

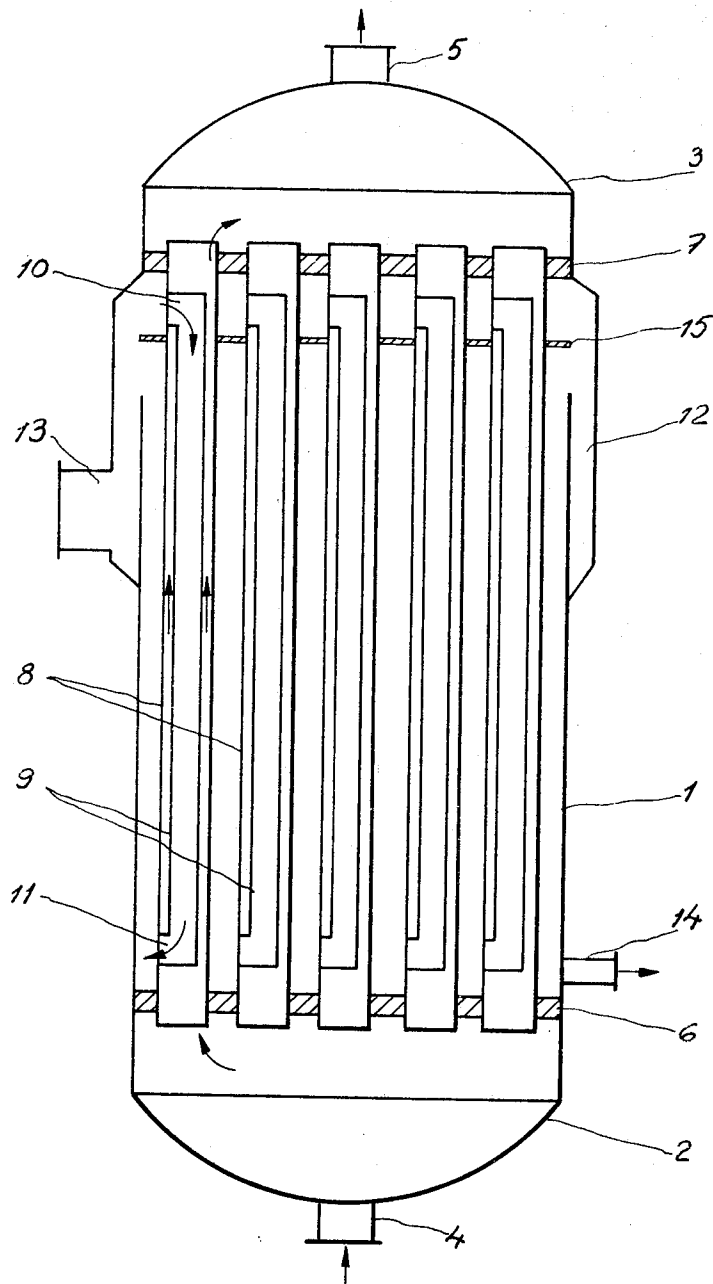
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TUBE HEAT EXCHANGER

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TUBE HEAT EXCHANGER

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1 Claim

ABSTRACT OF THE DISCLOSURE

The present invention relates to a tube heat exchanger having outer and inner tubes, the outer tubes having open ends and being secured in two tube plates, and the inner tubes opening through the walls of the outer tubes into the space between the tube plates, the medium to be heated flowing through the spaces between the outer and the inner tubes, and the heating medium flowing through said space and from there through the inner tubes, means being provided for to control the distribution of the heating medium between said space and the inner tubes.

BACKGROUND OF THE INVENTION

Tube heat exchanger or heating units with double tubes are previously known. In a prior known construction the outer of the double tubes is closed at its upper end, so that the medium will flow in one direction through the inner tube and then back in the opposite direction through the outer tube the outer and inner tubes being secured to their respective tube plates at the same end of the tubes. Heat transfer from the heating medium to the medium to be heated thus takes place only from one side of the heated medium through the tube walls. In another prior known construction the outer tubes are secured between two tube plates and open at both ends, while the inner tubes are arranged in the same manner as in the embodiment described above, in the form of double tubes closed at one end and secured to their respective tube plates. Since the medium to be heated flows through the outer tubes, heat exchange to the same will take place from both sides and thus more effectively than in the first mentioned case. The construction becomes, however, considerably more complicated in that four tube plates are required, which, of course, complicates the sealing problems as well as supervision, cleaning and repair.

According to another proposal double tubes are inserted in two tube plates only, the inner tubes opening through the walls of the outer tubes into the space between the tube plates. The inner tubes have been provided with longitudinal ribs which renders the construction rather complicated and expensive and also vulnerable for incrustation. In this prior known heat exchanger the circulation of heating medium through the inner tubes has been poor which fact has adversely affected the heat transfer.

SUMMARY OF THE INVENTION

The present invention provides a heat exchanger with effective heat transfer from the heating medium to the heated medium and of a more simple construction than that of prior known heat exchangers of corresponding type. In the heat exchanger according to the invention there are standard outer and inner tubes, the inner tubes being provided with inlets resp. outlets for the heating medium, said inlets resp. outlets extending through the wall of the adjacent outer tube and opening at opposite sides of the tube plates with respect to the inlets resp.

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outlets of the outer tubes. According to the invention an effective flow of heating medium through the inner tubes is provided by introducing the heating medium into the space surrounding the outer tubes through an annular slot, a baffle plate being inserted in said slot for the distribution of heating medium between said space surrounding the outer tubes on one hand and the inner tubes on the other hand.

A heat exchanger according to the invention thus has only two tube plates, and one outer tube with one inner tube form a unit, which facilitates tube replacement. Also with respect to tube connections the new heat exchanger is simplified, in that only one inlet resp. one outlet for the heating medium is required. With respect to tube heat exchangers with heat transfer only at one side, the inventive heat exchanger has the great advantage, that it is possible at constant volume to increase the capacity of the heat exchanger by from 50 to 60 percent, or inversely, at the same capacity to decrease the dimensions of the heat exchanger correspondingly.

DESCRIPTION OF THE DRAWING

The accompanying drawing shows schematically one embodiment of the invention in longitudinal section.

DETAILED DESCRIPTION

In the drawing the numeral 1 denotes a cylindrical housing, provided with end portions 2 and 3, having inlet and outlet connections 4 and 5 respectively for the medium to be heated which flows in the direction indicated by arrows. Two tube plates 6 and 7 are provided in the housing, to which plates a plurality of tubes 8 are secured in any suitable manner prior per se known, such as by expanding. Each tube 8 is provided with a substantially coaxially situated inner tube 9 which has an inlet 10 extending through the wall of the outer tube 8 and an outlet 11 arranged in a corresponding manner. Said inlets and outlets can be provided e.g. by cutting the tube ends at an angle of 45° and by welding the severed ends together with the tube together with the end portions only just can be inserted into an outer tube 8. The latter is provided with openings for the end portions 10, 11, correspondingly spaced, and the end portions are passed so far into the openings that the tube 9 will be substantially coaxial with the tube 8, after which the end portions are secured by welding, and any protruding portions are removed. Thus an outer tube 8 and an inner tube 9 form a fixed unit. The medium to be heated is arranged to flow in the space between the tubes 9 and 8. The end portions constitute hereby naturally a certain flow obstruction, but by virtue of their flow favoring circular cross section this obstruction is of no substantial practical importance.

The heating medium which suitably can consist of steam, is arranged to flow on the one hand on the outside of the outer tubes 8 and on the other hand through the inner tubes 9, 10, 11. The drawing shows a steam pipe 13 connected to a distributing hood 12 on the housing 1, while the numeral 14 denotes a condensate outlet from the space between the tube plates 6, 7 in the housing 1. To ensure a uniform distribution of the steam between the inner tubes 9, 10, 11 and the space around the outer tubes 8, a distributing plate 15 is provided below the openings 10 at such a level that the ratio between the openings formed at the periphery above and below the distributing plate will give the desired uniform distribution.

The heat exchanger according to the invention may further be partitioned into sections, and be provided with guiding means so that the medium to be heated, after having flown through one section, will be guided back through another section for further heating.

We claim:

1. A heat exchanger comprising an elongated casing, two partitions extending transversally in said casing at a distance from each other and defining end compartments at the opposite ends of said casing, a plurality of parallel outer tubes having open ends extending from one end compartment through said partitions into the other end compartment, an inner tube extending coaxially within each of said outer tubes, the ends of said inner tube opening through the wall of said outer tube into the space between and adjacent to said partitions, an inlet for a heat receiving medium connected to one of said end compartments, an outlet for said medium connected to the other end compartment, a jacket having an inlet for a heat delivering medium encircling said casing adjacent to one of said partitions, said partition and said casing forming between them a substantially annular slit, an outlet for said heat delivering medium connected to said casing adjacent to the other of said partitions, and a plate extend-

ing substantially in parallel with said partitions between said outer tubes into said annular slit for the distribution of said heat delivering medium on said inner tubes and the space surrounding said outer tubes respectively.

References Cited

UNITED STATES PATENTS

2,740,803	4/1956	Dorschner	165—106
3,170,511	2/1965	Guthrie	165—154

FOREIGN PATENTS

1,274,618	9/1960	France.
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