

May 8, 1956

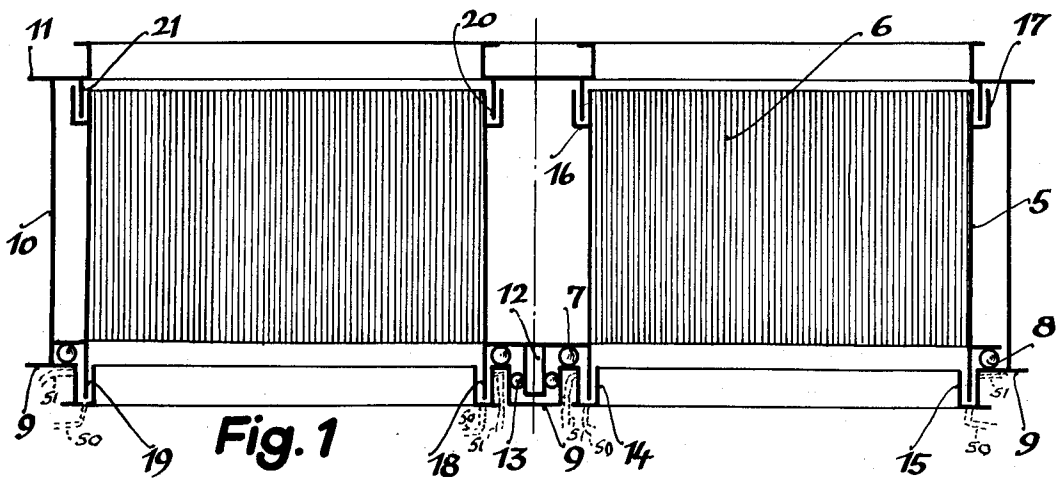
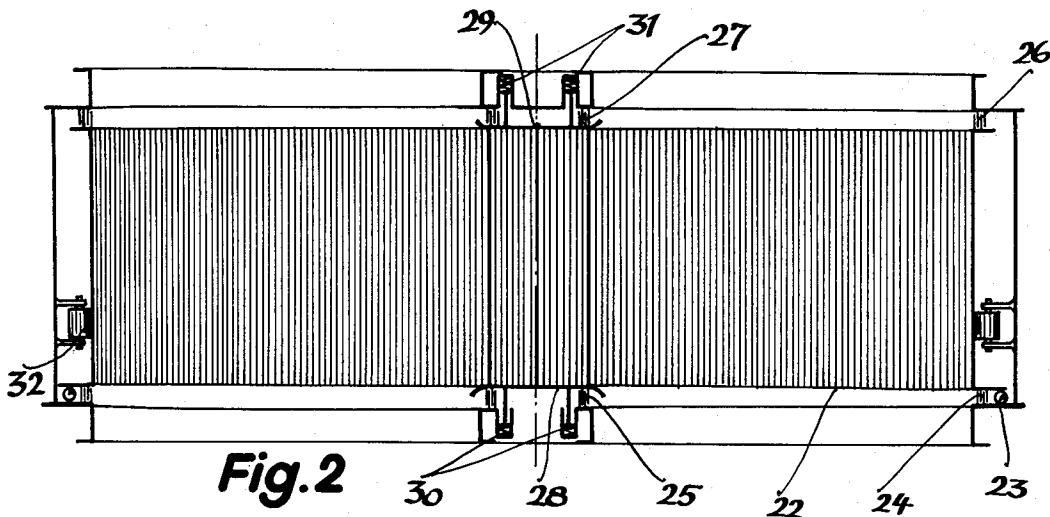
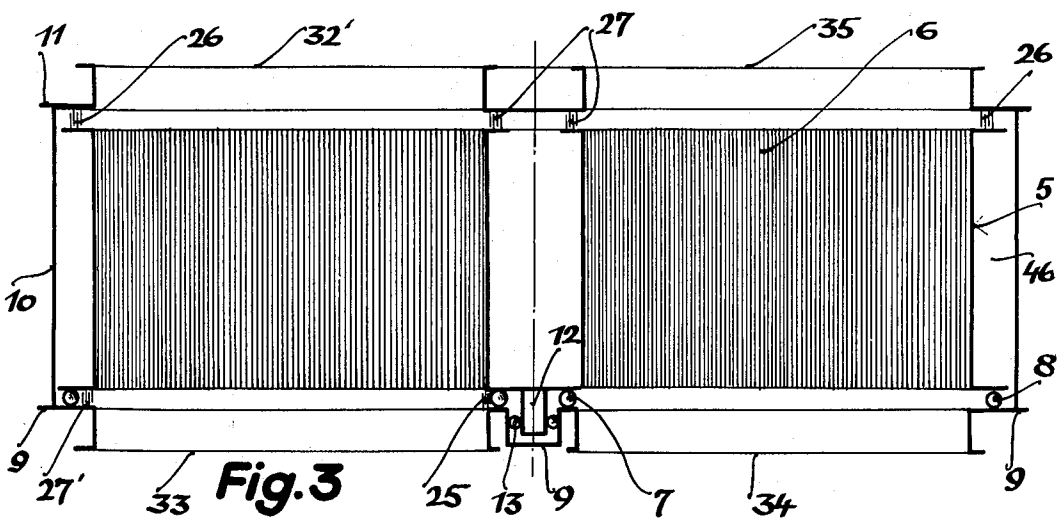
H. BRANDT

2,744,731

REGENERATIVE HEAT EXCHANGER

Filed May 11, 1951

2 Sheets-Sheet 1



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REGENERATIVE HEAT EXCHANGER

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2 Sheets-Sheet 2

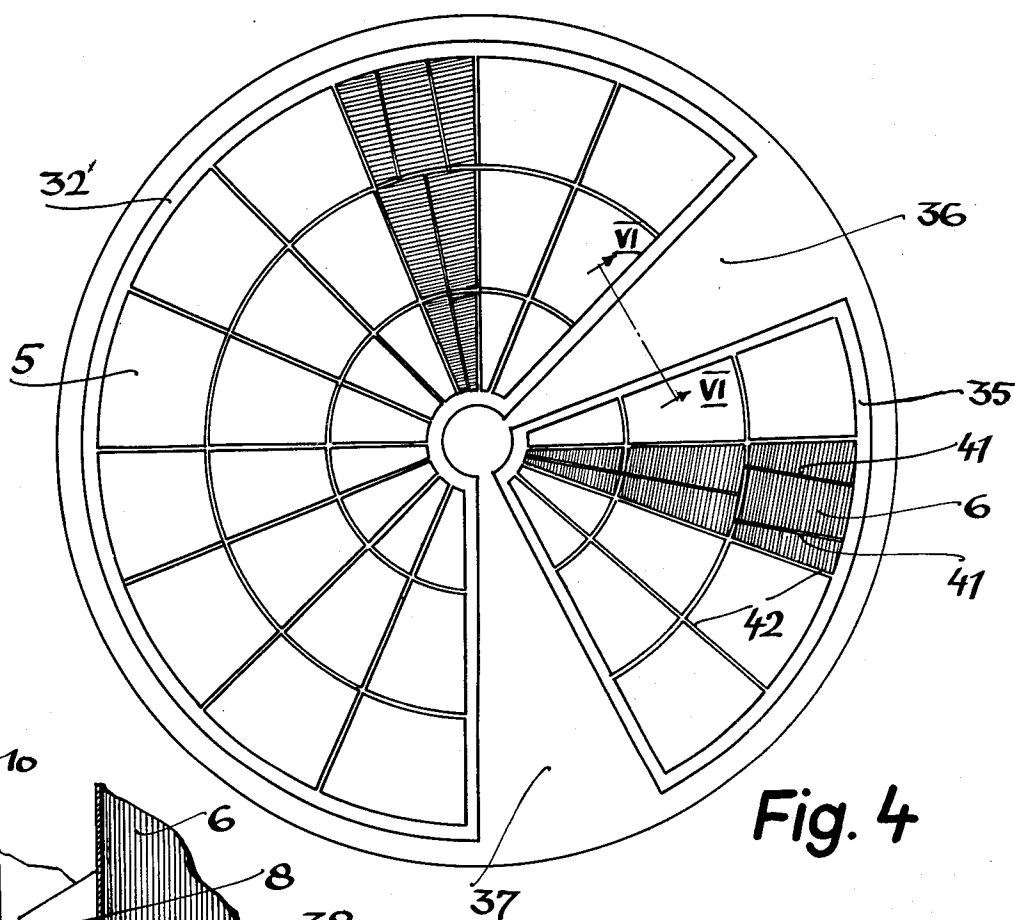


Fig. 4

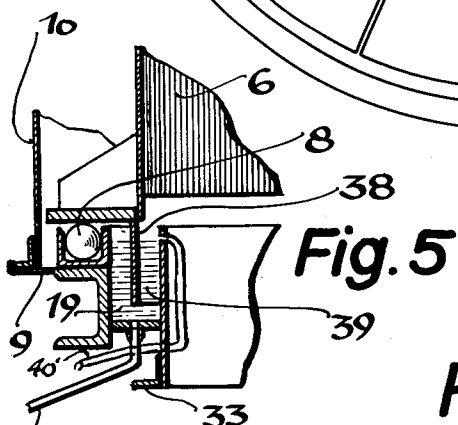


Fig. 5

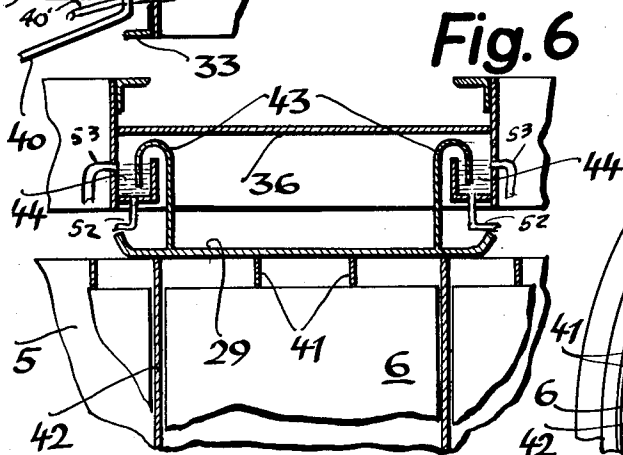


Fig. 6

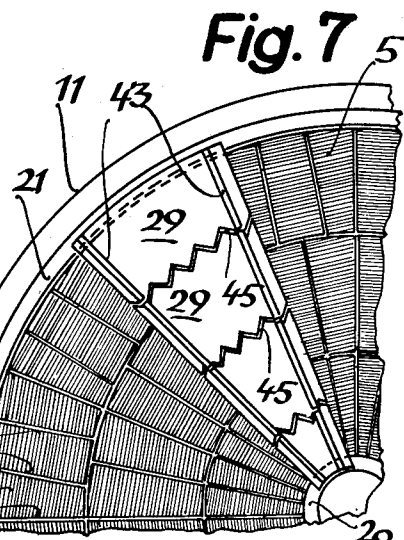


Fig. 7

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2,744,731

REGENERATIVE HEAT EXCHANGER

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Claims priority, application Germany May 12, 1950

20 Claims. (Cl. 257—6)

The present invention relates to the art of heat exchangers.

More particularly, this invention relates to improvements in regenerative heat exchangers of the type comprising a stationary casing and a rotor therein which to store the heat is provided with radially extending packets of corrugated sheet metal, one half of the circular cross section always being traversed by the heat-yielding medium and the other half by the heat-receiving medium while the rotor slowly rotates. Since such exchangers are constructed of metal and have substantial size, the temperature differences existing on one hand between the entry end and exit end, that is in the axial direction, and on the other hand between the heat-yielding and the heat-receiving media, that is in transverse direction, occasions considerable relative changes of form. These changes of form give rise to unavoidably large clearances between the rotor and the casing, because when starting up, that is, at room temperature when the parts have not expanded, binding must not take place. From the time regenerative heat exchangers of this kind become known, a principal problem has been to seal the clearances which are continually varying both during starting up and during operation, and therefore, this invention has as one object the solving of this problem.

The main observation leading to the invention has been that the greatest variations of clearance in the case of rotors with a vertical axis is to be expected at the outer periphery, because the rotor shaft in all the constructions known hitherto was a supporting member. This known construction of the heat exchanger has the following considerable fundamental disadvantages. The total weight of the rotor usually amounting to several tons is in the usual exchangers with a vertical axis, as a rule practically only supported at one point, namely at the upper bearing, while the lower bearing serves solely as a neck bearing. For this reason the rotor construction must be exceptionally stiff, which results in the rotor suffering considerable deformation due to temperature expansion, which in turn makes sealing extremely difficult. This mode of support also requires the upper bearing to be supported by carrying members of large dimensions, and which must even so be diametrically arranged in order to keep their size within bounds. From this arises another disadvantage in that the zone for the heat-yielding medium must be equal to the zone for the heat-receiving medium. This constructional requirement does not satisfy thermal considerations according to which the zone for the heat-yielding medium should be larger than that for the heat-receiving medium. It is not possible however to satisfy this thermal requirement because angular arrangement of the carrying members would involve still larger dimensions.

According to the present invention the supporting of the rotor in the casing is no longer effected by an upper main bearing, but at the outer periphery of the rotor. The invention is applicable to all varieties of the regenerative heat-exchangers of the kind in question and

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its practical embodiment can be varied within a wide range. By this mode of support both the hitherto usual rotor shaft and the bearings and the carrying members built of structural sections are eliminated.

In further development of the invention, it is desirable to make the rotor of light gauge sheet metal and thus of flexible construction, because then on one hand the bearing is substantially uniformly loaded all round the periphery notwithstanding non-uniform temperature effects, and on the other hand the sealing is substantially easier to effect.

The advantage of the mode of support according to the invention is not limited to the omission of the upper main bearing previously used and a considerable reduction in the height of the exchanger, but also includes the feature that full freedom is now provided as regards the division of the two zones. Additionally, the casing and the rotor have only to be mechanically so constructed as to support themselves. The main advantage however is that the clearance between the rotor and casing is now reduced to a minimum value much below anything hitherto known. In prior art arrangements under the effect of heat, the rectangular longitudinal section of the rotor was distorted so that the outer wall line was depressed and this the thermal distortion was supplemented by the mechanical distortion of the rotor due to its own weight. According to the invention the conditions are exactly opposite. The thermal distortion exhibits itself by a lifting at the axis, that is of the center part of the rotor. But opposing this is the considerable weight of the rotor, so that the final change of form is a minimum because the thermal and mechanical distortions to a great extent balance out. At the same time the periphery always retains a horizontal mean attitude while the axis can set itself inclined as there is nothing in the construction to stop it.

Therefore, the present invention has for a specific object to provide a regenerative heat-exchanger which comprises in combination, a stationary casing having channels for a fluid to be cooled and a fluid to be heated, a sheet metal rotor of flexible construction accommodated in the casing and including a plurality of segments movable in said channels, the rotor has a continuous peripheral supporting surface normal to the rotor axis at the base thereof and a continuous annular bearing supported in said casing, extending around the inner periphery of the casing substantially at the bottom thereof and engaging the supporting surface on the rotor and thus constituting a support for the entire peripheral edge of said rotor.

It is a still more specific object to provide an arrangement as set forth in the foregoing paragraph in which the continuous annular bearing is composed of closely arranged rolling contact elements.

If the use of the invention makes it possible to build the whole exchanger of lighter structural sections and thinner sheets and thus to save substantially in the weight and cost of foundations, this improvement can be carried still further by providing a support at the middle in addition to that at the outer periphery.

As a rule the support above described is entirely adequate. It is advantageous to construct the support bearing, which may be effected by balls, conical or cylindrical rollers, wheels or the like, with as far as may be considerable play and to confine its function to vertical support. Then however some retaining means in a direction at right angles is necessary. This may comprise a stub shaft arranged in the longitudinal axis, so that in the case of a rotor with a vertical axis which is usually the case, the stub shaft assumes the function of retaining the rotor against radial displacements. This arrangement

is advantageous because the peripheral bearing can now have substantial lateral play and the bearing friction is thereby reduced.

The mode of support according to the invention makes it imperative to effect as completely as possible the sealing for the protection of the bearing. In general sealing means can be provided of a kind which hitherto could not be used on account of the very large clearance between the rotor and the casing. Among sealing means which can now be used are, among others, the labyrinth joint—particularly when pressure air is used as described below—and also dipping, bell or cup joints as used for example in gasometers.

In the known heat-exchangers these sealing devices could not be used because the considerable irregularities of movement at the rotor periphery prevented it. This hindrance disappears with the support according to the invention. If now a dipping seal is used the efficiency of the exchanger is substantially increased and the operation simplified. The arrangement should be so contrived that as far as possible the bearing giving the support according to the invention is outside the dipping seal, that is no longer in the hot current.

The sealing is complete in so far that it is now possible to build the casing quite differently. Thus it is no longer necessary to provide a complete sheet metal wall; on the contrary so far as such a wall is provided it does not serve as a seal for the separation of the outer air from the gases passing through but solely for securing of the insulation.

The filling of the cup of the dipping seal can be suited to the conditions of the case. The use of water is possible even though the average temperature and in particular the local maximum temperature is above boiling point. A water flow may be maintained by means of water supply and discharge connections so that the flowing water always remains below boiling point. Or only a water supply may be provided and a float arranged outside the seal which ensures that at all times just so much water is supplied as is evaporated inside. The number and distribution around the periphery of supply and discharge connections can be such that even at the highest temperatures boiling point is not reached. But instead of water other liquids such as salt-solutions, oils and the like can be used.

Particularly desirable is a filling of sand, which was not used hitherto in similar circumstances because a complete seal could not thereby be obtained. The seal is entirely adequate for the present purpose and the somewhat increased friction occasioned by the use of sand is negligible both as regards wear and power consumption of the exchanger, as experience has shown.

For reasons of safety it is desirable to provide discharge openings between the seals and the rolling bearings so that the sealing agent or dust from the rotor cannot get into the bearings.

A further means to prevent the entry of dust from the seals or the heat-yielding medium into the bearing consists in maintaining a raised pressure as compared with the pressure in the rotor, in the space in which the bearing is located, that is say in the space between the casing and the rotor. The seal can then be omitted at the location of highest pressure.

In view of the small distortion of the end surfaces of the rotor not merely at the periphery but over the whole, the above developments can similarly be applied to the end seals between the zones. These have a double function. First to cover completely a transfer zone so that not more than its own content can pass through this zone from the one into the other zone. Second to seal the end surfaces of the rotor in the neutral zone. The first function can be fulfilled by dipping seals on the end surfaces because the small distortion permits the use of such, the small movements of the end surfaces requiring only small size of the dipping seals. This arrangement can be used primarily in heat exchangers with vertical axis, because

here the direction of movement of the end sealing plates is vertical and the arrangement of the dipping seal is particularly simple. Above all in this case sand filling can be used.

In order to obtain sealing between plates arranged on the end surfaces of the rotor in the same or approximately same measure of completeness as the sealing which is achieved with the use of dipping seals which are also used in the same way between the two zones in the clearance between the rotor and the casing at the end surfaces, it is finally proposed to let the end plates bear under their own weight or a corresponding pressure, for example spring pressure, against the end surfaces of the rotor. This again is only possible with heat exchangers in accordance with the invention. In the hitherto known constructions, this method of sealing would lead to excessive wear or even breakdown on account of the great irregularities of configuration of the rotor. Particularly smooth bearing of the plates is obtained if they are subdivided in their radial extension. The joints at these subdivisions can be adequately made by toothing on each edge, by interengaging groove and tongue, by interengaging step sections, or in similar manner.

Further and more specific objects will be apparent from the following description taken in connection with the accompanying drawing diagrammatically illustrating modifications of the invention and in which:

Figure 1 illustrates diagrammatically and in longitudinal section a rotary regenerative heat-exchanger having an inner centering arrangement,

Figure 2 is a view similar to Figure 1 but illustrating a modified arrangement incorporating an external centering relationship,

Figure 3 illustrates diagrammatically and in longitudinal section a rotary regenerative heat-exchanger having inner and outer roller journals, inner journal means and labyrinth seals protecting the journals from dust,

Figure 4 is a top plan view of a regenerative heat-exchanger constructed in accordance with the invention,

Figure 5 is a fragmentary longitudinal section on an enlarged scale illustrating the lower left hand corner of the arrangement of Figure 1 modified to incorporate a peripheral water seal,

Figure 6 is a fragmentary cross sectional view on an enlarged scale taken along lines VI—VI of Figure 4 and illustrating a sector seal, and

Figure 7 is a fragmentary top plan view of a heat-exchanger embodying the structure of Figure 6 but illustrating the parts after removal of the upper part of the casing.

In Figure 1, the rotor 5 of light sheet metal is in known fashion provided with sheet metal lamellae 6, but is so made that the structure is somewhat flexible. This rotor rests by an inner rolling (ball) bearing 7 and an outer rolling (ball) bearing 8 on the lower part of the casing 9 which is more strongly built of structural sections. The rest of the casing wall, namely the side 10 and the top closure 11 is made of thin sheet metal or light structural sections and carries no separate loads. Centering of the rotor in the casing is effected entirely by a stub shaft 12 which is guided in the casing by a radial bearing 13.

The sealing is effected by means of annular pockets 14, 15, 16 and 17 which are provided at the inner and outer peripheries of the lower part of the casing and the top of the rotor, and into which dip corresponding annular flanges 18, 19, 20 and 21 on the under-side of the rotor and the top of the casing. The pockets are filled with sand and so arranged that they protect the rolling (ball) bearings from the gas current. If desired, the dipping seals can be filled with liquid such as water and supply and discharge connections for the liquid are illustrated diagrammatically at 50 and 51 respectively.

In the embodiment of Figure 2, the rotor 22 is constructed similar to the arrangement of Figure 1. The support is here effected entirely by a single rolling bearing

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means 23, arranged at the outer periphery of the bottom of the rotor. Sealing is here simpler and is effected, giving rise only to very slight friction, by a labyrinth joint packing 24 in which a series of annular flanges alternating on the lower part of the casing and the opposite part of the rotor, intermesh. Similar labyrinth packings 25, 26 and 27 with the casing are provided internally at the bottom and at the inner and outer peripheries at the top of the rotor. Here it is to be noted that the inner packings 25 and 27 are not between the casing and the rotor, but between the casing and packing plates 28 and 29, these plates serving to separate the two media, e. g. hot gas and air respectively, and being divided in the radial direction. It has been found that the use of this packing in rotary regenerative heat exchangers is particularly useful because it provides full security against the exit of dust while the heat losses compared with the saving in power consumption is of subordinate importance. It is primarily the low power consumption which makes this construction particularly valuable. The joints between the parts of the plates are toothed and intermeshed, Figure 7, and the plates are pressed into sealing contact with the rotor by springs 30 and 31. It will be understood that this spring pressure takes into account the weight of the plates and in consequence differs in the two locations.

The centering of the rotor in this example is effected by rollers 32 arranged in the casing against which the rotor bears with the lower part of its outer periphery.

It will be understood that instead of labyrinth packings in Figure 2 dipping seals could be used and that in Figure 1 labyrinth packings could be used instead of dipping seals.

In accordance with the invention and as shown in Figure 3, the rotor 5 is constructed of light sheet metal in the same manner as in Figure 1. All of the elements are designated with the same reference numerals. In Figure 3 the construction of the invention is so designed that labyrinth seals instead of sand or water seals are illustrated and the space between the housing and the rotor is placed under a higher pressure than that pressure prevailing in the interior of the rotor.

Figure 3 relates to a smoke or flue gas air heater. The hot gas enters through entrance flange 32' passes through the rotor 5 and in this rotor it transfers heat to the sheet metal panels of the rotor with the gas exiting through the exit flange 33.

In contrast thereto, the air to be heated enters through entrance flange 34, passes into the heat exchanger, receives heat from the sheet metal panels of the rotating rotor and then leaves the heat exchanger through exit flange 35. In such heat exchangers the air is under a higher pressure than that of the gases. Owing to the extreme resistance in rotor 5, the air pressure at the entrance flange 34 is higher than at the exit flange 35. According to the invention, around the entrance flange, seals are entirely or partly omitted whereby the air, which at this spot has a super-pressure with respect to all other pressure conditions in the rotor, may enter through the ball bearings into the annular chamber 46 formed between the rotor 5 and the housing or casing wall 10. This annular space is at all points in free communication with the outer journal ring 8 but otherwise is closed by packings 26, 27' from passing smoke gases and heated air so that no air quantities worth mentioning can enter into the gases and so that cold air flowing around the rotor is prevented from mixing with the heated air that is leaving the heat exchanger. At the entrance flange 34 the packing or seals at the inner circumference of the rotor are omitted, the cool pure air having free access to the inner rotor space in which supporting bearing 7 and trunnion or stub shaft 12 with its radial guide bearing 13 is disposed. However, passage of air from this space into the flow of the gases is prevented by the packings 25 and 27.

Figure 4 illustrates a plan view of such a regenerative

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heat exchanger. The panel of the rotor 5 consisting of sheet metal packets 6 is shown in the drawing in only a portion of the rotor, otherwise the rotor is subdivided by radial ribs 42. Above and below the sheet metal packets are arranged strips 41 serving to hold the sheet metal packets in the rotor. The hot gases enter through flange 32' into the heat exchanger while the air leaves the same through the flange 35. Between these two zones are disposed neutral zones constituting the sectors 36 and 37 which advantageously are arranged at such breadth that they at least encompass the distance embodied in a rotor sector equivalent to the space between adjacent radial walls 42 so that within the rotor the radial walls 42 block connection between the heat supplying medium and the heat receiving medium.

In view of the fact that the rotor is journaled in accordance with the teachings of the invention, it is now possible to arrange sectors 36 and 37 of the neutral zones in any position relative to one another according to the desired size of the connecting flanges 32 and 33 for the hot media. In known constructions these sectors 36 and 37 must lie opposite to one another because a heavier beam construction necessarily had to be incorporated either within them or on them to hold or support the circular pintle from which the rotor is suspended. The wide range of the size of flanges assures easy access, which is of importance because the volume of heat supplying and heat receiving media, may in some cases have substantial differences as regards the relationship they bear to one another in volume.

In the arrangement according to Figure 5, the casing parts 9 and 10, the water seal 19 and roller bearing 8 at the periphery or circumference of the rotor are shaped in the manner similar to the arrangement of Figure 1. Into the water seal 19, which is fixed on the housing or casing, a sheet metal member 38 is submerged. This member is in sealing relationship with the rotor and blocks communication between the inside of this member and the space in which the bearing 8 is mounted. The area 39 of the seal may be filled with sand or liquid. In Figure 5, for example, liquid is illustrated and is fed to the seal through a pipe 40. Due to the location of the flange 33 and the fact that the sheet metal member 38 is immersed in the water, a certain quantity of sealing liquid is evaporated since these parts are heated and through pipe 40 is supplied a quantity of water sufficient to compensate for any evaporative losses. The water level may be controlled by a float, not shown. If evaporation is to be prevented, an additional overflow pipe 40' may be arranged. This pipe is disposed, however, a sufficient distance from the sheet metal member up to the surface of the sealing filler compartment 39 so that when the liquid is supplied in a larger quantity than necessary the overflow passes off through this pipe.

The structure illustrated in Figure 6 and for sealing the media having heat exchange relation includes sealing plates 29 subjacent sectors 36 and 37. These sealing plates carry upstanding sheet metal seal members 43 which have reversely bent ends immersed in a water seal channel 44. The supply and discharge connections for the water seal are diagrammatically indicated at 52 and 53 respectively. A closure piece 36 closes the sector and the top. However, this closure is not absolutely necessary but it does function as a counter plate for springs, not shown in this figure but shown diagrammatically at 30, 31 in Figure 2, and which springs exert pressure on the sealing plates to press them against the rotor 5 with such additional pressure as may be necessary, particularly on the bottom side of the heat exchanger.

In the Figure 4 and 6 arrangement the rotor 5, during rotation slides beneath the sealing plates 29. These sealing plates sliding over the radial walls of the rotor and the holding strips 41. The breadth of the sealing plates 29 is so dimensioned that at least a sector breadth of the rotor is covered so that there is always subjacent the sealing

plate a radial wall 42. It thus follows that within the rotor the two media remain separated. Holding strips 41 assist the proper sliding relationship of the sealing plates so that the radial walls are always guided beneath these sealing plates.

In the embodiment according to Figure 7, which shows in partial plan a portion of the heat exchanger after the removal of the upper part of the casing, the sealing plates are sub-divided radially. The sealing of the several sections of sealing plates relative to one another, as illustrated in this embodiment, is provided by mutual indentations 45. At the inner and outer end of their total radial extent the sealing plates 28 abut the submerged sheet metal pieces of the sand or water seals 20 and 21 which are diagrammatically illustrated in Figure 1. These sheet metal pieces are not shown in Figure 7 because they are carried by the housing or casing part that has been removed in this view. The submerged seals otherwise appear in Figure 1.

Therefore, the present invention provides an arrangement in which in view of the combination of a light gauge and flexible construction with an annular peripheral bearing of rolling contact members, the manufacture of rotary regenerative heat exchangers is simplified, the maintenance thereof is facilitated and the sealing means employed are of simplified construction.

Particularly, the invention provides a regenerative heat exchanger comprising a stationary casing having upper and lower channels providing inlets and outlets for a fluid to be cooled and fluid to be heated. Within the casing is disposed a sheet metal rotor of light gauge and thereby of flexible construction. The rotor has a vertical axis and a lower continuous external flange extending around the periphery thereof normal to the axis. There is a continuous annular arrangement of closely spaced rolling contact bearing members supported by the casing in underlying and contacting engagement with the said flange so as to continuously support substantially the entire peripheral flange and thereby the rotor. Additional rolling contact bearing means are mounted between the rotor and the casing to center the rotor in the casing and seal means are provided between the top of the rotor and the casing in the area of both upper channels and between the bottom of the casing and the rotor at least in the area of one of the lower channels with all the seal means including means permitting limited vertical and lateral movements of the rotor relative to the casing.

I claim:

1. A regenerative heat-exchanger comprising in combination, a stationary casing, having channels for a fluid to be cooled and a fluid to be heated, a sheet metal rotor of flexible construction accommodated in said casing and including a plurality of segments movable in said channels, said rotor having a continuous peripheral supporting surface normal to the rotor axis and at the base of the rotor and a continuous annular bearing supported in said casing, extending around the inner periphery of the casing substantially at the bottom thereof and engaging the supporting surface on the rotor and thus constituting a support for the entire peripheral edge of said rotor.

2. A regenerative heat-exchanger comprising in combination, a stationary casing, having channels for a fluid to be cooled and a fluid to be heated, a sheet metal rotor of flexible construction accommodated in said casing and including a plurality of segments movable in said channels, said rotor having a continuous peripheral supporting surface normal to the rotor axis and a continuous annular bearing composed of closely arranged rolling elements supported in said casing, extending around the inner periphery of the casing at the bottom thereof and underlying and engaging the said supporting surface and thereby constituting a support for the entire peripheral edge of said rotor.

3. A regenerative heat-exchanger comprising in com-

bination, a stationary casing, having channels for a fluid to be cooled and a fluid to be heated, a sheet metal rotor of flexible construction accommodated in said casing and including a plurality of segments movable in said channels, said rotor having a continuous peripheral supporting surface normal to the rotor axis, a continuous ring bearing supported in said casing, extending around the inner periphery of the casing at the bottom thereof and underlying and engaging the said surface and thereby constituting a support for the entire peripheral edge of said rotor and a second bearing between the casing and the rotor near the axis thereof.

4. A regenerative heat-exchanger comprising in combination, a stationary casing, having channels for a fluid to be cooled and a fluid to be heated, a sheet metal rotor of flexible construction accommodated in said casing and including a plurality of segments movable in said channels, said rotor having a continuous peripheral supporting surface normal to the rotor axis, a continuous ring bearing supported in said casing, extending around the inner periphery of the casing at the bottom thereof and underlying and engaging the said surface and thereby constituting a support for the entire peripheral edge of said rotor, an axial stub on said rotor and means between said casing and said stub for guiding the same in radial direction.

5. A regenerative heat-exchanger comprising in combination, a stationary casing, having channels for a fluid to be cooled and a fluid to be heated, a sheet metal rotor of flexible construction accommodated in said casing on a vertical axis and having a plurality of segments movable in said channels, said rotor having a peripheral external flange normal to the axis, a continuous annular rolling bearing supported in said casing, extending around the inner periphery of the bottom thereof and underlying engaging said flange to a support the entire peripheral edge of said rotor, an axial stub extending downwards from the bottom of said rotor and a second continuous rolling bearing supported between said casing and said stub and guiding said stub in the radial direction.

6. A regenerative heat-exchanger as claimed in claim 2 and dipping seals between said casing and said rotor in proximity to the axis of the latter and said rotor.

7. A regenerative heat-exchanger as claimed in claim 2 and dipping seals between said casing and the rotor at the inner and outer peripheries of both ends of said rotor.

8. A regenerative heat-exchanger as claimed in claim 2 and further including dipping seals between said casing and said rotor in proximity to the axis of the latter and said rotor, means for producing a flow of a sealing liquid through said seals and said means including supply and discharge connections leading to and from said seals to regulate the flow of liquid in said seals according to the temperature of the liquid, its latent heat and the operating temperature at the seals.

9. A regenerative heat-exchanger as claimed in claim 2 and sand filled dipping seals between said casing and said rotor in proximity to the axis of the rotor.

10. A regenerative heat-exchanger as claimed in claim 2 and dipping seals between said casing and said rotor on the inner side of said continuous bearing.

11. A regenerative heat-exchanger as claimed in claim 2 and further including means for supplying a gaseous medium between said rotor and said casing, said medium being at a higher pressure than the pressure prevailing inside the exchanger to thereby prevent access of the media in the exchanger to the continuous bearing.

12. A regenerative heat-exchanger comprising in combination a stationary casing, a rotor of flexible construction accommodated in said casing and having a peripheral edge, a continuous annular bearing means extending around the outer edge of the bottom of the casing and constituting a support for the entire peripheral edge of said rotor, means for supplying air between said rotor and said casing at a higher pressure than the pressure pre-

vailing inside the exchanger to thereby prevent access of the media in the exchanger to the continuous bearing, two packing plates one at the top end and one at the bottom end in the middle of said rotor, additional packing plates between said first mentioned packing plates and said casing separating the air from the media in the exchanger, and seals between said first mentioned plates and said casing.

13. A regenerative heat-exchanger comprising in combination a stationary casing, a rotor of flexible construction accommodated in said casing and having a peripheral edge, a continuous annular bearing in said casing and extending around the outer edge of the bottom of the casing and constituting a support for the entire peripheral edge of said rotor, means for supplying air between said rotor and said casing at a higher pressure than the pressure prevailing inside the exchanger to thereby prevent access of the media in the exchanger to the continuous bearing, two packing plates one at the top end and one at the bottom end in the middle of said rotor, said plates being radially subdivided, interengaging joints at the subdivisions, and additional packing plates between said first mentioned packing plates and said casing separating the air from the media in the exchanger.

14. A regenerative heat-exchanger as claimed in claim 2 and further including means for supplying air between said rotor and said casing at a higher pressure than the pressure prevailing inside the exchanger so as to prevent access of the media in the exchanger to the continuous bearing, two packing plates one at the top end and one at the bottom end in the middle of said rotor, additional packing plates between said first mentioned packing plates and said casing separating the air from the media in the exchanger, and seals between said first mentioned plates and said casing and additional seals between the outer periphery of said rotor and said casing at both ends of said rotor.

15. A regenerative heat exchanger comprising a stationary casing having upper and lower channels providing inlets and outlets for a fluid to be cooled and a fluid to be heated, a sheet metal rotor of light gauge and thereby of flexible construction disposed within the casing, said rotor having a vertical axis and including a lower continuous external flange extending around the periphery thereof normal to the axis, a continuous annular arrangement of closely spaced rolling contact bearing members supported by the casing in underlying and contacting engagement with the said flange to continuously support substantially the entire peripheral flange and thereby the rotor, additional rolling contact bearing means mounted between the rotor and the casing for centering the rotor in the casing, seal means between the top of the rotor and the casing in the area of both upper channels and between the bottom of the casing and the rotor at least in the area of one of the lower channels and all seal means including means permitting limited vertical and lateral movements of the rotor relative to the casing.

16. A regenerative heat exchanger as claimed in claim

15 in which the seal means are arranged between the bottom of the casing and the rotor in the area of both lower channels, said seal means including a continuous peripheral seal between rotor and casing disposed internally of the continuous annular arrangement of bearing members.

17. A regenerative heat exchanger as claimed in claim 15 in which the rotor includes a depending stub shaft, said additional bearing means being mounted between said stub shaft and the casing and a further continuous annular bearing means between rotor and casing in proximity to the rotor axis and concentrically disposed relative to the stub shaft.

18. A regenerative heat exchanger as claimed in claim 15 in which said casing and rotor include spaced side walls, said additional bearing means including roller elements supported by the internal side walls of the casing in engagement with the side walls of the rotor.

19. A regenerative heat exchanger as claimed in claim 15 in which the seal means are arranged between the bottom of the casing and the rotor in the area of both lower channels, said seal means including a continuous dipping seal between rotor and casing disposed internally of the continuous annular arrangement of bearing members.

20. A regenerative heat exchanger as claimed in claim 15 in which the rotor includes a depending stub shaft, said additional bearing means being mounted between said stub shaft and the casing, a further continuous annular bearing means between rotor and casing in proximity to the rotor axis and concentrically disposed relative to the stub shaft, said seal means comprising continuous dipping seals arranged between the outer periphery of the top of the rotor and the casing, the top of the rotor and the casing in proximity to the axis of the rotor, between the outer periphery of the bottom of the rotor and the casing internally of the bearing means and between the inner periphery of the rotor and the casing in proximity to the axis of the rotor and radially outward of the bearing means of the said additional and further bearing means.

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