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

(72) Inventor: **LELIEVELD, Mark Johannes**
5656AG Eindhoven (NL)

(74) Representative: **Philips Intellectual Property & Standards**
High Tech Campus 52
5656 AG Eindhoven (NL)

(54) DRYING DEVICE

(57) According to an aspect, there is provided a drying device (100) comprising at least one micro-electro-mechanical system (MEMS) device (102) having at least one vibrating member, the at least one MEMS device configured to generate a flow of air along an airflow path for drying an object; a housing (104) configured to at least partially house the at least one MEMS device; and an air outlet (106) formed in the housing, the air outlet configured to direct the flow of air away from the at least one MEMS device.

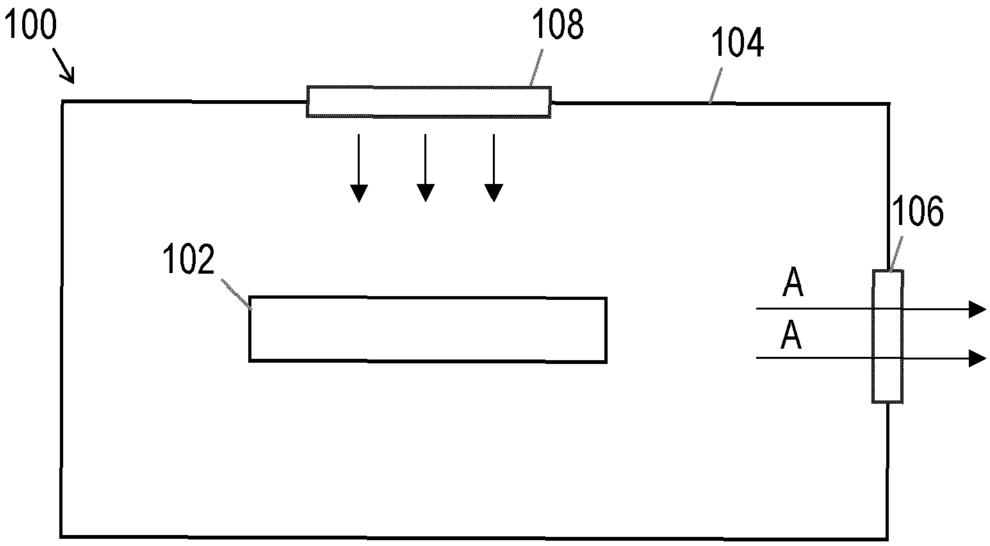

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a drying device, such as a hair dryer or a hand dryer.

BACKGROUND OF THE INVENTION

[0002] Drying devices, such as hairdryers and hand dryers typically include a heating element and a fan for air propulsion, to blow warm air towards an object to be dried (e.g., hair or a hand). Generating airflow using just a fan comes with several drawbacks. In order to generate sufficient airflow to achieve a desired drying effect, the fan used in the drying device needs to be of a sufficient size, meaning the drying device itself needs to be of a sufficient size to house the fan.

[0003] In addition to the size requirement, fans also have other drawbacks. For example, fans - which are typically driven by a motor - create a large amount of noise when they rotate, which can cause a negative experience for a user of a drying device having such a fan. Energy is required to drive the fan (e.g., to drive the motor), so a drying device having a larger fan will require a larger amount of energy.

[0004] As fans rotate, they can create undesired forces (due to rotational inertia), which can make use of a drying device unpleasant for the user, particularly if the drying device includes a large fan.

[0005] There is, therefore, a desire for a drying device that at least partially addresses one or more of the issues discussed above.

SUMMARY OF THE INVENTION

[0006] It would be desirable to have a drying device, such as a hair dryer or a hand dryer, which is capable of providing and equivalent or better drying effect as existing drying devices, but does not suffer from issues resulting from having just a fan to generate airflow. The inventor of the present disclosure has recognised that such improvements may be realised by providing a drying device that includes a different type of airflow generation device instead of, or in addition to, a fan. Specifically, according to embodiments disclosed herein, a drying device includes, among other features, a micro-electromechanical system (MEMS) device that includes one or more vibrating members that, when actuated, vibrate to cause a flow of air that can be used to dry an object. A MEMS device is smaller and quieter than many fans traditionally used in drying devices and, therefore, a similar drying effect may be achieved without the drawbacks suffered when using a drying device that uses just a fan for generating airflow.

[0007] According to a first specific aspect, there is provided a drying device comprising at least one micro-electromechanical system (MEMS) device having at least one vibrating member, the at least one MEMS device configured to generate a flow of air along an airflow path for drying an object; a housing configured to at least partially house the at least one MEMS device; and an air outlet formed in the housing, the air outlet configured to direct the flow of air away from the at least one MEMS device. In some embodiments, the drying device may further comprise a heat source in thermal communication with the at least one MEMS device, such that heat generated by the heat source is transferred to the flow of air.

[0008] The drying device may further comprise a heat transfer bonding medium between the at least one MEMS device and the heat source.

[0009] In some embodiments, the drying device may comprise a power source electrically connected to and configured to supply power to the at least one MEMS device. The power source may be in thermal communication with the at least one MEMS device, such that heat generated by the power source is transferred to the flow of air.

[0010] The drying device may further comprise a heat transfer bonding medium between the at least one MEMS device and the power source.

[0011] In some embodiments, the drying device may further comprise a fan configured to move air along the airflow path.

[0012] The drying device may further comprise a motor configured to drive the fan.

[0013] The drying device may further comprise an air inlet formed in the housing, the air inlet configured to direct ambient air from outside the housing towards the at least one MEMS device.

[0014] The at least one MEMS device may form at least one wall defining the airflow path along which the flow of air is to move.

[0015] At least a portion of the flow of air generated by the MEMS device may be redirected through the housing of the drying device.

[0016] In some embodiments, the at least one MEMS device may have a first end and a second end. Air may be provided to the at least one MEMS device at the first end, and the flow of air may be directed away from the at least one MEMS device at the second end. Alternatively, air may be provided to the at least one MEMS device via an inlet between the first end and the second end, and the flow of air may be directed away from the at least one MEMS device via at least one of the first end and the second end.

[0017] The drying device may, in some embodiments, be configured to at least partially dry a body part of a user.

[0018] In some embodiments, the drying device may comprise a hairdryer or a hand dryer.

[0019] The drying device may, for example, comprise a hairdryer and may further comprise a handle to be held by a user during use.

[0020] These and other aspects will be apparent from and elucidated with reference to the embodiment(s) described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Exemplary embodiments will now be described, by way of example only, with reference to the following drawings, in which:

Fig. 1 is a schematic illustration of an example of a drying device according various embodiments;
Fig. 2 is an illustration of an example of a micro-electromechanical system (MEMS) device;
Fig. 3 is a schematic illustration of a further example of a drying device according various embodiments;
Fig. 4 is a schematic illustration of a further of a drying device according various embodiments;
Fig. 5 is a schematic illustration of an example of an arrangement of MEMS devices;
Fig. 6 is a schematic illustration of a further example of an arrangement of MEMS devices;
Fig. 7 is a schematic illustration of a further example of an arrangement of MEMS devices;
Fig. 8 is a schematic illustration of a further example of an arrangement of MEMS devices;
Fig. 9 is an illustration of a further example of a MEMS device;
Fig. 10 is an illustration of a further example of a MEMS device;
Fig. 11 is a schematic illustration of an example of a hair dryer; and
Fig. 12 is a schematic illustration of an example of a hand dryer.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0022] Various embodiments of the present disclosure relate to drying devices, such as hand dryers and hair dryers. The drying devices disclosed herein include features intended to provide the same or improved drying ability, without the downsides that come with providing airflow using just a fan. For example, embodiments disclosed herein provide advantages in terms of improved efficiency when compared to existing drying devices, and improved user experience, due to the drying device disclosed herein generating less noise than existing drying devices. These and other advantages are achieved through the use of an alternative mechanism for generating a flow of air, rather than just a fan as is traditionally the case in existing drying devices.

[0023] The embodiments disclosed herein provide a drying device giving rise to the above advantages by using a micro-electromechanical system (MEMS) device to generate an airflow. Such a MEMS device includes at least one vibrating member which, when actuated (e.g., caused to vibrate), causing movement of air within the MEMS device, which can be directed to cause a flow of air that can be used to dry an object.

[0024] Referring to the drawings, Fig. 1 is a schematic illustration of an example of a drying device 100 according to various embodiments. The drying device 100 comprises at least one micro-electromechanical system (MEMS) device 102 having at least one vibrating member (not shown in Fig. 1), the at least one MEMS device configured to generate a flow of air along an airflow path for drying an object. The arrangement and functionality of the MEMS device 102 is discussed in greater detail below with reference to Fig. 2. The drying device 100 comprises a housing 104 configured to at least partially house the at least one MEMS device 102. An air outlet 106 is formed in the housing 104. The air outlet 106 is configured to direct the flow of air away from the at least one MEMS device 102. For example, the air outlet 106 may be configured to direct the flow of air generated by the MEMS device 102 in the direction of the arrows A, away from the MEMS device and out of the housing 104 via the air outlet 106. In use, the drying device 100 may be positioned such that the flow of air leaving the housing 104 via the air outlet 106 is directed towards or onto an object to be dried.

[0025] In some embodiments, the drying device 100 may further comprise an air inlet 108. The air inlet 108 may be configured to direct ambient air from outside the housing towards the at least one MEMS device 102.

[0026] It should be noted that the drying device 100 described herein with reference to the Figs. may include features other than those shown. For example, the drying device 100 may include one or more components for supporting the MEMS device 100 or other components relative to the housing 104 or relative to one another, components for directing the flow of air (e.g., from the air inlet 108, via the MEMS device 102, to the air outlet 106), a power source or a mechanism for providing power to the MEMS device, and so on.

[0027] According to the present invention, the drying device 100 generates a flow of air using at least one MEMS device 102, rather than just a fan. Fig. 2 is a schematic illustration of an example of a MEMS device 102 capable of generating a flow of air in the drying device 100. The drying device 100 may include or be provided with one or more of any suitable MEMS device 102 that has at least one vibrating member capable of generating a flow of air. One example of a MEMS device 102 that may be used to generate a flow of air in a drying device 100 is the AirJet (RTM), AirJet (RTM) Mini or AirJet (RTM) Pro by Frore Systems Inc., described briefly below and described in greater detail in US patent publication number 2023/012794 A1, the content of which is hereby incorporated by reference.

[0028] The MEMS device 102 includes an upper plate 202 which has at least one opening, aperture or vent 204 formed therein for receiving air, such as a hair that enters the drying device 100 via the air inlet 108. The MEMS device 102 also includes a lower plate 206 which has at least one opening, aperture or vent 208 formed therein, through which air can leave the MEMS device. In the example shown in Fig. 2, the lower plate 206 include two vents 208a, 208b. In this example, a vibrating member is formed by a vibration plate 210 which is attached to the lower plate 206 by a support 212.

[0029] In use, the vibration plate 210 is driven (e.g., by a piezoelectric) such that ends of the vibration plate 210 are caused to vibrate up and down in the directions shown by the solid arrows. The vibrational motion draws air into the MEMS device 102 fire the vent 204 and out of the vent or vents 208 at high speed and/or a high flow rate. The MEMS device 102 also includes a deflection plate 214 that serves to deflect air passing through the vent or vents 208 in an intended direction, such as towards the air outlet 106 of the drying device 100. The deflection plate 214 may also serve as a heat conduction plate, to conduct heat from a heat source (not shown in Fig. 2) to air impinging the deflection plate as it passes through the vent(s) 208, as discussed in greater detail below.

[0030] While Fig. 2 shows the general structure of the MEMS device 102 according to one example, various modifications may be made to achieve different effects from the MEMS device. For example, in the example shown in Fig. 2, the vibration plate 210 may comprise a substantially rectangular plate, supported at its central region by the support 212, such that when actuated, the two ends of the vibration plate vibrate up and down. However, in other examples, the vibration plate may be substantially round, such that, during actuation, edges of the vibration plate are caused to vibrate around its perimeter. Similarly, the number of vents 204, 208 in the upper plate 202 and the lower plate 206 may be varied, and the size, shape and/or location of the vents may be varied depending on the amount of air intended to enter and leave the MEMS device 102. In some embodiments, for example, vents may be positioned in sidewalls of the MEMS device 102 instead of, or in addition to, vents positioned in the upper plate 202 and the lower plate 206. The volume inside the MEMS device 102 (e.g., the volume defined by the upper plate 202, the lower plate 206 and walls of the men device) may be considered to be a chamber, and the size, shape and configuration of the chamber may be chosen based on the intended functionality of the MEMS device, such as the intended frequency at which the vibration plate 210 is to vibrate.

[0031] During use, the vibration plate 210 may be driven at a frequency that is equal to or approximately equal to a resonant frequency of the vibration plate and/or at a frequency that is equal to or approximately equal to a resonant frequency for an acoustic resonance of a pressure wave of air within the MEMS device 102. In some examples, actuation of the vibration plate 210 may be achieved using a piezoelectric, which may be located outside of the MEMS device 102, or within the MEMS device, such as within the vibration plate itself or within the support 212. The flow of air generated by actuation of the vibration plate 210, and leaving the MEMS device via the vent(s) 208 can be directed towards an object to be dried. It may be desirable to generate a flow of cool air (e.g., at ambient temperature) for use in drying and object. However, in other scenarios, it may be desirable to generate a flow of warmer air to aid the drying process. Vibration of the vibration plate 210 may generate heat, causing a temperature of air within the MEMS device 102 to increase, such that air leaving the MEMS device via the vent(s) 208 is hotter than air entering the MEMS device via the vent 204. In other embodiments, a heat source may be used to generate heat to warm the air.

[0032] Fig. 3 is a schematic illustration of a further example of a drying device 100. According to the drying device 100 shown in Fig. 3, the drying device may further comprise a heat source 302 in thermal communication with the at least one MEMS device 102, such that heat generated by the heat source is transferred to the flow of air. As noted above, the deflection plate 214 may also serve to conduct heat from the heat source 302 to air passing through the vent(s) 208 impinging the deflection plate 214. As such, the deflection plate 214 may be made of a material having good thermal conduction properties. In such examples, the heat source 302 may be coupled to or connected to the deflection plate 214 directly, such that as much heat as possible is transferred from the heat source to the air leaving the MEMS device 102.

[0033] In some embodiments, the drying device 100 may further comprise a heat transfer bonding medium 304 between the at least one MEMS device 102 and the heat source 302. For example, as shown in Fig. 3, the heat transfer bonding medium 304 may be provided between the heat source 302 and the deflection plate 214 of the MEMS device 102. The heat transfer bonding medium 304 may, for example, comprise a paste or adhesive having good thermal conduction properties, so that as much heat as possible is transferred from the heat source 302 via the heat transfer bonding medium and the deflection plate 214 into the air leaving the MEMS device 102.

[0034] In some embodiments, the drying device 100 may further comprise a power source electrically connected to and configured to supply power to the at least one MEMS device 102. The power source may be configured to provide power to one or more other components of the drying device 100. The power source may, for example, comprise one or more batteries. The power source may be in thermal communication with the at least one MEMS device 102, such that heat generated by the power source is transferred to the flow of air. Thus, in some embodiments, the heat source 302 may comprise a power source. In some embodiments, the drying device 100 may comprise a heat source 302 and a power source, and in such examples, both the heat source and the power source may be in thermal communication with the at least one MEMS device 102 (e.g., in thermal communication with the deflection plate 214 of the MEMS device), such that heat generated by both the heat source and the power source is used to increase the temperature of air leaving the MEMS device 102.

[0035] In examples in which the drying device 100 includes a power source, the drying device may further comprise a heat transfer bonding medium between the at least one MEMS device 102 and the power source. The heat transfer bonding medium used between the power source and the MEMS device 102 may be the same as the heat transfer bonding medium used between the heat source 302 and the MEMS device.

[0036] A significant advantage of the drying device 100 disclosed herein is that a flow of air can be generated using a MEMS device 102, thereby reducing the noise generation that would typically occur in existing drying devices that use a fan for generating airflow. It has been recognised, however, that an improved (e.g., stronger) airflow can be generated by the drying device 100 when the flow of air generated by the MEMS device 102 is supplemented by a flow of air generated by a fan. Fig. 4 is a schematic illustration of a further example of a drying device 100. According to the embodiment shown in Fig. 4, the drying device 100 may further comprise a fan 402 configured to move air along the airflow path. In some embodiments, the drying device 100 may further comprise a motor 404 configured to drive the fan 402. In examples in which a fan 402 is provided, the fan may be smaller than fans used in existing drying devices, since in these examples, the fan is used to supplement the flow of air generated by the MEMS device 102, rather than being used to generate the entire flow of air. Alternatively, the fan 402 may be driven at a lower rotational speed (e.g., using a smaller motor), such that less noise is generated by the fan 402 (and the motor 404) than in existing drying devices.

[0037] In some embodiments, a single MEMS device 102 may be used to generate the flow of air that is used to dry an object. However, in other embodiments, multiple MEMS devices may be provided. Figs. 5, 6, 7 and 8 are schematic illustrations of examples of arrangements of MEMS devices 102 that may be implemented into embodiments of the drying device 100 disclosed herein. The arrows shown in Figs. 5, 6, 7 and 8 indicate an example of the possible direction of airflow into and out of each MEMS device 102. The air generated by the MEMS devices 102 may be directed away from the MEMS device, towards the air outlet 106 of the drying device 100.

[0038] In Fig. 5, a plurality of MEMS devices 102 (i.e., three MEMS devices in this case) are stacked, one on top of another. With this arrangement, and increased flow of air may be achieved due to the increased number of MEMS devices 102, each having a vibrating member.

[0039] In Fig. 6, three MEMS devices 102 are arranged to form a triangular prism shape. With this arrangement, a heat source (not shown in Fig. 6) may be positioned in the centre of the prism, so that heat can be transferred to each of the MEMS devices 102.

[0040] In Fig. 7, for MEMS devices 102 are arranged to form a rectangular prism shape. A similar to the arrangement shown in Fig. 6, the rectangular prism arrangement allows for a heat source (not shown in Fig. 7) to be positioned in the centre of the prism, so that heat can be transferred to each of the MEMS devices 102.

[0041] In Fig. 8, a single MEMS device 102 is formed in a cylindrical shape. Alternatively, multiple MEMS devices may be curved and coupled together to form a cylindrical shape. With this arrangement, a heat source may be positioned in the centre of the cylinder, so that heat can be transferred to the or each MEMS device 102.

[0042] It will be apparent that other arrangements and configurations may be used. Thus, has shown in the drawings, the at least one MEMS device 102 may comprise a plurality of MEMS devices, each MEMS device configured to generate a flow of air and direct the flow of air towards the air outlet 106.

[0043] As noted above, the vents 204, 208 may be provided in the upper plate 202, the lower plate 206 and/or in one or more walls of the MEMS device 102. Figs. 9 and 10 are schematic illustrations of further examples of MEMS devices 102 having different configurations of vents 204, 208. In Fig. 9, vents 204a and 204b are provided in sidewalls of the MEMS device 102 for enabling air to flow into the MEMS device, and the vents 208a and 208b are provided in the lower plate 206 for allowing air to exit the MEMS device. In Fig. 10, vents 204a, 204b and 204c are provided in the upper plate 202 and the sidewalls of the MEMS device 102, and the vents 208a and 208b are provided in the lower plate 206. In the arrangement shown in Fig. 10, however, the support 212 extends beyond the lower plate 206, and connects to the deflection plate 214. In this way, air that leaves of the MEMS device 102 via the vent 208a is directed in a first direction indicated by the arrow B, and air that leaves the MEMS device via the vent 208b is directed in a second direction indicated by the arrow C. In this example, the direction indicated by the arrow B is opposite to the direction indicated by the arrow C. In this way, it is possible to generate two flows of air, for example to enable multiple objects to be dried at the same time.

[0044] In some embodiments, therefore, the at least one MEMS device 102 has a first end and a second end. Air may be provided to the at least one MEMS device 102 at the first end, and the flow of air may be directed away from the at least one MEMS device at the second end. This may, for example, represent an arrangement in which a vent is provided in a sidewall at one end of the MEMS device 102, and air is to exit the MEMS device at an opposite end of the MEMS device. In other embodiments, there may be provided to the at least one MEMS device 102 via an inlet (e.g., a vent) between the first end and the second end, and the flow of air may be directed away from the at least one MEMS device via at least one of the first end and the second end. This may, for example, represent the arrangement shown in Fig. 10 discussed above.

[0045] In the embodiments discussed above, a flow of air generated by the at least one MEMS device 102 is directed out of the housing 104 of the drying device 100, towards an object to be dried. In one example, however, at least a portion of the flow of air generated by the at least one MEMS device 102 may be redirected through the housing of the drying device 100. In this way, air may flow through a duct or cavity in the housing 104 of the drying device 100, and an object or objects to be dried may be placed within the duct or cavity to be dried by the flow of air. In an example, their hair close to the drying device 100, and the flow of air through the duct or cavity may cause the user's hair to be sucked or drawn into the drying device. The flow of air through the duct or cavity may pass over the hair in the drying device 100, causing it to be dried.

[0046] The drying device 100 disclosed herein may be suitable for drying any object, but may be configured to at least partially dry a body part of a user. In some embodiments, the drying device 100 may comprise a hair dryer or a hand dryer. Fig. 11 is a schematic illustration of an example of a hair dryer 1100, and Fig. 12 is a schematic illustration of an example of a hand dryer 1200.

[0047] Referring first to Fig. 11, the hair dryer 1100 may comprise the drying device 100 and further comprises a handle 1102 to be held by a user during use. The handle 1102 may include one or more controls, such as buttons or switches that the user may use to operate the hair dryer 1100, for example to switch the hairdryer on and off, to adjust the frequency of vibration of the vibration plate 210 and/or to adjust the temperature to which air is to be heated by the heat source 302.

[0048] Referring now to Fig. 12, the hand dryer 1200 may comprise the drying device 100, and may be configured such that a user positions their hands beneath the air outlet 106 to be dried. Other configurations of the drying device 100 may be implemented into devices used to dry other items.

[0049] According to the embodiments disclosed herein, a drying device is provided that can provide an improved user experience due to reduced noise generation (e.g., as a result of using a MEMS device instead of a fan to generate a flow of air) and that is capable of effectively and efficiently drying an object.

[0050] Variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the principles and techniques described herein, 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. A single processor or other unit may fulfil the functions of several items recited in the claims. 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. A computer program may be stored or distributed on a suitable medium, such as an optical storage medium or a solid-state medium supplied together with or as part of other hardware, but may also be distributed in other forms, such as via the Internet or other wired or wireless telecommunication systems. Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A drying device (100) comprising:

at least one micro-electromechanical system (MEMS) device (102) having at least one vibrating member, the at least one MEMS device configured to generate a flow of air along an airflow path for drying an object;
a housing (104) configured to at least partially house the at least one MEMS device; and
an air outlet (106) formed in the housing, the air outlet configured to direct the flow of air away from the at least one MEMS device.

2. A drying device (100) according to claim 1, further comprising:
a heat source (302) in thermal communication with the at least one MEMS device (102), such that heat generated by the heat source is transferred to the flow of air.

3. A drying device (100) according to claim 2, further comprising:
a heat transfer bonding medium (304) between the at least one MEMS device (102) and the heat source.

4. A drying device (100) according to any of the preceding claims, further comprising:

a power source electrically connected to and configured to supply power to the at least one MEMS device (102);
wherein the power source is in thermal communication with the at least one MEMS device, such that heat generated by the power source is transferred to the flow of air.

5. A drying device (100) according to claim 4, further comprising:
a heat transfer bonding medium between the at least one MEMS device (102) and the power source.

6. A drying device (100) according to any of the preceding claims, further comprising:
a fan (402) configured to move air along the airflow path.

7. A drying device (100) according to claim 6, further comprising:
a motor (404) configured to drive the fan.

8. A drying device (100) according to any of the preceding claims, further comprising:
an air inlet (108) formed in the housing, the air inlet configured to direct ambient air from outside the housing towards the at least one MEMS device (102).

9. A drying device (100) according to any of the preceding claims, wherein the at least one MEMS device (102) comprises a plurality of MEMS devices, each MEMS device configured to generate a flow of air and direct the flow of air towards the air outlet.

10. A drying device (100) according to any of the preceding claims, wherein at least a portion of the flow of air generated by the at least one MEMS device (102) is redirected through the housing of the drying device.

11. A drying device (100) according to any of the preceding claims, wherein the at least one MEMS device (102) has a first end and a second end; and wherein air is provided to the at least one MEMS device at the first end, and the flow of air is directed away from the at least one MEMS device at the second end.

12. A drying device (100) according to any of claims 1 to 10, wherein the at least one MEMS device (102) has a first end and a second end; and
wherein air is provided to the at least one MEMS device via an inlet between the first end and the second end, and the flow of air is directed away from the at least one MEMS device via at least one of the first end and the second end.

13. A drying device (100) according to any of the preceding claims, wherein the drying device is configured to at least partially dry a body part of a user.

14. A drying device (100) according to any of the preceding claims, wherein the drying device comprises a hairdryer (1100) or a hand dryer (1200).

15. A drying device (100) according to any of claims 1 to 13, wherein the drying device comprises a hairdryer (1100) and further comprises:
a handle (1102) to be held by a user during use.

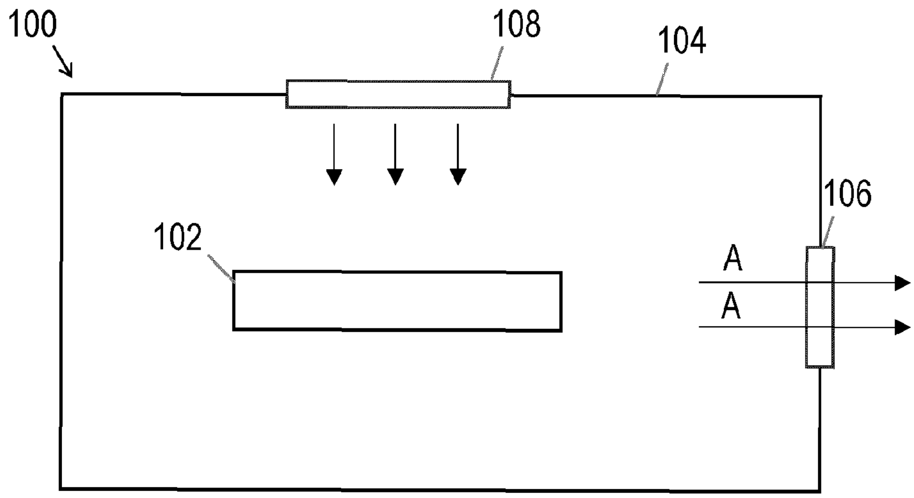


Fig. 1

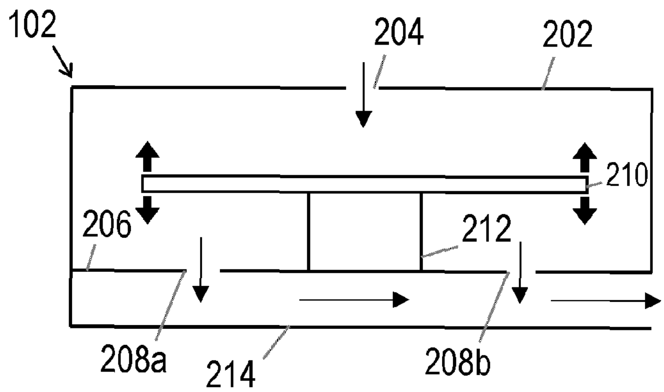


Fig. 2

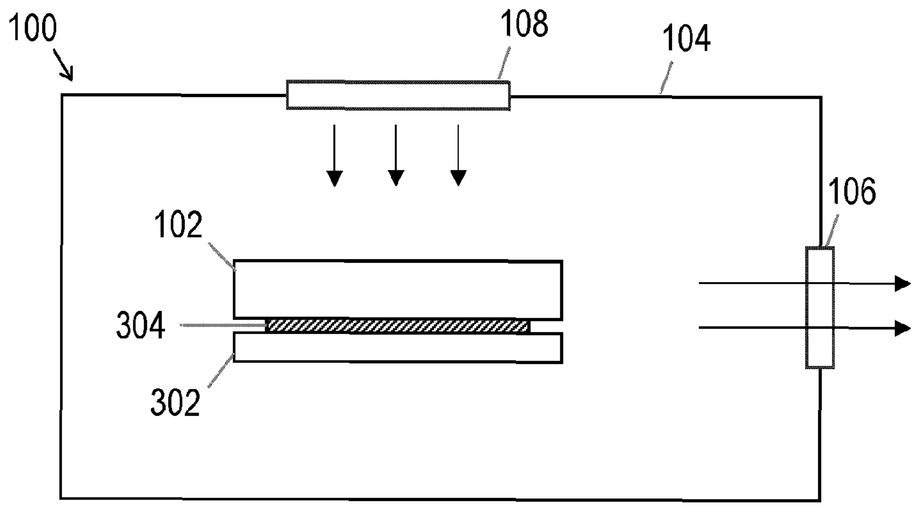


Fig. 3

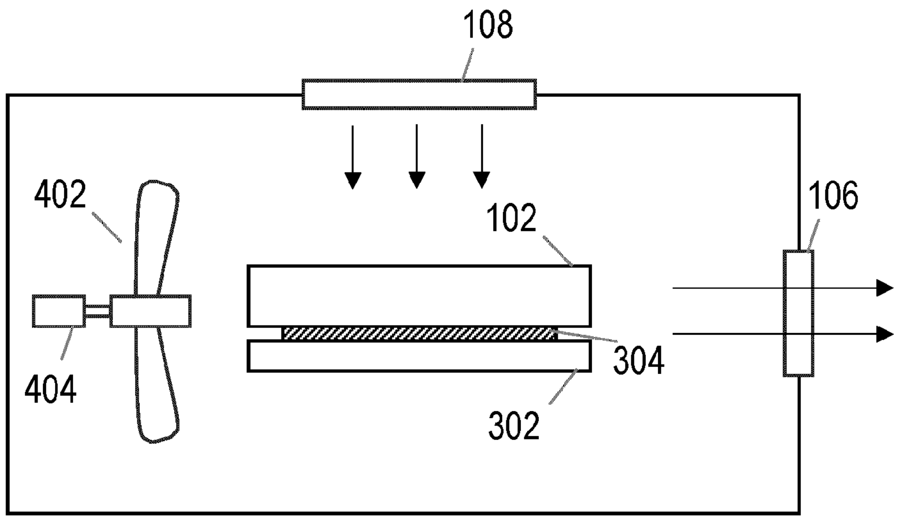


Fig. 4

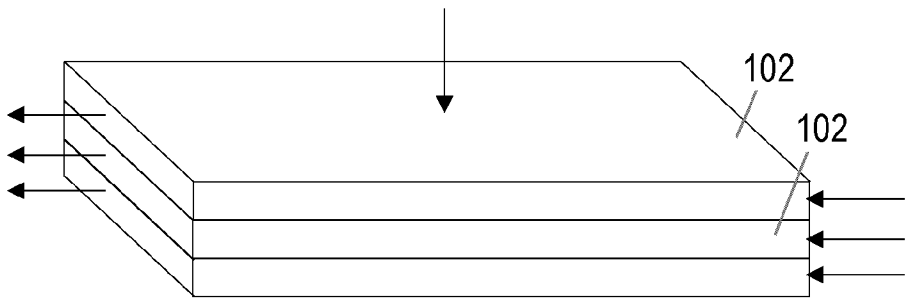


Fig. 5

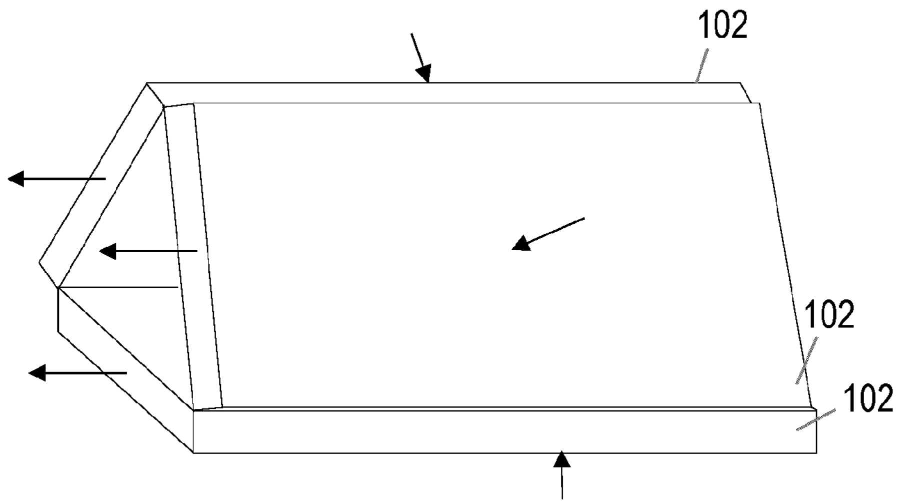


Fig. 6

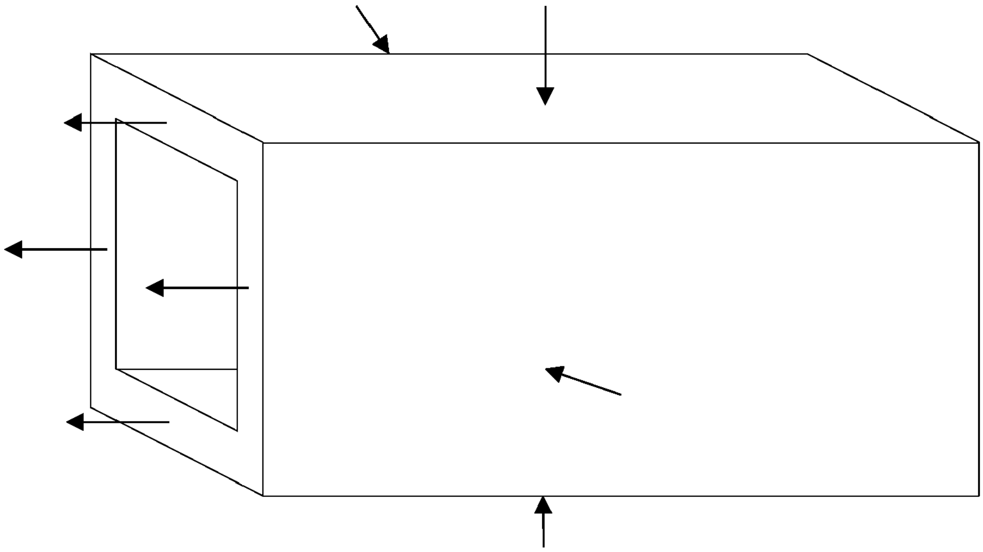


Fig. 7

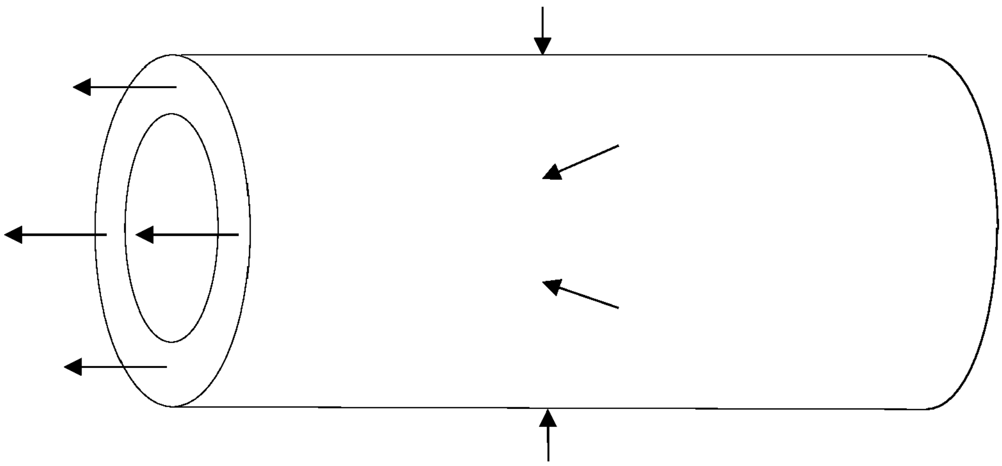


Fig. 8

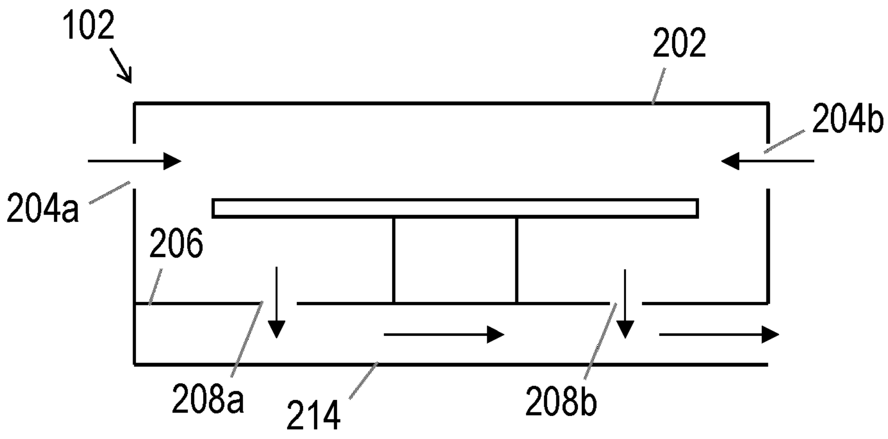
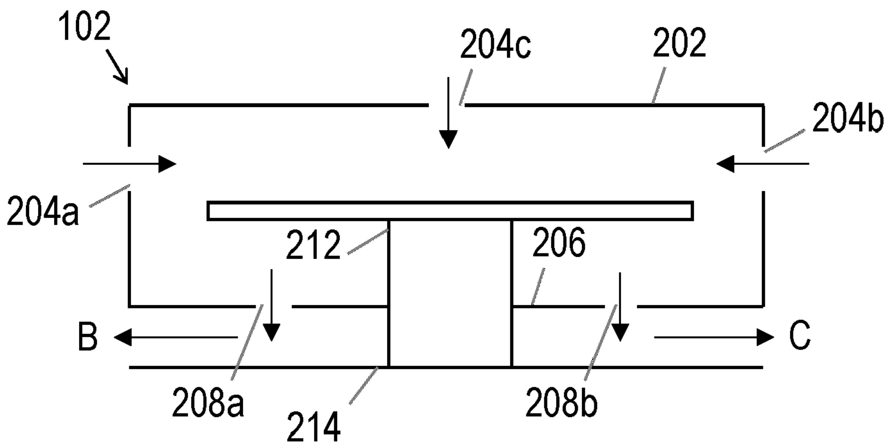

102
202
204b
204a
206
208a
214
208b

Fig. 9


102
204c
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C
208a
214
208b

Fig. 10

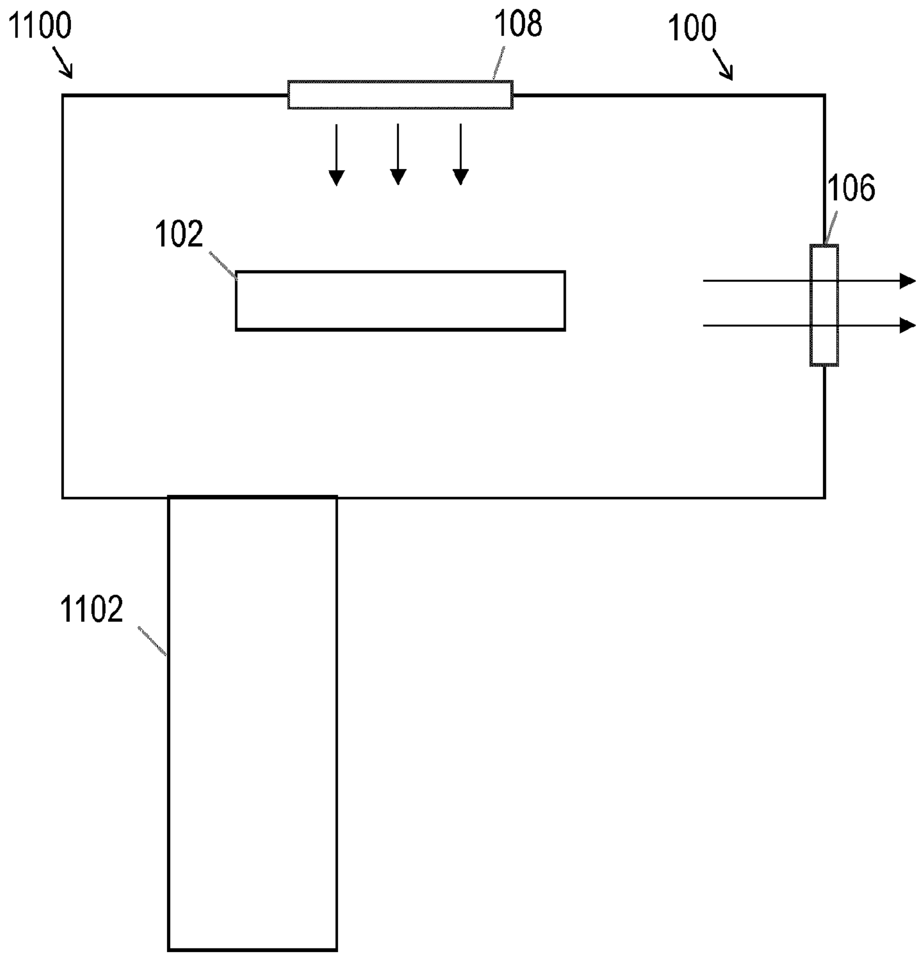

Fig. 11

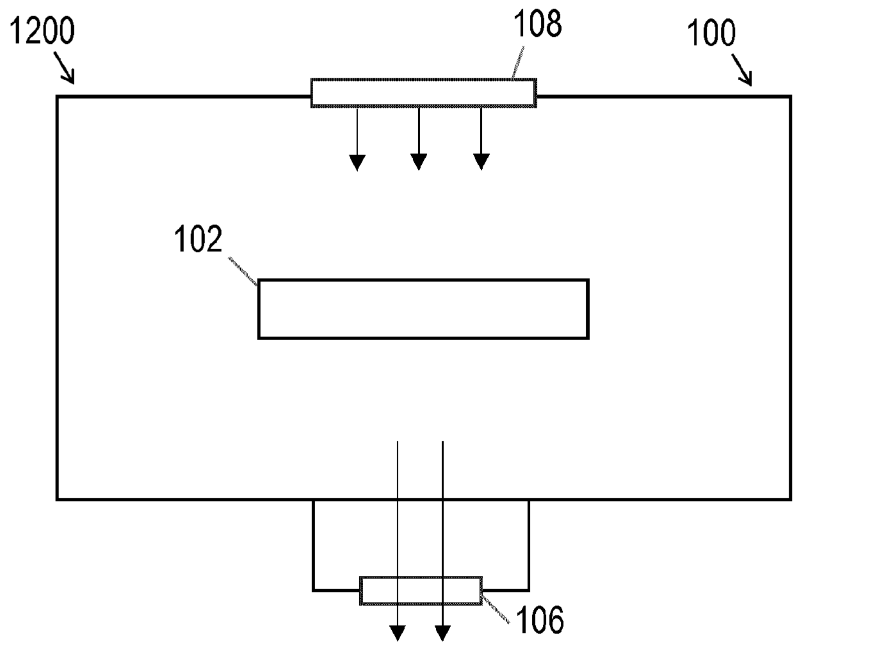

Fig. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 23 20 2946

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2021/230529 A1 (SHIN DONG HEOK [KR]; BAEK SEUNG HWA [KR]) 18 November 2021 (2021-11-18) * paragraph [0024] - paragraph [0048]; figures * -----	1-15	INV. A45D20/04 A45D20/12 A47K10/48
A	JP 2013 103060 A (PANASONIC CORP) 30 May 2013 (2013-05-30) * paragraph [0018] - paragraph [0021]; figures * -----	1	
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TECHNICAL FIELDS SEARCHED (IPC)

A45D
A47K
F26B

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	26 March 2024	van de Beek-Duijker

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26-03-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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