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(54) **HAIR DRYER**

HAARTROCKNER

SÈCHE-CHEVEUX

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Description

BACKGROUND OF THE INVENTION

[0001] US4118874A discloses a hair dryer having inner and outer ducts connected at one end to a centrifugal fan and at the other end to a hood. The fan sucks air through the inner duct and blows it toward said hood through the outer duct. A grille for supporting long hair is positioned in the inner duct so that air drawn toward the fan is drawn through any long hair on said grille.

[0002] KR20160024677A discloses a hair dryer for long hair, which accommodates and dries long hair insulated from the outside to maximize drying efficiency. The hair dryer comprises: a housing having a handle formed on the outer surface of one side and a hair accommodation space formed with a predetermined depth, wherein hair can be introduced through an opening at the upper part to be accommodated; a blower installed on the lower part of the housing to suck and blow external air into the hair accommodation space; a blowing induction part inducing the air blown by the blower to the inner wall surface of the housing to blow the air to the outer circumference of the hair accommodated in the hair accommodation space; and a heating means installed on a side of the blower, which outlets air, to heat the blown air.

[0003] US2016150864A1 discloses a hair grooming system includes a vacuum canister, a hose, and a hand-held unit. The hose is secured to and in fluid communication with the vacuum canister and the hand-held unit. The hand-held unit includes a vacuum chamber. A mechanism for creating a vacuum is positioned in the vacuum canister, and the vacuum is communicated to the vacuum chamber by the hose. The system can further include a heating element and a fan arranged to heat air and move the air into the vacuum chamber. In one embodiment disclosed herein, a method for grooming hair includes the steps of placing a section of hair into a vacuum chamber; drawing a vacuum to remove excess water from the hair; and applying heated air to the section of hair.

[0004] It is, inter alia, an object of the invention to provide an improved hair dryer. The invention is defined by the independent claims. Advantageous embodiments are defined in the dependent claims.

[0005] A cross-section of the drying chamber has a first dimension in a first direction, which first dimension is at least 5 times larger than a second dimension in a second direction perpendicular to the first direction, wherein the first and second directions are perpendicular to a direction of the air flow in the drying chamber. The drying chamber is thus oval or even flat. Compared to a drying chamber having a circular cross-section, the advantage is obtained that hair is spread over the width of the drying chamber so that it is more equally dried. With a circular drying chamber, hair in the middle of a hair strand will remain humid while hair at the outside of a hair strand will be dry, and if the settings are adjusted such that hair in the middle is also sufficiently dried, hair at the outside of the hair strand will be exposed to too much heat, which will damage the hair.

[0006] Preferably, the first dimension is at least 10 times larger than a second dimension.

[0007] A compact hair dryer design is obtained if the drying chamber is folded in that the drying chamber has a U-turn in the direction of the air flow.

[0008] If a first area of the cross-section of the drying chamber at the U-turn is smaller than a second area of the cross-section in the middle between the hair inlet and the U-turn, the air speed is locally increased which facilitates hair entering the device. With a smaller cross-section, it is additionally possible to increase the radius of the turns, which again makes it easier for the hair to make the U-turn without deformations or undesired curls.

[0009] A more satisfactory hair drying experience is obtained if the hair dryer is arranged for heating hair from multiple sides.

[0010] The drying speed is also increased if a wall of the drying chamber is provided with a hydrophilic or water absorbing or water surface tension reducing material.

[0011] If the water absorbing material can be regenerated by means of hot air, the material can be used multiple times.

[0012] If the drying chamber is openable, the drying chamber can be cleaned.

[0013] If the hair dryer has a sensor for sensing temperature and/or humidity of the air flow at an air outlet of the hair dryer, and a part of the air flow is recirculated based on an output of the sensor, the airflow can be controlled to get best results in terms of speed and hair feel, and it may become possible to do with less heater power.

[0014] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 shows a cross section of an embodiment of a hair dryer according to the invention.

Fig. 2 shows another view of a hair dryer according to the invention.

DESCRIPTION OF EMBODIMENTS

[0016] As best seen in Fig. 2, an inlet I1 for hair and cold air is wide, like a letter box sleeve. The wide inlet I1 of a drying chamber spreads hair evenly, thereby preventing hair in the middle of a tress from being not dried well. A rounded curve at the hair inlet I1 bends the hair into the device, based on the coanda effect. In preferred embodiments, the size of the hair inlet I1 ranges from 5 x 50 mm to 20 x 250 mm. In a practical example, the inlet I1 is 10 x 120 mm.

[0017] While the hair inlet I1 may be straight, in a preferred embodiment, the shape of the hair inlet I1 follows

a contour of a user's head to allow more hair to enter the drying chamber. The hair inlet I1 may thus be curved. In an alternative embodiment, the hair inlet I1 may be V-shaped.

[0018] In the embodiments shown, the drying chamber is formed by a folded hair channel HC in which the hair will go in (downwards), then around the first round edge E1 U-turn up, and then around the second round edge E2 U-turn down. In this way, a 60 cm long hair path as is needed for customers with long hair, can be fit into a compact device that is only about 20 cm high. At the edges E1 and E2, a cross-sectional area can be less than in the idle between the edges so as to locally increase the air speed to help pull the hair through the U-turn, and to ensure that the U-turns are rounder, which also helps to allow hair to pass the U-turns in the hair channel HC. In a less complex embodiment, the drying chamber has only one U-turn.

[0019] The inner wall of the drying chamber can be equipped with dimples as the airflow is defined and dimples may reduce drag. Dimples also help to improve the heat exchange.

[0020] Preferably, a wall of the drying chamber HC is shaped so as to style the hair and/or increase a contact area that is in contact with the hair. The hair channel HC may contain ribs to spread the hairs or even style the hair, and may contain swirl ribs which can be set to create a curl effect. If the walls of the hair channel are hot, such ribs increase a contact area that is in contact with the hair, thereby speeding up the drying process.

[0021] At the end of the drying chamber, a filter FT prevents hairs from going into a fan F. The filter FT is preferably removable so as to allow for cleaning.

[0022] The suction fan F can be set on flow, strong and weak. The fan F should be able to handle a minimal amount of water/moisture. The fan F may produce an air flow of between 5 and 40 l/s, preferably between about 18 to 20 l/s; fans as used in some vacuum cleaners may be suitable for this purpose. Preferably, a single motor/fan unit is used to create suction that will not only pull hair into the hair channel HC but also pull air through or along a heater HT into the hair channel HC.

[0023] In the shown embodiments, heated air is only provided from one side (i.e. from the right side in the drawings) to the hair that has entered the hair dryer. In another embodiment, heated air is provided from both left and right sides to the hair.

[0024] In the shown embodiments, the heater HT is shown to the right of the folded hair channel HC. In other embodiments, the heater HT is placed elsewhere, e.g. at the bottom, or before or after the folded hair channel as shown in Fig. 1 from the viewpoint of a person looking at Fig. 1.

[0025] Alternatively and/or additionally to a suction fan F at the end of the hair channel HC that sucks hair into the hair channel, it is possible to have a fan in the separate channel in which a heater HT is placed so as to create an air flow in the hair channel HC that guides hair into the hair channel.

[0026] As shown in application EP 20173773.1, the hair channel HC may have multiple hot air inlets along its trajectory so as to ensure that the heat is more evenly distributed over the hair length so as to ensure a more even drying rate.

[0027] After the fan F there is an outlet O for humid air. If the hair dryer is provided with a heater HT, the outlet air is warm and could be used to dry the scalp. To that end, the outlet air should be directed towards the scalp.

[0028] Just before the filter FT, or between the filter FT and the fan F, there can be a sensor MS to measure the moisture and/or temperature, linked to the dryness of the hair. Depending on the readings from the sensor MS, some outlet air from the fan F may be rechanneled by a valve V2 towards the heater HT to ensure an air flow along the heater HT. This recirculation may save energy (as the heat in the outlet air is not wasted but reused), which is particularly important for a battery-operated hair dryer. Yet, the air flow should allow for a sufficient cooling of the heater HT. However, the recirculated air may have too much moisture to ensure that hair is dried in a satisfactory way, so that if the sensor MS indicates that the air contains too much moisture, the air is not recirculated or only to a limited extent by suitably controlling the valve V2. Depending on the readings from the moisture sensor MS, the hair dryer may indicate that the hair has been sufficiently dried, e.g. by beep signals.

[0029] If the heater HT is of a type that provides hot air to the hair, an outlet of an air channel in which the heater HT is located, is placed at the beginning of the hair channel HC, near the hair inlet I1. The air flow is balanced in such a way that enough air goes through the heater to cool it and provide hot air to the hair. For example, about 50% of the air flow in the hair channel comes through the hair inlet, and about 50% of the air flow in the hair channel comes from the channel (or channels) in which the heater HT is positioned. Once the hair is closing the hair inlet I1, the hot air ratio will increase. To ensure that a sufficient amount of hot air is applied to the hair, a mechanism may be provided to make the inlet I1 narrower once hair has entered the hair dryer, so that less cold air can enter the hair dryer through the inlet I1. The air channel in which the heater HT is located may have its own inlet I2 for cold air in case there is no recirculation or insufficient recirculation to ensure a sufficiently large airflow to cool the heater HT and to provide a sufficient amount of hot air to the hair.

[0030] The heater HT can be controlled with a temperature switch. The temperature in the hair channel HC is preferably around 70 ~ 100 °C. The heater HT may be a conventional (coil/ceramic) heater. The heater HT may have a power between 1000 W and 2500 W, such as a 1600 W or 2100 W heater as used in conventional hair dryers.

[0031] If the heater HT is element-based, it can be placed along the hair channel walls (e.g. a PTC heater/thin film heater). Again the surface can be provided with

dimples to improve heat exchange. The heater capacity can be less as all the heat flows along the hairs. A lower heater wattage allows for a cordless, i.e. battery-operated device, as efficiency is better.

[0032] If the heater HT is light-radiation based, the entire hair channel HC can be made transparent/mirrored to allow all the light passing through and multiple times hit the hair. As disclosed in application WO2019/048357 heat generated by the LED units is preferably reused to heat the hair, e.g. by means of an airflow that has passed the LED units or cooling bodies thereof.

[0033] If the heater HT is off and cooled down, as indicated by a temperature sensor TS1, a valve V1 at the outlet of the hot air channel can be closed so as to ensure that the suction through the inlet I is increased.

[0034] There can be an IR sensor inside to measure the temp of the hair. Other sensors can be added, such as a camera allowing for settings of the fan F and/or heater HT and/or any ionizer to be adjusted based on an analysis (possibly involving artificial intelligence) of images taken by the camera.

[0035] If the hair dryer is battery-operated, the battery can be cooled by the air in the hair channel HC.

[0036] The hair dryer can be connected with IoT, e.g. the device may have a Bluetooth connection to a smartphone having an app so that the device can be controlled by means of the smartphone, which makes particularly sense if the hair dryer is a tabletop device placed on a desk at the back of the user while the hair dryer is in use so that any controls on the hair dryer cannot be reached. The device may have a UI. The hair dryer can be handheld with or without power cord. The device can be put on a desk and positioned under an angle.

[0037] An inner wall of the hair channel HC is preferably provided with a covering of a water absorbing material for absorbing water and/or a material to break / reduce the surface tension of the water droplets so as to increase the dry rate. Preferably, the water absorbing material can be regenerated by letting hot air pass the hair channel without hair being present.

[0038] The hair may alternatively be dried without applying hot air, viz. by using ultrasound e.g. as described in EP 3416521 B1

[0039] When the hair is pulled out, hair health can be measured by measuring the friction in a manner shown application WO 2019/057575.

[0040] In an embodiment, the hair dryer has a nozzle to channel hot air (e.g. outlet air) towards a user's scalp to dry the scalp while the hair is dried, which gives a spa-like experience.

[0041] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. Measures recited in mutually different dependent claims may advantageously be used in combination.

Claims

1. A hair dryer comprising:

   a fan (F) for generating an air flow; and
   a drying chamber (HC) having a hair inlet (I1) into which hair can be guided by the air flow;
   wherein a cross-section of the drying chamber (HC) has a first dimension in a first direction, which first dimension is at least 5 times larger than a second dimension in a second direction perpendicular to the first direction, wherein both the first direction and the second direction are perpendicular to a direction of the air flow.

2. A hair dryer as claimed in claim 1, wherein the first dimension is at least 10 times larger than a second dimension.

3. A hair dryer as claimed in any of the preceding claims, wherein the drying chamber (HC) is folded in that the drying chamber has a U-turn in the direction of the air flow.

4. A hair dryer as claimed in claim 3, wherein a first area of the cross-section of the drying chamber (HC) at the U-turn is smaller than a second area of the cross-section in the middle between the hair inlet (I1) and the U-turn.

5. A hair dryer as claimed in any of the preceding claims, wherein the hair inlet (I1) of the drying chamber (HC) is shaped to follow a contour of a user's head.

6. A hair dryer as claimed in any of the preceding claims, wherein the hair dryer is arranged for heating hair from multiple sides.

7. A hair dryer as claimed in any of the preceding claims, wherein a wall of the drying chamber (HC) is provided with a hydrophilic or water absorbing or water surface tension reducing material.

8. A hair dryer as claimed in claim 7, wherein the water absorbing material can be regenerated by means of hot air.

9. A hair dryer as claimed in any of the preceding claims, wherein the drying chamber (HC) is openable, whereby the drying chamber can be cleaned.

10. A hair dryer as claimed in any of the preceding claims, wherein the hair dryer has a sensor (MS) for sensing temperature and/or humidity of the air flow at an air outlet of the hair dryer, and wherein a part of the air flow is recirculated based on an output of the sensor.

11. A hair dryer as claimed in any of the preceding claims, wherein the hair dryer has a nozzle to channel hot air towards a user's scalp.

12. A hair dryer as claimed in any of the preceding claims, wherein a wall of the drying chamber (HC) is shaped so as to style the hair and/or increase a contact area that is in contact with the hair.

Patentansprüche

1. Haartrockner, umfassend:

einen Lüfter (F) zum Erzeugen eines Luftstroms; und
eine Trockenkammer (HC) mit einem Haareinlass (I1), in den Haare durch den Luftstrom geführt werden können;
wobei ein Querschnitt der Trockenkammer (HC) eine erste Abmessung in einer ersten Richtung aufweist, wobei die erste Abmessung mindestens 5-mal größer ist als eine zweite Abmessung in einer zweiten Richtung senkrecht zur ersten Richtung, wobei sowohl die erste Richtung als auch die zweite Richtung senkrecht zu einer Richtung des Luftstroms sind.

2. Haartrockner nach Anspruch 1, wobei die erste Abmessung mindestens zehnmal größer ist als eine zweite Abmessung.

3. Haartrockner nach einem der vorhergehenden Ansprüche, wobei die Trockenkammer (HC) so gefaltet ist, dass die Trockenkammer in Richtung des Luftstroms eine Kehrtwende aufweist.

4. Haartrockner nach Anspruch 3, wobei ein erster Bereich des Querschnitts der Trockenkammer (HC) an der Kehrtwende kleiner ist als ein zweiter Bereich des Querschnitts in der Mitte zwischen dem Haareinlass (I1) und die Kehrtwende.

5. Haartrockner nach einem der vorhergehenden Ansprüche, wobei der Haareinlass (I1) der Trockenkammer (HC) so geformt ist, dass er der Kontur des Kopfes eines Benutzers folgt.

6. Haartrockner nach einem der vorhergehenden Ansprüche, wobei der Haartrockner zum Erhitzen von Haaren von mehreren Seiten ausgelegt ist.

7. Haartrockner nach einem der vorhergehenden Ansprüche, wobei eine Wand der Trockenkammer (HC) mit einem hydrophilen oder wasserabsorbierenden oder die Wasseroberflächenspannung verringernden Material versehen ist.

8. Haartrockner nach Anspruch 7, wobei das wasserabsorbierende Material mittels heißer Luft regenerierbar ist.

9. Haartrockner nach einem der vorhergehenden Ansprüche, wobei die Trockenkammer (HC) geöffnet werden kann, wodurch die Trockenkammer gereinigt werden kann.

10. Haartrockner nach einem der vorhergehenden Ansprüche, wobei der Haartrockner einen Sensor (MS) zum Erfassen der Temperatur und/oder der Feuchtigkeit des Luftstroms an einem Luftauslass des Haartrockners aufweist, und wobei ein Teil des Luftstroms basierend auf einer Ausgabe des Sensors umgewälzt wird.

11. Haartrockner nach einem der vorhergehenden Ansprüche, wobei der Haartrockner eine Düse aufweist, um heiße Luft in Richtung der Kopfhaut eines Benutzers zu leiten.

12. Haartrockner nach einem der vorhergehenden Ansprüche, wobei eine Wand der Trockenkammer (HC) so geformt ist, dass sie die Haare stylt und/oder eine Kontaktfläche vergrößert, die mit den Haaren in Kontakt steht.

Revendications

1. Sèche-cheveux comprenant:

un ventilateur (F) pour générer un flux d'air; et
une chambre de séchage (HC) ayant une entrée pour les cheveux (I1) dans laquelle les cheveux peuvent être guidés par le flux d'air;
où une section transversale de la chambre de séchage (HC) a une première dimension dans une première direction, laquelle première dimension est au moins 5 fois plus grande qu'une seconde dimension dans une seconde direction perpendiculaire à la première direction, où à la fois la première direction et la seconde direction sont perpendiculaires à une direction du flux d'air.

2. Sèche-cheveux tel que revendiqué dans la revendication 1, dans lequel la première dimension est au moins 10 fois plus grande qu'une seconde dimension.

3. Sèche-cheveux tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel la chambre de séchage (HC) est pliée de telle sorte que la chambre de séchage présente un demi-tour dans la direction du flux d'air.

4. Sèche-cheveux tel que revendiqué dans la revendication 3, dans lequel une première zone de la section transversale de la chambre de séchage (HC) au niveau du demi-tour est plus petite qu'une seconde zone de la section transversale au milieu entre l'entrée pour les cheveux (I1) et le demi-tour.

5. Sèche-cheveux tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel l'entrée pour les cheveux (I1) de la chambre de séchage (HC) est façonnée pour suivre un contour de la tête d'un utilisateur.

6. Sèche-cheveux tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel le sèche-cheveux est agencé pour chauffer les cheveux depuis de multiples côtés.

7. Sèche-cheveux tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel une paroi de la chambre de séchage (HC) est pourvue d'un matériau hydrophile ou absorbant l'eau ou réduisant la tension superficielle de l'eau.

8. Sèche-cheveux tel que revendiqué dans la revendication 7, dans lequel le matériau absorbant l'eau peut être régénéré au moyen d'air chaud.

9. Sèche-cheveux tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel la chambre de séchage (HC) peut être ouverte, grâce à quoi la chambre de séchage peut être nettoyée.

10. Sèche-cheveux tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel le sèche-cheveux comporte un capteur (MS) pour détecter la température et/ou l'humidité du flux d'air au niveau d'une sortie d'air du sèche-cheveux, et dans lequel une partie du flux d'air est recyclée sur la base d'une sortie du capteur.

11. Sèche-cheveux tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel le sèche-cheveux comporte une buse pour canaliser l'air chaud vers le cuir chevelu d'un utilisateur.

12. Sèche-cheveux tel que revendiqué dans l'une quelconque des revendications précédentes, dans lequel une paroi de la chambre de séchage (HC) est façonnée de manière à coiffer les cheveux et/ou à augmenter une zone de contact qui est en contact avec les cheveux.

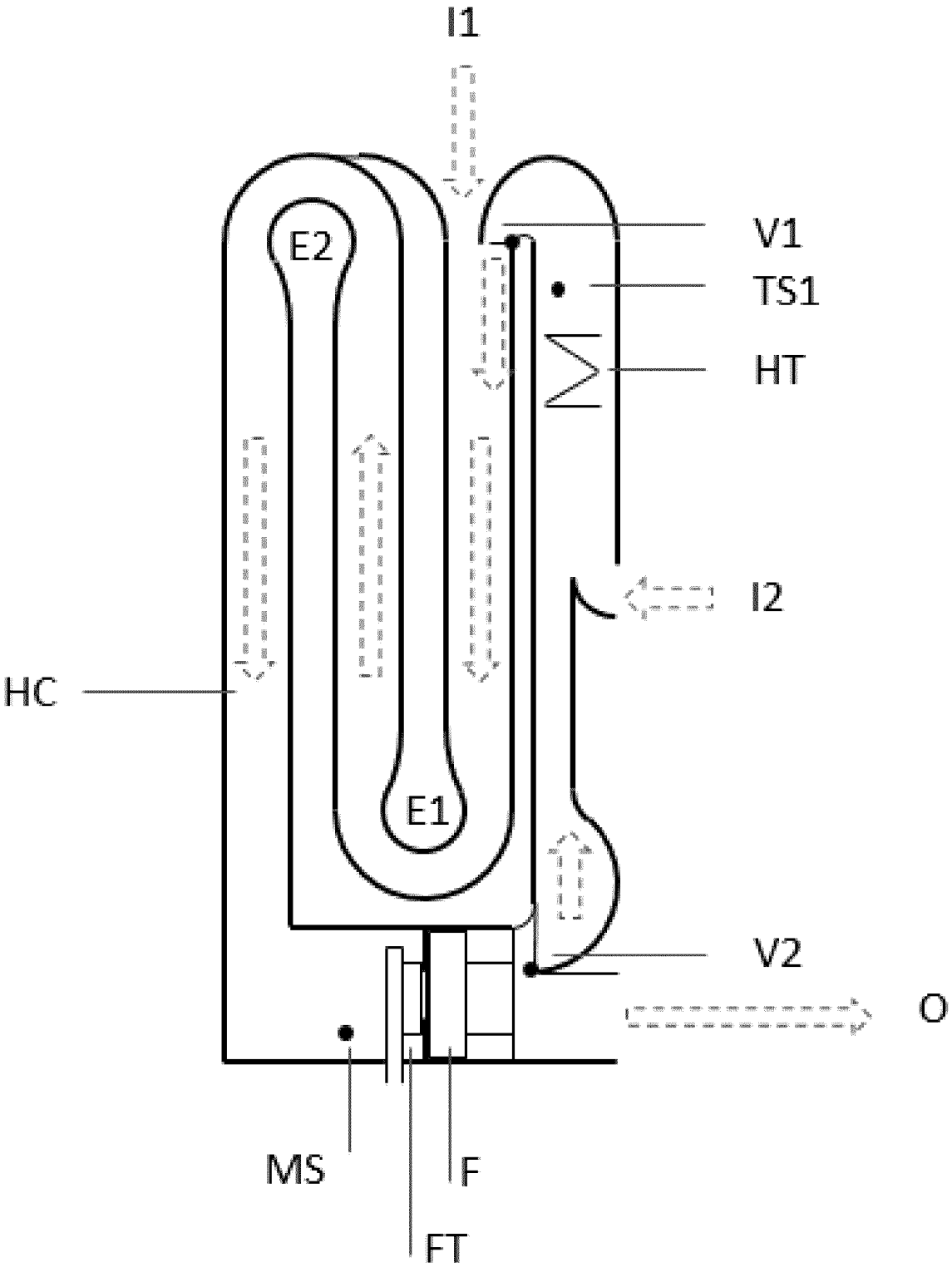

Fig. 1

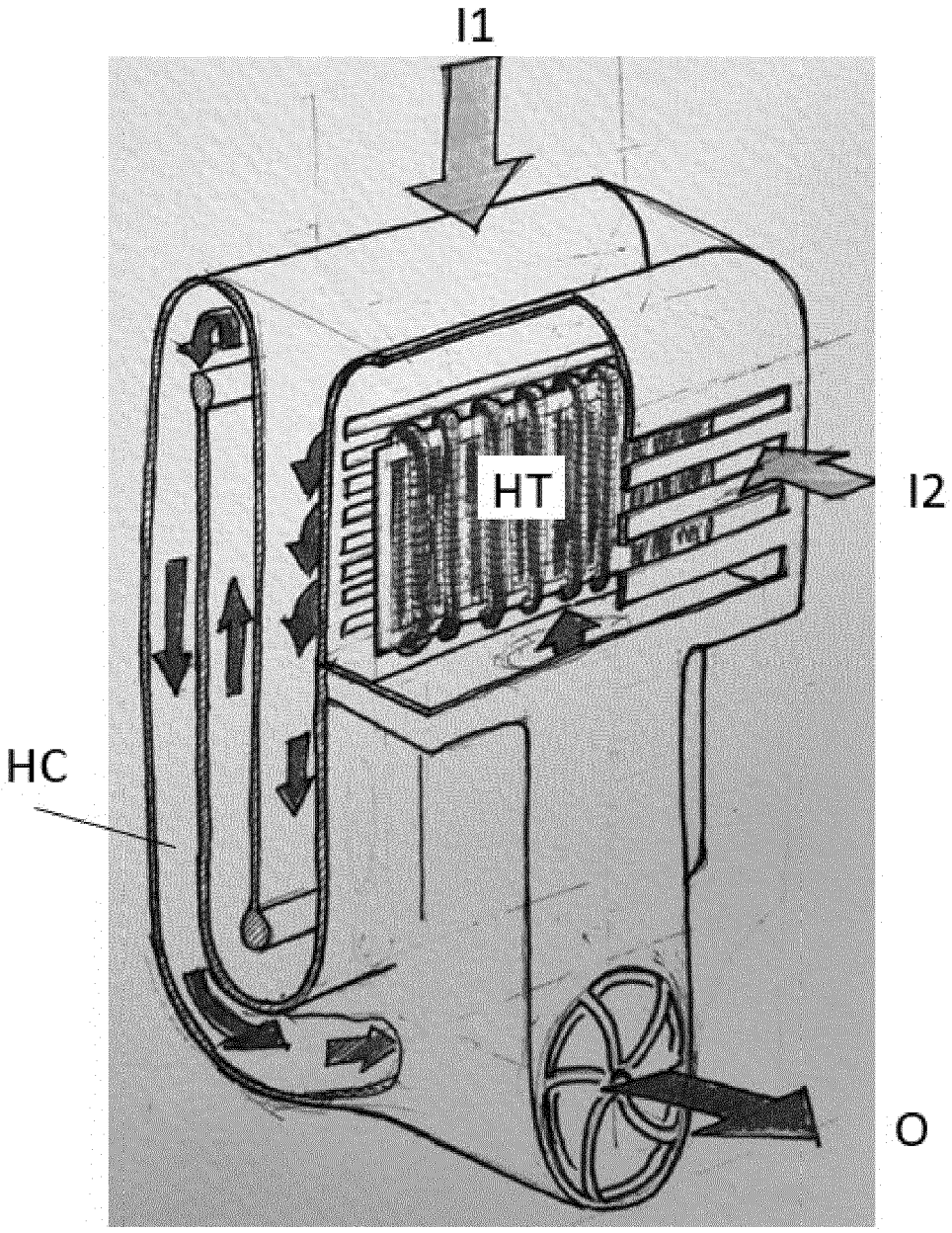

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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