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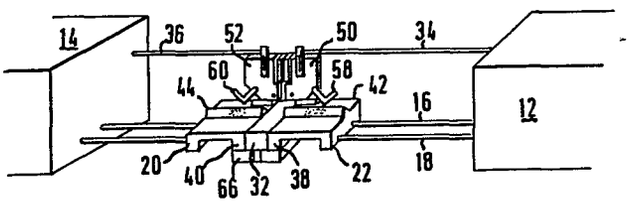
(54) Bag stripping machine.

(57) A machine (10) for opening a flexible bag (86) to remove the contents of the bag (86), for example frozen blood plasma, without the contents making contact with the machine (10). The bag (86) generally has an extension flap (90) and a longitudinal line of weakness (94). A bag supply station (24) advances the bag to bag stripping stations (20, 22) where gripping jaws (58, 60) grip the extension flap. The gripping jaws (58, 60) are moved perpendicularly to a line of weakness (94) in the bag causing it to split and eject the contents of the bag.



EP 0 159 792 A2

BAG STRIPPING MACHINE

This invention relates to a bag stripping machine.

Plasma is supplied frozen in polyvinyl chloride and polyethylene bags and after thawing the bag is slit open and the plasma removed by hand. This step results in contamination of the plasma.

GB1474257 relates to a cutting machine for opening pillow-like bags in which a cutting device is used. The danger of such a machine is that the cutting device may come into contact with the contents of the bag.

US4340152 and US4253458 each relate to a machine for opening and removing the contents of flexible or compressible containers particularly containers of frozen whole blood or the like. The machine has a cutting station where an end of the container is removed by a rotary knife. There is a danger that the knife may come into contact with the contents of the bag.

GB2136384 describes an apparatus for opening a sealed container containing frozen plasma by inserting a hollow needle and injecting a quantity of high pressure fluid such as nitrogen into the container to cause the container to explode and allow the contents to fall into a collecting receptacle. Such a method allows infection to spread from the bag to the needle and vice versa.

It is an object of the present invention to remove the plasma without the plasma contacting the machine.

It is also an object of the present invention to provide a bag stripping machine which allows the plasma to be removed from the bag without involving handling of the frozen plasma by an operator once the plasma has been removed from the bag.

According to the present invention, there is provided a machine for opening a flexible bag to remove the contents of the bag without the contents having contact with the machine, the bag having an extension flap and a

longitudinal line of weakness, a bag supply station to advance the bag to a predetermined position such that the longitudinal line of weakness of the bag is parallel to the direction of advance of the bag, the extension flap leading the advance of the bag, bag stripping stations including a pair of gripping means capable of gripping the extension flap on either side of the longitudinal line of weakness comprising V-shaped gripping jaws co-operable with corresponding V-shaped upstanding pieces, operating means to cause said gripping means to grip the extension flap, further operating means to cause said gripping means, whilst gripping the extension flap, to move perpendicularly to the direction of advance of the bag such that the bag splits along the line of weakness and the contents of the bag are ejected.

The operating means may comprise pneumatic cylinders or linear motors.

The gripping means may be operable on receipt of a signal obtained from an infra-red beam which indicates the correct positioning of the bag in the machine.

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a top view of the bag stripping machine of the present invention;

Figure 2 is a perspective view of the bag stripping machine of the present invention omitting the bag supply station;

Figure 3 is a detailed view of the slidable stripping station with the gripping means in an open position;

Figure 4 is a detailed view of the slidable stripping station with the gripping means in a closed position;

Figure 5 is a longitudinal view of the stripping station of the present invention;

Figure 6 shows a detailed exploded view of the bag

supply station;

Figure 7 shows a suitable plasma bag of the present invention; and

Figure 8 shows a wiring diagram of the bag stripping machine.

Referring to Figure 1, the bag stripping machine generally designated 10 has two drive units 12 and 14 separated by two parallel carriage rails 16 and 18 upon which are mounted slidable stripping stations 20 and 22. A bag supply station 24 is in the form of a slidable stainless steel tray 26 mounted on runners 28 and 30. The slidable stainless steel tray can be pushed towards and away from the slidable stripping stations on the runners 28 and 30. The stripping stations 20 and 22 are separated by a divider block 32 mounted and fixed to the carriage rails 16 and 18.

Figure 2 shows a general arrangement of the drive units 12 and 14 in perspective omitting the bag supply station 24 of Figure 1. The slidable stripping stations 20 and 22 are moved along the carriage rails 16 and 18 by means of operating rods 34 and 36. The operating rods are generally pulled outwards and inwards from the central dividing block 32 by means of linear motors (not shown) in a central position on the carriage rails 16 and 18.

The slidable stripping stations are more particularly shown in Figures 3 and 4. In particular, the slidable stripping stations 22 include a mounting block 38 and 40 through which the carriage rails 16 and 18 pass. The mounting blocks 38 and 40 are preferably made of nylon so that it slides easily on the carriage rails 16 and 18. Above the rails 16 and 18, and in the centre of the mounting block, are provided V-shaped upstanding pieces 42 and 44 providing the base of a clamping means. Upstanding from the mounting block 38 and 40 are back supports 46 and 48 upon which operating blocks 50 and 52 are pivotably

mounted by means of pivot pins 54 and 56. The operating blocks are generally rectangular in shape and have mounted thereon jaws 58 and 60 extending preferably approximately from 45° from one corner of the mounting blocks 50 and 52 and attached by means of jaw locating screws 62 and 64. Beneath the carriage rails 16 and 18, and mounted on the base of the slidable stripping station 22 is a magnet 66 which extends to the central point of the carriage rails 16 and 18 beneath the divider block 32. Mounted on the slidable stripping station 20 is a magnet plate 68 which co-operates with the magnet 66 holding the slidable stripping station 20 and 22 together when they are in the central position. On each of the operating blocks 50 and 52 is mounted a pin 68 and 70 which locate slides 72 and 74 connected by means of locking nuts 76 and 78 to the operating rod 34 and 36. Figure 5 shows the slidable stripping station in cross-section at right angles to the view of Figure 3 indicating the arrangement of the mounting block 38, the V-shaped upstanding pieces 42 which co-operate with the V-shaped jaws 58 on the mounting block 50. The mounting block 50 is connected by means of the slide 72 on slide pin 68 to the operating rod 34. The jaws 58 and V-shaped upstanding pieces are preferably roughened to allow for gripping of the plasma bag.

Figure 6 shows the bag supply station 24 in more detail and in an exploded form. As previously indicated, a third form of the bag supply station 24, is a slidable stainless steel tray 26 mounted on runners 28 and 30 by means of slider pins 80 and 82 with corresponding slider pins on the side of the slidable tray 26 (not shown). On the slider pin 80 is mounted a rubber stop 84 which acts as a buffer piece to prevent the tray moving too far towards the carriage rails 18.

Figure 7 shows one form of the bag which can be stripped by the present machine. The bag is a plasma bag

86 and is more particularly described in G.B. Patent Application No. 8417914 filed 13th July 1984, in the name of Tuta Laboratories (Australia) Pty Ltd. The bag 86 has a plasma containing portion 88 and an extension 90 divided by a "V" 92. The bag is preferably constructed so that it has a weakened tearline 94 extending longitudinally down the plasma containing portion 88.

In operation, a plasma bag 86 full of frozen plasma is placed on the slidable tray 26 with the extension portion 90 pointing towards the slidable stripping stations 20 and 22. The bag temperature is preferably in the range $-15^{o}C$ to $-10^{o}C$. A spacer 96 situated in the tray 26 locates the bag such that the bag extension flap is positioned on an extension portion 98 of the tray 26. The tray 26 is preferably manually positioned such that it slides along the rails 28 and 30 to offer the extension portion of the plasma bag 86 to the V-shaped upstanding portions 42 and 44 of the slidable stripping stations 20 and 22. The extension portion 90 is positioned over the "V" of the V-shaped portions 42 and 44. When in position, the linear motor is operated by means of a microswitch 100 which is operated by contat with the front rail 102. This operates the linear motors contained in the drive units 12 and 14 which cause the operating rods 34 and 36 to be pulled away from the divider block 32.

The initial position of the operating rods 34 and 36 is shown in Figure 3. This indicates that the jaws 58 and 60 are in an open position to receive the extension flap 90 of the plasma bag 88. On operation of the linear motor, the operating rods 34 and 36, as already indicated, move away from the dividing block 32 causing the operating blocks 50 and 52 to pivot on the pivot pins 54 and 56, and in turn causing the jaws 58 and 60 to co-operate with the V-shaped upstanding pieces 42 and 44 on the mounting blocks 38.

With the plasma bag in position, the extension flap 90 falls between the jaws 58 and 60 and the V-shaped upstanding pieces 42 and 44, and is gripped therebetween. The mounting blocks 38 and 40 are held together by means of the magnet and magnet plates 66 and 67. Although the linear motors cause the operating rods 34 and 36 to operate in a continuous motion, the magnet resists this motion and causes a slight delay to enable the jaws 58 and 60 to grip the extension 88 of the plasma pack before the force of the magnet 66 causing the magnet 66 and plate 68 to be held together is broken.

Once this occurs, the bag stripping stations 20 and 22 are drawn apart causing the bag to tear from the "V" along the weakened tearline 94. The continuous and rapid motion of the linear motor acting on the operating rods 34 and 36, tears the bag and causes the frozen plasma to be ejected in the direction away from the bag supply station into a collecting bin (not shown).

The magnet and magnet plate 66 and 67 delays the outward pull of the carriage until the force of the magnet is overcome. Once the operating rods 34 and 36 are near the end of their travel, the current of the linear motors is reversed causing the rods to return to the central position to grip the next plasma bag for a repeat of the cycle.

Figure 8 shows one form of wiring diagram for the operating of the machine. In essence, the microswitch 100 operates the relay to set the linear motors 104 and 106 in operation, causing the operating rods 34 and 36 to move away from the central dividing block 32. A delay relay 108 keeps the current in operation until the operating rods 34 and 36 reach the end of their stroke. In addition, it preferably holds them there for half a second to allow the plasma bag 86 to fall away from the jaws 58 and 60 by means of gravity into a collection bin (not shown).

More generally, the bag stripping machine is

preferably contained within a stainless steel framework with external sheet stainless steel cladding. All parts with which the bags or frozen plasma come into contact are constructed of stainless steel. The machine is so designed that all parts making contact with the plasma ice block, also the final feed plate section, can be removed for cleaning or autoclave sterilisation. During operation, the entire final feed area, i.e. feed plate, flange gripping clamps and clamp runners may be under constant ultra-violet radiation.

The machine can be used simply as a bag stripping machine. Alternatively, it may form the bag stripping section of three bolt-together sections to allow various options.

A bag stripping section consists of the actual bag stripping device of the present invention. As described above, a bag is drawn from the bag delivery section, carried forward on a stainless steel guide plate into position between bag gripping clamps. When the bag flange is correctly placed between the clamps it may break an infra-red beam which will electrically operate the circuitry to activate the linear motors and set the stripping cycle in motion. The bag stripping stations pull apart, and, at the end of their stroke, the jaws open, releasing the torn plastic which drops into a receptacle in the base of the machine.

A three second time delay allows time for the bag to be torn and the ice block ejected. The bag stripping stations then return automatically to the "pick-up" position to accept the next bag which the synchronised feed plate has placed in position. The machine will continue to feed, tear, dispose of torn bags, and eject plasma automatically until the supply of bags is exhausted.

If a malformed bag enters the machine, i.e. with flange damaged or badly distorted, it will not be gripped

by the jaws correctly, the infra-red beam will not be broken, and the machine will stop leaving the faulty bag, untorn, on the feed plate. In such an event pressing a restart button will cause the faulty bag to be diverted into a rejection chute from which it can be recovered. The machine will pick up a new bag and resume automatic operation.

One design of bag with weakened "tear lines" to facilitate efficient machine stripping is illustrated in Figure 7. It is appreciated that it may be desirable to use different sizes of bags. The machine may take interchangeable feed plates to suit bags of any particular size and preferably bags ranging from 200 to 1000 ml capacity.

The bag stripper unit as described can be hand fed if desired but a bolt-on magazine or bulk feed unit may be fitted to allow a continuous supply of bags to be fed automatically to the stripper.

Facilities for bar coding scrutiny of bags passing through the feed section of the machine may be provided by designing the bag transport system to carry each bag individually through an area which a bag scanning device can be mounted. Manual or automatic ejection of a bag which fails the coding test may be provided.

Modifications and improvements may be incorporated without departing from the scope of the invention, for example, the machine may include:-

(1) Stainless steel construction and cladding.

(2) Separation of electrical components into own compartment.

(3) More robust construction with precision engineering of moving parts.

(4) Tough nylon or "Tufnol" runners.

(5) Isolation of bag disposal area by stainless steel division panels.

(6) Control panel with indicator lights.

(7) Provision for air filter and piston lubrication.

(8) Ice chute and feed plate section removable for cleaning.

Thus, there has been described a bag stripping machine which employs the method of gripping the flange of the bag in a gripping device and exerting an initially sharp then steady pull by means of two operating rods which tear the bag from top to bottom along a weakened "tearing line". The forward motion produced by the tearing action ejects the block of frozen plasma cleanly and with some force into a receiving chute which can lead directly to the ice crusher or other suitable container.

CLAIMS

1. A machine (10) for opening a flexible bag (86) to remove the contents of the bag (86) without the contents having contact with the machine (10), the bag (86) having an extension flap (90) and a longitudinal line of weakness (94), a bag supply station (24) to advance the bag to a predetermined position such that the longitudinal line of weakness (94) of the bag (86) is parallel to the direction of advance of the bag (86), the extension flap (90) leading the advance of the bag (86), bag stripping stations (20,22) including a pair of gripping means capable of gripping the extension flap (90) on either side of the longitudinal line of weakness (94) comprising V-shaped gripping jaws (58,60) co-operable with corresponding V-shaped upstanding pieces (42,44), operating means to cause said gripping means to grip the extension flap (90), further operating means to cause said gripping means, whilst gripping the extension flap (90), to move perpendicularly to the direction of advance of the bag such that the bag (86) splits along the line of weakness (94) and the contents of the bag are ejected.

2. A machine (10) as as claimed in claim 1, characterised in that the surfaces of the V-shaped gripping jaws and co-operable V-shaped upstanding portions are roughened to enhance the gripping of the bag.

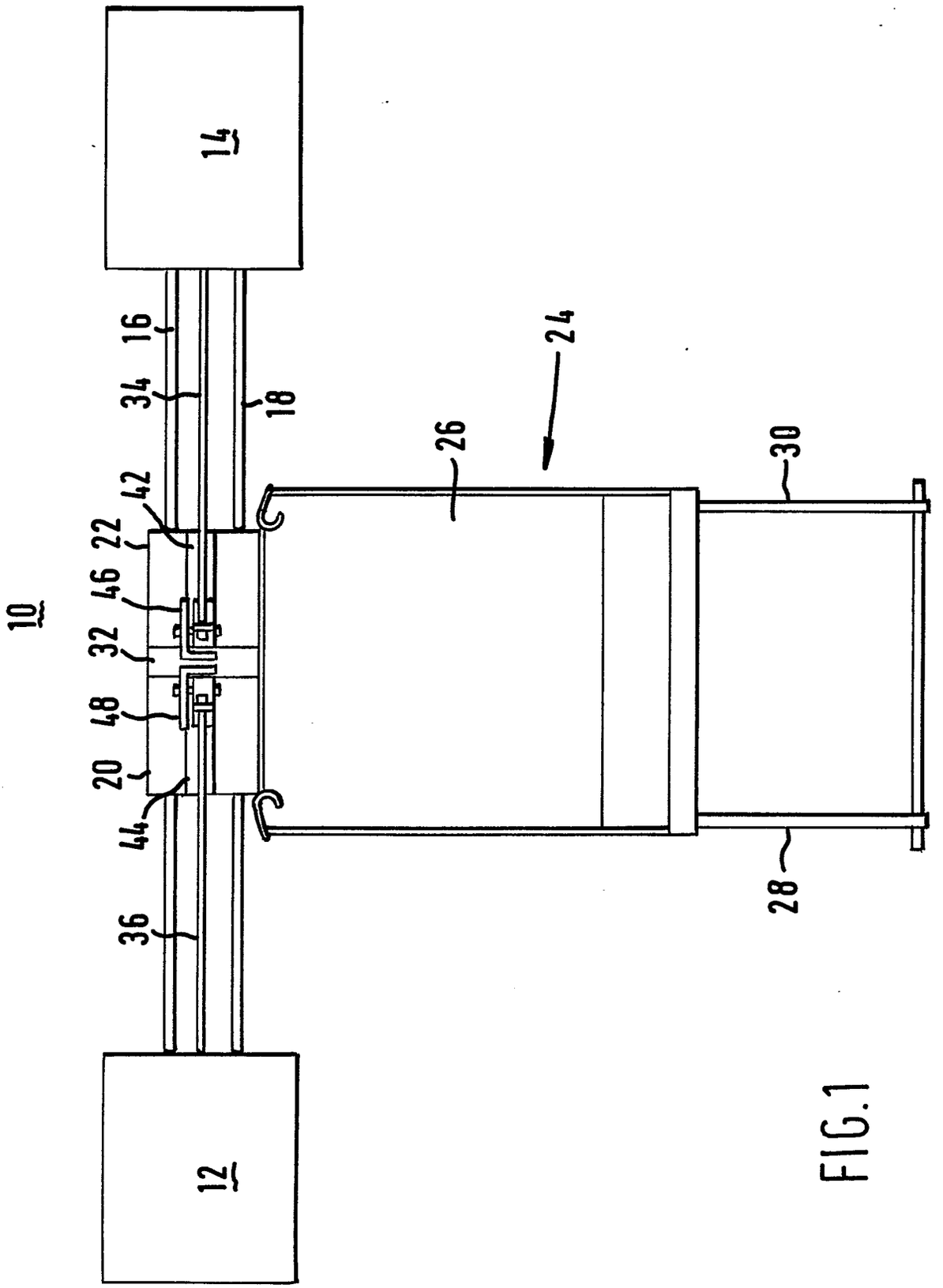


FIG.1

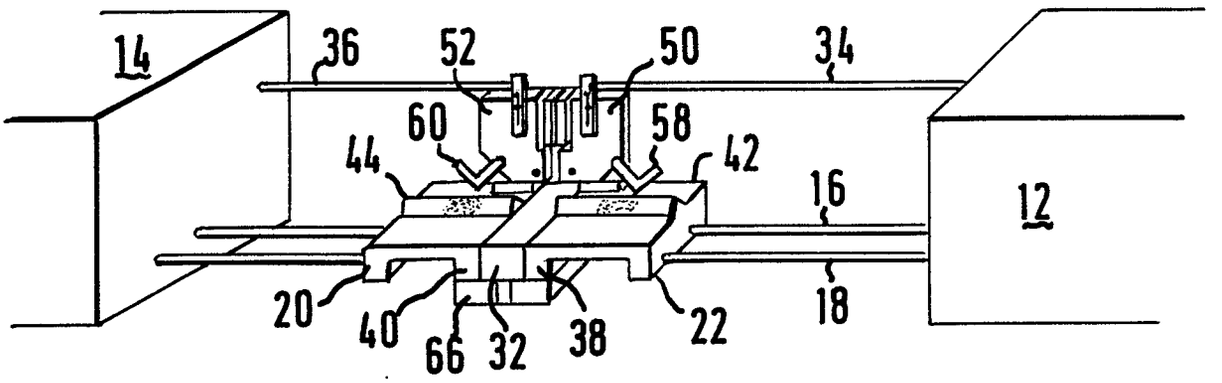

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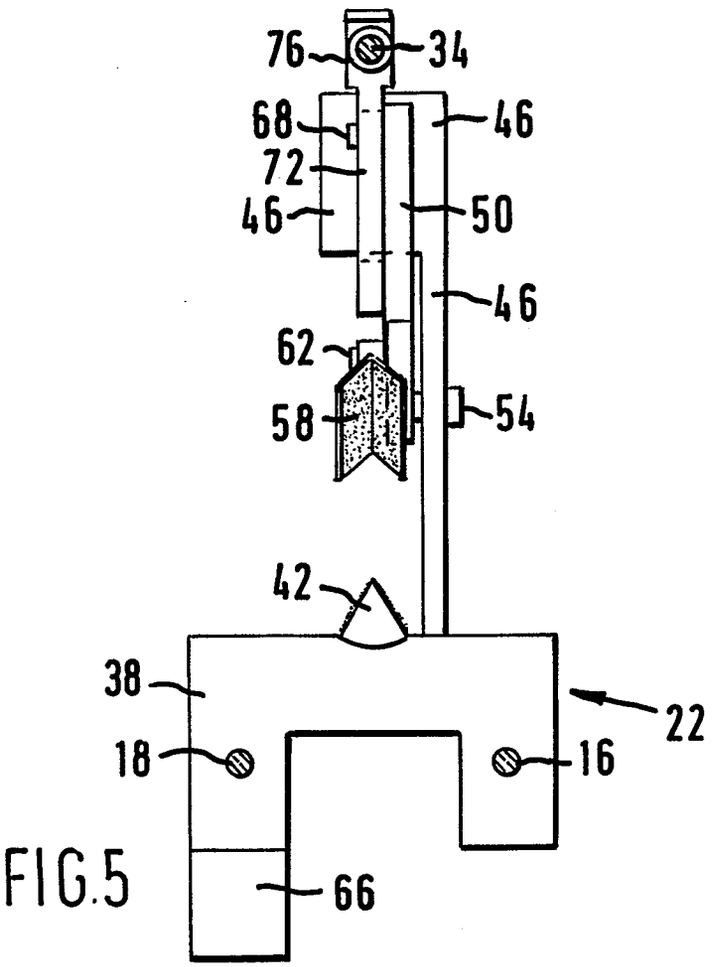
FIG.2


76
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72
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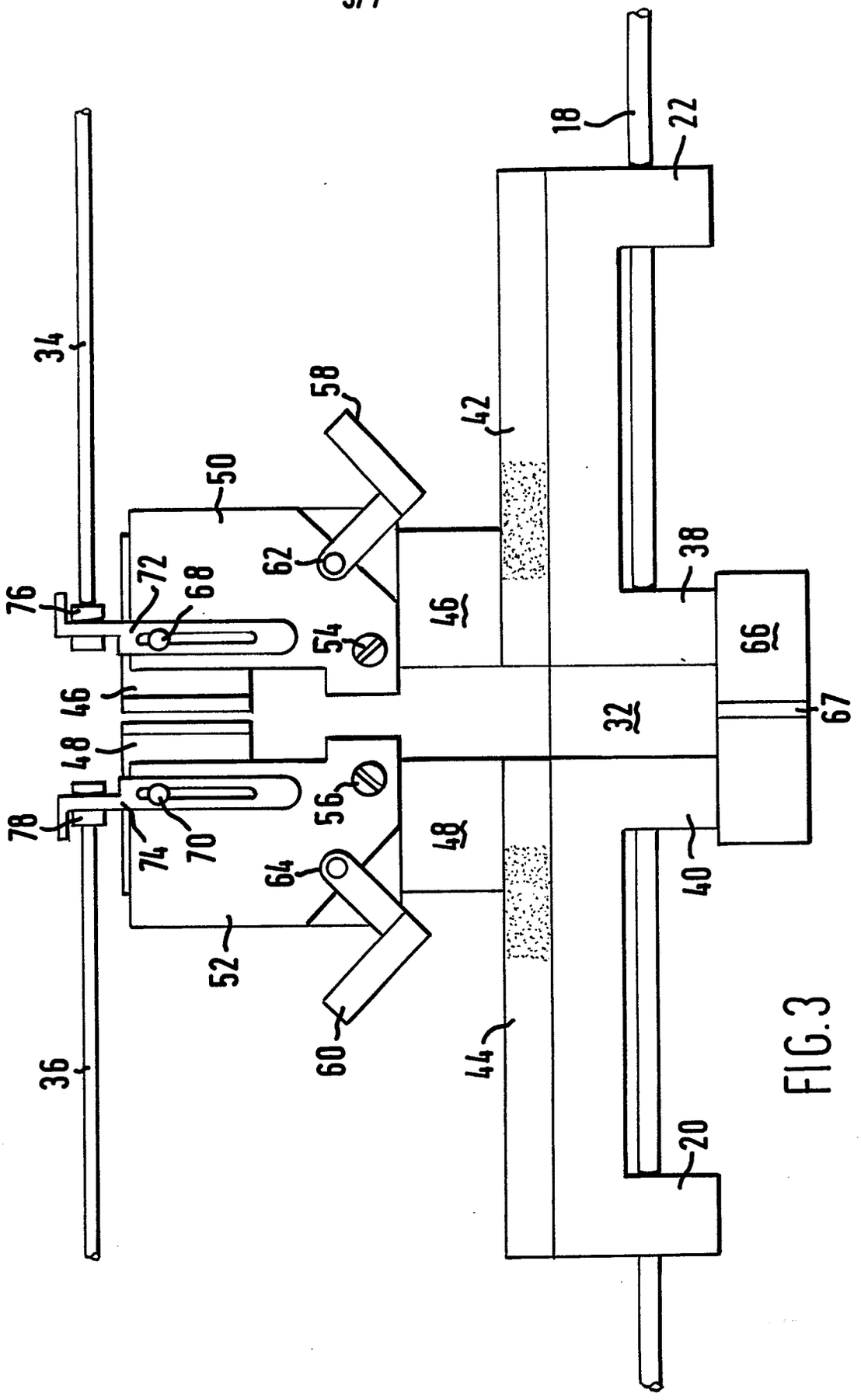
16
66

FIG.5


18
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42
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62
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72
68
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56
78
74
70
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64
40
52
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44
36
20

FIG.3

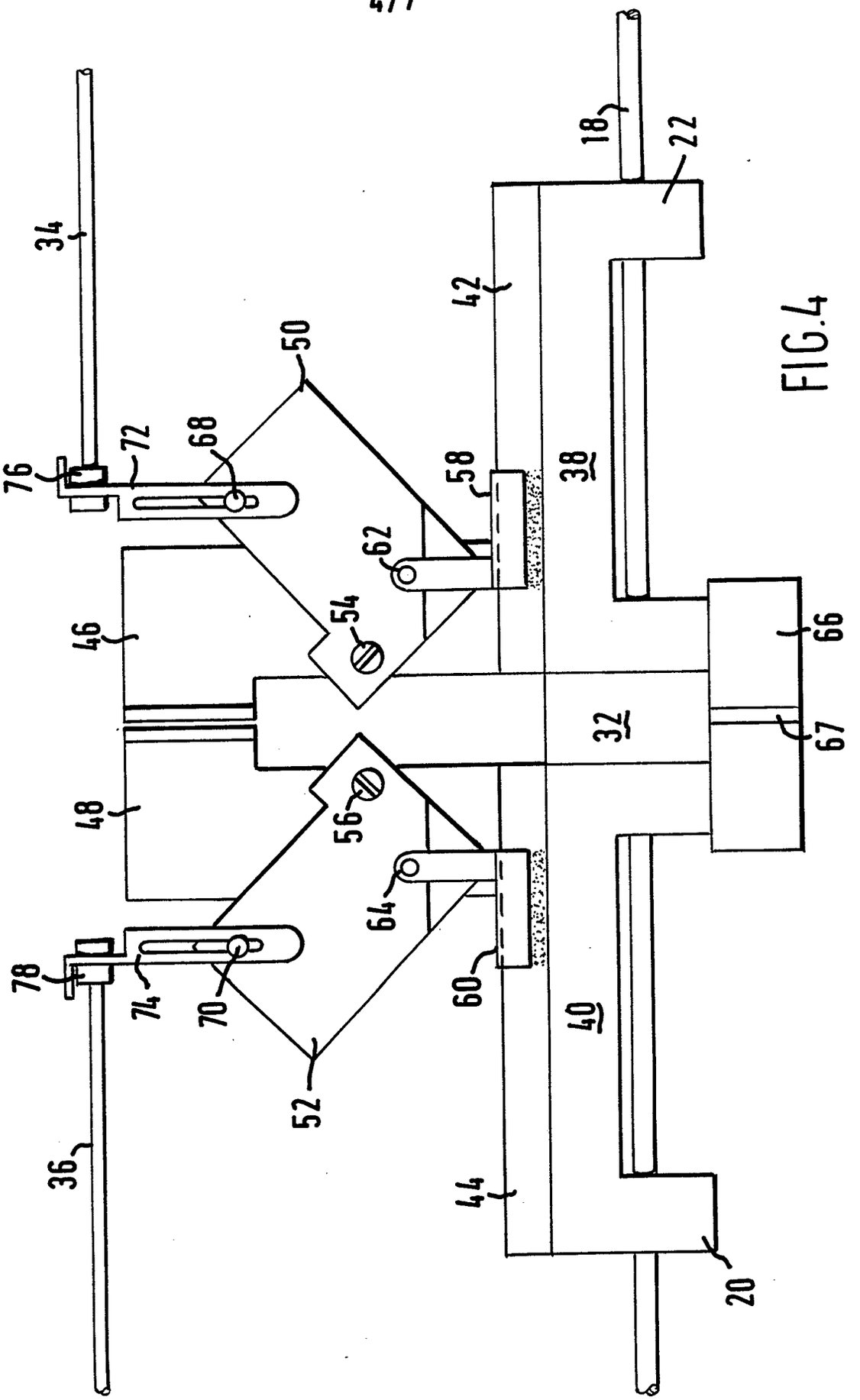
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FIG.4

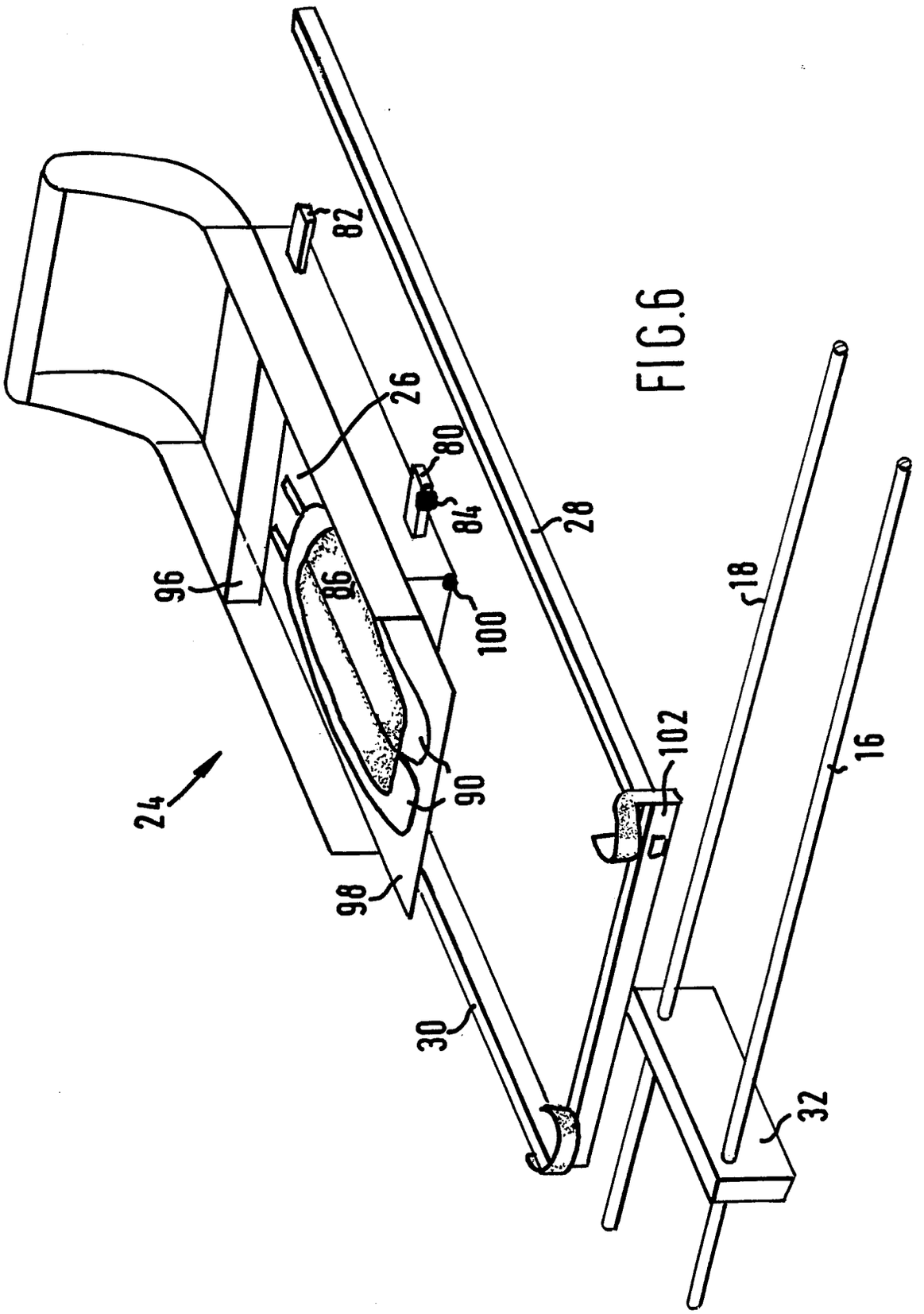
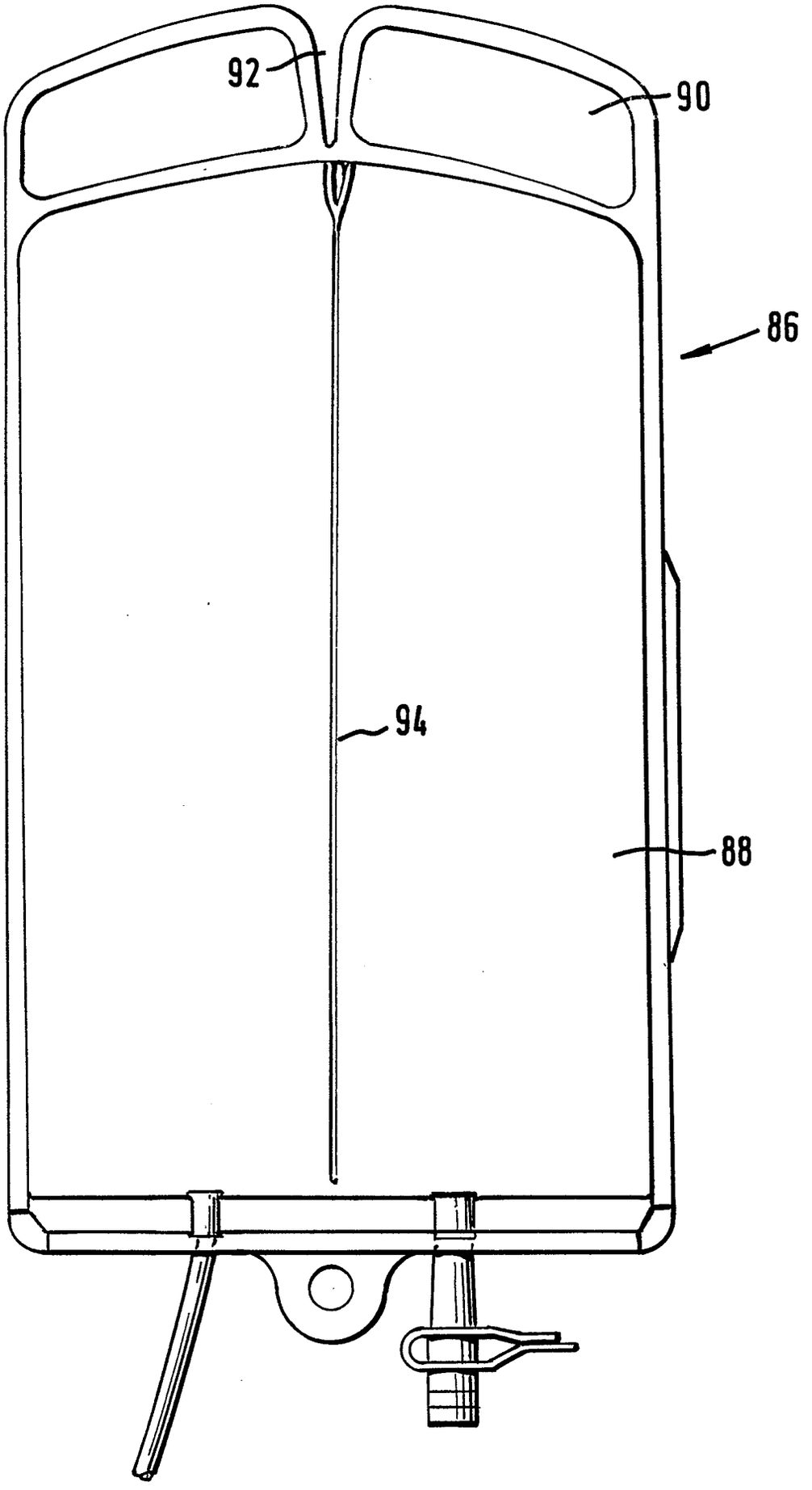


FIG.6

FIG.7



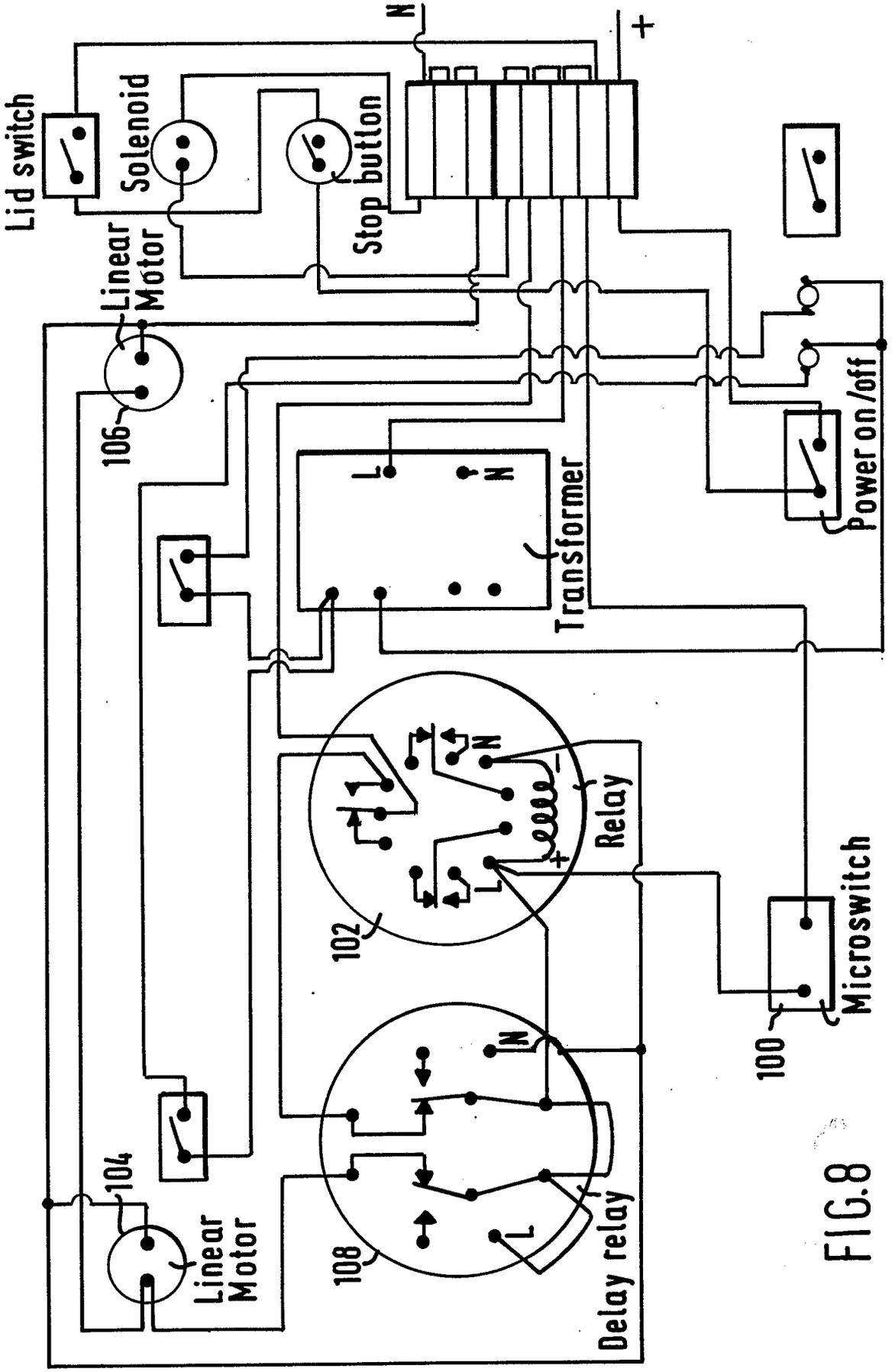

N
+
Lid switch
Solenoid
Stop button
Linear Motor
106
L
N
Transformer
Power on/off
102
N
L
Relay
100
Microswitch
104
Linear Motor
108
N
L
Delay relay

FIG.8