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TUBULAR HEAT EXCHANGER WITH CORES

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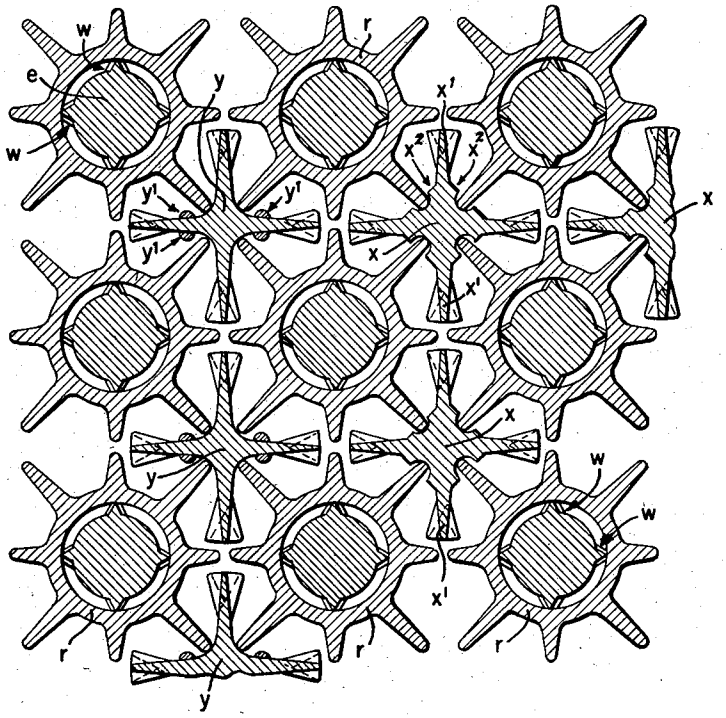


FIG. 1.

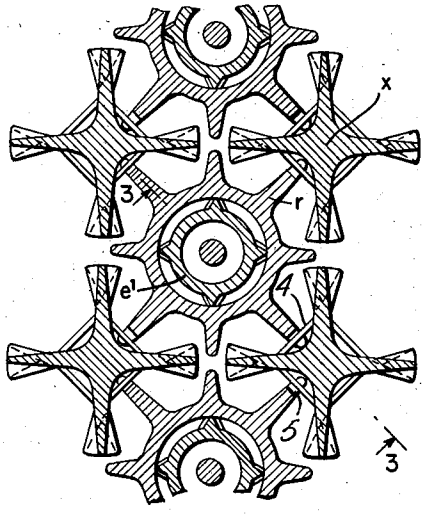


FIG. 2.

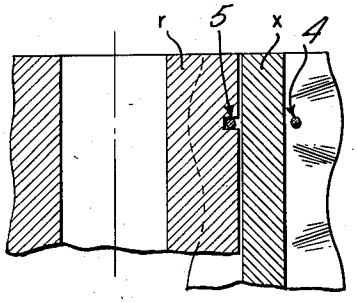


FIG. 3.

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TUBULAR HEAT EXCHANGER WITH CORES

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6 Claims. (Cl. 257—262.14)

The present invention concerns a tubular heat-exchanger in which the tubes are provided with longitudinal fins and are arranged in rows, with their axes parallel, inside the exchanger through which the fluid circulating on the outside of the tubes flows parallel to the axes of the tubes. For exchangers of this type, it has already been suggested to fit external solid cores in the spaces existing between the tubes.

According to the present invention, the external cores arranged between the finned tubes of the exchanger are themselves provided with fins which are set between the fins of the tubes and, as the case may be, are of a different number from that of the fins provided on the tubes. Preferably the fins of the core are waved along their length.

Moreover, on the body of the external core, or on the faces of its fins, are provided hollows, or stop cleats, in which or against which, are set the ends of the fins of the tubes adjoining the core. In that way, the said cores have a fourfold effect: they divide up the empty spaces between the tubes; in those spaces, due to the waved fins they provide the variations of section and of direction which influence the exchange of heat; they act as stays to keep the exchanger tubes in proper place arranged in regular rows or in quincunxes, as the case may be; finally, due to the fact that the tube fins come in contact with the cores, the heat is transmitted by conduction from the core to the finned tubes or vice versa.

The exchanger tubes may contain internal cores. To provide the core inside the finned tube of the exchanger, can be used a tubular pipe so as to provide three possible circuits for the fluids in the exchanger, and instead of losing the space caused by the presence of a solid core in each finned tube, to make use of part of that space for additional circulation.

The following description will show clearly how the invention can be realized.

Fig. 1 is a sectional view of part of a heat exchanger, according to the invention.

Fig. 2 is a sectional view of part of the exchanger shown in Fig. 1, with hollow cores inside the tubes.

Fig. 3 is a section through line III—III of a detail of Fig. 2.

In Fig. 1, the tubes r finned on the outside, are disposed in regular rows. As will be seen, the section of those tubes is inscribed in a square and the outer fins provided on the tubes for that purpose are of different lengths. It will be seen that the fins ending in the angles of the square are somewhat shortened in such a way that the square has blunted angles. As a consequence, between four adjoining tubes r, the axes of which are at the angles of a square, it is possible to fit a core x the body of which is arranged between the ends of the fins of the four adjoining tubes, the axis of the core coinciding with the center of the square. The core x possesses four fins x^1 which take their place in between the tubes r, in such a way as to subdivide the gap included between the fins of the tubes.

The body of the core x can be provided with a groove x^2 as is seen on the right of Fig. 1, to enable the points of the fins of the tubes r to fit into those grooves which define a housing which insures the wedging of the pipes and at the same time their maintenance in place.

Preferably, the fins x^1 are waved along their length as a result of which will occur, in the gaps produced between the fins x^1 and the fins of the tubes r, variations of direction and of section which, as already known, influence favorably the exchange of heat. At the time of assembling, a horizontal row of finned tubes r having been put in place, the cores x can then be arranged either by introducing them through the top or by slipping them in horizontally, on the two fins of the tubes with which the said cores are to cooperate.

In an alternative embodiment, likewise shown on the left of the drawing, the exterior core y has not been grooved in the manner of the x cores, but those grooves are replaced by welding-points y^1, applied at intervals along the surfaces of the horizontal fins. Those welding points form blocks for the fins of the tubes r with which the cores in question cooperate. That construction facilitates manufacture of the cores y which is thus made more economic. On the other hand, it enables the tubes r and the cores y to be put in place by packing in successive horizontal layers.

On the inside of the tubes r, there can be provided solid cores e, on which appear ribs or fins w waved longitudinally, or rolled spiralwise; the effect of these ribs is to cause variation of the section and of the direction of the intervals provided for between the said cores e and the inner surface of the tubes r.

In Fig. 2, the pipes, instead of being blocked up partially by a solid core, are blocked by a tubular core e^1. The tubular core e^1 is provided on the outside, with ribs w as in the case of the solid core.

The tubular form of the core e^1 makes it possible above all to cause circulation of a fluid on the inside of the core; the fluid can be the one circulating on the outside of the tubes r, which, in that way, passes on both sides of the fluid circulating on the inside of the tubes r and outside the cores e^1.

When the tubes of the exchanger are arranged vertically, the fins r of the finned tubes fit, by their points, into the grooves of the exterior cores x. In those hollows, at the top of the cores x, there is provided a small stay-piece, which fits into a notch 5 made at the top of the fin, as seen in Fig. 3. In that way, the outer cores x are of use as points of suspension for the finned tubes r.

What I claim is:

1. In a tubular heat-exchanger made of parallel rows of tubes provided with longitudinal fins, cores fitted on the outside of the tubes and between the tubes, said cores being provided with waved fins adapted to be set in between the fins of the tubes.

2. In a tubular heat-exchanger made of parallel rows of tubes provided with longitudinal fins, cores fitted on the outside of the tubes and between the tubes, said cores being provided with waved fins adapted to be set in between the fins of the tubes, and inner cores provided on the inside of the tubes and ribs provided on said inner cores.

3. In a tubular heat-exchanger made of parallel rows of tubes provided with longitudinal fins, cores fitted on the outside of the tubes and between the tubes, said cores being provided with waved fins adapted to be set in between the fins of the tubes, and inner cores provided on the inside of the tubes with waved ribs on said inner cores.

4. In a tubular heat-exchanger made of parallel rows of tubes, provided with longitudinal fins, cores fitted on the outside of the tubes and between the tubes, said cores being provided with waved fins adapted to be set in be-

tween the fins of the tubes, and inner cores made of hollow tubes provided on the inside of the tubes with waved ribs on said inner cores.

5. In a tubular heat-exchanger made of parallel rows of tubes provided with longitudinal fins, cores fitted on the outside of the tubes and between the tubes, said cores being provided with waved ribs adapted to be set in between the fins of the tubes, means provided on the outer cores to be used as housing for the points of the fins of the tubes adjacent said outer cores.

6. In a tubular heat-exchanger made of parallel rows of

tubes provided with longitudinal fins, cores fitted to the outside of the tubes and between the tubes, said cores being provided with waved fins adapted to be set in between the fins of the tubes, a stay-piece being provided between the fins of the outer cores at the ends of said cores and adapted to fit into a notch provided in the fin of the tube which comes into contact with the outer core.

References Cited in the file of this patent

UNITED STATES PATENTS

1,921,927 Jones et al. ---------- Aug. 8, 1933