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(54) **Title:** MULTI-NOZZLE LIQUID DISPENSING CAP

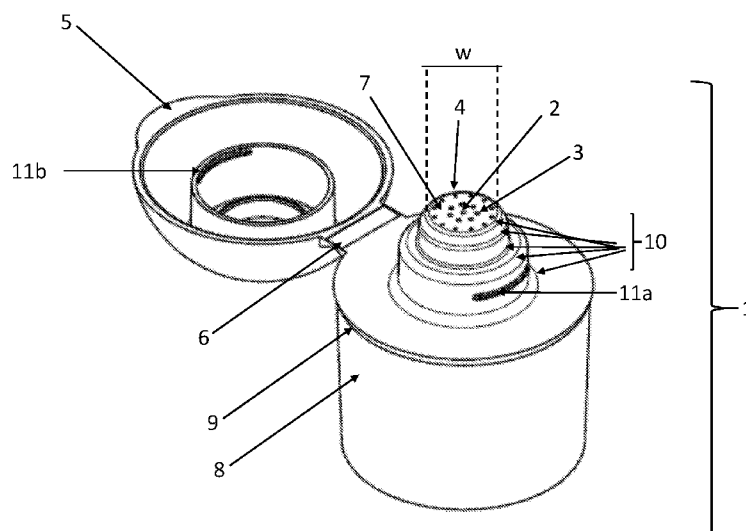


Fig 1

(57) Abstract: A one-piece plastic dispensing cap having a landing ranging in diameter from approximately 10 mm to approximately 20 mm further comprising a central nozzle and a plurality of other nozzles arranged in one or more rings, distanced from and concentric with the central nozzle.

MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

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MULTI-NOZZLE LIQUID DISPENSING CAP

Cross-Reference to Related Applications

The present application claims priority to GB Pat App No 1720376.1, filed 7

5 December 2017.

Technical Field

The present invention relates to a one-piece plastic dispensing cap having a landing ranging in diameter from approximately 13 mm to approximately 20 mm further comprising
10 a central nozzle and a plurality of other nozzles arranged in one or more rings, distanced from and concentric with the central nozzle.

Background

Dispensing caps are generally composed of plastic and injection moulded.

15 US Pat No 1,355,973 to Hollingsworth discloses elastic sprinkler caps that will fit various bottles regardless of the size or shape of the necks, within a reasonable range.

FR Pat No 1,035,103 to Rene del Piano discloses that the orifice of the vial is closed by a wall pierced with very small holes that the liquid contained can only cross when reduced to the state of very fine droplets.

20 GB Pat No 652,144 to Doris Mabel Ireland-Sargeant discloses an improved liquid sprinkler for discharging a fine spray of liquid, in which a bottle provided with a plurality of small sprinkling orifices may be inverted so as to discharge the liquid through the orifices, said orifices being long compared with their diameter.

25 US Pat No 3,131,870 to Henschert discloses a dispensing nozzle or spout structure having a provision for dispensing liquid therethrough in the form of a divided spray.

US Pat No 5,094,278 to Arao et al. discloses a filling nozzle comprising a vertical tubular nozzle body and at least one perforated plate disposed at a lower-end opening of the nozzle body for preventing a liquid from flowing down under gravity by a surface tension of the liquid.

30 FR Pat No 06 07555 to Pack Realisations S.A. discloses a seat for the filling nozzle of a filler, the filler having one or more filling nozzles intended to deliver the product in the packing to be filled.

PCT Pub No WO2013/064299 to Unilever discloses a nozzle assembly that is capable of dispensing a liquid by way of a plurality of diverging jets and that can be sealed in a leak-proof and/or spill proof way.

5 US Pat App Pub No 2017/0348707 to The Procter & Gamble Company discloses a multi-hole nozzle component having a periphery, an inlet side and an opposing outlet side.

The production of these dispensing caps requires a relatively complicated and therefore both technically and economically costly mould. See, e.g., page 14 of PCT pb No WO2013/064299 disclosing the need to fabricate both an inner nozzle part 11 and outer nozzle part 10 by injection moulding to produce the disclosed nozzle.

10 A further production complication arises for dispensing caps having multiple, thin stream nozzles. See, e.g., page 1, col. 2, line 88- page 2, col. 3, line 1 of GB652144 disclosing that metal nipples may be soldered or otherwise secured in corresponding holes in the metal disc.

15 It is an object of the present invention to obviate and/or mitigate these disadvantages.

Summary

A one-piece plastic dispensing cap is disclosed. The dispensing cap has a landing ranging in diameter from approximately 13 mm to approximately 20 mm. The dispensing cap comprises a central nozzle and a plurality of nozzles arranged in one or more rings, distanced from and concentric with the central nozzle. The central nozzle and plurality of nozzles have an average diameter ranging from approximately 0.3 mm to approximately 0.5 mm. The disclosed dispensing cap may include one or more of the following aspects:

- the central nozzle dispensing in a vertical angle;
- 25 • each nozzle of the plurality of nozzles being angled away from vertical;
- two concentric rings of nozzles;
- each nozzle in each successive ring being angled more from vertical than each nozzle in the preceding ring;
- 20 nozzles;
- 30 • the nozzle size varying from approximately 0.3 to approximately 0.45 mm;
- the nozzle size varying from approximately 0.35 to approximately 0.45mm;

- the size of the central nozzle and each nozzle of an inner ring of nozzles being about 0.35mm each;
- the size of each nozzle of an outer ring of nozzles being about 0.4mm each;
- the plastic being polyethylene; or
- 5 • the plastic being polypropylene.

Also disclosed is a bottle comprising any of the dispensing caps disclosed above.

The bottle may contain a cleaning formulation.

Also disclosed are methods of forming the dispensing caps disclosed above. A mono-block metal alloy mould is prepared comprising a central protuberance and a plurality of
10 protuberances arranged in one or more rings, distanced from and concentric with the central protuberance, the central protuberance and plurality of protuberances having an average diameter ranging from approximately 0.3 mm to approximately 0.5 mm. The dispensing cap is injection moulded using the mono-block metal alloy mould. The disclosed methods may include one or more of the following aspects:

- 15 • the central protuberance oriented in a vertical angle;
- each plurality of protuberances being angled away from vertical;
- each successive ring being angled more from vertical than the preceding ring;
- two concentric rings of protuberances;
- 20 protuberances;
- 20 • the protuberance size varying from approximately 0.35 to approximately 0.4mm;
- the size of the central protuberance and an inner ring of protuberances being about 0.35mm each; or
- the size of an outer ring of protuberances being about 0.4mm each.

25 Brief Description of the Figures

The invention is illustrated with reference to the following non-limiting Figures; in which,

Figure 1 shows a perspective view of one embodiment of the disclosed dispensing cap **1** with a lid **5**, and

30 **Figure 2** shows a perspective view of one embodiment of the mould **20** used to produce the dispensing cap **1** of Figure 1.

Description of Preferred Embodiments

According to a first aspect of the invention there is provided a dispensing cap comprising a central nozzle and a plurality of other nozzles arranged in one or more rings, distanced from and concentric with the central nozzle.

5 Preferably the central nozzle dispenses in vertical angle.

Generally, each ring is angled away from the vertical. Each successive ring is preferably angled more from the vertical.

The angle of the nozzles of each ring may define an angle from the vertical. The dispense angle of the or each ring can be varied and hence change the cone as required.

10 Generally, the dispensing cap has two concentric rings.

There may be a maximum of 2 rings around the central nozzle and these can be spaced accordingly to available space on moulded part. Each ring preferably has up to 10 nozzles.

Nozzle sizes vary, having an average diameter between approximately 0.35 to approximately 0.4mm, primarily due to angled tips/ processing /shrinkage. As the diameter of the nozzle may increase from its top to bottom, the average diameter of the nozzle is used for reference herein and is an average of the inner and outer diameters of the nozzle. As used herein, any and all ranges are inclusive of their endpoints. As used herein, the terms “about” or “approximately” mean $\pm 10\%$.

20 Preferably central nozzle and inner ring have an average diameter of about 0.3 to about 0.35mm.

Preferably the outer ring (where present) has nozzle size of about 0.4mm.

The overall cap diameter (in the area containing the nozzles) may range from approximately 13 mm to approximately 20 mm, and is preferably about 15mm.

25 Preferably the nozzle section is raised relative to the remainder of the cap.

Preferably the cap comprises a plastics material, such as polyethylene or the homopolymer, random copolymer, or block copolymer of polypropylene or combinations thereof. More preferably, the cap comprises the homopolymer, random copolymer, or block copolymer of polypropylene.

30 Preferably the cap is used for a bottle, wherein the bottle generally contains a cleaning formulation. As such the cap preferably includes a section suitable for attachment

to a bottle; e.g. such as screw threads suitable for engaging complementary threads on a bottle.

Preferably the cap has a lid (such as a hinged lid). The lid is preferably designed to shut off all nozzles, when in a closed position.

5 The bottle is preferably employed for cleaning vertical surfaces such as bathrooms, lavatories, showers as well as mopping floors & other horizontal surfaces.

Figure 1 shows a perspective view of one embodiment of the disclosed dispensing cap **1** with a lid **5**. The dispensing cap **1** comprises a central nozzle **2** and a plurality of other nozzles arranged in two rings **3** and **4**, distanced from and concentric with the central nozzles **2**. Although not visible in **Figure 1**, but as will become evident upon review of **Figure**
10 **2**, the nozzles of the rings **3** and **4** are successively angled away from the vertical.

The dispensing cap **1** includes a landing **7** having a width **w**. Width **w** may range from approximately 10 mm to approximately 20 mm. In **Figure 1**, width **w** is approximately 15 mm. As shown in **Figure 1**, landing **7** includes 20 nozzles; 1 central nozzle **2**, 7 nozzles in
15 ring **3**, and 12 nozzles in ring **4**. One of ordinary skill in the art will recognize that the width **w** of landing **7** may vary and permit fewer or more nozzles without departing from the teachings herein.

The dispensing cap **1** has an associated lid **5** which connects to the dispensing cap **1** via a hinge **6**. Locking mechanism **11a** and **11b** permit the lid to remain securely closed.

20 In **Figure 1**, dispensing cap **1** includes 4 steps **10** that raises the landing **7** and nozzles relative to the remainder of the cap **1**. One of ordinary skill in the art will recognize that the dispensing cap **1** may be designed with more or fewer steps **10** without departing from the teachings herein.

25 Dispensing cap further includes a skirt **8** and edge **9**. Skirt **8** and edge **9** permit the dispensing cap **1** to connect with a bottle (not shown).

Thus, according to a second aspect of the invention there is provided a cleaning method for a vertical hard surface comprising the discharge of a cleaning formulation from a container which includes a dispensing cap according to a first aspect of the invention. This method has been found to be advantageous. A principle advantage is that the
30 discharge of the cleaning composition has been found to be highly focussed onto the surface being cleaned: very little of the cleaning composition fails to reach or is cast off from the surface being cleaned.

According to a third aspect of the invention there is provided a method of forming a dispensing cap according to the first aspect of the invention wherein the forming process includes a mono-block design.

The prior art production of dispensing caps like those of **Figure 1** requires a comparatively complicated and thus technically and economically complex tool mold. The complications include the multiple pins required to mold these nozzles and very tight process settings to deliver tight specification tolerances. The cores which produce the inclined nozzles are circular in cross-section and cannot be handled with a common mould due to angular positions. This drawback is all the more serious since such dispensing caps are produced in different sizes, but not in particularly high numbers.

Figure 2 shows a perspective view of one embodiment of the mould **20** used to produce the dispensing cap **1** of **Figure 1**. The mould **20** includes a vertical protuberance **2a** used to produce the central nozzle **2** of dispensing cap **1**. The mould **20** includes a ring of 7 angled protuberances **3a** used to produce the nozzles of ring **3** of dispensing cap **1**. The mould **20** includes a ring of 13 angled protuberances **4a** used to produce the nozzles of ring **4** of dispensing cap **1**. One of ordinary skill in the art will recognize that the mould **20** may include fewer or more nozzles without departing from the teachings herein. One of ordinary skill in the art will further recognize that mould **20** of **Figure 2** is provided for exemplary purposes only and does not exactly match the dispensing cap **1** of **Figure 1** because it produces less steps **10**.

The mould **20** may be produced from a metal alloy block using a CNC machine (Computer Numerical Control). The dispensing cap **1** may be produced by injection moulding using the mono-block metal alloy mould **20**. Once the plastic cools, the dispensing cap **1** is removed from the mould **2**. One of ordinary skill in the art will recognize that process efficiency increases when multiple moulds **20** are used simultaneously. For example, some injection moulding processes may use 9 moulds **20** while others may use 26.

The use of the mono-block mould **20** design has been found to solve the prior art issues. The mono-block of steel can be easily maintained /replaced when required. Additionally, the mould **20** permits manufacture of a 1-piece dispensing cap **1** having a landing with a diameter ranging from approximately 13 nm to approximately 20 nm and multiple nozzles having an average diameter ranging from approximately 0.3 mm to approximately 0.5 mm.

The use of the mono-block design has been found to be advantageous. A principle advantage is that the dispensing caps can be formed quickly and in large numbers without the risk of frequent pin breakage / moulding down times and the need for frequent maintenance too. This reduces the overall cost of the cap.

- 5 Further this method does not include pins, which have been commonly used in prior art moulds to form the nozzles in such dispensing caps. Due to the size of the nozzles in the dispensing caps, these pins (although generally formed of metal) are fragile and frequently break / need replacing. The mono-block forming process solves this issue.

CLAIMS

We claim:

1. A one-piece plastic dispensing cap having a landing ranging in diameter from approximately 13 mm to approximately 20 mm, the dispensing cap comprising a central nozzle and a plurality of nozzles arranged in one or more rings, distanced from and concentric with the central nozzle, the central nozzle and plurality of nozzles having an average diameter ranging from approximately 0.3 mm to approximately 0.4 mm.
2. A dispensing cap according to claim 1, wherein the central nozzle dispenses in a vertical angle.
3. A dispensing cap according to claim 1 or 2, wherein each nozzle of the plurality of nozzles is angled away from the vertical.
4. The dispensing cap according to any preceding claim, wherein the cap comprises two concentric rings of nozzles.
5. A dispensing cap according to claim 4, wherein each nozzle in a successive ring is angled more from the vertical than each nozzle in a preceding ring.
6. The dispensing cap according to any preceding claim, wherein the dispensing cap comprises 20 nozzles.
7. The dispensing cap according to any preceding claim, wherein the nozzle size varies from 0.3 to 0.45 mm.
8. The dispensing cap according to any preceding claim, wherein the size of the central nozzle and each nozzle of an inner ring of nozzles is about 0.35mm each.
9. The dispensing cap according to any preceding claim, wherein the size of each nozzle of an outer ring of nozzles is about 0.4mm each.

10. The dispensing cap according to any preceding claim, wherein the cap is polypropylene.

11. A bottle comprising the dispensing cap according to any preceding claim.

5 12. The bottle according to claim 11, wherein the bottle contains a cleaning formulation.

13. A method of forming a dispensing cap according to any of the preceding claims, the method preparing a mono-block metal alloy mould comprising a central protuberance and a plurality of protuberances arranged in one or more rings, distanced from and concentric with the central protuberance, the central protuberance and plurality of protuberances having an average diameter ranging from approximately 0.3 mm to approximately 0.5 mm and injection moulding the dispensing cap using the mono-block metal alloy mould.

14. The method of claim 13, wherein the mono-block metal alloy mould comprises two concentric rings of protuberances.

15. The method of claim 13, wherein the mono-block metal alloy mould comprises 20 protuberances.

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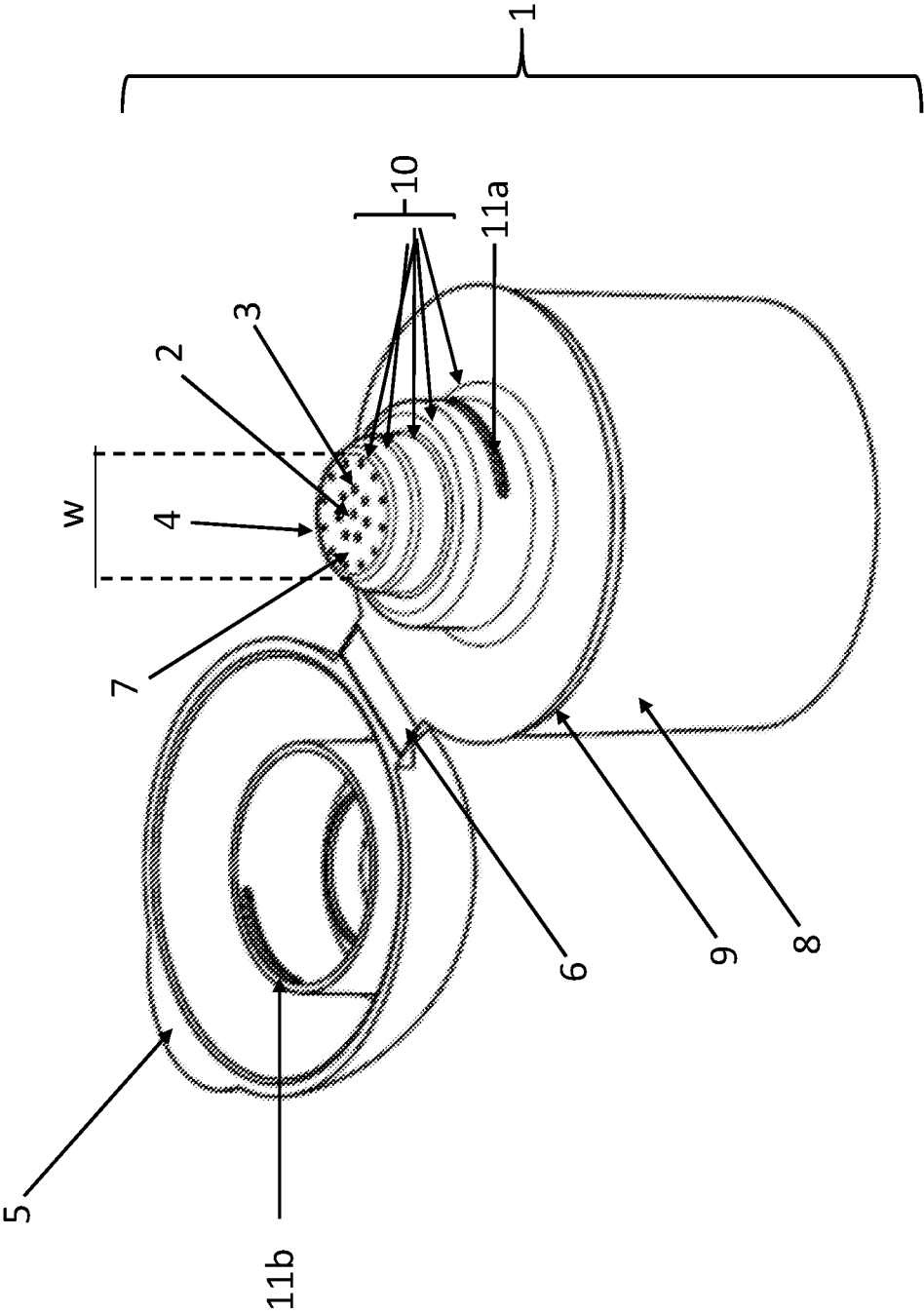


Fig 1

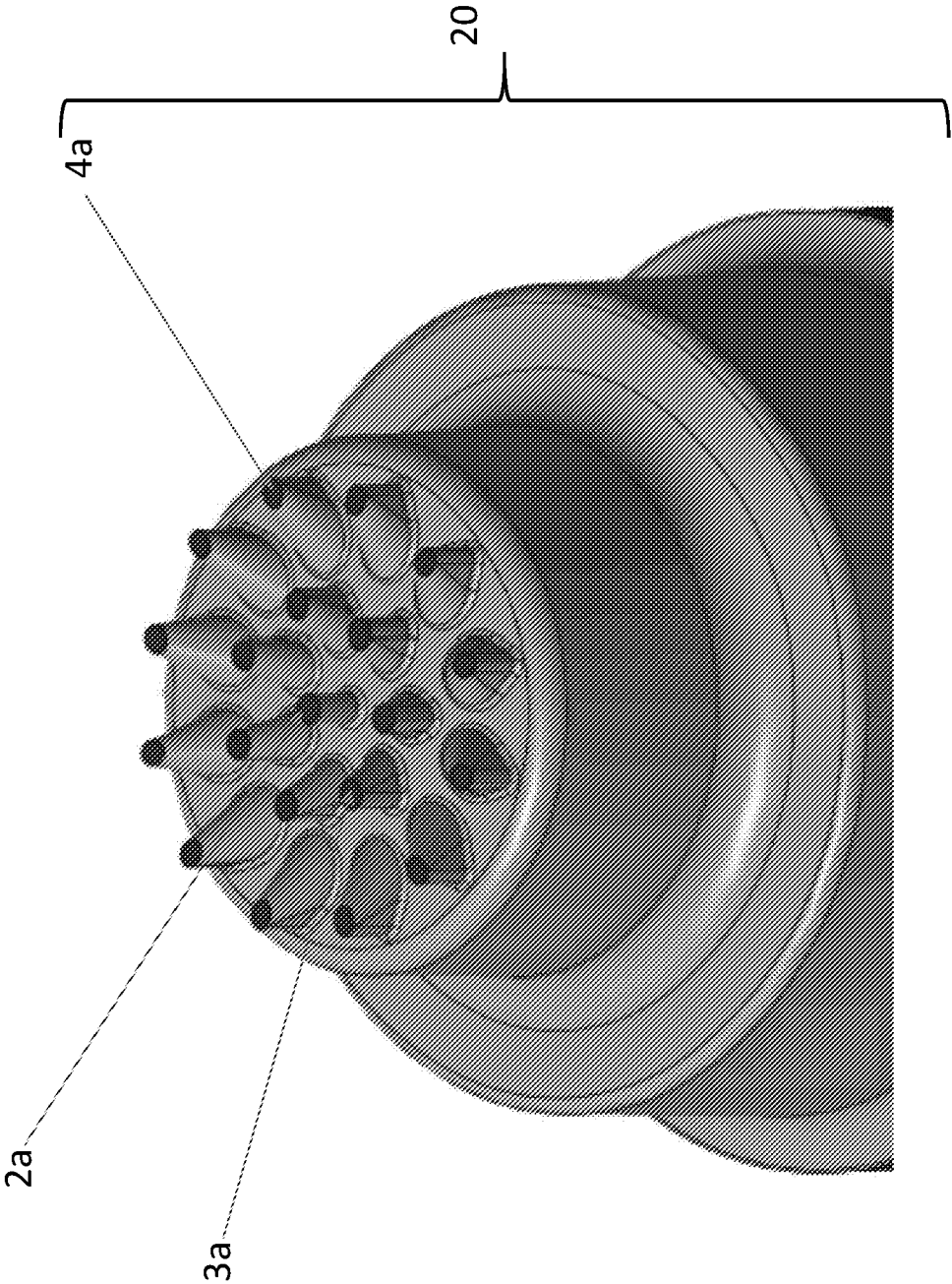


Fig 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2018/053531

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D47/18
ADD.

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)
B65D

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2009/008715 A1 (FRIESLAND BRANDS BV [NL]; BONGERS CORNELIS MARGARETHA THEODORUS MARIA) 15 January 2009 (2009-01-15) page 4, lines 18-26 page 11, line 23 - page 12, line 4 page 14, line 25 - page 15, line 29 page 18, lines 13-22; figure 4a -----	1-15
Y	WO 2013/064299 A1 (UNILEVER NV [NL]; UNILEVER PLC [GB]; UNILEVER HINDUSTAN [IN]; FOGGIA C) 10 May 2013 (2013-05-10) cited in the application page 9, line 28 - page 11, line 18; figures 1-16 ----- -/-	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

8 February 2019

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25/02/2019

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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2018/053531

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 652 144 A (DORIS MABEL IRELAND SARGEANT) 18 April 1951 (1951-04-18) cited in the application page 2, line 107 - page 3, line 109; figures 1-7 -----	1-15
A	US 1 355 973 A (HOLLINGSWORTH THOMAS L) 19 October 1920 (1920-10-19) cited in the application page 1, lines 52-101; figures 1-4 -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2018/053531

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2009008715 A1	15-01-2009	EP 2164776 A1 WO 2009008715 A1	24-03-2010 15-01-2009

WO 2013064299 A1	10-05-2013	NONE	

GB 652144 A	18-04-1951	NONE	

US 1355973 A	19-10-1920	NONE	
