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(54) **DEVICE FOR WASHING HANDS**

VORRICHTUNG ZUM WASCHEN VON HÄNDEN

DISPOSITIF DE NETTOYAGE DES MAINS

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Description

Field of the invention

[0001] The present invention is in the field devices for hand washing, in particular the washing and drying of hands in public bathrooms.

Background of the invention

[0002] Washing hands is commonly perceived as hygienic and proven to be an effective way to prevent spreading of several diseases.

[0003] Surveys show that people do not always wash their hands in public bathrooms (also known as restrooms). Without wishing to be bound by a theory it is commonly perceived that public bathroom themselves are not hygienic and users prefer not to touch anything inside a public bathroom and wish to leave them at their earliest opportunity.

[0004] Over the years many things have been tried to make hand washing in public bathrooms more attractive.

[0005] For decades, electric dryers haven been used for drying hands after washing, to avoid dirty towels and paper towel dispensers that can run out of stock.

[0006] Soap dispensers have replaced soap bars and automatic taps have solved the problem of touching a dirty tap knob after washing to turn the water off.

[0007] US 3918987 A (Kooper, Rudolph J.) discloses a hand and forearm cleaning device plurality of nozzles that eject streams of fluids inwardly at predetermined rates and pressure in order to perform washing procedure. Though the device discloses an integrated solution for hand wash, it, however, do not address the issue of saving water and using minimal amount for the operation.

[0008] All of these solutions are still highly cumbersome and time and space consuming. Furthermore, although these developments have improved the common handwashing practice, an integrated solution for washing, disinfecting and drying hands that consumes less water remains to be desired.

[0009] Accordingly it is an object of the present invention to provide a device.

[0010] It is a further object to provide a device for wetting hands, depositing a cleansing and/or disinfecting composition and rinsing consecutively.

[0011] It is yet another object to provide a device that also dries the hands after washing.

[0012] It is yet another object to use low amounts of water during washing.

[0013] Surprisingly it has been found that an air-water jet nozzle assembly comprising two nozzles wherein a first nozzle is in fluid communication with a feed liquid source; and a second nozzle connected to a source of compressed air may be used to clean hands using low amounts of water in a short time.

Summary of the invention

[0014] Accordingly, the present invention provides a device, as defined by claim 1, for washing hands comprising a chamber comprising an opening for inserting at least one hand, at least one of an air-water jet nozzle assembly comprising two nozzles wherein a first nozzle is in fluid communication with a feed liquid source; and a second nozzle connected to a source of compressed air.

[0015] In another aspect the invention provides a process, as defined by claim 4, for cleansing a hand with an air-water jet nozzle assembly comprising two nozzles wherein a first nozzle is in fluid communication with a feed liquid source; and a second nozzle connected to a source of compressed air; and comprising the steps of: spraying a fine mist of detergent composition onto the hand; rinsing the hand by spraying a fine mist of water onto it; and drying the hand by blowing air onto the hand.

[0016] These and other aspects, features and advantages will become apparent to those of ordinary skill in the art from a reading of the following detailed description and the appended claims. For the avoidance of doubt, any feature of one aspect of the present invention may be utilised in any other aspect of the invention. The word "comprising" is intended to mean "including" but not necessarily "consisting of" or "composed of." In other words, the listed steps or options need not be exhaustive. It is noted that the examples given in the description below are intended to clarify the invention and are not intended to limit the invention to those examples per se. Similarly, all percentages are weight/weight percentages unless otherwise indicated. Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use are to be understood as modified by the word "about". Numerical ranges expressed in the format "from x to y" are understood to include x and y. When for a specific feature multiple preferred ranges are described in the format "from x to y", it is understood that all ranges combining the different endpoints are also contemplated.

Brief Description of the Drawings

[0017]

Figure 1 shows a schematic drawing of the air-water jet nozzles

Figures 2 shows drawings of the air-water jet nozzles.

Detailed description of the invention

[0018] The present invention provides a device for hand washing. The device according to the invention may further be suitable for drying hands. The device is par-

ticularly suitable for use in public bathrooms, such as airport bathrooms, gas station bathrooms, office bathrooms, hospital bathrooms, etc. In home application of the device is also envisaged.

[0019] The device according to the invention comprises a chamber comprising an opening for inserting at least one hand, and an air-water jet nozzle assembly comprising two nozzles wherein a first nozzle is in fluid communication with a feed liquid source; and a second nozzle connected to a source of compressed air.

Chamber

[0020] The chamber comprises an opening for inserting a hand for washing with the device. The chamber may optionally comprise more than one opening for inserting two or more hands simultaneously, or a larger opening for the same purpose.

[0021] The opening may be at any end of the chamber. The most suitable sides for an opening is either at the top, for vertical insertion of the hands, or at one of the sides for horizontal insertion, or anywhere in between. An opening for the insertion of hands at the bottom, is not excluded from the scope of this application, but is typically not preferred by the intended user.

[0022] The chamber further comprises an air-water jet nozzle assembly comprising two nozzles, one for air and one for a liquid. Preferably the chamber may comprise more than one air-water jet assembly, even more preferably the device contains an array of air-water jet nozzles that simultaneously cover the whole surface of the hand, at least one side at the time, but preferably on both sides.

Air-water jet assembly

[0023] The air-water jet assembly comprises two nozzles wherein a first nozzle is in fluid communication with a feed liquid source; and a second nozzle connected to a source of compressed air. The air-water jet device is incorporated into a hand washing device.

[0024] The liquid source may be any water source, either provided to the air-water jet device straight from the water mains, through a pump, through a pressured container holding the water or by any other means, or even by gravity (i.e. by placing the water reservoir above the height of use of the air-water jet.

[0025] The feed liquid may be any liquid. For regular skin cleansing an aqueous composition is typically preferred. The nozzle for the liquid is called water nozzle herein below, but it is understood that the water nozzle may pass water or any other liquid, including aqueous liquids and other skin treatment composition optionally comprising benefit agents.

[0026] Similarly, the air source may be any air source, either provided through a compressor, separate from, or built into the hand washing device, or through a compressed air line, such as often available in hospitals.

[0027] It is preferred that the air may be heated. It is preferred that the air temperature is at least 30°C, more preferably at least 35°C, still more preferably at least 40°C, but typically less than 70°C, more preferably less than 65°C, or even less than 60°C.

[0028] Both, the first nozzle, (water nozzle) and the second nozzle (air nozzle) are positioned relative to an imaginary central axis (NOR). The first nozzle is positioned at an angle (α) of between 1 and 60°, preferably between 10° and 30° relative to the central axis; and the second nozzle is at an angle (φ) of between 1 and 45°, preferably between 15° and 30° relative to the central axis.

[0029] The mouth of the second nozzle is positioned more forward in the direction of the flow along the direction of the central axis than the mouth of the first nozzle, wherein the offset (OS) distance between the mouth of the first nozzle and the second nozzle is between 0.5 and 5 mm in said direction, preferably 1-3 mm.

[0030] The best results are obtained when the first nozzle has an opening of between 0.05 and 10 mm^2, preferably even at least 0.2 mm^2, and not more than 7 mm^2, more preferably not more than 5 mm^2 or even less than and 3 mm^2. Similarly, the opening of the second nozzle is preferably between 0.2 and 3 mm^2.

[0031] For nozzles with a circular opening, the diameter of the first nozzle is preferably between 0.25 and 3.5 mm, preferably at least 0.5 mm, but preferably not more than 3 mm, more preferably not more than 2.5 mm, or even less than 3 mm; while the diameter of the second nozzle is preferably between 0.5 and 2 mm.

[0032] The scope of the present invention further includes configurations comprising two or more water nozzles directed at a single air nozzle. Although this adds to the complexity of the device, which is generally not preferred, it provides the additional benefit of point of action mixing or reacting different or incompatible ingredients. Additionally different nozzle geometries are contemplated, including but not limited to circular, square, rectangular and oval openings, for either one or both nozzles. For larger surfaces, a slit type (oval or rectangular) air nozzle and a similarly dimensioned water nozzle, or multiple water nozzles are preferred, more preferably the ratio between the longest side-to-side distance and the shortest side-to-side distance of the oval or rectangular slit, is between 2:1 and 20:1, still more preferably between 2:1 and 10:1. Cross or star shaped air nozzles with one or more water nozzles being positioned between the extending parts (i.e. in the indentations) are also contemplated in this context.

[0033] Without wishing to be bound by a theory, it is thought that the present invention derives its performance from the positioning of the nozzles relative to the imaginary axis and the offset of the water nozzle (first nozzle) relative to the air nozzle (second nozzle). Because of this positioning, the feed liquid coming from the water nozzle forms a film around the air nozzle, and because of this, it gives a finer spray at a lower liquid-to-air

ratio (i.e. using less liquid). The air flow from the air nozzle is thought to create a local under-pressure that ensures that the liquid is driven in the direction of the air nozzle along the air nozzle tip, regardless of in which direction the nozzle is pointed. Furthermore, the liquid flow is not affected by the air pressure due to the separation of the air and water nozzle openings, which is a common problem with internal mix nozzle designs.

[0034] It is preferred that the distance of the hands from the nozzles is at least 1 cm and at most 15 cm The distance is preferably at least 2 cm, more preferably at least 3 cm, or even at least 4 cm. The distance is preferably not more than 12 cm, more preferably not more than 10 cm, or even not more than 8 cm.

[0035] It is preferred that the liquid : air ratio is between 10:90 and 1:9999, more preferably less than 5:95, still more preferably less than 4:96, even more preferably less than 3:97, less than 2:98 or even less than 1:99, while the ratio is preferably higher than 3:9997, more preferably higher than 5:9995.

[0036] It is further preferred that there is only a short distance between the opening of the water nozzle and the side of the air nozzle, this distance is preferably less than 2 mm, more preferably less than 1 mm, or even less than 0.5 mm. It is most preferred that the opening of the water nozzle is touching the air nozzle.

[0037] It is preferred that the air nozzle does not co-axially surround the water passage. It is also preferred that the water nozzle does not co-axially surround the air nozzle.

[0038] The air pressure of the air source is preferably in the range of 1 to 5 bar. The air preferably has a velocity of greater than 80 m/s at the exit of the nozzle (the nozzle opening), preferably greater than 120 m/s, more preferably greater than 180 m/s, and most preferably greater than 250 m/s. Although the invention would work up to very high air velocities, it is preferred for constructional reasons and convenience for the user, that the air velocity is less than the speed of sound (i.e. less than 334 m/s). Depending on the nozzle diameter, the airflow rate is preferably between 3 and 50 l/min, preferably more than 5 l/min or even more than 10 l/min. The air flow rate is preferably less than 40 l/min, more preferably less than 30 l/min or even less than 25 l/min.

[0039] The liquid flow rate is typically between 2 and 100 ml/min, preferably more than 5 ml/min or even more than 10 ml/min, while the liquid flow rate is preferably less than 80 ml/min, more preferably less than 50 ml/min, or even less than 40 ml/min.

Configuration

[0040] The air and/or liquid sources may be incorporated into the device, or be fitted in a separate unit. In the latter case, a separate unit comprising a compressor, a compressed air cartridge or cylinder, or another source of air and/or a liquid reservoir, optionally connected to the water mains, is provided. The unit is connected to a hand held device by means of a tubing as air line and/or water line.

[0041] A device that is fully integrated with the air, water and drain plumbing is preferred for public bathrooms, while in home, the water may be added and the drain may be emptied manually.

Nozzle array

[0042] The device comprises at least one nozzle assembly, comprising an air nozzle and a water nozzle.

[0043] It is preferred that the device comprises several nozzles per hand, preferably between 1 and 25 per hand. However, for the purpose of easy positioning and operation between 1 and 12 nozzles per hand is found to give the best results. The nozzles may be configured such that they spray one side of the hand only, or both sides simultaneously. The nozzle assemblies may be configured as a row along a linear profile, or in a curved manner, e.g. a curve following the shape of an average hand. Typically a row of nozzles comprises between 1 and 6 nozzle assemblies, preferably between 2 and 4 assemblies. It is also contemplated in the context of the present invention to have more than one row of nozzle assemblies per side of the hand.

[0044] The device of the present invention may further incorporate other cleaning features such as bristles, scrubbers and/or massaging elements, but from a hygiene perspective this is not preferred.

[0045] An array with air-water jet nozzles may be mounted on a movable rig, such that the mist spray may be moved over a larger area instead of using more nozzles.

[0046] The device may further comprise an air compressor as air source. The compressor may be built into chamber of the device, or provided as a separate device that is connected to the air-water jet by means of a tube. The compressor preferably provides at least 1 bar pressure and not more than 5 bar, preferably less than 4 bar. Thus, very low power compressors, typically in the range of 0.05 to 1 HP, can be used to achieve the above specifications. Due to a pressure drop in the tubing and the device, the pressure at the air nozzle will preferably be in the range of 1 to 4 bar, more preferably 2 to 3 bar. A device with a means to set the pressure is also contemplated; in this case the user is, for instance, able to choose between skin surface cleansing, or deep pore cleansing.

[0047] The liquid source may be the water mains, i.e. directly connected to the faucet, or be in the form of a separate reservoir. The pressure on the liquid source for use with the cleaning device may be relatively low, preferably at least 0.05 bar, more preferably at least 0.1 bar, but preferably not more than 3 bar, more preferably less than 2.5 bar, still more preferably less than 2 bar.

[0048] When a separate reservoir is used as liquid source, said reservoir may be filled with water only, a cleaning composition, a composition comprising benefit agents.

[0049] The liquid reservoir may be placed above the level of use of the cleaning device, such as to provide pressure, or may be pressured separately. When pressured separately, it is especially preferred that the reservoir is pressurised with compressed air from the compressed air source.

Drying

[0050] The device according to the invention may further provide the possibility to dry the hands after cleaning/treating.

[0051] This may be done by blowing only air, preferably heated air, through the air nozzles; and stop the water flow to the water nozzles. Alternatively a separate array of nozzles for the drying into the same washing and drying chamber is also contemplated.

[0052] It is preferred that the air velocity is at least 10 m/s, more preferably at least 20 m/s, still more preferably at least 30 m/s, while the air velocity is typically less than 200 m/s, more preferably less than 150 m/s, or even less than 100 m/s.

[0053] It is preferred that the airflow is at least 10 L/s, preferably at least 20 L/s, still more preferably at least 30 L/s, or even at least 50 L/s, while the flow is typically less than 1000 L/s, or more preferably less than 800 L/s, still more preferably less than 500 L/s, still more preferably less than 300 L/s, or even less than 100 L/s.

[0054] It is preferred that the temperature of the air for drying in s at least 30°C. more preferably at least 40°C, or even more than 50°, but typically less than 100°C, more preferably less than 90°C, still more preferably less than 80°, or even less than 70°C.

[0055] The air may be blown from any direction, but preferably from the top to the bottom.

Treatment compositions

[0056] Different kinds of treatment compositions are envisaged within the scope of this invention.

[0057] The device according to the invention may apply to the skin various skin care and cleansing products, including but not limited to hand soap, hand hygiene and fragrance compositions.

[0058] It is preferred that the contact time of the product with the skin before rinsing is at least 5 seconds, more preferably at least 10 seconds, still more preferably at least 15 seconds, or even at least 20 seconds.

[0059] It is preferred that the hand cleaning method according to the invention, is capable of cleaning a hand in less than 1 minute, preferably less than 45 seconds, or even less than 30 seconds.

[0060] The pH of the compositions is preferably neutral or mildly acidic, more preferably between pH 2 and 9, still more preferably at least pH 3, while more preferably less than pH 8, still more preferably less than pH 7, or even less than pH 6.

Hand cleansing

[0061] Hand cleansing compositions and/or sanitisation products typically comprise surfactants, preferably anionic surfactants, such as SLS and SLES, soluble soaps and/or non-ionic surfactants such as alcohol ethoxylates. The concentration of the surfactants is typically 0.2-5 g/L, preferably 1-3 g/L.

Hand sanitisation

[0062] The device is also suitable for spraying a hand sanitisation agent onto the hand. The sanitisation agent may be incorporated in the cleansing composition, or may be applied instead of washing, or after washing. Common sanitisation agents include lower alcohols and quaternary ammonium biocides, as commonly understood by the skilled person.

Operation

[0063] While using the device, the air-water jet may be used continuously, or discontinuously. One way of operation that is considered is to use the air-water jet during part of the operation. In another embodiment, the air-water jet is used in the first part of the cleaning process for cleaning and run with only the liquid flow or the liquid flow and low air flow to deposit a benefit agent to the hand, such as a hand cream or lotion.

[0064] In another embodiment the air-water jet is operated in a pulsed mode i.e. the air flow is controlled in an on-off fashion over time. In yet another embodiment the handheld device is fitted with a push button to switch the air-water jet on or off while cleansing and treatment skin (also including hair, scalp and other keratinous surfaces are defined herein above).

[0065] In any of the discontinuous operations, it is preferred to open and shut the air and/or liquid lines with a suitable solenoid valve.

[0066] A valve system may also be used to open the liquid and/or air lines when the device is in operation, while shutting the liquid and/or air lines when the device is not in use.

[0067] The invention will now be illustrated with reference to the following non-limiting figures and examples. The embodiments and examples are by way of illustration only and do not limit the scope of invention in any manner.

[0068] Accordingly, the invention provides a process for cleansing a hand with an air-water jet nozzle assembly comprising two nozzles wherein a first nozzle is in fluid communication with a feed liquid source; and a second nozzle connected to a source of compressed air; and comprising the steps of spraying a fine mist of detergent composition onto the hand, rinsing the hand by spraying a fine mist of water onto it, drying the hand by blowing air onto the hand.

[0069] Preferably, the process is preceded by the step of spraying a fine mist of water onto the hand for wetting.

[0070] The most preferred temperature of the air for reasons of skin comfort is 30°-70°C.

[0071] The ratio of air to water from the nozzle assembly is typically between 90:10 and 99.9:0.1

Detailed Description of the Drawings

[0072]

Figure 1 shows a configuration wherein, the nozzle (N) has the outlet port for liquid (OPW) positioned away from the substrate relative to the outlet port for air (OPA), offset by a distance (OS). The angle of incidence of the outlet port for liquid with respect to the substrate (FS) is defined by the angle. The angle of incidence of the outlet port for air with respect to the substrate (FS) is defined by the angle. The dashed line NOR represents an imaginary line which is normal to the surface of the substrate. As is apparent, in this embodiment of the nozzle the angle is greater than the angle The air exits from the nozzle through outlet port for air (OPA) and the liquid exits through the outlet port for liquid (OPW).

Figure 2 shows a configuration with 1 air nozzle and 1 water nozzle.

Examples

[0073] The invention will now be demonstrated by means of the following non-limiting examples.

Example 1: Hand cleansing

[0074] In this example the cleansing of hands by means of the device according to the present invention is compared to regular hand cleansing with the same cleaning formulation.

Pre-treatment

[0075] Prior to the test, the hands of the example and the comparative example were decontaminated with 70% alcohol to remove the normal flora from the hands, and were allowed to dry and were washed with sterile distilled water to remove traces of alcohol.

[0076] Then 100 microlitres containing of 10^7 cells of non pathogenic strain of *E.coli* (in the 100 microlitre) was applied onto each hand and the volunteers were asked to spread the culture across the palms and fingers.

[0077] One hand (example 1) was washed with 10 ml of 3 g/L of an ethoxylated alcohol non-ionic surfactant ($C_{<12>}EO_{<7>}$, non-ionic surfactant) for 15 seconds and the other hand (Comparative example A) was washed with the same amount of the same surfactant using the air-water jet device according to the invention for 15 seconds.

[0078] The air-water jet in the example comprised two nozzle assemblies; and the air pressure for the air-water jet device was 4 bar with a liquid flow rate of 20 ml/min per nozzle assembly.

[0079] The handwashing according to the invention was carried out in an air-tight chamber for safety purposes.

[0080] The remaining bacteria on the hands were measure in a conventional method.

Results

[0081] The washing results in terms of residual colonies (expressed as CFU/hand) are given in the table below.

Results

	Example 1	Comp A
Applied log CFU/hand	7	7
Residual log CFU/hand	4.2	3.6

[0082] It becomes clear from table above that the washing process with the air-water jet device removes about 0.6 log more of the *E.coli* than the conventional washing method.

Claims

1. A device for washing hands comprising a chamber comprising:

i An opening for inserting at least one hand,
ii At least one of a air-water jet nozzle assembly, comprising two nozzles wherein a first nozzle (PW) is in fluid communication with a feed liquid source; and a second nozzle (PA) connected to a source of compressed air;

characterized in that the first nozzle is at an angle (α) of between 1 and 60° relative to the central axis; and the second nozzle is at an angle (φ) of between 1 and 45° relative to the central axis (NOR); and
wherein the air nozzle does not co-axially surround the water passage; and
wherein the mouth of the second nozzle (OPA) is positioned more forward in the direction of the flow along the direction of the central axis than the mouth of the first nozzle (OPW), wherein the offset distance (OS) between the mouth of the first nozzle and the second nozzle is between 0.5 and 5 mm in said direction.

2. A device according to anyone of claims 1, wherein:

a the mouth of the first nozzle of the device has an opening of 0.2 - 3.5 mm^2;

b the mouth of the first nozzle of the device is less than 1 mm away from the wall of the second nozzle.

3. A device according to any one of the preceding claims, wherein the device is connected to a separate unit comprising a compressor and a reservoir for holding the liquid, the compressor being the source of the compressed air and the reservoir holding the liquid being the liquid source.

4. A process for cleansing a hand with an air-water jet nozzle assembly comprising two nozzles wherein a first nozzle is in fluid communication with a feed liquid source; and a second nozzle connected to a source of compressed air **characterized in that** the first nozzle is at an angle (α) of between 1 and 60° relative to the central axis; and the second nozzle is at an angle (φ) of between 1 and 45° relative to the central axis (NOR); and wherein the air nozzle does not coaxially surround the water passage; and wherein the mouth of the second nozzle (OPA) is positioned more forward in the direction of the flow along the direction of the central axis than the mouth of the first nozzle (OPW), wherein the offset distance (OS) between the mouth of the first nozzle and the second nozzle is between 0.5 and 5 mm in said direction; and comprising the steps of:

a Spraying a fine mist of detergent composition onto the hand;
b Rinsing the hand by spraying a fine mist of water onto it;
c Drying the hand by blowing air onto the hand.

5. A process according to claim 4, wherein said process is preceded by the step of spraying a fine mist of water onto the hand for wetting.

6. A process according to anyone of claims 4 or 5, wherein the air is heated to 30°-70°C.

7. A process according to anyone of claims 4 to 6, wherein the ratio of air to water from the nozzle assembly is between 90:10 and 99.9:0.1

Patentansprüche

1. Vorrichtung zum Waschen der Hände, die eine Kammer umfasst, umfassend

i eine Öffnung zum Einführen wenigstens einer Hand,
ii wenigstens eine Luft-Wasser-Sprühdüsenanordnung, die zwei Düsen umfasst, wobei eine erste Düse (PW) mit einer Flüssigkeitszufuhrquelle in Fluidkommunikation ist; und wobei eine zweite Düse (PA) mit einer Druckluftquelle verbunden ist;

dadurch gekennzeichnet, dass
die erste Düse in einem Winkel (α) zwischen 1° und 60° in Bezug auf die Mittelachse angeordnet ist; und dass die zweite Düse in einem Winkel (φ) zwischen 1° und 45° in Bezug auf die Mittelachse (NOR) angeordnet ist; und
wobei die Luftdüse den Wasserdurchlass nicht koaxial umgibt; und wobei die Mündung der zweiten Düse (OPA) in Richtung der Strömung entlang der Richtung der Mittelachse weiter vorn als die Mündung der ersten Düse (OPW) positioniert ist, wobei der versetzte Abstand (OS) zwischen der Mündung der ersten Düse und der zweiten Düse zwischen 0,5 und 5 mm in dieser Richtung beträgt.

2. Vorrichtung nach Anspruch 1, wobei:

a die Mündung der ersten Düse der Vorrichtung eine Öffnung von 0,2 - 3,5 mm2 aufweist;
b die Mündung der ersten Düse der Vorrichtung weniger als 1 mm von der Wand der zweiten Düse entfernt ist.

3. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Vorrichtung mit einer getrennten Einheit verbunden ist, die einen Kompressor und einen Behälter zum Enthalten der Flüssigkeit umfasst, wobei der Kompressor die Druckluftquelle ist und wobei der Behälter, der die Flüssigkeit enthält, die Flüssigkeitsquelle ist.

4. Verfahren zum Reinigen einer Hand mit einer Luft-Wasser-Sprühdüsenanordnung, die zwei Düsen umfasst, wobei eine erste Düse mit einer Flüssigkeitszufuhrquelle in Fluidkommunikation ist; und wobei eine zweite Düse mit einer Druckluftquelle verbunden ist, **dadurch gekennzeichnet, dass** die erste Düse in einem Winkel (α) zwischen 1° und 60° in Bezug auf die Mittelachse angeordnet ist; und dass die zweite Düse in einem Winkel (φ) zwischen 1° und 45° in Bezug auf die Mittelachse (NOR) angeordnet ist; und wobei die Luftdüse den Wasserdurchlass nicht koaxial umgibt; und wobei die Mündung der zweiten Düse (OPA) in Richtung der Strömung entlang der Richtung der Mittelachse weiter vorn als die Mündung der ersten Düse (OPW) angeordnet ist, wobei der versetzte Abstand (OS) zwischen der Mündung der ersten Düse und der zweiten Düse zwischen 0,5 und 5 mm in dieser Richtung beträgt; und das die folgenden Schritte umfasst:

a Sprühen eines feinen Nebels einer Reinigungsmittelzusammensetzung auf die Hand;
b Spülen der Hand durch Aufsprühen eines feinen Nebels aus Wasser;

c Trocknen der Hand durch Blasen von Luft auf die Hand.

5. Verfahren nach Anspruch 4, wobei dem Verfahren der Schritt des Sprühens eines feinen Nebels aus Wasser auf die Hand zum Befeuchten vorausgeht.

6. Verfahren nach einem der Ansprüche 4 oder 5, wobei die Luft auf 30-70 °C erwärmt ist.

7. Verfahren nach einem der Ansprüche 4 bis 6, wobei das Verhältnis von Luft zu Wasser von der Düsenanordnung zwischen 90:10 und 99,9:0,1 liegt.

Revendications

1. Dispositif pour le lavage de mains comprenant une chambre comprenant :

i une ouverture pour l'insertion d'au moins une main,
ii au moins un d'un assemblage de buses de jet d'air-eau, comprenant deux buses dans lequel une première buse (PW) est en communication fluide avec une source de liquide d'alimentation ; et une seconde buse (PA) connectée à une source d'air comprimé ;

caractérisé en ce que la première buse se trouve à un angle (α) de 1 à 60° par rapport à l'axe central ; et la seconde buse se trouve à un angle (φ) de 1 à 45° par rapport à l'axe central (NOR) ; et
dans lequel la buse d'air n'entoure pas co-axialement le passage d'eau ; et
dans lequel l'embouchure de la seconde buse (OPA) est disposée plus en avant dans la direction de l'écoulement le long de la direction de l'axe central que l'embouchure de la première buse (OPW), dans lequel la distance de décalage (OS) entre l'embouchure de la première buse et de la seconde buse est de 0,5 à 5 mm dans ladite direction.

2. Dispositif selon la revendication 1, dans lequel :

a l'embouchure de la première buse du dispositif présente une ouverture de 0,2 - 3,5 mm^2 ;
b l'embouchure de la première buse du dispositif est à moins de 1 mm de la paroi de la seconde buse.

3. Dispositif selon l'une quelconque des revendications précédentes, dans lequel le dispositif est connecté à une unité séparée comprenant un compresseur et un réservoir pour contenir le liquide, le compresseur étant la source de l'air comprimé et le réservoir contenant le liquide étant la source de liquide.

4. Procédé pour le nettoyage d'une main avec un assemblage de buses de jet d'air-eau comprenant deux buses dans lequel une première buse est en communication fluide avec une source liquide d'alimentation ; et une seconde buse connectée à une source d'air comprimé, **caractérisé en ce que** la première buse se trouve à un angle (α) de 1 à 60° par rapport à l'axe central ; et la seconde buse se trouve à un angle (φ) de 1 à 45° par rapport à l'axe central (NOR) ; et dans lequel la buse d'air n'entoure pas co-axialement le passage d'eau ; et dans lequel l'embouchure de la seconde buse (OPA) est disposée plus en avant dans la direction de l'écoulement le long de la direction de l'axe central que l'embouchure de la première buse (OPW), dans lequel la distance de décalage (OS) entre l'embouchure de la première buse et de la seconde buse est de 0,5 à 5 mm dans ladite direction ; et comprenant les étapes de :

a pulvérisation d'un fine brume de composition de détergent sur la main ;
b rinçage de la main par pulvérisation d'une fine brume d'eau sur celle-ci ;
c séchage de la main par soufflage d'air sur la main.

5. Procédé selon la revendication 4, dans lequel ledit procédé est précédé par l'étape de pulvérisation d'une fine brume d'eau sur la main pour un mouillage.

6. Procédé selon l'une quelconque des revendications 4 ou 5, dans lequel l'air est chauffé à 30°-70°C.

7. Procédé selon l'une quelconque des revendications 4 à 6, dans lequel le rapport air à eau de l'assemblage de buses est de 90:10 à 99,9:0,1.

FIGURE 1

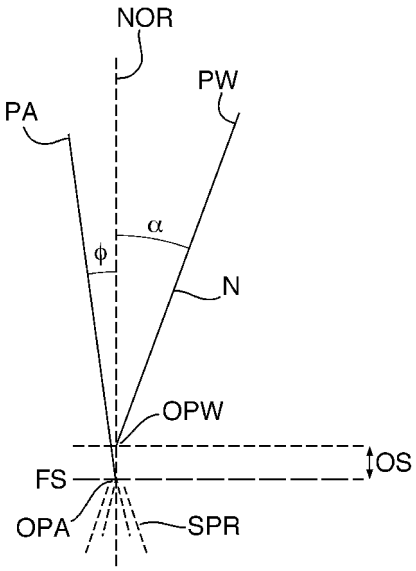
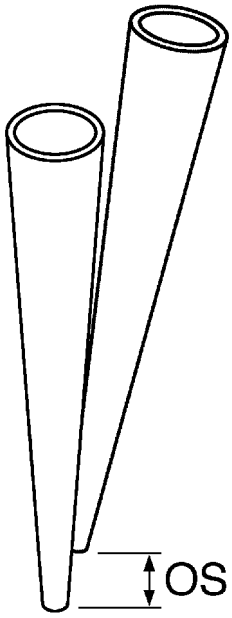


FIGURE 2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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