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(71) Applicant: **SEIKO CORPORATION**
2-8-1 Tenjin
Shimizu 424(JP)

(72) Inventor: **Hamataka, Mitsuharu**
649-52 Sokoji
Ohito-Cyo, Tagata-Gun 410-23(JP)
Inventor: **Tsuchiya, Hideo**
1805-4 Ooka
Numazuo 410(JP)
Inventor: **Komatsubara, Michio**
304-Go S-2-To Koporasu Daiba, 163-1
Daiba, Mishima 411(JP)
Inventor: **Murasaki, Makoto**
366-3 Hontachino Syuzenji-Cyo
Tagata-Gun 410-24(JP)

(74) Representative: **Marx, Lothar, Dr.**
Patentanwälte Schwabe, Sandmair, Marx
Stuntzstrasse 16
D-81677 München (DE)

(54) **Cap application and tightening apparatus for trigger pump vessel.**

(57) Disclosed is an apparatus by which caps with nozzle are supplied to vessels filled with a material such as, for example, a liquid, a positional relationship between a vessel and a cap with nozzle correponding thereto is uniformly regulated and the caps are automatically and continuously tightened with a predetermined torque.

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Background of the Invention

1. Field of the Invention

The present invention relates to a cap application and tightening apparatus for a trigger pump vessel used in a material filling and packing industry and the like.

2. Description of the Related Art

Today, available in a market are many vessel members used for spraying a foamed or atomized liquid of detergent or the like to a surface to be washed due to an eminent progress in a packing vessel member, the vessel member being composed of a vessel 1 containing a liquid and a cap 4 with a trigger pump type nozzle, as shown in Figure 3.

This type of the vessel member includes the above cap 4 rotatably attached to a pump 5 faced to a horizontal direction and the pump 5 includes a suction hose 6 provided on the lower side, i.e., on the liquid suction side thereof and a nozzle 7 faced to a predetermined direction and provided on the lower side, i.e., the liquid spray side thereof and further a trigger portion 8 to be pressed by a finger of a hand holding the above pump 5.

In addition, the nozzle 7 projecting upwardly from the vessel 1 through the above cap 4 must be arranged to a predetermined uniform direction with respect to a label 1a attached on the front surface of the vessel, taking the decorative effect thereof into consideration when the vessel is displayed in a shop.

A job for filling a liquid such as detergent or the like into the vessel and packing the same is automatically carried out as a trial by an apparatus having a continuous processes, which is disclosed, for example, in Japanese Patent Application (Laid-Open) Sho 63-67294 for a combination type capper.

The above conventional combination type capper has the following problems.

A funnel-shaped guide means is provided at the upper portion of the mouth of a vessel to properly and smoothly insert a suction hose on the liquid suction side of a pump attached to a cap into the mouth of a vessel to thereby cause the lower end of the above suction hose to be guided along the inner inclined surface of the guide means.

The above suction hoses, however, are differently curved and a largely curved hose as shown by an imaginary line of Figure 3 sometimes cannot put the extreme end thereof into the opening of the above guide means, and in this case a vessel with this hose is rejected because a cap with nozzle is not properly attached to the vessel.

Since the conventional combination type capper is arranged as a roller type capper in which a roller in abutment on the periphery of a cap transmits the rotating force thereof to the cap for tightening the same, the roller comes into contact with the cap through points or a line of the roller, so that the roller is in contact with the cap through a small area and thus a sufficient tightening torque necessary for finally tightening the cap cannot be obtained.

Further, the above roller must have a large diameter to provide a rotating torque for tightening, but since a cap to be rotated has a small diameter, a sufficient distance cannot be provided between rollers disposed in parallel. Further, although not shown, in the case of a vessel with a projection for positioning a pump and preventing the rotation thereof, the periphery of the above roller abuts against the projection to prevent the vessel from being gripped, and thus a roller to be used must have a small diameter and as a result a torque produced by the roller of small diameter is further reduced.

Therefore, the development of an apparatus for solving the above problems has been strongly desired in this industry.

Summary of the Invention

An object of the present invention made for satisfying the above desire is to provide a cap application and tightening apparatus for a trigger pump vessel capable of securely, automatically and continuously supplying caps with nozzle to vessels filled with a material, e,g, a liquid, with the extreme end of the hose of the cap securely corresponding to the mouse of each vessel in the state that each vessel corresponds to the cap with nozzle in a predetermined positional relationship and tightening the caps with a predetermined torque.

Further, according to the present invention, since a series of jobs from the application of caps to the tightening thereof are continuously carried out, these jobs can be automatically performed to improve a manufacturing efficiency as well as a factory automation can be achieved to cope of the shortage of manpower.

When caps are tightened by a machine, a stable tightening torque can be uniformly applied and thus the occurrence of products rejected due to untightened caps or insufficient tightening torque can be entirely prevented to improve a yield.

Even if the hose of a cap to be inserted into the opening at the mouth of a vessel is largely curved, since the hose is corrected to a vertical state and maintained in this attitude by a locking means provided with a mounting apparatus, the

occurrence of vessels rejected by the reason that they have an incorrectly inserted hose or no cap and thus no hose inserted thereinto can be prevented and as a result only good products pass through a series of these systems to achieve a high yield.

Since a belt used as a tightening means of a tightening unit abuts against the periphery of a cap to be tightened through a contact surface as large as possible, a sufficient tightening torque can be obtained and thus an eminent effect can be achieved in that a ratio of products rejected by the reason that caps are insufficiently tightened due to slip and the like can be greatly lowered, and the like.

Brief Description of the Drawings

Figure 1 is a front view conceptually showing an embodiment of a cap application and tightening apparatus for a vessel according to the present invention;
Figure 2 is a plan view of Figure 1;
Figure 3 is a front view of a vessel used in the apparatus shown in Figure 2;
Figure 4 is a bottom view of the vessel shown in Figure 3;
Figure 5 is a plan view showing a round vessel in Figure 3;
Figure 6 is a front view, partly in cross section, of a first cap arrangement unit;
Figure 7 is a plan view of Figure 6;
Figure 8 is an enlarged cross sectional view showing a cleaning-out plate of Figure 6;
Figure 9 is an enlarged view showing an outlet portion of Figure 6;
Figure 10 is a front view showing the main portion of a second arrangement unit;
Figure 11 is a longitudinal cross sectional view of Figure 10;
Figure 12 is a front view showing the main portion of a vessel delivery unit;
Figure 13 is a plan view schematically showing a cap delivery unit;
Figure 14 is a cross sectional view showing a chute;
Figure 15 is a front view showing an operational relationship between a cap delivery unit and a mounting unit;
Figure 16 is a front view, partly in longitudinal cross section, showing a positioning unit when a round vessel is employed in a mounting unit;
Figure 17 is a plan view showing a part of Figure 16;
Figure 18 is a cross sectional view showing the relationship between a mounting unit and a first transit means;
Figure 19 is a plan view of Figure 18;
Figure 20 is a cross sectional view showing a grip member when a round vessel is employed;
Figure 21 is a cross sectional view showing a grip member when a square vessel is employed;
Figure 22 is a front view showing the main portion of a locking means in a mounting unit;
Figures 23 and 24 are plan views of a locking means in a mounting unit;
Figure 25 is a front view, partly in longitudinal cross section, of a tightening unit;
Figure 26 is a longitudinal cross sectional view showing a tightening means in a tightening unit;
Figure 27 is a plan view of Figure 26;
Figures 28 and 29 are explanatory diagrams showing modifications of an actuation means in the tightening means in Figure 26; and
Figure 30 is a plan view showing a drive system of Figure 1.

Detailed Description of Preferred Embodiments

Next, an embodiment of a cap application and tightening apparatus for a trigger pump vessel according to the present invention will be described with reference to the drawings.

A vessel 1 used in this embodiment of the present invention is made of a synthetic resin and formed to an oval shape as shown in Figure 3 or a round shape as shown in Figure 5 having a mouth squeezed to a small diameter and provided with a male screw.

In the case of the round vessel 1, a recessed portion 2 is defined to the outside surface of the bottom thereof for positioning a printed surface 1a applied to the surface of the vessel, the vessel 1 is filled with a liquid such as detergent or the like and packed, and a cap 4 with a male screw defined around the inside periphery thereof is threaded to the male screw of the mouth.

The cap 4 is rotatably attached to a cylindrical pump 5 in a horizontal direction, a hose 6 having a length abutting against the bottom of the above vessel 1 is provided on the lower portion , i.e., the suction side of the pump 5 to suck the above liquid, a nozzle 7 facing to one side, i.e., one lateral direction is provided on the upper portion, i.e., the liquid ejection side of the above pump 5, and further a trigger portion 8 to be pressed by a finger of a hand holding the above pump 5. As a result, when this trigger portion 8 is depressed, foamed or atomized detergent or the like is sprayed to a surface to be washed.

In Figures 1 and 2, 9 designates a cap application and tightening apparatus as a whole which is composed of a transfer unit A for transferring the vessel 1, first cap arrangement unit B1, second cap arrangement unit B2, vessel delivery unit C, cap

delivery unit D, mounting unit E for mounting the vessel 1 and cap 4 with nozzle, tightening unit F, transfer unit G for transferring the vessel 1 with the cap 4, and drive means H associated with the above respective units.

The transfer unit A for the vessel 1 is composed of a horizontal endless conveyer attached to a support frame plate 10a provided along the entire length of a side of a machine body 10, and the above vessels 1 filled with a predetermined amount of detergent are placed thereon and continuously transferred to the vessel delivery unit C, the endless conveyer being driven in one direction by a drive means 11 such as a motor with reduction gear or the like.

Note although this transfer unit A is also used as the transfer unit G for discharging the vessel 1 having been tightened, these transfer operations may be carried out by independent units A and G (not shown).

The first arrangement unit B1 accommodating a multiplicity of the above caps 2 with nozzle therein is disposed in the vicinity of the above machine body 10 is used to arrange the direction of the caps 2, i.e. the caps 2 and hoses 6 in a predetermined direction. More specifically, as shown in Figure 6, a cylindrical cabinet 13 inclined by about 20 to 30° is supported by a support member 12 and the height thereof can be adjusted by a vertically moving member 14 contained in the support member 12.

A combing-up disk 16 is rotatably supported in the cabinet 13 by a support shaft 15 in accordance with the inclination of the cabinet 15 and the combing-up disk 16 is continuously rotated in a direction by a drive means 17 such as a motor or the like with reduction gear coupled to the support shaft 15.

Further, a multiplicity of radial cutouts 18 are intermittently defined around the periphery of the above combing-up disk 16 and cleaning-out plates 19 freely projecting from and entering into the cutouts 18 are mounted on the backside of the above combing-up disk 16 in such a manner that each of the cleaning-out plates 19 is urged by an elastic member 20 such as a leaf spring or the like in a direction along which the cleaning-out plate 19 is embedded below the above cutout 18.

Then, a guide 21 is provided in abutment against the lower edge of each of the cleaning-out plates 19 for regulating the embedding of the cleaning-out plate 19, and when the above combing-up disk 16 is moved along an ascending inclination as it is rotated, the cleaning-out plates 19 are projected from the above combing-up disk 16 so that the caps 4 with nozzle staying at the lower portion of the cabinet 13 are combed up by the above cleaning-out plates and transferred to the upper portion thereof. The thus combed up caps are engaged with the steps 22 defined around the peripheral edge of the combing-up disk 16 at the lower edges thereof and thus prevented from being dropped when the bombing-up disk 16 is moved upward and further the projected cleaning-out plates 19 prevent the caps with nozzle 4 from moving laterally.

In addition, when the above bombing-up disk 16 is in a downward process from an upper position, the cleaning-out plates 19 are embedded below the cutouts 18 by the returning force of the elastic members 20, and thus the lateral movement of the caps with nozzle 4 is not prevented.

Designated at 23 is a sweeping-down means provided at the inside upper portion of the above cabinet 13 and arranged such that rotating shafts 26, 26 are projected from a drive motor 25 supported by a mounting plate 24 to the opposite side thereof and a multiplicity of feather members 27 are attached to the rotating shafts 26, 26 in the tangential direction thereof. When the combed up caps 4 with nozzle are not properly accommodated in the cleaning-out plates 19, 19 at the lower portion of the cabinet 13, the caps 4 are swept down by the above feather members 27 rotating downward at the risen top the of the above combing-up disk 16 toward the bottom portion of the cabinet 13 and then transferred again upward by being accommodated in the cleaning-out plates 19, 19.

Designated at 28 is an outlet tangentially defined in the interior of the above cabinet 13 in the descending inclination of the above combing-up disk 16 for sending out the above caps 4 with nozzle arranged on the above combing-up plate 16 to the outside.

The second cap arrangement means B2 disposed in the midway of a chute 42 coupled to the outlet 28 of the above first cap arrangement means B1 is used to arrange the nozzle 7 of the above cap 4 in a predetermined direction. As shown in Figures 10 and 11, when the hose 6 supported by a first receiving piece 42a and the pump portion 5 supported by a second receiving piece 42b are transferred in the above chute 42 in a fallen down state, the pump portion 5 is turned as the above receiving piece 42b is inclined downward and thus the nozzle portion 7 having a large weight difference is arranged downward, and in this state the attitude of the cap 4 with nozzle is gradually raised up by the bending of the above chute 42 so that the cap 4 is corrected to be positioned at an upper portion and the hose 6 is corrected to be positioned at a lower portion.

The above vessel receiving unit C continuously supplies the vessels 1 on the transfer unit A to the mounting unit E through a first transit means 29 one by one, and is arranged such that a support

frame 30 is attached to the support frame plate 10a on the transfer unit A in the machine body 10 and a transfer screw 31 is rotatably attached to the support frame 30 by being supported by a shaft 32. An end of the shaft 32 is coupled to a rotation means 41 composed of a chain wheel 35 attached to a direction changing shaft 34 associated with a direction changing shaft 33, a gear 37 meshed with a synchronizing gear 36 of the above drive means H, and a chain 40 trained around a chain wheel 39 mounted on the shaft 38 of the gear 37.

The cap delivery unit D is interposed between the outlet 42c of the second cap arrangement unit B2 and the mounting unit E and supplies the cap 4 with nozzle to the mounting unit E, and as shown in Figures 13 and 15, the cap delivery unit D is arranged such that a channel-shaped chute 42 having a predetermined inclination for holding the pump portion 5 of the above cap 4 with nozzle on the opposite sides thereof is attached to the above outlet 42C. The end of the chute 42 is formed to a flat shape and a stopper 44 advanced and retracted by a fluid cylinder 43 is provided at the terminal end thereof in such a manner that it is perpendicular to the chute 42. When the above stopper 44 is released, the caps with nozzle are supplied one by one by a supply member 45 disposed below the above chute 42 in correspondence with the location of the stopper 44 and ejecting air for blowing off the caps.

As shown in Figure 13, a disk-shaped transfer means 49 with transfer cutouts 48 is horizontally and rotatably supported between the above end and the above mounting unit E and transfers the above supplied caps 4 with nozzle to the gripping member of the mounting unit E through the cutouts 48 along a guide 47 with a semi-annular groove 46, as the transfer means 49 is rotated. The nozzle 7 is faced to a predetermined direction at all times in such a manner that the arc-shaped cutout 48a of the above cutout 48 is engaged with the cylindrical portion of the cap 4 and the laterally long cutout 48b thereof is engaged with the tripper portion 8 of the pump 5.

The above first transit means 29 interposed between the vessel delivery unit C and the mounting unit E supplies the vessels 1 to the mounting unit E one by one. As show in Figure 2, since the first transit means 29 is arranged such that a horizontal rotating member 50 is rotatably supported on the machine body 10 by a shaft 51 and a multiplicity of cutouts 52, e.g., six sets of cutouts 52 corresponding to the outside configuration of the above vessel 1 are defined around the periphery of the rotating member 50, and thus the vessel 1 engaged with the cutout 52 is transferred from the vessel delivery unit C to the mounting unit E along an arc-shaped guide 52a as the rotating member 50 is rotated.

Note, when the vessel 1 to be used has a round or square shape, a multiplicity of, e.g., six sets of not shown grip means composed of a pair of radially openable and closable rotating claws are attached to the above rotating member 50 in place of the rotating member 50, so that the vessel 1 is transferred from the vessel delivery unit C to the mounting unit E by being gripped thereby.

The mounting unit E receives the vessel 1 transferred from the above first transit means 29 and the cap 4 with nozzle transferred from the above cap delivery unit D and assembles them on the mounting unit E. As shown in Figures 15 and 16, the mounting unit E is arranged such that a horizontal disk 53 the upper surface of which is in coincidence with the above rotating member 50 is rotatably sup ported by a shaft 54 on the machine body 10 and a multiplicity of, e.g., eight sets of grip means 55 for gripping the vessel 1 are radially attached to the horizontal disk 53 and thus locations corresponding to the grip means 55 of the horizontal disk 53 are used as placing locations 56.

As shown in Figures 15, 16, 20 and 21, each of the grip means 55 is composed of a pair of rotating claws 57, 57 the inner periphery of which is formed to a shape accustomed to the oval shape of the outside periphery of the vessel. More specifically, the pair of turning claws 57, 57 have a C-shaped side, supported on the above horizontal disk 53 by shafts 58, 58, respectively, actuated in association by synchronizing gears 59, 59 mounted on the shafts 58, 58 and meshed to each other and opened and closed to thereby grip and release the vessel 1. Usually, the turning claws 57, 57 are urged in a closing direction by a tension spring 60 attached to one of the synchronizing gears 59.

Further, as shown in Figure 16, the grip member 55 is continuously opened and closed along a moving locus of a cam plate 61 in such an arrangement that one of the above shafts 58 is provided with a roller 62 abutting against the cam plate 61 attached to the above rotating shaft 54.

Note that 55a and 55b in Figures 20 and 21 designate a grip means used for gripping a round or square vessel, wherein the grip means 55a is arranged such that grip rollers 63, 63 for gripping the mouth of the above vessel 1 is supported on the upper portion of the pair of rotating claws 57a, 57a and grip roller 64, 64 for gripping the lower body of the vessel 1 are disposed on the lower portion of the rotating claws 57a, 57a, respectively, and the pair of rotating claws 57b, 57b of the grip means 55b are formed to a flat and arc shape in accordance with the shape of the square vessel, supported by shafts 65, 65 on the above horizontal disk 53, and are freely opened and closed by an arrangement similar to that of the turning claws 57,

57 of the above oval vessel 1.

In the case of the above round vessel 1, a positioning means 66 is provided with the mounting unit E to rotate the respective vessels 1 so that the direction of the surface thereof is corrected, i.e., the printed surface of the vessels 1 is faced to a predetermined direction. As shown in Figures 16 and 17, the vessel 1 is rotated on the above placing location 56 in such a manner that each positioning plate 68 is engaged with each stepped round hole 67 provided with the above horizontal disk 53, a turning member 71 is supported by a rotating shaft 70 supported by a bearing 69 of the horizontal disk 53, and a projecting rod 73 projected upward by a spring 72 is locked to the turning member 71 through a passing hole 74 defined to a suitable location of the above positioning plate 68 and engaged with the recessed portion 2 of the vessel 1.

A range in which the vessel 1 is rotated by the positioning means 66 is intermittently controlled by a control means 75 to be described below.

The control means 75 for controlling the rotation and upward and downward movement of the above rotating shaft 70 is arranged such that a gear 88 meshed with a large gear 87 fixed to the machine body 10 is attached to the above rotating shaft 70 through a frction clutch 89, a disk 91 having a cutout 90 defined at a suitable location of the periphery thereof is attached to the rotating shaft 70, and further a bell crank 95 having a roller 93 engaged with a cam 92 and supported by a shaft 94 at an end of the bell crank 95is supported in the vicinity of the rotating shaft 70, and when an engaging member 96 supported at the other end of the bell crank 95 is engaged with the above cutout 90, the transmission of rotation to the above rotating shaft 70 is stopped by the above friction clutch 89.

Note that the above bell crank 95 is urged by a compressed spring 97 in the direction causing the engaging member 96 to be always engaged with the cutout 90.

Further, the above projecting rod 73 of the turning member 71 attached to the upper end of the rotating shaft 70 is freely moved upward and downward through the passing hole 74 defined to the above positioning plate 68 by the control means 75 in such an arrangement that an annular member 99 having a receiving groove 98 defined around the periphery thereof is attached to the lower end of the above rotating shaft 70, a roller 103, with which the engaging member 101 of an arm 100 attached to the shaft 94 of the above bell crank 95 and to which the shaft 102of the engaging member 101 is connected, is abutted against a cam provided around the above rotating shaft 54 and the above rotating shaft 70 is moved upward and downward as the circular motion of the cam 104 is changed into motion up and down.

Note that the above rotating shaft 70 is vertically floatingly supported by a compressed spring 105 accommodated in the above bearing 69 and urged upward at all times.

A cap supply means 106 in the above mounting unit E is composed of a vertically moving means 108 for the cap 4 with nozzle and a suspension means 109 therefore. The vertically moving means 108 supports the pump 5 of the cap 4 with nozzle supplied from the cap delivery unit D so that the cap 4 is correctly mounted to the vessel 1 supplied onto the placing location 56 of the above mounting unit E. As shown in Figure 15, a cylindrical member 111 having a cam groove 110 defined thereto is attached to the above machine body 10 and a vertically moving rod 113 supported by the upper mounting plate 112 of the above rotating shaft 54 at one end thereof is attached to the cam groove 110 of the cylindrical member 111 through a moving member 114 at the other end thereof, and thus when the above cylindrical member 111 is rotated, the vertically moving rod 113 is moved upward and downward while the moving member 114 slides along the above groove 110.

The above suspension means 109 is opened and closed by an actuation means 115 such as a fluid cylinder or the like attached to the lower end of the above vertically moving rod 113 and provided with a pair of claw members 116 for gripping the pump portion 5 of the above cap 4 supplied from the cap delivery unit D.

Further, since the mounting unit E is provided with a locking means 117 for smoothly and securely inserting the hose 6 of the cap 4 held by the above suspension means 109 into the vessel 1, and as shown in Figure 15, each of moving pieces 121 is engaged with each of a pair of spline shafts 119, 120 standing on the above upper mounting plate 112 of the above rotating shaft 54 and the lower mounting plate 118 attached to the rotating shaft 54, each of vertically moving members 122 such as a rodless cylinder or the like attached to a mounting member 118a is associated with each of the moving pieces 121, and each of grip claws 123, 124 connected to the lower portion of the above moving pieces 121 is slidingly attached to each of the above spline shafts 119, 120.

A rotating lever 125 is supported at the upper end of one of the pair of above spline shafts 119, 120 and a roller 127 abutting against the cam plate 126 attached to the lower portion of the above cylindrical member 111 is supported at the extreme end of the lever 125, and thus when a positional change caused by a rotational force of the cam 126 is transmitted to the pair of above spline shafts 119, 120 through the above rotating

lever 125 and synchronizing gears 128, 129, the above claws 123, 124 are opened as shown in Figure 23 or closed as shown in Figure 24. Therefore, even if the hose 6 of the cap 4 with nozzle is greatly bent as shown by a two-dot-and-dash line in Figure 3, the hose 6 is maintained vertically by being supported by the grip claws 123, 124 of the above locking means 17 in such a manner that the grip claws 123, 124 of the above locking means 117 are closed below the cap 4 to grip the hose 6 and the grip claws 123, 124 are lowered in this state, and thus the above hose 6 can be securely inserted into the vessel 1 through the opening at the mouse thereof waiting on the placing location 56 of the horizontal disk 54 by actuating the above vertically moving means 108.

In Figure 2, 130 designates a second transit means for supplying the vessel 1 on which the cap 4 with nozzle is mounted in the mounting unit E to the tightening unit F to be described below. Since the second transit means 130 is arranged similarly to that of the above first transit means 29, it is not described here in detail.

The above tightening unit F receives the vessel 1 supplied from the above second transit means 130 and tightens the cap 4 to the mouse of the vessel 1. As shown in Figure 25, the tightening unit F is arranged such that the above horizontal plate 53 and a rotating disk 131 the upper surface of which is in coincidence therewith are rotatably supported on the machine body 10 by a shaft 132, a multiplicity of, e.g., 8 sets of grip members 133 for gripping the vessel 1 are radially attached to the rotating disk 131, and the locations corresponding to the grip members 133 on the rotating disk 131 serve as placing locations 134.

Each of the grip members 133 is composed of a pair of turning claws 134, 134 the inner periphery of which is formed to a shape accustomed to the oval shape of the outside periphery of the vessel 1. Although Figure 25 shows only one of the turning claws 134, 134, the pair of turning claws 134, 134 have a C-shaped side, supported on the above rotating disk 131 by shafts 135, 135 and opened and closed by synchronizing gears 136, 136 mounted on the shafts 135, 135 and meshed to each other to thereby grip and release the above vessel 1. Usually, the turning claws 134, 134 are urged to a closing direction by a tension spring 137 attached to one of the gears 136.

Further, since opening and closing of the grip member 133 is controlled by an arrangement similar to the grip members 55, 55a in the above mounting unit E, this arrangement is not shown and described in detail.

A mechanism for performing a tightening operation is such that a tightening member 136 is vertically disposed above the vessel 1 on the placing location 134 so that the tightening member 136 can be lifted and lowered by a vertically moving means 135 supported by the above shaft 132 and a tightening means 138 composed of a pair of right and left endless belt members 137, 137 is vertically disposed at the lower portion of the tightening member 136 in correspondence with the upper portion of the vessel 1 with the cap supplied from the above mounting unit E so that the tightening means 128 can pressingly hold the cap 4 of the vessel 1.

The above vertically moving means 135 is arranged such that a cylindrical member 140 having a cam groove 139 defined around the periphery thereof is attached to the above shaft 132 and a moving member 141 provided at the upper portion of the above tightening member 136 is engaged with the cam groove 139 of the cylindrical member 140, so that the above tightening member 136 is lifted and lowered as the above cylindrical member 136 is rotated.

The tightening member 136 of the above tightening means 138 contains horizontal turning plates 143, 143 attached to drive shafts 142, 142 at the base thereof, each of drive rings 144, 144 is supported by each of the drive shafts 142, 142, each of follower rings 145, 145 is supported at the other end of each of the above horizontal turning plates 143, 143 by each of shafts 146, 146, and further, a pair of press rings 147, 147 are supported by shafts 148, 148 at the intermediate portion of each of the above horizontal turning plates 143, 143 so that the pair of press rings 147, 147 surround the outside periphery of the cap 4. Each of urethane or rubber type belt members 137, 137 having a large coefficient of friction is stretched around each set of these rings 144, 145, 147 and 147, and thus when the rotation of a drive means (not shown) is transmitted to drive gears 149, 149 attached to the upper portion of the above drive shafts 142, 142, the above belt members 137, 137 are traveled toward a tightening direction each other to thereby strongly tighten the above cap 4.

Further, this tightening means 138 is associated with an actuation means 151 for pressing against and retracting from the outside periphery of the cap 4 of the vessel 1, and thus when an advancing and retracting means 154 such as a fluid cylinder or the like the base portion of which is attached to the above tightening member 136 is associated with the lever 153 projected from the support cylinder 152 of the above horizontal turning plate 143 and operated, the above horizontal turning plate 143 is turned about the drive shaft 142, and as a result pressing against and retracting from the outside periphery of the cap 4 are arbitrarily carried out. The synchronizing gears 155, 155 mounted on the above drive shafts 142, 142 are

meshed to each other so that the turning angles of the above horizontal turning plates 143, 143 are in coincidence, that is, the belt members 137, 137 have the same abutting force to the cap 4.

The actuation means 151 for pressing against and retracting from the outside periphery of the cap 4 of the above vessel 1 may be arranged to perform a linear motion executed by the horizontal turning plate 143 as shown, for example, in Figures 28 and 29 in addition to the arrangement for performing the swing motion executed by the horizontal turning plate 143. In the case shown in Figure 28, this motion is carried out by associating the advancing and retracting means 154 with the horizontal plate 143, and in the case shown in Figure 29, a moving plate 156 capable of advancing and retracting is provided with the horizontal plate 143, and press rings 148, 148 and the tension rings 157, 157 of the belt member 137 are supported on the moving plate 156 and the moving plate 156 is associated with the advancing and retracting means 154 to thereby execute an advancing and retracting motion.

There is provided a grip member 158 for gripping the nozzle portion 7 of the cap 4 when the cap 4 is tightened by the above tightening means 138. The grip member 158 is arranged such that opening/closing levers 161, 161 having receiving rollers 160, 160 attached to the upper portions thereof and turningly supported by shafts 162, 162 are disposed at the opposite sides of a holding member 159 located just above the vessel 1 waiting at the above placing location 134, that is, just above the inserted cap 4, and rubber type elastic members 163, 163 for gripping the pump portion 8 of the cap 4 and preventing the cap 4 and the like from being damaged and slipped are attached to the lower edge of the opening/closing levers 161, 161. The opening/closing levers 161, 161 are opened and closed in such a manner that a taper cone 164 is inserted into the above holding member 159 and the taper cone 164 is advanced and retracted by an actuating means (not shown) to press the above receiving rollers 160, 160 abutting against the inclined surface of the taper cone.

In Figure 2, 165 designates a third transit means for supplying the vessel 1 with the tightened cap to the transfer unit G. Since this third transit means 165 has the same arrangement as that of the first and second transit means 29 and 130, it is not described in detail.

The above transfer means G for the vessel 1 with the cap 4 employs an endless rail type conveyer and also is used as the above transfer unit A for the vessel 1.

As shown in Figure 30, the drive means H in the above description drives the above first transit means 29, disk-shaped transfer means 49, mounting unit E, second transit means 130, tightening unit F, and third transit means 165 together in synchronism in such a manner that the rotation of a motor 166 mounted on the machine body 10 is transmitted to a transit shaft 168 through a connecting member 167 such as a belt or the like and then separately transmitted to reduction gears 170, 171 from the right and left sides of the intermediate shaft 168 through connecting members 169, 169 such as belts or the like.

In addition, gears 174, 175 are mounted on the output shafts 172, 173 of the reduction gears 170, 171, respectively, a gear 174 mounted on the shaft 51 of the first transit means 29 is meshed with the gear 174, a gear 36 mounted on the shaft 54 of the mounting unit E is meshed with the gear 176, and further a gear 177 mounted on the shaft of the disk-shaped transfer means 49 is meshed with the gear 36 for the transmission of rotation.

In addition, a gear 179 mounted on the shaft 178 of the third transit means 165 is meshed with the gear 175 mounted on the output shaft 173 of the above reduction gear 171, a gear 180 mounted on the shaft 132 of the tightening unit F is meshed with the gear 179, and further a gear 182 mounted on the shaft 181 of the second transit means 130 is meshed with the gear 180 for the transmission of rotation.

Next, operation of the above embodiment will be simply described.

When the respective drive means 11 and H are started to operate the respective units and means, they are operated together in synchronism.

First, when vessels 1 formed to have, e.g., an oval cross section and filled with a liquid such as detergent or the like are continuously transferred by the transfer unit A at the starting end side of the machine body 10, these vessels 1 are supplied to the vessel delivery unit C waiting on the transfer unit A.

At this time, these vessels 1 are transferred with the printed surfaces thereof uniformly faced to a predetermined direction.

Then, the vessel 1 reached to the vessel delivery unit C is accommodated in the recessed portion of the transfer screw 31 at the starting point thereof and supplied to the cutout 52 of the horizontal rotating member 50 in the first transit means 29.

The thus supplied vessel 1 is guided by the guide 52a provided along the outside periphery of the rotating member 50 while accommodated in the above cutout 52 and delivered onto the placing location 56 of the mounting unit E as the above rotating member 50 is rotated.

Note that when the vessel 1 supplied to the unit E is formed to a round shape, the projecting rod 73 projecting from the positioning plate 68 of

the horizontal disk 53 is turned as the positioning plate 68 is rotated, while the vessel 1 is transferred, and when the projecting rod 73 is positioned at the recessed portion 2 defined on the bottom of the vessel 1, it is engaged therewith by the spring 72 thereof so that the vessel 1 is rotated on the placing location 56 until the engaging member 96 is locked to the cutout 90 in the control means 75, i.e., the printed surface of the vessel 1 is positioned.

On the other hand, a multiplicity of caps 4 with nozzle put into the cabinet 13 of the first arrangement unit B1 are moved upward by being engaged with the cleaning-out plates 19 as the combing-up disk 16 is rotated and prevented from being dropped at the top portion thereof in such a manner that the caps 4 are locked to the steps 22 at the lower edges thereof, and the caps 4 not properly accommodated by the above cleaning-out plates 19 are dropped by the feather members 27 of the sweeping-down means 23 provided at the top portion and then combed up again.

Then, thus arranged caps 4 with nozzle are supplied from the outlet and dropped from the chute 42 of the cap delivery unit D in a horizontally-brought-down state and supplied to the second cap arrangement unit B2.

The thus transferred caps 4 with nozzle are dropped by the dead weight thereof and further transferred while the hose 6 of each of the caps 4 is supported by the receiving piece 42a of the second cap delivery unit B2 and the pump portion 8 thereof is supported by the receiving piece 42b thereof. While the caps 4 are transferred, the pump portion 8 engaged with the above downwardly inclined receiving piece 42b is turned and thus the nozzle portion 7 having a large difference of weight is faced downward, and thus the attitude of the cap 4 with nozzle is gradually lifted by the bending of the chute 42 in the state that the nozzle 7 is uniformly faced to a predetermined direction and the cap 4 is dropped along the chute 42 in a vertical state. Thus, a predetermined amount of the caps 4 stored by the stopper 44 at the lower portion of the chute 42 wait for a next operation.

The cap 4 regulated by the stopper 44 releases the stopper 44 in synchronism with the turning motion of the vessel 1 performed by the mounting unit E and supplied to the disk-shaped transfer means 49 by an air ejection force of the supply member 45.

Then, the cap 4 with nozzle is transferred to the delivery position of the mounting unit E gripping the vessel 1 along the guide 47 with the semi-annular groove 46 while turned by being pushed by the supply cutouts 38 of the transfer means 49, with the periphery of the cap 4 and the lower end of the trigger portion 8 engaged with the cutout 48.

When the vertically moving rod 113 of the cap supply means 106 waiting above the gripped vessel 1 is lowered by the actuation of the cam groove 110 of the vertically moving means 108 and the moving member 114 engaged therewith and the claw members 116 of the suspension means 109 provided at the lower end of the above vertically moving rod 113 are opened, the cap 4 with nozzle having reached the delivery position and waiting above the transfer means 49 is kept vertically with the pump portion 5 thereof gripped by the claw members 116.

Further, the above cap 4 with nozzle is inserted into the vessel 1 supplied onto the placing location 56 of the mounting unit E, and at this time even if the hose 6 of the cap 4 is greatly curved, the hose 6 is kept vertically by being squeezed in such a manner that the upper portion of the hose 6 is gripped by actuating the grip claws 123, 124 of the locking means 117 and these grip claws 123, 124 are lowered by the vertically moving member 122. When the above vertically moving means 108 is actuated in this state to insert the hose 6 into the opening at the mouth of the vessel 1 and then the above grip claws 123, 124 are opened, the cap 4 is set to the vessel 1.

Then, the vessel 1 and cap 4 with nozzle are continuously turned in synchronism to each other by the mounting unit E and supplied to the next tightening unit F through the second transit means 130.

Further, these caps 4 are tightened by the tightening means 138 of the tightening unit F with a predetermined tightening torque and sequentially discharged by the transfer means G or A provided at the terminal end of the above machine body 10. When the vessel 1 into which the cap 4 is inserted reaches the lower portion of the above tightening means 138, the belt members 137, 137 stretched around the rings 144, 145, 147, 147 of the horizontal turning plate 143 is turned inwardly by the actuation means 151 and abutted against the periphery of the cap 4 to obtain a predetermined torque, and then the belt members 137, 137 are caused to travel in a tightening direction by the drive shafts 142, 142, so that the belt members 137, 137 are rotated around the periphery of the cap 4 with a relatively large contact surface created therebetween to thereby tighten the cap 4.

Note that modifications of the above actuation means shown in Figures 28 and 29 may be employed by the apparatus of the present embodiment, operation thereof is not described here.

Claims

1. A cap application and tightening apparatus for a trigger pump vessel, comprising:

a transfer unit for transferring vessels;

a first cap arrangement unit for transferring caps with nozzle each having a hose and pump portion;

a vessel delivery unit for supplying said delivered vessels transferred onto said transfer means at a predetermined pitch;

a second cap arrangement unit coupled to said first cap arrangement unit and having a chute downwardly thereof;

a cap delivery unit for supplying said caps arranged by said second cap arrangement unit at a predetermined pitch;

a mounting unit for said vessels supplied by said vessel delivery unit and said caps with nozzle;

a tightening unit for tightening said caps with nozzle mounted on said vessels by said mounting unit;

a transfer unit for transferring said vessels with said caps having tightened by said tightening unit to the outside of a machine body.

2. A cap application and tightening apparatus according to claim 1, wherein said mounting unit comprising:

a horizontal disk rotatably supported on said machine body by a shaft and having a multiplicity of placing locations for placing said vessels intermittently defined around the outside periphery thereof;

first openable and closable grip means each provided with each of said placing locations and holding the outside of said vessel;

a cap supply means lifted and lowered by the lifting and lowering means attached to said horizontal disk above said placing locations and counter provided with a suspension means for detachably supporting said caps with nozzle supplied from said cap delivery means;

a mounting member provided with the shaft of said horizontal disk above said mounting location; and

an openable and closable locking means for gripping the hose of said cap with nozzle suspended to said mounting member by said suspension means and attached by a vertically moving member.

3. A cap application and tightening apparatus according to claim 1, wherein said tightening unit comprising:

a rotating disk rotationally supported on said machine body by a shaft and having a multiplicity of placing locations intermittently defined around the outside periphery thereof for placing said vessels;

an openable and closable grip means provided with each of said placing locations for holding the outside of said vessel;

a tightening member mounted above each of said mounting locations and vertically lifted and lowered by a vertically moving means supported by said shaft;

a tightening means composed of a pair of right and left endless belt members vertically disposed at the lower portion of said tightening member and pressing the cap with nozzle of said vessel supplied from said mounting unit from the opposite sides thereof in correspondence with the upper portion of said vessel provided with said cap with nozzle supplied from said mounting unit;

an actuation means provided with said tightening member in association said tightening means for applying a contact pressure to and removing the same from the outside periphery of said cap of said vessel; and

a grip member provided with said tightening member for gripping the nozzle portion of said cap when said cap is tightened by said tightening means.

4. A cap application and tightening apparatus according to claim 1, wherein said second cap arrangement comprising:

a first receiving piece for supporting the hose of said cap with nozzle horizontally transferred from first cap arrangement unit;

a second receiving piece for supporting the nozzle portion of the pump portion of said cap with nozzle; and

a chute for arranging the attitude of said cap with nozzle from a horizontal state to a vertical state.

5. A cap application and tightening apparatus according to claim 1, wherein said cap delivery unit comprising:

a stopper provided at the terminal end of said chute for supplying one by one said caps with nozzle supplied from said second cap arrangement unit; and

a transfer means with supplying cutouts horizontally and rotatably disposed in correspondence with said stopper for transferring said caps with nozzle supplied from said stopper.

6. A cap application and tightening apparatus according to claim 1, wherein said tightening unit comprising:

a rotating disk rotatably supported on said machine body by a shaft and having a multiplicity of placing locations for placing said vessels intermittently dfined around the outside

periphery thereof;

an openable and closable grip member provided with each of said placing locations for holding the outside of said vessel;

a tightening member mounted above said mounting locations and vertically lifted and lowered by a vertically moving means supported by said shaft;

a tightening means composed of a pair of right and left endless belt members and a pair of press rings inscribed to said endless belts, said pair of the right and left endless member being vertically disposed at the lower portion of said tightening member and pressing the cap with nozzle of said vessel supplied from said mounting unit from the opposite sides thereof in correspondence with the upper portion of said vessel;

an actuation means provided with said tightening member in association with said tightening means for applying a contact pressure to and removing the same from the outside periphery of the cap of said vessel; and

a grip member provided with said tightening member for gripping the nozzle portion of said cap when said cap is tightened by said tightening means.

FIG. 1

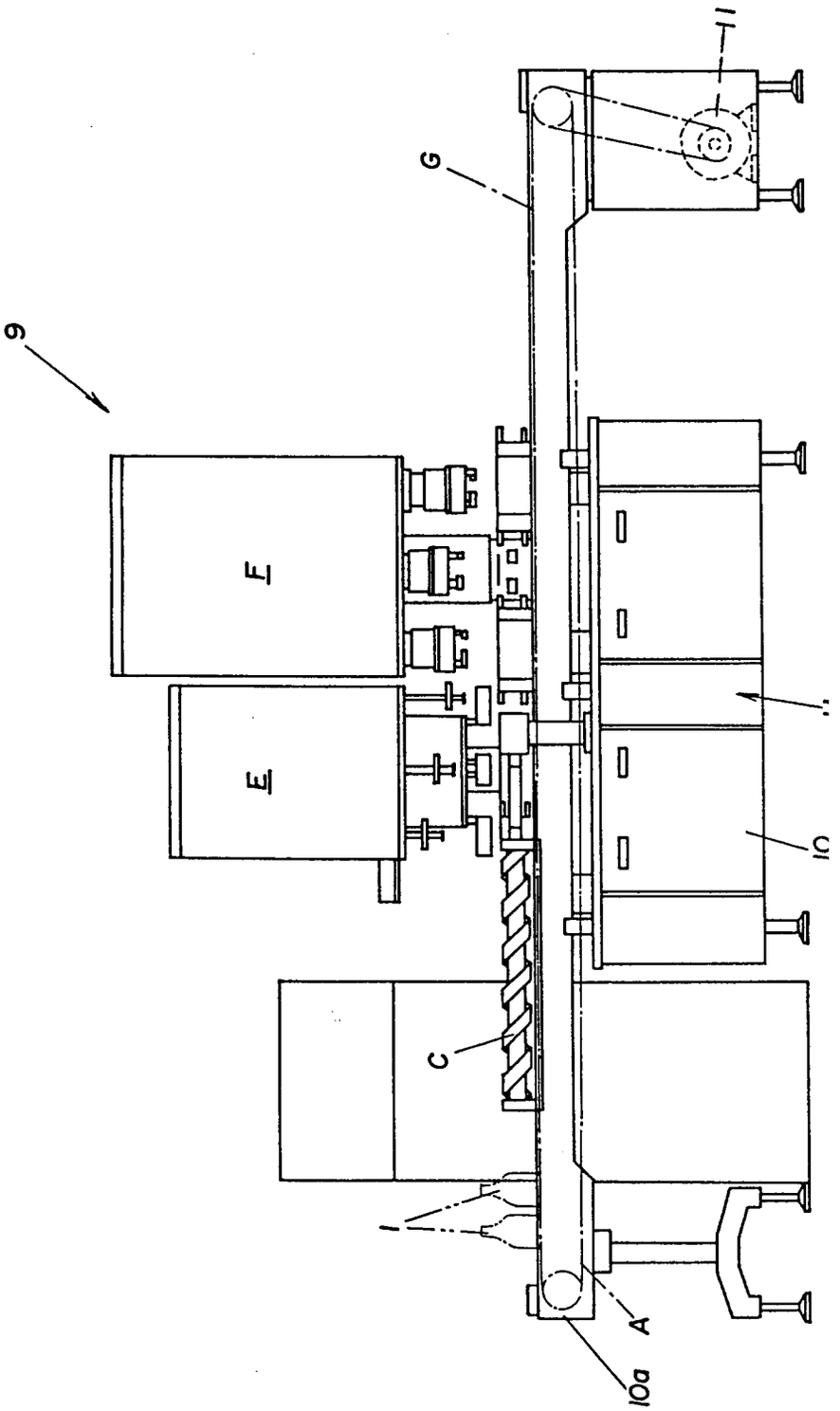


FIG.2

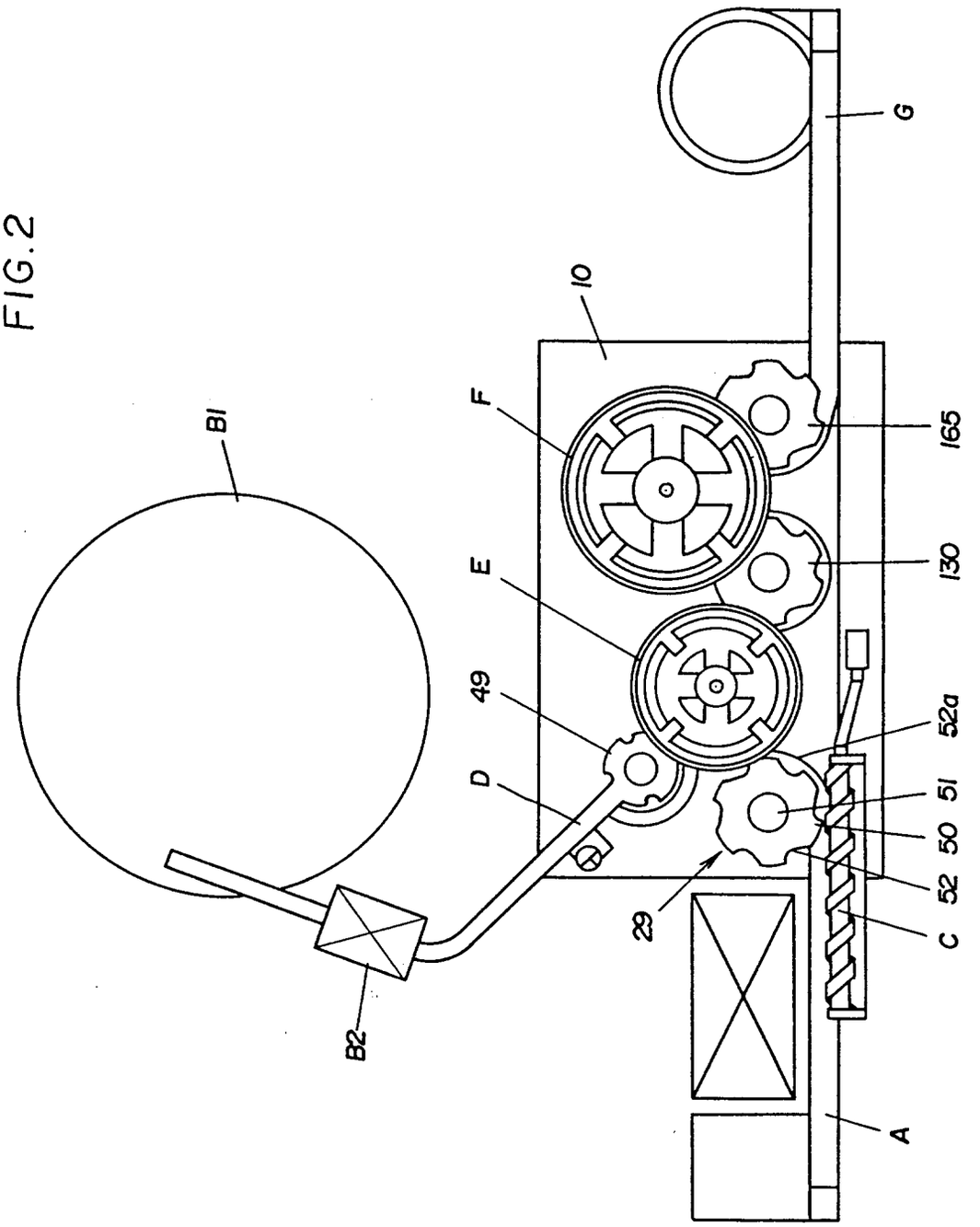


FIG.4

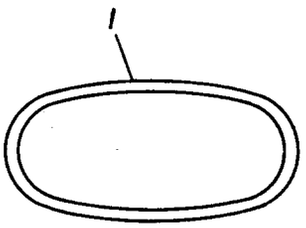


FIG.3

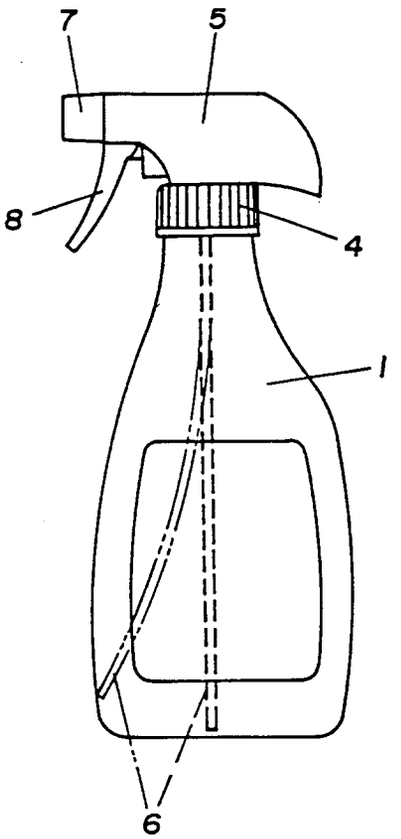


FIG.5

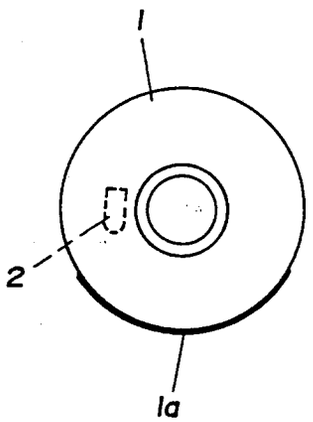


FIG.6

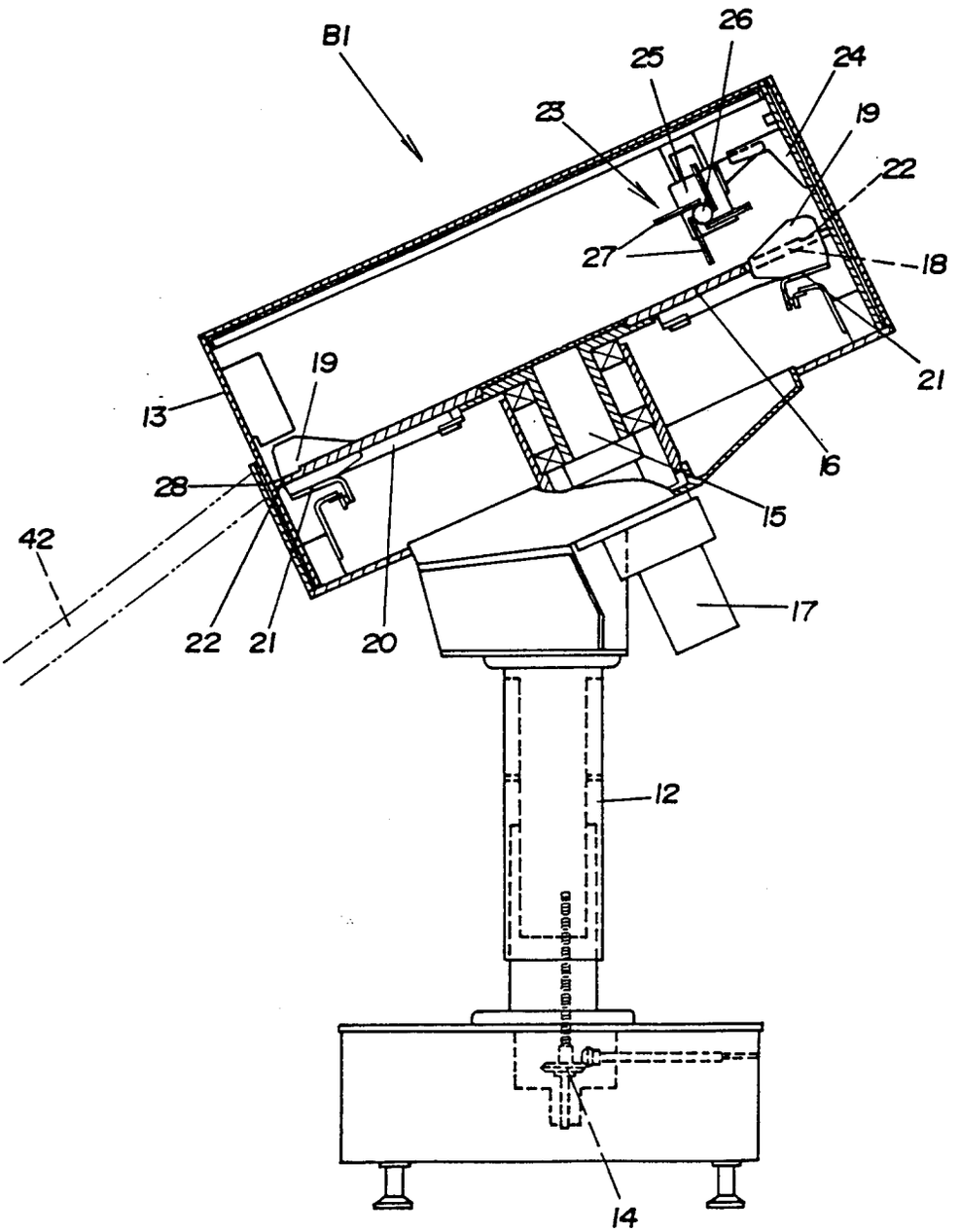


FIG.7

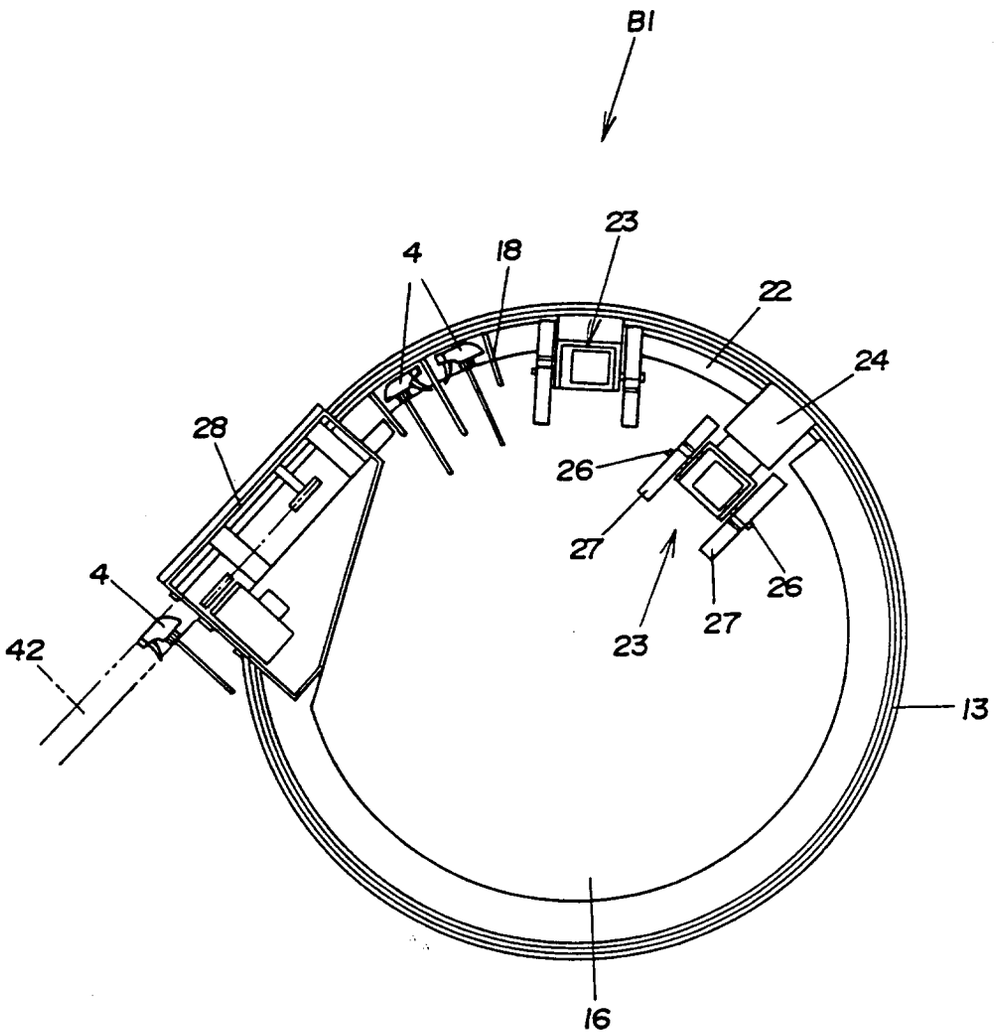


FIG.8

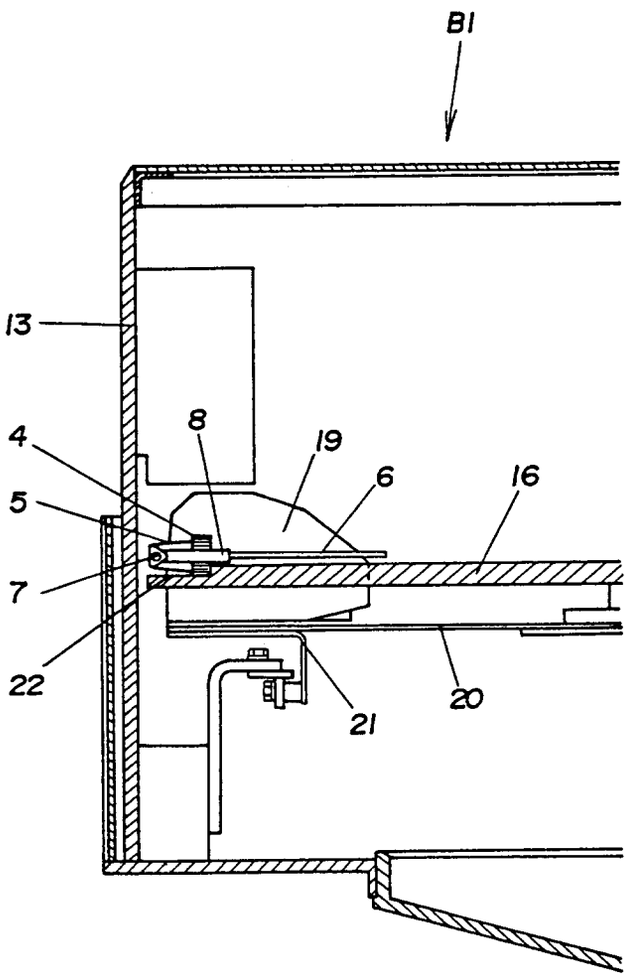


FIG.9

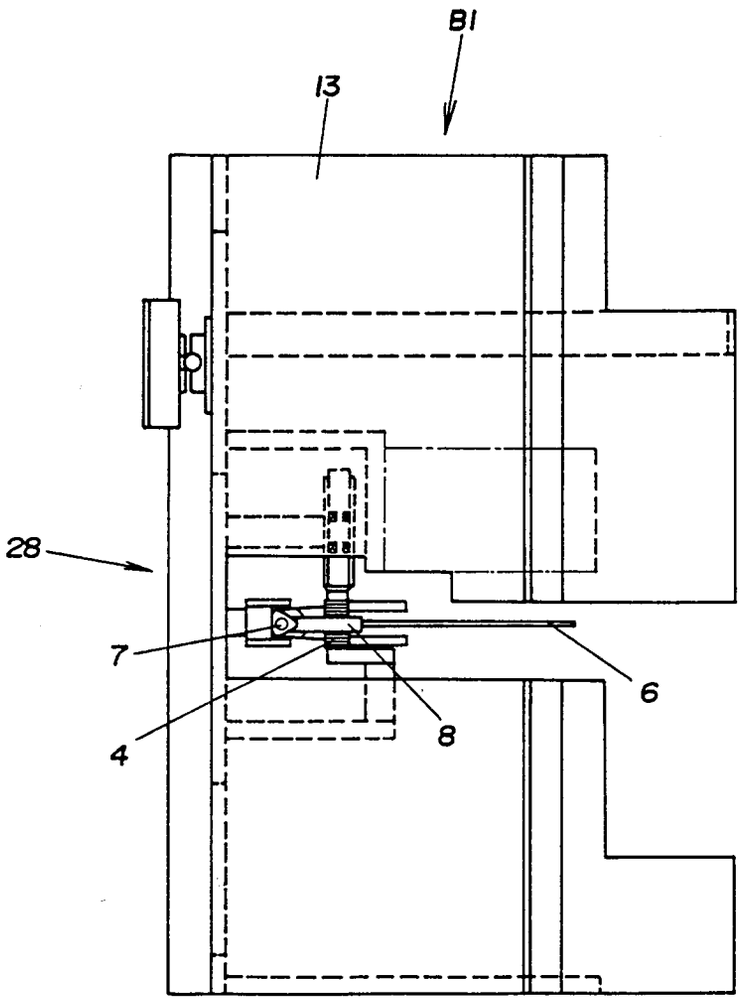


FIG.10

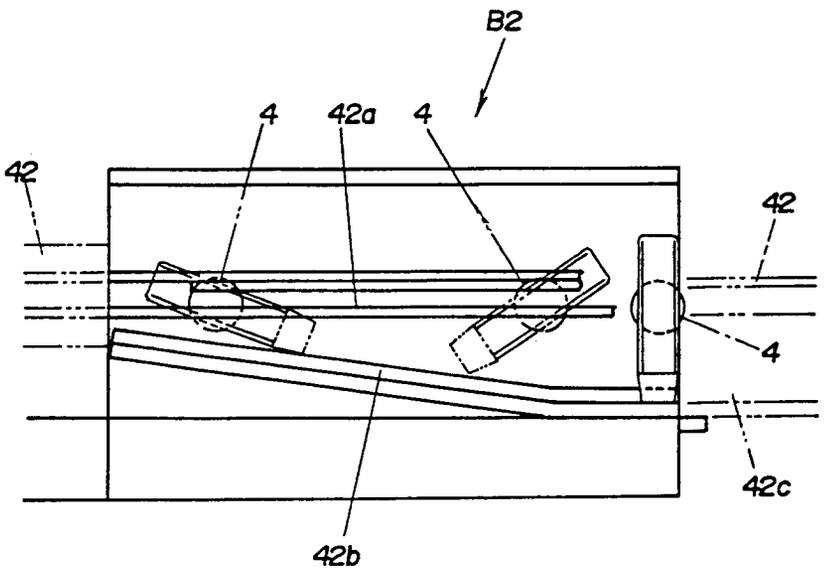
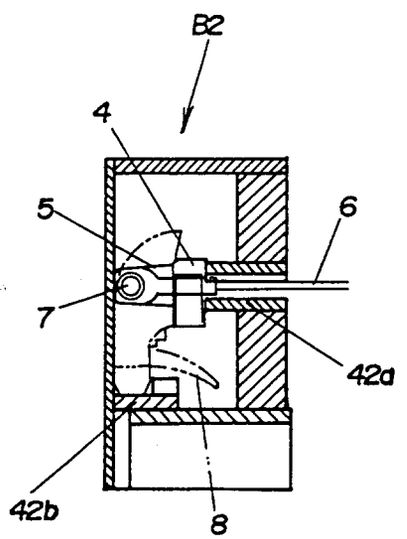


FIG.11



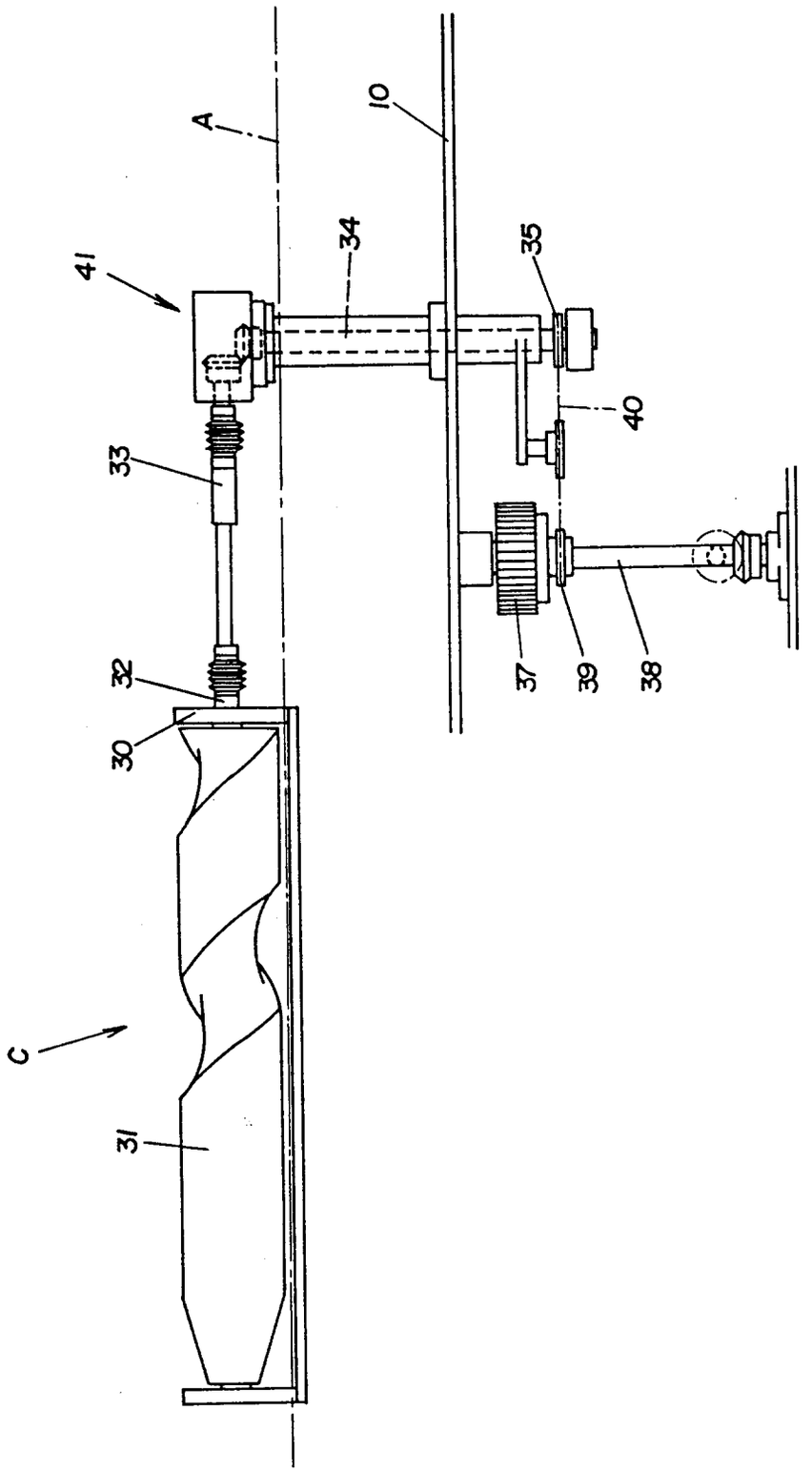


FIG.12

FIG.13

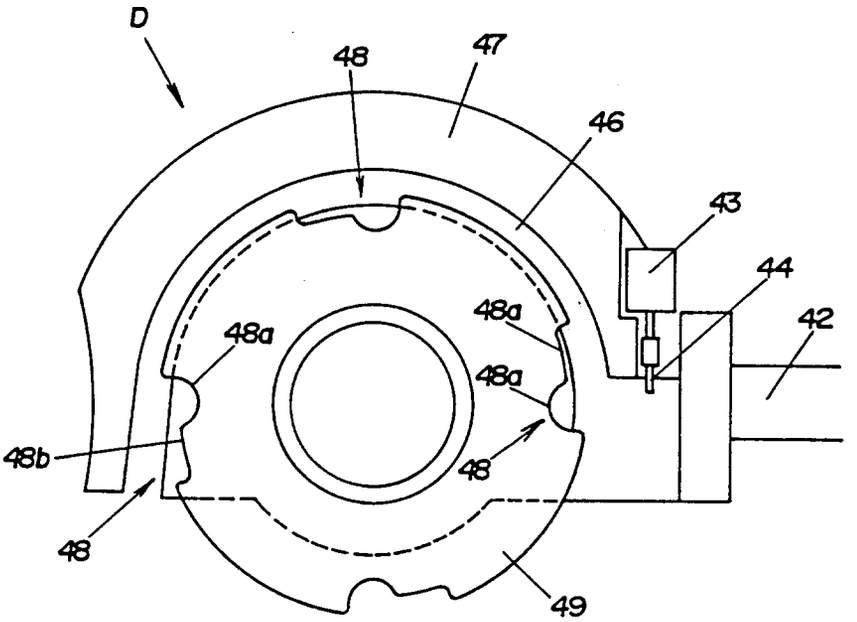


FIG.14

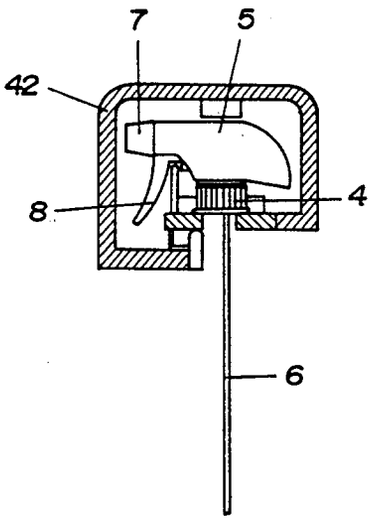


FIG.15

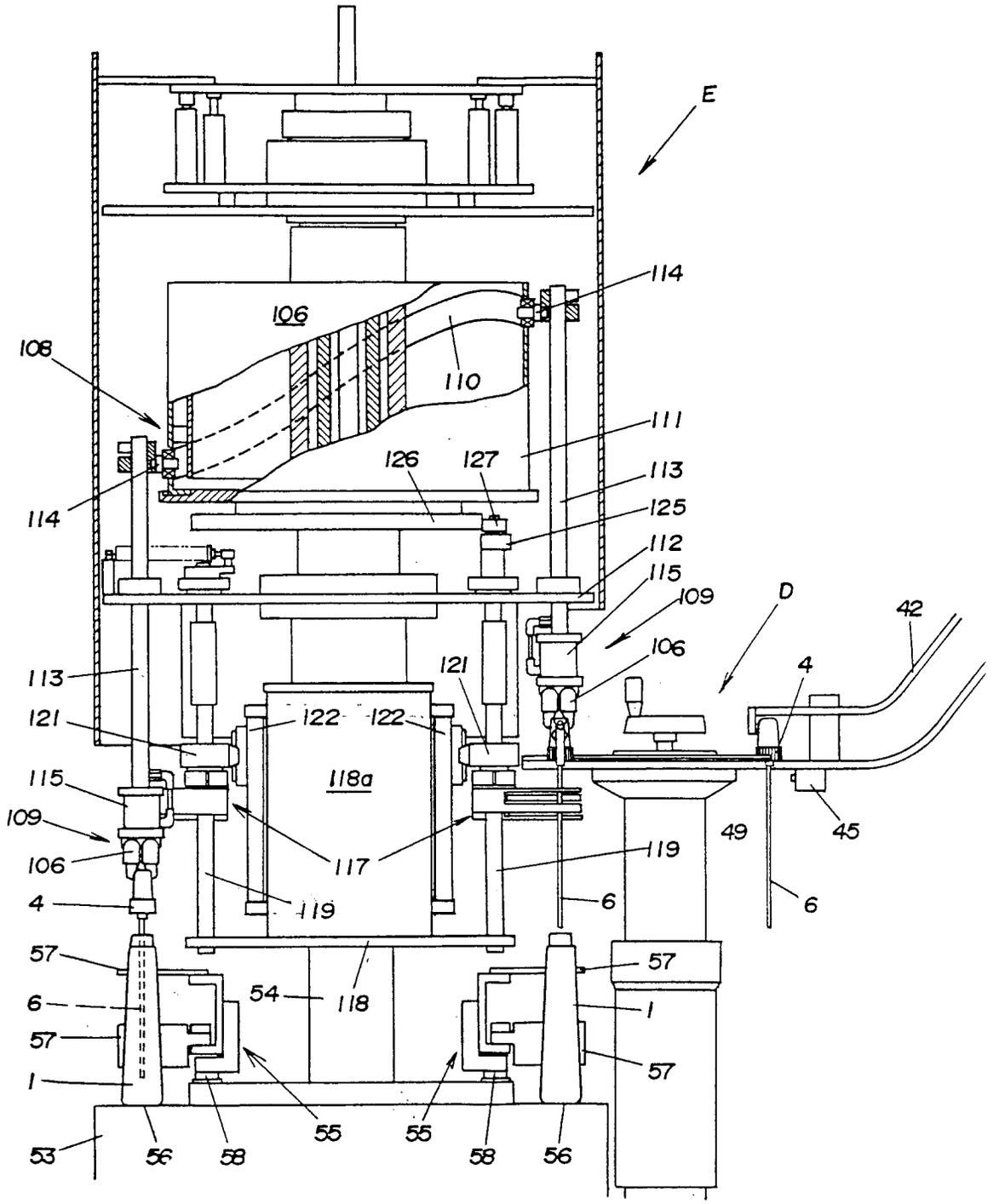

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FIG.16

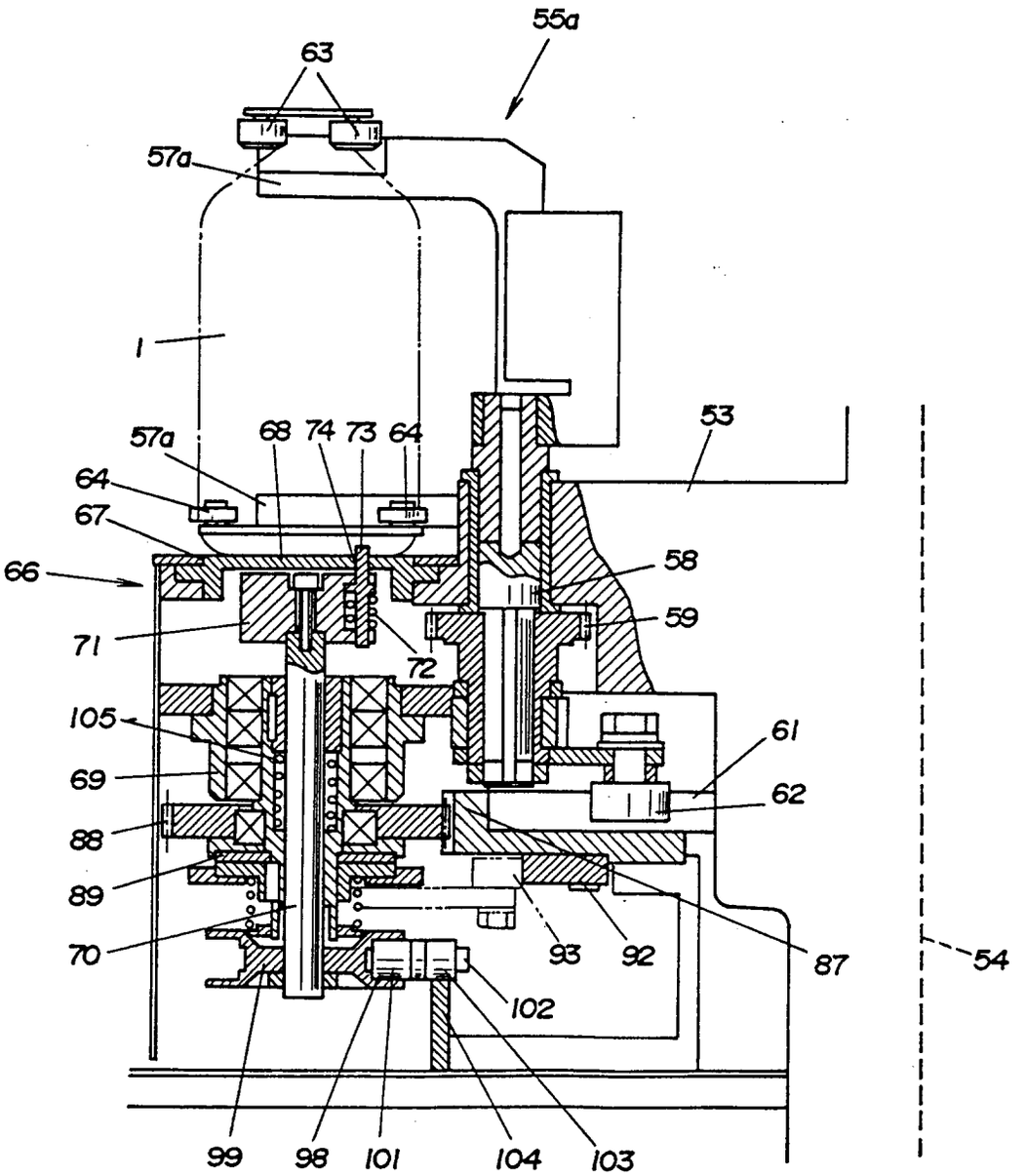
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FIG.17

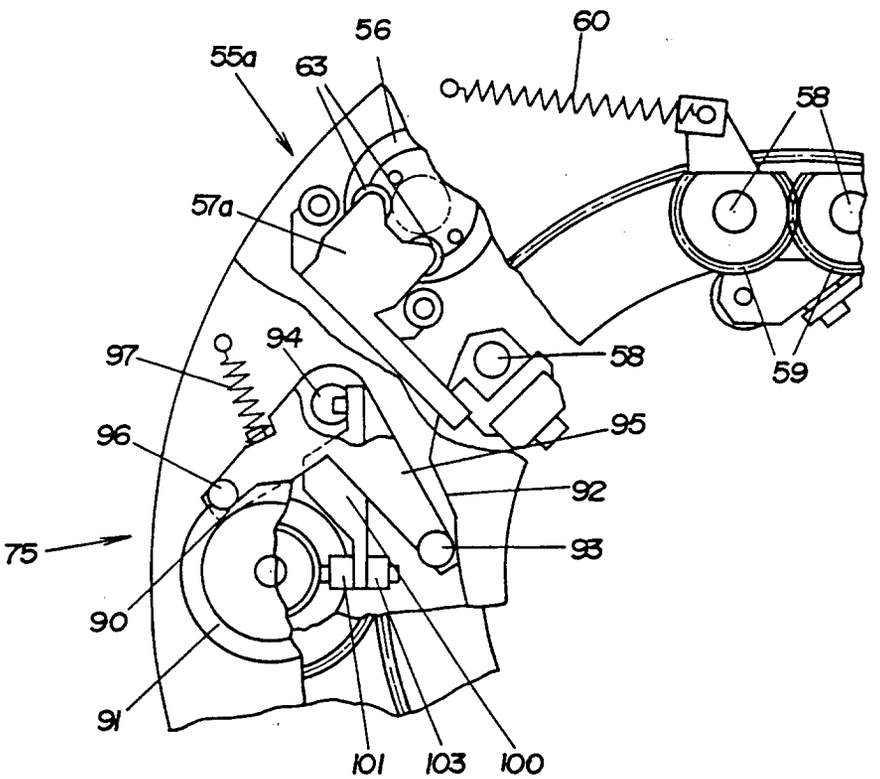

FIG.18

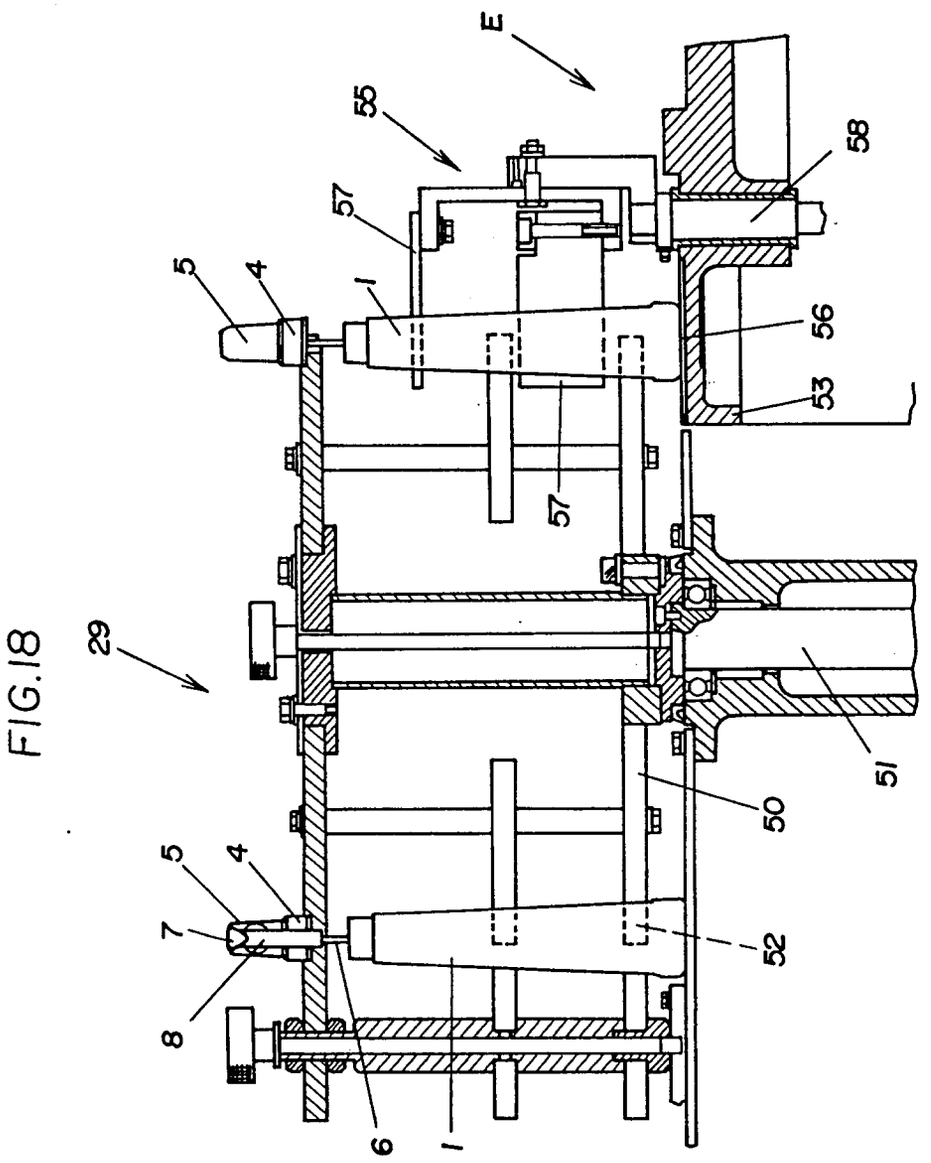

FIG.19

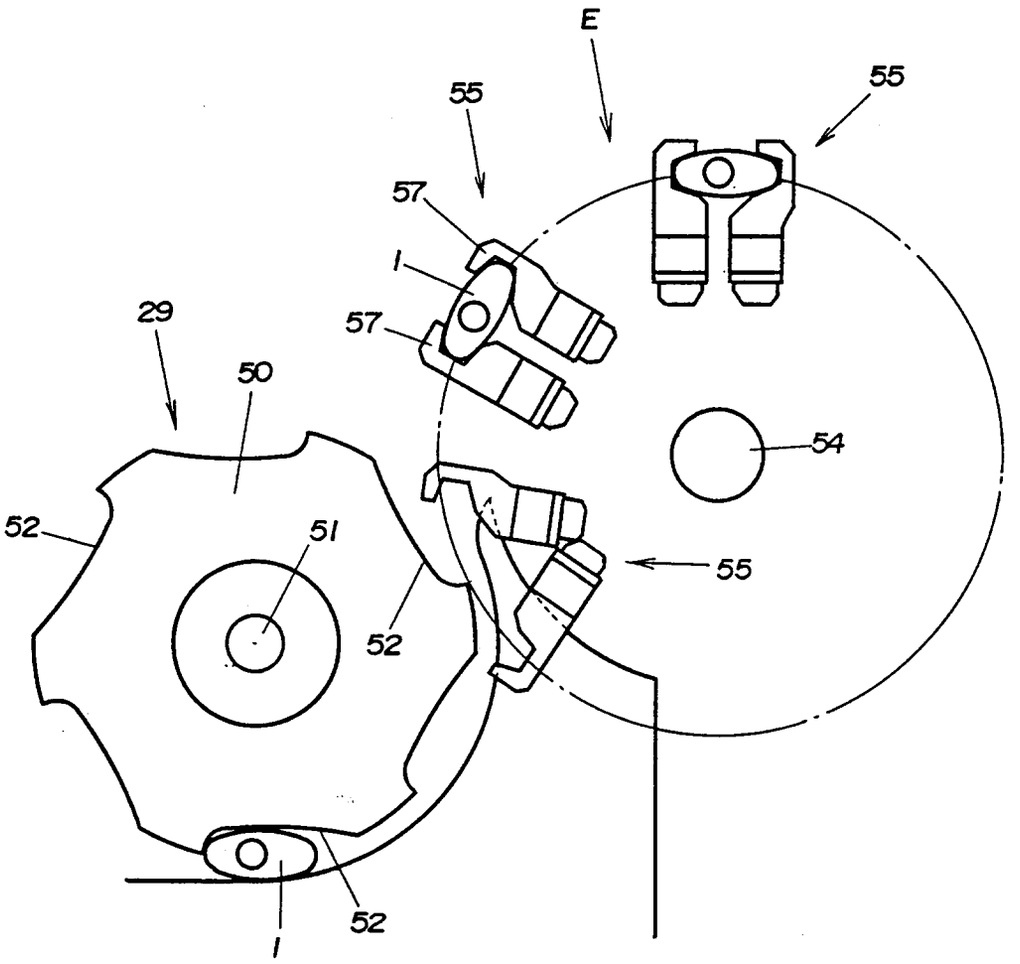

FIG.20

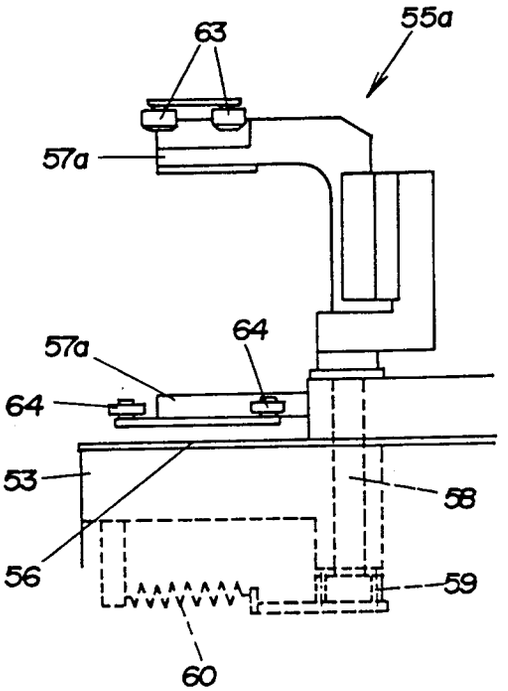

FIG.21

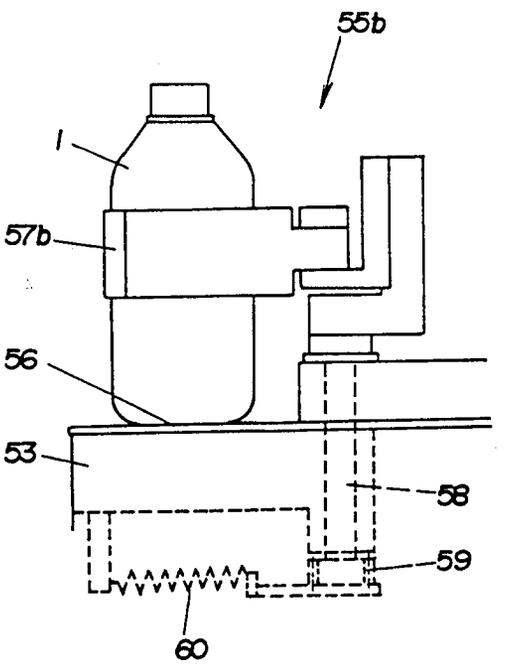

FIG.22

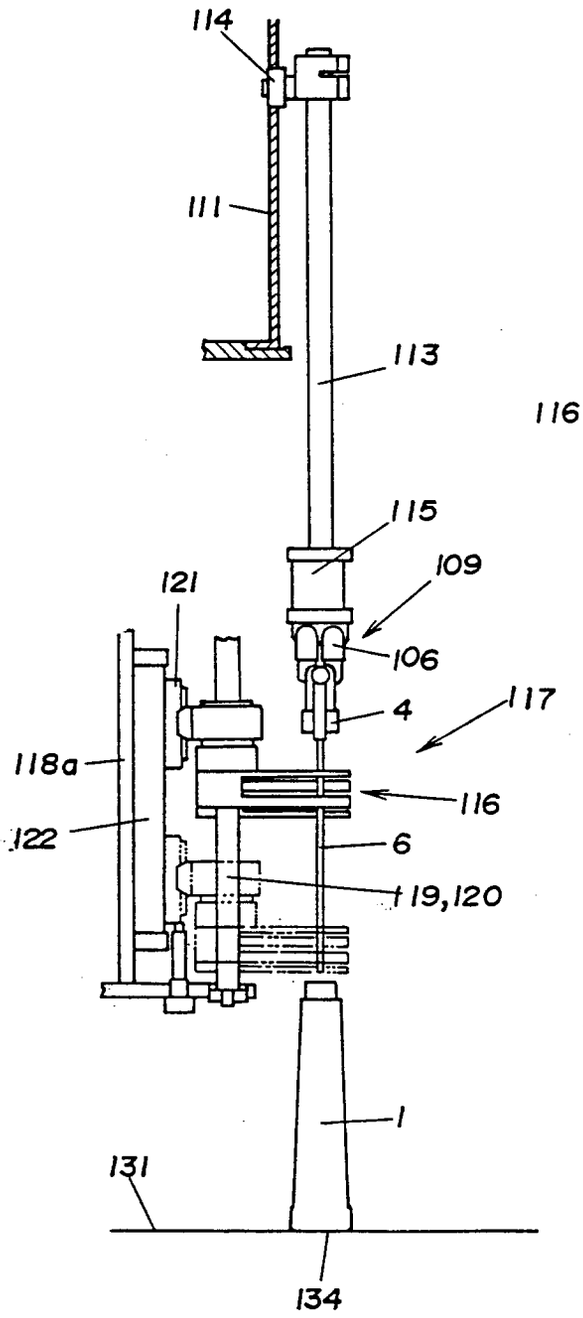

FIG.23

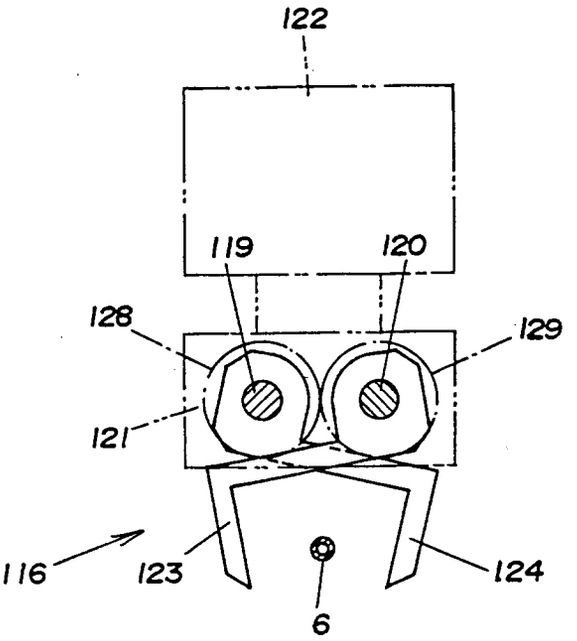

FIG.24

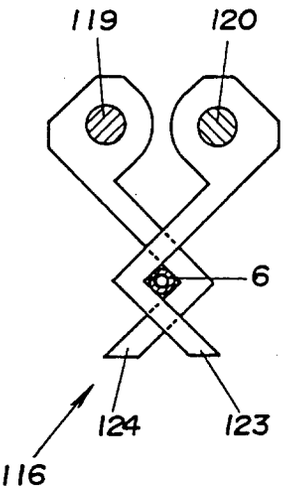

FIG.25

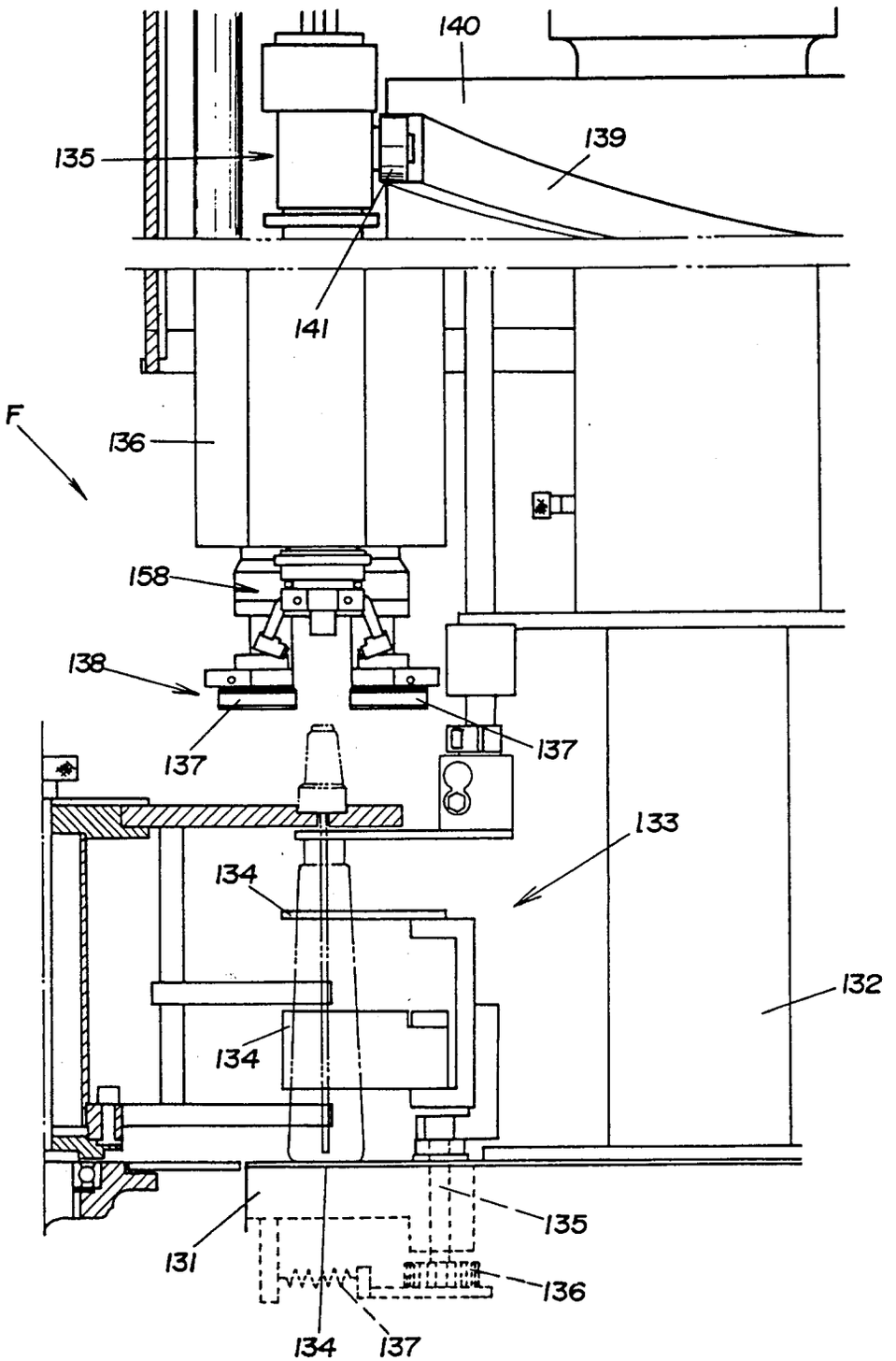
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FIG.26

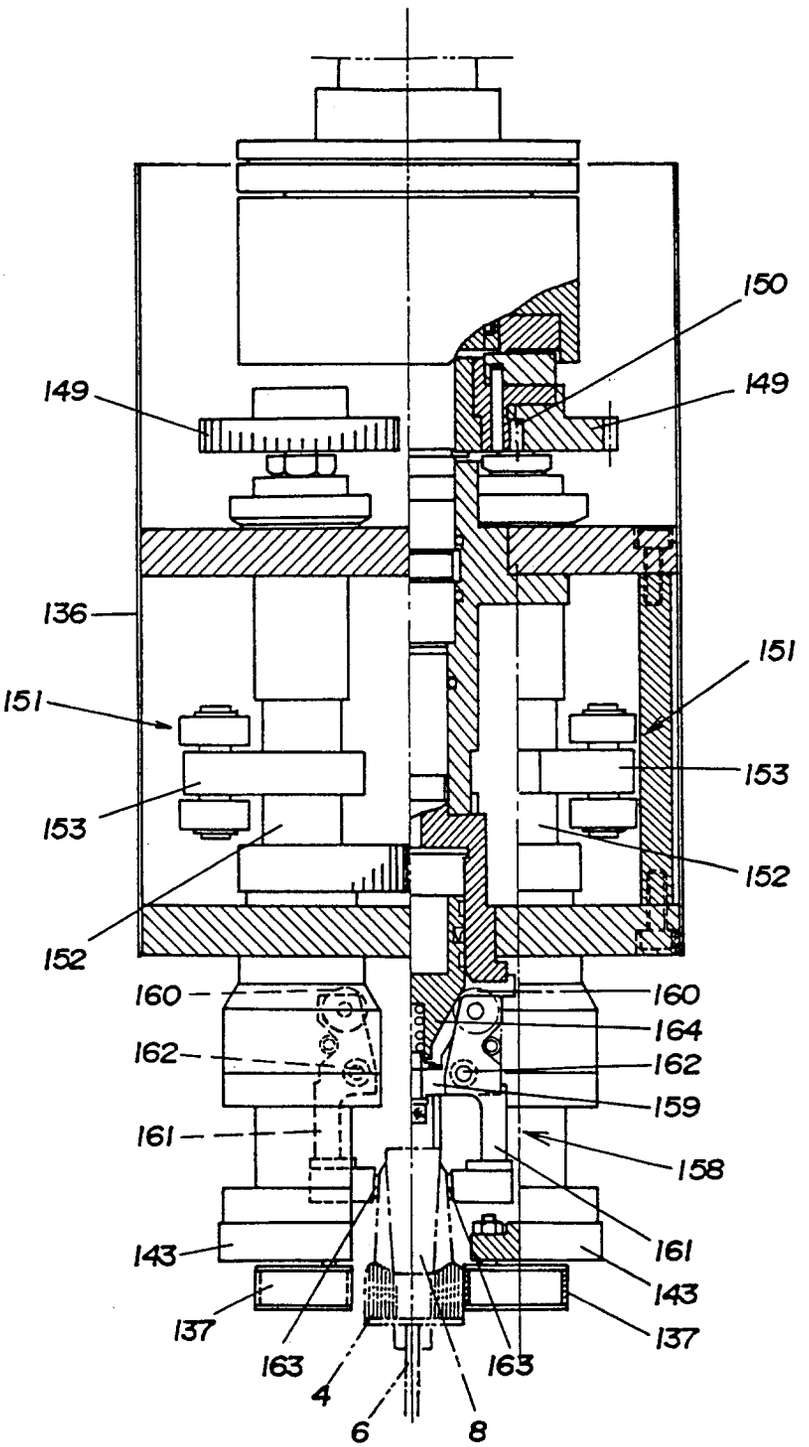
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FIG.27

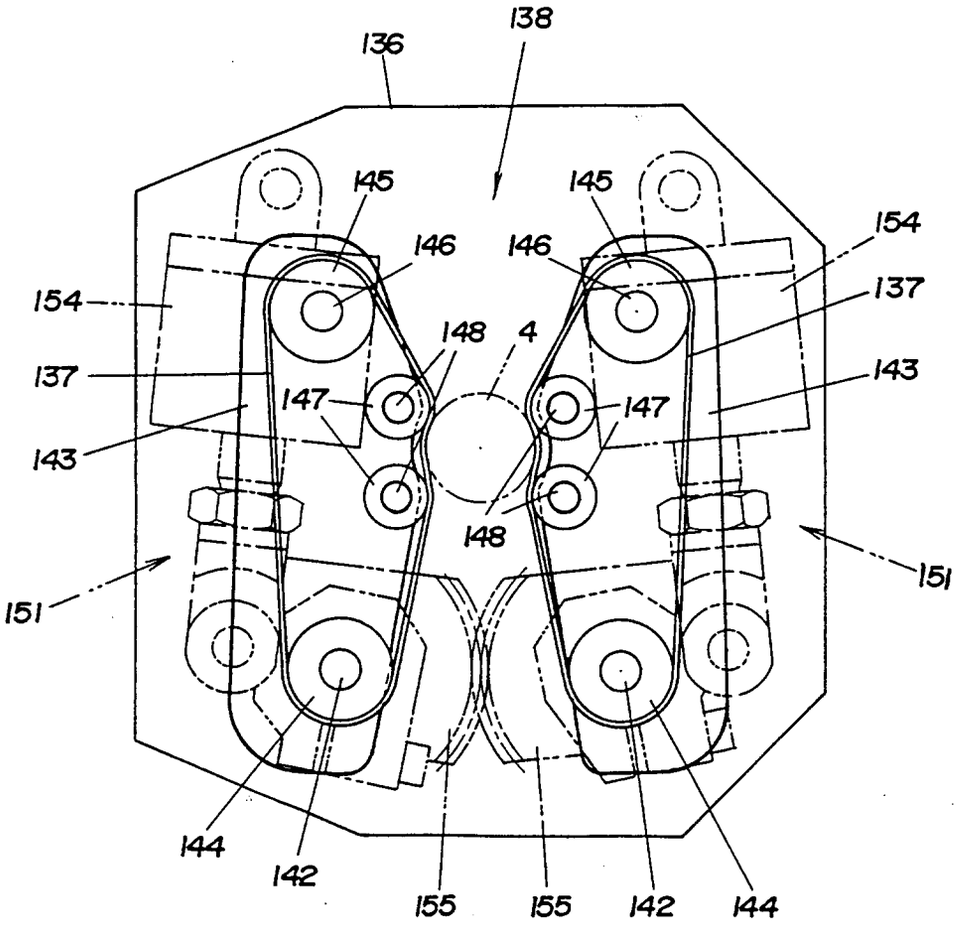
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FIG.28

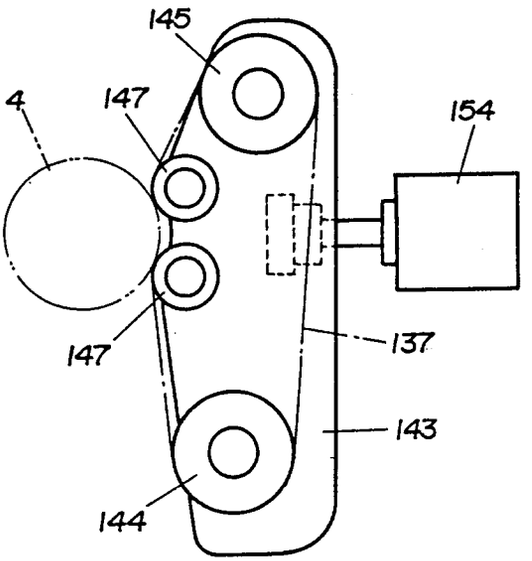
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FIG.29

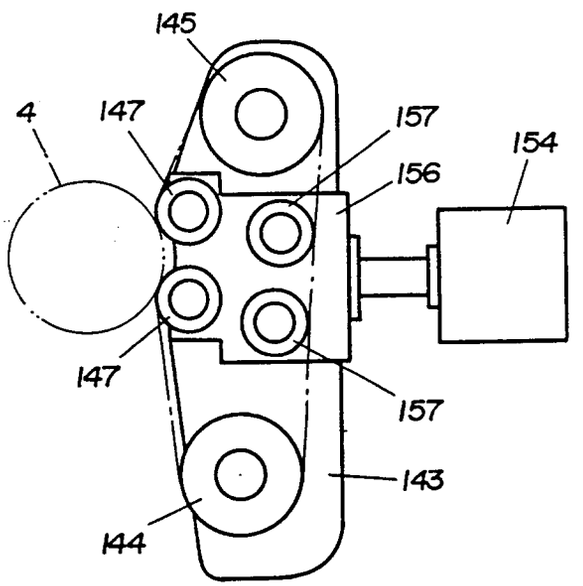
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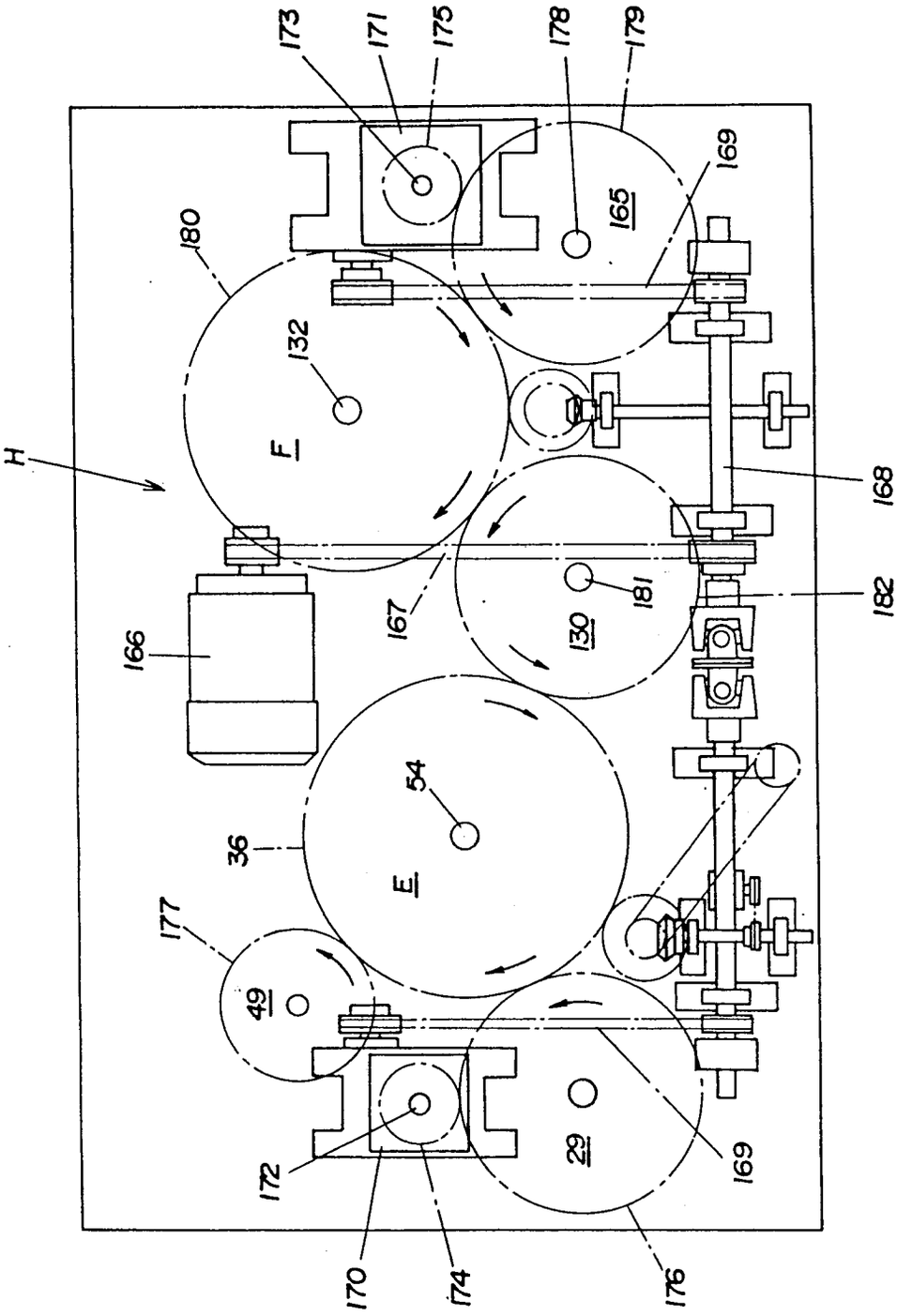
FIG.30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European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 10 4408

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.5)
A	EP-A-0 399 354 (ACMA) * the whole document *	1,2	B65B7/28
A	US-A-3 054 170 (BENICHASA) * column 1, line 61 - column 2, line 70; figure 1 *	1,5	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65B
B67B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 NOVEMBER 1992	CLAEYS H.C.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

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