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(54) ROTARY HEAT EXCHANGER DEVICE

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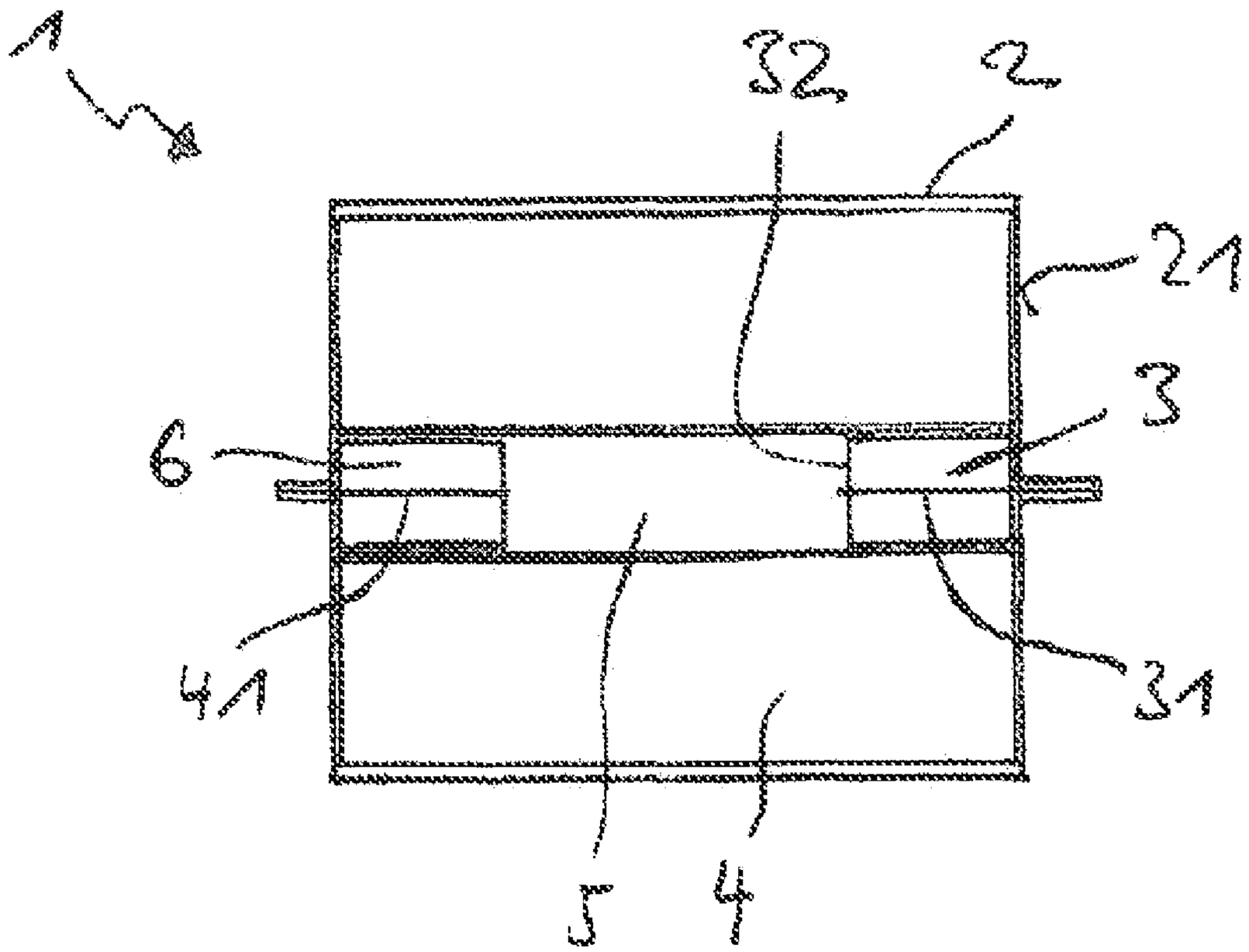
(57) **ABSTRACT**

A rotary heat exchanger device is disclosed. In an embodiment the rotary heat exchanger includes a rotary heat exchanger having a rotary heat exchanger axis of rotation, a drive motor having a stator and a rotor including a rotor axis of rotation and a housing into which the rotary heat exchanger is installed and in which the latter rotates, wherein the rotor axis of rotation and the heat exchanger axis of rotation extend coaxially and the rotor is rigidly connected to the rotary heat exchanger.



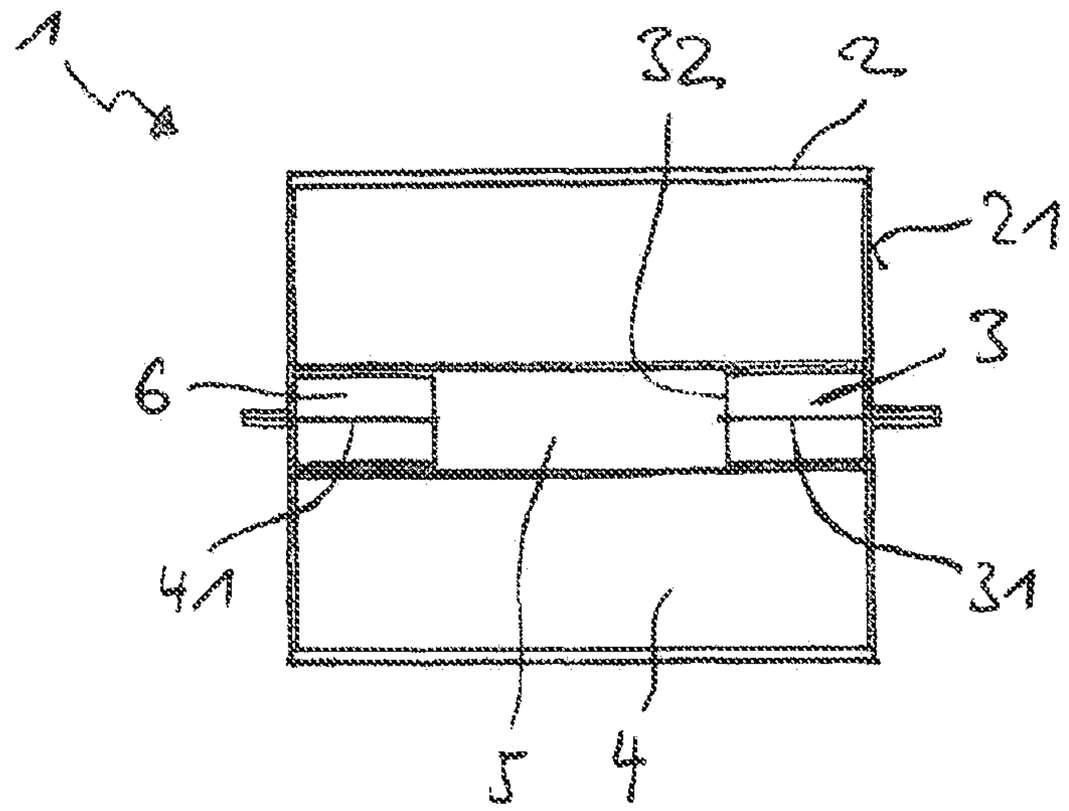


FIG. 1

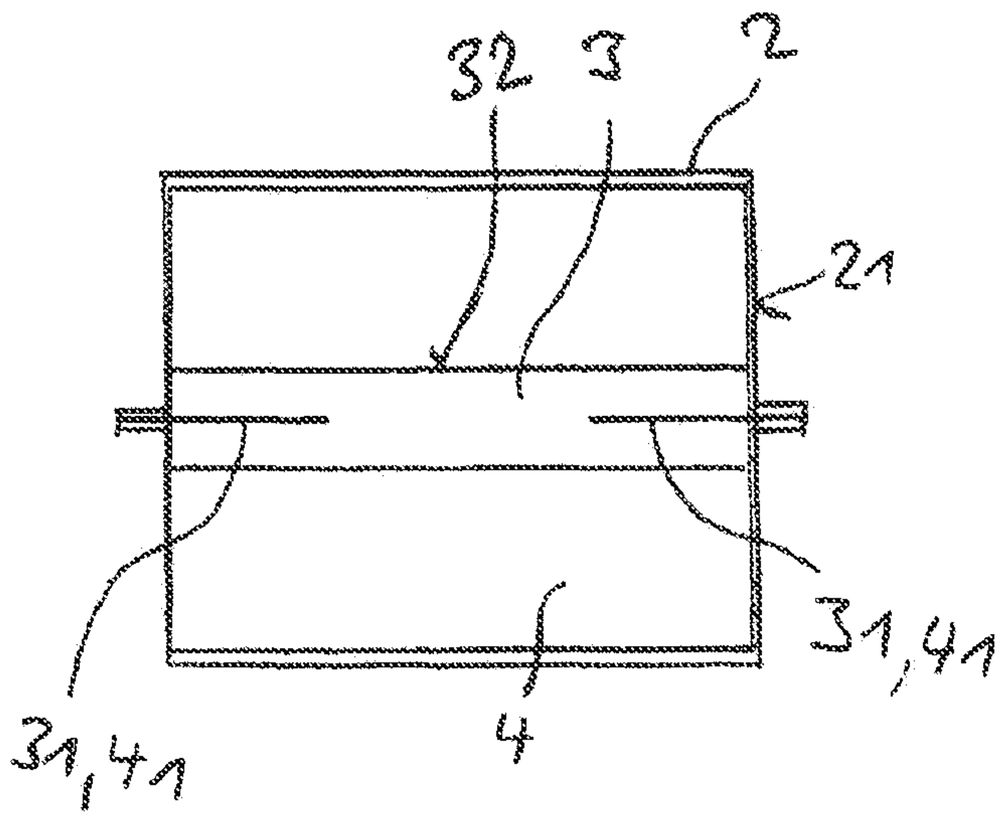


FIG. 2

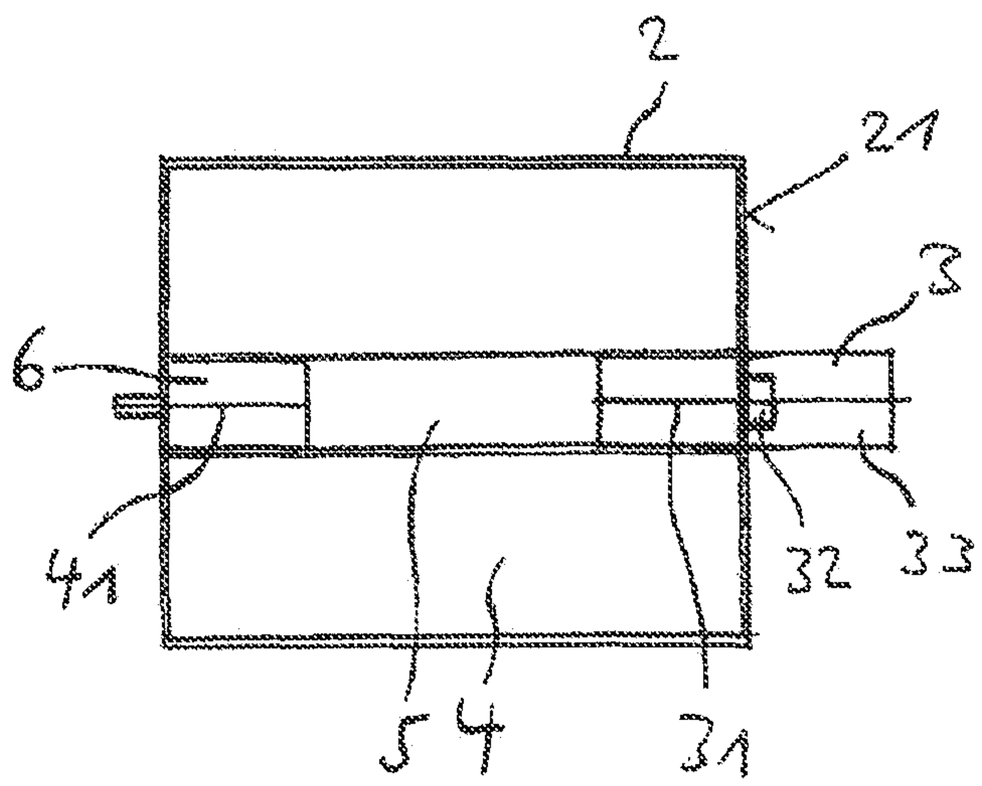


FIG. 3

ROTARY HEAT EXCHANGER DEVICE

[0001] This patent application is a national phase filing under section 371 of PCT/DE2015/000537, filed Nov. 11, 2015, which claims the priority of German patent application 20 2014 105 449.9, filed Nov. 12, 2014, each of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The invention relates to a rotary heat exchanger device, in particular for use in a decentralized ventilation system with heat recovery, comprising a rotary heat exchanger and a drive motor.

BACKGROUND

[0003] Such a rotary exchanger device is known from DE 20 2009 009 697 U1. In this rotary heat exchanger device the drive motor is an external rotor motor, which is arranged adjacent to the outside wall of the rotary heat exchanger and the rotor thereof drives the rotary heat exchanger directly by means of a direct form-fit and/or friction coupling to the outer wall.

[0004] The coupling between the outer wall of the rotary heat exchanger and rotor by means of a form-fit and/or friction coupling requires a high level of positional accuracy of the drive motor and rotary heat exchanger in relation to each other, and therefore high assembly costs. There is also a risk that, even at low abrasion, the coupling no longer functions reliably.

SUMMARY OF THE INVENTION

[0005] Embodiments of the present invention provide an enhanced rotary heat exchanger device, which in particular requires a reduced assembly cost and has increased reliability.

[0006] In various embodiments of the invention the drive motor is arranged at the axis of rotation of the rotary heat exchanger and the rotor of the drive motor is rigidly connected to the rotary heat exchanger.

[0007] In various further embodiments of the invention, the axis of rotation of the rotor and the axis of rotation of the heat exchanger are coaxial.

[0008] In various further embodiments the drive motor is located within the rotary heat exchanger and the rotor is directly coupled to an internal surface of the rotary heat exchanger. Alternatively, the rotor is rigidly connected to an axis of rotation of the rotary heat exchanger, to which the latter is attached.

[0009] In the present case, the rotor always means the part of the drive motor that is rigidly connected to the rotary heat exchanger and rotates the latter. By contrast, the stator means the part of the drive motor that is rigidly connected to the housing.

[0010] The drive motor is advantageously arranged in such a way that the axis of rotation of the rotary heat exchanger and the axis of rotation of the rotor of the drive motor are coaxial and the rotor is rigidly connected to the rotary heat exchanger and in operation rotates the latter at the desired rotation speed about the axis of rotation thereof. The drive motor is designed, preferably by means of suitable control electronics or software, such that its rotor rotates at the rotation speed desired for the rotary heat exchanger. A gearing is preferably not required.

[0011] Such a rotary heat exchanger device also in particular involves the advantage that no coupling means which are liable to wear, such as drive belts or gear-wheels or other means for producing a form-fit or friction coupling between the rotor and the rotary heat exchanger are required. It saves complicated calibration and readjustment of the coupling means and/or drive motor.

[0012] The fact that the drive motor is no longer arranged adjacent to the outer wall of the rotary heat exchanger enables that, for a unchanged size of a housing of the rotary heat exchanger device, the diameter thereof can be enlarged, which results in a higher heat recovery and a lower pressure loss with the same air performance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Further details, features, and advantageous extensions of the invention are obtained from the exemplary embodiments described hereafter and shown in the drawings, as well as from the dependent claims, the disclosure content of which as well as the disclosure content of claim **1**, is hereby incorporated into this description.

[0014] Shown is in:

[0015] FIG. **1** is a schematic view of a cross section parallel to the axis of rotation of a first exemplary embodiment,

[0016] FIG. **2** is a schematic view of a cross section parallel to the axis of rotation of a second exemplary embodiment and

[0017] FIG. **3** is a schematic view of a cross section parallel to the axis of rotation of a third exemplary embodiment.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0018] The FIGS. **1** to **3** show in each case one exemplary embodiment of a rotary heat exchanger device **1** having, for example, a cubic housing **2**, for example, made of sheet metal or plastic, an electric drive motor **3** and a cylindrical rotary heat exchanger **4**. The housing **2** comprises openings (not shown) at the sides for air intake into and air outlet out of the rotary heat exchanger **4**.

[0019] In the exemplary embodiments in accordance with FIGS. **1** and **2**, the drive motor **3** is arranged within the rotary heat exchanger **4** in such a way that the axis of rotation of the rotor **32** of the drive motor **3**, i.e., the motor axis of rotation **31**, is coaxial with an axis of rotation of the rotary heat exchanger **4**, hereafter heat exchanger axis of rotation **41**.

[0020] The rotor **32** is rigidly connected to the rotary heat exchanger **4**, for example, by means of a toothing system or a screw fitting between rotary heat exchanger **4** and rotor **32**.

[0021] A stator (not shown) of the drive motor **3** is rigidly connected to a side wall **21** of the housing **2**, for example, by means of a suitable screw connection.

[0022] On the opposite side of the sleeve **5** to the drive motor **3** a ball bearing **6** is arranged in said sleeve so as to pivot the rotary heat exchanger **4**, said ball bearing being fixed to the housing **2**.

[0023] In the operation of the rotary heat exchanger device the rotational speed of the drive motor **3** and thus that of the rotary heat exchanger **4** is given by means of suitable control electronics (not shown) and control software.

[0024] The difference between the first and the second exemplary embodiment is that in the first exemplary embodiment in accordance with FIG. **1** the rotor storage mass of the rotary heat exchanger **4** is disposed on a preferably cylindrical sleeve, into which the drive motor **3** is inserted and which is rigidly connected to the rotor **3 2** thereof as described above, and in the second exemplary embodiment in accordance with FIG. **2** the rotor storage mass of the rotary heat exchanger **4** is disposed directly on a carrier which is part of the rotor **3 2** of the drive motor **3**.

[0025] The third exemplary embodiment in accordance with Figure **3** differs from the above two exemplary embodiments by the fact that the drive motor **3** is disposed outside of the housing **2** and the rotor **32** thereof is connected to the rotary heat exchanger **4** through the side wall **21** of the housing **4** via suitable connection means.

[0026] The documents: Lautner "Functional Description"

[0027] (http://www.lautner.eu/rotorsysteme/waermer-ueckgewinnung-mit-rotorsystemen/funktionsprinzip.html); Lautner "Technical Description"

[0028] (http://www.lautner.eu/rotorSysteme/waermer-ueckgewinnung-mit-rotorsystemen/technische-beschreibung.html); Lautner "Rotor Construction"

[0029] (http://www.lautner.eu/rotorsysteme/geraetebeschreibungen/rotorbauart.html); and Lautner "Unit Specifications"

[0030] (http://www.lautner.eu/rotorsysteme/geraetebeschreibungen/rotortypen.htme are incorporated herein by reference in their entirety. These documents describe rotor storage masses or rotary heat exchangers in principle and their operating principle. In all exemplary embodiments, the drive motor can be embodied as an external rotor motor or internal rotor motor.

[0031] The invention is not limited to the exemplary embodiments described and illustrated, but comprises all embodiments that are designed and act within the meaning of the invention. In addition the invention is not yet limited to the feature combination defined in claim **1**, but can also be defined by any other desired combination of selected features of all individual features disclosed together.

1-5. (canceled)

6. A rotary heat exchanger device comprising:

a rotary heat exchanger having a rotary heat exchanger rotational axis;

a drive motor having a stator and a rotor with a rotor rotational axis; and

a housing, into which the rotary heat exchanger is installed and in which the rotary heat exchanger rotates, wherein the rotor rotational axis and the heat exchanger rotational axis extend coaxially, and wherein the rotor is rigidly connected to the rotary heat exchanger.

7. The rotary heat exchanger device according to claim **6**, wherein the drive motor is arranged at least partially inside the rotary heat exchanger.

8. The rotary heat exchanger device according to claim **7**, wherein the stator is rigidly connected to the housing and the rotor is rigidly connected to the rotary heat exchanger.

9. The rotary heat exchanger device according to claim **7**, wherein the drive motor is arranged at least partially in a support sleeve of the rotary heat exchanger.

10. The rotary heat exchanger device according to claim **9**, wherein the rotor is rigidly connected to the support sleeve.

11. The rotary heat exchanger device according to claim **7**, wherein a rotor storage mass of the rotary heat exchanger is arranged directly on a support sleeve of the rotor of the drive motor.

12. The rotary heat exchanger device according to claim **6**, wherein the drive motor is arranged outside of the housing.

13. The rotary heat exchanger device according to claim **12**, wherein the rotor is connected to the rotary heat exchanger through a side wall of the housing.

14. The rotary heat exchanger device according to claim **13**, wherein the rotor is connected to the rotary heat exchanger via connection means.

15. A method for using a rotary heat exchanger device, the method comprising:

locating, the rotary heat exchanger device according to claim **6**, in a decentralized room ventilation system with heat recovery.

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