(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
06 June 2024 (06.06.2024)

WIPO | PCT

(10) International Publication Number
WO 2024/118014 A1

(51) International Patent Classification:
D06F 29/00 (2006.01)

(21) International Application Number:
PCT/TR2023/050655

(22) International Filing Date:
06 July 2023 (06.07.2023)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2022/018425 02 December 2022 (02.12.2022) TR

(71) Applicant: **ARCELIK ANONIM SIRKETI** [TR/TR]; Karaagac Caddesi 2-6, Sutluce, 34445 Beyoglu/Istanbul (TR).

(72) Inventors: **ATILA, Meryem**; Arcelik A.S. Sutluce Karaagac Caddesi No:2/6, 34445 Beyoglu/Istanbul (TR). **ERTAS, Guven**; Arcelik A.S. Sutluce Karaagac Caddesi No:2/6, 34445 Beyoglu/Istanbul (TR). **CAVUSOGLU, Senol**; Arcelik A.S. Sutluce Karaagac Caddesi No:2/6, 34445 Beyoglu/Istanbul (TR). **KOCA, Burak**; Arcelik A.S. Sutluce Karaagac Caddesi No:2/6, 34445 Beyoglu/Istanbul (TR). **OZKAN, Yasemin**; Arcelik A.S. Sutluce Karaagac Caddesi No:2/6, 34445 Beyoglu/Istanbul (TR).

(74) Agent: **ANKARA PATENT BUREAU**; Mustafa Kemal Mahallesi Dumlupinar, Bulvari Eskisehir Yolu, 9. Km No:274/7 B Blok 14. Kat No:161, 34707 Cankaya/Ankara (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, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, 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, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, 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, ME, 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))*

WO 2024/118014 A1

(54) Title: A LAUNDRY WASHING-DRYING SYSTEM AND THE CONTROL METHOD THEREOF

(57) Abstract: The present invention relates to a laundry washing-drying system (1) comprising a laundry dryer (3) and a washing machine (2) connected to the laundry dryer (3), and a washing tub which is provided in the washing machine (2); a drum (5) which is provided in the laundry dryer (3); a condensate tank (4) wherein the water condensed in the drying process is stored; a steam generator (6) which turns water into hot steam; and a water tank (7) which supplies water to the steam generator (6).

A LAUNDRY WASHING-DRYING SYSTEM AND THE CONTROL METHOD THEREOF

The present invention relates to a laundry washing-drying system having a laundry dryer wherein the condensate tank and the drum of the laundry dryer are cleaned, and a washing machine connected to the laundry dryer, and relates to the control method thereof.

In laundry dryers, water condensing during the drying process is collected in a condensate tank or directly discharged. Microbial accumulation occurs in the condensate tank depending on the humidity and temperature values of the environment, and a biofilm forms on the walls of the condensate tank. It is determined that bacteria at the level of log 4 - 5 are formed in the water stored in the condensate tank. In case this water is taken into the washing machine, bacteria are carried both into the washing machine and onto the laundry loaded into the washing machine. Microbial contamination is eliminated during the washing process performed with high temperature programs or high alkalinity powder detergents in the washing machine. However, if the user uses liquid detergent and low temperature programs, microorganisms cannot be eliminated and a hygiene risk arises both in the washing machine and in the washing process since dirty water is taken into the washing machine. Microorganisms and biofilm accumulated in the condensate tank cause both a bad odor and a bad appearance.

The state of the art United States Patent Application No. US2011185511 discloses the heating of the washing water in the washing machine by benefiting from the temperature of the water condensed in the laundry dryer and the improvement of the washing performance and the reduction of energy consumption.

Another state of the art embodiment is Japanese Patent Application No. JP6936947. Said document discloses a household appliance wherein washing machines and laundry dryers are used together, and wherein it is provided that the water obtained as a result of condensation of the water vapor taken from the laundry during the drying process in the laundry dryer is heated in the steam

generator to be sent to both the washing machine and the laundry dryer to prevent bad odors and wrinkles on the laundry.

The aim of the present invention is the realization of a laundry washing-drying system having a laundry dryer wherein the condensate tank and the drum of the laundry dryer are cleaned, and a washing machine connected to the laundry dryer, and the realization of a control method thereof.

The laundry washing-drying system realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, is a laundry dryer and a washing machine connected to the laundry dryer, and comprises a washing tub which is provided in the washing machine; a drum which is provided in the laundry dryer; a condensate tank wherein the water condensed in the drying process is stored; a steam generator which turns water into hot steam; a water tank which supplies water to the steam generator; a first delivery line which transfers water from the condensate tank to the water tank; and a second delivery line, one end of which opens to the steam generator and the other end to the condensate tank, and which transmits the steam generated in the steam generator to the condensate tank. Moreover, the laundry washing-drying system comprises a third delivery line, one end of which opens to the steam generator and the other end to the drum, and which transfers the steam from the steam generator to the drum. The water transferred to the condensate tank during the drying process is transferred to the water tank via the first delivery line. At the beginning of the next drying process, the water in the water tank is converted into steam in the steam generator and transferred to the condensate tank via the second delivery line and to the drum via the third delivery line. Thus, the inside of the drum, the laundry in the drum and the condensate tank are disinfected with hot water vapor.

In the embodiment of the present invention, the water in the condensate tank is transferred to the water tank of the steam generator via the first delivery line. Thus, the water tank is enabled to be supplied with the water in the condensate tank without the need for the user to fill water into the water tank of the steam generator from outside.

In the embodiment of the present invention, the water condensed from the wet laundry during the drying process is stored directly in the condensate tank and transferred to the water tank of the steam generator via the first delivery line. In this embodiment of the present invention, the laundry washing-drying system comprises a hose which ensures the transfer of water from the condensate tank to the tub of the washing machine. In the preferred embodiment of the present invention, the first delivery line is connected to said hose.

In an embodiment of the present invention, the laundry washing-drying system comprises a sensor which detects the water level in the water tank.

In another embodiment of the present invention, the laundry washing-drying system comprises at least one valve which is disposed between the first delivery line and the second delivery line. In the preferred embodiment of the present invention, the valve is a multiport valve. By means of the valve, the water in the condensate tank is enabled to be transferred to the water tank or the hot steam generated in the steam generator to be transmitted to the condensate tank.

The control method suitable for use in the laundry washing-drying system described above comprises the steps of activating the steam generator if there is water in the water tank and sending hot water steam to the condensate tank and the drum. This process continues until there is no water in the water tank and the disinfection process is completed when there is no water in the water tank.

In another embodiment of the control method of the present invention, the steam generator is not operated when the condensate tank is full. In this embodiment, if the washing machine is also operational, the water in the condensate tank is taken into the washing machine and when the condensate tank is empty, the water tank is checked. If the water tank is full, the steam generator is activated and hot water vapor is sent to the condensate tank and the drum. In this embodiment of the present invention, first the condensate tank must be empty in order to be disinfected with hot water vapor. Therefore, after the first drying process is completed, water is transferred from the condensate tank to the water tank via the first delivery line. In this embodiment, if the water tank is empty, it is decided that the disinfection process is completed and the steam generator is not activated.

By means of the present invention, the condensate tank and the drum are effectively disinfected by means of the steam generator.

The laundry washing-drying system realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 – is the front perspective view of the laundry washing-drying system related to an embodiment of the present invention.

Figure 2 – is the rear perspective view of the laundry washing-drying system related to another embodiment of the present invention.

Figure 3 – is the sideways view of the laundry washing-drying system related to another embodiment of the present invention.

Figure 4 – is the view of the detail A of Figure 1.

Figure 5 – is the view of detail B in Figure 2.

The elements illustrated in the figures are numbered as follows:

1. Laundry washing-drying system
2. Washing machine
3. Laundry dryer
4. Condensate tank
5. Drum
6. Steam generator
7. Water tank
8. First delivery line
9. Second delivery line
10. Third delivery line
11. Valve

The laundry washing-drying system (1) is a laundry dryer (3) and a washing machine (2) connected to the laundry dryer (3), and comprises a washing tub which is provided in the washing machine (2); a drum (5) which is provided in the

laundry dryer (3); a condensate tank (4) wherein the water condensed in the drying process is stored; a steam generator (6) which turns water into hot steam; a water tank (7) which supplies water to the steam generator (6); a first delivery line (8) which transfers water from the condensate tank (4) to the water tank (7); and a second delivery line (9), one end of which opens to the steam generator (6) and the other end to the condensate tank (4), and which transmits the steam generated in the steam generator (6) to the condensate tank (4) (Figure 1, Figure 2 and Figure 3).

In another embodiment of the present invention, the laundry washing-drying system (1) comprises a third delivery line (10), one end of which opens to the steam generator (6) and the other end to the drum (5), and which transfers the steam from the steam generator (6) to the drum (5).

In this embodiment of the present invention, the water transferred to the condensate tank (4) during the drying process is transferred to the water tank (7) via the first delivery line (8). At the beginning of the next drying process, the water in the water tank (7) is converted into steam in the steam generator (6) and transferred to the condensate tank (4) via the second delivery line (9) and to the drum (5) via the third delivery line (10). Thus, the inside of the drum (5), the laundry in the drum (5) and the condensate tank (4) are disinfected with hot water vapor. Moreover, since the water in the condensate tank (4) is transferred to the water tank (7) of the steam generator (6) via the first delivery line (8), the user is not required to put water into the water tank (7) of the steam generator (6) from outside, and the water tank (7) is enabled to be supplied with the water in the condensate tank (4) (Figure 4 and Figure 5).

In the embodiment of the present invention, the water condensed during the drying process is stored directly in the condensate tank (4) and transferred to the water tank (7) of the steam generator (6) via the first delivery line (8). In this embodiment of the present invention, the laundry washing-drying system (1) comprises a hose which ensures the transfer of water from the condensate tank (4) to the tub of the washing machine (2). In the preferred embodiment of the present invention, the first delivery line (8) is connected to said hose.

In an embodiment of the present invention, the laundry washing-drying system (1) comprises a sensor which detects the water level in the water tank (7). The sensor is a micro switch or a water level sensor.

In another embodiment of the present invention, the laundry washing-drying system (1) comprises at least one valve (11) which is disposed between the first delivery line (8) and the second delivery line (9). In the preferred embodiment of the present invention, the valve (11) is a multiport valve. By means of the valve (11), the water in the condensate tank (4) is enabled to be transferred to the water tank (7) or the hot steam generated in the steam generator (6) to be transmitted to the condensate tank (4).

The control method suitable for use in the laundry washing-drying system (1) described above comprises the steps of activating the steam generator (6) if there is water in the water tank (7) and sending hot water steam to the condensate tank (4) and the drum (5). This process continues until there is no water in the water tank (7) and the disinfection process is completed when there is no water in the water tank (7).

In another embodiment of the control method of the present invention, the steam generator (6) is not operated when the condensate tank (4) is full. In this embodiment, if the washing machine (2) is also operational, the water in the condensate tank (4) is taken into the washing machine (2) and when the condensate tank (4) is empty, the water tank (7) is checked. If the water tank (7) is full, the steam generator (6) is activated and hot water vapor is sent to the condensate tank (4) and the drum (5). In this embodiment of the present invention, first the condensate tank (4) must be empty in order to be disinfected with hot water vapor. Therefore, after the first drying process is completed, water is transferred from the condensate tank (4) to the water tank (7) via the first delivery line (8). In this embodiment, if the water tank (7) is empty, it is decided that the disinfection process is completed and the steam generator (6) is not activated.

By means of the present invention, the condensate tank (4) and the drum (5) are effectively disinfected by means of the steam generator (6).

CLAIMS

1. A laundry washing-drying system (1) **comprising** a laundry dryer (3) and a washing machine (2) connected to the laundry dryer (3), and a washing tub which is provided in the washing machine (2); a drum (5) which is provided in the laundry dryer (3); a condensate tank (4) wherein the water condensed in the drying process is stored; a steam generator (6) which turns water into hot steam; and a water tank (7) which supplies water to the steam generator (6); **characterized by** a first delivery line (8) which transfers water from the condensate tank (4) to the water tank (7); and a second delivery line (9), one end of which opens to the steam generator (6) and the other end to the condensate tank (4), and which transmits the steam generated in the steam generator (6) to the condensate tank (4)

2. A laundry washing-drying system (1) as in Claim 1, **characterized by** a third delivery line (10), one end of which opens to the steam generator (6) and the other end to the drum (5), and which transfers the steam from the steam generator (6) to the drum (5).

3. A laundry washing-drying system (1) as in Claim 1 or 2, **characterized by** a sensor which detects the water level in the water tank (7).

4. A laundry washing-drying system (1) as in any one of the above claims, **characterized by** at least one valve (11) which is disposed between the first delivery line (8) and the second delivery line (9).

5. A control method suitable for use in the laundry washing-drying system (1) as in any one of the above claims, comprising the steps of activating the steam generator (6) if there is water in the water tank (7) and sending hot water steam to the condensate tank (4) and the drum (5).

6. A control method as in Claim 5, comprising the steps of taking the water in the condensate tank (4) into the washing machine (2) if the washing machine (2) is operational, checking the water tank (7) when the condensate tank (4) is empty, and activating the steam generator (6) if the

water tank (7) is full, and sending hot water vapor to the condensate tank (4) and the drum (5).

7. A control method as in Claim 6, comprising the step of not activating the steam generator (6) if the condensate tank is full.

Figure 1

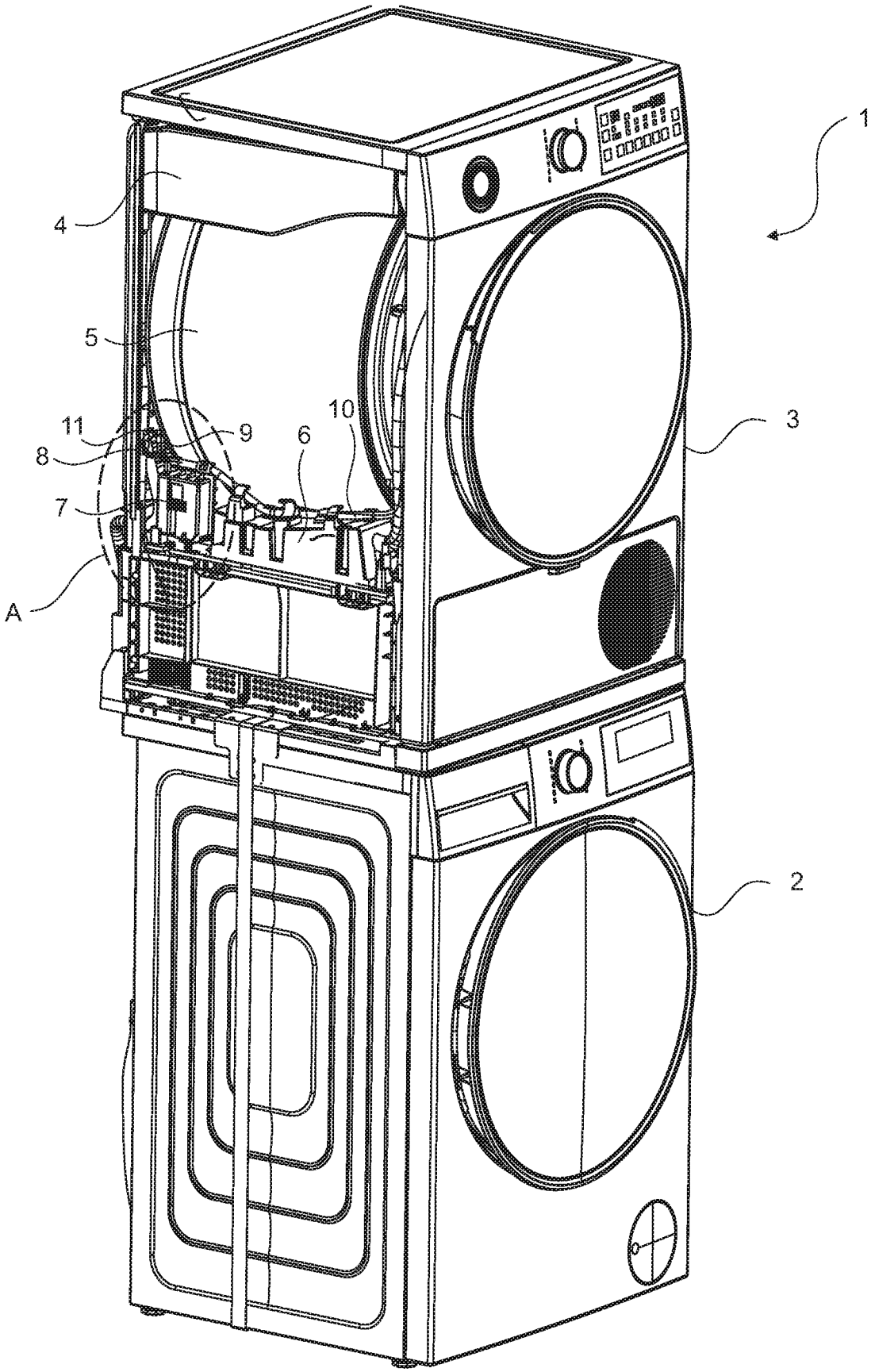


Figure 2

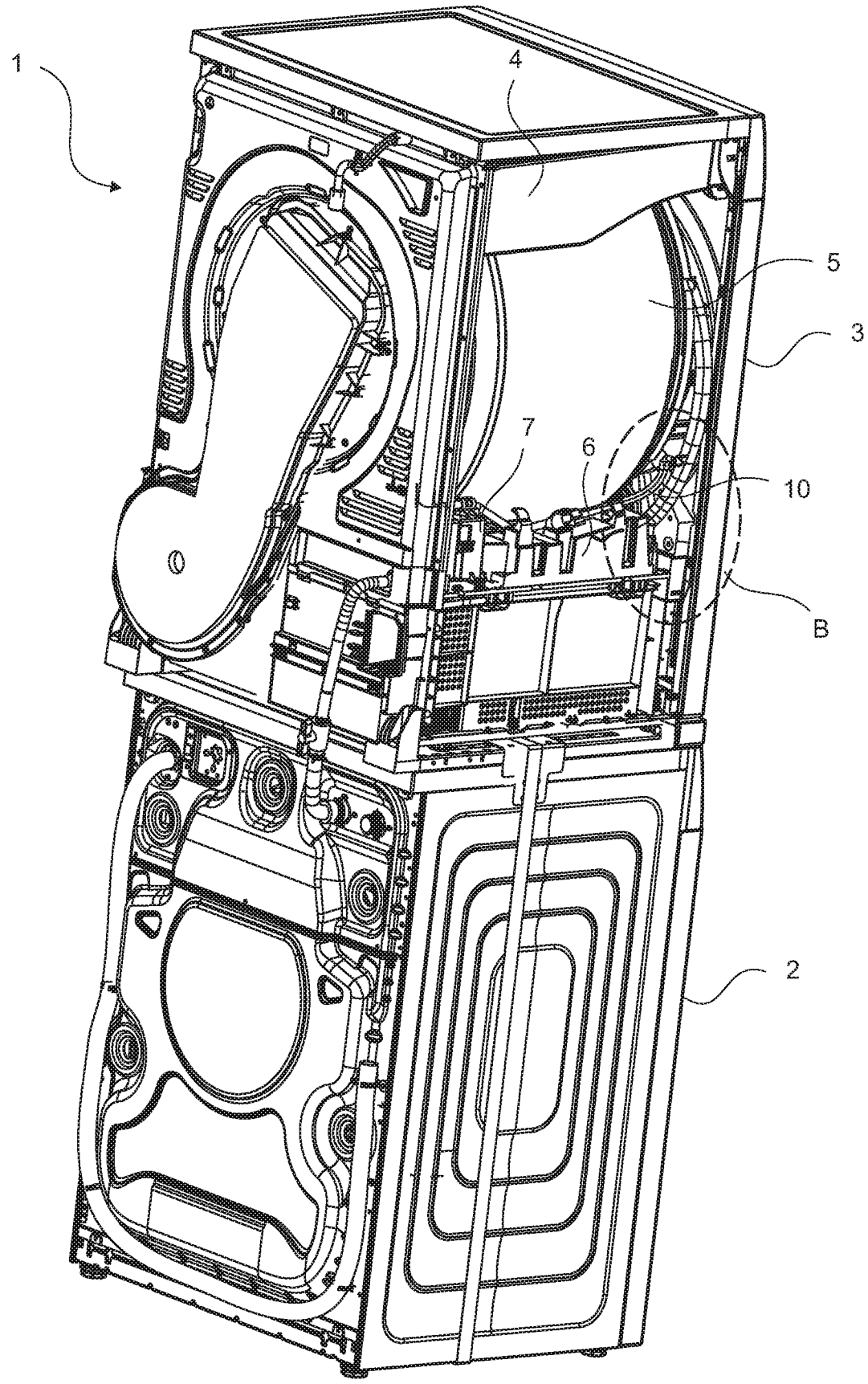


Figure 3

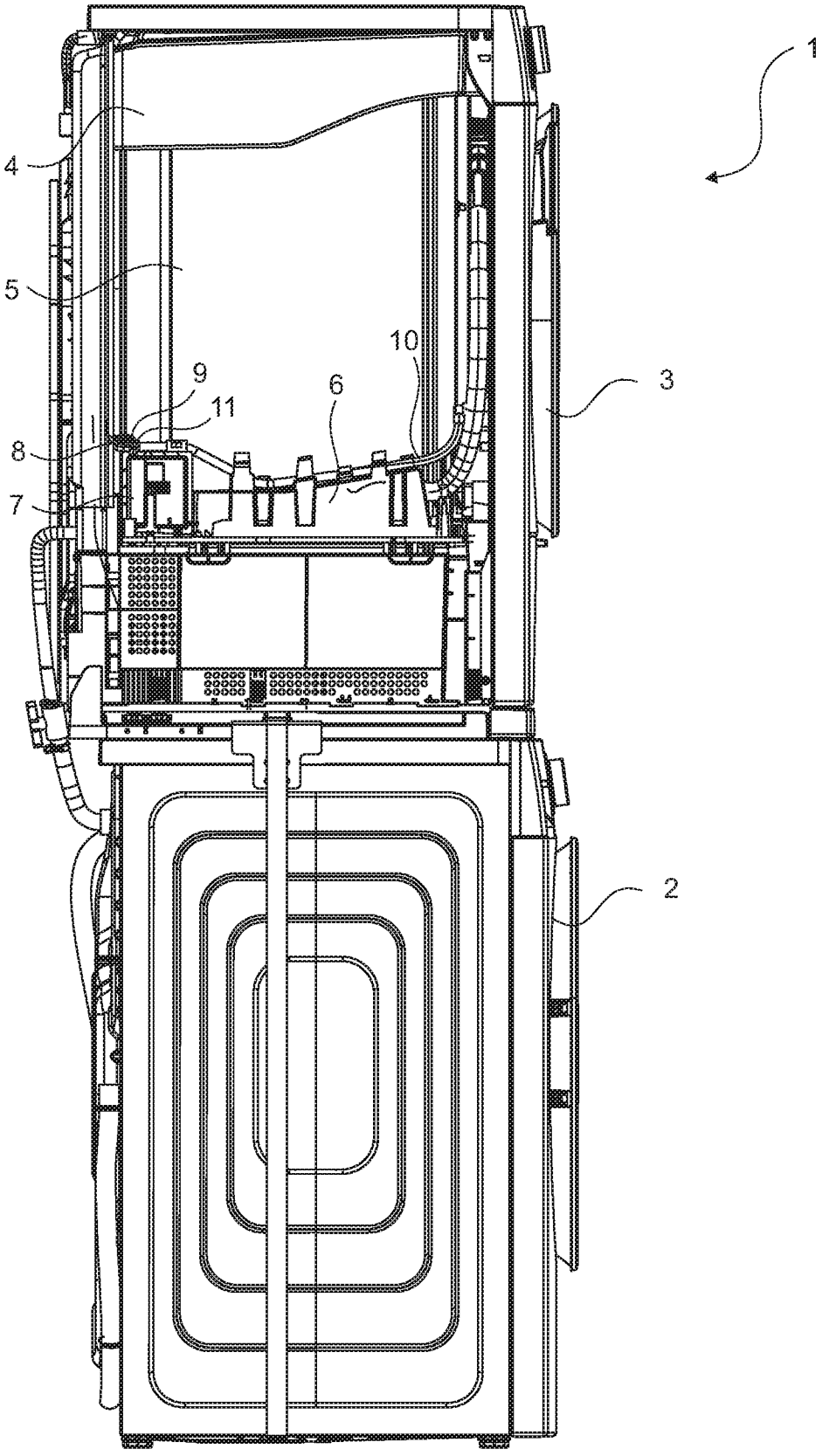


Figure 4

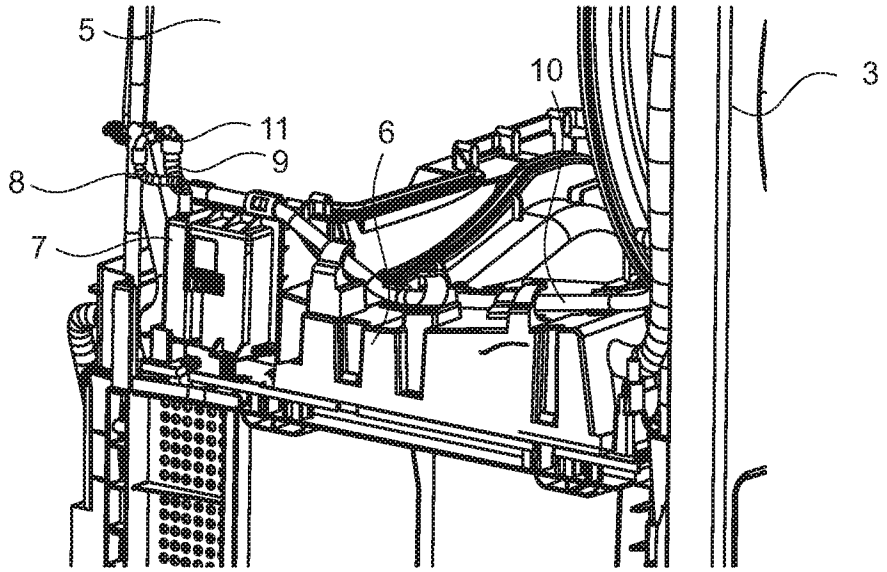
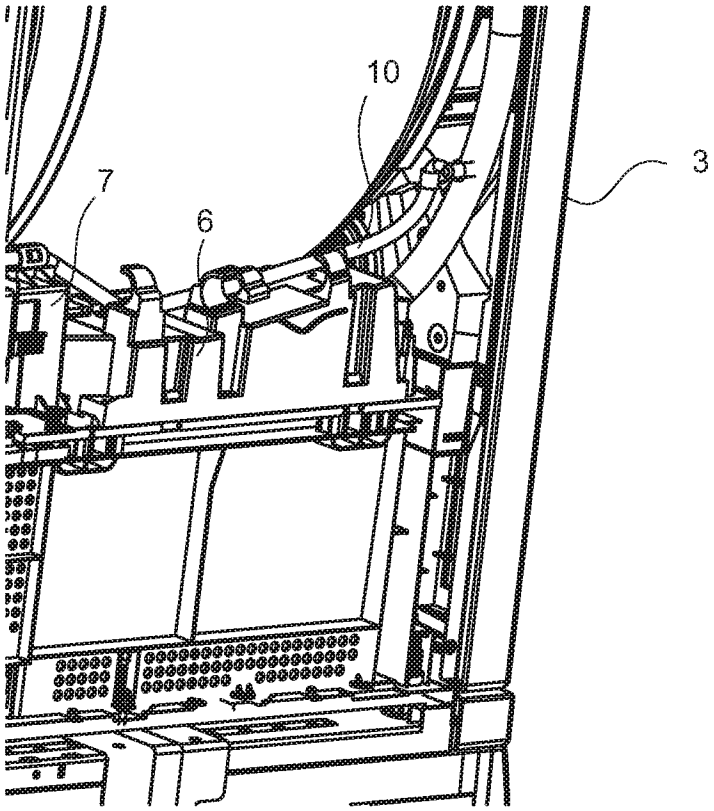


Figure 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/TR2023/050655

A. CLASSIFICATION OF SUBJECT MATTER

D06F 29/00 (2006.01)i

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 29/00

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)

EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2019011226 A1 (QINGDAO HAIER DRUM WASHING MACHINE CO LTD [CN]) 17 January 2019 (2019-01-17) Paragprahs 9,31,32,33,34, Claims 1,5,7,8, Figures	1-7
A	US 2006112585 A1 (LG ELECTRONICS INC [KR]) 01 June 2006 (2006-06-01) Whole document	1-7
A	CN 109989219 A (QINGDAO HAIER DRUM WASHING MACHINE CO LTD) 09 July 2019 (2019-07-09) Whole document	1-7
A	WO 2019011225 A1 (QINGDAO HAIER DRUM WASHING MACHINE CO LTD [CN]) 17 January 2019 (2019-01-17) Whole document	1-7
A	US 2012036902 A1 (HONG SANG WOOK [KR]) 16 February 2012 (2012-02-16) Whole document	1-7

☐ 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
"D" document cited by the applicant in the international application
"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	Date of mailing of the international search report
06 September 2023	**06 September 2023**

Name and mailing address of the ISA/TR
Turkish Patent and Trademark Office (Turkpatent)
Hipodrom Caddesi No. 13
06560 Yenimahalle
Ankara
Türkiye
Telephone No. **+903123031000**
Facsimile No. **+903123031220**

Authorized officer
Sinan KAYA
Telephone No. **+903123031660**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/TR2023/050655

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
WO	2019011226	A1	17 January 2019	CN	107287816	A	24 October 2017
				CN	107287816	B	17 December 2021
				JP	2020526318	A	31 August 2020
				JP	6936947	B2	22 September 2021
US	2006112585	A1	01 June 2006	US	7356945	B2	15 April 2008
				KR	20060046803	A	18 May 2006
				KR	100595263	B1	03 July 2006
CN	109989219	A	09 July 2019	CN	109989219	B	16 September 2022
WO	2019011225	A1	17 January 2019	CN	109234992	A	18 January 2019
				CN	109234992	B	03 December 2021
US	2012036902	A1	16 February 2012	US	8869568	B2	28 October 2014
				KR	20100120051	A	12 November 2010
				WO	2010128728	A2	11 November 2010
				WO	2010128728	A3	29 December 2010