(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 789 926 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.10.2014 Bulletin 2014/42

(51) Int Cl.:
F24H 3/04 *(2006.01)*

(21) Application number: **13163540.1**

(22) Date of filing: **12.04.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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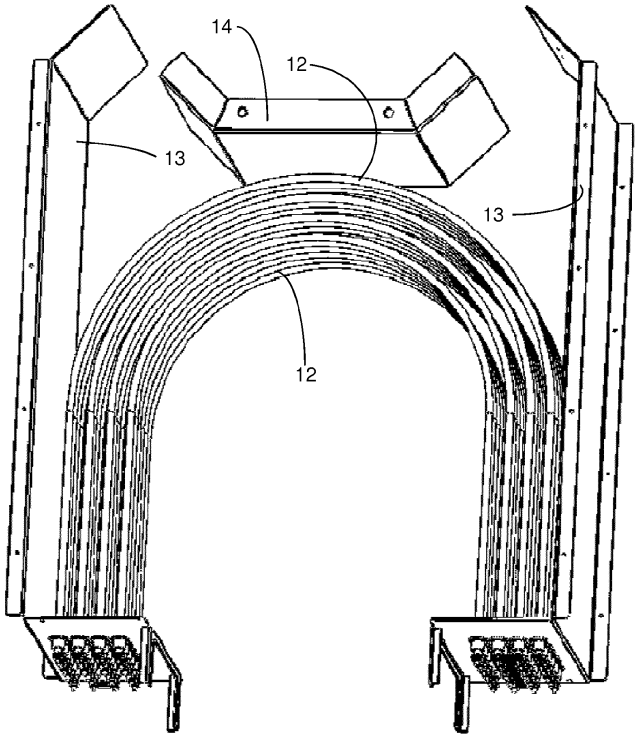
(54) Fan heater

(57) A fan heater for temporary heating of a building site includes a fan for transporting air through the fan heater from an inlet to an outlet. At least one heating element (12) is arranged for heating the air passing through the fan heater. The fan is a cylindrical fan and the heating element (12) is arranged to envelop the cylindrical fan at least partially.

Fig 4



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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention concerns a fan heater for temporary heating of a building site, including a fan, for transporting air through the fan heater from an inlet to an outlet, and at least one heating element for heating the air passing through the fan heater.

PRIOR ART

[0002] Heating of spaces during building is often necessary, especially before the permanent arrangements for heating, such as radiators and the like, have been installed. The benefits of heating are several. The comfort and working conditions of the workers on the building site will improve. The necessary conditions for using certain building materials, such as paints, glues etc. will be ensured. The humidity in the recently cast concrete or recently applied mortar, cement or plaster will also be reduced by heating the space, thus preparing it for further steps in the building process or interior decoration.

[0003] There exist a vast number of heating arrangements of various types for building sites. Fan heaters are among the most common. In general the function thereof is as follows. Cool air is drawn into the heater by a fan. The air passes by heating elements, which are arranged downstream of the fan, and its temperature is thereby increased, before the air is expelled by the action of the fan.

[0004] In order to accomplish a high heating effect, both the fan and the heating elements must have a large capacity. However, this desired effect results in a bulky construction, especially in the axial direction of the fan, which coincides with the air stream through the fan heater, since both the size and number of heating elements arranged downstream of the fan are increased.

[0005] Another consideration is that the outside surface of the fan heater must not be too hot. A suitable temperature of the casing is determined by acceptable temperatures in order to avoid risks of bum injuries to humans and of fire hazards. The temperature restrictions also tend to make the fan heaters bulky, since the volume needs to be increased in proportion to the power increase in order to keep the outside surfaces at an acceptable temperature.

[0006] While it would not be particularly difficult to make larger fan heaters, such heaters are difficult to handle and use. A fan heater which is too large and heavy to carry manually could be supplied with castors for rolling the heater, but it will still have to be able to pass through doorways and narrow passages, as well as be able to turn around corners where space is limited.

PROBLEM STRUCTURE

[0007] The present invention has for its object to attain a fan heater with a large power output, while its size and the temperature of its outer surfaces are limited.

SOLUTION

[0008] The object forming the basis of the present invention will be attained if the fan heater referred to initially is **characterized in that** the fan is a cylindrical fan and that the heating element is arranged to envelop the cylindrical fan at least partially.

[0009] Further advantages will be apparent from the dependent claims.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0010] The present invention will now be described in greater detail hereinbelow, with reference to the accompanying drawings. In the accompanying drawings:

Fig 1 shows a perspective view of a fan heater according to the invention;

Fig 2 shows a perspective view of the fan heater from the opposite side;

Fig 3 is a schematic side view of the fan heater, where an outer side panel and an inner guiding plate have been removed; and

Fig 4 is a perspective view of heating elements and guiding plates included in the fan heater according to the invention.

PREFERRED EMBODIMENT

[0011] Figure 1 shows an overview of a fan heater 1 according to the invention. The fan heater 1 has an inlet 2 for cool air on its side turned away from the viewer and an outlet 3 for heated air arranged on top of the fan heater 1. The outlet 3 is designed to distribute the air in different directions, but it is not essential for the invention, and could be replaced by any other outlet known in the art, as long as it is able to withstand the temperature of the heated air.

[0012] For the ease of transporting the fan heater, it is provided with castor wheels 4 and a handle bar 5 so that it may be steered in any direction manually. For the ease of handling and using the fan heater 1, one or more of the castors 4 is lockable. Also, the handle bar 5 is preferably made in a material which has a high heat capacity, i. e. its temperature will remain reasonably low despite long-term use of the fan heater, so that it may be touched without the risk of burning.

[0013] Next to the handle bar 5 there is an electrical connection device 6, which may be connected to a suitable electrical outlet. The connection device 6 should conform to the standards which are applicable on the

markets where the fan heater 1 is sold, and hence many variations thereof are possible. The fan heater 1 is designed for a considerable electrical power, yet its design is notably compact, in relation to the output power.

[0014] In figure 2, the fan heater 1 is viewed from its opposite side, with the air inlet 2 facing the viewer. An external filter of conventional design has been removed from the inlet side of the fan heater. The purpose of the external filter is to prevent dust and debris from being sucked into the fan heater 1, which could damage the internal parts of the fan heater 1, at least in large amounts. Another advantage is that the working environment on the building site will improve, since the filter will trap the dust and keep it from whirling around in the air.

[0015] Figure 2 reveals that an inner grille 7 is arranged in front of a fan 8 inside the fan heater 1. There is an approximately circular opening 9, through which the blades 10 of the fan 8 are visible. The fan 8 draws air into the fan heater 1, and transports it through the fan heater to the outlet 3.

[0016] The fan 8 is a cylindrical fan, the blades 10 of which rotate around a central axis 11. The air is drawn into the fan 8 from one end of the cylinder constituting the outer shape of the fan 8, in an axial direction, approximately parallel with the central axis 11 of rotation. The blades 10 of the fan 8 are angled so that they direct the air in a radial direction from the central axis 11. The air will be let out from the fan 8 through the envelope surface of the cylinder circumscribing the fan 8.

[0017] In the preferred embodiment, the diameter of the fan 8 is of the same magnitude as its axial length. The outlet of air is distributed over the axial length of the fan 8.

[0018] The schematic side view of figure 3 gives a better overview of the cylindrical fan 8, which is seen from the side in this view. The outer side plate of the casing and one inner guiding plate have been removed from the drawing for clarity. A number of heating elements 12 are also seen from the side, arranged around at least a part of the envelope of the cylindrical fan 8. As air is let out from the fan 8 radially, it will move past the heating elements, and will be heated to a high temperature. The heating elements 12 are distributed along the cylindrical fan 8, thus ensuring a reasonably even and efficient heating of the air. At the same time, the interior space of the fan heater 1 is used efficiently, and the heating elements 12 do not add to the axial length of the fan heater, as they are arranged on the outside of the cylindrical fan 8 in its radial direction.

[0019] The heating elements 12 in the preferred embodiment have the general shape of a U, with the shanks of the U electrically connected at the bottom. The rounded part of the U is arranged around the cylindrical fan 8 on its outside, so that the air expelled from the fan 8 has to pass the heating elements 12. Since the heating elements 12 follow the outer shape of the fan 8, the additional space needed for the heating elements 12 in the radial direction of the fan 8 is minimal.

[0020] Since there are several heating elements 12 arranged in the axial direction of the cylindrical fan 8, the space around the fan 8 is also used efficiently for heating the air coming out from the fan 8. The heating elements 12 are approximately uniformly arranged across the outer envelope surface of the cylindrical fan 8 in the axial direction.

[0021] Another aspect of the arrangement of the heating elements 12 is that there are several layers of heating elements 12 arranged in the radial direction of the cylindrical fan 8. This is difficult to see in figure 3, but will be apparent from figure 4. In this way the air from the fan 8 will pass by a number of heating elements 12, before it reaches the outlet 3. The increased number of heating elements 12 will further increase the turbulence in the airflow from the fan 8, thereby further increasing the contact of the air with the heating elements 12 an further increasing the efficiency of the heating of the air. In other words there will be an increased heating power.

[0022] To this effect, there is also arranged a diffusor 14 above the heating elements 12 and between the two guiding plates 13, whereof one plate is removed from the drawing for clarity.

[0023] Figure 4 shows a detail view of the heating elements 12 surrounding the cylindrical fan 8. In the figure two guiding plates 13 are arranged on either side of the heating elements 12. Between the two guiding plates 13 and above the heating elements 12, the diffusor 14 is clearly visible.

[0024] In figure 4 it is clear that the heating elements 12 are U-shaped and arranged in several rows in the axial direction and in several layers in the radial direction. The outermost heating elements 12 have a longer radius of curvature than the inner heating elements 12, and their radii of curvature are gradually less, with the innermost heating elements 12 having the least radius of curvature. The innermost heating elements 12 closely follow the curvature of at least half of the circumference of the cylindrical fan 8.

[0025] All the heating elements 12 have their electrical connections at the bottom, which means that the provision of electrical wires in the fan heater 1 will be simplified.

[0026] On both sides of the heating elements 12 there are guiding plates 13, as briefly mentioned above. The guiding plates 13 serve to guide the air flow from the fan 8 towards the outlet 3. The guiding plates 13 also deflect the air flow from the side plates of the casing, thereby keeping them as cool as possible. The material of the guiding plates 13 may in some embodiments be able to reflect the heat inwards. In some embodiments, a layer of insulation may also be provided between the guiding plates 13 and the outer side plates.

[0027] Although some of the air expelled from the cylindrical fan is initially not directed towards the outlet 3, the provision of the guiding plates 13 will make sure that the air flow is directed upwards eventually. Air which is deflected back towards the heating elements 12 by the guiding plates 13, will be heated further, and will thereby

have an increased tendency to rise towards the outlet 3.

[0028] Air moving upwards from the fan 8 will first pass and be heated by the heating elements 12, and its turbulence will be increased thereby. Some of the air will be deflected by the guiding plates 13, as described, and will be heated further. Air rising straight upwards, after passing the heating elements 12 at least once, will encounter the diffusor 14, and will be directed either back to the heating elements 12, directly or via the guiding plates 13, or to the sides, where it passes between the diffusor 14 and the guiding plates 13. In both cases its turbulence will increase, while its velocity of flow decreases.

[0029] The arrangement of the heating elements 12 around the fan 8 and the arrangement of the guiding plates 13 and the diffusor 14, to direct the air flow, cooperate to realize the compact fan heater 1 with a high heating power.

ALTERNATIVE EMBODIMENTS

[0030] While the embodiment shown in the drawings has a particular type of outlet 3, its shape is not essential for the invention. Any other type of outlet arrangement may be used, but an outlet arranged on the upper part of the fan heater will be preferred, in order to make the best use of the effects from heated air rising upwards.

[0031] In the preferred embodiment, U-shaped heating elements 12 have been used. They may be replaced by heating elements with other shapes, more or less circumscribing the cylindrical fan, e. g. Ω-shaped elements, spirals, or loops.

[0032] Other arrangements of the heating elements 12, for covering the majority of the axial length of the cylindrical fan 8, are envisaged, such as arranging the heating elements 12 in a zig-zag pattern across the envelope surface.

[0033] The invention may be further modified within the scope of the appended claims.

Claims

1. Fan heater for temporary heating of a building site, including a fan (8), for transporting air through the fan heater (1) from an inlet (2) to an outlet (3), and at least one heating element (12) for heating the air passing through the fan heater (1), **characterized in that** the fan (8) is a cylindrical fan and that the heating element (12) is arranged to envelop the cylindrical fan (8) at least partially.

2. Fan heater according to claim 1 **characterized in that** the fan (8) expels air around its envelope surface.

3. Fan heater according to claim 1 or 2, **characterized in that** the fan (8) is arranged in an outer casing and that guiding plates (13) are arranged between the heating element (8) and the outer casing.

4. Fan heater according to any of claims 1 to 3, **characterized in that** the heating elements (12) are arranged to extend in the axial direction of the cylindrical fan (8), as well as in the circumferential direction.

5. Fan heater according to any of claims 1 to 4, **characterized in that** the heating element (12) extends along approximately half of the circumference of the cylindrical fan (8).

Fig 1

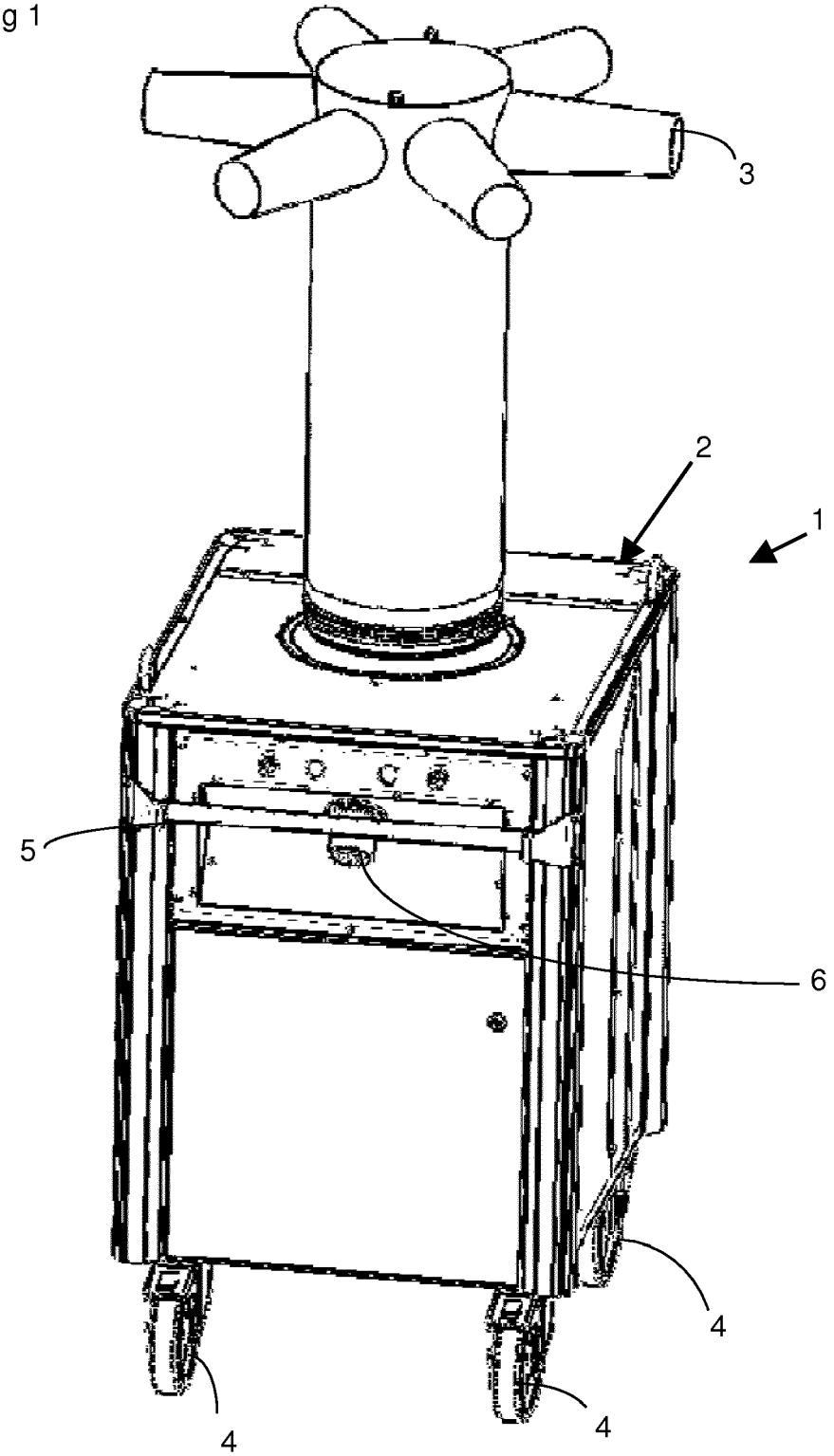


Fig 2

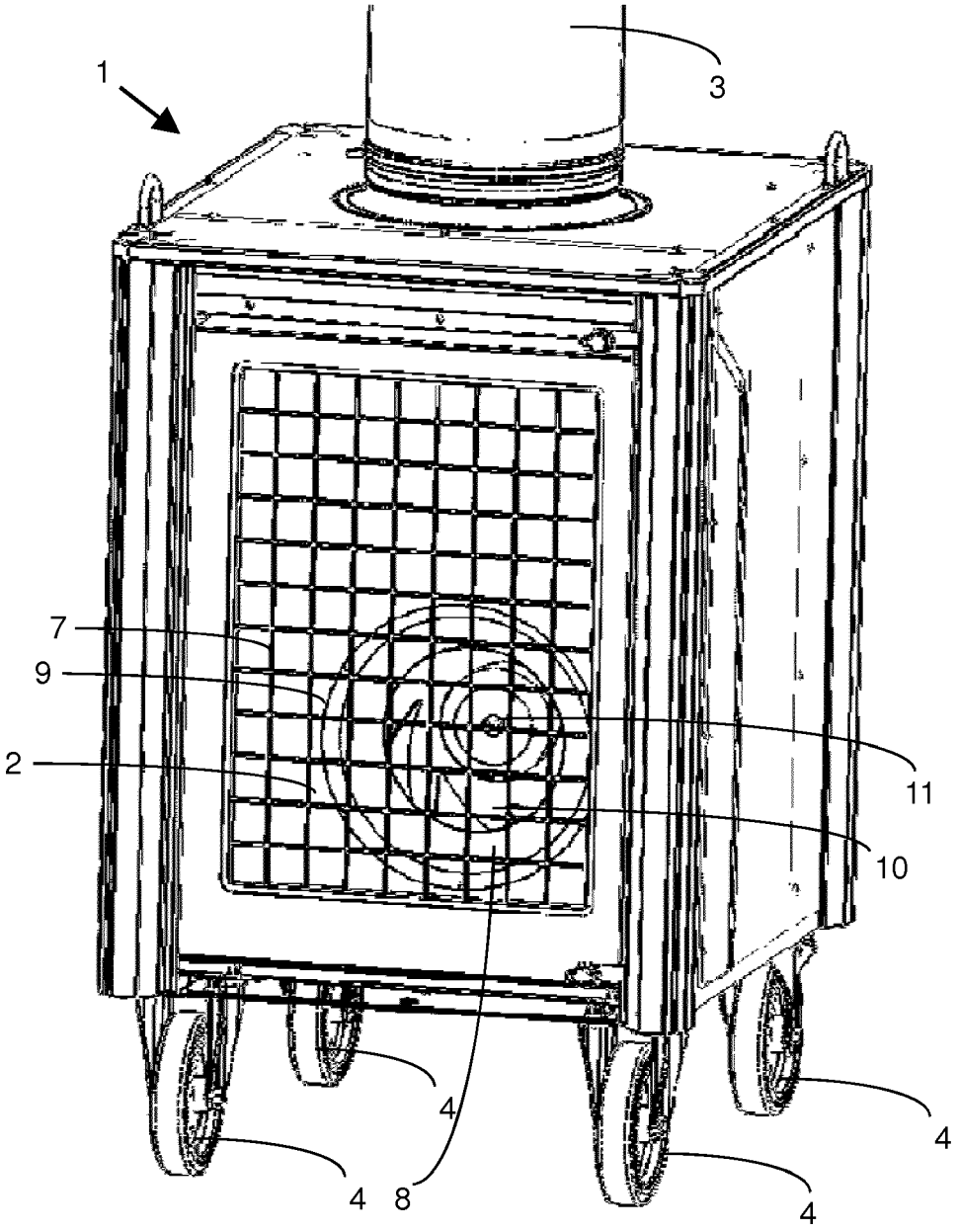


Fig 3

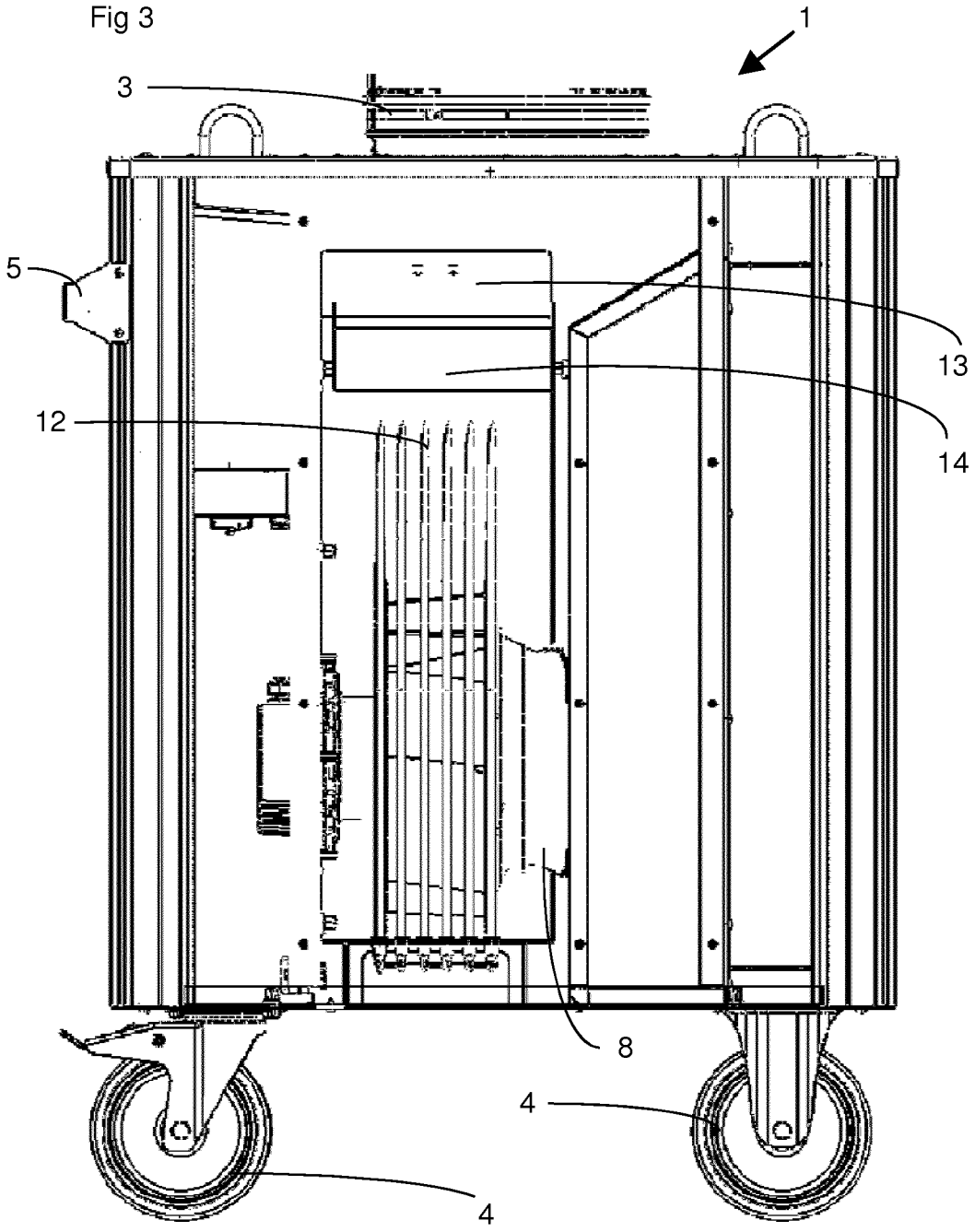
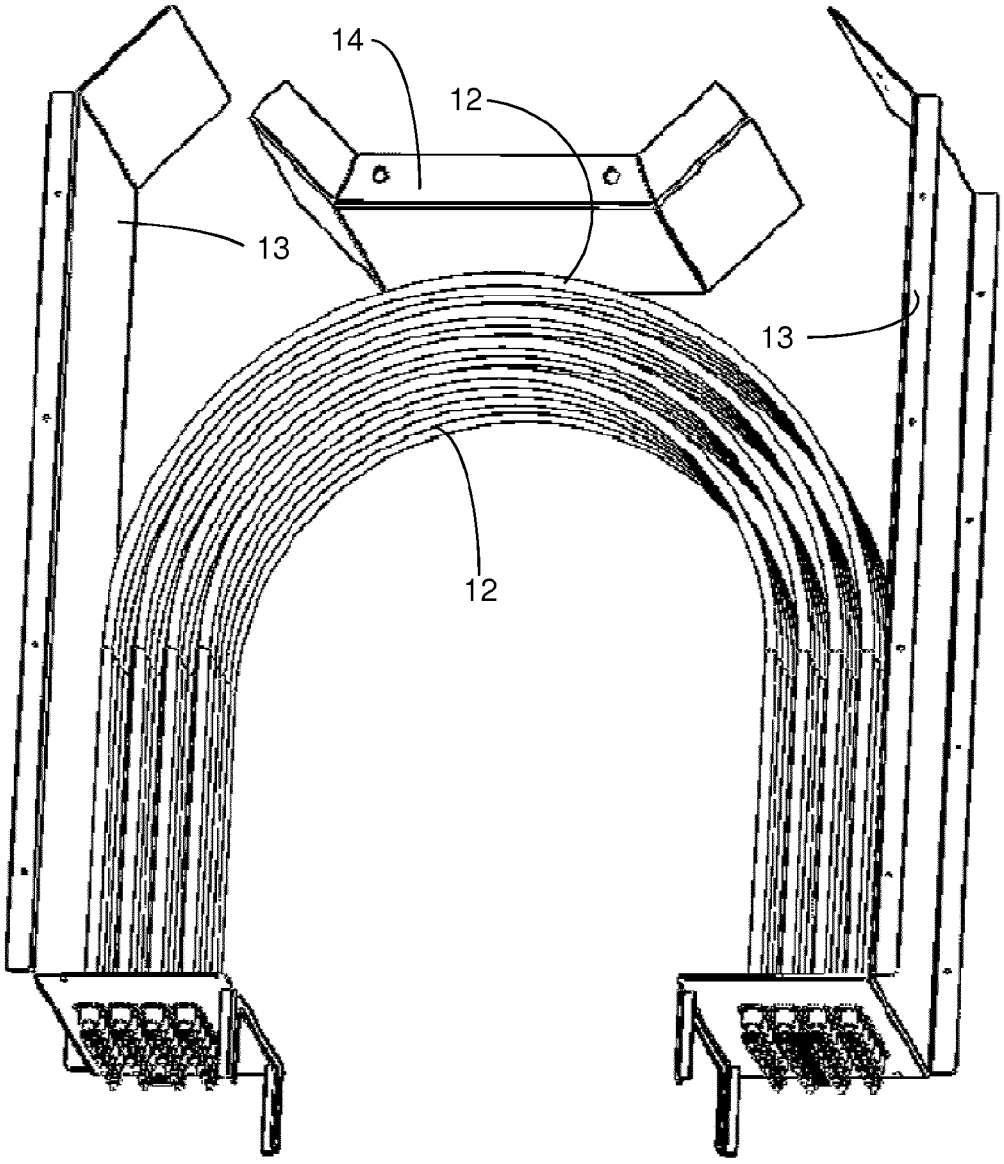


Fig 4



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EUROPEAN SEARCH REPORT

Application Number
EP 13 16 3540

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 43 30 878 A1 (PETZ ELEKTRO WAERME TECHN [DE]) 16 March 1995 (1995-03-16) * column 2, line 6 - column 2, line 35; figure 2 *	1-5	INV. F24H3/04
X	US 2 675 460 A (WINNER JR MARK H) 13 April 1954 (1954-04-13) * column 2, line 33 - column 5, line 2; figure 2 *	1-5	
X	EP 1 967 790 A1 (HUNTER FAN CO [US]) 10 September 2008 (2008-09-10) * paragraph [0005] - paragraph [0010]; figure 4 *	1-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 May 2013	Ast, Gabor

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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31-05-2013

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