

Description

This invention relates to a device for feeding materials in powder or granular form into a mould cavity loading carriage in the manufacture of ceramic tiles.

The device is combined with a loading carriage having one or more loading compartments open upperly and lowerly and provided with suitable grids; each compartment corresponds to one mould cavity and has plan dimensions substantially equal to those of the mould cavity. The carriage is moved forwards and rearwards while slidingly resting on a flat continuous surface positioned as a continuation of the upper surface of the mould die plate comprising the cavity to be filled.

The carriage is moved synchronously with the press operations between a retracted position in which the loading compartment receives the material, and an advanced position in which the compartment lies above the mould cavity so that the material falls into the cavity. While passing from the retracted position to the advanced position, the loading compartment is closed lowerly by the surface on which it slides.

In the known art, the carriage is fed by an overlying hopper the lower mouth of which has a transverse dimension (ie perpendicular to the carriage movement) equal to the total dimension of the loading compartments, whereas its longitudinal dimension is less than the corresponding compartment dimension. When the carriage moves in the vicinity of its retracted position, the lower mouth of the hopper covers the entire area of the loading compartments so that the material falling from the hopper fills these compartments.

When the carriage is moved to its advanced position, the lower mouth of the hopper is closed by a flat panel positioned on the carriage behind the loading compartments, to slide against said mouth.

To obtain certain aesthetic effects in the tiles, it is known to fill the mould cavity with several materials of different characteristics, in particular in terms of colour. In this manner tile regions are obtained with blurring of different colours (or other characteristics), typically for imitating natural stone.

For this purpose the different materials, originating from different silos, are introduced in the determined proportions into the loading hopper, where they are mixed together to some extent and are released together into the compartment in the loading carriage.

This method has however the drawback that the aesthetic appearance of the tile is random and substantially independent of one's wishes.

Moreover the tiles do not have an identically repeatable aesthetic appearance; on the contrary, the aesthetic appearance depends largely on factors independent of man.

An object of the present invention is to overcome said drawbacks by a device which enables determined aesthetic effects to be created in a controlled and constant manner, and to a large extent as desired.

These and further advantages are achieved by the device of the invention as characterised in the claims.

The invention is described in detail hereinafter with reference to the accompanying figures, which illustrate one embodiment thereof.

Figure 1 shows the device of the invention applied to a press mould in sectional view taken on a longitudinal vertical plane.

Figure 2 is an enlarged detail of Figure 1.

Figure 3 is a section on the plane III-III of Figure 1.

Figure 4 is a section on the plane IV-IV of Figure 3, in which some parts are shown in section to display underlying parts.

Figure 1 shows schematically a press 2 which can be of any type. On the base 3 there are positioned a die plate 4 and a lower mould die 5, which together define the forming cavity.

The cavity 6 can be of any shape. In addition one and the same mould can comprise several cavities 6 so that several tiles are formed simultaneously (multiple mould).

The upper die 7, which is vertically movable, is positioned in the upper part of the press.

The cavity (or cavities) 6 is filled with materials in powder form which are transferred by a loading carriage 10 having, for each cavity 6, a loading compartment 11 provided with a grid 12, and having plan dimensions substantially equal to those of the forming cavity 6.

The carriage 10 is guided by idle wheels 13 or other guide means, and by means of a crank mechanism of known type operated by a motor 15 is moved forwards and rearwards in a horizontal direction between a retracted position (shown in Figure 1), in which the loading compartment 11 receives the material to be transferred to the cavity 6, and an advanced position, in which the compartment 11 is positioned above the cavity 6 into which it releases the material from the compartment 11.

If the mould is of multiple type, the number of compartments 11 with relative grids 12 is equal to the number of cavities 6, they being aligned in a transverse direction as are the cavities 6.

The compartment 11 slides on and in contact with a fixed horizontal slide surface 8 coplanar to the upper surface of the die plate 4 and positioned adjacent thereto. The surface 8 keeps the lower end of the compartment 11 closed when the carriage 10 passes from its retracted position to its advanced position.

The device of the present invention is applied to the carriage 10 to load its compartment 11 when in the retracted position.

According to the invention, a perforated horizontal surface 20 is provided, substantially equal to the plan projection of the corresponding loading compartment 11, and positioned exactly above this latter when the carriage 10 is in the retracted position.

In the case of multiple moulds, the number of surfaces 20 provided is equal to the number of compart-

ments 11. The figures show an application to a mould with two cavities 6.

The surface 20 possesses numerous apertures 21 through which the material freely passes. The apertures are distributed as at least two pluralities; more precisely the number of pluralities is equal to the number of materials with different characteristics (in particular of different colours) with which the cavities 6 are to be loaded.

In addition, each said plurality of apertures 21 is fed by material conveying means which convey to each plurality of apertures a material originating from a respective feed container 30', 30".

In the illustrated embodiment, the device comprises a container 22 to contain a respective material and having a perforated lower side defining said perforated surface 20. The container 22 also has an upper side 23 provided with apertures 231, each connected to a respective conduit 24 branching from a respective container 30'. The end 23 is also traversed by at least one plurality (only one is shown in the figures) of conduits 25 each connected at its lower end to a respective aperture 21 in the side 20 and branching from an overlying respective container 30".

The two containers 30' and 30 are supported (by two side walls 35) above the container 22, a certain level of material in powder or granular form being maintained within them, with the material contained in one container being different from the material contained in the other. The material from the container 30' falls through the conduits 24 to fill that volume of the container 22 not occupied by the conduits 25. It then leaves this through those apertures 21 in the lower side 20 which are not closed by the conduits 25. These apertures, also indicated by 21' in the figures, define a first plurality for the passage of a first material.

The material from the container 30" falls through the conduits 25 to directly reach those apertures 21 in the lower side 20 served by the conduits 25. These apertures, also indicated by 21" in the figures, hence define a second plurality for the passage of a second material.

To use a larger number of different materials, a larger number of pluralities of conduits (such as the conduits 25) are provided branching from respective containers (such as the container 30' or 30") containing respective different materials.

The number of conduits 24 and 25 and their arrangement relative to the apertures 231 and 21 to which they are applied can be changed at will depending on the aesthetic appearance to be given to the tiles.

In detail, each conduit 24 comprises a short rigid nozzle 241 which is fixed onto a respective aperture 231 and a flexible tube 242 connected to the upper container 30' (Figure 2). Each conduit 25 comprises a rigid tube 251 the lower mouth of which is fixed to the lower side 20 about a relative aperture 21". The tube 251 traverses the upper side 23 as an exact fit and is then connected to a flexible tube 252 connected to the upper container 30".

Means are applied to the perforated surface 20 to open and respectively close its apertures 21 all simultaneously.

In the illustrated embodiment, these means comprise a flat plate 40 adhering to the surface 20 and provided with a plurality of apertures 41 identical to the apertures 231 and arranged geometrically so as to be able to mate with the apertures 21.

Two lateral guides 42 are fixed to the plate 40, to slidingly bear on lateral guides 43 fixed to the vertical side walls 26 of the container 22 (Figure 3).

Said guides 42 and 43 constrain the plate 40 to the container 22 such that it can slide only in a direction longitudinal to this latter. On the two longitudinal sides of the container 22 there are positioned two pneumatic cylinder-piston units 44 arranged to move the plate 40 relative to the container 22 forwards and rearwards through a short distance in the longitudinal direction.

This action moves the plate 40 between a first position in which the apertures 41 in the plate mate with the apertures 21 in the surface 20 (in which position the apertures 21 are hence open - Figure 2), and a second position in which the apertures 21 are closed by the solid regions of the plate 40.

In operation, when the carriage 10 reaches its retracted position, the plate 40 is moved to its first position to open the apertures 41. The materials then fall through the apertures 21 and into the loading compartment 11, filling the spaces in the grid 12.

The plate 40 is then moved into its closure position and the carriage 10, in synchronism with the operation of the press, moves the compartment 11 to above the cavity 6 where it releases the materials contained in it, to fill the cavity.

Because of the fact that a determined type of material passes through each aperture 21 to fill one or more determined spaces in the grid 12, a predetermined geometrical distribution of the various materials is obtained in the compartment 11 and then subsequently in the forming cavities 6. The result is that the tiles present a surface appearance which is substantially constant and controlled, and moreover aesthetic effects not possible to obtain in the known art can be achieved. For example, one of the materials can be concentrated in one or more regions of the tile, leaving the other material in the remaining regions. This is not possible in the known art because the materials tend to mix together almost homogeneously before being deposited into the mould cavities.

The grid 12 can be substantially of any type. However if a relatively precise controlled distribution is required, it is preferable for the spaces of the grid 12 to mate with the apertures 21 in the surface 20.

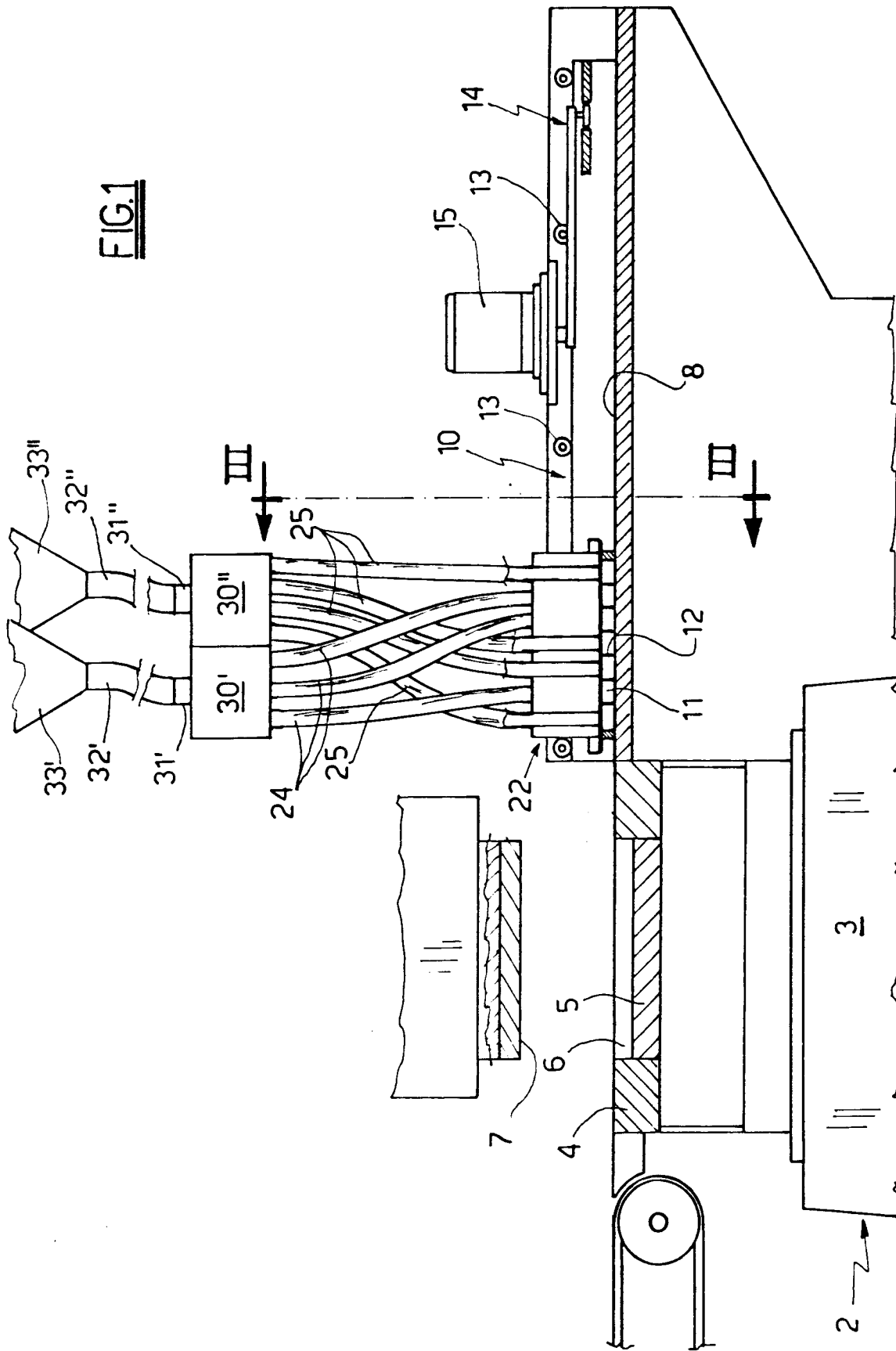
In the illustrated embodiment, the containers 30' and 30" are of narrow elongate shape and are each fed by a respective discharge mouth 31', 31" connected by a flexible tube 32', 32" to respective overlying silos 33', 33" containing a respective material.

The two mouths 31' and 31'' are joined together and are moved horizontally forwards and rearwards (by known means, not shown) along the entire length of the respective containers 30' and 30'', to uniformly distribute the materials within the containers.

In a different embodiment, not shown on the figures, all the apertures 21 are connected to respective conduits, such as the conduits 25, which are distributed as two or more pluralities, each plurality being connected to a respective feed container such as 30', 30''.

Claims

1. A device for feeding material in powder or granular form into a mould cavity loading carriage in the manufacture of ceramic tiles, said loading carriage having at least one loading compartment (11) comprising a grid (12) and with plan dimensions substantially equal to those of a mould cavity (6), and being driven with reciprocating movement between a retracted position in which the loading compartment (11) receives the material, and an advanced position in which the loading compartment (11) releases the material into the underlying mould cavity (6), characterised by comprising: a horizontal surface (20), which is substantially equal to the plan projection of the carriage loading compartment (11) and lies above this when the carriage (10) is in its retracted position, and comprises a plurality of apertures (21) for passage of the materials; means (40, 44) for opening and respectively closing the apertures (21) in the perforated surface (20); the apertures (21) in the perforated surface (20) being distributed as at least two separate pluralities (21', 21''), means (22, 24, 25) being provided for conveying material originating from a respective feed container (30', 30'') into each plurality of apertures (21', 21'').
2. A device as claimed in claim 1, characterised in that said conveying means comprise conduits (25) connected at their lower end to a respective aperture (21) and branching from an overlying feed container (30'').
3. A device as claimed in claim 2, characterised by comprising a container (22) to contain a respective material, and having a lower side defining said perforated surface (20) and an upper side (23) provided with apertures (231) connected via conduits (24) to a respective feed container (30'), said upper side (23) being traversed by at least one plurality of conduits (25) each connected at its lower end to a respective aperture (21) in the lower side (20) and branching from an overlying respective feed container (30'').
4. A device as claimed in claim 2, characterised in that each feed container (30', 30'') is fed by a discharge mouth (31', 31'') connected to an overlying silo (33', 33'') containing a respective material, means being provided to move the discharge mouth forwards and rearwards through the length of the container (30', 30'').
5. A device as claimed in claim 1, characterised in that said means for opening and closing the perforated surface (20) comprise a perforated plate (40) adhering to the perforated surface (20) and provided with a plurality of apertures (41) shaped and geometrically arranged to be able to mate with the apertures (21) in the perforated surface (20), and means (42-44) arranged to move the perforated plate (40) forwards and rearwards between a first position in which the apertures (41) in the plate (40) and the apertures (21) in the surface (20) mate, and a second position in which the solid regions of the perforated plate (40) close the apertures (21) in the perforated surface (20).



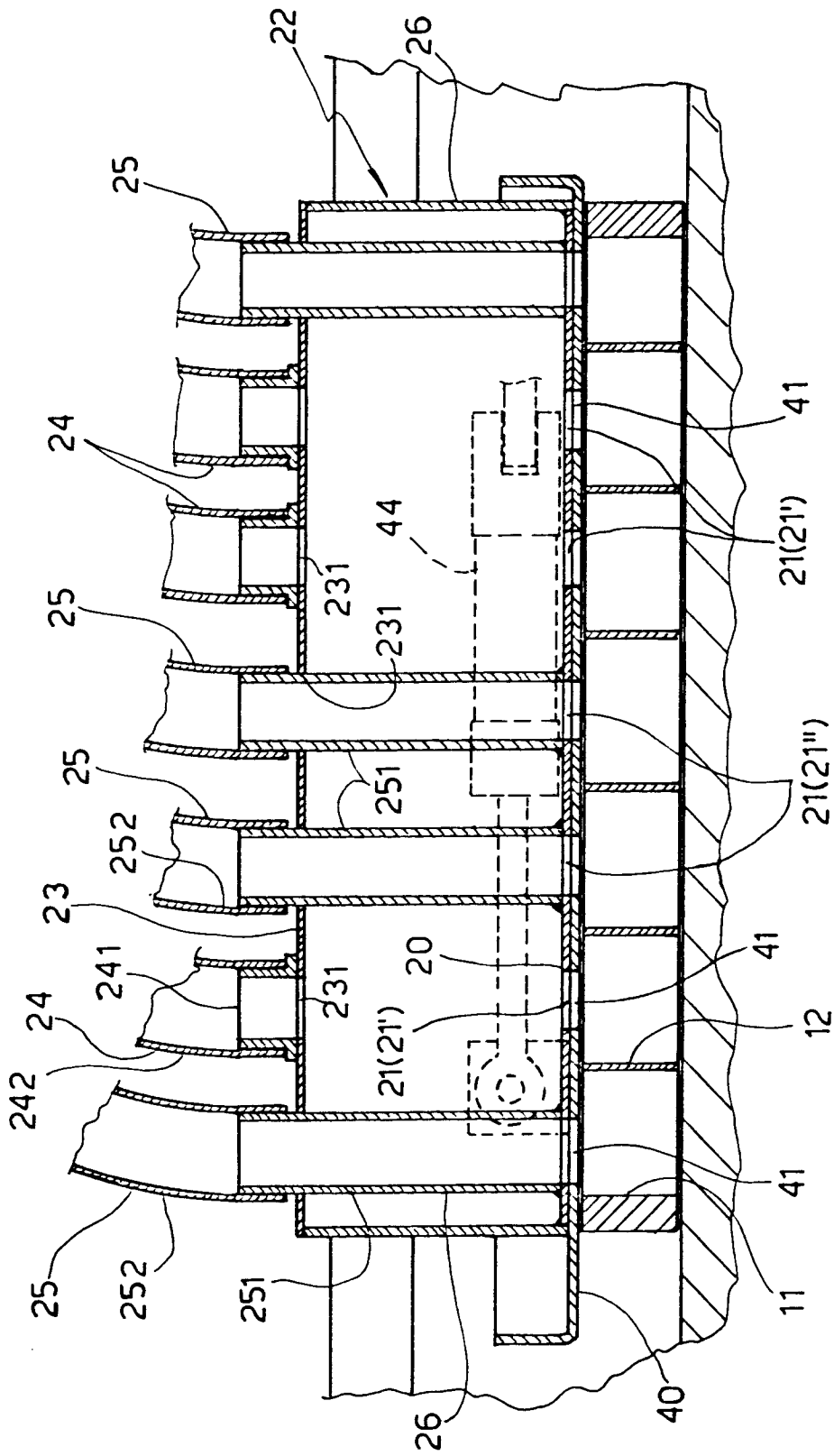
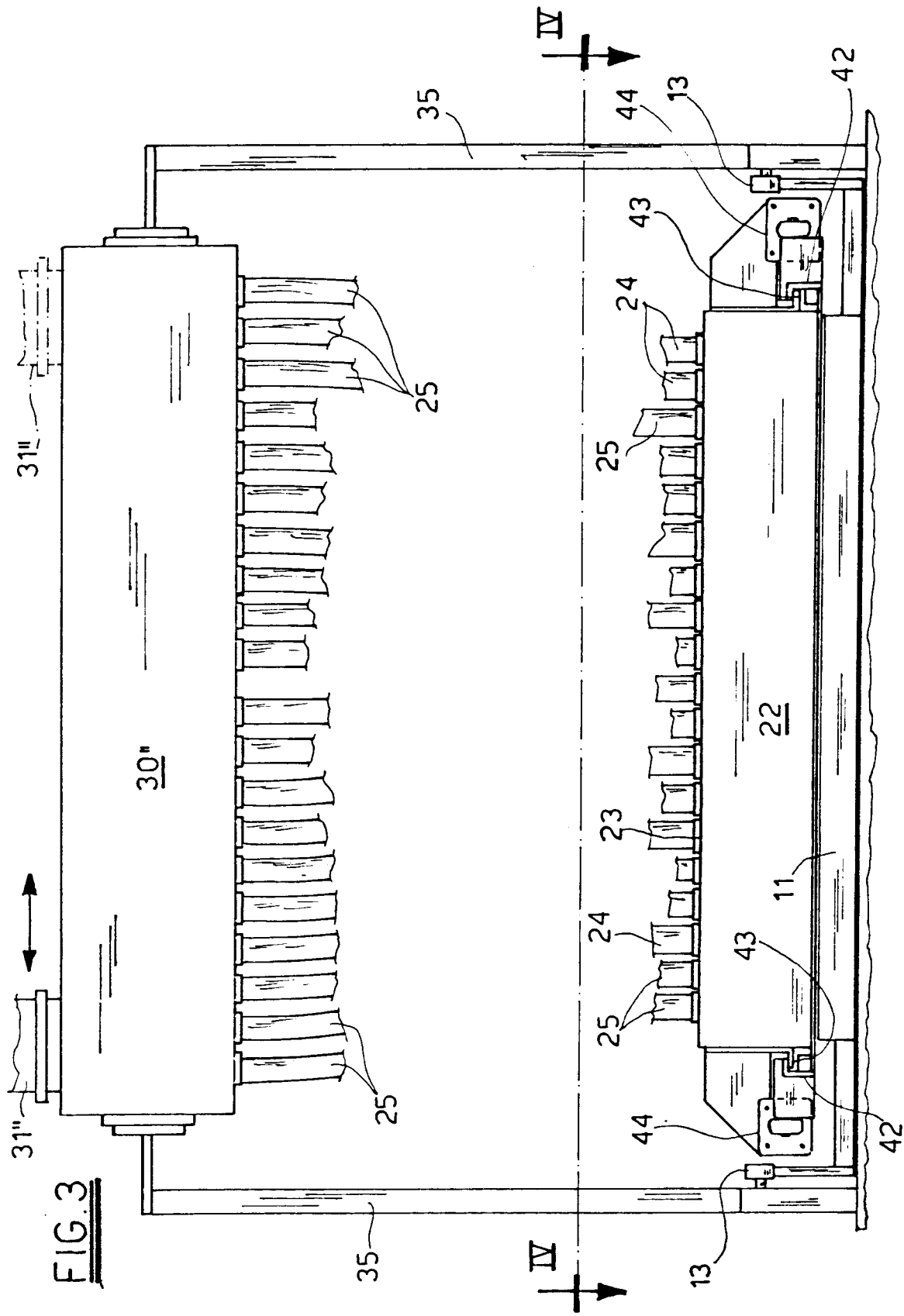


FIG. 2



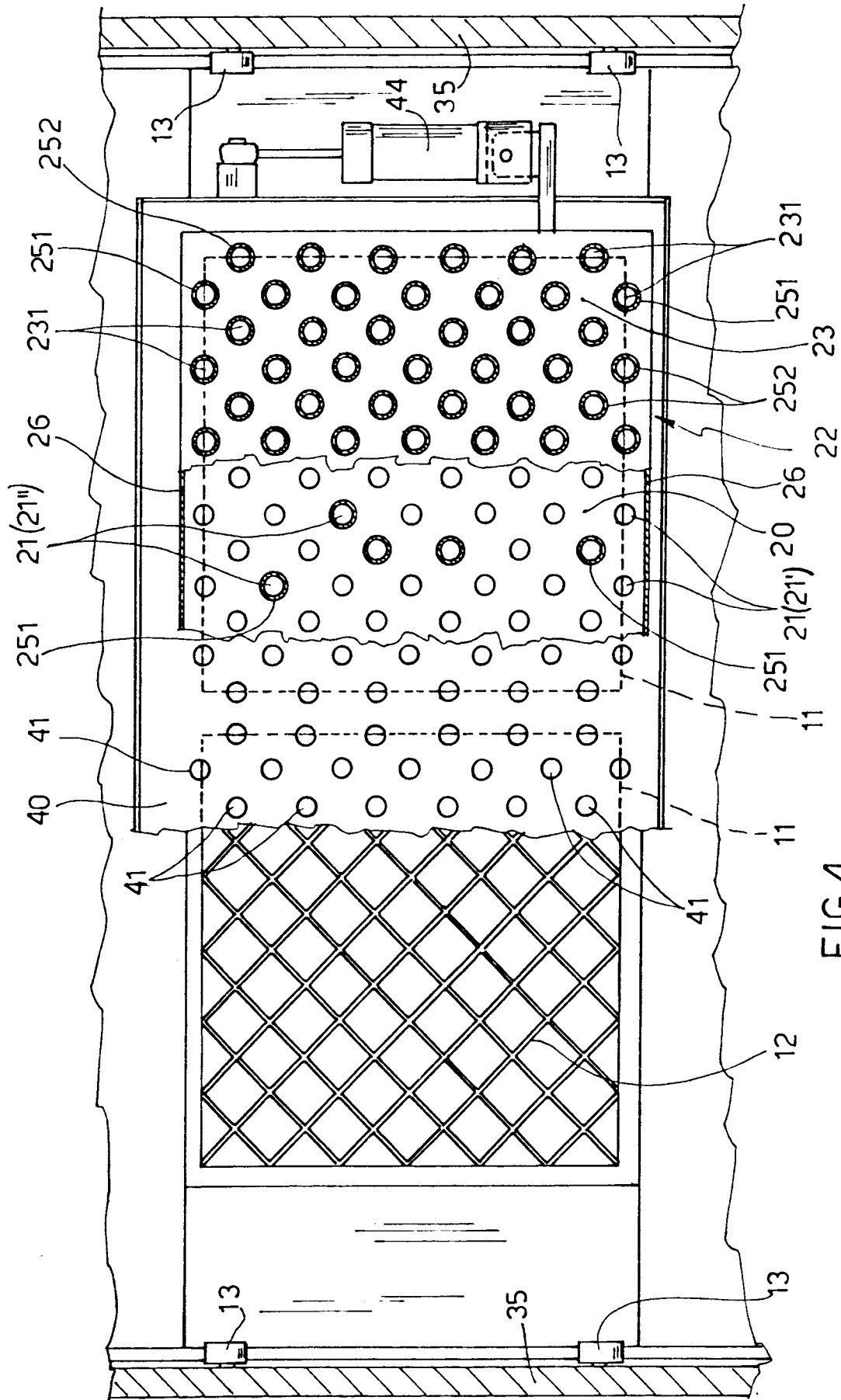


FIG. 4