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(54) **A VACUUM CLEANER**

(57) A rotatable cleaning bar for a vacuum cleaner comprises an elongate central body. At least one rigid carrier is removably mountable on the elongate central body and projects from the surface of the elongate central body by a first distance. At least one flexible cleaning

element is mounted to the at least one carrier and projects from the surface of the elongate central body by a second distance; wherein the first distance is less than the second distance.

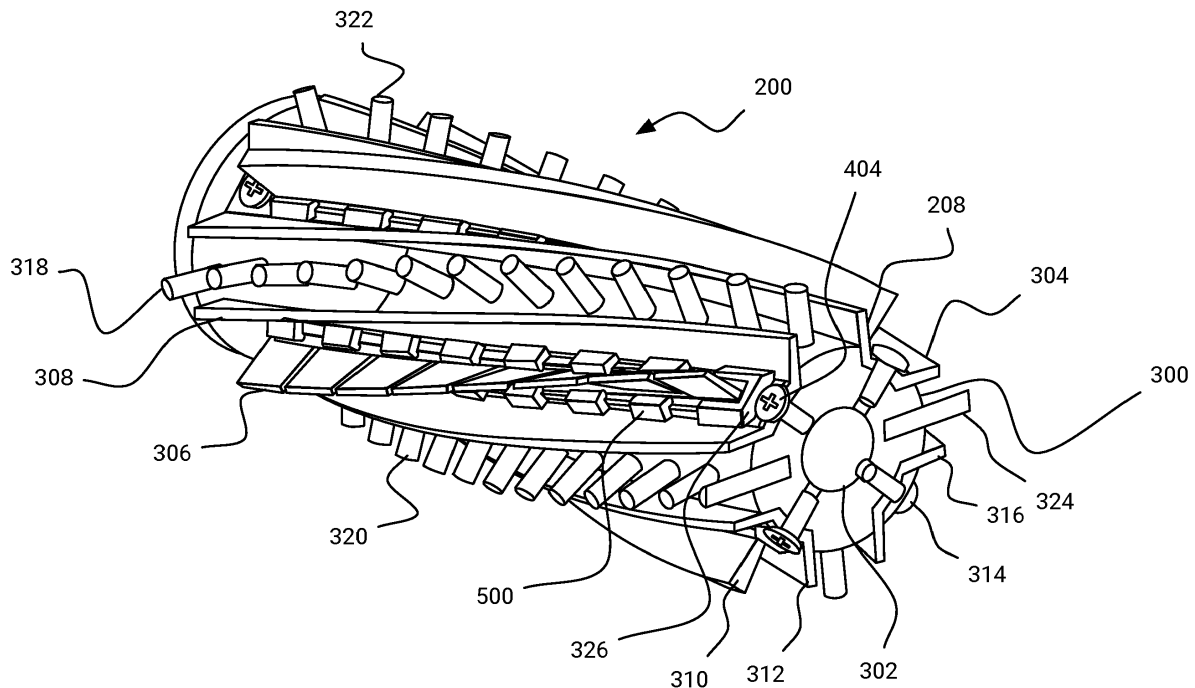


Figure 3

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Description

[0001] The present invention relates to a cleaning head for a vacuum cleaner and a beater bar for a cleaning head for a vacuum cleaner.

[0002] Vacuum cleaning devices are known to comprise motorised cleaning brushes. The motorised cleaning brushes or beater bars are mounted in the cleaning head of a vacuum cleaner in or adjacent to the suction nozzle. The cleaning brushes are configured to rotate within the cleaning head and engage against a surface to be cleaned. Accordingly, debris is physically moved and entrained in the inward airflow into the suction nozzle. The cleaning brushes can dislodge ingrained dirt in a textile such as a carpet. This means that the suction power required to clean particularly dirty surfaces may be less. This is particularly useful for cordless vacuum cleaners when energy efficiency can increase battery life.

[0003] A particular issue with cleaning heads of vacuum cleaners is that strands of hair can become wound round the rotating cleaning brushes mounted in the cleaning head. The hair can reduce the efficacy of the cleaning head and even jam the bearing of the rotating cleaning brush.

[0004] JP 2004-105770 shows a cleaning head with a rotatable brush for agitating a surface. The rotatable brush comprises a brush body mounted in a blade which together are mounted on a core material. The blade may prevent the hairs from becoming wound round the core material. A problem with this arrangement is that the blade carrier is flexible which can break due to the constant impact with the floor. Furthermore, the core material requires a relatively complex extruded cross-sectional shape in order for the body and blade to be mountable thereon.

[0005] US 2016/166052 and US 2018/125315 both show a brushroll with a spiral arrangement of bristles mounted directly in the brushroll. The brushroll comprises a channel in to which scissors or another cutting implement can be inserted. A problem with this arrangement is that the hair will still wrap round the surface of the brushroll between the bristles. Accordingly, the brushroll may not provide sufficient space to insert a cutting implement. This can mean that a user can inadvertently cut the bristles of the brushroll when trying to remove hair wound round the brushroll.

[0006] Embodiments of the present invention aim to address the aforementioned problems.

[0007] According to an aspect of the present invention there is a rotatable cleaning bar for a vacuum cleaner comprising: an elongate central body; at least one rigid carrier removably mountable on the elongate central body and projecting from the surface of the elongate central body by a first distance; and at least one flexible cleaning element mounted to the at least one carrier and projecting from the surface of the elongate central body by a second distance; wherein the first distance is less than the second distance.

[0008] Optionally, the at least one rigid carrier projects from the surface of the elongate central body in a different direction from the at least one flexible element.

[0009] Optionally, the rigid carrier is mountable in a recess on the surface of the elongate central body.

[0010] Optionally, the rigid carrier comprises a plurality of clips for securing a base of the flexible cleaning element to the rigid carrier.

[0011] Optionally, the at least one rigid carrier comprises a first rigid carrier and a second rigid carrier wherein different types of flexible cleaning elements are mounted respectively to the first and second rigid carriers.

[0012] Optionally, the at least one flexible cleaning element is one or more of a bristle strip, a cleaning blade, or cleaning flap.

[0013] Optionally, the at least one flexible cleaning element comprises one or more of: silicone material, nylon material, or rubber material.

[0014] Optionally, at least a portion of the at least one rigid carrier comprises a helical shape.

[0015] Optionally, the at least one rigid carrier comprises a first portion having helical shape in a first direction and a second portion having a helical shape in a second direction.

[0016] Optionally, at least one other cleaning element is mounted directly to the elongate central body.

[0017] Optionally, the at least one other cleaning element projects from the surface of the elongate central body by a third distance which is at least greater than the first distance.

[0018] Optionally, the preceding claims wherein the rigid carrier comprises at least one wall projecting in a direction at an angle to the direction of the projecting at least one flexible cleaning element.

[0019] Optionally, the rigid carrier comprises a first wall projecting from the elongate central body on a first side of the at least one flexible cleaning element and a second wall projecting from the elongate central body on a second side of the at least one flexible cleaning element.

[0020] Optionally, the preceding claims wherein the at least one flexible cleaning element is deformable to a position which is greater than the first distance when engaging a surface to be cleaned.

[0021] Optionally, the preceding claims wherein the at least one rigid carrier is fastened to the elongate central body with at least one screw fastening.

[0022] In a second aspect of the invention there is provided a cleaning head for a vacuum cleaner comprising a rotatable cleaning bar according to the first aspect. In a third aspect of the invention there is provided a method of manufacture of a rotatable cleaning bar having an elongate central body for a vacuum cleaner comprising: mounting at least one rigid carrier on the elongate central body wherein the at least one rigid carrier projects from the surface of the elongate central body by a first distance; and mounting at least one flexible cleaning element to the at least one carrier wherein the at least one flexible cleaning element projects from the surface of the

elongate central body by a second distance and the first distance is less than the second distance.

[0023] In a fourth aspect of the invention there is provided a rotatable cleaning bar for a vacuum cleaner comprising: an elongate central body; at least one carrier mountable to the elongate central body; and at least one cleaning element mountable to the at least one carrier; wherein the rotatable cleaning bar comprises at least one wall which projects away from the elongate central body and projects away from the at least one cleaning element.

[0024] Optionally, the at least one cleaning element and the at least one wall are circumferentially spaced on the surface of the elongate central body.

[0025] Optionally, the at least one cleaning element is flexible.

[0026] Optionally, the at least one wall is integral with the at least one carrier.

[0027] Various other aspects and further embodiments are also described in the following detailed description and in the attached claims with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of a cleaning head of a vacuum cleaner according to an embodiment;
Figure 2 shows a side view of rotatable cleaning bar according to an embodiment;
Figure 3 shows a perspective partial section of the rotatable cleaning bar;
Figure 4 shows a cross-sectional view of the rotatable cleaning bar along the line B-B;
Figure 5 shows a cross-sectional view of the rotatable cleaning bar along the line C-C; and
Figure 6 shows a cross-sectional view of a cleaning head according to an embodiment.

[0028] Figure 1 shows a perspective view of a cleaning head 100 for a vacuum cleaner (not shown). The cleaning head comprises a base portion 102 on which an articulated joint 104 is mounted. The articulated joint 104 couples the base portion 102 to a neck portion 106. The base portion 102 is arranged to move over a surface to be cleaned such as a floor. The neck 106 comprises an attachment mechanism 108 for attaching to a hose (not shown), extension tube (not shown), or the housing (not shown) of the vacuum cleaner. The cleaning head 100 is connectable to a handheld vacuum cleaner via an extension tube, a canister vacuum cleaner via a hose or directly to an upright or a stickvac vacuum cleaner. The neck 106 comprises an airway which is in fluid communication with a dirty inlet port 110 in the base portion 102. The neck portion 106 may comprise electrical power and control wires for powering and controlling functionality in the cleaning head 100. The vacuum cleaner can comprise one or more control buttons (not shown) for actuating a motor to drive a rotatable cleaning bar 200. The rotatable cleaning bar will be described in more detail below.

[0029] The articulated joint 104 provides at least two

degrees of freedom of the base portion 102 with respect to the neck portion 106. The articulated joint 104 as shown in Figure 1 comprises two pivot axes which are mounted perpendicular to each other. The articulated joint 104 is known and will not be discussed in any further detail.

[0030] The cleaning head 100 comprises rotatable cleaning bar 200 which is rotatably mounted in the cleaning head 100. In some embodiments, the rotatable cleaning bar 200 is optionally removably mountable in the base portion 102. The rotatable cleaning bar 200 is optionally mounted beneath a transparent cover 112 which is partially shown in Figure 1 for the purposes of clarity. This means that the user can see when the rotatable cleaning bar 200 is in operation and when the rotatable cleaning bar 200 requires maintenance.

[0031] The rotatable cleaning bar 200 and cleaning head 100 optionally comprise a locking mechanism 114 for selectively releasing the rotatable cleaning bar 200 from the cleaning head 100. The locking mechanism 114 comprises a latch (not shown) and catch arrangement. The rotatable cleaning bar 200 comprises a spring biased latch (not shown) which is coupled to a manually operated release button 116. In some embodiments, the rotatable cleaning bar 200 can be rotatably mounted in a removable cassette (not shown) which is then mounted in the cleaning head 100.

[0032] The base portion 102 optionally comprises a catch engageable with the latch on the rotatable cleaning bar 200. In some other embodiments, the spring biased latch and the manually operated release button can be mounted on the base portion 102 and the catch element is mounted on the rotatable cleaning bar 200. Alternatively, the spring biased latch can be mounted on the rotatable cleaning bar 200 and the release button is mounted on the base 102. In other embodiments any suitable locking mechanism can be provided for selectively releasing the rotatable cleaning bar 200 from the cleaning head 100.

[0033] In some embodiments, the rotatable cleaning bar 200 is optionally removable from the cleaning head 100 when the release button 116 is depressed. The rotatable cleaning bar 200 is upwardly removable from the base portion 102. This means that when removing the rotatable cleaning bar 200 from the base portion 102, the user lifts the rotatable cleaning bar 200 together with the cover 112 away from the surface to be cleaned (such as the floor). This makes removing the rotatable cleaning bar 200 from the base portion 102 easier for the user. Furthermore, by allowing the user to vertically lift the rotatable cleaning bar 200 from the cleaning head 100, the user does not need to tip the cleaning head 100 or the vacuum cleaner to access the cleaning assembly 200. This means that accessing and maintaining the cleaning assembly 200 is cleaner and less likely to dislodge debris which may be between the dirty air inlet and the dirt container (not shown) in the vacuum cleaner. In other embodiments, the rotatable cleaning bar 200 is removeable

from the underneath or the side of the cleaning head 100.

[0034] Turning to Figure 2, the rotatable cleaning bar 200 will be described in further detail. Figure 2 shows a side view of rotatable cleaning bar 200. The rotatable cleaning bar 200 is mounted on a shaft 202 to the cleaning head 100. In some embodiments, the shaft 202 is optionally a drive shaft which is coupled to a motor (not shown) for rotating the rotatable cleaning bar 200. Alternatively, the motor is mounted inside the of rotatable cleaning bar 200.

[0035] The rotatable cleaning bar 200 is generally linear in construction and extends along a longitudinal axis A-A. The shaft 202 can extend along the rotatable cleaning bar 200 along the axis A-A as shown in Figure 2. Alternatively, the shaft 202 can be formed from two separate sections at a first end 204 and a second end 206 of the rotatable cleaning bar 200.

[0036] In some embodiments the rotatable cleaning bar 200 is a cylindrical element. In other embodiments the rotatable cleaning bar 200 is elongate and substantially cylindrical and comprises ridges and groves. For example, the rotatable cleaning bar 200 can comprise spiral grooves and / or ridges for receiving one or more flexible cleaning elements such as cleaning brushes or ribs.

[0037] As mentioned, the rotatable cleaning bar 200 as shown in Figure 2 comprises at least one flexible cleaning element 208. The at least one flexible cleaning element 208 can be a cleaning brush having a plurality of projecting bristle cleaning elements 210. Additionally, or alternatively the rotatable cleaning bar 200 comprises different types of cleaning elements, which will be described hereinafter. In some embodiments, the flexible cleaning elements can be any means suitable for cleaning a surface.

[0038] For example, the at least one flexible cleaning element 208 can be a strip of nylon bristles, projecting rubber strip or projecting rubber fingers or a combination of different types of cleaning elements. In some embodiments, the flexible cleaning elements 208 can comprise bristles having different stiffness. A variable stiffness in the bristles means that different types of debris can be picked up by the rotatable cleaning bar 200.

[0039] The rotatable cleaning bar 200 is rotatably mounted in cleaning head 100 such that the rotatable cleaning bar 200 is configured to rotate with respect to the cleaning head. The first end 204 of the rotatable cleaning bar 200 optionally comprises a drive gear (not shown). Each of the first end 204 and the second end comprise an end cap 212, 214 for covering and shielding the first end 204 and the second end 206. The drive gear (not shown) is configured to mesh with a motor drive gear (not shown) mounted in the base portion 102 when the rotatable cleaning bar 200 is seated in the cleaning head 100. The drive gear is configured to transmit rotational movement from a brush motor in the cleaning head 100 to the rotatable cleaning bar 200. The brush motor can be selectively operated by the user or controlled auto-

matically. The control and operation of the brush motor is known as will not be discussed in any further detail.

[0040] The rotatable cleaning bar 200 will now be discussed in further detail with respect to Figure 3. Figure 3 shows a perspective partial section of the rotatable cleaning bar 200. Figure 3 shows a cross-sectional view along the line B-B as shown in Figure 2.

[0041] The rotatable cleaning bar 200 comprises an elongate central body 300. The elongate central body 300 is substantially cylindrical and is formed from a plastic extruded material. In other embodiments, the elongate central body is formed from metal or a composite material. In some embodiments, the elongate central body 300 optionally comprises a central cylindrical void 302 which optionally houses a cleaning bar motor (not shown) as previously mentioned.

[0042] As mentioned above, the rotatable cleaning bar 200 comprises at least one flexible cleaning element 208. The first flexible cleaning element 208 is mounted on a first rigid removable carrier 304. The first flexible cleaning element 208 is an elongate row of bristles 210. The elongate row of bristles 210 is a continuous row of bristles, although the bristles can also be arranged in discrete groups of bristles arranged along a similar path.

[0043] The first flexible cleaning element 208 is deformable as the first flexible cleaning element 208 impacts the surface to be cleaned. The first flexible cleaning element 208 is resiliently flexible and the first flexible cleaning element 208 returns to the undeformed position as shown in the Figures when the first flexible cleaning element 208 no longer is engaged with the surface to be cleaned.

[0044] The first rigid removable carrier 304 is arranged to securely grip the first flexible cleaning element 208 such as a row of bristles or a brush. In this way, the first rigid removable carrier 304 is a brush carrier. However, the first rigid carrier 304 is arranged to securely grip any type of flexible cleaning element whether a brush or not. The other flexible cleaning elements described hereinafter have similar flexible properties. The amount that the flexible cleaning elements can deform will depend on the material, shape, length and orientation.

[0045] A second flexible cleaning element 306 is mounted on a second rigid removable carrier 308. The second flexible cleaning element 306 is an elongate strip of silicone flaps. In some embodiments, the second flexible cleaning element 306 is alternatively a solid silicone blade that extends across the longitudinal axis of the rotatable cleaning bar 200.

[0046] A third flexible cleaning element 310 is mounted on a third rigid removable carrier 312. A fourth flexible cleaning element 314 is mounted on a fourth rigid removable carrier 316. In some embodiments, the first flexible cleaning element 208 is the same as the third flexible cleaning element 310. Similarly, the second flexible cleaning element 306 and the fourth flexible cleaning element 314. In other embodiments, all the flexible cleaning elements 208, 306, 310, 314 are the same type of

cleaning element. If there a plurality of different cleaning elements, then pairs of cleaning elements are arranged on opposing sides of the rotatable cleaning bar 200 in order to balance the weight of the flexible cleaning elements 208, 306, 310, 314. rotatable cleaning bar 200 when it rotates. In the embodiments shown in the Figures, there are four flexible cleaning elements 208, 306, 310, 314, but in other embodiments, there can be any number of flexible cleaning elements mounted on rigid carriers mounted on the rotatable cleaning bar 200.

[0047] Optionally, the flexible cleaning elements 208, 306, 310, 314 are arranged in a spiral path around the surface of the elongate central body 300. This means that the flexible cleaning elements 208, 306, 310, 314 do not hit the surface to be cleaned along their entire length at the same time. Instead, the flexible cleaning elements gradually engage the surface to be cleaned along their length as the rotatable cleaning bar 200 rotates. Alternatively, the flexible cleaning elements can be aligned in rows which are parallel to the longitudinal axis A-A of the rotatable cleaning bar 200. This reduces the force that the flexible cleaning elements 208, 306, 310, 314 experience when engaging the surface to be cleaned.

[0048] Optionally, the rotatable cleaning bar 200 comprises at least one flexible cleaning element 318 mounted directly to the elongate central body 300. As shown in Figure 3, there are four rows 318, 320, 322, 324 of discrete bristles embedded in the elongate central body 300 along a spiral path. In some embodiments, the rows 318, 320, 322, 324 of bristles are stapled to the elongate central body 300. Alternatively, any other suitable means for fastening the bristles to the elongate central body 300 can be used such as moulding or gluing. In some alternative embodiments, at least one flexible cleaning element 318 mounted directly to the elongate central body 300 can be any type of flexible cleaning element. For example, the different types of cleaning elements as previously discussed with reference to the flexible cleaning elements 208, 306, 310, 314 mounted on the rigid carriers 304, 308, 312, 316.

[0049] The rotatable cleaning bar 200 will now be described in further detail with respect to Figure 4. Figure 4 shows a cross-sectional view of the rotatable cleaning bar along the line B-B as shown in Figure 2.

[0050] For the purposes of clarity only the first flexible cleaning element 208 and first rigid carrier 304 will be described. However, the features described with respect to the first flexible cleaning element 208 and the first rigid carrier 304 are applicable to the other flexible cleaning elements and rigid carriers. The first rigid carrier 304 projects radially from the surface 400 of the elongate central body by a first distance D_1 . The first flexible cleaning element 208 projects radially from the surface 400 of the elongate central body 300 by a second distance D_2 . The first distance D_1 is less than the second distance D_2 .

[0051] When the rotatable cleaning bar 200 rotates and engages a surface to be cleaned, the first flexible cleaning element 208 engages and deforms against the sur-

face to be cleaned. The first flexible cleaning element 208 deforms by a distance such that the first flexible cleaning element 208 projects from the surface 400 by a distance D_3 . The first distance D_1 is less than the third distance D_3 . In this way, when the rotatable cleaning bar 200 rotates, the rigid carrier 304 does not impact on the surface to be cleaned.

[0052] Figure 4 shows three concentric circles having radii equal to D_1 , D_2 , D_3 which respectively represents the path of the undeformed first flexible cleaning element 208, the first rigid carrier 304, and the deformed first flexible cleaning element 208.

[0053] Furthermore, the flexible cleaning element 318 mounted directly to the elongate central body 300 projects from the surface 400 of the elongate cleaning body 300 by a distance D_2 which is at least greater than the first distance D_1 . As shown in Figure 4, the flexible cleaning element 318 mounted directly to the elongate central body 300 projects by the same distance as the flexible cleaning elements 208, 306, 310, 314 mounted on the removable rigid carriers 304, 308, 312, 316. In other embodiments the flexible cleaning elements 208, 306, 310, 314, 318, 320, 322, 324 whether mounted directly on the elongate central body 300 or on a removable rigid carrier 304, 308, 312, 316 can be different lengths. Reference will now be made to Figure 6 which shows a cross sectional view of the vacuum cleaning head 100. In some embodiments, the first distance D_1 can be selected to ensure that the removable rigid carriers 304, 308, 312, 316 do not impact the floor to be cleaned 600. For example, the differential distance, $D_2 - D_1$ between the second distance D_2 and the first distance D_1 is greater than a predetermined distance. In some embodiments, the predetermined distance is determined based on the type of surface to be cleaned. In other embodiments, the predetermined distance is an optimal differential difference between the first D_1 and the second distances D_2 so that the rigid carriers do not impact the surface to be cleaned 600. In some embodiments, the predetermined distance, $D_2 - D_1$, is greater than or equal to 2.5mm. This ensures that even when the surface to be cleaned 600 is a high pile carpet and that carpet protrudes into the suction mouth of the vacuum cleaning head 100, the rigid carriers 304, 308, 312, 316 will not impact the carpet.

[0054] Turning back to Figure 4, the first rigid carrier 304 is fastened to the elongate central body 300 with at least one screw 404. In some embodiments the first rigid carrier 304 is fastened to the body 300 with a plurality of screws 404 along the length of the rotatable cleaning bar 200. In other embodiments, the first rigid carrier 304 can be fixed to the elongate central body 300 with any suitable means for example, clips, clamps, glue, keyways etc.

[0055] This means that the first rigid carrier 304 is removably mountable on the surface 400 of the elongate central body 300. This makes assembly and maintenance of the rotatable cleaning bar 200 easily and less time consuming. For example, by not directly moulding

or mounting the flexible cleaning elements 208, 306, 310, 314 to the rotatable cleaning bar 200, the flexible cleaning elements, 208, 306, 310, 314 can be individually replaced as required. This means that only the affected flexible cleaning element 208, 306, 310, 314 needs to be replaced rather than the whole rotatable cleaning bar 200.

[0056] The rigid carrier 304 will now be described in further detail to Figure 5. Figure 5 shows a cross-sectional view of the rotatable carrier 200 along the line C-C as shown in Figure 2. Whilst reference has been made to the first rigid carrier 304, the description is also applicable to the identical second, third and fourth carriers.

[0057] The first rigid carrier 304 comprises at least one clip 500 for gripping a flange 502 of the base of the first flexible cleaning element 208. The clip 500 can be a single elongate clip arrangement on either side of the first flexible cleaning element 208 along the entire longitudinal length of the rotatable brush bar 200. Alternatively, there can be a plurality of clips 500 which fasten the first flexible cleaning element 208 at a series of positions along the length of the rotatable brush bar 200. For example, Figure 3 clearly shows the series of clips 500.

[0058] Advantageously the series of clips 500 means that the base flange 502 of the first flexible cleaning element 208 can be slid into position and secured to the first rigid carrier 304. A stop element 326 (as shown in Figure 3) prevents the first flexible cleaning element 208 being threaded beyond a centre point on axis B-B of the rotatable cleaning bar 200. This allows a screw 404 to fasten the first rigid carrier 304 in the centre of the rotatable cleaning bar 200. This means that the first flexible cleaning element 208 can be mounted on the first rigid carrier 304 before being mounted on the elongate central body 300 of the rotatable brush bar 200. This can reduce the complexity of the manufacturing process of the rotatable brush bar 200.

[0059] The embodiments as shown in the Figures show that the first flexible cleaning element 208 is removably mountable on the first rigid carrier 304. In some embodiments, other couplings are used to secure the first flexible cleaning element 208 to the first rigid carrier 304 such as screws. In some other embodiments, the first flexible cleaning element 208 can be permanently fixed to the first rigid carrier 304. For example, the cleaning element 208 can be moulded, rivets, ultrasonically welded or glued in place on the rigid brush 304. Advantageously, by mounting the flexible cleaning elements 208, 306, 310, 314 on the removeable rigid carrier 304, 308, 312, 316 manufacturing processing steps can be carried out in parallel. For example, the elongate central bar 300 can be manufactured at the same time as the flexible cleaning elements 208, 306, 310, 314 are assembled on the removeable rigid carrier 304, 308, 312, 316. This means that assembly of the rotatable cleaning bar 200 can be more efficient and quicker.

[0060] As mentioned above, the first rigid carrier 304 is mounted in recess 504 which is reciprocally shaped to the rigid carrier 304. The first rigid carrier 304 comprises

at least a portion comprises a helical shape. For example, this is shown in Figure 3. In some embodiments, the first rigid carrier 304 comprises a first portion 216 having helical shape in a first direction and a second portion 218 having a helical shape in a second direction. In some embodiments, the rotation of the spiralling in the first and second portion 216, 218 is 90 degrees. This can be best seen from Figure 2. By providing a first and second portion 216, 218 of the first rigid carrier 304 having different direction helices, the first rigid carrier 304 has only one direction that it can be mounted in the recess 504 on the elongate central body 300. This makes assembly of the rotatable brush bar 200 simpler.

[0061] Turning back to Figure 5, the first rigid carrier 304 comprises a first wall 506 that projects from the surface 400 of the elongate central body 300 on a first side of the first flexible cleaning element 208. The first rigid carrier 304 comprises a second wall 508 that projects from the surface 400 of the elongate central body 300 on a second side of the first flexible cleaning element 208.

[0062] The first flexible cleaning element 208 extends in a radial direction as shown in Figure 4 and 5. In contrast, the first and second walls 506, 508 extend at an angle to the radial direction of the projecting first flexible cleaning element 208. In this way, the first and second walls 506, 508 extend laterally from the first flexible cleaning element 208. This means that there is a first space 510 defined between the first and second walls 506, 508 and second 512, and third 514 spaces underneath the projecting first and second walls 506, 508.

[0063] Figure 5 shows an example hair H wound round the rotatable cleaning bar 200. The spaces 512, 514 provide a suitable space for receiving a cutting implement underneath the first and second walls 506, 508. Advantageously, the first and second walls 506, 508 provide an overhang for receiving the cutting implement. This means that the user can place the cutting implement between the first or second wall 506, 508 and the elongate central body 300. The first and second wall 506, 508 will then provide a shield and the user is less likely to damage the first flexible cleaning element 208 when using a cutting implement to remove hair wound round the rotatable cleaning bar 200.

[0064] The first and second walls 506, 508 of the first rigid carrier 304 do not deform when the rotatable cleaning bar 200 is in operation. Accordingly, the first rigid carrier 304 maintains its shape. As can be seen from Figure 5, a hair H wound round the rotatable cleaning bar 200 does not change the shape of the first rigid carrier 304. Whilst the hair H may have threaded through the flexible cleaning elements 208, 306, 310, 314, for example positioned between bristles, the hair H is maintained at a distance of D_1 from the surface 400 of the elongate rigid body 300. This is because the rigid carriers 304, 308, 312, 316 prevent the hair H from engaging the surface 400 of the elongate central body 300. In this way, the first rigid carrier 304 increases the effective wrap diameter for strand elements or hair whilst providing suit-

able access underneath the wound strand element or hair for a cutting implement.

[0065] Accordingly, the rigid carriers 304, 308, 312, 316 provide features for removal of hair or other strands without increasing the complexity of the structure of the elongate central body 300.

[0066] In another embodiment will now be described. The embodiment is the same as shown in Figures 1 to 5. A rotatable cleaning bar 200 for a vacuum cleaning head 100 comprises an elongate central body 300; at least one carrier 304 mountable to the elongate central body 300; at least one cleaning element 208 mountable to the at least one carrier 304; wherein the rotatable cleaning bar 200 comprises at least one wall 506, 508 which projects away from the elongate central body 300 and projects away from the at least one cleaning element 208.

[0067] In this way, the wall 506, 508 projects away from both the elongate central body 300 and the at least one cleaning element 208. This means a free end of at least one wall 506, 508 is distal from the cleaning element 208 and the surface 400 of the elongate central body 400. In some embodiments, the at least one cleaning element 208 and the at least one wall 506, 508 are circumferentially spaced on the surface 400 of the elongate central body 300. The cleaning element 208 and the wall 506, 508 can project from the same point on the surface 400 of the elongate central body 300 but away from each other. Alternatively, the cleaning element 208 and the wall 506, 508 can be positioned remote from each other such that there is a space therebetween on the surface 400 of the elongate central body 300.

[0068] This means that there is space between the surface 400 of the elongate central body 300 and the wall 506, 508 and between the cleaning element 208 and the wall 506, 508 for receiving a cutting implement. In some embodiments, the at least one cleaning element 208 is rigid or flexible. In some embodiments, the carrier 304 is flexible or rigid.

[0069] In some embodiments, the at least one wall 506, 508 is integral with the at least one carrier 304 as shown in the Figures. Alternatively, the at least one wall 506, 508 is separate from the carrier 304 and is spaced therefrom.

[0070] In another embodiment two or more embodiments are combined. Features of one embodiment can be combined with features of other embodiments.

[0071] Embodiments of the present invention have been discussed with particular reference to the examples illustrated. However, it will be appreciated that variations and modifications may be made to the examples described within the scope of the invention.

Claims

1. A rotatable cleaning bar for a vacuum cleaner comprising:

an elongate central body;

at least one rigid carrier removably mountable on the elongate central body and projecting from the surface of the elongate central body by a first distance; and

at least one flexible cleaning element mounted to the at least one carrier and projecting from the surface of the elongate central body by a second distance; wherein the first distance is less than the second distance.

2. A rotatable cleaning bar according to claim 1 wherein the at least one rigid carrier projects from the surface of the elongate central body in a different direction from the at least one flexible element.

3. A rotatable cleaning bar according to claims 1 or 2 wherein the rigid carrier is mountable in a recess on the surface of the elongate central body.

4. A rotatable cleaning bar according to any of the preceding claims wherein the rigid carrier comprises a plurality of clips for securing a base of the flexible cleaning element to the rigid carrier.

5. A rotatable cleaning bar according to any of the preceding claims wherein the at least one rigid carrier comprises a first rigid carrier and a second rigid carrier wherein different types of flexible cleaning elements are mounted respectively to the first and second rigid carriers.

6. A rotatable cleaning bar according any of the preceding claims wherein the at least one flexible cleaning element is one or more of a bristle strip, a cleaning blade, or cleaning flap.

7. A rotatable cleaning bar according to any of the preceding claims wherein at least a portion of the at least one rigid carrier comprises a helical shape.

8. A rotatable cleaning bar according to claim 7 wherein the at least one rigid carrier comprises a first portion having helical shape in a first direction and a second portion having a helical shape in a second direction.

9. A rotatable cleaning bar according to any of the preceding claims wherein at least one other cleaning element is mounted directly to the elongate central body.

10. A rotatable cleaning bar according to claim 9 wherein the at least one other cleaning element projects from the surface of the elongate central body by a third distance which is at least greater than the first distance.

11. A rotatable cleaning bar according to any of the pre-

ceding claims wherein the rigid carrier comprises at least one wall projecting in a direction at an angle to the direction of the projecting at least one flexible cleaning element.

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12. A rotatable cleaning bar according to claim 11 wherein the rigid carrier comprises a first wall projecting from the elongate central body on a first side of the at least one flexible cleaning element and a second wall projecting from the elongate central body on a second side of the at least one flexible cleaning element.

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13. A rotatable cleaning bar according to any of the preceding claims wherein the at least one flexible cleaning element is deformable to a position which is greater than the first distance when engaging a surface to be cleaned.

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14. A method of manufacture of a rotatable cleaning bar having an elongate central body for a vacuum cleaner comprising:

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mounting at least one rigid carrier on the elongate central body wherein the at least one rigid carrier projects from the surface of the elongate central body by a first distance; and
mounting at least one flexible cleaning element to the at least one carrier wherein the at least one flexible cleaning element projects from the surface of the elongate central body by a second distance and the first distance is less than the second distance.

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15. A rotatable cleaning bar for a vacuum cleaner comprising:

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an elongate central body;
at least one carrier mountable to the elongate central body; and
at least one cleaning element mountable to the at least one carrier;

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wherein the rotatable cleaning bar comprises at least one wall which projects away from the elongate central body and projects away from the at least one cleaning element.

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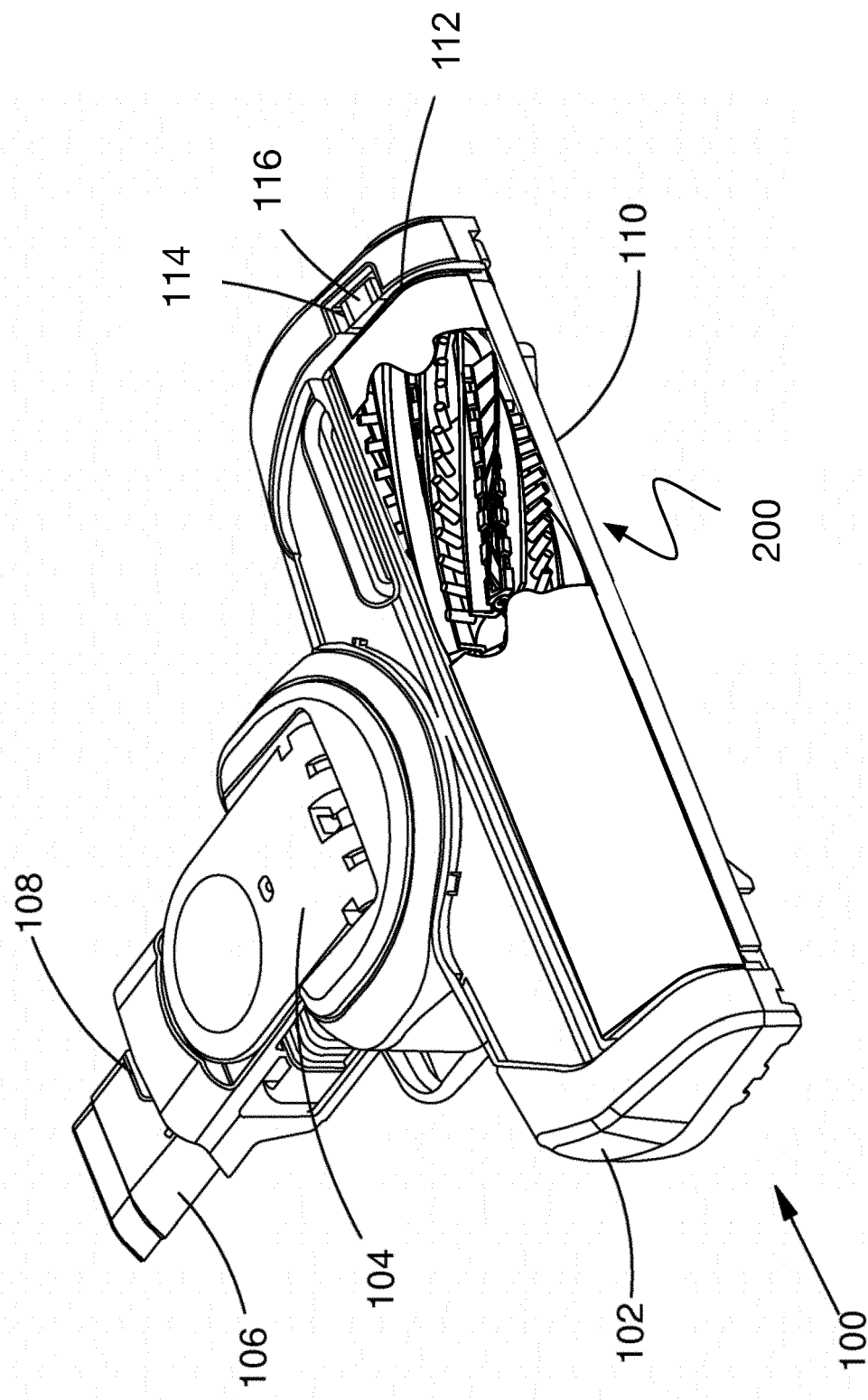


Figure 1

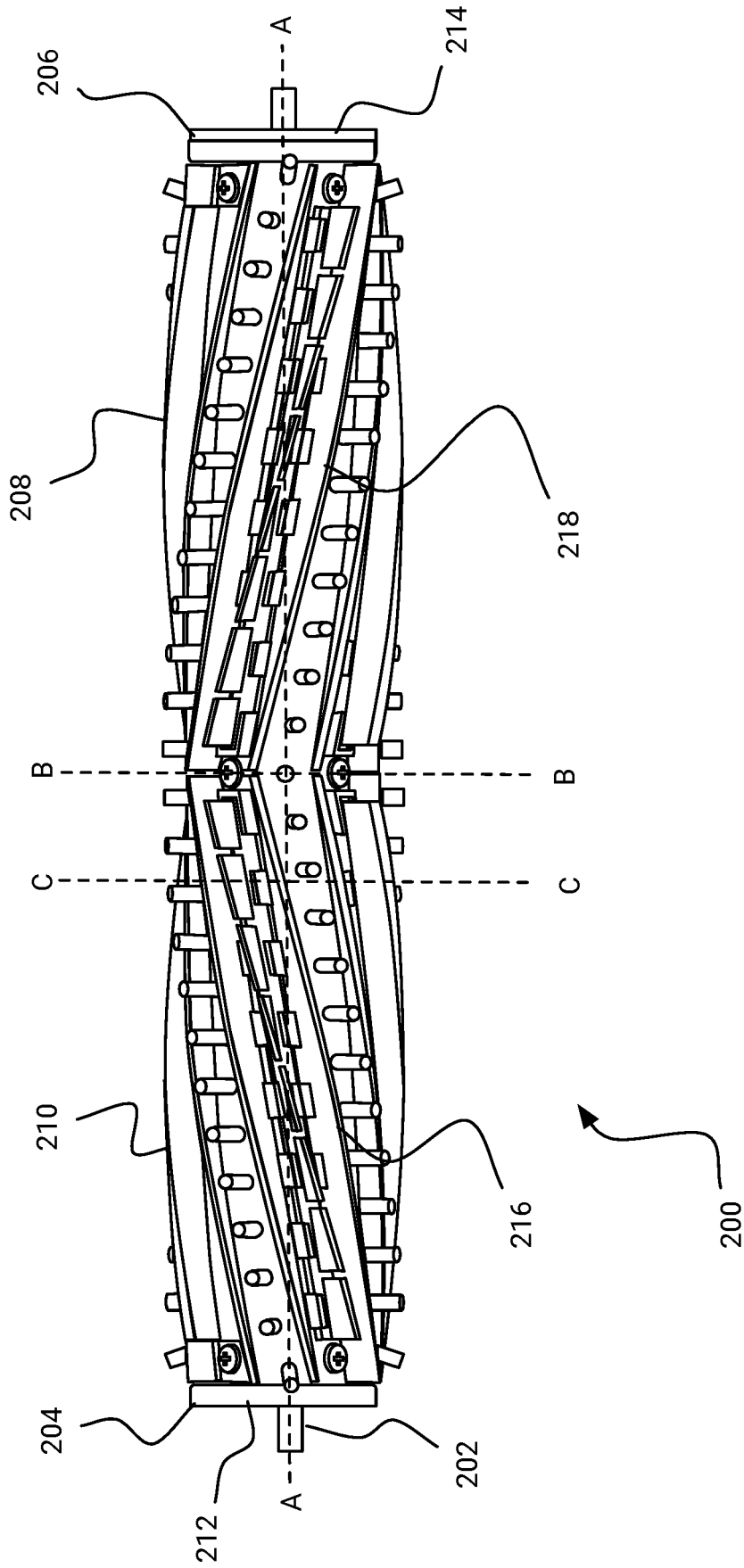


Figure 2

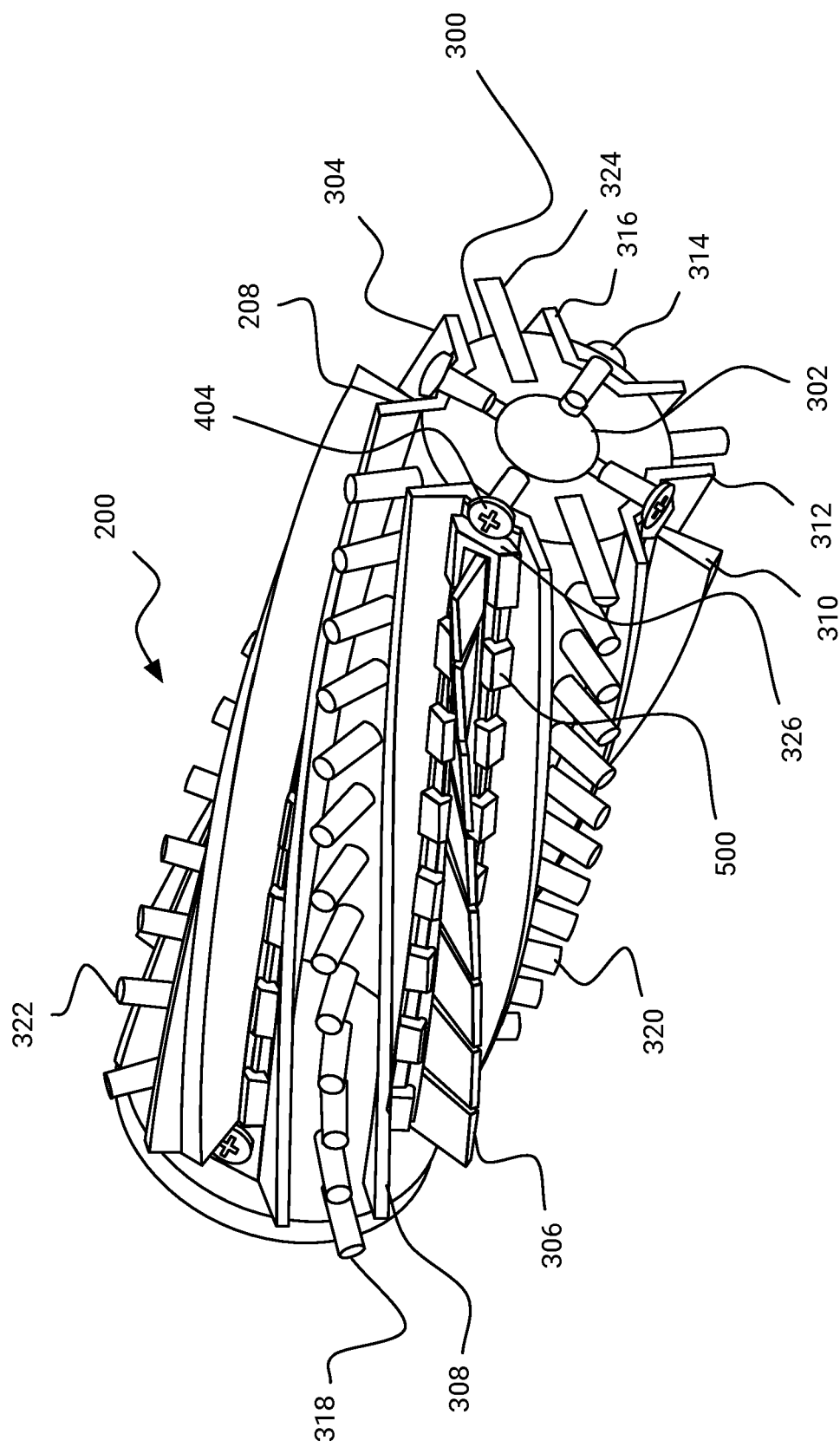


Figure 3

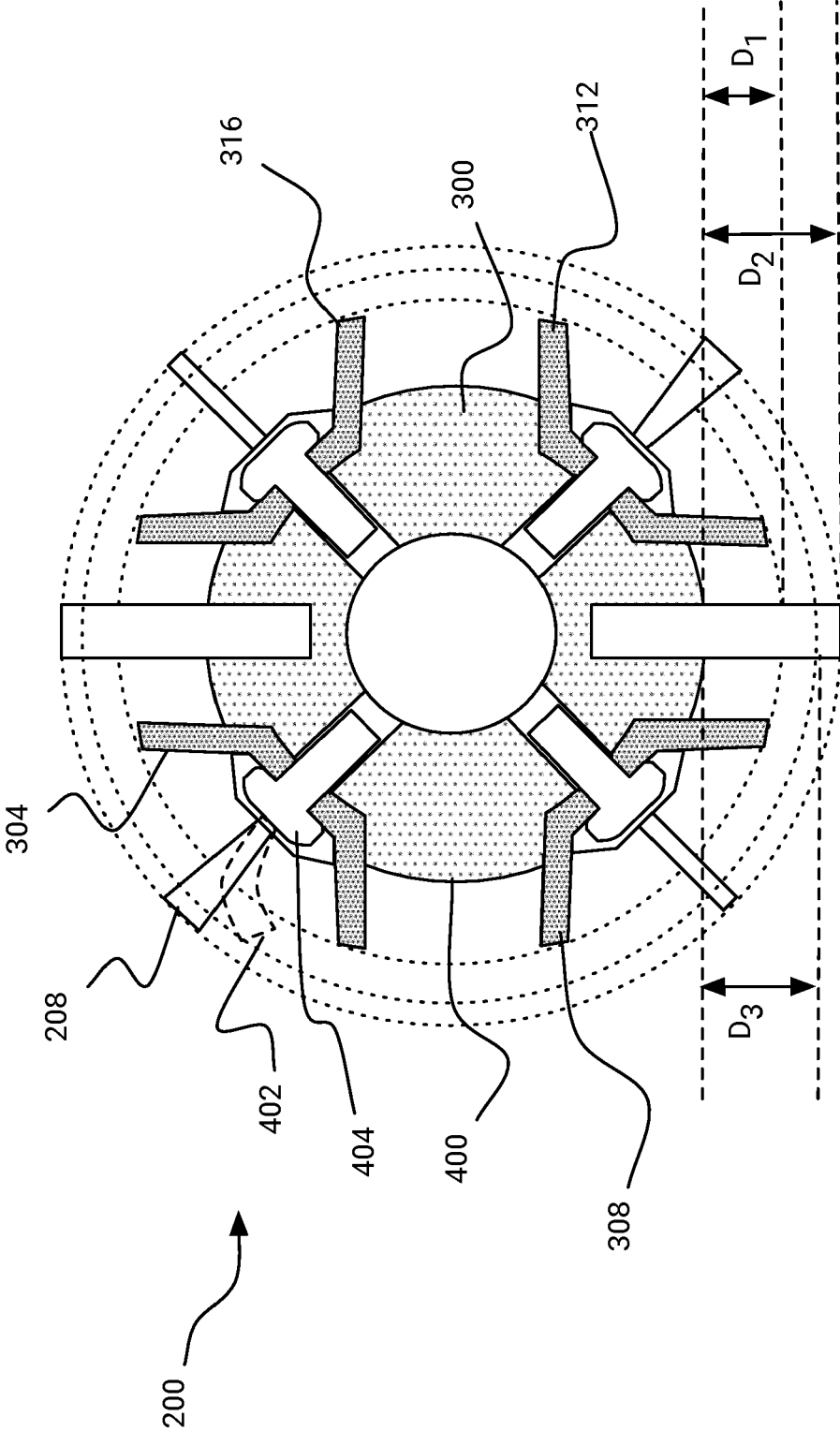


Figure 4

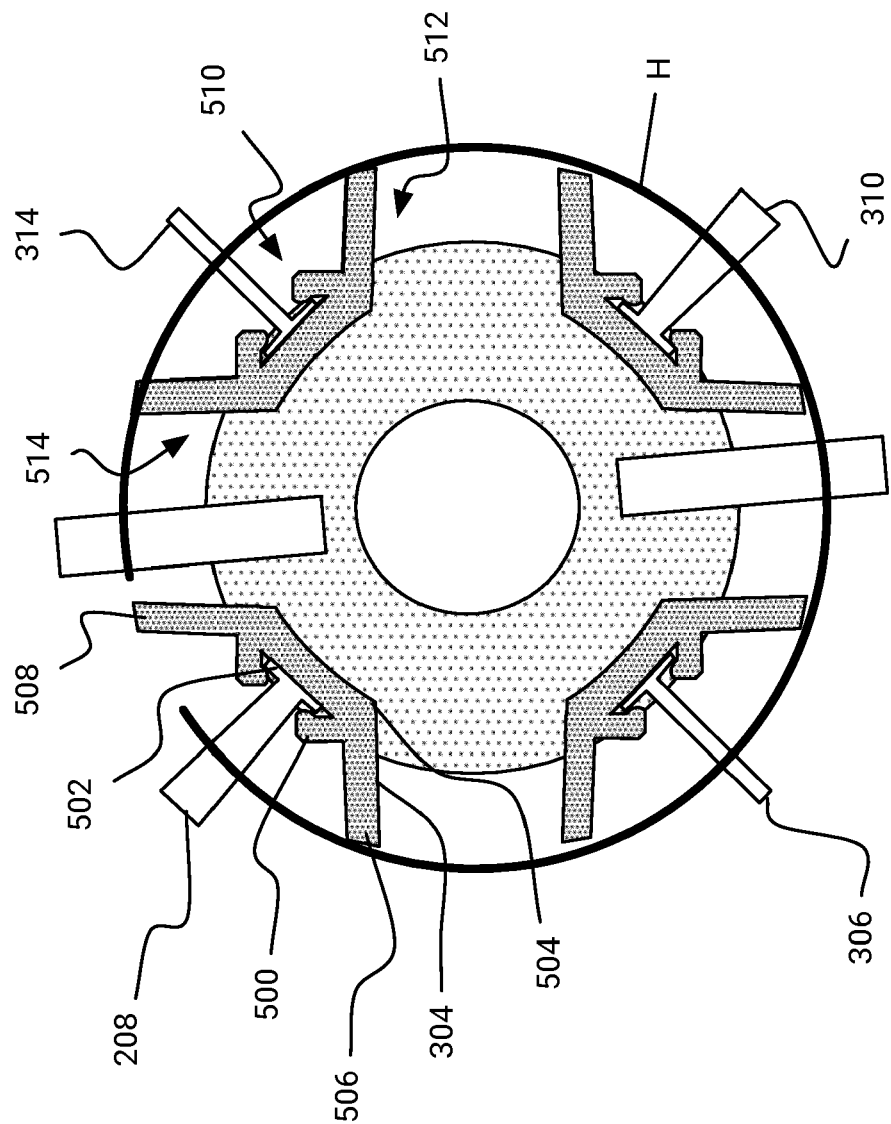


Figure 5

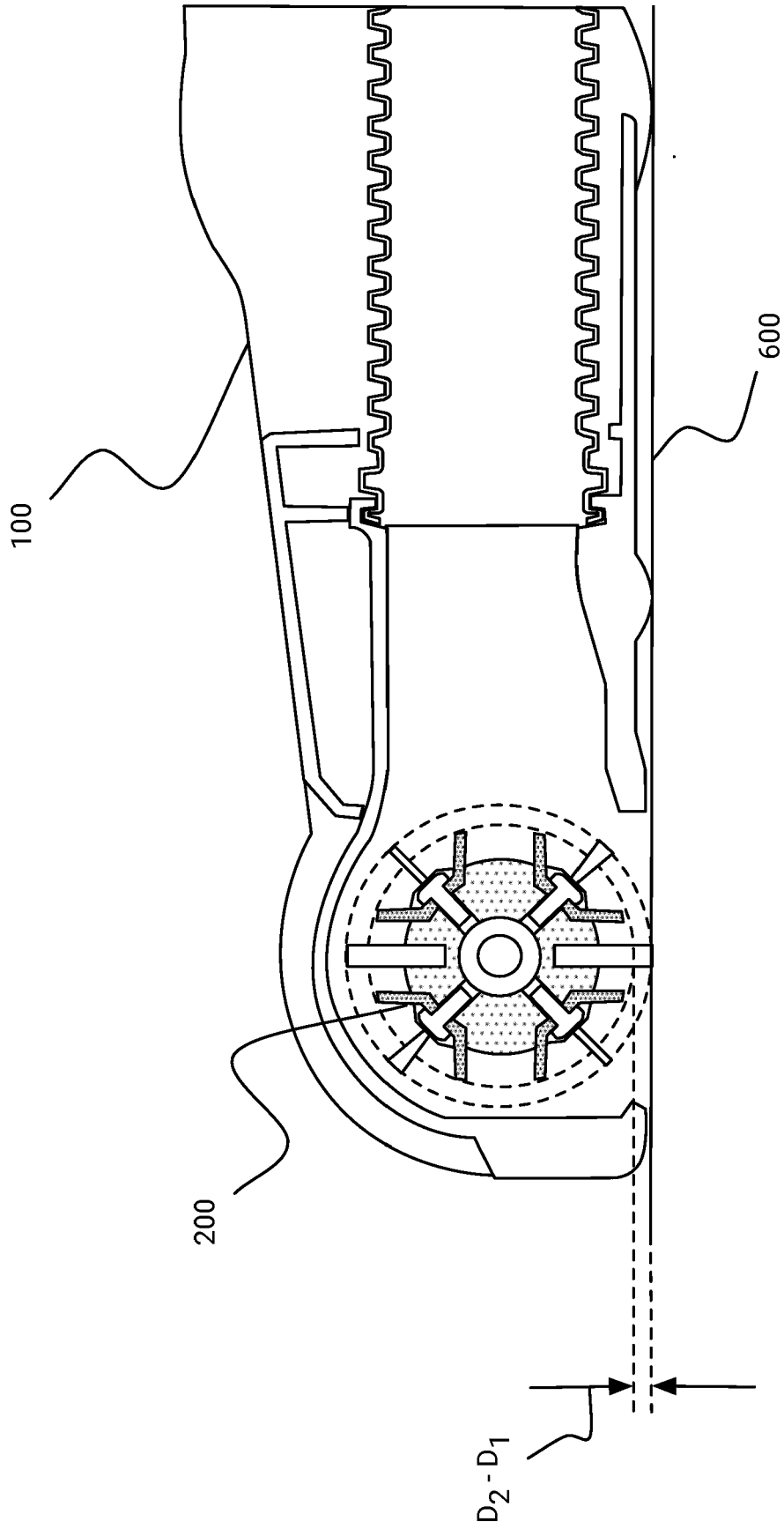


Figure 6



EUROPEAN SEARCH REPORT

 Application Number
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			A46B A61D A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 February 2020	Examiner Blumenberg, Claus
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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