(19) Europäisches Patentamt
European Patent Office
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(11) **EP 1 862 581 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.12.2007 Bulletin 2007/49

(51) Int Cl.:
D06F 39/04 *(2006.01)* ***D06F 37/42*** *(2006.01)*
D06F 35/00 *(2006.01)*

(21) Application number: **06011421.2**

(22) Date of filing: **01.06.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

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(54) **Method for operating a domestic appliance, especially a home dryer or a washing machine, and domestic appliance**

(57) The invention concerns a method for operating a domestic appliance, especially a home dryer (1) or a washing machine, and a domestic appliance (1) which comprises an operating mode for treating textiles with steam. According to the method at least one action for protection of an operator of the domestic appliance (1) is taken when an interruption of an active program for treating textiles with hot steam occurs. The method shall prevent that the operator is hurt by the hot steam generated in the domestic appliance. The domestic appliance (1) comprises a control (40) and a memory (41) storing at least one program for treating textiles with steam, wherein the control (40) is adjusted to execute the inventive method.

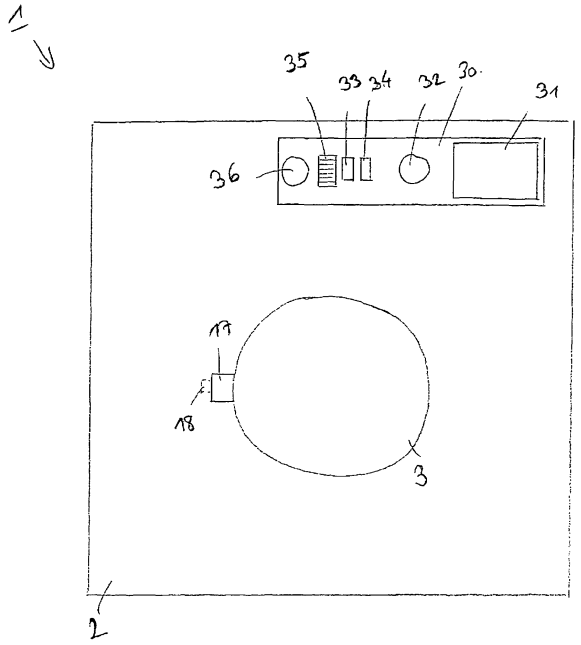

FIG 1

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Description

[0001] The invention concerns a method for operating a domestic appliance and a domestic appliance, especially a home dryer or a washing machine,

[0002] Home dryers and washing machines are well known in the state of the art. In relation to home dryers it is thereby known to dry textiles using a condensation process or using a wet exhausting air process.

[0003] It has been found out that the treatment of textiles can be improved by using steam which is applied to the textiles e.g. in a dryer during one operation mode of the dryer. One aspect of such a process is to prepare the textiles in a better way for the following ironing. Another aspect is to remove unwanted odours out of the textiles.

[0004] The dryer comprises as a rule a rotatable drum in which the textiles are contained when the textiles are treated with hot water steam. The steam generated by a steam unit is conducted by a conduit and a steam injector into the drum. The steam has during the operation in the drum normally a temperature of equal or more than 100°C. Opening the door used for loading and un-loading the drum of the dryer with textiles during the run of a program for treating textiles with steam can therefore be dangerously for an operator.

[0005] It is therefore an object of the present invention to propose a method for operating a domestic appliance and a domestic appliance as mentioned above which at least reduce the risk of an accident with hot steam during the operation of the domestic appliance.

[0006] This object is inventively achieved by the method for operating a domestic appliance, especially a home dryer or a washing machine, of claim 1, which domestic appliance comprises a steam unit and an operating mode for treating textiles with hot steam, wherein at least one action for protection of an operator of the domestic appliance is taken when an interruption of an active program for treating textiles with hot steam occurs. The inventors have recognized that every interruption of a program for treating textiles with steam should be supervised because independently thereof whether the interruption was caused by the operator or not there is always potentially the danger that the operator opens the door of the domestic appliance without thinking about the hot steam inside the domestic appliance. It is therefore reasonable to provide at least one preferably more actions that the operator is not hurt by the hot steam generated in the domestic appliance, when an interruption of a run of a program for treating textiles with hot steam occurs.

[0007] According to one variant of the invention the action is taken, when a door for loading and un-loading a room of the domestic appliance with textiles is opened, whereby the opening of the door interrupts the program for treating the textiles with steam. Normally the domestic appliance has a door to a rotatable drum containing the textiles during the operation of the domestic appliance. The door comprises a mechanism for opening and closing the door. It is proposed to have sensing means working together with the mechanism for opening and closing the door. Preferably the sensing means are connected with control means of the domestic appliance. The control means finally initiate the action for the protection of the operator, when the door is opened during a run of a program for treating the textiles with steam.

[0008] According to another variant of the invention the action is taken, when the program for treating textiles with steam is interrupted by activation of a switching equipment of the domestic appliance. The switching equipment comprises preferred a stop-button or a start/rest-button. Theses buttons are as a rule part of a operating panel of the domestic appliance. The switching equipment can also be a kind of virtual button e.g. a button displayed on a screen e.g. displayed on a touch screen.

[0009] The action is also taken, when the run of the program for treating textiles with steam is interrupted by a failure of the domestic appliance. Such a failure can be e.g. a short interruption of the supply voltage of the domestic appliance which can cause the interruption of the run of the program for treating textiles with steam.

[0010] A preferred action is to release at least one warning signal to the operator which calls the operator's attention to the hot steam inside the domestic appliance especially inside the drum. The warning signal can be an acoustic and/or an optical warning signal. When the warning signal is an optical warning signal it is preferred displayed with an optical display, which comprises a lamp or a LED-display (light emitting diode) or the operating panel of the domestic appliance, which operating panel comprises particularly a LCD-display (liquid crystal display).

[0011] Another action for protection of an operator is to stop at least partially the supply of steam to the room, particularly to the drum of the domestic appliance containing the textiles, when an interruption of a run of a program for treating textiles with steam occurs. Thereby the control means of the domestic appliance stop as a rule the activity of the steam unit, in particular the activity of the pump of the steam unit and/or the heating of the steam generator.

[0012] According to variants of the invention the supply of steam to the room of the domestic appliance containing the textiles can be at least partially stopped by closing a conduit which is used for supplying the room with steam. The conduit can thereby be closed by a valve, preferred by a magnetic valve.

[0013] Another possibility according to the invention to protect an operator is to deplete the steam unit of the domestic appliance of steam at least partially, when an interruption of a run of a program for treating textiles with steam occurs. This can be achieved by a valve, preferred a magnetic valve. Preferably the opening and closing of the valve is controlled by the control of the domestic appliance. The steam is thereby conducted in a part or in parts of the domestic appliance to which the operator has as a rule no contact or no access.

[0014] According to embodiments of the invention the

supply of steam to the room of the domestic appliance containing the textiles can be at least partially stopped by the reversion of the flux of the steam through the steam unit. By a reversion of the flux of the steam through the steam unit thus the steam do not flow through a conduit and an injector in direction to the room containing the textiles but flows in the opposite direction. Preferred the pump of the steam unit which normally pumps water out of a water tank into the steam generator of the steam unit is thereby operated in a reversed mode. In the reversed mode the pump of the steam unit is operated in an opposite direction and pumps the steam already generated in the steam generator into the water tank.

[0015] It is also possible for the protection of the operator to conduct the steam contained in the drum of the domestic appliance out of the drum, when an interruption of a run of a program for treating textiles with steam occurs. This can be achieved by a separate conduit connected with one side to the drum and with the other side e. g. to the outside of the domestic appliance. Preferably there is a controllable valve for opening the passage through the conduit. Advantageously a fan is used for conducting the steam out of the drum containing the textiles. Another possibility for conducting the steam out of the drum of the domestic appliance is to use an already existing conduit of the domestic appliance. Preferred is the use of the conduit of the supply air to the drum and/or the use of the conduit of the exhaust air out of the drum. Both conduits are normally used for air circulation during the process of drying textiles. The last mentioned embodiment is therefore particularly adapted for home dryers.

[0016] According to an embodiment of the invention the door for loading and un-loading the domestic appliance with textiles can not be opened after an interruption of an active program for treating textiles with steam until there is no more danger for an injury of an operator. Preferred the door for loading and un-loading the domestic appliance with textiles can not be opened for a certain period of time and/or until the temperature and/or the atmospheric moisture in the room of the domestic appliance containing the textiles has/have a certain value. The opening of the door is in these cases thus either time controlled or temperature controlled or atmospheric moisture controlled.

[0017] The domestic appliance can be in case of a dryer a dryer of the condensation type or a dryer of the exhaust air type.

[0018] The domestic appliance according to the invention comprises a control and a memory storing at least one program for treating textiles with steam, wherein the control is adjusted to execute at least one of the aforementioned methods.

[0019] Embodiments of the invention are illustrated in the accompanying schematic drawings. It is shown:

FIG 1 a dryer in a front view,

FIG 2 a first embodiment of components of the dryer of FIG 1, partially shown in a schematic block diagram and

FIG 3 a second embodiment of components of the dryer of FIG 1, partially shown in a schematic block diagram.

[0020] The invention is consecutively exemplarily described for a domestic appliance in form of a home dryer. But the domestic appliance according to the invention can also be a washing machine comprising a steam unit as described later and an operating mode for treating textiles with steam.

[0021] FIG 1 shows a front view of a dryer, especially a home dryer 1. FIG 2 shows in one embodiment of the invention components of the home dryer 1 of FIG 1. The home dryer 1 of FIG 1 and FIG 2 is a condensation type dryer. The home dryer 1 comprises a housing 2 with a door 3 for loading and un-loading a drum 4 with not shown textiles. The drum 4 is rotatable around an axis A by means of a motor 5 and a belt 6. The drum 4 is in a not shown way respectively pivoted.

[0022] For drying textiles the home dryer 1 comprises a conduit 7 for the supply air to the drum 4, a heating element 8 in case of the on hand embodiment arranged in or near the conduit 7 for the supply air, a conduit 9 for the exhausted air, a heat exchanger 10, a sump 11, a pump 12, a water tank or condensate collector 13, a first fan 14 in case of the on hand embodiment arranged in the conduit 7 for the supply air and a second fan 15 arranged near the heat exchanger 10. The first fan 14 and the second fan 15 are connected to a drive motor 16.

[0023] Further the home dryer 1 comprises an operating panel 30 with an display 31 and a turning knob 32 for choosing a program for drying textiles and/or a program for treating textiles with steam. The operating panel 30 is connected to control means in form of a control 40 of the home dryer 1. The control 40 is preferably a program driven computer and comprises a memory 41. A plurality of different programs for drying textiles and programs for treating textiles with steam is stored in the memory 41 which can be chosen with the turning knob 32. The display 31 is preferably a LCD-display. The display 31 is particularly intended for displaying program information and operating data of the home dryer 1. The knob 32 and the display 31 can also be used for setting operating parameters of the home dryer 1.

[0024] In one operation mode of the home dryer 1, when a program for drying textiles is chosen by an operator with the turning knob 32 of the operating panel 30 the home dryer 1 is operated in an air circulation mode. Thereby air heated by the heating element 8 in the conduit 7 for the supply air is applied by means of the fan 14 to wet textiles contained in the rotating drum 4. In the drum 4 the heated air is charged with moisture. The air charged with moisture arrives by means of the conduit 9 for the exhausted air at the heat exchanger 10 which is

cooled with the fan 15. Water condenses in the heat exchanger 10 and is collected in the sump 11. The pump 12 pumps the water of the sump 11 into the condensate collector 13. Now the air is again heated and conducted by means of the fan 14 into the drum 4. This air circulation process continues until the textiles in the drum 4 are dried in an adequate manner. The run of the chosen program for drying textiles is controlled by the control 40 of the home dryer 1 which is particularly connected to the motor 5, the heating element 8, the motor 16 and the pump 12 what is not explicitly shown in FIG 2.

[0025] In another operation mode of the home dryer 1 textiles contained in the drum 4 can be treated with hot water steam. The home dryer 1 comprises therefore a steam unit. The steam unit comprises a water tank 20, a pump 21, a steam generator 22 and a injector 23 for the steam connected to the steam generator 22 by a conduit 24. As described above the operator can choose a program for treating textiles with steam with the turning knob 32. During the run of such a program water contained in the water tank 20 is pumped by the pump 21 into the steam generator 22 and there heated. The steam generated in the steam generator 22 arrives by means of the conduit 24 and the injector 23 at the drum 4. The hot water steam is then applied to the textiles contained in the drum 4, which thereby rotates around the axis A. The hot water steam has a temperature of 100°C and more. This process particularly the run of the respective program is again controlled by the control 40.

[0026] Especially during the run of a program for treating textiles with hot steam the danger exists that an operator is hurt by the hot steam when an active program is interrupted. Normally an interruption of a run of program for treating textiles with steam is caused either by opening the door 3 for loading and un-loading the drum 4 with textiles or by switching of a switching equipment of the home dryer 1. But an interruption of a run of a program for treating textiles with steam can also occur in consequence of a failure of the home dryer 1. By the way this listing is not concluding.

[0027] For detecting the opening of the door 3 for loading and un-loading the drum 4 with textiles as soon as possible a mechanism 17 for opening and closing the door 3 is equipped with additional sensing means 18. The sensing means 18 are e. g. a light barrier or any other appropriate sensor for registering at once the opening of the door 3 with the mechanism 17. The sensing means 18 are connected to the control 40 (not shown in the drawings). Therefore the control 40 can at once register when the door 3 is opened.

[0028] As mentioned above the run of a program for treating textiles with steam can also be interrupted by the activation of switching means. Switching means for such an interruption are in the case of the on hand embodiment a stop-button 33 and/or a start/rest-button 34 of the operating panel 30 of the home dryer 1. The switching of any of these buttons is registered by the control 40.

[0029] In any case of interruption of a run of a program for treating textiles with steam, especially in the aforementioned cases, it is reasonable to take at least one action for protection of the operator. It is namely possible that the operator is not aware of the hot steam inside the drum 4 when the interruption occurs.

[0030] When the control 40 registers an interruption of a run of a program for treating textiles with steam is it by means of the sensing means 18 or by getting a stop signal or rest signal based on the activation of the stop-button 33 or of the start/rest-button 34 the control 40 runs in a kind of emergency mode and releases at once at least one warning signal. Preferably an acoustic and an optical warning signal are released or generated by the control 40 to direct the operator's attention to the hot steam inside the drum 4.

[0031] The acoustic warning signal is released e.g. by means of a buzzer or a speaker 35 of the operating panel 30 to the operator. The warning signal can be e.g. a beep or a spoken warning like "attention- hot steam".

[0032] The optical warning signal is released by means of an optical display preferably arranged in the front of the home dryer 1. The optical display can be e.g. a lamp, particularly a red lamp 36 or a LED-display or the LCD-display 31. The optical warning signal can thus be only a red warning light or in case of the LCD-display 31 red blinking words like "attention- hot steam".

[0033] Additionally to the release of the warning signals the control 40 stops after registering an interruption of a run of a program for treating textiles with steam the further supply of hot steam of the steam unit to the drum 4. The control 40 especially stops the operation of the pump 21 of the steam unit and the operation of the heating of the heat generator 22 of the steam unit.

[0034] The supply of steam to the drum 4 can thereby be stopped by closing the conduit 24 by a magnetic valve 25 which is attached to the conduit 24 and controlled by the control 40.

[0035] A further possibility to stop the supply of steam to the drum 4 containing the textiles can be the reversion of the flux of the steam through the steam unit. By a reversion of the flux of the steam through the steam unit thus the steam generated by the steam generator 22 do not flow through the conduit 24 and the injector 23 in direction to the drum 4 but flows in the opposite direction. The pump 21 of the steam unit which normally pumps water out of a water tank 20 into the steam generator 22 is thereby preferably operated in a reversed mode. In the reversed mode the pump 21 is operated in an opposite direction and pumps the steam already generated and still present in the steam generator 22 into the water tank 20. The pump 21 is thereby controlled by the control 40.

[0036] Another action to protect an operator is to deplete the steam unit of the home dryer 1 of the steam, when an interruption of a run of a program for treating textiles with steam occurs. This can be achieved by a magnetic valve 26 attached to the steam unit. E.g. the magnetic valve 26 is attached to a conduit connecting the pump 21 und the steam generator 22. The opening

and closing of the magnetic valve 26 is controlled by the control 40. when an interruption of a run of a program for treating textiles with steam occurs, the magnetic valve 26 is opened in direction to a conduit 27 which is attached to the magnetic valve 26 and the steam is conducted by means of the conduit 27 in a part or in parts of the home dryer 1 to which the operator has as a rule no contact or no access.

[0037] When the conduit 27 is connected to the magnetic valve 25 the steam unit can also be depleted of the steam by means of the magnetic valve 25 and the conduit 27. In this case the magnetic valve 26 is not necessary.

[0038] Another action taken by the control 40 in case of an interruption of a run of a program for treating textiles is to conduct as fast as possible the hot steam contained in the drum 4 out of the drum 4. This can be done by a separate conduit connected to the drum 4 and equipped with a controllable valve. But preferably the conduit 7 for the supply air and/or the conduit 9 for the exhausted air are used for conducting the hot steam out of the drum 4. In case of the on hand embodiment the conduit 7 for the supply air is used because of the fan 14 inside the conduit 7. So the control 40 can activate the motor 16 in such a way that the hot steam is conducted out of the drum 4 by means of the fan 14 which is operated in the reverse direction in comparison to the drying mode (see arrow in FIG 2).

[0039] In case of an interruption of a run of a program for treating textiles with steam by switching one of the buttons 33 or 34 the control 40 blocks the door 3 with a not explicitly shown closing device of the mechanism 17. The door 3 can thereby not be opened until there is no more danger for an injury for the operator. Preferably the door 3 is blocked by the control 40 for a certain period of time, e.g. 1 minute, and/or until the temperature and/or the atmospheric moisture in the drum 4 has reached a certain value. The value of the temperature can be registered with a separate temperature sensor 19 connected to the control 40 or in a respectively way with a not shown temperature sensor of the steam generator 22 whereby based on the temperature of the steam generator 22 and a known cool down behaviour of the steam in the drum 4 the control 40 computes the temperature in the drum 4. The value of the atmospheric moisture can be registered with a separate sensor 28 connected to the control 40 or with a already existing sensor of the home dryer 1.

[0040] The invention was afore described in connection with a home dryer of the condensation type. But the invention is not limited to home dryer of the condensation type. The invention is also applicably in home dryers using a wet exhausted air process as illustrated in FIG 3. Components shown in FIG 3 which are in type and function identically or comparably with components shown in FIG 2 have the same reference numerals.

[0041] In case of the embodiment of FIG 3 heated air is conducted in the drum 4 by means of the conduit 7 for supply air, the heating element 8 and the fan 14 for drying wet textiles contained in the drum 4. The air charged with moisture is conducted from the drum 4 to the outside of the home dryer.

[0042] The home dryer of FIG 3 can like the home dryer of FIG 2 be operated with at least one program for treating textiles in the drum 4 with hot steam. For protection of an operator in case of an interruption of a program for treating textiles with steam the same actions can be taken as described above. Acoustic and optical warning signals can be released in the same way. The supply of steam to the drum 4 can be stopped by the control 40. The steam unit can be depleted of steam. The steam contained in the drum 4 can be conducted out of the drum by means of the conduit 7 and the fan 14 whereby the fan can be operated in both turning direction. Also the door 3 can be blocked for a certain period of time and /or until the temperature in the drum 4 has reached a certain value.

[0043] As mentioned before the invention is also applicable to washing machines comprising a steam unit and an operating mode for treating textiles with hot steam.

[0044] As described above a lot of actions can be taken in case of an interruption of a run of a program for treating textiles with steam for the protection of an operator. Thereby it is not necessary to take all the described actions. It can be sufficient to take only one action or any adapted combination of the described actions that the operator is not hurt by hot steam.

Reference Numerals

[0045]

1	home dryer
2	housing
3	door
4	drum
5	motor
6	belt
7	conduit for supply air
8	heating element
9	conduit for exhausted air
10	heat exchanger
11	sump
12	pump
13	condensate collector
14	fan
15	fan
16	motor
17	mechanism
18	sensing means
19	temperature sensor
20	water tank
21	pump
22	steam generator
23	injector
24	conduit
25	magnetic valve

26 magnetic valve
27 conduit
28 sensor
30 control panel
31 display
32 turning knob
33 stop-button
34 start/rest-button
35 speaker
36 lamp
40 control
41 memory
A axis

Claims

1. Method for operating a domestic appliance, especially a home dryer (1) or a washing machine, which domestic appliance (1) comprises an operating mode for treating textiles with steam, wherein at least one action for protection of an operator of the domestic appliance (1) is taken when an interruption of an active program for treating textiles with steam occurs that the operator is not hurt by the steam generated in the domestic appliance (1).

2. Method according to claim 1, wherein the action is taken, when a door (3) for loading and un-loading a room (4) of the domestic appliance (1) with textiles is opened during the run of the program for treating textiles with steam.

3. Method according to claim 1, wherein the action is taken, when the program for treating textiles with steam is interrupted by activation of a switching equipment (33, 34) of the domestic appliance (1).

4. Method according to claim 3, wherein the switching equipment comprises a stop-button (33) or a start/rest-button (34).

5. Method according to claim 1, wherein the action is taken, when the program for treating textiles with steam is interrupted by a failure of the domestic appliance (1).

6. Method according to at least one of the claims 1 to 5, wherein at least one warning signal is released.

7. Method according to claim 6, wherein the warning signal is an acoustic and/or an optical warning signal.

8. Method according to claim 7, wherein the optical warning signal is displayed with an optical display, which comprises a lamp (36) or a LED-display or an operating panel (30) of the domestic appliance (1), which operating panel (30) comprises particularly a LCD-display (31).

9. Method according to at least one of the claims 1 to 8, wherein the supply of steam to the room (4) of the domestic appliance (1) containing the textiles is at least partially stopped.

10. Method according to claim 9, wherein a conduit (24) for supplying the room (4) of the domestic appliance (1) containing the textiles with steam is closed.

11. Method according to claim 10, wherein the conduit (24) is closed by a valve (25).

12. Method according to at least one of the claims 1 to 11, wherein the domestic appliance (1) comprises a steam unit, wherein the steam unit is at least partially depleted of steam.

13. Method according to claim 12, wherein the steam unit is at least partially depleted of steam by a valve (26).

14. Method according to at least one of the claims 9 to 13, wherein the supply of steam to the room (4) of the domestic appliance (1) containing the textiles is at least partially stopped by the reversion of the flux of the steam through the steam unit.

15. Method according to claim 14, wherein the steam unit comprises a steam generator (22) and a pump (21) for pumping water into the steam generator (22), wherein the pump (21) of the steam unit is operated in a reversed mode.

16. Method according to at least one of the claims 1 to 15, wherein the steam contained in the room (4) of the domestic appliance (1) containing the textiles is conducted out of the room (4).

17. Method according to claim 16, wherein a fan (14) is used for conducting the steam out of the room (4) containing the textiles.

18. Method according to claim 16 or 17, wherein the steam contained in the room (4) containing the textiles is conducted out of the room (4) by means of a conduit (7) of the supply air to the room (4) and/or by means of a conduit (9) of the exhaust air out of the room (4) which conduit/conduits is/are normally

used in an operating mode for drying textiles.

19. Method according to at least one of the claims 3 to 18, wherein
the door (3) for loading and un-loading the domestic appliance (1) with textiles can not be opened after an interruption of an active program for treating textiles with steam until there is no more danger for an injury of an operator.

20. Method according to claim 19, wherein
the door (3) for loading and un-loading the domestic appliance (1) with textiles can not be opened for a certain period of time and/or until the temperature and/or the atmospheric moisture in the room (4) of the domestic appliance (1) containing the textiles has/have a certain value.

21. Method according to at least one of the claims 1 to 20, wherein
the domestic appliance is a dryer of the condensation type.

22. Method according to at least one of the claims 1 to 20, wherein
the domestic appliance is a dryer of the exhaust air type.

23. Domestic appliance, especially home dryer (1) or washing machine, comprising
a control (40) and a memory (41) storing at least one program for treating textiles with steam, wherein
the control (40) is adjusted to execute a method of at least one of the claims 1 to 22.

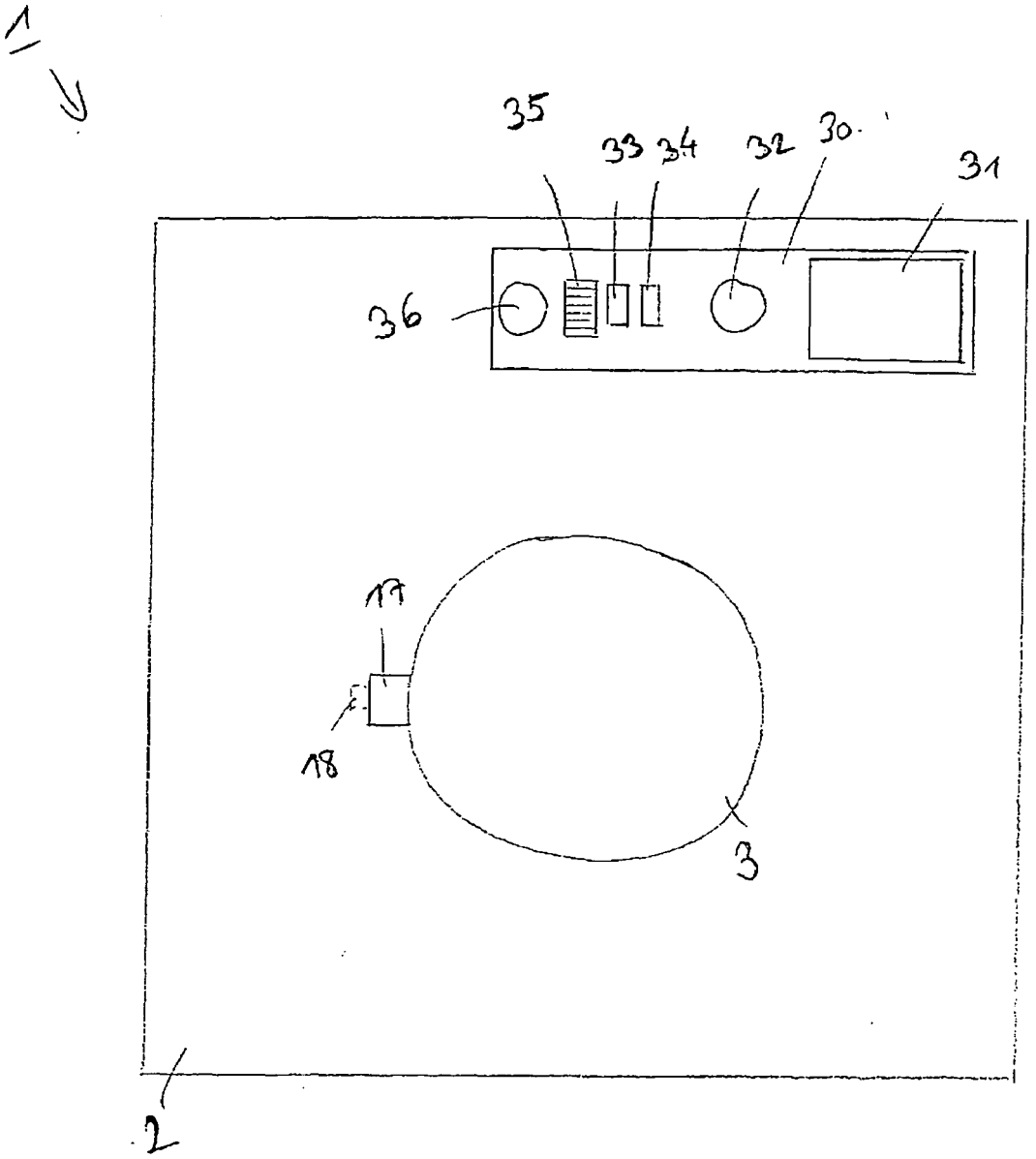

FIG 1

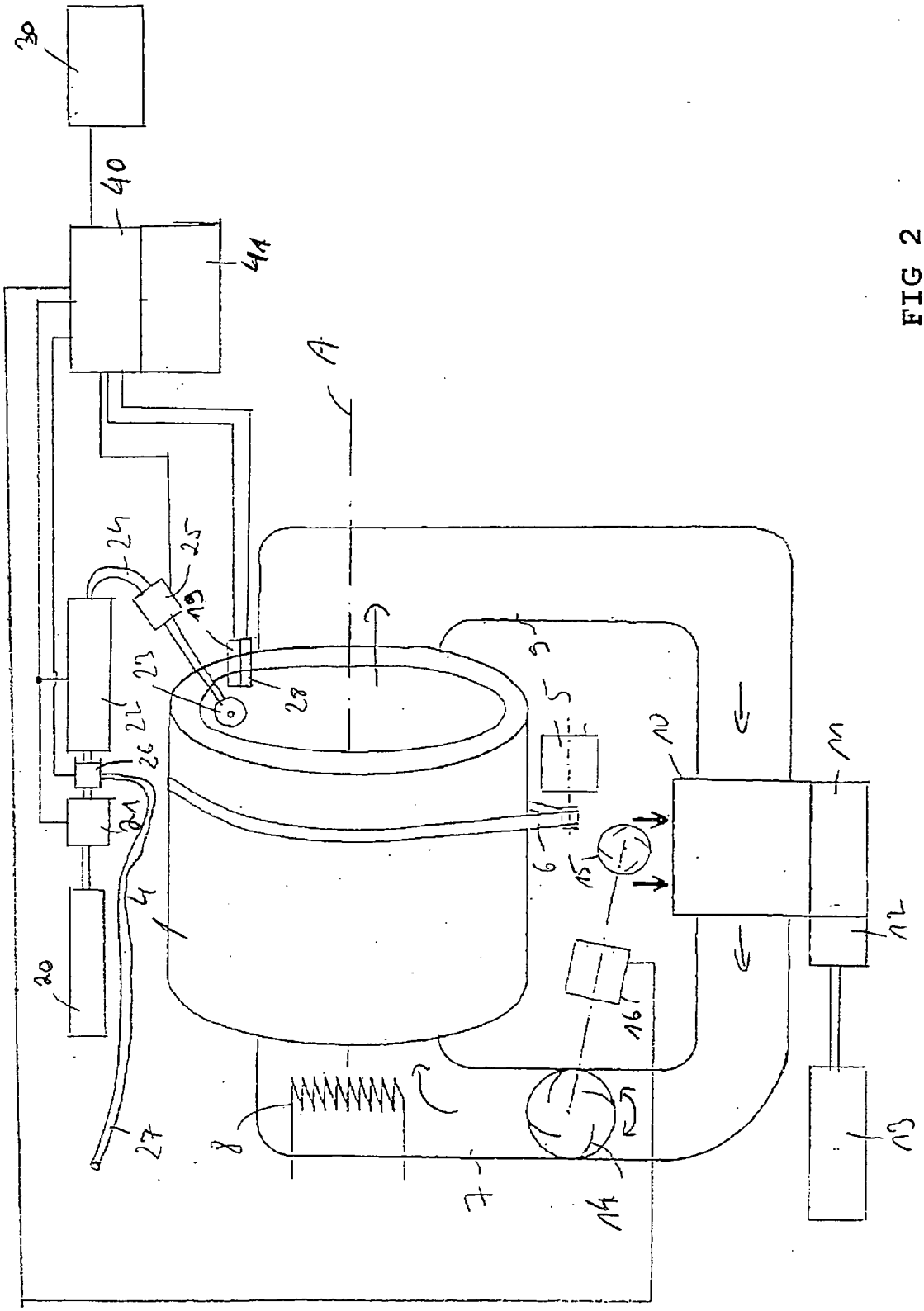

FIG 2

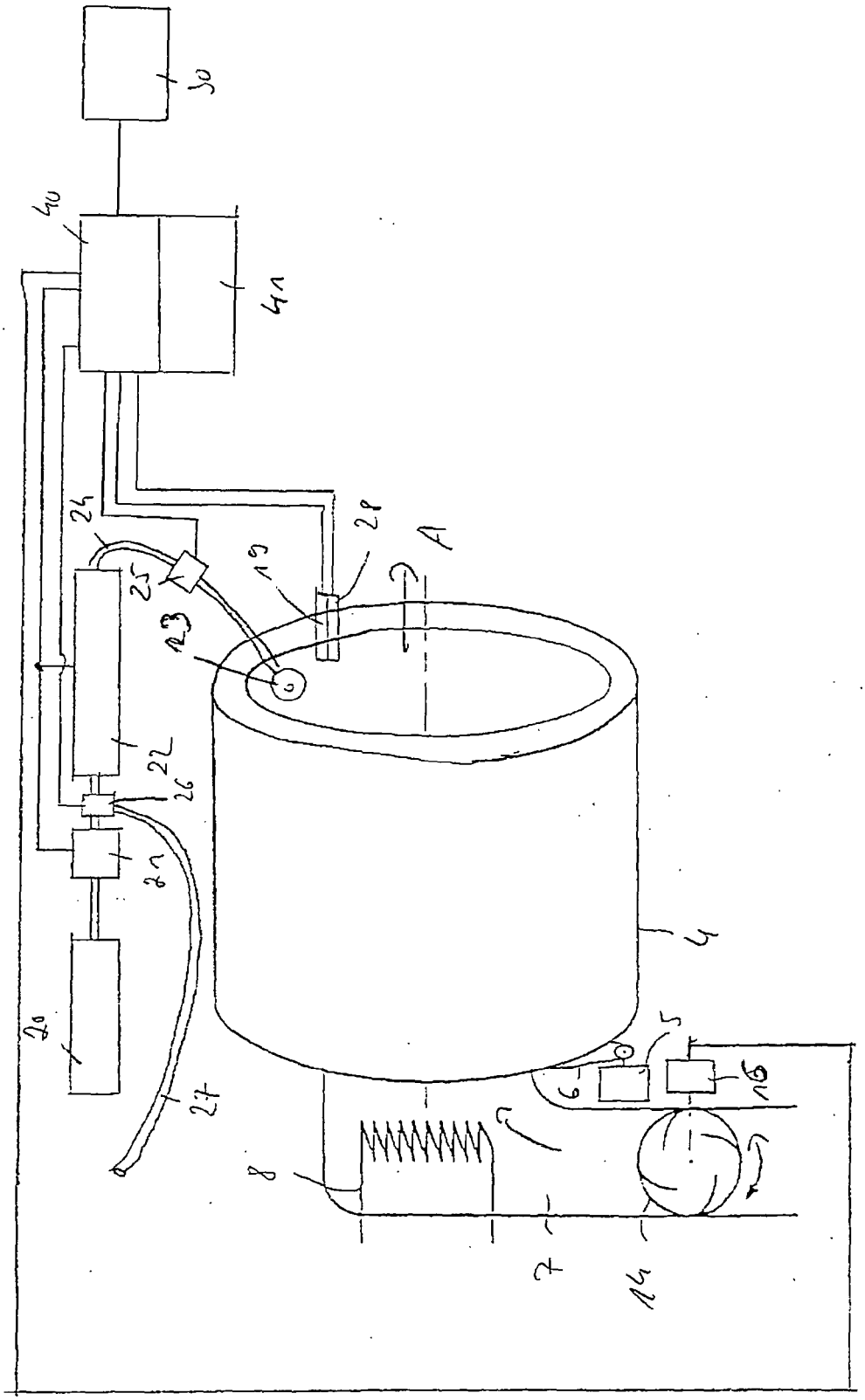

FIG 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 01 1421

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 October 2006	DIAZ, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 01 1421

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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