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(71) Applicant: **Air Power Group S.p.A.**
42013 Casalgrande
(Reggio Emilia) (IT)
(72) Inventor: **GIGLIOLI, Ivano**
42013 Casalgrande (IT)
(74) Representative: **Ruzzu, Giammario**
Via Gulli, 5
40068 San Lazzaro di Savena (BO) (IT)

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(54) **DEVICE FOR WASHING A DECORATION CABINET**

(57) The washing device (1) is associated with a box-shaped protective structure (20) of a ceramic tile decoration booth (2), arranged along a decoration line (L), and comprises: two movable arms (4), supported by the box-like protective structure (20), each equipped with an orientable washing head (3) provided with one or more spray nozzles (30) and driven in oscillation by the first actuator organs (5); second actuator organs (6), for the rotation movement of each swiveling washing head (3) along one or more axes, to obtain a coverage up to 360 °; a system (70) for supplying water and / or detergent liquid under pressure to the aforementioned spray nozzles (30), whose jets are intended to clean the organs

inside said decoration booth (2) as well as the internal walls of said box-like protective structure (20), in phase relation with the programmed stops of said decoration line (L).

Fixed auxiliary spray nozzles (33) are provided for cleaning areas not reached by the spray nozzles (30) of the swiveling washing head (3).

The resulting liquid is intended to be conveyed, by gravity, towards said at least one collection tank (24), subsequently cleaned by additional spray nozzles (34), from which the resulting liquid is evacuated by means of relative discharge pipes.

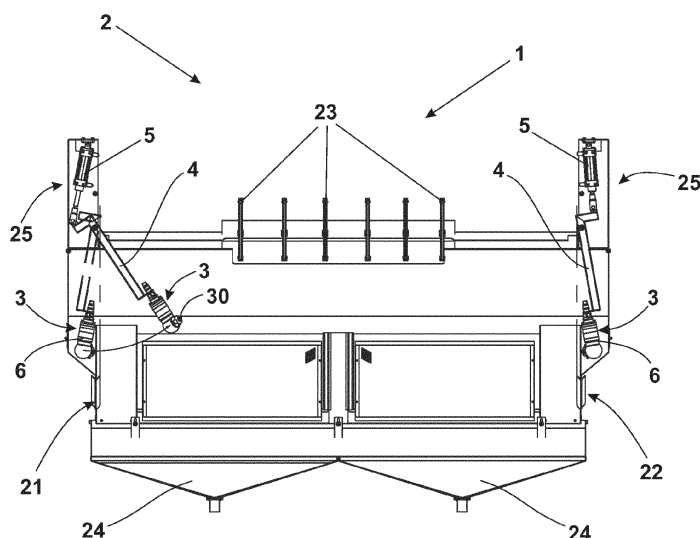


FIG. 3

Description

DESCRIPTION OF THE INVENTION

[0001] The present invention is part of the technical sector relating to machinery for the ceramic industry, with particular reference to those intended for the tile decoration lines.

PRIOR ART OF THE INVENTION

[0002] Along the aforementioned decoration lines, a certain number of decoration booths are located in succession, shaped like tunnels, in which the ceramic tiles, advancing on a conveyor, enter, pass through a battery of nozzles that deliver ceramic glaze and then they go out.

[0003] The number of decoration booths can vary according to the type of decoration, or how many different colors of enamel must be applied; in certain lines there may be six or more cabins.

[0004] At scheduled intervals, typically every 2-3 working hours, the decoration line is stopped for maintenance and washing; normally, the downtime of the line is contained within an hour, to minimize the loss of production.

[0005] At this juncture we also try to wash the decoration booths, especially inside them, but when the number of them is high it becomes impossible to do everything without dilating the downtime of the line, with the consequent inconveniences.

OBJECTS OF THE INVENTION

[0006] Ancora uno scopo dell'invenzione e quello di prevedere per il dispositivo un impianto di alimentazione a circuito chiuso, dotato di mezzi in grado di filtrare e depurare il liquido di risulta del lavaggio, per poterlo riutilizzare e riutilizzare.

[0007] The object of the present invention is therefore to provide each decoration booth with its own washing device, capable of cleaning the internal walls of the booth as well as the operating elements housed therein with water pressure jets, detergents, or water mixed with cleaning substances.

[0008] Another object of the invention is to provide that the washing device operates automatically according to a predefined work cycle, implemented in coincidence with the said programmed stop of the decoration line.

[0009] A further object of the invention is to program the automatic washing cycle in such a way as to minimize the steps necessary to clean the entire cabin.

[0010] Another object of the invention is to provide for the device a closed circuit feeding device, equipped with means capable of filtering and purifying the liquid resulting from the washing, in order to be able to clean and reuse it.

SUMMARY OF THE INVENTION

[0011] These and other purposes are fully achieved by means of a device for washing a decoration booth, with the latter associated with a line for the decoration of ceramic tiles and provided with: a box-shaped protective structure, in which two opposing openings are provided respectively for the entry and exit of a conveyor on which said ceramic tiles are advanced; nozzles for spraying ceramic glaze on said ceramic tiles, with said nozzles arranged in a battery inside the aforementioned box-shaped protective structure; at least one tank for collecting the excess enamel, arranged in the bottom of said box-like structure, with the aforementioned device comprising:

- at least one swiveling washing head, associated with the lower end of a mobile arm, the latter supported by the box-like protective structure, the swiveling washing head being equipped with one or more spray nozzles;
- first actuator elements, for moving the mobile arm according to a predefined program and with predetermined speed, for moving the washing head that can be oriented within the box-like protective structure;
- second actuator organs, for moving the washing head, according to at least one rotation axis, in a suitable phase relation with said movement of the mobile arm;
- a system for feeding water and / or detergent liquid under pressure, with pressure ranges typically between less than 10 bar and over 100 bar, to the spray nozzles of the washing head, with the jet coming out of the spray nozzles intended for clean the organs inside the cabin and the internal walls of the box-shaped protective structure. The resulting liquid is intended to be conveyed, by gravity, towards the collection tank, from which it is evacuated by means of relative drain pipes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The characteristics of the invention in question will be evident from the following description of a preferred embodiment of the device for washing a decoration booth, according to the object, in accordance with what is proposed in the claims and with the aid of the attached tables drawing, in which:

- Fig. 1 illustrates, in axonometric view, a decoration booth equipped with the washing device in question;
- Fig. 2 shows a front view of the cabin of Fig. 1;
- Fig. 3 shows a section view of the decoration booth, according to the plane II-II of Fig. 2;
- Fig. 4 illustrates, in an axonometric view similar to Fig. 1, the decoration booth with a part of the relative decoration line and a feeding system associated with

the washing device;

- Fig. 5 shows a side view of what is illustrated in Fig. 4;
- Fig. 6 shows a front view of Fig. 5.

DETAILED DESCRIPTION OF THE INVENTION

[0013] In the above figures, the washing device object of the present invention, as a whole, has been indicated with reference number 1.

[0014] The washing device 1 is associated with a decoration booth 2 of ceramic tiles (not shown), arranged along a decoration line L, partially visible in Fig. 4, and in which a conveyor T is included, for example with belts, for the advancement of said ceramic tiles.

[0015] The same decoration line L can provide a plurality of said decoration booths 2, arranged in succession at predetermined distances from each other, all advantageously equipped with a corresponding washing device 1.

[0016] Each decoration booth 2, in a manner known per se, is provided with:

- a box-shaped protective structure 20, in which two opposing openings 21, 22 are provided, respectively for the entry and exit of the conveyor T;
- a battery of nozzles 23 for spraying ceramic glaze on ceramic tiles, arranged inside the protective box-like structure 20;
- at least one collection tank 24 (two in the example shown in the figures) of the excess enamel, arranged in the bottom of the box-like protective structure 20.

[0017] It is omitted to describe in detail the further construction characteristics of the box-like protective structure 20, as well as other known members present in the painting booth 2, as they are irrelevant for the understanding of the invention in question.

[0018] The washing device 1, according to the invention, comprises at least one orientable washing head 3, provided with at least one spray nozzle 30 and associated with the lower end of a mobile arm 4, with the latter supported in the upper part of the box-like structure protection 20 and extended downwards.

[0019] In the preferred embodiment of the attached figures, two movable arms 4 are provided, each with a relative swiveling washing head 3. The latter is provided with 3 or 4 spray nozzles 30, to optimize the covered area during operations of washing.

[0020] The two movable arms 4 are arranged mutually symmetrical at the opposite ends of the box-like protective structure 20, placing themselves above the said inlet 21 and outlet 22 openings respectively made in the latter.

[0021] The box-like protective structure 20, in the illustrated non-limiting example, conforms two turrets 25, rising from its top, each of which is provided to house the upper portion of the corresponding mobile arm 4.

[0022] In a preferred construction solution, as shown in the figures, the movable arms 4 are of the oscillating

type and lie on a vertical plane coinciding with the vertical longitudinal centerline of the box-like protective structure 20.

[0023] Each of the aforementioned movable arms 4 is associated with first actuator elements 5, for their movement on the vertical plane, according to a predefined program and with a predetermined speed, for moving the washing head 3 inside the box-like protective structure 20.

[0024] In the illustrated construction solution, the first actuator organs 5 are advantageously housed in the turret 25 of the corresponding mobile arm 4, so as to be in areas protected from splashes and, at the same time, easily inspected from outside the box-like protective structure 20.

[0025] Each washing head 3 has associated second actuator organs 6, comprising a nozzle-holder body, for its movement along at least one axis of rotation, in a suitable phase relationship with the movement of the relative mobile arm 4. Preferably the nozzle-holder body it is subject to two combined movements according to two different degrees of freedom, to ensure maximum coverage of the washing area, and therefore operate at 360° for each movement.

[0026] The aforesaid first and second actuator organs 5, 6 are for example of the pneumatic type.

[0027] In any case, the movable arms 4 are operable between a rest position, shown in Figure 5 and, partially in dashed lines, in Figure 3, in which they do not interfere with the operation of the cabin 2, and a plurality of operating positions, given from all the positions that can be assumed by the washing head 3, and allowed by the aforesaid first 5 and second 6 actuator organs.

[0028] In a construction variant not shown, each of said movable arms 4 is constituted by a robotic arm with controlled axes, which incorporates said first and second electromechanical actuator elements 5, 6, in addition to any others for moving both the movable arm 4 that the washing head 3 along other axes.

[0029] In the washing device 1 fixed auxiliary spray nozzles 33 can also be provided which are intended to act in predetermined areas of the aforementioned box-like protective structure 20 not reached by the nozzles 30 of the orientable washing heads 3.

[0030] For example, some of said fixed auxiliary spray nozzles 33 (of which only one visible in Fig. 5) are present in the suction cassettes 26 present inside the box-like protective structure 20.

[0031] In the washing device 1 additional spray nozzles 34 can be further provided, intended to be actuated subsequently to those of said orientable washing heads 3, suitable for washing the aforementioned collection tanks 24.

[0032] The spray nozzles 30 of the washing heads 3, the fixed auxiliary spray nozzles 33 as well as the additional spray nozzles 34, receive water and / or detergent liquid from a member of a supply system 70, of a substantially known type, illustrated in Figs. 5, 6, 7, whose

components are mostly outside the box-like protective structure 20.

[0033] For information only, the following components of the supply system 70 can be distinguished in the aforementioned figures:

- a hydraulic control unit 71;
- a pump unit 72;
- a mixing tank 73, in addition to valves and pipes.

[0034] The supply system 70, activated together with the aforementioned first and second actuator elements 5, 6, supplies water and / or high pressure detergent liquid to the spray nozzles 30 of the washing heads 3, while to the fixed auxiliary spray nozzles 33 and to the nozzles additional sprayers 34, the water and / or the cleaning liquid preferably arrives at low pressure.

[0035] The jets that come out of said spray nozzles 30, 33, 34 clean the organs inside said decoration booth 2, the internal walls of the box-shaped protective structure 20 and follow the collection tanks 24 during the time in which the decoration line L is stopped for scheduled maintenance.

[0036] The resulting liquid is conveyed, by gravity, towards the underlying collection tanks 24, from which it is evacuated by means of the relative drain pipes, for the action of the relevant pumps, provided in the system 70.

[0037] The aforementioned liquid is then conveyed to the water treatment plant of the plant, to be duly treated before being disposed of.

[0038] In a construction variant, not illustrated in detail, it is possible to provide that said feeding system 70 comprises a tank for collecting the resulting liquid evacuated from the collection tanks 24, and a purification and filtering unit intended to treat said waste liquid, so as to regenerate clean water destined to be recycled in the washing cycle of the device 1 itself.

[0039] According to known technique, it is of course possible to provide that said feeding system 70, as well as any filtering and recirculation group, can be centralized for all the decoration booths 2 present in the decoration line L.

[0040] From the previous description emerge all of the advantageous aspects of the proposed device for washing a decoration booth, capable of cleaning its internal walls, as well as the operating organs housed therein, with jets of water or detergent liquid which are able, thanks to the mobile arms and the rotating washing heads, to reach all areas.

[0041] It should be noted that the washing device operates automatically according to a predefined work cycle, therefore without an operator having to intervene, with said cycle advantageously implemented coinciding with said stop of the decoration line for scheduled maintenance.

[0042] In this way, the washing operations of the decoration booths have no effect on the duration of the downtime of the line.

[0043] The automatic washing cycle, i.e. the programmed sequence of movements of the movable arms and changes in the orientation of the washing heads, is designed to ensure that the areas already cleaned are not again smeared with splashes of dirty water coming from other areas of the cabin in which the jets of the spray nozzles are directed.

[0044] Of particular interest, from the point of view of respect for the environment, the described variant is revealed in which the supply system operates in a closed circuit, thanks to the reuse of the washing liquid, obtained with means capable of filtering and purifying it.

[0045] As is also evident to those skilled in the art, the washing device proposed with the present invention is easily realizable, with elements of simple conception and certain reliability, many of which are of normal commercial availability, to guarantee low production costs.

[0046] However, it is understood that what described above has an exemplary and non-limiting value, therefore any detail variations that may become necessary for technical and / or functional reasons, are considered from now on to fall within the same protective sphere defined by the claims below.

Claims

1. Device for washing a decoration booth (2), with the latter associated with a line (L) for the decoration of ceramic tiles and provided with: a box-shaped protective structure (20), in which two opposite openings (21, 22), respectively for the entry and exit of a conveyor (T) on which said ceramic tiles are advanced; nozzles (23) for spraying ceramic glaze on said ceramic tiles, with said nozzles (23) arranged in a battery inside the aforementioned box-shaped protective structure (20); at least one collecting tank (24) of the excess enamel, arranged in the bottom of said box-like structure (20), with the aforementioned device (1) **characterized in that** it comprises:

- at least one movable arm (4), mounted in said box-like structure (20) and operable between a rest position, which does not interfere with the activity of said nozzles (23), and operating washing positions inside the said booth decoration (2);
 - at least one swiveling washing head (3), associated with the lower end of a related movable arm (4) and equipped with at least one spray nozzle (30), suitable for dispensing water or detergent liquid;
- First actuator organs (5), for moving said movable arm (4) according to a predefined program and with predetermined speed, for moving said orientable washing head (3) inside the aforementioned box-like protective structure (20);
- second actuator organs (6), for moving said

orientable washing head (3), according to at least one rotation axis, in a suitable phase relationship with said movable arm movement (4);
 • a system (70) for supplying water and / or detergent liquid under pressure to the aforementioned at least one sprayer nozzle (30) of the orientable washing head (30), with the jet coming out of said at least one sprayer nozzle (30) intended to clean the organs inside said decoration booth (2) as well as the internal walls of said box-like protective structure (20), with the resulting liquid destined to be conveyed towards the outside of the aforementioned decoration booth (2).

2. Device according to the rev. 1, **characterized in that** two of said movable arms (4) are provided, extended downwards, each with a relative orientable washing head (3) and arranged at one of the opposite ends of the aforementioned box-shaped protective structure (20), respectively overlying said inlet (21) and outlet (22) openings made in the latter. 15
3. Device according to the rev. 1 or 2, **characterized in that** the aforementioned box-shaped protective structure (20) conforms turrets (25) rising from the relative top, each of which is provided for housing the upper portion of the corresponding mobile arm (4). 20
4. Device according to the rev. 1 or 2 or 3, **characterized by** the fact that each of said movable arms (4) is of the type oscillating on a vertical plane coinciding with the vertical longitudinal centerline of said box-like protective structure (20), and by the fact that said first actuator organs (5) are housed in the respective turret (25). 25
5. Device according to the rev. 1 or 2 or 3, **characterized in that** each of said movable arms (4) is constituted by a robotic arm with controlled axes, which incorporates said first and second actuator organs (5, 6). 30
6. Device according to the rev. 1 or 2, **characterized in that** fixed auxiliary spray nozzles (33) are provided, connected to said system (70) for the supply of water and / or detergent liquid and intended for washing predetermined areas of the aforementioned box-like protective structure (20) not reached by said at least one orientable washing head (3). 35
7. Device according to the rev. 1 or 2, **characterized in that** additional spray nozzles (34) are provided, connected to said system (70) for supplying water and / or detergent liquid, intended to be operated after those of said at least one washing head orientable (3) and suitable for washing the aforementioned 40

at least one collection tank (24).

8. Device according to any one of the preceding claims, **characterized in that** in said plant (70) for the supply of water and / or detergent liquid there is a tank for collecting the liquid resulting from the at least one collection tank (24), and comprises a purification and filtering unit intended to treat said waste liquid, so as to regenerate clean water destined to be recycled in the washing cycle of the device (1) itself. 45

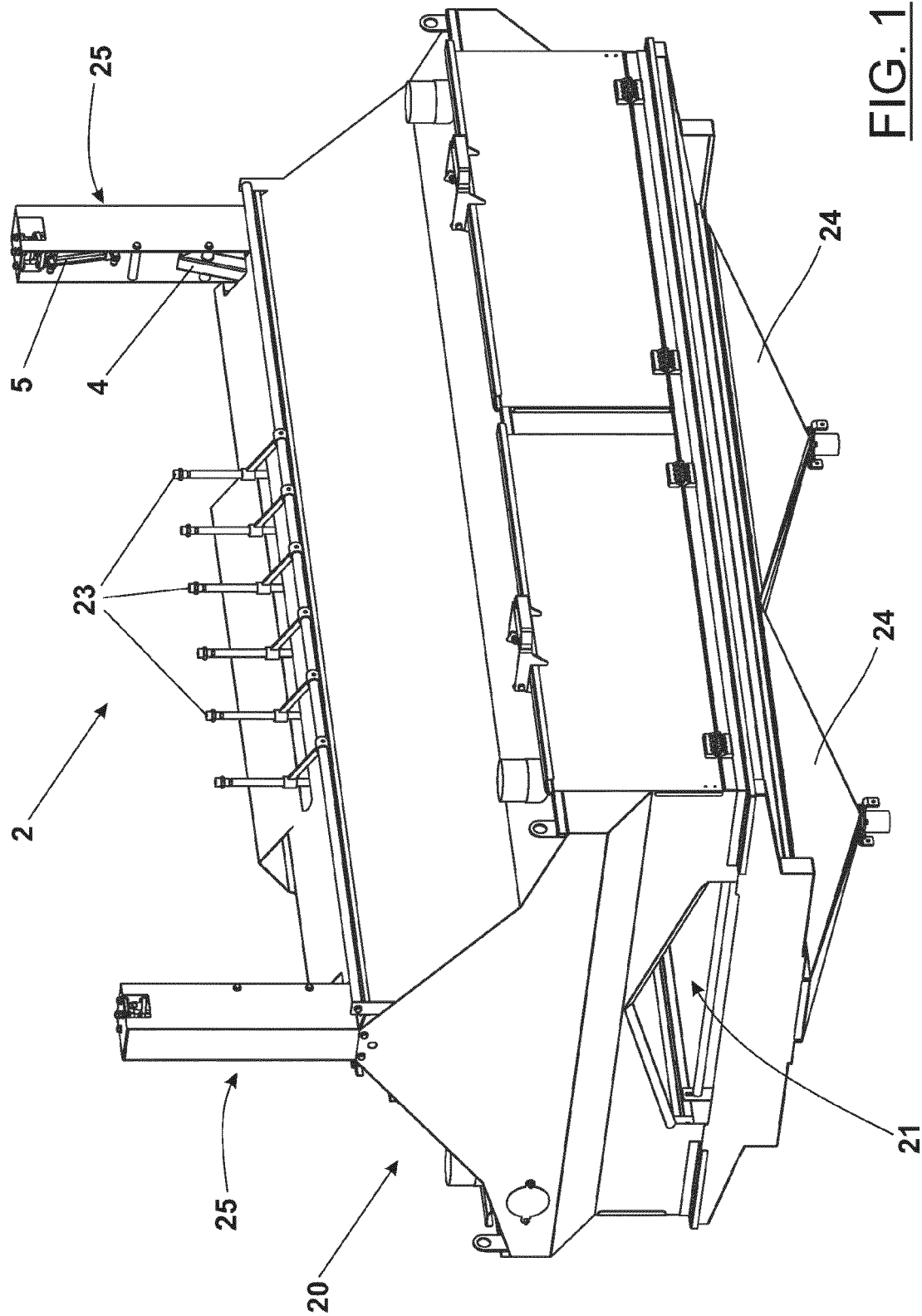


FIG. 1

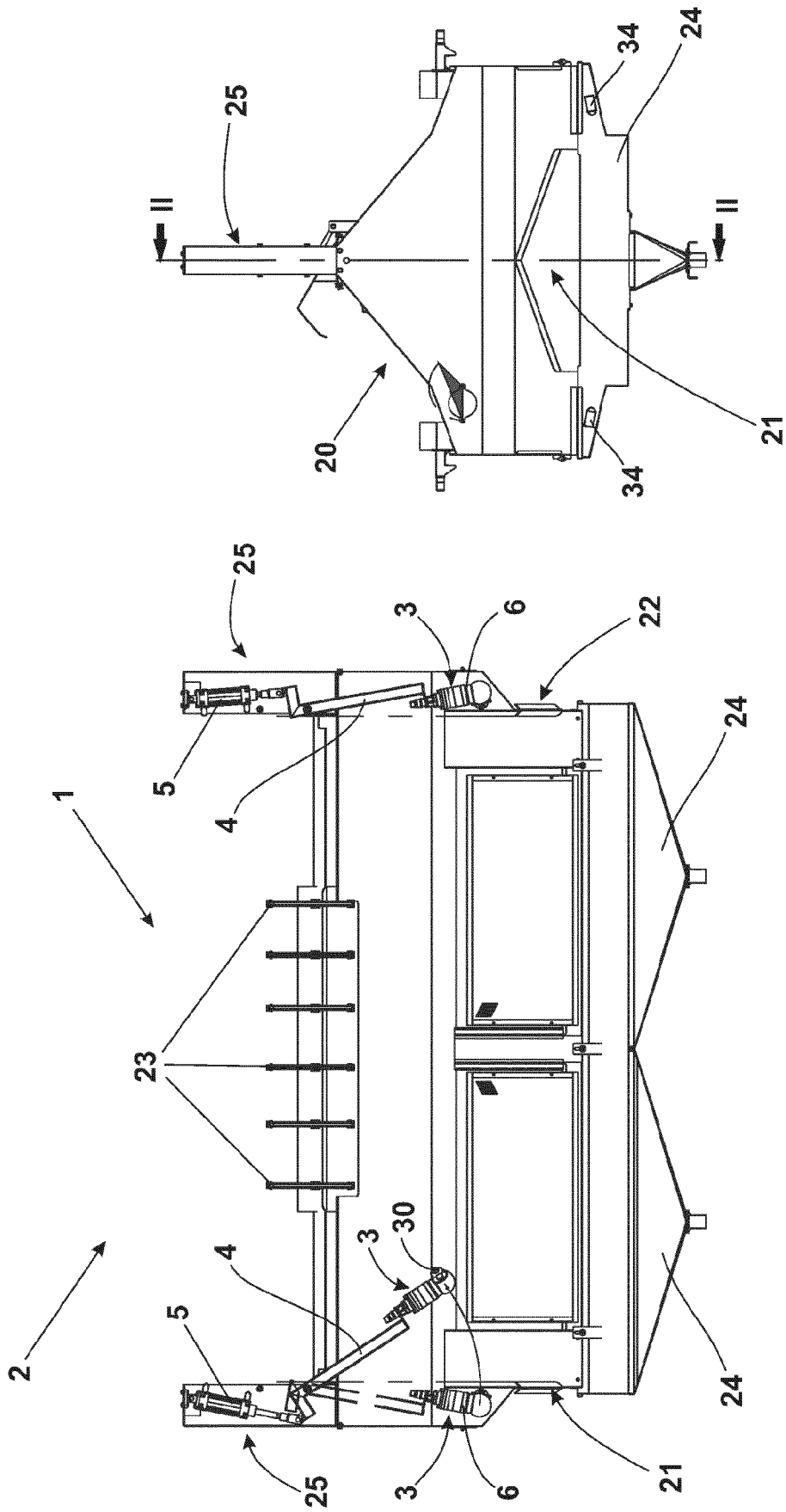
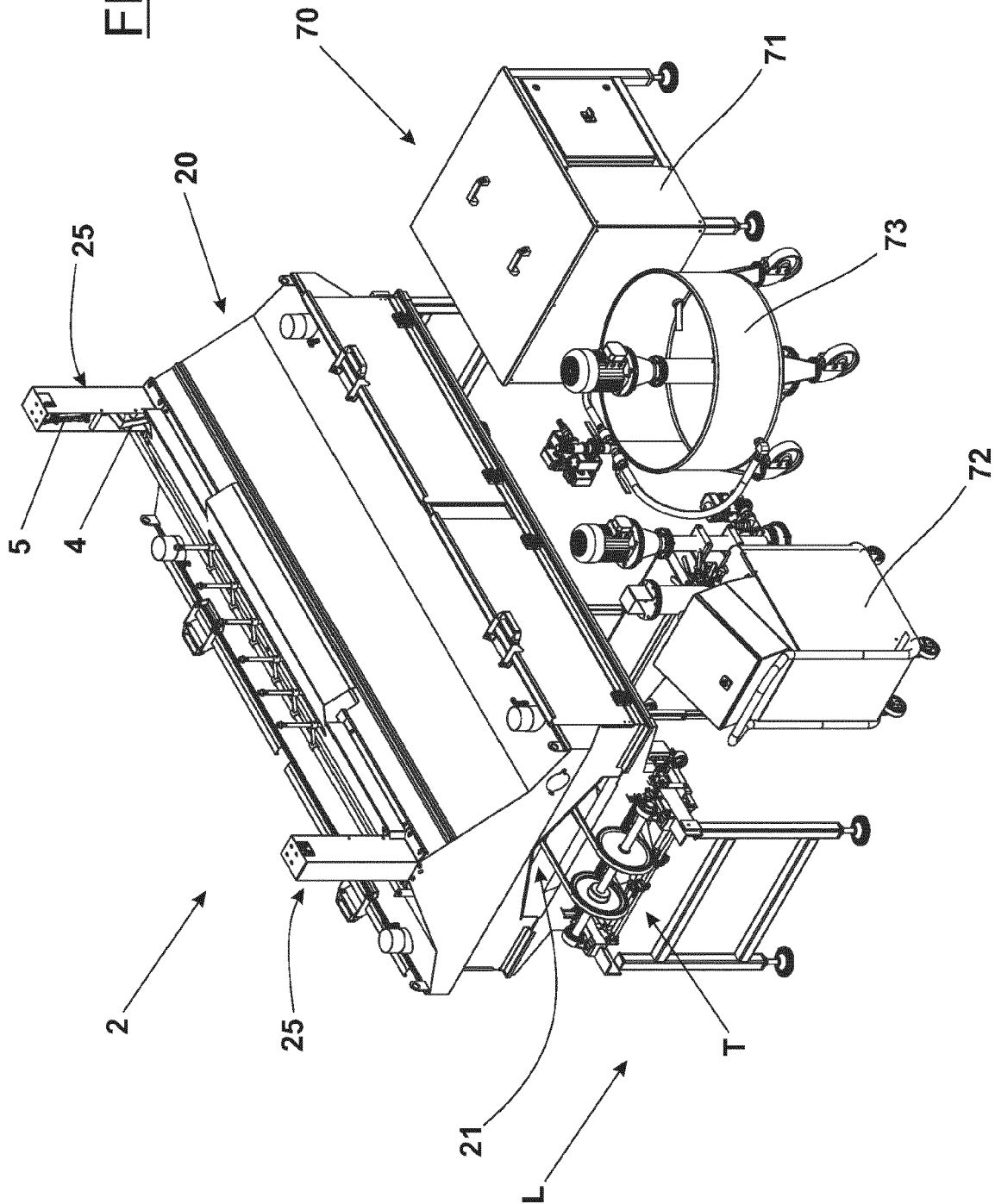


FIG. 2

FIG. 3

FIG. 4



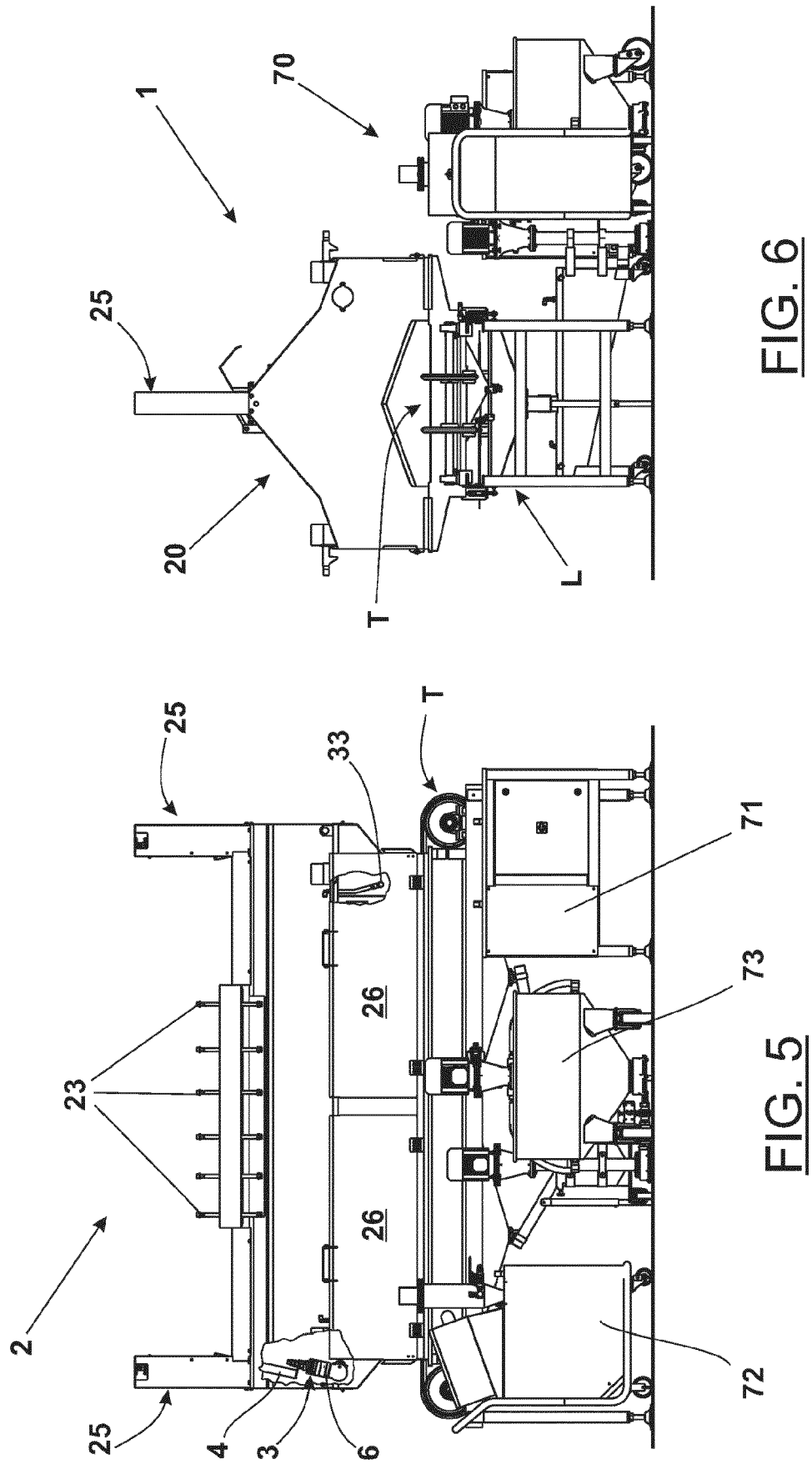


FIG. 6

FIG. 5



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 Application Number
 EP 20 17 3573

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