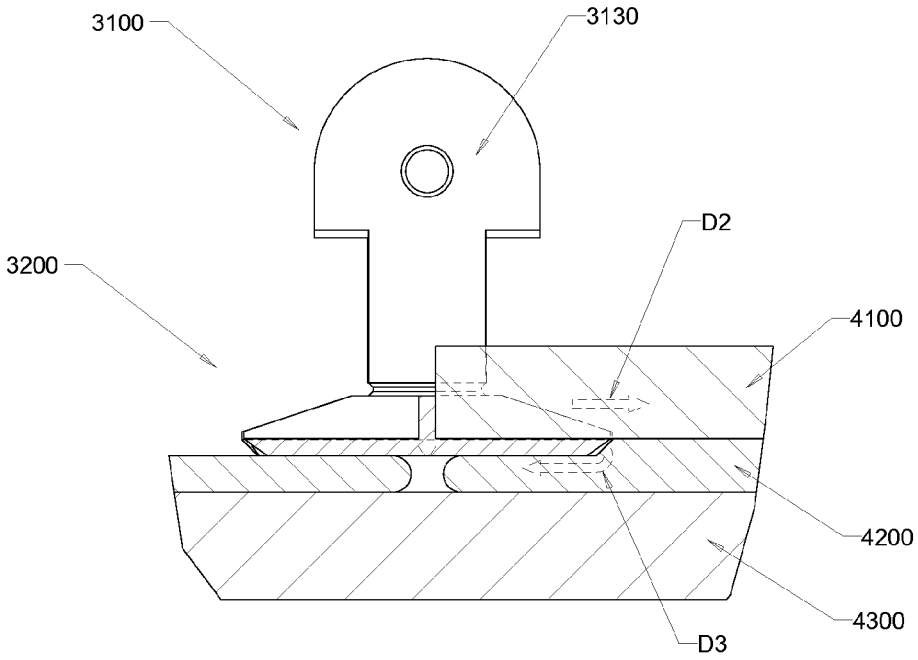

FIG. 12a

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EUROPEAN SEARCH REPORT

Application Number
EP 16 19 6881

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2014/033641 A1 (TREVISI FRANCO [IT]) 6 February 2014 (2014-02-06) * the whole document * -----	1-15	INV. E04F21/00
A	EP 2 762 658 A1 (DAKOTA GROUP S A S DI ZENO CIPRIANI & C [IT]) 6 August 2014 (2014-08-06) * the whole document * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 April 2017	Bourgoin, J

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03-04-2017

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US 2014033641 A1	06-02-2014	NONE	
EP 2762658 A1	06-08-2014	EP 2762658 A1	06-08-2014
		ES 2552318 T3	27-11-2015
		PT 2762658 E	07-12-2015

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