March 3, 1936. C. T. PERKINS ET AL 2,032,811

HEATER

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Fig. 1

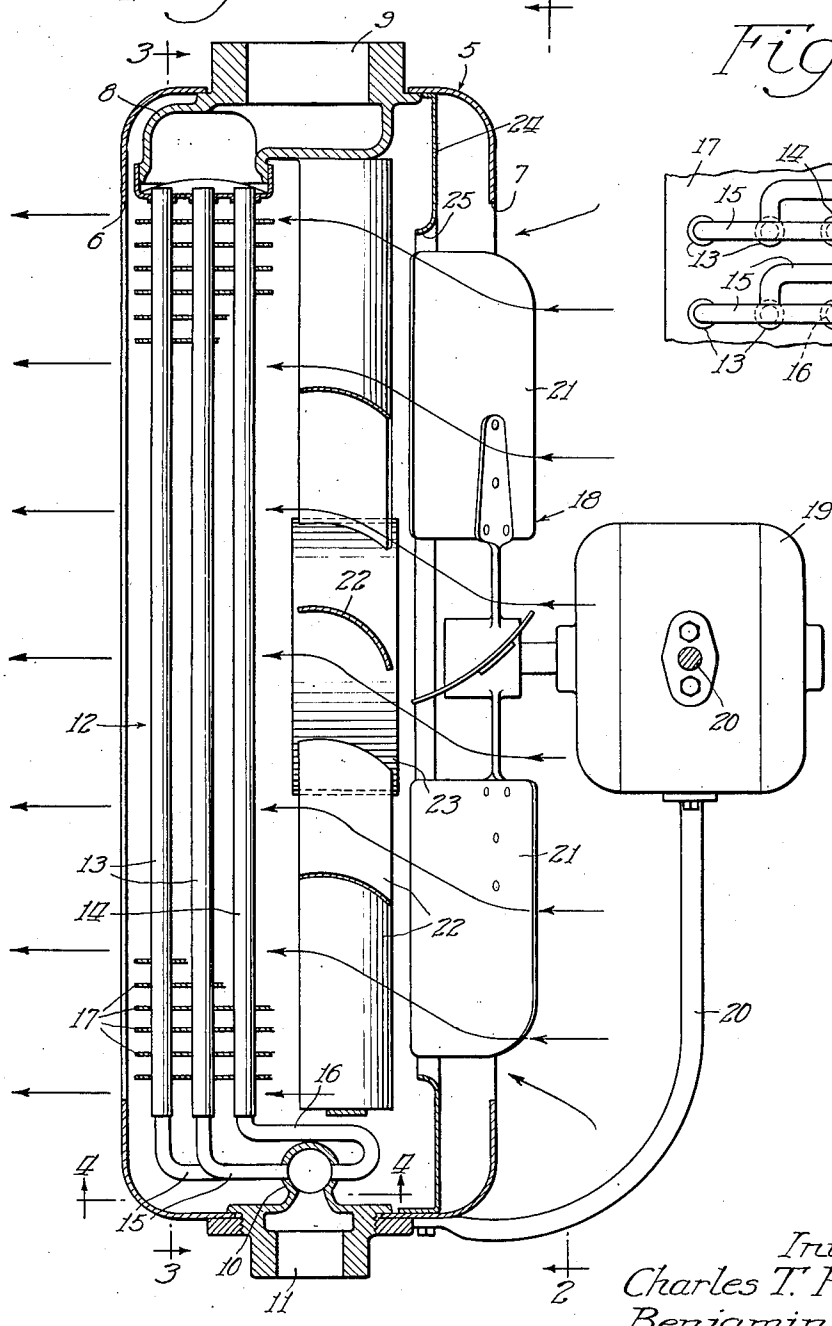

Fig. 4

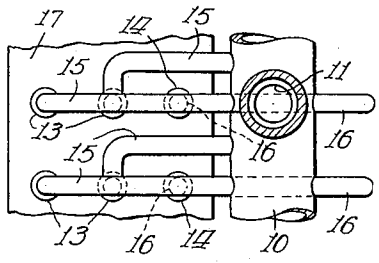

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Fig. 2

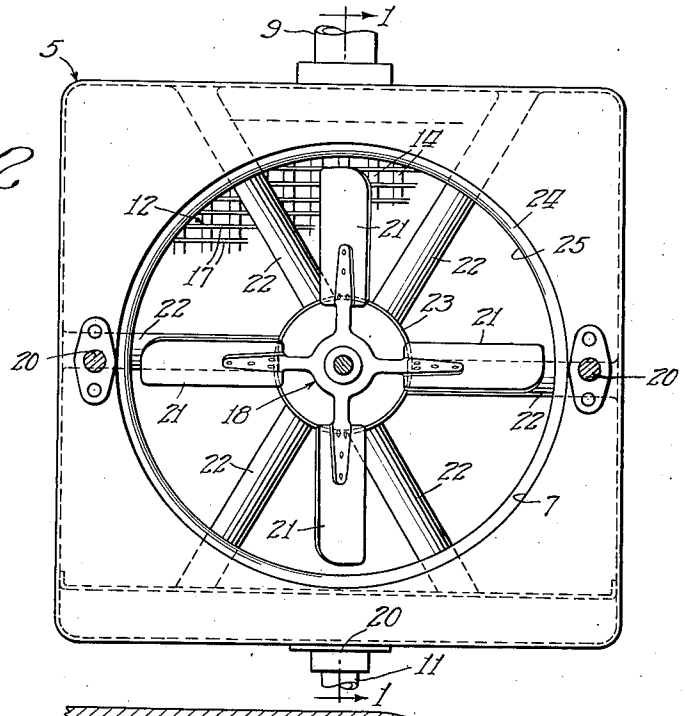
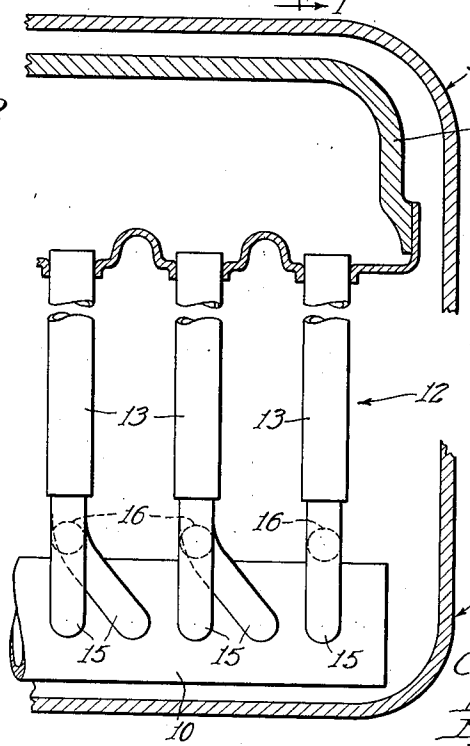


Fig. 3



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UNITED STATES PATENT OFFICE

2,032,811

HEATER

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Application April 19, 1934, Serial No. 721,279

4 Claims. (Cl. 257—137)

This invention relates to heat exchange devices, and particularly to a device for heating air as it passes through the heat exchange element or core of the device.

One object of the present invention is to provide a structure wherein portions of the heat exchange element or core may expand or contract without rupture of the core, or in any way impairing the efficiency of the device.

Another object of the invention is to provide a structure wherein various portions of the core may expand or contract, in accordance with varying heat conditions, independently of other portions thereof.

Another object of the invention is to provide a heat exchange device having air impelling means associated therewith for forcing air through the core thereof, and wherein means are provided for eliminating reverse eddy currents of the air adjacent the impelling means, and for preventing deflection of air currents away from the core of the device.

A further object of the invention is to provide a structure wherein air passing through the core is substantially uniformly distributed and directed therethrough in substantial alignment with the air passages formed in the core.

A still further object of the invention is to improve devices of the character described in sundry details hereinafter referred to and particularly pointed out in the appended claims.

One embodiment of the present invention is shown, for illustrative purposes, in the accompanying drawings, in which

Fig. 1 is a sectional elevational view through a heat exchange device, taken substantially as indicated by the line 1—1 of Fig. 2, and illustrating an embodiment of the present invention associated therewith;

Fig. 2 is a rear elevational view, on a reduced scale, of the structure illustrated in Fig. 1, and taken substantially as indicated by the line 2—2 thereof;

Fig. 3 is an enlarged fragmentary front sectional elevational view of a portion of the structure illustrated in Fig. 1, and taken substantially as indicated by the line 3—3 thereof; and

Fig. 4 is an enlarged fragmentary bottom plan sectional view, taken substantially as indicated by the line 4—4 of Fig. 1.

The illustrative embodiment of the present invention shown in the accompanying drawings comprises a housing, indicated as a whole by the numeral 5, having apertures formed in its front and rear walls as indicated at 6 and 7, respectively, the housing 5 being shown, in the present instance, as provided adjacent its upper side with a header 8 having an inlet port 9 associated therewith, and provided adjacent its lower side with a header 10 having an outlet port 11 associated therewith.

Positioned between the headers 8 and 10, and forming a portion of what is commonly known and shown, in the present instance, as a core 12, are a plurality of slightly flexible heat radiating tubes 13 and 14 adapted to communicate at their respective ends with the upper and lower headers 8 and 10, respectively.

In structures where fluids of varying degrees of temperature are passed through the heat radiating tubes, it is well known that expansion and contraction of the tubes occur in varying amounts in the different fluid passages formed by the tubes of the same core, and in structures where the headers are positioned in fixed relation to each other, as is usually the case in devices of the character described, considerable damage may be done and the efficiency of the device impaired, unless the tubes comprising the various fluid passages are permitted to expand and contract independently of each other, and for permitting the expansion and contraction of the various tubes independently of each other, the tubes 13 and 14 of the present invention are shown, in the present instance, as provided adjacent their lower ends with off-set or laterally extending transversely flexible portions 15 and 16, respectively, which may be formed integrally with the tubes 13 and 14 or suitably connected thereto.

It will be noted by reference to Figs. 1 and 4 that the laterally extending portions 15 of the tubes 13 communicate with the header 10 at the side thereof adjacent the tubes, while the laterally extending portions 16 of the tubes 14 extend above and beyond the header 10 and are adapted to communicate therewith at the opposite side thereof, thereby providing substantially uniform distribution of the laterally extending portions 15 and 16 throughout the length of the header 10, and providing a structure wherein the material from which the laterally extending portions 15 and 16 are formed, may be flexed sufficiently to compensate for the contraction and expansion of the tubes 13 and 14 independently of each other without stressing the material beyond its elastic limit. It will be observed also that any longitudinal expansion or contraction of the portions 15 and 16 will be compensated for by the slight flexibility of the tubes 13 and 14.

It will be observed from the foregoing description that the present invention, by reason of the construction and arrangement shown and described, provides a structure wherein the various tubes comprising the core of the device may expand and contract independently of each other, thereby avoiding damage to the device and impairing its efficiency.

For providing air passages through the core 12 in a manner to facilitate the radiation of heat from the tubes 13 and 14, a plurality of fins 17 are mounted on the tubes in spaced relation longitudinally thereof, and for forcing air through the passages thus formed, air impelling means is provided and shown, in the present instance, as a rotatable fan indicated as a whole by the numeral 18, and adapted to be driven by a motor 19 mounted, preferably, on brackets 20 adjacent the rear side wall of the housing 5 in a manner to position the blades 21 of the fan 18, preferably, within the aperture 7 formed in the rear wall of the housing 5.

For preventing deflection of air currents away from the core 12 of the device, eliminating reverse eddy currents of the air adjacent the impelling means, and providing for the substantially uniform distribution of air throughout the passages formed in the core, a plurality of deflectors or blades 22 are mounted within the housing 5, between the core 12 and fan 18, and are shown, in the present instance, as extending in radial directions outwardly from a ring 23 positioned substantially concentrically with respect to the axis of rotation of the fan 18 to the outer walls of the housing 5. These deflectors 22 are shown, in the present instance, as curved transversely to their length in a manner to direct air currents, produced by the fan 18, against the core 12 in a direction substantially transversely thereto and in a direction substantially coincident with the direction of the air passages formed in the core, thereby providing a substantially uniform distribution of air currents throughout the air passages and in a direction to facilitate the exchange of heat from the tubes 13 and 14 to the air currents passing through the core.

For confining the path of the air currents closely adjacent the fan 18 to facilitate the distribution of the air by the deflectors 22, a plate 24 having an aperture 25 formed therein, is positioned within the housing 5 in a manner to closely approach and surround the outer ends of the fan blades 20, as clearly shown in Figs. 1 and 2.

Obviously, the present invention is not limited to the precise construction and arrangement shown and described, as the same may be variously modified. Moreover, all the features of the invention need not be used conjointly as the same may be used to advantage in variously different combinations and sub-combinations.

What we claim and desire to cover by Letters Patent is:

1. A heat exchange device comprising a pair of headers and a plurality of substantially parallel tubes communicating at one of their ends with one of said headers and having laterally extending portions adjacent their opposite ends, said laterally extending portions of certain of said tubes communicating with the other of said headers at an adjacent side thereof, and the laterally extending portions of other of said tubes extending beyond said other header and communicating therewith at the opposite side thereof.

2. A heat exchange device comprising a housing having apertures in opposite sides thereof, a core in said housing having a plurality of transversely disposed fluid passages and air passages formed therein, a rotatable fan adjacent one of the apertured sides of said housing, and a plurality of substantially radially disposed deflector blades between said fan and core for directing air currents to said air passages in a direction substantially coincident with the direction of the air passages formed in said core.

3. A heat exchange device comprising a housing having apertures in opposite sides thereof, a core in said housing having a plurality of transversely disposed fluid passages and air passages formed therein, a rotatable fan adjacent one of the apertured sides of said housing, and a plurality of substantially radially disposed deflector blades between said fan and core, said blades being curved transversely in a common direction for directing air currents to said air passages in a direction substantially coincident with the direction of the air passages.

4. A heat exchange device comprising a housing having apertures in opposite sides thereof, a core in said housing having a plurality of fluid passages formed therein and having air passages extending substantially transversely to said fluid passages, a rotatable fan adjacent one of the apertured sides of said housing, a ring within the housing substantially concentric with the center line of rotation with said fan, and a plurality of transversely curved deflector blades between said fan and core and extending substantially radially from said ring to said housing for directing air currents to said air passages in a direction substantially coincident with the direction of the air passages formed in said core.

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