Machine for colouring ceramic products

A machine (1) for colouring ceramic products, wherein a unit (6) for metering a powdered colouring substance (7) presents a conveyor (8) for feeding products (2) with a substantially flat upper face (3) in a given direction (9) through an operating station (5); at least one dispenser (10)(12) being located over the conveyor (8) and being movable through the station (5); the dispenser (10)(12) presenting a rotary dispensing body (39), and at least one hopper (28) for housing the substance (7) and communicating with the dispensing body (39); and the dispenser (10)(12) also presenting a number of nozzles (34) communicating with the hopper (28) to transfer the substance (7) on to a given portion of the upper face (3) of the product.
Description

The present invention relates to a machine for colouring ceramic products.

It is an object of the present invention to provide a straightforward, low-cost machine for colouring ceramic products.

According to the present invention, there is provided a machine for colouring ceramic products with a powdered colouring substance; each ceramic product being defined at the top by a substantially flat face divisible into given portions; and the machine comprising an operating station and a metering unit for dispensing said powdered substance; characterized in that said unit comprises at least one dispensing member presenting a rotary dispensing body, and at least one hopper for housing said substance and communicating with said dispensing body; said dispensing body comprising a number of nozzles for receiving said substance from said hopper; and said unit also comprising an actuating device for moving said dispensing member in relation to said product at said operating station, so that a nozzle containing said substance is positioned facing a respective said given portion of each said face at said station.

A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic, partially sectioned front view of a machine in accordance with the teachings of the present invention;
Figure 2 shows a schematic side view, with parts in section and parts removed for clarity, of the Figure 1 machine.

Number 1 in Figure 1 indicates a machine for colouring ceramic products, e.g. tiles 2 presenting a substantially flat upper face 3 for colouring in various ways. To simplify the reproduction of a pattern on faces 3 of tiles 2, faces 3 may conveniently be divided ideallly into a given, e.g. grid, pattern defining given portions.

Machine 1 comprises an operating station 5 at the output of machine 1, a metering unit 6 for gravity feeding given quantities of powdered dye 7 at station 5; and a conveyor 8, the horizontal conveying branch of which extends in a given substantially horizontal direction 9 (Figure 2) to feed tiles 2 through station 5 and beneath unit 6 for colouring.

Over conveyor 8, unit 6 comprises two dispensing members 10 and 12 substantially aligned with each other in a substantially horizontal direction 13 perpendicular to direction 9, and connected rigidly to each other by a connecting member 16 shown schematically in Figure 1 and which ensures members 10 and 12 are maintained equidistant at all times.

Unit 6 also comprises an actuating device 19 for moving and supporting members 10 and 12, and which presents a step- or continuously-operated linear actuator 20 (shown schematically in Figure 1) for moving members 10 and 12 through station 5 in direction 13 and to and from an idle position in which members 10 and 12 are located downstream from station 5, in the traveling direction from member 10 towards station 5 in Figure 1, and astride station 5 as shown in Figure 2. Device 19 also comprises a pair of step- or continuously-operated linear actuators 21 (shown schematically in Figure 1) for selectively moving members 10 and 12 to and from the idle position through station 5 in direction 9. By means of actuator 20 and actuators 21, device 19 therefore provides for moving members 10 and 12 within a substantially rectangular work area defined by opposite sides parallel to directions 9 and 13.

Unit 6 also comprises an electronic central control unit 22, a pneumatic device 24 for producing high-pressure gas, normally air; and a further pneumatic device 26 for generating a vacuum. For the sake of simplicity, central control unit 22 and devices 24 and 26 are shown schematically in block form, and the operation of each is described in detail later on.

Since members 10 and 12 are substantially identical, for the sake of simplicity, only one will be described using the same reference numbers for the corresponding parts of both.

Member 10 extends along an axis 14 parallel to direction 9, and comprises at least one substantially prismatic hopper 28 (two in the example shown, as illustrated in Figure 2) presenting a downward-facing opening 30. Beneath hopper 28, member 10 comprises a ring 32 coaxial with axis 14, freely rotatable and axially fixed in relation to axis 14, and presenting a number of radial through openings or nozzles 34 equally spaced about axis 14, and each of which sweeps past bottom opening 30 of hopper 28 at each turn of ring 32, and is connected in an airtight manner to device 26 so that, when device 26 is activated, a vacuum is substantially maintained in nozzles 34. It should be pointed out that, to prevent dye 7 from being dispersed in the atmosphere around machine 1, conveyor 8 must be so adjusted in height that faces 3 of tiles 2 on the conveying branch of the conveyor are positioned immediately below nozzles 34.

Member 10 also comprises a dispenser 36 extending along axis 14 and which in turn comprises a further ring 38 coaxial with axis 14 and housed inside ring 32, and a number of radial conduits 40 substantially equal in number to nozzles 34. More specifically, each nozzle 34 constantly faces a corresponding conduit 40 from which it is separated by a porous cylindrical body 42 interposed between rings 32 and 38 and which provides for preventing dye 7 from being transferred from nozzle 34 to respective conduit 40, but for permitting the passage of air or other similar gas from conduit 40 to respective nozzle 34. It should be pointed out that body 42 mates constantly in contact with rings 32 and 38, together with which it defines a dispensing body 39 freely rotatable about axis 14 (axis 15 in the case of member 12).

Dispenser 36 also comprises, inside ring 38, a sup-
ply conduit 44 substantially parallel to and over axis 14 and which is supplied with pressurized gas by device 24; and a number of on-off valves 46, each of which is positioned substantially vertically and connects supply conduit 44 in airtight manner to a respective conduit 40 positioned vertically and substantially facing a tile 2 arrested in station 5.

Operation of machine 1 will now be described as of the condition in which members 10 and 12 are maintained in the respective idle positions by device 19; each hopper 28 is filled with respective dye 7; and a tile 2 is stationary on the conveying branch of conveyor 8 in station 5.

Nozzles 34 commence drawing off dye 7 when devices 24 and 26 are activated and dispensing body 39 is rotated clockwise (in Figure 1) by device 19 via a respective rotary actuator 50 (shown schematically in the drawings). It should be pointed out that dye 7 is fed into each nozzle 34 by force of gravity combined with the vacuum generated by device 26; that the dye 7 inside nozzles 34 downstream from respective openings 30 is retained inside nozzles 34 by the suction generated by device 26, and does not escape even when nozzles 34 are located beneath axis 14, 15; and, finally, that, in any case, the inside of dispenser 36 is protected by body 42, which retains dye 7 on the outside of ring 38.

At this point, once actuators 20 and 21 are operated to position a given nozzle 34 along the vertical axis of a given portion of tile 2 arrested in station 5, central control unit 22 opens the corresponding valve 46 for a given length of time to dispense a given quantity of dye 7. As such, by appropriately controlling the operation of actuators 20, 21 and the opening of valves 46 of given nozzles 34 by means of central control unit 22, lines of given shape may be drawn on face 3 of tile 2.

Obviously, for polychrome colouring of tiles 2, each hopper 28 is filled with a dye 7 of a different chemical composition to enable different dyes to be dispensed on to each tile 2. Since the dispensing of dye 7 is governed by central control unit 22, changes to the shade of a pattern or to the pattern itself may be made by simply operating unit 22 accordingly.

It should be pointed out that arresting tiles 2 in station 5 is only one of the possible operating modes of machine 1. In fact, the colouring of tiles 2 may be speeded up by central control unit 22 so operating device 19 and conveyor 8 as to feed given portions of tiles 2 towards a given nozzle 34 at any rate as required.

Clearly, changes may be made to machine 1 as described and illustrated herein without, however, departing from the scope of the present invention.

For example, if the pattern of tile 2 comprises more than four colours, the number of hoppers 28 may be increased, even to the extent of providing a hopper 28 for each nozzle 34.

Conversely, in the case of monochrome tiles 2, simplified dispensers 10 and 12 may be provided, each with a single hopper 28.

Claims

1. A machine (1) for colouring ceramic products (2) with a powdered colouring substance (7); each ceramic product (2) being defined at the top by a substantially flat face (3) divisible into given portions; and the machine (1) comprising an operating station (5) and a metering unit (6) for dispensing said powdered substance (7); characterized in that said unit (6) comprises at least one dispensing member (10)(12) presenting a rotary dispensing body (39), and at least one hopper (28) for housing said substance (7) and communicating with said dispensing body (39); said dispensing body (39) comprising a number of nozzles (34) for receiving said substance (7) from said hopper (28); and said unit (6) also comprising an actuating device (19) for moving said dispensing member (10)(12) in relation to said product (2) at said operating station (5), so that a nozzle (34) containing said substance (7) is positioned facing a respective said given portion of each said face (3) at said station (5).

2. A machine as claimed in Claim 1, characterized by comprising a conveyor (8) extending in a given substantially horizontal first direction (9); said conveyor (8) moving said products (2) through a given operating station (5) and in said first direction (9); said metering unit being located substantially to the side of said station (5); and said actuating device (19) supporting and moving said dispensing member (10)(12) in relation to said conveyor (8) so that, at said station (5), a nozzle (34) containing said substance (7) is positioned facing a respective said given portion of each said face (3).

3. A machine as claimed in Claim 2, characterized in that the actuating device (19) is located substantially over said conveyor (8); said hopper (28) presenting a bottom opening (30) and being located over said nozzles (34); and said nozzles (34) receiving, from said hopper, a given quantity of said substance (7) through said bottom opening (30).

4. A machine as claimed in Claim 3, characterized in that said dispensing member (10)(12) presents a respective longitudinal axis (14)(15) substantially perpendicular to said first direction (9); said dispensing body (39) comprising a first ring (38) coaxial with said longitudinal axis (14)(15); said first ring (38) presenting a number of radial conduits (40); said radial conduits (40) being equally spaced about said longitudinal axis (14)(15); and each of said radial conduits (40) adapted to be arranged in a facing position to each other and being separated from a respective said nozzle (34) by a filtering body (42) for preventing the passage of said substance (7) from said nozzles (34) to said radial conduits (40).
5. A machine as claimed in Claim 4, characterized in that said dispensing body (39) comprises a second ring (32) coaxial with and located outside said first ring (38); said filtering body (42) being a cylindrical body interposed between and mating constantly in contact with said first and second rings (38, 32).

6. A machine as claimed in Claim 5, characterized in that said nozzles (34) are formed in said second ring (32).

7. A machine as claimed in Claim 6, characterized in that, inside said first ring (38), said dispensing body (39) comprises a supply conduit (44) substantially parallel to said longitudinal axis (14)(15), and a number of valves (46), each of said valves (46) connecting said supply conduit (44) in airtight manner to one of said nozzles (34).

8. A machine as claimed in Claim 7, characterized in that said unit (6) comprises a first pneumatic device (26) communicating with said radial conduits (40) and for generating and maintaining a vacuum in said radial conduits (40); and a second pneumatic device (24) for supplying said supply conduit (44) with pressurized gas.

9. A machine as claimed in Claim 8, characterized in that said actuating device (19) comprises a first actuator (20) and a second actuator (21); the second actuator moving said dispensing member (10)(12) in said first direction (9) through said station (5); the first actuator moving said dispensing member (10)(12) through said station (5) in a second direction (13) substantially perpendicular to said first direction (9); and said actuating device (19) also comprising a third actuator for rotating said dispensing body (39) about said longitudinal axis (14)(15) so that a given nozzle (34) is alternately positioned facing said bottom opening (30) of the hopper (28) and over a said face (3).

10. A machine as claimed in Claim 9, characterized in that said first and second actuators (20, 21) are operated in steps or continuously.

11. A machine as claimed in Claim 10, characterized in that said unit (6) comprises an electronic central control unit (22) connected to said first and second pneumatic devices (26, 24) to control the vacuum in said radial conduits (40) and to selectively open and close said valves (46) to control the vacuum in said nozzles (34); said central control unit (22) also controlling said first and second actuators (20, 21) so as to move said dispensing member (10)(12) within a substantially rectangular work area.