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(54) **DEVICE FOR GLAZING PRODUCTS AND RELATED PLANT**

(57) A device (30) for glazing manufactured articles (M) comprising:
a box-shaped container (31) wherein a glaze for glazing manufactured articles (M) is contained, wherein the box-shaped container (31) comprises a bottom wall (32) having at least one passage opening (320) extending along a horizontal longitudinal axis (C) and configured to release a veil of glaze.

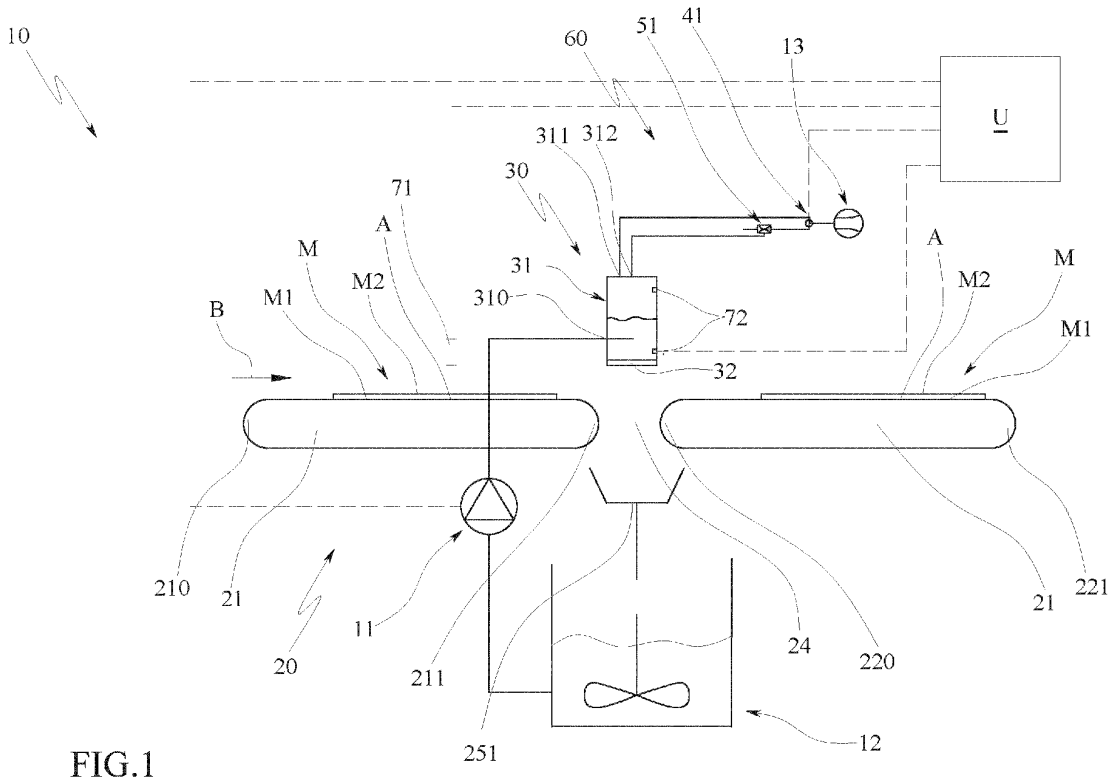

FIG.1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a device for glazing manufactured articles, in particular ceramic articles, and a related plant.

PRIOR ART

[0002] They are known several methods in the ceramic sector for applying glaze on ceramic articles.

[0003] A first known method involves using a device, known in jargon as a 'bell', which allows forming a film of glaze, under which the article is passed.

[0004] A disadvantage of this first known method is that it is difficult to apply the glaze evenly on the manufactured article, as the amount of glaze applied is greater at the edges of the article and lesser in the central area.

[0005] Furthermore, in order to cover the entire surface of the article, the film defined by the bell must be larger than the article itself, which implies a large waste of material and a large bell size.

[0006] A second known method, referred to in the jargon as "airless", involves applying the glaze by spraying.

[0007] However, this method also has some drawbacks, such as a high waste of material that remains suspended inside the container, and the fact that, especially for medium to large manufactured articles, it is difficult to apply the glaze evenly on the surface to be covered. An object of the present invention is to overcome the mentioned drawbacks of the prior art, within the context of a simple, rational and cheap solution.

[0008] Such objects are achieved by the characteristics of the invention reported in the independent claims. The dependent claims outline preferred and/or particularly advantageous aspects of the invention.

DISCLOSURE OF THE INVENTION

[0009] The invention, in particular, makes available a device for glazing manufactured articles which comprises:

a box-shaped container in which a glaze is contained for glazing manufactured articles, wherein the box-shaped container comprises a bottom wall having at least one passage opening extending along a horizontal longitudinal axis and configured to release a veil of glaze.

[0010] Thanks to this solution, a simple, functional, compact and effective device is made available which is adapted to allow evenly applying the glaze on the manufactured articles.

[0011] According to an aspect of the invention, the passage opening may consist of a plurality of through-holes arranged in a single row and aligned along a horizontal alignment direction parallel to the longitudinal axis and orthogonal to a direction of mutual handling between the manufactured articles and the box-shaped container.

[0012] According to the invention, each through-hole is formed by a respective delivery nozzle fixed to the bottom wall.

[0013] Basically, each delivery nozzle allows for a controlled and precise delivery of glaze and the set of delivery nozzles defines an even veil of glaze that results in an effective and even glazing of the manufactured articles.

[0014] Advantageously, each delivery nozzle may comprise an elongated tubular body having a longitudinal axis orthogonal to the direction of handling and the longitudinal axis of the passage opening, wherein the tubular body preferably protrudes below the bottom wall by at least an axial section.

[0015] Furthermore, the tubular body of each delivery nozzle may have a length substantially between 30 mm and 60 mm, preferably equal to 50 mm $\pm$ 5 mm, and/or the axial section protruding below the bottom wall of each tubular body may have a length substantially between 10 mm and 20 mm, preferably equal to 15 mm $\pm$ 2 mm.

[0016] Advantageously, each tubular body may have a circular and constant inner cross-section along its entire longitudinal extension, with an inner diameter substantially between 0.8 mm ($\pm$ 0.1 mm) and 1.2 ($\pm$ 0.1 mm).

[0017] For example, the glaze may have a density between 1350 g/L and 1600 g/L, or even higher than 1500 g/L.

[0018] Again, the through-holes in the row of through-holes (i.e. the delivery nozzles) are equally distant from each other, preferably with a pitch substantially equal to 5 mm $\pm$ 1 mm (i.e. between 4 mm and 6 mm).

[0019] In this way, said holes, designed to deliver a relative strip (or a relative jet) of glaze on the manufactured article, are spaced apart from each other so that the contiguous strips (or contiguous jets) join together to define a substantially even layer (or veil) of glaze, ensuring an excellent appearance of the manufactured article.

[0020] In particular, one aspect of the invention provides that the device may comprise a pressure control arrangement within the box-shaped container configured to generate a vacuum within the box-shaped container at a pressure value lower than an atmospheric pressure value to stop the release of glaze from the passage opening.

[0021] Thanks to the control arrangement, the device can operate as the manufactured article passes through and according to the size thereof, thereby controlling the delivery of the glaze so as to minimise (or avoid) waste of material and/or unwanted dripping and soiling. According to an aspect of the invention, said control arrangement may comprise a vacuum generator.

[0022] It is thereby made available a space-saving and energy-saving element, which is easy to maintain and assemble, and which generates a suitable vacuum inside the box-shaped container.

[0023] An aspect of the invention further provides that the passage opening may comprise at least one elongated through-slot arranged orthogonal to a direction of mutual handling between the articles and the box-shaped

container.

[0024] Thanks to this solution a passage opening is made available, shaped in such a way as to make it possible to deliver an even film of glaze on the articles.

[0025] In particular, delivery a film of glaze from the thus shaped passage opening makes it possible to obtain manufactured articles with an excellent quality and aesthetic appearance.

[0026] Alternatively, an aspect of the invention provides that the passage opening may consist of a plurality of through-holes arranged in a (single) row and aligned along a horizontal alignment direction parallel to the longitudinal axis and orthogonal to a direction of mutual handling between the manufactured articles and the box-shaped container.

[0027] Thanks to this solution, it is possible to minimise the waste of material, while ensuring an even film of glaze on the manufactured articles.

[0028] A further aspect of the invention also provides that the bottom wall of the device may be made of a plastic material, preferably polyurethane.

[0029] Thanks to this solution, the bottom wall of the device has excellent mechanical stress resistance/resilience and a good surface washability which guarantees a high wear resistance, important to maintain the performance of the device and to lengthen the service life thereof.

[0030] In particular, the bottom wall thus created is characterised by minimal deformation and/or wear phenomena at the passage opening (such as due to the abrasive composition of the glaze), ensuring an efficient glaze delivery for a high number of working cycles.

[0031] The delivery nozzles can be made at least partially of metal, such as steel.

[0032] An aspect of the invention provides that the bottom wall is removably associated with the box-shaped container.

[0033] It is thereby possible to replace the bottom wall of the container, minimising the device change-over costs and ensuring a constant efficiency over time.

[0034] A further aspect of the invention provides that the box-shaped container may comprise at least one openable wall adjacent or opposite to the bottom wall.

[0035] It is thus made available a container that is (at least partially) easy to clean, even inside, for instance at every colour change or when required.

[0036] According to a further aspect of the invention, the device may comprise at least one delivery arrangement configured to generate a positive pressure in the box-shaped container at least at a value of delivery pressure greater than the atmospheric pressure to allow the forced release of glaze from the passage opening.

[0037] Thanks to the delivery arrangement, the device can control the delivery of the glaze, i.e. its amount and/or the delivery pressure according to the desired degree of coverage.

[0038] In addition, thanks to the delivery arrangement, it is possible to deliver a continuous film of glaze at the optimum pressure, so as to obtain an excellent manufactured article appearance.

[0039] Furthermore, an aspect of the invention provides that the delivery arrangement may comprise a pressure regulator configured to vary the value of the delivery pressure to adjust the flow of glaze exiting the passage opening.

[0040] Thanks to this solution, it is possible to easily and conveniently adjust the amount of glaze to be delivered, resulting in a product with a more or less opaque glaze film as required. For the same purposes as set forth above, a further aspect of the invention makes available a plant for glazing manufactured articles comprising:

- a conveyor provided with a support plane configured to support at least one manufactured article and provided with a handling arrangement for moving the article along a horizontal handling direction;
- a device in which the bottom wall of the box-shaped container is superimposed in plan on at least one section of the support plane and at a distance from it (with the passage opening placed at a certain non-zero distance from the support plane).

[0041] According to one aspect of the invention, the box-shaped container can be movably mounted on a conveyor support frame.

[0042] Thanks to this solution, if the device is not operating and/or parts of the container need to be replaced and/or the container needs to be cleaned, it can be easily disassembled and reassembled and/or oriented on said frame.

[0043] In particular, in the context of such aspect of the invention, the system may provide that the box-shaped container may be slidable relative to the support frame along a sliding direction parallel to the longitudinal axis of the passage opening.

[0044] The assembly and disassembly operations of the container relative to the frame are thereby particularly simple and do not require any particular effort by the operator, who can easily slide said container onto the frame.

[0045] Again, as an alternative or in addition to the above, the box-shaped container may be associated in an oscillating manner with respect to the support frame, between a working position, in which the bottom wall is substantially horizontal, and a washing position, in which the bottom wall is tilted with respect to the horizontal one.

[0046] Thanks to this solution, it is possible to carry out the cleaning and washing operations of the container itself effectively and without having to remove it from the frame, reducing the downtime of the plant and facilitating these operations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047] Further characteristics and advantages of the invention will become clear from reading the following description provided by way of non-limiting example, with

the aid of the figures illustrated in the accompanying tables.

Figure 1 is a schematic view showing the main components of the plant according to the invention.

Figure 2 is a schematic perspective view of the plant according to the invention.

Figure 3 is an axonometric schematic view of a box-shaped container of the plant of Figure 2.

Figure 4a is a view from below of a bottom wall of the box-shaped container of Figure 3 according to a first embodiment of the invention.

Figure 4b is a view from above of the bottom wall of the box-shaped container of figure 3 according to the first embodiment of the invention.

Figure 5a is a view from below of a bottom wall of the box-shaped container of figure 3 according to a second embodiment of the invention.

Figure 5b is a view from above of the bottom wall of the box-shaped container of figure 3 according to the second embodiment of the invention.

Figure 6 is a section view according to the plane VI-VI of Figure 4b and Figure 5b.

Figure 7a is a view from below of a bottom wall of the box-shaped container of Figure 3 according to a third (and preferred) embodiment of the invention.

Figure 7b is a view from above of the bottom wall of the box-shaped container of Figure 3 according to the third embodiment of the invention.

Figure 7c is a side view of the bottom wall of the box-shaped container of Figure 3 according to the third embodiment of the invention.

Figure 8 is a section view according to the plane VIII-VIII of Figure 7b.

Figure 9 is a schematic view of a plant control circuit according to the invention.

BEST MODE OF THE INVENTION

[0048] With particular reference to these figures, a plant for glazing manufactured articles, in particular ceramic articles such as tiles, has been globally referred to as 10.

[0049] The plant 10 comprises a conveyor 20 configured to support at least one manufactured article M on its own lower support surface M1 opposite to an upper surface M2 to be glazed.

[0050] The conveyor 20 comprises a horizontal support plane A on which the articles M are to be placed with their upper surface M2 to be glazed facing upwards.

[0051] The conveyor 20 preferably comprises a handling arrangement for moving the article on the support plane A along a predetermined horizontal (substantially straight) handling direction B.

[0052] In the preferred example shown, the handling arrangement comprises a belt conveyor, in particular the handling arrangement comprises at least one pair of conveyor belts 21 arranged parallel to each other and to the direction of handling.

[0053] The conveyor belts 21 of the pair of conveyor belts are coplanar so that an external surface of the upper branch thereof is suitable to define the horizontal support plane A on which the manufactured articles M to be glazed rest.

[0054] The conveyor belts 21 are tensioned between a pair of end cylinders, arranged for example with an axis orthogonal to the direction of handling B, at least one of which is motor-driven, and on which the conveyor belts 21 are at least partially wound.

[0055] An internal surface of the conveyor belts 21 is therefore in contact with said cylinders, which are designed to ensure the movement of the conveyor belts 21 themselves.

[0056] In particular, at least one cylinder is connected to a motor (not shown in the figure), which is adapted to rotate said cylinder about its axis.

[0057] In the example shown in the figure, the cylinder in turn transmits movement to the conveyor belts 21 via a gear system 23.

[0058] It is not excluded that the transmission of the movement from the cylinder to the conveyor belts 21 may occur by means of a drive chain, belt, or other known motion transmission systems.

[0059] In the example shown in the figure, the handling arrangement comprises a pair of similar or identical belt conveyors, which are placed in sequence one after the other along the handling direction B at a predetermined non-zero distance between them.

[0060] In particular, a first upstream end 210 of the conveyor belts 21 of the first conveyor corresponds to a zone for loading the manufactured article M to be glazed in the plant 10, and a second downstream end 221 of the second conveyor corresponds to a zone for discharging the manufactured article M glazed by the plant 10.

[0061] As mentioned, the first conveyor and the second conveyor are spaced apart in the direction of handling B, so that a passage port 24 (having a dimension smaller than the length of the tiles to be glazed along the direction of handling B) is defined between a second downstream end 211 of the first conveyor and a first upstream end 220 of the second conveyor.

[0062] The conveyor 20 is further provided with a support frame 25 comprising at least one sidewall 250, which rests on the ground at a lower end, and supports the handling arrangement at an opposite upper end.

[0063] The support frame 25, at a central area of the sidewall 250, substantially vertically aligned with (and below) the passage port 24, comprises an exhaust opening 251 (the primary function of which will be specified below).

[0064] In alternative embodiments not shown in the figure, the handling arrangement may comprise a roller conveyor, or other conveyor suitable for glazing plants of the known type. In particular, the plant 10 comprises a device 30 for glazing manufactured products M, i.e. a device configured to deliver a predetermined (or predetermina-

ble) amount of glaze (shaped like a veil or a curtain) on the upper surface M2 of the manufactured article M resting on the support plane A made available by the handling arrangement (and in relative handling with respect to the device 30).

[0065] The device 30 comprises a box-shaped container 31, e.g. in the form of a hollow parallelepiped.

[0066] The box-shaped container 31 is formed of (comprises or consists of):

- a bottom wall 32, for example substantially quadrangular (in plan), having a prevailing longitudinal dimension defining the length of the box-shaped container 31 (and an orthogonal smaller dimension defining the width of the box-shaped container 31),
- an opposite upper wall 33, parallel to the bottom wall 32, which is placed at a distance from the bottom wall 32 substantially equal to a vertical dimension defining the height of the box-shaped container 31, and
- a shell, for example formed by four substantially vertical and substantially quadrangular-shaped infill walls joined together and joined at opposite ends to the bottom wall 32 and the upper wall 33, of which a bottom wall 34, an opposite front wall 35 (with the same shape as the bottom wall 34) and a pair of side walls 36 adjoining the bottom wall 34 and the front wall 35.

[0067] The inner volume of the box-shaped container 31 is delimited by the above mentioned walls.

[0068] The bottom wall 32 of the box-shaped container 31 is provided with at least one passage port 320 extended along a horizontal longitudinal axis C and, for example, arranged in a substantially central position, through which the inner volume of the box-shaped container 31 communicates with the outside.

[0069] In particular, the box-shaped container 31 contains a glaze for glazing the manufactured articles M, and the passage opening 320 of the bottom wall 32 is configured to release a veil of glaze.

[0070] The glaze is an aqueous suspension of powder, such as glass powder or other ceramic material, which preferably has to be baked (together with the substrate) to make a glazed tile.

[0071] In a first embodiment of the invention shown in Figures 4a, 4b and 6, said passage opening 320 consists of at least one through-slot 321, preferably a single through-slot 321) elongated and arranged so that its longitudinal axis C is orthogonal to the mutual direction of handling B between the manufactured articles M and the box-shaped container 31 (imposed by the conveyor 20).

[0072] In a second embodiment of the invention shown in Figures 5a, 5b and 6 and in a third (and preferred) embodiment of the invention shown in Figures 7a, 7b, 7c and 8, the passage opening 320 consists of a plurality of through-holes 322, for example arranged in a row, preferably a single row, and aligned along a horizontal alignment direction parallel to the longitudinal axis C and orthogonal to the mutual direction of handling B between the manufactured articles M and the box-shaped container 31 (imposed by the conveyor 20).

[0073] In the second embodiment shown in Figures 5a, 5b and 6, said through-holes 322 are obtained (directly) in the bottom wall 32.

[0074] Preferably, in the third embodiment shown in Figures 7a, 7b, 7c and 8, each through-hole 322 is formed by a respective delivery nozzle 323 (or needle) attached to the bottom wall 32.

[0075] In practice, the device 30 comprises a plurality of delivery nozzles 323 (each of which defines a respective through-hole 322 for the glaze exiting the box-shaped container 31), which are arranged in a row, preferably a single row, and aligned along the direction of alignment and which, as a whole, define the aforesaid passage opening 320 which releases from the box-shaped container 31 the aforesaid veil of glaze (which is in turn composed of a plurality of vertical jets of glaze, each of which is delivered by the single delivery nozzle 323).

[0076] For example, each delivery nozzle 323 comprises an elongated tubular body 3230, which has a longitudinal (straight) axis orthogonal to the direction of handling B and the longitudinal axis C of the passage opening 320, i.e. orthogonal to the support plane A.

[0077] Each delivery nozzle 323 has an inner longitudinal cavity defining the through-hole 322 from which the glaze exits.

[0078] In practice, the delivery nozzle 323 has a first upper (open) axial end that is arranged inside the box-shaped container 31, for example at a higher quota than the inner face of the bottom wall 32 or substantially flush with it, and an opposite second lower (open) axial end facing or arranged outside the box-shaped container 31, for example at a lower quota than the outer face of the bottom wall 32 (or, at the limit, substantially flush with it). Preferably, the second axial end (and the first axial end) of each tubular body 3230 lies on a plane orthogonal to the longitudinal axis of the tubular body 3230.

[0079] For example, the tubular body 3230 of each delivery nozzle 323 has a length substantially between 30 mm and 60 mm, preferably equal to 50 mm $\pm$ 5 mm

[0080] Preferably, the tubular body 3230 protrudes below the (outer face of) bottom wall 32 by at least one axial section.

[0081] Such axial section protruding below the bottom wall 32 of each tubular body 3230 preferably has a length substantially between 10 mm and 20 mm, preferably equal to 15 mm $\pm$ 2 mm

[0082] The tubular body 3230 of each delivery nozzle 323 has a circular and constant inner cross-section along the entire longitudinal length thereof, with an inner diameter substantially between 0.8 mm ($\pm$ 0.1 mm) and 1.2 mm ($\pm$ 0.1 mm).

[0083] For example, each delivery nozzle 323 is fixed to the bottom wall 32, e.g. removably or permanently.

[0084] For example, each delivery nozzle 323 can be

fixed to the bottom wall 32 by interference. In practice, each delivery nozzle 323 can be inserted axially, by interference, into an axial hole obtained in the bottom wall 32 (passing through it from one side to the other).

[0085] It is not excluded that each delivery nozzle 323 may be fixed in a different manner, such as screwed or the like, or may be permanently associated, such as welded to or co-moulded, with the bottom wall 32.

[0086] Each delivery nozzle 323 may have an annular enlargement 3231 at (or near) the first upper axial end of the delivery nozzle 323, which is configured to rest on the (inner wall of) the bottom wall 32.

[0087] For example, a sealing ring (e.g. defined integral with the annular enlargement 3231) is defined between the annular enlargement 3231 and the (inner wall of the) bottom wall 32. The annular enlargement 3231 may have a substantially conical shape, so as to substantially act as a pilot funnel to channel the glaze into the inner cavity of the tubular body 3230.

[0088] The through-holes 322 (in both the second and third embodiments) of the row of through-holes (i.e., the delivery nozzles 323 of the third embodiment) are equally distant from each other along said alignment direction, preferably with a pitch substantially equal to 5 mm $\pm$ 1 mm.

[0089] Furthermore, it is not excluded that the through-holes 322 (in themselves or the delivery nozzles 323) may be arranged in a plurality of rows, for example a pair of rows, side by side along a juxtaposition direction orthogonal to the longitudinal axis C.

[0090] Furthermore, the bottom wall 32 of the container body 31 is preferably internally shaped, so as to facilitate the release of the glaze from the passage opening 320.

[0091] In particular, an inner surface (inside the box-shaped container 31) of the bottom wall 32 defines an axially concave seat 324, which for example extends throughout the entire longitudinal dimension of the bottom wall 32 itself.

[0092] Said concave seat 324 thus defines a wide inlet at the outermost edges of the bottom wall 32 and a narrow outlet at the passage opening 320, so as to flow the glaze towards the passage opening 320 (i.e. the through-slot 321 or the through-holes 322 or the delivery nozzles 323 defining it).

[0093] The bottom wall 32, in this case, has a greater thickness (in the direction orthogonal to its longitudinal dimension) at the outermost edges, which decreases to a lower thickness at the passage opening 320.

[0094] In a preferred embodiment of the invention, the bottom wall 32 of the box-shaped container 31 is removably associated with it.

[0095] For this purpose, the bottom wall 32 can be removably (rigidly) fixed to the infill walls 34,35,36 of the box-shaped container 31, for example by means of fasteners such as screws or bolts (which thread into the shell from below and/or from the sides).

[0096] The infill walls 34,35,36, adjoining the bottom wall 32, or the upper wall 33, opposite to the bottom wall 32, may also be openable and therefore removably (rigidly) fixed to the corresponding adjoining walls of the box-shaped container 31, for example by removable fixing elements such as screws or bolts.

[0097] Alternatively, the box-shaped container 31 may at least partially comprise a single-piece body, to which, for example, the bottom wall 32 and possibly another wall adjoining or opposite to it may be attached.

[0098] In a preferred embodiment (see Figures 6 and 8), a filter partition 325 can be attached above the bottom wall 32, which is configured to filter the glaze directed towards the passage opening 320 (defined by the independent through-holes 322, the through-holes of the delivery nozzles 323 or the through-slot 321).

[0099] For example, the filtering partition 325 is defined by a membrane or filtering mesh, e.g. planar (horizontal), which is interposed between the infill walls 34,35,36 and the bottom wall 32 (so as to have its perimeter edge squashed in a vice between them).

[0100] In practice, all of the glaze contained in the box-shaped container 31 is forced to pass through (by gravity and/or other pushing forces) the filtering partition 325 before being able to exit (as filtered) through the passage opening 320 (defined by the independent through-holes or the through-holes 322 of the delivery nozzles 323 or the through-slot 321).

[0101] The front wall 35 of the box-shaped container 31 further has an opening 350 removably occluded by an infill element 351.

[0102] In the embodiment shown in the figures, the opening 350 of the front wall 35 consists of a through-hole, e.g. substantially quadrangular and of a dimension slightly smaller than the dimension of the front wall 35 itself.

[0103] The bottom wall 32 of the box-shaped container 31 is preferably made of a plastic material, preferably polyurethane.

[0104] It is not excluded, however, that such a bottom wall 32 could be made of metal or other material.

[0105] Each of the delivery nozzles 323, for example the tubular body 3230 thereof (with the exception of the annular enlargement 3231 which may be made of a plastic and/or elastic material), is made of metal, for example (stainless) steel.

[0106] The upper wall 33 and the infill walls 34,35,36 are, for example, made of metal material, such as steel.

[0107] The bottom wall 32 of the box-shaped container 31 is superimposed in plan at least on a section of the support surface A and at a (non-zero) distance from it.

[0108] In particular, the box-shaped container 31 is mounted on the support frame 25 of the conveyor 20, in particular so that the bottom wall 32 of the box-shaped container 31 faces the passage port 24 between the pairs of conveyors 21.

[0109] In this way, the box-shaped container 31 can deliver glaze onto the upper surface M2 of the manufactured article M which passes at the passage port 24 between the pairs of conveyors 21, and the exceeding glaze

which does not adhere to said upper surface M2 falls through the passage port 24 and is directed by a suitable collector and conveyor towards the discharge opening 251 of the support frame 25.

[0110] For example, the box-shaped container 31 is movably mounted relative to the support frame 25.

[0111] The support frame 25 comprises a support structure 26 of the box-shaped container 31, rigidly connected to the support frame 25 above the support plane A.

[0112] The support structure 26 comprises a pair of support walls 260 spaced apart from each other by a distance equal to or greater than the distance between two opposite side walls 36 of the box-shaped container 31.

[0113] Longitudinal guides 261, for example defined by grooved longitudinal struts with a horizontal longitudinal axis, are rigidly fixed to the support walls 260, to which suitable sliding runners 262 are connected, fixed to the opposite side walls 36 of the box-shaped container 31.

[0114] The box-shaped container 31 slides with respect to the longitudinal guides 261 along a sliding direction D parallel to the longitudinal axis C of the passage opening 320 of the bottom wall 32.

[0115] Furthermore, the at least one longitudinal guide 261 comprises a system for locking the box-shaped container 31, configured to lock it in position on the longitudinal guides 261, for example in a predefined axial working position on the support plane A.

[0116] In detail, said locking system is adapted to allow at least two relative positions of the box-shaped container 31 with respect to the longitudinal guides 261, of which a first backward working position, wherein the box-shaped container 31 is centred on the support plane A (defined by the conveyor 20 with respect to a vertical and longitudinal median plane thereof), and a second forward rest position, wherein the box-shaped container 31 is vertically off-centred from the support plane A, i.e. is arranged laterally relative thereto (i.e. on the same side of the vertical longitudinal median plane thereof) in a side zone of the support frame 25 accessible by an operator, in order to facilitate washing or possible maintenance of the box-shaped container 31.

[0117] In particular, the locking system comprises, for example, a snap-fit button 27, rigidly connected to the longitudinal guide 261, and adapted to be, for example, manually moved to axially lock (and unlock) the box-shaped container 31 by means of a forced contact (and detachment) with a side wall 36 thereof provided with engagement stops for said snap-fit button 27.

[0118] Each support wall 260 of the support structure 26 is, for example, movably associated, e.g. rotatably (about a horizontal axis of oscillation and parallel to the direction of handling B), with respect to the support frame 25 of the conveyor 20.

[0119] Preferably, the support walls 260 are configured to tilt the longitudinal guides 261 between a working configuration, wherein they are substantially horizontal, and a washing configuration, wherein they are tilted with respect to the horizontal one (e.g. by an acute angle, preferably lower than 45°, for example facing the side area of the support frame 25 accessible by the operator).

[0120] For example, the support walls 260 are driven by actuators 28, such as linear actuators, supported by the support frame 25 of the conveyor 20.

[0121] In particular, each actuator 28 is connected to a vertical support part 263 attached to the support wall 260.

[0122] Thus, the box-shaped container 31, associated with (the longitudinal guides 261 of) the support structure 26 by means of the sliding runners 262, is associated, in an oscillating manner, with respect to the support frame 25.

[0123] In particular, the box-shaped container 31 can be selectively positioned between a working position, corresponding to the working configuration of the longitudinal guides 261 at a retracted position of the linear actuators 28, wherein the bottom wall 32 of the box-shaped container 31 is substantially horizontal, and a washing position, corresponding to the washing configuration of the longitudinal guides 261 at an extracted position of the linear actuators 28, wherein the bottom wall 32 of the box-shaped container 31 is tilted with respect to the horizontal one, for example so that the highest portion of the box-shaped container 31 is arranged in the side area of the support frame 25 accessible by the operator.

[0124] The box-shaped container 31 further comprises at least one gripping device, adapted to facilitate the handling of the box-shaped container 31 itself and/or to allow the opening of certain walls thereof.

[0125] In the preferred example shown in Figure 3, the box-shaped container 31 comprises a first gripping device, i.e. a first handle 37, rigidly fixed at the infill element 351 of the front wall 35.

[0126] Said first handle 37 may, for example, allow removing the infill element 351 from the opening 350 of the front wall 35 and/or, when the infill element 351 is rigidly connected to the front wall 35, the first handle 37 may facilitate the handling of the box-shaped container 31.

[0127] In addition, the box-shaped container 31 includes a second gripping device, i.e., a second handle 38, rigidly fixed at the upper wall 33 and adapted to facilitate the handling of the box-shaped container 31 and/or the removal of the upper wall 33, in case the latter is removably fixed to the infill walls 34,35,36 of the box-shaped container 31.

[0128] The box-shaped container 31 further comprises a first glaze inlet opening 310, which is for example made at one of the infill walls 34,35,36 of the box-shaped container 31, preferably provided with a connection fitting.

[0129] The box-shaped container 31 further comprises a second pressurized air opening 311, which is for example made at the upper wall 33 of the box-shaped container 31, preferably provided with a connection fitting.

[0130] The box-shaped container 31 further comprises a third air intake opening 312, which is for example made at the upper wall 33 of the box-shaped container 31, preferably provided with a connection fitting.

[0131] In particular, the first opening 310 is connected, via the connection fitting, to a glaze delivery pump 11, which picks up the glaze from a tank 12, for example provided with a mixer, to send it to the box-shaped container 31.

[0132] The device 30 comprises at least one delivery arrangement 40 configured to generate a positive pressure in the box-shaped container 31 at least at a delivery pressure value greater than the atmospheric pressure.

[0133] Said delivery arrangement is configured to introduce air under pressure inside the box-shaped container 31, by means of the second opening 311 thereof, allowing the forced release of glaze from the passage opening 320 of the bottom wall 32.

[0134] In particular, the delivery arrangement 40 includes a pressure regulator 41 configured to vary the delivery pressure value to adjust the flow of glaze exiting the passage opening 320.

[0135] The device 30 further comprises a pressure control arrangement 50 inside the box-shaped container 31 configured to generate a vacuum inside thereof at a pressure value lower than an atmospheric pressure value.

[0136] In particular, said control arrangement 50 comprises a vacuum generator 51 configured to suck air from inside the box-shaped container 31 (i.e., to generate a vacuum condition inside the box-shaped container), by means of the third opening 312 thereof, allowing to stop the release of glaze from the passage opening 320 of the bottom wall 32 (i.e., from the through-holes 322 defined by the delivery nozzles 323 or from the independent through-holes 322 obtained in the bottom wall 32 or from the through-slot 321).

[0137] In particular, the system 10 comprises a control circuit 60 configured to allow the operation and/or control and setting of the delivery arrangement 40 and/or the control arrangement 50.

[0138] The control circuit 60 comprises, for example, a compressor 13 adapted to allow the pressurised air to enter the circuit 60.

[0139] The pressurised air, entering the control circuit 60, may selectively be directed to the delivery arrangement 40, the control arrangement 50 or a filling branch 62.

[0140] The delivery arrangement 40 and the control arrangement 50 are in communication with the second opening 311 and the third opening 312 of the box-shaped container 31 respectively by means of a set pressure outlet 601 and a set vacuum outlet 602, and the filling branch 62 is in communication with (the delivery of) the glaze delivery pump 11 and with the first opening 310 of the box-shaped container 31 by means of a glaze outlet 603. The pressurised air is initially directed through a filter F and a safety valve S.

[0141] A safety valve S is a pressure relief valve adapted to reduce the incoming air pressure to make it stable at the outlet.

[0142] In particular, the pressure is adjusted by means of a calibrated spring and controlled by a pressure switch located downstream of the safety valve S.

[0143] The control circuit 60 comprises, downstream of the safety valve S, mainly a first pressure branch 61, a second filling branch 62 and a third vacuum branch 63.

[0144] The first pressure branch 61 is initially intercepted by the pressure regulator 41.

[0145] In particular, the pressure regulator 41 comprises a microprocessor 410 adapted to establish a predetermined pressure of the air to be delivered.

[0146] Said microprocessor 410, following the setting of the predetermined pressure, drives at least one solenoid valve 610 adapted to allow the passage of pressurised air towards the set pressure outlet 601.

[0147] The solenoid valve 610 is therefore operatively movable (electrically driven by the microprocessor 410) between a first position in which it sends pressurised air towards the set pressure outlet 601, and a second position in which it is closed and does not send pressurised air.

[0148] The solenoid valve 610 is for example a valve electrically driven by a single coil solenoid and spring return.

[0149] The first pressure branch 61 is intercepted, downstream of the pressure regulator 41, by a passage valve 611, i.e. an isolation valve preferably shaped like a ball valve.

[0150] Said passage valve 611 is preferably a two-way and two-position valve configured to selectively open or close the first pressure branch 61 at the set pressure outlet 601.

[0151] The opening and closure of the passage valve 611, in particular, is controlled by a first control valve 612.

[0152] Said first control valve 612 is preferably a solenoid valve which is in turn controlled by applying a pneumatic pressure in a pilot stage.

[0153] The second filling branch 62 is initially intercepted by a further solenoid valve 620 controlled in its first passage position and in its second closing position, by electrical actuation and application of a pneumatic pressure in a pilot stage.

[0154] Downstream of the additional solenoid valve 620, the second filling branch is intercepted by a pneumatic actuator 621, which allows sending glaze to the glaze outlet 603, when the additional solenoid valve 620 is in its first passage position.

[0155] The third vacuum branch 63, initially intercepted by a second solenoid valve 630, is controlled by a vacuum switch adapted to monitor and ensure safety to the control circuit 60 which is about to generate a predetermined vacuum.

[0156] The second solenoid valve 630 is operationally movable between an operating position, controlled by electrical actuation and application of a pneumatic pressure in a pilot stage, and a non-operating position.

[0157] In particular, the control circuit 60 comprises a pair of tanks, of which a first tank 52 of maximum vacuum level, and a second tank 53 of controlled vacuum level, connected to each other and adapted to generate a vacuum inside the box-shaped container 31.

[0158] In particular, the first tank 52, located downstream of the second solenoid valve 630 on the third vacuum branch 63, is connected to the vacuum generator 51.

[0159] The vacuum generator 51 is configured to generate a vacuum inside the first tank 52 and the second tank 53 (as will be explained later), and via the set vacuum outlet 602 to generate a vacuum inside the box-shaped container 31, such that the glaze delivery is blocked.

[0160] The vacuum generator 51 preferably includes a venturi tube 510.

[0161] In detail, the venturi tube 510 comprises an inlet P of pressurised air, a necking section at a second inlet U, and an outlet R.

[0162] The air entering P, directed onto the third vacuum branch 63 from the second solenoid valve 630 in the operating position, undergoes an acceleration and a simultaneous reduction in pressure at the necking section of the venturi tube 510, allowing air to be sucked from the first tank 52 and generating the vacuum inside thereof.

[0163] In particular, a spring-loaded check valve 631 is interposed between the first tank 52 and the second inlet U of the venturi tube 510.

[0164] Said check valve 631 allows the passage of air from the first tank 52 to the second inlet U of the venturi tube 510 only if the pressure of the air upstream thereof, i.e. exiting the first reservoir 52, is greater than the pressure downstream of the check valve 631, i.e. at the second inlet U of the venturi tube 510, added to the pressure exerted by the force of the spring.

[0165] In other words, the spring-loaded check valve 631 is calibrated to generate a predetermined vacuum value within the first tank 52.

[0166] The first tank 52 communicates with the second tank 53 via a connection branch 64. This connection branch 64 is intercepted by a second safety valve 640.

[0167] The second safety valve 640 is a pressure adjustment valve adapted to adjust the incoming air pressure to make it stable at the outlet.

[0168] In particular, the pressure is adjusted by means of a calibrated spring and controlled by a pressure switch located downstream of the second safety valve 640.

[0169] The connection branch 64 is further intercepted by at least one first additional vacuum switch, and a second additional vacuum switch, adapted to monitor and establish the respective vacuum level of each tank.

[0170] The connection branch 64, which connects the first tank 52 to the second tank 53, provides a vacuum at the second tank 53, which is controlled according to the level set by the vacuum switch.

[0171] The second tank 53 is, then, in turn connected via a second passage valve 641 to the set vacuum outlet 602.

[0172] This second passage valve 641, i.e. an isolating valve, is preferably shaped like a ball valve.

[0173] The second passage valve 641 is preferably a two-way and two-position valve configured to selectively open or close the set vacuum outlet 602.

[0174] In particular, the opening and closure of the second passage valve 641, is controlled by a second control valve 642.

[0175] The second control valve 642 is preferably a solenoid valve which is in turn controlled by applying a pneumatic pressure in a pilot stage.

[0176] The first tank 52 and the second tank 53 are also connected to a respective tap, i.e. preferably a ball valve, configured to open or close the corresponding tank as required.

[0177] In an alternative embodiment not shown in the figures, the control circuit 60 may comprise a single pressure/vacuum branch intercepted by an electronically controlled proportional valve, adapted to adjust the delivery of pressure or the creation of a vacuum at the box-shaped container.

[0178] The plant 10 further comprises a detection arrangement operatively connected to the control circuit 60 and/or the glaze delivery pump 11.

[0179] The detection arrangement comprises at least one level sensor 71, connected to the box-shaped container 31 and the control circuit 60 and configured to measure the amount of glaze contained therein.

[0180] For example, the level sensor 71 is of the capacitive type, applied to the outside of the box-shaped container 31 and adapted to detect the specific and/or continuous level of glaze through a wall of the box-shaped container 31 itself.

[0181] It must not be excluded that the sensor level 71 may be of the optical, ultrasonic, or of any other type suitable for glazing systems.

[0182] For example, the level sensor 71 is connected to the glaze delivery pump 11 in such a way as to allow filling the box-shaped container 31 when the level of glaze falls below a predetermined threshold value, or to stop the filling of the box-shaped container 31 when the level of glaze rises above a predetermined limit value.

[0183] Furthermore, the level sensor 71 is for example connected to the additional solenoid valve 620 of the filling branch 62 of the control circuit 60, so as to control the first passing position and the second closing position thereof.

[0184] Thus, the level sensor 71 enables the handling of the pneumatic actuator 621 which sends the glaze to the box-shaped container, when the level of glaze falls below a predetermined threshold value, or which blocks supplying glaze to the box-shaped container, when the level of glaze rises above a predetermined threshold value.

[0185] The detection arrangement further comprises a position sensor 72, for example a position transducer, operatively connected to the control circuit 60 and configured for example to check the relative position of the

manufactured articles M relative to the box-shaped container 31.

[0186] In particular, the position sensor 72 is adapted to convert, by means of the control circuit 60, the relative position of the manufactured articles M with respect to the box-shaped container 31, into an air pressure value, allowing to deliver a glaze film or to block the release thereof from the box-shaped container 31.

[0187] The plant 10 also includes an electronic control arrangement U configured to manage the operation of the system 10 in an automated manner.

[0188] The electronic control arrangement U is, for example, operatively connected to the control circuit 60 and/or the glaze delivery pump 11 and/or the detection arrangement 71,72 for managing and controlling the automated operation of the plant 10.

[0189] In the light of the above, the operation of the plant 10 is the following.

[0190] A manufactured article M or a sequence of articles M to be glazed is fed in the handling direction B by conveyors 21, with the upper surface M2 to be glazed facing upwards.

[0191] Each manufactured article M thus arranged on the support plane A advances below the box-shaped container 31, which delivers glaze from the passage opening 320, for example defined by the set of through-holes 322 of the delivery nozzles 323 or the independent through-holes 322 or the through-slot 321.

[0192] In practice, each (through-hole 322 of each) delivery nozzle 323 (where provided) delivers a (perfectly) vertical jet of glaze, which joining the jet of the other delivery nozzles 323 generates an even veil of glaze falling vertically on the upper surface M2 of the article M advancing along the direction of handling B.

[0193] The veil of glaze generated by the delivery nozzles 323, due to their shape and distance from each other (and to the delivery pressure and/or the feed rate of the manufactured articles M) evenly covers the upper surface M2 of the manufactured article M advancing along the direction of handling B.

[0194] In particular, the delivery of glaze is controlled according to the position sensor 72 operatively connected to the control circuit 60.

[0195] In particular:

- by means of the pressure regulator 41 it is possible to set the pressure at which the glaze is to be delivered (thus adjusting the amount of glaze on the manufactured article M);
- by means of the vacuum generator 51, it is possible to generate a vacuum in the box-shaped container 31 so as to stop the delivery of glaze.

[0196] The exceeding glaze delivered from the box-shaped container 31 and not adhering to the manufactured article M is discharged from the passage port 24 between the conveyors 21 via the discharge opening 251 at the tank 12, from which it is picked up by the pump 11 and returned into the box-shaped container 31 to be delivered again.

[0197] Any lack or excess of glaze inside the box-shaped container 31 is also detected by the level sensor 71 operatively connected to the pump 11.

[0198] Furthermore, when the plant 10 is not operating, the box-shaped container 31 can be tilted with respect to the support frame 25 by driving the linear actuators 28, so as to facilitate cleaning and/or maintenance operations of the box-shaped container 31 itself. The invention thus conceived is susceptible to several modifications and variations, all falling within the scope of the inventive concept.

[0199] Moreover, all the details can be replaced by other technically equivalent elements.

[0200] In practice, the materials used, as well as the contingent shapes and sizes, can be whatever according to the requirements without for this reason departing from the scope of protection of the following claims.

Claims

1. A device (30) for glazing manufactured articles (M) comprising:
   a box-shaped container (31) wherein a glaze for glazing manufactured articles (M) is contained, wherein the box-shaped container (31) comprises a bottom wall (32) having at least one passage opening (320) extending along a horizontal longitudinal axis (C) and configured to release a veil of glaze.

2. The device (30) according to claim 1, further comprising a pressure control arrangement (50) inside the box-shaped container (31) configured to generate a vacuum inside the box-shaped container (31) at a pressure value lower than an atmospheric pressure value to stop releasing glaze from the passage opening (320).

3. The device (30) according to claim 2, wherein the control arrangement (50) comprises a vacuum generator (51).

4. The device (30) according to claim 1, wherein the passage opening (320) comprises at least one elongated through-slot (321) arranged orthogonal to a mutual direction of handling (B) between the manufactured articles (M) and the box-shaped container (31).

5. The device (30) according to claim 1, wherein the passage opening (320) comprises a plurality of through-holes (322) arranged in a single row and aligned along a horizontal alignment direction parallel to the longitudinal axis (C) and orthogonal to a mutual handling direction (B) between the manufactured articles (M) and the box-shaped container (31).

6. The device (30) according to claim 5, wherein each through-hole (322) is formed by a respective delivery nozzle (323) attached to the bottom wall (32).

7. The device (30) according to claim 6, wherein each delivery nozzle (323) comprises an elongated tubular body (3230) provided with a longitudinal axis orthogonal to the direction of handling (B) and the longitudinal axis (C) of the passage opening (320), wherein the tubular body (323) preferably protrudes below the bottom wall (32) by at least an axial section.

8. The device (30) according to the preceding claim, wherein the tubular body (3230) has a length substantially between 30 mm and 60 mm, preferably equal to 50 mm ± mm and/or the axial section protruding below the bottom wall (32) of each tubular body (3230) has a length substantially between 10 mm and 20 mm, preferably equal to 15 mm ± 2 mm.

9. The device (30) according to claim 7, wherein each tubular body (3230) has a circular and constant inner cross-section along the entire longitudinal extension thereof, with an inner diameter substantially between 0.8 mm and 1.2 mm.

10. The device (30) according to claim 5 or 6, wherein the through-holes (322) of the row of through-holes are equally distant from each other, preferably with a pitch substantially equal to 5 mm ± 1 mm.

11. The device (30) according to claim 7, wherein the bottom wall (32) is made of a plastic material, preferably polyurethane and, preferably, each delivery nozzle (323) is made of a metal material.

12. The device (30) according to claim 1, wherein the bottom wall (32) is removably associated with the box-shaped container (31).

13. The device (30) according to claim 1, wherein the box-shaped container (31) comprises at least one opening wall adjoining or opposite to the bottom wall (32).

14. The device (30) according to claim 1, further comprising at least one delivery arrangement (40) configured to generate a positive pressure in the box-shaped container (31) to at least one delivery pressure value greater than the atmospheric pressure to allow the forced release of glaze from the passage opening (320) and, preferably, the delivery assembly (40) comprises a pressure regulator (41) configured to vary the delivery pressure value to adjust the flow of glaze exiting the passage opening (320).

15. A plant (10) for glazing manufactured articles (M) comprising:

- a conveyor (20) provided with a support plane (A) configured to support at least one article (M) and provided with a handling arrangement (21) for moving the manufactured article (M) along a horizontal handling direction (B);
- a device (30) according to claim 1, wherein the bottom wall (32) of the box-shaped container (31) is superimposed in plan by at least one section of the support plane (A) with the passage opening (320) placed at a non-zero distance therefrom.

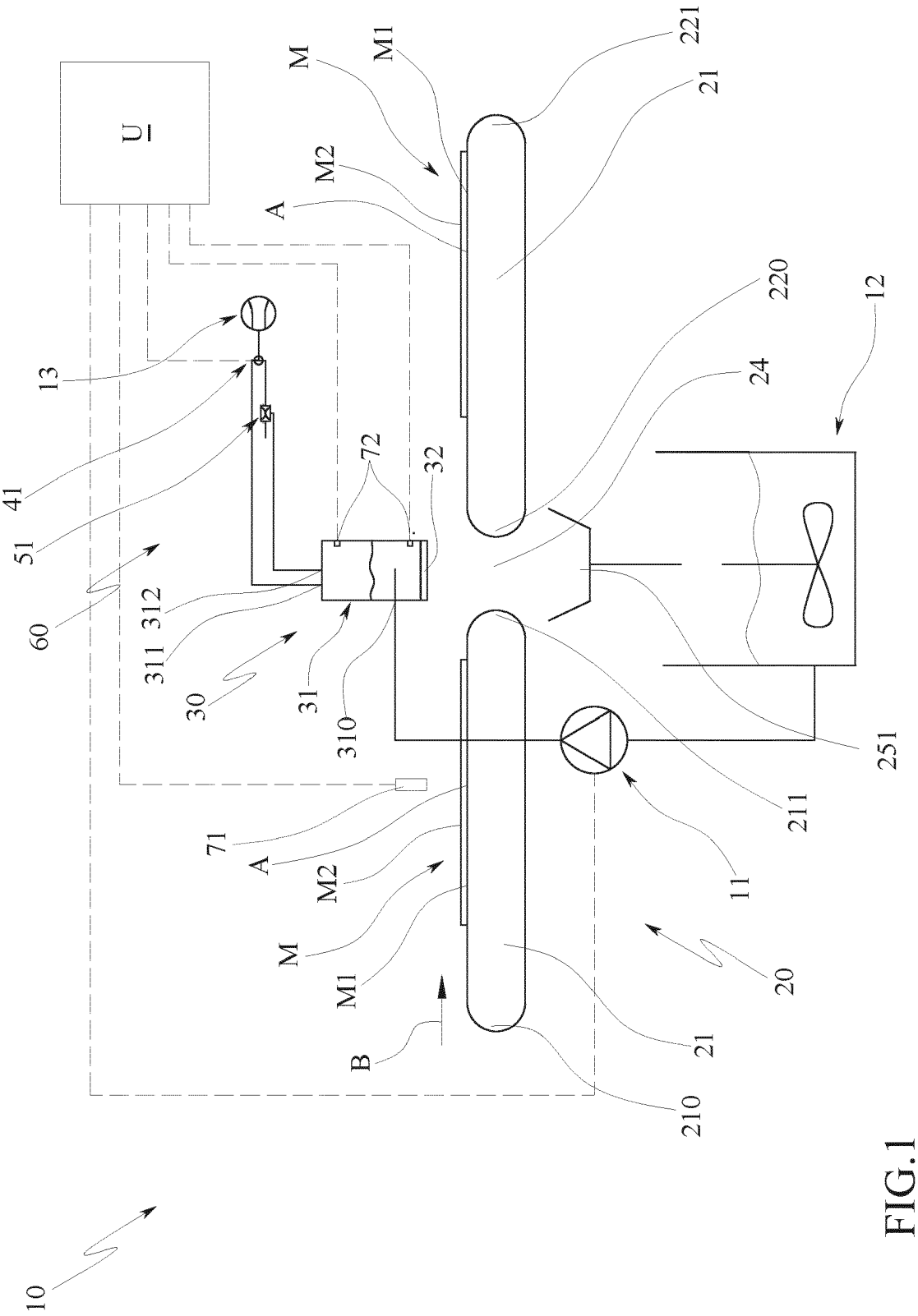
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FIG.1

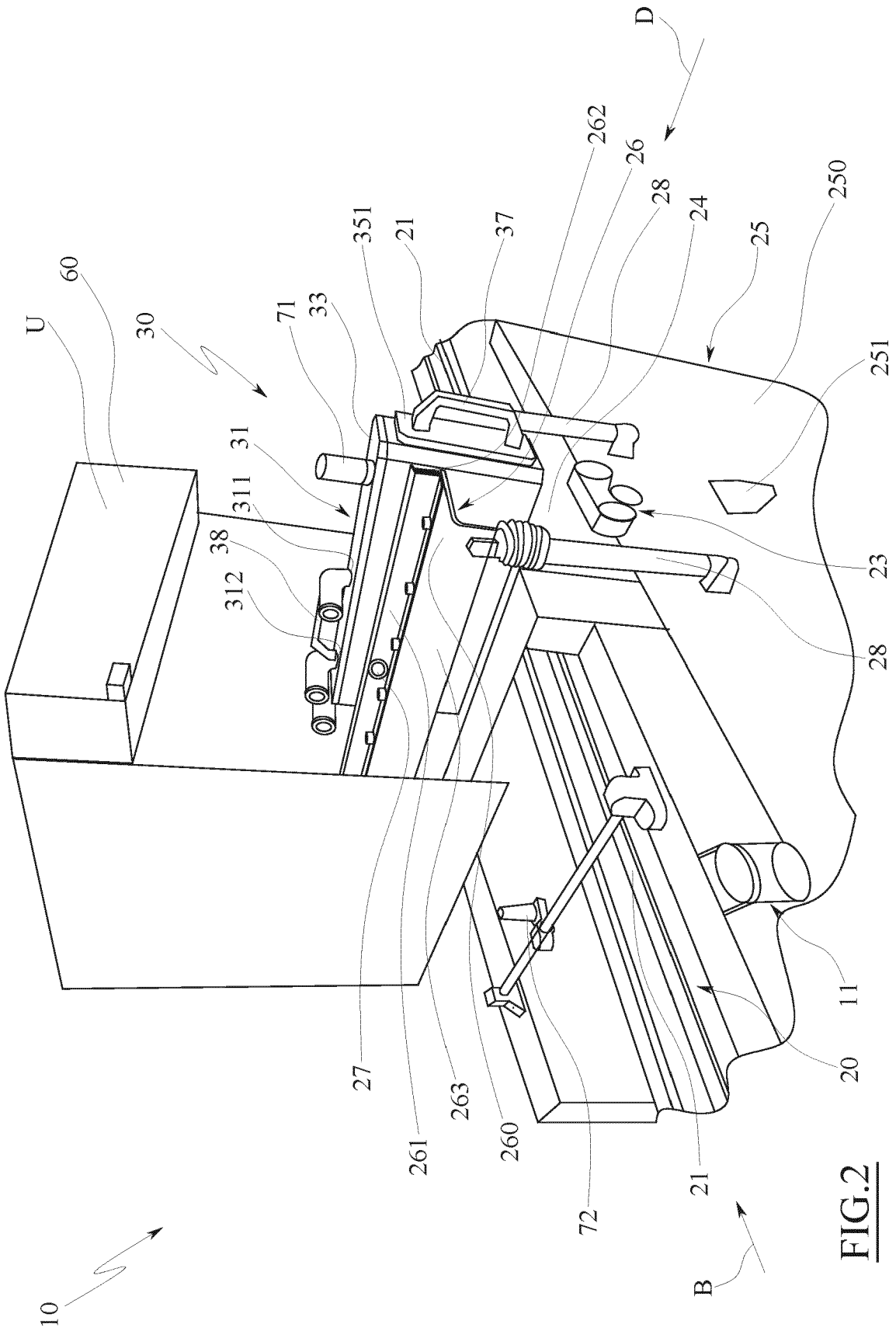
D
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FIG.2

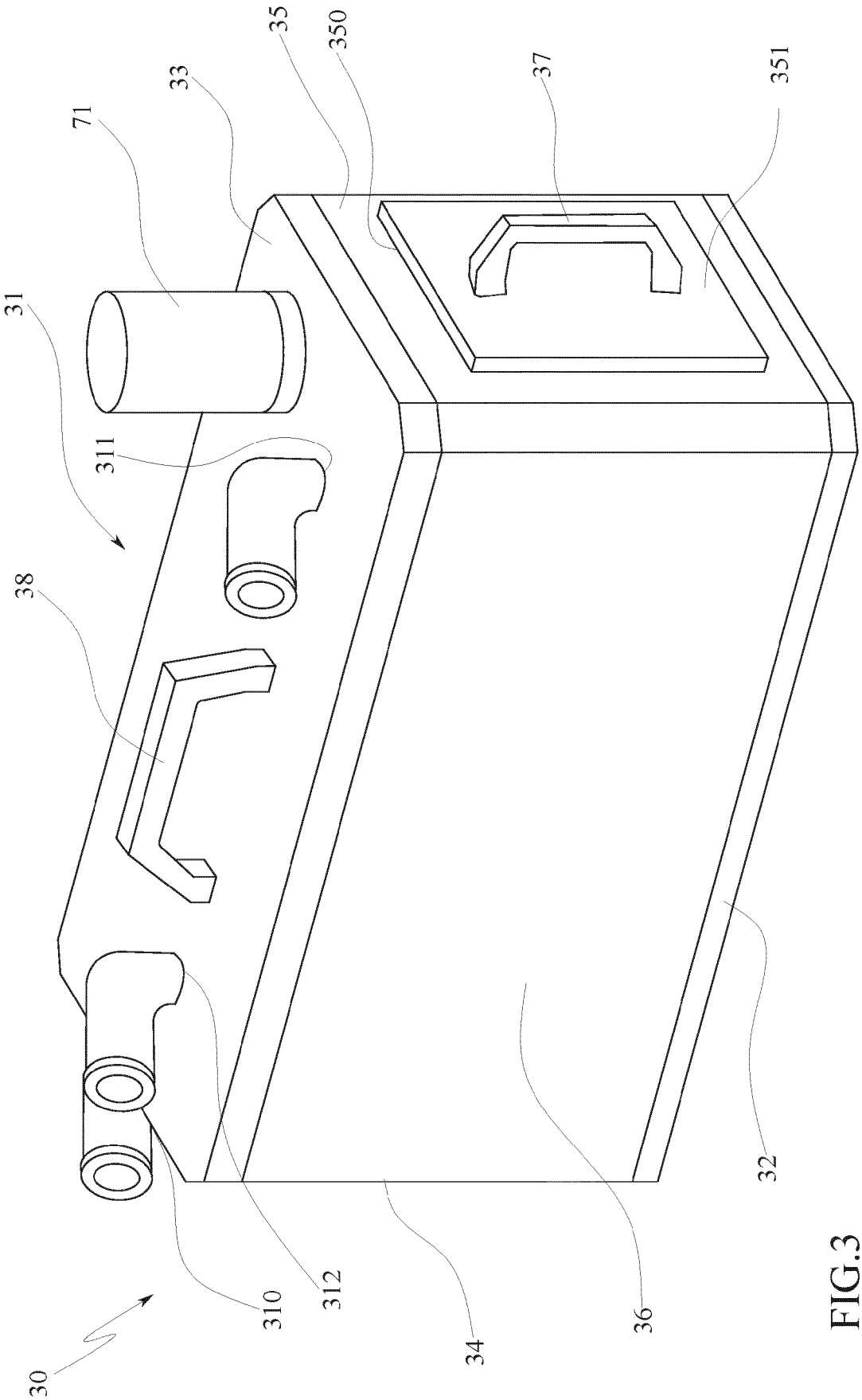

FIG.3

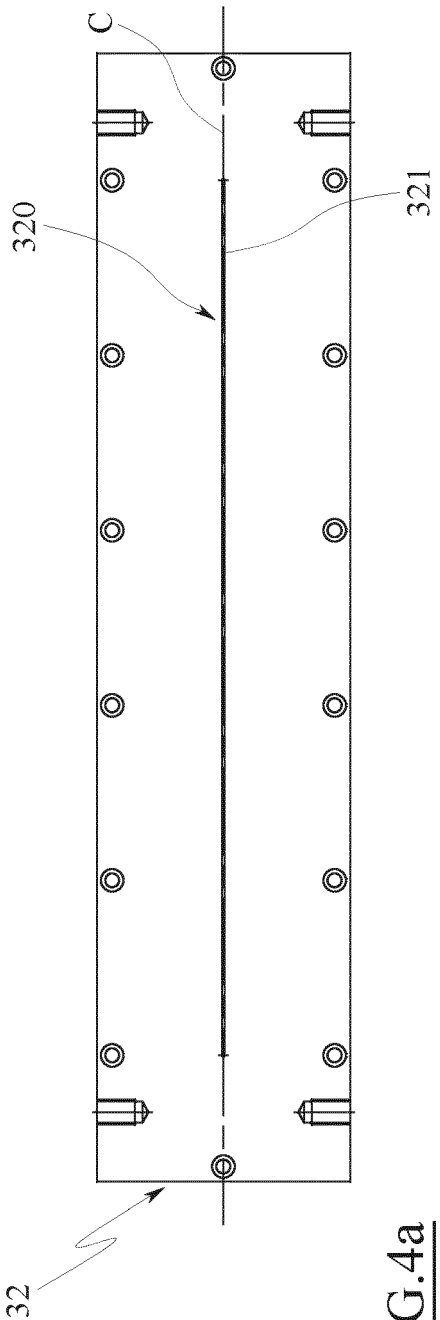

FIG.4a

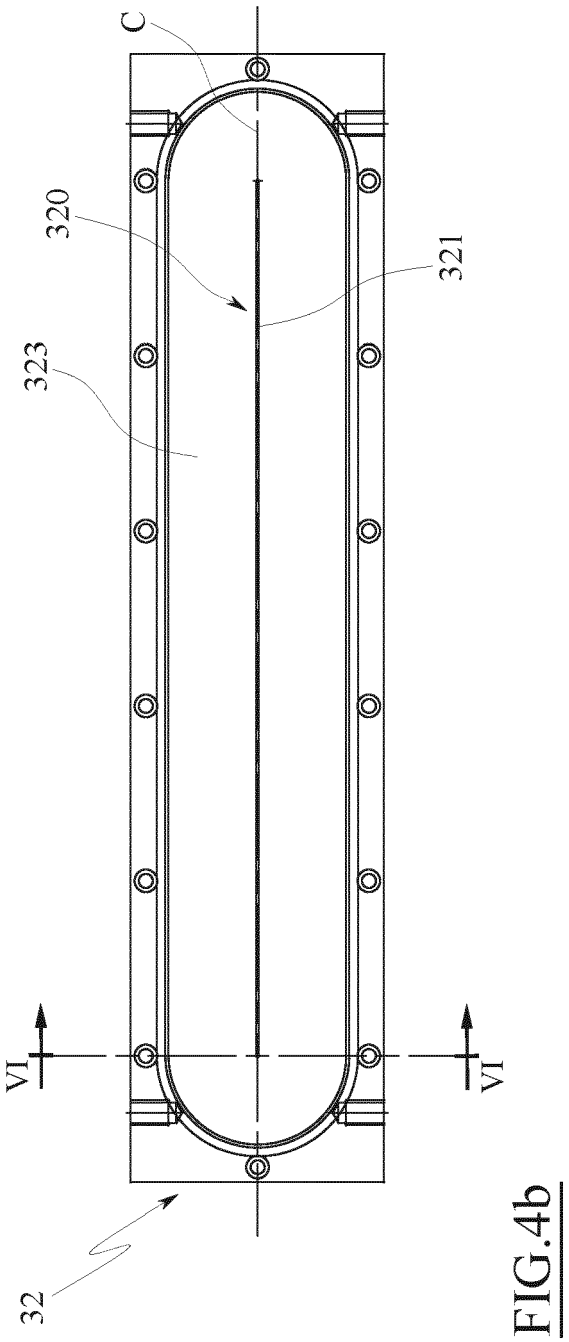

FIG.4b

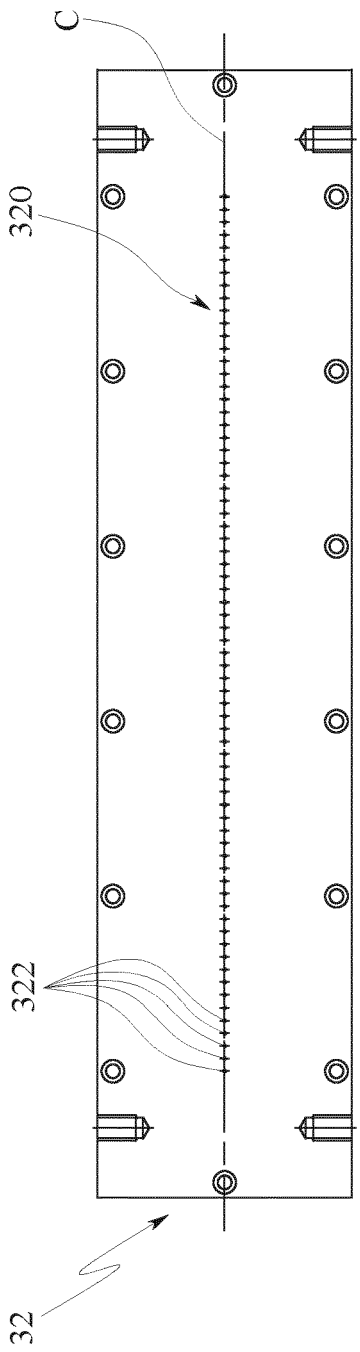

FIG.5a

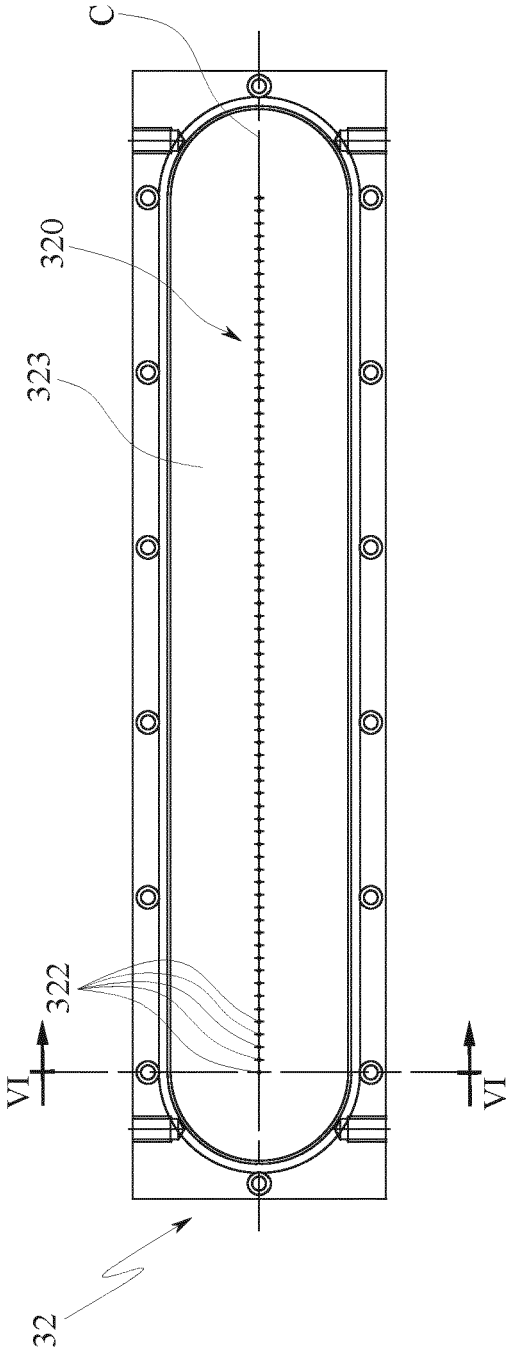

FIG.5b

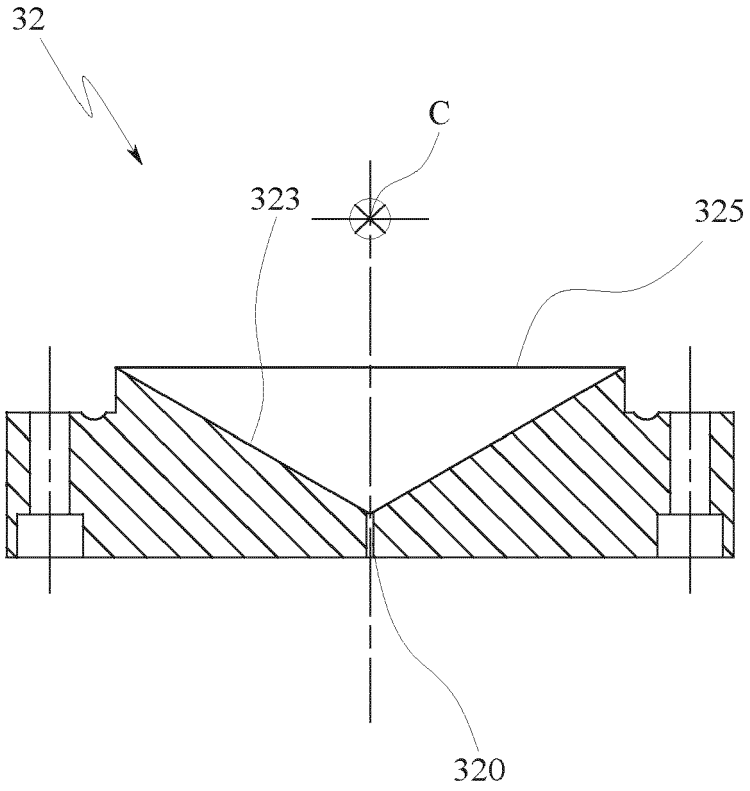

FIG.6

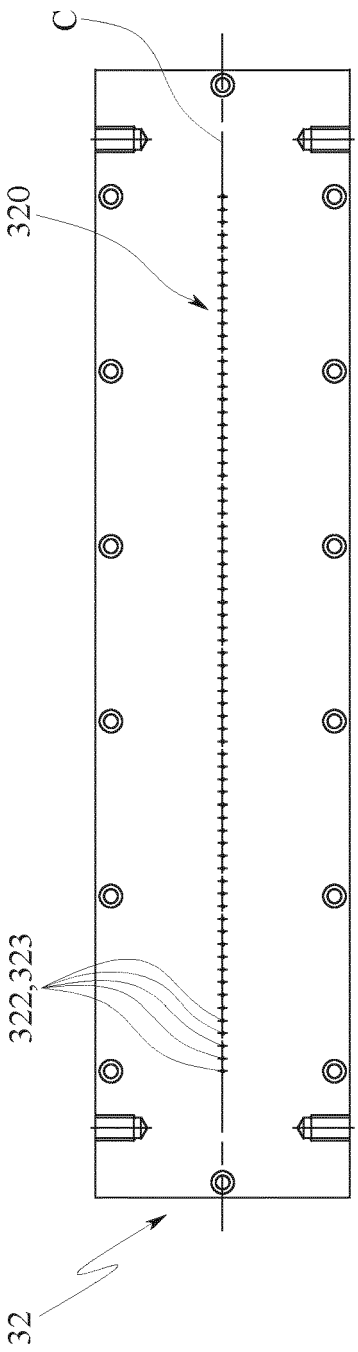

FIG.7a

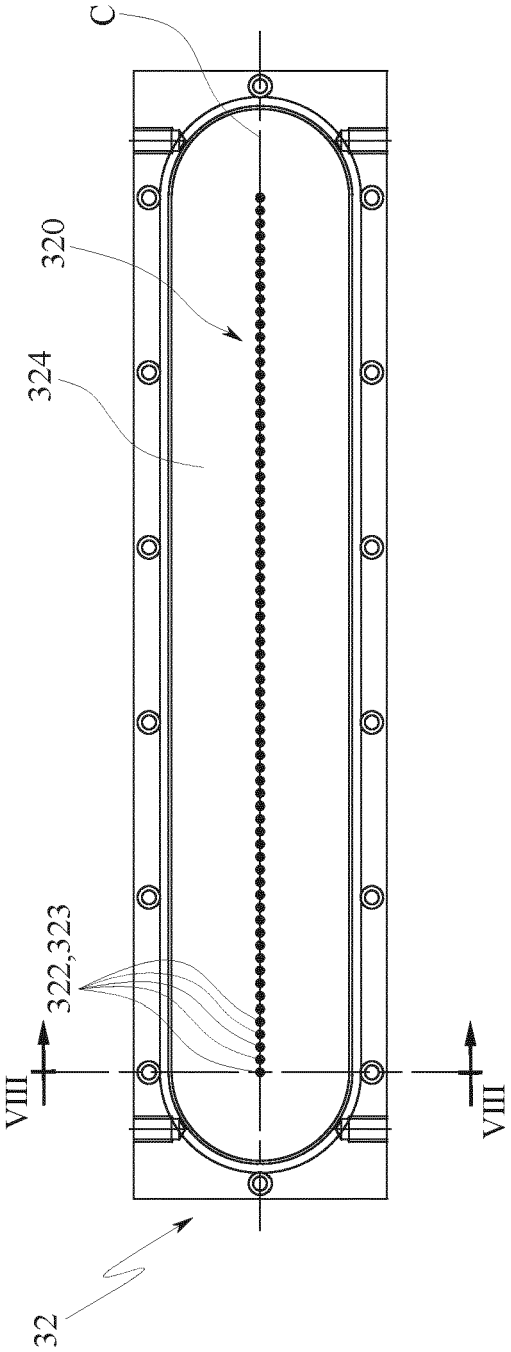

FIG.7b

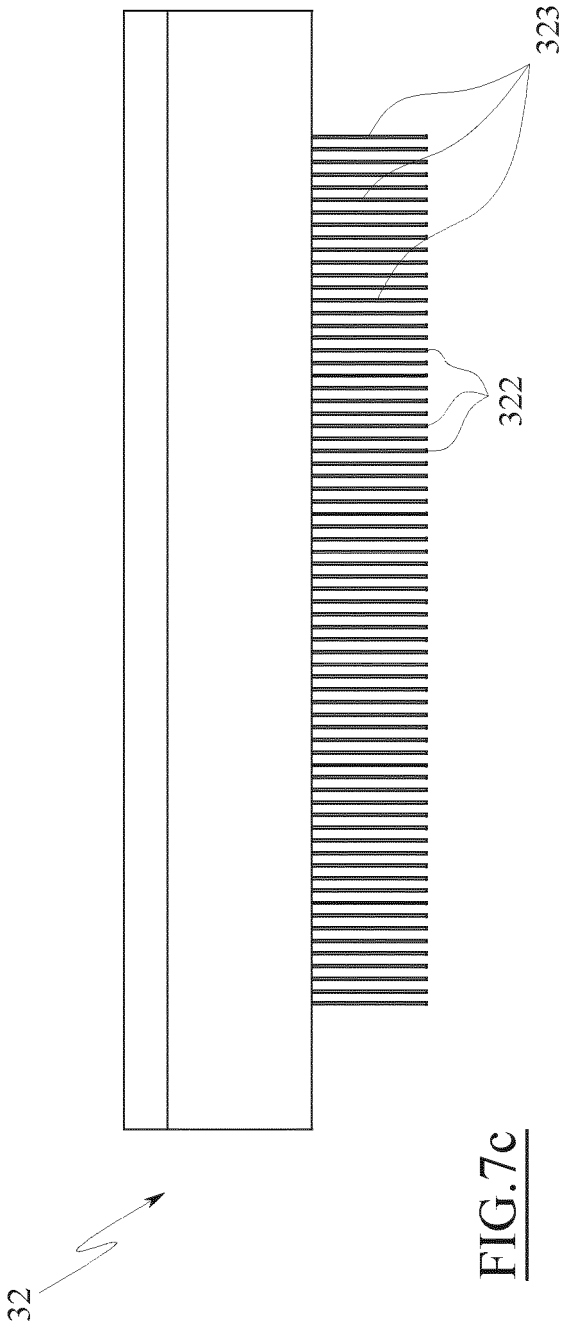

FIG.7c

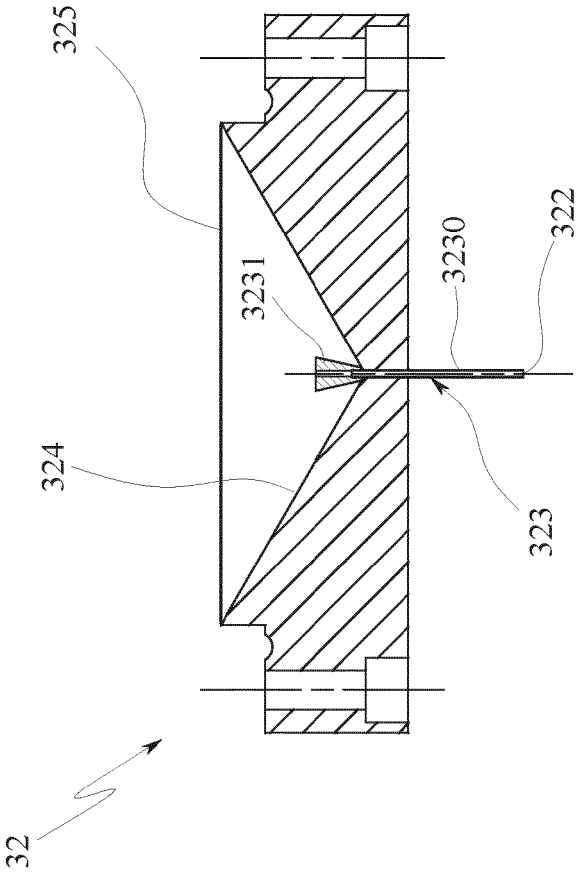

FIG.8

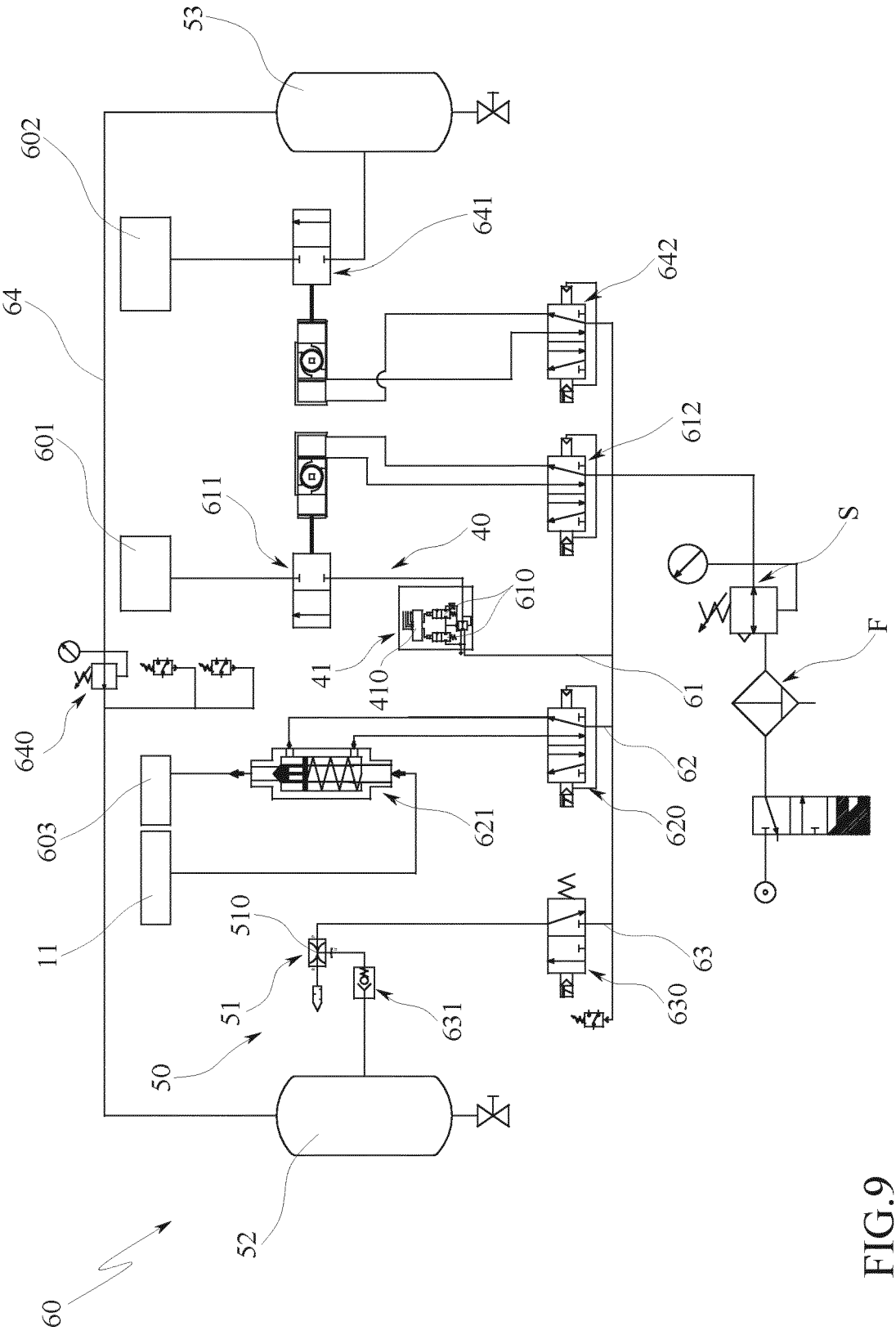
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FIG.9

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EUROPEAN SEARCH REPORT

Application Number
EP 21 18 5853

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B05C
B29C
B28B

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 December 2021	Roldán Abalos, Jaime

CATEGORY OF CITED DOCUMENTS

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