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Johnsson

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[54] **REGENERATOR BODIES FOR ROTARY REGENERATIVE HEAT EXCHANGERS**

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[52] **U.S. Cl.** **165/9,** 165/10

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

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

[56] **References Cited**

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[57] **ABSTRACT**

A regenerator body for a rotary regenerative heat exchanger of the type which comprises a cylindrical outer shell and a central core, and radial partitions subdividing the annular space between the shell and the core into sectorial compartments which are in turn subdivided into sections by tangential walls. At least some of the tangential walls are yieldable in the peripheral direction of the body, by means of pairs of overlapping peripherally space slits in the walls, in order to reduce the thermal stresses arising within the body during operation of the heat exchanger.

5 Claims, 2 Drawing Figures

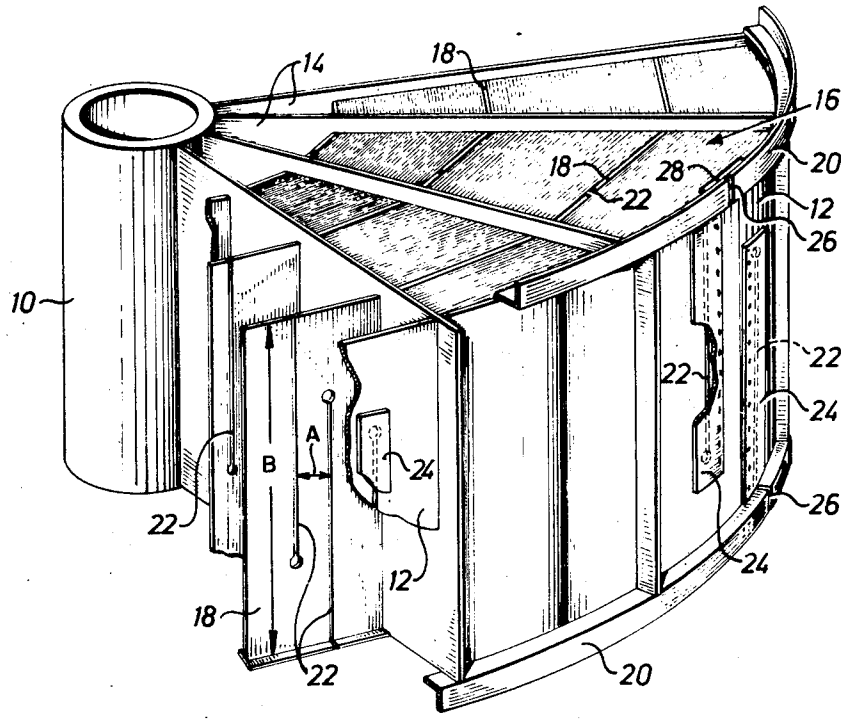


Fig. 1

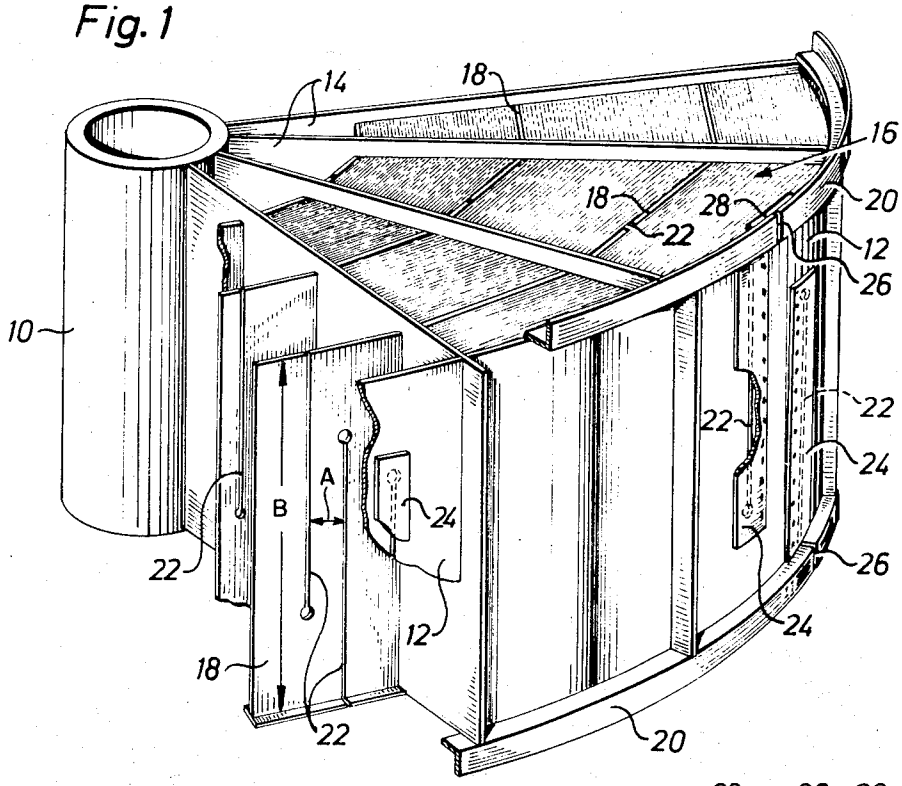
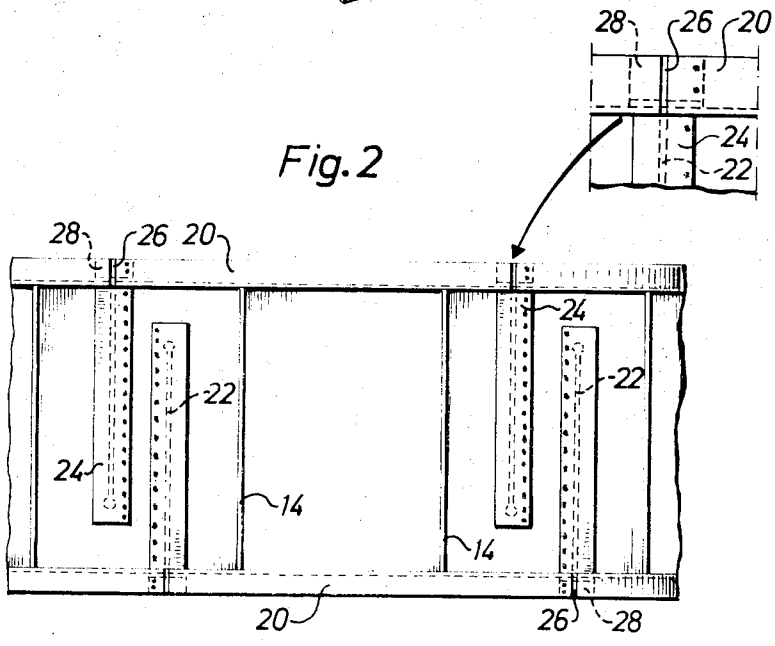

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Fig. 2


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REGENERATOR BODIES FOR ROTARY REGENERATIVE HEAT EXCHANGERS

This invention relates to rotary regenerative heat exchangers and more particularly to a regenerator body for such heat exchangers comprising a substantially central core portion, a substantially cylindrical outer shell and radial partitions interconnecting said core portion and said shell and subdividing the space between the core portion and the shell into a plurality of open-ended openended sectorial compartments for a heat exchanging mass, which compartments are in turn subdivided into sections by tangential walls, said shell forming the radially outer tangential walls of the radially outermost sections.

During operation, the regenerator body is subjected to severe thermal stresses due to temperature variations and uneven temperature distribution. Often these stresses result in fracture of weld joints and other damage.

When the heat exchanger is started from the cold condition, the radial walls or partitions and the tangential walls will be heated more rapidly than the core portion and the shell. Therefore the thermal expansion of the walls gives rise to thrust forces resulting in buckling of the walls and unfavourable stresses in the welds. On the other hand, when the walls are cooled down (for example during washing of the regenerative mass), while the shell is warm the walls are subjected to tensile forces involving heavy loads on the welds.

The present invention has for its object to provide a regenerator body in which the weld joints are relieved from dangerous load.

SUMMARY OF THE INVENTION

The regenerator body of the present invention is characterized in that at least some of the tangential wall portions are yieldable in the peripheral direction of the body. Each yieldable tangential wall portion is slotted in the axial direction of the body and according to the invention, is provided with at least two slits spaced apart in the peripheral direction and extending in axial direction of the body from opposite edges of the wall, the combined length of the slits being larger than the axial length of the wall so that said slits overlap in the axial direction.

The ratio between the peripheral width of a wall portion between two adjacent overlapping slits and the axial height of the wall portion is less than 3 to 10.

The invention will now be described more in detail with reference to the accompanying drawing in which:

FIG. 1 is a fragmentary perspective view of a rotor for a rotary regenerative heat exchanger such as an air preheater having stationary gas and air ducts and a rotating regenerative mass; and

FIG. 2 is a view of a portion of the rotor as seen in the direction of the arrow II in FIG. 1.

The regenerator or rotor body shown in the drawing comprises a central core portion or rotor post **10** and a substantially cylindrical outer shell **12.** The rotor post and the shell are interconnected by radial partitions **14** which subdivide the space between the rotor post and the shell into a plurality of open-ended sectorial compartments **16** which in turn are subdivided into sections by tangential walls **18.** These sections contain a heat exchanging mass usually consisting of plate elements.

As shown in FIG. **1** the partitions **14** extend through the shell **12** which is composed of a plurality of segments welded to the partitions and each forming the radially outer tangential wall of the radially outermost section of the respective compartment **16.** To the upper and lower edges of the shell segment and of the end portions of the partitions **14** are secured rings **20** of L-shaped cross section having cylindrical surfaces adapted to sealingly cooperate with stationary sealing strips or the like in known manner.

Each of the tangential walls **18** of every second compartment **16** is provided with two slits **22** spaced apart in the peripheral direction and extending in the axial direction of the body from opposite edges of the wall. The combined length of the slits is larger than the axial length of the wall, i.e., the two slits extend past each other or overlap in the axial direction. In this manner the walls are made yieldable in the peripheral direction of the body.

In order to prevent leakage, each slit **22** of the shell segments is covered by a plate **24** secured to the shell segment, for instance by tack welding, at one side of the slit **22.**

Each ring **20** is composed of a plurality of segments and each segment has a peripheral length substantially corresponding to the peripheral width of two compartments. The ring segments are separated from each other by gaps **26** registering with the slits **22** of the shell segment. Each gap **26** is covered by a plate element **28** secured to one of the two segment end portions forming the gap.

Since the shell **12** is yieldable in the peripheral direction it is also capable of changing its diameter under the influence of external forces produced by the partitions **14.** Thus, if the temperature of the partitions **14** is higher than that of the shell **12** the latter will be expanded by the partitions and buckling of the partitions will be prevented. If the temperature of the partitions **14** becomes lower than that of the shell **12** the latter is contracted whereby excessive tensile stresses in the partitions are obviated.

It is to be noted that the tangential walls **18** form a number of coaxial substantially cylindrical wall structures having the same properties and behaving in a similar manner as the shell **12.**

According to the general idea of the invention the tangential walls of all sectorial compartments may be yieldable in the peripheral direction. However, in order to reduce internal stresses in the body it is theoretically sufficient to make the walls of only one compartment yieldable but this would lead to untolerable deformations of the body as a whole and the reduction of the stresses would be insufficient.

The slitting of the tangential walls involves an extra cost and it is therefore desireable not to use more slitted walls than are necessary for reducing the stresses and deformations to tolerable levels. In practice it may be sufficient to provide for instance every second or every third compartment with yieldable tangential walls.

In order to make the tangential walls suitably yieldable, the width of the rectangular wall portion defined by the overlapping portions of the oppositely directed slits **22** (dimension A in FIG. 1) must not exceed about 30 percent of its axial extension or height (dimension

B in FIG. 1). Preferably said width A may amount to 15 percent to 25 percent of the height B.

I claim:

1. A regenerator body for a rotary regenerative heat exchanger comprising a core portion and a number of coaxial substantially cylindrical wall structures interconnected by a number of radial partitions welded thereto, said radial partitions dividing the regenerator body into a plurality of open-ended sectorial compartments and dividing said wall structures into a plurality of wall portions, each open-ended sectorial compartment being subdivided by wall portions of said wall structures into a number of segments for containing a heat exchanging mass,

the improvement wherein each wall structure, at least in one wall portion thereof disposed between two consecutive open-ended sectorial compartments, is provided with at least two peripherally spaced slits extending in the axial direction from opposite ends of the body and overlapping each other in the axial direction, the ratio between the peripheral width of the wall portion between two adjacent overlapping slits and the axial distance between the end points of said slits being less than 3 to 10.

2. A regenerator body as defined in claim **1**, wherein the ratio between the peripheral width of the wall portion between two adjacent overlapping slits and the axial distance between the end points of said slits is between about 1.5 to 10 and 2.5 to 10.

3. A regenerator body as defined in claim **1**, wherein a number of slitted wall portions are evenly spaced around the periphery of a substantially cylindrical wall structure and the ratio between the number of slitted wall portions of each wall structure disposed between two consecutive partitions and the number of the partitions is a maximum of 1 to 2.

4. A regenerator body as defined in claim **1**, wherein the radially outermost substantially cylindrical wall structure forming a shell of the body at each axial edge thereof carries a ring for cooperation with seals rotatably mounted relative to the body, each ring being comprised of ring segments, each of said ring segments extending between two adjacent slits in the adjoining edge of the carrying wall structure.

5. A regenerator body as defined in claim **1**, wherein said wall portions of said substantially cylindrical wall structures are substantially rectangular.

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