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APPARATUS FOR COOLING CERAMIC PRODUCTS

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An apparatus (1) for cooling ceramic products comprises:

a booth (2) that can be associated with a conveyor line (6) of said ceramic products, said booth (2) being provided with an inlet opening (19) and with an outlet opening, through which said conveyor line can pass;

fan means (11) intended for blowing air onto said ceramic products;

cooling means (14, 15) intended for cooling the air to be blown onto said ceramic products.

The booth (2) comprises a first space (5) in which said ceramic products transit on said conveyor line (6), a second space (8) separated from said first space (5) by a separating wall (10), said fan means (11) being arranged in said second space (8), said fan means (11) sucking air from said first space (5) through at least one cooling element (14) and again delivering said air into said first space (5), after said air has been cooled in said at least one cooling element (14), through diffusing elements (13) arranged in said first space (5).

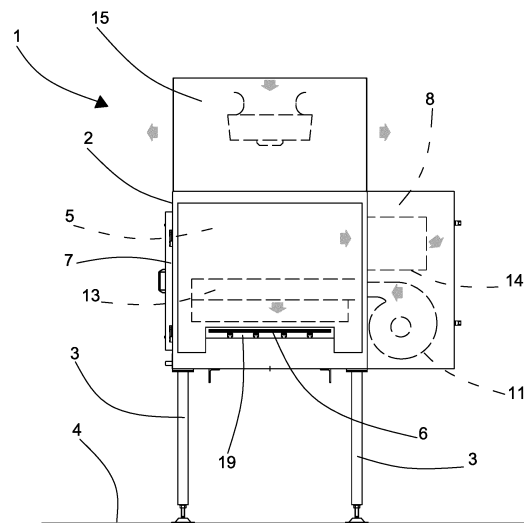


Fig. 3

Description

[0001] The present invention relates to an apparatus for cooling ceramic products, in particular an apparatus associated with a conveyor line for conveying ceramic products, intended for cooling the products exiting a dryer, before they are sent on for subsequent processing, for example to a decorating station for decorating by digital printing devices.

[0002] In order to decorate ceramic products, such as ceramic tiles, with printing devices, in particular with digital printing devices, it is necessary that the surface of the product to which the decoration has to be applied be at a suitable temperature and devoid of condensed humidity, the presence of which may compromise, also seriously, printing quality and may damage the printing heads.

[0003] Known apparatuses for cooling ceramic products, before the ceramic products are sent to a print decorating station, comprise a booth that is arranged above a conveyor line of the ceramic products, so that the ceramic products transit inside said booth.

[0004] Inside the booth, whilst the ceramic products transit on the conveyor line, air is delivered that is taken from outside the booth and is cooled by a cooling unit associated with the booth. The cooling unit is normally separated from the booth and requires suitable connecting pipes through which the cooling air is sent to the booth.

[0005] This type of apparatus has the drawback that the humidity that evaporates from the hot ceramic products coming from the dryer, in contact with the cold air coming from the cooling apparatus condenses, depositing itself on the surface of the products facing inside the booth and intended for being print decorated in a subsequent decorating station. The condensation of the humidity on the surface of the products is apt to seriously compromise the subsequent print decorating, in particular when it occurs using digital printers.

[0006] Further, the need to provide connecting pipes between the booth and the cooling unit makes it complicated to mount the cooling apparatus on a conveyor line for conveying ceramic products and requires the availability of space outside the conveyor line, in which to arrange the cooling unit.

[0007] The present invention proposes providing an apparatus for cooling ceramic products that remedies the above drawbacks.

[0008] The object of the present invention is solved with an apparatus for cooling ceramic products according to claim 1.

[0009] The apparatus according to the present invention enables the ceramic products to be cooled without humidity condensation forming on the surface of the ceramic products that is intended to be decorated, or minimising said condensation.

[0010] The apparatus according to the present invention is further easy and quick to install on a conveyor line

for conveying ceramic products and does not require space outside the conveyor line to be installed.

[0011] Further features and advantages of the present invention will be clear from the following description, which is provided merely by way of non-limiting example, with reference to the attached drawings, in which:

Figure 1 is a raised view of an apparatus for cooling ceramic products according to present invention;
Figure 2 is a raised view of the apparatus of Figure 1, on the opposite side with respect to Figure 1;
Figure 3 is a side view of the apparatus of Figures 1 and 2;
Figure 4 is a top view of the apparatus of Figures 1 and 2.

[0012] The apparatus 1 for cooling ceramic products comprises a booth 2 that rests on four supporting elements 3 that rest on a resting surface 4, for example a floor.

[0013] Inside the booth a first space 5 is defined inside which a conveyor line 6 of the ceramic products passes, for example a belt conveyor line, which enters the booth 2 via an inlet opening 19, which is visible in Figure 3, located at a first end of the booth 2, and exits the booth 2 via an outlet opening located at a second end of the booth 2, opposite the first end. Inside the booth 2 a second space 8 is further defined, separated from the first space 5 by a separating wall 10.

[0014] In the second space 8 a plurality of fans 11 is arranged, for example driven in pairs by respective motors 12. The fans 11 suck air from the first space 5 through at least one cooling element 14, preferably at least two cooling elements 14, connected to a cooling unit 15 located above the booth 2.

[0015] The cooling elements 14 communicate with the second space 8 and with the first space 5 through special openings of the separating wall 10. The air sucked from the space 5 by the fans 11, is cooled and dehumidified by traversing the cooling elements 14 and is delivered again into the space 5 through a plurality of diffusers 13, that are supplied by the fans 11 and arranged above the conveyor line 6 of the ceramic products, transversely to the conveyor line. After being delivered into the first space 5, the air is again sucked into the the second space 8, cooled, dehumidified and again sent to the first space 5, thus creating a continuous cycle of suction of air from the first space 5, cooling, dehumidifying and delivery of the cooled and dehumidified air to the first space 5.

[0016] In this manner, the humidity that the air removes from the ceramic products in transit in the first space 5, is not condensed in the first space 5, but condensation occurs whilst the air passes through the cooling elements 14 and in the second space 8, before being sucked by the fans 11 and delivered to the diffusers 13. The condensation produced during the transit of the air in the cooling elements 14 and in the second space 8 can be collected and evacuated from the apparatus, without be-

ing able to be deposited on the surface of the ceramic products. This enables high quality printing to be achieved on the ceramic products that is substantially free of defects, using, for example, digital printers and without damaging the delicate and often expensive printing heads.

[0017] The walls of the booth 2, i.e. the walls of the first space 5 and of the second space 8, are covered with thermally insulating material for minimising heat exchanges with the external environment, so as to maximise the efficiency of the air cooling.

[0018] In the lower part of the booth 2 at least one extractable drawer 18 is obtained, preferably at least two extractable drawers 18, by means of which it is possible to remove from the inside of the first space 5 possible waste originating from the ceramic products that has gathered on the bottom of the first space 5, even when the apparatus is in function.

[0019] The first space 5 is accessible from the outside via at least one hatch 7, preferably at least two hatches 7, to enable persons assigned to the apparatus to inspect the first space 5 and perform maintenance or repair works.

[0020] Similarly and for the same purposes, the second space 8 is accessible from the outside via at least one hatch 9, preferably at least two hatches 9.

[0021] It should be noted that the arrangement of the cooling unit 15 above the booth 2 simplifies significantly mounting of the apparatus 1 on the conveyor line 6, it not being necessary to arrange connecting pipes between the cooling unit 15 and the booth 2, inasmuch as the cooling unit 15 is integrated with the booth 2 and is no longer separated from the booth 2 as in known prior art cooling apparatuses. Further, by integrating the cooling unit 15 with the booth 2 the overall plan dimensions of the apparatus 1 are reduced significantly, the installation of which does not require more additional space outside the conveyor line as in the case of known prior art apparatuses.

Claims

1. Apparatus (1) for cooling ceramic products comprising:

- a booth (2) that can be associated with a conveyor line (6) of said ceramic products, said booth (2) being provided with an inlet opening (19) and with an outlet opening, through which said conveyor line can pass;
- fan means (11) intended for blowing air onto said ceramic products;
- cooling means (14, 15) intended for cooling the air to be blown onto said ceramic products, **characterised in that** said booth (2) comprises a first space (5) in which said ceramic products transit on said conveyor line (6), a second space

(8) separated from said first space (5) by a separating wall (10), said fan means (11) being arranged in said second space (8), said fan means (11) sucking air from said first space (5) through at least one cooling element (14) and again delivering said air into said first space (5), after said air has been cooled in said at least one cooling element (14), through diffusing elements (13) arranged in said first space (5).

2. Apparatus (1) according to claim 1, wherein said at least one cooling element (14) is supplied by a cooling unit (15) arranged above said booth (2).

3. Apparatus (1) according to claim 1, or 2, wherein said diffusing elements (13) are arranged above said conveyor line (6) transversely to the conveyor line.

4. Apparatus (1) according to any preceding claim, wherein said at least one cooling element (14) comprises at least two cooling elements (14).

5. Apparatus (1) according to any preceding claim, wherein said fan means comprises a plurality of pairs of fan elements (11), each pair of fan elements (11) being driven by a respective motor (12).

6. Apparatus (1) according to any preceding claim, wherein the walls of said first space (5) and of said second space (8) are covered with thermally insulating material.

7. Apparatus (1) according to any preceding claim, wherein said first space (5) is accessible from outside the booth (2) through at least one hatch (7).

8. Apparatus (1) according to any preceding claim, wherein said second space (8) is accessible from outside the booth (2) through at least one hatch (9).

9. Apparatus (1) according to any preceding claim, wherein in the lower part of said booth (2) at least one extractable drawer (18) is provided.

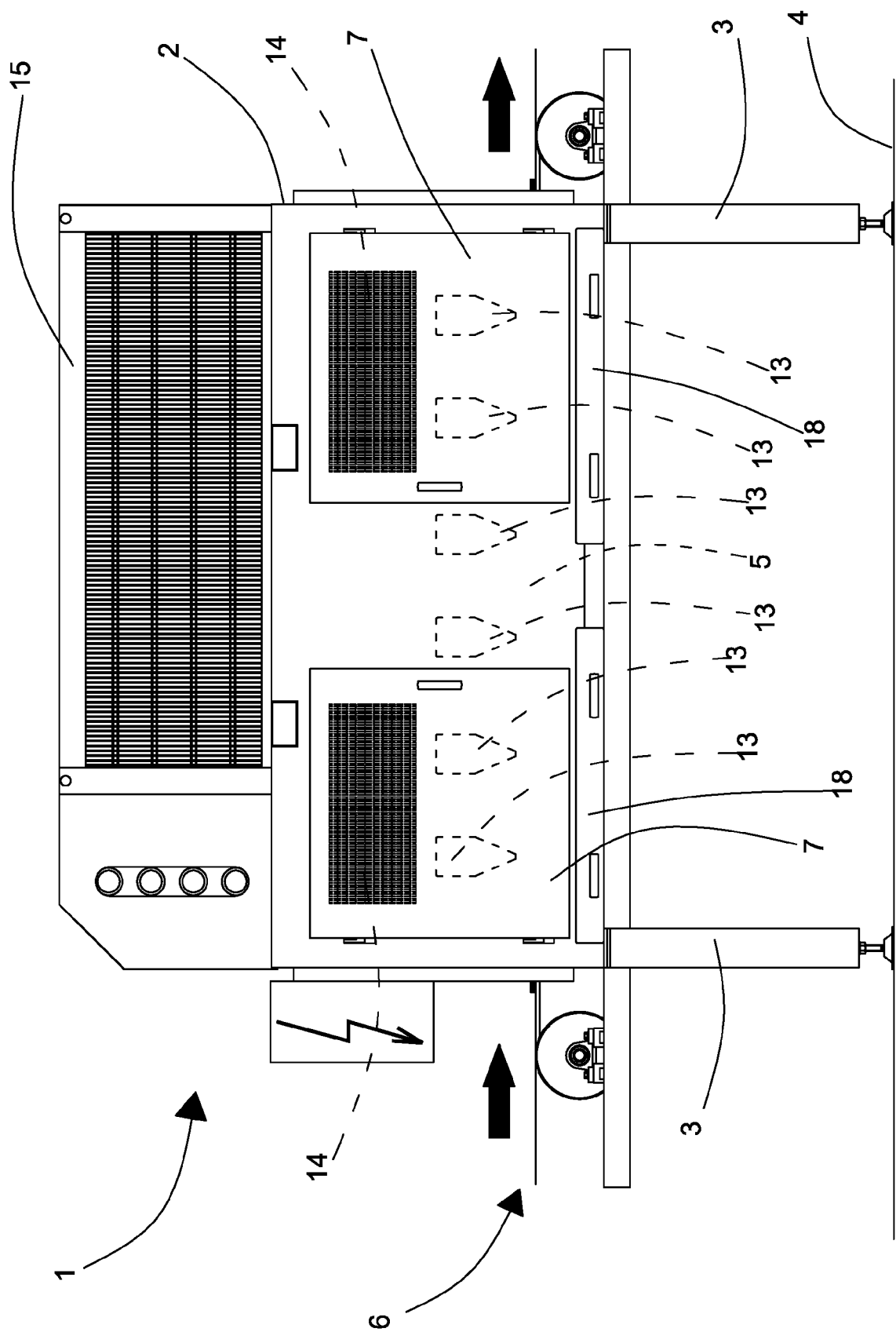


Fig. 1

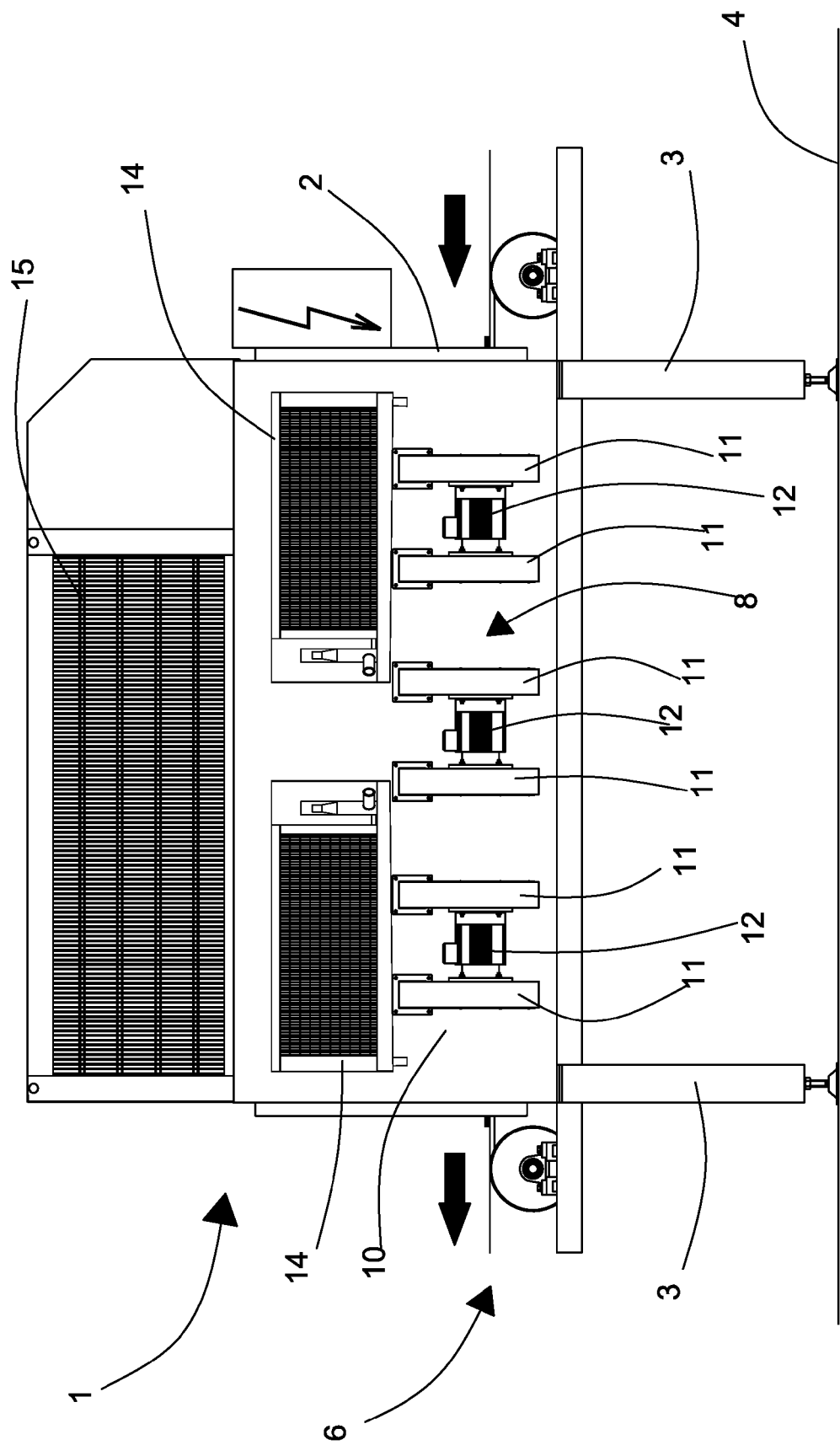


Fig. 2

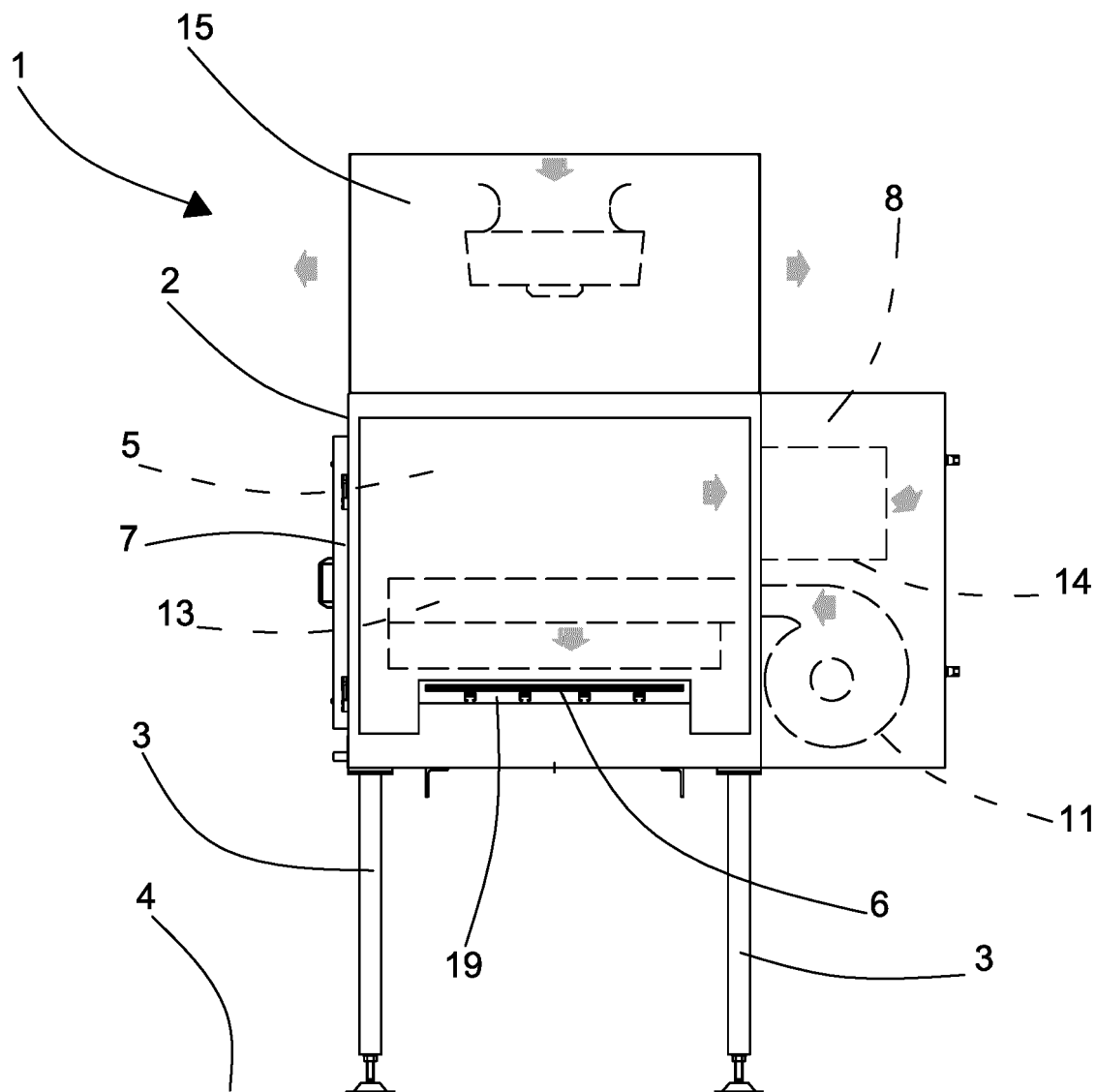


Fig. 3

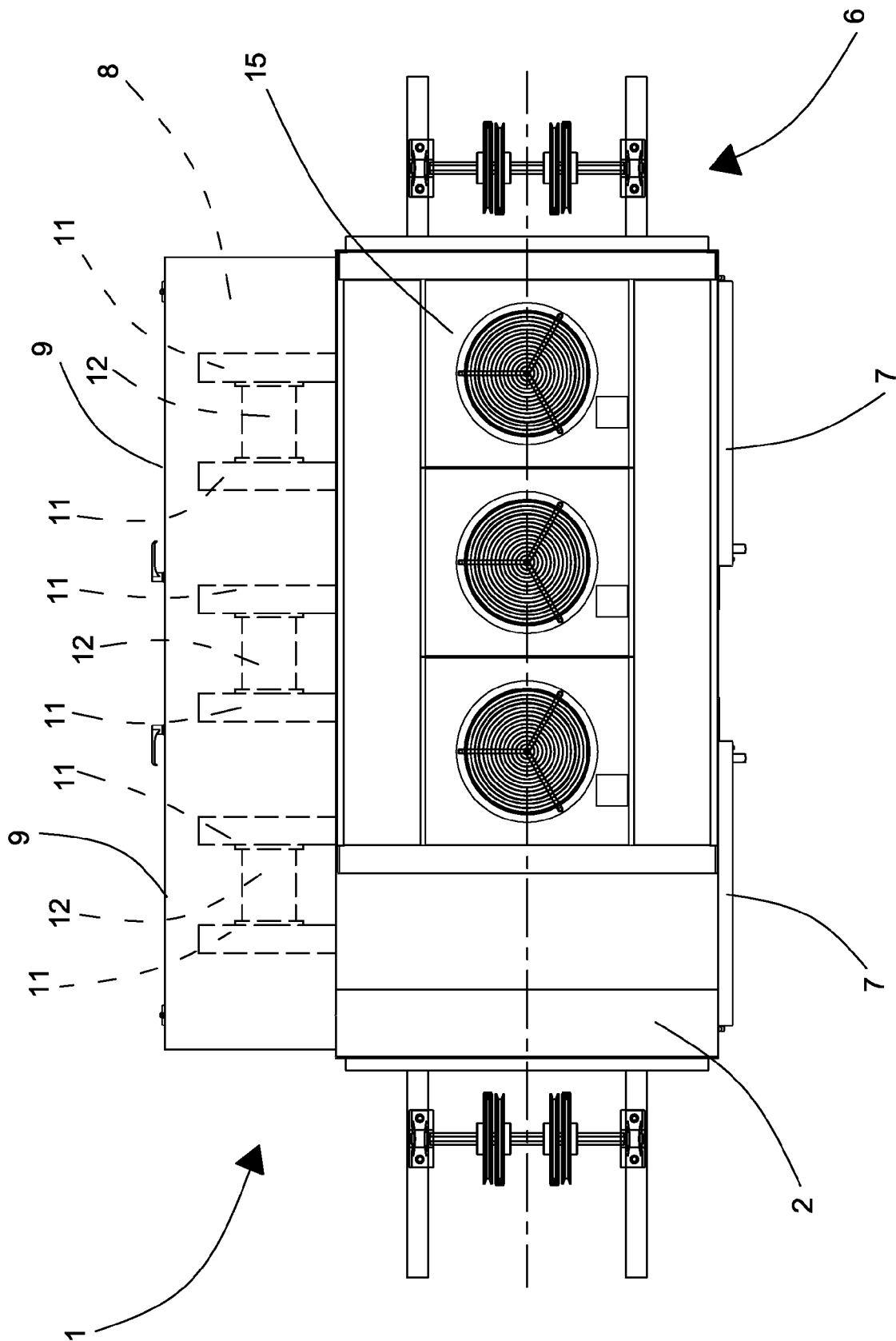


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 15 16 9958

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The present search report has been drawn up for all claims			

1

Place of search	Date of completion of the search	Examiner
The Hague	12 November 2015	De Meester, Reni
CATEGORY OF CITED DOCUMENTS 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 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		

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 15 16 9958

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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