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(54) **HEAT EXCHANGER CORE AND HEAT EXCHANGER EQUIPPED THEREWITH**

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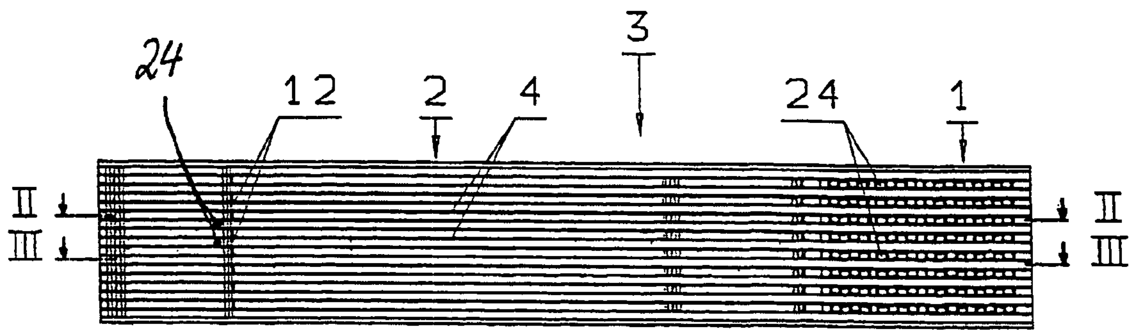
(57) **ABSTRACT**

A heat exchanger network has at least one passage for a coolant and a heat exchanger provided with such a core. The coolant passage has a plurality of flow channels which are disposed in parallel and delimited by separating walls and connected to each other in an undulating shape at their ends by deflection zones. The flow channels are formed by at least one lamella which has separating walls and a meandering cross-section. The deflection zones are formed by recesses which are provided at the ends of the separating walls.



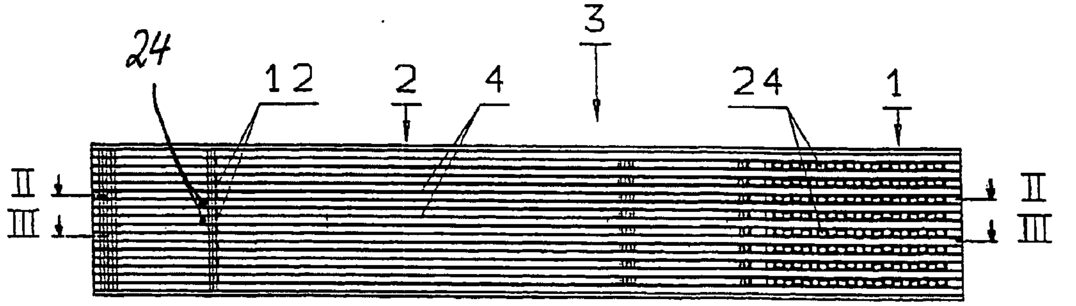


Fig.1

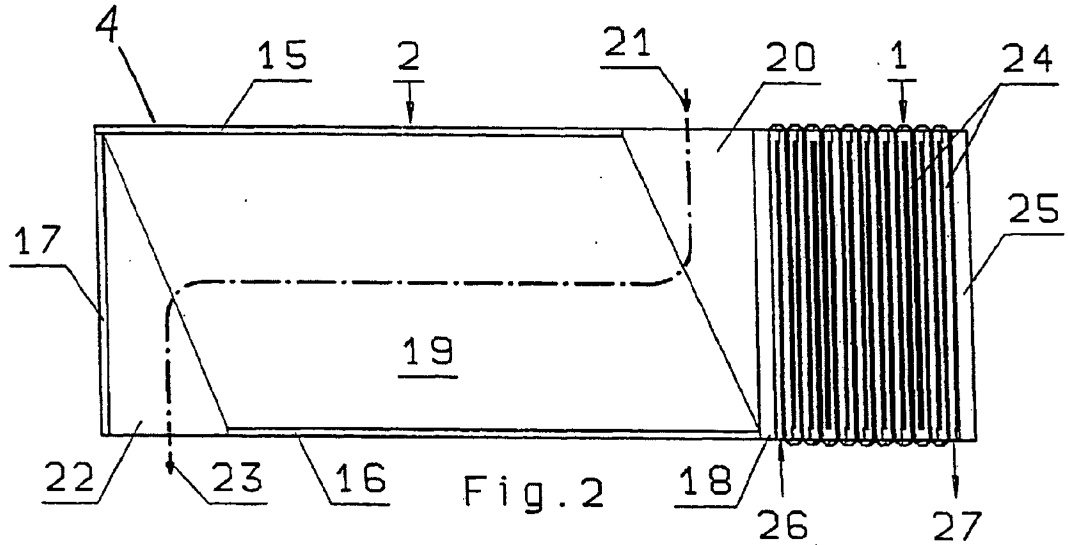


Fig.2

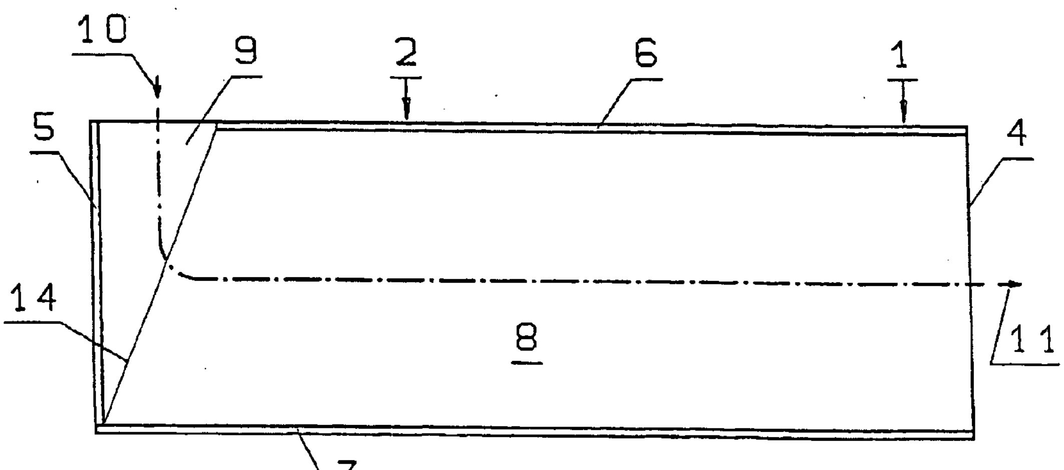


Fig.3

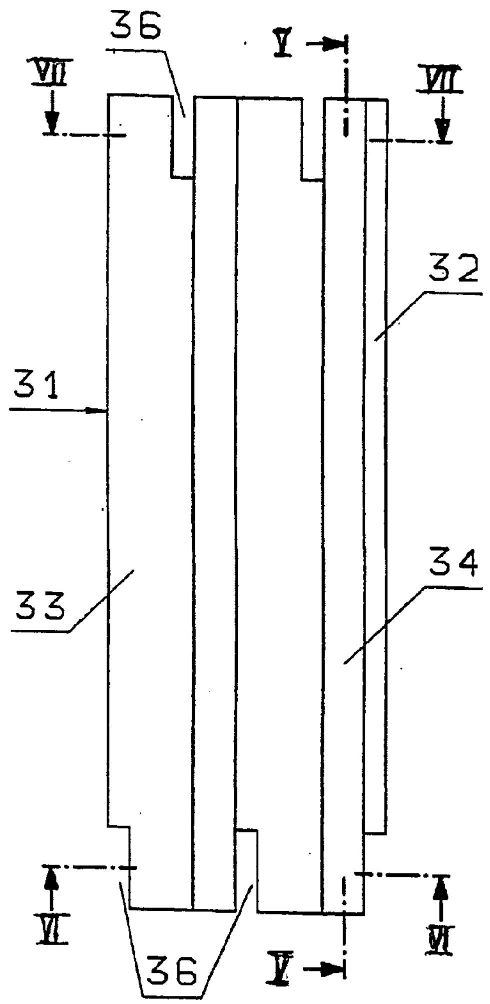


Fig. 4

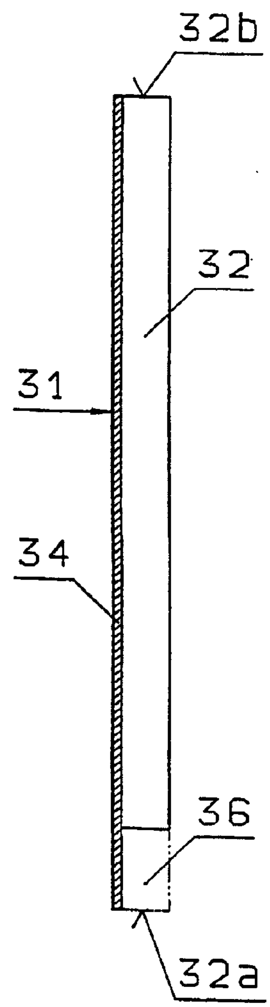


Fig. 5

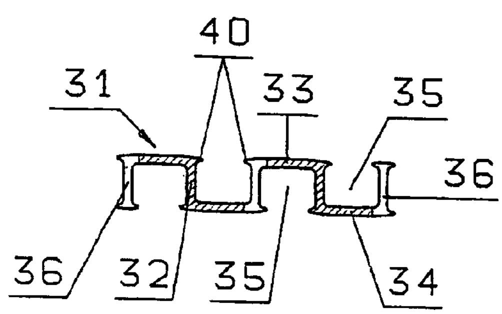


Fig. 6

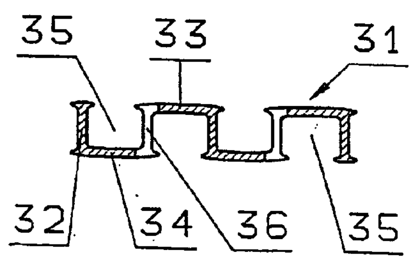


Fig. 7

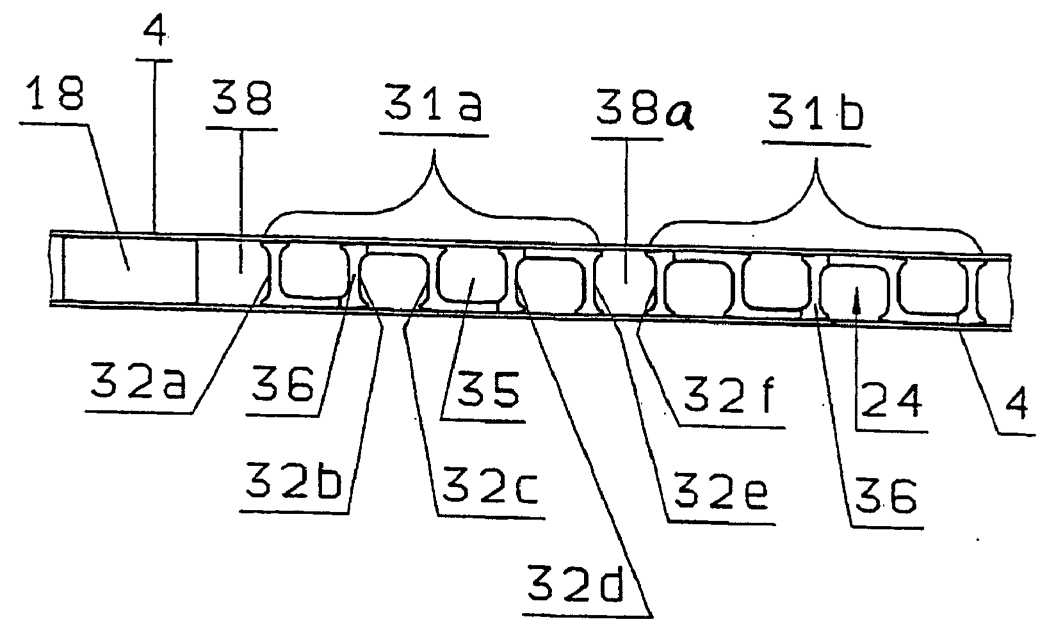

4
18
38
31a
38a
31b
32a
36
35
32f
24
4
32b
32c
32e
36
32d

Fig. 8

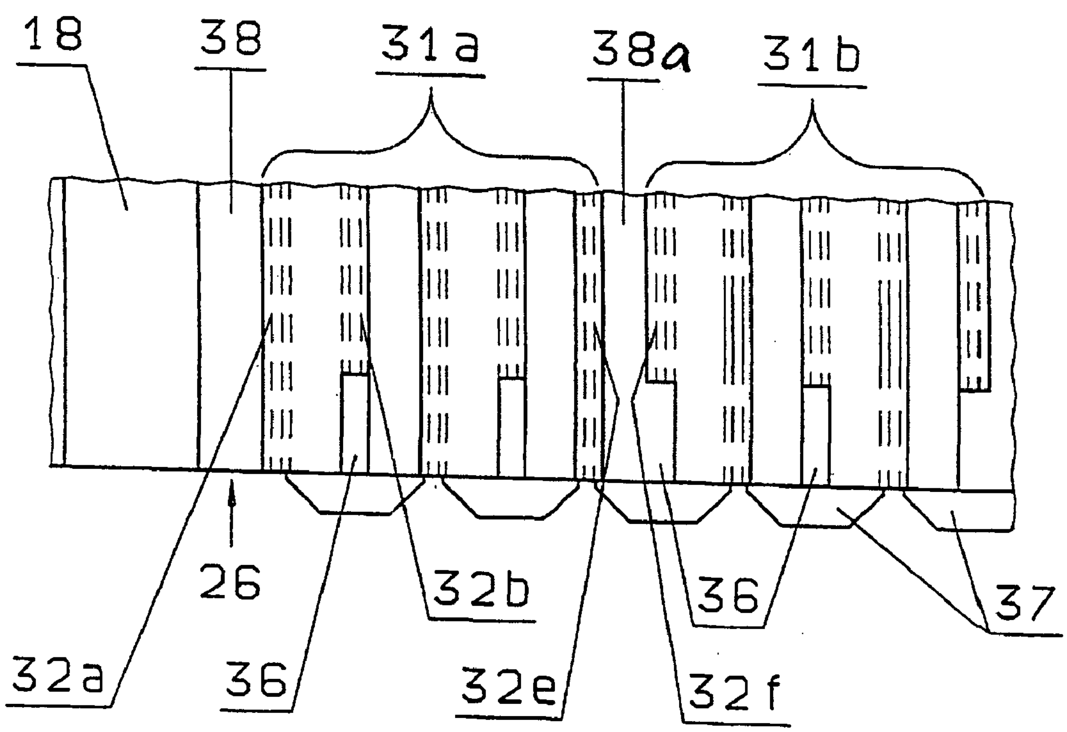

18
38
31a
38a
31b
26
32b
36
37
32a
36
32e
32f

Fig. 9

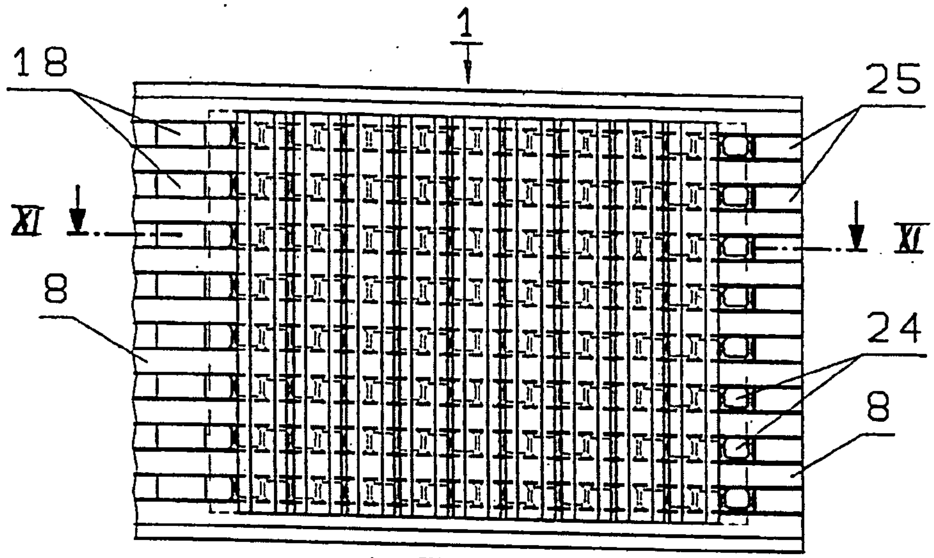


Fig. 10

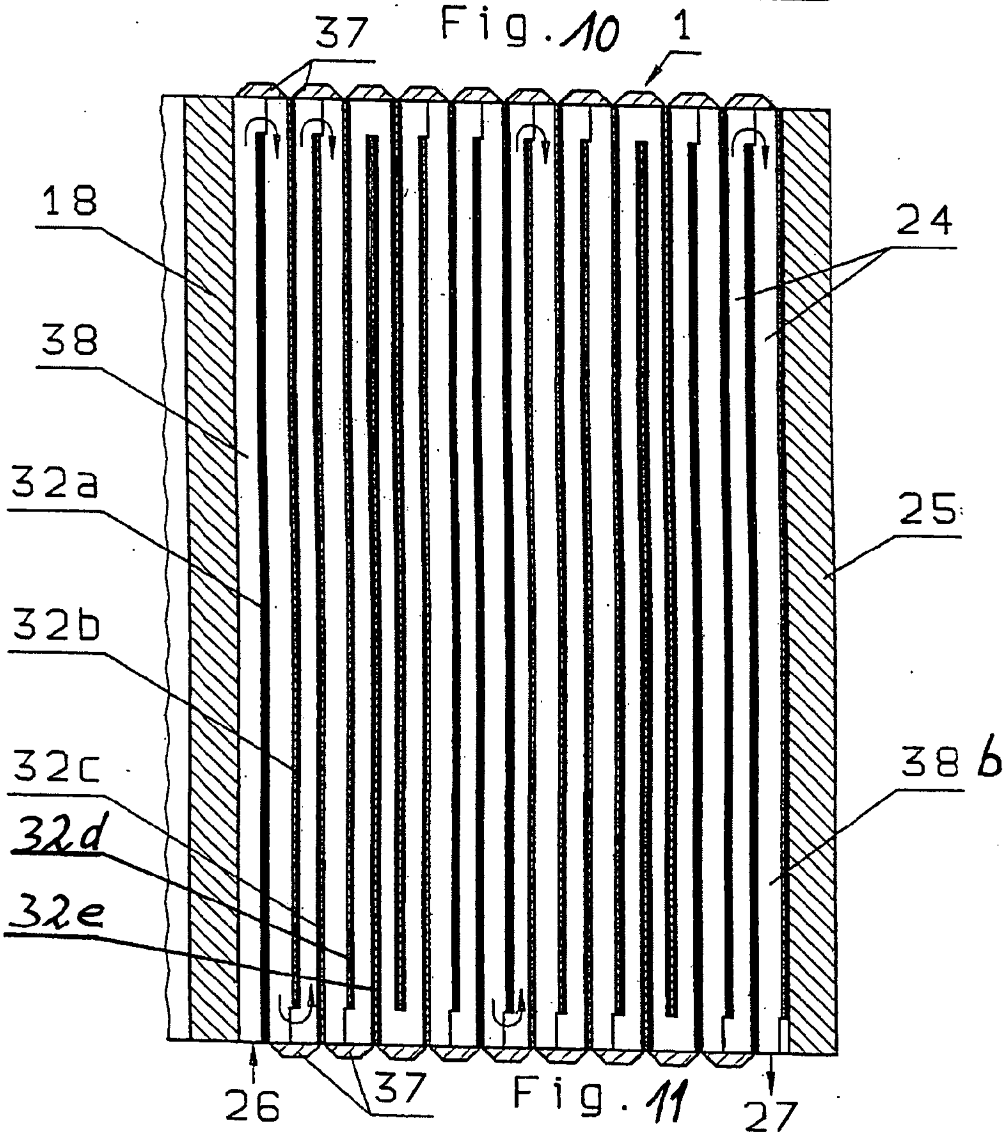


Fig. 11

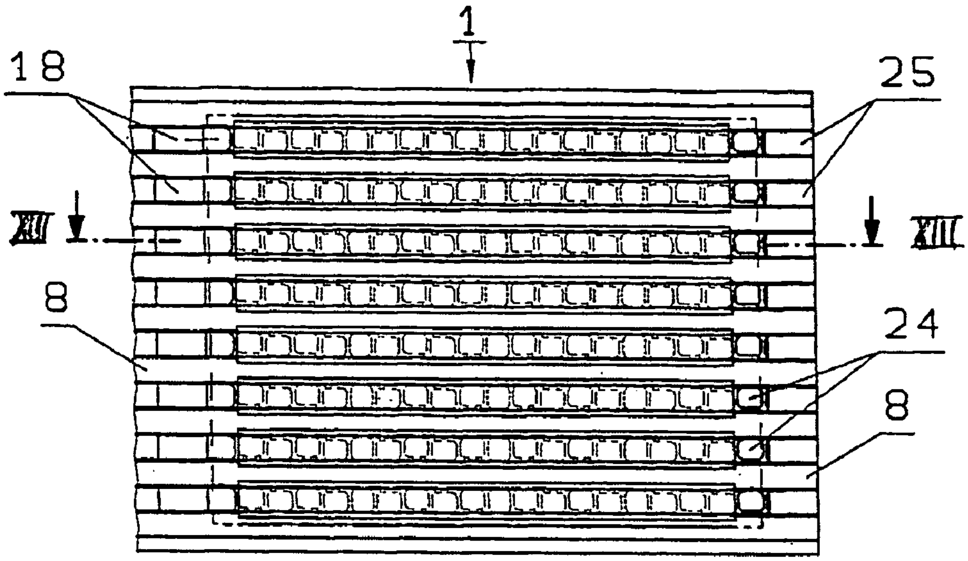


Fig. 12

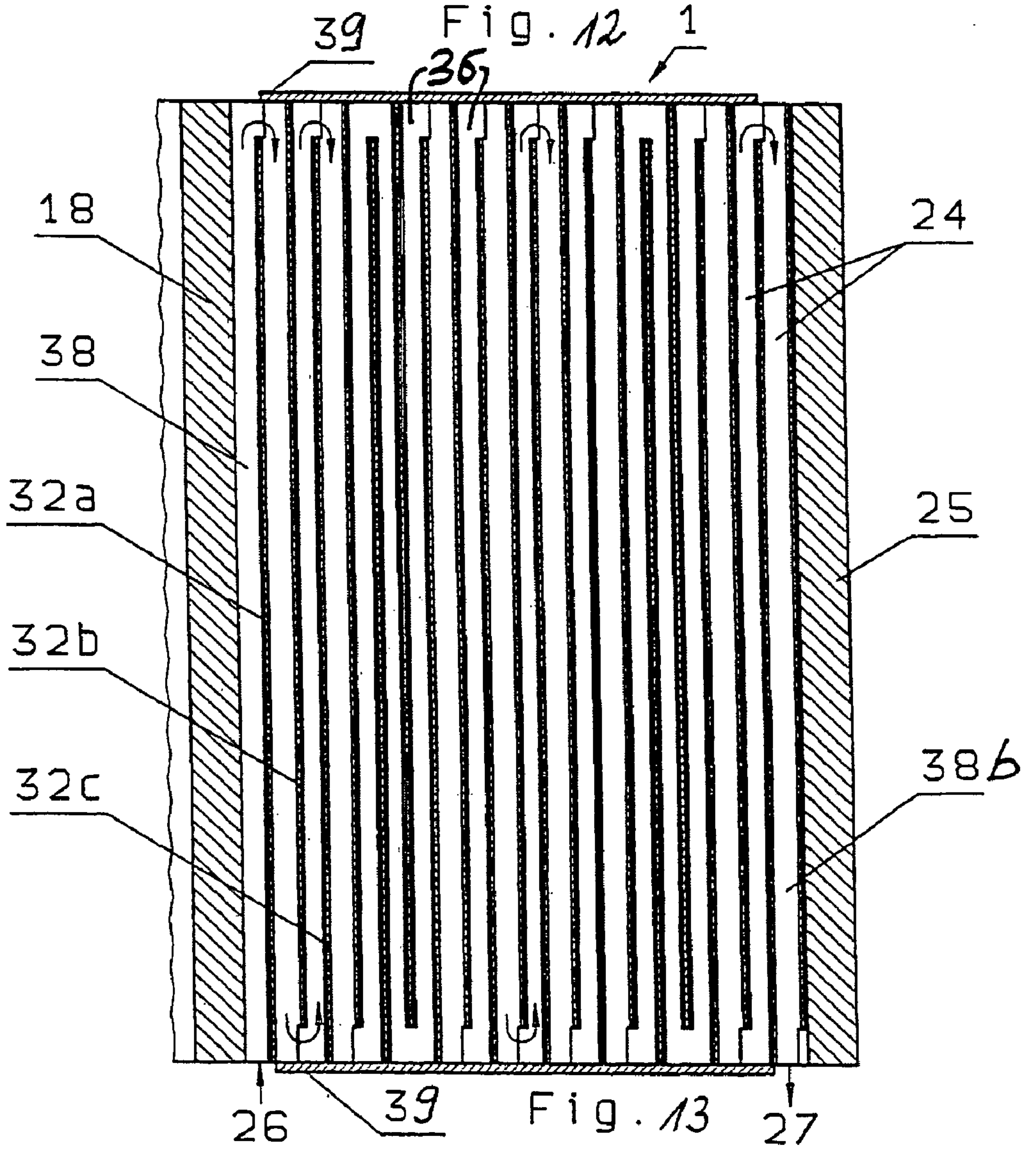


Fig. 13

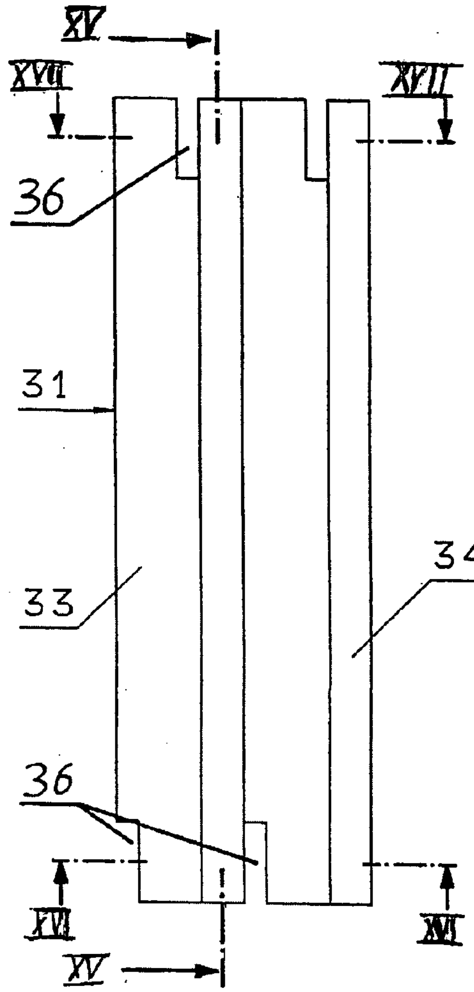


Fig. 14

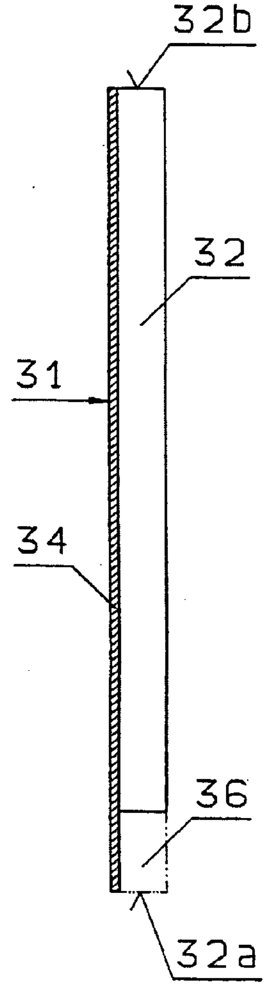


Fig. 15

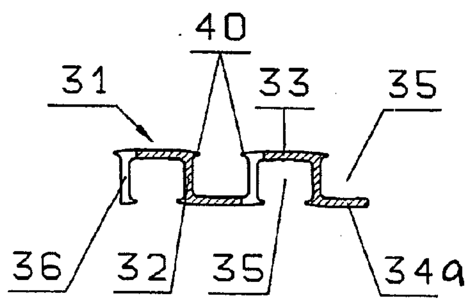


Fig. 16

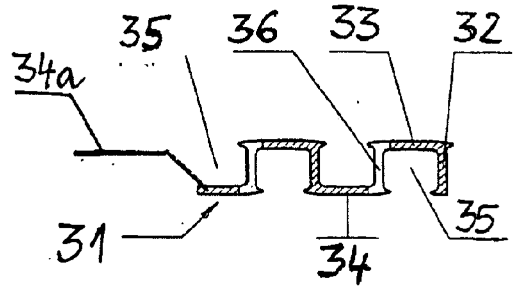


Fig. 17

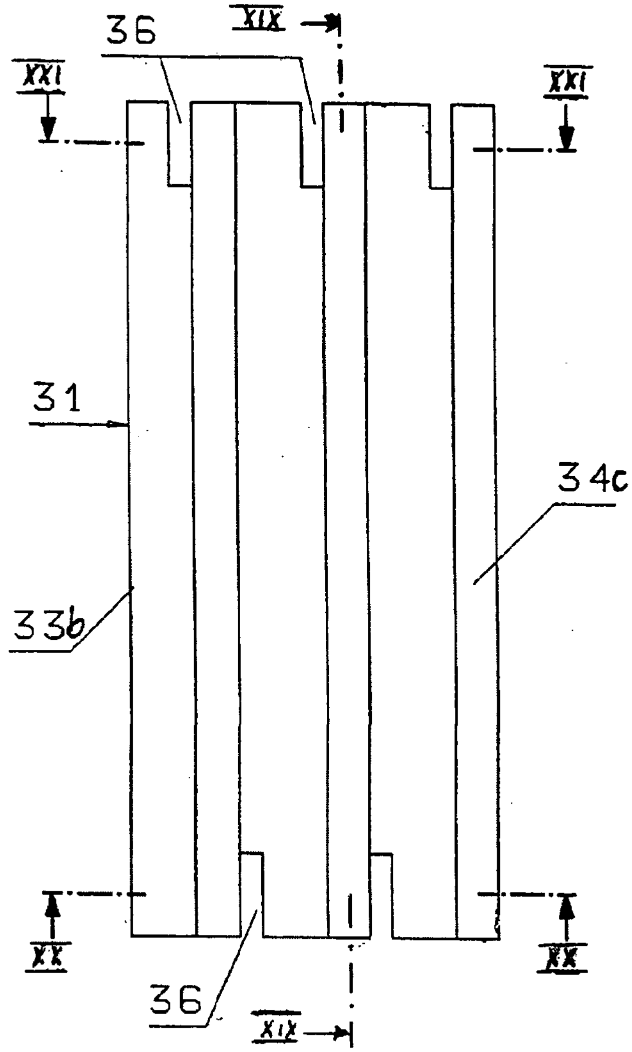


Fig. 18

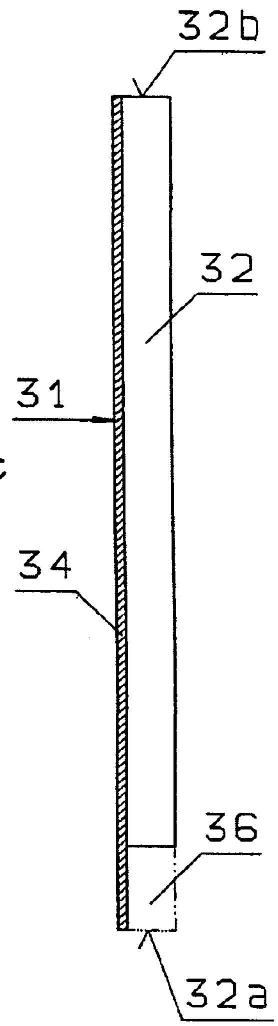


Fig. 19

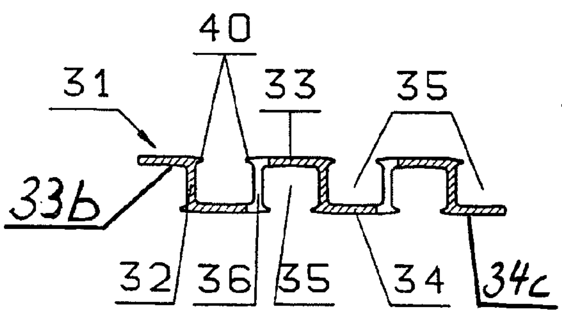


Fig. 20

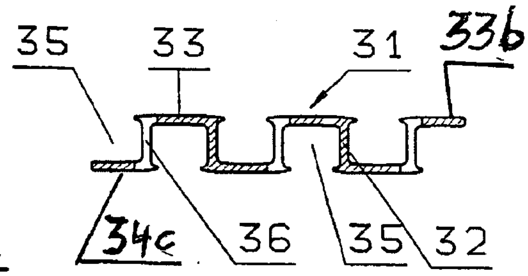


Fig. 21

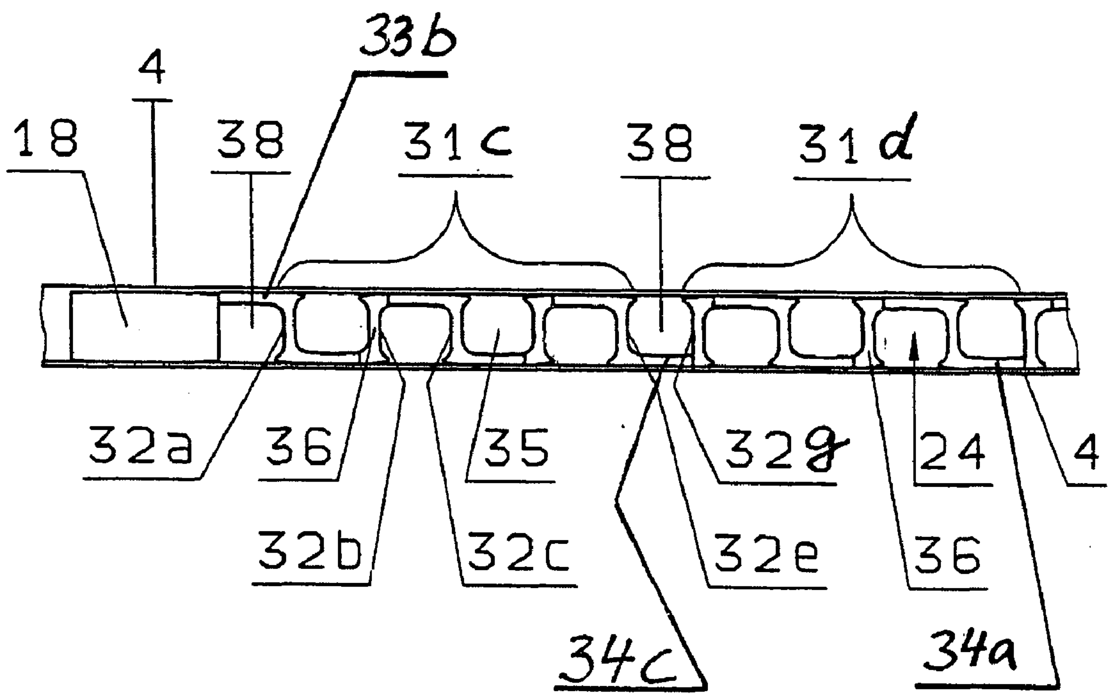


Fig. 22

HEAT EXCHANGER CORE AND HEAT EXCHANGER EQUIPPED THEREWITH

CROSS-REFERENCE TO A RELATED APPLICATION

[0001] The invention described and claimed hereinbelow is also described in German Patent Application 20 2005 015 627.2 filed on Sep. 28, 2005. This German Patent Application, whose subject matter is incorporated here by reference, provides the basis for a claim of priority of invention under 35 U.S.C. 119(a)-(d).

FIELD OF THE INVENTION

[0002] The invention relates to a heat exchanger core comprising at least two plates and a passage disposed between said plates for a coolant, said passage containing a plurality of flow channels which are disposed in parallel and delimited laterally by separating walls, which are disposed perpendicular to the plates, have respectively two ends and are connected to each other in an undulating shape by deflection zones which are provided alternately at the one or other ends of the separating walls. The invention also relates to a heat exchanger comprising such a heat exchanger core.

BACKGROUND OF THE INVENTION

[0003] Heat exchangers produced with heat exchanger cores of this type, are required e.g. in compressed air plants in order to dehumidify the compressed air produced by means of a compressor and at a pressure of e.g. 25 bar in order consequently to make it suitable for critical application purposes, such as e.g. in the food and paper industry or in the medical field. The air drying is effected in that the heated air coming from the compressor is conducted after passage through an aftercooler through a device which contains an air/air and a coolant/air heat exchanger.

[0004] Whilst the air/air heat exchanger is generally produced in the manner of a plate heat exchanger of a normal construction, the coolant/air heat exchanger comprises e.g. a combined pipe/plate heat exchanger with a core which has air passages which are formed from plates and strips holding the plates at a given spacing and coolant passages situated therebetween. The coolant passages comprise for example pipes, which have round or square cross-sections and are disposed respectively between two plates, said pipes having straight portions and deflecting portions connecting these in an undulating or in a meandering shape (EP 0 521 298 A2). A disadvantage of this construction is that unused spaces are produced between the individual pipe portions and that the curved deflecting portions are generally outwit the space taken up by the actual core and are not involved in the heat exchange.

[0005] In addition, it has already been proposed (likewise EP 0 521 298 A2) to replace those passages of the core, through which coolant flows, by pipe and deflecting portions produced in the normal plate construction in that said portions are delimited by normal separating walls in the form of strips which are disposed between the plates. A disadvantage of this construction is, however, that either comparatively thick strips must be provided in order to produce solder faces being sufficiently large for stable soldering joints, as a result of which reduced flow cross-sections are obtained with the given overall dimensions of the core, or that, if narrow strips are used which enable favourable flow cross-sections, in return comparatively small solder faces must be accepted which are not always adequate for the required strength of the heat exchanger.

[0006] The last-mentioned problems can be extensively avoided in that the separating walls are configured by the webs and/or flanges of profiles with I and/or U-shaped cross-sections disposed between the plates (EP 1 304 536 A2). However, if the flow channels are produced, according to a first variant, with the help of a multiplicity of I-profiles which are connected to the plates by soldering, then these profiles must be connected to the plates before the soldering process at at least two points by laser welding or the like in order to preclude relative positional changes between the plates and the profiles during immersion and tilting processes which are required during the soldering process. And if, in contrast, the flow channels are configured, according to a second variant, as U-shaped grooves in solid, plane-parallel plates, these and the deflection zones must be produced by milling, in particular track milling. Both variants incur, therefore, comparatively high production costs which are not always tolerable.

SUMMARY OF THE INVENTION

[0007] Starting from the above it is an object of the present invention to configure the heat exchanger core described above such that it can be produced with the required strength when using economical manufacturing methods.

[0008] A further object of the present invention is to design the heat exchanger core mentioned above in such a manner that manufacture thereof is unproblematic with respect to the soldering technology.

[0009] Yet another object of the present invention is to so design the heat exchanger core mentioned above that comparatively large flow cross-sections for the coolant can be provided within given overall dimensions.

[0010] A further object of the present invention is to provide a heat exchanger having a heat exchanger core of the type mentioned above.

[0011] These and other objects of the invention are solved by means of a heat exchanger core wherein the coolant passage is formed by at least one lamella which is connected to the plates, has a meandering cross-section and contains the separating walls, and wherein the deflection zones comprise recesses which are provided at the ends of the separating walls.

[0012] According to the invention, a coolant/air heat exchanger is charaterized in that it contains a heat exchanger core with the features mentioned above.

[0013] Due to the application according to the invention of lamellae which respectively form a plurality of flow channels each, the number of welding operations to be implemented before the soldering process can be significantly reduced. In addition, the lamellae can be produced by extrusion or milling and consequently economically with any arbitrary strength. Finally, in principle any arbitrary cross-sectional form can be given to the separating walls and/or to the flow channels delimited by these, which is favourable with respect to the output and stability of the heat exchanger core which is desired in the individual case.

[0014] Further advantageous features of the invention are revealed in the dependant claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The invention is explained subsequently in more detail in conjunction with the accompanying drawings with reference to embodiments. There are shown:

[0016] FIG. **1** a schematic front view of a combined coolant/air and air/air heat exchanger block for cooling dryers in compressed air plants;

[0017] FIG. **2** and **3** sections along the lines II-II and III-III of FIG. **1**;

[0018] FIG. **4** an enlarged plan view on a lamella according to the invention for producing coolant passages in a core according to FIG. **1** destined for the coolant/air-heat exchange;

[0019] FIG. **5** to **7** sections along the lines V-V to VII-VII of FIG. **4**;

[0020] FIG. **8** an enlarged front view of a detail of a coolant passage in a core according to FIG. **1** destined for the coolant/air-heat exchange and being made with lamellae according to FIGS. **4** to **7**;

[0021] FIG. **9** a plan view on the coolant passage according to FIG. **8**, an upper plate being omitted;

[0022] FIG. **10** an enlarged front view of the core of the block according to FIG. **1**, intended for the coolant/air heat exchange and being made with lamellae according to FIGS. **4** to **7**;

[0023] FIG. **11** a section along the line XI-XI of FIG. **10**;

[0024] FIG. **12** and **13** in views corresponding to FIGS. **10** and **11** a second embodiment of the core;

[0025] FIG. **14** to **17** in views corresponding to FIGS. **4** to **7** a second embodiment of the lamella according to the invention;

[0026] FIG. **18** to **21** in views corresponding to FIGS. **4** to **7** a third embodiment of the lamella according to the invention;

[0027] FIG. **22** a front view corresponding to FIG. **8** of a coolant passage if lamellae according to FIGS. **14** to **21** are used.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] A heat exchanger device for cooling dryers in compressed air plants contains, according to FIG. **1** to **3**, a coolant/air heat exchanger in the right portion and an air/air heat exchanger in the left portion. Only one coolant/air heat exchanger core **1** and, situated adjacently, one air/air heat exchanger core **2** are thereby illustrated, both being located beside each other in an assumed longitudinal direction, being combined into an integral constructional unit and forming a single, connected block **3**. Of course, it would be possible also as an alternative to produce and to operate both cores **1** and **2** as separate constructional units.

[0029] The two cores **1** and **2** are mainly formed by plane-parallel, rectangular or square plates or separating metal sheets **4**, respectively, which extend over the entire width and length of the block **3**. According to FIG. **1** and **3**, a part of the plates **4** are spaced on the one hand by strips **5** which extend perpendicular to the longitudinal direction and are disposed on ends of the block **3** at the left in FIG. **3** and, on the other hand, by strips **6**, **7** which extend in the longitudinal direction and are disposed on the lateral edges of the plates **4**. As a result, passages **8** are produced between these plates **4**. At the left end in FIG. **3**, the upper strips **6** are somewhat shorter so that intermediate spaces **9** respectively are produced between their left ends and the strips **5**, such that air is able to enter laterally through said intermediate spaces **9** in the direction of an illustrated arrow **10**. At the right end in FIG. **3**, the air can exit laterally in contrast parallel to the longitudinal direction of the passages **8** and in the direction of an illustrated arrow **11**. Normal lamellae or fins **12** are furthermore inserted expediently into the passages **8** and are illustrated only in part in FIG. **1**, and the passages thereof are deflected by 90° along lines **14**, corresponding to FIG. **3**.

[0030] The other part of the plates, according to FIG. **1** and **2** are spaced in the part forming the core **2** in pairs by strips **15** and **16** which extend parallel to the longitudinal direction and are disposed on the lateral edges of the plates **4** and also by end or closing strips **17** and **18** which extend transversely thereto and form the left and right end of the core **2**. As a result, a further passage **19** is produced respectively between two plates **4** respectively. On the sides of the closing strips **18** on the right in FIG. **2**, the upper strips **15** in FIG. **2** are slightly shorter so that intermediate spaces **20** respectively are produced between them and the closing strips **18** through which air can be supplied laterally in the direction of an illustrated arrow **21** (FIG. **2**). In contrast, the strips **16** on the left side in FIG. **2** are slightly shorter so that intermediate spaces **22** are produced here between these and the closing strips **17**, through which the air supplied at **20** can be discharged again (arrow **23**). The deflections are thereby effected, analogously to FIG. **3**, preferably with correspondingly configured lamellae or fins **24** provided in the passages **19** (FIG. **1**).

[0031] In the core **1**, the same plates **4** which delimit the passages **19** serve to form passages **24** which are disposed in an undulating shape (FIG. **1**), said passages having portions which are straight as well as portions which serve for deflection, as explained in more detail further on. The passages **24** extend respectively from the closing strips **18** to a closing strip or plate **25** which is disposed in FIG. **1** and **2** at the right end of the block **3**. Preferably, pairs of plates with the passages **8** alternate with pairs of plates with the passages **19**, **24** in superimposed planes, at least one passage **8**, **19**, **24** respectively being present in each plane. According to FIG. **2**, a coolant is supplied to the passages **24** at an inlet indicated by an arrow **26** and can flow out again at an outlet indicated by an arrow **27** for flowing the through a coolant cycle, not shown.

[0032] The inlets or outlets marked by the arrows **10**, **11**, **21**, **23**, **26** and **27** are connected to collection tanks or the like at known inlet nipples, not shown.

[0033] The mode of operation of the described heat exchanger device is essentially as follows:

[0034] The compressed air which comes from a compressed air plant and is heated e.g. to approx. 35° to 55° C. is supplied in the direction of the arrow **10** so that it flows through the passages **8**. The air is thereby cooled initially in the core **2** by the cold air, which is supplied in counter-flow in the direction of the arrow **21** and comes from a water separator, not shown, to a temperature of e.g. 20° C. On its further path through the passages **8**, the compressed air is then cooled gradually in the core **1** to its dew point since it interacts here with the coolant which flows into the passages **24** in the direction of the arrow **26** (FIG. **2**). The compressed air is then removed at the outlet marked by the arrow **11** (FIG. **3**) and supplied to a water separator, not shown, from where it is in-troduced into the core **2** at the arrow **21** and is removed from this core **2** at the outlet indicated by the arrow **23**, said outlet serving as a tapping point for the compressed air. The arrangement is chosen such that the air at the tapping point has again approximately room temperature.

[**0035**] Heat exchangers of the described type and their mode of operation are generally known to the person skilled in the art (EP 0 521 298 A1, EP 1 304 536 A2) and do not therefore require to be explained in more detail.

[**0036**] The embodiment according to the invention of a coolant passage **24** of the network **1** is explained subsequently in more detail with reference to FIG. **4** to **9**, the expressions "right", "left", "front", "rear", "top" and "bottom" being chosen, for simplification of the description, corresponding to the respective position which is produced from the special illustration in FIG. **4** to **9**. Accordingly, the passage **24** is formed by a plurality of lamellae **31** which are disposed parallel next to each other (FIG. **6** and **7**). Each lamella **31**, according to FIG. **6** and **7**, has a meandering cross-section and a plurality of separating walls **32**, five in the embodiment.

[**0037**] As likewise shown in FIG. **6** and **7**, the separating walls **32** are disposed vertically, parallel to each other and at the same spacings from each other and also connected to each other alternately above and below by horizontal, upper or lower webs **33**, **34**, as is typical of meanders. Because of the presence of five separating walls **32**, two upper and lower webs **33**, **34** respectively are provided so that respectively two adjacent separating walls **32** and a web **33** or **34** connecting them delimit a flow channel **35**, and in total four flow channels **35** of this type per lamella **31** are present. The arrangement is preferably such that each flow channel **35** has the same flow cross-section. At its lateral ends the lamella **31** is limited by a respective separating wall **32**.

[**0038**] The lamellae **31** are preferably produced by extrusion from aluminium or an aluminium alloy and subsequent cutting to a length desired in the individual case. The separating walls **32** thereof are therefore initially of the same length and provided with a front and rear end or a front end face **32***a* and a rear end face **32***b* (FIG. **5**). After cutting to length, the separating walls **32** are however provided with a recess **36** at the one or other end **32***a*, **32***b*. As is indicated in FIG. **5** by broken lines, for example the respectively last portion of the separating wall **32** which abuts against the end **32***a*, **32***b* is removed for this purpose by milling or the like, after which a cleaning process with a steel brush or the like can follow in order to grind off the burrs. As in particular FIG. **4** shows, the recesses **36** are fitted alternately on the one or other end **32***a*, **32***b* in the case of successive separating walls **32** so that, in the embodiment, three recesses **36** of this type are situated at the front end of the lamella **31** and two at the rear end of the lamella **31**.

[**0039**] FIG. **8** and **9** show a coolant passage **24** which substantially extends in a plane and is produced by application of the lamellae **31** (cf. also FIG. **2**). Further, FIG. **10** and **11** each show a complete portion of the heat exchanger device including the complete core **1**. For production of the coolant passage **24** according to FIGS. **8** and **9**, a first lamella **31***a* is disposed parallel to and at a spacing from the closing strip **18** corresponding to the width of a flow channel **35**. The position of the lamella **31***a* is chosen such that an outer separating wall **32***a* situated furthest left is disposed parallel to the strip **18** and has its recess **36** at the rear end of the lamella **31***a*, not shown in FIG. **9**. For this purpose, the lamella **31** shown in FIGS. **8** and **9** is used, but after rotating it about an axis perpendicular to the drawing plane in FIG. **4** and by about 180°.

[**0040**] Following the separating wall **32***a* which is indicated in broken lines in FIG. **9** like the remaining separating walls **32**, there are, corresponding to the meander shape, as shown in FIG. **8**, three central separating walls **32***b*, **32***c* and **32***d* and a further outer separating wall **32***e* which is situated furthest to the right in FIG. **8** and **9**. Because of the arrangement of the recesses **36** described with reference to FIG. **4** to **7**, the two recesses **36** of the separating walls **32***b*, **32***d* are situated at the front and three recesses **36** of the separating walls **32***a*, **32***c* and **32***e* which are not visible in FIG. **9** are situated at the rear. This can be best seen from FIG. **11**.

[**0041**] Abutting on the lamella **31***a* there is a second lamella **32***b* in FIG. **8** and **9**. The latter is identically configured to the lamella **31***a* but, in contrast to the latter, in a position shown in FIG. **4** and **6**, so that three recesses **36** are situated at the front and two further recesses **36** at the rear, not visible in FIG. **9**. In addition, a separating wall **32***f* of the lamella **31***a* situated furthest to the left is disposed at a spacing corresponding to the width of a flow channel **35** from the separating wall **32***e* of the lamella **31***a* and parallel to the latter. Also this can be best seen from FIG. **11**.

[**0042**] The flow channels **35** which are alternately open at the top and bottom (FIG. **6** and **7**) are closed according to FIG. **8** at the top or bottom by respectively one of the plates **4** which are connected to the outer sides of the webs **33**, **34** expediently by soldering. In contrast, the front and rear ends of the flow channels **35** are closed by individual profiles **37** which have a width corresponding substantially to twice the spacing of two separating walls **32**, are connected in a gas-impermeable manner to the front and rear ends of the lamellae **31***a* and **32***b* or of the separating walls **32** and also to the plates **4** preferably by welding (MIG or WIG) and, for weight and cost reduction, have for example the trapezoidal cross-sections evident in FIG. **9**. Correspondingly, the front and rear and also upper and lower regions of the flow channels **38**, **38***a* and **38***b* are sealed in a gas-impermeable manner and are formed between the lamella **31***a* and the closing strip **18**, between the lamellae **31***a* and **31***b* and on the other side of the core **1** between the last lamella **31** and the closing strip **25** (FIG. **10** and **11**), the two flow channels **38** and **38***b* remaining open e.g. on the front side corresponding to FIG. **11** in order to be able to supply and discharge the coolant there in the direction of the arrows **26**, **27**.

[**0043**] The application of individual profiles **37** is preferred despite the expenditure in labour associated therewith relative to the application of continuous plates if it is necessary to compensate tolerances and to safely avoid leakage currents of the coolant or consequently caused short circuits between the individual flow channels **35**, in FIG. **11** from left to right. If this can be achieved by other means, also plates **39** (FIG. **12** and **13**) can be used which practically extend over the whole width and height of core **1** and tightly seal all provided coolant passages **24** at the same time.

[**0044**] The described recesses **36**, after production of the coolant passage **24** (FIG. **11** and **13**) form respectively a deflection zone alternately situated at the front or rear, which is delimited by the relevant plates **4**, profiles **37** (or plates **39**) and separating walls **32**. Consequently, the coolant can enter for example in the direction of the arrow **26** according to FIG. **11** and **13** into the associated flow channel **38**, change over at the rear end thereof through the associated recess **36** in the separating wall **32***a* into the adjacent flow channel **35** formed between the separating walls **32***a*, **32***b* and flow through said flow channel from the rear to the front in order then to flow through the front recess **36** in the separating wall **32***b* into the flow channel **35** formed between said separating wall **32***b* and the separating wall **32***c* etc. until finally it flows out again from the flow channel **38***b* situated on the far right in FIG. **11** and **13** in the direction of the arrow **27**. The coolant flows therefore along an undulating flow path, marked in FIG. **11** and **13** partially by arrows, through the passage **24**.

[**0045**] Above and below the passage **24** illustrated in FIG. **8**, further corresponding passages **24** can be present and be separated from each other by air passages, as FIG. **1** to **3** and **10**, **12** in particular make clear. In this case, the profiles **37** (or plates **39**) extend expediently over the entire height of the heat exchanger core.

[**0046**] The number of flow channels **35** and **38**, from which the coolant passages **24** are formed, can be chosen as a function of the requirements of the individual case. Instead of the four flow channels **35** according to FIG. **6** and **7**, also more or fewer flow channels **35** per lamella **31** can be present. In the case of an even number of separating walls **32** per lamella **31**, these can be laid out in particular with the same orientation since, in this case, the recesses **36** of the first separating wall **32** are always situated for example at the front and the recesses **36** of the last separating wall **32** are always for example at the rear.

[**0047**] Also combinations with different numbers of separating walls **32** and flow channels **35** are possible, also adjacent lamellae **31** being able to be disposed directly next to each other, in which case the flow channels **38** situated between them would be missing. Lamellae **31** with a smaller number of separating walls **32** offer the advantage that, during extrusion, they become only slightly curved because of the more uniform material flow and hence can be straightened during setting up of the heat exchanger core **1** which is effected before the soldering. In contrast, lamellae **31** provided with a substantially greater number of separating walls **32** would require to be straightened before setting up the core **1** with the help of additional devices, such as e.g. rollers or the like.

[**0048**] The assembly of the heat exchanger block **3** according to FIG. **1** is effected in a normal manner for heat exchangers in that for example firstly the plates **4** and the lamellae **31** are connected by soldering and thereafter the profiles **37** (or plates **39**) are fixed to the plates **4** and lamellae **31** by welding. An advantage resulting therefrom is that before soldering the lamellae **31** require to be connected only at two points respectively by welding to an associated plate **4** respectively to ensure the position whilst, when applying individual profiles as separating walls (in the embodiment five individual profiles per lamella) respectively **10** welding processes would be required. FIGS. **14** to **17** show a second embodiment of the lamellae **31** according to the invention. Contrary to the lamellae **31** of FIG. **6** and **7**, the lamellae **31** of FIG. **14** to **17** have, at one of its lateral ends, a foot or web **34***a* instead of a separating wall **32**. This web **34***a* projects outwardly from a respective end separating wall **32** as clearly shown in FIGS. **16** and **17**. It is, therefore, possible to arrange two or more lamellae **31** one beside the other without rotation (as in FIG. **8**) in such as manner, that an end separating wall **32** of one lamella **31** always abuts a web **34***a* of a neighbored lamella **31**. Web **34***a* thus defines the distance between two neighbored lamellae **31**. An advantage resulting therefrom is that during setting up of the core is must not be taken care that all of the lamellae **31** have the correct distances from each other as is e.g. necessary in FIG. **8** for the lamellae **31** at both sides of the flow channels **38***a*. In an analogous manner web **34***a* can be laid in such a manner in FIG. **11** that it abuts the closing strip **25** at the right end of core **1** for properly forming flow channel **38***b*.

[**0049**] As an alternative, it would also be possible to locate the web **34***a* at the left side in FIG. **16** in order to e.g. form together with closing strip **18** the flow channel **38** at the left end of core **1**.

[**0050**] As a further alternative, a further lamella **31** according to FIGS. **18** to **21** is provided, said lamella **31** having two feet or webs **33***b* and **34***c*, each projecting outwardly from a respective end separating wall **32** as clearly shown in FIG. **20** and **21**. Advantageously, one web (e.g. **33***b*) is located above whereas another web (e.g. **34***c*) is located below thus having an upper or lower end web respectively on each of those lamellae. Is now possible to begin the setting up of a coolant passage **24** of core **1** (FIG. **11**) e.g. with a lamella **31** according to FIG. **20**, the web **33***b* of which is laid against the respective closing strip for making the flow channel **38**, as shown in FIG. **22** for a lamella **31***c*.

[**0051**] Following to lamella **31***c*, a lamella **31***d* according to FIG. **16** is provided such that an end separating wall **31***g* at the left end thereof abuts web **34***c* of lamella **31***c*. Next, further lamellae **31** according to FIG. **16** can follow at the right side of lamella **31***d* up to the closing strip **25** (FIG. **11**) in such a manner that the web **34***a* of the farthest right lamella **31** abuts closing strip **25** for making the flow channel **38***b*. Thus, the complete core **1** can be set up without taking care of the distances between the lamellae because all such distances are given by the webs **34***a*, **33***b* and **34***c*. It is, therefore, no danger that the distances erraneously will become too great or too small.

[**0052**] The invention is not restricted to the described embodiments which could be modified in many ways. This applies for example to the special cross-sections of the lamellae **31** which can be provided with lateral widenings **40**, according to FIG. **8**, on outer sides of the webs **33**, **34** in order to obtain larger soldering faces without consequently substantially reducing the flow cross-sections. In addition, the webs **33** and **34** and/or the widenings **40** could be curved slightly convexly in order to obtain a roundness desired for improving the soldering process. Furthermore, the lamellae **31** and profiles **37** or plates **39** in fact comprise for example aluminium and the plates **4** plated aluminium but it is clear that, according to requirement, also different materials which are generally used to produce heat exchanger cores can be used. Further, the production of the lamellae **31** can be made, as described, by extrusion but also in another way, particularly in that a plate is provided with the flow channels **35** by milling or the like.

[0053] Furthermore, it is in principle irrelevant whether the cores **1** and **2** form an integral component with the help of the continuous plates **4**, are produced separately and then assembled to form an integral component or are used as separate components which are connected to each other by corresponding lines or which are used independant upon each other. The cores **1**, **2** can also be disposed one above the other instead of next to each other. In addition, it is of course possible to apply the heat exchanger core **1** according to the invention for purposes other than those described and anywhere where coolant passages are required. Finally, it goes without saying that the different features can be provided also in combinations other than those described and illustrated.

[0054] It will be understood, that each of the elements described above or two or more together, may also find a useful application in other types of construction differing from the types described above.

[0055] While the invention has been illustrated and described as embodied in a heat exchanger core and a heat exchanger, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

[0056] Without further analysis, the forgoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

[0057] What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. Heat exchanger core comprising at least two plates and a passage disposed between said plates for a coolant, said passage containing a plurality of flow channels which are disposed in parallel and are delimited laterally by separating walls, said separating walls being disposed perpendicular to the plates, having respectively two ends, and being connected to each other in an undulating shape by deflection zones which are provided alternately at one or an other of said ends of said separating walls, wherein said coolant passage is formed by at least one lamella which is connected to said plates, has a meandering cross-section and contains said separating walls, and wherein said deflection zones comprise recesses which are provided at said ends of said separating walls.

2. Heat exchanger core according to claim 1, wherein said coolant passage is assembled from a plurality of lamellae which are situated next to each other, each lamellae having a plurality of separating walls.

3. Heat exchanger core according to claim 2, wherein said separating walls are held in preselected distances by means of webs which are alternatingly connected therewith above and below.

4. Heat exchanger core according to claim 2; and further comprising at least one lamella which ends at at least one lateral side with a web projecting outwards from one of the separating walls which is an end separating wall.

5. Heat exchanger core according to claim 2; and further comprising at least one lamella which ends at two lateral sides with a web projecting outwards from one of the separating walls which is respective end separating wall.

6. Heat exchanger core according to claim 5, wherein one web is connected with a respective separating wall at a top end thereof whereas another web is connected with a respective separating wall at a bottom end thereof.

7. Heat exchanger core according to claim 2, wherein said lamellae consist of extruded parts.

8. Heat exchanger core according to claim 2, wherein each of said lamellae are composed of a material selected from the group consisting of aluminium and an aluminium alloy.

9. Heat exchanger core according to claim 2, wherein said lamellae are situated next to each other in such a manner that separating walls facing each other are spaced at spacings which correspond to a width of a flow channel.

10. Heat exchanger core according to claim 1, wherein said lamellae and said plates are connected to each other by soldering connecting means.

11. Heat exchanger core according to claim 1, wherein open ends of adjacent flow channels and, with these, also assigned deflection zones are sealed by respective profiles which are connected to an outer side of said lamellae.

12. Heat exchanger core according to claim 1, wherein open ends of adjacent flow channels and, with these, also assigned deflection zones are sealed by common plates which are connected to outer sides of said lamellae.

13. Heat exchanger core according to claim 11, wherein said profiles are connected to said lamellae by welding connecting means.

14. Heat exchanger core according to claim 12, wherein said plates are connected to said lamellae by welding connecting means.

15. Heat exchanger core according to claims **1**, wherein said recesses are configured as recesses obtained by milling.

16. Heat exchanger core according to claim 1; and further comprising a plurality of coolant passages which are disposed one above the other and air passages which are disposed between said coolant passages.

17. Heat exchanger core according to claim 1; and being configured as part of a combined coolant/air heat exchanger block.

18. Heat exchanger core according to claim 17, wherein said plates have two portions, one portions forming a coolant/air heat exchanger core and the other portion forming an air/air heat exchanger core.

19. Coolant/air heat exchanger, comprising a heat exchanger core including at least two plates and a passage disposed between said plates for a coolant, said passage containing a plurality of flow channels which are disposed in parallel and are delimited laterally by separating walls, said separating walls being disposed perpendicular to the plates, having respectively two ends, and being connected to each other in an undulating shape by deflection zones which are provided alternately at one or an other of said ends of said separating walls, wherein said coolant passage is formed by at least one lamella which is connected to said plates, has a meandering cross-section and contains said separating walls, and wherein said deflection zones comprise recesses which are provided at said ends of said separating walls.

20. Heat exchanger according to claim 19; and being configured as a combined coolant/air and air/air heat exchanger in.

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