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(54) **Steam condenser with cross-flow heat exchanger**

(57) Steam condenser with cross-flow heat exchanger, according to invention is characterized in that on the side of hood 1, sucking the air or the steam from opened furnace doors, at least one assembly socket (2), at least one front cross-flow Exchange is located, adhering to equipped with fan mixing chamber (4), which is connected with inner chamber (5) and located in common hous-

ing condensation chambers (6) with tube exchangers (61), at the same time each of cross-flow exchangers (3) consists of stock-pile of rectangular sheets (31), connected in corners by rods (32), and between sheets 31 alternatively horizontal distance strips (33) and vertical strips (34) are located, creating the space for cross flow of air and steam.

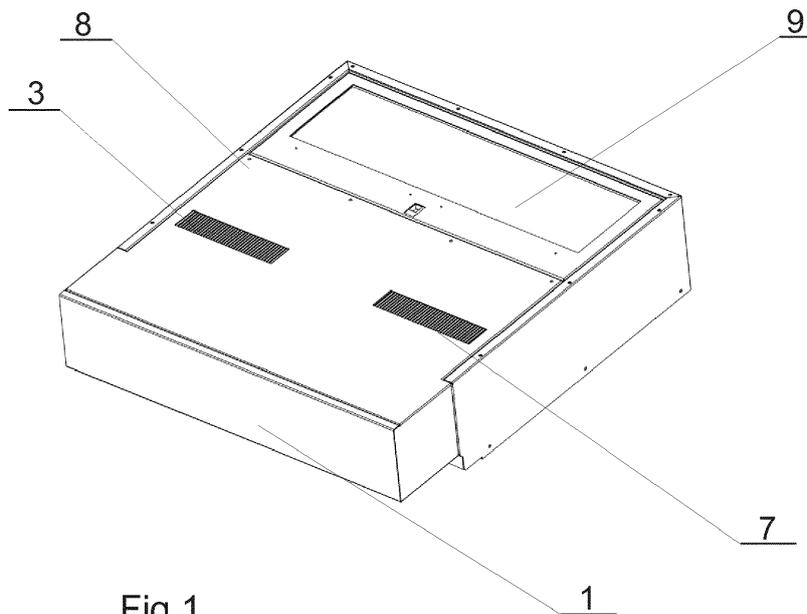


Fig. 1

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Description

[0001] The subject of the invention is a steam condenser with a cross-flow heat exchanger, designed for water steam condensation, especially in steam ovens of convection-type.

[0002] There is known from European patent application No EP2384626A1 a condenser for convection-type steam furnace. The condenser is characterized in that the exchanger located on the side of suction hood, along the perforated dividing wall of negative pressure channel, consists of cuboidal housing, inside of which are located collaterally and horizontally aluminum profile tubes, having radially located internal ribs, and at the same time the outlet channel, located on opposite side of exchanger then the fan, is changing to chimney channel, which has a chimney collar at the end.

[0003] There is known from German utility model No DE 29708079 device for steam condensation, which includes heat exchanger with the fan, connector pipes and inlet and outlet holes. Flow path of steam taken from the furnace is separated from the path of cooling air, delivered to exchanger by the fan sucking the air through the hood. The heat exchanger includes askew located plates with different systems of horizontal channels as well as sensors for temperature control units.

[0004] There is known, from the European patent application No EP1530901A1, a device for condensing substances from exhaust air of a cooking device, where inside of cuboidal housing exchanger is located, equipped with askew condensing plates. Before the exchanger air fans are located, whereas water steam from furnace is fed to exchanger through pipe, and water after condensation is getting out through the outlet pipe.

[0005] The steam condenser with the cross-flow heat exchanger, according to the invention, equipped with a suction hood located in cuboidal housing, a fan, a connector pipe for feeding a steam from a furnace and tube exchangers, is characterized in that on the side of the hood sucking the air or the steam from furnace opened doors, at least one front cross-flow exchanger is located in at least one assembly socket, adhering to the mixing chamber equipped with the fan. Said mixing chamber is connected to the inner chamber and condensing chambers, located in common housing, equipped with tube exchangers. Every cross-flow heat exchanger consists of series of rectangular sheets, connected in corners by rods. Between the sheets, there are alternatively located horizontal and vertical distance strips, which create the space for cross-flow of air and steam. Preferably, horizontal and vertical distance strip have on their length series of distance tongues.

Preferably, horizontal and vertical distance strips are fixed to the sheets by glue or glue tape.

Preferably, the cooling air is being sucked from environment through the holes in upper cover of cross-flow exchangers and discharged through the filter in outlet hole, located above the chamber with tube exchangers.

[0006] The steam condenser with the cross-flow heat exchanger, according to the invention, allows for condensation of water steam coming out of a furnace when opening the doors, without additional cooling medias, only by using air from environment. The design of condenser, especially by using cross-flow exchangers, containing a stock-pile of sheets, with directional distance strip and appropriate section of profile tubes, increasing the surface of heat exchange, significantly improves the efficiency of the device, especially when absorbing the steam coming out furnace, when the furnace doors are opened or partially opened.

[0007] These and other characteristics of the invention will be clear from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein, fig. 1 shows 3-D top view of Exchange, fig. 2 and fig. 3 - top view of condenser elements, fig. 4 - cross-section L-L of condenser, fig. 5 - cross-section A-A of condenser from fig. 6, fig. 6 - cross-section B-B of condenser from fig. 5, fig. 7 - cross-section R-R of condenser from fig. 4, fig. 8 - 3-D view of cross-flow exchanger, fig. 9 - 3-D partial view.

[0008] On the side of the hood 1 sucking the air or the steam from opened furnace doors, in assembly sockets 2, front cross-flow exchangers 3 are located, adhering to mixing chamber, equipped with fan 4. Mixing chamber 4 is connected to inner chamber 5 and to condensation chambers 6, located in common housing, with tube exchangers 61. Each of cross-flow exchangers 3 consists of stock-pile of rectangular sheets 31, connected in corners by rods 32, and between sheets 31 alternatively horizontal 33 and vertical 34 distance strips are located, creating space for cross-flow of air and steam. Horizontal distance strips 33 and vertical distance strips 34 have distance tongues 35 along. Horizontal distance strips 33 and vertical distance strips 34 are fixed to sheets 31 by glue or glue tape. On both sides of cross-flow exchanger 3 limiting sheets 36, with Bender edges are fixed.

[0009] Cooling air for the cross-flow heat exchanger is being sucked from environment through holes 7 in upper cover 8 of cross-flow exchangers 3 and discharged through filter 10 in outlet hole 9, located above chamber 5 of tube exchangers 6.

[0010] The hood 1 is equipped with askew stator 11 with rectangular holes 12 and preliminary filter 13.

[0011] The hot water steam (St) coming out of furnace is supplied by connector pipe 14 to condensation chambers 6 of tube exchangers 61, where it is cooled down by aluminum profiles and condensed and directed to mixing chamber 4, where is mixed with air having lower temperature (Ca) and sucked through holes 7 of upper cover 8 and cross-flow heat exchangers 3, is mixed up and comes to inner chamber 5 and next is coming out through tube exchangers 61 and outlet hole 9. At the same time, especially when the furnace doors are opened, the steam St and air Ca are going through holes 12 of askew stator 11 with filter of baffle type, to cross-flow exchangers 3,

where they are cooled down and the steam St is condensed. Next, the rest of steam sucked in front, coming from furnace chamber after opening the doors, is mixed on mixing chamber 4 and discharged through inner chamber 5 and tube exchanger 61.

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Claims

1. Steam condenser with cross-flow heat exchanger, equipped with suction hood, located in cuboidal housing, fan, connector pipe supplying the steam from the furnace and tube heat exchangers, **characterized in that** from the side the hood, sucking air or steam from opened furnace doors, **at least in one assembly socket (2), at least one front cross-flow exchanger (3)** is located, adhering to equipped with fan mixing chamber (4), which is connected with inner chamber (5) and located in common housing condensation chambers (6) with tube exchangers (61), and at the same time each of cross-flow exchangers (3) creates a stock-pile of rectangular sheets (31), connected in corners by bars (32), and between rectangular sheets (31) alternatively horizontal distance strips (33) and vertical strips (34) are located, creating the space for cross flow of air and steam.

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2. Steam condenser with cross-flow heat exchanger, according to claim 1, **characterized in that** horizontal distance strips (33) and vertical strips (34) have along series of distance tongues (35).

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3. Steam condenser with cross-flow heat exchanger, according to claim 1 or 2, **characterized in that** horizontal distance strips (33) and vertical strips (34) are fixed to the sheets (31) by glue or glue tape.

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4. Steam condenser with cross-flow heat exchanger, according to claim 1 or 2, **characterized in that** the air cooling the cross-flow exchanger is being sucked from environment through holes (7) in upper cover (8) of cross-flow exchangers (3) and discharged through filter (10) in outlet hole (9), located above chamber (5) of tube exchangers (6).

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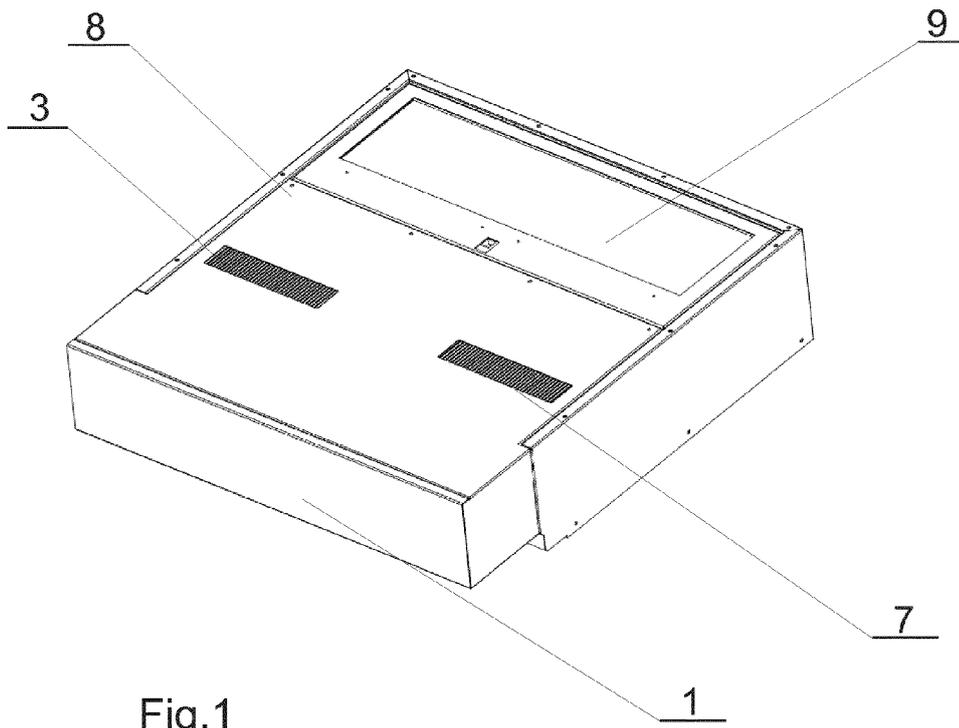


Fig.1

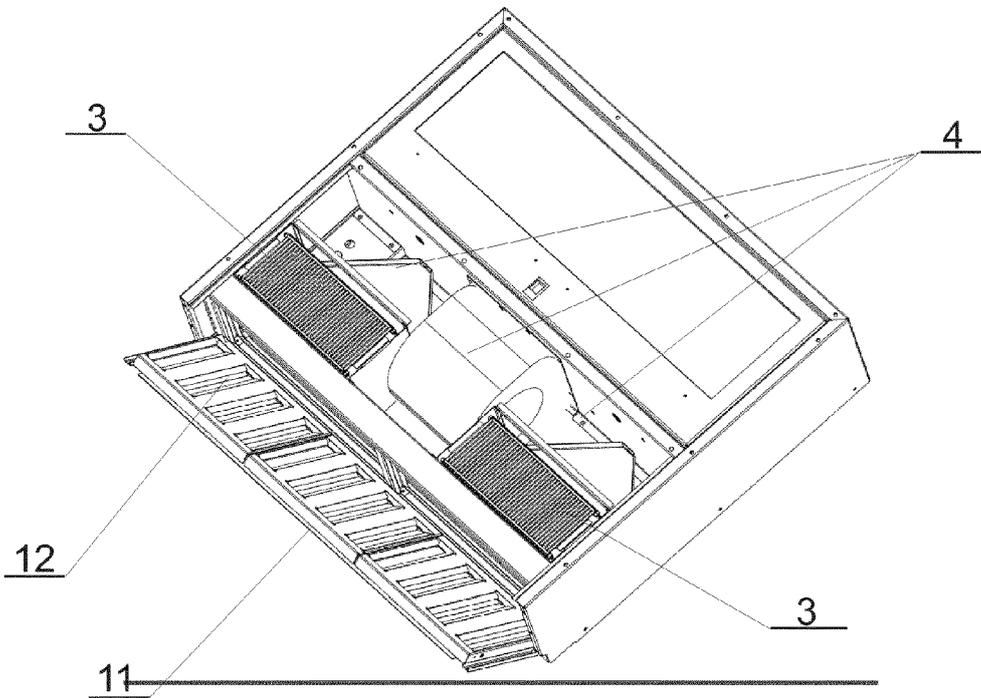


Fig.2

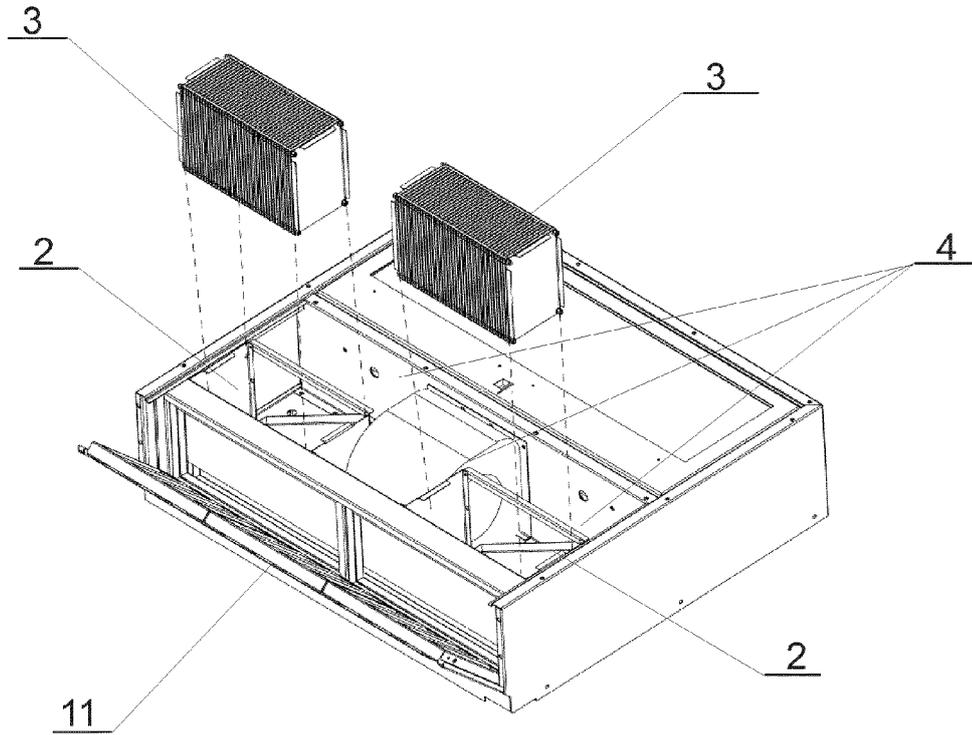


Fig.3

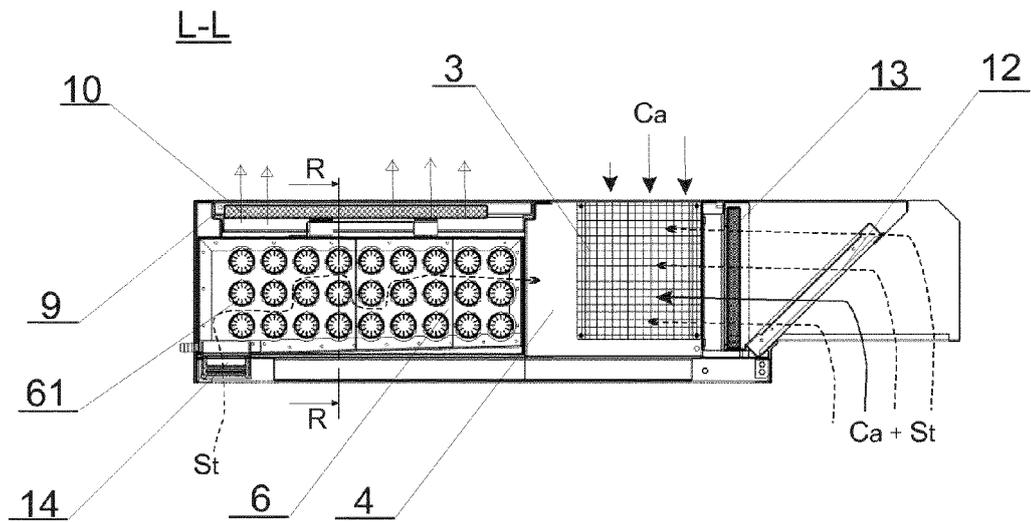
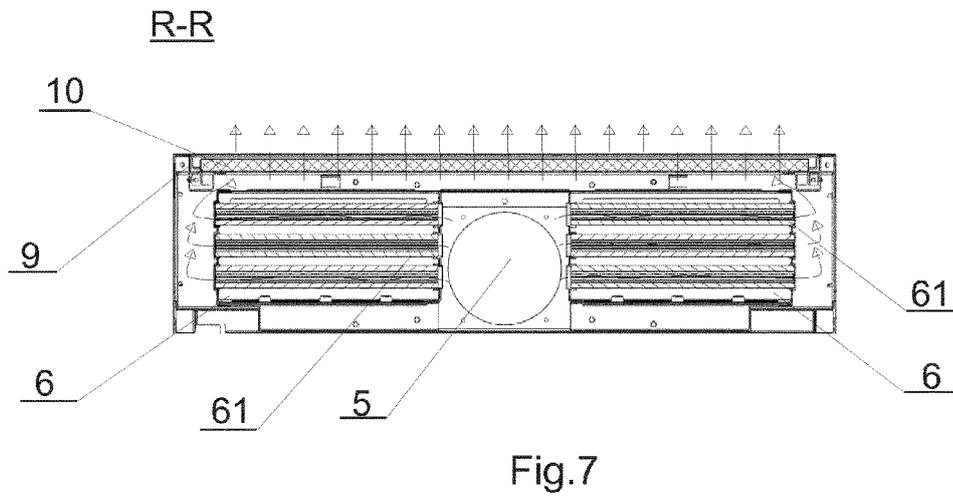
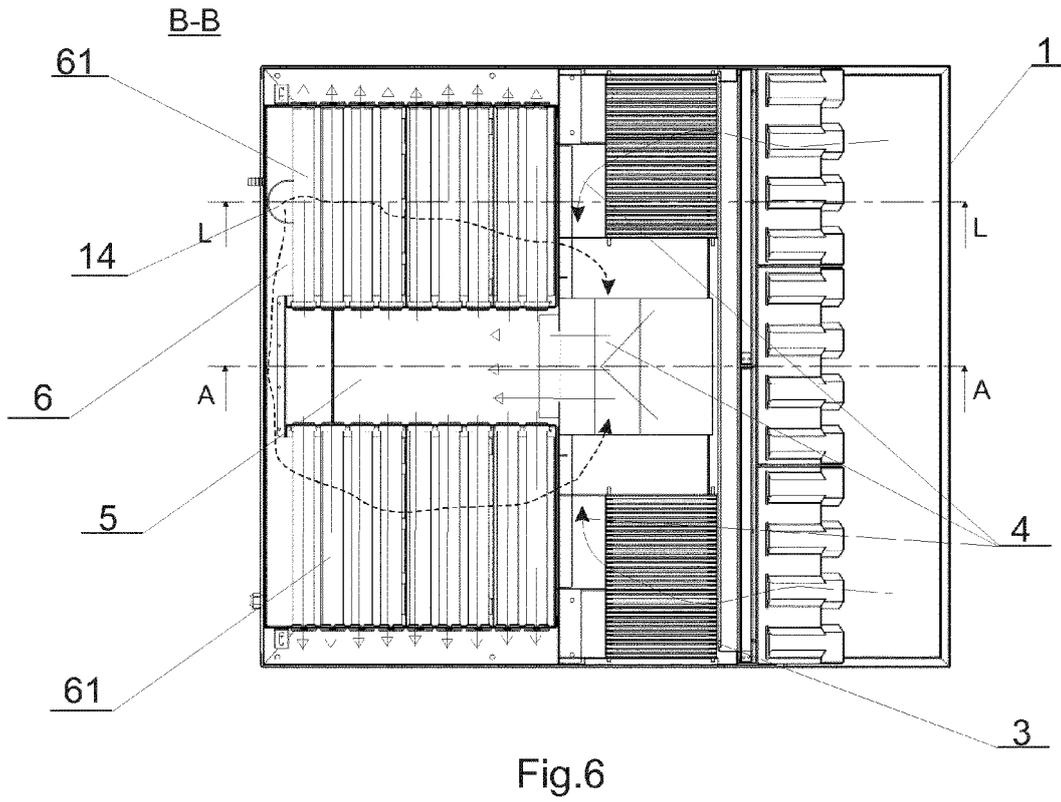
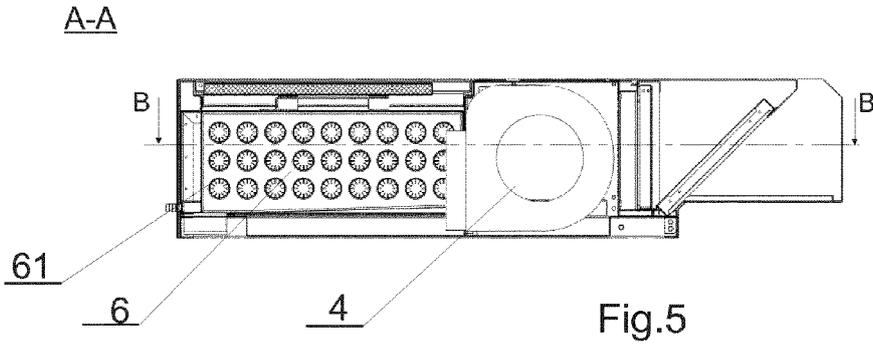


Fig.4



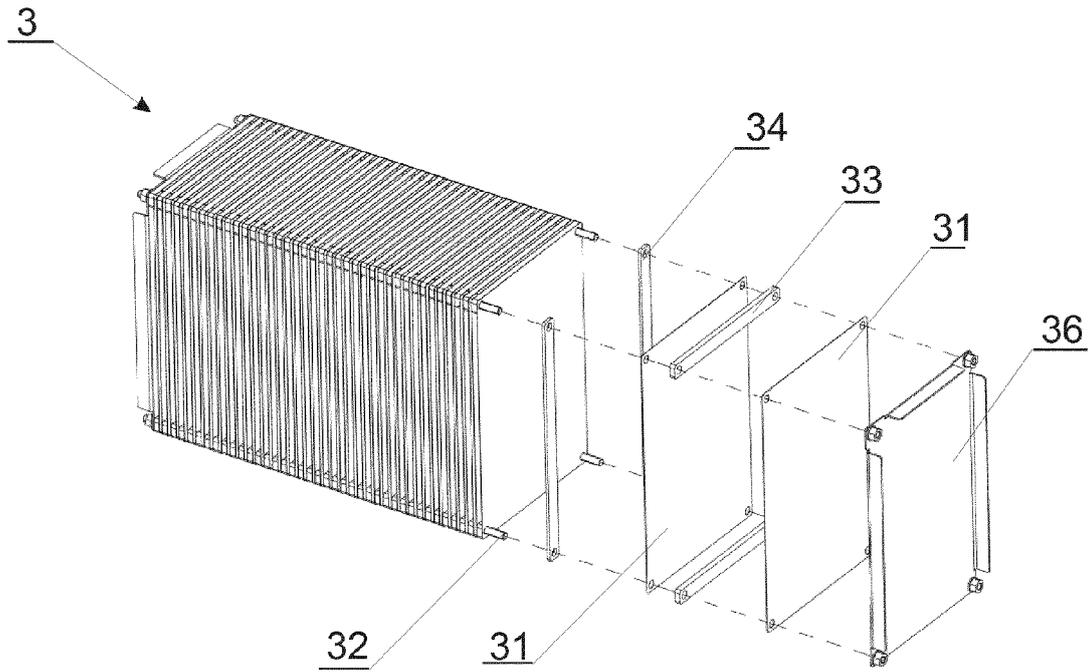


Fig.8

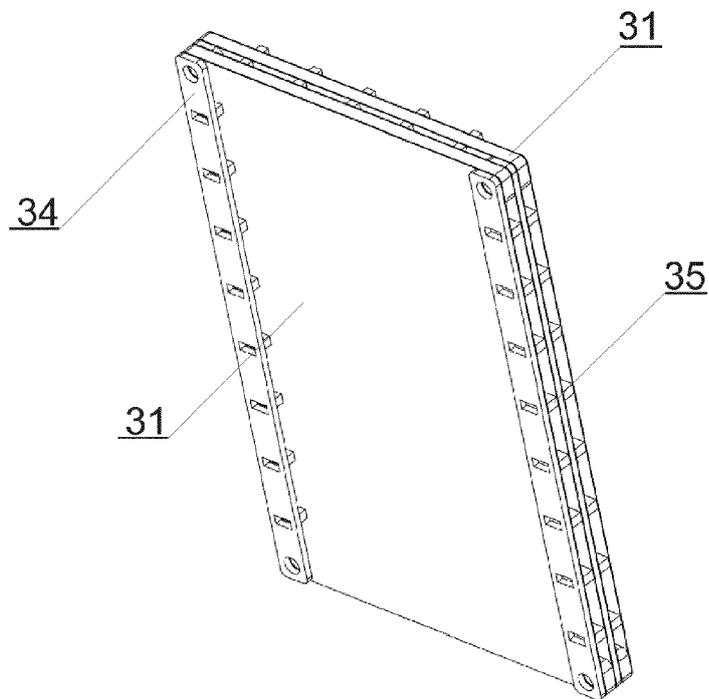


Fig.9



EUROPEAN SEARCH REPORT

Application Number
EP 14 46 1517

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Place of search		Date of completion of the search	Examiner	
The Hague		15 January 2015	Beltzung, Francis	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document				

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