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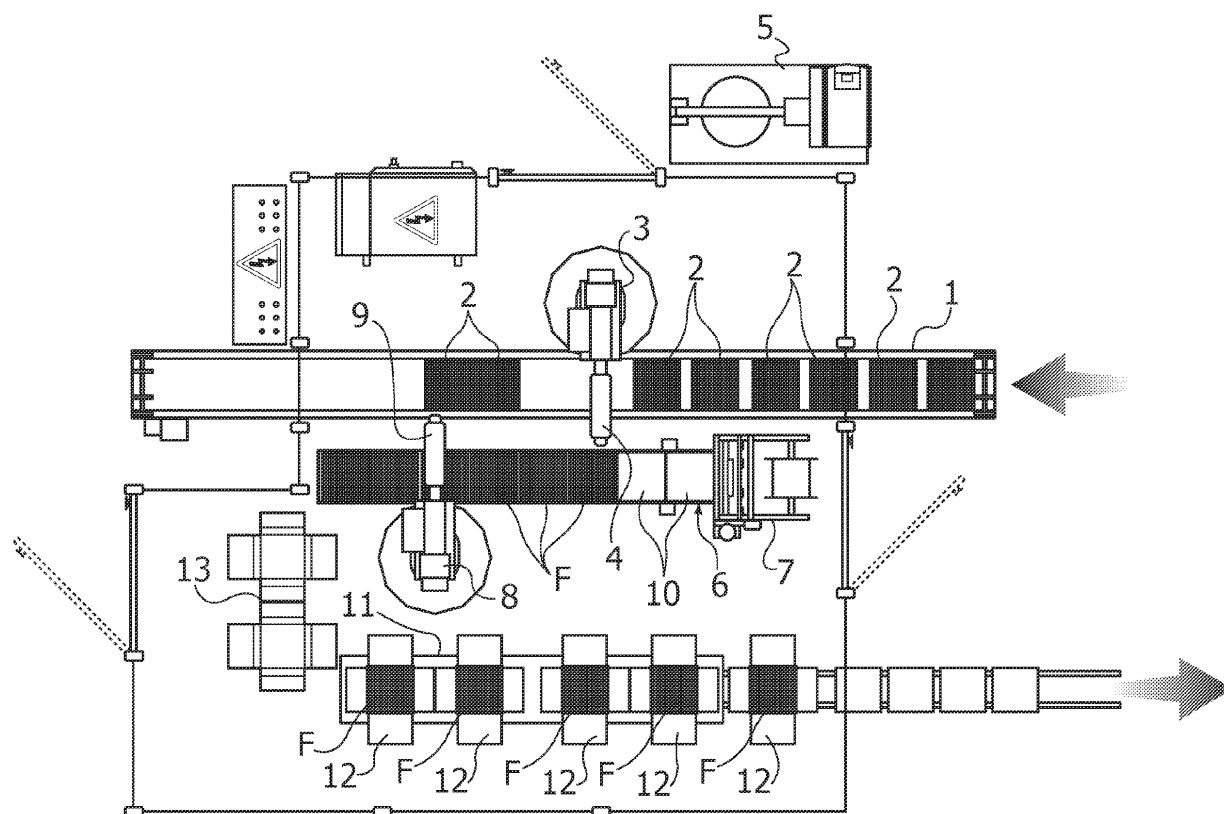
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(54) **Process and system for the formation of sheets of tesserae of mosaic**

(57) A process for the formation of sheets of tesserae of mosaic (F), in which the step of joining of each group of tesserae of mosaic ordered to form a chequered pattern envisages application from above of glue on an anti-adhesive substrate (6; 10) and positioning of the group

of tesserae on the glue applied to the anti-adhesive substrate (6; 10) keeping the front faces of the tesserae facing upwards so as to cause the glue to adhere to the back faces of the tesserae. The anti-adhesive substrate may consist of a regenerable endless belt (6) or else of a discrete plate (10).



Description

Field of the invention

[0001] The present invention relates to the formation of sheets of tesserae of mosaic designed to be laid for the decorative coating of mural structures, floors, pavements, and the like.

[0002] Sheets of this sort normally have standardized dimensions, and the number of the tesserae of each sheet, arranged in orderly fashion to form a chequered pattern, is evidently correlated to their dimensions. For example, with square tesserae having side of 2 cm, each sheet, which is also square, may include typically 15 rows by 15 columns of tesserae.

State of the art

[0003] For the formation of sheets of tesserae of mosaic of the aforesaid type, which in the past was performed manually, there are currently in use mechanized systems for the implementation of entirely automatic processes, which initially envisage a step of positioning of the individual tesserae of mosaic within purposely designed containment trays or "masks". The tesserae of mosaic, ordered to form a chequered pattern in rows and columns and not joined to one another, are then connected each with the contiguous tesserae by means of an adhesive, typically of a mono-component polyurethane type, applied so as to form bridges of mutual joining.

[0004] According to a first known process, the tesserae of mosaic are initially located within the trays with the respective front decorative faces, i.e., the faces that in the condition where the sheets are laid will be in view, facing upwards to enable visual verification of the integrity thereof. Next, the groups of tesserae of mosaic thus composed are turned over so as to position the base or back faces of the tesserae upwards. The joining adhesive is then applied from above on the back faces of the tesserae, normally using a mechanized dispenser that is equipped with nozzles for dosage of the adhesive and can be displaced according to paths corresponding to the rows and columns of tesserae. Finally, applied on the adhesive is a flexible covering sheet of anti-adhesive material, typically siliconed paper.

[0005] At output from the gluing station, the sheets of tesserae of mosaic are picked up from the corresponding trays and then transferred into packaging boxes.

[0006] This methodology, which, as has been said, envisages the application of the adhesive directly on the back faces of the tesserae, presents the drawback regarding the impossibility of inspecting and checking the integrity and quality of the front faces of the tesserae after they have been turned over within the corresponding containment trays. In the case where even only one of the tesserae has been damaged following upon laying in the tray, at the end of the gluing step the entire sheet will necessarily have to be rejected.

[0007] Furthermore, the adhesive applied from above while it is still hot and in the fluid state on the back faces of the tesserae can penetrate into the areas of intersection between contiguous tesserae and, particularly in the case of tesserae of small thickness, can become visible on their front faces with evident aesthetic drawbacks.

[0008] A further drawback of this methodology lies in the difficulty of managing and checking the thickness of the adhesive applied from above and in particular the homogeneity of height in so far as, once deposited and exposed to the ambient atmosphere, the adhesive immediately starts to solidify. Notwithstanding the use of squeezing and levelling rollers, at the end of its application, stretches of adhesive having different contact times with the atmosphere will have different hardening times before being subjected to the action of the rollers, with consequent lack of uniformity.

[0009] In an attempt to overcome these drawbacks at least in part, a second type of methodology has been proposed, which also envisages initial insertion of the tesserae into the containment trays with the corresponding front faces facing upwards. Each tray containing the tesserae can then be inspected visually to check the integrity of the corresponding front faces, and is then turned upside down so as to place the tesserae in a second tray in order to position the back faces thereof upwards. The next step is the operation of gluing, which envisages providing a sheet of paper rendered anti-adhesive and cut to size and positioning it on top of a device for dispensing the adhesive equipped with nozzles for delivering the adhesive from beneath upwards against the under face of the sheet of paper, also in this case according to a predetermined path. At the end of the application of the adhesive, the sheet of paper is deposited against the back faces of the tesserae of mosaic positioned in the underlying containment tray, thus obtaining mutual joining thereof. The sheet is then pressed with a constant pressure against the back faces of tesserae so as to obtain a homogeneous thickness of the adhesive applied.

[0010] Also this second methodology presents serious drawbacks.

[0011] In the first place, also this entails the need to turn over the groups of tesserae before the step of application of the adhesive, with the need to provide precise resources dedicated to said operation and with the risk of damaging the front faces thereof.

[0012] In the second place, it does not enable an effective visual inspection to be performed of proper deposition of the adhesive, in the right amounts and positions, on the under face of the sheet of paper.

[0013] Furthermore, since, as has been said, the dispensing of the adhesive by the dispenser is performed from beneath upwards, the corresponding nozzles are subject to clogging by the adhesive itself with consequent need for frequent machine stoppages for their cleaning and maintenance. For this reason, the productivity of the systems that operate with this second methodology is markedly limited.

[0014] A further drawback of this type of process lies in the impossibility of verifying visually that all the tesserae of mosaic adhere properly to the sheet of paper with the adhesive and, also in this case, that the front faces of the tesserae themselves remain intact at the end of the gluing step.

Summary of the invention

[0015] An object of the present invention is to overcome the drawbacks of the current methodologies and more in particular to provide a process for formation of sheets of tesserae of mosaic, as well as a system for implementation of the process, which will enable the operation of turning over of the tesserae of mosaic prior to the gluing step to be avoided, eliminating both the need for resources and the problems that derive therefrom.

[0016] Another object of the invention is to provide a process and a system for the formation of sheets of tesserae of mosaic that will enable a constant and efficient visual check of quality to be obtained before, during, and after the gluing step, thus ensuring the quality of the sheets of tesserae of mosaic formed and at the same time increasing efficiency and productivity by reducing or even eliminating the production of defective sheets.

[0017] According to the invention, the above objects are achieved thanks to a process of the type defined in the preamble of Claim 1, the peculiar characteristic of which lies in the fact that the step of joining envisages application from above of the glue on an anti-adhesive substrate and positioning of the group of tesserae on the glue applied on said anti-adhesive substrate, keeping the front faces of the tesserae facing upwards so as to cause the glue to adhere to the back faces of the tesserae.

[0018] According to a preferred embodiment of the invention, the anti-adhesive substrate is constituted by a regenerable endless belt.

[0019] Alternatively, the anti-adhesive substrate can be constituted by a discrete flexible plate.

[0020] Thanks to this arrangement, any need to turn over the tesserae is eliminated, since they are constantly kept with the corresponding front faces facing upwards so as to enable a continuous visual check on the quality thereof. Also proper application of the adhesive on the anti-adhesive substrate can be effectively checked visually, and the dispensing of the adhesive itself from above downwards prevents or at least drastically reduces the need for cleaning and maintenance of the dispenser device.

[0021] These effects, together with a faster production rate, enable the process according to the invention and the system for its implementation to increase productivity considerably, even up to 80%, as compared to methodologies currently in use, at the same time reducing appreciably the use of human resources dedicated to its implementation.

Brief description of the drawing

[0022] The invention will now be described in detail with reference to the annexed drawing, provided purely by way of non-limiting example, which represents a schematic top plan view of the layout of a system for implementation of the process according to the invention.

Detailed description of the invention

[0023] With reference to the drawing, the process for the formation of sheets of tesserae of mosaic according to the invention is implemented via a system basically constituted by the components listed hereinafter:

- at least one feed line 1, constituted by a motor-driven endless-belt conveyor which moves in stepper fashion, for feeding loading trays or masks 2, introduced into each of which is a plurality of tesserae of mosaic ordered to form a chequered pattern in rows and columns; the tesserae of mosaic, which are not joined to one another, usually have a front decorative face, which in the laid condition is in view, and a back or base face opposite to the front face; according to a first aspect of the invention, the groups of tesserae are placed, manually or more conveniently in a mechanized way, within the corresponding containment trays 2 with the respective front faces facing upwards, and are then kept with said orientation for the entire cycle;
- a gluing device constituted by a robot 3, set alongside the line 1 and equipped, in a general way in itself known, with a dispenser 4 of a fluid adhesive, typically of a mono-component polyurethane type, supplied to the robot 3 by a melting unit 5;
- an endless belt 6, which is set alongside the feeder 1 on the opposite side of the robot 3 and define a regenerable anti-adhesive substrate; possibly associated to one end of the belt 6 there may be a feeder 7 pre-arranged for depositing in succession on the surface of the belt 6 discrete plates, i.e., ones cut to size, of a flexible material, such as for example siliconed paper, plastic, and the like, designed to constitute themselves anti-adhesive substrates as an alternative to the surface of the belt 6;
- a manipulator robot 8, which is set alongside the belt 6, on the side opposite to the feeder 1, and is pre-arranged, in a way in itself known, via a suction assembly 9, for picking up one by one the groups of tesserae contained in the loading trays 2 arriving along the feeder 1 and for depositing each group of tesserae on the anti-adhesive substrate constituted by the regenerable endless belt 6 or, alternatively, by the plates 10 deposited thereon; and
- a packaging line 11, loaded on which are boxes 12 coming from a magazine 13 and within which the sheets of tesserae of mosaic F, each time formed

with the modalities clarified in what follows, are transferred from the belt 6 via the manipulator robot 8.

[0024] The system is moreover provided with a series of visual-inspection stations, not illustrated in detail in so far as they are within the reach of the person skilled in the branch, typically constituted by video cameras operatively connected to a pre-programmed image-processing system for comparing the images detected with reference images and verifying the congruity thereof. The video cameras will be positioned in such a way as to film both the groups of tesserae of mosaic each time located in the corresponding containment trays 2 as they advance on the conveyor 1, and the area of application of the adhesive on the anti-adhesive substrate, constituted, as has been said, by the belt 6 or alternatively by the plates 10 each time positioned thereon, as well as the sheets F subsequently transferred to the packaging line 11.

[0025] The process of formation of the sheets of tesserae of mosaic F implemented by the system thus described is outlined in what follows.

[0026] In the loading step, the tesserae of mosaic are, as has been said, positioned within the respective containment trays 2 in an orderly way to form a chequered pattern, with the corresponding front faces facing upwards. Then, whilst the trays 2 are transferred from the feeder 1 to the area where the manipulator robot 8 picks up the tesserae, the corresponding front faces are inspected by the video-camera system so as to verify not only the correct positioning thereof but also the absence of surface defects or anomalies.

[0027] At the same time, and in synchronism with the advance of the conveyor 1, the gluing robot 3 proceeds to application of the fluid adhesive on the anti-adhesive substrate constituted by the surface of the regenerable belt 6 or, alternatively, by the plates 10 each time deposited thereon. The adhesive is applied by the dispenser robot 4 from above downwards and in a generally conventional way according to paths defining a grid - either continuous or in stretches - corresponding to the arrangement in rows and columns of the groups of tesserae within the corresponding containment trays 2.

[0028] Following upon each cycle of application of the adhesive carried out by the dispenser robot 3, the manipulator robot 8 picks up, via the corresponding suction device 9, each group of tesserae 2 from the corresponding containment tray 2 on the feeder 1 and transfers it onto the grid of adhesive just applied on the anti-adhesive substrate. The group of tesserae is then deposited, in the same configuration in which it has been picked up, i.e., with the front faces of the tesserae facing upwards, on the grid of adhesive, thus obtaining joining therewith of the corresponding back faces.

[0029] After a relatively short lapse of time, sufficient to guarantee the stability of the adhesive against the back faces of the tesserae and their consequent mutual joining, each sheet F thus formed is picked up from the belt

6 by the same manipulator robot 8 and then transferred to the packaging line 11 for being boxed.

[0030] It will emerge clearly from the foregoing that, during the entire process of formation of the sheets F, the tesserae of mosaic remain constantly oriented with the corresponding front decorative faces facing upwards. This enables the system of visual inspection to check constantly not only the presence and correct positioning of the tesserae but also the integrity and the absence of surface defects of said front faces, together with proper dispensing of the adhesive each time applied on the anti-adhesive substrate.

[0031] Obviously, at the end of the cycle of formation each sheet F will be constituted only by the tesserae and by the grid of adhesive that joins the back faces thereof in the case where the anti-adhesive substrate is constituted by the surface of the regenerable belt 6, or else will include also the plate 10 in the alternative case where this is used for constituting the anti-adhesive substrate. In the first case, an auxiliary anti-adhesive plate may then be inserted, with separating function, between each sheet F each time introduced into the box 12 along the packaging line 11 and the underlying sheet F.

[0032] The advantages deriving from the process according to the invention lie not only in the elimination of the need to turn over the tesserae of mosaic and of the corresponding drawbacks referred to at the start, but also in the possibility of a constant visual inspection of the quality of the sheets F, in a considerable reduction in the need for maintenance and cleaning of the dispenser of adhesive, and, in practice, in an appreciable increase in productivity.

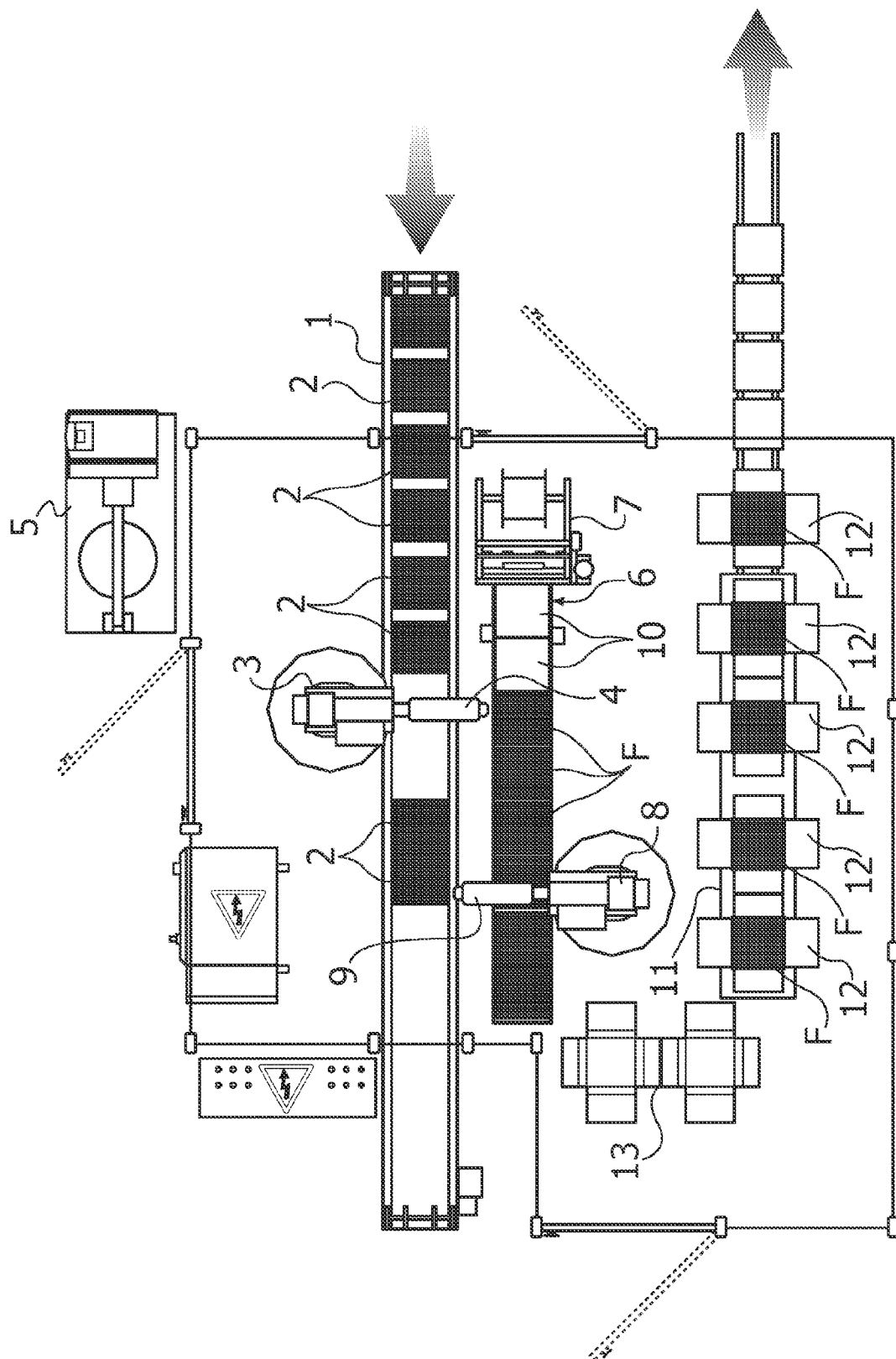
[0033] Of course, the details of construction and the embodiments of the system for implementation of the process may vary widely with respect to what has been described and illustrated herein, without thereby departing from the scope of the present invention as defined in the ensuing claims.

Claims

1. A process for the formation of sheets of tesserae of mosaic (F), comprising the steps of:

prearranging groups of tesserae of mosaic that are not joined to one another and are ordered to form a chequered pattern, the tesserae of each group having a front decorative face and a back face of joining; and

joining the back face of each tessera of mosaic of each group to the contiguous tesserae by means of a glue so as to form a sheet of tesserae of mosaic (F), said process being **characterized in that** the step of joining envisages application from above of the glue on an anti-adhesive substrate (6; 10) and positioning of the group of tesserae on the glue applied on said





EUROPEAN SEARCH REPORT

Application Number
EP 10 16 3961

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search		Date of completion of the search	Examiner
Munich		23 September 2010	Björklund, Sofie
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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