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(54) **CLEANER HEAD**

REINIGUNGSKOPF

TÊTE DE NETTOYAGE

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Description

[0001] The present invention relates to a cleaner head having an agitator and a drive assembly for driving the agitator.

[0002] The cleaner head of an appliance, such as a vacuum cleaner or floor sweeper, may include an agitator driven by a drive assembly. The drive assembly often includes a dog for transmitting torque generated by the drive assembly to the agitator. A problem with existing cleaner heads is that there is often a degree of play between the dog and the agitator. Consequently, as the agitator rotates, the agitator vibrates and generates noise.

[0003] DE102010060373 describes a cleaner head having a motor-driven brush body. The brush body includes a threaded portion which is inserted into a threaded hollow portion of a drive shaft.

[0004] The present invention provides a cleaner head comprising an agitator and a drive assembly for driving the agitator, the drive assembly comprising a dog for transmitting torque to the agitator, wherein one of the dog and the agitator comprises a tapered head, a shank that extends from the head, and a screw thread formed around the shank, the other of the dog and the agitator comprises a bore having a countersink and a complementary screw thread formed around a wall of the bore, the shank projects into the bore and the two threads mate such that, as the dog rotates, the agitator screws on to the dog and the tapered head mates with the countersink.

[0005] As the countersink mates with and tightens against the tapered head, play between the dog and the agitator is removed or reduced. As a result, the agitator vibrates less during rotation and thus noise is reduced.

[0006] A further problem with existing cleaner heads is that that the agitator may not align concentrically with the dog. As a result, out-of-balance forces place an increased stress on components of the cleaner head, particularly the bearings, which may reduce the lifespan of the cleaner head. With the cleaner head of the present invention, the mating of the countersink and the tapered head acts to align concentrically the agitator and the dog. As a result, out-of-balance forces are reduced and thus the lifespan of the cleaner head is prolonged.

[0007] Each screw thread may have a lead angle of no more than 60 degrees. As a result, over the torque range typically generated by the drive assembly of most conventional cleaner heads, the axial force exerted by the dog on the agitator is of a magnitude that ensures that the agitator is held against the tapered head with sufficient force so as to reduce vibration and noise.

[0008] Each screw thread may have a lead angle of no less than 40 degrees. As a result, over the torque range typically generated by the drive assembly of most conventional cleaner heads, the axial force exerted by the dog on the agitator is sufficient to hold the agitator against the dog without being excessive, which might otherwise result in premature failure of the threads.

[0009] Each screw thread may have a plurality of starts. By employing a plurality of starts, the torque applied by the dog is distributed over a greater number of starts. As a result, a greater torque may be transmitted to the agitator without failure of the threads. Additionally, where the agitator is removable from the cleaner head, a greater number of starts makes it easier for a user to mount the agitator. In particular, it is generally easier to align the thread of the agitator with the thread of the dog.

[0010] Each start may turn through an angle of no less than 120 degrees. The length of each start depends on the angle through which the start turns. As the angle decreases, so too does the length of the start. As a result, the start is subjected to a greater load per unit length. Below an angle of 120 degrees, the lengths of the starts may be insufficient to bear the torque required of most cleaner heads.

[0011] Each start may turn through an angle of no more than 360 degrees. This then has the advantage of maintaining a relatively short shank and bore. Additionally, where the agitator is removable from the cleaner head, the agitator can be removed from the dog by rotating the agitator through an angle of no more than 360 degrees, which can generally be achieved with a small number of twists of the agitator.

[0012] Each screw thread may have a buttress thread form. A buttress thread form has the advantage of relatively low friction properties. As a result, a greater axial force is exerted by the dog on the agitator for a given torque. Additionally, where the agitator is removable from the cleaner head, a low friction thread makes it easier for the user to unscrew the agitator from the dog. As the load on the agitator varies, so too does the torque generated by the drive assembly. In response to a decrease in torque, the agitator may experience a net axial force in a direction away from the dog. By employing a buttress thread form, the vertical (or near vertical) flanks of the threads act to oppose this negative axial force and thus prevent the agitator and the dog from loosening. Consequently, as the agitator experiences different loads, the agitator continues to be held tightly against the dog and thus vibration and noise continue to be reduced. Furthermore, in comparison to other thread forms, a buttress thread form has a relatively thick base resulting in a stronger thread. As a result, the threads are able to withstand a greater axial force and thus the agitator may be held more tightly against the dog.

[0013] The agitator may be removable from the cleaner head. In particular, by rotating the agitator relative to the dog, the agitator may be unscrewed and separated from the dog. In a conventional cleaner head having a removable agitator, it is generally difficult to ensure that the agitator is held axially tight within the cleaner head. With the cleaner head of the present invention, the agitator screws on to and is tightened against the dog so as to prevent or reduce the axial play. As a result, a removable agitator may be provided without the normally inherent problems of vibration and noise.

[0014] There are terms employed throughout this document that, in English, are well understood within the field of engineering. It is possible that one or more of these terms may not have a direct equivalent in other languages. Accordingly, for the purposes of clarity, an explanation of some of these terms will now be provided. The term 'dog' should be understood to mean a torque-transmission member. The term 'start' refers to a ridge of an external thread or a groove of an internal thread. The term 'lead angle' refers to the angle formed by the starts of a screw thread relative to a plane perpendicular to the screw axis. And the term 'thread form' refers to the cross-sectional shape or profile of the starts of a screw thread.

[0015] In order that the present invention may be more readily understood, an embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an exploded view of a cleaner head in accordance with the present invention;

Figure 2 is an isometric view of a dog forming part of the cleaner head;

Figure 3 is a side view of the dog;

Figure 4 is a side sectional view of the dog; and

Figure 5 is a side sectional view of one end of an agitator forming part of the cleaner head.

[0016] The cleaner head 1 of Figure 1 comprises a housing 2 within which an agitator 3 and a drive assembly 4 are mounted.

[0017] The agitator 3 comprises an elongate body 5 to which bristles, flicker strips or other means 6 for agitating a cleaning surface are attached. The agitator 3 is mounted at one end to a bushing 7 seated within a removable cap 8. The opposite end of the agitator 3 is mounted to a dog 12 forming part of the drive assembly 4.

[0018] The drive assembly 4 comprises an electric motor 10 and a transmission 11 for transmitting torque generated by the motor 10 to the agitator 3. The transmission 11 comprises, among other things, a dog 12 that engages with the agitator 3. The dog 12 is therefore responsible for transmitting the torque generated by the drive assembly 4 to the agitator 3. With the exception of the dog 12, the details of the drive assembly 4 are not pertinent to the present invention, and drive assemblies for driving an agitator of a cleaner head are well known. By way of example, the cleaner heads of the DC24 and DC26 vacuum cleaners sold by Dyson Limited each include a drive assembly suitable for use in the present cleaner head.

[0019] A more detailed explanation will now be provided of the dog 12, the end of the agitator 3 that engages with the dog 12, and how the two 3,12 engage in order to transmit torque.

[0020] As illustrated in Figures 2 to 4, the dog 12 comprises a head 13, a shank 14 that extends from the head 13, and a helical screw thread 15 formed around the shank 14.

[0021] The head 13 tapers in a direction towards the shank 14 and defines a frustoconical surface that is coaxial with the shank 14.

[0022] The shank 14 extends from the head 13 and is generally cylindrical in shape.

[0023] The screw thread 15 is an external thread that comprises four starts 16 that are evenly spaced about the shank 14. Each start 16 turns about the screw axis 18 through an angle of 180 degrees. Consequently, each start 16 completes one half turn only. The screw thread 15 also has a lead angle of 50 degrees and a buttress thread form.

[0024] As illustrated in Figure 5, one end of the agitator 3 includes a bore 19 having a countersink 20 and a helical screw thread 21 formed around a wall of the bore 19.

[0025] The countersink 20 has a frustoconical surface that complements the frustoconical surface of the tapered head 13 of the dog 12, i.e. both surfaces have the same or similar taper angle.

[0026] The screw thread 21 is an internal thread that complements the external screw thread 15 of the dog 12. Consequently, the screw thread 21 comprises four starts 22 that are evenly spaced about the bore 19 and turn through an angle of 180 degrees. The screw thread 21 also has a lead angle of 50 degrees and a buttress thread form.

[0027] With the agitator 3 mounted to the dog 12, the shank 14 of the dog 12 projects into the bore 19 of the agitator 3, and the external thread 15 of the dog 12 mates with the internal thread 21 of the agitator 3. Owing to tolerances in the cleaner head 1, there is a degree of play or backlash (both axial and radial) between the agitator 3 and the dog 12.

[0028] During operation of the cleaner head 1, the torque generated by the drive assembly 4 is transmitted to the agitator 3 via the dog 12. As a consequence of the threads 15,21, the torque applied by the dog 12 exerts both an axial force and a rotational force on the agitator 3. The rotational force causes the agitator 3 to rotate. The axial force, on the other hand, causes the agitator 3 to screw on to and tighten against the dog 12. In this regard, the threads 15,21 of the dog 12 and the agitator 3 are oriented (i.e. right-handed or left-handed) such that the axial force acts in a direction towards the dog 12. As the agitator 3 tightens against the dog 12, the countersink 20 mates with and tightens against the tapered head 13. As a result, the play between the agitator 3 and the dog 12 is removed or significantly reduced, and thus vibration of the agitator 3 is reduced. In addition to reducing play, the mating of the countersink 20 and the tapered head 13 ensures that the agitator 3 and the dog 12 are aligned concentrically. As a result, out-of balance forces are reduced and thus the lifespan of the cleaner head 1 is prolonged.

[0029] The magnitude of the axial force depends on, among other things, the lead angle of the threads 15,21. The threads 15,21 have a lead angle of 50 degrees. This results in an axial force of sufficient magnitude to ensure that the countersink 20 is tightened against the tapered head 13 with sufficient force to absorb the play between the agitator 3 and the dog 12. As the lead angle increases, the magnitude of the axial force decreases and thus the countersink 20 is held less tightly against the tapered head 13. It was found that, when the lead angle exceeds 60 degrees, the resulting axial force was insufficient to adequately tighten the countersink 20 against the tapered head 13. As a result, vibration and noise were observed to increase. The magnitude of the axial force also depends on the torque generated by the drive assembly 4. Accordingly, it may be possible or indeed desirable to employ a larger lead angle where a higher torque is generated. However, over the torque range typically generated by the drive assembly of most conventional cleaner heads (e.g. a stall torque of between 100 and 300 Nmm), a lead angle of no more than 60 degrees was found to reduce vibration and noise.

[0030] As the lead angle decreases, the magnitude of the axial force increases. Although this has the benefit of further tightening the agitator 3 against the dog 12, any further reduction in vibration and noise may be small or insignificant. Moreover, as the axial force increases, the threads 15,21 are required to withstand a greater axial load and may therefore fail prematurely. Over the torque range typically generated by the drive assembly of most conventional cleaner heads, a lead angle less than 40 degrees was found to give no appreciable reduction in vibration and noise beyond that observed at 40 degrees. Nevertheless, where the torque generated by the drive assembly is relatively low, a smaller lead angle may be necessary or desirable in order to generate the required axial force.

[0031] As illustrated in Figures 4 and 5, the threads 15,21 have a buttress thread form, which provides three key benefits. First, the magnitude of the axial force exerted on the agitator 3 depends also on the friction between the two threads 15,21. A buttress thread form has the advantage of relatively low friction properties. As a result, a greater axial force is generated for a given torque. Second, during use of the cleaner head 1, the agitator 3 experiences different loads. As the load on the agitator 3 varies, so too does the torque generated by the drive assembly 4. Should the torque generated by the drive assembly 4 decrease, the axial force exerted by the dog 12 on the agitator 3 will decrease. The countersink 20 and the tapered head 13 are under compression and therefore exert an axial force in the opposite direction. Consequently, in response to a decrease in the torque of the drive assembly 4, the agitator 3 experiences a net axial force in a direction away from the dog 12. By employing a buttress thread form, the vertical (or near vertical) flanks 17,23 of the threads 15,21 act to oppose this negative axial force and thus prevent the agitator 3 and the dog 12 from loosening.

[0032] Consequently, as the agitator 3 experiences different loads, the agitator 3 continues to be held tightly against the dog 12 and thus vibration and noise continue to be reduced. Third, a buttress thread form has a relatively thick base resulting in a stronger thread. The threads 15,21 are therefore able to withstand greater axial forces.

[0033] Each thread 15,21 has four starts 16,22 that each turn through 180 degrees. One could conceivably have a different number of starts and/or starts that turn through a different angle. However, as will now be explained, there are both advantages and disadvantages in changing the number of starts and/or the angle through which the starts turn.

[0034] The starts 16,22 are responsible for transmitting the torque generated by the drive assembly 4 to the agitator 3. Each start 16,22 is therefore required to bear a fraction of the total torque. If the number of starts 16,22 were reduced, each start 16,22 would be required to bear a larger load and may therefore fail prematurely. This may be addressed by increasing the size of the thread form so as to increase the strength of the starts 16,22. If the number of starts 16,22 were increased, the available space for each start 16,22 would decrease. Each start 16,22 would then have a smaller thread form which is likely to compromise the strength of the threads 15,21. Consequently, although each start 16,22 would be required to bear a smaller load, the strength of each start 16,22 may be weakened to a point at which failure of the starts 16,22 becomes a potential problem.

[0035] If the starts 16,22 were to turn through a smaller angle, the starts 16,22 would be shorter in length. This has the advantage that a shorter shank 14 and bore 19 may be employed. However, as the length of the starts 16,22 decreases, the starts 16,22 are subjected to a greater load per unit length and may therefore fail if subjected to excessive torque. Conversely, if the starts 16,22 were to turn through a larger angle, the starts 16,22 would be subjected to a smaller load per unit length and may therefore transmit a greater torque. However, a longer shank 14 and bore 19 would then be required.

[0036] There is therefore a balance to be struck between the various parameters, e.g. lead angle, number of starts, angle of rotation of the starts, length of dog and bore, stall torque of the drive assembly, material strength of the dog and bore etc.

[0037] The agitator 3 is removable from the cleaner head 1. This is achieved by removing the cap 8 forming part of the housing 2. Removal of the cap 8 creates an aperture in the side of the housing 2 through which the agitator 3 may be removed. In order to remove the agitator 3, a user is required to rotate the agitator 3 relative to the dog 12. This then causes the agitator 3 to unscrew and separate from the dog 12, after which the user may pull the agitator 3 through the aperture. Mounting the agitator 3 within the cleaner head 1 is then the reverse of this process.

[0038] The ends of the starts 16 of the dog 12 are tapered slightly. This then aids the user in mounting the agitator 3 to the dog 12. In particular, the end of the shank 14 is guided by the countersink 20 towards the centre of the bore 19.

[0039] When mounting the agitator 3 to the dog 12, the two threads 15,21 are likely to be misaligned. Each thread 15,21 has four starts 16,22. Consequently, a user need only rotate the agitator 3 through a maximum angle of 90 degrees in order to bring the two threads 15,21 into alignment. At 90 degrees, the user can comfortably rotate the agitator 3 whilst maintaining a hold of the agitator 3. If a smaller number of starts 16,22 were employed, the user would be required to rotate the agitator 3 through a larger angle, which the user might find uncomfortable.

[0040] Each start 16,22 turns through an angle of 180 degrees. Consequently, in order to remove and mount the agitator 3, the user is required to rotate the agitator 3 through 180 degrees. This is not overly burdensome and can generally be achieved with one or two short twists of the agitator 3. A smaller turn angle may be employed, which has the advantage that the user is required to rotate the agitator 3 through a smaller angle. However, as noted above, as the turn angle decreases, the lengths of the starts 16,22 decrease and thus the starts 16,22 are subjected to a greater load per unit length.

[0041] Accordingly, a turn angle of no less than 120 degrees may be preferable. A turn angle greater than 180 degrees may be employed for the starts 16,22. This then has the advantage that the starts 16,22 are longer in length and are therefore able to bear a higher torque. However, as the length of the starts 16,22 increases, so too does the length of the shank 14 and the bore 19. Moreover, in order to remove and mount the agitator 3, the user is required to rotate the agitator 3 through a larger angle. By employing a turn angle of no more than 360 degrees, a relatively short shank 14 and bore 19 may be maintained. Additionally, a user is able to remove and mount the agitator 3 through a small number of twists of the agitator 3.

[0042] Each thread 15,21 has a buttress thread form which, as noted above, has relatively low friction properties. Consequently, in addition to the benefits noted above, the thread form makes it easier for the user to remove and mount the agitator 3.

[0043] The fit between the two threads 15,21 may be relatively loose, which then further aids the user in removing and mounting the agitator 3. A relatively loose fit is likely to result in a relatively large degree of play between the agitator 3 and the dog 12. However, since the agitator 3 screws on to and tightens against the dog 12, even a relatively large amount of play may be absorbed.

[0044] In a conventional cleaner head having a removable agitator, it is generally difficult to ensure that the agitator is held axially tight within the cleaner head. The same is true of the cleaner head 1 of the present invention in that, after mounting the agitator 3 within the cleaner head 1, there is a degree of axial play between the agitator 3 and the dog 12. However, during operation of the cleaner head 1, the agitator 3 screws on to and is tightened against the dog 12 so as to absorb any axial play. As a result, a removable agitator may be provided without the normally inherent problems of vibration and noise.

[0045] In the embodiment described above, the thread 15 formed around the shank 14 is an external thread, and the thread 21 formed around the bore 19 is an internal thread. As an alternative, the thread 15 formed around the shank 14 may be an internal thread, and the thread 21 formed around the bore 19 may be an external thread. Furthermore, the dog 12 may comprise the bore 19 and the countersink 20, and the agitator 3 may comprise the tapered head 13 and the shank 14. Accordingly, in a more general sense, one of the agitator 3 and the dog 12 may be said to comprise the tapered head 13, the shank 14 and a first screw thread 15, and the other of the agitator 3 and the dog 12 may be said to comprise the bore 19, the countersink 20 and a second screw thread 21 which complements the first screw thread 15.

[0046] Although each start 16,22 has a buttress thread form, other thread forms might alternatively be used. For example, both square and trapezoidal thread forms have relatively low friction properties. However, the buttress thread form is typically stronger owing to the larger base of each start.

[0047] The cleaner head illustrated in Figure 1 is intended to form part of a vacuum cleaner. However, the agitator 3 and the dog 12 may equally be employed in the cleaner head of other appliances, such floor sweepers or carpet shampoo machines. Moreover, although the drive assembly 4 of the embodiment described above comprises an electric motor 10, the drive assembly 4 might comprise alternative means for generating the torque necessary to drive the agitator 3. For example, where the cleaner head 1 is intended to form part of a vacuum cleaner, the drive assembly 4 may comprise an air turbine that is driven by air drawn through the cleaner head 1.

Claims

1. A cleaner head (1) comprising an agitator (3) and a drive assembly (4) for driving the agitator (3), the drive assembly (4) comprising a dog (12) for transmitting torque to the agitator (3), wherein one of the dog (12) and the agitator (3) comprises a tapered head (13), a shank (14) that extends from the head (13), and a screw thread (15) formed around the shank (14), the other of the dog (12) and the agitator (3) comprises a bore (19) having a countersink (20) and a complementary screw thread (21) formed around a wall of the bore (19), the shank (14) projects into the bore (19), and the two threads (15,21) mate such that, as the dog (12) rotates, the agitator (3) screws on to the dog (12) and the tapered head (13) mates with the countersink (20).

2. A cleaner head as claimed in claim 1, wherein each screw thread (15,21) has a lead angle of no more than 60 degrees.

3. A cleaner head as claimed in claim 1 or 2, wherein each screw thread (15,21) has a lead angle of no less than 40 degrees.

4. A cleaner head as claimed in any one of the preceding claims, wherein each screw thread (15,21) has a plurality of starts (16,22).

5. A cleaner head as claimed in claim 4, wherein each start (16,22) turns through an angle of no less than 120 degrees.

6. A cleaner head as claimed in claim 4 or 5, wherein each start (16,22) turns through an angle of no more than 360 degrees.

7. A cleaner head as claimed in any one of the preceding claims, wherein each screw thread (15,21) has a buttress thread form.

8. A cleaner head as claimed in any one of the preceding claims, wherein the agitator (3) is removable from the cleaner head (1), and rotation of the agitator (3) relative to the dog (12) causes the agitator (3) to unscrew and separate from the dog (12).

Patentansprüche

1. Reinigungskopf (1) der Folgendes umfasst: einen Rührer (3) und eine Antriebseinheit (4) zum Antrieb des Rührers (3), wobei die Antriebseinheit (4) einen Mitnehmer (12) umfasst zur Übertragung des Drehmoments auf den Rührer (3), wobei einer der Mitnehmer (12) und der Rührer (3) einen konisch zulaufenden Kopf (13) und einen Schaft (14), der sich über den Kopf (13) erstreckt, und das Schraubengewinde (15), das um den Schaft (14) herum geformt ist, den anderen Mitnehmer (12) und den Rührer (3), die eine Bohrung (19) umfassen, die eine Ansenkung (20) und ein ergänzendes Schraubengewinde (21) umfasst, das durch die Ränder der Bohrung gebildet wird (19), wobei der Schaft (14) in die Bohrung ragt (19), und die beiden Gewinde (15, 21), so miteinander verbunden sind, dass sich der Mitnehmer (12) dreht, der Rührer (3) an den Mitnehmer (12) festgeschraubt ist und der konisch zulaufende Kopf (13) mit der Ansenkung (20) verbunden ist.

2. Reinigungskopf nach Anspruch 1, wobei jedes Schraubengewinde (15, 21) einen Anschnittwinkel von 60° nicht überschreiten darf.

3. Reinigungskopf nach Anspruch 1 oder 2, wobei jedes Schraubengewinde (15, 21) einen Anschnittwinkel von 40° nicht unterschreiten darf.

4. Reinigungskopf nach einem der vorhergehenden Ansprüche, wobei jedes Schraubengewinde (15, 21) eine Vielzahl von Gewindeanfängen (16, 22) aufweist.

5. Reinigungskopf nach Anspruch 4, wobei jeder Gewindeanfang (16, 22) sich um einen Winkel von mindestens 120° dreht.

6. Reinigungskopf nach Anspruch 4 oder 5, wobei jeder Gewindeanfang (16, 22) sich um einen Winkel von höchstens 360° dreht.

7. Reinigungskopf nach einem der vorhergehenden Ansprüche, wobei jedes Schraubengewinde (15, 21) ein Sägenprofilgewinde aufweist.

8. Reinigungskopf nach einem der vorhergehenden Ansprüche, wobei der Rührer (3) vom Reinigungskopf (1) demontierbar ist, und die Drehung des Rührers (3) relativ zu der Position des Mitnehmers (12) zum Abschrauben und Ablösen des Rührers (3) vom Mitnehmer (12) führt.

Revendications

1. Tête de dispositif de nettoyage (1) comprenant un agitateur (3) et un ensemble d'entraînement (4) destiné à entraîner l'agitateur (3), l'ensemble d'entraînement (4) comprenant un organe de transmission de couple (12) destiné à transmettre un couple à l'agitateur (3), dans lequel l'un de l'organe de transmission de couple (12) et de l'agitateur (3) comprend une tête conique (13), une tige (14) se prolongeant à partir de la tête (13), et un filetage (15) constitué autour de la tige (14), l'autre de l'organe de transmission de couple (12) et de l'agitateur (3) comprend un alésage (19) possédant un chanfrein (20) et un filetage complémentaire (21) constitué autour d'une paroi de l'alésage (19), la tige (14) se prolonge dans l'alésage (19), et les deux filetages (15, 21) s'enclenchent de telle sorte que, lorsque l'organe de transmission de couple (12) est en rotation, l'agitateur (3) se visse sur l'organe de transmission de couple (12) et la tête filetée (13) s'enclenche avec le chanfrein (20).

2. Tête de dispositif de nettoyage selon la revendication 1, dans lequel chaque filetage (15, 21) possède un angle d'inclinaison non supérieur à 60 degrés.

3. Tête de dispositif de nettoyage selon la revendication 1 ou 2, dans lequel chaque filetage (15, 21) possède un angle d'inclinaison non inférieur à 40 de-

grés.

4. Tête de dispositif de nettoyage selon l'une quelconque des revendications précédentes, dans lequel chaque filetage (15, 21) possède plusieurs filets (16, 22).

5. Tête de dispositif de nettoyage selon la revendication 4, dans lequel chaque filet (16, 22) effectue une rotation selon un angle non inférieur à 120 degrés.

6. Tête de dispositif de nettoyage selon la revendication 4 ou 5, dans lequel chaque filet (16, 22) effectue une rotation selon un angle non supérieur à 360 degrés.

7. Tête de dispositif de nettoyage selon l'une quelconque des revendications précédentes, dans lequel chaque filetage (15, 21) possède une forme trapézoïdale.

8. Tête de dispositif de nettoyage selon l'une quelconque des revendications précédentes, dans lequel l'agitateur (3) est démontable de la tête de dispositif de nettoyage (1), et la rotation de l'agitateur (3) par rapport à l'organe de transmission de couple (12) provoque le dévissage de l'agitateur (3) et la séparation de l'organe de transmission de couple (12).

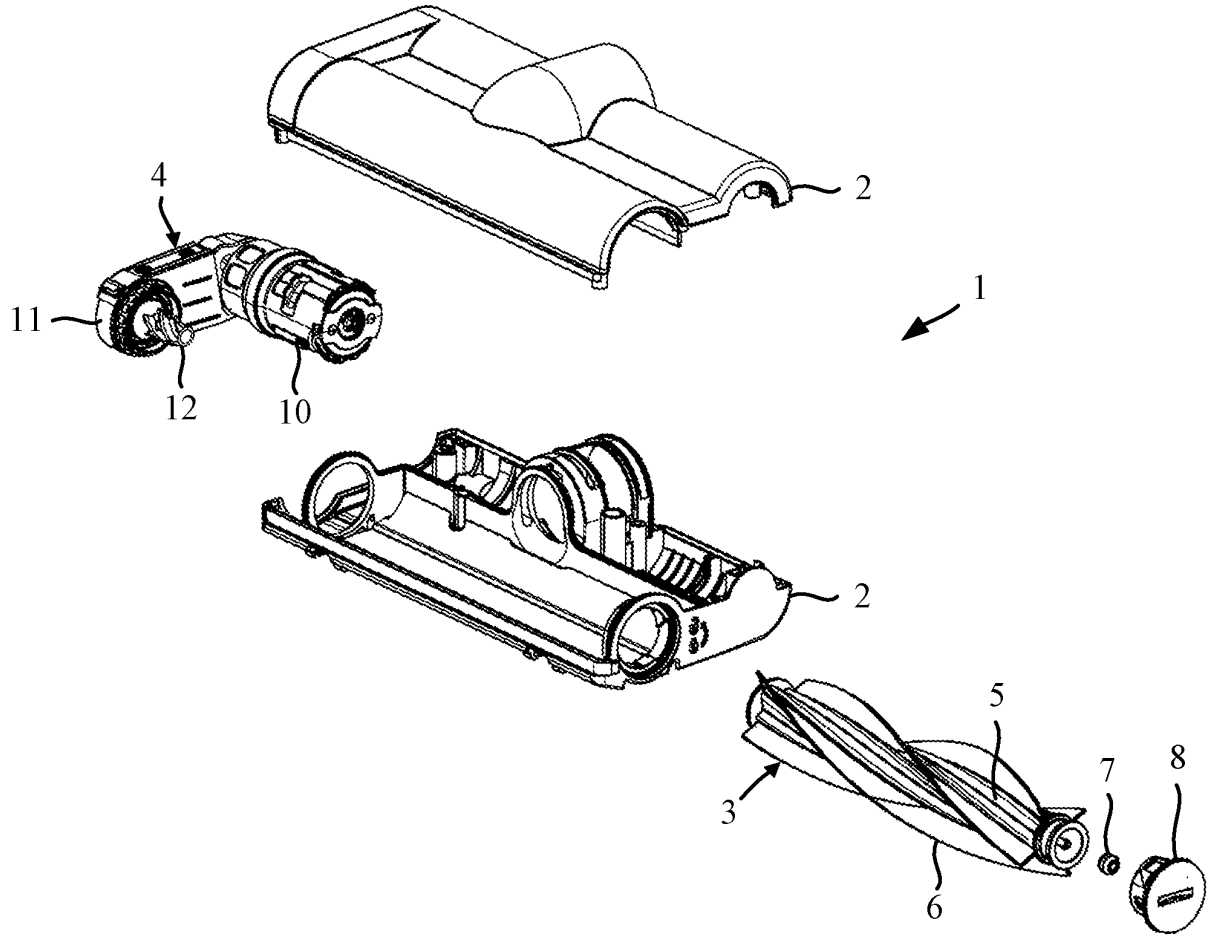


Fig. 1

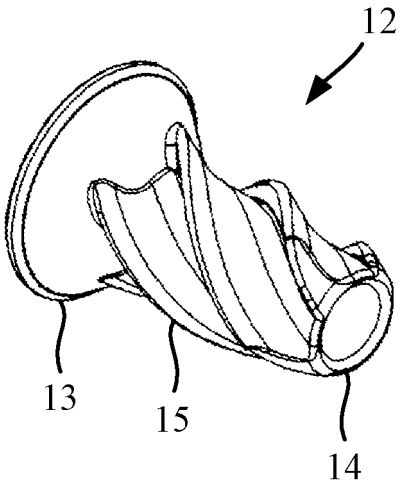


Fig. 2

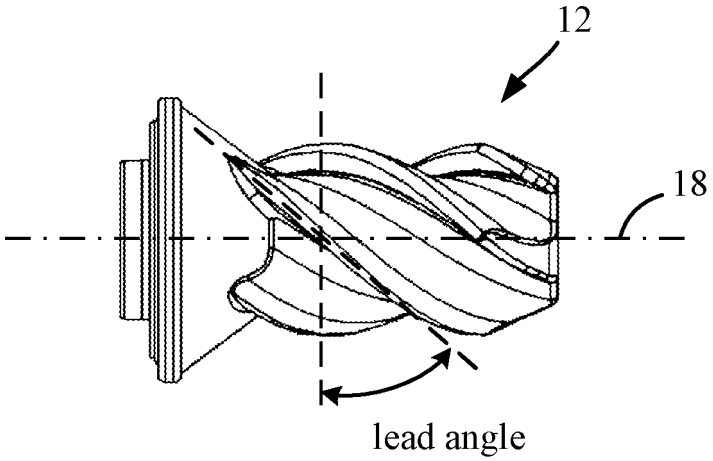


Fig. 3

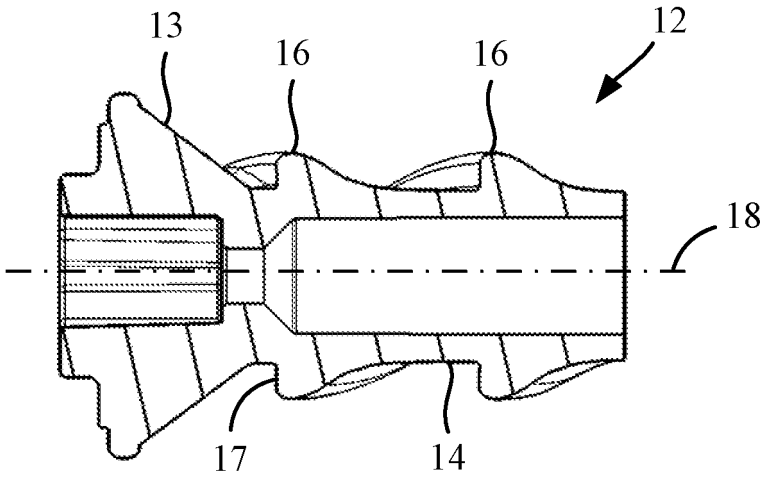


Fig. 4

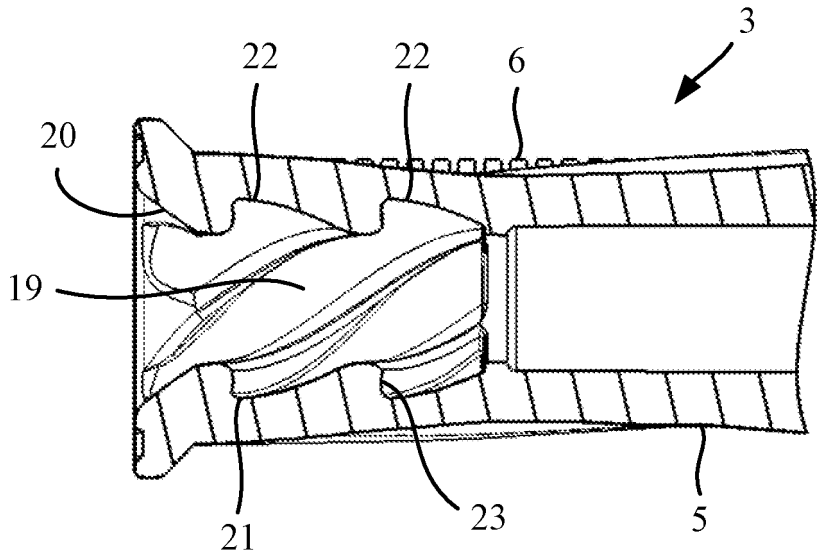


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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