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(54) **METHOD FOR OPERATING A REGENERATIVE HEAT EXCHANGER AND REGENERATIVE HEAT EXCHANGER HAVING IMPROVED EFFICIENCY**

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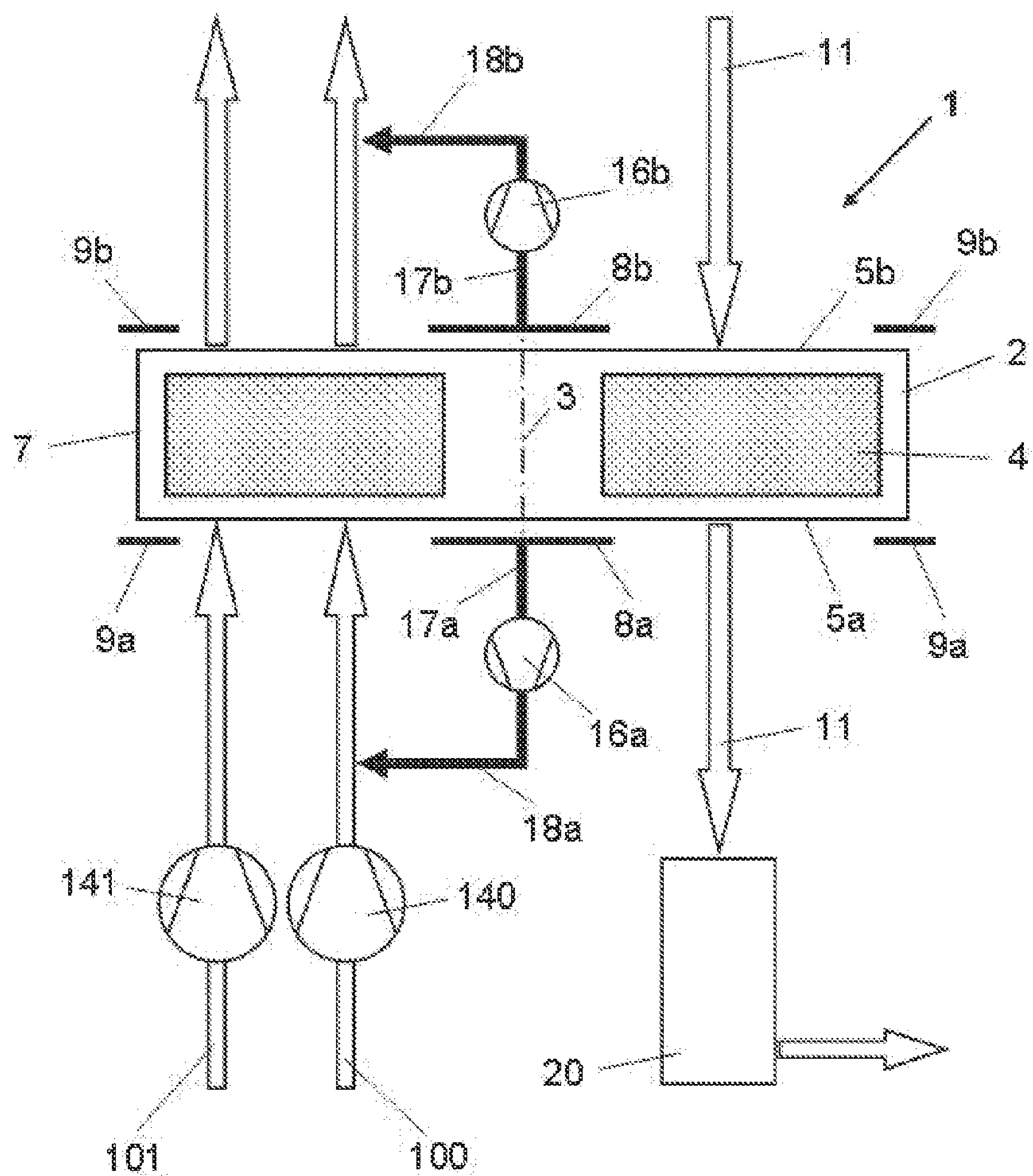
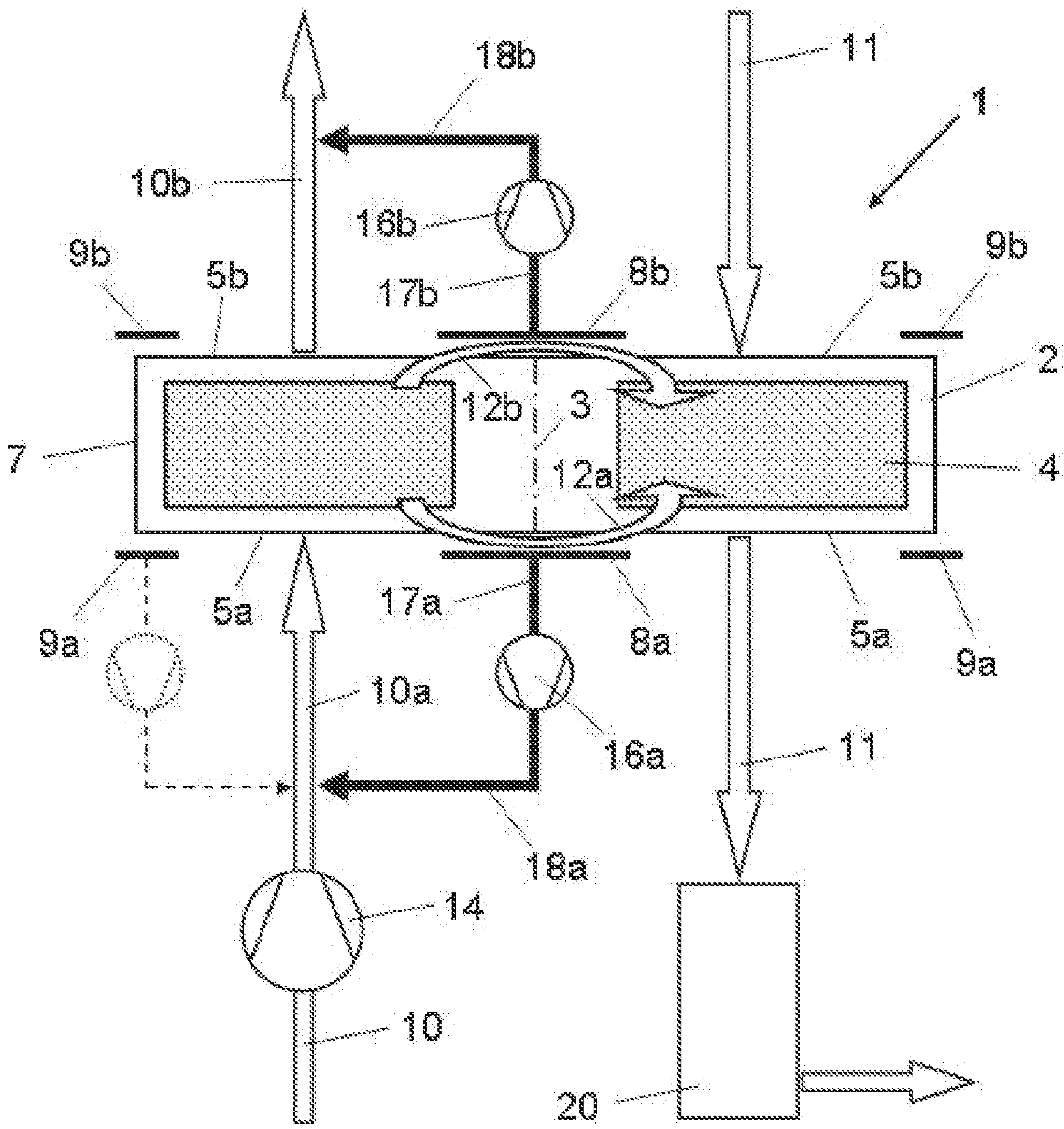
(57) **ABSTRACT**

A regenerative heat exchanger, including a rotor mounted so it is rotatable, which has at least one first gas volume flow to be heated and at least one second gas volume flow to be cooled flowing through it, as well as a method for operating the regenerative heat exchanger, is provided. The inflowing first gas volume flow enters the rotor at a first front side of the rotor and exits the rotor again at a second front side of the rotor at an outflowing first gas volume flow. To increase the heating performance, a leakage volume flow is captured at the first front side of the rotor and supplied to the inflowing first gas volume flow and/or a leakage volume flow is captured at the second front side of the rotor and supplied to the outflowing first gas volume flow.





18b
11
1
10b
16b
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17b
8b
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9b
2
12b
3
7
12a
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11
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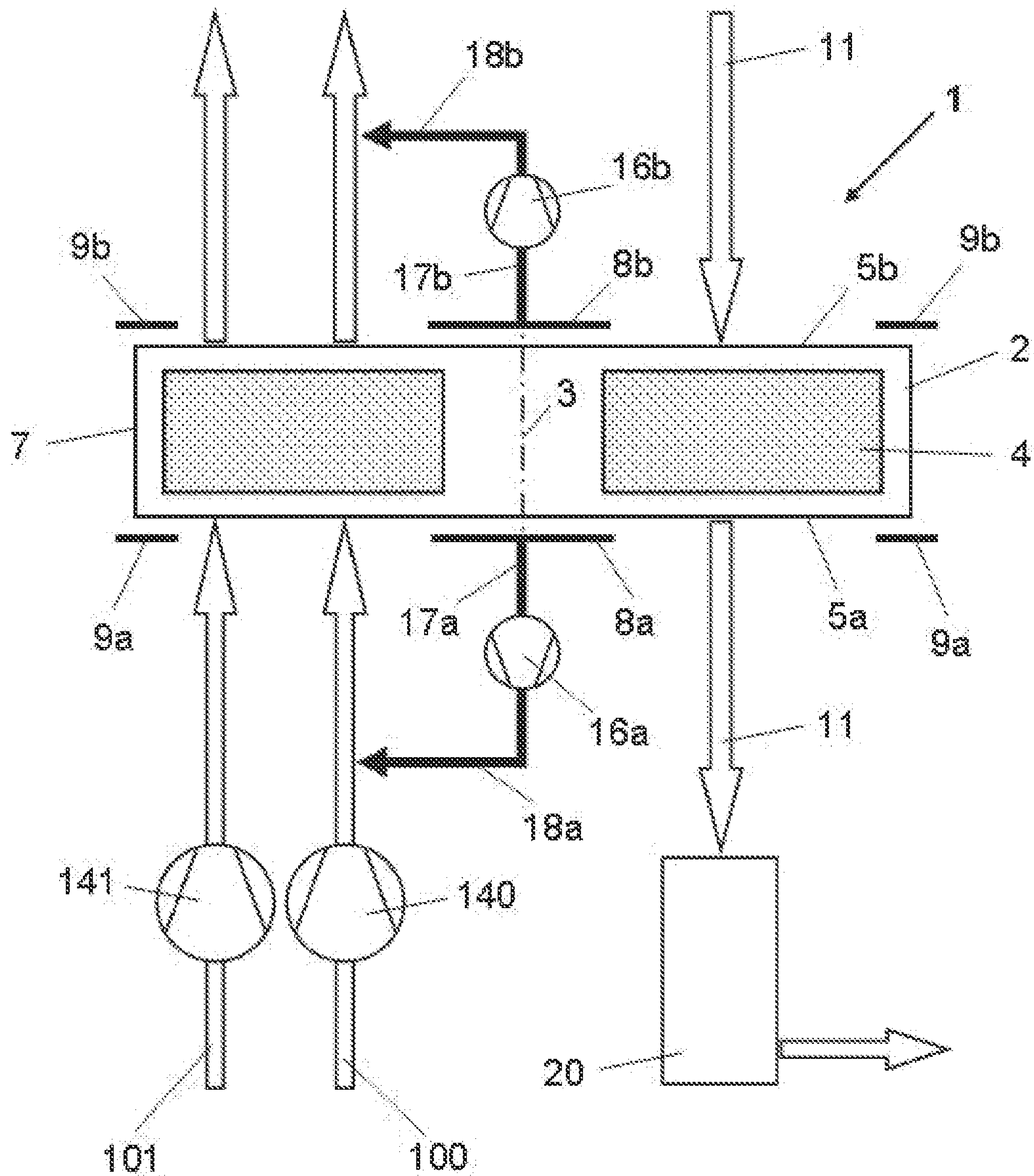
20

Fig. 1



18b
11
1
16b
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17b
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2
3
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9a
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9a
16a
11
18a
141
140
20
101
100

Fig. 2

METHOD FOR OPERATING A REGENERATIVE HEAT EXCHANGER AND REGENERATIVE HEAT EXCHANGER HAVING IMPROVED EFFICIENCY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to foreign Patent Application EP 08021916.5, filed on Dec. 17, 2008, the disclosure of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention relates to a method for operating a regenerative heat exchanger, in particular for air preheating in power plants. Furthermore, the invention relates to a regenerative heat exchanger.

BACKGROUND OF THE INVENTION

[0003] Regenerative heat exchangers of the relevant type (also only referred to as heat exchangers hereafter) are used for heat transfer from at least one gas volume flow to at least one other gas volume flow. For this purpose, the heat exchanger can comprise a rotating (and/or also revolving) storage mass (referred to hereafter as a rotor), which moves relative to fixed flow connections and is alternately heated by the at least one gas volume flow and cooled down again by the at least one other gas volume flow, whereby heat energy is transferable from at least one gas volume flow to at least one other gas volume flow.

[0004] The rotor of a regenerative heat exchanger is typically implemented as an essentially circular-cylindrical drum, slight deviations from this shape being possible. The rotor has a central rotational axis. The gas volume flows flow through the rotor essentially parallel to the rotational axis. The flow through is typically in opposite directions (so-called counter flow method). In order to provide sufficient heat storage mass, but also increase the mechanical stability of the rotor, it is sectored or segmented into multiple cells or chambers, which are also used as the flow channels for the gas volume flows. Heat-storage masses are typically situated in these chambers, such as so-called heat transfer plate packs.

[0005] In operation, a warm and/or hot gas volume flow flows through the individual chambers of the rotor, the gas being able to be flue gas from a combustion process, for example. Because the warm or hot gas volume flow flows through, the heat-storing masses of the chambers which it flows through heat up. Heat is withdrawn from the gas volume flow flowing through, so that it has a lower temperature upon exiting the rotor than upon entering. As a result of the rotor rotation, the heated chambers finally reach the section where a cooler or cold gas volume flow, such as fresh air, flows through the rotor and is heated on the heat-storing masses of these chambers, the heat-storing masses then cooling down again. With this type of heat transfer, a type of heat storage capability of the rotor is used in order to heat a first gas volume flow and cool a second gas volume flow.

[0006] Alternatively, a rotor can also be implemented as fixed, for example, and the flow connections may move relative thereto.

[0007] If the fresh air is used as the gas volume flow to be heated, the heat exchanger can be used for so-called air preheating. The efficiency of a power plant can be increased and the pollutant discharge can be reduced by air preheating.

[0008] To reduce mass losses and/or volume losses in regard to the gas volume flows, a complex seal is required on the rotor, which has been the subject of numerous refinements for some time. The sealing system for a rotor typically comprises at least one peripheral seal and at least one radial seal. A peripheral seal seals the gas volume flows flowing through the rotor at the external circumference of the rotor to the outside. A peripheral seal can comprise an axial seal and/or lateral seal on the outer circumference of the rotor. A radial seal is to prevent a so-called flow short-circuit and/or short-circuit volume flow between the individual gas volume flows at a rotor front side. As a result of the relative movement of the rotor to the seals and because of changing heat expansion, gaps and/or residual gaps between the seals and the rotor are unavoidable, through which leakage volume flows occur, in particular between the gas volume flows (so-called flow short-circuits), typically from the gas volume flow having the higher pressure to the gas volume flow having the lower pressure. In addition to volume losses, this also results in energy losses and thus in unsatisfactory efficiency.

[0009] Suction methods and suction facilities are known from the prior art for improving the efficiency of regenerative heat exchangers, however, these methods and facilities typically do not result in improvements of the efficiency for the transfer of the heat energy in practice. Worsening of the efficiency has sometimes even been observed.

SUMMARY OF THE INVENTION

[0010] Embodiments of the present invention advantageously improve the efficiency of a regenerative heat exchanger.

[0011] In a method for operating a regenerative heat exchanger, according to an embodiment of the invention, the rotor, which is preferably mounted so it is rotatable, has at least one first gas volume flow to be heated flowing through it, such as fresh air in particular, the gas volume flow heating on the heat-storing masses as it flows through the rotor. This is used in particular for air preheating of fresh air for a power plant. Furthermore, the rotor has at least one second gas volume flow to be cooled flowing through it, such as flue gas and/or combustion gas or exhaust gas in particular, which dissipates its heat to the heat-storing masses of the rotor and is itself cooled in this way.

[0012] The rotor has a first front side or front face, at which the inflowing first gas volume flow to be heated enters the rotor. The rotor has a second front side or front face opposite to the first front side, at which the outflowing first gas volume flow to be heated exits the rotor again. The first front side is typically also referred to as the "cold side" and the second front side as the "hot side".

[0013] The first gas volume flow and the second gas volume flow are sealed on the rotor using at least one rotor seal, in order to limit volume losses and particularly flow short-circuits. A rotor seal is particularly a peripheral seal, which seals a gas volume flow on the outer circumference of the rotor, and/or a radial seal, which seals the gas volume flows relative to one another and is to prevent flow short-circuits and/or short-circuit volume flows.

[0014] Because leakage volume flows occur in the area of a rotor seal, it is provided according to the invention that at least one leakage volume flow is acquired and/or captured on the first front side, or in the area of this front side, of the rotor and supplied to the inflowing first gas volume flow, and/or at least one leakage volume flow is acquired and/or captured on the second front side, or in the area of this front side, of the rotor and supplied to the outflowing first gas volume flow.

[0015] A leakage volume flow is particularly a short-circuit volume flow from the first gas volume flow into the second gas volume flow, which occurs in the area of a radial seal at the first front side of the rotor or at the second front side of the rotor. Thus, strictly speaking, this is a recirculation of a captured leakage volume flow into the first gas volume flow to be heated.

[0016] The acquisition or capture of a leakage volume flow, which occurs in the area of a rotor seal, typically cannot be performed completely for technical reasons, so that acquisition or capture of a leakage volume flow in the scope of this invention relates to a substantial part of the leakage volume flow, which can be acquired and/or captured under the particular technical conditions. Acquisition and capture are to be understood broadly in the scope of this invention and include all measures which are capable of handling a leakage volume flow.

[0017] The method differs from the prior art at least in that a leakage volume flow is only captured in the area of one of the front sides or both front sides of the rotor. It can thus be differentiated which temperature level a leakage volume flow has in each case. Furthermore, the method, according to an embodiment of the invention, also differs from the prior art in that, as a function of the temperature level of the leakage volume flow, a corresponding supply or recirculation is performed into the inflowing first gas volume flow, which is still cool, or the outflowing first gas volume flow, which has already been heated (always on the same side of the rotor in regard to flow technology). Energetic advantages are thus achieved, which increase the efficiency relative to the prior art, as explained in greater detail hereafter.

[0018] For a regenerative heat exchanger which is used in a power plant for heat transfer from a hot flue gas volume flow (from a combustion process) to a fresh air volume flow, for example, there is typically a leakage volume flow (short-circuit volume flow) from the fresh air volume flow into the flue gas volume flow in the area of a radial seal. When determining the operating parameters and designing the regenerative heat exchanger, such leakage volume flows are taken into consideration, because the leakage volume flow from the fresh air volume flow into the flue gas volume flow results in additional cooling of the flue gas volume flow by approximately 3° to 7° K. (so-called "corrected" flue gas or exhaust gas temperature). There is thus a danger that the temperature will fall below the acid dewpoint temperature of a component of the flue gas to be cooled and damage (in particular corrosion) of following facility components (such as dust removal facilities and filter facilities) in the flue gas train will occur. It must therefore be ensured that the temperature of the flue gas volume flow at the exit of the rotor and/or upon exiting the regenerative heat exchanger, in spite of the additional cooling by the leakage volume flow from the fresh air volume flow, is higher than a critical acid dewpoint temperature. The additional cooling of the flue gas volume flow by the leakage volume flow from the fresh air volume flow must therefore be taken into consideration in the design of the regenerative heat exchanger and its operating parameters. On the other hand, this additional cooling of the flue gas volume flow is not energetically available for the heat transfer from the flue gas volume flow to the fresh air volume flow. Accordingly, a lower "uncorrected" flue gas temperature is desirable.

[0019] Through the separate acquisition of a warm or hot leakage volume flow and the supply or recirculation thereof into the outflowing and already heated fresh air volume flow, and/or a cool or cold leakage volume flow and the supply or recirculation thereof into the inflowing and (still) cool fresh air volume flow, the negative additional cooling effect can be largely avoided. In other words: the now essentially "uncorrected" flue gas temperature can be lowered to a similar level as the earlier "corrected" exhaust gas temperature. With unchanged entry temperature of the gas volume flows into the rotor and with unchanged gas volume flows, as a result, the heat transfer from the flue gas volume flow to the fresh air volume flow can be increased, without the temperature falling below a critical acid dewpoint temperature in the flue gas volume flow. The increase of the heat transfer is possible through constructive design of the heat-storing masses, for example.

[0020] As a result of the defined recirculation, undesired cooling of the flue gas volume flow before the rotor and also undesired cooling of the flue gas volume flow after the rotor are also largely avoided, which additionally increases the efficiency of the regenerative heat exchanger.

[0021] As a result, the outflow-side temperature (i.e., the temperature after the rotor and/or after the regenerative heat exchanger) of the fresh air volume flow and thus the quantity of heat in the combustion air for the power plant combustion process are increased. This additional quantity of heat reduces the fuel demand. In relation to a boiler performance of 700 to 800 MW, savings in operating costs in the amount of €150,000 to €400,000 per year may be reckoned without reduction of the power, the savings increasing still further in the coming years because of rising fuel prices. A reduction of the discharge of pollutant gases, such as CO_2 in particular, results as a further substantial advantage.

[0022] According to an embodiment of the invention, it is preferably provided that at least one leakage volume flow is captured on the first front side of the rotor and supplied to the inflowing first gas volume flow and, to be precise, introduced or fed therein there, and at least one leakage volume flow is captured on the second front side of the rotor and supplied to the outflowing first gas volume flow, and, to be precise, introduced or fed therein there. Through this acquisition on both sides (in relation to the front sides of the rotor) and separate supply or recirculation of leakage volume flows, the efficiency of the regenerative heat exchanger improves significantly. Notwithstanding this, of course, acquisition and supply or recirculation at only one front side of the rotor is also possible and advantageous.

[0023] According to an advantageous refinement of the method, it is provided that the supply or recirculation of the leakage volume flow captured from the first front side of the rotor into the first gas volume flow is not performed directly, but rather upstream from the rotor. "Upstream" means that the supply occurs before the rotor in the flow direction. Alternatively or additionally, it is provided that the recirculation of the leakage volume flow captured from the second front side of the rotor into the first gas volume flow is not performed directly, but rather downstream from the rotor. "Downstream" means that the supply occurs after the rotor in the flow direction. The acquisition or capture of a leakage volume flow and its supply or recirculation into the first gas volume flow are thus separated in design and construction.

[0024] It is provided in particular for this purpose that the supply or recirculation of a captured leakage volume flow in the first gas volume flow occurs in spatial proximity, preferably in direct proximity to the rotor. The flow distances may thus be kept short in construction. A supplied or recirculated leakage volume flow is only subject to a slight temperature influence.

[0025] It is advantageously provided that at least one leakage volume flow acquired or captured at the first front side of the rotor and at least one leakage volume flow acquired or captured at the second front side of the rotor are recirculated on separate paths in each case upstream into the inflowing first gas volume flow and downstream into the outflowing first gas going flow. A path or recirculation path is any unit which is capable of transporting or conducting a gas volume flow. A path or recirculation path is particularly a line system made of pipes and pipe sections or the like.

[0026] It is preferably provided for this purpose that at least one fan unit is used per path. A partial vacuum can be generated using the fan unit, using which a leakage volume flow can be acquired or captured at a front side of the rotor by suctioning. An overpressure can also be generated using the fan unit, using which the suction leakage volume flow can be supplied or recirculated along the path or recirculation path to the first gas volume flow and introduced or fed therein. A fan unit is particularly a ventilator, which is preferably situated in a line system.

[0027] Furthermore, it is preferable that at least one leakage volume flow is acquired or captured, preferably using suctioning, at the first front side and/or the second front side of the rotor in the area of a radial seal. This measure thus relates to a particularly disadvantageous short-circuit volume flow, in particular from the first gas volume flow into the second gas volume flow.

[0028] It is also additionally or alternatively preferable that at least one leakage volume flow is acquired or captured, preferably by suctioning, at the first front side and/or the second front side of the rotor in the area of a peripheral seal. This also results in improvement of the efficiency.

[0029] According to a particularly preferred refinement of the inventive method, it is provided that at least one first gas volume flow to be heated and at least one second gas volume flow to be cooled flow through the rotor in opposite directions, i.e., in the counter flow method. Both gas volume flows have a lower temperature level at the first front side ("cold side") than at the second front side ("hot side"). It is thus easy to differentiate which temperature level an acquired or captured leakage volume flow has. A leakage volume flow acquired at the hot front side of the rotor is supplied to the outflowing first gas volume flow or recirculated therein and a leakage volume flow acquired at the cold front side of the rotor is supplied to the inflowing first gas volume flow or recirculated therein. Alternatively, the rotor can also have at least two gas volume flows flowing through it in the same direction.

[0030] In a preferred refinement of the method, at least two first gas volume flows are provided, at least one captured leakage volume flow, preferably all captured leakage volume flows, being supplied into only one of these two first gas volume flows. This will be discussed in greater detail in connection with the figures. Alternatively, a separate recirculation into two or more first gas volume flows is also possible.

[0031] The regenerative heat exchanger, according to an embodiment of the invention, comprises a rotor having at least two gas volume flows flowing through it, the rotor having a first front side, at which an inflowing first gas volume flow to be heated enters the rotor, and the rotor also having a second front side, opposite to the first front side, at which the outflowing first gas volume flow to be heated exits from the rotor again. Furthermore, the rotor comprises at least one rotor seal, such as a radial seal and/or a peripheral seal in particular, for sealing the first and the second gas volume flows. The regenerative heat exchanger, according to an embodiment of the invention, additionally comprises an acquisition unit or capture unit for a leakage volume flow which occurs in the area of a rotor seal, and at least one supply or supply unit or recirculation unit, which is associated with this acquisition unit or capture unit, for the acquired or captured leakage volume flow into the first gas volume flow.

[0032] According to an embodiment of the invention, at least one capture unit is provided on the first front side of the rotor having at least one associated supply or supply unit for the leakage volume flow captured at the first front side into the inflowing first gas volume flow, and/or at least one capture unit is provided on the second front side having at least one associated supply or supply unit for the leakage volume flow captured at the second front side into the outflowing first gas volume flow.

[0033] The regenerative heat exchanger, according to an embodiment of the invention, is preferably capable of using the method according to the invention described above. The method features described above and the advantages thereof are therefore transferable correspondingly to the regenerative heat exchanger according to an embodiment of the invention.

[0034] A capture unit is any unit which is capable of acquiring or capturing a leakage volume flow. A capture unit can be a system made of individual components. A capture device is preferably a suction unit.

[0035] A supply or supply unit is used for supplying or recirculating a leakage volume flow acquired or captured using a capture unit into the first gas volume flow. A supply or a supply unit is preferably implemented by a line system, through which the leakage volume flow acquired or captured on a rotor seal is supplied in a defined manner to the first gas volume flow. If the leakage volume flow originates from the first gas volume flow, the supply or supply unit is, strictly speaking, a recirculation or recirculation unit.

[0036] The line system of at least one supply or supply unit preferably comprises at least one fan unit, using which a defined flow can be generated in this line system.

[0037] The fan unit is designed so that a partial vacuum can be generated in a connection line, which is situated between this fan unit and a rotor seal, using which the leakage volume flow can be suctioned at the relevant rotor seal. In particular, the rotor seal is at least one radial seal and/or at least one peripheral seal which has a flow connection to the fan unit via the connection line. At least one radial seal and/or at least one peripheral seal is preferably implemented as divided and/or has multiple openings, so that a leakage volume flow occurring at this rotor seal can be suctioned in a simplified manner.

[0038] The same fan unit also generates an overpressure in a connection line which is situated between this fan unit and the first gas volume flow, using which the leakage volume flow suctioned at the rotor seal can be supplied to the first gas volume flow and/or recirculated therein, strictly speaking, can be introduced or fed therein.

[0039] It is particularly preferably provided that at least one suction or suction unit for a leakage volume flow is provided on the first front side of the rotor, in particular in the area of a radial seal and/or a peripheral seal, having an associated supply or supply unit for the suctioned leakage volume flow into the inflowing first gas volume flow. It is also provided that at least one suction unit for a leakage volume flow is provided on the second front side of the rotor, in particular in the area of a radial seal and/or a peripheral seal, having an associated supply or supply unit for the suctioned leakage volume flow into the outflowing first gas volume flow. The supplies or supply units are implemented separately from one another and each comprise at least one fan unit. This corresponds to a preferred and particularly advantageous exemplary embodiment of the invention.

[0040] The invention may also be implemented similarly on a heat exchanger having stationary heat-storing masses.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] FIG. **1** shows a preferred exemplary embodiment of the invention in a schematic illustration.

[0042] FIG. **2** shows an alternative exemplary embodiment of the invention in a schematic illustration.

DETAILED DESCRIPTION

[0043] The invention will now be described with reference to the drawing figures, in which like reference numerals refer to like parts throughout.

[0044] FIG. **1** shows a regenerative heat exchanger, identified as a whole by **1**, which is used in a power plant. It comprises a circular-cylindrical rotor **2**, which is horizontally oriented and is mounted so it is rotatable around the vertical axis **3**. Heat stores **4** (such as heat transfer plate packs as described at the beginning) are located in the interior of the rotor **2**. The rotor has a first, lower front side **5***a*, a second, upper front side **5***b*, and a lateral wall (peripheral wall)$_7$. Radial seals **8***a* and **8***b* (not specified in greater detail) and peripheral seals **9***a* and **9***b* (not specified in greater detail) are located on the front sides **5***a* and **5***b*.

[0045] According to the illustration, the rotor **2** has a first gas volume flow **10**, this being a fresh air volume flow, flowing through it from bottom to top on the left side. The fresh air volume flow **10** is suctioned by a fan unit **14** and supplied to the rotor **2**. The fresh air volume flow **10** enters the rotor on the lower front side **5***a* of the rotor **2** and exits again on the upper front side **5***b* and is heated on the heat stores **4** as it flows through the rotor **2**, which cool to the same extent in this case (as described at the beginning). In relation to the rotor **2**, the inflowing fresh air volume flow is identified by **10***a* and the outflowing fresh air volume flow by **10***b*.

[0046] On the right side, the rotor **2** has a second gas volume flow **11**, this being a flue gas volume flow from a combustion process flowing through it from top to bottom. The flue gas volume flow **11** enters the rotor **2** at the upper front side **5***b* and exits the rotor **2** again at the lower front side **5***a* and is cooled on the cool heat stores **4** as it flows through the rotor **2**, which heat up to the same extent in this case and are subsequently available for heating the fresh air volume flow **10** (as described at the beginning) After leaving the rotor **2**, the already cooled flue gas volume flow is supplied to flue gas purification facilities and/or filter units **20**.

[0047] As a result of the flow through in opposite directions, the temperatures of both gas volume flows **10** and **11** are higher at the upper, second front side **5***b* of the rotor **2** than at the lower, first front side **5***a*. Therefore, the upper front side **5***b* can also be referred to as the "hot side" and the lower front side **5***a* as the "cold side".

[0048] In order to seal the two gas volume flows **10** and **11** on the rotor **2**, the radial seals **8***a* and **8***b* and the peripheral seals **9***a* and **9***b* are provided. The peripheral seals **9***a* and **9***b* are to seal the gas volume flows **10** and **11** at the outer edge or outer circumference of the rotor **2**, while the radial seals **8***a* and **8***b* are to prevent mixing of the gas volume flows **10** and **11** by flow short-circuits and/or short-circuit volume flows. As a result of alternating thermal and mechanical strain, there are always gaps or residual gaps between the seals **8***a*, **8***b*, **9***a*, and **9***b* and the rotor **2**, through which leakage volume flows occur. In particular in the area of the radial seals **8***a* and **8***b*, leakage volume flows are additionally favored by pressure differences in the gas volume flows **10** and **11**, the fresh air volume flow **10** usually having a higher pressure than the flue gas volume flow **11** because of the fan unit **14**. This results in fresh air leakage volume flows **12***a* and **12***b*, so that fresh air is transferred or flows into the flue gas volume flow **11** at a lower temperature level, which results in an undesirable and disadvantageous cooling effect in the flue gas volume flow **11** (as described in greater detail above).

[0049] It is therefore provided that the leakage volume flows **12***a* and **12***b* are captured in the area of the radial seals **8***a* and **8***b* and the leakage volume flows from the "hot" front side **5***b* of the rotor **2** are to be supplied to the outflowing fresh air volume flow **10***b* or introduced therein and the leakage volume flows from the "cold" front side **5***a* of the rotor **2** are to be supplied to the inflowing gas volume flow **10***a* or introduced therein. Through this separate recirculation of the leakage volume flows from the "hot" front side into the already heated outflowing fresh air volume flow **10***b* and from the "cold" side into the still cool inflowing fresh air volume flow **10***a*, the undesired and disadvantageous cooling effect described above can be avoided in the flue gas volume flow **11**, whereby the efficiency of the heat exchanger and thus also of the power plant can be increased as a result (as explained in greater detail above). The condensation of critical flue gas components in cold temperature strands can also be prevented or at least reduced in the flue gas to be cooled.

[0050] The capturing of the leakage volume flows and/or fresh air leakage volume flows **12***a* and **12***b* is performed by suctioning at the radial seals **8***a* and **8***b*. In order to simplify the suctioning, the radial seals **8***a* and **8***b* may be implemented as divided and/or having a plurality of openings (not shown), through which a partial vacuum may be effectively applied in the gap or residual gap between the radial seal **8***a* and **8***b* and the rotor **2** and the leakage volume flows may thus be captured. The partial vacuum is generated in each case by a fan unit **16***a* and **16***b*, which can be a ventilator or the like, for example. A connection line **17***a* or **17***b*, via which the captured or suctioned leakage volume flows **12***a* and **12***b* are conducted away, is situated in each case between the fan unit **16***a* and **16***b* and the radial seals **8***a* and **8***b*. A connection line **18***a* or **18***b*, respectively, extends from the fan unit **16***a* and **16***b* into the inflowing fresh air volume flow **10***a* or **10***b*. These connection lines **18***a* and **18***b* are used for supplying or recirculating the captured leakage volume flows **12***a* and **12***b*, which were conducted away, into the fresh air volume flow **10**. The fan units **16***a* and **16***b* are designed so that they generate a partial vacuum in the connection lines **17***a* and **17***b* and an overpressure in the connection lines **18***a* and **18***b*.

[0051] The connection lines **17***a* and **18***a* form, together with the fan unit **16***a* here, a line system for the supply or recirculation of a leakage volume flow **12***a* captured or suctioned at the first front side ("cold side") **5***a* of the rotor **2** into the inflowing fresh air volume flow **10***a*. Independently thereof, the connection lines **17***b* and **18***b* form, together with the fan unit **16***b* here, a second separate line system for the supply or recirculation of a leakage volume flow **12***b* captured or suctioned at the second front side ("hot side") **5***b* of the rotor **2** into the outflowing fresh air volume flow **10***b*. The line cross sections and the fan performance are dimensioned correspondingly. It is also possible to segment the connection lines or to situate multiple connection lines in parallel. It is also possible to provide multiple fan units in parallel or in series.

[0052] Alternatively to the exemplary embodiment described above, it is also possible to provide suctioning and supply or recirculation at only one of the front sides **5***a* and **5***b* of the rotor **2** (not shown), whereby a significant improvement of the efficiency already results with less construction effort. Alternatively or additionally, the leakage volume flows may also be captured at the peripheral seals **9***a* and **9***b* and supplied to the inflowing fresh air volume flow **10***a* or the outflowing fresh air volume flow **10***b* and fed or introduced therein. This is shown for exemplary purposes on the left side of the rotor **2** in FIG. **1** using a dashed line for the peripheral seal **9***a*. A further fan unit can be used for the suctioning and supply or recirculation (in this case into the inflowing fresh air volume flow **10***a*) or the fan unit **16***a* can also be used for suctioning the leakage volume flow **12***a* at the lower front side **5***a*. In order to also simplify the suctioning at the peripheral seals **9***a* and **9***b*, the radial seals **8***a* and **8***b* may be implemented as divided and/or having a plurality of openings. The efficiency of the regenerative heat exchanger **1** can be improved further by the suctioning of a leakage volume flow at least one of the peripheral seals **9***a* and **9***b*. According to the invention, the supply or recirculation of a leakage volume flow acquired at a peripheral seal **9***a* at the lower front side ("cold side") **5***a* is performed into the inflowing, still cool fresh air volume flow **10***a* and the supply or recirculation of a leakage volume flow acquired at a peripheral seal **9***b* at the upper front side ("hot side") **5***b* is performed into the outflowing, heated fresh air volume flow **10***b*.

[0053] FIG. **2** shows an alternative exemplary embodiment of the invention. Only the differences from the exemplary embodiment of FIG. **1** (see above statements) are discussed hereafter. Therefore, the above statements on the exemplary embodiment of FIG. **1** apply accordingly.

[0054] The essential difference from the exemplary embodiment of FIG. **1** is that the rotor **2** has two separate gas volume flows **100** and **101** flowing through it in the same direction on its left side, which are each heated as they flow through the rotor. The gas volume flow **100** can be a secondary air volume flow, for example, and the gas volume **101** can be a primary air volume flow, for example. These gas volume flows **100** and **101** are used for different intended purposes in a power plant. Notwithstanding the illustration, in which the two gas volume flows **100** and **101** flow through the rotor **2** adjacent to one another, they may also flow through the rotor at different points in relation to the rotor cross-section. The separate supply or recirculation of the leakage volume flows captured or suctioned at the radial seals **8***a* and **8***b* is performed here, on both sides of the rotor **2** according to the above statements, into the same gas volume flow **100** in each case (secondary air volume flow). Alternatively, it is also possible to supply the captured leakage volume flows to the other gas volume flow **101** (primary air volume flow).

[0055] It is also conceivable in the exemplary embodiment of FIG. **2** to provide the suctioning of a leakage volume flow at only one front side **5***a* or **5***b* of the rotor **2**. The suctioning of a leakage volume flow can also be performed at a peripheral seal **9***a* and/or **9***b*, as described above.

[0056] The many features and advantages of the invention are apparent from the detailed specification, and, thus, it is intended by the appended claims to cover all such features and advantages of the invention which fall within the true spirit and scope of the invention. Further, since numerous modifications and variations will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation illustrated and described, and, accordingly, all suitable modifications and equivalents may be resorted to that fall within the scope of the invention.

What is claimed is:

1. A method for operating a regenerative heat exchanger, including a rotor having a first front side with a rotor seal and a second front side with a rotor seal, through which a first gas volume flow is heated and a second gas volume flow is cooled, the first gas volume flow flowing into the rotor at the first front side and flowing out of the rotor at the second front side, the method comprising:

capturing a leakage volume flow at the first front side of the rotor in the area of the rotor seal;

supplying the leakage volume flow, captured at the first front side of the rotor, to the inflowing first gas volume flow;

capturing a leakage volume flow at the second front side of the rotor in the area of the rotor seal; and

supplying the leakage volume flow, captured at the second front side of the rotor, to the outflowing first gas volume flow.

2. The method according to claim **1**, wherein the leakage volume flow captured at the first front side of the rotor is introduced into the inflowing first gas volume flow upstream from the rotor, and the leakage volume flow captured at the second front side of the rotor is introduced into the outflowing first gas volume flow downstream from the rotor.

3. The method according to claim **2**, wherein the leakage volume flows are introduced into the first gas volume flow proximate to the rotor.

4. The method according to claim **1**, wherein the leakage volume flows, captured at the first front side of the rotor and at the second front side of the rotor, are separately supplied to the inflowing first gas volume flow and the outflowing first gas volume flow, respectively.

5. The method according to claim **4**, wherein the regenerative heat exchanger includes respective fan units to capture the leakage volume flows from the rotor and supply the leakage volume flows to the first gas volume flow.

6. The method according to claim **1**, wherein the rotor seals are radial seals, said capturing a leakage volume flow at the first front side of the rotor in the area of the rotor seal is performed by suctioning, and said capturing a leakage volume flow at the second front side of the rotor in the area of the rotor seal is performed by suctioning.

7. The method according to claim **1**, wherein the rotor seals are peripheral seals, said capturing a leakage volume flow at the first front side of the rotor in the area of the rotor seal is performed by suctioning, and said capturing a leakage volume flow at the second front side of the rotor in the area of the rotor seal is performed by suctioning.

8. The method according to claim **1**, wherein the first gas volume flow and the second gas volume flow pass through the rotor in opposite directions.

9. The method according to claim **1**, wherein an additional gas volume flow flows through the rotor and is not supplied with leakage volume flows.

10. A regenerative heat exchanger, comprising:

a rotor, having a first front side with a rotor seal and a second front side with a rotor seal, through which a first gas volume flow is heated and a second gas volume flow is cooled, the first gas volume flow flowing into the rotor at the first front side and flowing out of the rotor at the second front side;

a first unit for capturing a leakage volume flow at the first front side of the rotor in the area of the rotor seal and supplying the leakage volume flow to the inflowing first gas volume flow; and

a second unit for capturing a leakage volume flow at the second front side of the rotor in the area of the rotor seal for supplying the leakage volume flow to the outflowing first gas volume flow.

11. The regenerative heat exchanger according to claim **10**, wherein the first unit is connected to the rotor and the inflowing first gas volume flow through a first line system, and the second unit is connected to the rotor and the outflowing first gas volume flow through a second line system.

12. The regenerative heat exchanger according to claim **11**, wherein the first and second units are fans.

13. The regenerative heat exchanger according to claim **10**, wherein the rotor seals are radial seals or peripheral seals.

14. The regenerative heat exchanger according to claim **10**, wherein the rotor seals are divided or provided with multiple openings.

15. The regenerative heat exchanger according to claim **10**, wherein the first and second units are suction units.

16. A regenerative heat exchanger, comprising:

a rotor, including a lower side with a rotor seal, an upper side with a rotor seal and a heat storing mass disposed therebetween, through which a gas volume flow is heated;

a fan unit for capturing a leakage volume flow at the lower side of the rotor in the area of the rotor seal and supplying the leakage volume flow to the gas volume flow before the gas volume flow enters the rotor.

17. The regenerative heat exchanger according to claim **16**, further comprising an additional fan unit for capturing a leakage volume flow at the upper side of the rotor in the area of the rotor seal and supplying the leakage volume flow to the gas volume flow after the gas volume flow exits the rotor.

18. The regenerative heat exchanger according to claim **16**, wherein the rotor seal is a radial seal.

19. The regenerative heat exchanger according to claim **16**, wherein the rotor seal is a peripheral seal.

20. The regenerative heat exchanger according to claim **16**, wherein each rotor seal includes a plurality of openings.

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