



(51) International Patent Classification:

B01F 13/10 (2006.01) **B01F 15/00** (2006.01)
B01F 3/12 (2006.01)

(21) International Application Number:

PCT/IB2009/006489

(22) International Filing Date:

7 August 2009 (07.08.2009)

(25) Filing Language:

Italian

(26) Publication Language:

English

(30) Priority Data:

MO2008A000218 8 August 2008 (08.08.2008) 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, BR, BW, BY, BZ,
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SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT,
TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

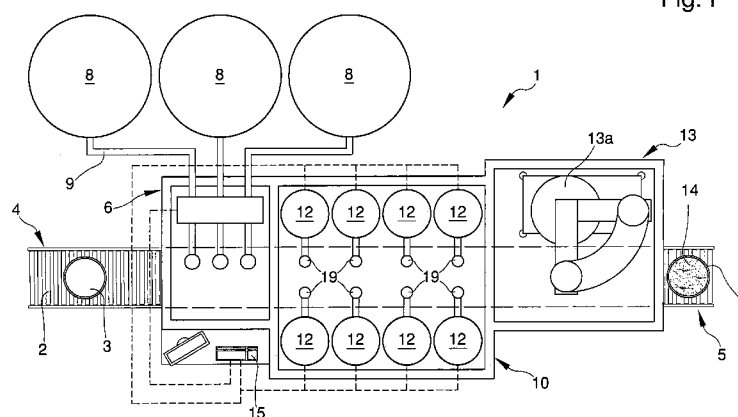
— as to the applicant's entitlement to claim the priority of
the earlier application (Rule 4.17(iii))

Published:

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

(54) Title: TINTOMETRIC SYSTEM FOR THE PRODUCTION OF SILK-SCREENING COLORANTS FOR CERAMIC PRODUCTS, PARTICULARLY TILES, BRICKS, SLABS AND THE LIKE

Fig. 1



(57) Abstract: The tintometric system (1) for the production of silk-screening colorants for ceramic products, particularly tiles, bricks, slabs and the like, comprises: - a dispensing station (6) for at least partially filling at least a containing recipient (3) with a pre-established quantity of a base product (7, 16) chosen from the list comprising a liquid silk-screening base (7) and a neutral powder for liquid silk-screening bases (16); - a batching station (10) for dispensing at least a powdered colorant substance (11) in at least a batching container (17) which is associated with measuring means (18) suitable for measuring a pre-established quantity of the powdered colorant substance (11) dispensed in the batching container (17), the pre-established quantity of powdered colorant substance (11) being transferable into the containing recipient (3); - a processing and control unit (15) operative ly associated with the dispensing station (6) and with the batching station and suitable for calculating the pre-established quantities of the base product (7, 16) and of the powdered colorant substance (11); and - a mixer station (13) suitable for mixing the base product (7, 16) and the powdered colorant substance (11) in the containing recipient (3) to obtain a fluid silk-screening colorant (14) for ceramic products.

TINTOMETRIC SYSTEM FOR THE PRODUCTION OF SILK-SCREENING COLORANTS FOR CERAMIC PRODUCTS, PARTICULARLY TILES, BRICKS, SLABS AND THE LIKE

Technical Field

- 5 The present invention relates to a tintometric system for the production of silk-screening colorants for ceramic products, particularly tiles, bricks, slabs and the like.

Background art

- With reference to the ceramic industry, it is known that for the manufacture of
10 silk-screening colorants, such as the colorants for glazes and slips, silk-screening pastes for screen silk-screening, silicone roller silk-screening or the like, a series of coloured components have to be mixed together until the right colour combination is obtained.

- In this respect, it is underlined that the components to be mixed together are
15 usually of two types: silk-screening bases and ceramic colouring fluids.

The silk-screening bases consist of a neutral powdered material mixed with a liquid substance that acts as a vehicle, with a white colour and are generally used as a filler, the colour of which is modified following mixing with ceramic colouring fluids in pre-established proportions.

- 20 The ceramic colouring fluids, in turn, consist of a colouring substance in the form of powder which, once mixed with the specific liquid vehicle (silk-screening oil), acquires the fluid consistency of liquids.

- To mix the silk-screening bases and the ceramic colouring fluids and obtain the silk-screening colorants of the desired colour, the ceramic industries are
25 normally endowed with an internal technical laboratory.

In these laboratories, the technicians appointed to such duties empirically combine a liquid silk-screening base with one or more of the ceramic colouring fluids, being careful to measure the mixed quantity by means of a weighing scale, so as to achieve the correct proportion among the colours.

- 30 These technical laboratories do however have a number of drawbacks including the fact that their correct operation is based on the expertise and on the skills of the technicians that work in them, who therefore unfortunately require long

periods of training and preparation to acquire the experience needed to do their job, with fairly high management and labour costs.

The empirical methods adopted in these laboratories are furthermore hard to reproduce and replicate in a standard way.

- 5 In this respect, the fact is emphasised that usually each laboratory has a broad range of ceramic colouring fluids supplied by a colorant manufacturer that produces its own and singular type of colours often different to that of the other colorant manufacturers.

- Whenever therefore the same laboratory decides to obtain its supplies from a
10 different colorant manufacturer, it is practically obliged to acquire the whole range of colours of the new colorant manufacturer, with a considerable increase in warehouse stocks and an inevitable waste of the remnants supplied by the previous colorant manufacturer.

- To overcome the above drawbacks, for some years now particular systems
15 called "tintometers", specifically designed for the ceramic industry, have been developed and fine tuned.

These systems make use of standard-tone colours, in which each liquid silk-screening base and each ceramic colouring fluid is contained in a special tank.

- In this respect, it must be emphasised that traditional tintometers exploit the fact
20 that both the silk-screening bases and the ceramic colouring fluids are in liquid form and that, therefore, by connecting their tanks to a hydraulic circuit controlled by an electronic unit, they can be conveyed in a batching head in quantities preset to obtain the desired colour combination.

- The practical operation of these systems is obtained by combining their
25 operation with specific spectrophotometers, i.e., instruments that permit detecting the colour of an initial sample and obtaining the correct proportions between the ceramic colouring fluids at disposal to reproduce their colour combination.

- Traditional tintometers nevertheless have considerable drawbacks including the
30 fact that to operate they require long and laborious preliminary operations to prepare the ceramic colouring fluids in liquid form.

The vehicle (silk-screening oil) in which the colouring substances of the

ceramic colouring fluids are mixed, in fact, must unfortunately have specific characteristics compatible with the vehicles contained in the silk-screening bases.

Due to the lack of compatibility between silk-screening bases and ceramic colouring fluids, furthermore, the use of the traditional tintometers is often restricted to the production of particular types of silk-screening colorants for ceramic products, while for other types, different methods have to be used.

It should not be forgotten furthermore that in the traditional tintometers, the ceramic colouring fluids in liquid form must be regularly shaken to keep the powdered colorant substances in suspension.

Each tank must therefore unfortunately be equipped with its own shaking system.

Furthermore, every time the machine has to be stopped for logistic reasons, it is unfortunately necessary to remove all the ceramic colouring fluids in liquid form, which would otherwise dry up, and clean the relevant tanks, with considerable wastes.

Object of the Invention

The main aim of the present invention is to provide a tintometric system for the production of silk-screening colorants for ceramic products, particularly tiles, bricks, slabs and the like, that is practical and easy to use and functional and allows reducing the wastes associated with traditional systems, being generally more economical.

Another object of the present invention is to provide a tintometric system for the production of silk-screening colorants for ceramic products, particularly tiles, bricks, slabs and the like that allows to overcome the mentioned drawbacks of the background art in the ambit of a simple, rational, easy, effective to use and low cost solution.

The above objects are achieved by this tintometric system for the production of silk-screening colorants for ceramic products, particularly tiles, bricks, slabs and the like, characterized in that it comprises:

- at least a dispensing station for at least partially filling at least a containing recipient with a pre-established quantity of at least a base

product chosen from the list comprising a liquid silk-screening base and a neutral powder for liquid silk-screening bases;

- at least a batching station for dispensing at least a powdered colorant substance in at least a batching container which is associated with measuring means suitable for measuring a pre-established quantity of said powdered colorant substance dispensed in said batching container, said pre-established quantity of powdered colorant substance being transferable into said containing recipient;
- at least a processing and control unit operatively associated with said dispensing station and with said batching station and suitable for calculating said pre-established quantities of the base product and of the powdered colorant substance; and
- at least a mixer station suitable for mixing said base product and said powdered colorant substance in said containing recipient to obtain a fluid silk-screening colorant for ceramic products.

Brief Description of the Drawings

Other characteristics and advantages of the present invention will become more evident from the description of a preferred, but not sole, embodiment of a tintometric system for the production of silk-screening colorants for ceramic products, particularly tiles, bricks, slabs and the like, illustrated purely as an example but not limited to the annexed drawings in which:

figure 1 is a plan view of the system according to the invention;

figure 2 is a side view of the system of figure 1;

figure 3 is a side view and on an enlarged scale of a detail of the system of figure 1;

figure 4 is a side, partial view and on an enlarged scale of an alternative embodiment of the system according to the invention;

figure 5 is a side, partial view and on an enlarged scale of another embodiment of the system according to the invention;

figure 6 is a side, partial view and on an enlarged scale of a further embodiment of the system according to the invention;

figure 7 is a side, partial view and on an enlarged scale of still another

embodiment of the system according to the invention;

figure 8 is a side, partial view and on an enlarged scale of a different embodiment of the system according to the invention;

figure 9 is a side, partial view and on an enlarged scale of another embodiment of the system according to the invention.

Embodiments of the Invention

With particular reference to the embodiment of the invention shown in figures from 1 to 3, globally indicated by 1 is a tintometric system for the production of silk-screening colorants for ceramic products, particularly tiles, bricks, slabs and the like.

In this respect, it must be pointed out that in the present treatise by “silk-screening colorant” is meant a substance in fluid state intended for the ceramic industry not only to colour silk-screening pastes (to be used on screen silk-screening, silicone roller machines or the like), but also to colour glazes and slips.

The system 1 comprises a feed line 2 suitable for moving a succession of containing recipients 3, of the type of bins or the like, between an inlet station 4, where the bins 3 are loaded on the feed line 2, and an outlet station 5, from where instead the bins 3 are picked up and which is arranged downstream of the inlet station 4.

In this respect, the fact is underlined that in the present treatise the expressions “downstream” and “upstream” are used with reference to the normal direction of movement of the bins 3 on the feed line 2.

Usefully, the feed line 2 is defined by a plurality of roller conveyors arranged in series above which the bins 3 are conveyed; alternative embodiments of the present invention cannot however be ruled out in which the feed line 2 is defined by other movement systems (e.g.: braces or conveyor belt).

Along the feed line 2 and immediately downstream of the inlet station 4 a dispensing station 6 is located for the at least partial filling of a bin 3 with a pre-established quantity of a base product 7, 16.

The base product 7, 16, in particular, is selected from the list comprising a liquid silk-screening base 7 and a neutral powder for liquid silk-screening bases

16; in the embodiment shown in the figures from 1 to 3, for example, the base product 7, 16 consists of a liquid silk-screening base 7.

In particular, the system 1 comprises a plurality of collection tanks 8 for containing a plurality of silk-screening bases 7 of types different the one from the other; each collection tank 8 is connected to the dispensing station 6 by means of a specific hydraulic circuit 9.

Along the feed line 2 and immediately downstream of the dispensing station 6 a batching station 10 is also located for dispensing at least a powdered colorant substance 11 in at least a batching container 17 which is associated with measuring means 18 suitable for measuring a pre-established quantity of the powdered colorant substance 11 dispensed in the batching container 17, for the subsequent transfer of such pre-established quantity into the bins 3.

In detail, the system 1 comprises a plurality of collection containers 12 for the dry containing of an equal number of powdered colorant substances 11 each different the one from the other.

The collection containers 12 are associated with a corresponding batching device 19 and are all mounted above the feed line 2.

Below each collection container 12 and above the feed line 2 a corresponding batching container 17 is mounted, the transfer of the powdered colorant substances 11 from the collection containers 12 to the batching containers 17 and from the batching containers 17 to the bins 3 occurring by gravity.

It cannot however be ruled out that the system 1 be equipped with other systems, e.g., of the suction type, suitable for picking up the powdered colorant substances 11 from the collection containers 12 and loading them in the batching containers 17 and in the bins 3.

More in detail, the batching containers 17 are associated with valve means for the transfer of the powdered colorant substances 11 into the bins 3.

In this respect, it must be underlined that in this treatise, by "valve means" is meant a generic mechanism/device able to allow the powdered colorant substances 11 to pass from the batching containers 17 into the underlying bins 3, e.g., a real valve located at the base of the batching containers 17, or a door with opening bottom, or a mechanism for tipping up the batching containers 17.

To measure, the quantity of powdered colorant substance/s 11 to be transferred into the bins 3, the measuring means 18 consist, e.g., of a series of weighing devices (e.g.: load cells or the like arranged below the batching containers 17), which allow quantifying the contents until the pre-established quantity is reached.

Usefully, along the feed line 2 a mixer station 13 is provided suitable for mixing the liquid silk-screening base 7 together with the powdered colorant substance/s 11 poured into the bins 3, so as to obtain a fluid silk-screening colorant 14 for ceramic products which has a pre-established colour in fluid, homogeneous and uniform form.

The mixer station 13, e.g., comprises an agitating apparatus 13a which is located immediately downstream of the batching station 10 and upstream of the outlet station 5 and which is suitable for agitating the bins 3 and with them their contents.

Advantageously, the system 1 also has a processing and control unit 15 which is operatively associated with the dispensing station 6 and with the batching station 10 and is suitable for calculating the pre-established quantities of liquid silk-screening base 7 and of powdered colorant substance/s 11 to be introduced into the bins 3.

For this purpose, the processing and control unit 15 is operatively associable with a spectrophotometric system able to detect the preset colour tone to be obtained in the fluid silk-screening colorant 14 starting with an initial sample.

Once the above pre-established colour tone has been detected, the processing and control unit 15 calculates the batch of the liquid silk-screening base 7 and of the powdered colorant substance/s necessary to obtain, at the end of the mixing done by the agitating apparatus 13a, the fluid silk-screening colorant 14 of the pre-established colour.

The processing and control unit 15, furthermore, is operatively associated with the feed line 2 and with the agitating apparatus 13a, so as to permit the automation of the entire system 1.

The processing and control unit 15, in fact, is preset to make the bins 3 move forward on the feed line 2 starting from the inlet station 4, stop these at the

dispensing station 6, dispense the liquid silk-screening base 7 in a preset quantity, make the bins 3 move forward until they stop at the batching station 10, batch a preset quantity of powdered colorant substance/s 11 and transfer this into the bins 3, make the bins 3 move forward as far as the agitating apparatus 13a, command the operation of the agitating apparatus 13a and, finally, allow the bins 3 to reach the outlet station 5 from where they can be picked up.

In other words, the operation of the system 1 described and illustrated in the figures from 1 to 3, is split into the following phases:

- 10 - to detect the colour pre-established by the initial sample by means of the spectrophotometric system;
- to calculate the pre-established quantity of base product 7 and powdered colorant substance/s 11 to be introduced into the bins 3 by means of the processing and control unit 15;
- 15 - to pour the pre-established quantity of base product 7 into the bins 3 which, by means of the system 1 in the figures from 1 to 3, consists in dispensing the liquid silk-screening base 7 through the dispensing station 6;
- to load the powdered colorant substance/s 11 in the batching containers 17, and monitor the weight by means of the weighing devices 18 until the pre-established quantity is reached calculated by the processing and control unit 15;
- 20 - to transfer the powdered colorant substance/s 11 from the batching containers 17 to the bins 3 through the valve means 20;
- 25 - to mix the liquid silk-screening base 7 and the powdered colorant substances 11 introduced into the bins 3 so as to obtain the required fluid silk-screening colorant 14. Such phase is obtained by means of the agitation of the bins 3 by means of the agitating apparatus 13a.

In an alternative embodiment of the invention shown in figure 4, the inlet station 4, outlet station 5, dispensing station 6 and mixer station 13 are substantially identical to the solution of the figures from 1 to 3 and, therefore, are neither shown on the drawing tables nor the subject of further detailed explanation, its being understood that for these it is best to refer to the above

description.

This embodiment differs from the previous one inasmuch as the batching station 10, besides the batching containers 17 and the measuring means 18, also comprises first pouring means 21 designed to pour a liquid vehicle for ceramic
5 colouring fluids 22 into the batching containers 17.

For example, the liquid vehicle for ceramic colouring fluids 22 consists in a silk-screening oil.

The batching station 10 also comprises agitating means 23 for mixing the powdered colorant substance/s 11 together with the silk-screening oil 22 in the
10 batching containers 17 before transferring everything into the bins 3.

In this embodiment, in actual fact, the loading of each batching container 17 with the corresponding powdered colorant substance 11 is done by measuring its weight until a pre-established quantity is reached calculated by the processing and control unit 15; afterwards a pre-established quantity of silk-
15 screening oil 22 is also poured into the batching container 17 again measured by means of the weighing devices 18, which silk-screening oil 22 is mixed together with the powdered colorant substance 11 by means of the agitating means 23.

All this makes it possible to make the powdered colorant substance 11 more flowable and therefore more easily transferable into the bins 3 by opening the
20 valve means 20.

In the embodiment shown in figure 4, like that shown in the figures from 1 to 3, the base product 7, 16 consists in a liquid silk-screening base 7 batched into the bins 3 by means of the dispensing station 6.

Other embodiments are however possible such as those shown in the figures 5
25 and 6 in which the base product 7, 16 consists in a neutral powder for liquid silk-screening bases 16.

In these embodiments, in actual fact, the dispensing station 6 is designed to dispense a neutral powder for liquid silk-screening bases 16 into the bins 3, e.g., by means of a weighing system identical to that of the batching station 10.

30 In this case, therefore, the bins 3 reach the batching station 10 containing only the neutral powder for liquid silk-screening bases 16 and will therefore not only be filled with the powdered colorant substance/s 11 but also with a liquid

vehicle for liquid silk-screening bases 24, so that the mixing of the neutral powder for liquid silk-screening bases 16 and the liquid vehicle for liquid silk-screening bases 24 results in the formation of the liquid silk-screening base 7.

For this purpose, the batching station 10 also comprises second pouring means
5 25 for pouring the liquid vehicle for liquid silk-screening bases 24 into the bins 3; the correct quantity of such liquid vehicle is calculated by means of special measuring apparatus 26, of the load cell type or the like positionable below the roller conveyors 2, or by means of flow rate measuring devices through the second pouring means 25.

10 In another embodiment shown in figure 7, the base product 7, 16 dispensed in the dispensing station 6 again consists of the neutral powder for liquid silk-screening bases 16, which is the only contents of the bins 3 that reach the batching station 10.

Furthermore, the batching station 10 is again provided with second pouring
15 means 25 for pouring the liquid silk-screening bases 24 which, however, unlike the solutions shown in the figures 5 and 6, is suitable for pouring the liquid vehicle for liquid silk-screening bases 24 not directly into the bins 3 but through the batching containers 17 after these have been filled with the pre-established quantities of powdered colorant substances 11.

20 This way, the powdered colorant substances 11 are more easily transferred into the bins 3 and, at the same time, the batching containers 17 can be cleaned as a result of the flow of the liquid vehicle for liquid silk-screening bases 24.

It cannot of course be ruled out that the second pouring means 25 shown in the figure 7 be designed to pour the liquid silk-screening base 7 directly into the
25 batching containers 17; in this case, the dispensing station 6 and the batching station 10 can be integrated into one, being suitable for receiving empty bins 3, measuring the pre-established quantity of powdered colorant substance/s 11 in the batching containers 17 and then pouring the liquid silk-screening base 7 into the bins 3 passing through the batching containers 17, to completely remove the
30 powdered colorant substance/s 11 contained in them and transfer it into the bins 3.

Alternative embodiments of the invention are finally possible in which the

batching containers 17 have a shape different to that shown in the previous illustrations.

In the solution of figure 8, for example, the batching container 17 is obtained from a narrowing of the base of the bins 3 and the batching of the powdered colorant substance/s 11 occurs inside the bins themselves.

The initially empty bins 3, in fact, are partially filled with the pre-established quantity of powdered colorant substance/s 11 which is allowed to fall from the collection containers 12.

This pre-established quantity is collected at the base of the bins 3 where it can usefully be mixed with the silk-screening oil 22 coming from the first pouring means 21.

After the powdered colorant substance/s 11 and the silk-screening oil 22 have been mixed together, the liquid silk-screening base coming from the second pouring means 25 can be poured into the bins 3.

A further embodiment of the invention is shown in figure 9 and presents the batching containers 17 which are mounted above the bins 3.

In this case, therefore, the batching containers 17 move forward together with the bins 3 until they reach the collection containers 12, from where the powdered colorant substance/s 11 is made to fall.

In this embodiment too, the batching containers 17 have specific weighing devices 18, for measuring the pre-established quantity of powdered colorant substance/s 11, and valve means 20 of the type suitable for overturning the batching containers 17 to transfer the contents into the underlying bins 3.

It has in point of fact been ascertained how the described invention achieves the proposed objects.

In this respect, the fact is underlined that the particular solution of providing a tintometric system according to the invention, in which the powdered colorant substances are stored dry in collection containers and are intended to be mixed with the silk-screening base or with a liquid vehicle in an extemporaneous way only at the time of the production of the fluid silk-screening colorants, allows overcoming in a practical, easy and functional way the drawbacks of the state of the art tied to the need to keep the powdered colorant substances in suspension

and/or to the compatibility between the silk-screening bases and the silk-screening oil of the traditional ceramic colouring fluids.

CLAIMS

- 1) Tintometric system (1) for the production of silk-screening colorants for ceramic products, particularly tiles, bricks, slabs and the like, characterized in that it comprises:
- 5 - at least a dispensing station (6) for at least partially filling at least a containing recipient (3) with a pre-established quantity of at least a base product (7, 16) chosen from the list comprising a liquid silk-screening base (7) and a neutral powder for liquid silk-screening bases (16);
 - 10 - at least a batching station (10) for dispensing at least a powdered colorant substance (11) in at least a batching container (17) which is associated with measuring means (18) suitable for measuring a pre-established quantity of said powdered colorant substance (11) dispensed in said batching container (17), said pre-established quantity of powdered colorant substance (11) being transferable into said containing recipient
 - 15 (3);
 - at least a processing and control unit (15) operatively associated with said dispensing station (6) and with said batching station and suitable for calculating said pre-established quantities of the base product (7, 16) and of the powdered colorant substance (11); and
 - 20 - at least a mixer station (13) suitable for mixing said base product (7, 16) and said powdered colorant substance (11) in said containing recipient (3) to obtain a fluid silk-screening colorant (14) for ceramic products.
- 2) System (1) according to claim 1, characterised in that it comprises at least a feed line (2) suitable for moving said containing recipient (3) between at least
- 25 an inlet station (4) and an outlet station (5), at least one between said dispensing station (6), said batching station (10) and said mixer station (13) being arranged along said feed line (2).
- 3) System (1) according to one or more of the preceding claims, characterised in that said processing and control unit (15) is operatively associated with said
- 30 feed line (2).
- 4) System (1) according to one or more of the preceding claims, characterised in that said processing and control unit (15) is operatively associable with a

spectrophotometric system to detect the colour tone of said fluid silk-screening colorant (14) starting with an initial sample.

5 5) System (1) according to one or more of the preceding claims, characterised in that it comprises at least a collection tank (8) for collecting said base product (7, 16) associable with said dispensing station (6).

6) System (1) according to one or more of the preceding claims, characterised in that it comprises a plurality of said collection tanks (8) for containing a plurality of said base products (7, 16).

10 7) System (1) according to one or more of the preceding claims, characterised in that it comprises at least a collection container (12) for the dry containing of said powdered colorant substance (11) associable with said batching station (10).

8) System (1) according to one or more of the preceding claims, characterised in that said collection container (12) is mounted above said feed line (2).

15 9) System (1) according to one or more of the preceding claims, characterised in that said batching container (17) is mounted below said collection container.

10) System (1) according to one or more of the preceding claims, characterised in that said batching container (17) is defined by a narrowing of the base of said containing recipient (3).

20 11) System (1) according to one or more of the preceding claims, characterised in that said batching container (17) is mounted above said containing recipient (3).

25 12) System (1) according to one or more of the preceding claims, characterised in that said measuring means (18) comprise at least a weighing device of the contents of said batching container (17).

13) System (1) according to one or more of the preceding claims, characterised in that said batching container (17) is associated with valve means (20) for the transfer of said powdered colorant substance (11) into said containing recipient (3).

30 14) System (1) according to one or more of the preceding claims, characterised in that said batching station (10) comprises first pouring means (21) of at least a liquid vehicle for ceramic colouring fluids (22) into said batching container

(17).

15) System (1) according to claim 14, characterised in that said batching station (10) comprises agitating means (23) for mixing said powdered colorant substance (11) together with said liquid vehicle for ceramic colouring fluids
5 (22) into said batching container (17).

16) System (1) according to one or more of the preceding claims, characterised in that it comprises second pouring means (25) of at least one of said liquid silk-screening base (7) and a liquid vehicle for liquid silk-screening bases (24) into at least one of said containing recipient (3) and said batching container (17).

10 17) System (1) according to one or more of the preceding claims, characterised in that it comprises a plurality of said collection containers (12) for the dry containing of a plurality of said powdered colorant substances (11).

Fig. 1

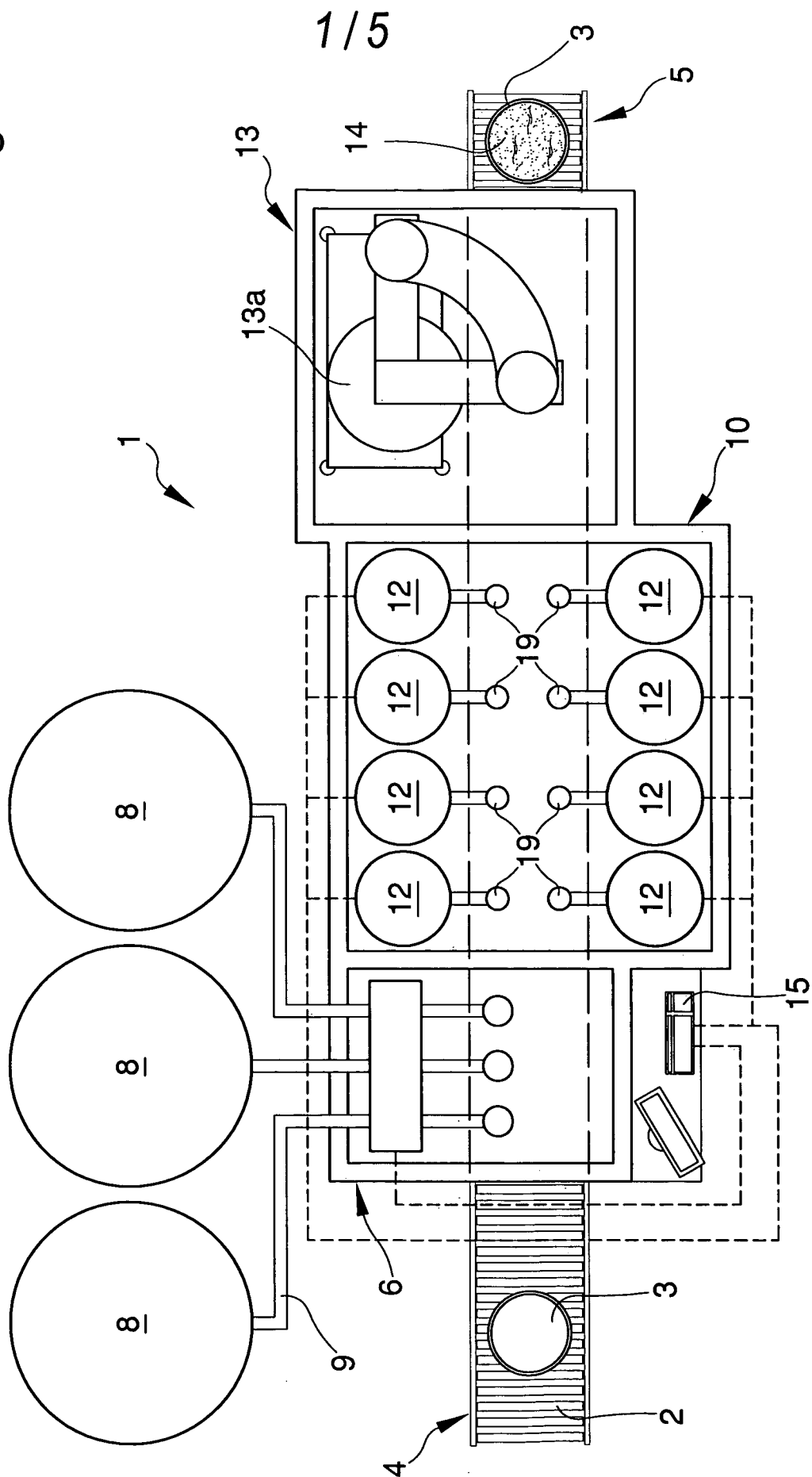


Fig. 2

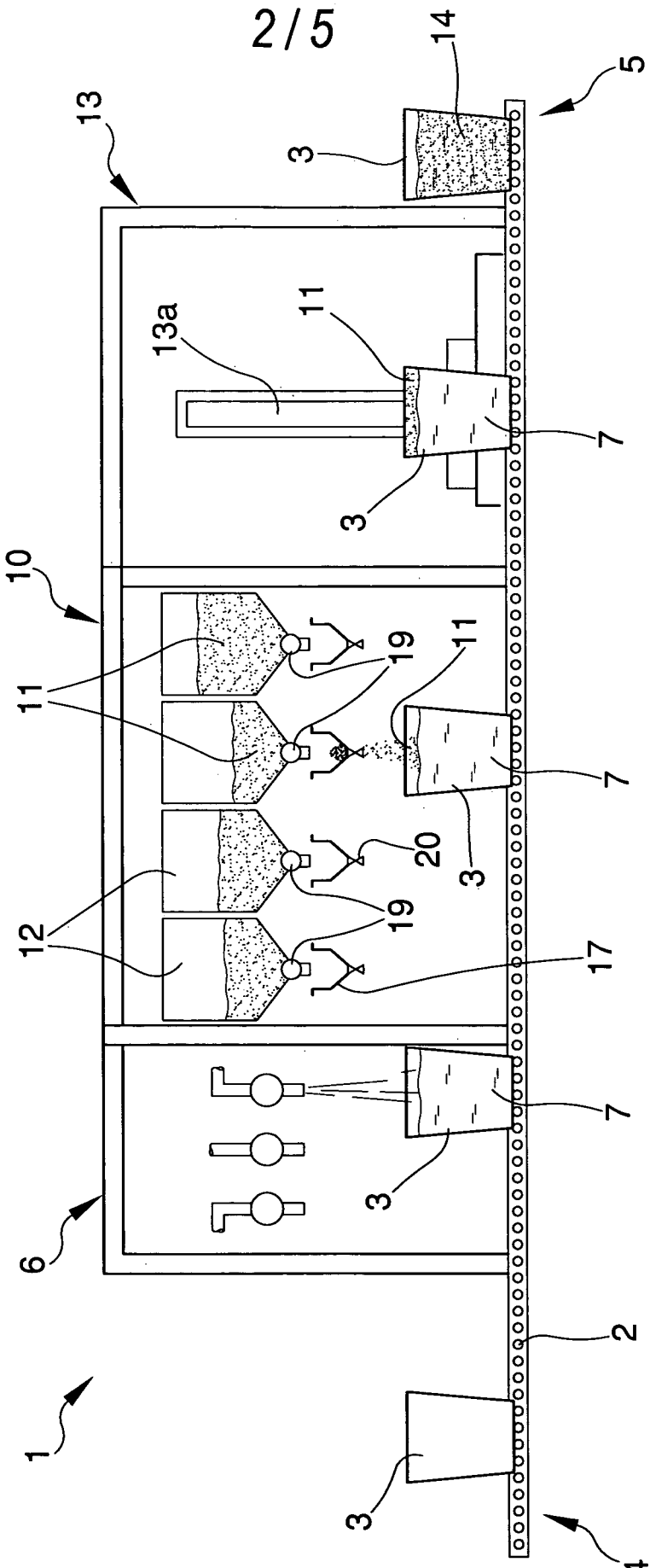
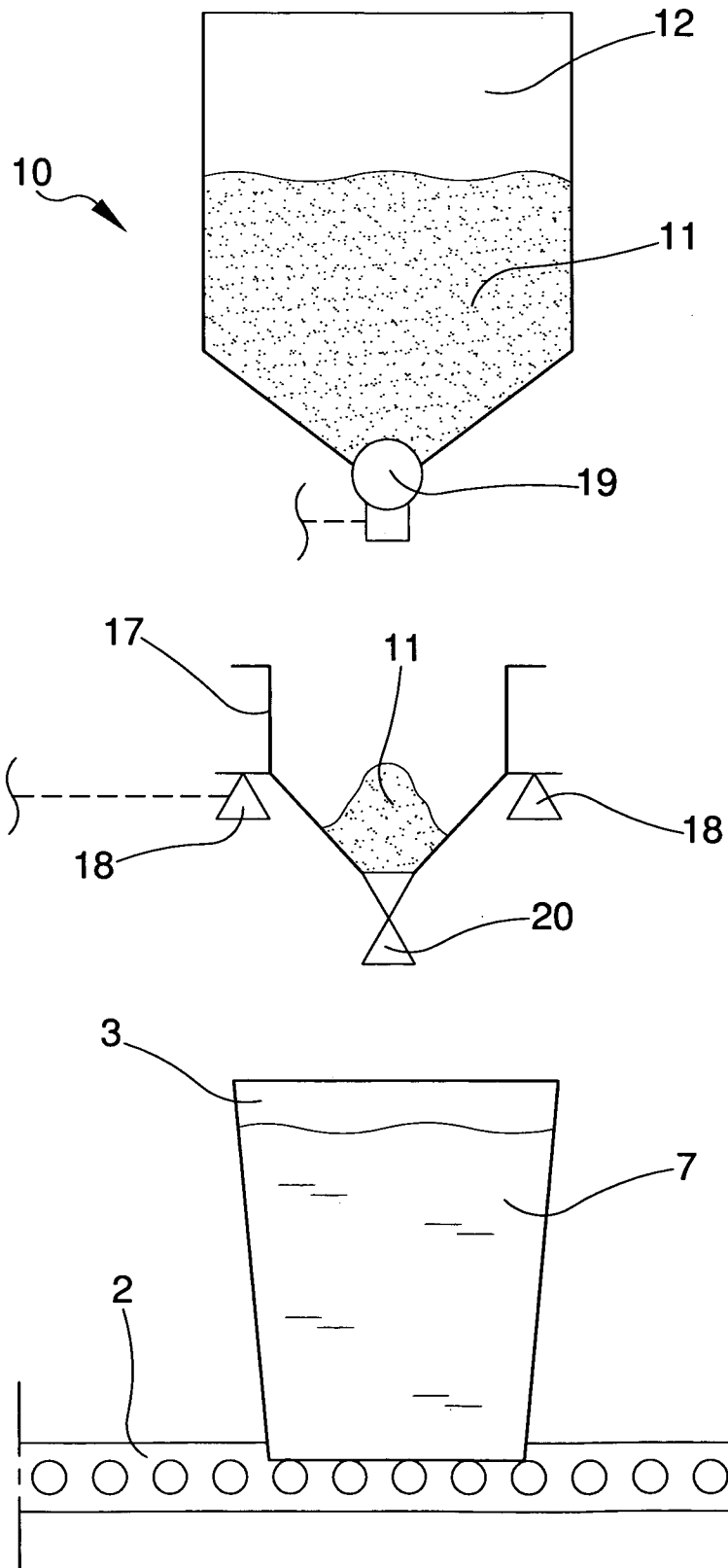


Fig. 3

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4/5

Fig. 4

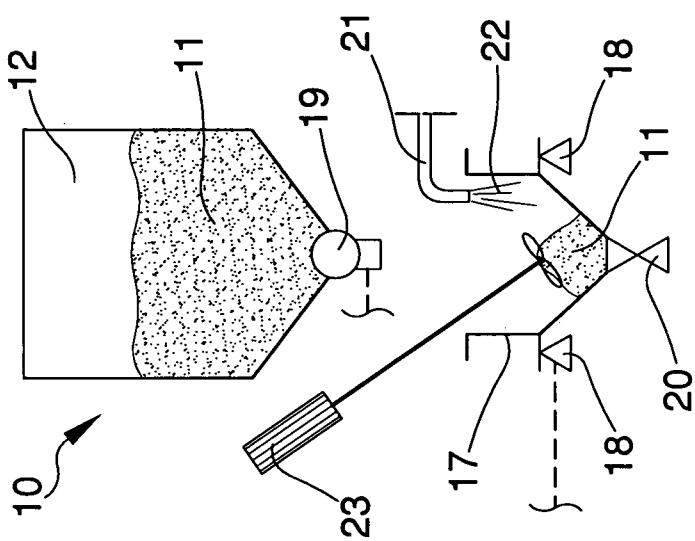


Fig. 5

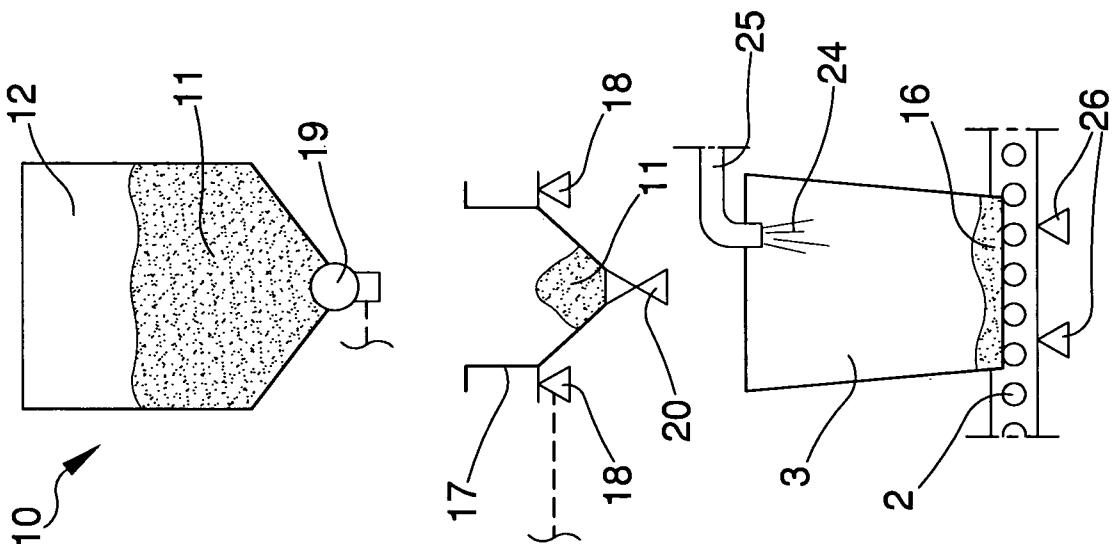


Fig. 6

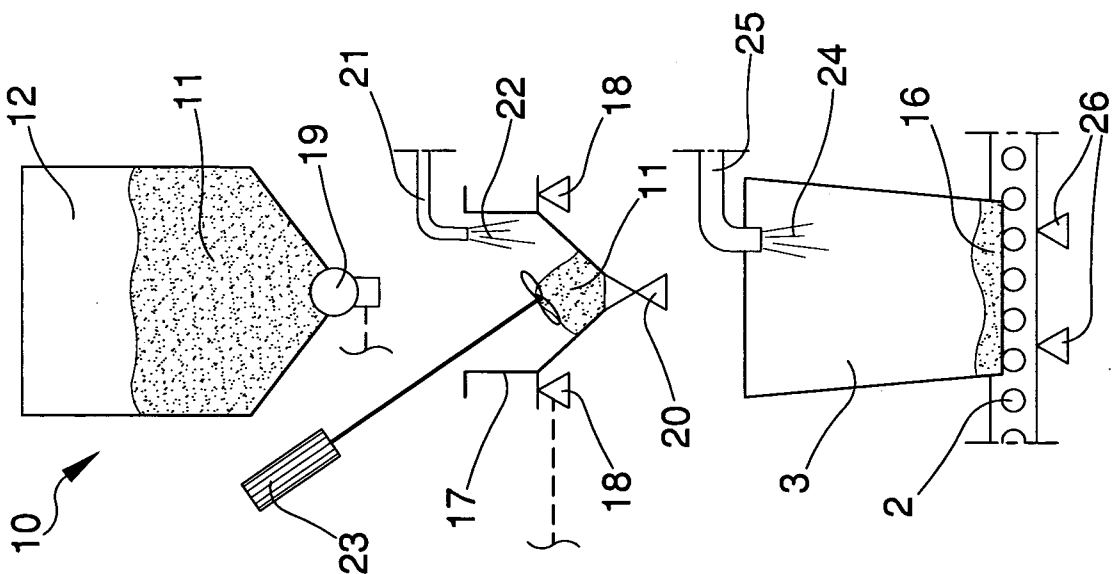


Fig. 7

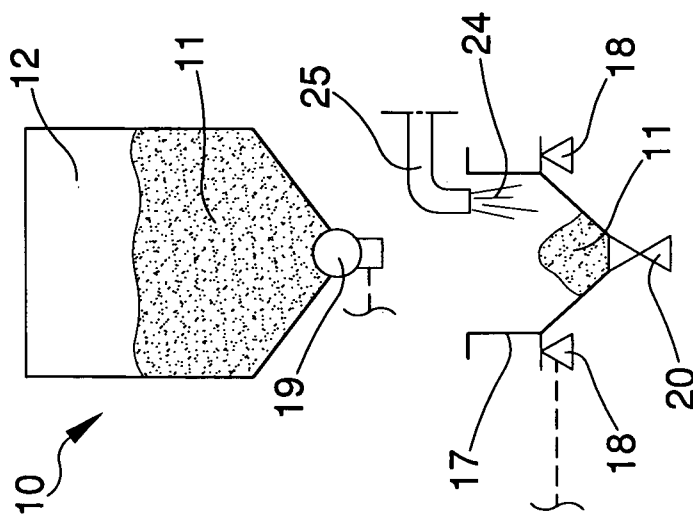


Fig. 8

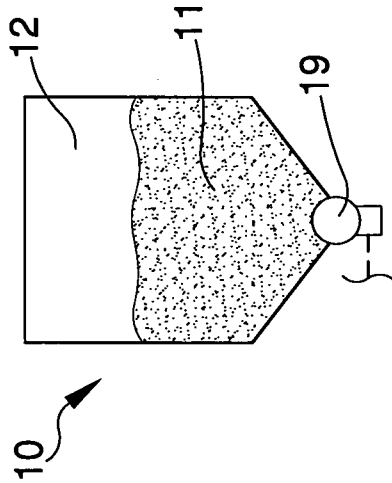


Fig. 9

