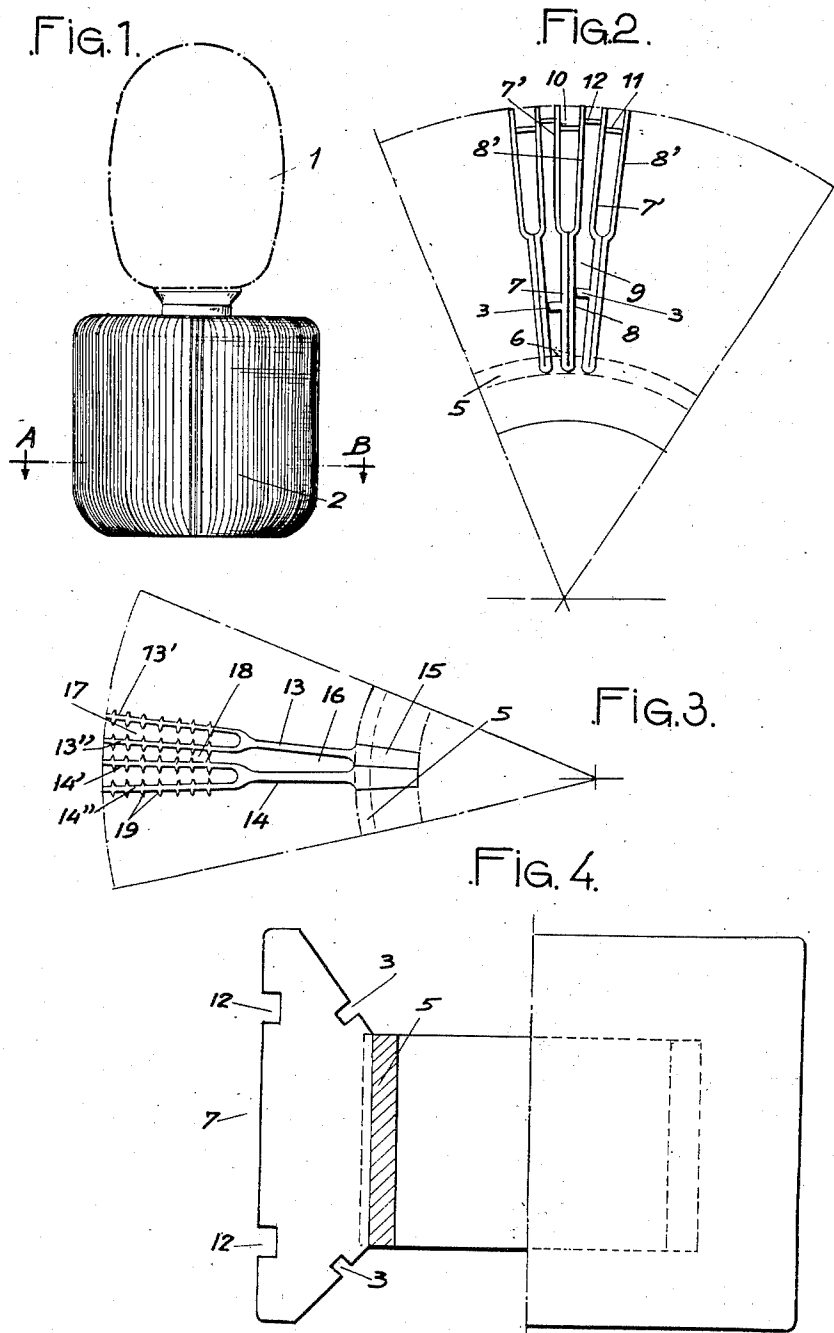


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CYLINDRICAL HEAT EXCHANGER

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CYLINDRICAL HEAT EXCHANGER

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1 Claim. (Cl. 257—263)

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My invention relates to cylindrical heat-exchangers comprising a sleeve on which is mounted a circular bundle of radial fins which are used in particular for dissipating the heat produced by the anode of thermionic valves for radio or for high-frequency heating, by causing said heat to be absorbed by another fluid, generally air.

The invention is however not limited to this application and covers all heat-exchangers of this type, in particular for heat engines.

In such exchangers, it is necessary to arrange about the anode a sufficient area of surfaces for the coefficient per unit of heat-exchange surface not to be too high and consequently not to require a speed and a rate of flow of air such that a high power is needed to produce them.

Such apparatus have been constructed by providing slits intended for the air to pass in a mass of copper or other metal of generally cylindrical shape. This method of manufacture has the drawback of requiring a large mass of metal, a considerable part of which is converted into chips, of requiring a long and costly machine and of only providing narrow air passages which are therefore not favourable for a turbulent flow, and also passage cross-sections for the heat through the metal which are not rationally arranged since they increase as they are more remote from the sleeve.

A cylindrical sleeve has also been constructed which is provided along its periphery with grooves in which were mounted fins comprising radiating blades. This device has the drawback that the fins are very close together adjacent the sleeve and are very far apart near the periphery of the bundle, so that as the air passages become considerably wider towards the periphery, the rates of flow of air through the various zones of the bundle of blades do not correspond to the cross-sections of metal conducting the heat.

My invention overcomes the drawbacks of these prior constructions. It has for its object to provide a heat-exchanger of the type referred to, in which a sleeve provided at its centre with a cylindrical passage, supports along its periphery a circular bundle of radial fins, each having a single plate at their portion located in the zone near said sleeve and two outwardly extending arms forming a fork at their peripheral portion, in such a manner as to provide air passages of substantially constant cross-section both adjacent the sleeve and towards the periphery of the bundle of fins. In this manner,

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air passages are provided whose cross-section varies but little, both near the sleeve and in the peripheral zone and the heat-exchange surface provided for the air is considerably increased relatively to the known apparatus.

According to an embodiment, each fin comprises a metal sheet which is cut out and folded on itself, the fold forming a base being intended to be fixed in a slot of a supporting sleeve, the two folded portions being contiguous in the zone adjacent the sleeve and then parting and forming a fork in the peripheral zone. In this manner, the brazing that fixes the fin to the sleeve cannot spread uselessly between the two parts of the fin into which capillarity might draw it, thereby also economising the brazing. In the manufacture of apparatus of this type comprising fins or blades arranged radially about a sleeve, the fins do not penetrate far enough into the grooves of said sleeve to make it possible to have the arms of the fins equidistant at the periphery. In order to effect the brazing it was therefore necessary to use combs which hold the fins in their relative position during the brazing operation. Said combs are fragile, they have to be constructed of the same metal as the fins for expansion purposes, they are expensive and their life is short owing to their frequent insertions in the brazing furnace.

The present invention also provides means which enable said combs to be dispensed with.

For this purpose, tongues cut out in the arms of the fork of the fins are bent so as to retain the spacing between the two arms of a fin and between the arms of successive fins. Tongues may also be formed in the body of the fins at the end portions, i. e. at the inlet and at the outlet of the draught of air. Several tongues may moreover be formed on the periphery in the direction of the height of the fin. Thus the fins are held in the suitable relative position before they are inserted in the brazing furnace without use having to be made of retaining combs. The tongues also have the advantage of producing a division in the air current and a turbulence of the air stream which favour the heat exchange.

According to a modification, instead of forming the fins by means of a metal sheet bent on itself, they may be obtained by shaping, for example by drawing, spinning, forging, extruding, planing and any other methods of machining. Such fins may have a base provided with two radial side faces relatively to the central cylindrical passage, so that when said bases are juxtaposed

and assembled, for example by brazing, they themselves form the sleeve bounding said passage.

The forked fins according to the invention may also be provided with secondary fins or be corrugated or be given any other shape which enables the extent of the heat-exchange surfaces to be increased and the heat-exchange coefficient to be increased by division or turbulence of the air stream.

Further objects and advantages of my invention will be apparent from the description and claim.

In the drawing, in which an embodiment of my invention is illustrated—

Fig. 1 is an elevation of a cylindrical heat-exchanger serving for cooling a transmitter valve.

Figs. 2 and 3 are partial transverse sections along the line A—B of Fig. 1 showing diagrammatically two embodiments of the invention.

Fig. 4 is a side view of the heat-exchanger, partially in elevation and partially in cross-section to show the profile of the fins.

For cooling a valve serving for example for a radio transmitter, said valve is mounted on a heat-exchanger 2 comprising a cylindrical bundle of radial fins held on a central sleeve.

In the embodiment of Fig. 2, a sleeve 5 is provided having slots 6 in which the forked fin bases are engaged. Said fins in this case comprise a metal sheet which is cut out and folded; the two portions 7, 8 located in the zone near the sleeve 5 are pressed against one another, so as to form, between the adjacent fins, passages 9 of substantial cross-section. Then, towards the periphery, the portions 7', 8' of the folded sheet are bent apart to form a fork, so as to provide further passages 10 between them, so that in the peripheral zone the number of passages is doubled, since it includes not only the spaces 9 provided between the double fins, but also the spaces 10 formed between the arms of each fin. In this manner, the air passages are substantially of the same cross-section throughout the mass of the fins, thereby producing an even out-flow of the heat.

In order to retain the spacing between the fins and the forked arms, tongues 11, 12 are cut out and bent in the metal sheet forming the fins, in such a manner that the tongues 11 cut out in one arm 8' of a fin bear against the arm 7' of said fin, then the tongues 12 cut out in the arm 7' of one fin bear against the arm 8' of the adjacent fin. Similar tongues 3 may also be cut out and bent on the periphery of the bodies 7, 8.

The tongues 11, 12, 3 may be staggered in such a manner that one of them is not located opposite a perforation of the other.

Fig. 3 shows a modification. In this case, use is made of forked fins 13, 14 with arms 13', 13'' and 14', 14'' which are obtained by means of a shaping process such as a drawing or other like process. A base 15, having two radial sides, is formed on said fins so that their juxtaposed bases form the sleeve which defines the internal cylindrical passage and it is not necessary to use a sleeve 5 as in the case of Fig. 2. The shape of these fins may be calculated so as to obtain air passage cross-sections which are substantially uniform, on the one hand, in the passages 16 provided between their bodies 13, 14, and on the other hand in the passages 17 provided between their arms 13', 13'', then in the passages 18 provided between the arms 13'', 14' of two adjacent forked fins.

Furthermore, secondary fins 19 may be formed on the arms of the forked fins so as to increase the heat exchange. Similar secondary fins may also be formed on the bodies 13, 14.

With this arrangement also, air passage cross-sections are obtained which are substantially constant over the entire radial extent of the bundle of fins. In the case of Fig. 2, the bases of the fins are brazed in the slots 6 of the sleeve 5 and in the case of Fig. 3, the bases 15 of the fins are brazed against one another. Instead of brazing, the fixing of the fin bases in the sleeve or to one another may be effected by any method which provides mechanical fixing and a passage for the heat.

The invention can be applied to all heat-exchangers comprising bundles of radial fins, whatever be the application of such heat-exchangers.

Further modifications will be apparent to those skilled in the art and it is desired, therefore, that the invention be limited only by the prior art and the scope of the appended claim.

I claim:

A cylindrical heat exchanger particularly adapted for dissipating heat produced by high frequency heating, comprising a passage forming sleeve and a plurality of fins extending outwardly from the periphery of said sleeve, said fins being closely and evenly juxtapositioned about said sleeve and extending radially therefrom to provide narrow substantially uniform spaces therebetween, each of said fins being formed by a sheet that is folded upon itself with the fold forming the base of the fin and being secured to the periphery of the sleeve, the folded portions being contiguous throughout their base portion to form a single body portion extending radially outward from the sleeve, said folded portion being bent apart to form a forked body portion spaced outwardly from said sleeve, and lugs struck from one of the folded portions of each fin and within both the contiguous and forked portions thereof, said lugs extending laterally into engagement with the adjacent fin to maintain said fins in uniformly spaced relation, the forked body portion being initiated at a point intermediate the radial length of the fins to maintain the spaces between adjacent fins and their forks substantially constant and the fork forming arms extending radially of the sleeve and being spaced a distance substantially equal to the distance between adjacent fins and their forks, whereby the spaces between said fins and fork arms are substantially equal and said fins and their forks provide a large heat-exchange surface having a substantially uniform relatively low coefficient per surface unit.

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