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(54) **ATOMIZING DEVICE**

ZERSTÄUBUNGSVORRICHTUNG

DISPOSITIF D'ATOMISATION

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Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates to an atomizing device for air humidification, particularly to an atomizing device for air humidification having an indirect spray unit.

2. DESCRIPTION OF THE PRIOR ART

[0002] A desktop air humidifier is usually used in a dry climate, atomizing the liquid of the humidifier into droplets to increase the humidity of the air. Generally speaking, the liquid should be atomized into droplets having a smaller diameter lest the air be over-humidified by larger droplets. In the conventional technology, a high-frequency oscillation plate undertakes high-frequency oscillations in a liquid to atomize the liquid. The heat generated by oscillation may overheat the machine and increase the risk of malfunction. If the liquid has additives, such as essences, flagrances, etc., heat may denature the additives.

US 2005/0011514 A1, DE 10 2013 002 596 B3, and US 2005/0224076 A1 disclose atomizing devices which are more suitable for delivering a medicament to the mouth of a patient than for humidifying ambient air.

[0003] Therefore, it is necessary for the manufacturers to provide an atomizing device for air humidification able to atomize liquid into droplets having a smaller diameter without generating too much heat.

SUMMARY OF THE INVENTION

[0004] The present invention provides an atomizing device for air humidification according to claim 1, which comprises a first liquid storage chamber having a liquid storage room to store the liquid to be atomized; a nozzle plate unit disposed on the liquid storage chamber and spraying the liquid into first atomized droplets; and an indirect spray unit disposed in a position where the first atomized droplets are sprayed out to receive the first atomized droplets. The indirect spray unit is a tapering channel-like structure having a droplet inlet and a droplet outlet. The droplet outlet is disposed on one side wall of the atomizing device. The droplet inlet faces the position where the nozzle plate unit sprays the first atomized droplets to receive the first atomized droplets to enter the indirect spray unit. The first atomized droplets undertake striking and rebounding in the tapering channel-like structure repeatedly to form second atomized droplets. The second atomized droplets are sprayed out from the droplet outlet of the indirect spray unit.

[0005] The opening of the droplet inlet is larger than the opening of the droplet outlet.

[0006] In one embodiment, the tapering channel-like structure has a first surface, a second surface and a pair of third surfaces. The first surface and the second surface are opposite to each other and connected by the pair of third surfaces to form the tapering channel-like structure.

[0007] In one embodiment, the first surface is tilted with respect to the second surface by a preset angle.

[0008] In one embodiment, the preset angle is within a range of 30-80 degrees.

[0009] In one embodiment, the diameter of the second atomized droplets is smaller than the diameter of the first atomized droplets.

[0010] In one embodiment, the first atomized droplets undertake striking and rebounding between the first surface and the second surface repeatedly to form the second atomized droplets.

[0011] In one embodiment, the atomizing device further comprises a second liquid storage chamber disposed in the periphery of the first liquid storage chamber and interconnected with the first liquid storage chamber by an interconnection unit.

[0012] In one embodiment, after entering the indirect spray unit, the first atomized droplets undertake striking and rebounding between at least two of the first surface, the second surface and the third surfaces to form third atomized droplets; the third atomized droplets are ejected from the droplet inlet.

[0013] In one embodiment, the third atomized droplets fall into the second liquid storage chamber and flow back to the first liquid storage chamber through the interconnection unit.

[0014] In one embodiment, the nozzle plate unit is detachably installed on the first liquid storage chamber.

[0015] In one embodiment, the nozzle plate unit includes a base and a nozzle plate structure. The nozzle plate structure is disposed on the base and has a plurality of electric-conduction contacts electrically connected with a plurality of external-connection contacts of the base.

[0016] Below, embodiments are described in detail with the attached drawings to make easily understood the objectives, technical contents, characteristics and accomplishments of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig.1 is a sectional view schematically showing an atomizing device according to one embodiment of the present invention;

Fig.2 is a diagram schematically showing the structure of a nozzle plate unit according to one embodiment of the present invention;

Fig.3 is a diagram schematically an indirect spray unit according to one embodiment of the present invention; and

Fig.4 is a diagram schematically showing the operation of an atomizing device according to one embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] The present invention will be described in detail with embodiments and attached drawings below. However, these embodiments are only to exemplify the present invention but not to limit the scope of the present invention. In addition to the embodiments described in the specification, the present invention also applies to other embodiments. Further, any modification, variation, or substitution, which can be easily made by the persons skilled in that art according to the embodiment of the present invention, is to be also included within the scope of the present invention, which is defined by the claims stated below. Although many special details are provided herein to make the readers more fully understand the present invention, the present invention as defined by the claims can still be practiced under a condition that these special details are partially or completely omitted. Besides, the elements or steps, which are well known by the persons skilled in the art, are not described herein lest the present invention be limited unnecessarily. Similar or identical elements are denoted with similar or identical symbols in the drawings. It should be noted: the drawings are only to depict the present invention schematically but not to show the real dimensions or quantities of the present invention. Besides, matterless details are not necessarily depicted in the drawings to achieve conciseness of the drawings.

[0019] Refer to Fig.1. The atomizing device 100 of the present invention comprises a first liquid storage chamber 101, a nozzle plate unit 20, and an indirect spray unit 30. The first liquid storage chamber 101 has a liquid storage room 10 storing a liquid 102 to be atomized, as shown in Fig.4. The nozzle plate unit 20 is disposed on one side wall of the liquid storage room 10 and used to spray the liquid 102 into first atomized droplets 201, as shown in Fig.4. Refer to Fig.2 a diagram schematically showing the structure of a nozzle plate unit according to one embodiment of the present invention. The nozzle plate unit 20 includes a base 21 and a nozzle plate structure 22. The nozzle plate 22 is disposed on the base 21 and has a plurality of electric-conduction contacts 23 electrically connected with a plurality of external-connection contacts 24 of the base 21. The nozzle plate unit 20 is detachably installed on a wall 50 of the first liquid storage chamber 101, whereby the user can easily replace the nozzle plate unit.

[0020] The indirect spray unit 30 is disposed in a position where the first atomized droplets 201 are sprayed out by the nozzle plate unit 20 to receive the first atomized droplets 201. Refer to Fig.3 and Fig.4 for the structure of the indirect spray unit 30. The indirect spray unit 30 is a tapering channel-like structure 300 having a droplet inlet 304 and a droplet outlet 305. The opening of the droplet inlet 304 is larger than the opening of the droplet outlet 305. The droplet outlet 305 is disposed on one side wall 40 of the atomizing device 100. The droplet inlet 304 faces the position where the nozzle plate unit 20 sprays the first atomized droplets 201. The tapering channel-structure 300 has a first surface 301, a second surface 302 and a pair of third surfaces 303. The first surface 301 and the second surface 302 are opposite to each other and connected by the pair of third surfaces 303 to form the tapering channel-like structure 300. In one embodiment, the first surface 301 is tilted with respect to the second surface 302 by a preset angle, preferably a preset angle within a range of 30-80 degrees. In the drawings of the specification, the tapering channel-like structure 300 is depicted to be a truncated pyramid exemplarily. The first surface 301 is tilted with respect to the second surface 302. In the indirect spray unit 30 having the abovementioned tapering channel-like structure 300, the droplet inlet 304 receives the first atomized droplets 201 sprayed by the nozzle plate unit 20 to enter the indirect spray unit 30. The first atomized droplets 201 undertake collisions in the tapering channel-like structure 300 repeatedly and decompose into droplets having further smaller diameters. The detail thereof will be described thereinafter.

[0021] Refer to Fig.4 for the operation of the atomizing device of the present invention. The first atomized droplets 201 of the liquid 102, which are sprayed by the nozzle plate unit 20, enter the indirect spray unit 30 via the droplet inlet 304 of the tapering channel-like structure 300. The first atomized droplets 201 strike against and rebound from at least two of the first surface 301, the second surface 302, and the pair of third surfaces 303 repeatedly to form the second atomized droplets 202. The second atomized droplets 202 are sprayed out from the droplet outlet 305. In one embodiment, the first atomized droplets 201 undertake repeated striking and rebounding between the first surface 301 and the second surface 302 of the tapering channel-like structure 300 to form the second atomized droplets 202. In the indirect spray unit 30, the first atomized droplets 201 undertake repeated striking and decompose into the second atomized droplets 202 having smaller diameters.

[0022] In one embodiment, after entering the indirect spray unit 30, the first atomized droplets 201 undertake repeated striking and rebounding between at least two of the first surface 301, the second surface 302 and the pair of third surfaces 303 to form third atomized droplets 203. The third atomized droplets 203 are ejected from the droplet inlet 304. In one embodiment, the atomizing device 100 further comprises a second liquid storage chamber 103 disposed in the periphery of the first liquid storage chamber 101 and interconnecting with the first liquid storage chamber 101 through an interconnection unit 104. While the first atomized droplets 201 strike the indirect spray unit 30 and generate the third atomized droplets 203 moving in a direction opposite the second atomized droplets 202, the third atomized droplets 203 fall into the second liquid storage chamber 103. Once the liquid accumulates to a given amount in the second liquid storage chamber 103, the liquid will flows through

the interconnection unit 104 back to the first liquid storage chamber 101. The liquid flow-back design can effectively recycle the liquid and achieve an environment protection function.

[0023] In conclusion, the present invention proposes an atomizing device having an indirect spray unit, wherein the first surface of the indirect spray unit is tilted with respect to the second surface by a preset angle, whereby the droplets that the nozzle plate unit sprays into the indirect spray unit undertake repeated striking and rebounding to form further smaller droplets, wherefore the present invention has an efficacy of further decreasing the size of droplets and achieves better spray quality. The present invention further has a recycling design: a portion of the droplets rebounding from the indirect spray unit are recycled and reused, whereby is achieved an environment protection effect.

Claims

1. An atomizing device for air humidification (100) comprising

a first liquid storage chamber (101) having a liquid storage room (10) storing a liquid (102) to be atomized;
a nozzle plate unit (20) disposed on said first liquid storage chamber (101) and spraying said liquid (102) into first atomized droplets (201); and
an indirect spray unit (30) being disposed at a position where said nozzle plate unit (20) sprays out said first atomized droplets (201) to receive said first atomized droplets (201),
wherein the indirect spray unit (30) has a tapering channel-like structure (300) having a droplet outlet (305) and a droplet inlet (304), wherein said droplet outlet (305) is disposed on a wall (40) of said atomizing device (100), and wherein said droplet inlet (304) faces a position where said nozzle plate unit (20) sprays out said first atomized droplets (201),
wherein an opening of said droplet inlet (304) is larger than an opening of said droplet outlet (305);wherein said droplet inlet (304) receives said first atomized droplets (201) to enter said indirect spray unit (30), and wherein said first atomized droplets (201) undertake repeated striking and rebounding in said tapering channel-like structure (300) to form second atomized droplets (202), and wherein said second atomized droplets (202) are sprayed out from said droplet outlet (305).

2. The atomizing device for air humidification (100) according to claim 1, wherein said tapering channel-like structure (300) has a first surface (301), a second surface (302) and a pair of third surfaces (303), and wherein said first surface (301) and said second surface (302) are opposite and connected by said third surfaces (303) to form said tapering channel-like structure (300).

3. The atomizing device for air humidification (100) according to claim 2, wherein said first surface (301) is tilted with respect to said second surface (302) by a preset angle.

4. The atomizing device for air humidification (100) according to claim 3, wherein said preset angle is within a range of 30-80 degrees.

5. The atomizing device for air humidification (100) according to claim 1, wherein a diameter of said second atomized droplets (202) is smaller than a diameter of said first atomized droplets (201).

6. The atomizing device for air humidification (100) according to claim 2, wherein said first atomized droplets (201) undertake repeated striking and rebounding between said first surface (301) and said second surface (302) to form said second atomized droplets (202).

7. The atomizing device for air humidification (100) according to claim 1 further comprising a second liquid storage chamber (103) disposed in a periphery of said first liquid storage chamber (101) and interconnecting with said first liquid storage chamber (101) through an interconnection unit (104).

8. The atomizing device for air humidification (100) according to claim 7, wherein after entering said indirect spray unit (30), said first atomized droplets (201) undertake striking and rebounding repeatedly in said tapering channel-like structure (300) to form third atomized droplets (203), and wherein said third atomized droplets (203) are ejected from said droplet inlet (304).

9. The atomizing device for air humidification (100) according to claim 8, wherein said third atomized droplets (304) fall into said second liquid storage chamber (103), and wherein said liquid in said second liquid storage chamber (103) flows through said interconnection unit (104) back to said first liquid storage chamber (101).

10. The atomizing device for air humidification (100) according to claim 1, wherein said nozzle plate unit (20) is detachably installed on said first liquid storage chamber (101).

11. The atomizing device for air humidification (100) according to claim 1, wherein said nozzle plate unit (20)

includes a base (21) and a nozzle plate structure (22), and wherein said nozzle plate structure (22) is disposed in said base (21) and has a plurality of electric-conduction contacts (23) electrically connected with a plurality of external-connection contacts (24) of said base.

Patentansprüche

1. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100), umfassend
eine erste Flüssigkeitsspeicherkammer (101) mit einem Flüssigkeitsspeicherraum (10), in dem eine zu zerstäubende Flüssigkeit (102) gespeichert ist;
eine Düsenplatteneinheit (20), die an der ersten Flüssigkeitsspeicherkammer (101) angeordnet ist und die Flüssigkeit (102) in ersten zerstäubten Tröpfchen (201) sprüht; und
eine indirekte Sprüheinheit (30), die an einer Position angeordnet ist, an der die Düsenplatteneinheit (20) die ersten zerstäubten Tröpfchen (201) herausprüht, um die ersten zerstäubten Tröpfchen (201) aufzunehmen,
wobei die indirekte Sprüheinheit (30) eine angeschrägte kanalartige Struktur (300) aufweist, die einen Tröpfchenauslass (305) und einen Tröpfcheneinlass (304) aufweist, wobei der Tröpfchenauslass (305) an einer Wand (40) der Zerstäubungsvorrichtung (100) angeordnet ist, und wobei der Tröpfcheneinlass (304) einer Position zugewandt ist, an der die Düsenplatteneinheit (20) die ersten zerstäubten Tröpfchen (201) heraussprüht,
wobei eine Öffnung des Tröpfcheneinlasses (304) größer ist als eine Öffnung des Tröpfchenauslasses (305); wobei der Tröpfcheneinlass (304) die ersten zerstäubten Tröpfchen (201) aufnimmt, um in die indirekte Sprüheinheit (30) zu gelangen, und wobei die ersten zerstäubten Tröpfchen (201) in der angeschrägten kanalartigen Struktur (300) wiederholt auftreffen und zurückprallen, um zweite zerstäubte Tröpfchen (202) zu bilden, und wobei die zweiten zerstäubten Tröpfchen (202) aus dem zweiten Tröpfchenauslass (305) gesprüht werden.

2. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 1, wobei die angeschrägte kanalartige Struktur (300) eine erste Fläche (301), eine zweite Fläche (302) und ein Paar von dritten Flächen (303) aufweist und wobei die erste Fläche (301) und die zweite Fläche (302) gegenüberliegen und durch die dritten Flächen (303) verbunden sind, um die angeschrägte kanalartige Struktur (300) zu bilden.

3. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 2, wobei die erste Fläche (301) in Bezug in Bezug auf die zweite Fläche (302) mit einem voreingestellten Winkel geneigt ist.

4. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 3, wobei der voreingestellte Winkel in einem Bereich von 30 bis 80 Grad liegt.

5. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 1, wobei ein Durchmesser der zweiten zerstäubten Tröpfchen (202) kleiner als ein Durchmesser der ersten zerstäubten Tröpfchen (201) ist.

6. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 2, wobei die ersten zerstäubten Tröpfchen (201) wiederholt zwischen der ersten Fläche (301) und der zweiten Fläche (302) auftreffen und zurückprallen, um die zweiten zerstäubten Tröpfchen (202) zu bilden.

7. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 1, ferner umfassend eine zweite Flüssigkeitsspeicherkammer (103), die in einer Peripherie der ersten Flüssigkeitsspeicherkammer (101) angeordnet und durch eine Verbindungseinheit (104) mit der ersten Flüssigkeitsspeicherkammer (101) verbunden ist.

8. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 7, wobei die ersten zerstäubten Tröpfchen (201) nach dem Einströmen in die indirekte Sprüheinheit (30) wiederholt in der angeschrägten kanalartigen Struktur (300) auftreffen und zurückprallen, um dritte zerstäubte Tröpfchen (203) zu bilden, und wobei die dritten zerstäubten Tröpfchen (203) aus dem Tröpfcheneinlass (304) ausgestoßen werden.

9. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 8, wobei die dritten zerstäubten Tröpfchen (304) in die zweite Flüssigkeitsspeicherkammer (103) fallen, und wobei die Flüssigkeit in der zweiten Flüssigkeitsspeicherkammer (103) durch die Verbindungseinheit (104) zurück zu der ersten Flüssigkeitsspeicherkammer (101) strömt.

10. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 1, wobei die Düsenplatteneinheit (20) lösbar an der ersten Flüssigkeitsspeicherkammer (101) angebracht ist.

11. Zerstäubungsvorrichtung für eine Luftbefeuchtung (100) nach Anspruch 1, wobei die Düsenplatteneinheit (20) eine Basis (21) und eine Düsenplattenstruktur (22) umfasst, und wobei die Düsenplattenstruktur (22) in der Basis (21) angeordnet ist und eine Vielzahl von elektrisch leitfähigen Kontakten (23) aufweist, die mit einer Vielzahl von externen Verbindungskontakten (24) der Basis (21) elektrisch verbunden ist.

Revendications

1. Dispositif d'atomisation pour l'humidification d'air (100) comprenant
une première chambre de stockage de liquide (101) ayant un espace de stockage de liquide (10) stockant un liquide (102) à atomiser ;
une unité de plaque à buse (20) disposée sur ladite première chambre de stockage de liquide (101) et pulvérisant ledit liquide (102) en premières gouttelettes atomisées (201) ; et
une unité de pulvérisation indirecte (30) disposée à une position où ladite unité de plaque à buse (20) pulvérise lesdites premières gouttelettes atomisées (201) pour recevoir lesdites premières gouttelettes atomisées (201),
dans lequel
l'unité de pulvérisation indirecte (30) a une structure de type canal effilé (300) ayant un orifice de sortie de gouttelettes (305) et un orifice d'entrée de gouttelettes (304), dans lequel ledit orifice de sortie de gouttelettes (305) est disposé sur une paroi (40) dudit dispositif d'atomisation (100), et dans lequel ledit orifice d'entrée de gouttelettes (304) est en regard d'une position où ladite unité de plaque à buse (20) pulvérise lesdites premières gouttelettes atomisées (201),
dans lequel une ouverture dudit orifice d'entrée de gouttelettes (304) est plus grande qu'une ouverture dudit orifice de sortie de gouttelettes (305) ; dans lequel ledit orifice d'entrée de gouttelettes (304) reçoit lesdites premières gouttelettes atomisées (201) pour qu'elles entrent dans ladite unité de pulvérisation indirecte (30), et dans lequel lesdites premières gouttelettes atomisées (201) mettent en œuvre une frappe et un rebond répétés dans ladite structure de type canal effilé (300) pour former des deuxièmes gouttelettes atomisées (202), et dans lequel lesdites deuxièmes gouttelettes atomisées (202) sont pulvérisées depuis ledit orifice de sortie de gouttelettes (305).

2. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 1, dans lequel ladite structure de type canal effilé (300) a une première surface (301), une deuxième surface (302) et une paire de troisièmes surfaces (303), et dans lequel ladite première surface (301) et ladite deuxième surface (302) sont opposées et reliées par lesdites troisièmes surfaces (303) pour former ladite structure de type canal effilé (300).

3. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 2, dans lequel ladite première surface (301) est inclinée par rapport à ladite deuxième surface (302) d'un angle préétabli.

4. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 3, dans lequel ledit angle préétabli est dans une plage de 30 à 80 degrés.

5. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 1, dans lequel un diamètre desdites deuxièmes gouttelettes atomisées (202) est plus petit qu'un diamètre desdites premières gouttelettes atomisées (201).

6. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 2, dans lequel lesdites premières gouttelettes atomisées (201) mettent en œuvre une frappe et un rebond répétés entre ladite première surface (301) et ladite deuxième surface (302) pour former lesdites deuxièmes gouttelettes atomisées (202).

7. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 1, comprenant en outre une seconde chambre de stockage de liquide (103) disposée dans une périphérie de ladite première chambre de stockage de liquide (101) et s'interconnectant avec ladite première chambre de stockage de liquide (101) par le biais d'une unité d'interconnexion (104).

8. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 7, dans lequel après être entrées dans ladite unité de pulvérisation indirecte (30), lesdites premières gouttelettes atomisées (201) mettent en œuvre une frappe et un rebond de façon répétée dans ladite structure de type canal effilé (300) pour former des troisièmes gouttelettes atomisées (203), et dans lequel lesdites troisièmes gouttelettes atomisées (203) sont éjectées depuis ledit orifice d'entrée de gouttelettes (304).

9. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 8, dans lequel lesdites troisièmes gouttelettes atomisées (304) tombent dans ladite seconde chambre de stockage de liquide (103), et dans lequel ledit liquide dans ladite seconde chambre de stockage de liquide (103) s'écoule à travers ladite unité d'interconnexion (104) de retour vers ladite première chambre de stockage de liquide (101).

10. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 1, dans lequel ladite unité de plaque à buse (20) est installée détachable sur ladite première chambre de stockage de liquide (101).

11. Dispositif d'atomisation pour l'humidification d'air (100) selon la revendication 1, dans lequel ladite unité de plaque à buse (20) comporte une base (21) et une structure de plaque à buse (22), et dans lequel ladite structure de plaque à buse (22) est disposée

dans ladite base (21) et a une pluralité de contacts de conduction électrique (23) connectés électriquement à une pluralité de contacts de connexion externe (24) de ladite base (21).

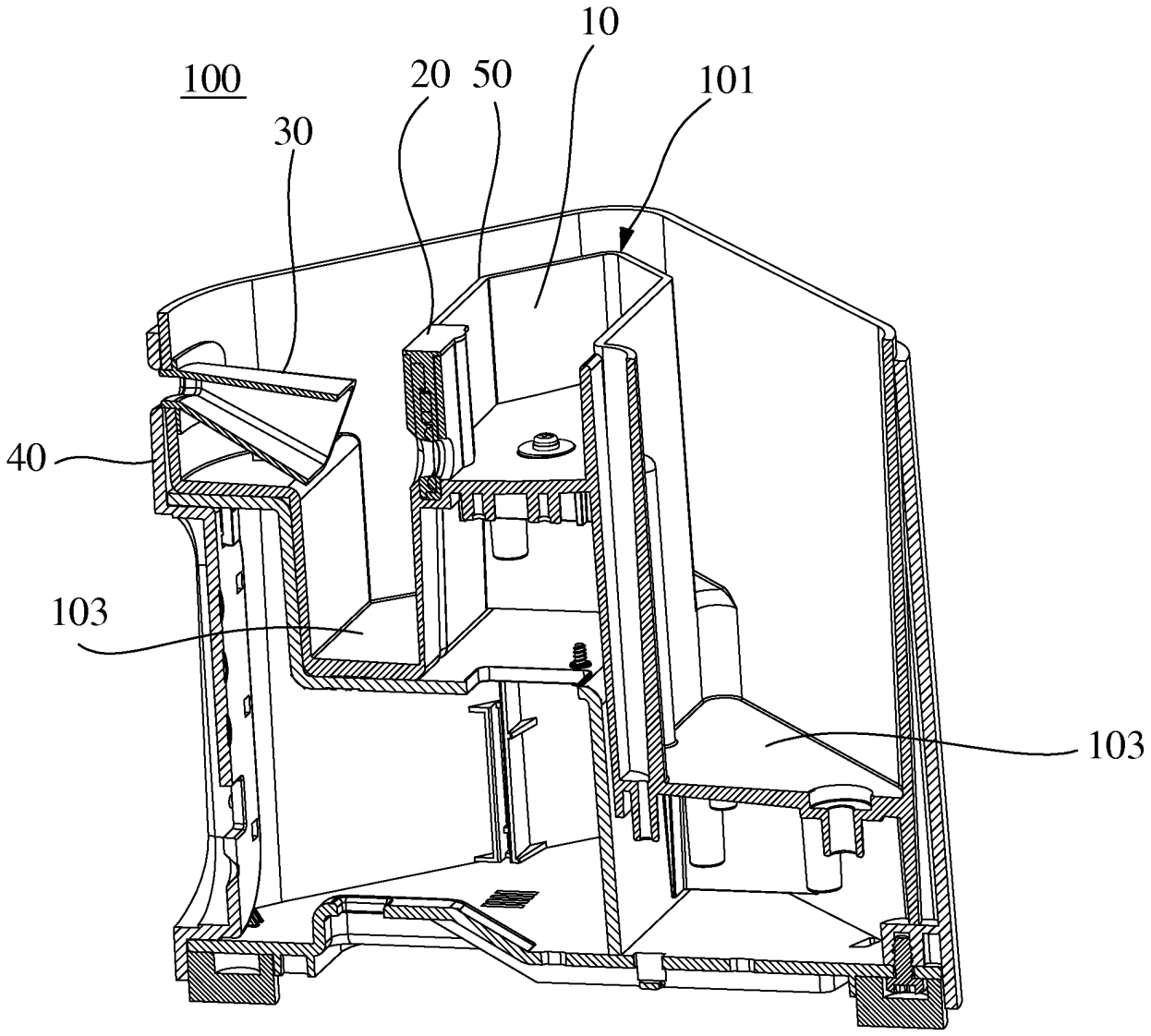

Fig. 1

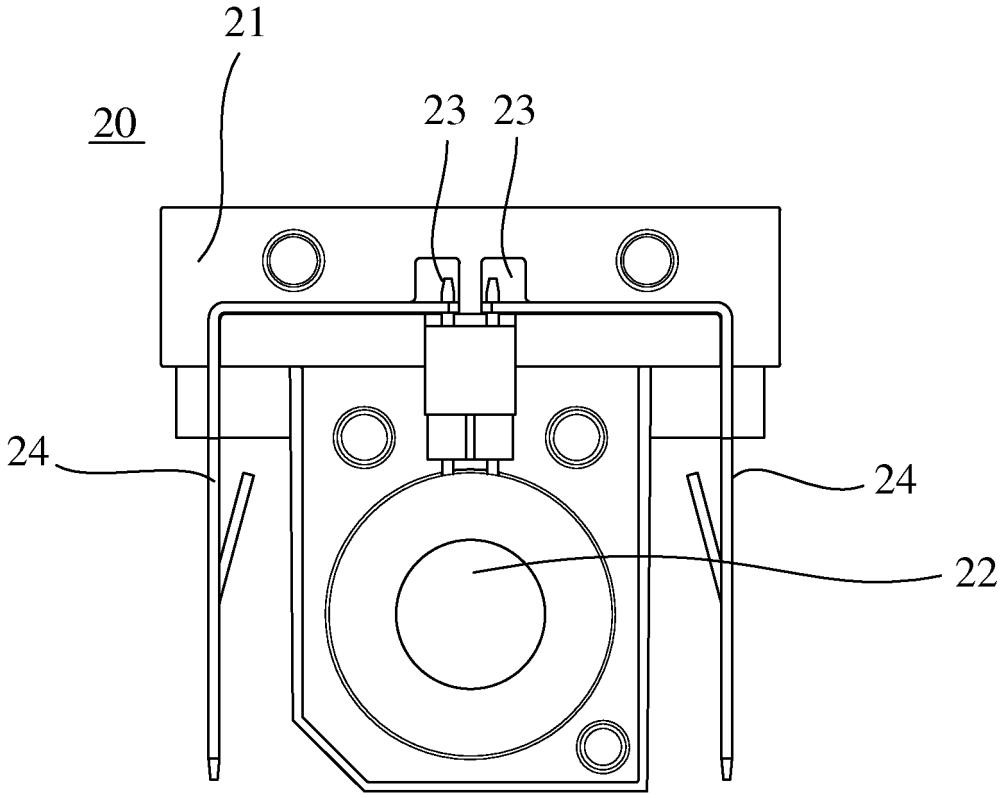

Fig. 2

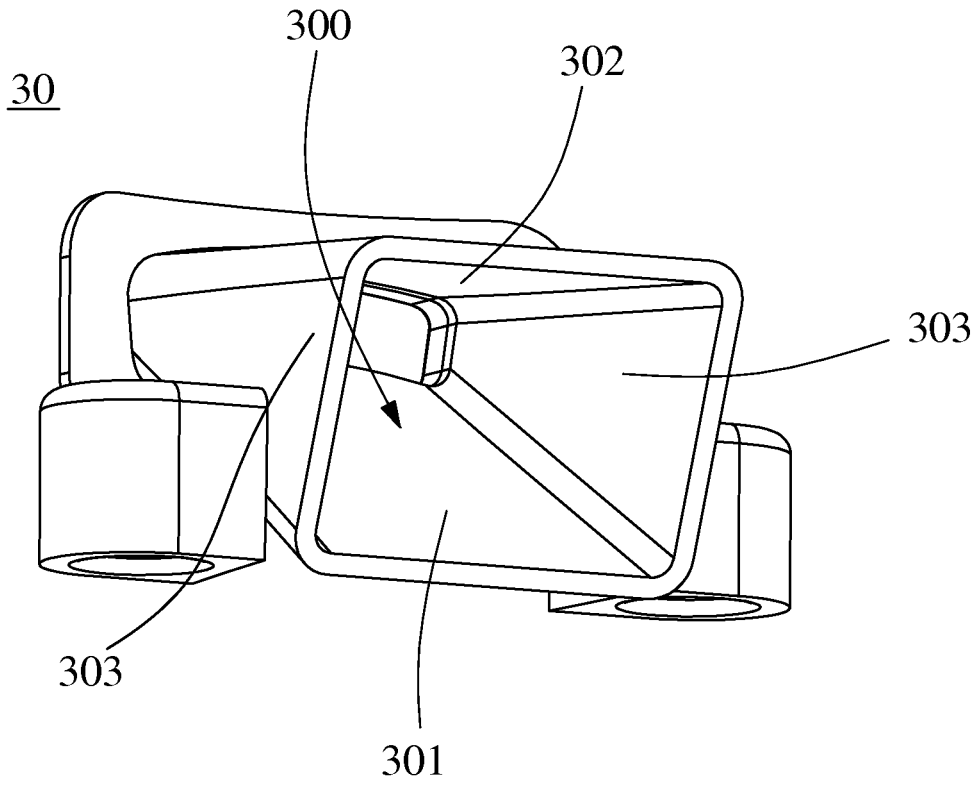

Fig. 3

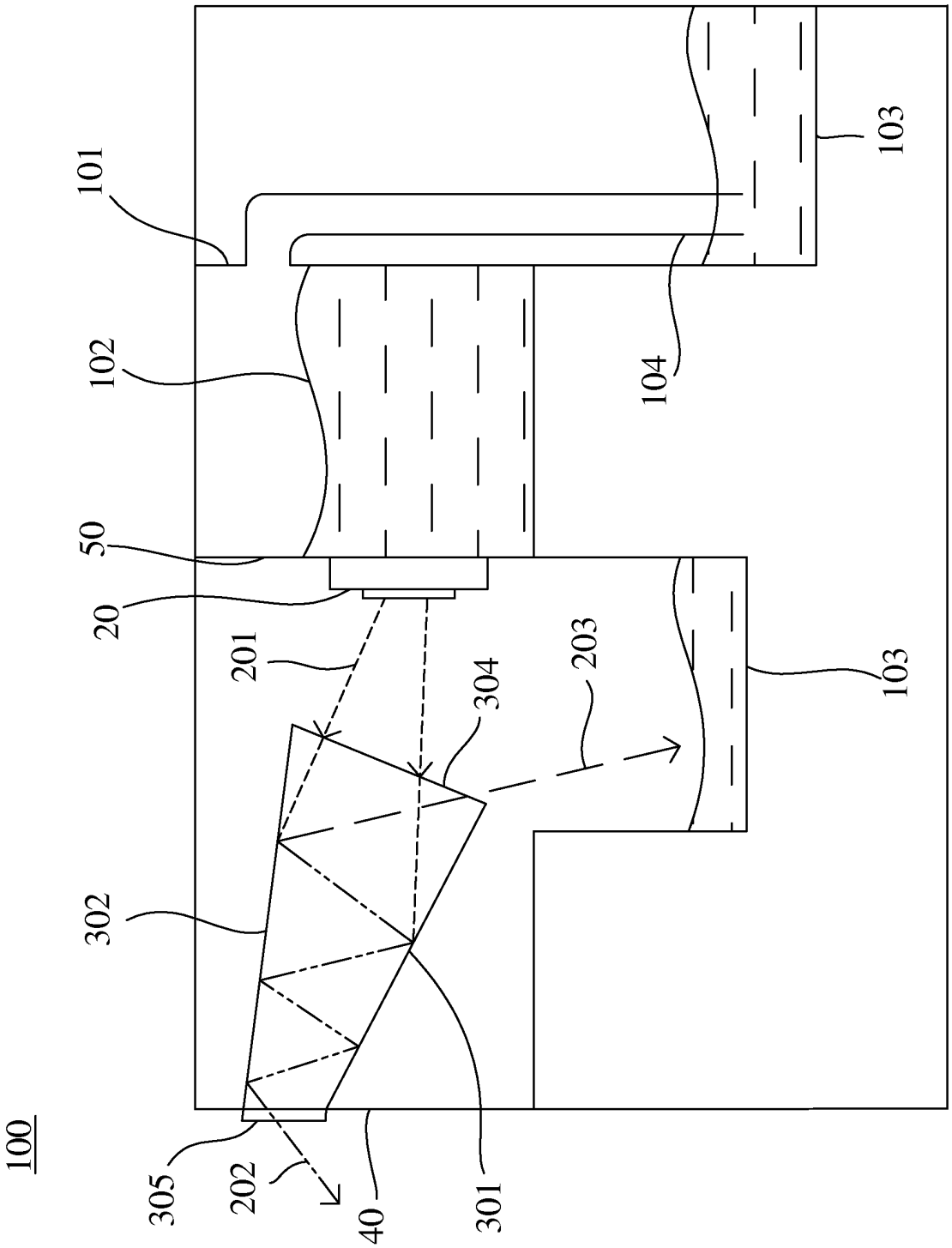

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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