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Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a
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- *of inventorship (Rule 4.17(iv))*

[Continued on next page]

(54) Title: CONVECTOR HEATER

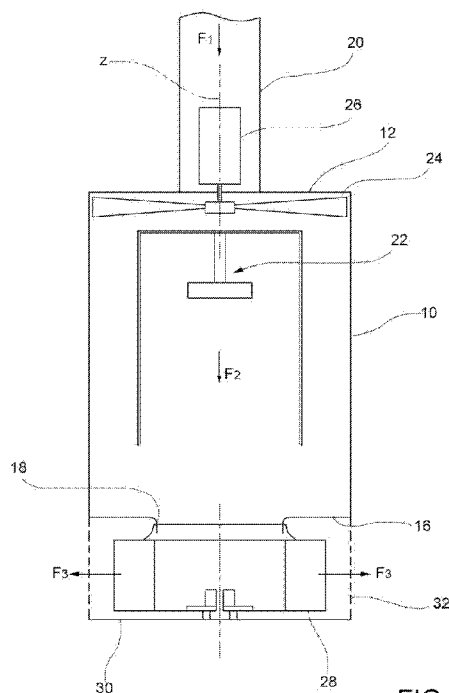


FIG.1

(57) Abstract: The convector heater comprises: a casing (10) with a top wall (12) having a first opening (14) and a bottom wall (16) having a second opening (18) vertically aligned with the first opening (14); an intake tube (12) connected to the top wall of the casing (10) near the first opening (14) to allow the air to be drawn through the intake tube (12) from the space to be heated; a heating device (22) arranged inside the casing (10) to heat the air drawn through the intake tube (12) from the space to be heated; an axial blower (24, 26) with a vertical axis (z) which is arranged upstream of the heating device (22) to draw the air through the intake tube (12) from the space to be heated and to blow it towards the bottom wall (16) of the casing (10) through the heating device (22); and a non-motorized bladed impeller (28) with a vertical axis (z), which is arranged downstream of the heating device (22), namely beneath the bottom wall (16) of the casing (10), and is configured to receive the axial air flow that is produced by the axial blower (24, 26) and comes out of the casing (10) and to generate a substantially radial air flow, the bladed impeller (28) being driven into rotation about its own axis (z) by the axial air flow produced by the axial blower (24, 26).



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Convector heater

The present invention relates to a convector heater for convection heating of closed spaces, particularly, though not exclusively, industrial and livestock farming buildings.

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International patent application No. WO2009/153673 in the Applicant's name discloses a convector heater comprising a casing, an intake tube having a vertical axis and connected to the casing, a heating device received in the casing to transmit heat to the air that is drawn into the casing through the intake tube, and a centrifugal blower arranged beneath
10 the casing, with its axis of rotation oriented vertically, to blow in the surrounding environment, in a substantially radial direction, the air that has been drawn through the intake tube and heated by the heating device. The casing is preferably made of sheet metal and has a substantially parallelepiped shape, with a flat top wall having a first opening for allowing the air drawn through the intake tube to enter the casing and with a flat bottom wall having
15 a second opening, coaxial to the first opening, for allowing the air to leave the casing. The air drawn by means of the blower enters therefore the casing through the intake tube and the first opening, is heated by the heating device (that is made for example as an air/water heat exchanger, but might also be a gas heater) and then leaves the casing through the second opening and is blown by the blower towards the surrounding environment. The blower
20 comprises, in per-se-known manner, a bladed impeller configured to produce an air flow directed radially from an incoming air flow directed axially, and an electric motor arranged to drive the impeller into rotation, if necessary via a motion transmission device. The impeller of the blower is supported at its bottom by a support plate which is arranged beneath the flat bottom wall of the casing, parallel thereto. The support plate is connected to the
25 casing by a plurality of struts (for example four struts arranged at the vertices of the flat bottom wall of the casing). The impeller of the blower is surrounded by a protection grid which allows the radial air flow generated by the impeller to pass through the grid, without substantially being obstructed by the latter. A convector heater of the above-mentioned type is typically installed so as to be suspended from the ceiling of the space to be heated,
30 so that it is able to draw the air from the highest zones of this space and blow it, once it has been heated by the heating device placed inside the casing, at a lower height from the ground.

It is an object of the present invention to provide a convector heater which is able to offer similar performances to those of the known convector heater cited above, in terms of pressure increase that is produced by the blower and/or in terms of air volume that is heated per time unit, but which is less expensive than the prior art.

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This and other objects and advantages, which will be better understood further on, are achieved according to the present invention by virtue of a convector heater having the features set forth in the enclosed independent claim 1.

10 Advantageous embodiments of the invention are defined in the dependent claims, the subject-matter of which is to be regarded as forming an integral and integrating part of the present description.

In short, the invention is based on the idea of providing a convector heater having an axial
15 blower which is located upstream of the heating device and is arranged to draw the air through the intake tube and blow it towards the heating device substantially along the direction of the axis of the intake tube, the convector heater further comprising a bladed, non-motorized impeller which is located downstream of the heating device and is arranged to receive the axial air flow produced by the axial blower and coming out of the casing and
20 generate a substantially radial air flow. Like the above-discussed prior art, therefore, the convector heater according to the present invention also comprises a bladed impeller arranged to generate a radial air flow from the axial air flow coming out of the casing. However, unlike the above-discussed prior art, the bladed impeller of the invention is not a motorized one but is driven into rotation by virtue of the axial air flow which is generated by
25 the axial blower and, coming out of the casing, hits the blades of the impeller. The use of an axial blower in combination with a non-motorized bladed impeller allows to obtain a convector heater that has similar performances to those of the above-discussed prior art, but is less expensive.

30 Further features and advantages of the present invention will become apparent from the following detailed description, given purely by way of non-limiting example with reference to Figure 1 of the appended drawings, which schematically shows a convector heater

according to an embodiment of the present invention.

With reference to Figure 1, a convector heater according to the present invention comprises an outer casing 10, preferably made of sheet metal, with a top horizontal wall 12 having a first opening 14 formed therein and with a bottom horizontal wall 16 having a second opening 18 formed therein, the second opening 18 being vertically aligned with the first opening 14. An intake tube 20 having a vertical axis (indicated z) is connected to the casing 10 near the first opening 14. The air is drawn through the intake tube 20 from the highest zones of the closed space where the convector heater is installed.

The casing 10 contains a heating device 22 arranged to heat the air that is drawn into the casing through the intake tube 20. The heating device 22 may be made for example as an air/water heat exchanger or as a gas heater. The casing 10 further includes, upstream of the heating device 22, an axial blower arranged to draw the air in the axial direction (i.e. along the direction of the vertical axis z) through the intake tube 20 (as indicated by arrow F1) and to blow the air thus drawn, still in the axial direction, towards the heating device 20 and towards the bottom horizontal wall 16 of the casing (as indicated by arrow F2). The axial blower comprises, in per-se-known manner, a bladed impeller 24 rotatable about an axis of rotation coinciding with the aforesaid vertical axis z and an electric motor 26 arranged to drive the bladed impeller 24 into rotation about its own axis of rotation.

A further bladed impeller 28 is placed downstream of the heating device 20, more specifically beneath the bottom horizontal wall 16 of the casing 10, and is configured to receive the axial air flow generated by the axial blower and to produce a radial air flow (as indicated by arrows F3). The bladed impeller 28 is not a motorized one, but is driven into rotation about its own axis of rotation (coinciding with the vertical axis z, and therefore coinciding with the axis of rotation of the bladed impeller 24) by virtue of the thrust received by the incoming axial air flow. Therefore, the bladed impeller 28 works substantially as a deflector or diverter that changes the direction of the air flow passing through the same from axial to radial. The bladed impeller 28 is supported at its bottom by a support plate 30 which is arranged beneath the bottom horizontal wall 16 of the casing 10, parallel thereto. The support plate 30 is connected to the casing by struts (not shown) so as to be carried by

the casing itself. The bladed impeller 28 is surrounded by a protection grid 32 which allows the radial air flow generated by the same impeller to pass through the grid without substantially being obstructed by the latter.

- 5 The convector heater may also comprise, in per-se-known manner, additional components (not shown in Figure 1), such as for example an air filter.

The convector heater described above operates as follows. As the bladed impeller 24 of the axial blower is driven into rotation about its own axis of rotation (vertical axis z) by the
10 electric motor 26, it draws air through the intake tube 20, preferably from the top region of the closed space where the convector heater is installed. The air drawn from that region of the space, which usually has a higher temperature than the air in the lowest region of the space, enters the casing 10 through the first opening 14 in the top horizontal wall 12, is filtered by the filter (if any) and then passes through the heating device 22, where it is heated
15 (for example by forced convection, in case the heating device is made as an air/water heat exchanger). The air heated by the heating device 22 leaves then the casing 10 through the second opening 18 in the bottom horizontal wall 16, still in the axial direction, and hits the bladed impeller 28, thereby causing the latter to rotate and to change the direction of the air flow from axial to radial. Since the bladed impeller 28 generates an air flow directed ra-
20 dially, the air is blown by the convector heater in a diffused manner and substantially in the radial direction (or, in any case, in a direction perpendicular to the axial one), thereby ensuring very high comfort.

Naturally, the principle of the invention remaining unchanged, the embodiments and the
25 constructional details may vary widely from those described and illustrated purely by way of non-limiting example, without thereby departing from the scope of the invention as defined in the appended claims.

CLAIMS

1. Convector heater for convection heating of spaces, particularly industrial and live-stock farming buildings, comprising:

- 5 - a casing (10) with a top wall (12) having a first opening (14) and a bottom wall (16) having a second opening (18) vertically aligned with the first opening (14),
- an intake tube (12) connected to the top wall of the casing (10) near the first opening (14) to allow the air to be drawn into the casing (10) through the intake tube (12) from the space to be heated, in particular from the highest zones of this space,
- 10 - a heating device (22) arranged inside the casing (10) to heat the air drawn through the intake tube (12) from the space to be heated,
- an axial blower (24, 26) with a vertical axis (z), which is arranged upstream of the heating device (22) to draw the air through the intake tube (12) from the space to be heated and to blow it towards the bottom wall (16) of the casing (10) through the heating device
- 15 (22), and
- a non-motorized bladed impeller (28) with a vertical axis (z), which is arranged downstream of the heating device (22), namely beneath the bottom wall (16) of the casing (10), and is configured to receive the axial air flow that is produced by the axial blower (24, 26) and comes out of the casing (10) and to generate a substantially radial air flow, the
- 20 bladed impeller (28) being driven into rotation about its own axis (z) by the axial air flow produced by the axial blower (24, 26).

2. Convector heater according to claim 1, wherein the heating device (22) is an air/water heat exchanger.

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3. Convector heater according to claim 1, wherein the heating device (22) is a gas heater.

4. Convector heater according to any of the preceding claims, further comprising a

30 support plate (30) which is placed beneath the bottom horizontal wall (16) of the casing (10), parallel thereto, and supports the bladed impeller (28).

5. Convector heater according to any of the preceding claims, further comprising a protection grid (32) which surrounds the bladed impeller (28) and is configured to allow the radial air flow coming from the bladed impeller (28) to pass through the grid, without substantially being obstructed by the latter.

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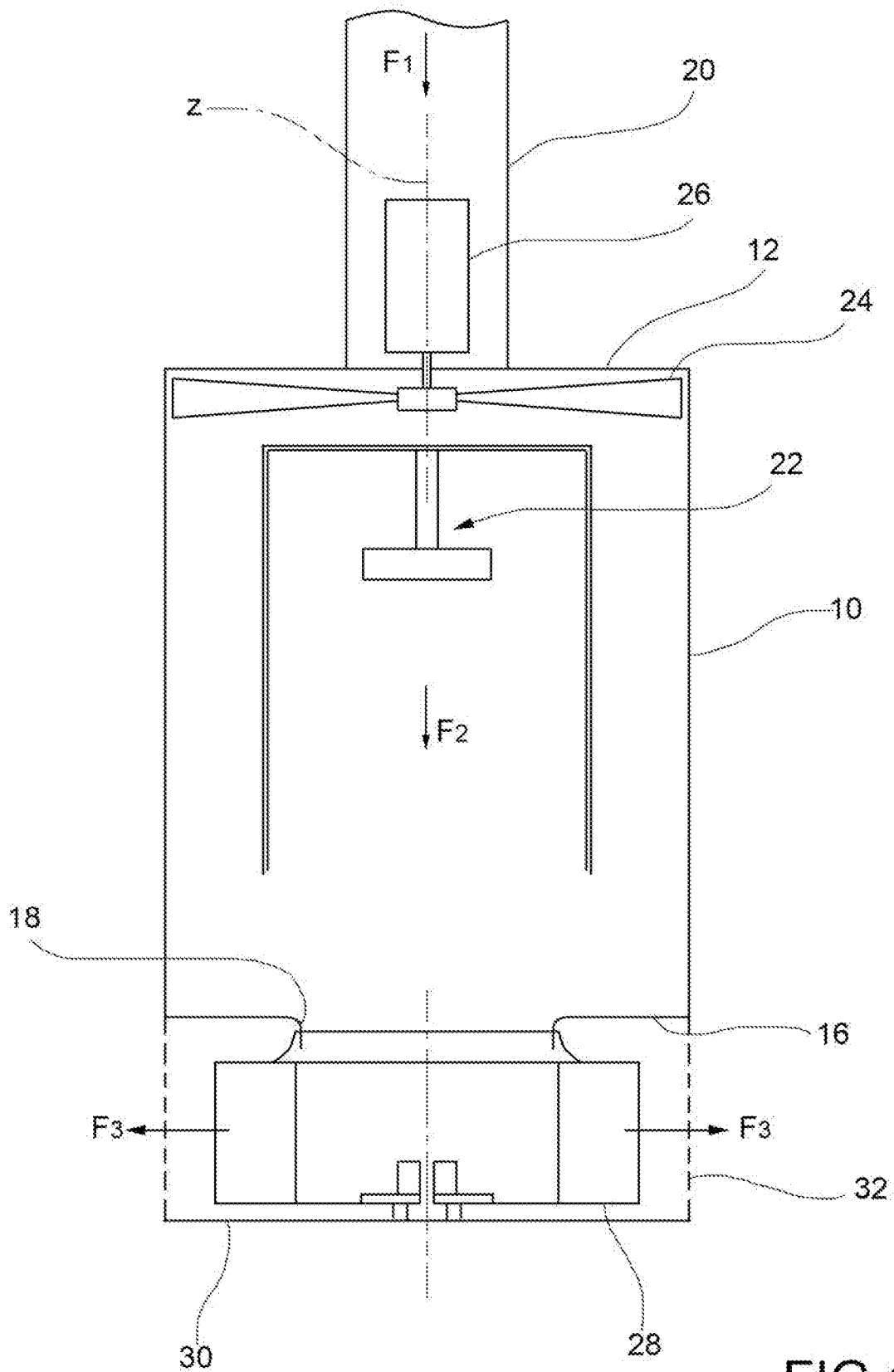


FIG.1

INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER
 INV. F24H3/02 F24F7/06
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 F24H F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2009/153673 A1 (C G M S R L [IT]; MASSIMINO GIANPIERO [IT]) 23 December 2009 (2009-12-23) cited in the application the whole document	1-5
A	----- "Hot air heater", 1 January 2014 (2014-01-01), XP055212677, Retrieved from the Internet: URL:http://www.gototalenergy.com/cubo/download.php?file=cubo-sg.pdf [retrieved on 2015-09-10] the whole document	1-5
A	----- US 2008/135224 A1 (PUN JOHN Y [US]) 12 June 2008 (2008-06-12) figures 1,1a	1-5



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2015/059998

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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