

Description

[0001] The present invention relates to a system and method for manufacturing green bricks from clay. The invention also relates to a releasing device and a mould container with which the green bricks can be manufactured.

[0002] Devices for manufacturing green bricks from clay are known wherein a large number of mould containers for filling with clay are arranged on a chain conveyor. The mould containers are filled with clay from above and, at the moment that the mould containers are turned over during the rotating movement of the chain conveyor, the clay in the mould containers is released and comes to lie on receiving plates. These receiving plates are then transferred by a further conveyor to a drying installation, where the bricks are further treated. Such a device can for instance be deemed known from EP-0 917 938 of applicant.

[0003] Although the known devices are suitable for manufacturing large quantities of bricks, they are less suitable when it is wished to manufacture only small series of bricks.

[0004] For the manufacture of small quantities of special green bricks, the green bricks will in practice have to be filled and released manually. This is not only labour-intensive, but it also has an impact on the health of the operatives. Especially in the case of relatively large green bricks, such as floor tiles or paving stones, the mould containers are for instance so heavy that repeated turning thereof to release the bricks can cause health problems.

[0005] It is an object of the invention to provide a system and a method for manufacturing relatively small series of green bricks, particularly paving bricks, building bricks, paving stones, floor tiles and so on, wherein the above stated drawbacks are obviated.

[0006] It is also an object to provide a system which is compact, occupies a limited surface area and which is moreover relatively easy to transport.

[0007] It is a further object of the invention to enable flexible manufacture of green bricks. Flexible is herein understood to mean that it is possible to switch relatively quickly and simply between the production of different types of brick (bricks of different shape and/or dimensions, bricks requiring a separate post-and/or pre-treatment and the like).

[0008] According to a first aspect of the present invention, there is provided for this purpose a system for manufacturing green bricks from clay, comprising:

- a circulating conveyor for transporting mould containers, above which mould container conveyor can be positioned a clay supplying device for arranging clay in at least one mould cavity in a mould container;
- a conveyor carrying transport plates for the purpose of transporting transport plates;

- a releasing device for removing a green brick from the at least one mould cavity of a mould container and placing thereof on a transport plate;

wherein the mould containers comprise a first part and a second part which is pivotable relative to the first part and provided with at least one mould cavity; and

wherein the conveyor is a chain conveyor, the chain of which is formed by the mutually coupled first parts of the mould containers; and

wherein the releasing device comprises pivoting means for reciprocally pivoting the second parts of the mould containers between a starting position in which the green brick is carried and an end position in which the green brick is released. By giving the mould containers a pivoting form, one or more mould containers can be pivoted each time they have been filled with clay and have optionally undergone a pre-treatment and post-treatment, whereby green bricks situated in the mould containers leave the mould containers under the influence of gravity and come to lie on a transport plate.

[0009] According to a preferred embodiment of the invention, the system comprises control means for intermittent driving of the mould container conveyor and for releasing a mould container each time the mould container conveyor stands still. When the conveyor has come to a standstill, the mould container positioned close to the releasing device is pivoted from the starting position to the end position so that the green brick is released from the mould container. Once the mould container has pivoted back again to the starting position, the conveyor is transported further over a determined distance. This means that a new mould container, still filled with clay, comes to lie close to the releasing device, and the removal can be repeated for the new mould container.

[0010] According to a preferred embodiment of the invention the pivoting means comprise:

- a guide member extending over substantially a semicircular arc;
- a travelling carriage displaceable along the guide member;
- one or more carriers which are provided on the travelling carriage and with which one mould container at a time can be carried along to cause the relevant mould container to pivot.

[0011] According to a further preferred embodiment of the invention, the travelling carriage is displaceable with a chain drive provided with an electric motor. The chain herein engages on the travelling carriage, whereby this latter is displaceable up and downward along the guide member, while the electric motor can be disposed in stationary position. This ensures an operation of the travelling carriage which is simple and not very susceptible to malfunction.

[0012] According to another preferred embodiment, a

mould container comprises an open side leaving the mould cavity clear, wherein in said starting position and end position the open side is directed respectively upward and downward. This means that in the end position the mould cavity is unloaded under the influence of gravity and the green brick can finally come to lie on the transport plate.

[0013] According to another preferred embodiment of the invention, the releasing device comprises:

- a cover member with which the mould cavity of the mould container can be covered;
- second pivoting means for pivoting the cover member substantially synchronously with the mould container;
- displacing means for displacing the cover member, in the end position of the mould container, between a position closing the mould cavity and a position leaving the mould cavity clear. The cover plate ensures that the green brick is not released too quickly from the mould cavity during the pivoting. Immediately from the beginning of the pivoting movement of the mould container or only when the mould container has pivoted so far that there is a danger of premature unloading, is the open side of the mould container covered by the cover member, such as for instance a cover plate closing the mould cavities, until the mould container has reached its end position. In the end position the cover member is pulled away from under the mould container by the displacing means, so that the green brick comes directly to lie on the transport plate.

[0014] The system further preferably comprises displacing means for displacing the transport plate downward and upward. The height over which the transport plate is displaced is minimally the height of the green brick, optionally increased by the height of the cover member. It is hereby possible to convey the transport plate forward without there being any danger of the green brick being snagged behind an edge of the mould container.

[0015] Other preferred embodiments can also be envisaged in which the mould container is first pivoted back and the transport plate then conveyed, or in which the pivoting-back movement of the mould container and the conveying movement of the transport plate take place simultaneously.

[0016] In a preferred embodiment the control of the transport plate conveyor is adapted to displace the transport plates intermittently. During the time interval in which the transport plates are stationary a green brick, or a set of green bricks in the case of more than one mould cavity, are placed on the transport plate. The control of said conveyor is herein adapted to convey the relevant transport plate in each case over a preset distance. The distance is herein set subject to the dimensions of the mould cavity of the mould container which

is next to be pivoted at that moment.

[0017] The set distance is preferably proportional to the longitudinal dimension of the mould cavity of the relevant mould container. The distance is therefore relatively small when the dimensions of the mould cavity of a mould container are relatively small and the distance is relatively large when the dimensions of the mould cavity of the mould container are relatively large. This provides an improved utilization of the surface of the transport plate.

[0018] The distance can otherwise also be made subject to the shape and the length of the transport plate. At the transition between successive plates a greater distance may for instance be necessary to allow the green bricks to be set down at a correct position on the transport plate.

[0019] In order to limit the floor area occupied by the system, the mould container conveyor preferably comprises a substantially vertically disposed chain conveyor, and the chain conveyor and the transport plate conveyor extend substantially parallel to each other.

[0020] According to another aspect of the invention, there is provided a mould container, comprising:

- a carrier mountable on a conveyor,
- a container arranged exchangeably on the carrier and provided with one or more mould cavities for holding clay;
- pivot means fixed to the carrier for pivoting the container laterally relative to the longitudinal direction of the conveyor. By embodying the mould container as an exchangeable container it is possible to prepare the conveyor quickly and easily for the manufacture of the desired form of brick.

[0021] Once the desired quantity of this form of brick has been manufactured, the conveyor can once again be modified quickly and easily for the manufacture of another form of brick. The carrier is therefore preferably suitable for arranging different containers provided with mould cavities of different dimensions. Green bricks of larger dimensions can be manufactured by for instance sliding out of the carrier a first container provided with relatively small mould cavities and sliding into the carrier a second container provided with relatively large mould cavities.

[0022] It is noted that when the dimensions of the mould cavities are varied, this relates not only to the length and width of the mould cavities but also to the number of mould cavities as well as the depth and/or the shape of the mould cavities in general. This means that bricks of a random size and shape can be manufactured.

[0023] According to a further aspect of the present invention, there is provided a method for manufacturing green bricks from clay, comprising of:

- transporting clay in a chain of mutually coupled

mould containers with a circulating mould container conveyor;

- supplying a transport plate;
- releasing the clay arranged in a mould container on-
to the supplied transport plate, wherein release
from the mould containers comprises the steps of:

- a) pivoting the pivotable part laterally from a
starting position in which a green brick is car-
ried to an end position in which a green brick is
released;
- b) pivoting the pivotable part back to the start-
ing position;
- c) displacing the transport plate;
- d) repeating steps a-c; and
- e) discharging the transport plate.

[0024] The method preferably also comprises of re-
peating steps a-c until the transport plate is optimally
loaded.

[0025] The transport plate can be uniformly loaded by
pivoting one mould container at a time laterally and
thereby releasing it, and displacing the transport plate
each time the mould container is released. The transport
plate is as it were loaded further until a sufficient degree
of loading is reached.

[0026] The conveyor belt is preferably displaced in-
termittently over a preset distance in each case. This
preset distance depends, among other factors, on the
size of the green bricks to be produced. In the case of
small green bricks a relatively large number of green
bricks can be arranged on a transport plate, while in the
case of large green bricks a relatively small number of
green bricks can be arranged on the transport plate.

[0027] When furthermore transport plates of different
dimensions, for instance of different lengths, are ap-
plied, these distances can also be modified. In the case
of for instance a small plate on which three rows of green
bricks can be placed, a subsequent transport plate must
be supplied each time three rows of green bricks have
been placed. For this purpose the transport plate is dis-
placed over quite a large distance and a new transport
plate is supplied. When however a longer transport plate
is used, four or five rows can for instance be placed one
after another. Once the transport plate has been dis-
placed through a predetermined fixed distance, in this
case five times, a greater displacement occurs in order
to discharge the transport plate.

[0028] Further advantages, features and details of the
present invention will be elucidated on the basis of the
following description of a preferred embodiment of the
invention. Reference is made in the description to the
annexed figures.

Figure 1 shows a schematic top view of a preferred
embodiment of a system for manufacturing bricks,
including the supply and discharge lines;
Figure 2 shows a schematic side view of the pre-

ferred embodiment of figure 2, including a clay sup-
plying device and excluding the releasing device;
Figure 3 shows a side view of the system of figure
2, as seen from the opposite side and including the
releasing device;

Figure 4 shows a cross-section at the position of
line IV-IV in figure 3; and

Figure 5 shows a side view of the system of figure
2, as seen from the same side and including the re-
leasing device.

[0029] Figure 1 shows a determined configuration of
supply lines for clay and transport plates (drying plates),
a system for forming green bricks (bricks) and discharge
lines for discharging the bricks to a kiln for further treat-
ment. Many alternative configurations can however be
envisaged.

[0030] A quantity of clay K is supplied via a conveyor
belt 1 in the direction of arrow P1, which clay then drops
via a clay mixer 3 into a clay filling device 4. Via clay
filling device 4 the clay passes into a mould container
conveyor (the operation of which will be set forth here-
inbelow) which is mounted on stationary frame 11 and
where the clay is brought into the desired shape. The
thus formed bricks are then transported (arrow P10, fig-
ure 2) and placed on drying plates 6. The drying plates
are supplied (arrows P2 and P3) via a conveyor, not
shown in figure 1, and discharged (arrow P4) in the di-
rection of a brick drying furnace after being provided with
bricks.

[0031] Figure 2 shows a side view of clay supplying
device 4 and a part of the system 5. Via a conduit 10
clay is intermittently guided from above into mould con-
tainers 17 of a mould container conveyor 12 intermit-
tently driven by an electric motor 19. Mould container
conveyor 12 is constructed from a left-hand chain wheel
13 and right-hand chain wheel 14 which are each pro-
vided with recesses 15. Rollers 16 can be received in
these recesses 15, which rollers are in turn mounted on
mould containers 17. Rollers 16 are guided along a rail
19. Mould containers 17 are furthermore connected to
each other (connection 18).

[0032] In the shown embodiments the chain conveyor
rotates to the right (P10), which means that a mould con-
tainer, once filled, is displaced to the right until it comes
to lie in the vicinity of right-hand chain wheel 14.

[0033] Before a determined clay-filled mould contain-
er reaches the right-hand chain wheel 14, this mould
container is released by a releasing device of the sys-
tem. A preferred embodiment of such a releasing device
is shown in detail in figures 3-5. The releasing device
has been omitted in figure 2 for the sake of simplicity.

[0034] The releasing device serves to turn over the
relevant mould container such that the green brick cre-
ated in the mould container comes to lie in correct man-
ner on a drying plate.

[0035] Figure 4 shows a cross-section of the system,
in which some parts of the system have been omitted

for the sake of clarity. The figure shows that mould containers 17 consist of a first part 31 on which rollers 16 are mounted and a part 32 pivotable relative to first part 31 using a pivot 20. The mould cavities are provided in the pivotable part.

[0036] On the underside of mould container conveyor 12 a rail 21 arranged fixedly on frame 11 functions as support for a protrusion 22 on the pivotable part 32 of mould container 17. Rail 21 hereby prevents the mould container from pivoting downward at this position. On the upper side of mould container conveyor 12 the protrusion 22 functions as carrier element for a travelling carriage 33 which can displace along a semicircular arc 28 extending transversely of the longitudinal direction of conveyor 12. Travelling carriage 33 is provided with rollers whereby the travelling carriage is displaced along arc 28. The drive of travelling carriage 33 is embodied as a system of chains and an electric motor 34. As travelling carriage 33 is displaced in counter-clockwise direction (arrow P11 in figure 4) the mould container pivots therewith from the starting position shown in the right-hand part of figure 4 until it reaches an end position shown in the left-hand part of figure 4.

[0037] In order to prevent clay situated in mould container 17 from falling out of the mould container halfway along, there is provided a cover plate 25 which co-displaces with mould container 17. Cover plate 25 is displaceable by means of a second travelling carriage 26 which can be displaced over a second semicircular arc 27 using rollers. The starting position of cover plate 25 is shown in the right-hand part of figure 4. When mould container 17 is rotated to the left through an angle of about 20 degrees from this position, the upper side of mould container 17 comes into the vicinity of cover plate 25. At that moment the travelling carriage 26 of cover plate 25 is activated and mould container 17 and cover plate 25 will perform a combined rotation until the end position shown in the left-hand part of figure 4 is reached. In this position cover plate 25 ensures that the clay cannot be released from the mould container.

[0038] In the end position the cover plate 25 is situated directly on or just above transport plate 6. A lift cylinder 30 then pulls cover plate 25 from under the mould container 17 so that the shaped clay comes to lie directly on drying plate 6. The retracted position of cover plate 25 is shown in figure 3.

[0039] Drying plate 6 is then displaced downward. For this purpose a part of the drying plate conveyor 23 takes a vertically movable form. After transport plate 6 has thus been placed lightly downward, cover plate 25 and mould container 17 return to their starting position. Once they have returned to the starting position, or already during the return transport thereof, the transport plate is once again displaced upward into its starting position and displaced in the direction of arrow P10, so that space is created for placing further bricks.

[0040] The distance over which this latter displacement takes place depends on the dimensions of the

mould container 17 being handled at that moment, or rather on the dimensions of the mould cavities in the mould container. When large mould cavities are applied and therefore large bricks are being manufactured, the transport plate will have to be displaced over a greater distance than in the opposite case. By thus adjusting the transport distance to the size of the bricks for manufacturing, the surface area available on a transport plate can be utilized optimally. This is shown schematically in figure 1.

[0041] It is for instance possible to arrange three relatively large bricks, such as floor tiles and the like, on a transport plate 6'. It is however also possible to provide two successive mould containers in each case with relatively large mould cavities, while a third mould container is provided with three small cavities. This configuration produces the arrangement of bricks shown for drying plate 6". It is also possible to provide all mould containers with more than one filling cavity. The result of such an arrangement produces for instance a transport plate 6''', wherein a total of nine stones are arranged on the transport plate. Although bricks of different shapes and dimensions are arranged in each case on a transport plate 6 in examples 6^I, 6^{II} and 6^{III}, the distance over which the transport plate is displaced each time is substantially the same. Transport plate 6^{IV} indicates however that when bricks are used which are smaller than the bricks for instance shown on transport plate 6^I, the distance over which a transport plate is displaced in each case can be reduced so that not three but four bricks fit one behind the other on a transport plate. Transport plate 6^V even shows a situation in which the distance is further reduced so that five successive bricks can be arranged on a transport plate. This means that the loading capacity of each transport plate can be utilized optimally. This is particularly important in the further processing of the bricks. In many cases the capacity in the drying furnace in which the bricks are dried is for instance limited. A non-optimal loading of the transport plates results in such a case in too low a production and relatively high production costs.

[0042] In a particularly advantageous preferred embodiment the mould containers consist of an exchangeable container 17' and a carrier 17". The rollers are mounted on carrier 17" while the mould cavities in which the clay is arranged are provided in the exchangeable container 17'. Two side walls of container 17' are provided with grooves, while carrier 17" is provided with corresponding protrusions. Containers 17' can hereby readily slide laterally off the carrier and optionally replaced with other containers. Operating personnel can thus easily provide the mould conveyor with containers with mould cavities of a suitable dimension and form. When a subsequent series of bricks has to be made, the mould cavities of the mould containers can therefore be exchanged quickly.

[0043] The present invention is not limited to the above described preferred embodiments thereof. The

rights sought are rather defined by the following claims, within the scope of which many modifications can be envisaged.

Claims

1. System for manufacturing green bricks from clay, comprising:

- a circulating conveyor (12) for transporting mould containers, above which mould container conveyor can be positioned a clay supplying device (4) for arranging clay in at least one mould cavity in a mould container;
- a conveyor (23) carrying transport plates (6) for the purpose of transporting transport plates;
- a releasing device for removing a green brick from the at least one mould cavity of a mould container and placing thereof on a transport plate (6);

wherein the mould containers (17) comprise a first part (31) and a second part (32) which is pivotable relative to the first part (31) and provided with at least one mould cavity; and

wherein the conveyor is a chain conveyor, the chain of which is formed by the mutually coupled first parts (31) of the mould containers (17); and

wherein the releasing device comprises pivoting means for reciprocally pivoting the second parts (32) of the mould containers (17) between a starting position in which the green brick is carried and an end position in which the green brick is released.

2. System as claimed in claim 1, comprising control means for intermittent driving of the mould container conveyor and for releasing the green brick(s) in a mould container (17) each time the mould container conveyor stands still.

3. System as claimed in claim 1 or 2, wherein the pivoting means comprise:

- a guide member (28) extending over substantially a semicircular arc;
- a travelling carriage (33) displaceable along the guide member;
- one or more carriers which are provided on the travelling carriage and with which one mould container at a time can be carried along to cause the relevant mould container to pivot.

4. System as claimed in claim 3, wherein the travelling carriage is displaceable with a chain drive provided with an electric motor.

5. System as claimed in claim 1, wherein a mould container comprises an open side leaving the mould cavity clear, wherein in said starting position and end position the open side is directed respectively upward and downward.

6. System as claimed in any of the foregoing claims, wherein the releasing device comprises:

- a cover member (25) with which the mould cavity of the mould container can be covered;
- second pivoting means (26,27) for pivoting the cover member;
- displacing means (30) for displacing the cover member, in the end position of the mould container, between a position closing the mould cavity and a position leaving the mould cavity clear.

7. System as claimed in claim 6, wherein the second pivoting means comprise:

- a second guide member (27) extending substantially over a semicircular arc;
- a second travelling carriage (26) which is displaceable along the guide member and to which the cover member is fixed.

8. System as claimed in claim 6 or 7, wherein the first and second pivoting means are adapted for substantially synchronous pivoting of the cover member and the mould container.

9. System as claimed in any of the foregoing claims, comprising transport member displacing means for displacing the transport plate downward and upward.

10. System as claimed in any of the foregoing claims, wherein the control of the transport plate conveyor is adapted to displace the transport plates intermittently.

11. System as claimed in any of the foregoing claims, wherein the transport plate conveyor is adapted to convey a transport plate in each case over a preset distance, which distance is set subject to the dimensions of the mould cavity of a mould container and is preferably proportional to the longitudinal dimension of the mould cavity of said mould container.

12. System as claimed in any of the foregoing claims, wherein the mould container conveyor comprises a substantially vertically disposed chain conveyor, and wherein the two conveyors preferably extend substantially parallel to each other.

13. Mould container for manufacturing green bricks

from clay, preferably in a system as defined in any of the claims 1-12, comprising:

- a carrier (17") mounted on a conveyor,
- a container (17') arranged exchangeably on the carrier and provided with one or more mould cavities for holding clay;
- pivot means (20) fixed to the carrier for pivoting the container laterally relative to the longitudinal direction of the conveyor.

- pivoting the cover member substantially synchronously with the pivoting movement of the mould container;
- removing the cover member in the end position in order to leave clear the mould cavity of the mould container.

14. Mould container as claimed in claim 13, wherein the carrier is suitable for arranging different containers (17') provided with mould cavities of different shape and/or dimensions.

15. Method for manufacturing green bricks from clay, comprising of:

- transporting clay in a chain of mutually coupled mould containers (17) with a circulating mould container conveyor (23);
- supplying a transport plate (6);
- releasing the clay arranged in a mould container (17) onto the supplied transport plate, wherein release from the mould containers comprises the steps of:

- a) pivoting a pivotable part (32) of a mould container (17) laterally from a starting position in which a green brick is carried to an end position in which a green brick is released;
- b) pivoting the pivotable part (32) back to the starting position;
- c) displacing the transport plate (6);
- d) repeating steps a-c; and
- e) discharging the transport plate (6).

16. Method as claimed in claim 15, comprising of repeating steps a-c until the transport plate is optimally loaded.

17. Method as claimed in claim 15 or 16, comprising of displacing the transport plate intermittently in each case over a preset distance which preferably depends on the dimensions of the mould container to be pivoted.

18. Method as claimed in claim 17, comprising of setting the distance such that an optimal loading of the transport plate is provided.

19. Method as claimed in any of the foregoing claims 15-18, comprising of:

- covering with a cover member the mould cavity of the mould container to be pivoted;

20. Method as claimed in any of the claims 15-19, wherein the system and/or the mould container as claimed in any of the claims 1-14 is applied.

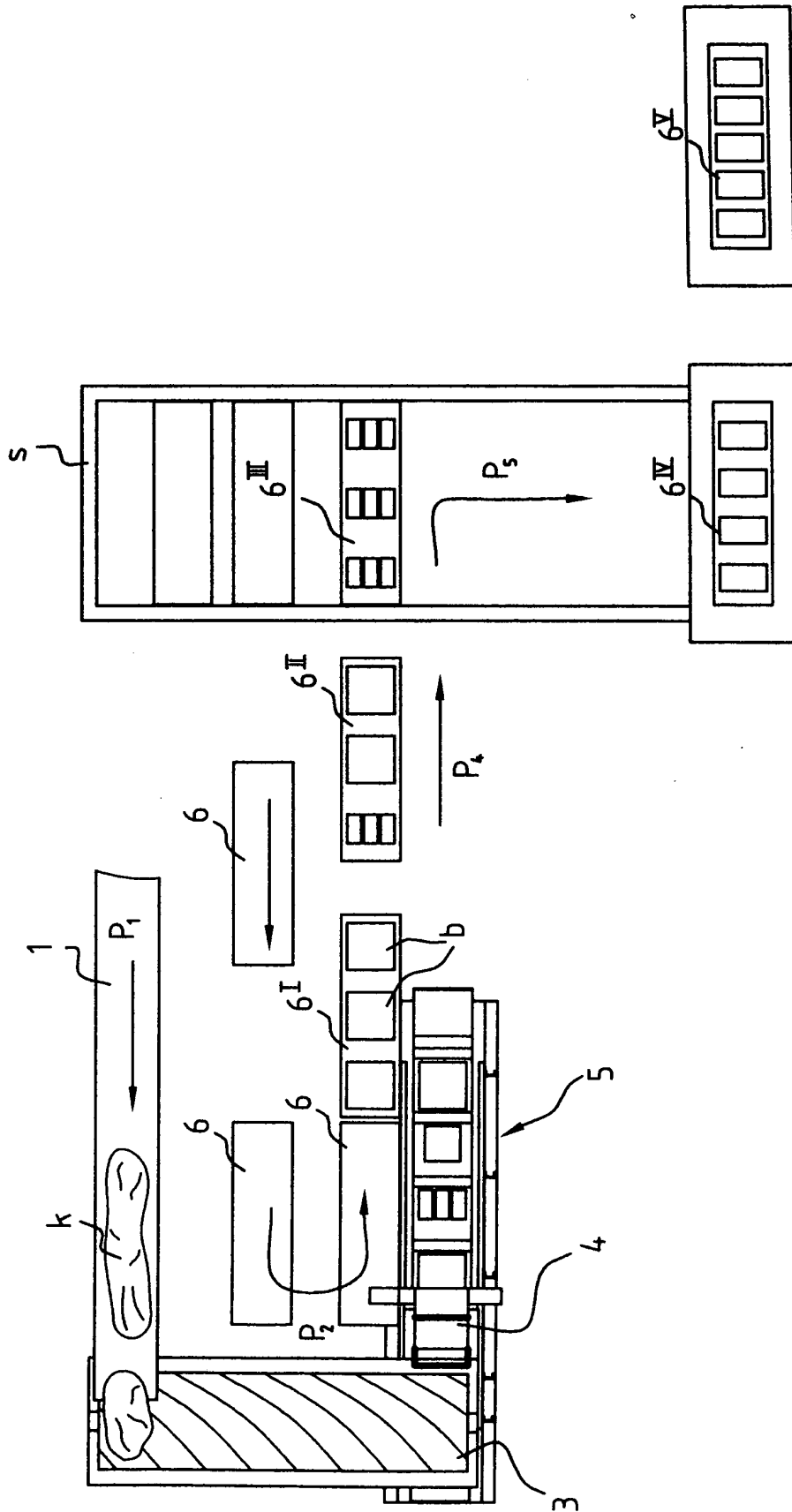
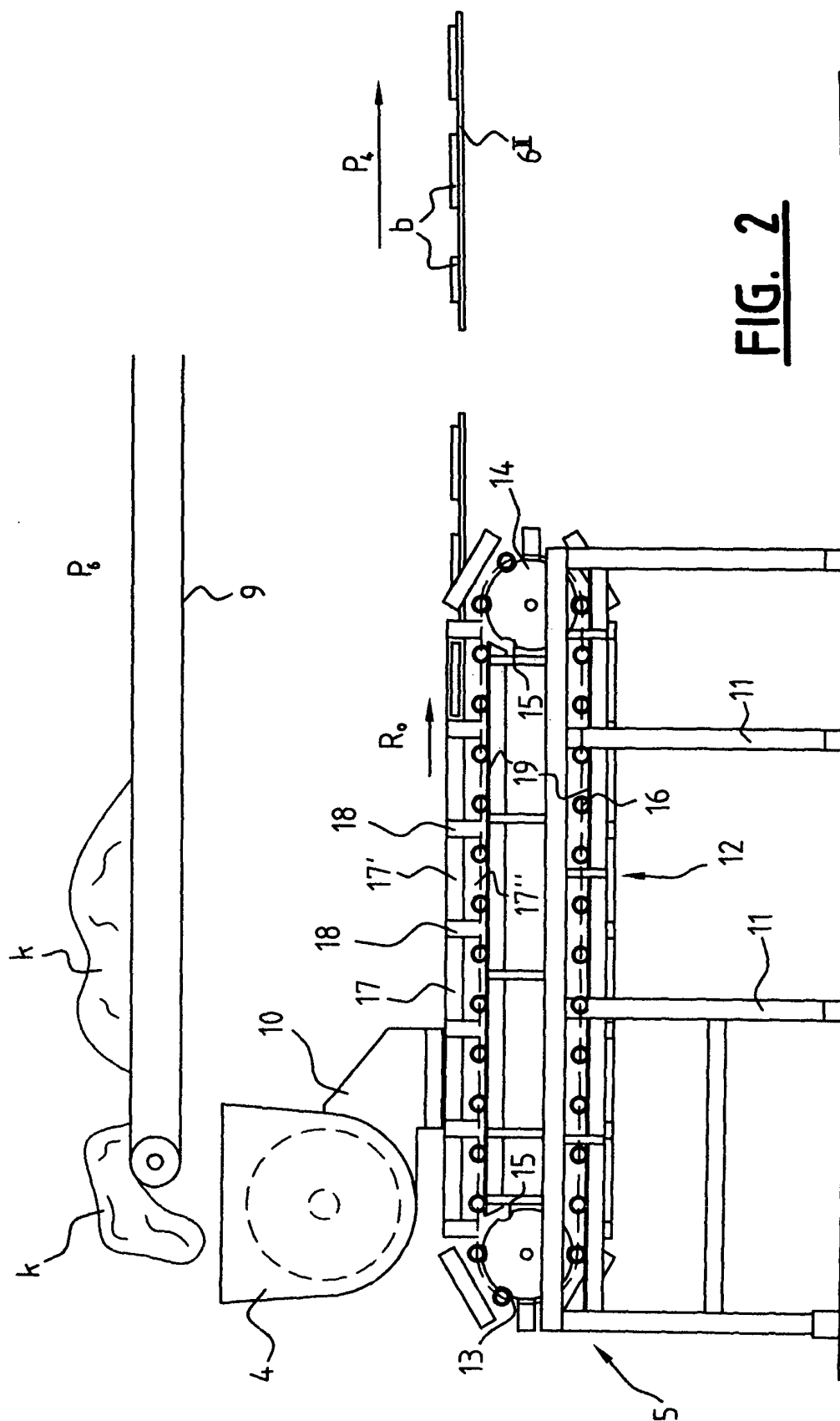


FIG. 1



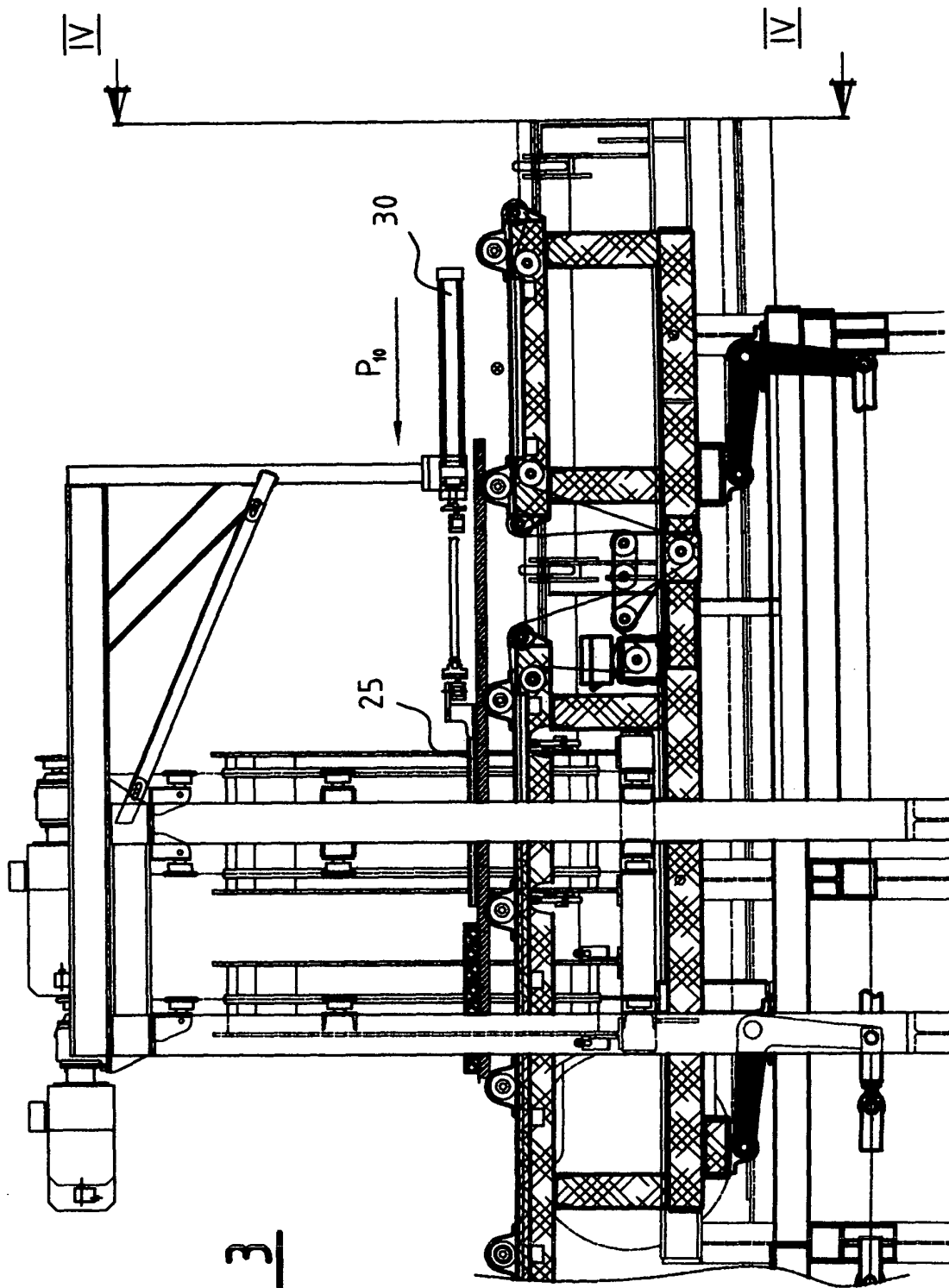
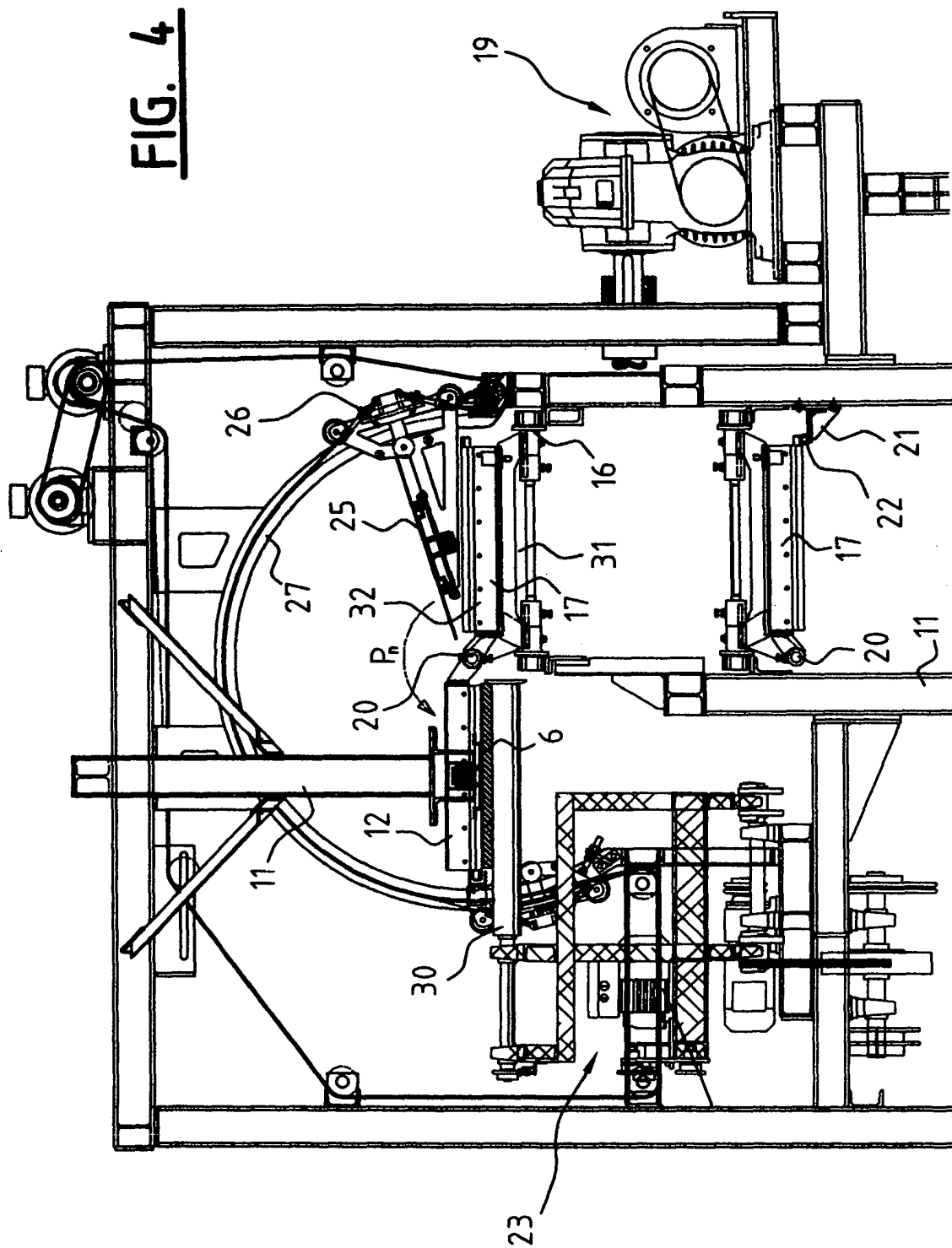
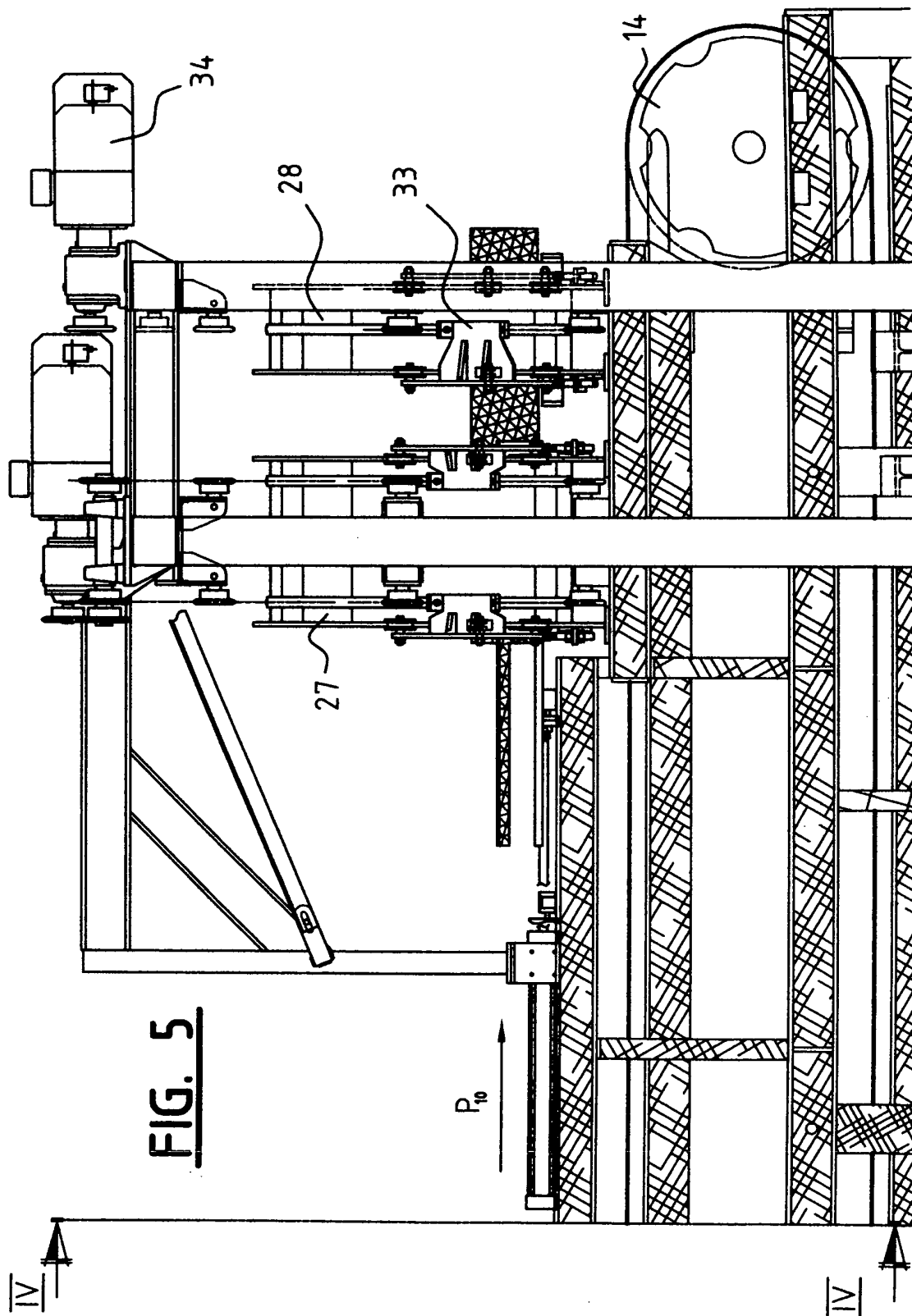


FIG. 4







European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 07 5922

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The Hague		30 September 2004	Boone, J
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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