Nov. 4, 1952 A. J. J. LAMBEEK 2,616,672

HEAT EXCHANGER

Filed July 15, 1950

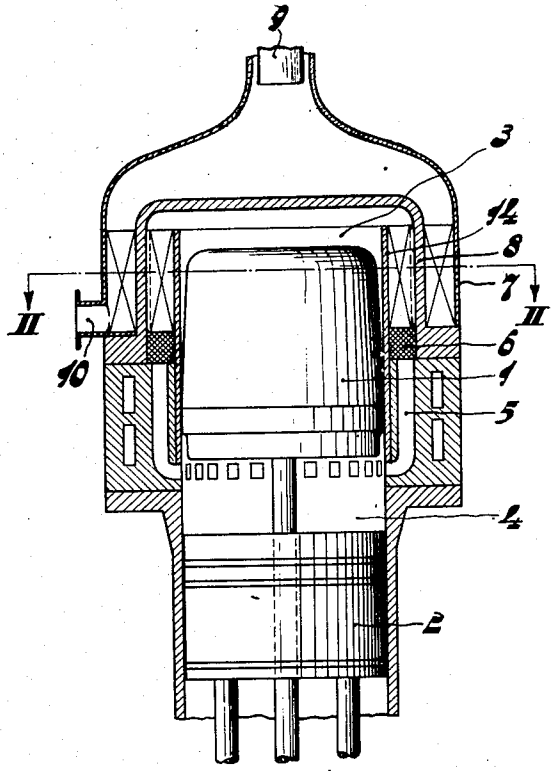


Fig. 1.

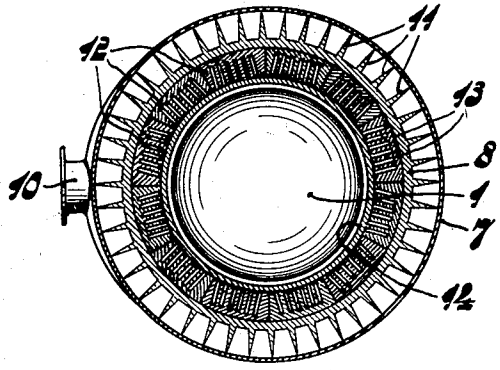


Fig. 2.

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Patented Nov. 4, 1952 2,616,672

UNITED STATES PATENT OFFICE

2,616,672

HEAT EXCHANGER

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Application July 15, 1950, Serial No. 174,025
In the Netherlands August 17, 1949

3 Claims. (Cl. 257—261)

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This invention relates to heat exchangers having a cylindrical wall through which the heat exchange takes place. With heat exchangers of this type a medium passes over the exterior of the cylindrical wall and is in heat-exchanging contact, through the wall, with another medium passing over the interior of the cylindrical wall. As a rule, the wall of such a heat exchanger is furnished, both externally and internally, with projecting parts e. g. ribs. It is also known to provide a strip of material, for example, zig-zag in section, at the inner side of the wall, thus forming channels for the working medium and considerably increasing the heat exchanging surface of the wall. However, these constructions have a limitation in that the provision of uniform folds in the material is comparatively difficult. In another known construction, the ribs and the wall are formed integrally by casting. This construction also has the disadvantage that a precise construction entails difficulties. The aforesaid known constructions are often used in hot-gas reciprocating apparatus, which term is to be understood to include hot-gas reciprocating engines and refrigerating apparatus operating according to the reversed hot-gas reciprocating engine principle.

The present invention has for its object to provide a heat exchanger of simple construction in which the channels for the working medium are of a correct size.

According to the invention, a heat exchanger having a cylindrical wall through which heat exchange is to take place is characterized in that segments, jointly constituting a cylinder, are provided at the interior of the wall and throughout its periphery, at least part of he said segments being provided with channels for passage of a medium to be in heat exchanging contact with the wall. The aforesaid segments are cheaply obtainable, for instance, by extrusion, drawing or milling.

In order to ensure a satisfactory heat transfer through the wall to the segments, the interior of the cylindrical wall may be subject to surface pressure exerted by the cylinder consisting of segments. Thus, the outer diameter of the cylinder consisting of segments may exceed the inside diameter of the cylindrical wall. Due to this the material of the segments becomes deformed on insertion, for example, with the use of thermal shrinking into the cylindrical wall, thus ensuring an intimate contact between the segments and the cylindrical wall.

The segments may be secured to the wall by

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soldering, which may be effected without the use of special tools. The soldered joint is corrosion proof, since only a small surface area of the joint is exposed to the air.

The channels provided in the segments may extend according to a generatrix of this segment and terminate at a cylindrical surface thereof.

For the manufacture of the segments, it is advantageous if the side walls of the channels extend parallel to one another in such segment.

In order that the invention may be more clearly understood and readily carried into effect, it will now be described in greater detail with reference to the accompanying drawing, given by way of example, which represents diagrammatically a hot-gas reciprocating engine comprising one embodiment of a heat exchanger according to the invention.

Fig. 1 is a longitudinal section of part of the engine and Fig. 2 is a section taken on the line II—II of Fig. 1.

The hot-gas reciprocating engine comprises a displacer 1 and piston 2 reciprocating with a constant phase difference and connected to a driving mechanism (not represented). The space above the displacer is the hot space 3, whereas the space between the displacer and the piston is the cold space 4. The spaces 3 and 4 are interconnected through a cooler 5, a regenerator 6, and a heater 7. The heater has a cylindrical wall 8 over the exterior of which the combustion gases pass. These gases are supplied from a burner 9 to the heater 7 and escape therefrom through a channel 10. As is shown in Fig. 2, the cylinder 8 is provided with external ribs 11 and internal segments 12 are provided having channels 13 which extend according to a generatrix of the segment and terminate at the cylindrical inner surface of this segment. The side walls of each channel extend parallel to one another. For convenience of manufacture, it may be advantageous if the side walls of all the channels in each segment are parallel to one another. In order to separate the hot space from the space within the heater, a cylinder 14 is provided within the segments.

It will be obvious that the use of the heat exchanger according to the invention is not limited to hot-gas reciprocating apparatus, but may also be used in other apparatus.

What I claim is:

1. A heat exchanger having a cylindrical wall through which heat exchange is to take place, a plurality of segments provided on the inner periphery of said wall and jointly constituting a

cylinder thereon, part of each segment being formed with channels for the passage of a medium to be in heat exchange contact with the wall, each of said channels extends according to the generatrix of the segment and each channel terminates at a cylindrical surface of the segment, and the side walls of each channel extending substantially parallel to each other and each channel being of substantially the same dimensions and spaced away from said wall.

2. A heat exchanger having a cylindrical wall through which heat exchange is to take place, a plurality of segments secured to the inner periphery of said wall by soldering and jointly constituting a cylinder thereon, part of each segment being formed with channels for the passage of a medium to be in heat exchange contact with the wall, each of said channels extends according to the generatrix of the segment and each channel terminates at a cylindrical surface of the segment, and the side walls of each channel extending substantially parallel to each other and each channel being of substantially the same dimensions and spaced away from said wall.

3. A heat exchanger having a cylindrical wall through which heat exchange is to take place, said wall being provided with a plurality of external ribs on the outer periphery of said wall, a plurality of segments provided on the inner periphery of said wall and jointly constituting a cylinder thereon, the outer diameter of said

cylinder exceeding the inner diameter of said cylindrical wall so that the cylindrical wall is subject to surface pressure by said cylinder when mounted on said inner periphery, part of each segment being formed with channels for the passage of a medium to be in heat exchange contact with the wall, each of said channels extends according to the generatrix of the segment and each channel terminates at a cylindrical surface of the segment, and the side walls of each channel extending substantially parallel to each other and each channel being of substantially the same dimensions and spaced away from said wall.

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