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(54) **Asymmetric corrugated fins with louvers**

(57) A fluid flow guide member (16) of a heat exchanger (10), adapted to be traversed by a fluid flow (F). The guide member (16) is made from a corrugated metallic strip (18), the width (W) of which extends along a transversal axis (T) from a leading edge (26) to a trailing edge (28). The leading edge portion (30) of the guide member (16) is provided with slit louvers (34) adapted to deviate the flow (F) and, the trailing edge portion (32) is free of slit louvers.

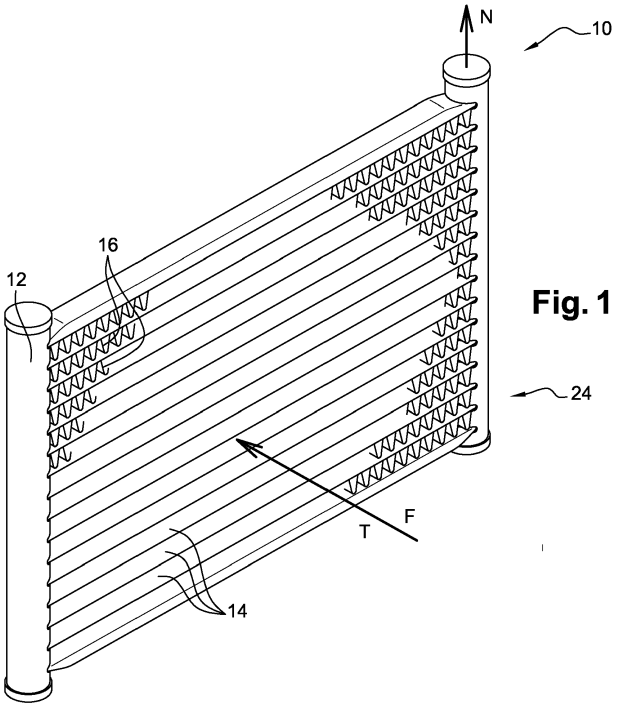

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a tube and fin heat exchanger and more particularly to the louvered fins that are arranged between two parallel tubes.

BACKGROUND OF THE INVENTION

[0002] Tube and fin heat exchangers typically comprise parallel flat tubes wherein flows the fluid and, corrugated louvered fins arranged between the tubes and across which flows an air stream. The louvered fins are made in a metal strip fanfold creating panels substantially parallel and extending between the tubes from a leading edge with louvers to a trailing edge with inversed louvers. Furthermore, the fins are provided with slit louvers forcing the air stream to deviate and to traverse the panels. The symmetrical fins usually comprise an upstream series of louvers, arranged in the leading half of the strip and, a downstream series of louvers arranged in the trailing half. While the upstream louvers deviate the air flow in one direction, the trailing louvers deviate it in the opposite direction. These symmetrical fins theoretically don't curl in production. However if one side is stronger than the other, the metal strip will curl toward the weaker side. The curl makes it for all intents and purposes impossible to handle in a production environment.

SUMMARY OF THE INVENTION

[0003] Accordingly, it is an object of the present invention to provide a fluid flow guide member of a heat exchanger, adapted to be traversed by fluid flow. The guide member is made from a corrugated metallic strip, the width of which extending along a transversal axis from a leading edge to a trailing edge. The leading edge portion of the guide member is provided with slit louvers adapted to deviate the flow. The trailing edge portion is free of slit louvers and provided with strengthening ribs. Particularly, the ribs are not slit and are formed by corrugating the trailing edge portion of the strip.

[0004] In a particular embodiment, the ribs have a trapezoidal cross section.

[0005] The width of the strip is divided between the leading edge portion and the trailing edge portion along the transversal axis. In an embodiment both portion have equal length while, in another specific embodiment, the leading edge portion is longer than the trailing edge portion. In still another embodiment, the leading edge portion is shorter than the trailing edge portion.

[0006] The invention is also related to a heat exchanger having tubes between which are arranged fluid flow guide member as set in any of the preceding paragraphs.

BRIEF DESCRIPTION OF THE DRAWING

[0007] The present invention is now described by way of example with reference to the accompanying figures where:

Figure 1 is an air-fluid heat exchanger having fins as per the invention.
Figure 2 is an isometric view of corrugated fins of figure 1.
Figure 3 is a cross-section of the fins as per a first embodiment.
Figure 4 is a cross-section of the fins as per a second embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0008] As per figure 1, a brazed air-fluid heat exchanger 10 comprises two parallel tanks 12 extending along a normal axis N, a plurality of longitudinal L flat tubes 14 extending between the tanks 12 and corrugated fins 16 arranged between the tubes 14. The fins 16 are made of a metal strip 18 fanfold so to form flat panels 20 substantially parallel to each other's, and only joining along the fold lines 22 brazed to the tubes 14. As visible on the figure, the heat exchanger 10 has a large front face 24 perpendicular to a transversal axis T.

[0009] In operation, an air flow F crosses the heat exchanger 10 flowing between the fins 16 from the leading edge 26 to a trailing edge 28.

[0010] As represented in figure 2, between the two edges 26, 28, the fins 16 have a leading portion 30 followed by a trailing portion 32. The leading portion 30 is provided with slit louvers 34 oriented to deviate and skew the air flow F of the transversal axis T and, the trailing portion 32 is provided with ribs 36 extending between the fold lines 22.

[0011] A first embodiment is represented on figure 3 where the leading edge 26 is on the left of the figure. The leading portion 30 and the trailing portion 32 have equal transversal length, approximately half the width W of the strip 18. The louvers 34 are represented by a series of parallel skewed lines and the ribs 36, on the trailing portion 32, have trapezoidal profiles. In this first embodiment the ribs 36 are not slit and consequently the air flow that enters the trailing portion 32 remains between the same two fins until exiting by the trailing edge 28. While many alternatives can be made, it appears that a good dimensional compromise resides in an inter-louvers distance 38 of approximately 1 mm and in a trapezoidal base width of approximately 3mm for the ribs, each of the three sides of the rib having approximately the same dimension.

[0012] In second embodiment represented by figure 4, the leading edge portion 30, containing louvers 34, is much wider/longer along the transversal axis T than the trailing portion 32.

[0013] Other alternatives, not represented, can be made. The ribs do not need to be trapezoidal and other

shapes such as square, semi-circular or triangular are also possible.

[0014] The following references have been utilized in this description.

10	heat exchanger
12	tank
14	tube
16	fins - fluid flow guide member
18	metal strip
20	panels
22	fold line
24	front face
26	leading edge
28	trailing edge
30	leading portion
32	trailing portion
34	louvers
36	strengthening ribs
38	inter-louvers distance
N	normal axis
T	transversal axis
F	air flow

Claims

1. Fluid flow guide member (16) of a heat exchanger (10), adapted to be traversed by fluid flow (F), the guide member (16) being made from a corrugated metallic strip (18), the width (W) of which extending along a transversal axis (T) from a leading edge (26) to a trailing edge (28), the leading edge portion (30) of the guide member (16) being provided with slit louvers (34) adapted to deviate the flow (F), **characterized in that** the trailing edge portion (32) is free of slit louvers.

2. Fluid flow guide member (16) as set in the preceding claim further provided with strengthening ribs (36) arranged in the trailing edge portion (28).

3. Fluid flow guide member (16) as set in claim 2, wherein the ribs (36) are not slit.

4. Fluid flow guide member (16) as set in any of the claims 2 or 3, wherein the ribs (36) are formed by corrugating the trailing edge portion (32) of the strip (18).

5. Fluid flow guide member (16) as set in any of the claims 2 to 4, wherein the ribs (36) have a trapezoidal cross section.

6. Fluid flow guide member (16) as set in any of the preceding claims wherein the leading edge portion (30) and the trailing edge portion (32) are of equal length.

7. Fluid flow guide member (16) as set in any of the claims 1 to 5 wherein the leading edge portion (30) and the trailing edge portion (32) are of unequal length.

8. Heat exchanger (10) having tubes (14) between which are arranged fluid flow guide members (16) as set in any of the preceding claims.

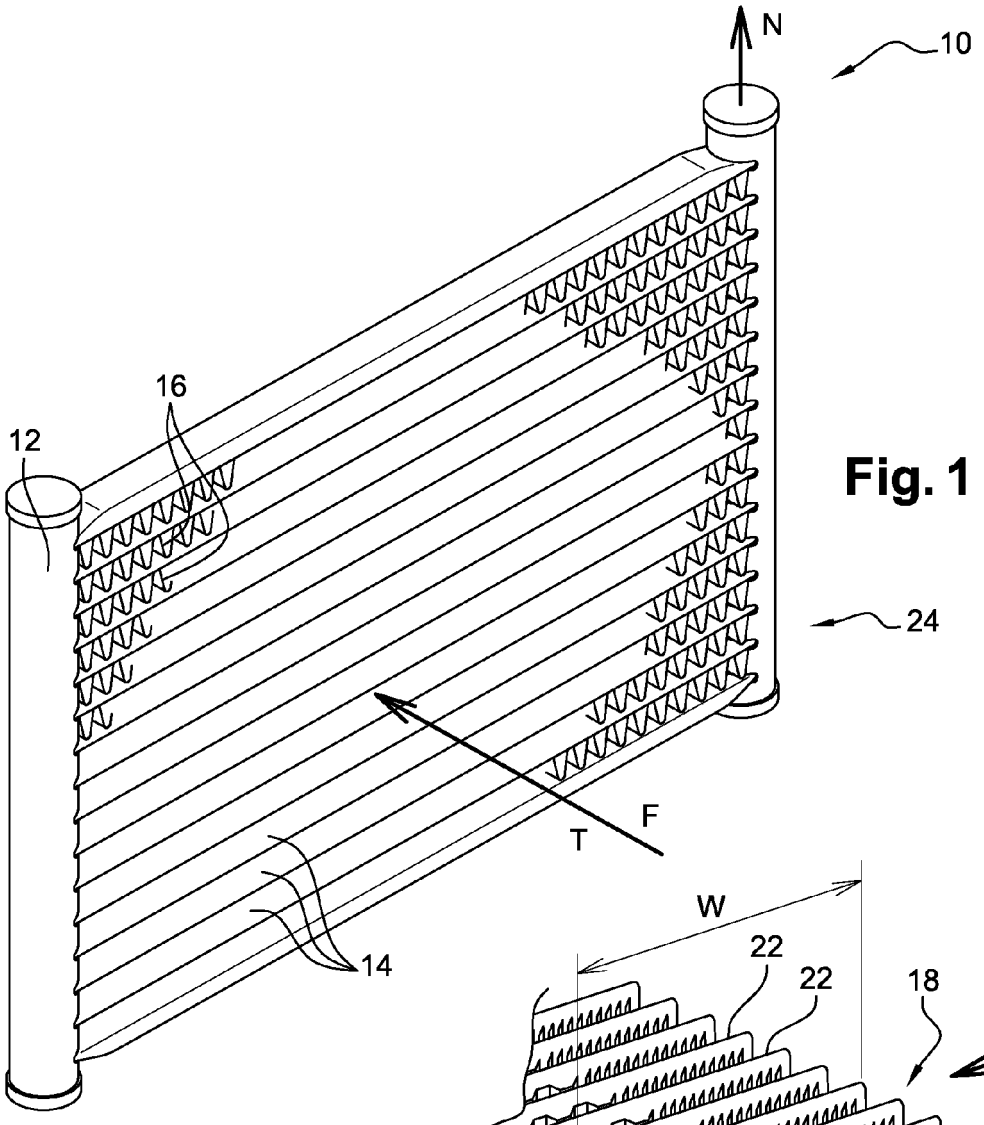

Fig. 1

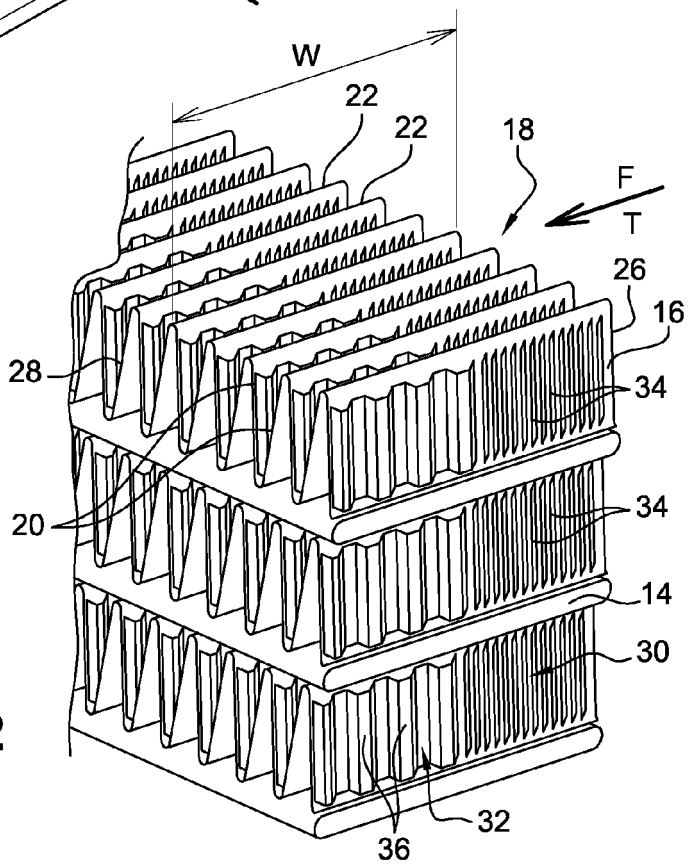

Fig. 2

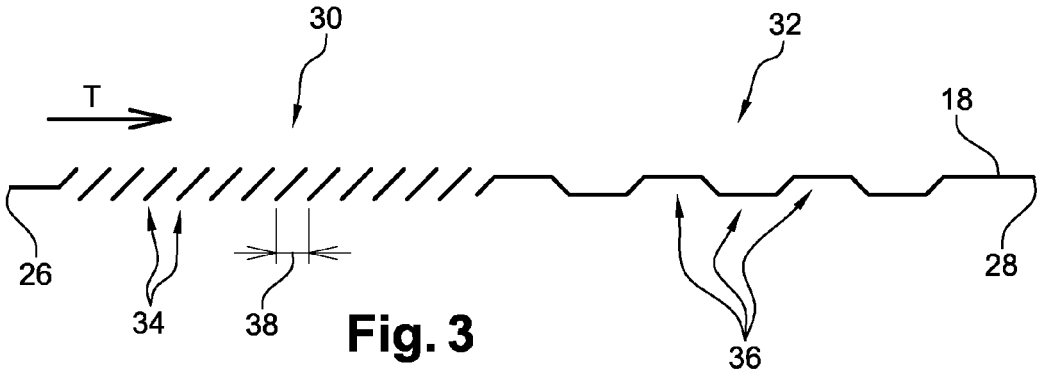

Fig. 3

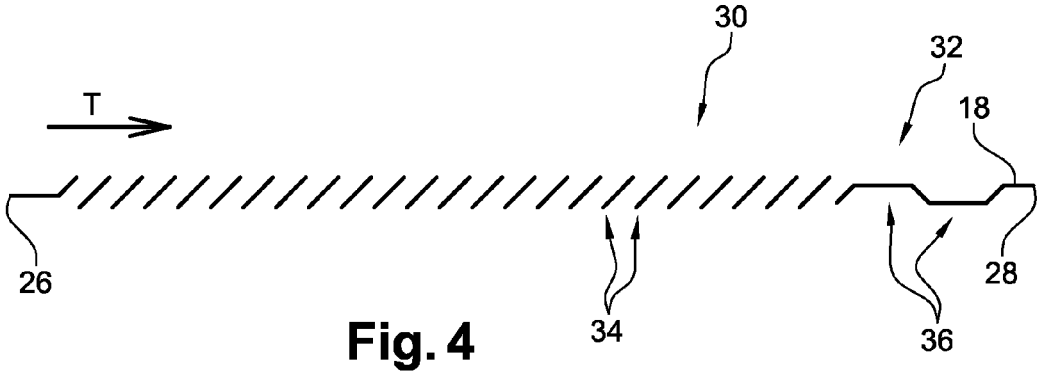

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 13 19 1548

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC) F28F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 March 2014	Mootz, Frank

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 19 1548

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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28-03-2014

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82