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(54) **Method and machine for the production of cement tiles**

(57) A method for the production of cement tiles (11) starting from cement paste (11a) comprises
- the movement of cement paste (11a)in a movement direction (M) in order to position the cement paste (11a) under a molding unit (15) which acts in a vertical molding direction (S);
- the molding of the cement paste (11a) in the molding direction (S) for the production of at least one cement tile (11);
- the extraction of at least one cement tile (11) produced in an extraction direction (E) transverse to said movement direction (M);
wherein the extraction direction (E) lies on an extraction plane vertically offset with respect to a movement plane on which the movement direction (M) lies and disposed at a distance (H2) greater than the height (H1) of the movement plane.

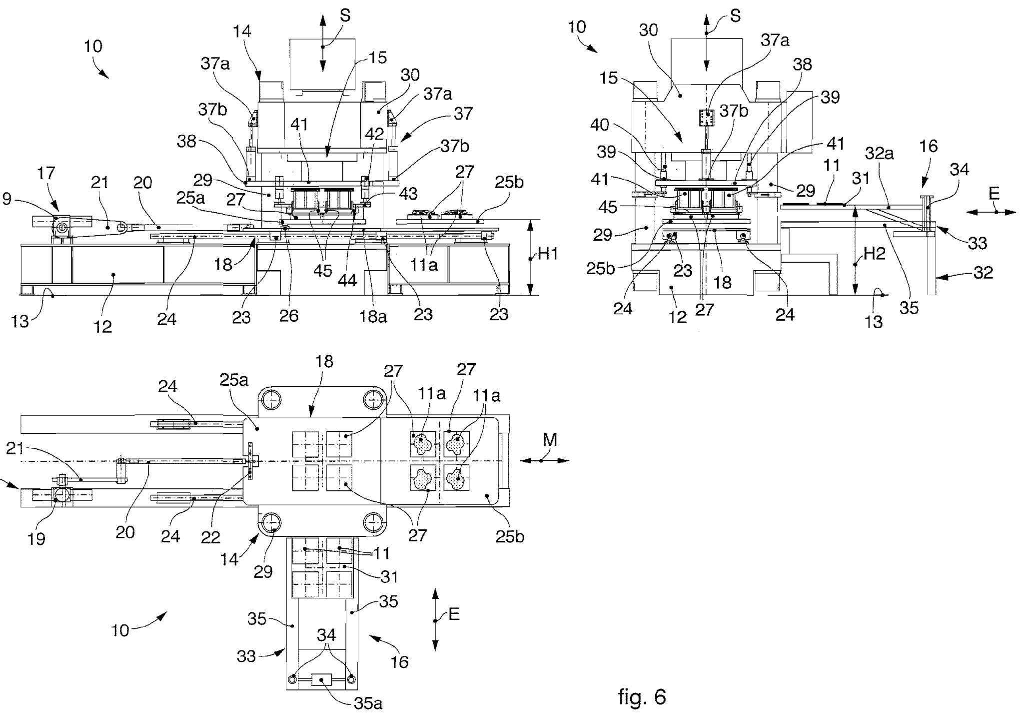

fig. 6

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a method for the production of cement tiles and/or cement artifacts, for example single-layered or double-layered, by molding.

[0002] In particular the present invention concerns a method which perfects the demolding and extraction of said cement tiles.

[0003] The present invention applies to linear alternate molding machines of cement paste, fed for example in piles, or to alternate pile press machines, or fed in piles which are then leveled, with different mixtures.

BACKGROUND OF THE INVENTION

[0004] It is known to use cement tiles to line and/or decorate surfaces of a building, such as walls or floors, or for paving pavements, sidewalks or other external zones.

[0005] It is known that cement tiles can be single-layered, that is, consisting of a single material, for example cement paste, or multi-layered, that is, obtained by coupling several layers of materials, for example cement paste and sand. These materials can define one or more bearing layers and a decorative surface layer.

[0006] It is known in particular that, for the production of single-layered cement tiles, initially a cement paste is prepared, which can be low viscosity or semiliquid, and then the cement paste is pressed or molded to obtain artifacts and/or tiles with a desired shape and size.

[0007] During the pressing, most of the excess water present in the cement paste is eliminated by suction or percolation from below, or suction from above, or again by suction from above and below simultaneously.

[0008] A subsequent drying step allows to completely dry the semi-worked tiles thus obtained.

[0009] Other surface finishing steps, such as for example beveling possible edges, smoothing or polishing, can be provided to obtain the finished tile, ready for laying.

[0010] It is known to use rotary or linear alternate molding machines or presses for the production of single-layered or multi-layered cement tiles.

[0011] Molding machines can be provided with automatic or semi-automatic devices to feed and dose the cement paste, or they can be fed manually.

[0012] Generally, rotary presses comprise a rotatable platform or turntable, divided into a plurality of work stations, to perform the different work steps.

[0013] Each work station may comprise one or more work planes, which can be connected to each other and supported by vibrating supports. Normally, the work planes of rotary presses each have at least one mold in which the cement paste is constantly confined during the different work steps.

[0014] Furthermore, the work planes can be lifted by lifting pistons.

[0015] Known rotary presses normally also comprise three operating columns, each configured to perform a specific operation. This allows to perform a plurality of operations simultaneously.

[0016] Rotary presses have the disadvantage, however, that they are very bulky, costly and complex. It is therefore known to use, for example particularly for the production of single-layered tiles, linear alternate molding machines or presses, which are less bulky, less costly and more simple to produce and use than rotary presses. The linear alternate molding machines normally used for the production of single-layered cement tiles comprise a loading station for loading the semiliquid paste, a pressing station and a discharge station to discharge the tiles obtained by pressing.

[0017] These operating stations are normally linearly adjacent in succession, with the pressing station disposed in the center and below a printing apparatus with alternate movement.

[0018] The successive steps of loading the cement paste and pressing it, and the subsequent steps of demolding, or removing from the mold, and discharging the semi-worked tiles define a molding cycle of a single-layered cement tile.

[0019] The loading step provides to position the cement paste needed to obtain a tile on an upper surface of a molding plane, initially positioned in the loading station.

[0020] Linear alternate molding machines are known, in which the cement paste is loaded by depositing piles of the material on molding planes or other supports. Such molding machines are also known as pile press machines.

[0021] Linear alternate molding machines are also known which provide that a mold is disposed on the molding planes, and that the cement paste is loaded by depositing it inside the mold. The cement paste is thus confined and uniformly distributed in the mold before molding, for example by vibrating the molding plane. This vibration is not provided in known pile press machines.

[0022] Subsequently, the molding plane is translated toward the pressing station, where the pressing step is carried out.

[0023] The pressing step provides that a molding unit, normally comprising at least one mold and a molding slider, performs the pressing of the cement paste to mold the tile in the desired form.

[0024] Subsequently, the tile thus obtained, which can be finished or semi-worked, is released from the mold during a demolding step, which generally takes place by lifting the molds and thrusting by sliders, and again positioned on the molding plane.

[0025] Following demolding, the tile is removed from the pressing station by translating the molding plane.

[0026] This translation causes a corresponding translation of another molding plane, generally connected to the first, on which the cement paste has already been loaded. In this way, the other molding plane passes from the loading station to the molding station for a new molding cycle, identical to the one described above.

[0027] Other known machines are described for example in documents DE-A-19622001 and DE101005020428.

[0028] One disadvantage of known linear alternate molding machines is that, although they have the advantage of reduced bulk, they also have reduced productivity. In particular, the demolding cycle of tiles in known linear alternate molding machines considerably affects the production cycle since in a known linear press it is not possible to simultaneously carry out other operations such as for example pressing, translation of the load, as well as loading the cement paste. Consequently, the demolding and pressing time in known linear presses with a mold is equivalent, the operations are carried out in succession and in the meantime it is only possible to load another station with cement paste.

[0029] It is also a disadvantage of known molding machines, in particular alternate pile press machines, that it is not possible to adequately contain the cement paste before molding. This can cause leakages of material and can dirty the molding machine, with negative consequences on the maintenance times and production costs of the cement tiles.

[0030] Another disadvantage of known molding machines is that they comprise molding units that need a long time to be replaced or maintained.

[0031] One purpose of the present invention is to obtain a machine for the production of cement tiles that allows to achieve higher productivity than that obtainable with known molding machines.

[0032] Another purpose of the present invention is to obtain a containing device, for example used in particular in alternate pile press machines, to efficiently contain the cement paste before molding, from which the cement tiles will be obtained.

[0033] Another purpose of the present invention is to obtain a molding unit that allows to speed up and facilitate maintenance operations, thus also reducing the relative costs.

[0034] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0035] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0036] In accordance with the above purposes, a method for the production of cement tiles starting from cement paste comprises:

- the movement of cement paste in a movement direction in order to position the cement paste under a molding unit which acts in a vertical molding direction;
- the molding of the cement paste in the molding direction for the production of at least one cement tile;
- the extraction of the cement tile produced in an extraction direction transverse to the movement direction;

wherein the extraction direction lies on an extraction plane vertically offset with respect to a movement plane on which the movement direction lies and disposed at a distance greater than the height of the movement plane.

[0037] In this way an increase in productivity is advantageously obtained since the frontal extraction of the tiles produced allows to reduce the molding times, allowing the substantially simultaneous execution of both the movement of the cement paste and the extraction cycle of the tiles produced.

[0038] The synchronicity of the movement and extraction considerably reduces the cycle times and is made possible by offsetting the planes on which the two movement and extraction directions lie. The present invention makes possible a synchronicity of the demolding and the movement of the cement paste, which is impossible in known machines.

[0039] According to one feature of the method of the present invention, the cement paste is moved alternately on one side and the other of a mold in the movement direction and at least one cement tile is extracted frontally from the molding unit in the extraction direction.

[0040] The advantage of increasing productivity is thus achieved, in terms of cement tiles produced in a unit of time, since the movements of the cement paste occur on two sides of the mold. Moreover, the frontal and offset extraction does not impede the movement of subsequent cement paste to be subjected to molding.

[0041] One feature of the present invention provides that after the molding of the cement tiles the method comprises:

the distancing of the molding unit from at least one molding plane in the molding direction;

- the positioning of a demolding plane in a molding station by moving the demolding plane in the extraction direction, which lies on a plane parallel to the plane on which the molding plane lies;
- the demolding of the cement tiles, positioning them on the demolding plane;
- the movement of the demolding plane in the extraction direction, away from the molding station, in order to remove the cement tiles.

[0042] According to another feature of the present invention, the positioning of the demolding plane in the molding station provides that it is located above the molding plane, which is present at the same time in the same molding station.

[0043] In this way, the demolding of the cement tiles and the positioning of the cement paste to be molded can occur at the same time, further reducing the times of the molding cycle and consequently increasing productivity.

[0044] The present invention also concerns a machine for the production of cement tiles starting from cement paste, comprising a molding unit, configured to carry out the molding of the cement paste in a vertical molding direction to obtain the cement tiles, a movement device configured to move at least the cement paste in a movement direction to position the cement paste under the molding unit; an extractor device configured to extract the at least one cement tile produced in an extraction direction transverse to the movement direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0045] These and other characteristics of the present invention will become apparent from the following description of some forms of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a three-dimensional view of a molding machine for the production of cement tiles according to the present invention;
- figs. 2-6 each show a front view, a lateral view and a plan view of the molding machine in fig. 1 during successive steps of a molding cycle;
- fig. 7 is a plan view, partially sectioned, of a component of the molding machine in fig. 1;
- figs. 8-11 show, in a schematic lateral section, the behavior of the component of fig. 7 in successive steps of a molding cycle;
- figs. 12 and 13 are two plan views of a variant of fig. 7;
- fig. 14 is a lateral section view of the component in figs. 12 and 13 in conditions of use;
- fig. 15 is a three-dimensional view of a molding machine for the production of cement tiles according to some forms of embodiment of the present invention.

DETAILED DESCRIPTION OF FORMS OF EMBODIMENT

[0046] We shall now refer in detail to the various forms of embodiment of the present invention, of which one or more examples are shown in the attached drawing. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof. For example, the characteristics shown or described insomuch as they are part of one form of embodiment can be adopted on, or in association with, other forms of embodiment to produce another form of embodiment. It is understood that the present invention shall comprise all such modifications and variants.

[0047] With reference for example to fig.1, forms of embodiment are described which can be combined with all the forms of embodiment described here, of a molding machine 10 according to the present description, for the production of cement tiles 11, for example single or double layered.

[0048] According to possible forms of embodiment, which can be combined with all the forms of embodiment described here, the machine 10 can comprise a base frame 12, resting on a support surface, for example a floor 13, and a casing 14, attached to the base frame 12.

[0049] In some forms of embodiment, described by way of example using the attached drawings, figs. 1-14 for example, the casing 14 is advantageously positioned in the central zone of the base frame 12.

[0050] The function of the casing 14 is to support a molding unit 15, which is configured to move with rectilinear alternate motion in a substantially vertical molding direction S, moving toward and away from the base frame 12.

[0051] In alternate forms of embodiment, the casing 14 and the base frame 12 are replaced by a single monolithic structure, consisting of components welded or attached to each other.

[0052] The zone under the molding unit 15 is also called molding station.

[0053] As will become clear in the following description, the molding unit 15 is able to both mold and demold the cement tiles 11.

[0054] According to some forms of embodiment, which can be combined with all the forms of embodiment described here, an extractor or removal device 16 can be provided, configured to extract in the extraction direction E at least one cement tile 11 produced. In particular, the extractor device 16 can be configured to collect the cement tiles 11 during demolding and, translating away from the molding position in the extraction direction E, extracts the cement tiles 11 from the molding station.

[0055] The extraction direction E can be, in the case shown here by way of example, orthogonal to the molding direction S.

[0056] According to some forms of embodiment, which can be combined with all the forms of embodiment described here, a movement device 17 can be provided, configured to move cement paste 11 a in a movement direction M in order to position the cement paste 11a under the molding unit 15.

[0057] In possible implementations, the movement device 17 can be disposed and attached on the base frame 12 and can have the function of making a support element 18 translate horizontally in the movement direction M, which can be orthogonal to the molding direction S.

[0058] In some forms of embodiment, the movement direction M and the extraction direction E are parallel to each other.

[0059] In other forms of embodiment, the extraction direction E is transverse to the movement direction M.

[0060] Other forms of embodiment provide that the movement direction M, the molding direction S and the extraction direction E are all reciprocally orthogonal, in order to define a triad of orthogonal Cartesian axes.

[0061] According to some forms of embodiment described here, the extraction direction E and the movement direction M lie on planes parallel to each other and substantially horizontal. The lying planes are vertically offset with respect to each other, so that the plane on which the extraction direction E lies, or extraction plane, is located above the plane on which the movement direction M, or movement plane, lies.

[0062] In this way, the extraction of the cement tiles 11 does not impede the movement of the support element 18, and extraction and movement can occur at the same time.

[0063] The support element 18 can be defined by a single metal sheet, or by a first support sheet 18a and a second support sheet 18b, disposed side by side and adjacent to each other to define a substantially rectangular plan bulk of the support element 18.

[0064] A first molding plane 25a, also known in Italian as a stool or mobile anvil to a person of skill in the art, is attached on the first support sheet 18a, while a second molding plane 25b or stool or mobile anvil is attached on the second support sheet 18b.

[0065] In some forms of embodiment, the molding planes 25a, 25b can be without matrices, molding seatings or other systems for containing the material to be molded. In other forms of embodiment, the molding planes 25a, 25b can be provided with matrices, molding seatings or other containing systems (see fig. 15 for example).

[0066] The movement device 17 is configured to make the support element 18 perform an alternate to-and-fro motion in the movement direction M. In this way it is possible to alternately position the first support sheet 18a, and therefore the first molding plane 25a, and the second support sheet 18b, and therefore the second molding plane 25b, in the aforesaid molding station.

[0067] When the first support sheet 18a is positioned laterally with respect to the molding station inside the casing 14, it is in a first loading station.

[0068] When the second support sheet 18b is positioned laterally with respect to the molding station inside the casing 14, it is in a second loading station.

[0069] In the first and second loading stations, the deposition of cement paste 11a to be subjected to pressing in order to obtain the cement tiles 11 occurs, on the first molding plane 25a and on the second molding plane 25b, as will be described hereafter.

[0070] According to possible forms of embodiment described here, the loading of the cement paste 11a can be carried out in as many piles of cement paste 11a as there are cement tiles 11 to be obtained. Or, in other variants, such as for example as described hereafter with reference to fig. 15, the cement paste 11a can be leveled, that is, distributed in a pile and then leveled and made uniform in thickness, before molding.

[0071] The steps of loading or depositing the cement paste 11a, and the molding, demolding and extraction steps define, all together, a molding cycle.

[0072] In the case shown here by way of example, the movement device 17 is the rod-crank type and comprises a motor 19, a rod 20 and a crank 21.

[0073] The rod 20 is pivoted at one end to the crank 21 and at the opposite end to a pin 22 attached to one end of the first support sheet 18a of the support element 18. The rod 20 is driven by the crank 21 and alternately draws and thrusts the support element 18 by means of the pin 22.

[0074] The support element 18 is provided, in its lower part, with slider devices 23, which are able to slide on rails 24 attached to the base frame 12. The coupling of the slider devices 23 and the rails 24 constrains the support element 18 to slide linearly in the desired movement direction M. The rails 24 are in fact located parallel to the movement direction M.

[0075] One or more slider devices 23 can be provided, in the same way as a single rail 24 can be provided, or a plurality of rails 24.

[0076] In the specific case described here, the support element 18 is provided, in its lower part, with six slider devices 23, coupled to two rails 24, parallel to each other and to the rotation plane of the crank 21.

[0077] Other types of movement device 17, such as for example a linear actuator or a linear electromagnetic motor, or even a belt or rack device, can be used to make the support element 18 translate, in the same way as described above.

[0078] The attachment of the molding planes 25a, 25b and the support element may not be direct, and there may be shock absorbers 26 present, for example mechanical, hydraulic or pneumatic, interposed between each support sheet 18a, 18b and the respective molding plane 25a, 25b.

[0079] The shock absorbers 26 allow to absorb possible knocks due to the impact of the molding unit 15 against the first 25a or second 25b molding plane during the molding step of the cement tiles 11.

[0080] Moreover, the shock absorbers 26 can give flexibility to the system defined by the support sheet (18a, 18b) and respective molding plane (25a, 25b).

[0081] The shock absorbers 26 can also keep the first molding plane 25a and the second molding plane 25b constantly orthogonal to the molding direction S in which the molding unit 15 moves.

[0082] In some forms of embodiment, the shock absorbers 26 are connected to one or more vibration devices, configured to make the first molding plane 25a and the second molding plane 25b vibrate independently. The vibration, which is effected after the piles of cement paste 11a have been loaded onto the molding planes 25a, 25b, and before the molding, advantageously allows to distribute the cement paste 11 a of the piles and make it uniform. This facilitates subsequent molding operations.

[0083] The upper surface of the first molding plane 25a and second molding plane 25b is positioned at a height H1 from the floor 13 and the height H1 is kept substantially constant during the whole molding cycle. The height H1 also corresponds to the height of the movement plane on which the movement direction M lies.

[0084] If the water contained in the cement paste 11a is eliminated from below, one or more plates 27 are attached on the first 25a and on the second 25b molding planes; the number of plates 27 is equal to the number of cement tiles 11 which are to be obtained for each molding cycle.

[0085] In the case shown by way of example in the attached drawings, the molding machine 10 is configured to produce four cement tiles 11 with each molding cycle. In some forms of embodiment, the molding machine 10 can be configured to produce two, three, five, six or more than six cement tiles 11. In general the molding machine 10 can be configured to simultaneously produce, in terms of space and time, a plurality of cement tiles 11.

[0086] The number of cement tiles 11 obtainable with every molding cycle is variable and depends on the size of the cement tile 11 to be produced. In the form of embodiment described here, the four plates 27 are parallelepiped shaped and have a plan bulk about equal to that of the cement tile 11 to be obtained.

[0087] The plates 27 can have a reticular structure, defined by a plurality of through capillary channels 28 which allow, during molding, to discharge the water initially present in the cement paste 11a.

[0088] In other forms of embodiment, in which the molding machine 10 is provided with a suction apparatus of the water from above, for example for the production of a double layer or single layer with semi-damp mixture, the plates 27 are not provided or have a full structure. In this case, the plates 27 can be made of plastic material, such as rubber or polyurethane, or a metal material, such as steel for example.

[0089] Some forms of embodiment provide that the upper surface of the plates 27 with a full structure is smooth.

[0090] In some forms of embodiment, the surface can have bas-reliefs, or grooves, imprints or incisions, or high-reliefs, ridges or protuberances, which develop along a decorative pattern or motif to be reproduced on the visible surface of the cement tiles 11.

[0091] The casing 14, in the specific case shown here by way of example, has an overall bulk which is substantially parallelepiped, delimited by four columns 29 that support a support structure 30 and keep it distanced from the base frame 12.

[0092] The columns 29 are distanced from each other in a direction orthogonal to the movement direction M, so as to allow the passage of the support element 18 between them.

[0093] In the same way, the columns 29 are distanced from each other in a direction orthogonal to the extraction direction E, so as to allow the passage of the extractor device 16.

[0094] The extractor device 16 is provided with a demolding plane 31, on which the cement tiles 11 are positioned after molding and during demolding.

[0095] The demolding plane 31 can be supported by a frame 32, having a mobile part 32a to which the demolding plane 31 is attached, and a fixed part 32b.

[0096] The mobile part 32a is mounted sliding on the fixed part 32b in the extraction direction E.

[0097] According to some forms of embodiment, which can be combined with all the forms of embodiment described here, movement means 33 can be provided to move the demolding plane 31 nearer to and away from the molding station. In some forms of embodiment, the movement means 33 can comprise a pair of guide elements 35, for example a pair of slotted beams disposed parallel and distanced from each other (fig. 1), configured to guide part of the frame 32 and therefore move the demolding plane 31.

[0098] This movement provides that the demolding plane 31 is positioned alternately in the molding station and in a position outside the casing 14, and vice versa, with each molding cycle.

[0099] The extractor device 16 is configured so that the upper surface of the demolding plane 31, when it is positioned in the molding station, has a distance H2 from the floor 13. The distance H2 also corresponds to the height of the extraction plane on which the extraction direction E lies.

[0100] The distance H2 is greater than the height H1 at which the upper surface of the molding planes 25a, 25b is positioned.

[0101] The distance H2 is greater than the height H1 at least by a quantity equal to the vertical bulk of the piles of cement paste 11 a and, where provided, of the plates 27. In other words, given that the height H2 is greater than the height H1, the height H1 can also be considered as the height of the molding plane 25a, 25b added to the height of the cement paste 11a present thereon, so that the height H2 is also in any case always greater than the sum of the height of the molding planes 25a, 25b and the cement paste 11a loaded on them, for example in piles or leveled, according to the possible variants.

[0102] In particular, the difference H2-H1 is advantageously such as to allow the simultaneous positioning, in at least a spatial sense, that is, the simultaneous presence, and with a gap or a defined interspace, in the molding station, both of the demolding plane 31, on which the cement tiles 11 are placed, and of the first 25a or second 25b molding planes, on which the cement paste 11a to be pressed is placed, possibly supported by the plates 27; that is, it allows to position the molding planes 25a, 25b containing the cement paste, damp or semi-damp, in one or more layers, semi-dried, with or without a mounted matrix, or in any case to position a mold containing the cement paste 11a.

[0103] Advantageously, the height H2 is adjustable, either manually or by mechanical means, possibly even automatic means, in order to adapt to the possible different heights of the cement paste 11a which can be loaded on each occasion, so as not to have any contact or interference of the demolding plane 31 with the cement paste 11 a.

[0104] The aforesaid positioning in simultaneous presence in the molding station can occur in sequence, or can also occur simultaneously, and allows to begin a new molding cycle immediately after the removal of the demolding plane 31 from the molding station.

[0105] It is therefore clear that the difference H2-H1 is advantageously such as to allow the aforesaid simultaneous positioning and movement of the demolding plane 31 and the first 25a or second 25b molding plane, without the demolding plane 31 interfering with any pile of cement paste 11a.

[0106] In this way the loading and extraction operations are made quicker, with a consequent increase in productivity of the molding machine 10.

[0107] The present invention can provide to simultaneously carry out a rising movement of the molding unit 15 in the molding direction S, a movement of the cement paste 11 a in the movement direction M, and also the extraction cycle of the cement tile 11 in the extraction direction E.

[0108] In fact, advantageously, it is possible to provide the simultaneous rising movement of the molding unit 15 in the molding direction S, the movement of the cement paste 11a, by means of the movement device 17, in the movement direction M, and also the movement of the demolding plane 31 of the extractor device 16 in the extraction direction E to extract the cement tile 11.

[0109] According to some forms of embodiment, when the extractor device 16 is free in the extraction direction E, and the trajectory is unimpeded and without risk of collision with the molding unit 15, or in particular with the multiple mold 44, it is possible to begin the demolding cycle and in the meantime the molding planes 25a, 25b can already move toward the molding position and the loading position alternately.

[0110] The mobile part 32a of the frame 32, as in the present form of embodiment, can comprise two uprights 34 to which the demolding plane 31 is attached cantilevered. The uprights 34 can be advantageously sliding in the extraction direction E, for example using the guide elements 35.

[0111] There can be two guide elements 35, parallel to each other and defining the extraction direction E, or more than two, depending on the conformation of the frame 32.

[0112] The movement means 33 can comprise a motor 35a, electric for example, which can carry out the automatic movement, along the guide elements 35, of the mobile part 32a of the frame 32 with respect to its fixed part 32b.

[0113] Other types of movement means 33 can be used to move the mobile part 32a of the frame 32, such as for example belt or rack devices, or devices using linear electromagnetic motors.

[0114] The molding unit 15 (figs. 2-6) comprises a first pair of linear actuators 37, each of which has a first end 37a attached to the support structure 30.

[0115] A platform 38 is attached to a second end 37b of each actuator of the first pair of linear actuators 37, opposite the first end 37a.

[0116] In some forms of embodiment, the first end 37a is a terminal part of the piston of the linear actuator and the second end 37b is a terminal part of the cylinder, while other forms of embodiment provide a reversed attachment of the first pair of linear actuators 37.

[0117] The relative motion of the second end 37b with respect to the first end 37a determines the movement of the platform 38, toward and away from the base frame 12.

[0118] The rectilinear nature of the movement of the platform 38 is determined by guide bars 39, each of which can be attached to a column 29 or to the support structure 30.

[0119] In some forms of embodiment, it is also provided that each of the guide bars 39 is attached to a column 29 and to the support structure 30.

[0120] The guide bars 39 can be sliding inside through holes 40 made in the platform 38.

[0121] In the lower part of the platform 38 a plurality of molding sliders 41 is attached, also known to a person of skill in the art as pressing buffer units, in a number equal to the number of cement tiles 11 to be obtained in each molding cycle.

[0122] A second pair of linear actuators 42 is also attached to the platform 38, with sliding axes parallel to those of the first pair of linear actuators 37 and to the molding direction S.

[0123] The second pair of linear actuators 42 has a first end 42a, corresponding for example to an end of the cylinder of the actuator, attached to the platform 38, so that the second pair of actuators 42 is solidly mobile with the latter.

[0124] A support plate 43 is attached to a second end 42b of the second pair of actuators 42, corresponding for example with the end of the piston of each actuator.

[0125] A multiple mold 44 is in its turn attached to the support plate 43, with as many through cavities 45 as there are cement tiles 11 to be produced.

[0126] Each through cavity 45 has the sizes and shape of a cement tile 11.

[0127] In fact, the cement tiles 11 can have various shapes, for example they can be square, rectangular, polygonal, regular or irregular, or defined by any closed curvilinear profile.

[0128] In alternative forms of embodiment, the molding unit 15 can comprise a single mold, with a single through cavity 45, instead of the multiple mold 44.

[0129] The multiple mold 44 is positioned so that each molding slider 41 can slide inside a through cavity 45 due to the effect of the relative motion of the platform 38 and the support plate 43 determined by the relative movement of the first 37 and second 42 pair of linear actuators.

[0130] In particular, the multiple mold 44 and the molding sliders 41 are configured so that the latter remain constantly inside the respective through cavities 45, even when the second pair of linear actuators 42 is in a maximum travel position and the first pair of linear actuators 37 is in a minimum travel position.

[0131] This advantageously allows to keep the dimensional tolerances between the molding sliders 41 and the corresponding through cavities 45 reduced, with consequent benefit to the quality of the cement tiles 11.

[0132] Another advantage is due to the fact that, as they always stay inside the through cavities 45, the centering of the molding sliders 41 with respect to the latter is carried out only once. This consequently reduces the preparation time of the molding machine 10 and therefore increases productivity.

[0133] The molding machine 10, which in some forms of embodiment allows to obtain, for each molding cycle, a plurality of cement tiles 11 starting from cement paste 11a, functions as follows.

[0134] In figs. 2 to 6 a succession of working steps is schematically shown.

[0135] In fig. 2 three views in sequence are shown of the molding machine 10 in an initial step of the molding cycle. During this initial step, the crank 21 and the rod 20 are aligned in the position of maximum extension of the crank mechanism, so that the first support sheet 18a, and consequently the first molding plane 25a, is in the molding station and the second support sheet 18b, and consequently the second molding plane 25b, is in the second loading station.

[0136] Piles of cement paste 11a are positioned on the plates 27 of the second molding plane 25b, so that on each plate 27 there is a pile of cement paste 11 a, with the quantity necessary to obtain one cement tile 11.

[0137] In this initial step, the demolding plane 31 is outside the casing 14 and both the first 37 and the second 42 pair of linear actuators are in the minimum travel position. The molding unit 15 is therefore at the maximum distance from the molding station.

[0138] Fig. 3 shows a molding preparation step, during which the second pair of linear actuators 42 moves to the maximum travel position, lowering the multiple mold 44 with respect to the molding sliders 41 in the molding direction S.

[0139] This allows to position the multiple mold 44 so as to house the piles of cement paste 11a inside the through cavities 45.

[0140] After the molding preparation step, the movement device 17 moves the support element 18 in the movement direction M, so as to position the first support sheet 18a, and hence the first molding plane 25a, in the first loading station, and the second support sheet 18b, and hence the second molding plane 25b, in the molding station (fig. 4).

[0141] After this movement, the rod 20 and the crank 21 are aligned in the position of minimum extension of the crank mechanism.

[0142] The molding operation is then performed, which provides that the first pair of linear actuators 37 moves to the maximum travel position, lowering the rest of the molding unit 15 in the molding direction S and toward the second molding plane 25b. At the end of this movement, the multiple mold 44 rests on the plates 27, enclosing the cement paste 11a inside its own through cavities 45.

[0143] At the same time, the second pair of linear actuators 42 moves to an intermediate travel position.

[0144] In the case shown by way of example in fig. 4, the intermediate travel position corresponds to about half the total travel of the linear actuators.

[0145] However, the present invention also provides the possibility of adjusting the proportion between the intermediate travel position and the total travel, depending on the thickness of the cement tiles 11 to be obtained.

[0146] The positioning of the second pair of linear actuators 42 in the intermediate travel position reduces the distance between the multiple mold 44 and the molding sliders 41.

[0147] In this way, the combination of the movements of the first pair of linear actuators 37 and the second pair of linear actuators 42 determines the sliding of the molding sliders 41 inside the through cavities 45 of the multiple mold 44. The molding sliders 41 thus enter into contact with the cement paste 11 a, and then exert upon it a molding pressure such as to obtain the cement tiles 11 in the desired shape and compactness.

[0148] During the molding step, the cement paste 11a is also loaded onto the plates 27 of the first molding plane 25a, positioned in the first loading station.

[0149] When the molding step is finished, the first pair of linear actuators 37 retreats again to the minimum travel position (fig. 5), causing the rest of the molding unit 15 to be distanced in the molding direction S from the second molding plane 25b.

[0150] The cement tiles 11 remain inside the through cavities 45 of the multiple mold 44, since the pressure of the molding sliders 41 not only causes a reduction in height of the cement paste 11a, but also causes it to adhere to the walls of the multiple mold 44 facing toward the through cavities 45. The friction generated during molding is such as to make the tiles 11 adhere to the internal walls.

[0151] After the molding unit 15 has retreated, the movement device 17 and the movement means 33 respectively and simultaneously move the support element 18 and the extractor device 16. These movements can also be simultaneous and serve to position respectively the first molding plane 25a and the demolding plane 31 both in the molding station.

[0152] At the same time, the second molding plane 25b is positioned in the second loading station.

[0153] As already described, the demolding plane 31 is in a position above the first molding plane 25a and does not come into contact with the cement paste 11a present on the plates 27 of the first molding plane 25a or with possible containing molds mounted on the molding planes.

[0154] Once the demolding plane 31 is correctly positioned under the molding unit 15, the second pair of linear actuators 42 returns to the minimum travel position. This causes a relative movement in the molding direction S of the multiple mold 44 with respect to the molding sliders 41, away from the demolding plane 31 below. This relative movement takes the molding sliders 41 into contact with the cement tiles 11 present inside the through cavities 45 of the multiple mold 44. As a consequence of the contact between the molding sliders 41 and the cement tiles 11, the latter are demolded, and are thrust outside the multiple mold 44. The cement tiles 11 therefore rest on the demolding plane 31 below.

[0155] Afterward (fig. 6), the extractor device 16 extracts the cement tiles 11 from the casing 14, allowing a new molding cycle to start. In fact, the movement means 33 are driven to move the demolding plane 31 in the extraction direction E, away from the molding station.

[0156] The cement tiles 11 can then be removed from the demolding plane 31, automatically or manually. They can then be transferred to a drying line, or a finishing line, or again they can be stored for drying or sale.

[0157] After demolding, the second pair of linear actuators 42 moves to the maximum travel position, as in the step of preparing for molding, described above.

[0158] As soon as the demolding plane 31 is outside the casing 14, another molding step can be carried out, which provides to produce another four cement tiles 11 starting from the cement paste 11a present on the plates 27 of the first molding plane 25a.

[0159] In order to carry out the other molding step, the first pair of linear actuators 37 can pass from the minimum travel position to the maximum travel position, and then the second pair of linear actuators 42 can pass from the maximum travel position to the intermediate travel position.

[0160] During the other molding step, which completes the molding cycle, more cement paste 11a is loaded on the plates 27 of the second molding plane 25b and a new molding cycle can start.

[0161] Subsequently, the demolding operation is performed as described above and the molding machine 10 is returned to the conditions for preparing for molding (fig. 3), as already mentioned.

[0162] The molding cycle described above can be applied both to molding machines 10 with downward discharge of the excess water contained in the cement paste 11a, and to molding machines 10 provided with suction from above of the excess water, and also to molding machines 10 that integrate both the methods for taking in and eliminating water.

[0163] In some forms of embodiment, the molding machine 10 comprises a device for containing one or more piles of cement paste 11 a comprising a frame 46, removably attached directly or indirectly above the molding plane 25a, 25b, and a deformable support, indicated for example by the reference number 47, constrained peripherally to the frame 46 and having a part inside the frame 46 on which at least a pile of cement paste 11a is located, configured to deform so as to define a containing cavity. The deformable support 47 therefore has a non-deformed condition, substantially horizontal, and a deformed condition, substantially concave. This allows to retain the cement paste 11 a without it spilling over and dispersing outside, in particular preventing it from leaking laterally.

[0164] In some forms of embodiment, which provide to use said containing device, when the molding plane 25a, 25b is in the loading station, at least one pile of the cement paste 11a is put on the deformable support 47 which, after loading, is deformed, bending to assume a concave shape to contain the cement paste 11a. In some forms of embodiment, after loading, the molding plane 25a, 25b can be moved to the molding station, under the molding unit 15 which in turn is lowered on the molding plane 25a, 25b in order to take the mold 44 into contact with the frame 46 and to insert at least one pile of cement paste 11a inside a through cavity 45. The contact between mold 44 and frame 46 determines the repositioning at least of the deformable support 47 toward a substantially horizontal position, no longer deformed.

[0165] If the water is removed from below, in some forms of embodiment a filter device 36 may be provided (figs. 7-11), positioned above the plates 27.

[0166] The filter device 36 may also function as a containing device for the cement paste 11 a as set forth above, and indeed may have the multiple function of containing and supporting the cement paste 11a when it is put on the plates 27 during the loading operation, and to filter the water emerging from the cement paste 11a during the subsequent molding step.

[0167] The filter device 36 (fig. 7) advantageously comprises a frame 46, for example flexible, and a filter 47 which as well as the filtering function can also function as a deformable support as indicated above. The filter 47 is connected along the peripheral edge of the frame 46 and is free to deform and yield in the internal central part.

[0168] The filter 47 may consist of a single filtering sheet or cloth, or several overlapping sheets or cloths, and can be made of a warp and weft fabric, or nonwoven fabric, with natural or synthetic fibers, or other permeable materials suitable for filtration. The fibers, or in general the filtration materials used, can be configured so as to allow the water to permeate and the granular material that makes up the cement paste 11a to be retained.

[0169] The frame 46 can be made of a metal sheet or of plastic material, and can be provided with a number of through apertures 48 equal in number to that of the cement tiles 11 to be obtained for every molding cycle. The through apertures 48 have a plan shape and sizes roughly equal to those of the plates 27, although slightly greater, so that each through aperture 48 can contain one plate 27 (figs. 8-11).

[0170] The frame 46 is removably attached to the first 25a and second 25b molding plane for example by coupling bolts 50, which function as attachment means, and a corresponding plurality of through holes 49 made peripherally in the outermost zone of the frame 46.

[0171] In some forms of embodiment, instead of the bolts 50, pins can be used, or plugs, pegs or other mobile removable attachment devices, for example pneumatic or hydraulic pistons, suitable for the purpose of keeping the filter device in the desired position above the plates 27.

[0172] Coaxially with the stem of the screw 52 of each bolt 50, or pin, plug or peg, an elastic element is mounted, for example a spring 51, which functions as an abutment mean with the lower surface of the frame 46. The springs 51, or any other type of similar or comparable elastic mean, such as for example the pistons cited above, support the frame 46 and keep it in a slightly raised position with respect to the upper surface of the plates 27.

[0173] In the inactive position, the filter 47 is positioned above the frame 46 and is substantially horizontal.

[0174] Loading the cement paste 11a (fig. 9) provides that it is deposited on the part of the filter 47 above the through apertures 48. The filter device 36 is configured so that the filter 47, due to the effect of its peripheral constraint with the filter 47, is subjected, for example in the part substantially corresponding to the center, to a downward deformation and bending, under the weight of the cement paste 11a, and is therefore concave in correspondence with each through aperture 48. The filter 47 thus has, in the specific case of fig. 7 and fig. 9, four concavities.

[0175] This is due to the action of the weight of the cement paste 11 a, together with the flexibility of the frame 46, the thrust exerted thereon by the springs 51 and the deformability of the filter 47 with respect to the frame 46.

[0176] Each concavity resulting from the deformation of the filter 47, which thus functions as a deformable support, has the advantage that it contains the cement paste 11a, keeping it and retaining it inside the zone delimited at the lower part by the corresponding through aperture 48.

[0177] This zone also corresponds to the central zone of the plate 27 and the zone on which, during the subsequent molding step, the corresponding molding slider 41 presses.

[0178] In this way, even if semiliquid, the cement paste 11 a remains on the filter 47 and is not dispersed elsewhere.

[0179] In the forms of embodiment where it is provided, the vibration of the first molding plane 25a or second molding plane 25b increases the certainty that the cement paste 11a will remain on the filter 47.

[0180] This could in fact dirty the molding machine 10, with a consequent increase in the maintenance times and a reduction in productivity. Furthermore, leakage of cement paste 11a outside the multiple mold 44 might cause defects in the cement tiles 11 and reduce the performance of the molding machine 10.

[0181] When the molding unit 15 is lowered toward the first molding plane 25a or the second molding plane 25b (fig. 10), the multiple mold 44 enters into contact with the frame 46 and thrusts it downward, overcoming the resistance of the springs 51. The thrust of the multiple mold 44 causes a deformation of the frame 46, which consequently causes a tensioning of the filter 47, which is disposed rectilinear and horizontal on the upper surface of the plates 27.

[0182] In some forms of embodiment, this tensioning can also be performed by the pneumatic or hydraulic pistons before the multiple mold 44 enters into contact with the frame 46.

[0183] The filter device 36 is kept in this position by the multiple mold 44 also during the subsequent molding step (fig. 11), during which the molding sliders 41 descend inside the through cavities 45 of the multiple mold 44 and compress the cement paste 11a to obtain the cement tiles 11.

[0184] During molding, the water that comes out from the cement paste 11 a is filtered by the filter 47 and conveyed downward by the capillary channels 28 of the plates 27.

[0185] In some forms of embodiment, in the case of a molding machine 10 equipped with suction of the excess water from above, or both from below and above, a filter device 136 (figs. 12-14) can be connected to each molding slider 141, instead of to the plates 27.

[0186] In the case given by way of example of a molding machine 10 with suction of the water from above and below, the molding slider 141 (fig. 14) is defined by two components, coupled together, that is, an upper buffer-carrier component 142 and by the cited filter device 136, disposed below the upper buffer-carrier component 142. The filter device 136 comprises a molding buffer 143, connected mechanically to the upper buffer-carrier component 142 and a filter 147 (figs. 12-14). In some forms of embodiment, the molding buffer 143 is releasably connected by magnetic connection means 152, 153 to the filter 147.

[0187] In some forms of embodiment, the molding buffer 143 can have a parallelepiped shape, and a plan bulk substantially equal to that of the cement tiles 11 to be obtained.

[0188] In some forms of embodiment, the filter 147 is attached magnetically to the lower part of the molding buffer 143.

[0189] In some forms of embodiment, the molding buffer 143 has a network of channels 144 in its lower face, communicating with each other and having the function of conveying the water arriving from the cement paste 11a below toward a collection chamber 145.

[0190] The collection chamber 145 can be communicating with a discharge channel 146 that allows to discharge the water upward, for example through one or more apertures made in the molding slider 141 and not shown in the drawings.

[0191] Through holes 149 are also made in the molding buffer 143, which serve to removably attach the molding buffer 143 to the upper buffer-carrier component 142, for example using screws 150.

[0192] A plurality of blind housing seatings 151 are also made in the molding buffer 143, each suitable to contain a permanent magnet 152.

[0193] The filter 147 comprises a metal grid 153, for example consisting of a metal net or a holed metal plate, to which a filtering membrane 154, with a thick mesh, is stably connected. The latter constitutes, during use, the lower external surface of the molding slider 141 and, in the molding step, enters into contact with the cement paste 11 a.

[0194] The metal grid 153 can be made in a single piece with a plan bulk such as to cover the whole lower face of the molding buffer 143, or it may consist of several modules which cover, all together, the lower surface of the molding buffer 143.

[0195] The metal grid 153 is advantageously made of metal material with magnetic characteristics, such as for example a low-alloy steel or ferritic stainless steel. The metal grid 153 cooperates with the magnets 152 which keep it, due to the effect of magnetic attraction, in contact with the lower face of the molding buffer 143.

[0196] This magnetic coupling is at the same time stable and easily removable, and has the advantage that it does not require further mechanical working on the upper buffer-carrier component 142. Furthermore, this solution allows the rapid replacement of the filter 147 if it is blocked or worn, consequently reducing the maintenance times and downtimes of the machine required for the replacement.

[0197] This consequently allows to increase the productivity of the molding machine 10.

[0198] Fig. 15 is used to describe forms of embodiment, which can be combined with all the forms of embodiment described here, of a machine 10 according to the present description for the production of cement tiles 11 of the double-layered type, that is, with a layer of cement paste 11a and a layer of sand, in any case also usable to make single-layered cement tiles 11.

[0199] Some forms of embodiment of the machine 10 described using fig. 15 essentially differ from forms of embodiment of the machine 10 described using for example fig. 1 in that the cement paste is, here too, loaded in piles of cement paste 11 a, but is then distributed in counter-molds, where it is leveled, for example through vibration, without leaking out because it is contained peripherally by the counter-mold, and is only subsequently molded.

[0200] Some forms of embodiment of the machine 10 described using fig. 15 provide, in the same way as forms of embodiment described using for example figs. 1-14, that the molding unit 15 is configured to perform the molding of the cement paste 11a in the vertical molding direction S, to obtain the cement tiles 11. Moreover, according to the present description, the movement device 17 is configured to move cement paste 11a in the movement direction M to position the cement paste 11a under the molding unit 15. For example, the movement device 17 can comprise alternate linear movement means 66, such as a rack and pinion system 68, for example supported by supports 75.

[0201] According to the present description, the extractor device 16 is configured to extract the at least one cement tile 11 produced in the extraction direction E, transverse to the movement direction M. For example, fig. 15 shows a containing element 72 which houses a device to adjust the height H2, and also possible shock absorbers to perform the extraction adequately. The motor 35a associated with the movement means 33 provided to move the demolding plane 31 can be provided in the fixed part 32b of the frame 32.

[0202] The movement device 17 is configured to move cement paste 11 a alternately on one side and the other of the mold 44 in the movement direction M, while the extractor device 16 is configured to extract at least one cement tile 11 frontally with respect to the molding unit 15, in the extraction direction E.

[0203] Forms of embodiment of the machine 10 described using fig. 15 provide, in the same way as forms of embodiment described using for example figs. 1-14, that the cement paste 11a is moved in the movement direction M in order to position the cement paste 11a under the molding unit 15 which acts in the vertical molding direction S. Furthermore, the molding of the cement paste 11a is provided in the molding direction S for the production of at least one cement tile 11. Moreover, according to the present description, the extraction is provided in the extraction direction E, transverse to the movement direction M, of the cement tile 11 produced. According to some forms of embodiment described here, the extraction direction E lies on an extraction plane vertically offset with respect to a movement plane on which the movement direction M lies, and disposed at a distance H2 which is greater than the height H1 of the movement plane.

[0204] In particular, some forms of embodiment described here provide that the molding unit 15 comprises the mold 44, which acts as an upper molding matrix, and at least two counter-molds, or lower mold matrices 64. Each counter-mold or lower mold matrix 64 is configured to receive the cement paste 11 a. The counter-molds or lower mold matrices 64 have said molding planes 25a, 25b. The counter-molds or lower mold matrices 64 are alternately mobile from and toward a position under the mold 44, alternately positioning themselves under it or on one side, as can be seen for example in fig. 15. As previously described, the support element 18 can be provided, associated to the molding planes 25a, 25b, which can be made to translate by the movement device 17 in the movement direction M.

[0205] Each counter-mold or lower mold matrix 64 can comprise one or more molding seatings 65, which act as systems to contain the material to be molded, and therefore a multiple molding can be provided, or one molding of a single cement tile 11 each time, as described above with reference to figs. 1-14 for example.

[0206] Typically, in possible implementations, a leveling device can be provided, so that the cement paste 11a distributed in a lower matrix mold 64 is uniformly leveled, to receive for example a subsequent amount of sand, which can be leveled in its turn, before molding. For example, the leveling device can comprise a vibrating device 76, which makes the material vibrate, for example in the position below the mold 44, or it can be a mobile leveling bar device, which acts for example before positioning the material to be molded under the mold 44, or after it has been positioned under the mold 44. In this way, a pile of leveled material to be molded is positioned under the mold 44, which can be single-layered, that is, only cement paste, or double-layered, that is, cement paste and sand.

[0207] In possible implementations, devices 67 to feed the raw materials to make the cement tiles 11 can be provided at the sides of the molding unit 15, for example of the hopper type 71. The feed devices 67, provided at respective loading stations at the sides of the molding station, can also have a double compartment 73, to possibly feed a pile of cement paste 11a and sand separately, for example in the production of double-layered cement tiles 11, that is, with a layer of cement paste, which will then be leveled, and a layer of sand.

[0208] In forms of embodiment described using fig. 15, once the cement tile 11 is molded, it is lifted together with the mold 44, and can for example be held by an action of mechanical adhesion of the molded material to the internal walls of the mold 44. Possibly, a vacuum suction system can also be used, which creates a depression in the mold 44 in order to retain the molded material, as described with reference to figs. 1-14.

[0209] To obtain the demolding of the cement tile 11, an expulsion element can be provided, for example the aforesaid molding slider 41, 141, which acts on the tile 11 and deposits it on the demolding plane 31 below, which in the meantime has been properly positioned below.

[0210] It is clear that modifications and/or additions of parts may be made to the molding machine 10 as described heretofore, without departing from the field and scope of the present invention.

Claims

1. Method for the production of cement tiles (11) starting from cement paste (11 a), **characterized in that** it comprises

   - the movement of said cement paste (11a) in a movement direction (M) in order to position said cement paste (11a) under a molding unit (15) which acts in a vertical molding direction (S);
   - the molding of said cement paste (11a) in the molding direction (S) for the production of at least one cement tile (11);
   - the extraction of said at least one cement tile (11) produced in an extraction direction (E) transverse to said movement direction (M);

   wherein the extraction direction (E) lies on an extraction plane vertically offset with respect to a movement plane on which said movement direction (M) lies and disposed at a distance (H2) greater than the height (H1) of said movement plane.

2. Method as in claim 1, **characterized in that** said cement paste (11a) is moved alternately on one side and the other of a mold (44) in said movement direction (M) and said at least one cement tile (11) is extracted frontally with respect to the molding unit (15) in said extraction direction (E).

3. Method as in claim 1 or 2, **characterized in that** said extraction direction (E) is orthogonal to said movement direction (M).

4. Method as in claim 1, 2 or 3, **characterized in that** said extraction direction (E), said movement direction (M) and said molding direction (S) constitute a triad of orthogonal Cartesian axes.

5. Method as in claims 2 and 3, or 2 and 4, **characterized in that** it comprises:

   - the positioning of at least one molding plane (25a, 25b) in at least one loading station;
   - the loading of said cement paste (11a) on said at least one molding plane (25a, 25b);
   - the movement, after said loading, of said molding plane (25a, 25b), by means of translation in the movement direction (M), from said at least one loading station to a molding station, at the lower part with respect to said molding unit (15) having at least said mold (44);
   - the positioning of said mold (44), by means of a movement in the molding direction (S), above said molding plane (25a, 25b), so that said cement paste (11a) is inserted into a corresponding through cavity (45) of said mold (44);
   - the molding of said cement paste (11a) by sliding a molding buffer (41, 141) of the molding unit (15) in said molding direction (S) inside said through cavity (45), in order to obtain at least one cement tile (11).

6. Method as in claim 5, **characterized in that** it comprises, after said molding:

   - the distancing of said molding unit (15) from said molding plane (25a, 25b) in said molding direction (S);
   - the positioning of a demolding plane (31) in

said molding station by moving said demolding plane (31) in said extraction direction (E), lying on a plane parallel to the plane on which said molding plane (25a, 25b) lies;

- the corresponding sliding of said pressing molding buffer (41, 141) inside said through cavity (45) of said mold (44), in order to demold said cement tiles (11), so as to position said cement tiles (11) on said demolding plane (31);
- the movement of said demolding plane (31) in said extraction direction (E) away from said molding station, to remove said cement tiles (11).

7. Method as in claim 6, **characterized in that** said positioning of said demolding plane (31) in said molding station provides that it is located above said molding plane (25a, 25b), present at the same time in said molding station.

8. Method as in claim 6 or 7, **characterized in that** after said molding unit (15) has been distanced from said molding plane (25a, 25b) in said molding direction (S) and after said demolding plane (31) has been positioned in said molding station, said molding plane (25a, 25b) is moved away from said molding station and another molding plane (25b, 25a) is positioned in said molding station, under said demolding plane (31).

9. Method as in any claim from 6 to 8, **characterized in that** before positioning said other molding plane (25b, 25a) in said molding station, cement paste (11a) is positioned on it.

10. Method as in any claim hereinbefore, **characterized in that** it provides to simultaneously carry out both a rising movement of the molding unit (15) in the molding direction (S), and a movement of the cement paste (11a) in the movement direction (M), and also an extraction cycle of the cement tile (11) in the extraction direction (E).

11. Machine for the production of cement tiles (11) starting from cement paste (11a), **characterized in that** it comprises:

- a molding unit (15) configured to carry out the molding of said cement paste (11a) in a vertical molding direction (S) to obtain the cement tiles (11);
- a movement device (17) configured to move cement paste (11a) in a movement direction (M) to position said cement paste (11a) under the molding unit (15);
- an extractor device (16) configured to extract said at least one cement tile (11) produced in an extraction direction (E) transverse to said movement direction (M), wherein said movement device (17) is configured to move cement paste (11a) alternately on one side and the other of a mold (44) in said movement direction (M) and said extractor device (16) is configured to extract at least one cement tile (11) frontally with respect to the molding unit (15) in said extraction direction (E).

12. Machine as in claim 11, **characterized in that** said extraction direction (E) is orthogonal to said movement direction (M), in particular said extraction direction (E), said movement direction (M) and said molding direction (S) constitute a triad of orthogonal Cartesian axes.

13. Machine as in claim 11 or 12, **characterized in that** it comprises at least one molding plane (25a, 25b), on which cement paste (11a) can be positioned, **and in that** said movement device (17) is configured to move said molding plane (25a, 25b) in the movement direction (M) from at least a loading station disposed at least at one side of the molding unit (15) to a molding station aligned vertically to the molding unit (15).

14. Machine as in any claim from 11 to 13, **characterized in that** it comprises:

- a base frame (12) resting on a supporting surface (13) and a casing (14) attached to said base frame (12), to support said molding unit (15);
- a demolding plane (31) of said extractor device (16);
- movement means (33) configured to move said demolding plane (31) in the extraction direction (E), to make said demolding plane (31) cyclically assume a position outside said casing (14) and a position inside said casing (14), to extract on each occasion the cement tiles (11) produced.

15. Machine as in claim 13 and 14, **characterized in that** an upper surface of said at least one molding plane (25a, 25b) is positioned at a constant height (H1) from said supporting surface (13) **and in that** the upper surface of said demolding plane (31) is located at a determinate distance (H2) from said supporting surface (13), greater than said height (H1).

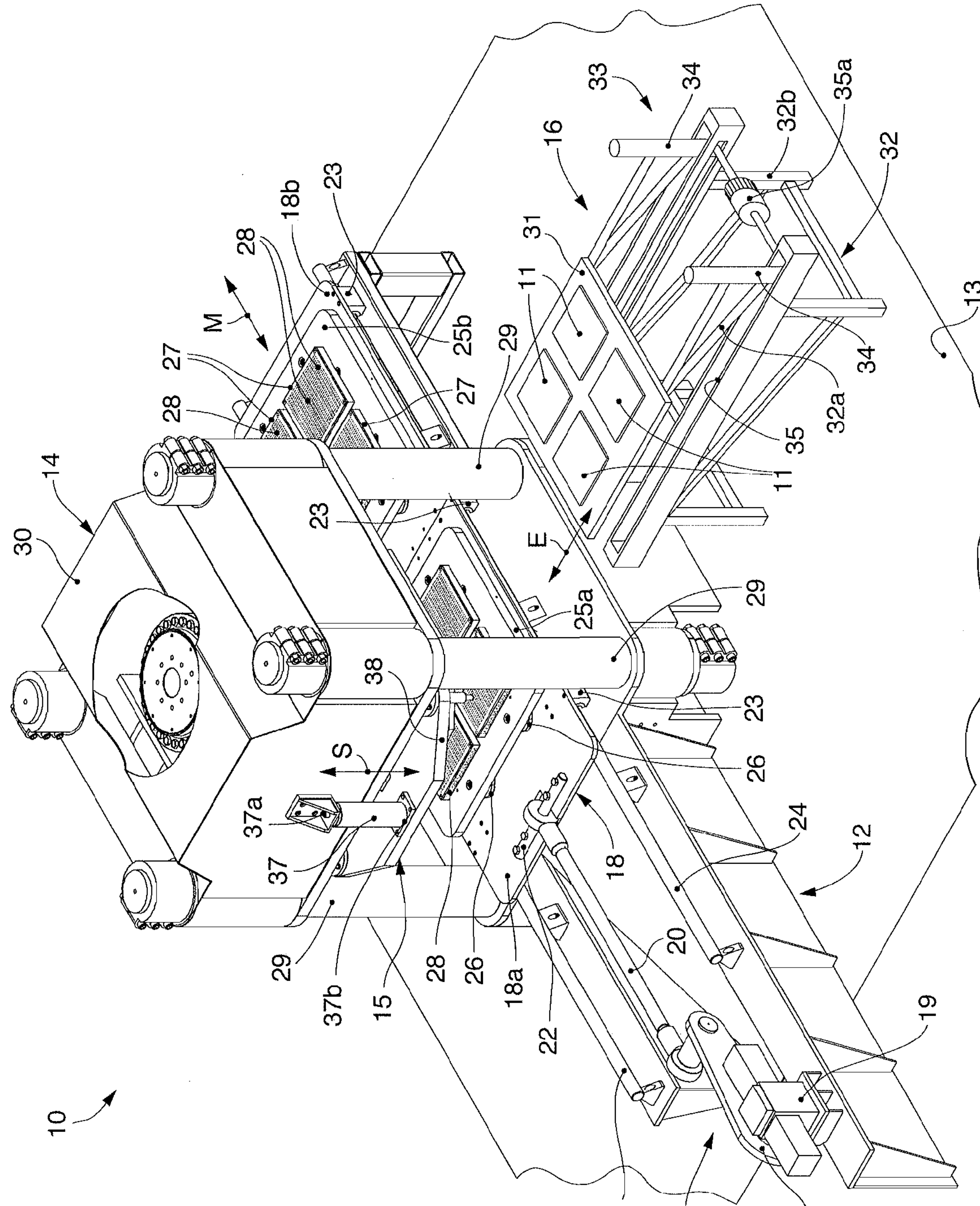
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fig. 1

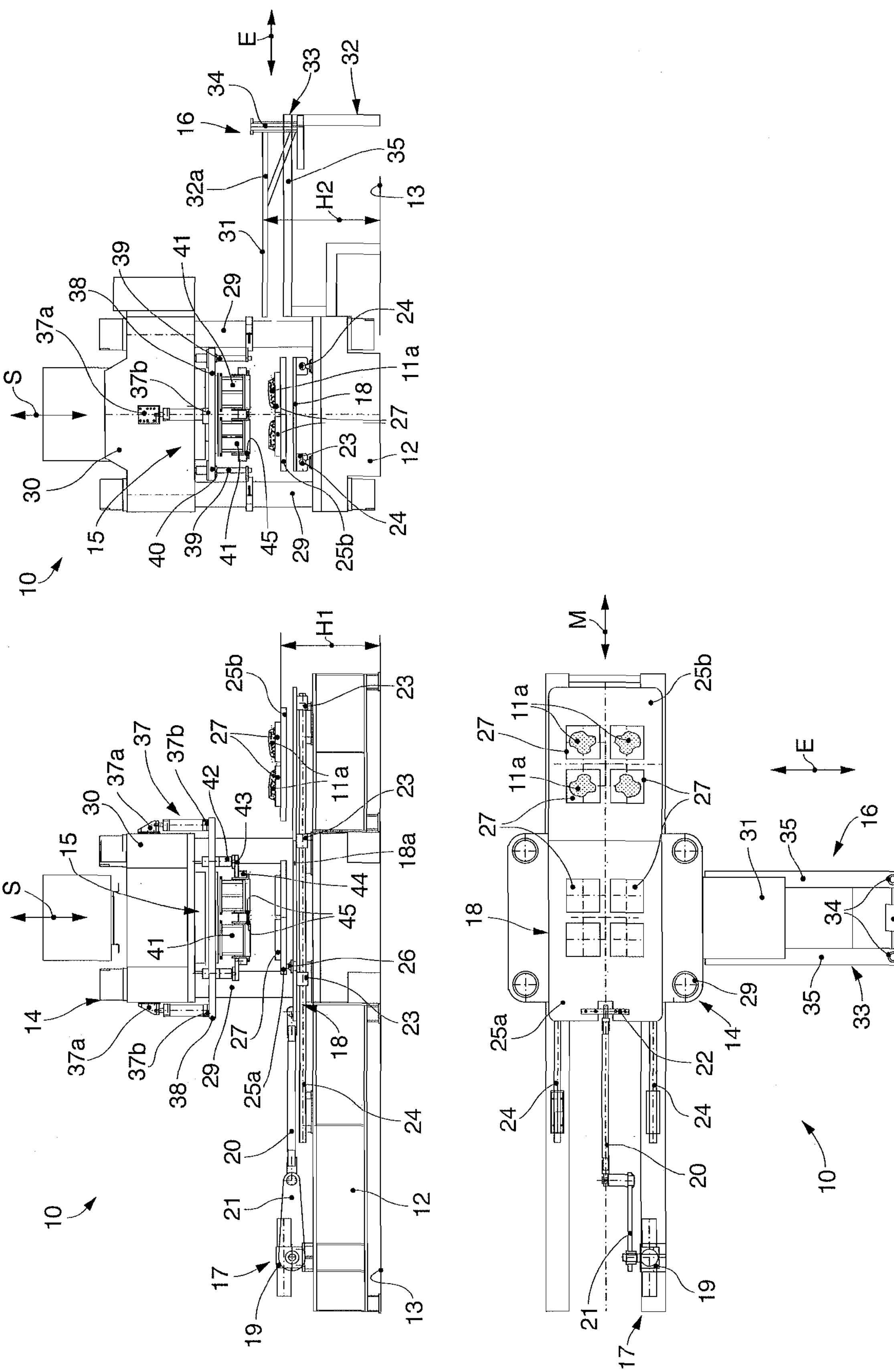


fig. 2

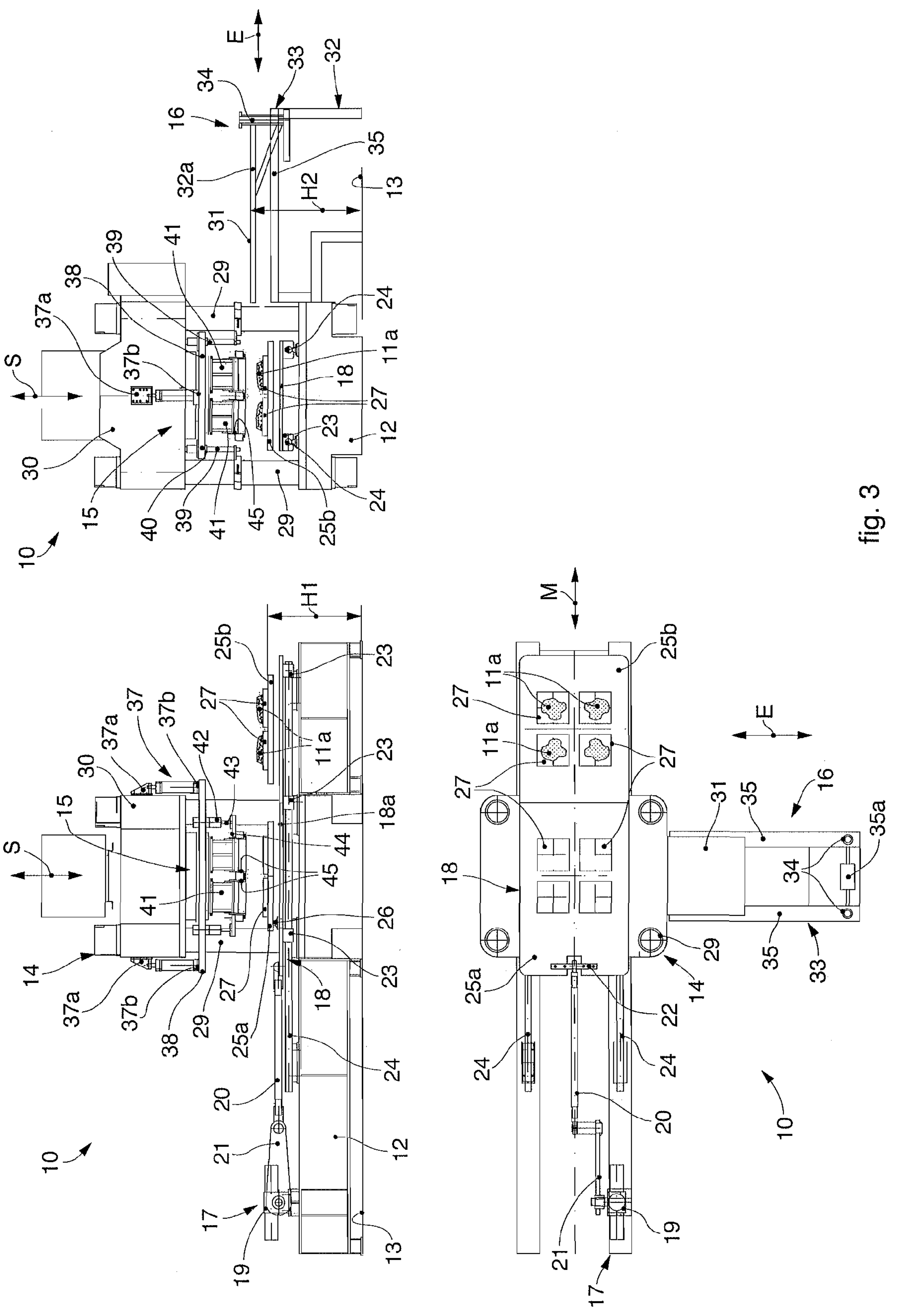


fig. 3

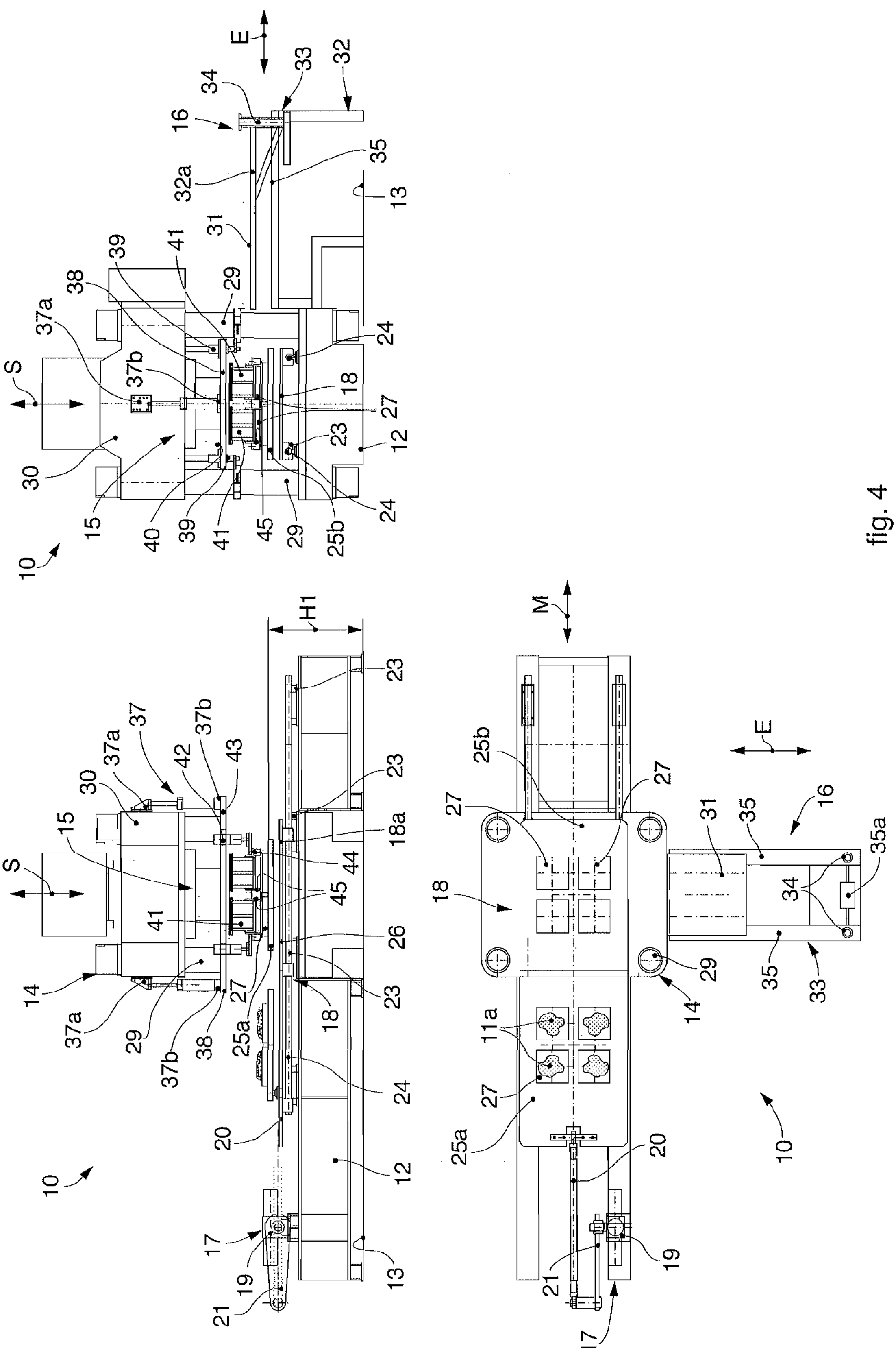


fig. 4

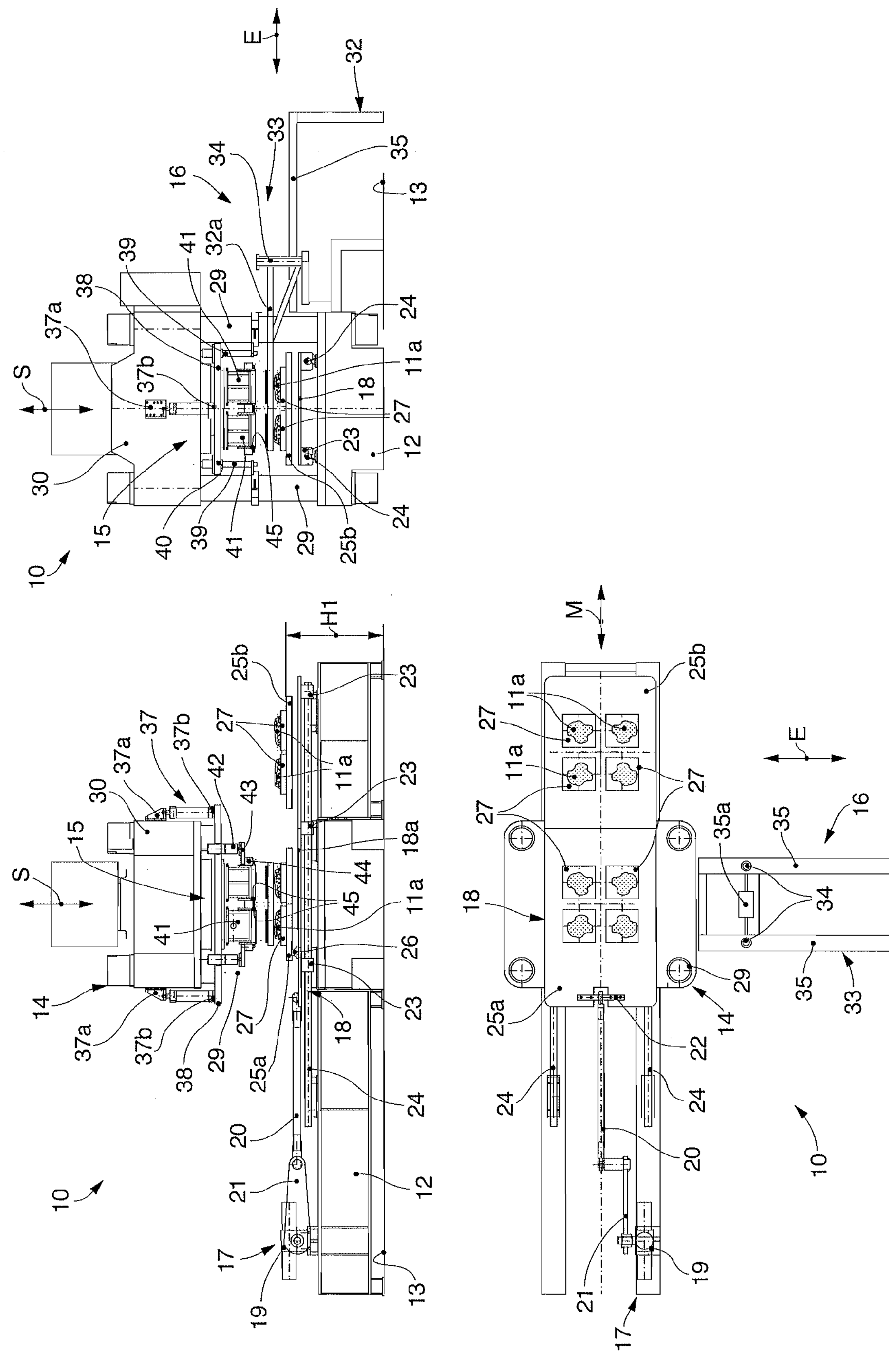
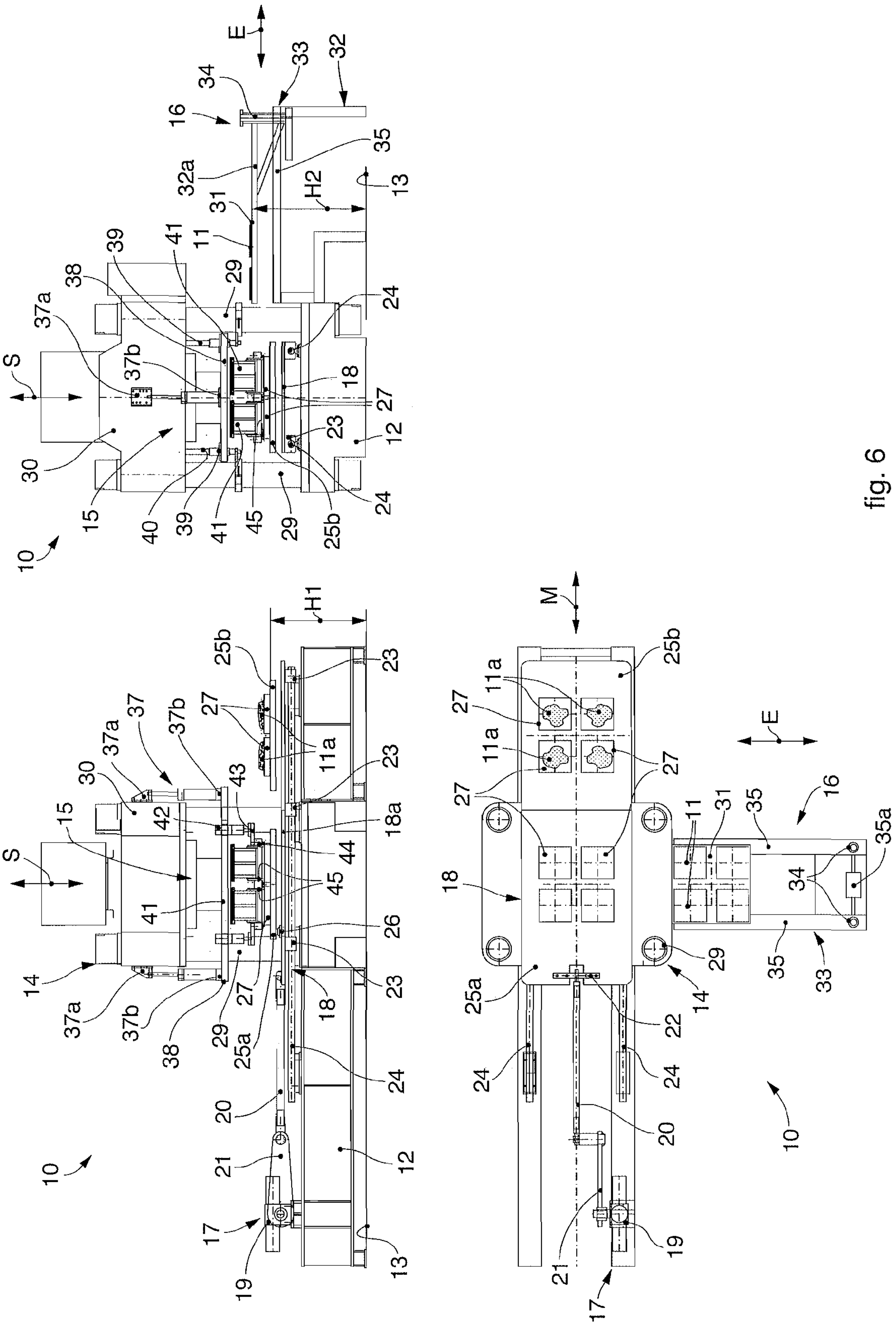


fig. 5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35a
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37a
37b
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H1
H2
S
E
M

fig. 6

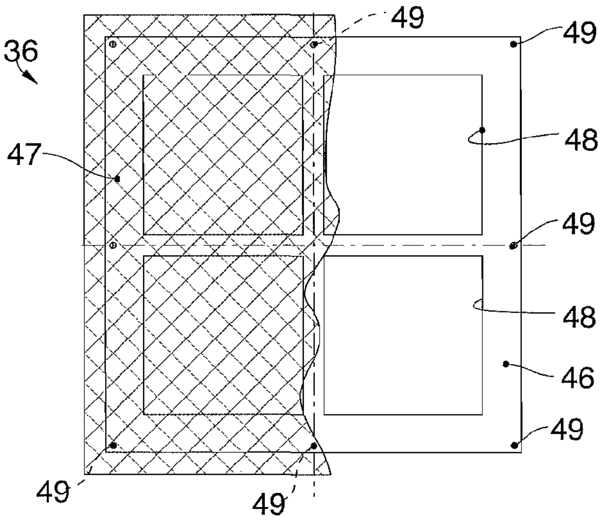


fig. 7

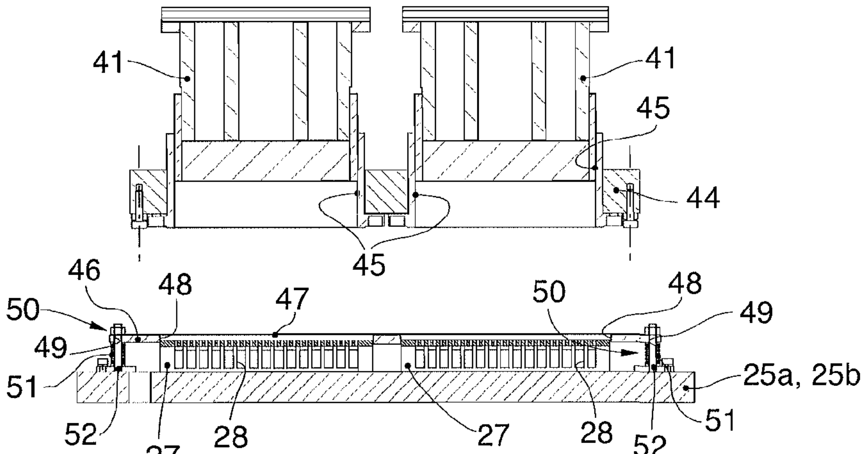


fig. 8

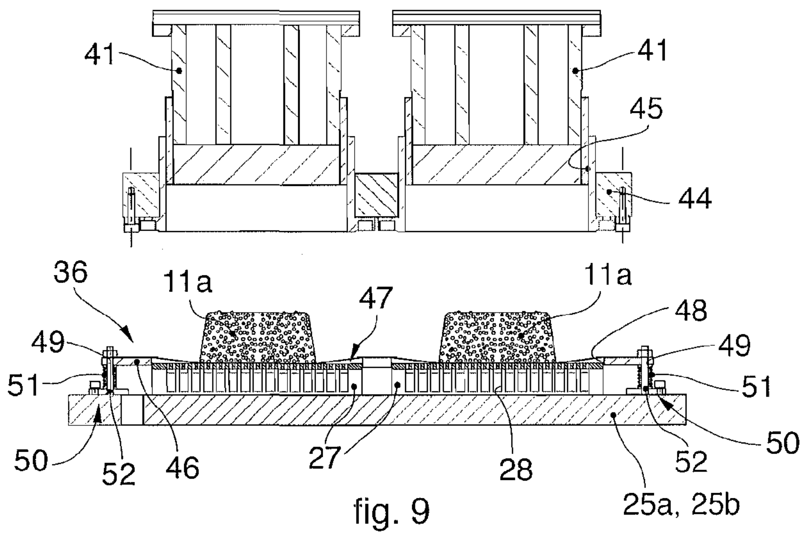


fig. 9

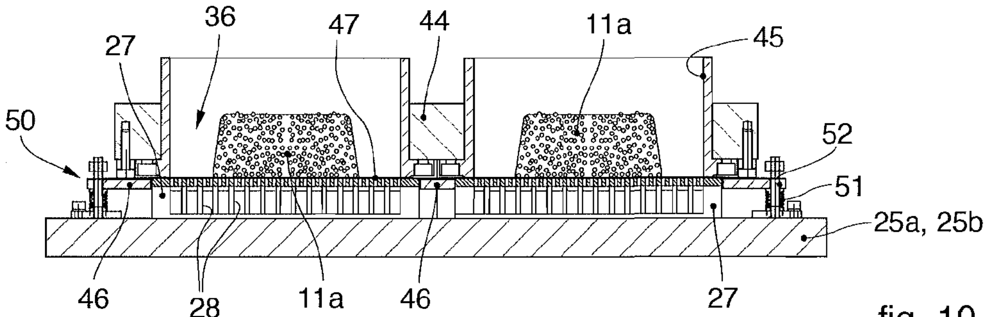


fig. 10

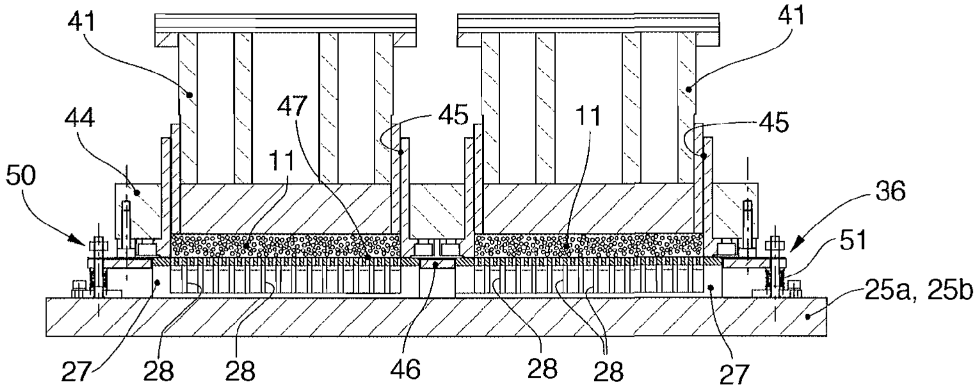


fig. 11

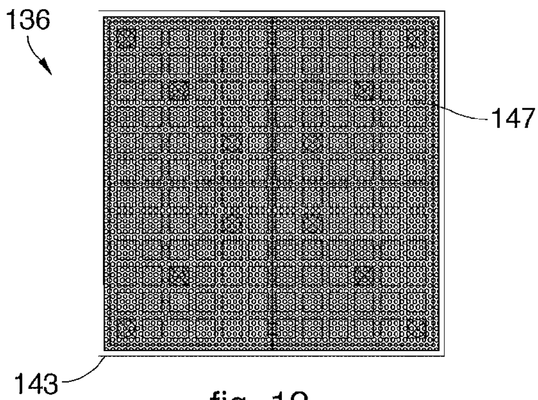


fig. 12

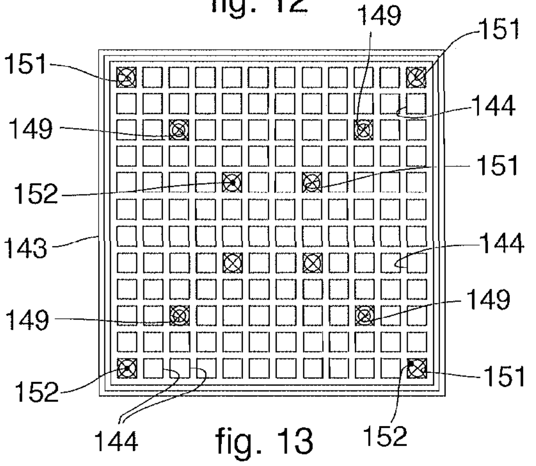


fig. 13

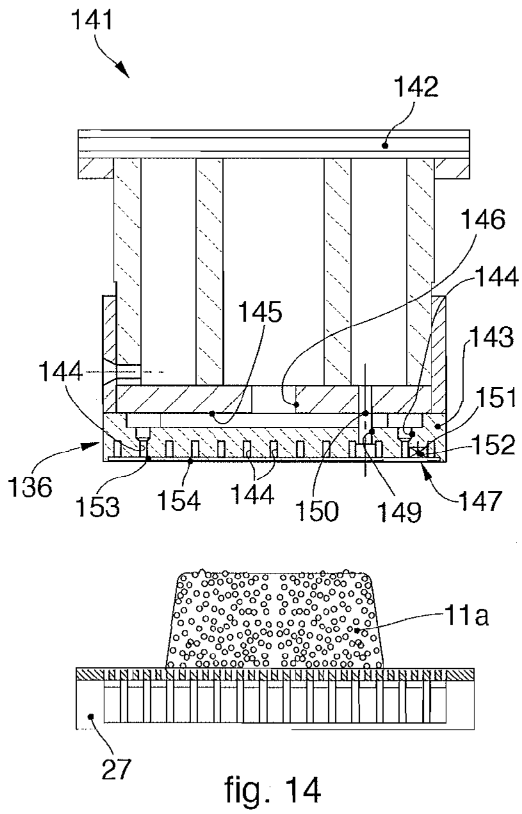
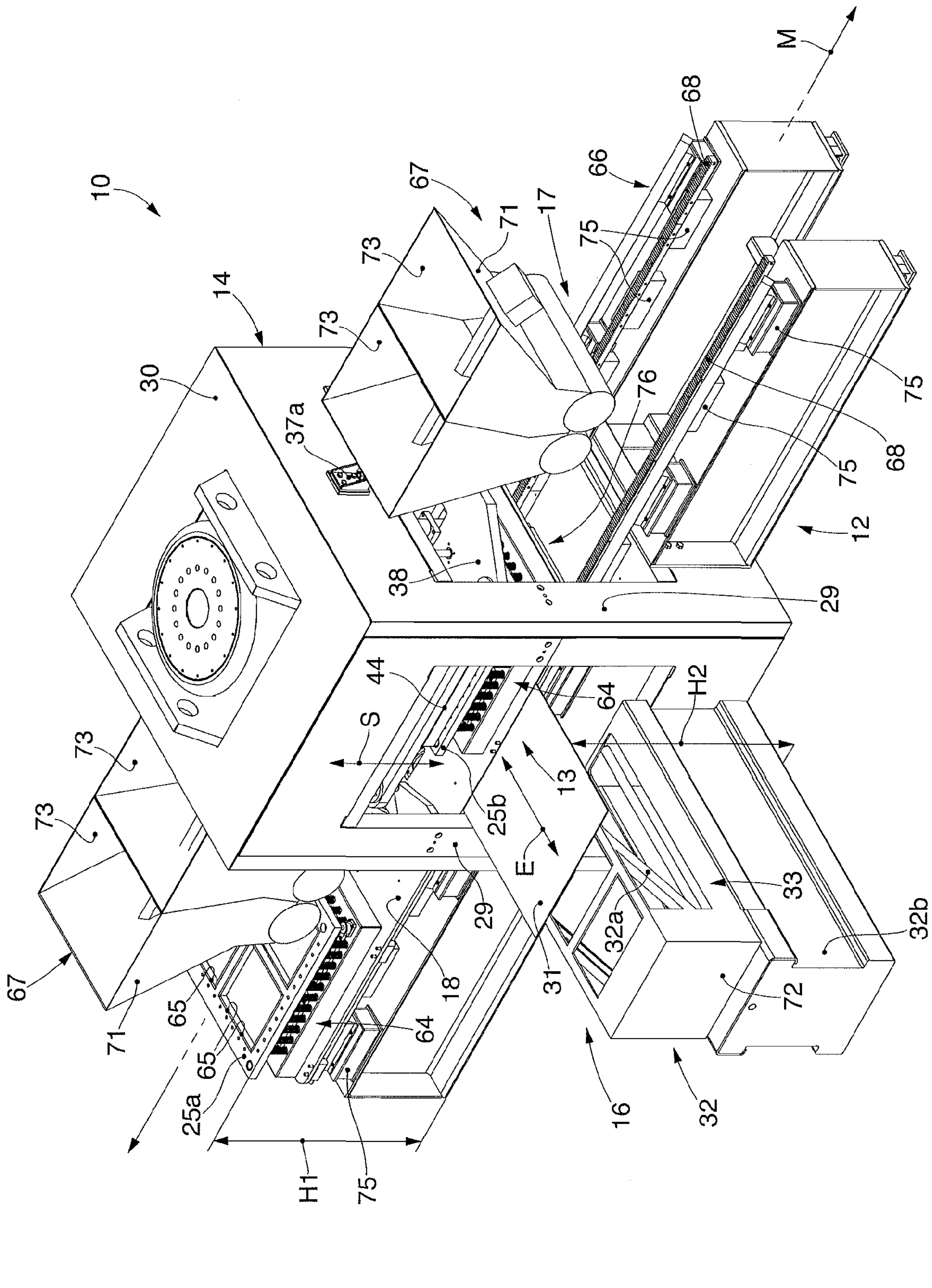


fig. 14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29
29
44
64
64
S
E
25b
25a
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H1
H2
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32a
32b
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fig. 15

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EUROPEAN SEARCH REPORT

Application Number
EP 13 19 5178

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A	WO 03/051593 A1 (MIRAGE GRANITO CERAMICO S P A [IT]; CHIODI MAURIZIO [IT]) 26 June 2003 (2003-06-26) * claim 1; figures 3,6 *	1,11	INV. B28B3/08 B28B13/02
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			B28B

The present search report has been drawn up for all claims

2

Place of search	Date of completion of the search	Examiner
The Hague	11 March 2014	Boone, John

CATEGORY OF CITED DOCUMENTS

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