(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
19 December 2024 (19.12.2024)

WIPO | PCT

(10) International Publication Number
WO 2024/256930 A2

(51) International Patent Classification:
Not classified

(21) International Application Number:
PCT/IB2024/055546

(22) International Filing Date:
06 June 2024 (06.06.2024)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
102023000012042 13 June 2023 (13.06.2023) IT

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,

(54) **Title:** DISPENSER FOR A MATERIAL IN FLAKES OR GRAINS

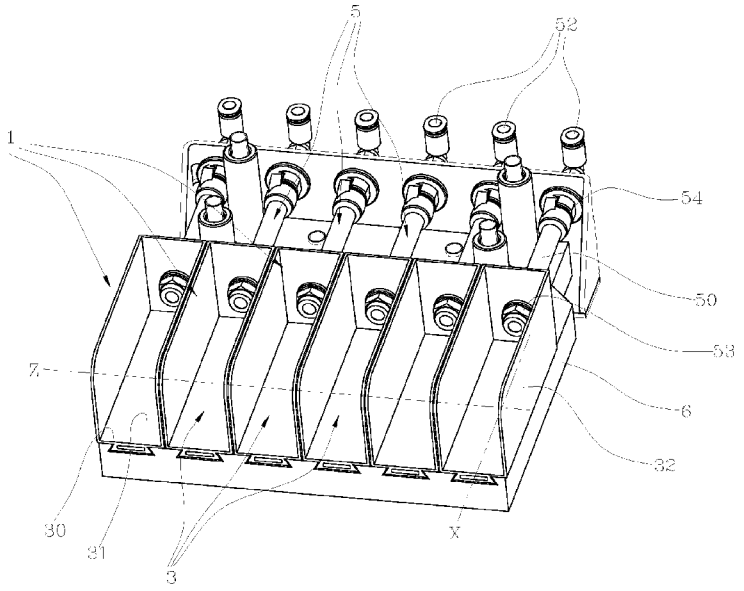

Fig.1

(57) **Abstract:** A dispensing device for granular materials in flakes or grains, characterized in that it comprises: a hopper (2), provided with a lower discharge opening (21); a drawer (3), arranged below the discharge opening (21) of the hopper (2), 5 which defines a containment space and is provided with a free edge (30) allowing the flow of the granular material along at least one main direction (X); a transverse wall (4), lying on a plane transverse to the main direction (X) and arranged at least partly inside the drawer (3); 10 motor means (5), arranged to implement an alternating relative motion along the main direction (X) between the drawer (3) and the transverse wall (4).

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DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

DESCRIPTION

DISPENSER FOR A MATERIAL IN FLAKES OR GRAINS

The present invention relates to a dispensing device for materials in flakes or grains.

In particular, the invention concerns a dispensing device which allows the controlled deposit of a material in flakes or grains.

By material in flakes or grains is meant a material comprising particles with sizes relatively larger than the sizes of the particles present in the ceramic mixtures in the atomised form. In particular, the invention is able to dispense in a controlled manner materials comprising flakes or grains with significant sizes up to 15 mm or more.

The invention is useful for the decoration of ceramic tiles.

As is known, the decoration of ceramic tiles substantially occurs with two main techniques.

A first technique involves applying the decoration on the raw tile by means of ink jet printers. The decoration is applied on the tile after pressing and before firing.

A second technique involves applying the decoration, always in a step prior to firing the tile, in the form of granular or powdered material.

In this second technique, the granular or powdered material which forms the decoration is deposited by means of devices of varying nature.

Some of the devices currently used involve depositing the material by gravity, through discharge openings provided with a closure means which can be operated in a controlled manner. The Applicant has devised a device for the deposit of powdered material, particularly suitable for the controlled deposit of ceramic material in atomised form, which makes it possible to perform an extremely precise deposit. Such a device is described in Italian patent applications 102019000003497 and 102019000008619.

Apart from the aforementioned device, which in any case is not entirely effective for the deposit of materials having a larger grain size, the current

devices, even those of a more complex type, do not however allow the amount or the position of the material deposited to be controlled precisely. The current devices, in substance, are only useful for making decorations in the form of relatively undefined shading or veins.

The object of the present invention is to offer a dispensing device for granular materials in flakes or grains that allows to overcome the drawbacks of currently available devices.

An advantage of the dispensing device according to the present invention is that it allows a very precise deposit of the material.

Another advantage of the device is that it is very compact and lightweight, suited to be moved and positioned with ease.

A further advantage of the device, due to its compact size, is that of being able to be used in a relatively high number of items, to speed up the application of the decoration.

Additional features and advantages of the present invention will become more apparent from the following detailed description of an embodiment of the invention in question, illustrated by way of non-limiting example in the appended figures, in which:

- figure 1 shows an isometric view of a group of dispensing devices according to the present invention;
- figure 2 shows a dispensing bar according to the present invention;
- figure 3 shows an isometric view of an area of the dispensing bar of figure 2, with some parts removed to show others;
- figure 4 shows a sectional view of the dispensing bar, carried out on plane IV-IV represented in figure 4;
- figure 5 schematically shows a tile obtained by applying the method according to the present invention.

The dispensing device according to the present invention is capable of dispensing in a precisely controlled manner granular materials, comprising flakes or grains. By flakes or grains are meant particles with size relatively larger than the size of the particles present in the ceramic mixtures in the

atomised form. In particular, the invention is able to dispense in a controlled manner materials comprising flakes or grains with a size up to 15 mm or more.

The dispensing device comprises a hopper (2), provided with a lower discharge opening (21). The hopper (2) substantially defines a container, intended to receive the granular material to be dispensed through the discharge opening (21). The granular material to the hopper (2) can be fed continuously or discontinuously, by means of a feeding device of a known type and not represented. In the embodiment represented, the hopper (2) has a tubular shape, tapered downwards in the area of the discharge opening (2). The granular material through the discharge opening (21) is discharged substantially by gravity.

The dispensing device further comprises a drawer (3), arranged below the discharge opening (21) of the hopper (2). The drawer (3) substantially defines a container, i.e. it defines a containment space for the granular material coming from the hopper (2). The drawer is provided with a free edge (30) that allows the flow of granular material along at least one main direction (X). Preferably, but not necessarily, the main direction (X) is horizontal.

In particular, the drawer (3) has a bottom wall (31) and a side wall (32), substantially C-shaped, which extends perpendicularly to the bottom (31) along the contour of the bottom (31), leaving the free edge (30) free, i.e. without extending on the free edge (30). Preferably, but not necessarily, the bottom (31) is parallel to the main direction (X). Preferably, but not necessarily, the bottom (31) is horizontal. In this way, the bottom (31) is able to support the granular material coming from the hopper (2), without hindering the flowing of the granular material along the main direction (X), except for the friction. In an embodiment not represented, the bottom (31) is inclined downwards towards the free edge (30).

The drawer (3) is open at the top, so that it can freely receive the granular material coming from the hopper (2). The granular material, flowing

through the discharge opening (21) of the hopper (2), deposits on the bottom (31) and is contained laterally by the side wall (32), while it is free to pass beyond the free edge (30) if subjected to a thrust directed along the main direction (X), as will be better explained below.

The dispensing device according to the present invention is provided with motor means (5), arranged to implement an alternating motion of the drawer (3) along the main direction (X), i.e. a motion comprising two back and forth strokes in the opposite direction. In other words, the motor means (5) is configured to produce an alternating displacement or sliding of the drawer (3), along the main direction (X), in opposite alternating directions.

The implementation of an alternating motion of the drawer (3) produces the following effects.

The granular material is fed to the hopper (2), by means of known means. Under initial conditions of stop of the motor means (5),the granular material flows along the hopper (2) and, through the discharge opening (21), deposits in the drawer (3), accumulating without reaching the free edge (30). To this end, the discharge opening (21) is arranged at a height from the bottom (31) of the drawer (3) such that the accumulation of granular material is kept inside the free edge (30), i.e. in such a way as to prevent the accumulation of granular material, naturally arranged on the bottom (31) according to its natural angle of repose, from reaching the free edge (30). As is known, a granular material, when deposited by gravity on a horizontal plane, forms a conical heap whose base angle is precisely called "angle of internal friction" or "natural angle of repose". By subsequently activating the motor means (5), the alternating motion of the drawer (3) along the main direction (X) is produced.

At each reversal of the motion, an acceleration is produced on the system comprising the drawer (3) and the material deposited thereon. This acceleration produces a thrust on the material, directed along the main direction (X). In particular, the reversal between the stroke of advancement

in the direction of the free edge (30) and the opposite stroke produces on the material a thrust directed towards the free edge (30), which thrust is due to the inertia force of the material itself. This allows the material to advance towards the free edge (30) and to pass beyond it, being discharged from the drawer (3). By regulating in a controlled manner the acceleration curves imposed by the motor means (5) on the drawer (3), with calculation methods known to the person skilled in the art, it is possible to regulate the advancement of the material and therefore the amount of material discharged at each reversal between the stroke of advancement in the direction of the free edge (30) and the opposite stroke.

In the represented, preferred but not exclusive, embodiment the dispensing device according to the present invention comprises a transverse wall (4), lying on a plane transverse to the main direction (X), arranged at least partly inside the drawer (3). Preferably, but not necessarily, the transverse wall (4) is perpendicular to the main direction (X).

The motor means (5) is arranged to implement an alternating relative motion along the main direction (X) between the drawer (3) and the transverse wall (4). In other words, the motor means (5) is configured to produce a relative displacement, or relative sliding, directed along the main direction (X), between the drawer (3) and the transverse wall (4), in alternating and opposite directions. This allows at least one thrust directed along the main direction (X) towards the free edge (30) to be transmitted to the granular material present inside the drawer (3).

The effect produced by the transverse wall (4) is as follows.

As already mentioned, the granular material is fed to the hopper (2), by means of known means. Under initial conditions of stop of the motor means (5), there is no alternating relative motion between the drawer (3) and the transverse wall (4). The granular material flows along the hopper (2) and, through the discharge opening (21), deposits in the drawer (3),

accumulating without reaching the free edge (30). This is because the discharge opening (21) is arranged at a height from the bottom (31) of the drawer (3) such that the accumulation of granular material is kept inside the free edge (30), i.e. in such a way as to prevent the accumulation of granular material, naturally arranged on the bottom (31) according to its natural angle of repose, from reaching the free edge (30). By subsequently activating the motor means (5), the alternating relative motion is produced along the main direction (X) between the drawer (3) and the transverse wall (4).

The alternating relative motion produced by the motor means (5) produces a displacement between the transverse wall (4) and the drawer (3) with strokes with opposite direction. In one direction, the stroke brings the transverse wall (4) closer to the free edge (30), while in the opposite direction the stroke moves the transverse wall (4) away from the free edge (30). During the stroke that brings the transverse wall (4) and the free edge (30) closer together, the transverse wall (4) pushes the granular material towards the free edge (30), so that at least a part of the granular material passes beyond the free edge (30), thus dropping downwards. The granular material is substantially dispensed by drop. By regulating and controlling the amplitude of the alternating relative motion, that is, by regulating and controlling the length of the strokes in the opposite direction, and/or by regulating and controlling the frequency of the alternating relative motion, it is possible to regulate and control the flow rate of granular material that is dispensed by transiting through the free edge (30) and dropping downwards.

The dispensing device according to the present invention offers the very important advantage of operating precisely and effectively in the presence of granular materials of any grain size. The substantially open configuration of the drawer (3) is free of risks of clogging or unwanted dispensing blockage, even in the presence of materials of high grain size. Furthermore, the dispensing, which takes place by drop as a result of the

alternating relative motion between the drawer (3) and the transverse wall (4), does not require the presence of movable shutters or other types of barrier, making the dispensing device particularly simple and reliable. The control of the dispensing flow rate is also particularly simple and reliable, since it is done by simply regulating the frequency and/or the amplitude of the alternating relative motion.

The dispensing of the granular material, which takes place substantially by drop from the drawer (3) through the free edge (30), can be directed towards a deposit surface positioned below the drawer (3), so as to form a layer of granular material. In particular, by displacing the deposit surface and the drawer (3) relatively to each other along a direction parallel to the main direction (X), it is possible to deposit a continuous or discontinuous layer of granular material.

In the preferred but not exclusive embodiment represented, the transverse wall (4) is solidly constrained to the hopper (2). Furthermore, the transverse wall (4) is arranged so that the discharge opening (21) is interposed between the free edge (30) of the drawer (3) and the transverse wall (4). In this way, in the stroke that brings the transverse wall (4) and the free edge (30) closer together, the granular material present in the drawer (3) is pushed along the main direction (X) towards the free edge (30).

In the embodiment represented, the transverse wall (4) defines a lower portion of the hopper (2), and delimits a rear side of the discharge opening (21), i.e. a side located on the opposite side with respect to the free edge (30).

In other embodiments, not represented, the transverse wall (4) could be applied to the hopper (2), or it could be associated with a support distinct from the hopper (2).

Preferably, the dispensing device according to the present invention comprises a support (6), to which the drawer (3) and/or the transverse wall (4) are slidingly associated along the main direction (X). The motor means

(5) is also preferably associated with the support (6). The motor means (5) is configured to slidingly actuate the drawer (3) and/or the transverse wall (4) with respect to the support (6).

In the embodiment represented, the drawer (3) is slidingly associated along the main direction (X) to the support (6). A guide (G) of known type is interposed between the drawer (3) and the support (6), to allow the sliding along the main direction (X). The guide is preferably located below the drawer (3). The motor means (5) is interposed between the support (6) and the drawer (3). In this embodiment, the transverse wall (4) is static and, preferably, is solidly constrained to the hopper (2).

In another embodiment, not represented, the transverse wall (4) is slidingly associated along the main direction (X) to the support (6) and/or to the drawer (3), by means of a guide of known type. The motor means (5) is interposed between the support (6) and the transverse wall (4). The drawer (3) is static.

In the embodiment represented, the motor means (5) comprises an elastic sleeve (50) provided with a cavity (51). The sleeve (50) is concentric to a longitudinal axis (S) and preferably has a cylindrical shape. Feeding means is arranged to feed in a controlled manner an operating fluid to the cavity (51). Feeding operating fluid to the cavity (51) results in a radial expansion of the sleeve (51) and a consequent shortening along the longitudinal axis (S). The discharge involves an elastic return of the elastic sleeve (50) to the initial configuration, and therefore an elongation along the longitudinal axis (S). Feeding and cyclically emptying the cavity (51) produces a corresponding cycle of alternating shortening and elongation of the elastic sleeve (50). By associating one end of the elastic sleeve (50) with one between the drawer (3) and the transverse wall (4), it is possible to produce the already described alternating relative motion along the main direction (X), which results in the granular material being dispensed.

Advantageously, the feeding means allows to regulate the flow rate of the fed operating fluid. The flow rate regulation allows to regulate the sliding

speed of the drawer (3).

As an alternative or in addition to regulating the flow rate, the feeding means allows to regulate the pressure of the fed operating fluid. The regulation of the pressure allows to regulate the amplitude or length of the stroke made by the drawer (3).

Alternatively or in addition to one or both of the above regulations, the feeding means allows to regulate the feeding frequency of the operating fluid. The regulation of the frequency allows to regulate the frequency of the stroke made by the drawer (3). In the embodiment represented, in which the drawer (3) is slidingly associated along the main direction (X) to the support (6), the elastic sleeve (50) is interposed between the drawer (3) and the support (6). In particular, a first end (53) of the elastic sleeve (50) is associated with the drawer (3). A second end (54) of the elastic sleeve (50) is associated with the support (6), i.e. a bracket (61) solidly constrained to the support (6).

In the alternative embodiment, not represented, in which the transverse wall (4) is slidingly associated along the main direction (X) to the support (6), the elastic sleeve (50) is interposed between the transverse wall (4) and the support (6). In particular, a first end (53) of the elastic sleeve (50) is associated with the transverse wall (4). A second end (54) of the elastic sleeve (50) is associated with the support (6), i.e. a bracket (61) solidly constrained to the support (6).

Preferably, the operating fluid that is fed to the elastic sleeve (50) is air. To this end, the feeding means comprises a source of pressurized air, for example a compressor and/or a pressurized tank not illustrated, connected to the elastic sleeve (50) by means of a fitting (52). The feeding means also comprises a pneumatic control unit, i.e. a device known in the sector comprising one or more valves with controlled actuation, by means of which it is possible to implement a feeding and discharge cycle of the elastic sleeve (50), of controlled frequency.

As already mentioned, feeding fluid to the elastic sleeve (50) produces a

shortening thereof along the longitudinal axis (S), while the discharge produces an elongation thereof. By carrying out a controlled feeding and discharge cycle of the elastic sleeve (50) it is therefore possible to implement the described alternating relative motion along the main direction (X) between the drawer (3) and the transverse wall (4).

The use of motor means comprising the elastic sleeve (50) offers the considerable advantage of greatly simplifying the structure of the dispensing device according to the invention. In fact, the elastic sleeve (50) does not require the presence of other moving parts, such as for example gears, levers or other mechanisms, which lend themselves poorly to operation in dusty environments. Furthermore, the motor means comprising the elastic sleeve (50) is much lighter, for the same performance, than other actuators suitable for the purpose.

In other embodiments not represented, the motor means could be in different forms, known in the sector, comprising for example rotating motors connected to eccentrics or connecting rod and crank mechanisms.

The dispensing device according to the present invention is also particularly useful for realizing a dispensing bar for a granular material in flakes or grains.

The dispensing bar comprises two or more dispensing devices (1) according to the present invention, arranged side by side and with the main directions (X) substantially parallel to each other. Preferably, the free edges (30) of the drawers (3) are aligned with each other to define a single and linear free edge.

In particular, two or more dispensing devices according to the present invention are arranged along an alignment direction, side by side, to realize a dispensing bar. For example, the dispensing devices (1) are aligned along a transverse direction (Z). Said transverse direction (Z) is preferably horizontal and perpendicular to the main direction (X).

The dispensing bar allows to define a dispensing front extended along the direction of alignment of the dispensing devices, i.e. along the transverse

direction (Z). In this case, the dispensing front is an area on which the granular material is dispensed, which has a length, measured along the transverse direction (Z), substantially equal to the overall length of the free edges (30) of the drawers (3).

Preferably, each dispensing device (1) comprises its own motor means (5) that can be activated independently of the motor means (5) of the other dispensers (1). In other words, each dispenser (1) can be activated and controlled independently of the other dispensers.

The dispensing bar according to the present invention can be used to deposit the granular material, in a controlled manner, on an underlying surface or an underlying surface. Both the dispensing bar and the deposit surface of the product can be movable through suitable motors.

For example, the dispensing bar may be used to deposit the granular material on a movable conveyor table, such as a conveyor belt. The movable surface can be driven in motion along a conveying direction, while the dispensing device can be static or movable along a direction horizontal and perpendicular to the conveying direction of the movable surface, and possibly also along a direction parallel to the conveying direction of the movable surface. Preferably, the dispensing bar is static during operation.

It is also possible to arrange several dispensing bars in parallel, for the coordinated dispensing of non-homogeneous materials, i.e. materials different in colour and/or grain size and/or shape of the grains or flakes.

The dispensing of the material by the dispensing bar on an underlying movable surface allows to create a layer of granular material, or, if the movable surface carries a layer of granular material already deposited by another device, to deposit on the surface of this layer already deposited a further layer of granular material, either continuous or discontinuous. The independent activation of the individual dispensing devices (1) allows the layer deposited as a whole by the dispensing bar to be configured as desired, also making any decoration patterns or graphics, reproducing a

model defined as desired.

In a preferred embodiment of the invention, the independent activation of the individual dispensing devices (1) allows to deposit either on the underlying movable surface or on the underlying surface of the granular material or on a surface of a ceramic support resting on the movable surface, a design representative of a digital image to be printed.

The independent activation of the dispensing devices (1) is implemented through a digital control, allowing to make on the support a design which is representative of a digital image to be printed.

A control processor is set up to carry out the digital control of the individual dispensing devices, so as to deposit the granular material, making a graphic or decoration. To this end, the control processor is provided with an algorithm that allows to process an image of the decoration and obtain a series of activation and deactivation commands for each dispensing device (1), so that the overall material dispensed by the dispensing devices (1) is deposited, on the underlying surface, according to the graphic or pattern required. Each activation and deactivation command produced by the control processor is transmitted to the motor means (5) of a specific dispensing device (1). The control processor coordinates the various activation and deactivation commands between them, in order to make the expected pattern or graphic.

In a manner known in the sector, the overall layer obtained can be conveyed to a press, to be compacted and subsequently fired.

The dispensing bar according to the present invention could also be arranged downstream of the press, for depositing a further layer of granular material on an already pressed layer.

In the preferred but not exclusive embodiment represented, the dispensing bar comprises a support (6), with which two or more drawers (3) are associated. Each drawer (3) is slidable on the support (3) along the main direction (X), independently of the other drawers (3). Each drawer is slidable on the support (6) by means of its own guide (G). The support (6)

is substantially in the form of a plate, associable with a support structure not illustrated.

The drawers (3) are placed side by side and approached to one another, with the free edges (30) aligned along the transverse direction (Z). This makes it possible to create a particularly compact structure, thanks to which the dispensing front obtainable overall by the dispensing devices (1) associated with the bar is substantially continuous.

Each drawer (3) is also associated with its own motor means (5), and in particular with its own elastic sleeve (50). The elastic sleeves (50) are all arranged on the same side of the drawers (3), so that they are parallel to each other and with the fittings (52) facing the same side of the dispensing bar.

The second end (54) of each elastic sleeve (50) is associated with the bracket (61) solidly constrained to the support (6). As the support (6) is unique for all the drawers (3), the bracket (61), in the case of the dispensing bar, is also unique for all the elastic sleeves (50). In turn, the bracket (61) can be associated with a support structure not illustrated.

The dispensing bar further comprises a manifold (70), arranged above the hoppers (2). The manifold (70) is placed in communication with the hoppers (2).

Preferably, the hoppers (2) are arranged below the manifold (70), and have the upper opening in communication with the manifold (70).

In the preferred but not exclusive embodiment represented, the manifold (70) is delimited by a base plate (71), with which the hoppers (2) are associated, and two longitudinal sidewalls (72), which rise from the base plate (71) substantially parallel to each other. The longitudinal sidewalls (72) are also substantially parallel to the transverse direction (Z).

The hoppers (2) have an inlet section (22) arranged through the base plate (71), turning the inlet opening towards the inside of the manifold (70).

The manifold (70) receives the material to be dispensed from a feeder not illustrated, known in the sector. From the manifold (70), the material to be

dispensed flows through the hoppers (2) to reach the drawers (3). In this way, the manifold (70) facilitates the feeding of the material to be dispensed to the hoppers (2).

The dispensing device according to the present invention is particularly useful for allowing the implementation of a method for the production of ceramic tiles.

The method according to the present invention is particularly useful and effective in coordination with a series of known production steps comprising:

a step of preparing a layer of base material, in granular or powdered form, provided or not provided with decorations;

pressing the base layer;

possibly applying decorative or protective layers on the base layer after pressing;

firing the base layer.

The method according to the present invention allows to perfect the step of preparing the layer of base material, upstream and/or downstream of the pressing step.

The method according to the present invention provides a step of depositing a first layer of a first granular or powdered material on a support surface. The first layer can be deposited, for example, by means of the device and the method described in publications IT102018000010925 and WO2020121098 in the name of the Applicant, which are intended to be incorporated in the present description.

Advantageously, but not necessarily, the first material comprises two or more components having different characteristics. Such characteristics comprise for example, but are not limited to, colour, grain size, type of material. The components can be deposited in a controlled manner, by arranging at least a first component according to veins distributed within a second component. In particular, at least the first component is arranged according to veins that are arranged at least partially in the thickness of

the first layer. The device and the method described in publications IT102018000010925 and WO2020121098 allow to control in an extremely accurate way the realization of veins according to a desired graphic, through the controlled deposit of two or more components on a support surface.

In essence, through the controlled deposit of at least a first and a second component, it is possible to a first decoration (200) of the tile.

The method according to the present invention comprises a step of depositing, on the first layer, a second layer of a second granular or powdered material. The second material comprises flakes or grains of grain size greater than about 2 mm.

Advantageously, the step of depositing a second layer is implemented in a controlled manner by means of a dispensing bar according to the present invention. The second layer defines a second decoration (300) of the tile.

As already underlined, the dispensing device according to the present invention allows the precise and controlled dispensing of the material, both in quantity and in time. In particular, the dispensing bar, comprising a plurality of dispensing devices (1) according to the present invention, allows the material to be dispensed in a digitally controlled manner, as a function of a desired graphic. This allows the second granular or powdered material to be deposited as a function of the veins made in the first layer. Advantageously, but not necessarily, the second material is deposited substantially on the veins made in the first layer.

The second layer could be deposited before and/or after the pressing step. In other words, the first layer could be deposited entirely before or entirely after pressing, or it could be deposited partly before and partly after pressing. Depositing partly before and partly after pressing can be carried out by means of two or more dispensing bars, arranged upstream and downstream of the press.

The second material, deposited after the pressing step, forms reliefs of variable height with respect to the surface of the first layer. These reliefs

may or may not be aligned, i.e. at least partially superimposed on the veins made in the first layer.

Thanks to the method according to the present invention, it is therefore possible to make a ceramic tile provided with veins that extend in the thickness of the tile itself, and with surface reliefs that follow the course and arrangement of the veins. This allows to obtain an overall structural effect of the tile that is very similar to that of a natural material, be it, for example, a stone or wood.

The second material deposited before pressing is levelled, by the press, with respect to the surface of the first layer, so that the layer presents a substantially flat surface. In this case, the second material contributes to making the veins reproduced in the first layer more evident.

The method then provides for firing the base layer, comprising the first and second layer described above.

Preferably, but not necessarily, the method according to the present invention comprises a further step, to be implemented before the firing step. This further step provides for making and/or applying a surface layer on said second layer. The surface layer comprises, for example, a graphic arranged as a function of the veins made in the first layer and/or as a function of the deposit of the second material.

The surface layer, for example, is a ceramic glaze layer, which can be applied with an inkjet digital printer, known in the sector in various embodiments. Thanks to digital printing, it is possible to coordinate a graphic of the surface layer with the veins made in the first layer and/or with the graphic made with the deposit of the second material. In particular, it is possible to superimpose or align the graphic of the surface layer with the graphic, in relief or not in relief, made in the second layer by means of the dispensing bar according to the present invention.

The surface layer applied on the second layer, in addition to increasing the surface resistance of the tile, accentuates and makes more evident the graphics made, especially the graphics in the form of veins in relief.

The method according to the present invention allows to produce ceramic tiles provided with programmable and settable graphic effects and surface structures with considerable precision, in order to reproduce, for example, the appearance of a natural stone, wood or other. The possibility of dispensing flakes or grains of high grain size allows to accentuate the graphic effects and the surface structures made.

The method according to the present invention allows to produce a ceramic tile comprising a body (100), made of ceramic material, which has a thickness (S) delimited by a first face (110) and by a second face (120), substantially flat and parallel to one another;

The ceramic tile further comprises a first decoration (200), of a colour and/or tone different from the body (100), which extends at least partly in the thickness (S) of the body (100) and at least partly on one of the two faces (110,120); Preferably, but not necessarily, the first decoration (200) is obtained by depositing the first layer of the method according to the present invention.

The ceramic tile according to the present invention also comprises a second decoration (300), applied on the first face (110). The second decoration (300) is obtained by depositing the second layer of the method according to the present invention.

The first decoration (200) is made of a granular ceramic material or powder of grain size of less than 2 mm.

The second decoration (300) is made of a ceramic material in flakes or grains of grain size greater than 2 mm. The second decoration (300) is obtainable thanks to the dispensing bar according to the present invention, which, as already underlined, allows to dispense flakes or grains of grain size greater than 2 mm in a precise and controllable manner.

Preferably, but not necessarily, the ceramic tile according to the present invention comprises a surface layer (400), comprising a surface decoration. The surface layer (400) is applied, for example, by means of a digital inkjet printer. Preferably, but not necessarily, the surface decoration

is configured as a function of the second decoration (300) and/or of the first decoration (200). For example, the surface decoration is at least partly superimposed and/or aligned with the second decoration (300) and/or with the first decoration (200).

CLAIMS

1. A dispensing device for granular materials in flakes or grains, for the production of ceramic tiles, comprising:

a hopper (2), provided with a lower discharge opening (21);

a drawer (3), arranged below the discharge opening (21) of the hopper (2), which defines a containment space and is provided with a free edge (30) allowing the flow of the granular material along at least one main direction (X);

motor means (5), arranged to implement an alternating motion of the drawer (3) along the main direction (X),

characterized in that it comprises a transverse wall (4), lying on a plane transverse to the main direction (X) and arranged at least partly inside the drawer (3), wherein the motor means (5) is arranged to implement an alternating relative motion along the main direction (X) between the drawer (3) and the transverse wall (4).

2. The dispensing device according to claim 1, wherein the transverse wall (4) is solidly constrained to the hopper (2).

3. The dispensing device according to claim 2, wherein the discharge opening (21) is interposed between the free edge (30) of the drawer (3) and the transverse wall (4).

4. The dispensing device according to any one of the preceding claims, comprising a support (6) to which the drawer (3) and/or the transverse wall (4) are slidingly associated along the main direction (X).

5. The dispensing device according to claim 4, wherein the motor means (5) is configured to slidingly actuate the drawer (3) and/or the transverse wall (4) with respect to the support (6).

6. The device according to claim 5, wherein the motor means (5) is controllable so as to regulate amplitude and/or speed and/or frequency of the stroke of the drawer (3).

7. The dispensing device according to any one of the preceding claims, wherein the motor means (5) comprises: an elastic sleeve (50) provided

with a cavity (51); feeding means, arranged to feed in a controlled manner an operating fluid to the cavity (51).

8. The dispensing device according to claim 7, wherein the feeding means allows to regulate the flow rate of the operating fluid fed to the cavity (51).

9. The dispensing device according to claim 7 or 8, wherein the feeding means allows to regulate the pressure of the operating fluid fed to the cavity (51).

10. The dispensing device according to one of claims 7 to 9, wherein the feeding means allows to regulate the feeding frequency of the operating fluid fed to the cavity (51).

11. The dispensing device according to one of claims 7 to 10, wherein the drawer (3) is slidingly associated along the main direction (X) to the support (6), and wherein the elastic sleeve (50) is interposed between the drawer (3) and the support (6).

12. The dispensing device according to one of claims 7 to 10, wherein the transverse wall (4) is slidingly associated along the main direction (X) to the support (6), and wherein the elastic sleeve (50) is interposed between the transverse wall (4) and the support (6).

13. A dispensing bar for a granular material in flakes or grains, for the production of ceramic tiles, comprising two or more dispensing devices according to any one of the preceding claims, arranged side by side and with the main directions (X) substantially parallel to each other.

14. A method for producing ceramic tiles, comprising the following steps:

preparing a base layer of granular or powdered material;

pressing the base layer;

firing the base layer;

wherein the step of preparing the base layer comprises the following steps:

depositing a first layer of a first granular or powdered material on a support surface;

depositing a second layer of a second granular or powdered material on

said first layer, wherein said second material comprises flakes or grains of grain size greater than about 2 mm, and wherein said second layer is deposited before and/or after the pressing step;

wherein the step of depositing a second layer is implemented in a controlled manner by means of the dispensing device according to one or more preceding claims.

15. The method according to claim 14, wherein:

said first material comprises two or more components having different characteristics;

the step of depositing a first layer comprises a step of depositing in a controlled manner said two or more components, at least one first component having second veins distributed within a second component;

the step of depositing a second layer comprises a step of depositing said second granular or powdered material as a function of the veins made in the first layer.

16. The method according to claim 15, wherein said step of depositing said second granular or powdered material as a function of the veins made in the first layer comprises depositing the second material substantially on the veins made in the first layer.

17. The method according to claim 16, comprising a step of making a surface layer on said second layer, wherein said surface layer comprises a graphic arranged as a function of the veins made in the first layer and/or of the deposition of the second material.

18. A ceramic tile, made with the dispensing device according to one of claims 1 to 12 or with the dispensing bar according to claim 13 or with the method according to one of claims 14 to 17, comprising:

a body (100), made of ceramic material, which has a thickness (S) delimited by a first face (110) and by a second face (120), substantially flat and parallel to one another;

a first decoration (200), of a colour and/or tone different from the body (100), which extends at least partly in the thickness (S) of the body (100)

and at least partly on the first face (110);

a second decoration (300), applied on the first face (110);

characterized in that:

the first decoration (200) is made of a granular ceramic material or powder of grain size of less than 2 mm;

the second decoration (300) is made of a ceramic material in flakes or grains of grain size greater than 2 mm.

19. The ceramic tile according to claim 18, comprising a surface layer (400), comprising a surface decoration, wherein the surface decoration is configured according to the second decoration (300) and/or the first decoration (200).

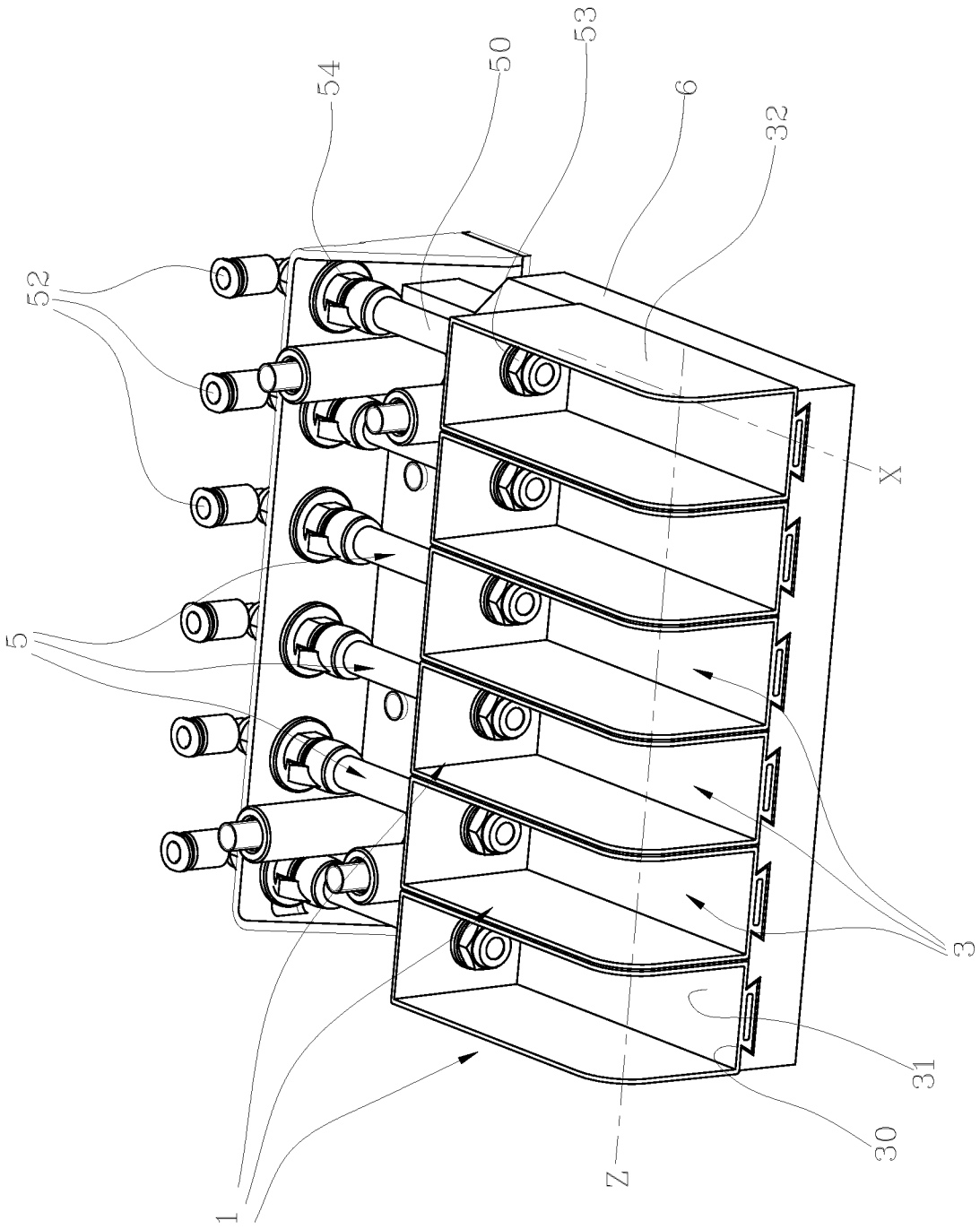


Fig.1

Fig.2

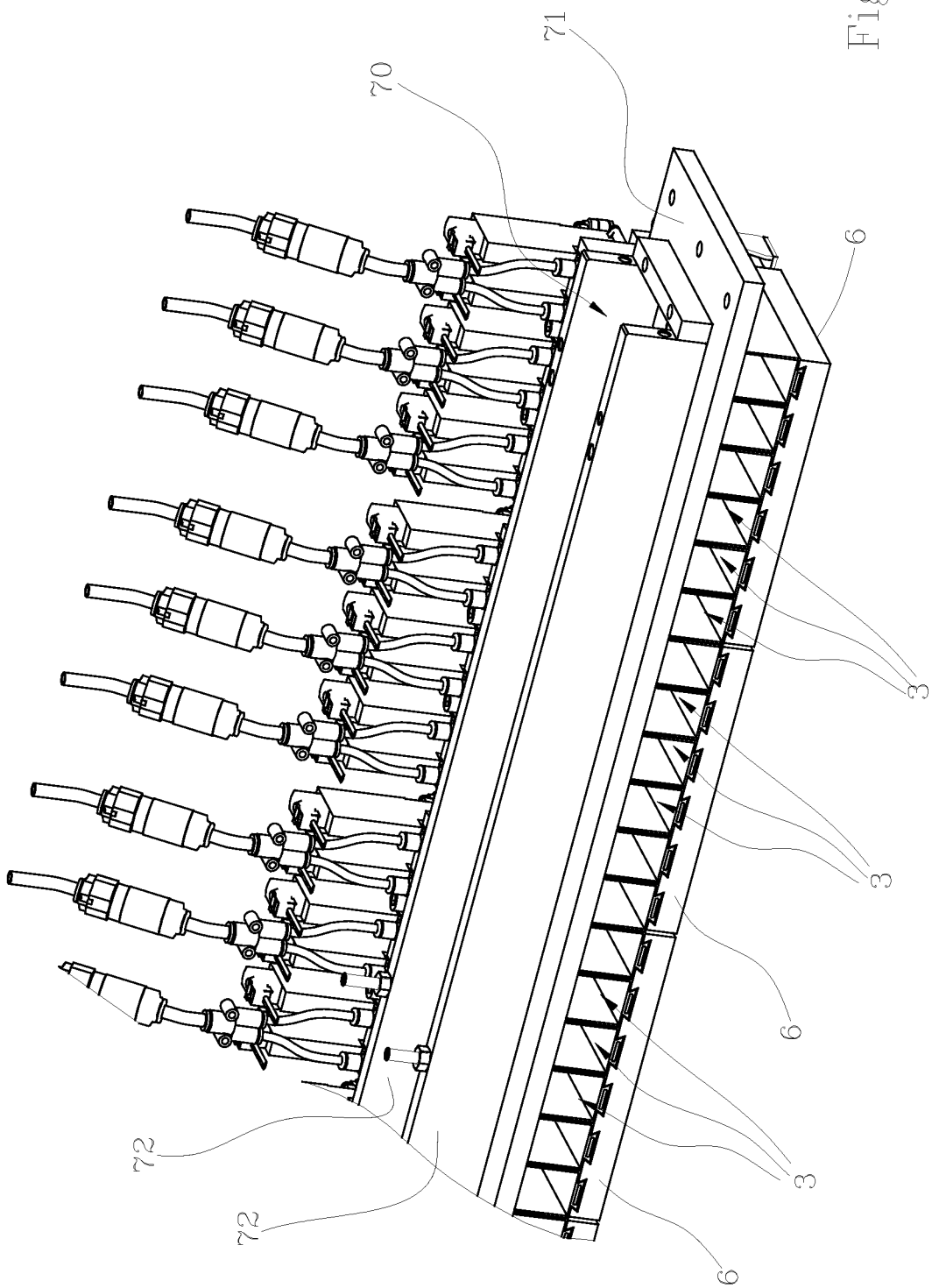


Fig.3

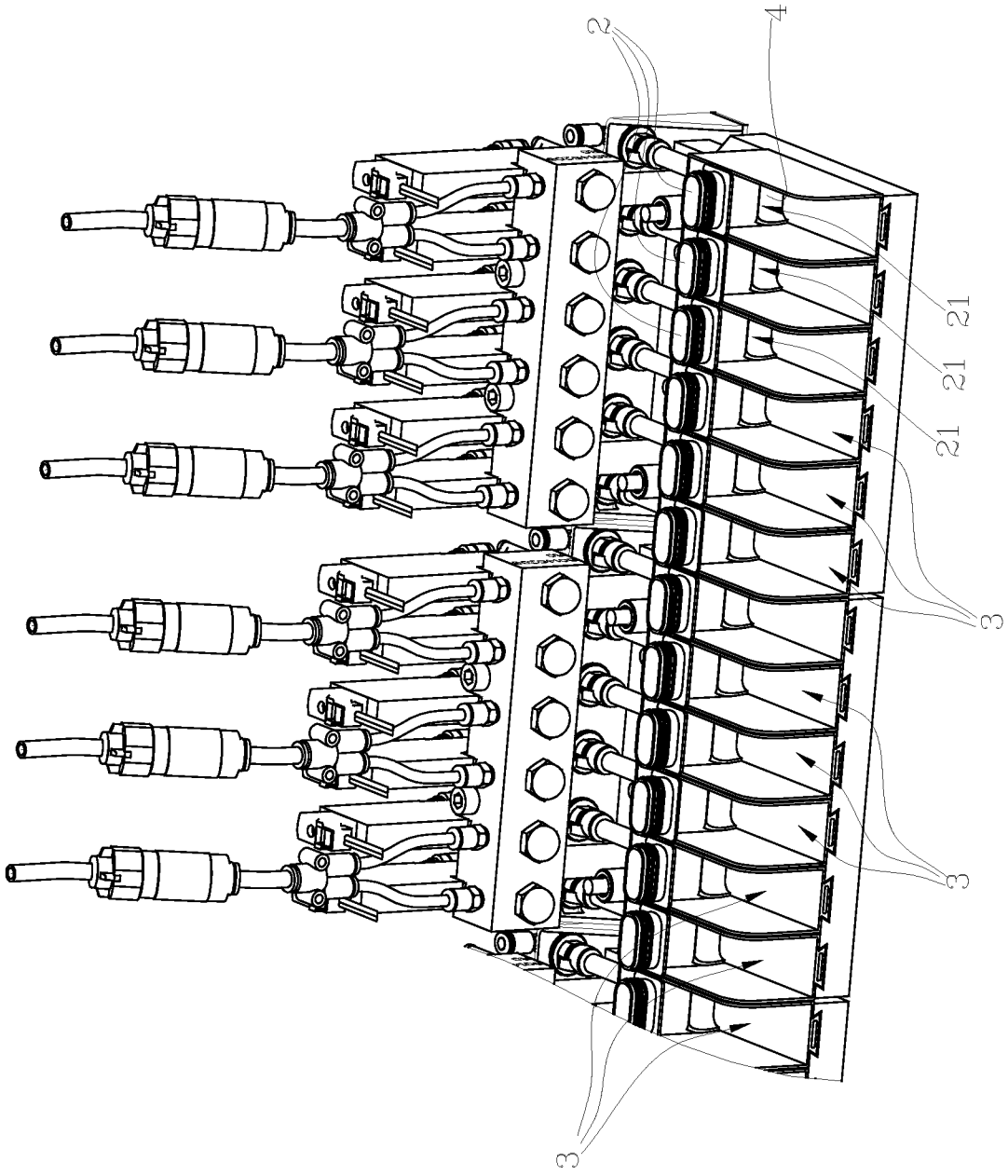
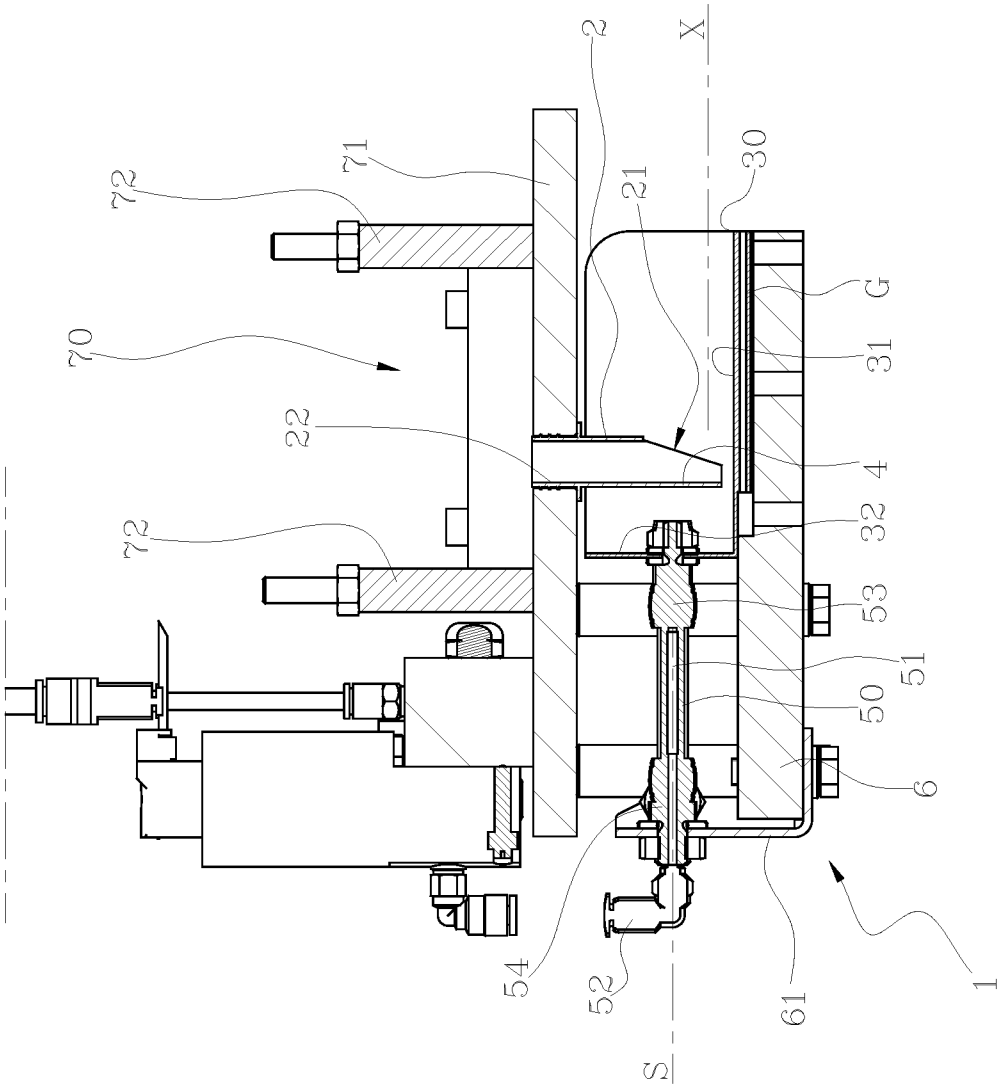
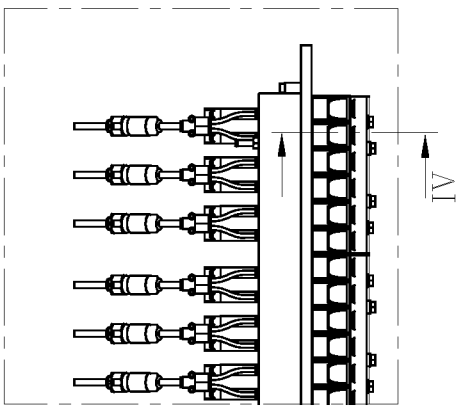


Fig.4





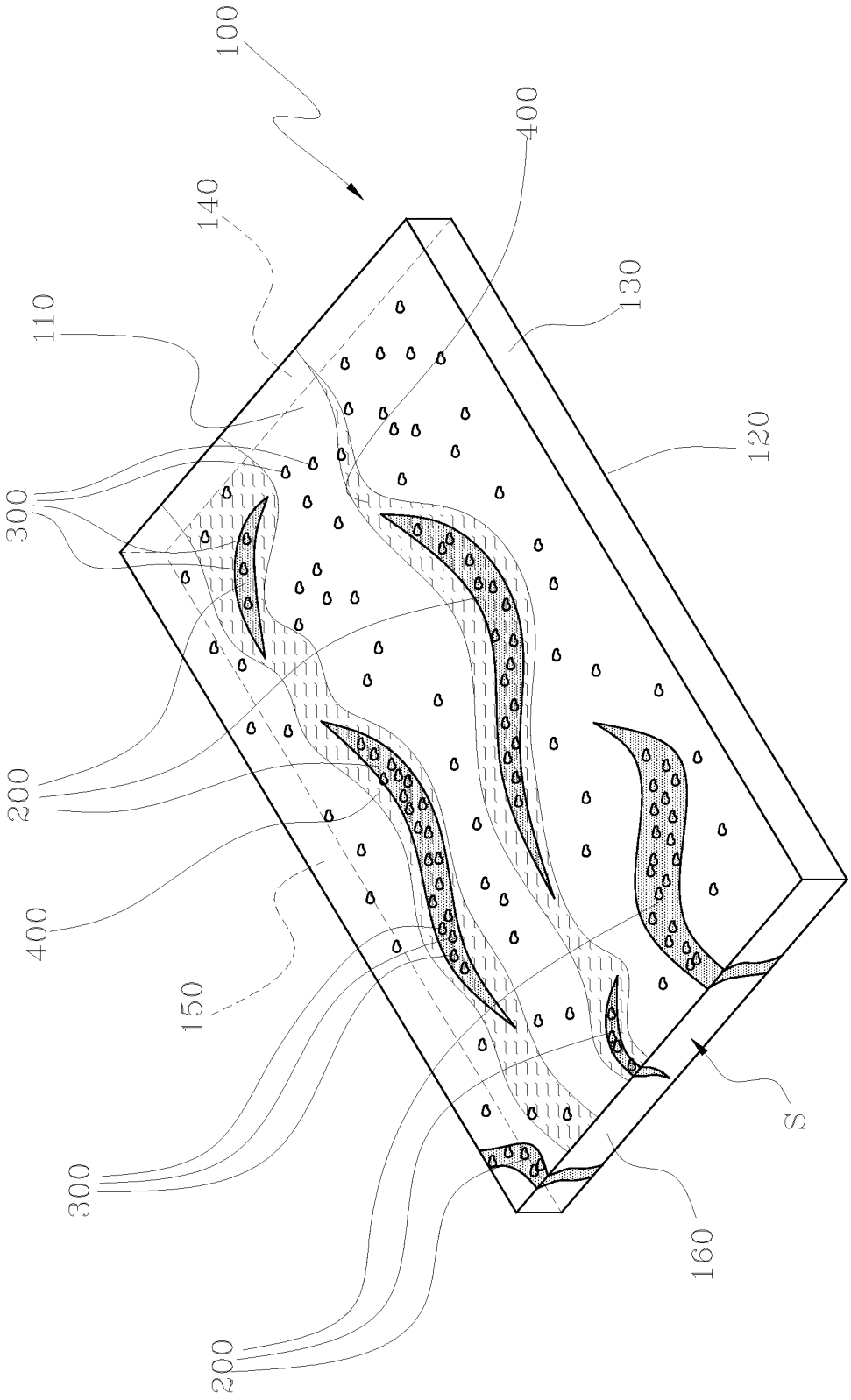


Fig.5