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A. B. MODINE

2,032,065

RADIATOR CORE

Filed Nov. 16, 1932

Fig. 1

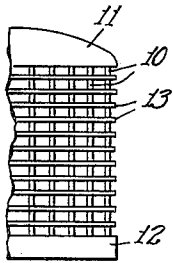


Fig. 3

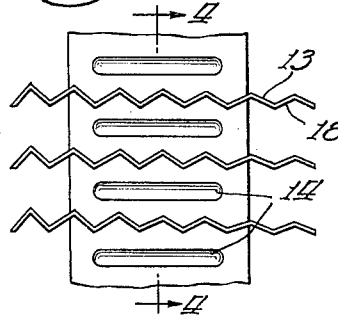


Fig. 2

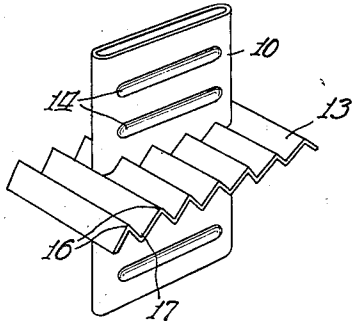
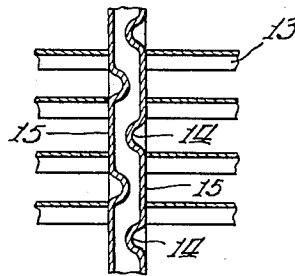


Fig. 4



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RADIATOR CORE

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3 Claims. (Cl. 257—130)

The invention relates to improvements in radiator cores such as those employed in automobiles and heat exchange devices and has as its principal object the provision of a construction which will materially increase the rate of heat exchange between the fluid circulating through the radiator and the cooling medium or air advanced through the core.

It is a further object of the invention to provide a construction whereby turbulence of both the fluid to be cooled and the air advanced through the core is secured, thus materially increasing the heat exchange capacity of the radiator.

In addition to the above, it is an object to construct a radiator of tubes and fins, both of which are provided with means for respectively causing turbulence of the fluid circulating through the tubes and the air advanced over the fins.

The invention has these and other objects, all of which will be readily understood when read in conjunction with the accompanying drawing which illustrates one embodiment of which the invention is susceptible, it being manifest that changes and modifications may be resorted to without departing from the spirit of the appended claims forming a part hereof.

In the drawing, Fig. 1 is a front elevation of a heat exchange device comprised of tubes and fins having the invention applied thereto;

Fig. 2 is a perspective view of a fragment of the tube and fin structure employed in Fig. 1;

Fig. 3 is a side elevation of the structure shown in Fig. 2; and

Fig. 4 is a section taken on line 4—4 of Fig. 3.

The radiator core shown in Fig. 1 contemplates the utilization of a plurality of tubes generally designated 10 having the opposite ends thereof respectively connected with the headers 11 and 12, the tubes having fins generally designated 13 arranged transversely of the tubes. The tubes are relatively flat or elongated in cross section and the fins are preferably of a length sufficient to accommodate the several tubes, it being understood that each of the fins is provided with a plurality of openings for the reception of the respective tubes.

As before stated, it is an object of the invention to provide a construction which will increase the cooling capacity of the core and to this end, all of the tubes and also all of the fins are each provided with means for respectively causing turbulence of the fluid circulating through the tubes and causing turbulence of air engaging the fins. In the structure shown, all of the tubes are pro-

vided at intervals of their length with inwardly projecting protuberances 14 which are arranged transversely of the tubes and project into the path of the fluid circulating through the tubes and cause turbulence to be imparted to the fluid circulating through said tubes and in addition cause the fluid to be projected against the opposite side of the tube to engage with the portions 15—15 thereof to cause a scrubbing action between the walls of the tube and the fluid which will displace the fluid adjacent the inner face of these walls and cause another portion of fluid to be presented to the cooling effect thereof.

As before stated, heat radiating fins are associated with the tubes generally designated 10. These fins are constructed to provide means for causing turbulence of air passing between the fins and tubes which will materially aid the cooling effect of this air and increase the cooling capacity of the radiator. This means for causing turbulence of the air comprises a plurality of corrugations 16 and 17 which preferably extend longitudinally of each fin from one end to the other thereof and provide means arranged transversely of the path of the air passing through the radiator for causing its turbulence. These corrugations are of a varied character and it will be noted that those near the forward side of the radiator are of greater amplitude and that the amplitude of the corrugations diminishes toward the rear portion of the fins and that the greatest turbulence is therefore created at the front or forward part of the space between the fins. This turbulence of the air combined with the turbulence of the fluid circulating through the tubes materially increases the efficiency of the radiator as a heat exchange device.

The protuberances 14 may be formed in the tube by indenting the material of the tube at intervals of its length, it being understood that these protuberances are formed in the opposite side walls of the tube and preferably with the protuberances of one side of the tube offset relatively to the protuberances of the opposite side of the tube.

From the foregoing description of the structure, it is believed manifest that radiator core is produced comprised of tubes and fins each having means for respectively causing turbulence of fluid circulating through the tubes and air advanced between the fins which will materially enhance the cooling capacity of the device without materially adding to the cost thereof and in which the air initially introduced to the structure has the greatest turbulence applied thereto

which it has been found materially increases the cooling effect of the air circulating between the fins.

Having thus described the invention, what I claim as new and desire to cover by Letters Patent is:

1. A radiator core comprising a plurality of tubes each having inwardly protruding transverse projections upon their opposite sides spaced to form a zigzag channel of substantially uniform width adapted to direct a fluid flowing through said tube alternately from side to side and against the opposite sides and projections of the tube turbulently, in combination with a plurality of fins arranged transversely of said tubes and engaging the walls thereof, said fins being corrugated and spaced to form a zigzag channel of substantially uniform width between said fins, thereby directing the air passing therebetween from side to side of said channel and against said fins turbulently, said corrugations being of maximum amplitude at the forward side of said fins and diminishing toward the rear thereof.

2. A radiator core comprising a plurality of tubes each having inwardly protruding transverse projections upon their opposite sides spaced to form a zigzag channel adapted to direct a fluid flowing through said tubes alternately from side to side and against the opposite sides and projections of the tubes turbulently, in combination

with a plurality of fins arranged transversely of said tubes and engaging the walls thereof, said fins being corrugated and spaced to form a zigzag channel of substantially uniform width between said fins, thereby directing the air passing therebetween from side to side of said channel and against said fins turbulently, said corrugations being of maximum amplitude at the forward side of said fins and diminishing toward the rear thereof.

3. A radiator core comprising a plurality of flattened tubes each having inwardly protruding transverse projections on their opposite sides spaced to form a channel having zigzag portions adjacent the edge portions of the tubes and adapted to direct a fluid flowing therethrough alternately in opposite directions transversely to the longitudinal plane of the tubes and turbulently against oppositely disposed sides thereof, in combination with a plurality of fins arranged transversely of said tubes and engaging the walls thereof, said fins being corrugated and spaced to form a zigzag channel of substantially uniform width between said fins thereby directing the air passing therebetween from side to side of said last mentioned channel and against said fins turbulently, said corrugations being of maximum amplitude at the forward side of said fins and diminishing toward the rear thereof.

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