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HEAT EXCHANGER AND METHOD OF MAKING THE SAME

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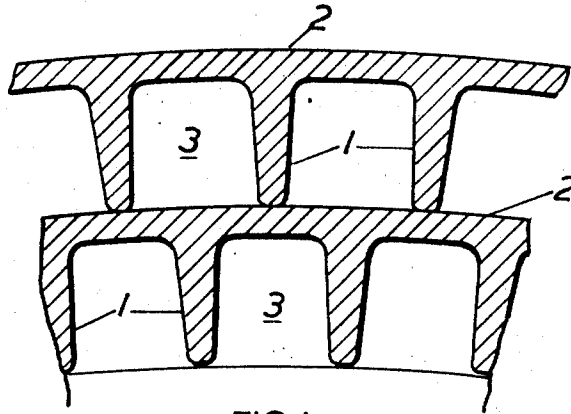


FIG. 1

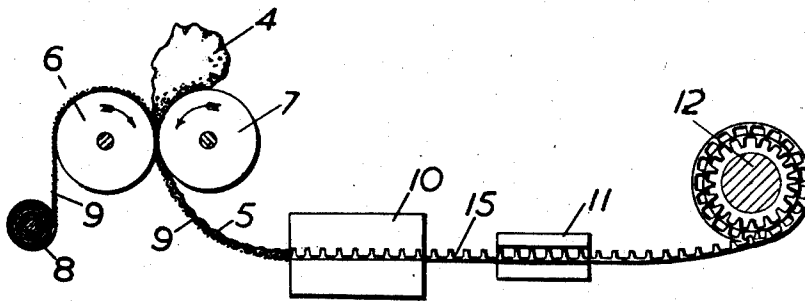


FIG. 2

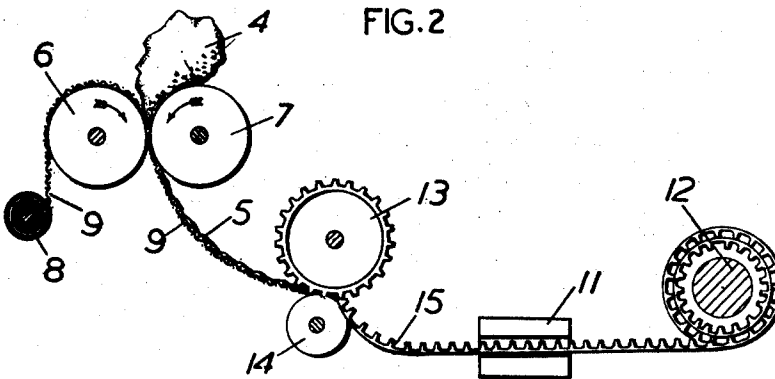


FIG. 3

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HEAT EXCHANGER AND METHOD OF
MAKING THE SAME

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3 Claims. (Cl. 25—156)

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This invention relates to improvements in heat exchangers of the regenerator type, i. e. of the kind wherein solid material—termed herein the matrix—is successively subjected to the influence of fluids at different temperatures, absorbing heat from a hotter fluid and subsequently imparting heat to a colder fluid.

The invention relates more particularly to the known kind of regenerator heat exchangers which are especially adapted for use with gas turbine engines and which comprise a matrix of ceramic or other refractory material provided with numerous passages traversing the matrix and through which the hotter and colder fluids are intended to flow in alternating succession, for example by mounting the heat exchanger for rotation so that each portion of the matrix rotates successively through the hotter and colder fluids.

The invention provides a convenient construction and a convenient method of manufacture of such heat exchangers.

According to the invention a heat exchanger of the kind described comprises a strip of ceramic material provided with ridges and wound or wrapped to provide a matrix structure having a plurality of superposed layers so that the ridges form passages traversing the said structure.

In the convenient form a heat exchanger according to the invention comprises a strip of ceramic material of which one side is formed with transverse ridges and of which the opposite side is substantially flat, said strip being arranged in the form of a cylindrical roll so that the ends of the ridges abut against the flat side to form axially directed passages.

According to a further feature of the invention a heat exchanger of the kind described is produced by forming a plastic mass of ceramic material into a continuous strip, impressing ridges on said strip, winding or wrapping said strip so as to form a matrix structure having a plurality of superposed layers so that the ridges form passages traversing the structure, and firing the said structure.

The strip may be impressed with transverse ridges on one side while the opposite side is left substantially flat, and the strip may be rolled so as to form a cylindrical roll and so that the ends of the said ridges abut against the flat side to form axially directed passages.

Preferably a layer of webbed or gauze material of a non-refractory nature, for example of cloth, is applied to the ceramic strip before the ridges are formed, in order to increase the strength of

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the strip. After the ridges have been formed the ceramic strip may be subjected to a preliminary drying process and after the strip has been wrapped or rolled the whole assembly is fired, whereby the gauze layer is burnt off and the different layers become rigidly fixed together to form a permanent structure.

In the accompanying drawings:

Figure 1 is an enlarged transverse section of part of one form of a heat exchanger constructed according to the invention;

Figure 2 shows diagrammatically one method of manufacture according to the invention;

Figure 3 shows diagrammatically another method of manufacture according to the invention.

In Figure 1 two superimposed ceramic layers are shown, each of which is formed on one side with transverse ridges 1, while the opposite side 2 is substantially flat so that when the ends of the ridges 1 abut against the side 2, axially directed passages 3 are formed.

In Figure 2 a plastic mass of ceramic material 4 of the consistency for example of fairly stiff putty is passed between a pair of oppositely rotating rollers 6, 7 so as continuously to form by pressure a strip 5 of ceramic material. At the same time a gauze or webbing strip 9 fed from a roll 8 is continuously passed between the same pair of rollers so that the ceramic strip 5 is applied on its lower surface a strip 9 of similar dimensions. The composite strip then passes through a press 10 by means of which projections are formed in the upper surface in the form of a series of parallel ridges directed at right angles to the longitudinal edges of the strip. The latter is then dried by passing through a heater 11 and is subsequently wound on to a cylindrical core 12.

After a sufficient number of layers have been wound on the core, the strip is cut and the whole assembly removed and fired in a suitable furnace whereby the strip 9 is burnt off, and after removal of the core 12 the cylindrical ceramic annulus so formed may then be cut up if required into cylinders or discs of the desired thickness.

The ceramic material may contain a proportion of thermoplastic ingredient in order to prevent the drying process from rendering the strip 5 too stiff to be wound on the core 12.

In the alternative method shown in Figure 3 the ceramic strip 5 after being provided with a gauze layer 9 as in the above described method is formed with ridges by passing it between two rollers 13, 14 of which roller 13 is provided with suitable flutes or projections adapted to form the

required ridges while the other roller 14 is adapted to direct the deformed strip 15 out of the path of roller 13, in order to prevent damage to the ridges after they have been formed. The remainder of the process is similar to that described above.

I claim:

1. The method of producing a regenerative rotary heat exchanger comprising the steps of forming a plastic mass of ceramic material into a continuous strip as a coating on a strip of non-refractory webbing, impressing transverse channels on one face only of said strip to form transverse walls, winding said strip into a roll so that the ends of the transverse walls abut against the opposite face of the strip to separate the convolutions of the roll and form axial passages through said roll, and firing the structure to obtain a rigid matrix having a large heat-exchanging surface area.

2. The method of producing a regenerative rotary heat exchanger comprising the steps of forming a plastic mass of ceramic material containing a thermo-plastic ingredient into a continuous strip of non-refractory webbing, impressing transverse channels on one face only of said strip to form transverse walls, subjecting the said strip to a preliminary drying process, winding said strip into a roll so that the ends of the trans-

verse walls abut against the opposite face of said strip to separate the convolutions of the roll and form axial passages through said roll, and firing the structure to obtain a rigid matrix having a large heat exchanging surface area.

3. A regenerative rotary heat exchanger comprising a spiral coil of superimposed courses of a strip of molded rigid refractory material, one face of said strip being smooth, continuous and regular and the other face of said strip having a plurality of transverse walls extending therefrom, the free ends of the transverse walls lying in contact with the smooth face of an adjacent coil of the strip to define therewith axial passages extending through the structure.

HENRY COHEN.

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