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54 **Device for synchronously driving the dispensing and the container handling means in bottling machines.**

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Description

The present invention relates to the technical sector of automatic machinery for filling containers with liquid products.

A variety of automatic machines are known which fill liquids into containers such as bottles or vials. These machines usually have carousels or star-wheels which rotate about a vertical axis and which are designed to receive the bottles to be filled in orderly fashion from a feed line. The carousel mounts means for dispensing the liquid product which work synchronously with means which match each bottle with the nozzle of the corresponding dispensing unit. The filled bottles are then transferred to an outfeed line. Such a machine is known from US-A-4 108 221, which discloses a device in accordance with the preamble of claim 1.

The liquid dispensing units usually consist of a plurality of cylinder and plunger assemblies connected through valves to a feed tube and to a dispensing nozzle alternately.

In the aforesaid machines the liquid dispensing units and the means which move the bottles relative to the filling nozzles must operate in perfect synchrony.

In traditional machines drive is achieved through complicated mechanisms which hinder machine efficiency. In particular, the known machines require separate means to effect each individual movement, thus encumbering the carousel and making it difficult to carry out the necessary maintenance operations.

The aim of the present invention is to provide a device capable of simultaneously driving the cylinder and plunger assemblies and the mechanisms which move the bottles relative to the liquid dispensing units in automatic machines for filling liquid products into said bottles.

Another aim of the invention is to provide a drive device made according to a simple, reliable and efficient technique that can be applied to a wide range of bottle sizes.

The said aims are achieved in accordance with the invention by the characterizing features of claim 1.

The characteristics of the invention are highlighted in the following detailed description, with reference to the accompanying drawings, where:

- Figure 1 is a schematic plan view of the bottle filling machine;
- Figures 2a and 2b are cross sections along line II-II of Fig. 1, showing the upper and lower sections of the aforesaid carousel, respectively;
- Figure 3 is a plan view, with enlarged details, of the aforesaid bottle grippers.

With reference to the drawings just listed, the machine for filling bottles 1 with a liquid product has means 2 for feeding the said bottles to a carousel 3

which rotates about a vertical axis in the direction indicated by arrow A.

Feed means 2 consist of a bottle 1 conveying line 4 along which there is an auger 5 which rotates axially in such a manner as to space the conveyed bottles 1 apart. Auger 5 is designed to operate in conjunction with a distributor 6, shaped like a star, for example, which rotates in the direction of arrow B. The bottles to be fed are held and guided by recesses 6a in distributor 6 and by ring guide 7 which partially surrounds the distributor itself.

Carousel 3 receives bottles 1 fed by distributor 6 one by one at the point where the equally spaced grippers 8, mounted on the circumference of the carousel itself, are activated. Carousel 3 also mounts dispensing units, labelled 9 in the drawings, which fill the liquid product into bottles 1.

Downstream of carousel 3 there is a full bottle outfeed system 10 consisting of a conveyor line 11 and another distributor 12, shaped like a star, for example, which rotates in the direction of arrow C. The outgoing bottles are received by distributor 12 at the point where they are released by grippers 8 and are held and guided by recesses 12a in the distributor and by a ring guide 13 which partially surrounds the distributor.

Dispensing units 9 consist of a plurality of cylinder and plunger assemblies mounted by carousel 3 which lines them up with grippers 8. Each of the said cylinder and plunger assemblies 14 is connected through a valve 15 to a liquid feed chamber 16 and to a filling nozzle 17 alternately. Chamber 16 is mounted on a platform 18 attached to the rotating part of carousel 3.

Platform 18 is secured to the top of a vertical shaft 19, rotated continuously by the drive motor of the machine through transmission means 20 located at the bottom of the said shaft where the lower face 21 of the carousel frame is situated. Shaft 19 is set inside a tubular casing 22 which rotates with it. At the top, casing 22 is covered by a cylindrical sleeve 18a formed under platform 18.

Between shaft 19 and casing 22 and coaxial to them there is a tubular element 24, with appropriate rotational means, about which shaft 19 and casing 22 rotate. The bottom end of tubular element 24 is attached to a plate 25 supported by columns 26 which pass through plate 21 and are fixed to plate 27.

Grippers 8 and cylinder and plunger assemblies 14 are driven synchronously by drive means 28 which form a set of vertical columns arranged around the circumference of carousel 3. Each of the said drive means consists of a first sleeve 29 the top of which mounts casing 30 of grippers 8 and which is axially crossed by a stem 31.

The first sleeve 29 is in turn located inside a second sleeve 32 at the top of which there is a crosswise fitting 32a attached to stem 33a of plunger 33 of cy-

linder and plunger assembly 14. Second sleeve 32 is guided by a bushing 34 mounted on the circumference of a plate 35 attached to tubular casing 22.

First sleeve 29, on the other hand, mounts on its bottom end a roller 36 which rotates about a radial axis in relation to the carousel, the said roller engaging a cam 37 made on a cylindrical wall 38 mounted on lower plate 21 and concentric with the axis of the carousel.

The bottom end of stem 31 mounts a lever with a roller 40 that rotates about a vertical axis. Roller 40 engages a ring cam 41 formed on lower plate 21, as shown in Fig.3.

As shown by enlarged details P and R in the said Fig. 3, grippers 8 consist of a pair of jaws 8a and 8b which rotate on casing 30 by means of pins 42a and 42b respectively. Jaws 8a and 8b are attached to toothed gears 43a and 43b which mesh with each other. Pin 42a has inserted in it a fork 44 which engages a pin 45 vertically attached to stem 31. The rotation of stem 31 through a defined angle, by action of cam 41, thus determines the rotation of the gear pair formed by toothed gears 43a and 43b in such a way as to cause jaws 8a and 8b to move symmetrically from the gripping position P to the release position R and vice versa.

The bottom end of the aforesaid second sleeve 32 mounts a roller 46 which rotates diametrically in relation to the carousel. Roller 46 runs in a groove 47 defined by a ring 48 around tubular casing 22. One side of ring 48 is hinged at the bottom to a pivot 49 whose axis is horizontally tangent to a circle concentric with the axis of the carousel. Pivot 49 is mounted on a support 50 fixed to a ring shaped disc supported horizontally by columns 52 standing on lower plate 21. On the side diametrically opposite pivot 49, ring 48 is pivotally attached to stem 53a of an actuator 53. The said actuator is supported in vertical position by disc 51.

The operation of the device claimed will now be described starting from the moment when grippers 8 and related cylinder and plunger assemblies 14, rotated by carousel 3, move to the area where the aforesaid bottles, fed by distributor 6, are picked up.

The closing of jaws 8a and 8b to gripping position P is effected by cam 41, which at the said pickup area, causes stem 31 to rotate axially (refer to Fig. 3). Stem 31 is carried in direction A by carousel 3, so that roller 40 slides in cam 41. The rotation of stem 31 through a defined angle is transmitted to gear pair 43a and 43b and hence to jaws 8a and 8b.

After being gripped by jaws 8a and 8b, bottle 1 is lifted vertically, as shown by arrow D in Fig.6a, in such a way that nozzle 17 of dispensing unit 9 is inserted into the mouth of bottle 1. The raising of the bottle is achieved by the axial sliding of the first sleeve 29, attached to casing 30 of grippers 8. The said sliding motion is controlled by cam 37 in which

roller 36 carried by sleeve 29 runs.

When nozzle 17 has been inserted into bottle 1, cylinder and plunger assembly 14 starts discharging its fill of liquid. While nozzle 17 was being inserted into bottle 1, plunger 33 of cylinder and plunger assembly 14 was driven downwards, as shown by arrow E, Fig. 2a, in such a manner as to suck liquid product out of chamber 16; then, once nozzle 17 has been inserted into the bottle, the plunger is driven upwards again so as to allow the liquid product to flow into nozzle 17. At the same time, valve 15 closes the liquid suction duct and opens the liquid delivery duct.

The reciprocating motion of plunger 33 of cylinder and plunger assembly 14 is achieved by the axial sliding of second sleeve 32, attached to stem 33a of the plunger. This sliding motion is effected by roller 46, mounted by sleeve 32, which runs in the circumferential groove of ring 48.

The stroke of plunger 33 may be adjusted by varying the angle of ring 48, usually set in an oblique plane in relation to carousel 3. To adjust the stroke, the ring may be shifted using actuator 53, to the side opposite its pivot 49, as shown schematically by dashed line 54 in Fig.2b. Adjusting the stroke of the plunger makes it possible to vary the amount of liquid to be filled into the bottles.

When the bottle is full, bottle 1 is lowered again in such a way that nozzle 17 is disengaged. At this stage, cam 41 is synchronized to open jaws 8a and 8b at release position R in such a way that distributor 12 of outfeed system 10 can engage the bottle and move it away.

In short, the device described constitutes a means for synchronously driving cylinder and plunger assembly 14, opening and closing bottle gripper 8, and moving said gripper 8 upwards in such a manner as to insert nozzle 17 of dispensing unit 9 into the bottle.

It should be stressed in particular that the above movements are obtained with a device that forms a sort of upright column arranged around carousel 3. The device therefore occupies very little space and allows easy access to the internal parts of the carousel. Furthermore, since the structure of the device is very simple, the machine to which it is applied has added efficiency and reliability.

Claims

1. A device for synchronously driving the dispensing means and the container handling means in automatic machines for filling liquid products into said containers, these machines consisting of: means (2) for feeding containers (1) to be filled; a carousel (3) rotating about a vertical axis and designed to receive containers (1) one by one from feed means (2);

grippers (8) for holding containers (1), said grippers being mounted on the circumference of carousel (3), liquid dispensing units (9) in the form of cylinder and plunger assemblies, also mounted on the carousel (3), which operate synchronously with said grippers (8) in order to fill said containers (1); and
 an outfeed unit (10) for moving the full containers away from said carousel (3);
 said device comprising means for simultaneously driving the plungers of the dispensing units and mechanisms which move the containers relative to said dispensing units and being **characterized in that** it comprises a first sleeve (29) the top of which mounts casing (30) of grippers (8) and the bottom of which mounts a roller (36) which engages a cam (37) made on a cylindrical wall (38) concentric with the axis of said carousel (3); said first sleeve (29) being concentric with and extending through a second sleeve (32), which is linked to the plunger (33) of a cylinder and plunger assembly (14) of said dispensing units (9) and which mounts a roller (46) able to rotate according to a diametrical axis in relation to carousel (3), said roller being designed to run in a groove (47) defined by the circumference of a ring (48) which surrounds the axis of carousel (3) and which is set in an oblique plane in relation to carousel (3); a stem (31) through said first sleeve (29), the bottom of said stem (31) mounting a roller (40) able to rotate about a vertical axis and designed to engage a cam (41) in the shape of a ring on a horizontal plate (21), whilst the top of said stem (31) is designed to rotate a gear pair (43a,43b) through a defined angle, which transmits motion to said grippers (8) in such a way as to cause the pair of jaws (8a,8b) to rotate from a gripping position (P) where said containers (1) are gripped to a release position (R) where the containers are released.

2. A device according to claim 1 **characterized in that** bottom end of said stem (31) mounts a lever (39) with said roller (40) that rotates about a vertical axis and that runs in said cam (41), the latter being designed to close gripper jaws (8a,8b) at a gripping position (P) where containers (1) are picked up, and to open gripper jaws (8a,8b) at position (R) where containers (1) are released and moved away from carousel (3).
3. A device according to claim 1 **characterized in that** said jaws (8a,8b) are rotatably mounted on said casing (30) of the grippers (8) and have attached to them toothed gears (43a,43b), which mesh with each other to form a gear pair, and one of which has inserted in its centre a fork (44) designed to engage a pin (45) vertically attached to

said stem (31).

4. A device according to claim 1 **characterized in that** said cam (37) is designed to cause said first sleeve (29) to slide alternately between a lowered position and a raised position at which a nozzle (17) of dispensing unit (9) is inserted into the mouth of a container to be filled.
5. A device according to claim 1 **characterized in that** one side of said ring (48) is hinged at the bottom to a pivot (49) whose axis is horizontally tangent to a circle concentric with the axis of carousel (3), whilst the diametrically opposite side of said ring (48) is pivotally attached to an actuator (53) with a vertical axis.

Patentansprüche

1. Vorrichtung zum synchronen Antrieb der Spendevorrichtung und der Vorrichtung zur Behälterhandhabung in automatischen Maschinen für die Abfüllung flüssiger Produkte in die genannten Behälter. Zu den Maschinen gehören: eine Zuführvorrichtung (2) für die zu füllenden Behälter (1); ein Karussell (3), das sich um eine senkrechte Achse dreht und die von der Zuführvorrichtung (2) kommenden Behälter (1) einzeln aufnimmt; Greifer (8) zum Festhalten der Behälter (1). Die Greifer (8) sind entlang des Karussellumfanges (3) montiert; Flüssigkeitsspender (9) in Form von Zylinder-Kolben-Gruppen, die ebenfalls auf dem Karussell (3) montiert sind und zur Füllung der Behälter (1) synchron zu den genannten Greifern (8) betrieben werden; sowie eine Ausgabeeinheit (10) um die gefüllten Behälter von dem Karussell (3) wegzubefördern. Die Vorrichtung beinhaltet eine Einrichtung zum gleichzeitigen Antrieb der Kolben der Spendevorrichtungen und der Mechanismen, die die Behälter im Verhältnis zu den genannten Spendern bewegen. Die Vorrichtung ist dadurch gekennzeichnet, daß sie eine erste Manschette (29) aufweist, auf der oben das Gehäuse (30) der Greifer (8) und unten eine Rolle (36) angebracht ist, die in eine Nocke (37) eingreift, welche auf einer zylinderförmigen, zur Achse des genannten Karussells (3) konzentrische Wand (38) gefertigt ist. Die genannte erste Manschette (29) verläuft in einer zweiten Manschette (32), zu der sie konzentrisch ist. Die zweite Manschette (32) ist mit dem Kolben (33) einer Zylinder-Kolben-Gruppe (14) der genannten Spendevorrichtung (9) verbunden und ist mit einer Rolle (46) versehen, die sich entsprechend einer diametrischen Achse

des Karussells (3) drehen kann. Die Rolle (46) läuft in einer Rille (47), die durch den Umfang eines Ringes (48) gebildet wird, der die Drehachse des Karussells (3) umringt und in schräger Ebene zum Karussell (3) angeordnet ist. Die Vorrichtung beinhaltet außerdem einen durch die genannte erste Manschette (29) geführten Stab (31), der unten mit einer Rolle (40) versehen ist, die sich um eine senkrechte Achse drehen kann und in eine Nocke (41) in Form eines Ringes auf einer waagerechten Platte (21) eingreift. Das obere Ende des Stabes (31) ist dagegen so ausgeführt, daß es ein Zahnradpaar (43a,43b) in einem festgelegten Winkel dreht, welches die Bewegung auf die genannten Greifer (8) überträgt. Auf diese Weise wird das Backenpaar (8a,8b) von einer Greifposition (P), in der die Behälter (1) festgehalten werden, in eine Freigabeposition (R) gedreht, in der die Behälter losgelassen werden.

2. Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, daß auf dem unteren Ende des genannten Stabes (31) ein Hebel (39) mit der genannten Rolle (40) montiert ist, die sich um eine vertikale Achse dreht und in der genannten Nocke (41) läuft. Diese ist so ausgeführt, daß sie die Greiferbacken (8a,8b) in einer Greifposition (P) schließt, in der die Behälter (1) aufgenommen werden, und die Greiferbacken (8a,8b) in einer Position (R) öffnet, in der die Behälter (1) losgelassen und vom Karussell (3) wegtransportiert werden.
3. Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, daß die genannten Backen (8a,8b) drehbar auf dem genannten Gehäuse (30) der Greifer (8) montiert sind und daß an ihnen zwei ineinandergreifende Zahnräder (43a,43b) angebracht sind, die zusammen ein Getriebepaar bilden. Eines der Zahnräder hat in seiner Mitte eine Gabel (44), die zur Aufnahme eines senkrecht an dem genannten Stab (31) angebrachten Bolzens (45) vorgesehen ist.
4. Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, daß die genannte Nocke (37) so ausgeführt ist, daß sie die erste Manschette (29) abwechselnd zwischen der unteren und der oberen Position hin und her gleiten läßt, in der eine Düse (17) des Spenders (9) in die Öffnung eines zu füllenden Behälters eingeführt wird.
5. Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, daß eine Seite des genannten Ringes (48) an der Unterseite drehbar an einen Zapfen (49) eingehängt ist, dessen Achse horizontal tangential zu einem zur Karussellachse (3) konzentrischen Kreis ist. Die diametrisch gegenüber-

liegende Seite des genannten Ringes (48) ist drehbar mit einem Antrieb (53) mit senkrechter Achse verbunden.

Revendications

1. Ce dispositif permet l'actionnement synchrone des organes d'avance et de dosage sur des machines qui remplissent automatiquement des conteneurs avec des substances liquides et qui se composent:
d'une unité d'avance en entrée (2) des conteneurs (1) vides; un carrousel (3) tournant autour d'un axe vertical et conçu pour recevoir les conteneurs (1) un par un de l'unité d'avance en entrée (2);
de pinces (8) pour tenir les conteneurs (1), montées sur la circonférence du carrousel (3), des unités de dosage du liquide (9), sous forme de pompes, montées elles-aussi sur le carrousel (3), dont le fonctionnement est synchronisé au mouvement des pinces (8) pour remplir les conteneurs (1); et d'une unité d'avance en sortie (10) des conteneurs pleins en provenance du carrousel (3);
ce dispositif comprenant les organes d'actionnement synchrone des pompes des unités de dosage et des organes d'avance des conteneurs pour les unités de dosage possède les caractéristiques suivantes:
un premier manchon (29), dont le sommet porte le corps (30) des pinces (8) et la base fait tourner suivant l'axe radial du carrousel (3), un rouleau (36) engageant une came (37) se développant de la paroi cylindrique (38) concentrique à l'axe du carrousel (3); un deuxième manchon (32) qui est l'extension du premier (29), tous deux étant concentriques, est relié, par le sommet, au piston (33) de la pompe (14) des unités de dosage (9) et la base fait tourner, suivant un axe diamétral du carrousel (3), un rouleau (46) en mesure d'engager une mortaise (47) délimitée par la circonférence interne d'un anneau (48) qui entoure l'axe du carrousel (3) par rapport auquel le rouleau (46) est sur un plan oblique; à travers le premier manchon (29) passe une tige (31) dont la base fait tourner, suivant un axe vertical un rouleau (40) en mesure d'engager une came (41) façonnée en anneau sur un plan (21) horizontal, tandis que le sommet est en mesure d'entraîner la rotation angulaire de l'engrenage des roues dentées (43a, 43b) pour la transmission du mouvement aux pinces (8), de manière à effectuer la rotation d'un couple de branches (8a, 8b) entre une position de saisie P, quand la pince saisit le conteneur (1) et une position de repos R, quand elle le libère.

2. Ce dispositif suivant la revendication 1 **est caractérisé par le fait que** le bas de la tige (31) tient la manivelle (39) qui fait tourner, suivant un axe vertical, le rouleau (40) courant dans la came (41), celle-ci étant en mesure de commander la fermeture des branches (8a, 8b) en position de saisie (P) et leur ouverture en position de repos, correspondant respectivement à une zone de saisie et à une zone d'éloignement des conteneurs du carousel (3). 5 10
3. Ce dispositif suivant la revendication 1 **est caractérisé par le fait que** les branches (8a, 8b) fixées au corps (30) des pinces (8) sont pivotantes et solidaires des roues dentées (43a, 43b) engrenées l'une à l'autre et dans l'axe d'une d'entre elles se trouve une fourchette (44) en mesure d'entraîner une goupille solidaire verticalement de la tige (31). 15 20
4. Ce dispositif suivant la revendication 1 **est caractérisé par le fait que** la came (37) est en mesure d'entraîner le mouvement alternatif du premier manchon (29) de bas en haut et en correspondance de ce mouvement, la buse (17) des unités de dosage (9) est en mesure de s'introduire dans le col des conteneurs à remplir. 25
5. Ce dispositif suivant la revendication 1 **est caractérisé par le fait qu'un** côté de l'anneau (48) est fixé, sur sa base, à un pivot (49) dont l'axe est horizontalement tangentiel à une circonférence concentrique de l'axe du carousel (3) et le côté diamétralement opposé de l'anneau (48) est fixé à un organe de réglage automatique (53) pivotant suivant un axe vertical. 30 35

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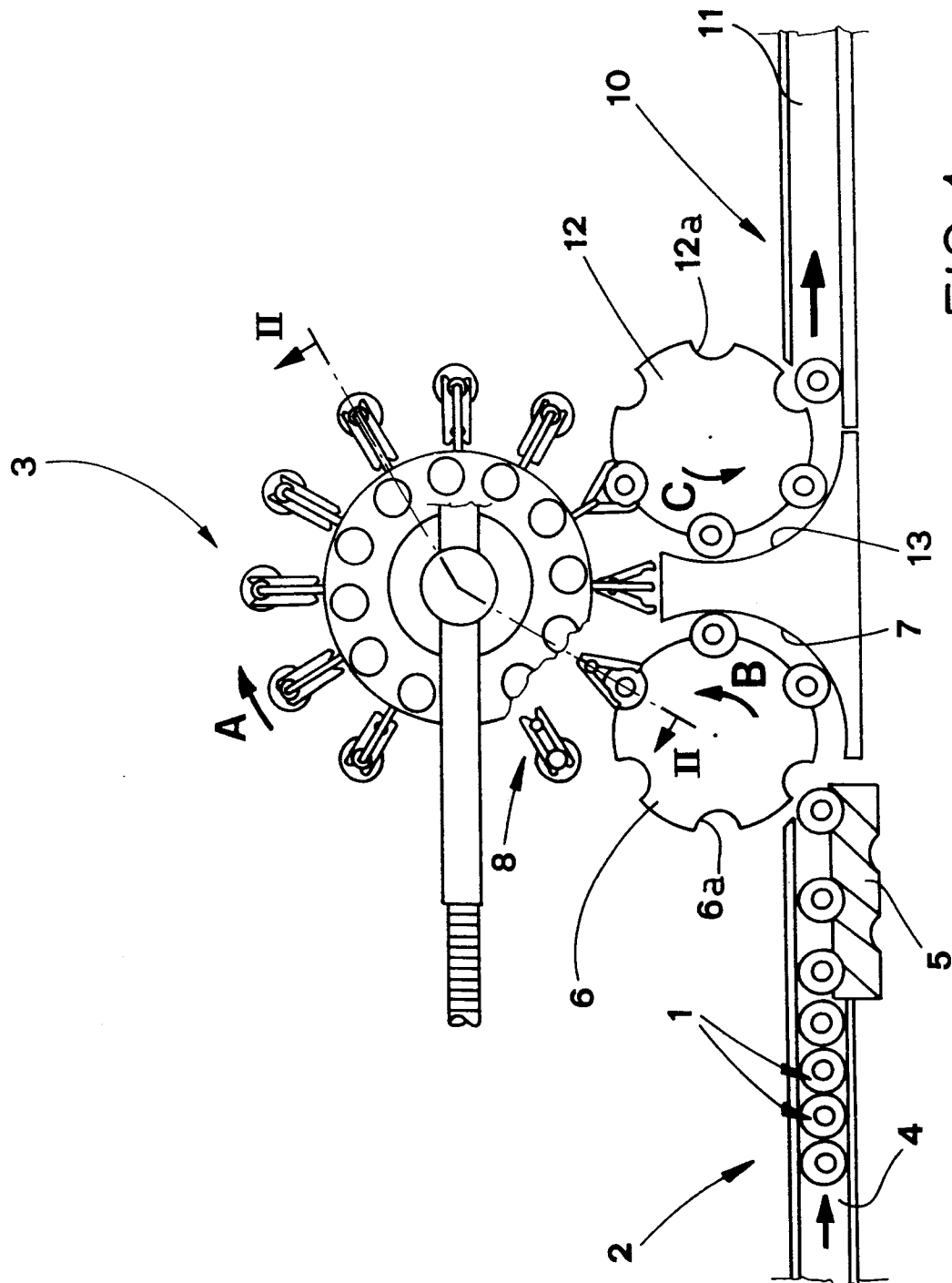


FIG. 1

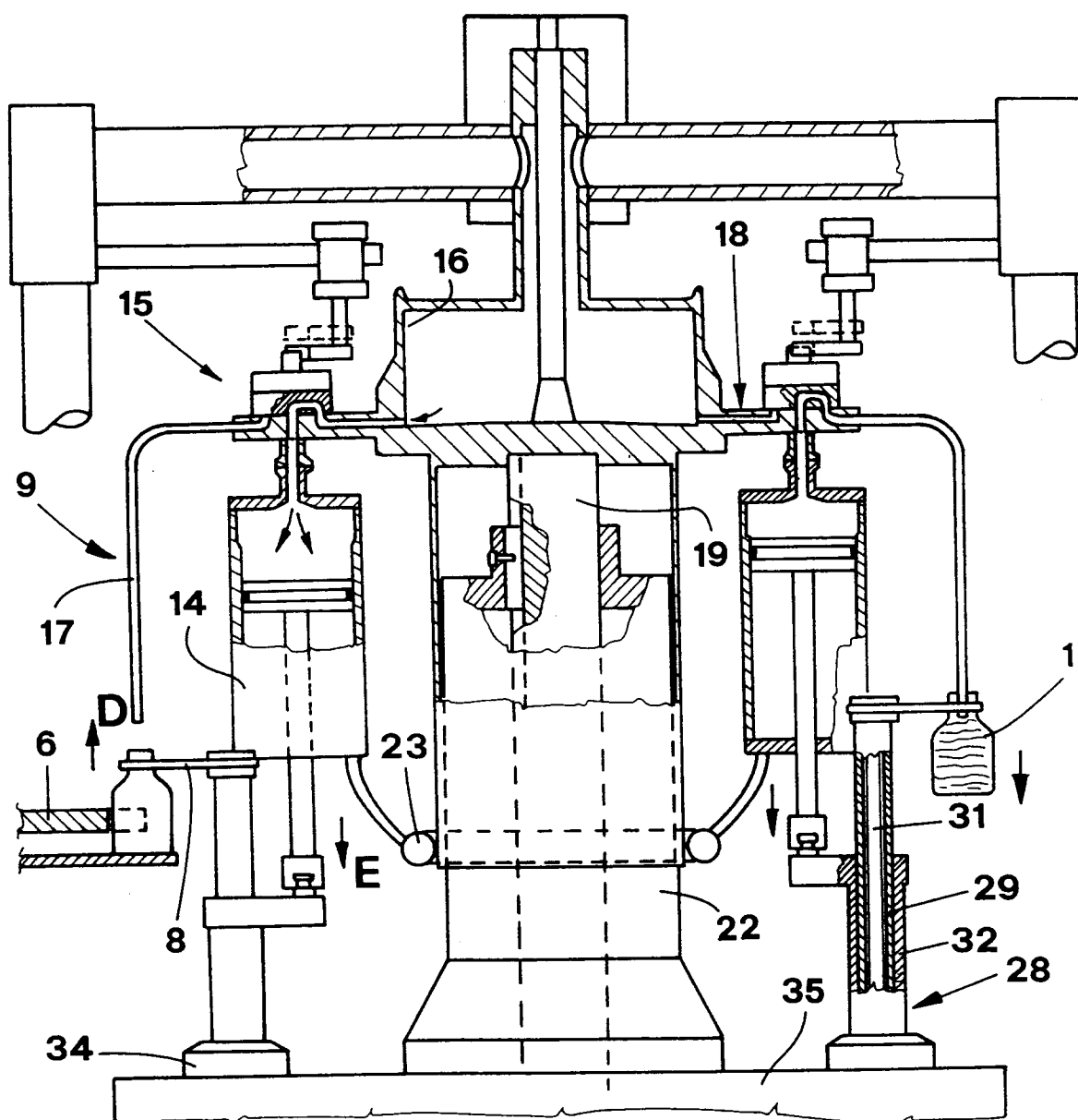
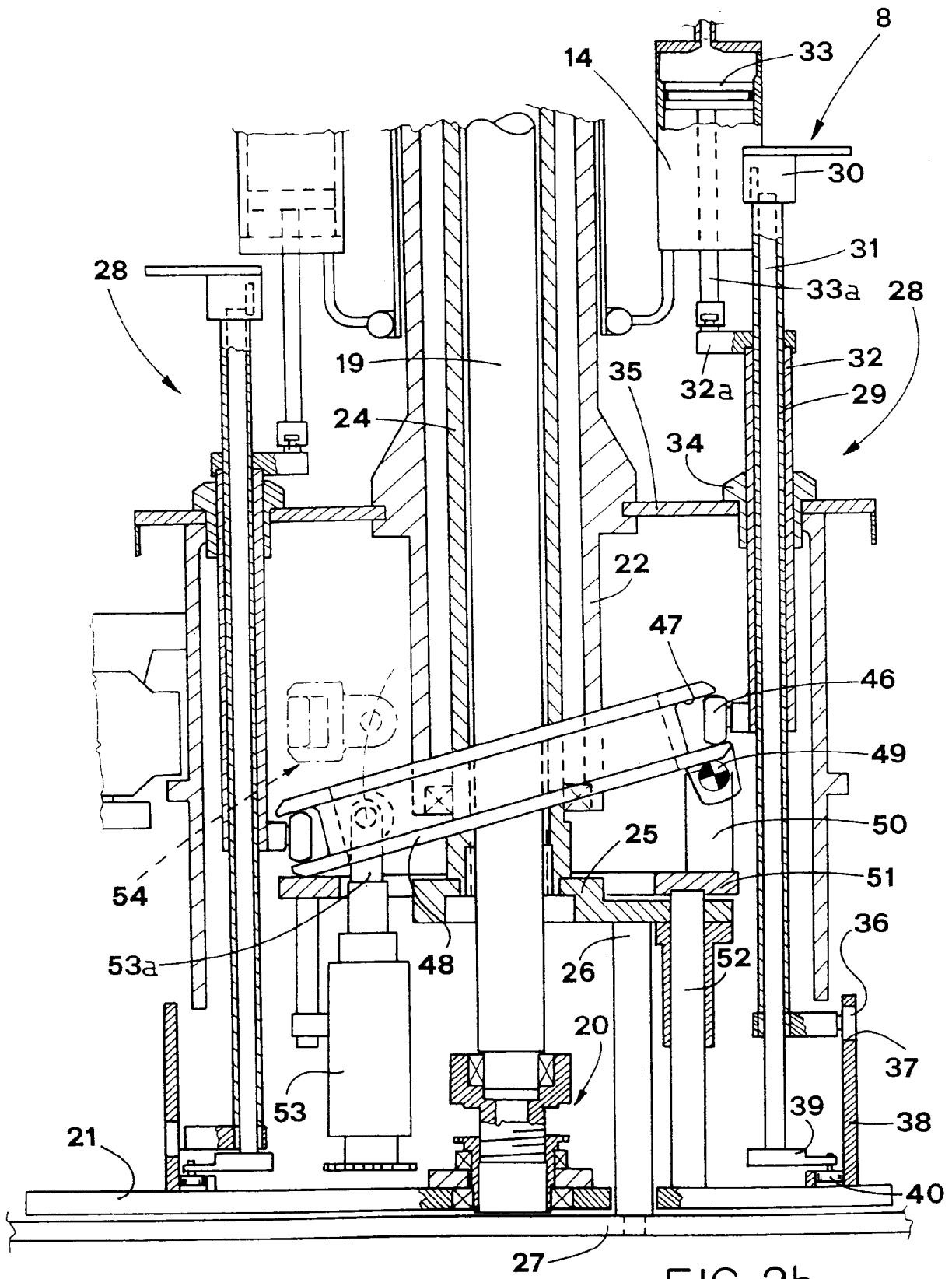


FIG. 2a



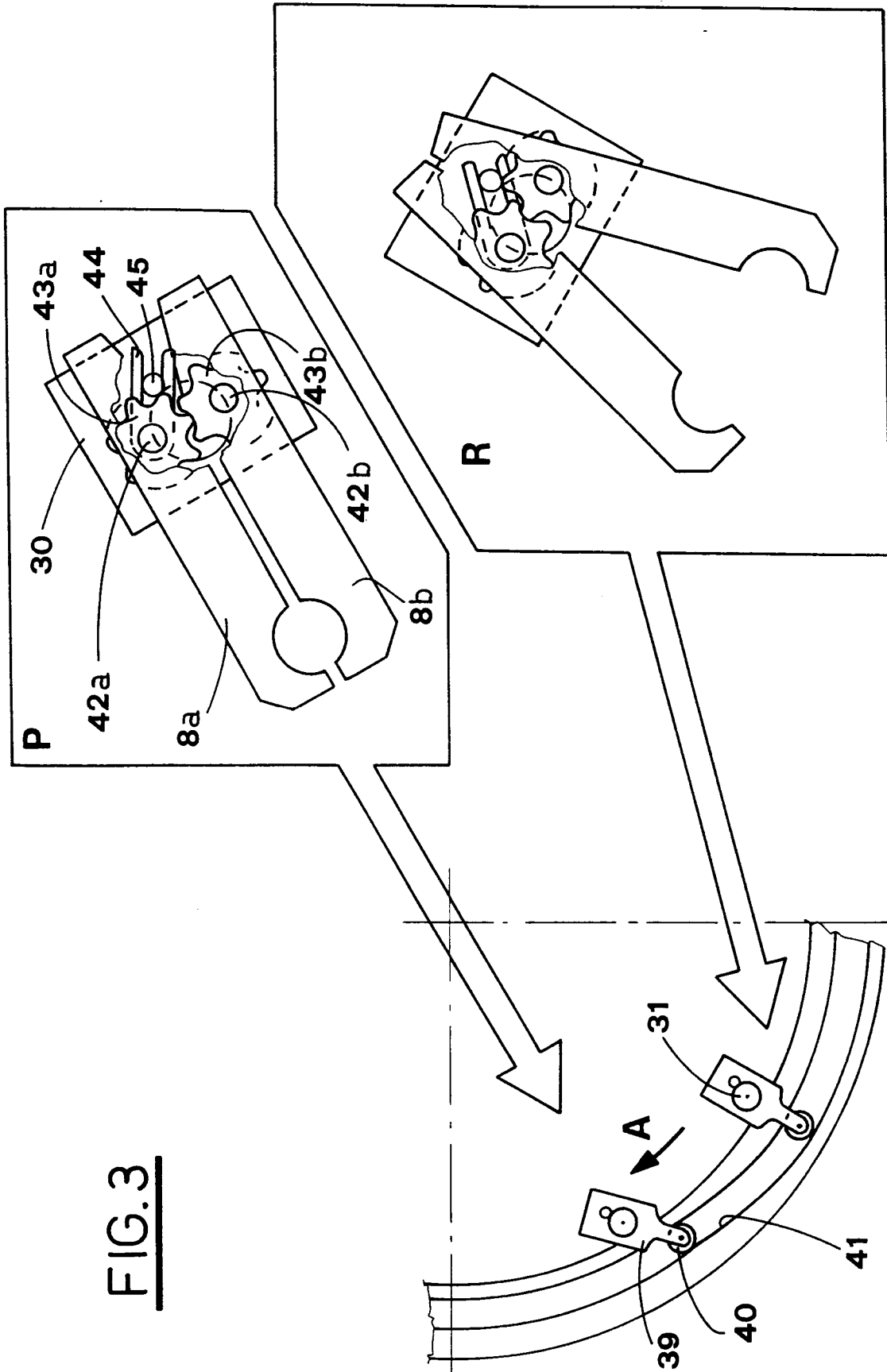


FIG. 3