



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
20.09.2017 Bulletin 2017/38

(51) Int Cl.:
B22D 17/20 (2006.01) B22D 17/22 (2006.01)

(21) Application number: **16188908.4**

(22) Date of filing: **15.09.2016**

(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:
MA MD

(71) Applicant: **Yu, Chai-Long**
Taichung City 427 (TW)

(72) Inventor: **Yu, Chai-Long**
Taichung City 427 (TW)

(74) Representative: **Zimmermann, Tankred Klaus et al**
Schoppe, Zimmermann, Stöckeler
Zinkler, Schenk & Partner mbB
Patentanwälte
Radtkoferstrasse 2
81373 München (DE)

(30) Priority: **18.03.2016 TW 105108377**

(54) **NOZZLE MECHANISM AND DIE CASTING MACHINE HAVING THE SAME**

(57) A nozzle mechanism (3) includes a main body (4), a plurality of dispensers (5) and a plurality of spray tube units (6). The main body (4) has two receiving chamber units (42), each of which has a plurality of receiving chambers (421) isolated from each other. The dispensers (5) are mounted to the main body (4). Each of the dispensers (5) has a spray opening (526) communicating

with a respective one of the receiving chambers (421). The spray tube units (6) are mounted to the main body (4). Each of the spray tube units (6) includes at least one spray tube (61) communicating with a respective one of the receiving chambers (421). At least one of the spray tube units (6) is operable to spray atomized working liquid via a respective one of the dispensers (5).

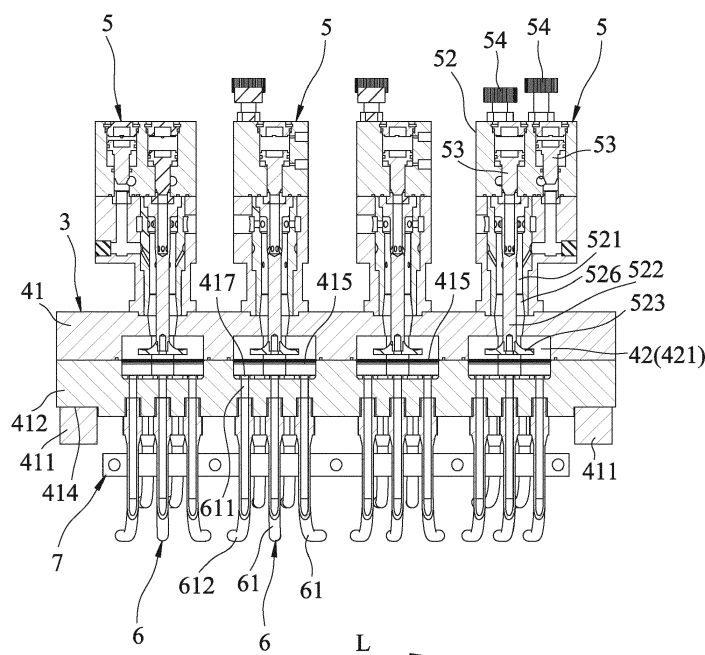


FIG. 7

Description

[0001] The disclosure relates to a nozzle mechanism, and more particularly to a nozzle mechanism of a die casting machine.

[0002] As shown in Figures 1 and 2, a nozzle mechanism 1 of a conventional die casting machine includes a main body 11, four dispensers 12, a cap board 13 and a plurality of nozzles 14. The main body 11 has two elongated tanks 111, and an air tank 112 disposed between the elongated tanks 111. Each of the elongated tanks 111 has two ends, each of which is connected to a respective one of the dispensers 12, so that atomized working liquid can be emptied into the elongated tanks 111 by the dispensers 12. The cap board 13 is disposed over the main body 11 to seal the elongated tanks 111 and the air tank 112. The nozzles 14 are connected to the cap board 13, and communicate with the elongated tanks 111 and the air tank 112, so that the atomized working liquid retained in the elongated tanks 111 and high pressure air retained in the air tank 112 can be sprayed out through the nozzles 14.

[0003] A distal end of each of the nozzles 14 may be bent as needed. Accordingly, when a certain area of a mould is required to be sprayed with the high pressure air, at least one of the nozzles 14 which communicates with the air tank 112 will be bent to a corresponding position, and when another certain area of the mould is required to be sprayed with the atomized working liquid, at least one of the nozzles 14 which communicates with the elongated tanks 111 will be bent to a corresponding position. In such manner, the nozzle mechanism 1 would need to be replaced and recalibrated frequently, resulting in a relatively high-cost and complicated die casting process.

[0004] Therefore, an object of the disclosure is to provide a nozzle mechanism that can alleviate the drawback associated with the abovementioned prior art.

[0005] According to the disclosure, the nozzle mechanism is adapted to be connected to a driving arm mounted to a machine frame of a die casting machine. The machine frame is mounted with a core plate and a cavity plate that are movable relative to each other. The nozzle mechanism includes a main body, a plurality of dispensers and a plurality of spray tube units. The main body has two receiving chamber units formed therein. Each of the receiving chamber units has a plurality of receiving chambers arranged in a longitudinal direction and isolated from each other. The receiving chamber units are formed respectively in opposite end portions of the main body in a transverse direction transverse to the longitudinal direction. The dispensers are mounted to the main body and are adapted for atomizing a working liquid. Each of the dispensers has a spray opening communicating with a respective one of the receiving chambers for permitting passage of the atomized working liquid therethrough into the respective one of said receiving chambers. The spray tube units are mounted to the main

body. Each of the spray tube units includes at least one spray tube communicating with a respective one of the receiving chambers. The nozzle mechanism is adapted to be movable to a location between the core plate and the cavity plate so that at least one of the spray tube units is operable to spray the atomized working liquid to the core plate and the cavity plate via a respective one of the dispensers.

[0006] Another object of the disclosure is to provide a die casting machine that has the abovementioned nozzle mechanism, in which replacement of the abovementioned nozzle mechanism is not required.

[0007] According to the disclosure, the die casting machine includes a machine body and the abovementioned nozzle mechanism. The machine body includes a machine frame, a driving arm mounted to the machine frame, and a core plate and a cavity plate mounted to the machine frame and movable relative to each other. The nozzle mechanism is mounted to the driving arm and is driven movably by the driving arm.

[0008] Other features and advantages of the disclosure will become apparent in the following detailed description of the embodiment with reference to the accompanying drawings, of which:

Figure 1 is a partly exploded perspective view of a nozzle mechanism of a conventional die casting machine;

Figure 2 is a fragmentary side view of the conventional die casting machine;

Figure 3 is a perspective view of an embodiment of a die casting machine according to the disclosure;

Figure 4 is a side view of the embodiment;

Figure 5 is a perspective view of a nozzle mechanism of the embodiment;

Figure 6 is a fragmentary partly exploded perspective of the nozzle mechanism of the embodiment;

Figure 7 is a sectional view taken along line VII-VII in Figure 5;

Figure 8 is a front view of the nozzle mechanism of the embodiment;

Figure 9 is a side view of the nozzle mechanism of the embodiment;

Figure 10 is a perspective view of a dispenser of the nozzle mechanism of the embodiment;

Figure 11 is a sectional view taken along line XI-XI in Figure 10; and

Figure 12 is a sectional view taken along line XII-XII in Figure 10.

[0009] Referring to Figures 3 and 4, the embodiment of a die casting machine includes a machine body 2 and a nozzle mechanism 3.

[0010] The machine body 2 includes a machine frame 21, a driving device 22, a driving arm 23 and a mould 24. The machine frame 21 includes a frame seat 211, two spaced-apart base seats 212, four spaced-apart supporting shafts 213, a sliding seat 214 and a side seat 215.

Each of the base seats 212 has a rectangular cross section, has four engaging segments 216 respectively formed at four corners thereof, and is perpendicular to the frame seat 211. Each of the supporting shafts 213 has two opposite end portions respectively connected to the base seats 212, and each of the end portions of the supporting shafts 213 engages a respective one of the engaging segments 216 of the base seats 212. The sliding seat 214 has a rectangular cross section, and has four sliding segments 217 formed at four corners thereof. Each of the sliding segments 217 is slidably connected to a respective one of the supporting shafts 213. The side seat 215 is mounted to one of the base seats 212.

[0011] The driving device 22 is mounted to the side seat 215 of the machine frame 21, and has a driver 221 and a driving rod 222. The driving rod 222 has two end sections. One of the end sections is connected to the driver 221, and the other one of the end sections is movably mounted to one of the base seats 212.

[0012] The driving arm 23 is mounted to the side seat 215 of the machine frame 21. In this embodiment, the driving arm 23 could be a conventional robotic arm, such as a Cartesian robot, a SCARA robot or an articulated robot.

[0013] The mould 24 is mounted to the machine frame 21, and has a core plate 241 and a cavity plate 242 movable relative to each other. The core plate 241 is mounted to the sliding seat 214, and the cavity plate 242 is mounted to one of the base seats 212 and is opposite to the core plate 241. The cavity plate 242 is connected to the driving rod 222 of the driving device 22, such that the cavity plate 242 is driven by the driving rod 222 so as to be movable relative to the core plate 241.

[0014] As shown in Figures 4 and 5, the nozzle mechanism 3 is connected to the driving arm 23, and is movably driven by the driving arm 23. The nozzle mechanism 3 includes a main body 4, a plurality of dispensers 5, a plurality of spray tube units 6, two supporting frames 7 (see Figure 9), two air tube units 8 and a control unit 9. The nozzle mechanism 3 is movable to a location between the core plate 241 and the cavity plate 242, so that the spray tube units 6 are operable to spray an atomized working liquid to the core plate 241 and the cavity plate 242 via the dispensers 5.

[0015] As shown in Figures 5 to 7, and 9, the main body 4 has a top seat 41, two receiving chamber units 42 formed in the top seat 41, a bottom seat 43 and an air channel 44.

[0016] The top seat 41 has two inverted T-shaped frames 411, two side boards 412, a top board 413 and a top pillar 410. The inverted T-shaped frames 411 are spaced apart from each other in a longitudinal direction (L), and cooperatively define two receiving spaces 414 extending in the longitudinal direction (L) and spaced apart from each other in a transverse direction (T) that is transverse to the longitudinal direction (L). The side boards 412 extend in the longitudinal direction (L) and are respectively disposed in the receiving spaces 414.

The top board 413 is disposed over the side boards 412 and cooperates with the inverted T-shaped frames 411 to securely clamp the side boards 412 therebetween. The top pillar 410 is mounted on the top board 413 and is connected to the driving arm 23.

[0017] The receiving chamber units 42 are formed respectively in opposite end portions of the top seat 41 of the main body 4 in the transverse direction (T). Each of the receiving chamber units 42 has a plurality of receiving chambers 421 arranged in the longitudinal direction (L) and isolated from each other. In this embodiment, each of the receiving chambers 421 has two chamber parts. One of the chamber parts extends through the top board 413 and the other one of the chamber parts is formed in a corresponding one of the side boards 412.

[0018] The top seat 41 further has a plurality of turbulence plates 415, each of which has a plurality of through holes 416 and is disposed in a respective one of the receiving chambers 421. A diameter of each of the through holes 416 is ranged between 0.5 to 5 millimeters. In this embodiment, the diameter of each of the through holes 416 is 2 millimeters.

[0019] As shown in Figures 8 and 9, the bottom seat 43 is disposed under the top seat 41, and has a central pillar 431 mounted between the side boards 412, an air tube frame 432 mounted to a bottom end portion of the central pillar 431 and extending in the longitudinal direction (L), and two extending frames 433 disposed under the air tube frame 432 and spaced apart from each other in the longitudinal direction (L).

[0020] As shown in Figure 9, the air channel 44 is formed in the main body 4, extends downwardly from the top pillar 410 of the top seat 41 through a central portion of the top board 413 and the central pillar 431 of the bottom seat 43, and communicates with an air tank 441 formed inside the air tube frame 432 of the bottom seat 43. The air channel 44 communicates with the air tube units 8 and is adapted for introducing ambient air into the air tube units 8.

[0021] As shown in Figures 7 and 10, the dispensers 5 are mounted to the main body 4, are adapted for atomizing a working liquid, and are respectively connected to the receiving chambers 421. In this embodiment, each of the dispensers 5 is adapted to introduce and atomize two types of the working liquid, so the atomized working liquid can then be delivered into a respective one of the receiving chambers 421. The two types of the working liquid may respectively be a release agent or water. Each of the dispensers 5 has a dispenser body 52, two valve members 53 and two regulating members 54.

[0022] As shown in Figures 7, 11 and 12, the dispenser body 52 has a mixing chamber 521, an extending portion 522, a spreading portion 523, two fluid passages 524, an air passage 525 and two valve chambers 527. The mixing chamber 521 is formed in the dispenser body 52 and has a spray opening 526 communicating with the respective one of the receiving chambers 421 for permitting passage of the atomized working liquid therethrough into the re-

spective one of said receiving chambers 421. The extending portion 522 is disposed in the mixing chamber 521. The spreading portion 523 extends from the extending portion 522 and outwardly of the spray opening 526, has a distal end section being plate-shaped, being spaced apart from the spray opening 526, and being received in the respective one of the receiving chambers 421. In such manner, the atomized working liquid would hit the spreading portion 523 and would be received in the respective one of the receiving chambers 421 to be well-mixed.

[0023] As shown in Figure 11, the fluid passages 524 are formed in the dispenser body 52 and are adapted to be respectively connected to two different types of working liquid source for respectively introducing the two types of the working liquid into the mixing chamber 521. One of the fluid passages 524 is formed in the extending portion 522 and communicates with the mixing chamber 521, so that one of the two types of the working liquid can flow along a first path (I) into the mixing chamber 521. The other one of the fluid passages 524 is formed in the dispenser body 52 and communicates with the mixing chamber 521, so that the other one of the two types of the working liquid can flow along a second path (II) into the mixing chamber 521. The air passage 525 is formed in the dispenser body 52 and communicates with the mixing chamber 521 at a top end portion of the mixing chamber 521 that is opposite to the spray opening 526, so that high pressure air can pass along a third path (III) into the mixing chamber 521. In this embodiment, the working liquid that flows along the first path (I) is a release agent, and the working liquid that flows along the second path (II) is water. In such manner, the high pressure air that passes along the third path (III) can atomize the two types of the working liquid in the mixing chamber 521, and spray the two types of the working liquid outwardly from the spray opening 526. The ratio of the release agent and the water forming the working liquid may be adjusted as required.

[0024] The valve members 53 are respectively disposed in the valve chambers 527 of the dispenser body 52. One of the valve members 53 is operable to open and close a respective one of the fluid passages 524, and the other one of the valve members 53 is operable to open and close the other one of the fluid passages 524. Each of the valve members 53 includes a top cover 531 fixedly mounted to a top end of a respective one of the valve chambers 527, and sealing the respective one of the valve chambers 527, and a movable bottom valve 532. For each of the valve members 53, when air flows into a first space defined between the top cover 531 and the bottom valve 532, the bottom valve 532 would be pushed away from the top cover 531 to close the respective one of the fluid passages 524, and when air flows into a second space defined between the bottom valve 532 and the respective one of the valve chambers 527, the bottom valve 532 would be pushed toward the top cover 531 to open the respective one of the fluid passag-

es 524. It should be noted that, the valve members 53 may be other conventional valve units in other embodiments.

[0025] Each of the regulating members 54 extends threadedly into the dispenser body 52, and can be rotated to block and unblock a respective one of the fluid passages 524 to control an amount of a respective one of the two types of the working liquid input into the respective one of the fluid passages 524.

[0026] As shown in Figures 6 to 8, the spray tube units 6 are mounted to the main body 4. In this embodiment, each of the spray tube units 6 includes seven spray tubes 61 that communicate with a respective one of the receiving chambers 421. Each of the spray tubes 61 has a connecting portion 611 and a bent portion 612 bent outwardly. The connecting portion 611 of each of the spray tubes 61 is mounted to a corresponding one of the side boards 412 of the main body 4, and the bent portions 612 of the spray tubes 61 of each of the spray tube units 6 are spaced apart from each other. The top seat 41 of the main body 4 further has a plurality of protrusions 417 formed in the receiving chambers 421 and corresponding respectively in position to the connecting portions 611 of the spray tubes 61. A height of each of the protrusions 417 is ranged between 0.3 to 3 millimeters. In this embodiment, the height of each of the protrusions 417 is 1 millimeter.

[0027] As shown in Figures 8 and 9, the supporting frames 7 extend in the longitudinal direction (L), are disposed under the top seat 41, are spaced apart from each other in the transverse direction (T), and are disposed for installation of the spray tube units 6 thereto to securely fix the spray tubes 61.

[0028] The air tube units 8 are respectively mounted to two opposite end portions of the bottom seat 43 of the main body 4 in the transverse direction (T), and communicate with the air tank 441. Each of the air tube units 8 includes a plurality of straight air tubes 81 mounted to the air tube frame 432, and a plurality of curved air tubes 82 mounted to the extending frame 433. The straight air tubes 81 and the curved air tubes 82 are adapted for jetting out the air which comes from the air channel 44 to the core plate 241 and the cavity plate 242 once the nozzle mechanism 3 is moved to the location between the core plate 241 and the cavity plate 242.

[0029] As shown in Figure 4, the control unit 9 is connected to the dispensers 5 and is adapted for controlling the operation of each of the dispensers 5. In this embodiment, the operation of each of the dispensers 5 is controlled by introducing air into the first and second spaces defined in the valve chambers 527 to open or close a desired one of the fluid passages 524 (see Figure 11). The valve members 53 are solenoid valves (not shown). In such manner, a user could set the operating parameters in advance, so that desired ones of the dispensers 5 can be actuated in order, and the mould 24 can be consequently sprayed with the water to cool down and then sprayed with the release agent so the user can pro-

ceed to the next die casting process.

[0030] As shown in Figures 4 and 9, during operation, when a die casting process is completed, the core plate 241 and the cavity plate 242 of the mould 24 are separated, and a produced blank (not shown) is then removed from the mould 24. Next, the driving arm 23 is driven by the control unit 9 to drive the nozzle mechanism 3 to the place between the core plate 241 and the cavity plate 242, the air tube units 8 then spray the air to clean burrs clinging to the mould 24. Afterward, the spray tube units 6 are adjusted to a place corresponding in position to a certain area of the mould 24 which is required to be sprayed with the working liquid, and the working liquid is then introduced into a respective one of the dispensers 5 to be atomized. Then, the water is sprayed out to cool down the mould 24, and a release agent liquid (a mixture of the water and the release agent) is then sprayed onto the mould 24. Finally, the air tube units 8 are driven to blow the air to cool down the release agent liquid for the next die casting process.

[0031] If the mould 24 size needs to be changed, the user only needs to adjust the position of the nozzle mechanism 3, so that replacement of the entire nozzle mechanism 3 is not required.

[0032] It should be noted that, each of the dispensers 5 may be configured to atomize and spray out only one type of the working liquid. Since the receiving chambers 421 are isolated, some of the dispensers 5 can be connected to a water source and actuated first, and the remaining of the dispensers 5 can be connected to a release agent source and actuated later. In such manner, the same effectiveness of the die casting process can be achieved.

[0033] With the abovementioned configuration, the die casting machine of the disclosure has the following advantages:

1. The nozzle mechanism 3 can be adjusted for various working areas of moulds with different sizes, and the replacement thereof is not required, so high costs associated with die casting process can be avoided.
2. With the spaced-apart bent portions 612 of the spray tube units 6, the working liquid can be evenly sprayed out, and a spraying efficiency is increased.
3. Since different types of the working liquid can be selected to be sprayed out from the nozzle mechanism 3, time for the mould 24 to cool down and the amount of release agent used can be reduced.
4. The same effectiveness of the die casting process can be assured when each of the dispensers 5 only atomizes and sprays out one type of the working liquid.
5. The atomized working liquid can be well-mixed after hitting the spreading portions 523 of the dispensers 5 and being received in the receiving chambers 421.
6. The turbulence plates 415 can allow the atomized

working liquid that is received in the receiving chambers 421 to be further mixed. In addition, the turbulence plates 415 can allow the atomized working liquid to be evenly received in the receiving chambers 421, so that the spray tubes 61 may have equal flow rates.

7. With the design of the protrusions 417, turbulent flows may be created in the receiving chambers 421 near the spray tubes 61. In such manner, the atomized working liquid can be further mixed.

8. The nozzle mechanism 3 can be moved by the driving arm 23 relative to the mould 24 to thoroughly clean the mould 24.

9. By virtue of the straight air tubes 81 and the curved air tubes 82, the air tube unit 8 can spray in different angles, thereby increasing the burr-cleaning efficiency.

[0034] In the description above, for the purposes of explanation, numerous specific details have been set forth in order to provide a thorough understanding of the embodiment. It will be apparent, however, to one skilled in the art, that one or more other embodiments may be practiced without some of these specific details. It should also be appreciated that reference throughout this specification to "one embodiment," "an embodiment," an embodiment with an indication of an ordinal number and so forth means that a particular feature, structure, or characteristic may be included in the practice of the disclosure. It should be further appreciated that in the description, various features are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of various inventive aspects.

Claims

1. A nozzle mechanism (3) adapted to be connected to a driving arm (23) that is mounted to a machine frame (21) of a die casting machine, the machine frame (21) being mounted with a core plate (241) and a cavity plate (242) that are movable relative to each other, said nozzle mechanism (3) **characterized by:**

a main body (4) having two receiving chamber units (42) that are formed therein, each of said receiving chamber units (42) having a plurality of receiving chambers (421) that are arranged in a longitudinal direction (L) and that are isolated from each other, said receiving chamber units (42) being formed respectively in opposite end portions of said main body (4) in a transverse direction (T) that is transverse to the longitudinal direction (L);

a plurality of dispensers (5) mounted to said main body (4) and adapted for atomizing a work-

- ing liquid, each of said dispensers (5) having a spray opening (526) that communicates with a respective one of said receiving chambers (421) for permitting passage of the atomized working liquid therethrough into the respective one of said receiving chambers(421); and a plurality of spray tube units (6) mounted to said mainbody (4), each of said spray tube units (6) including at least one spray tube (61) that communicates with a respective one of said receiving chambers(421); wherein said nozzle mechanism (3) is adapted to be movable to a location between the core plate (241) and the cavity plate (242) so that at least one of said spray tube units (6) is operable to spray the atomized working liquid to the core plate (241) and the cavity plate (242) via a respective one of said dispensers (5).
2. The nozzle mechanism as claimed in Claim 1, further **characterized by** a control unit (9) connected to said dispensers (5) and adapted for controlling the operation of each of said dispensers (5).
 3. The nozzle mechanism as claimed in Claim 1, **characterized in that** each of said spray tube units (6) includes a plurality of said spray tubes (61), each of which has a bent portion (612) bent outwardly, said bent portions (612) of said spray tubes (61) of each of said spray tube units (6) being spaced apart from each other.
 4. The nozzle mechanism as claimed in any one of Claims 1 to 3, **characterized in that** each of said dispensers (5) has two fluid passages (524) that are adapted to be respectively connected to two different types of working liquid source, and two valve members (53), one of said valve members (53) being operable to open and close a respective one of said fluid passages (524), the other one of said valve members (53) being operable to open and close the other one of said fluid passages (524).
 5. The nozzle mechanism as claimed in Claim 4, further **characterized in that** each of said dispensers (5) has an extending portion (522), and a spreading portion (523) extending from said extending portion (522) and outwardly of said spray opening (526), having a distal end section that is plate-shaped, and received in the respective one of said receiving chambers (421) of said receiving chamber units (42).
 6. The nozzle mechanism as claimed in any one of Claims 1 to 3, further **characterized by** two air tube units (8) respectively mounted to said two opposite end portions of said main body (4) in the transverse direction (T) and adapted for jetting out air to the core plate (241) and the cavity plate (242) when said nozzle mechanism (3) is moved to the location between the core plate (241) and the cavity plate (242).
 7. The nozzle mechanism as claimed in Claim 6, **characterized in that** said main body (4) further has a top seat (41) formed with said receiving chamber units (42), and a bottom seat (43) disposed under said top seat (41) and mounted with said air tube units (8).
 8. The nozzle mechanism as claimed in Claim 7, further **characterized in that** said top seat (41) has:
 - two inverted T-shaped frames (411) spaced apart from each other in the longitudinal direction (L), and cooperatively defining two receiving spaces (414) that extend in the longitudinal direction (L) and spaced apart from each other in the transverse direction (T);
 - two side boards (412) extending in the longitudinal direction (L) and respectively disposed in said receiving spaces (414);
 - a top board (413) disposed over said side boards (412) and cooperating with said inverted T-shaped frames (411) to securely clamp said side boards (412) therebetween; and
 - a top pillar (410) mounted on said top board (413) and connected to the driving arm (23).
 9. The nozzle mechanism as claimed in Claim 7, further **characterized in that** said bottom seat (43) has an air tube frame (432), and an extending frame (433) disposed under said air tube frame (432), each of said air tube units (8) including a plurality of straight air tubes (81) that are mounted to said air tube frame (432), and a plurality of curved air tubes (82) that are mounted to said extending frame (433).
 10. The nozzle mechanism as claimed in Claim 9, further **characterized in that** said main body (4) further has an air channel (44) formed therein, extending from said top seat (41) to said bottom seat (43), communicating with said air tube units (8), and adapted for introducing ambient air into said air tube units (8).
 11. The nozzle mechanism as claimed in Claim 1, further **characterized by** two supporting frames (7) extending in the longitudinal direction (L), and disposed for installation of said spray tube units (6) thereto to securely fix said spray tubes (61).
 12. The nozzle mechanism as claimed in any one of Claims 1 to 3, **characterized in that** said main body (4) further has a plurality of turbulence plates (415), each of which has a plurality of through holes (416) and is disposed in a respective one of said receiving chambers (421).

13. The nozzle mechanism as claimed in any one of Claims 1 to 3, **characterized in that** said main body (4) further has a plurality of protrusions (417) formed in said receiving chambers (421) and corresponding respectively in position to said spray tubes (61). 5

14. A die casting machine **characterized by:**

a machine body (2) including a machine frame (21), a driving arm (23) that is mounted to said machine frame (21), and a core plate (241) and a cavity plate (242) that are mounted to said machine frame (21) and that are movable relative to each other; and 10
a nozzle mechanism (3) as claimed in Claim 1 15
mounted to said driving arm (23) and being driven movably by said driving arm (23).

20

25

30

35

40

45

50

55

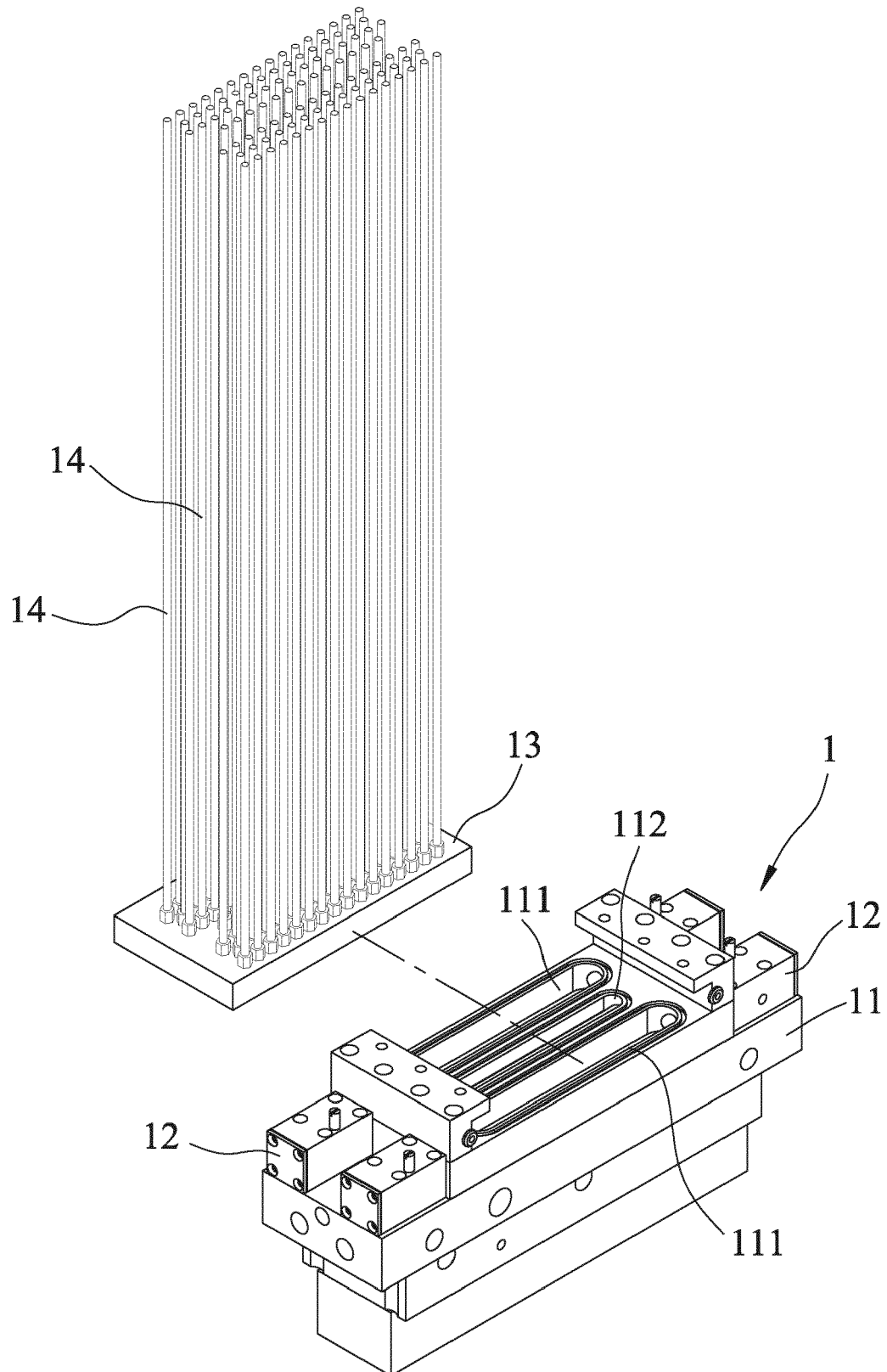


FIG.1

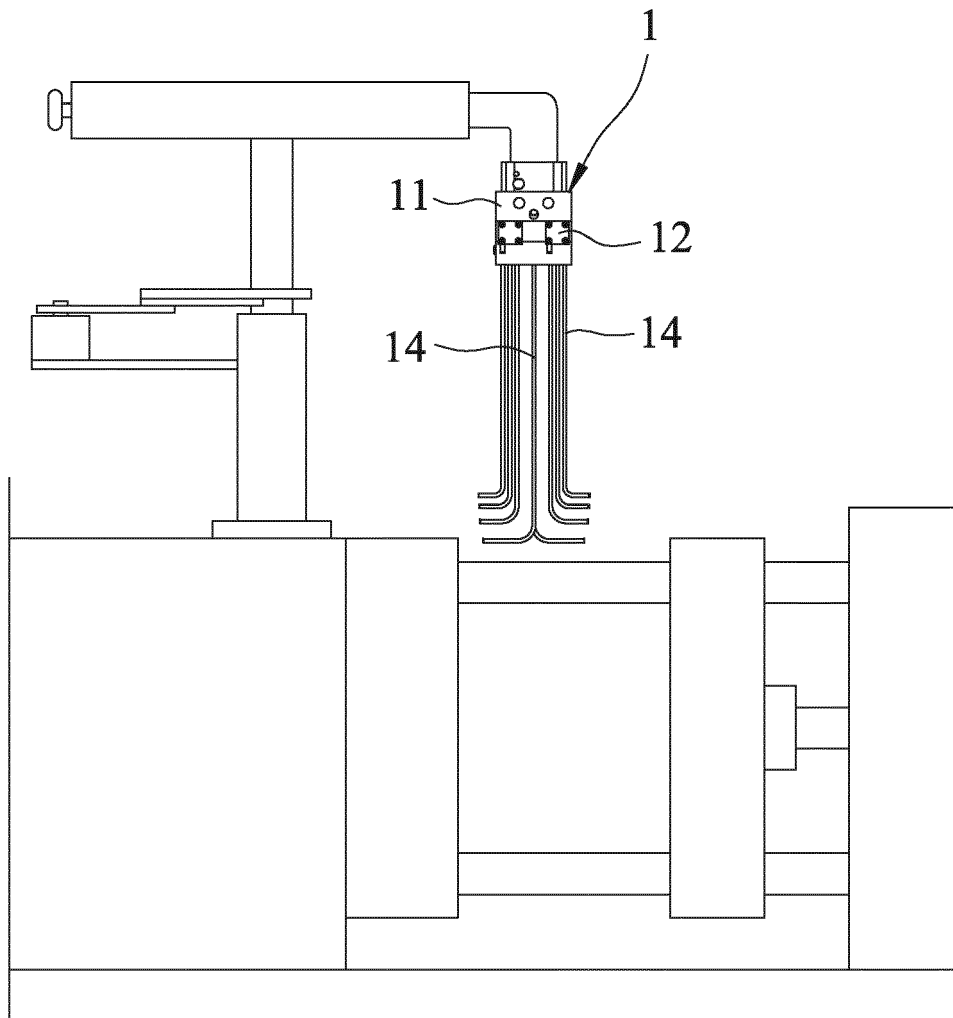


FIG.2

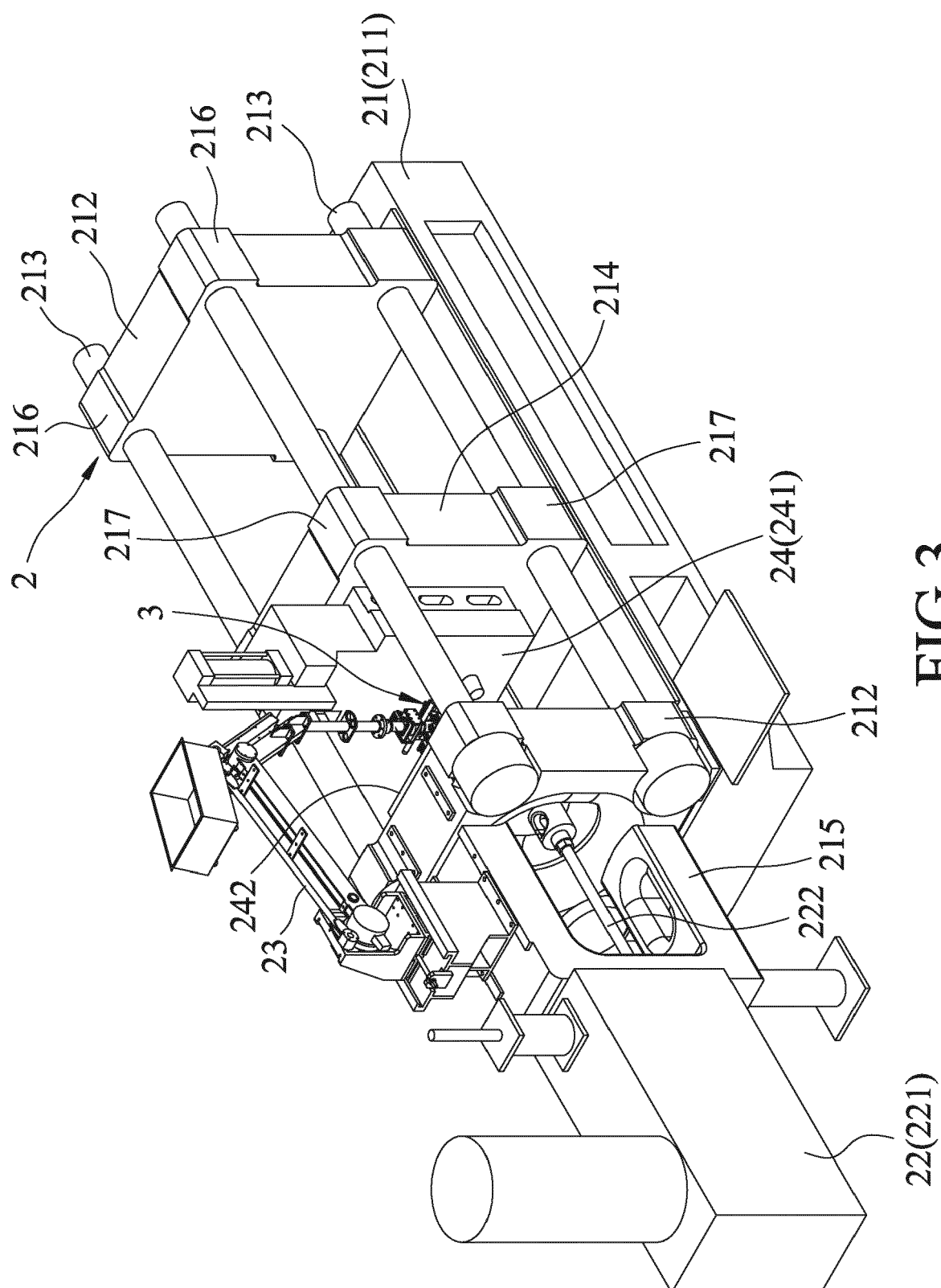


FIG. 3

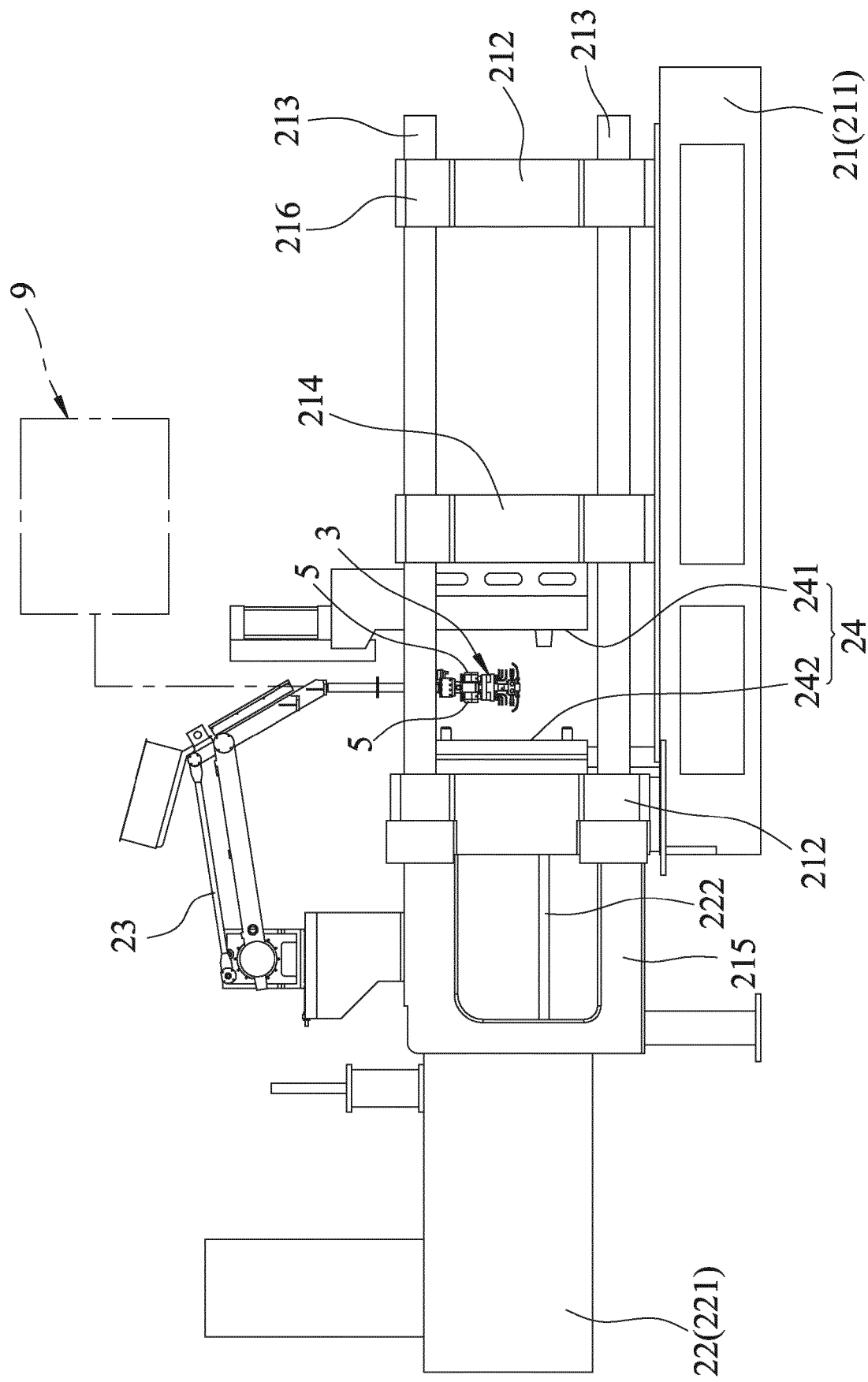


FIG. 4

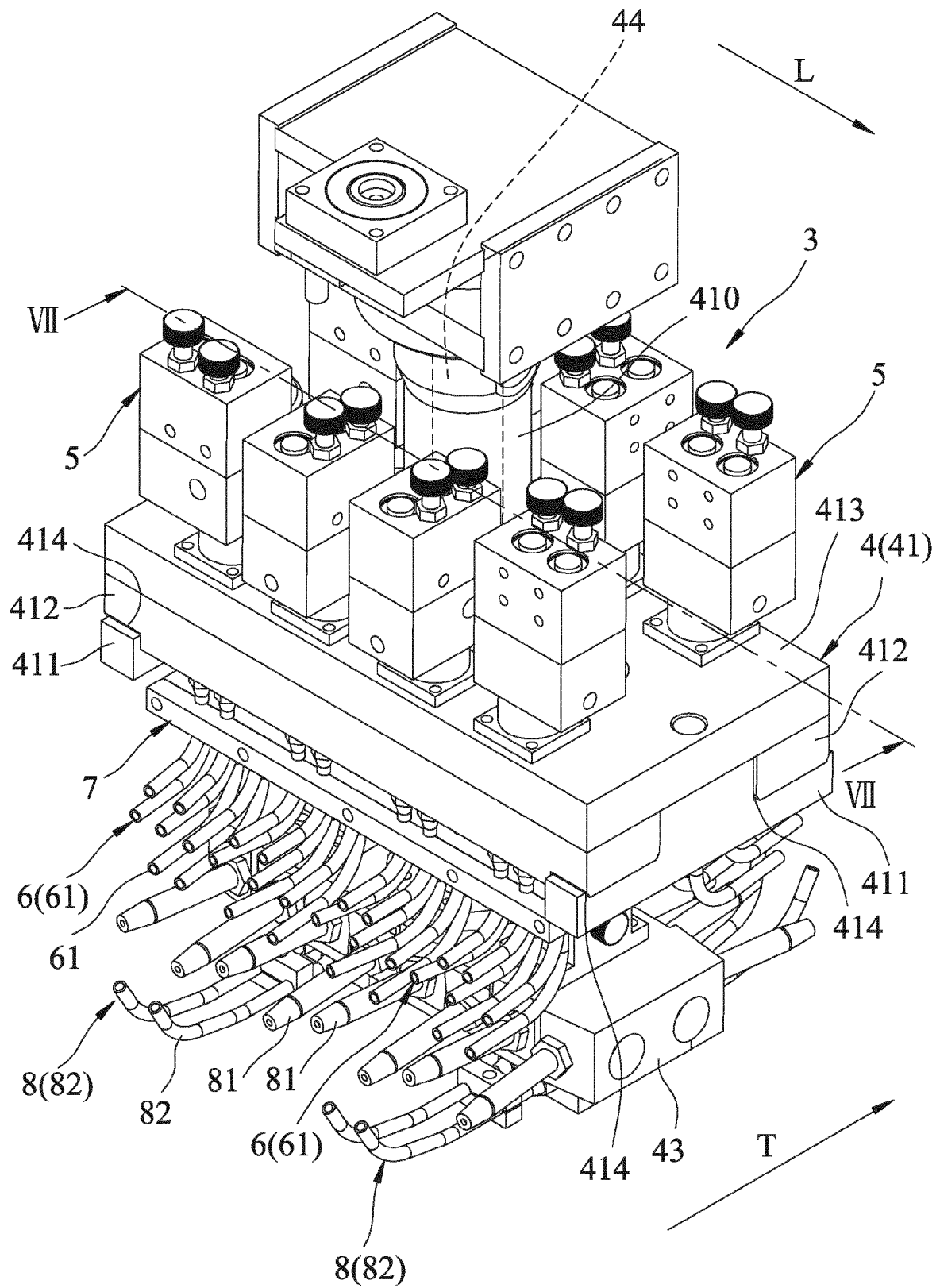


FIG.5

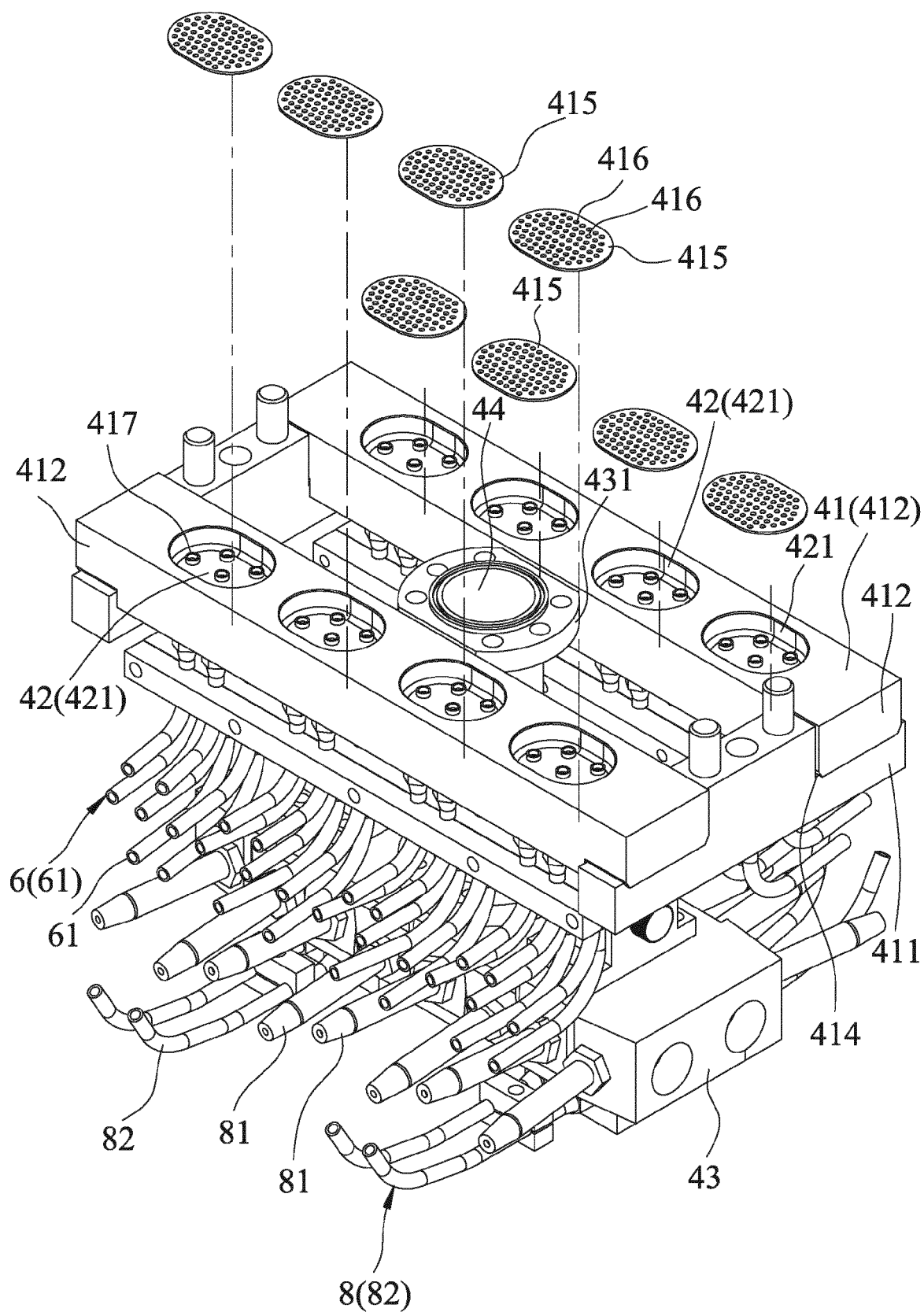


FIG.6

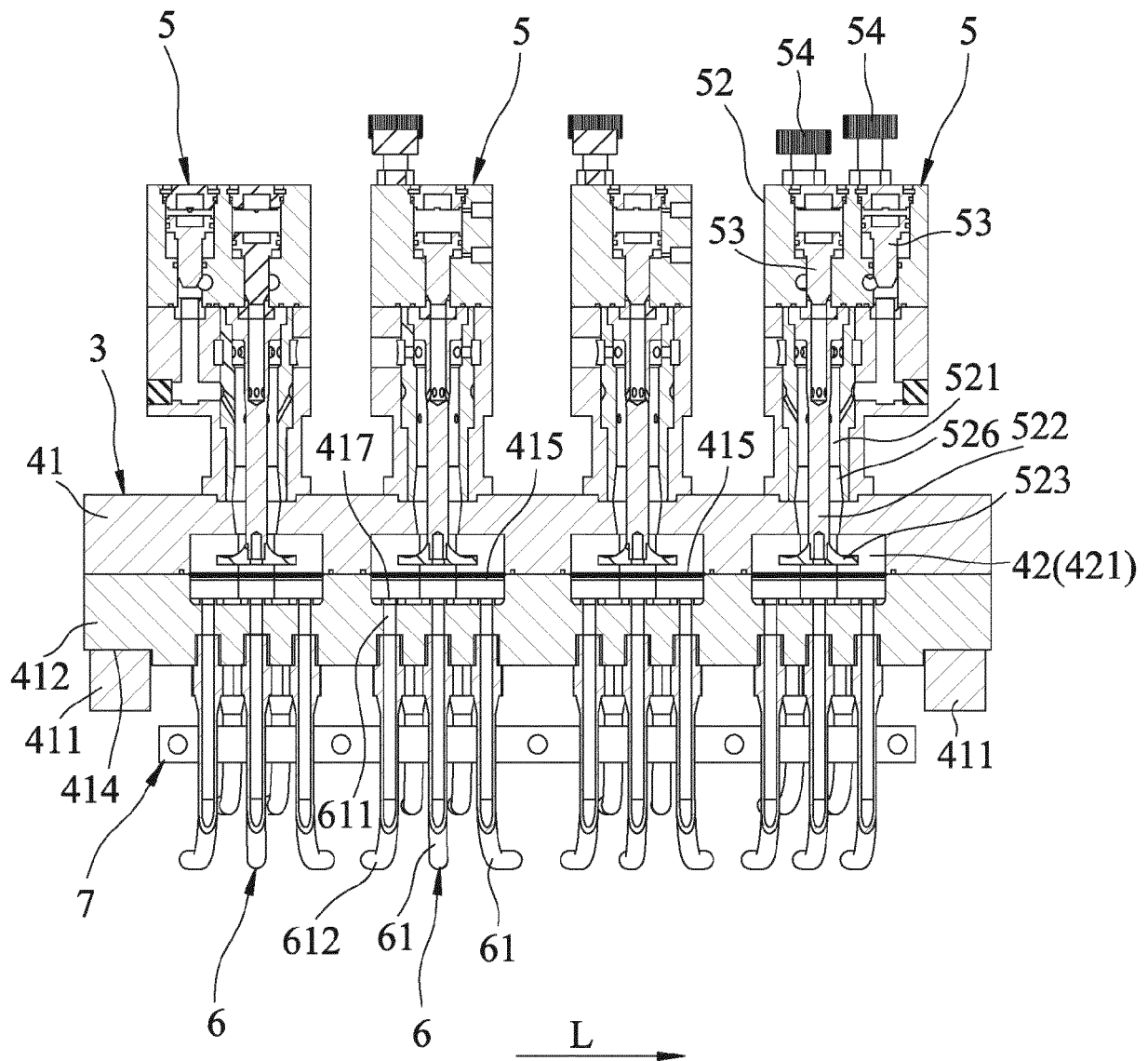


FIG. 7

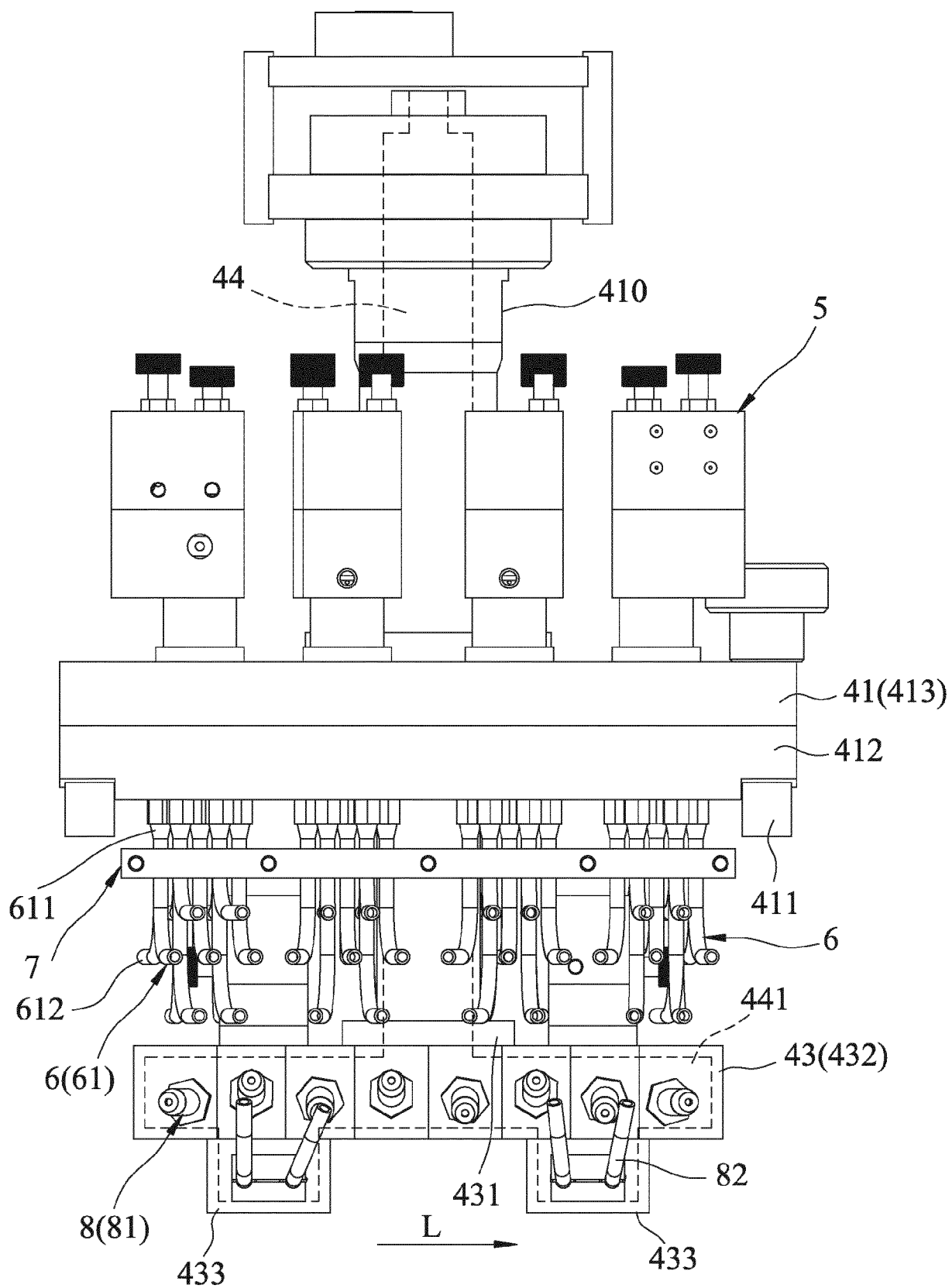


FIG.8

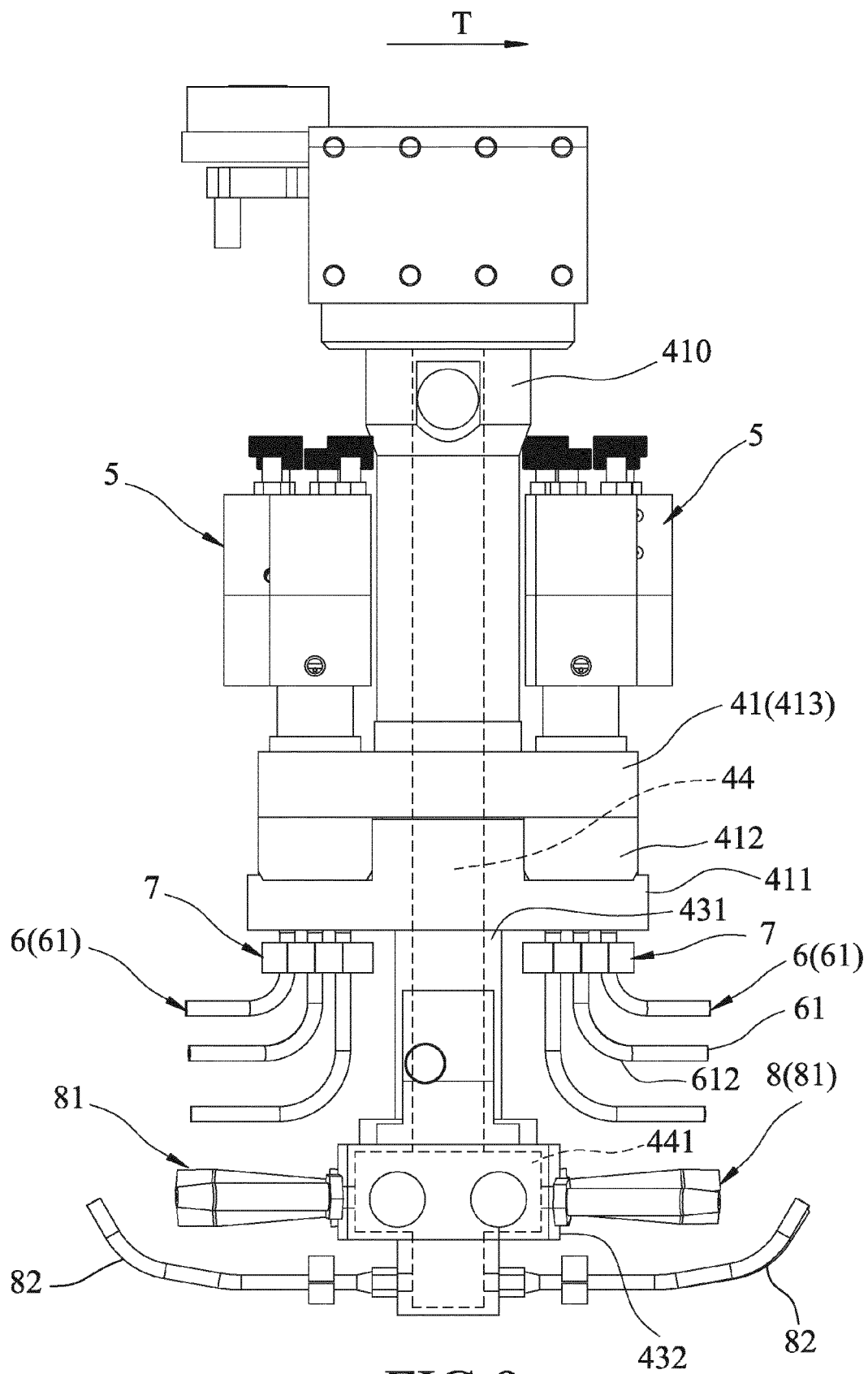


FIG.9

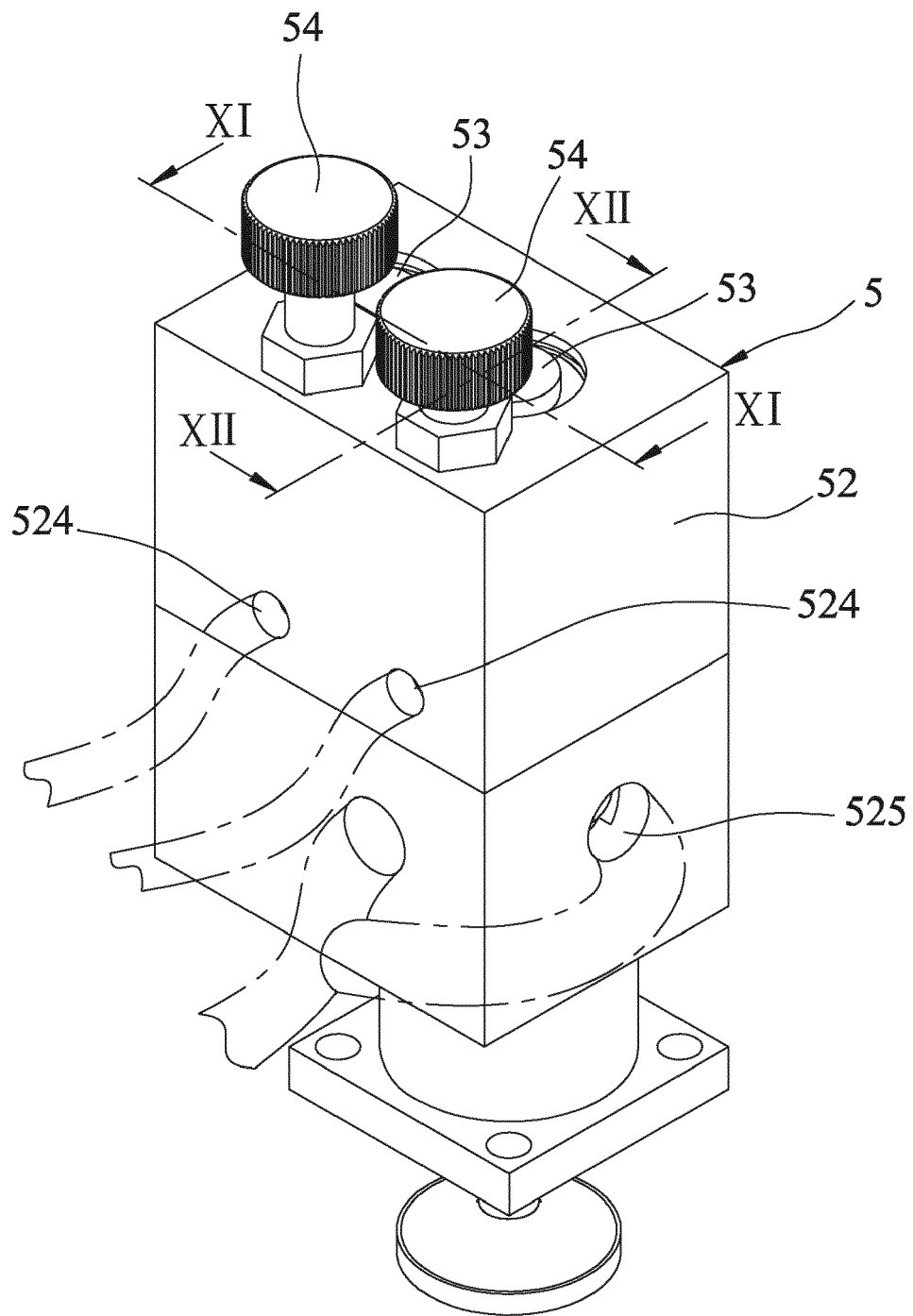


FIG.10

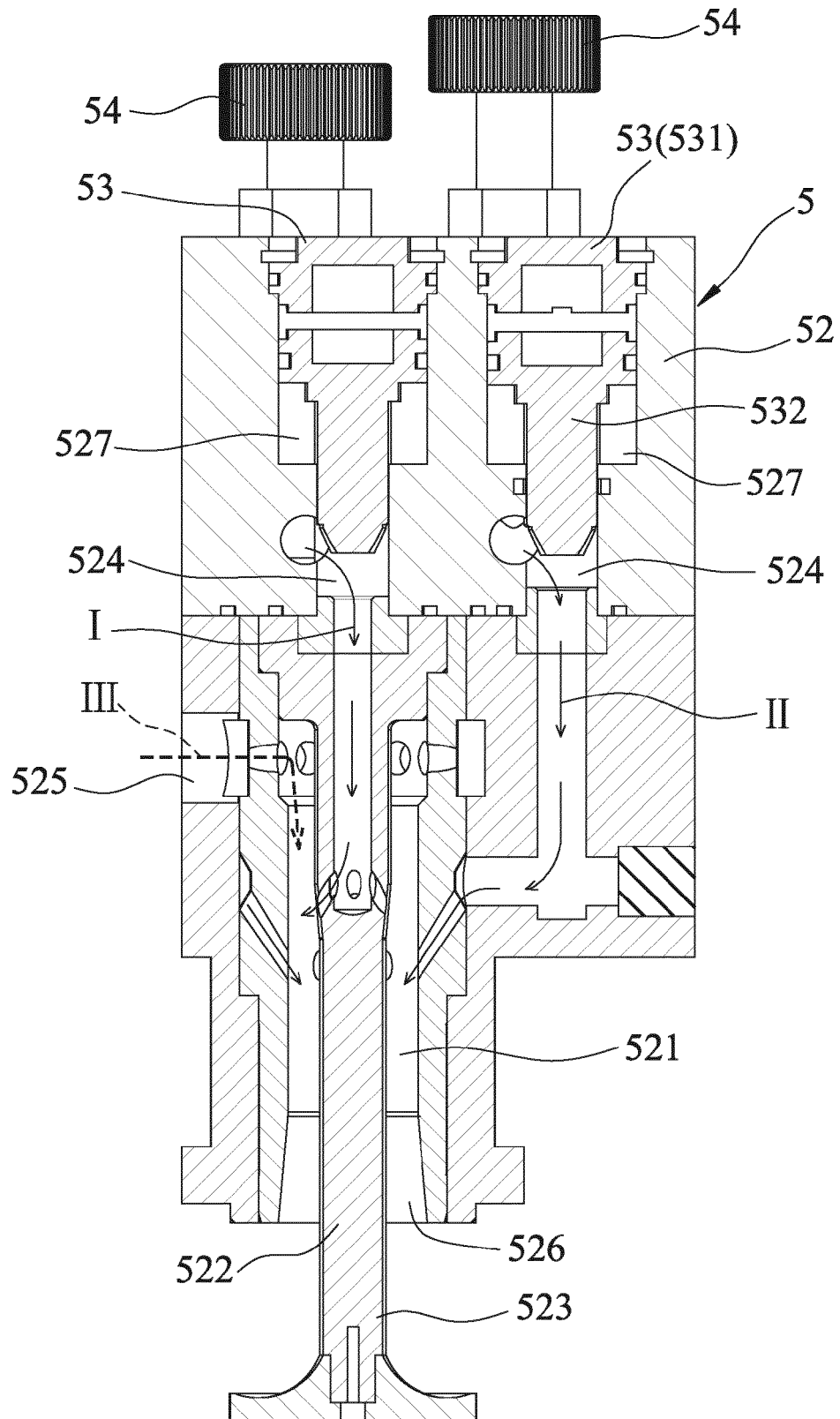


FIG.11

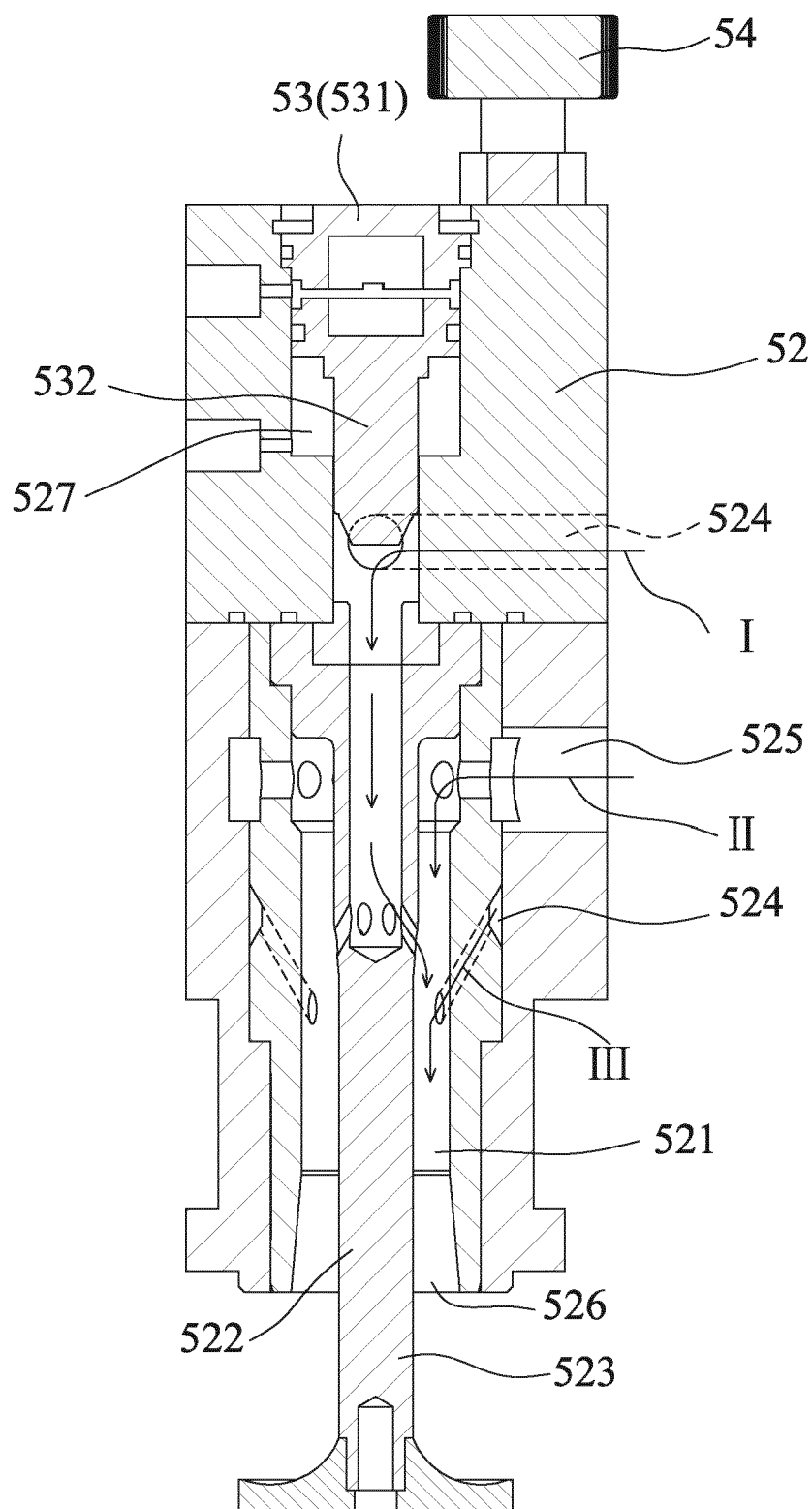


FIG.12



EUROPEAN SEARCH REPORT

Application Number
EP 16 18 8908

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	US 4 739 933 A (HANANO TAKASHI [JP]) 26 April 1988 (1988-04-26)	1-3,6,7, 11-14	INV. B22D17/20
A	* column 2, line 63 - column 3, line 3; claim 1; figures 1-7 * * column 3, line 64 - column 4, line 15 * * column 5, lines 37-41, 50-52 *	4,5,8-10	B22D17/22
A	US 6 830 200 B1 (JORDAN TODD [US] ET AL) 14 December 2004 (2004-12-14) * the whole document *	1-14	
A	JP 5 435924 B2 (TOYO MACHINERY & METAL) 5 March 2014 (2014-03-05) * the whole document *	1-14	
A	JP 2014 226717 A (TOSHIBA MACHINE CO LTD) 8 December 2014 (2014-12-08) * paragraphs [0025] - [0032]; claims 1,2; figures 1-6 *	1-14	
A	JP 2010 110769 A (SAN MECHANIC KK) 20 May 2010 (2010-05-20) * claims 1-3; figures 2,4-8 *	1-14	TECHNICAL FIELDS SEARCHED (IPC) B22D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 July 2017	Examiner Nikolaou, Ioannis
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

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

EP 16 18 8908

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.

25-07-2017

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4739933 A	26-04-1988	JP S63123549 A US 4739933 A	27-05-1988 26-04-1988
US 6830200 B1	14-12-2004	US 6830200 B1 US 6857463 B1	14-12-2004 22-02-2005
JP 5435924 B2	05-03-2014	JP S5435924 B2 JP S51103420 A	06-11-1979 13-09-1976
JP 2014226717 A	08-12-2014	JP 6131106 B2 JP 2014226717 A	17-05-2017 08-12-2014
JP 2010110769 A	20-05-2010	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82