Dec. 12, 1933. C. C. HANSEN 1,938,588

HEAT EXCHANGER

Filed April 11, 1931 2 Sheets-Sheet 1

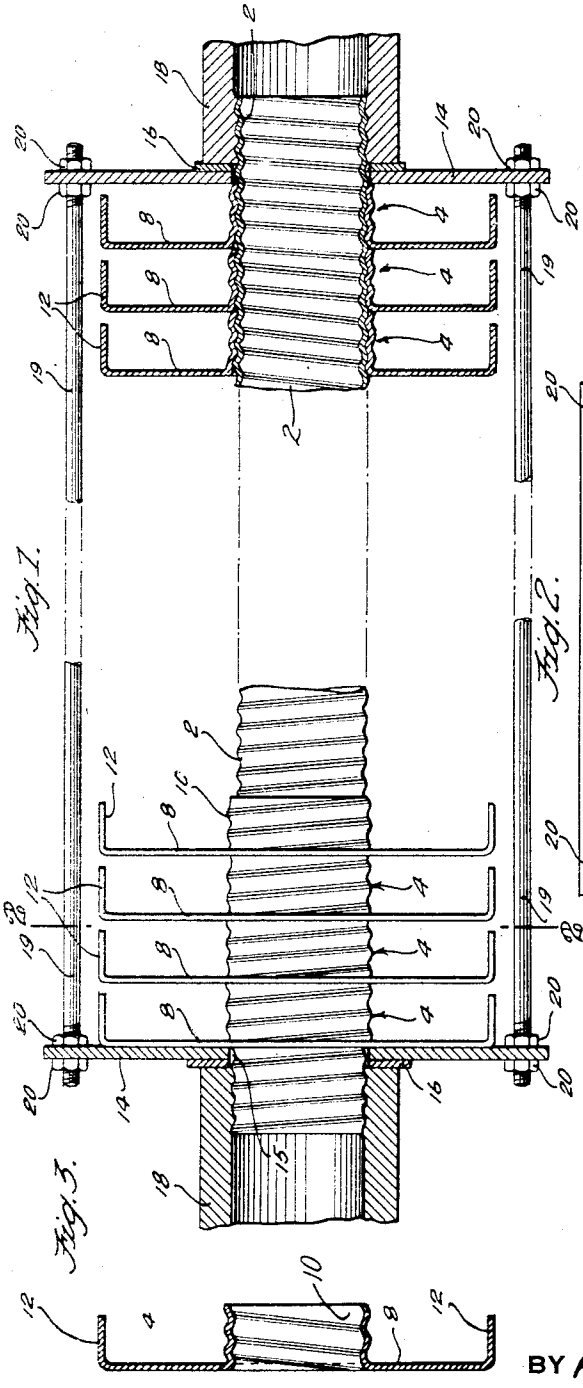

Fig. 1.

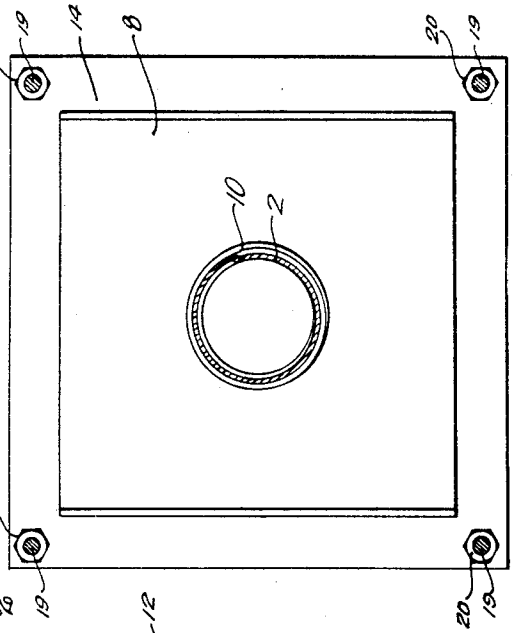

Fig. 2.

Fig. 3.

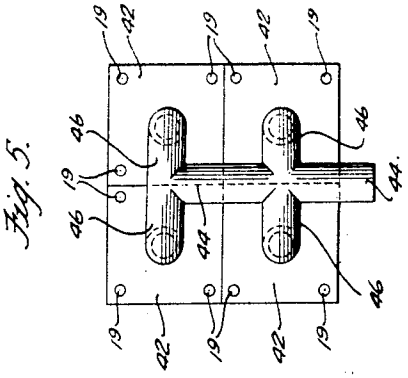

Fig. 5.

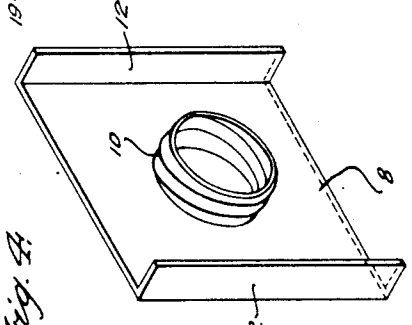

Fig. 4.

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Dec. 12, 1933. C. C. HANSEN 1,938,588

HEAT EXCHANGER

Filed April 11, 1931 2 Sheets-Sheet 2

Fig. 6.

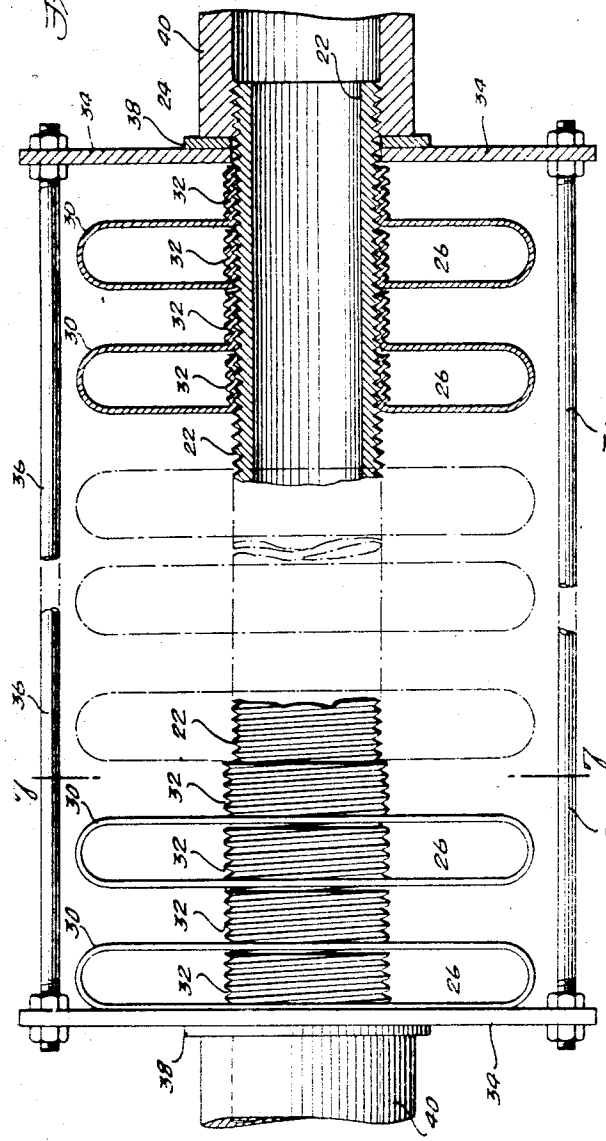


Fig. 10.

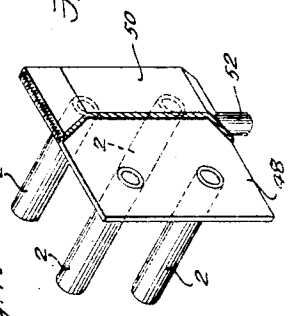


Fig. 7.

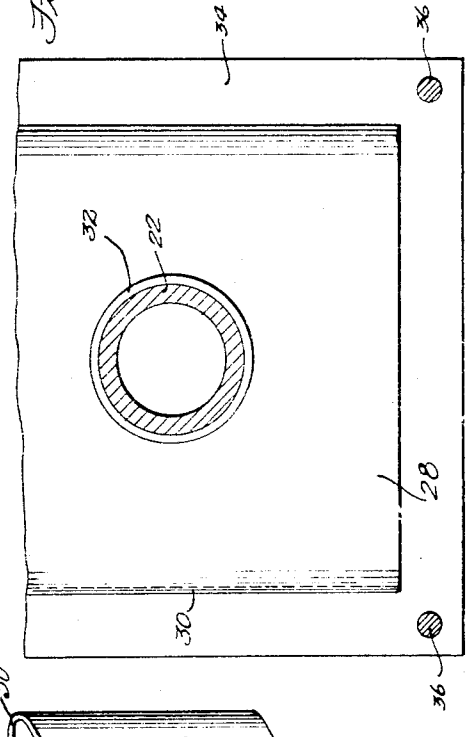


Fig. 9.

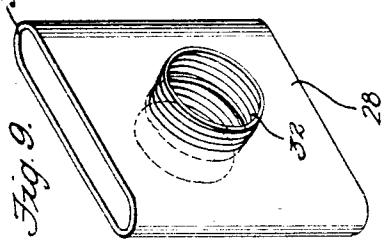
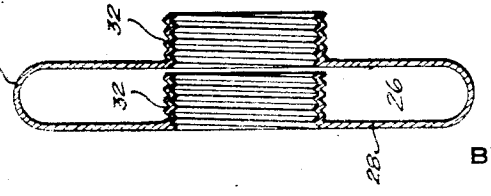


Fig. 8.



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Patented Dec. 12, 1933

1,938,588

UNITED STATES PATENT OFFICE

1,938,588

HEAT EXCHANGER

Charles C. Hansen, South Orange, N. J., assignor, by mesne assignments, to The Chase Companies, Incorporated, Waterbury, Conn., a corporation of Connecticut

Application April 11, 1931. Serial No. 529,335

10 Claims. (Cl. 257—124)

This invention relates to heat exchangers, and more particularly to heat exchangers of the radiator type, comprising a tube for the circulation of a fluid medium and a series of fins attached to the tube and extending outwardly therefrom.

The primary objects of the present invention are to improve the construction of heat exchangers of the above type, and to produce an improved heat exchanger of said type which is relatively simple in construction and inexpensive to manufacture and is highly efficient in the transfer of heat.

With the above and other objects in view the invention consists in a heat exchanger embodying the novel and improved features, constructions and combinations of parts hereinafter described and particularly pointed out in the claims, the advantages of which will be readily understood and appreciated by those skilled in the art.

The invention will be clearly understood from the accompanying drawings illustrating the invention in its preferred form and the following detailed description of the constructions therein shown.

In the drawings—

Fig. 1 is a view partly in plan and partly in horizontal section illustrating a heat exchanger construction embodying the invention;

Fig. 2 is a view in vertical section of the construction shown in Fig. 1 taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a detail sectional view illustrating one of the fin-forming elements of the construction shown in Fig. 1;

Fig. 4 is a detail perspective view of the element shown in Fig. 3;

Fig. 5 is a view in end elevation illustrating a number of heat exchangers of the type shown and described herein, connected for the flow of a fluid medium in parallel therethrough;

Fig. 6 is a view partly in plan and partly in horizontal section illustrating a modified form of heat exchanger embodying the invention;

Fig. 7 is a view in vertical section of the construction shown in Fig. 6 taken substantially on the line 7—7 of Fig. 6;

Fig. 8 is a detail sectional view illustrating one of the fin-forming elements of the heat exchanger shown in Fig. 6;

Fig. 9 is a detail perspective view of the element shown in Fig. 8; and

Fig. 10 is a perspective view illustrating a header construction for connecting a number of heat exchangers of the type shown and described herein for the flow of a fluid medium in parallel therethrough.

In the form of the invention shown in Figs. 1 to 4, inclusive, the heat exchanger comprises a central tube indicated at 2, to which are attached a series of elements 4 forming fins extending outwardly from the tube. The tube 2 is preferably made of relatively thin sheet metal and is provided with a corrugated wall. The corrugations in the wall of the tube extend about the tube and are arranged in a spiral formation longitudinally of the tube, thereby providing the tube with peripheral screw threads 6.

Each of the elements 4 is made of thin sheet metal and comprises a plate-like body 8 and is provided centrally with a tubular boss 10 extending laterally from said body. This boss 10 is formed to fit over the tube 2 and is corrugated to provide the same with screw threads complemental to the threads on the tube so that the element 4 may be screwed onto the tube. The size of the boss, however, is preferably such that it will fit rather tightly on the tube so that the element will be held in place on the tube by the frictional contact of the boss with the tube. The elements 4 may be made from sections of sheet metal by stamping or dieing operations.

The body 8 of each of the elements is preferably rectangular in outline and said body is provided, at two opposite margins, with parallel flanges 12 extending transversely from said body.

In making up the heat exchanger, a series of the elements 4 are assembled on the tube 2 and are arranged in regular spaced relation and with the flanges 12 on adjacent elements in adjacent positions and lying substantially in the same plane. When in operation the heat exchanger is preferably located with the flanges 12 extending in vertical directions. The fins and the flanges 12 form flues through which air or other fluid surrounding the fins circulates rapidly.

The heat exchanger shown in Figs. 1 and 2 comprises end plates 14 corresponding in shape with the shape of the elements 4 and having central openings 15 to receive the end portions of the tube 2, each of these plates being fitted over the tube shown in Fig. 1. The left hand plate, Fig. 1, engages the body of the adjacent element 4. A washer 16 is placed over each end portion of the tube outside of the corresponding plate and a pipe 18 is threaded on the end of the tube and is engaged with said washer. The corresponding corners of the end plates 14 are connected by rods 19 to form a comparatively rigid frame. Each rod passes through openings in the

plates and is secured to each plate by nuts 20 engaging the opposite faces of the plate.

In the form of the invention shown in Figs. 6 to 9, inclusive, the heat exchanger comprises a central tube 22 provided with peripheral screw threads cut in the wall of the tube upon which are threaded a series of fin-forming elements 26. Each of the elements 26 consists of a section of a sheet metal tube flattened to form a body having parallel walls 28, opposite side margins of which are connected by curved walls 30. The parallel walls 28 are each formed with centrally located hollow bosses 32 extending laterally in the same direction from the corresponding wall and arranged to fit over the tube 22. These bosses are formed with screw threads complemental to the screw thread 24 on the tube 22, so that the elements 26 may be screwed onto the tube. The elements 26 may be made from flattened sections of ordinary sheet metal tubing. The bosses 32 may be formed in the walls of the tube sections by stamping or dieing operations.

The elements 26 are threaded upon a tube and located in spaced relation to each other, as shown in Fig. 6. The bosses 32 are arranged to fit rather tightly upon the tube so that the elements will be held in position on the tube by a frictional contact between said bosses and the tube.

The heat exchanger, when in use, is preferably located with the end walls 30 of the elements 26 extending in vertical directions. The elements, when thus located, will form flues which will promote the rapid circulation of air or other fluid medium surrounding the same. When the heat exchanger is employed as a heat radiator for heating a building, the air between the several fins will rise as it becomes heated by the heat transmitted from said fins. The air will rise more rapidly, however, through the flues formed by the walls of each element 26, than between the walls of adjacent elements, and this will increase the rapidity of the circulation of the air about the entire heat exchanger.

The heat exchanger shown in Figs. 6 to 9, inclusive, comprises end plates 34 applied over the end portions of tube 22, rods 36 connecting the end plates, washers 38 and pipes 40 threaded on the end portions of the pipe 22. All of these parts have substantially the same construction, arrangement and mode of operation as the corresponding parts shown in Figs. 1 and 2.

Fig. 5 shows four heat exchangers such as that shown in Figs. 1 and 2 or that shown in Figs. 6 and 7 arranged in parallel relation and connected for the flow of a fluid medium in parallel through the several heat exchangers. In this figure, each of the several heat exchangers is indicated at 42. These heat exchangers are assembled in parallel relation and the central tubes of the several heat exchangers are connected with a pipe 44 of the fluid circulating system by branch pipes 46.

Fig. 10 illustrates a header construction for the circulation of a fluid medium through the central pipes of a series of heat exchangers such as that shown in Figs. 1 and 2, or that shown in Figs. 6 and 7. As shown in this figure, the central tubes 2 of a series of exchangers such as that shown in Figs. 1 and 2 are secured within suitable openings in a plate 48. To the plate 48 is attached a concavo-convex plate 50 with its concave side adjacent the plate 48, the contacting margins of the two plates being secured together preferably by welding. This forms a chamber between the two plates communicating with the passages of the pipes 2 of the several heat exchangers. A fluid circulating pipe 52 attached to the plate 50 communicates with this chamber.

The above described heat exchangers are comparatively simple in construction and inexpensive to manufacture and are highly efficient in heat exchange operations. The threaded bosses on each of the fin members or plates furnish a relatively large contact area engaging the tube through which the fluid medium circulates, thereby causing a rapid heat exchange by conduction from the tube through the bosses and fins, or from the fins through the bosses and tube. The formation and arrangement of the fins also will produce a rapid circulation of air or other fluid medium between the fins. This rapid circulation produces a correspondingly rapid heat exchange.

Having explained the nature and the object of the invention, and having specifically described certain constructions embodying the invention, what is claimed is:

1. A heat exchanger construction, comprising, in combination, a tube for containing a fluid or other heat exchange medium having screw threads thereon, and a radiator fin formed entirely of sheet metal and having a tubular screw threaded boss, and constructed to be applied to the tube by threading the boss on the tube.

2. A heat exchanger construction, comprising, in combination, a tube for the reception of a fluid or other heat exchange medium having screw threads thereon, and a radiator fin formed entirely of sheet metal and having a tubular screw threaded boss and constructed to be applied to the tube by threading the boss on the tube and to be held in position on the tube by the contact of the boss with the tube.

3. A heat exchanger construction comprising, in combination, a tube for the reception of a heat exchange medium and a series of flattened flue tubes mounted transversely on said first tube and forming fins extending transversely from said first tube, the walls of adjacent flue tubes beng spaced from each other to form flues between said flue tubes open at the sides thereof.

4. A heat exchanger construction, comprising, in combination, a tube for containing a fluid or other heat exchange medium having screw threads thereon and a series of flattened flue tubes threaded on said first tube in positions transverse thereto and forming fins extending transversely from said first tube.

5. A heat exchanger construction, comprising, in combination, a tube for the reception of a fluid or other heat exchange medium having screw threads thereon and a series of flattened flue tubes having threaded tubular bosses screwed on said first tube.

6. A heat exchanger construction, comprising, in combination, a tube for the reception of a fluid or other heat exchange medium having a peripherally corrugated wall forming a plurality of annular elevations and depressions in the outer face thereof and a sheet metal fin-forming element having a tubular boss formed with a plurality of corrugations forming annular elevations and depressions interfitting with the elevations and depressions on said tube and having a close heat conducting contact with said tube.

7. A heat exchanger construction, comprising in combination, a tube for containing a fluid or other heat exchange medium having screw threads thereon and a fin-forming element formed entirely of sheet metal and threaded on said tube.

8. A heat exchanger construction, comprising in combination, a sheet metal tube having its wall corrugated to form screw threads and a sheet metal fin-forming element having a tubular boss corrugated to form screw threads complementary to the threads on the tube, said element beng arranged to be applied to the tube by threading the boss on the tube.

9. A heat exchanger construction comprising in combination a tube for the reception of a heat exchanger medium and a series of flattened fin-forming flue tubes having substantially parallel side walls mounted on said first tube with their parallel walls extending substantially in parallel planes transverse to said first tube.

10. A heat exchanger construction comprising in combination, a tube for the reception of a fluid or other heat exchange medium having screw threads thereon and a fin element having a boss formed of sheet metal bent into shape to form screw threads and threaded on said tube, and a fin plate formed of sheet metal integral with said boss and extending outwardly from said boss.

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