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(54) **SINGLE-BASKET STAPLE FIBER OR TOW PROCESSING PLANT**

(57) A plant for the production of staple or tow material is described, comprising a dyeing station (2), a centrifuge station (3) and a drying station (44). Said plant further comprises a loading station (1) comprising means (18-25) able to pour the material into a basket (5), to press the material into the basket (5) and to operate a lid (8) separably associable with the basket (5), and a discharge station (4), located downstream of said dyeing station (2) and of said centrifuge station (3), comprising means (36, 41-43) able to disengage the lid (8) from the basket (5) and to remove the material from the basket (5).

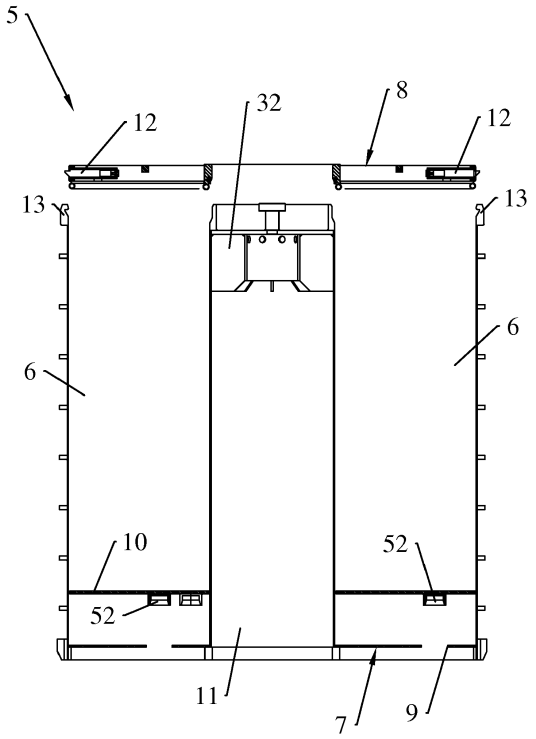

FIG.1

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Description

[0001] The present invention relates to a plant for processing material in form of cotton, polyester, wool, viscose or acrylic staple or tow with a single basket.

[0002] In the textile industry, tow fiber is a coarse and broken fiber which is removed during the processing of flax, hemp or jute. In man-made and composite fiber industries, tow is an unstretched bundle of continuous filaments, particularly of viscose, acrylic or carbon fibers.

[0003] Staple is a form of material resulting from the disintegration of fibrous bundles generally from retted fiber.

[0004] Dyeing, centrifuging and drying operations are normally carried out in succession in staple or tow processing.

[0005] The material to be processed is manually loaded into a first basket in successive layers by means of chains. After loading, the basket is closed, again manually, and introduced into a machine for dyeing the material.

[0006] At the end of the step of dyeing, the material is removed manually from the first basket and introduced into a second basket, i.e. into the centrifuge basket.

[0007] Finally, the centrifuged material, still in layers, is removed from the centrifuge and laid on a conveyor belt which introduces it into the dryer.

[0008] It can be easily noted that the known plants require a high level of skilled labor to carefully fill the first basket and move the material from the first basket to the second one.

[0009] Production is therefore limited and labor costs are very high.

[0010] It is the object the present invention to make a plant for processing staple or tow material, which automates the entire process, from initial loading to discharging in the dryer, passing through the steps of dyeing and centrifuging.

[0011] A further object of the present invention is that the system has simple and space-saving machining stations.

[0012] A further object of the present invention is that the plant limits the intervention of operators, thereby increasing their safety.

[0013] According to the invention, said and further objects are achieved by a plant for the production of staple or tow material, comprising a dyeing station, a centrifuge station and a drying station,

characterized in that it also comprises

a loading station comprising means able to pour the material into a basket, to press the material into the basket and to operate a lid separably associable with the basket,

a discharge station, located downstream of said dyeing station and of said centrifuge station, comprising means able to disengage the lid from the basket and to remove the material from the basket,

said basket comprises means suitable for separably associating it with said dyeing station and centrifuge station maintaining the lid engaged with the basket.

[0014] Advantageously, the material is not touched by the operator, whereby guaranteeing repeatable steps of dyeing and centrifuging, which are therefore easy to manage.

[0015] The pressing of the material during the step of loading is uniform and is not affected by extensions of the basket and of the lid.

[0016] The material is discharged gradually and quickly.

[0017] These and other features of the present invention will be more apparent from the following detailed description of a practical embodiment thereof, shown by way of non-limiting example in the accompanying drawings, in which:

figure 1 shows a section view taken along a vertical plane of a basket for staple;

figure 2 shows a plan view from the bottom of the basket of figure 1;

figure 3 shows a plan view from the top of a disc vertically movable inside the basket of figure 1;

figure 4 shows a section view taken along a vertical plane of a basket for tow;

figure 5 shows a plan view from the bottom of the basket of figure 4;

figure 6 shows a plan view from the top of a lid for the baskets of figures 1 and 4;

figure 7 shows a plan view from the bottom of a bell with lid grippers;

figure 8 shows a partial section view taken along a vertical plane of the bell of figure 7;

figure 9 shows a side view of a loading station in a first configuration;

figure 10 shows a side view of a loading station in a second configuration;

figure 11 shows a side view of a loading station in a third configuration;

figure 12 shows a side view of a loading station in a fourth position;

figure 13 shows a side view of the loading station in a fifth position;

figure 14 shows a side section view taken along a vertical plane of a centrifuge station;

figure 15 shows a plan view from the top of the centrifuge station;

figure 16 shows a section view taken along a vertical plane of the centrifuge station, in a first loading/discharging configuration of the basket;

figure 17 shows a side section view taken along a vertical plane of the centrifuge station, in a second loading/discharging configuration of the basket;

figure 18 shows a side section view taken along a vertical plane of a discharge station of the staple from the basket;

figure 19 shows a plan view from the top of the discharge station of the staple from the basket;

figure 20 shows a section view taken along a vertical

plane of a plant portion for tow;
figure 21 shows a plan view from the top of a portion of a plant for tow;
figure 22 shows a section view taken along a vertical plane of a dyeing station;
figure 23 shows a side view of the discharge station of the staple from the basket.

[0018] A plant for the production of material in the form of cotton, polyester, wool, viscose or acrylic staple, and in the form of fiber named tow, comprises a loading station 1, a dyeing station 2, a centrifuge station 3, a discharge station 4 and a drying station 44. Dyeing also refers to the bleaching process.

[0019] The material to be treated, either staple or tow as mentioned above, is placed in a basket 5 which has an annular shape chamber 6 delimited by a bottom 7 and a lid 8 (figures 1-6).

[0020] The basket 5 for staple has, in particular, a bottom 7 with through holes 9 and an annular disc 10 suitable for moving vertically in the chamber 6 and equipped on the bottom with attachment areas 52.

[0021] The tow basket 5 has no disc 10 or through holes 9 because discharge is performed differently, as it will be apparent below.

[0022] The basket 5 also has a central cavity 11 for coupling the basket 5 to the mechanical means of one or more of said stations 2-4, and a flange 32 at the top of said central cavity 11.

[0023] The central cavity 11 has a cylindrical shape and is surrounded by the chamber 6.

[0024] The chamber 6 is defined by perforated walls to allow the passage of liquid. Thus, the central cavity 11 has a perforated outer wall corresponding to the inner wall of the chamber 6.

[0025] The lid 8 (figure 6) has pistons 12 suitable for coupling to an upper edge 13 of the basket 5.

[0026] Said pistons 12 are arranged along a circular edge 14 of the lid 8 and are able to move radially driven by pneumatic means.

[0027] The loading station 1 (figures 9-13) comprises a base 17 provided with a support base 15 with a thickness 16 able to fit into the cavity 11 of the basket 5 to prevent the movement on the support base 15.

[0028] The base 17 further supports a movable structure 18 which comprises a head 19 able to compress the material inserted in the chamber 6, to maneuver the lid 8 and to maneuver an extension 20 of the basket 5.

[0029] The head 19 comprises a bell 21 which has hooks 23 (figures 7-8) at a lower edge 22.

[0030] The lower edge 22 has a circular shape and the hooks 23 are arranged along said lower edge 22 and are able to move radially, controlled by pneumatic means 24.

[0031] The material to be loaded into the basket 5 reaches the loading station 1 via a conveyor 25.

[0032] The head 19 is movable in the space by means of known sliding and driving means associated with the movable structure 18.

[0033] The dyeing station 2 (figure 22) comprises a container 26 which can be closed by a lid 34 by means of pneumatic means 60, and which is able to house the basket 5, spraying means 50 of dyeing liquid to fill the container 26 with dyeing liquid.

[0034] The centrifuge station 3 (figures 14-17) comprises a container 27 which can be closed by a lid 28 by pneumatic means 61, and is able to house the basket 5, and means able to rotate the basket 5 comprising a motor 29, springs 33, belt drive means 30 and a revolving pin 31 for coupling the basket 5 to the flange 32.

[0035] The discharge station 4 of the staple (figures 18-19, 23) comprises a base 37 suitable for blocking the basket 5 by means of hooks 38, pneumatic means 39 able to remove the lid 8, and a lower cavity 40 able to house ejection means of the staple, comprising rods 36 able to slide vertically by pushing up the disc 10 housed in the chamber 6. The rods 36 are controlled by known driving means and at the lower end are integral with a single block 62.

[0036] The discharge station 4 of the staple further comprises a comb 41 (figures 19, 23) able to move horizontally, by pneumatic means 51, above the basket 5 in order to remove layers of staple pushed out of the basket 5 by said rods 36.

[0037] Figure 20 shows a portion of the plant with a discharge station 4 of the tow, which has means 63 to remove the lid 8, and means 42 to pull a thread 43 of tow.

[0038] Figures 19-20 also show a drying station 44 also present in the staple processing plant.

[0039] In the loading station 1, the basket 5 with the lid 8 is operatively associated with the base 15 (figure 9) and then the head 19, by moving in the space, deposits an extension 20 over the basket 5 and hooks the lid 8 of the basket 5 by means of the hooks 23 of the bell 21 (figure 10).

[0040] The head 19 is raised by feeding the lid 8 with it and releasing the inlet of the basket 5 by means of the extension 20 which facilitates the entry of material transported over the basket 5 by the conveyor 25 (figure 11). The flange 32 cooperates with the coupling of the extension 20 to the basket 5.

[0041] After filling of the basket 5 and of the extension 20 is finished, the head 19 is positioned over the basket 5 again and goes down with the bell 21, whereby pressing the material with the lid 8 still attached by means of the hooks 23 (figure 12).

[0042] The material is compressed until the extension 20 is free of material and ready to be hooked and removed from the bell 21 that firstly releases from the lid 8 which goes back to close the basket 5 which is ready to be removed from the base 15 loaded with material to be processed (figure 13).

[0043] Advantageously, the basket 5 was automatically filled with the correct amount of material, without intervention by the operator except in the control area via PC.

[0044] From loading station 4, the basket 5 is sent to the dyeing station 2 where it is loaded into container 26

and subjected to the step of dyeing, known in itself (figure 22).

[0045] The operator does not intervene on basket 5 which remains with the lid 8 in the closed position. The liquid which fills the container 26 enters into the basket 5 crossing the material through peripheral holes in the chamber 6 according to a known technique.

[0046] After dyeing, by means of known loading means, the basket 5 is removed from the container 26 and taken to the centrifuge station 3 where the pin 31 facilitates the insertion into the container 26 and the subsequent closing of the lid 28. The pin 31 is coupled with the flange 32.

[0047] The basket 5 is ready for the step of centrifuging without any intervention inside the basket 5 by the operator: the material has not been touched by the operator since the basket 5 was closed in the loading station 1.

[0048] The step of centrifuging is followed by the discharging of the material which, in the case of staple, takes place at the discharge station 4 shown in figures 18-19, 23.

[0049] The basket 5 loaded of dyed and centrifuged staple is positioned on the base 37 and fixed to it by means of hooks 38.

[0050] The basket 5 must be perfectly centered so that the ends of the rods 36 can enter into the basket 5 by means of the through holes 9 and associate with the attachment areas 52 in the lower part of the disc 10 (figure 3).

[0051] Once the basket 5 has been hooked onto the base 37 and the rods 36 have been hooked to the disc 10 (figure 18), driving means control the vertical movement of the rods 36 which push the disc 10 upwards making a first layer of staple protrude.

[0052] The movement of the rods 36 is adjusted by means of a control unit according to the thickness of the staple it is desired to remove. This is a step by step movement until the basket 5 is completely emptied.

[0053] Said first layer is removed by means of a comb 41 which moves horizontally over the basket 5, and loads the first layer onto conveyor means able to convey it to a drying station.

[0054] If the material contained in the basket 5 is tow, because of its filamentary structure, one end of a thread of tow contained in the basket 5 is mechanically hooked to a thread of tow 43 capable of being pulled by means 42 towards the drying station 44.

[0055] Thus, the different structure of the staple and of the tow determines a different structure for discharging the material and a different basket 5 which, in all cases, always remains closed from the loading station 1 to the discharging station 4.

[0056] Advantageously, the material is not touched by the operator, whereby guaranteeing repeatable steps of dyeing and centrifuging which are therefore easy to manage.

[0057] The amount of material loaded into the basket 5 is controlled by the control unit which coordinates the activities of the conveyor 25 and of the head 19.

[0058] The pressing of the material during the step of loading is uniform and is not affected by the extension 20 or the lid 8.

[0059] The bell 21 with the hooks 23 allows the optimization of the loading times because it speeds up the deposit and removal of the extension 20 which takes place simultaneously with the removal and attachment operations of the lid 8.

[0060] In the variant for staple, the basket 5 allows a removal by layers which speeds up the emptying operation of the basket 5 still independently of the operator who in practice never touches the material from the loading to the end of the drying process.

Claims

1. Plant for the production of staple or tow material, comprising a dyeing station (2), a centrifuge station (3) and a drying station (44),
characterized in that it also comprises
a loading station (1) comprising means (18-25) able to pour the material into a basket (5), to press the material into the basket (5) and to operate a lid (8) separably associable with the basket (5),
a discharge station (4), located downstream of said dyeing station (2) and of said centrifuge station (3), comprising means (36, 41-43) able to disengage the lid (8) from the basket (5) and to remove the material from the basket (5),
said basket (5) comprises means (11, 32) suitable for separably associating it with said dyeing station (2) and centrifuge station (3) maintaining the lid (8) engaged with the basket (5).

2. Plant according to claim 1, **characterized in that** the basket (5) comprises a chamber (6) of annular shape delimited by a bottom (7) and superiorly closed by the lid (8), and a central cavity (11) of cylindrical shape surrounded by said chamber (6) and able to house a flange (32) for coupling with the dyeing station (2) and the centrifuge station (3).

3. Plant according to claim 2, **characterized in that** the basket (5) has the bottom (7) with through holes (9), and also provides an annular disk (10) suitable for sliding vertically in the chamber (6).

4. Plant according to any of the previous claims, **characterized in that** the lid (8) has pistons (12) suitable for coupling with an upper edge (13) of the basket (5), said pistons (12) being arranged along a circular edge (14) of the lid (8) and being able to move radially driven by pneumatic means.

5. Plant according to any of the previous claims, **characterized in that** the loading station (1) comprises

a base (17) and a movable structure (18) which provides a head (19) able to compress the material inserted into the chamber (6), to maneuver the lid (8) and to maneuver an extension (20) of the basket (5).

6. Plant according to claim 5, **characterized in that** the head (19) comprises a bell (21) which provides, at a lower edge (22), hooks (23) able to move radially driven by pneumatic means (24).

7. Plant according to any one of the previous claims, **characterized in that** the discharge station (4) comprises a base (37) suitable for blocking the basket (5) by hooks (38), pneumatic means (39) able to remove the lid (8), and a lower recess (40) for housing material expulsion means comprising rods (36) able to slide vertically through the through holes (9) of the base (7) and suitable for engaging with attachment areas (52) of the disc (10) thus moving it vertically in the chamber (6).

8. Plant according to claim 7, **characterized in that** the discharge station (4) comprises a comb (41) able to move horizontally over the basket (5) so as to remove layers of material pushed out of the basket (5) by said rods (36).

9. Plant according to any one of claims 1-6, **characterized in that** the discharge station (4) comprises means (63) for removing the lid (8), and means (42) for pulling a thread (43) of tow.

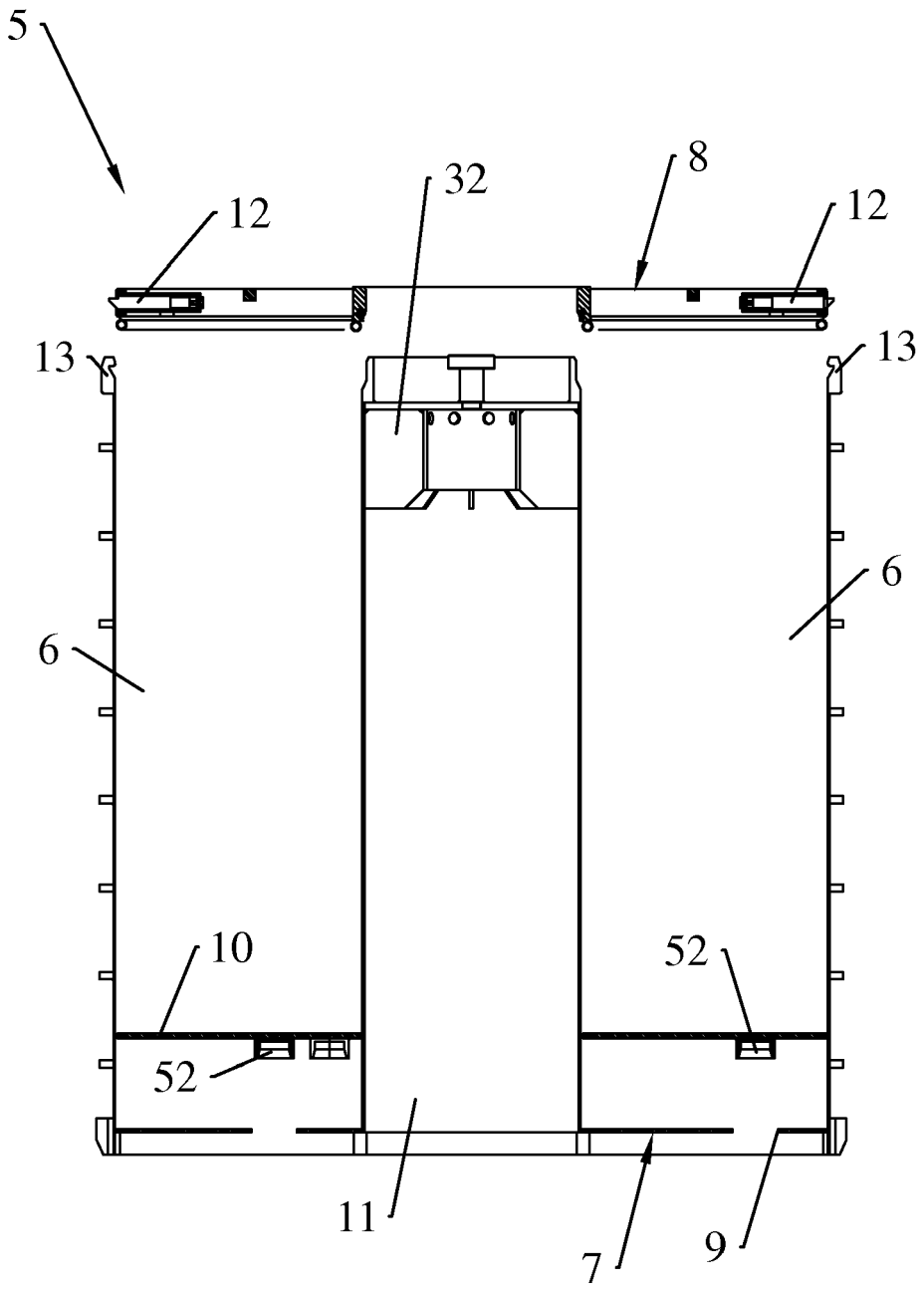


FIG.1

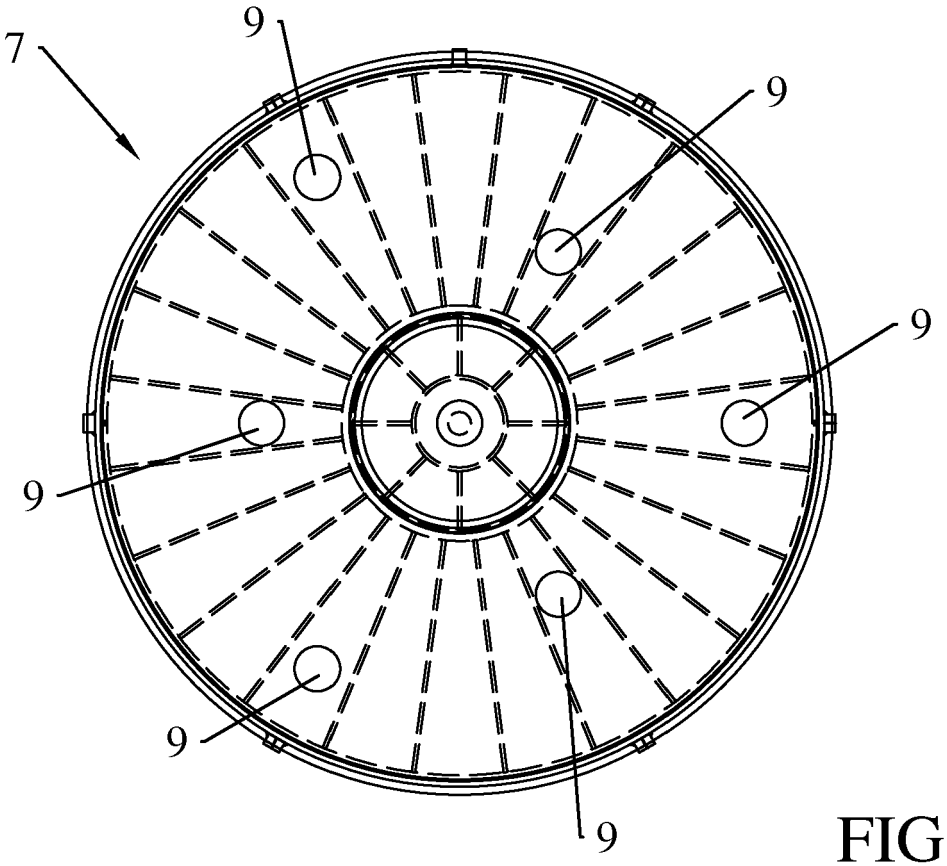


FIG.2

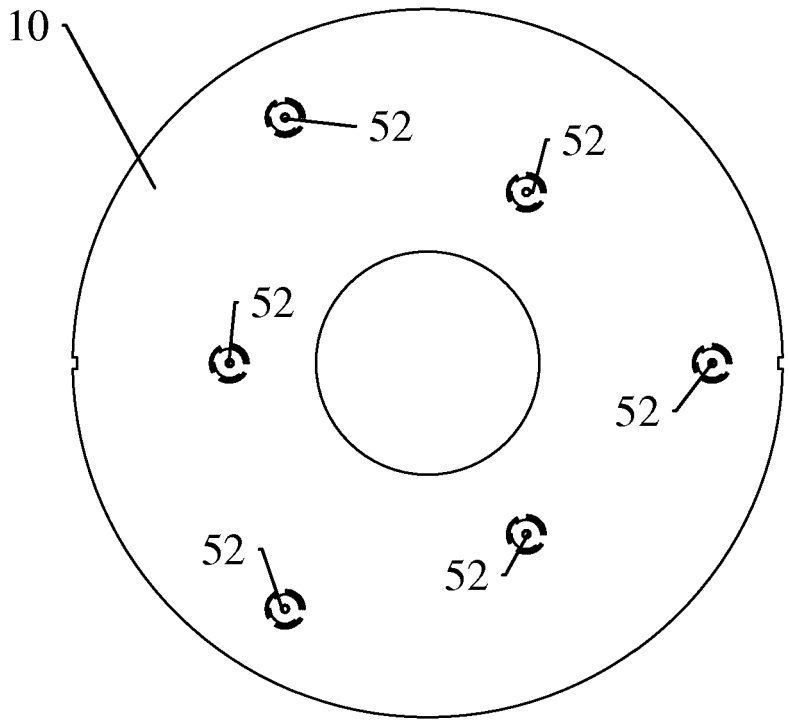


FIG.3

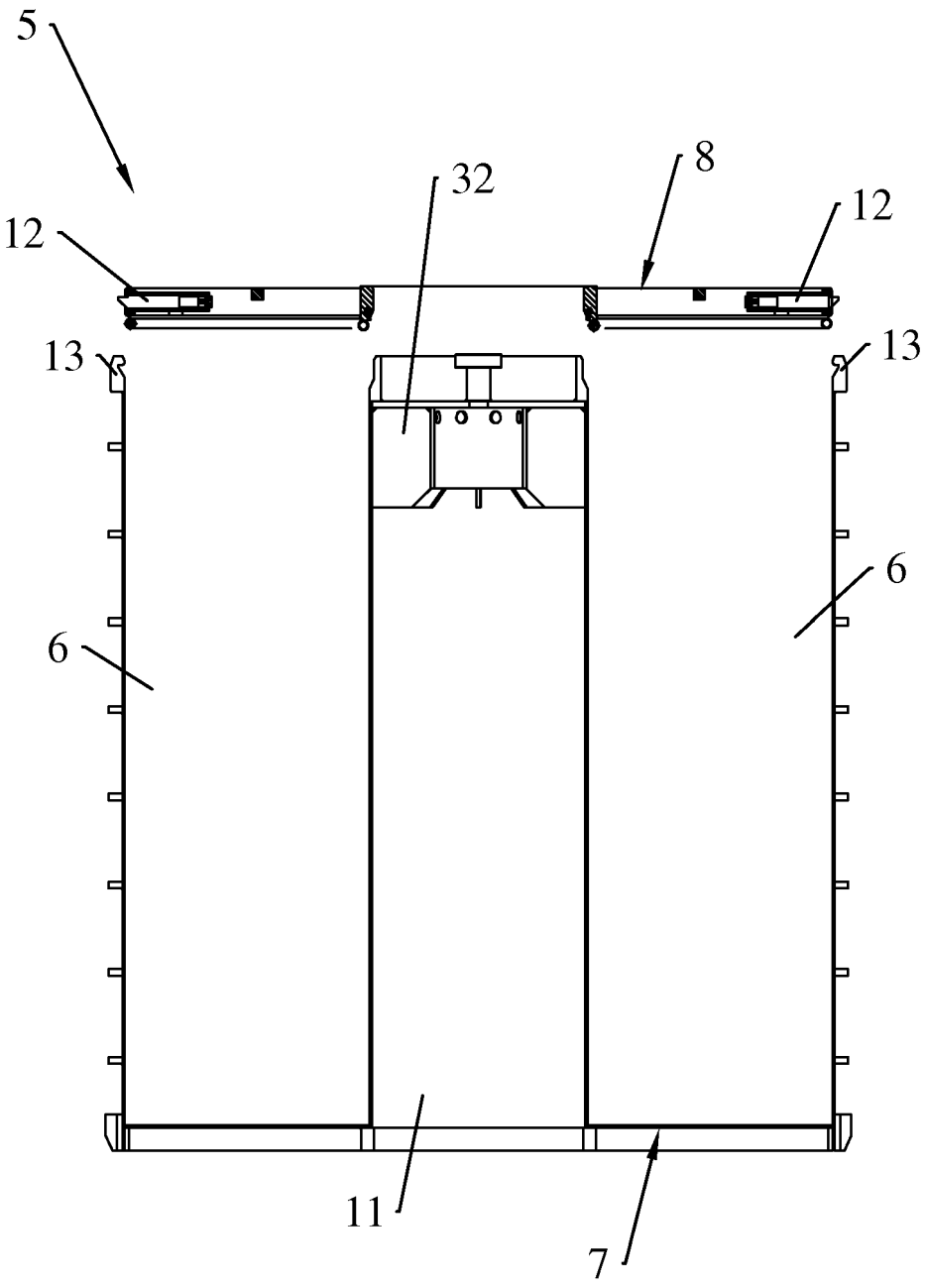


FIG.4

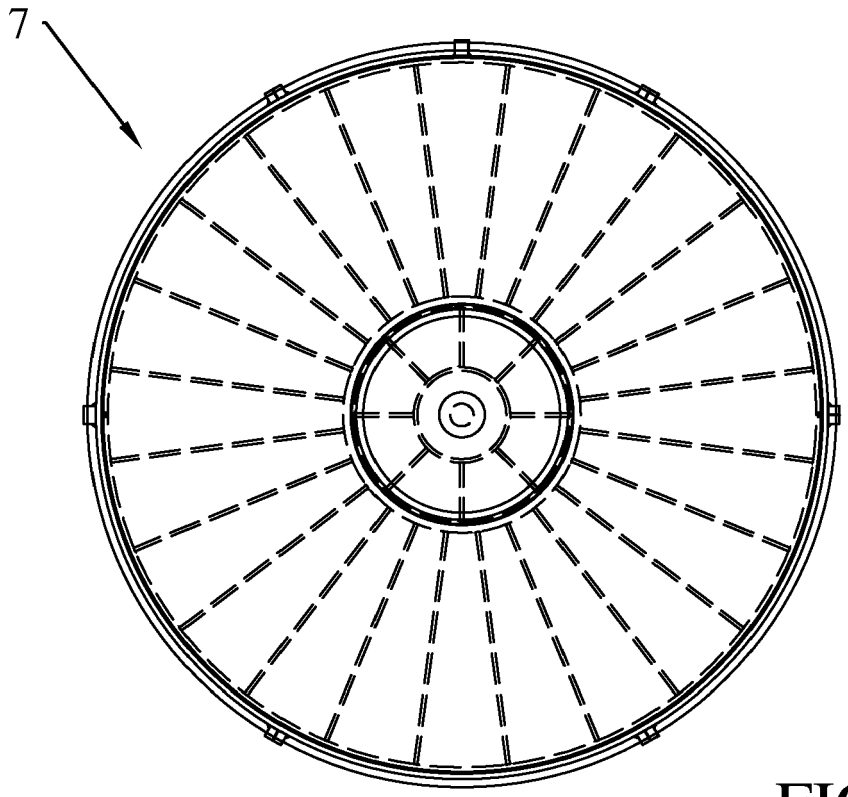


FIG.5

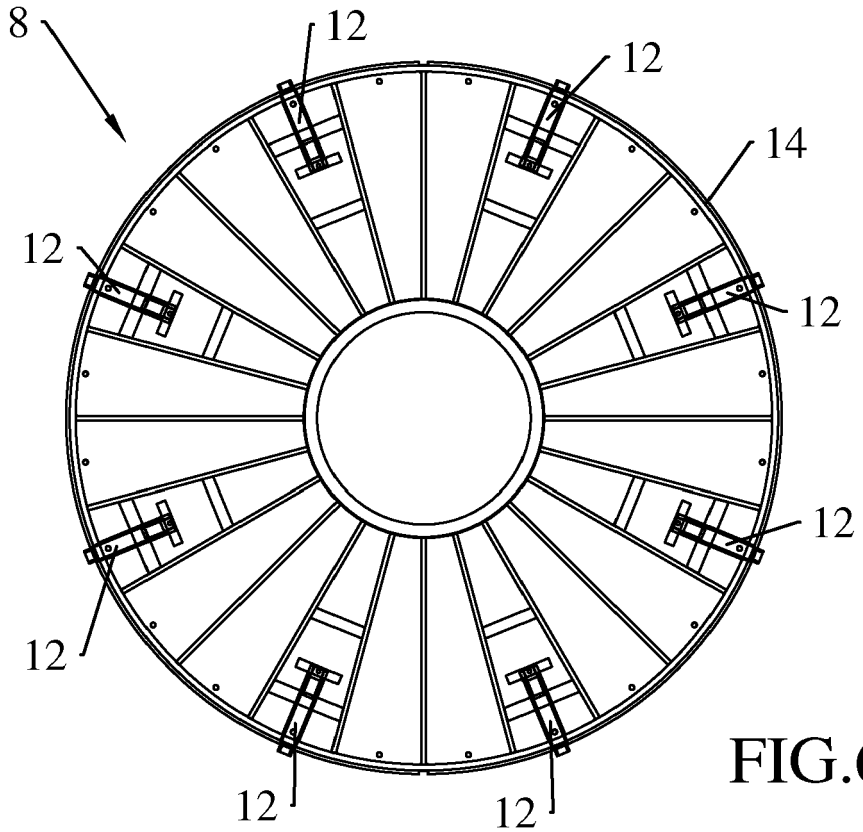


FIG.6

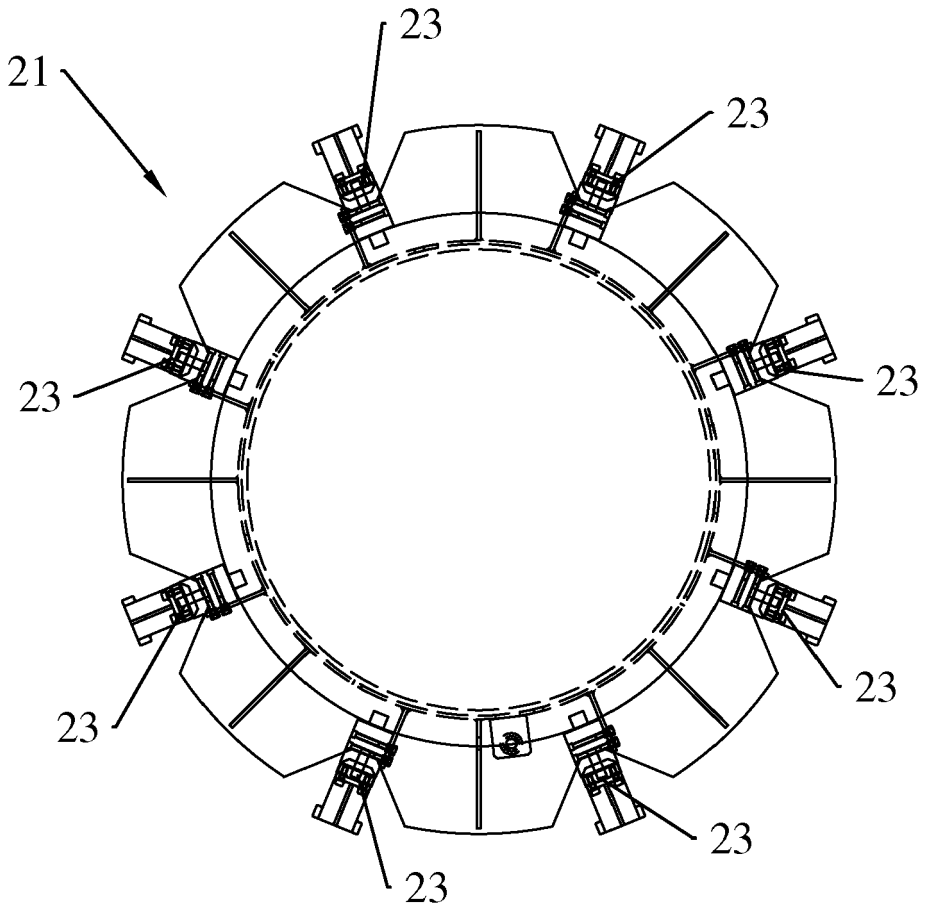


FIG.7

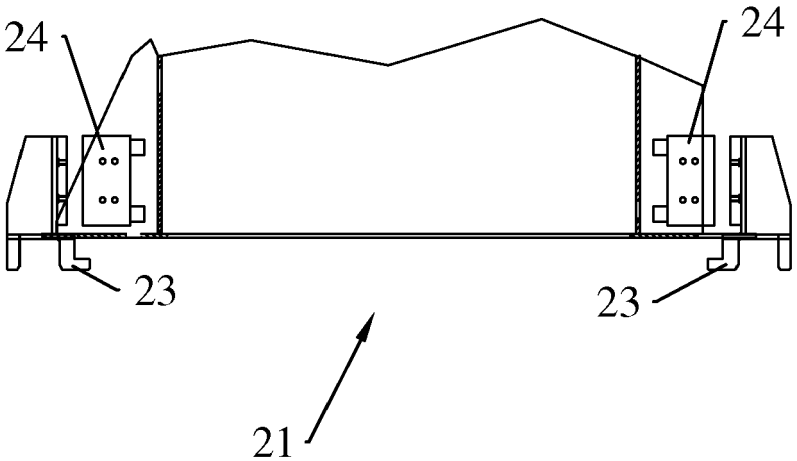


FIG.8

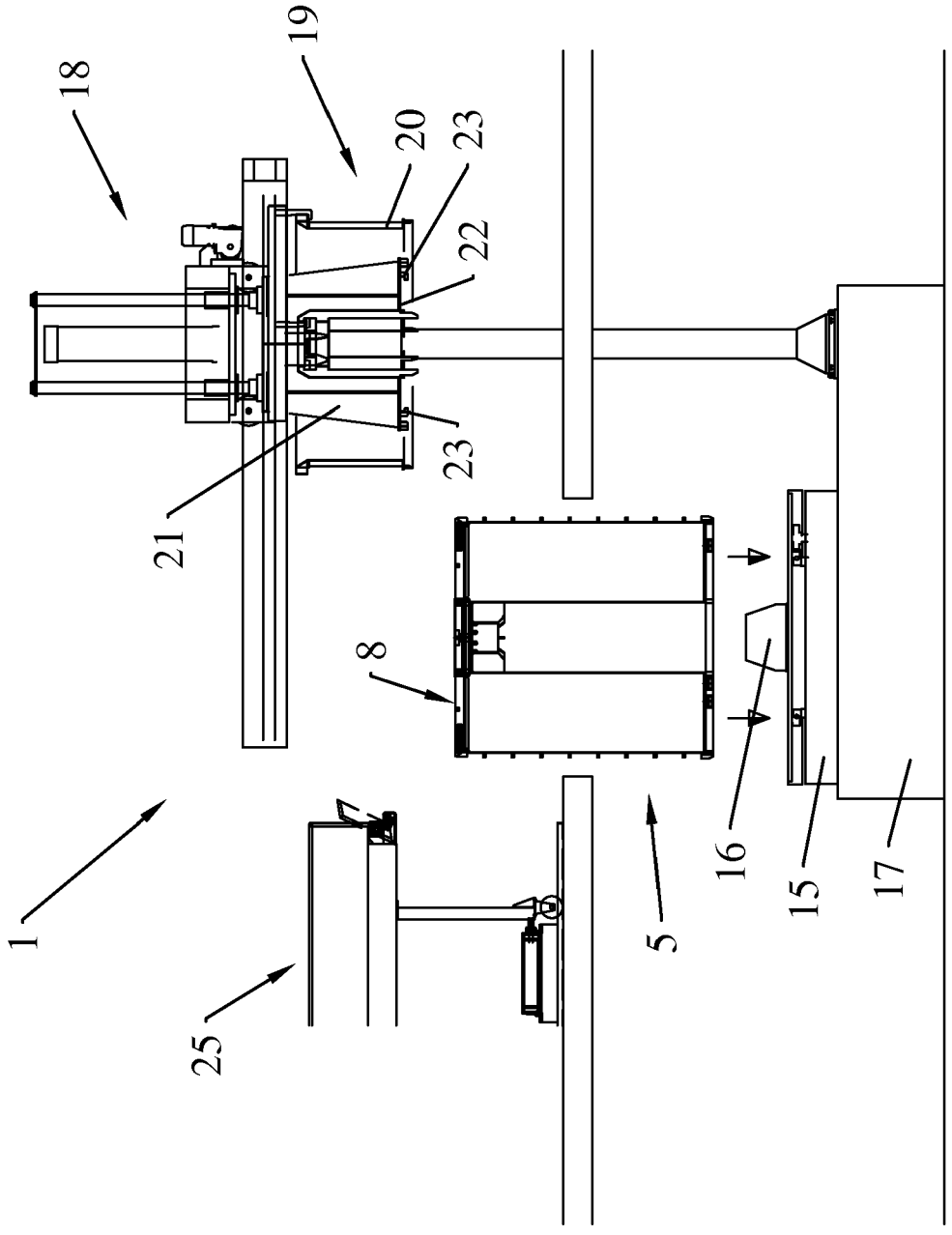


FIG.9

FIG.10

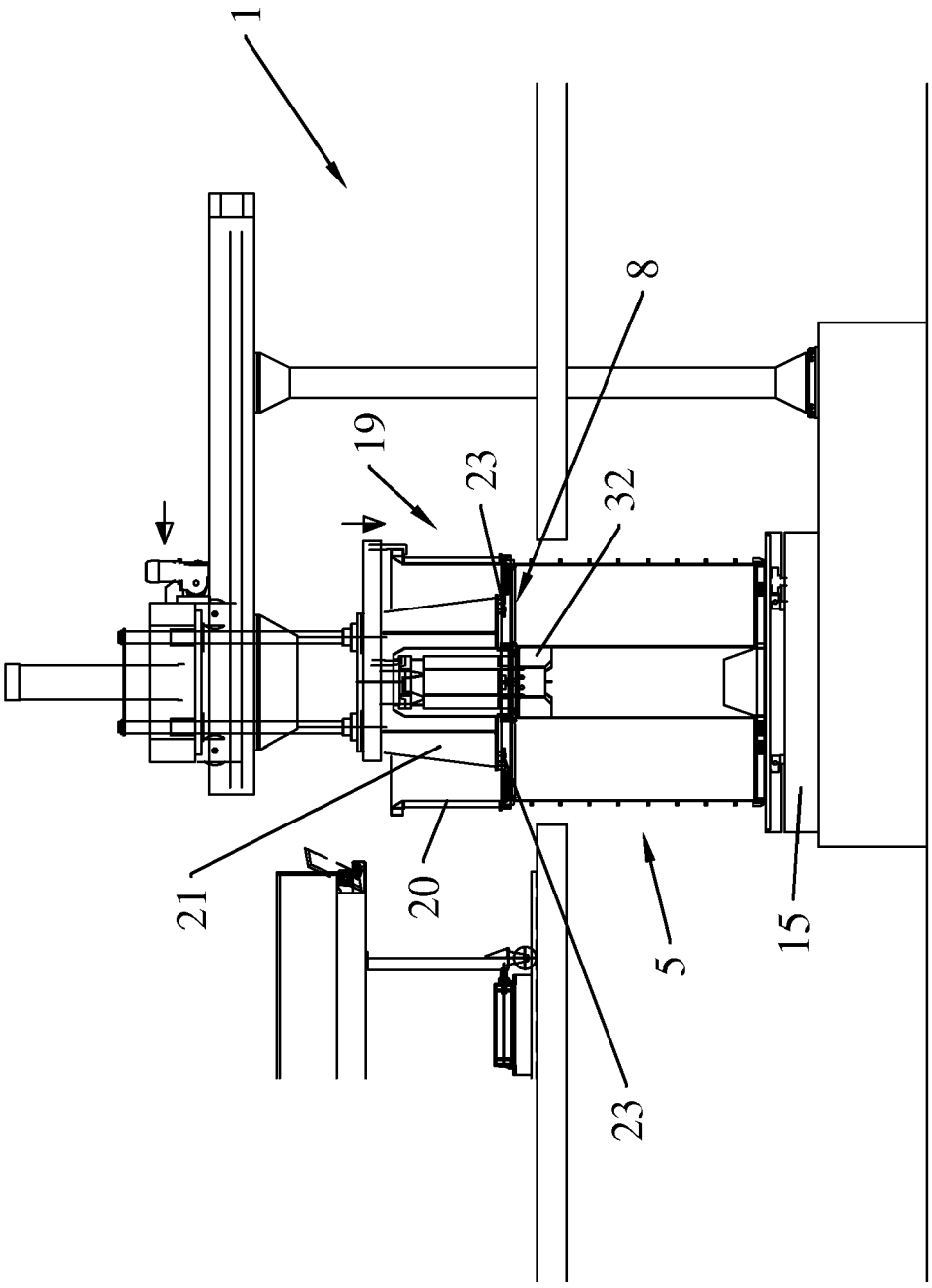


FIG.11

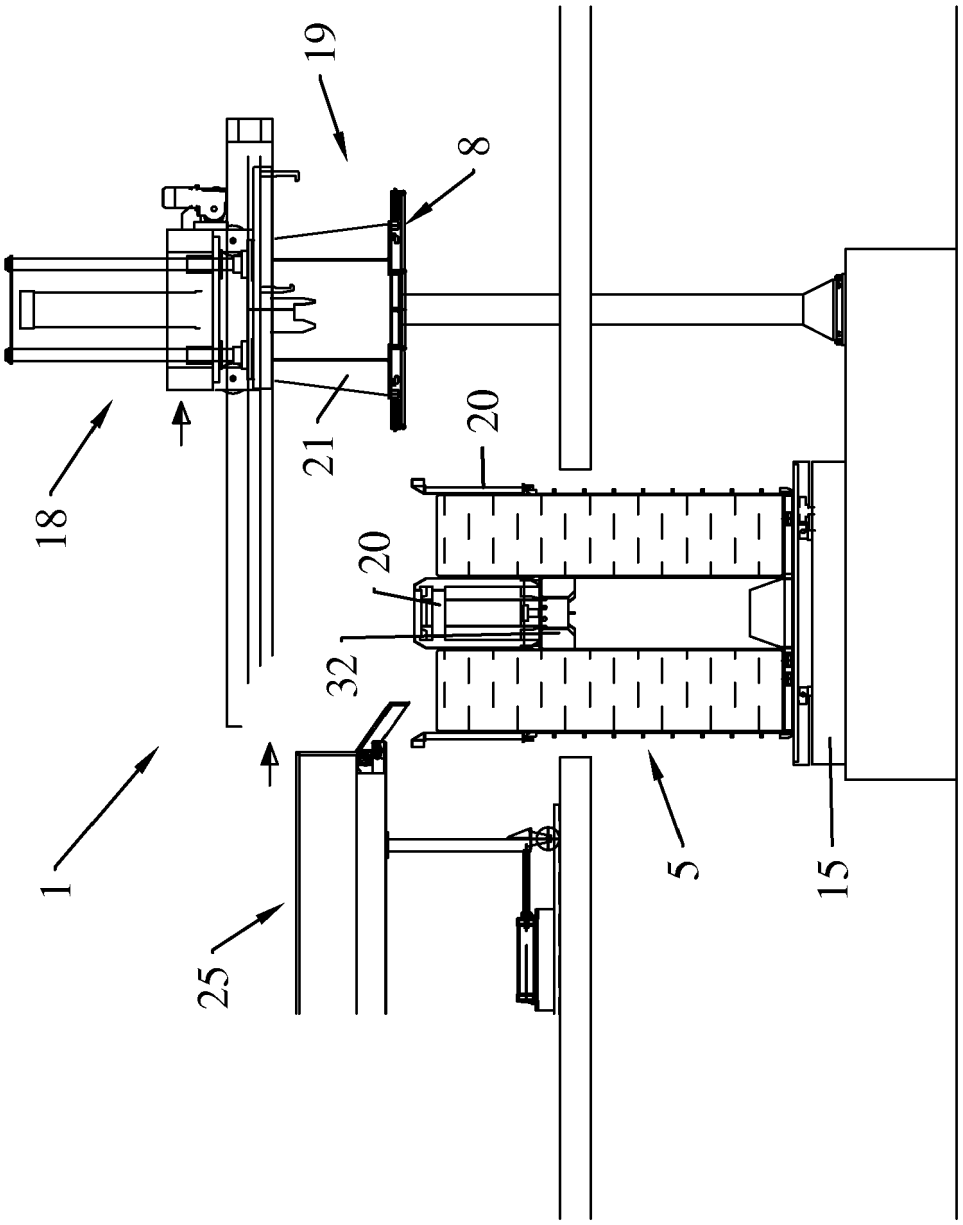


FIG.12

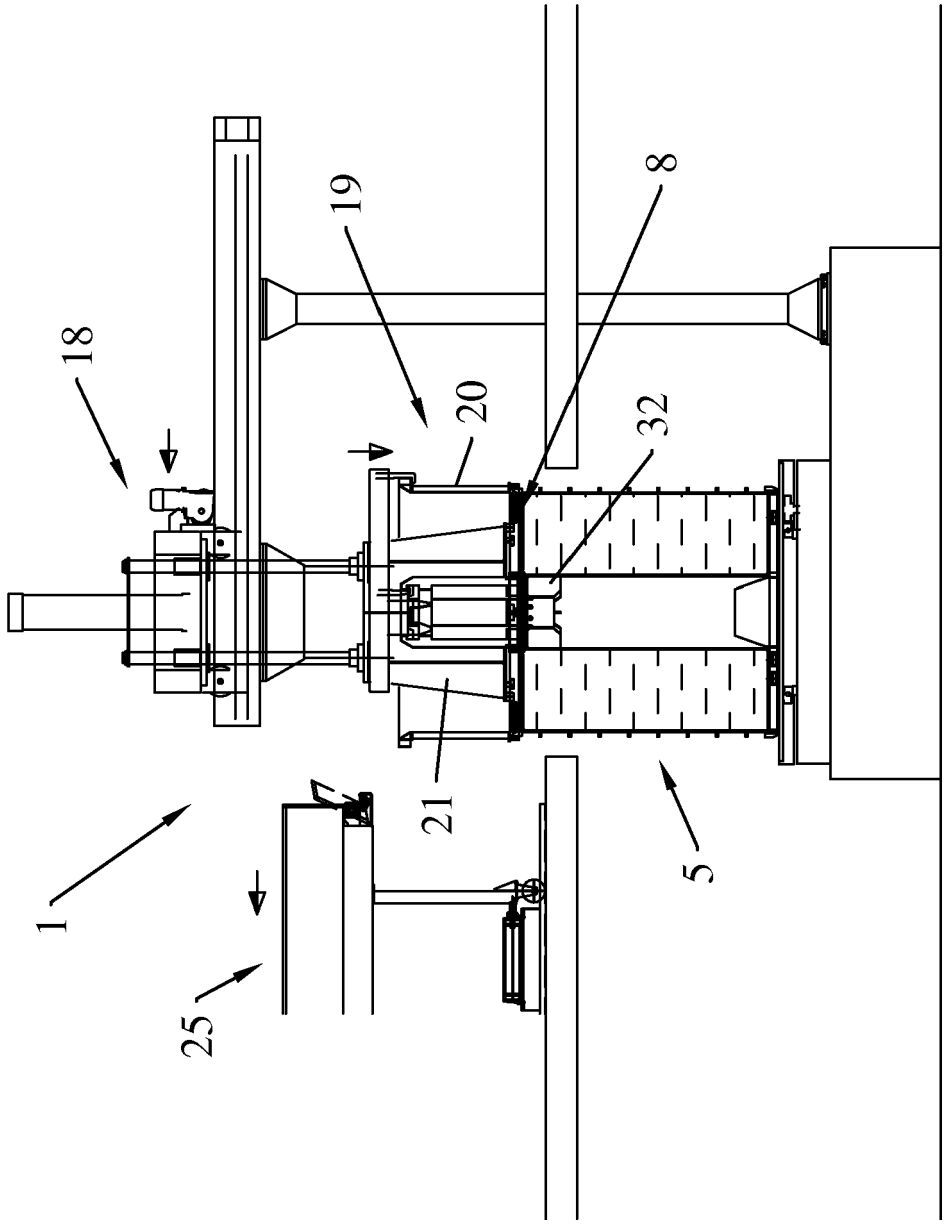
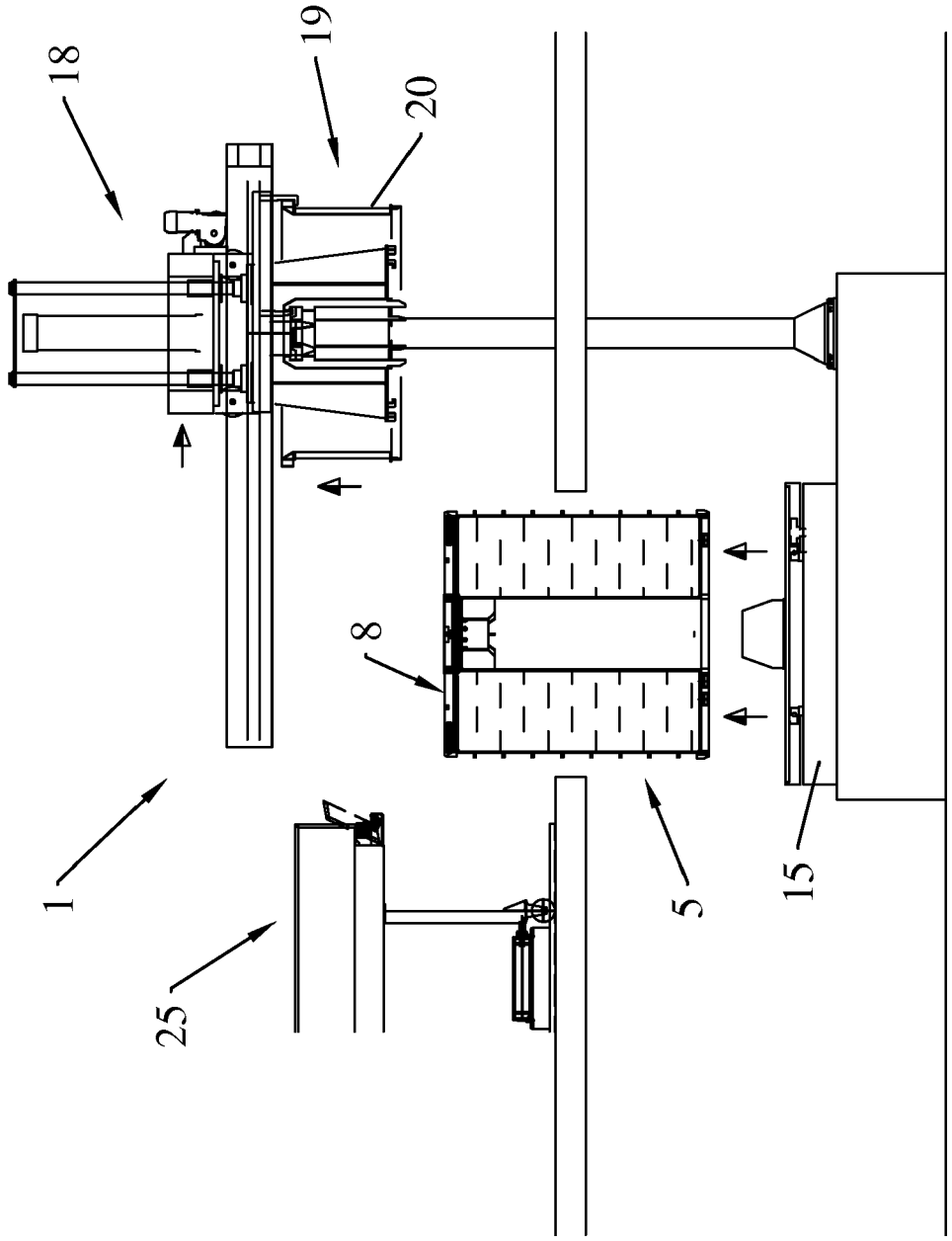


FIG.13



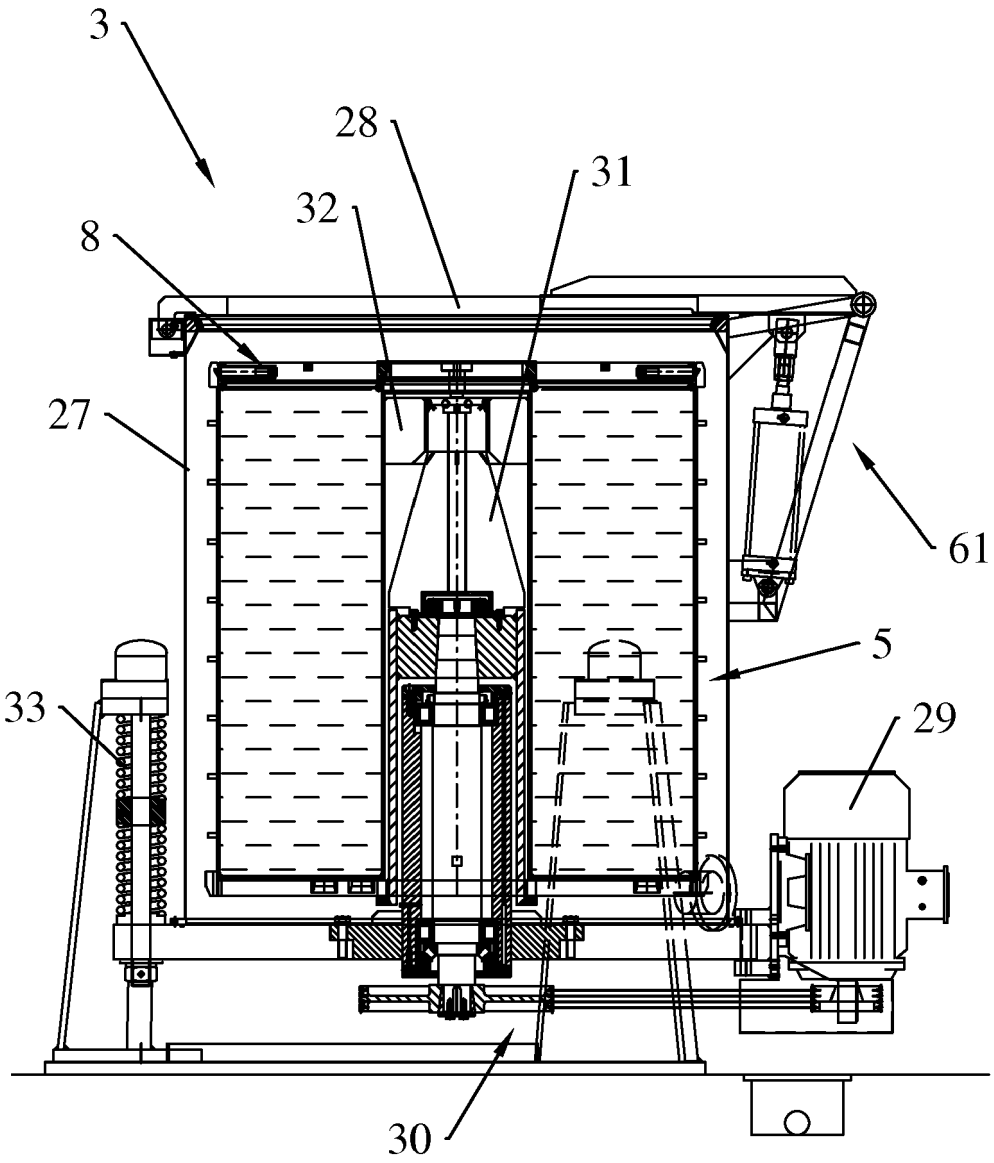


FIG.14

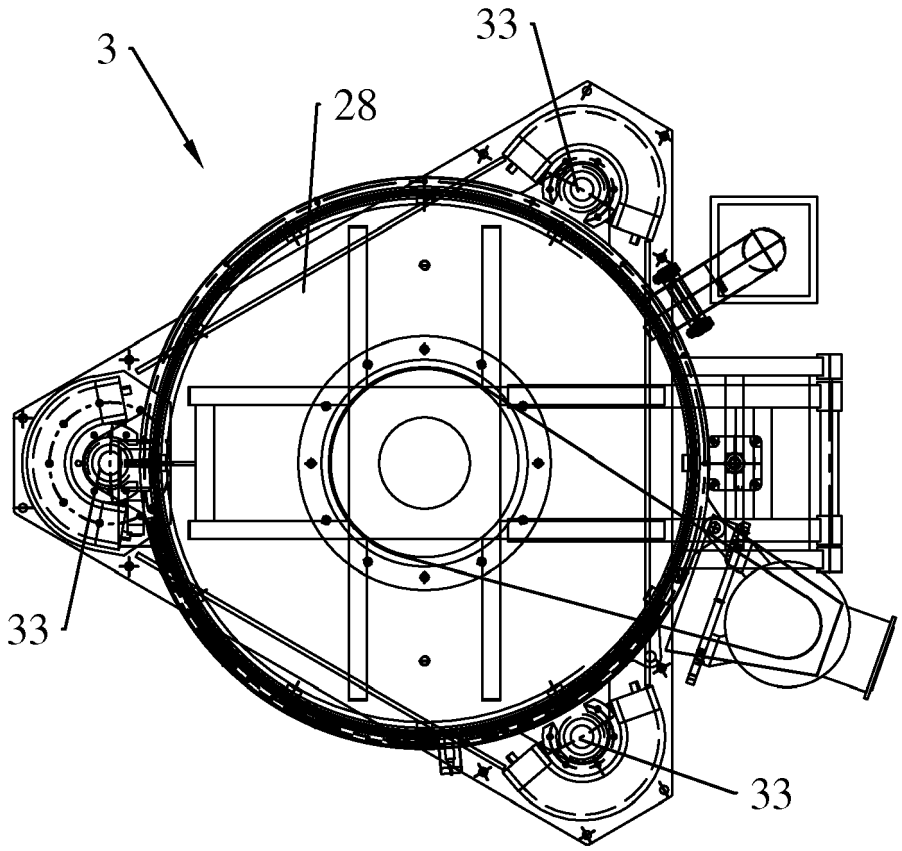


FIG.15

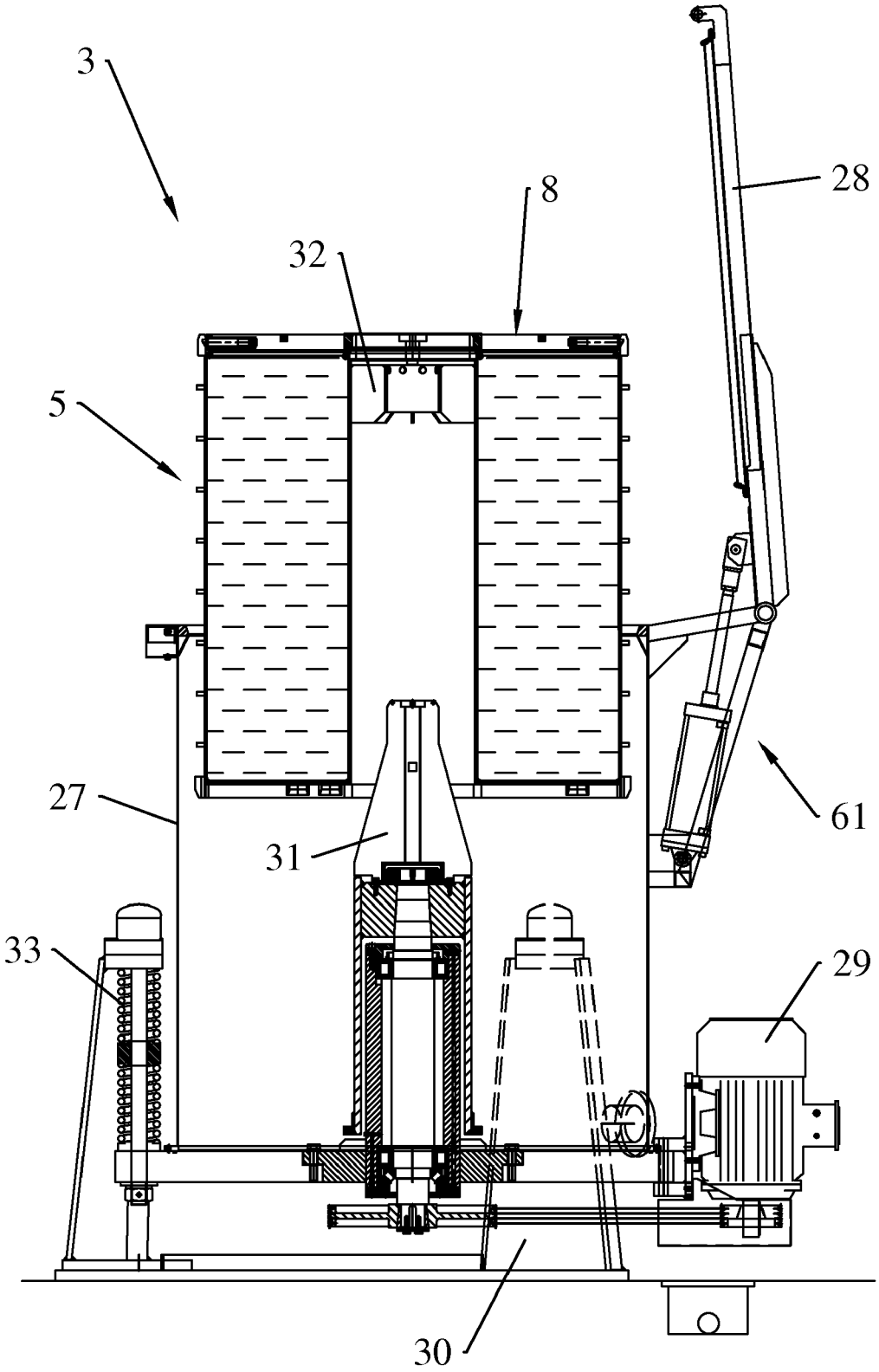


FIG.16

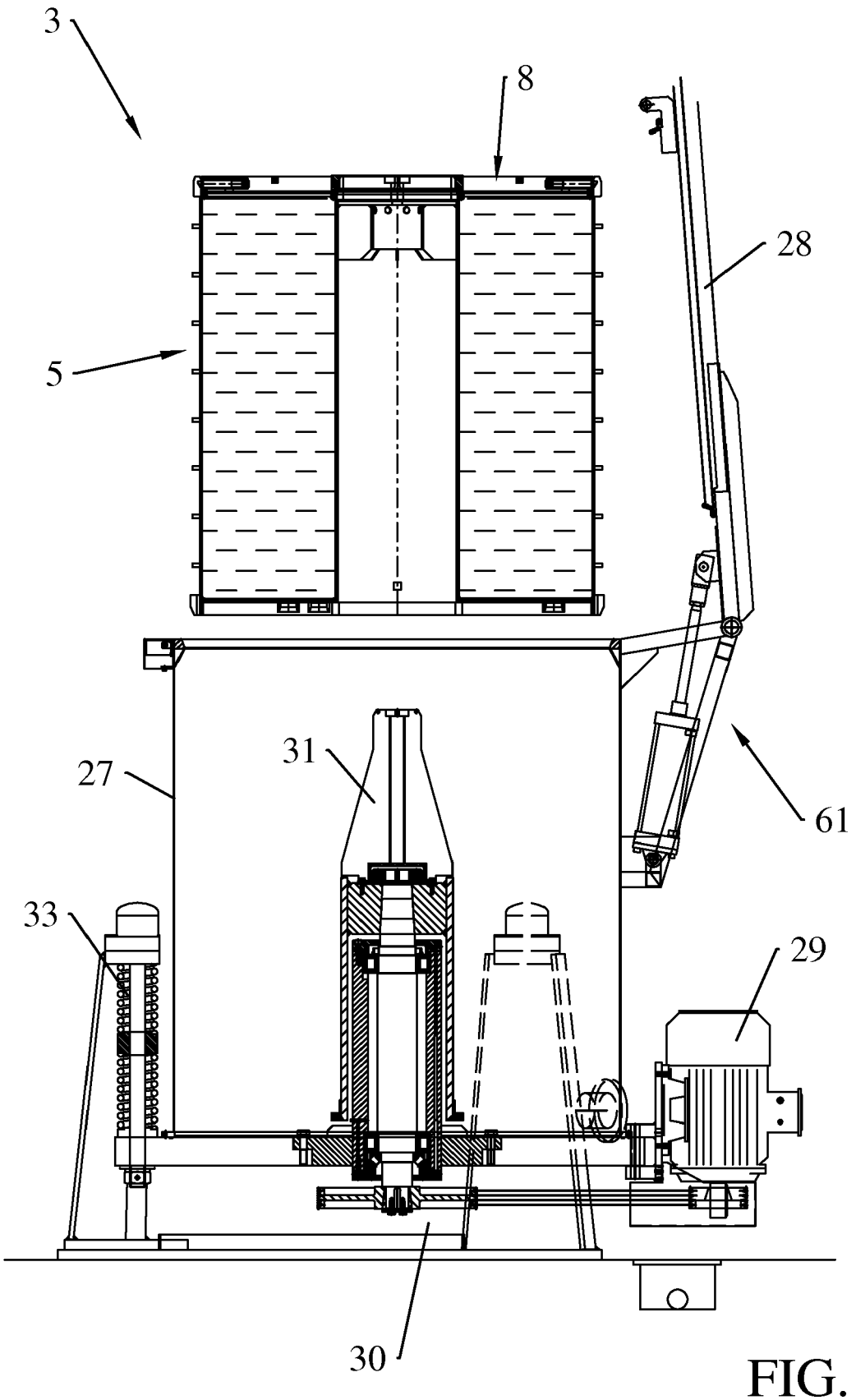


FIG.17

FIG.18

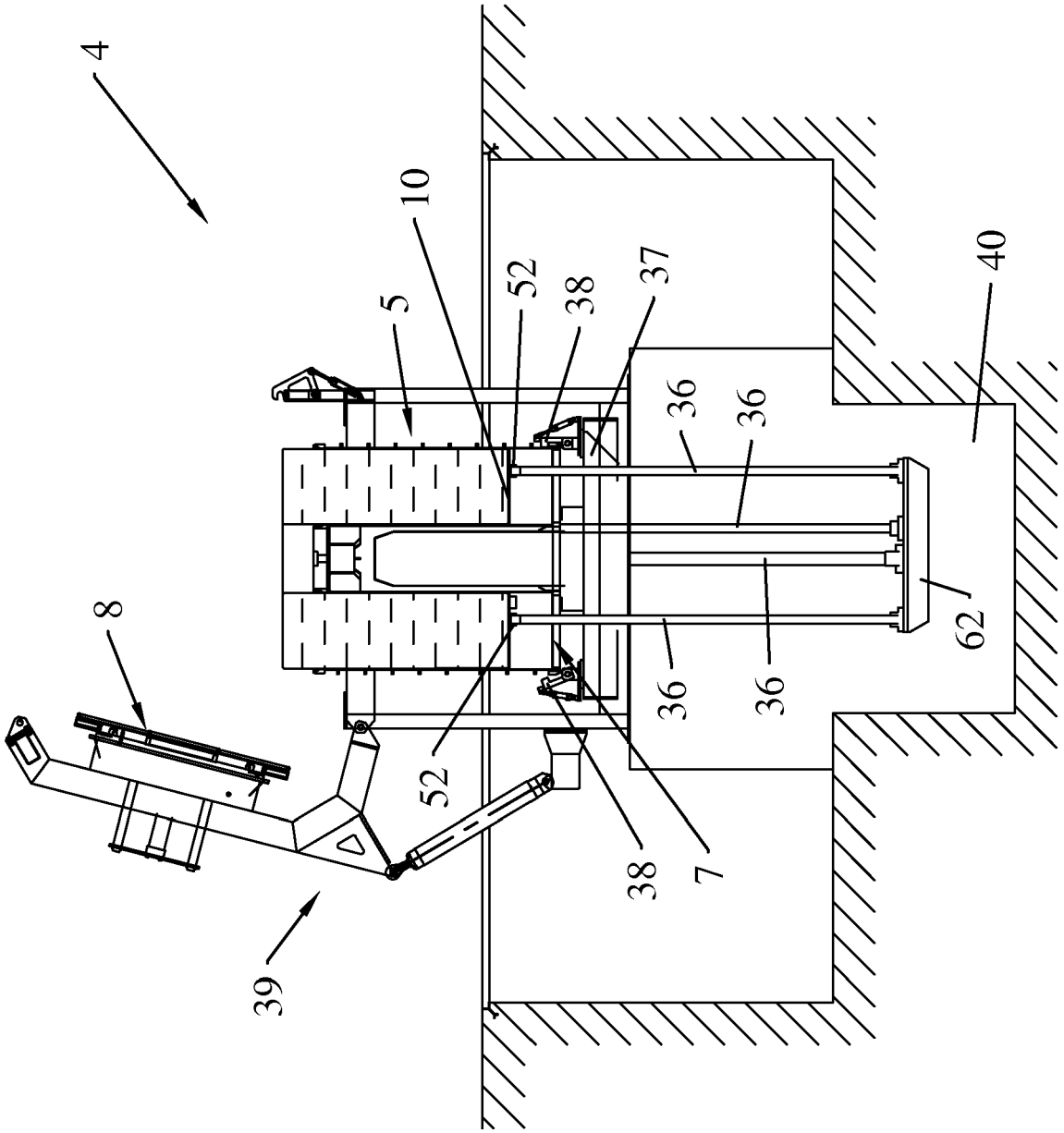


FIG.19

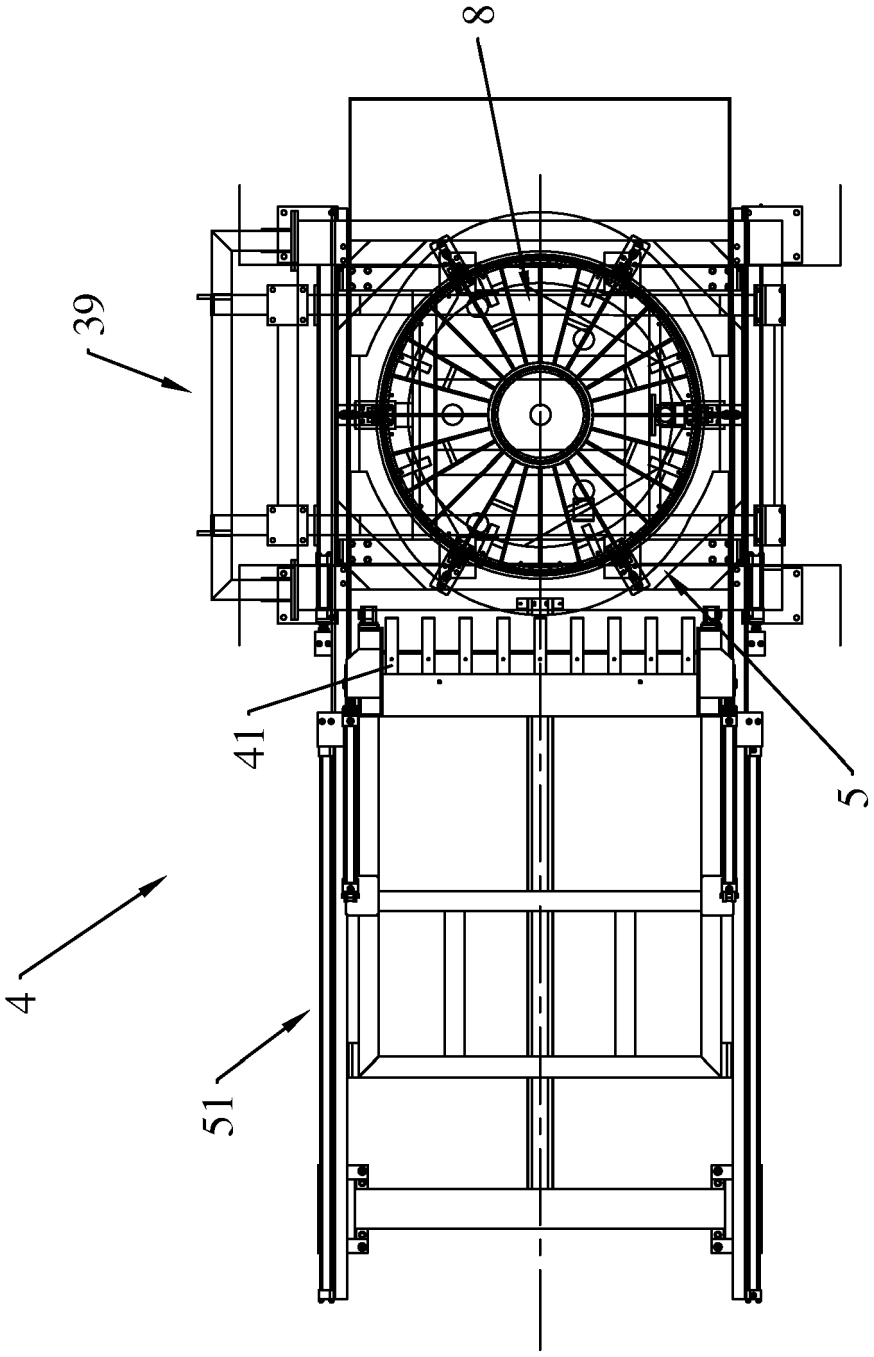


FIG.20

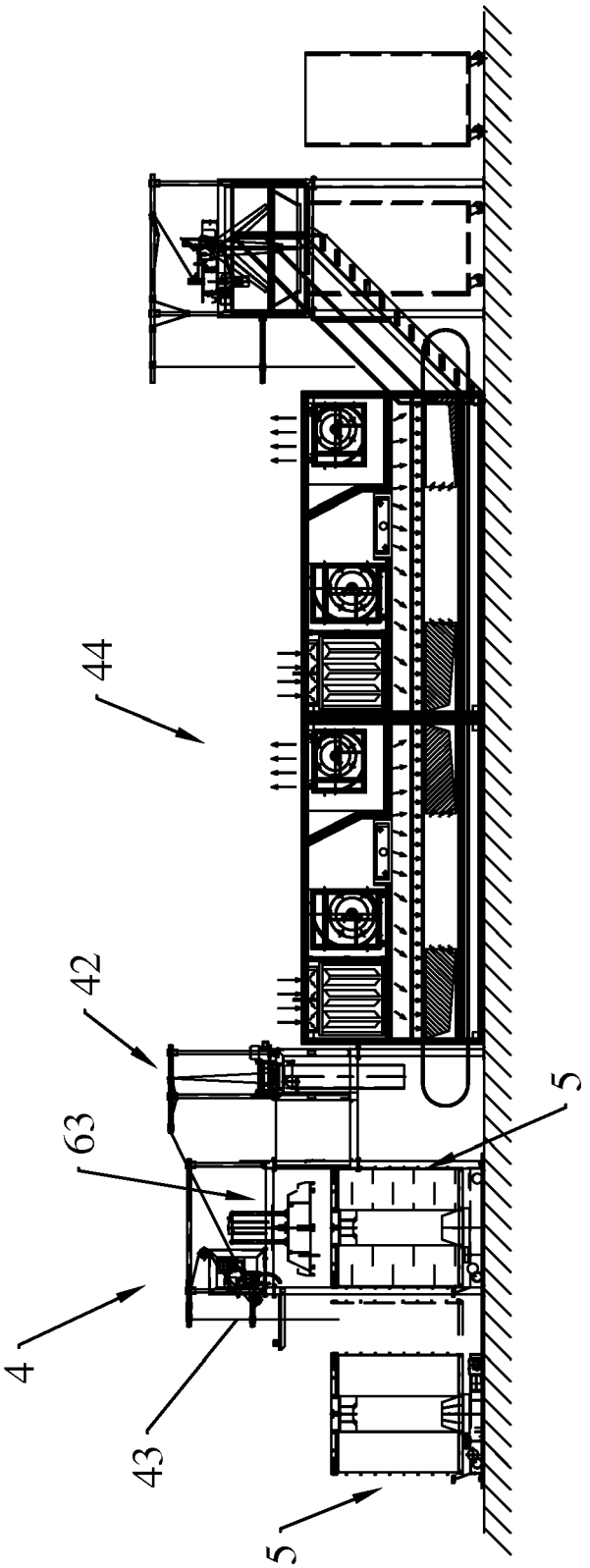
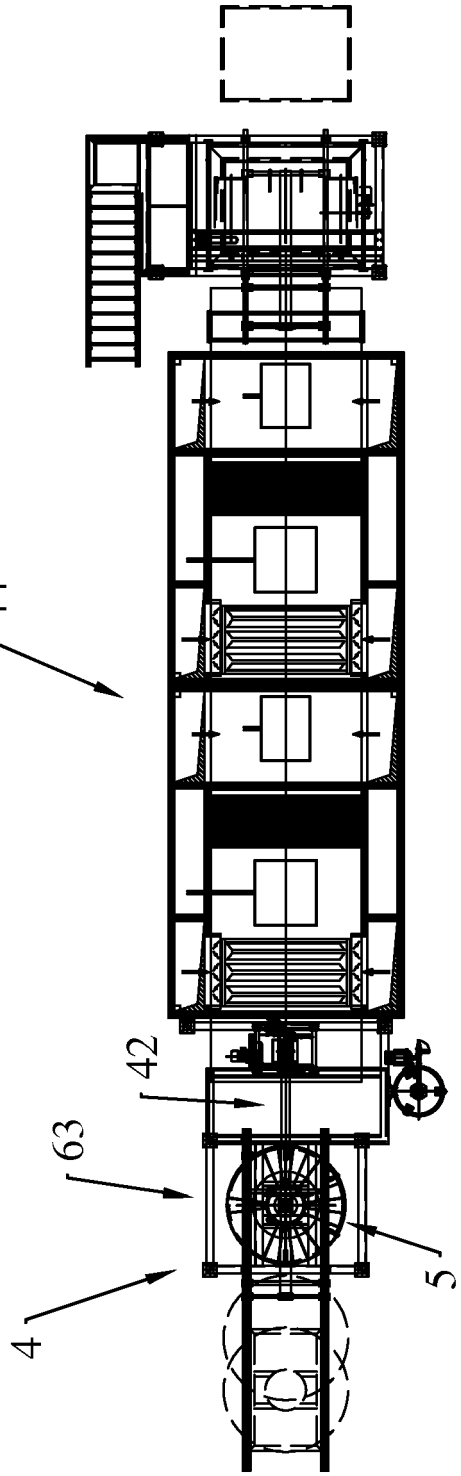


FIG.21



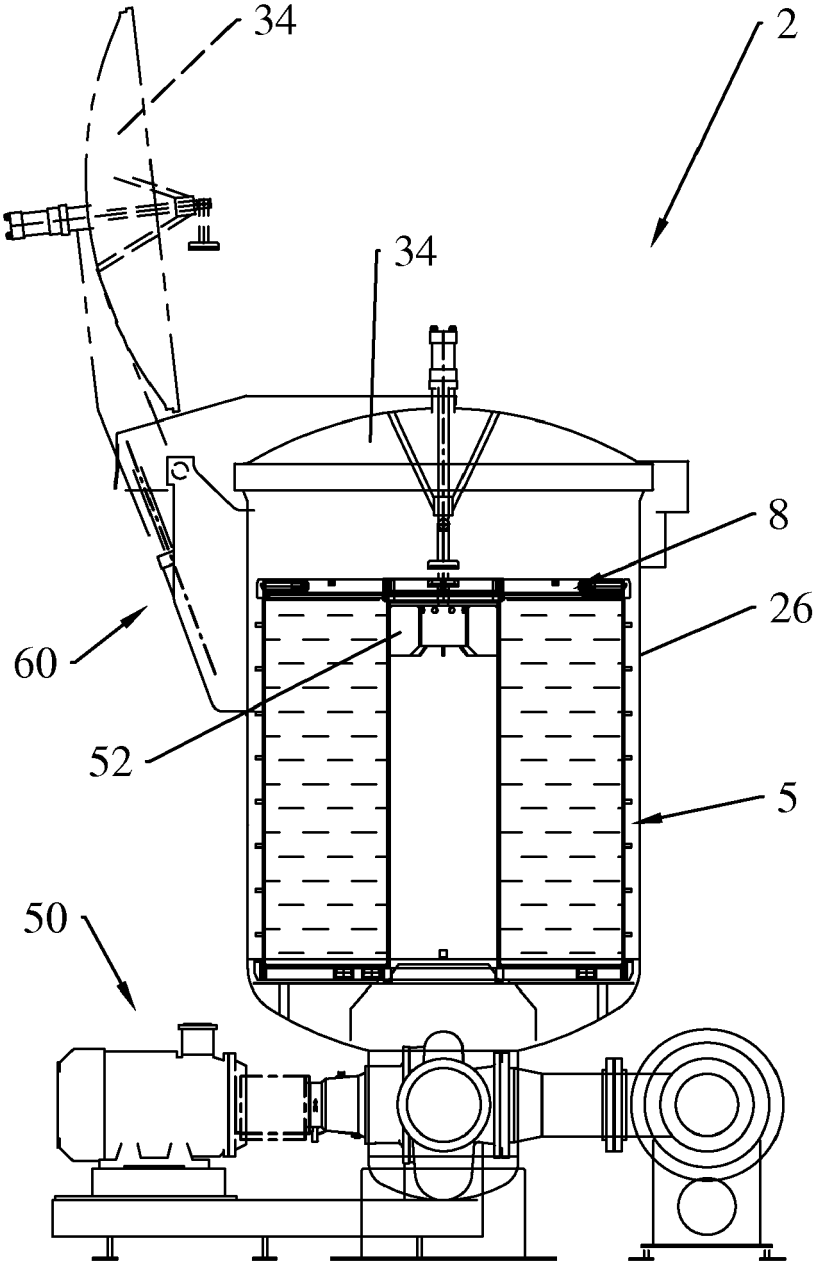
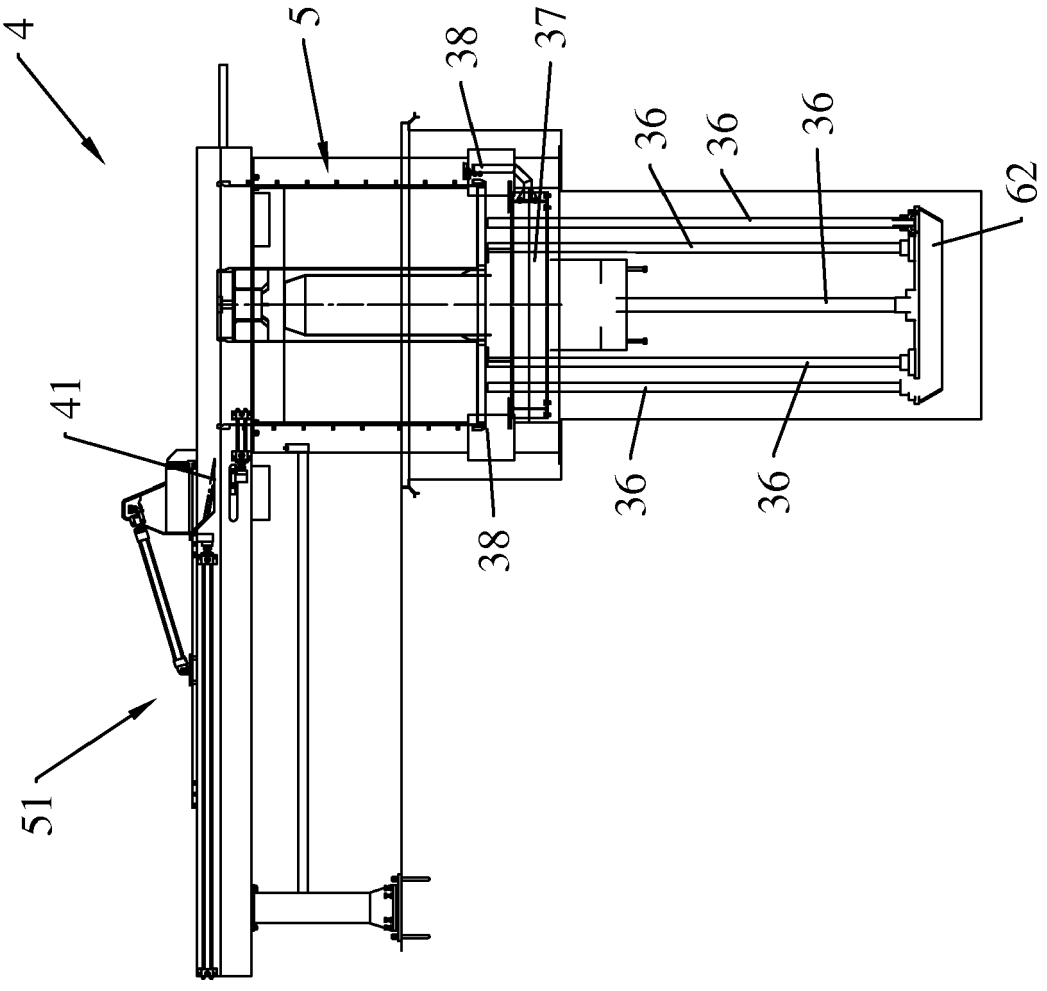


FIG.22

FIG.23



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EUROPEAN SEARCH REPORT

Application Number
EP 19 19 8869

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP H01 213462 A (HISAKA WORKS LTD) 28 August 1989 (1989-08-28) * the whole document *	1-9	INV. D06B5/06 D06B5/10 D06B21/00 D06B23/04 D06B23/14
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