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(54) **A PROTECTION PANEL FOR ADIABATIC PRE COOLING SYSTEM**

(57) The invention relates to cooling systems, especially to adiabatic pre cooling systems, and panels there-to.

The present invention is a protective panel (1) for adiabatic pre cooling system to be installed on a heat exchanger, comprising a profiled frame (2), a flat frame (5), a net (6) and a cell panel (8), wherein the panel in assembled state comprises the profiled frame (2) as a base, where the net (6) is installed, which is followed by the cell panel (8) and above the cell panel (8) another net (6) is placed forming a sandwiched panel, wherein the flat frame (5) is attached to the sandwiched panel in order to secure the formed protective panel (1).

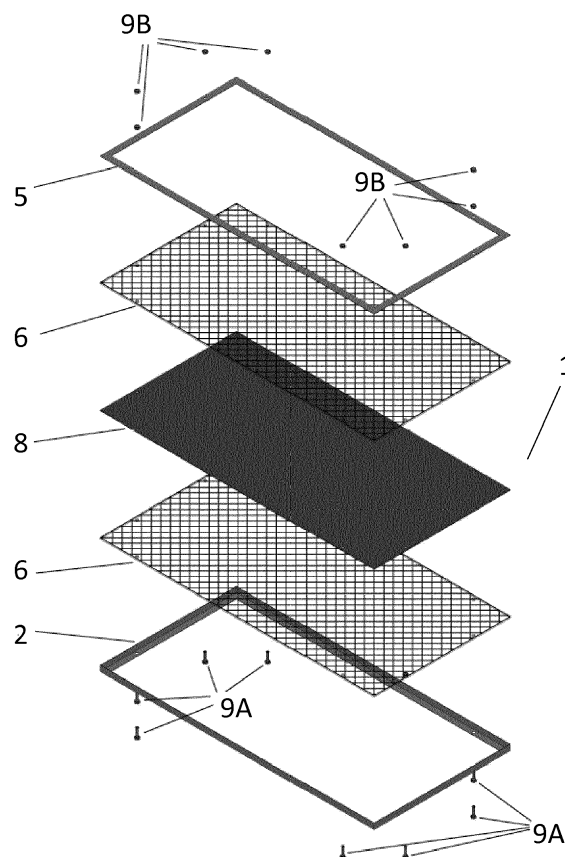


Fig. 7

**Description**Technical Field

**[0001]** The invention relates to cooling systems, especially to adiabatic pre cooling systems, and panels thereto.

Background Art

**[0002]** United States patent No. US 8,468,846 discloses a system and a method for indirect evaporative cooling and for two stage evaporating cooling having a module and a cartridge. International patent application publication No. WO2011/074005 discloses a pre-cooling system and method for pre-cooling air having adiabatic cooling means.

**[0003]** United states patent No. US 6,385,987 discloses heat exchanger for cooling and a pre-cooler for turbine intake air conditioning having heat exchanger plates.

**[0004]** In disclosed cooling systems a water is used to intensify a cooling process. In the mean time use of water reduces life of cooling system elements. Therefore, a protection system for the cooling devices or heat exchangers should be designed.

Summary of the Invention

**[0005]** Aim of the invention is reached by developing a protection panel for adiabatic pre cooling system to be installed on a heat exchanger or a cooling device. The protection panel comprises a profiled frame, flat frame, a net and a cell panel which are arranged on each other creating sandwiched protective panel.

**[0006]** The profiled frame is designed from at least four profiles and the profiles are connected to each other by angles forming a the profiled frame. Preferably, the profiled frame is of rectangular shape. It can be made in any other shape to be able to fit to any heat exchanger. The flat frame is designed from at least four flat bars and is configured to be attached to the profiled frame.

**[0007]** The net comprises holes, where a width of each hole is in the range of 4 mm to 100 mm and a height of each hole is in range of 4 mm to 16 mm. More preferably, the width of each hole is in the range of 6 mm to 20 mm and a height of each hole is in range of 6 mm to 20 mm.

**[0008]** The cell panel comprises cells, where a cell diameter of each cell is in the range of 1000  $\mu\text{m}$  to 7000  $\mu\text{m}$ , more preferably in the range of 1500  $\mu\text{m}$  to 3500  $\mu\text{m}$ .

**[0009]** The protective panel in assembled state comprises the profiled frame as a base, where the net is installed, which is followed by the cell panel and above the cell panel another net is placed forming a sandwiched panel, wherein the flat frame is attached to the sandwiched panel in order to secure the formed protective panel. After that all panels are attached together by means of attachment members. All elements of the panel are secured together by means of attachment members. The attachment members can be bolts and washers. Instead of bolts and washers, clips can be used.

**[0010]** The cell panel with cells has the following properties:

| Property                   | Unit              | Method of measure  | Specification |
|----------------------------|-------------------|--------------------|---------------|
| net or cell density        | kg/m <sup>3</sup> | ISO 845            | 10 - 50       |
| Compression resistance 40% | kPa               | ISO 3386/1         | 1 - 9         |
| Cell diameter              | $\mu\text{m}$     | Recticel / T.013.4 | 1000 - 7000   |

Brief description of the drawings

**[0011]** The following disclosure will be better understood by a person skilled in the art when read in conjunction with the figures.

Fig. 1 illustrates a flat frame **5** assembled by four flat bars **6**.

Fig. 2 illustrates the flat bar **6** for the flat frame **5**.

Fig. 3 illustrates a profiled frame **2** comprising four profiles **3** and four angles **4**.

Fig. 4 illustrates a cell panel **8**.

Fig. 5 illustrates a part of a net **6** having holes **7**, wherein a width **B** of each hole **7** is in the range of 4 mm to 100 mm and a height **H** of each hole is in range of 4 mm to 16 mm.

Fig. 6 illustrates two protective panels 1 in assembled state and attached to each other.

Fig. 7 illustrates the protective panel 1 in exploded view.

Fig. 8 illustrates the protective panel 1 installed on a heat exchanger.

Fig. 9 illustrates unassembled protective panel having clips 9C as attachment members.

**[0012]** A protective panel 1 comprises a flat frame 5, a profiled frame 2, a cell panel 8 and two nets 6 (see Fig. 7). The flat frame 5 comprises four flat bars 6 (see Fig. 2), that are connected together by means of four angles 4. The result is rectangular flat frame 5 (see Fig. 1). A profiled frame 2 is formed in a similar way. The profiled frame 2 is created by connecting together four profiles 3 by means of four angles 4. In the result a rectangular profiled frame 2 is created (see Fig. 3). The next step includes assembling of the panel 1. The net 6 is laid in the profiled frame 2. The a cell panel 8 is added and then covered by another net 6 and above all the flat frame is attached. Therefore, a sandwiched protective panel 1 is created. To secure all said elements a attachment members are used. As attachments member bolts 9A and washers 9B are used (see Fig. 7). When the panel 1 is assembled it is installed on a cooling device 10 (see Fig. 8). Beforehand, separate panels 1 can be attached together creating one large protective panel (see Fig. 6).

**[0013]** In another embodiment instead of bolts 9A and washers 9B, clips 9C are used.

**[0014]** While the inventions have been described with reference to certain embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the invention. Therefore, it is intended that the inventions not be limited to the particular embodiments disclosed herein.

## Claims

1. A protection panel (1) for adiabatic pre-cooling system to be installed on a cooling device, comprising:

- a profiled frame (2) designed from at least four profiles (3) and the profiles (3) are connected to each other by angles (4) forming the profiled frame (2),
- a flat frame (5) designed from at least four flat bars (6) and is configured to be attached to the profiled frame (2);
- a net (6) having holes, where a width (B) of each hole (7) is in the range of 4 mm to 100 mm and a height (H) of each hole (7) is in range of 4 mm to 100 mm;
- a cell panel (8) having cells, where a cell diameter of each cell is in the range of 1000  $\mu\text{m}$  to 7000  $\mu\text{m}$ ,

wherein the protective panel (1) in assembled state comprises the profiled frame (2) as a base, where the net (6) is installed, which is followed by the cell panel (8) and above the cell panel (8) another net (6) is placed forming a sandwiched panel, wherein the flat frame (5) is attached to the sandwiched panel in order to secure the protection panel (1).

2. A panel (1) according to Claims 1, wherein all elements (2, 5, 6, 8) of the panel (1) are secured together by means of attachment members.

3. A panel (1) according to Claim 1 or 2, wherein the width (B) of each hole (7) of the net (6) is in the range of 6 mm to 20 mm and a height (H) of each hole (7) of the net (6) is in range of 6 mm to 20 mm.

4. A panel (1) according to Claim 1 or 2, wherein where a diameter of each cell in the cell panel (8) is in the range of 1500  $\mu\text{m}$  to 3500  $\mu\text{m}$ .

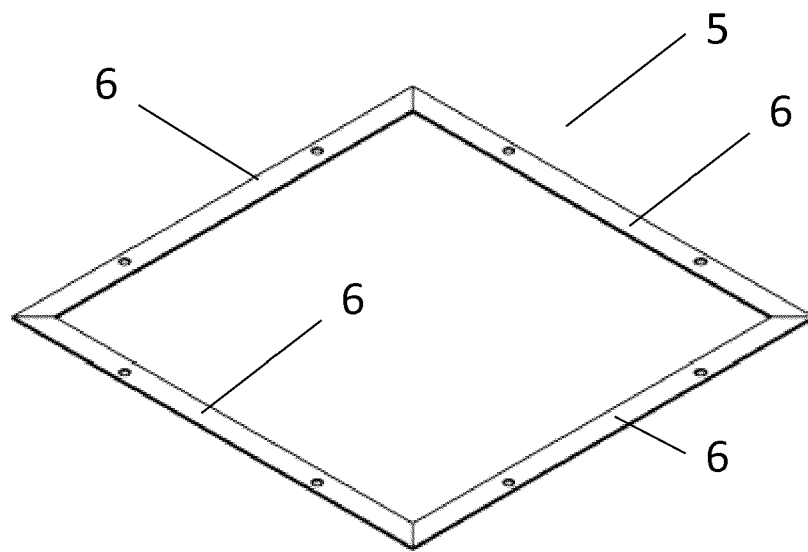


Fig. 1

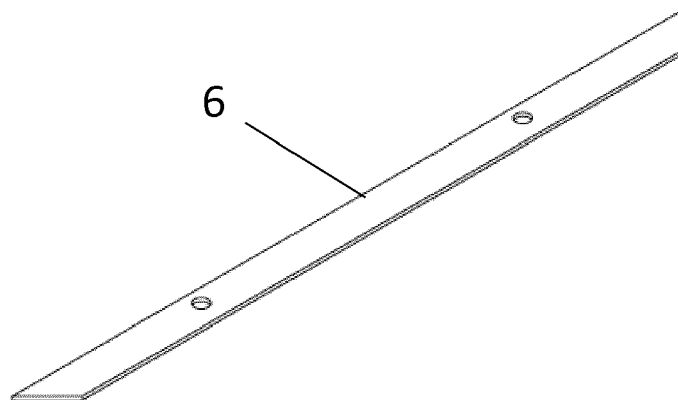


Fig. 2

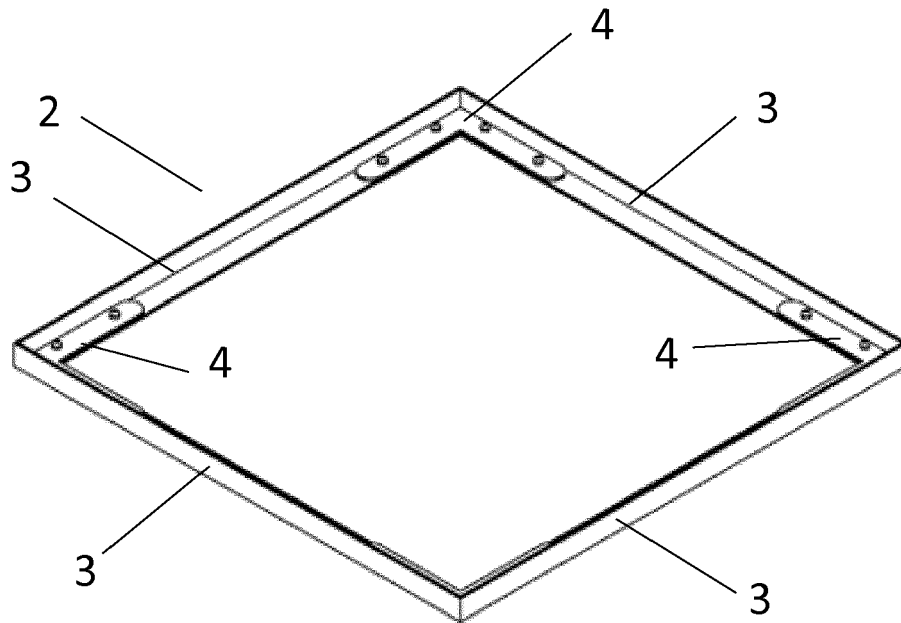


Fig. 3

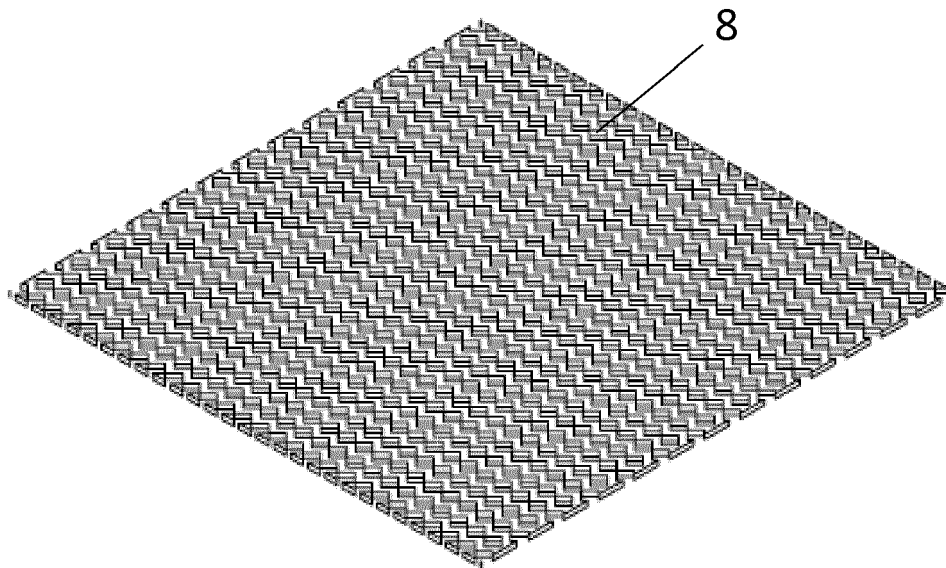


Fig. 4

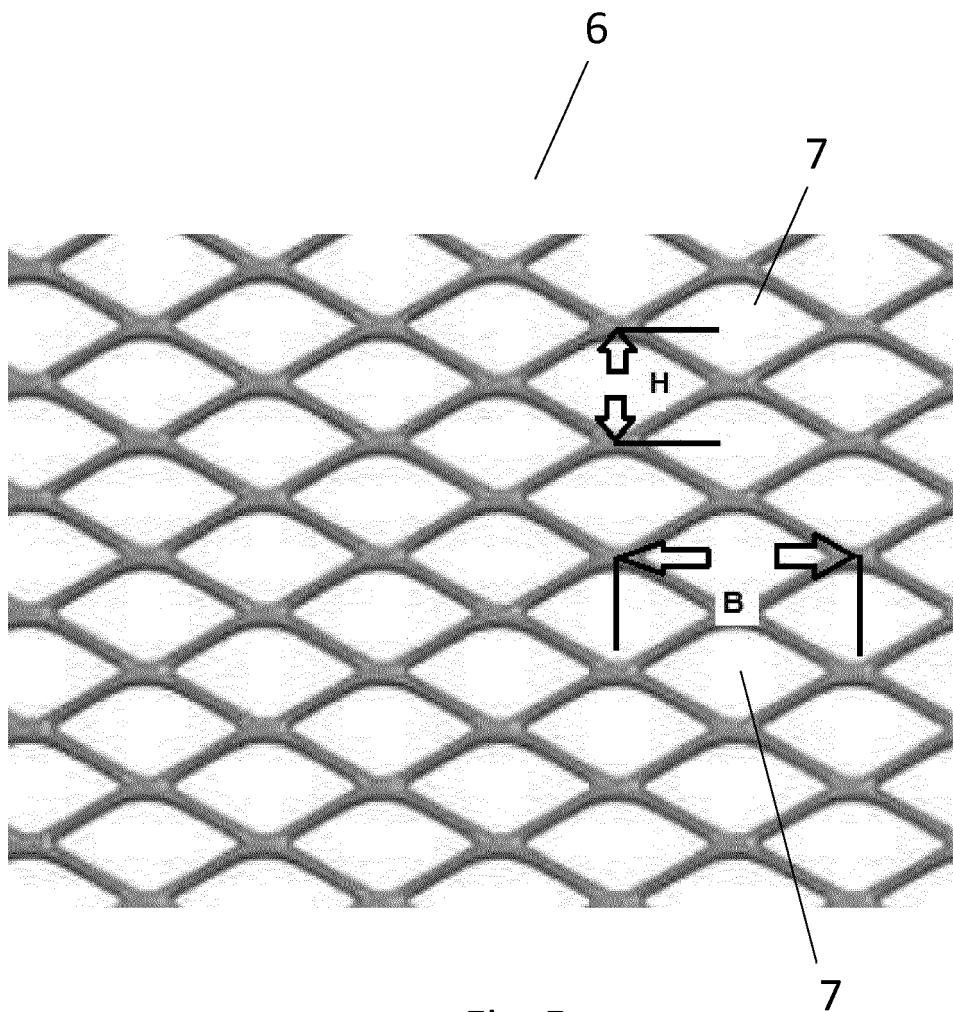


Fig. 5

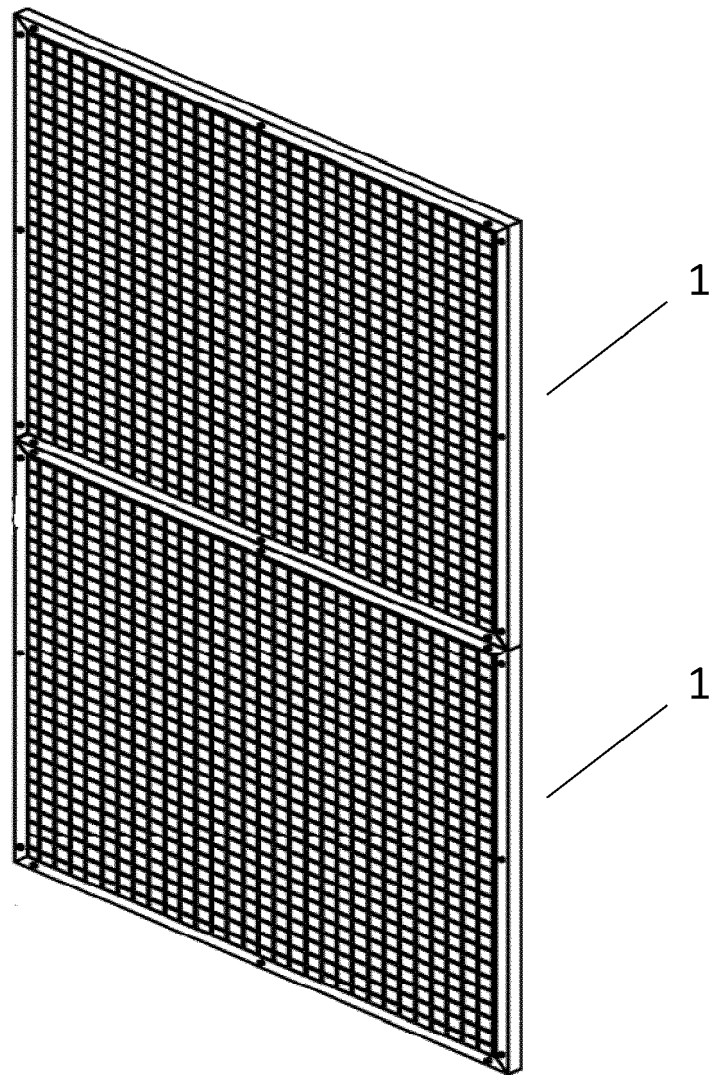


Fig. 6

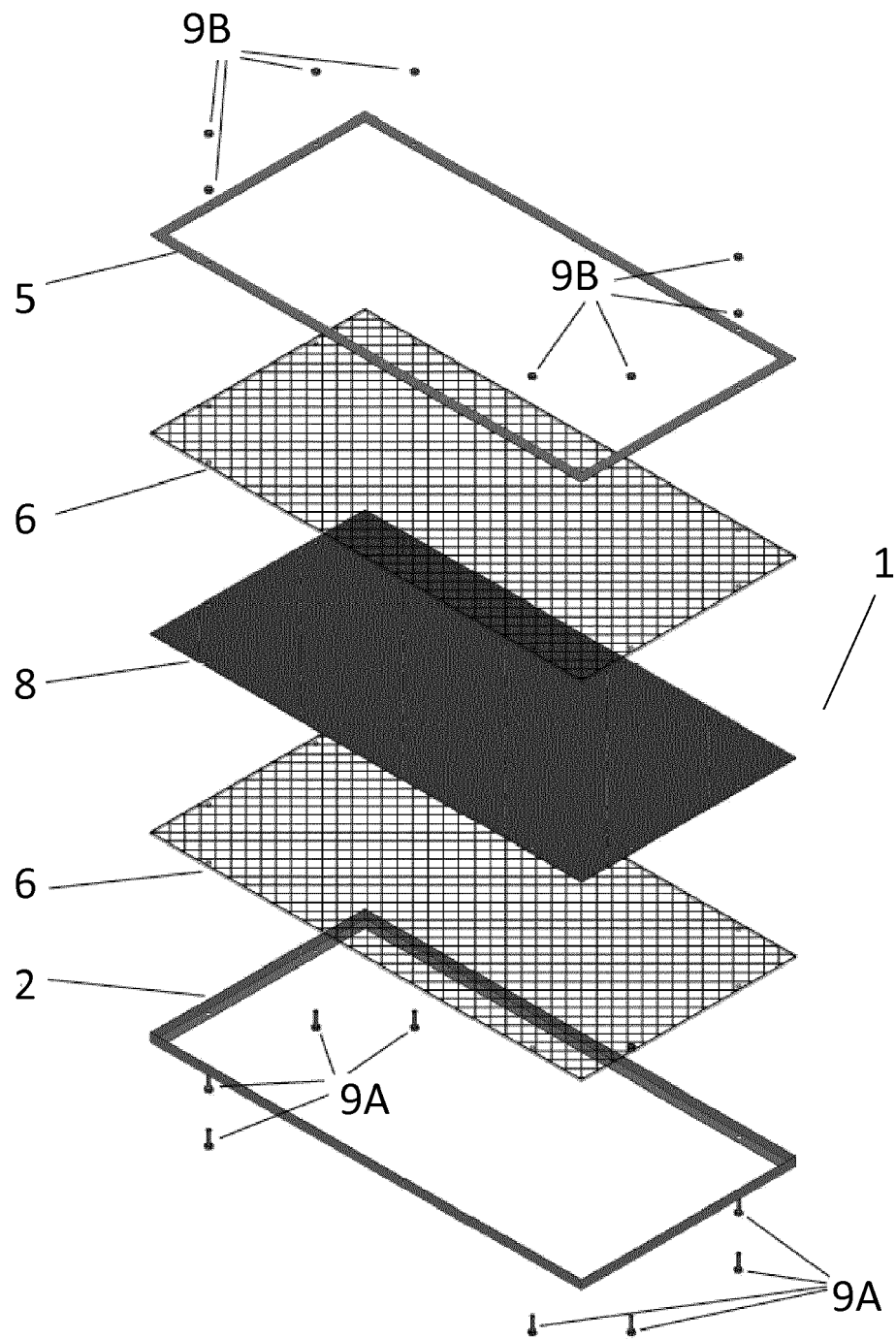


Fig. 7

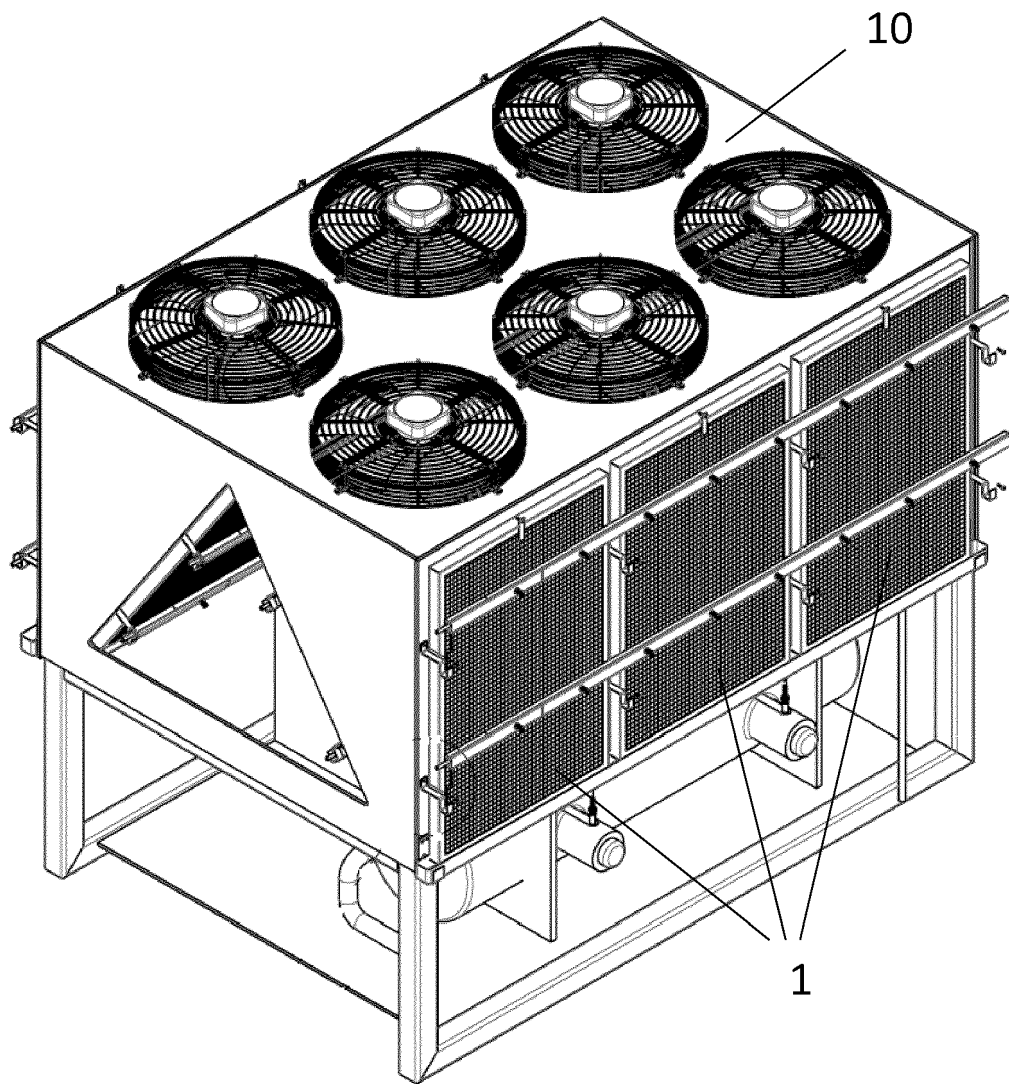


Fig. 8

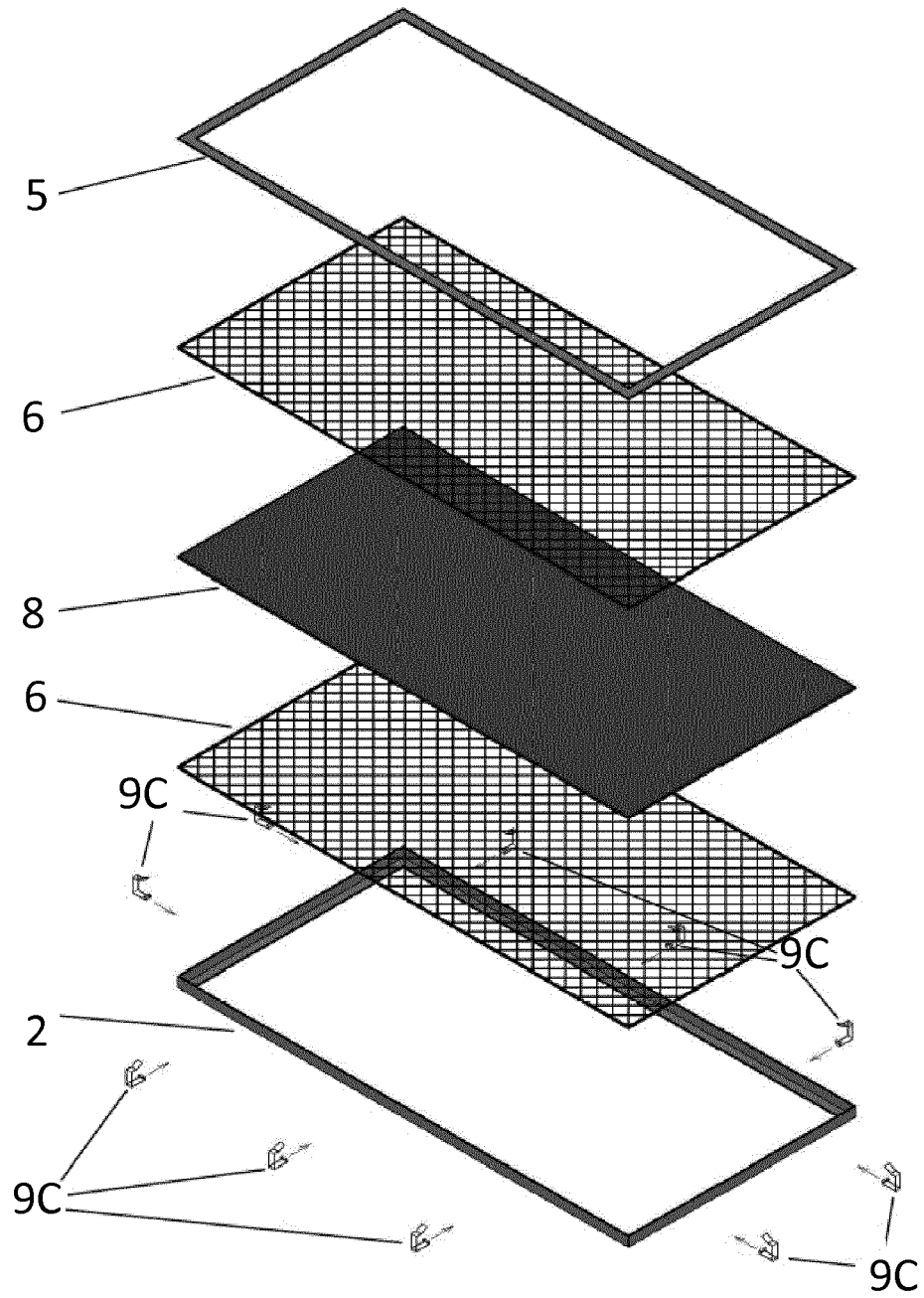


Fig. 9



## EUROPEAN SEARCH REPORT

Application Number  
EP 15 19 7411

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                              |                                                       |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages                                                                | Relevant to claim                                     | CLASSIFICATION OF THE APPLICATION (IPC) |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | FR 1 582 829 A (LOUIS GIAGALONE)<br>10 October 1969 (1969-10-10)<br>* the whole document *                                                   | 1-4                                                   | INV.<br>F28F19/00<br>B01D46/10          |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 5 196 040 A (MALLOY PATRICK A [US] ET AL)<br>23 March 1993 (1993-03-23)<br>* column 2, line 21 - column 4, line 11;<br>figures 2,3 *      | 1-4                                                   |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 2009/019824 A1 (LAWRENCE JONATHAN GORDON [US])<br>22 January 2009 (2009-01-22)<br>* paragraph [0011] - paragraph [0017];<br>figures 1,2 * | 1                                                     |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 5 689 969 A (CONROY MITCH [CA])<br>25 November 1997 (1997-11-25)<br>* column 3, line 53 - column 4, line 23 *                             | 1                                                     |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GB 2 198 053 A (MARSHALL D A G)<br>8 June 1988 (1988-06-08)<br>* page 3, line 16 - page 7, line 12;<br>figures 1,6,7 *                       | 1                                                     | TECHNICAL FIELDS<br>SEARCHED (IPC)      |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GB 1 349 971 A (DAVIS IND EQUIPMENT LTD)<br>10 April 1974 (1974-04-10)<br>* the whole document *                                             | 1                                                     | F28F<br>B01D                            |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                              |                                                       |                                         |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                              | Date of completion of the search<br><b>3 May 2016</b> | Examiner<br><b>Jessen, Flemming</b>     |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                              |                                                       |                                         |

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 19 7411

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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| FR 1582829 A                              | 10-10-1969          | NONE                       |                     |
| US 5196040 A                              | 23-03-1993          | US 5196040 A               | 23-03-1993          |
|                                           |                     | US 5318607 A               | 07-06-1994          |
| US 2009019824 A1                          | 22-01-2009          | NONE                       |                     |
| US 5689969 A                              | 25-11-1997          | NONE                       |                     |
| GB 2198053 A                              | 08-06-1988          | NONE                       |                     |
| GB 1349971 A                              | 10-04-1974          | FR 2145732 A1              | 23-02-1973          |
|                                           |                     | GB 1349971 A               | 10-04-1974          |

EPO FORM P0459

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

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 8468846 B [0002]
- WO 2011074005 A [0002]
- US 6385987 B [0003]