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SUPPORT OF ROTOR HOUSING OF REGENERATIVE HEAT EXCHANGERS

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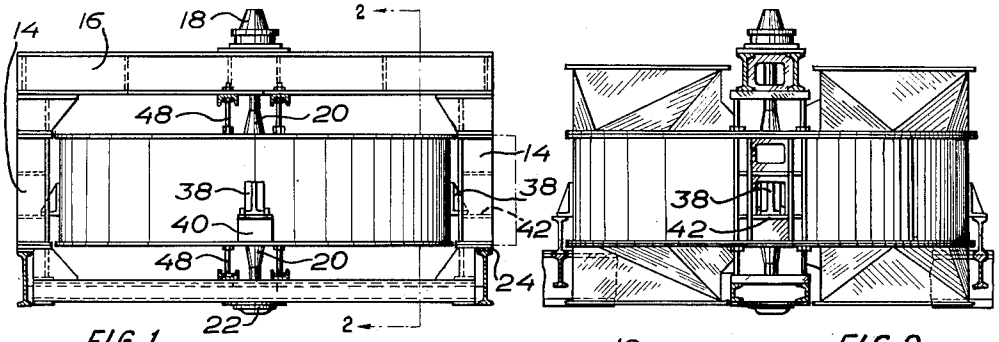


FIG. 1

FIG. 2

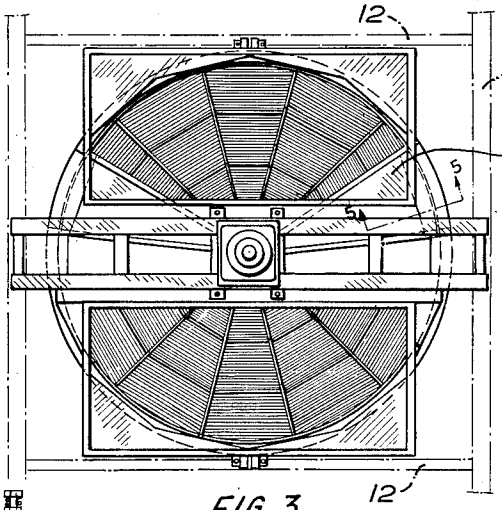


FIG. 3

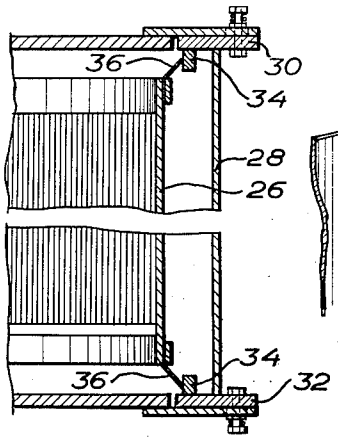


FIG. 5

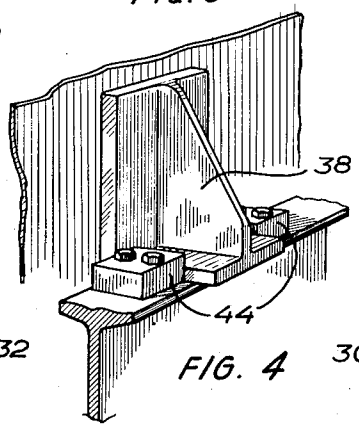


FIG. 4

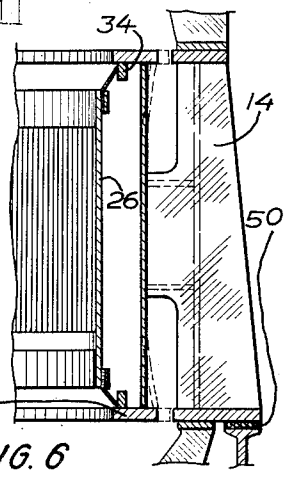


FIG. 6

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SUPPORT OF ROTOR HOUSING OF REGENERATIVE HEAT EXCHANGERS

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6 Claims. (Cl. 257—6)

The present invention relates to regenerative heat exchangers, for example of the Ljungstrom type, which consist of a rotor containing heat transfer elements and placed within a housing having inlet and outlet channels for gas and air respectively. Upon rotation of the rotor the heat transfer elements are passed by the gas flow and the air flow alternatively, absorbing and admitting heat respectively. Generally the gas side and the air side are separated by radial as well as peripheral sealings provided between rotor and rotor housing. The most simple type of such peripheral sealings consists of sealing strips mounted peripherally on the rotor and effecting sealing together with annular flanges provided on the inner side of the rotor housing at its upper and lower end portions. These sealings are of course highly dependent on the circular shape of the annular flanges and this shape may, due to heat stress, be changed to oval form, resulting in an increased leakage.

In earlier known designs of rotary regenerative heat exchangers the rotor is carried by beams resting on vertical supports placed outside the housing which is fixed to said supports. The frame formed by the beam and its supports and the rotor housing are not uniformly heated so that heat stresses arise at the connection between rotor housing and the vertical supports. Due to this fact the housing and its flanges will warp to oval shape reducing the peripheral sealing effect between housing and rotor.

In order to avoid this drawback the invention has for its primary object to provide a support and centering of the rotor housing in such a manner that the end portions of the housing may freely expand or contract in radial direction.

According to one embodiment of the invention this is attained thereby that the rotor is carried by a frame which is free from the housing and that the housing is carried by supports provided to move freely in radial direction and being located at the outer circumference of the housing, said supports being in cooperation by guiding members to center said housing.

The invention will be hereinafter described with reference to the accompanying drawing showing suitable embodiments by way of example.

Fig. 1 is a front view of a preheater having a device according to the invention.

Fig. 2 is a side view.

Fig. 3 is a top view of the preheater.

Fig. 4 is a perspective view of an embodiment of support for carrying and centering the rotor housing.

Fig. 5 shows an example of connection between the sector plates of the housing and the housing itself, according to section 5—5 of Fig. 3.

Fig. 6 shows another example of supporting the rotor housing according to the invention.

Referring to the drawings, numeral 10 designates two parallel main beams which are interconnected by crossbars 12. On the main beams are placed two vertical supports 14 interconnected by a horizontal beam 16. A bearing 18 mounted at the middle of beam 16 supports the rotor post 20, which at its lower end is guided by a bearing 22 carried by a bar 17.

To reduce heat stresses in the frame formed by the beam 16 and its supports, one of said supports 14 may rest with its foot on a roller or sliding bearing 24.

The rotor 26 is surrounded by a rotor housing 28 having upper and lower flanges 30 and 32 respectively and being at the inner sides provided with annular sealing rings 34 against which sealing strips 36 rest with sealing effect.

According to the invention the rotor housing is supported and centered so that the upper and lower portions of the housing and its flanges may freely move in radial direction and in such a way as to maintain substantially a circular shape.

In the embodiment shown in Figs. 1 to 3 the rotor housing is provided with four carrier arms in the form of inverted brackets 38 fixed to the shell of the housing. By means of these brackets the housing rests on corresponding bearing supports 40, 42, which are mounted to the bars 10 and 12. The bearing supports 42 consist of brackets located in the supports 14 as shown in Fig. 2. The brackets are radially movable on their supports with respect to the centre of the housing and said movement may be effected by sliding or by means of roller bearings. For enabling centering of the housing when assembling the bearing supports are provided with guiding members 44 which are adjustable and lockable on both sides of the bracket, as shown in Fig. 4, and thereby fix the housing in its proper position.

The air and gas sides are as usual separated by sector plates 46 which at the centre are carried by arms 48 fixed to the upper and lower beams 16 and 17 respectively. This connection may of course be provided in another way as, for example, with heat insulating members for reducing heat conduction to the beams 16 and 17.

The connection between the sector plates and housing may be fixed or, as shown in Fig. 5, may be slidable in a manner known per se.

The free movement of the housing flanges may also be effected by connecting the housing with the supports 14 according to Fig. 6. The supports 14 are here welded or bolted to the shell of the housing, but at such a distance from the flanges 30 that they are allowed to expand and contract freely respectively. Due to the large cross sectional area of the flanges and the flexibility of the plate forming the shell any ovality cannot arise if the distances between the flanges and the connection are large enough. In this embodiment where one of the vertical supports conveniently rests on roller bearings 50, the carrier beam 16 is adjusted so that centering is obtained between housing 28 and rotor 26.

The invention is not to be considered as being limited to the embodiments shown and described but may be carried out in several other forms within the scope of the inventive idea.

What is claimed is:

1. A rotary regenerative heat exchanger of the vertical type comprising a rotor mounted to rotate about a vertical axis, a stationary housing, said housing comprising a shell portion encircling said rotor and end plates secured to the ends of the shell and extending over the respective ends of the rotor, sealing means providing peripheral seals between the ends of the rotor and the respectively adjacent portions of said housing, and supporting structure for carrying said rotor and said housing, said supporting structure including means secured to the shell portion of said housing in a common horizontal zone intermediate the ends of the shell and axially spaced from

said end portions of the shell to permit freedom of expansion and contraction of the end parts of the shell portion of said housing structure in response to differential heating without distortion thereof due to stresses imposed by said supporting structure, whereby to minimize leakage past said sealing means due to such distortion.

2. A heat exchanger as defined in claim 1 in which said housing comprises a central shell portion and relatively more rigid end portions providing the housing parts of said sealing means and said supporting structure includes vertical supporting members connected to support the housing at substantially the vertically middle portion of the housing.

3. A heat exchanger as defined in claim 2, including carrier members fixed to said housing shell and mounted to have radially slidable movement relative to said vertical supports.

4. A heat exchanger as defined in claim 3, including guide means on said supports for laterally guiding said carrier members to center said housing with respect to said supporting structure.

5. A rotary heat exchanger of the vertical type comprising a rotor mounted to rotate about a vertical axis, a stationary housing comprising a shell portion encircling said rotor and end plates secured to the ends of the shell and extending across the ends of the rotor, sealing means providing peripheral seals between the ends of the rotor and the respectively adjacent portions of the housing, said seals comprising sealing strips at the ends of the rotor and annular sealing members secured to the respective end plates of said housing and located to be engaged by

said sealing strips, supporting structure comprising a frame for carrying said rotor, said frame being free from said housing and said supporting structure including vertical supports for carrying said housing, means for securing said shell to said vertical support in a common horizontal zone intermediate the ends of the shell and axially spaced from the ends thereof to permit freedom of expansion and contraction of the ends of the shell in response to differential heating without distortion of the housing resulting from stresses imposed thereon by said supporting structure, whereby to minimize leakage losses past said sealing means due to said distortion.

6. A heat exchanger as defined in claim 5 in which the connection between said housing and said vertical supports comprises carrier members connected to the shell portion of the housing substantially midway of its vertical length and slidably mounted for movement in radial direction with respect to said vertical supports.

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