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(71) Applicant *(for all designated States except US)*: **DYSON TECHNOLOGY LIMITED** [GB/GB]; Tetbury Hill, Malmesbury, Wiltshire SN16 0RP (GB).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **GAMMACK, Peter, David** [GB/GB]; Dyson Technology Limited, Tetbury Hill, Malmesbury, Wiltshire SN16 6RP (GB). **NICOLAS, Frederic** [FR/GB]; Dyson Technology Limited, Tetbury Hill, Malmesbury, Wiltshire SN16 0RP (GB). **SIMMONDS, Kevin, John** [GB/GB]; Dyson Technology Limited, Tetbury Hill, Malmesbury, Wiltshire SN16 0RP (GB).

(74) Agents: **BONNER, Catherine Louise** et al.; DYSON TECHNOLOGY LIMITED, Intellectual Property Department, Tetbury Hill, Malmesbury, Wiltshire SN16 0RP (GB).

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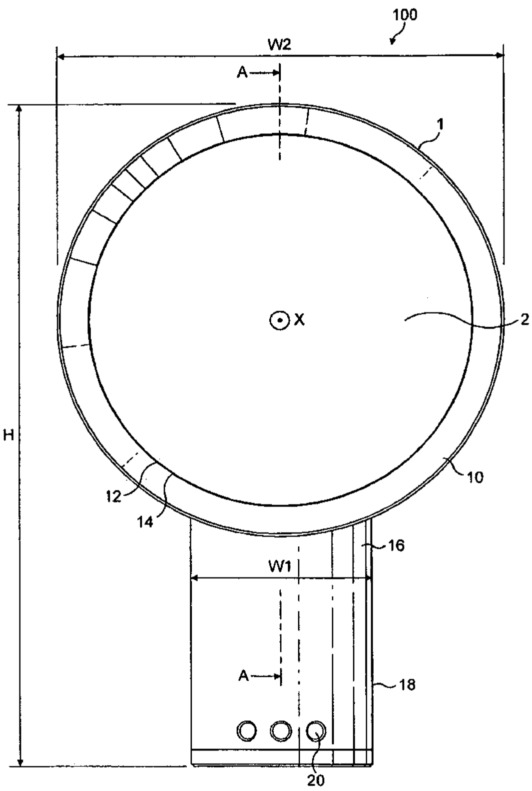

FIG. 1

(57) Abstract: A fan assembly for creating an air current is described. There is provided a bladeless fan assembly (100) comprising a nozzle (1) mounted on a base (16) housing means for creating an air flow through the nozzle (1). The nozzle (1) comprises an interior passage (10) for receiving the air flow from the base (16) and a mouth (12) through which the air flow is emitted. The nozzle (1) extends substantially orthogonally about an axis to define an opening (2) through which air from outside the fan assembly (100) is drawn by the air flow emitted from the mouth (12) and the nozzle (1) and the base (16) each have a depth m the direction of the axis, such that the depth of the base (16) is no more than twice the depth of the nozzle (1). The fan provides an arrangement producing an air current and a flow of cooling air created without requiring a bladed fan i.e. air flow is created by a bladeless fan. Alternatively, the fan assembly (100) has a height extending from the end of the base (16) remote from the nozzle (1) to the end of the nozzle (1) remote from the base (16) and a width perpendicular to the height both the height and the width being perpendicular to the axis so that the width of the base (16) is no more than 75 % the width of the nozzle (1). These arrangements create a fan assembly with a compact structure.

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A Fan

The present invention relates to a fan appliance. Particularly, but not exclusively, the present invention relates to a domestic fan, such as a desk fan, for creating air circulation and air current in a room, in an office or other domestic environment.

A number of types of domestic fan are known. It is common for a conventional fan to include a single set of blades or vanes mounted for rotation about an axis, and driving apparatus mounted about the axis for rotating the set of blades. Domestic fans are available in a variety of sizes and diameters, for example, a ceiling fan can be at least 1 m in diameter and is usually mounted in a suspended manner from the ceiling and positioned to provide a downward flow of air and cooling throughout a room.

Desk fans, on the other hand, are often around 30 cm in diameter and are usually free standing and portable. In standard desk fan arrangements the single set of blades is positioned close to the user and the rotation of the fan blades provides a forward flow of air current in a room or into a part of a room, and towards the user. Other types of fan can be attached to the floor or mounted on a wall. The movement and circulation of the air creates a so called 'wind chill' or breeze and, as a result, the user experiences a cooling effect as heat is dissipated through convection and evaporation. Fans such as that disclosed in USD 103,476 and US 1,767,060 are suitable for standing on a desk or a table. US 1,767,060 describes a desk fan with an oscillating function that aims to provide an air circulation equivalent to two or more prior art fans.

A disadvantage of this type of arrangement is that the forward flow of air current produced by the rotating blades of the fan is not felt uniformly by the user. This is due to variations across the blade surface or across the outward facing surface of the fan. Uneven or 'choppy' air flow can be felt as a series of pulses or blasts of air and can be noisy. A further disadvantage is that the cooling effect created by the fan diminishes with distance from the user. This means that the fan must be placed to the user in order for the user to receive the benefit of the fan.

In a domestic environment it is desirable for appliances to be as small and compact as possible due to space restrictions. It is undesirable for parts to project from the appliance, or for the user to be able to touch any moving parts of the fan, such as the blades. Some arrangements have safety features such as a cage or shroud around the blades to protect a user from injuring himself on the moving parts of the fan. USD 103,476 shows a type of cage around the blades however, caged blade parts can be difficult to clean.

Other types of fan or circulator are described in US 2,488,467, US 2,433,795 and JP 56-167897. The fan of US 2,433,795 has spiral slots in a rotating shroud instead of fan blades. The circulator fan disclosed in US 2,488,467 emits air flow from a series of nozzles and has a large base including a motor and a blower or fan for creating the air flow.

Locating fans such as those described above close to a user is not always possible as the bulky shape and structure mean that the fan occupies a significant amount of the user's work space area. In the particular case of a fan placed on, or close to, a desk the fan body or base reduces the area available for paperwork, a computer or other office equipment. Often multiple appliances must be located in the same area, close to a power supply point, and in close proximity to other appliances for ease of connection and in order to reduce the operating costs.

The shape and structure of a fan at a desk not only reduces the working area available to a user but can block natural light (or light from artificial sources) from reaching the desk area. A well lit desk area is desirable for close work and for reading. In addition, a well lit area can reduce eye strain and the related health problems that may result from prolonged periods working in reduced light levels.

The present invention seeks to provide an improved fan assembl disadvantages of the prior art. It is an object of the present invention to provide a compact fan assembly which, in use, generates air flow at an even rate over the emission output area of the fan.

According to a first aspect of the invention, there is provided a bladeless fan assembly for creating an air current, the fan assembly comprising a nozzle mounted on a base housing means for creating an air flow through the nozzle, the nozzle comprising an interior passage for receiving the air flow from the base and a mouth through which the air flow is emitted, the nozzle extending substantially orthogonally about an axis to define an opening through which air from outside the fan assembly is drawn by the air flow emitted from the mouth, wherein the nozzle and the base each have a depth in the direction of the axis, and wherein the depth of the base is no more than twice the depth of the nozzle.

Preferably the depth of the base is in the range of 100 mm to 200 mm, more preferably around 150 mm. In this arrangement it is preferred that the fan assembly has a height extending from the end of the base remote from the nozzle to the end of the nozzle remote from the base, and a width perpendicular to the height, both the height and the width being perpendicular to the said axis, and wherein the width of the base is no more than 75% the width of the nozzle.

According to a second aspect of the present invention, there is also provided a bladeless fan assembly for creating an air current, the fan assembly comprising a nozzle mounted on a base housing means for creating an air flow through the nozzle, the nozzle comprising an interior passage for receiving the air flow from the base and a mouth through which the air flow is emitted, the nozzle extending substantially orthogonally about an axis to define an opening through which air from outside the fan assembly is drawn by the air flow emitted from the mouth, the fan assembly having a height extending from the end of the base remote from the nozzle to the end of the nozzle remote from the base, and a width perpendicular to the height, both the height and the

width being perpendicular to the axis, and wherein the width of the ba
75% the width of the nozzle.

Both aspects of the invention provide arrangements in which an air current is generated and a cooling effect is created without requiring a bladed fan. The bladeless arrangement leads to lower noise emissions due to the absence of the sound of a fan blade moving through the air, and a reduction in moving parts and complexity. The dimensions of the base are small compared to those of the nozzle and compared to the size of the overall fan assembly structure. The depth of the base of the fan assembly is such that the fan assembly is a slim product, occupying little of a user's work space area. Advantageously the invention provides a fan assembly delivering a suitable cooling effect from a footprint smaller than that of prior art fans. Advantageously, by this arrangement the assembly can be produced and manufactured with a reduced number of parts than those required in prior art fans. This reduces manufacturing cost and complexity.

In the following description of fans and, in particular a fan of the preferred embodiment, the term 'bladeless' is used to describe apparatus in which air flow is emitted or projected forwards from the fan assembly without the use of blades. By this definition a bladeless fan assembly can be considered to have an output area or emission zone absent blades or vanes from which the air flow is released or emitted in a direction appropriate for the user. A bladeless fan assembly may be supplied with a primary source of air from a variety of sources or generating means such as pumps, generators, motors or other fluid transfer devices, which include rotating devices such as a motor rotor and a bladed impeller for generating air flow. The supply of air generated by the motor causes a flow of air to pass from the room space or environment outside the fan assembly through the interior passage to the nozzle and then out through the mouth.

Hence, the description of a fan assembly as bladeless is not intended to extend to the description of the power source and components such as motors that are required for secondary fan functions. Examples of secondary fan functions ca adjustment and oscillation of the fan.

Preferably, the width of the base of the fan assembly is in the range from 65% to 55% the width of the nozzle, more preferably around 50% the width of the nozzle. In a preferred embodiment the height of the fan assembly is in the range 300 mm to 400 mm, more preferably around 350 mm. The preferred features and dimensions of the fan assembly result in a compact arrangement while generating a suitable amount of air flow from the fan assembly for cooling a user.

It is preferred that the base is substantially cylindrical. This arrangement creates a fan assembly with a compact base that appears tidy and uniform. This type of uncluttered design is desirable and often appeals to a user or customer. In addition, when placed on a desk or work surface the area of the desk surface occupied by the base of the fan assembly is less than the space occupied by other known fan assemblies. The nozzle occupies space above the desk surface, extending away from the base without obscuring the desk surface or impeding the user's access to the surface of the desk.

Preferably the base has at least one air inlet arranged substantially orthogonal to the axis. Preferably the base has a side wall comprising said at least one air inlet. Locating air inlets around the base provides flexibility in the arrangement of the base and the nozzle, and enables air to flow into the base from a variety of points thereby to enable more air to flow into the assembly as a whole. More preferably, said at least one air inlet comprises a plurality of air inlets extending about a second axis substantially orthogonal to said first-mentioned axis. In this arrangement it is preferred that the assembly has a flow path extending from each air inlet to an inlet to the means for creating an air flow through the nozzle, wherein the inlet to the means for creating an air flow is substantially orthogonal to the or each air inlet. The arrangement provides an inlet air path that minimises noise and frictional losses in the system.

In either of the aforementioned aspects, the nozzle may comprise located adjacent the mouth and over which the mouth is arranged to direct the air flow. A Coanda surface is a known type of surface over which fluid flow exiting an output orifice close to the surface exhibits the Coanda effect. The fluid tends to flow over the surface closely, almost 'clinging to' or 'hugging' the surface. The Coanda effect is already a proven, well documented method of entrainment whereby a primary air flow is directed over the Coanda surface. A description of the features of a Coanda surface, and the effect of fluid flow over a Coanda surface, can be found in articles such as Reba, Scientific American, Volume 214, June 1963 pages 84 to 92. Through use of a Coanda surface, air from outside the fan assembly is drawn through the opening by the air flow directed over the Coanda surface.

In the present invention an air flow is created through the nozzle of the fan assembly. In the following description this air flow will be referred to as primary air flow. The primary air flow exits the nozzle via the mouth and preferably passes over the Coanda surface. The primary air flow entrains the air surrounding the mouth of the nozzle, which acts as an air amplifier to supply both the primary air flow and the entrained air to the user. The entrained air will be referred to here as a secondary air flow. The secondary air flow is drawn from the room space, region or external environment surrounding the mouth of the nozzle and, by displacement, from other regions around the fan assembly. The primary air flow directed over the Coanda surface combined with the secondary air flow entrained by the air amplifier gives a total air flow emitted or projected forward to a user from the opening defined by the nozzle. The total air flow is sufficient for the fan assembly to create an air current suitable for cooling.

The air current delivered by the fan assembly to the user has the benefit of being an air flow with low turbulence and with a more linear air flow profile than that provided by other prior art devices. Linear air flow with low turbulence travels efficiently out from the point of emission and loses less energy and less velocity to turbulence than the air flow generated by prior art fans. An advantage for a user is that the cooling effect can be felt even at a distance and the overall efficiency of the fan increases. This means that the user can choose to site the fan some distance from a work area able to feel the cooling benefit of the fan.

Advantageously, the assembly results in the entrainment of air surrounding the mouth of the nozzle such that the primary air flow is amplified by at least 15%, whilst a smooth overall output is maintained. The entrainment and amplification features of the fan assembly result in a fan with a higher efficiency than prior art devices. The air current emitted from the opening defined by the nozzle has an approximately flat velocity profile across the diameter of the nozzle. Overall the flow rate and profile can be described as plug flow with some regions having a laminar or partial laminar flow.

Preferably the nozzle comprises a loop. The shape of the nozzle is not constrained by the requirement to include space for a bladed fan. In a preferred embodiment the nozzle is annular. By providing an annular nozzle the fan can potentially reach a broad area. In a further preferred embodiment the nozzle is at least partially circular. This arrangement can provide a variety of design options for the fan, increasing the choice available to a user or customer.

Preferably, the interior passage is continuous, more preferably substantially annular. This allows smooth, unimpeded air flow within the nozzle and reduces frictional losses and noise. In this arrangement the nozzle can be manufactured as a single piece, reducing the complexity of the fan assembly and thereby reducing manufacturing costs.

In the preferred fan arrangement the means for creating an air flow through the nozzle is arranged to create an air flow through the nozzle having a pressure of at least 400 kPa. This pressure is sufficient to overcome the pressure created by the constriction caused by the mouth of the nozzle and provides pressure for an output air flow suitable for cooling a user. More preferably, in use, the mass flow rate of air projected from the fan assembly is at least 450 l/s, most preferably in the range from 600 l/s to 700 l/s. Advantageously this mass flow rate can be projected forward from the opening and the area surrounding the mouth of the nozzle with a laminar flow and can the user as a superior cooling effect to that from a bladed fan.

In the preferred fan arrangement the means for creating an air flow through the nozzle comprises an impeller driven by a motor. This arrangement provides a fan with efficient air flow generation. More preferably the means for creating an air flow comprises a DC brushless motor and a mixed flow impeller. This arrangement reduces frictional losses from motor brushes and also reduces carbon debris from the brushes in a traditional motor. Reducing carbon debris and emissions is advantageous in a clean or pollutant sensitive environment such as a hospital or around those with allergies.

The nozzle may be rotatable or pivotable relative to a base portion, or other portion, of the fan assembly. This enables the nozzle to be directed towards or away from a user as required. The fan assembly may be desk, floor, wall or ceiling mountable. This can increase the portion of a room over which the user experiences cooling.

The mouth may be substantially annular. By providing a substantially annular mouth the total air flow can be emitted towards a user over a broad area. Advantageously, an illumination source in the room or at the desk fan location or natural light can reach the user through the central opening. The mouth may be concentric with the interior passage. This arrangement will be visually appealing and the concentric location of the mouth with the passage facilitates manufacture.

An embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a front view of a fan assembly;

Figure 2 is a perspective view of a portion of the fan assembly of Figure 1;

Figure 3 is a side sectional view through a portion of the fan assembly at line A-A;

Figure 4 is an enlarged side sectional detail of a portion of the fan assembly of Figure 1; and

Figure 5 is a sectional view of the fan assembly taken along line B-B of Figure 3 and viewed from direction F of Figure 3.

Figure 1 shows an example of a fan assembly 100 viewed from the front of the device. The fan assembly 100 comprises an annular nozzle 1 defining a central opening 2. With reference also to Figures 2 and 3, nozzle 1 comprises an interior passage 10, a mouth 12 and a Coanda surface 14 adjacent the mouth 12. The Coanda surface 14 is arranged so that a primary air flow exiting the mouth 12 and directed over the Coanda surface 14 is amplified by the Coanda effect. The nozzle 1 is connected to, and supported by, a base 16 having an outer casing 18. The base 16 includes a plurality of selection buttons 20 accessible through the outer casing 18 and through which the fan assembly 100 can be operated. The fan assembly has a height, H, width, W, and depth, D, shown on Figures 1 and 3. The nozzle 1 is arranged to extend substantially orthogonally about the axis X. The height of the fan assembly, H, is perpendicular to the axis X and extends from the end of the base 16 remote from the nozzle 1 to the end of the nozzle 1 remote from the base 16. In this embodiment the fan assembly 100 has a height, H, of around 530 mm, but the fan assembly 100 may have any desired height, for example around 475 mm. The base 16 and the nozzle 1 have a width, W, perpendicular to the height H and perpendicular to the axis X. The width of the base 16 is shown labelled W1 and the width of the nozzle 1 is shown labelled as W2 on Figure 1. The base 16 and the nozzle 1 have a depth in the direction of the axis X. The depth of the base 16 is shown labelled D1 and the depth of the nozzle 1 is shown labelled as D2 on Figure 3.

Figures 3, 4 and 5 show further specific details of the fan assembly 100. A motor 22 for creating an air flow through the nozzle 1 is located inside the base 16. The base 16 is substantially cylindrical and in this embodiment the base 16 has a d: width W1 and a depth D1) of around 145 mm. The base 16 further comprises air inlets 24a, 24b formed in the outer casing 18. A motor housing 26 is located inside the base 16. The motor 22 is supported by the motor housing 26 and held in a secure position by a rubber mount or seal member 28.

In the illustrated embodiment, the motor 22 is a DC brushless motor. An impeller 30 is connected to a rotary shaft extending outwardly from the motor 22, and a diffuser 32 is positioned downstream of the impeller 30. The diffuser 32 comprises a fixed, stationary disc having spiral blades.

An inlet 34 to the impeller 30 communicates with the air inlets 24a, 24b formed in the outer casing 18 of the base 16. The outlet 36 of the diffuser 32 and the exhaust from the impeller 30 communicate with hollow passageway portions or ducts located inside the base 16 in order to establish air flow from the impeller 30 to the interior passage 10 of the nozzle 1. The motor 22 is connected to an electrical connection and power supply and is controlled by a controller (not shown). Communication between the controller and the plurality of selection buttons 20 enable a user to operate the fan assembly 100.

The features of the nozzle 1 will now be described with reference to Figures 3 and 4. The shape of the nozzle 1 is annular. In this embodiment the nozzle 1 has a diameter of around 350 mm, but the nozzle may have any desired diameter, for example around 300 mm. The interior passage 10 is annular and is formed as a continuous loop or duct within the nozzle 1. The nozzle 1 is formed from at least one wall defining the interior passage 10 and the mouth 12. In this embodiment the nozzle 1 comprises an inner wall 38 and an outer wall 40. In the illustrated embodiment the walls 38, 40 are arranged in a looped or folded shape such that the inner wall 38 and outer wall 40 approach one another. The inner wall 38 and the outer wall 40 together define the mouth 12, and the mouth 12 extends about the axis X. The mouth 12 comprises a tapered region 42 narrowing to an outlet 44. The outlet 44 comprises a gap or spacing formed between the inner wall 38 of the nozzle 1 and the outer wall 40 of the nozzle 1. The spacing between the opposing surfaces of the walls 38, 40 at the outlet 44 (chosen to be in the range from 1 mm to 5 mm. The choice of spacing will depend on the desired performance characteristics of the fan. In this embodiment the outlet 44 is around 1.3 mm wide, and the mouth 12 and the outlet 44 are concentric with the interior passage 10.

The mouth 12 is adjacent the Coanda surface 14. The nozzle 1 of the illustrated embodiment further comprises a diffuser portion located downstream of the Coanda surface. The diffuser portion includes a diffuser surface 46 to further assist the flow of air current delivered or output from the fan assembly 100. In the example illustrated in Figure 3 the mouth 12 and the overall arrangement of the nozzle 1 is such that the angle subtended between the Coanda surface 14 and the axis X is around 15°. The angle is chosen for efficient air flow over the Coanda surface 14. The nozzle 1 extends by a distance of around 5 cm in the direction of the axis. The diffuser surface 46 and the overall profile of the nozzle 1 are based on an aerofoil shape, and in the example shown the diffuser portion extends by a distance of around two thirds the overall depth of the nozzle 1.

The fan assembly 100 described above operates in the following manner. When a user makes a suitable selection from the plurality of buttons 20 to operate or activate the fan assembly 100, a signal or other communication is sent to drive the motor 22. The motor 22 is thus activated and air is drawn into the fan assembly 100 via the air inlet 24. In the preferred embodiment air is drawn in at a rate of approximately 20 to 30 litres per second, preferably around 27 l/s (litres per second). The air passes through the outer casing 18 and along the route illustrated by arrow F of Figure 3 to the inlet 34 of the impeller 30. The air flow leaving the outlet 36 of the diffuser 32 and the exhaust of the impeller 30 is divided into two air flows that proceed in opposite directions through the interior passage 10. The air flow is constricted as it enters the mouth 12 and is further constricted at the outlet 44 of the mouth 12. The constriction creates pressure in the system. The motor 22 creates an air flow through the nozzle 16 having a pressure of at least 400 kPa. The air flow created overcomes the pressure created 1 and the air flow exits through the outlet 44 as a primary air flow.

The output and emission of the primary air flow creates a low pressure area at the air inlets 24a, 24b with the effect of drawing additional air into the fan assembly 100. The operation of the fan assembly 100 induces high air flow through the nozzle 1 and out through the opening 2. The primary air flow is directed over the Coanda surface 14 and the diffuser surface 46, and is amplified by the Coanda effect. A secondary air flow is generated by entrainment of air from the external environment, specifically from the region around the outlet 44 and from around the outer edge of the nozzle 1. A portion of the secondary air flow entrained by the primary air flow may also be guided over the diffuser surface 46. This secondary air flow passes through the opening 2, where it combines with the primary air flow to produce a total air flow projected forward from the nozzle 1.

The combination of entrainment and amplification results in a total air flow from the opening 2 of the fan assembly 100 that is greater than the air flow output from a fan assembly without such a Coanda or amplification surface adjacent the emission area.

The amplification and laminar type of air flow produced results in a sustained flow of air being directed towards a user from the nozzle 1. In the preferred embodiment the mass flow rate of air projected from the fan assembly 100 is at least 450 l/s, preferably in the range from 600 l/s to 700 l/s. The flow rate at a distance of up to 3 nozzle diameters (i.e. around 1000 to 1200 mm) from a user is around 400 to 500 l/s. The total air flow has a velocity of around 3 to 4 m/s (metres per second). Higher velocities are achievable by reducing the angle subtended between the Coanda surface 14 and the axis X. A smaller angle results in the total air flow being emitted in a more focussed and directed manner. This type of air flow tends to be emitted at a higher velocity but with a reduced mass flow rate. Conversely, greater mass flow can be achieved by increasing the angle between the Coanda surface and the axis. In this case the velocity of the emitted air flow is reduced but the mass flow generated increases. Thus the performance of the fan assembly can be altered by altering the angle s· the Coanda surface and the axis X.

The invention is not limited to the detailed description given above. Variations will be apparent to the person skilled in the art. For example, the fan could be of a different height or diameter. The base and the nozzle of the fan could be of a different depth, width and height. The fan need not be located on a desk, but could be free standing, wall mounted or ceiling mounted. The fan shape could be adapted to suit any kind of situation or location where a cooling flow of air is desired. A portable fan could have a smaller nozzle, say 5cm in diameter. The means for creating an air flow through the nozzle can be a motor or other air emitting device, such as any air blower or vacuum source that can be used so that the fan assembly can create an air current in a room. Examples include a motor such as an AC induction motor or types of DC brushless motor, but may also comprise any suitable air movement or air transport device such as a pump or other means of providing directed fluid flow to generate and create an air flow. Features of a motor may include a diffuser or a secondary diffuser located downstream of the motor to recover some of the static pressure lost in the motor housing and through the motor.

The outlet of the mouth may be modified. The outlet of the mouth may be widened or narrowed to a variety of spacings to maximise air flow. The air flow emitted by the mouth may pass over a surface, such as Coanda surface, alternatively the airflow may be emitted through the mouth and be projected forward from the fan assembly without passing over an adjacent surface. The Coanda effect may be made to occur over a number of different surfaces, or a number of internal or external designs may be used in combination to achieve the flow and entrainment required.

Other shapes of nozzle are envisaged. For example, a nozzle comprising an oval, or 'racetrack' shape, a single strip or line, or block shape could be used. The fan assembly provides access to the central part of the fan as there are no blades. This means that

additional features such as lighting or a clock or LCD display could
opening defined by the nozzle.

Other features could include a pivotable or tiltable base for ease of movement and adjustment of the position of the nozzle for the user.

CLAIMS

1. A bladeless fan assembly for creating an air current, the fan assembly comprising a nozzle mounted on a base housing means for creating an air flow through the nozzle, the nozzle comprising an interior passage for receiving the air flow from the base and a mouth through which the air flow is emitted, the nozzle extending substantially orthogonally about an axis to define an opening through which air from outside the fan assembly is drawn by the air flow emitted from the mouth, wherein the nozzle and the base each have a depth in the direction of said axis, and wherein the depth of the base is no more than twice the depth of the nozzle.

2. A fan assembly as claimed in claim 1, wherein the depth of the base is in the range of 100 mm to 200 mm, preferably around 150 mm.

3. A fan assembly as claimed in claim 1 or claim 2, wherein the fan assembly has a height extending from the end of the base remote from the nozzle to the end of the nozzle remote from the base, and a width perpendicular to the height, both the height and the width being perpendicular to the said axis, and wherein the width of the base is no more than 75% the width of the nozzle.

4. A bladeless fan assembly for creating an air current, the fan assembly comprising a nozzle mounted on a base housing means for creating an air flow through the nozzle, the nozzle comprising an interior passage for receiving the air flow from the base and a mouth through which the air flow is emitted, the nozzle extending substantially orthogonally about an axis to define an opening through which air from outside the fan assembly is drawn by the air flow emitted from the mouth, the fan assembly having a height extending from the end of the base remote from the nozzle to the end of the nozzle remote from the base, and a width perpendicular to the height,

both the height and the width being perpendicular to the said axi: width of the base is no more than 75% the width of the nozzle.

5. A fan assembly as claimed in claim 3 or claim 4, wherein the width of the base is in the range from 65% to 55% the width of the nozzle, preferably around 50% the width of the nozzle.

6. A fan assembly as claimed in claim 3, 4 or 5, wherein the height of the fan assembly is in the range 300 mm to 400 mm, preferably around 350 mm.

7. A fan assembly as claimed in any preceding claim, wherein the base is substantially cylindrical.

8. A fan assembly as claimed in any preceding claim, wherein the base has at least one air inlet, and wherein said at least one air inlet is arranged substantially orthogonal to said axis.

9. A fan assembly as claimed claim 8, wherein the base has a side wall comprising said at least one air inlet.

10. A fan assembly as claimed in claim 8 or claim 9, wherein said at least one air inlet comprises a plurality of air inlets extending about a second axis substantially orthogonal to said first-mentioned axis.

11. A fan assembly as claimed in any of claims 8, 9 or 10, comprising a flow path extending from each air inlet to an inlet to said means for creating an air flow through the nozzle, wherein the inlet to the said means is substantially orthogonal to the or each air inlet.

12. A fan assembly as claimed in any preceding claim, wherein the nozzle comprises a loop.

13. A fan assembly as claimed in any preceding claim, wherein the nozzle is substantially annular.

14. A fan assembly as claimed in any preceding claim, wherein the nozzle is at least partially circular.

15. A fan assembly as claimed in any preceding claim, wherein the interior passage is continuous.

16. A fan assembly as claimed in any preceding claim, wherein the interior passage is substantially annular.

17. A fan assembly as claimed in any preceding claim, wherein said means is arranged to create an air flow through the nozzle having a pressure of at least 400 kPa.

18. A fan assembly as claimed in any preceding claim, wherein, in use, the mass flow rate of air projected therefrom is at least 450 l/s, and preferably in the range from 600 l/s to 700 l/s.

19. A fan assembly as claimed in any preceding claim, wherein the means for creating an air flow through the nozzle comprises an impeller driven by a motor.

20. A fan assembly as claimed in claim 18, wherein the means for creating an air flow comprises a DC brushless motor and a mixed flow impeller.

21. A fan assembly substantially as hereinbefore described with reference to the accompanying drawings.

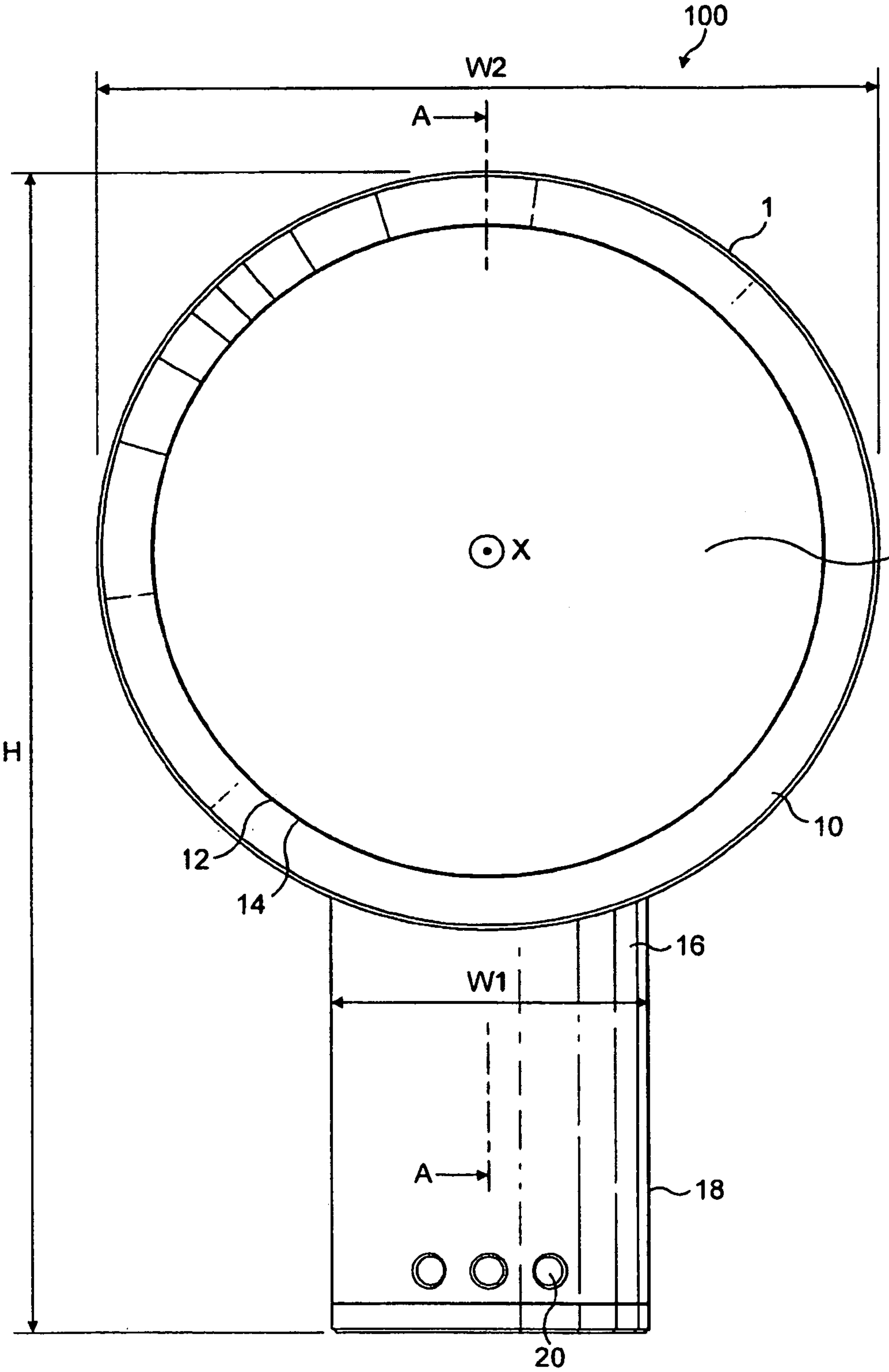

FIG. 1

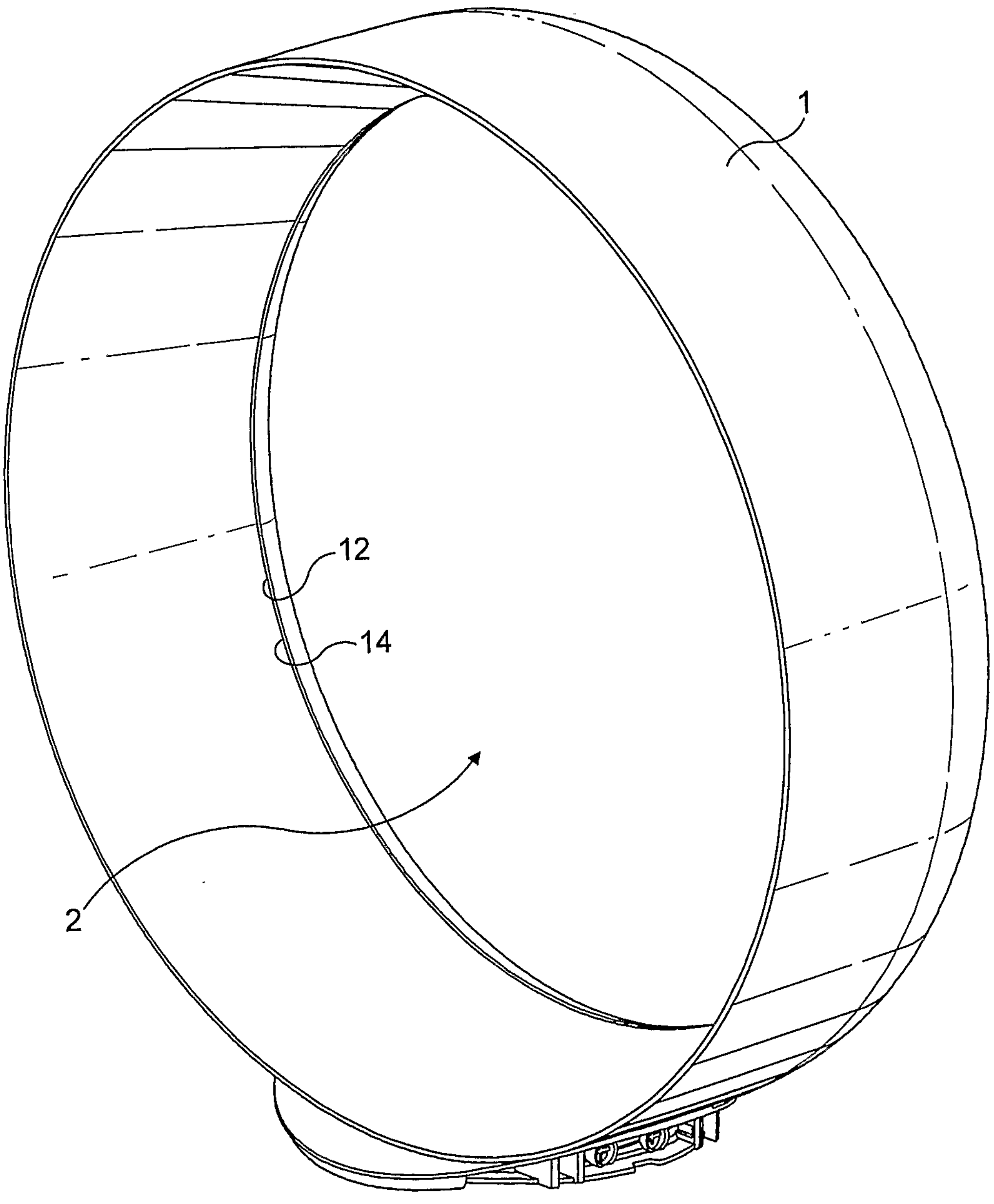

FIG. 2

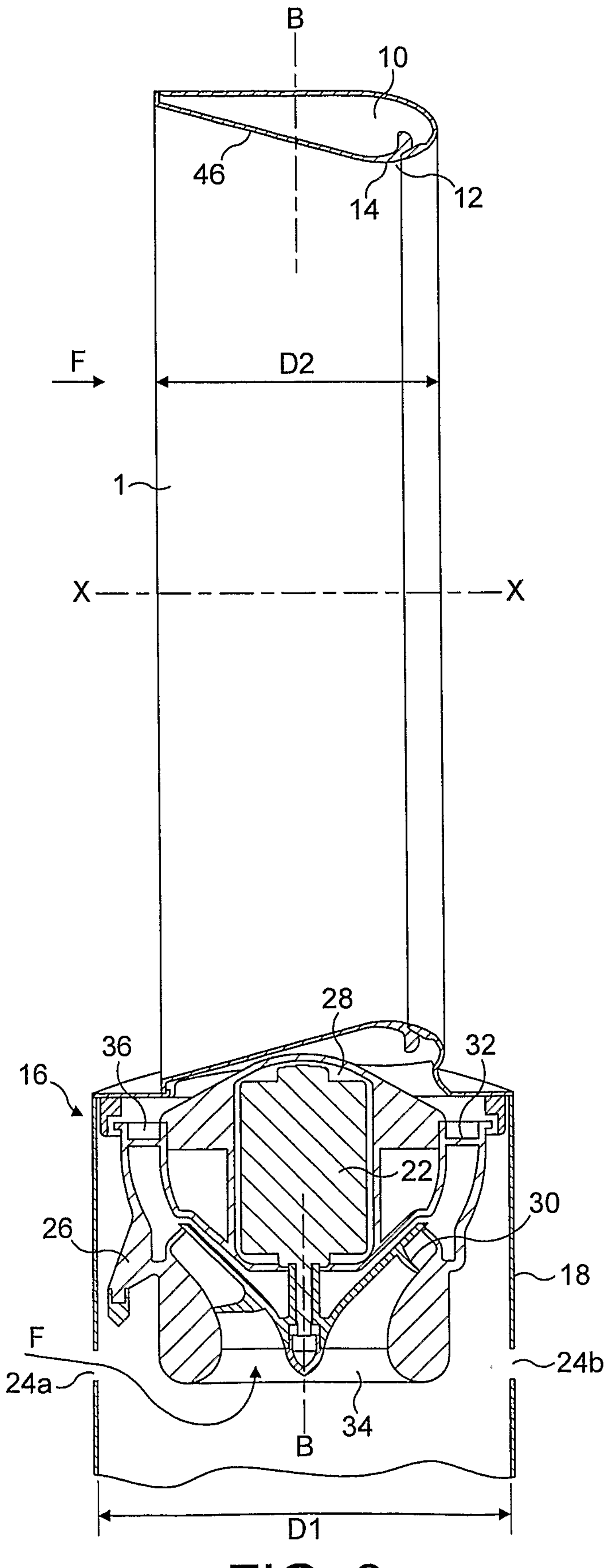

FIG. 3

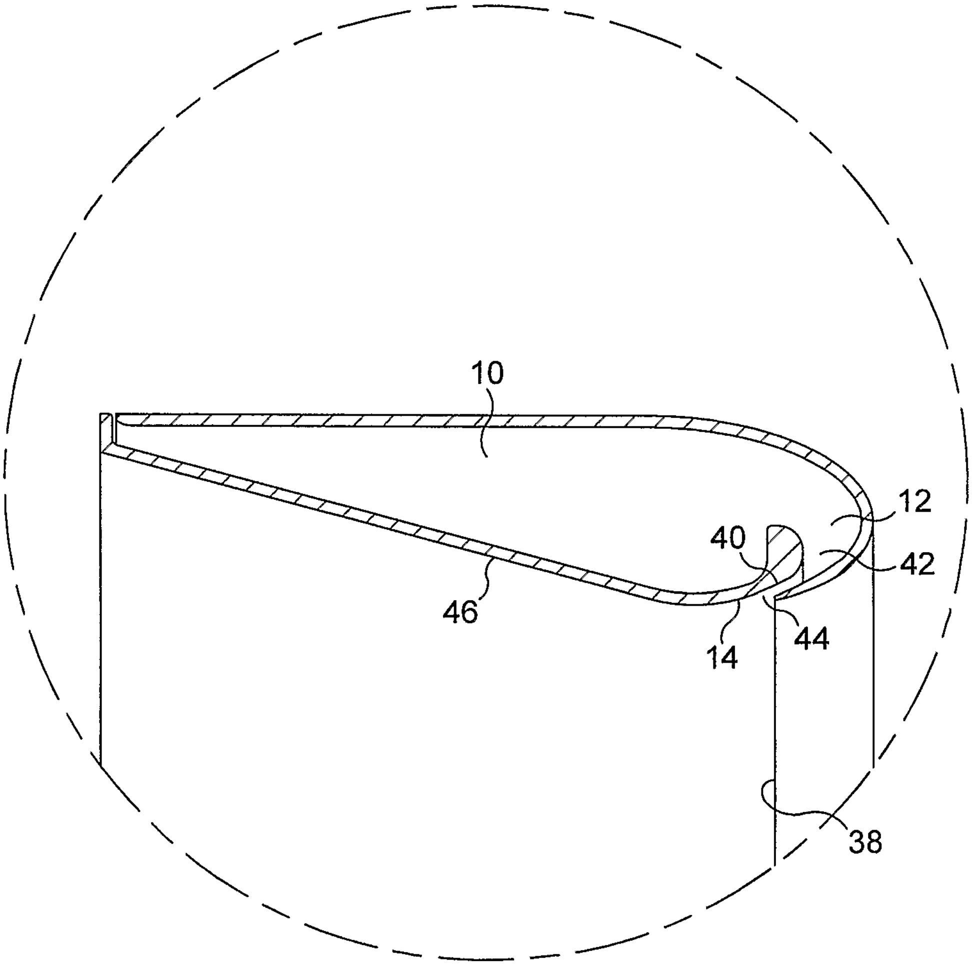

FIG. 4

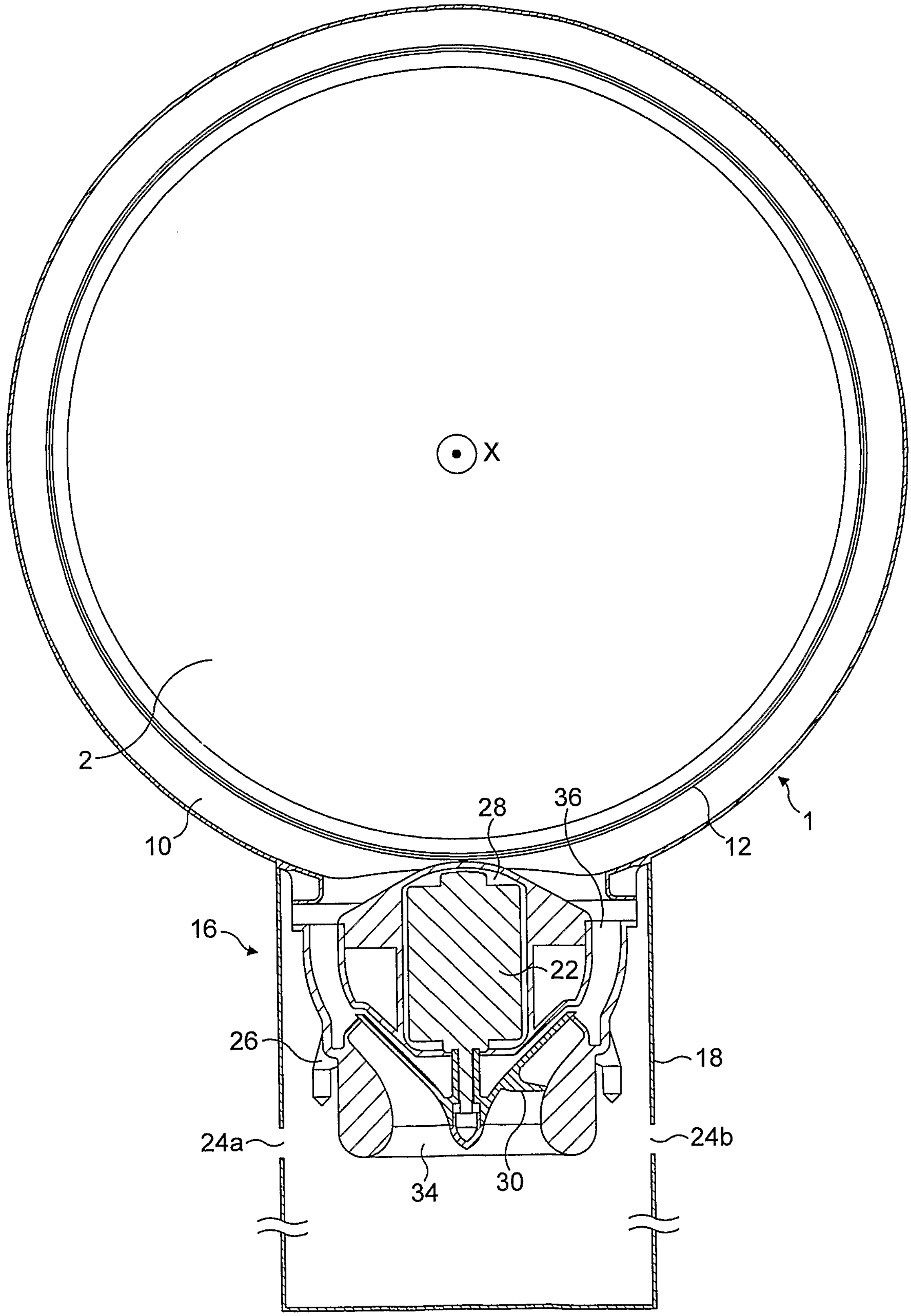

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2008/002891

A. CLASSIFICATION OF SUBJECT MATTER
INV. F04D25/08 F04D33/00

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F04D F24F

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 56 167897 A (TOKYO SHIBAURA ELECTRIC CO) 23 December 1981 (1981-12-23) abstract; figure 1	1-21
A	US 2 488 467 A (DE LISIO SALVATORE) 15 November 1949 (1949-11-15) abstract; figures 1,2	1,4
A	DE 12 91 090 B (SCHMIDT GEB HALM ANNELIESE) 20 March 1969 (1969-03-20) abstract; figures 1-3	1,4

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 October 2008	29/10/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	de Martino, Marcello

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2008/002891

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 56167897	A	23-12-1981	NONE	
US 2488467	A	15-11-1949	NONE	
DE 1291090	B	20-03-1969	NONE	