# INTEGRATED WASHER-DRYER

## TECHNICAL FIELD

**[0001]** The present disclosure relates to the field of household appliances, and, in particular, to an integrated washer-dryer.

## BACKGROUND

**[0002]** With the improvement of people's living standards, their lifestyles are also changing constantly, and they are no longer satisfied with the basic functions of consumer goods. For the washer industry, automatic integrated washer-dryers can dry clothes after washing, which is particularly useful for wet weather, and thus the automatic integrated washer-dryers are more and more favored by consumers. Drying module assemblies in existing integrated washer-dryers are typically classified into an exhaust type, a condensation type, and a heat-pump type.

**[0003]** The exhaust-type drying module assembly works by heating air with a heater in an exhaust assembly, delivering the heated air to a drum to take away moisture from clothes in the drum by using the heated air and, finally, discharging hot and humid air from a machine. In this way, there are defects of high energy consumption, low efficiency, high noise, and great damage to the clothes due to high hot air temperature. In addition, it is required to provide an additional exhaust pipe to discharge the heated air, which not only takes up a relatively large space but also presents a risk of scalding people or burning environmental objects.

**[0004]** The condensation-type drying module assembly works by heating air with a heater in a condensing assembly, blowing the heated air to a drum to take away moisture from clothes in the drum by using the heated air, condensing the resulting hot and humid air via a condenser to separate out the moisture and change the hot and humid air into dry and cold air, and heating the dry and cold air and delivering the heated air to the drum, repeating the process until the drying purpose is achieved. However, the energy consumption and drying efficiency of the condensation-type drying are strongly dependent on ambient temperature and, therefore, sharply fluctuate with the change of the ambient temperature, since heating and condensing procedures therein are closely related to a temperature difference. In particular, in regions with relatively low ambient temperature, there are defects such as high energy consumption, low efficiency, and even an unsatisfactory drying effect.

**[0005]** The heat-pump-type drying module assembly works by heating air with a condenser in a heat pump circulation assembly, delivering the heated air to a drum to take away moisture from clothes in the drum, delivering the resulting hot and humid air to an evaporator for

**[00103]** FIG. 3 shows a drying module assembly D in the integrated washer-dryer, according to the first embodiment of the present disclosure. The drying module assembly D includes a moisture-absorbing and dehumidifying component D1, a moisture-absorbing passage D2 and a dehumidifying passage D3. The moisture-absorbing and dehumidifying component D1 includes a moisture-absorbing rotary wheel assembly D11, a rotary wheel housing D12, and a rotary wheel driving mechanism D13. In the moisture-absorbing passage D2, an air inlet D21 of the moisture-absorbing passage, an air outlet D22 of the moisture-absorbing passage, and a fan D23 for the moisture-absorbing passage are provided. In the dehumidifying passage D3, a fan D33 for the dehumidifying passage, a dehumidifying and heating assembly D34, and a dehumidifying and condensing assembly D35 are provided. Furthermore, a moisture-absorbing and heating assembly, a moisture-absorbing and condensing assembly, and/or a moisture-absorbing and filtering assembly may also optionally be provided inside the moisture-absorbing passage D2, and a dehumidifying and filtering assembly may also optionally be provided inside the dehumidifying passage D3.

**[00104]** As shown in FIGs. 3 and 5, the aforementioned functional modules are connected to each other and are disposed via lap joint on four edges at the top of the rack B of the integrated washer-dryer by means of at least four hangers B1, respectively. This can be clearly seen in FIG. 1. At least three of the at least four hangers B1 are independently manufactured and then connected to the edges of the aforementioned functional modules, and at least another hanger B1 is directly integrally formed with the rotary wheel housing D12 of the moisture-absorbing and dehumidifying component D1. It is also possible to contemplate other numbers of hangers B1 and other forms of connection to the rack B. In summary, the functional modules that have been connected as a whole are directly fixed onto the rack by using the hangers B1, which facilitates the assembling on the one hand, and is also advantageous for reducing the impact of vibration of the drum on the drying module assembly D on the other hand. It is also possible to contemplate fixing these functional modules on the drum and the rack, respectively. Here, particularly advantageously, the moisture-absorbing and dehumidifying component is fixed on the rack.

**[00105]** As shown in FIGs. 3, 4 and 6, an axis of rotation of the moisture-absorbing rotary wheel assembly D11 taking up a relatively large space and an axis of rotation of the fan D23 for the moisture-absorbing passage are heteroplanar with and generally perpendicular to the axis of rotation of the drum R, and are distributed on two sides of the axis of rotation of the drum R. Particularly advantageously, these functional modules, in particular the moisture-absorbing rotary wheel assembly D11, the rotary wheel driving mechanism D13, the fan D23 for the moisture-absorbing passage, the fan D33 for the dehumidifying passage, the dehumidifying and heating assembly D34, and the dehumidifying and condensing assembly D35, are radially arranged in

substantially the same plane side by side. That is, these functional modules at least partially overlap, without complete staggering, in the direction of the axis of rotation of the moisture-absorbing rotary wheel assembly D11.

**[00106]** In this embodiment, the air inlet D21 of the moisture-absorbing passage D2 and the air outlet of the drum R are in fluid communication, and the air outlet D22 of the moisture-absorbing passage D2 and the air inlet of the drum R are in fluid communication. As shown in FIG. 3, an air outlet of the fan D23 for the moisture-absorbing passage is configured to open in a direction perpendicular to the axis of rotation of the moisture-absorbing rotary wheel assembly D11, and, by virtue of an air-opening connecting part, the air outlet is in fluid communication with a moisture-absorbing airflow inlet configured in a circumferential side wall of the rotary wheel housing D12 and is thus in fluid communication with a moisture-absorbing region D1211 of the rotary wheel housing D12. The moisture-absorbing airflow inlet of the rotary wheel housing D12 is arranged on the circumferential side wall of the rotary wheel housing D12 between the moisture-absorbing rotary wheel assembly D11 and the bottom of the rotary wheel housing D12.

**[00107]** As shown in FIG. 3, the dehumidifying passage D3 that is connected end to end is configured to be an inner circulating passage without communication with an ambient environment. The air outlet of the fan D33 for the dehumidifying passage is similarly configured to open in the direction perpendicular to the axis of rotation of the moisture-absorbing rotary wheel assembly D11; and, by virtue of the air-opening connecting part, the air outlet is in fluid communication with a circumferential side wall D3413 of the dehumidifying and heating housing D341 of the dehumidifying and heating assembly D34. The dehumidifying and heating assembly D34 is fixed onto an upper surface of a rotary wheel upper housing D12U of the rotary wheel housing D12 and is configured in a shape complementary to the shape of the upper surface. A dehumidifying airflow outlet is configured in a lower end surface wall D3412 of the dehumidifying and heating assembly housing D341 and is in fluid communication with a dehumidifying region D1212 of the moisture-absorbing rotary wheel assembly D11.

**[00108]** Hence, the drying module assembly D with a compact structure, in particular in the direction of the axis of rotation, is formed, which is very advantageous for reducing the height or thickness of the integrated washer-dryer.

**[00109]** FIG. 4 schematically shows, with arrows, a flow path of a moisture-absorbing airflow in the integrated washer-dryer according to the first embodiment of the present disclosure. When the fan D23 for the moisture-absorbing passage starts, an airflow circularly flows among the drum R, the drying module assembly D, and optionally the filtering module assembly F to form a moisture-absorbing airflow. The fan D23 for the moisture-absorbing passage sucks a humid gas to the air inlet D21 of the moisture-absorbing passage of the drying module assembly D from the drum R

## CLAIMS

What is claimed is:

1. An integrated washer-dryer, comprising a drum and a drying module assembly, wherein the drying module assembly comprises a moisture-absorbing and dehumidifying component, a moisture-absorbing passage, and a dehumidifying passage; the moisture-absorbing passage comprises an air inlet of the moisture-absorbing passage and an air outlet of the moisture-absorbing passage; the drum is communicated with the air inlet of the moisture-absorbing passage and the air outlet of the moisture-absorbing passage, respectively; a fan for the moisture-absorbing passage is arranged in the moisture-absorbing passage so as to form a moisture-absorbing airflow in the drum and in the moisture-absorbing passage; a fan for the dehumidifying passage is arranged in the dehumidifying passage so as to form a dehumidifying airflow in the dehumidifying passage; the moisture-absorbing and dehumidifying component is disposed in a path of the moisture-absorbing passage and the dehumidifying passage, such that the moisture-absorbing airflow and the dehumidifying airflow both flow through the moisture-absorbing and dehumidifying component, thereby allowing the moisture-absorbing and dehumidifying component to absorb moisture from the moisture-absorbing airflow during rotation and to discharge the absorbed moisture by means of the dehumidifying airflow.

2. The integrated washer-dryer according to claim 1, wherein the moisture-absorbing and dehumidifying component comprises a moisture-absorbing rotary wheel assembly, a rotary wheel housing, and a rotary wheel driving mechanism for driving the moisture-absorbing rotary wheel assembly to rotate, and the moisture-absorbing rotary wheel assembly is rotatably supported in the rotary wheel housing along an axis of rotation.

3. The integrated washer-dryer according to claim 2, wherein the moisture-absorbing rotary wheel assembly is driven at an outer periphery thereof by the rotary wheel driving mechanism.

4. The integrated washer-dryer according to claim 2, wherein the rotary wheel driving mechanism is entirely or partially arranged beyond a radial dimensional range of the moisture-absorbing rotary wheel assembly.

5. The integrated washer-dryer according to claim 2, wherein the moisture-absorbing rotary wheel assembly comprises a wheel disc, an outer-periphery housing member connected to a peripheral region of the wheel disc in a relative non-rotatable manner, and a center housing member connected to a center region of the wheel disc in a relative non-rotatable manner.

6. The integrated washer-dryer according to claim 5, wherein the outer-periphery housing member comprises an outer-periphery upper clamp housing and an outer-periphery lower clamp housing, and the outer-periphery upper clamp housing and the outer-periphery lower clamp housing are configured to be fixed with each other while surrounding an outer peripheral surface of the wheel disc, and to clamp an end surface in a peripheral region of the wheel disc.

7. The integrated washer-dryer according to claim 5, wherein the center housing member comprises a center upper clamp member and a center lower clamp member, and the center upper clamp member and the center lower clamp member are configured to be fixed with each other, and clamp an end surface in a center region of the wheel disc.

8. The integrated washer-dryer according to claim 5, wherein the moisture-absorbing rotary wheel assembly further comprises an end surface damping member that is arranged between the end surface in the center region of the wheel disc and an end surface of an end segment of the center housing member to form a buffer.

9. The integrated washer-dryer according to claim 5, wherein the moisture-absorbing rotary wheel assembly further comprises an auxiliary rotating ring, and the auxiliary rotating ring is integrally formed on or connected to an outer peripheral surface of the outer-periphery housing member and matches a position of a circumferential roller mechanism that is arranged on an inner periphery of the rotary wheel housing.

10. The integrated washer-dryer according to claim 5, wherein the drying module assembly comprises a dehumidifying and heating assembly arranged in the path of the dehumidifying passage, and the dehumidifying and heating assembly is configured to heat the dehumidifying airflow for increasing a temperature of the dehumidifying airflow.

11. The integrated washer-dryer according to claim 2 or 3, wherein at least one circumferential roller mechanism is disposed at an inner periphery of the rotary wheel housing and comprises a circumferential roller and a circumferential roller bracket, the circumferential roller being rotatably supported on the circumferential roller bracket, and the circumferential roller bracket being disposed at the inner periphery of the rotary wheel housing, wherein, when viewed in a direction parallel to the axis of rotation, the circumferential roller is arranged in a dimensional range of the moisture-absorbing rotary wheel assembly in a direction of the axis of rotation; when

viewed in a direction perpendicular to the axis of rotation, the circumferential roller is arranged between the moisture-absorbing rotary wheel assembly and the rotary wheel housing; and the circumferential roller is capable of being in rolling contact with an outer peripheral surface of the moisture-absorbing rotary wheel assembly for at least part of time during the rotation of the moisture-absorbing rotary wheel assembly.

12. The integrated washer-dryer according to claim 2 or 3, wherein at least one bottom roller mechanism is disposed at an inner bottom surface of the rotary wheel housing; the bottom roller mechanism comprises a bottom roller and a bottom roller bracket; the bottom roller is rotatably supported on the bottom roller bracket; the bottom roller bracket is disposed on the rotary wheel housing; when viewed in a direction perpendicular to the axis of rotation, the bottom roller is arranged in a dimensional range of the moisture-absorbing rotary wheel assembly in the direction perpendicular to the axis of rotation; and when viewed in a direction parallel to the axis of rotation, the bottom roller is arranged between the moisture-absorbing rotary wheel assembly and the rotary wheel housing, and a distance between the bottom roller and the moisture-absorbing rotary wheel assembly is smaller than a minimum distance between the moisture-absorbing rotary wheel assembly and the rotary wheel housing.

13. The integrated washer-dryer according to claim 2 or 3, wherein a sealing member of a rotary wheel is disposed at an outer surface of an outer periphery of the moisture-absorbing rotary wheel assembly, a sealing member of the rotary wheel housing is disposed at an inner surface of the rotary wheel housing, and the sealing member of the rotary wheel and the sealing member of the rotary wheel housing are in contact with each other in a relative rotatable manner to form a seal.

14. The integrated washer-dryer according to claim 2 or 3, wherein an axis of rotation of the moisture-absorbing rotary wheel assembly and an axis of rotation of the fan for the moisture-absorbing passage are both heteroplanar with and perpendicular to the axis of rotation of the drum and are distributed on two sides of the axis of rotation of the drum.

15. The integrated washer-dryer according to any one of claims 1 to 3, wherein a plurality of partition ribs extending in a radius range are integrally formed on or fixed onto an inner wall of an end surface of the rotary wheel housing, thereby partitioning an inner cavity of the rotary wheel housing at least into a moisture-absorbing region and a dehumidifying region; partition sealing members are optionally fixed onto surfaces of the partition ribs; and a distance between the

partition sealing member and a wheel disc in the moisture-absorbing rotary wheel assembly is in a range of 0 mm to 5 mm.

16. The integrated washer-dryer according to claim 2, wherein at least three partition ribs opposite one another and extending toward one another are integrally formed on or fixed onto an inner wall of an end surface of the rotary wheel housing, thereby partitioning an inner cavity of the rotary wheel housing at least into a moisture-absorbing region, a dehumidifying region, and a cooling region, and the cooling region is arranged between the moisture-absorbing region and the dehumidifying region.

17. The integrated washer-dryer according to claim 2, wherein at least one airflow guide sheet is further disposed in the rotary wheel housing and is configured to divide a moisture-absorbing airflow entering the rotary wheel housing into at least two streams of airflows, and to allow the at least two streams of airflows to flow through a wheel disc of the moisture-absorbing rotary wheel assembly from different regions, respectively.

18. The integrated washer-dryer according to any one of claims 1 to 3, wherein the integrated washer-dryer further comprises an air outlet pipeline disposed between the air outlet of the drum and the air inlet of the drying module assembly; and a filtering module assembly is disposed in the air outlet pipeline and comprises a filter screen for filtering an airflow flowing through the air outlet pipeline, and a filter screen self-cleaning device.

19. The integrated washer-dryer according to claim 1, wherein the drying module assembly is arranged above, behind, or below the drum.

20. A drying module assembly in the integrated washer-dryer according to any one of claims 1 to 19.