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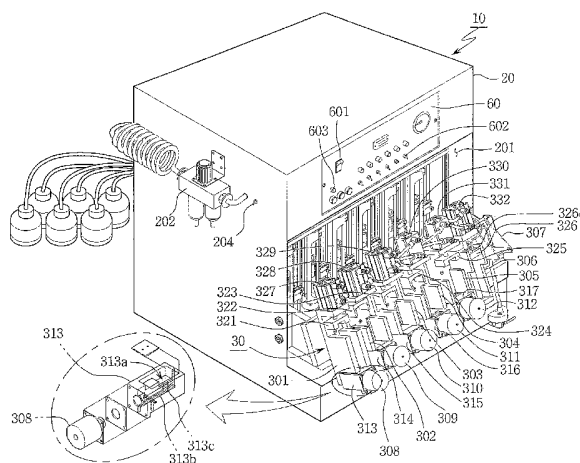
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(54) Title: INK REFILL APPARATUS FOR WASTE INK CARTRIDGE



(57) Abstract: Disclosed is an ink refill apparatus for refilling a waste ink cartridge with ink, capable of automatically fixing the waste ink cartridge while preventing impurities from being introduced into the waste ink cartridge. The ink refill apparatus includes a body section provided at a front center portion thereof with a receiving part, a fixing unit for fixing at least one of the ink cartridges installed in front of the receiving part of the body section by using pressurized air supplied thereto from a pressurized air supplying unit, a waste ink exhausting unit installed in the body section so as to exhaust waste ink from the waste ink cartridges, an ink refill unit for refilling the waste ink cartridges with new ink supplied from an ink reservoir, a control panel section installed at a front upper portion of the body section and including a power button for turning on/off the ink refill apparatus and a plurality of selection buttons and operation buttons, and a control unit installed in the body section in order to control the fixing unit, the waste ink exhausting unit, and the ink refill unit as the power button is powered on and having a relay section and a control section for controlling an amount of refill ink.

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## INK REFILL APPARATUS FOR WASTE INK CARTRIDGE

## Technical Field

5 The present invention relates to an ink refill apparatus for a waste ink cartridge, and more particularly to an automatic ink refill apparatus for a waste ink cartridge, capable of rapidly, stably and simultaneously refilling at least one of waste ink cartridges with new ink.

## 10 Background Art

Recently, as personal computers have been widely used, there is a great demand for printers.

Various kinds of printers are now available from markets and such printers include various kinds of ink cartridges in the form of small vessels for receiving ink.

15 Ink contained in the ink cartridge may be exhausted when a certain period of time lapses, so users must exchange the waste ink cartridge with a new ink cartridge.

Currently, various kinds of ink refill apparatuses have been developed in order to reuse the waste ink cartridge by refilling the waste ink cartridge with new ink when ink contained in the ink cartridge has been completely exhausted.

20 However, such ink refill apparatuses have a disadvantage in that a worker must manually refill the waste ink cartridge with new ink after fixing the waste ink cartridge, lowering workability.

In addition, when refilling the waste ink cartridge with new ink, impurities, such as lubricant for facilitating an operation of the ink refill apparatus, may be  
25 introduced into the waste ink cartridge together with new ink, so ink spreads on papers.

## Disclosure of the Invention

Therefore, the present invention has been made in view of the above-mentioned problems occurring in the prior art, and it is an object of the present  
30 invention to provide an ink refill apparatus for waste ink cartridges, capable of automatically refilling at least one of waste ink cartridges with new ink by automatically fixing the waste ink cartridges while preventing impurities from being introduced into the waste ink cartridges when refilling the waste ink cartridges with new ink.

35

### Brief Description of the Drawings

The foregoing and other objects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

5 FIG. 1 is a left-side perspective view showing an ink refill apparatus for a waste ink cartridge according to one embodiment of the present invention;

FIG. 2 is a right-side perspective view showing an ink refill apparatus for a waste ink cartridge according to one embodiment of the present invention;

10 FIG. 3 is a front view showing an ink refill apparatus for a waste ink cartridge according to one embodiment of the present invention;

FIG. 4 is a rear view showing an ink refill apparatus for a waste ink cartridge according to one embodiment of the present invention;

FIG. 5 is a bottom view showing an ink refill apparatus for a waste ink cartridge according to one embodiment of the present invention;

15 FIG. 6 is a view showing a structure of an ink refill apparatus for a waste ink cartridge shown in FIG. 1 according to one embodiment of the present invention; and

20 FIG. 7 is an exploded perspective view showing an ink refill cylinder, an ink quantity determining member, and a proximity sensor installed in a supporting bar of an ink refill apparatus for a waste ink cartridge according to one embodiment of the present invention.

### Best Mode for Carrying Out the Invention

25 In order to accomplish the above object, there is provided an ink refill apparatus comprises a body section provided at a front center portion thereof with a receiving part, a fixing unit for fixing at least one of the ink cartridges installed in front of the receiving part of the body section by using pressurized air supplied thereto from a pressurized air supplying section, a waste ink exhausting unit installed in the body section so as to exhaust waste ink from the waste ink cartridges, an ink refill unit for  
30 refilling the waste ink cartridges with new ink supplied from an ink reservoir, a control panel section installed at a front upper portion of the body section and including a power button for turning on/off the ink refill apparatus and a plurality of selection buttons and operation buttons, and a control unit installed in the body section in order to control the fixing unit, the waste ink exhausting unit, and the ink refill unit as the power  
35 button is powered on and having a relay section and a control section for controlling an

amount of refill ink.

Hereinafter, a preferred embodiment of the present invention will be described with reference to accompanying drawings.

It is noted that a basic concept of the present invention is to simultaneously  
5 refill at least one of waste ink cartridges with ink by fixing or releasing various ink cartridges installed in a printer using pressurized air and to prevent impurities from being introduced into the ink cartridges when refilling the ink cartridges with ink by movably installing an ink quantity determining member having a vacuum state in an ink refill cylinder.

10 Hereinafter, a preferred embodiment of an ink refill apparatus for a waste ink cartridge having the above basic concept will be described with reference to accompanying drawings.

FIGS. 1 to 5 show the ink refill apparatus for the waste ink cartridge according to the present invention. As shown in FIG. 1, the ink refill apparatus 10 for the waste  
15 ink cartridge includes a body section 20 provided at a front center portion thereof with a receiving part 201, a fixing unit 30 for fixing at least one of various ink cartridges installed in front of the receiving part 201 of the body section 20 by using pressurized air supplied thereto from a pressurized air supplying section, a waste ink exhausting unit 40 installed in the body section 20 so as to exhaust waste ink from the waste ink  
20 cartridges, an ink refill unit 50 for refilling the waste ink cartridges with new ink supplied from an ink reservoir, a control panel section 60 installed at a front upper portion of the body section 20 and including a power button 601 for turning on/off the ink refill apparatus 10 and a plurality of selection buttons 602 and operation buttons 603, and a control unit 70 installed in the body section 20 in order to control the fixing  
25 unit 30, the waste ink exhausting unit 40, and the ink refill unit 50 as the power button 601 is powered on and having a relay section 701 and a control section 702 for controlling an amount of refill ink.

The fixing unit 30 has a plurality of receiving members 301 to 307 installed at a front portion of the body section 20 so as to receive the waste ink cartridge. At least  
30 one of jigs 313 to 317 is fixed to a lower portion of at least one of the receiving members 301 to 307. An insertion groove 313a having a sectional shape corresponding to a sectional shape of the waste ink cartridge is formed at each upper portion of the jigs 313 to 317 in order to receive the waste ink cartridge. A main ink exhaust hole 313b for exhausting waste ink from the waste ink cartridge and a main ink refill hole 313c for  
35 refilling the waste ink cartridge with new ink are formed at a bottom portion of the

insertion hole 313a. The jigs 313 to 317 are provided at front portions thereof with first solenoid valves 308 to 312 for opening/closing the main ink exhaust holes 313b under the control of the control unit 70. At least one of pressing members 327 to 332 is provided at an upper portion of at least one of the receiving members 301 to 307 in order to press an upper portion of the waste ink cartridge inserted into the insertion groove 313a. The pressing members 327 to 332 are formed at front portions thereof with a plurality of pressurized air inlet ports 327a, 327b, 328a, 328b, 329a, 329b, 330a, 330b, 331a, 331b, 332a, and 332b. Pressurized air supplied from a pressurized air supplying section (not shown) is introduced into the pressurized air inlet ports 327a, 327b, 328a, 328b, 329a, 329b, 330a, 330b, 331a, 331b, 332a, and 332b through a regulator 202 installed at one side of the body section 20 in order to adjust pressure of pressurized air and to remove impurities contained in pressurized air, a second solenoid valve 318, a branch hose 319 and a pressurized air branching section 320. The pressing members 327 to 332 are provided at lower portions thereof with pressing pieces 321 to 326, which are movable up and down corresponding to pressurized air introduced into the pressurized air inlet ports 327a, 327b, 328a, 328b, 329a, 329b, 330a, 330b, 331a, 331b, 332a, and 332b. An ink injection port 326c is formed at one of the pressing pieces 321 to 326 in order to refill the waste ink cartridge with new ink.

As shown in FIG. 6, the waste ink exhausting unit 40 includes a vacuum pump 401 installed in the body section 20 and driven by receiving power from a power supply section so as to exhaust waste ink from the waste ink cartridge fixed by the fixing unit 30, a collecting container 402 connected to the vacuum pump 401 through a vacuum hose 401a so as to collect waste ink therein using waste ink draining hoses 402a to 402f, which are connected to a bottom portion of the main ink exhaust hole 313b of the jigs 313 to 317 or a bottom portion of the receiving member 307, when waste ink is exhausted from the waste ink cartridge by means of the vacuum pump 401, and a third solenoid valve 403 installed at a lower portion of the waste ink collecting container 402 and operated under the control of the control unit 70 in order to exhaust waste ink from the waste ink collecting container 402 to a main waste ink reservoir.

The ink refill unit 50 includes a fixing member 501 vertically installed on the body section so as to refill the empty waste ink cartridge with new ink, an ink intake section 510, an ink refill section 519, a fourth solenoid valve 562, a plurality of ink refill cylinders 520 to 525 made from transparent acryl material, a plurality of ink quantity determining members 527 to 532 made from transparent acryl material, a pair of proximity sensors 540 and 540', a plurality of ink feeding hoses 541 to 546, and a

plurality of ink refill hoses 547 to 552. The ink intake section 510 is provided at one side of an upper portion of the fixing member 501. The ink intake section 510 is connected to the waste ink collecting container 402 through an ink intake hose 503 having a fifth solenoid valve 502, which is operated under the control of the control unit 70 to allow ink to be introduced into the ink intake section 510. A plurality of ink intake ports 504 to 509 are provided at an upper portion of the ink intake section 510. The ink refill section 519 is fixed to the other side of the upper portion of the fixing member 501. The ink refill section 519 is connected to the branch hose 319 through an ink injection hose 512 having a sixth solenoid valve 511, which is operated under the control of the control unit 70 to allow ink to be introduced into the ink refill section 519. A plurality of ink refill ports 513 to 518 are provided at an upper portion of the ink refill section 519. The fourth solenoid valve 562 is arranged between the sixth solenoid valve 511 and the ink refill section 519 so as to exhaust pressurized air under the control of the control unit 70 when the waste ink cartridge is filled with new ink. The ink refill cylinders 520 to 525 are detachably coupled to a coupling member 526, which is fixedly installed in the receiving part 201 of the body section 201. First ends of main intake hoses 504a to 509a are connected to the ink intake ports 504 to 509, first ends of main refill hoses 513a to 518a are connected to the ink refill ports 513 to 518, and second ends of main intake hoses 504a to 509a and main refill hoses 513a to 518a are connected to an upper portion of the coupling member 526. As shown in FIG. 7, connection ports 520a to 525a are provided at bottom portions of ink refill cylinders 520 to 525. The ink quantity determining members 527 to 532 have cylindrical shapes and are installed in the ink refill cylinders 520 to 525 in such a manner that the ink quantity determining members 527 to 532 are moved up and down while maintaining a vacuum state. A magnet 527a is fixedly inserted into each upper portion of the ink quantity determining members 527 to 532. The proximity sensors 540 and 540' are provided at upper and lower ends of supporting bars 533 to 538, first ends of which are fixedly coupled to the coupling member 526 adjacent to the ink refill cylinders 520 to 525 in such a manner that the operation of the sixth solenoid valve 511 and the vacuum pump 401 is controlled by the control unit 70 as the magnets 527a provided in the ink quantity determining members 527 to 532 approach the proximity sensors 540 and 540'. One of the proximity sensors 540 and 540' is fixedly inserted into a moving member 539, which is moved along the supporting bars 533 to 538. First ends of the ink feeding hoses 541 to 546 are connected to the connection ports 520a to 525a of the ink refill cylinders 520 to 525 and second ends of the ink feeding hoses 541 to 546 are connected to the new ink

reservoir. A plurality of ink feeding valves 541a to 546a operated under the control of the control unit 70 are installed in the ink feeding hoses 541 to 546. The ink feeding hoses 541 to 546 have branch sections 541b to 546b for feeding new ink into the waste ink cartridge. First ends of the ink refill hoses 547 to 552 connected to the branch sections 541b to 546b of the ink feeding hoses 541 to 546 and second ends of the ink refill hoses 547 to 552 are connected to the main ink refill holes 313c of the jigs 313 to 317 and an injection port 336c formed in the pressing piece 336. A plurality of ink refill valves 547a to 552a operated under the control of the control unit 70 are installed in the ink refill hoses 547 to 552.

10 A pair of ink adjustment valves 563 and 564 are installed in the ink intake hose 503 and the ink injection hose 512, respectively, so as to prevent bubbles from being formed in ink by adjusting a moving speed of the ink quantity determining members 527 to 532 installed in the ink refill cylinders 519 to 525.

The moving member 539 is used for adjusting an amount of new ink introduced into the waste ink cartridge. As shown in FIG. 7, not only the proximity sensor 540', but also the supporting bars 533 to 538 are fixedly inserted into the moving member 539. The moving member 539 includes a moving piece 539a having an H-sectional shape and moving up and down, a fixing pin 539b passing through the moving piece 539a so as to press the supporting bars 533 to 538, thereby fixing the moving piece 539a, and an indication pin 539c fixedly installed at a front portion of the moving piece 539a so as to indicate an amount of ink contained in the ink refill cylinders 519 to 525.

In addition, an on/off switch 204 is provided at one side of the body section 20 in order to allow a user to operate the vacuum pump 401, and an ink suction hose 206 is provided at the other side of the body section 20 so as to intake and exhaust ink remaining in the jigs 313 to 317 after the waste ink cartridge has been filled with ink by means of the operation of the driving pump 401. One end of the suction hose 206 is connected to the collecting container 402 and the other end of the suction hose 206 is hanging on a hanger section 207 installed at the other side of the body section 20.

30 Hereinafter, an operation of the ink refill apparatus for the waste ink cartridge having the above-mentioned structure according to the present invention will be described.

The ink refill apparatus for the waste ink cartridge according to the present invention can simultaneously exhaust waste ink from a plurality of waste ink cartridges installed in a plurality of jigs. However, the following description will be made in

connection with one waste cartridge installed in one jig for the purpose of explanation.

As shown in FIGS. 1 to 7, after installing the waste ink cartridge in the insertion groove of the jig 313 through the receiving member 301 of the fixing unit 30 fixedly installed at the front portion of the body section 20, the user operates the power button 601, selection buttons 602 and operation buttons 603, which are installed in the control panel 60. Then, The control section 702 of the control unit 70 opens the second solenoid valve 318 so that pressurized air is supplied from the pressurized air supplying section (not shown) into the pressurized air inlet port 327b of the selected pressing member 327 by way of the regulator 202, the second solenoid valve 318, the branch hose 319 and the pressurized air branching section 320.

Accordingly, the pressing piece 321 is moved down while pressing an upper portion of the waste ink cartridge.

Then, the control section 702 of the control unit 70 applies a control signal to the vacuum pump 401 of the waste ink exhausting unit 40 so that the vacuum pump 401 is driven, thereby exhausting waste ink from the waste ink cartridge. At this time, the first solenoid valve 308 installed at a front end of the jig 313, the fifth solenoid valve 502 of the ink refill unit 50 and the ink feeding valve 541 are opened.

Due to the operation of the vacuum pump 401, air contained in the collecting container 402 is completely exhausted through the vacuum hose 401 so that the collecting container 402 is maintained in a vacuum state. Thus, waste ink contained in the waste ink cartridge installed in the jig 313 of the fixing unit 30 is exhausted towards the collecting container 402 through the waste ink draining hoses 402a. At the same time, since the fifth solenoid valve 502 and the ink feeding valve 541 have been opened, new ink is introduced into the ink refill cylinder 520 from the new ink reservoir (not shown).

That is, as the vacuum pump 401 operates, air contained in the ink refill cylinder 520 is exhausted into the collecting container through the ink intake port 504 connected to the ink intake hose 503 and the main intake hose 504a connected to the ink intake port 504, so that new ink is introduced into the ink refill cylinder 520 through the ink feeding hose 541 connected to both connection port 520a of the ink refill cylinder 520 and new ink reservoir.

As new ink is introduced into the ink refill cylinder 520, the ink quantity determining member 527 moves upwards.

While the ink quantity determining member 527 is moving upwards, if the magnet 527a approaches the proximity sensor 540, the proximity sensor 540 detects the



magnet 527a and sends a detected value to the control section 702.

Upon receiving the detected value for the magnet 527a, the control section 702 shuts off the ink feeding valve 541 and opens the ink refill valve 547a and the sixth solenoid valve 511.

5 Therefore, pressurized air is introduced into the ink refill cylinder 520 through the ink refill hose 547, the ink refill section 519, and the main refill hose 513a.

The ink quantity determining member 527 installed in the introduced into the ink refill cylinder 520 is moved down due to pressurized air introduced into the ink refill cylinder 520, so that new ink introduced into the introduced into the ink refill  
10 cylinder 520 introduced into the main ink refill hole 313c through the ink feeding hose 541, the refill valve 547a and the refill hose 512. Accordingly, the waste ink cartridge is filled with new ink.

At this time, if the magnet 527a approaches the proximity sensor 540' while the ink quantity determining member 527 is moving downwards, the proximity sensor  
15 540' detects the magnet 527a and sends a detected value to the control section 702. Upon receiving the detected value from the proximity sensor 540', the control section 702 shuts off the ink refill valve 547a and opens the fourth solenoid valve 562 and second solenoid 318, thereby exhausting remaining pressurized air. In addition, the control section 702 releases the pressing piece 321 applying pressure to the upper  
20 portion of the waste ink cartridge, thereby completing refill work for the waste ink cartridge.

While this invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiment and the drawings, but, on the  
25 contrary, it is intended to cover various modifications and variations within the spirit and scope of the appended claims.

#### Industrial Applicability

As can be seen from the foregoing, according to the present invention, the  
30 fixing unit automatically fixes the waste ink cartridge by using pressurized air, and waste ink contained in the waste ink cartridge can be exhausted by the waste ink exhausting unit having the vacuum pump. In addition, as the waste ink exhausting unit operates, new ink is introduced into the ink refill cylinder so that the waste ink cartridge is filled with new ink. Furthermore, the ink refill cylinder for refilling the waste ink  
35 cartridge with new ink is operated by means of the vacuum pump and pressurized air so

that impurities are not introduced into the waste ink cartridge when refilling the waste ink cartridge with new ink.

## Claims

1. An ink refill apparatus for exhausting waste ink from a waste ink cartridge and for automatically refilling at least one of waste ink cartridges with new ink, the ink refill apparatus comprising:

a body section provided at a front center portion thereof with a receiving part;

a fixing unit for fixing at least one of the ink cartridges installed in front of the receiving part of the body section by using pressurized air supplied thereto from a pressurized air supplying section;

a waste ink exhausting unit installed in the body section so as to exhaust waste ink from the waste ink cartridges;

an ink refill unit for refilling the waste ink cartridges with new ink supplied from an ink reservoir;

a control panel section installed at a front upper portion of the body section and including a power button for turning on/off the ink refill apparatus and a plurality of selection buttons and operation buttons; and

a control unit installed in the body section in order to control the fixing unit, the waste ink exhausting unit, and the ink refill unit as the power button is powered on and having a relay section and a control section for controlling an amount of refill ink.

2. The ink refill apparatus as claimed in claim 1, wherein the fixing unit includes:

a plurality of receiving members provided at a front portion of the body section so as to receive the waste ink cartridge;

at least one jig fixed to a lower portion of at least one of the receiving members, an insertion groove having a sectional shape corresponding to a sectional shape of the waste ink cartridge being formed at an upper portion of the jig in order to receive the waste ink cartridge, a main ink exhaust hole for exhausting waste ink from the waste ink cartridge and a main ink refill hole for refilling the waste ink cartridge with new ink being formed at a bottom portion of the insertion hole, the jig being provided at a front portion thereof with a first solenoid valve for opening/closing the main ink exhaust hole under a control of the control unit; and

at least one pressing member provided at an upper portion of at least one of the receiving members in order to apply pressure to an upper portion of the waste ink cartridge inserted into the insertion groove of the jig, the pressing member being formed

at a front portion thereof with a plurality of pressurized air inlet ports for receiving pressurized air supplied from a pressurized air supplying section through a second solenoid valve, a branch hose and a pressurized air branching section, the pressing member being provided at a lower portion thereof with a pressing piece, which is  
5 movable up and down corresponding to pressurized air introduced into the pressurized air inlet ports, the pressing piece having an ink injection port in order to refill the waste ink cartridge with new ink.

3. The ink refill apparatus as claimed in claim 1, wherein the waste ink  
10 exhausting unit includes:

a vacuum pump installed in the body section and driven by receiving power from a power supply section so as to exhaust waste ink from the waste ink cartridge fixed by the fixing unit;

15 a collecting container connected to the vacuum pump through a vacuum hose so as to collect waste ink therein using waste ink draining hoses, which are connected to a bottom portion of the main ink exhaust hole of the jig or a bottom portion of the receiving member, when waste ink is exhausted from the waste ink cartridge by means of the vacuum pump; and

20 a second solenoid valve installed at a lower portion of the waste ink collecting container and operated under a control of the control unit in order to exhaust waste ink from the waste ink collecting container to a main waste ink reservoir.

4. The ink refill apparatus as claimed in claim 1, wherein the ink refill unit includes:

25 a fixing member vertically installed on the body section so as to refill the waste ink cartridge, in which waste ink is completely exhausted by the waste ink exhausting unit, with new ink;

30 an ink intake section provided at a first side of an upper portion of the fixing member and connected to a waste ink collecting container through an ink intake hose having a second solenoid valve, which is operated under a control of the control unit to allow ink to be introduced into the ink intake section, a plurality of ink intake ports being provided at an upper portion of the ink intake section;

35 an ink refill section fixed to a second side of the upper portion of the fixing member and connected to a branch hose through an ink injection hose having a third solenoid valve, which is operated under a control of the control unit to allow ink to be

introduced into the ink refill section, a plurality of ink refill ports being provided at an upper portion of the ink refill section;

an ink refill cylinder detachably coupled to a coupling member, which is fixedly installed in the receiving part of the body section, first ends of main intake hoses being connected to the ink intake ports, first ends of main refill hoses being connected to the ink refill ports, second ends of main intake hoses and main refill hoses being connected to an upper portion of the coupling member, a connection port being provided at a bottom portion of the ink refill cylinder;

an ink quantity determining member having a cylindrical shape and installed in the ink refill cylinder in such a manner that the ink quantity determining member is moved up and down while maintaining a vacuum state, a magnet being fixedly inserted into an upper portion of the ink quantity determining member;

a pair of proximity sensors provided at upper and lower ends of a supporting bar, a first end of which is fixedly coupled to the coupling member adjacent to the ink refill cylinder in such a manner that an operation of an ink refill solenoid valve and the vacuum pump is controlled by the control unit as the magnet provided in the ink quantity determining member approaches the proximity sensors, one of the proximity sensors being fixedly inserted into a moving member, which is moved along the supporting bar;

an ink feeding hose having a first end connected to the connection port of the ink refill cylinder and a second end connected to a new ink reservoir, an ink feeding valve operated under a control of the control unit being installed in the ink feeding hose, the ink feeding hose having a branch section for feeding new ink into the waste ink cartridge; and

an ink refill hose having a first end connected to the branch section of the ink feeding hose and a second end connected to both main ink refill hole of the jig and injection port formed in a pressing piece, an ink refill valve operated under a control of the control unit being installed in the ink refill hose.

5. The ink refill apparatus as claimed in claim 3, further comprising an on/off switch 204 provided at a first side of the body section in order to operate the vacuum pump, and an ink suction hose provided at a second side of the body section so as to intake and exhaust ink remaining in the jig after the waste ink cartridge is filled with ink by means of the driving pump, a first end of the suction hose being connected to a collecting container, a second end of the suction hose hanging on a hanger section

installed at the second side of the body section.

6. The ink refill apparatus as claimed in claim 4, further comprising a fourth solenoid valve arranged between the ink refill solenoid valve and the ink refill section  
5 so as to exhaust pressurized air under a control of the control unit when the waste ink cartridge is filled with new ink.

7. The ink refill apparatus as claimed in claim 4, wherein each of the ink refill cylinder and the ink quantity determining member is made from transparent acryl.  
10

8. The ink refill apparatus as claimed in claim 4, wherein the moving member includes a moving piece moving up and down and having an H-sectional shape such that the proximity sensor and the supporting bar are fixedly inserted into the moving piece, a fixing pin passing through the moving piece so as to press the supporting bars,  
15 thereby fixing the moving piece, and an indication pin fixedly installed at a front portion of the moving piece so as to indicate an amount of ink contained in the ink refill cylinder.

9. The ink refill apparatus as claimed in claim 4, further comprising a pair of  
20 ink adjustment valves installed in the ink intake hose and the ink injection hose, respectively, so as to prevent bubbles from being formed in ink by adjusting a moving speed of the ink quantity determining member installed in the ink refill cylinder.







FIG. 3

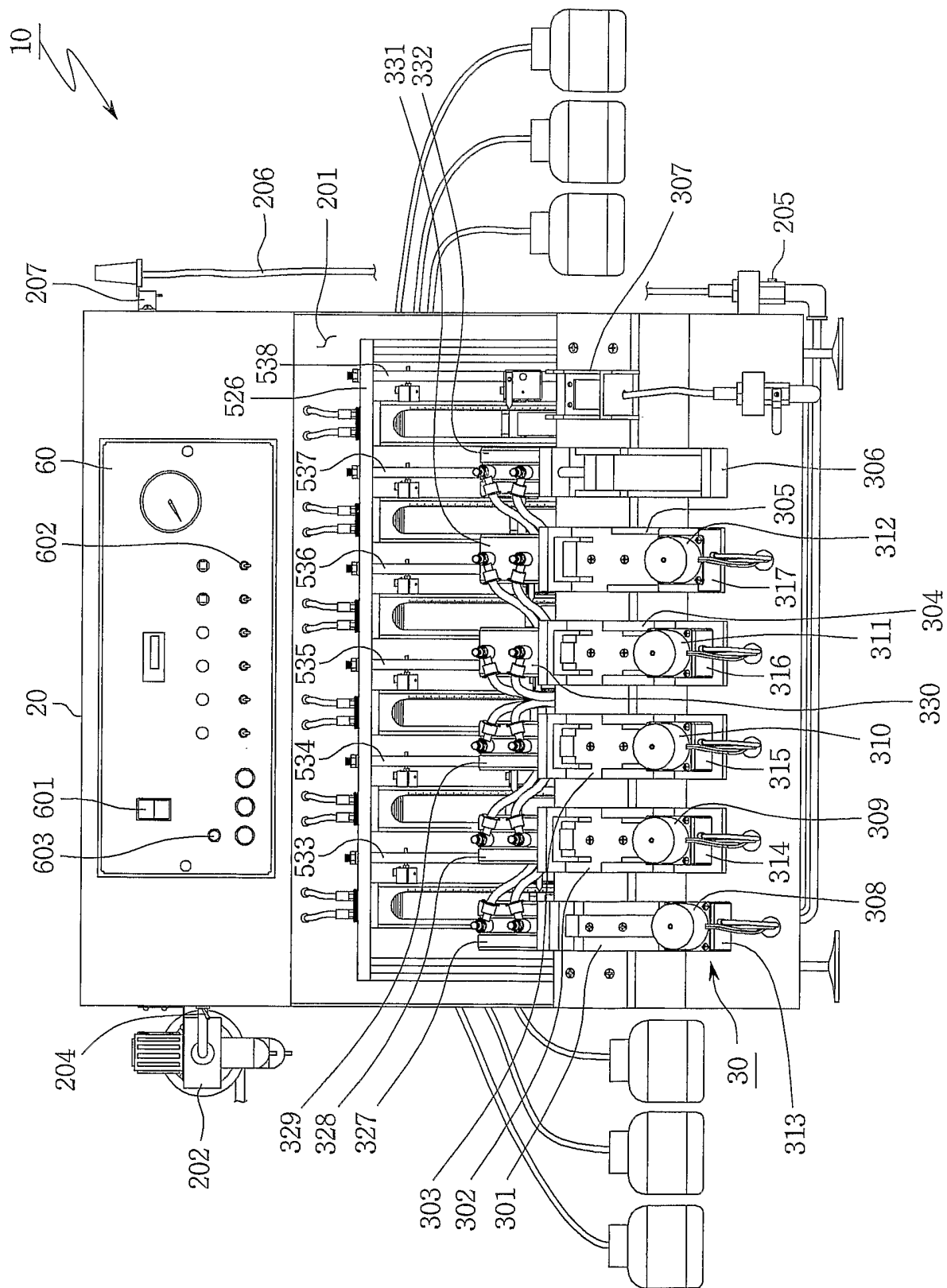


FIG. 4

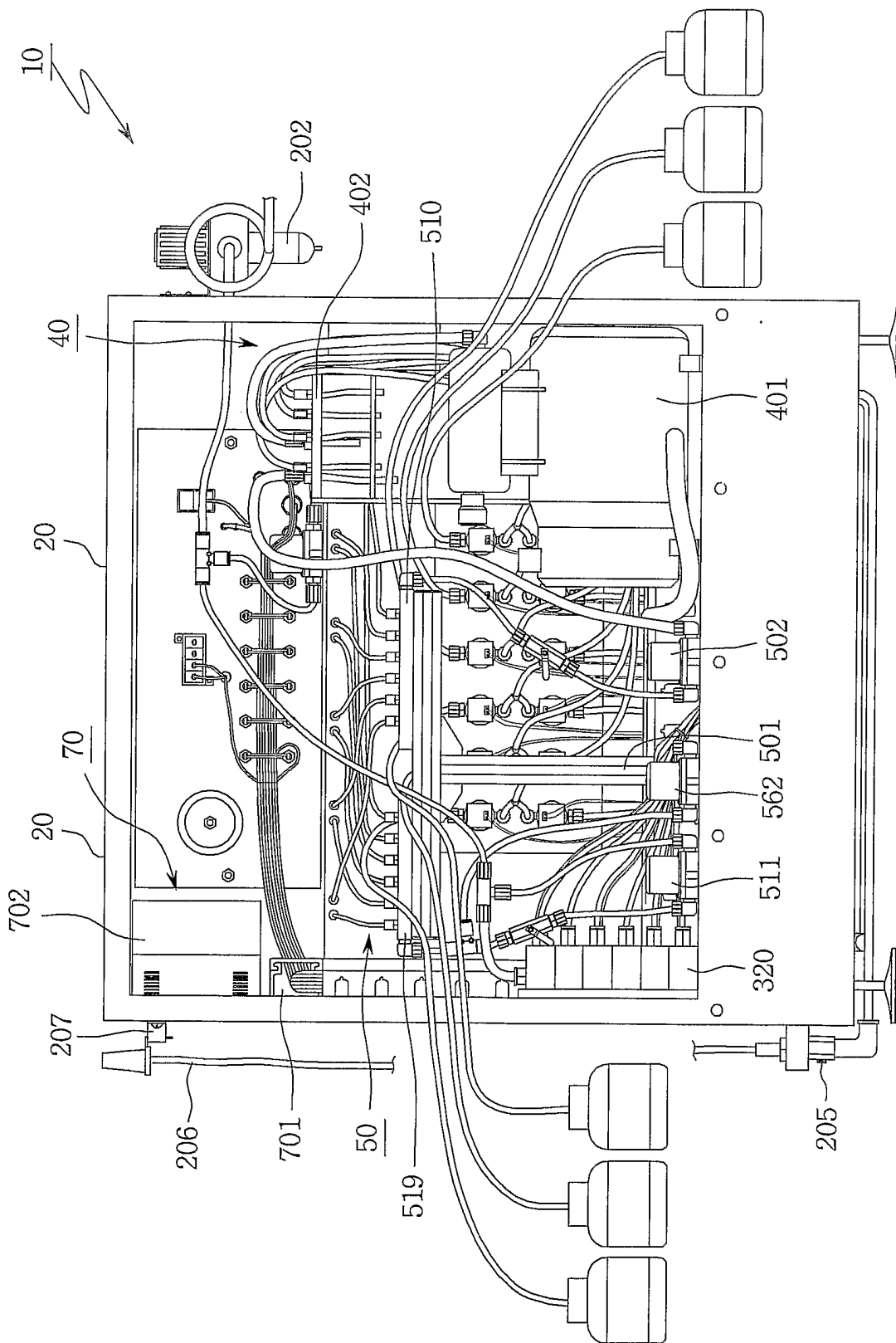


FIG. 5

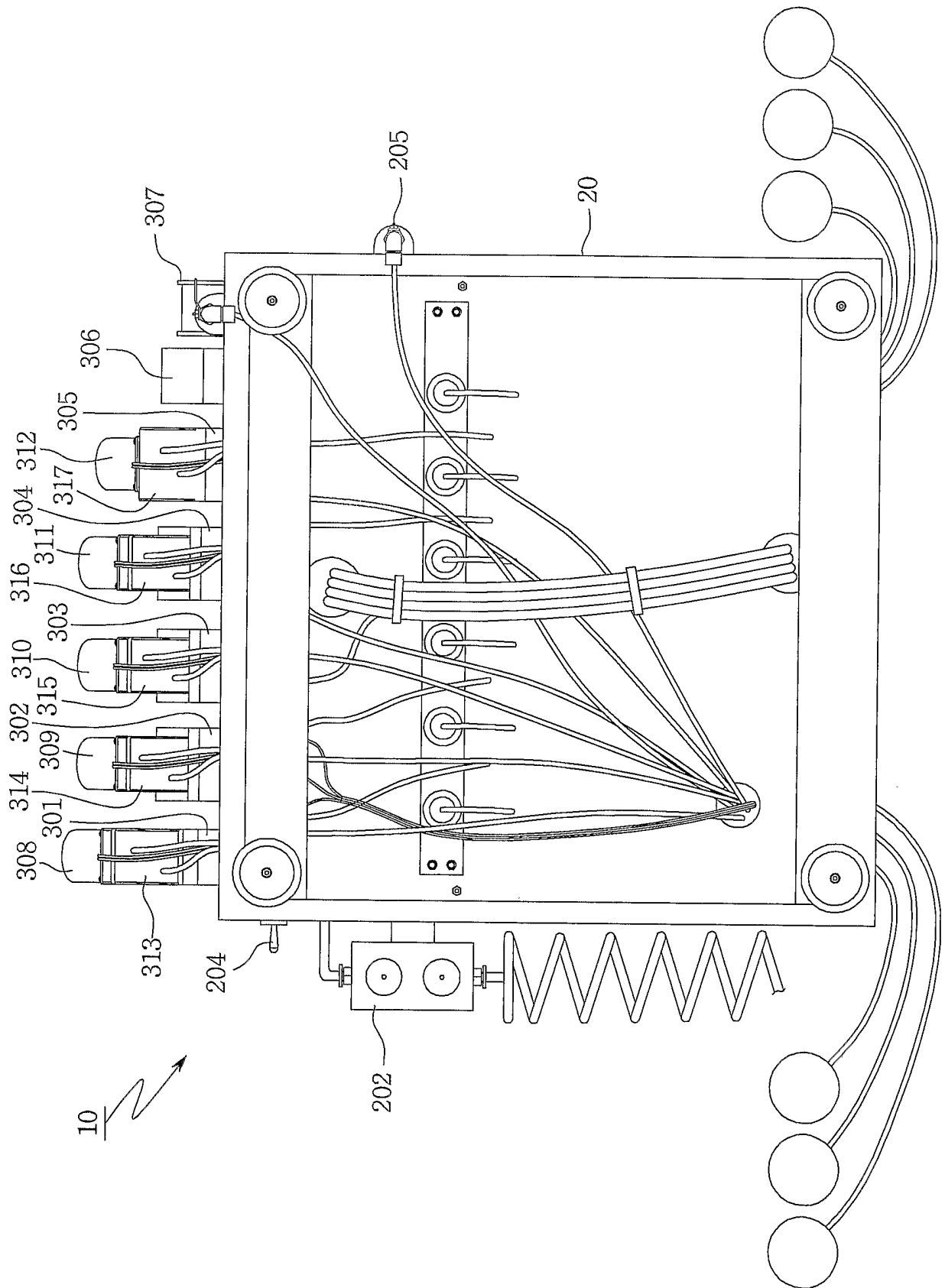


FIG. 6

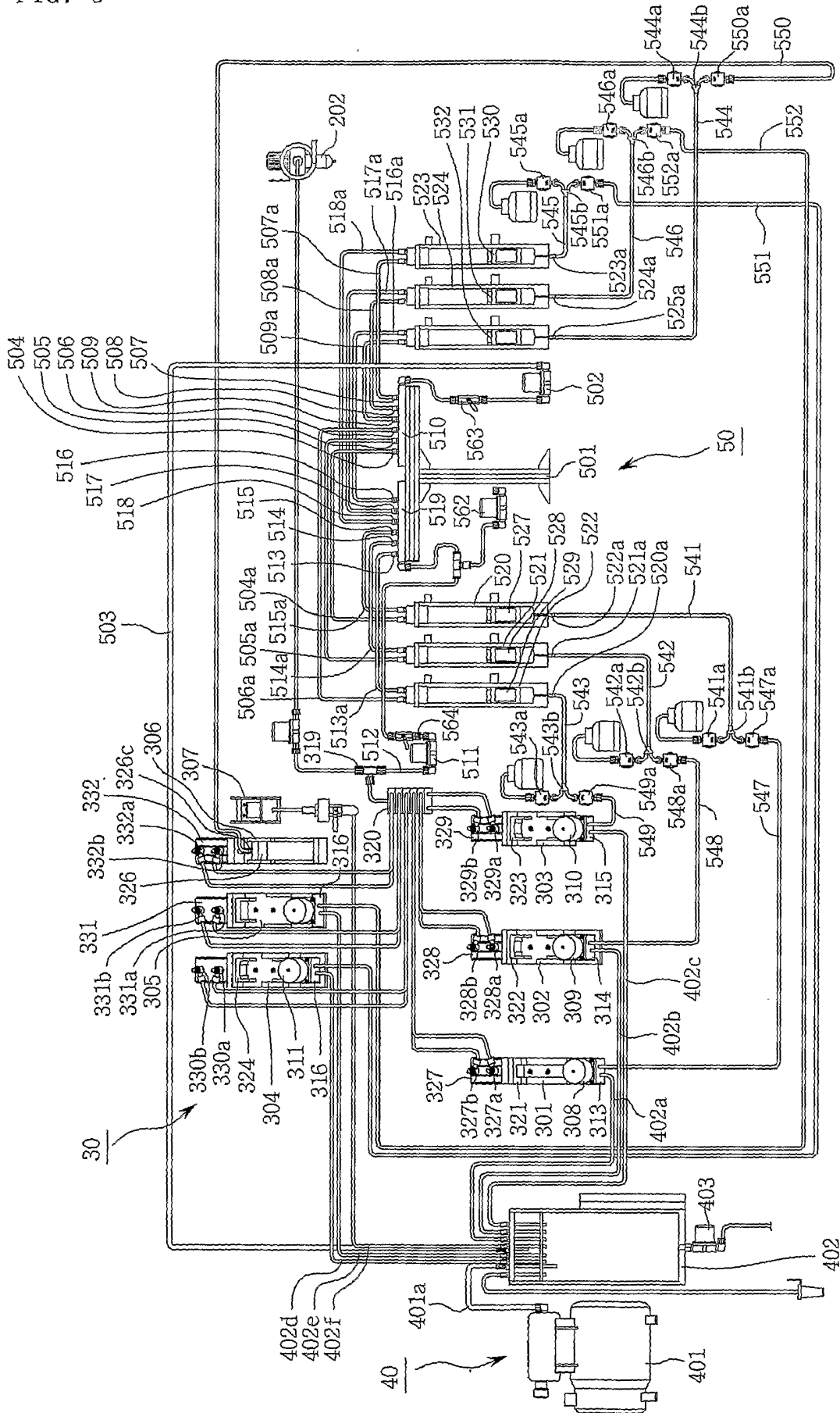
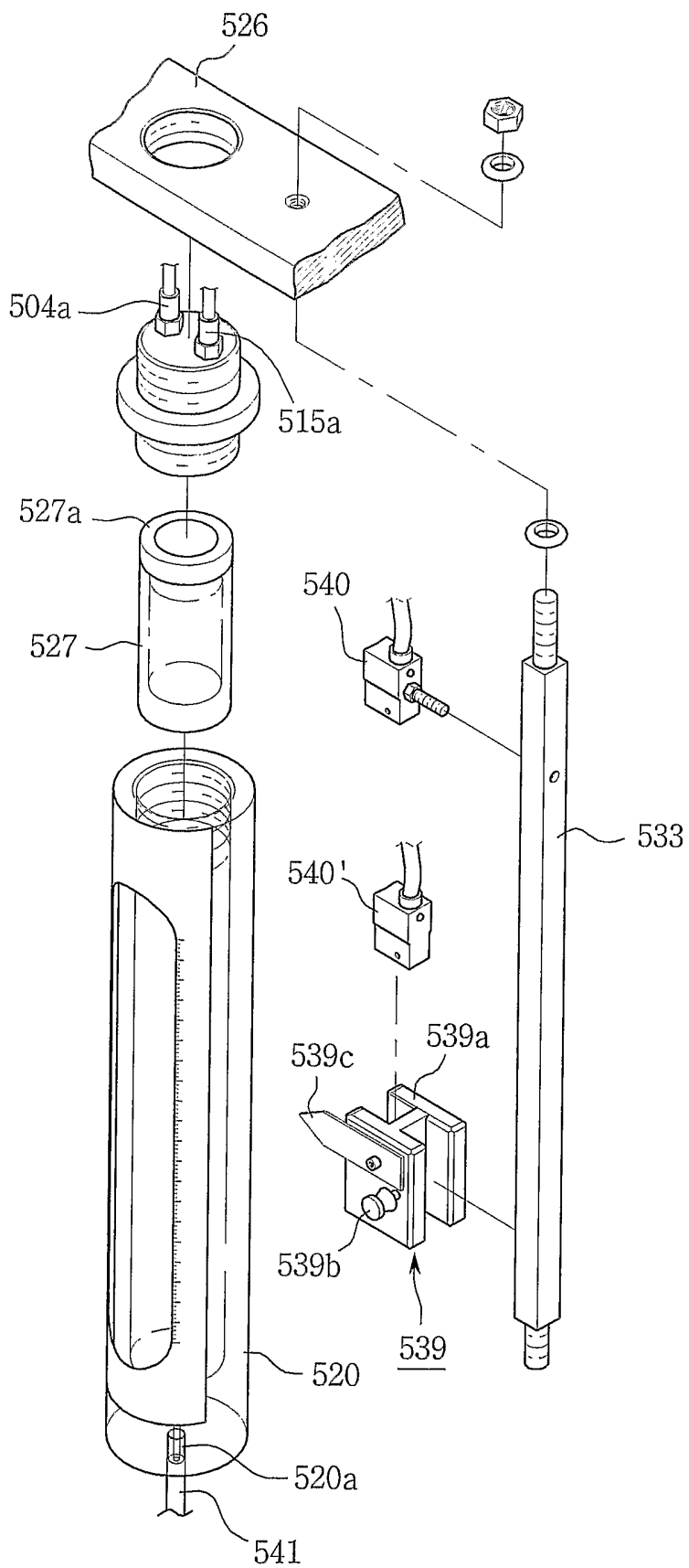


FIG. 7



**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/KR2004/000466

**A. CLASSIFICATION OF SUBJECT MATTER**  
**IPC7 B41J 2/175**  
According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**  
Minimum documentation searched (classification system followed by classification symbols)  
B41J 2/175

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean Patent and application for invention  
Japanese Patent and application for invention

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 20-0294672 Y1(RIO KOREA CORP) 30 OCTOBER 2002 See entire document	1 -9
A	KR 20-0274087 Y1(HWANG HONG SOP) 20 APRIL 2002 See entire document	1 -9
A	JP 07-117236 A (LASERMASTER CORP) 9 MAY 1995 See entire document	1 -9

Further documents are listed in the continuation of Box C.


See patent family annex.

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