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(54) Process and device for loading the moulds of pressure-glazed tile-forming presses

(57) A process for loading the moulds (28) of tile-forming presses (27) comprises the following operations: arranging in a hopper (7) a succession of superposed irregular layers of powder material, the constituent material of one layer having different characteristics from the constituent material of the adjacent layers; pouring said material layers from the hopper (7) into a parallelepiped chamber (23) having two vertical major sides of dimensions substantially equal to the plan dimensions of the tile to be formed; pouring said material into a mould (28) forming cavity without modifying its distribution within the chamber (23); pressing said soft material in a direction perpendicular to the two major sides of the chamber.

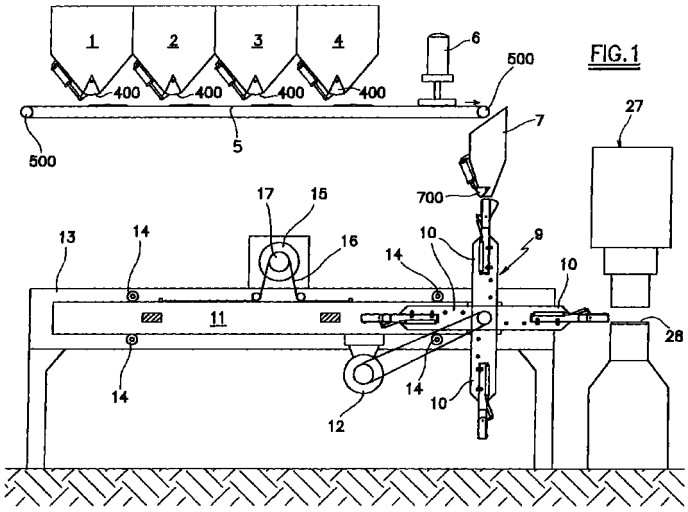


FIG.1

EP 1 005 967 A1

Description

[0001] This invention relates to loading processes for the moulds of ceramic presses, and their implementation means.

[0002] The known tile manufacturing technology, and in particular that relative to porcellainized stone tiles, involves the formation of a soft material mass within the loading compartment of a press mould loading carriage.

[0003] Said loading carriage is driven by known means in such a manner as to position the compartment alternately above the mould cavity of the press to discharge into it the soft mass to be compacted, and below a hopper which allows the material to fall into the compartment.

[0004] In the most recent loading systems this soft mass consists of a number of superposed layers of material of different characteristics, for example different colours, with the lower layers partly emerging at the upper layer, to create tiles in which veining similar to that present in natural marble appears on their treadable (visible) surface.

[0005] The known method does not however enable tiles resembling marble slabs cut from a marble block to be produced, in which the same vein is visible on both the upper side and lower side of the tile.

[0006] An object of the invention is to provide a process for loading a ceramic mould with a number of differently coloured powders, such that in the mould a mass is formed comprising portions of a different colour partially mixed with the adjacent portions and emerging on both sides of the tile so that, when compressed, a body is obtained showing on its surfaces veining which reproduces that of marble and extends throughout its entire thickness.

[0007] A further object of the invention is to provide a plant for implementing said process.

[0008] In the process of the invention the soft mass which is to form the tile is prepared within a parallelepiped chamber with its major walls positioned vertically, and into which superposed layers of powders of different characteristics are poured in succession by suitable means.

[0009] Said chamber can be either the mould forming cavity or a prechamber able to pour the layered powders into the mould forming cavity.

[0010] According to one method of implementation, the process comprises the following operations:

- positioning a parallelepiped chamber for containing the powder with its larger flat walls lying vertically,
- feeding into said chamber in succession, via one of the smaller peripheral walls, at least two types of powders having different characteristics,
- compressing the powders present in said chamber in a direction perpendicular to said larger flat walls.

[0011] According to a further method of implementation, the process comprises the following operations:

- positioning a parallelepiped chamber for containing the powder with its larger flat walls lying vertically,
- feeding into said chamber in succession, via one of the smaller peripheral walls, at least two types of powders having different characteristics,
- rotating said chamber through 90° to locate its larger walls in a horizontal position,
- positioning said chamber above the cavity of a mould, removing the lower wall of said chamber so that the powders contained in it become deposited in the cavity without undergoing horizontal movement.

[0012] The invention also comprises the plant for implementing the process.

[0013] Said plant has the characteristics defined in the claims.

[0014] The functional and constructional characteristics of the invention will be more apparent from the ensuing description of some preferred embodiments thereof given by way of non-limiting example and illustrated on the accompanying drawings.

Figure 1 is a side view of a first embodiment of the plant of the invention.

Figure 2 is a detail of Figure 1.

Figure 3 is a side view of a second embodiment of the plant of the invention.

Figure 4 is a section on the line IV-IV of Figure 3.

Figures 5A, 5B and 5C are schematic representations of the stages A, B, C of the second embodiment of the invention.

Figures 6A, 6B, 6C and 6D represent the stages A, B, C, D of a further embodiment of the invention.

[0015] Figure 1 shows four identical hoppers 1, 2, 3, 4, each of which contains a different type of powder material to be compacted, and comprises a usual closure device 400.

[0016] Below the hoppers 1, 2, 3, 4 there is positioned a belt 5 for collecting the individual powder layers discharged by said hoppers, this being positioned about two rollers 400 and driven by means of known type:

[0017] On the collection belt 5 there is also positioned a device 6 for irregularizing the material distribution in each hopper layer before the belt 5 deposits the layer in the underlying small hopper 7, the lower mouth of which is provided with a usual closure device 700.

[0018] At the lower mouth of the small hopper 7 there is positioned a cross-shaped member 9 provided

with four equal transverse arms 10, the purpose of which is described hereinafter.

[0019] Said cross-shaped member 9 is supported by the carriage 11 which moves it between two positions, of which that shown in Figure 1 is the retracted position.

[0020] The cross-shaped member 9 can undergo 90° clockwise rotations about its central axis driven, via known means, by an electric motor 12 provided with suitable control means and fixed to the bottom of the carriage 11.

[0021] The carriage 11 is supported by a structure 13 and is arranged to translate horizontally by being moved on suitable guide wheels 14 under the drive of a geared motor 15 via a chain 16, the ends of which are fixed to the carriage 11 and which engages a sprocket wheel 17 mounted on the shaft of the geared motor 15.

[0022] The transverse arms 10 of the cross-shaped member 9 are shown in Figure 2, in which it can be seen that each of them consists of a sheet metal box structure 18 provided with a transverse dividing wall 19 which together with the box structure 18, the slidable wall 20 and the wall 21 of the closure device 22 defines the chamber 23 for containing the material to be compacted.

[0023] The closure device 22, of sheet metal construction, is hinged by known means to the side walls of the chamber 23 and is opened and closed by a usual pneumatic unit 24.

[0024] Within the box structure 18 there are positioned the means for horizontally moving the slidable wall 20, they comprising a usual cylinder-piston unit 20, the rod of which is connected to the sheet metal 20 by an appendix and the body of which is hinged to the structure 18.

[0025] The slidable wall 20 moves on guide wheels 26 of known type between an advanced position shown in Figure 2, and a withdrawn position in which its front edge lies behind the dividing wall 19.

[0026] In front of the cross-shaped member 9 there is positioned a usual tile forming press 27.

[0027] All the plant motorization and mover means are under the control of a processor executing a program controlling the following method of operation.

[0028] The hoppers 1, 2, 3, 4 each discharge a layer of powder material onto the underlying collection belt 5, which has the same width as the mouths of the hoppers 1, 2, 3, 4.

[0029] Initially the collection belt 5 conveys the material to the device 6 for irregularizing its distribution, after which it discharges it into the small hopper 7.

[0030] Superposed layers slightly mixed together at their respective separation surfaces hence form in the hopper 7.

[0031] At this point the plant control processor opens both the closure device 22 for the chamber 23 and the closure device 700 of the hopper 7, so that superposed layers of powder of different characteristics having substantially the same distribution as in the hopper 7 are deposited in the chamber 23, until the chamber has been completely filled.

[0032] The processor closes the closure devices 22 and 77 and rotates the cross-shaped member clockwise through 90° so that the major walls of the chamber 23 lie horizontal.

[0033] At this point the carriage 11 is advanced until the chamber 23 lies above the forming cavity 28 of the press 27 (see Figure 1).

[0034] Once in position, the slidable metal sheet 20 is withdrawn by the operation of the cylinder-piston unit 25, and the material to be compacted becomes deposited in the forming cavity 28 of the press 27 without undergoing horizontal shifting.

[0035] The tile is then formed in the usual manner.

[0036] Figure 3, Figure 4, Figure 5A, Figure 5B and Figure 5C show a second embodiment of the device of the invention.

[0037] Said figures show a usual horizontal press 29 provided with a movable die plate and two dies, of which one 31 is fixed and one 32 is movable. The die plate 30 has a central hole 300 of the same section as the dies 31 and 32, and can be moved horizontally during the press operation, driven by known means.

[0038] The die plate 30 and the dies 31 and 32 form the mould forming chamber 33.

[0039] Figure 5A shows the relative positions of said elements during the loading of the powder into the chamber 33.

[0040] The die plate 30 is provided with a full-width feed channel 34 for the powders to be compacted.

[0041] The hopper 35 is positioned at the end of a powder feed chain such as that shown in Figure 1, above it there being positioned a hopper 7 with relative closure means 700 such as that of Figure 1.

[0042] In stage A (see Figure 5A), in which the movable die 32 is positioned at a distance of about 20 mm from the fixed die 31, and the die plate 30 is positioned such that the feed channel 34 is positioned to correspond with the lower mouth of the hopper 35, horizontal layers of powders are deposited in the chamber 33 substantially in the same order as contained in the hopper 7, the small hopper 35 acting substantially as a funnel.

[0043] When the chamber 33 has been filled with the required quantity of material, the die plate 30 is positioned as shown in Figure 5B, the forming cavity is closed and the material is pressed.

[0044] On termination of this operation the die plate 30 is positioned as shown in Figure 5C and the formed tile falls onto the roller conveyor 37 of the truck 36, which leads it to the subsequent processing stages.

[0045] The invention also enables a tile to be formed which, besides comprising full-thickness veining, ie emerging both on the upper surface and on the lower surface, is also layered in a direction parallel to its major sides.

[0046] In this manner a tile can be formed in which

the exposed face has a better appearance than the rear or is constructed of a more wear-resistant material.

[0047] A tile can also be constructed composed of at least two layers, one of which is formed of high-quality material and the other, forming the rear, is formed of more economical material.

[0048] For this purpose the invention uses the device shown in Figure 6A, Figure 6B, Figure 6C and Figure 6D, in which those components illustrated in the preceding figures carry the same reference numerals.

[0049] A movable metal plate 38 is used, driven by known means, its purpose being to divide the chamber 33 internally into two chambers 39 and 40.

[0050] The tile base material is fed into the chamber 40 by means of the hopper 41, whereas a succession of irregular layers of powder are discharged into the chamber 39 by the hopper 42 until said chamber 39 is full, as shown in Figure 6A.

[0051] The movable metal plate 38 is then extracted from the chamber 33 (Figure 6B) and the die plate 30 is positioned in such a manner as to upperly close the chamber 33 in order to be able to compact the powder mixture (see Figure 6C).

[0052] On termination of pressing, the die plate 30 is moved into the extraction or rest position shown in Figure 6D, with the result that the formed tile falls onto a roller conveyor identical to the conveyor 37 shown in Figure 3.

Claims

1. A process for loading the moulds of tile-forming presses, characterised by comprising the following operations:

- arranging in a hopper a succession of superposed irregular layers of powder material, the constituent material of one layer having different characteristics from the constituent material of the adjacent layers;
- pouring said material layers from the hopper into a parallelepiped chamber having two vertical major sides of dimensions substantially equal to the plan dimensions of the tile to be formed;
- pouring said material into a mould forming cavity without modifying its distribution within the chamber;
- pressing said soft material in a direction perpendicular to the two major sides of the mould forming cavity.

2. A process as claimed in claim 1, characterised in that the material is pressed in the same chamber into which the superposed material layers have been poured, this constituting the mould forming cavity.

3. A process as claimed in claim 1, characterised in that the material is poured from the chamber into the mould forming cavity after the chamber has been rotated through 90° to lie with its major sides horizontal, but without subjecting the material to horizontal movement.

4. A plant for loading the mould cavities of ceramic tile forming presses, characterised by comprising means for feeding powder material into a parallelepiped powder collection chamber having its major sides substantially of the same dimension as the tile to be formed; means for rotating said chamber between a position in which the major sides are vertical and a position in which the major sides are horizontal; means for translationally moving said chamber between a position distant from the mould forming cavity and a position overlying the mould forming cavity; and means for pouring the powder from said chamber into the mould cavity without causing it to undergo mixing.

5. A plant as claimed in claim 4, characterised in that said chamber possesses a slidable major wall which forms the lower side of the chamber when this is positioned with its major sides horizontal, and means for sliding said wall from a position in which it lowerly closes said chamber to a position in which it lies outside the outline of said chamber.

6. A plant as claimed in claim 4, characterised in that that minor wall of the chamber which is located upperly when the major walls are vertical consists of an openable gate.

7. A plant as claimed in claim 4, characterised by comprising a carriage, a box structure positioned on the carriage and having at least two mutually perpendicular arms, of which at least one is vertical, means for rotating the box structure through 90°, and means for moving the carriage between a withdrawn position and an advanced position in which the collection chamber positioned at the end of the horizontal arm overlies the mould cavity.

8. A plant as claimed in claim 4, characterised by comprising a horizontal belt positioned below a succession of hoppers arranged to deposit powder layers onto said belt, and a small collection hopper for said layers into which said layers fall in succession to lie one on another, said small hopper overlying said collection chamber, into which the superposed layers are made to fall in the same order in which they lie within the small hopper.

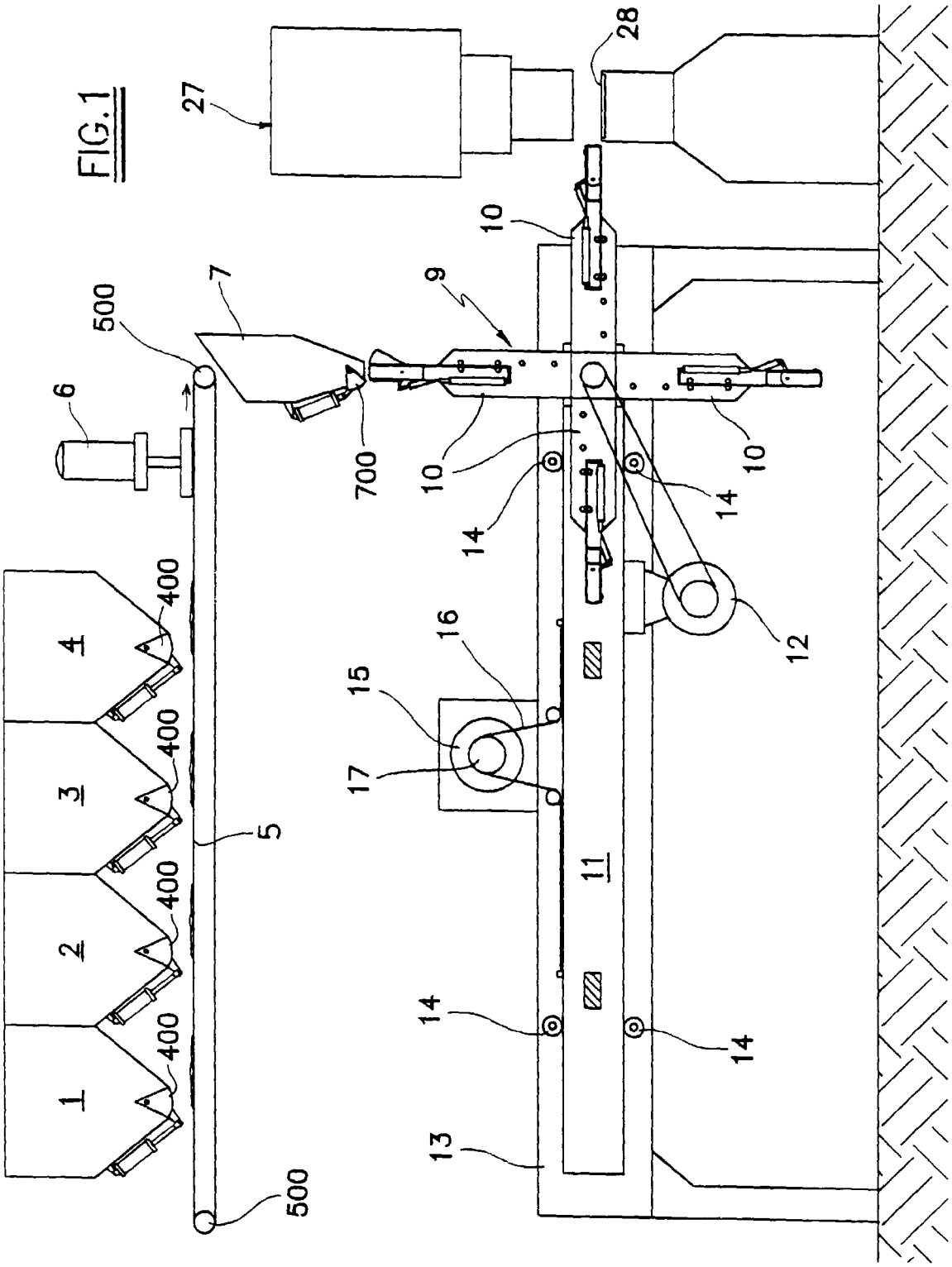
9. A plant as claimed in claim 4, characterised in that said collection chamber constitutes the tile forming cavity of a horizontal press.

10. A plant as claimed in claim 9, characterised in that said cavity comprises an external die plate in the shape of a vertical rectangular frame, into the internal hole of which there are inserted a fixed die and a movable die, said die plate being able to slide between a position in which it receives the entire fixed die, and a position in which it receives both dies in a condition of mutual approach.

11. A plant as claimed in claim 9, characterised in that the upper side of said die plate comprises a full-width through channel able to assume a first position in which its lower mouth lies in correspondence with the space between the two dies when in their position of mutual approach, and a position in which its lower mouth is closed by the lateral wall of said fixed die.

12. A plant as claimed in claim 9, characterised in that below said forming cavity there is located a roller conveyor which has a vertical entry portion close to the mould and a substantially horizontal exit portion) and onto which the tiles fall after their expulsion from the mould.

FIG.1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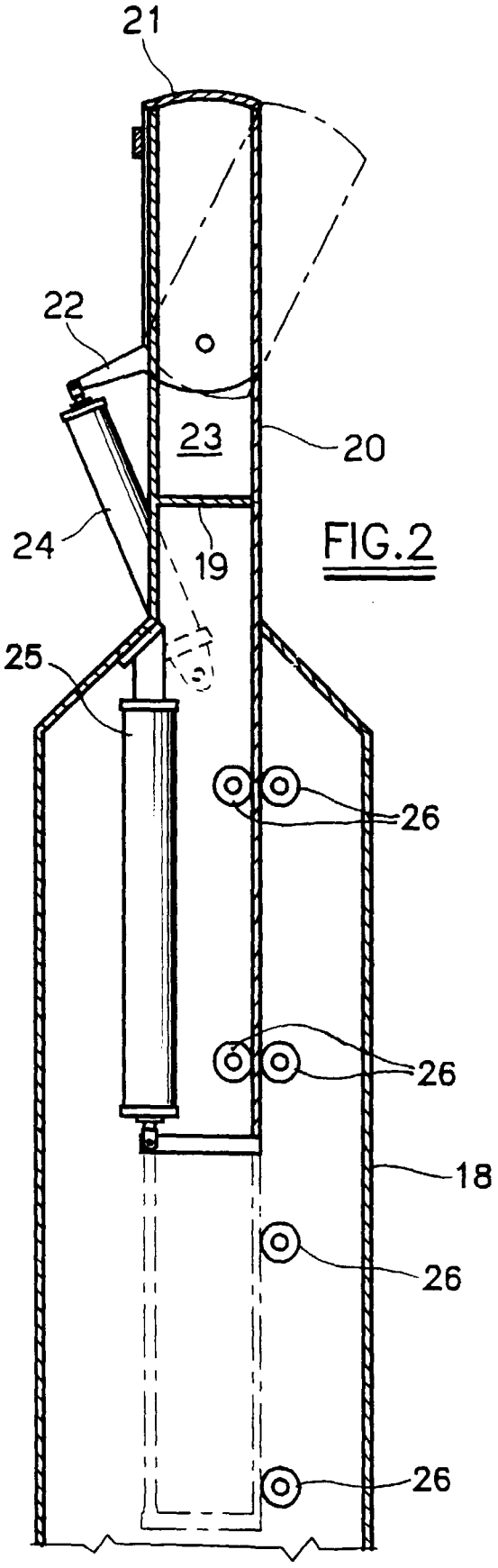

FIG.2

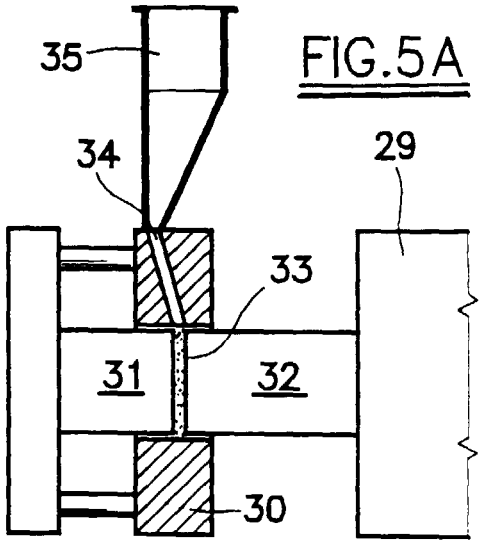

FIG.5A

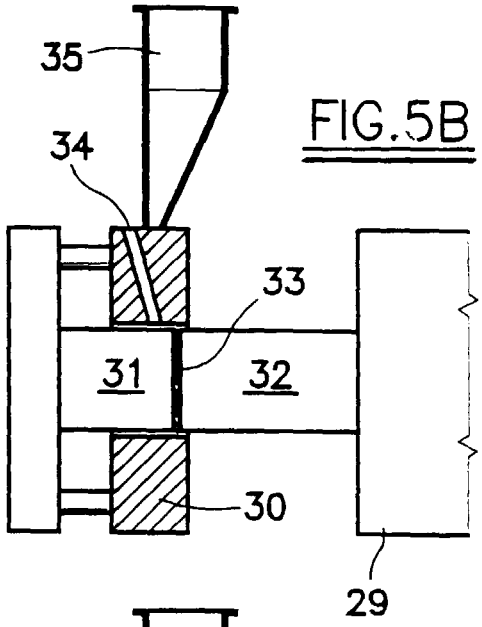

FIG.5B

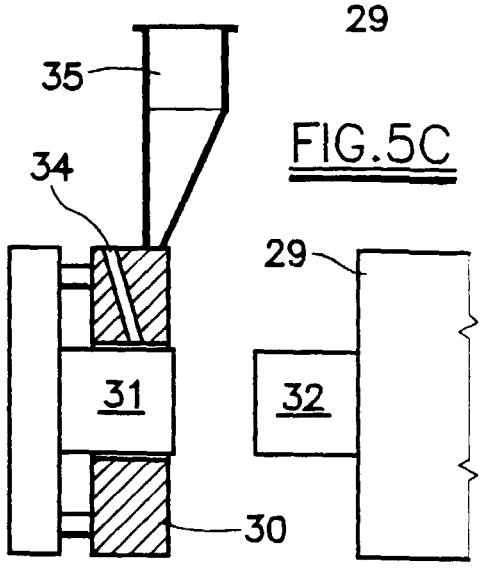

FIG.5C

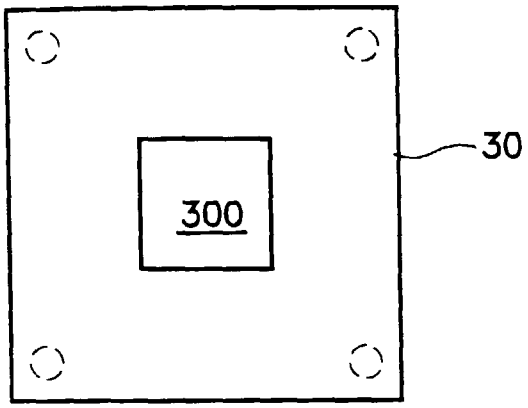

FIG.4

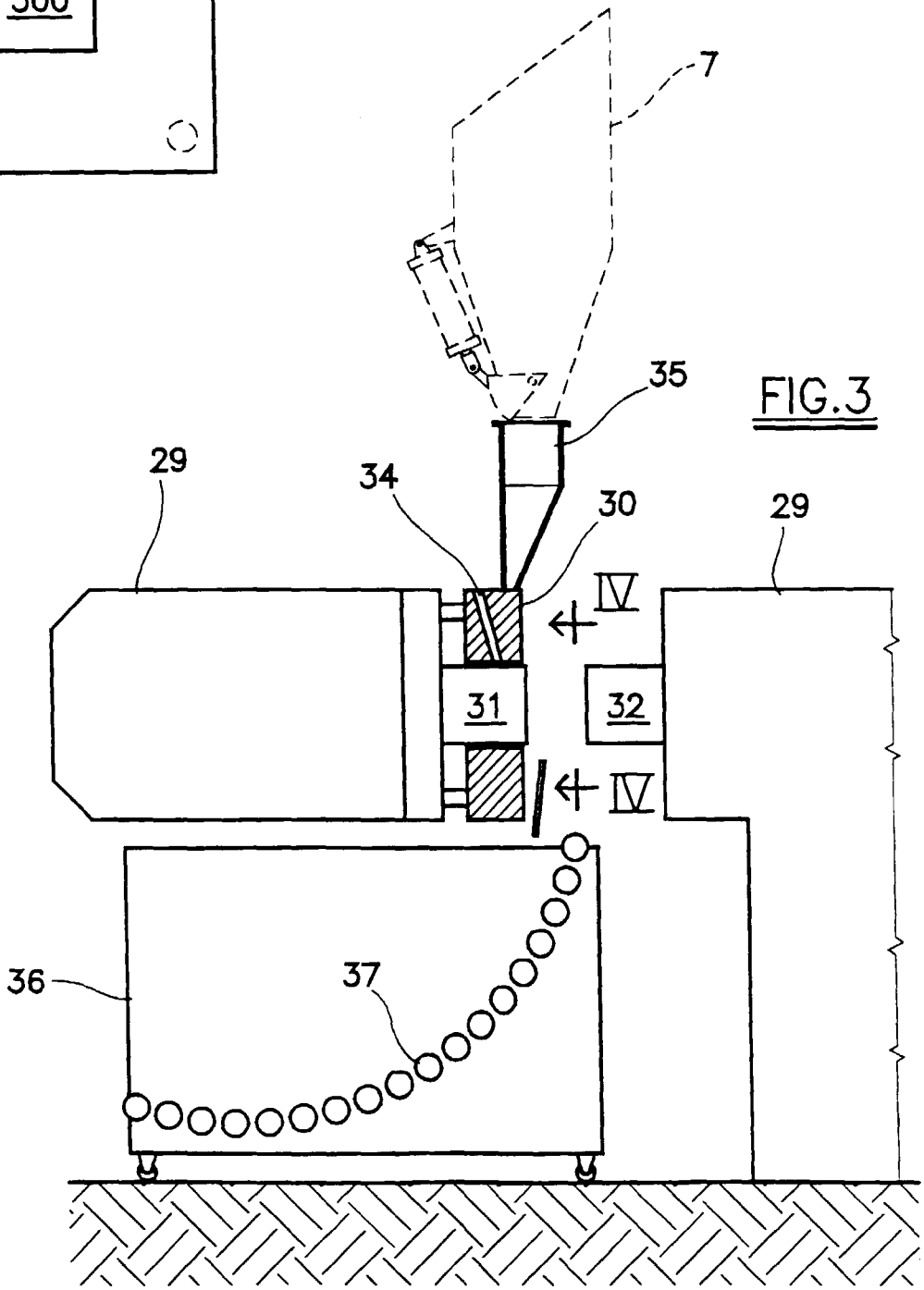

FIG.3

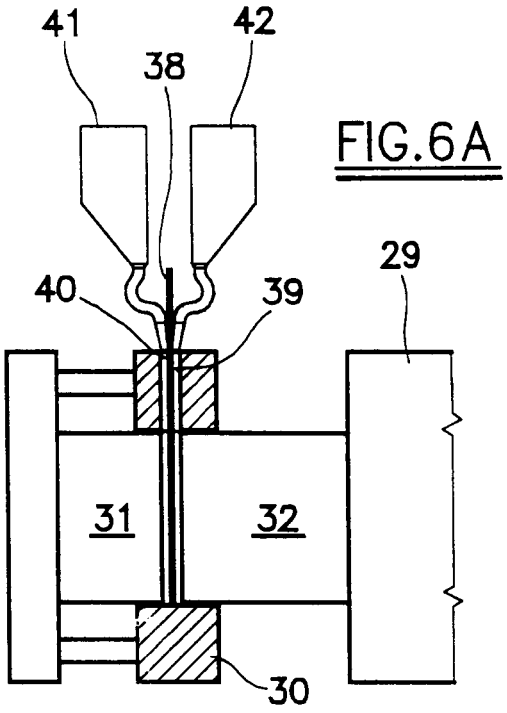

FIG.6A

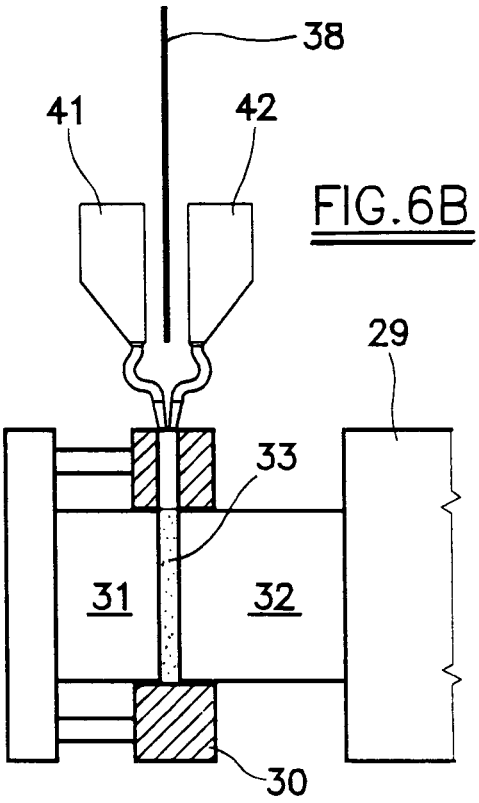

FIG.6B

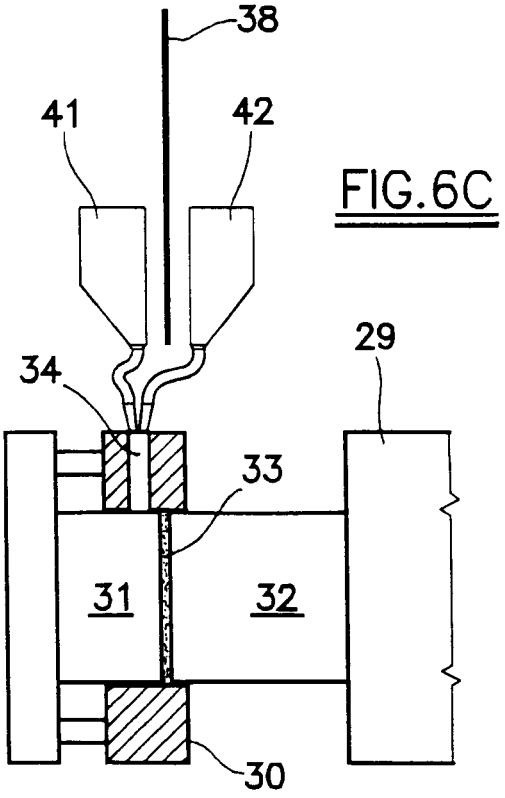

FIG.6C

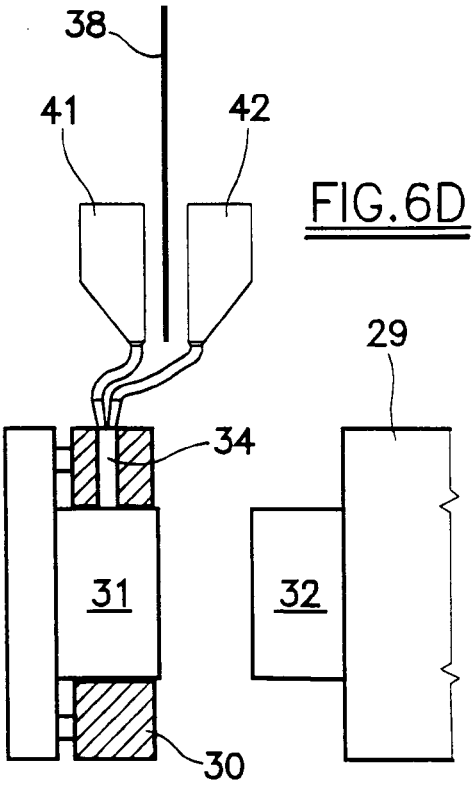

FIG.6D

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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 4045

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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A	PATENT ABSTRACTS OF JAPAN vol. 097, no. 001, 31 January 1997 & JP 08 244024 A (INAX CORP), 24 September 1996 * abstract *	1,3-7	
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TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B28B
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 April 1999	Gourier, P

CATEGORY OF CITED DOCUMENTS

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