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RADIAL SEAL FOR ROTARY HEAT EXCHANGER

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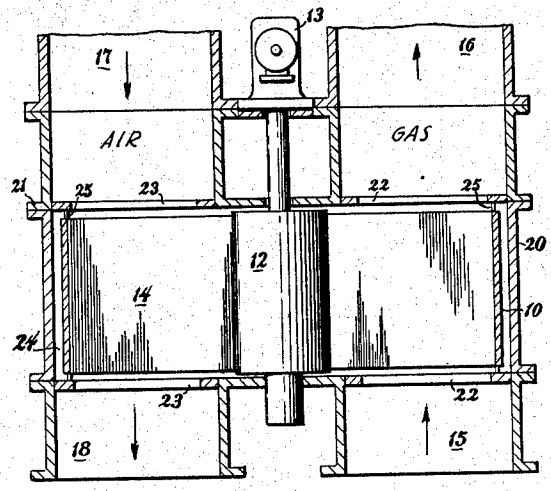


Fig. 1

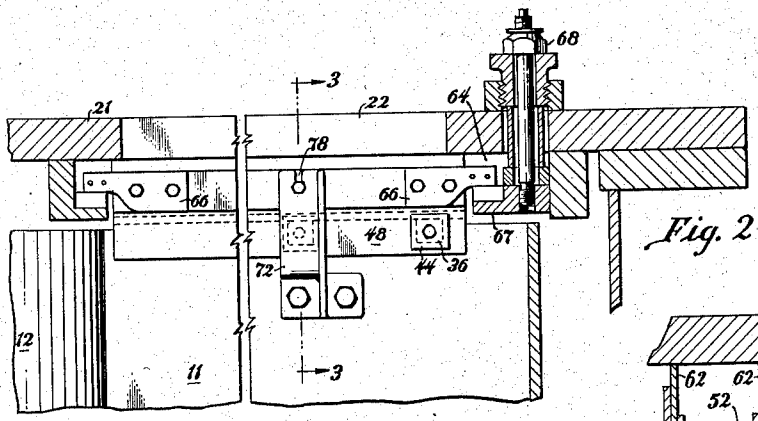


Fig. 2

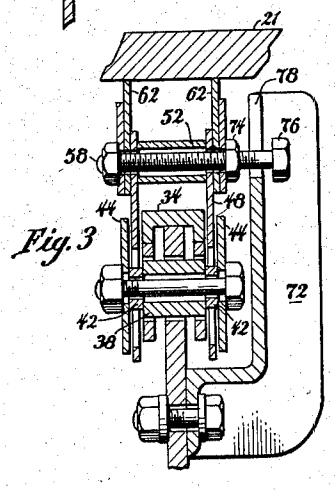


Fig. 3

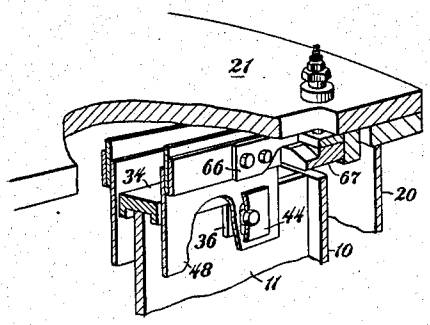


Fig. 4

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RADIAL SEAL FOR ROTARY HEAT EXCHANGER

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5 Claims. (Cl. 257—6)

The present invention relates to heat exchange apparatus and particularly to improved radial seals for use between the rotor and end plates of a housing enclosing the rotor of a rotary regenerative air preheater or similar apparatus of the general type disclosed in the United States patent of Hammond et al. 2,674,442, of April 6, 1954.

In rotary regenerative air preheaters of the type described a cylindrical rotor has compartments carrying heat transfer material which as the rotor turns is first exposed to heating gases and then disposed in the air passage to impart the absorbed heat to the air. The rotor is surrounded by a housing having end or sector plates formed with openings to provide for the flow of gas and air. To prevent the mingling of the two fluids, the partitions forming the rotor compartments are provided with radial sealing members that wipe against the imperforate portions of the sector plates.

The present invention is directed to an improved arrangement by which the radial sealing members are imparted complete freedom of movement not subject to the thermal distortions of the radial partitions. However, the invention will be more completely understood upon consideration of the following detailed description of an illustrative embodiment thereof when read in conjunction with the accompanying drawings in which:

Figure 1 is a sectional elevational view in diagrammatic form of a rotary regenerative air preheater.

Figure 2 is an enlarged fragmentary view showing the relationship between a radial seal and the end plate at one side of the rotor.

Figure 3 is a fragmentary view in section as seen on line 3—3 of Figure 2.

Figure 4 is a fragmentary perspective view illustrating the relationship between the radial partition and the radial sealing means.

In the drawings the numeral 10 designates the cylindrical shell of a rotor divided into sector shaped compartments by radial partitions 11 connecting it with a rotor post 12 which is driven by a motor and reduction gearing 13 to turn the rotor slowly about its axis. The rotor compartments contain regenerative heat transfer material in the form of metallic plates 14 which first absorb heat from hot gases entering the preheater through a duct 15 from a boiler or other source to be discharged after passing over the heat transfer plates 14 through an outlet duct 16 to which an induced draft fan (not illustrated) is connected. As the rotor turns slowly about its axis the heated plates 14 are moved into the stream of air admitted through the duct 17. After passing over the plates 14 and absorbing heat therefrom the stream of air is conveyed to the boiler furnace or other place of use through duct 18.

A housing 20 enclosing the rotor 10 is provided at either end opposite the rotor with end or sector plates 21 which are apertured at 22 and 23 to admit and discharge streams of gas and air flowing through the rotor. The radial partitions 11 are provided with radial sealing

members 62 which are adapted to bear against the imperforate portions of the sector plates to prevent the flow of fluids across the ends of the rotor. In order that the streams of gas and air do not bypass the rotor by flowing through the annular clearance space 24 between the rotor shell 10 and the housing 20, it is customary to provide circumferential seals indicated diagrammatically at 25 on shell 10 which wipe against confronting parts of sector plates 21 so as to seal off the space 24 from each end of the rotor.

In accordance with the present invention, the radial sealing arrangement comprises an elongate channel member 34 positioned over the end edges of each diaphragm and extending radially between the rotor post and the rotor shell. Each channel member is provided with a span between opposite sides thereof which is substantially greater than the edge thickness of the enclosed diaphragm 11 in order that the diaphragm may freely distort or laterally deform within the channel. Each channel is provided with a plurality of tabs 36 with ports therethrough arranged in alignment with similar ports through the intermediate diaphragms as seen in Figure 3. A first bushing 38 having a length substantially equal to the thickness of channel member 34 is placed through the aligned openings in the tabs 36 and the enclosed diaphragm to link them together in order that each channel member may be substantially fixed against axial movement. A small bushing 42 at each end of the first bushing 38 comprises spacing means whereby washers 44 are maintained at a fixed distance from the sides of the sealing channel 34. The space between each side of channel 34 and the adjacent side of washer 44 comprises a U-shaped guide for side plate 48, one of which is fitted loosely at each side of channel 34. A plurality of such guide assemblies radially spaced along the edge of each diaphragm maintain adjacent edges of said plates spaced apart in parallel relationship, while the remote edges thereof are maintained in a similarly spaced relationship by bushings 52 extending therebetween. A pair of sealing strips 62 are connected to side plates 48 by bolts 58 which also serve to connect radial extensions 66 thereto. The portion of these extensions which protrudes radially beyond the sealing strips provides a wearing surface adapted to ride in grooves 64 formed by a cam member 67 carried beneath the imperforate portion of the end plate 21. The cam member 67 is axially adjustable with respect to end plate 21 by an adjusting means 68 which extends through the end plate and suitable packing means to permit adjustment during operation. This adjusting means 68 may be omitted when utilized at the lower edge of the diaphragm where gravity alone acting upon the axially movable sealing assembly will hold it in an abutting relationship with the adjacent sector plate.

A driving means 72 fixed to an end edge of each diaphragm extends axially thereof toward end plate 21 to support the sealing assembly 34—62 and maintain it in substantial radial alignment during rotation of the rotor. By providing a lock nut 74 on the bolt 58 a section thereof lying between nut 74 and its head 76 may be arranged to cooperate with slot 78 as shown in Figure 3 to permit the sealing arrangement to be held in its proper relationship.

When assembled as disclosed, the space at either side of partition 11 within the channel member 34 permits extensive lateral distortion of each partition without restriction thereof so that relatively undistorted sealing members 62 may at all times be held in sealing relationship with an adjacent end plate.

During operation, clearance between the sealing members 56 and the end plate 21 may be adjusted as described to maintain an optimum of efficiency throughout wide

ranges of temperature variation and its attendant thermal distortion.

While this invention has been described with reference to the embodiment illustrated in the drawing, it is evident that numerous changes may be made without departing from the spirit of the invention, and it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative only and not in a limiting sense.

What we claim is:

1. A sealing arrangement for a regenerative air preheater or the like having a rotor including a cylindrical shell joined to a rotor post by radial partitions forming compartments that carry masses of heat transfer material and a housing surrounding the rotor and provided opposite the latter with end plates including imperforate portions located between circumferentially spaced apertures formed in said plates for the flow of heating gases and air to and through the regenerative heat transfer material carried by the rotor; radial sealing means between the partitions and the end plates comprising elongate channel members adapted to fit over the end edges of said partitions in axially abutting relationship; cam means mounted on the end plate arranged to extend axially into the space between the rotor and end plate; radial sealing means slidably embracing the outer side faces of said channel members; and means mounted on the radial outer ends of the sealing means adapted to engage said cam means for support of the sealing means independently of the elongate channel member.

2. A sealing arrangement for a regenerative air preheater or the like as defined in claim 1 wherein the sides of the elongate channel member are spaced apart a distance substantially greater than the thickness of the enclosed diaphragm to permit relative movement therebetween.

3. A sealing arrangement for a regenerative air preheater or the like having a rotor including a cylindrical shell joined to a rotor post by radial partitions forming compartments that carry heat transfer material, and a housing surrounding the rotor and provided at remote ends with end plates including imperforate portoins located between circumferentially spaced apertures formed in said plates for the flow of heating gases and air to and through the regenerative heat transfer material carried by the rotor; radial sealing members between the partitions and the imperforate portions of the end plates comprising elongate channel members adapted to fit over the end edges of said partitions in axially abutting relationship; track means mounted on the end plates arranged to extend axially into the space between the rotor and end plates; parallel side plates slidably embracing the side faces of the channel members and extending axially thereof toward the end plates; radially extending sealing strips fixed to the parallel side plates to bridge the space between the side plates and the adjacent end plate; and means at the outer end of the sealing strips adapted to engage the track for supporting the sealing bars in sealing relationship with said end plate.

4. A sealing arrangement for a regenerative air preheater as recited in claim 3 wherein the track means is mounted radially outward from the imperforate portion of the end plate.

5. A sealing arrangement for a regenerative air preheater as recited in claim 3 having driving means depending from the radial partitions slidably supporting the radial sealing means for axial movement into a sealing relationship with the imperforate portion of said end plate.

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