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(54) **INTEGRATED LAUNDRY WASHER-DRYER, AND CONTROL METHOD THEREFOR**

(57) Disclosed are an integrated laundry washer-dryer, and control method therefor. The integrated laundry washer-dryer comprises: a housing (1), and a washing apparatus (10) and a drying apparatus (11), which are arranged inside the housing (1) and can respectively independently operate, wherein the drying apparatus (11) comprises a heat exchange element and a heat exchange element filter device (2); and the washing apparatus (10) comprises a water drainage path, and a water drainage control device (8), which is arranged on the water drainage path and is used for controlling the connection and disconnection thereof, the water drainage path being in communication with the heat exchange element filter device (2). The above-mentioned integrated laundry washer-dryer solves, by means of the water drained from the washing apparatus (10), the problem of rinsing lint away from the heat exchange element filter device (2) of the integrated laundry washer-dryer, realizes the secondary use of the water drained from the washing apparatus (10), and saves on water resources.

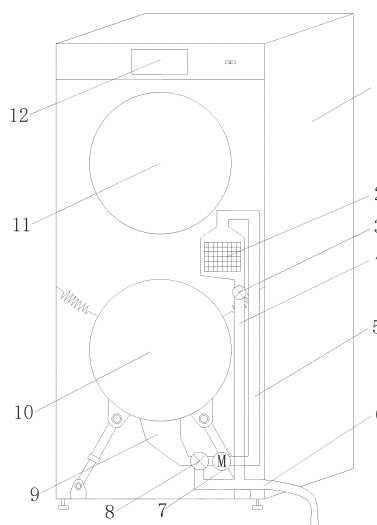


FIG. 1

Description

TECHNICAL FIELD

[0001] The disclosure relates to the technical field of washing and drying device, and particularly herein relates to an integrated laundry washer-dryer and control method therefor.

BACKGROUND

[0002] Washing machines, as a kind of household appliances, gradually become an indispensable part of people's life. With the improvement of the living conditions, fast clothes washing cannot meet people's need in daily life. Sometimes, people need that the clothes can be worn shortly after being washed. Therefore, as a kind of clothes drying device, clothes dryers are becoming more and more popular as household appliance.

[0003] However, if both a washing machine and a clothes dryer are placed at home, it will occupy a large space. Also, people need to move the clothes to the clothes dryer from the washing machine after washing. The capacity of the clothes dryer is usually smaller than that of the washing machine, so the clothes washed in one time cannot be dried by the clothes dryer in one time. The clothes dryer needs to run twice or even more times to complete the clothes drying. In addition, there is a kind of drum washing machine with the function of drying. But the capacity of this kind of washing machine is often limited due to the need for drying. And it takes a long time to complete the whole washing and drying process.

[0004] A Chinese utility model patent with an application number 201220157731.3 and filed on April 16, 2012, named a combined-type clothes washing and clothes dryer discloses a combined-type clothes washing and clothes dryer. The combined-type clothes washing and clothes dryer comprises a main frame, wherein the clothes washing machine is arranged in a lower frame of the main frame. A clothes dryer is arranged in an upper frame of the main frame. The upper part of the clothes washing machine is connected with an electrical appliance control board through a second isolation layer. The upper part of the electrical appliance control board is connected with the clothes dryer through a first isolation layer. The clothes washing machine is provided with a clothes washing machine working door, and the clothes dryer is provided with a clothes dryer working door. By the combined-type clothes washing and clothes dryer, the known clothes washing machine and the clothes dryer are combined together, so that the manufacturing materials are saved, the manufacturing cost is reduced, and the occupied area is small. As the working height is formed on the upper position of the clothes dryer, the machine is convenient to use.

[0005] The above utility model patent combines the clothes washing machine and the clothes dryer, so that the clothes can be washed and dried at the same time.

However, due to the different working process of the clothes washing machine and the clothes dryer, the two machines are not integrated, resulting in a waste of resources. For example, a clothes dryer, specifically a condenser clothes dryer comprises a condenser and a condenser filter device arranged in the air path in front of the condenser. The condenser filter device is used to filter the lint in the condensing air to keep the heat exchange efficiency of the condenser. In order to ensure the effectiveness of the condenser filter device and the circulation of the condensing air, it is necessary to rinse lint away from the condenser filter device regularly.

[0006] In view of this, based on the integrated laundry washer-dryer, the disclosure is proposed to solve the problem of the rinsing of the condenser filter device according to the respective operating characteristics of the washing machine and the clothes dryer.

SUMMARY

[0007] In order to solve the technical problem above, the first purpose of the disclosure is to provide an integrated laundry washer-dryer, specifically, the following the technical scheme is adopted:

An integrated laundry washer-dryer comprising a housing, a washing apparatus and a drying apparatus, which are arranged inside the housing and can respectively independently operate; the drying apparatus comprises a heat exchange element and a heat exchange element filter device; the washing apparatus comprises a water drainage path and a water drainage control device, the water drainage control device is arranged on the water drainage path and is used for controlling the connection and disconnection thereof; the water drainage path is in communication with the heat exchange element filter device.

[0008] Further, the drying apparatus adopts a condensing module, the heat exchange element is a condenser, the heat exchange element filter device is a condenser filter device; or the drying apparatus adopts a heat pump drying module, the heat exchange element is an evaporator, the heat exchange element filter device is an evaporator filter device; the washing apparatus comprises an outer drum for holding water, the water drainage path includes a first drainage pipe and a second drainage pipe; one end of the first drainage pipe is in communication with the outer drum, and another end is in communication with the heat exchange element filter device; one end of the second drainage pipe is in communication with the outer drum, and another end is in communication with the outside of the housing; the water drainage control device is arranged on the first drainage pipe and/or the second drainage pipe.

[0009] Further, the water drainage control device is a drainage valve; a first drainage valve is arranged on the first drainage pipe, and a second drainage valve is arranged on the

second drainage pipe;

or the drainage valve includes a water inlet and two water outlets, the water inlet is in communication with the outer drum and the two water outlets are in communication with the first drainage pipe and the second drainage pipe respectively.

[0010] Further, the drying apparatus is arranged above the washing apparatus, a circulation pump is arranged on the water drainage path for circulating the water drained from the washing apparatus to the heat exchange element filter device;

preferably, the circulation pump is arranged on the first drainage pipe and is between the drainage valve and the heat exchange element filter device.

[0011] Further, the heat exchange element filter device is in communication with a third drainage pipe, and the third drainage pipe is in communication with the second drainage pipe;

preferably, a third drainage valve is arranged on the third drainage pipe.

[0012] Further, the heat exchange element filter device includes a filter screen and a filter screen frame, a flushing channel is arranged on the filter screen frame and is in communication with the water drainage path.

[0013] The second purpose of the disclosure is to provide a control method of the integrated laundry washer-dryer, specifically, the following the technical scheme is adopted:

A control method of the integrated laundry washer-dryer comprising a control device for controlling the operation of the drying apparatus and the washing apparatus; when the drying apparatus needs to rinse the heat exchange element filter device, when detecting the drainage of the washing apparatus, the control device controls the water drainage control device to introduce the water drained from the washing apparatus to the heat exchange element filter device.

[0014] Further, when the drying apparatus needs to rinse the condenser filter device before or after clothes drying, when detecting the drainage of rinsing water from the washing apparatus, the control device controls the water drainage control device to introduce the rinsing water drained from the washing apparatus to the heat exchange element filter device;

preferably, when the washing apparatus carries out rinse several times, the control device controls the washing apparatus to introduce the rinsing water drained from the washing apparatus to the heat exchange element filter device when the washing apparatus carries out the last rinsing drainage;

when the washing apparatus only carries out rinse once, the control device controls the rinsing water drained from the washing apparatus to drain outside through the water drainage path.

[0015] Further, the control method of the integrated laundry washer-dryer includes that when the drying apparatus needs to rinse the heat exchange element filter device before or after clothes drying, when detecting that

the washing apparatus is carrying out the last rinsing drainage, then control the drainage valve to open the first drainage pipe and at the same time, open the circulation pump and the third drainage valve to circulate the rinsing water drained from the washing apparatus to the heat exchange element filter device, and then from the third drainage pipe to the second drainage pipe and drain outside.

[0016] Further, the drying apparatus comprises a rinsing path which is in communication with the heat exchange element filter device, the rinsing path is connected with an external water source; when the drying apparatus needs to rinse the heat exchange element filter device before or after clothes drying, when detecting that the washing apparatus is not operating, then control the rinsing path to open so that the water from the external water source can be introduced to the heat exchange element filter device.

[0017] In the integrated laundry washer-dryer, the drying apparatus used for clothes drying and the washing apparatus used for clothes washing are installed in the same housing, so that users' needs for clothes washing and drying are both met. Also, the manufacturing cost is saved compared to separate manufacturing and the space for placing is saved. In addition, users can choose to wash or dry the clothes separately, giving users more choices and improving the efficiency.

[0018] In the integrated laundry washer-dryer, the operating characteristics of the washing apparatus and the drying apparatus are fully considered. The heat exchange element filter device usually uses inlet water to rinse lint away, while the washing apparatus needs water inlet and outlet during the washing process. The water drainage path in the washing apparatus is in communication with the heat exchange element filter device in the disclosure. By controlling the washing apparatus to drain the draining water to the heat exchange element filter device to rinse lint away, the cleaning of the heat exchange element filter device is realized.

[0019] Therefore, the integrated laundry washer-dryer solves, by means of the water drained from the washing apparatus, the problem of rinsing lint away from the heat exchange element filter device of the integrated laundry washer-dryer, realizes the secondary use of the water drained from the washing apparatus, and saves on water resources.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a schematic of an integrated laundry washer-dryer of embodiment 1;

FIG. 2 is a schematic of an integrated laundry washer-dryer of embodiment 3 and 5;

FIG. 3 is a schematic of an integrated laundry washer-dryer of embodiment 6;

FIG. 4 is a schematic of an integrated laundry wash-

er-dryer of embodiment 7;

FIG. 5 is a schematic of an integrated laundry washer-dryer of embodiment 7 with another implementation.

DETAILED DESCRIPTION

[0021] An integrated laundry washer-dryer and control method therefor of the disclosure will then be described in detail with combination with the attached figures:

Embodiment 1

[0022] As illustrated in FIG. 1, an integrated laundry washer-dryer comprises a housing 1, a washing apparatus 10 and a drying apparatus 11, which are arranged inside the housing 1 and can respectively independently operate. The drying apparatus 11 comprises a heat exchange element and a heat exchange element filter device 2 used for filtering the condensing air. The washing apparatus 10 comprises a water drainage path and a water drainage control device 8. The water drainage control device 8 is arranged on the water drainage path and is used for controlling the connection and disconnection thereof. The water drainage path is in communication with the heat exchange element filter device 2. In the integrated laundry washer-dryer of this embodiment, the drying apparatus 11 used for clothes drying and the washing apparatus 10 used for clothes washing are installed in the same housing 1, so that users' needs for clothes washing and drying are both met. Also, the manufacturing cost is saved compared to separate manufacturing and the space for placing is saved. In addition, users can choose to wash or dry the clothes separately, giving users more choices and improving the efficiency.

[0023] In the integrated laundry washer-dryer of the embodiment, the operating characteristics of the washing apparatus and the drying apparatus are fully considered. The heat exchange element filter device 2 usually uses inlet water to rinse lint away, while the washing apparatus needs water inlet and outlet during the washing process. The water drainage path in the washing apparatus is in communication with the heat exchange element filter device 2 in the embodiment. By controlling the washing apparatus to drain the draining water to the heat exchange element filter device 2 to rinse lint away, the cleaning of the heat exchange element filter device 2 is realized. Therefore, the integrated laundry washer-dryer of the embodiment solves, by means of the water drained from the washing apparatus, the problem of rinsing lint away from the heat exchange element filter device 2 of the integrated laundry washer-dryer, realizes the secondary use of the water drained from the washing apparatus, and saves on water resources.

[0024] The drying apparatus of the embodiment adopts a condensing module. The heat exchange element is a condenser, and the heat exchange element filter device is a condenser filter device. Or, the drying

apparatus adopts a heat pump drying module. The heat exchange element is an evaporator, and the heat exchange element filter device is an evaporator filter device.

[0025] A condensing module adopted drying apparatus is used as an example in the following description and the heat exchange element filter device is a condenser filter device. For the person skilled in the art, it should be understood that when adopting a heat pump drying module and using an evaporator filter device as the heat exchange element filter device, the following description is still applicable.

[0026] In order to introduce the water drained from the washing apparatus to the condenser filter device 2, the water drainage path of the washing apparatus is modified. Specifically, the washing apparatus of the embodiment comprises an outer drum for holding water. The water drainage path includes a first drainage pipe 5 and a second drainage pipe 6. One end of the first drainage pipe 5 is in communication with the outer drum, and another end is in communication with the condenser filter device 2. One end of the second drainage pipe 6 is in communication with the outer drum, and another end is in communication with the outside of the housing 1. The water drainage control device 8 is arranged on the first drainage pipe 5 and/or the second drainage pipe 6.

[0027] According to the embodiment, the first drainage pipe 5 introduces the water drained from the washing apparatus to the condenser filter device 2 to rinse lint away, and the second drainage pipe 6 introduces the water drained from the washing apparatus outside.

[0028] The water drainage control device is arranged on the first drainage pipe 5 and/or the second drainage pipe 6. By controlling the water drainage control device, the connection and disconnection of the first drainage pipe 5 and the second drainage pipe 6 can be controlled, realizing the control of the drainage of the washing apparatus. Due to the different turbidity of the water drained from the washing apparatus, it is not necessary to introduce all the water drained from the washing apparatus to the condenser filter device. Therefore, by controlling the water drainage control device, the control of that whether to introduce the water drained from the washing apparatus to the condenser filter device is realized.

[0029] Further, in order to determine whether the turbidity of the water drained from the washing apparatus meets the requirement, a turbidity sensor is provided to the washing apparatus. When detecting that the turbidity meets the requirement for rinsing the condenser filter device, the first drainage pipe 5 is controlled to be connected, otherwise, only the second drainage pipe 6 is connected.

[0030] Alternatively, the connection and disconnection of the first drainage pipe 5 and the second drainage pipe 6 can be controlled by programming. Specifically, because the water in the washing apparatus during the rinsing process is relatively clean, especially the water of the last rinsing process, the first drainage pipe 5 is controlled to be connected by default during the drainage of the last

rinsing process, and during other process, the first drainage pipe 5 is disconnected and the second drainage pipe 6 is connected to drain water.

[0031] As a preferred implementation of the embodiment, the drainage control device 8 is a drainage valve. A first drainage valve is arranged on the first drainage pipe, and a second drainage valve is arranged on the second drainage pipe. In this way, the controlling of the connection and disconnection of the first drainage pipe and the second drainage pipe is realized by controlling the on and off of the first drainage valve and the second drainage valve.

[0032] Alternatively, as illustrated in FIG. 1, the drainage valve of the embodiment includes a water inlet and two water outlets, the water inlet is in communication with the outer drum 10 and the two water outlets are in communication with the first drainage pipe 5 and the second drainage pipe 6 respectively. In this way, the conduction of the first drainage pipe and the second drainage section can be achieved by controlling the conduction of the corresponding water outlet end of the drainage valve.

[0033] The water inlet of the drainage valve is in communication with the drainage outlet of the outer drum by a connecting pipe 9.

[0034] Further, in the integrated laundry washer-dryer of the embodiment, the drying apparatus is arranged above the washing apparatus. Because of the relatively large mass of the washing apparatus, by arranging the washing apparatus under the drying apparatus, the gravity centre of the integrated laundry washer-dryer can be lowered, so that the stability when working is improved.

[0035] Since the drying apparatus is arranged above the washing apparatus, the condenser and other drying components of the drying apparatus need to be arranged above the washing apparatus. Therefore, in order to introduce the water drained from the washing apparatus to the condenser filter device, a circulation pump 7 is arranged on the water drainage path for circulating the water drained from the washing apparatus to the condenser filter device 2 to rinse lint away.

[0036] Specifically, the circulation pump 7 is arranged on the first drainage pipe 5 and is between the drainage valve and the condenser filter device 2. In the embodiment, the circulation pump is provided for circulating the water drained from the lower washing apparatus to the condenser filter device 2 of the upper drying apparatus in order to rinse lint away.

[0037] The integrated laundry washer-dryer of the embodiment uses the water drained from the washing apparatus to rinse the condenser filter device 2. And the water can be drained through the drainage outlet of the drying apparatus after rinsing. In consideration of a better solution of the drainage of the integrated laundry washer-dryer, the drainage outlet of the drying apparatus can be replaced by introducing the water back to the water drainage path of the washing apparatus and then drained outside. Specifically, the condenser filter device 2 is in communication with a third drainage pipe 4, and the third

drainage pipe 4 is in communication with the second drainage pipe 6. Preferably, a third drainage valve 3 is arranged on the third drainage pipe 4.

[0038] As a preferred implementation of the embodiment, the condenser filter device 2 includes a filter screen and a filter screen frame, a flushing channel is arranged on the filter screen frame and is in communication with the water drainage path. The water drained from the washing apparatus goes through the water drainage path into the flushing channel of the filter screen frame to rinse lint away from the filter screen.

[0039] The integrated laundry washer-dryer of the embodiment comprises a control device 12 for controlling the operation of the drying apparatus and the washing apparatus. The control device 12 is electrically connected with the water drainage control device 8, the circulation pump 7 and the third drainage valve 3 respectively. The control device controls the connection and disconnection of each electrical element according to the operation of the washing apparatus and the drying apparatus.

[0040] As an implementation of the embodiment, the condenser filter device is a filter screen and the filter screen is arranged on the air path in front of the condenser.

Embodiment 2

[0041] The embodiment herein discloses a control method of the integrated laundry washer-dry according to embodiment 1. The integrated laundry washer-dry comprises a control device for controlling the operation of the drying apparatus and the washing apparatus. When the drying apparatus needs to rinse the heat exchange element filter device, when detecting the drainage of the washing apparatus, the control device controls the water drainage control device to introduce the water drained from the washing apparatus to the heat exchange element filter device for rinsing lint away.

[0042] The control method of the embodiment realizes introducing the water drained from the washing apparatus to the heat exchange element filter device for rinsing lint away by controlling the water drainage control device. So that the purpose to clean the heat exchange element filter device is realized. It also realizes the secondary use of the water drained from the washing apparatus and saves on water resources.

[0043] Due to the different turbidity of the water drained from the washing apparatus, it is not necessary to introduce all the water drained from the washing apparatus to the heat exchange element filter device. Therefore, by controlling the water drainage control device, the control of that whether to introduce the water drained from the washing apparatus to the heat exchange element filter device is realized.

[0044] As a preferred implementation of the embodiment, in order to determine whether the turbidity of the water drained from the washing apparatus meets the requirement, a turbidity sensor is provided to the washing

apparatus. When detecting that the turbidity meets the requirement for rinsing the heat exchange element filter device, the first drainage pipe is controlled to be connected, otherwise, only the second drainage pipe is connected.

[0045] As another preferred implementation of the embodiment, the connection and disconnection of the first drainage pipe and the second drainage pipe can be controlled by programming. Specifically, when the drying apparatus needs to rinse the heat exchange element filter device before or after clothes drying, when detecting the drainage of rinsing water from the washing apparatus, the control device controls the water drainage control device to introduce the rinsing water drained from the washing apparatus to the heat exchange element filter device.

[0046] Preferably, when the washing apparatus carries out rinse several times, the control device controls the washing apparatus to introduce the rinsing water drained from the washing apparatus to the heat exchange element filter device to rinse lint away when the washing apparatus carries out the last rinsing drainage.

[0047] When the washing apparatus only carries out rinse once, the control device controls the rinsing water drained from the washing apparatus to drain outside through the water drainage path.

[0048] Because the water in the washing apparatus during the rinsing process is relatively clean, especially the water of the last rinsing process, to rinse lint away by means of the rinsing water drained from the washing apparatus can not only get rid off the lint, but also ensure the cleanliness of the heat exchange element filter device.

[0049] Specifically, the control method of the integrated laundry washer-dryer includes: when the drying apparatus needs to rinse the heat exchange element filter device before or after clothes drying, when detecting that the washing apparatus is carrying out the last rinsing drainage, then control the drainage valve to open the first drainage pipe and at the same time, open the circulation pump and the third drainage valve to circulate the rinsing water drained from the washing apparatus to the heat exchange element filter device, and then from the third drainage pipe to the second drainage pipe and drain outside.

[0050] In addition, when the drying apparatus is operating by itself and needs to rinse the heat exchange element filter device, the drying apparatus of the embodiment herein comprises a rinsing path which is in communication with the heat exchange element filter device. The rinsing path is connected with an external water source. When the drying apparatus needs to rinse the heat exchange element filter device before or after clothes drying, when detecting that the washing apparatus is not operating, then control the rinsing path to open so that the water from the external water source can be introduced to the heat exchange element filter device for rinsing lint away. The integrated laundry washer-dryer of the embodiment can realize rinsing lint away from the

heat exchange element filter device when the washing apparatus is not operating, ensuring the independent operation of the drying apparatus and increasing the flexibility of users' operation on the device.

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Embodiment 3

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[0051] As illustrated in FIG. 2, the integrated laundry washer-dryer of the embodiment comprises a housing 1, a washing apparatus 10 and a drying apparatus 11, which are arranged inside the housing 1 and can respectively independently operate. The drying apparatus 11 comprises a heat exchange element and a heat exchange element filter device 2 used for filtering the condensing air. The washing apparatus 10 comprises a water inlet path used for introducing water for clothes washing. A rinsing path 13 is provided and is in communication with the water inlet path of the washing apparatus. A rinsing control device 14 is provided in the rinsing path 13. The rinsing path is in communication with the heat exchange element filter device 2. The rinsing control device 14 is used to control the connection of the rinsing path so that the inlet water to the washing apparatus is introduced to the heat exchange element filter device 2 for rinsing line away.

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[0052] In this embodiment, the inlet water to the washing apparatus is introduced to the heat exchange element filter device 2 for rinsing line away, realizing the rinsing of the heat exchange element filter device 2. In this way, the integrated laundry washer-dryer only needs to be connected with the tap with an inlet pipe, then the water inlet of the washing apparatus and the inlet of water for rinsing the heat exchange element filter device 2 in the drying apparatus are realized at the same time. As a result, the whole structure is simplified, and it makes the integrated laundry washer-dryer more convenient to use for the users.

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[0053] The drying apparatus of the embodiment adopts a condensing module. The heat exchange element is a condenser, and the heat exchange element filter device is a condenser filter device. Or, the drying apparatus adopts a heat pump drying module. The heat exchange element is an evaporator, and the heat exchange element filter device is an evaporator filter device.

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[0054] A condensing module adopted drying apparatus is used as an example in the following description and the heat exchange element filter device is a condenser filter device. For the person skilled in the art, it should be understood that when adopting a heat pump drying module and using an evaporator filter device as the heat exchange element filter device, the following description is still applicable.

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[0055] Further, the water inlet path includes a water inlet valve and a water inlet pipe. One end of the water inlet pipe is connected with the water inlet valve, another end is in communication with the external tap. The rinsing path is connected with the water inlet valve or the water inlet pipe.

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[0056] The water inlet pipe of the embodiment is connected with a three-way pipe, and the three-way pipe is in communication with the water valve and the rinsing path respectively. In this way, the rinsing path is in communication with the external water source by the water inlet pipe, so that the connection and disconnection of the rinsing path can be realized by controlling the on-off of the rinsing control device 14 in the rinsing path.

[0057] Alternatively, the water inlet valve of the embodiment includes a water inlet and at least two water outlets. The water inlet is connected with the water inlet pipe and the water outlets are respectively in communication with the outer drum of the washing apparatus and the rinsing path. In this way, the rinsing path can only be connected by turning on the rinsing control device 14 when the water is being introduced into the washing apparatus.

[0058] In this embodiment, the water inlet to the washing apparatus is introduced to the condenser filter device for rinsing lint away. Through the design of the structure and program, the connection of the rinsing path is not limited by whether the washing apparatus is operating, ensuring the independent operation of the drying apparatus.

Embodiment 4

[0059] A control method of the integrated laundry washer-dryer according to embodiment 3, wherein the integrated laundry washer-dryer comprises a control device for controlling the operation of the drying apparatus and the washing apparatus. When the drying apparatus needs to rinse the heat exchange element filter device, the control device controls the rinsing control device to open the rinsing path, introducing the inlet water of the washing apparatus to the heat exchange element filter device.

[0060] In this embodiment, the control method of the integrated laundry washer-dryer combines the design of program with that of the rinsing path, so that water inletting to rinse the heat exchange can be independent from the water inlet of the washing apparatus and can also be carried out simultaneously with the water inlet of the washing apparatus.

[0061] As a preferred implementation of the embodiment, when the drying apparatus needs to rinse the heat exchange element filter device before or after clothes drying, when detecting the water inlet of the washing apparatus, the control device controls the rinsing control device to open the rinsing path, introducing the inlet water of the washing apparatus to the heat exchange element filter device for rinsing lint away. In this embodiment, the rinsing water inlet of the heat exchange element filter device in the drying apparatus is synchronized with the water inlet of the washing apparatus, so that it also fits those users who are used opening the tap of the washing apparatus, ensuring the water inlet of the rinsing path in the drying apparatus.

[0062] Further, the control method of the integrated laundry washer-dryer includes: when the drying apparatus needs to rinse the heat exchange element filter device before or after clothes drying, when detecting that the washing apparatus is not operating, the control device controls the water inlet valve to open the water outlet which is in communication with the rinsing path. At the same time, the rinsing control device is controlled to open the rinsing path, introducing the inlet water to the heat exchange element filter device. According to the control method of the embodiment, when the drying apparatus is operating on its own and needs water inlet for rinsing, the water outlet of the water inlet valve, which is in communication with the rinsing path, is controlled to open and the rinsing control device is controlled to open the rinsing path.

Embodiment 5

[0063] As illustrated in FIG. 2, the embodiment herein combines the scheme of embodiment 1 on the basis of the embodiment 3 and discloses an integrated laundry washer-dryer which can rinse lint away from the condenser device by means of both the inlet and outlet water of the washing apparatus.

[0064] Specifically, the washing apparatus of the embodiment comprises a water drainage path. The condenser filter device is in communication with the water drainage path through a connecting pipe, so that the rinsing water for cleaning the condenser filter device can be drained from the water drainage path.

[0065] Further, the water drainage path includes a drainage pipe which is in communication with the outer drum of the washing apparatus and a drainage valve provided on the drainage pipe. The connecting pipe is connected with the downstream part of the drainage pipe relative to the drainage valve. A control valve is provided in the connecting pipe.

[0066] Further, the water drainage path includes a first drainage pipe and a second drainage pipe. One end of the first drainage pipe is in communication with the outer drum, and another end is in communication with the heat exchange element filter device. One end of the second drainage pipe is in communication with the outer drum, and another end is in communication with the outside of the housing. A water drainage control device is provided on the first drainage pipe and/or the second drainage pipe.

[0067] Preferably, the water drainage control device is a drainage valve.

[0068] A first drainage valve is arranged on the first drainage pipe, and a second drainage valve is arranged on the second drainage pipe.

[0069] Or, the drainage valve includes a water inlet and two water outlets, the water inlet is in communication with the outer drum and the two water outlets are in communication with the first drainage pipe and the second drainage pipe respectively.

[0070] Further, the drying apparatus is arranged above the washing apparatus. A circulation pump is arranged on the water drainage path for circulating the draining water from the washing apparatus to the condenser filter device to rinse lint away.

[0071] Preferably, the circulation pump is arranged on the first drainage pipe and is between the drainage valve and the condenser filter device.

[0072] The embodiment also discloses a control method of the integrated laundry washer-dryer. The control of the inlet and outlet water for rinsing the washing apparatus is as follows.

[0073] The washing apparatus comprises a turbidity sensor. When the turbidity sensor detects that the water drained from the washing apparatus meets the requirement, the water drained from the washing apparatus is used for rinsing.

[0074] When the washing apparatus carries out rinse several times, the rinsing water drained from the washing apparatus is introduced to the condenser filter device when the washing apparatus carries out the last rinsing drainage.

[0075] When the above two conditions are not met, the washing apparatus is controlled to introduce the inlet water to the rinsing path for rinsing lint away from the condenser filter device.

Embodiment 6

[0076] As illustrated in FIG. 3, the integrated laundry washer-dryer of the embodiment comprises a housing 1, a washing apparatus 10 and a drying apparatus 11, which are arranged inside the housing 1 and can respectively independently operate. The drying apparatus 11 comprises a heat exchange element and a heat exchange element filter device 2 used for filtering the condensing air. The washing apparatus comprises an outer drum for holding water. the integrated laundry washer-dryer also comprises a rinsing path 13 used for rinsing lint away from the heat exchange element filter device. The water outlet of the rinsing path is in communication with the outer drum of the washing apparatus 10, so that the water used for rinsing the heat exchange element filter device 2 can be introduced into the outer drum.

[0077] For those rinsing the heat exchange element filter device 2 by the inlet water of the washing apparatus or by the independent inlet water to the rinsing path 13, the rinsing water is relatively clean. So, the water after rinsing the heat exchange element filter device 2 can be introduced into the outer drum of the washing apparatus 10 for secondary use or drained through the drainage system of the washing apparatus.

[0078] The drying apparatus of the embodiment adopts a condensing module. The heat exchange element is a condenser, and the heat exchange element filter device is a condenser filter device. Or, the drying apparatus adopts a heat pump drying module. The heat exchange element is an evaporator, and the heat ex-

change element filter device is an evaporator filter device.

[0079] A condensing module adopted drying apparatus is used as an example in the following description and the heat exchange element filter device is a condenser filter device. For the person skilled in the art, it should be understood that when adopting a heat pump drying module and using an evaporator filter device as the heat exchange element filter device, the following description is still applicable.

[0080] Further, the rinsing path of the embodiment includes a first water outlet 16 and a second water outlet. The first water outlet 16 is in communication with the outer drum of the washing apparatus 10. A first control valve 15 is provided in the first water outlet 16. The second water outlet is used for draining the water used for rinsing the condenser filter device outside the housing. A second control valve is provided in the second water outlet.

[0081] The rinsing path of the embodiment includes two water outlets which are the first water outlet 16 and the second water outlet. Through controlling the connection of the corresponding water outlet, the drainage of the rinsing water is realized.

[0082] Further, the washing apparatus of the embodiment comprises a water drainage path. The second water outlet is in communication with the water drainage path through a connecting pipe, used for draining the water used for rinsing the condenser filter device outside the housing through the water drainage path.

[0083] Specifically, the water drainage path of the embodiment includes a first drainage pipe 5 and a second drainage pipe 6. One end of the first drainage pipe 5 is in communication with the outer drum, and another end is in communication with the rinsing path 13. One end of the second drainage pipe 6 is in communication with the outer drum, and another end is in communication with the outside of the housing. A water drainage control 8 device is arranged in the first drainage pipe and/or the second drainage pipe.

[0084] Preferably, the water drainage control 8 is a drainage valve.

[0085] A first drainage valve is arranged on the first drainage pipe, and a second drainage valve is arranged on the second drainage pipe.

[0086] Or, the drainage valve includes a water inlet and two water outlets, the water inlet is in communication with the outer drum and the two water outlets are in communication with the first drainage pipe and the second drainage pipe respectively.

[0087] In this embodiment, the drained water from the washing apparatus can enter the rinsing path through the first water drainage path for rinsing the condenser filter device, realizing the purpose of rinsing the condenser filter device by means of the water drained from the washing apparatus. So that the secondary use of the water drained from the washing apparatus is realized and water resources is saved.

[0088] The second water outlet of the rinsing path is in

communication with the second drainage pipe, draining the rinsing water outside through the second drainage pipe 6 after rinsing.

[0089] The drying apparatus of the embodiment is arranged above the washing apparatus. A circulation pump is arranged on the water drainage path for circulating the water drained from the washing apparatus to the condenser filter device for rinsing lint away. Preferably, the circulation pump is arranged on the first drainage pipe and is between the drainage valve and the condenser filter device.

[0090] The integrated laundry washer-dryer of the embodiment also comprises a lint filter device. The lint filter device is arranged on the rinsing path which is between the outer drum and the condenser filter device. Or, the lint filter device is detachable installed on the outer drum at a position corresponding to the water outlet of the rinsing path. The lint filter device can filter and collect the lint in the rinsing water, ensuring the cleanliness of the water entering the outer drum of the washing apparatus.

[0091] The embodiment also discloses a control method of the integrated laundry washer-dryer. The integrated laundry washer-dryer comprises a control device for controlling the drying apparatus and the washing apparatus. When the drying apparatus needs to rinse the condenser filter device, the water enters the condenser filter device for rinsing through the rinsing path. The control device opens the water outlet of the rinsing path which is in communication with the outer drum, introducing the water into the outer drum of the washing apparatus after rinsing.

[0092] When using the clean inlet water to the washing apparatus or the external water for rinsing the condenser filter device, due to the relative high cleanliness of the rinsing water, the secondary use of the water can be considered. A lint filter device is provided for filtering the lint and the water can be reused. Also, the rinsing water can be drained from the drainage system of the washing apparatus.

[0093] Further, when the washing apparatus is operating, then determine whether the washing apparatus is during the washing process. If so, then open the first control device to introduce the water into the outer drum of the washing apparatus after rinsing. If not, then open the second control valve to drain the water outside the housing after rinsing.

[0094] When the washing apparatus is not operating, the second control valve is controlled to open, so that the water is drained outside the housing after rinsing.

Embodiment 7

[0095] As illustrated in FIG. 4, the integrated laundry washer-dryer of the embodiment comprises a housing 1, a washing apparatus 10 and a drying apparatus 11, which are arranged inside the housing 1 and can respectively independently operate. The drying apparatus 11 comprises a heat exchange element and a heat exchange element filter device 2 used for filtering the condensing

air. The washing apparatus 10 comprises a water drainage path. A storage tank 17 is provided in communication with the water drainage path. A control valve is arranged between the storage tank 17 and the water drainage path.

5 The storage tank 17 is connected with the heat exchange element filter device through a connecting pipe 18.

[0096] The storage tank 17 is used to collect the drained water from the washing apparatus and the water stored in the storage tank is discharged to the heat exchange element filter device for rinsing according to the needs of the drying apparatus. The drained water from the washing apparatus is temporarily stored in the storage tank, so that the drying apparatus can choose to rinse the heat exchange element filter device according to the needs, regardless of whether the washing apparatus is working. In this way, the operation is more flexible, and the independence of the drying apparatus and the washing apparatus is stronger.

[0097] The drying apparatus of the embodiment adopts a condensing module. The heat exchange element is a condenser, and the heat exchange element filter device is a condenser filter device. Or, the drying apparatus adopts a heat pump drying module. The heat exchange element is an evaporator, and the heat exchange element filter device is an evaporator filter device.

[0098] A condensing module adopted drying apparatus is used as an example in the following description and the heat exchange element filter device is a condenser filter device. For the person skilled in the art, it should be understood that when adopting a heat pump drying module and using an evaporator filter device as the heat exchange element filter device, the following description is still applicable.

[0099] The washing apparatus 10 of the embodiment comprises an outer drum for holding water. The water drainage path includes a first drainage pipe 5 and a second drainage pipe 6. One end of the first drainage pipe 5 is in communication with the outer drum, and another end is in communication with the storage tank 17. One end of the second drainage pipe 6 is in communication with the outer drum, and another end is in communication with the outside of the housing 1. The drainage valve is arranged on the first drainage pipe 5.

[0100] Further, the drying apparatus is arranged above the washing apparatus. A circulation pump 7 is arranged on the connecting pipe for circulating the stored water in the storage tank 17 to the heat exchange element filter device 2 for rinsing lint away.

[0101] In order to keep the stored water in the storage tank at a certain level, a water level detecting device is provided in the storage tank 17. The integrated laundry washer-dryer comprises a control device 12 for controlling the operation of the drying apparatus and the washing apparatus. The water level detecting device is electrically connected with the control device 12. The control device 12 controls the open/close of the control valve and the circulation pump according to the water level in the storage tank detected by the water level detecting

device.

[0102] In order to keep the stored water in the storage tank at a certain level, a water outlet and an overflow port are provided in the storage tank 17. The connecting pipe 18 is in communication with the water outlet and the overflow port is in communication with the water drainage path. When the storage tank is full of water, the drained water from the washing apparatus flows out through the overflow port and is drained through the water drainage path.

[0103] The condenser filter device 2 of the embodiment is in communication with a third drainage pipe 4. The third drainage pipe 4 is in communication with the second drainage pipe 6. Preferably, a third drainage valve is arranged on the third drainage pipe 4.

[0104] The washing apparatus of the embodiment comprises a water inlet path used for introducing water for clothes washing.

[0105] The integrated laundry washer-dryer also comprises a rinsing path 13 which is in communication with the water inlet path of the washing apparatus. A rinsing control device 14 is provided in the rinsing path 13. The rinsing path is in communication with the condenser filter device 2. The rinsing control device 14 is used to control the connection of the rinsing path 13 so that the inlet water to the washing apparatus is introduced to the condenser filter device 2 for rinsing lint away.

[0106] As illustrated in FIG. 5, further, the washing apparatus comprises an outer drum for holding water. The water outlet of the rinsing path is in communication with the outer drum of the washing apparatus, used to introduce the rinsing water for rinsing the condenser filter device into the outer drum.

[0107] The embodiment also discloses a control method of the integrated laundry washer-dryer. The integrated laundry washer-dryer comprises a control device for controlling the operation of the drying apparatus and the washing apparatus.

[0108] When the washing apparatus is draining water, if the drained water meets the turbidity requirements, the control device opens the control valve so that the drained water from the washing apparatus is introduced into the storage tank for storage.

[0109] When the drying apparatus needs to rinse the condenser filter device, the control device turns on the circulation pump so that the stored water in the storage tank is circulated to the condenser filter device for rinsing lint away.

[0110] Further, when the drying apparatus does not operate within a set time T, the control device turns on the circulation pump and opens the control valve, so that the stored water in the storage tank is circulated to the condenser filter device for rinsing lint away, and the water after rinsing is drained through the water drainage path.

[0111] It should be understood by the person skilled in the art that the above embodiment of the disclosure can be carried out independently and they can also be combined to implement.

[0112] The above description is just used to illustrate some more practical embodiments of the disclosure but is not the limitation of the disclosure in any way. Although the disclosure has been enclosed as the above embodiments, they are not used to limit the disclosure. Within the technical scheme of the disclosure, any person skilled in the art should be able to make some changes or modifications based on the above techniques to obtain other embodiments with equal benefits. But any simple changes, equivalent changes or modifications, made to the above embodiments according to the technical substance within the technical scheme of the disclosure, still belong to the protection range of the disclosure.

Claims

1. An integrated laundry washer-dryer comprising a housing, a washing apparatus and a drying apparatus being arranged inside the housing and being configured to respectively independently operate, **characterized in that:**
 - the drying apparatus comprises a heat exchange element and a heat exchange element filter device;
 - the washing apparatus comprises a water drainage path and a water drainage control device, the water drainage control device is arranged on the water drainage path and is used for controlling a connection and disconnection of the water drainage path;
 - the water drainage path is in communication with the heat exchange element filter device.
2. The integrated laundry washer-dryer according to claim 1, **characterized in that:** the drying apparatus adopts a condensing module, the heat exchange element is a condenser, the heat exchange element filter device is a condenser filter device; or the drying apparatus adopts a heat pump drying module, the heat exchange element is an evaporator, the heat exchange element filter device is an evaporator filter device; the washing apparatus comprises an outer drum for holding water, the water drainage path includes a first drainage pipe and a second drainage pipe; an end of the first drainage pipe is in communication with the outer drum, and another end is in communication with the heat exchange element filter device; an end of the second drainage pipe is in communication with the outer drum, and another end is in communication with outside of the housing; the water drainage control device is arranged on the first drainage pipe and/or the second drainage pipe.
3. The integrated laundry washer-dryer according to

- claim 2, **characterized in that:** the water drainage control device is a drainage valve;
a first drainage valve is arranged on the first drainage pipe, and a second drainage valve is arranged on the second drainage pipe;
or the drainage valve includes a water inlet and two water outlets, the water inlet is in communication with the outer drum and the two water outlets are in communication with the first drainage pipe and the second drainage pipe respectively.
4. The integrated laundry washer-dryer according to claim 2 or 3, **characterized in that:** the drying apparatus is arranged above the washing apparatus, a circulation pump is arranged on the water drainage path for driving to circulate water drained from the washing apparatus to the heat exchange element filter device;
preferably, the circulation pump is arranged on the first drainage pipe and is located between the drainage valve and the heat exchange element filter device.
 5. The integrated laundry washer-dryer according to any one of claims from 2 to 4, **characterized in that:** the heat exchange element filter device is in communication with a third drainage pipe, and the third drainage pipe is in communication with the second drainage pipe;
preferably, a third drainage valve is arranged on the third drainage pipe.
 6. The integrated laundry washer-dryer according to any one of claims from 1 to 5, **characterized in that:** the heat exchange element filter device includes a filter screen and a filter screen frame, a flushing channel is arranged on the filter screen frame and the flushing channel is in communication with the water drainage path.
 7. A control method of the integrated laundry washer-dryer according to any one of claims from 1 to 6, **characterized in that:** the integrated laundry washer-dryer comprises a control device for controlling an operation of the drying apparatus and an operation of the washing apparatus;
the method comprises when the drying apparatus needs to rinse the heat exchange element filter device, and a drainage of the washing apparatus is detected, the control device controls the water drainage control device to introduce the water drained from the washing apparatus to the heat exchange element filter device.
 8. The control method of the integrated laundry washer-dryer according to claim 7, comprising: the control device controlling the water drainage control device to introduce rinsing water drained from the washing apparatus to the heat exchange element filter device, when the drying apparatus operates to rinse the condenser filter device before or after drying laundry and a drainage of the rinsing water from the washing apparatus is detected;
preferably, when the washing apparatus carries out a rinse program for several times, the control device controls the washing apparatus to introduce the rinsing water drained from the washing apparatus to the heat exchange element filter device when the washing apparatus carries out a last rinsing drainage;
when the washing apparatus only carries out the rinse program once, the control device controls the rinsing water drained from the washing apparatus to drain outside through the water drainage path.
 9. The control method of the integrated laundry washer-dryer according to claim 7, **characterized in that:** when the drying apparatus operates to rinse the heat exchange element filter device before or after drying laundry and the washing apparatus is carrying out the last rinsing drainage, the drainage valve is controlled to open for being communicating the first drainage pipe and the circulation pump and the third drainage valve is controlled to open,
the rinsing water drained from the washing apparatus is introduced to the heat exchange element filter device, and then drained to outside from the third drainage pipe to the second drainage pipe.
 10. The control method of the integrated laundry washer-dryer according to claim 7, wherein: the drying apparatus comprises a rinsing path which is in communication with the heat exchange element filter device, the rinsing path is connected with an external water source;
when the drying apparatus operates to rinse the heat exchange element filter device before or after clothes drying and the washing apparatus is not operating, the rinsing path is controlled to open so that water from the external water source is introduced to the heat exchange element filter device.

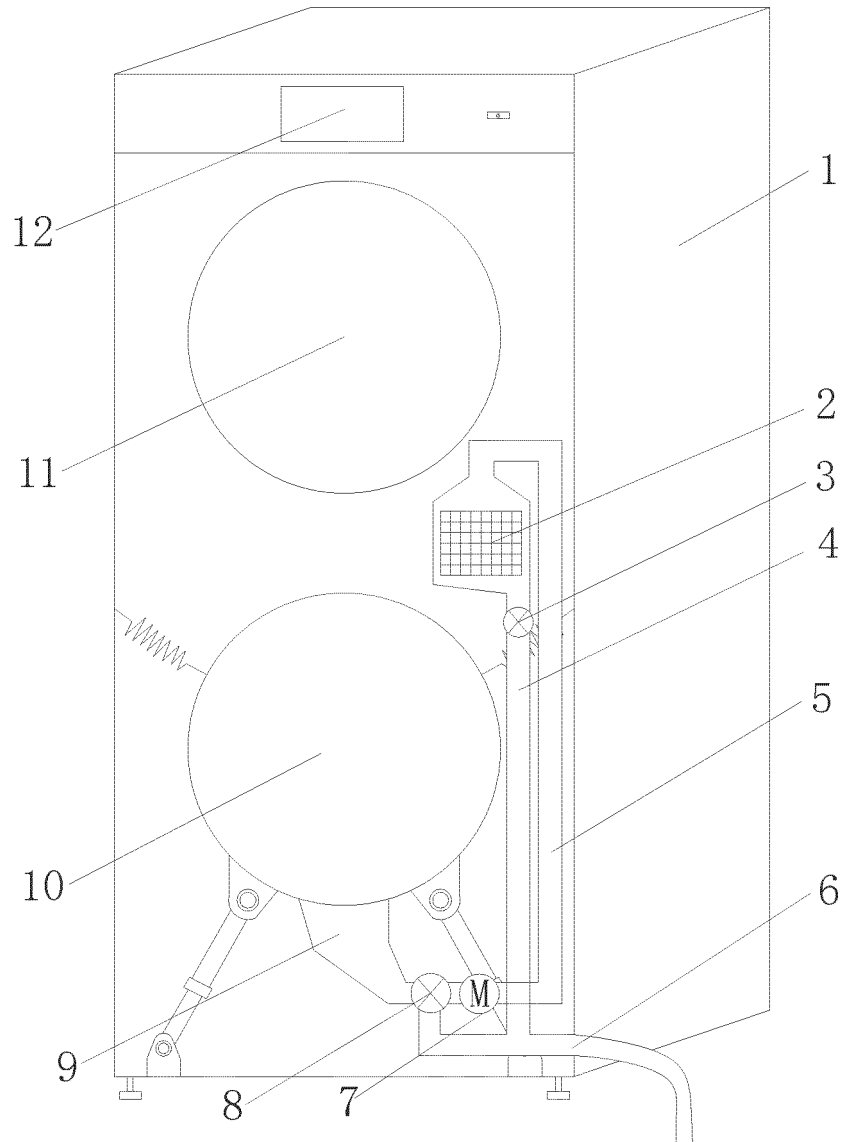


FIG. 1

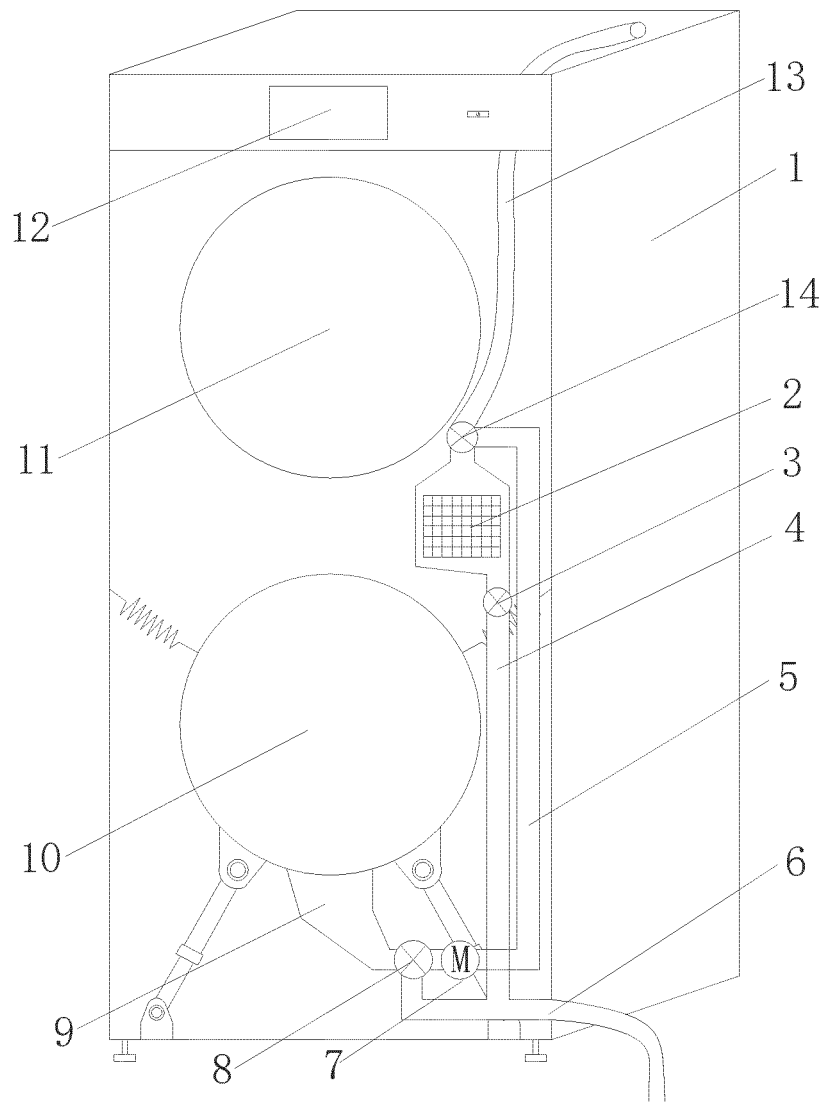


FIG. 2

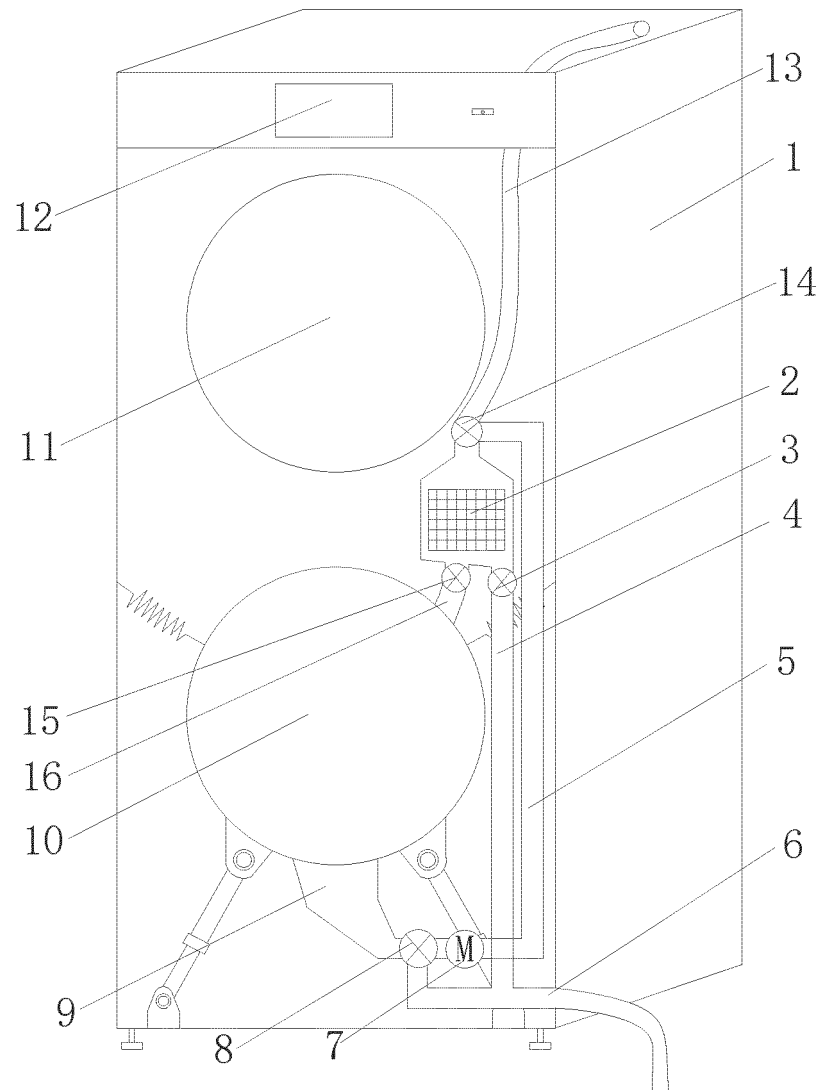


FIG. 3

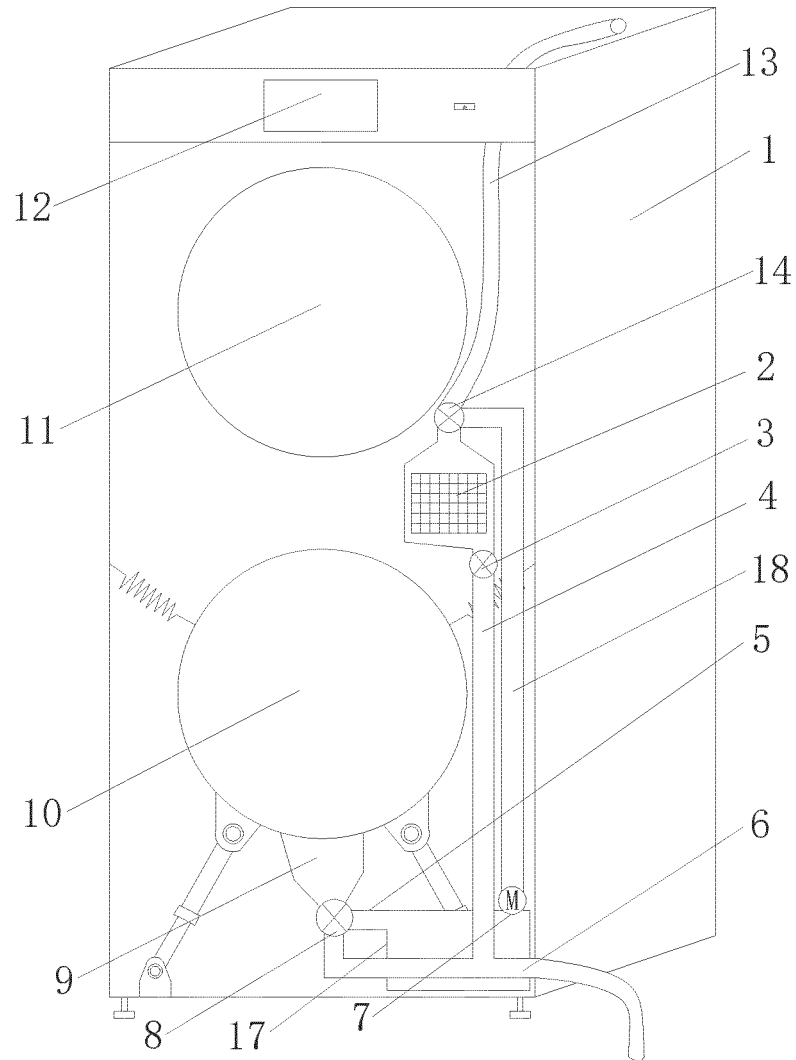


FIG. 4

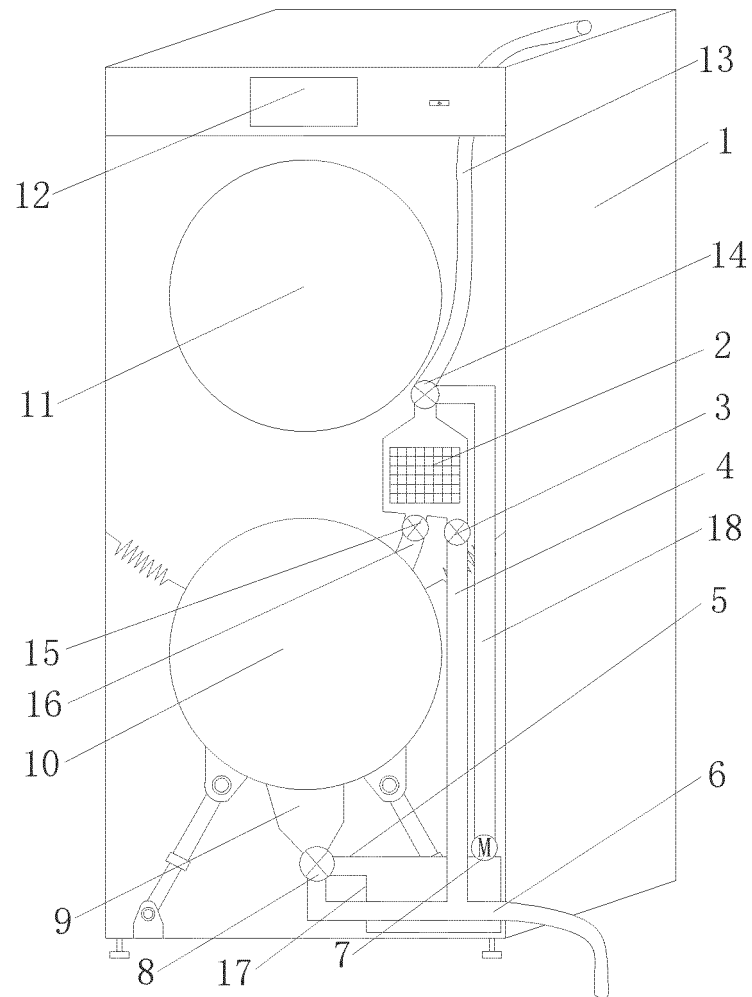


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/103453

A. CLASSIFICATION OF SUBJECT MATTER

D06F 29/02(2006.01)i; D06F 39/08(2006.01)i; D06F 58/22(2006.01)i; D06F 58/28(2006.01)i; D06F 33/02(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

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)

CNPAT, WPI, EPODOC, CNKI: 洗衣, 干衣, 烘干, 洗干一体, 过滤, 清洗, 冲洗, 放水, 排水, 泵, washing, drying, filter+, clean +, water, exhaust, pump

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 105483970 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 13 April 2016 (2016-04-13) description, paragraphs [0024]-[0034], and figures 1-3	1-7, 10
Y	CN 106400378 A (TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORPORATION) 15 February 2017 (2017-02-15) description, paragraphs [0068], [0073], [0074], [0086], [0103], and [0219], and figures 1, 2, 5, and 8	1-7, 10
A	CN 102348843 A (BSH BOSCH UND SIEMENS HAUSGERAETE GMBH) 08 February 2012 (2012-02-08) entire document	1-10
A	CN 106637796 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 10 May 2017 (2017-05-10) entire document	1-10
A	CN 105506939 A (QINGDAO JIAONAN HAIER WASHING MACHINE CO., LTD.) 20 April 2016 (2016-04-20) entire document	1-10

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search

08 October 2018

Date of mailing of the international search report

31 October 2018

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/103453

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2013226185 A (TOSHIBA CORPORATION ET AL.) 07 November 2013 (2013-11-07) entire document	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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CN	105506939	A	20 April 2016		WO	2016045173	A1	31 March 2016	
JP	2013226185	A	07 November 2013		None				

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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