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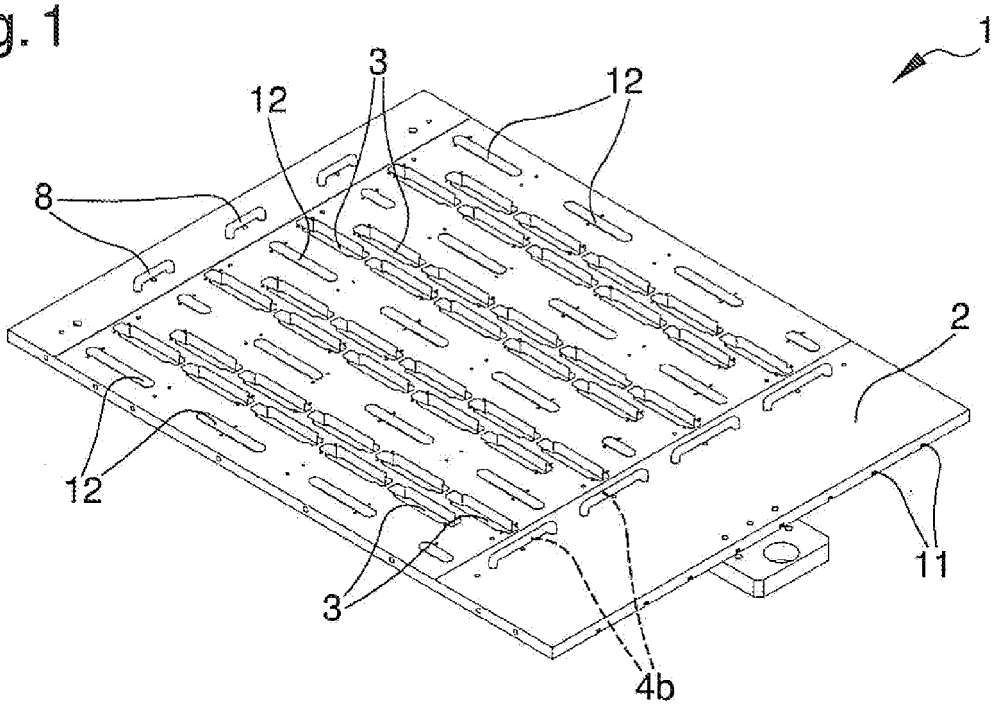
(54) **Device for supporting the heads of a machine for the digital printing of ceramic tiles**

(57) The device (1) for supporting the heads of a machine for the digital printing of ceramic tiles comprises a plate-shaped element (2) having one or more openings (3) for inserting corresponding heads for the digital printing and at least one duct (4) for the flow of a heating/cooling fluid of the plate-shaped element (2).

Fig. 1



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Description

[0001] The present invention relates to a device for supporting the heads of a machine for the digital printing of ceramic tiles.

[0002] The decoration technique of ceramic tiles by means of digital printing is known at present.

[0003] The machines for the digital printing which are now offered on the market generally comprise a plurality of printing heads, each of which has a nozzle suitable for dispensing ink and an electronic part suitable for controlling the opening and closing of the relevant nozzle.

[0004] More precisely, the machines for the digital printing of known type comprise a plate for supporting the printing heads.

[0005] Such plate has a plurality of through openings, equal in number to that of the heads, through which the relevant nozzles are inserted.

[0006] More precisely, the supporting plate defines a first face in correspondence to which are arranged the relevant electronic parts of the printing heads and a second face from which the nozzles protrude.

[0007] Since printing heads contain ceramic enamel, the expert in the field knows that this type of enamel has an ideal work temperature, and that if this temperature is not complied with the enamel loses some of its properties, thus originating imprecise and unsatisfying decorations.

[0008] Furthermore, since the tiles arriving in proximity of the machine for the digital printing generally come from a heating machine, such as a oven or a drier, some condensation creates on the supporting plate due to the difference in temperature between the tile and the plate itself. Such condensation, which therefore generates on the second face of the supporting plate from which the nozzles of the printing heads protrude, can jeopardize the successful performance of the decoration.

[0009] It is known that, to obtain a pleasing effect and a good resolution, digital printing has to be performed in an environment which is to be as clean as possible and free from external impurities.

[0010] It is therefore clear that the presence of condensation on the supporting plate can compromise the successful performance of the digital print since condensation can mix with the ink dispensed by the nozzles or falling directly on the decorated tile.

[0011] In order to overcome these problems, the supporting plates of known type are generally provided with a heating element arranged on their first face and suited to heat the plate itself.

[0012] These supporting plates of known type do have a number of drawbacks.

[0013] The supporting plates of known type do not allow, in fact, bringing the enamel contained in the printing heads to the ideal work temperature.

[0014] In actual fact, the heating elements with which such plates are provided allow to supply heat at a constant temperature, and therefore do not allow to adjust themselves to the temperature changes of the external environment.

[0015] In some particularly hot areas in the world the external temperature of the printing heads can even be higher than the ideal work temperature, so it may be necessary to cool the supporting plate.

[0016] This inconvenience of the known supporting plates, besides preventing to use the enamel for decoration in the best way, also causes the formation of condensation by effect of the difference in temperature between the plate itself and the surrounding environment.

[0017] This drawback is also increased by the fact the temperature of the plates of known type is not uniform along their thickness.

[0018] In actual fact, the positioning of the heating clement on the first face of the supporting plate causes the temperature on this face to be higher than that on the opposite face due to the thickness of the plate itself.

[0019] It follows that such difference in temperature leads to the formation of temperature gradients on the supporting plate which encourage the formation of condensation.

[0020] The main aim of the present invention is to provide a device for supporting the heads of a machine for the digital printing of ceramic tiles which permits to keep the enamel contained in the printing heads at a temperature which is as close as possible to the ideal work temperature.

[0021] One object of the present invention is therefore to allow an adjustment of the element temperature which supports the printing heads according to the specific needs.

[0022] Another object of the present invention is therefore to improve the reliability of the relative machine for digital printing, thus allowing a precise decoration and reducing production waste.

[0023] Yet another object of the present invention is to reduce greatly, with respect to the plates of known type, the formation of condensation on the element that supports the printing heads.

[0024] Not the last object of the present invention is to prevent the formation of areas with different temperature on the supporting device itself.

[0025] Another object of the present invention is to provide a device for supporting the heads of a machine for the digital printing of ceramic tiles that allows overcoming the mentioned drawbacks of the background art within the ambit of a simple, rational, easy to use and low cost solution.

[0026] The above objects are achieved by the present device for supporting the heads of a machine for the digital printing of ceramic tiles, comprising a plate-shaped element having one or more openings for inserting corresponding heads for the digital printing and characterised by the fact that it comprises at least one duct for the flow of a heating/cooling fluid of said plate-shaped element.

[0027] Other characteristics and advantages of the

present invention will become more evident from the description of a preferred, but not exclusive, embodiment of a device for supporting the heads of a machine for the digital printing of ceramic tiles, illustrated by way of example, but not limited to them, in the annexed drawings in which:

figure 1 is an axonometric view from above of the device according to the invention;
figure 2 is a plan view from above of the device of figure 1;
figure 3 is an axonometric view from below of the device of figure 1;
figure 4 is an axonometric view from above of the plate-shaped element of the device of figure 1.

[0028] With particular reference to such figures, by 1 is globally indicated a device for supporting the heads of a machine for the digital printing of ceramic tiles.

[0029] The device 1 comprises at least a plate-shaped element 2 having one or more openings 3 intended to house the heads for the digital printing not shown in the figures and of type known to the expert in the field.

[0030] More particularly, the plate-shaped element 2 defines a first face 2a, on which are intended to rest the electronic parts of the heads for the digital printing, and a second face 2b, opposite the first face 2a and from which the nozzles of the heads for digital printing protrude.

[0031] According to the invention, the device 1 comprises at least a duct 4 for the flow of a heating/cooling fluid of the plate-shaped element 2.

[0032] Advantageously, the duct 4 is arranged substantially around at least one part of each opening 3.

[0033] More particularly, the plate-shaped element 2 comprises a plurality of openings 3 arranged in such a way as to form one or more rows 5 which extend along directions substantially parallel to one another and the duct 4 is shaped in such a way as to define a coil that passes at least alongside the openings 3 so arranged. The rows 5 of openings 3 extend along a direction substantially parallel to at least one of the sides of the plate-shaped element 2.

[0034] Preferably, the openings 3 which define each row 5 are aligned to one another along the extension direction of the row itself and are arranged parallel to the openings 3 of the other rows 5. Alternative embodiments cannot however be ruled out which provide a different arrangement of the openings 3 along each row 5. The arrangement and direction of the openings 3 and therefore of the relative rows 5 is not essential for the purpose of the present invention.

[0035] In the embodiment shown in the figures, the openings 3 are arranged so as to define a plurality of groups 6 at a distance to one another and which extend along directions parallel to one another.

[0036] More in detail, each group 6 comprises one or more rows 5 of openings 3 and the duct 4 is shaped in such a way as to pass between a group 6 of openings 3 and the adjacent group 6.

[0037] The openings 3 which make up the rows 5 of a same group 6 are staggered from one another along a direction substantially at right angles to that of extension of the rows themselves.

[0038] In the embodiment shown in the figures, the plate-shaped element 2 also comprises a plurality of through slots 12 associable, in correspondence to the first face 2a, with suction means of the impurities present in proximity of the second face 2b.

[0039] Preferably, the slots 12 are arranged in such a way as to form rows 13 substantially parallel to one another.

[0040] More in particular, the slots 12 and rows 13 are arranged substantially parallel to the openings 3 and rows 5, respectively. Alternative embodiments cannot however be ruled out in which the slots 12 and rows 13 have a different extension from that of the openings 3 and rows 5, respectively. As for the openings 3, also the arrangement of the slots 12 and therefore of the relative rows 13 is not essential for the purpose of the present invention.

[0041] In the embodiment of figure 1, 2 and 3, between two groups 6 one alongside the other is placed at least a row 13 of slots 12.

[0042] Advantageously, the duct 4 is defined at least in part in the plate-shaped element 2.

[0043] Preferably, the duct 4 comprises a plurality of first sections 4a defined in the plate-shaped element 2 and at least a second section 4b, suitable for connecting two first sections 4a to one another, which is external to the plate-shaped element itself.

[0044] The first sections 4a extend substantially in a direction parallel to the rows 5 and are placed in between the groups 6.

[0045] Suitably, the first sections 4a are placed in between each group 6 of openings 3 and each row 13 of slots 12 arranged laterally to the group 6. Between two groups 6 of openings 3 one alongside the other two first sections 4a are therefore placed in.

[0046] More in particular, the first sections 4a are defined by relative holes obtained in the plate-shaped element 2 and each having at least a closed extremity.

[0047] The holes which define the first sections 4a are placed in between the first and second face 2a and 2b.

[0048] In the embodiment shown in figure 3, me holes which define the first sections 4a are blind holes.

[0049] Each first section 4a has then at least one gap 7 which faces on the first face 2a of the plate-shaped element 2 for the connection to the relative second section 4b.

[0050] The second sections 4b are therefore made up of a relative connection element 8 which connects two gaps 7 defined on two respective first sections 4a separate to each other.

[0051] The connection elements 8 extend along a direction substantially at right angles to that of the first sec-

tions 4a.

[0052] Preferably, the duct 4 comprises at least an inlet mouth 9 and an outlet mouth 10 of the heating/cooling fluid which can be connected to heating/cooling means, e.g. a heat pump made up of Peltier cells, suited to vary the temperature of the fluid itself depending on the temperature outside the plate-shaped element 2.

[0053] More in detail, the inlet mouth 9 and the outlet mouth 10 are defined by an open extremity of the hole which defines a relative first section 4a, while the open extremity of the other first sections 4a is closed by a cap or the like not visible in detail in the figures.

[0054] The first sections 4a which define the inlet mouth 9 and the outlet mouth 10 have therefore an open and a closed extremity, while the other first sections 4a have both the extremities closed to allow the outflow of the heating/cooling fluid through the respective gaps 7 for the connection to the second sections 4b. Advantageously, the device 1 comprises means for adjusting the temperature of the heating/cooling fluid which can be operatively connected to the heat pump. More in detail, according to the temperature outside the plate-shaped element 2, which can be detected by means of sensors or the like, and to the ideal work temperature of enamel to be applied on the tiles, the temperature adjustment means trigger on the heat pump to heat or cool the fluid flowing inside the duct 4 in such a way as to bring the temperature of the plate-shaped element 2 as close as possible to the ideal one.

[0055] Preferably, the device 1 comprises means for the application of at least a protection element for the nozzles of the heads for the digital printing not shown in the figures.

[0056] More in particular, the application means comprise at least a groove 11 defined on the second face 2b of the plate-shaped element 2 inside which at least one part of the protection element can be inserted sliding.

[0057] The protection element defines a protection surface facing the second face 2b and at a distance to it.

[0058] Suitably, the application means comprise a plurality of grooves 11, which extend along a direction substantially parallel to the first sections 4a.

[0059] As can be seen in figure 4, the grooves 11 are through grooves and extend between two opposite sides of the second face 2b.

[0060] The grooves 11 are arranged in correspondence to the first sections 4a and are therefore positioned between the groups 6 of openings 3.

[0061] Advantageously, the grooves 11 are shaped in such a way as to prevent the protection element from moving along a direction different from the insertion one, i.e. along a direction different from that of extension of the grooves themselves.

[0062] In the embodiment shown in figure 4, the grooves 11 are "T"-shaped, and therefore define locator stops against which rest respective counter-locator stops defined by the covering element.

[0063] It has in practice been ascertained how the described invention achieves the proposed objects and in particular the fact is underlined that it allows to adjust at will the temperature of the plate-shaped element which supports the heads for the digital printing, adjusting it to the ideal work temperature of enamel and to external environment conditions.

[0064] The presence of a channel for the flow of a fluid obtained internally to the plate-shaped element which supports the heads allows not only to rise the temperature of the plate-shaped element itself but also to reduce it in case of need.

[0065] The present invention therefore allows to obtain more precise decorations and with better quality with respect to the decorations with respect to the decorations obtained using the plates of known type.

[0066] Moreover, the device according to the invention greatly reduces, with respect to the supporting plates of known type, the formation of condensation during the phase of digital decoration of the ceramic tiles.

[0067] The supporting device according to the invention also allows to make the temperature of the plate-shaped element substantially even, because the first sections of the fluid flowing channel placed in between the two faces of the plate-shaped element allow to keep the same temperature on both faces, thus avoiding the formation of temperature gradients on it.

[0068] Although the present description has been referred to a plate-shaped element having a plurality of openings arranged along parallel rows to define groups at a distance to one another, the expert of the field will immediately apply the features of the present invention also to plate-shaped elements having different shape.

Claims

1. Device (1) for supporting the heads of a machine for the digital printing of ceramic tiles, comprising a plate-shaped element (2) having one or more openings (3) for inserting corresponding heads for the digital printing, **characterised by** the fact that it comprises at least one duct (4) for the flow of a heating/cooling fluid of said plate-shaped element (2).

2. Device (1) according to claim 1, **characterised by** the fact that said duct (4) is defined at least in part in said plate-shaped element (2).

3. Device (1) according to claim 2, **characterised by** the fact that said duct (4) comprises a plurality of first sections (4a) obtained in said plate-shaped element (2) and at least a second section (4b), suitable for connecting two of said first sections (4a) to each other, which is external to said plate-shaped element (2).

4. Device (1) according to claim 3, **characterised by** the fact that said first sections (4a) are defined by

corresponding holes obtained in said plate-shaped element (2), each of said holes having at least one closed extremity.

5. Device (1) according to claim 3 or 4, **characterised by** the fact that each of said first sections (4a) has at least a gap (7) which faces at least a first face (2a) of said plate-shaped element (2) for the connection to the relative second section (4b).

6. Device according to one or more of the preceding claims, **characterised by** the fact that said duct (4) comprises at least one inlet mouth (9) and at least one outlet mouth (10) for said heating/cooling fluid connectable to heating/cooling means of said fluid.

7. Device (1) according to claim 6, **characterised by** the fact that said inlet mouth (9) and said outlet mouth (10) are defined by an open extremity of the hole which defines a relative first section (4a).

8. Device (1) according to one or more of the preceding claims, **characterised by** the fact that said duct (4) is arranged substantially around said openings (3).

9. Device (1) according to one or more of the preceding claims, **characterised by** the fact that it comprises a plurality of said openings (3) arranged in such a way as to form one or more rows (5) substantially parallel to one another and by the fact that said duct (4) is shaped in such a way as to define a coil that passes alongside said rows (4) of openings (3).

10. Device (1) according to claim 9, **characterised by** the fact that it comprises a plurality of groups (6) of openings (3) at a distance to one another, each of which comprising at least one of said rows (5) of openings (3), and that said duct (4) is shaped in such a way as to pass between said groups (6) of openings (3).

11. Device (1) according to claim 10, **characterised by** the fact that said first sections (4a) extend substantially in a parallel direction to said rows (5) of openings (6) and are placed in between each of said groups (6) of openings (3).

12. Device (1) according to one or more of the preceding claims, **characterised by** the fact that it comprises adjustment means for adjusting the temperature of said heating/cooling fluid.

13. Device (1) according to one or more of the preceding claims, **characterised by** the fact that said plate-shaped element (2) comprises one or more through slots (12) associable with air suction means.

14. Device (1) according to one or more of the preceding claims, **characterised by** the fact that it comprises means for the application of at least one protection element of the nozzles of said heads.

15. Device (1) according to claim 14, **characterised by** the fact that said application means comprise at least one groove (11) defined on a second face (2b) of said plate-shaped element (2), at least one part of said protection element being insertable sliding in said at least one groove (11).

Fig. 1

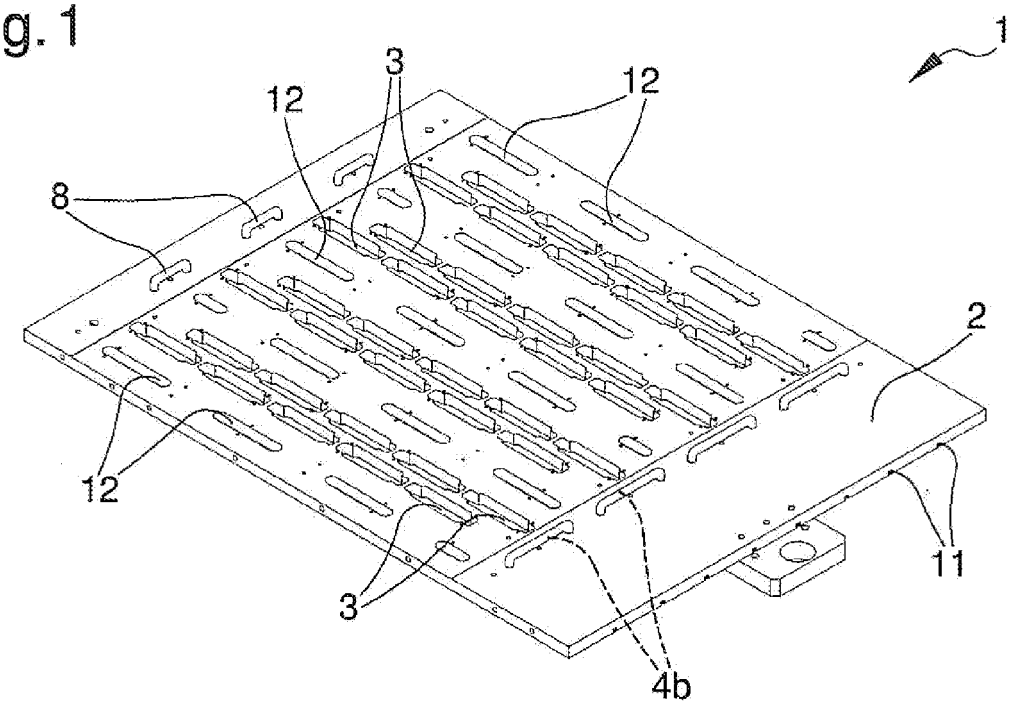


Fig. 2

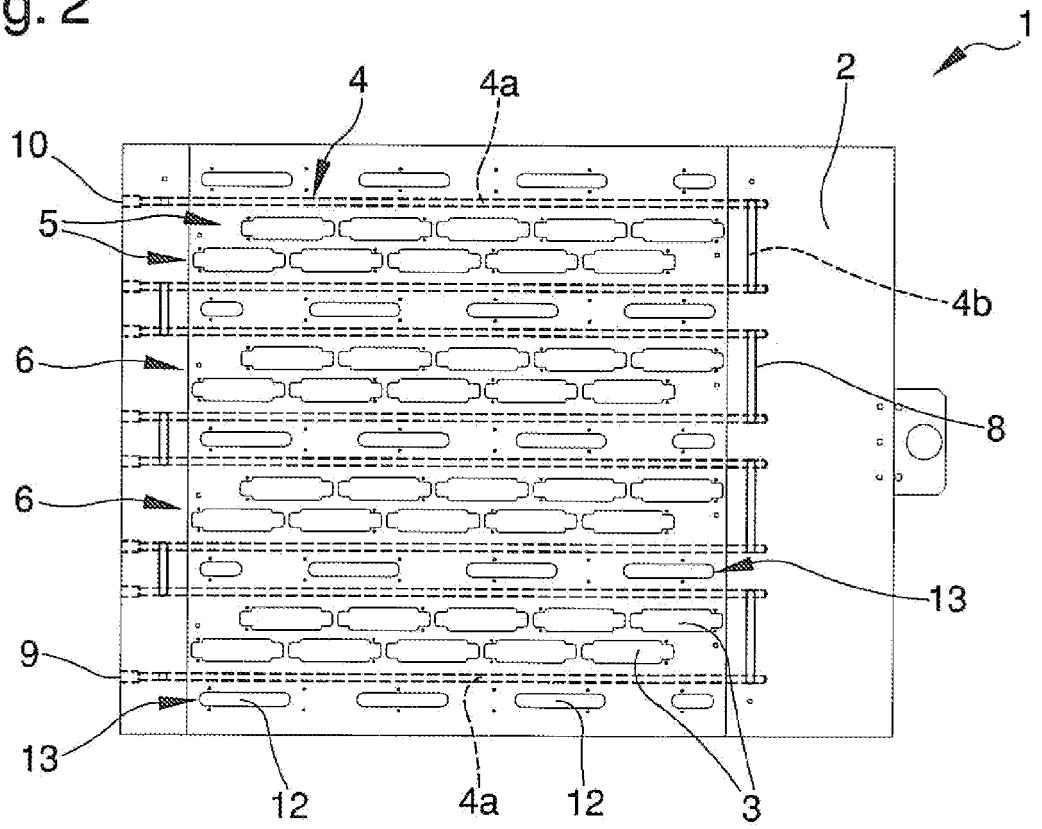
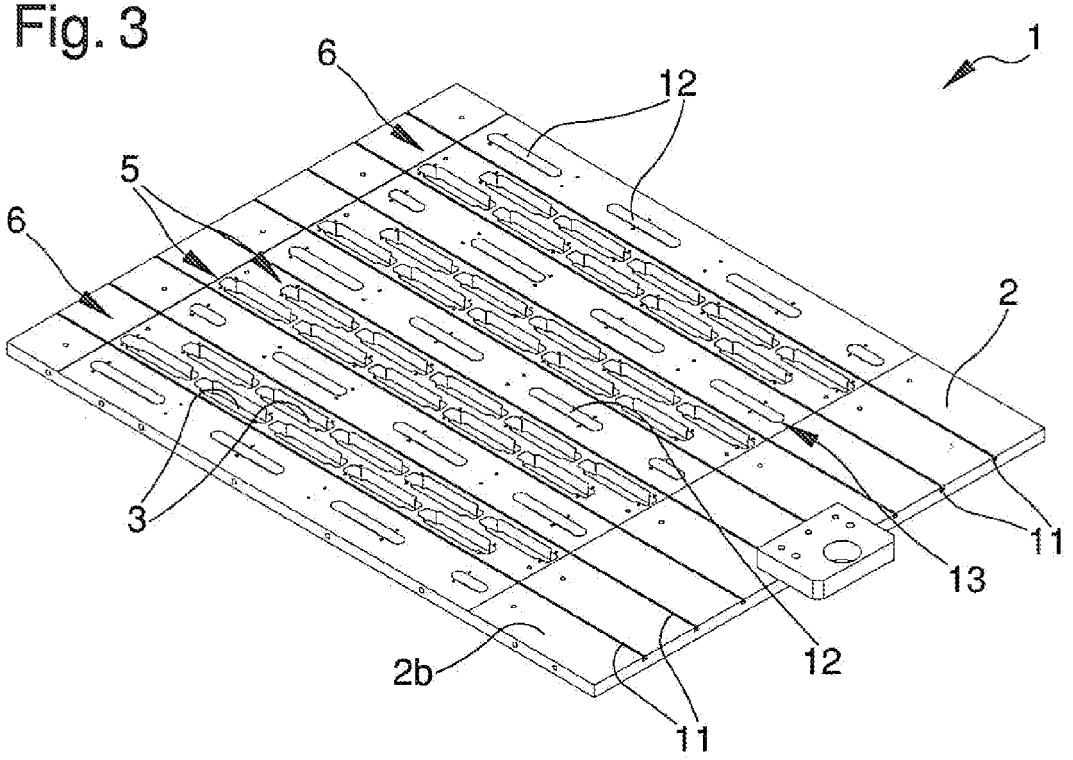


Fig. 3



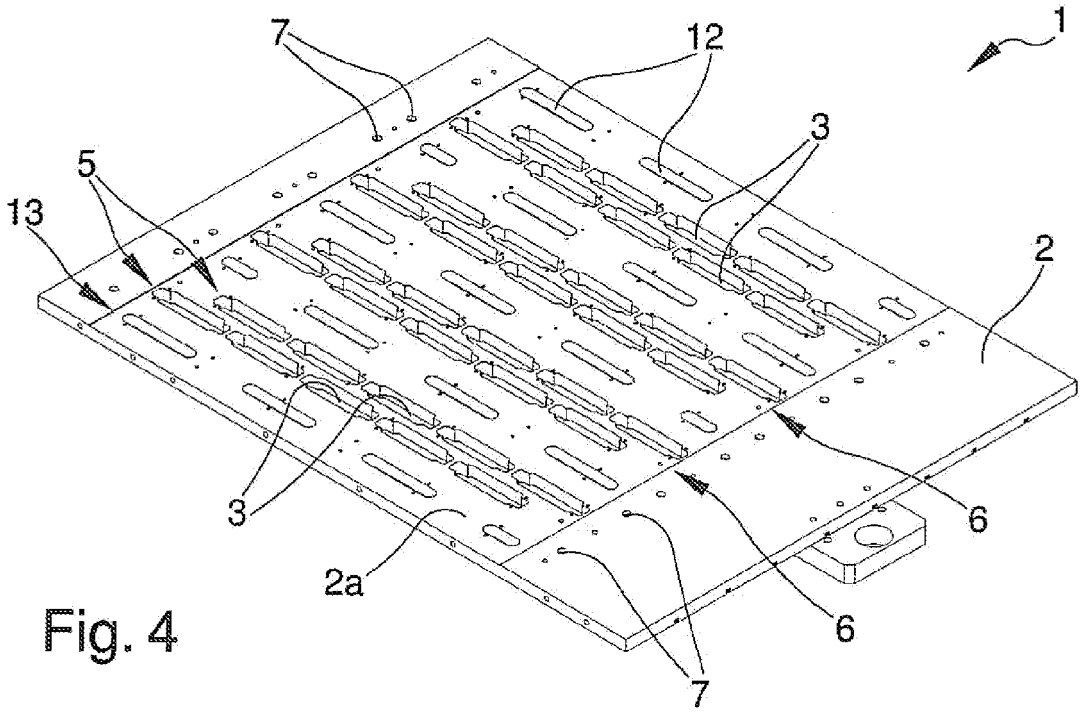


Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 11 16 0137

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 A	US 2008/273910 A1 (VERLINDEN BART [BE] ET AL) 6 November 2008 (2008-11-06) * paragraphs [0037], [0045], [0046]; figures 5b,6a,6d * -----	1,6-15 2-5	INV. B41J29/377
A	EP 0 870 622 A1 (XEROX CORP [US]) 14 October 1998 (1998-10-14) * column 5, line 52 - column 6, line 7; figure 4 * -----	1-15	
A	DE 197 43 804 A1 (POLITRUST AG [CH]) 8 April 1999 (1999-04-08) * column 8, lines 15-47; figures 9-13 * -----	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 August 2011	Urbaniec, Tomasz

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 16 0137

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30-08-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82