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(54) **SHOE REFRESHMENT SYSTEM AND USE**

(57) A shoe refreshment system (100) comprises a base (10) for placing the system (100) on a horizontal surface (H). The system comprises at least one shoe holder (20) having an elongate shape (20s) configured to fit inside a respective shoe and hold the respective shoe above the base (10). A pump is configured to generate an air flow. A set of exhaust ports is disposed on the elongate shape (20s) and configured to output the generated air flow inside the respective shoe. The system (100) is configured to generate the air flow with the elongate shape (20s) of the shoe holder (20) arranged along the horizontal surface (H) to hold the respective shoe horizontally above the base (10). The inventors find this configuration may improve longevity and efficiency of the system.

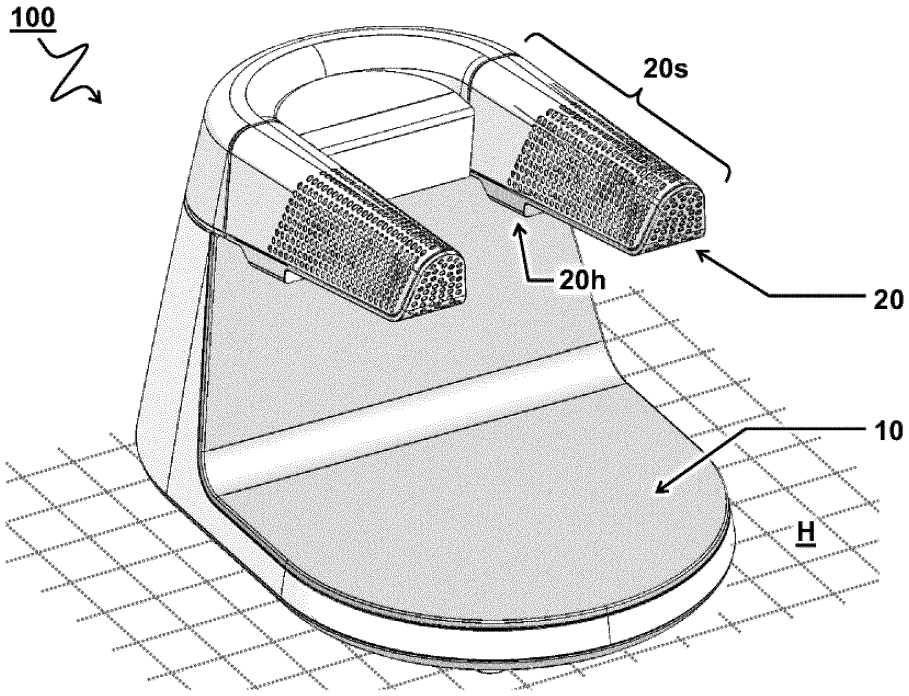

FIG 1A

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Description

TECHNICAL FIELD AND BACKGROUND

[0001] The present disclosure relates to systems for refreshing shoes, and use of such systems, e.g. for drying and/or sterilization of shoes thereby improving hygiene and/or removing of unwanted odors.

[0002] As background, CN100393272C describes an automatic control ozone sterilization air-dry machine for shoes. The known machine comprises a pair of vertically extending flat tubes with air outlets at the top for hanging the shoes. The flat pipe body which contacts the shoes is provided with infrared inductors; the casing comprises an ozone generation device, a heating device, a blower and an automatic control circuit system; the front surface of the flat pipe body is in the shape of a convex arc, and the back surface is a groove. A heat timing switch and a temperature regulation switch are arranged outside the casing; an air inlet is arranged at the bottom of the casing; the automatic control circuit system mainly comprises a power supply circuit, a power supply safety pipe, a thyristor temperature regulation circuit, a relay, an infrared control circuit, an ozone timing circuit, a heat timing circuit, a fan rotation speed control circuit, an ozone generation circuit and a fan driving circuit. This known system has the advantage of simple and convenient use, in particular by the ability to automatically finish the process of sterilizing, deodorizing and airing only by hanging shoes on the machine.

[0003] There is yet a need for further improvements in shoe refreshment systems and methods, such as improvements in longevity and efficiency.

SUMMARY

[0004] These and other needs can be provided by the present disclosure of a shoe refreshment system and method for refreshing shoes. In the system or method at least one shoe holder is provided, preferably at least two (or more). Each shoe holder has an elongate shape configured to fit inside a respective shoe and hold the respective shoe. A pump is configured to generate an air flow through a set of exhaust ports disposed on the elongate shape. Accordingly, the exhaust ports are arranged to output the generated air flow inside the respective shoe. Advantageously, the at least one shoe holder is adapted such that the elongate shape is (in use) arranged predominantly along a horizontal plane. Accordingly, the shoe holder is configured to hold the respective shoe in an essentially horizontal manner. Preferably, the system has a base, e.g. including a bottom plate, allowing the system to be stably positioned on a horizontal surface such as a floor or shelf. Accordingly, the shoes may be held horizontally above the base along a plane of to the bottom plate.

[0005] Surprisingly, the inventors find that holding the shoes in an essentially horizontal orientation can significantly improve longevity and efficiency of the system. This is in contrast to the vertical shoe orientation as used in the aforementioned known machine. For example, the inventors have recognized that sand and dirt is mainly found at the bottom of the shoes near the insole. By orienting the shoes in a horizontal manner, e.g. with the soles facing downwards, the problem of sand and dirt entering the exhaust ports may be alleviated. So, it is easier to keep the system clean and maintain hygienic conditions. Furthermore, internal components such as the pump fan may not be blocked and the system can have a longer lifespan. Additionally, the inventors have recognized that moisture in a more horizontally oriented shoe may be less inclined to all sink to the heel compared to a more vertically oriented shoe. When the moisture is spread more evenly throughout the shoe, instead of concentrated at the heel, the overall drying process (applied everywhere in the shoe) can also be faster and more efficient.

[0006] Without being bound by theory, the inventors have furthermore recognized that, due to the orientation of gravity, air blown inside a horizontally oriented shoe can form a different flow pattern compared a vertically oriented shoe. For example, in a horizontally oriented shoe, the air blown inside may circulate more evenly and/or remain longer, compared to a vertically oriented shoe. For example, when the air is heated and warm air is blown inside a vertically oriented shoe, the warm air tends to rise and concentrate at the tip of the shoe (when the tip is held vertically upwards) or immediately exits the shoe (when the shoe is held horizontally at least such that the shoe opening can face upwards). This is in contrast to a horizontally oriented shoe, where the warm air can more evenly spread through the shoe and/or circulate longer before exiting the shoe. Alternatively, or additionally, when ozone is generated as a part of the air provided into the shoe, the ozone (which is heavier than air) tends to sink to the lowest point in the shoe. So when the shoe is horizontally oriented, the ozone may spread more easily over the shoe and remain longer inside the shoe compared to a vertically oriented shoe where the ozone may immediately exit the shoe opening (when this is at the bottom), or concentrate at the tip (when the tip is held down). Specific advantages may be achieved when the shoe is oriented horizontally with the sole of the shoe oriented on the bottom. In this case the ozone tends to sink and spread in particular over the inside bottom of the shoe, possibly concentrating at the heel to increase disinfection effectiveness.

[0007] In addition to preventing dirt entering the system, the shoe holders can be provided with an antibacterial coating to further improve hygienic conditions. In conjunction with preventing moisture accumulating in the heel, optionally a humidity sensor can be provided in the shoe holders to measures the humidity in the shoes. To make the system more efficient, the duration and/or other parameters of the cleaning program (e.g. amount of air flow, temperature, etc) can automatically adjusted based

on one or more measurements. For example, the program may stop when a measurement indicates the shoes are completely or sufficiently dry inside, e.g. with a measured humidity below a threshold. Alternatively, or additionally, one or more sensors can be provided, e.g. in the holders to automatically start and/or stop the cleaning program when the shoes are placed or removed, respectively, over the holders. For example, an infrared light source and/or light sensor can be provided in the shoe holders. Alternatively, or additionally, the cleaning program may be easily adjusted, e.g. using an optional control interface on a screen at the top of the device. Alternatively, or additionally, a feedback interface can be provided, e.g. indicating parameters of the cleaning program such as temperature, duration, type of cleaning, et cetera.

[0008] By providing the system with an ozone generator, cleaning efficiency and/or hygienic operation may be substantially improved. By providing a delay from a start the cleaning program, before initiating the ozone generation, a user may leave the room without being bothered by the smell of cleaning. Similar delays can also be provided before initiating other or further components, such as the heater. It can also be envisaged to completely delay operation of the system after initially detecting the shoes and/or the system is started by the user. For example, the ozone generation and/or heating may initiate after at least ten seconds, at least thirty second, at least one minute, or more. Most preferably, the cleaning program is configured such that the shoes are first cleaned with ozone and the main drying stage of the shoes is activated later. For example, the drying stage is implemented by activating the heater and/or increasing air flow of the pump. Without being bound by theory, the inventors find that ozone may act more efficiently on a damp surface. Optionally, a special cloth or other covering means can be provided as part of the system, or separately, to cover the shoes during the program. In this way also the outside of the shoes may be cleaned and dried and/or the user may be less bothered by the smell of the cleaning.

[0009] The inventors have recognized that different conditions and/or different types of shoes may be more efficiently handled by providing different possible cleaning programs. In particular, the system can have one or more special programs aimed at a specific type of shoes including a program for sneakers, sport shoes, and/or leather shoes. Each program may have a different setting for parameters including at least one of the amount of air flow (volume per unit time), air temperature (e.g. temperature of the heating element), optional ozone generation (e.g. activated or not, or amount of ozone), total cleaning time, et cetera. For example, sport shoes may need more rigorous moisture removal, while leather shoes may be more sensitive to damage by overheating. The system may also provide a temperature control to protection against overheating. The maximum temperature may be set for each cleaning program individually and/or for all programs the same.

[0010] In preferred design, the shoe holders have a specially developed hole pattern, i.e. perforations forming exhausts of the air flow, so that the shoes are cleaned and dried more evenly. Most preferably, the shoe holders also have one or more special air outlet aimed specifically at the heel part of the shoes so that it is properly dried for any moisture still concentrating there. By providing the heel cleaning exhaust on a protruding part of the shoe holder, the shoe can be more firmly and securely held by the system, and also the air flow may be better focused to this particular part. By making the shoe holders removable and/or replaceable, these can be easily exchanged for clean replacement pieces and/or with other attachment possibilities. For example, the system could also be used to refresh gloves with a more flat (e.g. hand-shaped) attachment piece. It can also be envisaged to provide an extension piece which allows more than two shoes to be refreshed simultaneously.

BRIEF DESCRIPTION OF DRAWINGS

[0011] These and other features, aspects, and advantages of the apparatus, systems and methods of the present disclosure will become better understood from the following description, appended claims, and accompanying drawing wherein:

FIGs 1A and 1B illustrates a shoe refreshment system without and with shoes, respectively;
FIGs 2A and 2B illustrates aspects of an air flow through the system;
FIGs 3A and 3B illustrate components inside the system;
FIGs 4A and 4B illustrate operation of a sensor arrangement;
FIGs 5A and 5B illustrate aspects of shoe holders.
FIG 6 illustrates a top view showing a user interface.

DESCRIPTION OF EMBODIMENTS

[0012] Terminology used for describing particular embodiments is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. The term "and/or" includes any and all combinations of one or more of the associated listed items. It will be understood that the terms "comprises" and/or "comprising" specify the presence of stated features but do not preclude the presence or addition of one or more other features. It will be further understood that when a particular step of a method is referred to as subsequent to another step, it can directly follow said other step or one or more intermediate steps may be carried out before carrying out the particular step, unless specified otherwise. Likewise it will be understood that when a connection between structures or components is described, this connection may be established

directly or through intermediate structures or components unless specified otherwise.

[0013] The invention is described more fully hereinafter with reference to the accompanying drawings, in which embodiments of the invention are shown. In the drawings, the absolute and relative sizes of systems, components, layers, and regions may be exaggerated for clarity. Embodiments may be described with reference to schematic and/or cross-section illustrations of possibly idealized embodiments and intermediate structures of the invention. In the description and drawings, like numbers refer to like elements throughout. Relative terms as well as derivatives thereof should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description and do not require that the system be constructed or operated in a particular orientation unless stated otherwise.

[0014] FIG 1A illustrates a shoe refreshment system 100 place on a horizontal surface "H". FIG 1B illustrates use of the system 100 for refreshing shoes. In some embodiments, the system 100 has at least one shoe holder 20, preferably at least two shoe holders. In one embodiment, each shoe holder comprise a protruding shape configured to hold a respective shoe "S". In another or further embodiment, each shoe holder 20 has an elongate shape 20s configured to fit at least partially inside the respective shoe "S". In a preferred embodiment, the elongate shape 20s has a length extending (at least in use) along an essentially horizontal direction, e.g. parallel to the horizontal surface "H". In another or further preferred embodiment, the elongate shape 20s includes a heel segment 20h, protruding transversely to a main length of the elongate shape 20s. Most preferably, the heel segment 20h is arranged to point downwards.

[0015] In some embodiments, e.g. as shown, the system 100 comprises a base 10, e.g. for placing the system 100 on the horizontal surface "H". While the present figures show the base 10 as a plate like bottom structure, also other placement structures can be envisaged, e.g. a structure having (three or more) feet, or even attachment means configured to attach the system to a wall or other structure. In a preferred embodiment, e.g. as shown, the shoe holders 20 are configured to hold the respective shoe "S" above the base plate. For example, the shoes "S" are provided over the shoe holders 20 while the heel segment 20h faces the respective heel of the shoe. Advantageously, the base below the shoes may catch any dirt or moisture falling from the shoes, instead of this landing on the floor. In one embodiment, the base is provided with means for catching and/or retaining dirt such as a tray. In another or further embodiment, the base is provided with a removable cloth, which may be washable and/or disposable. Also other means can be envisaged.

[0016] FIGs 2A illustrates aspects of an air flow "F" generated by the system 100. In some embodiments, e. g. as shown, the system 100 comprises or couples to a pump 31 configured to generate an air flow "F". In other or further embodiments, the system comprises a set of exhaust ports 21,22. Preferably, the exhaust ports 21,22 are disposed at one or more locations along the elongate shape 20s. Accordingly the exhaust ports 21,22 may be configured to output at least part of the generated air flow "F" inside a respective shoe "S". Most preferably, the system 100 is configured to exclusively generate the air flow "F" while the shoe holder 20 is arranged to hold the respective shoe "S" horizontally, e.g. above the base 10. For example, the shoe holders 20 may be fixed in the horizontal configuration, without possibility of adjustment. This may prevent unintended use of the system in sub-optimal configurations. Alternatively, or additionally, the system may be configured to only operate when the (adjustable) shoe holders are provided in the horizontal configuration. Alternatively, or additionally, the direction of the shoe holders may be adjustable and the system is configured to operate in different configurations, preferably including an essentially horizontal configuration to achieve the optimal benefits of the systems and methods as described herein. For example, the user may be given the option and responsibility to choose the optimal horizontal configuration. Overall, it may be recognized, at least some of the benefits described may be achieved by the various other technical features of the device, even if the shoe holders are not in a horizontal direction, but in a vertical direction, or diagonal direction.

[0017] In some embodiments, the system comprises a heating element 32 for heating the air flow "F", e.g. before passing to the set of exhaust ports 21,22. Preferably, an electric heating element is used, e.g. based on resistive heating (also known as "Joule heating"). Also other or further types of heating can be envisaged such as an infrared light source. Alternatively, or in addition to heating the air flow while it passed along or through the heating element, it can also be envisaged to directly heat the shoe holder 20 and/or provide a heating element in the shoe holder (not shown) that can both heat the air and the shoe. This may provide more efficient use heat. On the other hand, keeping the heat source remote from the shoe holder 20 may prevent inadvertent overheating and/or damage to the shoe, so this is preferred. For example, the heating element 32 may be provided directly adjacent the pump 31, as shown.

[0018] FIG 2B illustrates details of a pump 31 and part of a flow channel 35. In some embodiments, the system is provided with a pump 31 configured to suck air into the flow channel 35, e.g. through an air inlet 11 (e.g. perforated housing as better shown in FIGs 4A and 4B). For example, the pump 31 comprises a fan or other means for displacing air. In a preferred embodiment, the flow channel 35 is configured to split the flow of air generated by a single pump, and direct respective parts of the air flow into respective shoe holders 20. For example, the air flow "F" is split into at least two main portions F1,F2. Each portion can be directed to a respective shoe holder 20, may be further split into sub portions, e.g. a sub por-

tion for exhaust ports 21 along a length of the elongate shape 20s and/or a sub portion directed out from a heel exhaust port 22 at the heel segment 20h. In some embodiments, e.g. as shown, the flow channel 35 may be shaped like a swan neck, or "S" shape, branching into two or more channels for the respective shoe holders 20. This may provide a relatively compact arrangement, as illustrated. The flow channel 35 may also be used to house, or otherwise couple to various air treatment components, such as the heating element 32, or other components as will be discussed in the following.

[0019] FIGs 3A and 3B illustrate further components which may be housed inside the system 100. In some embodiments, the comprises an ozone generator 33 configured to generate ozone. Typically an ozone generator is configured to generate ozone molecules (O_3) from oxygen molecules (O_2) in the air. Preferably, the ozone generator is arranged in a path of the air flow "F", e.g. as described with reference to FIG 2A, and configured to apply an electrical charge to the passing air. For example, the electrical charge is applied such that at least some of the oxygen molecules are split into unstable single atoms which may bond with other oxygen molecules to form the ozone. In one embodiment, the ozone generator is based on corona discharge, e.g. forcing oxygen through a high voltage metallic grid. Also other types of ozone generators can be used such a UV based ozone generator. For example, oxygen molecules may be split when exposed to UV light e.g. <400 nm. In other or further embodiments, the system comprises an ionizer.

[0020] In some embodiments, the system comprises one or more controller configured to perform operational acts as described herein, e.g. control operation of the system and/or allow adjustment of said control. In one embodiment, the system comprises electronics 33 for controlling properties of the air flow "F". For example, this may include one or more, preferably all, of a flow rate generated by the pump 31, a temperature of the heating element 32, and/or activation of the ozone generator 33 (or adjustment of the amount of generated ozone). In other or further embodiments, the system comprises a control interface 41, e.g. connected to an internal control board 42. For example, the control board 42 may be connected to control the electronics 33. Of course these components may also be integrated. It will be further be understood that some or all functional control may be implemented in software, hardware, or a combination thereof. In one embodiment, the system comprises a non-transitory computer-readable medium storing instructions that, when executed by one or more processors, cause the system to perform the methods described herein.

[0021] In some embodiments, the system comprise one or more sensors. In one embodiment, the system comprises a sensor arrangement 25 configured to detect a presence (or absence) of a respective shoe "S" on the shoe holder 20. In another or further embodiment, the system (e.g. controller) is configured to automatically start a cleaning program upon detecting the presence of a shoe on a respective shoe holder 20 and/or stop a cleaning program upon detecting the absence of a shoe (or not detecting anything). The start of the cleaning program may also be delayed for a period after detecting the presence of a shoe, or parts of the program may be delayed such as the ozone generation.

[0022] In some embodiments, the system comprises at least one humidity sensor. For example, a humidity sensor may be arranged on a respective shoe holder 20 and configured to measure a humidity, e.g. inside a shoe placed over the holder. The humidity sensor can also be placed elsewhere, e.g. near the shoe. In another or further embodiment, the system (e.g. controller) is configured to automatically start a cleaning program based on measuring a humidity above a threshold value and/or stop a cleaning program based on measuring a humidity below the same or another threshold value. Also other or further sensors can be used, e.g. a temperature sensor. It can also be envisaged to dynamically adjust the cleaning program based on one or more sensor measurement. In one embodiment, the system (e.g. controller) is configured to adjust at least one of the flow rate of the pump, the temperature of the heating element, and/or ozone generation, based on a sensor measurement of humidity and/or temperature. In another or further embodiment, the system comprises a biosensor, e.g. configured to detect the presence of bacteria and/or fungi (or the effects thereof on the air). For example, the treatment program may be adjusted based on a signal from the biosensor and/or a warning signal may be provided. In some embodiments, the system comprises one or more pod connectors 26, e.g. as illustrated. For example, the pod connectors can be used to (electrically) connect/disconnect various attachments pieces, such as the shoe holders 20, which may comprise various electrical components, such as sensors, light sources, et cetera, that can be connected to the system.

[0023] In some embodiments, the system comprises a power supply and/or transformer 34 for powering the system, e.g. providing a requisite voltage for one or more of the pump 31, heating element 32, ozone generator 33, sensor arrangement, electronics, control and/or display panel, et cetera. Alternatively, the power supply could be an external component and/or the requisite power can be directly provided to the components. In other or further embodiments (not shown), the system comprises a battery configured to power the complete system, or at least some of its components. For example, a battery may be provided to remember optional control settings and/or software programs (and/or these may be stored in non-volatile memory).

[0024] FIGs 4A and 4B illustrate further aspects of a sensor arrangement 25a,25b configured to detect the presence of at least one shoe on a respective shoe holder. In one embodiment, the sensor arrangement comprises an infrared light source 25a arranged in at least one of the shoe holders. In another or further embodiment, the sensor arrangement comprises an infrared light

sensor 25b arranged in at least one of the shoe holders. Preferably, the light source 25a is arranged in a first shoe holder facing a second shoe holder, and the light sensor 25b is arranged in the second shoe holder facing the first shoe holder. For example, the light source 25a and light sensor form an infrared gate which may detect the presence of a shoe when the gate is interrupted. This may provide a relatively efficient system requiring only one source and one sensor to detect the presence of a shoe on either shoe holder. Advantageously, the infrared light may be transmitted through openings which are already present for exhausting air. Of course also or further detection sensors and/or arrangements can be envisaged. For example, each shoe holder may comprise both a light source and light detector operating in reflection mode to individually detect a shoe on a respective shoe holder.

[0025] FIGs 5A and 5B illustrate further aspects of the elongate shape 20s and arrangement of exhaust ports 21,22. In general, it will be understood that the elongate shape 20s is intended to fit inside a typical shoe. In some embodiments, the elongate shape 20s, e.g. part protruding from the rest of the device, has a (minimum and/or maximum) length L of more than ten centimeter, preferably more than fifteen centimeter, e.g. between twenty and thirty centimeter, up to forty centimeters, or more. In other or further embodiments, the elongate shape 20s has a (minimum and/or maximum) diameter D less than ten centimeter, preferably less than eight centimeter, e.g. between three and six centimeter, possibly down to one centimeter. It can also be envisaged to provide a system with exchangeable shoe holders, e.g. to accommodate different sizes and/or shapes of shoes.

[0026] In addition to the typical dimensions of a foot, the elongate shape 20s may also be provided with a shape that more resembles a foot and/or inside of the shoe. In some embodiments, the elongate shape 20s has a rounded top side (e.g. shown in FIG 3A). In other or further embodiments, the elongate shape 20s has a flat bottom side. In one embodiment, the bottom side is relatively wide compared to the top side. In another or further embodiment, a width through a cross-section profile (anywhere) along a length of the elongate shape 20s is highest at the bottom side of the elongate shape 20s.

[0027] In some embodiments, a top side of the elongate shape 20s extends along a length L of the shoe holder 20 at an angle θt of less than twenty degrees (plane angle) with respect the horizontal surface "H" (e.g. determined by the bottom side of the system), preferably less than ten degrees, most preferably less than five degrees, or even completely parallel with the bottom side. The lower the angle θt, the more horizontal the shoe. In other or further embodiments, the bottom side of the elongate shape 20s may extend at the same or similar angle θb, preferably a slightly higher angle, e.g. $\theta b \geq \theta t+2°$. In one embodiment, a cross-section diameter D of the shoe holder 20 converges towards a tip of the elongate shape 20s. In another or further embodiment, the tip of the elongate shape 20s extends further at the top side than at the bottom side.

[0028] In some embodiments, the set of exhaust ports 21,22 includes exhaust holes arranged over at least fifty percent of a perforated surface area of the elongate shape 20s. For example, the effective surface area covered by holes is more than ten square centimeter, preferably more than twenty square centimeter, more than thirty square centimeter, or even more than fifty square centimeter. The more surface area of the elongate shape 20s is covered by holes, the better the spread of air throughout the shoe interior. Preferably, over the surface of the elongate shape 20s covered by the exhaust holes, a fraction of at least thirty percent is taken up by the holes themselves, i.e. less than seventy percent is taken up by the surrounding surface. Also other percentages can be envisaged, e.g. at least 20% holes and 80% surrounding surface. The higher the fraction of surface taken up by the holes, the more easily air can be passed through.

[0029] In some embodiments, the exhaust holes each have a diameter less than five millimeter, preferably less than three millimeter, e.g. down to one millimeter, or less. The smaller the individual holes, the less likely larger pieces of dirt may enter the system. Alternatively, or in addition, it can also be envisaged to provide a filter covering the holes, e.g. allowing air to flow out while preventing particulate matter such as sand from entering.

[0030] In some embodiments, the set of exhaust ports includes exhaust holes 21 provided at least at the bottom side of the elongate shape 20s, i.e. the side facing the base 10. These exhaust holes may blow air towards the sole of the shoe. In other or further embodiments, the set of exhaust ports 21,22 includes one or more heel ventilation holes 22 arranged at the bottom side of the elongate shape 20s adjacent a connection point from which the elongate shape 20s protrudes from the rest of the system, e.g. at least ten centimeters away from the tip of the elongate shape. This may correspond to a location of the heel of the shoe, to provide extra drying at this location. Preferably, the elongate shape 20s is provided with a protrusion, i.e. heel segment 20h, at the bottom side where the heel ventilation holes 22 are provided. The protrusion may help to better define a position of the shoe to be held and/or help to direct air into the heel. In other or further embodiments, the set of exhaust ports 21,22 include exhaust holes 21 covering also the top side of the elongate shape. In this way the entire shoe can be dried.

[0031] In some embodiments, the elongate shape 20s is provided with a perforated distal surface area at portion including a tip of the shoe holder 20. In one embodiment, the perforated distal surface area is covered by exhaust ports 21. In another or further embodiment, the elongate shape 20s is provided with a non-perforated proximal surface area, where the shoe holder 20 is connected to the rest of the system. In other or further embodiments, e.g. as shown, an edge is formed between the perforated distal surface area and the non-perforated proximal surface area. Preferably, the edge is slanted at an angle Φ

with respect to a vertical axis, normal to the horizontal surface H. Most preferably, the angle Φ is slanted towards the distal side at the top of the shoe holder 20. As illustrated in FIG 5B, this specific arrangement of holes may ensure that most holes exit inside the shoe while providing maximal coverage. This may alleviate part of the air flow being wasted, thus increasing efficiency.

[0032] FIG 6 illustrates a top view of the system including a control panel 41 and/or display. In some embodiments, the control panel includes an option to select a type of cleaning program, e.g. adjusted to clean a sports shoe, sneaker, or leather shoe. The selection may also be indicated as feedback in the display. In other or further embodiments, the display includes an indication of time, e.g. (estimated) time remaining to complete the cleaning program and/or time elapsed since the start of the program. Also other or further buttons and/or information can be provided at the interface, such as a temperature.

[0033] In interpreting the appended claims, it should be understood that the word "comprising" does not exclude the presence of other elements or acts than those listed in a given claim; the word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements; any reference signs in the claims do not limit their scope; several "means" may be represented by the same or different item(s) or implemented structure or function; any of the disclosed devices or portions thereof may be combined together or separated into further portions unless specifically stated otherwise. Where one claim refers to another claim, this may indicate synergetic advantage achieved by the combination of their respective features. But the mere fact that certain measures are recited in mutually different claims does not indicate that a combination of these measures cannot also be used to advantage. The present embodiments may thus include all working combinations of the claims wherein each claim can in principle refer to any preceding claim unless clearly excluded by context.

Claims

1. A shoe refreshment system (100) comprising

a base (10) for placing the system (100) on a horizontal surface (H);
a shoe holder (20) having an elongate shape (20s) configured to fit inside a respective shoe (S) and hold the respective shoe (S) above the base (10);
a pump (31) configured to generate an air flow (F); and
a set of exhaust ports (21,22) disposed on the elongate shape (20s) and configured to output the generated air flow (F) inside the respective shoe (S);
wherein the system (100) is configured to generate the air flow (F) with the elongate shape (20s) of the shoe holder (20) arranged along the horizontal surface (H) to hold the respective shoe (S) horizontally above the base (10).

2. The system according to claim 1, wherein the base (10) comprises a bottom plate for placement on the horizontal surface (H), wherein each shoe holder (20) is fixated with respect to the bottom plate with a length (L) of the elongate shape (20s) arranged along a horizontal plane of the bottom plate.

3. The system according to any of the preceding claims, comprising an air inlet (11) and a heating element (32) for heating the air flow (F) passing from the air inlet (11) to the set of exhaust ports (21,22).

4. The system according to any of the preceding claims, comprising an ionizer or ozone generator (33) configured to generate ozone in the air flow (F).

5. The system according to any of the preceding claims, comprising a controller (42) and/or electronics (33) for controlling properties of the air flow (F) and/or operation of the system (100).

6. The system according to any of the preceding claims, comprising a humidity sensor arranged in or on the shoe holder (20) for measuring a humidity of a shoe (S) placed on the shoe holder (20), wherein the system is configured to automatically start and/or stop and/or adjust its operation based on the measured humidity.

7. The system according to any of the preceding claims, comprising a sensor arrangement (25a,25b) configured to detect a presence and/or absence of a respective shoe (S) on the shoe holder (20), wherein the system is configured to automatically start and/or stop a cleaning program based on the detection.

8. The system according to any of the preceding claims, wherein the elongate shape (20s) protruding from the rest of the system has a length (L) of more than fifteen centimeter and a diameter (D) of less than ten centimeter, wherein the elongate shape (20s) has a rounded top side and a flat bottom side, which bottom side is relatively wide compared to the top side.

9. The system according to the preceding claim, wherein the set of exhaust ports (21,22) includes exhaust holes (21) provided at the flat bottom side of the elongate shape (20s), facing the base (10), and exhaust holes (21) covering also the rounded top side of the elongate shape (20s).

10. The system according to any of the preceding claims, wherein the set of exhaust ports (21,22) includes one or more heel ventilation holes (22) arranged at the

bottom side of the elongate shape (20s) adjacent a connection point from which the elongate shape (20s) protrudes from the rest of the system.

11. The system according to any of the preceding claims, wherein the elongate shape (20s) is provided with a heel segment (20h) protruding at the bottom side towards the base (10), wherein the heel segment (20h) is provided with heel ventilation holes (22) facing the base (10).

12. The system according to any of the preceding claims, wherein the set of exhaust ports (21,22) includes exhaust holes arranged over at least fifty percent of a surface area of the elongate shape (20s), wherein over said surface of the elongate shape (20s) covered by the exhaust holes, a fraction of at least thirty percent is taken up by the area of the holes themselves, wherein the exhaust holes each have a diameter less than three millimeter.

13. The system according to any of the preceding claims, wherein the elongate shape (20s) is provided with a perforated distal surface area at portion including a tip of the shoe holder (20), wherein the perforated distal surface area is covered by exhaust ports (21), wherein the elongate shape (20s) is provided with a non-perforated proximal surface area, where the shoe holder (20) is connected to the rest of the system, wherein an edge is formed between the perforated distal surface area and the non-perforated proximal surface area, wherein the edge is slanted at an angle (Φ) with respect to a vertical axis, normal to the horizontal surface (H), wherein the angle (Φ) is slanted towards the distal side at the top of the shoe holder (20).

14. The system according to any of the preceding claims, wherein a top side of the elongate shape (20s) extends along a length (L) of the shoe holder (20) at an angle (θt) of less than ten degrees with respect the horizontal surface (H).

15. Use of the system (100) according to any of the preceding claims, the use comprising placing at least one shoe (S) on the respective shoe holder (20) such that a length of the shoe (S) is arranged along the horizontal surface (H) and an opening of the shoe (S) is facing upwards; and energizing the system to dry and/or sterilize the shoe (S).

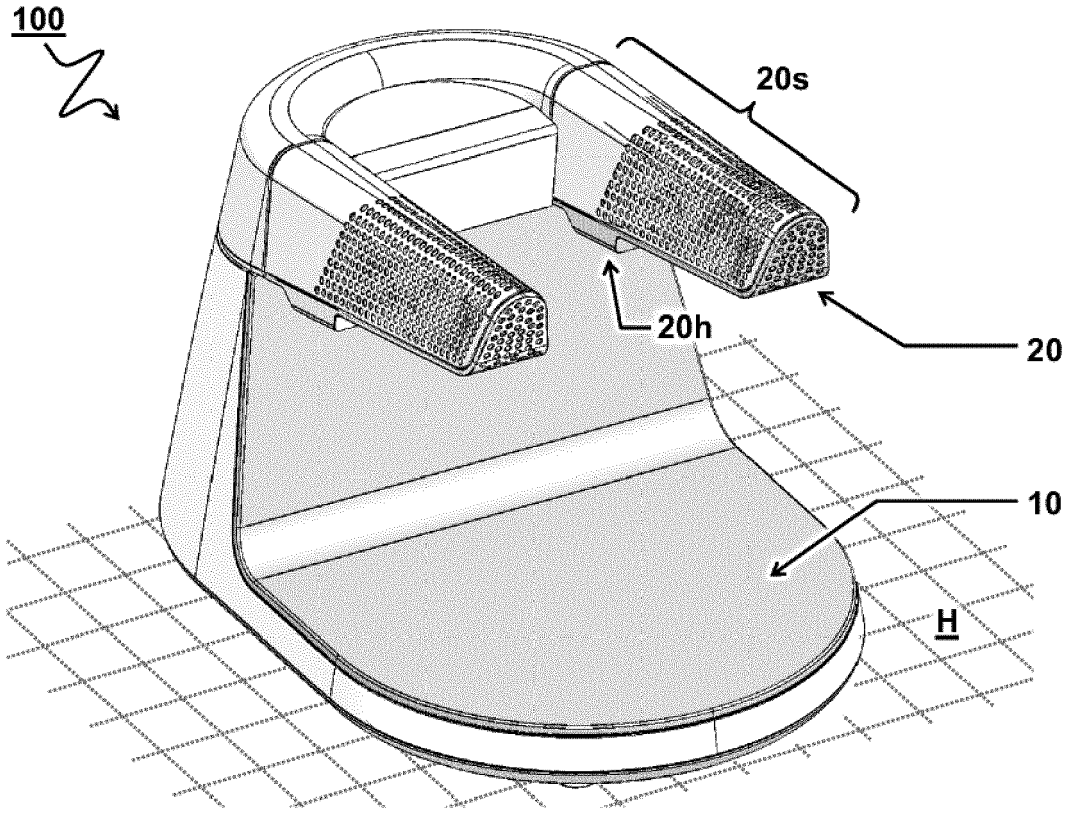

FIG 1A

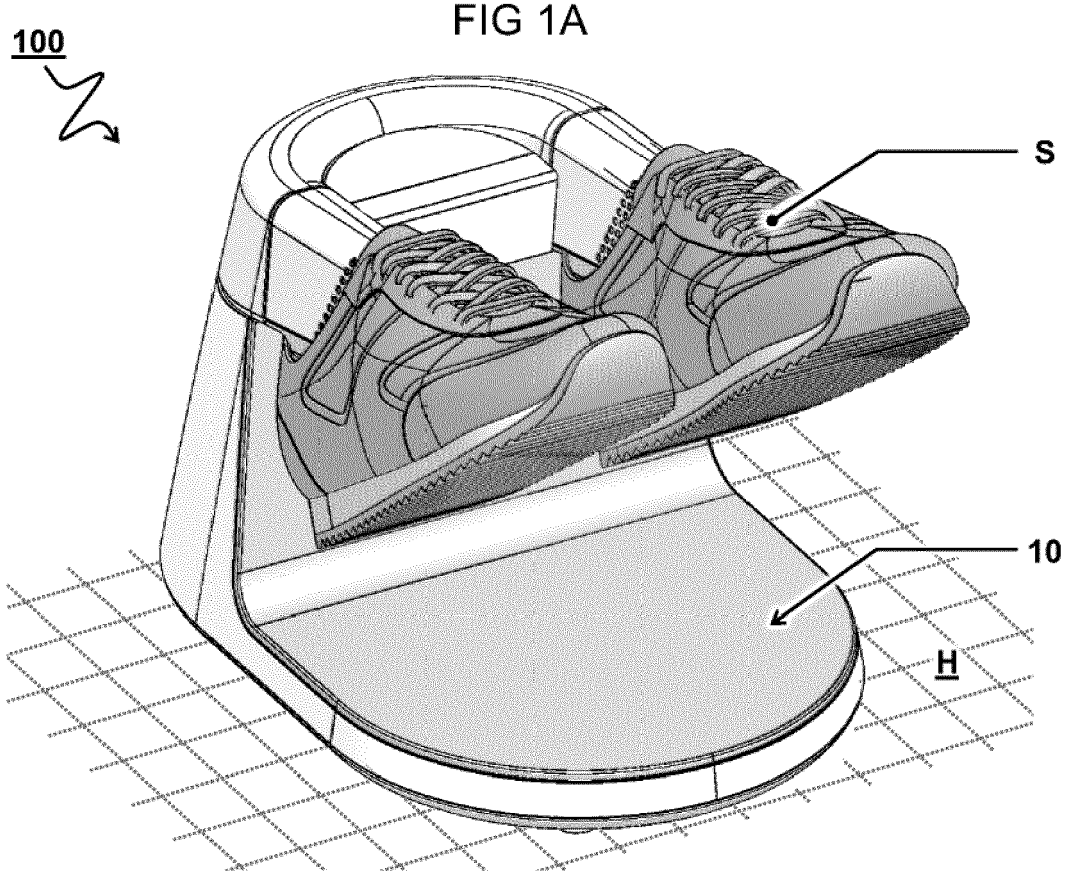

FIG 1B

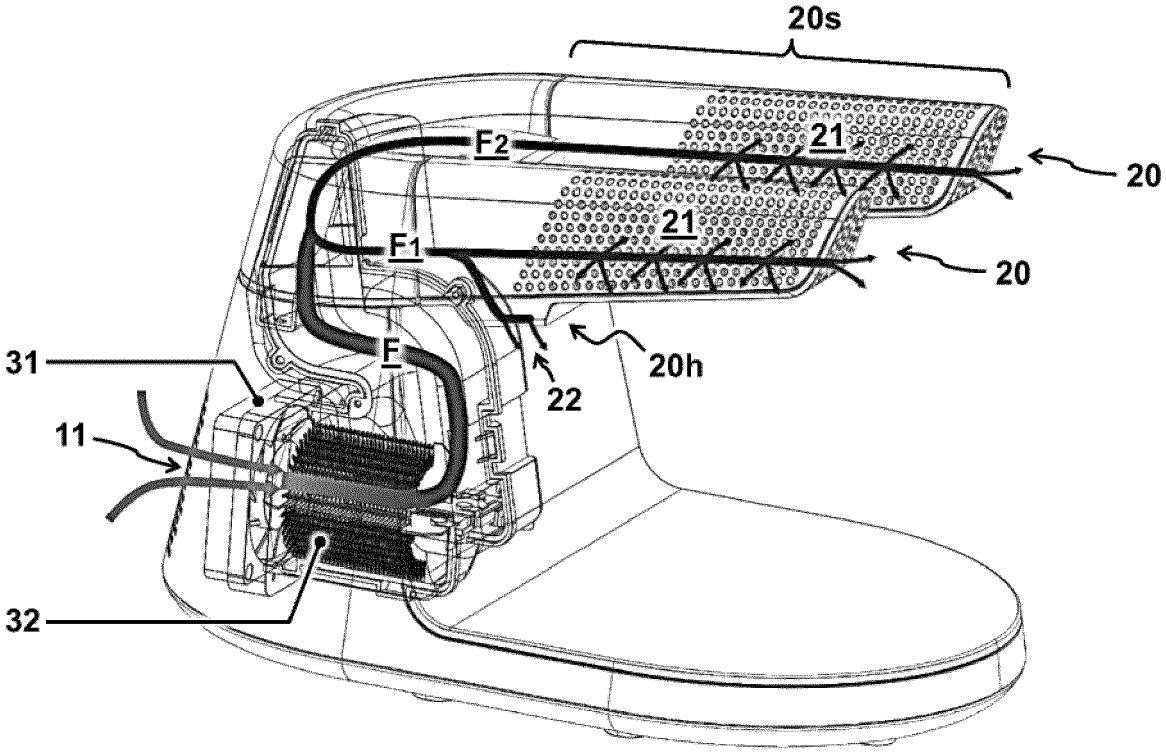

FIG 2A

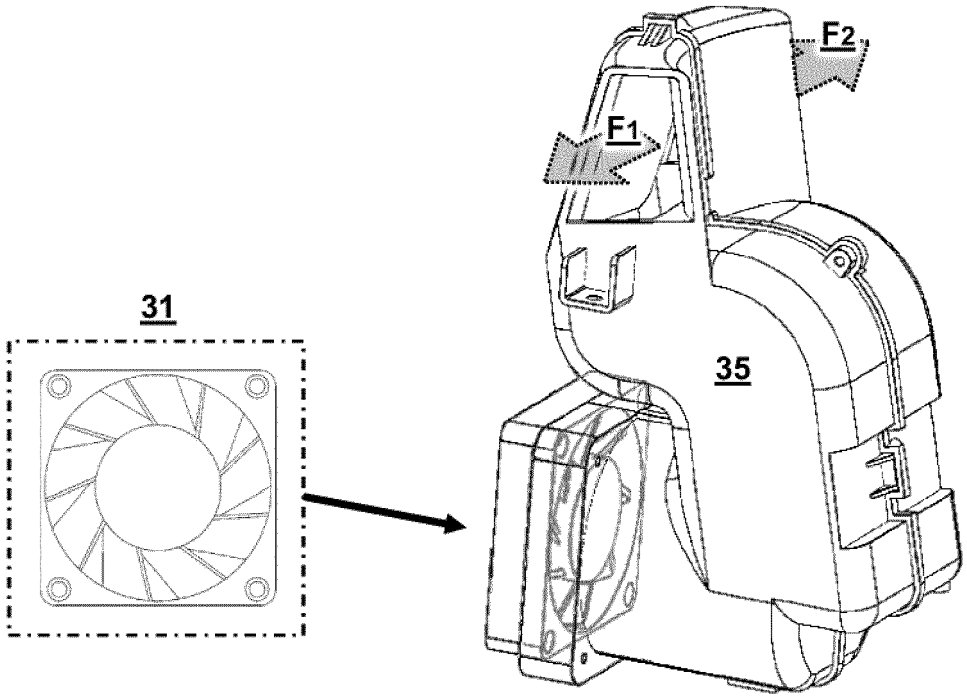

FIG 2B

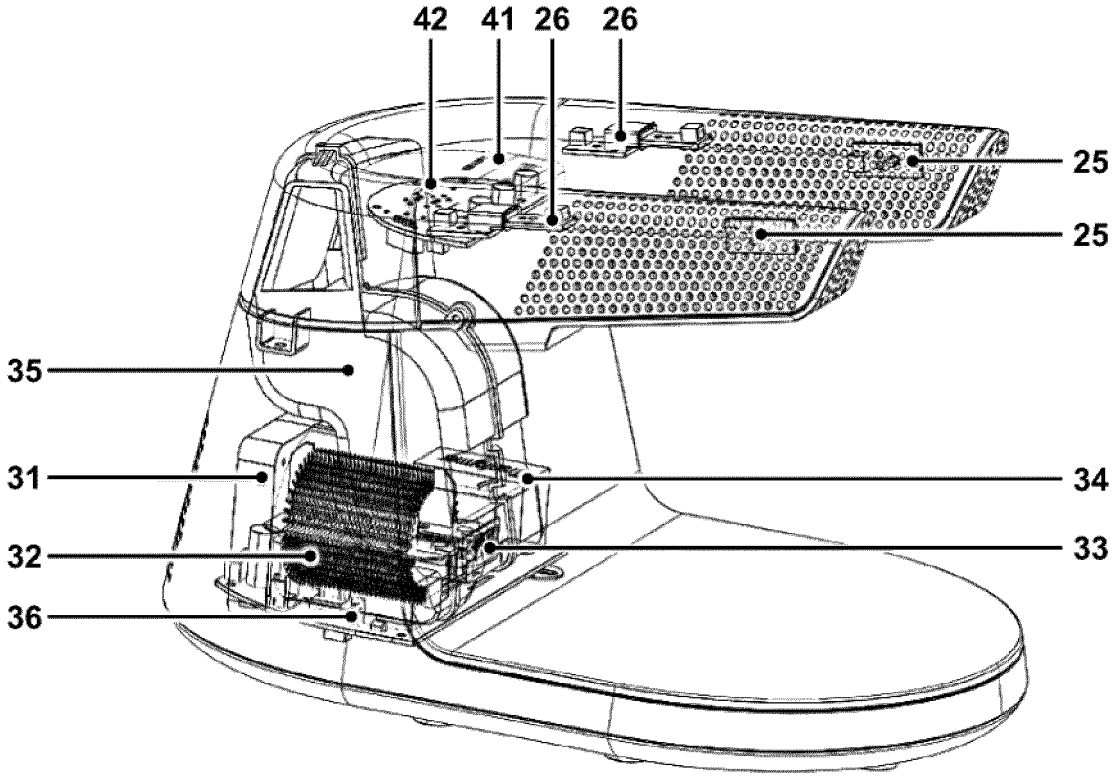

FIG 3A

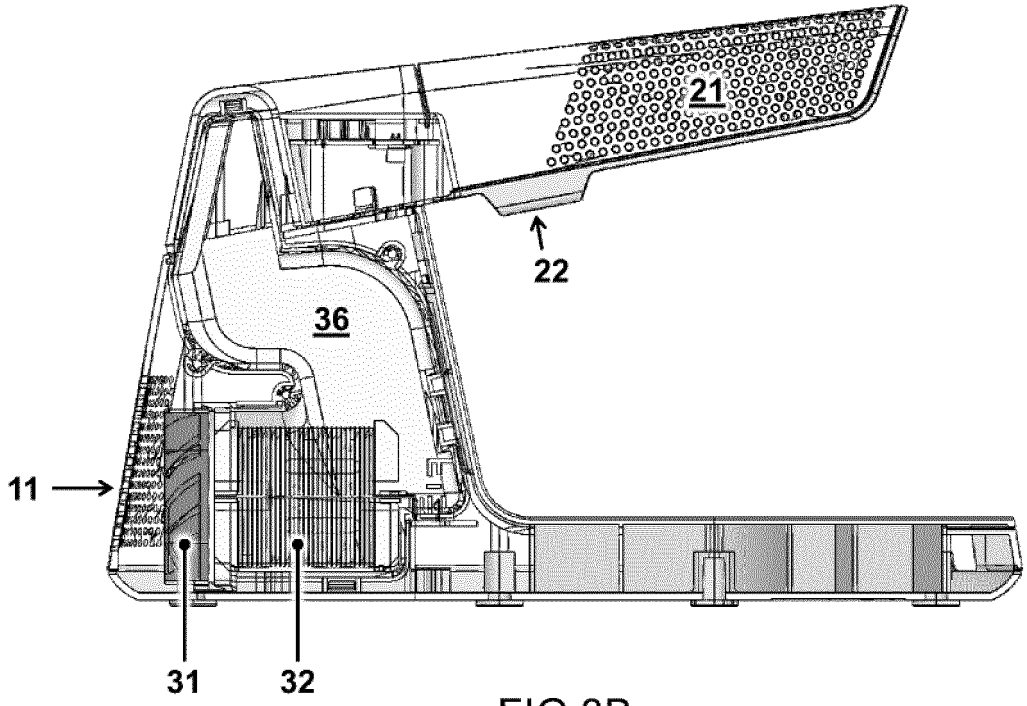

FIG 3B

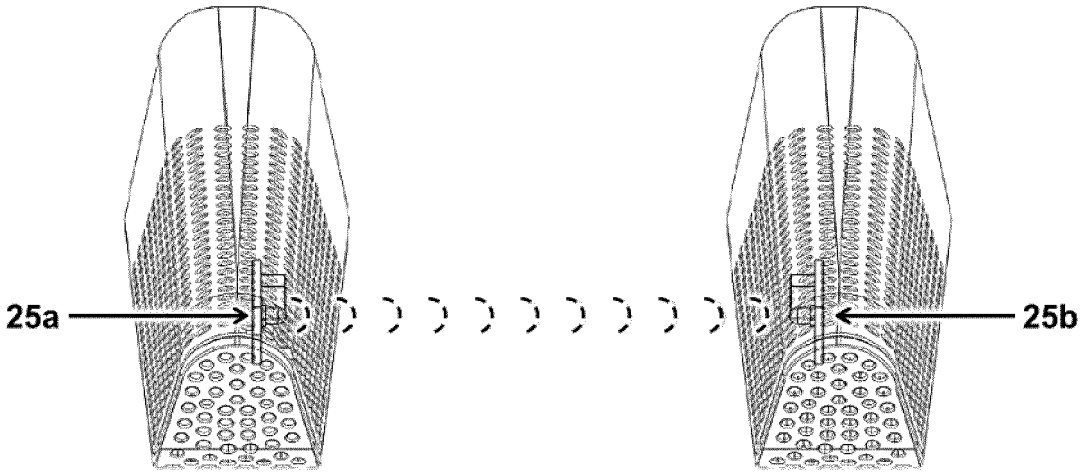

FIG 4A

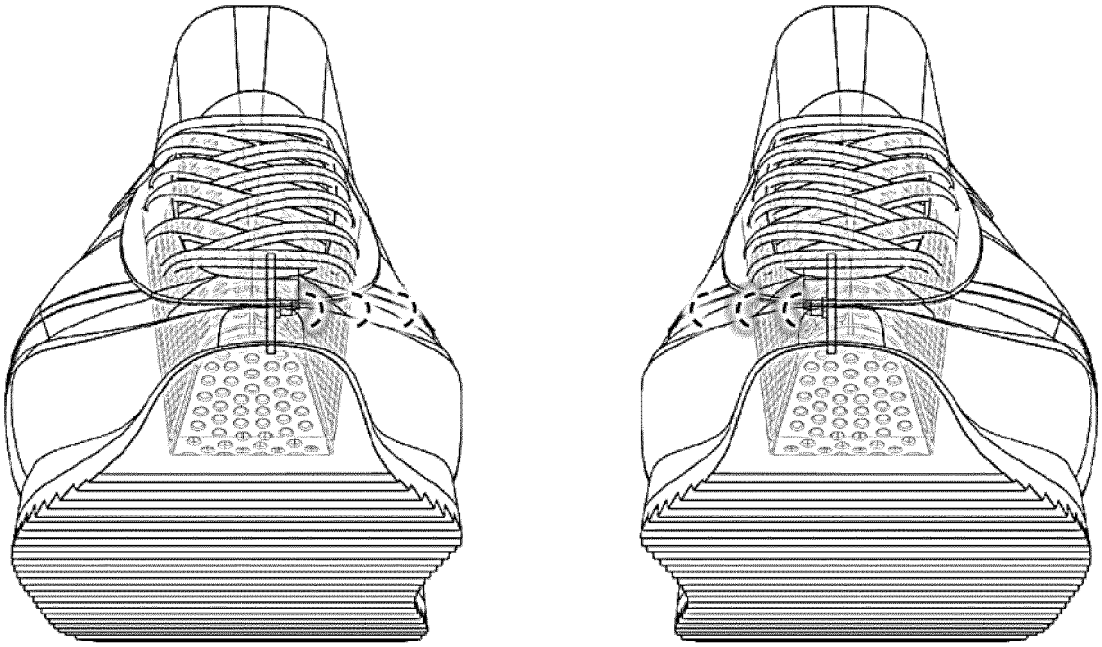

FIG 4B

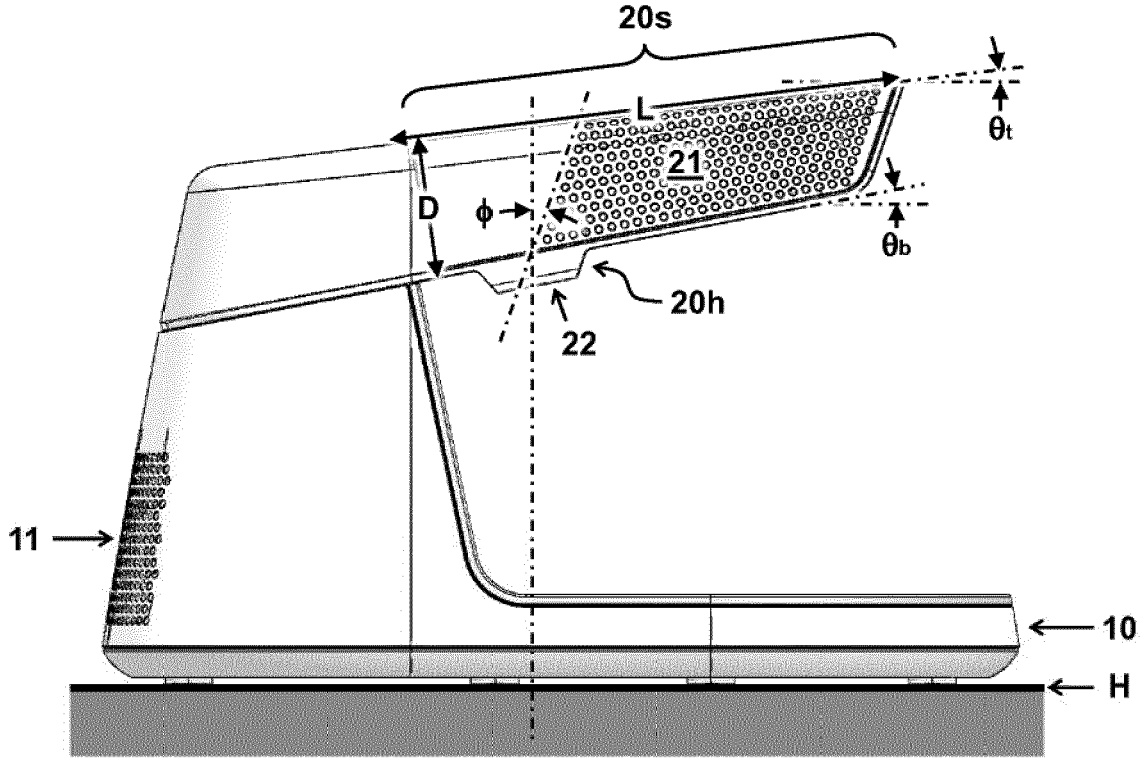

FIG 5A

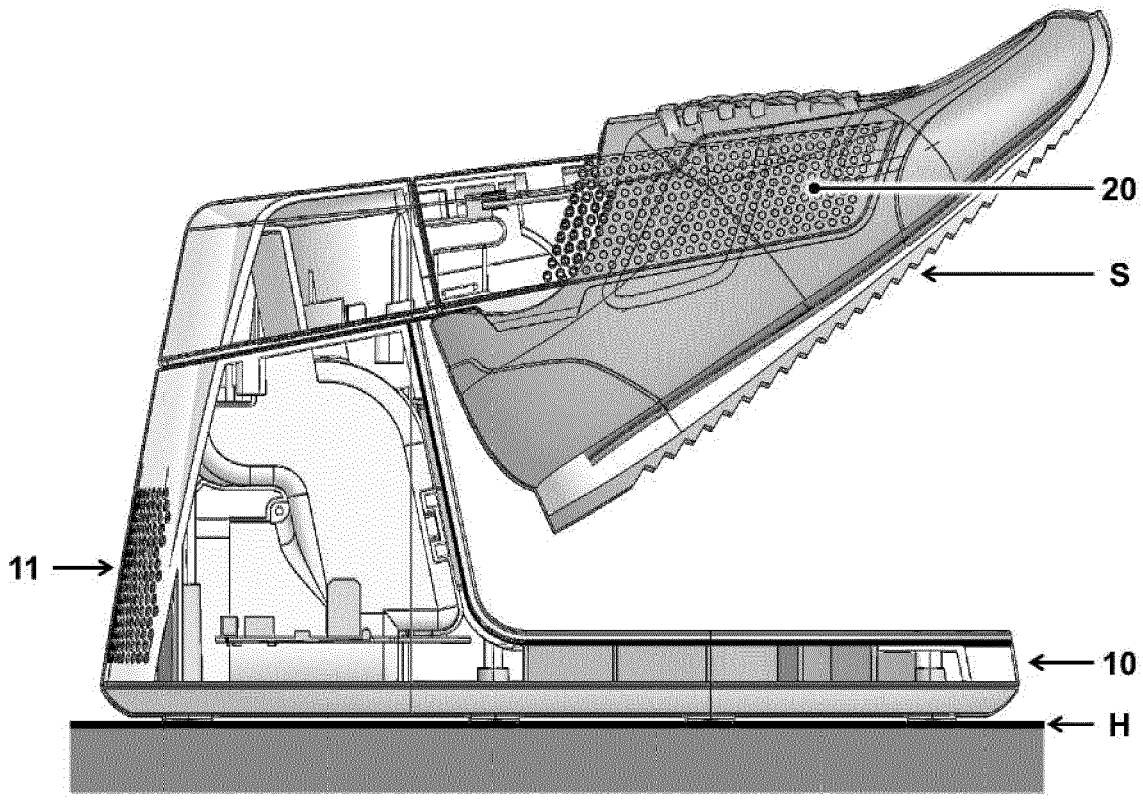

FIG 5B

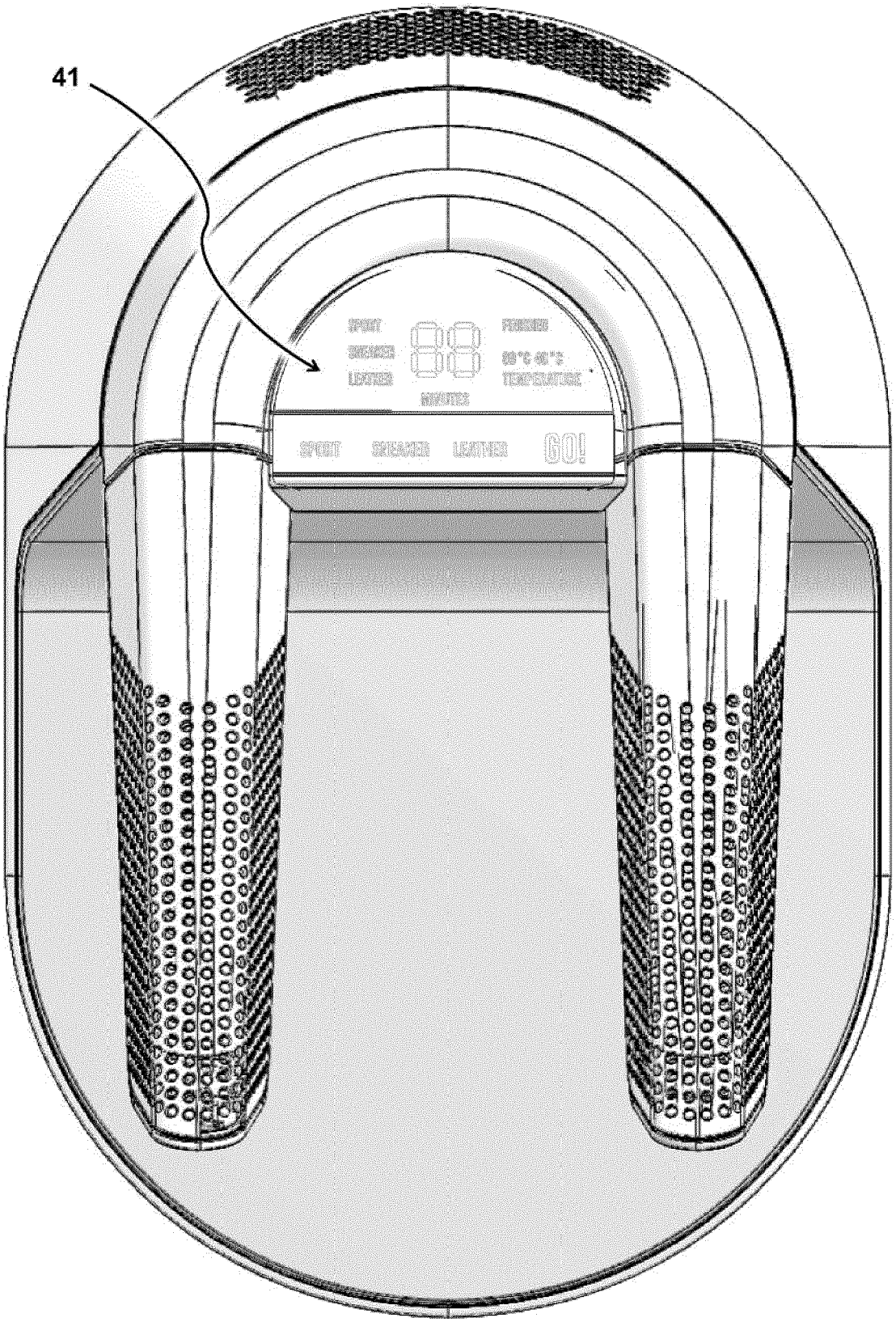
41
SPORT
SNEAKER
LEATHER
MINUTES
FINISHED
TEMPERATURE
SPORT
SNEAKER
LEATHER
GO!

FIG 6

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EUROPEAN SEARCH REPORT

Application Number
EP 23 16 8469

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X Y A	US 6 845 569 B1 (KIM SOO KIL [US]) 25 January 2005 (2005-01-25) * column 4, line 20 - line 47 * * column 6, line 5 - line 27 *	1,2,4, 10,11,15 6,7 3,5,8,9, 12-14	
Y	US 2021/071950 A1 (OHNARI HIROTO [JP] ET AL) 11 March 2021 (2021-03-11) * paragraph [0136]; figure 8b * * paragraph [0191] - paragraph [0192] *	6	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 August 2023	Desittere, Michiel

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08-08-2023

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REFERENCES CITED IN THE DESCRIPTION

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