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[54] **HORIZONTAL SUPPORT FOR ROTARY REGENERATIVE HEAT EXCHANGER**

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[52] **U.S. Cl.** **165/7,** 165/8, 165/10

[51] **Int. Cl.** **F28d 19/00**

[58] **Field of Search** 165/8, 9, 10, 7

[56] **References Cited**

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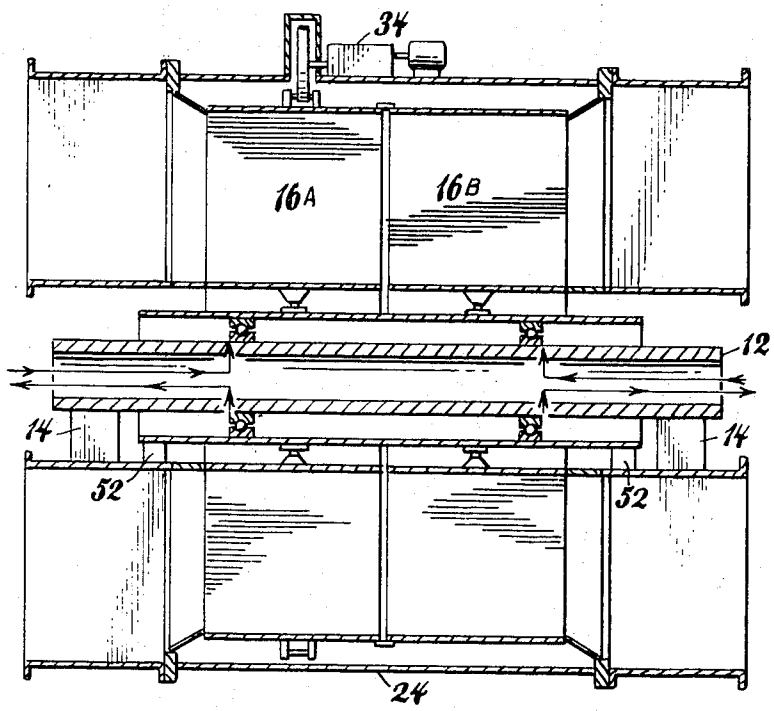
[57] **ABSTRACT**

A rotor arrangement for a rotary regenerative heat exchanger that is adapted to rotate about a fixed horizontal shaft that extends axially through the rotor. The rotor is comprised of a plurality of independent sectorial segments, each of which is pivotally connected to a cylindrical sleeve which in turn concentrically surrounds the horizontal rotor shaft. Bearing means that support the sleeve for rotation about the horizontal shaft are located in the space between the rotor shaft and the concentric sleeve.

5 Claims, 3 Drawing Figures



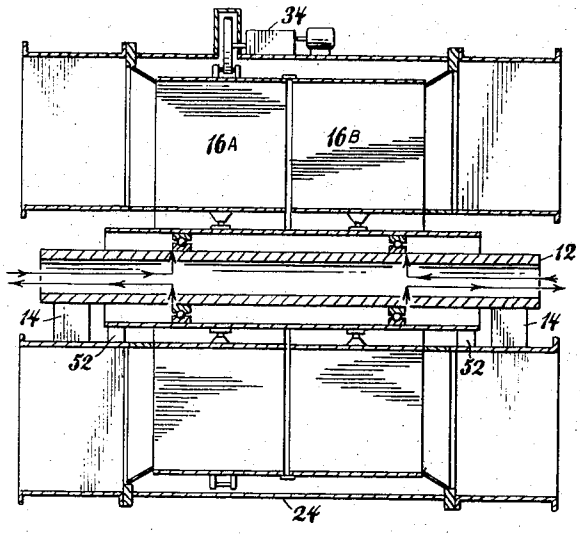


Fig. 1

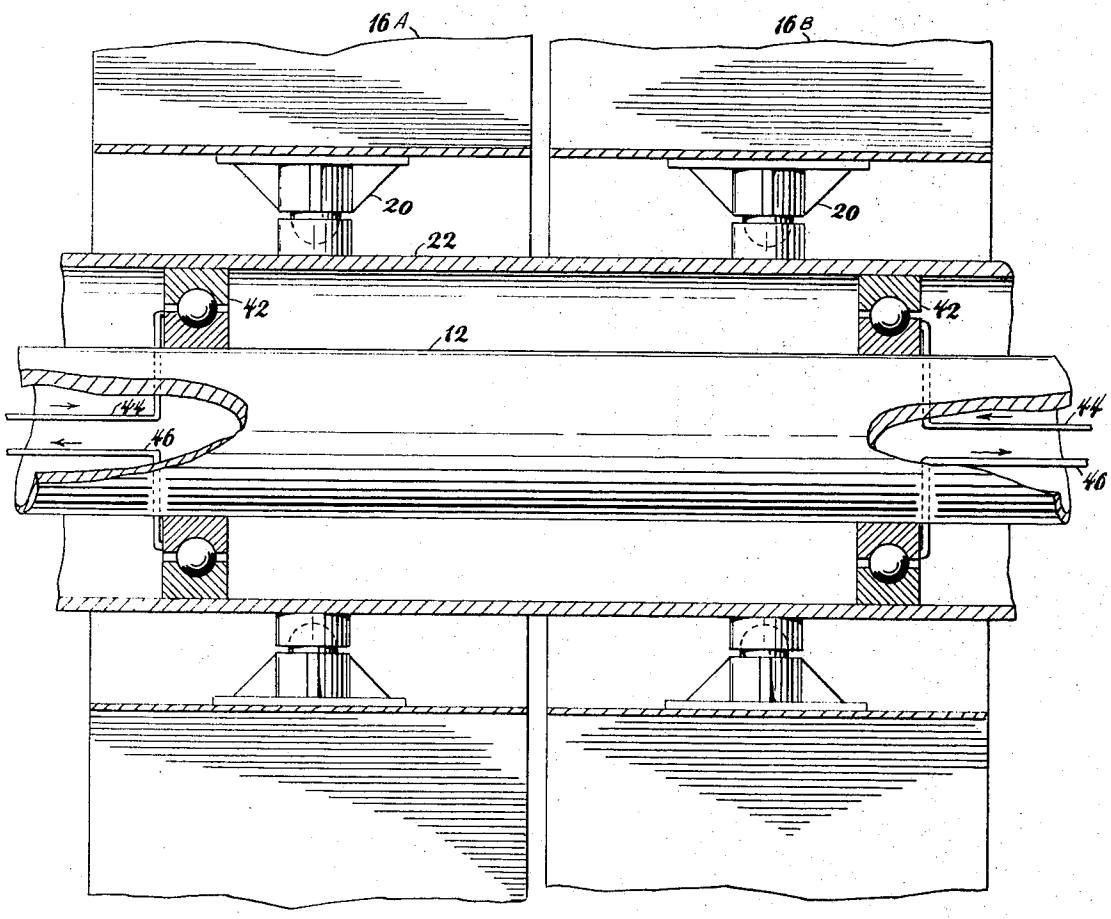


Fig. 2

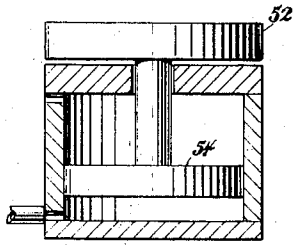


Fig. 3

HORIZONTAL SUPPORT FOR ROTARY REGENERATIVE HEAT EXCHANGER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to rotary regenerative heat exchange apparatus having a cylindrical mass of heat absorbent material that is alternately contacted by a heating fluid and a fluid to be heated. The heat absorbent material is carried in baskets suspended from a central shaft that rotates between fluids. As the heat absorbent material contacts the heating fluid it absorbs heat therefrom to in turn give it up to the fluid to be heated.

2. Description of Prior Art

Baskets containing the heat absorbent material are usually fixed to a rotor post, while the entire assembly comprising the rotor post and the heat absorbent material is being slowly rotated about its axis between ducts carrying a heating fluid and a fluid to be heated so as to subject the heat absorbent material alternately to the fluids flowing through the several ducts.

Inasmuch as the rotor rotates between ducts carrying hot and cool fluids it is inherently subjected to a cyclic heating and cooling process causing alternate expansion and contraction of the rotor that effects a warping and twisting of the rotor and the adjacent housing to destroy a critical sealing relationship therebetween. Moreover, as the rotor turns about its axis a continuous shifting of thermal stress causes a loss of strength to the rotor post and surrounding rotor due to cyclic fatigue. Furthermore, the thermal deformation of the rotor causes a cracking and breaking of the joints or weldments between differently stressed parts to effect an overall weakening of the heat exchanger and upon occasion, its complete structural failure.

SUMMARY OF THE INVENTION

The present invention relates to a rotary regenerative heat exchanger rotatably mounted on a horizontal shaft or support beam that remains fixed so that it is not rotated between hot and cool fluids to be subjected to varying temperatures with a resulting differential of expansion. Therefore, the heat exchanger of the present invention does not alternately expand and contract to break the weldments between welded surfaces or open excessive leakage paths between the relatively movable surfaces, nor is a rotor so constructed subject to loss of strength through cyclic fatigue.

BRIEF DESCRIPTION OF THE DRAWING

A more complete understanding of my inventiom may be realized by referring to the following description which may be reviewed in conjunction with the accopmanying drawings in which:

FIG. **1** is a horizontal cross-section of a horizontal rotary regenerative heat exchanger,

FIG. **2** is an enlarged cross-sectional view of a heat exchanger having a fixed horizontal shaft according to my invention, and

FIG. **3** is an enlarged cross-sectional view of a rotor lifting arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing the rotor is carried on a horizontal

support shaft **12** that is fixedly supported at each end by a stationary support **14.** The rotor is comprised of two or more axially spaced layers of heat absorbent element represented at **16A** and **16B.** Each of the layers of element is in turn comprised of a plurality of sectorial baskets arranged in lateral juxtaposition and independently hinged at **20** to a cylindrical sleeve **22** that surrounds the support shaft **12.**

The entire rotor is enclosed in a housing **24** having suitable inlets and outlets whereby a heating fluid and a fluid to be heated may be directed to and through the heat absorbent element carried by the rotor. The rotor is rotated about its axis slowly by a motor **34** that moves the compartments of heat absorbent element alternately between the heating fluid and the fluid to be heated in order that heat from the heating fluid may be transferred to the fluid to be heated through the intermediary of the heat absorbent material.

In accordance with my invention, I position bearing means **42** to support the rotor for rotation about the horizontal shaft **12** at opposite ends of the rotor intermediate the stationary support shaft **12** and the concentric cylindrical sleeve **22** so that the support shaft **12** will remain continuously fixed while the concentric sleeve **22** will be able to freely rotate. Inasmuch as each basket of element carried by the rotor is independently hinged to the cylindrical sleeve **22,** it is free to thermally expand, contract or otherwise distort independently from other baskets either radailly or axially adjacent whereby the cyclical thermal or structural stresses generated in one part of the rotor will not be imparted to the cylindrical sleeve **22,** the support shaft **12,** or other rotor structure adjacent thereto.

Inasmuch as the horizontal support shaft **12** remains fixed at all times, ducts **42** for lubricating oil may be readily directed through the cored central position thereof. Accordingly, clean oil is supplied to the several support bearings **42** through the supply duct **44,** while contaminated oil already used for lubrication of the bearings is exhausted through ducts **46.**

A rotor lifting arrangement **52** having a conventional hydraulic cylinder **54** with a suitable source of pressure fluid is located at each end of the apparatus intermediate the cylindrical sleeve **22** and fixed support means **14** and operated by conventional controls.

Upon actuation of the lifting arrangement, the cylindrical sleeve and the rotor elements attached thereto are raised free of the horizontal support shaft whereby the entire rotor is raised independent of the bearings **44,** and said bearings may then be removed for replacement or repair.

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

I claim:

1. Rotary regenerative heat exchange apparatus having a cylindrical central shaft forming a duct with ends open to the atmosphere to permit the flow of ambient air therethrough, fixed support means supporting opposite ends of said shaft, a cylindrical sleeve concentrically surrounding said shaft in spaced relation to provide an annular space therebetween open at opposite

ends to the atmosphere, a series of sector-shaped baskets arranged in lateral juxtaposition around said sleeve to form a composite rotor, means independently connecting each basket to the cylindrical sleeve, a mass of permeable heat absorbent material carried in each of the sector-shaped baskets, a housing surrounding the rotor having inlet and outlet ports for a heating fluid and a fluid to be heated to permit the axial flow of fluids through spaced baskets of the rotor, means adapted to rotate the rotor about its horizontal axis, and bearing means in the annular space between the cylindrical sleeve and the central shaft adapted to support the cylindrical sleeve for rotation about said shaft.

2. Rotary regenerative heat exchange apparatus mounted on a fixed support shaft as defined in claim **1** including a lifting means intermediate the cylindrical sleeve and the fixed support means adapted to lift the sleeve and surrounding mass of heat absorbent material radially relative to the support shaft whereby the baskets of heat exchange material are entirely supported on the lifting means.

3. Rotary regenerative heat exchange apparatus mounted on a horizontal support shaft as defined in claim **1** wherein lubrication ducts for said bearings lie longitudinally in said shaft and extend radially through the shaft to the surrounding bearings.

4. Rotary regenerative heat exchange apparatus mounted on a horizontal support shaft as defined in claim **1** wherein each basket of heat absorbent material is pivotally secured to the cylindrical sleeve.

5. Rotary regenerative heat exchange apparatus as defined in claim **1** wherein the sector-shaped baskets of heat exchange material lie in axially spaced layers.

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