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(54) **Title:** A SELF SUSTAINING LIQUID CIRCULATING APPARATUS

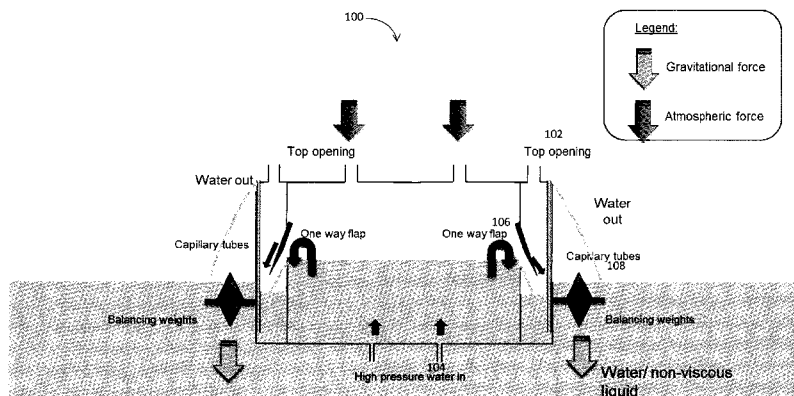


Figure 1

(57) **Abstract:** A self-sustaining liquid circulating apparatus (100) is provided, the apparatus (100) includes a buoyant housing which includes at least 2 inlets (104) at bottom of the housing, such that a high pressure flow path is present, at least 2 outlets (106) at mid portion of the housing, fitted with unidirectional flap valve, wherein at least 2 capillary tubes (108) are positionable exterior to the housing such that a continuous flow of liquid is produced throughout the apparatus (100), and at least 2 outlets (102) on top of the housing, such that atmospheric pressure is introduced to circulate the liquid.



A SELF SUSTAINING LIQUID CIRCULATING APPARATUS

FIELD OF INVENTION

- 5 The present invention relates to a self-sustaining liquid circulating apparatus and a method of circulating liquid thereof.

BACKGROUND OF INVENTION

- 10 Current liquid circulation systems require aid of external pressure source or pumping system to ensure continuous operating, hence they are not self-sustaining. These systems often require external power/energy supply to power pumps and therefore may not be suitable for aqua based environment.
- 15 US 2010/0212744 A1 describes a method for continually circulating a fluid in a system, in the absence of an external pumping mechanism. However, this prior art relies on mechanical bearing movement for continuous flow which would still require some energy expenditure to get the bearing moving.
- 20 Therefore, there is a need for a fluid circulation system that does not depend on an external pump or energy expenditure to circulate liquid by itself.

SUMMARY OF INVENTION

Accordingly, there is provided a self-sustaining liquid circulating apparatus, the apparatus includes a buoyant housing which includes at least 2 inlets at bottom of the housing, such
5 that a high pressure flow path is present, at least 2 outlets at mid portion of the housing, fitted with unidirectional flap valve, wherein at least 2 capillary tubes are positionable exterior to the housing such that a continuous flow of liquid is produced throughout the apparatus, and at least 2 outlets on top of the housing, such that atmospheric pressure is introduced to circulate the liquid.

10

There is further provided a method of circulating liquid in a self-sustaining manner, the method includes the steps of creating an inlet flow by high pressure liquid and allowing an outlet flow by capillary action, such that volume of liquid in apparatus is maintained at less than 60% of total volume of apparatus by use of atmospheric pressure instead of external
15 pump.

The present invention consists of several novel features and a combination of parts hereinafter fully described and illustrated in the accompanying description and drawings, it being understood that various changes in the details may be made without departing from
20 the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, wherein:

Figure 1 shows a cross sectional view of a self-sustaining liquid circulating apparatus in the present embodiment of the invention;

Figure 2 shows a top view of a self-sustaining liquid circulating apparatus in the present embodiment of the invention; and

Figure 3 shows a flowchart of method of circulating liquid in a self-sustaining manner in the preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention relates to a self-sustaining liquid circulating apparatus and a method
5 of circulating liquid thereof. Hereinafter, this specification will describe the present invention
according to the preferred embodiment of the present invention. However, it is to be
understood that limiting the description to the preferred embodiment of the invention is
merely to facilitate discussion of the present invention and it is envisioned that those skilled
in the art may devise various modifications and equivalents without departing from the scope
10 of the appended claims.

The following detailed description of the preferred embodiment will now be described in
accordance with the attached drawings, either individually or in combination.

15 Figure 1 illustrates a self-sustaining liquid circulating apparatus (100). The apparatus (100)
includes a buoyant housing which includes at least 2 inlets (104) at bottom of the housing,
such that a high pressure flow path is present, at least 2 outlets (106) at mid portion of the
housing, fitted with unidirectional flap valve, wherein at least 2 capillary tubes (108) are
positionable exterior to the housing such that a continuous flow of liquid is produced
20 throughout the apparatus (100), and at least 2 outlets (102) on top of the housing, such that
atmospheric pressure is introduced to circulate the liquid. Figure 2 shows the top view of the
apparatus (100) illustrating all 3 of the inlets and outlets (102, 104, 106).

The apparatus (100) is ideal for various applications such cooling mechanism, power
25 generation and water treatment or liquid filtration. The invention uses a flow mechanism to
generate a continuous medium of flow/circulation of water/non- viscous liquid based on
equation of continuity of fluid motion and capillary action. The apparatus (100) provides a

continuous circulating liquid, in absence of any external/internal pumping system. Therefore no electrical power source is required, unlike those of the prior art. The apparatus (100) is suitable for small to medium scale aqua/water based environment applications such as cooling mechanism, filtration and water treatment.

5

The flow mechanism is based on fluid dynamics principles where the flow rate of fluid through a path that varies in cross-sectional area is constant. This can be expressed as the equation of continuity for fluids: ($A_1V_1 = A_2V_2$) where A is the area, V is the velocity of the fluid [Equation of continuity of fluid states that product of the area and the fluid speed at all points along the pipe is constant for an incompressible fluid. In equation form: ($A_1V_1 = A_2V_2 =$ constant)] Therefore, the at least 2 inlets (104) at the bottom of the apparatus (100) would generate a high speed flow, in which the liquid fills up a primary chamber of the apparatus (100). With two wide opening fitted with a uni-directional flap at a mid upper side of the primary chamber, the total liquid volume within the primary chamber of the apparatus (100) is always kept to 60 - 70% full. At the side, there is a separate secondary chamber output with a small radius tube for capillary reaction to ensure continuous liquid flowing out from the apparatus.

It is to be appreciated that the outlets (106) at the mid-section of the apparatus (100) is larger than the inlets (104) at the bottom of the apparatus (100). The mid-section outlets (106) comprise a unidirectional flap valve. It is further to be appreciated that the apparatus (100) can be made into any geometrical shape such as circular, rectangular, square or any possible shape suitable for desired applications.

A method of circulating liquid in a self sustaining manner is described herein as seen in Figure 3. The method includes the steps of creating an inlet flow by high pressure liquid and allowing an outlet flow by capillary action, such that volume of liquid in apparatus is

maintained at less than 60% of total volume of apparatus by use of atmospheric pressure instead of external pump.

Based on Pascal's law, differential atmospheric pressure will ensure a continuous in-flow of the liquid, meanwhile the capillary action would ensure a continuous out-flow, hence a generating a self sustaining mechanism. [Pascal's law states that a change in the pressure applied to a fluid is transmitted undiminished to every point of the fluid and to the walls of the container. $P = P_0 + \rho gh$] External balancing weights on both sides are used to sustain a downward pressure and to balance the apparatus (100) so that the apparatus (100) will not sink into the water/liquid for aqua based applications.

10

This invention is adapted for liquid circulation in aqua based applications. The disclosed invention is suitable, but not restricted to, for use in water filtration and treatment, cooling mechanism and power generation when paired with other attachments such as dynamo, turbine and motor-liked systems.

15

CLAIMS

1. A self-sustaining liquid circulating apparatus (100), the apparatus (100) includes:

- 5 a buoyant housing which includes at least 2 inlets (104) at bottom of the housing, such that a high pressure flow path is present;
at least 2 outlets (106) at mid portion of the housing, fitted with unidirectional flap valve, wherein at least 2 capillary tubes (108) are positionable exterior to the housing such that a continuous flow of liquid is produced throughout the
10 apparatus (100), and
at least 2 outlets (102) on top of the housing, such that atmospheric pressure is introduced to circulate the liquid.
2. The apparatus (100) as claimed in claim 1, wherein the at least 2 outlets (106) at mid
15 portion are larger than the at least 2 inlets (104) at the bottom of the housing.
3. The apparatus (100) as claimed in claim 1, wherein the apparatus (100) is attachable with weights for balancing purposes.
- 20 4. The apparatus (100) as claimed in claim 1, wherein the apparatus (100) does not require any external pumps.
5. The apparatus (100) as claimed in claim 1, wherein differential atmospheric pressure will ensure a continuous in-flow of the liquid, meanwhile capillary action would ensure a
25 continuous out-flow.

6. A method of circulating liquid in a self sustaining manner, the method includes the steps of:

i. creating an inlet flow by high pressure liquid; and

ii. allowing an outlet flow by capillary action, such that volume of liquid in apparatus

5 is maintained at less than 60% of total volume of apparatus by use of atmospheric pressure instead of external pump.

7. The method as claimed in claim 6, wherein differential atmospheric pressure will ensure a continuous in-flow of the liquid, meanwhile capillary action would ensure a continuous out-flow.

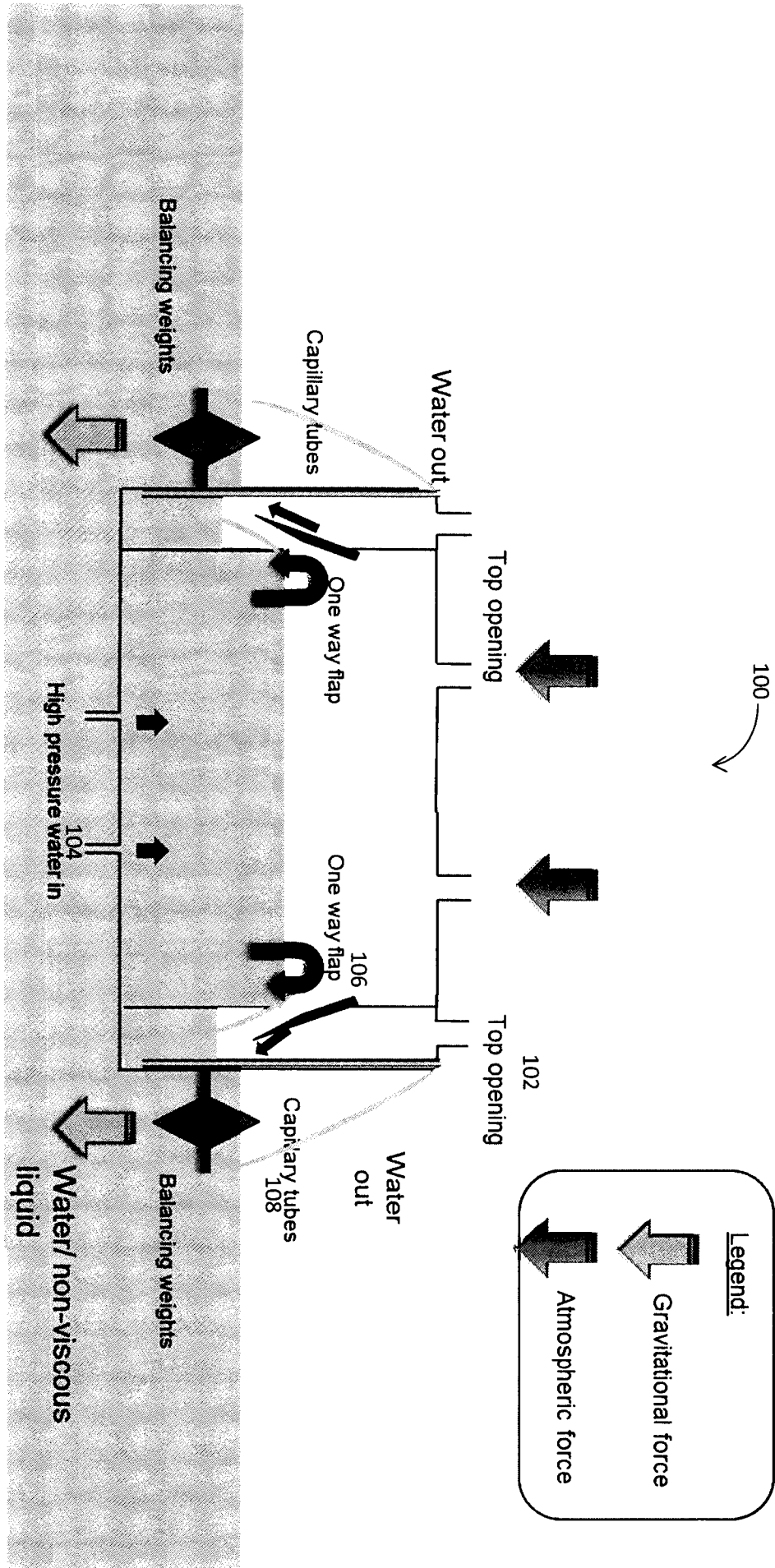


Figure 1

• Top View

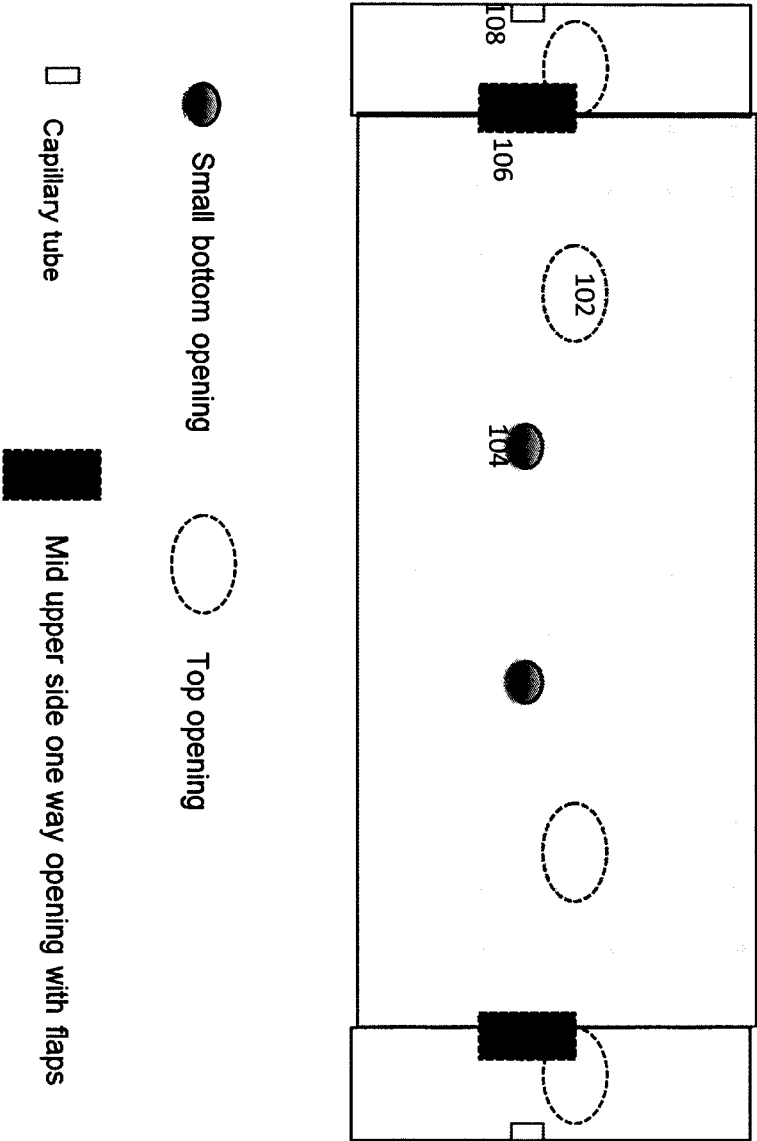


Figure 2

Operational flow chart

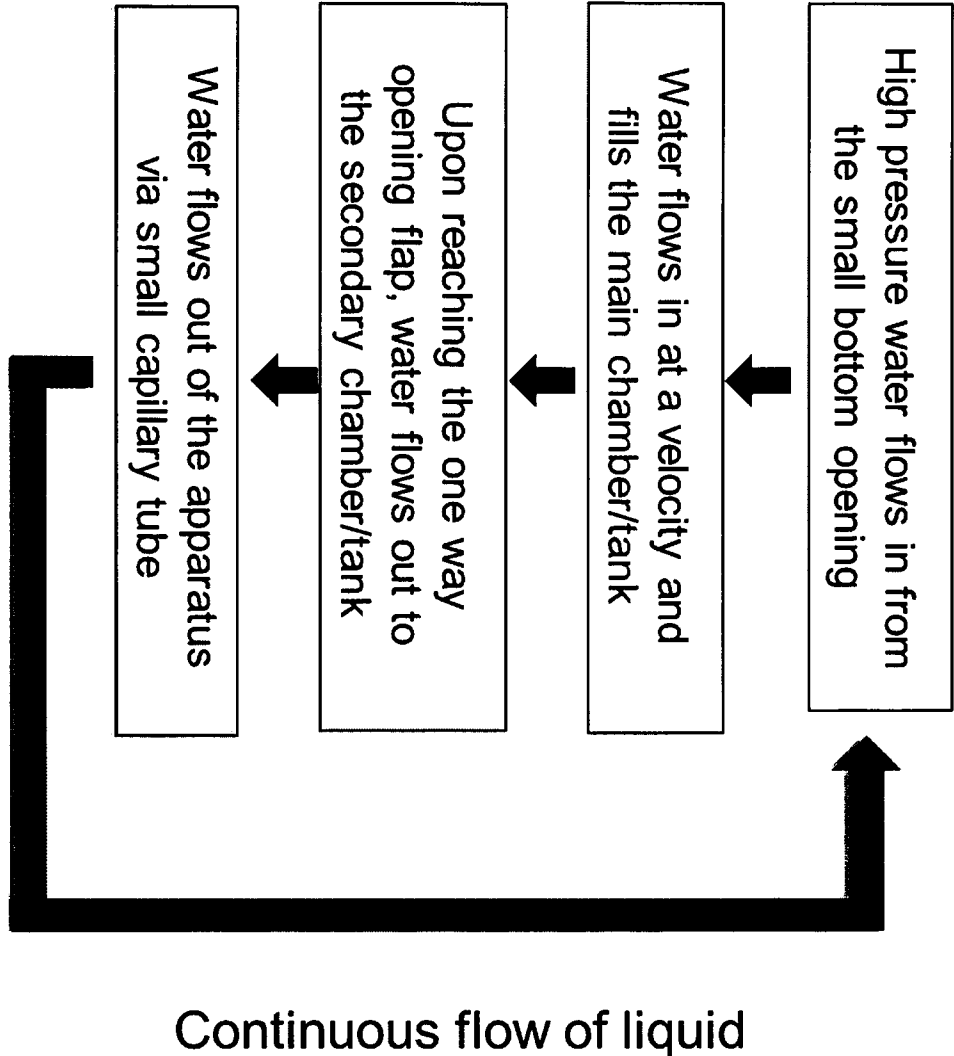


Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/MY2013/000226

A. CLASSIFICATION OF SUBJECT MATTER
INV. F03B17/00 F03B17/04
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)
F03B

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP H03 265780 A (TLV CO LTD) 26 November 1991 (1991-11-26) abstract; figures -----	1-7
A	JP S58 122370 A (HANASHIRO TAKEO) 21 July 1983 (1983-07-21) abstract; figures -----	1-7
A	WO 2010/076613 A2 (EGHFAIER MOHAMED KHALIL OMRAN [LY]) 8 July 2010 (2010-07-08) the whole document -----	1-7
A	ORD-HUME A ED - ORD-HUME A: "CAPILLARY ATTRACTION AND SPONGEWHEELS", 1 January 1994 (1994-01-01), PERPETUAL MOTION. HISTORY OF AN OBSESSION, NEW YORK, ST. MARTIN'S PRESS, US, PAGE(S) 94 - 109, XP002043129, the whole document -----	1-7



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP H03265780	A	26-11-1991	NONE	
JP S58122370	A	21-07-1983	NONE	
WO 2010076613	A2	08-07-2010	NONE	