Dec. 26, 1933. P. J. McINTYRE 1,940,963

CONDENSER

Filed Jan. 12, 1931 2 Sheets-Sheet 1

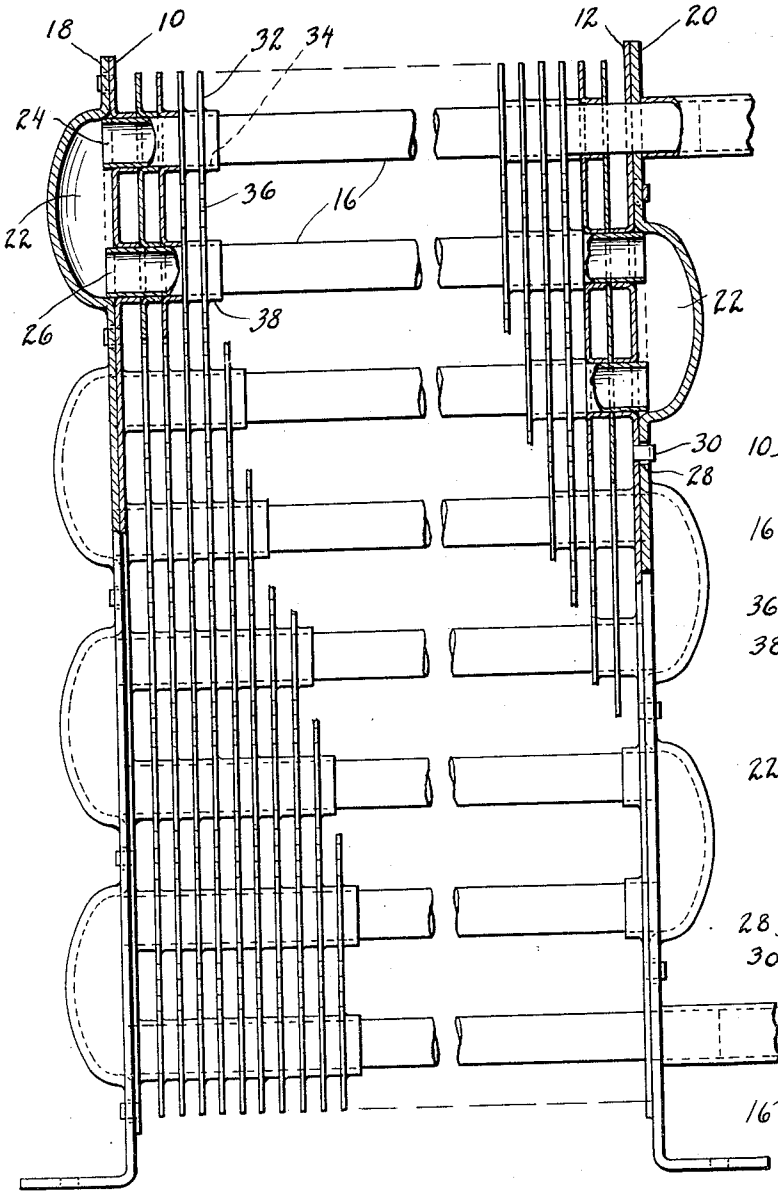


Fig. 1

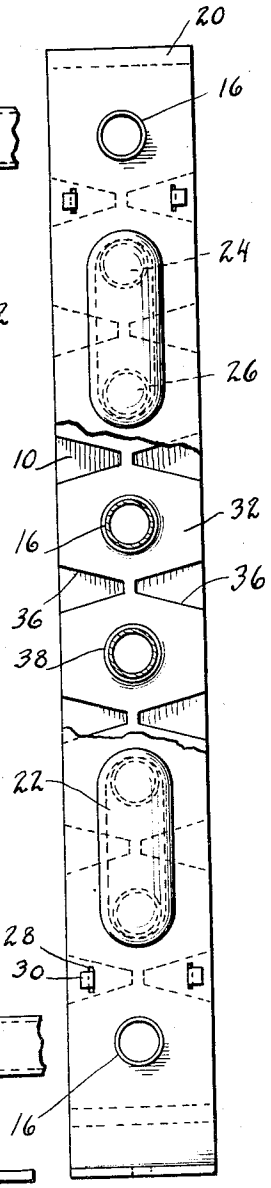


Fig. 2

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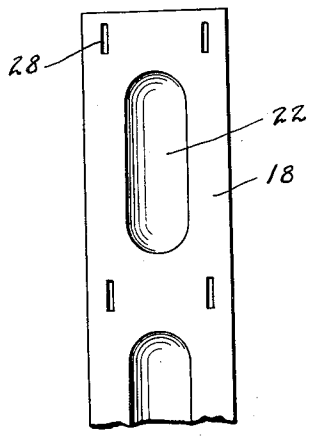


Fig. 4

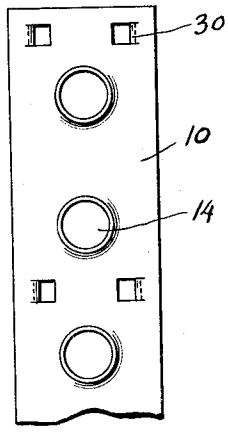


Fig. 5

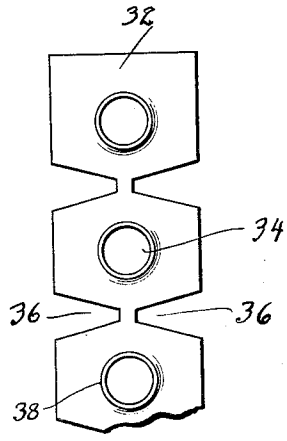


Fig. 6

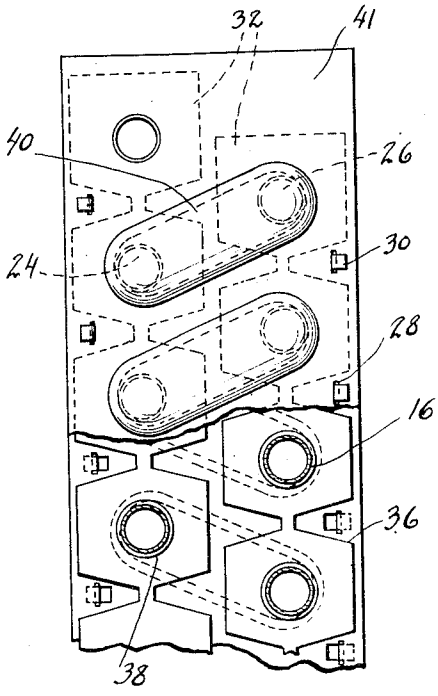


Fig. 7

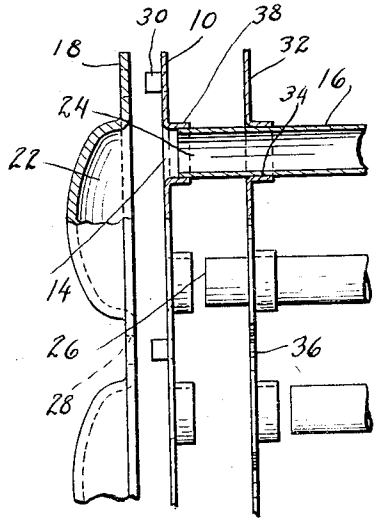


Fig. 3

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UNITED STATES PATENT OFFICE

1,940,963

CONDENSER

Patrick Joseph McIntyre, Detroit, Mich.

Application January 12, 1931. Serial No. 508,080

8 Claims. (Cl. 257—255)

My invention relates to condensers and has particular reference to the so-called tubular type.

A major object of my invention is to secure a maximum cooling surface with a minimum amount of tubing and to so design and construct the condenser that the tubing utilized will operate with a maximum of efficiency.

Heretofore it has been the practice to arrange tubing in a series of substantially parallel lengths, bending the tubing at intervals to form a plurality of U-shaped configurations. The gas to be condensed is pumped or otherwise caused to flow through the tubes and during the process condensation takes place. A certain minimum thickness of wall in the tubing is essential in order to preclude the possibility of the tubing buckling when it is bent to form the U-shape heretofore described. I propose to arrange tubing in substantially the same form and at the same time permit the use of tubing having walls of much less thickness than was possible heretofore. For this purpose I contemplate utilizing a plurality of straight open ended tubes arranged in substantially parallel relation and providing means at adjacent extremities of the tubes whereby a passageway is provided from one tube to another. In this way the effectiveness of such an arrangement is maintained and at the same time its efficiency of operation is increased many times by virtue of the greater cooling effect secured by the thinnest walls.

Yet another object of my invention is to provide cooling fins at spaced apart intervals along each tube and to so construct and arrange these fins that they may be manufactured inexpensively and rapidly, assembled quickly and easily, and function with extreme efficiency. Hitherto individual fins have been secured to each of the lengths of tubing, the fins extending laterally outwardly from the tube and a large number of them being spaced apart axially along the length of the tubing. I propose to provide an integral fin unit which may be associated with a plurality of alined tube lengths at a single operation in lieu of the individual fins heretofore used. This is a great time saver in the assembly of condensers of this type and the cooling efficiency of the individual fins is maintained.

Various other objects and meritorious features of my invention will be apparent from the following description taken in conjunction with the drawings wherein like numerals refer to like parts throughout the several figures and wherein:

Fig. 1 is a side elevation, partly in section, of my improved structure,

Fig. 2 is an end elevation partly broken away for the sake of clearness,

Fig. 3 is a side elevation, partially in section and disassembled, illustrating the manner of assembling the structure,

Fig. 4 is an elevation of what I shall term the end passage unit,

Fig. 5 is an end elevation of the header unit,

Fig. 6 is an elevation of the fin unit, and

Fig. 7 is an end elevation of a modified structure.

Referring to the drawings, the structure involved may best be described in conjunction with its manner of assembly. A pair of header units 10 and 12 provided with apertures 14 spaced at intervals along its length serve to support the tubes 16. These tubes are inserted in the apertures 14 provided in one of the header units, let us say 10, and what I have termed a passage unit 18 is subsequently secured to the header unit to provide a passage permitting flow from the extremity of one tube to the next.

Each of these passage units 18 and 20 consists of a strip provided at spaced apart intervals with a series of passageways 22 which correspond substantially, both in function and in shape, to the U-shaped bottom of a U tube. These passages 22 are so spaced apart that their extremities register with the end openings 24 and 26 of adjacent tubes 16, thereby permitting the flow of condensate from one tube to the adjacent tube. At spaced apart intervals along their length the passage units 18 and 20 are provided with slots 28 which are adapted to receive tangs 30 stamped out at corresponding spaced apart intervals along the length of header units 10 and 12. The tubes having been inserted in one of the header units, the passage unit is secured to the assembly by means of the tangs 30.

Each of the fin units 32 is apertured at spaced apart intervals as at 34 in Fig. 6 and from each side of the unit intermediate the apertures portions of the material are cut away to provide the notches indicated at 36. In this way a plurality of integral spaced apart individual fins are provided and the unit may be slipped over alined tubes from the unassembled end of the structure. A short sleeve 38 is associated with each aperture in the fin unit which functions as a spacer element between each of the fin units 32 when the entire group is assembled in axially spaced apart relation as indicated clearly in Fig. 1.

The other header unit 12 is subsequently

placed over the unassembled ends of the tubes and the passage unit 20 is secured thereto by means of the tongue and slot heretofore described in conjunction with the assembly of the opposite end.

It will be apparent that the tubes 16 may be spaced apart as short a distance as desired, there being no risk whatsoever of buckling the tubes by bending and thus spoiling the structure. Very thin walled tubes may therefore be utilized, which was heretofore impossible when bending was resorted to.

In Fig. 7 I have illustrated a somewhat modified form of structure wherein a double row of vertically spaced apart substantially parallel tubes are utilized. In this particular structure the passages 40 extend diagonally from one vertical row of tubes to another. The header units are substantially the same, involving a difference only in the number of apertures and their relative location, and the fin units are the same.

By providing the heretofore described integral fin units so notched that it forms what is, to all intents and purposes insofar as cooling efficiency is concerned, a series of independent separated cooling fins, the cooling efficiency of such an arrangement is maintained and, at the same time, an integral unit is substituted for a large number of independent elements. The time and labor required in production and assembly is thus substantially reduced.

The passage units at either end of the assembled structure function as an additional cooling medium for the gas being condensed. This is in contradistinction to the vertical supports hitherto utilized for carrying the tube assembly and permits the supporting elements to perform a double function. The increased metal surface by which the heat of the gases may be transferred to the air substantially increases the efficiency of the unit as a whole.

Having assembled the structure as already explained, the assembly may be tightened by dipping in a solder pot, or, by virtue of the fact that the individual units may be so readily and rapidly assembled, the elements may first be tinned with soft solder prior to assembly and subsequently conveyed through a furnace where the heat will tighten up the structure. This tightening up by the use of solder is customarily termed the "sweating" process.

It will be apparent from the foregoing that various modifications may be devised without departing from the inventive concept disclosed herein and for that reason I intend to limit myself only within the scope of the appended claims.

What I claim:

1. A cooling fin unit adapted to be associated with a plurality of spaced apart alined tubes comprising a strip apertured at spaced apart intervals along its length, and notches cut into the edge of said strip intermediate each pair of apertures.

2. A cooling fin unit adapted to be associated with a plurality of spaced apart alined tubes comprising a strip apertured at spaced apart intervals along its length, and notches formed in both edges of said strip intermediate each pair of apertures whereby a plurality of substantially independent cooling fins connected by only a relatively small area of the strip material are formed.

3. A cooling fin unit adapted to be associated with a plurality of spaced apart alined tubes comprising a strip apertured at spaced apart intervals along its length, and notches cut into the edge of said strip intermediate each pair of apertures, and a spacer sleeve extending laterally away from each aperture.

4. In a device of the class described in combination with a plurality of spaced apart tubes, a plurality of sheet metal fin units each having a plurality of apertures one for each tube and a spacer sleeve extending away from each aperture to position the adjacent fin unit, each fin unit being cut away inwardly from its outer edges between each pair of apertures intermediate the tubes for substantially its entire width.

5. In apparatus of the class described, the combination of a header unit including spaced tube receiving sleeves, a plurality of tangs struck from the body of said unit, and an end passage unit having slots cooperable with said tangs to secure said end passage and header units in operative relation to one another.

6. In combination with apparatus of the class described, a header unit including a plurality of spaced tube receiving sleeves and means formed from the body of said unit cooperable with a fluid flow directing element to secure the two together.

7. In combination with apparatus of the class described, an end passage fluid flow directing unit comprising a sheet of material having cup shaped deformations arranged at spaced intervals and slots in the body of the sheet.

8. In apparatus of the class described, a plurality of pairs of sheet metal tubes, spaced fin elements mounted on said tubes, a header element having pairs of apertures to receive said pairs of tubes and a sheet metal fluid flow directing element secured to said header element and having a series of cup shaped deformations one embracing each pair of apertures in the header element to which the fluid flow directing element is secured.

PATRICK J. McINTYRE.