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(71) Applicant: **Rocchi, Flavio**
43010 Fontevivo (Parma) (IT)

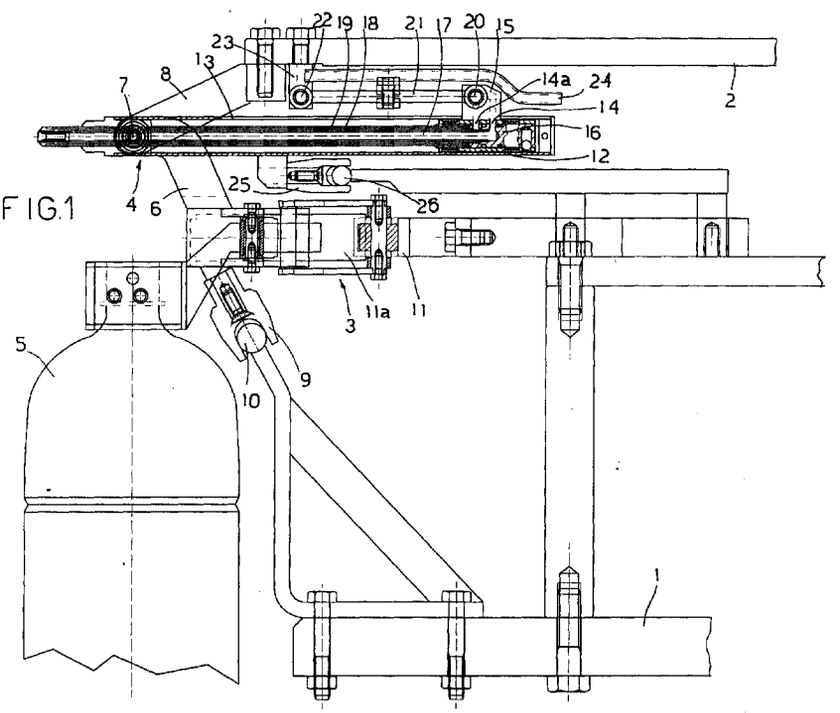
(72) Inventor: **Rocchi, Flavio**
43010 Fontevivo (Parma) (IT)

(74) Representative: **Gotra, Stefano**
Bugnion S.p.A.
Via Garibaldi 22
43100 Parma (IT)

(54) Method and machine for rinsing or sterilizing bottles with movable nozzles penetrating into the bottles

(57) The invention falls within the sector of processes for rinsing or sterilization or blowing of bottles or containers in filling plants. The method involves striking with one or more jets of liquid or gas, which may also be different, both the bottom and the side walls of the bottles by means of inclination or rotation of the jets with respect to the axis of the bottles or by means of inclination of the bottles with respect to the jets. The machine of the carousel type with movable nozzles penetrating inside the bottles comprises a plurality of nozzles (4) which are positioned with their axes substantially horizontal radially on the carousel (2) and has means for causing rotation of the bottle (5), which is independent of the nozzlc, and means for causing rotation and penetration of the nozzle into the respective bottle during simultaneous tilting of the bottle and the nozzle.

FIG.1



EP 0 894 543 A1

Description

[0001] The present invention relates both to a method for rinsing or sterilizing bottles, and to a rinsing or sterilizing machine of the rotary type with movable nozzles penetrating inside the bottles.

[0002] Essentially two types of rotary rinsing machines are known: a first type with a fixed nozzle, where the bottle is arranged so that its mouth is above the nozzle which remains substantially at the height of the opening in the neck, and a second type with a movable nozzle, where the nozzle penetrates inside the bottle by a given amount.

[0003] The invention relates in particular to this latter type of rinsing machine.

[0004] Methods and machines operating with the bottles in line and with nozzles outside the bottles are known, such as those illustrated in the patent DE 4,330,335 A which have the by now well-known drawbacks compared to the type of rotary machines with movable nozzles penetrating inside the bottles, to which the invention belongs.

[0005] In rinsing machines of the known type the nozzle is always in a vertical position with the axis coinciding with the axis of the bottle in the rinsing position, so that the jet of rinsing liquid strikes the bottom of the bottle centrally and only strikes the side walls as a result of deflection. This represents a drawback since perfect rinsing cannot be ensured particularly in the case of bottles with a shaped bottom and walls.

[0006] Solutions which have partly attempted to overcome this drawback are known. In particular, essentially two possible types of solution have been adopted: oscillation of the nozzle with respect to the longitudinal axis of the bottle or rotation of the bottle positioned inclined with respect to the axis of the jet emerging from the nozzle.

[0007] In particular, with regard to oscillation of the nozzle with respect to the axis of the bottle, with reference to the method described in the patent DE 524 004 C, relating to a non-rotary machine with manual positioning, oscillation of the nozzle is actuated by the bottle itself which comes into contact with the walls of the resiliently deformable nozzle. This solution, in addition to being adopted in a machine operating with principles different from the rotary machine in question, has the drawback of contact between the walls of the bottle and the nozzle, said contact representing a possible source of pollution and contamination of the bottle.

[0008] As regards, on the other hand, rotation of the bottle positioned inclined with respect to the axis of the jet, two types of operation are known, both relating to a machine of the rotary type: the first one involves rotation of the bottle inclined with respect to the axis of the nozzle and the second one involves rotation of the bottle coaxial with the nozzle which produces an inclined jet.

[0009] In the first case, with particular reference to the patent DE 175 369 C, the machine in question consists of a machine with manual positioning of the bottles, where there is still contact between the external surface of the nozzle and the internal surface of the bottles with the drawbacks mentioned above.

[0010] In the second case, with particular reference to the patent EP 0634230 A, the machine in question consists of a rotary machine which requires a special and complex configuration of the nozzle in order to be able to strike a portion of the side walls of the bottle.

[0011] In both cases, rotation of the bottle produces a notable increase in the complexity of the machine with risks of malfunctions or breakages.

[0012] Another drawback of the known rotary rinsing or sterilizing machines with movable nozzles penetrating inside the bottles is due to the fact that washing starts when the nozzle has penetrated completed or partially into the bottle, said penetration only starting when the bottle has been completely tilted through 180° onto the nozzle itself, resulting in long idle times during the course of the process.

[0013] Rotary rinsing machines with nozzles penetrating inside the bottle are known with reference to the patent WO 95 09699 A, in which penetration of the nozzle is performed by means of relative translation of the bottle or of the means retaining it, also during a step prior to complete tilting of bottle and nozzle. This solution also has the drawback of fairly long idle times since the treatment can in any case start only once tilting has occurred, when the connection to the liquid supply means is established. This connection is performed by means of contact, without the intervening arrangement of seals and therefore is unable to provide any guarantee as regards either reliability or absence of any risk of contamination.

[0014] Moreover, since the axis of the bottle and that of the nozzle coincide during the whole of the integral rotation of the two elements there is the danger of dripping of the treatment liquid from the nozzle inside the bottle, in particular during the return movement. Another drawback encountered in the abovementioned solution is that of striking only the bottom of the bottle, since the nozzle at best is able to travel axially with respect to the bottle.

[0015] One object of the present invention is to eliminate the abovementioned drawbacks and provide a method and a machine for rinsing or sterilizing bottles of the rotary type with movable nozzles penetrating inside the bottles, in which the jet emerging from the nozzle strikes both the bottom and the side walls of the bottle, as a result of a relative movement of the nozzle and the bottle which does not cause contact between the two elements, guaranteeing hygienic conditions.

[0016] In order to achieve the above, the purpose of the machine according to the present invention is that of being able to orient the nozzle in one or more directions inclined with respect to the axis of the bottle.

[0017] Moreover, an object of the present invention is that of providing a method and a machine which elimi-

nates the idle time, with treatment being started prior to the total tilting of the bottle.

[0018] A further object of the present invention is that of dividing the step involving rotation of the bottle into a step independent of the nozzle, the latter remaining at a standstill in a substantially horizontal position, and a step integral with the nozzle with simultaneous penetration of the nozzle into the bottle. In this way the danger of dripping encountered in the other known solutions is avoided, since, along the section where the bottle is located underneath the nozzle, the axis of the nozzle itself remains in a horizontal position while the bottle returns into the vertical position.

[0019] The present invention has a further advantage relating to the complete lack of possible contamination of the bottle, both because the nozzle does not touch the internal walls and because the supply duct is closed and sealed, along the section between the storage tank and the nozzle.

[0020] This object is achieved by using the means which supply the nozzle as means for producing penetration of the nozzle into the bottle, thus giving rise to a further advantage of the present invention. It has in fact been established that there is a reduction in the dimensions of the gripper and nozzle assembly and hence an increase in the number of grippers for the same carousel diameter.

[0021] Consequently the performance of the machine is increased and its dimensions are reduced for the same number of bottle treatment cycles.

[0022] These and other objects are achieved with the method for rinsing or sterilizing bottles according to the present invention which is characterized in that it envisages striking directly with a jet of rinsing or sterilizing liquid both the bottom and the side walls of the bottle. According to the method in question the side walls are struck by the jet by means of inclination of the nozzle itself or by means of inclination of the bottles with respect to the jet.

[0023] The objects mentioned above are all achieved also by a machine for rinsing or sterilizing bottles of the rotary type with movable nozzles penetrating inside the bottles, which is characterized in that it comprises: means designed to cause rotation of the bottle independently of the nozzle until the coaxial condition of the bottle and nozzle is reached, means for relative fixing of the bottle and nozzle, which act when the coaxial condition of the two elements is reached, and means for causing rotation of the bottle integral with the nozzle, which generate at the same time the penetrating movement of the nozzle into the bottle.

[0024] The configuration of the machine in question is characterized also by the presence of a plurality of nozzles which are positioned with their axes substantially horizontal radially with respect to the carousel.

[0025] These and other characteristic features will emerge more clearly from the following description of preferred embodiments illustrated, purely by way of a non-limiting example, in the accompanying illustrative plates, in which:

- Figure 1 shows a side view of a machine portion, which is partially sectioned so as to highlight certain details;
- Figures 2, 3, 4 and 5 show the same machine portion according to Figure 1 in four operating positions of the gripper and nozzle;
- Figures 6, 7 and 8 show the same machine portion according to the preceding figures in possible positions assumed by gripper and nozzle so as to illustrate the method;
- Figures 9, 10 and 11 show a possible variation of embodiment of a machine portion in different operating positions which also illustrate the method according to the invention;
- Figures 12, 13 and 14 illustrate three operating steps which form part of the rinsing method according to a possible variation;
- Figures 15 and 16 show a further possible variation of a portion of the machine during two operating steps.

[0026] With reference to Figure 1, 1 denotes a fixed frame of the machine, which supports a rotating platform or carousel 2 which is made to rotate in accordance with known techniques not illustrated.

[0027] The carousel 2 supports a plurality of grippers 3 and a corresponding plurality of nozzles 4 which are connected to a washing liquid storage tank. The bottles reach the rinsing machine in the erect position by means of a conveyor of the screw or star type.

[0028] Each gripper 3 is designed to grip a bottle 5 by the neck and tilt it through 180° so that the neck is directed downwards. To perform this tilting operation, the gripper 3 is supported by an arm 6 which is pivotably hinged at 7 with a fork member 8 integral with the carousel 2. For the rotation about the pivot 7, during the step where the gripper 3 and hence the bottle 5 move independently of the nozzle 4, each gripper has, integral with it, a fork member 9 which engages with a first actuating bar 10 of the known type which is circular and supported by the fixed frame 1. Closing and opening of the grippers is performed in accordance with a known technique by a cam 11 which is supported by the fixed frame 1 and with which a sliding piece 11a of the gripper of a known type interferes. Each nozzle 4 consists of an external cylinder 12 which is pivotably hinged at 7 via means which allow the gripper 3 to rotate independently of the nozzle 4, until the coaxial condition of the two elements is reached, and then render the gripper 3 and the nozzle 4 integral with each other during tilting and penetration of the nozzle into the bottle. The cylinder 12 forming the nozzle 4 has a longitudinal eyelet 13 through which one or more ducts 14 are able to pass (in the example illustrated two ducts 14 and 14a), said ducts connecting an external distribution block 15 to a sliding

piece 16 inside the cylinder. The sliding block 16 has, fixed to it, two concentric pipes 17 and 18 which are spaced so as to form a first cannula, for injection of the washing fluid, inside the pipe 17 and a second injection cannula, in the interstice 19 between the two concentric pipes. The duct 14 is connected to the pipe 17, while the duct 14a is connected to the interstice 19.

[0029] The distribution block 15 has, connected to it, by means of articulated headers 20, two rigid pipes 21 which engage, again by means of articulated headers 22, with a distribution block 23 which is integral with the carousel 2. Rigid pipes 24 supply the distributor 23 with suitable washing or sterilization liquids.

[0030] The external cylinder 12 has, integral with it, a fork member 25 which embraces a second actuating bar 26 which is designed to cause integral rotation of the nozzle 4 and the gripper 3 about the same pivot 7.

[0031] The external cylinder 12, the rotating pivot 7 and the actuating bar 26 form means for causing penetration of the nozzle into the bottle during the simultaneous rotation of bottle and nozzle, when the bottle has reached the position where it is coaxial with the nozzle itself.

[0032] Operation of the machine with reference to Figures 1 to 8 will now be described.

[0033] Figure 1 illustrates the step where the bottle in the erect position is gripped around the neck by the grippers 3 and the nozzle 4 is located in the rest position with its axis in a substantially horizontal position.

[0034] Rotation of the carousel and the travel path of the first actuating bar 10 result in the gripper 3 and hence the bottle 5 being arranged so that their axes coincide with the axis of the nozzle, as illustrated Figure 2.

[0035] This rotation of the gripper 3 and hence the bottle 5, independently of the nozzle 4, is possible owing to the fact that the gripper and nozzle are hinged independently at the same pivot point 7. When the gripper and nozzle are coaxial, the two elements are locked with respect to each other so as to continue rotation integrally.

[0036] In this position, the mouth of the bottle is located at a small distance from the nozzle and in this position it is possible to start injection of the washing liquid into the bottle.

[0037] Continuing rotation, the second actuating bar 26 causes rotation of the external cylinder 12 of the nozzle about the pivot 7 together with rotation of the gripper.

[0038] In short, gripper and hence bottle and nozzle cylinder 12 rotate simultaneously about the pivot 7, remaining coaxial.

[0039] The rotation of the cylinder 12 connected to the carousel by means of the rigid pipes 21 causes sliding, along the cylinder itself, of the sliding piece 16 and hence the outward movement, from the cylinder itself, of the pipes 17 and 18 which form the injection cannulae. In this way the nozzle starts to penetrate into the bottle as shown in Figures 3 and 4 until the vertical position is reached, where the nozzle and bottle are completely tilted, as shown in Figure 5.

[0040] In the position shown in Figure 5, complete washing, or final washing, if said washing was started during the previous steps, is performed. Since two injection cannulae are provided, varied washing may be performed using different liquids during the rotational steps.

[0041] Since gripper and associated nozzle are hinged independently of one another at the same point 7, the respective actuating bars 10 and 26 may be shaped so that the bottle and nozzle are not perfectly coaxial during their rotation, as shown in Figures 6, 7 and 8. In this way the jet of washing liquid may be advantageously directed into particular zones of the bottom of the bottle or onto the side walls thereof.

[0042] With reference to Figures 9, 10 and 11, a second embodiment will now be described, in which the nozzle 30 is able to perform a translatory movement vertically since it is integral with a slide 31 sliding along vertical pins 32.

[0043] The slide is made to perform its translatory movement by means of a cam 33 of the known type.

[0044] The nozzle 30 is supported by the slide 31 via a bracket 34 through which one or more ducts 35 supplying the washing fluid pass.

[0045] Connection of said ducts to the nozzle is effected by means of an articulated header 36 so as to allow the nozzle 30 to rotate and incline to the right or to the left with respect to the vertical axis.

[0046] Said rotation, which is shown in Figures 10 and 11, is performed by means of an actuating bar 37 embraced by a fork member 38 integral with the nozzle 30.

[0047] In both the solutions described above, the nozzle may oscillate with respect to the axis of the bottle through a certain angle, said oscillation being imparted by the second actuating bar which is suitably shaped and having the purpose of reaching, with the jet of water, shaped zones of the bottom of the bottle (bottles with a petal-shaped bottom) or also the side walls of the bottle.

[0048] In the first embodiment described, the nozzle, in the rest position, is situated so that it is substantially horizontal and, when the bottle also reaches this position, it is possible to start washing and to continue this washing operation during simultaneous rotation of bottle and nozzle, consequently increasing the hourly productivity of the machine for the same number of nozzles mounted on the carousel.

[0049] With the machine described above with refcrence to Figures 1 to 8, there is the advantage of eliminating all the flexible pipes which connect a liquid distribution header to the nozzles or to valves arranged between the latter and the header.

[0050] A further advantage consists in the fact that the embodiment according to Figures 1 to 8 allows considerable penetration of the nozzle into the bottle with limited vertical dimensions of the gripper/nozzle assembly.

[0051] As is obvious from the description given above, a method for rinsing or sterilizing a bottle is provided, whereby both the bottom and the side walls of the bottle

are struck directly with a jet of liquid. This rinsing method is achieved by means of inclination of the jet with respect to the axis of the bottle, as illustrated in Figures 6, 7, 8, 9, 10 and 11 or by inclining the bottle with respect to the axis of the nozzle or the jet of liquid, as illustrated in Figures 12, 13 and 14. In this latter case the machine will be provided with an actuating bar which is suitably shaped and allows inclination of the gripper and hence the bottle.

[0052] In the description specific reference has been made to rinsing or sterilizing machines, but it is obvious that the whole of the above description may also be applied to a blowing machine since it is structurally identical.

[0053] The accompanying drawings show that inclination of the jet of liquid is performed in a plane which contains both the axis of the bottle and the axis of rotation of the carousel, but it is obvious that said inclination may also be performed in any other plane or so as to cause spatial rotation of the jet, in which case a nozzle supply coupling of the spherical type and a suitable shape of the actuating bar will be necessary.

[0054] With reference to Figures 15 and 16, according to a further variation, a fork member 40 is fixed on the arm 6 and has, inserted between its prongs, a magnetic plate 41 arranged opposite a permanent magnet 42 integral with the cylinder 12.

[0055] 43 denotes a cover-piece for protecting the mouth of the bottle from any drips of washing liquid when said bottle returns into the erect position.

[0056] The function of the magnetic plate 41 and the permanent magnet 42 is that of coupling gripper and nozzle-carrying cylinder, as illustrated in Figure 16, so as to displace the nozzle from the vertical position into the horizontal position during the return movement of the gripper once washing has been performed. Displacement continues for a rotating movement of 90° until the nozzle-carrying cylinder comes into contact with the end-of-travel stopper 44.

[0057] As a result of the solution described above it is possible to eliminate advantageously the actuating bar 26 provided in the embodiment according to Figure 1 since rotation of the nozzle so as to bring into the vertical position occurs by means of direct pushing by the gripper, while the return movement occurs by means of displacement via the magnetic coupling system.

Claims

1. Method for rinsing or sterilizing bottles with nozzles penetrating inside the bottle, characterized in that it involves striking directly with one or more jets of one or more rinsing or sterilizing liquids both the bottom and the side walls of the bottle during penetration of the nozzle into the bottle or when the nozzle is completely inside the bottle.

2. Method according to Claim 1, characterized in that, in order to strike directly with one or more jets of liquids both the bottom and the side walls of the bottle, the jet of liquid is inclined with respect to the axis of the bottle.

3. Method according to Claim 1, characterized in that, in order to strike directly with one or more jets of liquid both the bottom and the side walls of the bottle, the bottle is inclined with respect to the axis of the jet or the nozzle during the rinsing step.

4. Rinsing or sterilizing machine of the rotary type with movable nozzles penetrating inside the bottles and provided with grippers designed to tilt the bottles through 180°, characterized in that it comprises a plurality of nozzles (4) positioned with their axes substantially horizontal radially with respect to the carousel (2) and each provided with means designed to cause both rotation or tilting of the nozzle substantially through 90° so as to bring it into the vertical position, and a penetrating movement of the nozzle itself into the respective bottle during the step of simultaneous tilting of the bottle and the nozzle itself.

5. Rinsing or sterilizing machine according to Claim 4, characterized in that the means designed to cause rotation and a penetrating movement of the nozzle (4) into the bottle comprise a cylinder (12) inside which one or more injection cannulae (17) (19) of the nozzle are able to slide and which is hinged with the carousel and provided with a fork member (25) engaging with a second actuating bar (26).

6. Rinsing or sterilizing machine according to Claim 4, charactcrized in that each gripper and associated nozzle rotate about a single point (7) integral with the carousel.

7. Rinsing or sterilizing machine according to Claims 4 and 6, characterized in that the point 7 of rotation of the gripper and the nozzle lies on the axis of bottle.

8. Rinsing or sterilizing machine according to Claims 4 to 7, characterized in that it comprises one or more rigid pipes (21) which connect the articulated headers (20) to a same number of articulated headers (22) integral with the carousel, said rigid pipes acting as a connecting rod for sliding of injection cannulae (17) (19) of the nozzle inside the cylinder (12).

9. Machine for rinsing or sterilizing bottles of the rotary type with movable nozzles penetrating inside the bottles, characterized in that each nozzle (4) (30) oscillates with respect to the axis of the bottle into which it penetrates at a predetermined angle during

the rinsing step so as to orient the jet of the nozzle in an inclined direction with respect to said axis of the bottle.

10. Rinsing or sterilizing machine according to Claim 1 or Claim 9, characterized in that at least one articulated header (20) (36) for supplying the rinsing fluid to the nozzle itself is provided for each nozzle.

11. Rinsing or sterilizing machine according to Claim 1 or Claim 9, characterized in that it comprises a second actuating bar (37) (26) on which fork members (38) (25) integral with the nozzles slide so as to cause oscillation of the nozzles themselves.

12. Rinsing or sterilizing machine according to Claims 9 and 10, characterized in that it comprises a header with a spherical articulation for allowing spatial rotation of the nozzle.

13. Rinsing or sterilizing machine according to Claims 4 to 8, characterized in that the means for causing a penetrating movement of each nozzle into the bottle comprise a permanent magnet (42) integral with the cylinder (12) and a magnetic plate (41) integral with the gripper for tilting the bottle.

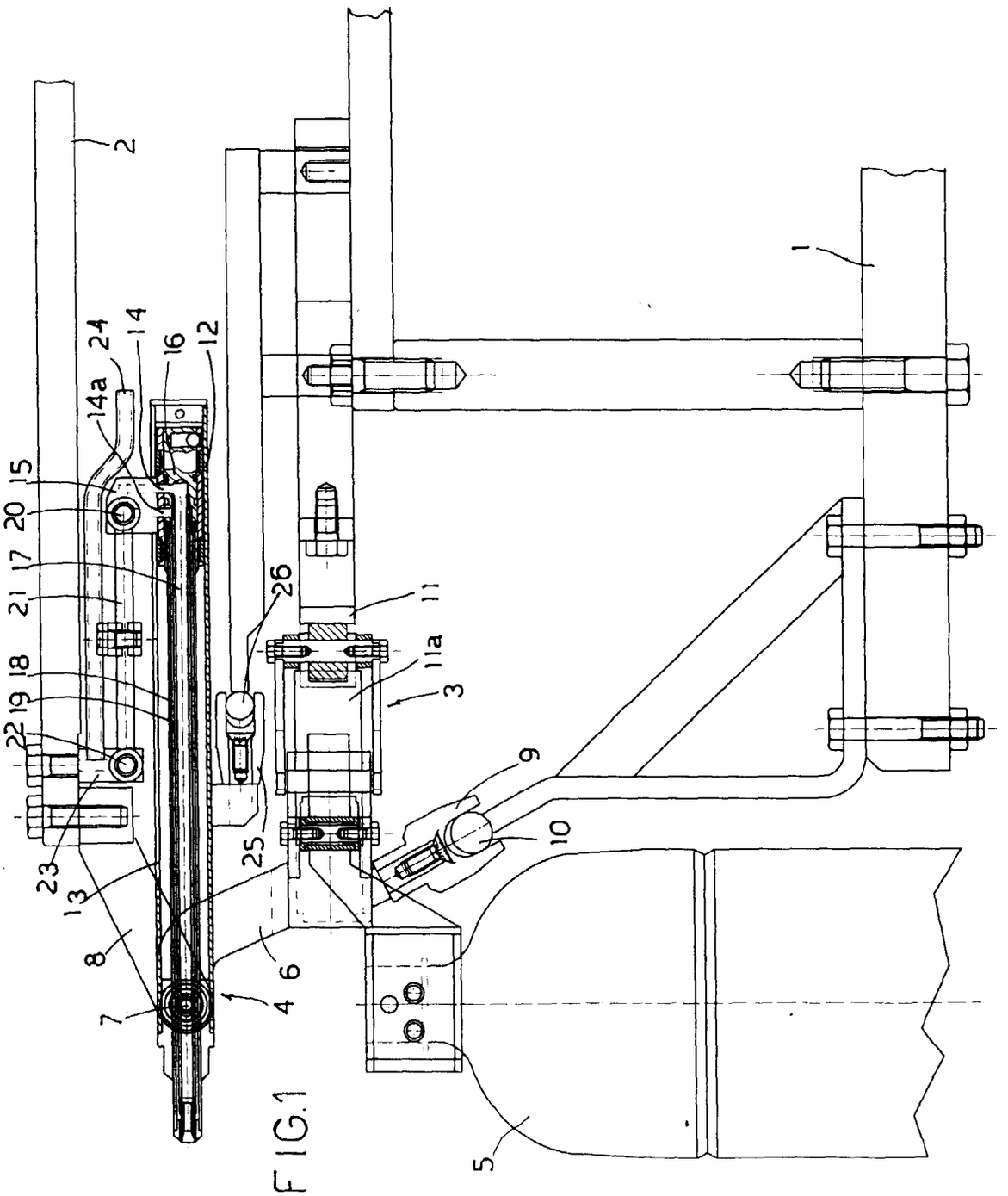


FIG.1

FIG.3

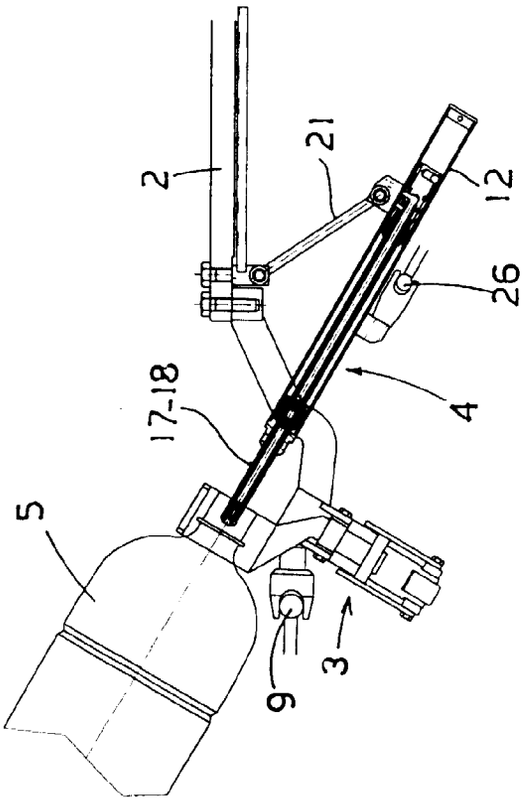


FIG.2

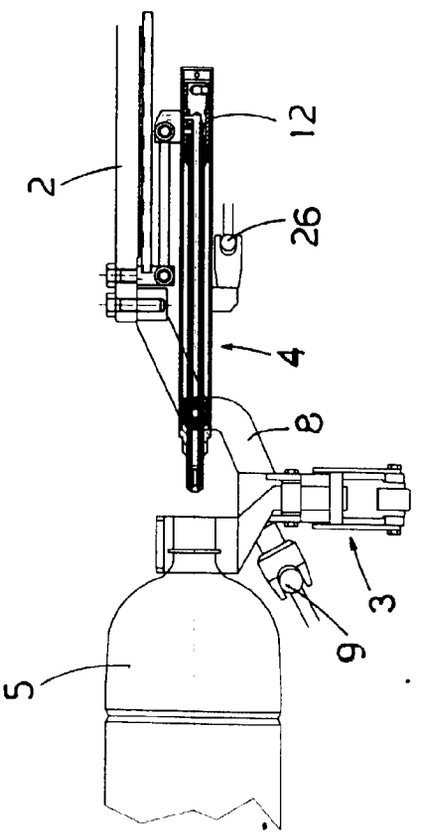


FIG.5

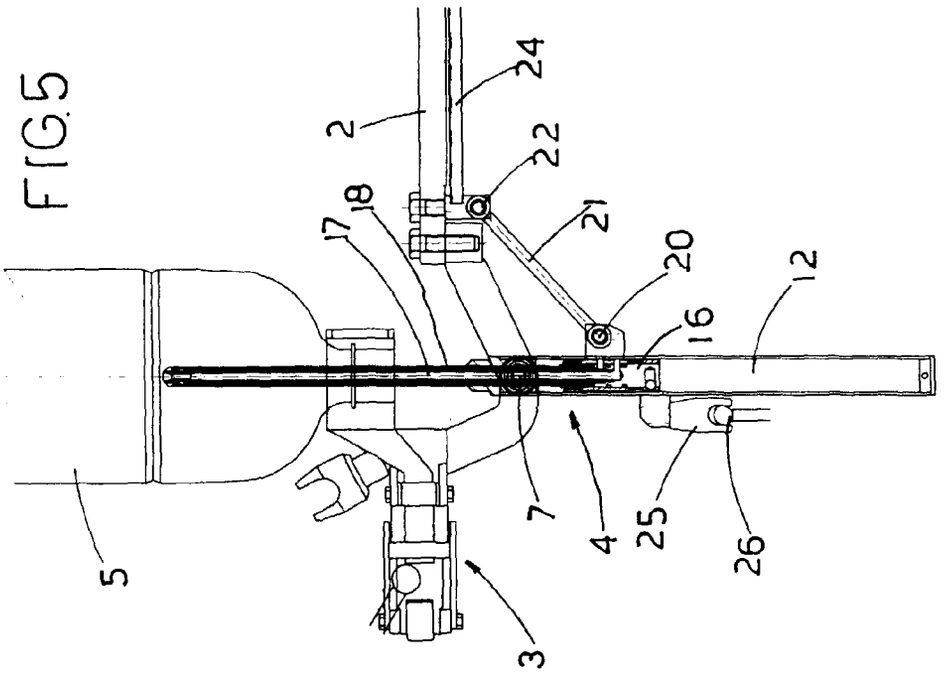


FIG.4

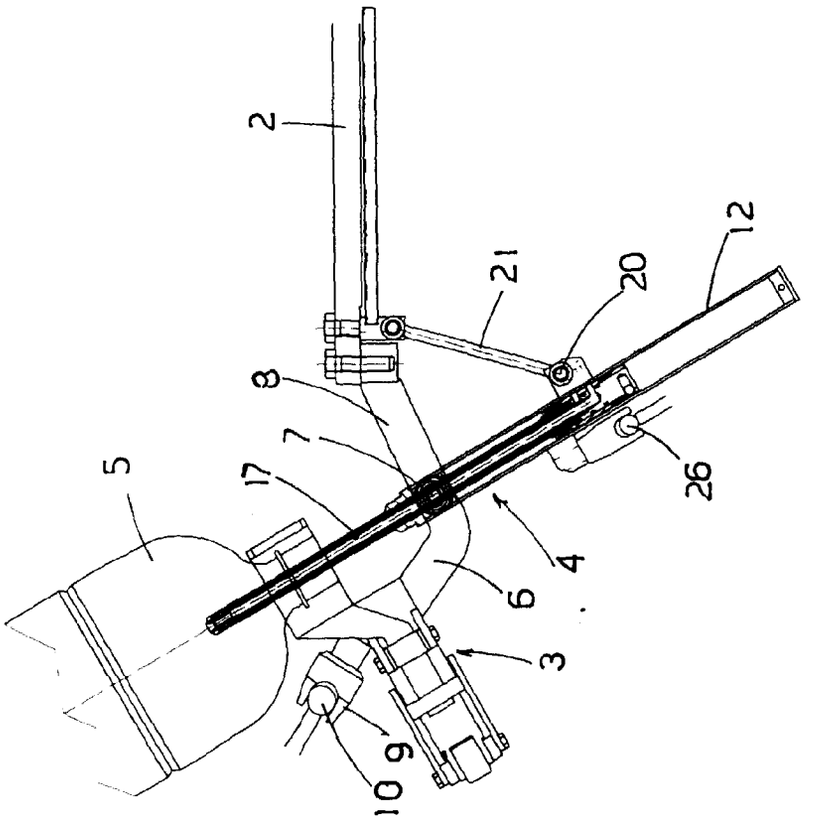


FIG.8

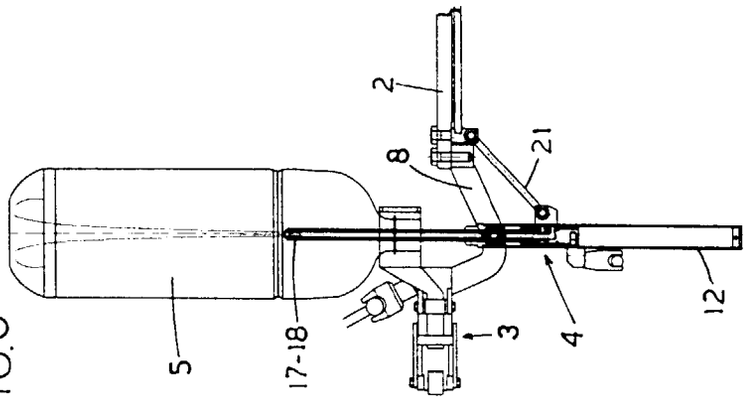


FIG.7

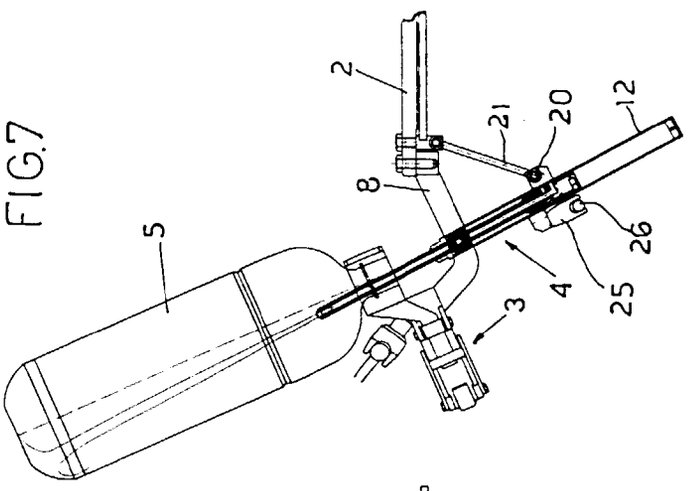


FIG.6

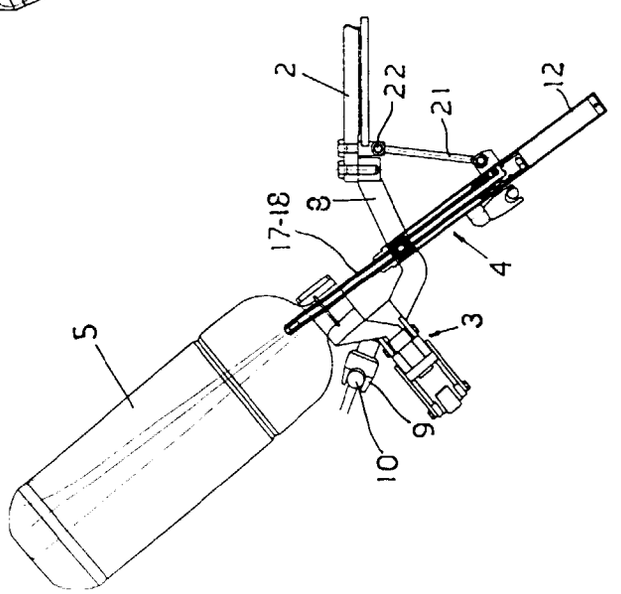


FIG.11

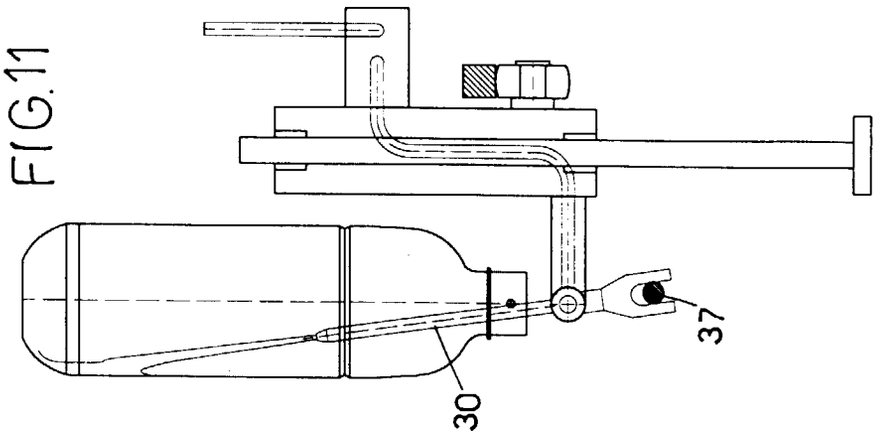


FIG.10

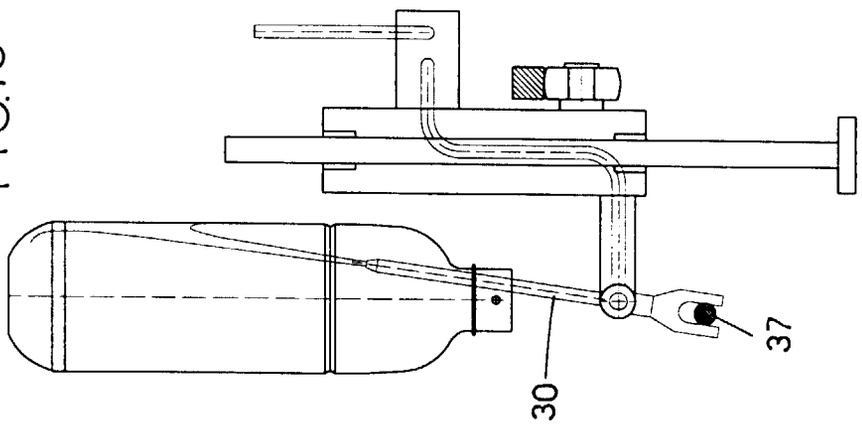


FIG.9

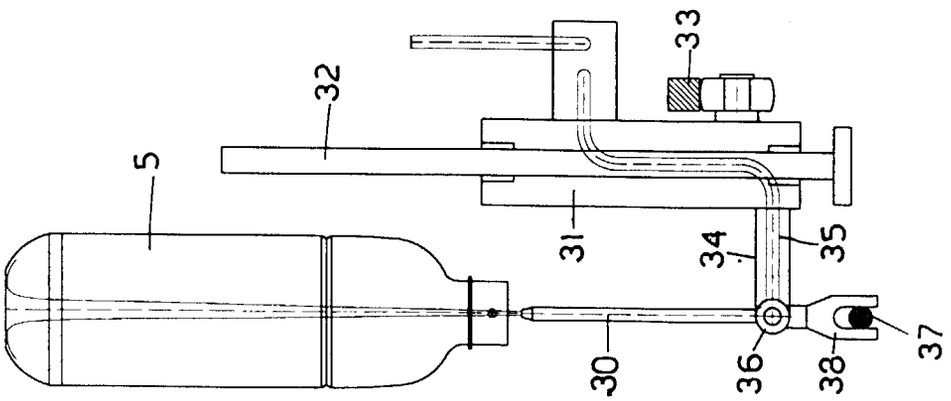


FIG.14

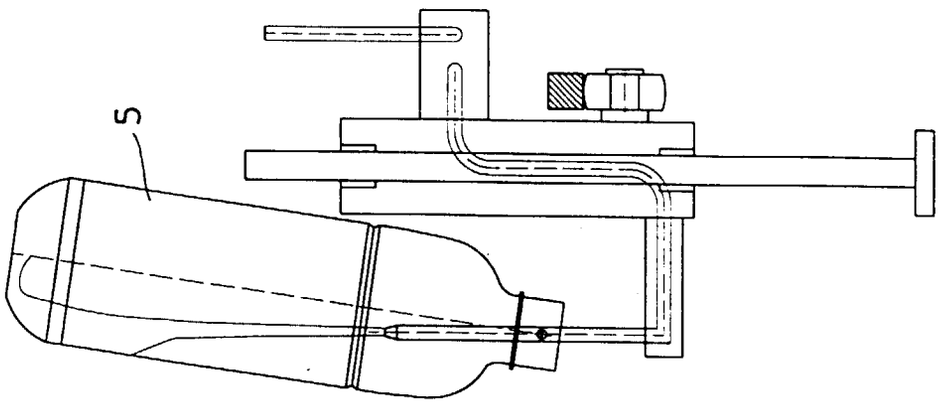


FIG.13

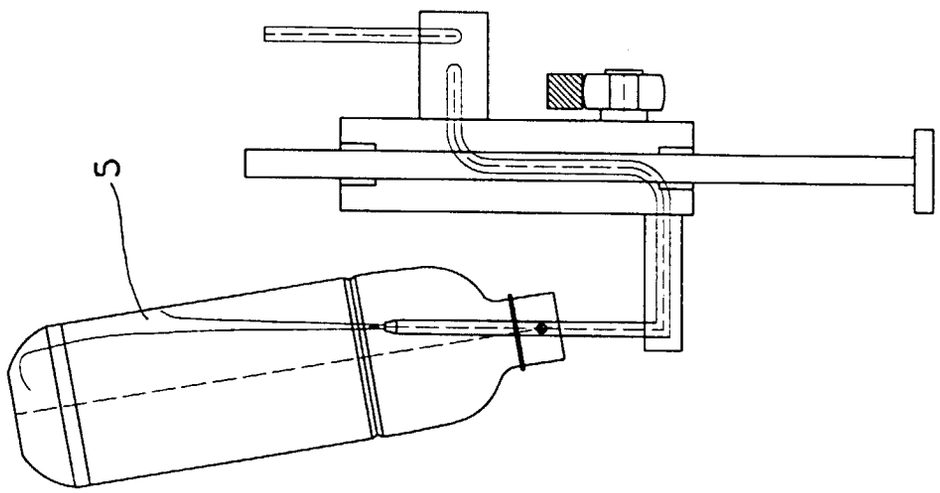


FIG.12

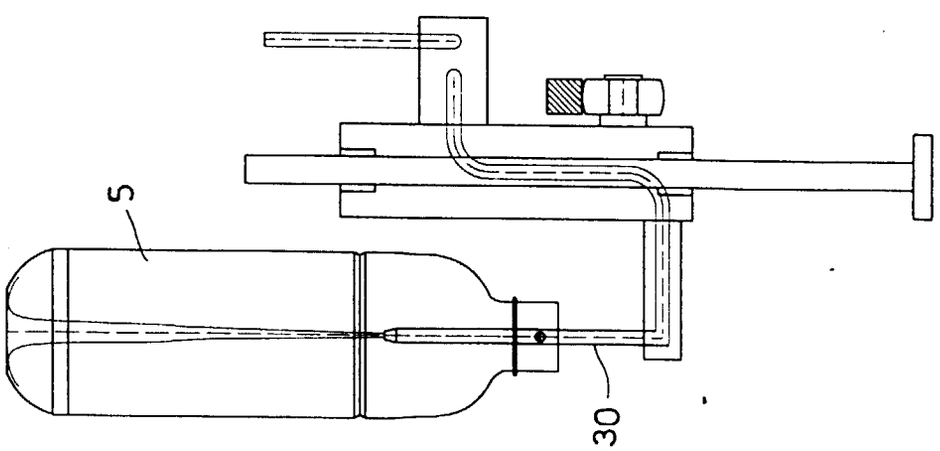
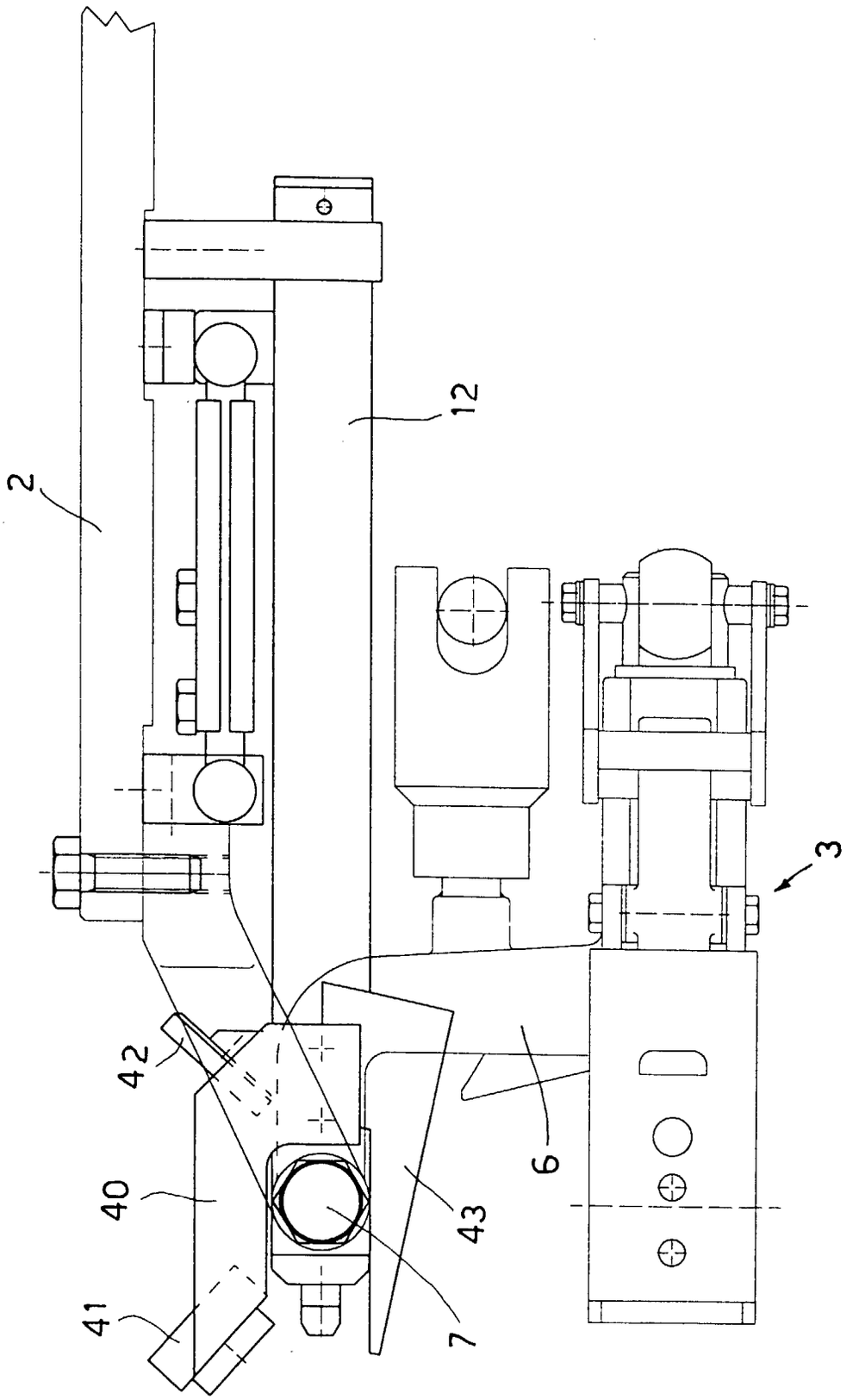


FIG.15



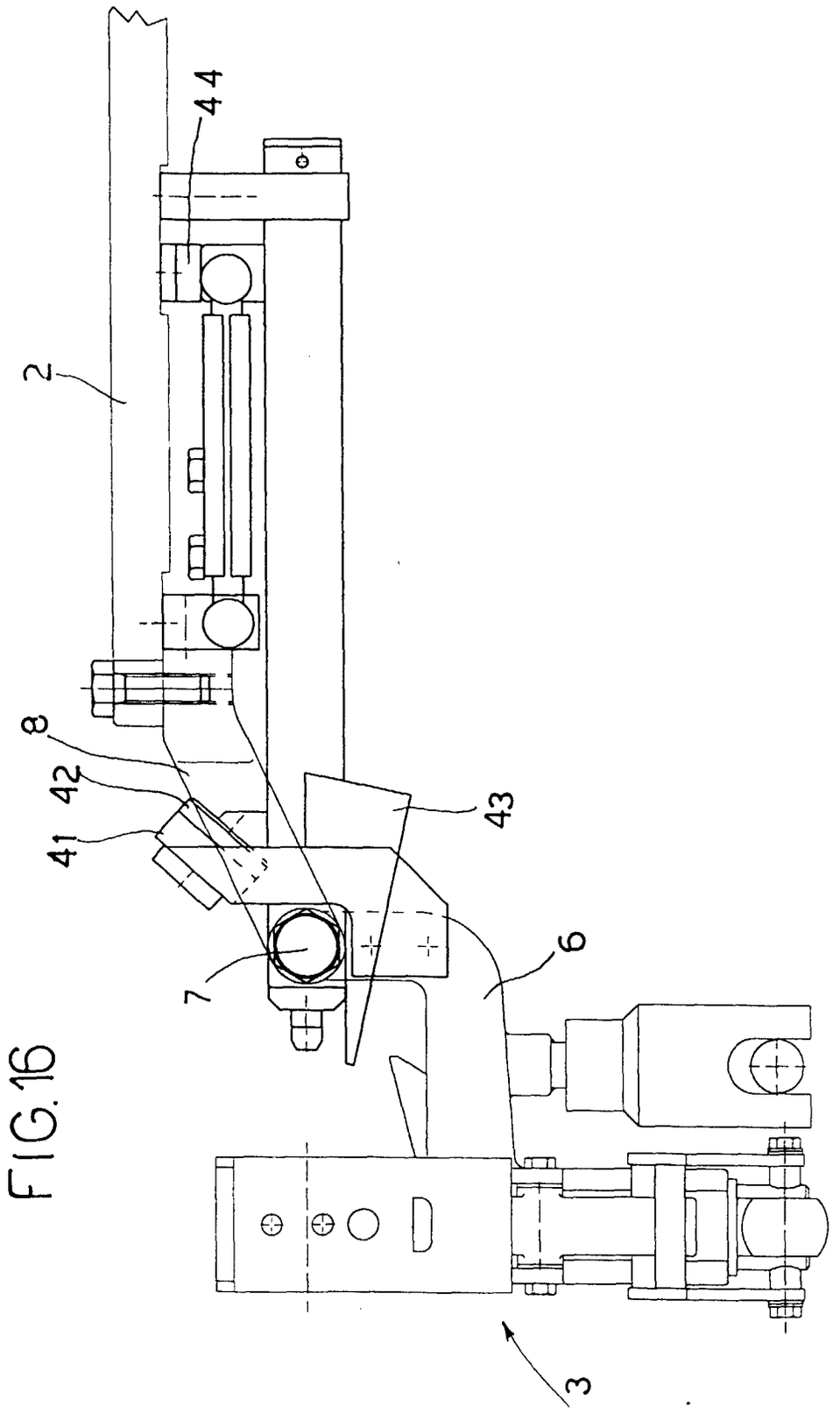


FIG.16

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 83 0454

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,X	EP 0 634 230 A (PEPSICO, INC.) 18 January 1995 * column 15, line 34 - column 16, line 37 * * column 27, line 8 - column 28, line 53; figures 4-6,14-17 *	1-3	B08B9/34 B08B9/32 B08B9/28
A		4,9	
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A		1,4-6	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 October 1998	Van der Zee, W

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