

[54] **PROCESS OF FABRICATING A RADIATOR CORE**

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[22] Filed: June 15, 1970

[21] Appl. No.: 46,033

[30] **Foreign Application Priority Data**

June 18, 1969 France.....6920355

[52] U.S. Cl.29/157.3 B, 29/157.3 D, 29/455 LM, 29/469, 113/118 D

[51] Int. Cl.B21d 53/02

[58] Field of Search.....29/157.3 B, 157.3 D, 157.3 V, 29/455 LM, 469; 113/118 D

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[57] **ABSTRACT**

Heat exchanger in which alternate sets including two fins each are connected along transverse staggered lines while the fins are flat, said fins which bear outlet holes for the pipes are then bundled up and the fins are finally stretched out along lines so as to form a honeycomb structure wherein the pipes are embedded.

4 Claims, 5 Drawing Figures

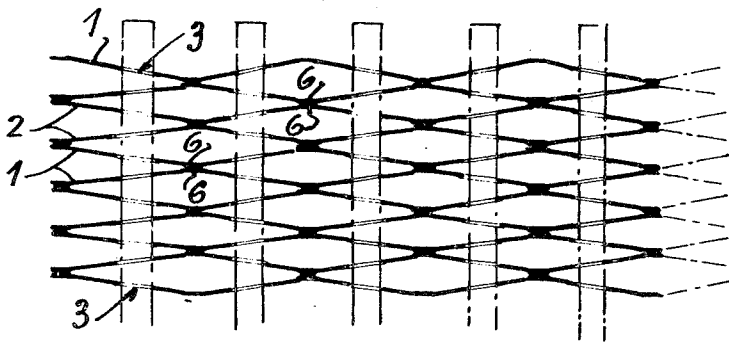


Fig.2.

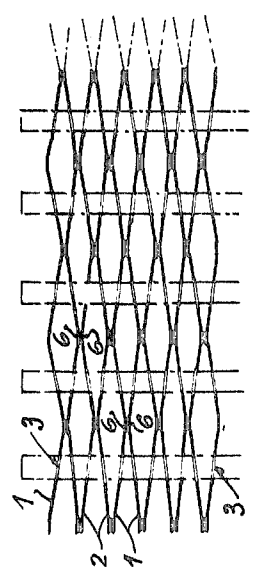


Fig.3.

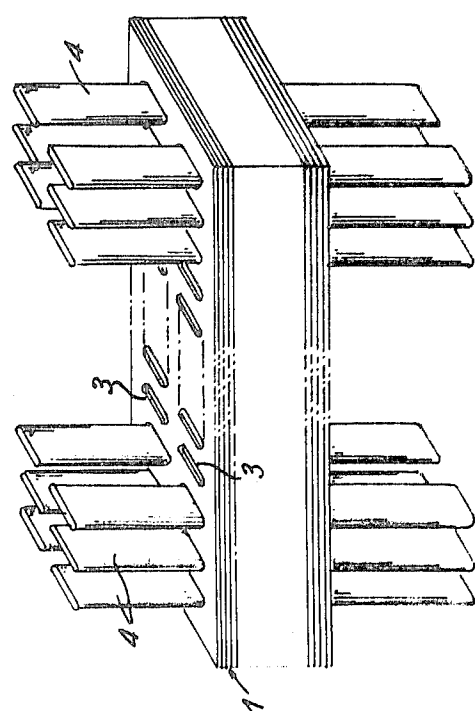
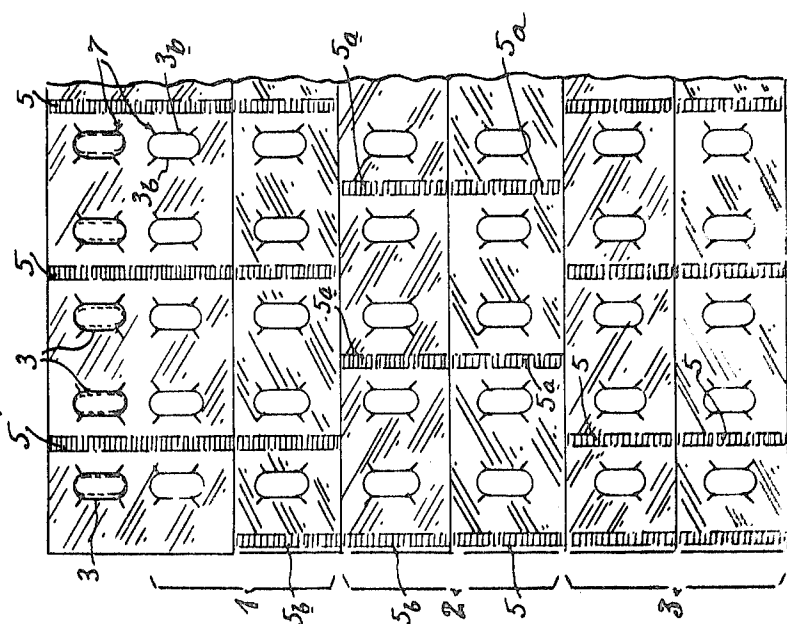


Fig.1.



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Fig.5.

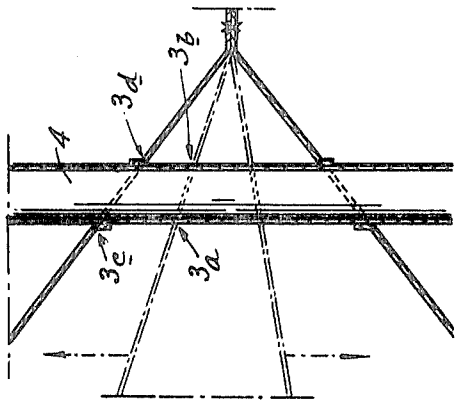
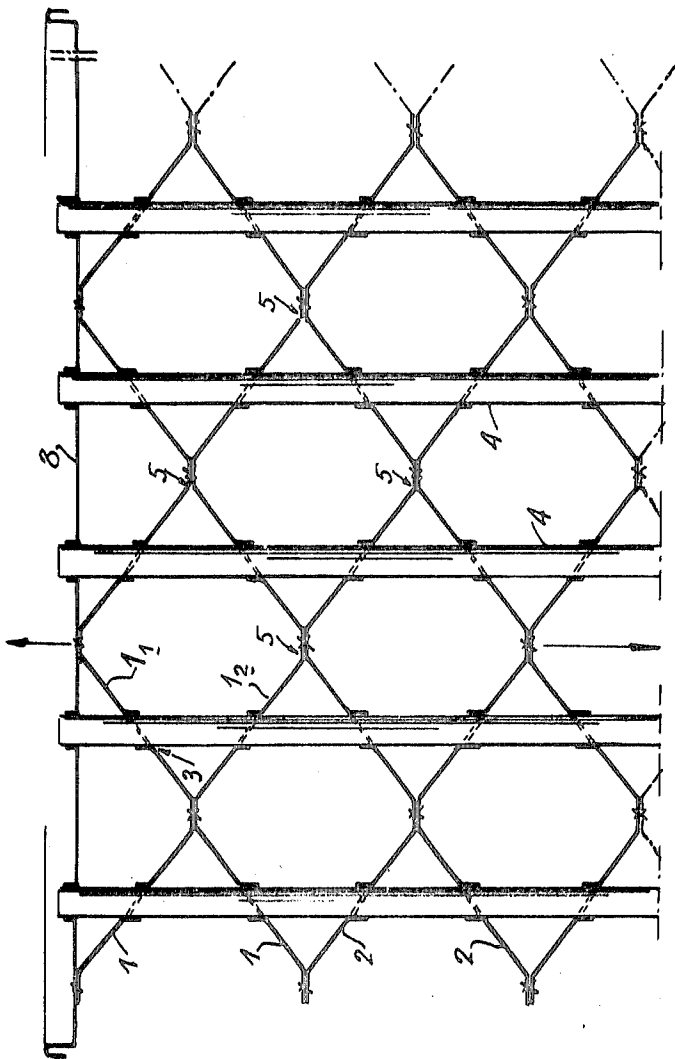


Fig.4.



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PROCESS OF FABRICATING A RADIATOR CORE

This invention relates to a novel process for the manufacture of cooling radiator cores making possible for the making of fins working as secondary exchange surfaces, to use metal sheets fairly thinner than those used heretofore, thereby allowing substantial savings of metal and lowering the weight of the core thus obtained, though said core presents improved thermic and mechanical strength characteristics as compared with those currently manufactured.

Moreover, the manufacture of cores according to the invention is greatly simplified, and, in particular, the fitting in of the pipes into the pipe outlets of the fins presents no difficulties, nor any risk of damage for the pipes as well as for the fins, as it is the case with conventional processes.

According to the invention, the process is characterized in that holes delimiting the outlet of pipes are punched into thin plates intended to form fins, said holes having dimensions slightly larger than those of the pipes of the core to be manufactured, and wherein the fins are alternately joined together according to alternate groups of two by a transverse connection, said connection being staggered from a group to another group of fins which are assembled after the carrying out of said connection into a pack in the holes of which the pipes of the core are inserted, and wherein, further, the fins are unfolded by exerting a pull at least upon the end-fins of the pack of fins, so as they are so strained as to take a honeycomb structure while the side edges of the holes thereof are applied against the pipe walls and strained in such way as to form support flanges.

The invention also relates to the product obtained by the above-described process, i.e., to radiators including a core made according to said process.

Various other features of the invention appear from the detailed description which follows.

Embodiments of the invention are shown, as nonrestrictive examples, on the accompanying drawings.

FIG. 1 is a layout of radiator fins showing a particular feature of the invention.

FIG. 2 is a front elevational view, showing a particular feature of an embodiment of the invention.

FIG. 3 shows a manufacturing stage of a radiator core according to the invention.

FIG. 4 is a partial elevational view, at a larger scale, showing another manufacturing stage.

FIG. 5 is an explanatory elevational view, at a larger scale, showing a specific result obtained according to the invention.

On FIG. 1 are shown radiator core fins, said fins being arranged into two separate groups respectively referenced by 1 and 2.

The fins of each group are all manufactured along the same process from thin sheets of metal wherein holes 3 are punched serving as outlet apertures for pipes 4 (FIGS. 3 to 5) which are designed to form a radiator core when assembled with said fins. Holes 3, intended to pipe outlets, have a shape corresponding with that of the pipes, a roughly rectangular shape in the case of flat pipes, for instance. However the dimensions of said holes 3 are slightly larger than the outer dimensions of the pipes, so as to allow said pipes to be fitted in the fins without friction or with gentle friction, as described hereunder.

One of the stage of the invention consists in assembling together the constituent fins of each fin groups 1-2 and also in assembling together the fin groups between them. Various processes may be used for this purpose. Strips of glue 5, for instance, stretching transversally, are laid over fins of groups 1 preferably from the leading edge to the trailing edge thereof, said strips of glue being set in the interval between holes 3, but however by overrunning one interval at each step. In the same way, as concerns fin groups 2, strips of glue 5a are laid as indicated above, but in shifting said strips of glue 5a by half a pitch, as shown on FIG. 1. In other words, strips of glue 5-5a are staggered in alternate rows. In addition, strips of glue 5b are also laid along the tip short sides of the fins, except, possibly, along the two end-fins of the radiator core to be

manufactured. All the fins are thereafter joined together by pressing them so as to ensure the mutual assembly thereof along strips of glue 5, 5a and 5b.

The assembly, for the making up of a pack of fins which is joined as described above, may obviously be carried out by other means than strips of glue. In fact, it is known, particularly in the radiator engineering, that such bonds may easily be carried out according to many different processes, by means of soft welding, for instance, or by brazing, or also by cold-forging, after coating the rough shapes intended to form the fins with a suitable ink, excepting the parts of said rough shapes to be joined, and by subjecting then the pack of fins to a rolling.

Another process is shown on FIG. 2, according which at the time holes 3 are punched, by means of a press, for instance, the fins are slightly corrugated in such way as they will show alternate support parts 6, the corrugations having a very small amplitude and the support parts 6 being strictly aligned, as shown on said figure. Support parts 6 are thereafter welded together by means of an electronic bombardment by passing the pack of assembled fins under an electron gun, thereby allowing to obtain a rough shape of a pack of fins quite satisfactory for the next manufacturing stages. After the the assembly of the fins together, as explained above, pipes 4 are set in position, which can be made very easily since, as indicated above, holes 3 have larger dimensions than the pipes.

FIG. 4 shows the next manufacturing stage which consists, by means of suitable combs, in the unfolding of the pack of fins inserted over the pipes in such way that said pack of fins will form thereby a honeycomb structure.

FIG. 5 shows that during the unfolding of the fins, side edges 3a, 3b of holes 3 come into contact with the wall of each tube 4. Thereafter, as the unfolding is carried on, and owing to the extreme thinness of the fins, ranging about a few hundredth of a millimeter, said edges 3a, 3b are strained in order to form flanges 3c, 3d which are thereby tightened by compression on the walls of pipes 4, once the pack of fins is entirely unfolded. In order to make the shaping of the flanges 3c, 3d still easier, it is recommended, as shown on FIG. 1, to work out cutting up scarfs 7 at the edge tips 3a, 3b of each hole 3. As a matter of fact, the metal is thereby folded more easily and particularly more evenly all along said side edges 3a, 3b which delimit each hole 3.

It has been explained hereinabove that the unfolding of the pack of fins is performed by means of combs, said combs being in this case fitted between the end-fins and those which are set immediately before, i.e., in the case of FIG. 4, between fins 1₁ and 1₂.

It also possible, and this is a preferred feature of the invention, to fasten to the pack of fins assembled as described above, and with the same means as those ensuring the tightening between the fins, collectors 8, and then to carry out the unfolding of the fin pack by exerting a pull so as to push aside from each other the two collectors the radiator core is fitted with, the combs or the other parts thus resting under the collectors.

Once the core is made as described above, it only remains to secure tightness between the tips of pipes 4 and the collectors, such as 8, which may be performed according to any ordinary engineering process, by means of flexible joints for instance, or also, by means of a thermic treatment ensuring the fastening by welding. This latter process is particularly recommended in the case the fins are fastened together, as explained on FIG. 2, by electron beams welding at the resting part 6 thereof, because in this case, the welding of the collectors and even that of flanges 3c, 3d, formed when the pack of fins is unfolded, may be easily performed by means of soft welding.

Obviously, the present invention is not limited to the embodiments shown and described hereinabove and various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

I claim:

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1. A process for the manufacturing of radiators pipe cores, said process comprising punching holes delimiting the outlet of pipes into thin metal plates from which the fins will be formed, said holes having dimensions slightly larger than those of the pipes of the core to be manufactured, alternately joining said plates together to form alternate groups of two by means of a transverse connection, said connection being staggered from one group to another group of said plates, assembling together a plurality of said alternate groups of plates to define a pack having aligned holes, inserting the pipes of the core into said aligned holes in said pack, and unfolding the plates so as to define the fins by exerting a pull at least upon the end plates of the pack of plates, so as to strain the assembly and thus produce a honeycomb structure having the side edges of the holes therethrough are applied against the pipe walls and being strained in such way as to form support flanges.

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2. A process, according to claim 1, wherein two opposite collectors are further fitted on the end-fins of the pack of fins, and a pull intended to stretch out the fin pack into a honeycomb structure is exerted on said collectors.

3. A process, according to claim 1, wherein cutting up scarfs are worked out into the extending part of the side edges delimiting the pipe outlet holes in order to facilitate the folding of rest flanges during the unfolding of the fin pack.

4. A process, according to one of claim 1, wherein the parts of the fins which are to be fastened together are so shaped as to form support lines, while holes are punched into said fins, wherein the fins so shaped are set in position one above the other, and further, wherein said support parts are fastened together by means of an electron beam welding.

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