



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
03.11.2021 Bulletin 2021/44

(51) Int Cl.:
D21J 5/00 (2006.01) D21J 7/00 (2006.01)

(21) Application number: **18945133.9**

(86) International application number:
PCT/CN2018/000434

(22) Date of filing: **27.12.2018**

(87) International publication number:
WO 2020/132776 (02.07.2020 Gazette 2020/27)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Changzhou City Cheng Xin Environmental Protection Technology Co., Ltd**
Changzhou, Jiangsu 213311 (CN)

(72) Inventor: **HUANG, Simon**
hangzhou, Jiangsu 213311 (CN)

(74) Representative: **Lang, Christian**
LangPatent Anwaltskanzlei IP Law Firm
Ingolstädter Straße 5
80807 München (DE)

(54) **OVERTURNING PULP-SUCTION AUTOMATIC FORMING MACHINE FOR MOLDED PULP PRODUCTS AND MANUFACTURING METHOD**

(57) A rotatably automatic molding machine and a method of operating the same contains: a suction mold (31) configured to move into an accommodation tank (33) so as to draw pulps, thus producing a pulp layer; a cold pressing mold (32) configured to contact with the suction mold (31) to form a molded pulp; a first hot pressing mold (41) and a second hot pressing mold (42) which contact with each other to hot press a molded pulp; a delivering mold (44) configured to deliver the molded pulp; and a picking arm (43) including a picker (432) which has a moving portion and a sucker configured to draw the molded pulp to move away from the delivering mold (44) upward. Thereafter, a slide mechanism (431) of the picking arm (43) is driven to move above a delivery mechanism (45). After stopping the picker (432) drawing the molded pulp, the molded pulp drops on and is delivered by the delivery mechanism (45).

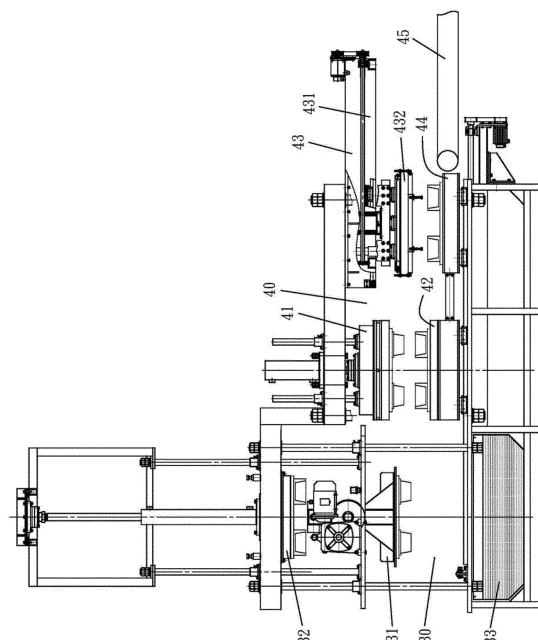


FIG. 10

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a rotatably automatic molding machine of making molded pulp and method of operating the same which is capable of accelerating production time and reducing fabrication cost.

BACKGROUND OF THE INVENTION

[0002] At present, there have been developed products that are made by mixing pulp fiber materials and/or plant fiber materials as pulp materials, and then attaching the pulp to the pulp through a suction mold, and then undergoing hot-pressing and shaping technology, in order to distinguish it from "plastic products". Generally referred to as "paper-plastic products". "Paper-plastic products have the advantage of being easily recycled, remanufactured and reused. They are in line with the trend of environmentally friendly reuse and energy saving and carbon reduction. Therefore, they are quickly accepted and adopted by the business community and the general public. Paper-plastic products are often seen such as bowls, plates, cups, covers, packaging materials, shock-absorbing materials, cushion materials and other products are gradually being adopted.

[0003] It is known that a method of making paper-plastic products with small draft angles generally must go through three continuous operations: "suction forming", "hot pressing shaping" and "finished product transfer". As shown in FIG. 1, a conventional method of making paper-plastic products contains a first operation space 10; a suction mold 11 fixed in the first operation space 10, driven to move and rotate vertically, facing downward when returns back to an original position. The suction mold 11 is connected with a first pumping device to draw and blow the suction mold 11; a cold pressing mold 12 mounted on a top of the first operation space 10, facing downward, connected with a second pumping device to draw and blow the cold pressing mold 12; an accommodation tank 12 disposed on a bottom of the first operation space 10 and configured to accommodate pulps; a second operation space 20 defined beside the first operation space 10; a first hot pressing mold 21 disposed on a top of the second operation space 20, located adjacent to the first operation space 10, connected with a third pumping device, and configured to draw and blow the first hot pressing mold 21; a second hot pressing mold 22 fixed on a bottom of the second operation space 20, moving horizontally, connected with a fourth pumping device, configured to draw and blow the second hot pressing mold 22; a delivering mold 23 mounted on a top of the second operation space 20, located proximate to the first hot pressing mold 21, connected with a fourth pumping device, and configured to draw and blow the delivering mold 23; and a holding platform 24 arranged adjacent to the second hot pressing mold 22, moving with the second

hot pressing mold 22, and locate outside the second operation space 20 when returning to an original position.

[0004] With reference to FIGS. 2-9, a method of operating a conventional rotatable molding machine contains steps of:

- 1) starting the first pumping device and descending the suction mold 11, as shown in FIG. 2, such that the suction mold 11 moves into the accommodation tank 13 to draw the pulps, thus forming a pulp layer on the suction mold 11, and moving the second hot pressing mold 22 to locate below the first hot pressing mold 21, wherein the holding platform 24 is driven to move into the second operation space 20 and is located below the delivering mold 23;
- 2) lifting the suction mold 11 to move away from the accommodation groove 13, as shown in FIG. 3, rotating the suction mold 11 to face the pulp layer upward and to contact with the cold pressing mold 12, thus producing a molded pulp, wherein the first and second pumping devices draw and blow the suction mold 12 to reduce humidity of the molded pulp;
- 3) operationally changing the second pumping device to blow when reaching a set molding time, such that the molded pulp removes from the cold pressing mold 12, and moving the suction mold 11 away from the cold pressing mold 22 and rotating the suction mold downward, in the meantime, moving the second hot pressing mold 22 to locate below the suction mold 11, and the holding platform 24 being driven to move;
- 4) descending the suction mold 11 to contact with the second hot pressing mold 22, as illustrated in FIG. 5, and starting the fourth pumping device so that the second hot pressing mold 22 draws the molded pulp, and the first pumping device being operationally changed to blow so that the molded pulp removes from the suction mold 11;
- 5) lifting the suction mold 11 to back to an original position, as shown in FIG. 6, moving the second hot pressing mold 22 to locate below the first hot pressing mold 21 reversely, and moving the first hot pressing mold 31 downward to contact with the second hot pressing mold 22, thus producing the molded pulp, wherein the third and fourth pumping devices are started to blow the blank, thus forming the molded pulp;
- 6) operational changing the third pumping device to blow, when reaching a set molding time, as illustrated in FIG. 7, such that the molded pulp removes from the first hot pressing mold 21, and lifting the first hot pressing mold 21 back to the original position, moving the second hot pressing mold 22 to locate below the delivering mold 23, in the meantime, the holding platform 24 being driven to move, and the delivering mold 23 being descended to contact with the second hot pressing mold 22, and the fourth pumping device being operationally changed to blow so that the

molded pulp removes from the second hot pressing mold 22, and the fifth pumping device being started to draw so that the delivering mold 23 draws the molded pulp;

7) lifting the delivering mold 23 to move back to an original position, as shown in FIG. 8, and moving the second hot pressing mold 22 to locate below the first hot pressing mold 21, wherein the holding platform 23 being driven to move to locate below the delivering mold 23, and the fifth pumping device is operationally changed to blow, such that the molded pulp drops on the holding platform 24; and

8) moving the second hot pressing mold 22 to locate below the delivering mold 23 so that the holding platform 24 receives and moves the molded pulp out of the second operation space 20, thus removing the molded pulp from the holding platform.

[0005] Accordingly, the making steps are classified to three production cycle, inclusive of "pulp forming time", "hot pressing time", and "delivering time", and the second hot pressing mold 22 is moved in the "pulp forming time in the first operation space 10", "the hot pressing time", and "the delivering time in the second operation space 20". However, such a production cycle is time-consuming at a high fabrication cost.

[0006] The present invention has arisen to mitigate and/or obviate the afore-described disadvantages.

SUMMARY OF THE INVENTION

[0007] The primary aspect of the present invention is to provide a rotatably automatic molding machine of making molded pulp and method of operating the same which is capable of accelerating production time and reducing fabrication cost.

[0008] To obtain above-mentioned object, a rotatably automatic molding machine provided by the present invention contains:

a first operation space including a suction mold fixed in the first operation space; a cold pressing mold arranged in the first operation space; and an accommodation tank formed on a bottom of the first operation space and configured to accommodate pulps; a second operation space formed beside the first operation space, and the second operation space including a first hot pressing mold arranged on a top of the second operating space and located adjacent to the first operation space; a second hot pressing mold arranged on a bottom of the second operation space and moving horizontally; a delivering mold fixed beside, connected and moving with the second hot pressing mold, and having a receiving mold; and a picking arm located proximate to the first hot pressing mold, having an extending end located on a top of a third operation space, and a distal end extending out of the third operation space; a slide mechanism

extending out of a distal end of the third operation space from a top of the first hot pressing mold; and a picker connected on a bottom of the slide mechanism and moving with the slide mechanism.

[0009] Preferably, the picker has a moving portion moving vertically and has a sucker extending downward.

[0010] Preferably, the rotatably automatic molding machine further contains a delivery mechanism mounted outside the third operation space and located below the picking arm.

[0011] Preferably, the suction mold is driven to move and rotate vertically.

[0012] Preferably, the cold pressing mold is arranged on a top of the first operation space and faces downward.

[0013] A method of operating a rotatably automatic molding machine, the rotatably automatic molding machine contains:

a first operation space including a suction mold fixed in the first operation space; a cold pressing mold arranged in the first operation space; and an accommodation tank formed on a bottom of the first operation space and configured to accommodate pulps; a second operation space formed beside the first operation space, and the second operation space including a first hot pressing mold arranged on a top of the second operating space and located adjacent to the first operation space; a second hot pressing mold arranged on a bottom of the second operation space and moving horizontally; a delivering mold fixed beside, connected and moving with the second hot pressing mold, and having a receiving mold; and a picking arm located proximate to the first hot pressing mold, having an extending end located on a top of a third operation space, and a distal end extending out of the third operation space; a slide mechanism extending out of a distal end of the third operation space from a top of the first hot pressing mold; and a picker connected on a bottom of the slide mechanism and moving with the slide mechanism. The picker has a moving portion moving vertically and has a sucker extending downward; and a delivery mechanism mounted outside the third operation space and located below the picking arm.

[0014] The method of operating the rotatably automatic molding machine comprises steps of:

- 1) starting the first pumping device so that the suction mold descends into the accommodation tank to suck the pulps, hence the suction mold produces a pulp layer on a bottom thereof;
- 2) lifting the suction mold to move away from the accommodation tank and rotating the bottom of the suction mold to face upward so that the pulp layer faces upward;
- 3) lifting the suction mold continuously to contact with

the cold pressing mold so that the pulp layer is pressed by the cold pressing mold to form a blank;
4) blowing the blank so that the blank removes from the cold pressing mold, and the suction mold draws the blank to move away from the cold pressing mold downward, then the suction mold is rotated so that the blank faces downward;

5) moving the second hot pressing mold to locate below the suction mold and actuating the delivering mold to move with the second hot pressing mold, then the suction mold drawing the blank to contact with the second hot pressing mold downward, and the blank being processed by the second hot pressing mold;

6) moving the suction mold back to the original position upward, drawing and moving the blank to locate below the first hot pressing mold by using the second hot pressing mold, in the meantime, the delivering mold is driven to move back to an original position;

7) descending the first hot pressing mold to contact with the second hot pressing mold so as to press the blank to produce molded pulp;

8) removing the molded pulp from the second hot pressing mold and drawing the molded pulp to move upward by using the first hot pressing mold;

9) moving the second hot pressing mold to locate below the suction mold and to drive the delivering mold to move to locate below the first hot pressing mold, and the first hot pressing mold drawing and moving the molded pulp to contact with the delivering mold downward;

10) removing the molded pulp from the first hot pressing mold, drawing the molded pulp by using the delivering mold, and lifting the first hot pressing mold;

11) moving the molded pulp to locate below the picking arm by ways of the delivering mold;

12) driving the sucker to draw the molded pulp by using the picker of the picking arm;

13) moving the mold pulp to move upward by using the sucker and to remove from the delivering mold; and

14) driving the picker to draw and move the molded pulp to locate above the delivery mechanism by using the slide mechanism of the picking arm, stopping the picker drawing the molded pulp so that the mold pulp drops on and is delivered by the delivery mechanism or drops into the delivery mechanism is delivered by the delivery mechanism.

[0015] Preferably, when descending the first hot pressing mold to contact with the second hot pressing mold to produce molded pulp in the step 7), the suction mold is descended into the accommodation tank again to draw the pulps, such that the suction mold produces another pulp layer of a second production cycle on the bottom thereof, then another molded pulp of the second production cycle is produced in the same steps.

[0016] Preferably, the suction mold draws the blank of the second production cycle to move away from the cold pressing mold and rotating the blank of the second production cycle to face downward, when the first hot pressing mold draws the molded pulp upward; and when moving the second hot pressing mold to locate below the suction mold, the suction mold draws the blank of the second production cycle to descend so that the second hot pressing mold presses the blank, and the second hot pressing mold receives the blank of the second production cycle.

[0017] Preferably, when the first hot pressing mold moves upward and the delivering mold drives the molded pulp to move to locate below the picker of the picking arm, the suction mold moves upward and the second hot pressing mold draws the blank of the second production cycle to move reversely and to locate below the first hot pressing mold. When the picker of the picking arm descend to draw the molded pulp, the first hot pressing mold contacts with the second hot pressing mold to hot press the blank of the second production cycle and to produce another molded pulp of the second production cycle; and the suction mold descend again to move into the accommodation tank so that the other pulp layer of a third production cycle attached on the suction mold, and the other pulp layer is processed by the same steps to produce the other molded pulp; when the picker of the picking arm draws the other molded pulp to move away from the delivering mold upward, another molded pulp of the second production cycle removes from the second hot pressing mold, and the first hot pressing mold draws another molded pulp of the second production cycle upward, and the suction mold draws the other blank of the third production cycle to descend away from the cold pressing mold.

[0018] Preferably, when stopping the picker drawing the molded pulp so that the mold pulp drops on and is delivered by the delivery mechanism, the second hot pressing mold moves and locates below the suction mold the delivering mold moves and locates below the first hot pressing mold, and the first hot pressing mold descends to move another molded pulp of the second production cycle to the delivering mold, and the suction mold draws, rotates, and descends the other blank of the third production cycle to contact with the second hot pressing mold so that the other blank of the third production cycle is moved to the second hot pressing mold.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a schematic view showing the assembly of a conventional automatic molding machine.

FIGS. 2 to 9 are a schematic view showing operation of the conventional automatic molding machine of making molded pulp.

FIG. 10 is a schematic view showing the assembly of a conventional automatic molding machine ac-

cording to a preferred embodiment of the present invention.

FIGS. 11 to 25 are a schematic view showing operation of the conventional automatic molding machine of making molded pulp.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] With reference to FIG. 10, a rotatably automatic molding machine according to a preferred the present invention comprises: a first operation space 30 and a second operation space 40,

[0021] The first operation space 30 includes a suction mold 31 fixed in the first operation space 30, driven to move and rotate vertically, and connected with a first pumping device configured to draw and blow, wherein the suction mold 31 faces downward when moving back to an original position; a cold pressing mold 32 arranged on a top of the first operation space 30, facing downward, and connected with a second pumping device configured to draw and blow; and an accommodation tank 33 formed on a bottom of the first operation space 30 and configured to accommodate pulps.

[0022] The second operation space 40 is formed beside the first operation space 30, and the second operation space 40 includes a first hot pressing mold 41 arranged on a top thereof, located adjacent to the first operation space 30, and connected with a third pumping device configured to draw and blow; a second hot pressing mold 42 arranged on a bottom of the second operation space 40, moving horizontally when moving back to an original position, located below the first hot pressing mold 41, and connected with a fourth pumping device configured to draw and blow; a picking arm 43 located proximate to the first hot pressing mold 41, having an extending end located on a top of a third operation space 20, a distal end extending out of the third operation space 20, a slide mechanism 431 extending out of a distal end of the third operation space 20 from a top of the first hot pressing mold 41, a picker 432 which is connected on a bottom of the slide mechanism 431, moves with the slide mechanism 431, and has a moving portion moving vertically and has a sucker extending downward; a delivering mold 44 fixed beside, connected and moving with the second hot pressing mold 42, having a receiving mold, coupled with a fifth pumping device configured to draw and blow, and located below the picker 432 of the picking arm 43 when moving back to an original position; and a delivery mechanism 45 mounted outside the third operation space 20 and located below the picking arm 43, wherein a top of the delivery mechanism 45 is a plane or has a fixture.

[0023] The first, second, third, fourth, and fifth pumping devices are well-known art, further remarks are omitted and are not shown in drawings of the present invention.

[0024] Referring to FIG. 11, a method of operating the rotatably automatic molding machine comprises steps of:

1) starting the first pumping device so that the suction mold 31 descends into the accommodation tank 33 to suck the pulps, hence the suction mold 31 produces a pulp layer on a bottom thereof, as shown in FIG. 11;

2) lifting the suction mold 31 to move away from the accommodation tank 33 and rotating the bottom of the suction mold 31 to face upward so that the pulp layer faces upward, as shown in FIG. 12;

3) lifting the suction mold 31 continuously to contact with the cold pressing mold 32 so that the pulp layer is pressed by the cold pressing mold 32 to form a blank, in the meantime, the first pumping device and the second pumping device draw successively so that the blank decreases a humidity, as shown in FIG. 13;

4) operationally changing the second pumping device to blow the blank when reaching a set molding time so that the blank removes from the cold pressing mold 32, and the suction mold 31 draws the blank to move away from the cold pressing mold 32 downward, then the suction mold 31 is rotated so that the blank faces downward, as illustrated in FIG. 14;

5) moving the second hot pressing mold 42 to locate below the suction mold 31 and actuating the delivering mold 44 to move with the second hot pressing mold 42, then the suction mold 31 drawing the blank to contact with the second hot pressing mold 42 downward, in the meantime, the fourth pumping device being started so that the second hot pressing mold 42 draws the blank, thereafter the first pumping device being operationally changed to blow the blank, such that the blank removes from the suction mold 31, as illustrated in FIG. 15;

6) moving the suction mold 31 back to the original position upward, drawing and moving the blank to locate below the first hot pressing mold 41 by using the second hot pressing mold 42, in the meantime, the delivering mold 44 is driven to move back to an original position, as shown in FIG. 16;

7) descending the first hot pressing mold 41 to contact with the second hot pressing mold 42 so as to press the blank to produce molded pulp, in the meantime, the third pumping device and the fourth pumping device being started to draw the blank, thus producing the molded pulp, and descending the suction mold 31 into the accommodation tank 33 again to draw the pulps, such that the suction mold 33 produces another pulp layer on the bottom thereof, as shown in FIG. 17, wherein the suction mold 31 descends into the accommodation tank 33 again in a second production cycle, and a first production cycle is executed when processing the second production cycle;

8) drawing the pulp layer to move away from the accommodation tank 33 by using the suction mold 31 in the second production cycle when processing a hot pressing process in the first production cycle,

as shown in FIG. 18, and rotating and descending the suction mold 31 to contact with the cold pressing mold 32 in the second production cycle so that another pulp layer is pressed by the cold pressing mold 32 to produce another blank in the second production cycle;

9) operationally changing the fourth pumping device to blow when reaching a set hot pressing time in the first production cycle, as shown in FIG. 19, such that the mold pulp removes from the second hot pressing mold 42, and the third pumping device pumps so that the first hot pressing mold 41 draws and moves the molded pulp upward, in the meantime, the suction mold 31 draws the blank to move away from the cold pressing mold 32 downward and to rotate the blank to face downward when reaching a set molding time in the second production cycle;

10) moving the second hot pressing mold 42 to locate below the suction mold 31, as shown in FIG. 20, descending the suction mold 31 to contact with the second hot pressing mold 42 in the second production cycle, in the meantime, the fourth pumping device being started so that the second hot pressing mold 42 draws the blank in the second production cycle, and the first pumping device being operationally changed to blow so that the blank removes from the suction mold 31, in the meantime, the delivering mold 44 is driven by the suction mold 31 to move and to locate below the first hot pressing mold 41, and the first hot pressing mold 41 draws and moves the mold pulp downward to contact with the delivering mold 44 in the first production cycle so that the mold pulp moves into the receiving mold on the delivering mold 44 in the first production time, and the fifth pumping is started to draw the molded pulp in the first production cycle;

11) operationally changing the third pumping device to blow so that the molded pulp removes from the first hot pressing mold 41 in the first production cycle, then moving the first hot pressing mold 41 back to the original position upward, and moving the suction mold 31 back to the original position, as illustrated in FIG. 21; wherein the second hot pressing mold 42 draws the blank in the second production cycle;

12) reversely moving the second hot pressing mold 42 in the second production cycle back to locate below the first hot pressing mold 41, as illustrated in FIG. 22, and delivering the molded pulp to locate below the picker 432 of the picking arm 43 by ways of the delivering mold 44 in the first production cycle;

13) driving the sucker to draw the molded pulp by using the picker 432 of the picking arm 43 in the first production cycle, as shown in FIG. 23, and moving the first hot pressing mold 41 to contact with the second hot pressing mold 42 downward so that the blank is hot molded in the second production cycle, thus producing another molded pulp in the second production cycle; in the meantime, the suction mold 31

moves into the accommodation tank 33 downward to draw the other pulps, such that the suction mold 31 has the other pulp layer attached thereon in a third production cycle, wherein the first and second production cycles are processed when executing the third production cycle;

14) driving the sucker to draw the molded pulp by using the picker 432 of the picking arm 43 in the first production cycle and to move away from the delivering mold 44, as shown in FIG. 24, wherein when reaching a set hot molding time in the second production cycle, the fourth pumping device is operationally changed to blow so that another molded pulp removes from the second hot pressing mold 42 in the second production cycle, and the third pumping device pumps continuously so that the first hot pressing mold 41 draws another molded pulp in the second production cycle, and the first hot pressing mold 41 draws another molded pulp in the second production cycle to move back to the original position upward, in the meantime, the suction mold 31 draws and removes the other molded pulp from the accommodation tank 33 in the third production cycle, and the suction mold 31 is rotated and lifted to contact with the cold pressing mold 32, thus producing the other blank in the third production cycle, and the other blank is drawn by the suction mold 31 to move away from the cold pressing mold 32 downward; and

15) driving the picker 432 to draw and move the molded pulp of the first production cycle above the delivery mechanism 45 by using the slide mechanism 431 of the picking arm 43, as illustrated in FIG. 25, stopping the picker 432 drawing the molded pulp of the first production cycle so that the mold pulp drops on and is delivered by the delivery mechanism 45 (i.e. the plane) or drops into the fixture of the delivery mechanism 45 and is delivered by the delivery mechanism 45, then the molded pulp is cut, trimmed, checked, and packed to complete the first production cycle, in the meantime, the second hot pressing mold 42 is moved to locate below the suction mold 31, and the delivering mold 44 moves to locate below the first hot pressing mold 41 so that the first hot pressing mold 41 moves another molded pulp of the second production cycle into the receiving mold 44, and the suction mold 31 draws and rotates the blank of the third production cycle to contact with the second hot pressing mold 42, thus executing the first, second, and third production cycles simultaneously to accelerate production time greatly.

[0025] After the first, second, third production cycles, entire molded pulp are molded so as to accelerate production time and to reduce fabrication cost.

Claims

1. A rotatably automatic molding machine comprising:

a first operation space (30) including a suction mold (31) fixed in the first operation space (30); a cold pressing mold (32) arranged in the first operation space (30); and an accommodation tank (33) formed on a bottom of the first operation space (30) and configured to accommodate pulps;

a second operation space (40) formed beside the first operation space (30), and the second operation space (40) including a first hot pressing mold (41) arranged on a top of the second operating space (40) and located adjacent to the first operation space (30); a second hot pressing mold (42) arranged on a bottom of the second operation space (40) and moving horizontally; a delivering mold (44) fixed beside, connected and moving with the second hot pressing mold (42), and having a receiving mold; and a picking arm (43) located proximate to the first hot pressing mold (41), having an extending end located on a top of a second operation space (40), and a distal end extending out of the second operation space (40); a slide mechanism (431) extending out of a distal end of the second operation space (40) from a top of the first hot pressing mold (41); and a picker (432) connected on a bottom of the slide mechanism (431) and moving with the slide mechanism (431).

2. The rotatably automatic molding machine as claimed in claim 1, **characterized in that** the picker (432) has a moving portion moving vertically and has a sucker extending downward.

3. The rotatably automatic molding machine as claimed in claim 1 further comprising a delivery mechanism (45) mounted outside the second operation space (40) and located below the picking arm (43).

4. The rotatably automatic molding machine as claimed in claim 1, **characterized in that** the suction mold (31) is driven to move and rotate vertically.

5. The rotatably automatic molding machine as claimed in claim 1, **characterized in that** the cold pressing mold (32) is arranged on a top of the first operation space (30) and faces downward.

6. A method of operating a rotatably automatic molding machine, the rotatably automatic molding machine comprising:

a first operation space (30) including a suction mold (31) fixed in the first operation space (30);

a cold pressing mold (32) arranged in the first operation space (30); and an accommodation tank (33) formed on a bottom of the first operation space (30) and configured to accommodate pulps;

a second operation space (40) formed beside the first operation space (30), and the second operation space (40) including a first hot pressing mold (41) arranged on a top of the second operating space (40) and located adjacent to the first operation space (30); a second hot pressing mold (42) arranged on a bottom of the second operation space (40) and moving horizontally; a delivering mold (44) fixed beside, connected and moving with the second hot pressing mold (42), and having a receiving mold; and a picking arm (43) located proximate to the first hot pressing mold (41), having an extending end located on a top of a second operation space (40), and a distal end extending out of the second operation space (40); a slide mechanism (431) extending out of a distal end of the second operation space (40) from a top of the first hot pressing mold (41); and a picker (432) connected on a bottom of the slide mechanism (431) and moving with the slide mechanism (431); **characterized in that** the picker (432) has a moving portion moving vertically and has a sucker extending downward; and a delivery mechanism (45) mounted outside the second operation space (40) and located below the picking arm (43);

characterized in that the method of operating the rotatably automatic molding machine comprises steps of:

- 1) starting the first pumping device so that the suction mold (31) descends into the accommodation tank (33) to suck the pulps, hence the suction mold (31) produces a pulp layer on a bottom thereof;
- 2) lifting the suction mold (31) to move away from the accommodation tank (33) and rotating the bottom of the suction mold (31) to face upward so that the pulp layer faces upward;
- 3) lifting the suction mold (31) continuously to contact with the cold pressing mold (32) so that the pulp layer is pressed by the cold pressing mold (32) to form a blank;
- 4) blowing the blank so that the blank removes from the cold pressing mold (32), and the suction mold (31) draws the blank to move away from the cold pressing mold (32) downward, then the suction mold (31) is rotated so that the blank faces downward;
- 5) moving the second hot pressing mold (42) to locate below the suction mold (31) and actuating the delivering mold (44) to

- move with the second hot pressing mold (42), then the suction mold (31) drawing the blank to contact with the second hot pressing mold (42) downward, and the blank being processed by the second hot pressing mold (42);
- 6) moving the suction mold (31) back to the original position upward, drawing and moving the blank to locate below the first hot pressing mold (41) by using the second hot pressing mold (42), in the meantime, the delivering mold (44) is driven to move back to an original position;
- 7) descending the first hot pressing mold (41) to contact with the second hot pressing mold (42) so as to press the blank to produce molded pulp;
- 8) removing the molded pulp from the second hot pressing mold (42) and drawing the molded pulp to move upward by using the first hot pressing mold (41);
- 9) moving the second hot pressing mold (42) to locate below the suction mold (31) and to drive the delivering mold (44) to move to locate below the first hot pressing mold (41), and the first hot pressing mold (41) drawing and moving the molded pulp to contact with the delivering mold (44) downward;
- 10) removing the molded pulp from the first hot pressing mold (41), drawing the molded pulp by using the delivering mold (44), and lifting the first hot pressing mold (41);
- 11) moving the molded pulp to locate below the picking arm (43) by ways of the delivering mold (44);
- 12) driving the sucker to draw the molded pulp by using the picker (432) of the picking arm (43);
- 13) moving the mold pulp to move upward by using the sucker and to remove from the delivering mold (44); and
- 14) driving the picker (432) to draw and move the molded pulp to locate above the delivery mechanism (45) by using the slide mechanism (431) of the picking arm (43), stopping the picker (432) drawing the molded pulp so that the mold pulp drops on and is delivered by the delivery mechanism (45) or drops into the delivery mechanism (45) is delivered by the delivery mechanism (45).
7. The method as claimed in claim 6, **characterized in that** when descending the first hot pressing mold (41) to contact with the second hot pressing mold (42) to produce molded pulp in the step 7), the suction mold (31) is descended into the accommodation tank (33) again to draw the pulps, such that the suction mold (31) produces another pulp layer of a second production cycle on the bottom thereof, then another molded pulp of the second production cycle is produced in the same steps.
8. The method as claimed in claim 7, **characterized in that** the suction mold (31) draws the blank of the second production cycle to move away from the cold pressing mold (32) and rotating the blank of the second production cycle to face downward, when the first hot pressing mold (41) draws the molded pulp upward; and when moving the second hot pressing mold (42) to locate below the suction mold (31), the suction mold (31) draws the blank of the second production cycle to descend so that the second hot pressing mold (42) presses the blank, and the second hot pressing mold receives the blank of the second production cycle.
9. The method as claimed in claim 8, **characterized in that** when the first hot pressing mold (41) moves upward and the delivering mold (44) drives the molded pulp to move to locate below the picker (432) of the picking arm (43), the suction mold moves upward and the second hot pressing mold draws the blank of the second production cycle to move reversely and to locate below the first hot pressing mold (41); when the picker of the picking arm (43) descend to draw the molded pulp, the first hot pressing mold (41) contacts with the second hot pressing mold (42) to hot press the blank of the second production cycle and to produce another molded pulp of the second production cycle; and the suction mold (31) descend again to move into the accommodation tank (33) so that the other pulp layer of a third production cycle attached on the suction mold (31), and the other pulp layer is processed by the same steps to produce the other molded pulp; when the picker (432) of the picking arm (43) draws the other molded pulp to move away from the delivering mold (44) upward, another molded pulp of the second production cycle removes from the second hot pressing mold (42), and the first hot pressing mold (41) draws another molded pulp of the second production cycle upward, and the suction mold (31) draws the other blank of the third production cycle to descend away from the cold pressing mold (32).
10. The method as claimed in claim 9, **characterized in that** when stopping the picker (432) drawing the molded pulp so that the mold pulp drops on and is delivered by the delivery mechanism (45), the second hot pressing mold moves and locates below the suction mold (31), the delivering mold (44) moves and locates below the first hot pressing mold (41), and the first hot pressing mold descends to move another molded pulp of the second production cycle to the delivering mold (44), and the suction mold (32) draws, rotates, and descends the other blank of the

third production cycle to contact with the second hot pressing mold (42) so that the other blank of the third production cycle is moved to the second hot pressing mold (42).

5

10

15

20

25

30

35

40

45

50

55

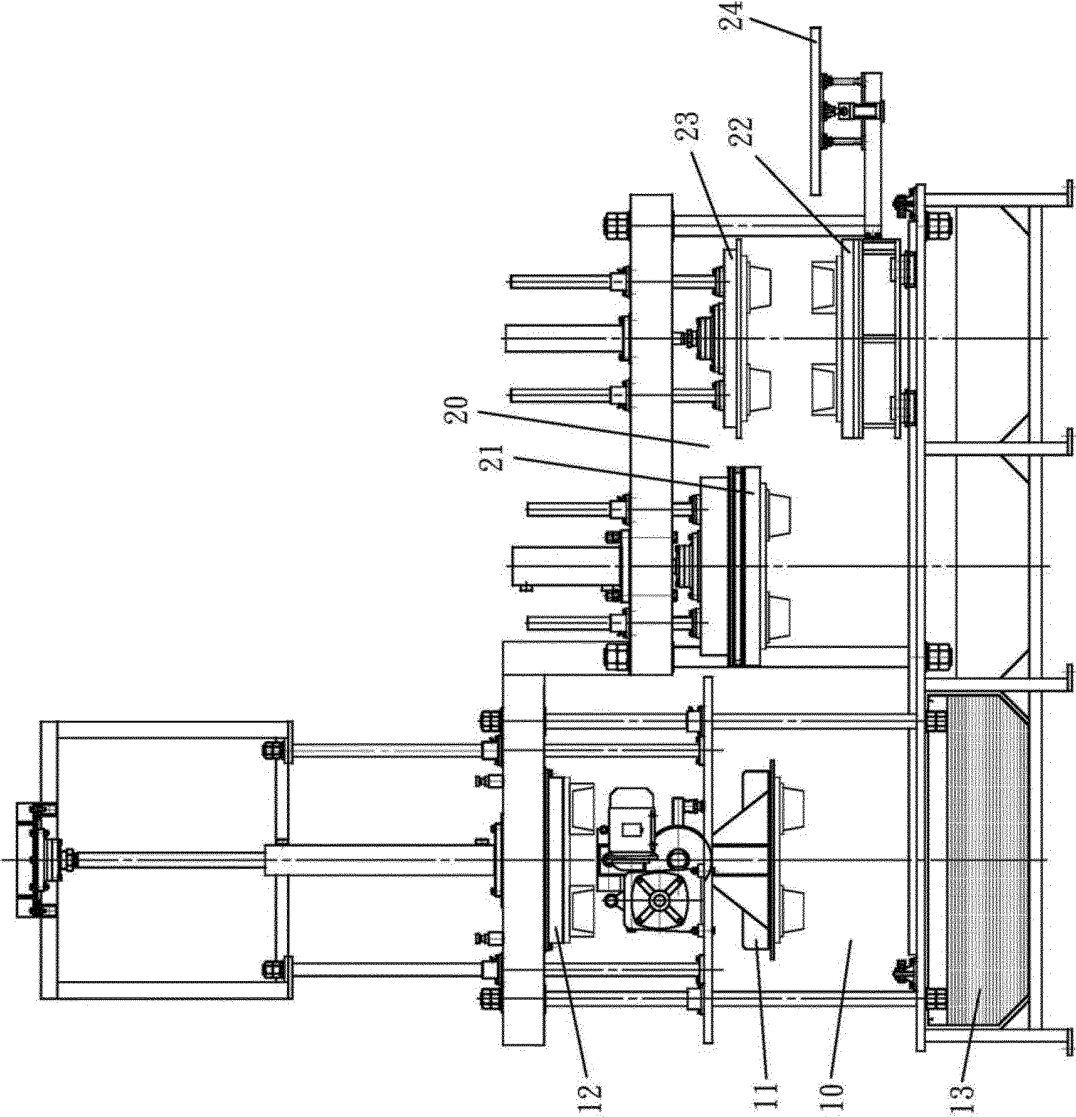


FIG. 1

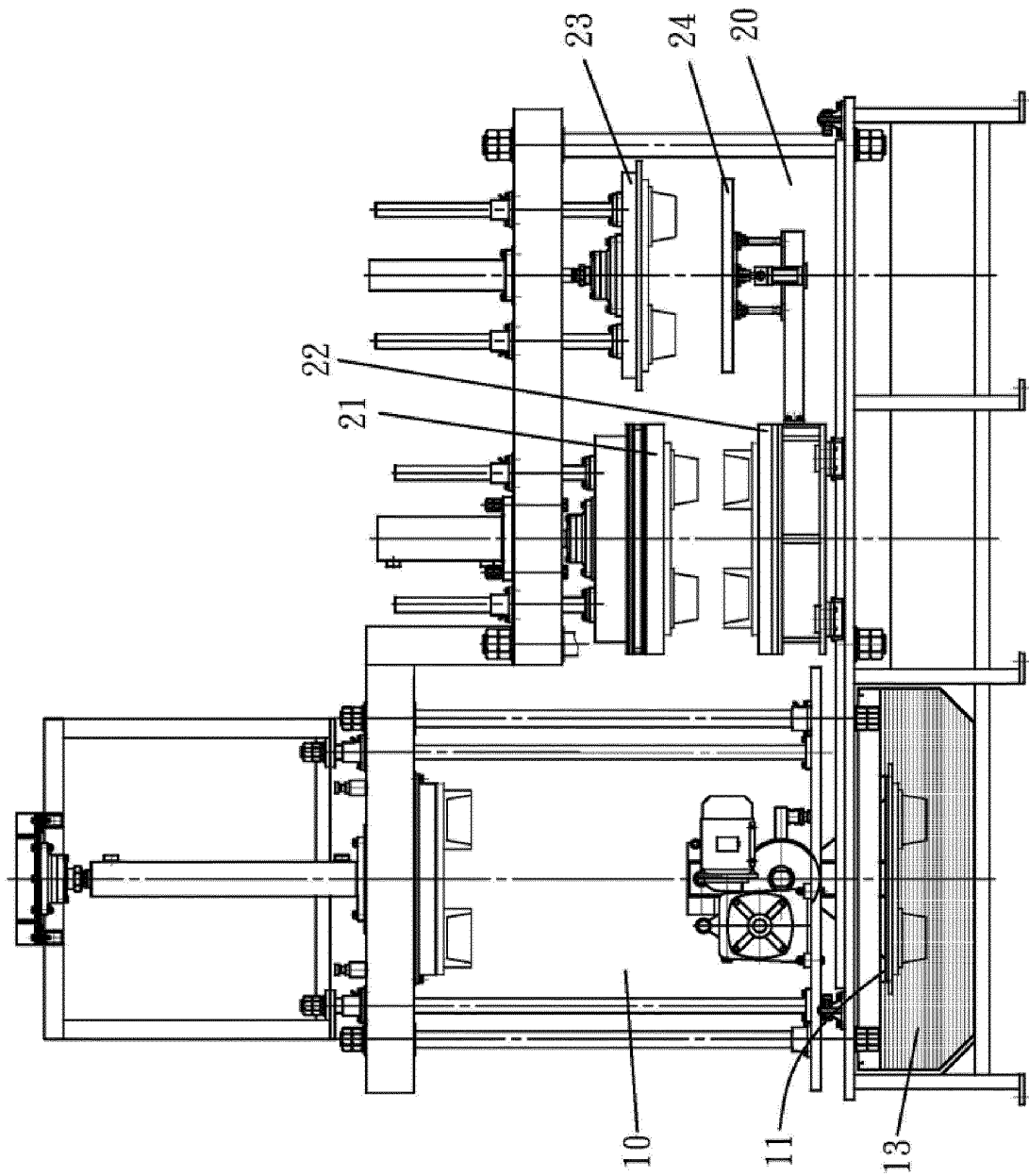


FIG. 2

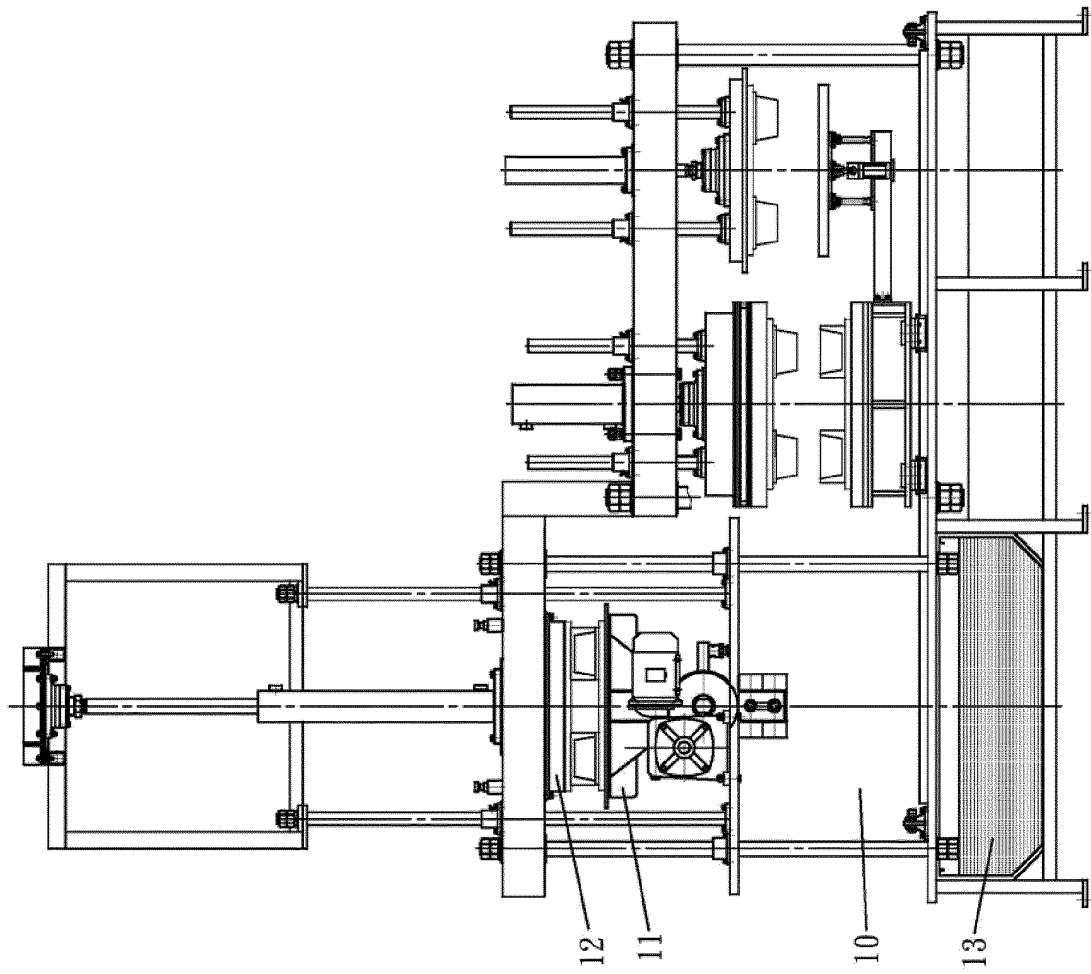


FIG. 3

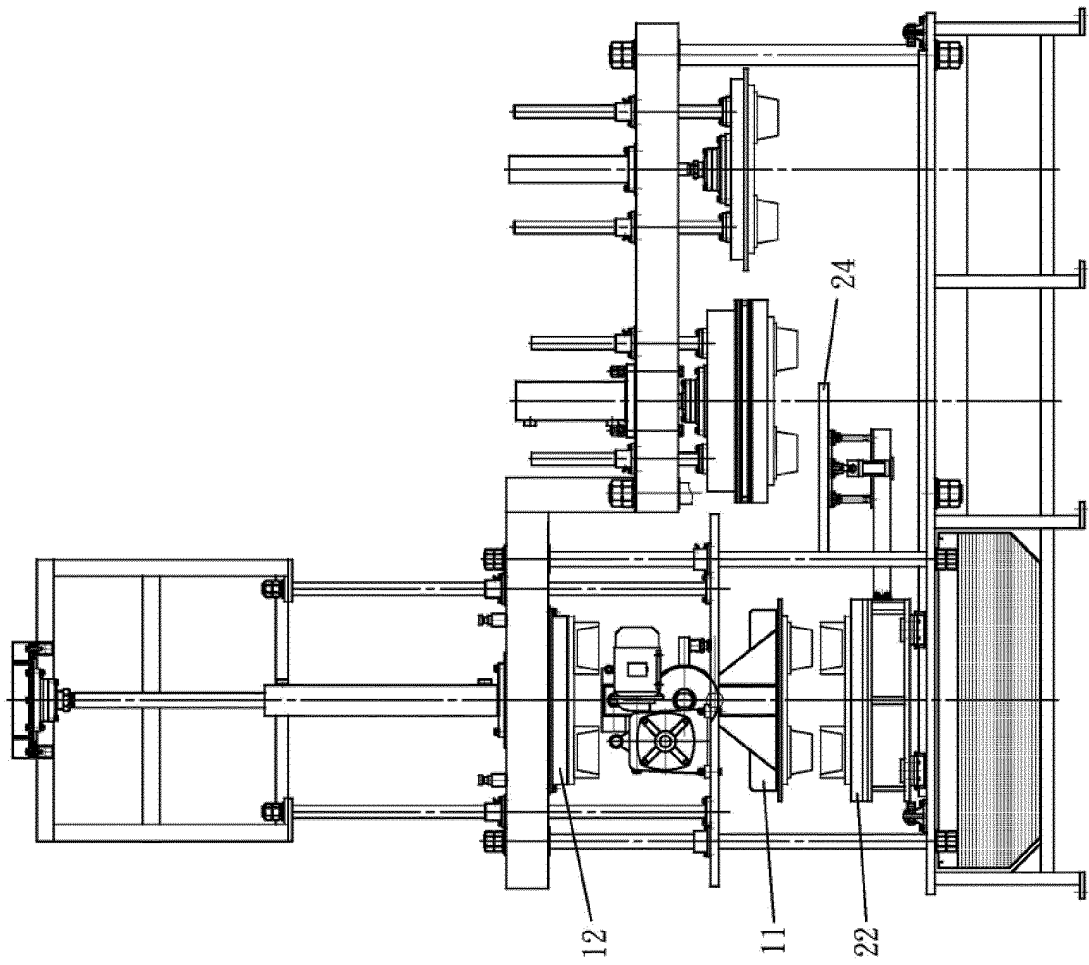


FIG. 4

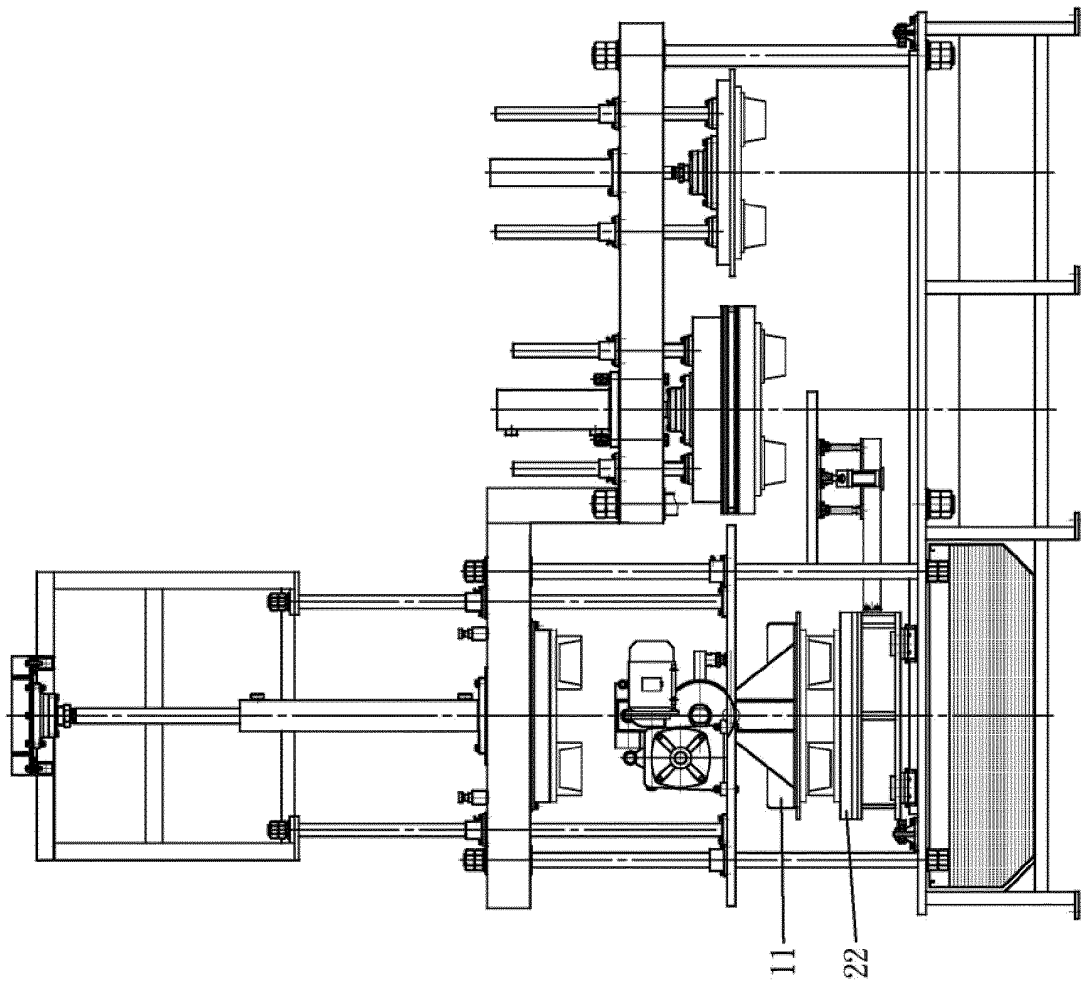


FIG. 5

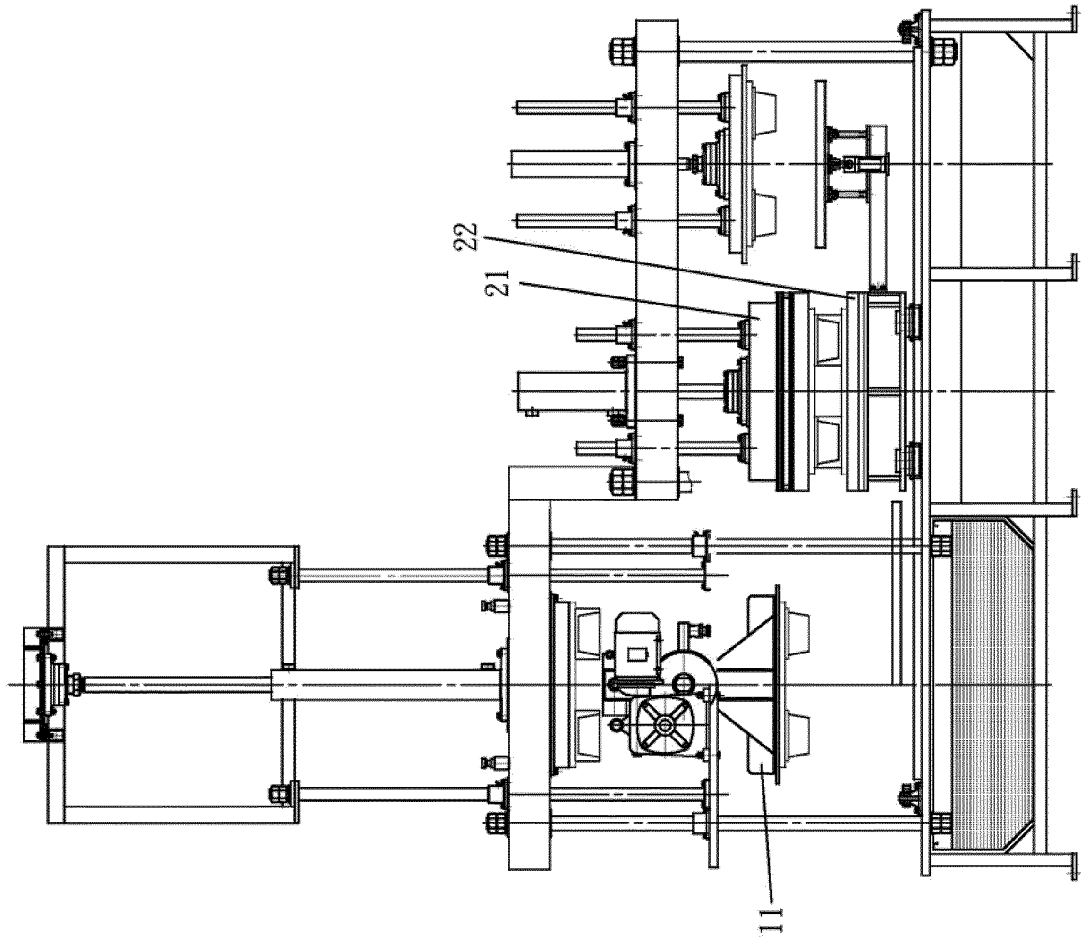


FIG. 6

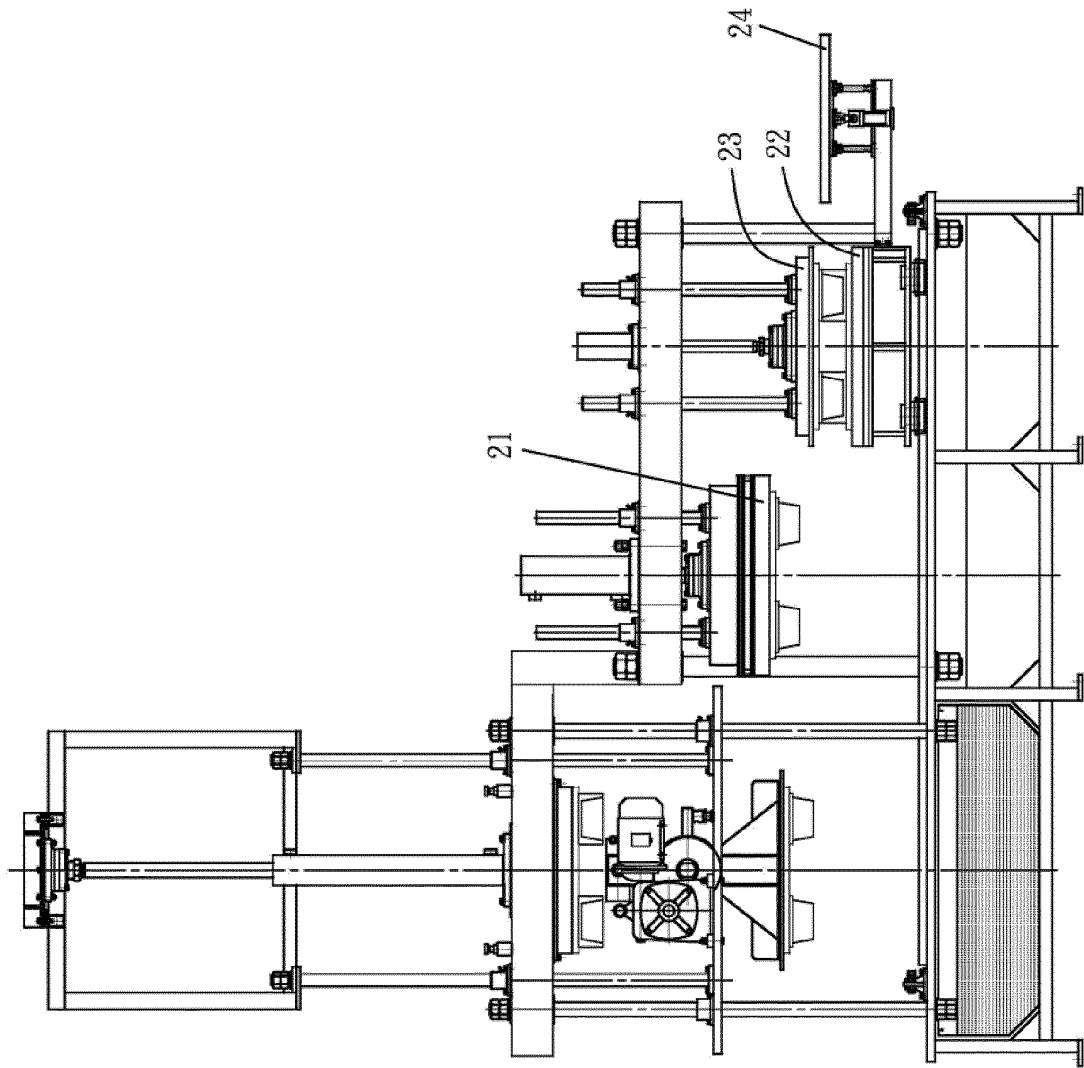


FIG. 7

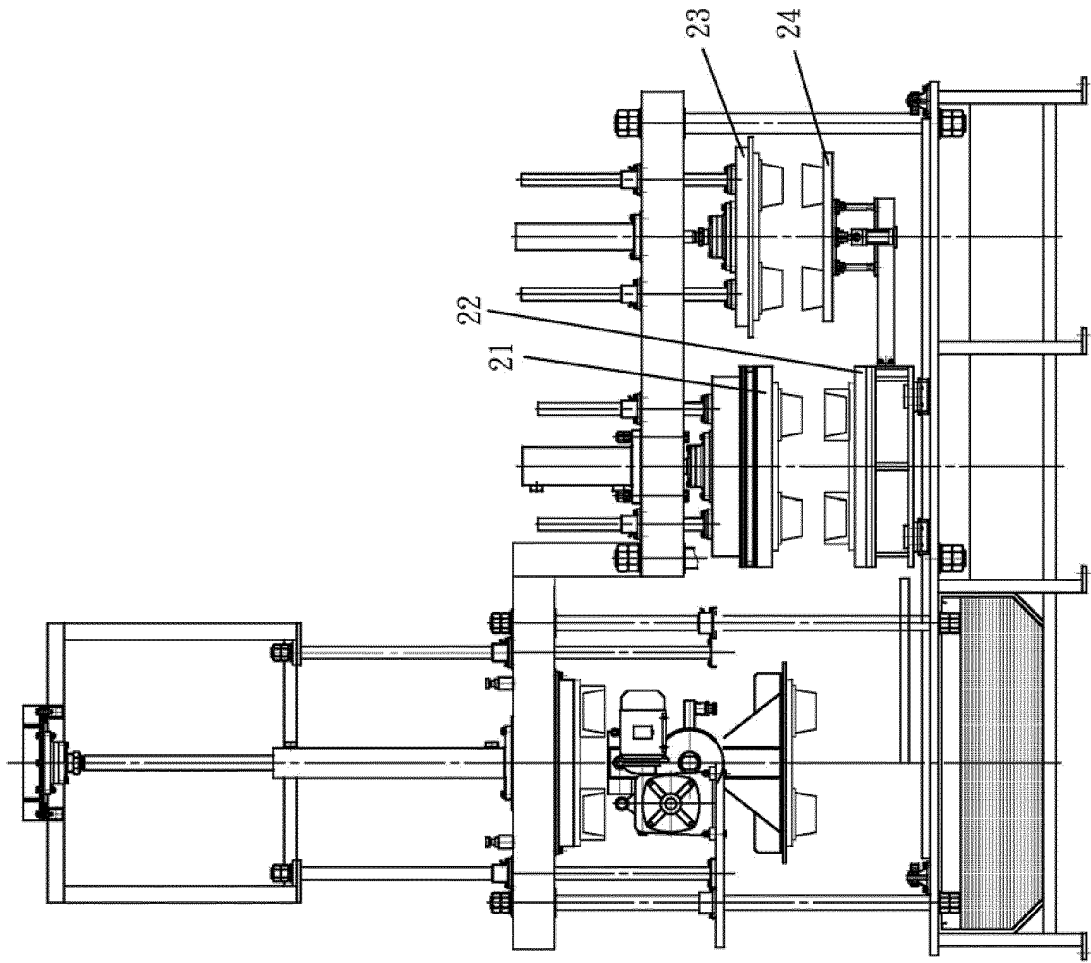


FIG. 8

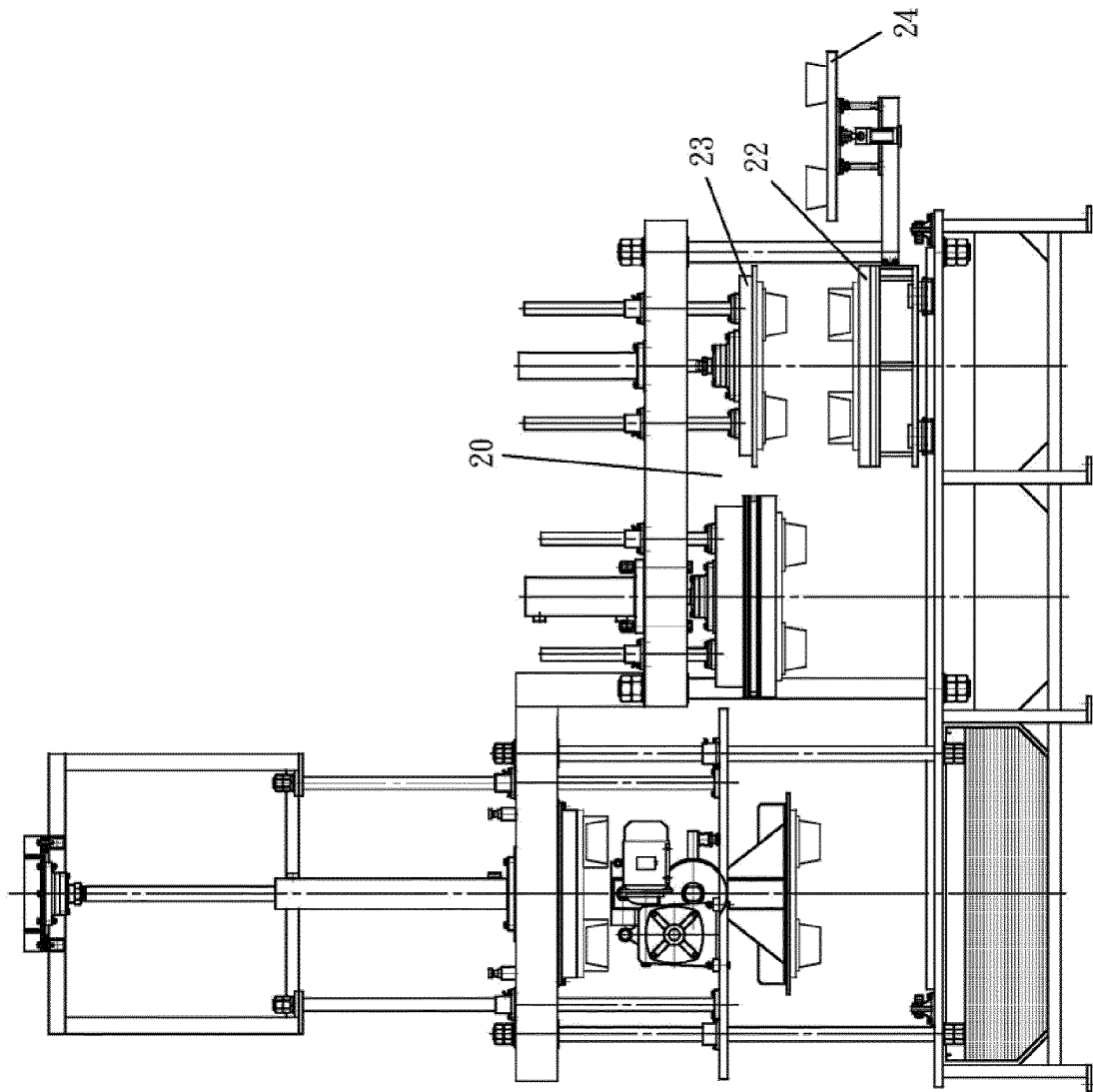


FIG. 9

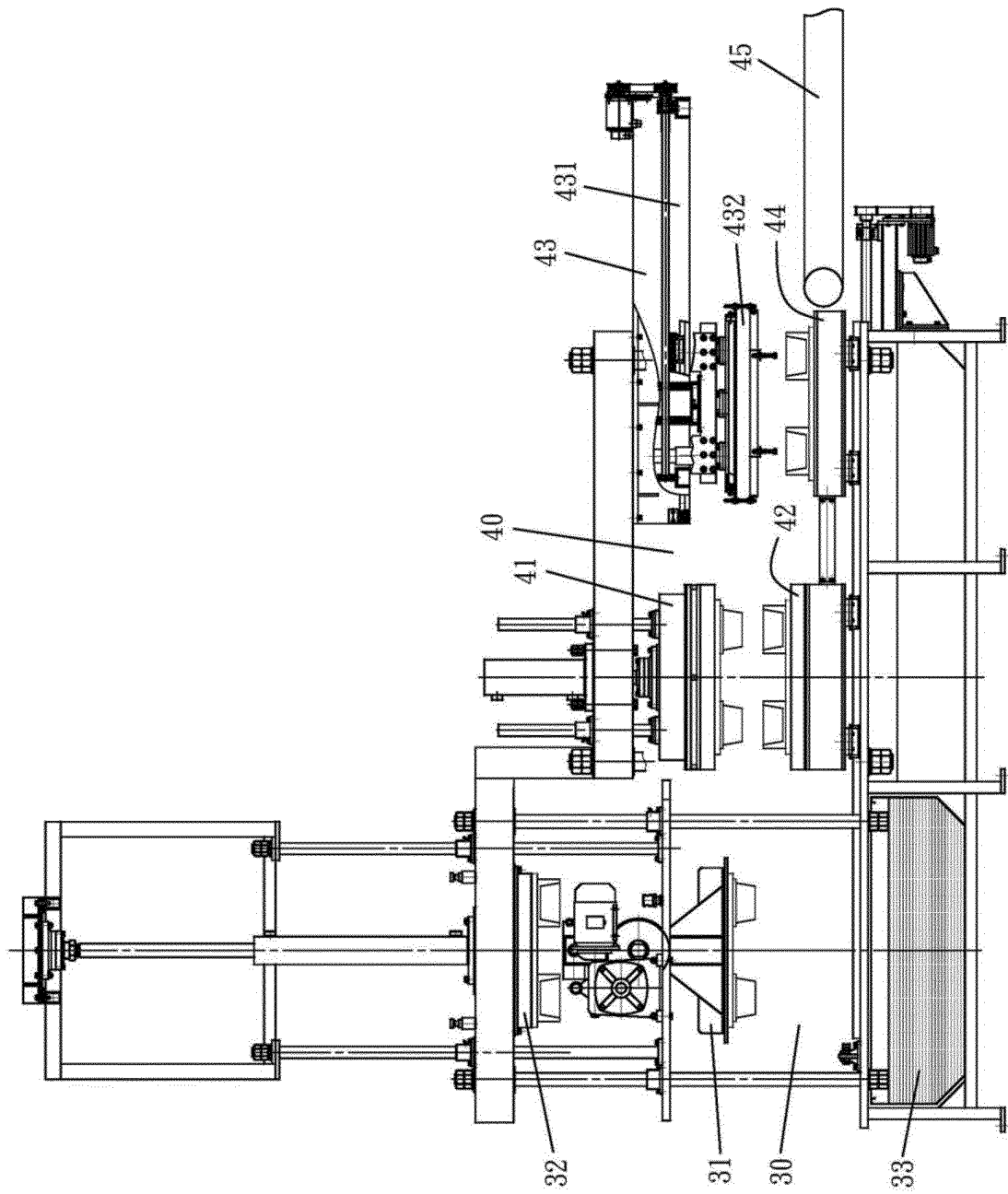


FIG. 10

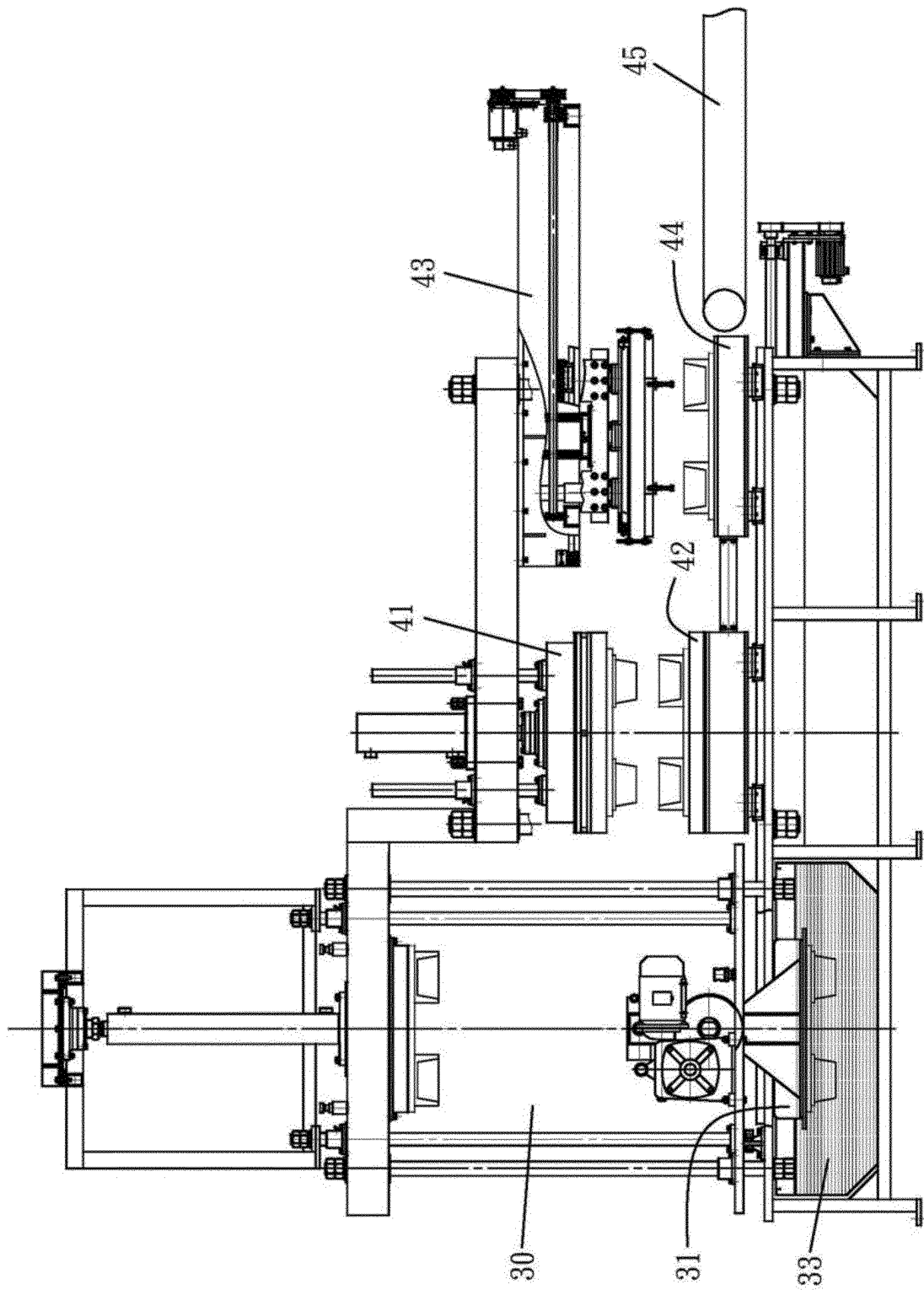


FIG. 11

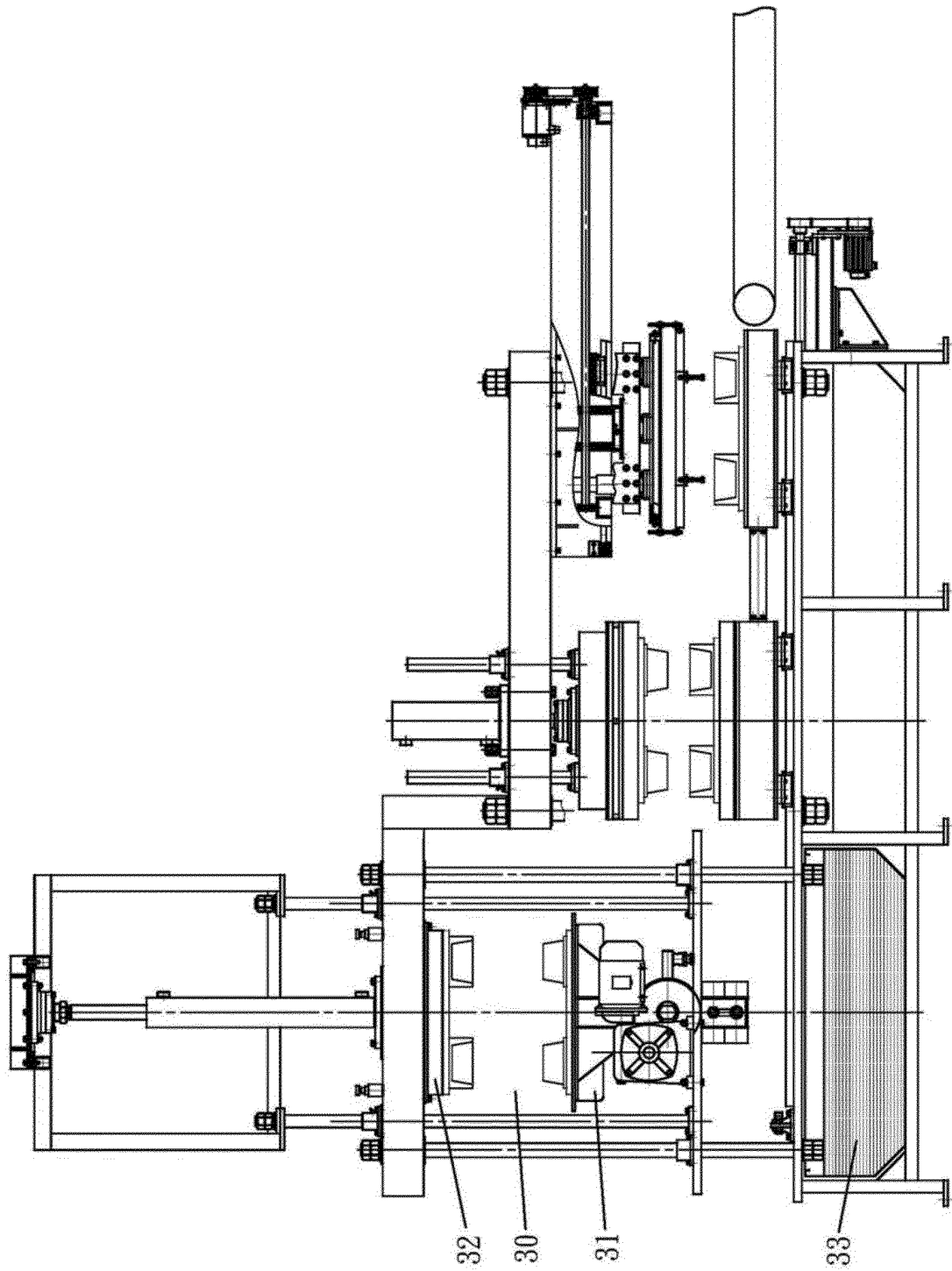


FIG. 12

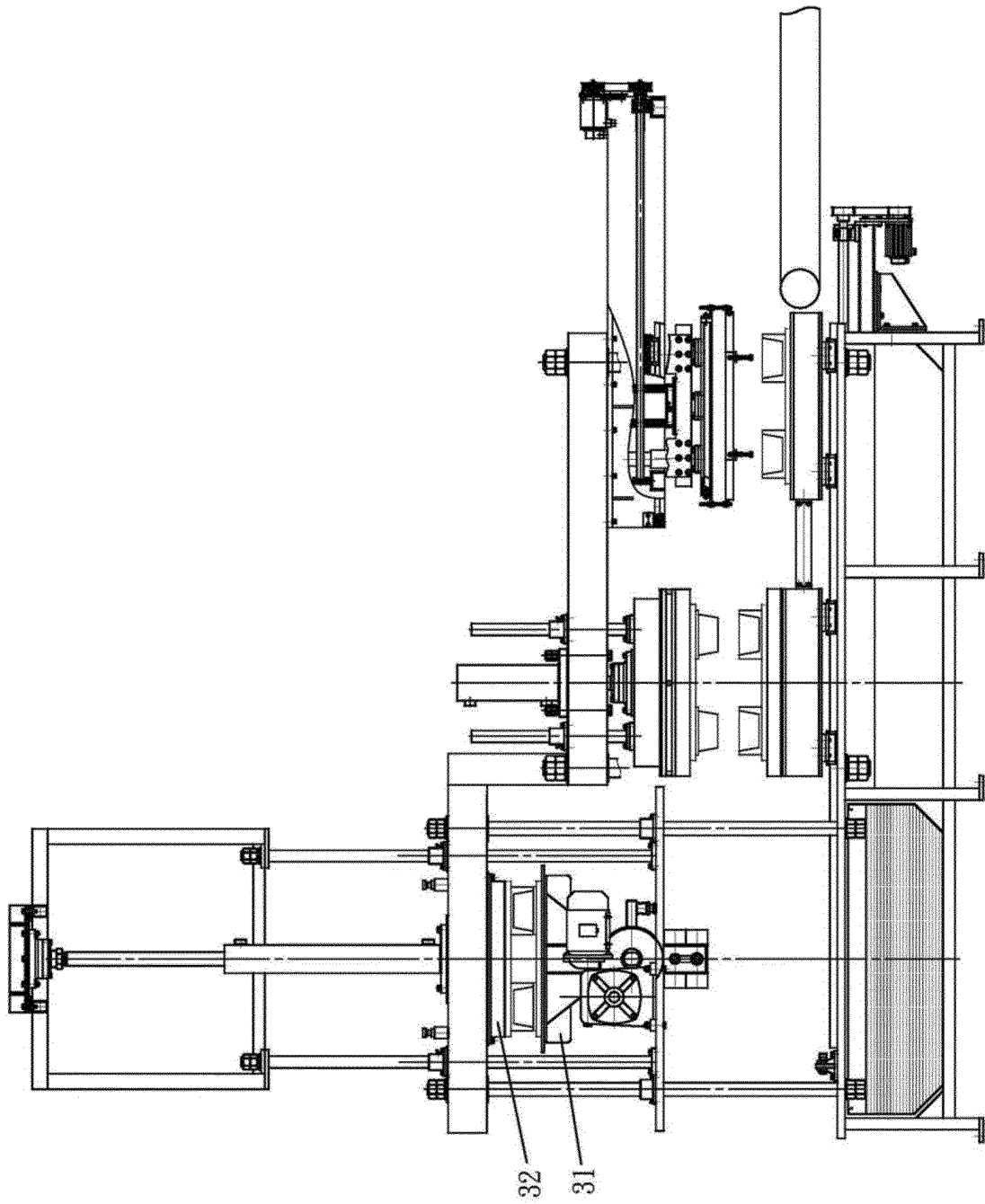


FIG. 13

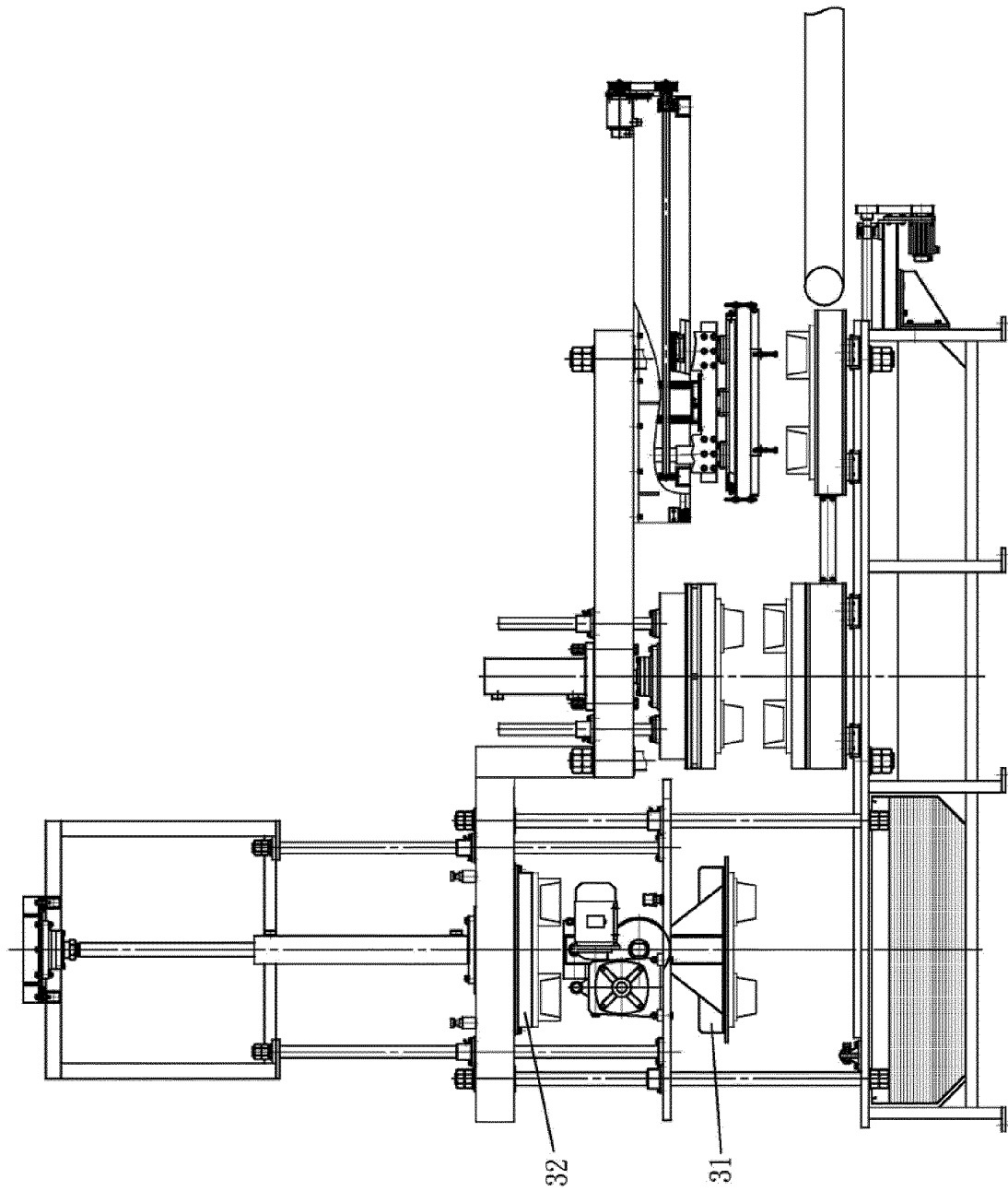


FIG. 14

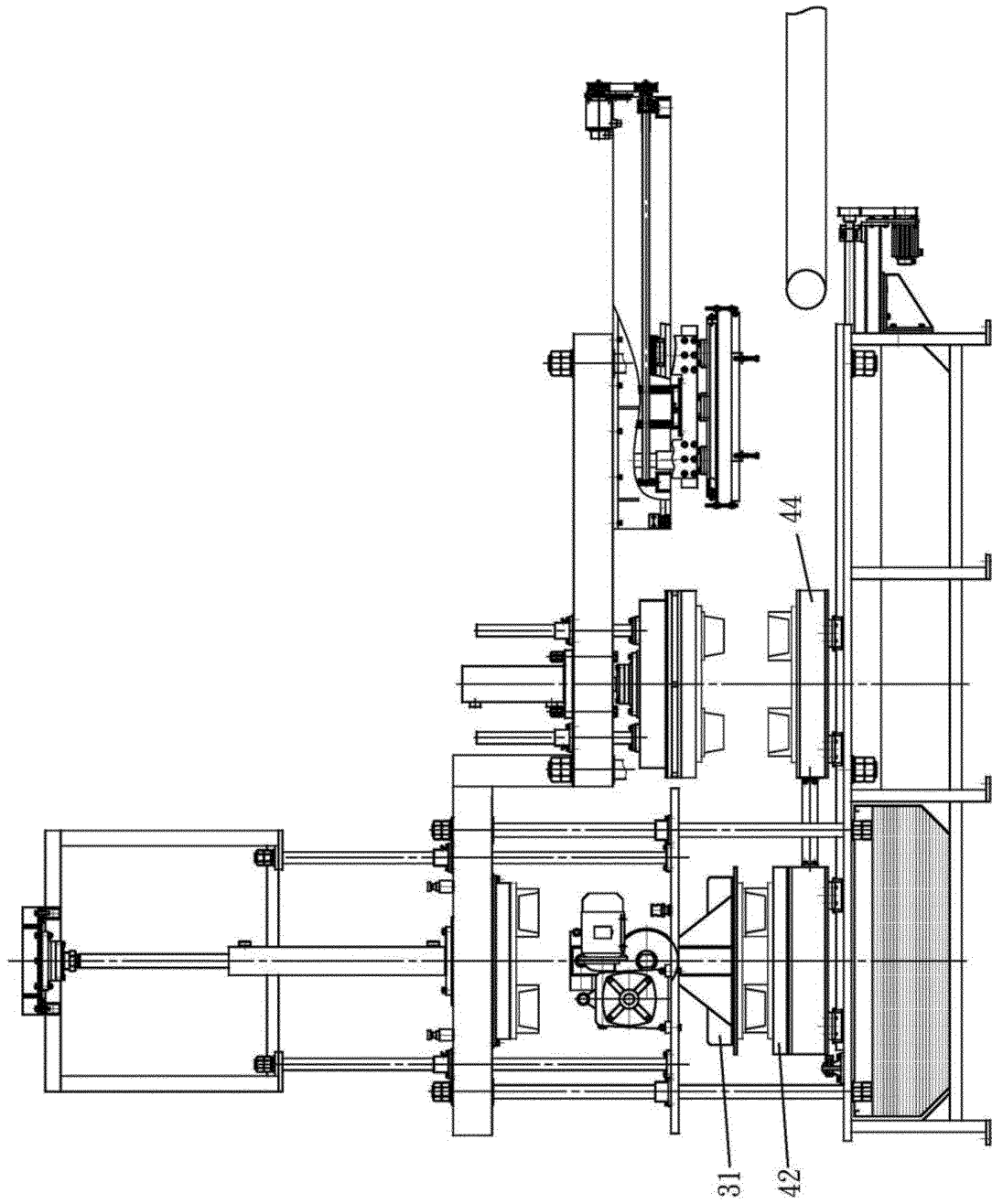


FIG. 15

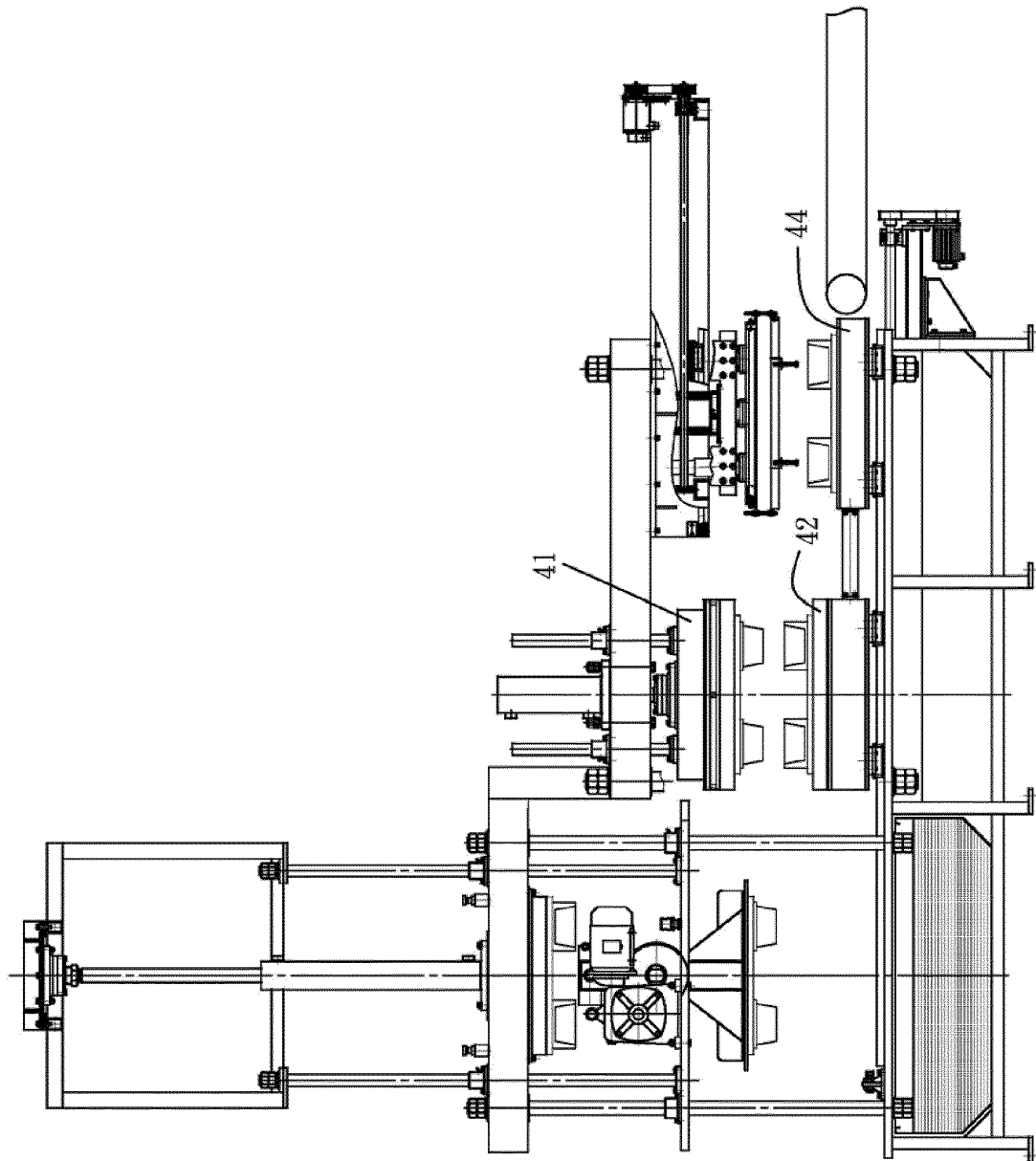


FIG. 16

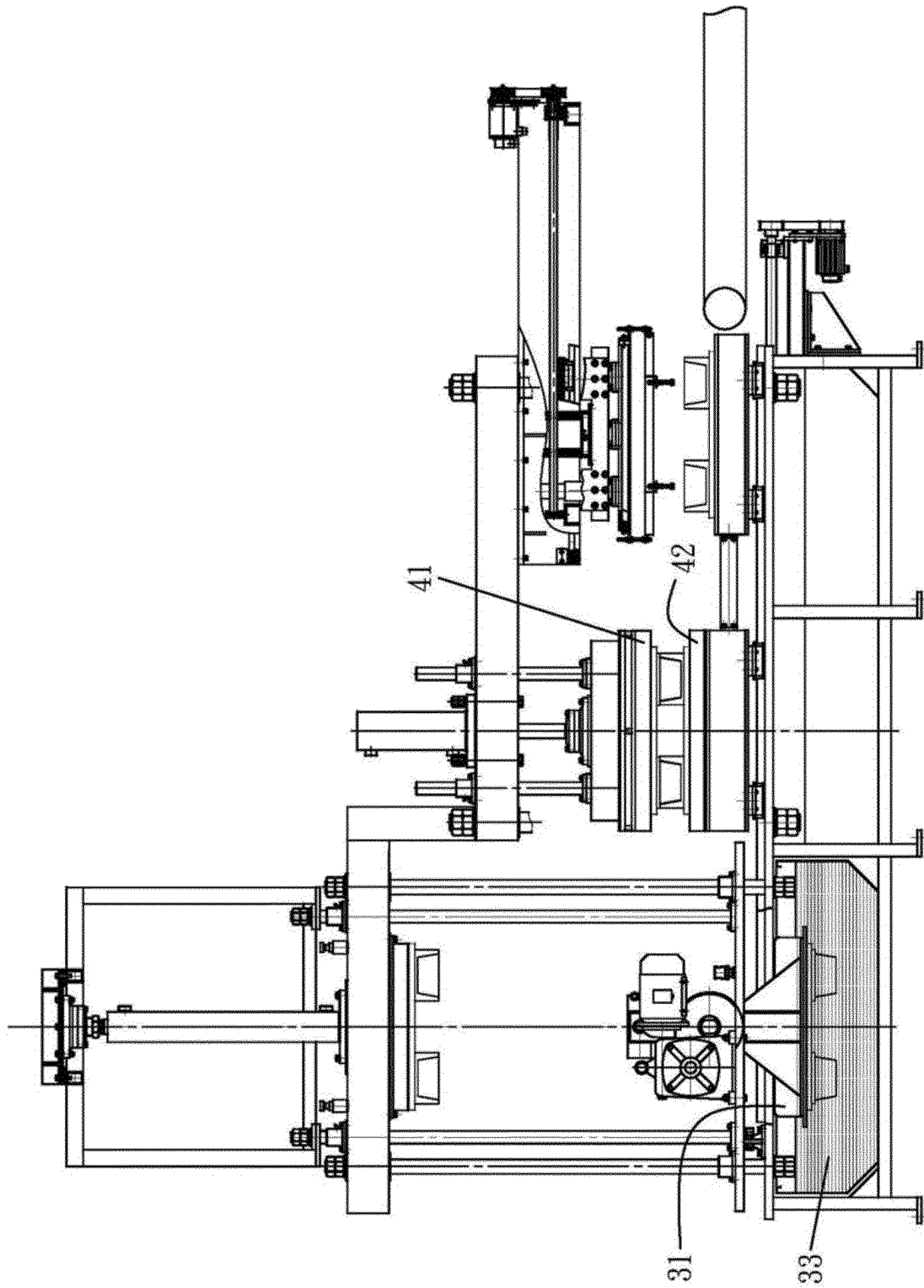


FIG. 17

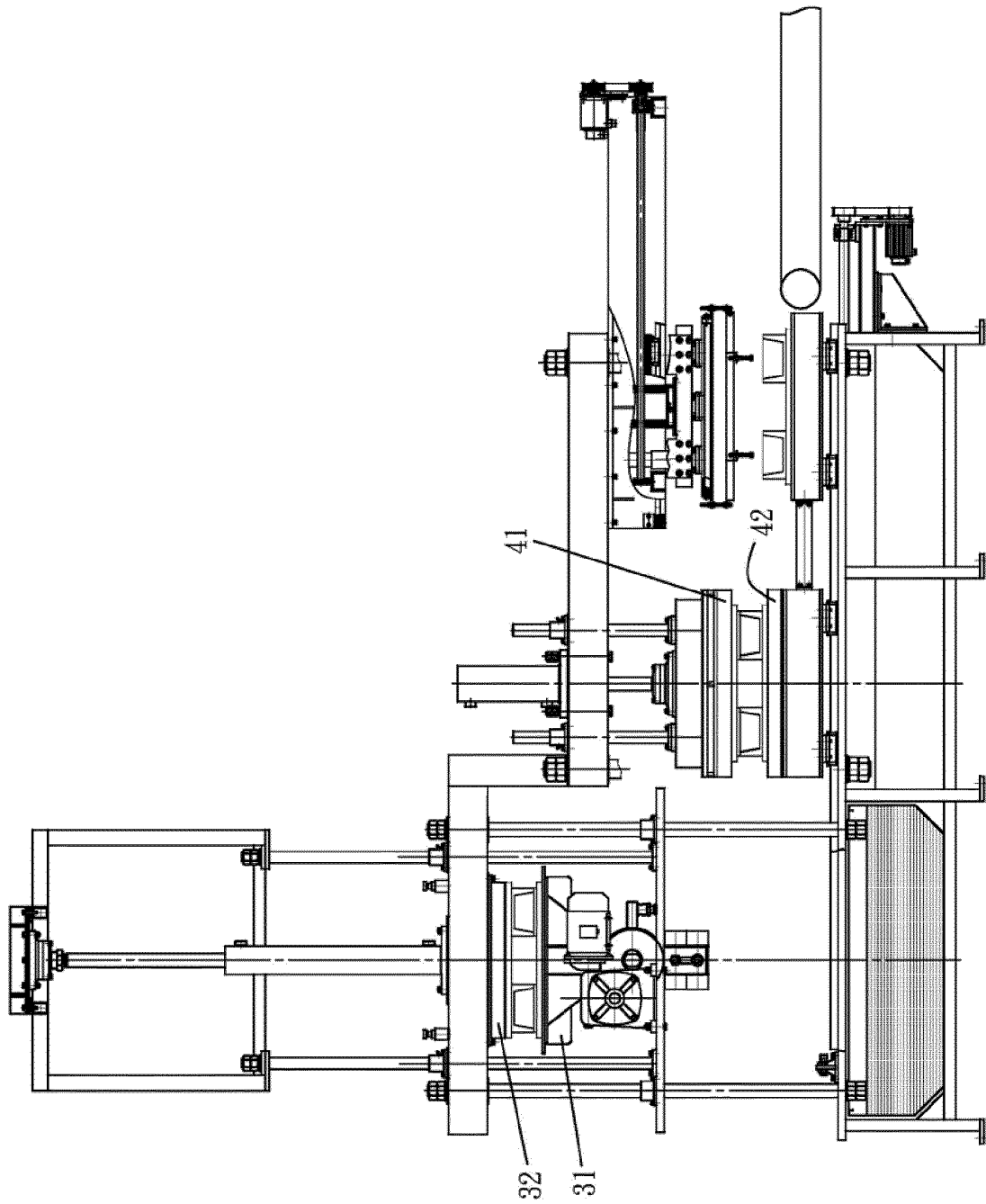


FIG. 18

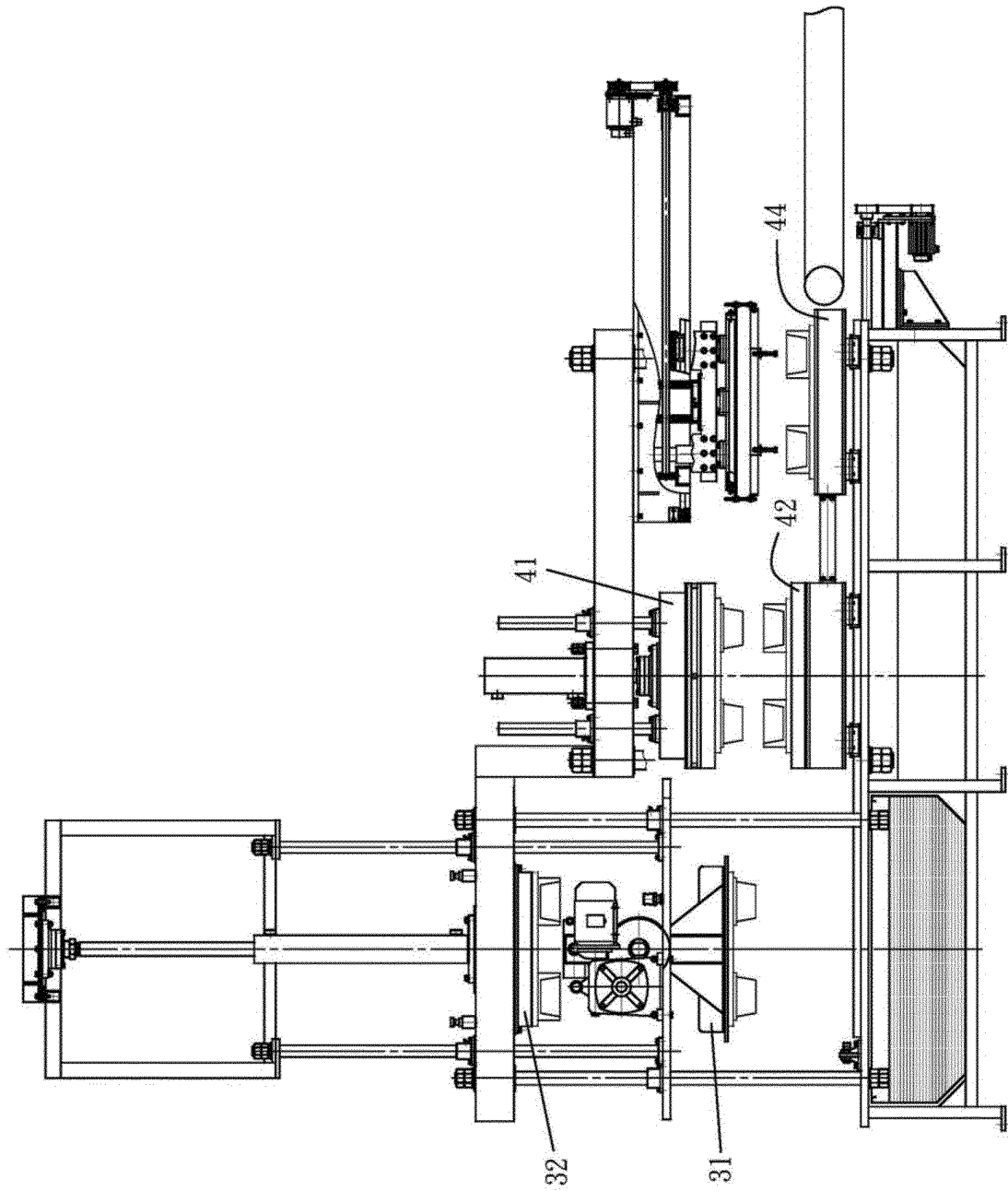


FIG. 19

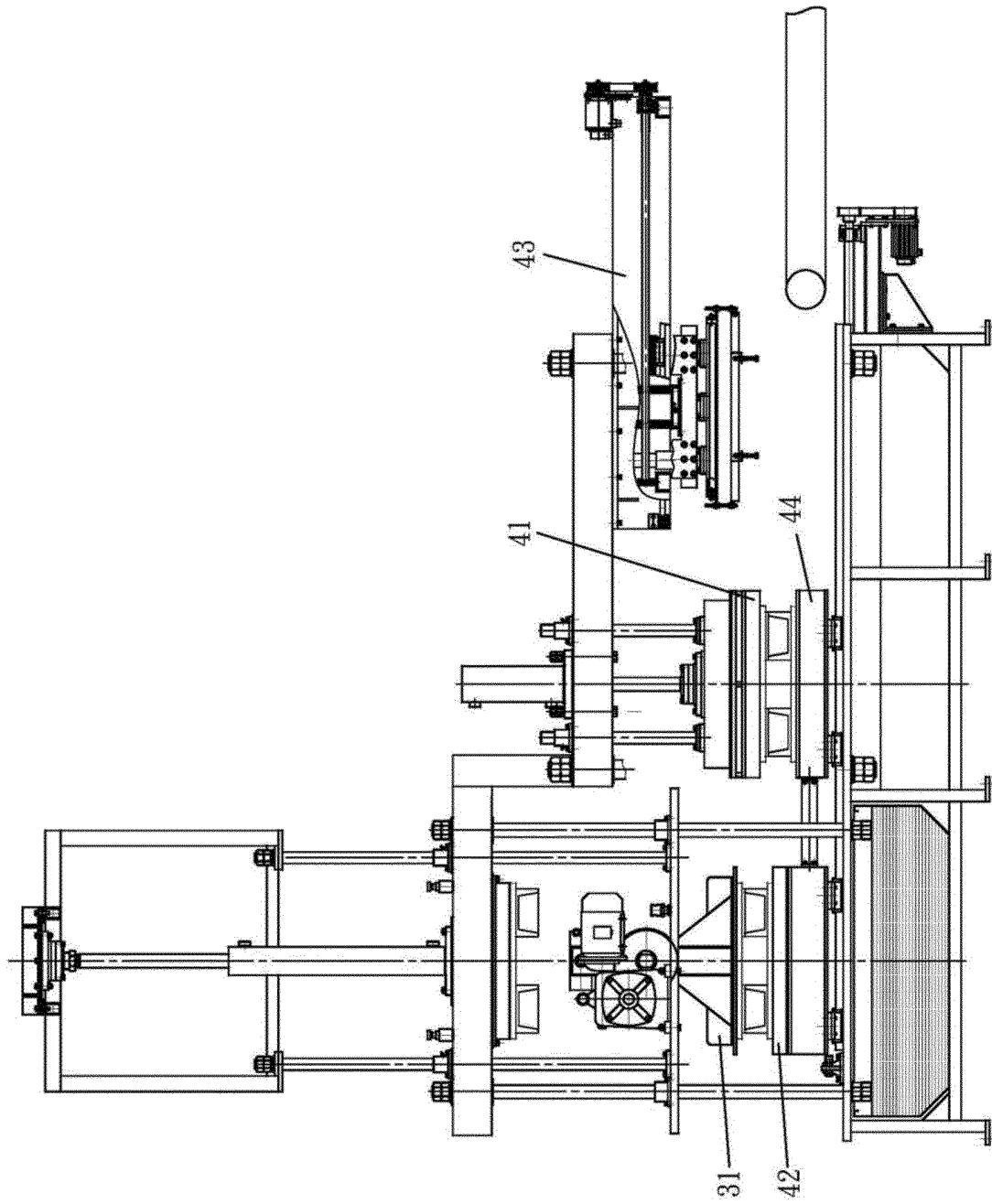


FIG. 20

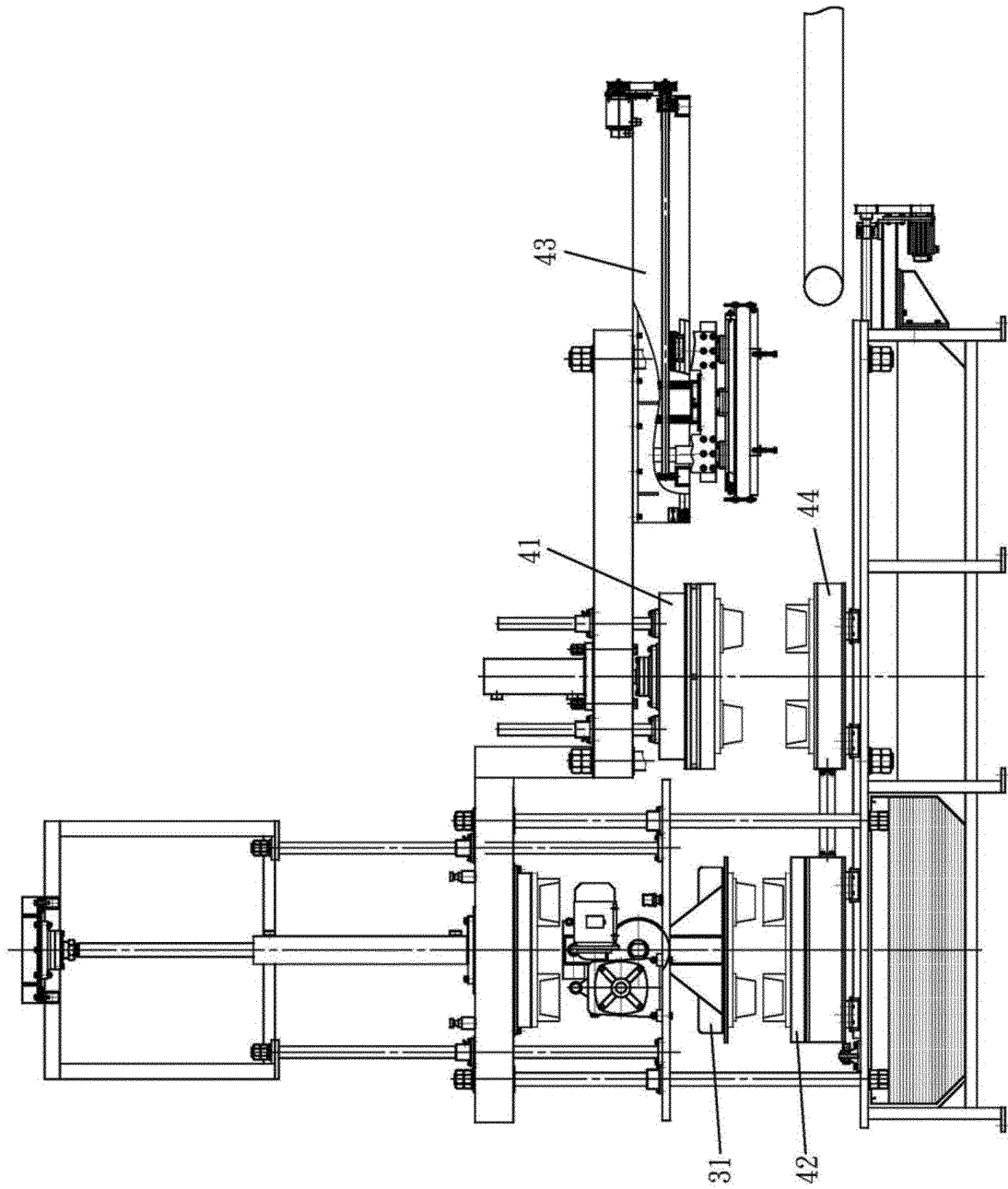


FIG. 21

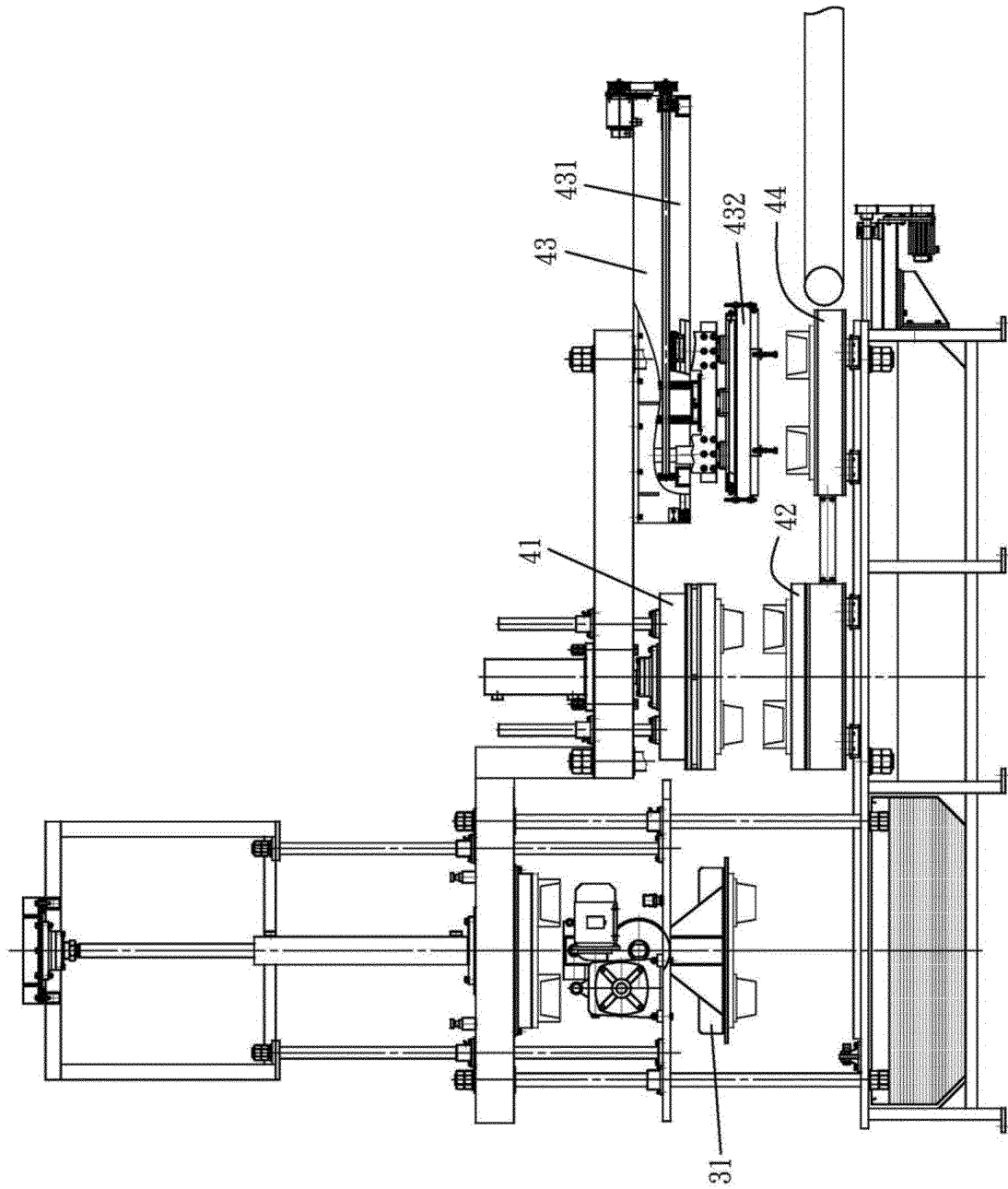


FIG. 22

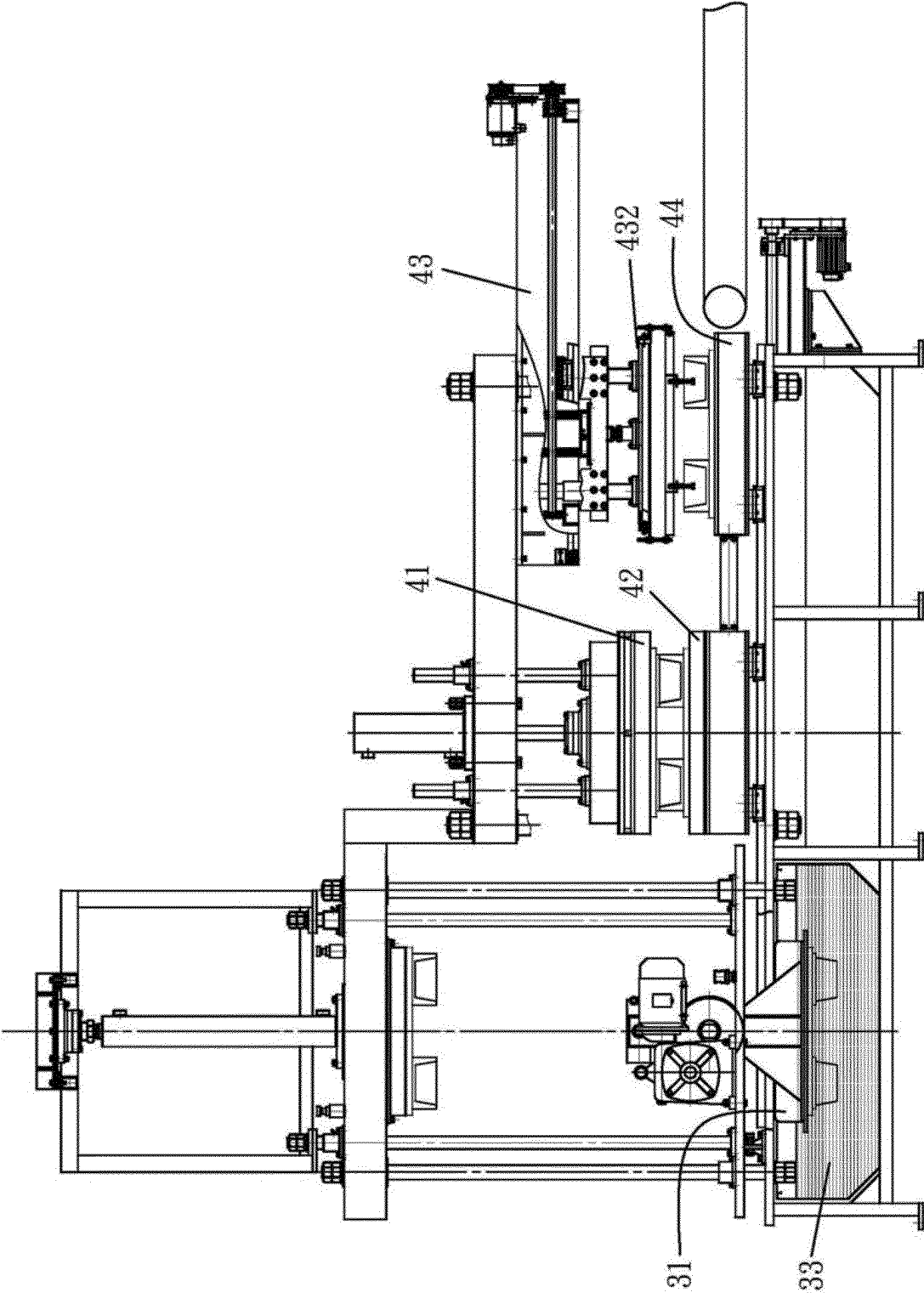


FIG. 23

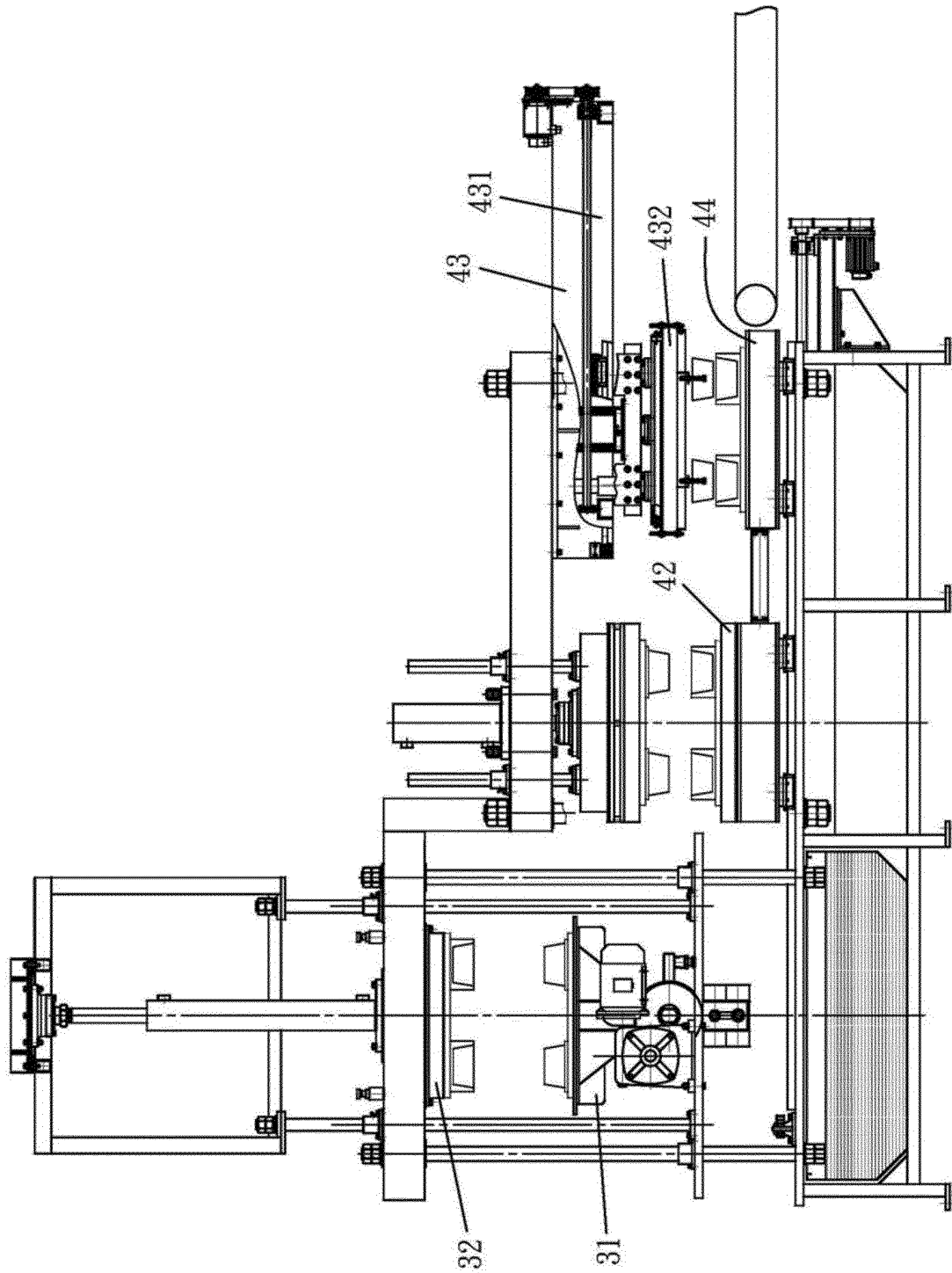


FIG. 24

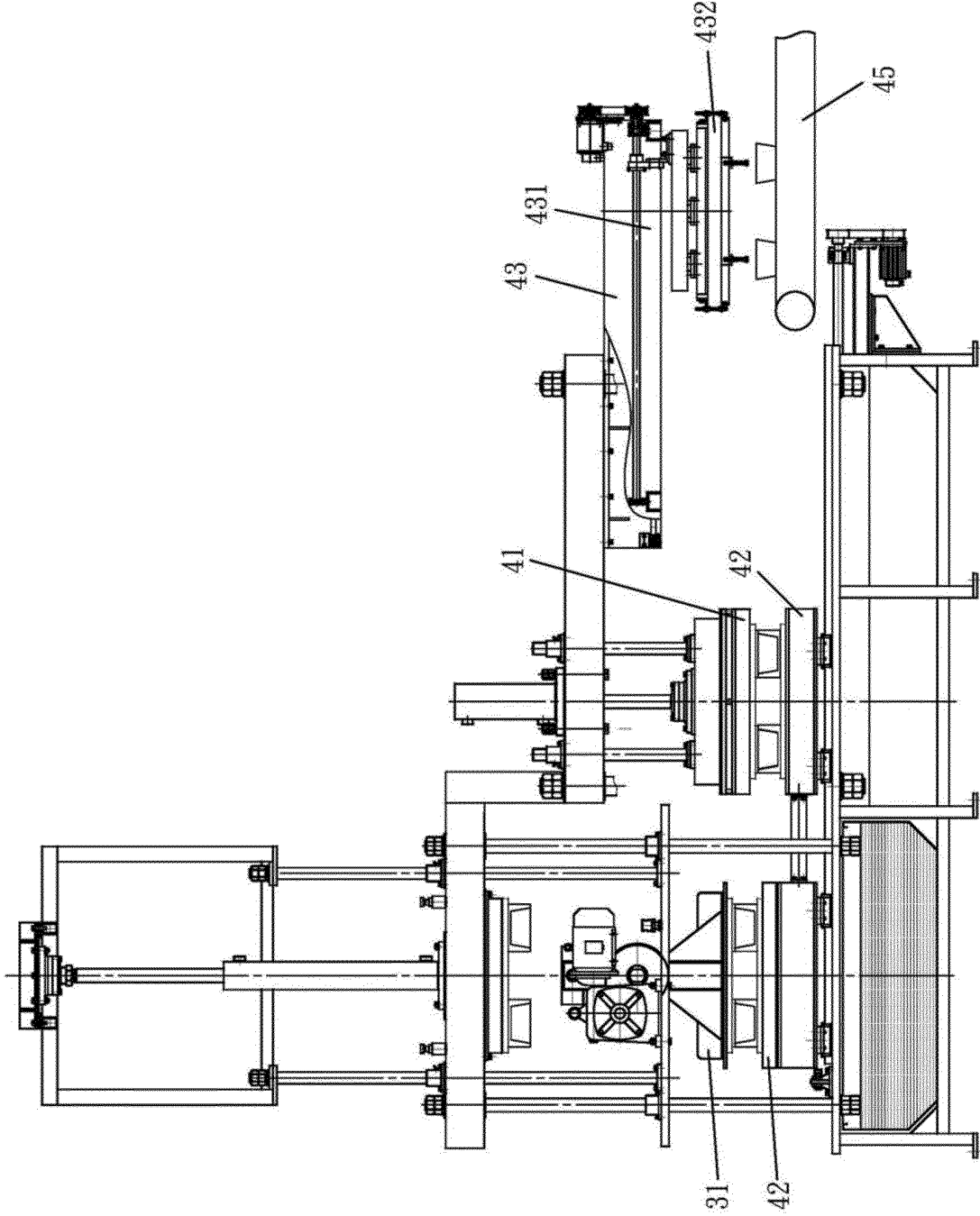


FIG. 25

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/000434

A. CLASSIFICATION OF SUBJECT MATTER D21J 5/00(2006.01)i; D21J 7/00(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC																			
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) D21J 5/00; D21J 7/00; B65G 11/- Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																			
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) VEN; CNTXT; CNABS; CNKI: 纸塑, 一次性用品, 模具, 纸浆, 吸浆, 挤压, 热压, 取料, 机械手, 滑动, 输送, 运输, 生产周期, 常州市城鑫环保科技有限公司, 黄茂荣, paper plastic, disposal goods, mold, suction, slurry, pulp, press+, heat, manipulator, slide, slip, guide, rail, convey, transport, deliver, cycle, cost, CHANGZHOU CITY CHENG XIN ENVIRONMENTAL PROTECTION TECHNOLOGY, HUANG MAORONG																			
C. DOCUMENTS CONSIDERED TO BE RELEVANT																			
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>CN 107237217 A (DELUXE ENVIRONMENTAL TECHNOLOGY (SHANGHAI) CO., LTD.) 10 October 2017 (2017-10-10) description, paragraphs 57-84, and figures 1-14</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 203128950 U (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 14 August 2013 (2013-08-14) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 106049191 A (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 26 October 2016 (2016-10-26) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>CN 204385562 U (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 10 June 2015 (2015-06-10) entire document</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>JP 06316900 A (NORITAKE CO., LTD.) 15 November 1994 (1994-11-15) entire document</td> <td>1-10</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A	CN 107237217 A (DELUXE ENVIRONMENTAL TECHNOLOGY (SHANGHAI) CO., LTD.) 10 October 2017 (2017-10-10) description, paragraphs 57-84, and figures 1-14	1-10	A	CN 203128950 U (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 14 August 2013 (2013-08-14) entire document	1-10	A	CN 106049191 A (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 26 October 2016 (2016-10-26) entire document	1-10	A	CN 204385562 U (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 10 June 2015 (2015-06-10) entire document	1-10	A	JP 06316900 A (NORITAKE CO., LTD.) 15 November 1994 (1994-11-15) entire document	1-10	
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																	
A	CN 107237217 A (DELUXE ENVIRONMENTAL TECHNOLOGY (SHANGHAI) CO., LTD.) 10 October 2017 (2017-10-10) description, paragraphs 57-84, and figures 1-14	1-10																	
A	CN 203128950 U (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 14 August 2013 (2013-08-14) entire document	1-10																	
A	CN 106049191 A (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 26 October 2016 (2016-10-26) entire document	1-10																	
A	CN 204385562 U (FOSHAN HAobo ENVIRONMENTAL PRODUCTS CO., LTD.) 10 June 2015 (2015-06-10) entire document	1-10																	
A	JP 06316900 A (NORITAKE CO., LTD.) 15 November 1994 (1994-11-15) entire document	1-10																	
☒ Further documents are listed in the continuation of Box C.	☒ See patent family annex.																		
* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family																		
Date of the actual completion of the international search 28 June 2019	Date of mailing of the international search report 12 July 2019																		
Name and mailing address of the ISA/CN State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																		

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No. PCT/CN2018/000434

5

10

15

20

25

30

35

40

45

50

55

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2004060113 A (MITSUI ENGINEERING & SHIPBUILDING CO., LTD.) 26 February 2004 (2004-02-26) entire document	1-10
A	CN 205576635 U (CHEN, Jianfeng) 14 September 2016 (2016-09-14) entire document	1-10
A	WO 2005012640 A1 (ECOLOGICO PACKAGING SDN BHD et al.) 10 February 2005 (2005-02-10) entire document	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2018/000434

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	107237217	A	10 October 2017	None			
CN	203128950	U	14 August 2013	None			
CN	106049191	A	26 October 2016	None			
CN	204385562	U	10 June 2015	None			
JP	06316900	A	15 November 1994	None			
JP	2004060113	A	26 February 2004	None			
CN	205576635	U	14 September 2016	None			
WO	2005012640	A1	10 February 2005	MY	137949	A	30 April 2009

Form PCT/ISA/210 (patent family annex) (January 2015)