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(54) **A METHOD AND A PLANT FOR THE WEIGHT DISTRIBUTION OF GLAZES ON SURFACES OF HANDPIECES**

(57) The method for the weight application of glazes on surfaces of ceramic handmade articles (2) comprises the steps of:

- setting a plant (1) for the weight application of glazes on a base-weight of glaze to be supplied, loading a base-data set in an electronic control unit (9) of the plant (1), which produces a base-flow rate of glaze to be supplied as a function of the base-data, which comprise a base-density of a reference base-glaze; a base-surface

of a reference handmade article (2); a base-weight of glaze to be supplied;

- resetting the plant (1) by loading in the electronic control unit (9), in order to produce a pre-established flow rate of said glaze to be supplied, a series of target-data which comprise a density of a target-glaze to be supplied; a target-surface of the target-handmade article (2); the pre-established weight value of glaze to be supplied on the target-surface.

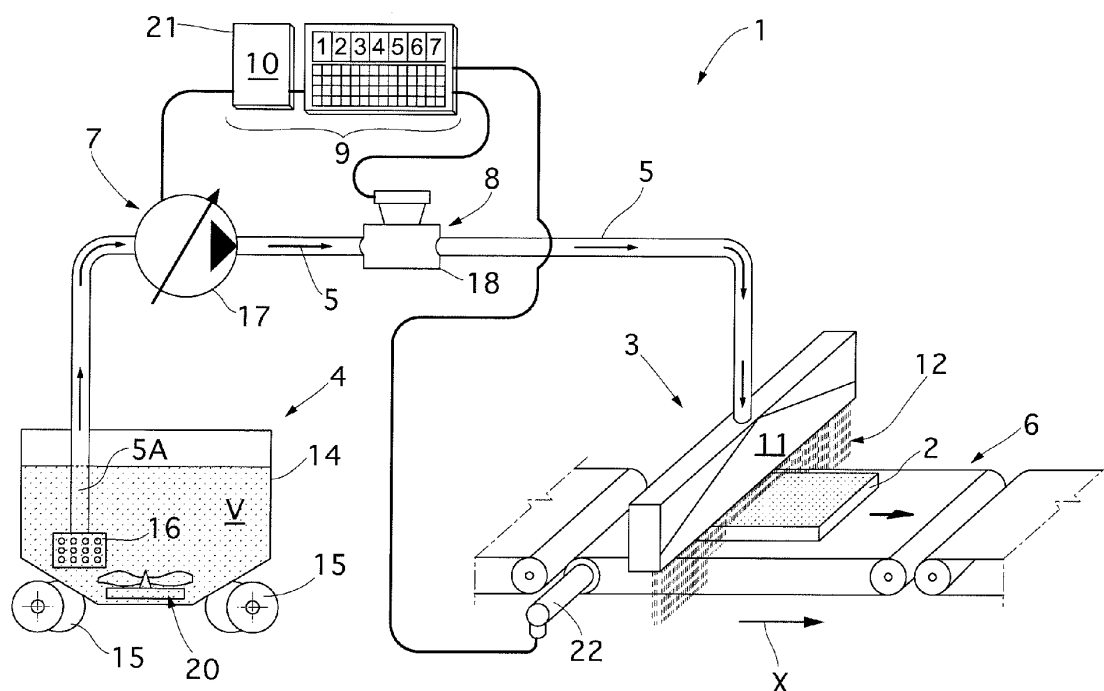


Fig. 1

Description

Field of the invention

[0001] The invention concerns a method and a plant for the weight supply of glazes on surfaces of handmade articles, in particular on surfaces of ceramic handmade articles, which can generally be used to establish and control the weights of glazes that are to be supplied.

Background of the invention

[0002] Automatic plants are known for supplying glazes on the surfaces of products, specifically on flat surfaces of products, which are able to uniformly supply glazes with the purpose of decorating the surfaces chromatically.

[0003] Typically, this is required in particular in the ceramic industry, which produces tiles and slabs, in short, ceramic handmade articles, for covering surfaces.

[0004] The step of supplying the glazes on the surfaces of the ceramic handmade articles takes place on the production lines, typically in the decoration stations of the plants, and the supply must be such as to obtain a covering of their surfaces that is as homogeneous as possible and, above all, free from defects.

[0005] In addition to the above, it is also necessary to avoid wasting glazes, which are notoriously expensive and polluting, with supplies that are too abundant or, on the contrary, insufficient.

[0006] To control the supply of ceramic glazes on the handmade articles, plants are used that are able to monitor and modulate the quantities supplied and which generally comprise a transport line for the handmade articles, such as for example a parallel belt conveyor, a delivery hopper in which the glazes to be supplied are accumulated, which is arranged transversely above the transport line, and which has a lower delivery mouth typically equipped with members to adjust the width as needed.

[0007] In these plants it is also provided to assemble a pumping unit which creates a flow of glazes between a container in which they are prepared and accumulated and the hopper, and which are connected together by a connection duct.

[0008] Suitable devices to detect the data of pressure and flow rate are positioned along the connection duct, to continuously monitor the correct functioning of the plants according to the desired final characteristics of the handmade articles.

[0009] As an alternative to the delivery hopper, one or more nebulizing nozzles can be provided, which are supported by a suitable structure above the conveyor and which have adjustable delivery openings.

[0010] In the ceramic sector, it has been found that one of the values that most influences the quality of the supply of glazes on the handmade articles is the weight of the glazes themselves that are supplied on them.

[0011] To determine this parameter and keep it con-

stant, transport lines are currently used which consist of a central transport section, along which the glazes are supplied on the handmade articles, a transport section located upstream of the central section which is equipped with devices for weighing the handmade articles before the glazes are applied, and a transport section downstream of the central section, also equipped with devices for weighing the handmade articles, after the glazes have been supplied on their surfaces in the central section.

[0012] In the state of the art, the values of the weights of the glazes supplied are obtained empirically, determining the difference in weight of the handmade articles detected between the two transport sections, upstream and downstream.

[0013] This datum is cyclically compared with a base-datum that is to be maintained during the supply cycle and that can be set in the control logic of an electronic control unit that typically manages these plants automatically.

[0014] This state of the art has a specific disadvantage, which is that the operators are obliged to repeatedly check in the downstream section that the weight of glazes supplied on the handmade articles corresponds to the desired weight set in the control logic of the electronic control unit.

[0015] These repetitive checks require specific weighing apparatuses along the transport lines, upstream and downstream of the central transport section, which apparatuses are integrated with the structural characteristics of the glaze supply plants so as to allow them to function in a fully automated manner.

[0016] Furthermore, the necessary checks for subsequent weighing operations generate a further disadvantage, which is the waste of time that the operators responsible for checking have to devote to assessing and evaluating the weights of glazes supplied.

[0017] These times have a negative impact on the overall productivity of known plants for making handmade articles, in particular the productivity of the decoration stations, in which the glazes are supplied on the ceramic handmade articles.

[0018] A decrease in the productivity coefficient leads to a proportional increase in the management costs of the production plants, which are also reflected in the final costs of the handmade articles produced.

[0019] To the above, it must also be added that a further disadvantage which affects the productivity coefficients of known plants, and which determines a significant lowering thereof, is the dispersions of the glazes which occur when they are supplied on the surfaces of the ceramic handmade articles.

[0020] These dispersions occur mainly for two reasons.

[0021] A first reason are the ricochets of particles of glaze which occur when they strike, simply by falling in the form of a curtain or by blowing on the surfaces of the handmade articles when they are in a nebulized form and sprayed onto the surfaces by one or more nebulizing noz-

zles.

[0022] It happens that, in the zones close to the perimeter of the surfaces, some of the particles of glaze, as they ricochet, fall outside the surfaces themselves, becoming lost glaze that is not deposited on the surfaces to be decorated.

[0023] A second reason is that the glazes, especially when they are in their nebulized form, are partly aspirated by the aspirators of the filtering systems that are compulsorily mounted along the transport lines to purify polluting components from the surrounding air, as required by specific regulations.

[0024] In this case too, some of the expensive glazes are irretrievably lost.

Purposes of the invention

[0025] One purpose of the invention is to overcome the disadvantages highlighted above, by providing a method and a plant for the weight supply of glazes on surfaces of handmade articles, in particular on surfaces of ceramic handmade articles which, after the values of the weights of the glazes to be supplied on the products have been selected and set, do not require the integrated assembly of expensive weighing apparatuses to carry out further repetitive checks by operators in order to verify the correspondence between the values of the desired theoretical weights of the glazes to be supplied programmed in the control logic of the electronic control unit, and the values of the real weights, therefore values that already take into account the losses caused by the ricochets, of the glazes supplied on the handmade articles during transport on the glazing lines.

[0026] Another purpose of the invention is to improve the productivity coefficient of the plants for supplying glazes on handmade articles, in particular on the surfaces of ceramic handmade articles, making them more productive and, ultimately, reducing the costs of finished handmade articles, the organoleptic characteristics of the latter being equal.

[0027] A further purpose of the invention is to simplify the structure of the plants for supplying glazes on handmade articles, in particular on the surfaces of ceramic handmade articles, so that they are significantly cheaper, since they are able to eliminate the presence of weighing devices mounted in an integrated manner along the transport lines.

[0028] According to one aspect of the invention, a method is provided for the weight supply of glazes on surfaces of products, in particular on surfaces of ceramic products, in accordance with the characteristics of claim 1.

[0029] According to another aspect of the invention, a plant is provided for the weight supply of glazes on surfaces of products, in particular on surfaces of ceramic products, in accordance with the characteristics of claim 5.

[0030] The invention allows to obtain the following ad-

vantages:

- program and keep constant in an automatic plant the programmed values of weights of glazes to be supplied on the surfaces of handmade articles, in particular ceramic handmade articles, on the production lines;
- eliminate the need for repetitive checks on the constancy of the programmed and distributed weight values;
- improve the productivity coefficient of the plants for producing handmade articles, in particular ceramic handmade articles;
- make the handmade articles produced more competitive;
- prevent waste and dispersion of expensive and polluting glazes.

Brief description of the drawings

[0031] Other characteristics and advantages of the invention will become more apparent from the detailed description of some preferred, but not exclusive, embodiments of a method and a plant for the weight supply of glazes on surfaces of handmade articles, in particular on surfaces of ceramic handmade articles, shown as a non-limiting example in the attached drawings wherein:

Fig. 1 is a very schematic view of a first version of the plant according to the invention, according to a first point of view;

Fig. 2 is a very schematic view of the first version of the plant according to the invention, according to a second point of view;

Fig. 3 is a very schematic view of a second version of the plant according to the invention;

Fig. 4 is a very schematic view of the operating sequence of the plant according to the invention;

Fig. 5 is a partial front view of the plant according to the invention, taken according to a plane V-V of fig. 4;

Fig. 6 is a flow chart of the operating steps of the method according to the invention and of the plant for carrying out the method.

Detailed description of an example preferred embodiment

[0032] With reference to figs. 1 and 2, 1 denotes as a whole a plant for the weight supply of glazes on the surfaces of ceramic target-handmade articles 2, hereafter briefly plant 1.

[0033] The plant 1, which can be used both to produce base-handmade articles and also target-handmade articles, generally comprises:

- a supply unit 3 for supplying the glazes;
- container means 4 for containing the glazes to be supplied;

- a connection duct 5 interposed between the container means 4 and the supply unit 3;
- a moving line 6 for moving handmade articles 2 in a direction X below the supply unit 3 and comprising an upstream section 6A, a downstream section 6B and a central section 6C, all preferably consisting of closed loop conveyor belts on motorized return and tensioning rollers, indicated as a whole with 6D;
- a pumping unit 7 for pumping the glazes mounted along the connection duct 5;
- detection means 8 for detecting data of said glazes; and
- an electronic control unit 9 of the plant 1, for example a PLC, hereafter briefly PLC 9.

[0034] The unit 9 comprises adjusting means 10 for adjusting the flow rate of the pumping unit 7 which are interlocked with the detection means 8.

[0035] In detail, the supply unit 3, in a first version, consists of a supply machine, normally known by the technical definition "curtain coater" 11, that is, a machine that releases fluid glazes in the form of a continuous curtain 12 which falls by gravity depositing almost entirely on the handmade articles 2 as they pass under the curtain coater 11, transported on the section 6C of the moving line 6.

[0036] The curtain 12 falls transversely to the movement direction X and has a width sufficient to cover, with a small excess, the entire width of the handmade article 2, as can be better seen in fig. 2.

[0037] Typically, the curtain coater 11 has a lower supply aperture (not visible in the drawings) which is adjustable in width, in such a way as to adjust the thickness, and possibly also the width, of the curtain 12 according to production requirements, that is, according to the sizes of the handmade articles to be decorated.

[0038] With reference to fig. 3, a second version of the plant 1 can be observed which is substantially the same as the first version, with the only difference that the supply unit 3 comprises at least one nozzle (or even a battery of nozzles) 13 which nebulizes the fluid glaze spraying it on the surfaces of the handmade articles 2, also in this case during their movement on the central section 6C of the moving line 6.

[0039] In both versions of the plant 1, the container means 4 comprise a tank 14 which is mounted on wheels 15 in order to be displaced according to the positioning requirements along a plant for the production of the handmade articles 2.

[0040] The tank 14 contains a volume V of fluid glazes, in this specific case target-glazes, that is, glazes selected for production, and one end 5A of the duct 5 draws from this volume V and can be equipped with a filtering device 16 for separating from the fluid glazes possible impurities present, or lumps that have formed and that would damage the continuity of the curtain 12 of glazes and, ultimately, the surface coating of the handmade articles 2, making them imperfect and unmarketable.

[0041] The pumping unit 7 comprises at least one

pump 17 of the variable flow rate type, the functioning of which is interlocked with the PLC 9, in particular with the means 10 for adjusting the flow rate.

[0042] Between the pump 17 and the supply unit 3 there is mounted, on the duct 5, a volumetric flow sensor 18 which is connected to the PLC 9 and, in the second version of the plant 1, there is also provided a pressure sensor 19 which is also connected to the PLC 9.

[0043] The tank 14 can also be equipped with a stirrer unit 20 to keep the fluid glazes mixed and prevent them from depositing, accumulating and aggregating on the bottom.

[0044] The adjusting means 10 preferably comprise an inverter 21 which is able to control the pump 17, modifying its flow rate according to requirements, as will be better described below.

[0045] The moving line 6 is equipped with a device for controlling the translation speed of the handmade articles 2, typically consisting of an encoder 22, which is also connected to the PLC 9.

[0046] The method for the weigh application of glazes on surfaces of handmade articles 2, in particular on surfaces of ceramic handmade articles 2, comprises a step of initial setting of the plant 1 using a base-weight, conventionally indicated with P1, of a base-glaze to be supplied.

[0047] For the setting step, a known base-data set is loaded into the PLC 9, so that the latter produces a theoretical base-flow rate of glaze to be supplied, hereafter again conventionally indicated with Q1 and which is a function of the loaded base-data.

[0048] The base-data comprise:

- a base-density, conventionally indicated with D1, of a reference base-glaze which has an absolute value known to an operator;
- a base-surface, conventionally indicated with S1, of a reference handmade article known to the operator; and
- the theoretical base-weight P1 of base-glaze to be supplied on the base-surface S1, established by the operator.

[0049] The theoretical base-weight P1 is determined in a conventional manner, that is, by weighing the reference handmade article, or base-handmade article, before and after the supply of the base-glaze, first by removing it from, and then returning it to, the moving line 6 after each weighing which takes place on two known weighing apparatuses PS1 and PS2 outside the glazing line, which are represented schematically in fig. 4 with images of two scales.

[0050] The person of skill will understand that to carry out the two weighings, even a single weighing apparatus would be sufficient.

[0051] From this first setting step, as indicated in fig. 6, a real base-glaze value supplied on the base-surface is obtained.

[0052] In the event the real value of the glaze weight supplied corresponds to the desired value of the glaze weight, therefore in the absence of significant glaze losses, the target-surfaces of the target-handmade articles can be decorated by using the base-data introduced in PLC 9 without any correction.

[0053] On the contrary, in the event that significant differences occur between the real value of the base-glaze weight supplied on the base-surface of the base-handmade article and the desired theoretical target-weight value of target-glaze to be supplied on the target-surface, the base-data is corrected so that the real target-weight value of target-glaze reaches the desired theoretical value.

[0054] In order to subsequently supply a desired and programmed target-weight of target-glaze, different from P1 since it has to take into account the losses due to ricochets and conventionally indicated with P2, the operator, in order to obtain the supply of the same desired theoretical target-glaze weight on the target-surface, has to reset the plant 1, by intervening on the PLC 9, into which the operator has to load a target-data set that refers to a new production of target-handmade articles, that is, the real ones.

[0055] For example, it is possible to modify the base-data so that the PLC 9 controls the pump 17 by means of the inverter 21 to produce a pre-established increased flow rate, conventionally indicated with Q2, of said target-glaze to be supplied and normally different from the flow rate Q1.

[0056] Alternatively, in order to obtain the supply of a real glaze weight on the target-surfaces S2 of the target-handmade articles, the PLC 9 can intervene on the translation speed of the transport line 6, generally decreasing it when it is necessary to increase the glaze weight on the base-surfaces, or increasing it when the glaze weight supplied on the base-tile is excessive.

[0057] The target-data that the operator has to load into the PLC 9 can comprise:

- a new target-density, conventionally indicated with D2, of a target-glaze to be supplied and normally different from the base-density D1;
- a new target-surface, conventionally indicated with S2, of a target-handmade article 2 and equal or even different to the base-surface S1;
- the desired real target-weight value P2 of glaze to be supplied on the new target-surface S2 which takes into account the quantities lost due to ricochets.

[0058] The pump 17, which is managed by the inverter 21 in turn controlled by the PLC 9, after the target-data has been loaded, produces the flow rate Q2 of fluid target-glaze which is collected in the tank 14 and which flows inside the duct 5, until it reaches the curtain coater 11, or the nozzle, or the battery of nozzles, 13, from which it is supplied onto the target-handmade articles 2 that pass

below them, moved on the moving line 6.

[0059] In the event a curtain coater 11 is used, the width of the curtain 12 is maintained so that it is able to cover the overall transverse size (width) of the target-handmade articles 2, with a small excess which is collected in a tray 23 disposed under the moving line 6.

[0060] In the event the curtain coater 11 is replaced by one or more nozzles 13, their spray is adjusted and oriented in such a way as to homogeneously cover the entire target-surface of the target-handmade articles 2 and minimize the quantities of glazes lost due to ricochets.

[0061] The flow rate sensor 18 controls the passage of the fluid glazes in the duct 5 and sends the detection target-data to the PLC 9.

[0062] The encoder 22 also sends the speed target-data to the PLC 9 which, after processing them according to the work program, verifies that the target-weight P2 is actually the one to be distributed on the target-handmade articles 2.

[0063] It should be noted that, if the encoder 22 detects a target-datum that differs from the one loaded by the operator into the PLC 9, this commands the inverter 10 so that it in turn modifies the conditions of rotation of the pump 17 in order to correct the flow rate Q2, so as to keep the target-weight P2 of glazes supplied constant.

[0064] In any case, the method allows to prevent the weighing of the target-handmade articles at least after the supply of the real quantity of target-glaze, advantageously corrected in order to take into account the losses caused by the ricochets or also by the suction of the filtering systems provided along the glazing lines.

[0065] In practice it has been verified that the invention achieves the intended purposes.

[0066] The invention as conceived is susceptible to modifications and variants, all of which are within the scope of the inventive concept.

[0067] Furthermore, all the details can be replaced with other technically equivalent elements.

[0068] In their practical embodiment, any other materials, as well as shapes and sizes, can be used according to requirements, without departing from the main field of protection of the following claims.

Claims

1. A method for the weight application of glazes on surfaces of handmade articles (2), in particular on surfaces of ceramic handmade articles, comprising:

- to set on a base-weight of a base-glaze to be supplied a plant (1) for the weight application of glazes on base-surfaces of base-handmade articles (2), said to set comprising:
- to load a base-data set in an electronic control unit (9) of said plant (1), obtaining a base-flow rate of base-glaze to be supplied which is a function of said base-data which comprise:

- a base-density of said base-glaze; and
- a base-weight of glaze to be supplied on said base-surface;

characterized in that after said to set the method comprises: 5

- to reset said plant (1) for supplying on a target-handmade article (2) a target-glaze weight value, said to reset comprising: 10
- to load in said electronic control unit (9) a series of target-data, obtaining a target-flow rate; said target-data comprising:
- a density of a target-glaze to be supplied; 15
- a target-surface of said target-handmade article (2); and
- said target-glaze weight value to be supplied on said target-surface.

2. The method according to claim 1, wherein it further comprises: 20

- to move said target-handmade article (2) in a movement direction (X); and
- to supply said target-weight value on said target-surface during said to move. 25

3. The method according to claim 1, wherein said to set comprises to weigh said base-handmade article (2) with weighing means that are outside said plant (1) for the weight application of glazes on base-surfaces of base-handmade articles, before and after a supply of said base-weight on said base-surface. 30

4. The method according to one or more of the preceding claims, wherein said set of base-data is partially/totally different from said set of target-data. 35

5. The method according to one or more of preceding claims, wherein said to reset comprises alternatively: 40

- to control a pump (17) so that said target-flow rate (Q2) of target-glaze is greater than a base-flow rate (Q1); or
- to modify the translation speed of a transport line (6) of said target-handmade article. 45

6. A plant (1) for the weight application of glazes on surfaces of handmade articles (2), in particular on surfaces of ceramic handmade articles, which comprises: 50

- containing means (14) for containing the glazes (V);
- a supply unit (3) for supplying a target-weight of target-glazes on a target-surface of a target-handmade article (2); 55
- a connection duct (5) interposed between said

container means (14) and supply unit (3);

- a moving line (6) for moving target-handmade articles (2) in a direction (X) below said supply unit (3);

- a pumping unit (7) for pumping said target-glazes mounted along said connection duct (5) and which has a variable target-flow rate;

- detecting means (18, 19) for detecting data of said target-glazes; and

- an electronic control unit (9) of said plant, **characterized in that** said electronic control unit (9) comprises adjusting means (10) for adjusting said variable target-flow rate of said pumping unit (7) which are interlocked with said detection means (18, 19).

7. The plant according to claim 6, wherein said moving line (6) comprises detecting means (22) for detecting the moving speed of said target-handmade articles (2) which are connected to said electronic control unit (9).

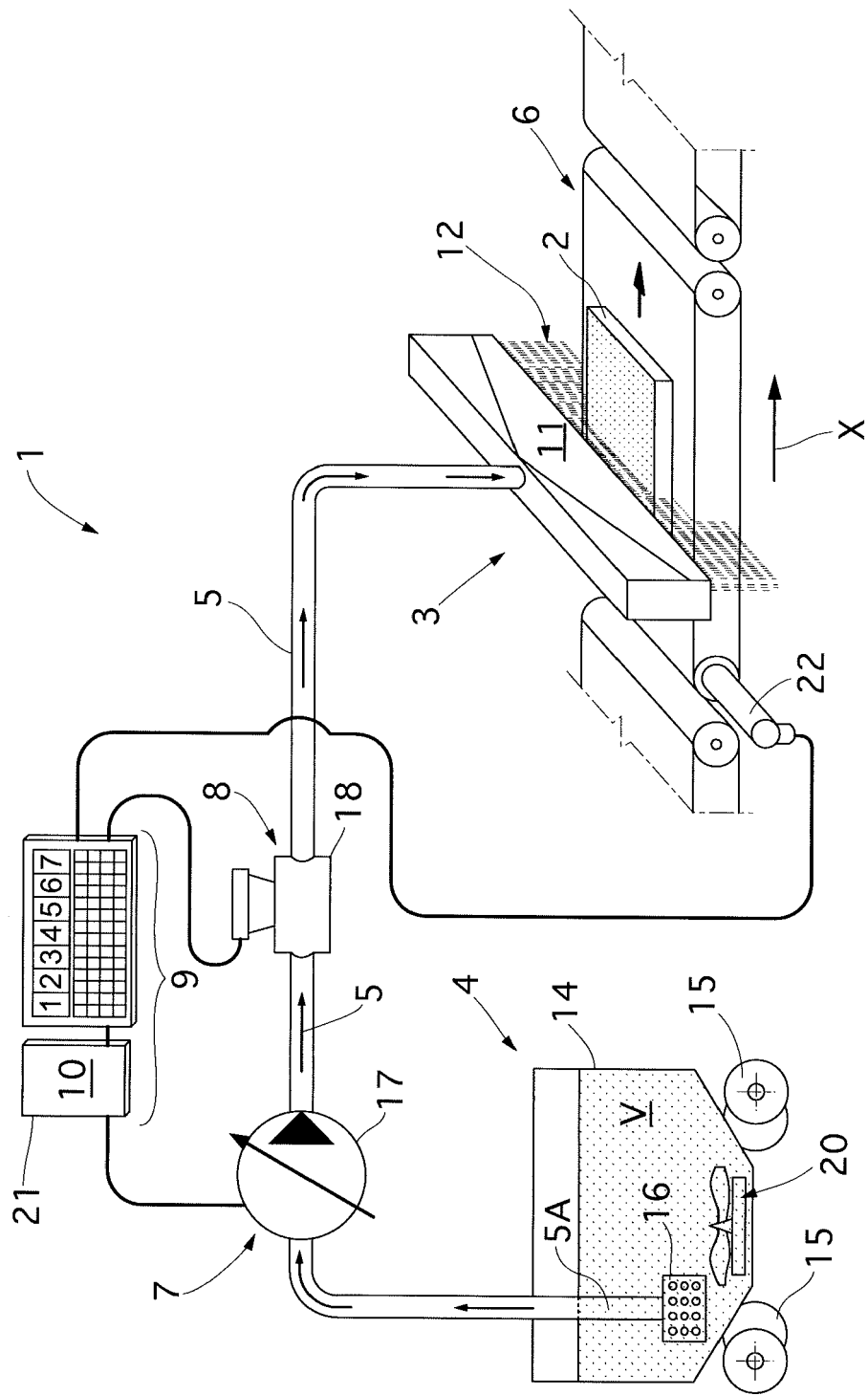


Fig. 1

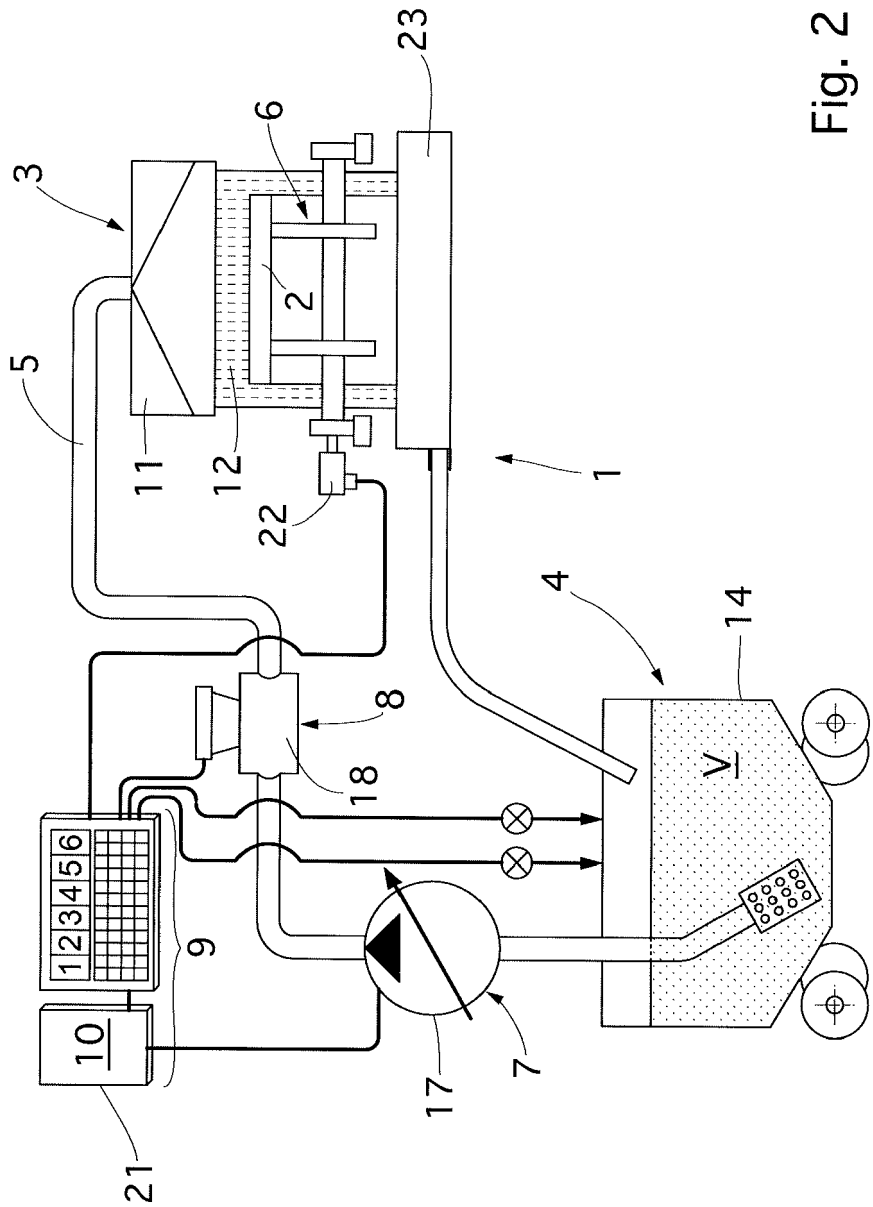


Fig. 2

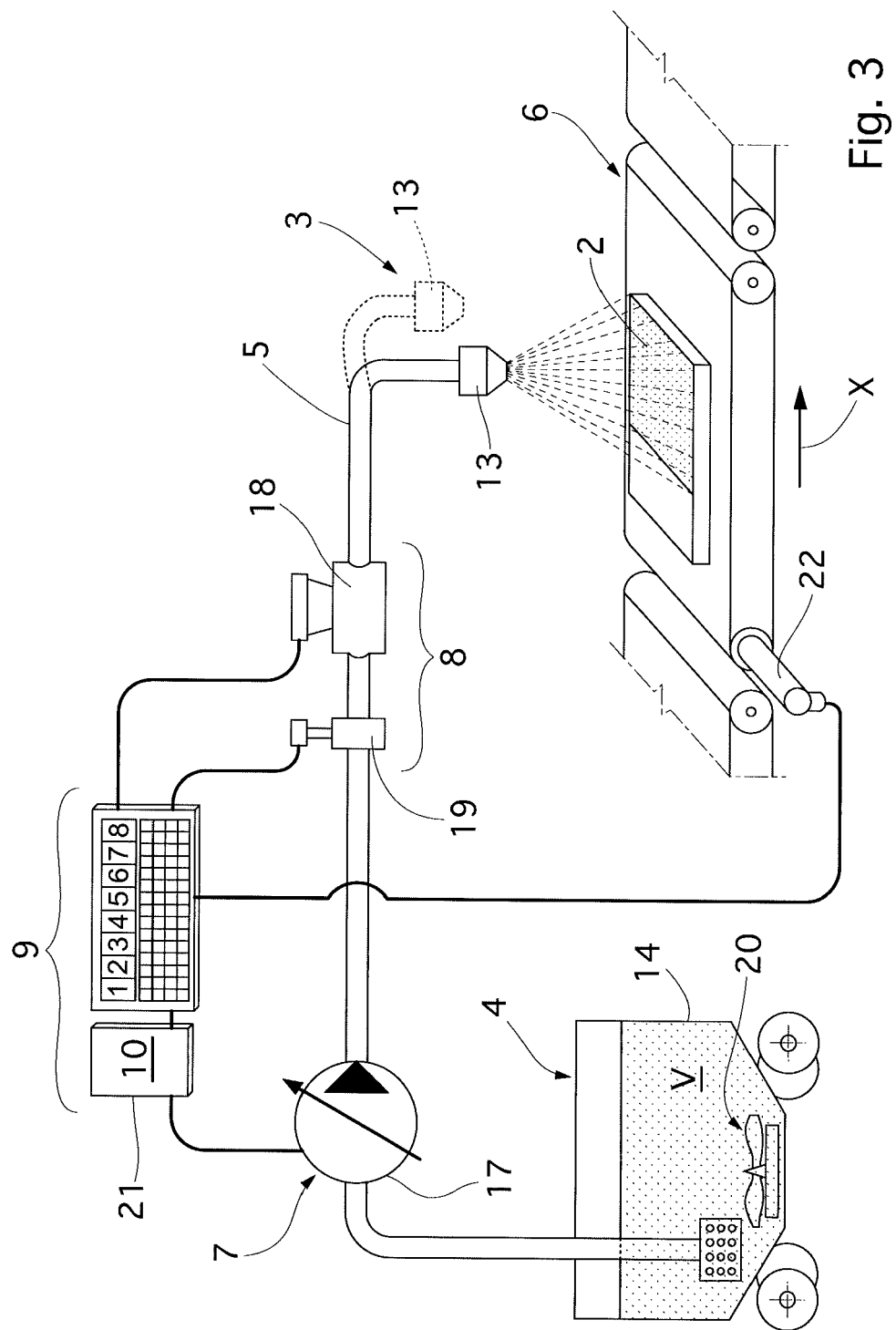
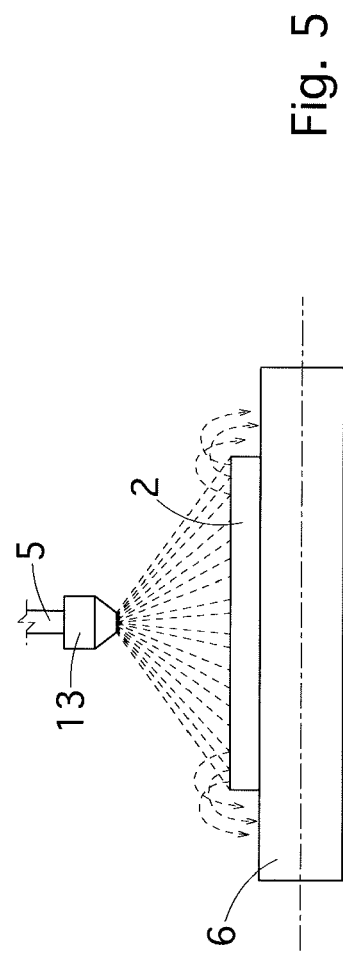
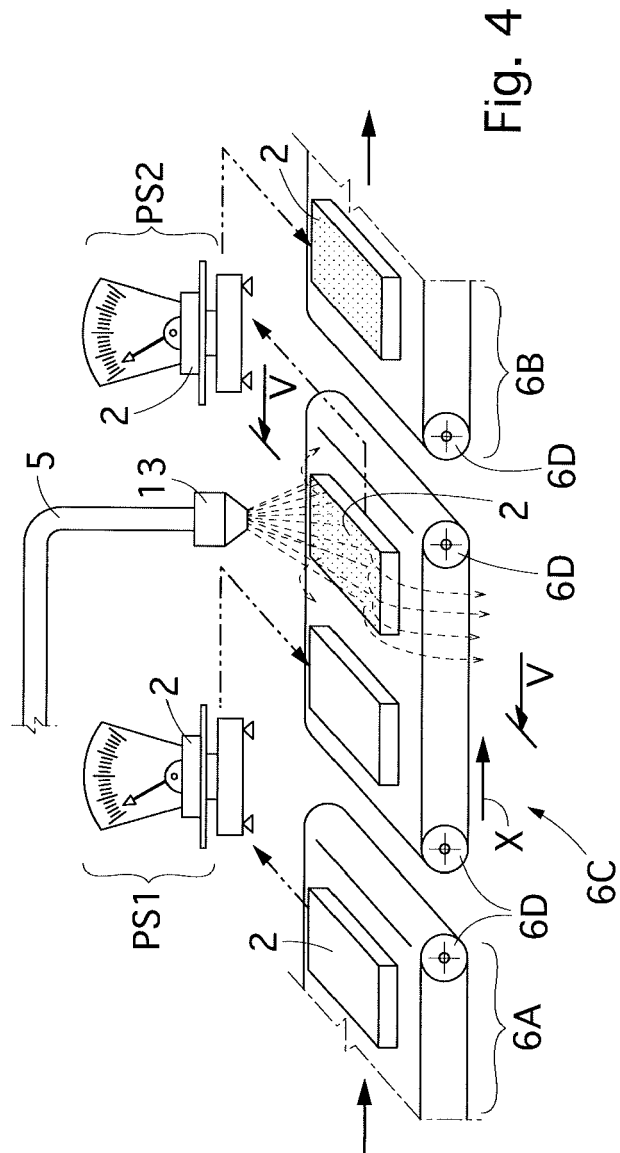


Fig. 3



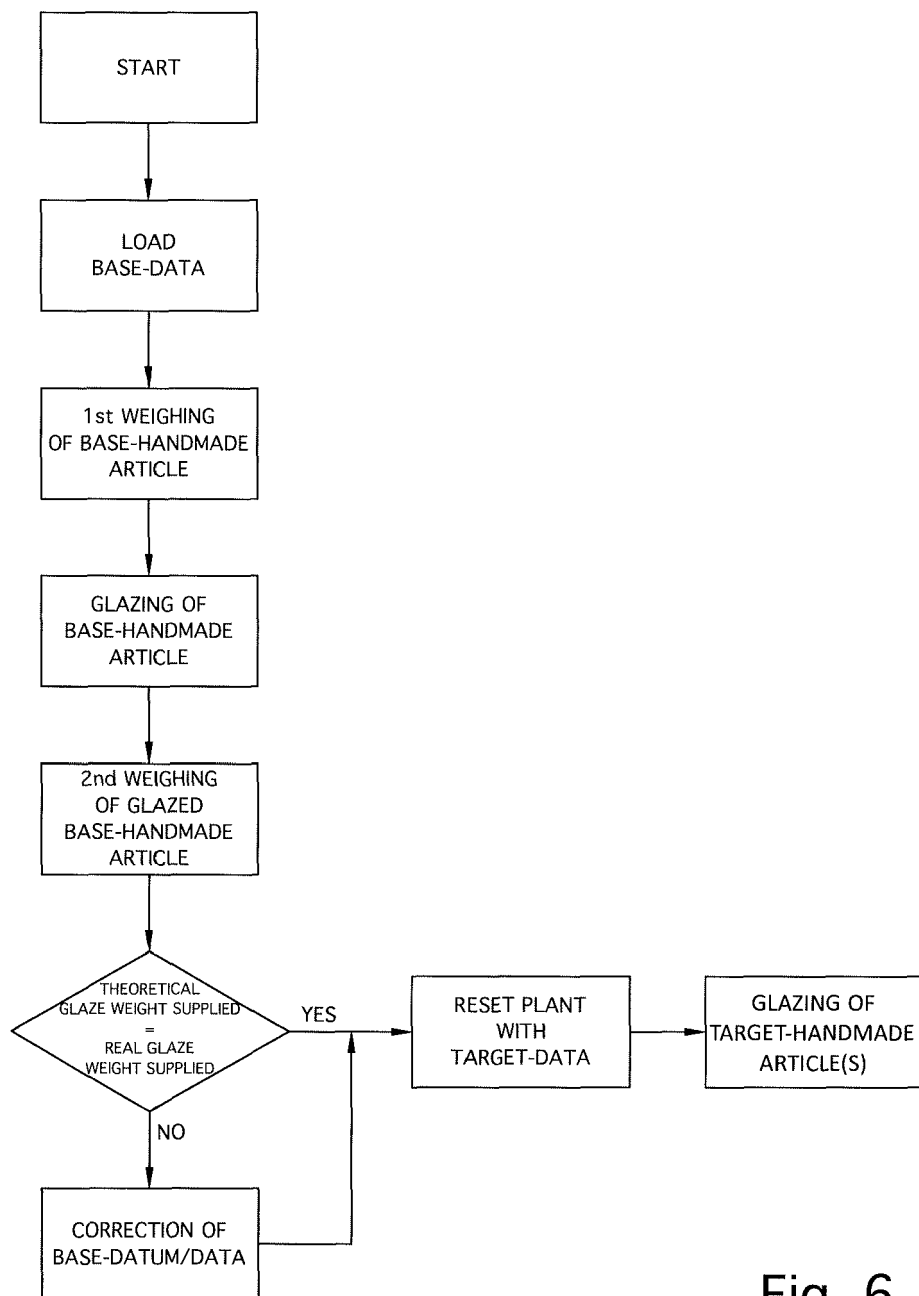


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 20 02 0629

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 April 2021	Examiner Orij, Jack
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 20 02 0629

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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