Oct. 12, 1943. H. D. STERICK 2,331,437

HEAT EXCHANGING ELEMENT

Filed July 23, 1941

Fig. 1.

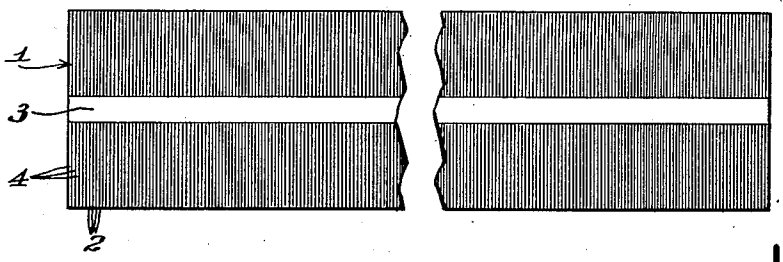


Fig. 2.

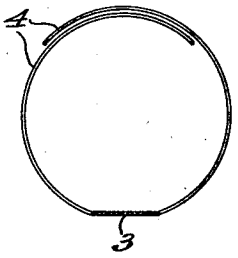


Fig. 6.

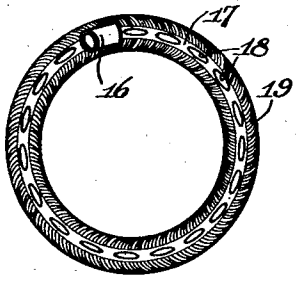


Fig. 4.

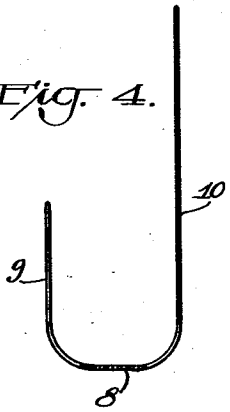


Fig. 3.

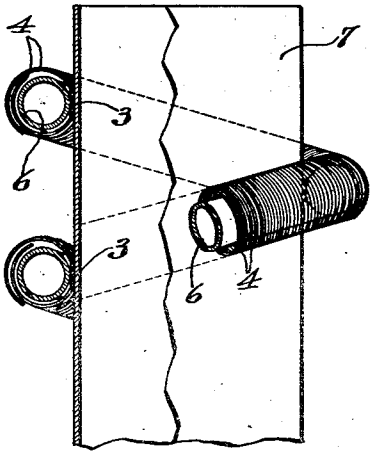
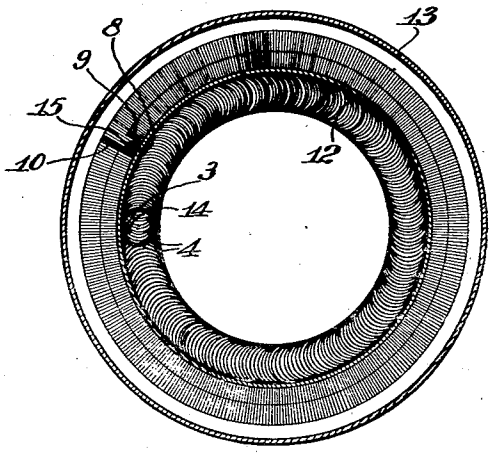


Fig. 5.



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HEAT EXCHANGING ELEMENT

Harrison D. Sterick, Pittsburgh, Pa.

Application July 23, 1941, Serial No. 403,614

4 Claims. (Cl. 257—262)

This invention relates to heat exchanging elements, and more particularly to such elements of the fin type.

It is among the objects of this invention to provide a fin type heat exchanging element which is easy and inexpensive to produce, simple in construction, easy to mount in position, and highly efficient for conducting heat to or from an object the temperature of which it is desired to affect.

In accordance with this invention a strip of metal is provided with a plurality of closely spaced transverse slits that form a row of very narrow ribbon-like fins. The slits extend only part way across this strip so that the fins are integrally connected to a body portion which extends lengthwise of the strip. This body portion most suitably is spaced from both side edges of the strip to permit a row of fins to be formed on both sides of it. The strip is bent or curved transversely to form a channel or tube-like member with the body portion adapted to engage the object whose temperature is to be affected. The fins conduct heat either to or from the body portion depending upon whether the element is being used to cool or to heat the object to which it is attached. If the element is to be curved in the plane of the body portion the latter is provided with a series of holes to permit such curvature. These holes also make it easier to braze the body portion to the object it is attached to.

The invention is illustrated in the accompanying drawing in which Fig. 1 is a plan view of my heat exchanging element in its flat condition before it has been bent transversely; Fig. 2 is an enlarged transverse section through the finished element; Fig. 3 is a side view, partly broken away, showing the element mounted on a pipe coiled around a supporting member; Fig. 4 is a view similar to Fig. 2 of a modification of the invention; Fig. 5 is a transverse section through a pair of concentric conduits showing the heat exchanging element of Fig. 2 inside the inner conduit and the heat exchanging element of Fig. 4 coiled around the outside of the inner conduit; and Fig. 6 is an end view of a pipe coil supporting another modified embodiment of the invention.

Referring to Figs. 1, 2 and 3 of the drawing, a rectangular metal strip 1, such as copper, of any convenient length is provided with two rows of substantially parallel slits 2 that extend inwardly from the opposite side edges of the strip. The inner ends of the slits of the two rows are spaced apart far enough to leave a solid body portion 3 extending lengthwise of the strip along its center. The slits in the strip form a plurality of very narrow ribbon-like heat conducting fins 4 integrally connected to the central body portion at their inner ends. If the strip is cut with shears it will curve transversely of its own accord as it is cut. If cut in such a manner that it lies flat, the strip may then by a separate operation be curved transversely so that the outer ends of the fins of the two rows tend to overlap, as shown in Fig. 2, to form a tube-like element. In actual practice the curvature of the fins is not uniform and the overlapping is quite irregular, so that there are many projecting surfaces.

This heat exchanging element can be used in many places where it is desired to either heat or cool an object. For example, referring to Fig. 3 in either a hot water heater or a refrigerating device the pipe 6 through which the hot water or refrigerating fluid flows is threaded through the tube-like heat exchanging element and then may be wrapped helically around a supporting member 7 and secured in place. This clamps the body portion 3 of the heat exchanging element between the pipe and supporting member. In case the supporting member is omitted the body portion of the element is brazed or otherwise fastened to the pipe 6. If we assume that heat from a gas burner or the like rises around and between the fins 4 of the heat exchanging element outside of supporting member 3, the fins will absorb the heat and rapidly conduct it to the body portion of the element from which it will be conducted by pipe 6 to the water flowing through it. On the other hand, in a refrigerating device fins 4 will take up the surrounding warm air and conduct it to the refrigerant flowing through the coil, whereby the air around the fins will be cooled. Or, if a hot fluid is flowing through pipe 6, the fins will radiate the heat to the surrounding atmosphere and thereby cool the fluid.

In the modification shown in Fig. 4 the body portion 8 of the heat exchanging element is off center so that one row of fins 9 is narrower than the other row 10. Also, the element is bent transversely so that a channel-like element is formed in which the two rows of fins are substantially parallel and the wide row extends beyond the narrow row. Air that flows across the outer ends of the short fins will be intercepted by the projecting portions of the long fins. This type of element can be substituted for the one shown in Fig. 3 if desired.

Fig. 5 illustrates a way in which two of my heat exchanging elements can be used. The inner conduit 12 may be the smoke stack of a

furnace, while the outer conduit 13 may lead to a room that is to be heated. Extending helically around the inner surface of the inner conduit is one of my heat exchanging elements the body portion 3 of which is held tightly against the conduit by means of a spring wire coil 14 inserted in the element. Wrapped helically around the outside of the inner conduit is another of my heat exchanging elements which is held in position by a wire 15 engaging the inner surface of its body portion 8. If desired, these heat exchanging elements may both be of the form shown in Fig. 2 or in Fig. 4. The hot waste gases flowing through inner conduit 12 are absorbed by the inner heat exchanging element and conducted through the inner conduit to the heat exchanging element that surrounds it. From this element the heat is radiated into the space between the two conduits and the air heated thereby is conducted to a room for heating it. In this way the waste gases of a furnace are utilized for heating purposes.

My heat exchanging element, by having very narrow fins on both sides of its central body portion, has substantially the maximum practicable surface area exposed to the atmosphere. This results in a very high degree of heat transfer. Due to the transverse curvature of the element it is readily mounted on a pipe or around a supporting object, because it can be telescoped over a pipe or retaining wire. It is much quicker to slip the element over a pipe than to wrap it around the pipe as it has been necessary to do heretofore with similar types of heat exchangers.

In Fig. 6 a slightly modified heat exchanging element is shown mounted in a different way on a pipe coil 16. The body portion 17 of the element engages the pipe between the convolutions rather than inside of the coil. To permit the body portion to be bent laterally so that it can follow the coil it is provided with a plurality of longitudinal openings 18 that allow the body portion to "give" laterally. These openings also make it easy to solder the body portion to the pipe at spaced intervals, wherefore a separate supporting or attaching member is unnecessary. It will be observed that with this manner of mounting my heat exchanging element the ends of the fins 19 are disposed between the pipe convolutions instead of outside of the coil.

Many other uses for my heat exchanging elements will be apparent. One such use is the cooling of air cooled airplane motors.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. The combination with a supporting member, of a heat exchanging element in the form of a metal strip having a body portion extending lengthwise thereof and spaced inwardly from the side edges of the strip, said strip being provided with a plurality of closely spaced slits extending outwardly from both sides of said body portion to said edges of the strip and forming two rows of narrow fins, said strip being curved transversely and coiled around said supporting member, and a coiled pipe engaging the inner surface of said body portion and holding it against the supporting member.

2. In combination, a metal strip having a central body portion extending lengthwise thereof and having a plurality of closely spaced slits extending outwardly from both sides of said body portion to the side edges of the strip whereby to form two rows of ribbon-like fins, said strip being curved transversely to form a tube-like element with said two rows of fins partially overlapping, and a pipe extending through said tube-like element in engagement therewith.

3. In a heat exchanging device, a coiled member, and a metal strip having a central body portion extending lengthwise of itself and having a plurality of closely spaced slits extending outwardly from both sides of said body portion to the side edges of the strip whereby to form two rows of ribbon-like fins, said body portion extending lengthwise along said coiled member in engagement therewith and with its surface substantially parallel to the axis of the coil, and said fins extending at least part way around said member.

4. In a heat exchanging device, a coiled pipe, and a metal strip having a central body portion extending lengthwise of itself and having a plurality of closely spaced slits extending outwardly from both sides of said body portion to the side edges of the strip whereby to form two rows of ribbon-like fins, said body portion extending lengthwise along said coiled pipe in engagement therewith and with its surface substantially parallel to the axis of the coil, and said fins extending at least part way around said pipe.

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