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AIR DISPLACEMENT DEVICE

(57) Provided is an air displacement appliance (100). The air displacement appliance comprises a housing (102) that delimits a first air inlet (104), a second air inlet (106), and an air outlet (108). A first impeller (116) is arranged such that air from the first air inlet is drawn axially into the first impeller and radially expelled from the first impeller. A second impeller (118) is arranged such that air from the second air inlet is drawn axially into the second impeller and radially expelled from the second impeller. The air outlet is arranged to permit the air radially expelled from the first impeller and from the second impeller to pass therethrough to exit the housing.

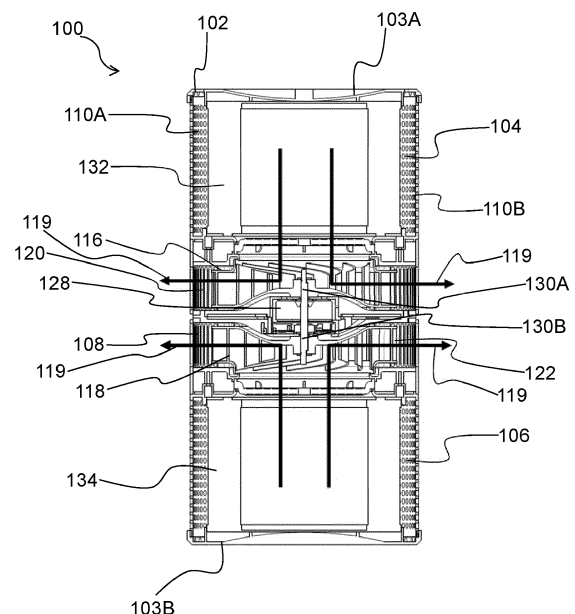


FIG. 1

Description

FIELD OF THE INVENTION

[0001] This invention relates to an air displacement appliance.

BACKGROUND OF THE INVENTION

[0002] Various different designs for air displacement appliances are known. As well as displacing air, air displacement appliances may include an air treatment system for treating the air, such as one or more of an air purification system, e.g. comprising a filter assembly; an air cooling system; an air heating system; an air humidification system; an air dehumidification system; and a fragrance emitting unit.

[0003] A traditional architecture for an air displacement appliance comprising an air purification system, in other words an air purifier, comprises an impeller arranged to draw in air through an air inlet provided in a side of the appliance's housing along an axial direction, and blow air out in a radial direction through an air outlet provided at an upper end of the appliance's housing. Such a design may include a single squirrel-cage impeller, one air inlet, and one air outlet.

[0004] Other known architectures include an impeller arranged to draw in air through air inlets provided in opposite sides of the appliance's housing along an axial direction and blow air out in a radial direction through an air outlet provided at an upper end of the appliance's housing. Such a design may include a single mirrored impeller, two air inlets, and one air outlet.

[0005] A so-called "tower" architecture is also known in which a centrifugal fan is arranged to draw air into the appliance's housing via an air inlet provided around a perimeter of the housing, and blow air towards an upper end of the housing.

[0006] Whilst such designs may have some advantages, it remains desirable to improve certain characteristics of such air displacement appliances, for example to enhance delivery of air in a room in which the air displacement appliance is operating, in a way that is comfortable for the user, limits energy consumption and noise production, and/or enables the air displacement appliance to have a robust and compact physical design.

SUMMARY OF THE INVENTION

[0007] The invention is defined by the claims.

[0008] According to examples in accordance with an aspect of the invention, there is provided an air displacement appliance comprising: a housing delimiting a first air inlet, a second air inlet, and an air outlet; a first impeller arranged such that air from the first air inlet is drawn axially into the first impeller and radially expelled from the first impeller; and a second impeller arranged such that air from the second air inlet is drawn axially into the

second impeller and radially expelled from the second impeller, the air outlet being arranged to permit the air radially expelled from the first impeller and from the second impeller to pass therethrough to exit the housing, wherein the air outlet is provided around a perimeter of the housing such that the air exits the housing in frontwards, backwards and sideways directions.

[0009] By the air displacement appliance including the first impeller and the second impeller, with the first impeller drawing in air from the first air inlet and the second impeller drawing in air from the second air inlet, an airflow rate of the air displacement appliance may be effectively doubled in comparison to a single-impeller design. In addition, when compared to a single fan whose size corresponds to the total size of the first and second impellers, a lower sound level can be achieved at the same flow rate.

[0010] It is noted that energy consumption of the air displacement appliance may depend on fan efficiency and motor efficiency of motor(s) that may rotate the first and second impellers. The fan efficiency value may change according to the impeller design. This value may be equal to the ratio of the hydraulic power produced to the mechanical power. The dual impeller design, when compared to a single fan design in the same volume, may provide a larger suction area, corresponding to suction from two separate zones (rather than suction from a single zone in the case of the single fan design). The larger suction area may increase fan efficiency. In addition, air velocities may be relatively high in the case of the single fan design, especially in the single suction zone, and the fan efficiency may be correspondingly lower in the case of the single fan design. For these reasons, the dual impeller design may provide a more efficient air displacement appliance compared to the single fan design. This more efficient air displacement appliance may provide comparable performance relative to the single fan design while consuming less energy.

[0011] Due to air radially expelled from the first impeller and the second impeller exiting the housing through the air outlet in frontwards, backwards and sideways directions, the air displacement appliance may spread air relatively homogeneously in a room in which the air displacement appliance is operating in a relatively short period of time, for example in comparison to a scenario in which air exits the housing in fewer directions, such as in only one direction. In other words, when air is supplied into the room from fewer directions, for example from only one direction, it may take longer for the air to spread homogeneously in the room. However, due to the forwards, backwards and sideways air egress from the air outlet of the air displacement appliance according to the present disclosure, fresh air may be spread over a wider area in a shorter period of time.

[0012] Distributing the airflow to the frontwards, backwards and sideways directions may also result in enhanced user comfort than, for instance, a scenario in which airflow is directed in fewer directions, such as only frontwards and backwards directions. This is because

distributing the airflow in more directions can lessen the risk that a user positioned along such directions experiences an uncomfortably high velocity airflow.

[0013] In other words, for a given flow rate, the air velocity may be higher when air is supplied from a narrower air outlet that permits air to exit the housing in fewer directions, for example in only one direction. Due to the forwards, backwards and sideways air egress from the air outlet of the air displacement appliance according to the present disclosure, air exits the housing via an air outlet having a relatively large area. This larger area air outlet may enable the air displacement appliance to deliver lower air velocities, noting that air velocity = flow rate / flow cross-sectional area. This may assist to lessen the risk of the user being disturbed by relatively high air velocities.

[0014] Furthermore, in a system that delivers air in fewer directions, for example in a single direction, closing off of the air delivery section of the system may be more likely, and the system's performance may be significantly impacted. Arranging such a system in a corner of a room, may mean that the entire area over which air is supplied may be relatively easily closed off, with concomitant significant detriment to the system's performance.

[0015] By providing the air outlet of the air displacement appliance according to the present disclosure around the perimeter of the housing such that air exits the housing in frontwards, backwards and sideways directions, the risk of blocking of the air outlet, and concomitant interference with airflow, may be reduced.

[0016] In some embodiments, the sideways direction(s) along which air exits the housing via the air outlet include(s) a sideways direction perpendicular to each of the frontwards and backwards directions.

[0017] In some embodiments, the air outlet is provided around the perimeter of the housing such that the air exits the housing in the frontwards and backwards directions, a first sideways direction, and a second sideways direction facing away from the first sideways direction.

[0018] By the air being directed in the forwards, backwards and both of the first and second sideways directions, the air outlet design may assist to enhance spreading of air relatively homogeneously in the room in which the air displacement appliance is operating in a relatively short period of time, as well as assisting to provide lower air velocities, and less risk of interference with airflow caused by blocking of the air outlet.

[0019] In some embodiments, the first sideways direction and the second sideways direction each include a sideways direction perpendicular to both of the frontwards and backwards directions.

[0020] In some embodiments, the air outlet is provided around substantially the entirety of the perimeter of the housing, for example at least 70% of the perimeter of the housing.

[0021] By providing the air outlet around substantially the entire perimeter of the housing, air may exit the housing from all radial directions, e.g. via a 360 degrees fully

open air outlet. This may assist to enhance spreading of air relatively homogeneously in the room in which the air displacement appliance is operating in a relatively short period of time. In other words, the air delivered via the air outlet may be able to disperse into the room faster, since the distance the air is required to move is effectively shortened due to the 360 degrees open air outlet.

[0022] Due to the 360 degrees open air outlet, operation of the air displacement appliance may be less likely to be adversely affected by the manner in which the air displacement appliance is used, e.g. positioned in a room, by the user. This is because the 360 degrees open air outlet may mean that closure, e.g. unintentional closure, of the entire air outlet is unlikely, thereby assisting to ensure consistent performance of the air displacement appliance that is minimally affected by the way in which the air displacement appliance is used.

[0023] For example, if the air displacement appliance is placed in a corner of the room, it may not be able to deliver air efficiently from a 90 degree portion of the air outlet, but may still deliver air effectively from the remaining 270 degree portion of the air outlet. Thus, the 360 degrees open air outlet may assist to minimize performance being compromised by such positioning of the air displacement appliance in the room.

[0024] In some embodiments, frontwards exit of air from the air outlet may be via a front part of the air outlet provided at a front portion of the housing, with backwards exit of air from the air outlet being via a back part of the air outlet provided at a back portion of the housing, and sideways exit of air from the air outlet being via side part(s) of the air outlet provided at side portion(s) of the housing that extend(s), e.g. curve(s), between the front and back portions.

[0025] In some embodiments, the air displacement appliance includes one or more outlet grids arranged in the air outlet.

[0026] In such embodiments, the one or more outlet grids may be arranged to deflect the air exiting the air outlet.

[0027] The one or more outlet grids can, for example, be arranged to provide an upwards or downwards deflection of the air exiting the air outlet in the frontwards, backwards and sideways directions.

[0028] In some embodiments, the one or more outlet grids are adjustable to enable selection of angle at which the air exiting the air outlet is deflected by the one or more outlet grids.

[0029] In some embodiments, a non-uniform distribution of outlet grids may be provided around the air outlet.

[0030] In such embodiments, while air exits the housing in the frontwards, backwards and sideways directions, e.g. to provide 360 degree air distribution, the air can be delivered more densely in some regions and less densely in other regions. In this way, if the user wants to receive more dense air, he or she may turn the air displacement appliance so that they are faced by a portion of the air outlet having fewer outlet grids, in other words

a portion in which the outlet grids are more widely spaced from each other. If the user wants to receive less air, he or she can turn the air displacement appliance so that they are faced by a different portion of the air outlet having more outlet grids, in other words a portion in which the outlet grids are more frequent/more closely spaced apart from each other.

[0031] Some conventional air displacement appliances include a cover called a volute to assist in pressurizing the air. This type of cover may span a relatively large area and hence may increase the size of such air displacement appliances. Such a cover may not be required for the air displacement appliance according to embodiments disclosed herein. There may be no need for such a volute. A high-performance structure may be obtainable in a relatively limited space.

[0032] The first impeller may have a first periphery from which air is radially expelled from the first impeller, and the second impeller may have a second periphery from which air is radially expelled from the second impeller. In such embodiments, the air outlet preferably aligns with the first periphery and the second periphery.

[0033] By the air outlet aligning with the first periphery and the second periphery, the air being radially expelled from the first impeller and the second impeller may directly exit the housing. Thus, no volute, in other words scroll housing, for pressurizing air expelled from the first and second impellers, may be needed, and therefore may be omitted.

[0034] In some embodiments, the housing is an elongate housing whose length extends from a first end of the housing to a second end of the housing.

[0035] In such embodiments, the first end may be an upper end of the housing, with the second end being a lower end of the housing when the air displacement appliance is orientated for use.

[0036] In some embodiments, the elongate housing has a circular or substantially circular cross-sectional shape so that the elongate housing is cylindrical or substantially cylindrical.

[0037] The term "substantially circular cross-sectional shape" may refer to an elliptical cross-sectional shape.

[0038] In other embodiments, the elongate housing has a polygonal cross-sectional shape, such as polygonal cross-sectional shape having rounded vertices.

[0039] In some embodiments, the elongate housing has a soft triangular cross-sectional shape, with one side of the soft triangular shape corresponding to a front portion of the housing, and the other two sides respectively corresponding to a side portion and a back portion.

[0040] Other cross-sectional shapes can also be contemplated, such as a soft square or soft rectangular cross-sectional shape.

[0041] It is noted that the term "soft" in the context of such soft polygonal cross-sectional shapes for the housing may refer to polygonal cross-sectional shapes having rounded vertices.

[0042] In some embodiments, the first impeller and the

second impeller are arranged at an intermediate region along the length of the housing between the first end and the second end.

[0043] By arranging the first impeller and the second impeller, for example as well as a motor (or motors) for rotating the first and second impellers, in the intermediate region along the length of the housing, a center of gravity of the air displacement appliance may be lowered, thereby alleviating vibration of the air displacement appliance.

[0044] Alternatively or additionally, the air displacement appliance may comprise a foot assembly provided at the lower end of the housing. In such embodiments, the foot assembly is arranged to enable the air displacement appliance to stand on a surface, such as a floor.

[0045] The foot assembly may assist the air displacement appliance to balance when standing on the surface.

[0046] Moreover, since the foot assembly is provided at the lower end of the housing, the foot assembly may assist to lower the center of gravity of the air displacement appliance, thereby assisting to alleviate vibration of the air displacement appliance.

[0047] As an alternative or in addition to the foot assembly and/or arrangement of the first and second impeller at the intermediate region along the length of the housing, the motor(s) that rotate the first and second impellers may be mounted via resilient mounting member(s) arranged to suppress transmission of vibration from the motor(s) to the housing.

[0048] In some embodiments, the resilient mounting member(s) include absorber parts, e.g. rubber absorber parts, placed on motor mounting feet by which the motor(s) is or are mounted to the housing.

[0049] In some embodiments, the first air inlet is arranged at or proximal to the first end, the second air inlet is arranged at or proximal to the second end, and the air outlet is arranged in a central region along the length of the housing between the first air inlet and the second air inlet.

[0050] Thus, the first impeller and the second impeller may draw air into the housing from opposing ends of the air displacement appliance, and the air exiting the air displacement appliance may exit from the central region between the opposing ends. This has been found to provide effective air displacement performance in combination with a relatively compact design. In particular, this arrangement may assist in maximizing suction and air supply areas. Velocities can be reduced due to such relatively large areas, and a relatively quiet air displacement appliance can be correspondingly obtained (noting that lower velocities may result in lower sound levels).

[0051] In some embodiments, the first air inlet is arranged at or proximal to the upper end of the housing and the second air inlet is arranged at or proximal to the lower end of the housing when the air displacement appliance is orientated for use.

[0052] Thus, air suction can be from both the upper and lower ends, with the air intake via the first air inlet drawing air from an upper area of the room, while the air

intake via the second air inlet draws air from a lower area of the room.

[0053] In some embodiments, the first air inlet is provided around the perimeter of the housing such that air enters the housing, via the first air inlet, from frontwards, backwards and sideways directions.

[0054] Frontwards entry of air into the first air inlet may be via a front part of the first air inlet provided at the front portion of the housing, with backwards entry of air into the first air inlet being via a back part of the first air inlet provided at the back portion of the housing, and sideways entry of air into the first air inlet being via side part(s) of the first air inlet provided at side portion(s) of the housing that extend(s), e.g. curve(s), between the front and back portions.

[0055] Alternatively or additionally, the second air inlet is provided around the perimeter of the housing such that air enters the housing, via the second air inlet, from frontwards, backwards and sideways directions.

[0056] Frontwards entry of air into the second air inlet may be via a front part of the second air inlet provided at the front portion of the housing, with backwards entry of air into the second air inlet being via a back part of the second air inlet provided at the back portion of the housing, and sideways entry of air into the second air inlet being via side part(s) of the second air inlet provided at side portion(s) of the housing that extend(s), e.g. curve(s), between the front and back portions.

[0057] Thus, air can be drawn into the first air inlet and/or the second air inlet from around the air displacement appliance along several radial directions.

[0058] In some embodiments, the sideways direction(s) along which air enters the housing via the first air inlet and/or the second air inlet include(s) a sideways direction perpendicular to each of the frontwards and backwards directions.

[0059] In some embodiments, the first air inlet and/or the second air inlet is or are provided around the perimeter of the housing such that the air enters the housing along the frontwards and backwards directions, a first sideways direction, and a second sideways direction opposing the first sideways direction.

[0060] In some embodiments, the first sideways direction and the second sideways direction each include a sideways direction perpendicular to both of the frontwards and backwards directions.

[0061] In some embodiments, the first air inlet and/or the second air inlet is or are provided around substantially the entirety of the perimeter of the housing, for example at least 70% of the perimeter of the housing.

[0062] Thus, a 360 degrees air suction may be provided. In this way, the air inside the room can be drawn efficiently into the housing, e.g. at/proximal to upper and lower ends of the housing, and then, owing to the air outlet opening being provided around a perimeter of the housing, e.g. around substantially the entirety of the perimeter of the housing, the air can be delivered into the room from a relatively large area air outlet.

[0063] As an alternative or in addition to the first air inlet being provided around the perimeter of the housing such that air enters the housing, via the first air inlet, from frontwards, backwards and sideways directions, the first air inlet may be provided at an end, for example the first end or upper end, of the housing. Thus, air may enter the housing, via the first air inlet, along a direction normal to such an end, e.g. the first end or upper end, of the housing.

[0064] In the scenario in which the first air inlet is (at least partly) provided at the upper end of the housing, the first air inlet can be regarded as being provided at a top side or top face of the housing.

[0065] As an alternative or in addition to the second air inlet being provided around the perimeter of the housing such that air enters the housing, via the second air inlet, from frontwards, backwards and sideways directions, the second air inlet may be provided at an end, for example the second end or lower end, of the housing. Thus, air may enter the housing, via the second air inlet, along a direction normal to such an end, e.g. the second end or lower end, of the housing.

[0066] In the scenario in which the second air inlet is (at least partly) provided at the lower end of the housing, the second air inlet can be regarded as being provided at a bottom side or bottom face of the housing.

[0067] In some embodiments, the first air inlet is (at least partly) provided at the top end, e.g. top side or top face, of the housing, and the second air inlet is (at least partly) provided at the bottom end, e.g. bottom side or bottom face, of the housing.

[0068] The air displacement appliance may include at least one motor arranged to rotate the first impeller and the second impeller.

[0069] In some embodiments, the at least one motor includes a first motor for rotating the first impeller, and a second motor for rotating the second impeller.

[0070] In such embodiments, the first and second motors may be controllable independently of each other, for instance to enable rotation of the first and second impellers at different rotational speeds relative to each other.

[0071] Alternatively, the air displacement appliance includes a motor, in other words a common motor, arranged to rotate the first impeller and the second impeller.

[0072] By the air displacement appliance including a common motor that rotates both the first impeller and the second impeller, there may be advantages in terms of size, cost, and energy consumption.

[0073] The air displacement appliance may be made more compact, and the complexity and cost of the design may be reduced, e.g. relative to embodiments in which a first motor rotates the first impeller and a second motor rotates the second impeller. Designs including two motors may require a larger space for accommodating the two motors, and two motors may require separate motor controller outputs. Hence dual motor designs may suffer from greater complexity and higher cost compared to embodiments in which a common motor rotates both the

first impeller and the second impeller.

[0074] In some embodiments, the motor is sandwiched between the first impeller and the second impeller, with a drive shaft of the motor comprising a first drive shaft portion extending from the motor to the first impeller, and a second drive shaft portion extending from the motor, in an opposite direction relative to the first drive shaft portion, to the second impeller.

[0075] Sandwiching the motor between the first impeller and the second impeller in this manner may assist to provide a relatively compact and robust design for the air displacement appliance.

[0076] Due to this positioning of the motor, it may be possible to operate the first and second impellers in a relatively simple geometry.

[0077] Should the motor not be positioned between the first and second impellers, a shaft length extending from the motor may be required to increase, thereby increasing torsion of the shaft and shortening the life of the air displacement appliance.

[0078] In addition, should the motor be positioned in an airflow path, rather than between the first and second impellers, the motor may obstruct the flow, and cause an additional pressure drop, with concomitant decrease in efficiency of the air displacement appliance because more energy may be required to provide a given flow from the air outlet.

[0079] In alternative embodiments, the motor is arranged to drive rotation of the first impeller and the second impeller from a position adjacent to the first impeller, so that the first impeller is positioned between the motor and the second impeller. Alternatively, the motor is arranged to drive rotation of the first impeller and the second impeller from a position adjacent to the second impeller, so that the second impeller is positioned between the motor and the first impeller.

[0080] In some embodiments, the air displacement appliance comprises an air treatment system configured to treat air displaced by the air displacement appliance.

[0081] The air treatment system can include one or more of: an air purification system, e.g. comprising a filter assembly, arranged to purify the air displaced by the air displacement appliance; an air heating system arranged to heat the air displaced by the air displacement appliance; an air cooling system arranged to cool the air displaced by the air displacement appliance; an air humidification system arranged to humidify the air displaced by the air displacement appliance; an air dehumidification system arranged to dehumidify the air displaced by the air displacement appliance; and a fragrance emitting unit arranged to emit fragrance into the air displaced by the air displacement appliance.

[0082] In some embodiment, the air displacement appliance comprises a filter assembly for filtering air displaced by the air displacement appliance.

[0083] The filter assembly can, for example, include a high-efficiency particulate absorbing (HEPA) filter material.

[0084] Alternatively or additionally, the filter assembly may comprise a gas removal material.

[0085] Examples of gas removal materials include active carbon, and porous and gas-absorbing materials, such as zeolites and metal organic frameworks.

[0086] In some embodiments, HEPA and activated carbon layers included the filter assembly can be arranged separately or in a sandwich form. The filter assembly may also have a pre-filtering structure.

[0087] In some embodiments, the filter assembly comprises a first filter, with the first filter and the first impeller being arranged such that air from the first air inlet is drawn through the first filter prior to the filtered air being drawn axially into the first impeller and radially expelled from the first impeller.

[0088] Alternatively or additionally, the filter assembly may comprise a second filter, with the second filter and the second impeller being arranged such that air from the second air inlet is drawn through the second filter prior to the filtered air being drawn axially into the second impeller and radially expelled from the second impeller.

[0089] In embodiments in which the air displacement appliance includes the first filter and the second filter, the inclusion of two filters may mean that it is possible to use first and second filters with different filtering properties relative to each other.

[0090] For example, one of the first and second filters may include a filter configured to alleviate pet odor, while the other of the first and second filters may include a filter configured to alleviate cooking odor.

[0091] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0092] For a better understanding of the invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings, in which:

FIG. 1 provides a view showing an interior of an air displacement appliance according to an example;

FIG. 2 provides a cross-sectional view of the air displacement appliance shown in FIG. 1 that shows the air displacement appliance's air outlet provided around a perimeter of the air displacement appliance's housing;

FIG. 3 provides a first perspective view of the air displacement appliance shown in FIGs. 1 and 2; and

FIG. 4 provides a second perspective view of the air displacement appliance shown in FIGs. 1 to 3.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0093] The invention will be described with reference to the Figures.

[0094] It should be understood that the detailed de-

scription 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.

[0095] Provided is an air displacement appliance. The air displacement appliance comprises a housing that delimits a first air inlet, a second air inlet, and an air outlet. A first impeller is arranged such that air from the first air inlet is drawn axially into the first impeller and radially expelled from the first impeller. A second impeller is arranged such that air from the second air inlet is drawn axially into the second impeller and radially expelled from the second impeller. The air outlet is arranged to permit the air radially expelled from the first impeller and from the second impeller to pass therethrough to exit the housing.

[0096] FIGs. 1 to 4 show an air displacement appliance 100 according to an example. The air displacement appliance 100 includes a housing 102.

[0097] The housing 102 may be formed of any suitable material, such as a plastic material, a metal and/or a metal alloy. Particular mention is made of the housing 102 being formed of a plastic material, such as an engineering thermoplastic, since this may assist the air displacement appliance 100 to be made more lightweight.

[0098] The housing 102 may have any suitable shape. In some embodiments, such as that shown in FIGs. 1 to 4, the housing 102 is an elongate housing 102 whose length extends from a first end 103A of the housing 102 to a second end 103B of the housing 102.

[0099] In such embodiments, the first end 103A may be an upper end of the housing 102, with the second end 103B being a lower end of the housing 102 when the air displacement appliance 100 is orientated for use, as shown in FIGs. 1, 3 and 4.

[0100] With reference to FIGs. 3 and 4, the air displacement appliance 100 may comprise a foot assembly 105 provided at the lower end 103B of the housing 102. In such embodiments, the foot assembly 105 is arranged to enable the air displacement appliance 100 to stand on a surface, such as a floor.

[0101] The foot assembly 105 may assist the air displacement appliance 100 to balance when standing on the surface. Moreover, since the foot assembly 105 is provided at the lower end 103B of the housing 102, the foot assembly 105 may assist to lower the center of gravity of the air displacement appliance 100, thereby assisting to alleviate vibration of the air displacement appliance 100.

[0102] More generally, the housing 102 delimits a first air inlet 104, a second air inlet 106, and an air outlet 108.

[0103] In some embodiments, such as that shown in FIGs. 1 to 4, the first air inlet 104 is defined by a plurality of holes of a perforate portion of the housing 102 that permit air to enter the housing 102.

[0104] In such embodiments, the perforate portion may be provided at or proximal to the upper end 103A of the housing 102. The perforate portion may, for example, be provided around a perimeter of the housing 102 proximal to the upper end 103A of the housing 102. This is illustrated by the example shown in FIGs. 1 to 4.

[0105] Alternatively or additionally, the second air inlet 104 may be defined by a plurality of holes of a further perforate portion of the housing 102 that permit air to enter the housing 102.

[0106] In such embodiments, the further perforate portion may be provided at or proximal to the lower end 103B of the housing 102. The further perforate portion may, for example, be provided around a perimeter of the housing 102 proximal to the lower end 103A of the housing 102. This is illustrated by the example shown in FIGs. 1 to 4.

[0107] More generally, the first air inlet 104 may be provided around a perimeter of the housing 102 such that air enters the housing 102, via the first air inlet 104, from frontwards, backwards and sideways directions. Thus, air can be drawn into the first air inlet 104 from around the air displacement appliance 100 along several radial directions.

[0108] In some embodiments, the sideways direction(s) along which air enters the housing 102 via the first air inlet 104 include(s) a sideways direction perpendicular to each of the frontwards and backwards directions.

[0109] The first air inlet 104 may be provided around the perimeter of the housing 102 such that the air enters the housing 102 along the frontwards and backwards directions, a first sideways direction, and a second sideways direction opposing the first sideways direction.

[0110] In such embodiments, the first sideways direction and the second sideways direction may each include a sideways direction perpendicular to both of the frontwards and backwards directions.

[0111] In some embodiments, the first air inlet 104 is provided around substantially the entirety of the perimeter of the housing 102, for example at least 70% of the perimeter of the housing 102. Thus, a 360 degrees air suction may be provided. In this way, the air inside the room can be drawn efficiently into the housing 102 via the first air inlet 104.

[0112] Alternatively or additionally, the second air inlet 106 is provided around the perimeter of the housing 102 such that air enters the housing 102, via the second air inlet 106, from frontwards, backwards and sideways directions.

[0113] In some embodiments, the sideways direction(s) along which air enters the housing 102 via the second air inlet 106 include(s) a sideways direction per-

pendicular to each of the frontwards and backwards directions.

[0114] The second air inlet 106 may be provided, e.g. similarly to the first air inlet 104, around the perimeter of the housing 102 such that the air enters the housing 102 along the frontwards and backwards directions, a first sideways direction, and a second sideways direction opposing the first sideways direction.

[0115] In such embodiments, the first sideways direction and the second sideways direction may each include a sideways direction perpendicular to both of the frontwards and backwards directions.

[0116] In some embodiments, the second air inlet 106 may be provided, e.g. similarly to the first air inlet 104, around substantially the entirety of the perimeter of the housing 102, for example at least 70% of the perimeter of the housing 102. Thus, a 360 degrees air suction may be provided. In this way, the air inside the room can be drawn efficiently into the housing 102 via the second air inlet 106.

[0117] In some embodiments, the first air inlet 104 is arranged at or proximal to the upper end 103A of the housing 102 and the second air inlet 106 is arranged at or proximal to the lower end 103B of the housing 102 when the air displacement appliance 100 is orientated for use. Thus, air suction can be from both the upper and lower ends 103A, 103B, with the air intake via the first air inlet 104 drawing air from an upper area of the room, while the air intake via the second air inlet 106 draws air from a lower area of the room.

[0118] Such arrangement of the first and second air inlets 104, 106 at or proximal to the upper and lower ends 103A, 103B of the housing 102 respectively can be combined with the first and the second air inlets 104, 106 being each provided around the perimeter of the housing 102 such that air enters the housing 102, via the first and second air inlets 104, 106, from frontwards, backwards and sideways directions. This has been found to provide a particularly effective air intake arrangement.

[0119] When determining the percentage of the perimeter of the housing 102 that the first or second air inlet 104, 106 is provided, the width of each of the hole(s) through which air enters the housing 102 around the perimeter of the housing 102 may be measured and summed, and this sum divided by the perimeter and multiplied by one hundred.

[0120] In the case that the hole(s) have non-uniform width(s), the maximum width of each hole may be used for the percentage determination.

[0121] In some embodiments, the elongate housing 102 has a circular or substantially circular cross-sectional shape so that the elongate housing 102 is cylindrical or substantially cylindrical.

[0122] The term "substantially circular cross-sectional shape" may refer to an elliptical cross-sectional shape.

[0123] In such embodiments, and as best shown in FIG. 2, a front portion 109A and a back portion 109B of the housing 102 may be separated from each other by a

diameter of the cylindrical or substantially cylindrical housing 102. In such embodiments, side portions 110A, 110B may include, or correspond to, portions of the circumference of the housing 102 that curve between the front and back portions 109A, 109B.

[0124] In other embodiments, the elongate housing 102 has a polygonal cross-sectional shape, such as a polygonal cross-sectional shape having rounded vertices.

[0125] In some embodiments, the elongate housing 102 has a soft triangular cross-sectional shape, with one side of the soft triangular shape corresponding to a front portion of the housing 102, and the other two sides respectively corresponding to a side portion and a back portion of the housing 102.

[0126] Other cross-sectional shapes can also be contemplated, such as a soft square or soft rectangular cross-sectional shape. Such a soft square or soft rectangular cross-sectional shape of the elongate housing 102 may mean that the elongate housing 102 is substantially cuboidal.

[0127] It is noted that the term "soft" in the context of such soft polygonal cross-sectional shapes for the housing 102 may refer to polygonal cross-sectional shapes having rounded vertices.

[0128] Frontwards entry of air into the first air inlet 104 may be via a front part 104A of the first air inlet 104 provided at the front portion 109A of the housing 102, with backwards entry of air into the first air inlet 104 being via a back part of the first air inlet 104 provided at the back portion 109B of the housing 102, and sideways entry of air into the first air inlet 104 being via side part(s) 104C, 104D of the first air inlet 104 provided at side portion(s) 110A, 110B of the housing 102 that extend(s), e.g. curve(s), between the front and back portions 109A, 109B. An example of this is illustrated in FIGs. 3 and 4.

[0129] Similarly, frontwards entry of air into the second air inlet 106 may be via a front part 106A of the second air inlet 106 provided at the front portion 109A of the housing 102, with backwards entry of air into the second air inlet 106 being via a back part of the second air inlet 106 provided at the back portion 109B of the housing 102, and sideways entry of air into the second air inlet 106 being via side part(s) 106C, 106D of the second air inlet 106 provided at side portion(s) 110A, 110B of the housing 102 that extend(s), e.g. curve(s), between the front and back portions 109A, 109B. An example of this is illustrated in FIGs. 3 and 4.

[0130] More generally, and referring again to FIG. 1, the air displacement appliance 100 includes a first impeller 116 arranged such that air from the first air inlet 104 is drawn axially into the first impeller 116 and radially expelled from the first impeller 116. The air displacement appliance 100 further includes a second impeller 118 arranged such that air from the second air inlet 106 is drawn axially into the second impeller 118 and radially expelled from the second impeller 118. The air displacement provided by the first and second impellers 116, 118 is rep-

resented in FIG. 1 by four arrows 119.

[0131] In some embodiments, such as that shown in FIGs. 1 to 4, the first impeller 116 and the second impeller 118 are arranged at an intermediate region along the length of the elongate housing 102 between the first end 103A and the second end 103B.

[0132] By arranging the first impeller 116 and the second impeller 118, for example as well as a motor (or motors) 128 for rotating the first and second impellers 116, 118, in the intermediate region along the length of the housing 102, a center of gravity of the air displacement appliance 100 may be lowered, thereby alleviating vibration of the air displacement appliance 100.

[0133] By the air displacement appliance 100 including the first impeller 116 and the second impeller 118, with the first impeller 116 drawing in air from the first air inlet 104 and the second impeller 118 drawing in air from the second air inlet 106, an airflow rate of the air displacement appliance 100 may be effectively doubled in comparison to a single-impeller design. In addition, when compared to a single fan whose size corresponds to the total size of the first and second impellers 116, 118, a lower sound level can be achieved at the same flow rate.

[0134] As represented in FIG. 1 by the arrows 119, air radially expelled from the first impeller 116 and the second impeller 118 exits the housing 102 through the air outlet 108.

[0135] The air outlet 108 is provided around the perimeter of the housing 102 such that air exits the housing 102 via the air outlet 108 in frontwards, backwards and sidewards directions. Thus, the air displacement appliance 100 may spread air relatively homogeneously in a room in which the air displacement appliance 100 is operating in a relatively short period of time, for example in comparison to a scenario in which air exits the housing 102 in fewer directions, such as in only one direction. In other words, when air is supplied into the room from fewer directions, for example from only one direction, it may take longer for the air to spread homogeneously in the room. However, due to the forwards, backwards and sidewards air egress from the air outlet 108 of the air displacement appliance 100 shown in FIGs. 1 to 4, fresh air may be spread over a wider area in a shorter period of time.

[0136] Distributing the airflow to the frontwards, backwards and sidewards directions may also result in enhanced user comfort than, for instance, a scenario in which airflow is directed in fewer directions, such as only frontwards and backwards directions. This is because distributing the airflow in more directions can lessen the risk that a user positioned along such directions experiences an uncomfortably high velocity airflow.

[0137] In other words, for a given flow rate, the air velocity may be higher when air is supplied from a narrower air outlet that permits air to exit the housing 102 in fewer directions, for example in only one direction. Due to the forwards, backwards and sidewards air egress from the air outlet 108 of the air displacement appliance 100

shown in FIGs. 1 to 4, air exits the housing 102 via an air outlet 108 having a relatively large area. This larger area air outlet 108 may enable the air displacement appliance 100 to deliver lower air velocities, noting that $\text{air velocity} = \text{flow rate} / \text{flow cross-sectional area}$. This may assist to lessen the risk of the user being disturbed by relatively high air velocities.

[0138] Furthermore, in a system that delivers air in fewer directions, for example in a single direction, closing off of the air delivery section of the system may be more likely, and the system's performance may be significantly impacted. Arranging such a system in a corner of a room, may mean that the entire area over which air is supplied may be relatively easily closed off, with concomitant significant detriment to the system's performance.

[0139] By providing the air outlet 108 around the perimeter of the housing 102 such that air exits the housing 102 in frontwards, backwards and sidewards directions, the risk of blocking of the air outlet 108, and concomitant interference with airflow, may be reduced.

[0140] With reference to FIGs. 2 to 4, frontwards exit of air from the air outlet 108 may be via a front part 108A of the air outlet 108 provided at the front portion 109A of the housing 102, with backwards exit of air from the air outlet 108 being via a back part 108B of the air outlet 108 provided at the back portion 109B of the housing 102, and sidewards exit of air from the air outlet 108 being via side part(s) 108C, 108D of the air outlet 108 provided at side portion(s) 110A, 110B of the housing 102 that that extend(s), e.g. curve(s), between the front and back portions 109A, 109B.

[0141] The sidewards direction(s) along which air exits the housing 102 via the air outlet 108 may include a sidewards direction perpendicular to each of the frontwards and backwards directions.

[0142] In some embodiments, the air outlet 108 is provided around the perimeter of the housing 102 such that the air exits the housing 102 in the frontwards and backwards directions, a first sidewards direction, and a second sidewards direction facing away from the first sidewards direction.

[0143] By the air being directed in the forwards, backwards and both of the first and second sidewards directions, the air outlet 108 design may assist to enhance spreading of air relatively homogeneously in the room in which the air displacement appliance 100 is operating in a relatively short period of time, as well as assisting to provide lower air velocities, and less risk of interference with airflow caused by blocking of the air outlet 108.

[0144] In some embodiments, the first sidewards direction and the second sidewards direction each include a sidewards direction perpendicular to both of the frontwards and backwards directions.

[0145] In some embodiments, the air outlet 108 is provided around substantially the entirety of the perimeter of the housing 102, for example at least 70% of the perimeter of the housing 102.

[0146] By providing the air outlet 108 around substan-

tially the entire perimeter of the housing 102, air may exit the housing 102 from all radial directions, e.g. via a 360 degrees fully open air outlet 108. This may assist to enhance spreading of air relatively homogeneously in the room in which the air displacement appliance 100 is operating in a relatively short period of time. In other words, the air delivered via the air outlet 108 may be able to disperse into the room faster, since the distance the air is required to move is effectively shortened due to the 360 degrees open air outlet 108.

[0147] Due to the 360 degrees open air outlet 108, operation of the air displacement appliance 100 may be less likely to be adversely affected by the manner in which the air displacement appliance 100 is used, e.g. positioned in a room, by the user. This is because the 360 degrees open air outlet may mean that closure, e.g. unintentional closure, of the entire air outlet is unlikely, thereby assisting to ensure consistent performance of the air displacement appliance 100 that is minimally affected by the way in which the air displacement appliance 100 is used.

[0148] For example, if the air displacement appliance 100 is placed in a corner of the room, it may not be able to deliver air efficiently from a 90 degree portion of the air outlet 108, but may still deliver air effectively from the remaining 270 degree portion of the air outlet 108. Thus, the 360 degrees open air outlet 108 may assist to minimize performance being compromised by such positioning of the air displacement appliance 100 in the room.

[0149] In some embodiments, such as that shown in FIGs. 1 to 4, the air outlet 108 is defined by a grille portion of the housing 102 whose plurality of slots permit air to exit the housing 102.

[0150] When determining the percentage of the perimeter of the housing 102 that the air outlet 108 is provided, the width of each of the aperture(s), e.g. slots, through which air exits the housing 102 around the perimeter of the housing 102 may be measured and summed, and this sum divided by the perimeter and multiplied by one hundred.

[0151] In the case that the aperture(s), e.g. slots, have non-uniform width(s), the maximum width of each aperture may be used for the percentage determination.

[0152] In some embodiments, such as that shown in FIGs. 1 to 4, the first air inlet 104 is arranged at or proximal to the first end 103A, the second air inlet 106 is arranged at or proximal to the second end 103B, and the air outlet 108 is arranged in a central region along the length of the elongate housing 102 between the first air inlet 104 and the second air inlet 106.

[0153] Thus, the first impeller 116 and the second impeller 118 may draw air into the housing 102 from opposing ends 103A, 103B of the air displacement appliance 100, and the air exiting the air displacement appliance 100 may exit from the central region between the opposing ends 103A, 103B. This has been found to provide effective air displacement performance in combination with a relatively compact design. In particular, this

arrangement may assist in maximizing suction and air supply areas. Velocities can be reduced due to such relatively large areas, and a relatively quiet air displacement appliance 100 can be correspondingly obtained (noting that lower velocities may result in lower sound levels).

[0154] The air displacement appliance 100 may include one or more outlet grids arranged in the air outlet 108. In such embodiments, the one or more outlet grids may be arranged to deflect the air exiting the air outlet 108. The one or more outlet grids can, for example, be arranged to provide an upwards or downwards deflection of the air exiting the air outlet 108 in the frontwards, backwards and sideways directions.

[0155] In some embodiments, the one or more outlet grids are adjustable to enable selection of angle at which the air exiting the air outlet 108 is deflected by the one or more outlet grids.

[0156] In some embodiments, a non-uniform distribution of outlet grids may be provided around the air outlet 108. In such embodiments, while air exits the housing 102 in the frontwards, backwards and sideways directions, e.g. to provide 360 degree air distribution, the air can be delivered more densely in some regions and less densely in other regions. In this way, if the user wants to receive more dense air, he or she may turn the air displacement appliance 100 so that they are faced by a portion of the air outlet 108 having fewer outlet grids, in other words a portion in which the outlet grids are more widely spaced from each other. If the user wants to receive less air, he or she can turn the air displacement appliance 100 so that they are faced by a different portion of the air outlet 108 having more outlet grids, in other words a portion in which the outlet grids are more frequent/more closely spaced apart from each other.

[0157] As shown in FIG. 1, the first impeller 116 may have a first periphery 120 from which air is radially expelled from the first impeller 116, and the second impeller 118 may have a second periphery 122 from which air is radially expelled from the second impeller 118. In such embodiments, the air outlet 108 preferably aligns with the first periphery 120 and the second periphery 122.

[0158] By the air outlet 108 aligning with the first periphery 120 and the second periphery 122, the air being radially expelled from the first impeller 116 and the second impeller 118 may directly exit the housing 102. Thus, no volute, in other words scroll housing, for pressurizing air expelled from the first and second impellers 116, 118, may be needed, and therefore may be omitted, between the peripheries 120, 122 of either or both of the first and second impellers 116, 118 and the air outlet 108.

[0159] With continued reference to FIG. 1, the air displacement appliance 100 may include at least one motor 128 arranged to rotate the first impeller 116 and the second impeller 118.

[0160] Any suitable type of motor 128 can be contemplated for the at least one motor 128, such as a brushless motor 128. A brushless motor 128 may assist to make operation of the air displacement appliance 100 quieter.

Other types of motor 128 can be used.

[0161] In some embodiments, the motor(s) 128 that rotate the first and second impellers 116, 118 may be mounted via resilient mounting member(s) (not visible) arranged to suppress transmission of vibration from the motor(s) 128 to the housing 102.

[0162] In such embodiments, the resilient mounting member(s) may include absorber parts, e.g. rubber absorber parts, placed on motor mounting feet by which the motor(s) 128 is or are mounted to the housing 102.

[0163] It is noted that energy consumption of the air displacement appliance 100 may depend on fan efficiency and motor efficiency of the motor(s) 128 that may rotate the first and second impellers 116, 118. The fan efficiency value may change according to the impeller design. This value may be equal to the ratio of the hydraulic power produced to the mechanical power. The dual impeller design, when compared to a single fan design in the same volume, may provide a larger suction area, corresponding to suction from two separate zones (rather than suction from a single zone in the case of the single fan design). The larger suction area may increase fan efficiency. In addition, air velocities may be relatively high in the case of the single fan design, especially in the single suction zone, and the fan efficiency may be correspondingly lower in the case of the single fan design. For these reasons, the dual impeller 116, 118 design may provide a more efficient air displacement appliance 100 compared to the single fan design. This more efficient air displacement appliance 100 may provide comparable performance relative to the single fan design while consuming less energy.

[0164] In some embodiments (not visible), the at least one motor 128 includes a first motor for rotating the first impeller 116, and a second motor for rotating the second impeller 118. In such embodiments, the first and second motors may be controllable independently of each other, for instance to enable rotation of the first and second impellers 116, 118 at different rotational speeds relative to each other.

[0165] Alternatively, and as shown in FIG. 1, the air displacement appliance 100 may include a motor 128, in other words a common motor 128, arranged to rotate the first impeller 116 and the second impeller 118.

[0166] By the air displacement appliance 100 including a common motor 128 that rotates both the first impeller 116 and the second impeller 118, there may be advantages in terms of size, cost, and energy consumption.

[0167] The air displacement appliance 100 may be made more compact, and the complexity and cost of the design may be reduced, e.g. relative to embodiments in which a first motor rotates the first impeller 116 and a second motor rotates the second impeller 118. Designs including two motors may require a larger space for accommodating the two motors, and two motors may require separate motor controller outputs. Hence dual motor designs may suffer from greater complexity and higher cost compared to embodiments in which a common

motor 128 rotates both the first impeller 116 and the second impeller 118.

[0168] In some embodiments, the motor 128 is sandwiched between the first impeller 116 and the second impeller 118, with a drive shaft 130A, 130B of the motor 128 comprising a first drive shaft portion 130A extending from the motor 128 to the first impeller 116, and a second drive shaft portion 130B extending from the motor 128, in an opposite direction relative to the first drive shaft portion 130A, to the second impeller 118.

[0169] Sandwiching the motor 128 between the first impeller 116 and the second impeller 118 in this manner may assist to provide a relatively compact and robust design for the air displacement appliance 100.

[0170] Due to this positioning of the motor 128, it may be possible to operate the first and second impellers 116, 118 in a relatively simple geometry.

[0171] Should the motor 128 not be positioned between the first and second impellers 116, 118, a shaft length extending from the motor 128 may be required to increase, thereby increasing torsion of the shaft and shortening the life of the air displacement appliance 100.

[0172] In addition, should the motor 128 be positioned in an airflow path, rather than between the first and second impellers 116, 118, the motor 128 may obstruct the flow, and cause an additional pressure drop, with concomitant decrease in efficiency of the air displacement appliance 100 because more energy may be required to provide a given flow from the air outlet 108.

[0173] In some embodiments, the air displacement appliance 100 comprises an air treatment system configured to treat air displaced by the air displacement appliance 100.

[0174] The air treatment system can include one or more of: an air purification system, e.g. comprising a filter assembly 132, 134, arranged to purify the air displaced by the air displacement appliance 100; an air heating system arranged to heat the air displaced by the air displacement appliance 100; an air cooling system arranged to cool the air displaced by the air displacement appliance 100; an air humidification system arranged to humidify the air displaced by the air displacement appliance 100; an air dehumidification system arranged to dehumidify the air displaced by the air displacement appliance 100; and a fragrance emitting unit arranged to emit fragrance into the air displaced by the air displacement appliance 100.

[0175] As shown in FIG. 1, the air displacement appliance 100 may include a filter assembly 132, 134 for filtering air displaced by the air displacement appliance 100.

[0176] The filter assembly 132, 134 can, for example, include a high-efficiency particulate absorbing (HEPA) filter material.

[0177] Alternatively or additionally, the filter assembly 132, 134 may comprise a gas removal material.

[0178] Examples of gas removal materials include active carbon, and porous and gas-absorbing materials,

such as zeolites and metal organic frameworks.

[0179] In some embodiments, HEPA and activated carbon layers included the filter assembly 132, 134 can be arranged separately or in a sandwich form. The filter assembly 132, 134 may also have a pre-filtering structure.

[0180] In some embodiments, and as shown in FIG. 1, the filter assembly 132, 134 comprises a first filter 132, with the first filter 132 and the first impeller 116 being arranged such that air from the first air inlet 104 is drawn through the first filter 132 prior to the filtered air being drawn axially into the first impeller 116 and radially expelled from the first impeller 116.

[0181] Alternatively or additionally, the filter assembly 132, 134 may comprise a second filter 134, with the second filter 134 and the second impeller 118 being arranged such that air from the second air inlet 106 is drawn through the second filter 134 prior to the filtered air being drawn axially into the second impeller 118 and radially expelled from the second impeller 118.

[0182] In embodiments in which the air displacement appliance 100 includes the first filter 132 and the second filter 134, the inclusion of two filters 132, 134 may mean that it is possible to use first and second filters 132, 134 with different filtering properties relative to each other.

[0183] For example, one of the first and second filters 132, 134 may include a filter configured to alleviate pet odor, while the other of the first and second filters 134, 132 may include a filter configured to alleviate cooking odor.

[0184] 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.

[0185] 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.

[0186] If the term "adapted to" is used in the claims or description, it is noted the term "adapted to" is intended to be equivalent to the term "configured to". If the term "arrangement" is used in the claims or description, it is noted the term "arrangement" is intended to be equivalent to the term "system", and vice versa.

[0187] Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. An air displacement appliance (100) comprising:

a housing (102) delimiting a first air inlet (104), a second air inlet (106), and an air outlet (108); a first impeller (116) arranged such that air from

the first air inlet is drawn axially into the first impeller and radially expelled from the first impeller; and

a second impeller (118) arranged such that air from the second air inlet is drawn axially into the second impeller and radially expelled from the second impeller, the air outlet being arranged to permit the air radially expelled from the first impeller and from the second impeller to pass therethrough to exit the housing, wherein the air outlet is provided around a perimeter of the housing such that the air exits the housing in frontwards, backwards and sideways directions.

2. The air displacement appliance (100) according to claim 1, wherein the air outlet (108) is provided around the perimeter of the housing (102) such that the air exits the housing in the frontwards and backwards directions, a first sideways direction, and a second sideways direction facing away from the first sideways direction.

3. The air displacement appliance (100) according to claim 1 or claim 2, wherein the air outlet (108) is provided around substantially the entirety of the perimeter of the housing (102).

4. The air displacement appliance (100) according to any one of claims 1 to 3, wherein the first impeller (116) has a first periphery (120) from which air is radially expelled from the first impeller, and the second impeller (118) has a second periphery (122) from which air is radially expelled from the second impeller, the air outlet (108) aligning with the first periphery and the second periphery.

5. The air displacement appliance (100) according to any one of claims 1 to 4, wherein the housing (102) is an elongate housing whose length extends from a first end (103A) of the housing to a second end (103B) of the housing.

6. The air displacement appliance (100) according to claim 5, wherein the first impeller (116) and the second impeller (118) are arranged at an intermediate region along the length of the housing (102) between the first end (103A) and the second end (103B).

7. The air displacement appliance (100) according to claim 5 or claim 6, wherein the first air inlet (104) is arranged at or proximal to the first end (103A), the second air inlet (106) is arranged at or proximal to the second end (103B), and the air outlet (108) is arranged in a central region along the length of the housing (102) between the first air inlet and the second air inlet.

8. The air displacement appliance (100) according to any one of claims 1 to 7, wherein the first air inlet (104) is provided around the perimeter of the housing (102) such that air enters the housing, via the first air inlet, from frontwards, backwards and sideways directions; and/or wherein the first air inlet is provided at an end (103A) of the housing. 5

9. The air displacement appliance (100) according to any one of claims 1 to 8, wherein the second air inlet (106) is provided around the perimeter of the housing (102) such that air enters the housing, via the second air inlet, from frontwards, backwards and sideways directions; and/or wherein the second air inlet is provided at an end (103B) of the housing. 10
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10. The air displacement appliance (100) according to any one of claims 1 to 9, comprising a motor (128) arranged to rotate the first impeller (116) and the second impeller (118). 20

11. The air displacement appliance (100) according to claim 10, wherein the motor (128) is sandwiched between the first impeller (116) and the second impeller (118), a drive shaft (130A, 130B) of the motor comprising a first drive shaft portion (130A) extending from the motor to the first impeller, and a second drive shaft portion (130B) extending from the motor, in an opposite direction relative to the first drive shaft portion, to the second impeller. 25
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12. The air displacement appliance (100) according to any one of claims 1 to 11, comprising an air treatment system configured to treat air displaced by the air displacement appliance. 35

13. The air displacement appliance (100) according to any one of claims 1 to 12, comprising a filter assembly (132, 134) for filtering air displaced by the air displacement appliance. 40

14. The air displacement appliance (100) according to claim 13, wherein the filter assembly (132, 134) comprises a first filter (132), the first filter and the first impeller (116) being arranged such that air from the first air inlet (104) is drawn through the first filter prior to the filtered air being drawn axially into the first impeller and radially expelled from the first impeller. 45

15. The air displacement appliance (100) according to claim 13 or claim 14, wherein the filter assembly (132, 134) comprises a second filter (134), the second filter and the second impeller (118) being arranged such that air from the second air inlet (106) is drawn through the second filter prior to the filtered air being drawn axially into the second impeller and radially expelled from the second impeller. 50
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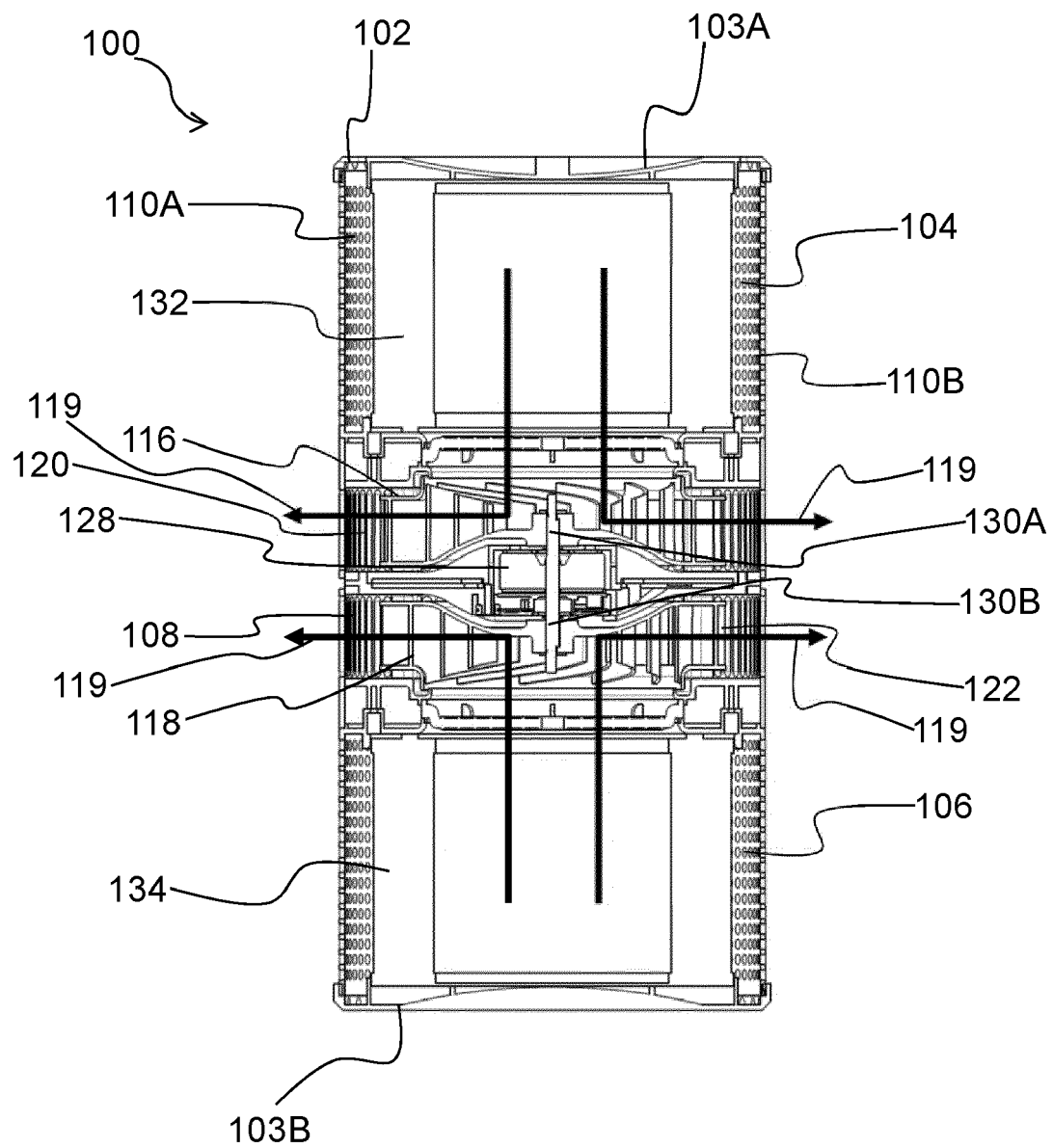


FIG. 1

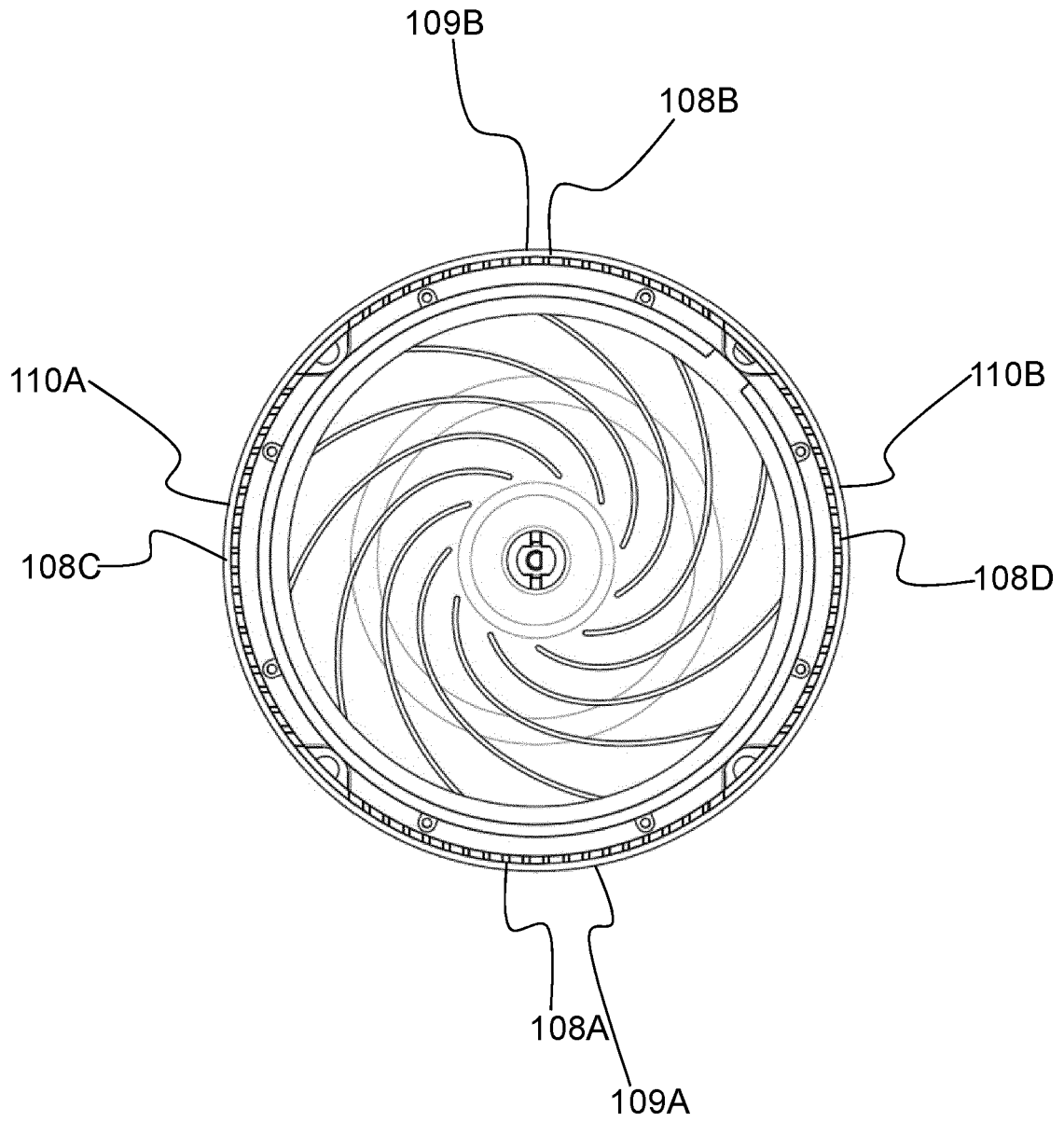


FIG. 2

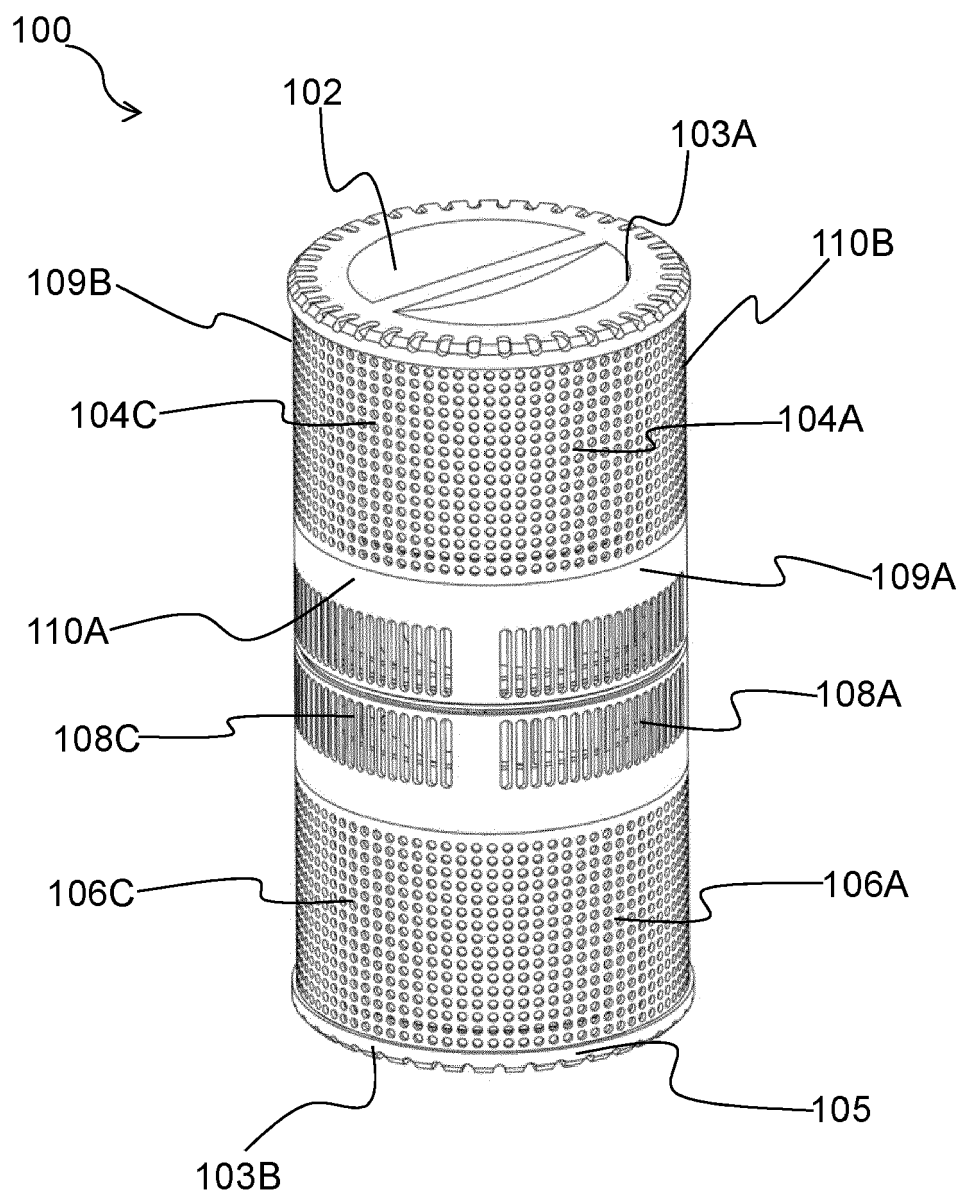


FIG. 3

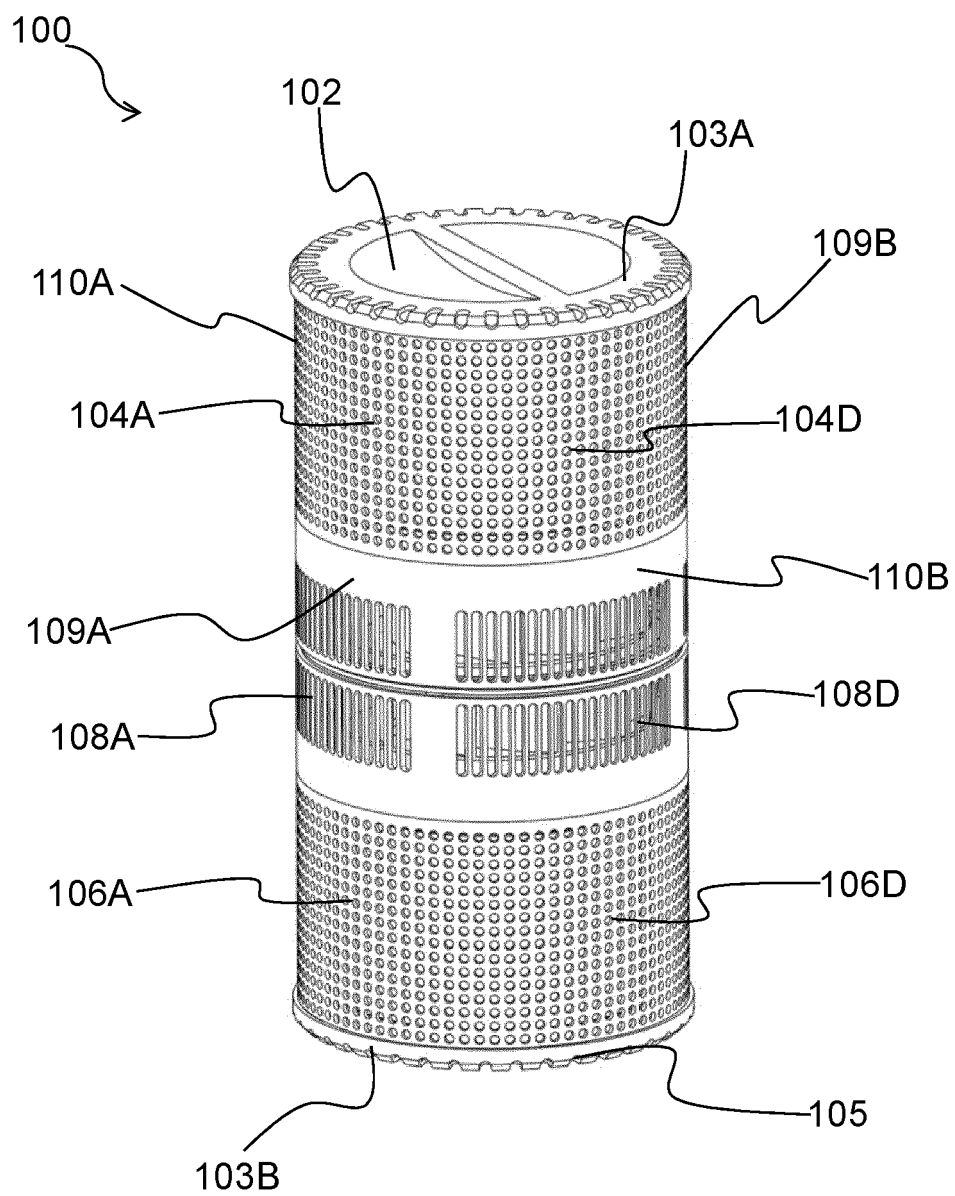


FIG. 4



EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 August 2023	Examiner Decking, Oliver
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	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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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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