

(19)



(11)

**EP 3 901 066 A1**

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**27.10.2021 Bulletin 2021/43**

(51) Int Cl.:  
**B65F 3/12** (2006.01) **B65F 3/20** (2006.01)  
**B65B 3/12** (2006.01) **B65B 3/32** (2006.01)  
**B65B 37/20** (2006.01) **B67C 3/26** (2006.01)

(21) Application number: **21170349.1**

(22) Date of filing: **26.04.2021**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB  
 GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO  
 PL PT RO RS SE SI SK SM TR**  
 Designated Extension States:  
**BA ME**  
 Designated Validation States:  
**KH MA MD TN**

(71) Applicant: **Vanlier, Peter Theodorus Lambertus  
 5995 SE Kessel (NL)**

(72) Inventor: **Vanlier, Peter Theodorus Lambertus  
 5995 SE Kessel (NL)**

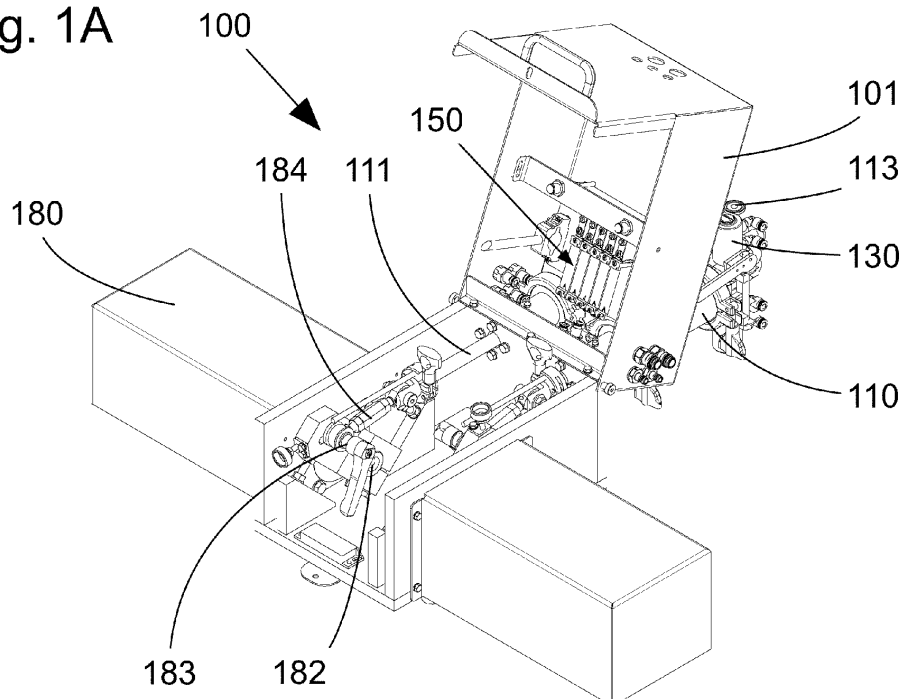
(74) Representative: **Altenburg, Bernardus Stephanus  
 Franciscus  
 DOGIO Patents BV  
 PO Box 2350  
 1200 CJ Hilversum (NL)**

(30) Priority: **24.04.2020 NL 2025420**

(54) **A METHOD OF INTRODUCING AN AMOUNT OF LIQUID INTO A PACKAGE, AS WELL AS A FILLING DEVICE**

(57) Method and filling device (100) for introducing an amount of liquid into a package by means of the filling device (100). The filling device (100) comprises a chamber for liquid and a filling lance (200) for dispensing liquid from the chamber. The filling lance (200) has at its end

a mouth piece (201). In this method a measured amount of the liquid is introduced in the package and the package is closed. For preventing problems in closing the package liquid which is still in the mouth piece (201) is at least partially sucked back into the filling lance (200).

**Fig. 1A****EP 3 901 066 A1**

## Description

**[0001]** The present invention relates to a method of introducing an amount of liquid into a package by means of a filling device, which filling device

- comprises a chamber for liquid,
- comprises a filling lance connected to the chamber, which filling lance comprises a mouth piece at a distal end thereof for dispensing liquid from the chamber;

wherein the method comprises the steps of

- introducing a measured amount of the liquid into the package using the filling device, and
- closing the package after introducing the liquid into the package using the filling lance.

**[0002]** Introducing a liquid into a package is generally known in the art. The most well known application is of course packaging a liquid, wherein the package is filled with liquid. Another application is adding liquid to a package for another product. In this way sauce may for example be added to a foodstuff. It is also possible to form the package simultaneous with or immediately prior to filling, such as a film package which is to be formed by means of sealing a film sheet. Water may also be added to a fresh product, such as carrots. The package may also be a container having an edge on top of which a film is applied for closing the package.

**[0003]** Introducing the liquid may lead to liquid ending up at the outside of the package, which may be undesired from the perspective of hygiene or rejection by the consumer. It is also problematic when the presence of the liquid results in unsuccessful closing of the package or in a weakened sealing such as a seal, causing its leakage and/or causing the contents of the package to have a shorter shelf life.

**[0004]** A method according to the preamble is known from DE102015204951.

**[0005]** The present invention aims to provide a method by means of which a measured amount of liquid may be dispensed with a smaller chance of leakage of the liquid.

**[0006]** To this end, method according to the preamble is characterized in that

- after introducing the liquid into the package, and
- without the mouth piece extending into the liquid which is introduced into the package;

liquid remaining in the mouth piece is at least partially sucked back into the filling lance.

**[0007]** In this way the chance of leakage of the liquid from the filling lance is reduced and therefor also the chance of aforementioned problems which may be associated with it. The liquid is for example sucked back over a distance of at least 0.5 cm, preferably over at least 2 cm. A relatively runny liquid (such as water) will be

sucked back over a relatively large distance, while a relatively viscous liquid such as a sauce may be sucked back over a relatively short distance.

**[0008]** For sucking back, a branch pipe may be placed between the chamber and the mouth piece, which is provided with a device for discharging liquid, such as a powered vacuum pump.

**[0009]** US2019/077648 describes a valve assembly for filling containers and the dripping occurring therein.

**[0010]** According to a favourable embodiment, the step of sucking back comprises sucking liquid at least partially back in the filling lance to the chamber.

**[0011]** The chamber may effectively be used for storing sucked back liquid.

**[0012]** According to a favourable embodiment, the step of introducing a measured amount of the liquid into the package using the filling device comprises introducing the mouth piece of the filling lance into the package by a relative movement of the package and the mouth piece, and

between the step of introducing a measured amount of the liquid into the package using the filling device and the step of closing the package after removing the mouth piece of the filling lance from the package, the distal end of the filling lance is removed from the package by a relative movement of the package and the mouth piece.

**[0013]** In this way liquid may effectively be introduced into the package such as a bottle or a bag while the chance of a problem due to dripping is reduced.

**[0014]** According to a favourable embodiment, the filling device comprises a cylinder, which cylinder comprises a piston and the chamber, wherein the cylinder is fitted with

- a controlled inlet valve, and
- a controlled outlet valve between the chamber and the filling lance;

wherein

- in a first step the piston is moved in a first direction for discharging liquid through the controlled outlet valve from the chamber, to the filling lance, wherein the inlet valve of the chamber is closed and the outlet valve is opened, and
- in a second step after the first step the piston is moved in a second direction opposite to the first direction for supplying liquid to the chamber through the supply valve, wherein in a first stage of the second step at least the outlet valve is opened for sucking back liquid from the filling lance, and in a second stage of this second step the outlet valve is closed and the inlet valve is opened.

**[0015]** In this way sucking back liquid from the filling lance, and more specifically from the mouth piece of the filling lance in the direction of the chamber, may be achieved very effectively. Advantageously the inlet valve

of the chamber is closed during the first stage, whereby sucking back liquid into the mouth piece may be assured more effectively.

**[0016]** According to a favourable embodiment, the filling lance is provided with a further valve at a distance of less than 20 cm from the mouth piece, which further valve

- is opened during the first step, and
- is opened during the first stage of the second step and is closed during at least part of the second stage of the second step.

**[0017]** In this way leaking of liquid from the filling lance is prevented more effectively, in particular in case of a filling lance having a relatively large own volume. The distance of the third valve to the mouth piece is preferably less than 30 cm, more preferably less than 15 cm and most preferably less than 7 cm.

**[0018]** Advantageously the further valve is closed during the entire second stage.

**[0019]** According to a favourable embodiment, the filling lance

- comprises a first section and a second section, wherein
  - the first section comprises a distal end comprising the mouth piece, and
  - the second section comprises a proximal end in fluid connection with the chamber; and
- comprises a dispense chamber delimited by a chamber wall, wherein an end of a section chosen from
  - the proximal end of the first section, and
  - the distal end of the second section

extends into the dispense chamber, wherein the chosen section only in its side wall comprises a through hole, and wherein the chamber wall and the chosen section are moved in axial direction with respect to each other between i) a first position in which the through hole of the chosen section is closed by the chamber wall and ii) a second position in which the through hole of the chosen section is located at least partially in the dispense chamber and the distal end of the first section is in liquid connection with the proximal end of the second section.

**[0020]** In this way the filling lance provides a third valve and the liquid flow may be blocked or enabled by the chamber wall by moving the chamber wall and the section with respect to each other.

**[0021]** Generally the relative movement will be achieved by an actuator.

**[0022]** According to a favourable embodiment, the first section is kept stationary independent of the position.

**[0023]** Not moving the first section in axial direction for

opening and closing the further valve reduces the chance of dripping by moving the first section.

**[0024]** Furthermore the use of a push rod in the second section to the first section and a seal for the push rod by the second section are avoided. Due to the absence of this seal the chance of air entering the liquid through the seal is reduced, which air increases the chance of dripping.

**[0025]** According to a favourable embodiment, the controlled valves are diaphragm valves.

**[0026]** Diaphragm valves may be opened and closed quickly, which contributes to a precise dispensation and preventing leakage.

**[0027]** According to a favourable embodiment, the cylinder is a first cylinder and the filling device comprises a second cylinder, which second cylinder comprises a second piston and a second chamber, wherein the second chamber is equipped with

- a second controlled inlet valve, and
- a second controlled outlet valve between the second chamber and the filling lance;

wherein the first piston and the second piston are driven in opposite phase.

**[0028]** In this way twice the number of packages may be provided with liquid using a single filling lance.

**[0029]** In case of a further valve this will not be closed during the entire second stage of a cylinder.

**[0030]** Finally, the present invention relates to filling device for introducing an amount of liquid into a package, wherein the filling device

- comprises a chamber for liquid,
- comprises a filling lance connected to the chamber, which filling lance comprises a mouth piece at a distal end thereof for dispensing liquid from the chamber; wherein the filling device is configured to suck liquid which in use remains in the mouth piece after dispensing the liquid at least partially back into the filling lance.

**[0031]** In this way the chance of leaking of the liquid from the filling lance is reduced and thereby also the chance of the aforementioned problems which may be associated with it. It may for example be possible to suck the liquid back over a distance of at least 0.5 cm, preferably at least 2 cm. A relatively runny liquid (such as water) will be sucked back over a relatively large distance, while a relatively viscous liquid such as a sauce may be sucked back over a relatively short distance.

**[0032]** For sucking back, a branch pipe may be present between the chamber and the mouth piece, which is provided with or connectable to a device for discharging liquid, such as a vacuum pump.

**[0033]** According to a favourable embodiment, the filling device comprises a cylinder, which cylinder comprises a piston and the chamber, wherein the cylinder is

equipped with

- a controlled inlet valve, and
- a controlled outlet valve between the chamber and the filling lance;

wherein

- in a first step, the piston is movable in a first direction for discharging liquid from the chamber through the controlled outlet valve, to the filling lance, wherein the inlet valve of the chamber is closed and the outlet valve is opened, and - in a second step after the first step, the piston is movable in a second direction opposite to the first direction for supplying liquid to the chamber through the supply valve, wherein in a first stage of the second step at least the outlet valve is opened for sucking back liquid from the filling lance, and in a second stage of the second step the outlet valve is closed and the inlet valve is opened.

**[0034]** In this way sucking back of liquid from the filling lance, and more in particular from the mouth piece of the filling lance towards the chamber, may be achieved very effectively. Advantageously the inlet valve of the chamber is closed during the first stage, whereby sucking back liquid into the mouth piece may be assured more effectively.

**[0035]** According to a favourable embodiment, the filling lance is provided with a further controlled valve at a distance of less than 20 cm from the mouth piece.

**[0036]** In this way leaking of liquid from the filling lance is prevented more effectively, in particule in case of a filling lance having a relatively large own volume. The distance from the third valve to the mouth piece is preferably less than 30 cm, more preferably less than 15 cm and most preferably less than 7 cm.

**[0037]** According to a favourable embodiment, the filling lance

- comprises a first section and a second section, wherein
  - the first section comprises a distal end comprising the mouth piece, and
  - the second section comprises a proximal end in liquid connection with the chamber; and
- comprises a dispense chamber delimited by a chamber wall, wherein an end of a section chosen from
  - the proximal end of the first section, and
  - the distal end of the second section

extends into the dispense chamber, wherein the chosen section only in a side wall thereof comprises a through hole, and

wherein the chamber wall and the chosen section are moved in axial direction with respect to each other between i) a first position in which the through hole of the chosen section is closed by the chamber wall and ii) a second position in which the through hole of the chosen section is located at least partially in the dispense chamber and the distal end of the first section is in liquid connection with the proximal end of the second section.

**[0038]** In this way the filling lance provides a third valve and the liquid flux through the dispense chamber may be blocked or enabled by moving the chamber wall and the section with respect to each other.

**[0039]** Generally the relative moment will be obtainable by an actuator.

**[0040]** According to a favourable embodiment, the controlled valves are diaphragm valves.

**[0041]** Diaphragm valves may be opened and closed quickly, which contributes to a precise dispensation and preventing leakage.

**[0042]** According to a favourable embodiment, the cylinder is a first cylinder and the filling device comprises a second cylinder, which second cylinder comprises a second piston and a second chamber, wherein the second chamber is equipped with

- a second controlled inlet valve, and
- a second controlled outlet valve between the second chamber and the filling lance;

wherein the filling device is arranged for driving the first piston and the second piston in opposite phase.

**[0043]** Such a filling device allows to provide twice as many packages with liquid using a single filling lance.

**[0044]** The present invention will now be illustrated with reference to the drawing where

Fig. 1A and Fig. 1B show perspective views of a part of a filling device;

Fig. 2 shows a perspective view of the filling lance 200 for the part of the filling device 100 shown in Fig. 1A;

Fig. 3A and Fig. 3B show longitudinal cross sections through an end of the filling lance of Fig. 2; and

Fig. 4A to Fig. 4G show diagrams illustrating the method according to the invention.

Fig. 1A en Fig. 1B show perspective views on part of a filling device 100, wherein filling lance 200 (Fig. 2) is omitted.

**[0045]** The filling device 100 discussed in this exemplary embodiment is provided with two cylinders 110 for faster dispensing of liquid, which are alternateley being filled and dispense liquid to a part of dispense channel 190 having an outlet opening 191 to which the filling lance 200 is connected.

**[0046]** The cylinder 110 is filled through a shared supply channel 112 having a supply opening 113 for connection to a storage tank for liquid.

**[0047]** The cylinders 110 comprise a piston, wherein a piston rod 111 is driven by a servomotor 181 in motor housing 180 having a drive axis 182, which is connected to a crankshaft 183 which may move the piston rod 111 through a drive rod 184. The servomotor drives the crankshaft 183 to perform a back and forth going motion, wherein an extreme is determined by a stop 84. In Fig. 1B one motor housing 180 is omitted.

**[0048]** The filling device 100 comprises for each cylinder 110 a controlled inlet valve 130 and a controlled outlet valve 140, in the form of pneumatically drivable diaphragm valves. These diaphragm valves are provided with air inlets which may be connected to a pneumatic control unit 150 housed in lid 101. Air hoses are omitted for clarity. The pneumatically drivable diaphragm valves are in themselves known.

**[0049]** The filling lance 200 according to the preferred embodiment comprises a first section 210 and a second section 220 which are movable with respect to each other in axial direction.

**[0050]** The first section 210 comprises a mouth piece 201 at a distal end.

**[0051]** The second section 220 comprises a proximal end 202 for connection to the dispense opening 191. Liquid dispensed by the cylinders 110 liquid flows through the dispense channel 190, through the second section 220, through the first section 210 to the mouth piece 201 where the liquid is dispensed by the filling lance 200.

**[0052]** For further improved prevention of leakage the filling lance 200 comprises a further valve 230. This is formed by a proximal part of the first section 210 and a distal part of the second section 220, as will be explained by means of Fig. 3.

**[0053]** In the embodiment shown here, the first section 210 is not moved while filling and the second section 220 may move with respect to the first section 210 in axial direction by an actuator 250, and a lever arm 255 which is hingedly attached to the second section 220.

**[0054]** Fig. 3A and Fig. 3B show longitudinal cross sections through an end of the filling lance 200 of Fig. 2. Fig. 3A shows the further valve 230 in an opened state and Fig. 3B shows the further valve 230 in a closed state.

**[0055]** The first section 210 has near a proximal end thereof in the side wall 310 a through hole 311. The proximal end of the first section 210 is closed and provided with a cover plate 312 and a sealing ring 313.

**[0056]** The second section 220 comprises at a distal end thereof a dispense chamber 320 delimited by a chamber wall 321, wherein the proximal end of the first section 210 extends into the dispense chamber 320.

**[0057]** In the embodiment discussed here the chamber wall 321 is fixedly connected to the second section 220.

**[0058]** The first section 210 and the second section 220 are in axial direction relatively moveable with respect to each other between i) a first position in which the through hole 311 of the first section 210 is closed by the chamber wall of the distal end of the second section 220 (Fig. 3B) and the sealing ring 313 seals against the sec-

ond section 220 and ii) a second position in which the through hole 311 of the first section is located at least partially in the dispense chamber 320 and is in liquid connection with the proximal end of the second section 220.

**[0059]** Fig. 4A to Fig. 4G show diagrams illustrating the method according to the invention for the filling device 100 of Fig. 1.

**[0060]** Storage tank 490 is filled with a liquid, for example a sauce, which is to be dispensed by the filling lance 200.

**[0061]** The first cylinder 110' comprises a first chamber 410', a first piston 411' and is driven by the first piston rod 111'.

**[0062]** The filling device 100 comprises a first controlled inlet valve 130' between the supply channel 112 and the first chamber 410'. The filling device 100 comprises furthermore first controlled outlet valve 140' between the first chamber 410' and the dispense channel 190.

**[0063]** The second cylinder 110" comprises a second chamber 410", a second piston 411" and is driven by the second piston rod 111".

**[0064]** The filling device 100 comprises a second controlled inlet valve 130" between the supply channel 112 and the second chamber 410". The filling device 100 comprises furthermore second controlled outlet valve 140" between the second chamber 410" and the dispense channel 190.

**[0065]** Fig. 4A shows the filling device 100 in a state in which all valves are closed.

**[0066]** For dispensing liquid the first controlled outlet valve 140' and the further valve 230 are brought into an opened state.

**[0067]** The filling device 100 according to this preferred embodiment allows to dispense liquid very frequently. Therefore the second chamber 410" is filled simultaneously with dispensing liquid from the first chamber 410' by moving the second piston 411" to the right into a state where the second controlled inlet valve 130" is open and the second controlled outlet valve 140" is closed.

**[0068]** When the required amount of liquid is dispensed from the first chamber 410' towards the further valve 230, the first piston 411' is moved slightly to the left resulting in it sucking back liquid from the filling lance 200 (Fig. 4C). Therefore the chance of liquid leaking from the filling lance 200 is reduced.

**[0069]** Through a state in which all valves are closed (Fig. 4D) including the further valve 230 in order to avoid the chance of dripping, for example because air enters through the mouth piece, the method is continued as follows.

**[0070]** For dispensing liquid from the second chamber 410" the second controlled outlet valve 140" and the further valve 230 are brought into an opened state.

**[0071]** Liquid is dispensed from the second chamber 410" and the first chamber 410' is filled by moving the first piston 411' and the second piston 411" to the left into a state where the second controlled inlet valve 130" is closed and the first controlled inlet valve 130' is open

(Fig. 4E).

**[0072]** Then the first controlled inlet valve 130' and the first controlled outlet valve 140' are closed and the second piston 411" is moved to the right to suck liquid back. After this the cycle may be performed another time.

## Claims

1. A method of introducing an amount of liquid into a package by means of a filling device (200), which filling device (100)

- comprises a chamber for liquid,
- comprises a filling lance (200) connected to the chamber, which filling lance (200) comprises a mouth piece (201) at a distal end (202) thereof for dispensing liquid from the chamber;

wherein the method comprises the steps of

- introducing a measured amount of the liquid into the package using the filling device (100), and
- closing the package after introducing the liquid into the package using the filling lance (200);

### characterized in that

- after introducing the liquid into the package, and
- without the mouth piece (201) extending into the liquid which is introduced into the package;

liquid remaining in the mouth piece (201) is at least partially sucked back into the filling lance (200).

2. Method according to claim 1, wherein the step of sucking back comprises sucking liquid at least partially back in the filling lance (200) to the chamber.
3. Method according to claim 1 or 2, wherein the step of introducing a measured amount of the liquid into the package using the filling device (100) comprises introducing the mouth piece (201) of the filling lance (200) into the package by a relative movement of the package and the mouth piece (201), and between the step of introducing a measured amount of the liquid into the package using the filling device (100) and the step of closing the package after removing the mouth piece (201) of the filling lance (200) from the package, the distal end (202) of the filling lance (200) is removed from the package by a relative movement of the package and the mouth piece (201).
4. Method according to any of the preceding claims, wherein the filling device (100) comprises a cylinder

(110), which cylinder (110) comprises a piston and the chamber, wherein the cylinder is fitted with

- a controlled inlet valve (130), and
- a controlled outlet valve (140) between the chamber and the filling lance (200);

wherein

- in a first step the piston is moved in a first direction for discharging liquid through the controlled outlet valve (140) from the chamber, to the filling lance (200), wherein the inlet valve (130) of the chamber is closed and the outlet valve (140) is opened, and
- in a second step after the first step the piston is moved in a second direction opposite to the first direction for supplying liquid to the chamber through the supply valve, wherein in a first stage of the second step at least the outlet valve (140) is opened for sucking back liquid from the filling lance (200), and in a second stage of this second step the outlet valve (140) is closed and the inlet valve (130) is opened.

5. Method according to claim 4, wherein the filling lance (200) is provided with a further valve (230) at a distance of less than 20 cm from the mouth piece (201), which further valve (230)

- is opened during the first step, and
- is opened during the first stage of the second step and is closed during at least part of the second stage of the second step.

6. Method according to claim 5, wherein the filling lance (200)

- comprises a first section (210) and a second section (220), wherein

- the first section (210) comprises a distal end comprising the mouth piece (201), and
- the second section (220) comprises a proximal end in fluid connection with the chamber; and

- comprises a dispense chamber (320) delimited by a chamber wall (321), wherein an end (202) of a section chosen from

- the proximal end of the first section (210), and
- the distal end of the second section (220)

extends into the dispense chamber (320), wherein the chosen section only in its side wall (310)

comprises a through hole (311), and wherein the chamber wall (321) and the chosen section are moved in axial direction with respect to each other between i) a first position in which the through hole (311) of the chosen section is closed by the chamber wall (321) and ii) a second position in which the through hole (311) of the chosen section is located at least partially in the dispense chamber (320) and the distal end of the first section (210) is in liquid connection with the proximal end (202) of the second section (220).

7. Method according to claim 6, wherein the first section (210) is kept stationary independent of the position.

8. Method according to any of the claims 4 to 7, wherein the controlled valves are diaphragm valves.

9. Method according to any of the claims 4 to 8, wherein the cylinder (110) is a first cylinder (110') and the filling device (100) comprises a second cylinder (110''), which second cylinder (110'') comprises a second piston (411'') and a second chamber (410''), wherein the second chamber (410'') is equipped with

- a second controlled inlet valve (130''), and
- a second controlled outlet valve (140'') between the second chamber (410'') and the filling lance (200);

wherein the first piston (411') and the second piston (411'') are driven in opposite phase.

10. Filling device (100) for introducing an amount of liquid into a package, wherein the filling device (100)

- comprises a chamber for liquid,
- comprises a filling lance (200) connected to the chamber, which filling lance (200) comprises a mouth piece (201) at a distal end (202) thereof for dispensing liquid from the chamber; **characterized in that** the filling device (100) is configured to suck liquid which in use remains in the mouth piece (201) after dispensing the liquid at least partially back into the filling lance (200).

11. Device according to claim 10, wherein the filling device (100) comprises a cylinder (110), which cylinder (110) comprises a piston and the chamber, wherein the cylinder (110) is equipped with

- a controlled inlet valve (130), and
- a controlled outlet valve (140) between the chamber and the filling lance (200);

wherein

- in a first step, the piston is movable in a first

direction for discharging liquid from the chamber through the controlled outlet valve (140), to the filling lance (200), wherein the inlet valve (130) of the chamber is closed and the outlet valve (140) is opened, and

- in a second step after the first step, the piston is movable in a second direction opposite to the first direction for supplying liquid to the chamber through the supply valve, wherein in a first stage of the second step at least the outlet valve (140) is opened for sucking back liquid from the filling lance (200), and in a second stage of the second step the outlet valve (140) is closed and the inlet valve (130) is opened.

12. Device according to claim 11, wherein the filling lance (200) is provided with a further controlled valve (230) at a distance of less than 20 cm from the mouth piece (201).

13. Device according to claim 12, wherein the filling lance (200)

- comprises a first section (120) and a second section (220), wherein

- the first section (210) comprises a distal end comprising the mouth piece (201), and
- the second section (220) comprises a proximal end (202) in liquid connection with the chamber; and

- comprises a dispense chamber (320) delimited by a chamber wall (321), wherein an end (202) of a section chosen from

- the proximal end of the first section (210), and
- the distal end of the second section (220)

extends into the dispense chamber (320), wherein the chosen section only in a side wall (310) thereof comprises a through hole (311), and wherein the chamber wall (321) and the chosen section are moved in axial direction with respect to each other between i) a first position in which the through hole (311) of the chosen section is closed by the chamber wall (321) and ii) a second position in which the through hole (311) of the chosen section is located at least partially in the dispense chamber (320) and the distal end of the first section (210) is in liquid connection with the proximal end (202) of the second section (220).

14. Device according to any of the claims 11 to 13, wherein the controlled valves are diaphragm valves.

15. Device according to any of the claims 11 to 14, wherein the cylinder (110) is a first cylinder (110') and the filling device (100) comprises a second cylinder (110''), which second cylinder (110'') comprises a second piston (411'') and a second chamber (410''), wherein the second chamber (410'') is equipped with

- a second controlled inlet valve (130''), and
- a second controlled outlet valve (140'') between the second chamber (410'') and the filling lance (200);

wherein the filling device (100) is arranged for driving the first piston (411') and the second piston (411'') in opposite phase.

20

25

30

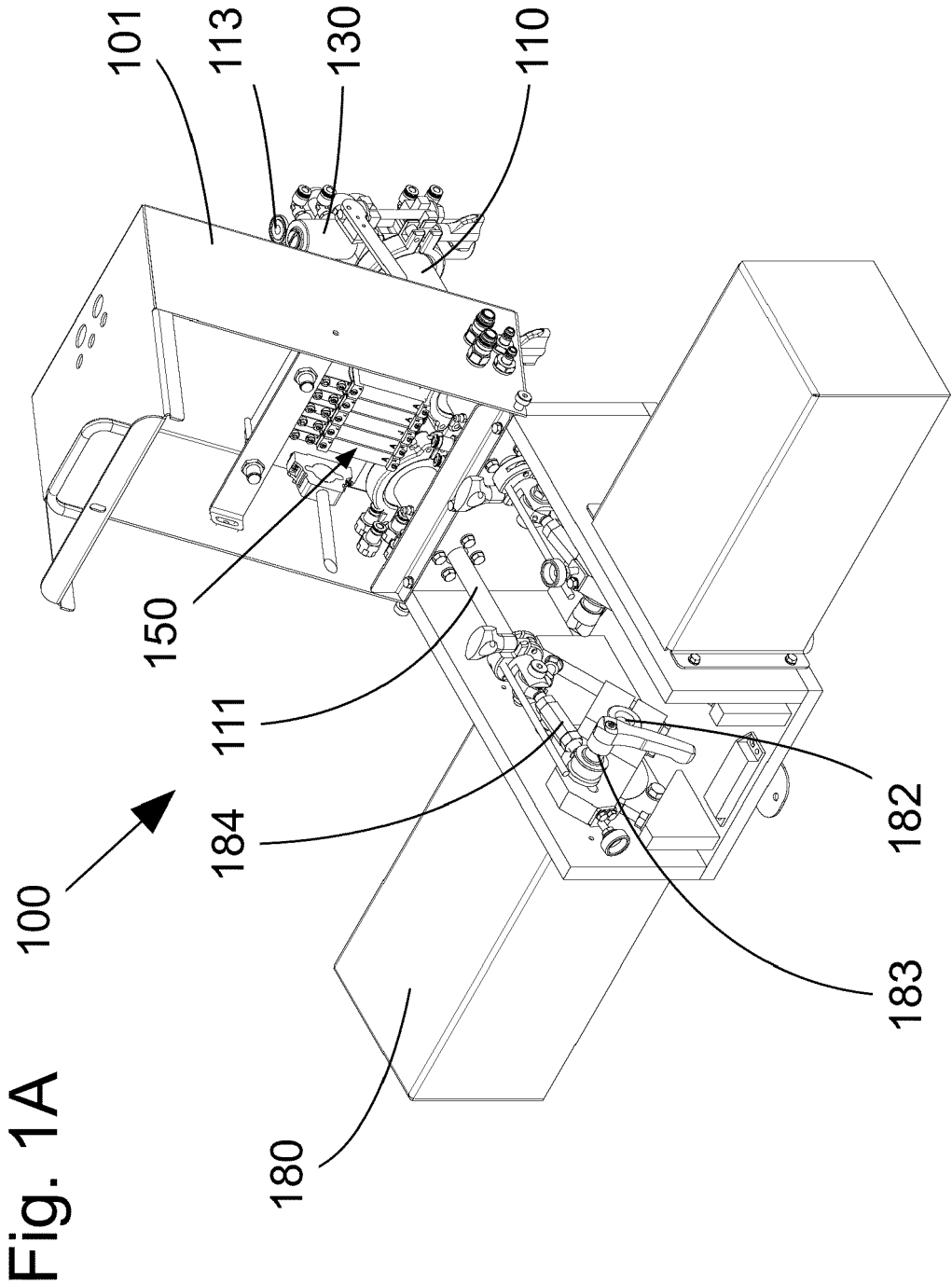
35

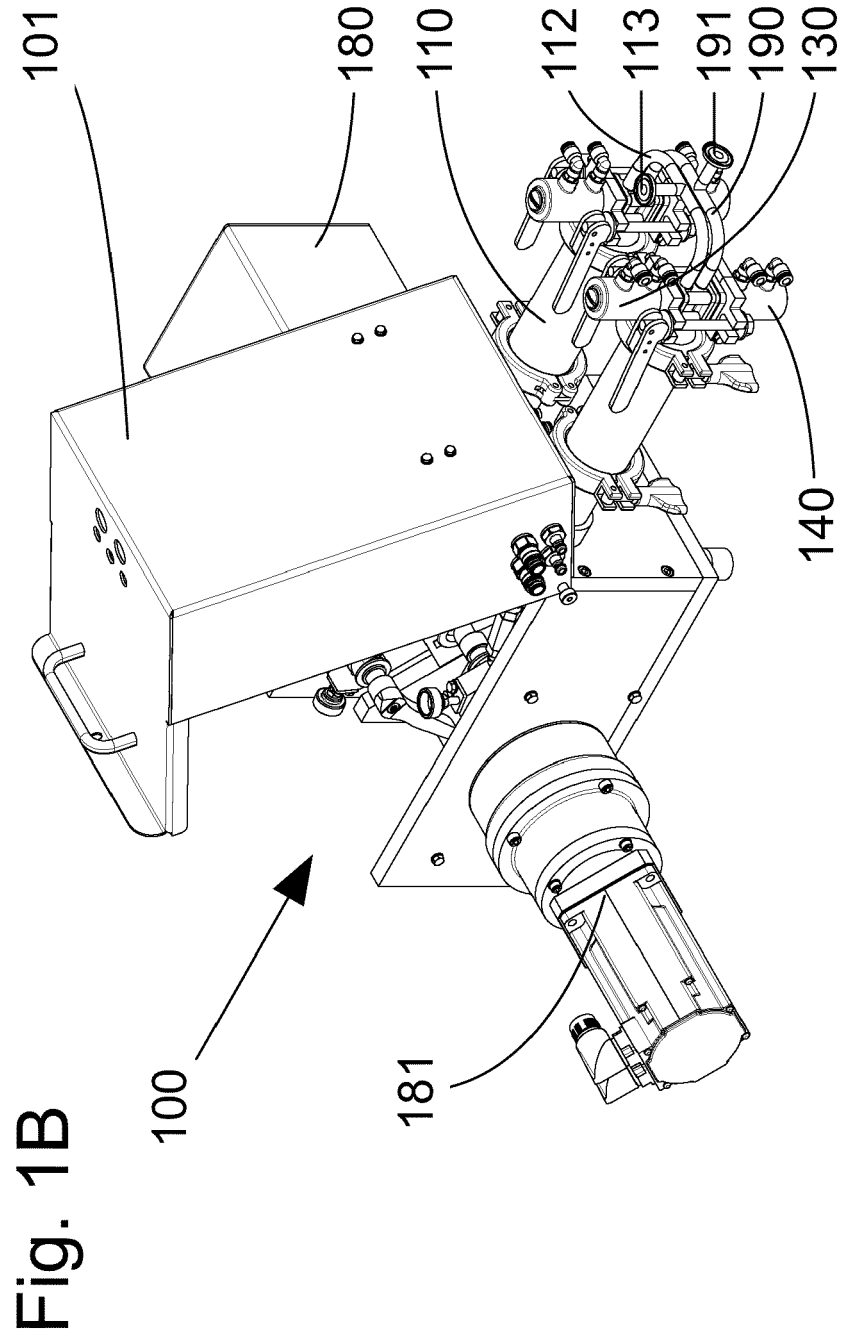
40

45

50

55





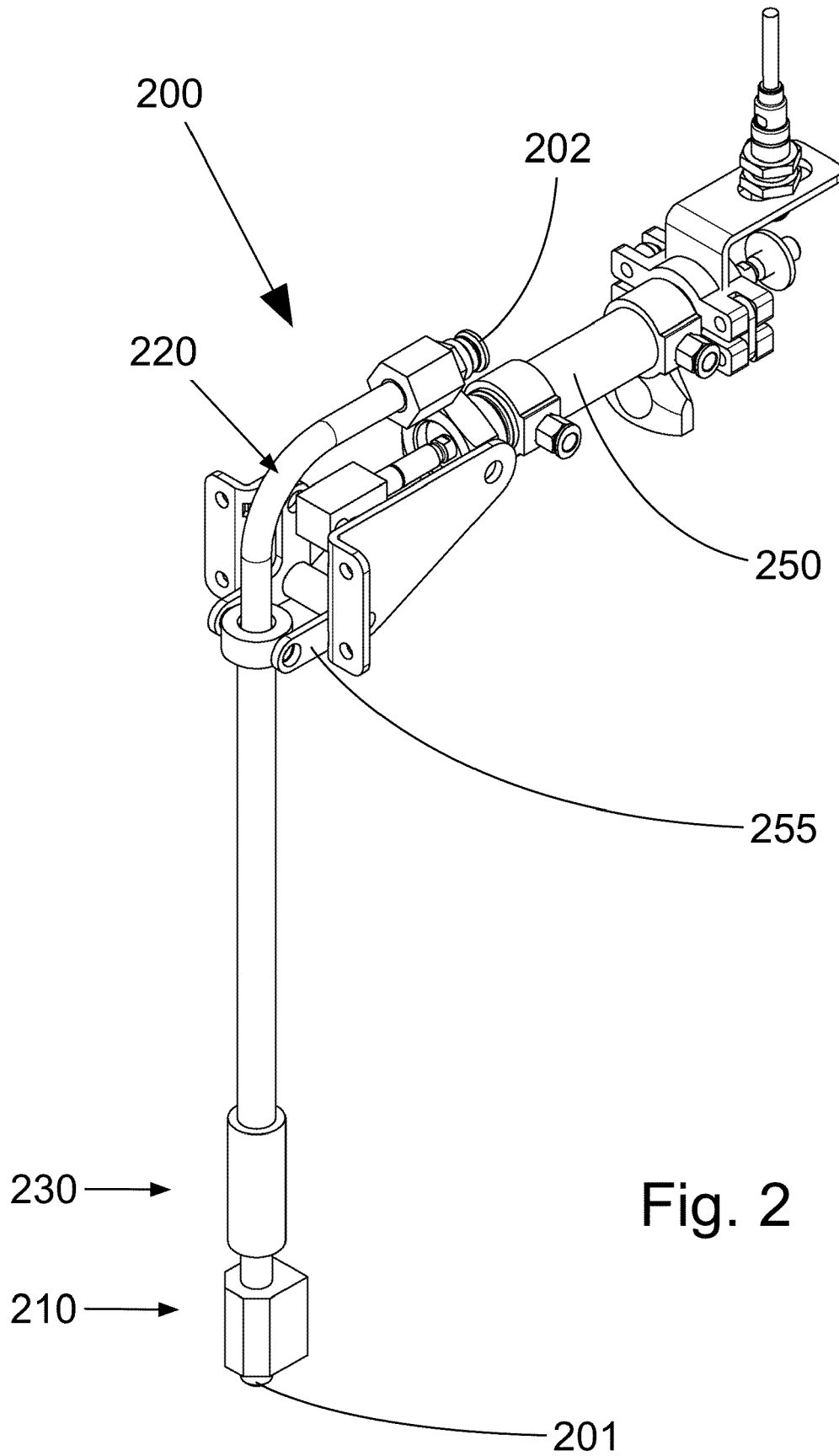


Fig. 2

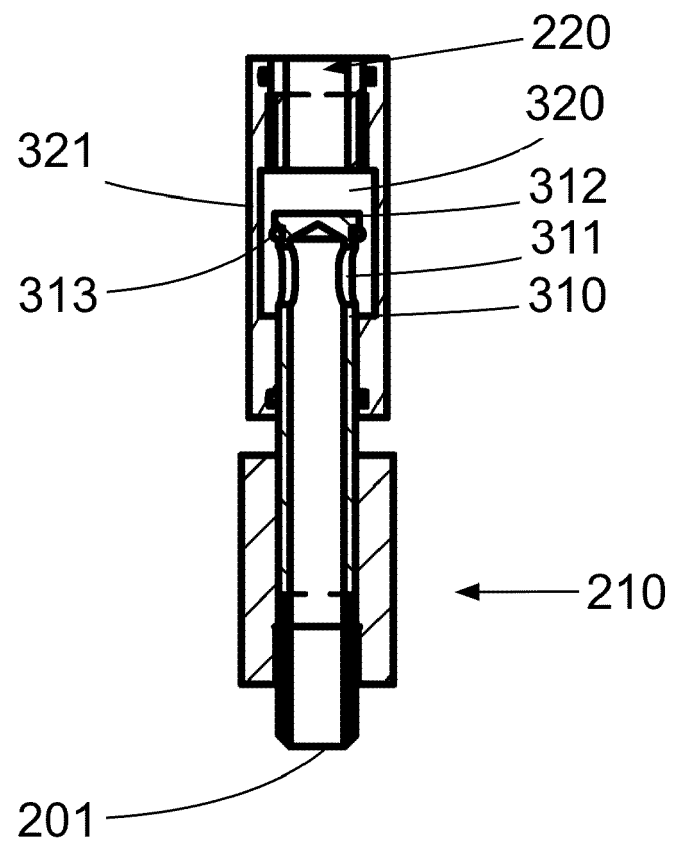


Fig. 3A

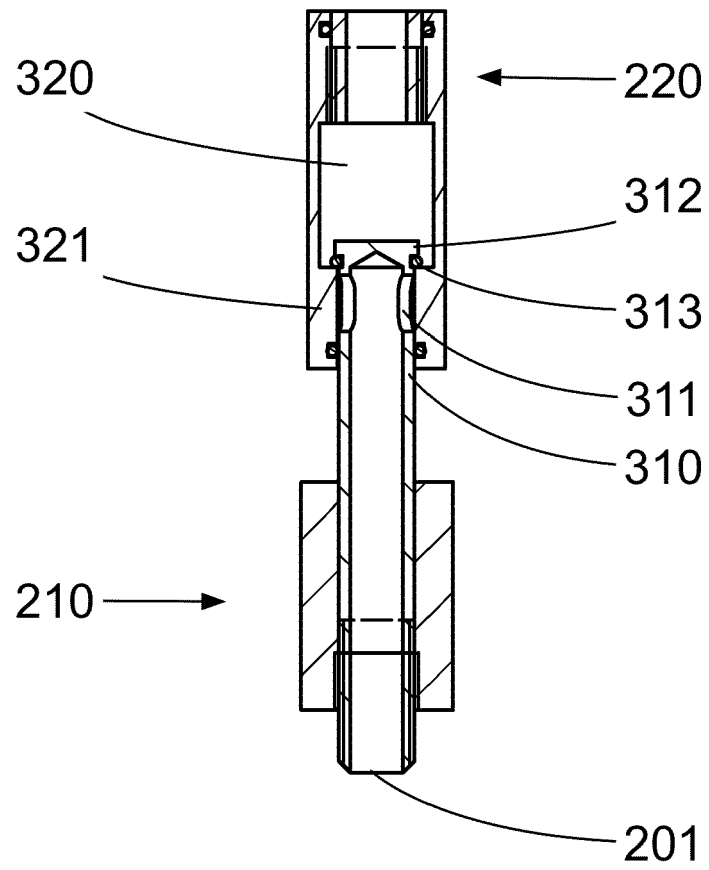


Fig. 3B

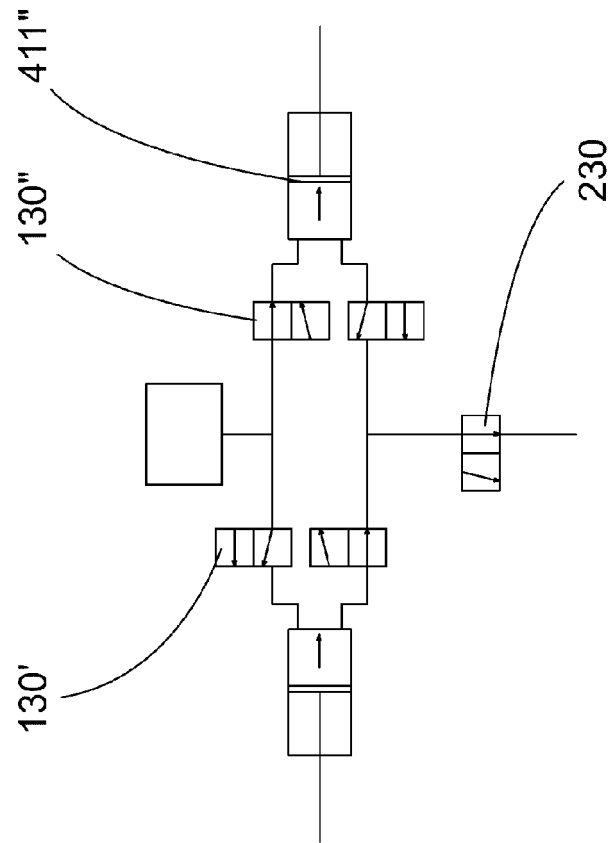


Fig. 4B

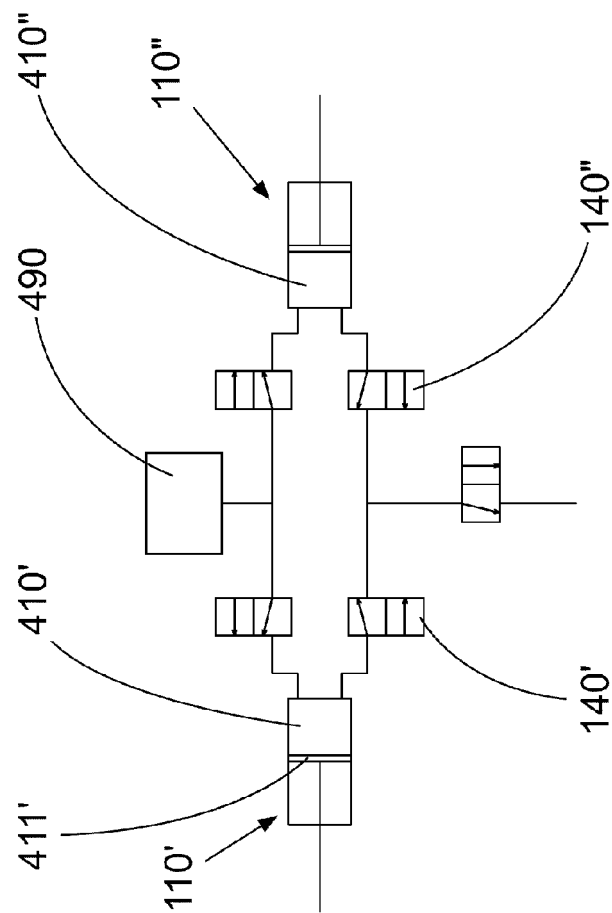


Fig. 4A

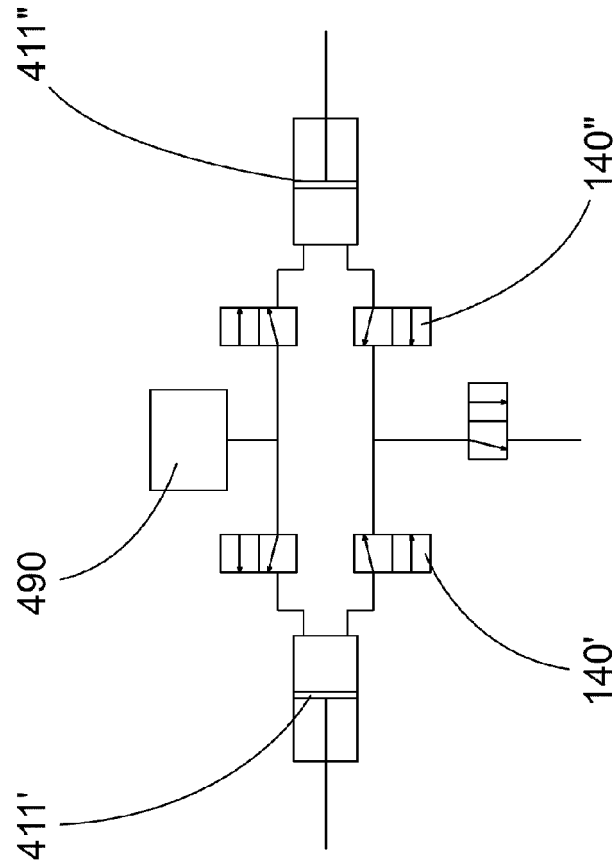


Fig. 4D

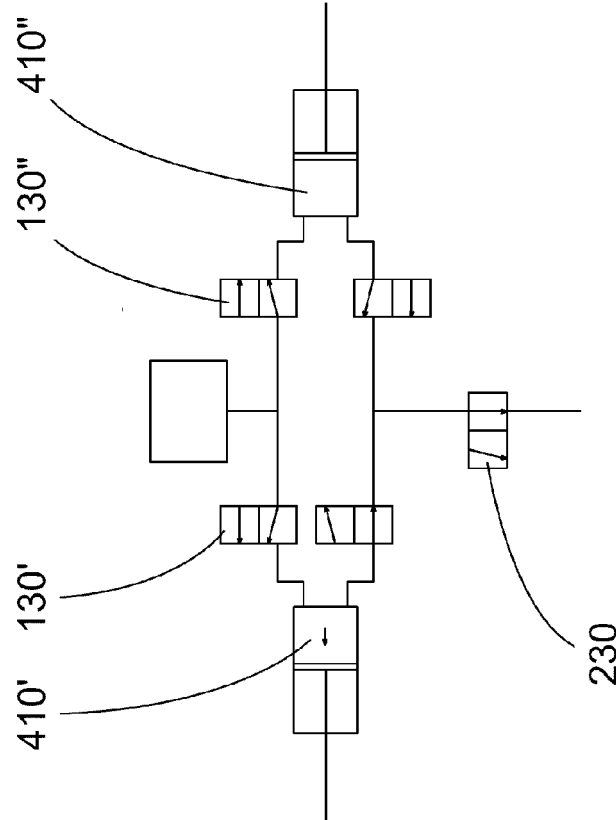


Fig. 4C

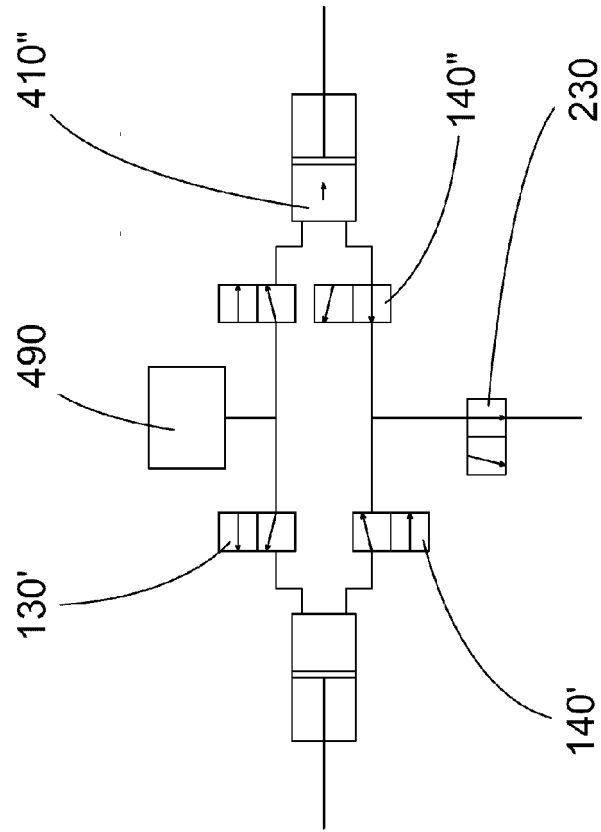


Fig. 4F

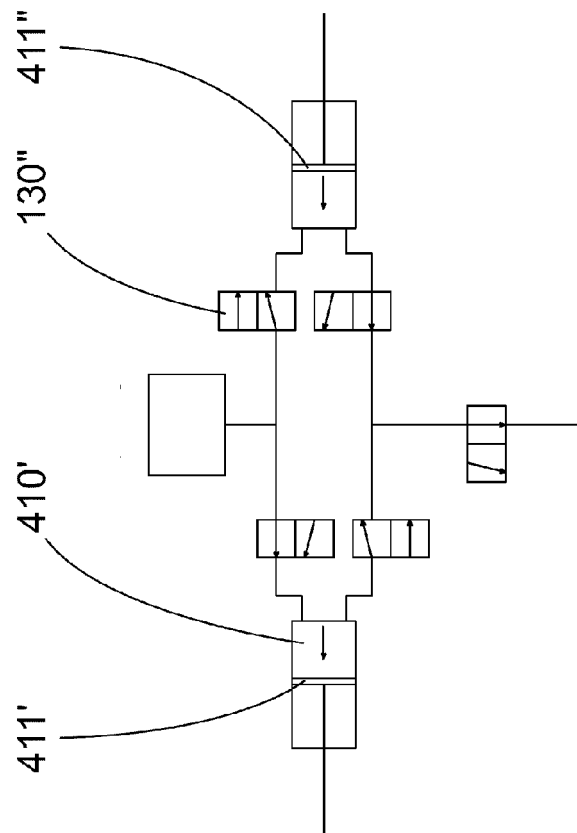


Fig. 4E



## EUROPEAN SEARCH REPORT

 Application Number  
 EP 21 17 0349

5

10

15

20

25

30

35

40

45

50

55

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                     |                                                           |                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                       | Relevant to claim                                         | CLASSIFICATION OF THE APPLICATION (IPC)                                       |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE 10 2015 204951 A1 (BOSCH GMBH ROBERT [DE]) 22 September 2016 (2016-09-22)<br>* paragraphs [0022], [0023], [0033], [0034], [0040]; figures 1, 3 * | 1-5,<br>10-12                                             | INV.<br>B65F3/12<br>B65F3/20<br>B65B3/12<br>B65B3/32<br>B65B37/20<br>B67C3/26 |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2019/077648 A1 (WANG XIN [CN] ET AL) 14 March 2019 (2019-03-14)<br>* page 7, paragraph 3; figures 1, 3 *                                         | 1,2,10,<br>11                                             |                                                                               |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE 297 07 536 U1 (HEES HANS WERNER [DE]) 27 August 1998 (1998-08-27)<br>* page 18, line 26 - page 21, line 2; figures 2, 3 *                        | 6,13                                                      |                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                     |                                                           | TECHNICAL FIELDS SEARCHED (IPC)                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                     |                                                           | B65F<br>B67C<br>B65B                                                          |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                     |                                                           |                                                                               |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                     | Date of completion of the search<br><b>17 August 2021</b> | Examiner<br><b>Augé, Marc</b>                                                 |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                                     |                                                           |                                                                               |

 1  
 EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 17 0349

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-08-2021

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| DE 102015204951 A1                        | 22-09-2016          | DE 102015204951 A1         | 22-09-2016          |
|                                           |                     | EP 3271251 A1              | 24-01-2018          |
|                                           |                     | US 2018079536 A1           | 22-03-2018          |
|                                           |                     | WO 2016146366 A1           | 22-09-2016          |
| -----                                     |                     |                            |                     |
| US 2019077648 A1                          | 14-03-2019          | CN 111065849 A             | 24-04-2020          |
|                                           |                     | EP 3679279 A1              | 15-07-2020          |
|                                           |                     | JP 2020529565 A            | 08-10-2020          |
|                                           |                     | US 2019077648 A1           | 14-03-2019          |
|                                           |                     | WO 2019047150 A1           | 14-03-2019          |
| -----                                     |                     |                            |                     |
| DE 29707536 U1                            | 27-08-1998          | NONE                       |                     |
| -----                                     |                     |                            |                     |

**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- DE 102015204951 [0004]
- US 2019077648 A [0009]