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(54) Labelling machine

Etikettiermaschine

Etiqueteuse

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EP 0 624 522 B1

Description

The present invention relates to a labelling machine according to the preamble of claim 1. A labelling machine of this kind is known from US-A-5 188 696.

This invention concerns more particularly the application of the label, counter-label and a third label known as the seal or neck-band to bottles.

The label and counter-label are applied to opposite sides of the cylindrical portion of the bottle body, whereas the seal is applied to its frusto-conical part or to the cylindrical part of its neck.

These machines comprise a star feeder which feeds the bottles equidistantly spaced to at least one labelling station in which at least a label is applied. Said station is positioned along the path of an intermittently moving conveyor, which comprises means for immobilizing the bottle while simultaneously rotating it.

With said means there are associated a label feeder and a presser roller which causes the labels to adhere to the bottle. The labels used in these machines are of self-adhesive type and are provisionally fixed on a continuous web.

In the feed station the web slides along the edge of a blade which is parallel to the generatrices of that part of the bottle to which the label is to be applied, and is positioned close to it.

At the edge the web reverses its direction of movement, whereas the more rigid label continues in the same direction to position itself in front of the bottle at the disposal of the presser roller. The web moves at the peripheral speed of the bottle.

Said labelling stations are not able to apply the so-called seal to the frusto-conical part of the bottle in a sufficiently precise manner.

The seal consists of a fairly thin strip with a widened part at its centre or, rarely, a single proper seal of circular or oval shape. The plan development of the seal is therefore similar to a half moon. The seal must be applied such that when adhering to the bottle it lies perfectly centered relative to the underlying rectangular label and perfectly horizontal.

Centering is possible only if the centre line of the seal is firstly fixed, it then being necessary to delay the adhesion of the seal to the bottle until more than half of it projects beyond the blade which separates it from the web, while at the same time maintaining it as close as possible to the bottle but separated therefrom.

An object of the invention is to locate the application station for at least one label directly on the star feeder, so avoiding the need to transfer the bottle into a separate application station distant from the star.

A further object of the invention is to provide means for applying the seal in a perfectly horizontal and centered position on the frusto-conical part of a bottle or on its cylindrical neck.

A further but no less important object of the invention is to unify the application of the label and seal, and possibly of the counter-label, in a single station.

Said objects are attained according to the invention as defined in the claims by a machine provided with a star feeder the bays of which, for receiving the bottle, are provided with means, such as rollers, which enable the bottle to rotate about its axis without it sliding within the bay.

In a predetermined position in front of said bay there is provided a rubber presser and drive roller rotated by an electric motor and mounted such that it can make contact with the bottle or be spaced therefrom.

Further according to the invention, means are provided for placing the seal or neck-band in the desired position such that its central part adheres to the bottle first.

In a first embodiment of the invention, the blade which detaches the seals from their support web, and which is positioned parallel to the bottle surface, is followed in the label direction of advancement by a projecting rectangular tang on which the label already detached from the web slides without adhering to it.

Said tang has a length slightly less than one half the length of the label, and is positioned with its front edge parallel to the possibly frusto-conical surface of the bottle, at a short distance from it.

The edge of the tang is very close to, and almost coincident with, the bottle generatrix which is to receive the centre or rather the centre line of the label.

It should be noted that said generatrix is that corresponding to the centre, or centre line, of the possible underlying rectangular label fixed to the cylindrical part of the bottle.

In an alternative embodiment, which is preferred if the application of the seal or neck-band and at least one label is to be unified in a single station, the means for placing the seal or neck-band are represented by the blade which detaches the seals or neck-bands from the web, and which in this case is arranged with its axis cutting the bottle axis and with its front edge substantially horizontal.

According to a further modification, said blade can be vertically movable, this being particularly advantageous for applying round, oval or rectangular seals, ie not of half-moon shape, as are neck-bands for example.

Finally according to the invention, the means for causing the label to adhere to the conical part of the bottle is an idle frusto-conical sponge roller positioned at the end of a rotatable arm, and having a taper substantially equal to that of the bottle and its axis advantageously inclined to the bottle axis by an angle double said taper.

Alternatively said roller can be idly mounted on the shaft of the underlying rubber presser and drive roller.

The merits and operational and constructional characteristics of the invention will be more apparent from the detailed description given hereinafter with reference to the figures of the accompanying drawings, which show various embodiments thereof by way of non-limiting example.

Figure 1 is a perspective view of the invention, provided with only the means for applying the label and counter-label.

Figure 2 is a schematic plan view of the invention, provided only with a first embodiment of the means for applying the seal.

Figure 3 is a view of Figure 2 in the direction III.

Figure 4 is a perspective view of the invention, provided with the devices for applying the label, counter-label and half-moon seal.

Figure 5 is a view of Figure 4 in a different operating position.

Figure 6 is a perspective view of the invention, provided with the devices for applying the label, counter-label and a rectangular neck-band.

Figure 7 is a view of Figure 6 in another operating position.

Figures 8 to 11 are side schematic views of the invention shown in Figures 6 and 7.

Figure 12 is a section on the line XII-XII of Figure 2.

Figure 1 shows a horizontal table 1 fixed to a base 2.

The table 1 carries columns 3 supporting the bottle resting surface 4, columns 5 and 6 supporting the label and counter-label distribution stations respectively, and a bottle feed star 100.

The star consists of a horizontal circular disc 7 coplanar with the surface 4, and on which there are fixed discs 9 and 10 rigidly connected together by columns 11.

The periphery of the discs 9 and 10 comprises bays 12 with a radius at least a few millimetres greater than the radius of the bottles 33 to be fed.

The star moves stepwise, driven by a usual stepping motor, not shown, each step being of 360 degrees divided by the number of bays 12 present in the star.

The number of bays present in the star depends on the number of operating stations provided, in addition to the label application station, along the path of the star.

In proximity to the bays 12 and in a position symmetrical about the radius joining the centre of the disc to the centre of the bays there are provided idle rollers 13, the lateral surface of which projects a few millimetres beyond the edge of the relative bay 12.

The outer surface of the rollers 13 is preferably of rubber.

The bottles 33 placed in the bays therefore rest against the rollers 13 and not against the edge of the bays 12 themselves.

From the right hand side, with reference to the figure, of the table 1 there projects a support 14 connected by the arm 19 positioned below the table 1 to the pin 15, which is also fixed to the underside of the table 1.

The support 14 carries an idle shaft 16 which is supported by bearings, not visible in the figures, and on the upper part of which there is fixed a rubber-covered roller 17.

Rigid with the bottom of the support 14 there is a structure 20 connected to the base by a pneumatic cylinder-piston unit 21. The structure 20 supports an encoder 22 keyed onto the shaft 16.

On its lower part the shaft 16 carries a toothed pulley 23, which is rotated by a belt 24 driven by a usual electric motor, not shown.

On the columns 5 and 6 there are positioned a usual label distributor unit 27 and counter-label distributor unit 28 respectively, said labels being provisionally arranged on two webs 26 and 25 which pass about two blades 34 and 35 respectively so that the labels 27 and counter-labels 28 are detached when the webs slide over the front edge of said blades.

The speed of the webs is equal to the tangential speed of the roller 17.

As soon as the star halts, the cylinder-piston unit 21 operates to press the roller 17 against the bottle with a force of some tens of daN. The position of the end of the blades 34 and 35 is such that when the labels and counter-labels separate from the webs 25 and 26 they are inserted between the roller 17 and bottle 33.

Figures 2 and 3 show the machine of Figure 1 provided with only the device for applying seals.

In addition to the already described devices for transporting the bottle 33, said figures show an inclined blade 201 about which the web 202 provisionally carrying the seals 30 moves.

The blade 201 is supported by a structure 204, which is supported by the base via a telescopic column 205 and a hinge 206, and can be adjusted so as to be tangential to the frusto-conical surface of the bottle 33.

The web 202 unwinds from a reel 207, slides along the front side of the blade 201, slides about its front edge and rewinds onto a reel not visible in the figure.

The front end of the blade 201 is slightly curved, a roller 208 maintaining the web adhering to the blade before it passes about its front edge.

The roller 208 is fixed and carries at one end a right angled bracket 209 which extends beyond the edge of the blade 201.

The bracket 209 lowerly supports a tang 210 covered with antiadhesive material on which the seal 30 slides before coming into contact with the frusto-conical surface of the bottle.

The length of the bracket 209 and relative tang 210 are such that the seal projects from this latter at least by an amount sufficient to expose its central part.

Above the roller 17 there is fixed a bracket 211 supporting a column 212, to the top of which there is pivoted a shaped lever 213.

Between the bracket 211 and the end of the lever 213 there is positioned a pneumatic actuator 214.

At the other end of the lever there is provided a frusto-conical roller 18 of very soft material, such as sponge.

Figures 4 and 5 show the machine of Figure 1, provided with a second embodiment of the device for applying seals 30 of half-moon shape.

These provisionally adhere to the web 31, which is guided so that it slides over the blade 29.

This latter is supported by the machine fixed structure such that its centre axis cuts the bottle axis.

As the web passes about the lower edge of the blade 29 the seals are detached starting from their central part, and are placed on the bottle as shown in Figure 4, suspended by their ends.

On the shaft 16 above the roller 17 there is fixed a frusto-conical member 18 of soft material such as sponge.

When the seal is about to separate, the cylinder-piston unit 21 draws the support 14 towards the bottle with the result that the roller 17 and frusto-conical member 18 make contact with the bottle 33 (see Figure 5), to make the label, counter-label and seal adhere securely thereto by the rotation of the bottle about its axis.

Figures 6 to 11 show a further improvement in the machine illustrated in Figures 4 and 5.

Said improvement consists of the fact that the blade 29 can undergo vertical movement, by which seals not of half-moon shape can be applied to the cylindrical part of the bottle neck, for example to stick rectangular neck-bands to said cylindrical part.

In this improvement the distributor unit for the neck-bands 30 comprises a vertical plate 350 supported by a column 136 fixed to the base 1. From the plate 350 there projects the spindle 351 supporting the reel from which the web 31 carrying the neck-bands 30 is unwound. Said web 31 passes about the rollers 39 and 40, the blade 29, the rollers 44, 43, 42, 45 and the dragging roller 46 to pass to the recovery roller 47, all fixed to the plate 350.

The blade 29 is fixed to a plate 48 connected to the plate 350 by connecting rods 51 and 52 rotating about pins 49, 50, 54 and 55.

Rigid with the connecting rod 51 there is an appendix 520, at the end of which there is the roller 43.

A usual cylinder-piston unit 56 is connected to the plate 350 by a pin 57 and to the plate 48 by a pin 58.

The neck-band or seal 30 to be placed on a cylindrical neck as shown in Figure 6 remains attached along its entire length to the web 31. To prevent the blade 29 remaining between the top of the roller 18 and the bottle when the roller 18 (which in this case is cylindrical) presses the neck-band onto the bottle neck, the cylinder-piston unit 56 operates before the bottle begins to rotate about itself, in order to raise the blade 29 and enable the roller 18 to press the entire neck-band 30 directly against the bottle.

The operation of the cylinder-piston unit 56 also causes the appendix 520 and hence the roller 43 to rotate about the pin 54.

The length of the appendix 520 is such that the path of the web 31 between the rollers 44, 43, 42 when the blade 29 is raised is greater than this path when the blade 29 is lowered, by an amount equal to double the stroke of the blade 29. This enables the web 31 to remain taut during the raising of the blade.

Simultaneously with the separation of the neck-band 30 the roller 17 presses against the bottle 33 with a force of some tens of daN.

The position of the end of the blades 34 and 35 is such that when the labels 27 and counter-labels 28 separate from the respective webs 26 and 25 they are inserted between the roller 17 and bottle 33.

The operation of the machine illustrated in Figures 6 to 11 is described hereinafter, from which it is simple to also understand the operation of the various embodiments shown in Figures 1 to 5.

When the seal or neck-band separates from the web and its central part is pressed against the bottle neck by the roller 18, the roller 17 begins to rotate clockwise, so rotating the bottle 33 anticlockwise. The roller 18 presses the left side of the neck-band 30 against the bottle to cause it to adhere thereto.

The webs carrying the labels 27 and counter-labels 28 are at rest.

The encoder 22 is rigid with the lower part of the shaft 16.

An electronic control system equipped with a usual microprocessor begins to count the encoder pulses starting from the moment in which the roller 17 and hence the bottle 33 begin to rotate.

After the bottle has undergone a rotation of about 180 degrees the microprocessor halts the roller 18 and reverses its movement,

During this second movement the label and counter-label are fed and attached, in that the microprocessor, under the control of the encoder, drives the web carrying the label 27 such that its end begins to attach to the bottle when the angle which it still has to undergo in order to reach the initial position is equal to the angle subtended on the bottle by one half of the label.

The roller 17 then continues to rotate, to rotate the bottle through a further angle greater than 180 degrees.

During this second movement the right hand part of the neck-band 30 is also pressed against the bottle.

When the clockwise rotation has reached 180 degrees less an angle equal to that subtended by one half of the counter-label, the counter-label begins to attach to the bottle, and the rotation continues until the counter-label has completely separated and has passed below the roller 17 to be pressed against the bottle.

During the next rotation of the feed star 100, the blade 29 becomes repositioned in its lowest position.

Claims

1. A machine for applying at least one self-adhesive label to bottles, comprising means for conveying the bottles in a circular path, and a label application station comprising a blade (201, 29, 34, 35) for guiding and reversing the direction of movement of a support web from which the labels are peeled off and which converges towards a plane tangential to that surface of the bottle to which the label (30) is to be applied; characterised in that the conveying means is a spacing star feeder provided with bays, where the star bays of the feeder are defined by an envelope of idle rollers (13) projecting in such a manner as to he able

to receive a bottle under rotation without damaging it, and in that the machine comprises a bottle presser and drive roller (17) positioned at the label application station facing the bays and arranged to assume a position distant from the bottle to be labelled and a position in contact with the bottle to rotate it and to press a label against it.

2. A machine as claimed in claim 1, characterised in that said blade (201) which guides the web from which the labels are peeled off carries at its front, projecting in a position spaced from the edge guiding said web, a tang (210) covered with anti-adhesive material on which the label (30) slides after having been separated from the web.

3. A machine as claimed in claim 1, characterised in that the presser roller is connected to an electric motor controlled by a microprocessor governed by an encoder.

4. A machine as claimed in claim 1, characterised in that said application station comprises a first blade (34) guiding the web from which the labels (27) are peeled off, a second blade (35) guiding the web from which the counter-labels are peeled off, each blade converging towards a plane tangential to the cylindrical body of the bottle, and a third blade (29) guiding the web from which the seals or neck-bands (30) are peeled off, and descending from above to graze the neck of the bottle.

5. A machine according to claim 4, characterised in that the third blade (29) is carried by means able to raise it during the application of the seal or neck band (30) and to bring it again in the lower position at the end of said application.

6. A machine as claimed in claim 4, characterised in that the third blade (29) is rigid with a plate (48) connected to a fixed part of the machine by two connecting rods (51) and (52) and a cylinder-piston unit (65), by virtue of this latter the plate (48) and blade (29) being able to be arranged in a lowered position and to rise during the application of the seal or neck-band (30).

7. A machine as claimed in claim 4, characterised in that one of the connecting rods (51), (52) comprises an appendix (520), at the end of which there is a roller (43) for tensioning the web (31) carrying the seals or neck-bands (30).

8. A machine as claimed in claim 1, characterised in that said presser roller (17) is associated with an idle presser roller (18) of soft rubber such as sponge, which is arranged to come into contact with that upper region of the bottle on which the presser roller (17) does not act.

9. A machine as claimed in claim 8, characterised in that the presser roller (18) is idly mounted on the same shaft as the presser roller (17).

10. A machine as claimed in claim 8, characterised in that the presser roller (18) is mounted on a lever (213) which is independent of the presser roller (17) and by means of a cylinder-piston unit (214) can assume two positions, in one of which the roller (18) is spaced from the bottle, and in the other of which the roller (18) is in contact with the bottle.

Patentansprüche

1. Maschine zur Anbringung von wenigstens einer Selbstklebe-Etikette auf Flaschen, enthaltend Flaschentransportmitteln auf kreisförmiger Bahn und eine Etikettierstation mit einer Schaufel (201, 29, 34, 35) zur Führung und Richtungsumkehr eines Etikettenlaufbandes, von dem die Etiketten abgelöst werden und das einer Tangentialfläche der Flasche zugeleitet wird, auf der die Etikette anzubringen ist (30); dadurch gekennzeichnet, daß das Transportmittel aus einem automatischen Distanzierungs- und Zuführungsstern mit Flaschenaufnahmen besteht, die durch hervorstehende Losrollen (13) definiert sind, damit die Flasche während der Rotation ohne Beschädigung aufgenommen werden kann, und dadurch, daß die Maschine mit einem Flaschenhalter und einer Führungswalze (17) ausgestattet ist, welche in der Etikettierstation vor den Flaschenaufnahmen und so installiert ist, daß sie eine Position in einem gewissen Abstand von der zu etikettierenden Flasche und eine Position in Berührung mit der Flasche einnimmt, wodurch sie die Flasche dreht und die Etikette aufdrückt.

2. Maschine gemäß dem Patentanspruch 1, dadurch gekennzeichnet, daß die vorab genannte Schaufel (201) zur Führung des Etikettenbandes, von dem die Etiketten abgelöst werden, auf der entsprechenden Vorderseite eine in einer vom Rand der Bandführung entfernten Position hervorstehende Feder (210) trägt, die mit einem Belag aus abhäsivem Material versehen ist, auf dem die Etikette (30) nach der Ablösung vom Band gleitet.

3. Maschine gemäß Patentanspruch 1, dadurch gekennzeichnet, daß die Druckwalze an einen mikroprozessorgesteuerten und encodergeregelten E-Motor angeschlossen ist.

4. Maschine gemäß Patentanspruch 1, dadurch gekennzeichnet, daß die obengenannte Etikettierstation enthält: eine erste Schaufel (34) zur Führung des Bandes, von dem die Etiketten (27) abgelöst werden, eine zweite Schaufel (35) zur Führung des Bandes, von dem die Gegenetiketten abgelöst werden; beide Schaufeln sind konvergent zu einer Flä-

che ausgerichtet, die tangential zum zylindrischen Körper der Flasche verläuft; eine dritte Schaufel (29) zur Führung des Bandes, von dem die Schließvorrichtungen (30) oder Bünde abgelöst werden und das sich bis zur Berührung des Flaschenhalses senkt.

5. Maschine gemäß Patentanspruch 4, dadurch gekennzeichnet, daß die dritte Schaufel durch ein Mittel gestützt ist, das sie während der Anbringung der Schließvorrichtung (30) oder des Bundes hebt und nach Abschluß dieses Vorganges wieder senkt.

6. Maschine gemäß Patentanspruch 4, dadurch gekennzeichnet, daß die dritte Schaufel (29) steif mit einer Platte (48) gepaart ist, die mit einer festen Maschinenkomponente durch zwei Pleuel (51) und (52) und eine Zylinder-Kolbeneinheit (65) verbunden ist, über die die Platte (48) und die Schaufel (29) während der Anbringung der Schließvorrichtung (30) oder Bundes abgesenkt und wieder angehoben werden können.

7. Maschine gemäß Patentanspruch 4, dadurch gekennzeichnet, daß einer der zwei Pleuel (51) (52) einen Ansatz (502) hat, an dessen Ende sich eine Walze (43) zur Spannung des Bandes der Schließvorrichtungen (30) oder Bünde befindet.

8. Maschine gemäß Patentanspruch 1, dadurch gekennzeichnet, daß die obengenannte Druckwalze (17) mit einer losen Druckwalze (18) aus weichem schwammigem Gummi gepaart ist, die so angeordnet ist, daß sie mit dem oberen Flaschenbereich, auf den die Druckwalze (17) nicht einwirkt, in Berührung kommt.

9. Maschine gemäß Patentanspruch 8, dadurch gekennzeichnet, daß die Druckwalze (18) auf derselben Welle der Druckwalze (17) lose montiert ist.

10. Maschine gemäß Patentanspruch 4, dadurch gekennzeichnet, daß die Druckwalze (18) auf einem von der Druckwalze (17) unabhängigen Hebel (213) montiert ist und durch eine Zylinder-Kolbeneinheit (214) zwei Stellungen annehmen kann, in einer ist die Druckwalze (18) von der Flasche abgehoben, in der anderen steht die Druckwalze (18) mit der Flasche in Berührung.

Revendications

1. Machine pour appliquer au moins une étiquette auto-adhésive à des bouteilles, comprenant des moyens pour amener les bouteilles, dans un trajet circulaire, et un poste d'application d'étiquettes comprenant une lame (201, 29, 34, 35) pour guider et inverser la direction du mouvement d'une bande support à partir de laquelle les étiquettes sont arrachées et qui converge en direction d'un plan tangentiel à cette surface de la bouteille sur laquelle l'étiquette (30) doit être appliquée, ladite machine étant caractérisée en ce que les moyens de convoyage sont constitués par un mécanisme d'approvisionnement et d'espacement en étoile comportant des renfoncements, où les renfoncements de l'étoile du mécanisme d'approvisionnement sont définis par une enveloppe de rouleaux fous (13) faisant saillie de telle façon qu'ils sont susceptibles de recevoir une bouteille qui tourne sans l'endommager, et en ce que la machine comprend un mécanisme presseur de bouteille et un rouleau d'entraînement 17 positionnés au poste d'application d'étiquette en faisant face au renfoncement et étant disposés de façon à occuper une position distante de la bouteille à étiqueter et une position en contact avec la bouteille pour l'entraîner en rotation et presser une étiquette contre elle.

2. Machine selon la revendication 1, caractérisée en ce que ladite lame (201) qui guide la feuille à partir de laquelle les étiquettes sont arrachées porte sur son devant, faisant saillie dans une position écartée de l'arête qui guide ladite feuille, une languette (210) recouverte d'un matériau anti-adhésif sur laquelle l'étiquette (30) glisse après avoir été séparée de la feuille.

3. Machine selon la revendication 1, caractérisée eu ce que le rouleau presseur est relié à un moteur électrique commandé par un microprocesseur contrôlé par un encodeur.

4. Machine selon la revendication 1, caractérisée en ce que ledit poste d'application comprend une première lame (34) guidant la feuille à partir de laquelle les étiquettes (27) sont arrachées, une seconde lame (35) guidant la feuille à partir de laquelle les contre-étiquettes sont arrachées, chaque lame convergeant en direction d'un plan tangentiel au corps cylindrique de la bouteille, et une troisième lame (29) guidant la feuille à partir de laquelle les sceaux ou bandes de col (30) sont arrachés et qui vient en descendant par dessus pour venir tangenter le col de la bouteille.

5. Machine selon la revendication 4, caractérisée en ce que la troisième lame (29) est portée par des moyens susceptibles de la soulever lors de l'application du sceau ou de la bande de col (30) et de l'amener à nouveau dans la position inférieure à la fin de ladite application.

6. Machine selon la revendication 4, caractérisée en ce que la troisième lame (29) est solidaire d'une plaque (48) reliée à une partie fixe de la machine par deux tiges de liaison (51) (52) et une unité cylindre-piston (65) par le moyen de laquelle la plaque (48)

et la lame (29) sont susceptibles d'être amenées dans une position abaissée et de se soulever lors de l'application du sceau ou de la bande de col (30).

7. Machine selon la revendication 4, caractérisée en ce que l'une des tiges de liaison (51) (52) comporte un appendice (520) à l'extrémité duquel se trouve un rouleau (43) pour la mise sous tension de la bande (31) qui porte les sceaux ou bandes de col (30).

8. Machine selon la revendication 1, caractérisée en ce que ledit rouleau presseur (17) est associé à un rouleau presseur fou (18) de caoutchouc mou tel qu'une éponge, lequel est disposé de façon à venir en contact avec cette partie supérieure de la bouteille sur laquelle le rouleau presseur (17) n'agit pas.

9. Machine selon la revendication 8, caractérisée en ce que le rouleau presseur (18) est monté fou sur le même arbre que le rouleau presseur (17).

10. Machine selon la revendication 8, caractérisée en ce que le rouleau presseur (18) est monté sur un levier (213) qui est indépendant du rouleau presseur (17) et, par le moyen d'une unité cylindre-piston (214), peut prendre deux positions, la première dans laquelle le rouleau (18) est espacé de la bouteille, et la seconde dans laquelle le rouleau (18) est contact avec la bouteille.

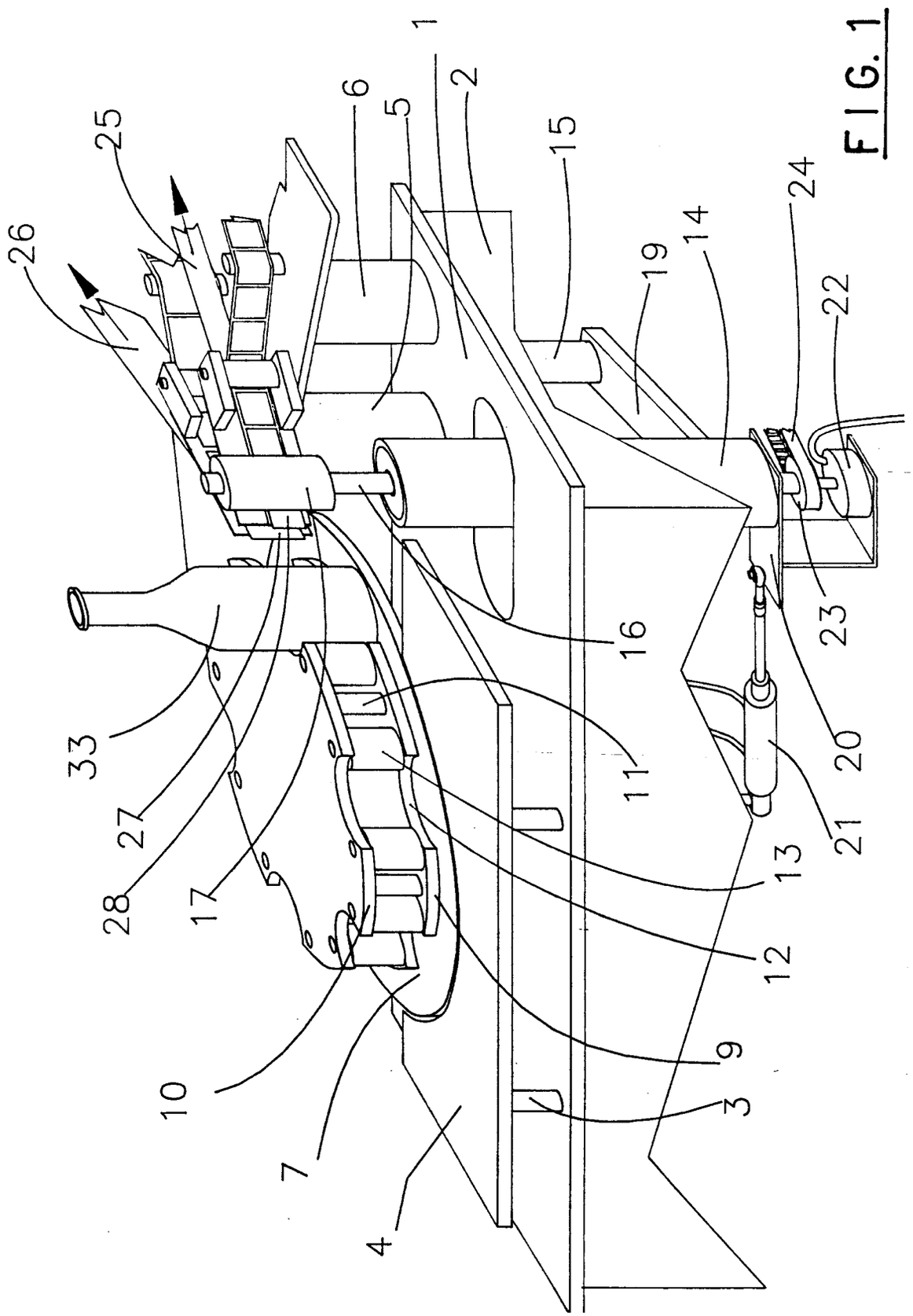


FIG. 1

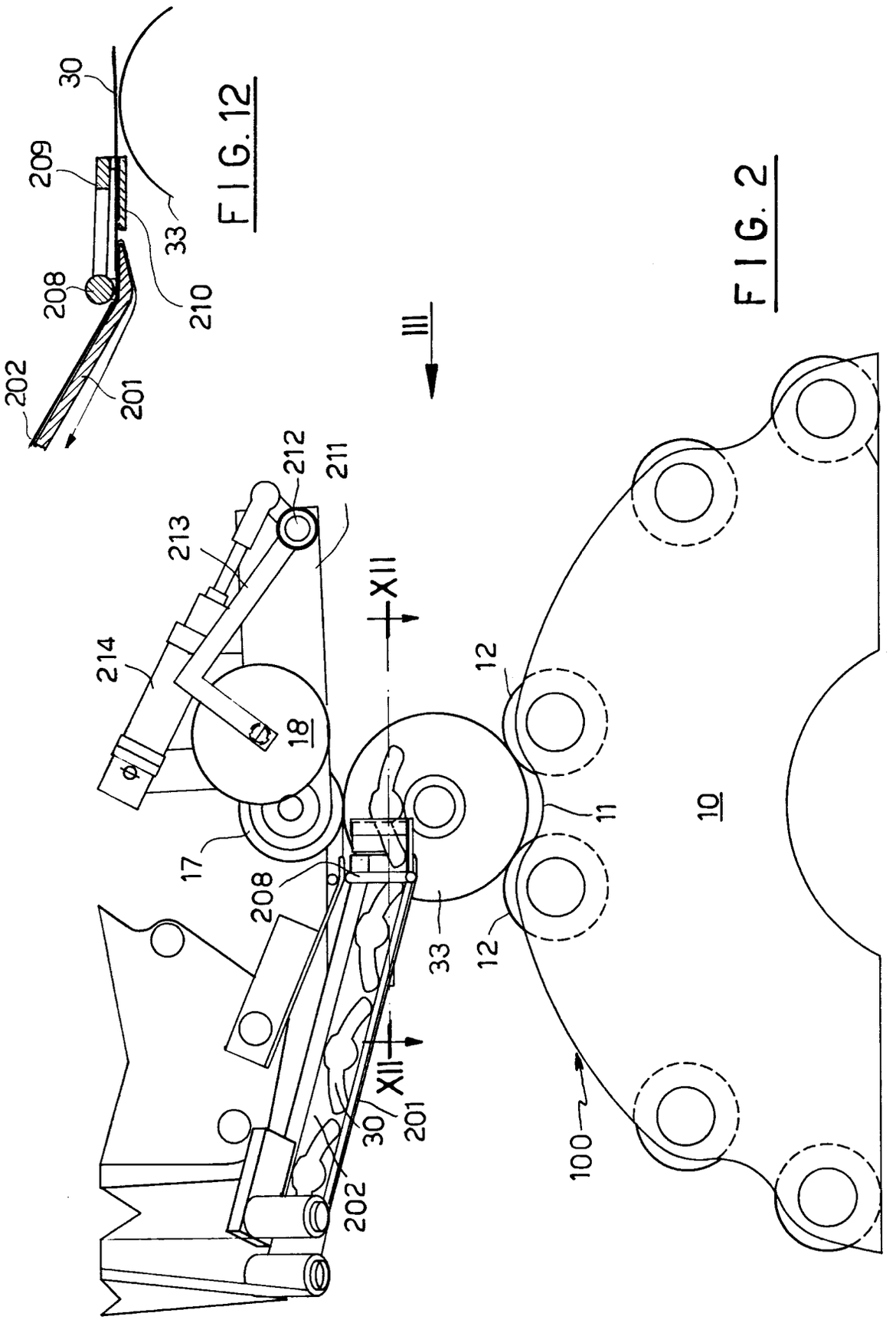
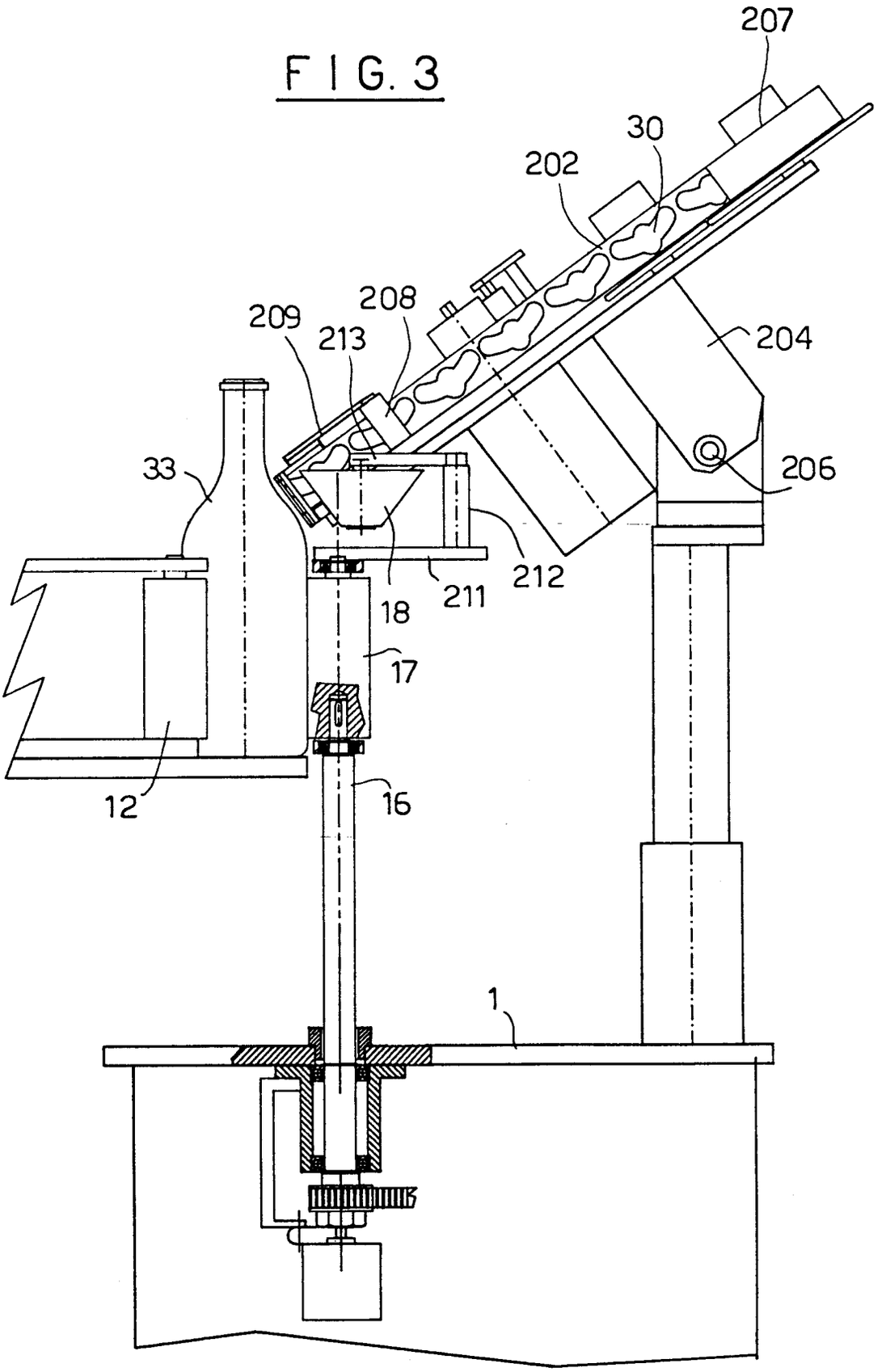

30
209
208
210
33
202
201
212
211
213
214
18
17
208
33
12
12
11
10
100
III
XII
XII
30
201
202

FIG.12

FIG.2

FIG. 3



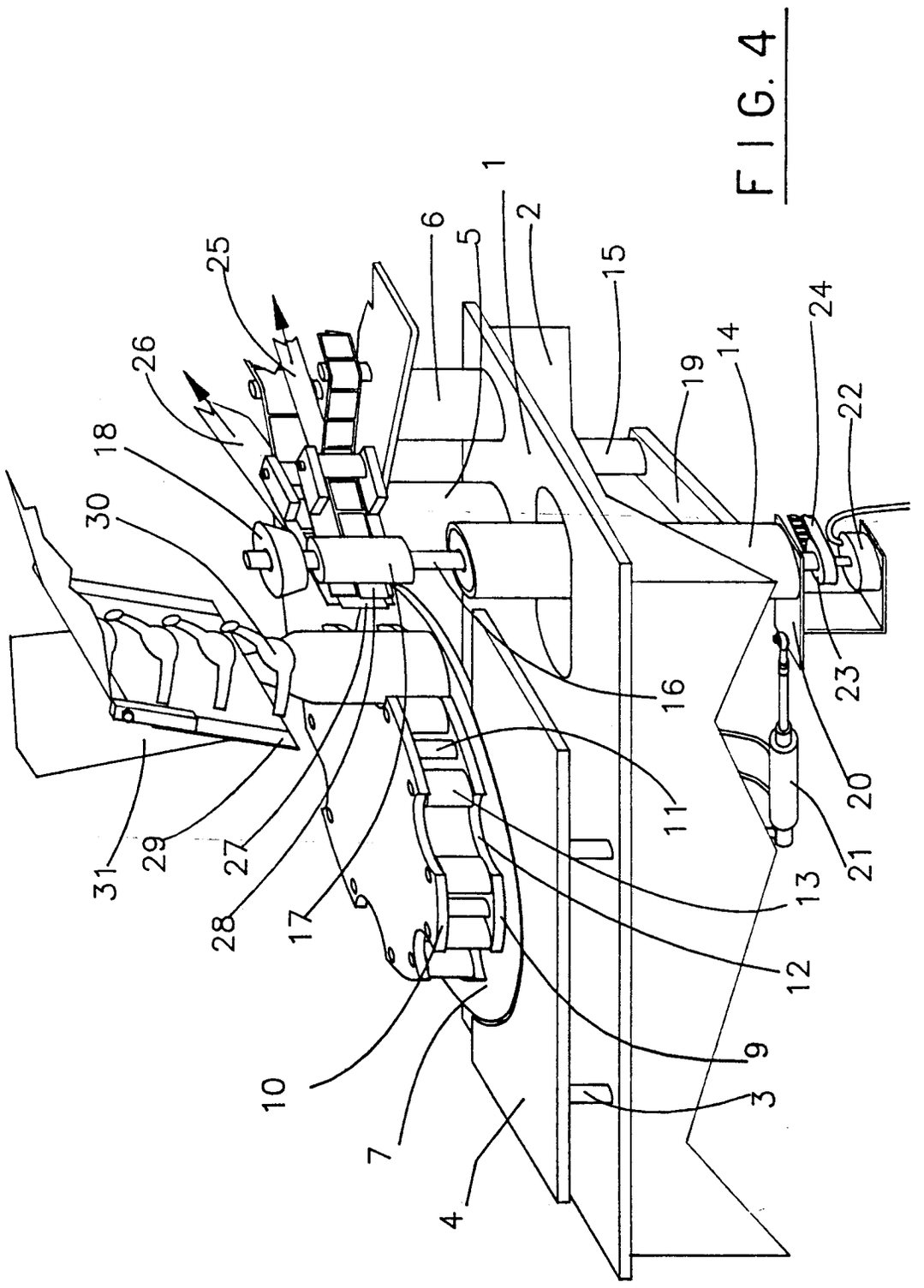

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FIG. 4

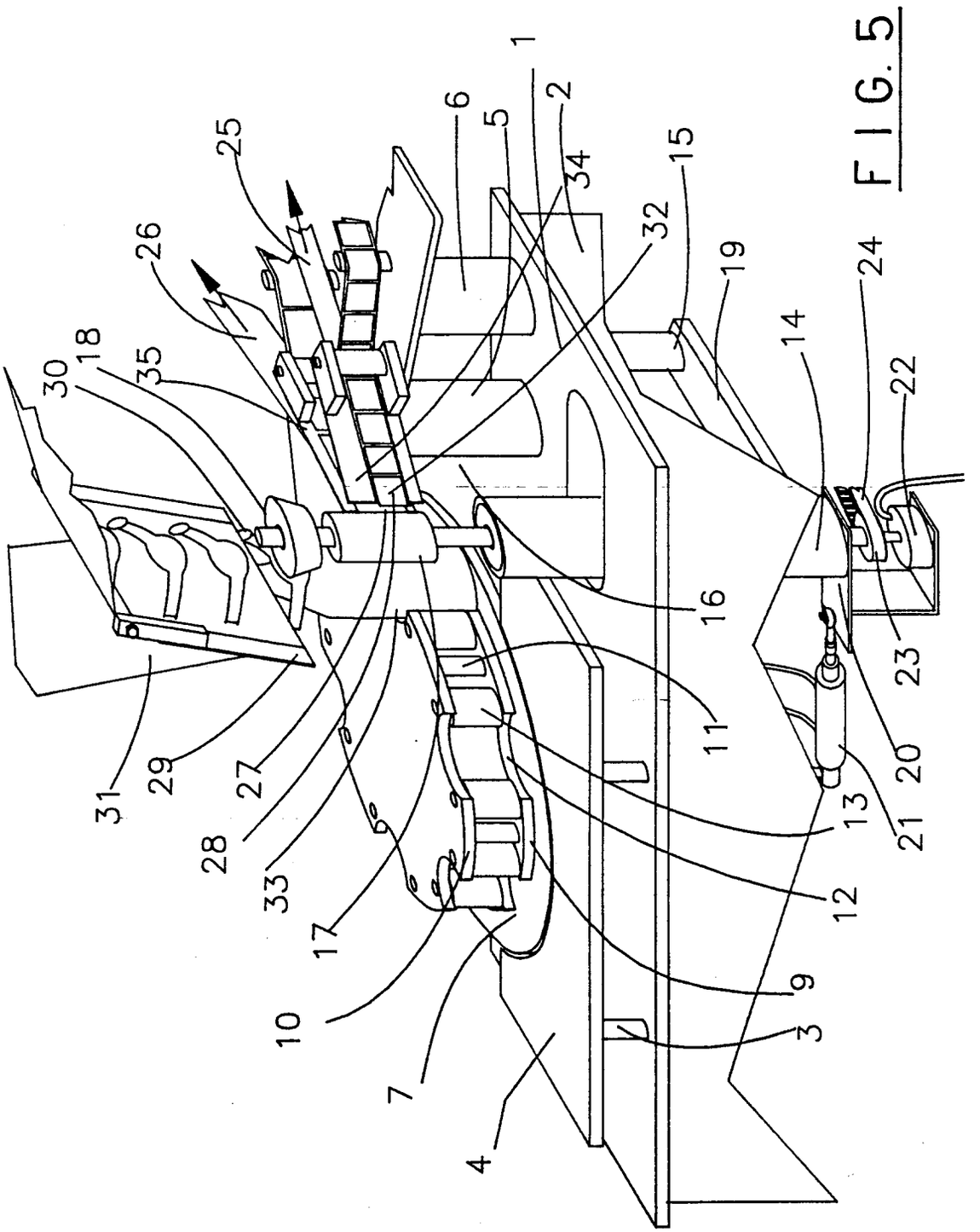

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FIG. 5

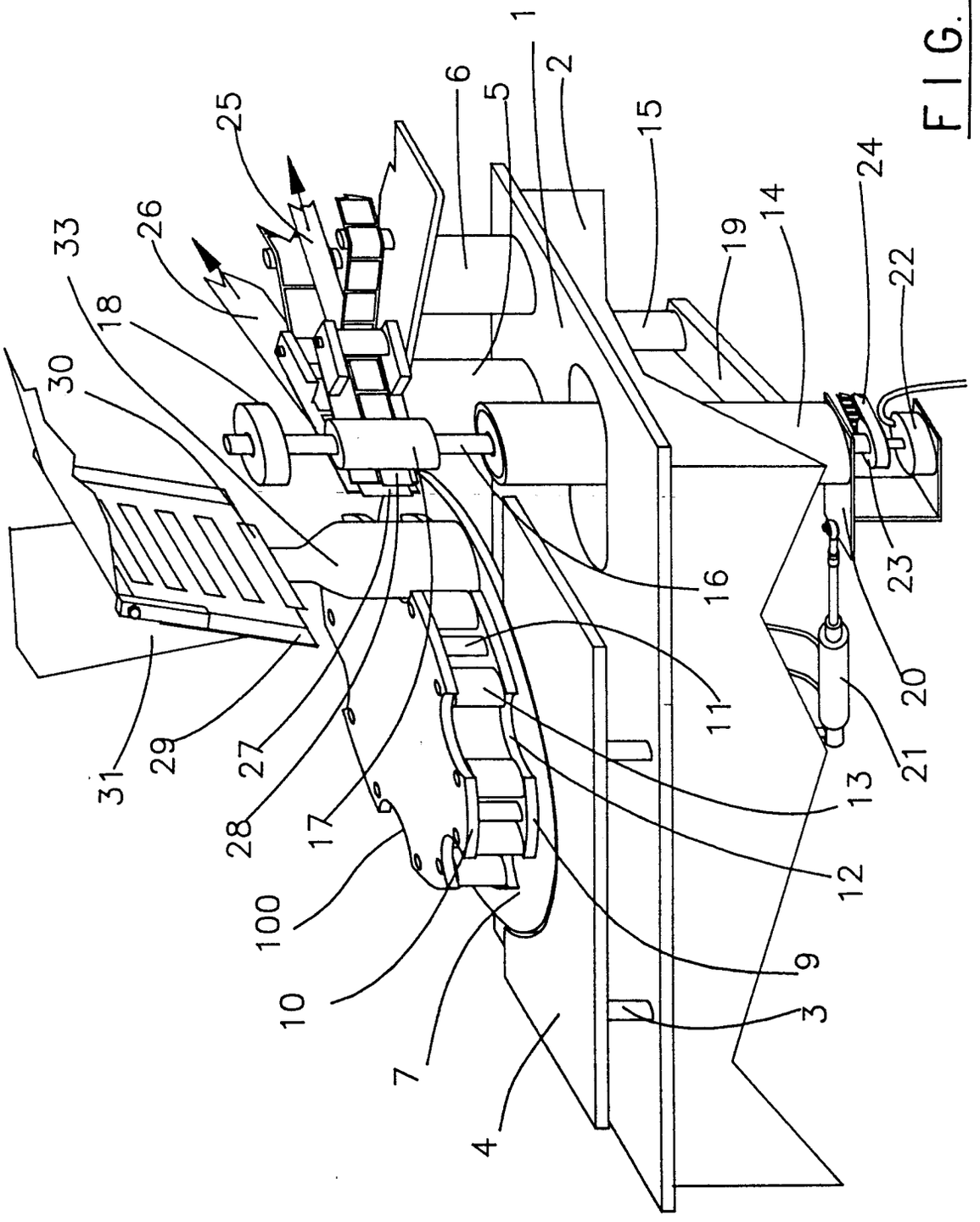

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FIG. 6

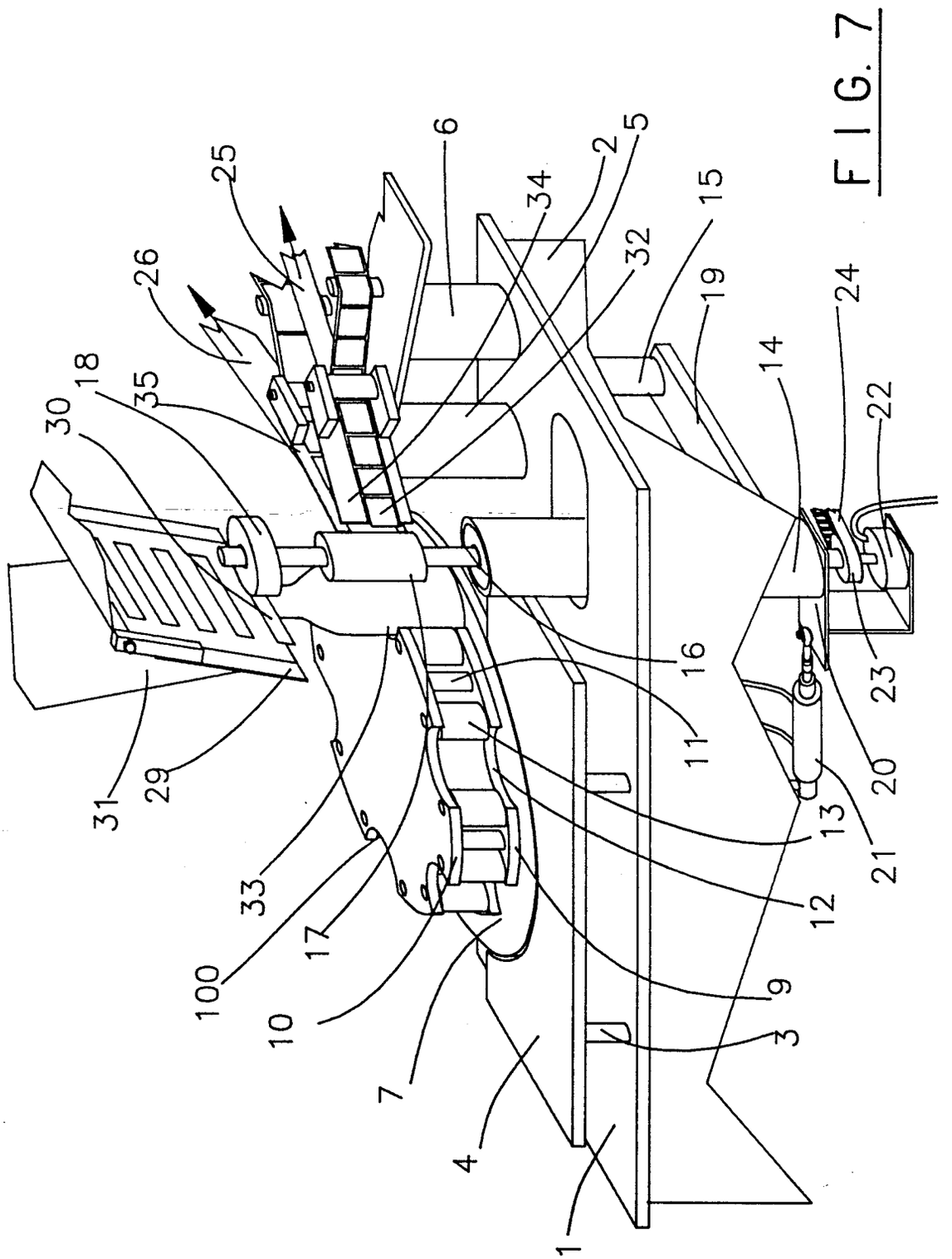

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FIG. 7

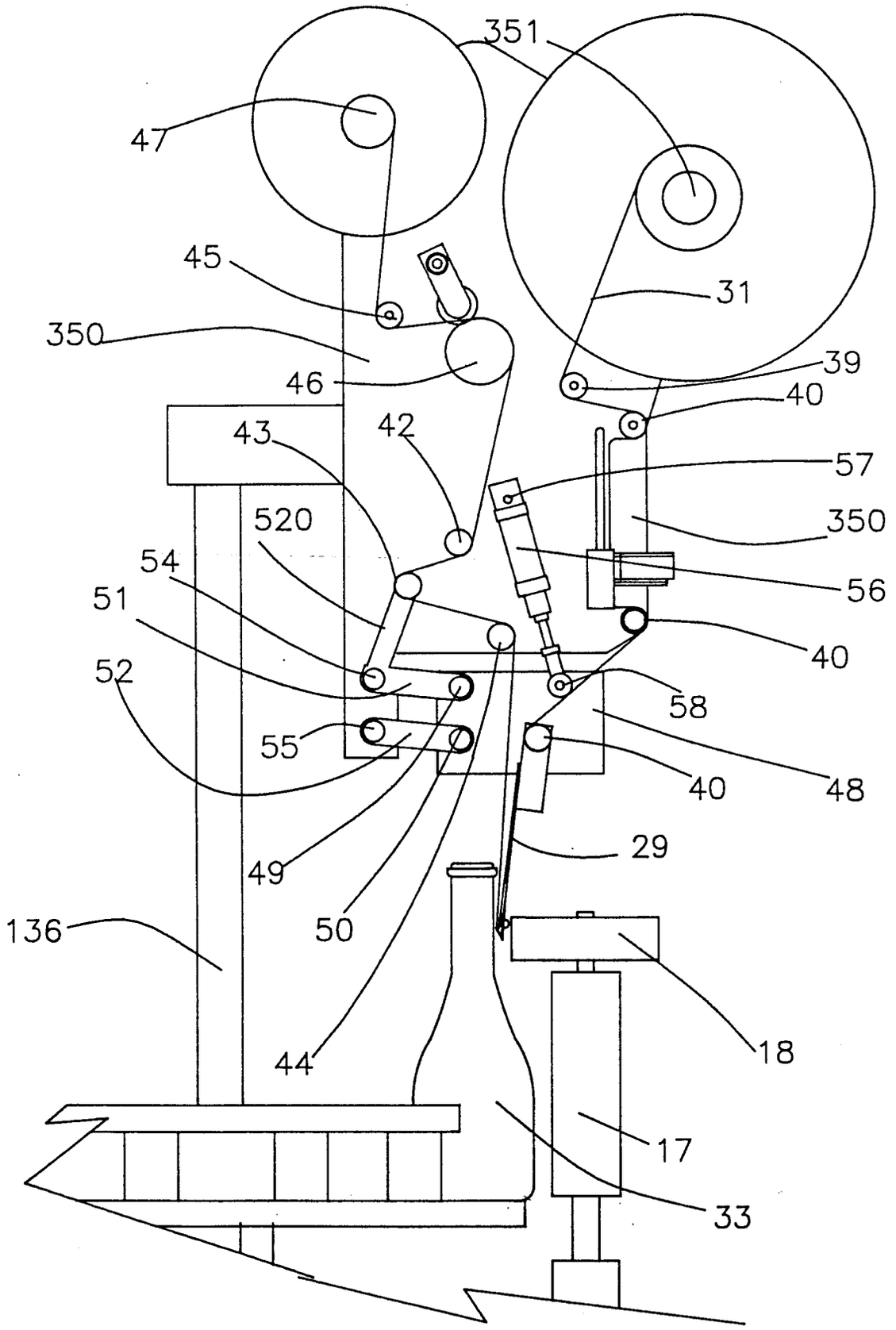

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FIG. 8

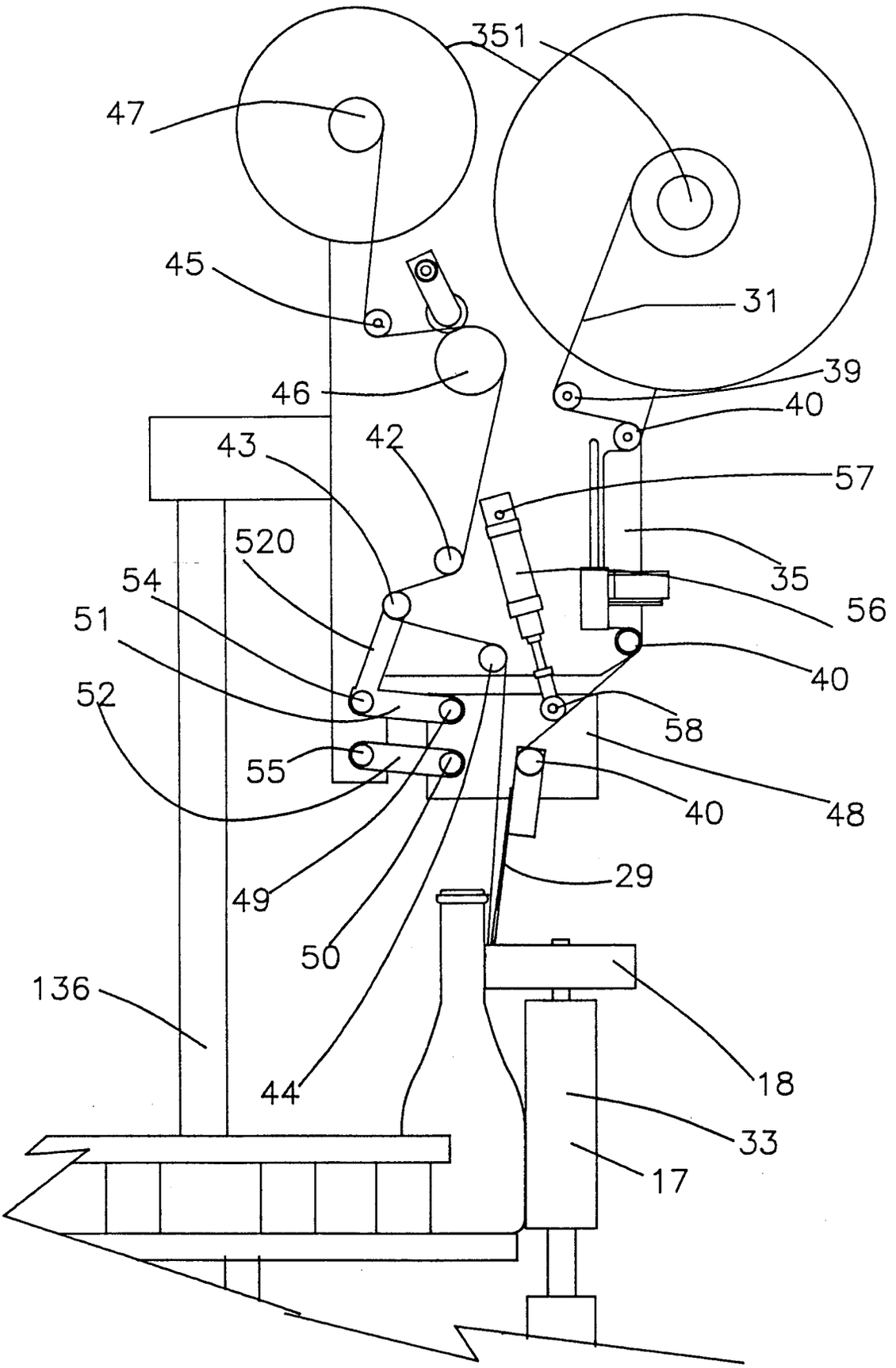

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FIG. 9

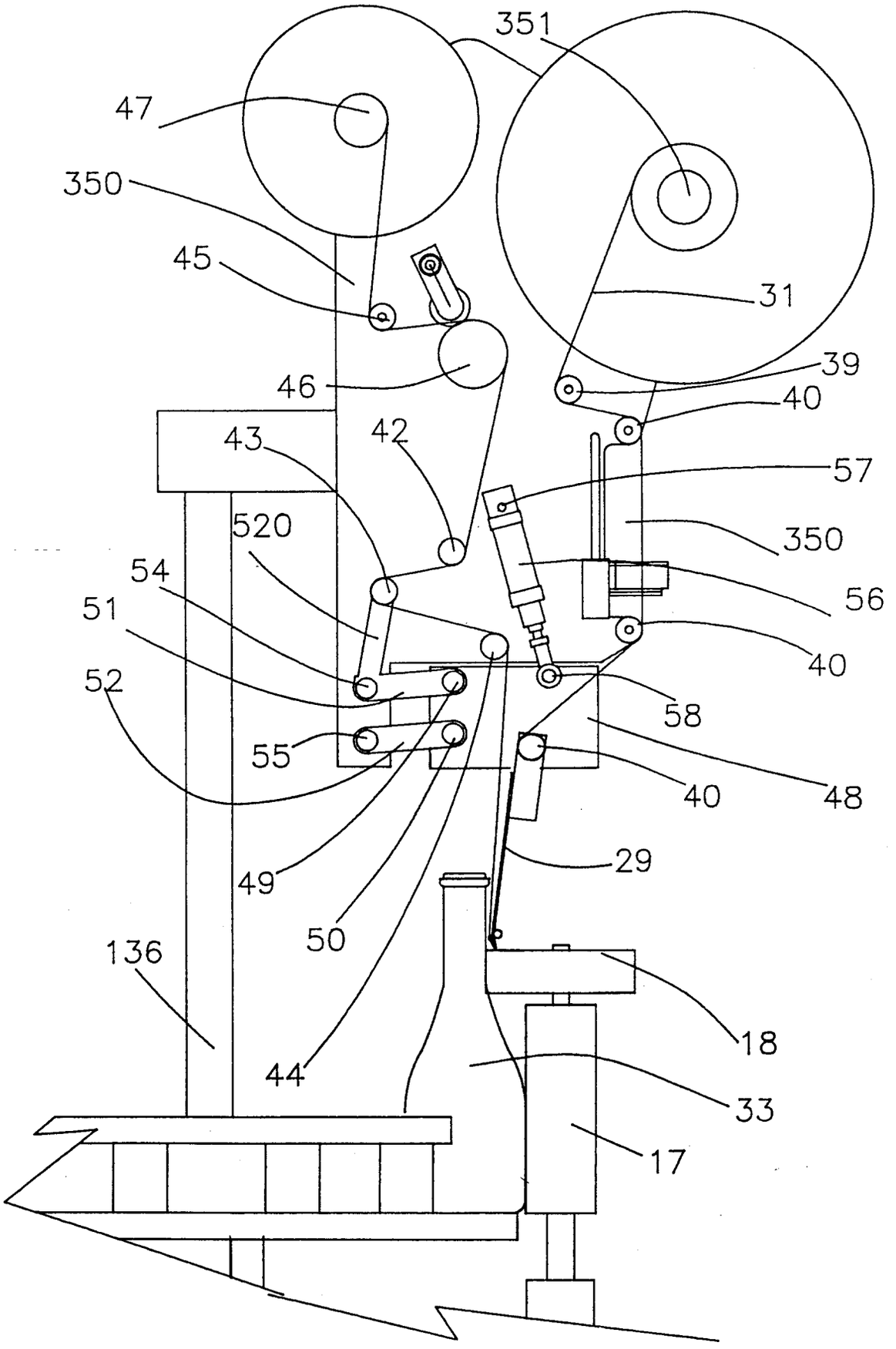

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FIG.10

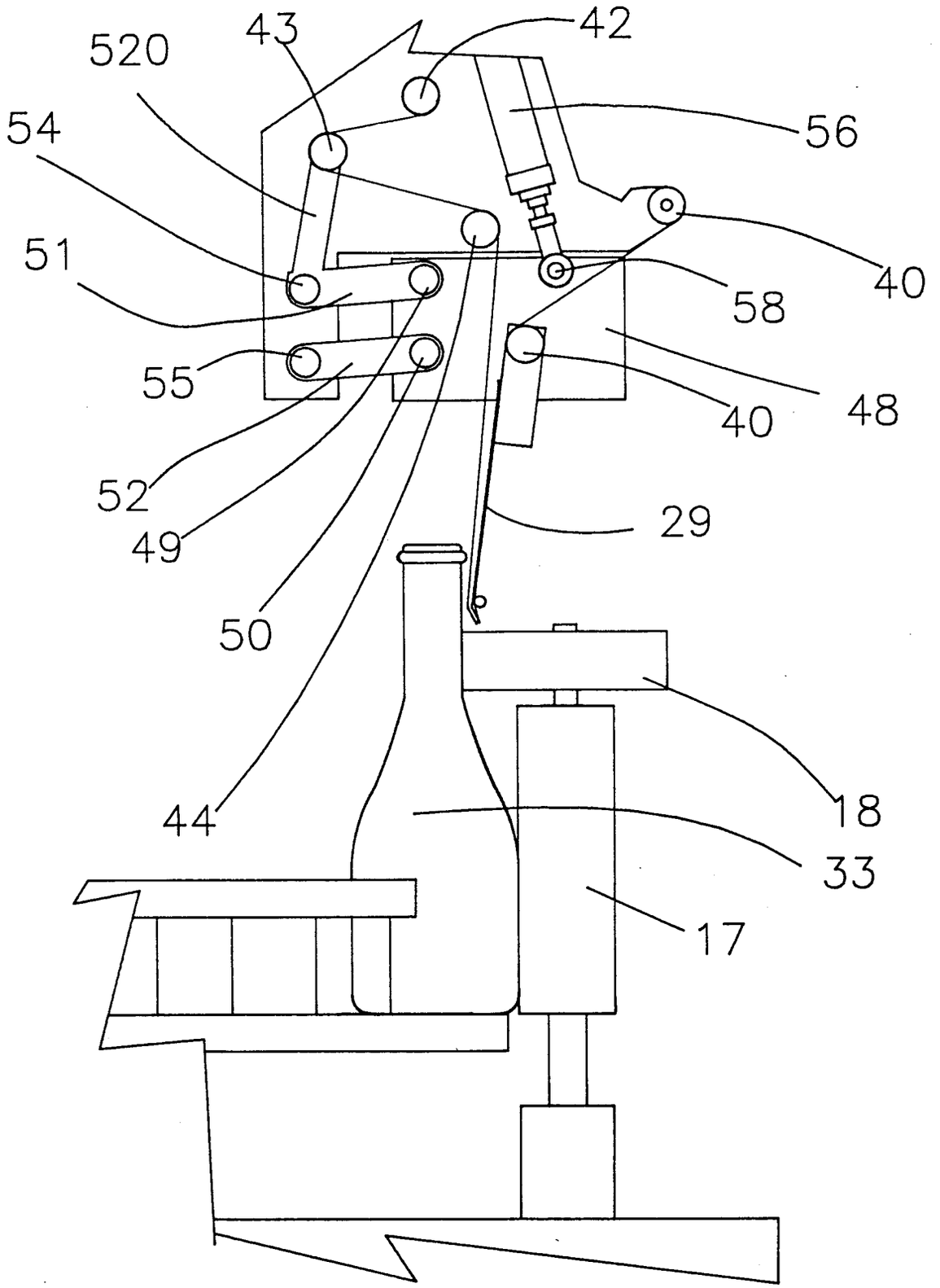


FIG. 11