April 28, 1942. P. F. SCHOEN 2,281,206

HEAT EXCHANGE DEVICE

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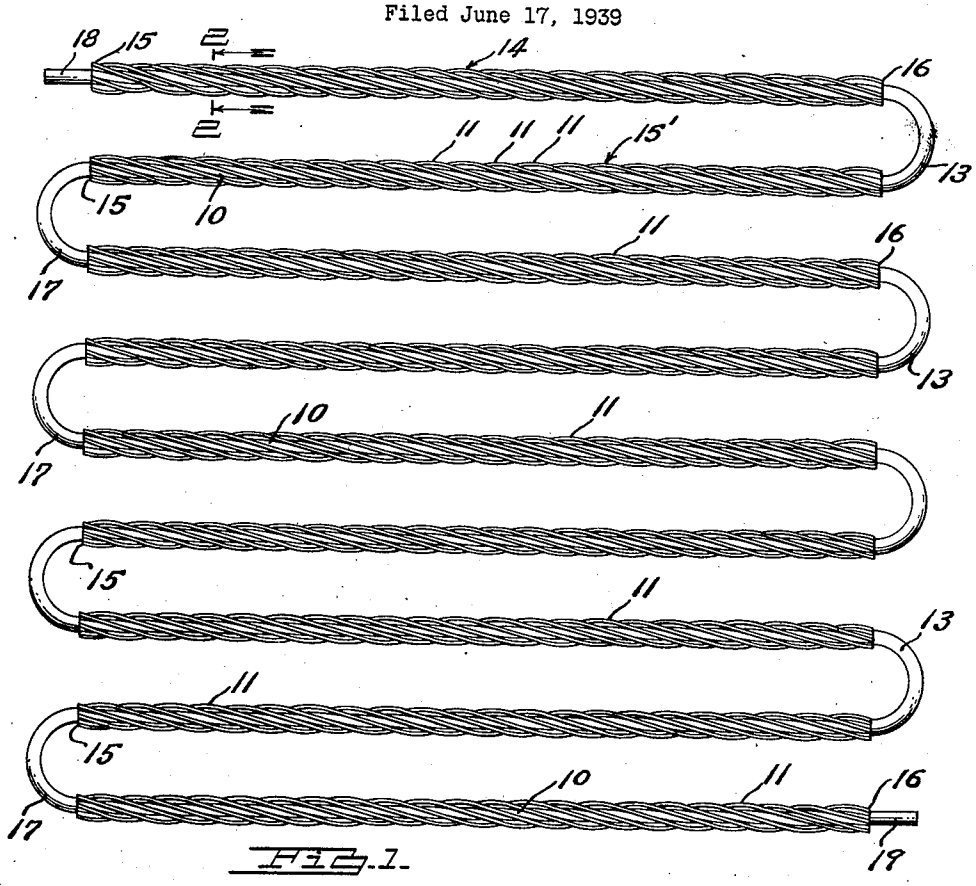


FIG. 1.

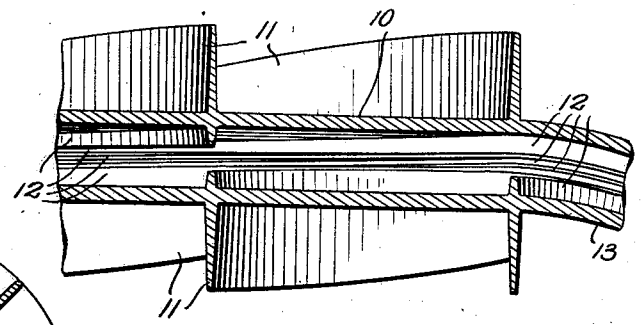
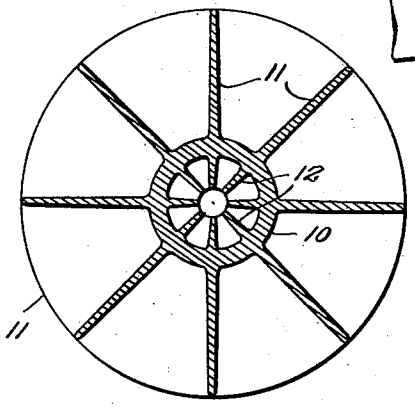


FIG. 2

FIG. 3



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HEAT EXCHANGE DEVICE

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4 Claims. (Cl. 257—148)

This invention relates to a heat-exchange device and to the method of producing the same.

A primary object of the invention is to provide a structure of improved economy and efficiency, and this object is accomplished by construction of the heat exchanger from tubing extruded from aluminum or other suitable material. The tubing is extruded with fins on both the inner and outer diameters, and the tubing is twisted to give the fins a spiral form, which increases the heat-exchange efficiency and improves the physical properties of the tubing. If the tubing is to be bent in forming a heat-exchange unit, the part to be bent is kept in more pliable condition by not twisting it, and the external fins are removed prior to bending.

While preferred forms of the invention are disclosed herein for purposes of illustration, various changes may be made in the structure without departing from the spirit of the invention as herein set forth and claimed.

These and other objects and advantages of the invention will become apparent as the description proceeds.

In the drawing:

Fig. 1 is a plan view of a heat exchange device embodying the invention.

Fig. 2 is a section on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary cross-section of the device.

The invention is illustrated in the drawing as a unit for application to a wall or ceiling of a cold storage room, although obviously the novel features may be used in heat exchange devices for other purposes.

The cooling unit illustrated consists of a single length of tubing 10, which is extruded with a plurality of external fins 11 and with a plurality of internal fins 12. This tubing is preferably extruded from commercially pure aluminum, although other suitable materials may be used.

At places where the tubing is to be bent, such as at 13, the outer fins are sheared off to prevent any interference with the bending operation.

In order to give the fins of the tubing a spiral shape the length of the tubing to be spiraled, for example the straight run 14, is twisted while under tension. This is preferably done by applying clamps to the outside of the tube at the points 15 and 16, and rotating one of the clamps while pulling it away from the other clamp. This operation maintains the tube perfectly straight and gives an even and uniform spiral shape to the fins, the pitch of the spiral depending on the number of turns given to the movable clamp.

The run 14 is preferably twisted while the entire piece 10 is a straight length, and it is to be understood that this first twisting operation does not twist the tube beyond the point 16, so that the internal fins at the place 13 have not been spiraled.

The next operation is to bend the tube at the place 13. In order to prevent collapse of the tube and of the internal fins a "mouse" formed of a plurality of flexible elements, such as wires, is drawn into the tubing to the place 13, and the tube is then bent in the desired direction.

The next run 15' of the tubing is then spiraled, and the bend 17 is next formed, these operations being repeated until the unit illustrated is formed. As an alternative method the different runs of the tubing can be spiraled while the tubing 10 is in one straight piece if suitable arrangements are made to keep the sections where the bends are to be made in their original untwisted condition.

The external fins are removed at the ends 18 and 19 in order to provide a smooth tube adapted for connection with the tubing of a refrigeration system. The internal fins may also be removed at the ends 18 and 19 if desired.

Among the advantages of the above construction are the fact that the twisting of the tube to spiral the fins elongates the edges of the fins, which were extruded as thin as possible, thus thinning them and increasing their efficiency for heat conduction. At the same time the tubing itself is shortened and thickened, thus increasing the safety factor on the tube. The spiral fins serve as very stiff ribbing against bending of the tube sections, and the bending of the fins in spiraling serves to cold-work the fins, increasing their hardness against external damage.

The spiral fins make very efficient contact with air currents, since air moving across the tube is directed around the spiral fins, making wiping contact with the tube and the fins. The spiral shape of the fins avoids any pockets in which condensation might collect.

The runs 14, 15, etc., need not be parts of a single tube, but can be separate pieces connected together or to a header by suitable fittings.

It will be clear to those skilled in the art that the tube used in the above unit can be fabricated into units of different shapes and dimensions to provide heat exchange units for various types of installations.

I claim:

1. A heat exchange unit comprising a single length of tubing formed into straight runs connected by bent portions, each of the straight runs having external spiral fins and internal spiral fins, the bent portions having smooth external surfaces free of fins and having internal non-spiraled fins, a portion at each end of the length of tubing having smooth external surfaces free of fins.

2. A heat exchange unit comprising a single length of tubing formed into straight runs connected by bent portions, each of the straight runs having external spiral fins and internal spiral fins, the bent portions having internal fins and smooth external surfaces free of fins, the internal fins on each bent portion being in non-spiral form, a portion at each end of the length of tubing having smooth external surfaces.

3. A heat exchange unit comprising a single length of tubing formed into straight runs connected by bent portions, the tubing having internal longitudinal fins throughout its length, each of the straight runs having external spiral fins, the internal fins on each straight run having spiral form, the bent portions having smooth external surfaces free of fins, the internal fins on each bent portion being in non-spiral form, a portion at each end of the length of tubing having smooth external surfaces.

4. A heat exchange unit comprising a single length of aluminum tubing formed into straight runs connected by bent portions, the tubing having internal longitudinal fins throughout its length, each of the straight runs having external spiral fins, the internal fins on each straight run having spiral form, the bent portions having smooth external surfaces free of fins, the internal fins on each bent portion being in non-spiral form, a portion at each end of the length of tubing having smooth external surfaces.

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