

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 941 826 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.09.1999 Bulletin 1999/37

(51) Int Cl.⁶: **B28B 13/02**, B28B 3/02

(21) Application number: **99200534.8**

(22) Date of filing: **23.02.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventors:
• **Ligabue, Ivanno L.B. Officine Meccaniche S.p.A.
41042 Fiorano Modenese (Modena) (IT)**
• **Bigi, Ermes L.B. Officine Meccaniche S.p.A.
41042 Fiorano Modenese (Modena) (IT)**

(30) Priority: **10.03.1998 IT RE980025**

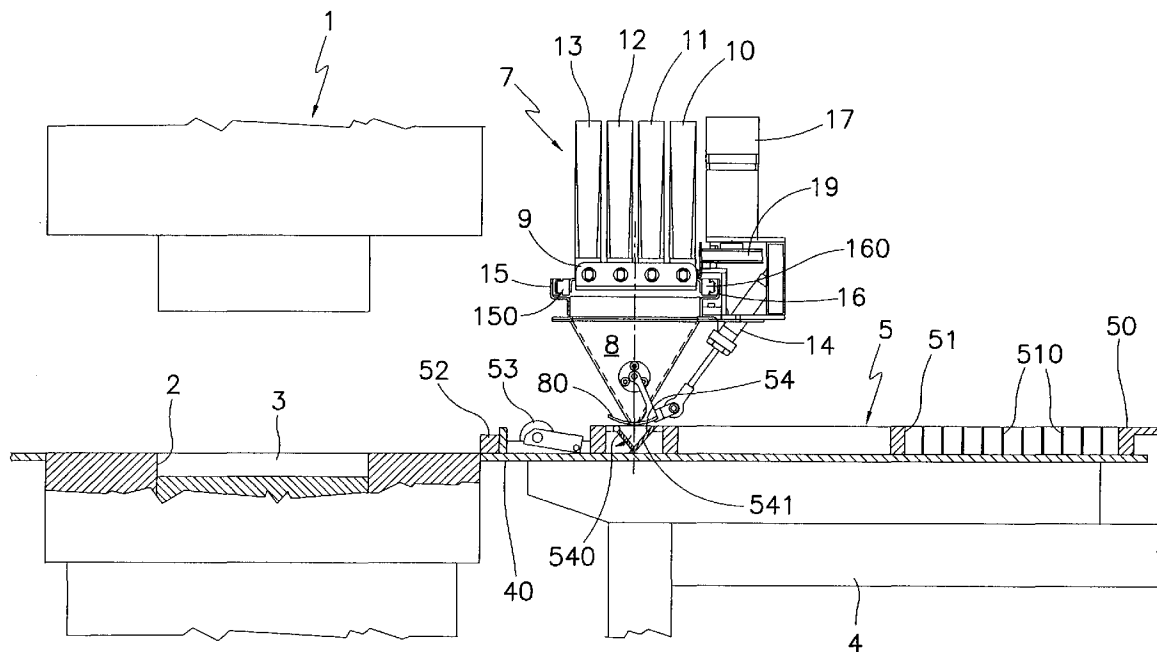
(74) Representative: **Corradini, Corrado et al
Studio Ing. C. CORRADINI & C. S.r.l.
4, Via Dante Alighieri
42100 Reggio Emilia (IT)**

(71) Applicant: **L.B. Officine Meccaniche S.p.A.
41042 Fiorano Modenese (Modena) (IT)**

(54) **Method for manufacturing a decorated tile, the relative loading device for the press moulds, and a tile manufactured thereby**

(57) A device for loading powders and coloured pigments into the cavity of a ceramic tile mould, comprising a usual loading carriage for transferring into the mould cavity the powder intended to form the tile body; said carriage comprises a first transverse hopper which is

positioned in front of the loading compartment of said carriage and which, when the carriage is in one of its two end-of-travel positions, lies below a second hopper provided with a lower gate and fixed to the machine base, and having its upper opening traversed by a series of pigment micro-dispensers with to-and-fro movement.

**FIG. 1****EP 0 941 826 A2**

Description

[0001] This invention relates to loading devices for the moulds of tile forming presses.

[0002] The object of this patent is to provide a loading system for the forming press mould which enables a tile to be formed, the visible surface of which presents variously distributed side-by-side or partially superposed single or multi-colour veining or spots.

[0003] The patent also provides the method for manufacturing the tile, and the tile itself.

[0004] In the known art, multi-colour effects are obtained on the tile surface by feeding the forming mould with coloured powders variously mixed together, to give rise to a so-called bulk-coloured tile, ie having the variously coloured veining distributed throughout its entire thickness and emerging on the visible surface of the tile.

[0005] However in the known art it is not possible to obtain tiles in which the visible surface presents substantial programmed colour differences at each stroke of the press.

[0006] The object of this patent is precisely to provide a manufacturing method and a mould cavity loading device which enable the appearance of the upper surface of each tile to be programmed at the moment of its formation in the mould.

[0007] A further object is to be able to modify the programming in real time between one press stroke and the next.

[0008] The object of the invention is attained by a method as defined in the claims.

[0009] The invention also attains said object by a feed device for the moulds of the tile forming press, comprising a usual loading carriage which under the action of known means can traverse between a material loading position and at least one material discharge position in correspondence with said mould cavity. More specifically, said carriage comprises a number of clay loading compartments equal to the number of press mould cavities, and having the same dimensions as the cavities. Said loading cavities are fed with clay by known means.

[0010] According to the invention, in front of each loading compartment there is provided a first hopper having the same dimensions as the mould cavity and arranged to distribute within the cavity small quantities of pigments, or atomized clay coloured with high concentrations of pigments, which determine the appearance of the visible treading surface of the tile.

[0011] Said pigments are fed into said first hopper by dispenser means which allow their precise and programmed distribution in the form of separate masses intended to partially mix one with another.

[0012] The pigment feed means comprise a series of micro-dispensers either aligned one adjacent to another or grouped into a group above a second hopper having the same transverse dimension as the underlying first hopper, which is rigid with the carriage.

[0013] Said micro-dispensers are slidable as a group

above the second hopper with a programmed to-and-fro movement during which each of them, or at least one of them, discharges small quantities of the respective pigment one or more times.

[0014] Each micro-dispenser is provided with its own independent closure and opening shutter.

[0015] The second hopper is provided with a lower gate having variously shaped apertures and is made to open when the second hopper overlies the first hopper rigid with the carriage.

[0016] Hereinafter reference will be made to pigments, this term also comprising atomized and coloured clay.

[0017] The operational and constructional characteristics of the invention will be more apparent from the description of some preferred embodiments thereof given hereinafter by way of nonlimiting example and illustrated on the accompanying drawings.

[0018] Figure 1 is a partly sectional side view of a first embodiment of the device of the invention.

[0019] Figure 2 is a plan view of the first embodiment of the device of the invention.

[0020] Figure 3 is a section on the line III-III of Figure 2.

[0021] Figure 4 is an enlarged view of one of the components of the device of the invention.

[0022] Figure 5 is a partly sectional side view of a second embodiment of the device of the invention.

[0023] Figure 6 is a plan view of the second embodiment of the device of the invention.

[0024] Figure 7 is a partly sectional side view of a third embodiment of the device of the invention.

[0025] Figure 8 is a partly sectional side view of a fourth embodiment of the device of the invention.

[0026] Figure 9 is a partly sectional side view of a fifth embodiment of the device of the invention.

[0027] Figure 10 is a diagram of a possible glazing powder distribution cycle programmed by the processor of the device of the invention.

[0028] Figure 1 shows a usual press 1 provided with a mould 2 with a single cavity 3. With reference to Figure 1, to the side of the press 1 there is a frame 4 supporting a table 40, the front edge of which is in contact with the rear edge of the press 1, and along which the usual loading carriage 5 traverses under the action of known means, not shown.

[0029] The carriage 5 comprises an external frame 50, which itself comprises a loading compartment 51 provided with an internal grid 510 having the same dimensions as the cavity 3 of the mould 2. Said carriage 5 comprises at its front a pusher with scraper 52 and a brush roller 53. The first hopper 54 lies to the rear of the brush roller 53.

[0030] More specifically, said first hopper 54 comprises two oblique parts 540 and 541 of metal construction, at least one of which is upperly hinged and is maintained lowerly in contact with the other by known means, not shown, which open and close it.

[0031] When the carriage 5 is in the retracted position said first hopper 54 lies below the device 7 for distributing the coloured powders for decorating the visible or treading surface of the tile.

[0032] Said distributor device 7 comprises a second hopper 8 supported by a frame fixed to the base, not shown, and a carriage 9 moving along said second hopper 8 and supporting identical micro-dispensers 10, 11, 12 and 13, which in the illustrated example are four in number.

[0033] More specifically, the second hopper 8 has the same transverse dimension as the cavity 3 of the mould 2, and is provided lowerly with an opening and closure gate 80. The gate 80 comprises variously shaped apertures, not shown, enabling the coloured powders contained in the second hopper 8 to be randomly distributed within the underlying first hopper 54. The gate 80 is operated by a usual cylinder-piston unit 14.

[0034] The carriage 9 moves along the upper mouth of said second hopper 9 in such a manner as to feed into it the differently coloured powders contained in said micro-dispensers 10, 11, 12, 13. In particular, the carriage 9 slides along two guides 15 and 16 by way of wheels 150 associated with the guide 15 and the slide block 160 associated with the guide 16. Said carriage 9 is driven by a stepping motor 17 having its shaft fixed to a pulley 18 about which there passes the toothed belt 19 connected by known means to the bracket 20 rigid with the carriage 9.

[0035] Each micro-dispenser 10, 11, 12, 13 is provided with its own shutter 21 for opening and closing its lower mouth. As shown in Figure 3, said shutters 21 are each operated by a cylinder-piston unit 22 of known type.

[0036] Finally it should be noted that the devices 10, 11, 12, 13 contain powders of the same or different colour, which are fed into them by known means, not shown.

[0037] The operation of all the plant motorization and drive means is controlled by a processor, which controls their operation in the following manner.

[0038] Figure 1 shows the carriage 5 in the retracted position, in which the processor causes the loading compartment 51 to be filled by known means, not shown. At the same time the carriage 9 undergoes at least one travel stroke along the upper mouth of the hopper 8 such that the lower mouths 100, 110, 120, 130 of the micro-dispensers 10, 11, 12, 13 cover the entire area of said upper mouth to deposit measures of differently coloured powders. It should be noted that each of said measures comprises a powder quantity of between 0.1 and 50 grams, and preferably, in the case of pure pigments, between 0.1 and 12 grams. The loading cycle for said hopper 8 is preprogrammed in the processor.

[0039] An example of a loading cycle is shown in Figure 10.

[0040] With reference to said Figure 10, the micro-dispenser 10 contains red pigments (R), the micro-dis-

penser 11 contains blue pigments (B), the micro-dispenser 12 contains red pigments (R) and the micro-dispenser 13 contains white pigments (W). The processor commands the carriage 9 to undergo two outward and return strokes along the hopper 8, to deposit during each individual stroke the programmed number of measures of powders at the desired distance apart.

[0041] Again with reference to Figure 10, during the first outward stroke the micro-dispenser 13 deposits nine measures of white colour (W) into the second hopper 8, during the first return stroke the micro-dispenser 11 deposits one measure of blue colour (B) and the micro-dispenser 12 one measure of red colour (R), during the second outward stroke the micro-dispenser 11 deposits three measures of blue colour (B) and the micro-dispenser 12 three measures of red colour (R), and finally during the final return stroke the micro-dispenser 11 deposits two measures of blue colour (B) and the micro-dispenser 12 two measures of red colour (R).

[0042] When the second hopper 8 has been loaded, it deposits its coloured powders into the first hopper 54, and the carriage 5 advances until the loading compartment 51 is positioned exactly above the cavity 3 of the mould 2 to discharge the clay contained in the loading compartment 51 into the cavity 3 of the mould 2.

[0043] The carriage 5 then retracts, and during this rearward movement the hopper 54 is made to deposit the coloured powders onto the clay present in the cavity 3. It should be noted that the moment of opening of the lower mouth of the hopper 54, which can be controlled mechanically or electronically by the processor using known means, occurs when it encounters the front edge of the cavity 3, this lower mouth closing when it encounters the rear edge of the cavity 3.

[0044] It should be also noted that the cycle by which the coloured powders are loaded into the second hopper 8 could comprise only a single passage of the carriage 9 along the hopper mouth. In this case the micro-dispensers 10-13 are made to deposit the measures of coloured powders simultaneously or in succession, depending on the type of mixing to be achieved between said measures.

[0045] The illustrated embodiment of the invention enables tiles to be created with their treading surface facing upwards with reference to the cavity 3 of the mould 2 of the accompanying figures.

[0046] The device of the invention is also able to create tiles with their treading surface facing downwards. To this end Figures 5 and 6 show the second embodiment of the invention. In said figures those means identical to those described in the preceding embodiment are indicated by the same numbers.

[0047] This second embodiment differs from the first in the means provided for depositing the clay into the cavity 3 of the mould 2. In this respect, the clay is not deposited into the mould cavity 2 by the loading compartment 51, but by a traversing hopper 25. More specifically, said hopper 25 traverses along a masking ele-

ment 26 comprising a central aperture 260 having the same dimensions as the mould cavity 3. Said masking element 26 also has a front edge 261 and a rear edge 262 on which the hopper halts at each stroke, their purpose being to close the lower mouth of the hopper 25.

[0048] In this embodiment the device processor controls its operation in the following manner.

[0049] Figure 5 shows the carriage 5 in its retracted position in which the soft material (clay and coloured powders) to be compacted is loaded into the hopper 25 by a known distributor, not shown. Simultaneously the device 7 feeds the coloured powders into the first hopper 54. It should be noted that the device 7 and its constituent components undergo exactly the same operations as described in the preceding embodiment.

[0050] On termination of loading, the carriage 5 is advanced and when the lower mouth of the hopper 54 encounters the rear edge of the mould cavity 3, the hopper 54 is commanded by the processor to distribute the coloured powders onto the base of the cavity, while the carriage continues to advance. The glazing powder distribution terminates when the lower mouth of the hopper 54 encounters the front edge of the mould cavity 3.

[0051] Advancement of the carriage ceases when the aperture 260 in the masking element 26 lies exactly above the mould cavity 3. At this point the processor causes the hopper 25 to undergo a travel stroke along said aperture 260 to deposit the clay into the mould cavity 3, above the coloured powder layer deposited by the hopper 54.

[0052] The carriage is then again retracted to its loading position.

[0053] Figure 7 shows a third embodiment of the invention which differs from the illustrated embodiment in the means for loading the clay into the mould cavity 3.

[0054] In this embodiment the loading carriage 5 comprises a rear hopper 30 the lower mouth of which is closed by the table 40 along which the carriage 5 slides. At its front the carriage supports the pusher with scraper 52 and the brush roller 53, behind which there is a hopper 54. Between the hopper 54 and the hopper 30 there is a space having the same dimensions as the mould cavity 3.

[0055] The processor of the device of the invention controls its operation in the following manner.

[0056] Figure 7 shows the device of the invention in the position for loading the soft material to be compacted.

[0057] In said position the hopper 30 is filled with the quantity of clay required to fill the cavity 3, while simultaneously the device 7 deposits into the underlying hopper 54 the coloured powders which are to form the decoration on the treading surface of the tile.

[0058] When the clay and coloured powders have been loaded the loading carriage 5 is advanced, and during this advancement the clay contained in the hopper 30 is discharged, after which the carriage is made to retract, the hopper 54 depositing the coloured pow-

ders onto the clay layer present in the cavity 3 during this retraction.

[0059] Figure 8 shows a fourth embodiment of the invention which differs from the illustrated embodiment in the means for distributing the coloured powders within the mould cavity 3.

[0060] In this embodiment the loading carriage 5 comprises the loading compartment 51 provided with a grid 510, to the front of which there are provided in succession a belt 27 driven by usual means not shown and supported by the carriage 5, the brush roller 53, and the pusher with scraper 52.

[0061] This third embodiment provides for creating on the belt 27 a layer of variously arranged coloured powders. Said powders are deposited on the belt 27 by a hopper 31 overlying the belt 27 and fed by the distributor device 7.

[0062] For this purpose the device of the invention provides for the belt 27, during the loading of the carriage 5, to move in the direction of the arrow of Figure 8 while the hopper 31, previously fed with powders by the device 7, deposits on it a layer of variously coloured mixed powders. Simultaneously the loading compartment 51 is filled with clay by known means, not shown.

When the carriage 5 has been loaded, it is advanced until the loading compartment 51 lies exactly in correspondence with the mould cavity 3, to deposit therein the clay contained in it. The carriage is then retracted and during this rearward movement the moving belt 27 deposits the coloured powder layer onto the clay present in the cavity 3. It should be noted that the speed with which the belt moves must equal the speed of rearward movement of the loading carriage 5 if a virtually uniform layer of glazing powders is to be deposited in the cavity 3, otherwise the belt speed can vary according to the degree of non-uniformity of the layer to be achieved.

[0063] Figure 9 shows a further embodiment of the device of the invention.

[0064] In this embodiment the coloured powders are fed into the hopper 54 by an overlying motorized belt 28 on which a layer of powders is created by the device 7.

[0065] In this manner, on the belt 28 there is always a layer of mixed coloured powders present, which is topped up by the device 7 each time the belt 28 traverses to fill the hopper 54.

[0066] It should be noted that the mould cavity 3 is loaded by the same operations described in detail in the first embodiment, the glazing powders being loaded into the hopper 8 of the device 7 in the manner already described.

Claims

1. A device for loading powders and coloured pigments into the cavity of a ceramic tile mould, comprising a usual loading carriage for transferring into

the mould cavity the powder intended to form the tile body, characterised in that said carriage comprises a first transverse hopper which is positioned in front of the loading compartment of said carriage and which, when the carriage is in one of its two end-of-travel positions, lies below a second hopper provided with a lower gate and fixed to the machine base, and having its upper opening traversed by a series of pigment micro-dispensers with to-and-fro movement.

2. A device as claimed in claim 1, characterised in that the second hopper is associated with a group of micro-dispensers positioned on a slide which is slidable with to-and-fro movement above the mouth of the second hopper, and is driven by an electric motor with controlled advancement.

3. A device as claimed in claim 1, characterised in that the micro-dispensers of said group are each provided with a lower opening and closure shutter.

4. A device as claimed in claim 1, characterised in that the gate positioned below the second hopper consists of a cylindrical sector rotating below a closure position and an opening position under the action of a cylinder-piston unit, said sector comprising variously shaped apertures.

5. A device as claimed in claim 1, characterised in that the first hopper associated with the loading carriage is provided with means for its opening and closure.

6. A device as claimed in the preceding claims, characterised by comprising a frame transverse to the machine feed direction and overlying the surface on which the loading carriage slides, said frame comprising two lateral guides for the sliding of the slide carrying the micro-dispensers and a controlled advancement motor connected to said slide by a toothed belt transmission.

7. A device as claimed in claim 1, characterised in that a programmed electronic processor coordinates the movements of said slide, the simultaneous opening and closure of at least one of said micro-dispensers, and the opening and closure of the gate of the second hopper.

8. A device as claimed in claim 1, characterised in that between the first hopper and the second hopper there is positioned a motorised belt which receives and transports the pigments falling from the second hopper.

9. A device as claimed in claim 8, characterised in that the belt discharges the pigments directly into the mould cavity during the traversing movement of the

carriage, a collection hopper being provided between the second hopper and the belt.

10. A method for manufacturing a ceramic tile provided with surface decorations, characterised by comprising the following operations:

- loading into the mould cavity a desired quantity of soft material in the form of atomized clay;
- arranging on an intermediate means a certain number of small individually dispensed quantities of coloured material;
- distributing said small dispensed quantities on the surface of the soft material lying in the mould cavity; and
- proceeding in the usual manner with the subsequent pressing followed by drying and firing in a kiln.

11. A method for manufacturing a ceramic tile provided with surface decorations, characterised by comprising the following operations:

- arranging on an intermediate means a certain number of small individually dispensed quantities of coloured material;
- distributing said small dispensed quantities on the base surface of the mould cavity;
- loading into said cavity a desired quantity of soft material; and
- proceeding in the usual manner with the subsequent pressing followed by drying and firing in a kiln.

12. A method as claimed in the preceding claims, characterised in that the dispensed quantities of coloured material are arranged on the intermediate means by a distributor comprising at least two micro-dispensers each provided with an aperture closed by a timed shutter.

13. A method as claimed in the preceding claims, characterised in that the dispensing is effected on the basis of the time for which said shutter is opened.

14. A method as claimed in the preceding claims, characterised in that the coloured material is partially mixed by falling between said micro-dispensers and said intermediate means.

15. A surface-decorated tile, characterised by comprising on its exposed surface small dispensed and partially distinct quantities of pigments or coloured materials of different colours.

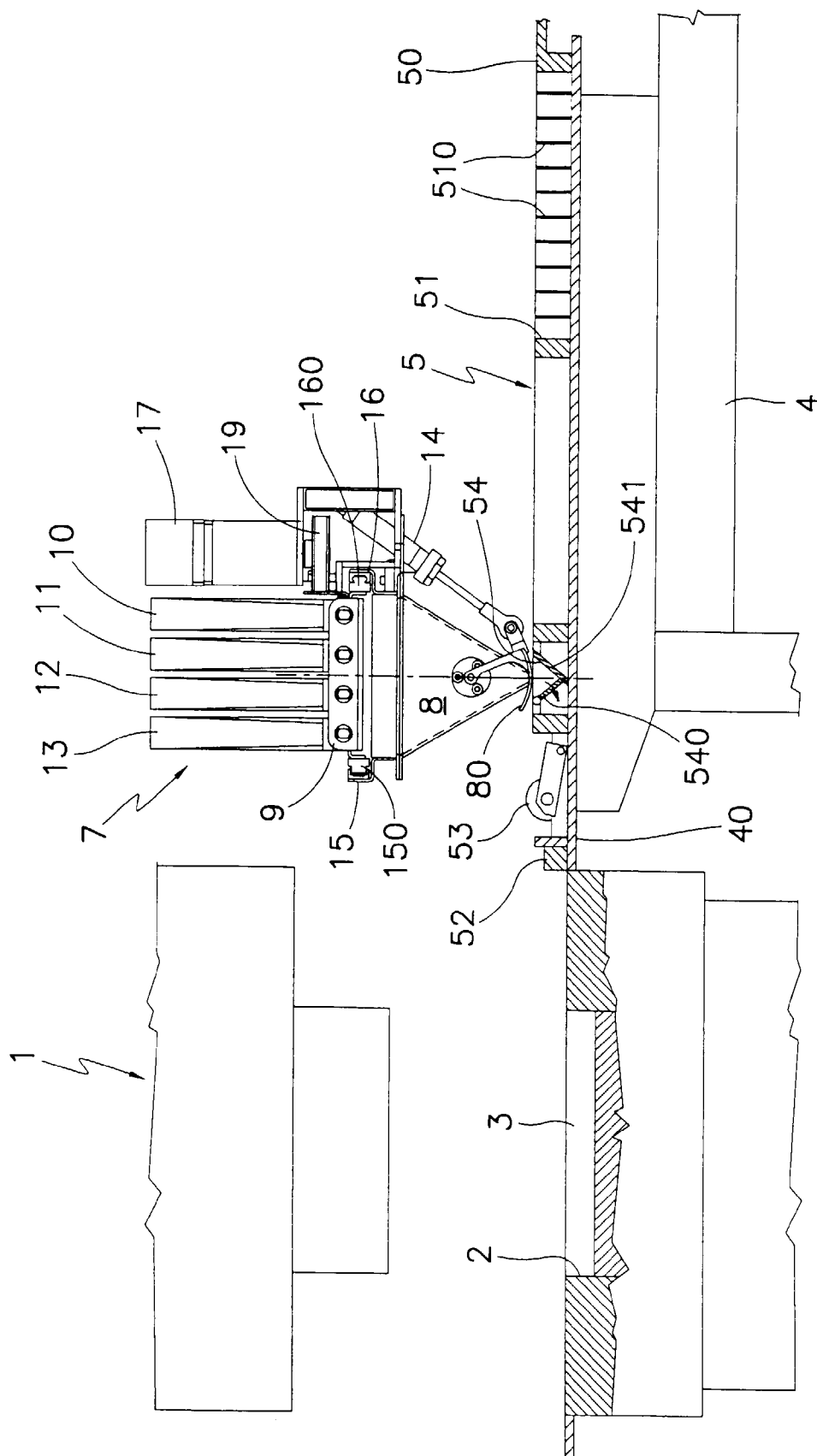
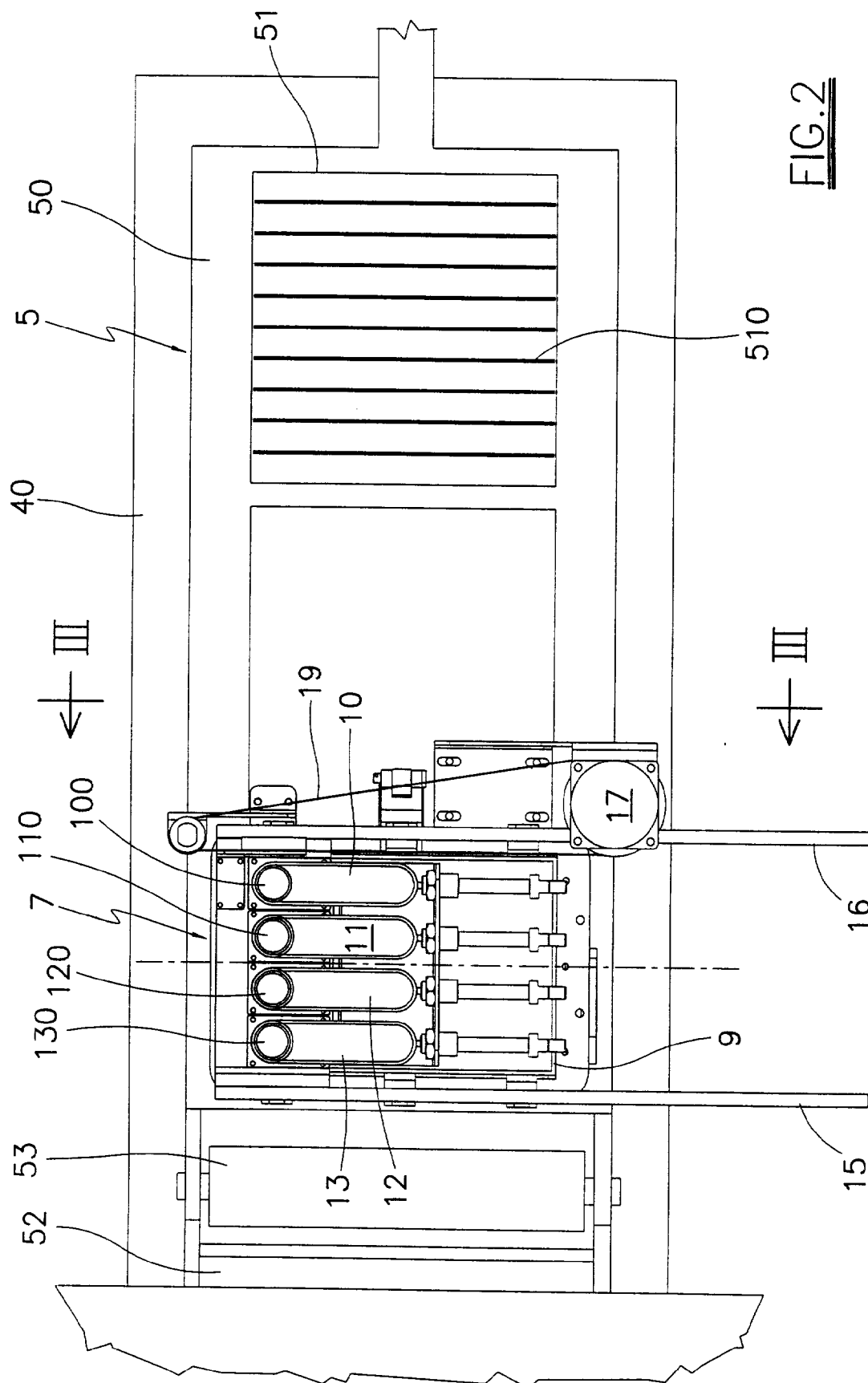
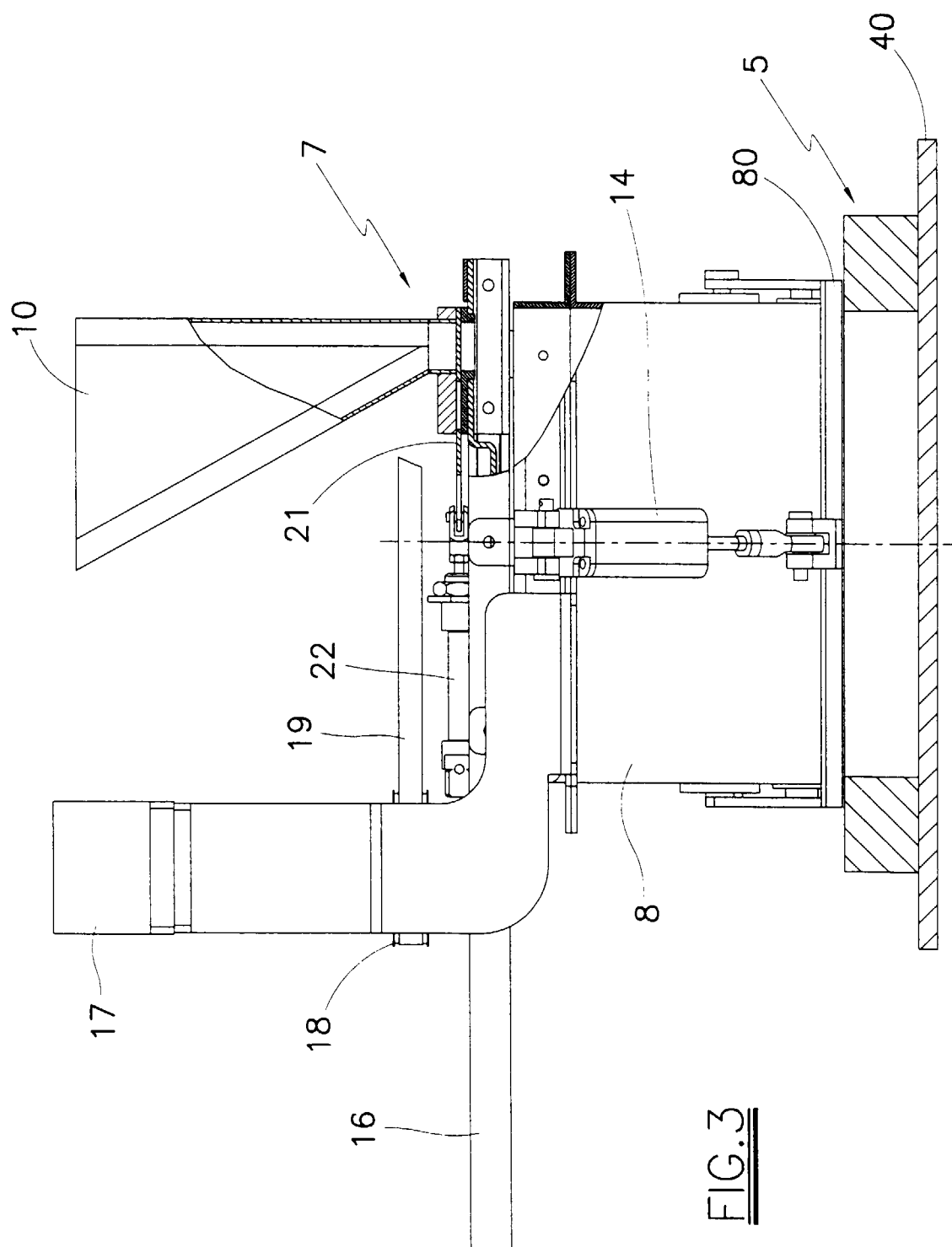


FIG. 1





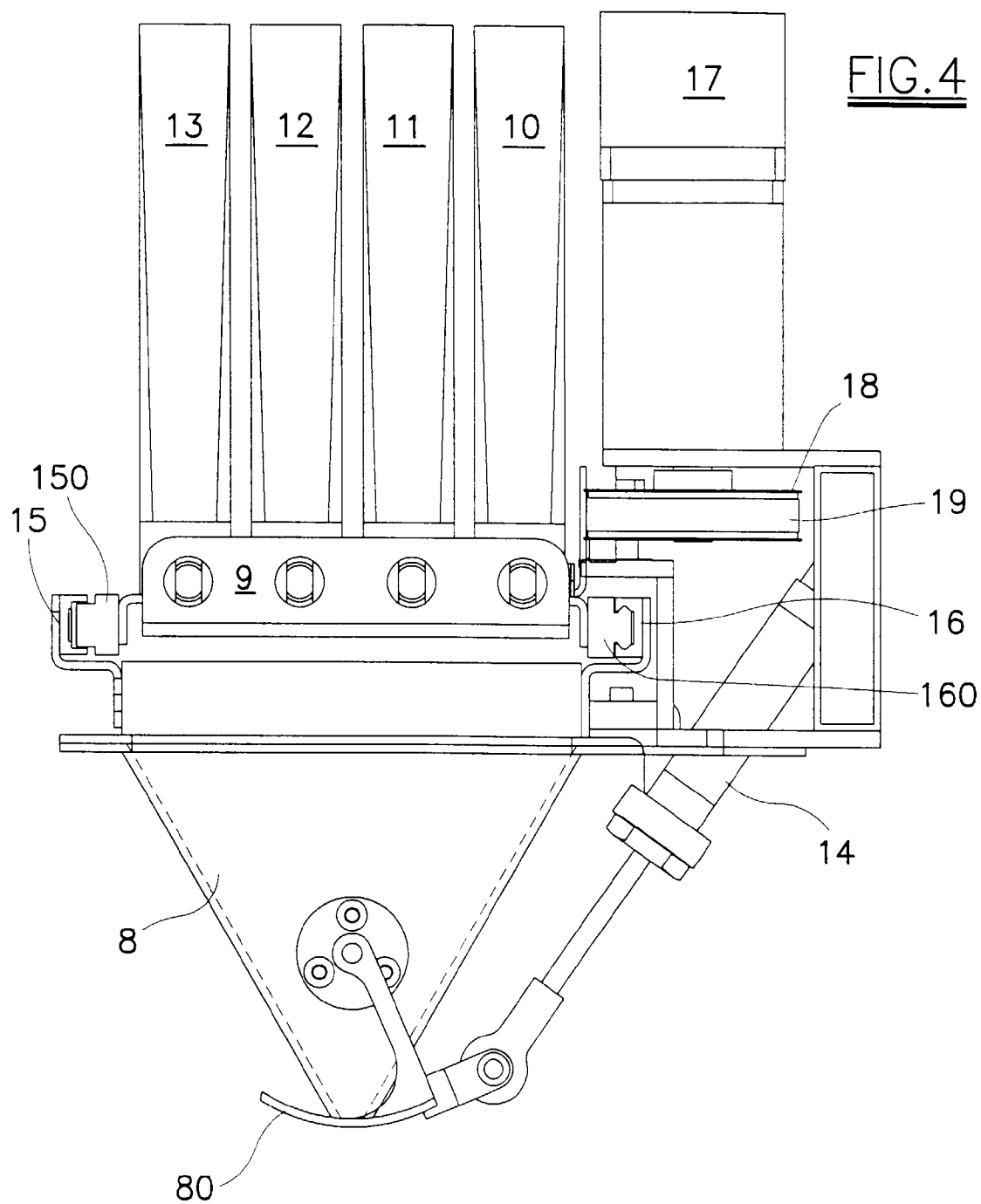


FIG. 10

R			B			R			B			B
B		R		B		R		B				B
R												B
W	W	W	W	W	W	W	W	W	W			W

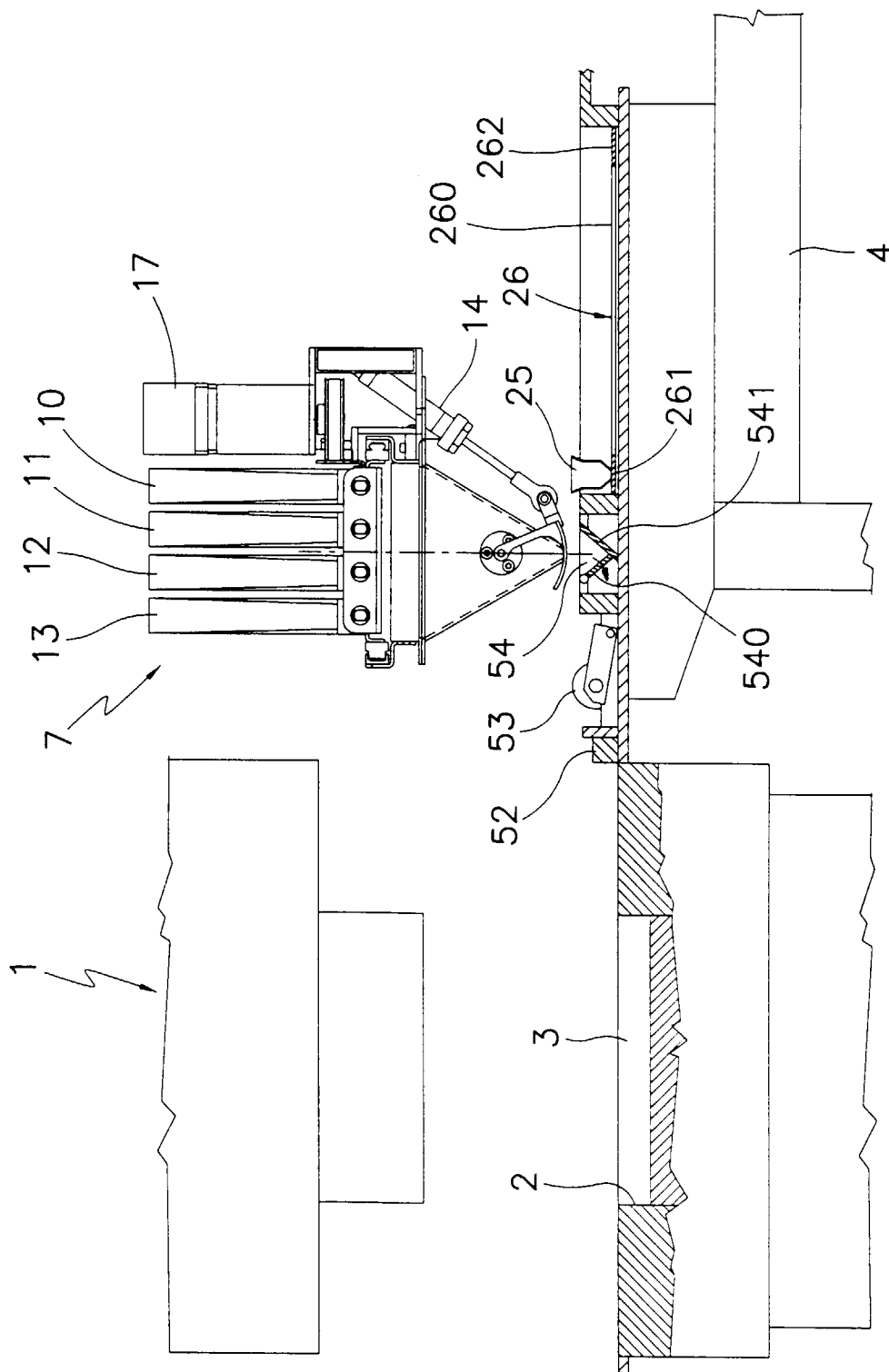


FIG. 5

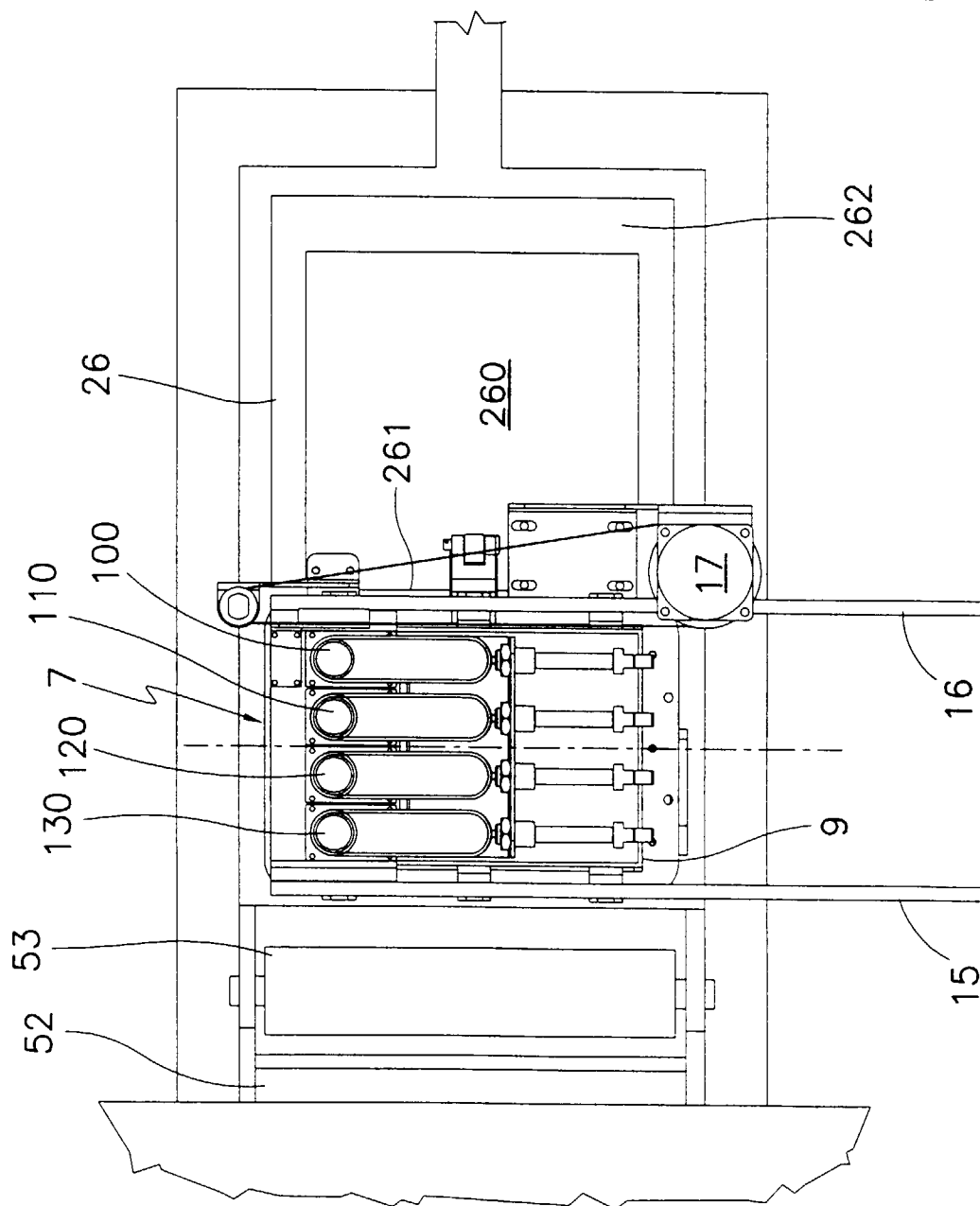
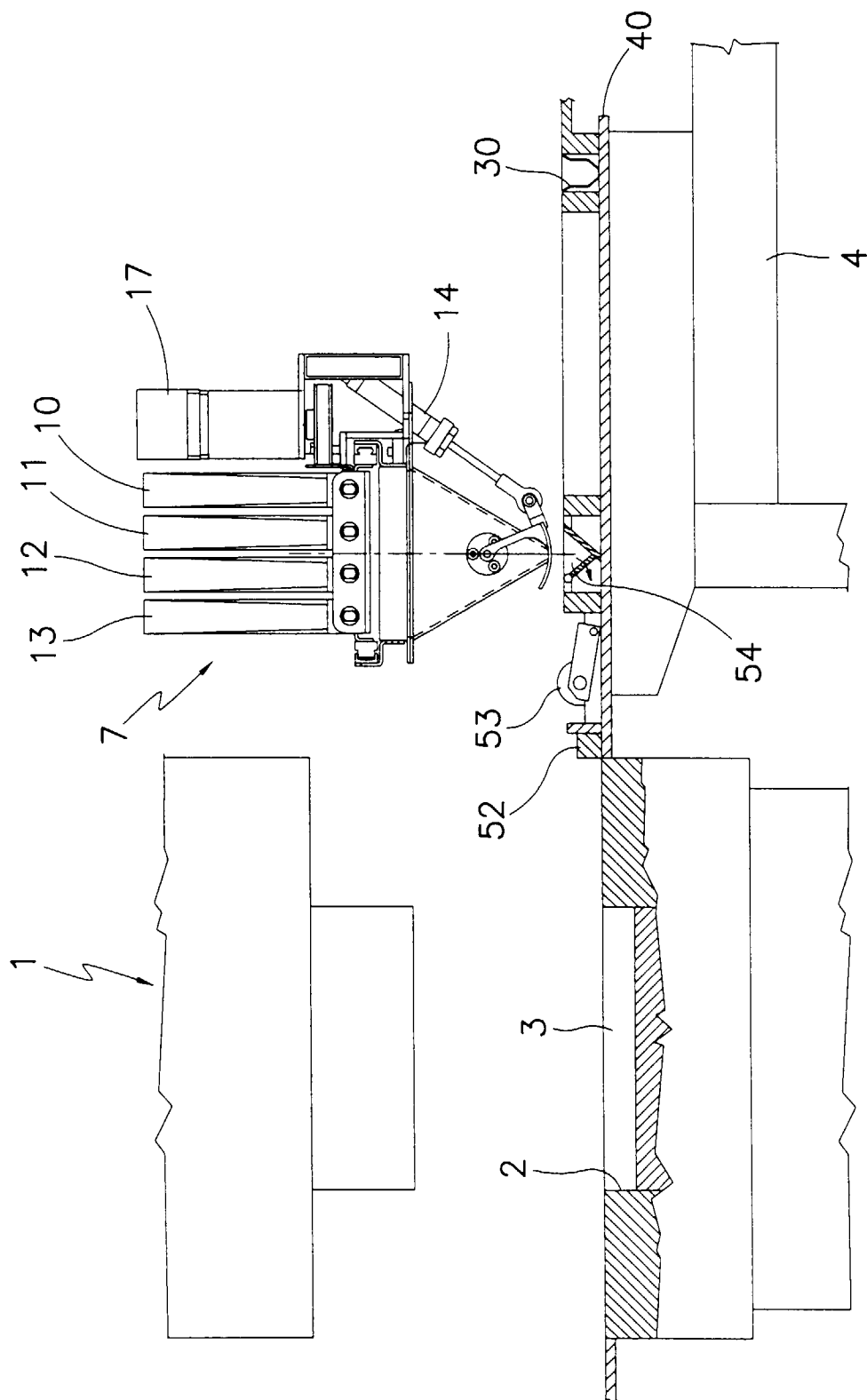
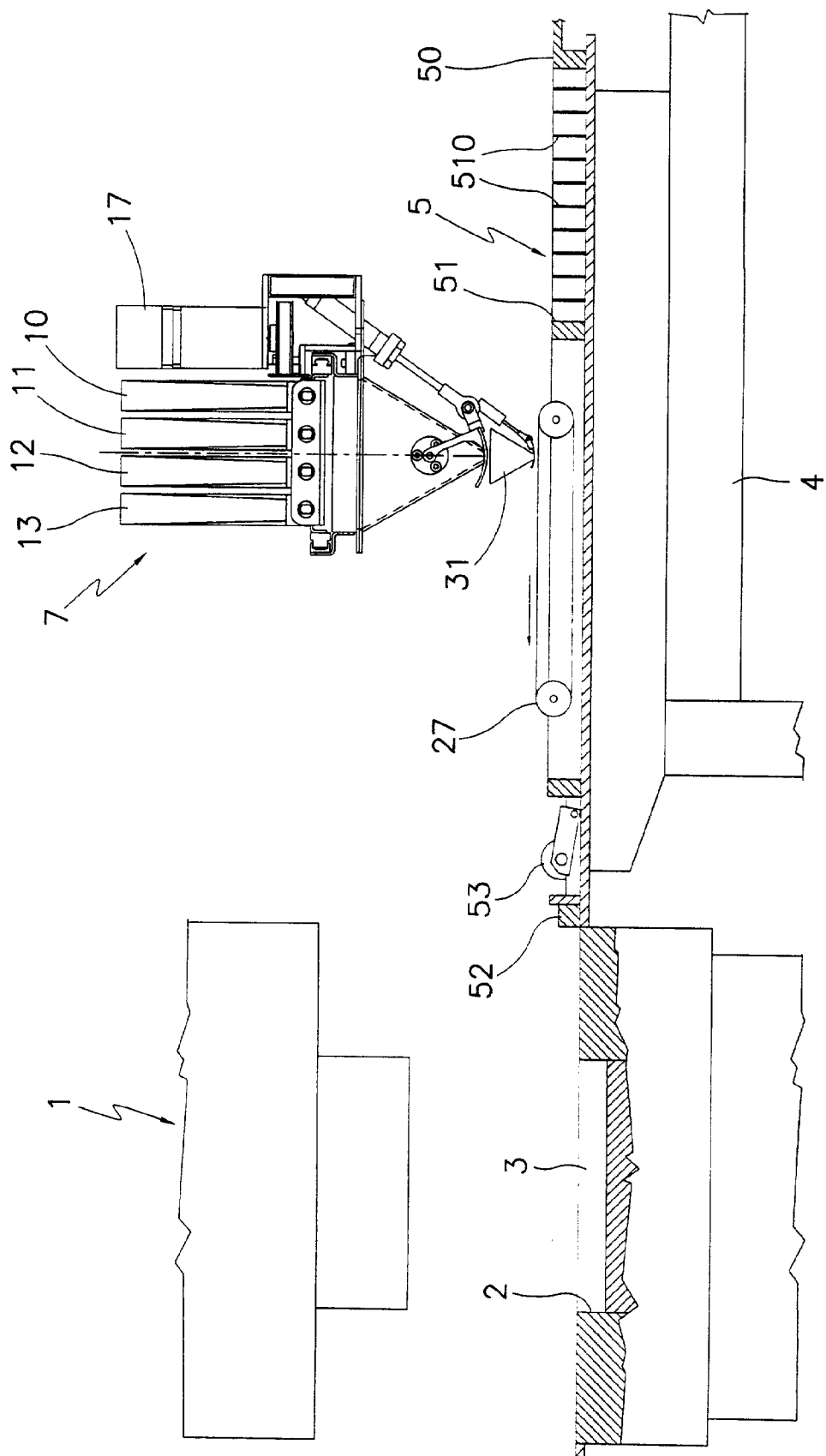


FIG. 6





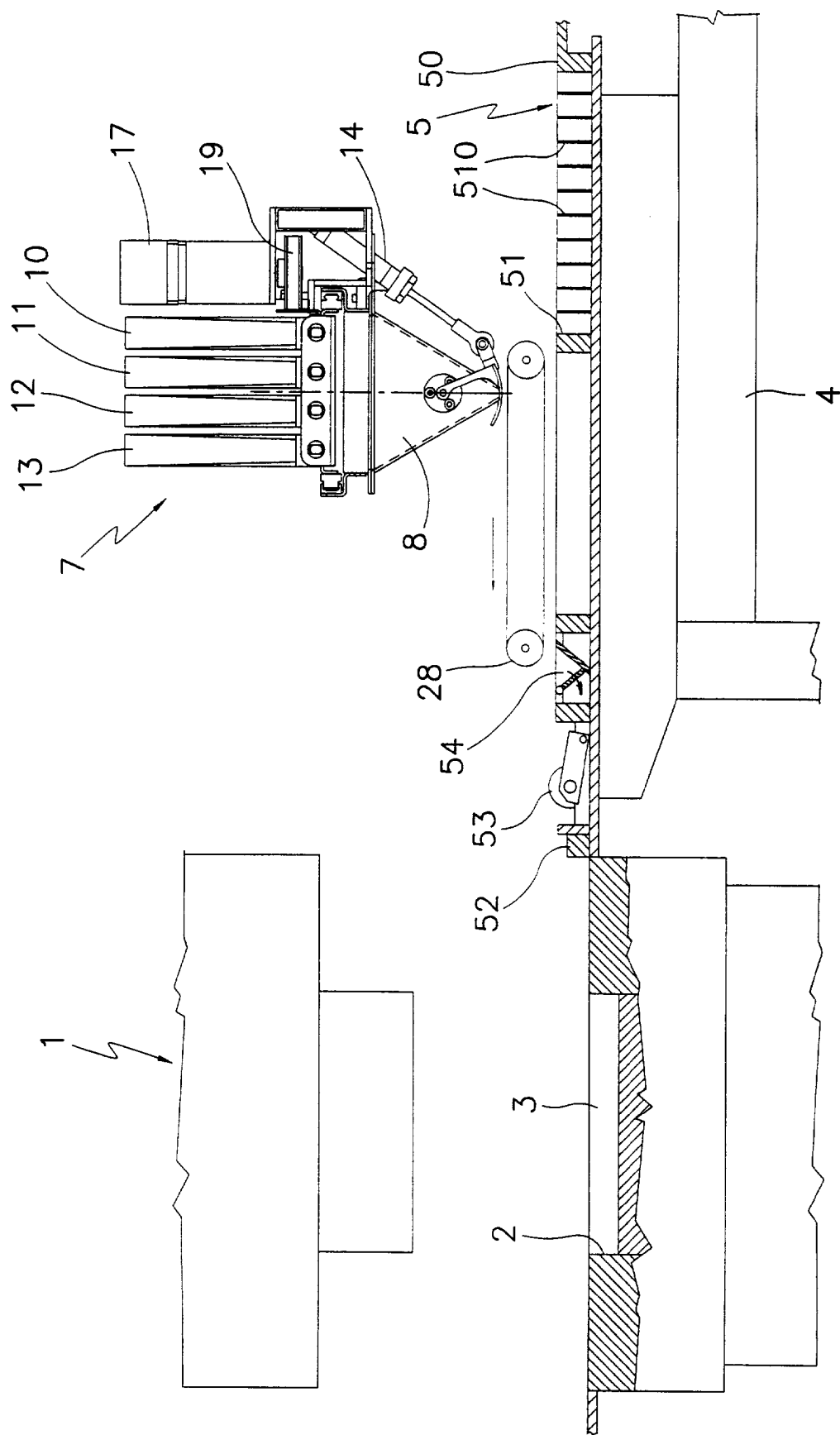


FIG. 9