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(54) **Machine for the production of ceramic products.**

Maschine zur Herstellung keramischer Produkte.

Machine pour la fabrication de produits céramiques.

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(56) References cited:
EP-A1- 0 557 995 EP-A1- 0 561 613
FR-A1- 2 602 452 US-A- 5 741 388

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EP 2 366 517 B1

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Description

[0001] This invention relates to a machine for the production of ceramic products, in particular ceramic sanitaryware.

[0002] At present, machines for the production of ceramic products vary according to both their primary structures, such as their mould and clamping units, and their auxiliary structures, such as the fixed machine frames and the units or plates for supporting and moving the mould, depending on the type of products to be made, which may be washbasins, toilet bowls, bidets, shower trays, etc.

[0003] This specification refers to a machine for the production of toilet bowls and bidets.

[0004] One such machine, of a type known as single mould machine, basically comprises, in a minimum configuration:

- a mould divided into two or more parts, usually at least four, namely, base, right-hand side, lefthand side and top;
- a first unit, associated with the mould top, for moving and clamping the latter along a vertical axis;
- a second and a third unit, associated with the sides of the mould, for moving and clamping the respective side parts of the mould along another axis, perpendicular to the previously mentioned axis, that is to say, along a horizontal axis.

[0005] In addition to the above, the following are usually provided:

- a servo assisted device for demoulding the product made or, alternatively, a robotized unit used for the same purpose but which can, if necessary, be designed to perform other functions for processing and finishing the moulded product;
- service means for the cavity formed by the four parts of the mould in the closed configuration, such as means for feeding the slip into the mould or for injecting air for drainage and slip consolidation during the casting cycle;
- service means for a drainage system.

[0006] The drainage system is located inside porous moulds to allow the fluids that go through the inside surfaces of the mould during the casting cycle to be channelled to the outside, or to pump fluids in under pressure in the opposite direction in order to detach the moulded product from the mould walls or to recondition the mould part.

[0007] The above mentioned three units for moving and clamping the mould parts along the respective movement axes usually consist of a plate that supports the mould part and a movement cylinder for moving the plate and mould part assembly towards and away from the casting zone defined by the fixed position of the mould

base.

[0008] Each plate is equipped with frames or means of sliding on respective guides located both at floor level and at a certain height in order to allow the mould to change between a closed configuration, where the four mould parts are close together, and an open, product demoulding configuration, where at least the top and sides of the mould are moved away from the base: the top of the mould along a vertical axis and the two sides of the mould in opposite directions along a horizontal axis.

[0009] The movement cylinders - that is, the means which contribute to opening/closing the different parts of the mould - also constitute and act as clamping means for keeping the mould parts in the correctly closed position, overcoming the forces generated inside the cavity formed by the mould during the casting cycle.

[0010] In practice, therefore, the movement units, that is, the cylinders, are required to move the respective mould parts to the closed configuration and then act as resisting elements for opposing the forces generated by the slip under pressure during the casting cycle: in practice, these forces are transferred to the machine structure as a whole. This type of single-mould machine was also followed by an implementation, for increasing the productivity of casting installations, with multiple mould features (see European patent EP 885.701 to the same Applicant as the present one), comprising a plurality of moulds (four), each structurally similar to the one described above and positioned in line side by side, with the end plates of the mould sides of the outermost moulds equipped with the above mentioned means of clamping along the horizontal axis. In this specific case, there may also be corresponding servo assisted devices for demoulding the product or, alternatively, robotized demoulding units.

[0011] These machines, though functional in terms of operating reliability and end product quality, are extremely cumbersome, structurally very heavy (to be able to withstand the forces generated during casting, as stated above) and cost-intensive in terms of the installation as a whole, meaning by this the sum total of all the main and auxiliary equipment. Moreover, in the case of the single-mould machines, the productivity is not always high enough to meet factory requirements and, above all, to make up for the cost of the installation itself. The French application FR 2 602 452 discloses a machine for the production of ceramic products according to the preamble of claim 1. It is therefore an aim of this invention to overcome the above mentioned disadvantages by providing a machine for the production of ceramic sanitaryware according to the teaching of claim 1 that is simpler in structure, less cumbersome and relatively inexpensive compared to the prior art machinery, while maintaining or even increasing the productivity per unit time.

[0012] Another aim of the invention is to provide a machine that can be used to create modular installations with space-saving, light-weight structures in series and having high-productivity characteristics.

[0013] Another aim of the invention is to maximize automation at all the stages of the production process using a simple, low-cost constructional architecture.

[0014] According to this invention, the above aims are achieved by providing a machine for making ceramic products, in particular a machine for making ceramic sanitaryware and comprising a four-part mould, where each mould part has a corresponding outside supporting portion. Each part of the mould and the respective outside supporting portion may be separated from each other by respective sliding and positioning means in such a way as to allow only the parts of the mould to be changed in the machine.

[0015] Thanks to this constructional feature, the mould can be changed quickly and easily while keeping the other operating parts (clamping and containing units) in the same predetermined position and without having to reconfigure them for a different mould each time.

[0016] Further, all the mould parts can be set up and configured according to standard outside dimensions and architectures, as can the corresponding outside part and, hence, also the containing means, thus considerably reducing the overall costs of the machine.

[0017] It should also be added that with this configuration, the mould can be changed by a simple robotized unit because the mould is relatively light in weight. This factor, too, considerably reduces the costs of the machine and of the auxiliary equipment.

[0018] The technical features of the invention, with reference to the above aims, are clearly described in the claims below and its advantages are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention provided merely by way of example without restricting the scope of the inventive concept, and in which:

- Figure 1 is a schematic side view, with some parts cut away in order to better illustrate others, of a machine for the production of ceramic sanitaryware according to the invention, in a closed configuration;
- Figure 2 is a front view, with some parts cut away to better illustrate others, of the machine of Figure 1;
- Figure 3 illustrates the machine shown in the figures listed above in a front view where the mould parts are shown partly cut away in order to better illustrate certain details;
- Figures 4, 5 and 6 illustrate the machine shown in the figures listed above in a product demoulding or mould changing configuration; the three drawings being, respectively, a schematic side view, a schematic front view and a schematic top plan view;
- Figures 7, 8 and 9 are all perspective views illustrating another embodiment of the machine shown in the figures listed above in three different operating configurations.

[0019] With reference to the accompanying drawings,

in particular Figures 1 to 6, the machine 1 according to the invention is used for the production of ceramic products, in particular ceramic sanitaryware.

[0020] In the example illustrated, the ceramic product M is a toilet bowl purely by way of an example but without thereby limiting the scope of the invention.

[0021] The machine 1 essentially comprises:

- a mould S made up of at least four parts 2, 3, 4, 5 (described in more detail below) adapted to form, in a closed configuration, a cavity C for casting the ceramic product M;
- means 6, 7 for clamping and containing the mould S acting on the mould S in the closed configuration;
- movement means 8 acting between the clamping and containing means 6, 7 and the mould S to enable the clamping and containing means 6, 7 themselves and the mould S in the closed configuration to slide relative to each other along a single movement axis X between:
 - a first, non-operating position, where the mould S and the clamping and containing means 6, 7 are uncoupled from one another (see Figures 4, 7 and 8), and
 - a second, operating position, where the mould S and the clamping and containing means 6, 7 are matchingly coupled inside one another (see Figures 1, 2 and 9).

[0022] Preferably, the movement axis X is substantially horizontal.

[0023] More specifically (as described in more detail below), the means 6, 7 have at least one open-ended tubular body made as a single part, matchingly shaped to be coupled to the mould S to enable the mould S to be enclosed on four closing surfaces or outsides of it.

[0024] More in detail, the clamping and containing means, in practice, have a twofold function: holding the mould in the closed position through the tubular body 6 and opposing the forces acting on the parts 2, 3, 4, 5 of the mould S during a step of casting, that is, making, the product M.

[0025] For this opposing function, the tubular body 6 comprises at least one inflatable element 7 which opposes the forces acting on the mould S.

[0026] The element 7 (or the two or more elements, depending on the geometrical architecture of the tubular body) can be supplied with a fluid under pressure between a non-operating, limit configuration of minimum pressure and reduced size (see Figure 5) and a second operating, limit configuration of maximum pressure and maximum size (as shown in Figure 3).

[0027] As mentioned, the inflatable element 7 is located inside the tubular body 6 and acts on the closing surfaces of the mould S, that is to say, round the full perimeter of the mould S.

[0028] The inflatable element 7 will not be described in detail since its main functions and structural specifica-

tions are fully described in European patent EP 1.043.132 and in European patent application EP 1.905.561 in the name of the same Applicant as the present.

[0029] In the accompanying drawings, and purely by way of an example, the tubular body 6 is of the type made as a single, rigid part, cylindrical in shape and controlled by the movement means 8.

[0030] With this geometrical configuration of the body 6, the inflatable element 7 may be divided into four parts 7a, 7b, 7c, 7d which, when under maximum pressure, may be configured, in cross section, like a cylindrical segment with a straight surface in contact with the respective closing surface of the mould S part 2, 3, 4, 5 (see Figures 2 and 3). Figure 3 also schematically illustrates means 7e for feeding/discharging a fluid to and from the parts of the inflatable element 7.

[0031] As regards the external structure of the tubular body 6, the latter is provided, on the outside and on both sides of it, with supports 12 equipped with bottom carriages 13 resting on a pair of rails 14. The bottom carriages 13 are controlled by the above mentioned movement means 8 allowing the body 6 to slide along the axis X in both directions (see arrows FX, Figures 1, 4, 6, 9), from the first, non-operating position to the second, operating position where the mould S parts 2, 3, 4, 5 are covered, in the closed configuration, and vice versa.

[0032] In the case illustrated in Figures 1 and 4, again by way of an example, the movement means 8 may consist of a motor 8m, the latter being mounted behind the rails 14 and driving a pair of wheels 8a, 8b round which an endless belt 8c associated with the tubular body 6 is trained.

[0033] In addition to the above, the machine 1 has an internal frame 15, or stand, in the shape of an upturned U, which supports the entire mould S at one end of it and in hanging fashion. The frame 15 is mounted at a certain height and extends parallel to the axis X in such a way as to allow the tubular body 6 to pass in both directions.

[0034] As may be observed in Figures 1 to 6, with special attention to Figure 2, the frame 15 also supports:

- first means 16, for retaining at least two side parts 3, 4 of the mould S in the closed configuration; and
- second means 17, for pre-opening the two side parts 3, 4 of the mould S in a direction at right angles to the axis X (see arrows F17) during a step of demoulding the product M.

[0035] In effect, as is known, for the demoulding step, or step of detaching the product from the mould, after moving the upper part 2, or top, the side parts 3, 4 must be moved apart (this being a more critical operation since it involves large surfaces that may be liquid cast - that is, very thin) and it is therefore necessary to apply a relatively low force, followed by air, to allow all the contact zones to be detached (within a certain lapse of time) and completely separated.

[0036] As regards the first, retaining means 16, these are supported at a certain height by the internal frame 15, at the front of the zone where the mould S rests on the frame 15.

[0037] The first means 16 are located under the frame 15, in a position where they do not interfere with the movement of the tubular body 6 and operate in coordinated fashion on each of the side parts 3, 4. More in detail, the means 16 may, by way of a nonlimiting example, comprise a pair of opposite cylinders 16a, 16b, each equipped with a rocker lever 16c (see Figure 2 and arrows F16) that swings between a lowered, non-operating horizontal position and an operating, vertical position where it abuts against a bar 30 protruding from the respective side part 3, 4 of the mould S: the abutting action of the levers 16c against the bars 30 occurs in opposite directions so as to clamp the two parts 3, 4 towards each other.

[0038] The second means 17, too, are supported at a certain height, centrally with respect the axis X and on bars forming part of the internal frame 15 at a position where they do not interfere with the passage of the tubular body 6.

[0039] In practice, the second means 17 may comprise two pairs of actuators 17a, 17b located in front of and behind the zone occupied by the mould S on the frame 15.

[0040] Each pair of actuators 17a, 17b is associated, bilaterally, with a wall 15a of the frame 15 in such a way as to abut against the respective bar 30 protruding from the corresponding side part 3, 4 of the mould S.

[0041] That way, after swinging the levers 16c of the first means 16 to release the side parts 3, 4, it is possible to push the side parts 3, 4 themselves in opposite directions to allow them to be pre-opened for demoulding (obviously after the upper part 2, or top, has been moved).

[0042] To correctly obtain this sideways movement or shift in both directions at right angles to the axis X, the side parts 3, 4 of the mould S are equipped with bottom carriage units 18 located on respective bases 19 on the frame 15 of the machine 1.

[0043] Further, the parts 2, 3, 4, 5 of the mould S are each equipped with auxiliary pick-up and release means 9 adapted to allow them to pass from a first demoulding or mould change position, where the parts 2, 3, 4, 5 of the mould S are apart from each other, and a second, closed operating position, where the parts 2, 3, 4, 5 of the mould S are close to each other.

[0044] More in detail, on the parts 2, 3 and 4 (sides and top) the means 9 may also be used both for the demoulding movement and for changing the mould S, while on the base 5, they are used only for changing the mould S.

[0045] As may be observed in Figure 4, the machine 1 may also be served by a robotized unit 10 located in the vicinity of the machine 1 itself.

[0046] The robotized unit 10, usually used to manipulate and process the product M, may be used to pick up and release the parts 2, 3, 4, 5 of the mould S through suitable pick-up and release means 11, shown in Figures

4 and 5, in a preferred but nonlimiting embodiment.

[0047] This operation is possible precisely because the parts of the mould S do not have any containing parts or supplementary accessories and therefore are as a whole much lighter.

[0048] For this type of operation, the upper part 2, or top, is equipped with pins 2p protruding from its front and rear ends, constituting the aforementioned auxiliary means 9, in order to allow it to be picked up and released by the robotized unit 10 (see Figure 4) with the respective pick-up means 11 for:

- moving it towards and away from the other parts 3, 4, 5 of the mould S when the product M is demoulded, or
- changing the entire mould in the machine 1, and
- subsequently reconfiguring the entire mould S in the closed position.

[0049] Similarly, each of the side parts 3, 4 of the mould S is equipped with pins 3p, 4p protruding from its front and rear ends, constituting the auxiliary means 9, in order to allow them to be picked up and released by the robotized unit 10 (with the respective pick-up means 11) to perform the same operations as those listed above for the top 2. Obviously, in this specific case, the robotized unit 10 must move the side parts 3, 4 along a preferably arcuate path away from the product M and in such a way as to keep clear of the product M.

[0050] As for the bottom part 5, or base, of the mould, this is equipped with side flanges 20 (see in particular Figures 3 and 5) to allow the base 5 to rest in hanging fashion on the frame of the machine 1, in such a way as to enable the bottom zone of the tubular body 6 to pass under the base 5 itself. The base 5, too, is equipped with pins 5p protruding from its front and rear ends, constituting the auxiliary means 9, in order to allow it to be picked up and released by the robotized unit 10 (with the respective pick-up means 11) in order to move it away from, or position it on, the frame 15 only when the entire mould S is changed in the machine 1.

[0051] The base 5 also has means 21 for quick coupling to accessory fluid feed and drainage units 22 (illustrated schematically in Figure 6) on the mould S.

[0052] To allow the product M to be demoulded by the robotized unit 10 or other servo assisted unit, the machine 1 also comprises an external gantry frame 23 equipped with a plurality of projecting brackets 24 on which the top 2 and the side parts 3, 4 can be placed in hanging fashion by the robotized unit 10: that way, the robotized unit 10 can be left free to substitute the pick-up and release means 11 with a suitable element for picking up and manipulating the product M (not shown here).

[0053] Figures 7 to 9 illustrate another embodiment of the machine 1 described above according to the invention.

[0054] In this case, too, the clamping and containing means comprise the rigid, tubular body 6. Preferably, the

rigid body 6 has a cylindrical tubular shape.

[0055] Preferably, also, the body 6 is equipped, on its inside surface, with a plurality of elastically deformable ring-shaped sectors 7, or sleeves, for opposing the forces acting on the parts 2, 3, 4, 5 of the mould S during the casting of the product M. Preferably, each of the four parts 2, 3, 4, 5 of the mould S has outside supporting portions 2', 3', 4', 5'.

[0056] Preferably, but not necessarily, the outside portions 2', 3', 4', 5' are in the shape of cylindrical segments, in such a way as to form, in the closed configuration, a mould S with a cylindrical surface that can be engaged inside the cylindrical clamping and containing body 6.

[0057] In other words, therefore, the outside portions 2', 3', 4', 5' form the four closing surfaces of the mould S.

[0058] That way, the inflatable elements 7 are thinner and can extend continuously round the full inside circumference of the body 6.

[0059] Each part 2, 3, 4, 5 of the mould S and the respective outside supporting portions 2', 3', 4', 5' may be separated from each other by respective sliding and positioning means 25 in such a way as to allow only the parts 2, 3, 4, 5 of the mould S to be changed in the machine 1.

[0060] The sliding and positioning means 25 may be in the form of suitable guides and counter-guides located between the contact surfaces of the respective parts, while the separating and housing movement may be performed by the robotized unit 10 using the aforementioned pins on the parts 2, 3, 4, 5 of the mould S.

[0061] At least three outside supporting portions 2', 3', 4' are associated with respective auxiliary movement units 26, 27 in order to allow a first demoulding or mould S change position, where the parts 2, 3, 4 of the mould S are apart from each other (see Figure 7), and a second, closed operating position, where the parts 2, 3, 4 of the mould S are close to each other (see Figures 8 and 9).

[0062] The two semicircular supports 3', 4' associated with the respective side parts 3, 4, are connected to respective auxiliary units 26 comprising respective actuators 26a, 26b for synchronously moving the two supports 3', 4' on the front of them.

[0063] The actuators 26a, 26b are in turn associated with a first fixed U-shaped front frame 28 forming part of the machine 1.

[0064] The cylindrical segment shaped support 2' of the upper part 2, or top, of the mould is associated with an auxiliary unit 27 comprising a U-shaped front frame 29 forming part of the machine 1 and pivoted to a mounting structure 23 (the aforementioned upturned U-shaped frame) of the machine 1 in such a way as to swing between a raised position for demoulding the product M (Figures 7 and 8) and a lowered position for closing the mould S (Figure 9).

[0065] In both the supporting and movement structures, the points of contact for the movements are such as not to interfere with the movement of the cylindrical clamping and containing body 6.

[0066] A machine made as described above fully achieves the aforementioned aims thanks to the separation between the mould and the clamping and containing unit which are joined only when the product casting cycle has to be activated.

[0067] This special architecture has several advantages:

- the structures are made lighter since the clamping and containing unit is independent of the movement means;
- mould movements are automated by a robotized unit during both demoulding and mould changing operations thanks to lighter mould parts and with faster operating cycles;
- the overall dimensions of the machine are reduced thanks to movement along a single working axis for the clamping and containing units, thereby allowing two or more machines to be installed in line in relatively small spaces and served by a single robotized unit;
- costs are lowered because moving, clamping and containing individual mould parts do not require multiple, cumbersome and cost-intensive hydraulic units but instead can be performed by a single robotized unit.

[0068] The invention described above is susceptible of industrial application

Claims

1. A machine for the production of ceramic products (M), the machine (1) comprising:

- a mould (S) made up of at least four parts (2, 3, 4, 5) configured to obtain, in a closed configuration, a moulding cavity (C) for casting the product (M); each of the four parts (2, 3, 4, 5) of the mould (S) having a corresponding outside supporting portion (2', 3', 4', 5');
- means (6, 7) for clamping and containing the mould (S) acting on the mould (S) in the closed configuration; said means (6, 7) having a tubular shaped, open-ended body, designed to be coupled to the mould (S) to enable the mould (S) to be enclosed on the four outside closing portions (2', 3', 4' and 5') of the mould (S) itself;
- movement means (8) acting between the clamping and containing means (6, 7) and the mould (S) to enable the clamping and containing means (6, 7) themselves and the mould (S) in the closed configuration to slide relative to each other along a single, substantially horizontal movement axis (X) between a first, non-operating position, where the mould (S) and the clamping and containing means (6, 7) are uncoupled

from one another, and a second, operating position, where the mould (S) and the clamping and containing means (6, 7) are coupled inside one another,

characterized in that each part (2, 3, 4, 5) of the mould (S) and the respective outside supporting portions (2', 3', 4', 5') can be separated from each other by respective sliding and positioning means (25) in such a way as to allow only the parts (2, 3, 4, 5) of the mould (S) to be changed in the machine (1).

2. The machine according to claim 1, **characterized in that** the clamping and containing means comprise a single, tubular cylindrical body (6) controlled by the movement means (8).

3. The machine according to claim 2, **characterized in that** the single, tubular cylindrical body (6) is provided on the inside of it with at least one inflatable element (7) constituting the other part of the clamping and containing means.

4. The machine according to claim 2, **characterized in that** the clamping and containing means comprise at least one inflatable element (7) for opposing the forces acting on the parts (2, 3, 4, 5) of the mould (S) during the casting of the product (M), and designed to be supplied with a fluid under pressure between a non-operating, limit configuration of minimum pressure and reduced size and a second operating, limit configuration of maximum pressure and maximum size; the at least one inflatable element (7) being located inside the tubular body (6) and being designed to act at least on the closing surfaces of the mould (S), that is to say, round the full perimeter of the mould (S).

5. The machine according to claim 1, **characterized in that** it comprises auxiliary pick-up and release means (9) acting on at least three of the mould (S) parts (2, 3, 4) and adapted to allow a first demoulding or mould change position, where the parts (2, 3, 4) of the mould (S) are apart from each other, and a second, closed operating position, where the parts (2, 3, 4) of the mould (S) are close to each other.

6. The machine according to claim 1, where there is a robotized unit (10) located near the machine (1) and serving the machine (1), **characterized in that** the robotized unit (10) is equipped with means (11) for picking up and releasing the parts (2, 3, 4, 5) of the mould (S).

7. The machine according to claim 1, **characterized in that** the clamping and containing means comprise a single, tubular cylindrical body (6) provided on the inside surface of it with a plurality of elastically de-

formable, ring-shaped sectors (7), or sleeves, for opposing the forces acting on the parts (2, 3, 4, 5) of the mould (S) during the casting of the product (M); the sectors (7) being designed to be supplied with a fluid under pressure between a non-operating, limit configuration of minimum pressure and reduced size and a second operating, limit configuration of maximum pressure and maximum size.

8. The machine according to claim 1, **characterized in that** the outside supporting portions (2', 3', 4', 5') of each of the four parts (2, 3, 4, 5) of the mould (S) are shaped in such a way as to form, in the closed configuration, a mould (S) with a cylindrical surface that can be engaged inside the cylindrical clamping and containing body (6).

9. The machine according to claim 2, **characterized in that** the cylindrically shaped tubular body (6) is provided, on the outside and on both sides of it, with supports (12) equipped with bottom carriages (13) resting on a pair of rails (14); the bottom carriages (13) being controlled by the movement means (8) allowing the body (6) to slide along the axis (X) in both directions from the first, non-operating position to the second, operating position where the mould (S) parts (2, 3, 4, 5) are covered, in the closed configuration, and vice versa.

10. The machine according to claim 9, **characterized in that** it comprises an internal frame (15), or stand, in the shape of an upturned U, mounted at a certain height and extending parallel to the axis (X) in such a way as to allow the tubular body (6) to pass in both directions; the frame (15) supporting the mould (S) at one end of it and in hanging fashion.

11. The machine according to claim 1, **characterized in that** it comprises first means (16) for retaining at least the two side parts (3, 4) of the mould (S), in the mould (S) closed configuration during the production or casting of the product (M); the first means (16) being supported at a certain height by an internal frame (15) that supports the mould (S) and operating in coordinated fashion on each of the side parts (3, 4).

12. The machine according to claim 1, **characterized in that** it comprises second means (17) for pre-opening at least the two side parts (3, 4) of the mould (S) in a direction at right angles to the axis (X) during a step of demoulding the product (M); the second means (17) being supported at a certain height by an internal frame (15) that supports the mould (S) on the machine (1) and operating in coordinated fashion on each of the side parts (3, 4).

13. The machine according to claim 5, **characterized in that** the mould upper part (2), or top, is equipped

with pins (2p) protruding from its front and rear ends, constituting the auxiliary means (9), to allow it to be picked up and released by a robotized unit (10) in order to move it towards and away from the other parts (3, 4, 5) of the mould (S) when the product (M) is demoulded and/or for changing the entire mould in the machine (1), and, respectively, for reconfiguring the entire mould (S) in the closed position.

14. The machine according to claims 11 and 12, **characterized in that** the side parts (3, 4) of the mould (S) are equipped with bottom carriage units (18) located on respective bases (19) on the frame (15) of the machine (1) and adapted to allow their sideways movement or shift in both directions at right angles to the axis (X), under the action of first, retaining means (16) or second, pre-opening means (17); each of the side parts (3, 4) of the mould (S) being equipped with pins (3p, 4p) protruding from their front and rear ends, constituting the auxiliary means (9), to allow them to be picked up and released by a robotized unit (10) in order to move them towards and away from the other parts (2, 5) of the mould (S) when the product (M) is demoulded and/or for changing the entire mould in the machine (1), and, respectively, for reconfiguring the entire mould (S) in the closed position.

15. The machine according to claim 5, **characterized in that** a part (5), or base, of the mould is equipped with side flanges (20) to allow the base (5) to rest on a frame (15) of the machine (1); the base (5) being provided with pins (5p) protruding from its front and rear ends, constituting the auxiliary means (9), to allow it to be picked up and released by a robotized unit (10) in order to move it away from, or position it on, the frame (15) when the entire mould (S) is changed in the machine (1).

16. The machine according to claim 1, **characterized in that** the part (5), or base, of the mould (S) is equipped with means (21) for quick coupling to accessory fluid feed and drainage units (22) on the mould (S).

17. The machine according to claim 1, **characterized in that** it comprises an external gantry frame (23) equipped with a plurality of projecting brackets (24) on which the top (2) and the side parts (3, 4) can be placed in hanging fashion by a robotized unit (10) during the step of demoulding the product (M).

18. The machine according to claim 8, **characterized in that** at least three outside supporting portions (2', 3', 4') are associated with respective auxiliary movement units (26, 27) in order to allow a first demoulding or mould (S) change position, where the parts (2, 3, 4) of the mould (S) are apart from each other, and a

second, closed operating position, where the parts (2, 3, 4) of the mould (S) are close to each other.

19. The machine according to claim 18, **characterized in that** the two supports (3', 4'), associated with the respective side parts (3, 4) of the mould (S), are connected to respective auxiliary units (26) comprising respective actuators (26a, 26b) for synchronously moving the two supports (3', 4'); the actuators (26a, 26b) being associated with a first fixed U-shaped front frame (28) forming part of the machine (1).
20. The machine according to claim 18, **characterized in that** the support (2') of the upper part (2), or top, of the mould is associated with an auxiliary unit (27) comprising a U-shaped front frame (29) forming part of the machine (1) and pivoted to a mounting structure (23) of the machine (1) in such a way as to swing between a raised position for demoulding the product (M) and a lowered position for closing the mould (S).

Patentansprüche

1. Maschine zur Herstellung keramischer Produkte (M), wobei die Maschine (1) Folgendes umfasst:
- ein Formwerkzeug (S), bestehend aus mindestens vier Teilen (2, 3, 4, 5), die dazu konfiguriert sind, in einer geschlossenen Konfiguration eine Formkavität (C) zum Gießen des Produkts (M) zu bilden; wobei jedes der vier Teile (2, 3, 4, 5) des Formwerkzeugs (S) einen entsprechenden äußeren Halteabschnitt (2', 3', 4', 5') aufweist;
 - Mittel (6, 7) zum Einspannen und Fassen des Formwerkzeugs (S), die auf das Formwerkzeug (S) in der geschlossenen Konfiguration einwirken, wobei die Mittel (6, 7) einen rohrförmigen Körper mit offenen Enden aufweisen, der dazu konzipiert ist, mit dem Formwerkzeug (S) verkuppelt zu werden, um zu gewährleisten, dass das Formwerkzeug (S) an den vier äußeren schließenden Abschnitten (2', 3', 4' und 5') des Formwerkzeugs (S) eingeschlossen wird;
 - Bewegungsmittel (8), die zwischen den Mitteln (6, 7) zum Einspannen und Fassen und dem Formwerkzeug (S) wirken, um zu gewährleisten, dass die Mittel (6, 7) zum Einspannen und Fassen und das Formwerkzeug (S) in der geschlossenen Konfiguration relativ zueinander entlang einer einzelnen, im Wesentlichen horizontalen Bewegungsachse (X) zwischen einer ersten Ruheposition, in der das Formwerkzeug (S) und die Mittel (6, 7) zum Einspannen und Fassen voneinander abgekuppelt sind, und einer zweiten Betriebsposition, in der das Formwerkzeug (S) und die Mittel (6, 7) zum Einspannen und Fassen ineinander verkuppelt sind,

gleiten,

dadurch gekennzeichnet, dass jedes der Teile (2, 3, 4, 5) des Formwerkzeugs (S) und die entsprechenden äußeren Halteabschnitte (2' 3', 4', 5') voneinander so durch entsprechende Gleit- und Positionierungsmittel (25) getrennt werden können, dass nur ein Auswechseln der Teile (2, 3, 4, 5) des Formwerkzeugs (S) in der Maschine (1) ermöglicht wird.

2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mittel zum Einspannen und Fassen einen einzelnen, rohrförmigen, zylindrischen Körper (6) umfassen, der von den Bewegungsmitteln (8) gesteuert wird.
3. Maschine nach Anspruch 2, **dadurch gekennzeichnet, dass** der einzelne, rohrförmige, zylindrische Körper (6) an seiner Innenseite mit mindestens einem aufblasbaren Element (7) ausgestattet ist, das das andere Teil der Mittel zum Einspannen und Fassen bildet.
4. Maschine nach Anspruch 2, **dadurch gekennzeichnet, dass** die Mittel zum Einspannen und Fassen mindestens ein aufblasbares Element (7) zum Entgegenwirken der Kräfte umfassen, die auf die Teile (2, 3, 4, 5) des Formwerkzeugs (S) während des Gießens des Produkts (M) einwirken und das dazu konzipiert ist, mit einem Fluid unter Druck zwischen einer Ruhe- und Grenzkonfiguration eines Mindestdrucks und einer reduzierten Größe und einer zweiten Betriebs- und Grenzkonfiguration eines Maximaldrucks und einer Maximalgröße versorgt zu werden, wobei das mindestens eine aufblasbare Element (7) innerhalb des rohrförmigen Körpers (6) liegt und dazu konzipiert ist, zumindest auf die schließenden Oberflächen des Formwerkzeugs (S) einzuwirken, d. h. entlang dem vollen Umfang des Formwerkzeugs (S).
5. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** sie zusätzliche Aufnahme- und Freigabemittel (9) umfasst, die auf mindestens drei Teile (2, 3, 4) des Formwerkzeugs (S) einwirken und dazu geeignet sind, eine erste Position des Entformens oder des Auswechselns des Formwerkzeugs, in der die Teile (2, 3, 4) des Formwerkzeugs (S) voneinander entfernt liegen, und eine zweite geschlossene Betriebsposition, in der die Teile (2, 3, 4) des Formwerkzeugs (S) nah zueinander liegen, zu ermöglichen.
6. Maschine nach Anspruch 1, wobei eine robotisierte Einheit (10) vorhanden ist, die in der Nähe der Maschine (1) liegt und die Maschine (1) bedient, **dadurch gekennzeichnet, dass** die robotisierte Einheit (10) mit Mitteln (11) zur Aufnahme und Freigabe

der Teile (2, 3, 4, 5) des Formwerkzeugs (S) ausgestattet ist.

7. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mittel zum Einspannen und Fassen einen einzelnen, rohrförmigen, zylindrischen Körper (6) umfassen, der an seiner Innenseite mit einer Vielzahl von elastisch verformbaren, ringförmigen Bereichen (7) bzw. Manschetten zum Entgegenwirken der Kräfte, die auf die Teile (2, 3, 4, 5) des Formwerkzeugs (S) während des Gießens des Produkts (M) einwirken, ausgestattet ist, wobei die Bereiche (7) dazu konzipiert sind, mit einem Fluid unter Druck zwischen einer Ruhe- und Grenzkonfiguration eines Mindestdrucks und einer reduzierten Größe und einer zweiten Betriebs- und Grenzkonfiguration eines Maximaldrucks und einer Maximalgröße versorgt zu werden.
8. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die äußeren Halteabschnitte (2', 3', 4', 5') eines jeden der vier Teile (2, 3, 4, 5) des Formwerkzeugs (S) so geformt sind, dass sie in der geschlossenen Konfiguration ein Formwerkzeug (S) mit einer zylindrischen Oberfläche bilden, die in den zylindrischen Einspann- und Fasskörper (6) in Eingriff gebracht werden kann.
9. Maschine nach Anspruch 2, **dadurch gekennzeichnet, dass** der zylindrisch geformte, rohrförmige Körper (6) an seiner Außenseite und an seinen beiden Seiten mit Halterungen (12) versehen ist, die mit unteren Schlitten (13) ausgestattet sind, die auf einem Schienenpaar (14) ruhen, wobei die unteren Schlitten (13) durch die Bewegungsmittel (8) gesteuert werden, die ein Gleiten des Körpers (6) entlang der Achse (X) in beide Richtungen von der ersten Ruheposition in die zweite Betriebsposition, in der die Teile (2, 3, 4, 5) des Formwerkzeugs (S) in der geschlossenen Konfiguration bedeckt sind, und umgekehrt, ermöglichen.
10. Maschine nach Anspruch 9, **dadurch gekennzeichnet, dass** sie einen inneren Rahmen (15) bzw. Ständer in Form eines umgedrehten U umfasst, der in einer bestimmten Höhe montiert ist und sich so parallel zur Achse (X) erstreckt, dass ein Laufen des rohrförmigen Körpers (6) in beide Richtungen ermöglicht wird, wobei der Rahmen (15) das Formwerkzeug (S) an einem seiner Enden hängend hält.
11. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** sie erste Mittel (16) zum Festhalten mindestens der beiden Seitenteile (3, 4) des Formwerkzeugs (S) in der geschlossenen Konfiguration des Formwerkzeugs (S) während der Herstellung oder des Gießens des Produkts (M) umfasst, wobei die ersten Mittel (16) in einer bestimmten Höhe durch

einen inneren Rahmen (15) gehalten werden, der das Formwerkzeug (S) hält und auf jedem der Seitenteile (3, 4) koordiniert betreibt.

12. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** sie zweite Mittel (17) zum Voröffnen mindestens der beiden Seitenteile (3, 4) des Formwerkzeugs (S) in einer Richtung im rechten Winkel zur Achse (X) während eines Schrittes des Entformens des Produkts (M) umfasst, wobei die zweiten Mittel (17) in einer bestimmten Höhe durch einen inneren Rahmen (15) gehalten werden, der das Formwerkzeug (S) auf der Maschine (1) hält und auf jedem der Seitenteile (3, 4) koordiniert betreibt.
13. Maschine nach Anspruch 5, **dadurch gekennzeichnet, dass** der obere Teil (2) bzw. die Oberseite des Formwerkzeugs mit Bolzen (2p) ausgestattet ist, die aus seinen vorderen und hinteren Enden hervorragen und die zusätzlichen Mittel (9) bilden, wodurch ihre Aufnahme und Freigabe durch eine robotisierte Einheit (10) ermöglicht wird, um sie auf die anderen Teile (3, 4, 5) des Formwerkzeugs (S) zu und von ihnen weg zu bewegen, wenn das Produkt (M) entformt und/oder das gesamte Formwerkzeug in der Maschine (1) ausgewechselt wird bzw. das gesamte Formwerkzeug (S) in der geschlossenen Position rekonfiguriert wird.
14. Maschine nach den Ansprüchen 11 und 12, **dadurch gekennzeichnet, dass** die Seitenteile (3, 4) des Formwerkzeugs (S) mit unteren Schlitteneinheiten (18) ausgestattet sind, die auf entsprechenden Basen (19) auf dem Rahmen (15) der Maschine (1) liegen und dazu geeignet sind, ihre seitliche Bewegung bzw. Verschiebung in beide Richtungen im rechten Winkel zur Achse (X) unter der Einwirkung von ersten Festhaltemitteln (16) oder zweiten Voröffnungsmitteln (17) zu ermöglichen, wobei jedes der Seitenteile (3, 4) des Formwerkzeugs (S) mit Bolzen (3p, 4p) ausgestattet ist, die aus ihren vorderen und hinteren Enden hervorragen und die zusätzlichen Mittel (9) bilden, wodurch ihre Aufnahme und Freigabe durch eine robotisierte Einheit (10) ermöglicht wird, um sie auf die anderen Teile (2, 5) des Formwerkzeugs (S) zu und von ihnen weg zu bewegen, wenn das Produkt (M) entformt und/oder das gesamte Formwerkzeug in der Maschine (1) ausgewechselt wird bzw. das gesamte Formwerkzeug (S) in der geschlossenen Position rekonfiguriert wird.
15. Maschine nach Anspruch 5, **dadurch gekennzeichnet, dass** ein Teil (5) bzw. eine Basis des Formwerkzeugs mit seitlichen Flanschen (20) ausgestattet ist, um ein Ruhen der Basis (5) auf einem Rahmen (15) der Maschine (1) zu ermöglichen, wobei die Basis (5) mit Bolzen (5p) versehen ist, die aus ihren vorderen und hinteren Enden hervorragen

und die zusätzlichen Mittel (9) bilden, um ihre Aufnahme und Freigabe durch eine robotisierte Einheit (10) zu ermöglichen, um sie vom Rahmen (15) weg zu bewegen oder darauf zu positionieren, wenn das gesamte Formwerkzeug (S) in der Maschine (1) ausgetauscht wird.

16. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** das Teil (5) bzw. die Basis des Formwerkzeugs (S) mit Mitteln (21) zur Schnellkupplung an zusätzliche Fluidzufuhr- und Fluidabflusseinheiten (22) an das Formwerkzeug (S) ausgestattet ist. 5
17. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** sie einen externen Gantry-Rahmen (23) umfasst, der mit einer Vielzahl auskragender Träger (24) ausgestattet ist, auf denen die Oberseite (2) und die Seitenteile (3, 4) hängend durch eine robotisierte Einheit (10) während des Schritts des Entformens des Produkts (M) platziert werden können. 10
18. Maschine nach Anspruch 8, **dadurch gekennzeichnet, dass** mindestens drei äußere Halteabschnitte (2', 3', 4') an entsprechende zusätzliche Bewegungseinheiten (26, 27) angeschlossen sind, um eine erste Position des Entformens oder des Auswechselns des Formwerkzeugs (S), in der die Teile (2, 3, 4) des Formwerkzeugs (S) voneinander entfernt liegen, und eine zweite geschlossene Betriebsposition, in der die Teile (2, 3, 4) des Formwerkzeugs (S) nah zueinander liegen, zu ermöglichen. 15
19. Maschine nach Anspruch 18, **dadurch gekennzeichnet, dass** die beiden Halterungen (3', 4'), die an die entsprechenden Seitenteile (3, 4) des Formwerkzeugs (S) angeschlossen sind, mit zusätzlichen Einheiten (26) verbunden sind, umfassend entsprechende Aktoren (26a, 26b) zum synchronen Bewegen der beiden Halterungen (3', 4'), wobei die Aktoren (26a, 26b) an einen ersten fixierten, U-förmigen, vorderen Rahmen (28) angeschlossen sind, der ein Teil der Maschine (1) bildet. 20
20. Maschine nach Anspruch 18, **dadurch gekennzeichnet, dass** die Halterung (2') des oberen Teils (2) bzw. der Oberseite des Formwerkzeugs an eine zusätzliche Einheit (27) angeschlossen ist, umfassend einen U-förmigen, vorderen Rahmen (29), der ein Teil der Maschine (1) bildet und so an einer Befestigungsstruktur (23) der Maschine (1) schwenkbar befestigt ist, dass er zwischen einer angehobenen Position zum Entformen des Produkts (M) und einer herabgesenkten Position zum Schließen des Formwerkzeugs (S) schwingen kann. 25

Revendications

1. Machine pour la fabrication de produits céramiques (M), la machine (1) comprenant :
 - un moule (S) constitué au moins de quatre parties (2, 3, 4, 5) configuré de sorte à obtenir, dans une configuration fermée, une cavité de moulage (C) pour mouler le produit (M) ; chacune des quatre parties (2, 3, 4, 5) du moule (S) présentant une portion de soutien externe correspondante (2', 3', 4', 5') ;
 - des moyens (6, 7) pour bloquer et pour contenir le moule (S) agissant sur le moule (S) dans la configuration fermée ; lesdits moyens (6, 7) présentant un corps tubulaire ouvert conçu pour s'accoupler au moule (S) afin d'enfermer le moule (S) sur les quatre portions de fermeture externes (2', 3', 4' et 5') dudit moule (S) ;
 - des moyens de déplacement (8) agissant entre les moyens de blocage et de contenance (6, 7) et le moule (S) pour permettre auxdits moyens de blocage et de contenance (6, 7) et au moule (S), dans la configuration fermée, de coulisser les uns par rapport aux autres le long d'un unique axe de mouvement essentiellement horizontal (X) entre une première position non opérationnelle dans laquelle le moule (S) et les moyens de blocage et de contenance (6, 7) sont désaccouplés, et une seconde position opérationnelle dans laquelle le moule (S) et les moyens de blocage et de contenance (6, 7) sont accouplés les uns aux autres, **caractérisée en ce que** chaque partie (2, 3, 4, 5) du moule (S) et les portions de soutien externes respectives (2', 3', 4', 5') peuvent s'éloigner les unes des autres via des moyens de coulissement et de positionnement respectifs (25), de sorte à pouvoir changer uniquement les parties (2, 3, 4, 5) du moule (S) sur la machine (1).
2. Machine selon la revendication 1, **caractérisée en ce que** les moyens de blocage et de contenance comprennent un unique corps cylindrique tubulaire (6) commandé par les moyens de déplacement (8).
3. Machine selon la revendication 2, **caractérisée en ce que** l'unique corps cylindrique tubulaire (6) présente, à l'intérieur, au moins un élément gonflable (7), formant l'autre partie des moyens de blocage et de contenance.
4. Machine selon la revendication 2, **caractérisée en ce que** les moyens de blocage et de contenance comprennent au moins un élément gonflable (7) pour s'opposer aux forces agissant sur les parties (2, 3, 4, 5) du moule (S) pendant le moulage du produit (M), et conçu pour recevoir un fluide sous pression

entre une configuration limite non opérationnelle de pression minimale et taille réduite, et une seconde configuration limite opérationnelle de pression maximale et taille maximale ; le au moins un élément gonflable (7) se situant à l'intérieur du corps tubulaire (6) et étant conçu pour agir au moins sur les surfaces de fermeture du moule (S), autrement dit, autour de tout le périmètre du moule (S).

5. Machine selon la revendication 1, **caractérisée en ce qu'elle** comprend des moyens auxiliaires de préhension et de dépose (9) agissant sur au moins trois parties (2, 3, 4) du moule (S) et en mesure de permettre une première position de démoulage ou changement de moule, dans laquelle les parties (2, 3, 4) du moule (S) sont éloignées les unes des autres, et une seconde position opérationnelle fermée, dans laquelle les parties (2, 3, 4) du moule (S) sont proches les unes des autres.
6. Machine selon la revendication 1, avec une unité robotisée (10) placée près de la machine (1) et servant la machine (1), **caractérisée en ce que** l'unité robotisée (10) est équipée de moyens (11) pour prélever et pour déposer les parties (2, 3, 4, 5) du moule (S).
7. Machine selon la revendication 1, **caractérisée en ce que** les moyens de blocage et de contenance comprennent un unique corps cylindrique tubulaire (6) équipé, à l'intérieur, d'une pluralité de secteurs annulaires élastiquement déformables (7), ou manchons, pour s'opposer aux forces agissant sur les parties (2, 3, 4, 5) du moule (S) pendant le moulage du produit (M) ; les secteurs (7) étant conçus pour recevoir un fluide sous pression entre une configuration limite non opérationnelle de pression minimale et taille réduite, et une seconde configuration limite opérationnelle de pression maximale et taille maximale.
8. Machine selon la revendication 1, **caractérisée en ce que** les portions de soutien externes (2', 3', 4', 5') de chacune des quatre parties (2, 3, 4, 5) du moule (S) présentent une forme de sorte à composer, dans la configuration fermée, un moule (S) avec une surface cylindrique qui peut s'engager dans le corps cylindrique de blocage et de contenance (6).
9. Machine selon la revendication 2, **caractérisée en ce que** le corps cylindrique tubulaire (6) est équipé, à l'extérieur et sur ses deux côtés, de supports (12) munis de chariots inférieurs (13) reposant sur une paire de rails (14) ; les chariots inférieurs (13) étant commandés par les moyens de déplacement (8) permettant au corps (6) de coulisser le long de l'axe (X) dans les deux directions de la première position non opérationnelle à la seconde position opérationnelle,

dans laquelle les parties (2, 3, 4, 5) du moule (S) sont couvertes, dans la configuration fermée, et vice versa.

10. Machine selon la revendication 9, **caractérisée en ce qu'elle** comprend un bâti interne (15), ou colonne, en forme d'un U renversé, monté à une certaine hauteur et évoluant parallèlement à l'axe (X), de manière à permettre au corps tubulaire (6) de passer dans les deux directions; le bâti (15) soutenant le moule (S) à l'une de ses extrémités et en suspens.
11. Machine selon la revendication 1, **caractérisée en ce qu'elle** comprend des premiers moyens (16) pour retenir au moins les deux parties latérales (3, 4) du moule (S), dans la configuration fermée du moule (S), pendant la production ou le moulage du produit (M) ; les premiers moyens (16) étant soutenus à une certaine hauteur par un bâti interne (15) qui soutient le moule (S) et fonctionnant de façon coordonnée sur chacune des parties latérales (3, 4).
12. Machine selon la revendication 1, **caractérisée en ce qu'elle** comprend des seconds moyens (17) pour pré-ouvrir au moins les deux parties latérales (3, 4) du moule (S), dans une direction à angles droits par rapport à l'axe (X) pendant une étape de démoulage du produit (M) ; les seconds moyens (17) étant soutenus à une certaine hauteur par un bâti interne (15) qui soutient le moule (S) sur la machine (1) et fonctionnant de façon coordonnée sur chacune des parties latérales (3, 4).
13. Machine selon la revendication 5, **caractérisée en ce que** la partie supérieure du moule (2), ou partie supérieure, est équipée de goupilles (2p) dépassant de ses extrémités avant et arrière, formant les moyens auxiliaires (9), pour pouvoir la prélever et la déposer avec une unité robotisée (10) afin de la rapprocher et de l'éloigner des autres parties (3, 4, 5) du moule (S), lorsque le produit (M) est démoulé et/ou pour changer tout le moule sur la machine (1), et respectivement, pour reconfigurer tout le moule (S) dans la position fermée.
14. Machine selon les revendications 11 et 12, **caractérisée en ce que** les parties latérales (3, 4) du moule (S) sont équipées d'unités de chariots inférieurs (18) situées sur des bases respectives (19) sur le bâti (15) de la machine (1) et pouvant leur permettre de se déplacer latéralement ou de se déplacer dans les deux directions à angles droits par rapport à l'axe (X), sous l'action des premiers moyens de retenue (16) ou des seconds moyens de pré-ouverture (17) ; chacune des parties latérales (3, 4) du moule (S) étant munie de goupilles (3p, 4p) dépassant de ses extrémités avant et arrière, formant les moyens auxi-

liaires (9), pour pouvoir la prélever et la déposer avec une unité robotisée (10), afin de la rapprocher et de l'éloigner des autres parties (2, 5) du moule (S), lorsque le produit (M) est démoulé et/ou pour changer tout le moule sur la machine (1), et respectivement, pour reconfigurer tout le moule (S) dans la position fermée.

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U (29), qui fait partie de la machine (1) et est monté pivotant sur une structure de montage (23) de la machine (1), de sorte à passer d'une position haute pour démouler le produit (M) à une position basse pour fermer le moule (S).

15. Machine selon la revendication 5, **caractérisée en ce qu'**une partie (5), ou base, du moule est équipée d'ailes latérales (20) pour permettre à la base (5) de reposer sur un bâti (15) de la machine (1) ; la base (5) étant munie de goupilles (5p) dépassant de ses extrémités avant et arrière, formant les moyens auxiliaires (9), pour pouvoir la prélever et la déposer avec une unité robotisée (10), afin de l'éloigner du, ou de la positionner sur le, bâti (15), lorsque tout le moule (S) est changé sur la machine (1). 10 15
16. Machine selon la revendication 1, **caractérisée en ce que** la partie (5), ou base, du moule (S) est munie de moyens (21) pour s'attacher rapidement à des unités accessoires d'alimentation et de drainage du fluide (22) sur le moule (S). 20 25
17. Machine selon la revendication 1, **caractérisée en ce qu'**elle comprend un bâti à portique externe (23) muni d'une pluralité de crochets saillants (24), sur lesquels la partie supérieure (2) et les parties latérales (3, 4) peuvent être mises en suspens par une unité robotisée (10) pendant l'étape de démoulage du produit (M). 30
18. Machine selon la revendication 8, **caractérisée en ce qu'**au moins trois portions de soutien externes (2', 3', 4') s'assortissent d'unités de déplacement auxiliaires respectives (26, 27) pour permettre une première position de démoulage ou changement de moule (S), dans laquelle les parties (2, 3, 4) du moule (S) sont éloignées les unes des autres, et une seconde position opérationnelle fermée, dans laquelle les parties (2, 3, 4) du moule (S) sont proches les unes des autres. 35 40
19. Machine selon la revendication 18, **caractérisée en ce que** les deux supports (3', 4'), associés aux parties latérales respectives (3, 4) du moule (S), sont raccordés aux unités auxiliaires respectives (26) comprenant des actionneurs respectifs (26a, 26b) pour déplacer de manière synchrone les deux supports (3', 4') ; les actionneurs (26a, 26b) étant assortis d'un premier bâti avant fixe en forme de U (28) qui fait partie de la machine (1). 45 50
20. Machine selon la revendication 18, **caractérisée en ce que** le support (2') de la partie supérieure (2), ou partie supérieure, du moule s'assortit d'une unité auxiliaire (27) comprenant un bâti avant en forme de 55

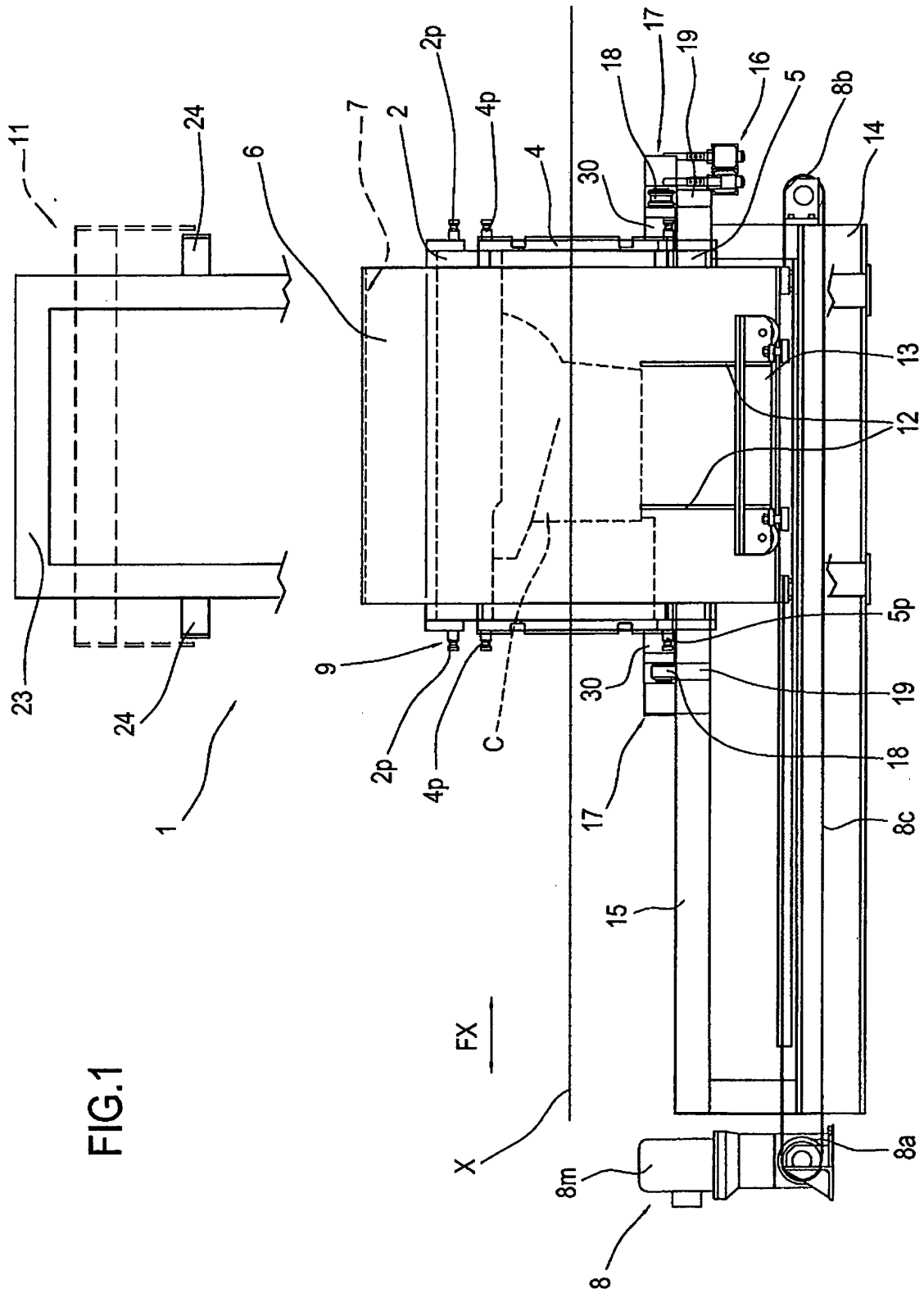


FIG.2

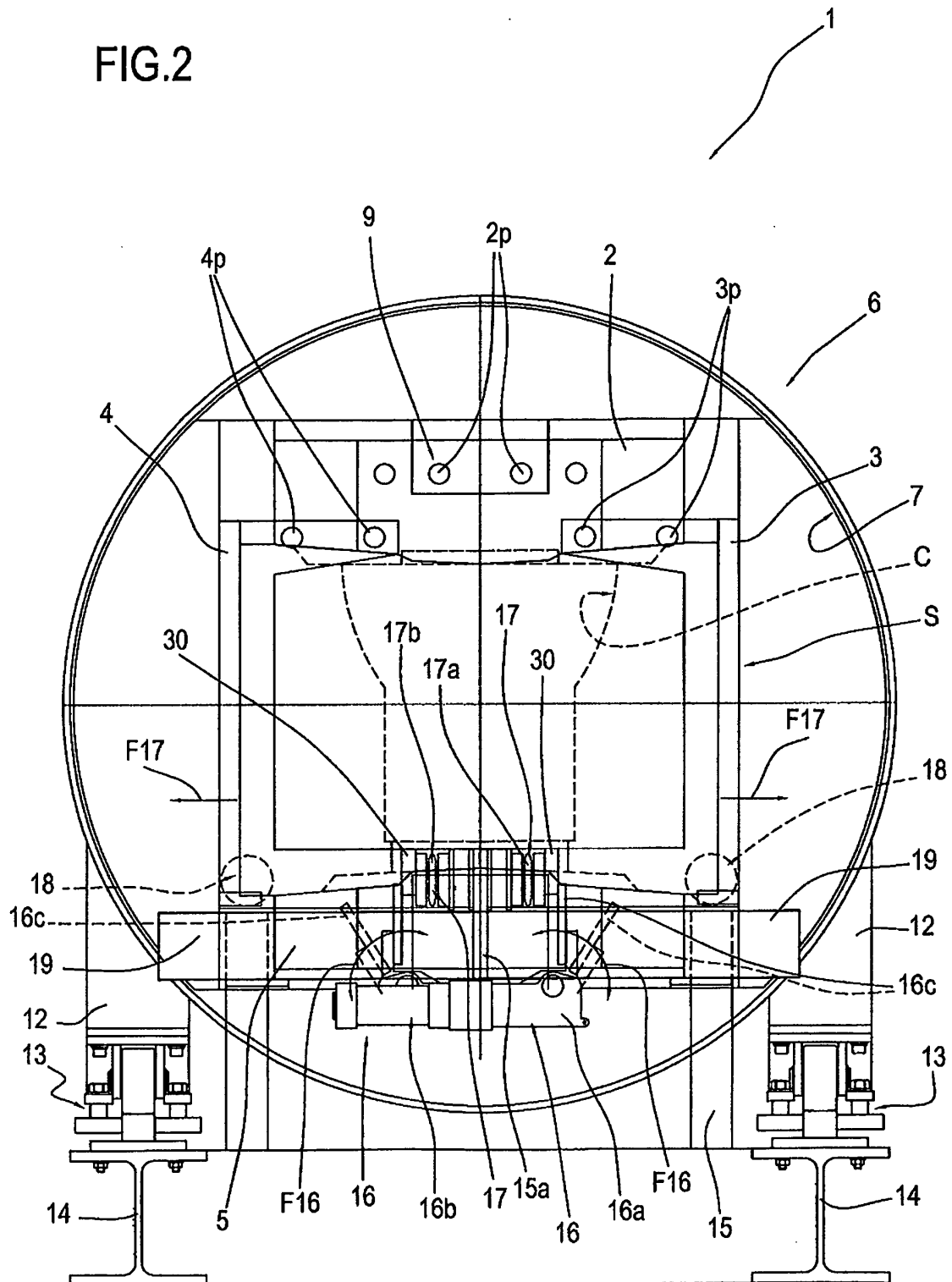
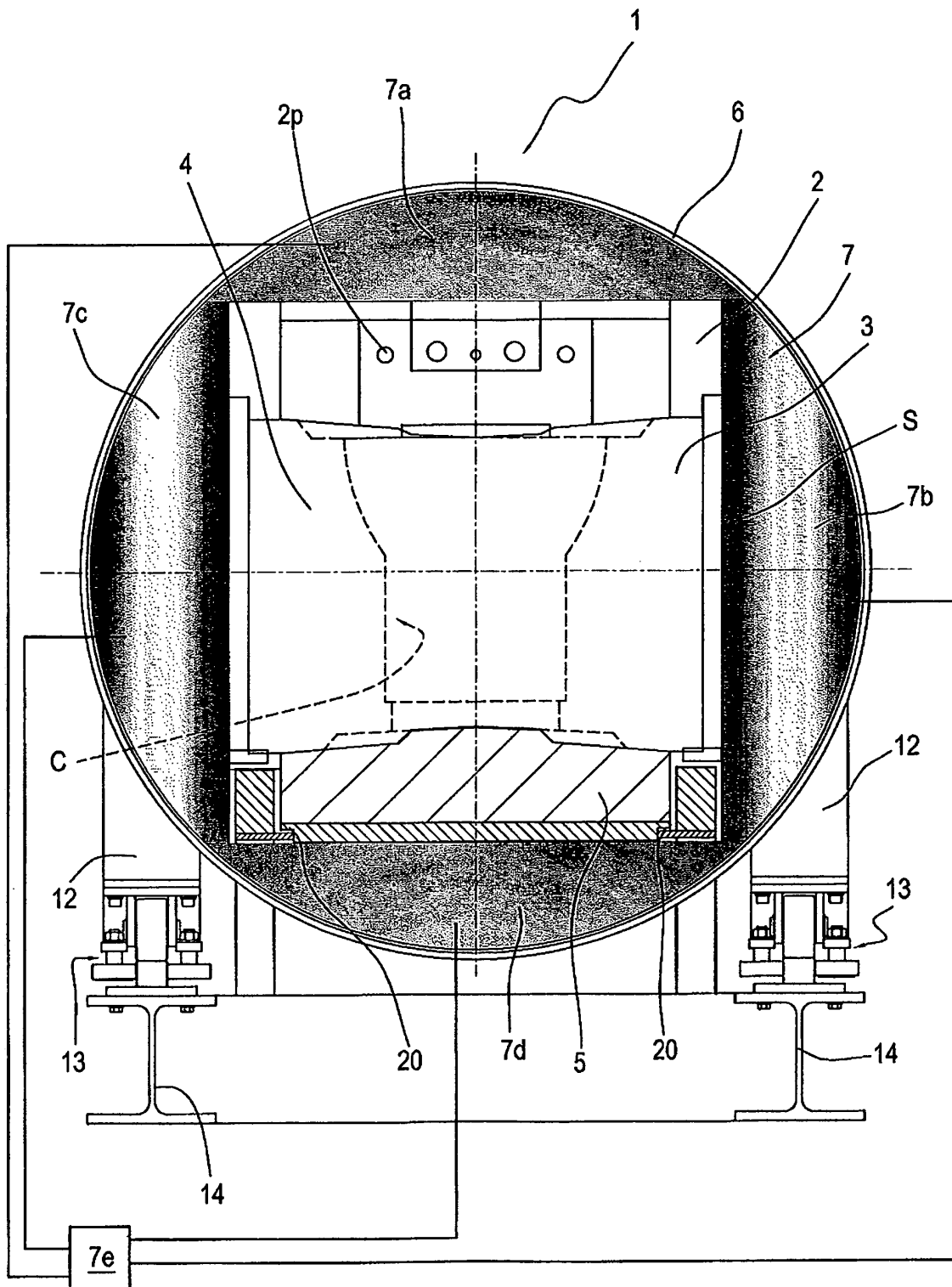
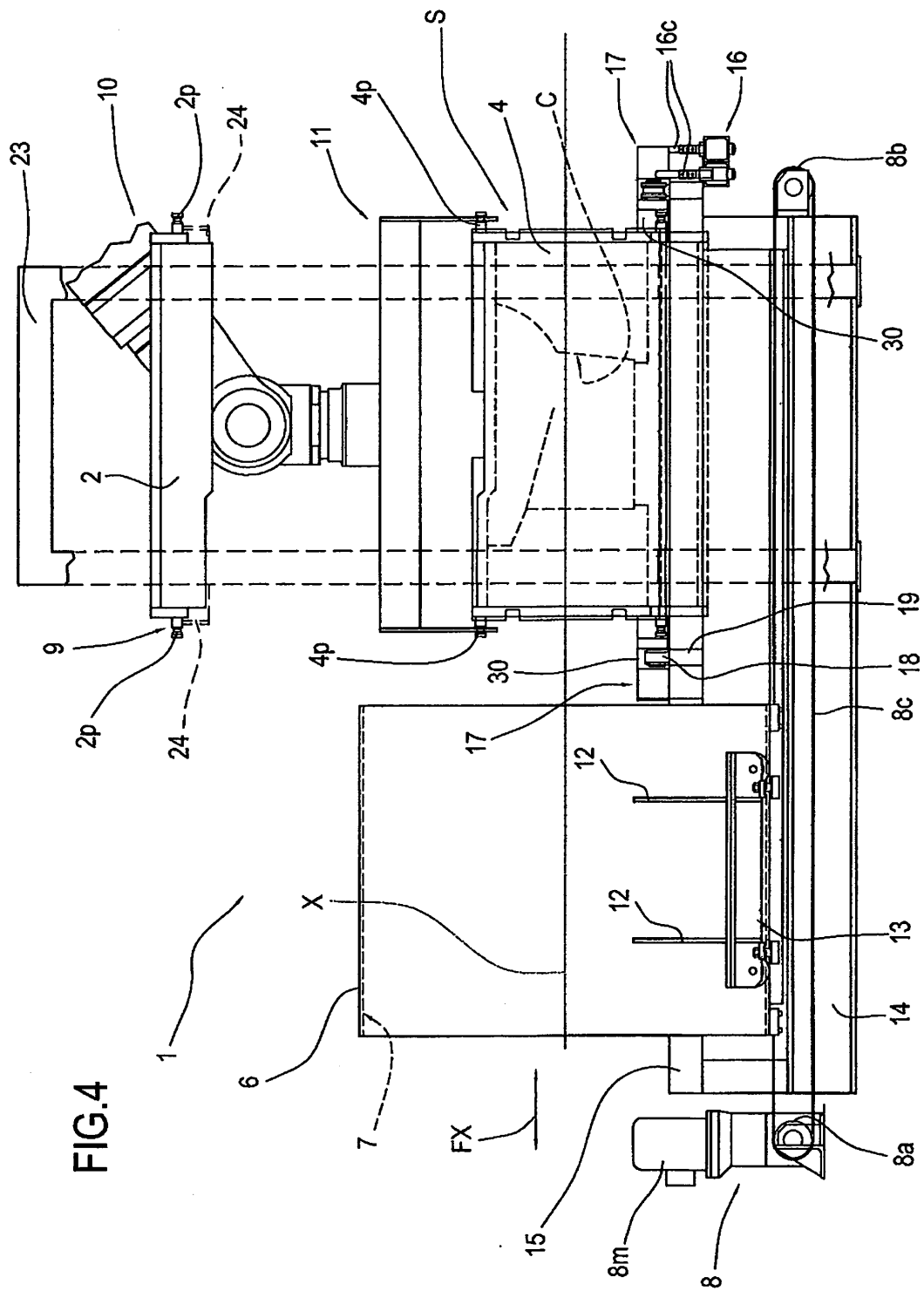
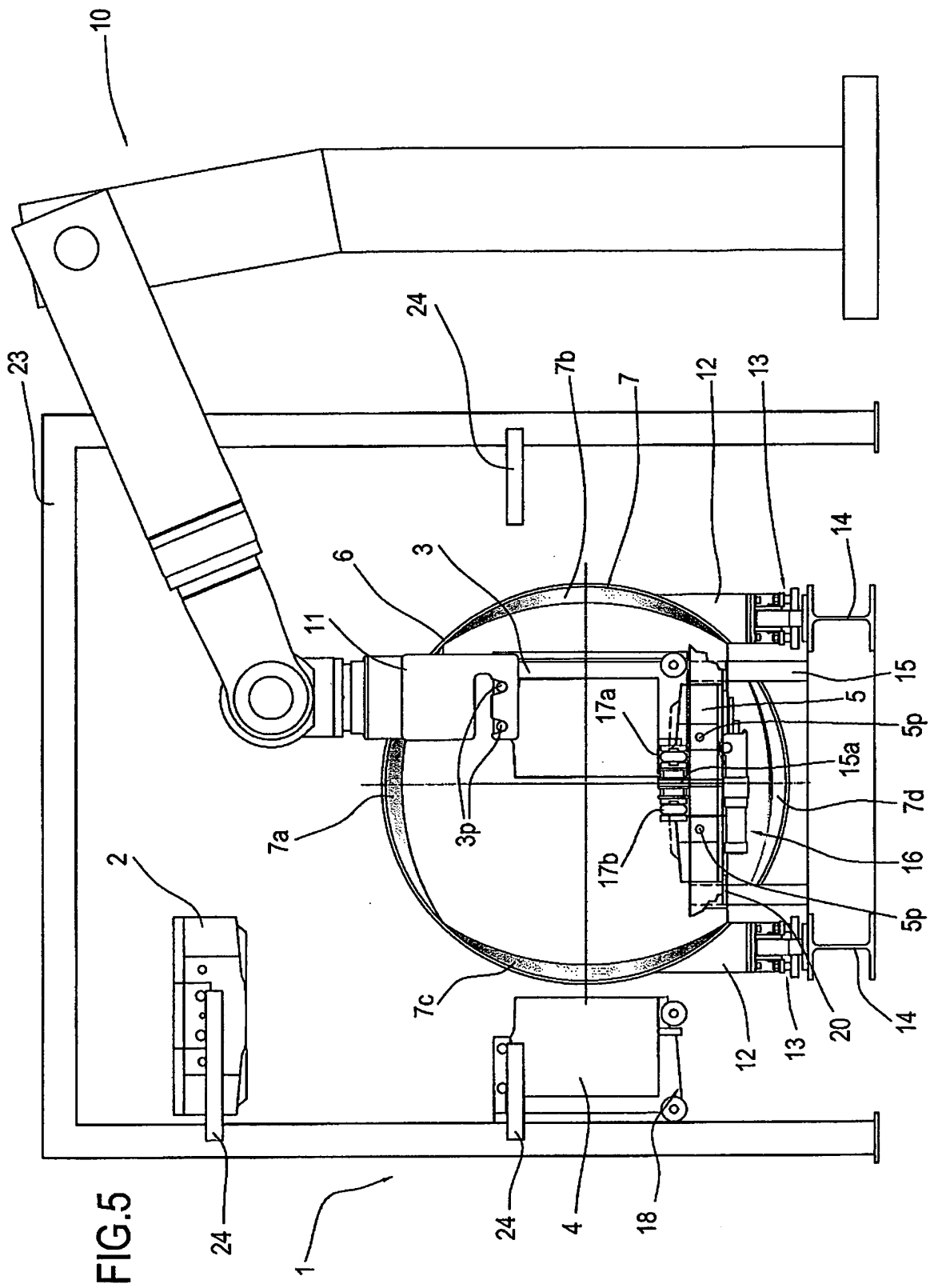
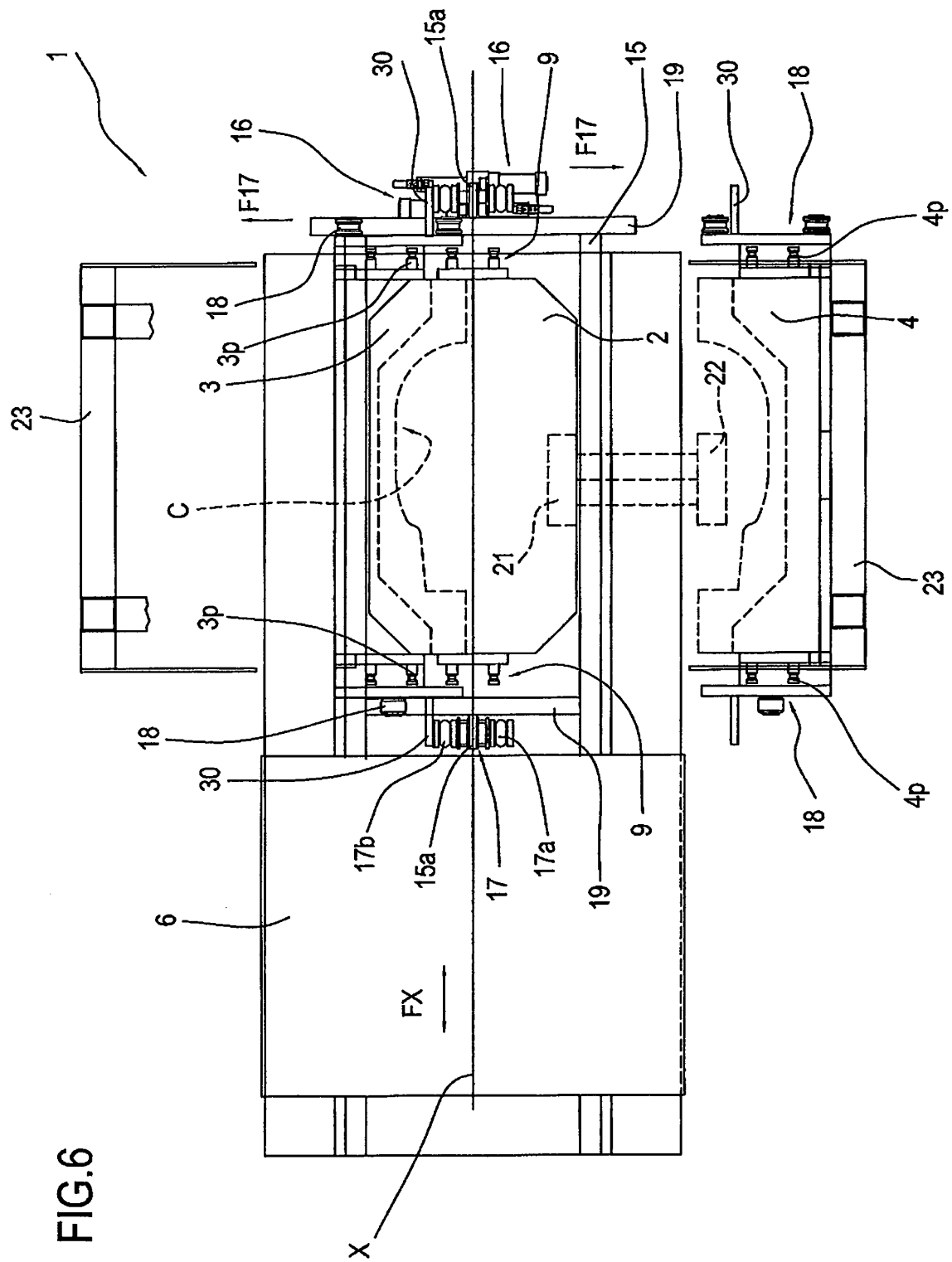


FIG.3









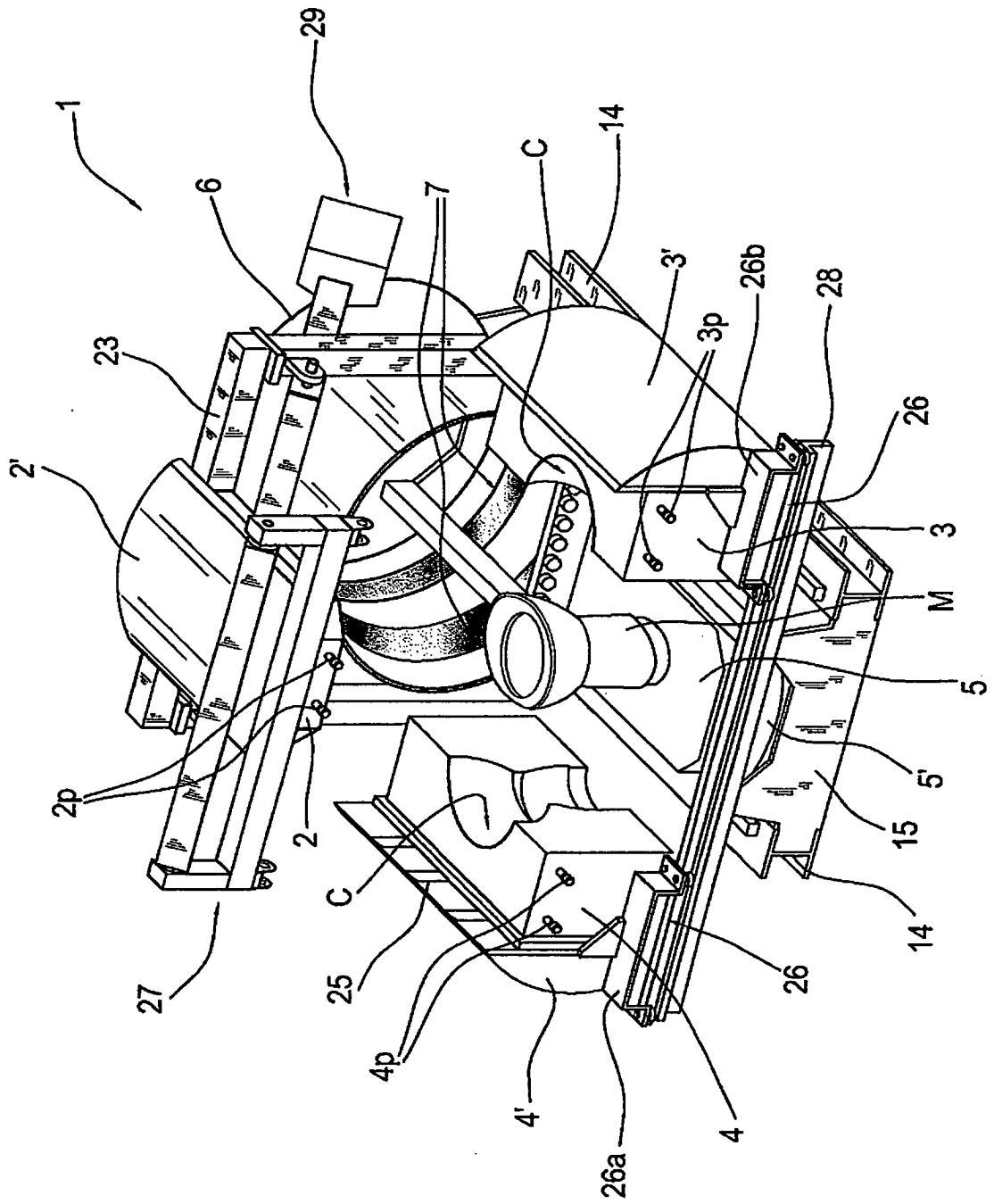


FIG. 7

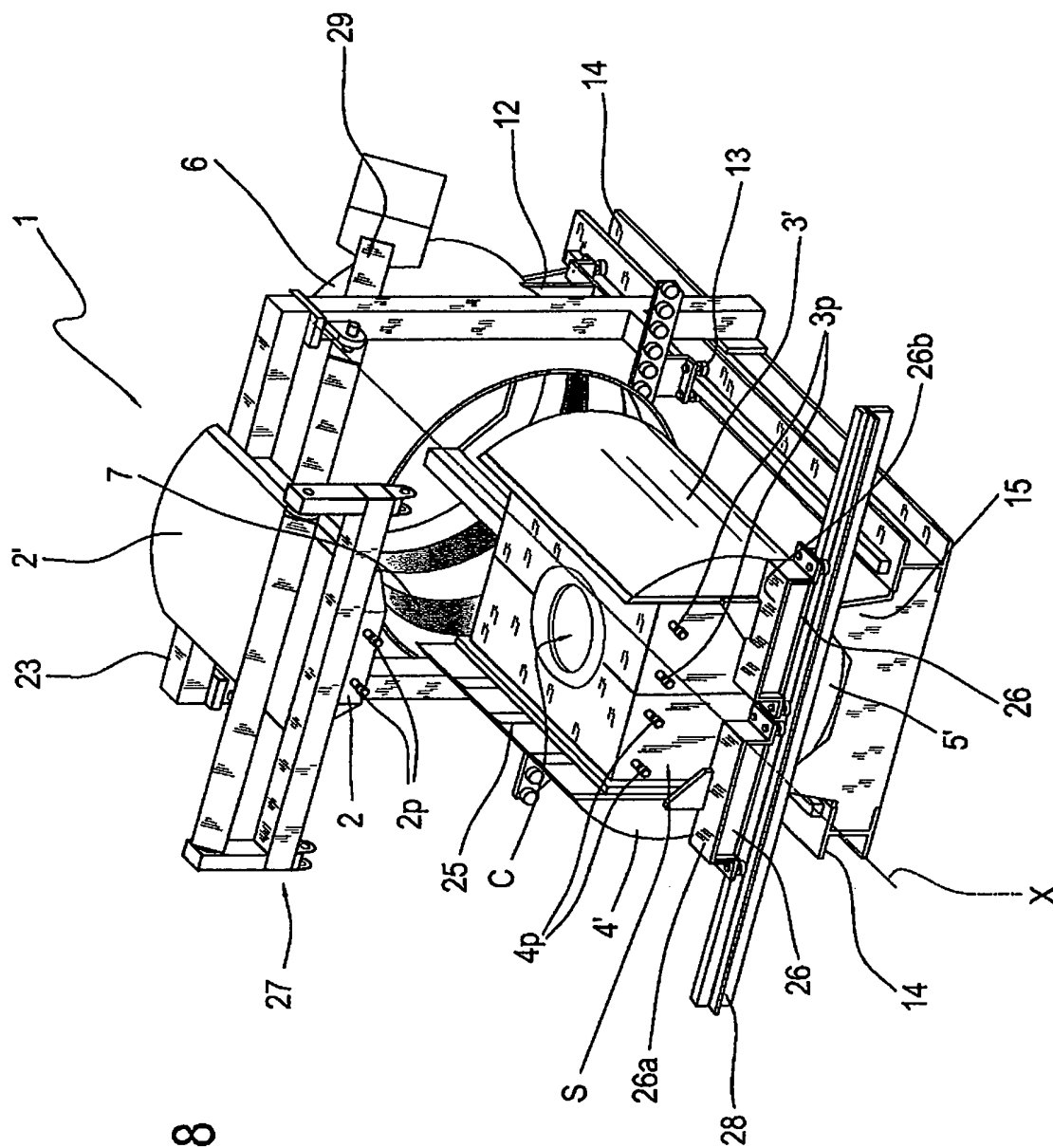


FIG. 8

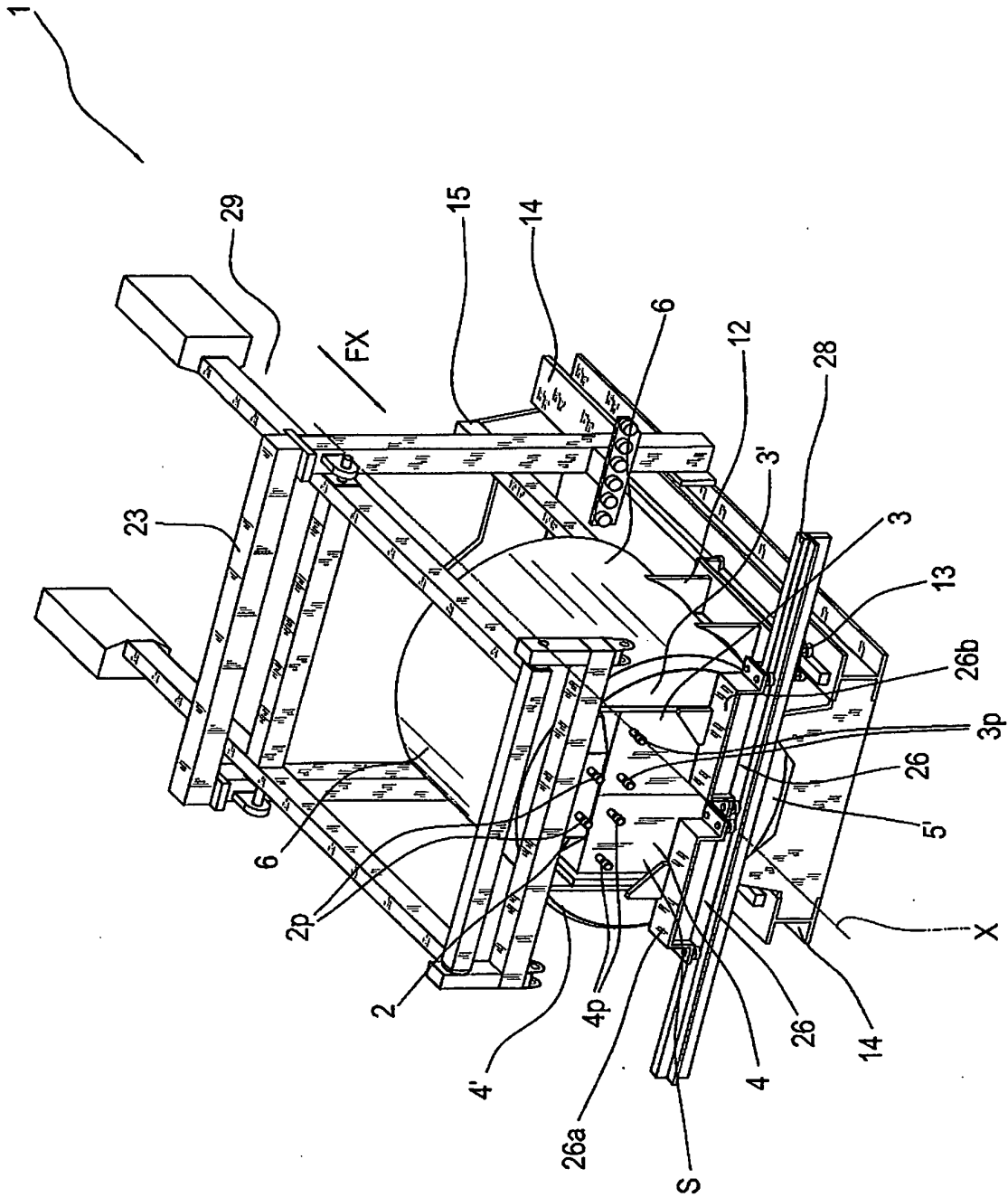


FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 885701 A [0010]
- FR 2602452 [0011]
- EP 1043132 A [0028]
- EP 1905561 A [0028]