

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
12 March 2009 (12.03.2009)

PCT

(10) International Publication Number  
**WO 2009/030633 A1**

(51) International Patent Classification:  
C02F 1/42 (2006.01) C02F 1/00 (2006.01)  
D06F 1/00 (2006.01)

(74) Agents: **PETRAZ, Gilberto** et al.; GIp Srl, Piazzale Cavedalis, 6/2, I-33100 Udine (IT).

(21) International Application Number:  
PCT/EP2008/061282

(22) International Filing Date: 28 August 2008 (28.08.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
UD2007A000157  
6 September 2007 (06.09.2007) IT

(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, 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, ST, SV, SY, 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, 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, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (for all designated States except US): **DE' LONGHI SPA** [IT/IT]; Via L. Seitz, 47, I-31100 Treviso (IT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **DE' LONGHI, Giuseppe** [IT/IT]; Vicolo Rovero, 1, I-31100 Treviso (IT).

Published:  
— with international search report

(54) Title: DEVICE TO DECALCIFY WATER IN IRONING APPARATUSES AND RELATIVE METHOD

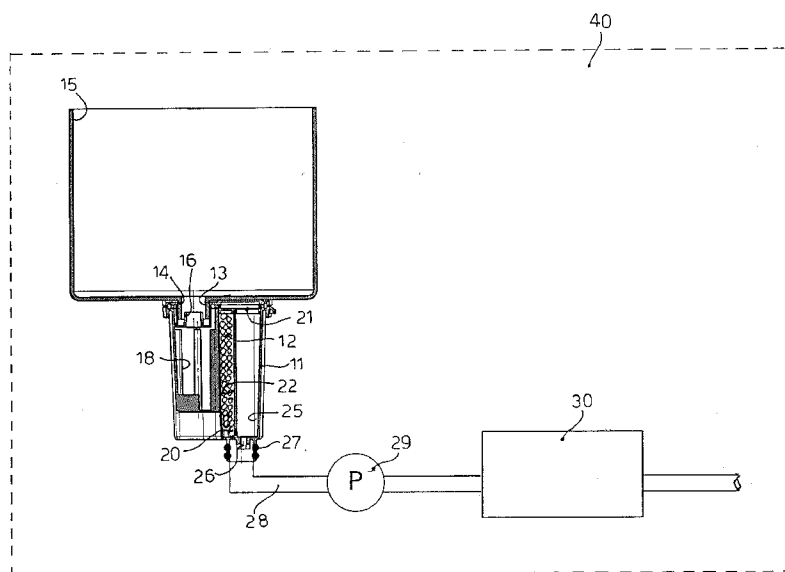


fig. 1

(57) Abstract: A device and a method used to decalcify the water in an ironing apparatus (40) comprises at least a filter (11) containing resin (12). The resin (12) is of the regeneratable type by means a solution comprising either water and a weak acid or water and common salt.

WO 2009/030633 A1

“DEVICE TO DECALCIFY WATER IN IRONING APPARATUSES AND  
RELATED METHOD”

\* \* \* \* \*

FIELD OF THE INVENTION

5 The present invention concerns a device and a method to decalcify water, particularly suitable to be used in ironing apparatuses, to prevent the water used to generate steam for ironing from causing the formation of scale.

BACKGROUND OF THE INVENTION

10 One of the main problems in ironing apparatuses which use water or steam is the formation of scale inside them, caused by the excessive hardness of the water circulating therein. In particular, as time passes, the water used causes the formation of scale encrustations inside the apparatus, especially in the boiler. These encrustations initially reduce the performance of the ironing apparatus and subsequently make it completely unusable. The functioning life of the apparatus  
15 therefore depends on the level of hardness of the water used: the harder the water, the shorter the life of the apparatus.

To obviate this problem, at present, ironing apparatuses on the market use various solutions.

20 One known solution provides that the user of the ironing apparatus must wash the boiler periodically. The boiler is washed by pouring a specific compound of the type that prevents the formation of scale, or reacts with the scale already present, based on citric acid or lactic acid, through a hole connected to the boiler, normally provided with a stopper, and present in the bottom or in a side of the apparatus.

25 This operation may not be easy, however, and may therefore be carried out by the user incorrectly, which entails that the apparatus may be only partly and incompletely descaled. In this way, small pieces of scale may not be eliminated and may even enter into circulation in the hydraulic system of the ironing apparatus with the risk of obstructing it or blocking the critical components.

30 Another known solution to the problem of the formation of scale encrustations consists in using, inside the ironing apparatus, filters with partly or totally demineralizing resins. These have the function of decalcifying the water by exploiting the chemical properties of the resins, whose ions react with the

substances dissolved in the water. In this way the water, once filtered, enters into the boiler with a lower level of hardness than the original, considerably reducing the possibility of scale formation. This known solution also has disadvantages, however. Indeed, after treating a limited quantity of water, the filters must be replaced and often they are difficult to find as spare parts. Moreover, when the water used in the ironing apparatus has a high level of hardness, the filters must be replaced frequently, with a consequent increase in the management costs. Finally, but no less important, these filters are of the disposable type, and every time they are replaced they become waste, thus causing a serious environmental impact.

Purpose of the present invention is to achieve a device to decalcify water by means of one or more resin filters, to reduce the formation of scale inside ironing apparatuses, which is economical, which does not need to be replaced and thrown away as waste and which therefore has a reduced environmental impact.

The Applicant has devised and perfected the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes or advantages.

#### SUMMARY OF THE INVENTION

The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

In accordance with the above purposes, a device according to the present invention, able to be used to decalcify the water used in an ironing apparatus, comprises at least a filter containing resin. The resin is able to react with the substances suspended and dissolved in the water, decalcifying it.

According to a characteristic feature of the present invention, the resin used is of the regeneratable type, such as for example those marketed under the trademark Lewatit® S 8227, which is a weak carboxyl cationic resin typically used in decarbonation processes, or the trademarks Purolite® D4752 and Purolite® C104. These resins are regenerated both with strong acids and also with weak acids.

The use of this type of resin allows it to be regenerated, also automatically, at predefined intervals, according to the quantity of water used and its level of

hardness, so that it can be re-used without needing to be replaced and thrown away. This gives a considerable advantage from both the economic and also the environmental point of view.

5 The filter is able to be mounted permanently or removably inside the ironing apparatus and is able to be connected to a water tank of the ironing apparatus.

10 The resin contained in the filter is able to be regenerated by means of a solution introduced inside the tank. The solution is able to flow inside the filter for a time comprised between about 40 minutes and about 80 minutes and comprises water and a weak acid, for example citric acid, with a concentration comprised between about 10% and about 20%, advantageously 13%. This is an acid easily found on the market, it does not entail any problem of toxicity or corrosiveness, unlike strong acids, for example sulphuric or hydrochloric acid, and can therefore be easily used and managed by the user of the ironing apparatus.

15 According to a variant of the present invention the solution comprises water and common salt, with a concentration comprised between about 10% and about 20%, advantageously 13%.

20 According to another variant of the present invention, a support mean, comprising a cavity having sizes correlated to those of the filter, to contain it, is able to support the filter. The support mean is also able to support said water tank, removed from the ironing apparatus. In this way the regeneration takes place outside the apparatus.

25 According to a variant of the present invention, the device comprises, or is associated with, means able to identify the state of the resin so as to be able to determine the moment when to subject it to regeneration, possibly also automatically.

#### BRIEF DESCRIPTION OF THE DRAWINGS

30 These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 shows schematically and in section a device according to the present invention mounted in an ironing apparatus;
- fig. 2 is a view from above of a detail of the device in fig. 1;

- 4 -

- fig. 3 is a section from III to III of fig. 2;
- fig. 4 is a section from IV to IV of fig. 2;
- fig. 5 is an enlargement of a detail of fig. 4;
- fig. 6 is a section from VI to VI of fig. 2;
- 5 - fig. 7 is a view from above of a detail of the device in fig. 1;
- fig. 8 is a lateral view of the detail in fig. 6; and
- fig. 9 is a front view of the detail in fig. 6.

#### DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

10 With reference to fig. 1, a device 10 according to the present invention is used to decalcify the water, to be transformed into steam, in an ironing apparatus 40. The latter may be of any known type and therefore is not described in detail here.

The device 10 comprises a filter 11, for example made of plastic material, on whose upper side a cylindrical cavity 13 is made, which constitutes the housing  
15 for a first mouth 14 of a water tank 15 of the ironing apparatus 40.

The cylindrical cavity 13 is provided inside with a first sleeve 16 disposed coaxial therewith and which develops upward.

The first sleeve 16 is able to be inserted in the first mouth 14 so as to guarantee a stable connection of the filter 11 with the water tank 15. The sleeve  
20 16 is able to convey the water arriving from the water tank 15 inside a central compartment 18, made inside the filter 11.

The first sleeve 16 is also provided with a calibrated hole 17 (figs. 2 and 4) able to slow down the stream of water, or of a solution, able to be introduced into the filter 11, as will be explained in more detail hereafter.

25 The filter 11 is shaped so as to define two lateral channels 19 which put the central compartment 18 in communication with the lower part of the filter 11, in which there is a first containing grid 20, whose edge is shaped so as to form a substantially U-shaped profile facing downward. The containing grid 20 thus conformed defines a lower compartment 23.

30 A second containing grid 21 is disposed parallel to the first in the upper part of the filter 11 and is attached to the internal wall of the filter 11.

The two containing grids 20 and 21 define a compartment 22, and are able to contain and block inside the latter a resin 12, of the regeneratable type, consisting

of balls having a diameter comprised between about 0.20 mm and about 0.30 mm.

Moreover, the containing grids 20 and 21 comprise a plurality of slits 24 (fig. 5) smaller than said balls, for example less than 0.20 mm and able to allow the  
5 water to pass.

The filter 11 also comprises a rear compartment 25, through which the decalcified water is able to flow toward the outside.

In the lower part of the rear compartment 25, there is a second sleeve 26, which constitutes a narrowing of the rear compartment 25. The second sleeve 26  
10 develops downward inside a second mouth 27, present in the lower part of the filter 11. The second sleeve 26 is able to make the decalcified water flow through a pipe 28 (fig. 1). The latter is inserted into the second mouth 27 and connects the filter 11 to a pump 29 of the ironing apparatus 40. The pump 29 is able to take in the water present in the water tank 15, to make it flow through the filter 11 and to  
15 transfer it to a boiler 30 able to transform it into steam needed for ironing.

The device 10 as described heretofore functions as follows. The water to be decalcified and needed to form the steam for ironing is introduced into the water tank 15 and from here inside the filter 11, before being transferred to the boiler 30. The water taken in by the pump 29 flows into the central compartment 18  
20 through the calibrated hole 17 of the sleeve 16. The water first reaches the lower compartment 23, through the two lateral channels 19, and then, through the slits 24 of the first containing grid 20, the compartment 22, inside which the balls of regeneratable resin 12 are disposed. The water then rises through the compartment 22, where it is subjected to the decalcifying effect of the resin 12.  
25 The water then exits from the compartment 22 through the slits 24 of the second containing grid 21 and reaches the rear compartment 25. Here the completely decalcified water flows downward so as to exit from the filter 11, through the second sleeve 26, and reach the pump 29 through the pipe 28.

The regeneration of the resin 12 contained in the filter 11 is performed by  
30 making a particular solution, for example water and citric acid, pass through the resin, in an indicative time comprised between about 40 minutes and about 80 minutes, advantageously 60 minutes. The solution, like the water necessary to generate the steam for ironing, is introduced into the water tank 15 and from here

- 6 -

into the filter 11. The solution is made to flow freely inside the filter 11 through the calibrated hole 17, which slows down the flow of the solution in order to allow the reaction between the acid and the resin 12 to take place. The solution follows the same route previously described for the water.

5       According to a variant of the present invention, both the filter 11 and the water tank 15 are removable. In this case, to effect the regeneration, a support mean 32 is provided (figs. 7 to 9) able to support the filter 11 and the water tank 15. The support mean 32 has a cavity 34, having sizes correlated to those of the filter 11, able to contain the filter 11, and three supports 36, able to support the filter 11  
10       and the water tank 15, removed from the ironing apparatus 40.

It is clear that modifications and/or additions of parts may be made to the device as described heretofore, without departing from the field and scope of the present invention.

It is also clear that, although the present invention has been described with  
15       reference to a specific example, a person of skill in the art shall certainly be able to achieve many other equivalent forms of device to decalcify water, to be transformed into steam, by means of a resin filter, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

20

## CLAIMS

1. Device to decalcify the water used in an ironing apparatus (40) comprising at least a filter (11) containing resin (12) and a water tank (15) connected to said filter (11), characterized in that said resin (12) is a weak carboxyl cationic resin  
5 able to be regenerated by means of a solution selectively introduced into said water tank (15), and from it to said filter (11), wherein said solution comprises either water and a weak acid, or water and common salt.
2. Device as in claim 1, characterized in that said filter (11) is mounted permanently or removably inside said ironing apparatus (40).
- 10 3. Device as in claim 1, characterized in that said resin consists of balls having a diameter comprised between about 0.20 mm and about 0.30 mm.
4. Device as in claim 1, characterized in that said filter (11) is connected to said water tank (15) by means of a sleeve (16) provided with a calibrated hole (17) able to slow down said solution when it is introduced into said filter (11) for  
15 regenerating the resin.
5. Device as in claim 1, characterized in that it also comprises a support mean (32) able to support said filter (11), said support mean (32) comprising a cavity (34) having sizes correlated to those of said filter (11) in order to contain said filter (11).
- 20 6. Device as in claims 1 and 5, characterized in that said support mean (32) is also able to support said water tank (15), removed from said ironing apparatus (40), so as to perform the regeneration of the resin outside said apparatus (40).
7. Device as in claim 1, characterized in that it comprises, or is associated with, means able to identify the state of said resin (12) of said filter (11).
- 25 8. Device as in claim 1, characterized in that it comprises, or is associated with, means able to automatically regenerate said resin (12) of said filter (11).
9. Device as in any claim hereinbefore, characterized in that said filter (11) comprises at least two containing grids (20, 21), disposed parallel to each other so as to form a compartment (22) in which said resin (12) is able to be disposed.
- 30 10. Method to decalcify the water used in an ironing apparatus (40) which employs at least a filter (11) containing resin (12) and a water tank (15) connected to said filter (11), characterized in that it comprises at least a step wherein the resin contained in the filter (11) is regenerated by means of a

- 8 -

solution introduced inside said water tank (15), and from it to said filter (11), wherein said solution is made to flow inside said filter (11) for a time comprised between about 40 minutes and about 80 minutes, and wherein said solution comprises either water and a weak acid, or water and common salt.

- 5 11. Method as in claim 10, characterized in that it provides to use a citric acid, with a concentration in the solution comprised between about 10% and about 20%, advantageously 13%.
12. Method as in claim 10, characterized in that it provides to use a common salt, with a concentration in the solution comprised between about 10% and about  
10 20%, advantageously 13%.

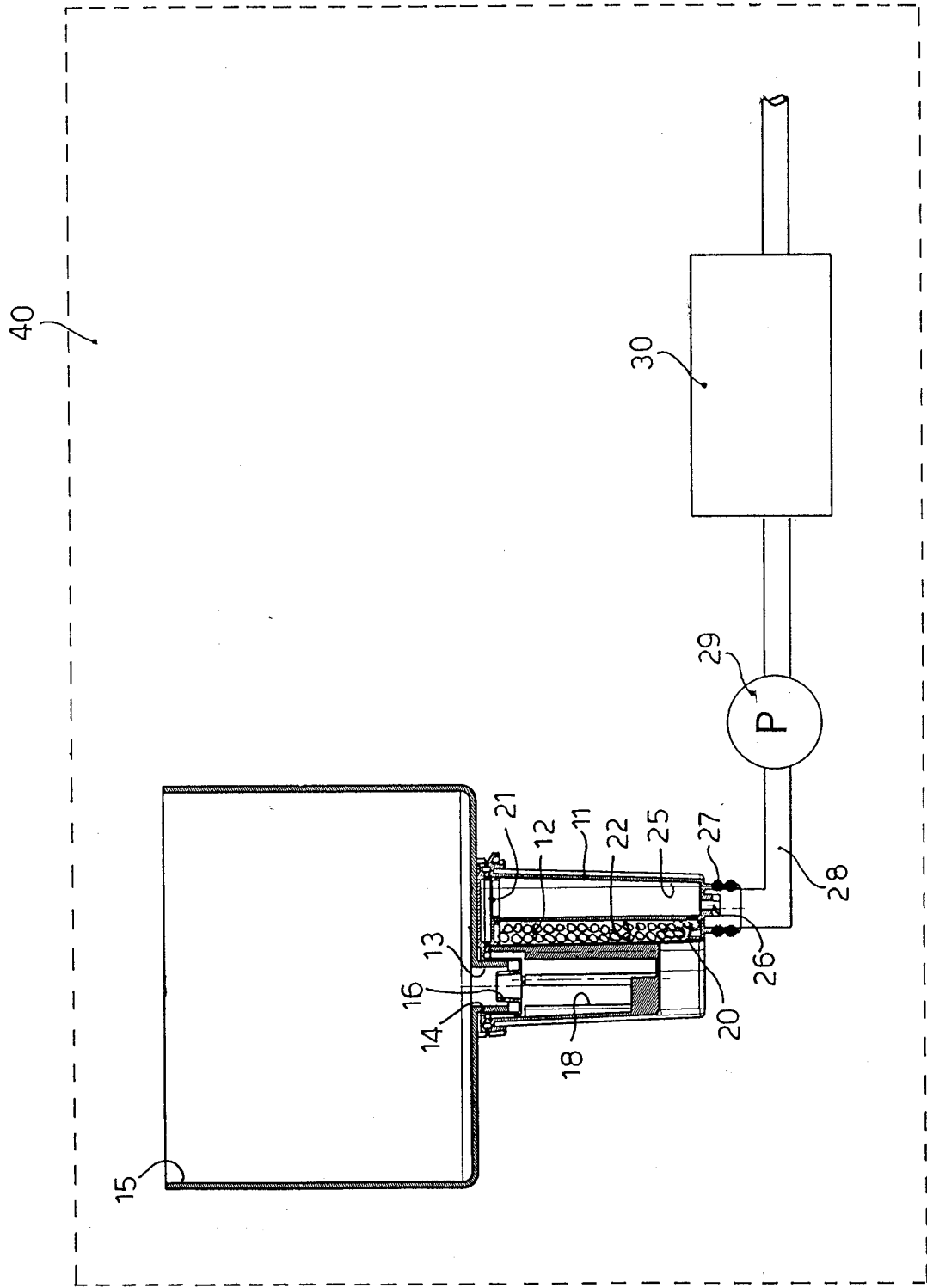
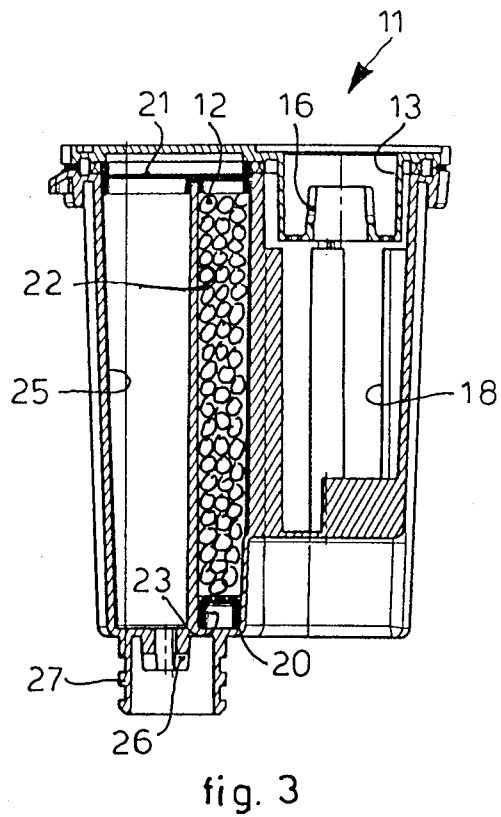
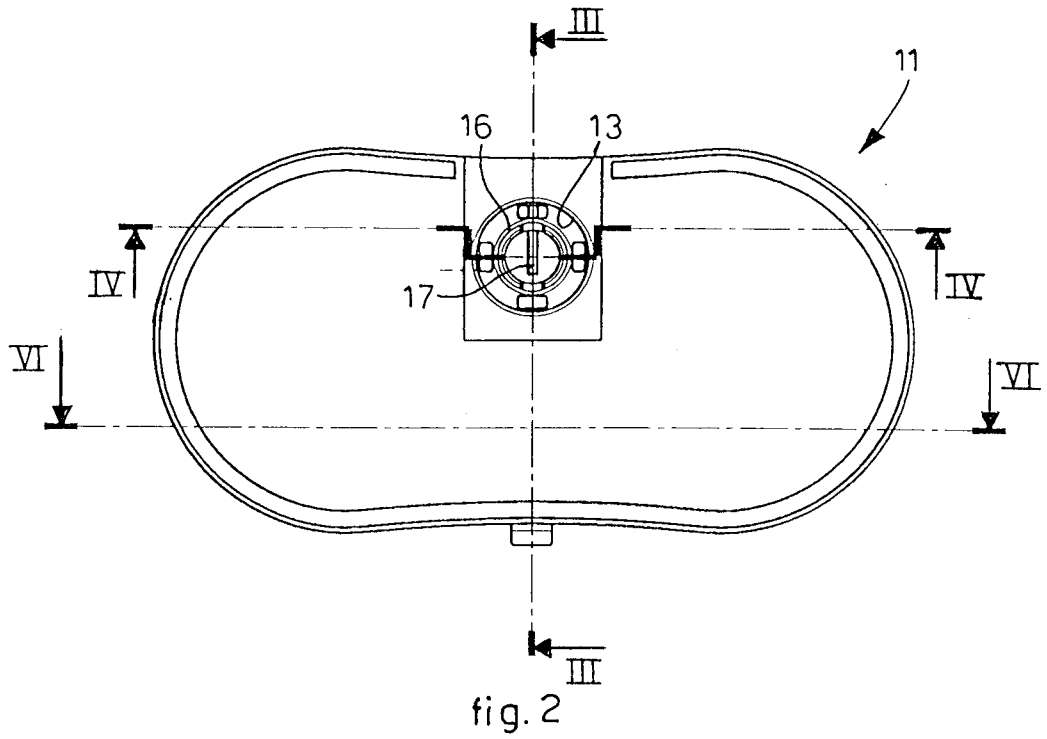
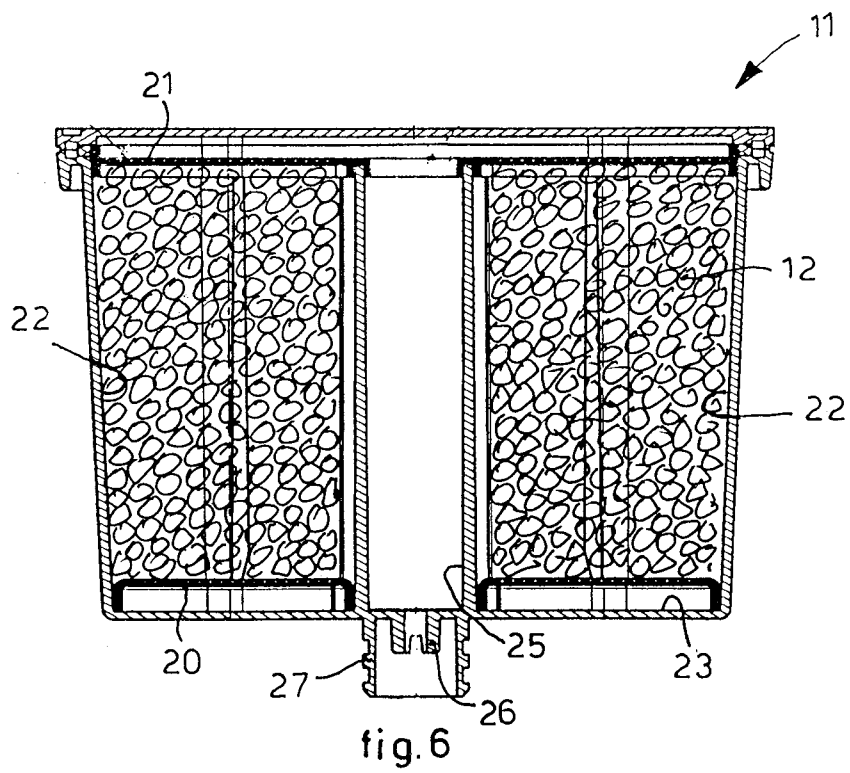
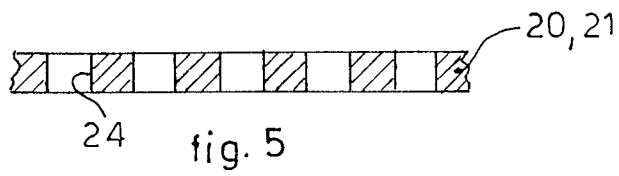
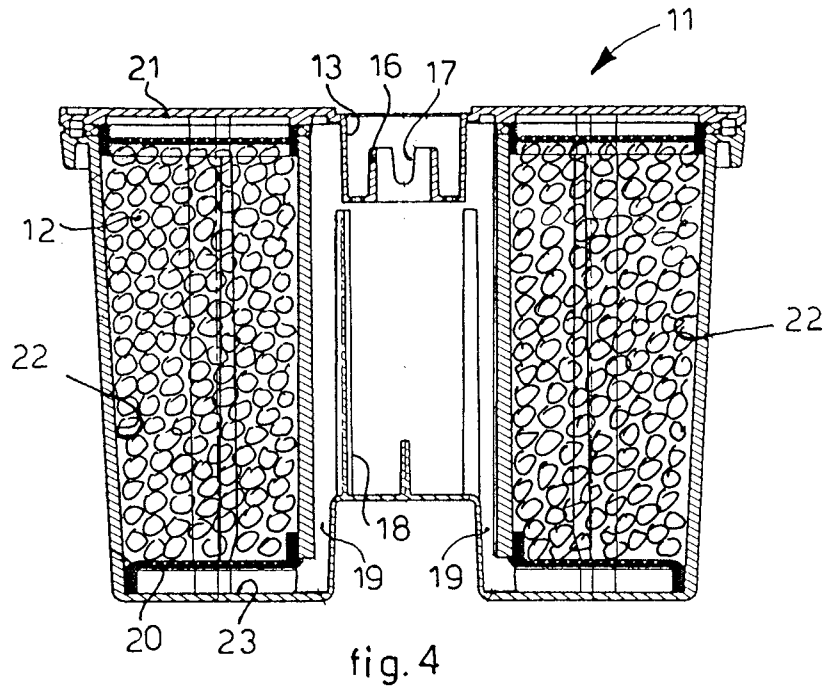
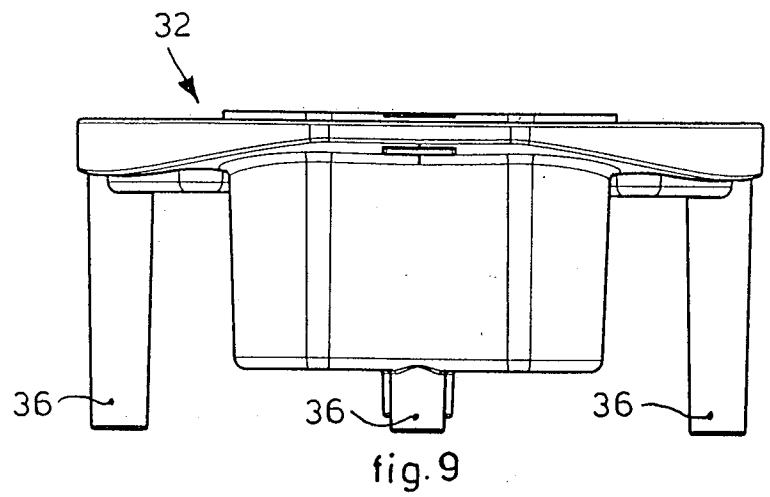
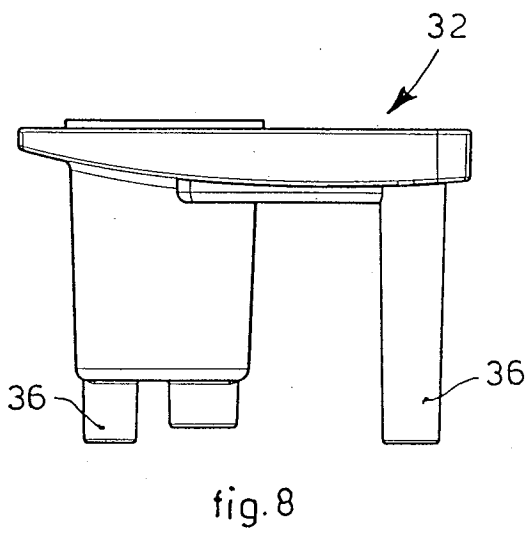
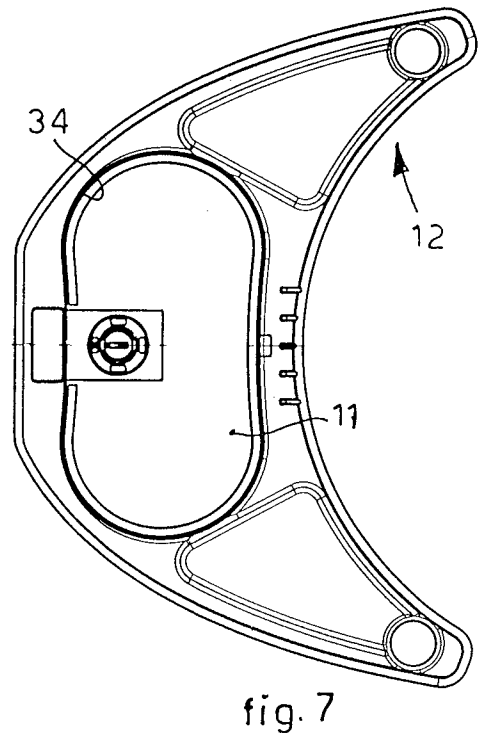


fig.1



3/4





## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2008/061282

A. CLASSIFICATION OF SUBJECT MATTER  
INV. C02F1/42 D06F1/00  
ADD. C02F1/00

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 D06F

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 2006/095282 A (KONINKL PHILIPS ELECTRONICS NV [NL]; VAN BOMMEL TIES [NL]; YU ZHENHUA) 14 September 2006 (2006-09-14) paragraphs [0024], [0031]; claims	1-12
A	EP 0 574 602 A (MIRALFIN SRL [IT]) 22 December 1993 (1993-12-22) the whole document	1, 10
A	FR 2 850 677 A (SEB SA [FR]) 6 August 2004 (2004-08-06) the whole document	1, 10
A	DE 200 20 600 U1 (MOULINEX SA [FR]) 15 February 2001 (2001-02-15) the whole document	1-10

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 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.

\*Z\* document member of the same patent family

Date of the actual completion of the international search

27 November 2008

Date of mailing of the international search report

08/12/2008

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

Serra, Renato

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2008/061282

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006095282	A	14-09-2006	CN 101137786 A 05-03-2008
			JP 2008535647 T 04-09-2008
			US 2008230451 A1 25-09-2008
			US 2008214625 A1 04-09-2008
EP 0574602	A	22-12-1993	NONE
FR 2850677	A	06-08-2004	EP 1479814 A1 24-11-2004
			US 2004181979 A1 23-09-2004
DE 20020600	U1	15-02-2001	FR 2802195 A1 15-06-2001
			IT MI20002649 A1 06-06-2002