Jan. 12, 1943. B. SPIETH 2,308,119

RADIATOR CONSTRUCTION

Filed Feb. 23, 1940 2 Sheets-Sheet 1

Fig. 1.

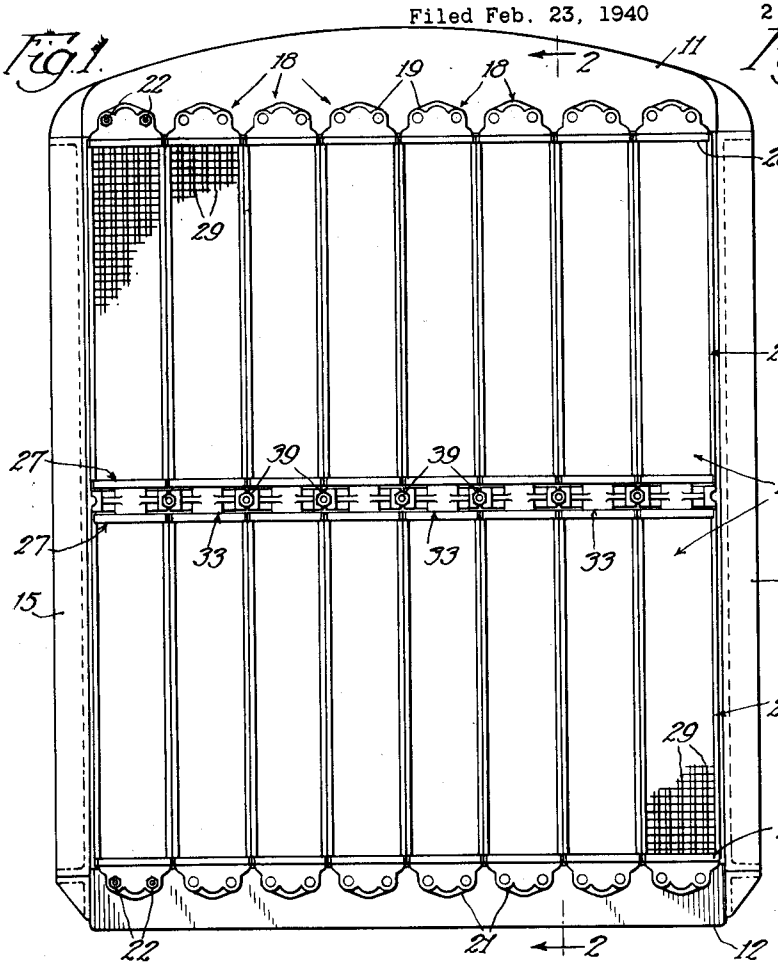


Fig. 2.

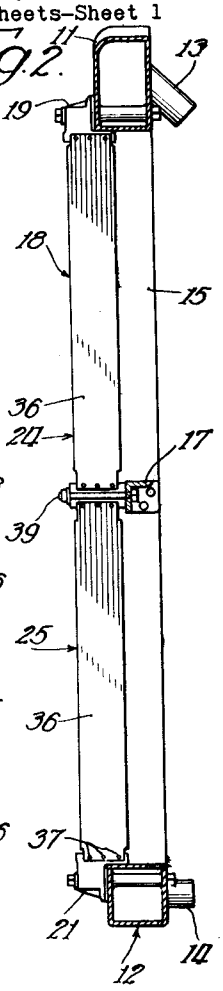
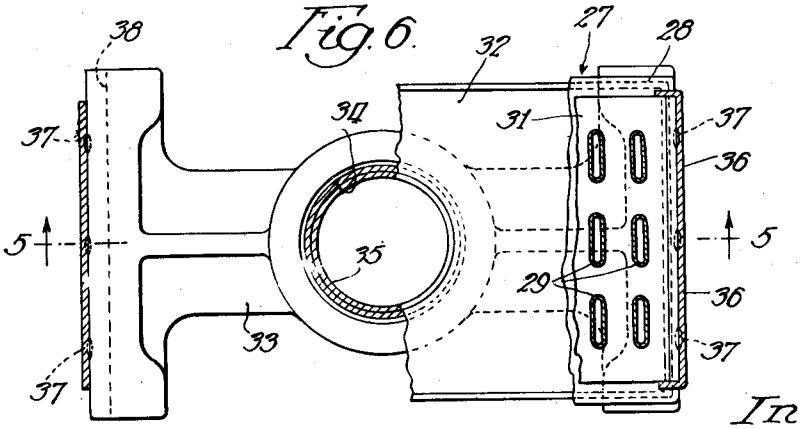


Fig. 6.



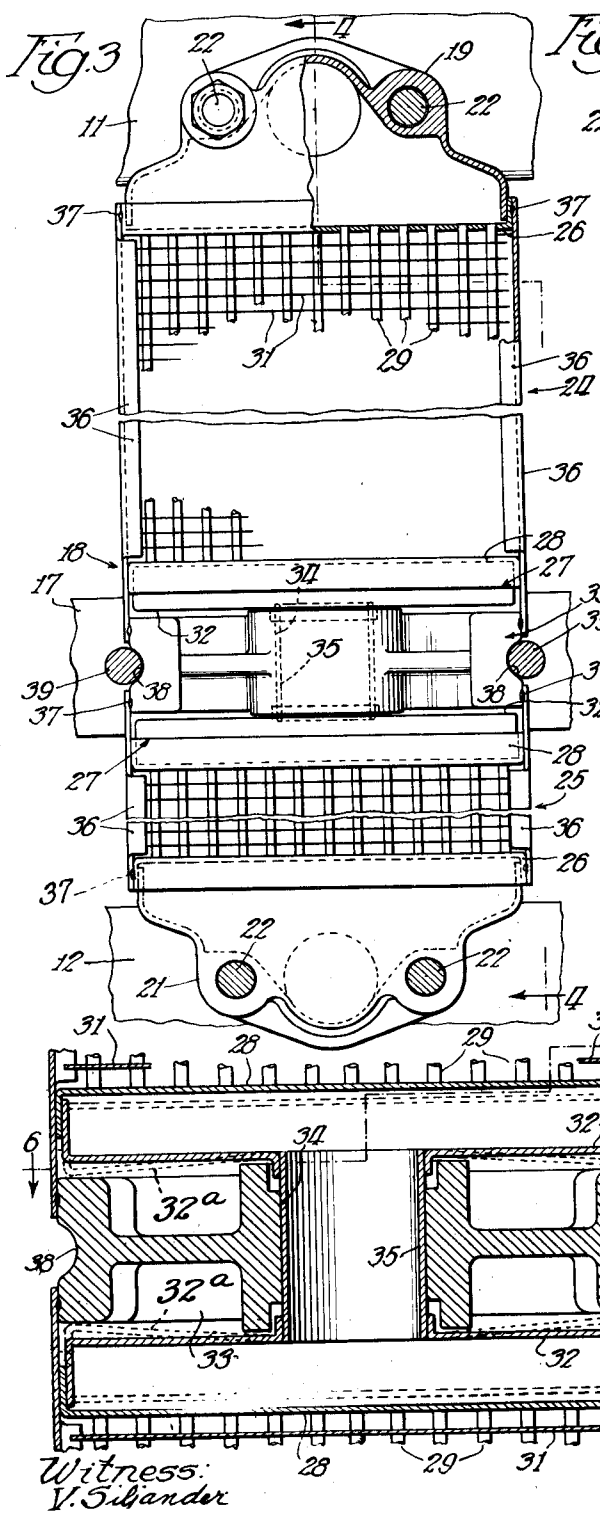
Inventor
Benjamin Spieth
By: Hill & Hill.
Attys.

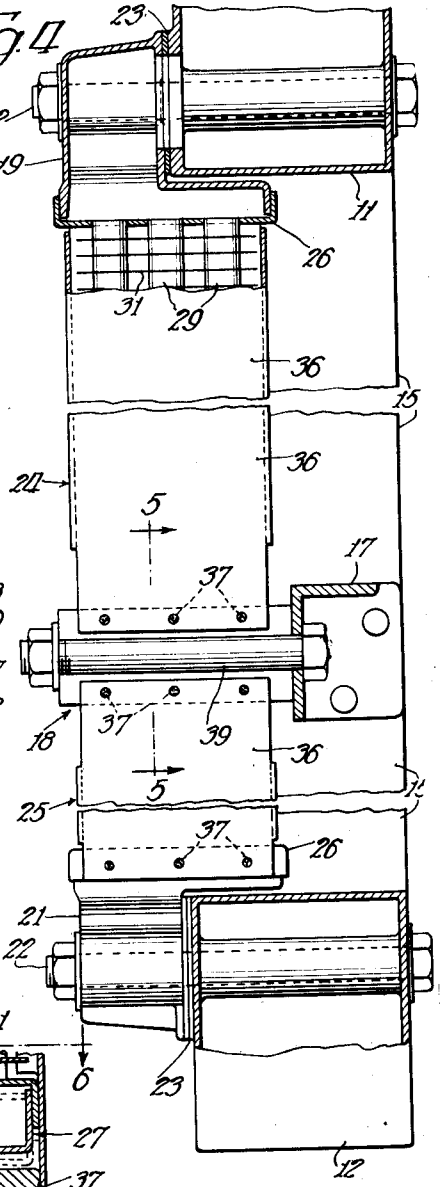
Witness:
V. Siljander

Jan. 12, 1943. B. SPIETH 2,308,119

RADIATOR CONSTRUCTION

Filed Feb. 23, 1940 2 Sheets-Sheet 2





Witness:
V. Silfander

Inventor
Benjamin Spieth
By Hill & Hill
Attys.

Patented Jan. 12, 1943 2,308,119

UNITED STATES PATENT OFFICE

2,308,119

RADIATOR CONSTRUCTION

Benjamin Spieth, Racine, Wis., assignor to Modine Manufacturing Company, Racine, Wis., a corporation of Wisconsin

Application February 23, 1940, Serial No. 320,401

6 Claims. (Cl. 257—125)

This invention relates to radiator construction, and particularly to the construction of radiator units and the use of expansion headers adapted to compensate for the expansion and construction of radiator cores forming a part of said units and employed in a fluid cooling system commonly associated with water jacketed engines such, for example, as internal combustion engines.

In some types of radiators, the top and bottom tanks are rigidly secured in relatively fixed position with respect to each other, and the connecting core sections, in some radiators are of considerable length, sometimes as much as five feet or more.

The fluid conducting tubes of these cores or radiating sections are ordinarily made of copper, which has a relatively high degree of thermal expansion, and since the fluid passing through the radiator is hot, the tubes, particularly in the long cores, expand longitudinally to a considerable extent, while the distance between the top and bottom tanks to which the cores are connected remains the same, or fixed.

Heretofore, it has been the custom and practice to rely upon the flexibility of the tube plates of a header to compensate for longitudinal expansion of the tubes employed in systems of the character described. In the use of such an arrangement on radiator sections of considerable length, the distortion of the tube plates caused by the longitudinal expansion of the radiator tubes would be so great that the tube plates, and joints of the tubes and plates would be ruptured and cause leakage in the system.

One object, therefore, of the present invention is to provide efficient means to compensate for this expansion, in a manner to relieve the radiator structure of undue strains and stresses, and to avoid the possible rupture of joints and parts thereof.

Another object of the invention is to provide an expansion header construction suitably positioned with reference to the core for relieving the core structure from excessive strains due to the expansion of parts thereof.

Another object of the invention is to provide a novel elongated tubular radiator unit of efficient heat radiating capacity, and having novel means associated therewith to compensate for the expansion of the tubes of the radiator structure.

Another object of the invention is to provide an elongated radiator unit comprising a plurality of aligned connected core sections having expansion headers associated therewith, and having means for retaining the core sections in substantial alignment.

A further object of the invention is to provide a radiator construction wherein fluid conducting radiator core units are employed, and wherein novel means are provided for retaining the units in proper position, and for securing an intermediate portion thereof to the radiator frame.

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 front elevational view of a radiator structure embodying features of the present invention and illustrating the application of my improved radiator unit thereto;

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

Fig. 3 is an enlarged front elevational view partly in section of my improved radiator unit, portions of the figure being broken away to facilitate the showing of the structure on a larger scale;

Fig. 4 is a side elevational view partly in section of the structure illustrated in Fig. 3, and taken substantially as indicated by the line 4—4 thereof;

Fig. 5 is a further enlarged fragmentary sectional elevational view, taken substantially as indicated by the lines 5—5 of Figs. 4 and 6, respectively; and

Fig. 6 is a plan sectional view of the structure illustrated in Fig. 5, and taken substantially as indicated by the line 6—6 thereof.

Referring to Figs. 1 and 2, the type of radiator illustrated in the accompanying drawings comprises top and bottom tanks 11 and 12 respectively, adapted to be connected through conduits 13 and 14 of the respective tanks to the water jacket of an internal combustion engine or the like, (not shown), the tanks 11 and 12 being connected together in relatively fixed position by means of vertically disposed rigid side frame members 15 and 16 connected together adjacent their central portion by a transversely disposed frame member 17 shown, in the present instance, as of angular cross section, as clearly illustrated in Figs. 2 and 4.

For connecting the tanks 11 and 12, and for passing the fluid from one to the other thereof, a plurality of elongated, relatively slender radiator

units of improved construction, indicated as a whole and respectively by the numeral 18, are operatively connected to the respective tanks of the radiator structure, as clearly illustrated in Figs. 1, 2, 3, and 4.

As shown in Figs. 1 to 4, inclusive, of the drawings, my improved radiator unit comprises upper and lower hollow header castings 19 and 21, respectively, adapted to be rigidly secured to the respective top and bottom tanks 11 and 12 by means of bolts 22 extending through the header castings and tanks, and having gaskets 23 associated therewith to provide a water-tight connection therebetween.

Positioned between the upper and lower header castings 19 and 21 are a plurality or pair of elongated, vertically disposed, longitudinally spaced, upper and lower core sections indicated, as a whole and respectively, by the numerals 24 and 25 and comprising header plates 26 adjacent their outer end portions operatively connected, by soldering or other suitable means, to the respective upper and lower header castings 19 and 21, respectively, the opposite or inner end portions of the respective core sections being provided with expansion headers indicated, as a whole, by the numeral 27 and including header or tube plates 28 operatively connected to the header plates 26 by a plurality of tubes 29 having cooling fins 31 mounted thereon.

Each of the expansion headers 27 includes a flexible diaphragm portion or member 32 formed, preferably, of copper-nickel or other suitable flexible material, and operatively connected by soldering or other suitable means to the adjacent header or tube plates 28.

Positioned between the expansion headers 27 of the respective core sections 24 and 25 is a supporting bracket indicated, as a whole, by the numeral 33 having an opening 34 formed therein adjacent the central portion thereof, for receiving a sleeve or connecting member 35 adapted to be secured therein by brazing, or other suitable means, and connected adjacent its respective end portions to the diaphragm members 32 of the expansion headers 27 operatively related to the inner end portions of the core sections 24 and 25, respectively.

For retaining the core sections 24 and 25 and the supporting bracket 33 in substantial alignment, a plurality of elongated, relatively broad, shallow channel members 36 are positioned adjacent the respective sides of the core sections 24 and 25 and secured adjacent their respective outer and inner end portions, by spot-welding or the like, to the header plates 26 and the supporting bracket 33, as indicated at 37 in Figs. 3, 4, 5, and 6, thereby providing also, suitable guides for the headers 27 in their movement vertically due to the expansion and contraction of the tubes 29.

For securing the respective radiator units and the respective supporting brackets 33, operatively related thereto, in proper relative position with respect to each other and with respect to the radiator frame, each of the supporting brackets 33 is provided on its respective outer sides with elongated, horizontally disposed recesses or grooves 38, as clearly illustrated in Figs. 3 and 5, the grooves of the respective brackets being positioned adjacent the grooves of an adjacent bracket and adapted to receive bolts 39 extending through a portion of the transversely disposed frame member 17 in a manner to secure the brackets 33 rigidly to the radiator frame, as clearly illustrated in Figs. 2, 3, and 4 of the drawings.

As previously stated, the upper and lower tanks 11 and 12 and the header castings 19 and 21 connected thereto are secured in relatively fixed position with respect to each other by the side frame members 15 and 16 of the radiator structure, and that the tubular members 29 of the core sections 24 and 25 are ordinarily made of copper or other suitable heat conducting material, which has a relatively high degree of thermal expansion, and since the fluid passing through the radiator and cores thereof is hot, the tubes 29, particularly in long cores, will expand to a considerable extent, which, without providing means to compensate for this expansion, would place the cores under extreme strains and stresses, possibly to the extent of breaking or rupturing joints or parts of the core structure sufficient to produce leaks therein.

It will be noted, however, by reference particularly to Fig. 5, that by reason of the flexible diaphragms 32 of the respective expansion headers 27, the expansion of the tubes 29 when sufficiently heated will cause a bodily movement of the tube plates 28, and cause the diaphragms 32 to flex in the manner shown, and to occupy a position substantially as indicated by dotted lines 32a in Fig. 5, and thereby relieve the core structure from the stresses and strains due to such expansion, and that upon cooling of the fluid in the radiator units, the material of the tubes 29 may contract and, owing to the flexibility of the diaphragms 32, the expansion headers 27 may assume their normal position, such expansion and contraction of the tubes 29 being accomplished without damage to the core structure.

It will be apparent also, that by reason of the arrangement of the guide members 36 adjacent the expansion headers 27, the tube plate portions 28 of the headers, in the present instance, may slide between the members 36 when the headers are moved vertically, as the tubes 29 expand and contract under the influence of the heat of the water passing through the tubes.

It will be observed from the foregoing description that the present invention provides a radiator of efficient heat radiating capacity having novel means associated therewith to compensate for the expansion of tubes forming a part of the radiator structure, and wherein novel means are provided for retaining the core sections of the radiators units in substantial alignment, and for retaining the units in proper position with respect to each other and to the radiator frame.

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

1. In a radiator unit and in combination, a pair of hollow header castings, a pair of elongated longitudinally spaced core sections positioned between and operatively connected adjacent their respective outer end portions to said header castings, expansion headers operatively connected to the respective inner end portions of said core sections, a supporting bracket having an opening therein positioned between said expansion headers, and a sleeve secured in said

opening and communicating at its respective ends with said headers.

2. In a radiator unit and in combination, a pair of hollow header castings, a pair of aligned elongated longitudinally spaced core sections positioned between and operatively connected adjacent their respective outer end portions to said header castings, expansion headers operatively connected to the respsective adjacent inner end portions of said core sections, a supporting bracket having an opening therein positioned between said expansion headers, a sleeve secured in said opening and communicating at its respective ends with said headers, and means connected to said header castings for maintaining said core sections in alignment.

3. In a radiator unit and in combination, a pair of upper and lower hollow header castings adapted to be connected to and to communicate with relatively fixed top and bottom tanks, respectively, of a fluid circulating system, a pair of aligned elongated longitudinally spaced core sections positioned between and communicating adjacent their respective outer end portions with said header castings, expansion headers operatively connected to the respective adjacent inner end portions of said core sections, a supporting bracket having an opening therein positioned between said expansion headers, a sleeve secured in said opening and communicating at its respective ends with said headers, and means connected to said header castings and said bracket for maintaining said core sections in alignment.

4. In a radiator of a fluid circulating system and in combination, a pair of upper and lower tanks, substantially rigid frame members connected thereto for securing said tanks in relatively fixed position, a pair of vertically aligned elongated longitudinally spaced core sections positioned between and communicating adjacent their respective outer end portions with said tanks, expansion headers operatively connected to the respective inner end portions of said core sections, a supporting bracket having an opening therein and positioned between said expansion headers, a sleeve secured in said opening and communicating at its respective ends with said headers, respectively, said bracket having horizontally disposed elongated recesses formed in opposite side portions thereof, and bolts positioned in said recesses and operatively related to said bracket and a portion of said frame for securing the bracket thereto.

5. In a radiator of a fluid circulating system and in combination, a pair of upper and lower tanks, substantially rigid frame members for securing said tanks in relatively fixed position, a pair of hollow header castings rigidly secured to and communcating, respectively, with said tanks, a pair of vertically aligned elongated longitudinally spaced core sections positioned between and communicating adjacent their respective outer end portions with said header castings, expansion headers operatively connected to the respective inner end portions of said core sections, said headers having diaphragm portions forming a part thereof, a supporting bracket having an openng therein and positioned between said expansion headers, a sleeve secured in said opening and connected at its respective ends to the respective diaphragm portions of said headers, said bracket having horizontally disposed elongated recesses formed in opposite side positions thereof, and bolts positioned in said recesses and operatively related to said bracket and a portion of said frame for securing the bracket thereto.

6. In a radiator unit and in combination, a pair of hollow header castings, a pair of elongated longitudinally spaced core sections including fluid conducting tubes operatively connected adjacent their respective outer end portions to said header castings, a pair of expansion headers positioned between the adjacent inner ends of said core sections, said expansion headers having tube plates at one side of the respective headers, said plates being operatively connected, respectively, to the inner end portions of the tubes of the respective core sections, flexible diaphragms forming a part of the respective headers at the opposite sides thereof from said tube plates, and tubular means connecting said diaphragm to provide communication between said headers.

BENJAMIN SPIETH.