

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
2 July 2009 (02.07.2009)

PCT

(10) International Publication Number  
**WO 2009/081428 A1**

(51) International Patent Classification:  
C02F 1/68 (2006.01) C02F 1/32 (2006.01)  
C02F 1/44 (2006.01)

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(21) International Application Number:  
PCT/IT2007/000905

(22) International Filing Date:  
21 December 2007 (21.12.2007)

(25) Filing Language: Italian

(26) Publication Language: English

(71) Applicant and  
(72) Inventor: BERGER, Simona [IT/IT]; Via Roma, 51, I-20080 Basiglio MI (IT).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventor; and  
(75) Inventor/Applicant (for US only): MASCIADRI, Marco [IT/IT]; Via Verga 24, I-20025 Legnano MI (IT).

Published:  
— with international search report  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(74) Agents: PIZZOLI, Antonio et al.; Società Italiana Brevetti S.p.A., Via Carducci, 8, I-20123 Milano (IT).

(54) Title: APPARATUS AND PROCESS FOR MINERALIZING LIQUIDS

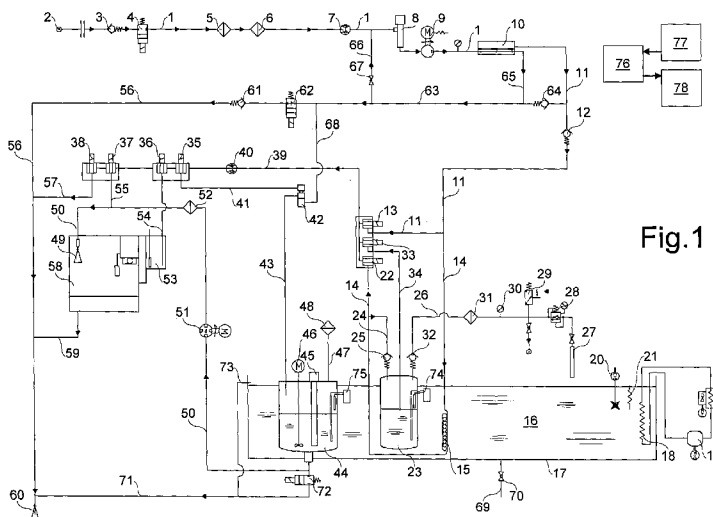


Fig. 1

(57) Abstract: Apparatus for mineralizing liquids, which comprises at least one mineralizing device (42) suitable for dissolving mineral salts or other substances in liquids, wherein a demineralizer (10) suitable for demineralizing liquids coming from an inlet (1) is connected to one or more main valves (13, 22, 33) connected in turn to one or more secondary valves (35, 36, 37, 38), wherein at least one secondary valve (35) is connected to the mineralizing device (42) for dissolving mineral salts or other substances in the demineralized liquids coming from at least one main valve (13, 22, 33), said mineralizing device (42) being in turn connected to at least one tank (44) suitable for collecting the liquids mineralized by the mineralizing device (42) and to a sterilizer (45) suitable for sterilizing the liquids mineralized by the mineralizing device (42). The present invention also relates to a process which can be carried out by said apparatus.

WO 2009/081428 A1

## APPARATUS AND PROCESS FOR MINERALIZING LIQUIDS

The present invention relates to an apparatus for mineralizing liquids, in particular water coming from a water network. The present invention also relates to a process  
5 which can be carried out by said apparatus.

Known apparatuses for mineralizing liquids comprise a mineralizing device suitable for dissolving mineral salts or other substances in liquids coming from an inlet. Said known apparatuses are relatively primitive, since the content of the mineralized liquids depends not only on the mineral salts used in the mineralizing device but also on  
10 the content of the liquids coming from the inlet. Furthermore, the purity of the liquids mineralized with said apparatuses is relatively low.

Known industrial plants for mineralizing liquids instead use means and processes which cannot be reduced for obtaining an apparatus which can be transported and installed in offices or houses.

15 It is therefore an object of the present invention to provide an apparatus free from said disadvantages. Said object is achieved with an apparatus and a process, whose main features are disclosed in claims 1 and 23, respectively, while other features are disclosed in the remaining claims.

Thanks to the use of a demineralizer, a cooling tank and a sterilizer for the liquids  
20 mineralized by the mineralizing device, the apparatus and the process according to the present invention allow to obtain in a simple and fast manner mineralized liquids having a high purity and with contents exclusively determined by the mineral salts employed in the mineralizing device, also when water of a water network is used as a source of liquids.

25 Furthermore, thanks to the particular hydraulic circuit of valves and ducts, the apparatus according to the present invention is very compact, so that it can be easily transported and installed everywhere. This apparatus can even be provided with machine for coffee or other infusions, without significantly increasing its size. With this arrangement, it is possible to produce coffee or other infusions with a taste which is not  
30 influenced by the water and without the risk of encrustations.

According to a particular aspect of the invention, the apparatus is provided with

- 2 -

particular ducts, valves and devices for easily and quickly obtaining cold and/or sparkling liquids.

The apparatus and the process are also optimized for saving electric energy and water, in particular with a liquid recirculation circuit in the demineralizer and an auxiliary circuit, which serves for the apparatus maintenance and/or for driving the mineralizing device only when it is necessary.

The use of particular filters and sterilizers allows to obtain bacteriologically pure liquids. Furthermore, the use of a cooling tank allows to limit the precipitation of the salts and to oppose the bacterial proliferation.

The apparatus and the process according to the present invention are provided with particular devices and valves for being advantageously controlled by an electronic control unit, so as to obtain in an automatic manner demineralized liquids with temperatures and contents of salts and/or gasses freely programmable by the user. Also the maintenance of the apparatus can be controlled automatically by said control unit, so that the user does not have to carry out this activity.

The mineralizing device of the apparatus according to the present invention can be used for dissolving not only mineral salts but also other substances, for example flavors for beverages, in the demineralized liquids. For this purpose, the apparatus can include several tanks connected in parallel and/or in series through ducts provided with pumps, so as to collect, stir, sterilize, mix and supply in an independent manner the different liquids coming from the mineralizing device.

Further advantages and features of the apparatus and the process according to the present invention will become clear to those skilled in the art from the following detailed and non-limiting description of an embodiment thereof with reference to the attached drawing, wherein figure 1 shows a scheme of the apparatus.

Referring to said figure, it is seen that the apparatus according to the present invention comprises in a known way at least one inlet 1 suitable for being connected to a liquid source 2, for example a water network. Inlet 1 is provided with a non-return valve 3 for preventing the reflow of liquids toward source 2 and an inlet valve 4 for separating the inlet of the apparatus from source 2. Inlet 1 is also provided with one or more filters 5, 6 suitable for filtering from solid particles and/or polluting substances the

- 3 -

liquids coming from source 2, as well as with a flowmeter 7. Inlet 1 is further provided with a UV sterilizer 8 suitable for eliminating bacterial charges and with a pump 9 suitable for pumping liquids from inlet 1 toward a demineralizer 10 provided with an osmotic membrane suitable for filtering further and demineralizing these liquids. The liquids demineralized by demineralizer 10 are conveyed through a main duct 11 provided with a non-return valve 12 to a first main valve 13 or, through a first derivation 14, to a heat exchanger 15, in particular a coil immersed in a cooling liquid 16 contained in a vat 17 for cooling the demineralized liquids. Cooling liquid 16 is for example water which is cooled by a cooling device 18 provided with a compressor 19 and is stirred by a stirrer 20 for making uniform the temperature of cooling liquid 16, measured by a thermostat 21. The demineralized liquids cooled in heat exchanger 15 reach a second main valve 22 through first derivation 14. The demineralized liquids cooled in heat exchanger 15 reach also a saturator 23 through a second derivation 24 which is provided with a non-return valve 25 and is connected to first derivation 14 between heat exchanger 15 and second main valve 22. Saturator 23 is connected to a carbon dioxide source 26, for example a bottle under pressure, through a gas duct 27 provided with a pressure reducer 28, a manostat 29, a manometer 30, an antibacterial filter 31 and a non-return valve 32. Saturator 23 is connected to a third main valve 33 by means of a duct 34 for sparkling water and is immersed in a cooling liquid, in particular the same cooling liquid 16 contained in vat 17.

Main valves 13, 22, 33 are connected to one or more secondary valves 35, 36, 37, 38 through at least one distribution duct 39 provided with a flowmeter 40.

First secondary valve 35 is connected through a duct 41 to a mineralizing device 42 suitable for dissolving mineral salts or other substances in the demineralized liquids coming from at least one main valve 13, 22 and/or 33. Mineralizing device 42 is in turn connected through a duct 43 to a tank 44 immersed in a cooling liquid, in particular the same cooling liquid 16 contained in vat 17. Tank 44 is suitably provided with a UV sterilizer 45 suitable for sterilizing the mineralized liquids, with a stirrer 46 suitable for stirring the mineralized liquids and with a vent 47 in turn provided with an antibacterial filter 48. The bottom of tank 44 is connected to an output nozzle 49 through an outlet 50 provided with a pump 51 and an antibacterial filter 52.

Second secondary valve 36 is connected to a boiler of a machine 53 for coffee or other infusions through a duct 54, while third secondary valve 37 is connected to outlet 50 through a duct 55 and fourth secondary valve 38 is connected to a drain duct 56 through a duct 57. Outlet nozzle 49 and/or the nozzle of machine 53 are arranged in a collection space 58 having the bottom connected to drain duct 56 through a duct 59. Drain duct 56 ends at a drain 60.

Drain duct 56 is provided with a non-return valve 61 and is connected by means of an auxiliary valve 62 to an auxiliary duct 63 which is in turn provided with a non-return valve 64 and is connected to main duct 11 between demineralizer 10 and heat exchanger 15. The liquids which are not demineralized by demineralizer 10, that is the residual liquids upstream of the osmotic membrane, are collected and sent to auxiliary duct 63 by a first recirculation duct 65 arranged between non-return valve 64 of auxiliary duct 63 and auxiliary valve 62. Auxiliary duct 63 is further connected to inlet 1 upstream of demineralizer 10 through a second recirculation duct 66 provided with a regulation valve 67, so as to recirculate the residual liquids and filter them through demineralizer 10. Auxiliary duct 63 is also connected to mineralizing device 42 through a driving duct 68, so as to drive mineralizing device 42 only when the liquids in auxiliary duct 63 are under pressure, that is when pump 9 is working. The bottom of vat 17 is connected to a drain 69 provided with a drain valve 70, while the bottom of tank 44 is connected to drain duct 56 through a duct 71 provided with a drain valve 72. The edge of vat 17 is connected to drain duct 56 by means of an overflow duct 73. Saturator 23 and/or tank 44 are provided with level sensors 74 and/or 75 connected to an electronic control unit 76 provided with a keyboard 77 and a display 78. Inlet valve 4, main valves 13, 22, 33, secondary valves 35, 36, 37, 38, auxiliary valve 62 and/or drain valve 72 are preferably electric valves connected to control unit 76. Also flowmeters 7, 40, compressor 19, pumps 9, 51 and/or stirrers 20, 46 are connected to control unit 76.

In the process of the apparatus according to the present invention, control unit 76 opens inlet valve 4 and starts pump 7 if the quantity of liquids coming into inlet 1 and measured by flowmeter 7 has not exceeded a threshold level, beyond which the apparatus must be controlled. The liquids in inlet 1 are filtered by filters 5, 6, sterilized by UV sterilizer 8 and demineralized by demineralizer 10, after which they reach main

valves 13, 22, 33 through main duct 11, heat exchanger 15 and/or saturator 23, so as to obtain liquids at a room temperature, cold liquids and sparkling cold liquids, respectively. As a matter of fact, vat 17 contains cooling liquid 16 cooled by means of compressor 19 driven by control unit 76 according to the temperature detected by thermostat 21. Control unit 76 drives at least one of main valves 13, 22, 33 and at least one of secondary valves 35, 36, 37, 38 according to the selection of the user through keyboard 77.

Secondary valve 35 is opened for preparing by means of mineralizing device 42 concentrated mineralized liquids which are collected in tank 44, sterilized by UV sterilizer 45 and stirred by stirrer 46, until the filling of tank 44 determined by level sensor 75. If the user requests mineralized liquids through keyboard 77, control unit 76 drives pump 51 and the mineralized liquids are supplied by outlet nozzle 49. Control unit 76 also opens secondary valve 37, drives pump 9 and at least one of main valves 13, 22 and/or 33 for mixing the concentrated mineralized liquids with demineralized liquids. If the user requests demineralized liquids through keyboard 77, pump 51 is not driven, so that outlet nozzle 49 supplies only demineralized liquids coming from at least one of main valves 13, 22 and/or 33. Control unit 76 can also drive pump 9, open at least one of main valves 13, 22 and/or 33, in particular first main valve 13, and secondary valve 36 for filling the boiler of machine 53 which demineralized liquids. Control unit 76 can further drive pump 9, open at least one of main valves 13, 22 and/or 33, secondary valve 36, auxiliary valve 62 and/or drain valve 72 for emptying and/or cleaning the inner circuit of the apparatus, in particular after a determined period of inactivity of the apparatus.

Another embodiment of the apparatus according to the present invention can include one or more further tanks connected in parallel and/or in series to tank 44 between mineralizing device 42 and outlet nozzle 49 through outlets provided with a pump and an antibacterial filter. These further tanks are provided with a sterilizer and a stirrer, are immersed in a cooling liquid, in particular cooling liquid 16, and may contain mineralized liquids differing from each other. These mineralized liquids are obtained by charging in subsequent steps different salts and/or substances in mineralizing device 42 or by using several mineralizing devices connected in parallel and/or in series. One or

- 6 -

more distribution valves arranged between mineralizing device 42 and the tanks distribute the different mineralized liquids in the relevant tanks.

Further modifications and/or additions may be made by those skilled in the art to the hereinabove disclosed and illustrated embodiment while remaining within the scope  
5 of the following claims.

## CLAIMS

1. Apparatus for mineralizing liquids, which comprises at least one mineralizing device (42) suitable for dissolving mineral salts or other substances in liquids, characterized in that a demineralizer (10) suitable for demineralizing liquids coming from an inlet (1) is connected to one or more main valves (13, 22, 33) connected in turn to one or more secondary valves (35, 36, 37, 38), wherein at least one secondary valve (35) is connected to the mineralizing device (42) for dissolving mineral salts or other substances in the demineralized liquids coming from at least one main valve (13, 22, 33), said mineralizing device (42) being in turn connected to at least one tank (44) suitable for collecting the liquids mineralized by the mineralizing device (42) and to a sterilizer (45) suitable for sterilizing the liquids mineralized by the mineralizing device (42).
2. Apparatus according to the previous claim, characterized in that the tank (44) is suitable for cooling the liquids mineralized by the mineralizing device (42).
3. Apparatus according to one of the previous claims, characterized in that the tank (44) is provided with a stirrer (46).
4. Apparatus according to one of the previous claims, characterized in that the sterilizer (45) is arranged in the tank (44).
5. Apparatus according to one of the previous claims, characterized in that the tank (44) is connected to an outlet nozzle (49) through an outlet (50).
6. Apparatus according to the previous claim, characterized in that a secondary valve (37) is connected to the outlet (50) for mixing the mineralized liquids with demineralized liquids.
7. Apparatus according to one of the previous claims, characterized in that the inlet (1) is provided with a sterilizer (8).
8. Apparatus according to one of the previous claims, characterized in that the demineralizer (10) is connected to a main valve (13) through a main duct (11) provided with a non-return valve (12).
9. Apparatus according to one of the previous claims, characterized in that the demineralizer (10) is connected to a main valve (22) through a heat exchanger (15)



for cooling the demineralized liquids.

10. Apparatus according to one of the previous claims, characterized in that the demineralizer (10) is connected to a main valve (33) through a saturator (23).

5 11. Apparatus according to one of the previous claims, characterized in that the saturator (23) and/or the tank (44) are arranged in a vat (17) suitable for containing cooling liquid (16).

12. Apparatus according to one of the previous claims, characterized in that a secondary valve (36) is connected to a boiler of a machine (53) for coffee or other infusions.

10 13. Apparatus according to one of the previous claims, characterized in that the liquids which are not demineralized by the demineralizer (10) are recirculated toward the demineralizer (10) by one or more recirculation ducts (65, 66).

14. Apparatus according to one of claims 8 to 13, characterized in that a drain duct (56) is connected by means of an auxiliary valve (62) to an auxiliary duct  
15 (63) connected to the main duct (11).

15. Apparatus according to the previous claim, characterized in that a secondary valve (38) is connected to the drain duct (56).

16. Apparatus according to claim 14 or 15, characterized in that at least one recirculation duct (65, 66) is connected to the auxiliary duct (63).

20 17. Apparatus according to one of claims 14 to 16, characterized in that the auxiliary duct (63) is connected to the mineralizing device (42) through a driving duct (68).

18. Apparatus according to one of the previous claims, characterized in that the saturator (23) and/or the tank (44) are provided with level sensor (74, 75) connected  
25 to a control unit (76).

19. Apparatus according to one of the previous claims, characterized in that the main valves (13, 22, 33), the secondary valves (35, 36, 37, 38) and/or the auxiliary valve (62) are electric valves connected to a control unit (76).

20. Apparatus according to claim 18 or 19, characterized in that said control  
30 unit (76) is an electronic control unit.

21. Apparatus according to one of the previous claims, characterized in that

said sterilizers (8, 45) are UV sterilizers.

22. Apparatus according to one of the previous claims, characterized in that one or more further tanks are connected in parallel and/or in series to said tank (44), are provided with a sterilizer and are connected to the outlet nozzle (49) through outlets  
5 provided with a pump.

23. Process for mineralizing liquids, characterized in that it comprises the following operating steps:

- drawing liquids from an inlet (1);
- demineralizing said liquids by means of at least one demineralizer (10);
- 10 - conveying the demineralized liquids to a mineralizing device (42) suitable for dissolving mineral salts or other substances in the demineralized liquids;
- collecting in at least one tank (44) the liquids mineralized by the mineralizing device (42);
- sterilizing by means of a sterilizer (45) the liquids mineralized by the mineralizing  
15 device (42).

24. Process according to the previous claim, characterized in that the demineralized liquids are cooled by a heat exchanger (15) before they are mineralized.

25. Process according to claim 23 or 24, characterized in that the demineralized liquids are made sparkling by a saturator (23) before they are  
20 mineralized.

26. Process according to one of claims 23 to 25, characterized in that the mineralized liquids are mixed with demineralized liquids before they are supplied by an outlet nozzle (49).

27. Process according to one of claims 23 to 26, characterized in that the  
25 mineralized liquids are sterilized by the sterilizer (45) in the tank (44).

28. Process according to one of claims 23 to 27, characterized in that the mineralized liquids are cooled in the tank (44).

29. Process according to one of claims 23 to 28, characterized in that the mineralized liquids are stirred by a stirrer (46) in the tank (44).

30. Process according to one of claims 23 to 29, characterized in that the  
30 liquids drawn from the inlet (1) are sterilized before they are demineralized by the

- 10 -

demineralizer (10).

31. Process according to one of claims 23 to 30, characterized in that the liquids which are not demineralized by the demineralizer (10) are recirculated toward the demineralizer (10).

5 32. Process according to one of claims 23 to 31, characterized in that the mineralizing device (42) is driven through at least one driving duct (68) connected to a pump (9) which draws liquids from the inlet (1).

10 33. Process according to one of claims 23 to 32, characterized in that different mineralized liquids are collected in one or more further tanks which are connected in parallel and/or in series to said tank (44), are provided with a sterilizer and are connected to the outlet nozzle (49) through outlets provided with a pump.

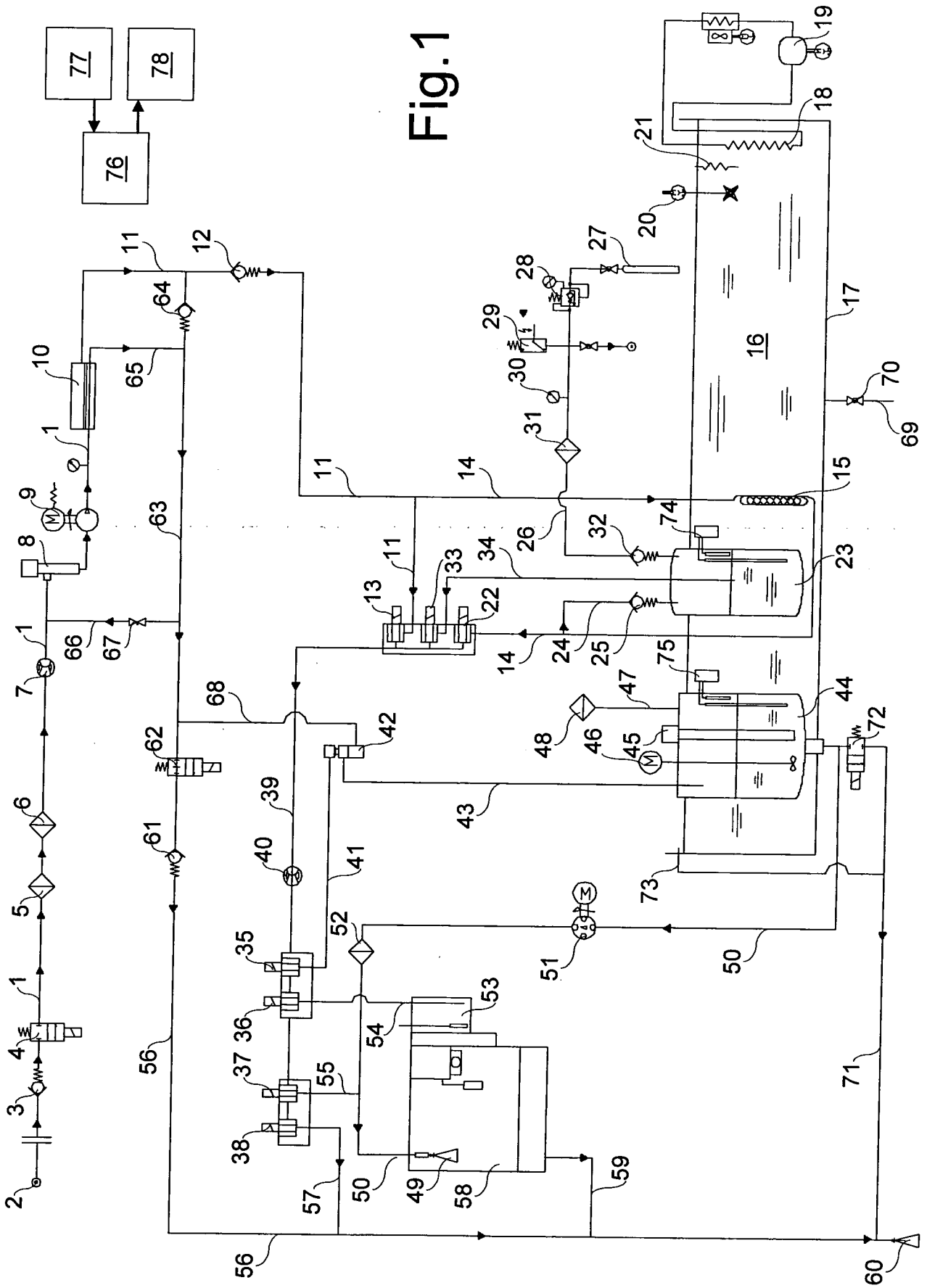


Fig.1

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/IT2007/000905

A. CLASSIFICATION OF SUBJECT MATTER INV. C02F1/68 C02F1/44 C02F1/32		
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) C02F		
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 practical, 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.
X	WO 94/06547 A (VOGEL PREMIUM WATER CO J [US]) 31 March 1994 (1994-03-31) abstract; figure 2	1-33
X	EP 1 857 415 A (G M MEGA S P A [IT]) 21 November 2007 (2007-11-21) paragraph [0019] - paragraph [0024]; figure 2	1-33
X	FR 2 902 026 A (GRCEVIC VLADIMIR [FR]) 14 December 2007 (2007-12-14) page 15 - page 16; figure 1	1-33
X	US 5 059 317 A (MARIUS DIETRICH [AT] ET AL) 22 October 1991 (1991-10-22) column 3 - column 4; figure 1	1-33
	-/--	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> 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 document 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  22 April 2009		Date of mailing of the international search report  29/04/2009
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  González Arias, M

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/IT2007/000905

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 40 15 336 A1 (JOPA WASSERTECHNISCHE GERAETE [DE]) 14 November 1991 (1991-11-14) column 2, line 25 - line 55 column 3, line 30 figure -----	1-33

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No  
PCT/IT2007/000905

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9406547	A	31-03-1994	AU 669001 B2 23-05-1996
			AU 4928693 A 12-04-1994
			BR 9307053 A 29-06-1999
			CA 2144519 A1 31-03-1994
			EP 0663851 A1 26-07-1995
			JP 8503650 T 23-04-1996
			MX 9305697 A1 30-06-1994
-----			
EP 1857415	A	21-11-2007	NONE
-----			
FR 2902026	A	14-12-2007	EP 2038224 A2 25-03-2009
			WO 2007144491 A2 21-12-2007
-----			
US 5059317	A	22-10-1991	NONE
-----			
DE 4015336	A1	14-11-1991	NONE
-----			