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

(11) **EP 3 023 260 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.05.2016 Bulletin 2016/21

(51) Int Cl.:
B44C 1/28 *(2006.01)* ***B44C 3/12*** *(2006.01)*

(21) Application number: **15194673.8**

(22) Date of filing: **16.11.2015**

(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
Designated Validation States:
MA MD

(30) Priority: **24.11.2014 IT FI20140256**

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(54) METHOD AND APPARATUS FOR THE FORMATION OF MOSAIC PANELS AND PANELS THUS OBTAINED

(57) The present invention refers to the field of mosaic panels for wall coverings and floors, and, more specifically, to that of systems for forming the aforementioned panels. More specifically, the invention concerns a new system for connecting together the tiles to form the panel that represents an essential product in the practice of applying mosaics.

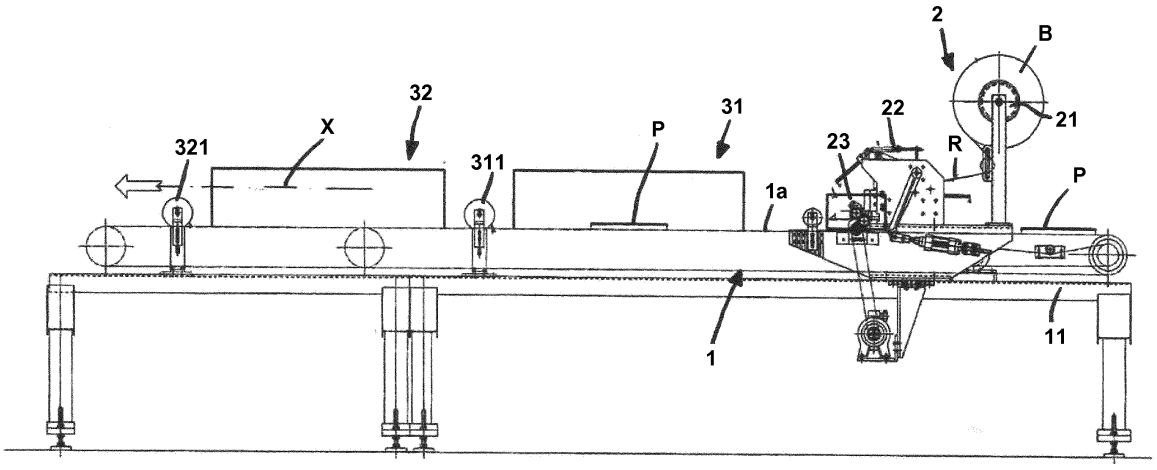

Fig. 1

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Description

[0001] The present invention refers to the field of mosaic panels for wall coverings and floors, and, more specifically, to that of systems for forming the aforementioned panels. More specifically, the invention concerns a new system for connecting together the tiles to form the panel that represents an essential semi-finished product in the practice of applying mosaics.

[0002] The aforementioned panels, as known, are compositions of tiles (made from glass, marble, ceramic or other materials), joined together in advance in order to facilitate and speed up application, at the same time obtaining a higher quality result, since the tiles are positioned and spaced with the maximum regularity. There are numerous techniques for forming the panels and apparatuses for the automated composition thereof.

[0003] As far as the present invention is concerned, attention will be focused on the systems for fixing together the tiles of a panel, after they have been supplied and arranged, also in terms of orientation, in the desired configuration in organised rows. The prior art includes different types of solution in this regard.

[0004] One of these, which is particularly common, provides for the use of a netting in fiberglass that is applied onto the back face of the tiles (i..e. the rough face that remains invisible when the mosaic is set) and glued to it by means of a cold-applied vinyl glued. The backing netting is flexible and offers consequent advantages in terms of the ability to manipulate the panels, also during application, in which the operator applying them can also recover possible small imprecisions in application, correcting the spacing of the tiles, within certain limits, which is not rigidly constrained by the support. The use of the vinyl glue that remains trapped in the masonry is, however, considered to be unsatisfactory for a few reasons, especially in some types and conditions of application and storage since the water-based glue can be subject to deterioration, especially if exposed to humidity or low temperatures. Moreover, in order for the vinyl glue to ensure adhesion it needs a backing netting with fine mesh that leaves a small surface exposed on the back faces of the tiles, which is not suitable for ensuring an optimal hold when the panel is applied.

[0005] An alternative solution, an improvement in terms of the inert nature of the material and the surface exposed on the back faces, provides for the use of points of PVC plasticizer applied as a bridge between one tile and another, normally two or more points for each facing side between the tiles. The gluing points are applied to the base of the tiles resting with their back face on a sheet of teflon-coated material (in order to avoid adhesion). At the temperature of application (ambient temperature) the PVC plasticizer has a substantially liquid consistency, and must be set by heating. This method does, however, in turn have drawbacks.

[0006] Firstly, the machinery required to carry out the method in question is very bulky due to the presence of large curing ovens necessary to set the PVC previously applied in points as just described. The curing also implies substantial energy consumption and a long cycle time, with it being necessary to cure for at least 15 minutes at about 180°. Moreover, the transportation of the tiles from the grids in which they have been arranged at the teflon-coated plate can frequently disturb the correct distancing and in general the organisation of the distribution, with the need for additional worker interventions.

[0007] Furthermore, the rigid nature of the connection points ensures that the panel is indeed rigid, and the distance between the tiles cannot be modified, thus not allowing corrective actions at the moment of application. Finally, with the grouting of the tile lines (i.e. the filling of the empty spacings between the tiles) there can be phenomena of poor adhesion between the grouting material and the underlying PVC point, due to the non-optimal affinity between such materials. Therefore, there can be detachments of the grouting, with consequent irregularities, holes and in general an unsatisfactory aesthetic result.

[0008] Turning back to the solution with backing netting, with the aim of making its advantages of simplicity and flexibility free from drawbacks, it has also been attempted to simply replace the vinyl glue with glues of inert nature, in particular quick setting, such as UVA ray drying resins. Such attempts, however, have not produced satisfactory results, both in economic terms (high gluing costs) and in technical terms, not ensuring secure adhesion between netting and tiles, due to the difficulty in completing the adhesion manoeuvring of the netting over all the tiles before the glue dries.

[0009] Considering the entirety of the situation, the present applicant has now devised a new system that surprisingly combines some elements of the prior art, achieving a result that is fully and unexpectedly effective, clearly an improvement with respect to all the methods of application currently in use.

[0010] In particular, such a system firstly manages to effectively combine cost-effectiveness and simple production, secure connection of the tiles, low deterioration of the glue from atmospheric agents, practicality of application and amount (over 70%) of the surface that is exposed and useful for gripping onto the building infrastructure to be coated with the mosaic.

[0011] According to the invention, such results are accomplished with the method and apparatus for the formation of mosaic panels according to the invention, and by the panels thus obtained, the essential characteristics of which are defined by the respective attached independent claims. Further advantageous aspects of the invention are defined by the dependent claims.

[0012] The characteristics and advantages of the method and apparatus for the formation of mosaic panels, and of the panels thus obtained according to the present invention will become clearer from the following description of embodiments thereof, given as a non-limiting example, with reference to the attached drawings,

in which:

- figure 1 is a schematic representation in side view of an apparatus according to the invention, in a first embodiment;
- figure 2 is an enlargement of figure 1 in the area of the unit for the application of a backing netting to the tiles arranged in panels;
- figure 3 represents in isolation a part of the unit of figure 2, namely a distribution device of the glue on the backing netting;
- figure 4 is a circuit diagram of the system for feeding and circulating the glue;
- figures 5a to 5c show respective variants of panels obtained according to the invention; and
- figure 6 represents, analogously to figure 1, an apparatus according to a different embodiment.

[0013] With reference to said figures, in the method according to the invention liquid PVC is used (more correctly, particles of PVC in suspension in a liquid plasticizer such as a phthalic resin), of a nature corresponding to that used in the prior art for application in points but now selected with a particular viscosity and above all distributed over an appropriate netting with wire-like structure, preferably in fiberglass and subjected to pretreatment to ensure strong adhesion of the PVC, as well as sized so as to ensure over 70% of surface left free on the back faces.

[0014] Going into greater detail, an apparatus according to the invention comprises a conveyor 1, typically a conveyor belt, supported by a frame 11 and having a horizontal plane 1 a on which panel arrays of tiles P are fed. The tiles, previously arranged and spaced to form the panel arrays, and carried along an advancement direction X, resting on the plane with their back faces facing upwards. Leaving aside for the time being the variant of figure 6, which will be discussed thereafter, a panel P arranged and conveyed on the conveyor 1 passes in sequence through a unit 2 for applying a backing netting to the panel itself, and two heating/curing stations 31, 32, all in sequence following the advancement direction X corresponding to the direction of longitudinal extension of the conveyor.

[0015] The netting application unit, shown in greater detail in figure 2, comprises a spindle 21 for feeding the netting R continuously from a reel B, towards a cutting device 22 above the conveyor, adapted for cutting the netting into pieces of the desired length as a function of the size of the panel being processed. The unit also comprises, downstream of the cutting device and below it, a device 23 for spreading the glue on the netting R, said device, according to the representation in figure 3, being provided with a tank 231 for collecting liquid PVC, represented by the mass C, with a distributor roll 232 partially immersed and cooperating with a doctor blade 233 that is smooth or toothed depending on the amount of PVC required, said amount also being adjustable by varying the rotation speed of the roll 232.

[0016] The netting R, guided by a plate 234 and with the tangential cooperation of a pressing roll 235 advantageously displaced upwards with respect to the distributor roll 232, makes contact, again tangentially, with the distributor roll itself, thus being uniformly affected by the distribution of PVC. The PVC is kept in the desired condition of fluidity through a supply and recirculation system represented in figure 4 and comprising a circuit 4 with, in a looped line, an external reservoir 41, a supply pump 42 for supplying the material towards the tank, the same tank 231, and a return pump 43 for returning the material to the reservoir. The level of PVC in the tank 231 is controlled by means of a sensor 231 a.

[0017] Again downstream of the tank, the netting R is finally made to fall from above onto the tiles arranged in a grid tray and supported by the conveyor 1, this mating being improved by a guide cylinder 24 that applies a first gentle pressure on the netting against the tiles. In order to ensure the perfect sizing of the netting on the panel, the advancement and cutting movements of the netting and the advancement movement of the tray are coordinated, through obvious transmission means.

[0018] The entire unit 2, briefly described above, makes use of technical solutions, in terms of actuation and control, visible in part from the figures, that are obvious to those skilled in the art and here not detailed further, being analogous, when considered as such, to those already used in the system for applying the netting with vinyl glue.

[0019] As mentioned above, beyond the unit 2 there are two successive drying ovens or stations 31, 32, for example and typically using surface radiation through infrared halogen lamps that, in two stages, take care of drying the PVC so as to stabilize the cohesion between tiles and netting. More specifically, the drying takes place in two stages; downstream of each of them, respective pressing cylinders 311, 321 press the netting against the panel/tiles.

[0020] In a first preheating station there is a first partial curing of the PVC with a passage time of the material of about one minute and a corresponding softening of the netting, thanks to which the action of the first pressing cylinder 311 will be able to make the netting itself copy all of the irregularities of the back faces of the tiles, so as to promote perfect adhesion. The second stage, in a second station of true curing, with a passage of about two minutes in an oven at a temperature of over 150° C, preferably about 180°, involves the mutual dissolving of the PVC suspension in the plasticizer and the desired setting of the material. The second pressure by the cylinder 321 immediately downstream of the curing station 32 improves the mechanical adhesion process between netting and tiles resulting in a panel that is ready for installation, after cooling at ambient temperature, advantageously, in order to speed up production, with the help of fans.

[0021] As mentioned, with reference to figure 6, the

first preheating station can, depending on the circumstances dictated by the type of material being processed, also precede the netting application unit. In this case there will be, in practice, a preheating of the tiles only, and a drying action that will take place starting from, and through the effect of, the contact on the tiles by the netting impregnated with PVC. The first pressing cylinder 311 will be in this case, of course, arranged downstream of the unit 2.

[0022] The electric power installed in the two stations can vary and will be optimised in an obvious manner depending on the type of material treated, just like their extension along the longitudinal direction in relation to the advancing speed; indicatively, as mentioned, an overall time of exposure to the action of the lamps of about three minutes will be adequate in most circumstances. Other heating means can involve different times.

[0023] Considering now specifically the characteristics of the PVC (or more correctly of the suspension of PVC and plasticizer) according to the invention, it is selected with a viscosity comprised between 50000 and 85000 mPa.s. For example, it is possible to use the product known as Plastisol® (http://en.wikipedia.org/wiki/Plastisol, http://www.icapsira.com/EN/Products/Plastisol/AboutPlastisol.aspx), as the resin PVC cat. DM 100 STD-BRT of the firm Plastek (http://www.plastek-srl.it/) or similar. The glue, applied as already described, is distributed on the netting in a specific small amount, which stably clings to the netting itself, avoiding, in a surprisingly effective manner, undesired dripping; nevertheless, through the homogeneity of the distribution the glue is capable to achieve perfect adhesion. A contribution to achieve such an effect is given by the selection of the dimensional parameters of the netting, which, contrary to conventional nettings of the prior art, according to the invention is made with open mesh, for example orthogonal square mesh of at least 10x10 mm but more generally any other configuration that diffusely affects all of the tiles and achieves a ratio between the surface area remaining exposed after the netting is applied, and the tile size area (overall area of the back faces without the netting) equal to at least 70%. Such a solution makes it possible to obtain an optimal compromise between rigidity of the panel, secure adhesion on all of the tiles and large area left free on the tiles for their effective clinging to the infrastructure to be coated at the moment of installation.

[0024] Regarding precisely this, with reference to figures 5a to 5c, it can be seen how in the example case of orthogonal square meshes the side L of the netting (side of a mesh square) is advantageously such as to ensure an arrangement of the netting with at least one crossing inside the surface of each tile. Such crossing can be just one at the centre of the tile (example of figure 5b, with side of the netting of 24 mm and side of the tiles of the same size), or double like in the examples of figures 5a and 5c, respectively referring to tiles again with side of 24 mm and netting with side of 12 mm (figure 5a), and to tiles with side of 48 mm and netting again with side of 24 mm. In all cases it can be seen how the netting, with its relatively large mesh, leaves a large portion of the back surface (over 70%) free and available for the clinging action of the installation materials.

[0025] The tiles that can be used according to the invention can be made from various materials such as ceramic, glass and natural stone, according to the most readily used types. The netting made of fiberglass or other equivalent material can possibly be pretreated with a stiffener (for example a butyl methacrylate-based resin) to make the cohesion with the PVC even more solid.

[0026] As well as the advantages already highlighted, it is possible to note and summarise the following characteristics of the invention all obtained simultaneously and in combination:

- ease of application of the glue;
- ease of gluing of the backing netting to the tiles, with a drying time that leaves time to consolidate the cohesion through successive pressure;
- speed of curing with respect to point PVC systems, since the PVC is exposed on the surface and with a high surface/volume ratio;
- guarantee of alignment of the grooves since the netting is applied to the tiles arranged in a grid, without the need for transfers;
- larger surface of the tiles uncovered and available for the masonry
- guaranteed seal over time, since PVC unlike vinyl glue does not suffer deterioration due to temperature and/or humidity;
- possibility of small corrections during application since the filaments of the netting, although making a reliable armature that facilitates the attachment and makes it secure, maintain some degree of flexibility;
- during application, no detachment of the grouting material of the tile lines since such lines are not actually affected by the PVC, and a reliable cohesion is obtained between the fibre and the cementitious glue that facilitates the attachment to the wall or building infrastructure in general and makes it secure.

[0027] The present invention has been described up to here with reference to possible example embodiments thereof. It should be understood that there can be other embodiments all covered by the scope of protection of the claims here attached.

Claims

1. Method for obtaining a mosaic tile product comprising tiles arranged and mutually joined in an irreversible fashion to form a panel (P), the method compris-

ing:

- preparing said panel (P) with said tiles exposed on their back faces;
- providing a backing netting (R) in a wire-like material adapted to be superimposed to said tiles in connection with all of them, leaving on the back faces an exposed surface area of at least 70% the size area of the tiles;
- spreading over said netting (R) a distribution of PVC plasticizer in a liquid state;
- joining said PVC glued netting (R) to said tiles over the back faces;
- processing the compound thus obtained in at least one curing step of the PVC plasticizer and at least one pressing step of the netting against the tiles.

2. Method according to claim 1, wherein the spreading of the PVC plasticizer is carried out at ambient temperature.

3. Method according to claim 1 o 2, wherein said PVC plasticizer has a viscosity comprised between 50000 and 85000 mPa.s.

4. Method according to any of the previous claims, wherein said at least one curing step is carried out at a temperature greater than 150° C, preferably of 180° C.

5. Method according to any of the previous claims, further comprising a tile preheating step preceding said curing step.

6. Method according to any of the previous claims, wherein said netting (R) is a netting with orthogonal meshes having side (L) greater or equal to 10 mm, the netting (R) being applied so as to have at least one crossing inside each tile.

7. Method according to any of the previous claims, wherein said wire-like material is fiberglass.

8. Apparatus for obtaining a panel product of mosaic tiles arranged and mutually joined in an irreversible fashion, the apparatus comprising:

- conveyor means (1) adapted to support said tiles and transport them according to an advancement direction (X);
- feeding and cutting means (22) of a tile backing netting (R) made of a wire-like material;
- means (23) for spreading over said netting a distribution of PVC plasticizer in liquid state and for applying said PVC glued netting to said tiles;
- PVC plasticizer drying means (31, 32) comprising at least one PVC curing oven (32);
- and pressing means (311, 321) of the netting (R) against the tiles,
- wherein said PVC spreading means comprise a liquid PVC accumulation tank (231), a distributor roll (232) partially immersed in the PVC and tangentially cooperating with an adjustable doctor blade (233) and with a pressing roll (235) displaced upwards with respect to said distributor roll (232), and wherein said tank (231) is associated with a continuous recirculation circuit (4) of the PVC to and from an external reservoir.

9. Apparatus according to claim 8, wherein said drying means further comprise a tile preheating oven (31) upstream of said curing oven (32).

10. Apparatus according to claim 8 or 9, wherein said pressing means comprise respective pressing cylinders (311, 321) arranged downstream of said preheating oven (31) and said curing oven (32).

11. Product of mosaic tiles arranged and mutually joined in an irreversible fashion to form a panel (P), comprising a backing netting (R) in a wire-like material applied to said tiles over the back face through a distribution of PVC plasticizer, the netting being superimposed to said tiles in connection with all of them and leaving on the back faces an exposed surface area of at least 70% the size area of the tiles.

12. Product according to claim 11, wherein said netting (R) is a netting with orthogonal meshes having side (L) greater or equal to 10 mm.

13. Product according to claim 12, wherein said netting (R) has a single crossing at the center of each tile.

14. Product according to claim 12, wherein said netting (R) has at least two crossings inside each tile.

15. Product according to any of the claims from 11 to 14, wherein said wire-like material is fiberglass.

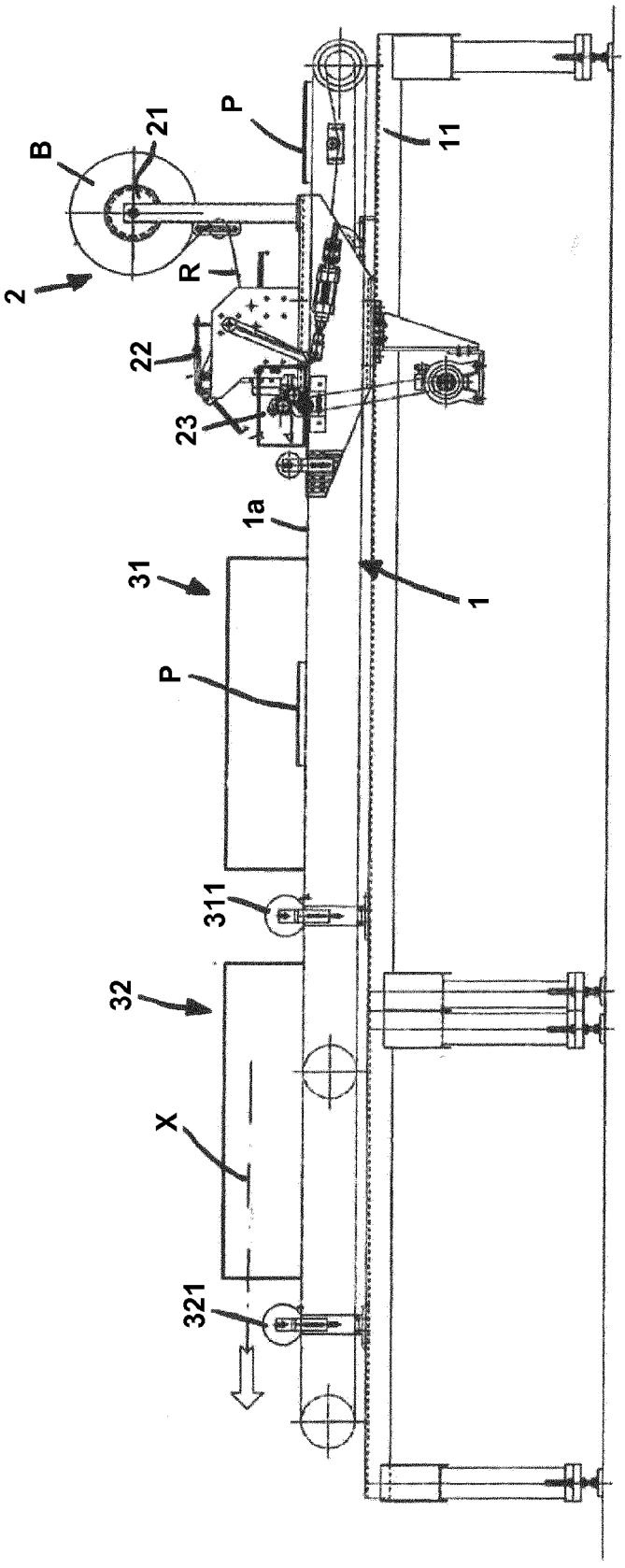

Fig. 1

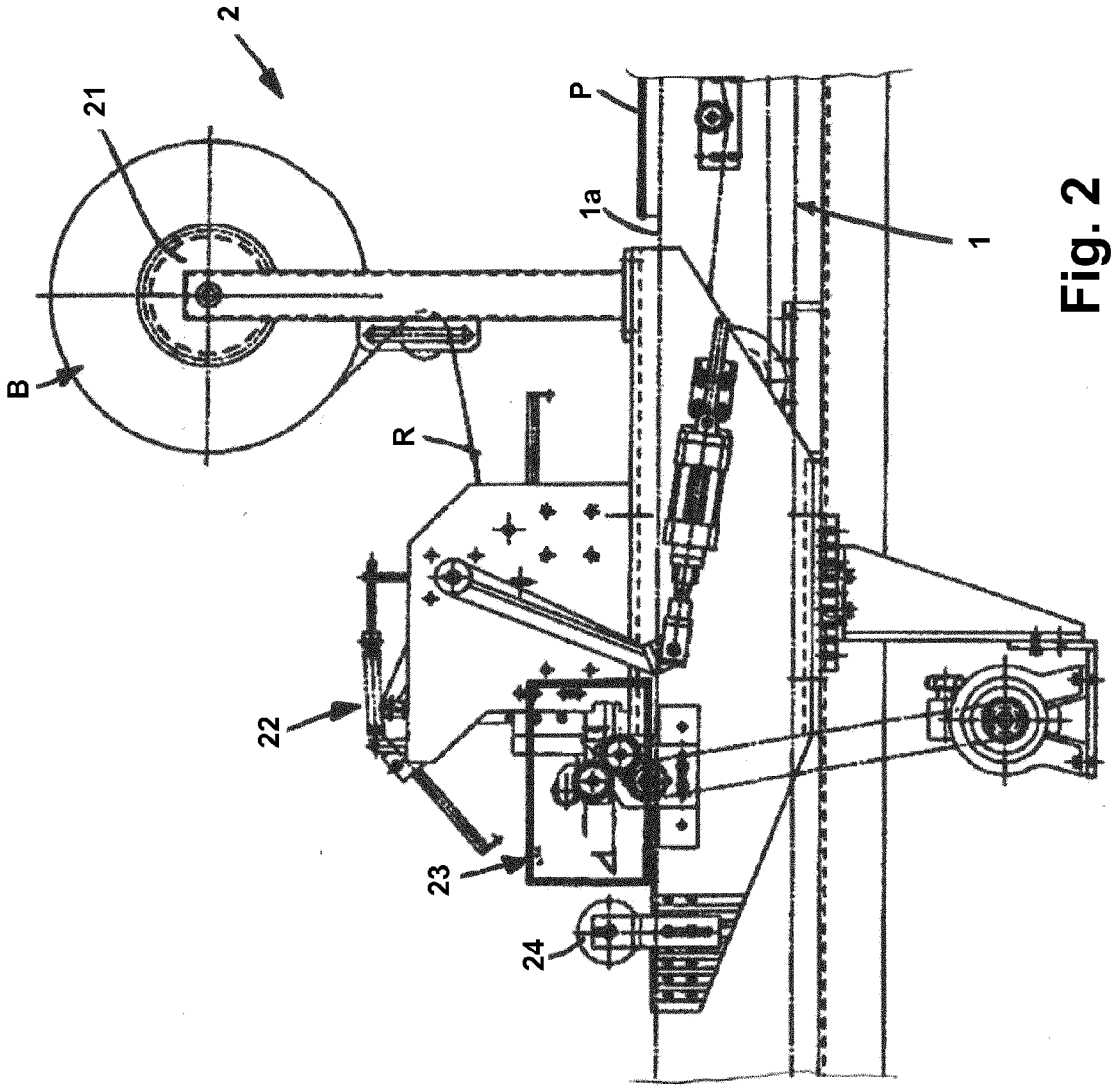

Fig. 2

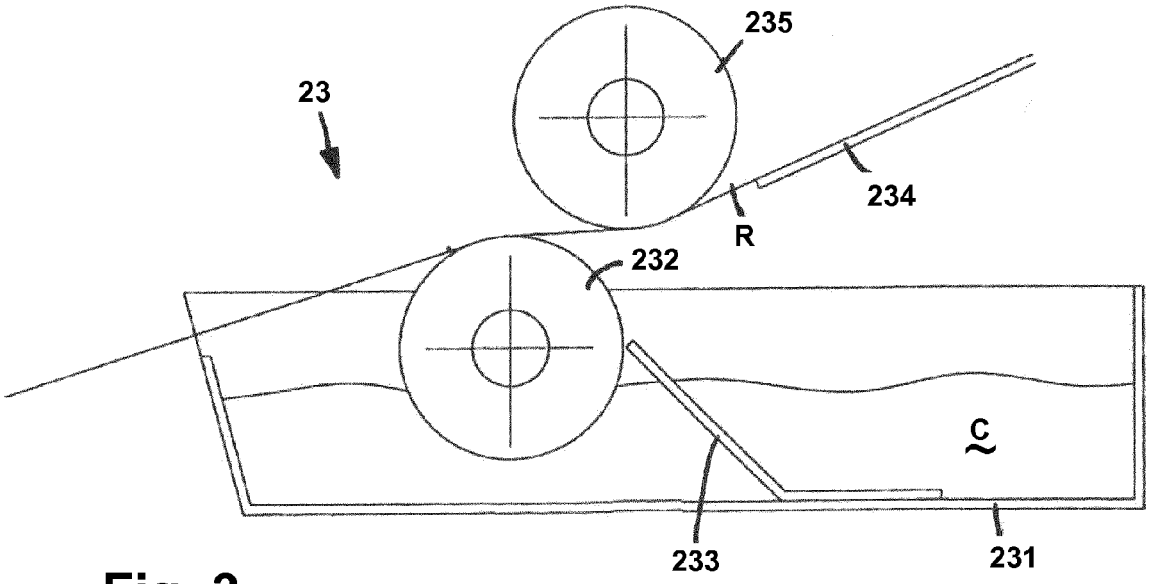

Fig. 3

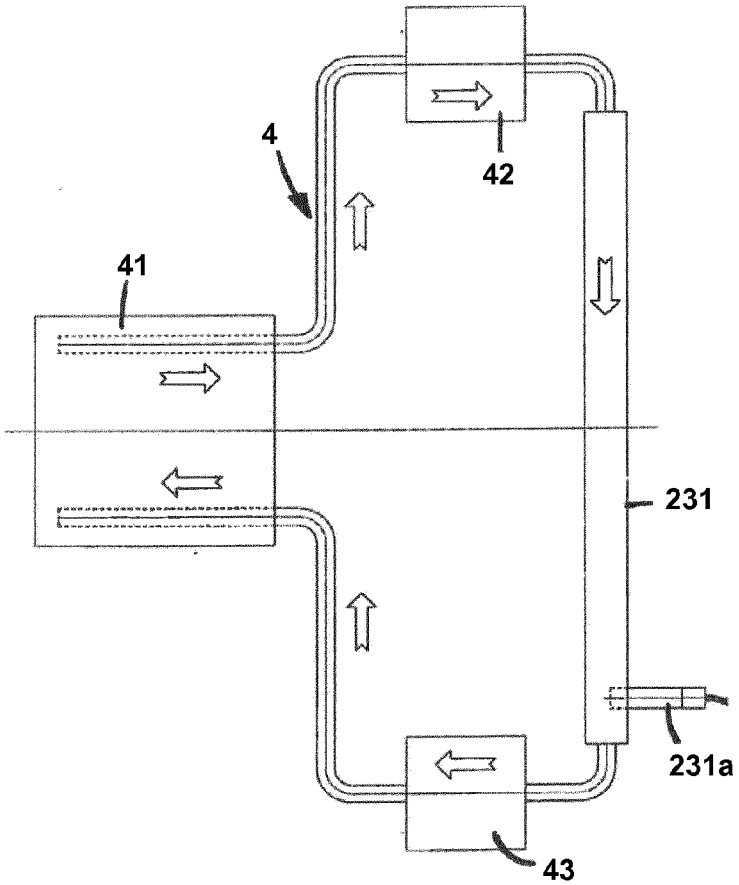

Fig. 4

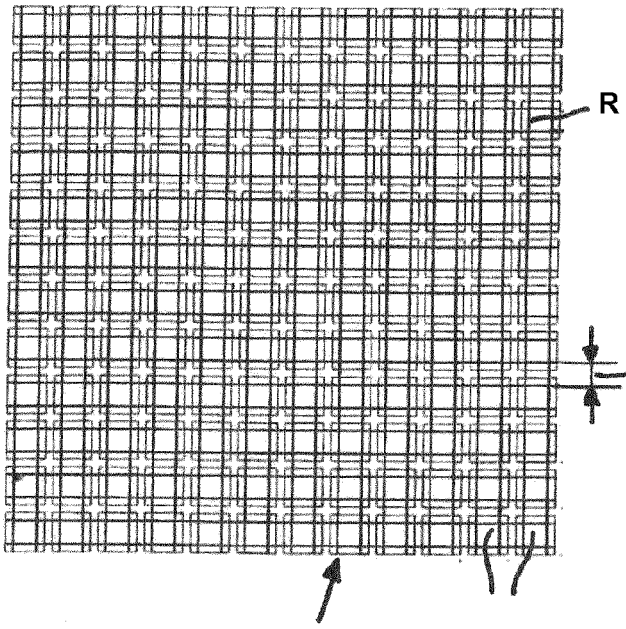

Fig. 5a

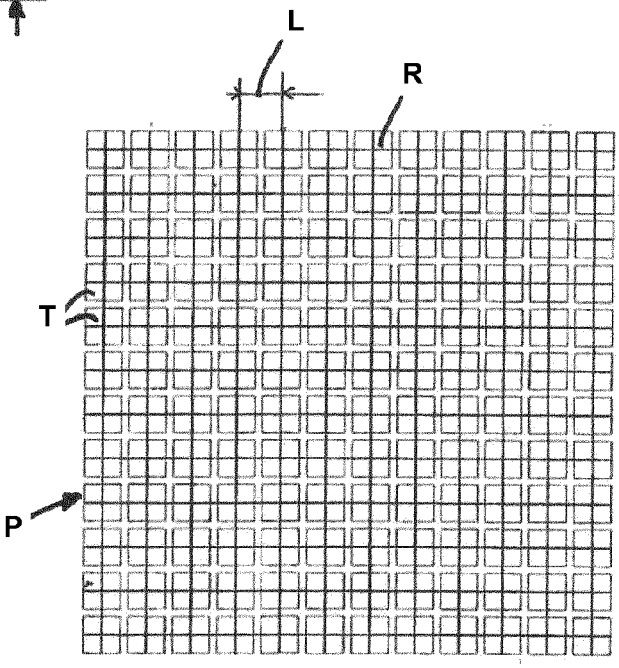

Fig. 5b

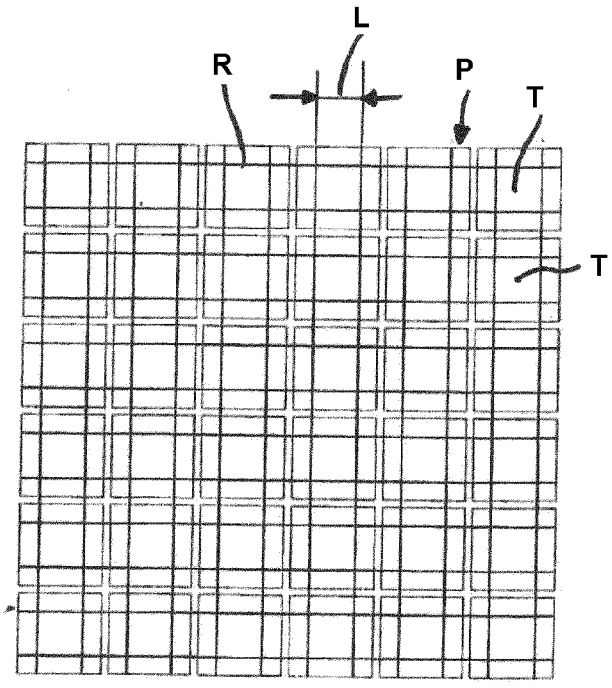

Fig. 5c

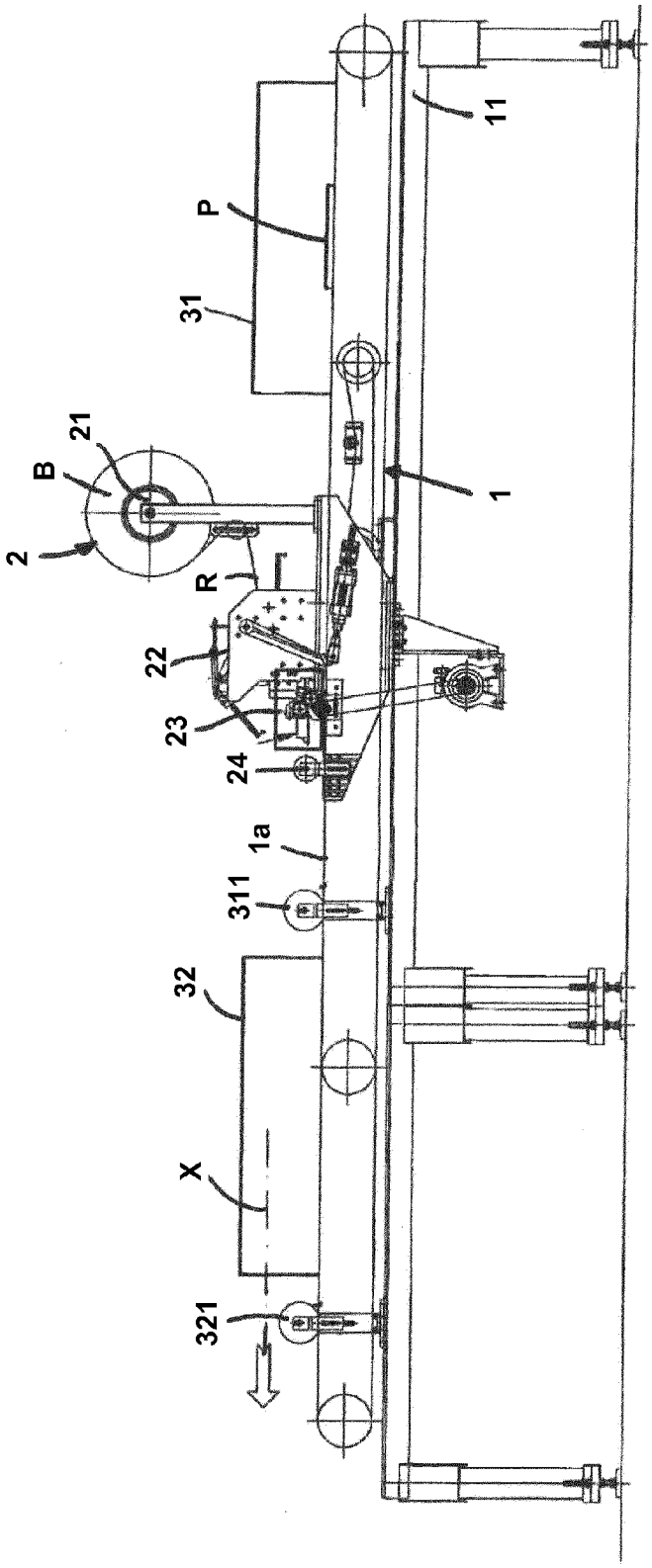

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 15 19 4673

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2009/013148 A1 (ROSSI RENATO [BE]) 29 January 2009 (2009-01-29) * page 5, line 7 - page 5, line 30; figure 1 *	1-15	INV. B44C1/28 B44C3/12
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TECHNICAL FIELDS SEARCHED (IPC)

B44C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 March 2016	Kelliher, Cormac

CATEGORY OF CITED DOCUMENTS

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22-03-2016

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