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(71) Applicant: **UNI-MAC S.r.l.**
42027 Montecchio Emilia, (Reggio Emilia) (IT)

(72) Inventor: **Delmonte, Alessandro**
42027 Montecchio Emilia, (Reggio Emilia) (IT)

(74) Representative: **Lecce, Giovanni**
Dott. Giovanni Lecce & C. S.r.l.
Via G. Negri 10
20123 Milano (IT)

(54) **Automatic gravity filling plant with a total scraping cleaning system**

(57) The injection heads (1) of a filling machine are mounted in alignment with the horizontal delivery unit (5), intersecting it horizontally. The delivery unit (5) connects with the fixed line (11) by means of an articulated tubular duct (12) with tight rotary joints (13) that allows it to shift in the space, keeping a horizontal orientation. The unit (5), the duct (12) and the line (11) have a constant diameter and can be internally traveled by at least a scraping pad (15) that passes through and cleans also heads (1). Injectors (7) of heads (1) discharge from the residues and clean either by gravity or by means of additional independent scrapers (37).

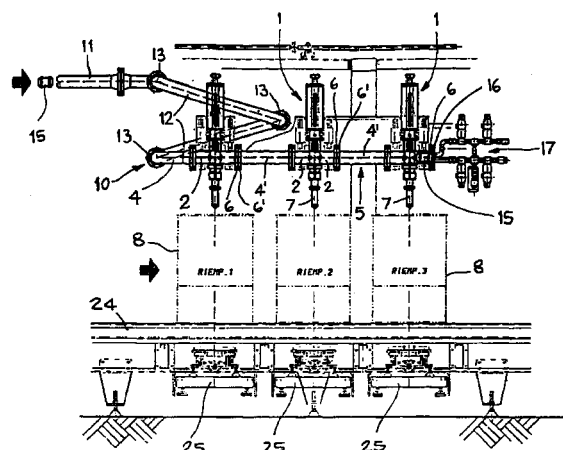


FIG. 4

EP 1 020 360 A2

Description

[0001] The present invention relates to an automatic gravity filling machine provided with a scraping pad total cleaning system, of the type known by the British name of "pigable system" or "pig scraper". The scraping pads or pigs are capable of carrying out the internal cleaning scraping of the whole line, starting from the main distribution one up to the end delivery unit, and vice-versa, passing through the injection head or heads that are mounted in alignment on said unit, intersecting it orthogonally. The position of the delivery unit can be varied vertically and possibly transversally, keeping the horizontal orientation thanks to its connection with the fixed line obtained by means of an articulated tubular duct, with tight rotary joints. The delivery unit, the pantograph duct, the rotary joints and the line have the same inner diameter, so that they can be sequentially traveled by scraping pads or pigs that pass along and clean also the heads that are present on said delivery unit. The vertical injectors of the heads discharge from the residues either by gravity dripping or by means of additional vertical scrapers.

[0002] As is known, the present automatic gravity filling plants for drums, barrels, tanks and the like, that contain fluid products in general, such as for instance oils, fats, paints, chemical products, are usually provided with pad systems for scraping internally tubings, called by the British term "pig scrapers". Such scraping means are obviously necessary, before any subsequent utilization of the distribution plants, to remove from the tubings the residues of the preceding products. To this aim, at the end of each cycle, the pigs or pads are pressure-pushed in the inside of tubings so as to exercise on the internal surfaces and possibly, along all their development, a scraping action, discharging towards the outside the residues collected.

[0003] It is also known that in said plants the injection heads must be able to translate vertically (and for particular applications also transversally) to allow the right positioning and the alignment of the injection lances with the filling mouths, for the various types of containers, having different size and/or heights. At present, to perform such translations, the injection heads are separated from the fixed distribution header and are connected to it by means of hoses which, while ensuring a correct feeding of the fluid products to be discharged into the containers during the active steps, are less suitable to allow the end-of-cycle internal cleaning by means of the scraping pad systems. In substance, the cleaning with scraping pads can be carried out only up to the fixed distribution header included, while the cleaning of the hoses, the injection heads and the injectors can be carried out only upon disassembly of said parts, their discharge and their hand-cleaning, with ensuing waste of resources due to the engagement of unproductive manpower, the excessive dead times, the necessity of collecting the recovered fluid products and

the sending of the same to recirculation, whenever possible, or, when it is not possible, with a total or partly product loss, with the sending of wastes to the polluting substance collection centers, the authorized dumps or the recovery and regeneration plants.

[0004] Object of the present invention is to obviate said drawbacks. The invention, as is characterized by the claims, solves the problems by means of an automatic gravity filling machine with a total scraping cleaning system by which the following results are obtained: the vertical injection head or heads comprise orthogonal transversal passages that associate orthogonal to each other and with the passages of possible intermediate and/or end tubular tubing sections, to form one only delivery horizontal tubular unit, with a continuous linear passage; the position of the horizontal delivery unit, complete with the orthogonal injection head or heads, is height-adjustable to allow the desired positioning and/or alignment of the injection lances, with respect to the filling of containers having different size and/or heights; the delivery unit couples with the product arrival fixed line by means of an articulated tubular duct, with tight rotary joints; the inner diameter of the delivery unit, the articulated tubular ducts, the tight rotary joints and the fixed line is the same, and within it there slides at least a cleaning pad scraper or pig; the lance of the injector(s) can be cleaned by dripping, gravity or an additional, independently controlled vertical pad, through the lower discharge outlet where the shutter is activated by fully or partly external means.

[0005] The advantages achieved by the present invention lie essentially in that the scraping pad(s) or pig(s) can slide, either sequentially or by single passes, in the delivery unit, the injection head or heads, the articulated duct, the tight rotary joints and the fixed feeding line, operating a total scraping, without requiring external interventions; only the cleaning of the injector lances may be different: more or less automated and/or extreme, depending on the quality of the products treated and the related admitted tolerances.

[0006] The invention will be now described in detail, according to embodiments solely given by way of non limiting example, with reference to the attached drawings, wherein:

Figure 1 shows the cross-section of a first example of embodiment of an injection head, associatable to a delivery unit;

Figure 2 shows the view-side section of the same injection head of Figure 1,

Figure 3 shows the cross-section of a second example of embodiment of an injection head, associatable to a delivery unit;

Figure 4 shows a partial front view of a filling machine with a three injection head unit, and

Figure 5 shows the same filling machine of Figure 4, in side view.

[0007] With reference to the figures, it can be noticed that the injection heads (1) are substantially vertically structured and orthogonally intersected, on their middle part, by opposite coaxial tubular connections (2). Each injection head (1) comprises a central tubular passage (3) aligned with its own tubular connections (2). In their turn, connections (2) are coaxially alignable between each other or with possible and (4) and/or intermediate (4') tubing sections, to form continuous and constant diameter tubular ducts that constitute the delivery units (5) for the gravity automatic filling machines. The union between the tubular connections (2) and the possible tubing sections (4) is through the respective tight rigid flanges (6, 6'), and the delivery unit (5) as a whole is constituted by the fixed engagement of said elements with at least an injection head (1). Units (5) having several couple heads may comprise also the use of possible intermediate tubings (4') depending on the requirements of the spacing pitch between said heads. In all cases, each unit (5) of the gravity automatic filling machine is constituted by one only rigid, continuous and tubular structure formed by one or more injection heads (1), possible tubular elements (4, 4') and the related flanges (6, 6'), sequentially assembled with each other, so that the related central through-holes (3) of a same diameter are coaxially aligned with each other.

[0008] Figures 4 and 5 show, only by way of non limiting example, a delivery unit (5) having three injection heads (1).

[0009] The position of the horizontal delivery unit (5), complete with the orthogonal injection head or heads, may be height-adjustable depending on the alignments of the injection lances (7) with respect to the containers (8) to be filled, that may have different shapes or size. Such adjustment is made by means of devices that do not make part of the invention, as they substantially correspond to those adopted to adjust the heads of the traditional plants.

[0010] Keeping the horizontal alignment, the delivery unit (5) can be translated in the vertical direction and possibly in the transversal and/or longitudinal direction thanks to the connection of its inlet end (10) with the main fixed line (11), by means of an intermediate articulated tubular duct (12) with tight rotary joints (13); the inner diameter (3) that goes through the whole delivery unit (5) is equal to that of the main fixed line (11) and the intermediate articulated tubular duct (12), with the related curves (14) and the related tight rotary joints (13).

[0011] From the terminal side, the delivery unit (5) comprises a containment extension for at least a scraping pad or pig (15) and is closed by a flange (16) whereon the tubular connections (17) of a so-called pigable system or pig scraper end. The pad containment extension may be and independent tubular section, flanged to

one of the tubular connections (2) of the last injection head (1), or the same connection (2), depending on the size of said pad. A second pigable system or pig scraper is also applied to the part of the main fixed line (11), in a conventional way.

[0012] Based on what has been said above, it is evident that the whole line intended for the flow of fluid products is substantially constituted, from the beginning to the end, by one only constant diameter tubular duct having a mixed rectilinear and/or curvilinear development, wherein it is in any case possible to cause the pressure-circulation of the conventional pad scrapers (15) for cleaning and removing by one only continuous rapid and total operation, the residues of the products, at the end of each filling process and before of any subsequent utilization of the distribution plants, with different products.

[0013] With respect to the fact that the scraping pads (15) must freely slide through the central passage (3), the opening-closing control of shutter (18) of lance (7) of each injection head (1) must be such as no to hinder said passage. Figures 1 and 3 show two different solutions, solely given by way of non limiting example, designed for different applications: the first one concerns applications on operating plants or cycles wherein the tolerances for the amount of residues of the fluids treated are not very severe, the second one concerns applications on operating plants or cycles with severe tolerances. In the first configuration, stem (19) supporting shutter (18) is fixed and connected by means of a bracket (20) to the internal part of the discharge outlet (21) of the lower body (22), under the passage hole (3) that remains free. In the same body (22), duct (23) of the injection lance (7) freely slides. When the container or containers (8) that progress along conveyors (24) stop in correspondence of the weighing stations (25), with the loading mouths (26) aligned with injector(s) (7), piston (9) activates the descent of the delivery unit (5), complete with the injection head or heads (1). Each duct (23) enters the underlying and aligned mouth (26) of a container (8) for a length sufficient to allow the total opening of the discharge outlet (27), which is not carried out by opening shutter (18) which is fixed, but by lifting said duct by means of adjusting pistons (28, 28') that, through stem (29), cause the return travel of bracket (30) with which rods (31) are engaged that slide in guides (32) and that engage with a small flange (33) integral with said duct. Pistons (28, 28') adjust the opening and the subsequent closing of the discharge outlet (27) at the end of the filling operation: rapid in the first stage and slow and progressive in the final stage of precise dosing depending on the weighed weight. At the end of each filling process, before starting a subsequent process with different products, and after the cleaning step of the whole line by means of scraping pads (15) that pass through holes (3), each discharge outlet (27) is opened again and the small amount of product comprised in each duct (23) is

caused to gravity-discharge and drip. Obviously, said discharge depends on the fluidity of the products treated and in any case some residue will always remain on the wall of the discharge outlet wall (21): the amount of such residue must be comprised within the tolerance limits expected and acceptable. However, possible more accurate cleaning operations are possible by adopting quick fasteners, for instance bayonet fasteners, for the connection of the lower bodies (22) and the small flange (33) to the head units (1).

[0014] In the second configuration (Fig. 3), also the internal duct (21) of the lower body (22) under the passage hole (3) is free, while shutter (18) is mounted on the lower end of an element (34), external and coaxial with said body (22), that is supported by the small flange (33) that receives the downward/opening and upwards/closing movement by means of rods (31), sliding in guide (32) and coupled to the adjusting pistons (28, 28') through stem (29) and bracket (30). The shutter control unit is misaligned, with respect to the body of the injection head, in order to coaxially align an upper piston (35) with the internal duct (21) of the underlying body (22). A secondary scraping pad (37) is engaged with stem (36) of piston (35), positioned, when it does not operate, above the passage hole (3), while in the subsequent step of total scraping of the feeding lines by pads (15) it is pushed downwards, goes diametrically through the passage hole (3) and inserts and slides in the internal duct (21), exercising on its surface the cleaning desired. The length of pad (37) is such as to allow an adequate and correct guiding, both during the passage through hole (3) and in the mouth of duct (21). In this second solution, it is evident that the cleaning and the removal of the residues of the products treated takes place along all the tubular ducts that constitute the delivery units, and that one only continuous and quick operation can be carried out at the end of each filling process and before any subsequent utilization of the plants with different products, and is advantageously applicable in all cases when the tolerances for the acceptable residues are severe. It is also evident that the second solution described, if its is realized without the upper piston (35) and the related secondary shutter (18), misaligned or aligned as it may be, has a configuration that entirely corresponds to that of the first solution, for the purposes specified.

[0015] While the present invention has been described and illustrated according to some embodiments solely given by way of non limiting example, those skilled in the art will understand that various modifications may be introduced with respect to the shapes, structures, components, details, orientations, possible combinations and units, falling always within its scope and aim.

Claims

1. An automating gravity filling machine with a system

of total scraping cleaning, characterized in that the injection head or heads (1) of the fluid products to be discharged into containers (8) are either vertically aligned and integrated or constitute one only integral horizontal tubular delivery unit (5); said vertical injection head or heads (1) integrate with each other, with or without the interposition of tubular sections (4, 4'), to constitute the delivery unit (5) by means of the coupling of its own horizontal tubular through-connections (2) which are provided with a central free passage (3) in correspondence of which there extends downwards the internal duct (21) of the corresponding injector (7) whereon the opening and closing means of the discharge outlet (27) end, said means being activated by control means that do not hinder said passage (3); said free passage (3) of the injection head or heads (1), constituting or integral with the horizontal delivery unit (5) has a coaxially aligned inner diameter equal to that of the other possible parts of said unit (5), of the tubular elements of the feeding line (11) and of an intermediate articulated tubular duct (12) with tight rotary joints (13), and said equal diameter corresponds to the diameter of at least a pressure-pushed sliding scraping pad.

2. The automating gravity filling machine with a system of total scraping cleaning according to claim 1, characterized in that the free central passage (3) of the injection head or heads (1) constituting or integral with the horizontal delivery unit (5) has a coaxially aligned inner diameter equal to that of all the other parts of said unit (5), of the tubular elements of the feeding line (11) and of an intermediate articulated tubular duct (12) with tight rotary joints (13).
3. The automating gravity filling machine with a system of total scraping cleaning according to claims 1 and 2, characterized in that the discharge outlet (27) of injector (7) of each injection head (1) is combined with means for opening and closing a shutter (18) that do not intersect nor hinder the central free passage (3) of the injection head or heads constituting or integral with the horizontal delivery unit (5).
4. The automating gravity filling machine with a system of total scraping cleaning according to claims 1-3, characterized in that the discharge outlet (27) of injector (7) of each injection head (1) is combined with opening and closing means constituted by the coaxial coupling of a fixed shutter (18), fastened in the inside of the discharge body (22) and a mobile duct (23) that slides in said body (22) disengaging from or tight-engaging with said shutter (18); the sliding movements of said mobile duct (23) are constituted by controls external with respect to the central free passage (3) of the injection heads (1), and comprise small flanges (30, 33) combined with

guided rods (31) associated with stem (29) of adjusting pistons (28, 28').

5. The automating gravity filling machine with a system of total scraping cleaning according to claims 1-3, characterized in that the discharge outlet (27) of injector (7) of each injection head (1) is combined with opening and closing means constituted by the coaxial coupling of a fixed discharge body (22), and of a mobile duct (23) mounted on the lower end of an external element (4) that slides coaxially with said body (22); the sliding movements of said mobile duct (23) are constituted by controls external with respect to the central free passage (3) of the injection heads (1), and comprise small flanges (30, 33) combined with guided rods (31) associated with stem (29) of adjusting pistons (28, 28').
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6. The automating gravity filling machine with a system of total scraping cleaning according to claims 1-3 and 5, characterized in that the controls, external with respect to the central free passage (3) of the injection heads (1), that activate a mobile duct (18) mounted on the lower end of an external element (34) that slides coaxially with the discharge body, may be mounted aligned or misaligned with respect to said injection heads.
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7. The automating gravity filling machine with a system of total scraping cleaning according to claims 1-3, 5 and 6, characterized in that vertical pistons (35) are associated to the injection heads (1) provided with external misaligned controls that activate the respective mobile shutters (18); said vertical pistons (35) control secondary scraping pads (37), which are coaxially aligned with the internal part (21) of the lower bodies (22) of injectors (7), and slide therein during the active stages, while they are receded with respect to said central free passages (3) during the passive stages.
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8. The automating gravity filling machine with a system of total scraping cleaning according to claims 1-7, characterized in that the connections of the lower bodies (22) and the small flange (33) with the head units (1) are provided with quick disassembly means.
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9. The automating gravity filling machine with a system of total scraping cleaning according to claims 1-8, characterized in that the central passages (3), the horizontal tubular connections (2) of the injection heads (1), and the possible end (4) or intermediate (4') tubing sections constitute the integral horizontal delivery unit (5); the position of said units is adjustable depending on the alignment of injectors (7) with respect to the filling mouths (26) of containers (8) having different shape and /or height; the
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delivery unit couples with the product arrival fixed line (11) by means of an articulated tubular duct (12), provided with tight rotary joints (13).

- 5 10. The automating gravity filling machine with a system of total scraping cleaning according to claims 1-9, characterized in that the horizontal delivery unit (5) that comprises one or more injection heads (1) rigidly and integrally integrated, either with or without end (4) or intermediate (4') tubing sections, is connected to the feeding line (11) by means of an articulated intermediate tubular duct (12) and tight rotary joints (13); said components having all the same passage inner diameter and constituting one only continuous tubular unit that can be traveled by scraping pads.

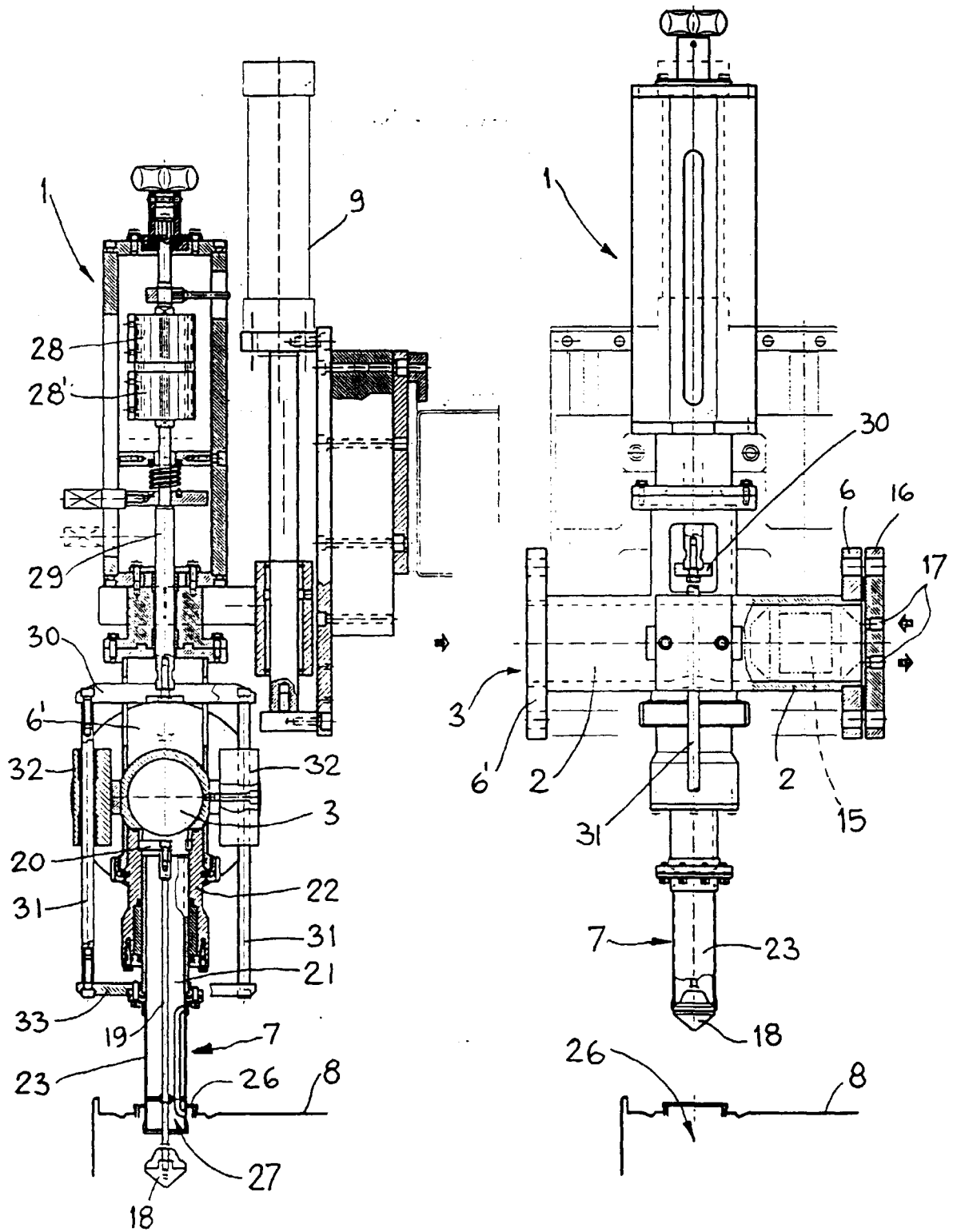


FIG. 1

FIG. 2

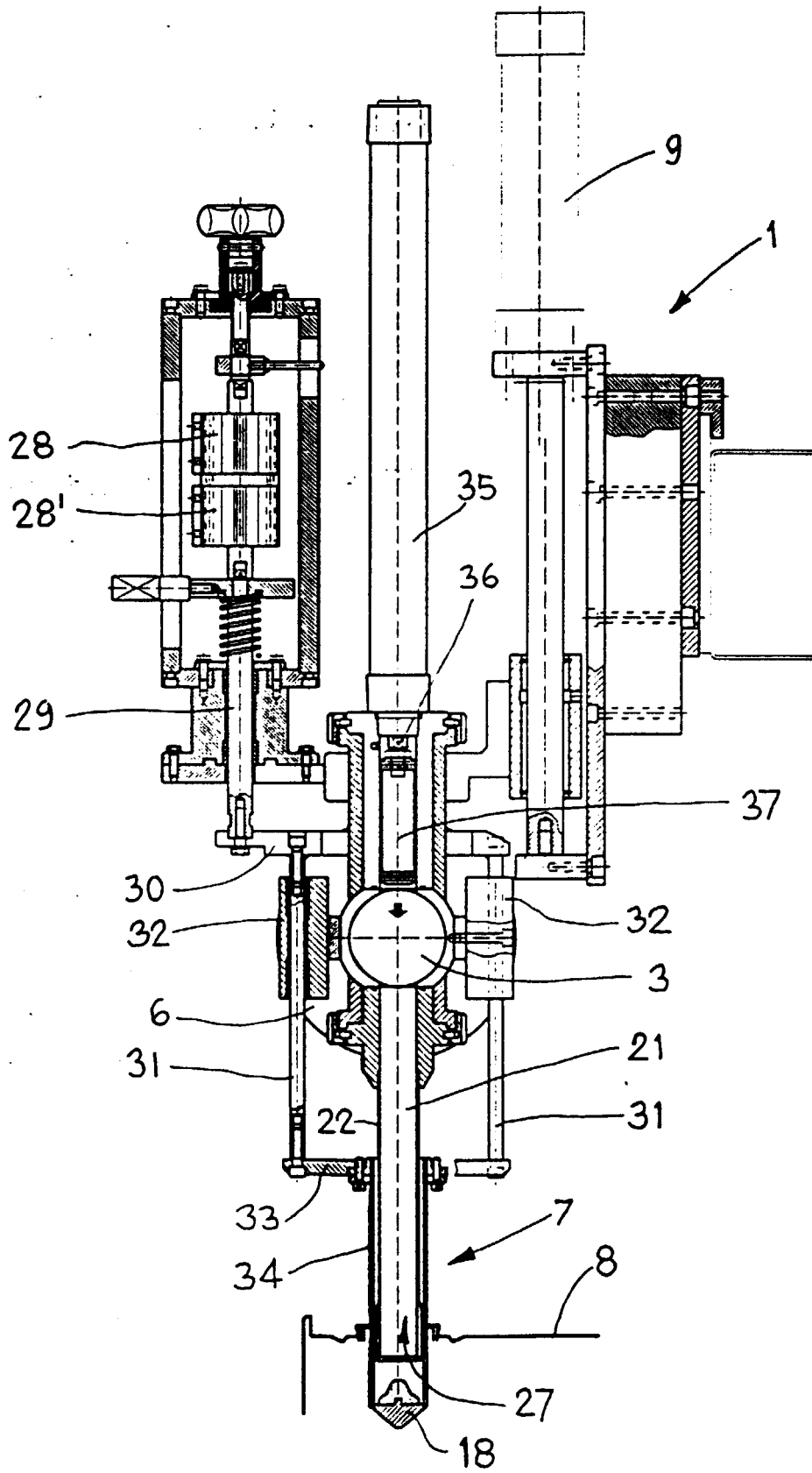


FIG. 3

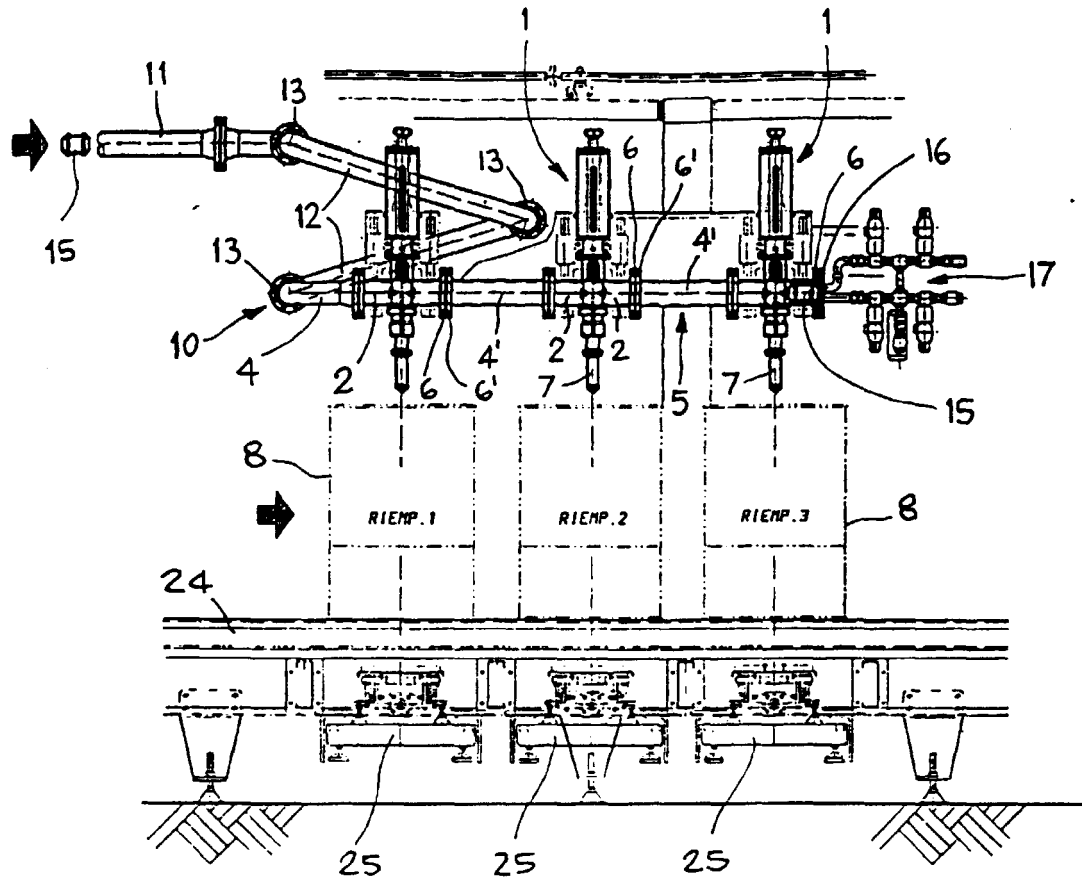


FIG. 4

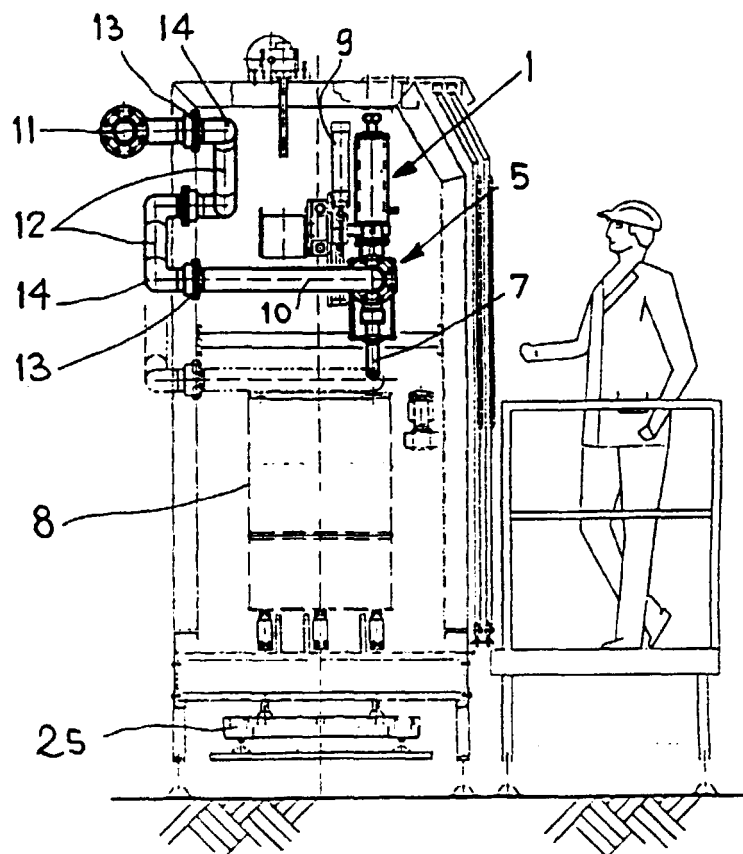


FIG. 5