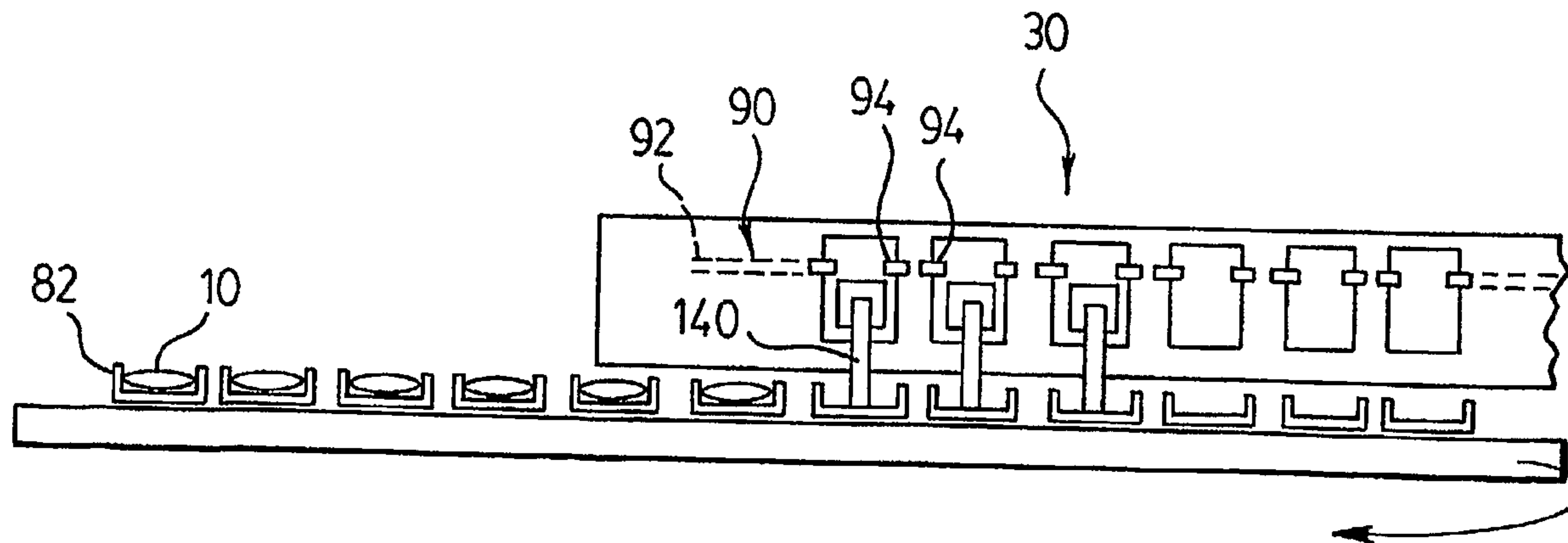




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 (54) Title: METHOD AND SYSTEM FOR FILLING POUCHES



(57) **Abrégé/Abstract:**

A method of filling a flexible pouch having a base and sidewalls extending from the base to define a mouth. The method comprising the steps of delivering the pouches to an infeed conveyor (28) to a predetermined orientation and transporting the pouches in a controlled manner toward a filler station (D,E,F), and transferring the pouches from the infeed conveyor to a transport conveyor (90) in which the pouch is gripped adjacent to the mouth so as to be suspended from the transport conveyor. Opening the mouth of the pouch to permit filling at the filling station passing the pouches through the filler station, closing the mouth and sealing the mouth prior to release from the transport conveyor.

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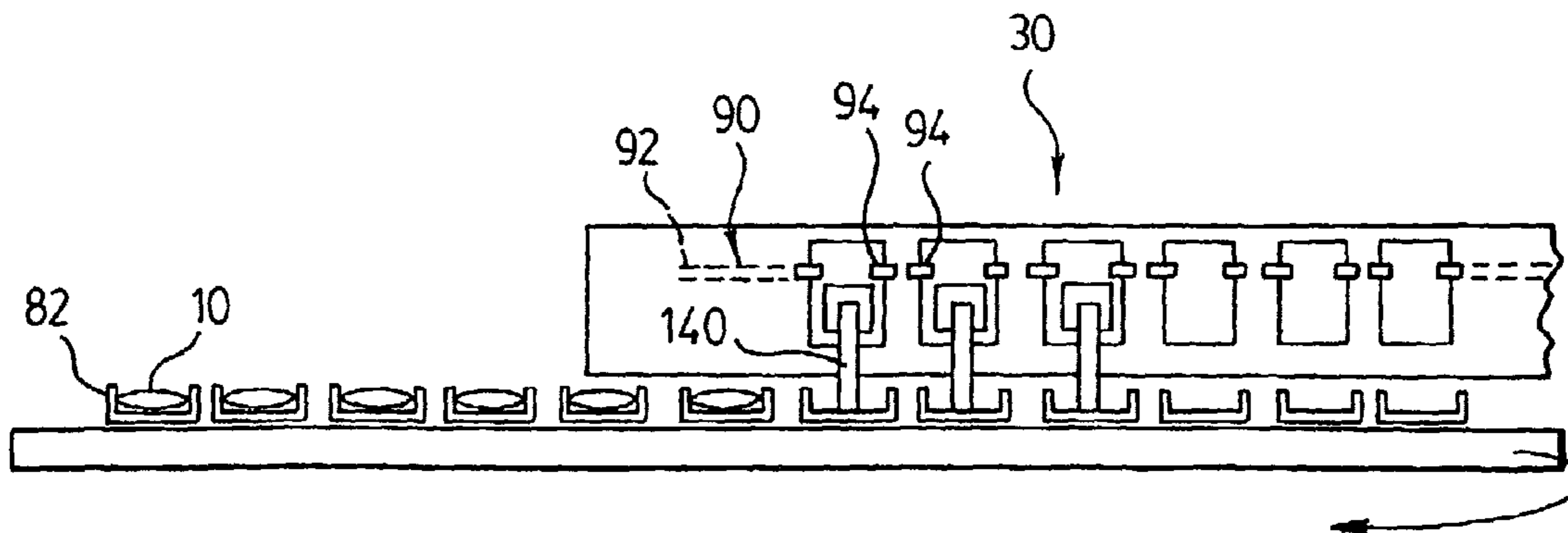
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(54) Title: METHOD AND SYSTEM FOR FILLING POUCHES



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METHOD AND SYSTEM FOR FILLING POUCHES

1

2

3 FIELD OF THE INVENTION

4 [0001] The present invention relates to packaging systems and their method of use.

5

6 BACKGROUND OF THE INVENTION

7 [0002] There are a wide variety of packaging machines available. The function of most
8 machines is dictated by the container and the product to be packaged in the container. A
9 particular form of container that is becoming more popular is the flexible stand up pouch. The
10 pouches are conocuneous with a peripheral wall extending from a circular or elliptical base to an
11 elongate opening. These pouches are self-supporting but have a degree of flexibility that
12 facilitates the packaging of items and the by consumers.

13

14 [0003] Existing systems utilizing external pouch formers must accumulate pouches and then
15 manually transfer them into a filling and sealing machine. This results in speed, quality, cost,
16 space and operation problems. The pouches are filled through the elongate opening and
17 subsequently sealed. They therefore need to be filled in an upright position, which requires a
18 degree of control to be used on the pouches. Existing systems -used to fill such pouches tend to
19 be slow, inefficient and inflexible due to the lack of control exercised on the pouches, their basic
20 design and the drive systems utilized . In particular, where the contents are fluids, the transport
21 of the pouch must be accomplished without spillage or splashes on the top heat seal area.

22

23 [0004] Prior art in-line machines are intermittent in operation, thereby causing difficulties with
24 fluids in pouches resulting in quality problems such as poor top seals. The intermittent motion of
25 these machines makes it difficult to fill at high speeds (over 200 pouches/minute) for any type of
26 product including solids and liquids of all types. Moreover, fitments are frequently included in
27 the pouch to assist in using and resealing the contents. These fitments must be inserted in a
28 controlled and efficient manner. Existing systems either use a slow three-step manual transfer
29 operation or they operate their filler/sealer at a very slow speed.

1 [0005] Some machines utilize a circular arrangement for filling but this complicates the addition
2 and removal of pouches. Circular machines are also limited in their versatility of products and
3 pouch sizes and are not adaptable to multiple line operations.
4

5 [0006] In general, existing systems do not seek to maintain control of the product from basic roll
6 stock to the finished shipping unit in a manner that facilitates an integrated production and
7 dispatch of filled pouches.
8

9 [0007] It is therefore an object to the present invention to obviate or mitigate the above
10 disadvantages.
11

12 BRIEF DESCRIPTION OF THE DRAWINGS

13 [0008] An embodiment of the invention will now be described by way of example only with
14 reference to the accompanying drawings in which

15 [0009] Figure 1 is a perspective view of a prior art container in the form of a pouch.

16 [0010] Figure 2 is a view similar to Figure 1 of a pouch with a fitment.

17 [0011] Figure 3 is a schematic representation of the overall arrangement of a packaging system
18 used to fill the pouches of Figure 1 and 2.

19 [0012] Figure 4 is a schematic representation of a portion of the machine shown in Figure 3 in
20 greater detail.

21 [0013] Figure 5 is a view on the line V-V of Figure 4.

22 [0014] Figure 6 is a view on the line VI-VI of Figure 4.

23 [0015] Figure 7 is a plan view of a conveyor using the machine shown in Figure 3.

24 [0016] Figure 8 is a side elevation of the conveyor shown in Figure 7.

25 [0017] Figure 9 is a perspective view on an enlarged scale of a component used in the conveyor
26 shown in Figure 7 and 8.

27 [0018] Figure 10 is a representation of the progress of the pouches of Figure 1 through the filling
28 station on the machine of Figure 3.

- 1 [0019] Figure 11 is a schematic representation in greater detail of the passage of a pouch through
2 apparatus shown in Figure 10.
- 3 [0020] Figure 12 is a side elevation showing in greater detail the successive steps in opening the
4 pouch in Figure 11
- 5 [0021] Figure 13 is a perspective view of the mechanism used to perform the successive steps of
6 Figure 12.
- 7 [0022] Figure 14 is a perspective view similar to Figure 13 of an alternative embodiment.
- 8 [0023] Figure 15 is a perspective end view of the alternative embodiment of the apparatus shown
9 in Figure 14.
- 10 [0024] Figure 16 is an exploded perspective view of a clip shown in Figure 14.
- 11 [0025] Figure 17 is a perspective view from beneath the clip of Figure 15.
- 12 [0026] Figure 18 is a rear view showing the operation of the clip of Figure 15.
- 13 [0027] Figure 19 is a plan view of the clip shown in Figure 15.
- 14 [0028] Figure 20 is a schematic representation of a filler circuit.
- 15 [0029] Figure 21 is a front perspective view of a pump assembly used in the circuit of Figure 20.
- 16 [0030] Figure 22 is a section on the line XXII-XXII of Figure 21.
- 17 [0031] Figure 23 is a perspective view of a fitment placing stage that may be incorporated in the
18 packaging system of Figure 2.
- 19 [0032] Figure 24 is a side view of a portion of the device shown in Figure 23.
- 20 [0033] Figure 25 is a perspective view of the fitment placing stage shown in Figure 24.
- 21 [0034] Figure 26 is a schematic representation of a conveyor transfer station and cooler in-feed.
- 22 [0035] Figure 27 is a perspective view of a portion of the cooler/dryer transport chain used in the
23 pouch transfer and cooler in-feed station of Figure 26.
- 24 [0036] Figure 28 is a perspective view of a clip used on the conveyor of Figure 27.
- 25 [0037] Figure 29 shows the conveyor chain connection to the clips of Figure 28.
- 26 [0038] Figure 30 is a portion of the interior of the cooler.
- 27 [0039] Figure 31 is a perspective view of an integrity checking station used in the system shown
28 in Figure 3.
- 29 [0040] Figure 32 is a perspective view of a component used in the station of Figure 31.

1 [0041] Figure 33 is a schematic representation similar to Figure 4 of an alternative arrangement
2 of pouch feed.

3 [0042] Figure 34 is a view similar to Figure 33 of a further alternative.

4 [0043] Figure 35 is a view similar to Figure 33 of a yet further alternative.

5

6 DESCRIPTION OF THE PREFERRED EMBODIMENTS

7 [0044] Referring therefore to Figure 1, a container 10, known in the prior art as a flexible stand
8 up pouch, includes a peripheral wall 12 and a base 14. The wall 12 and base 14 are formed from
9 a flexible plastics material with indicia printed on the outside to identify the product within the
10 container. The wall 12 terminates in a mouth 16, which can be sealed after filling to provide an
11 enclosed package. As shown in Figure 2, additional items referred to as fitments 250, such as
12 spouts or resealable closures, may be incorporated into the wall 12 either during or after initial
13 manufacture of the container 10. The container 10 is of known construction and it will be
14 understood that alternate forms of container may be used with the apparatus and process
15 described below. The pouch 10 is filled using the packaging system 18.

16

17 [0045] The general arrangement of the packaging system 18 is shown in Figure 3 and includes a
18 pair of pouch makers 19, 20 each of which will manufacturer the containers 10 from feedstock in
19 a well-known manner. The containers 10 are manufactured within each of the pouch makers 19,
20 20 in pairs, two pairs at a time and are delivered four at a time on to discharge conveyors 21, 22.
21 These discharge conveyors 21, 22 deliver the pouches via vision scanning and alignment system
22 23, 24 to a transfer station 26. Transfer station 26 moves the pouches from either of the discharge
23 conveyors 21, 22 to a filler/sealer in-feed conveyor 28. The filler/sealer in-feed conveyor feeds
24 the pouches 10 from the robotic transfer station 26 through four parallel paths, to the filler/sealer
25 30, where vacuum swing arms insert the pouches 10 into clips carried on a transport chain of the
26 filler/sealer 30. The filler/sealer 30 moves the pouches along path 31 in 4 lanes through a
27 sequence of pouch opening, filling, fitment insertion, heat-sealing, and seal cooling stations. The
28 filler/sealer30 is connected to the positive displacement filling system 32 and an optional fitment
29 insertion unit 34, where additional items, such as spouts, may be fitted to the containers 10.

1 After passing through the insertion unit 34, the filled and sealed pouch is passed through a water
2 cooler 36 and in-line inspection and straw feeder station 38 to a cartoning and casing station 40.

3
4 [0046] It will be appreciated that the combination of units used with a particular container will
5 vary according to the product to be packaged and the manner in which it is packaged. For
6 example, a cooling unit 36 may not be required and a straw feeder 38 will not be required unless
7 the product is a drink product. Similarly, the particular form of pouch maker 19 may vary with
8 different numbers of lanes per machine, eg. 1 or 2 machines and 2 or 4 lanes per machine.

9 Control of the movement of the pouches through the system 18 is controlled by a computer-
10 based controller 42 operating through servo actuators on the components of the system. The
11 controller 42 receives control signals from monitors along the path 31 and provides control
12 signals to the motors to maintain the components in synchronism as will be described more fully
13 when the functionality of the system 18 has been explained.

14
15 [0047] The details of the discharge conveyors 21, 22, vision scanning and alignment systems 23,
16 24, transfer station 26 and the filler/sealer in-feed conveyor 28 are better shown in Figure 4. The
17 discharge conveyors 21, 22 include four parallel lanes 50, 52, 54, 56 associated with each of the
18 pouch makers 19, 20. It will be appreciated that each of the pouch makers discharge conveyors
19 and vision scanning and alignment systems is essentially identical and therefore the operation of
20 only one of the pouch makers and associated conveyor and systems will be described in detail.
21 Each of the discharge conveyors 21, 22 are designed to receive the pouches 10 from the pouch
22 makers 19, 20 and pass them through an alignment station having vision scanning and alignment
23 systems 23, 24. The vision scanning and alignment systems 23, 24 ensure the pouches are
24 aligned and placed into the buckets 58 at proper alignment tolerances. The scanning and
25 alignment system 23 includes a camera 25 or laser scanner that determines the position and
26 station of each pouch relative to a preferred orientation. The error is communicated to a robotic
27 arm 27 that adjusts the position of the pouch 10. Typically, a tolerance of $\pm \frac{1}{8}$ " along each
28 edge of the pouch is acceptable.

29

1 [0048] The bucket 58 is shown in more detail in Figure 5 and includes a peripheral frame 60.
2 Fingers 62, 64 extend outwardly and downwardly from a pair of opposed sides of the frame 60 to
3 support the pouch 10. The ends of the fingers 64 are arranged to be lower than that of the fingers
4 62 so that the pouch 10 is supported on an inclined plane and biased into abutment with a central
5 partition 66.

6
7 [0049] The pouch maker 19, 20 produces the pouches in two pairs that are allochiral so that the
8 mouths 16 are adjacent one another and the bases 14 remote from one another. Accordingly, the
9 frames 60 on opposite sides of the partition 66 are likewise allochiral causing the pouches 10 to
10 abut the common partition 66. The downwardly inclined plane defined by the fingers 62,64 and
11 the abutment against the partition 66 ensures that the pouches 10 are oriented in a preferred
12 position in each of the buckets 58.

13
14 [0050] The buckets 58 are advanced along the discharge conveyors 21, 22 as the pouches are
15 produced by the pouch makers 19, 20 to the transfer station 26 which serves as a collection zone
16 to accumulate pouches. Arrival at the transfer station is monitored by a vision system 68 (Figure
17 4) that determines that at least 4 rows of filled buckets 58 are accumulated before transfer can be
18 effected.

19
20 [0051] The vision system 68 also interfaces with the controller 42 to determine which of the
21 discharge conveyors 21, 22 should be accessed by the transfer station 26 to complete the transfer
22 process.

23
24 [0052] The transfer station 26 includes a robotic device having 2 sets of robotic arms 70 arranged
25 in a 4 by 4 grid and supported by a floor-mounted frame 72. Multiple arms 70 may be arranged
26 in series and larger grids, eg. 4 x 5, may be utilised to increase the throughput. The multiple
27 axial robotic swing arms 70 are moveable relative to the discharge conveyors 21, 22 in a fore and
28 aft direction as indicated by the arrow X and in a lateral direction as indicated by the arrow Y.
29 The robotic arm assemblies 70 are each individually controllable and have the required

1 movement to be able to move the pouches 10 from the buckets 58 on intermittent motion
2 discharge conveyors 21, 22 to the continuous motion filler/sealer in-feed conveyor 28. As may
3 be seen from Figure 6, each of the robotic arm assemblies 70 has multiple axial arms 74 that
4 articulated to provide the necessary movement in a horizontal and vertical plane. An actuator 75
5 is mounted on the swing arm 74 and may extend vertically toward and away from the buckets 58.
6 Each of the actuators has a head 76 that carries a suction pad that is engagable with the pouch 10
7 to secure it to the arm assembly for transfer.

8
9 [0053] The arm assembly 70 also provides for rotation of the head 76 about a vertical axis. As
10 illustrated in Figure 6, the height of the head 76 may be individually adjusted by the actuator 75
11 so that after picking up the pouches 10 they may be staggered in a vertical direction during
12 transfer. A pair of the heads 76 in each row of four are then rotated through 180° to move the
13 pouches into an orientation with both pair of pouches having their mouths facing away from the
14 centre for depositing into buckets 80 on the conveyor 28.

15
16 [0054] The filler/sealer in-feed conveyor 28 is also arranged in four lanes with a set of containers
17 in the form of buckets 80 arranged along the lanes. The buckets 80 can be seen in Figures 7 and
18 8 and include an open frame 82 supporting fingers 84,86 to maintain the pouches 10 in a
19 predetermined orientation. The fingers 84, 86 are arranged in a similar manner to the fingers 62,
20 64 so that the pouch 10 is biased toward the end wall 88 of the respective frame 82.

21
22 [0055] The buckets 80 are advanced on the filler/sealer in-feed conveyor 28 in a controlled
23 continuous manner by servomotors controlled by the controller 42. The buckets 80 are advanced
24 to the filler/sealer 30 shown schematically in Figures 10 and 11. It will be appreciated that each
25 lane is similar and therefore only one will be described in detail. Similar operations are
26 undertaken in parallel in the other lanes as the pouches advance.

27
28 [0056] The fill filling/sealing unit 30 has a number of different stations arranged sequentially
29 along path 31. The pouches 10 are advanced in continuous motion and are dressed in sets of 3

1 through each station. Movement of the pouches through the filler/sealer 30 sealing units is
2 controlled by a transport conveyor 90. The transport conveyor 90 includes a drive chain 92 that
3 carries clip assemblies 94 and is driven in a continuous manner by a servomotor, not shown,
4 under the control of controller 42. The clip assemblies 94 are arranged in pairs and maintained at
5 a nominal spacing corresponding to the spacing between the buckets 80 on the conveyor 28 and
6 act as retainers to grip the pouch.

7
8 [0057] One embodiment of the clip assemblies 94 is shown in Figure 13 and includes a
9 stationary clip 96 and a sliding clip 98. Each of the clips 96, 98 is supported by hangers 100
10 depending from the chain 92.

11
12 [0058] The clip 96 has a pair of jaws 102, 104. The jaw 104 is attached to the hangers 100 and
13 the jaw 102 is moveable in a direction transverse to the movement of the chain 92 between open
14 and closed positions. The jaw 102 is secured to the jaw 104 by a pin 106 that is slidably received
15 in the jaw 104 and biased to a closed position by a spring 108. The pin 106 has a head 110 that
16 can be engaged by actuating cam 107 at selected positions to overcome the bias of the spring 108
17 as will be explained below.

18
19 [0059] The clip 98 is similar to the clip 96 having a pair of jaws 112, 114. The jaw 112 is
20 guided for movement between open and closed positions by a pin 116. A spring 118 biases the
21 jaws 112, 114 to a closed position and a head 120 is provided for co-operation with an actuator
22 to open the jaws. The jaws 112, 114 are moveable as a unit longitudinally relative to the hangers
23 100. To accomplish this jaw 114 is slidably mounted on a rod 122 and biased away from the clip
24 96 by a spring 124. Movement of the jaw 114 along the rod 122 is controlled by a cam follower
25 126 connected to the jaw 114 at a pin 128. The cam follower 126 has a fulcrum 130 supported
26 on the chain 92 and a cam lobe 132 for engagement with a set of cam bars 134 disposed through
27 the filler/sealer 30 as will be described in more detail below. Engagement of the follower 126
28 with the cam bar 134 effects longitudinal movement on the rod 122 and thereby moves the clip
29 98 in the direction of movement of chain 92 toward the clip 96.

1
2 [0060] The passage of the pouch through the filler/sealer 30 is shown in greater detail in Figures
3 10 to 12. Transfer of the pouches 10 from the buckets 80 to the clip assemblies 94 is
4 accomplished by swing arm 140 associated with each of the buckets 80 as part of the filler/sealer
5 in-feed conveyor 28. These swing arms elevate the pouches 10 from a horizontal position to a
6 vertical position and place the pouches 10 into the filler/sealer 30's chain clips 96,98 shown in
7 Figure 12 and 13, at filler sealer 30 station A. As can best be seen in Figure 9 the swing arms 140
8 include a vacuum pad 142 secured to one end of a telescopic arm 144 and selectively connected
9 to a vacuum source as it moves with the conveyor 28. For example, the shaft 145 may be ported
10 to a vacuum manifold so that as it rotates, the pad 142 is connected to the manifold and the
11 pouch subjected to the suction. The arm 144 is mounted upon a shaft 145 rotatable about a
12 horizontal axis so that it may move from a horizontal to a vertical position. Movement of the
13 arms 144 is controlled by a stationary cam located under the arms 144 in the filler/sealer in-feed
14 conveyor as the buckets 80 arrive under station A of filler sealer 30. The continuous motion in-
15 feed conveyor 28 and the continuous motion filler/sealer carrier chain must be aligned and
16 moving at the same speed to allow for the pouch transfer from the discharge conveyor buckets 80
17 to the carrier chain clips 94. The action is accomplished by controller 42 synchronizing the linear
18 servo motor drives of each conveyor and ensuring proper alignment.

19
20 [0061] Cam bar 107 associated with each of the clips 96, 98, is configured at the station A so
21 that the heads 110, 120 are automatically actuated by the movement of the conveyor chain 90 to
22 overcome the bias of the springs 108, 118 and open the clips 96, 98. After the arm 140 has been
23 moved to a vertical position, the arm 144 is extended to move the edges of the pouch 10 between
24 the jaws 102-104, 112-114 of the clips 96, 98 respectively as shown in chain dot lines in Figure
25 13. The cam bar 107 is profiled to release the heads 110, 120 and allow the jaws 102, 104, 112,
26 114 to move to a closed position and grip the pouch 10 at its edges as the chain advances. Once
27 the jaws are closed, the vacuum is released from the pad 142 and the arms 140 retracted and
28 returned to the horizontal position below the buckets 80.

29

1 [0062] With the arms retracted, the filler/sealer in-feed conveyor 28 returns buckets 80 and
2 associated arms 140 to the transfer station and chain 92 carries the pouches 10 to the second
3 station within the filling/sealing unit 30. As the chain 92 is advanced to the second station B, the
4 cam lobe 132 engages with the cam bar 134 and slides the jaw 114 along the rod 122. At the
5 same time the oppositely directed flanks of the pouch 10 are engaged by suction cups 145
6 (Figure 11) causing the mouth 16 of the pouch 10 to open to present an unencumbered interior
7 of the pouch 10.

8
9 [0063] The cam bar 134 extends to the next station, station C, and so holds the mouth of the
10 pouch 10 open. At this station, an air blast is provided to inflate the pouch 10 to ensure that the
11 walls are separated.

12
13 [0064] Movement of the sets of pouches 10 continues through a set of fill stations D, E, and F,
14 each of which may be used to add an additional component to the pouch 10 or to supplement the
15 contents already in the pouch 10. In the next station G fitments are added if required. During
16 movements through these stations, the cam bar 134 engages the lobe 132 to maintain the clips
17 96, 98 toward one another and ensure the mouth 16 remains open. The cam bar 134 terminates at
18 the end of the fitment insertion station G, and the springs 124 slide the jaws 112, 114 along the
19 rod 122 return the clips 96, 98 to their original spaced position. The increase in the spacing of
20 the clips 96, 98 cause the mouth 16 to close ready for scaling.

21
22 [0065] Before describing the subsequent stages of fitment insertion and sealing, an alternative
23 embodiment of clip to that shown in Figure 13 will be described with reference to Figures 14
24 through 19 in which like references will be used to identify like components with the suffix a
25 added for clarity. In the embodiment shown in Figures 14 to 19 the clips 96a, 98a are integrated
26 into a single unit and each is movable relative to the chain 92a to effect opening of the pouch
27 10a. As can be seen from Figure 15, the chain 92a is supported in a housing 400. A wall 402 of
28 the housing 400 carries the cam bars 134a. A hanger 100a projects laterally from the chain 92a
29 and provides support for the movable components of the clip 98a. The hanger 100a extends

1 downwardly to engage in a channel 404 located on the underside of the housing 400. The
2 channel provides stability for the clip 98a when loaded by the pouch 10a.

3
4 [0066] As can best be seen in Figures 16 through 19, the clip 98a includes a pair of jaws 112a,
5 114a. The jaws 114a have a pair of pins 406 that slide in slots 408 provided in the front face of
6 hanger 100a. The jaw 112a is pivotally connected to jaw 114a by a pin 410 and is connected to
7 an enlarged head 412 of actuating rod 116a. The connection of the jaw 112a to the head 412 is
8 through a pin and a slot 414.

9
10 [0067] The rod 116a carries a roller 118a at its inner end for engagement with the cam tracks
11 107a and is slidably supported for movement transverse to the direction of movement of the
12 chain 92a in a housing 414. The housing 414 is rotatably supported on the hanger 100a and has
13 an actuating arm 126a that carries a roller 132a for engagement with the cam bars 134a. The
14 housing 414 is connected to the pins 406 of jaws 114a by a pair of links 416 pivotally connected
15 to the pins 406 and the housing 414. A torsion spring 124a is located within the housing to bias
16 the housing 414 to the position shown in Figure 18.

17
18 [0068] In operation, with the rod 118a retracted, the jaws 114a, 112a are open and the pins 406
19 are at one limit of travel in the slots 408 to move the jaws 114a toward one another. Upon
20 engagement of the roller 118a with the cam track 134a, the rod 116a is extended relative to the
21 hanger 100a to cause pivotal movement of the jaw 112a toward the jaws 114a. The jaws 112a,
22 114a close about the edges of the pouch 10, which is then gripped between the jaws.

23
24 [0069] Upon engagement of the roller 132a with the cam track 134a, the housing 414 is rotated
25 relative to the hanger 100a causing the pins 406 to slide along slots 408 and move the jaws 112a,
26 114a toward the centre line of the pouch 10a. A similar movement is effected at the opposite
27 edge of pouch 10a causing the mouth to open as described above.

28

1 [0070] The cam bars 134a are profiled to achieve the same motion as described above with
2 respect to the embodiments of Figure 13 and therefore do not need to be described further. It
3 will be noted that the arrangements of Figures 14 through 19 provide close coupling between the
4 pouches 10 and a unitary construction for pairs of clips to provide enhanced compactness of the
5 design.

6
7 [0071] Returning to the processing of the pouch 10 through the system, where the contents of the
8 pouch 10 are a fluid, the supply of fluid to the pouches 10 at stations D E and F is preferably
9 supplied through a closed loop system shown in Figure 20. The fluid is stored in a batch holding
10 tank 200 and delivered upon demand to a high temperature short time pasteuriser 202. The
11 pasteuriser supplies fluid at the requisite temperature through an outlet 204 to a header 206. The
12 header 206 delivers fluid under positive pressure to each of a number of conduits 208, one for
13 each pouch in which fluid is to be disposed, and returns surplus fluid through overflow line 210
14 to the tank 200. The conduits 208 have a flexible wall to allow for pinch-seal intake and
15 discharge valving.

16
17 [0072] Control of fluid through each of the conduits 208 is provided by the positive
18 displacement filler pump assembly 212 shown in Figures 21, and 22. The pump assembly 32 is
19 mounted on a support plate 213 which in turn is fixed to the framework of the filler/sealer unit
20 30. Each of the filler pump assembly 32 includes a pump 214 to transfer fluid from the conduit
21 208 to a supply line 216 that is attached to a filling nozzle that is disposed in the mouth of a
22 respective pouch 10. The supply line 216 is flexible so the filling nozzles can follow the
23 movement of the pouch 10 on the conveyor 92 as it is filled and subsequently be returned to an
24 initial position. Movement is effected by a linear actuator controlled by said controller 42. The
25 pump 214 includes a cylinder 218 having an inlet port 220 and an outlet port 222. A piston 224
26 defines a chamber 225 within the cylinder 218 and reciprocates under the control of a linear
27 servomotor 226. The servomotor 226 under the control of the controller 42 drives the piston 224
28 in proportion to the line speed and the volume to be dispensed to vary the fill rate of pouch 10.

29

1 [0073] Flow through the ports 220, 222 is controlled by a pair of valves 228, 230 that operate on
2 the conduit 208 and supply line 216 respectively. Each of the valves 228, 230 has a body 232,
3 which is supported on the plate 213 by pins 233. The body 232 has a bore 234 through which
4 the conduit 208 or supply line 216 passes. A plunger 236 is mounted in a slide 238 formed in the
5 body 232 to intersect the bore 234. The head of the plunger engages the wall of the conduit 208
6 or supply line 216 and the opposite end is engaged by actuating plates 238, 240 respectively.
7 The plates 238, 240 are controlled by synchronism with the servo motor 226 to open and close
8 valves 228, 230 and induce fluid in to the chamber 225 from the conduit 208 as the chamber
9 expands and expel fluid from the chamber 225 to supply line 216 as it contracts. Reciprocation
10 of the piston 224 continues until the required volume of fluid is dispensed, at which time the
11 mouth of the pouch 10 is closed.

12
13 [0074] After the filling at station F is complete the pouches move to station G. As noted above,
14 the profile of the cam 134 at the end of station G allows the cam follower 126 to pivot about its
15 fulcrum 130 and move the clip 98 away from the clip 96. The spacing between the clips 96, 98
16 thus increases, causing the mouth of the pouch to close. A preliminary top seal is applied by
17 heated sealing plates 150 applied to the pouch adjacent the mouth 16. The plates 150 move with
18 the pouch 10 and contact the walls 12 long enough to effect a seal but not to melt the pouch.
19 After the requisite time, the plates 150 are released and returned to a start of the station G to
20 engage the next set of pouches 10. The closure of the mouth 16 provides containment of the
21 contents of the pouch 10 so that on subsequent movement of the pouches 10 to the next station
22 the contents are less likely to spill. If fitments are to be used they are inserted at the beginning of
23 station G as will be explained more fully below.

24
25 [0075] With the plates 150 retracted and a tack seal applied, the chain 92 moves the set of
26 pouches 10 to the next station H, where final top seal is made at the mouth 16 of the container 10
27 in a manner similar to that at station G. At the next station I the top seals are cooled by a
28 cooling plates. Where a fitment is used, the plates 150 will be profiled to accommodate the
29 fitment and ensure a seal around it

1
2 [0076] The insertion of a fitment 250 into the pouch shown in Figures 22 through 25 and
3 operates in conjunction with the movement of the pouches through the station G. As shown in
4 Figure 23 through 25, the fitment 250 is applied to the four lanes of pouches 10 in parallel with
5 the fitment 250 being fed from a pair of vibrator hoppers 252. (Only one hopper is shown in
6 Figure 23 but it will be understood that a duplicate arrangement is utilised to feed the other pair
7 of lanes.) The hoppers 252 deliver the fitment through slides 254 to a transfer mechanism 256.
8 The transfer mechanism 256 includes an inclined belt 264 convergent with the transport
9 conveyor 90 and delivers the fitment 250 into the mouth of pouch 10 and then transfers the
10 fitment to horizontal placement belt 258 positioned above the mouth of the pouches 10. The
11 placement belt 258 travels in unison and parallel with the pouches 10 holding the fitments 250 in
12 the mouth of the pouch and releases them as the spacing between the clips 96, 98 increases and
13 the preliminary tack seal is applied causing the mouth of the pouch 10 to close and hold the
14 fitment 250.

15
16 [0077] The inclined transfer mechanism 256 includes a notched wheel 260 that rotates about a
17 vertical axis adjacent the end of a respective slide 254. The periphery of the wheel 260 has a
18 series of notches 262 and as the notches pass the end of the slide 254 they receive a fitment 250
19 that is carried by the wheel to inclined belt 264. The belt 264 is entrained about a pair of toothed
20 pulleys 266 that are maintained in synchronism with the wheel 260 by a timing belt 268. The belt
21 264 has a carrier 270 on its outwardly directed surface that is configured to engage the fitment
22 250 in the notch 262 as the carrier 270 passes the periphery of the wheel 260. The fitment 250 is
23 thus transferred from the notch 262 to the carrier 270 and delivered by the inclined belt 264 and
24 is progressively introduced into the mouth of the pouch and then transferred to the placement
25 belt 258. The belt 258 is aligned with the run of chain 92 so that the fitments 250 are held in
26 place in to the mouth of the pouch 10.

27
28 [0078] The placement belt 258 is also a toothed belt driven in synchronism with the belt 266
29 through a gearbox 272 and motor 274. The placement belt 258 has carriers 276, similar to the

1 carriers 270, and configured to support the fitment along a lower horizontal run of the belt 258.
2 As can best be seen in Figure 25, the carrier 276 provides continued support for the fitment 250
3 as the pouches are moved through the station and the clips 96, 98 spaced to close the mouth of
4 the pouch around the fitment. A sealer (not shown) is then applied to the mouth of the pouch to
5 secure the fitment and the carrier 276 releases the fitment and pouch for further processing.

6
7 [0079] The pouches then move through successive stations to provide a final top seal, cooling of
8 the pouch 10 and integrity check.

9
10 [0080] As the pouch 10 moves through station J, the pouch 10 is transferred from the conveyor
11 90 to a supplementary chain conveyor 171 as shown in Figures 26 to 29, . A top clip 172
12 carried by the supplementary conveyor chain 171 is opened by a cam 173 acting against cam
13 follower 294. The clips 172 are positioned over the pouches by conveyor chain 171. As the cam-
14 follower 294 clears the cam 173 and the clips 172 grab the top edge of the pouch 10 and support
15 it. At the same time cam 107 engages the head 110, 120 of the clips 96, 98 to open the clips and
16 release the sides of the pouches. As the pouch 10 is released, it is moved laterally to clear the
17 clips 96, 98 and allow further transportation of the pouch. The filled and sealed pouch is then
18 passed through the cooler 36, inline pressure testing & straw feeder 38 if included to the
19 cartooning and casing station where it can be packaged according to customer's requirements.

20
21 [0081] As can be seen from Figures 27, 28 and 29, the top clip 172 depends from a chain 280 on
22 an L-shaped bracket 282. The bracket 282 has a pair of guide pins 284 extending to opposite
23 sides of a resilient jaw 286. The jaw 286 is secured to the bracket 282 and is jogged along its
24 length so that its lower end is spaced from the body of the bracket 282. The jaw 286 has a
25 circular aperture that passes over a retaining pin 288 secured to the body of the bracket 282. A
26 rigid cranked jaw 290 is also received on the retainer pin 288 and secured by a fulcrum pin 292.

27
28 [0082] The rigid jaw 290 is generally V-shaped having a pair of arms 296, 298 extending from
29 the right. A head 294 is provided at the distal end of one of the arms 296. The other arm 298

1 terminates in a gripping pad 300 that is disposed generally parallel to the distal end of the
2 flexible jaw 286.

3
4 **[0083]** The resilience of the flexible jaw 286 forces the fixed jaw 290 against the fulcrum pin
5 292 causing it to rotate about the fulcrum pin and bring the pad 300 into engagement with the
6 lower end of the resilient jaw 286. The jaws 286, 290 may be separated upon application of a
7 force to the head 294 to rotate the jaw 290 in the opposite direction about the fulcrum pin 290
8 and cause flexure of the jaw 286. The flexure is induced by the heel 302 formed opposite the
9 fulcrum pin 292 in the bight of the V-shaped jaw 290. The head 294 is as positioned against a
10 cam surface 173 in Figure 26 as it is lowered into position over the pouch 10 and released by the
11 cam surface 173 to engage the pouches and support them as they released by the clips 96, 98.

12
13 **[0084]** With the pouches supported by the chain 280, they are moved into a cooler 36 shown in
14 greater detail in Figures 26 and 30. The cooler 36 processes the pouches 10 on the four
15 supplementary conveyors 171 in parallel. The pouches 10 remain secured to the conveyor 171 as
16 it is fed through the cooler 36 in a serpentine path. A spray assembly 310 is located between
17 adjacent runs of the conveyor 171 to spray coolant on the pouches 10. The spray assembly 310
18 includes a manifold 312 that extends longitudinally parallel to the run of the conveyor 171. The
19 manifold 312 includes nozzles 314 at closely spaced intervals along the manifold to provide a
20 continuous spray of coolant along the run of the conveyor. The manifold 312 is supported
21 adjacent the upper edge of the pouches 10 beneath the clip 172 so that the coolant runs over the
22 length of the pouch. The manifold 312 is supplied by a riser 316 connected to a primary coolant
23 line 318. The coolant is collected in a sump 320 for recirculation after further chilling.

24
25 **[0085]** After the pouches 10 have passed along the serpentine path defined by the conveyor
26 within the cooler 36, they exit the cooler 36 through a drier 322. The drier is typically an air
27 blast that images on the pouch and removes surplus coolant from the surface of the pouch.

28

1 [0086] Following cooling, the pouches 10 may be packaged. However, to ensure the integrity of
2 the pouches prior to packaging, a pressure tester 330 is incorporated into the line whilst the
3 pouches 10 are supported on the conveyor 171. The pressure tester is shown in Figure 31 and 32
4 and includes an anvil 332 and load cell 334. The pouch 10 passes between the anvil and load
5 cell, which measures the pressure which may be applied to the pouch 10 and thereby indicates
6 the integrity of the pouch. The anvil 322 includes a pair of spaced rollers 336 mounted within a
7 frame 338. A belt 340 extends around the rollers 336 and a drive is provided to one of the rollers
8 336 to move the belt at the same linear speed as the conveyor 171.

9
10 [0087] The load cell 334 (Figure 32) is similarly provided with a pair of rollers 342 maintained
11 in spaced relationship by a frame 344. A belt 346 extends around the rollers, one of which is
12 driven to move the belt 346 at the same linear speed as the conveyor. A sensing roller 348 is
13 supported between the rollers 342 on a cantilevered arm 350. The arm 350 is secured to the
14 frame 344 by a bracket 352. A strain gauge or a similar load sensing device is incorporated into
15 the arm 350 to sense the bending moment applied by the roller 348 to the arm 350. The roller
16 348 engages the inner surface of the belt 346 and acts through the arm 350 and bracket 352 to
17 resist deflection of the belt 346. As the pouch 10 passes between the belts 340, 346, which are
18 positioned so as to attempt to compress the pouch 10 and its contents, the load exerted on the belt
19 346 is sensed by the roller 348 and monitored by the strain gauges. If the load exceeds a
20 threshold, the integrity of the pouch is assumed; otherwise the pouch is flagged for removal and
21 further inspection. The pouches are then delivered to a packing station where the clips 172 are
22 released and the conveyor 171 returned to the entrance to the cooler/dryer 36.

23
24 [0088] As will be appreciated from the above description, the control 42 operates to ensure that
25 the conveyors 28, 90, and 171 function in synchronism and provide a continuous flow of
26 pouches through the system 18. It does this through the use of linear servo drives that provide
27 feedback to the controller 42 so that drive signals can be adjusted. The controller 42 similarly
28 receives signals from the visions systems to ensure an orderly supply of pouches 10 and controls
29 the operation of the filling sealing station 30 to dispense the required contents.

1
2 [0089] The controller 42 will also ensure the shuttle movement of the filler nozzles and sealing
3 plates is accomplished by utilising linear servo drives to obtain the requisite movement, and,
4 where a fitment is inserted, ensure the drives in the fitment insertion station for transfer
5 mechanism 256 and placement belt 258 are maintained in synchronism with the conveyor 91.
6 More particularly, several PLC controllers interfacing into one master controller control the
7 timing and operation of the system. The sequence control is as follows:

- 8
- 9 1) The speed of the entire system is controlled by the discharge rates of the pouch
10 formers. The pouches are scanned by the vision systems as they are discharged by the
11 pouch formers and are picked up by robotic vacuum arms.
12
 - 13 2) The master controller sets the speed of the filler/sealer in-feed conveyor servo drive to
14 match the output rate of the pouch former.
15
 - 16 3) The master controller sets the speed of the filler/sealer servo drive to match the speed
17 to the filler/sealer input conveyor. The pouch transfer swing arms, the opening and
18 closing of the filler chain clips and movement of the chain clips toward and away from
19 each other are controlled via cams and mechanical actuators as described above.
20
 - 21 4) The air blast, fillers, and fitment systems are individually servo driven and their timing
22 and operation are controlled by servo drives through individual PLC's which are
23 integrated into and controlled by the master control system.
24
 - 25 5) The top clips transfer system, water cooling system, inspection and reject system,
26 straw feeding system and the discharge into the case packing equipment are controlled by
27 individual servo drives and their timing and operation are controlled through individual
28 PLC which are integrated into and controlled by the master controller.
29

1

2 The integration of the controls utilises conventional linear servo technology, such as that
3 available from Allen Bradley, and need not be described further.

4

5 [0090] It will be noted that at all times the pouch is controlled and moved in synchronism
6 through the various stations of the filling and sealing unit.

7

8 [0091] Alternative arrangements of pouch delivery are shown schematically in Figures 33 to 35,
9 which are similar to Figure 4.

10

11 [0092] In Figure 33, a single pouch former 19a delivers pouches to a four lane discharge
12 conveyor 21a. The alignment of the pouches is monitored by vision system 23a. A pair of
13 robotic arms 70a each operate on a 2x2 grid to correct alignment and pass the pouches past a
14 transfer vision system 68a to transfer arms 70a. The arms 70a operate on alternate lanes and are
15 staggered along the conveyor to provide access to the alternate lanes. The arms 70a move 2 rows
16 of 6 pouches in an accurate path to be deposited on the transfer conveyor for delivery to filling
17 and sealing lanes. It will be noted that the picking of alternate lanes by each arm avoids the need
18 to rotate the pouches when transferring to the transfer conveyors 28a as the alternate lanes are
19 commonly oriented.

20

21 [0093] In Figure 34, similar components are used to Figure 33 but in this case, the robotic arms
22 70b collect adjacent lanes and rotate the pouches of one of the lanes during transfer.

23

24 [0094] In Figure 35, the pouch maker 19c supplies 2 lanes of pouches and two pairs of robot
25 arms 70c are spaced apart on either side of the conveyor. The pouches from each lane are
26 selected in groups of 6 with one group of 6 being transferred to an outer lane of the transfer
27 conveyor 28c by the first of the arms and the other group of 6 being transferred to an inner lane
28 by the second arm. The two lane pouch former is thus converted into a four lane transfer
29 conveyor.

1
2 [0095] Although the invention has been described with reference to certain specific
3 embodiments, various modifications thereof will be apparent to those skilled in the art without
4 departing from the spirit and scope of the invention as outlined in the claims appended hereto.

1 THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR
2 PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

3

- 4 1. A method of filling a flexible pouch having a base and sidewalls extending from said base to
5 define a mouth, said method comprising the steps of delivering said pouches to an infeed
6 conveyor in a predetermined orientation, transporting said pouches in a controlled manner by
7 said infeed conveyor toward a filler station, transferring said pouches from said infeed
8 conveyor to a transport conveyor in which said pouch is gripped adjacent to said mouth so as
9 to be suspended from said transport conveyor, opening said mouth of said pouch to permit
10 filling at said filling station, passing said pouches through said filler station, closing said
11 mouth and sealing said mouth prior to release from said transport conveyor.
- 12 2. A method according to claim 1 wherein movement of said transport conveyor is continuous.
- 13 3. A method according to claim 2 wherein a discharge conveyor receives pouches from a
14 pouch maker and delivers said pouches to said infeed conveyor.
- 15 4. A method according to claim 3 wherein said pouches are aligned on said discharge conveyor
16 in a preferred orientation.
- 17 5. A method according to claim 4 wherein a vision system detects misalignment of said pouches
18 on said discharge conveyor and a robotic arm adjusts said pouch to said preferred orientation.
- 19 6. A method according to claim 4 wherein said pouches are received in containers on said
20 discharge conveyor and biased to said preferred orientation.
- 21 7. A method according to claim 3 wherein said pouches are transferred from said discharge
22 conveyor to said infeed conveyor by a robotic device.
- 23 8. A method according to claim 7 wherein said robotic device deposits said pouches in buckets
24 carried by said infeed conveyor.
- 25 9. A method according to claim 8 wherein said buckets bias said pouches to said predetermined
26 orientation.
- 27 10. A method according to claim 7 wherein said discharge conveyor includes a collection zone at
28 which pouches accumulate and said robotic device transfers pouches from said collection
29 zone to said infeed conveyor.

- 1 11. A method according to claim 7 wherein said robotic device is adjustable relative to said
2 discharge conveyor in the direction of movement of said discharge conveyor.
- 3 12. A method according to claim 11 wherein said robotic device is adjustable transversely o the
4 direction of movement of said discharge conveyor.
- 5 13. A method according to claim 7 wherein said pouches are arranged on said discharge
6 conveyor in pairs side by side with said mouths oppositely directed and said robotic device
7 rotates at least one of said pouches during transfer to said infeed conveyor to direct said
8 mouths in the same direction.
- 9 14. A method according to claim 13 wherein said pouches are supported generally horizontally
10 on said discharge conveyor and said robotic device staggers pairs of pouches in a vertical
11 direction during transfer to said infeed conveyor to facilitate rotation thereof.
- 12 15. A method according to claim 7 wherein a pair of discharge conveyors supply pouches to said
13 infeed conveyor and said robotic device selects pouches from either of said discharge
14 conveyors on an intermittent basis.
- 15 16. A method according to claim 15 wherein each of said discharge conveyors includes a
16 collection zone to accumulate pouches for selection by said robotic device.
- 17 17. A method according to claim 16 including a step of monitoring the pouches at said collection
18 zone and determining which of said zones is to have pouches selected by said robotic device.
- 19 18. A method according to claim 18 wherein said step of monitoring is performed by a vision
20 system.
- 21 19. A method according to claim 2 including the step of moving said pouches from a horizontal
22 disposition on said infeed conveyor to a vertical disposition for engagement by said transport
23 conveyor.
- 24 20. A method according to claim 19 including the step of rotating said pouch about a generally
25 horizontal axis and elevating said pouch into a position for engagement by said transport
26 conveyor.
- 27 21. A pouch filling system for filling a flexible pouch having a base and sidewalls extending
28 from said base to define a mouth, said system including an infeed conveyor having a plurality
29 of containers to maintain said pouches in a predetermined orientation of said infeed

- 1 conveyor, a filler station to dispense contents into said pouch, a transport conveyor to move
2 said pouch through said filler station, said transport conveyor including a plurality of
3 retainers moveable with said conveyor to grip said pouch adjacent to said mouth so as to be
4 suspended therefrom, and a sealer unit to seal said mouth after said contents are dispensed by
5 said filler whilst gripped by said retainers.
- 6 22. A system according to claim 21 where said transport conveyor includes a drive to move said
7 pouches in a continuous manner through said filler.
- 8 23. A system according to claim 22 including a discharge conveyor to carry pouches from a
9 pouch maker to said infeed conveyor.
- 10 24. A system according to claim 23 including an alignment station to ensure said pouch is in a
11 preferred orientation on said discharge conveyor.
- 12 25. A system according to claim 25 wherein said alignment station includes a vision system to
13 determine the disposition of said pouch relative to said preferred orientation and a robotic
14 unit to adjust said pouch to said preferred orientation.
- 15 26. A system according to claim 23 including a plurality of containers on said discharge
16 conveyor, each of said containers receiving a pouch and biasing said pouch to said preferred
17 orientation.
- 18 27. A system according to claim 26 wherein said containers have an inclined base to bias said
19 pouches to a preferred position.
- 20 28. A system according to claim 26 wherein said discharge conveyor has pairs of containers
21 arranged side by side and said containers bias said pouches to abut a common partition.
- 22 29. A system according to claim 23 including a robotic device to transfer said pouches from said
23 discharge conveyor to said infeed conveyor.
- 24 30. A system according to claim 29 wherein said robotic device has a plurality of heads to
25 transfer corresponding plurality of pouches from said discharge conveyor to said infeed
26 conveyor.
- 27 31. A system according to claim 30 wherein said robotic device is adjustable relative to said
28 discharge conveyor in a direction parallel to the direction of movement of said pouches and
29 said discharge conveyor.

- 1 32. A system according to claim 30 wherein said robotic device is adjustable relative to said
2 discharge conveyor in a direction transverse to the direction of movement of said pouches on
3 said discharge conveyor.
- 4 33. A system according to claim 30 wherein selected ones of said heads is operable to rotate said
5 pouch during movement between said discharge conveyor and said infeed conveyor.
- 6 34. A system according to claim 33 wherein said heads are relatively adjustable in a vertical
7 direction to facilitate rotation of said pouches.
- 8 35. A system according to claim 29 including a pair of discharge conveyors, said robotic device
9 being operable to select pouches intermittently from either of said discharge conveyors.
- 10 36. A system according to claim 35 wherein each of said conveyors includes a collection zone to
11 accumulate pouches.
- 12 37. A system according to claim 36 wherein said collection zones are located at a position to be
13 accessible by said robotic device.
- 14 38. A system according to claim 21 wherein said infeed conveyor includes a plurality of lift arms
15 to elevate said pouches from said containers on said infeed conveyor to said retainers on said
16 transport conveyor.
- 17 39. A system according to claim 38 wherein said lift arms rotate said pouches from a generally
18 horizontal position to a generally vertical position.
- 19 40. A system according to claim 39 wherein said lift arms are extendable to elevate said pouches
20 relative to said retainers.
- 21 41. A method of inserting a fitment into a mouth of a pouch, comprising the steps of opening
22 said mouth of said pouch, positioning said fitment at the desired location relative to said
23 mouth, closing said mouth so as to engage said fitment and sealing said mouth to retain said
24 fitment.
- 25 42. A method according to claim 41 including the steps of continuously moving said pouch
26 during insertion and sealing.
- 27 43. A method according to claim 42 including the step of supporting said fitment on a conveyor
28 moving in synchronism with said pouch.

- 1 44. A method according to claim 43 including the step of introducing said fitment into said
2 mouth by moving said pouch and said fitment in unison or convergent paths.
- 3 45. A method according to claim 44 including the step of moving said fitment along a path
4 parallel to said pouch during sealing of said mouth.
- 5 46. A method according to claim 45 including the step of releasing said fitment upon initial
6 sealing and subsequently effecting a further sealing operation on said pouch.
- 7 47. A method according to claim 42 including the step of subjecting said pouch to external
8 pressure subsequent to said sealing operations to determine the integrity of said operations.
- 9 48. A method according to claim 47 including the steps of cooling said pouch after said sealing
10 operations.
- 11 49. A method according to claim 48 including the step of transferring said pouch from one
12 conveyor to another between said sealing and cooling operations.
- 13 50. A method according to claim 49 wherein said pouch is suspended from said other conveyor
14 during said cooling operation and liquid coolant is sprayed on said pouch to effect said
15 cooling.
- 16 51. Apparatus for inserting a fitment into a mouth of a pouch, said apparatus including a first
17 conveyor including retainers to support said pouch in either a first position in which said
18 mouth is open, or a second position in which said mouth is closed, a second conveyor to
19 carry a retainer and position it in said mouth and a sealer to seal said mouth in a closed
20 position about said fitment.
- 21 52. Apparatus according to claim 51 wherein said second conveyor includes a transfer device to
22 move a fitment along a path convergent with said pouch for insertion into said mouth and a
23 placement device moving parallel to said pouch to support said fitment as said sealer effects
24 said seal.
- 25 53. Apparatus according to claim 52 wherein said transfer device includes on a wheel operable to
26 select individual fitment from a hopper and a transfer belt to receive fitments from said wheel
27 and move individual fitments into said mouth.
- 28 54. Apparatus according to claim 53 wherein said placement device includes a placement belt
29 having supports thereon to receive said fitment from said transfer belt.

- 1 55. Apparatus according to claim 51 including an actuator to adjust said retainers between said
2 open and closed position of said mouth.
- 3 56. Apparatus according to claim 55 wherein said actuator moves said retainers to said closed
4 position after insertion of said fitment and prior to operation of said sealer.
- 5 57. Apparatus according to claim 56 wherein said retainers include a pair of clips engaging
6 opposite slides of said pouches.
- 7 58. Apparatus according to claim 57 wherein said actuator is operable to move said clips relative
8 to one another to effect opening and closing of said mouth.
- 9 59. Apparatus according to claim 59 wherein said sealer includes a pair of sealing plates
10 moveable with said pouch.
- 11 60. Apparatus according to claim 59 wherein said plates are profiled to accommodate said
12 fitment.
- 13 61. A cooler for cooling contents of a pouch, said cooler including a conveyor to suspend said
14 pouches and move them through said cooler, along a path, a plurality of nozzles arranged
15 along said path, and a coolant supply to supply coolant to said nozzles, said nozzles being
16 positioned to spray said coolant on opposite sides of said pouches as they are moved through
17 said cooler.
- 18 62. A cooler according to claim 61 wherein said path is serpentine and said nozzles are arranged
19 between linear runs of said serpentine path.
- 20 63. A cooler according to claim 62 wherein said nozzles are located on a manifold disposed
21 between said linear runs and said nozzles project fluid to either side of said manifold.
- 22 64. A cooler according to claim 63 wherein said conveyor includes a chain with clips secured
23 thereto to suspend said pouches, said clips being positioned to engage an upper edge of said
24 pouch.
- 25 65. A cooler according to claim 64 wherein said nozzles are positioned to spray an upper portion
26 of said pouch.
- 27 66. A filler system for filling a pouch with a fluid comprising a reservoir of said fluid, a supply
28 line to deliver said fluid to manifold, at least one pump having an inlet connected by an inlet
29 conduit to said manifold and an outlet connected to by an outlet conduit to a filler nozzle, and

- 1 a pair of valves associated respectively with said inlet and outlet, said valves operable to
2 control flow through said conduits by engagement of an exterior wall thereof to cause
3 deformation of said exterior wall and collapse of said conduit.
- 4 67. A filler system according to claim 66 wherein said pump includes a piston reciprocating with
5 a cylinder and said valves are driven in synchronisation with said piston to control flow of
6 fluid between said inlet and outlet.
- 7 68. A filler system according to claim 66 including a return conduit to return fluid from said
8 manifold to said reservoir.

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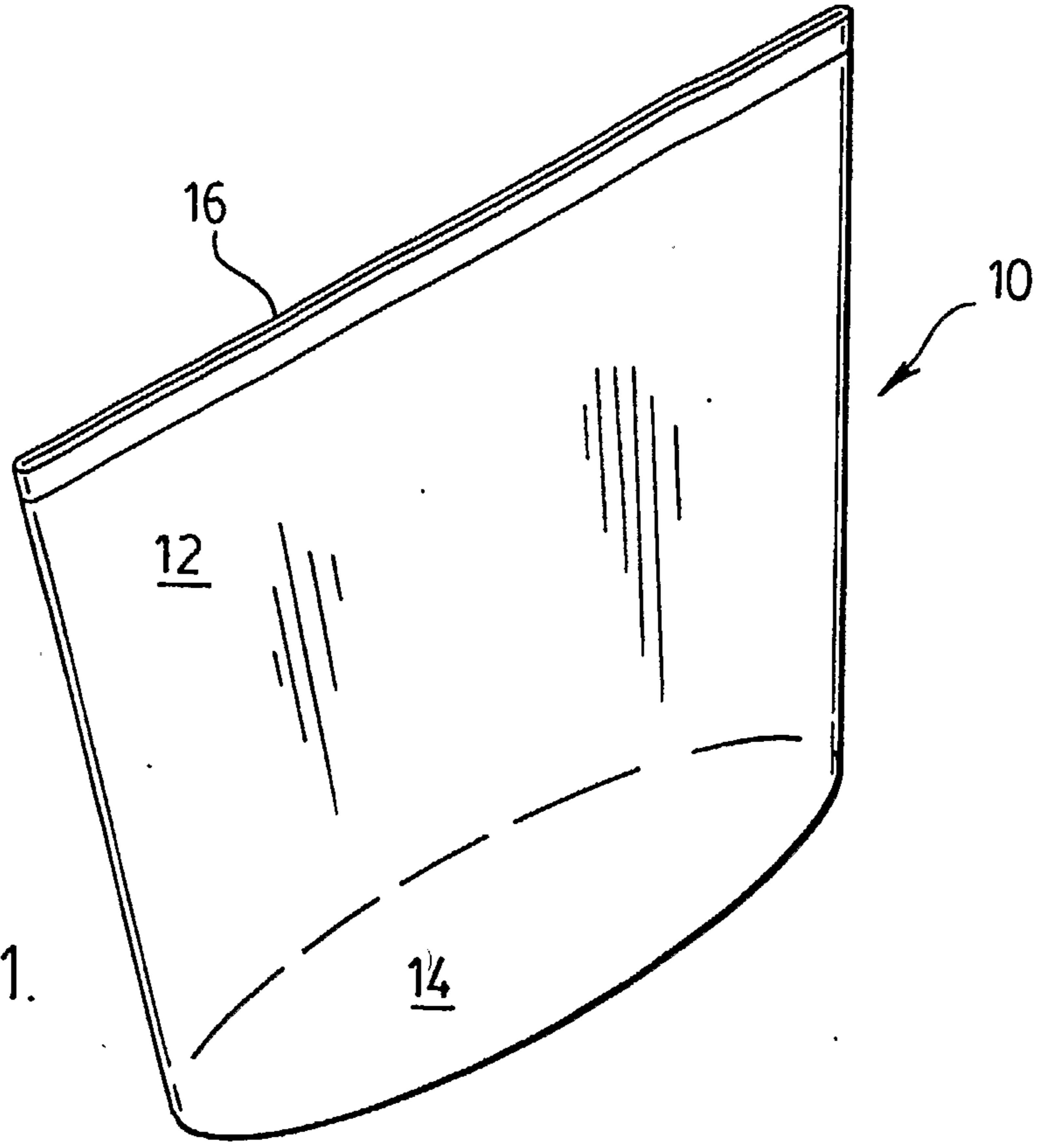


FIG. 1.

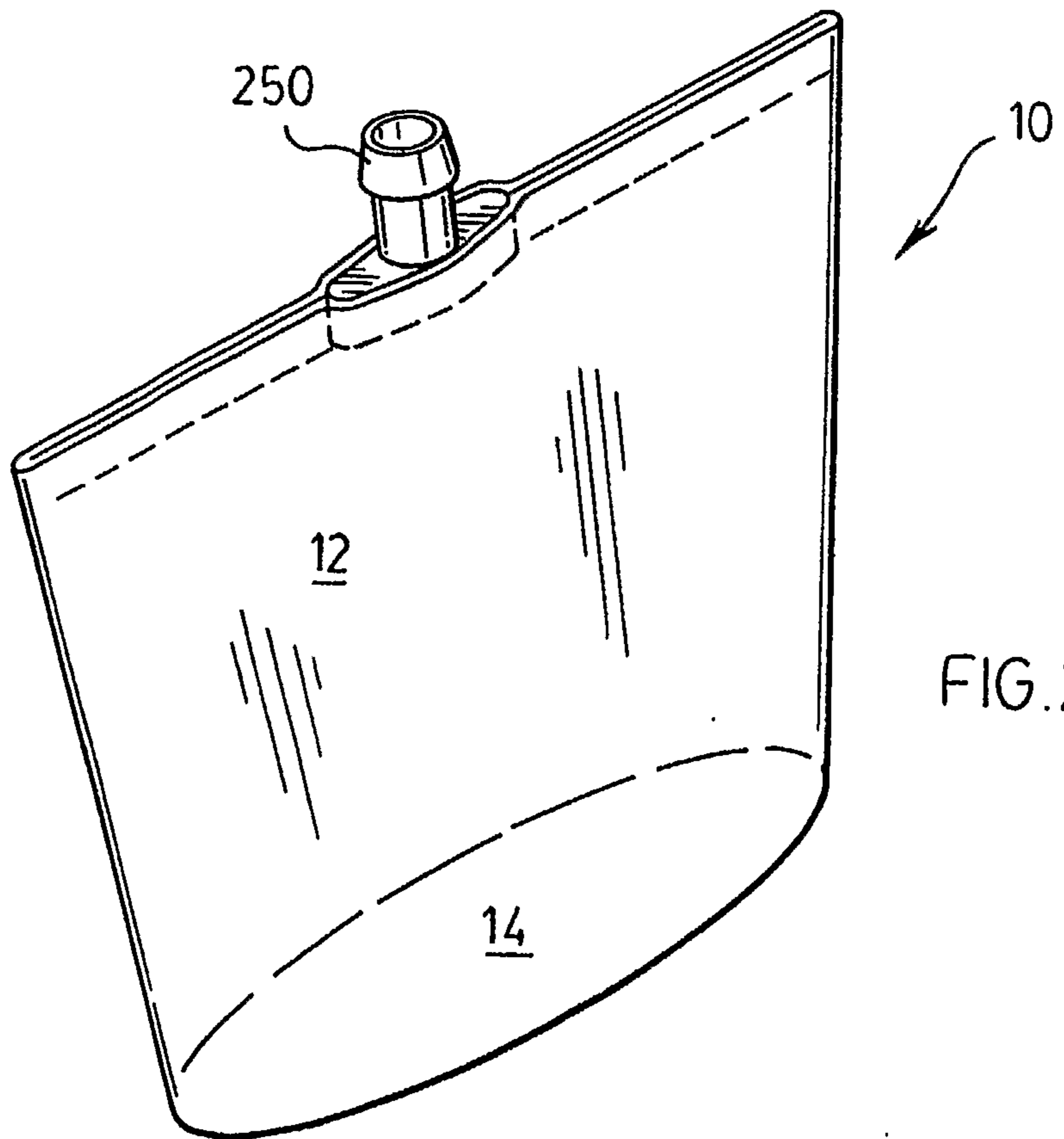
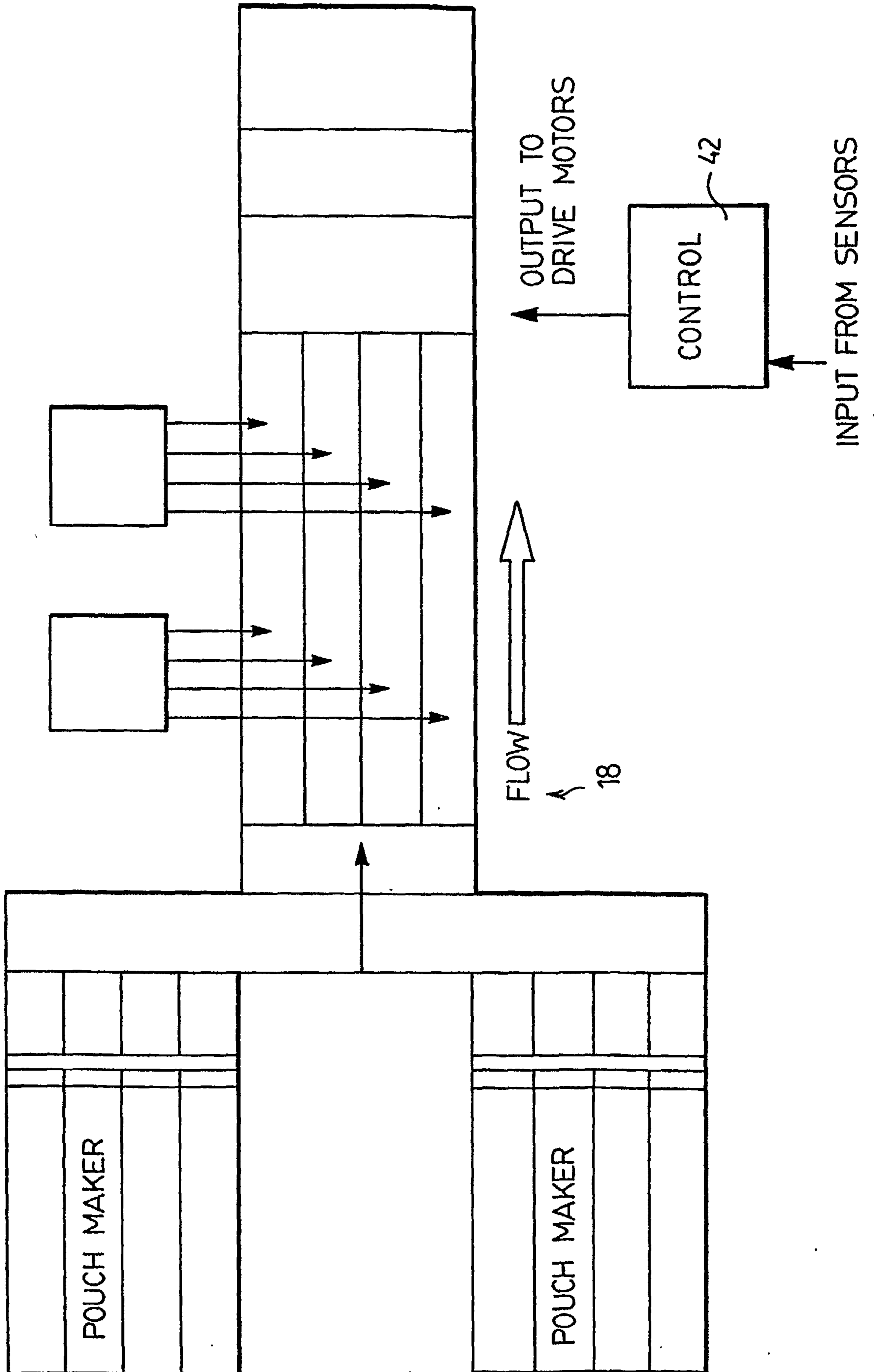


FIG. 2.

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FIG. 3.



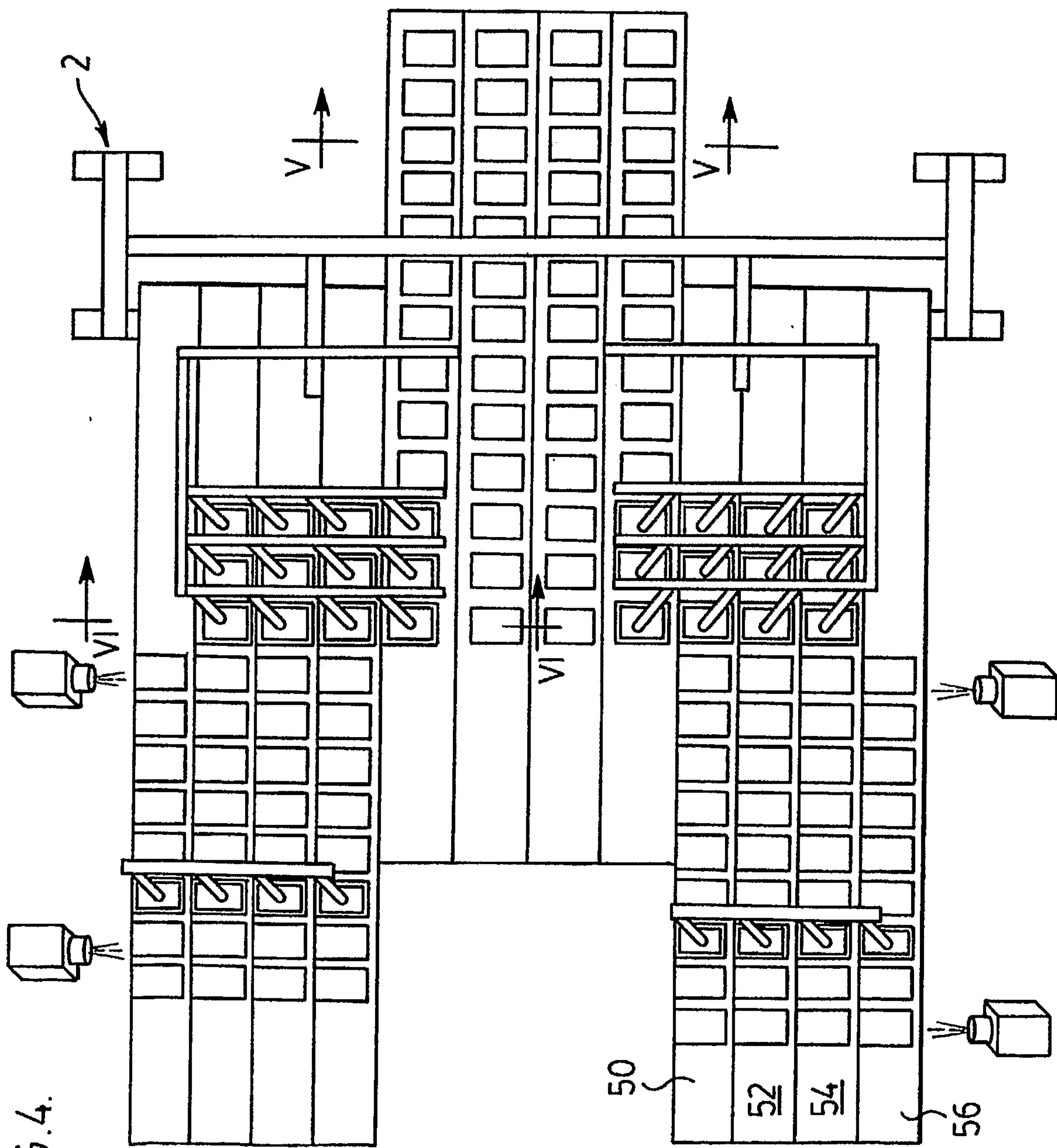


FIG. 4.

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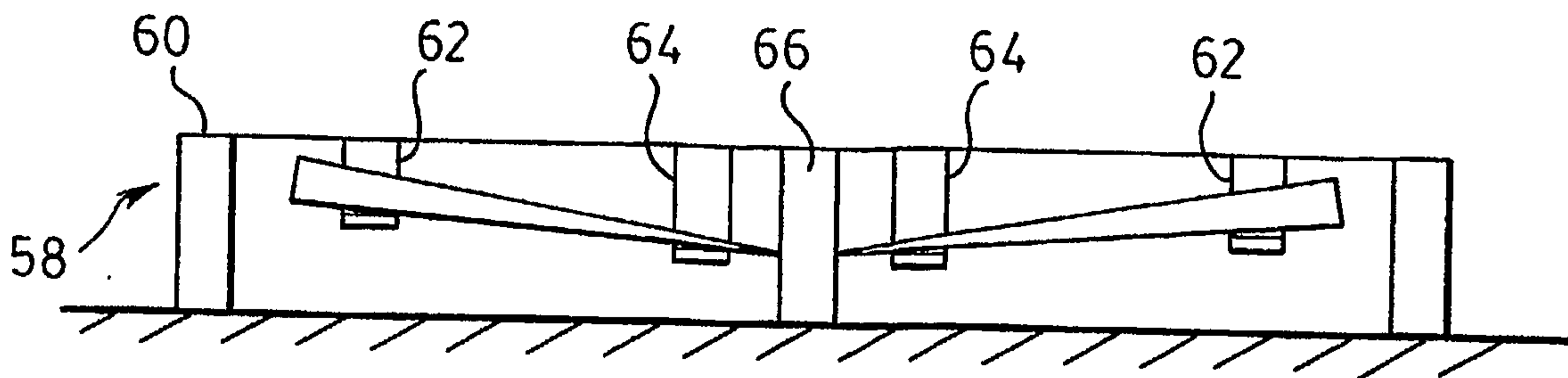


FIG. 5.

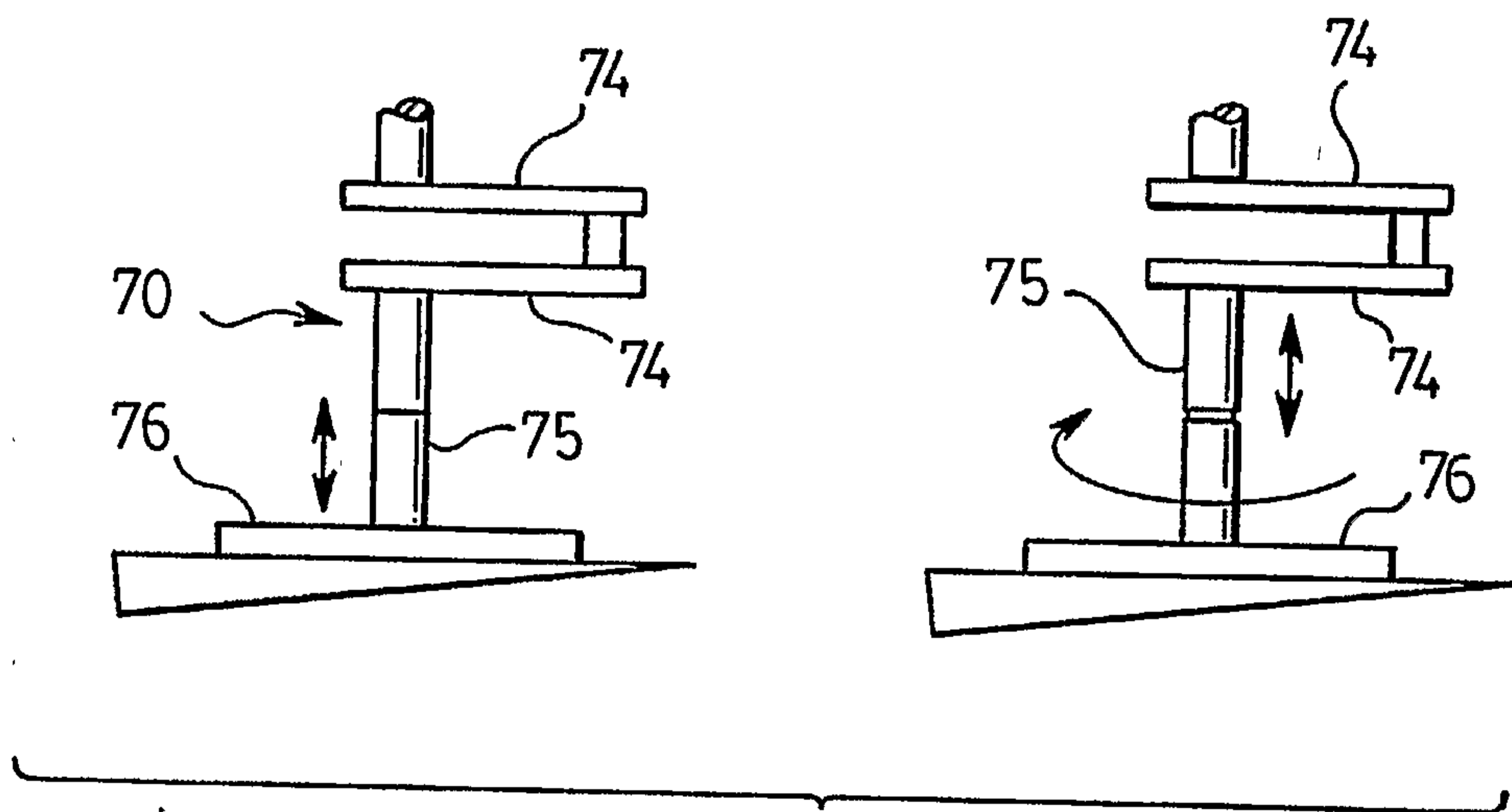


FIG. 6.

FIG. 7.

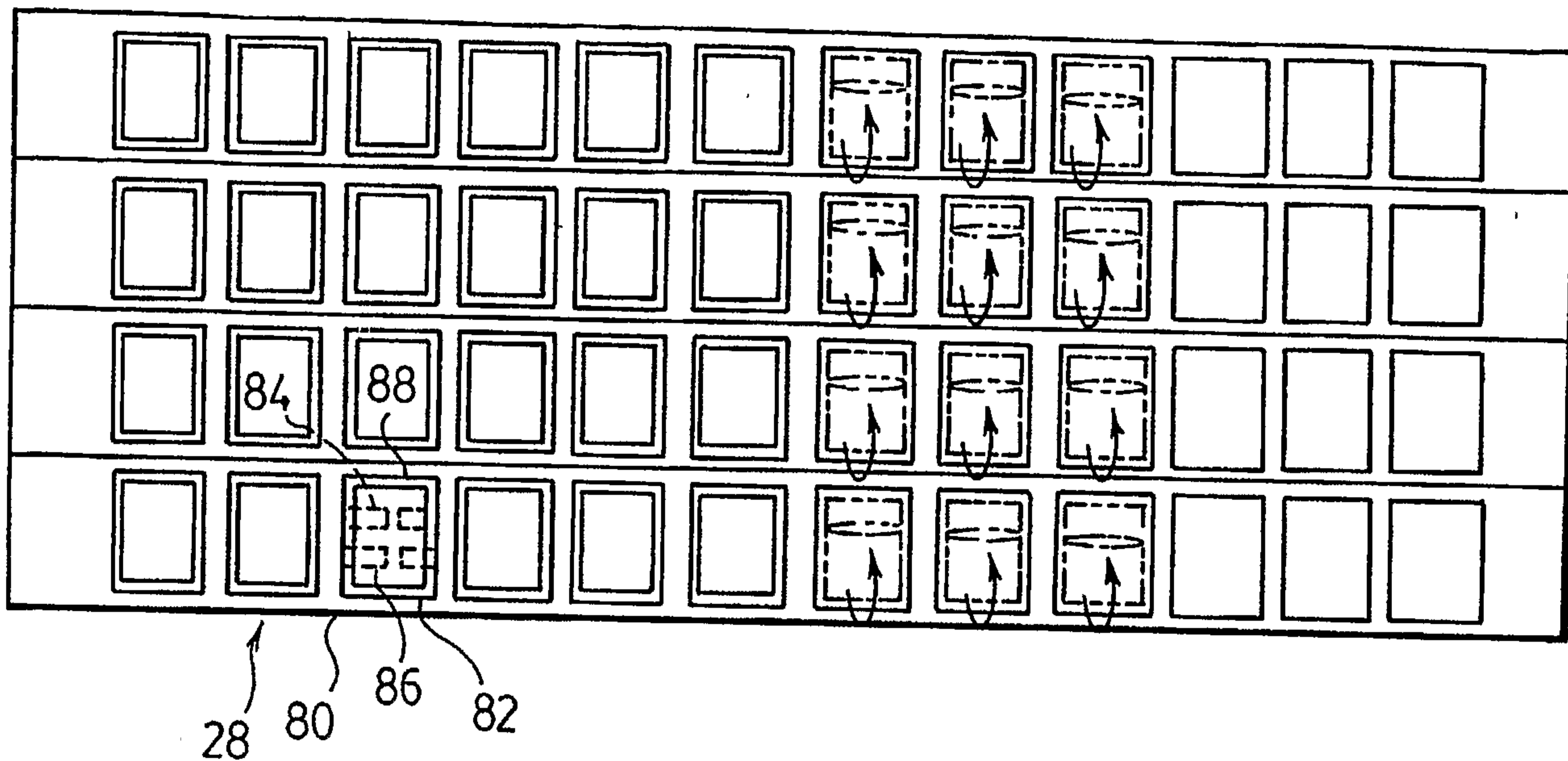
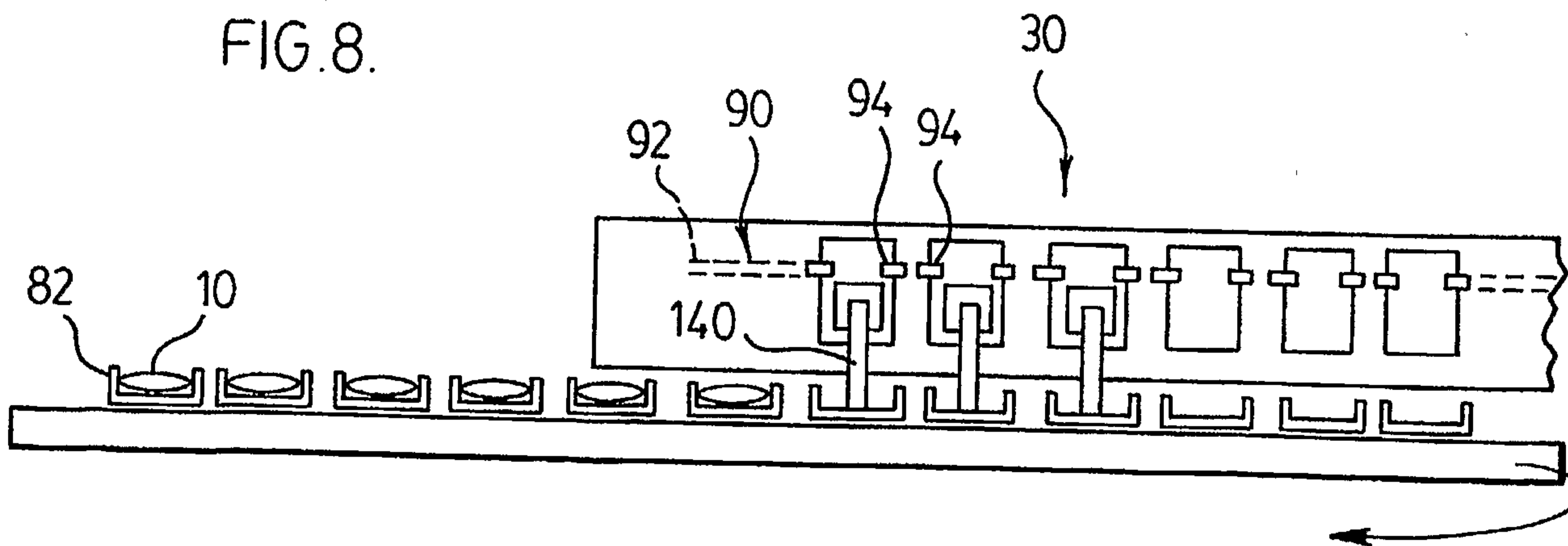


FIG. 8.



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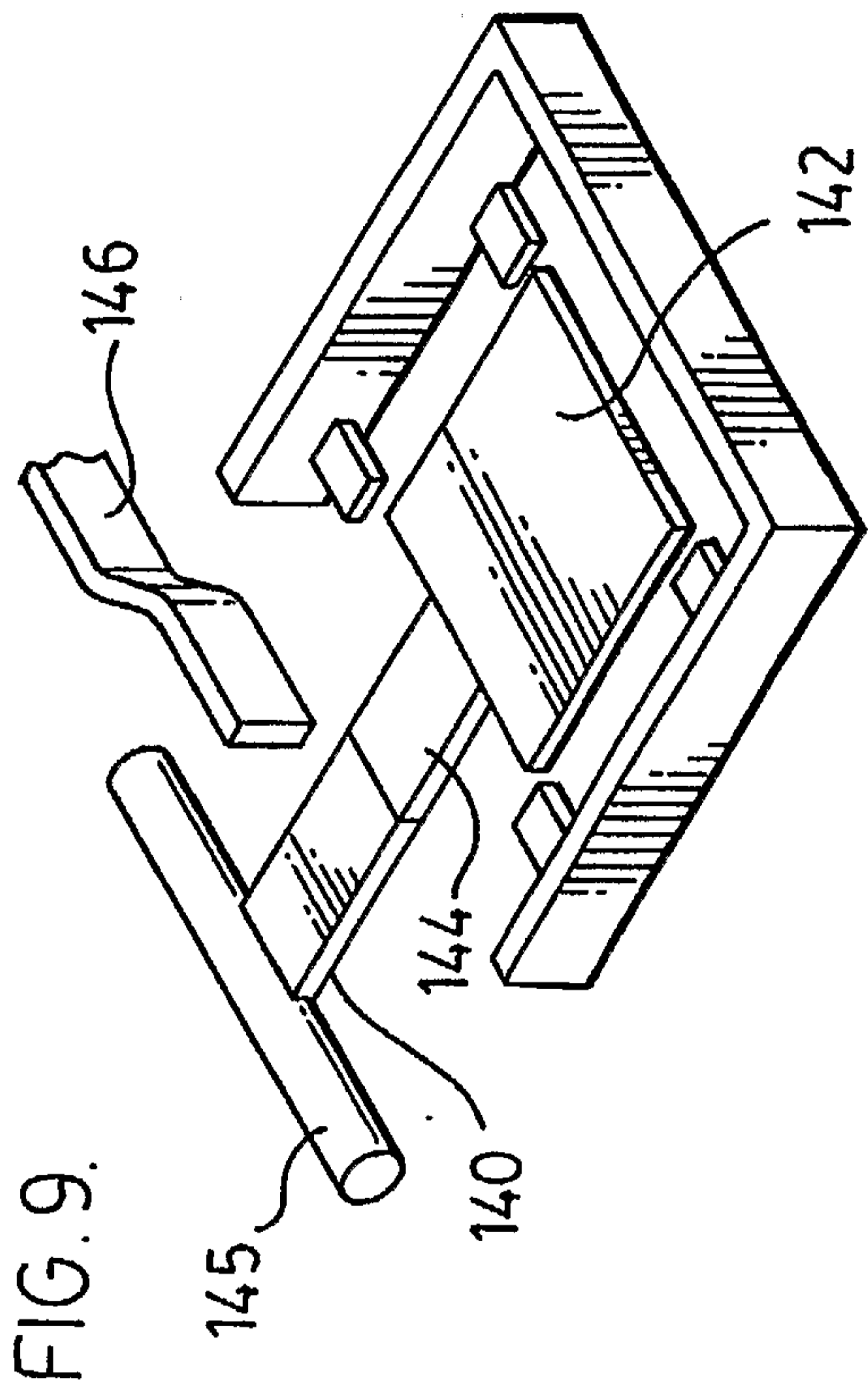
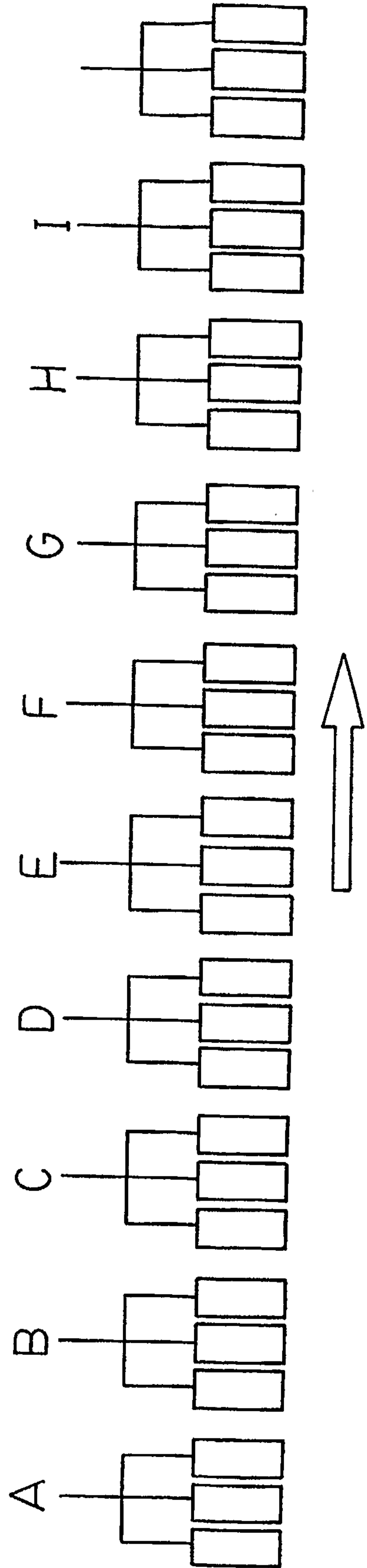
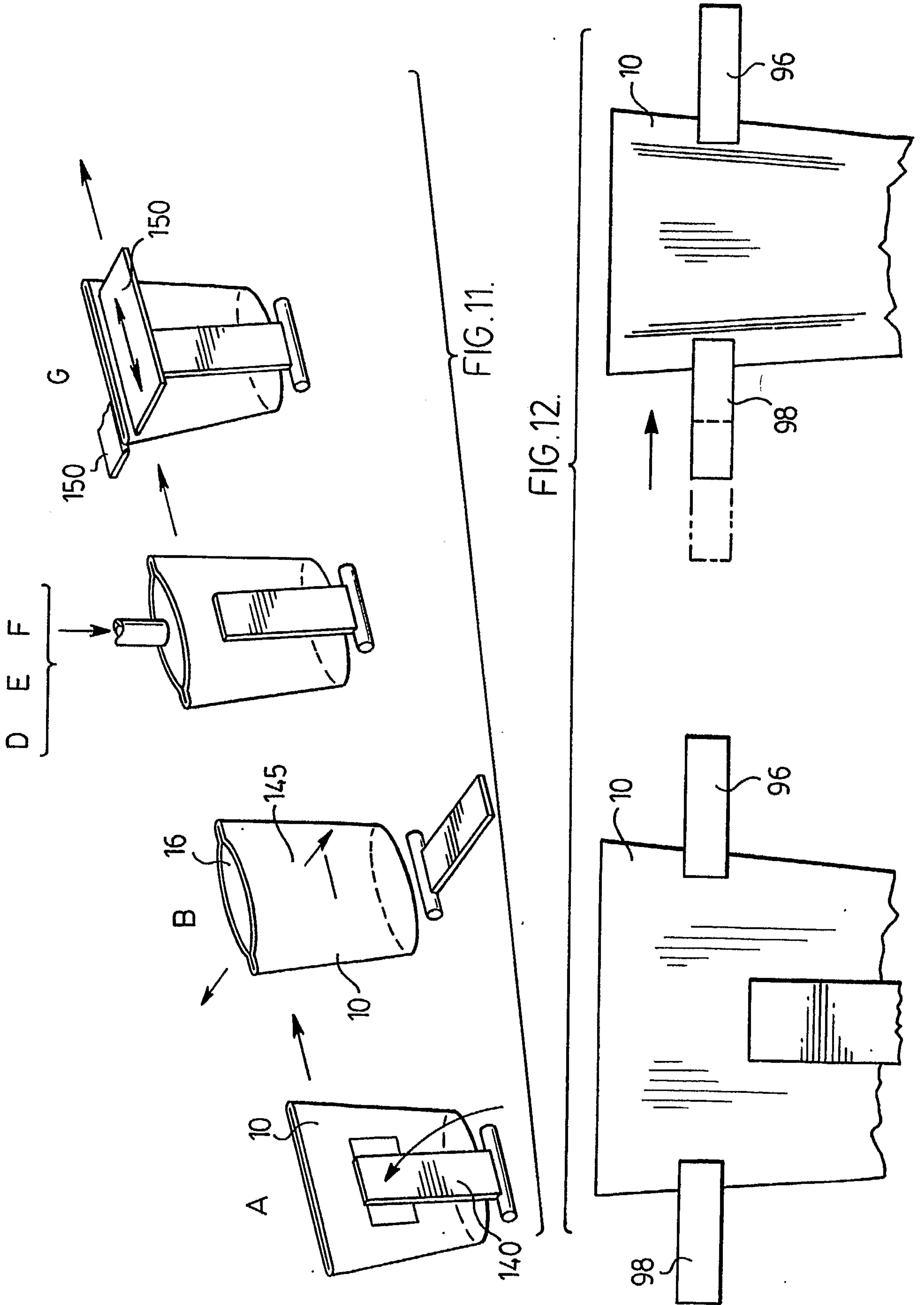


FIG. 9.

FIG. 10.



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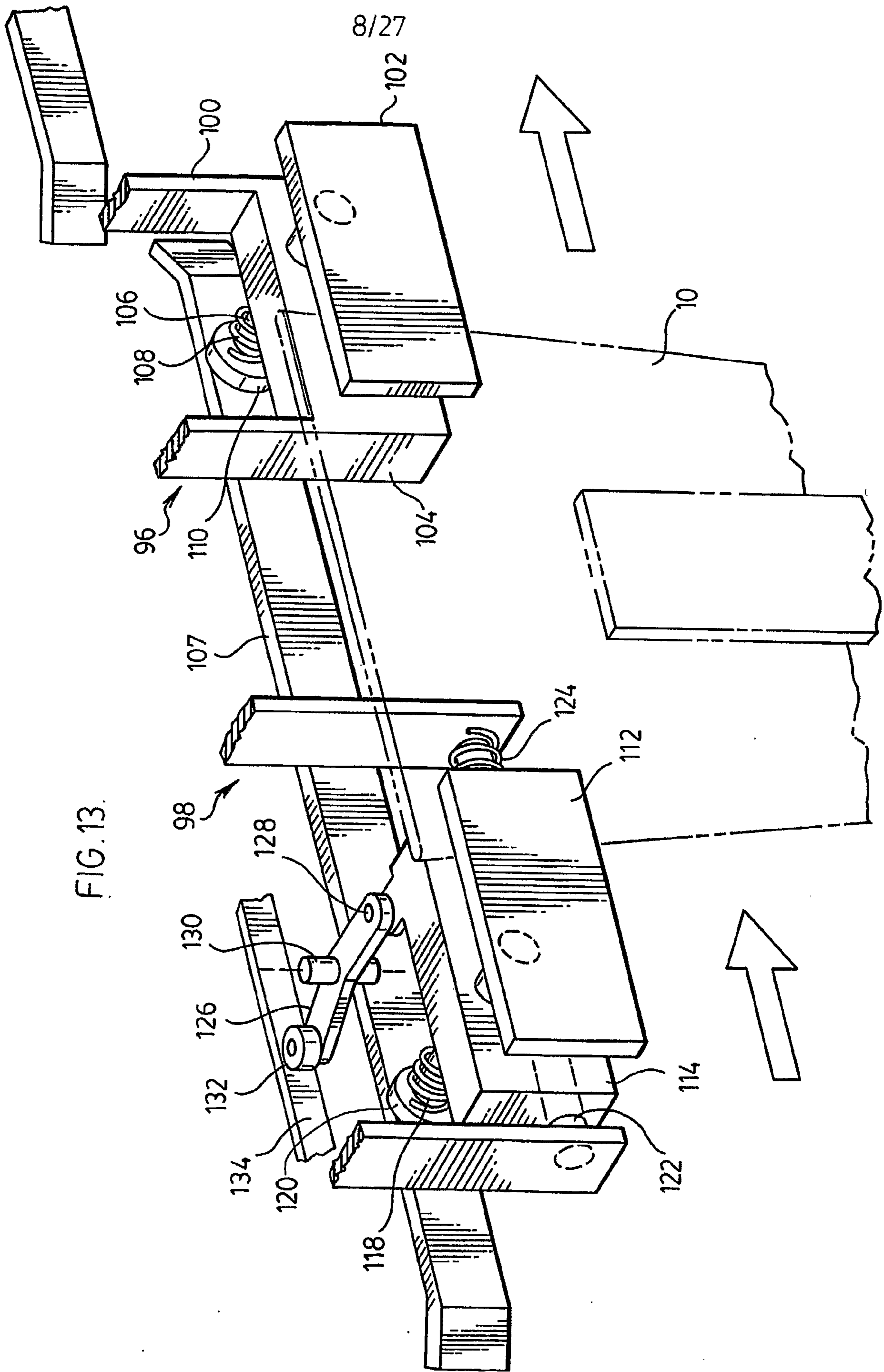


FIG. 13.

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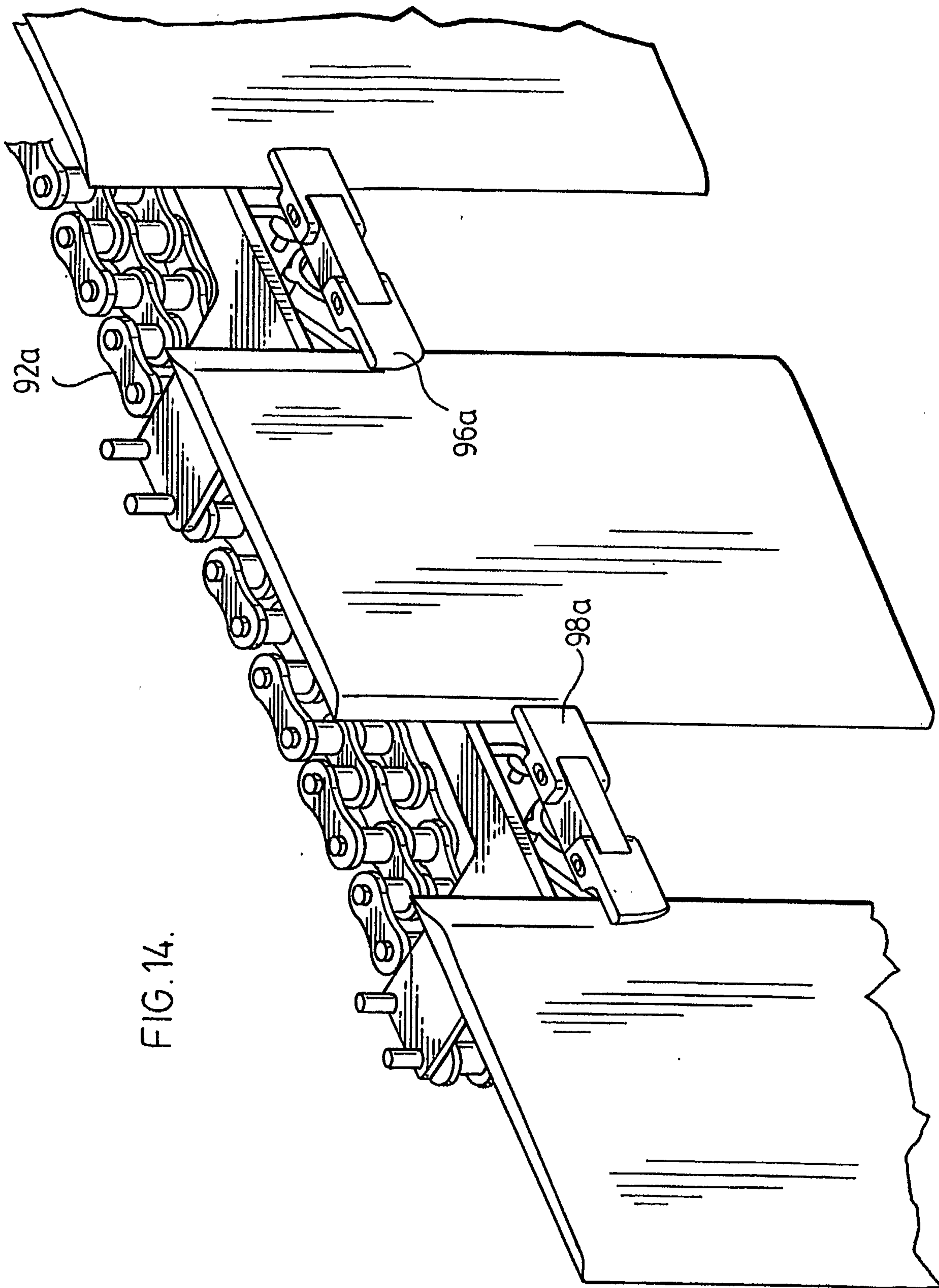
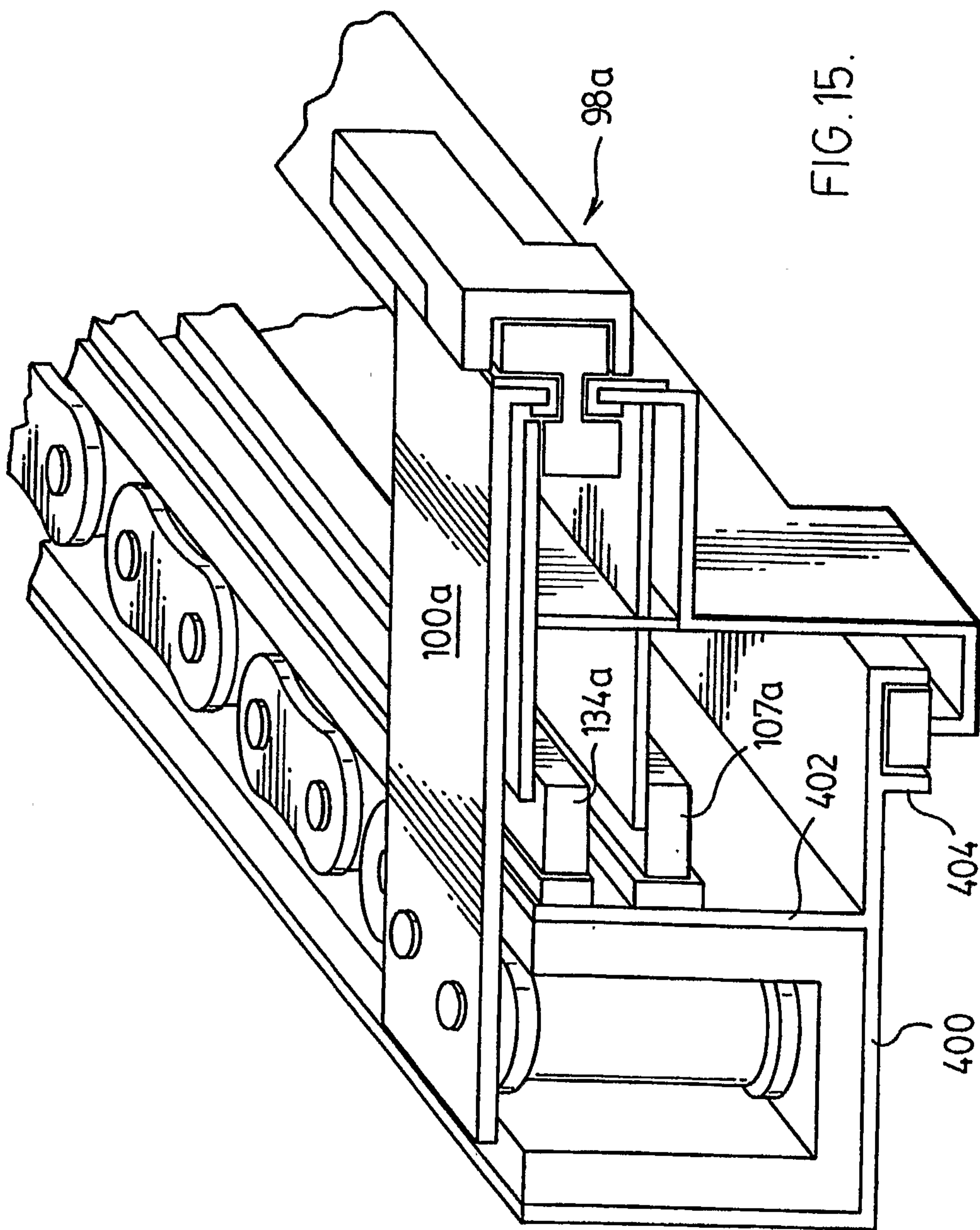
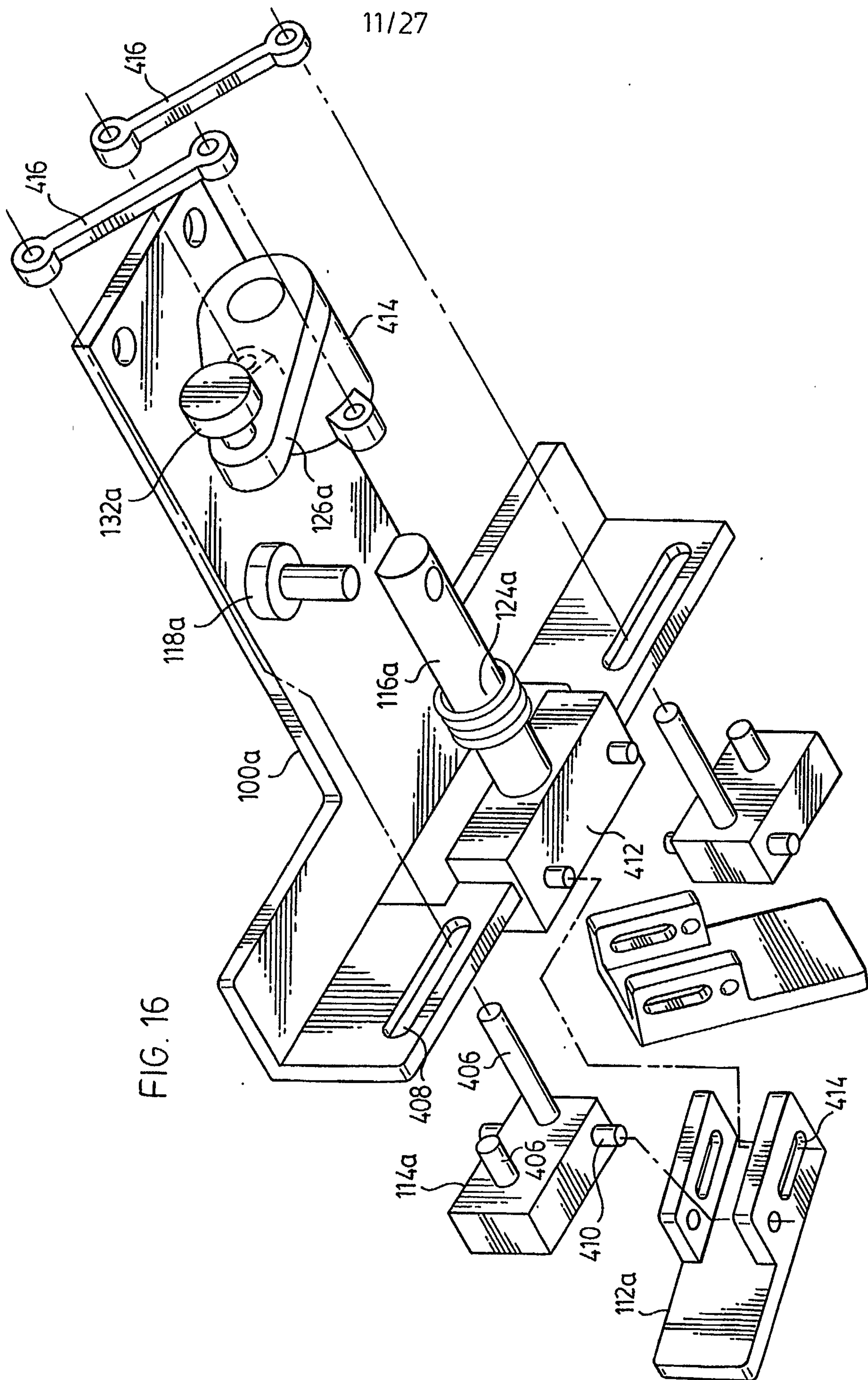
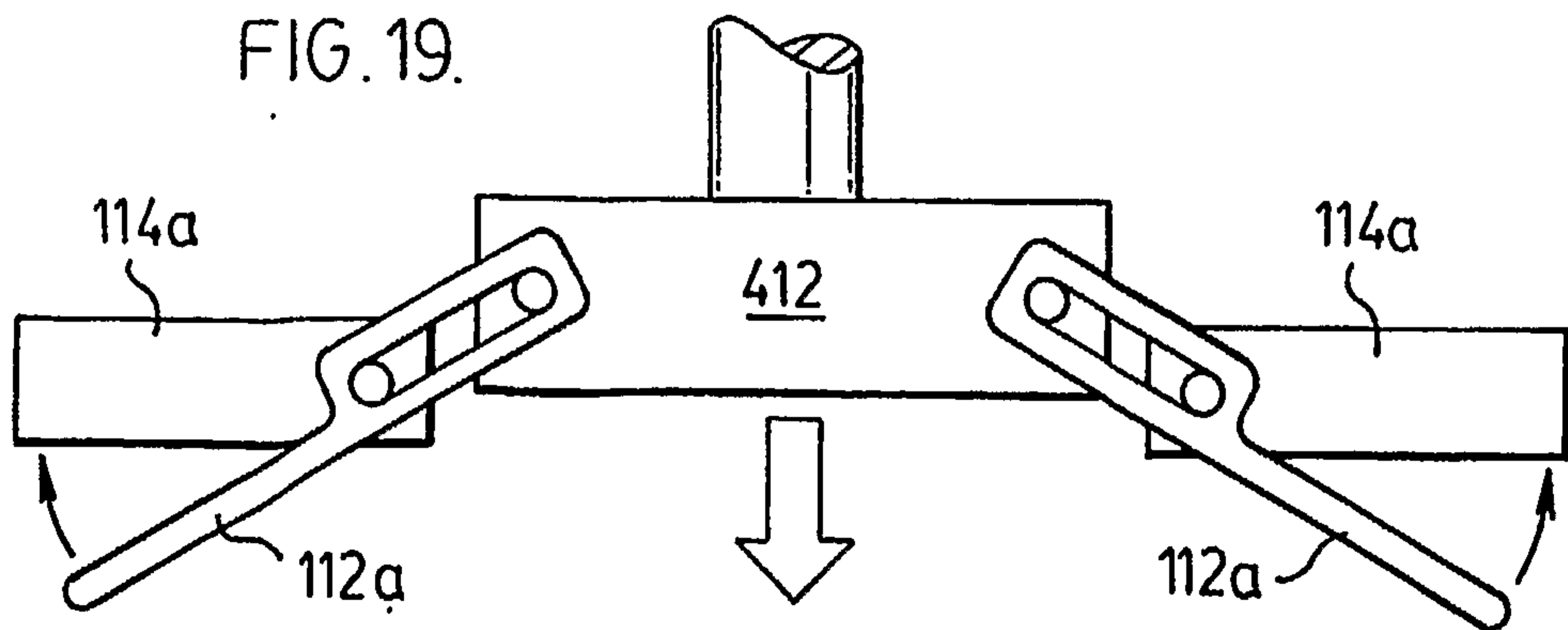
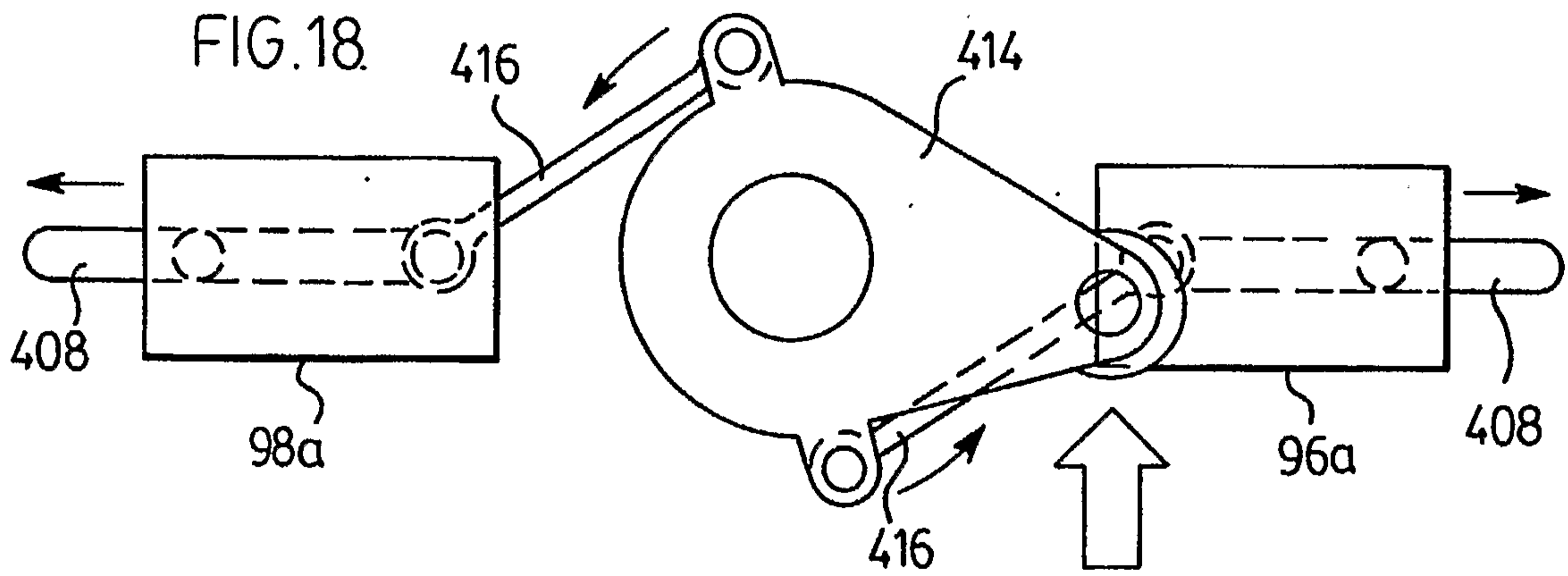
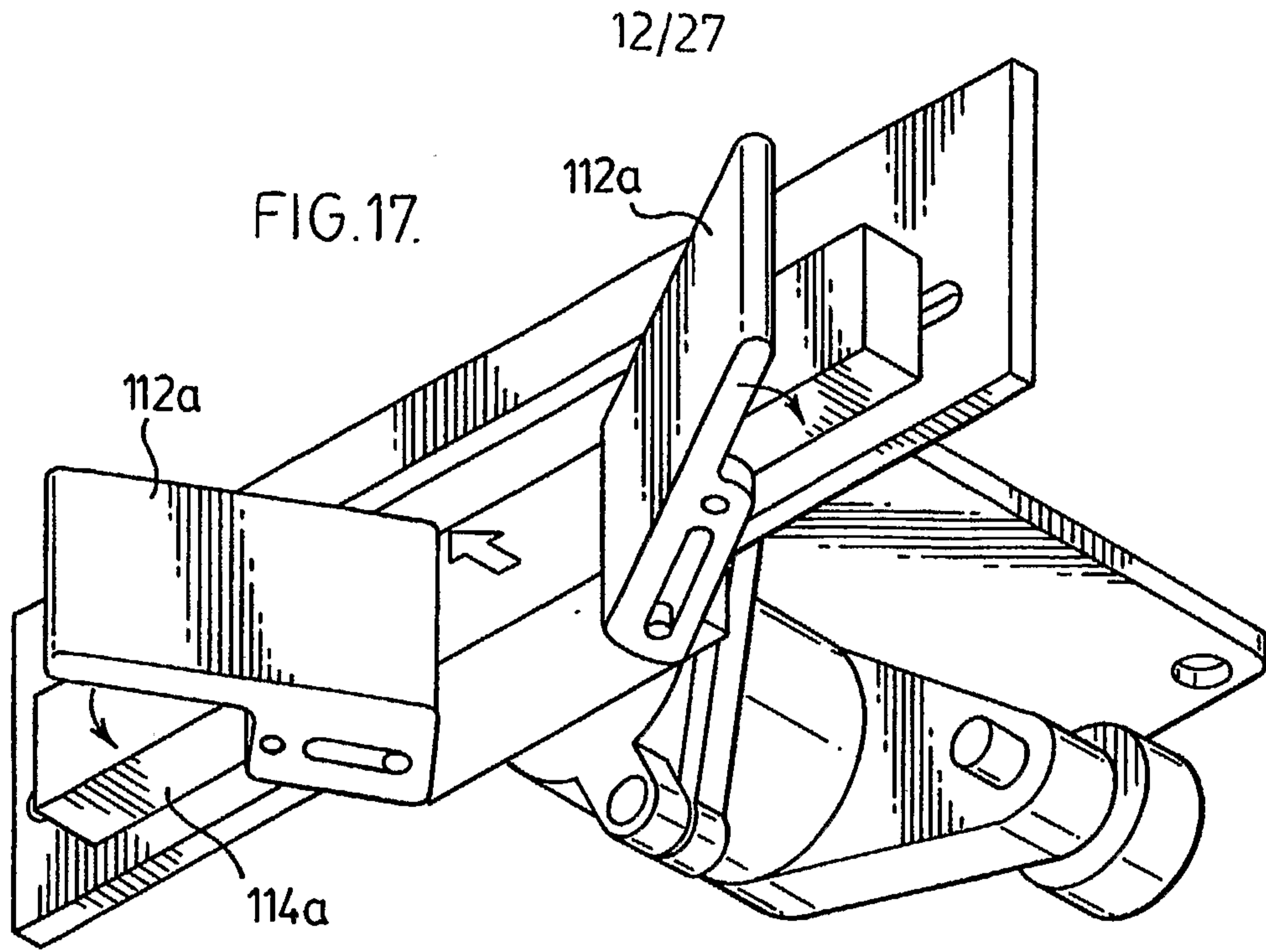


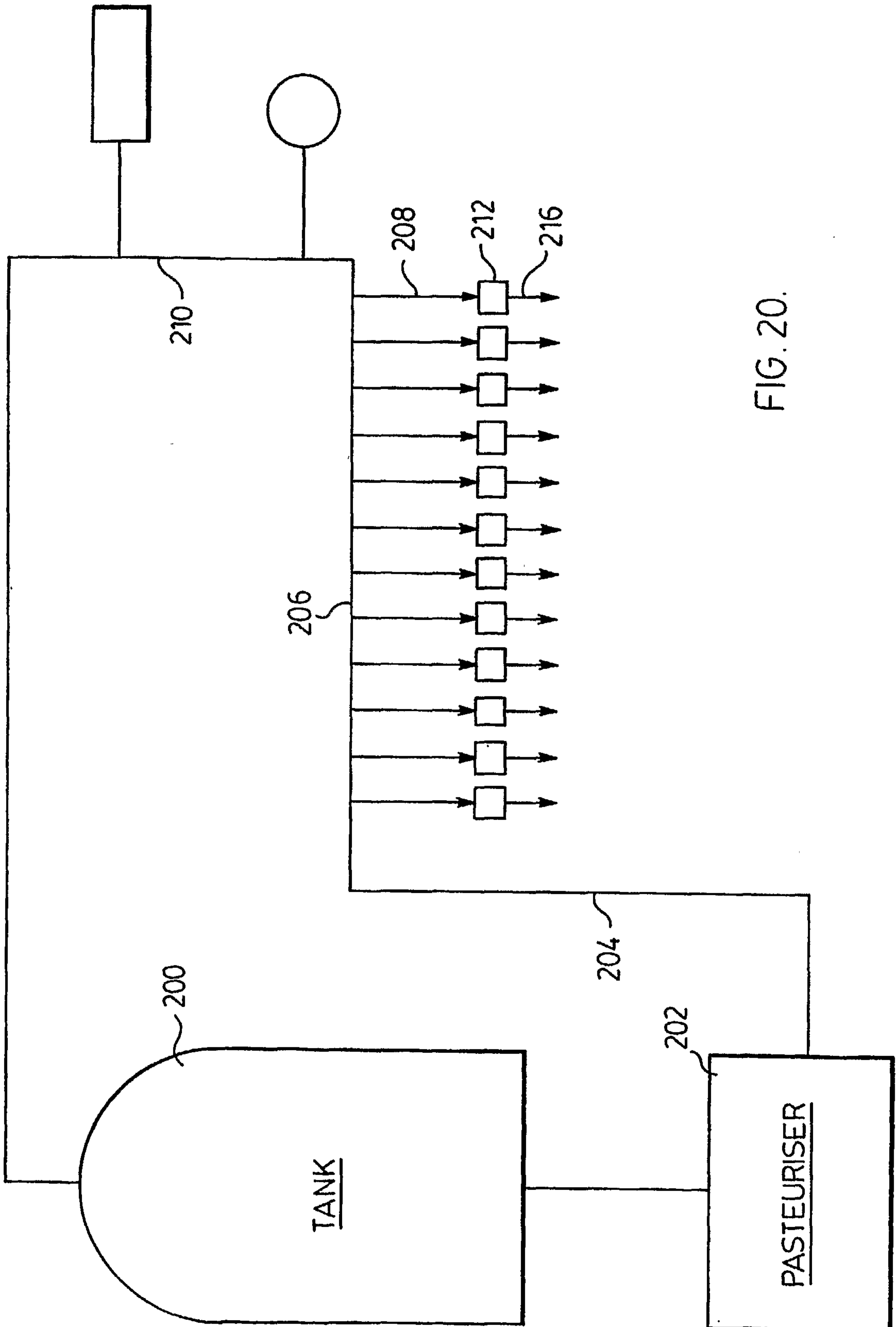
FIG. 14.

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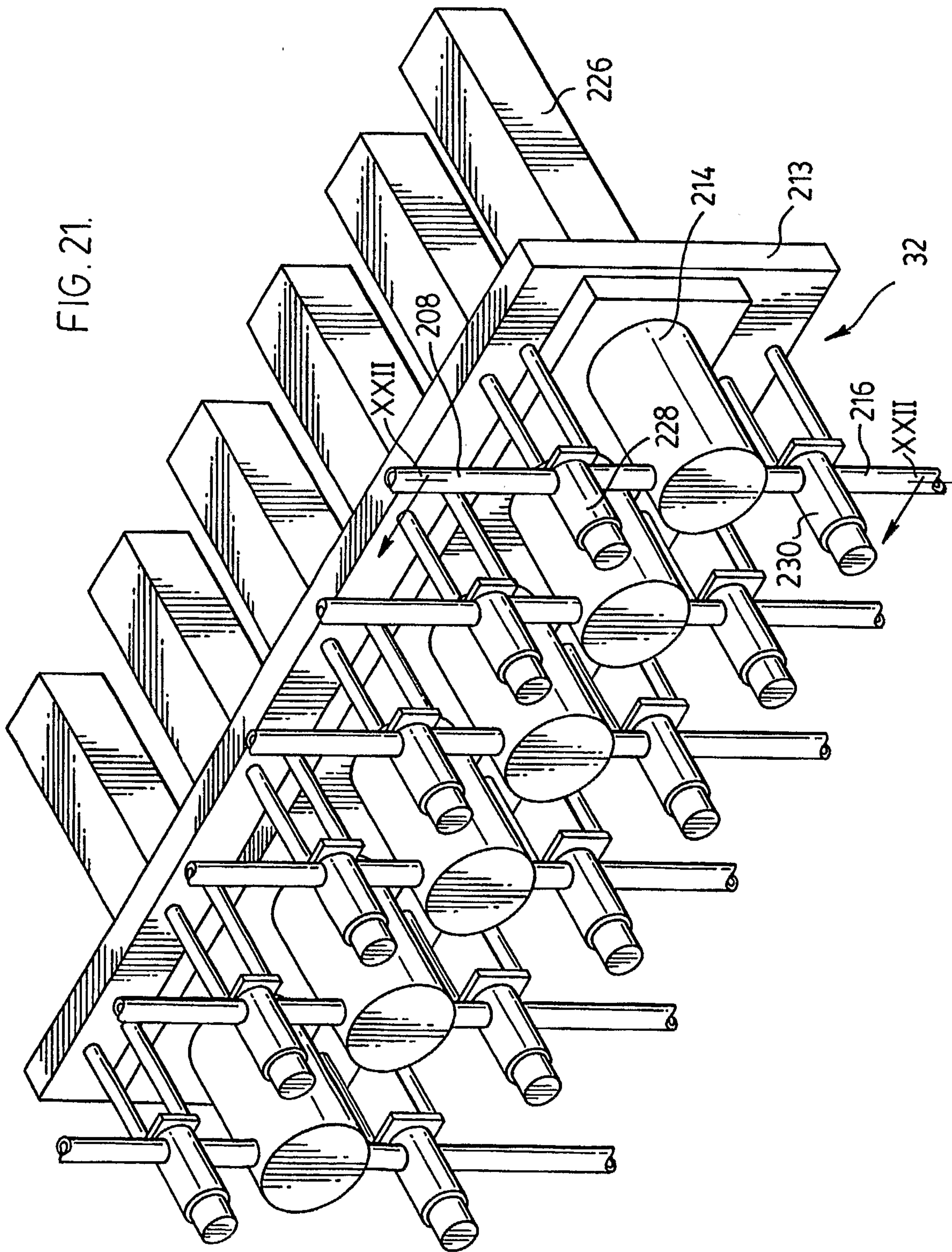


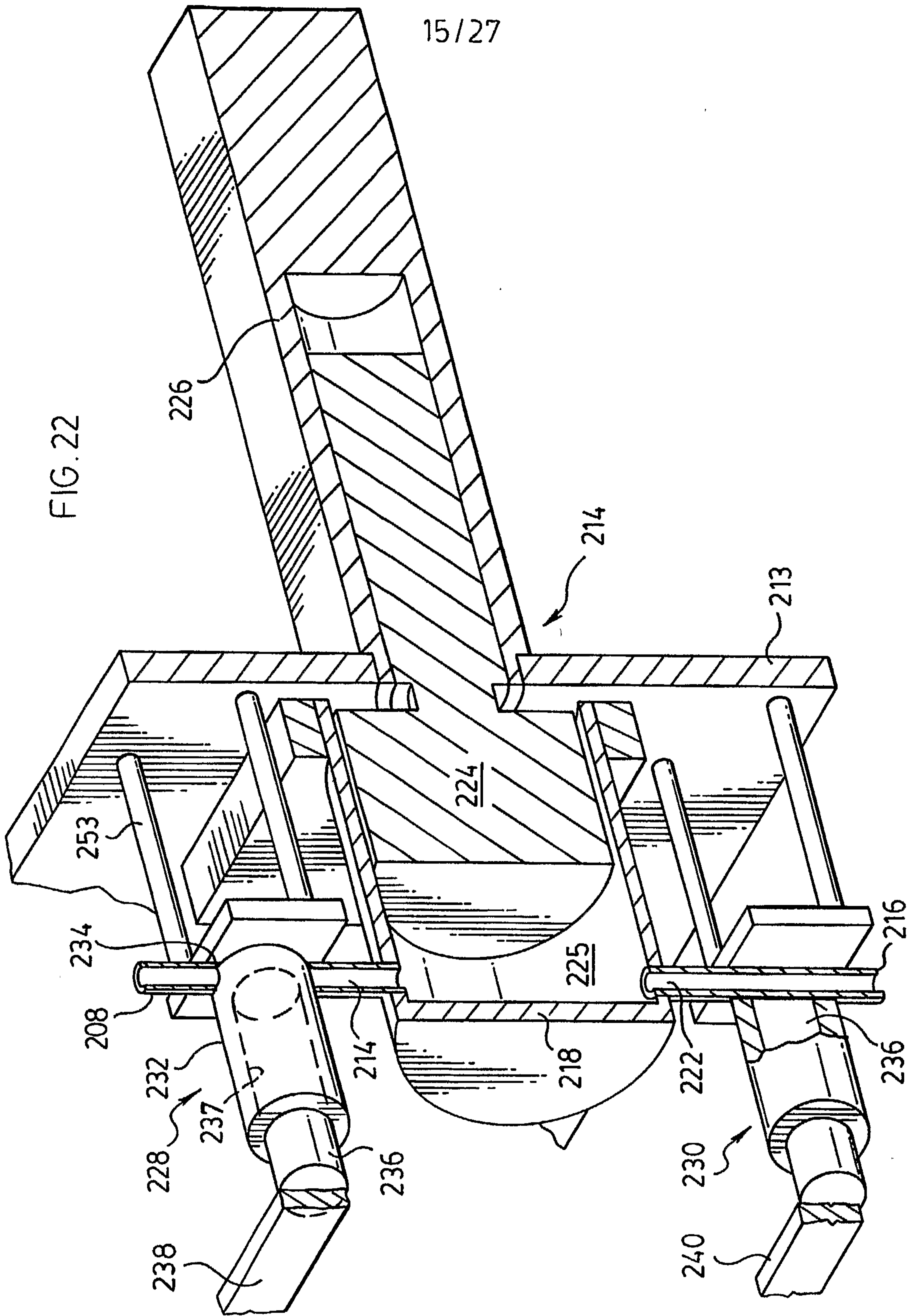




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FIG. 21.





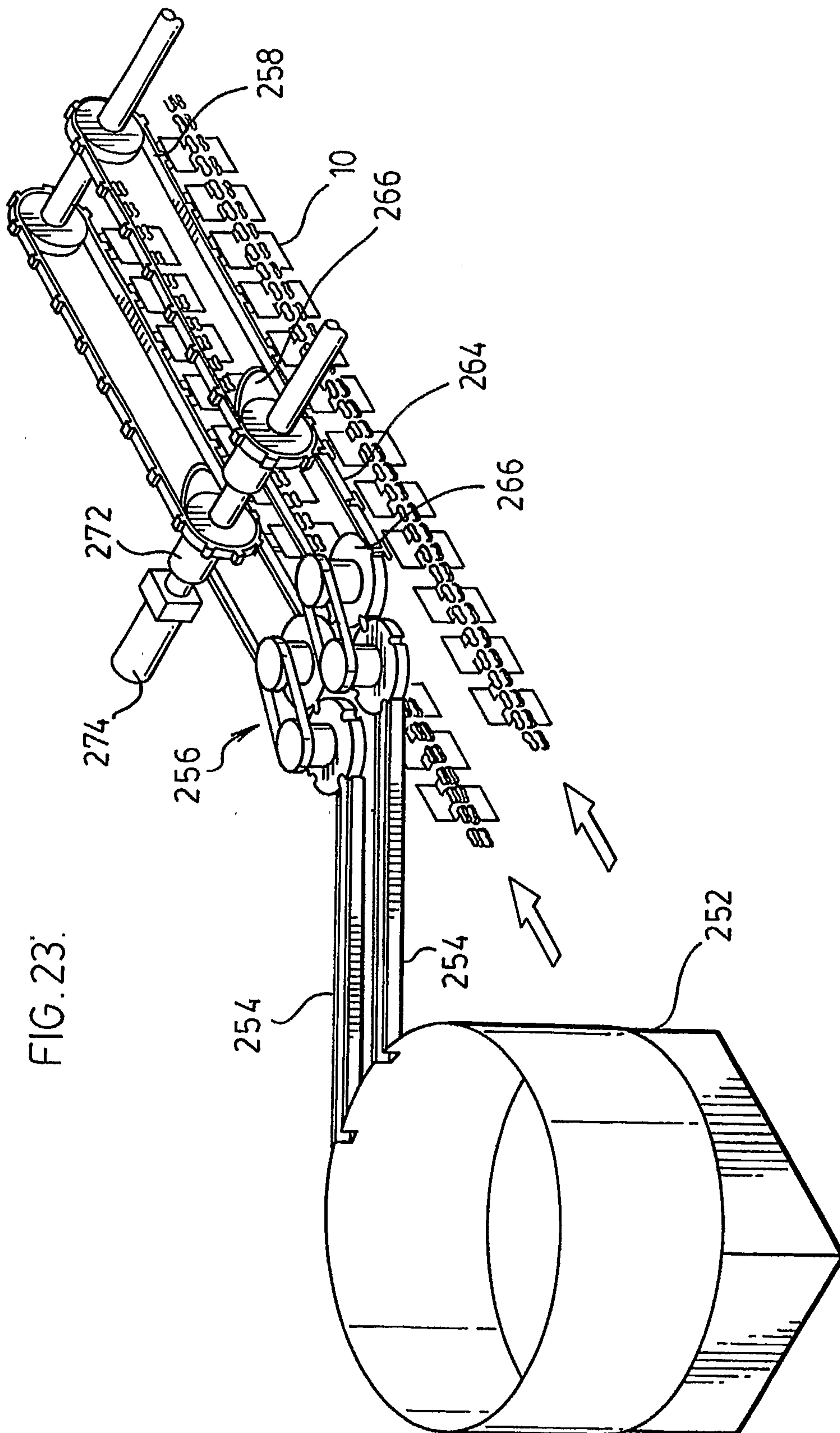


FIG. 23.

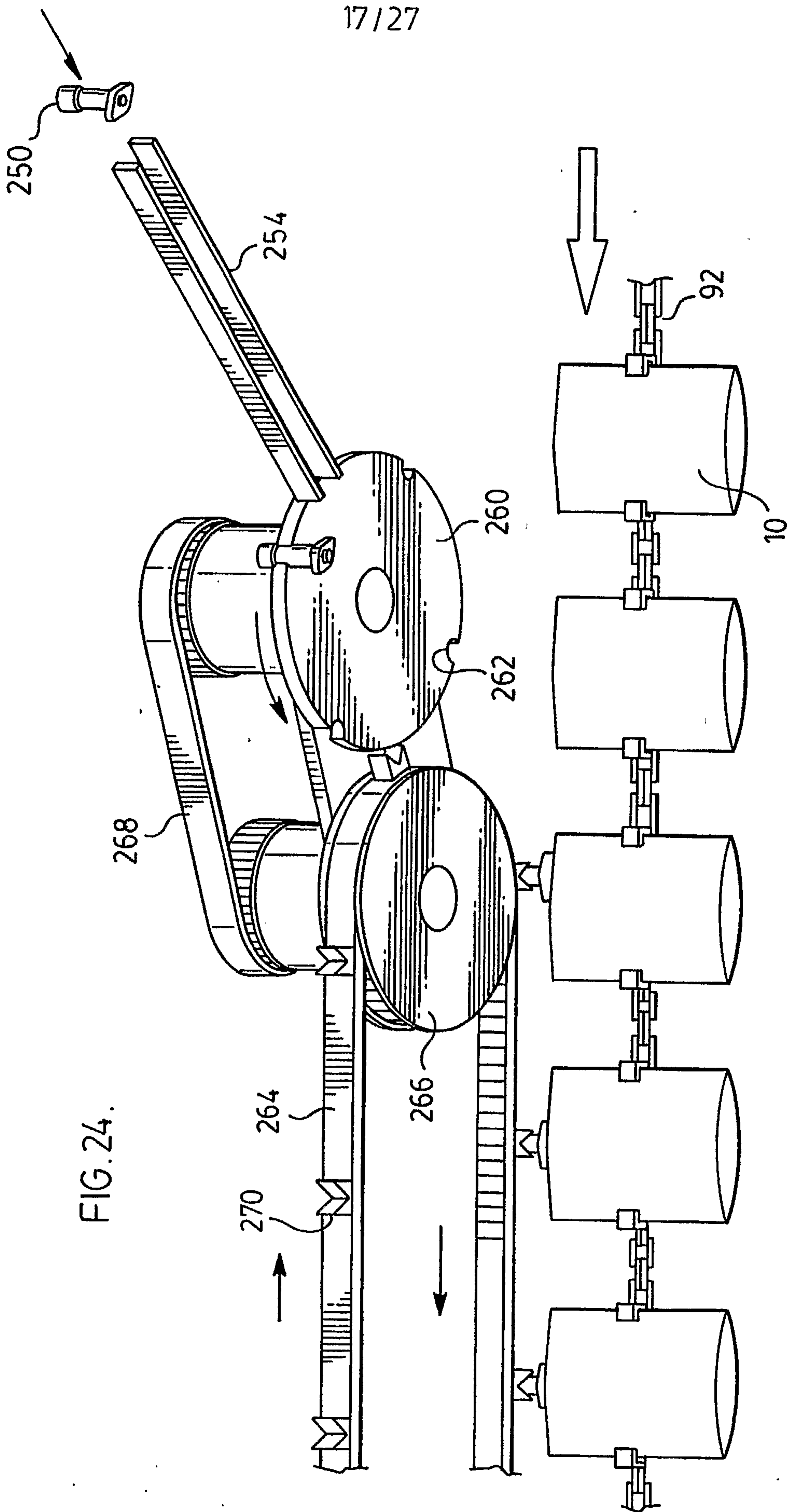
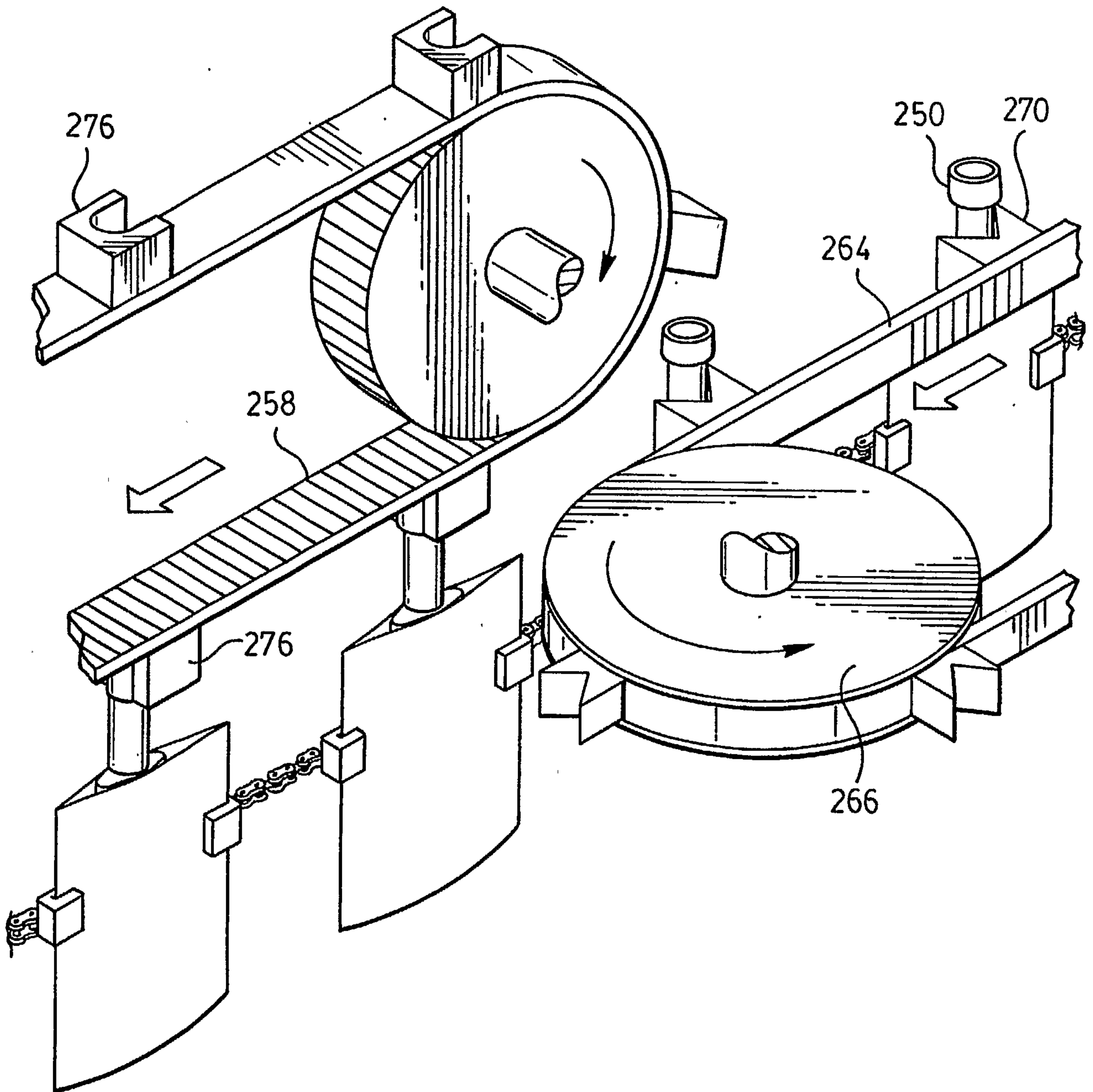


FIG. 24.

FIG. 25.



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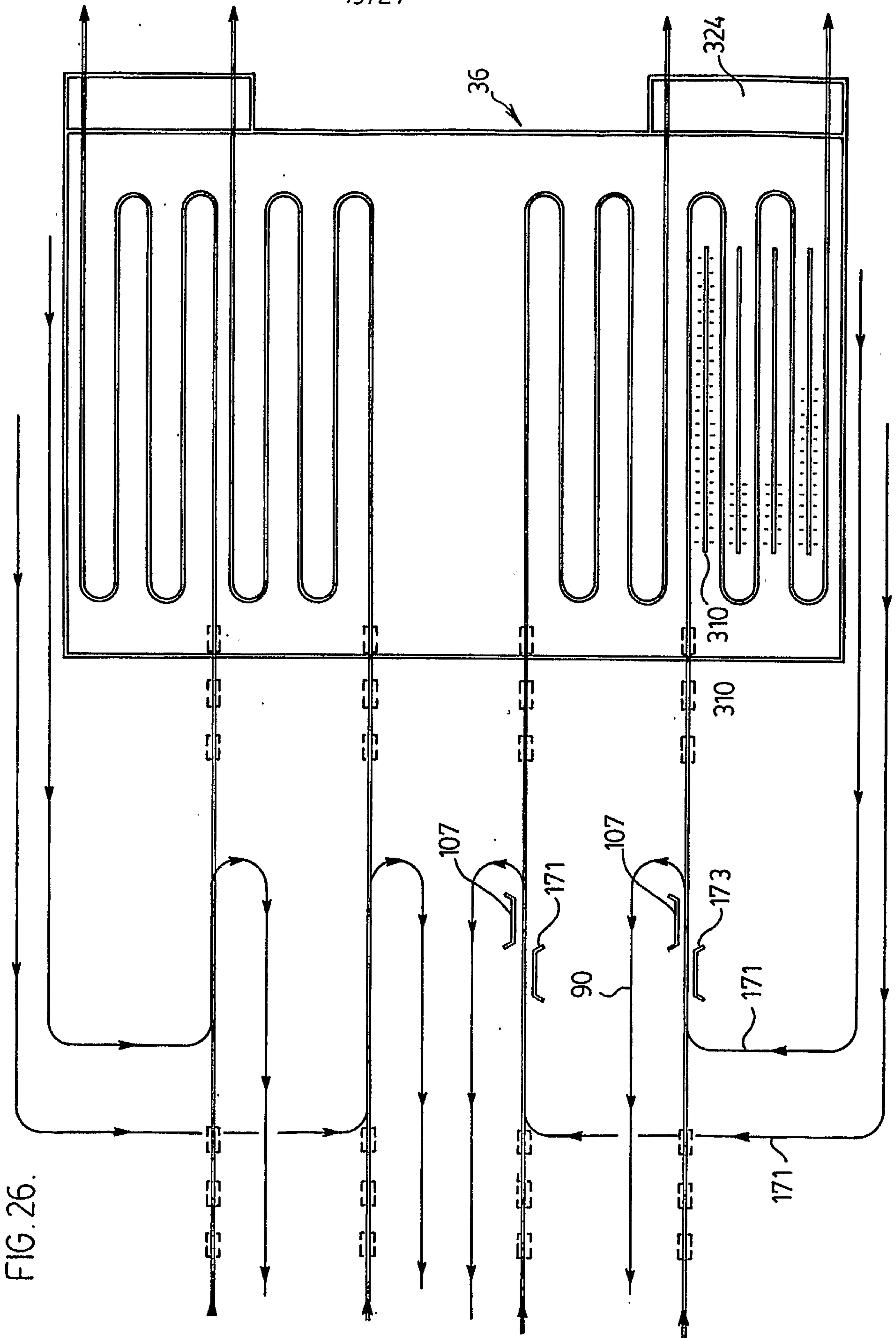
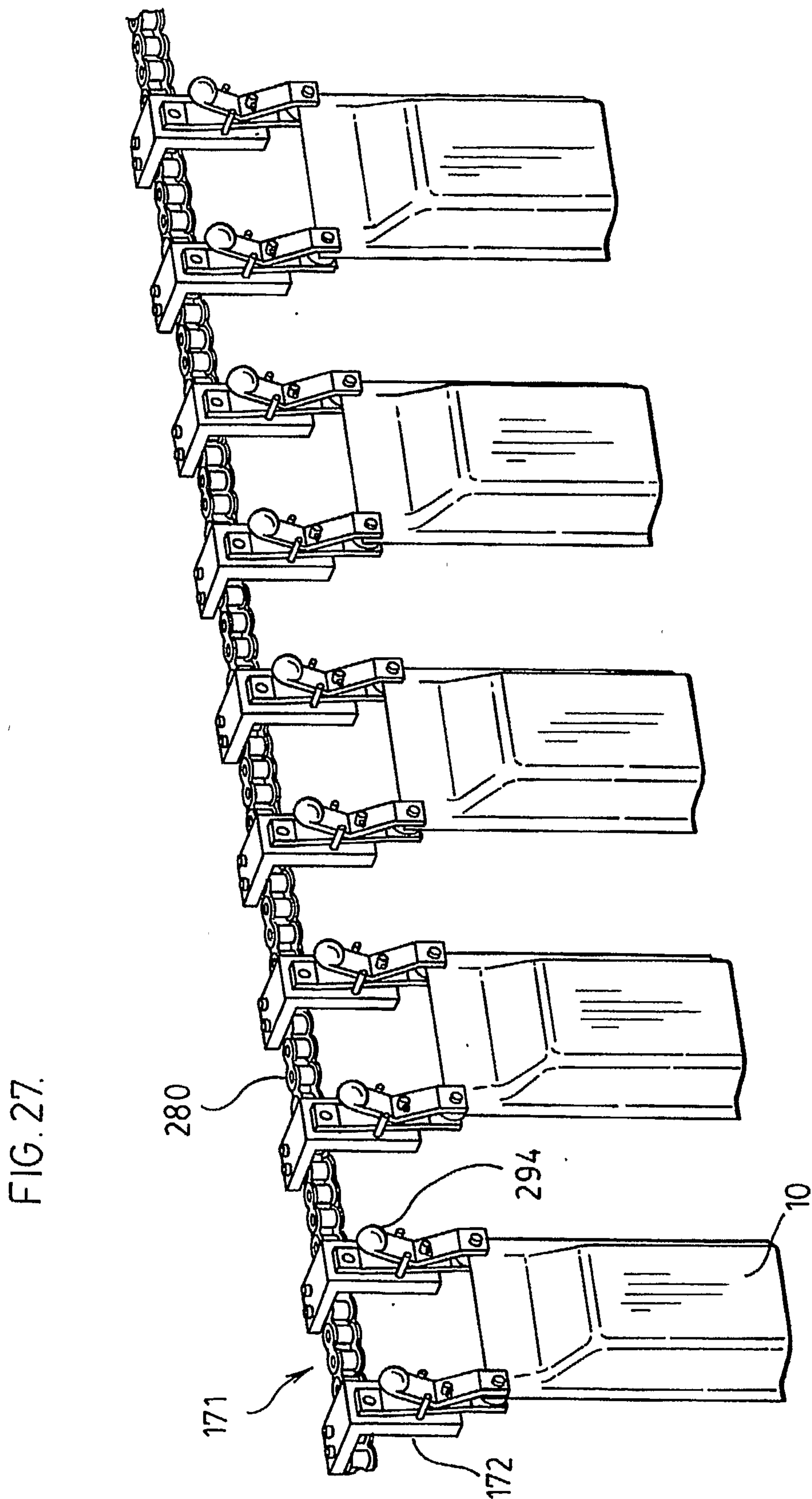


FIG. 26.

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FIG. 28.

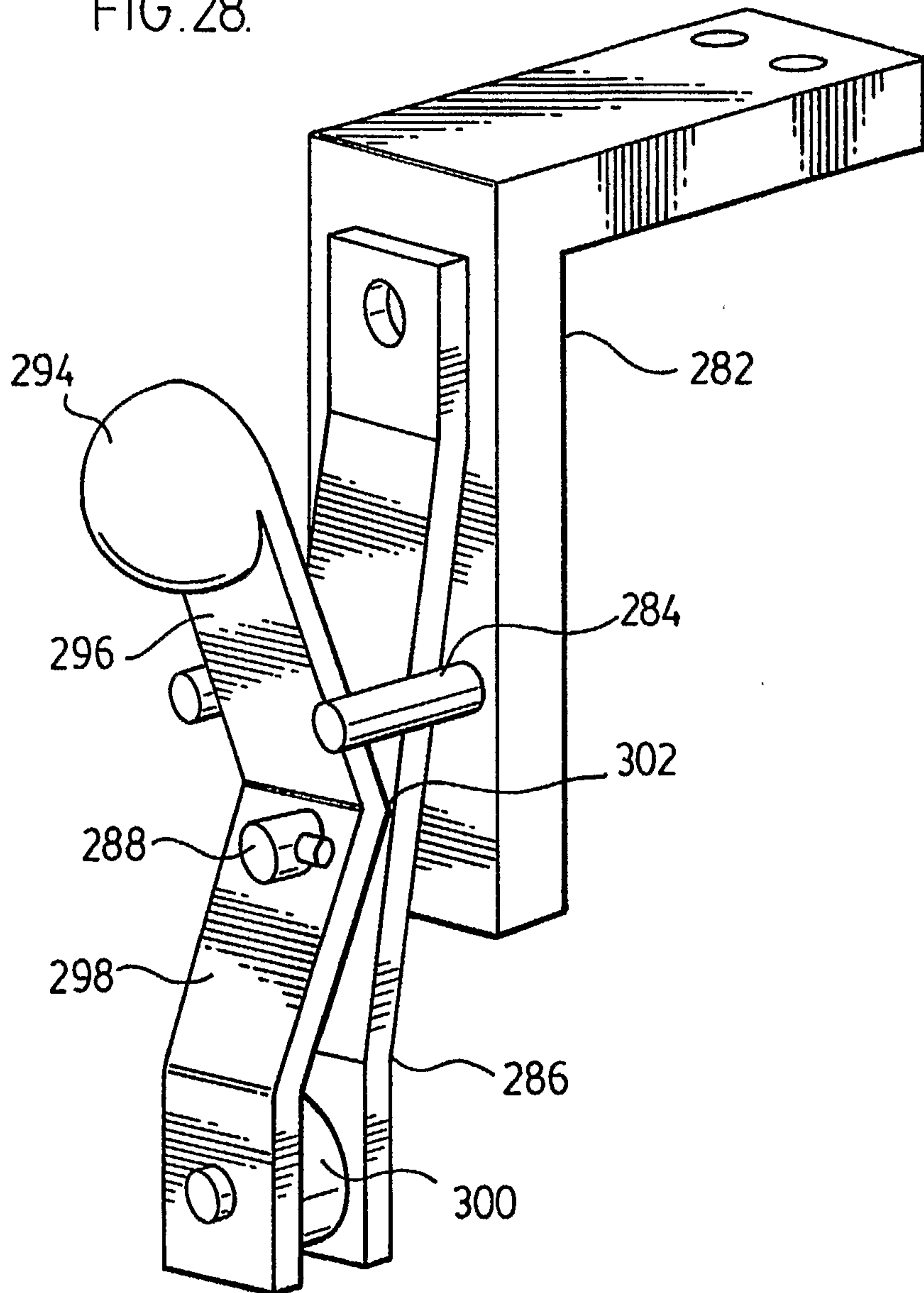
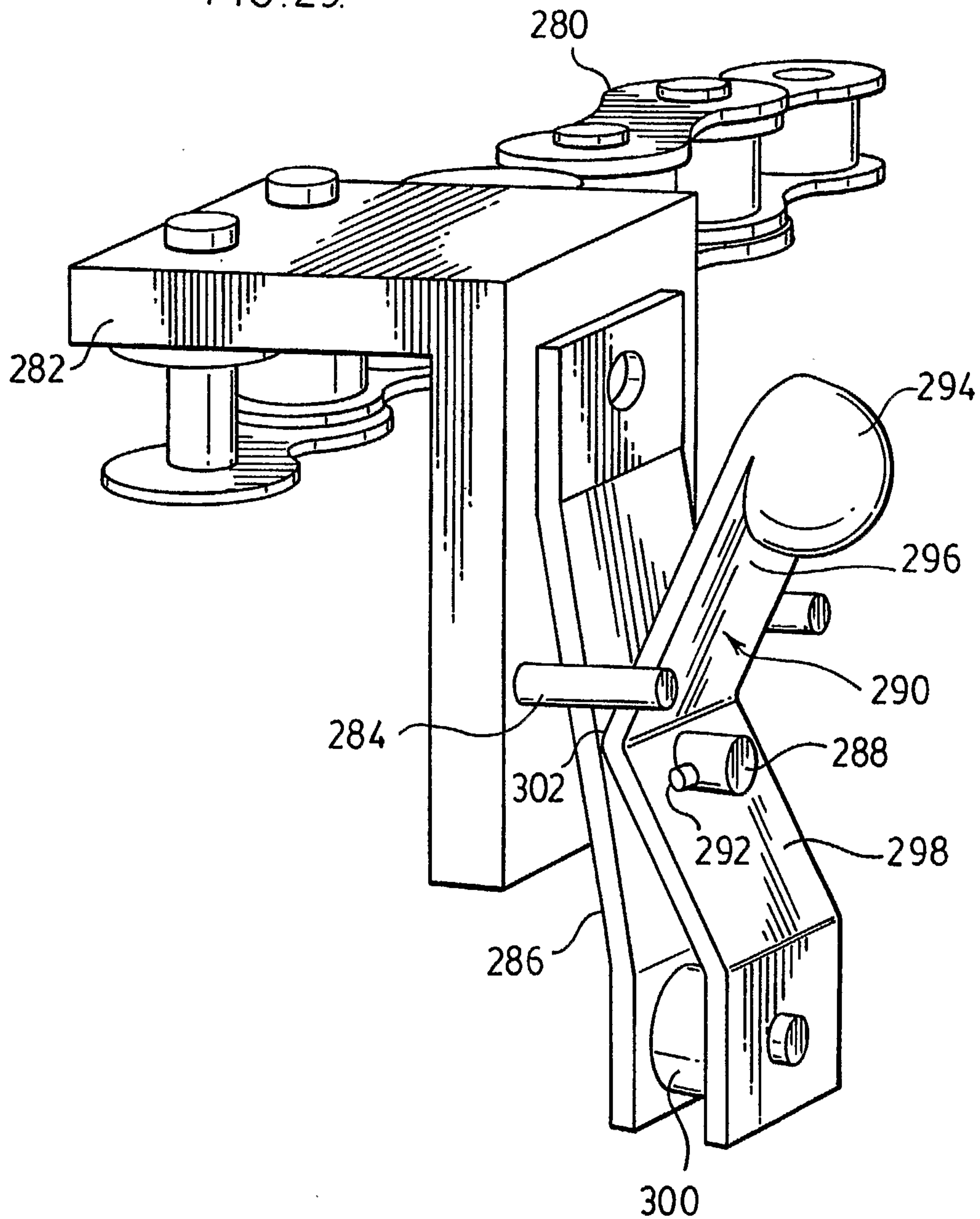
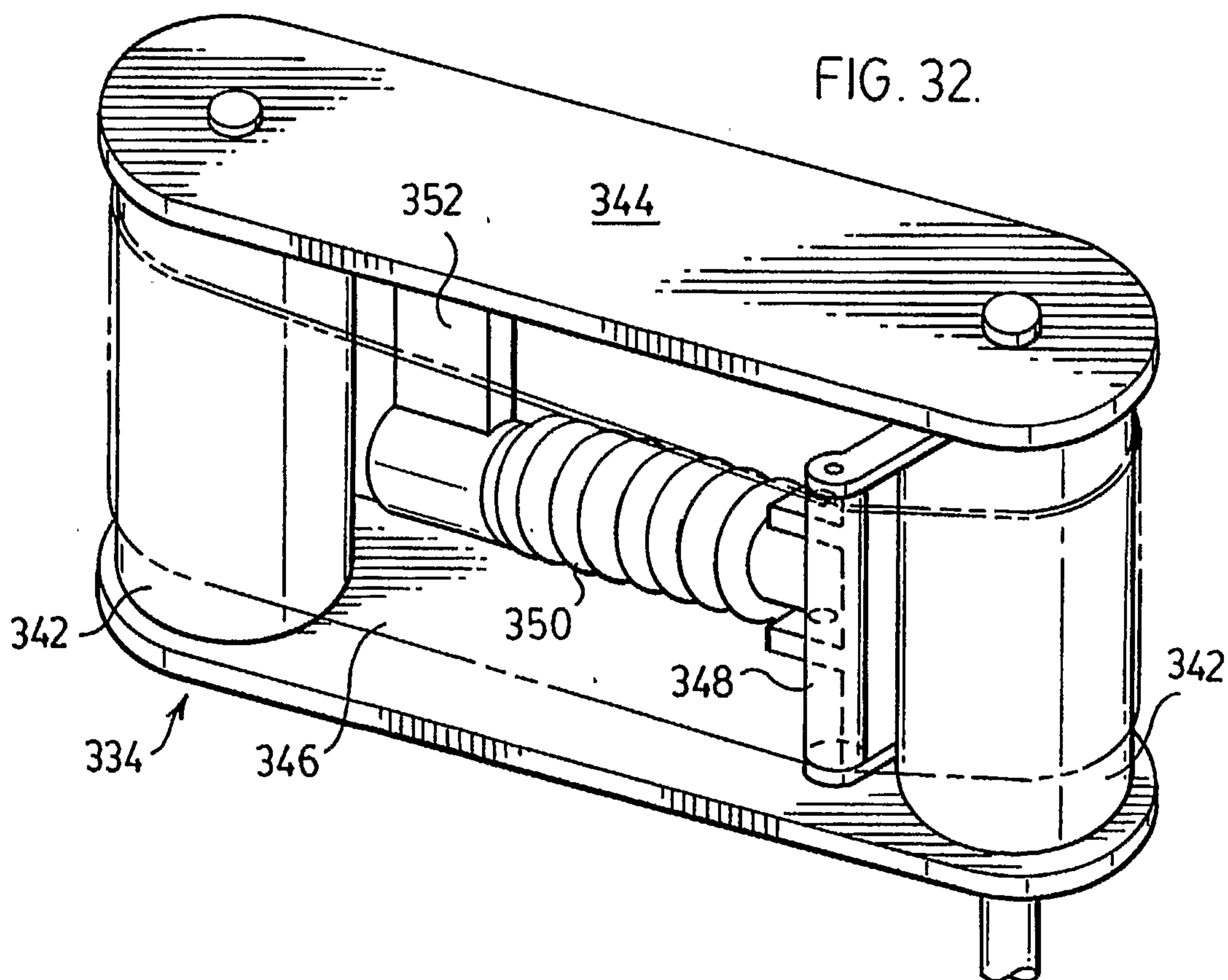
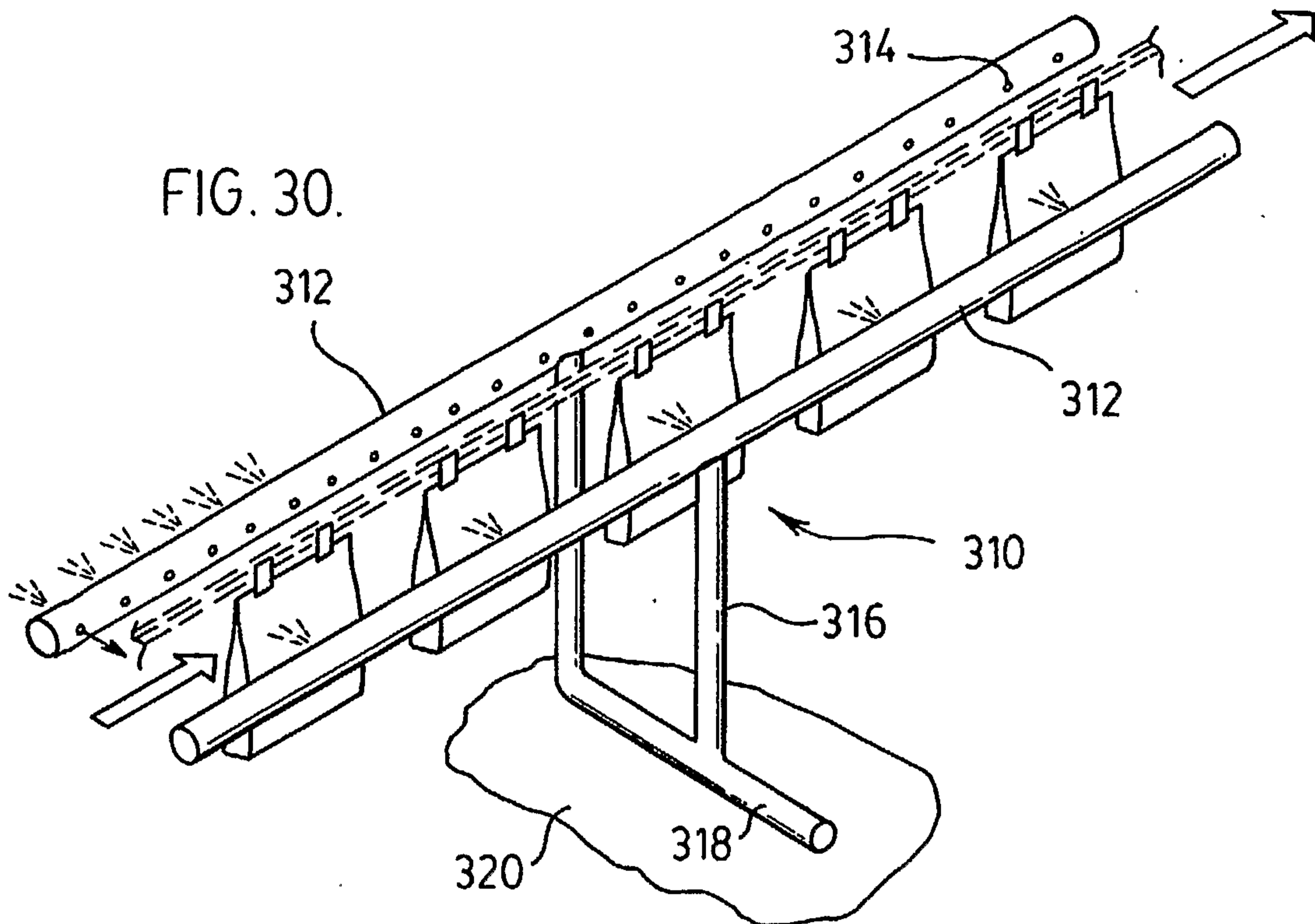


FIG. 29.



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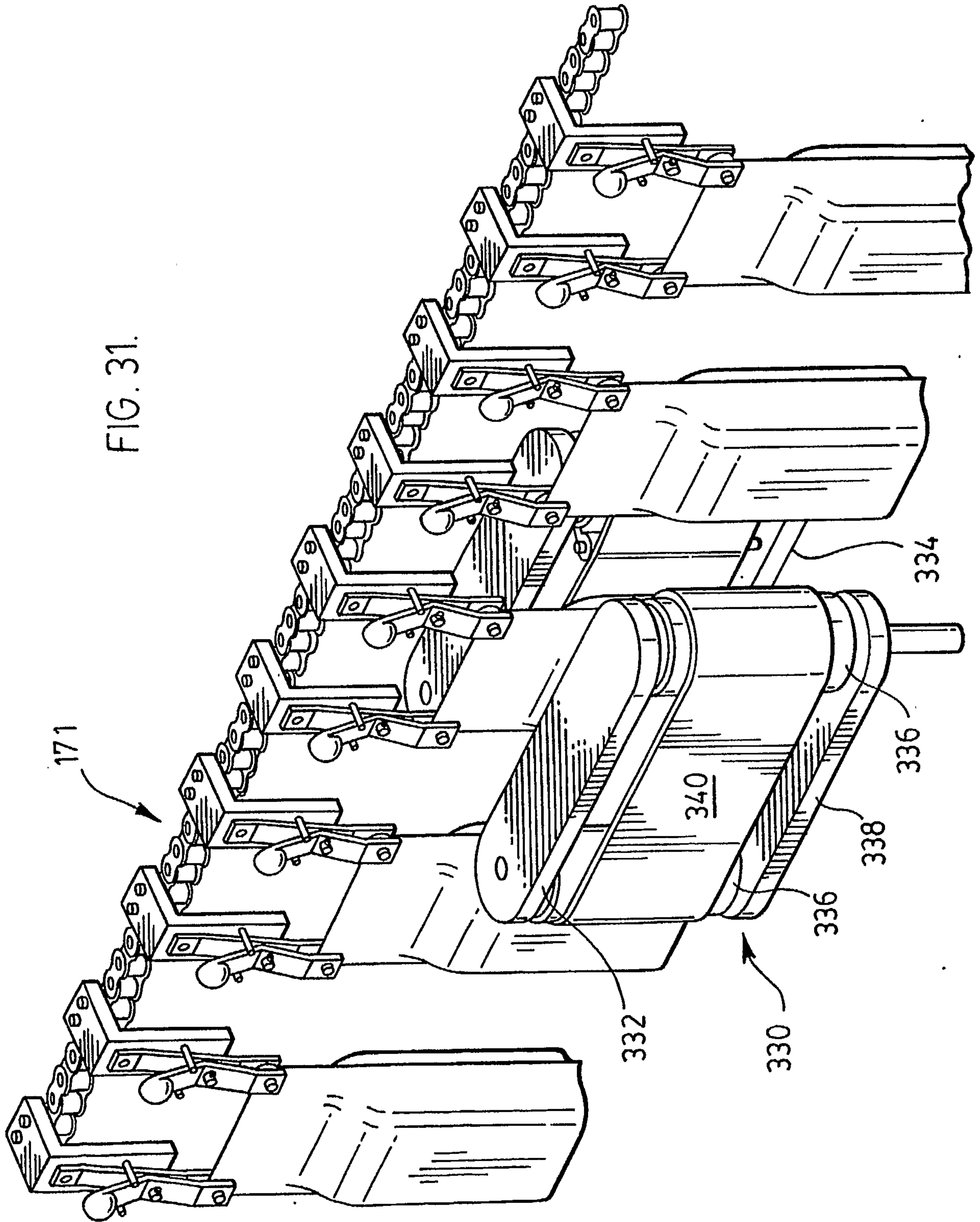


Figure 33

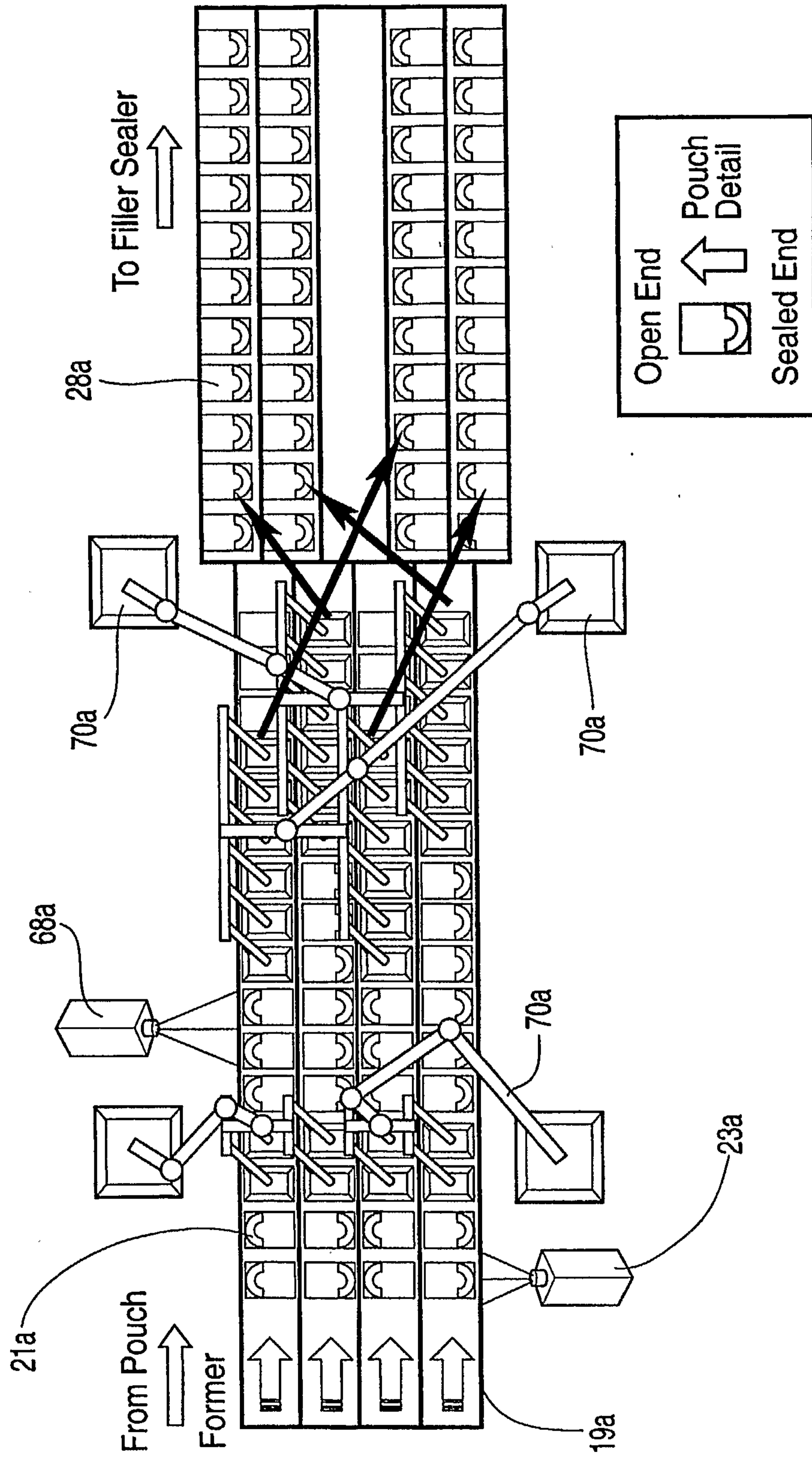
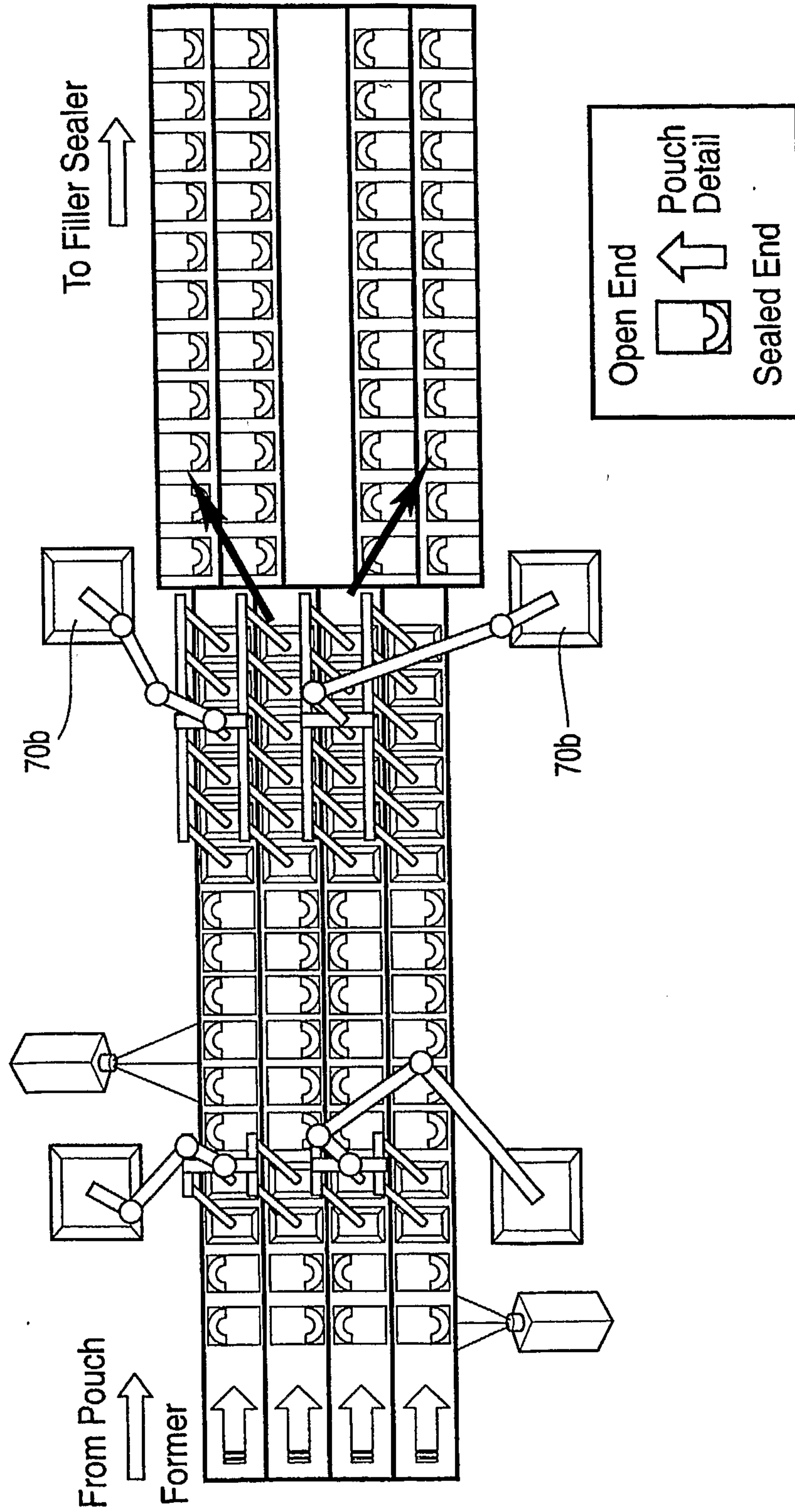


Figure 34



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Figure 35

