(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 135 805 A1**

# (12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
**01.03.2017 Bulletin 2017/09**

(51) Int Cl.:
***D06F 58/22*** *(2006.01)*

(21) Application number: **16183111.0**

(22) Date of filing: **05.08.2016**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA ME**
Designated Validation States:
**MA MD**

(30) Priority: **31.08.2015 CN 201510549012**

(71) Applicant: **BSH Hausgeräte GmbH**
**81739 München (DE)**

(72) Inventors:
- **Qian, Shanliang**
  **Nanjing/ Jiangsu, 210046 (CN)**
- **Zhang, Qi**
  **Nanjing, 210046 (CN)**

## (54) LAUNDRY DRYER

(57) The present invention discloses a laundry dryer 1, having a drum 5 and an air duct 13 connected to the drum 5, and further including: a cavity 14 disposed on a wall of the air duct 13; a flushing apparatus 15 disposed in the cavity 14; and a filter screen 16 that is divided by a baffle plate 17 into a first part 161 and a second part 162, where the first part 161 and the second part 162 are respectively located in the air duct 13 and the cavity 14, the baffle plate 17 separates the cavity 14 from the air duct 13, and the filter screen 16 moves to exchange spatial positions at which the first part 161 and the second part 162 are located. By means of the present invention, a prior-art problem that it is inconvenient for a laundry dryer 1 to automatically clean up a filtering apparatus is resolved. On the one hand, the laundry dryer 1 can automatically clean a filter screen 16 in a drying process without interfering running of the laundry dryer 1; and on the other hand, it is convenient for a user to clean up filtered foreign matter such as lint when the laundry dryer 1 is working.

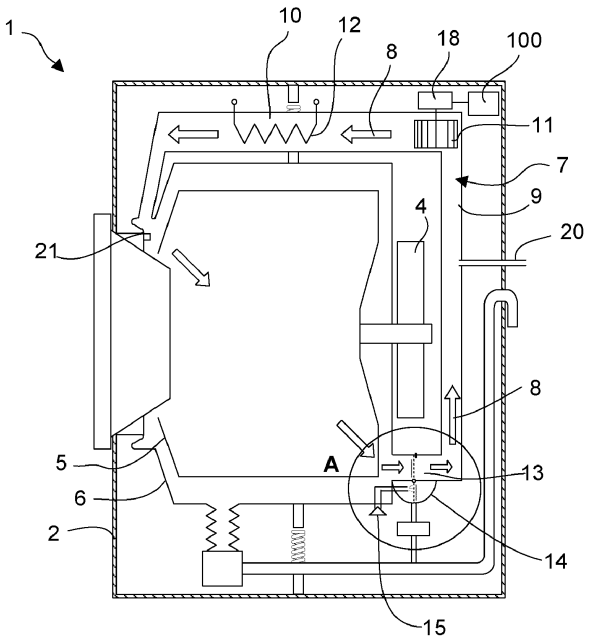


FIG. 1

EP 3 135 805 A1

## Description

**[0001]** The present invention relates to a machine that can dry laundry, and in particular, to a filtering apparatus of the machine.

**[0002]** Laundry dryers generally include machines having only a laundry drying function, and machines integrating a laundry washing function and a laundry drying function. A drying principle of the laundry dryer may be basically summarized as follows: With a heater, dry air is heated into dry hot air, then enters a drum to exchange heat with wet laundry, takes moisture away from the laundry, and becomes relatively wet hot air. The wet hot air subsequently passes through a condensing device. By condensation of the condensing device, moisture in the wet hot air is condensed into water and is discharged through a drainage tube. After the condensation, the air becomes relatively dry cold air, is guided into the heating tube again by a fan, becomes dry hot air after heating, and enters another circle. The circle repeats until a drying program ends. In the foregoing circulation path, the laundry dryer is provided with a temperature sensor or a temperature controller, to detect a temperature of air, so as to determine a working status of the machine.

**[0003]** In each circulation process some foreign matter is blocked by a filter, and when the laundry dryer is used for a long time, a large amount of foreign matter is accumulated; therefore, an air duct is caused to be blocked, for example, an air volume of a fan decreases, and consequently, heat generated by a heater cannot be dissipated in time, thereby causing a temperature of air flowing through the temperature controller to be relatively high, until the laundry dryer stops working because a set temperature of the temperature controller is reached. If the filter is cleaned up during running of the machine, the machine needs to be stopped, which affects, especially, a machine having a heat pump system.

**[0004]** For a prior-art problem that it is inconvenient for a laundry dryer to automatically clean up a filtering apparatus, currently, no effective solution has been proposed yet.

**[0005]** The present invention provides a laundry dryer, to resolve at least a prior-art problem that it is inconvenient for a laundry dryer to automatically clean up a filtering apparatus.

**[0006]** Accordingly the invention provides a laundry dryer as defined in the independent claim. Facultative preferred embodiments of the invention are defined in dependent claims, described in the subsequent description or shown in the attached drawing.

**[0007]** To achieve the foregoing objective, according to an aspect of the present invention, a laundry dryer is provided, including a drum and an air duct connected to the drum, and further including: a cavity disposed on a wall of the air duct; a flushing apparatus disposed in the cavity; and a filter screen that is divided by a baffle plate into a first part and a second part, where the first part and the second part are respectively located in the air duct and the cavity, the baffle plate separates the cavity from the air duct, and the filter screen moves to exchange spatial positions at which the first part and the second part are located.

**[0008]** The laundry dryer may be various machines having a laundry drying function, for example, a machine used only to dry laundry, or a washer-dryer.

**[0009]** An outlet of the drum is connected to one end of the air duct, so that high temperature wet hot air with foreign matter such as lint in the drum is discharged. The other end of the air duct is connected to a condenser or a heat pump apparatus, which can condense moisture in the high temperature wet hot air. The filter screen can filter the foreign matter in the high temperature wet hot air, and can clean up accumulated foreign matter in time together with the flushing apparatus, thereby preventing the condenser or the heat pump apparatus from being blocked by the foreign matter. Cleaning of foreign matter on a filter screen by a prior-art flushing apparatus affects running of the machine, such as increases air humidity. In the solutions of the present invention, the baffle plate is disposed to divide the filter screen into two parts, where the first part is located in the air duct, and is used to filter foreign matter such as lint, and the other part is located in the cavity on the wall of the air duct, and is used to flush foreign matter by using the flushing apparatus. The spatial positions at which the first part and the second part are located are exchanged through movement of the filter screen. Moreover, the baffle plate separates the flushing apparatus from the air duct, which implements separation of filtering and flushing, and causes no impact in a drying system.

**[0010]** Preferably, the baffle plate perpendicularly divides the filter screen. The baffle plate may divide the filter screen at any angle. When the baffle plate is parallel to the wall of the air duct, and the filter screen is perpendicular to the wall of the air duct, a filter effect is best. Therefore, the effect is best when the baffle plate is disposed by perpendicularly dividing the filter screen.

**[0011]** Preferably, the filter screen rotates to exchange the spatial positions at which the first part and the second part are located. In the foregoing solution, the filter screen is set to rotate clockwise or counterclockwise. The filter screen rotates to exchange spatial positions at which the first part and the second part are located, thereby implementing separation of filtering and flushing.

**[0012]** Preferably, an angle at which the first part and the second part rotate is 180 degrees.

**[0013]** Preferably, the first part and the second part rotate on a plane in which the filter screen is located to exchange the spatial positions at which the first part and the second part are located. In the foregoing solution, the filter screen may be set to rotate on the plane in which the filter screen is located. Through rotation of the filter screen, spatial positions at which the first part and the second part are located are exchanged, thereby implementing separation of filtering and flushing.

**[0014]** Preferably, a control apparatus connected to

the filter screen, where the control apparatus controls, according to a set parameter or period, the filter screen to move. The control apparatus is connected to the filter screen in multiple manners, so as to control movement of the filter screen, for example, directly controls a rotation shaft of the filter screen to rotate, or stirs the filter screen to rotate. A moment at which the filter screen is controlled to move is set in combination with a parameter.

**[0015]** Preferably, the control apparatus controls, by using a set time period, the filter screen to move. As describe above, a time interval at which the filter screen moves is set, so as to control movement of the filter screen by means of the period.

**[0016]** Preferably, the laundry dryer further includes a limiting apparatus that is disposed on an inner wall of the air channel to limit movement of the filter screen.

**[0017]** Preferably, after determining that a value of pressure, which is borne by the limiting apparatus, of the first part or the second part of the filter screen reaches a target value of the set parameter, the control apparatus controls the limiting apparatus to release the filter screen. The limit apparatus is a controllable elastic piece such as a scalable pin with controllable scalability. The control apparatus selects to limit or release the scalable pin according to the foregoing judgment.

**[0018]** Preferably, after a value of pressure, which is borne by the limiting apparatus, of the first part or the second part of the filter screen reaches a target value of the set parameter, the limiting apparatus automatically releases the filter screen. The limiting apparatus is set. Therefore, after the foreign matter such as lint is filtered, the value of the pressure of the filter screen on the limiting apparatus is higher than the target value of the set parameter, and the limit apparatus automatically opens or release the filter screen.

**[0019]** Preferably, in the foregoing solution, the limiting apparatus is an elastic piece having an elasticity coefficient. Preferably, after the filter screen moves, a signal is triggered to start the flushing apparatus. Preferably, the laundry dryer includes a sensor for sending the trigger signal. The sensor transfers the foregoing signal to the flushing apparatus.

**[0020]** Preferably, the flushing apparatus includes a flushing channel and at least a flushing valve. One or more flushing valves are disposed, and can clean two surfaces of the filter screen.

**[0021]** Preferably, the laundry dryer includes a filter connected to the flushing channel. By disposing a filter below the flushing channel, lint foreign matter in flushed water is separated. Compared with the filter screen for filtering air, the filter has a large capacity, and may store more foreign matter.

**[0022]** Preferably, the filter is detachably installed on the laundry dryer. The foregoing filter may be taken out at any time, and cause no impact in a system even if the machine is running.

**[0023]** By means of the present invention, a prior-art problem that it is inconvenient for a laundry dryer to automatically clean up a filtering apparatus is resolved. On the one hand, the laundry dryer can automatically clean a filter screen in a drying process without interfering running of the machine; and on the other hand, it is convenient for a user to clean up filtered foreign matter such as lint when the machine is working.

**[0024]** The embodiments in this application and features in the embodiments can be combined with each other without a conflict.

**[0025]** Preferred embodiments of the invention are now described in detail with reference to the drawing attached. In the drawing:

FIG. 1 is a side view of a laundry dryer;

FIG. 2 is an enlarged schematic view of an area A in FIG. 1;

FIG. 3 is a schematic view (1) of movement of a filter screen; and

FIG. 4 is a schematic view (2) of movement of a filter screen.

**[0026]** FIG. 1 is a side view of a laundry dryer. As shown in FIG. 1, the laundry dryer 1 has a case body 2, a drum 5 that is located in the case body and that can be driven by a main motor 4 to rotate, and a tub 6 sleeved outside the drum 5. In this case the laundry dryer 1 is dedicated to both washing and drying laundry so the function of holding washing liquids or drying air is provided by the tub 6, and the function of tumbling the laundry to be washed or dried is provided by the drum 5. In a laundry dryer 1 exclusively dedicated to drying laundry the tub 6 and the drum 5 are preferably combined into a single rotatable element.

**[0027]** The tub 6 is connected to and is in spatial communication with an air channel 9 of a condensing apparatus 7. The air channel 9 of the condensing apparatus is sequentially connected to a fan 11 and an air heating channel 10. The other end of the air heating channel 10 is then in spatial communication with the tub 6.

**[0028]** In a drying process, a heater 12 (a heating apparatus) in the air heating channel 10 heats drying air 8 that flows through the air heating channel 10. The high-temperature drying air 8 after heating enters the drum 5 and the tub 6 in the effect of the fan 11, heats wet laundry in the drum 5 and makes moisture in the laundry evaporate. The drying air 8 carries the evaporated moisture into the air channel 9 of the condensing apparatus 7, and the moisture in the drying air 8 is condensed, becomes liquid again, and is separated from the drying air 8. The drying air 8 thus becomes low-temperature and dry again, enters the air heating channel 10 again driven by the fan 11, starts a new circle, again and again, until the laundry in the drum 5 is finally heated.

**[0029]** An outlet of the tub 6 is connected to one end of an air duct 13, so that high temperature wet hot air

with foreign matter such as lint in the drum is discharged from the air duct 13. The other end of the air duct 13 is connected to a condenser or a heat pump apparatus, which can condense moisture in the high temperature wet hot air. A cavity 14 is provided on a wall of the air duct 13, and the flushing apparatus 15 is disposed in the cavity. The air duct 13 may be disposed horizontally, or may be disposed perpendicularly, which needs to only adjust a position of a water pipe of the flushing apparatus 15 and an arrangement position of another corresponding component.

**[0030]** FIG. 2 is an enlarged schematic view of an area A in FIG. 1. As shown in FIG. 2, a filter screen 16 is disposed in an air duct 13 to filter foreign matter 200 such as lint in high temperature wet hot air. The filter screen 16 is divided by a baffle plate 17 into a first part 161 and a second part 162. Preferably, the foregoing baffle plate 17 perpendicularly divides the filter screen 16, where the first part 161 and the second part 162 of the filter screen 16 are respectively located in the air duct 13 and a cavity 14, and the baffle plate 17 separates a flushing apparatus 15 from the air duct 13.

**[0031]** By using a rotation shaft 21, the filter screen 16 moves to exchange spatial positions at which the first part 161 and the second part 162 are located. When a machine is running, the first part 161 of the filter screen is located in the air duct 13 to filter the foreign matter 200 such as lint, and the second part 162 waits in the cavity 14. After the filter screen moves, the first part 161 is exchanged to a spatial position at which the second part 162 is located, can clean up, together with the flushing apparatus, foreign matter accumulated in the filter screen 16 in time, thereby preventing a condenser or a heat pump apparatus from being blocked by the foreign matter. Moreover, the baffle plate 17 separates the flushing apparatus 15 from the air duct 13, which implements separation of filtering and flushing, and causes no impact in a drying system.

**[0032]** In a preferred embodiment, FIG. 3 is a first schematic view of movement of a filter screen. As shown in FIG. 3, the filter screen 16 rotates to exchange spatial positions at which the first part 161 and the second part 162 in the foregoing solution are located. In the foregoing solution, the filter screen 6 is set to rotate clockwise or counterclockwise. The filter screen 16 rotates around a shaft 21 in an X direction to exchange the spatial positions at which the first part 161 and the second part 162 are, thereby implementing separation of filtering and flushing. An angle at which the first part 161 and the second part 162 rotate is 180 degrees.

**[0033]** In another preferred embodiment, FIG. 4 is a second schematic view of movement of a filter screen. As shown in FIG. 4, according to different design of the air duct 13, the first part 161 and the second part 162 in the foregoing solution may be set to rotate on a plane in which the filter screen 16 is located to exchange spatial positions at which the first part 161 and the second part 162 are located. The plane in which the filter screen 16 is located rotates through rotation of the filter screen 16 around a shaft 21 in a Y direction, so that spatial positions at which the first part 161 and the second part 162 are located are exchanged, thereby implementing separation of filtering and flushing as well.

**[0034]** The laundry dryer is provided with a control apparatus 100, which is connected to the filter screen 16, where the control apparatus 100 controls, according to a set parameter, the filter screen 16 to move. The control apparatus 100 is connected to the filter screen 16 in multiple manners, so as to control movement of the filter screen 16, for example, directly controls a rotation shaft of the filter screen 16 to rotate, or stirs the filter screen 16 to rotate. A moment at which the filter screen is controlled to move is set in combination with a parameter.

**[0035]** Preferably, the control apparatus 100 controls, according to a set time period, the filter screen to move. That is, a time interval at which the filter screen 16 moves is set, so as to control movement of the filter screen 16 by means of the period. After the movement, a part of the filter screen in the air duct 13 is exchanged to be in the cavity 14, and is cleaned by the flushing apparatus.

**[0036]** The laundry dryer 1 further includes a limiting apparatus 101 that is disposed on a wall of the air channel 13 to limit movement of the filter screen 16. For example, the limiting apparatus 101 may be set to an elastic piece, a scalable pin, or the like.

**[0037]** In a preferred embodiment, after the control apparatus 100 determines that a value of pressure, which is borne by the limiting apparatus 101, of the first part 161 or the second part 162 of the filter screen reaches a target value of the set parameter, the control apparatus 100 releases the filter screen. The limit apparatus 101 is a controllable elastic piece such as a scalable pin with controllable scalability. The control apparatus 100 selects to limit or release the scalable pin 16 according to the foregoing judgment.

**[0038]** In another preferred embodiment, after a value of pressure, which is borne by the limiting apparatus 101, of the first part 161 or the second part 162 of the filter screen reaches a target value of the set parameter, the limiting apparatus automatically releases the filter screen 16. The limiting apparatus 101 is set. Therefore, after the foreign matter 200 such as lint is filtered, the value of the pressure of the filter screen 16 on the limiting apparatus 101 is higher than the target value of the set parameter, and the limit apparatus 101 automatically opens or release the filter screen 16. For example, in another preferred embodiment, as shown in FIG. 2, with reference to the foregoing solutions, after the filter screen 16 moves, a signal is triggered to start the flushing apparatus 15. In this case, a sensor 22 for sending the trigger signal may be disposed to sense the movement or rotation of the foregoing filter screen 16.

**[0039]** Preferably, the foregoing flushing apparatus 15 includes a flushing channel 152 and at least a flushing valve 151. For example, two flushing valves are disposed, and can clean two surfaces of the filter screen 16.

**[0040]** Preferably, by disposing a filter 18 directly connected to the 152 below the flushing channel 152, lint foreign matter 200 in flushed water can be separated. Moreover, the filter 18 is connected to a water discharge system, to discharge the filtered water. Compared with the filter screen 16 for filtering wet hot air, the filter 18 has a large capacity, and may store more foreign matter such as lint.

**[0041]** Preferably, the filter 18 is detachably installed on the laundry dryer, and may be taken out at any time, which causes no adverse impact on a system even if the machine is running.

**[0042]** By means of the foregoing solution, a prior-art problem that it is inconvenient for a laundry dryer to automatically clean up a filtering apparatus is resolved. The laundry dryer can automatically clean a filter screen in a drying process by determining accumulation of lint in the filter screen, without interfering running of the machine; moreover, a user can clean up filtered foreign matter such as lint as needed when the machine is working.

**[0043]** Various specific embodiments described in the foregoing and shown in accompanying drawings are only used for illustrating the present invention, and are not regarded as the entirety of the present invention. Within the scope of the basic technical thought of the present invention, any types of modifications for the present invention made by persons ordinarily skilled in the art fall within the scope of the present invention.

## Claims

**1.** A laundry dryer (1), having a drum (6) and an air duct (13) connected to the drum (6), **characterized by** comprising:

a cavity (14) disposed on a wall of the air duct (13); a flushing apparatus (15) disposed in the cavity (14); and
a filter screen (16) that is divided by a baffle plate (17) into a first part (161) and a second part (162), wherein the first part (161) and the second part (162) are respectively located in the air duct (13) and the cavity (14),

the baffle plate (17) separates the cavity (14) from the air duct (13), and the filter screen (16) moves to exchange spatial positions at which the first part (161) and the second part (162) are located.

**2.** The laundry dryer (1) according to claim 1, **characterized in that**: the baffle plate (17) perpendicularly divides the filter screen (16).

**3.** The laundry dryer (1) according to any preceding claim, **characterized in that**:

the filter screen (16) rotates to exchange the spatial positions at which the first part (161) and the second part (162) are located.

**4.** The laundry dryer (1) according to claim 3, **characterized in that**:

an angle at which the first part (161) and the second part (162) rotate is 180 degrees.

**5.** The laundry dryer (1) according to any of claims 3 and 4, **characterized in that**: the first part (161) and the second part (162) rotate on a plane in which the filter screen (16) is located to exchange the spatial positions at which the first part (161) and the second part (162) are located.

**6.** The laundry dryer (1) according to any preceding claim, **characterized by** comprising:

a control apparatus (100) connected to the filter screen (16), wherein the control apparatus (100) controls, according to a set parameter, the filter screen (16) to move.

**7.** The laundry dryer (1) according to claim 6, **characterized in that**: the control apparatus (100) controls, by using a set time period, the filter screen (16) to move.

**8.** The laundry dryer (1) according to any of claims 6 and 7, **characterized by** comprising a limiting apparatus (101) that is disposed on an inner wall of the air channel (13) to limit movement of the filter screen (16).

**9.** The laundry dryer (1) according to claim 8, **characterized in that**:

after determining that a value of pressure, which is borne by the limiting apparatus (101), of the first part (161) or the second part (162) of the filter screen (16) reaches a target value of the set parameter, the control apparatus (100) controls the limiting apparatus (101) to release the filter screen (16).

**10.** The laundry dryer (1) according to claim 9, **characterized in that**:

after a value of pressure, which is borne by the limiting apparatus (101), of the first part (161) or the second part (162) of the filter screen (16) reaches a target value of the set parameter, the limiting apparatus (101) automatically releases the filter screen (16).

**11.** The laundry dryer (1) according to any of claims 8 to 10, **characterized in that**: the limiting apparatus

(101) is an elastic piece having an elasticity coefficient.

**12.** The laundry dryer (1) according to any preceding claim, **characterized in that**: after the filter screen (16) moves, a signal is triggered to start the flushing apparatus (15).

**13.** The laundry dryer (1) according to claim 12, **characterized by** comprising: a sensor (22) for sending the trigger signal.

**14.** The laundry dryer (1) according to any of claims 12 and 13, **characterized in that**:

the flushing apparatus (15) comprises a flushing channel (152) and at least a flushing valve (151).

**15.** The water heater (1) according to claim 14, **characterized by** comprising: a filter (19) connected to the flushing channel (152).

**16.** The laundry dryer (1) according to claim 15, **characterized in that**: the filter (19) is detachably installed on the laundry dryer (1).

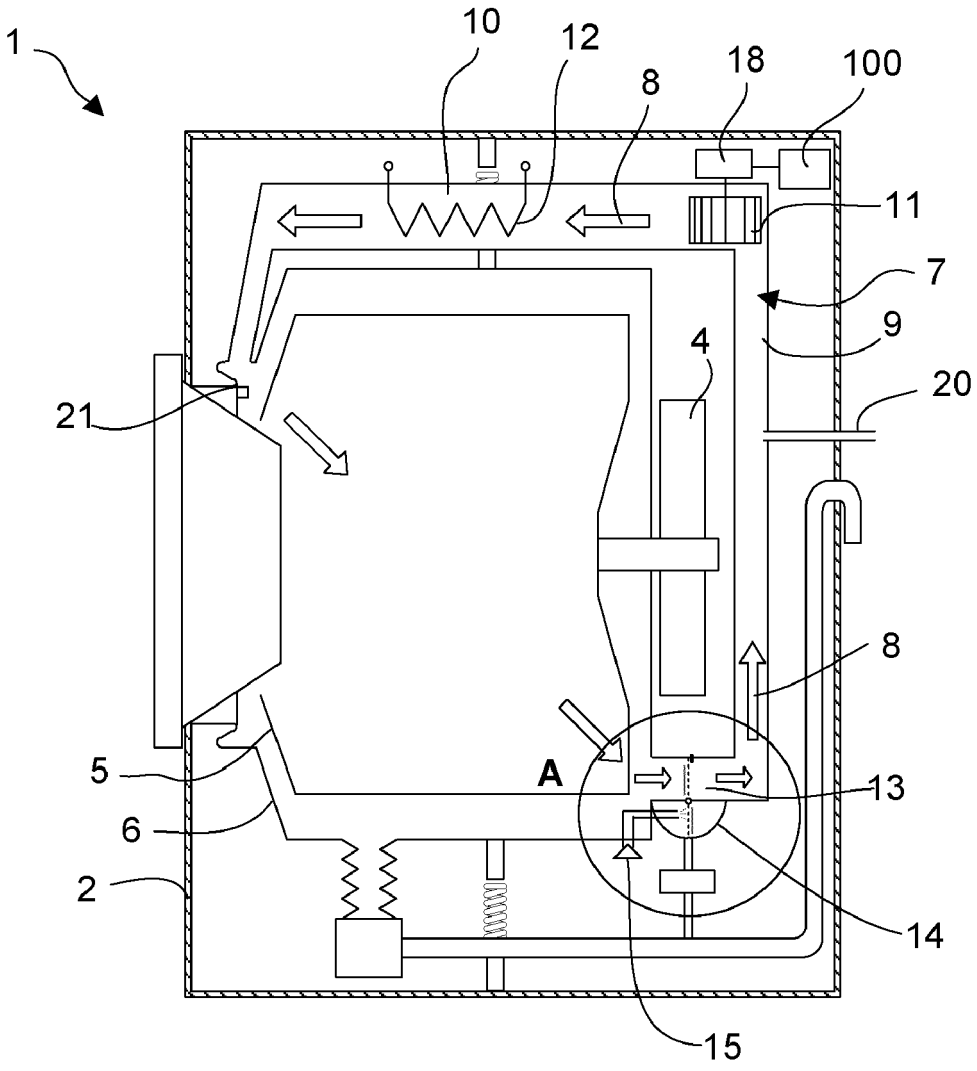


FIG. 1

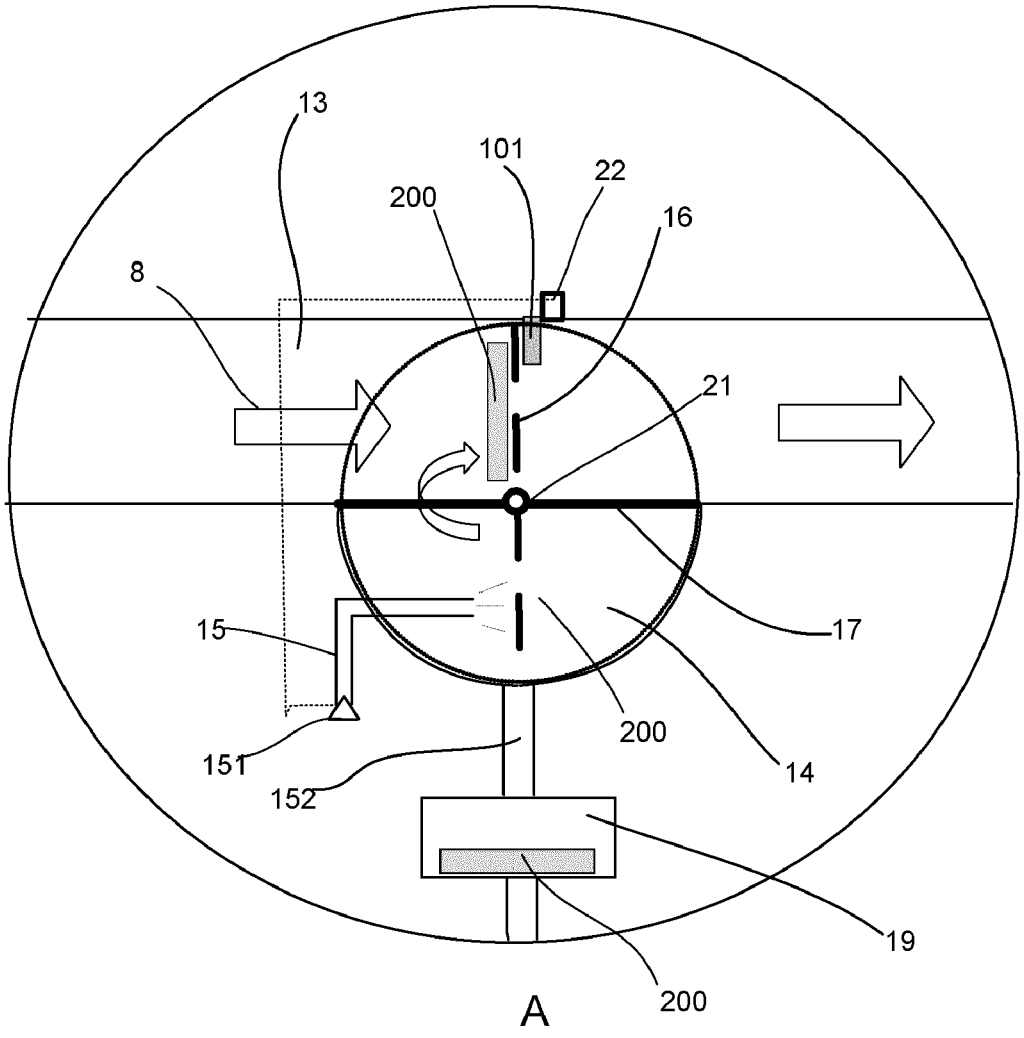


FIG. 2

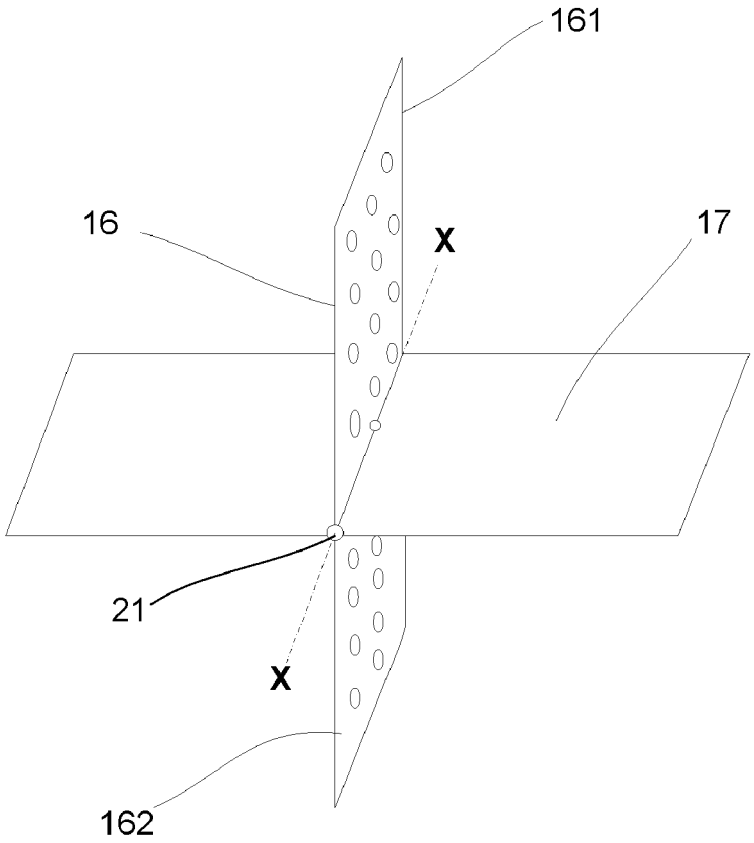


FIG. 3

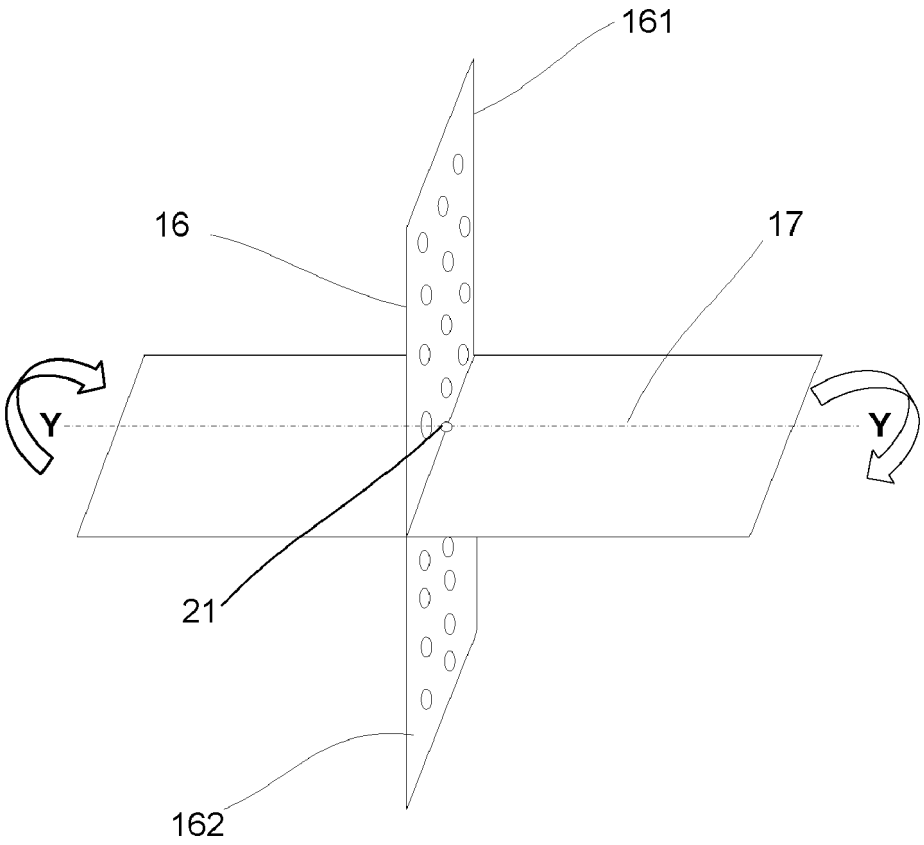


FIG. 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 16 18 3111

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A | US 3 085 348 A (ADEY WILFRED M ET AL) 16 April 1963 (1963-04-16) * column 5, line 66 - column 6, line 68; figures 3,4 * | 1,3-7 | INV. D06F58/22 |
| A | DE 91 02 035 U1 (BÖWE-PASSAT REINIGUNGS UND WÄSCHETECHNIK) 8 May 1991 (1991-05-08) * page 10, line 25 - page 12, line 12; figures 1,2 * | 1,3,6,7 | |
| A | EP 1 669 487 A1 (LG ELECTRONICS INC [KR]) 14 June 2006 (2006-06-14) * paragraphs [0061], [0062]; figure 4 * | 1 | |
| A | DE 10 2008 057460 A1 (MIELE & CIE [DE]) 20 May 2010 (2010-05-20) * figure 4 * | 1,3 | |
| A | JP 2012 170626 A (TOSHIBA CORP; TOSHIBA CONSUMER ELECT HOLDING; TOSHIBA HOME APPLIANCES) 10 September 2012 (2012-09-10) * figures 1,2,7 * | 1 | |

TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 13 January 2017 | Kising, Axel |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 18 3111

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-01-2017

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 3085348 A | 16-04-1963 | NONE | |
| DE 9102035 U1 | 08-05-1991 | NONE | |
| EP 1669487 A1 | 14-06-2006 | AU 2005203176 A1 | 29-06-2006 |
| | | CN 1786328 A | 14-06-2006 |
| | | EP 1669487 A1 | 14-06-2006 |
| | | KR 20060065266 A | 14-06-2006 |
| | | US 2006123854 A1 | 15-06-2006 |
| DE 102008057460 A1 | 20-05-2010 | NONE | |
| JP 2012170626 A | 10-09-2012 | NONE | |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82