

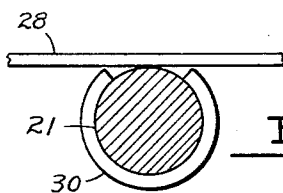
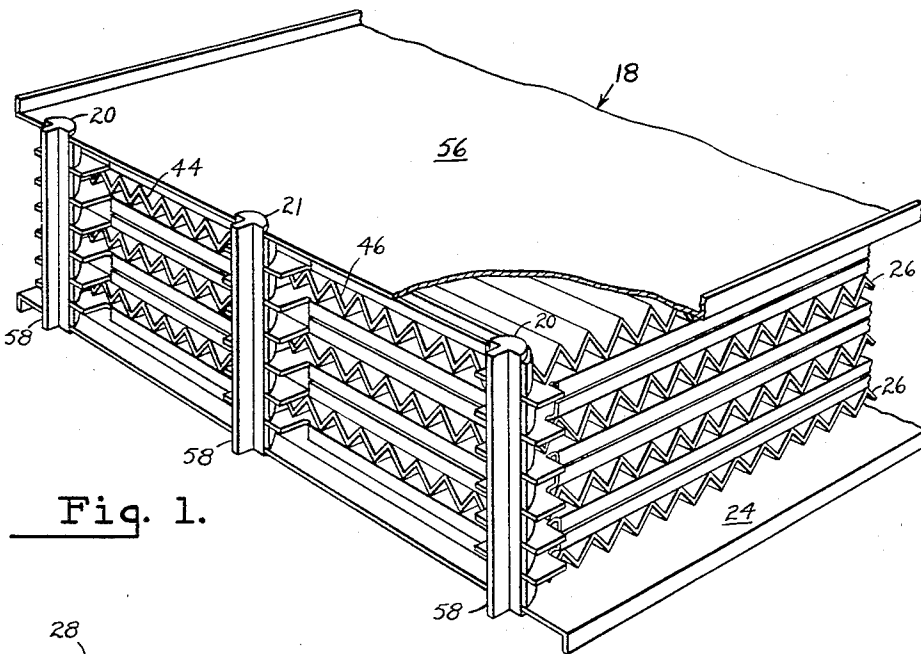
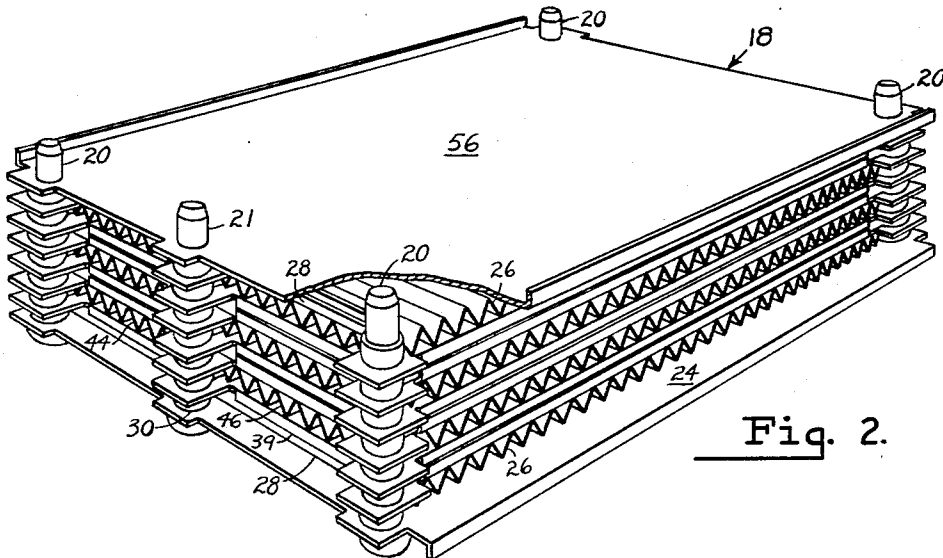
Nov. 22, 1960

A. G. BUTT
HEAT EXCHANGER

2,961,222

Filed Dec. 6, 1957

4 Sheets-Sheet 1



INVENTOR.
ALAN G. BUTT

BY *Holmes & Auduson*
ATTORNEYS

Nov. 22, 1960

A. G. BUTT
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4 Sheets-Sheet 2

Fig. 3.

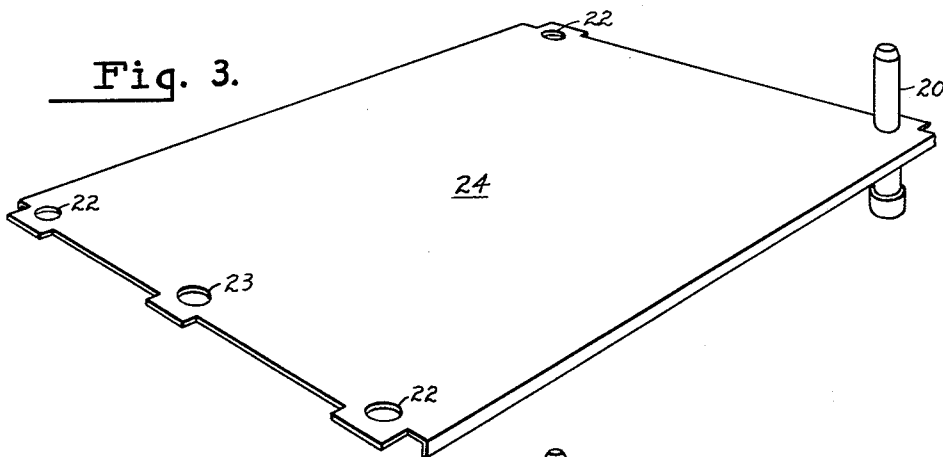


Fig. 4.

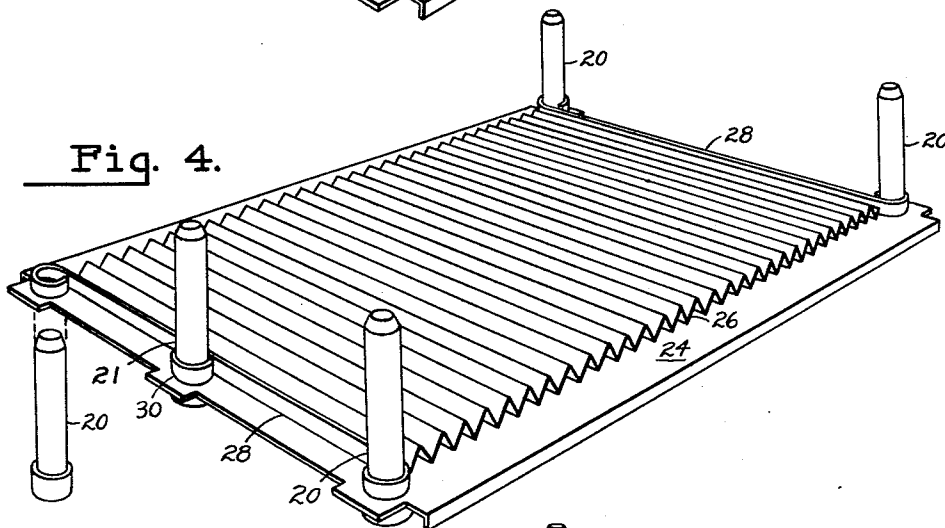
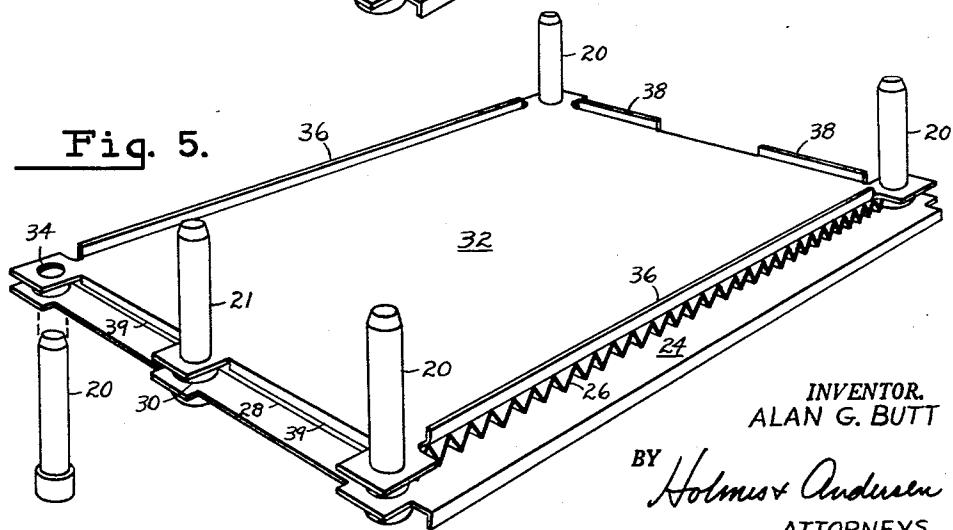


Fig. 5.



INVENTOR.
ALAN G. BUTT

BY *Holmes & Andersen*
ATTORNEYS

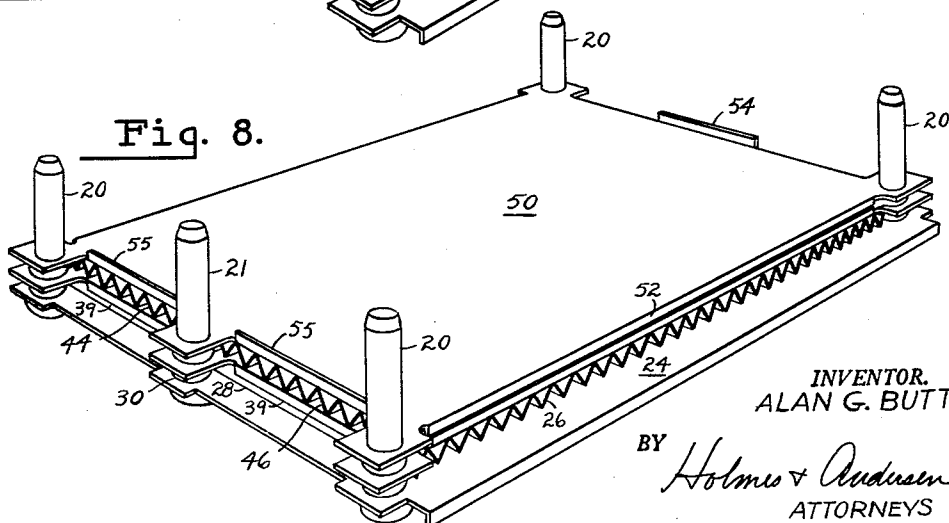
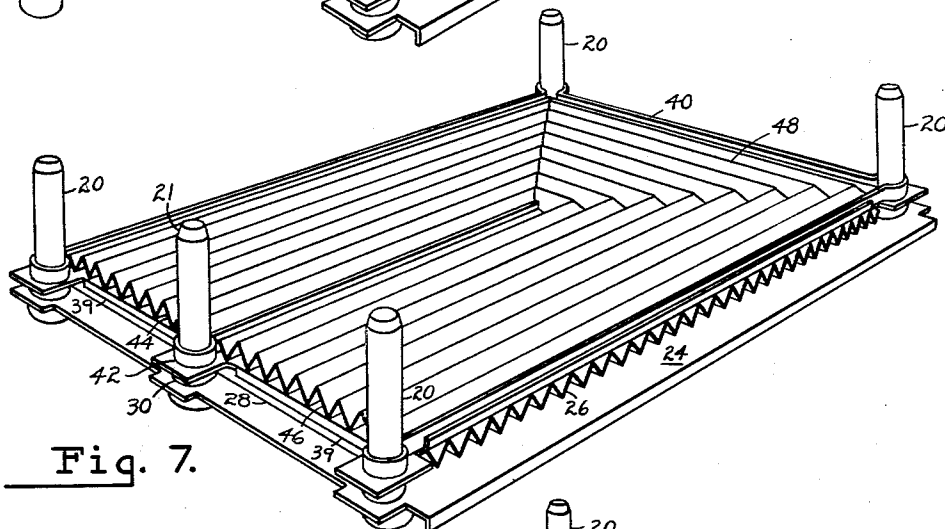
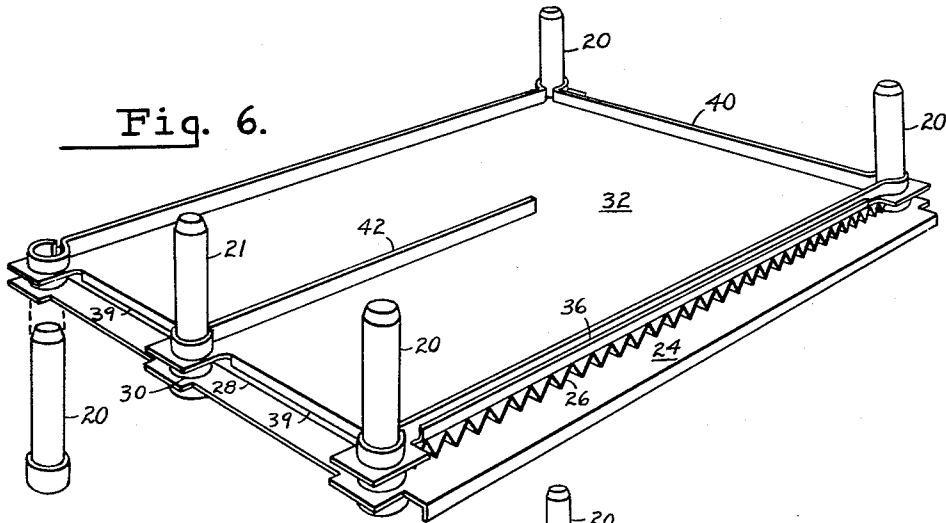
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A. G. BUTT
HEAT EXCHANGER

2,961,222

Filed Dec. 6, 1957

4 Sheets-Sheet 3



INVENTOR.
ALAN G. BUTT
BY *Holmes & Andersen*
ATTORNEYS

Nov. 22, 1960

A. G. BUTT
HEAT EXCHANGER

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4 Sheets-Sheet 4

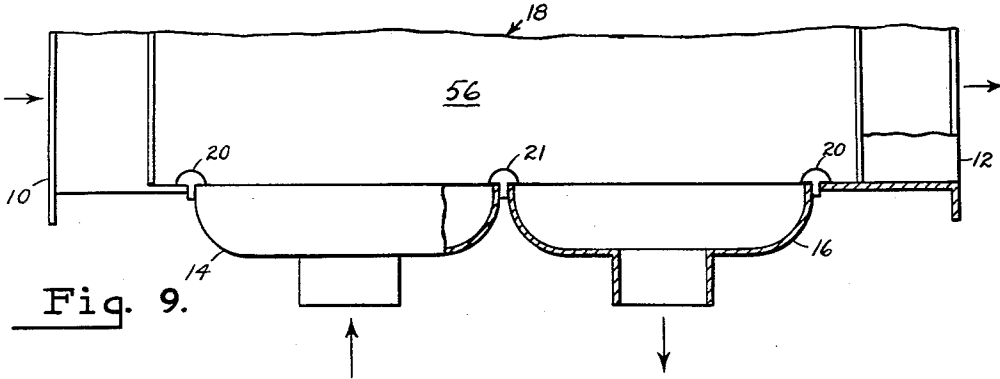


Fig. 9.

Fig. 10.

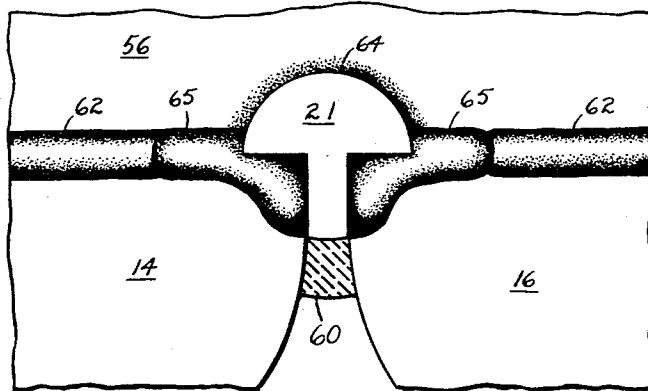
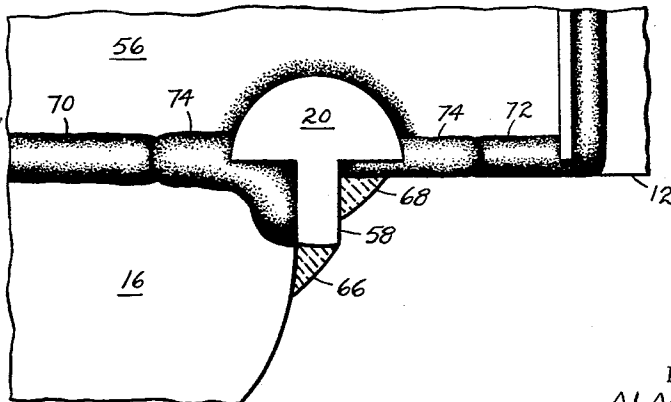


Fig. 11.



INVENTOR.
ALAN G. BUTT

BY *Holmes & Andrusen*
ATTORNEYS

1

2,961,222

HEAT EXCHANGER

Alan G. Butt, La Crosse, Wis., assignor to The Trane Company, La Crosse, Wis., a corporation of Wisconsin

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3 Claims. (Cl. 257—245)

This invention relates to heat exchangers and particularly to heat exchangers having spaced metallic plates forming passageways for the flow of two or more fluids. Heat exchangers of this type have had various boundary means for closing the spaces between the plates along the edges of the plates to form envelopes for the passage of fluids.

It has been a problem with heat exchangers of this type to weld a header to the heat exchanger core because the heat from the welding operation can damage adjacent brazed joints.

When heat exchangers are put into operation, forces are transmitted from the headers to the core. These forces may be due to fluid pressure, to expansion and contraction, or to the suspension of the heat exchanger from the headers. The exterior walls of the core are usually of thin material which is incapable of withstanding the forces transmitted from the headers.

It is an object of this invention to provide pegs which are strong and rigid and which extend outwardly from the walls of the core to provide a continuous surface to which the header may be welded.

It is another object of the invention to provide means on the core of the heat exchanger which engage the pegs for locating and holding the heat exchanger elements during the brazing or welding operation.

Other objects and advantages of the invention will appear as the specification proceeds to describe the invention with reference to the accompanying drawings in which:

Figure 1 is a perspective with portions broken away showing the heat exchanger prior to attachment of the headers.

Figure 2 is a perspective view showing the heat exchanger core prior to machining.

Figure 3 is a perspective view of the bottom sheet of the heat exchanger showing one peg in position.

Figure 4 is a perspective view showing the position of the fin sheet and the closure strips of the cold fluid passageway on the bottom sheet.

Figure 5 is a perspective view showing a parting sheet added to the assembly of Figure 4.

Figure 6 is a perspective view showing the closure strips and divider strips of the hot fluid passageway added to the assembly of Figure 5.

Figure 7 shows the fin sheets of the hot fluid passageway added to the assembly of Figure 6.

Figure 8 is a perspective view showing a parting sheet added to the assembly of Figure 7.

Figure 9 is a partial plan view partly in section of portion of the completed heat exchanger.

Figure 10 is an enlarged partial view partly in section showing the welded and brazed joints between the headers and the center peg.

Figure 11 is an enlarged view partly in section showing the brazed joint between the headers and the corner peg.

2

Figure 12 is a partial sectional view showing the closure strip and the spacer ring in relation to the center peg.

Referring now to the drawings and in particular to Figure 9, the heat exchanger has an inlet header 10 and an outlet header 12 for a first heat exchange fluid and an inlet header 14 and an outlet header 16 for a second heat exchange fluid. The core of the heat exchanger is designated 18.

For the purposes of description, the fluid conducted from header 10 to header 12 will be referred to as the cold fluid and the heat exchange fluid flowing from the header 14 to the header 16 will be referred to as the hot fluid. It should be understood that for certain applications, the hot fluid could flow from the header 10 to the header 12 and the cold fluid could flow from the header 14 to the header 16.

The heat exchanger will be described by referring to the assembly operation. As shown in Figures 3 and 4, corner pegs 20 are inserted in holes 22 of a bottom sheet 24. A center peg 21 is inserted in a center hole 23. A cold fluid fin 26 is then placed on the bottom sheet 24 and the closure strips 28 are placed over the pegs 20. A split ring 30 is placed on the center post 21.

Referring now to Figure 5, parting sheet 32 having holes 34 is placed over the pegs 20 and 21. Parting sheet 32 has upwardly extending flanges 36 along its sides, upwardly extending flanges 38 at the back end, and downwardly extending flanges 39 at the front end.

Referring now to Figure 6, the hot passageway closure strip 40 is placed on the pegs 20 and rests on the parting sheet 32. A divider strip 42 is placed over the center peg 21 and also rests on the parting sheet 32.

Referring now to Figure 7, two longitudinal fin sheets 44 and 46 are placed in position on the parting sheet 32. A cross flow fin sheet 48 is also placed on the parting sheet 32.

Referring now to Figure 8, a second parting sheet 50 is placed over the pegs 20 and 21 and rests upon the fins 46 and 48, upon the closure strip 40 and upon the divider strip 42. The parting sheet 50 has downwardly extending flanges 52 along its sides and an upwardly extending flange 54 at the back end and upwardly extending flanges 55 at the front end. The sequence of steps is then repeated by placing another fin sheet 26 on the parting sheet 50 and so on. The assembly operation is continued until a heat exchanger having the desired number of passageways has been assembled.

An outside sheet 56 is then placed over the pegs 20 and 21 and it rests upon the uppermost fin sheet 26. As shown in Figure 2, the heat exchanger core has been completely assembled and is ready for the brazing operation.

During the assembly of the elements, a powdered brazing material is placed between the surfaces to be joined. I may also use in place of the powdered brazing material, a brazing foil which is placed between the core elements which are to be connected by a brazed joint. This brazing foil has a melting temperature below that of the core elements. The assembled core as shown in Figure 2 is placed in a simple fixture which compresses the assembly to insure contact between the elements of the core. I prefer to braze the core in a furnace having a reducing atmosphere such as hydrogen. The assembly is heated in the furnace to a temperature sufficient to melt the brazing powder or brazing foil thus joining all the elements of the heat exchanger into a unitary structure.

After the core has been removed from the furnace and has cooled in temperature, the pegs 20 and 21, portions of the parting sheets 32 and 50, portions of the bottom sheet and top sheet, portions of the closure strips 28 and 40, and a portion of the split ring 30 are machined away as shown in Figure 1 producing flanges 58 on the

3

pegs 20 to which the headers 10, 12, 14 and 16 are welded as shown in Figures 9, 10 and 11.

In welding the headers to the core 18, it is necessary that the welding operation be at some distance from the nearest brazed joint in order to prevent heating of the brazed joint to a temperature which would impair it.

A welding bead 60 is produced between the headers 14 and 16 and the flanges 58 of the peg 21. Welding beads 62 are then produced between the headers 14 and 16 and the top and bottom sheets 24 and 56. These welding beads 62 terminate short of the peg 21 in order not to impair the brazed joint 64. It is then necessary to hand braze at 65 between the ends of welds 62 and the peg 21.

Referring now to Figure 11, a weld 66 is produced between the header 16 and the flange 58 of the peg 20 and another weld 68 is produced between the header 12 and the flange 58 of the peg 20. It should be understood that some of the material of the flange 58 may be melted in producing the welds 66 and 68 and that substantially a single weld may result. Welds 70 are produced between the header 16 and the top and bottom sheets 56 and 24 respectively. These welds terminate short of the peg 20 for the reasons described above. Welds 72 are produced between the header 12 and the top and bottom sheets 56 and 24 respectively. These welds terminate short of the peg 20 for the reasons described above. Hand brazed joints 74 are then produced extending from the ends of the welds 70 and 72 to the peg 20.

Although specific embodiments have been shown and described, it should be understood that certain changes may be made without departing from the spirit of the invention and I desire to be limited only by the claims.

I claim:

1. A heat exchanger comprising a plurality of substantially parallel, substantially flat envelopes arranged one above the other, a plurality of pegs secured to said envelopes at their peripheries and having their longitudinal axes normal to said envelopes, said pegs having longitudinal flanges extending outwardly from said envelopes and being adapted for attachment to headers, first closure strips wrapped around said pegs and extending along and closing portions of the peripheries of said envelopes to define with said envelopes a plurality of first inlet openings arranged one above the other and to define with said envelopes a plurality of first discharge openings one above the other, second closure strips wrapped around said pegs and extending between said envelopes along portions of the peripheries of said envelopes to close portions of the spaces between said envelopes to define with said envelopes a plurality of second inlet openings arranged one above the other and to define a plurality of second discharge openings arranged one above the other, means brazing said envelopes, said pegs, and said closure strips to each other, headers communicating with said inlet openings and said discharge openings, and means fusing said headers to the flanges of said pegs, said last mentioned means being spaced from said envelopes.

2. A heat exchanger comprising a plurality of substantially flat, substantially parallel envelopes arranged one above the other, a plurality of pegs each having a cross-section at least a portion of which is circular, said pegs

4

extending through said envelopes substantially normal to the planes of said envelopes, first closure strips secured to said pegs and having opposite edges contacting said envelopes and extending along and closing portions of the peripheries of said envelopes to define with said envelopes a plurality of first inlet openings arranged one above the other and to define with said envelopes a plurality of first discharge openings arranged one above the other, second closure strips secured to said pegs and extending between and having opposite edges contacting said envelopes to space said envelopes and extending along portions of the peripheries of said envelopes to close portions of the spaces between said envelopes to define with said envelopes a plurality of second inlet openings arranged one above the other and to define with said envelopes a plurality of second discharge openings arranged one above the other, means brazing said envelopes, said pegs, and said closure strips to each other, headers communicating with said inlet openings and said discharge openings, and means fusing said headers to said pegs, said last mentioned means being spaced from said envelopes.

3. A heat exchanger comprising a plurality of substantially parallel, substantially flat envelopes arranged one above the other, a plurality of pegs each having a cross-section at least a portion of which is circular, said pegs secured to said envelopes at their peripheries and having their longitudinal axes normal to said envelopes, said pegs having longitudinal flanges extending outwardly from said envelopes and being adapted for attachment to headers, first closure strips wrapped around said pegs and having opposite edges contacting said envelopes and extending along and closing portions of the peripheries of said envelopes to define with said envelopes a plurality of first inlet openings arranged one above the other and to define with said envelopes a plurality of first discharge openings one above the other, second closure strips wrapped around said pegs and having opposite edges contacting said envelopes and extending between said envelopes along portions of the peripheries of said envelopes to close portions of the spaces between said envelopes to define with said envelopes a plurality of second inlet openings arranged one above the other are to define a plurality of second discharge openings arranged one above the other, means brazing said envelopes, said pegs, and said closure strips to each other, headers communicating with said inlet openings and said discharge openings, and means fusing said headers to the flanges of said pegs, said last mentioned means being spaced from said envelopes.

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