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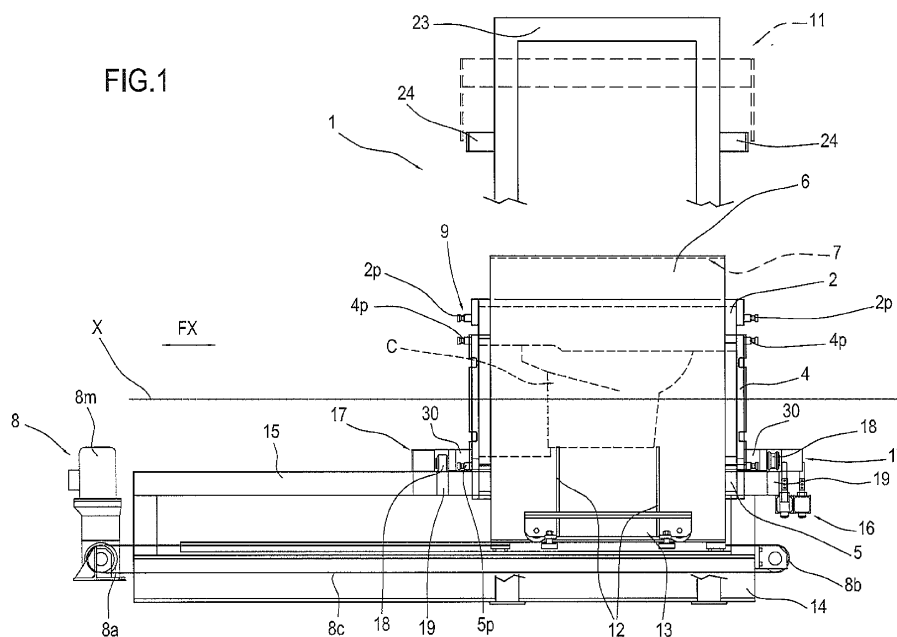
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(54) **Machine for the production of ceramic products.**

(57) A machine (1) for the production of ceramic products (M) comprises at least: a mould (S) made up of at least four parts (2, 3, 4, 5) 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; the means (6, 7) having a tubular shaped, open-ended body, 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; and movement means (8) act-

ing 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, horizontal movement axis (X) between a first, non-operating position, where the mould (S) and the clamping and containing means (6, 7) are apart, and a second, operating position, where the mould (S) and the clamping and containing means (6, 7) are matchingly coupled inside one another.

FIG.1



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. It is therefore an aim of this invention to overcome the above mentioned disadvantages by providing a machine for the production of ceramic sanitaryware 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 specifications 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 contain-

ing 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 and may be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

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 clamp-

ing 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') 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).

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 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); 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** 5
in that the two supports (3', 4'), associated with the
respective side parts (3, 4) of the mould (S), are con-
nected to respective auxiliary units (26) comprising
respective actuators (26a, 26b) for synchronously
moving the two supports (3', 4'); the actuators (26a, 10
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, 15
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 struc-
ture (23) of the machine (1) in such a way as to swing
between a raised position for demoulding the product 20
(M) and a lowered position for closing the mould (S).

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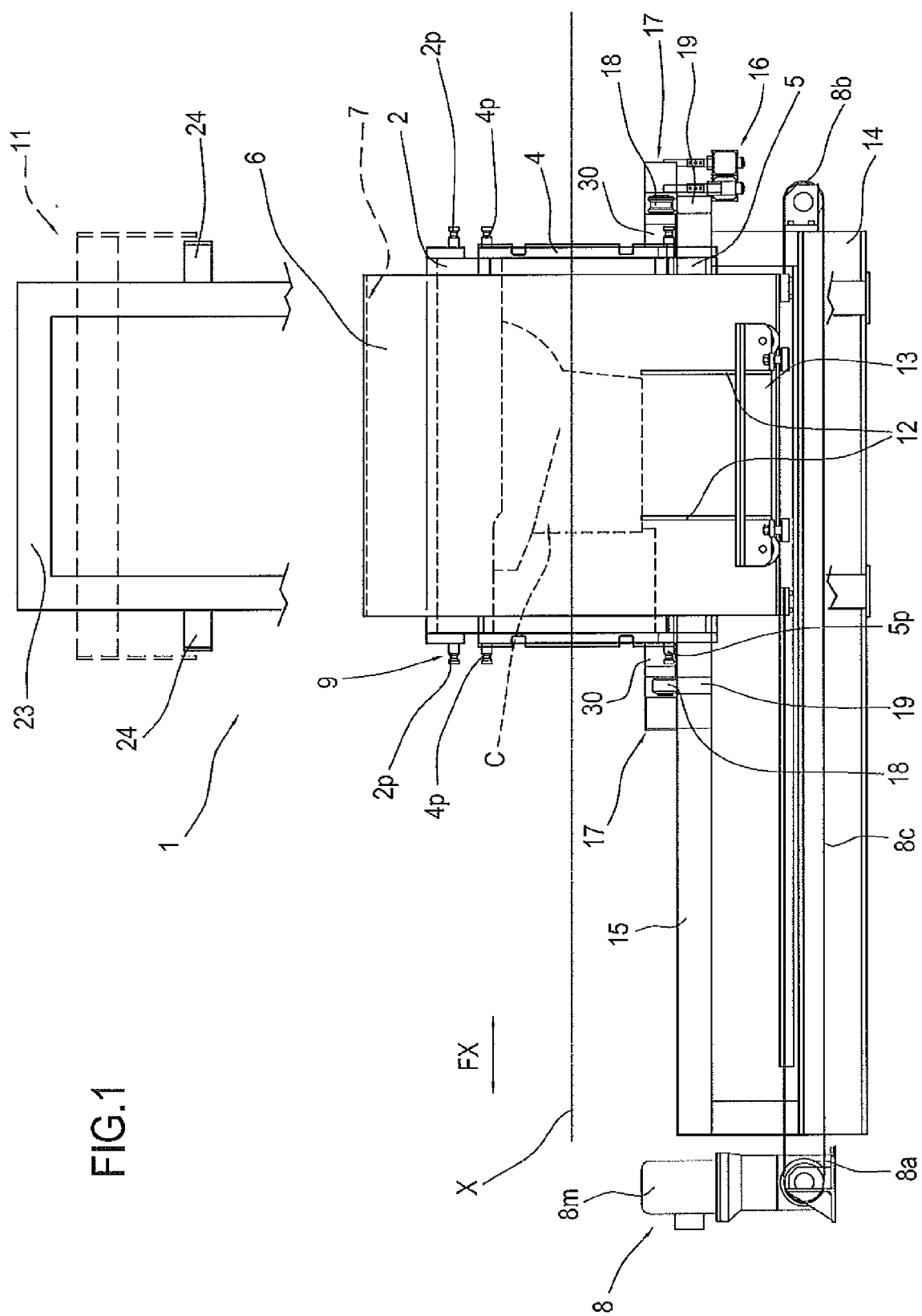


FIG.1

FIG.2

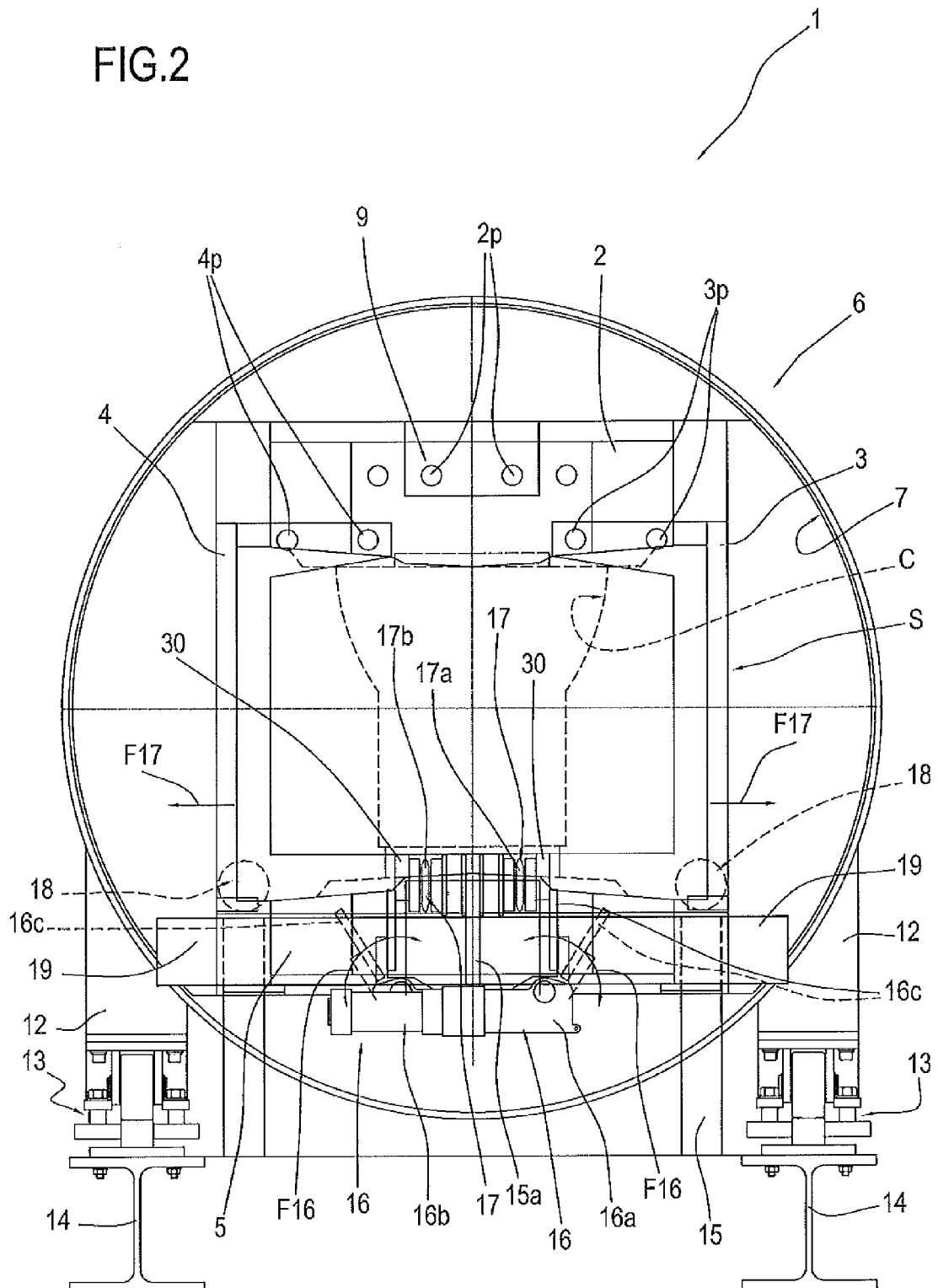
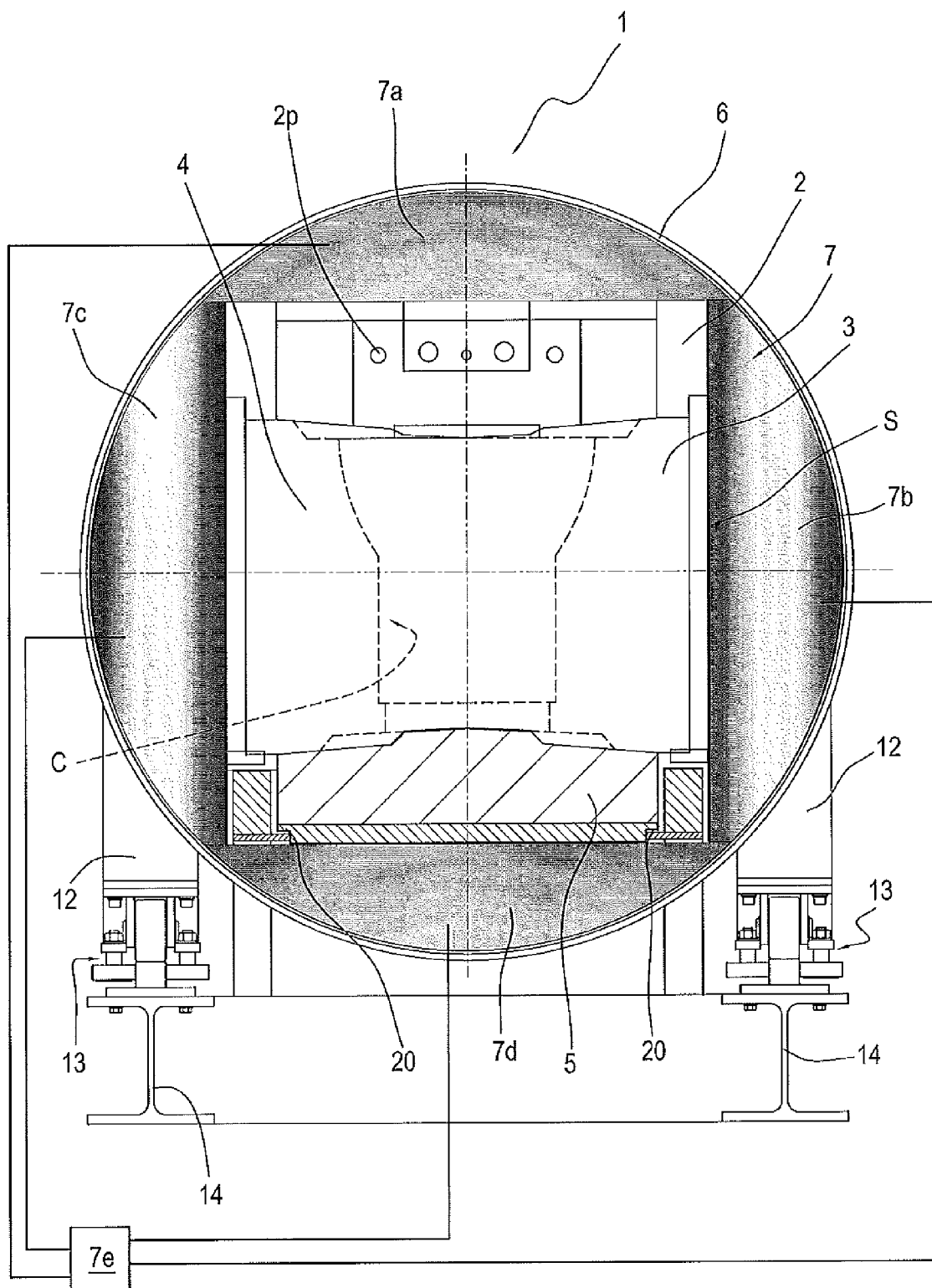
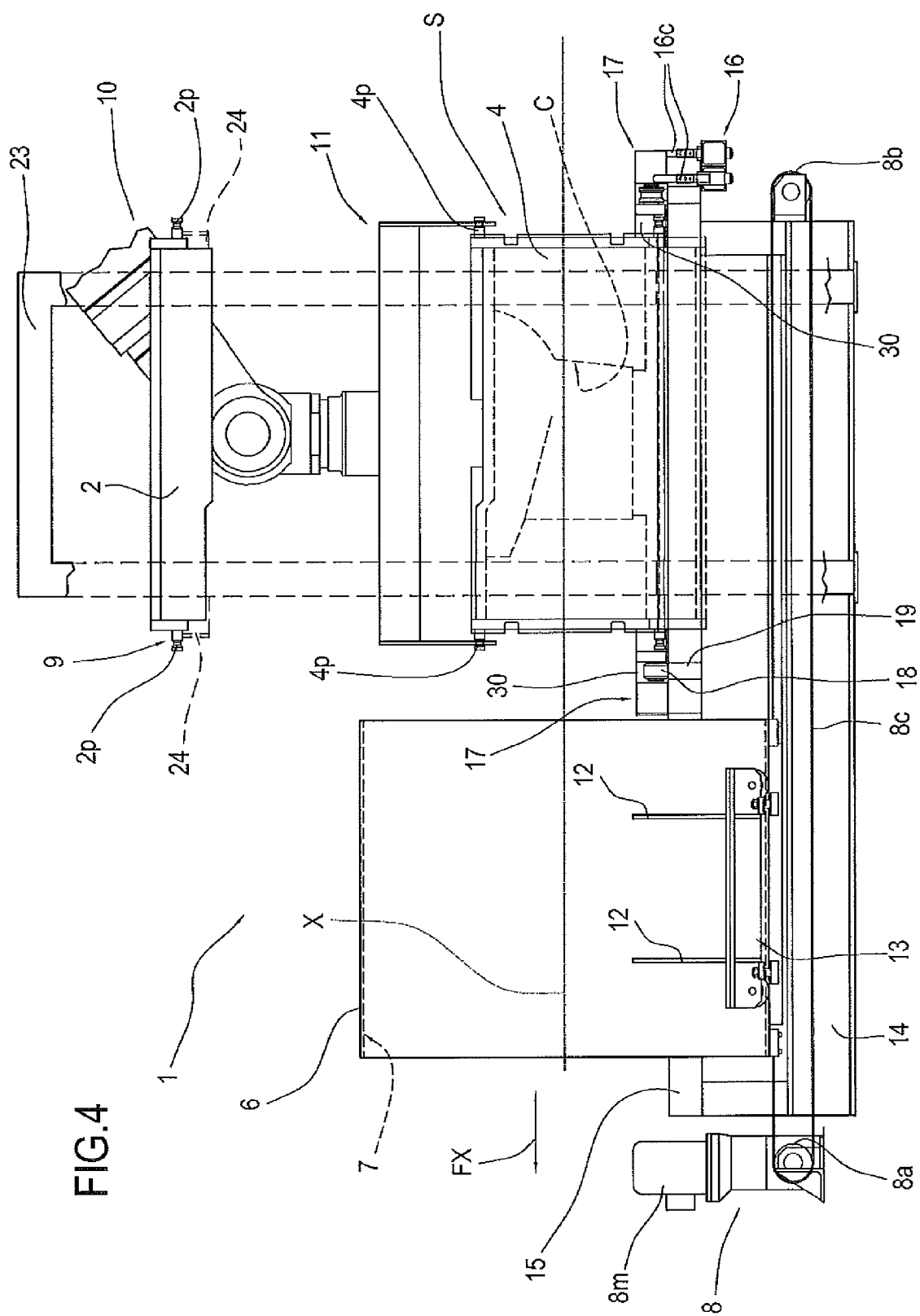
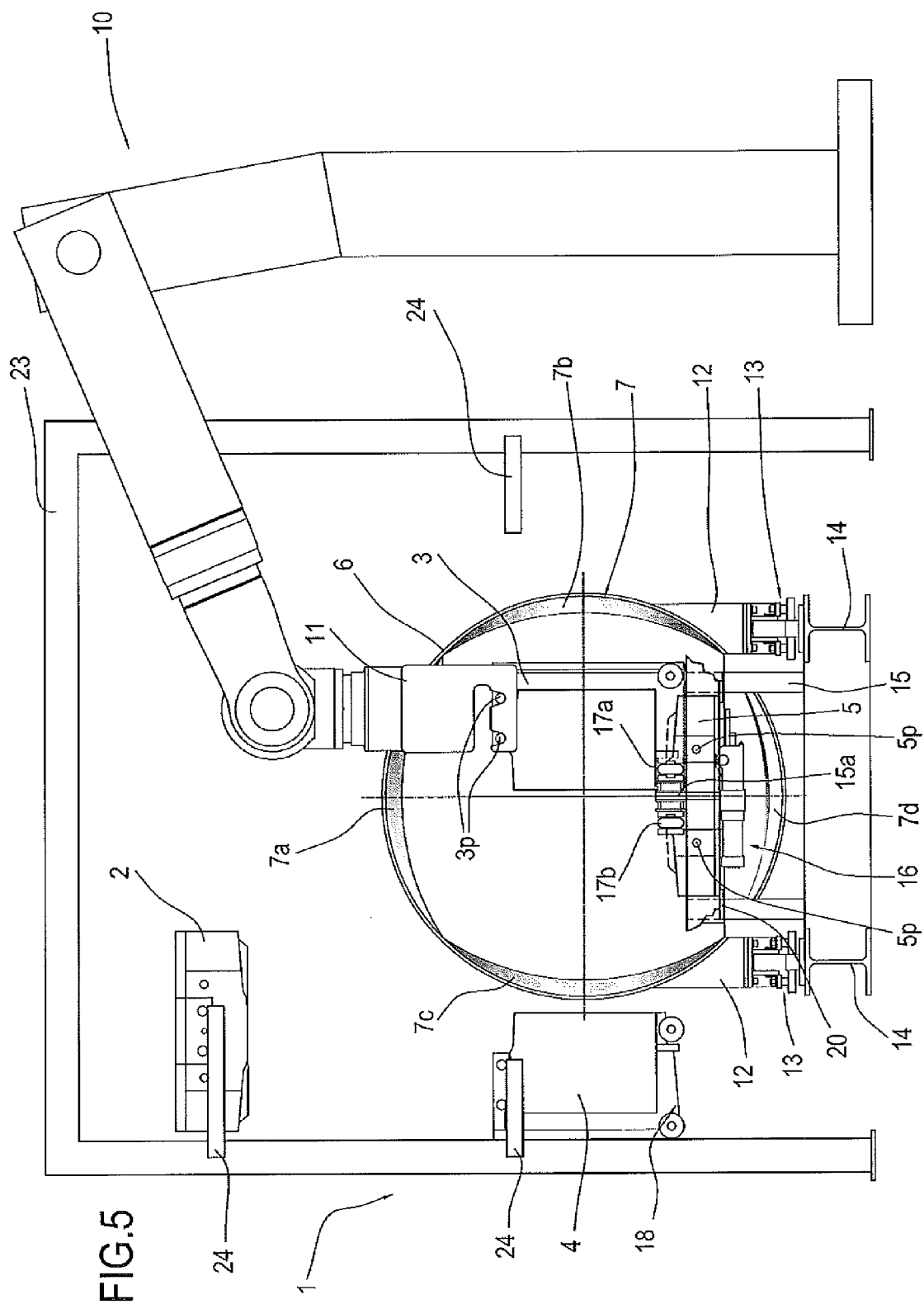
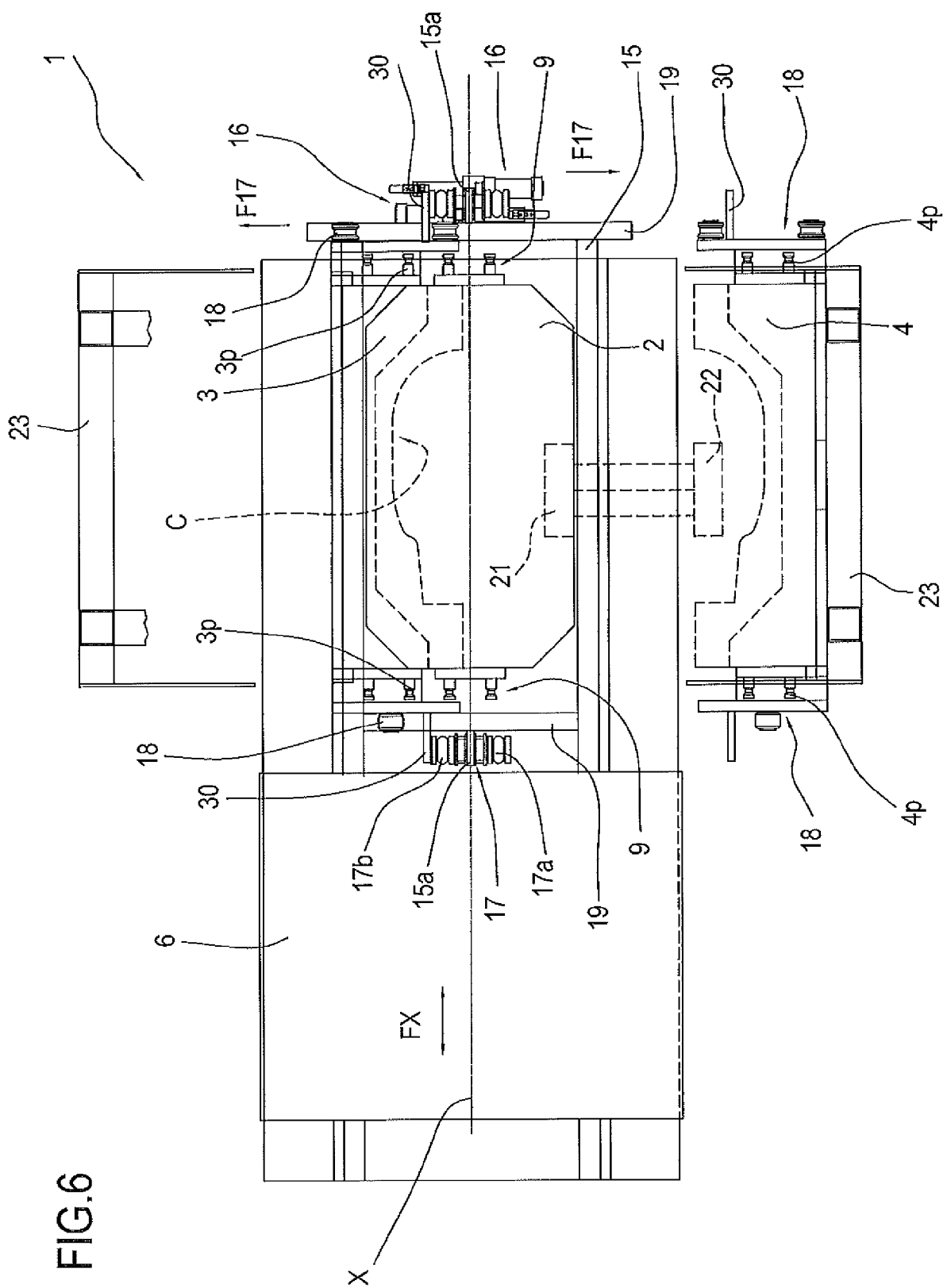


FIG.3









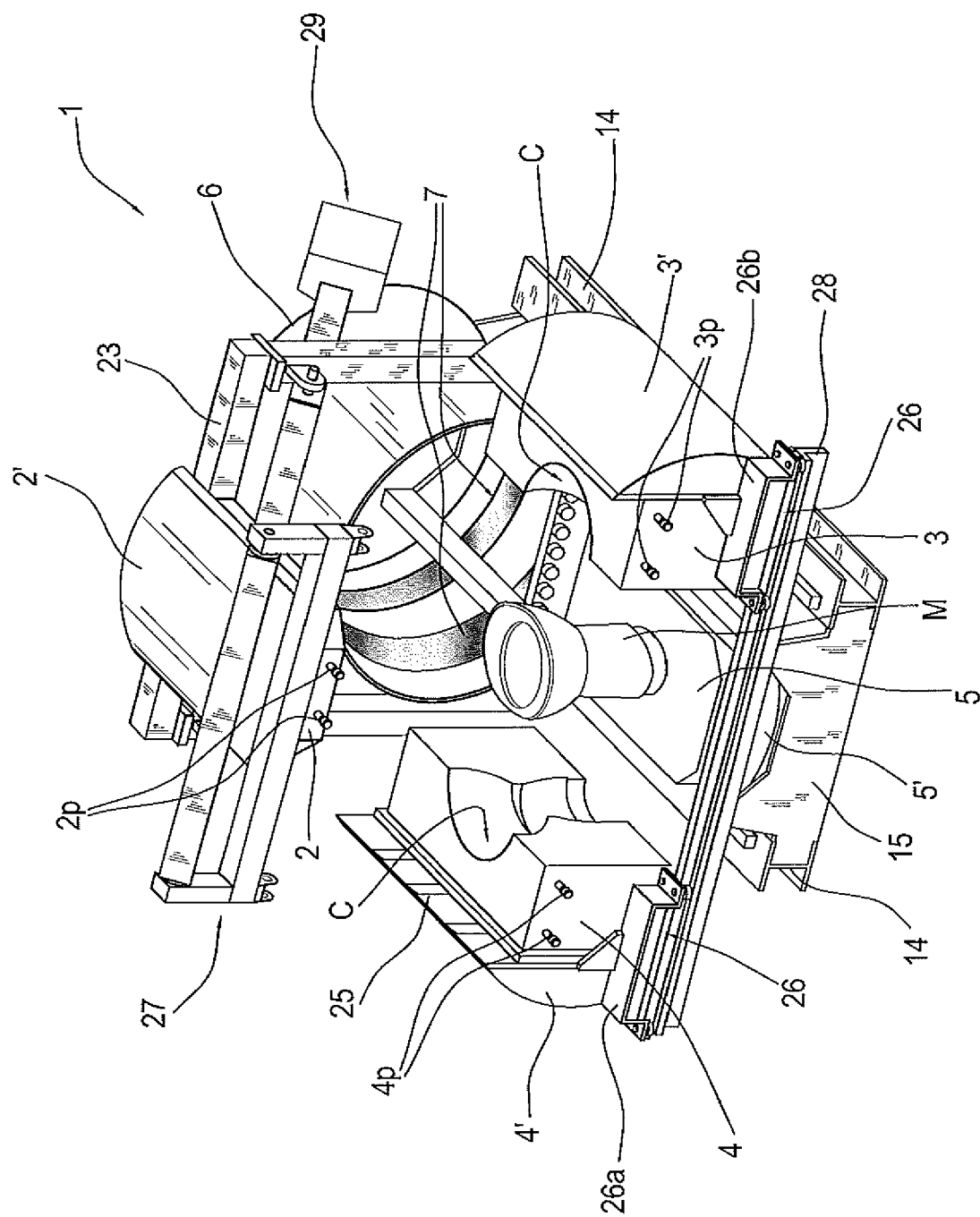


FIG. 7

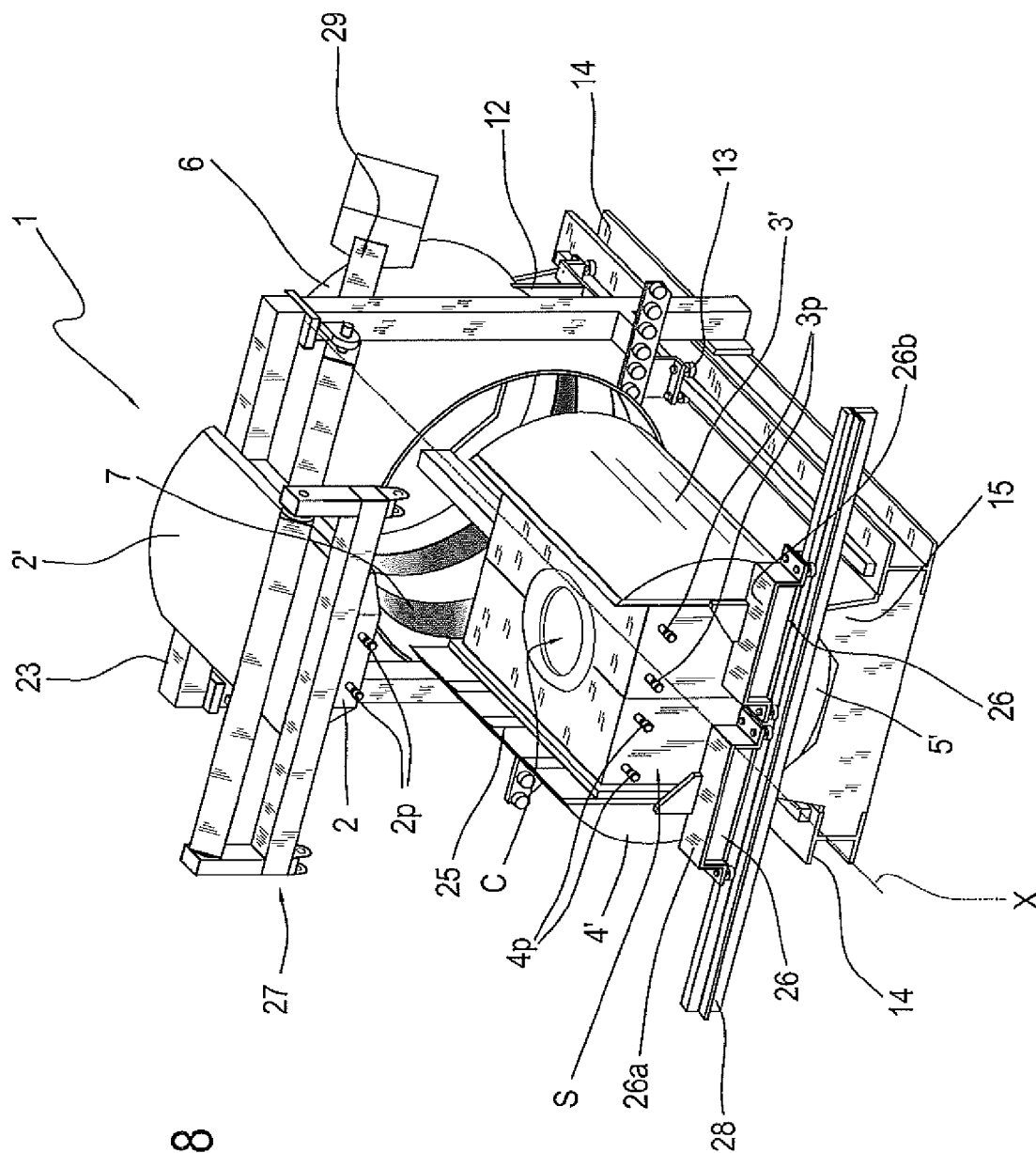


FIG. 8

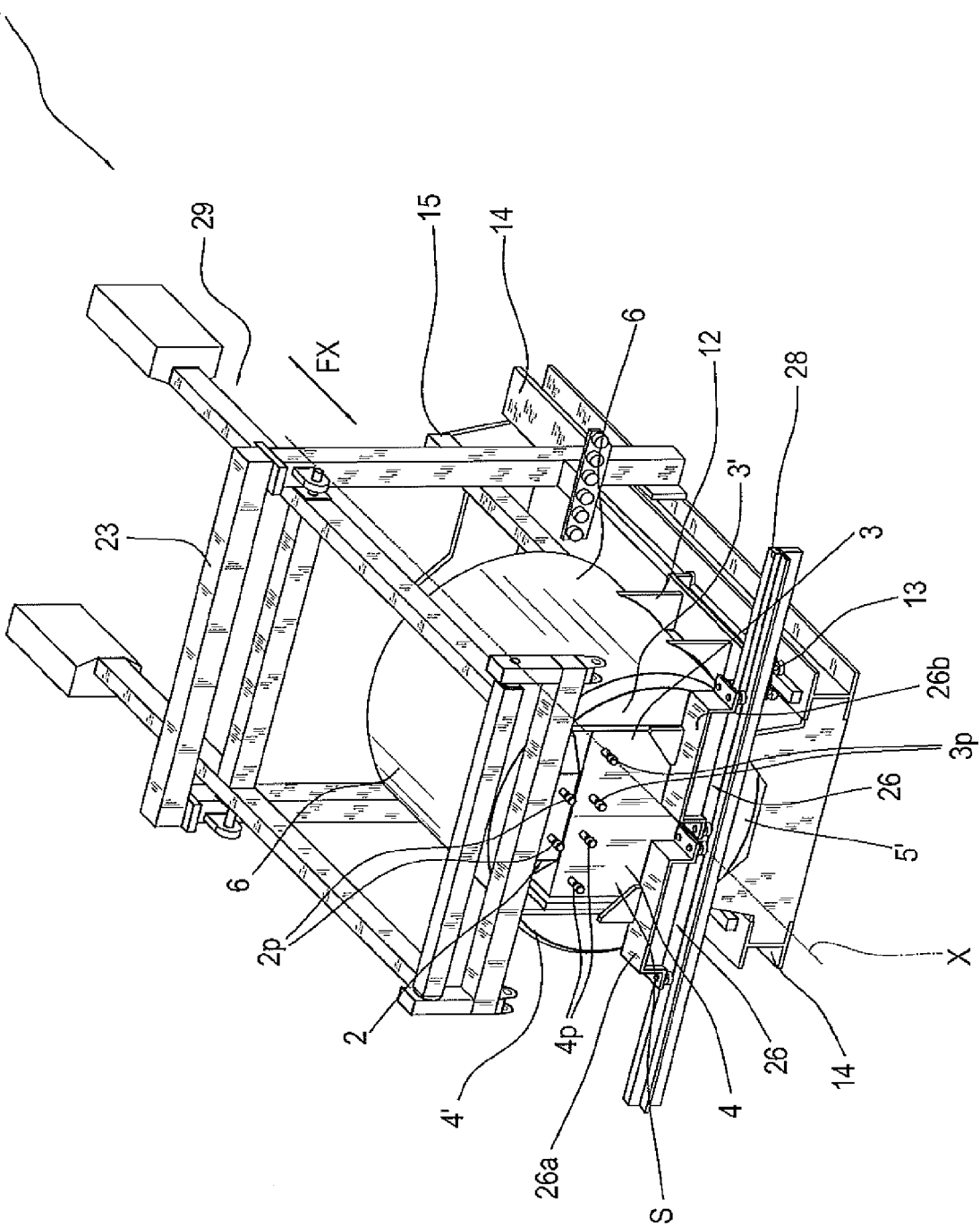


FIG. 9



EUROPEAN SEARCH REPORT

Application Number
EP 11 15 7733

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 May 2011	Examiner Voltz, Eric
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EPO FORM 1503 03.82 (P04C01)

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EP 11 15 7733

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