



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.01.2007 Bulletin 2007/04

(51) Int Cl.:
B28B 13/02 (2006.01)

(21) Application number: **06076158.2**

(22) Date of filing: **02.06.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(72) Inventor: **Valli, Silvano,**
Sacmi Cooperativa Meccanici
40026 Imola
Bologna (IT)

(74) Representative: **Corradini, Corrado et al**
Studio Ing. C. CORRADINI & C. S.r.l.
4, Via Dante Alighieri
42100 Reggio Emilia (IT)

(30) Priority: **19.07.2005 IT RE20050083**

(71) Applicant: **SACMI COOPERATIVA MECCANICI**
IMOLA SOCIETA'
COOPERATIVA
40026 Imola (Bologna) (IT)

(54) **Method for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones and related apparatus**

(57) A method for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones, comprising the following steps:
a) providing a layer (100) of coloured powders to be compacted having a prearranged arrangement, said layer

(100) being defined inside a container (20;40);
b) inserting a compressed air flow inside said container (20;40) through at least one hole (3), so to locally alter the prearranged arrangement of the powders;
c) conveying the layer (100) of altered powders towards a system of compaction and forming.

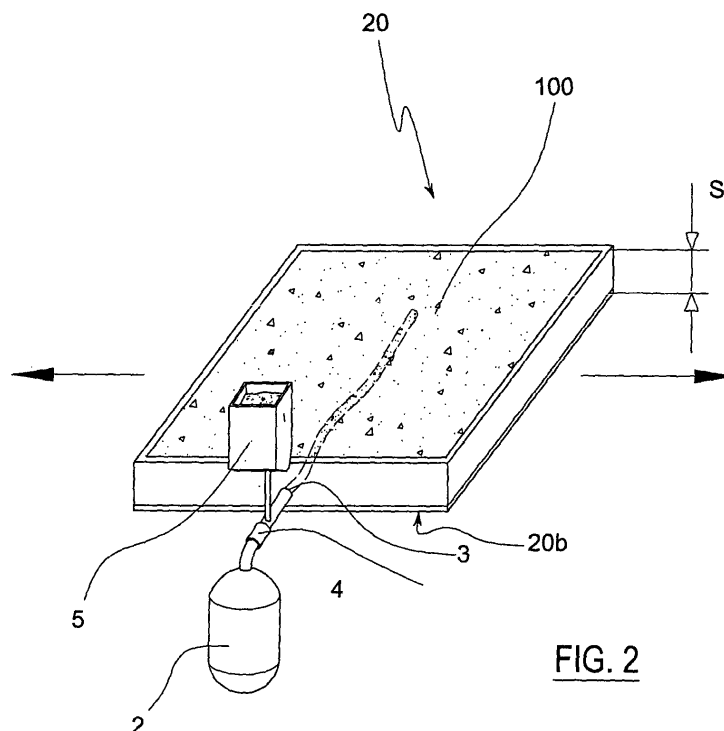


FIG. 2

Description

[0001] The present invention refers to a method for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones and a related apparatus.

[0002] More in particular, the present invention refers to a method and related apparatus for the forming of ceramic tiles or slabs reproducing the typical visible aspects of the natural stones, altering the prearranged veining arrangement in powders forming a layer to be compacted.

[0003] As is known, there exist methods and related systems at the state of the art which are capable of achieving tiles reproducing aesthetic effects very close to those present in the natural stones.

[0004] One of these systems is described in the application PCT/IB2005/000025 of the same applicant.

[0005] The drawback encountered by applying the methods and the systems of the known art is the difficulty to faithfully recreate, on the finished tiles, in addition to the normal veining, also those typical discontinuous decorative motifs caused by particular natural phenomena, such as those which cause a "crack" or irregular displacements of the veining.

[0006] There is therefore a great need to have available a method and related apparatus for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones which permits obtaining a final tile having an arrangement of the veining altered, so to also reproduce the discontinuous decorative motifs caused by particular natural phenomena, such as for example a crack.

[0007] Object of the present invention is that of providing a method and related apparatus which permits satisfying the aforesaid needs and overcoming at the same time the drawbacks mentioned with reference to the prior art.

[0008] Such object is attained by means of a method and related apparatus in accordance with the claims 1 and 8, respectively.

[0009] The dependent claims outline preferred and particularly advantageous embodiments of the method and the apparatus according to the invention.

[0010] Further characteristics and advantages of the invention shall be evident from the reading of the following description, provided as exemplifying and not limiting, with the aid of the figures illustrated in the attached tables, wherein:

- Figures 1 and 1A show a schematic view in vertical section of an apparatus for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones, in accordance with a first embodiment of the present invention;
- Figures 2 and 2A show a perspective view of a detail of figure 1 and 1A, respectively;
- Figure 3 shows a front view, partially in section, of

the apparatus in accordance with a second embodiment of the present invention;

- Figure 4 shows a view taken along the line IV-IV of figure 3.

[0011] In the figures, an apparatus is shown for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones, in accordance with the present invention.

[0012] The apparatus comprises, in its most general form, a container adapted to contain a layer 100 of coloured powders to be compacted having a prearranged arrangement and compressed air blowing means adapted to insert an air flow inside the container through at least one hole 3, so to locally alter the prearranged arrangement of the powders.

[0013] The hole has a very small diameter in relation to the thickness, so to have a reduced air flow rate at high speed.

[0014] At the end of the alteration of the powders, with respect to their prearranged arrangement, the layer 100 is conveyed towards forming means adapted to compact the powders.

[0015] In accordance with a first embodiment of the present invention, the container is a carriage 20 adapted to move atop a surface 30 between a back position (Fig. 1), wherein it receives (by not illustrated, prior art means) the coloured powders which form at its interior the layer 100 to be compacted, having a substantially constant thickness S, and an advanced position, not illustrated, wherein it loads a forming cavity 50 of the tile.

[0016] The carriage 20 laterally has the hole 3, through which the compressed air is inserted (Fig. 2). Although only one hole 3 is illustrated it is possible to foresee several holes through which compressed air is blown, also arranged on opposite sides.

[0017] The compressed air blowing means is a compressed air blower, schematised in figure 2 and indicated with 2.

[0018] The insertion pressure of the compressed air can be adjusted with known means, such as an electric valve 4 which intercepts the air input conduit.

[0019] Essentially, by blowing compressed air within the carriage 20, the powders present at its interior undergo a local remixing, with consequent interruption at the blow point of the previously achieved graphics. This generates a layer 100 having, at the point wherein it was operated, an effect similar to a crack.

[0020] In order to avoid the undesired exit of the powders present in the carriage 20 during the compressed air insertion, it is necessary that at least the lower opening of the carriage 20 is closed.

[0021] To such end, the use is foreseen of a movable plate 20b associated with the carriage 20 and adapted to slide in relation to it so to be able to close the lower opening, as is visible in figure 2.

[0022] This embodiment is well adapted for carriages 20 containing a great volume of powders; however, for

reduced volumes it is possible that the powders can exit during the insertion of compressed air, through the upper opening which has been left open. In such case, it is possible to foresee the use, in association with the lower plate 20b, of a further plate 20a adapted to close the upper opening of the carriage 20 (Figs. 1A, 2A).

[0023] In order to permit, in the variant of the first embodiment just described, the exit of the air inserted in the carriage 20 closed by both plates 20a, 20b, the wall of the carriage 20 opposite to that from which the air is inserted is provided with an air discharge valve, not illustrated.

[0024] The positioning of the valve with respect to the insertion hole, situated on the opposite wall, determines the progression of the line of air in the powders and therefore the position of the "crack" marked by the broken line in the figures.

[0025] At the end of the compressed air insertion, the carriage is brought towards the forming cavity 50 according to the prior art, and subsequently the lower plate 20b, and if present the upper plate 20a, accompany the carriage 20 until they arrive above the mould cavity 50, then the plates 20a, 20b are removed to permit the loading of the powder in the mould. If the used plate has a high thickness, it may be removed from the carriage 20 at the edge of the mould.

[0026] Alternatively, it is possible to not use any lower plate, and to rest the carriage 20 directly atop the surface 30 which in this case must be flush with the mould, which will have the lower punch raised when the carriage 20 is brought over the mould.

[0027] The pressure of the compressed air can be adjusted as desired, as a function of the desired aesthetic effect. Preferably, operation takes place at a pressure in the range of 0.2 - 6 bars through a hole having a diameter in the range of 1 - 8 mm.

[0028] In order to create a new aesthetic effect, for example reproducing extraneous inclusions, it is possible to insert in the carriage 20, through the blown air, additional coloured powders which can be placed in a pourer 5 and dragged by the Venturi effect (Figs. 2, 2A).

[0029] In accordance with a second embodiment, illustrated in figures 3 and 4, the container is a vertical hopper 40 with a loading opening 6 above and an unloading opening 7 below. In particular, the hopper 40 is placed above a horizontal movable surface 10 and has a parallelepiped conformation with the two faces 40a, 40b with larger surface placed perpendicular to the advancing direction of the movable surface 10, indicated with an arrow in Fig. 4, and therefore with the remaining two opposite vertical faces 40c, 40d placed parallel to the advancing direction of the surface 10. The distance between the two faces 40a, 40b with larger surface is preferably equal to the thickness S of the layer 100 of powders to be compacted.

[0030] Due to this second embodiment, it is possible to operate on a layer 100 of powders which continuously descends into the hopper 40, which is fed from above

with the coloured powders with a predefined arrangement and which are unloaded below after having been altered by means of the insertion of compressed air through the hole 3 made on at least one of the two faces 40c, 40d parallel to the advancing direction.

[0031] It is preferable that the distance between the unloading opening 7 and the underlying movable surface 10 is equal to that of the thickness S of the layer 100 to be compacted, so that the exit speed of the powders from the hopper is approximately equal to that of the movable surface 10.

[0032] Although only one hole 3 was used in the illustrated examples, it is possible to operate through several holes arranged in any manner, preferably always along the sides defining the thickness S of the powder layer 100.

[0033] Moreover, the compressed air flow is preferably inserted in a substantially horizontal direction.

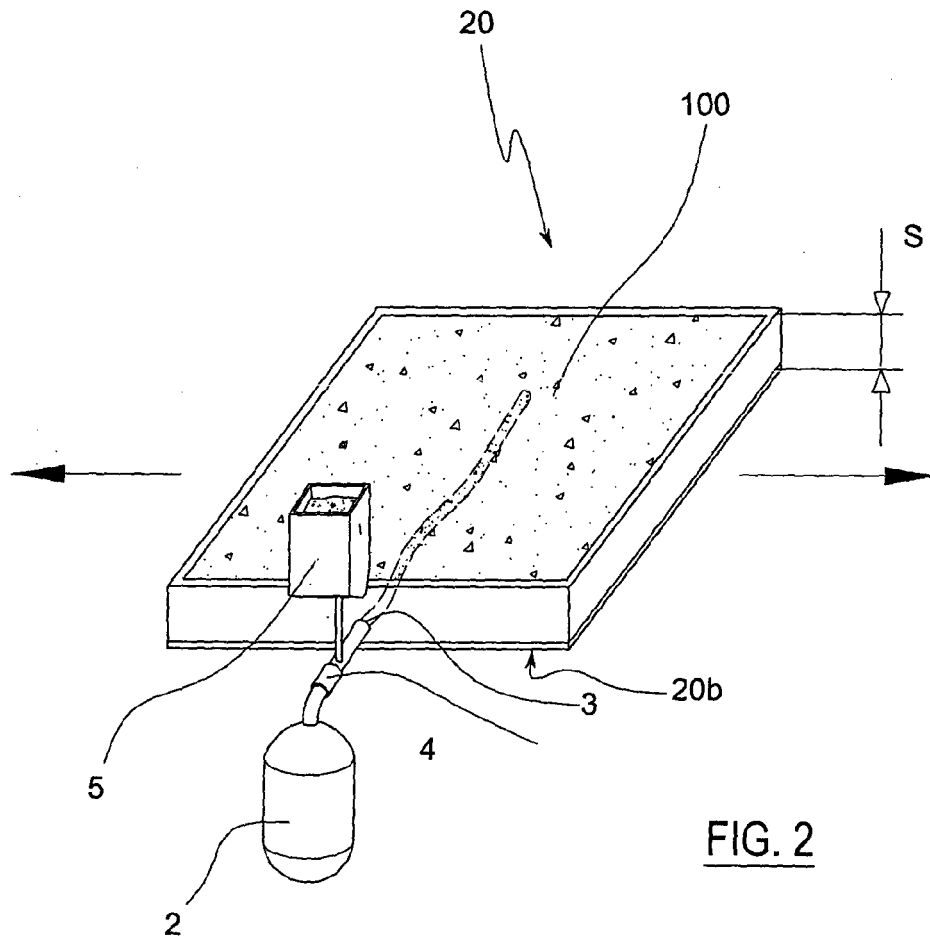
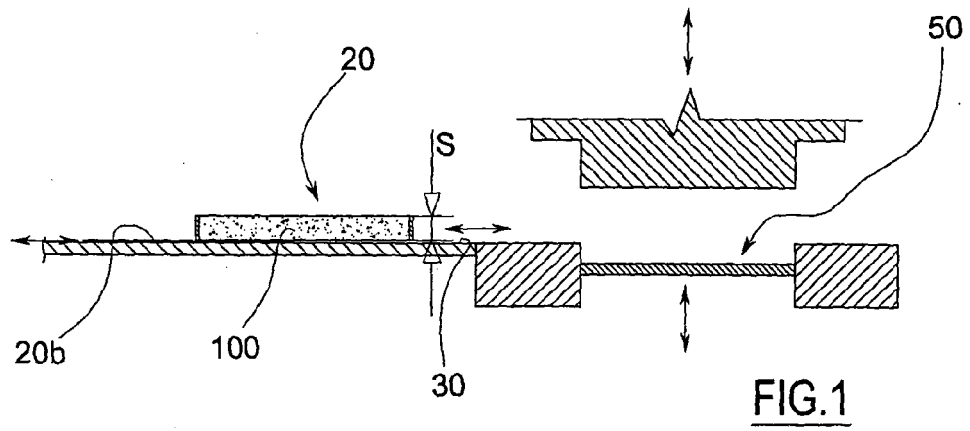
[0034] As can be appreciated from that described, the method and apparatus for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones according to the present invention permits satisfying the needs and overcoming the drawbacks as stated in the introductory part of the present description with reference to the prior art.

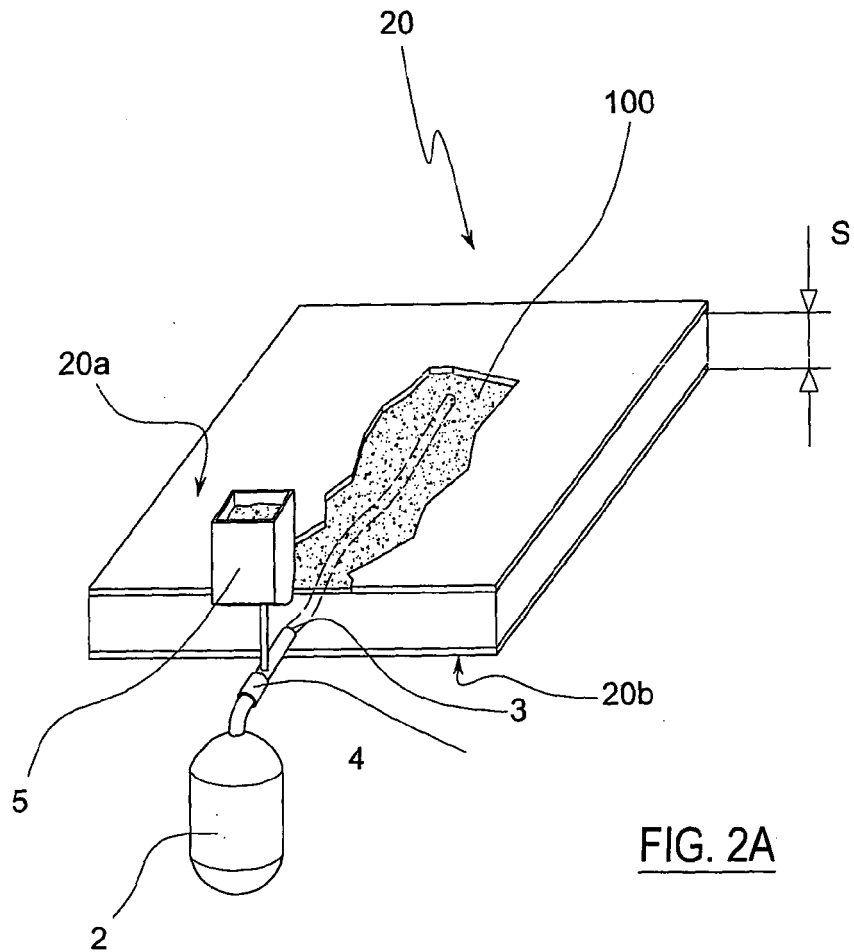
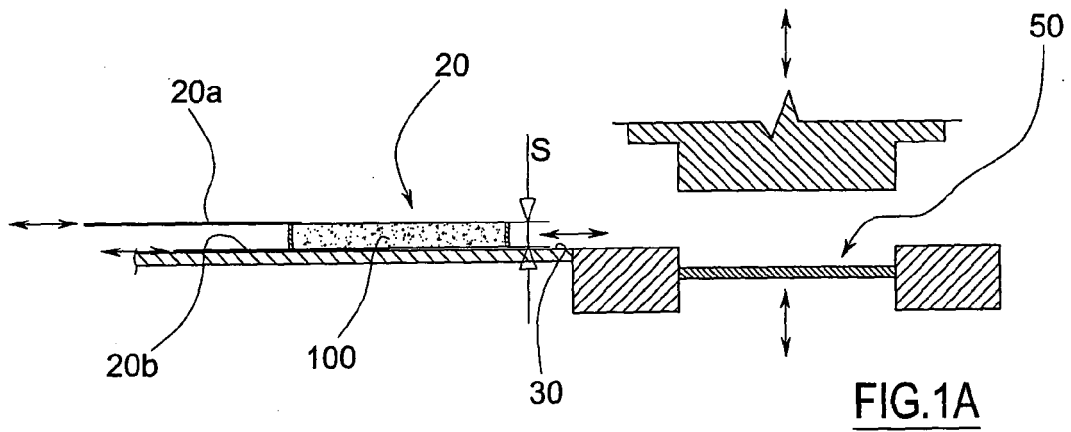
[0035] Of course, a man skilled in the art, in order to satisfy contingent and specific needs, may make numerous modifications and variations to the method and apparatus described above, all moreover contained in the protective scope of the invention as defined by the following claims.

Claims

1. Method for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones, comprising the following steps:
 - a) providing a layer (100) of coloured powders to be compacted having a prearranged arrangement, said layer (100) being defined inside a container (20; 40);
 - b) inserting a compressed air flow inside said container (20; 40) through at least one hole (3), so to locally alter the prearranged arrangement of the powders;
 - c) conveying the layer (100) of altered powders towards a system of compaction and forming.
2. Method according to claim 1, wherein said container (20; 40) has a parallelepiped conformation.
3. Method according to claim 2, wherein said at least one hole (3) is made on one of the sides of the container (20; 40) defining the thickness (S) of the contained layer (100) of powders.

4. Method according to claim 3, wherein said compressed air flow is inserted in a substantially horizontal direction.
5. Method according to claim 1, wherein said compressed air flow drags additional coloured powders inside the container (20;40). 5
6. Method according to claim 1, wherein said additional coloured powders are dragged by the Venturi effect. 10
7. Method according to claim 1, wherein said step b) of air insertion is conducted at a pressure in the range of 0.2 - 6 bars through a hole having a diameter in the range of 1 - 8 mm. 15
8. Apparatus for the forming of ceramic tiles or slabs reproducing the typical characteristics of the natural stones, **characterised in that** it comprises a container (20;40) adapted to contain a layer (100), to be compacted, of coloured powders having a prearranged arrangement, compressed air blowing means (2) adapted to insert a compressed air flow inside the container (20;40) through at least one hole (3), said air flow altering the prearranged arrangement of the powders. 20
25
9. Apparatus according to claim 8, further comprising forming means adapted to compact the powders after their arrangement has been altered. 30
10. Apparatus according to claim 8, wherein said container is composed of a movable carriage (20) provided with a first plate (20b) which is movable in relation to the carriage (20) and is adapted to close its bottom during the insertion of compressed air. 35
11. Apparatus according to claim 10, wherein said carriage (20) is further provided with a second plate (20a) which is movable in relation to the carriage (20) and is adapted to close its top during the insertion of compressed air, said carriage (20) being provided, on the wall opposite to that of the air insertion, with an air discharge valve. 40
45
12. Apparatus according to claim 8, wherein said container is composed of a vertical hopper (40) with a loading opening (6) above and an unloading opening (7) below, said hopper (40) being placed above a horizontal movable surface (10) and has a parallelepiped conformation with the two faces (40a,40b) with larger surface placed perpendicular to the advancing direction of said surface (10) and the remaining opposite vertical faces (40c,40d) placed parallel to the advancing direction, the distance between said faces (40a,40b) with larger surface being equal to the thickness (S) of the layer (100) of powders to be compacted. 50
55
13. Apparatus according to claim 12, wherein said at least one hole (3), through which the air flow is inserted, is made on one of the two opposite faces (40c,40d) of the hopper (40) placed vertically and parallel to the advancing direction of the surface (10).
14. Apparatus according to claim 12, wherein said hopper (40) is fed from the loading opening (6) in a continuous manner.
15. Apparatus according to claim 8, comprising a pourer (5) adapted to pour additional coloured powders in the insertion conduit of said air flow, so that they are dragged by the Venturi effect into the container (20; 40).





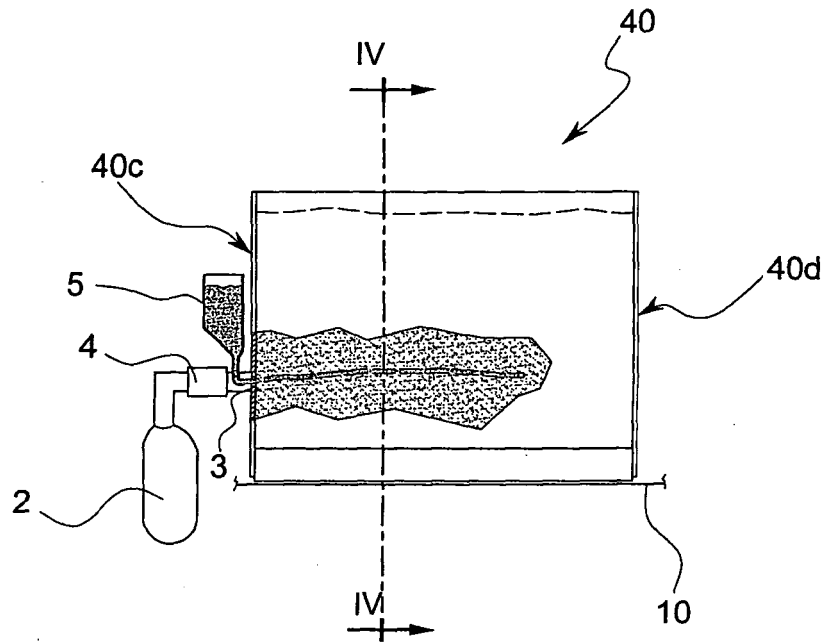


FIG. 3

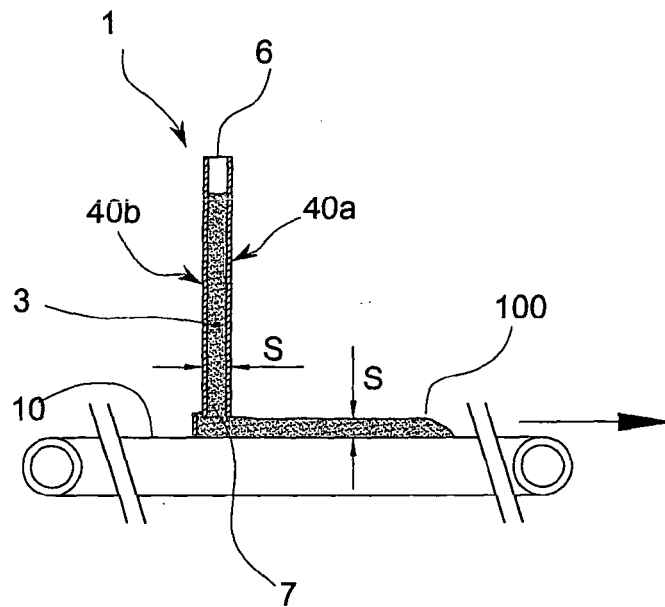


FIG. 4