Dec. 9, 1958 B. SPIETH 2,863,645

HEAT EXCHANGER MOUNTING

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Fig. 1

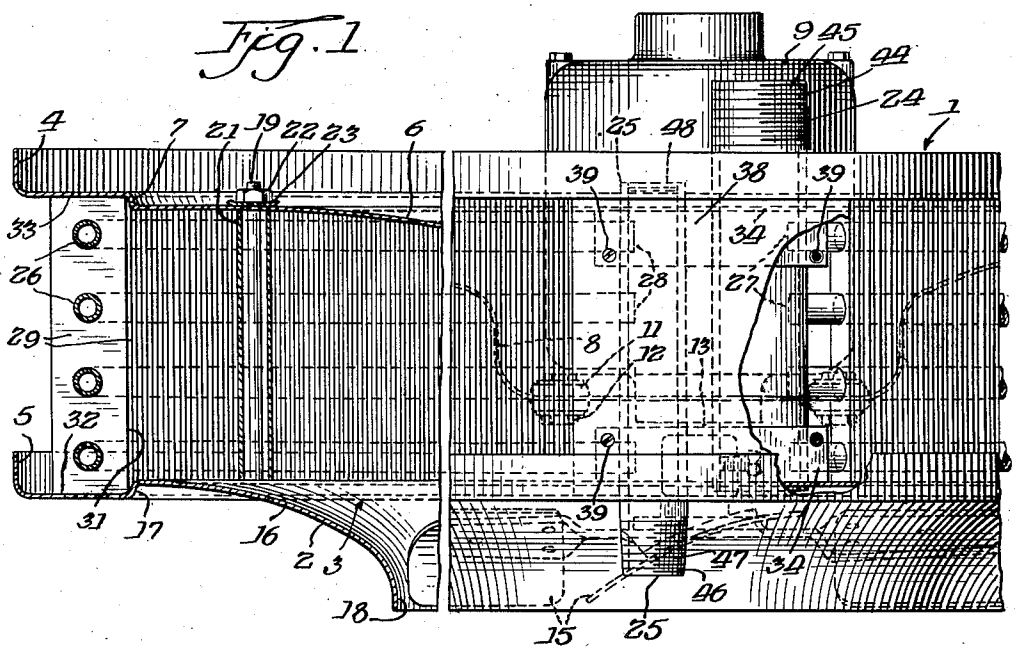
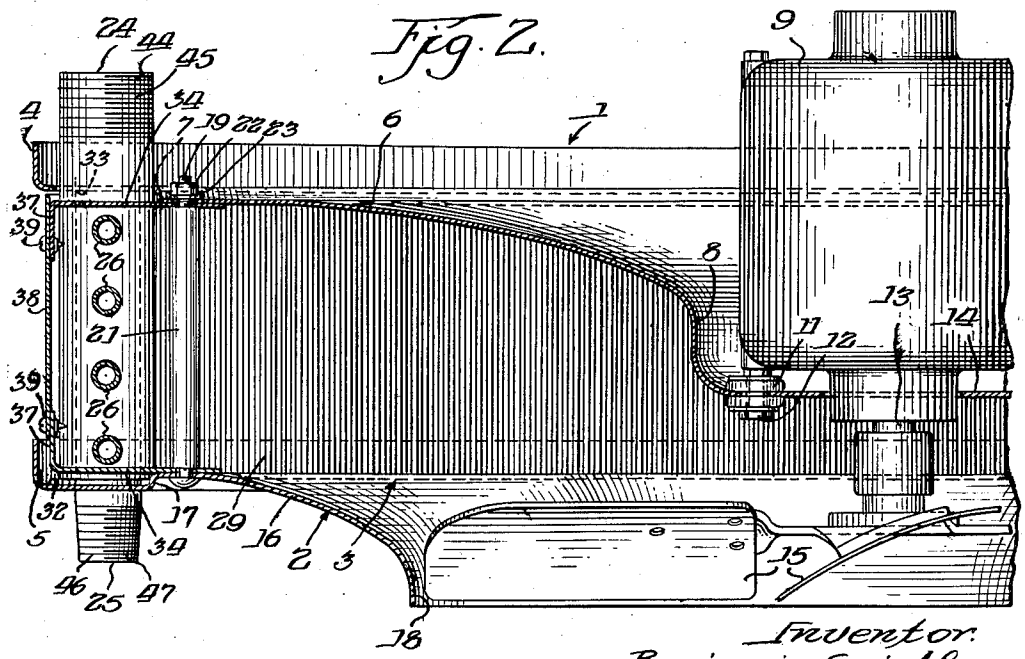


Fig. 2.



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Fig. 3.

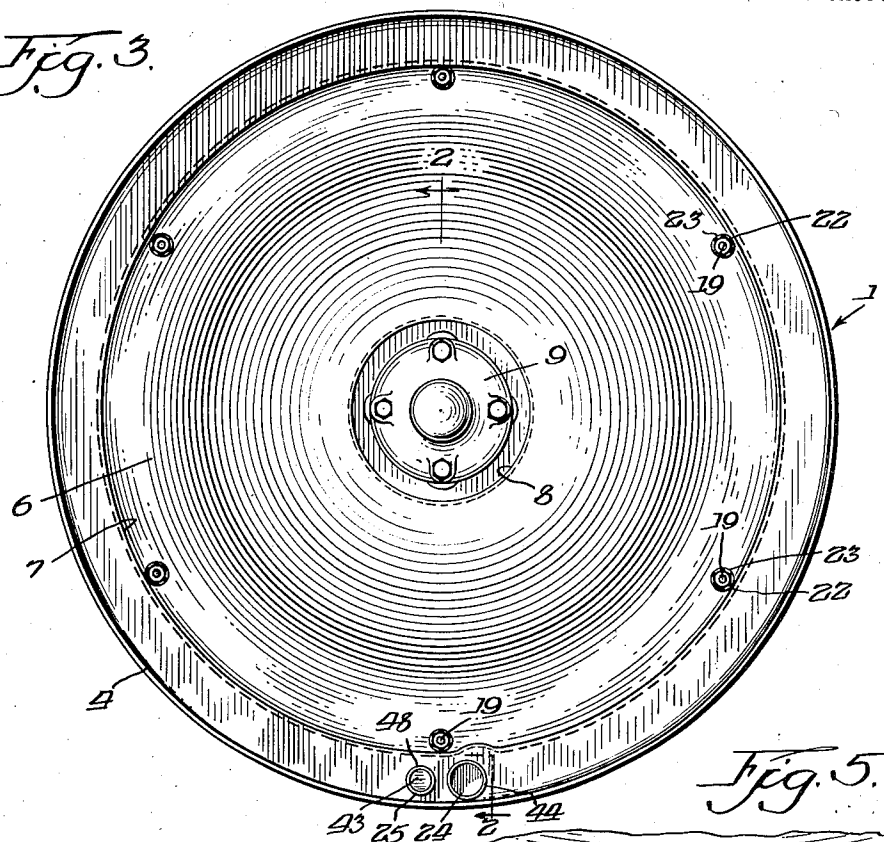


Fig. 5.

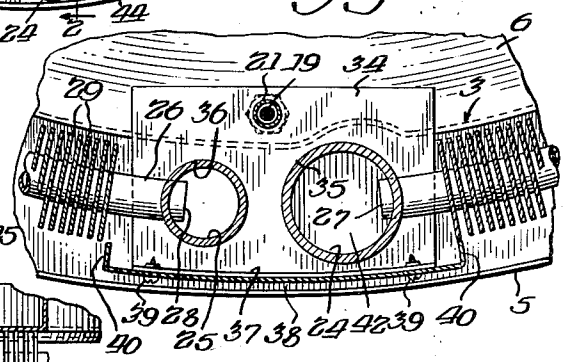
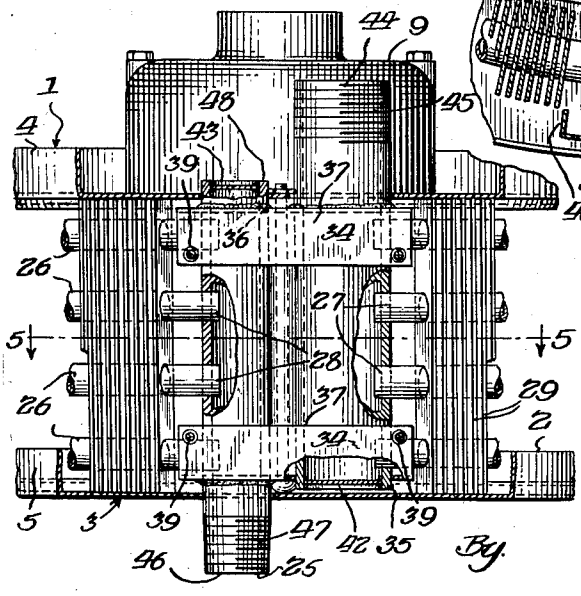


Fig. 4.



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HEAT EXCHANGER MOUNTING

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3 Claims. (Cl. 257—137)

The invention relates generally to heat exchangers and more particularly to a novel mounting structure for supporting a heat exchanger in an assembly which, for example, may be of the unit heater type.

The present invention is of particular advantage in connection with unit heater assemblies designed to discharge air in a vertical direction commonly known as a vertical delivery type of unit heater. In such type of heater assembly, the heat exchanger structure or core may be constructed in the form of a ring or annular shaped assembly in which the air to be heated is drawn horizontally through the annular heat exchanger and discharged therefrom in an axial direction. It has been common practice in the past to utilize a heat exchange structure comprising a plurality of tubes each of which are bent in the form of a ring with the opposite ends of each tube connected to respective header members, a plurality of fin members being positioned on the tubes and arranged in radially extending planes. Such types of construction have heretofore normally employed relatively heavy fin members spaced at regular intervals along the tubes between which are positioned a plurality of relatively light or thin fins. The heavy fins are suitably designed to ocoperate with bolts or other suitable mounting means for securing the heat exchanger to the remainder of the heater assembly, thereby satisfactorily supporting the heat exchanger structure in operative relation with respect to such remainder of the assembly. Obviously, in the employment of such a construction, the fabrication of the special heavier supporting fins, assembling the same in position at precise intervals along the heat exchanger tubes, as well as providing for accommodating expansion and contraction during heating and cooling of the exchanger, entails considerable expense both in materials and in the labor required attendant to the construction and assembly of such a heating unit.

The present invention, therefore, has among its objects the production of a heat exchanger assembly, particularly that of the vertical delivery type, which is very simple in construction, having a minimum of separate parts which may be readily and easily assembled, thus reducing the cost of material and labor, and in which the heat exchanger proper has substantially complete freedom for expansion and contraction, thereby reducing strains in the various components thereof with a corresponding reduction in potential failure and maintenance problems.

Another object of the invention is to the production of such a heat exchanger construction wherein a plurality of individual mounting members for the heat exchanger are eliminated, whereby the heat exchanger structure is primarily retained in operative position by an interlocking construction rather than by mechanical fastening means, such interlocking construction, however, permitting all necessary expansion and contraction of the heat exchanger with respect to the remainder of the assembly.

A further object of the invention is the production of such a heat exchanger construction which is rugged in

construction, durable in use, and in which the motor and other components thereof may be readily disassembled with a minimum of effort, thus facilitating cleaning, repair, or other maintenance.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end, my invention consists in the novel construction, arrangement, and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawings, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a side elevational view of a unit heater assembly of the vertical delivery type with portions of the structure broken away to illustrate the details thereof;

Fig. 2 is a transverse sectional view taken approximately on the line 2—2 of Fig. 3;

Fig. 3 is a top plan view of the structure illustrated in Figs. 1 and 2;

Fig. 4 is a side elevational view of the header portion of the heat exchange structure with portions of the assembly broken away; and

Fig. 5 is a sectional view taken approximately on the line 5—5 of Fig. 4.

The present invention contemplates the use of an upper and a lower sheet or member which forms the top and bottom members of the heater assembly, between which the heat exchanger or condenser is positioned. The supply and return headers of the heat exchanger may be positioned adjacent one another and secured in relatively fixed position with respect to the top and bottom members, whereby the remainder of the condenser structure may be supported between the two members without the use of rigid securing or connecting elements. The upper and lower members are so shaped that an interlocking connection between the same and the remainder of the heat exchanger is produced, which is operative to prevent undesired shifting of the heat exchanger relative to said members but, at the same time, will permit the heat exchanger to freely expand and contract as a result of temperature changes therein.

Referring to the drawings and particularly to Figs. 1 and 2, 1 indicates generally an upper housing member and 2 a lower housing member, between which is positioned an annular shaped heat exchanger core or condenser indicated generally by the numeral 3. Both of the members 1 and 2, as illustrated in Fig. 3, are generally circular in shape and of a diameter slightly greater than the external diameter of the heat exchanger 3. As illustrated in Figs. 1 and 2, the members 1 and 2 may be respectively provided with generally similar upturned peripheral flanges 4 and 5. The central portion 6 of the member 1 is downwardly offset, as viewed in Fig. 1 as indicated at 7, with the portion 6 having a generally concave lower surface which extends radially inward to a centrally positioned well 8 adapted to receive a fan motor 9 carried by the member 1. The motor 9 may be mounted on the member 1 by any suitable means as, for example, resilient grommets or washers 11 and nuts 12 threaded on respective mounting studs extending from the motor 9. The driving shaft 13 of the motor extends through an opening 14 in the member 1 and carries the actuating fan blades 15.

The portion 16 of the lower member 2 is offset upwardly as indicated at 17, and the bottom or outer surface of the portion 16 is generally concave. The member 2, as illustrated in Fig. 2, is provided with a centrally positioned opening 18 in which is operatively positioned the fan blade 15. The upper and lower members 1 and 2 may be rigidly secured together by suitable means such

as a plurality of spaced bolts 19, passing through the respective members adjacent the offsets 7 and 17 thereof, each of the bolts 19 carrying tubular spaced members 21 which are positioned between the respective members 1 and 2, the bolts 19 being secured in operating relation by nuts 22 and lock washers 23.

The heat exchanger structure 3, positioned between the members 1 and 2, comprises a tubular inlet or supply header 24 and an outlet or condensate return header 25, such headers being arranged in parallel relationship with their axes extending parallel to the common axis of the members 1 and 2. Operatively connecting the two headers 24 and 25 are a plurality of fluid conducting tubes 26, the respective tubes being bent into circular shape and, in the particular embodiment of the invention illustrated, on equal radii, one end 27 of each tube extending through the header member 24 and opening on the interior thereof, and the opposite end 28 extending into the header 25 and opening into the same. Carried by the tubes 26 are a plurality of generally rectangularly shaped fins 29 which are uniformly spaced along the respective tubes from adjacent one header to adjacent the other header. As illustrated in Fig. 1, the offset 7 of the member 1 and the offset 17 of the member 2 are positioned at substantially equal distances from the axis of the assembly, adjacent the inner vertical edges 31 of the fin members 29. The height of the fin members is substantially equal to the distance between the upper surface 32 of the peripheral portion of the member 2 and the lower surface 33 of the corresponding peripheral portion of the member 1. It will be apparent that with such construction the heat exchanger 3 is supported by the fins 29 on the surface 32 of the member 2, and that relative movement between the members 1 and 2 and the exchanger 3 in an axial direction is prevented by engagement of the upper end edges of the fins 29 with the lower face 33 of the member 1. It will be apparent that as the heat exchanger is merely supported between the members 1 and 2, the heat exchanger is relatively free to expand radially outward or contract to the position illustrated in Fig. 1, the positions of the offsets 7 and 17 being so determined that maximum contraction of the heat exchanger is permitted and, in like manner, the radial width of the face portions 32 and 33 is greater than the maximum expansion of the unit.

Referring to Figs. 4 and 5, the header members 24 and 25 are connected adjacent their upper and lower ends by respective mounting plates or brackets 34, the plates 34 being provided with respective apertures 35 and 36 through which the respective headers extend, the latter being rigidly secured to the plates by welding, brazing, or other suitable means. As illustrated in Figs. 2 and 5, the plates 34 may be rigidly secured to the respective members 1 and 2 by means of the adjacent bolt 19, which passes through the respective plates, with the tubular spacer 21 surrounding such bolt being of a slightly lesser length than the other tubular spacers to allow for the thickness of material of each plate 34. As illustrated in Figs. 2 and 4, the plates 34 are each provided adjacent their outer edges with oppositely directed flanges 37, the flange on the lower plate 34 extending upwardly and the flange on the upper plate extending downwardly. Carried by the plates 34 is a baffle member or plate 38 secured to the respective flanges 37 by suitable means such as screws 39 with the side edges of the baffle 38 terminating in radially extending inwardly directed flanges 40 positioned adjacent the endmost fins 29 at opposite ends of the respective tubes, the member 38 thus cooperating with the plates 34 to prevent the by-pass of air into the structure adjacent the header assembly.

As illustrated in Fig. 4, the lower end of the inlet header 24 is closed by a suitable closure member 42 while the upper end of the return header 25 is closed by a similar member 43, both of the members 42 and 43 being secured to their respective headers in fluid-tight relation by any suitable means as, for example, brazing, welding, or the like. The upper end 44 of the header 24 is extended upwardly through an opening in the upper member 1 and is provided at its free ends with suitable means, such as the pipe threads 45, for engagement with a supply conduit. In like manner, the lower end 46 of the return header extends through an opening in the lower member 2 and is provided at its free end with similar pipe threads 47. In the particular embodiment of the invention illustrated, the upper end 48 of the return header extends through an opening in the member 1, as illustrated in Fig. 4, such construction thus accurately locating the return header with respect to both of the members 1 and 2.

In operation, a suitable heating or cooling medium may be passed into the header 24, through the tubes 26, and discharged through the header 25, and as air is drawn by the fan 15 radially through the heat exchange structure, it will be heated or cooled, as the case may be, following which it is discharged through the opening 18 of the lower member 2. It will be particularly noted that the motor 9 is spaced from the heat exchange structure proper and as some relatively cool air may flow downwardly along the motor through the opening 14, at no time is the motor subjected to excessive heat from the heat exchange structure which would have a deteriorating action thereon.

It will be particularly noted that with the exception of the miscellaneous mounting bolts, etc., the entire heater assembly comprises only four basic parts: the upper and lower members 1 and 2, the heat exchanger 3, and the power assembly comprising the motor 9 and fan blade 15. If necessary or desired, the motor assembly may be readily removed by removing the four securing nuts 12, while the entire heat exchanger structure may be removed by disengaging the several securing bolts 19.

The specific contour of the members 1 and 2 may be varied as desired, and similarly a suitable ornamental or deflecting grille structure may be positioned below the fan blade 15, if desired. It will be apparent from the above description that I have provided an extremely simple yet highly efficient and durable heater assembly which may be readily fabricated with a minimum of material and labor costs, and which is so designed that adequate provision for expansion and contraction of the heat exchanger is provided.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described, or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. In a unit heater, the combination of a pair of opposed housing members having uniformly spaced annularly shaped planar portions adjacent their peripheral edges, a heat exchange structure of generally annular shape comprising inlet and outlet headers, fluid conducting tubes operatively conecting the respective headers, and fin elements carried by said tubes, spaced plate members affixed to said inlet and outlet headers for affixing the free ends of said heat exchanger structure together, said fin elements having their corresponding end edges positioned in respective planes and engaged with the respective planar portions of the housing members, securing means connecting said housing members, operative to exert clamping forces on the heat exchange structure therebetween, spacing means for limiting such clamping forces to a predetermined maximum, and certain of said securing means and spacing means operatively mounted with respect to said spaced plate members for affixing the heat exchanger to the opposed housing members at a predetermined location at which the inlet and outlet headers extend through the opposed housing members.

2. In a unit heater, the combination of a pair of op-

posed housing members having uniformly spaced annularly shaped planar portions adjacent their peripheral edges, a heat exchange structure of generally annular shape comprising inlet and outlet headers, positioned in adjacent relation and extending parallel to the axis of the heat exchange structure, fluid conducting tubes operatively connecting the respective headers, and fin elements carried by said tubes, said fin elements having their corresponding end edges positioned in respective planes and engaged with the respective planar portions of the housing members, means including spaced plate members affixed to said inlet and outlet headers for rigidly connecting said headers to the respective housing members, and annular ledge means on the housing members engageable with the fin elements to restrict radially inward movement of the latter relative to said housing members.

3. In a heat exchanger mounting, the combination of a heat exchange structure including a plurality of heat transfer members having oppositely disposed planar faces, and a pair of opposed housing members, said housing members operatively forming two opposite substantially planar faces supporting the heat exchange structure, said faces being disposed in parallel planes, said pair of opposed housing members comprising a pair of mounting

members having respective planar portions fixedly arranged in spaced opposed parallel relation, with said planar portions positioned adjacent to and engageable with the planar faces of said heat transfer members, means for urging said housing members toward one another to exert clamping forces on the heat exchange structure therebetween, said heat exchange structure of generally annular shape and comprising laterally spaced and vertically extending inlet and outlet headers, spaced plate members affixed to said inlet and outlet headers for rigidly connecting said headers to the respective housing members, and annular ledge means forming the boundary of said planar portions for restricting movement of the heat exchange structure relative to said housing members in a direction parallel to said faces.

References Cited in the file of this patent

UNITED STATES PATENTS

1,903,939	Payne	Apr. 18, 1933
2,260,594	Young	Oct. 28, 1941
2,267,425	Rowe et al.	Dec. 23, 1941
2,458,159	Goldthwaite	Jan. 4, 1949
2,461,409	Christensen	Feb. 8, 1949