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(54) Machine and moulds with interchangeable bottoms for forming green bricks

(57) A machine with moulds with interchangeable bottom for forming from a mixture bricks still to be baked, comprises a chain conveyor (1) carrying moulds (2). The moulds (2) are provided with movable bottoms (6) each whereof comprises a support (9) engaged to a corresponding ejector (7) and a bottom plate (10) separable from the support (9). Connecting means between the bottom plate (10) and the support (9) comprise a first part (12) integrally connected with the support (9) and a corresponding second part (13) integrally engaged in a non-through manner to the bottom plate (10) on the

side oriented towards the support (9). The upper surface (15) of the bottom plate in contact with the mixture does not present prints, marks, traces or irregularities due to the presence of the connecting means. The first and the second part (12,13) of the connecting means interact by means of at least an axial coupling and at least an elastic constraint substantially transverse to the axial coupling to allow the rapid stable fastening of the connecting means by simple pressure of the bottom plate (10) on the support (9). The lateral walls (28) of the moulds are conformal to the shape of the corresponding bottom plate (10).

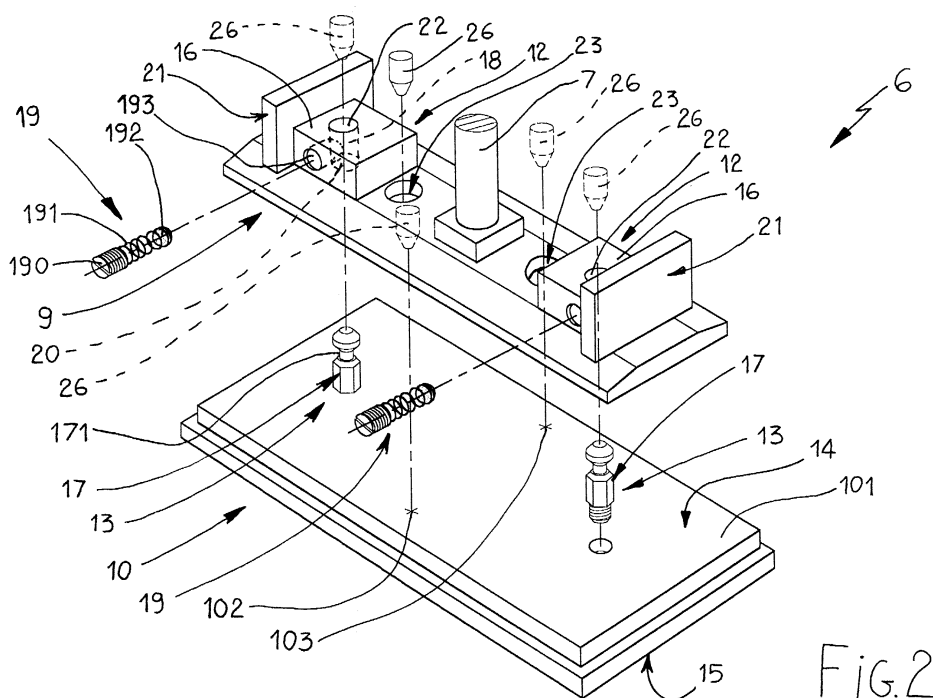


Fig. 2

Description

[0001] The present invention relates to a machine with moulds with interchangeable bottoms to form from a mixture bricks still to be baked of different shapes and sizes, in particular to be used in floors.

[0002] In general, machines are known for forming from a mixture bricks still to be baked, wherein a chain conveyor transports moulds which are filled with a mixture drawn from a tank positioned above the conveyor. The mixture is pressed and trimmed to form the brick and subsequently, either by effect of the motion of the conveyor or by suitable means, the moulds are upset to release the bricks still to be baked on appropriate discharging means.

[0003] To allow the release of the brick, the moulds are provided with movable bottoms which, once the mould has been upset, are made to translate by means of corresponding ejectors activated by suitable actuators.

[0004] Each movable bottom comprises a support engaged to the corresponding ejector and a plate constituting the bottom of the mould.

[0005] The plates are usually secured to the corresponding supports by means of through screws, which are introduced into the plate from the side of the cavity of the mould. These screws are generally used also to maintain fastened to the plate a possible coating made of plastic material or rubber which is an integral part of the plate itself.

[0006] This assures the ability to remove the plates from the support, and allows maintenance and replacement operations on the plate.

[0007] The machines to form from a mixture bricks still to be baked, described above, present some drawbacks.

[0008] In particular, in the first place, the presence of the heads of the screws or of any stoppers used to cover them causes prints on the surface of the brick in contact with the plate. In order to be used in paving streets, squares, courtyards and houses, the bricks thus obtained must be oriented by the layer in such a way as to hide the prints from view, so as not to create heavily anti-aesthetic visual effects. This operation, in addition to extending the time required for laying, is not simple, since frequently the prints are clearly visible only under certain lighting conditions and under a certain sight angle. Therefore, their presence is often realised only after the laying of the pavement.

[0009] In the second place, the separation of the plate from the support is not easy, because it is necessary to unscrew more than one screw for each mould. Since, on average, a chain conveyor transports a very high number of moulds, this makes it practically impossible to replace all plates rapidly, for instance in order to modify the shape or the dimensions of the bricks produced.

[0010] The aim of the present invention is to overcome the drawbacks described above, making available a machine with moulds having interchangeable bottom

for forming from a mixture bricks still to be baked which allows to obtain bricks that do not present prints, marks, traces or irregularities on any face.

[0011] Another aim of the present invention is to make available a machine with moulds having interchangeable bottoms for forming from a mixture bricks still to be baked which allows the rapid replacement of the bottom plates of the moulds.

[0012] A further aim of the present invention is to make available a machine having moulds with interchangeable bottom for forming from a mixture bricks still to be baked which allows simultaneously to produce bricks with different shapes and/or sizes.

[0013] These aims and others besides, which shall become more readily apparent in the course of the description that follows, are achieved, in accordance with the present invention, by a machine with moulds having interchangeable bottoms for forming from a mixture bricks still to be baked as described in the claims that follow.

[0014] The invention is described more in detail hereafter with the aid of the drawings, which represent an embodiment provided purely by way of non limiting example.

- Figure 1 shows a schematic lateral view of the machine constituting the subject of the present invention, wherefrom some parts have been removed for the sake of greater clarity.
- Figure 2 shows an exploded perspective view of a movable bottom of a mould of the machine of the present invention.
- Figure 3 shows an exploded perspective view of a chain unit of the conveyor in a particular embodiment of the present invention.

[0015] With reference to Figure 1, the machine with moulds having interchangeable bottom for forming from a mixture bricks still to be baked, comprises a continuous chain conveyor 1, which transports moulds 2 for forming the bricks. A tank 3 for the mixture is positioned above the conveyor 1 and means 4 are provided for carrying the mixture from the tank 3 to the moulds 2 and for filling them. Means for pressing and trimming the mixture in the moulds 2, not shown in the figures, cooperate with the moulds 2 in forming the bricks. Downstream of the means for pressing and trimming the mixture, along the motion of the conveyor 1, means 5 are situated for offloading the bricks still to be cooked released by the moulds 2. In particular, in the embodiment shown in Figure 1, a distribution station 50 lays onto chain units 29 flat trays 51 which fully cover the moulds 2 themselves. A holding belt 52 maintains the flat trays 51 against the moulds 2 when, by effect of the motion of the conveyor 1, the moulds 2 are upset. Immediately downstream of the belt 52, along the motion of the conveyor 1, a first conveyor belt 53 receives the flat trays 51 which carry the bricks released by the upset moulds 2.

[0016] With reference to Figure 3, the moulds 2 are provided with movable bottoms 6, with corresponding ejectors 7 and with corresponding means 8 for actuating the ejectors 7, for displacing the movable bottoms 6 and for favouring the detachment and the release of the bricks from the moulds 2 in correspondence with the first conveyor belt 53.

[0017] In the embodiment shown in Figure 3, each ejector 7 is a bar engaged to the movable bottom 6 and maintained normally in contact on the bottom 70 of the chain unit 29 by a spring 71. The actuator means 8 comprise a bar 81, positioned transversely to the conveyor 1. Through appropriate means, not shown in the figures and positioned in correspondence with the first conveyor belt 53 and downstream of the holding belt 52, the bar 81 is made to translate and checks all the ejectors 7 corresponding to the chain unit 29, compressing the springs 71 and causing the displacement of the movable bottom 6. In this way the release of the bricks from the moulds 2 is caused.

[0018] With reference to Figure 2, each movable bottom 6 comprises a support 9 engaged to the corresponding ejector 7 and a bottom plate 10 removable from the support 9. Connecting means are also present between the bottom plate 10 and the support 9.

[0019] The connecting means comprise a first part 12 integrally connected with the support 9 and a corresponding second part 13 integrally engaged in a non-through manner to the bottom plate 10 on the side 14 oriented towards the support 9. In this way, the upper surface 15 of the bottom plate 10 in contact with the mixture does not present prints, marks, traces or irregularities due to the presence of the connecting means.

[0020] Advantageously, the first and the second part 12, 13 of the connecting means interact by means of at least an axial coupling and at least an elastic constraint substantially transverse to the axial coupling. This allows the rapid, stable fastening of the connecting means by simple pressure of the bottom plate 10 on the support 9.

[0021] In particular, in the preferred embodiment of the present invention, the first part 12 of the connecting means comprises at least an appropriate body 16 integral with the support 9 and the second part 13 comprises at least a protuberance 17. The protuberance 17 is able to be inserted in a corresponding seat 18 obtained in the body 16. Elastic means 19 for geometric interference between the protuberance 17 and the body 16 make stable the connection between the bottom plate 10 and the support 9.

[0022] The body 16 can be integrated in a single piece with the support 9 (for instance by machining from a single block of material or by moulding or casting), or can be associated to the support 9 after being previously machined and shaped.

[0023] In the embodiment shown in Figure 2, conveniently, the direction of coupling is perpendicular to the bottom plate 10 and two bodies 16 are provided, posi-

tioned on opposite ends with respect to the ejector 7, two corresponding protuberances 17 and two corresponding elastic means of geometric interference 19.

[0024] By way of non exhaustive example, the protuberance 17 can be obtained by means of an elastically deformable foil, engaged in correspondence with an edge of the bottom plate and presenting, at the free extremity, a substantially bulb-shaped bulge. This bulge may be able to be inserted into a cavity obtained laterally on the body 16, in turn positioned in correspondence with an edge of the support 9, said cavity constituting the seat 18. The elastic means of geometric interference between the protuberance 17 and the body 16 are thus integrated in the protuberance 17.

[0025] By way of non-exhaustive example, moreover, the protuberance 17 can be obtained by means of a shaped pin, welded or screwed onto the bottom plate 10 and presenting a free extremity. The elastic means of geometric interference between the protuberance 17 and the body 16 can be associated to said free extremity and cause it to bulge. The seat 18 can correspondingly be obtained by means of a cavity having a narrow entrance which introduces into a larger compartment. The elastic means of interference, by their contraction, allow the insertion of the pin into the entrance of the cavity constituting the seat 18 and, once introduced into the larger compartment, their elastic return causes the locking of the bottom plate 10 on the support 9.

[0026] In the embodiment shown by way of example in Figure 2, the protuberance 17 is obtained with a shaped pin, engaged to the bottom plate 10 by means of a screw-nut coupling which involves only partially the thickness of the bottom plate 10 itself. The shaped pin can be inserted into the seat 18 by means of a hole obtained on the body 16. The elastic means 19 of geometric interference comprise a grub screw 190, whereto is associated a spring 191. A ball 192 is trapped at the extremity of the spring 191 opposite relative to the grub screw 190. The grub screw 190 is engageable in a corresponding nut screw obtained on the walls of a first hole 193 obtained on a side of the body 16. The first hole 193 allows the insertion of the ball 192 and of the spring 191 inside the seat 18 in a direction transverse to the development of the seat 18 itself. The shaped pin presents a radial groove 171 to receive the interference by the ball 192 and determine the stable coupling of the bottom plate 10 to the support 9.

[0027] Still with reference to Figure 2, the body 16 is located on the side of the support 9 oriented opposite the bottom plate 10 and the seat 18 is accessible to the protuberance 17 by means of a corresponding first opening 20 obtained on the side of the support 9 oriented towards the bottom plate 10. In this case, advantageously, in an embodiment of the present invention, the body 16 has a predetermined thickness and defines a reference for the movable bottom 6, to determine the depth of the mould 2. This reference can be obtained on any corresponding part of the chain unit 29. To the

body 16, as shown in Figure 2, can also be associated a further reference element 21 for the movable bottom 6 to determine the thickness of the mould 2. The reference element 21 can be integrated in a single piece together with the support 9 and to the body 16 (for example by machining from a single block of material or by moulding or casting), or can be engaged to the body 16, to the support 9 or to both, after having previously been machined and shaped.

[0028] In a particular embodiment of the present invention shown in Figure 2, the support 9 presents at least a through hole 23, to allow the rapid uncoupling of the connecting means and the removal of the bottom plate 10 by simple pressure on the bottom plate 10. Figure 2 shows a pair of through holes 23, situated at opposite ends relative to the ejector 7.

[0029] Alternatively, or also additionally, still with reference to Figure 2, the bottom plate 10 presents a larger surface 101 than the corresponding surface of the support 9, to allow the rapid uncoupling of the connecting means and the removal of the bottom plate 10 by simple pressure on the bottom plate 10, for instance in the points indicated as 102 and 103 in Figure 2.

[0030] Moreover, alternatively, or also additionally, advantageously the seat 18 is accessible also through a corresponding second opening 22 obtained on the side of the support 9 oriented opposite the bottom plate 10. This allows the rapid uncoupling of the connecting means and the removal of the bottom plate 10 by simple pressure on the plate 10 by means of the protuberance 17.

[0031] The uncoupling of the connecting means can be obtained by imparting pressure on the bottom plate 10 manually, for instance through the use of an appropriate tool which can be inserted in the through hole 23 or in the second opening 22 providing access to the seat 18, or which can be pressed on the side 14 of the bottom plate 10 in correspondence with one of the points 102, 103.

[0032] Advantageously, in a preferred embodiment of the present invention, presser means 24 are provided for pressing the bottom plate 10 for the automatic rapid uncoupling of the connecting means and the releasing of the bottom plate 10. In particular, the presser means 24 comprise at least an actuator 241 which commands the actuation of at least a support element 25 in such a way as to make it movable in substantially vertical direction and at least a punch 26 removably engaged to the support element 25, as Figure 1 clearly shows in schematic fashion. Advantageously, each chain unit 29 comprises at least two moulds 2 set mutually side by side and transversely to the motion of the chain conveyor 1. In particular, in the embodiment shown in Figure 3, each chain unit comprises twelve moulds. The support element 25 conveniently develops (perpendicularly to the plane of Figure 1) over the entire dimension of the chain unit 29 transverse to the motion of the conveyor 1. The punches 26 are removably engaged to the sup-

port element 25 in correspondence with the moulds 2 involved with the change of the bottom plate 10 and according to the number and position of said moulds on the chain unit 29. As shown in Figure 2, the punches 26 can be positioned and dimensioned in such a way as to act on the bottom plate 10 in correspondence with the points 102, 103 of the side 14 of the bottom plate 10. Alternatively or additionally, the punches 26 can be positioned and dimensioned in such a way as to be inserted into the through holes 23. Alternatively or additionally, moreover, the punches 26 can be dimensioned and positioned in such a way as to be inserted into the second opening 22 and to press onto the bottom plate 10 acting on the protuberance 17. The presser means 24 are supported by elements not shown in the figure for the sake of greater clarity and are preferably situated along the segment of conveyor 1 which presents the up-set moulds 2. In this way, after being released, the bottom plates 10 fall by gravity with their upper surface 15 oriented downward.

[0033] Conveniently, the machine of the present invention comprises also a station 27 for the collection and conveyance of the released bottom plate 10. This station is situated in correspondence with the presser means 24 and, purely by way of example, comprises a second conveyor belt 271 (which in Figure 1 develops perpendicularly to the plane of the figure).

[0034] The presser means 24 and the station 27 for collecting and conveying the bottom plates 10 are activated when the bottom plates 10 need to be replaced rapidly. Following the motion of the conveyor 1, the individual chain units 29 come in succession under the presser means 24, which cause the uncoupling of the corresponding bottom plates 10 and their fall onto the second conveyor belt 271.

[0035] Advantageously, the bottom plate 10 presents its surface 101 at least as ample as the corresponding surface of the support 9, so that the replacement of the bottom plate 10 with a plate 10 having different shape or dimensions does not leave uncovered portions of the support 9. Conveniently, the lateral walls 28 of the moulds 2 are conformal to the shape of the corresponding bottom plate 10.

[0036] With reference to Figure 3, advantageously, in this case, each chain unit 29 comprises at least a first and a second portion 30,31 removably connected to each other. The first portion 30 is connected to the conveyor 1 and comprises the movable bottoms 6, whereas the second portion 31 comprises the lateral walls 28 of the moulds 2 and is divided into at least a first and a second segment 311,312 mutually separable and each comprising at least the walls of a mould 2. In the embodiment shown in Figure 2, in particular, a third segment 313 is provided. The first, second and third segment 311, 312, 313 group each respectively four of the twelve moulds 2 comprised in the chain unit 29. The segments 311, 312, 313 can be inserted in appropriate lateral guides 300 obtained in the first portion 30 of the

chain unit 29 and can be engaged thereto, for instance by means of screws or pins.

[0037] Advantageously, at least the bottom plates 10 of the moulds 2 corresponding to the first segment 311 have different shape from the bottom plates 10 of the moulds 2 corresponding to the second segment 312. 5

[0038] Alternatively or additionally, advantageously, moreover, at least the bottom plates of the moulds 2 corresponding to the first segment 311 have different dimensions from the bottom plates 10 of the moulds 2 corresponding to the second segment 312. 2. 10

[0039] In the example shown in Figure 3, the moulds 2 corresponding to the first segment 311 have different shape from those corresponding to the second segment 312, which in turn can have different dimensions or shape from the moulds 2 corresponding to the third segment 313. 15

[0040] In this way, each individual chain unit 29 can carry, interchangeably, groups of moulds 2 of mutually different shapes and/or dimensions, and it can advantageously be provided for all the first segments 311 and the corresponding bottom plates 10 present on the conveyor 1 to be identical to each other, for all the second segments 312 and the corresponding bottom plates 10 present on the conveyor 1 to be identical to each other and for the third segments 313 and the corresponding bottom plates 10 present on the conveyor 1 to be identical to each other. In this way, the parallel production of bricks having different shapes is obtained. 20 25

[0041] The invention achieves important advantages. 30

[0042] First of all, it allows to obtain bricks free of prints, marks, traces or irregularities and, hence, suitable to be employed for pavements.

[0043] Advantageously, it allows for the rapid coupling and uncoupling of the bottom plates of the mould, thereby enabling easily to modify the shape and the dimensions of the plates employed on the machine. 35

[0044] The uncoupling, the collection and the conveyance of the bottom plates are conducted automatically. Moreover, all the bottom plates of a single chain unit which are to be replaced are uncoupled simultaneously, with considerable savings in terms of machine set-up and/or maintenance time. 40

[0045] In the second place, the simultaneous production of bricks with different shapes and dimensions is enabled, with the additional possibility of modifying at the user's discretion and in a simple manner such shape and such dimensions. 45

[0046] The invention thus conceived can be subject to numerous modifications and variations, without thereby departing from the scope of the inventive concept that characterises it. 50

[0047] Moreover, all components can be replaced by technically equivalent elements.

[0048] In practice all materials employed, as well as the dimensions, can be any and all, as need be. 55

Claims

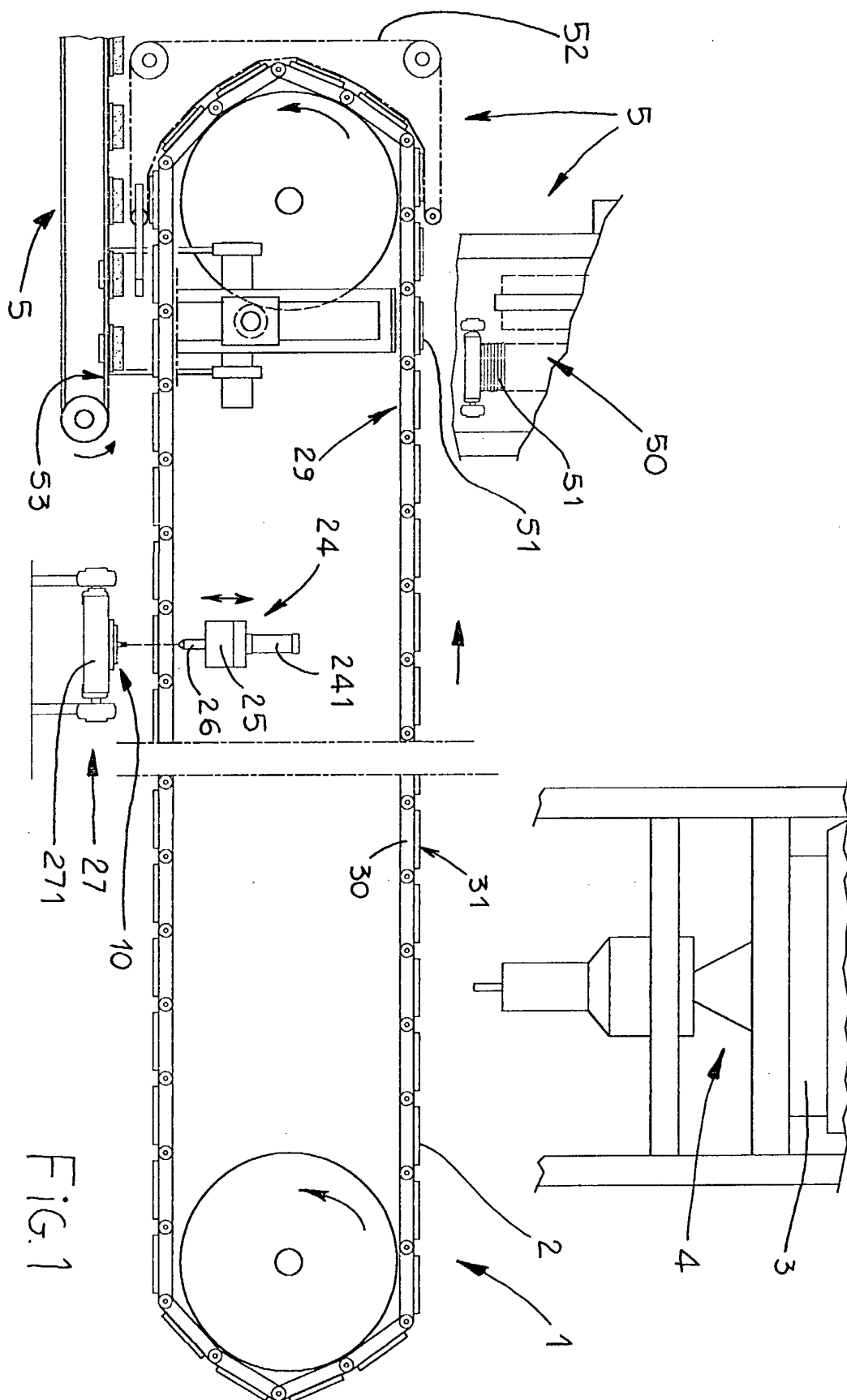
1. A machine with moulds with interchangeable bottoms to form from a mixture bricks still to be baked, comprising a continuous chain conveyor (1) carrying moulds (2), a tank (3) for the mixture situated above the conveyor (1), means (4) to carry the mixture from the tank (3) to the moulds (3), means for pressing and trimming the mixture in the moulds (2), means (5) to unload the bricks still to be baked released by the moulds (2), the moulds (2) being provided with movable bottoms (6), with corresponding ejectors (7) to displace the movable bottoms (6) and with corresponding means (8) for actuating the ejectors (7), each movable bottom (6) comprising a support (9) engaged to the corresponding ejector (7) and a bottom plate (10) detachable from the support (9), characterised in that it is provided with connecting means between the bottom plate (10) and the support (9) comprising a first part (12) integrally connected with the support (9) and a corresponding second part (13) integrally engaged in a non-through manner to the bottom plate (10) on the side (14) oriented towards the support (9), so that the upper surface (15) of the bottom plate (10) in contact with the mixture does not present prints, marks, traces or irregularities due to the presence of the connecting means.
2. A machine as claimed in claim 1, characterised in that the first and the second part (12,13) of the connecting means interact by means of at least an axial coupling and at least an elastic constraint substantially transverse to the axial coupling to allow the rapid stable fastening of the connecting means by simple pressure of the bottom plate (10) onto the support (9).
3. A machine as claimed in claim 2, characterised in that the first part (12) of the connecting means comprises at least an appropriate body (16) integral with the support (9), that the second part (13) comprises at least a protuberance (17) able to be inserted into a corresponding seat (18) obtained in the body (16) and in that elastic means (19) of geometric interference are provided between the protuberance (17) and the body (16).
4. A machine as claimed in claim 3, characterised in that the body (16) is situated on the side of the support (9) oriented opposite to the bottom plate (10) and in that the seat (18) is accessible to the protuberance (17) by means of a corresponding first opening (20) obtained on the side of the support (9) oriented towards the bottom plate (10).
5. A machine as claimed in claim 4, characterised in that the body (16) has a predetermined thickness

and defines a reference for the movable bottom (6) to determine the depth of the mould (2).

6. A machine as claimed in claim 4, characterised in that to the body (16) is associated a reference element (21) for the movable bottom (6) to determine the thickness of the mould (2). 5
7. A machine as claimed in any of the claims from 3 to 6, characterised in that the seat (18) is accessible through a corresponding second opening (22) obtained on the side of the support (9) oriented opposite to the bottom plate (10), to allow the rapid uncoupling of the connecting means and the removal of the bottom plate (10) by simple pressure on the bottom plate (10) by means of the protuberance (17). 10
8. A machine as claimed in any of the claims from 2 to 7, characterised in that the support (9) presents at least a through hole (23), to allow the rapid uncoupling of the connecting means and the removal of the bottom plate (10) by simple pressure on the bottom plate (10). 15
9. A machine as claimed in any of the claims from 2 to 8, characterised in that the bottom plate (10) presents a larger surface (101) than the corresponding surface of the support (9), to allow the rapid uncoupling of the connecting means and the removal of the bottom plate (10) by simple pressure on the bottom plate (10). 20
10. A machine as claimed in any of the claims from 7 to 9, characterised in that it comprises presser means (24) for pressing the bottom plate (10) for the automatic rapid uncoupling of the connecting means and the release of the bottom plate (10). 25
11. A machine as claimed in claim 10, characterised in that the presser means (24) comprise at least a support element (25) movable in a direction transverse to the conveyor (1) and at least a punch (26) removably engaged to the support element (25). 30
12. A machine as claimed in claim 10 or 11, characterised in that it comprises a station (27) for the collection and the conveyance of the released bottom plate (10). 35
13. A machine as claimed in any of the previous claims characterised in that the bottom plate (10) presents a surface (101) at least as large as the corresponding surface of the support (9). 40
14. A machine as claimed in any of the previous claims, characterised in that the lateral walls (28) of the moulds (2) are conformal to the shape of the corre- 45

sponding bottom plate (10).

15. A machine as claimed in claim 13 or 14, characterised in that each chain unit (29) comprises at least two moulds (2) set mutually side by side and transversely to the motion of the chain conveyor (1). 50
16. A machine as claimed in claim 15, characterised in that each chain unit (29) comprises at least a first and a second portion (30,31) removably connected to each other, the first portion (30) being connected to the conveyor (1) and comprising the movable bottoms (6), the second portion (31) comprising the lateral walls (28) of the moulds (2) and being divided into at least a first and a second segment (311,312) mutually separable and each comprising at least the walls of a mould (2). 55
17. A machine as claimed in claim 16, characterised in that at least the bottom plates (10) of the moulds (2) corresponding to the first segment (311) are shaped differently from the bottom plates (10) of the moulds (2) corresponding to the second segment (312).
18. A machine as claimed in claim 16 or 17, characterised in that at least the bottom plates (10) of the moulds (2) corresponding to the first segment (311) have different dimensions from the bottom plates (10) of the moulds (2) corresponding to the second segment (312).



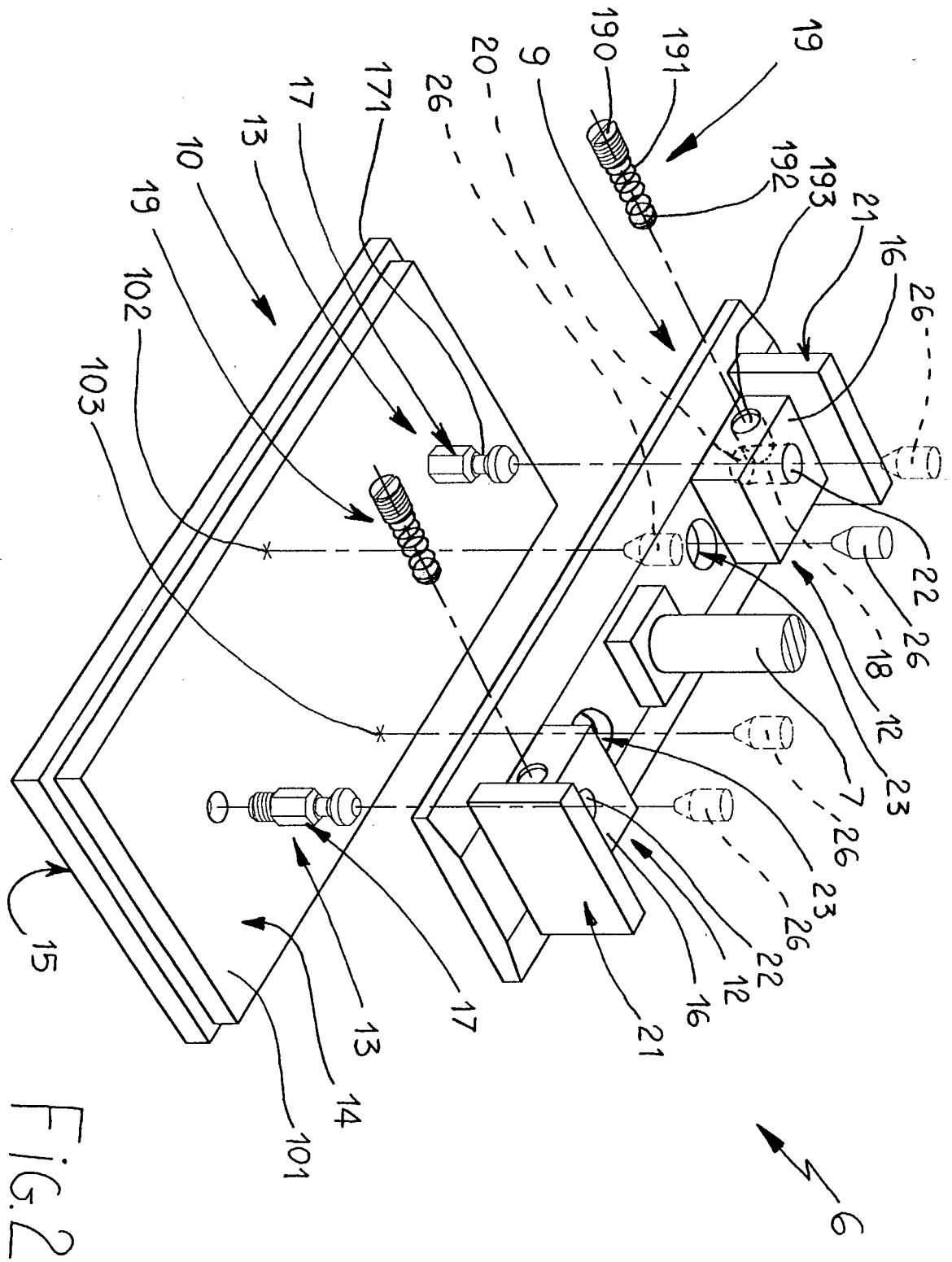
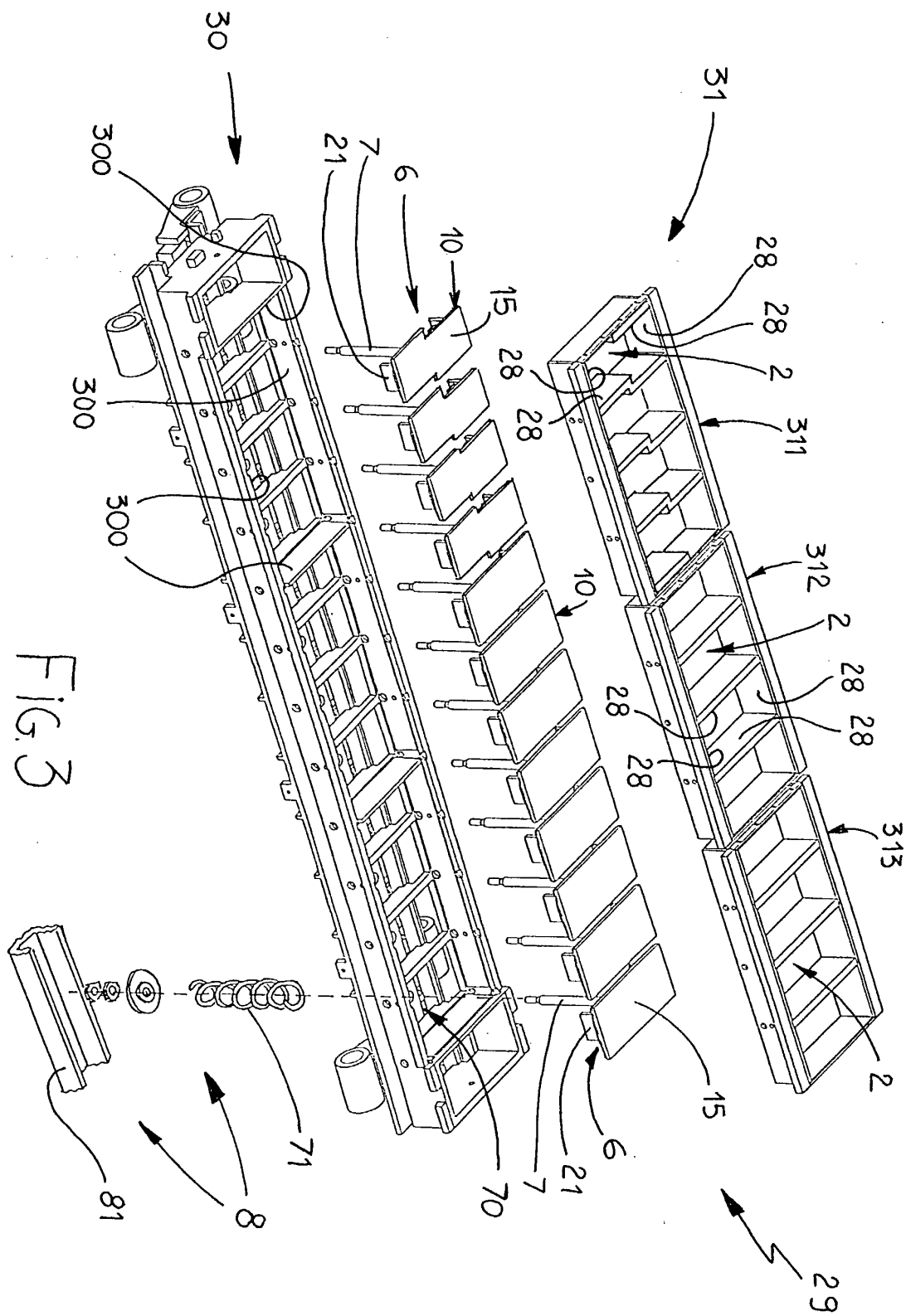


FIG. 2





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0810

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The present search report has been drawn up for all claims			
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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