Aug. 6, 1940. D. O. BRANT 2,210,200

LIQUID COOLER

Filed Jan. 23, 1939

Fig. 2.

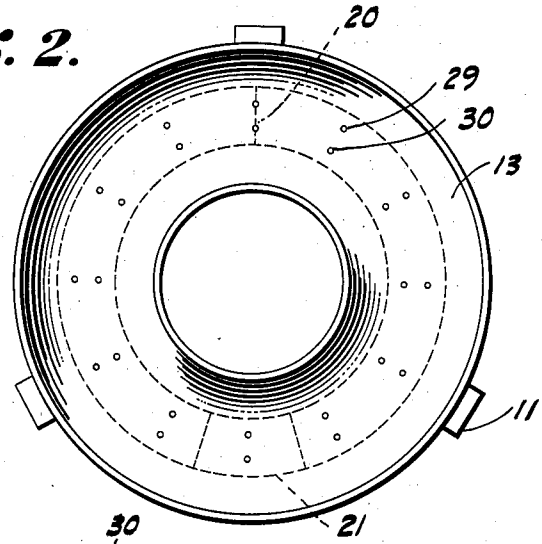
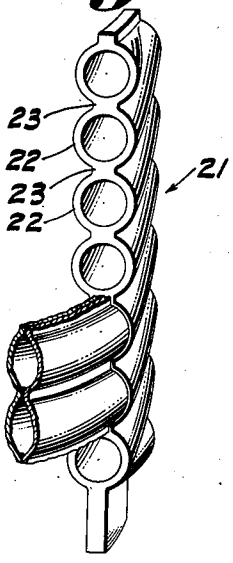


Fig. 3.



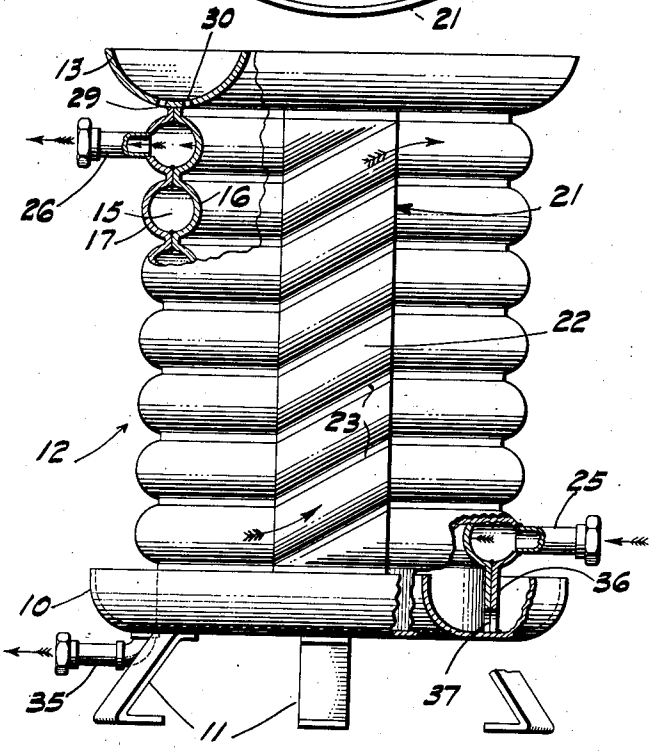


Fig. 1.

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LIQUID COOLER

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2 Claims. (Cl. 257—179)

This invention relates to a device for cooling liquids, the cooling effect being secured mainly according to the heat exchange method and by a conduit structure whereby the heat from the liquid being cooled is absorbed by a relatively cold liquid caused to pass through an ascending conduit which is not of a truly spiral form, but the turns or runs of which pass horizontally around the cooler and at one side thereof each tube is stepped up to the next higher one by an inclined connecting tube.

The invention may be used to cool various liquids, but is more particularly intended for cooling milk, and an embodiment of the invention suited to this purpose is illustrated in the drawing.

It is an object of the invention to provide a more economically constructed liquid cooling device of the kind stated. With this end in view the conduit portions of the device are constructed partly of die-pressed or rolled sheet metal and partly of cast metal, these parts being constructed in such a way as to be readily assembled and secured together in a complete structure of a sturdy, durable character.

Another object of the invention is to provide a means for more efficiently conducting the cooling liquid through the cooler and whereby it will pass through substantially all those parts of the structure where it is desired to secure its cooling effect.

The invention in its broader aspect is considered as pertaining to a liquid cooler wherein the cooling liquid is, a plurality of times, conducted circumferentially in an ascending current between the outer and inner walls of a double-walled tubular structure, while the liquid to be cooled is caused to pass downwardly over wall surfaces of such a structure.

Other objects, advantages and features of invention will hereinafter appear.

Referring to the accompanying drawing, which illustrates what is at present deemed to be a preferred embodiment of the invention:

Fig. 1 is a side elevation of the device, surface portions being broken away and underlying parts shown in mid-section in order to disclose interior construction more clearly.

Fig. 2 is a plan view of the structure shown in Fig. 1.

Fig. 3 is a perspective view showing principally the header seen in the front part of Fig. 1. A fragment of the tubular structure which cooperates with said header is included in Fig. 3.

Referring in detail to the drawing, the main parts of the embodiment shown are the base 10, which is shaped to form an annular trough, and which is supported by legs 11; a multitubular cooling structure 12, also of an annular character, which is supported by said base in an upstanding position; and an annular feeding trough 13 which surmounts said cooling structure and is positioned to feed the milk or other liquid to be cooled down both the outer and the inner surface of the annular tubular structure 12, thereby causing such liquid to be cooled as it pursues its downward course to the lower trough 10.

The cooling structure 12 includes a series of superposed conduits 15, which are made up of cooperating annular inner and outer walls, the inner wall being designated 16 and the outer wall being designated 17. Said walls 16 and 17 are each uniformly circumferentially corrugated as shown, the corrugations of the outer wall being directed outwardly while those of the inner wall are directed inwardly, corrugation matching corrugation, as shown to contribute to the production of the continuous tubular structure desired as an ascending conduit for the cooling liquid.

The double-walled, corrugated structure 12 is formed mainly in two sections each of which extends through nearly a semicircumference, as indicated by the dotted line showing in Fig. 2 where these two sections are indicated as meeting at a joint 20 near one side of the structure and at the opposite side of the structure as abutting against a header element 21, better understood from the full line showing of Fig. 1, and shown still more clearly in Fig. 3 where only a small fragment of the structure with which it is connected is included in the view.

The tubes resulting from the cooperating inner and outer corrugated walls of each of these sections are open ended at the welded joint 20 so that each pair of cooperating, aligning tubes forms a C-shaped conduit the gap in the C being filled by the header structure 21. Said header structure is shown as consisting of a casting made up of a series of short, straight, inclined, open-ended tube sections 22, adjacent sections being united by webs 23. These tube sections are of substantially the same internal diameter as the conduits 15 and they are uniformly inclined to such an extent as to bring the upper end of each of them into register with one of the open ends of one of the C-shaped conduits mentioned while the lower end of the same inclined tube section comes into register with an open end of the next lower C-shaped conduit at the opposite side of the header.

After the header 21 has been welded or other-

wise secured in the position already indicated and as shown in Fig. 1, in combination with the remainder of the tubular structure 12 it affords a continuous conduit which has a lower inlet connection 25 and an upper outlet connection 26, the arrows in Fig. 1 indicating the course of a cooling liquid supplied by the connection 25 and, after it circulates upwardly through the coil flowing out through the outlet connection 26. The cooling liquid is thus kept entirely separate from the milk or other liquid supplied to the trough 13 for cooling.

Said trough 13 is furnished in its botton portion with two rows of outlet passages 29 and 30, the outlets 29 delivering the milk to the outer surface of the corrugated cooling structure 12 while the outlets 30 conduct additional liquid streams to the inner surface of said corrugated structure. After milk being cooled has descended in two films or sheets over the outer and inner surfaces of the corrugated structure 12 until it reaches the lower trough 10, it will have become thoroughly cooled, provided an adequate stream of the cooling liquid be meantime passed through the device.

At the lower end of the cooler is an outlet connection 35 through which the cooled liquid may be drawn off from the lower trough 10.

The two troughs 10 and 13 are separately formed, preferably out of sheet metal, and are welded into place, as shown. The corrugated portion of the structure is provided at its lower end with a double annular part 36 the lower edge of which is welded along the mid-width of the bottom of the trough 10. Said part 36 is provided close to its lower edge with one or more holes 37 which conduct the portion of the liquid which flows down the interior of the device to the outer portion of the lower trough for withdrawal through the outlet connection 35.

In constructing the device, the two identical conduit forming sections, which are united at the back by the weld 20 and in front by the header 22, are constructed by die pressing into shape from sheet metal the inner and outer corrugated walls of which each of said sections is formed and then welding said walls together with the corrugations in register and directed away from each other. Then the two conduit forming sections may be united by the weld 20 at the back of the device, as already stated. Owing to the fact that each of these twin, conduit forming sections is shaped as somewhat less than a semicircumference, in constructing them the die work may be performed without difficulty.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the subject matter claimed.

What is claimed is:

1. In a liquid cooling device, an upstanding generally cylindrical structure C-shaped in cross section, said structure comprising a series of horizontally disposed tubular members in a superposed relation to each other and united to each other by webs, thereby presenting uniformly corrugated inner and outer walls, a header filling the gap in said C-shaped cross section, said header comprising a series of inclined tubes connected to each other by webs, and so positioned to form passages between each of said horizontally disposed C-shaped tubes on one side of the C-gap with the next tube above on the opposite side of the gap with the inner and outer surfaces of the header matching the inner and outer surfaces of the C-shaped structure to produce a continuous trickler surface.

2. In a liquid cooling device, an upstanding generally cylindrical structure which is C-shaped in cross section, said structure comprising a series of tubular members connected to each other by webs and providing a uniformly corrugated inner and outer surface, and a header comprising a series of tubular members with web connections therebetween filling the gap in said C-shaped cross section, said header having its inner and outer surfaces corrugated in conformity with the surfaces of the generally cylindrical structure, thereby providing a trickler surface over the entire area on the inner and outer surfaces of the structure.

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