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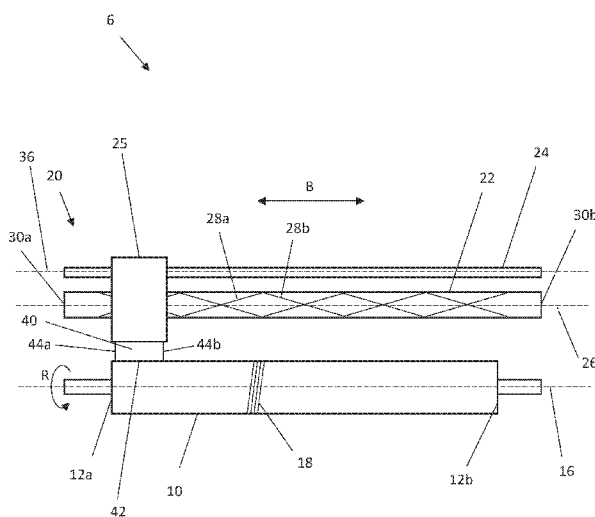


Fig. 2

(57) Abstract: A cleaner head (6) for a hard floor cleaner (2), the cleaner head (6) is provided. The cleaner head (6) comprises an elongate roller (10), a helical screw (22), a carrier head (25), and a contact member (40). The elongate roller (10) is configured to rotate about a roller axis (16) and the helical screw (22) is configured to rotate about a screw axis (26), the screw axis (26) being offset from the roller axis (16). The carrier head (25) is mounted to the helical screw (22) and is configured to travel along the screw axis (26) as the helical screw (22) rotates. The contact member (40) extends from the carrier head (25) and is arranged to contact an outer surface of the roller (10) so as to push debris (18) located on the outer surface towards an end (12b) of the roller (10).

CLEANER HEAD FOR A HARD FLOOR CLEANER

BACKGROUND

Wet floor cleaners with motor driven rotating mop rollers are becoming more popular.

5 The performance of such cleaners is superior to traditional mops as the number of passes that a motor driven mop roller is able to make over a stained region of a floor in any given period of time far exceeds the number of passes possible when using a traditional mop.

However, as the mop roller rotates against the floor, threadlike debris such as hair is drawn
10 around the roller where it collects and becomes tangled. A build-up of such debris on the mop roller reduces the cleaning the performance of the roller and can lead to blockages within the cleaner which prevents the roller from rotating as usual. Removing such debris from the roller usually requires the user to manually untangle or cut the debris from the roller. Not only is this time consuming and difficult, but such manual handling can also
15 result in damage to the cleaning surface of the mop roller.

It is against this background that the examples of the invention have been devised.

SUMMARY

20 According the invention, a cleaner head for a hard floor cleaner is provided. A hard floor cleaner comprising the cleaner head is also provided. The cleaner head comprises an elongate roller, or mop roller, which is configured to rotate about a roller axis. The cleaner head also comprises a helical screw which is configured to rotate about a screw axis, the screw axis being offset from the roller axis. The cleaner head further comprises a carrier
25 head, or cartridge, which is mounted to the helical screw and configured to travel along the screw axis as the helical screw rotates. The cleaner head further comprises a contact member which extends from the carrier head and is arranged to contact an outer surface of the roller to push debris located on the outer surface towards an end of the roller.

30 Thus, the invention provides means for automatically removing debris, in particular threadlike debris, from the roller when the cleaner head is in use.

The carrier head may be configured to reciprocate along the screw axis as the helical screw rotates. Such reciprocating motion may be achieved by providing the helical screw with a double helix thread. Accordingly, the helical screw need only rotate in one direction in order to move the carrier head in both directions back and forth along the screw axis. As a
5 result, the drive arrangement for driving the helical screw to rotate may be simplified.

A forward direction may be defined along the screw axis towards the end of the roller. The contact member may define a forward surface which extends towards the outer surface of the roller. The forward surface of the contact member may extend perpendicularly towards
10 the outer surface of the roller. Alternatively, the forward surface may extend toward the outer surface at an oblique angle. The forward surface may be angled from the carrier head towards the end of the roller. The contact member may also define a rear surface which extends from the carrier head towards the outer surface of the roller. The rear surface may be congruent to and spaced from the forward surface. The rear surface may
15 also be parallel to the forward surface.

The cleaner head may comprise a plurality of contact members with such forward and rear surfaces. The or each contact member may be rigid. Alternatively, the contact member may be flexible, for example the contact member may take the form of a brush. Such a
20 brush may have tough but pliable bristles.

The roller may comprise an outer layer of compliant material for contacting a surface to be cleaned. The outer layer may be an absorbent material for applying cleaning fluid to the surface. The outer surface of the roller may comprise a microfibre material or a foam, such
25 as Polyvinyl Alcohol (PVA) foam.

The cleaner head may further comprise a pressure member which extends from the carrier head and is arranged to compress the outer surface of the roller as the roller rotates in use. By compressing the outer surface of the roller, the pressure member may act to remove
30 excess moisture from the roller. The pressure member may take the form of a rectangular plate, although other shapes are envisaged. Where the pressure member is of a substantially rectangular shape, the corners may be radiused. The pressure member may

be made from metal, a hard plastic, or a compliant plastic such as a thermoplastic elastomer (TPE), for example. The pressure member may be formed integrally with the carrier head or may be mounted to the carrier head as a separate piece.

5 The helical screw may comprise a first helical screw thread arranged to engage with the carrier head to cause the carrier head to travel along the screw axis as the helical screw rotates. The helical screw may further comprise a second helical screw thread having an opposite rotation direction to the first helical screw thread. This can provide reciprocating motion, such that when carrier head engages with the second helical screw thread it travels
10 along the screw in the opposite direction to when the carrier head engages with the first screw thread. The first and second screw threads may be connected towards one or both ends of the screw to allow the carrier head to move between the screw threads. The screw threads may be female or male threads, which engage with a corresponding male or female part on the carrier head.

15 The pitch of the second helical screw thread may be different from the pitch of the first helical screw thread. This may allow the carrier head to move at different speeds in as it travels in opposite directions along the length of the roller, even whilst rotating the helical screw at the same rate. A steeper pitch will mean the carrier head travels faster along the
20 length of the roller, whilst a shallow pitch will mean the carrier head travels more slowly.

In some embodiments, the pitch of the first helical screw thread and/or the pitch of the second helical screw thread varies along the length of the helical screw. This may allow the carrier head to travel at different speeds at different positions along the length of the
25 roller.

For example, the pitch of the first helical screw thread and/or the pitch of the second helical screw thread could be steeper towards at least one end of the helical screw compared to the centre of the helical screw. This may be particularly advantageous where
30 a hydration element, or fluid inlet, is provided on the carrier head as it would provide less hydration at the edges of the roller and more hydration at the centre of the roller without altering the flow rate of fluid from the fluid inlet.

In another example, the pitch of the first helical screw thread and/or the pitch of the second helical screw thread is shallower towards at least one end of the helical screw compared to the centre of the helical screw. This can be particularly advantageous where the carrier head has a contact member for pushing debris off the roller as this can allow the speed of the contact member to slow down towards the end of the roller, which can improve the ease with which debris can be pushed off the end of the roller.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a wet floor cleaner having a cleaner head in accordance with an example of the invention;

Figure 2 is a schematic view of the inside of the cleaner head in Figure 1, having a roller and a roller cleaning assembly;

Figure 3 is a close up perspective view of the roller and roller cleaning assembly of Figure 2;

Figures 4a to 4c are schematic views of the roller and roller cleaning assembly of Figure 2, when in use;

Figures 5a and 5b are schematic close up views of other examples of the roller and roller cleaning assembly of the cleaner head in Figure 1;

Figures 6a and 6b are schematic close up views of other examples of the roller and roller cleaning assembly of the cleaner head in Figure 1;

Figure 7 is a schematic view of another example of the roller and roller cleaning assembly of the cleaner head in Figure 1.

DETAILED DESCRIPTION

In general terms, embodiments of the invention provide a cleaner head for a hard floor cleaner which has been adapted to automatically remove threadlike debris from the cleaning roller. The cleaner head comprises a roller cleaning assembly which utilises a carrier head mounted on a helical screw so as reciprocate along the length of the roller when the floor cleaner is in use. The carrier head comprises a contact member which acts to push or sweep debris off one or both ends of the roller as the carrier head reciprocates.

To provide context for the invention, Figure 1 shows a wet floor cleaner 2 comprising a main body 4 with a cleaner head 6 attached at its lower end. An elongated handle 8 extends upwardly from the main body 4 and is arranged to allow a user to manoeuvre the wet floor cleaner 2 over a hard floor surface from a standing position. Generally, the cleaner head 6 is adapted to collect debris and moisture from the floor surface as the wet floor cleaner 2 is manoeuvred.

Figure 2 shows the inside of the cleaner head 6 in more detail. The cleaner head 6 comprises a housing (not shown) defining a cavity, or roller cavity, which opens onto the floor surface; and an elongate roller 10 arranged within the cavity to contact the floor surface when the floor cleaner 2 is positioned for use.

The elongate roller 10 is generally cylindrical in shape and extends between two ends 12a and 12b, thereby defining an axis 16, or roller axis, about which the roller 10 can rotate. The roller 10 is mounted within the cavity such that the roller axis 16 is generally parallel to the floor surface and perpendicular to the direction of movement of the cleaner head 6 when the floor cleaner 2 is manoeuvred over the floor surface. As such, in use, the roller 10 rotates against the floor surface and thereby draws threadlike debris 18, such as hair, into the roller cavity where it wraps around the roller 10 as the roller 10 continues to rotate.

The roller 10 comprises a main body made from hard plastic, for example, and an outer surface which comprises a softer material which is particularly adapted for capturing debris and absorbing moisture, such as microfibre or PVA foam.

A motor (not shown) is coupled to one or both ends 12a and 12b of the roller 10 and is arranged to drive the roller 10 to rotate about the roller axis 16. Alternatively, the motor may be positioned within the roller 10. More specifically, when in use, the motor drives the roller 10 in a rolling direction (R) in which the foremost side of the roller 10 rotates
5 downwardly towards the floor surface. In the context of this description, it will be understood that the foremost side of the roller is the portion of the roller 10 which is in front of the roller axis 16 when the cleaner head 6 is pushed over the floor surface in a forward direction away from the user (depicted by arrow A in Figure 1).

10 Also arranged within the housing of the cleaner head 6 is a roller cleaning assembly 20. The roller cleaning assembly 20 comprises a helical screw 22, a guide rod 24, and a carrier head 25 mounted to the helical screw 22 and the guide rod 24.

As shown, the helical screw 22 takes the form of an elongate rod arranged with a
15 longitudinal axis 26, or screw axis, which is disposed from the elongate roller 10 so as to be offset from and parallel to the roller axis 16. A motor (not shown) is arranged to drive the helical screw 22 to rotate about its screw axis 26. The helical screw 22 may be driven by the same motor that drives the roller 10, for example via a gear arrangement or drive belt.

20

The elongate rod of the helical screw 22 comprises a pair of continuous grooves 28a and 28b formed in its surface; a first groove 28a spirals around the rod from one end 30a to the other 30b in a clockwise direction, and a second groove 28b spirals around the rod from the one end 30a to the other 30b in an anticlockwise direction. Both grooves 28a and 28b
25 have the same constant spiral pitch so that they cross at regular intervals along the length of the elongate rod, thereby forming a female double helix screw thread.

In alternative embodiments, the grooves 28a and 28b may be arranged with different spiral pitches so that the carrier head 25 travels along the helical screw 22 in one direction more
30 quickly than in the other. Such an arrangement is particularly advantageous when paired with a contact member 40 having an asymmetric shape (described further below) which sweeps debris when the carrier head 25 travels in one direction but not in the other.

Furthermore, the pitch of each groove 28a, 28b may vary along the length of the elongate rod so that the carrier head 25 travels at varying speed along the length of the helical screw 22. In this way, the carrier head 25 may be slowed or paused at positions on the roller where additional attention may be required. For example, the grooves 28a, 28b may be configured to slow or pause the carrier head 25 at the end(s) 30a, 30b of the roller 10 to allow additional time for the debris 18 to collect in front of the contact member 40 and drop off the end 30a, 30b of the roller 10. Similarly, the grooves 28a, 28b may be configured to slow the carrier head 25 at the centre of the roller 10 to allow a mounted fluid inlet 50 (described further below) to wet the centre portion of the roller more thoroughly.

Figure 3 shows the carrier head 25 in more detail. The carrier head 25 is formed in two halves which are coupled together to form a main body 31. When assembled, the main body 31 comprises a through hole 32 with a male internal thread which corresponds to the female double helix screw thread of the helical screw 22. Thus, when assembled, the thread of the helical screw 22 engages with the internal thread of the carrier head 25 such that carrier head 25 is mounted around the helical screw 22 with the helical screw 22 extending through the through hole 32.

Turning again to Figure 2, the guide rod 24 is a slender rod form with a longitudinal axis 36 arranged parallel to and offset from the longitudinal axes 26, 16 of both the helical screw 22 and the roller 10. The guide rod 24 is substantially the same length as the helical screw 22.

As shown more clearly in Figure 3, the carrier head 25 further comprises a guide aperture 34 arranged to be slidingly mounted around the guide rod 24 when the carrier head 25 is mounted to the helical screw 22. Thus, as the helical screw 22 rotates about the screw axis 26, the engaged carrier head 25 is prevented by the guide rod 24 from also rotating. As a result, the carrier head 25 is instead urged along the double helix screw thread so as to travel from one end 30a of the helical screw 22 to the other 30b. When the carrier head 25 reaches the other end 30b of the helical screw 22, the double helix screw thread urges the carrier head 25 to change direction and travel along the helical screw 22 to return to the

starting end 30a. In this way, and as depicted by arrow B, the carrier head 25 reciprocates along the screw axis 26 of the helical screw 22 as the helical screw 22 rotates.

The roller cleaning assembly 20 further comprises a contact member 40 which extends
5 from the carrier head 25 and is arranged to contact the outer surface of the roller 10 so that, as the roller 10 rotates, the contact member 40 acts to push or sweep debris 18 collected on the outer surface of the roller 10 towards one end 12a, 12b of the roller 10. In the example shown in Figures 2 and 3, the contact member 40 takes the form of a rigid rectangular tab which extends away from the main body 31 of the carrier head 25 so that the most distal
10 surface 42 of the tab is parallel to and contacts the outer surface of the roller 10. As such, the tab defines opposing surfaces 44a and 44b which act to sweep or plough the outer surface of the roller 10 as the carrier head 6 reciprocates along the screw axis 26 of the helical screw 22. The contact member 40 may extend from one or both halves of the main body 31 of the carrier head 25. The most distal surface 42 is generally defined to have a
15 length which is considerably shorter than the length of the roller 10. For example, the distal surface 42 may have a length which is around 2% to 15% of the length of the roller 10. In preferred embodiments, the distal surface 42 has a length of around 2% to 8% of the roller 10. Such a ratio may allow for greater travel along the length of the roller 10, which can aid with debris removal. It may also help reduce power consumption due to decreased
20 interference between the contact member 40 and the roller 10.

As shown in Figures 4a to 4c, with each pass of the carrier head 25, the contact member 40 acts to push threadlike debris 18a which has wrapped around the roller 10 towards the end 12a, 12b of the roller 10 towards which the carrier head 25 is traveling until, eventually,
25 the debris 18 is pushed off the end 12a, 12b of the roller 10 where it may be easily removed from the cleaner head 6.

In more detail, Figures 4a and 4b depict the carrier head 25 moving along the helical screw 22 from end 30a to end 30b. This forward travelling direction is indicated by arrow D in
30 Figure 4a. As the carrier head 25 travels, the forward surface 44b of the contact member 40 pushes the debris 18a together and then along the roller 10 to end 12b. The pass of the carrier head 25 is completed once it reaches the end 30b of the helical screw 22.

Then, the direction of travel of the carrier head 25 reverses so that it returns towards end 30a of the helical screw 22, as indicated by arrow D in Figure 4c. This direction of travel now defines the forward direction of the carrier head 25. Debris 18b which was drawn onto the roller 10 behind the carrier 25 as the carrier head 25 performed the first pass is now in front of the carrier head 25 and in position for the contact member 40 to remove it on the next pass, as shown in Figure 4c. Thus, as the carrier head 25 travels from end 30b to end 30a, the forward surface 44a of the contact member 40 pushes the debris 18b together and along the roller 10 to end 12a of the roller 10.

Figures 5a and 5b show alternative embodiments of the contact member 40. In the embodiment shown in Figure 5a, the contact member 40 has a trapezium shape and comprises opposing surfaces 44a and 44b which extend from the carrier head 25 towards the outer surface of the roller 10 at an oblique angle (α). More specifically, the surface 44b is angled from the carrier head 25 towards the end 30b of the roller 10, while the opposing surface 44a is angled from the carrier head 25 to towards the other end 30a of the roller 10. In the example shown, the trapezium shape of the contact member 40 is symmetric so that the oblique angle (α) of each of the opposing surfaces 44a and 44b is the same. However, in other examples, the trapezium shape may be asymmetric so that the surfaces 44a and 44b contact the outer surface of the roller 10 at different oblique angles.

By virtue of being angled towards the nearest respective end 12a, 12b of the roller 10, each surface 44a, 44b is better able to scoop debris 18 onto the contact member 40 so that it may be more easily pushed to the respective end 30a, 30b of the roller 10.

According to the embodiment shown in Figure 5b, the contact member 40 has the asymmetric shape of a parallelogram and comprises opposing surfaces 44a and 44b which extend from the carrier head 25 towards the outer surface of the roller 10 at an oblique angle (α). More specifically, both surfaces 44a and 44b are angled from the carrier head 25 towards one end 30b of the roller 10. In this way, the surface 44b nearest to the that roller end acts as a pushing surface while the other surface 44a (referred to herein at the rear surface) does not. That is to say, the rear surface 44a is congruent to the forward surface 44b and is spaced from the forward surface 44b to extend from the carrier head 25

to the outer surface of the roller 10. In the example shown, the rear surface 44a is parallel to the forward surface 44b, but this need not be the case.

In more detail, when the carrier head 25 travels in the forward direction from end 30a to 30b, indicated arrow D', the forward surface 44a serves to push the debris 18 together and then along the roller 10 to end 12b, as previously described. Then, when the carrier head 25 travels in the reverse direction from end 30b to 30a, indicated by arrow D'', the rear surface 44b passes over any debris 18 remaining on the outer surface of the roller 10 without disrupting its position. Then, when the carrier head 25 passes along the helical screw 22 once again in the forward direction D', the forward surface 44b pushes the remaining debris 18 toward end 12b of the roller. This configuration of contact member 40 ensures that debris 18 is continuously pushed to the same end 12b of the roller. As such, debris 18 removed from the roller 10 will collect at one end 12b only, thus allowing for easier removal from the cleaner head 6.

Figure 6a shows another embodiment of a roller cleaning assembly 20. In this embodiment, a plurality of rigid contact members 40 extend from the carrier head 25 in a series to form a comb 46. In the example shown, the comb 46 comprises a forward surface 44a and a rear surface 44b which are arranged in the same manner as described with reference to Figure 5b. In the example shown, each of the contact members 40 are identical and are spaced apart in the longitudinal direction at regular intervals. The contact members 40 are angled from the carrier head 25 towards one end 30b of the roller 10.

Figure 6b shows another embodiment of a roller cleaning assembly 20 comprising a plurality of contact members 40. In this example, the plurality of contact members 40 are non-rigid and here are in the form of bristles packed together to form a brush 48 having a forward surface 44a and a rear surface 44b which are arranged in the same manner as described above with reference to Figure 5b. The bristles are angled from the carrier head 25 towards one end 30b of the roller 10. In a similar embodiment, the contact members may be in the form of a plurality of discrete tufts of bristles.

Figure 7 shows a modified version of the roller cleaning assembly 20 described above. Although the example shown has a contact member 40 as described above with reference to Figure 2, 3 and 4a to 4c, it will be understood that the contact member 40 may take any of the forms described above. In some examples, there is no contact member 40 present at all. The roller cleaning assembly 20 further comprises a fluid inlet 50 which is attached to the carrier head 25 and arranged to deliver fluid to the roller cavity to wet the roller 10. More specifically, the fluid inlet 50 is arranged to wet the roller 10 directly in front of the carrier head 25. Thus, as the roller 10 rotates, it applies clean wetting fluid to the floor surface which helps to clean stains and residue from the floor. As the fluid inlet 50 is attached to the carrier head 25, wetting fluid is distributed along the length of the roller as the carrier 25 reciprocates so that all of the roller 10 is wetted.

The roller cleaning assembly 20 further comprises a mangle, or a pressure member 52, which extends from the carrier head 25 towards the roller and is arranged to compress the outer surface of the roller 10 as the roller rotates. In the example shown, the pressure member 52 is arranged to extend towards the outer surface of the roller behind the fluid inlet 50 with reference to the rolling direction (R) of the roller 10. Thus, as the roller 10 rotates, the pressure member 52 serves to squeeze the outer surface of the roller 10 so as to remove excess fluid therefrom. As the pressure member 52 is positioned behind the fluid inlet 50, relative to the direction of the roller's rotation (R), the outer surface of the roller 10 is first 'dried' by the pressure member 52 and then re-wetted by the fluid inlet 50, as the roller 10 rotates. In this way, the roller 10 is continuously wetted with clean fluid while dirty fluid is continuously removed.

In other embodiments, the pressure member 52 may be positioned in front of the fluid inlet 50, relative to the direction of the roller's rotation (R) so that the excess soiled cleaning fluid on the outer surface of the roller 10 is diluted with fresh cleaning fluid before being squeezed from the roller 10 by the pressure member 52. Such an arrangement can lead to improved removal of soil and dirt from the roller 10.

As the pressure member 52 is attached to the carrier head 25, the simultaneous wetting and drying action is performed along the entire length of the roller 10 as the carrier head 25

reciprocates. The pressure member 52 may be formed integrally with the carrier head 25 to achieve the same effect.

The pressure member 52 is arranged in front of the contact member 40 with reference to the rolling direction (R) so that, in use, the contact member 40 operates on a wet, uncompressed portion of the roller 10. This makes it easier for the contact member 40 to collect debris 18 from the roller 10 as described above.

In more detail, the pressure member 52 takes the form of a rectangular plate and comprises a contact edge 54 which is parallel to the roller axis. The pressure member 52 is made from a rigid material such as a hard plastic, although other materials would also be appropriate. In this way, the contact edge 54 of the pressure member 52 presses into the outer surface of the roller 10 to perform a squeegee-like action which forces moisture from the roller 20 where it can be collected in an underlying sump or tank (not shown). The corners 56a, 56b of the pressure member 52 are radiused to prevent build up of debris on the pressure member 52 as the carrier head 25 reciprocates along the helical screw 22.

In some embodiments, the roller cleaning assembly 20 may comprise the fluid inlet 50 mounted to the carrier head 25, but no contact member 40 or pressure member 52. Accordingly, such a roller cleaning assembly 20 is arranged to only provide hydration to the roller 10, without also providing means for removing threadlike debris or moisture from the roller.

The roller cleaning assembly 20 may be employed in a cleaner head 6 which comprises a pair of rollers 10 arranged next to each other, for example in a forward/backwards direction (i.e. with long sides of the rollers adjacent one another, rather than the rollers being end-to-end). In such embodiments, the roller cleaning assembly 20 comprises a common helical screw 22, guide rod 24 and carrier head 25 which is configured to reciprocate along the helical screw 22 as described above.

However, so as to remove debris from both rollers 10, the roller cleaning assembly 20 comprises two contact members 40, as shown in Figure 3. A first contact member 40 is

arranged to contact the outer surface of the first roller 10, and a second contact member 40' is arranged to contact the outer surface of the second roller (not shown). Furthermore, so as to wet and dry both rollers, the roller cleaning assembly 20 may comprise two fluid inlets 50 and two corresponding pressure members 52: the first of each being arranged to
5 wet and dry the first roller 10 respectively, and the second of each being arranged to wet and dry the second roller 10 respectively.

The common helical screw 22 may be arranged between the two rollers 10 so that the roller cleaning assembly 20 is symmetrical about the screw axis 26. Alternatively, the helical
10 screw 22 may be arranged closer to one roller 10 such that the roller cleaning assembly 20 is asymmetric.

In both single and double roller arrangements, the roller(s) 10 may be arranged to be cantilevered within the roller cavity so that one end 30b of the roller(s) 10 is free. Such an
15 arrangement facilitates easier removal of threadlike debris from the free end 30b. Such cantilevered rollers 10 also provide improved edge to edge cleaning of the floor surface.

CLAIMS

1. A cleaner head for a hard floor cleaner, the cleaner head comprising:

an elongate roller configured to rotate about a roller axis;

5 a helical screw configured to rotate about a screw axis, wherein the screw axis is offset from the roller axis ;

a carrier head mounted to the helical screw and configured to travel along the screw axis as the helical screw rotates; and

10 a contact member extending from the carrier head and arranged to contact an outer surface of the roller to push debris located on the outer surface towards an end of the roller.

2. A cleaner head according to claim 1, wherein the carrier head is configured to reciprocate along the screw axis as the helical screw rotates.

15 3. A cleaner head according to claim 1 or 2, wherein a forward direction is defined along the screw axis towards the end of the roller, and wherein the contact member defines a forward surface which extends towards the outer surface of the roller at an oblique angle.

4. A cleaner head according to claim 3, wherein the forward surface is angled from
20 the carrier head towards the end of the roller.

5. A cleaner head according to claims 3 or 4, wherein the contact member defines a rear surface congruent to the forward surface, wherein the rear surface is spaced from the forward surface and extends towards the outer surface of the roller.

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6. A cleaner head according to claim 5, wherein the rear surface is parallel to the forward surface.

7. A cleaner head according to claim 6, comprising a plurality of contact members.

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8. A cleaner head according to any preceding claim, wherein the or each contact member is rigid.

9. A cleaner head according to any preceding claim, wherein the or each contact member is formed integrally with the carrier head.

10. A cleaner head according to any of claims 1 to 7, wherein the contact member takes the form of a brush.

11. A cleaner head according to any preceding claim, wherein the roller comprises an outer layer of compliant material for contacting a surface to be cleaned.

10 12. A cleaner head according to claim 11, wherein the outer layer is an absorbent material for applying cleaning fluid to a surface to be cleaned.

13. A cleaner head according to any preceding claim, wherein the outer surface of the roller comprises a microfibre material or a foam, preferably a PVA foam.

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14. A cleaner head according to any preceding claim, further comprising a pressure member extending from the carrier head and arranged to compress the outer surface of the roller as the roller rotates in use.

20 15. A cleaner head according to any preceding claim, wherein the helical screw comprises a first helical screw thread arranged to engage with the carrier head to cause the carrier head to travel along the screw axis as the helical screw rotates.

16. A cleaner head according to claim 15, wherein the helical screw further comprises a second helical screw thread having an opposite rotation direction to the first helical screw thread, preferably wherein the pitch of the second helical screw thread is different from the pitch of the first helical screw thread.

17. A cleaner head according to claim 15 or 16, wherein the pitch of the first helical screw thread and/or the pitch of the second helical screw thread varies along the length of the helical screw.

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18. A cleaner head according to claim 17, wherein the pitch of the first helical screw thread and/or the pitch of the second helical screw thread is shallower towards at least one end of the helical screw compared to the centre of the helical screw.

5 19. A hard floor cleaner comprising the cleaner head of any preceding claim.

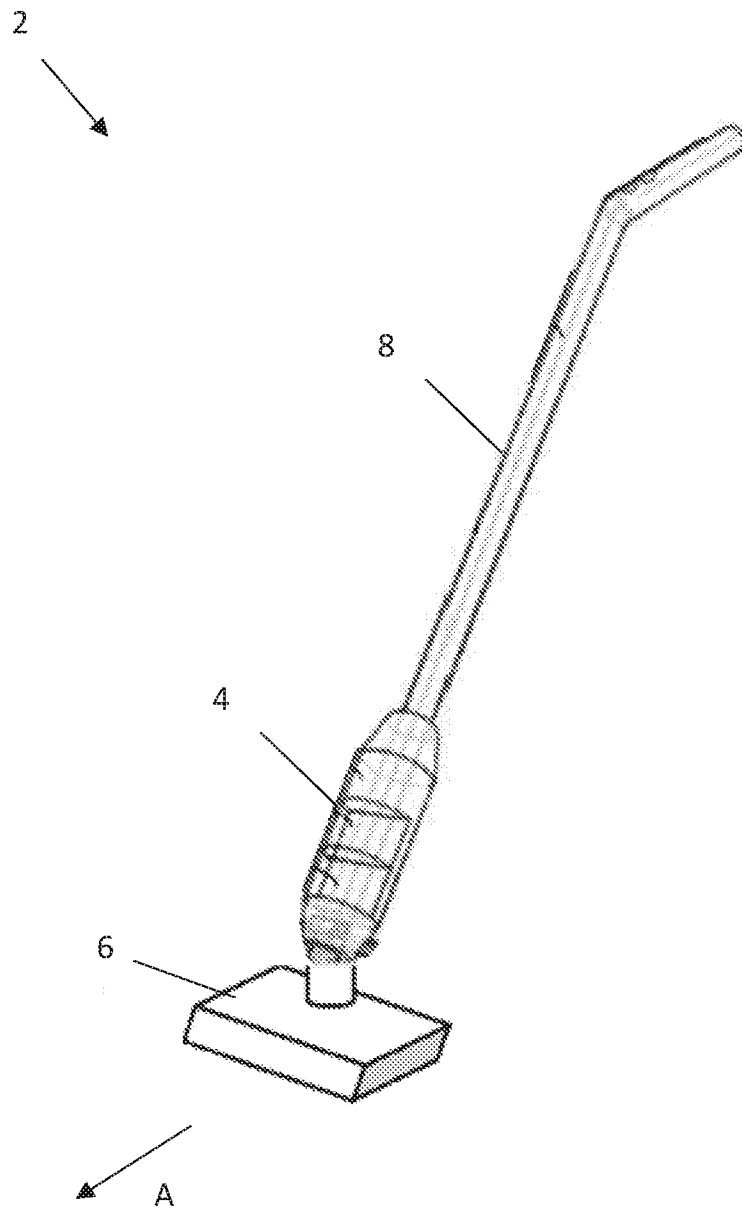


Fig. 1

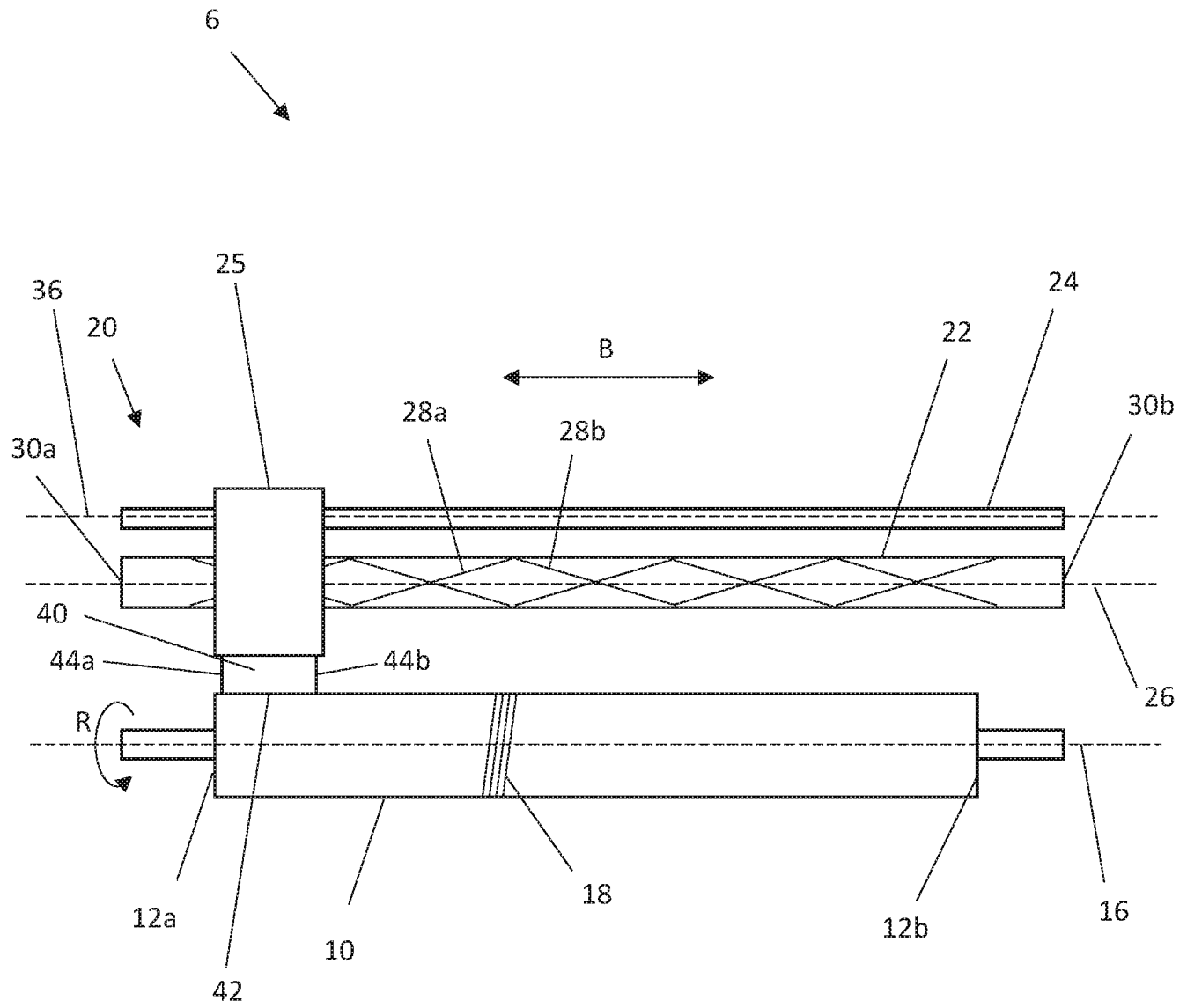


Fig. 2

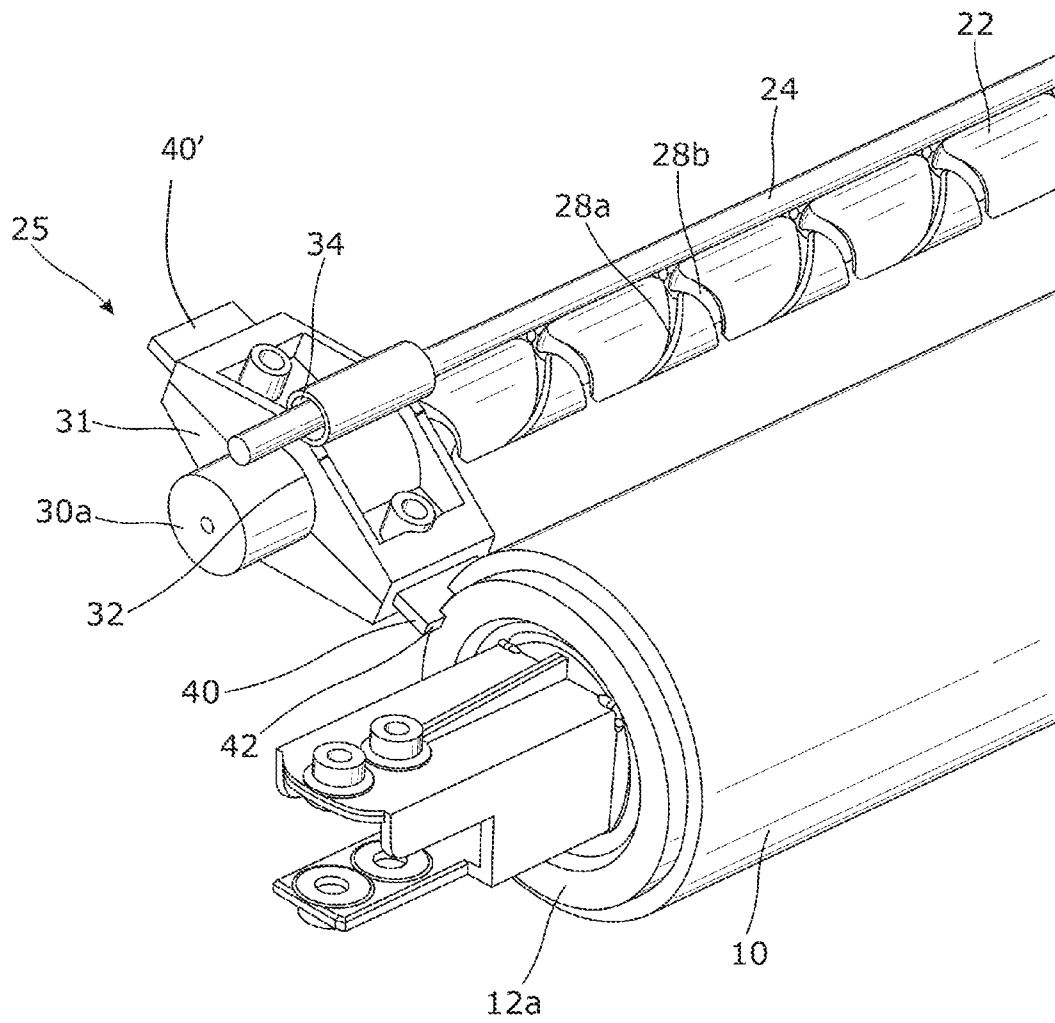


Fig. 3

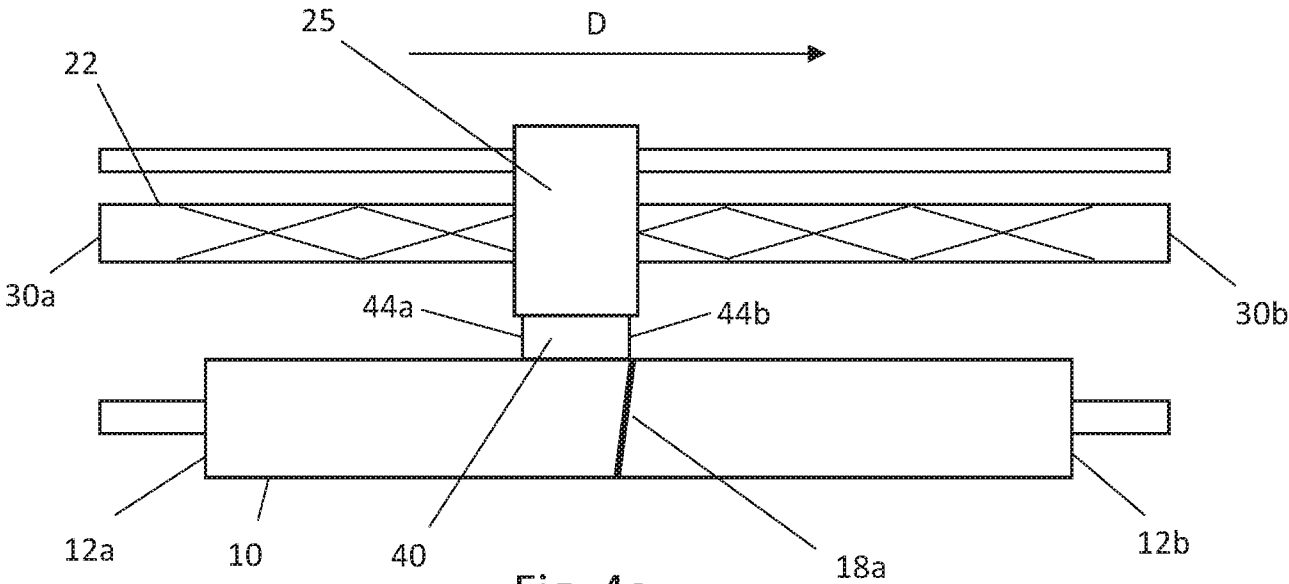


Fig. 4a

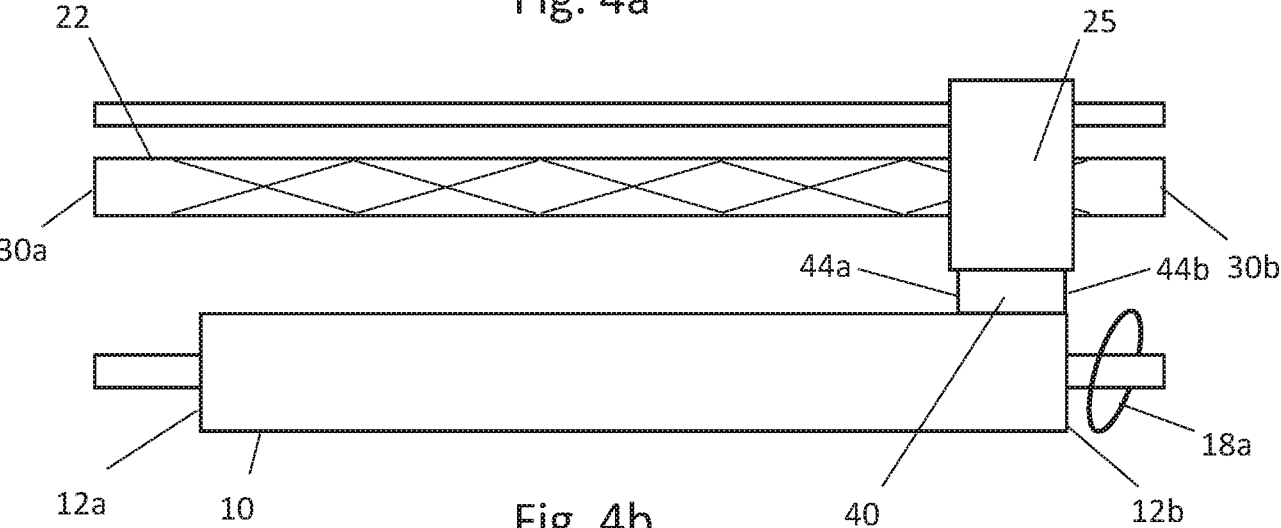


Fig. 4b

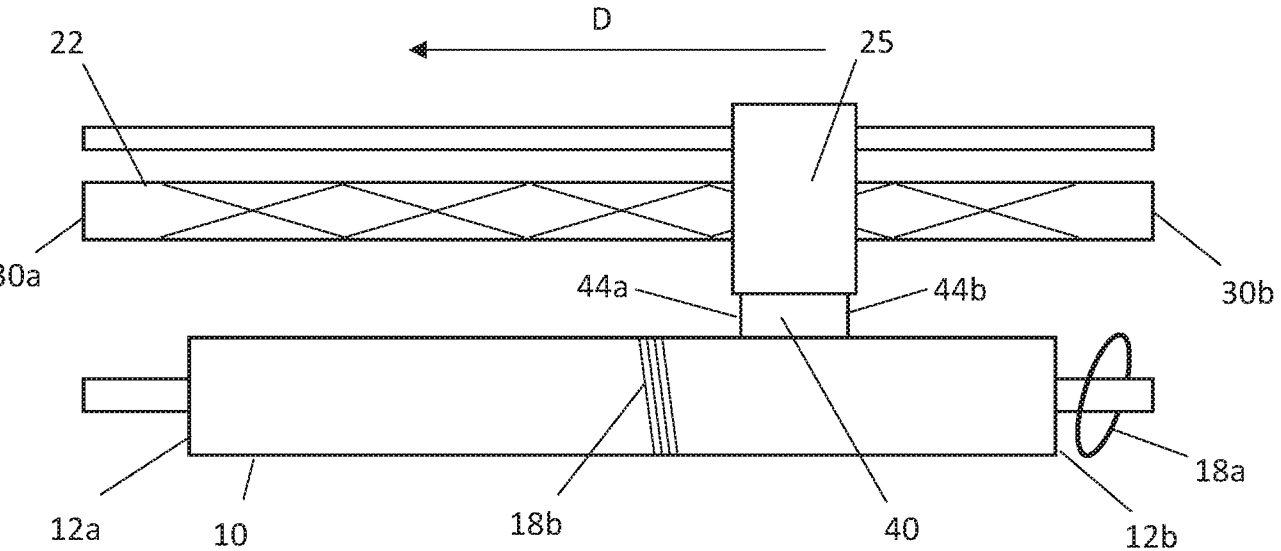


Fig. 4c

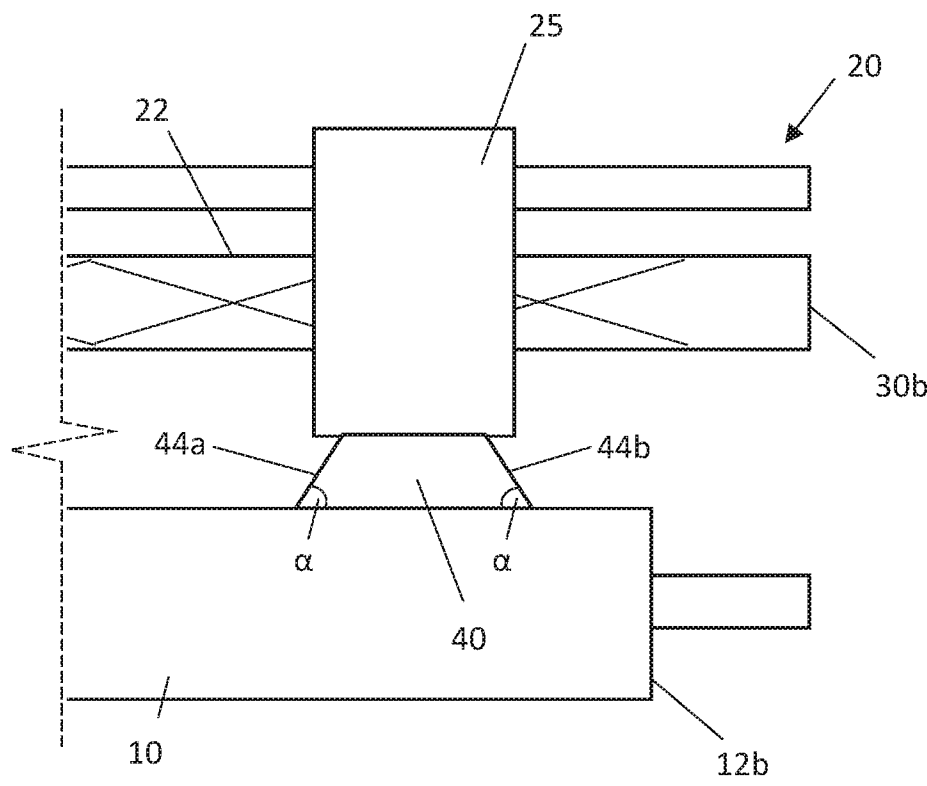


Fig. 5a

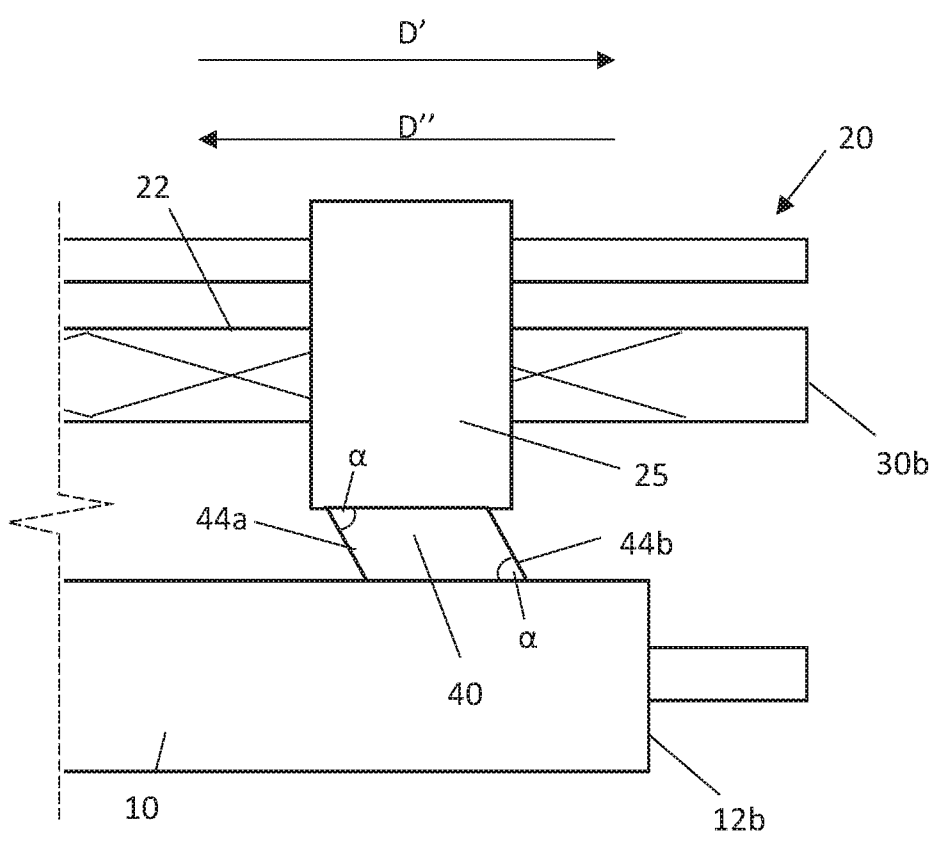


Fig. 5b

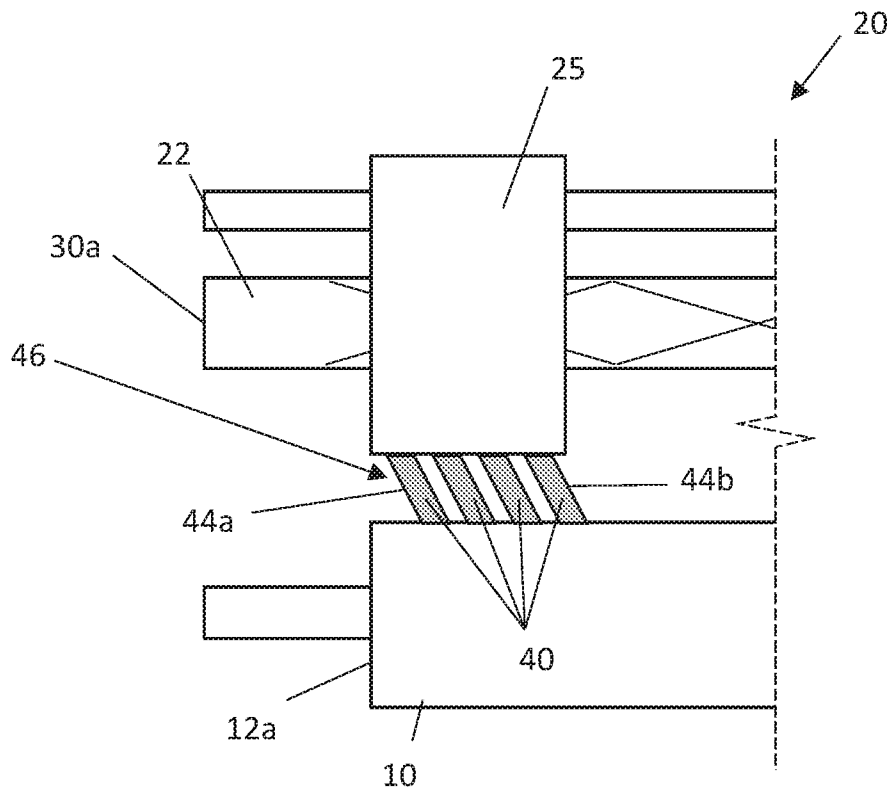


Fig. 6a

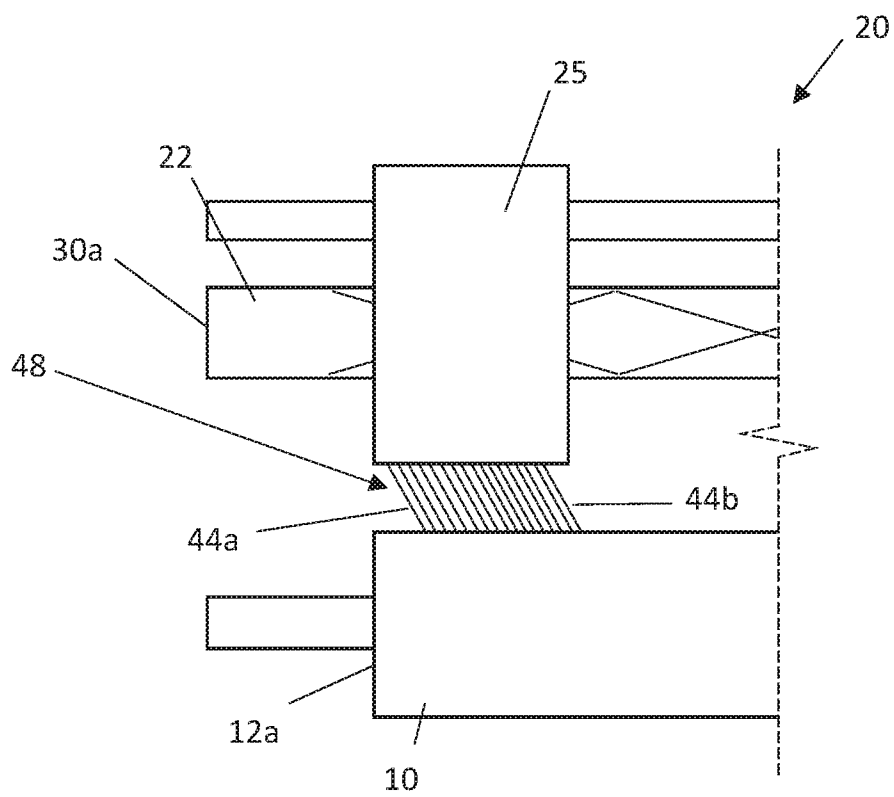


Fig. 6b

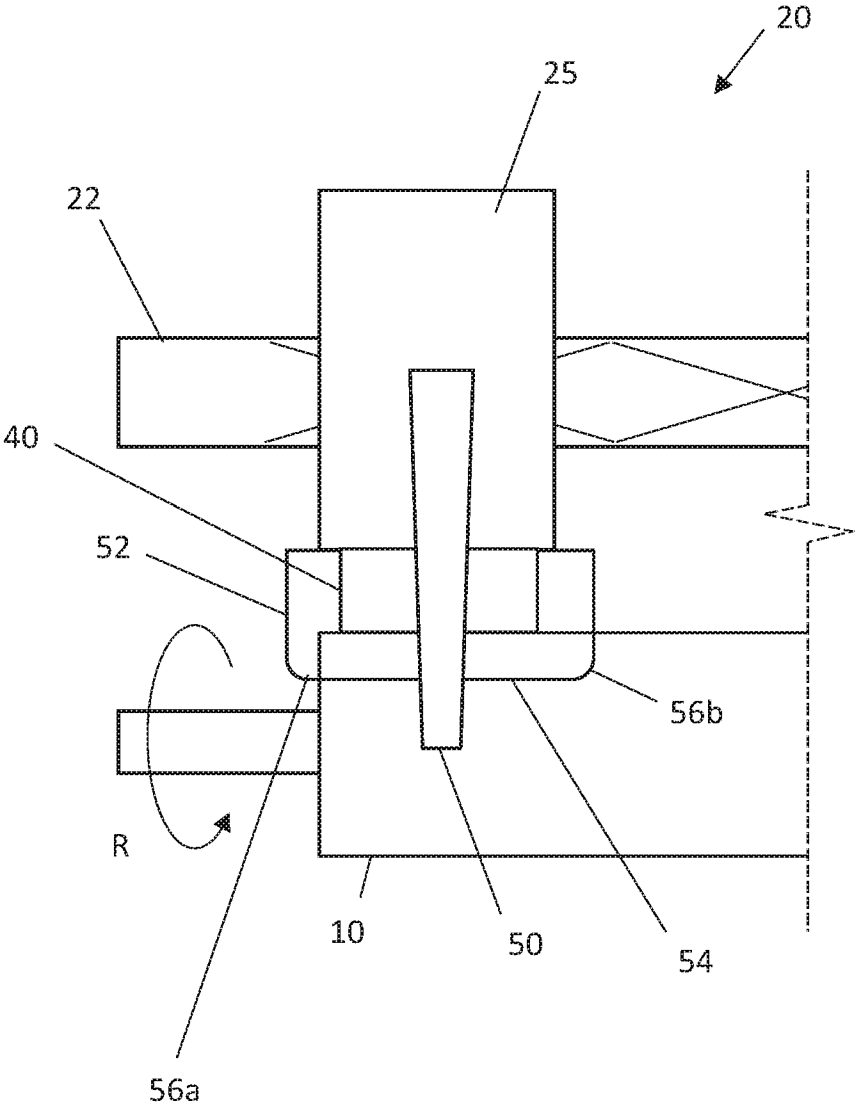


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2024/052070

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47L11/282 A47L11/40

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	paragraphs [0030] - [0033]; claims; figures 5, 6	17, 18
X	CN 108 836 203 A (DONGGUAN ULEGEND SMART APPLIANCES CO LTD) 20 November 2018 (2018-11-20)	1-9, 14-16, 19
A	paragraphs [0020] - [0025]; claims; figures	17, 18
X	CN 214 906 440 U (PROCENIC POLYTRON TECH INC) 30 November 2021 (2021-11-30)	1, 2, 15, 16
	paragraphs [0044] - [0092]; figures	
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Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

6 May 2024

Date of mailing of the international search report

15/05/2024

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2024/052070

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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