

DESCRIPTION

HAND DRYING APPARATUS

5 TECHNICAL FIELD

[0001] The present invention relates to a hand drying apparatus for drying wet hands, which become due to washing, with wind.

BACKGROUND ART

10 [0002] When drying hands with a conventional hand drying apparatus, a user must move, with his hands wet, from a washstand to the hand drying apparatus. While moving to the hand drying apparatus, water may drip from the hands and wet the floor. To avoid this, one approach is to
15 install the hand drying apparatus on or above the washstand, or beside the washstand (for example, see Patent document 1).

[0003] Patent document 1: Japanese Patent Application laid-open No. H6-319658

20 DISCLOSURE OF INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] In the above conventional technology, the hand drying apparatus is installed at an upper-side position of the washstand. However, no one had thought about usage of
25 the hand drying apparatus in a situation where water or the like is filled in a wash bowl. If the washbowl is filled with water, a high-speed airflow from a nozzle hits the water in the washbowl directly or via a water receiving unit arranged at a lower position of the hand drying
30 apparatus, so that the high-speed airflow from the nozzle disadvantageously causes the water inside the washbowl to be splashed around. The splashed water makes the washstand or a washstand mirror near the washstand dirty, which may

give users an unpleasant feeling.

[0005] Moreover, the above conventional technology employs a plane-shaped water receiving unit. Therefore, the high-speed airflow causes water drops that have been
5 blown off the hands to scatter sideward or backward, and the scattered water drops make the washstand dirty.

[0006] The present invention has been achieved to solve the above problems in the conventional technology and it is an object of the present invention to provide a hand drying
10 apparatus that prevents scattering of water or the like and does not give users an unpleasant feeling even if the hand drying apparatus is installed on or above a washstand and used in a situation where water or the like is filled in a washbowl.

15 MEANS FOR SOLVING PROBLEM

[0007] To achieve the above objects, according to the present invention there is provided an hand drying apparatus that is configured to be installed near a side of a washbowl of a washstand includes a main body; a high-
20 pressure airflow generator that takes air from outside to inside of the main body; and a nozzle that discharges air from the high-pressure airflow generator as a high-speed airflow, the nozzle being arranged at an upper portion of the main body. The hand drying apparatus includes a water
25 receiving unit that includes a tilt portion that extends from a side face of the main body, the side face being a side where the nozzle is attached to the washbowl. The water receiving unit guides water drops that are on the water receiving unit to the washbowl, and the water
30 receiving unit includes a water-scattering prevention/drainage member that prevents scattering of water inside the washbowl by the high-speed airflow discharged from the nozzle and passed along the water

receiving unit.

EFFECT OF THE INVENTION

[0008] According to the present invention, it is possible to obtain an effect of preventing scattering of water or the like toward surroundings to avoid an annoying situations to users even if the hand drying apparatus is installed on an upper-side position of a washstand and used in a situation that water is filled in a washbowl. Moreover, it is possible to prevent water drops that have been blown off the hands from dripping down onto the washstand or the floor, and exclude necessity of drain processing related to the water receiving unit, which enhances maintenance efficiency.

BRIEF DESCRIPTION OF DRAWINGS

15 [0009] [Fig. 1] Fig. 1 is an internal cross-sectional view for explaining the structure of a hand drying apparatus according to the present invention.

[Fig. 2] Fig. 2 is a schematic diagram of the hand drying apparatus that is installed on or above a washstand.

20 [Fig. 3] Fig. 3 is a perspective view of an example of the structure of a water receiving unit according to a first embodiment of the present invention.

[Fig. 4] Fig. 4 is a side view of an example of a shape of the water receiving unit.

25 [Fig. 5] Fig. 5 is a side view of another example of the shape of the water receiving unit.

[Fig. 6] Fig. 6 is a perspective view for schematically explaining the structure of a water receiving unit according to a second embodiment of the present invention.

30 [Fig. 7] Fig. 7 is an exemplary lateral cross-sectional view of the structure shown in Fig. 6.

[Fig. 8] Fig. 8 is another exemplary lateral cross-

sectional view of the structure shown in Fig. 6.

[Fig. 9] Fig. 9 is a schematic diagram of a hand drying apparatus according to a third embodiment of the present invention that is installed on or above the washstand.

EXPLANATIONS OF LETTERS OR NUMERALS

	[0010]	1	hand insertion space
		2	casing (main body)
		3	high-pressure airflow generator
10		3a	motor
		3b	turbofan
		4	heater
		5	exhaust duct
		6	intake duct
15		7	nozzle
		7a	flow-out port
		8	air filter
		9	air inlet
		11	water receiving unit
20		11a	casing attaching portion
		11b	tilt portion
		11c	horizontal bottom-end portion
		11d	side-wall portion
		11e	wind-shield wall
25		11f	wind-shield wall opening
		11g	hinge portion
		12	washbowl
		13	washstand
		14	drain
30		15	step

BEST MODE(S) FOR CARRYING OUT THE INVENTION

[0011] Exemplary embodiments of the hand drying

apparatus according to the present invention are described in detail below with reference to the accompanying drawings. The present invention is not limited to these embodiments.

[0012]

5 First embodiment.

Fig. 1 is an internal cross-sectional view for explaining the structure of a hand drying apparatus according to the present invention; Fig. 2 is a schematic diagram of the hand drying apparatus that is installed on or above a washstand; and Fig. 3 is a perspective view of an example of the structure of a water receiving unit according to a first embodiment of the present invention. A longitudinal cross-sectional view of the washstand and the washbowl is shown in Fig. 2 for deeper understanding.

15 [0013] The hand drying apparatus includes a high-pressure airflow generator 3 that generates a high-pressured air inside a casing 2. The high-pressure airflow generator 3 includes a motor 3a and a turbofan 3b that is driven to be rotated by the motor 3a. In the example shown in Fig. 1, the high-pressure airflow generator 3 is arranged so that a rotation axis of the turbofan 3b is parallel to the horizontal line. Air is taken in from an air-intake-side of the turbofan 3b, and the air flows toward the motor 3a because of the rotation of the turbofan 3b.

25 [0014] A part of the casing 2 on the side of the turbofan 3b of the high-pressure airflow generator 3 is provided with an air inlet 9, and the air inlet 9 is provided with an air filter 8 for preventing invasion of dusts inside the casing 2. A HEPA (High Efficiency Particulate Air) filter or a sterilization filter can be used as the air filter 8. Alternatively, a plurality of HEPA filters or sterilization filters can be arranged

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downstream of the air filter 8. An intake duct 6 is formed from the air inlet 9 to the air-intake side of the high-pressure airflow generator 3 so that the intake air can flow from the air inlet 9 to the high-pressure airflow generator 3. The casing 2 corresponds to a main body described in claims.

[0015] A nozzle 7 is provided in the casing 2 at a location that is above the high-pressure airflow generator 3. The nozzle 7 has a flow-out port 7a that points

downward. The high-pressure airflow is discharged out of the casing 2 from the nozzle 7. An exhaust duct 5 for guiding the high-pressure airflow from the side of the motor 3a of the high-pressure airflow generator 3 to the nozzle 7 is provided at an upper portion of the casing 2.

A heater 4 for heating the high-pressure airflow generated by the high-pressure airflow generator 3 is provided inside the exhaust duct 5.

[0016] Moreover, although not shown, a sensor is arranged inside the nozzle 7 to sense approach of hands toward the hand drying apparatus. When it is sensed by the sensor that hands are present in a predetermined range from the nozzle 7 of the hand drying apparatus, the high-pressure airflow generator 3 is driven.

[0017] The hand drying apparatus having such a configuration is installed near a side of a washbowl 12 of a washstand 13. In the example shown in Fig. 2, the hand drying apparatus is installed such that the hand drying apparatus is on the right of a user as compared to the washbowl 12. A water receiving unit 11 is fixed to a side face of the casing 2 (i.e., side face to which the nozzle 7 is attached). The water receiving unit 11 is machined so that its bottom portion is positioned at a location below an upper plane of the washbowl 12. The water receiving

unit 11 includes a casing attaching portion 11a for fixing to the casing 2, a tilt portion 11b sloping from the casing attaching portion 11a toward the washbowl 12, and a horizontal bottom-end portion 11c stretching from a bottom end of the tilt portion 11b in a substantially horizontal direction. Moreover, the water receiving unit 11 includes a side-wall portion 11d provided at portions of the casing attaching portion 11a, the tilt portion 11b, and the horizontal bottom-end portion 11c located rear-side of the washstand 13. The horizontal bottom-end portion 11c (or a portion of the horizontal bottom-end portion 11c located front-side of the washstand 13) is positioned at the lowest position in the water receiving unit 11. A high-speed airflow flow-out axis of the nozzle 7 protrudes toward the washbowl 12 such that the high-speed airflow flow-out axis of the nozzle 7 falls on the water receiving unit 11. The horizontal bottom-end portion 11c corresponds to a water-scattering prevention/drainage member described in claims.

[0018] Scattering of water drops that have been blown off the hands toward the washstand 13 or the washstand mirror near the washstand 13 is prevented by attaching the water receiving unit 11 to the hand drying apparatus installed near a side of the washbowl 12. Moreover, scattering of water in the washbowl 12 toward the washstand 13 or the floor is prevented even when the hand drying apparatus operates in a situation where water is filled in the washbowl 12; because, the high-speed airflow flow-out axis of the nozzle 7 falls on the water receiving unit 11.

[0019] In the hand drying apparatus installed on or above the washstand 13, a space surrounded by a bottom portion of the nozzle 7, the water receiving unit 11, and the side face of the casing 2 to which the water receiving unit 11 is attached functions as a hand insertion space 1.

Viewed from the nozzle 7 of the hand drying apparatus as front, it is preferable that both sides of the hand insertion space 1 are open, and an entrance width, a height, and a depth of the hand insertion space 1 are large enough
5 for a user to see the hands in an insertion position without a feeling of wrongness or restless and to freely insert or remove the hands.

[0020] When a user after hand washing his hands places his hands at a position in the hand insertion space 1 near
10 an end portion of the nozzle 7, a not-shown sensor that is arranged inside of the nozzle 7 senses the hands, and the high-pressure airflow generator 3 is driven. That is, when the turbofan 3b rotates in accordance with rotation of the motor 3a, air from which dusts are removed using the air
15 filter 8 enters the hand drying apparatus via the air inlet 9 and flows to the high-pressure airflow generator 3 through the intake duct 6. Thus, the air is taken inside the high-pressure airflow generator 3. The intake air is pressurized by the high-pressure airflow generator 3, and
20 heated by the heater 4 provided inside the exhaust duct 5. The heated air flows to the nozzle 7 through the exhaust duct 5 and is accelerated by the nozzle 7. The high-speed airflow flows downward to the hand insertion space 1 outside of the casing 2. At this time, the high-pressure
25 airflow generator 3 generates the high-speed airflow flowing into the hand insertion space 1 as a dryer airflow enough to blow water off. Thus, water is removed from user's hands.

[0021] The water removed from user's hands falls in the
30 water receiving unit 11 (at a side) of the hand insertion space 1, more particularly, the casing attaching portion 11a, the tilt portion 11b, the horizontal bottom-end portion 11c, and the side-wall portion 11d provide at parts

of those portions rear-side of the washstand 13. The collected water flows down along the water receiving unit 11 by gravity. Because the horizontal bottom-end portion 11c is located at the lowest position, water drops on the casing attaching portion 11a, the tilt portion 11b, or the side-wall portion 11d flow to the horizontal bottom-end portion 11c by gravity. The water drops further flows from the horizontal bottom-end portion 11c of the water receiving unit 11 into the washbowl 12, and drains off through a drain 14 of the washbowl 12.

[0022] The high-speed airflow discharged from the nozzle 7 flows along the water receiving unit 11 and then goes in the substantial horizontal direction away from the horizontal bottom-end portion 11c because the horizontal bottom-end portion 11c of the water receiving unit 11 stretches in the substantial horizontal direction. In this manner, it is possible to prevent a situation that the high-speed airflow directly hits, for example, water filled in the washbowl 12. Moreover, because the high-speed airflow flow-out axis of the nozzle 7 falls on the water receiving unit 11, the high-speed airflow flows down along the water receiving unit 11, and water drops removed from hands to the water receiving unit 11 flows down into the washbowl 12 without remaining on the water receiving unit 11.

[0023] Fig. 4 is a side view of an example of a shape of the water receiving unit; and Fig. 5 is a side view of another example of the shape of the water receiving unit. In the example shown in Fig. 4, the horizontal bottom-end portion 11c of the water receiving unit 11 is positioned at substantially the same level as that of an upper plane of the washbowl 12, and its starting position (boundary with the tilt portion 11b) is substantially overlapped with an

upper marginal portion of the washbowl 12. That is, the water receiving unit 11 is formed in such a manner that the tilt portion 11b covers a space between the casing 2 and the upper marginal portion of the washbowl 12.

5 [0024] In the example shown in Fig. 5, a bottom end of the tilt portion 11b of the water receiving unit 11 is positioned below the upper plane of the washbowl 12.

Therefore, the horizontal bottom-end portion 11c is also positioned lower than the upper plane of the washbowl 12.

10 In addition, in the example shown in Fig. 5, a tilt angle of the tilt portion 11b with respect to the horizontal plane is smaller than a tilt angle of the tilt portion 11b in the example shown in Fig. 4, and a length of the horizontal bottom-end portion 11c (length in a left-and-
15 right direction in the drawings) is shorter than a length of the horizontal bottom-end portion 11c in the case of Fig. 4.

[0025] In those examples shown in Figs. 4 and 5, a portion of the water receiving unit 11 overlapped with the
20 washbowl 12 is positioned 100 mm or farther away from the end of the nozzle 7, so that a speed of the high-speed airflow on the upper plane of the washbowl 12 is reduced to 20 m/s or lower. Accordingly, scattering of water or the like toward surroundings or the user is prevented even when
25 the hand drying apparatus operates in a situation where water or the like is filled in the washbowl 12.

[0026] In the hand drying apparatus installed near a side of the washbowl 12 according to the first embodiment, the water receiving unit 11 is provided that extends from
30 the casing 2 of the hand drying apparatus to the washbowl 12. With this configuration, when a user after hand washing dries the hands with the hand drying apparatus, it is possible to accumulate the water drops with the water

receiving unit 11 and then cause the water drops to flow down into the washbowl 12. Thus, the water drops flow down into the washbowl 12 naturally without scattering toward the surroundings of the hand drying apparatus including the washstand mirror, the washstand 13, or the floor.

Therefore, it is unnecessary to prepare special drainage processing for the water receiving unit 11. Moreover, the high-speed airflow discharged from the hand drying apparatus, after hitting the water receiving unit 11, turns in the horizontal direction at the horizontal bottom-end portion 11c. This brings an effect of preventing scattering of water in the washbowl 12 due to the high-speed airflow discharged from the hand drying apparatus when water is filled in the washbowl 12.

[0027]

Second embodiment.

Fig. 6 is a perspective view for schematically explaining the structure of a water receiving unit according to a second embodiment of the present invention; and Fig. 7 is an exemplary lateral cross-sectional view of the structure shown in Fig. 6. The water receiving unit 11 includes the casing attaching portion 11a attached to the casing 2, the tilt portion 11b arranged from the casing 2 to the washbowl 12, the side-wall portion 11d provided on both side-end portions of the casing attaching portion 11a and the tilt portion 11b, and a wind-shield wall 11e provided at the bottom end of the tilt portion 11b to receive wind from the hand drying apparatus. The wind-shield wall 11e is provided with a wind-shield wall opening 11f through which water drops flow from the tilt portion 11b or the side-wall portion 11d to the washbowl 12. The wind-shield wall opening 11f is formed so that sizes of its cross section (size of the opening) viewed from the high-

speed air flow-in side (inlet) and the high-speed air flow-out side (outlet) agree with each other. The wind-shield wall 11e and the wind-shield wall opening 11f correspond to the water-scattering prevention/draining member described in claims.

[0028] With the wind-shield wall 11e having such structure, when the high-speed airflow discharged from the nozzle 7 of the hand drying apparatus hits the wind-shield wall 11e, most of the high-speed airflow is blocked and a part of the high-speed airflow flows out through the wind-shield wall opening 11f, but its wind speed is slower than a speed of the high-speed airflow at the nozzle 7. Water drops received by the water receiving unit 11 can flow down to the washbowl 12 through the wind-shield wall opening 11f. Because the structure of the hand drying apparatus is similar to the structure in the first embodiment, an explanation about it is omitted.

[0029] The shapes of the wind-shield wall 11e and the wind-shield wall opening 11f are not limited to those shown in Fig. 6 or 7. In other words, the wind-shield wall 11e and the wind-shield wall opening 11f can have any shape until a wind-shield wall can guide water drops that have been blown off the hands into the washbowl 12 and prevent a situation that the high-speed airflow flows discharged from the nozzle 7 of the hand drying apparatus flows into the washbowl 12 at the high speed.

[0030] Fig. 8 is another exemplary lateral cross-sectional view of the cross-section structure shown in Fig. 6. As shown in Fig. 8, the wind-shield wall opening 11f is formed so that a size of its cross section (size of the opening) viewed from the high-speed air flow-in side (inlet) is smaller than a size of its cross section viewed from the high-speed air flow-out side (outlet). In this

manner, the wind speed at the high-speed air flow-out side (outlet) becomes slower than the wind speed at the high-speed air flow-in side (inlet). The wind speed at the high-speed air flow-out side (outlet) is reduced as compared with the example shown in Fig. 7.

[0031] The water receiving unit 11 in the second embodiment is provided with the wind-shield wall 11e at the bottom thereof and the wind-shield wall opening 11f for guiding water drops attached thereto into the washbowl 12.

10 With such a configuration, it is possible to obtain an effect of preventing a situation that the high-speed airflow discharged from the nozzle 7 of the hand drying apparatus flows to the washbowl 12 at a high speed, and draining water drops dripped down from the hands flow to the washbowl 12 through the wind-shield wall opening 11f.

[0032]

Third embodiment.

Fig. 9 is a schematic diagram of a hand drying apparatus according to a third embodiment of the present invention that is installed on or above the washstand. As shown in Fig. 9, the water receiving unit 11 that is provided between the hand drying apparatus and the washbowl 12 is configured to include a hinge portion 11g between the casing attaching portion 11a and the tilt portion 11b.

25 That is, the tilt portion 11b is rotatable around a shaft extending in the hinge portion 11g that extends in a direction vertical to the sheet with respect to the casing attaching portion 11a. The other structure is similar to the structure in the first embodiment, and therefore an explanation about the other structure is omitted.

[0033] The hinge portion 11g of the water receiving unit 11 allows adjusting an angle between the tilt portion 11b and the horizontal bottom-end portion 11c to fit along a

shape of the washstand 13 and the washbowl 12. For example, if there is a step 15 right of the washstand 13, an area of a lower side of the step 15 is not large enough for installing the hand drying apparatus while an area of a higher side of the step 15 is large enough for installing the hand drying apparatus. If the tilt portion 11b of the water receiving unit 11 is movable, it is possible to arrange the tilt portion 11b at an arbitrary position (angle) depending on the step 15. It is possible to fold down the water receiving unit 11 during cleaning of the washstand 13.

[0034] The tilt portion 11b of the water receiving unit 11 in the third embodiment is configured to be movable with respect to the casing attaching portion 11a, which makes it possible to arrange the water receiving unit 11 at a proper position regardless of an installation position of the hand drying apparatus. Moreover, because the water receiving unit 11 is foldable, it is possible to clean the dirty washstand 13 without detaching the water receiving unit 11.

[0035] Although the explanations described in the first embodiment to the third embodiment are made assuming that the hand drying apparatus is installed on or above the washstand 13, similar explanation will apply to a situation where the hand drying apparatus is installed on a wall adjacent to the washstand 13.

[0036] The water receiving unit 11 is configured to be easily detachable from the casing 2, which makes it possible to clean the water receiving unit 11 in the detached state to remove dirt caused by water drops that have blown off the hands. Moreover, the side-wall portion 11d is can be provided on either one side or both sides of the water receiving unit 11.

INDUSTRIAL APPLICABILITY

[0037] As set forth hereinabove, the hand drying apparatus according to the present invention is suitable for an add-on hand drying apparatus to be installed near a washstand or a washbowl of a rest room in an office building, a hotel, a family restaurant, amusement equipment, a general supermarket, a food/medical/cosmetic/other general factory, a school, or public facilities.

CLAIMS

1. A hand drying apparatus that is configured to be installed near a side of a washbowl of a washstand and that includes
- 5 a main body;
- a high-pressure airflow generator that takes air from outside to inside of the main body; and
- a nozzle that discharges air from the high-pressure airflow generator as a high-speed airflow, the nozzle being
- 10 arranged at an upper portion of the main body, the hand drying apparatus comprising:
- a water receiving unit that includes a tilt portion that extends from a side face of the main body, the side face being a side where the nozzle is attached to the
- 15 washbowl, wherein
- the water receiving unit guides water drops that are on the water receiving unit to the washbowl, and
- the water receiving unit includes a water-scattering prevention/drainage member that prevents scattering of
- 20 water inside the washbowl by the high-speed airflow discharged from the nozzle and passed along the water receiving unit.
2. The hand drying apparatus according to claim 1, wherein
- 25 the nozzle is arranged in such a manner that an airflow axis of the nozzle extends toward inside of the washbowl, and
- the water receiving unit is arranged on an area including a position on which the airflow axis falls.
- 30 3. The hand drying apparatus according to claim 1, wherein the water receiving unit includes
- a main-body attaching portion attached to the main body;

the tilt portion sloping from a bottom end of the main-body attaching portion to the washbowl;

a horizontal bottom-end portion extending in a horizontal direction from a bottom end of the tilt portion;

5 and

a side-wall portion arranged at both-side ends or one-side end extending in a direction orthogonal to a vertical direction of the main-body attaching portion, the tilt portion and the horizontal bottom-end portion.

10 4. The hand drying apparatus according to claim 1, wherein the water receiving unit includes

a main-body attaching portion attached to the main body;

15 the tilt portion sloping from a bottom end of the main-body attaching portion to the washbowl;

a side-wall portion arranged at both-side ends or one-side end extending in a direction orthogonal to a vertical direction of the main-body attaching portion and the tilt portion;

20 a wind-shield wall arranged at a bottom-end side of the tilt portion to receive the high-speed airflow discharged from the nozzle; and

a wind-shield wall opening formed at a bottom portion of the wind-shield wall for flowing water drops from the main-body attaching portion, the tilt portion, and the side-wall portion to the washbowl.

25 5. The hand drying apparatus according to claim 4, wherein the wind-shield opening is formed in such a manner that a size of an opening viewed from a side from which the high-speed airflow from the nozzle enters is smaller than a size of the opening viewed from another side from which the high-speed airflow from the nozzle exits.

30 6. The hand drying apparatus according to claim 1,

wherein the tilt portion is rotatable, with respect to the main-body attaching portion, around a shaft parallel to a horizontal direction on the side face of the main body to which the water receiving unit is attached.

- 5 7. The hand drying apparatus according to claim 1, wherein the water receiving unit is detachable from the side face of the main body.