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(72) Inventors:
• **AL-SHORACHI, Albert**
5656 AE Eindhoven (NL)
• **ZIJLSTRA, Aaldert Geert**
5656 AE Eindhoven (NL)
• **VAN DER KOOL, Johannes Tseard**
5656 AE Eindhoven (NL)

(71) Applicant: **Koninklijke Philips N.V.**
5656 AG Eindhoven (NL)

(74) Representative: **Kapoor, Pavan Puneet**
Philips Domestic Appliances
IP Department
High Tech Campus 42
5656 AE Eindhoven (NL)

(54) **WET CLEANING APPARATUS**

(57) Provided is a wet cleaning apparatus (10), such as a wet vacuum cleaner. The wet cleaning apparatus comprises a cleaner head (12) for cleaning a surface to be cleaned. The cleaner head has a dirt inlet (11). A motor (14) and fan (16) deliver suction to the dirt inlet. The wet cleaning apparatus includes a separator unit (18) for separating water from a flow of air generated by the suction. The separated water is collected in a container (19). The container has a top (19A) and a bottom (19B), and a side portion (19D) extending there between. The separated air is passed out of the container towards the motor and fan via an air passage (22). The air passage is spatially separated from the bottom of the container. The wet cleaning apparatus has a handle (24) for grasping by a user of the apparatus. A user pushing the handle causes at least the cleaner head and the container to move forward, and the user pulling the handle causes said at least the cleaner head and the container to move backwards towards the user. The water collected in the container sloshes against the side portion of the container when the user is pushing the cleaner head and the container forward. A water directing member (26) sealingly adjoins the side portion, and protrudes into the container backwards from the side portion, thereby to inhibit the water sloshing against the side portion from continuing to move along the side portion towards the air passage.

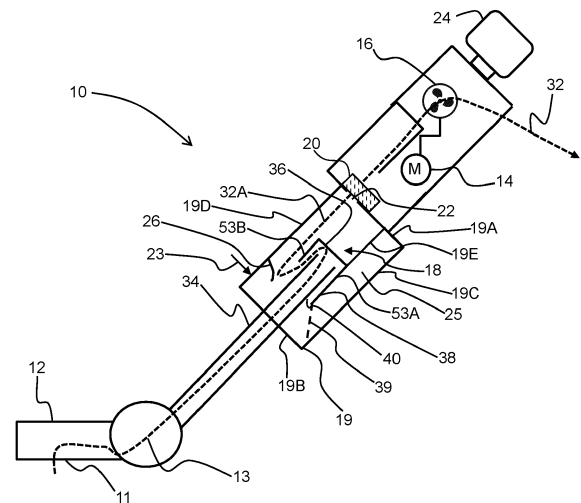


FIG. 1

Description

FIELD OF THE INVENTION

[0001] This invention relates to wet cleaning apparatuses, and in particular wet vacuum cleaners.

BACKGROUND OF THE INVENTION

[0002] Traditionally, hard floor cleaning has involved first vacuuming the floor, followed by mopping it. Vacuuming removes the fine dust and coarse dirt, while mopping removes any very fine dust and stains.

[0003] There are now many available appliances on the market that claim to vacuum and mop in one go, and this is what is referred to by a "wet vacuum cleaner". Many of these appliances have a vacuum nozzle for picking up the coarse dirt by means of an airflow and a (wet) cloth or brush for removing the stains. These wet cloths or brushes can be pre-wetted or can be wetted by the consumer but also in some cases they can be wetted by the appliance (by means of a liquid but also by means of steam).

[0004] The wet vacuum cleaner then needs to be able to collect moist dirt from the floor and transport it to the dirt container. This is achieved using the flow generated by a motor and fan arrangement. The moist dirt and liquid in the form of droplets needs to be separated from the airflow. The moist dirt and liquid enters the dirt container whereas the remaining airflow passes through the fan and any post-filtering units, and exits the appliance.

[0005] It is known to use labyrinth-type, filter-type or cyclone-type separator units to separate liquid and moist dirt from the airflow.

[0006] It remains a challenge to improve the separation performance of such separator units, particularly during back and forth movement of the wet vacuum cleaner during cleaning. Such movement risks causing liquid collected in the container to be re-entrained in the separated airflow, such that the liquid is passed downstream towards the motor. This risks damage to the motor, and thus may compromise the reliability of the wet vacuum cleaner.

SUMMARY OF THE INVENTION

[0007] The invention is defined by the claims.

[0008] Provided is a wet cleaning apparatus comprising: a cleaner head for cleaning a surface to be cleaned, the cleaner head having a dirt inlet; a motor and fan for delivering suction to the dirt inlet; a separator unit for separating water from a flow of air generated by the suction; a container for collecting the separated water, the container having a top and a bottom, and a side portion between the top and the bottom; an air passage provided in the container for passing the air separated from the water towards the motor and fan, the air passage being spatially separated from the bottom of the container; a

handle for grasping by a user of the apparatus, wherein the handle, the cleaner head, and the container are arranged such that a user pushing the handle causes at least the cleaner head and the container to move forward, and the user pulling the handle causes said at least the cleaner head and the container to move backwards towards the user, the water collected in the container sloshing against the side portion of the container during the pushing; an optional pivot point between the cleaner head and the container, wherein the pivot point is arranged to permit tilting of the container towards the user grasping the handle while the dirt inlet continues to provide suction to the surface to be cleaned; and a water directing member sealingly adjoining the side portion, the water directing member protruding backwards from the side portion, thereby to inhibit the water sloshing against the side portion from continuing to move along the side portion towards the air passage.

[0009] Pushing the container, together with the cleaner head, in the forward direction can result in a wave moving towards the side portion of the container at the end of the movement. Such waves may generate water droplets that become airborne proximal to the separated airflow path between the separator unit and the air passage. This may compromise reliable operation of the wet cleaning apparatus because the thus formed water droplets risk being drawn towards the air passage and downstream towards the motor.

[0010] By the water directing member sealingly adjoining the side portion, and protruding into the container backwards from the side portion, the water directing member inhibits the water sloshing against the side portion from continuing to move along the side portion towards the air passage. The water directing member may assist to dissipate the energy of such waves, and thereby prevent formed water droplets from contacting the flow of separated air.

[0011] A longest lateral extension of the water directing member from the side portion measured normal to the side portion may be at least 5 mm. Such a minimum lateral extension has been found to be sufficient for effective inhibition of the progress of the water sloshing against the side portion towards the air passage.

[0012] Preferably the longest lateral extension is 10 to 50 mm, such as about 20 mm. Alternatively or additionally, the longest lateral extension may be up to 75% of an interior width of the container. This balances the requirement for inhibiting the progress of water along the side portion towards the air passage with the requirement to provide sufficient space within the container for other components of the wet cleaning apparatus. The upper limit of 50 mm and/or up to 75% of the interior width of the container may also assist to minimise the possibility that the water directing member impedes the passage of the separated water towards the bottom of the container.

[0013] The water directing member may comprise a peripheral shut-off area or a sealing portion for sealingly adjoining the water directing member to the side portion.

[0014] A thickness of the water directing member may increase towards a region of the side portion to which the peripheral shut-off area or sealing portion is sealingly adjoined. This may assist the peripheral shut-off area or sealing portion to sealingly adjoin the water directing member to the side portion of the container. This, in turn, may assist the water directing member to inhibit the progress of the water sloshing against the side portion towards the air passage.

[0015] The water directing member may comprise a surface which faces away from the air passage. This surface may contact the water sloshing against the side portion of the container.

[0016] The water directing member may, for example, comprise a curved surface which curves from the surface towards the peripheral shut-off area or sealing portion. The curved surface may assist to guide the water on the water directing member towards the side portion and the bottom of the container.

[0017] The sealing portion may be formed from an elastomeric material. For example, the elastomeric material may comprise silicone rubber.

[0018] The water directing member may comprise a first surface and/or a second surface for contacting the water sloshing against the side portion.

[0019] In an embodiment, the first surface extends from the side portion and the second surface extends from the first surface.

[0020] The first surface may extend normal to the side portion. Alternatively, the first surface may incline towards the top of the container.

[0021] The second surface may decline towards the bottom of the container such as to guide water thereon away from the air passage.

[0022] Alternatively, when the first surface inclines towards the top of the container, the second surface may extend in a direction which is normal to the side portion.

[0023] More generally, a declining second surface extending from the first surface may reduce the risk that the water running off the water directing member impacts, for instance, a tube delivering airflow to the separator unit. Thus, the declining second surface may reduce the risk of water droplets being formed which may be re-entrained in the separated airflow.

[0024] In an embodiment, the water directing member comprises the first surface and the second surface, and the second surface curves from the first surface towards the bottom of the container and/or towards the side portion. This may assist the water directing member to direct the water sloshing against the side portion away from the air passage.

[0025] The water directing member may be detachable from the side portion. This may facilitate cleaning of the container. Alternatively, the water directing member may be permanently affixed to the side portion.

[0026] An inner surface of the side portion may be arcuate such that the inner surface curves outwardly in the forward direction. This arcuate inner surface may act as

a wave breaker to assist in dissipating the energy of a wave of water moving towards the side portion during pushing of the container and the cleaner head in the forward direction.

[0027] The wet cleaning apparatus may comprise an internal wall extending from the top towards the bottom of the container. A space may thus be defined between the container and the internal wall; water collected at the bottom of container being receivable in the space when the container is orientated such that the collected water moves from the bottom towards the top of the container. The internal wall may be arranged to prevent water received in the space from passing into the air passage.

[0028] Thus, the internal wall assists to protect the motor from being damaged by ingress of water into the air passage, particularly when the wet cleaning apparatus is tilted for cleaning underneath furniture. Moreover, the internal wall may assist to inhibit sloshing-related ingress of water into the air passage resulting from pulling of the container and the cleaner head in the backwards direction.

[0029] The internal wall may sealingly adjoin to the container. The internal wall may be detachable from the container or the internal wall and the container may be integrally formed.

[0030] The internal wall may comprise a first shut-off area which adjoins the top of the container. Alternatively or additionally, the internal wall comprises second shut-off areas, each second shut-off area adjoining a respective side part of the container.

[0031] The shut-off areas may be formed of the same material as the remainder of the internal wall, e.g. an engineering thermoplastic, such as polypropylene.

[0032] The shut-off areas assist to sealingly adjoin the internal wall to the container. This, in turn, assists the internal wall to prevent water received in the space from entering the air passage. Moreover, the shut-off areas may, in certain examples, facilitate detachment of the internal wall from the container.

[0033] In an embodiment, the thickness of the internal wall increases towards one or more, e.g. each, of the first and second shut-off areas. This may assist the internal wall to sealingly adjoin the container, and thus effectively block water within the space from passing towards the air passage.

[0034] The separator unit and the water directing member may be included in a detachable unit. The detachable unit may be detachable from the container. Detachment of the detachable unit may facilitate cleaning inside the container.

[0035] When the wet cleaning apparatus also includes the internal wall, the internal wall may also be included in the detachable unit. Detachment of the internal wall, together with the separator unit and the water directing member, may facilitate cleaning of the container, particularly in the space between the container and the internal wall.

[0036] The separator unit may comprise at least one

selected from a labyrinth-type separator unit, a filter-type separator unit, and a cyclone-type separator unit.

[0037] The wet cleaning apparatus may comprise a tube for delivering the airflow to the separator unit.

[0038] In an embodiment, the tube extends in a central region of the container towards the cup. Thus, the tube may divide the water moving towards the side portion when the container is being pushed, together with the cleaner head, in the forward direction away from the user grasping the handle. Dividing the collected water in this manner assists to dissipate the energy of a wave of water moving towards the side portion during pushing in the forward direction.

[0039] This may, for example, be assisted by the above-described arcuate inner surface of the side portion. The divided flows may be guided towards each other around the arcuate inner surface, and may collide with each other in a horizontal plane of the container. Such horizontal collision of the flows may assist to minimise the movement of the water vertically towards the air passage.

[0040] Alternatively or additionally, the separator unit may comprise a cup which receives an end of the tube. The cup causes the direction of flow to change such that water entrained in the air drawn from the dirt inlet is flung against the interior surface of the cup, and thereby separated from the flow of air. This "tube-in-cup" design may be regarded as an example of a labyrinth-type separator unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] Examples of the invention will now be described in detail with reference to the accompanying drawings, in which:

FIG. 1 schematically depicts a wet cleaning apparatus according to an example;

FIG. 2 schematically depicts movement of water in a container of a wet cleaning apparatus upon tilting of the container;

FIG. 3 schematically depicts a container, tilted similarly to the wet cleaning apparatus shown in FIG. 2, having an internal wall;

FIG. 4 schematically depicts movement of water in the container upon tilting of the container away from the orientation shown in FIG. 3;

FIG. 5 schematically depicts movement of water in a container of a wet cleaning apparatus having a water directing member adjoining a side portion of the container;

FIG. 6 provides views of an interior part of an exemplary wet cleaning apparatus;

FIG. 7 depicts part of a wet cleaning apparatus according to an example;

FIG. 8 provides a plan view of a container of an exemplary wet cleaning apparatus showing movement of water in the container;

FIG. 9 provides a plan view of a container of another exemplary wet cleaning apparatus showing movement of water in the container;

FIG. 10A-10E schematically depict various exemplary water directing members;

FIG. 11 provides a perspective view of a water directing member according to another example;

FIG. 12 shows part of a wet cleaning apparatus incorporating the water directing member shown in FIG. 11;

FIG. 13 shows part of a wet cleaning apparatus according to an example;

FIG. 14 shows a cross-sectional view of part of an exemplary wet cleaning apparatus including a separator unit;

FIG. 15 shows a perspective view of the part shown in FIG. 14 assembled within a container of a wet cleaning apparatus;

FIG. 16 shows a cross-sectional view of part of another exemplary wet cleaning apparatus including a separator unit;

FIG. 17 schematically depicts a wet cleaning apparatus according to an example;

FIG. 18 provides a perspective view of the separator unit included in the wet cleaning apparatus shown in FIG. 17, with an inset which provides an enlarged view of the rim of an outlet member included in the separator unit;

FIG. 19 provides a cross-sectional view of part of a wet cleaning apparatus including a separator unit according to an example; and

FIG. 20 shows a wet cleaning apparatus according to an example.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0042] The invention will be described with reference to the Figures.

[0043] It should be understood that the detailed description and specific examples, while indicating exemplary embodiments of the apparatus, systems and methods, are intended for purposes of illustration only and are not intended to limit the scope of the invention. These and other features, aspects, and advantages of the apparatus, systems and methods of the present invention will become better understood from the following description, appended claims, and accompanying drawings. It should be understood that the Figures are merely schematic and are not drawn to scale. It should also be understood that the same reference numerals are used throughout the Figures to indicate the same or similar parts.

[0044] Provided is a wet cleaning apparatus, such as a wet vacuum cleaner. The wet cleaning apparatus comprises a cleaner head for cleaning a surface to be cleaned. The cleaner head has a dirt inlet. A motor and fan deliver suction to the dirt inlet. The wet cleaning apparatus includes a separator unit for separating water

from a flow of air generated by the suction. The separated water is collected in a container. The container has a top and a bottom, and a side portion extending therebetween. The separated air is passed out of the container towards the motor and fan via an air passage. The air passage is spatially separated from the bottom of the container. The wet cleaning apparatus has a handle for grasping by a user of the apparatus. A user pushing the handle causes at least the cleaner head and the container to move forward, and the user pulling the handle causes said at least the cleaner head and the container to move backwards towards the user. The water collected in the container sloshes against the side portion of the container when the user is pushing the cleaner head and the container forward. A water directing member sealingly adjoins the side portion, and protrudes into the container backwards from the side portion, thereby to inhibit the water sloshing against the side portion from continuing to move along the side portion towards the air passage.

[0045] When the wet cleaning apparatus is pushed forward and pulled backward the relatively high velocities of the water collected in the container can result in relatively large waves being generated at the end of the respective pushing/pulling movement. Water "sloshing" results from relatively high dynamic flows being generated during back and forth movement of the wet cleaning apparatus. Because of the relatively high velocities, such waves may create new droplets that become airborne, e.g. at a position proximal to the separated airflow path between the separator unit and the air passage. This may compromise reliable operation of the wet cleaning apparatus because the thus formed water droplets risk being drawn towards the air passage and downstream towards the motor.

[0046] By the water directing member sealingly adjoining the side portion, and protruding into the container backwards from the side portion, the water directing member inhibits the water sloshing against the side portion from continuing to move along the side portion towards the air passage. The water directing member may assist to dissipate the energy of the wave generated during pushing of the container and the cleaner head in the forwards direction by the user pushing the handle. This assists to prevent the formed water droplets from contacting the flow of separated air.

[0047] FIG. 1 shows a wet vacuum cleaner 10. The vacuum cleaner 10 comprises a dirt inlet 11 through which water and/or dirt particles, e.g. moist dirt particles, and air are sucked into the wet vacuum cleaner 10. As shown in FIG. 1, the dirt inlet 11 is provided in a cleaner head 12.

[0048] The wet cleaning apparatus 10 shown in FIG. 1 is a stick vacuum cleaner so that in use the vacuum cleaner head 12 forms the only contact with the surface to be vacuumed. Of course, it may be an upright vacuum cleaner or a canister vacuum cleaner. The present disclosure relates to design features which may be applied to any wet cleaning apparatus 10, and any wet vacuum

cleaner 10.

[0049] A pivot point 13 is, in the example shown in FIG. 1, provided to enable tilting of the wet vacuum cleaner 10 while the dirt inlet 11 in the cleaner head 12 remains facing the surface to be cleaned. The pivot point 13 enables the wet vacuum cleaner 10 to be tilted in order to, for instance, facilitating cleaning underneath furniture.

[0050] The range of tilting provided by the pivot point may, for instance, be up to 90°. A 0° tilt may be regarded as an upright orientation, and a 90° tilt may be regarded as a horizontal, i.e. flat, orientation of the wet cleaning apparatus 10. Tilting towards or to the horizontal orientation may permit cleaning underneath furniture.

[0051] The wet vacuum cleaner 10 comprises a motor 14 and a fan 16 for delivering suction to the dirt inlet 11. The motor 14 and fan 16 may, for instance, be described more generally as an airflow generator. Any suitable fan 16, e.g. impeller, may be used to deliver suction to the dirt inlet 11.

[0052] The motor 14, for example, comprises a bypass motor 14. This type of motor 14 can tolerate water content in the airflow, because the drawn in airflow is not used for motor cooling and is isolated from the motor parts. Instead, ambient air is drawn into the motor 14 for cooling purposes.

[0053] The wet cleaning apparatus 10 also includes a separator unit 18 for separating water from a flow of air generated by the suction. In other words, the separator unit 18 is provided for separating liquid and particles from the flow generated by the suction generated by the motor 14 and fan 16.

[0054] Any suitable design of separator unit 18 may be considered, provided that the separator unit 18 is capable of separating water from the flow of air. In an embodiment, the separator unit 18 comprises at least one selected from a labyrinth-type separator unit, a filter-type separator unit, and a cyclone-type separator unit.

[0055] The separator unit 18 may be regarded as being part of a wet dirt management system, which dirt management system may include additional filters. The dirt management system has a container 19 for collecting the separated moisture and dirt. An outlet filter 20 may, for example, be provided between the outlet flow of the separator unit 18 and the motor 14 and fan 16, as shown.

[0056] More generally, the maximum capacity of the container 19 for the separated water may be at least 100 mL so that the user is permitted to perform wet cleaning with minimal interruptions associated with emptying the container 19. For example, the maximum capacity of the container 19 for the separated water may be 100 mL to 1 L, such as 400 mL to 800 mL. The present disclosure concerns modifications which permit reliable operation of the wet cleaning apparatus 10 while such a volume of water is collected in the container 19. An air passage 22 passes the air separated from the water and/or dirt particles towards the motor 14 and fan 16. As shown in FIG. 1, an aperture in the container 19 may at least partly define the air passage 22.

[0057] The air passage 22 may, for example, be provided in the top 19A of the container 19.

[0058] The terms "top" and "bottom" in the context of the container 19 refer to the respective ends of the container 19, and are named with reference to an upright orientation of the wet vacuum cleaner 10: the top 19A being above the bottom 19B of the container 19 in such an upright orientation.

[0059] The air passage 22 is spatially separated from the bottom 19B of the container 19. This is to minimise the risk of the separated water collected at the bottom 19B of the container from passing through the air passage 22 towards the motor 14 and fan 16.

[0060] As an alternative to providing the air passage 22 in the top 19A of the container 19, the air passage 22 may be provided, for example, in a side portion/part of the container 19, preferably in a region of the side portion/part which is proximal to the top 19A of the container 19.

[0061] In an embodiment, the air passage 22 is provided in part of the container 19 which is higher than an uppermost water line 23 for the water collected in the container 19. This uppermost water line 23 may correspond to a maximum capacity of the container 19 for the separated water.

[0062] The uppermost water line 23 may, for instance, be indicated by a mark or sticker provided on the container 19, and/or defined by the maximum water level as determined by a water level sensor (not visible).

[0063] In a non-limiting example, the wet cleaning apparatus 10 is configured to shut off power to the motor 14 when the maximum water level 23 is determined by the water level sensor as having been reached. Any suitable water level sensor may be considered for this purpose, such as a Hall effect sensor, or a float level switch sensor.

[0064] By locating the air passage 22 in the top 19A of the container 19, or in a side portion/part but proximal to the top 19A of the container, the risk of the water collected at the bottom 19B of the container 19 being recombined with the air and passed downstream towards the motor 14 and fan 16 may be minimised.

[0065] The user may be required to deliver cleaning water to the surface being vacuumed independently of the wet cleaning apparatus 10. However, the wet cleaning apparatus 10 may instead also include a clean water reservoir (not visible) for delivering cleaning water to the cleaner head 12.

[0066] The cleaner head 12 may have, for example, a rotary brush (not visible) to which water is delivered from the clean water reservoir, and hence may also have an inlet for receiving water from the clean water reservoir. The cleaner head 12 is specifically designed to pick up wet dirt and optionally also perform the floor wetting.

[0067] There is a handle 24 at the opposite end to the cleaner head 12. The handle 24 can be grasped by a user of the wet cleaning apparatus 10. The user pushing the handle 24 causes at least the cleaner head 12 and

the container 19 to move forward, and the user pulling the handle 24 causes the cleaner head 12 and the container 19 to move backwards towards the user.

[0068] In the example shown in FIG. 1, the pivot point 13 between the cleaner head 12 and the container 19 permits tilting of the container 19 towards the user grasping the handle 24 while the dirt inlet 11 continues to provide suction to the surface to be cleaned.

[0069] FIG. 2 schematically depicts movement of collected water CW in the container 19 of a wet cleaning apparatus 10 upon tilting of the container 19, e.g. via the pivot point 13.

[0070] The pivot point 13 may be arranged to permit angular adjustment of the container 19 towards the surface to be cleaned such that water collected at the bottom 19B of the container 19 moves towards the top 19A of the container 19. The pivot point 13 is also configured such that the dirt inlet 11 continues to face the surface to be cleaned during the angular adjustment.

[0071] As shown in FIG. 2, the tilting may cause the collected water CW to move along a first side portion 19C of the container 19 towards the top 19A of the container 19. In particular, a wave WV1 may build towards the top 19A of the container 19, which wave WV1 may send water towards and through the air passage 22.

[0072] Moreover, sloshing of the collected water CW against the first side portion 19C, particularly when the wet cleaning apparatus 10 is being pulled backwards by the user pulling the handle 24, can cause some of the collected water CW to pass into the air passage 22.

[0073] One possibility for minimising the risk of the collected water CW passing into the air passage in the manner shown in FIG. 2 would be to increase the length of the container 19. In other words, the container 19 may be elongated along the axis A1. This, however, has the drawback of the added length causing other aspects of user convenience to be compromised, such as handling the wet cleaning apparatus 10 during cleaning. Increasing the length of the container 19 may also not reduce the risk of water passing into the air passage 22 to a sufficient extent.

[0074] FIG. 3 schematically depicts a container 19 of a wet cleaning apparatus 10, tilted similarly to the wet cleaning apparatus 10 shown in FIG. 2, but having an internal wall 19E within the container 19. In this example, the internal wall 19E extends from the top 19A towards the bottom 19B of the container 19.

[0075] A space 25 is defined between the container 19 and the internal wall 19E. The collected water CW at the bottom 19B of container 19 when the wet cleaning apparatus 10 is upright is received in the space 25 when the container 19 is orientated such that the collected water CW moves from the bottom 19B towards the top 19A of the container 19.

[0076] As shown in FIG. 3, the internal wall 19E is arranged to prevent the collected water CW received in the space 25 from passing into the air passage 22. Thus, the internal wall 19E assists to protect the motor 14 from

being damaged by ingress of water into the air passage 22, particularly when the wet cleaning apparatus 10 is tilted for cleaning underneath furniture.

[0077] Moreover, the internal wall 19E may also serve to reduce blowing of the airflow over the collected water CW, which also reduces the risk that water droplets are swept towards the air passage 22.

[0078] The capacity of the space 25 may be enhanced by the internal wall 19E extending from the end 19A of the container 19, e.g. relative to the scenario in which the internal wall 19E extends from the first side portion 19C.

[0079] In an embodiment, the internal wall 19E extends from the top 19A of the container 19 along the axis A1 extending between the top 19A and the bottom 19B of the container 19. This may avoid that the space tapers in the direction of the top 19A of the container 19, such as to assist to maximise the capacity of the space 25. This may assist the wet cleaning apparatus 10 to operate in tilted orientations, such as the horizontal orientation shown in FIG. 3, for cleaning under furniture.

[0080] The axis A1 may, for example, extend substantially parallel with the first side portion 19C of the container 19. The term "substantially parallel" may, for example, encompass the internal wall 19E extending at an angle of $\pm 5^\circ$ with respect to a parallel relationship with the direction of extension of the first side portion 19C between the top 19A and the bottom 19B of the container 19.

[0081] Alternatively or additionally, the internal wall 19E may extend from the top 19A of the container 19 at an angle which is normal to the end 19A of the container 19.

[0082] Whilst the internal wall 19E in the example shown in FIG. 3 extends from the top 19A of the container 19 along the axis A1, this is not intended to limit the internal wall 19E to extending in its entirety along the axis A1. An end portion of the internal wall 19E proximal to the bottom 19B of the container 19 may, for example, curve away from the axis A1, as will be described in more detail herein below with reference to FIG. 7.

[0083] In an embodiment, the internal wall 19E sealingly adjoins the top 19A of the container 19. This assists the internal wall 19E to prevent collected water CW received in the space 25 from entering the air passage 22. An example of this will be described in more detail herein below with reference to FIG. 6.

[0084] As shown in FIG. 3, the wave WV2 is contained within the space 25 defined between the container 19 and the internal wall 19E. Upon tilting the container 19 back towards the upright orientation, the collected water CW moves in the direction of the hashed arrow. This movement of the collected water CW is shown in FIG. 4, which shows an orientation of the container 19 between the horizontal orientation shown in FIGs. 2 and 3, and an upright orientation.

[0085] In other words, angularly adjusting the container 19 away from the surface to be cleaned, e.g. via the

pivot point 13, causes the collected water CW to move back towards the bottom 19B and a second side portion 19D of the container 19. The first side portion 19C opposes the second side portion 19D across the container 19.

[0086] The internal wall 19E may thus assist to guide the collected water CW back towards the bottom 19B of the container 19 upon tilting towards the upright orientation.

[0087] As shown in FIG. 4, such angular adjustment towards the upright orientation may, however, cause a wave WV3 of the collected water CW to build towards the second side portion 19D.

[0088] Moreover, the collected water CW may slosh against the second side portion 19D of the container 19 when the container 19 and cleaner head 12 are being pushed forwards by the user pushing the handle 24. As shown in FIG. 5, a wave WV4 may be generated by such pushing of the container 19 and the cleaner head 12.

[0089] In the example shown in FIG. 5, a water directing member 26 sealingly adjoins the second side portion 19D. The water directing member 26 protrudes backwards from the second side portion 19D. Thus, the water directing member 26 protrudes backwards from the second side portion 19D in the general direction of the user grasping the handle and pushing/pulling the container 19 and the cleaner head 12.

[0090] As shown in FIG. 5, this arrangement of the water directing member 26 inhibits the collected water CW sloshing against the second side portion 19D from continuing to move along the second side portion 19D towards the air passage 22. The water directing member 26 protrudes from the second side portion 19D towards the first side portion 19C.

[0091] Referring to FIGs. 1 and 5, the second side portion 19D is distal with respect to the user grasping the handle 24, and the first side portion 19C, which opposes the second side portion 19D, is proximal to the user grasping the handle 24.

[0092] At this point it is reiterated that the collected water moves along the first side portion 19C of the container 19 towards the top 19A of the container 19 when, for example, the orientation of the container 19 is adjusted via the pivot point 13 such that the first side portion 19C is moved towards the surface to be cleaned while the dirt inlet 11 of the cleaner head 12 continues to face the surface to be cleaned.

[0093] The water directing member 26 may assist to dissipate the remaining energy of the wave WV4, and to assist to prevent formed water droplets from contacting the flow of separated air, denoted by the arrows 32A, and being drawn towards the air passage 22.

[0094] Referring again to FIG. 1, the dotted line 32 schematically represents the flow of air passing through the wet vacuum cleaner 10. A tube 34 may carry the air from the dirt inlet 11 to the separator unit 18.

[0095] The separator unit 18 may comprise a flow path member 36 which changes the direction of flow 32

through the wet vacuum cleaner 10. This flow direction change causes the water and/or dirt particles entrained in the air to be flung against an interior surface portion of the flow path member 36. In this way, the water and/or dirt particles are separated from the air.

[0096] A principal difference between water and air is that the water tends to stick to many types of solid materials, as well as to itself, while most gases will not. This principle is conveniently applied to, for example, separate water from air. Merely guiding a water-air mixture through a tube 34 may cause droplets and streams of liquid to form on the walls of the tube 34. But by guiding the mixture through a geometry that forces it to change direction as well, such as in a bend or a cyclone, liquids (as well as solids) will accumulate outwardly because of centrifugal forces. In doing so liquid will become adhered to, and flow along a wall against which the liquid is directed, while the dry or drier air will flow in the bulk.

[0097] The flow path member 36 may have any suitable design provided that the change in direction of flow causes the water and/or dirt particles to be separated from the flow of air.

[0098] As shown in FIG. 1, the separated airflow path 32A is included in the airflow path 32, and is provided between the opening of the separator unit 18 and the air passage 22. In this example, a separated water flow path 39 is directed away from, and thus is substantially prevented from crossing, the separated airflow path 32A, which assists to minimise or prevent re-entrainment of the water and/or dirt particles in the flow of air.

[0099] In the non-limiting example shown in FIG. 1, the separator unit 18 further comprises an outlet member 38 which adjoins, e.g. is directly connected to, the flow path member 36. The outlet member 38 extends from the flow path member 36, and terminates at an opening delimited by a rim 40 of the outlet member 38.

[0100] The separated water and/or dirt particles are guided by the outlet member 38 towards the opening of the outlet member 38. The outlet member 38 may be configured such that air drag and gravity assists with this guiding of the water and/or dirt particles towards the opening. Moreover, the outlet member 38 is arranged to direct the separated water and/or dirt particles from the opening towards the bottom 19B of the container 19 along the separated water flow path 39 when the apparatus 10 is orientated for use. The outlet member 38 may thus be alternatively termed a "liquid guiding structure".

[0101] Such guiding and accumulating of the separated water and/or dirt particles by the outlet member may be implemented in any suitable manner. In the non-limiting example shown in FIG. 1, the opening of the outlet member 38 is delimited by a slanted rim 40. The slanted rim 40 is slanted such that the separated water and/or dirt particles flow along the slanted rim 40 to a region, e.g. a point, on the slanted rim 40 from which the separated water flow path 39 extends towards the bottom 19B of the container 19. As shown in FIG. 1, gravity, together with air drag, may assist the separated water and/or dirt

particles to flow along the separated water flow path 39 from the region, e.g. point, on the slanted rim 40.

[0102] The slanted rim 40 of the outlet member 38 may further assist in directing the flow of separated air away from the separated water flow path 39. This is because the airflow resistance may be higher on the side of the outlet member 38 towards which the water and/or dirt particles are guided by the slanted rim 40.

[0103] Alternatively or additionally, the outlet member 38 may comprise a water guiding element (not visible). The water guiding element may be arranged on or in a surface of the outlet member 38 and configured to guide the separated water and/or dirt particles to the opening and towards the bottom 19B of the container 19 from the opening along the separated water flow path 39.

[0104] Such a water guiding element may, for example, comprise at least one of a rib protruding from an inner surface of the outlet member 38, and a groove in the inner surface of the outlet member 38. The water and/or dirt particles may, for example, be channelled by the rib(s) and/or groove(s) to the region, e.g. point, at the opening from which the separated water flow path 39 extends towards the bottom 19B of the container 19.

[0105] In the non-limiting example shown in FIG. 1, the tube 34 carries the air from the dirt inlet 11 to the separator unit 18, and a cup receives an end of the tube 34. In this case, the first interior surface portion of the flow path member 36 is defined by an interior surface of the cup. The cup is spaced apart from the end of the tube 34, thereby to allow the air to flow between the end of the tube 34 and the cup towards the air passage 22.

[0106] The cup causes the direction of flow 32 to change such that water entrained in the air drawn from the dirt inlet 11 is flung against the interior surface of the cup, and thereby separated from the flow of air.

[0107] In this example, the outlet member 38 is defined by a downstream portion of the cup. This downstream portion 38 adjoins, e.g. is directly connected to, an upstream portion of the cup which implements the flow direction change. The flow path member 36 and the outlet member 38 may thus, for example, be integrally formed.

[0108] The separated water is guided, with the assistance of gravity and air drag, by the outlet member 38 towards the opening of the outlet member 38. The arrangement of the outlet member 38 is also such that the separated water is directed from the opening towards the bottom 19B of the container 19 along the separated water flow path 39 when the apparatus 10 is orientated for use.

[0109] In the example shown in FIG. 1, the outlet member 38 has a first side 53A and a second side 53B, and the first side 53A opposes the second side 53B. The outlet member 38 is arranged when the apparatus 10 is orientated for use such that the separated water and/or dirt particles are accumulated and guided towards the first side 53A. The first side 53A terminates at the lowermost point of the outlet member 38, from which the separated water flow path 39 extends.

[0110] The above-described internal wall 19E in the

container 19 serves an additional purpose in this example of providing an airflow barrier for restricting airflow from the first side 53A to the air passage 22. This arrangement may result in the separated airflow path 32A being directed away from the first side 53A and towards the air passage 22. In this way, the separated airflow path 32A is directed away from, and is substantially prevented from crossing, the separated water flow path 39.

[0111] FIG. 6 provides views of an interior part of an exemplary wet cleaning apparatus 10. In particular, FIG. 6 shows the top 19A of the container 19 which, in this example, delimits the air passage 22. Part of the separator unit 18 is also visible in FIG. 6, which includes the cup described above in relation to FIG. 1.

[0112] An outer wall portion 18A of the separator unit 18 may be included in the internal wall 19E, as best shown in the plan view underneath the perspective view provided in FIG. 6. In other words, the space 25 is defined by the container 19, and the internal wall 19E including the outer wall portion 18A of the separator unit 18.

[0113] The internal wall 19E may be offset from the container 19 by any suitable distance such that the collected water CW is receivable in the space 25 when the container 19 is tilted towards the horizontal orientation.

[0114] It is, however, desirable that entry of the collected water CW into the space 25 is minimised when the wet cleaning apparatus 10 is upright and is moving forwards and backwards. A width W of the space 25 of 0.1 to 0.8 mm may thus be provided between the internal wall 19E and the first side portion 19C. This width W may be sufficient for the collected water CW to flow from the space 25 towards the bottom 19B of the container 19 without the passage of the collected water being hindered by dirt clogging the space 25.

[0115] The internal wall 19E is shown in FIG. 6 extending from the top 19A of the container 19. The internal wall 19E extends normal to the top 19A of the container 19 and from the top 19A of the container 19 along the above-described axis A1. The internal wall 19E in this example also comprises an end portion 19F which curves inwardly towards the centre of the container 19, as will be described in greater detail with reference to FIG. 7.

[0116] In an embodiment, the internal wall 19E comprises a first shut-off area 19G which adjoins the top 19A of the container 19. This first shut-off area 19G is best shown in the upper view above the perspective view provided in FIG. 6.

[0117] The thickness of the internal wall 19E preferably increases towards the first shut-off area 19G adjoining the top 19A of the container 19. The first shut-off area 19G thus assists to sealingly adjoin the internal wall 19E to the top 19A of the container 19. This, in turn, assists the internal wall 19E to prevent collected water CW received in the space 25 from entering the air passage 22, as previously described.

[0118] A sealing portion, e.g. comprising a rubber seal, such as a silicone rubber seal, may be used as an alternative to the first shut-off area 19G, thereby to permit the

internal wall 19E to sealingly adjoin the top of the container 19A.

[0119] In an embodiment, which may be in addition or an alternative to the above-described first shut-off area/sealing portion, the internal wall 19E comprises second shut-off areas 19H, each second shut-off area 19H adjoining a respective side part of the container 19; the side parts extending from the top 19A of the container 19.

[0120] The thickness of the internal wall 19E preferably increases towards each of the second shut-off areas 19H. The second shut-off areas 19H assist to sealingly adjoin the internal wall 19E to each of the side parts of the container 19. This, in turn, assists the internal wall 19E to prevent collected water CW received in the space 25 from entering the air passage 22.

[0121] Moreover, the shut-off areas 19H may, in certain examples, facilitate detachment of the internal wall 19E from the container 19, e.g. relative to the scenario in which the internal wall 19E adjoins the container 19 via a rubber seal.

[0122] The shut-off areas 19G, 19H may be formed of the same material as the remainder of the internal wall 19E, e.g. an engineering thermoplastic, such as polypropylene.

[0123] FIG. 7 depicts part of a wet cleaning apparatus 10 having the above-described tube-in-cup separator unit 18. The wet cleaning apparatus 10 comprises the internal wall 19E which extends from the top 19A of the container 19 along the axis A1, and includes the end portion 19F which curves inwardly towards the centre of the container 19.

[0124] In an embodiment, the tube 34 extends in a central region of the container 19 towards the separator unit 18. In the example shown in FIG. 7, the tube 34 extends in a central region of the container 19 towards the cup of the separator unit 18. Positioning the tube 34 in this manner divides the water moving towards the second side portion 19D, particularly when the container 19 and the cleaner head 12 are being pushed in the forward direction away from the user, as will be described in more detail herein below with reference to FIG. 9.

[0125] In the example shown in FIG. 7, the tube 34 comprises a first section 34A which extends at an angle away from the first side portion 19C and towards the opposing second side portion 19D. The tube 34 also comprises a second section 34B which extends parallel to the first and second side portions 19C, 19D. Angling of the first section 34A in this manner assists to accommodate the extension of the water directing member 26 from the second side portion 19D towards the centre of the container 19, as shown.

[0126] In an embodiment, the separator unit 18 and the water directing member 26 are included in a detachable unit which is detachable from the container 19. This is to facilitate cleaning of the container 19, since detaching the separator unit 18 and the water directing member 26 avoids access to the container 19, particularly access to the bottom 19B of the container 19, being impeded.

[0127] In an alternative embodiment, the detachable unit comprises the separator unit 18 and the internal wall 19E. In a further example, the detachable unit comprises the separator unit 18, the internal wall 19E, and the water directing member 26, as shown in FIG. 7.

[0128] In the non-limiting example shown in FIG. 7, the water directing member 26 is attached to the separator unit 18, in this case the cup, by one or more attachment member 27.

[0129] More generally, the water directing member 26 may be detachable from the second side portion 19D of the container 19, e.g. independently of the separator unit 18 and/or the internal wall 19E. The water directing member 26 is nevertheless sealingly adjoined to the side portion 19D when attached thereto, as will be explained in more detail herein below.

[0130] FIG. 8 provides a plan view of a container 19 of an exemplary wet cleaning apparatus 10 which is substantially rectangular in plan; the term "substantially" in this context accounting for the curved corners of the container 19. Upon pushing of the container 19 and the cleaner head 12 in the forward direction, a wave WV5 advances towards the second side portion 19D.

[0131] FIG. 9 shows a different design from that shown in FIG. 8 in which the tube 34 which supplies the airflow from the inlet 11 to the separator unit 18 extends in a central region of the container 19. Thus, the tube 34 divides the water moving towards the second side portion 19D when the container 19 is being pushed, together with the cleaner head 12, in the forward direction away from the user grasping the handle 24. Dividing the collected water CW in this manner assists to dissipate the energy of the wave WV6 as the water moves towards the second side portion 19D.

[0132] The tube 34 is preferably cylindrical in this example because this facilitates smooth division of the collected water CW.

[0133] Alternatively or additionally, an inner surface of the side portion 19D may be arcuate such that the inner surface curves outwardly in the forward direction. The arcuate inner surface shown in FIG. 9 may act as a wave breaker to assist in dissipating the energy of the wave WV6.

[0134] The arcuate inner surface of the second side portion 19D, together with the tube 34 being disposed in the central region of the container 19 in the example shown in FIG. 9, assists to create the flow pattern in which vertical movement of the collected water CW towards the air passage 22 may be minimised. The respective flows divided by the centrally positioned tube 34 may be guided by the arcuate inner surface towards each other, such that the flows collide in a horizontal plane of the container 19. Such horizontal collision of the flows may assist to minimise the movement of the water vertically towards the air passage 22.

[0135] More generally, the container 19 shown in FIG. 9 has third and fourth side parts 19I, 19J. The first and second side portions 19C, 19D are spaced apart from

each other by the third and fourth side parts 19I, 19J. In the case of the arcuate inner surface of the second side portion 19D, the inner surface, e.g. together with the second side portion 19D as a whole, arches away from the first portion 19C. As shown in FIG. 9, the inner surface of the second side portion 19D arches from the third side part 19I around to the fourth side part 19J. The container 19 may, however, have any suitable shape, such as cubic, cuboidal, prismatic, etc. In the case, for example, of the prismatic container 19, the container 19 is triangular in plan. A side of the triangle may, for example, correspond to the first side portion 19C, and the corner of the triangle opposing the first side portion 19C, together with regions of the remaining two sides of the triangle on either side of the corner, may constitute the second side portion 19D. In this non-limiting example, the water directing member 26 may extend from the corner and the regions of the remaining two sides of the triangle which define the second side portion 19D.

[0136] Various exemplary water directing members 26 are depicted in FIGs. 10A-10E. In the non-limiting example shown in FIG. 10A, the water directing member 26 comprises a first surface 26B for contacting the water sloshing against the second side portion 19D. In this particular example, the first surface 26B extends normal to the second side portion 19D.

[0137] The water directing member 26 shown in FIG. 10B comprises a first surface 26B extending normal to the second side portion 19D and a second surface 26C which declines towards the bottom 19B of the container 19. In this example, the first surface 26B extends from the second side portion 19D, and the second surface 26C extends from the first surface 26B. The declining second surface 26C in this example assists to direct water away from the air passage 22 and towards the bottom 19B of the container 19.

[0138] FIG. 10C shows a water directing member 26 having a first surface 26B which declines towards the bottom 19B of the container 19. The declining first surface 26B in this example assists to direct water away from the air passage 22 and towards the bottom 19D of the container 19.

[0139] The water directing member 26 shown in FIG. 10D is similar to that shown in FIG. 10B, in that the water directing member 26 comprises a first surface 26B which extends from the second side portion 19D, and a second surface 26C which extends from the first surface 26B; the second surface 26B declining towards the bottom 19B of the container 19. However, in the example shown in FIG. 10D, the first surface 26B inclines towards the top 19A of the container 19.

[0140] More generally, a declining second surface 26C extending from the first surface 26B may reduce the risk that the water running off the water directing member 26 impacts the tube 34 and creates water droplets which may be re-entrained in the separated airflow 32A.

[0141] The water directing member 26 shown in FIG. 10E comprises a first surface 26B which extends from

the second side portion 19D, and a second surface 26C which extends from the first surface 26B. In this case, the first surface 26B inclines towards the top 19A of the container 19, and the second surface 26C extends in a direction which is normal to the second side portion 19D.

[0142] Whilst not shown in FIGs. 10A-10E, the second surface 26C may curve from the first surface 26B towards the bottom 19B of the container 19 and/or towards the second side portion 19D. This may assist the water directing member 26 to direct the water sloshing against the second side portion 19D away from the air passage 22.

[0143] In an embodiment, a longest lateral extension LE of the water directing member 26 from the second side portion 19D measured normal to the second side portion 19D is at least 5 mm. Such a minimum lateral extension LE has been found to be sufficient for effective inhibition of the progress of the water sloshing against the second side portion 19D towards the air passage 22.

[0144] Preferably the longest lateral extension LE is 10 to 50 mm, such as 10 to 30 mm, e.g. about 20 mm.

[0145] Alternatively or additionally, the longest lateral extension LE may be up to 75% of an interior width of the container 19. The interior width may be measured between opposing side portions 19C, 19D of the container 19.

[0146] This balances the requirement for inhibiting the progress of water along the second side portion 19D towards the air passage 22 with the requirement to provide sufficient space within the container 19 for other components of the wet cleaning apparatus 10, such as the tube 34 which carries the airflow from the dirt inlet 11 to the separator unit 18. The upper limit of 50 mm and/or up to 75% of the interior width of the container 19 may also assist to minimise the possibility that the water directing member 26 impedes the passage of the separated water towards the bottom 19B of the container 19.

[0147] In an embodiment, the water directing member 26 comprises a peripheral shut-off area or a sealing portion 26A for sealingly adjoining the water directing member to the side portion 19D.

[0148] The sealing portion 26A may, for example, be formed from an elastomeric material, such as silicone rubber.

[0149] The shut-off area 26A may be formed from the same material as the rest of the water directing member, e.g. an engineering thermoplastic, such as polypropylene.

[0150] A thickness of the water directing member may, for example, increase towards a region of the side portion to which the peripheral shut-off area or sealing portion 26A is sealingly adjoined, as shown in FIG. 11. This may assist the peripheral shut-off area or sealing portion 26A to sealingly adjoin the water directing member 26 to the second side portion 19D of the container 19. This, in turn, may assist the water directing member 26 to inhibit the progress of the water sloshing against the second side portion 19D towards the air passage 22.

[0151] The water directing member may be detachable from the second side portion 19D of the container 19, as previously described. Alternatively, the water directing member 19D may be permanently affixed to the second side portion 19D. Particularly in the former case, manufacturing tolerances may allow for a less than 2 mm gap between the water directing member 26, e.g. the peripheral shut-off or sealing portion 26A, and the second side portion 19D. By ensuring that any gap is less than 2 mm, the progress of water droplets along the second side portion 19D towards the air passage 22 may be inhibited.

[0152] In an embodiment, the water directing member 26 comprises a surface 26B which faces away from the air passage 22. The water directing member 26 may comprise a curved surface which curves from the surface 26B towards the peripheral shut-off area or sealing portion 26A. This assists to direct the water on the surface 26B towards the second side portion 19D, and away from the air passage 22.

[0153] The curved surface of the water directing member 26 shown in FIG. 11 may be regarded as a "rounding", which guides the water on the water directing member 26 back towards the second side portion 19D and the bottom 19B of the container 19.

[0154] As shown in FIG. 11, the water directing member 26 comprises the first surface 26B and the second surface 26C for contacting the water sloshing against the second side portion 19D. In this example, both the first surface 26B and the second surface 26C decline towards the bottom 19B of the container 19, with the second surface 26C declining more steeply than the first surface 26B. In the example shown in FIG. 11, the first surface 26B extends from the shut-off or sealing portion 26A, and the second surface 26C extends from the first surface 26B.

[0155] The declining second surface 26C extending from the first surface 26B reduces the risk that the water running off the water directing member 26 impacts the tube 34 and creates water droplets which may be re-entrained in the separated airflow 32A, as previously described.

[0156] FIG. 12 shows part of a wet cleaning apparatus 10 incorporating the water directing member 26 shown in FIG. 11. As shown in FIG. 12, the water directing member 26 is positioned above the uppermost water line 23 for the water collected in the container 19. In the example shown in FIG. 12, the tube 34 comprises the first section 34A which extends at an angle away from the first side portion 19C and towards the opposing second side portion 19D. The tube 34 also comprises the second section 34B which extends parallel to the first and second side portions 19C, 19D. The angled first section 34A assists to accommodate the extension of the water directing member 26 from the second side portion 19D, similarly to the example shown in FIG. 7.

[0157] Part of a wet cleaning apparatus 10 comprising the above-described tube-in-cup separator unit 18 is shown in FIG. 13. In this example, the cup of the separator

unit 18, the internal wall 19E and the water directing member 26 are included in a detachable unit which is detachable from the container 19.

[0158] FIG. 13 shows the detachable unit being detached from the container 19, as well as the tube 34, by lifting the detachable unit from the container 19 in the direction of the arrow.

[0159] In this particular example, the top 19A of the container 19 is also included in the detachable unit, such that by lifting the top 19A of the container, the cup, the internal wall 19E, and the water directing member 26 are also removed. This facilitates cleaning of the container 19.

Further evident in FIG. 13 are the attachment members 27 by which the separator unit 18, in this example the cup of the separator unit 18, is attached to the water directing member 26.

[0160] Whilst FIG. 13 shows an example in which the internal wall 19E is detachable from the container 19, this is not intended to be limiting. In other examples, the internal wall 19E is an integral part of the container 19.

[0161] As described above in relation to FIG. 1, the separated water and/or dirt particles are guided, with the assistance of gravity and air drag, by the outlet member 38 towards the opening of the outlet member 38. The arrangement of the outlet member 38 is also such that the separated water and/or dirt particles are directed from the opening towards the bottom 19B of the container 19 along the separated water flow path 39 when the apparatus 10 is orientated for use, as previously described.

[0162] FIG. 14 shows a further example of the above-described tube-in-cup separator unit 18. The cup has a cylindrical side wall 37A extending from a base 37B. The side wall 37A in this example extends perpendicularly to a plane of the base 37B. This geometry leads to a 180° change in the direction of flow 32, which may facilitate efficient separation of the water and/or dirt particles from the air. It should nevertheless be noted that any suitable angle of flow direction change may be considered, e.g. by the side wall 37A extending non-perpendicularly from the base 37B, provided that the change of flow direction effects the requisite separation of the water and/or dirt particles from the air. An example of this will be described herein below with reference to FIG. 16.

[0163] As shown in FIG. 14, the slanted rim 40 is provided by the cylindrical side wall 37A being truncated on a plane 50 angled to the plane of the base 36B. However, alternative designs are conceivable. FIG. 16, for example, shows a cup having a side wall 37A which extends at an angle to the plane of the base 37B, such that the flow-through area of the outlet member 38 widens towards the opening. This may assist to keep the droplets 48 separated from the airflow because the air speed through the outlet member 38 is correspondingly decreased.

[0164] In a non-limiting example, the side wall 37A extends perpendicularly from a plane of the base 37B, and the outlet member 38 may be defined by a flared portion

of the cup which adjoins the side wall 37A. In this way, the flow direction change may be 180°, but the flared portion may assist to avoid liquid/dirt re-entrainment.

[0165] Gravity, as well as air drag, may assist the droplets 48 to flow along the slanted rim 40 in a direction away from the uppermost point 51 of the rim 40 and towards the lowermost point 52 of the rim 40. Moreover, gravity may assist the separated water and/or dirt particles to flow along the water flow path 39 from the lowermost point 52 towards the bottom 19B of the container 19, as previously described.

[0166] The outlet member 38 has an inner surface which extends from the interior surface portion 36A of the flow path member 36. Whilst not visible in FIG. 14, the outlet member 38 may further comprise a first outer surface which opposes the bottom 19B of the container 19, and a curving surface between the inner surface 38A and the first outer surface. The separated water and/or dirt particles are guided by the curving surface from the inner surface 38A to the first outer surface.

[0167] Moreover, the outlet member 38 may further comprise a second outer surface, and the first outer surface meets the second outer surface at a defined edge or corner, thereby to assist to retain droplets on the first outer surface, as will be described in greater detail herein below with reference to FIG. 18.

[0168] FIG. 15 provides a perspective view of the separator unit 18 shown in FIG. 14. FIG. 15, in common with FIG. 14, shows part of the internal wall 19E. As well as assisting reliable operation of the wet cleaning apparatus 10 when tilted horizontally, the internal wall 19E assists to define the separated airflow path 32A, as previously described.

[0169] Whilst the tube 34 is located centrally in the cup in the example shown in FIGs. 14 and 15, this is not intended to be limiting. In this respect, the tube 34 may, for example, be off-centre with respect to the cup, for example as shown in FIG. 7.

[0170] The slanted rim 40 of the outlet member 38 may further assist in directing the flow of separated air away from the first flow path 39, since the airflow resistance may be higher on the first side 53A of the outlet member 38 towards which the water and/or dirt particles are guided by the slanted rim 40. In other words, a lower speed airflow region is defined by the first side 53A, since the air has to travel further before reaching the opening.

[0171] This separated airflow path 32A may, for example, be further controlled by using the location of the tube 34 with respect to the cup. Moving the tube 34 further towards the first side 53A may increase the airflow resistance, thereby to increase the propensity for the air to exit the opening at the second side 53B of the cup.

[0172] FIG. 16 shows another exemplary separator unit 18. In this example, the internal wall 19E is partly defined by a wall of the cup of the separator unit 18. Thus, the internal wall 19E extends from the opening of the outlet member 38 to the top 19A of the container 19. In this case, one of the functions of the internal wall 19E is

to block the path of airflow from the first side 53A of the outlet member 38 (towards which the water and/or dirt particles are guided) towards the air passage 22. The separated airflow path 32A is correspondingly defined between the second side 53B of the outlet member 38 and the air passage 22. In this way, the separated water flow path 39 from the first side 53A of the outlet member 38 towards the bottom 19B of the container 19 is directed away from, and is substantially prevented from crossing, the separated airflow path 32A from the second side 53B of the outlet member 38 towards the air passage 22.

[0173] As shown in FIG. 16, the droplets 48 are guided towards the lowermost point 52 of the slanted rim 40. This is indicated in FIG. 16 by the arrow 57.

[0174] An angle θ is defined between the airflow direction within the outlet member 38 and the direction in which the separated water and/or dirt particles are transported towards the lowermost point 52 of the slanted rim 40. This angle θ is greater than 0° , and less than or equal to 90° , such as 20° to 75° , e.g. about 45° .

[0175] FIG. 17 shows a wet vacuum cleaner 10 according to another example. The wet vacuum cleaner 10 comprises the internal wall 19E. This is to minimise the risk of damage to the motor 14 by ingress of water into the air passage 22, particularly when the wet cleaning apparatus 10 is tilted for cleaning underneath furniture, as previously described. Similarly, to the examples depicted in FIGs. 1-16, a tube 134 carries the air from the dirt inlet 11 to the separator unit 118. But in this example, the flow path member 136 is defined by a curved tube section. An upstream end of the curved tube section 136 adjoins, e.g. is directly connected to, the tube 134.

[0176] The curved tube section 136 is U-shaped in the example shown in FIG. 17, such that the tube section 136 causes the direction of flow to change by 180° . This may facilitate efficient separation of the water and/or dirt particles from the air, although any suitable angle of flow direction change may be considered provided that the change of flow direction effects the requisite separation of the water and/or dirt particles from the air. Thus, the curved tube 136 causes the direction of flow 32 to change in an analogous manner to the separator unit 18 described above in relation to FIGs. 1-16.

[0177] FIG. 18 shows the flow path member 136 and the outlet member 138 of the separator unit 118 depicted in FIG. 17 in greater detail. As shown in FIG. 18, the water and/or dirt particles 44 entrained in the air flowing through the tube 134 are guided against the interior surface portion 136A of the flow path member 136 as a result of the change in flow direction. This may cause accumulation of the water and/or dirt particles into larger droplets 46 on the interior surface portion 136A, thereby assisting separation from the air.

[0178] In the example shown in FIG. 18, the interior surface portion 136A is defined by an outboard surface of the curved tube section 136. The change in direction imposed by the curved tube section 136 causes the water and/or dirt particles to be flung by centrifugal forces

against the outboard surface 136A of the curved tube section 136. A further interior surface portion 136B is defined by an inboard surface of the curved tube section 136.

[0179] The separator unit 118 further comprises an outlet member 138 which adjoins, e.g. is directly connected to, the flow path member 136. The outlet member 138 extends from the flow path member 136, and terminates at an opening delimited by a rim 140 of the outlet member 38.

[0180] The outlet member 138 adjoins the flow path member 136 at position 142. The outlet member 138 may, for example, be joined to the flow path member 136, e.g. using fasteners and/or a suitable adhesive. Alternatively, the outlet member 138 and the flow path member 136 may be integrally formed. For example, the flow path member 136 and the outlet member 138 may be integrally formed in a single moulded, e.g. injection moulded, piece.

[0181] More generally, a locality, e.g. a corner, at which air separation occurs, due to the air being unable to follow the sudden change, may result in a "wake" corresponding to a lower speed airflow region. Such a corner may, for example, be provided at the position 142 at which the further interior surface portion 136B meets an inner surface 138A of the outlet member 138. The angle of such a corner may, for example, be greater than 7° . Such an angle may assist to ensure efficient separation of the air from the liquid and/or dirt particles. As shown in FIG. 18, the slanted rim 140 causes further accumulation of the water and/or dirt particles into droplets 48 as they are guided along the slanted rim 140 in a direction from a first region 151, in other words an "uppermost point" 151 on the slanted rim 140 when the apparatus 10 is orientated for use, towards a second region 152. The region 152 may be alternatively termed a "lowermost point" 152 on the slanted rim 140 when the apparatus 10 is orientated for use.

[0182] The droplets 48 of the separated water and/or dirt particles flow along the slanted rim 140 and towards the bottom 19B of the container 19. The slanted rim 140 may thus slope in the direction of the bottom 19B of the container 19. The separated water and/or dirt particles flow along the slanted rim 140 towards the lowermost point 152 on the slanted rim 140. The separated water flow path 39 may extend towards the bottom 19B of the container 19 from the lowermost point 152.

[0183] Gravity, as well as air drag, may assist the droplets 48 to flow along the slanted rim 140 towards the lowermost point 152 on the rim 140. Moreover, gravity may assist the separated water and/or dirt particles to flow along the separated water flow path 39 from the lowermost point 152 towards the bottom 19B of the container 19.

[0184] The outlet member 138 has an inner surface 138A which extends from the interior surface portion 136A of the flow path member 136. As best shown in the inset of FIG. 18, the outlet member 138 further comprises a first outer surface 138B which opposes the bottom 19B

of the container 19, and a curving surface 138C between the inner surface 138A and the first outer surface 138B. The separated water and/or dirt particles are guided by the curving surface 138C from the inner surface 138A to the first outer surface 138B. In this way, the droplets 48 may be guided to the first outer surface 138B and, in the case of the slanted rim 140 of this non-limiting example, the droplets 48 may flow along the first outer surface 138B towards the lowermost point 152.

[0185] As also shown in the inset of FIG. 18, the outlet member 138 further comprises a second outer surface 138D. The first outer surface 138B meets the second outer surface 138D at a defined edge or corner 138E. This edge 138E assists to retain the droplets 48 on the first outer surface 38B, partly as a consequence of their wetting properties, thereby to assist the passage of the droplets 48 along the first outer surface 38B towards the lowermost point 152 of the slanted rim 40.

[0186] Thus, at the opening, the liquid may accumulate on the first outer surface 138B. Again, forced by air and gravity, the accumulated liquid follows the contour of the slanted rim 140 towards a single focus region or point, in other words the lowermost point 152. From here on the liquid that was previously distributed on the interior surface portion 136A of the flow path member 136 and the inner surface 138A of the outlet member 138 may now be accumulated and can be guided towards the bottom 19B of the container 19 along the separated water flow path 39 in a controlled manner.

[0187] In the example shown in FIG. 18, the flow-through area of the outlet member 138 increases towards the opening. In other words, the cross-sectional area of the interior of the outlet member 138 may increase towards the opening. This may assist to keep the droplets 48 separated from the airflow because the air speed through the outlet member 138 is correspondingly decreased. In other words, by increasing the cross-sectional area of the outlet member 138 towards the opening, the liquid may be exposed to a lower speed airflow, and may thus be less likely to be re-entrained in the airflow.

[0188] In the non-limiting example shown in FIGs. 17 and 18, the outlet member 138 comprises a conical portion, e.g. an asymmetric conical portion. The flow-through area of the outlet member 138 thus widens towards the opening. It should nevertheless be noted that other cross-sectional shapes of the widening outlet member 138 may also be contemplated, such as square, rectangular, triangular, and so on. The conical portion 138 adjoins, e.g. directly connects with, a downstream end of the curved tube section 136.

[0189] As shown in FIG. 18, the conical portion is truncated at the opening, thereby to define the slanted rim 140. The slanted rim 140 in combination with the widening flow-through area of the outlet member 138 may provide a particularly suitable arrangement for guiding the water droplets 48 towards the opening and onwards along the separated water flow path 39 towards the bottom 19B of the container 19 with reduced risk of re-en-

trainment in the airflow.

[0190] FIG. 19 provides a cross-sectional view of a separator unit 118 according to another example. The outlet member 138 is defined, in this case, by an asymmetric conical portion. The slanted rim 140 is defined by a truncation of the conical portion by the plane. The separated airflow path 32A of the air from the opening of the outlet member 138 towards the air passage 22 may, for example, be determined by the spatial arrangement of the outlet member 138, and particularly the opening, relative to the air passage 22.

[0191] As shown in FIG. 19, the outlet member 138 has a first side 153A and a second side 153B. In this particular example, the first side 153A opposes the second side 153B. The outlet member 138 is arranged when the apparatus 10 is orientated for use such that the separated water and/or dirt particles are accumulated and guided towards the first side 153A. The first side 53A terminates at the lowermost point 152 of the outlet member 138, from which the separated water flow path 39 extends.

[0192] The air passage 22 is positioned proximal to the second side 153B, and distal with respect to the first side 153A. This geometry may result in the separated airflow path 132A being directed away from the first side 153A and towards the air passage 22. In this way, the separated airflow path 32A is directed away from, and is substantially prevented from crossing, the separated water flow path 39.

[0193] It is emphasised that the separated airflow path 32A may be defined in any suitable manner. In an embodiment, the internal wall 19E further serves to block airflow from the first side 153A of the outlet member 138 (towards which the water and/or dirt particles are guided) to the air passage 22. In this case, the separated airflow path 32A is provided between the second side 153B of the outlet member 138 and the air passage 22.

[0194] FIG. 20 shows a wet cleaning apparatus 10 comprising a cyclone-type separator unit 218. In this example, the airflow is drawn through the tube 234 and into the container 19. Upon entering the container 19, the airflow is guided around a hollow cylindrical flow path member 236, thereby causing the water entrained in the airflow to be separated therefrom and collected at the bottom 19B of the container 19. The separated air passes into and through the hollow cylindrical flow path member 236 towards the motor 14 and fan 16 via the air passage 22.

[0195] In this example, the wet cleaning apparatus 10 further comprises the above-described internal wall 19E, such that the risk of damage to the motor 14 by ingress of water into the air passage 22, particularly when the wet cleaning apparatus 10 is tilted for cleaning underneath furniture, is minimised.

[0196] In the example shown in FIG. 20, the wet cleaning apparatus 10 also comprises the water directing member 26 so as to inhibit the collected water CW sloshing against the second side portion 19D from continuing

to move along the second side portion 19D towards the air passage 22, as previously described.

[0197] Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A wet cleaning apparatus (10) comprising:

a cleaner head (12) for cleaning a surface to be cleaned, the cleaner head having a dirt inlet (11); a motor (14) and fan (16) for delivering suction to the dirt inlet;

a separator unit (18, 118, 218) for separating water from a flow of air generated by the suction; a container (19) for collecting the separated water, the container having a top (19A) and a bottom (19B), and a side portion (19D) between the top and the bottom;

an air passage (22) provided in the container for passing the air separated from the water towards the motor and fan, the air passage being spatially separated from the bottom of the container;

a handle (24) for grasping by a user of the apparatus, wherein the handle, the cleaner head, and the container are arranged such that a user pushing the handle causes at least the cleaner head and the container to move forward, and the user pulling the handle causes said at least the cleaner head and the container to move backwards towards the user, the water collected in the container sloshing against the side portion of the container during said pushing;

an optional pivot point (13) between the cleaner head and the container, wherein the pivot point is arranged to permit tilting of the container towards the user grasping the handle while the dirt inlet continues to provide suction to the surface to be cleaned; and

a water directing member (26) sealingly adjoining the side portion, the water directing member protruding backwards from said side portion, thereby to inhibit said water sloshing against the side portion from continuing to move along the side portion towards the air passage.

2. The wet cleaning apparatus (10) according to claim 1, wherein a longest lateral extension of the water directing member (26) from the side portion (19D) measured normal to the side portion is at least 5 mm; preferably wherein said longest lateral extension is 10 to 50 mm or up to 75% of an interior width of the container (19).

3. The wet cleaning apparatus (10) according to claim 1 or claim 2, wherein the water directing member (26) comprises a peripheral shut-off area or a sealing portion (26A) for sealingly adjoining the water directing member to the side portion (19D); optionally wherein a thickness of the water directing member increases towards a region of the side portion to which the peripheral shut-off area or sealing portion is sealingly adjoining.

4. The wet cleaning apparatus (10) according to claim 3, wherein the water directing member (26) comprises a surface which faces away from the air passage (22), and wherein the water directing member comprises a curved surface which curves from the surface towards the peripheral shut-off area or sealing portion (26A).

5. The wet cleaning apparatus (10) according to claim 3 or claim 4, wherein the sealing portion (26A) is formed from an elastomeric material; optionally wherein the elastomeric material comprises silicone rubber.

6. The wet cleaning apparatus (10) according to any of claims 1 to 5, wherein the water directing member (26) comprises a first surface (26B) and/or a second surface (26C) for contacting said water sloshing against the side portion (19D).

7. The wet cleaning apparatus (10) according to claim 6, wherein
the first surface (26B) extends normal to the side portion (19D) or inclines towards the top (19A) of the container (19);
the second surface (26C) declines towards the bottom (19B) of the container such as to guide water thereon away from the air passage (22) or, when the first surface inclines towards the top (19A) of the container, the second surface extends normal to the side portion; optionally wherein the first surface extends from the side portion and the second surface extends from the first surface.

8. The wet cleaning apparatus (10) according to claim 6 or claim 7, wherein the water directing member (26) comprises the first surface (26B) and the second surface (26C), wherein the second surface curves from the first surface towards the bottom (19B) of the container and/or towards the side portion (19D).

9. The wet cleaning apparatus (10) according to any of claims 1 to 8, wherein the water directing member (26) is detachable from the side portion (19D).

10. The wet cleaning apparatus (10) according to any of claims 1 to 9, wherein an inner surface of the side portion (19D) is arcuate such that the inner surface curves outwardly in the forward direction. 5

11. The wet cleaning apparatus (10) according to any of claims 1 to 9, comprising an internal wall (19E) extending from the top (19A) towards the bottom (19B) of the container (19), a space (25) being defined between the container and the internal wall, water collected at the bottom of container being receivable in the space when the container is orientated such that the collected water moves from the bottom towards the top of the container, wherein the internal wall is arranged to prevent water received in the space from passing into the air passage (22); optionally wherein the internal wall sealingly adjoins to the container and/or wherein the internal wall and the container are integrally formed. 10
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12. The wet cleaning apparatus (10) according to any of claims 1 to 11, wherein the separator unit (18, 118, 218), and the water directing member (26) are included in a detachable unit, said detachable unit being detachable from the container (19). 25
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13. The wet cleaning apparatus (10) according to claim 12, as according to claim 10 or claim 11, wherein the internal wall (19E) is included in the detachable unit.

14. The wet cleaning apparatus (10) according to any of claims 1 to 13, wherein the separator unit (18, 118, 218) comprises at least one selected from a labyrinth-type separator unit, a filter-type separator unit, and a cyclone-type separator unit. 35
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15. The wet cleaning apparatus (10) according to any of claims 1 to 14, comprising a tube (34) for delivering said airflow to the separator unit (18), wherein the separator unit comprises a cup which receives an end of the tube; optionally wherein the tube extends in a central region of the container towards the cup. 45

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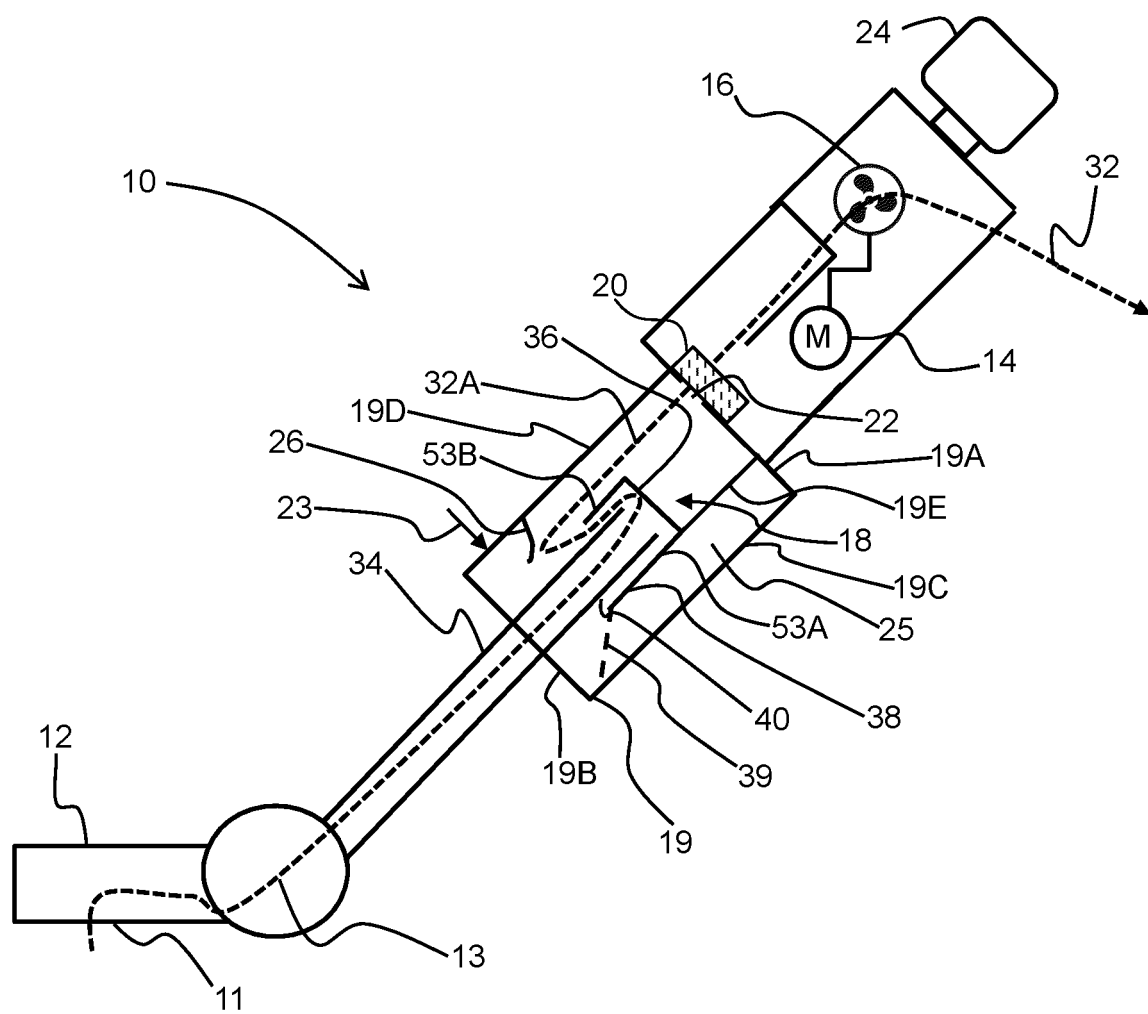


FIG. 1

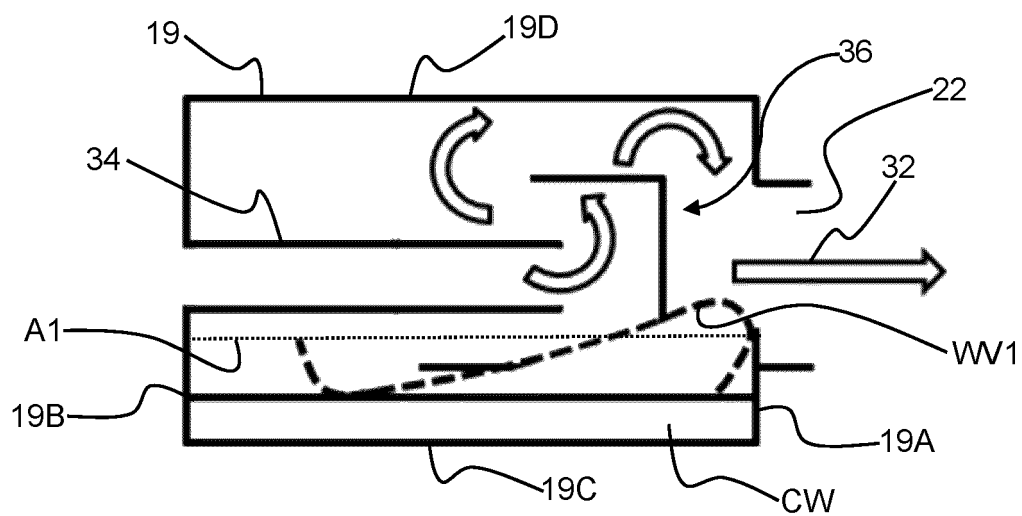


FIG. 2

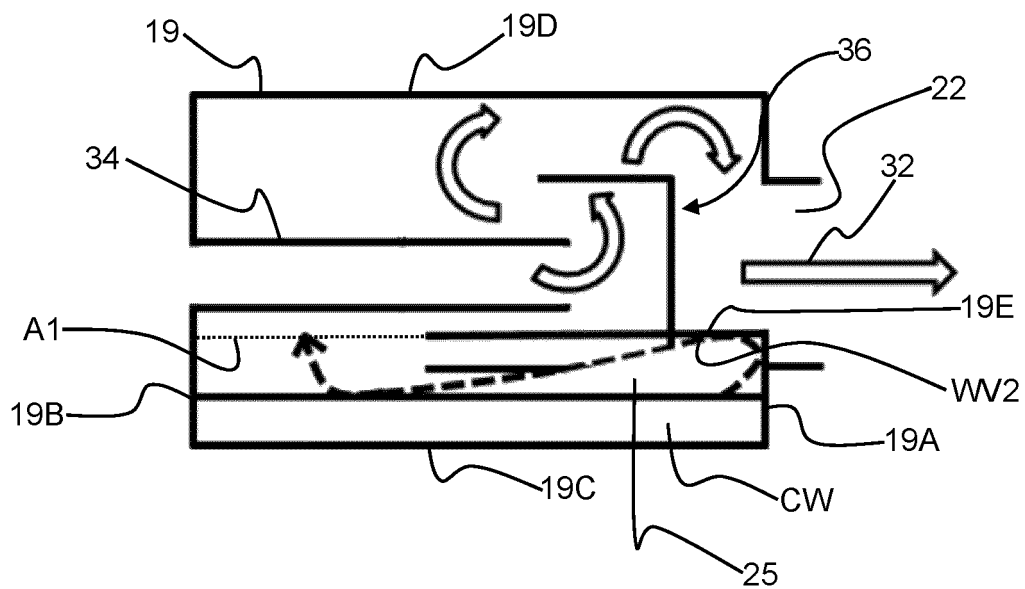


FIG. 3

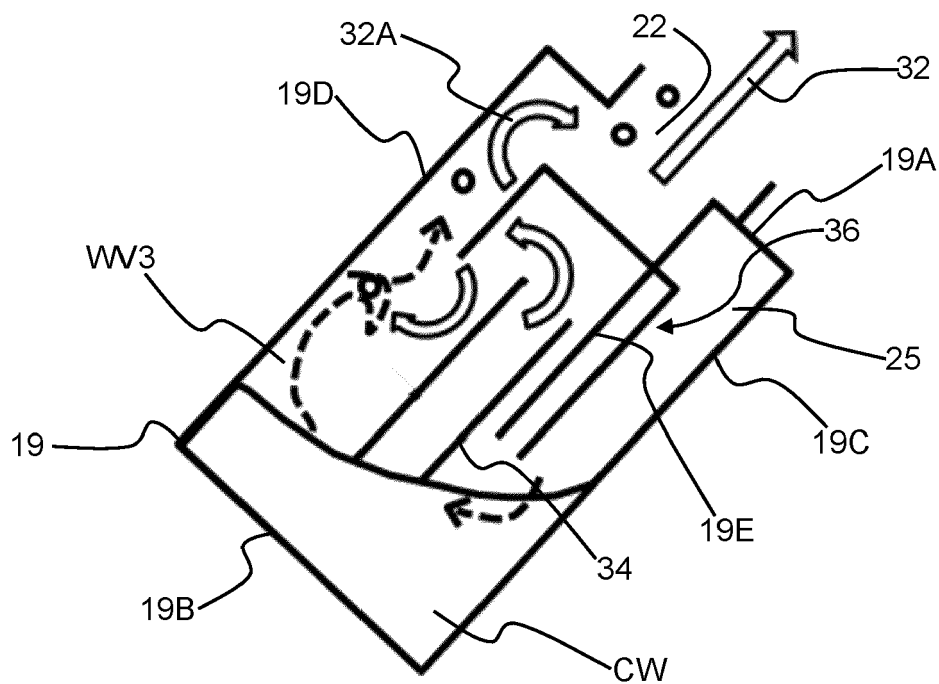


FIG. 4

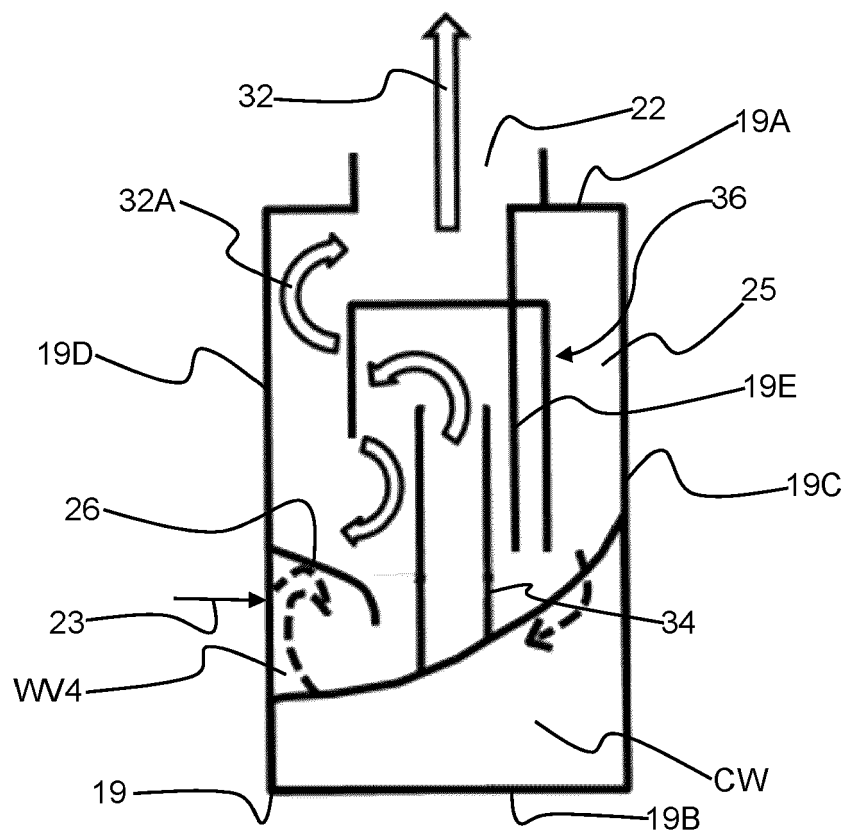


FIG. 5

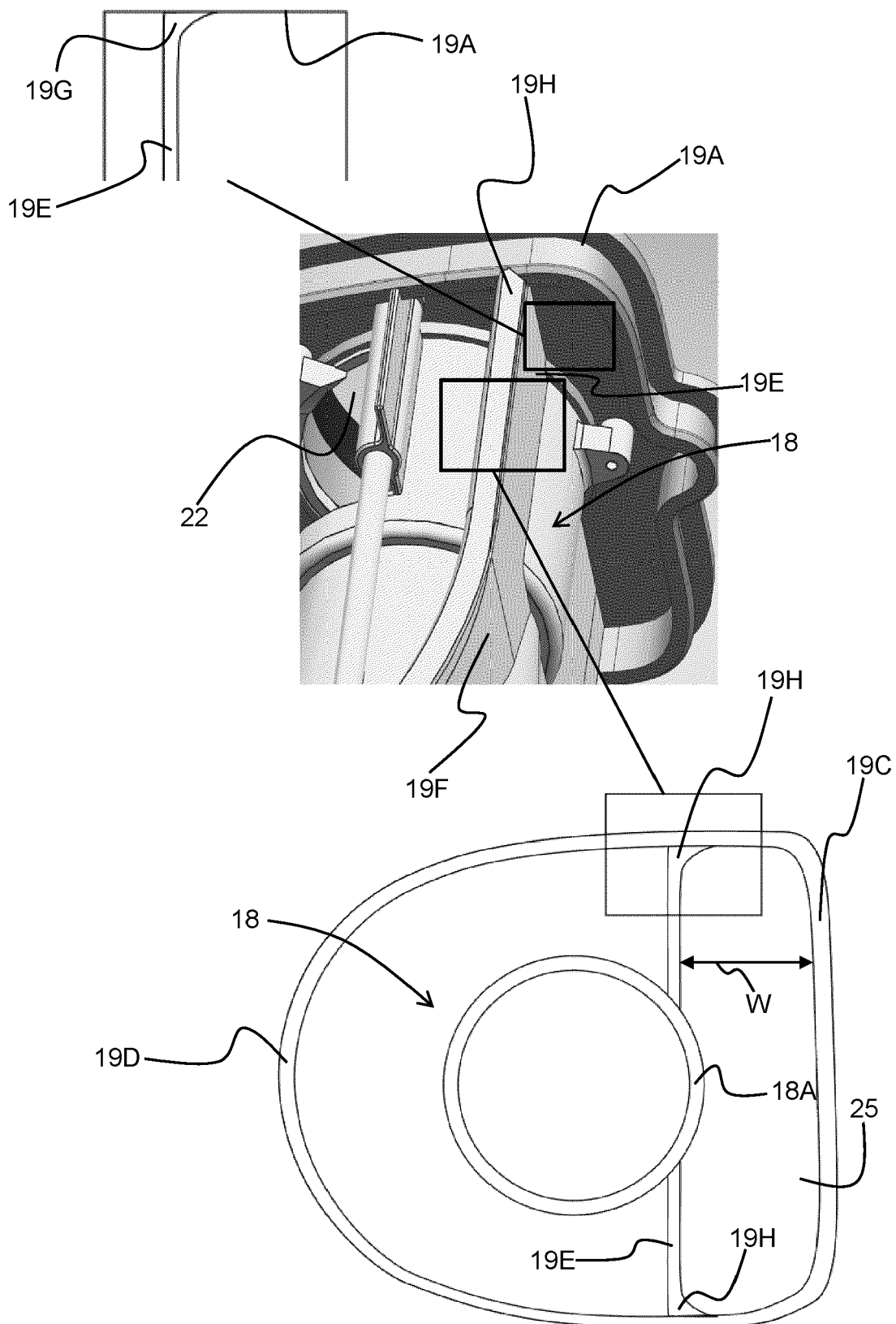


FIG. 6

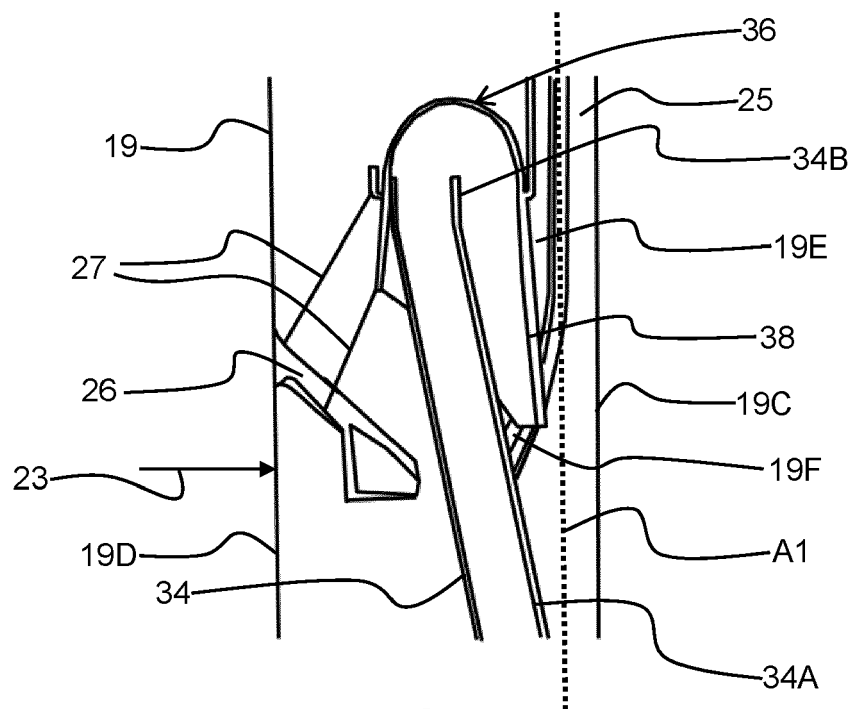


FIG. 7

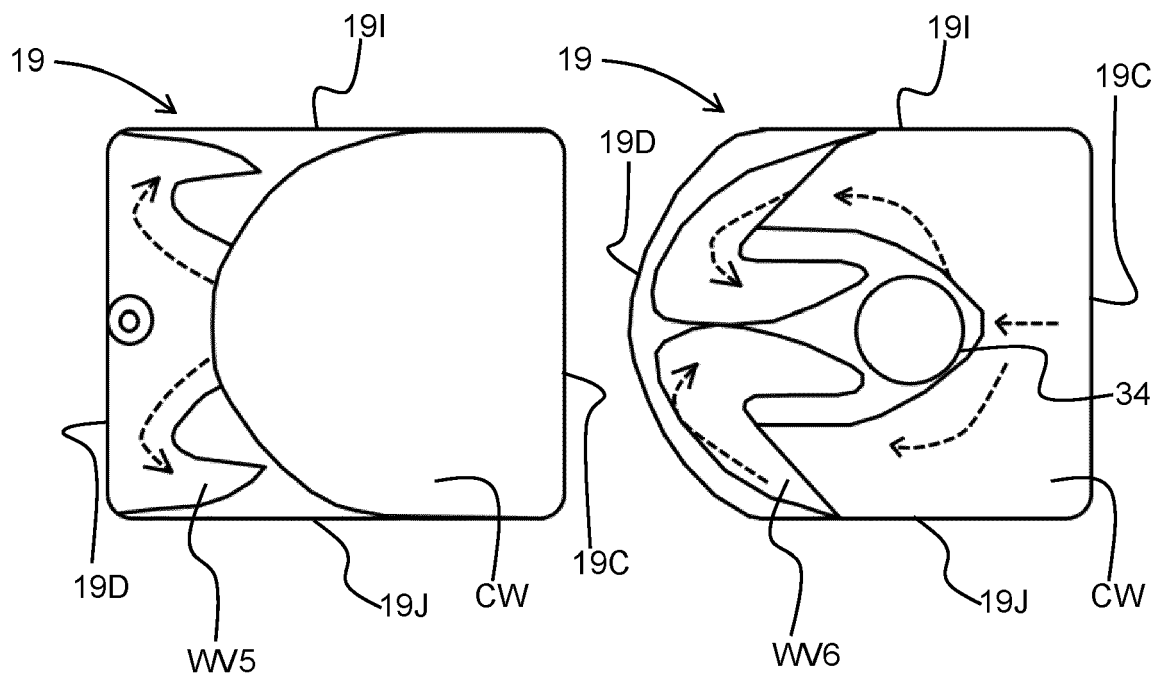


FIG. 8

FIG. 9

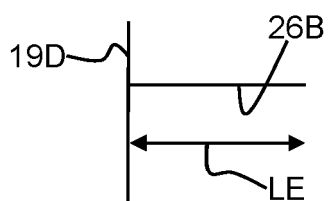


FIG. 10A

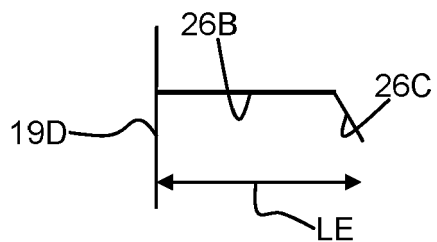


FIG. 10B

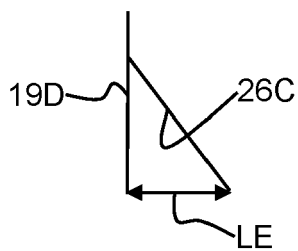


FIG. 10C

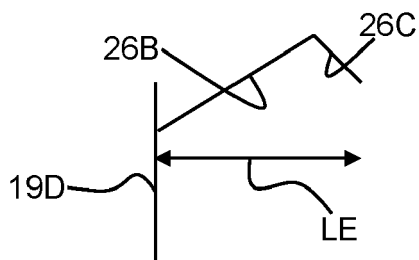


FIG. 10D

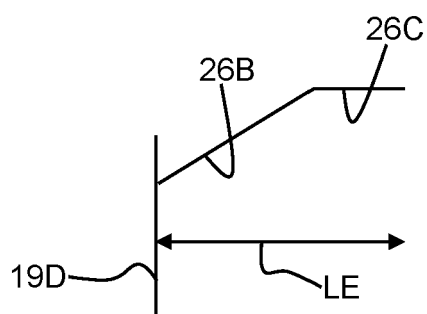


FIG. 10E

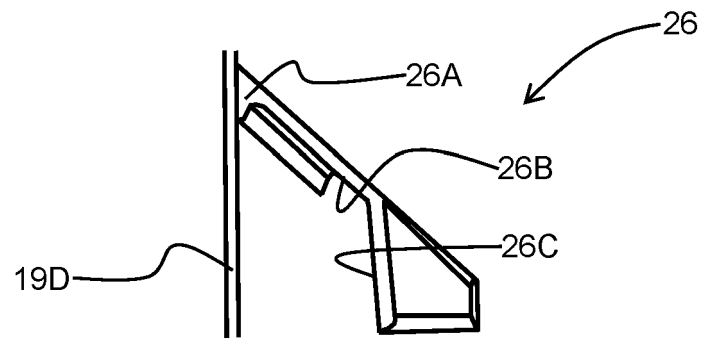


FIG. 11

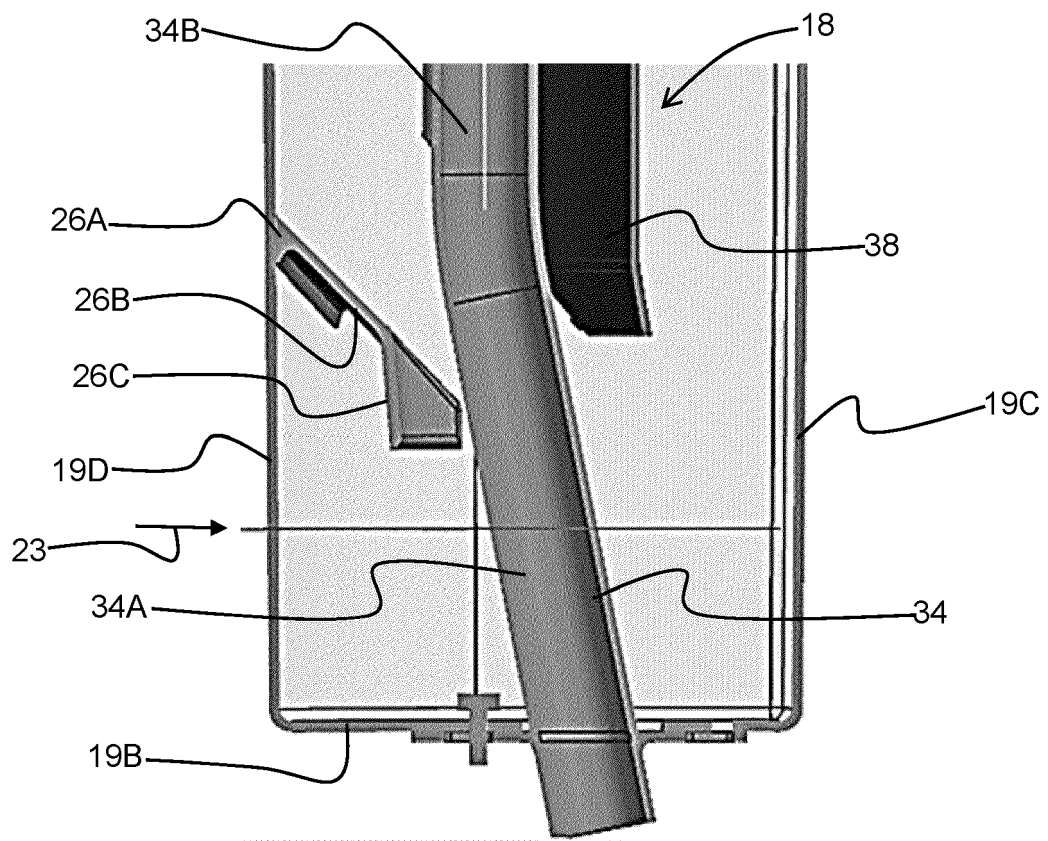


FIG. 12

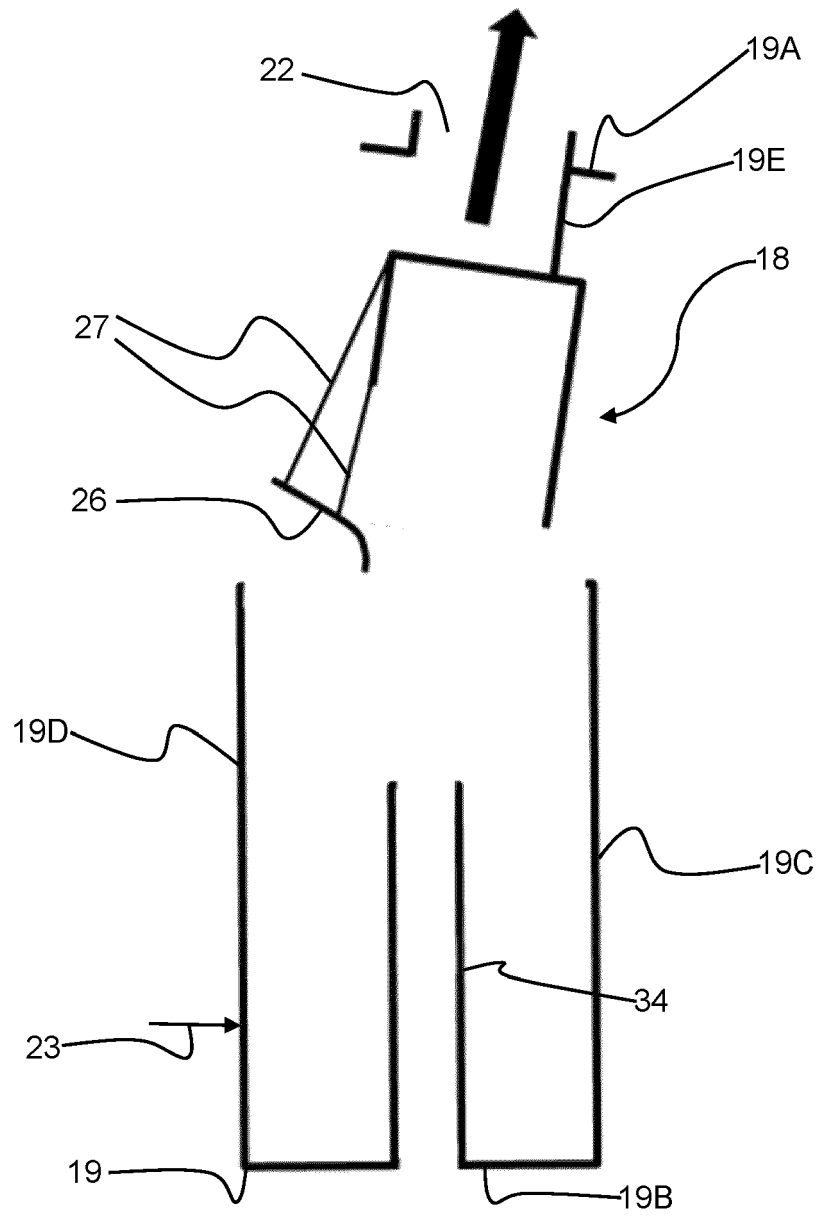


FIG. 13

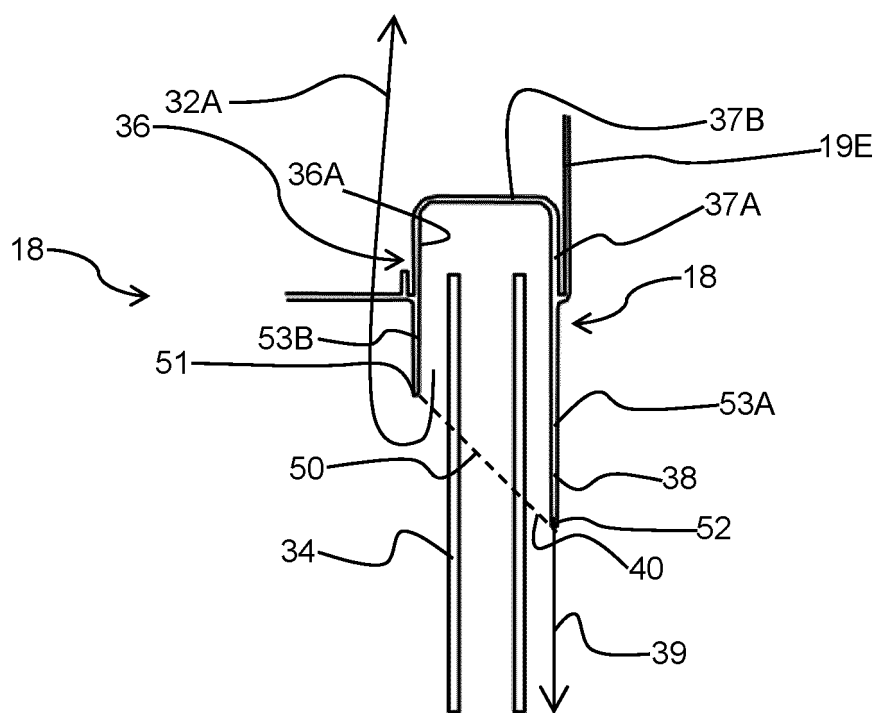


FIG. 14

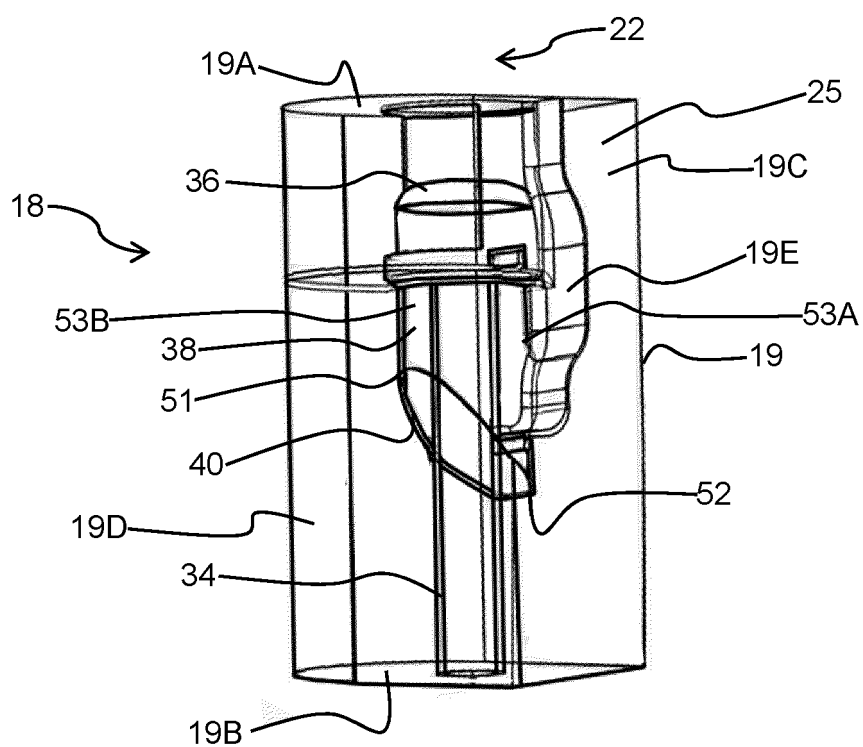


FIG. 15

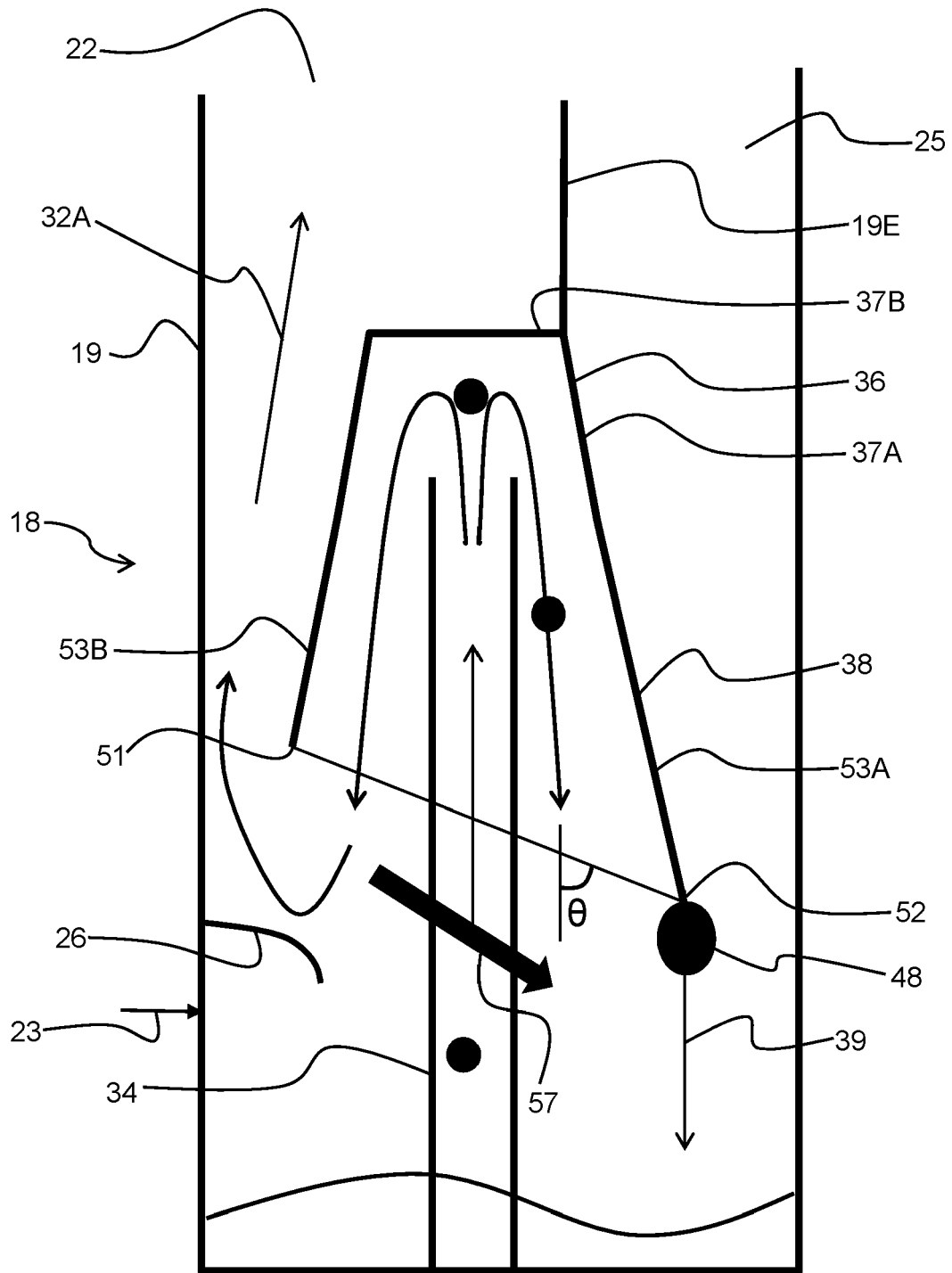


FIG. 16

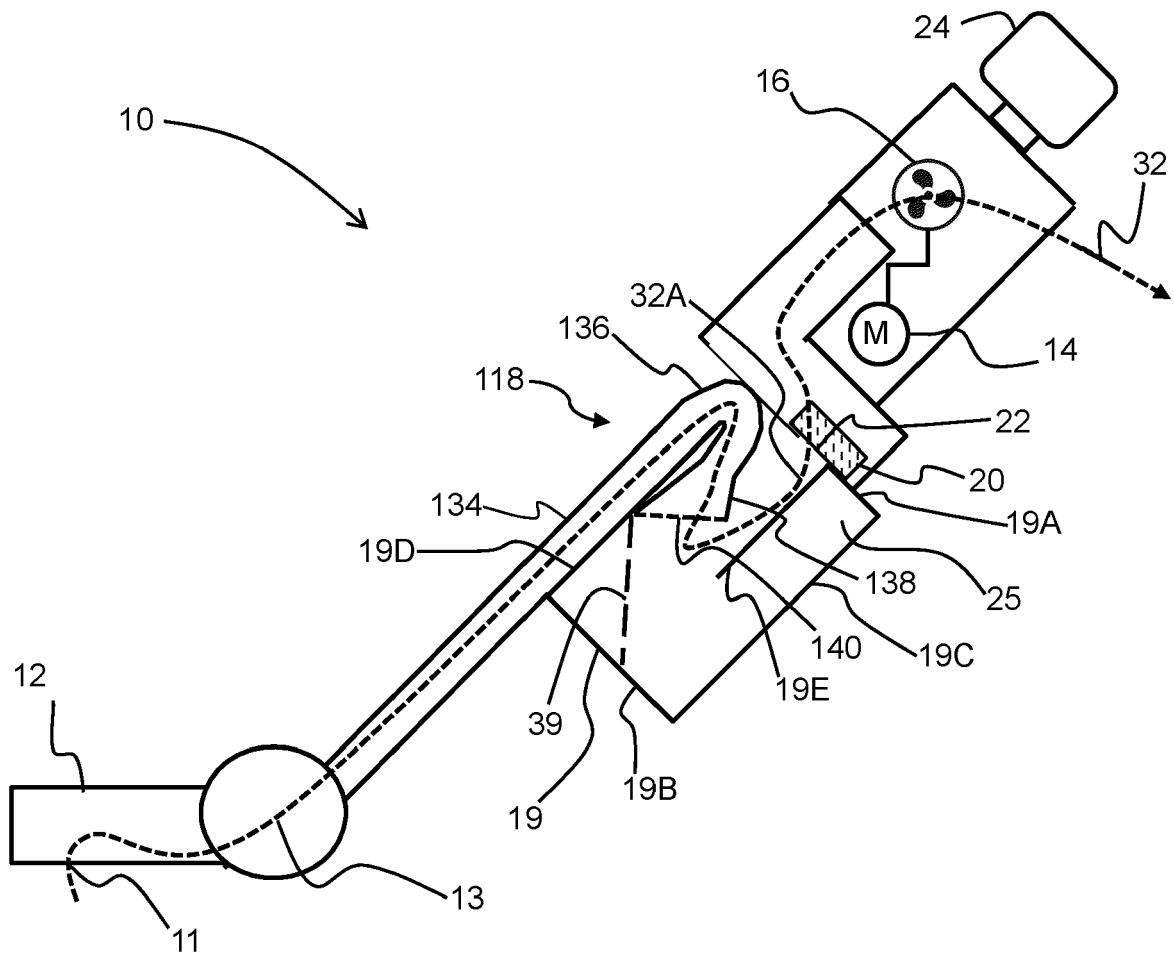


FIG. 17

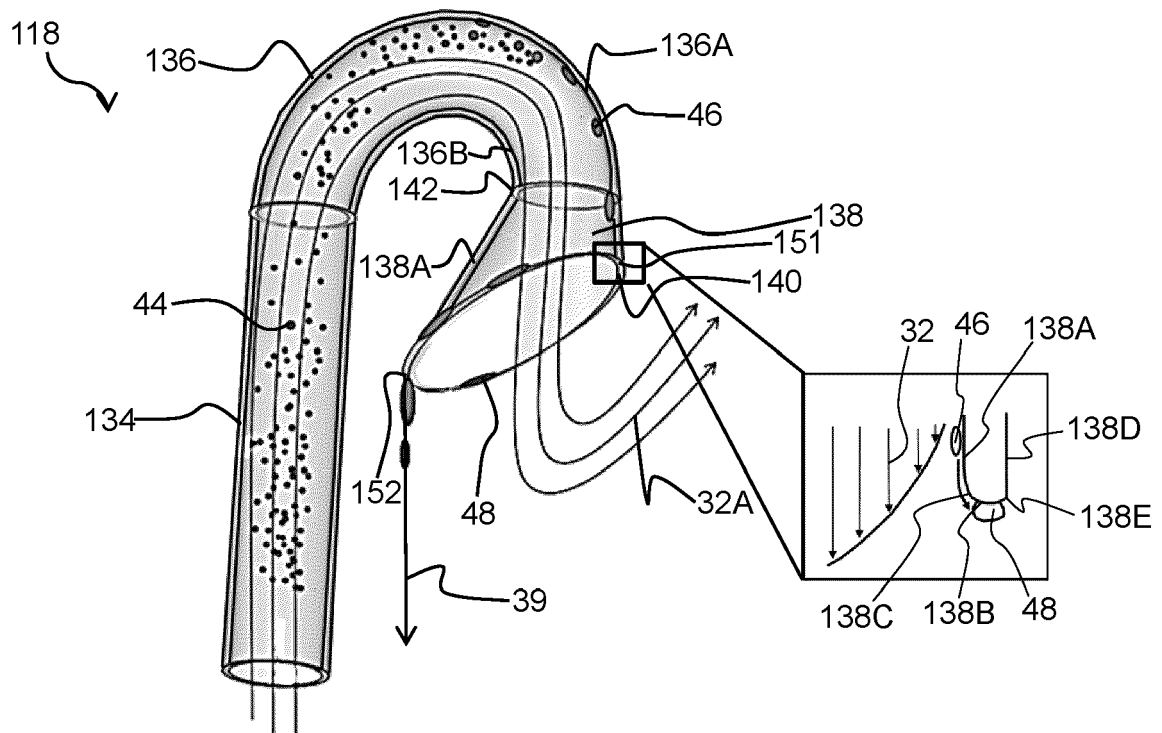


FIG. 18

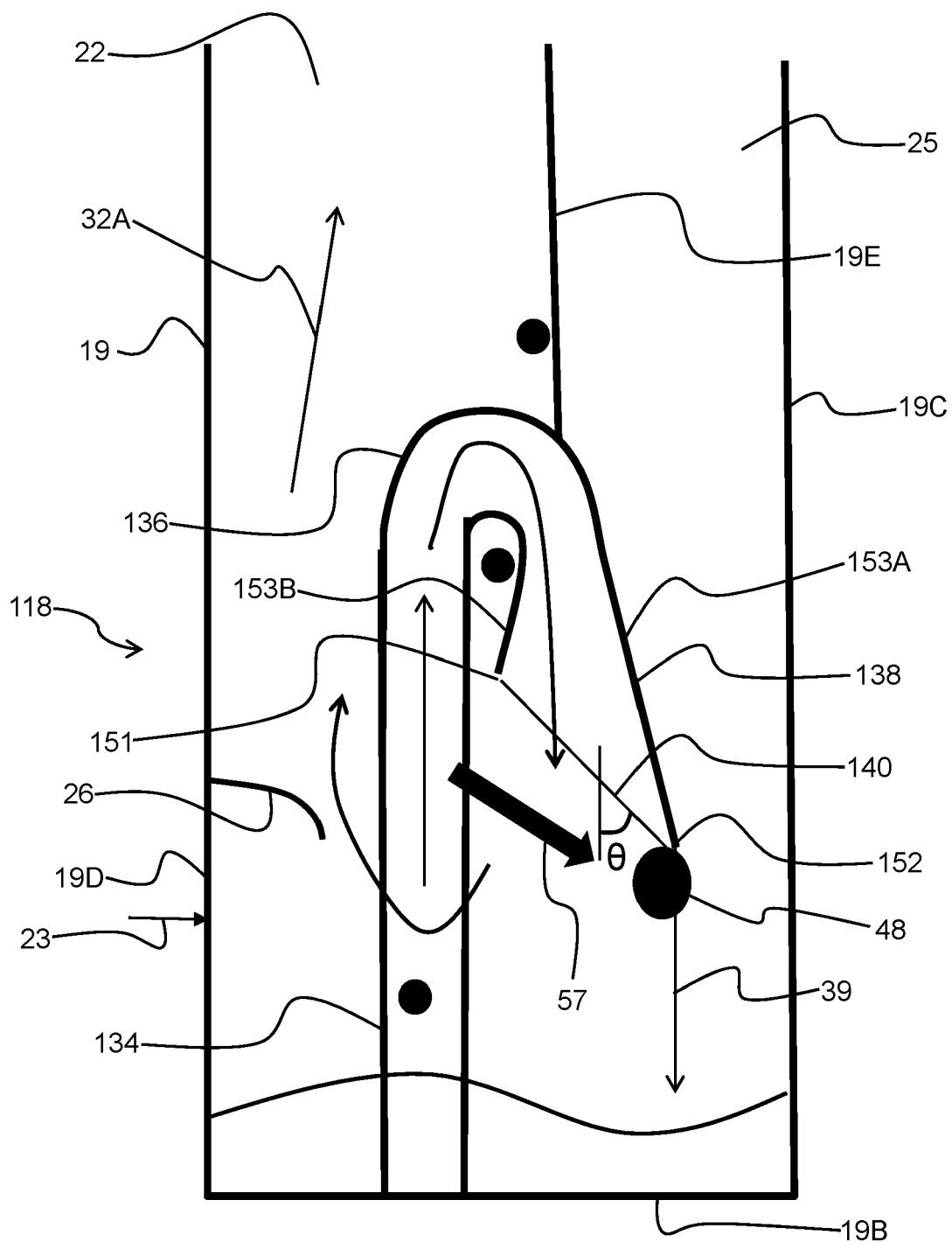


FIG. 19

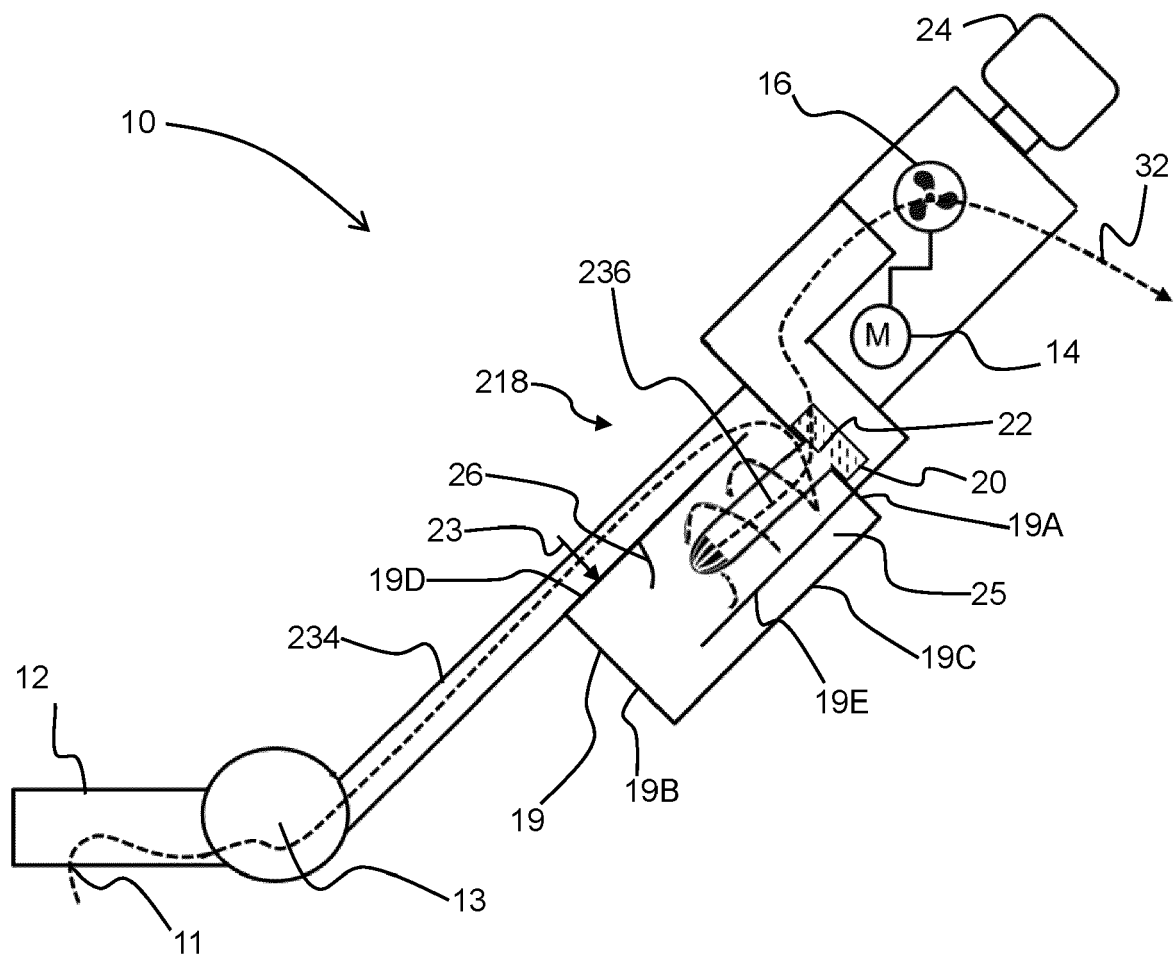


FIG. 20



EUROPEAN SEARCH REPORT

Application Number
EP 20 19 6634

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A	----- US 2016/227973 A1 (YORK LARRY D [US] ET AL) 11 August 2016 (2016-08-11) * paragraphs [0057] - [0059] *	3-5,7-9, 11-15	
A	----- DE 10 2005 026692 A1 (SAMSUNG KWANGJU ELECTRONICS CO [KR]) 8 June 2006 (2006-06-08) * paragraphs [0037] - [0042] *	1-15	
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			A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 March 2021	Examiner Eckenschwiller, A
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 19 6634

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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03-03-2021

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