



- (51) International Patent Classification:
D06F 25/00 (2006.01)
- (21) International Application Number:
PCT/EP2016/064908
- (22) International Filing Date:
28 June 2016 (28.06.2016)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
A 2015/08403 7 July 2015 (07.07.2015) TR
- (71) Applicant: **ARCELIK ANONIM SIRKETI** [TR/TR]; E5
Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul (TR).
- (72) Inventors: **SARITAS, Ugur**; E5 Ankara Asfalti Uzeri,
Tuzla, 34950 Istanbul (TR). **KASAP, Fatih**; E5 Ankara
Asfalti Uzeri, Tuzla, 34950 Istanbul (TR). **HATIPOGLU,
Ozcan**; E5 Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul
(TR). **SAHIN, Yavuz**; E5 Ankara Asfalti Uzeri, Tuzla,
34950 Istanbul (TR).
- (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, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

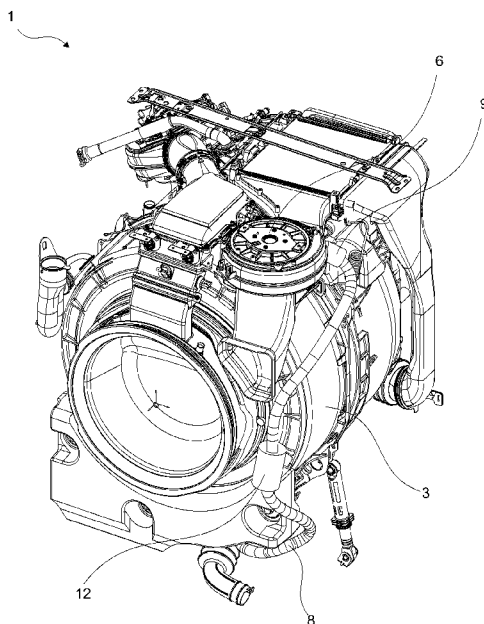
- (84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

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

(54) Title: A LAUNDRY WASHING AND DRYING MACHINE WITH IMPROVED WASHING PERFORMANCE

Figure 1



(57) Abstract: The present invention relates to a laundry washing and drying machine (1) comprising a drum (2) wherein the laundry is placed; a tub (3) wherein the drum (2) moves; an air circulation duct (4) wherein the process air (PA) circulation, providing the drying of the laundry, is performed in the drying process after the washing process; a condenser (5) that is disposed on the air circulation duct (4) and that enables the process air (PA) passing therethrough to be condensed; a fan (6) that sucks the cooling air (CA) from the outer environment; and a first air delivery line (7) that extends between the fan (6) and the condenser (5) and that enables the delivery of the cooling air (CA) sucked by the fan (6) to the condenser (5).

Description**A LAUNDRY WASHING AND DRYING MACHINE WITH IMPROVED WASHING PERFORMANCE**

- [0001] The present invention relates to a washing and drying machine of which the washing performance is improved.
- [0002] In laundry washing and drying machines, the cleaning agents like the detergent, softener etc. required for the washing process are placed into a dispenser. The water received from the mains is passed through the dispenser and mixed with detergent, and the mixed wash water is transferred to the tub. In the drying process realized after the washing process, air-cooled condensers that realize the condensation process by using the outer environment air are widely used. The humid air that comes from over the laundry and passes through the process air duct is condensed in the condenser cooled by means of the outside environment air, thus the air that is dried by being dehumidified is delivered again onto the laundry through the process air duct.
- [0003] When the water received from the mains and the detergent are mixed during the washing process, the entire detergent is not dissolved in the water. The undissolved detergent is discharged with the wash water after the washing process without being used. As a result, the performance of the laundry washing and drying machine is decreased.
- [0004] In the state of the art Japanese Patent Application No. JP2003311064, a laundry washing machine is disclosed, whereof the washing performance is improved by means of a pump generating foam and by generating foam by means of the air pump.
- [0005] The aim of the present invention is the realization of a laundry washing and drying machine whereof the washing performance is improved by increasing the amount of detergent that is dissolved in the wash water.
- [0006] The laundry washing and drying machine realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a drum wherein the laundry is placed; a tub wherein the drum moves; an air circulation duct wherein the process air circulation, providing the drying of the laundry, is performed in the drying

process after the washing process; a condenser that is disposed on the air circulation duct and that enables the process air passing therethrough to be condensed; a fan that sucks the cooling air from the outer environment, and a first air delivery line that extends between the fan and the condenser and that enables the delivery of the cooling air sucked by the fan to the condenser. The humid air that comes from over the laundry and passes through the air circulation duct is condensed in the condenser that is cooled by means of the cooling air, thus the air that is dried by being dehumidified is delivered again onto the laundry through the air circulation duct.

- [0007] The laundry washing and drying machine of the present invention comprises a second air delivery line that extends from the fan or the first air delivery line to the tub and that enables the delivery of the air from the fan to the tub. The cooling air sucked by the fan from the outer environment is transferred from the second delivery line to the tub. The mechanical movements generated by the cooling air that contacts the wash water in the tub by creating bubbles in the wash water enables more detergent to be dissolved in the wash water.
- [0008] In an embodiment of the present invention, the laundry washing and drying machine comprises a valve that is disposed on the first air delivery line. In this embodiment, the valve has an inlet end connected to the fan and at least two outlet ends connected to the first air delivery line and the second air delivery line. Thus, the cooling air is enabled to be directed from the outlet of the fan to the first air delivery line or the second air delivery line.
- [0009] In another embodiment of the present invention, the laundry washing and drying machine comprises a control unit that controls the operation of the valve and enables the cooling air to be directed to the first air delivery line or the second air delivery line by means of the valve. The control unit controls the delivery of the cooling air leaving the fan to the condenser from the first air delivery line or to the tub from the second air delivery line by controlling the open/closed positions of the shutters at the outlet ends of the valve.
- [0010] In another embodiment of the present invention, the control unit enables

the cooling air to be directed to the second air delivery line in the water intake step by means of the valve. In the water intake step, the water received from the mains is passed through the detergent dispenser and mixed with detergent and then transferred to the tub to be used in the main washing step. As the water intake step begins, the control unit enables the delivery of cooling air from the second air delivery line to the tub. The control unit continues to send the cooling air until the water intake step is completed, thus the maximum amount of detergent is enabled to be dissolved in the washing water until the main washing step begins. As the main washing step begins, the control unit ends the delivery of the cooling air to the second air delivery line.

- [0011] In another embodiment of the present invention, the laundry washing and drying machine comprises a conductivity sensor disposed inside the tub and the control unit that determines the type of detergent used according to the data received from the conductivity sensor and controls the amount of cooling air delivered to the second air delivery line by means of the valve according to the type of detergent. Depending on the use of powder detergent or liquid detergent, the amount of detergent remaining without dissolving in the wash water varies. Therefore, the control unit initially determines the type of detergent used by means of the conductivity sensor and controls the amount of cooling air delivered to the tub from the second air delivery line with respect to this data. In the case the use of powder detergent is detected, since the amount of detergent remaining without dissolving in the tub is more, the control unit enables the delivery of a higher amount of cooling air to the tub from the second air delivery line than the case when liquid detergent is used.
- [0012] In another embodiment of the present invention, the laundry washing and drying machine comprises a heater that is disposed on the second air delivery line. The cooling air leaving the fan by means of the heater is delivered to the tub after being heated in the second air delivery line. Thus, a pre-heating process is enabled to be realized before the water heater is operated in the main washing step.
- [0013] By means of the present invention, a laundry washing and drying machine

is realized, wherein the amount of detergent dissolving in the wash water is increased by delivering the air from the fan to the tub. By using the available fan that enables the cooling of the condenser, the need for the use of an additional component is eliminated, thus providing cost advantage.

[0014] The laundry washing and drying machine realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0015] Figure – 1 is the perspective view of the tub, the fan, and the second air delivery line in an embodiment of the present invention.

[0016] Figure 2 – is the schematic view of the laundry washing and drying machine in an embodiment of the present invention.

[0017] The elements illustrated in the figures are numbered as follows:

1. Laundry washing and drying machine
2. Drum
3. Tub
4. Air circulation duct
5. Condenser
6. Fan
7. First air delivery line
8. Second air delivery line
9. Valve
10. Control unit
11. Conductivity sensor
12. Heater

[0018] PA: Process air

[0019] CA: Cooling air

[0020] The laundry washing and drying machine (1) comprises a drum (2) wherein the laundry is placed; a tub (3) wherein the drum (2) moves; an air circulation duct (4) wherein the process air (PA) circulation, providing the drying of the laundry, is performed in the drying process after the washing process; a condenser (5) that is disposed on the air circulation duct (4) and that enables the process air (PA) passing therethrough to be condensed; a fan (6) that sucks the cooling air (CA) from the outer

environment; and a first air delivery line (7) that extends between the fan (6) and the condenser (5) and that enables the delivery of the cooling air (CA) sucked by the fan (6) to the condenser (5) (Figure 1 and Figure 2).

- [0021] The laundry washing and drying machine (1) of the present invention comprises a second air delivery line (8) that extends from the fan (6) or the first air delivery line (7) to the tub (3) and that enables the delivery of the air from the fan (6) to the tub (3). During the drying process, a portion of the cooling air (CA) that enables the humid process air (PA) to be condensed by decreasing the temperature thereof is sent into the tub (3) from the second air delivery line (8). By means of the bubbles created by the cooling air (CA) in the wash water in the tub (3), a higher amount of detergent is enabled to be dissolved in the wash water.
- [0022] In an embodiment of the present invention, the laundry washing and drying machine (1) comprises a valve (9) that is disposed on the first air delivery line (7). Thus, the cooling air (CA) is enabled to be directed from the outlet of the fan (6) to the first air delivery line (7) or the second air delivery line (8). The valve (9) has an inlet end connected to the fan (6) and at least two outlet ends connected to the first air delivery line (7) and the second air delivery line (8).
- [0023] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises a control unit (10) that controls the operation of the valve (9) and that enables the cooling air (CA) to be directed to the first air delivery line (7) or the second air delivery line (8) by means of the valve (9). The control unit (10) controls the delivery of the cooling air (CA) leaving the fan to the first air delivery line (7) or to the second air delivery line (8) by controlling the open/closed positions of the shutters at the outlet ends of the valve (9). When the end of the valve (9) opening to the second air delivery line (8) is closed, the cooling air (CA) is delivered to the condenser (5) and when the end of the valve (9) opening to the first air delivery line (7) is closed, the cooling air (CA) is delivered to the tub (3).
- [0024] In another embodiment of the present invention, the control unit (10) enables the air to be directed to the second air delivery line (8) in the water intake step by means of the valve (9). In the water intake step, the water

received from the mains is passed through the detergent dispenser and mixed with detergent, and then transferred to the tub (3) to be used in the main washing step. As the water intake step begins, the control unit (10) delivers the cooling air (CA) to the tub (3) by opening the end of the valve (9) opening to the second air delivery line (8), and the delivered cooling air (CA) enables the detergent to be better dissolved in the water by creating bubbles in the water-detergent mixture carried into the tub (3). Thus, the performance of the laundry washing and drying machine (1) is improved by increasing the amount of detergent dissolved in the water before the main washing step.

[0025] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises a conductivity sensor (11) disposed inside the tub (3) and the control unit (10) that determines the type of detergent used according to the data received from the conductivity sensor (11) and controls the amount of cooling air (CA) delivered to the second air delivery line (8) by means of the valve (9) according to the type of detergent. Compared to powder detergent, liquid detergent dissolves better in the wash water. Therefore, in the case powder detergent is used in the washing process, the control unit (10) increases the amount of detergent dissolving in the wash water by increasing the amount of cooling air (CA) sent to the tub (3) (Figure 2).

[0026] In another embodiment of the present invention, the laundry washing and drying machine (1) comprises a heater (12) that is disposed on the second air delivery line (8). The cooling air (CA) leaving the fan (6) by means of the heater (12) is delivered to the tub (3) after being heated in the second air delivery line (8). The hot air enables a higher amount of detergent to be dissolved in the wash water (Figure 2).

[0027] In the laundry washing and drying machine (1) of the present invention, by delivering the cooling air (CA), that is sucked by the fan (6) from the outside environment and sent on the condenser (5) in order for the air cooled condenser (5) to be cooled, to the tub (3) instead of the condenser (5), the washing performance is improved by enabling the detergent to be better dissolved in the wash water by means of the bubbles created in the

wash water by the air.

Claims

1. A laundry washing and drying machine (1) **comprising** a drum (2) wherein the laundry is placed; a tub (3) wherein the drum (2) moves; an air circulation duct (4) wherein the process air (PA) circulation, providing the drying of the laundry, is performed in the drying process after the washing process; a condenser (5) that is disposed on the air circulation duct (4) and that enables the process air (PA) passing therethrough to be condensed; a fan (6) that sucks the cooling air (CA) from the outer environment; and a first air delivery line (7) that extends between the fan (6) and the condenser (5) and that enables the delivery of the cooling air (CA) sucked by the fan (6) to the condenser (5), **characterized by** a second air delivery line (8) that extends from the fan (6) or the first air delivery line (7) to the tub (3) and that enables the delivery of air from the fan (6) to the tub (3).
2. A laundry washing and drying machine (1) as in Claim 1, **characterized by** a valve (9) that is disposed on the first air delivery line (7).
3. A laundry washing and drying machine (1) as in Claim 2, **characterized by** a control unit (10) that controls the operation of the valve (9) and enables the cooling air (CA) to be directed to the first air delivery line (7) or the second air delivery line (8) by means of the valve (9).
4. A laundry washing and drying machine (1) as in Claim 2 or 3, **characterized by** the control unit (10) that enables the air to be directed to the second air delivery line (8) in the water intake step by means of the valve (9).
5. A laundry washing and drying machine (1) as in Claims 3 or 4, **characterized by** a conductivity sensor (11) that is disposed inside the tub (3); and the control unit (10) that determines the type of detergent used according to the data received from the conductivity sensor (11) and controls the amount of cooling air (CA) directed to the second air delivery line (8) by means of the valve (9) according to the type of detergent.
6. A laundry washing and drying machine (1) as in any one of the above claims, **characterized by** a heater (12) that is disposed on the second air delivery line (8).

Figure 1

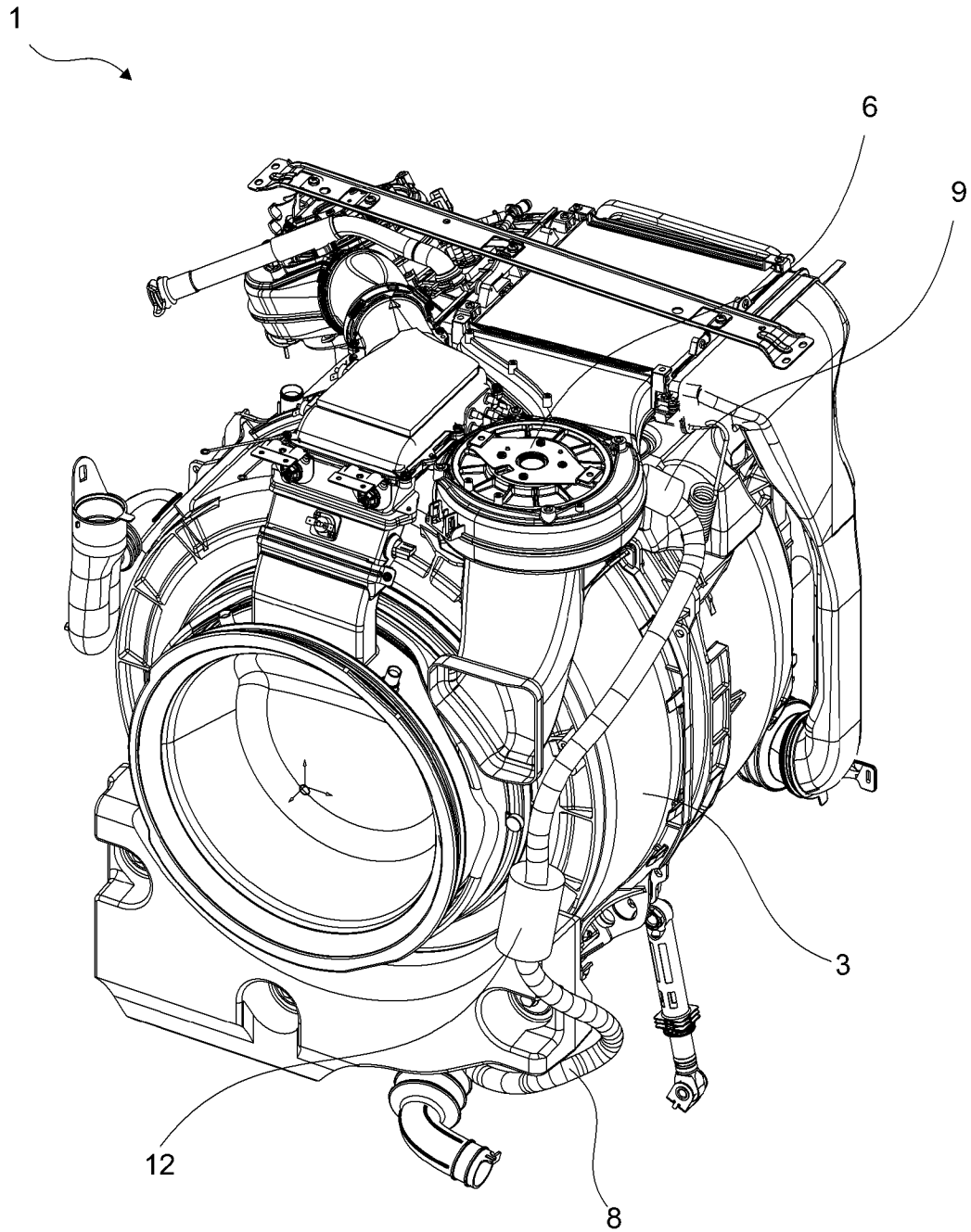
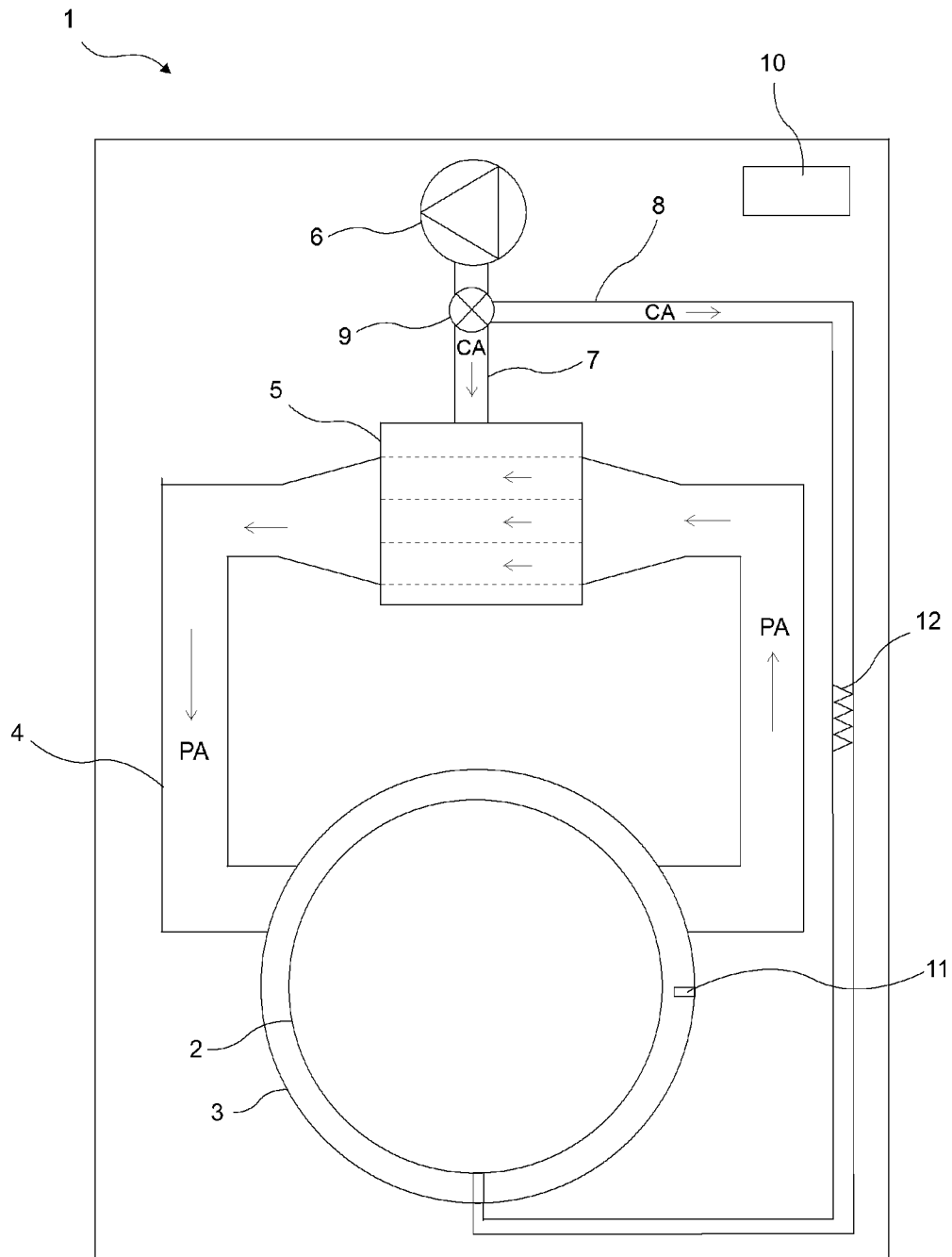


Figure 2



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/064908

A. CLASSIFICATION OF SUBJECT MATTER

INV. D06F25/00

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)

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 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.
X	WO 2010/060810 A1 (ARCELIK AS [TR]; CAN YUSUF [TR]; SARIOGLU KEMAL [TR]) 3 June 2010 (2010-06-03) abstract; figures 1,2 -----	1-3,6
A	JP 2013 085802 A (PANASONIC CORP) 13 May 2013 (2013-05-13) abstract; figures 1,3 -----	1-3,6
A	EP 0 495 168 A1 (DAEWOO ELECTONICS CO LTD [KR]) 22 July 1992 (1992-07-22) figure 6 -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 July 2016

Date of mailing of the international search report

05/08/2016

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

Kising, Axel

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/064908

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010060810	A1	03-06-2010	CN 102227530 A 26-10-2011
			EP 2373841 A1 12-10-2011
			WO 2010060810 A1 03-06-2010

JP 2013085802	A	13-05-2013	NONE

EP 0495168	A1	22-07-1992	AU 637266 B2 20-05-1993
			AU 8684091 A 23-07-1992
			DE 69122736 D1 21-11-1996
			DE 69122736 T2 13-02-1997
			EP 0495168 A1 22-07-1992
			ID 865 B 08-08-1996
			JP H0531285 A 09-02-1993
			JP H0785760 B2 20-09-1995
			US 5253380 A 19-10-1993
			US 5295373 A 22-03-1994
			US 5307649 A 03-05-1994
