(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 122 116**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **84302319.3**

(22) Date of filing: **04.04.84**

(51) Int. Cl.³: **B 22 C 15/28**, B 22 C 15/22, B 22 C 11/10

(30) Priority: **07.04.83 DK 1554/83**

(43) Date of publication of application: **17.10.84**
Bulletin 84/42

(84) Designated Contracting States: **BE CH DE FR GB IT LI NL SE**

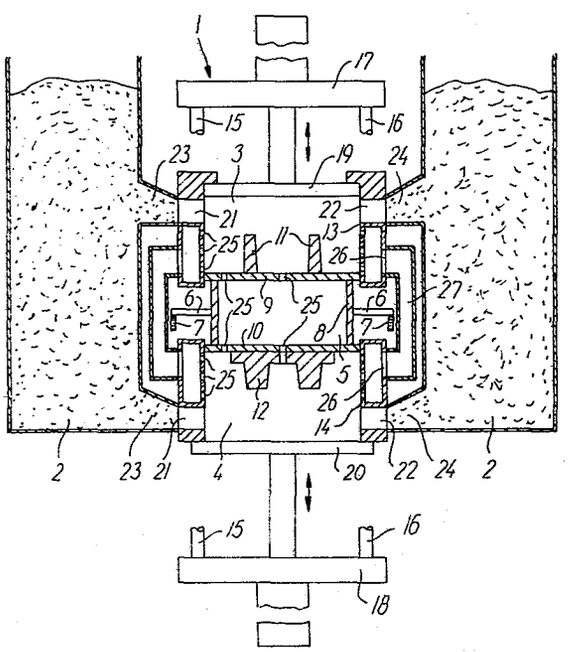
(71) Applicant: **DANSK INDUSTRI SYNDIKAT A/S, No. 15-17, Herlev Hovedgade, DK-2730 Herlev (DK)**

(72) Inventor: **Mogensen, Vagn, No. 6 Sassvej, DK-2830 Gentofte (DK)**
Inventor: **Petersen, Carl Herbert, No. 4 Kodrivervej, DK-4600 Koge (DK)**
Inventor: **Hansen, Peter Uffe, No. 81 Krebsen, DK-3650 Olstykke (DK)**

(74) Representative: **Westwood, Edgar Bruce et al, STEVENS, HEWLETT & PERKINS 5, Quality Court Chancery Lane, London WC2A 1HZ (GB)**

(54) A machine for the production of flaskless, horizontally divided casting moulds of sand or similar material.

(57) In a machine for the simultaneous production of a pair of associated upper and lower casting mould parts in pressing chambers (3, 4) which are movable towards and away from an intermediate pattern carrier (5), and for joining the mould parts after drawing off and lateral removal of said carrier, the pressing chamber walls (13, 14) have sand introduction openings (22) as well as evacuation ports (16) which by displacement of the walls in relation to the pattern carrier come into and out of position to communicate with a sand store (2) and a vacuum source, respectively, in order to produce vacuum in the chambers.



EP 0 122 116 A2

A Machine for the Production of Flaskless, Horizontally Divided Casting Moulds of Sand or Similar Material.

BACKGROUND AND FIELD OF THE INVENTION

DE-AS 26 53 788 discloses various methods and machines for the production of horizontally divided casting moulds consisting of simultaneously finished upper and lower parts which in a final phase are united and delivered for the pouring process. Said reference discloses flaskless moulds as well as moulds in ordinary boxes or frames.

Starting from the prior art known from the above mentioned reference, the present invention relates to a machine adapted to produce flaskless, horizontally divided casting moulds of sand or similar material, said machine comprising in a known manner a mould parts producing apparatus for the simultaneous production of a pair of associate upper and lower mould parts in two co-axial pressing chambers which are disposed one above the other within frame-shaped, vertically displaceable walls and are further bounded by a pattern carrier, common to both chambers, and a respective pressing plate, and which may be brought into and out of communication with, firstly, a vacuum source for the creation of vacuum in the chambers and, secondly, a sand store for shotwise filling of the evacuated chambers, the pressing chamber walls subsequent to the production of a pair of mould parts being displaceable first away from the pattern carrier to release the mould parts therefrom and then, after lateral removal of the carrier, towards each other to join the mould parts.

In the production of such flaskless mould parts it is recommended, according to the reference, to make use of pressing plates in the form of grids

through which the mould material may be introduced into the pressing chambers from above and from below, respectively, after a suitable vacuum has been provided in said chambers by air evacuation through the pattern carrier which for this purpose includes a cavity which through evacuation nozzles in the pattern supporting boards and possibly also in these patterns themselves are in communication with the pressing chambers. It is moreover recommended to let the pressing plate of the upper pressing chamber consist of two mutually movable grids allowing opening and closing of the communication between the chamber and the superposed sand store, to create vacuum condition in two steps, and to open the said communication with the upper chamber only a fraction of a second after the attainment of the maximum vacuum. The purpose is to compensate for the influence of the force of gravity which expedites the sand shot down into the upper chamber while delaying the sand shot up into the lower chamber but, on the other hand, the design becomes more complicated because an exact control is required both of the valve which determines the vacuum condition in the chambers, and of the movable grid.

The reference further mentions that the production of mould parts in boxes may involve air evacuation from the pressing chambers both through the pattern carrier and through a pair of frames between which the mould box is clamped during the evacuation step, the sand shooting and the final compression of the mould part by means of the pressing plates.

NOVEL FEATURES OF THE INVENTION

The machine according to the invention differs from the prior art in that the pressing chamber walls include evacuation nozzles and are provided with sand inlet openings and evacuation ports so positioned that by the displacement of the chamber walls towards and away from their closed position in relation to the

pattern carrier, said openings and ports come into and out of communication with the sand store and the vacuum source, respectively.

In spite of a relatively simple design, due to the fact that the control of the vacuum condition and the introduction of the mould sand are effected directly from the movements of displacement of the chamber walls, such a machine may result in completely satisfactory mould parts of suitable and uniform hardness in the surfaces which in the joined mould form its casting cavity. Moreover, the vacuum condition may be established at a high degree of efficiency and at a very short time because the total cross-section available for the evacuation may be made abundantly large, and the cycle time may thus be reduced to a minimum.

This applies in particular when the sand store comprises two containers positioned at opposite sides of the mould parts producing apparatus, and in case both the pressing chamber wall portions opposite the sand containers have sand inlet slits at the top of the upper and at the bottom of the lower chamber. In such case sand may be shot into the pressing chambers simultaneously from their opposite sides at the level of the surfaces of the pressing plates, and more or less in parallel thereto, from where the further sand movement is effected substantially in the axial direction downwardly and upwardly, respectively, towards the pattern carrier so that "shade effect" implying less compact mould part areas is substantially eliminated.

The remainder of the pressing chamber wall is provided with appropriately uniformly distributed evacuation nozzles which through cavities in the wall are connected with evacuation ports in the wall portions concerned. In this way the total cross-section available for the air evacuation may be sufficiently large so that the vacuum condition in the pressing chamber may be obtained so to say immediately, after the evacuation ports have come into communication with

the vacuum source.

The above mentioned axial sand movement may be further expedited when air is evacuated also through the pattern carrier, mainly in the same manner as is the case with the above mentioned prior art, but approximately the same effect may be obtained without the structural complications necessary in the above case, viz. when the pattern carrier consists of a box closed to the surroundings except for openings towards the two pressing chambers. This entails that the cavity in the pattern carrier is evacuated automatically together with the chambers and may consequently contribute an extra suction effect on the mould sand being introduced.

After the introduction phase has finished the two mould parts may be further compressed by displacement of the pressing plates, and possibly also the frame-shaped chamber walls, towards the horizontal centre plane of the apparatus, following which the separation of the mould parts from the pattern carrier, the lateral removal of this carrier, the joining of the mould parts, and the removal of the finished casting mould from the apparatus may be effected in a manner known per se.

BRIEF DESCRIPTION OF THE DRAWINGS

The casting mould production machine according to the invention will now be more fully explained with reference to the mainly schematical drawings, in which

Fig. 1 is a vertical axial section in a first embodiment of the machine prior to the sand introduction into the two pressing chambers, and

Figs. 2 and 3 are two axial sections perpendicular to each other in a second embodiment in the same operation phase.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In either of the illustrated embodiments the machine consists mainly of a mould parts production

apparatus 1 and a sand store comprising two sand containers 2 positioned on either side of said apparatus. The assemblies concerned may be separately constructed and assembled at the place of use, for instance by mounting them on a common framework or base.

The mould parts production apparatus 1 includes an upper pressing chamber 3 and a lower pressing chamber 4 which in the situation illustrated on the drawing are separated from each other by a common pattern carrier 5 which from the illustrated position may be run laterally out of the apparatus. This has been indicated in Fig. 1 in that the carrier via a pair of side flanges 6 rests on supporting rollers 7. The carrier 5 has the shape of a hollow box with a peripheral frame 8 and exchangeable upper and lower pattern boards 9 and 10 with half patterns 11 and 12.

The pressing chambers 3 and 4 are surrounded by walls 13 and 14 that are displaceable on vertical guide columns 15 and 16 between a pair of cross members 17 and 18 so that the walls 13 and 14 may be moved towards and away from each other, and said two chambers are closed at the top and bottom, respectively, by upper and lower pressing plates 19 and 20. Adjacent said pressing plates the wall portions, illustrated in section in Fig. 1, have sand introduction slits 21 and 22 which in the illustrated position of the chamber walls have just come into communication with outlets 23 and 24 from the two sand containers 2, and beneath and above said slits the walls 13 and 14 include cavities which are in communication with the chambers 3 and 4 through a number of uniformly distributed air evacuation nozzles 25 and to the opposite side are in communication with evacuation ports 26 communicating with a common passage 27 which is again in communication with a vacuum source, not shown. Through additional air evacuation nozzles 15 om the pattern boards 9 and 10 and possibly also in the half patterns themselves the

pressing chambers 3 and 4 are further in communication with the cavity in the box-like pattern carrier 5.

The vacuum condition in the pressing chambers 3 and 4 causes a so to say instantaneous filling of the chambers with sand from the containers 2 which may have suitable air inlet slits towards the surroundings. Then, the mould parts formed by the sand are finally compressed by displacement of the chamber walls 13 and 14 with the pressing plates 19 and 20 towards each other, following which an opposed displacement draws the finished mould parts free of the half patterns 11 and 12, so that the pattern carrier 5 may be removed laterally from the illustrated position, in order to allow the mould parts to be joined, possibly after insertion of any necessary cores. By the joining operation the upper pressing chamber wall 13 is firstly displaced downwardly to abut against the lower wall 14, and subsequently the upper pressing plate 19 is displaced somewhat further downwardly until the upper mould part has come to rest on the lower one. Then the assembled mould which is now clamped between the pressing plates 19 and 20 is displaced downwardly through the apparatus and then delivered to a conveyor, not shown. After the pressing chamber walls 13 and 14 together with the pressing plates 19 and 20 have been returned to the positions they occupied after the drawing off movement, the pattern carrier 5 may again be run into position, and the pressing chambers may be reclosed at renewed displacement of the walls and the plates into the position in Fig. 1, thereby automatically creating the communication with the sand store and the vacuum source.

The same reference numerals used in Fig. 1 are applied to Figs. 2 and 3 for the same or analogous parts. The most important difference is that the pattern carrier 5 is pivotal as marked by the double arrow in Fig. 3 instead of being linearly displaceable.

According to Figs. 2 and 3 the pattern carrier 5 is through a spacer 28 rigidly connected with a lever 29 which is pivotal about a lower, horizontal axis 30 into a passive position in which the carrier has been swung about 90°, so that it will be particularly easy to exchange the pattern boards 9 and 10 or possibly only the half patterns 11 and 12.

In the illustrated embodiment the lever 29 serves at the same time as evacuation manifold, in that it is connected with the vacuum source through a flexible hose 31 and is provided with a pair of mouth pieces 32 with which the evacuation ports 26 enter into communication. Said mouth pieces are further provided with stop valves 33 which makes it possible to minimize wear of the packings or surfaces adapted to ensure tightness around the ports, as the mechanical connection may have taken place before the valves open.

PATENT CLAIMS

1. A machine for the production of flaskless, horizontally divided casting moulds of sand or similar material and comprising a mould parts producing apparatus (1) for the simultaneous production of a pair of associate upper and lower mould parts in two co-axial pressing chambers (3, 4) which are disposed one above the other within frame-shaped, vertically displaceable walls (13, 14) and are further bounded by a pattern carrier (5), common to both chambers, and a respective pressing plate (19, 20), and which may be brought into and out of communication with, firstly, a vacuum source for the creation of vacuum in the chambers and, secondly, a sand store (2) for shotwise filling of the evacuated chambers, the pressing chamber walls (13, 14) subsequent to the production of a pair of mould parts being displaceable first away from the pattern carrier (5) to release the mould parts therefrom and then, after lateral removal of the carrier, towards each other to join the mould parts, characterized in that the pressing chamber walls (13, 14) include evacuation nozzles (25) and are provided with sand inlet openings (22) and evacuation ports (26) so positioned that by the displacement of the chamber walls towards and away from their closed position in relation to the pattern carrier, said openings and ports come into and out of communication with the sand store (2) and the vacuum source, respectively.

2. A machine as claimed in claim 1 and having a sand store comprising two containers (2) disposed at opposite sides of the mould parts producing apparatus (1), characterized in that both the pressing chamber wall portions (13, 14) opposite the sand containers (2) have sand inlet slits (22) at the top of the upper and at the bottom of the lower chamber (3, 4).

3. A machine as claimed in claim 2, characterized in that the remainder of the pressing chamber

walls (13, 14) is provided with appropriately uniformly distributed evacuation nozzles (25) which through cavities in the wall are connected with evacuation ports (26) in the wall portions concerned.

4. A machine as claimed in claims 1, 2 or 3, characterized in that the pattern carrier (5) is constituted of a box closed to the surroundings except for openings (25) towards the two pressing chambers.

5. A machine as claimed in claim 1, characterized in that the pattern carrier (5) is laterally displaceable from its active position by swinging into a passive position in which it is easily accessible for exchange of both pattern boards (9, 10).

6. A machine as claimed in claim 5, characterized in that the pattern carrier (5) is rigidly secured to a pivot arm (29) with mouth pieces (31) controlled by valves (33) and adapted to be connected with the evacuation ports (26) of the pressing chamber walls (13, 14).

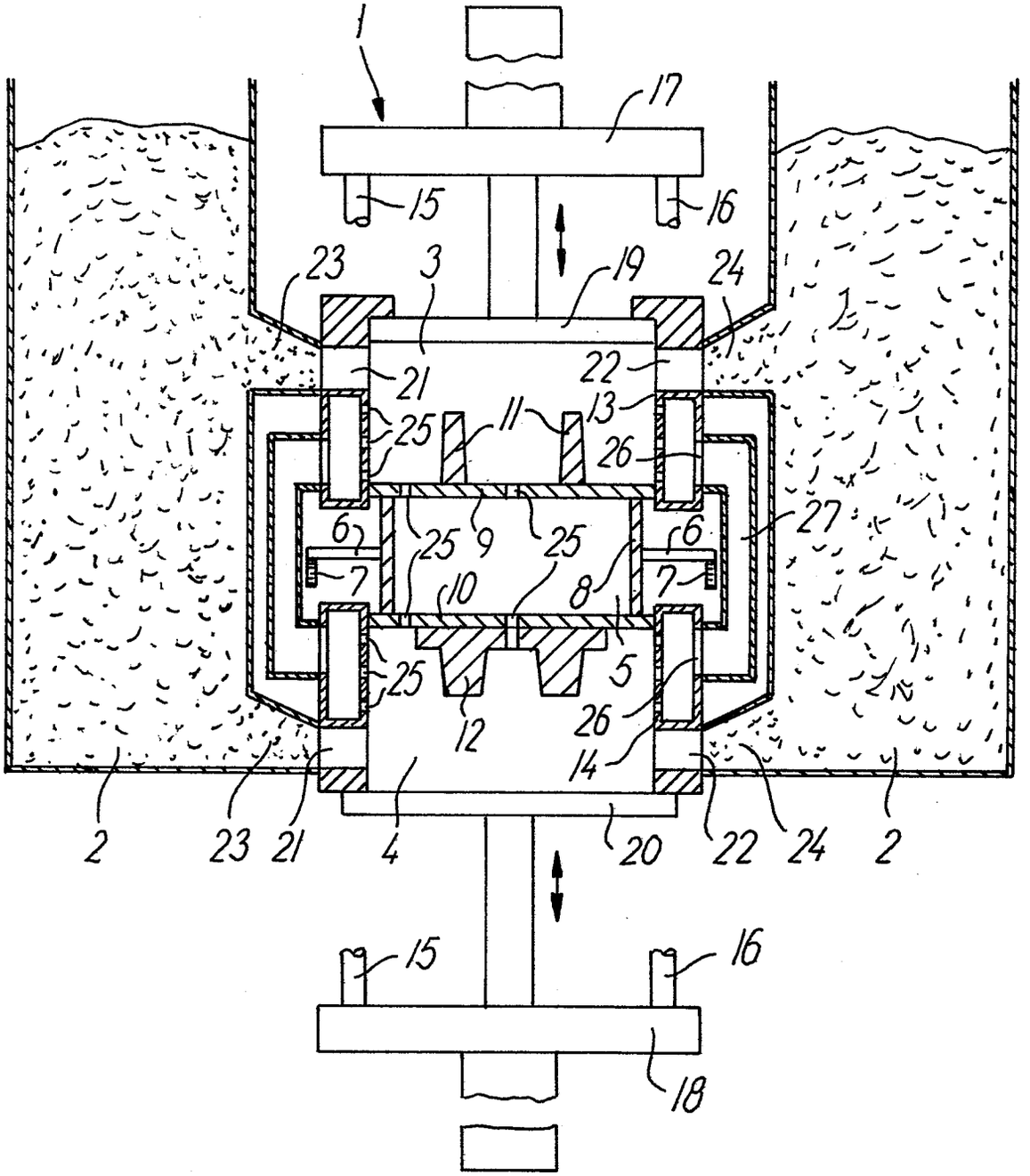

1
17
15
16
23
3
19
24
21
22
25
11
13
26
6
25
9
25
6
27
7
10
8
7
25
5
26
12
14
2
23
21
4
20
22
24
2
15
16
18

FIG.1

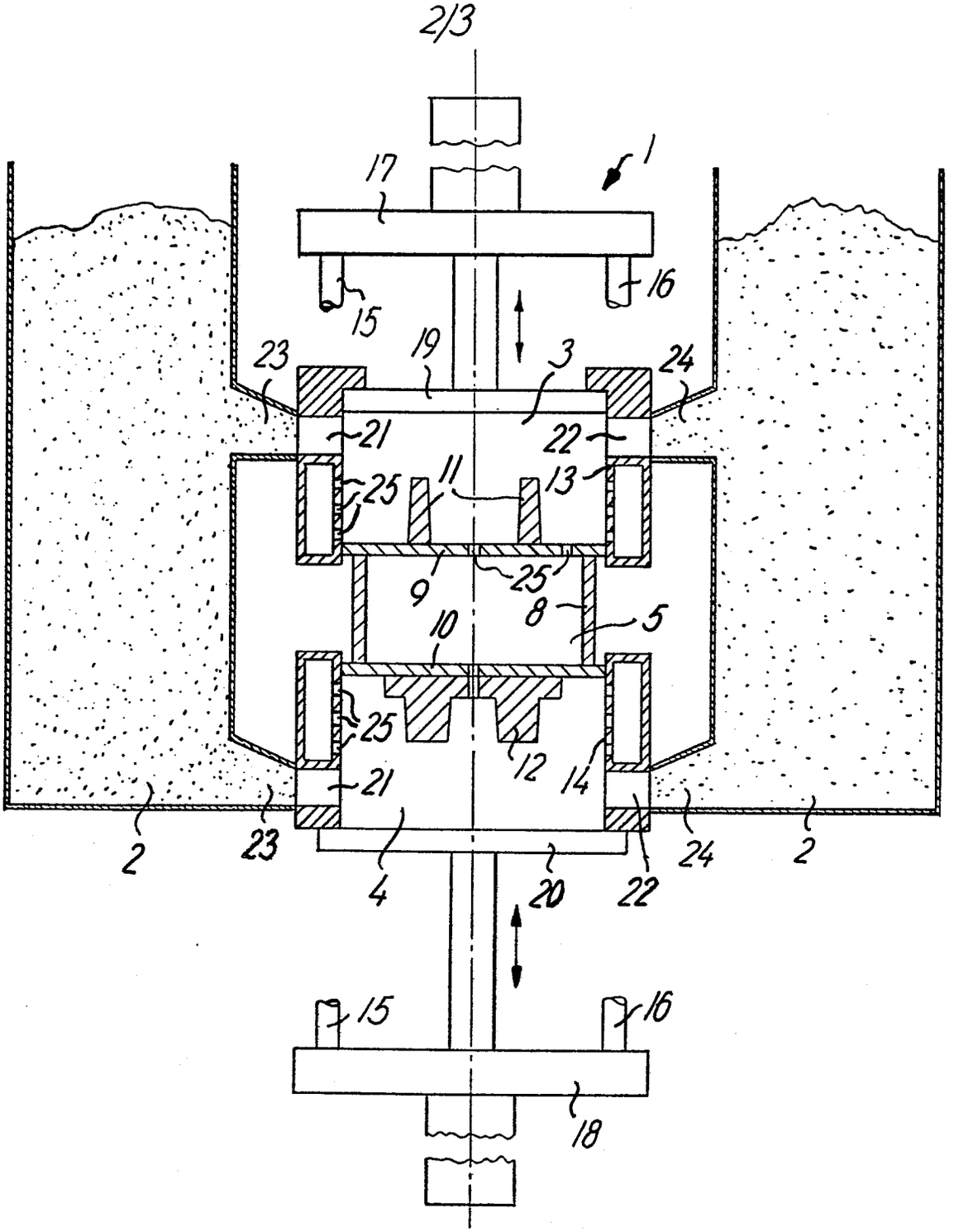

2/3
1
17
15
16
19
3
23
24
21
22
25
11
13
9
25
8
5
10
25
12
14
21
2
23
4
20
22
24
2
15
16
18

FIG. 2

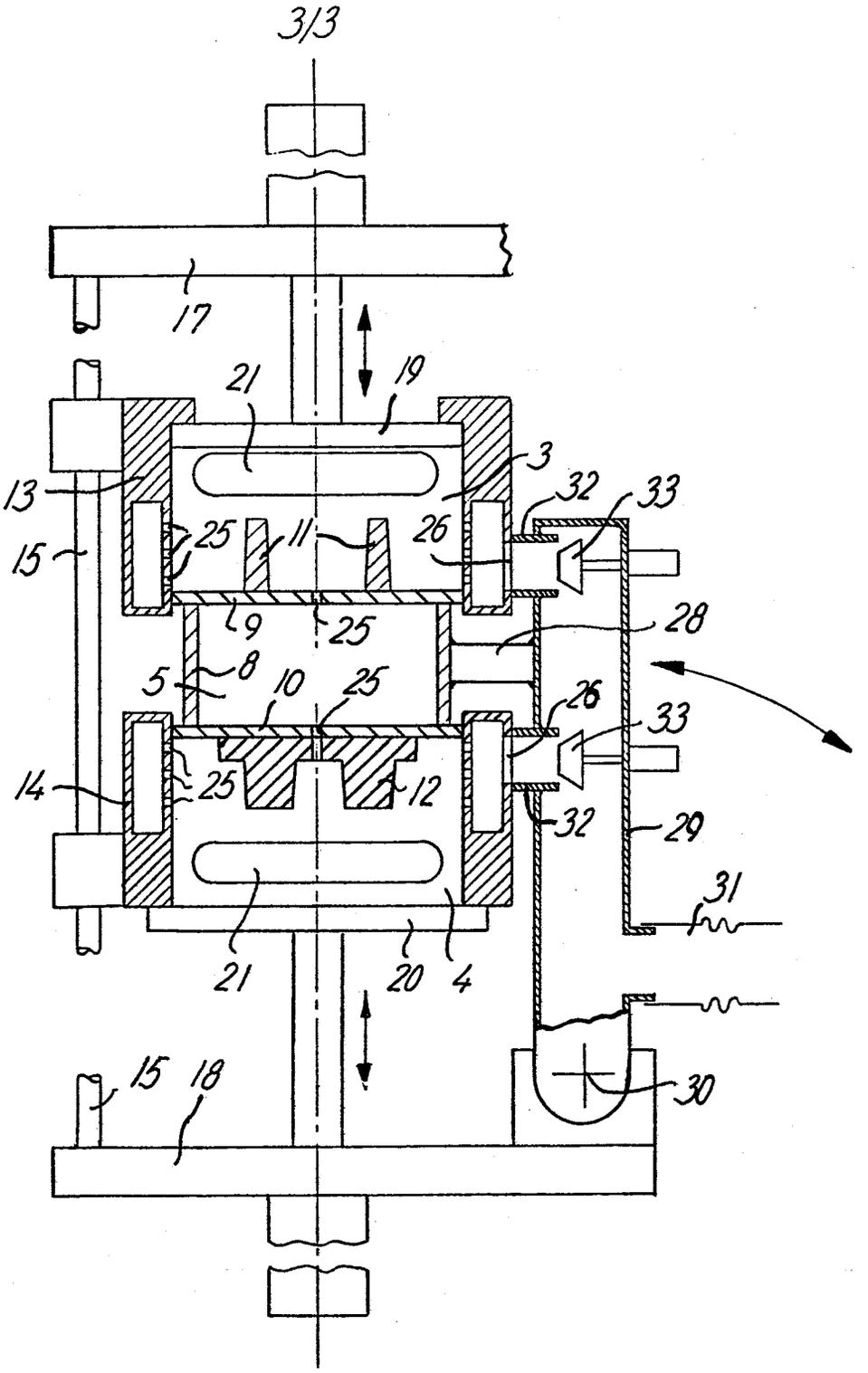

3/3
17
19
21
13
3
32
33
15
25
11
26
9
25
28
5
8
10
25
26
33
14
25
12
32
29
31
21
20
4
15
18
30

FIG. 3