



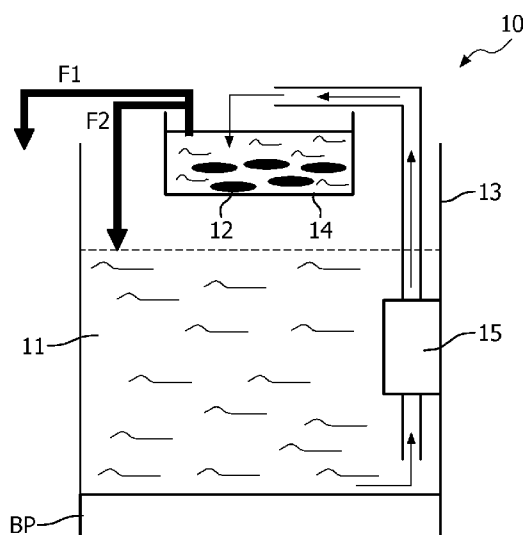
- (51) **International Patent Classification:**
A47J 31/053 (2006.01) A47J 31/18 (2006.01)
- (21) **International Application Number:**
PCT/IB2012/052279
- (22) **International Filing Date:**
8 May 2012 (08.05.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
PCT/CN2011/074523 23 May 2011 (23.05.2011) CN
- (71) **Applicant (for all designated States except US):**
KONINKLIJKE PHILIPS ELECTRONICS N.V.
[NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
- (72) **Inventor; and**
- (75) **Inventor/Applicant (for US only):** **HA, Wan, Kei, Ricky**
[CN/CN]; c/o High Tech Campus Building 44, NL-5656 AE Eindhoven (NL).
- (74) **Agents:** **COOPS, Peter** et al.; High Tech Campus, Building 44, NL-5656 AE Eindhoven (NL).
- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, 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, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

[Continued on next page]

(54) **Title:** APPARATUS AND METHOD FOR PREPARING A BEVERAGE FROM A SOLVENT AND INGREDIENTS

**FIG. 1**

(57) **Abstract:** The invention relates to a method of, and an apparatus (10) for, preparing a beverage from a solvent (11) and ingredients (12). The apparatus comprises: - a container (13) for containing the solvent, - an infuser (14) for containing the ingredients, - a first system (15) for moving solvent from the container to the infuser, and - a second system adapted to assume a first position for moving solvent being in the infuser out of the container, and a second position for carrying solvent being in the infuser back into the container. This apparatus allows preparing a beverage from a solvent and ingredients by means of a preliminary rinsing step of the ingredients, which is conducted in a simple manner for the user. Also, this apparatus allows a user to easily control the rinsing of the ingredients with respect to time, amount of water, etc., which minimizes nutritional loss (e.g. catechins in tea) during rinsing of the ingredients.



Published:

— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

APPARATUS AND METHOD FOR PREPARING A BEVERAGE FROM A SOLVENT AND INGREDIENTS

5 FIELD OF THE INVENTION

The invention relates to an apparatus for and a method of preparing a beverage from a solvent and ingredients.

The invention may be used in the field of beverage preparation.

10

BACKGROUND OF THE INVENTION

When preparing a beverage from a solvent and ingredients, users often perform a preliminary rinsing step of the ingredients for hygienic purposes, so that dirt and other impurities are removed from the ingredients.

15

This is for example the case when preparing a tea beverage from water and tea leaves. To some tea drinkers, tea rinsing is a necessary step in in the tea making process, wherein the first tea brew is not consumed and is either thrown away or used for other purposes like cup rinsing. Then, after rinsing the tea leaves, the tea leaves are brewed in water, resulting in the tea
20 beverage. In spite of modern tea production methods that greatly improve tea cleanliness and hygiene, the practice of tea rinsing still persists.

Patent US 201010263549 A1 describes an infusing apparatus or beverage container including a container, a perforated infuser configured to be positioned in the container, and an actuator
25 including an activating member and an actuator body. The activating member is accessible from outside the interior space and rotatably coupled with respect to the container, and the actuator body is rotatably coupled to the infuser, such that rotation of the actuator body with respect to the container can lower and raise the infuser with respect to the container to selectively begin and cease an infusion process and drink the resulting beverage without having to remove

ingredients placed in the infuser.

The apparatus described in Patent US 201010263549 A1 is adapted to perform brewing of ingredients, but has some limitations in the sense that it is not adapted to perform preliminary rinsing of ingredients put in the infuser. If a user of this apparatus wants to perform preliminary
5 rinsing of ingredients, the user must manually throw away the beverage in the container resulting from the rinsing process, which is not convenient. Moreover, if a user performs this manual rinsing step, some nutrients contained in the ingredients may also be carried away because the rinsing can hardly be controlled by the user, thereby risking reducing the nutritional contents of the beverage obtained after brewing.

10

SUMMARY OF THE INVENTION

It is an object of the invention to propose an improved apparatus and method for preparing a beverage from a solvent and ingredients. The invention is defined by the independent claims. The dependent claims define advantageous embodiments.

15

To this end, the apparatus according to the invention comprises:

- a container for containing said solvent,
- an infuser for containing said ingredients,
- a first system for carrying solvent from said container into said infuser, and
20 - a second system adapted to assume a first position for carrying solvent being in the infuser from said container, and a second position for carrying solvent being in the infuser back into said container.

This apparatus allows preparing a beverage from a solvent and ingredients by subjecting the
25 ingredients to preliminary rinsing in a manner which is simple for the user. Also, this apparatus allows the user to easily control the rinsing of ingredients with respect to time, amount of water, etc., thereby minimizing nutritional loss (e.g. catechins in tea) during rinsing the ingredients.

Detailed explanations and other aspects of the invention will be given below.

BRIEF DESCRIPTION OF THE DRAWINGS

The particular aspects of the invention will now be explained with reference to the embodiments described hereinafter and considered in connection with the accompanying drawings, in which

5 identical parts or sub-steps are designated in the same manner:

Fig.1 depicts schematically an apparatus according to the invention,

Fig.2 depicts a drainage assembly used in an apparatus according to the invention,

Fig.3 depicts a drainage assembly used in an apparatus according to the invention,

Fig.4 depicts top views of an apparatus according to the invention,

10 Fig.5 depicts cross-sectional views of an apparatus according to the invention,

Fig.6 depicts top views of an apparatus according to the invention,

Fig.7 depicts cross-sectional views of an apparatus according to the invention,

Fig.8 depicts a drainage assembly used in an apparatus according to the invention,

Fig.9 depicts a drainage assembly used in an apparatus according to the invention,

15 Fig.10 depicts top views of an apparatus according to the invention,

Fig.11 depicts cross-sectional views of an apparatus according to the invention,

Fig.12 depicts top views of an apparatus according to the invention,

Fig.13 depicts cross-sectional views of an apparatus according to the invention,

Fig.14 depicts a drainage assembly used in an apparatus according to the invention,

20 Fig.15 depicts top views of an apparatus according to the invention,

Fig.16 depicts cross sectional views of an apparatus according to the invention,

Fig.17 depicts a drainage assembly used in an apparatus according to the invention,

Fig.18 depicts a drainage assembly used in an apparatus according to the invention,

Fig.19 depicts cross-sectional views of an apparatus according to the invention,

25 Fig.20 depicts top views of an apparatus according to the invention,

Fig.21 depicts cross-sectional views of an apparatus according to the invention,

Fig.22 depicts a drainage assembly used in an apparatus according to the invention,

Fig.23 depicts an apparatus according to the invention,

Fig.24 depicts an apparatus according to the invention,

Fig.25 depicts an apparatus according to the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Fig.1 depicts an apparatus 10 for preparing a beverage from a solvent 11 and ingredients 12

5 according to an embodiment of the invention. The apparatus 10 comprises:

- a container 13 for containing said solvent,
 - an infuser 14 for containing said ingredients,
 - a first system 15 for carrying solvent from said container into said infuser, and
 - a second system adapted to assume a first position P1 for carrying solvent being in the infuser
- 10 from said container, and a second position P2 for carrying solvent being in the infuser back into said container.

The solvent is preferably selected, without limitation, from among the following solvents, or a mix of the following solvents: water, mineral water, tap water, salted water, alcohol.

15

The ingredients may be selected, without limitation, from among at least one of the following ingredients: tea leaves, plant leaves, coffee grind, herbs, plant roots, fruits, dry fruits.

After the solvent has been carried into the infuser by the first system 15, the second system

20 allows carrying solvent being in the infuser from said container, as schematically illustrated by arrow F1, and carrying solvent being in the infuser back into said container, as schematically illustrated by arrow F2. The step of carrying solvent being in the infuser from said container is used to rinse ingredients in the infuser. By positioning the second system in the first position P1 during a given period of time, for example a time duration indicated to the user depending on

25 the ingredients used, part of the solvent initially in the container is carried by the first system 15 into the infuser for rinsing the ingredients, and the solvent in the infuser is then carried out of the container., By positioning the second system in the second position P2 after rinsing of the ingredients has been performed, the solvent in the infuser is carried back into the container so that the closed circulation of the solvent from the container to the infuser allows brewing the

ingredients. This closed circulation is continued until the solvent in the container has reached a desired level of infusion of ingredients in the solvent.

Advantageously, the infuser 14 is preferably placed at an upper part of the container, above the solvent. Optionally, the container comprises a bottom part BP that is used to strengthen the structure of the container, or to embed various elements, as will be further detailed herein below.

In a preferred embodiment, the second system is the infuser 14 itself. The infuser comprises a drainage assembly having a first end E1 and a second end E2. The first end E1 is intended to communicate with solvent being inside said infuser. The drainage assembly may correspond to:

- an open conduit structure DA1 placed at an upper part of the infuser, as depicted in Fig.2,
- an open conduit structure DA1 placed at a lower part of the infuser, as depicted in Fig.3,
- a pipe assembly DA2 placed at an upper part of the infuser, as depicted in Fig.8,
- a pipe assembly DA2 placed at a lower part of the infuser, as depicted in Fig.9,
- a siphon assembly DA4, as depicted in Fig.14.

The container comprises walls which are shaped so as to be asymmetric in section, such that said second end E2 can communicate with the exterior of said container in said first position P1), and such that said second end E2 can communicate with the interior of said container in said second position P2. Fig.4-10-15 depict top views of an apparatus according to the invention, also represented via cross-sections depicted in Fig.5-11-16, respectively, where the walls of the container are elliptically shaped. In this case, the walls of the container extend along two main axes, with a different length along each of said two axes. Similarly (not shown), the walls of the container could be rectangular-shaped. As depicted in Fig. 5-11-16, when the infuser 14 is in the first position P1), solvent in the infuser 14 is carried out of the container because the drainage assembly extends outside the walls of the container, whereas when the infuser 14 is in the second position P2), solvent in the infuser 14 is carried back into the container because the drainage assembly extends inside the walls of the container.

In another preferred embodiment, the second system is the infuser 14 itself. The container

comprises an exit path EP. The infuser comprises:

- a drainage assembly having a first end E1 and a second end E2), said first end E1 being intended to communicate with solvent being inside said infuser, and said second end E2 being intended to communicate with said exit path EP in said first position P1, and to communicate
- 5 inside said container in said second position P2,
- an open conduit structure DA1 placed at an upper part of the infuser, as depicted in Fig.2,
- an open conduit structure DA1 placed at a lower part of the infuser, as depicted in Fig.3,
- a pipe assembly DA2 placed at an upper part of the infuser, as depicted in Fig.8,
- a pipe assembly DA2 placed at a lower part of the infuser, as depicted in Fig.9,
- 10 - a hole DA3 in walls of said infuser placed at an upper part of the infuser, as depicted in Fig.17,
- a hole DA3 in walls of said infuser placed at a lower part of the infuser, as depicted in Fig.18,
- a siphon assembly DA4, as depicted in Fig.14.

Fig.6-12-20 depict top views of an apparatus according to the invention, also represented in the cross-sectional views of Fig.7-13-21, respectively. The exit path EP has one part extending

15 inside the container, and one part extending outside the walls of the container. As depicted in Fig.7-13-21, when the infuser 14 is in the first position P1), the second end of the drainage assembly is located above the part of the exit path being inside the container, which results in the solvent in the infuser 14 being carried out of the container via the exit path, whereas when the infuser 14 is in the second position P2), the second end of the drainage assembly is more

20 located above the part of the exit path being inside the container, which results in the solvent in the infuser 14 being carried back into the container.

Advantageously, as depicted in the apparatus of Fig.23, the infuser is adapted to rotate from the first position P1 to the second position P2), and to rotate from the second position P2 to the first

25 position P1. If the center of the infuser is taken as a reference, the angle of rotation is for example 90 degrees, as illustrated in the various top views. To this end, the infuser is mounted on a pivoting link PL connected to the walls of the container via an arm A. Advantageously, as depicted in Fig.24, this apparatus further comprises an actuator AC that can be activated by a user for rotating the infuser, such as an electrical motor activated by a switch (not shown)

operated by the user to move the second system between the first position P1 and the second position P2.

In another preferred embodiment, the second system comprises a drainage assembly mounted on the infuser 14. According to this embodiment, the infuser is fixed, while the drainage assembly can move between the first position P1 and the second position P2. As depicted in Fig.22, the drainage assembly DA5 may correspond to a siphon assembly DA5 comprising a mechanism C, such as a clip, to allow the drainage assembly to move (e.g. through manual user action) along the upper edge of infuser 14 between the first position P1 and the second position P2. This drainage assembly can advantageously be mounted on an apparatus as depicted in Fig.15-16-20-21.

In the various apparatus according to the invention described above, the container further comprises a heating element (not shown) placed in the bottom part BP of the container. The heating element is intended for heating the solvent. For example, the heating element may correspond to a resistor (not illustrated) connected to an electrical source. The heating element is intended for heating the solvent in the container, so that heated solvent is used in the infuser for rinsing ingredients, and then for brewing ingredients in the container.

In the various apparatus according to the invention described above, the first system 15 comprises a fluid pump for pumping solvent from said container into said infuser. Alternatively, as depicted in Fig.25, the first system 15 comprises:

- a tube T placed in the container, said tube having a first extremity EX1 placed in the proximity of a bottom part BP of the container, and a second extremity EX2 reaching the infuser 14, and
- an air pump AP for generating an air flow exiting at said bottom part and entering the tube at said first extremity, for carrying said solvent in said tube from said first extremity to said second extremity.

The air flow is illustrated by empty circles in solvent, under the first extremity. The air pump may be of any type, but is preferably a diaphragm air pump. Air originating from outside the

container is pumped into the container. It is appreciated that the tube T preferably extends vertically, so as to facilitate the movement of the air flow and the solvent in the tube. However, the tube may also be such that its main axis departs from the vertical direction, for example by an angle between 0 and 45 degrees. Also, the tube T is preferably cylindrical-shaped, but may alternatively have different shapes, such as a corkscrew-shape, or a curved-shape. The tube T advantageously has an average diameter between 5 and 7 millimeters, or an average sectional area between 19.6 and 38.5 square millimeters. Advantageously, as illustrated, the first extremity of tube T has a funnel-shaped entrance so that an air flow generated by the air pump can more easily enter the tube. The air pump advantageously generates an air flow of between 1 and 2 liters per minute, and in order for the tube to be efficient at least 80 % of this air flow should enter the tube at the first extremity. By generating an air flow by means of the air pump instead of vapor bubbles naturally generated by locally boiling water, as is the case with a standard percolator, the solvent can reach the upper part of the tube while having a temperature much below the boiling temperature of the solvent, which temperature can thus be adapted to the ingredients used. Preferably, if a heating element is used in the bottom part of the container, the heating power of the heating element is such that the solvent is heated to a temperature in excess of 60 degrees Centigrade, so as to improve the pumping effect in the tube T.

The invention also relates to a method of preparing a beverage from a solvent and ingredients, using a container containing the solvent and an infuser containing the ingredients. The method corresponds to various steps conducted by the various apparatus according to the invention described above. The method comprises the steps of:

- carrying solvent from said container into said infuser,
- carrying solvent being in the infuser from said container: this step is carried out to perform the rinsing of ingredients.
- carrying solvent being in the infuser back into said container: this step is carried out to perform the brewing of ingredients.

Other variations to the disclosed embodiments can be understood and effected by those skilled

in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single unit may fulfill the functions of several items recited in the claims. The mere fact that certain measures are
5 recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference signs in the claims should not be construed as limiting the scope.

CLAIMS

1. An apparatus (10) for preparing a beverage from a solvent (11) and ingredients (12), said apparatus comprising:

- 5 - a container (13) for containing said solvent,
 - an infuser (14) for containing said ingredients,
 - a first system (15) for carrying solvent from said container into said infuser, and
 - a second system adapted to assume a first position (P1) for carrying solvent being in the
infuser from said container, and a second position (P2) for carrying solvent being in the infuser
10 back into said container.

2. Apparatus as claimed in claim 1, wherein said second system is the infuser (14) itself.

3. Apparatus as claimed in claim 1, wherein said second system comprises a drainage assembly
15 mounted on said infuser.

4. Apparatus as claimed in claim 2, wherein said infuser comprises a drainage assembly having a
first end (E1) and a second end (E2), said first end (E1) being intended to communicate with
solvent being inside said infuser, said container comprising walls which are shaped so as to be
20 asymmetric in section such that said second end (E2) can communicate outside said container in
said first position (P1), and such that said second end (E2) can communicate inside said
container in said second position (P2).

5. Apparatus as claimed in claim 2, wherein said container comprises an exit path (EP), and
25 wherein said infuser comprises a drainage assembly having a first end (E1) and a second end
(E2), said first end (E1) being intended to communicate with solvent being inside said infuser,
said second end (E2) being intended to communicate with said exit path (EP) in said first
position (P1) and to communicate inside said container in said second position (P2).

6. Apparatus as claimed in claim 4 or 5, wherein said drainage assembly comprises an open conduit structure (DA1).

7. Apparatus as claimed in claim 4 or 5, wherein said drainage assembly comprises a pipe assembly (DA2).

8. Apparatus as claimed in claim 5, wherein said drainage assembly forms a hole (DA3) in walls of said infuser.

9. Apparatus as claimed in claim 3, 4 or 5, wherein said drainage assembly comprises a siphon assembly (DA4).

10. Apparatus as claimed in claim 2, wherein said infuser is adapted to rotate from said first position (P1) to said second position (P2), and to rotate from said second position (P2) to said first position (P1).

11. Apparatus as claimed in claim 10, further comprising an actuator (AC) for rotating said infuser.

12. Apparatus as claimed in claim 1, 2 or 3, wherein said first system comprises a fluid pump (15) for pumping solvent from said container into said infuser.

13. Apparatus as claimed in claim 1, 2 or 3, wherein said first system comprises:

- a tube (T) placed in the container, said tube having a first extremity (EX1) placed in the proximity of a bottom part (BP) of the container, and a second extremity (EX2) reaching the infuser 14, and

- an air pump (AP) for generating an air flow exiting at said bottom part and entering the tube at said first extremity, for carrying said solvent in said tube from said first extremity to said second extremity.

14. A method of preparing a beverage from a solvent and ingredients, using a container containing the solvent and an infuser containing the ingredients, said method comprising the steps of:

- 5 - carrying solvent from said container into said infuser,
 - carrying solvent being in the infuser from said container,
 - carrying solvent being in the infuser back into said container.

1/13

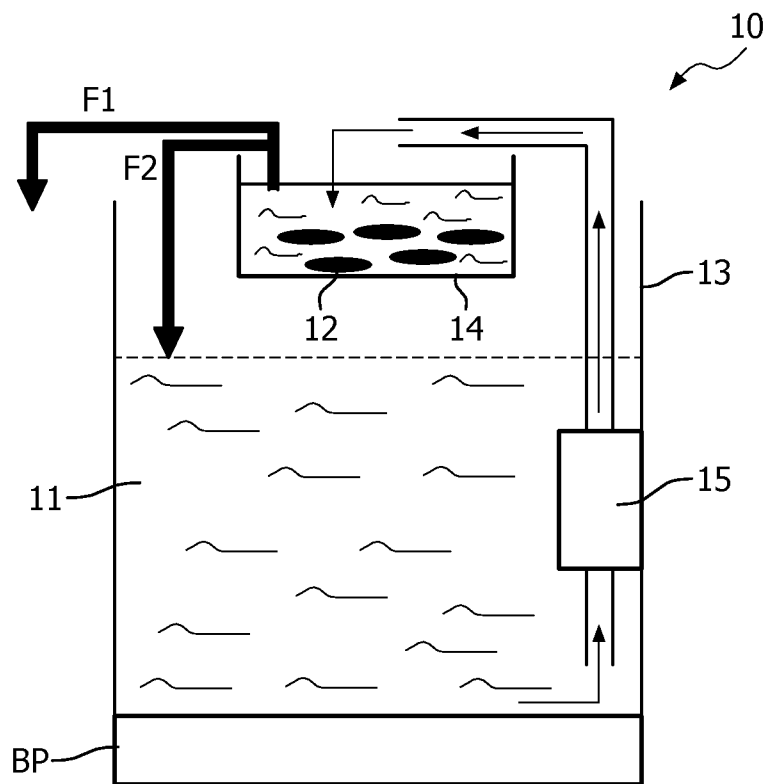


FIG. 1

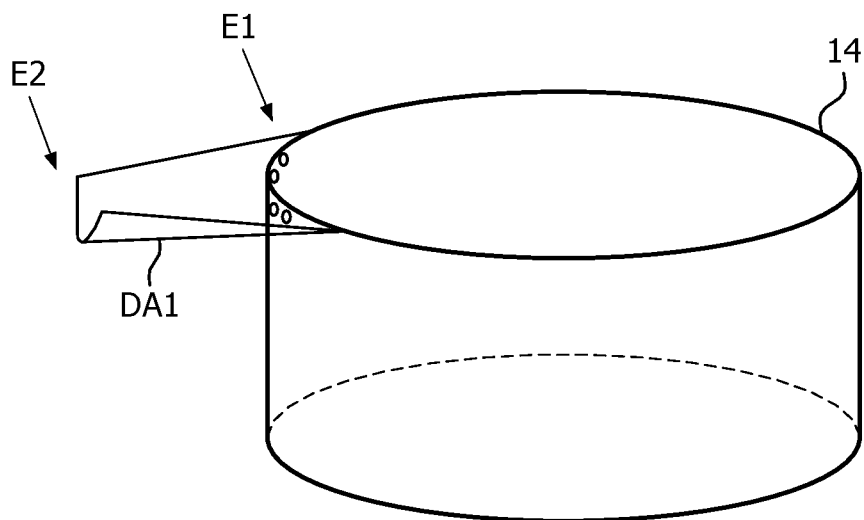


FIG. 2

2/13

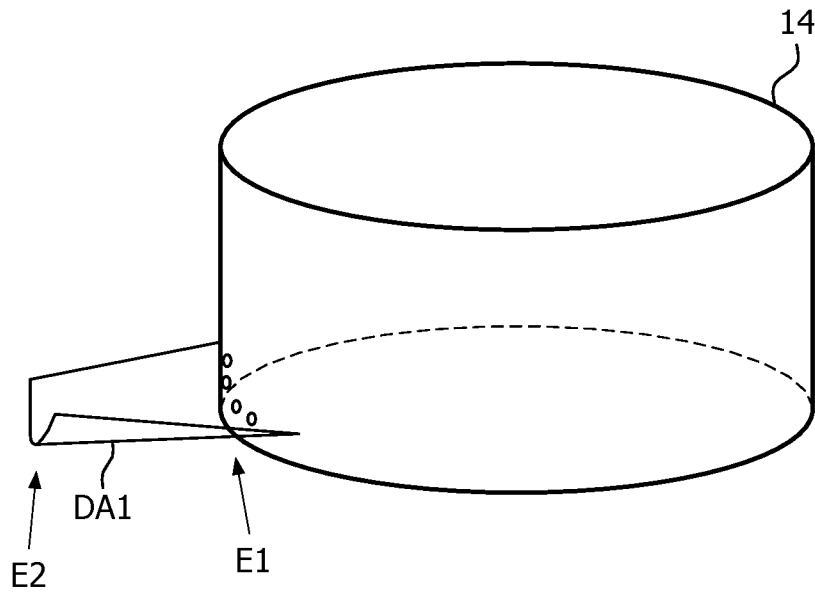


FIG. 3

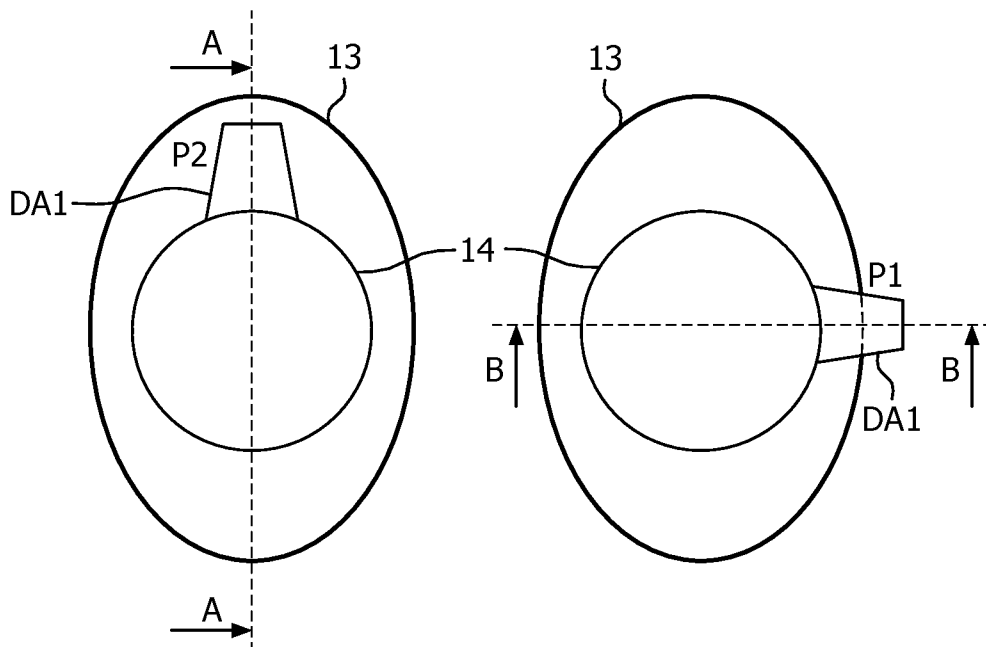


FIG. 4

3/13

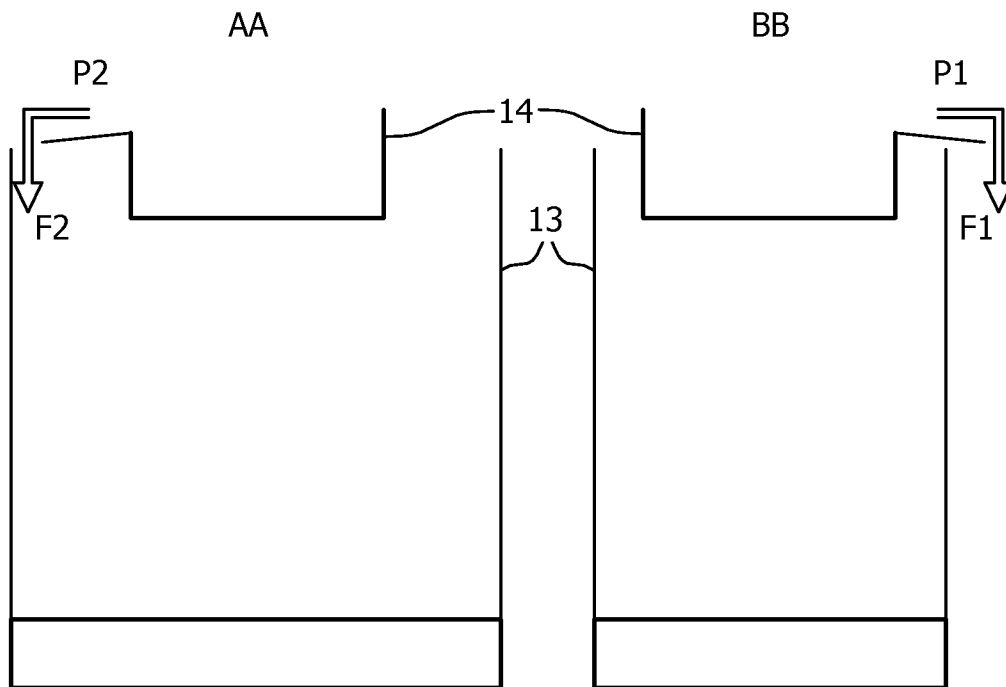


FIG. 5

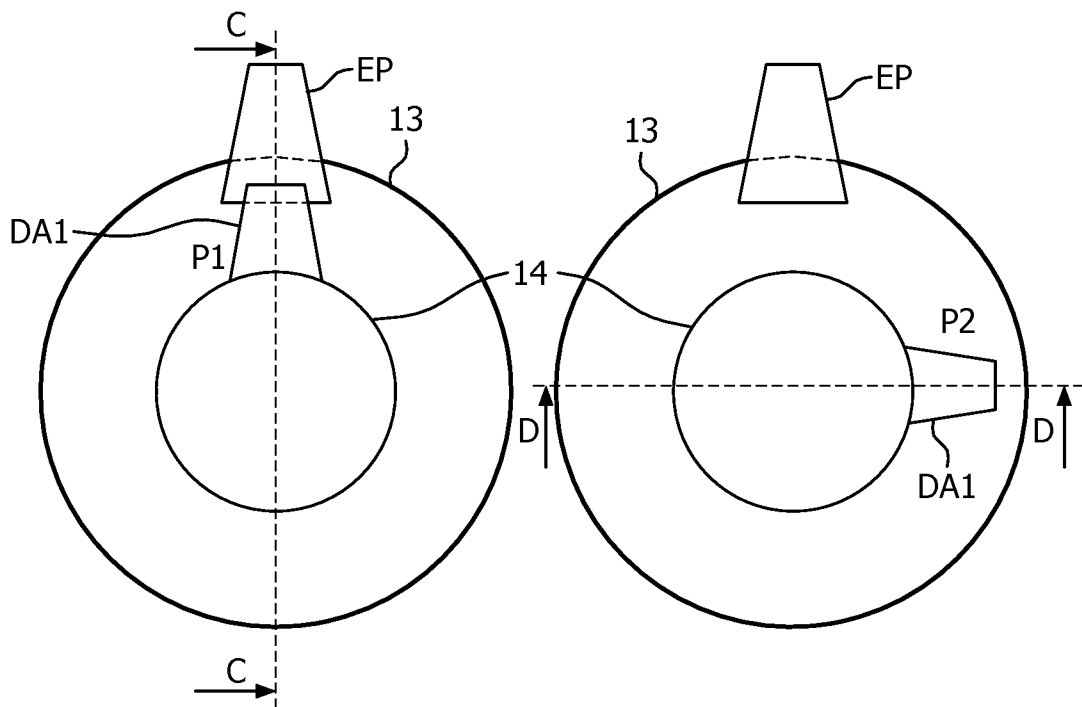


FIG. 6

4/13

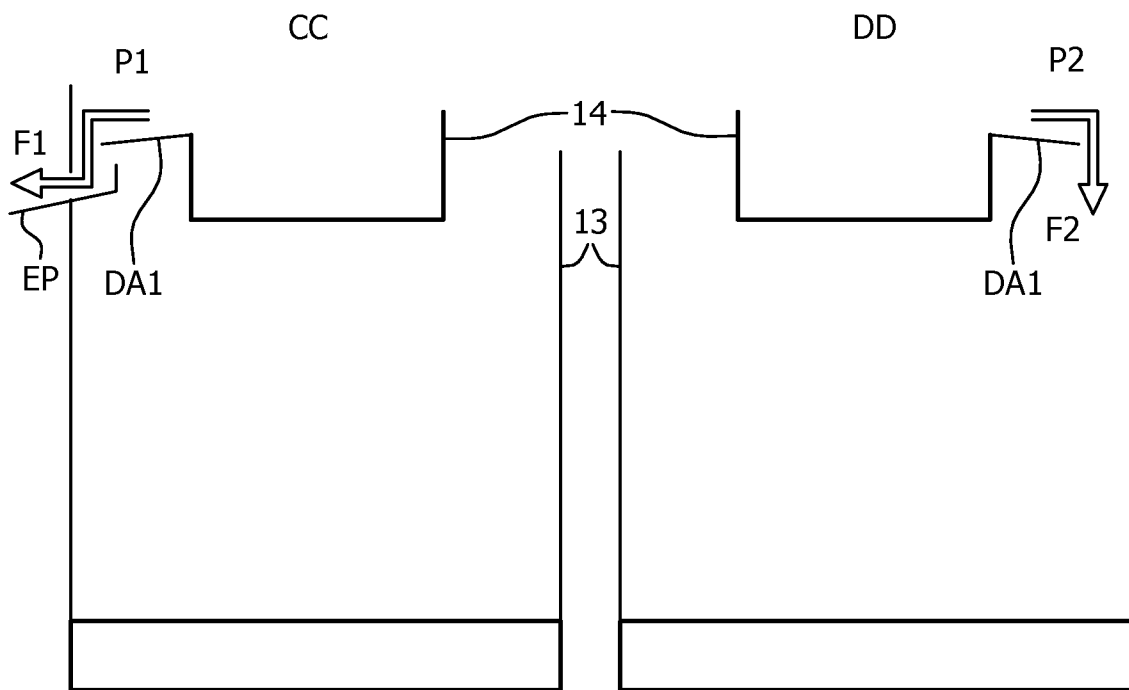


FIG. 7

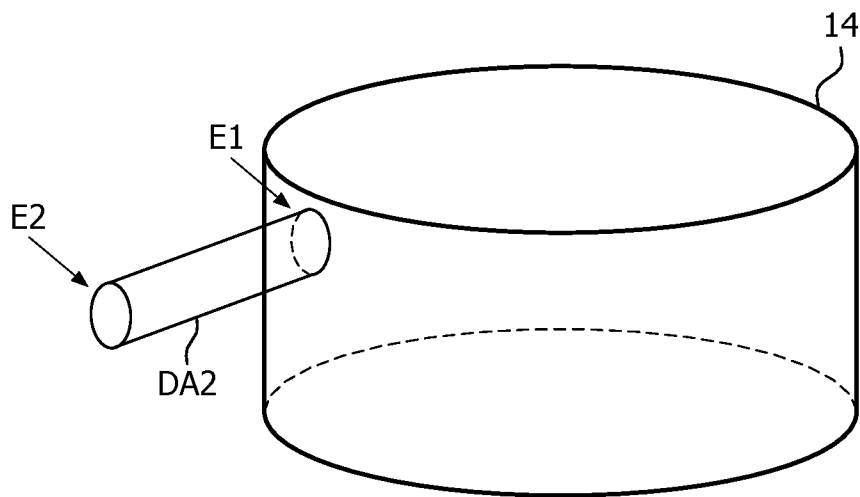


FIG. 8

5/13

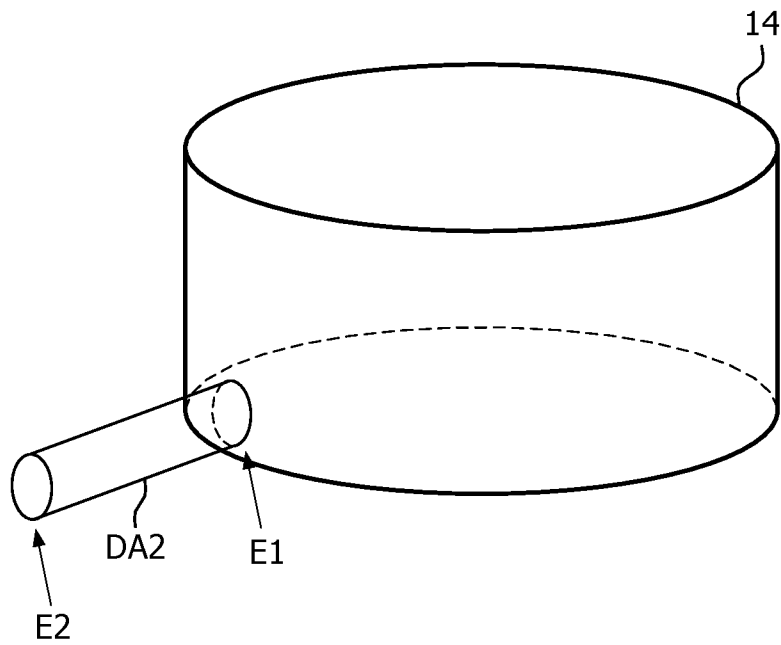


FIG. 9

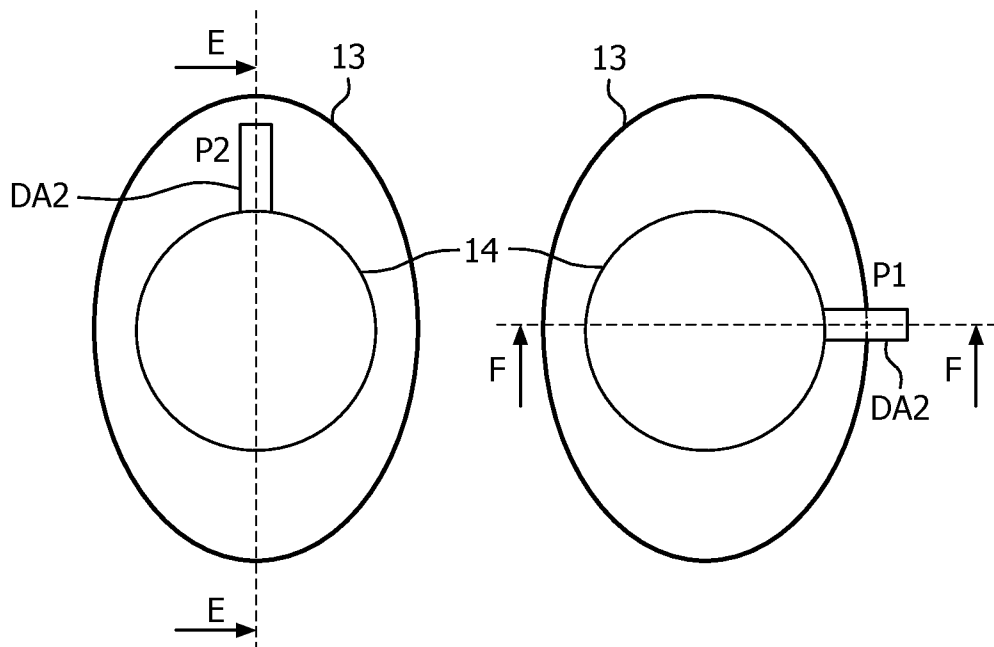


FIG. 10

6/13

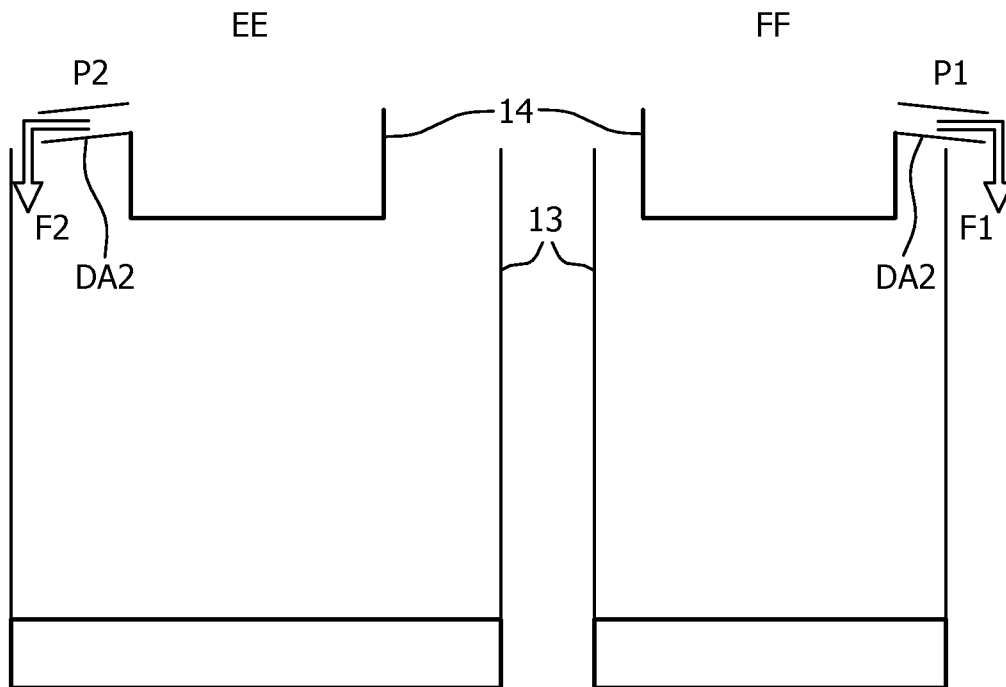


FIG. 11

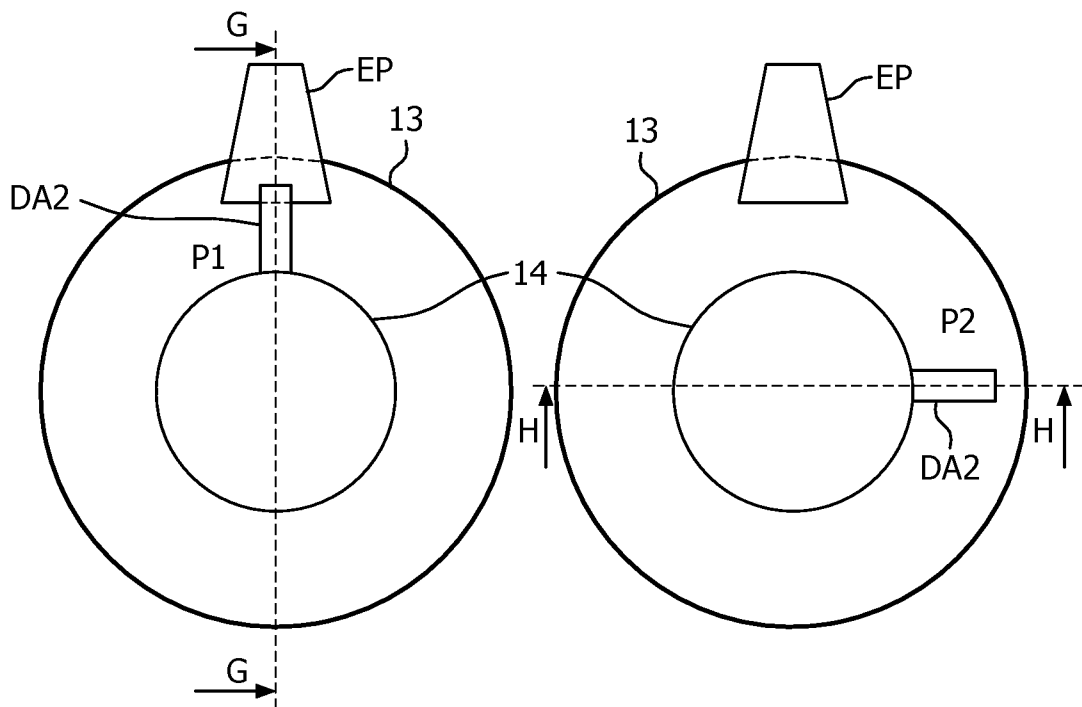


FIG. 12

7/13

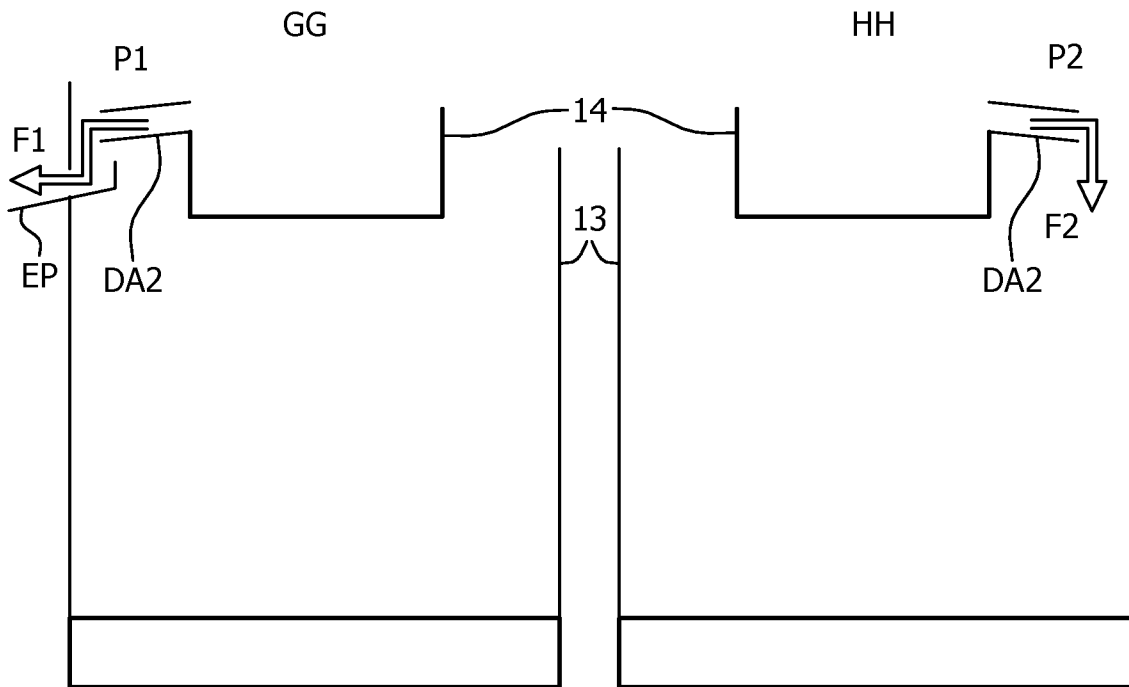


FIG. 13

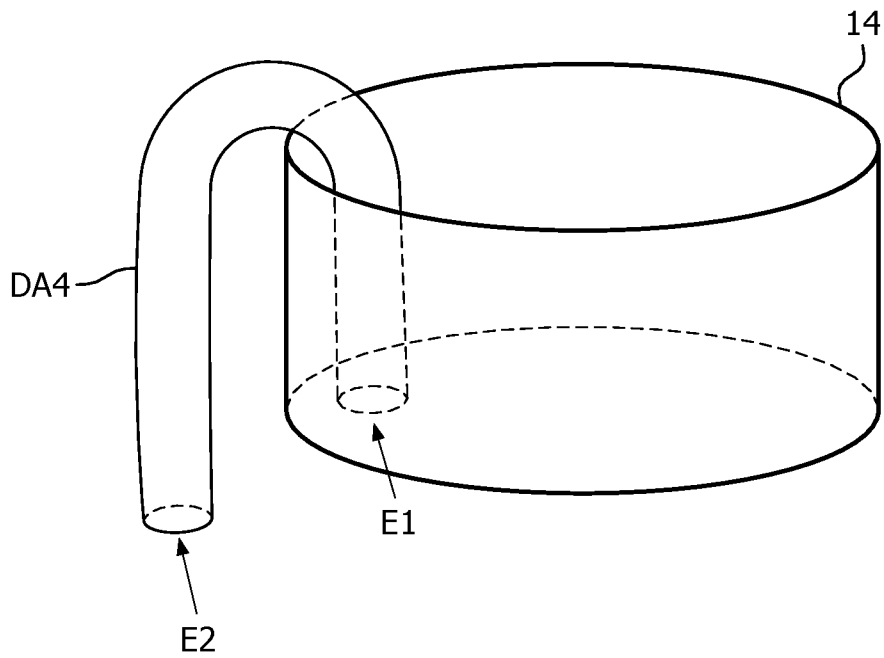


FIG. 14

8/13

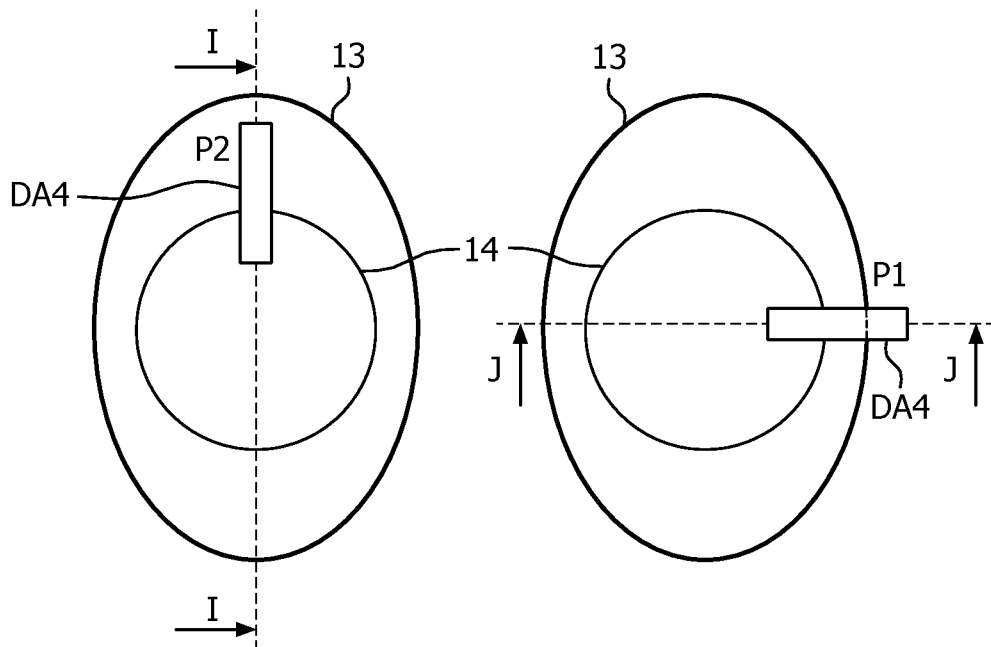


FIG. 15

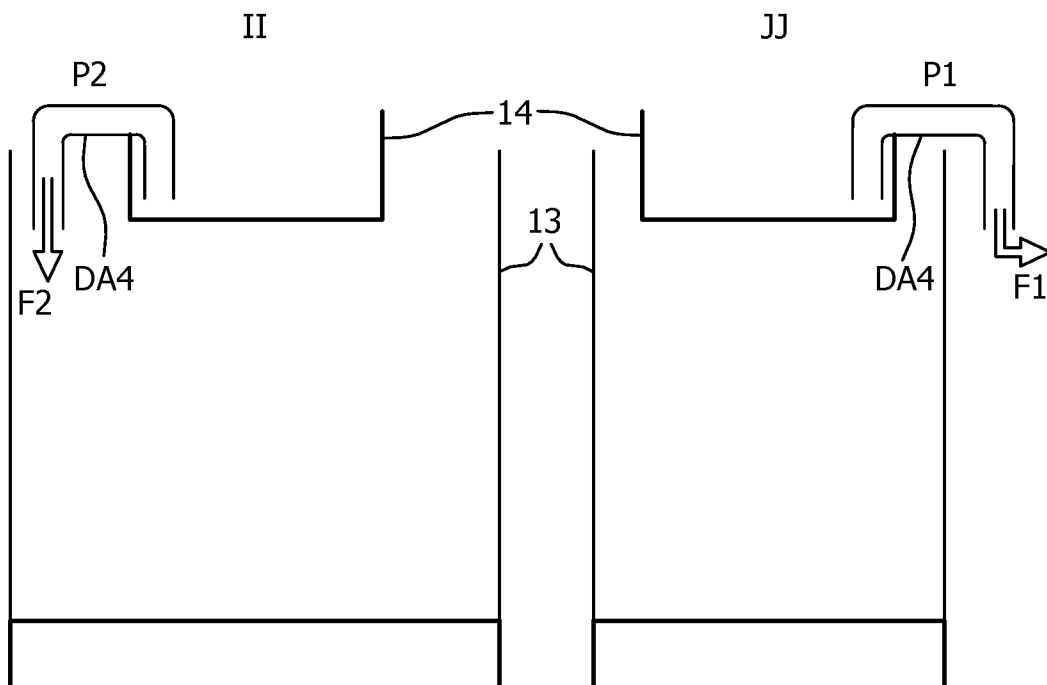


FIG. 16

9/13

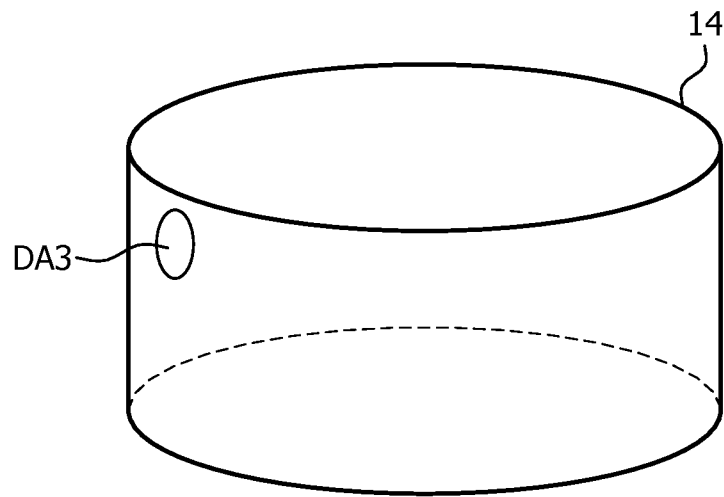


FIG. 17

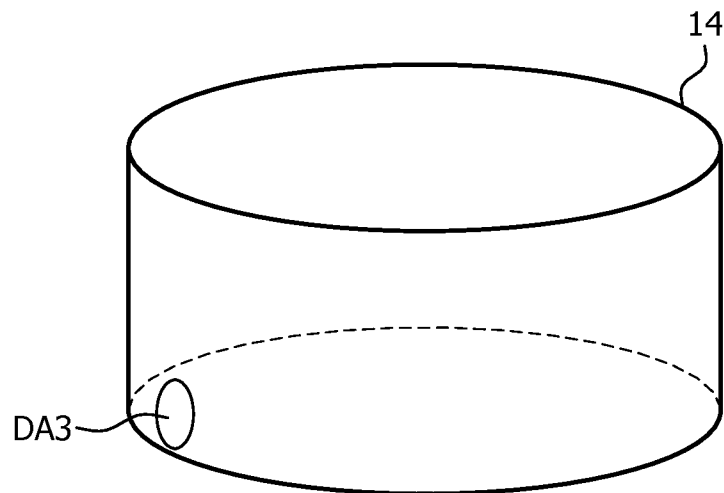


FIG. 18

10/13

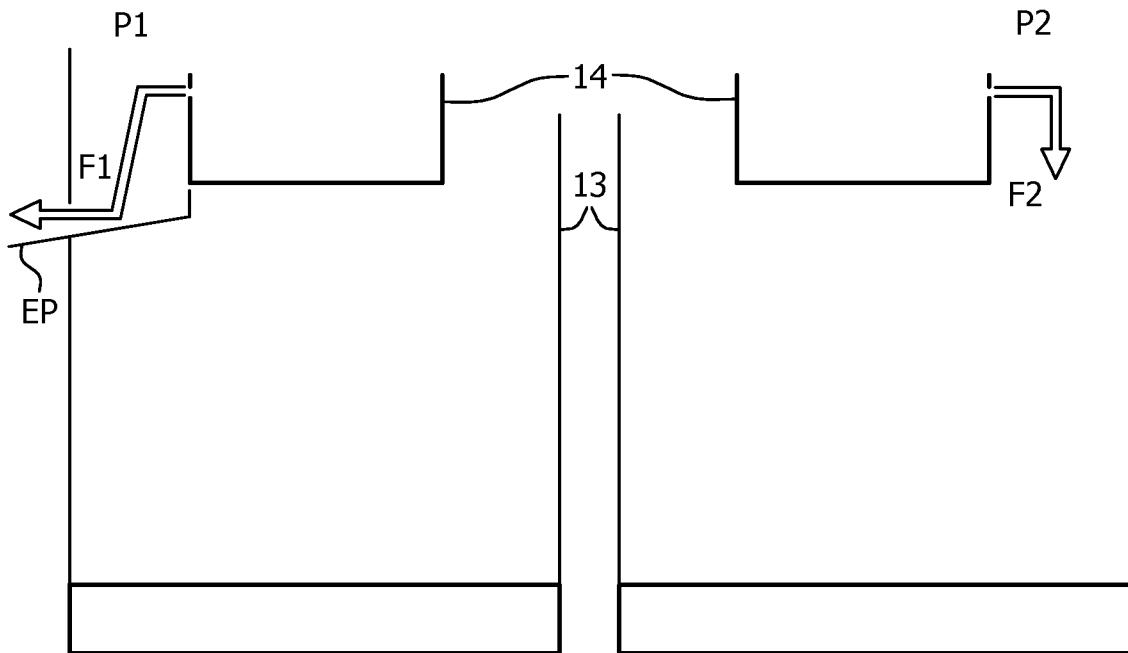


FIG. 19

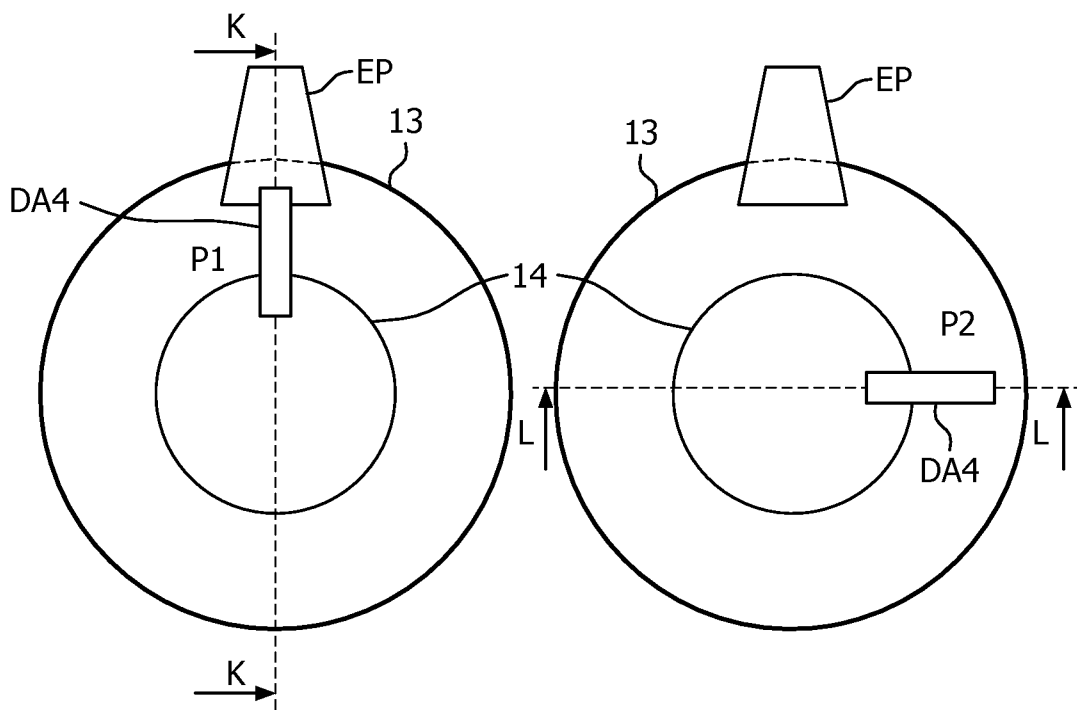


FIG. 20

11/13

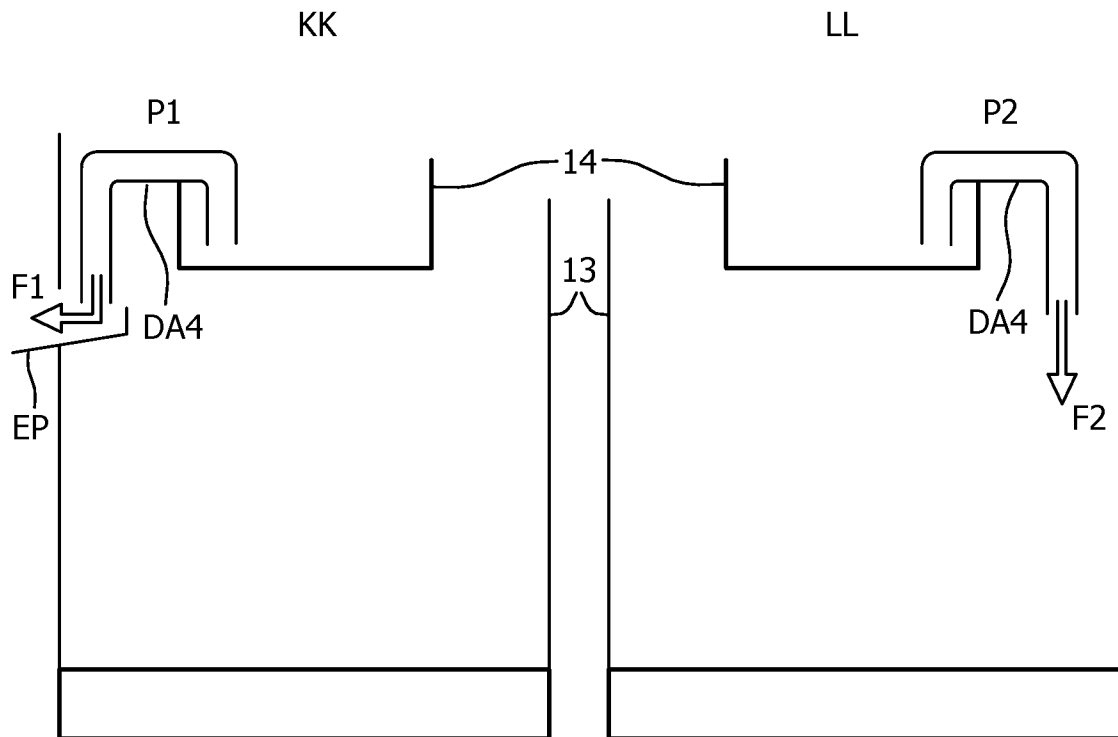


FIG. 21

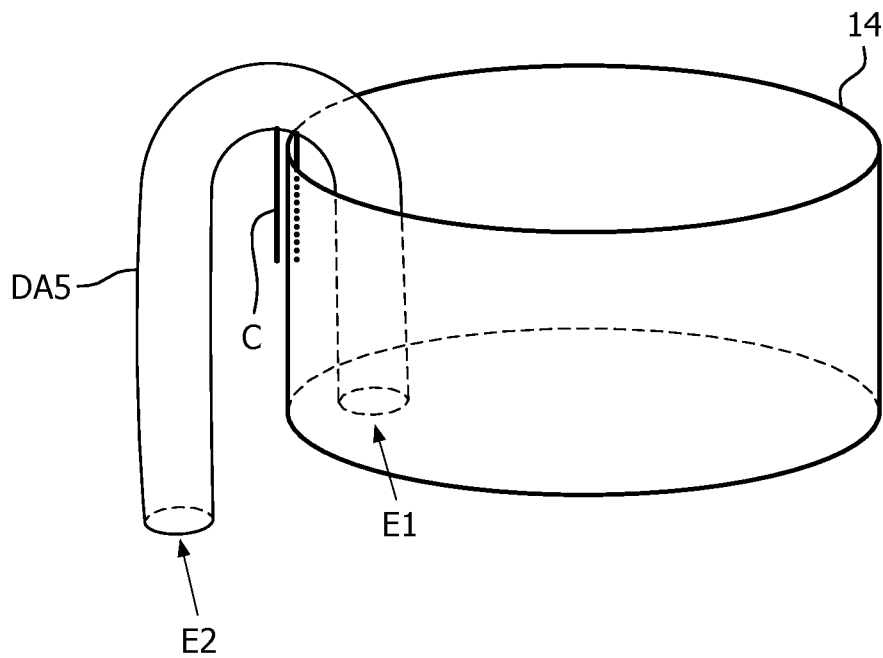


FIG. 22

12/13

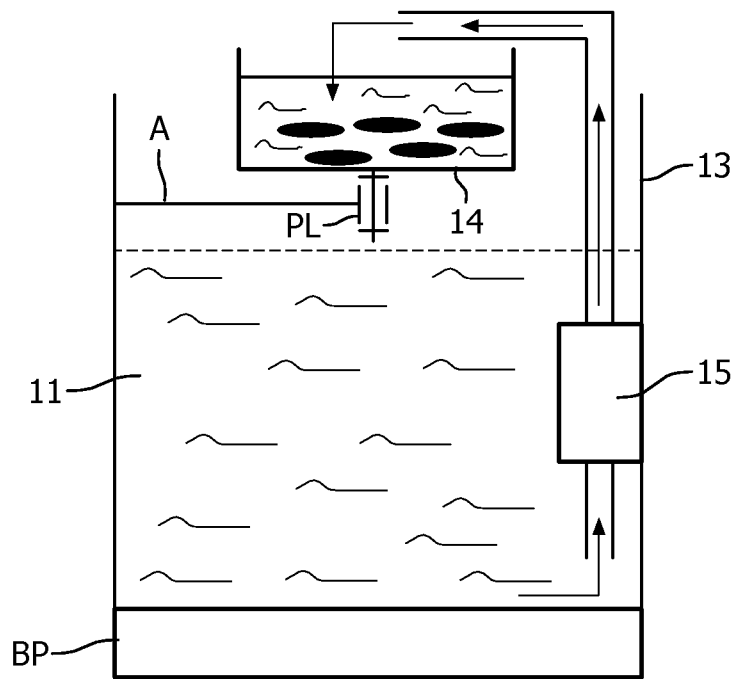


FIG. 23

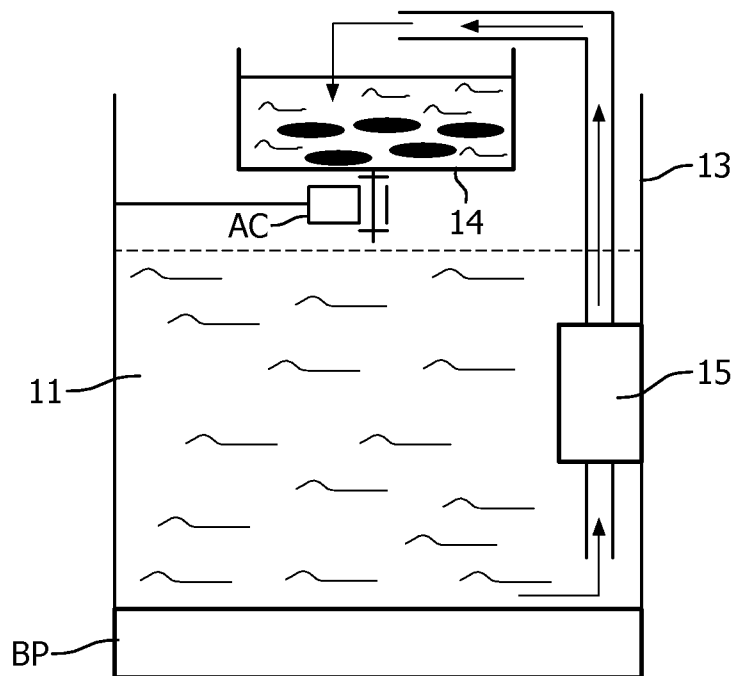


FIG. 24

13/13

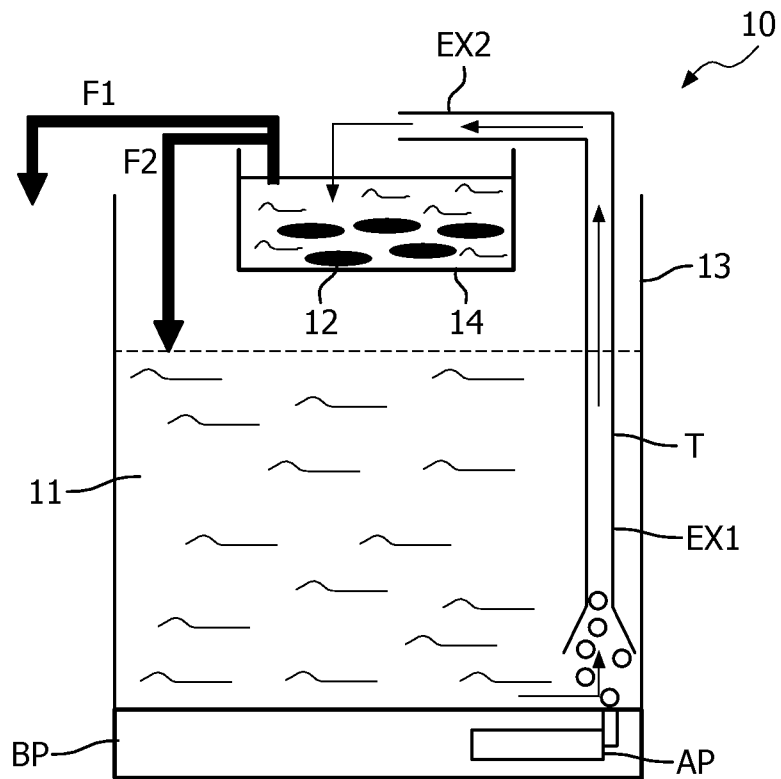


FIG. 25

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/052279

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J31/053 A47J31/18
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)
A47J

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)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 868 062 A (ENOMOTO KAZUO [JP]) 9 February 1999 (1999-02-09)	14
A	column 1, line 42 - line 46 column 18, line 15 - column 19, line 65 column 21, line 43 - column 22, line 53; claims; figures -----	1-13
X	US 4 464 983 A (CHAPPELL WILLIAM A [US] ET AL) 14 August 1984 (1984-08-14)	14
A	the whole document -----	1-13
X	US 2 975 723 A (ANDREWS THEODORE E) 21 March 1961 (1961-03-21)	14
A	the whole document -----	1-13



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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

25 September 2012

Date of mailing of the international search report

08/10/2012

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Acerbis, Giorgio

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2012/052279

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5868062	A	09-02-1999	CN 1164822 A	12-11-1997
			EP 0788753 A1	13-08-1997
			US 5868062 A	09-02-1999
			WO 9707722 A1	06-03-1997

US 4464983	A	14-08-1984	CA 1198761 A1	31-12-1985
			US 4464983 A	14-08-1984
			US 4512246 A	23-04-1985

US 2975723	A	21-03-1961	NONE	
