

June 20, 1967

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ARRANGEMENT FOR FASTENING SPIRAL WIRE SPACERS
IN TUBULAR HEAT EXCHANGERS
Filed Feb. 2, 1966

3,326,282

Fig. 1.

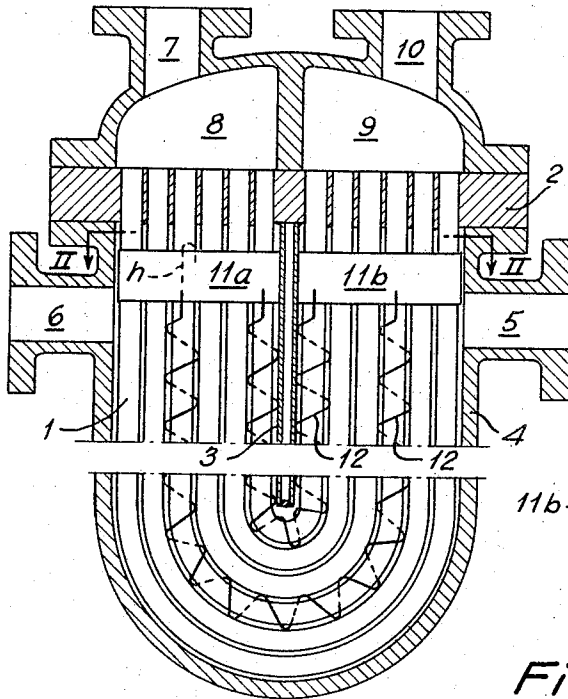


Fig. 3.

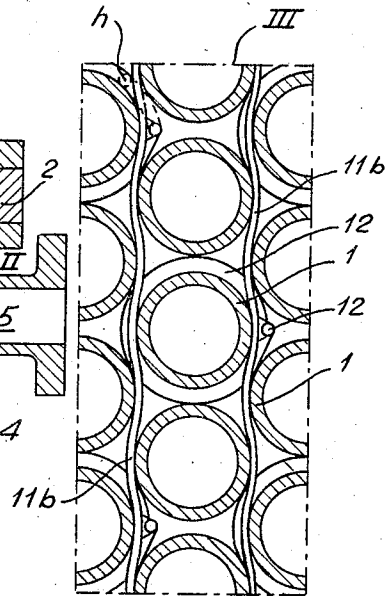


Fig. 2.

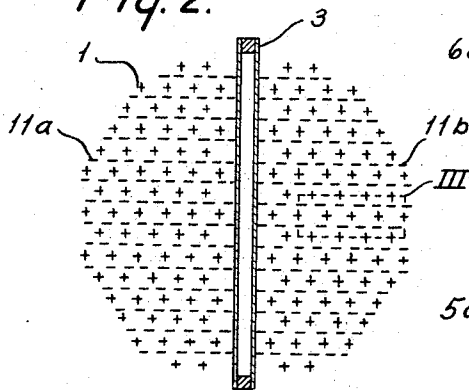
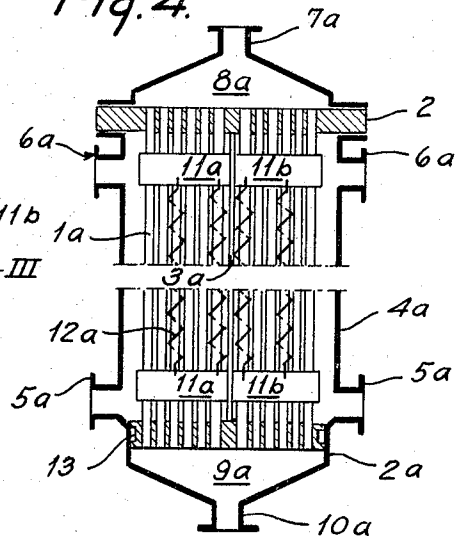


Fig. 4.



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ARRANGEMENT FOR FASTENING SPIRAL WIRE SPACERS IN TUBULAR HEAT EXCHANGERS

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Filed Feb. 2, 1966, Ser. No. 524,396

Claims priority, application Sweden, Feb. 8, 1965, 1,564/65

1 Claim. (Cl. 165—172)

ABSTRACT OF THE DISCLOSURE

An arrangement for fastening spiral wire spacers in a tubular heat exchanger. The heat exchanger has a tube bundle which is mounted in a tube sheet and extending generally normal thereto, such tube bundle containing rows of parallel tubes in spaced relation. Every third tube in each row thereof is encircled by a helical wire which spaces adjacent tubes from the encircled tube.

The arrangement of the invention includes thin metal wall members extending between adjacent rows of tubes adjacent each end of the helical wires, means to secure the wall members in fixed relation with respect to the tube sheet, and means securing the ends of the helical wires to the respective wall members.

It has been known previously to maintain the wire helix extended around the tube fastened in place by welding its ends either to the tube or to the tube sheet between the adjacent tubes. However, both of these methods involve considerable disadvantages. Thus, when welding the wire to the tube it is difficult to avoid burning through the tube wall, and when welding to the tube sheet difficulty arises first because there is little space for the welding and second because of the poor temperature balance which during welding arises between the tube sheet and the wire which is thin compared to the tube sheet. This temperature unbalance is particularly troublesome when thick tube sheets are involved.

The invention concerns an arrangement wherein the helical wire can be fastened without the mentioned difficulties and is characterized mainly in that this helical wire at each end is secured to a thin metal sheet wall which is fastened in fixed relationship with respect to the tube sheet and is arranged in the interspace between a row of tubes in which the tube encircled by the wire helix is located and an adjacent row of tubes.

The invention will now be more fully described with reference to the accompanying drawing wherein:

FIG. 1 illustrates a side sectional view of a tubular heat exchanger provided with fastening device according to the present invention;

FIG. 2 shows a cross section view of the tube bundle taken along line II—II in FIG. 1 showing the positions of the tubes and the fastening devices respectively;

FIG. 3 shows a fragment III of the cross section view of FIG. 2 in a larger scale; and

FIG. 4 shows a side sectional view of a further embodiment of a heat exchanger according to the invention.

All figures are merely schematic and are intended to serve as examples only, without limiting the invention. Identical details are designated with the same reference characters in the various figures.

In FIG. 1 a bundle of tubes 1 is mounted in a thick tube sheet or end wall 2. The tubes are bent like a U around a partition 3 which is also fastened to the tube

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sheet and diametrically divides the space in the cylindrical container or shell 4 surrounding the tube bundle and closed by the tube sheet. One of the heat exchange mediums is for example led into the container 4 via connection piece 5 and out via connection piece 6 while another heat exchange medium passes through the tubes, suitably in counterflow, in via connection piece 7 and chamber 8 and out via distribution chamber 9 and connection piece 10.

As shown in FIG. 3, every third tube 1 of each row thereof is encircled by a helical wire 12, the other tubes being free from helical wires. The tubes 1 (indicated only + in FIG. 2) are arranged on a triangular pitch in rows on both sides of partition 3 which is furnished with wings 11a, 11b of thin sheet metal extending out from respective sides of the partition. According to the invention each helical wire 12 surrounding a tube has one end welded against the side of wing 11a and its other end welded against the side of wing 11b. The partition 3, being fastened to the tube sheet 2, thus indirectly fastens the wall members 11a, 11b to the tube sheet.

The tube sheet, tubes with helical wires, and partition with wings together form a tube bundle removable from shell 4. This removable construction may be assembled in the following manner: The tubes, with and without helical wires, are introduced in horizontal position into the tube sheet, horizontal row after horizontal row starting from below and building upward. After each row is completed wings 11a, 11b are placed on top of the row and welded to the partition. The ends of the helical wires are welded to the free upper side of these wings. Thereafter the next row of tubes is introduced and the next sheets are applied whereupon the next welding operations are carried out etc. until the tube bundle is completed. In this manner the welding can be easily performed with a good heat balance between the wire and the thin wing.

The possibility of applying the invention in this manner is, of course based on the provision of the removable tube bundle but it is not essential that the tubes be U-shaped for practicing the invention. FIGURE 4 shows as an example an embodiment of a heat exchanger with a removable tube bundle having straight tubes. The straight tubes 1a extend between an upper tube sheet 2 and a lower tube sheet 2a which is tightly fitted into the lower portion of shell 4a by means of a packing in groove 13. The top of the shell 4a is closed by the upper tube sheet. A partition 3a also extends between the tube sheets and this partition is furnished with wings 11a and 11b to which the ends of helical wires 12 are fastened. In this embodiment individual tubes, even those which are provided with helical wires, may easily be replaced because the wire remains in place in the bundle when such a tube is drawn out. The first heat exchanging medium is for example led in through the shell 4a via the two connection pieces 5a and out via the two connection pieces 6a, while the other heat exchanging medium is led through the tubes, suitably in counterflow, in via connection piece 7a and chamber 8a and out via chamber 9a and connection piece 10a. Of course it is also possible to arrange single connection pieces 5a and 6a so that the first heat exchanging medium is distributed on both sides of partition 3a and/or this partition may be replaced by another arrangement for anchoring wings 11a, 11b which does not partition the shell. For example the center portion of the partition between the two groups of wings may be omitted.

Instead of welding the ends of the helical wires they may be hooked fast to the wings as is shown by the dashed lines h in FIG. 1 and FIG. 3.

What I claim is:

In a tubular heat exchanger having a tube bundle and a tube sheet mounting the tube bundle, said tube bundle containing rows of parallel tubes in spaced relation extending from the tube sheet generally normal thereto, and a helical wire encircling every third tube of each row thereof to space adjacent tubes from the wire-encircled tube, the improved arrangement for fastening the helical wires which comprises thin sheet metal wall members extending between adjacent rows of tubes adjacent each end of the helical wires, means to secure the wall members in fixed relationship with respect to the tube sheet, and means securing the ends of the helical wires to the respective wall members.

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