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(54) **AEROSOL PRODUCT**

(57) To provide a simple-structured aerosol product with few limitations on applicable liquids and capable of spraying a mist of fine particles without giving too much sensation of coldness. The aerosol container (101) includes a plurality of holding spaces by being partitioned and a plurality of valves (110) corresponding to the holding spaces. At least one of the plurality of holding spaces is a liquefied gas containing section (131) that holds a liquefied gas LG, and at least one of the plurality of valves (110) is a gas phase valve (110A) that ejects vaporized gas from the liquefied gas containing section (131).

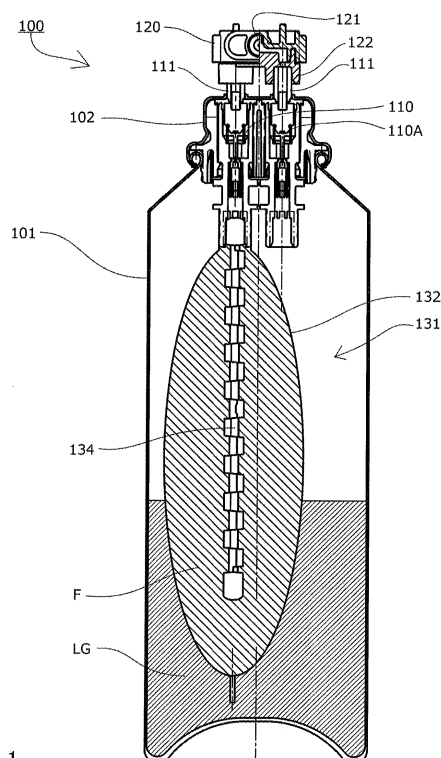


Fig. 1

Description

[Technical Field]

5 **[0001]** The present invention relates to an aerosol product having a valve with a stem protruding from an aerosol container, and a nozzle that fits with the stem, and more particularly to an aerosol product that favorably sprays a mist of the content therein.

[Background Art]

10 **[0002]** Aerosol products having a valve with a stem protruding from an aerosol container, and a nozzle that fits with the stem, are well known, and so are products that spray a mist of the contents in the container from the nozzle.

15 **[0003]** The content is atomized as it is ejected from the outlet orifice. For spraying the mist of the content, generally, the amount of ejected content, the ejection pressure, and the nozzle outlet shape are designed suitably in accordance with the properties of the content so as to produce a favorable spray of mist by the expansion force of the liquefied gas near the outlet orifice.

20 **[0004]** The ejection pressure of the content and the expansion force of the liquefied gas near the outlet orifice are adjusted depending on the type and amount of the liquefied gas to be mixed with the content, while the amount of ejected content is regulated by the flow paths of the valve and nozzle.

25 **[0005]** However, the type and amount of the liquefied gas are restricted by the properties and affinities of contents, and the amount of ejected content varies depending on the purpose of use. A configuration that creates an optimal mist was thus not necessarily achievable.

30 **[0006]** To alleviate these problems and achieve a favorable spray of mist, various improvements have been made in configurations other than the nozzle. An aerosol product known from Patent Literature 1, for example, has a valve with a housing configured to have a Venturi aperture in the circumferential wall and to absorb the liquid inside the container by the capillary action, to cause the liquid to evaporate through the Venturi effect and generate an aerosol in a lower end part of the housing.

35 **[0007]** An aerosol product known from Patent Literature 2 includes a first container holding a gas and a second container holding a liquid. The gas held in the first container is expelled as a gas stream from a first nozzle part. The aerosol product includes a second nozzle part for discharging the liquid held in the second container such that the liquid is drawn by the gas stream emerging from the first nozzle part and forced into the area of the expelled gas stream.

40 **[0008]** An aerosol product known from Patent Literature 3 includes an inner aerosol device that sprays an atomized liquid, and an outer aerosol device that ejects a gas for delivering the atomized liquid sprayed from this inner aerosol device.

[Citation List]

[Patent Literature]

45 **[0009]**

Patent Literature 1: Japanese Laid-open Patent Application No. 2001-286795

Patent Literature 2: Japanese Patent No. 4564297

Patent Literature 3: Japanese Laid-open Patent Application No. 2000-271514

[Summary of Invention]

[Technical Problem]

50 **[0010]** These known aerosol containers have configurations other than the nozzle refined to enable spraying of a mist optimized as suited to the content.

55 **[0011]** The aerosol product known from Patent Literature 1, however, uses the capillary action and the Venturi effect, because of which applicable liquids are much limited, and entailed the problem that the nozzle had a complex internal structure.

60 **[0012]** The aerosol product known from Patent Literature 2 uses the Venturi effect, and the liquid is exposed to the outside air, because of which applicable liquids are much limited, and entailed the problem that the aerosol container as a whole was bulky.

65 **[0013]** The aerosol product known from Patent Literature 3 entailed the problem that the nozzle structure and the

container structure were extremely complex.

[0014] The present invention solves the problems described above, and it is an object of the invention to provide a simple-structured aerosol product with few limitations on applicable liquids and capable of spraying a mist of fine particles without giving too much sensation of coldness.

[Solution to Problem]

[0015] The aerosol product according to the present invention is an aerosol product having a valve with a stem protruding from an aerosol container, and a nozzle that fits with the stem, the aerosol container including a plurality of holding spaces by being partitioned and a plurality of valves corresponding to the holding spaces, at least one of the plurality of holding spaces being a liquefied gas containing section that holds a liquefied gas, and at least one of the plurality of valves being a gas phase valve that ejects vaporized gas from the liquefied gas containing section, whereby the problems noted above are solved.

[Advantageous Effects of Invention]

[0016] The aerosol product according to claim 1 has the aerosol container including a plurality of holding spaces by being partitioned and a plurality of valves corresponding to the holding spaces, at least one of the plurality of holding spaces being a liquefied gas containing section that holds a liquefied gas, and at least one of the plurality of valves being a gas phase valve that ejects vaporized gas from the liquefied gas containing section. As the content such as a liquid and the vaporized gas mix with each other inside the nozzle, the content can be atomized into a mist of fine particles that hardly gives the sensation of coldness.

[0017] Since the content such as a liquid and the vaporized gas are ejected from respective valves, the two valves can be designed optimally as required, which reduces limitations on applicable liquids.

[0018] Also, aerosol containers having a known dual valve configuration can be utilized, which results in a simple structure.

[0019] According to the configuration set forth in claim 2, the aerosol container includes a can-like vessel and one or more content holding bags accommodated inside the can-like vessel, the liquefied gas containing section being formed by a space outside the content holding bag inside the can-like vessel, and a valve or valves other than the gas phase valve being configured to eject a content inside the content holding bag. As the content is forced out by the pressure from the liquefied gas containing section, contents that should not be mixed with a liquefied gas in storage can be accommodated, and thus the limitations on applicable liquids are further reduced.

[0020] Also, since the aerosol container is formed by one can-like vessel, the container can be designed to have a shape easy to hold for the user.

[0021] According to the configuration set forth in claim 3, the nozzle includes a fitting part that fits with stems of the plurality of valves, a mixing part where fluids ejected from the plurality of valves are mixed, and an outlet orifice for forcing out the mixed fluids. Spraying of an optimal mist is made possible by a suitable internal design of a single nozzle, which enables an even simpler structure.

[Brief Description of Drawings]

[0022] [Fig. 1] Fig. 1 is a cross-sectional illustrative view of an aerosol product according to one embodiment of the present invention.

[Description of Embodiments]

[0023] An aerosol product 100 according to a first embodiment of the present invention is a product known as a dual valve type, which has two valves 110 fixed to the mouth of an aerosol container 101 by means of a mounting cup 102, with two stems 111 protruding upwards, as shown in Fig. 1.

[0024] A content holding bag 132 is provided in the holding space inside the aerosol container 101 so that the container is partitioned into two holding spaces, i.e., inside and outside of the content holding bag 132.

[0025] The content holding bag 132 tightly contains a content F therein, while the outside of the content holding bag 132 forms a liquefied gas containing section 131 where a liquefied gas LG is stored.

[0026] The liquefied gas LG may be any of LPG, dimethyl ether, alternatives for CFCs and so on that are used as the propellant for common aerosol products. Non-flammable, more environmentally friendly hydrofluoroolefin is preferable, and HFO-1234ze is even more preferable.

[0027] One of the two valves 110 is connected to spray the content F inside the content holding bag 132, while the other valve 110A (hereinafter, "gas phase valve 110A") is connected to force out the vaporized gas that is the gaseous

phase of the liquefied gas LG stored in the liquefied gas containing section 131.

[0028] A nozzle 120 is attached to the stems 111 protruding upward from the two valves 110 via a fitting part 122. Pressing down the nozzle 120 opens the valve 110 and gas phase valve 110A, whereby the vaporized gas is forced out from the stem 111 by the pressure of the gaseous phase of the liquefied gas LG stored in the liquefied gas containing

section 131, and the content F is forcefully projected from the stem 111, as the content holding bag 132 is pressurized, too.

[0029] The content F and vaporized gas are mixed inside the nozzle 120 and driven out from an outlet orifice 121, and in this process, the content F is atomized into a fine mist as it is sprayed.

[0030] This embodiment includes a residual quantity reduction member 134 attached below the valve 110 inside the content holding bag 132 and configured to keep the amount of ejected content F consistent until the end and to reduce the amount of leftover.

[0031] Since the content F is forced out by the pressure the content holding bag 132 receives from the liquefied gas containing section 131, the content F does not contact the liquefied gas LG during storage, and there is no need to mix in a material that applies pressure to the content F.

EXAMPLE 1

[0032] Table 1 shows the test results when water, alcohol, and vegetable oil were sprayed as a mist of the content F, using the aerosol product 100 described above.

[0033] The test conditions were as follows:

Example 1:

[0034] Flow path diameter of the valve 110 for the content F: 0.35 mm

Flow path diameter of the gas phase valve 110A: 0.35 mm

Liquefied gas: HFO-1234ze

Example 2:

[0035] Flow path diameter of the valve 110 for the content F: 2.00 mm

Flow path diameter of the gas phase valve 110A: 0.35 mm

Liquefied gas: HFO-1234ze

[0036] A common one-valve aerosol spray container was used as comparative examples.

Comparative Example 1:

[0037] Valve flow path diameter: 0.40 mm

Propellant: N₂

Comparative Example 2:

[0038] Valve flow path diameter: 0.40 mm

Propellant: LPG (mixed with the content)

[Table 1]

Item	Liquid content	Example 1	Example 2	Comparative example 1	Comparative example 2
Particle size (μm)	Water	40.29	41.22	135.70	198.30
	Alcohol	52.80	57.36	88.34	26.76
	Vegetable oil	47.63	51.19	*Not measurable	40.57
Ejection pressure (g)	Water	8.3	6.4	4.6	2.7
	Alcohol	6.7	6.4	4.0	5.1
	Vegetable oil	8.1	7.2	0.6	5.3

(continued)

Item	Liquid content	Example 1	Example 2	Comparative example 1	Comparative example 2
Sensation of coldness	Water	Θ	Θ	Θ	O
	Alcohol	○	○	○	X
	Vegetable oil	Θ	Θ	Θ	X
*Not measurable because mist was not formed. Θ: No sensation of coldness ○: Slight sensation of coldness X: Clear sensation of coldness					

[0039] As the test results show, when the content F is water, the examples of the aerosol product of the present invention can spray a mist of very fine particles without giving much sensation of coldness.

[0040] In contrast, the particle size is large in both comparative examples, and when LPG is used to be mixed with the content, the aerosol produces some sensation of coldness.

[0041] When the content F is alcohol, the examples of the aerosol product of the present invention can spray a mist of very fine particles, and while the aerosol does produce some sensation of coldness derived from the alcohol, the cold sensation is felt relatively less.

[0042] In contrast, when nitrogen is used as the propellant gas in the comparative examples, while the cold sensation is felt as little as the examples of the aerosol product of the present invention, the particle size is large. When LPG is used to be mixed with the content, while the particle size is smaller, the cold sensation is intense.

[0043] When the content F is vegetable oil, the examples of the aerosol product of the present invention can spray a mist of very fine particles without giving much sensation of coldness.

[0044] In contrast, when nitrogen is used as the propellant gas in the comparative examples, no mist is formed, and when LPG is used to be mixed with the content, the cold sensation is intense.

EXAMPLE 2

[0045] Table 2 shows the test results of the aerosol product 100 according to the first embodiment using water as the content F, with varying flow path diameters of the valve 110.

[Table 2]

Condition	Flow path diameter (mm)		Area ratio	Gas type	Average particle size	Ejection pressure
	Liquid	Gas	Liquid/gas		(μm)	(g)
1	0.3	2	2%	HFO-1234ze	Not ejectable	Not measurable
1	0.3	2	2%	LPG 0.15	28.13	2.1
1	0.3	2	2%	LPG 0.39	Not ejectable	Not measurable
1	0.3	2	2%	DME	15.44	7.2
2	0.35	2	3%	HFO-1234ze	19.63	5.9
2	0.35	2	3%	LPG 0.39	17.14	6.2
3	0.4	2	4%	HFO-1234ze	20.4	5.9
4	0.45	2	5%	HFO-1234ze	22.16	5.6
5	0.5	2	6%	HFO-1234ze	21.06	5.2
6	2	2	100%	HFO-1234ze	33.94	5.5
6	2	2	100%	LPG 0.15	35.1	3.1
6	2	2	100%	LPG 0.39	22.48	6.5
6	2	2	100%	DME	55.49	6.2

(continued)

Condition	Flow path diameter (mm)		Area ratio	Gas type	Average particle size	Ejection pressure
	Liquid	Gas	Liquid/gas		(μm)	(g)
7	2	0.5	1600%	HFO-1234ze	33.76	5.9
8	2	0.35	3265%	HFO-1234ze	41.22	6.4
9	2	0.3	4444%	HFO-1234ze	58.06	5.9

[0046] In Condition 1 to Condition 6, the flow path diameter of the gas phase valve 110A was 2.00 mm, while the flow path diameter of the valve 110 for the content F was increased stepwise, i.e., 0.3 mm, 0.35 mm, 0.4 mm, 0.45 mm, 0.5 mm, and 2.00 mm.

[0047] In Condition 6 to Condition 9, the flow path diameter of the valve 110 for the content F was 2.00 mm, while the flow path diameter of the gas phase valve 110A was decreased stepwise, i.e., 2.00 mm, 0.5 mm, 0.35 mm, and 0.3 mm.

[0048] As the test results show, under Condition 1 (with the liquid/gas area ratio of the flow path of 2%), when the liquefied gas was LPG 0.15 or DME (dimethyl ether), a fine mist could be sprayed, while, when the liquefied gas was HFO-1234ze or LPG 0.39, no mist could be sprayed.

[0049] Under Condition 2 (with the liquid/gas area ratio of the flow path of 3%), a fine mist could be sprayed even when the liquefied gas was HFO-1234ze or LPG 0.39.

[0050] This indicates that a fine mist can be sprayed if the flow path area of the valve for the content F is 3% or more of the flow path area of the gas phase valve, irrespective of the type of the liquefied gas.

[0051] Under Condition 6 (with the liquid/gas area ratio of the flow path of 100%), a fine mist could be sprayed, with any of LPG 0.15, LPG 0.39, DME (dimethyl ether), and HFO-1234ze used as the liquefied gas.

[0052] Under Condition 9 (with the liquid/gas area ratio of the flow path of 4444%), too, a fine mist could be sprayed when HFO-1234ze was used as the liquefied gas.

[0053] This indicates that the use of HFO-1234ze as the liquefied gas enables a fine mist to be sprayed even when the flow path diameter of the gas phase valve 110A is reduced and a smaller amount of gas is used.

[0054] The aerosol product 100 of the embodiment described above is a product known as a dual valve type that has two valves 110 in one aerosol container 101, but there may be three or more valves.

[0055] Alternatively, the aerosol container may have one valve and a plurality of holding spaces, at least one of the plurality of holding spaces being assigned to ejection of vaporized gas, or, a plurality of holding spaces may be configured with a plurality of aerosol containers with one valve, at least one of the plurality of aerosol containers being assigned to ejection of vaporized gas.

[0056] While the content F in the embodiment described above does not contain a liquefied gas, it may contain a liquefied gas mixed therein.

[0057] The test examples shown in Table 2 were obtained with the outlet orifice 121 at the tip of the nozzle 120 having a configuration that causes the expelled fluid to swirl in spirals (known as "mechanical breakup"). Table 3 below shows the test results obtained with the nozzle 120 having an outlet orifice 121 at the tip with a straight configuration.

[Table 3]

Condition	Flow path diameter (mm)		Area ratio	Gas type	Average particle size	Ejection pressure
	Liquid	Gas	Liquid/gas		(μm)	(g)
6	2	2	100%	HFO-1234ze	35.71	6.4

[0058] As shown, an equally fine mist can be sprayed even with a straight configuration. Therefore, the outlet orifice 121 at the tip of the nozzle 120 may have a configuration that causes the expelled fluid to swirl in spirals (mechanical breakup) if the nozzle 120 is of the type that mixes the content F and the vaporized gas inside the nozzle 120, or, the nozzle may have a straight configuration that forces out the content F and vaporized gas directly to the outside.

[Reference Signs List]

[0059]

100	Aerosol product
101	Aerosol container
102	Mounting cup
110	Valve
111	Stem
120	Nozzle
121	Outlet orifice
122	Fitting part
131	Liquefied gas containing section
132	Content holding bag
134	Residual quantity reduction member
LG	Liquefied gas
F	Content

Claims

1. An aerosol product comprising a valve having a stem protruding from an aerosol container, and a nozzle that fits with the stem,
the aerosol container including a plurality of holding spaces by being partitioned and a plurality of valves corresponding to the holding spaces,
at least one of the plurality of holding spaces being a liquefied gas containing section that holds a liquefied gas, and
at least one of the plurality of valves being a gas phase valve that ejects vaporized gas from the liquefied gas containing section.
2. The aerosol product according to claim 1, wherein the aerosol container includes a can-like vessel and one or more content holding bags accommodated inside the can-like vessel,
the liquefied gas containing section being formed by a space outside the content holding bag inside the can-like vessel, and
a valve or valves other than the gas phase valve being configured to eject a content inside the content holding bag.
3. The aerosol product according to claim 1 or 2, wherein the nozzle includes a fitting part that fits with stems of the plurality of valves, a mixing part where fluids ejected from the plurality of valves are mixed, and an outlet orifice for forcing out the mixed fluids.
4. The aerosol product according to any one of claims 1 to 3, wherein a valve or valves other than the gas phase valve has/have a flow path area of 3% or more of a flow path area of the gas phase valve.
5. The aerosol product according to any one of claims 1 to 4, wherein the liquefied gas is hydrofluoroolefin.

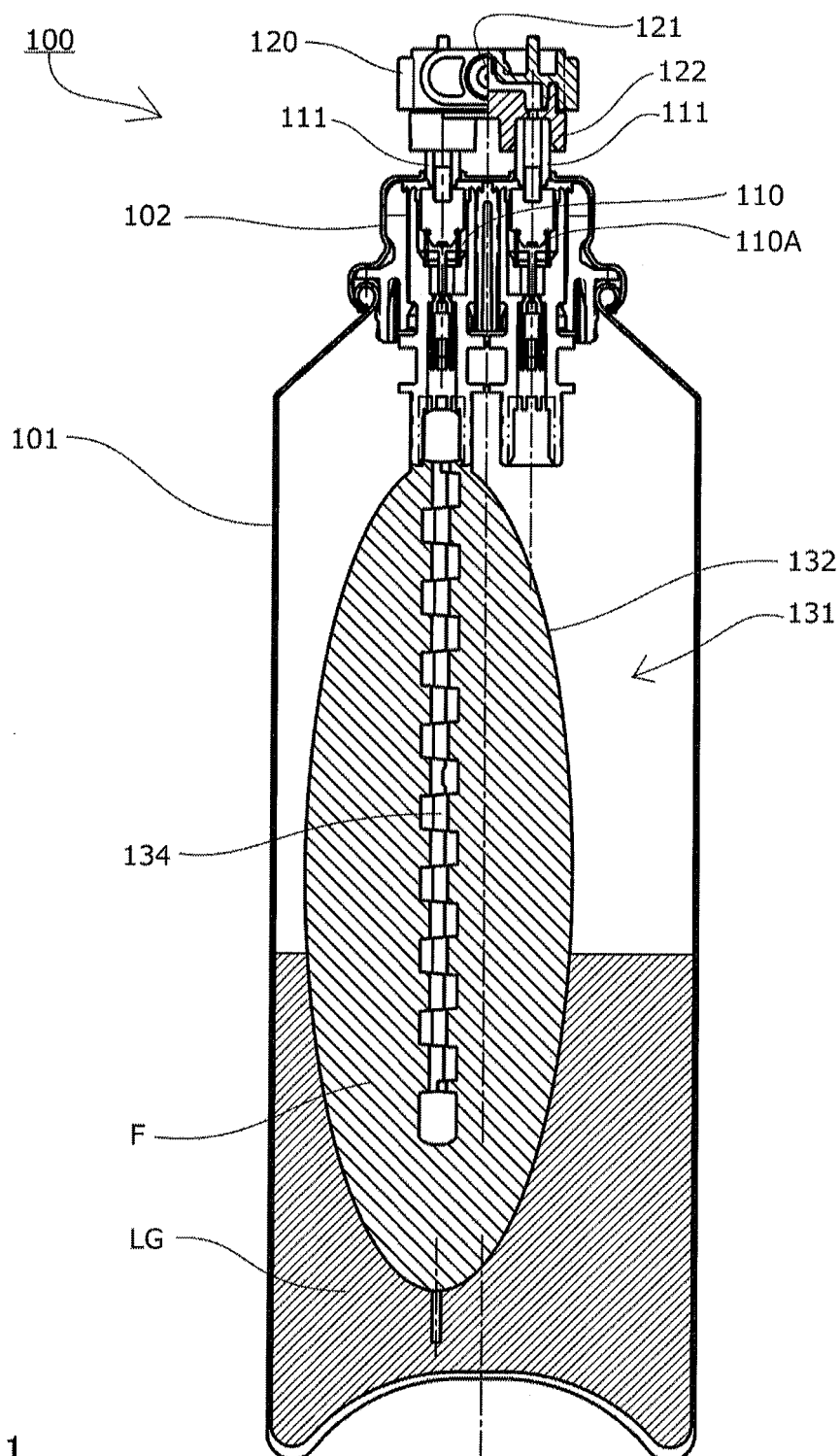


Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/032695

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. B65D83/58 (2006.01) i, B05B9/04 (2006.01) i, B65D83/62 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. B65D83/58, B05B9/04, B65D83/62

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2018

Registered utility model specifications of Japan 1996-2018

Published registered utility model applications of Japan 1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3610481 A (MARRAFFINO, Leonard L.) 05 October	1-2
Y	1971, column 1, line 32 to column 2, line 42, fig. 1, 4 (Family: none)	3-5
Y	JP 2014-516882 A (THE PROCTER & GAMBLE COMPANY) 17 July 2014, paragraphs [0064]-[0065], fig. 10 & US 2012/0291912 A1, paragraphs [0076]-[0077], fig. 10 & WO 2012/158744 A1 & CN 103534173 A	3-5



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

14 November 2018 (14.11.2018)

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Name and mailing address of the ISA/

Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/032695

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2016/210217 A1 (THE PROCTER & GAMBLE COMPANY) 29 December 2016, page 15, line 20 to page 16, line 2, fig. 13 & JP 2018-520066 A & US 2016/0377186 A1 & CN 107735340 A	3-5
Y	JP 2016-160185 A (TOYO AEROSOL INDUSTRY CO., LTD.) 05 September 2016, paragraph [0049], fig. 1-2 & US 2018/0029781 A1, paragraph [0120], fig. 1-2 & WO 2016/136703 A1 & EP 3263090 A1 & KR 10-2017- 0117526 A & CN 107405262 A	3-5
Y	WO 2012/057342 A1 (DAIZO CORPORATION) 03 May 2012, paragraph [0034] & US 2013/0284759 A1, paragraph [0074] & EP 2634111 A1 & CN 103189283 A	5

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REFERENCES CITED IN THE DESCRIPTION

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- JP 4564297 B [0009]
- JP 2000271514 A [0009]