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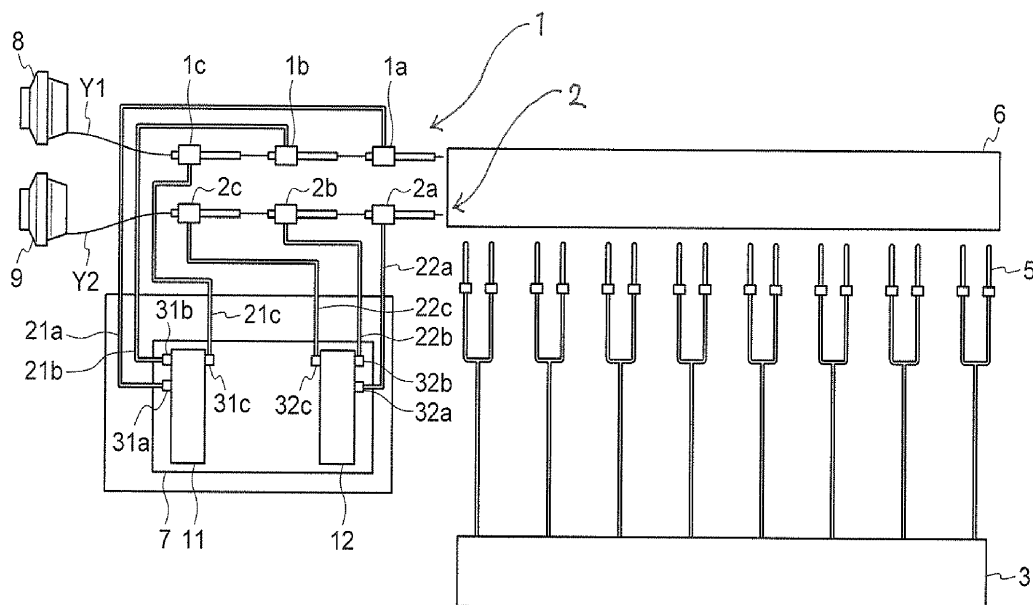
(54) **MULTI-COLOR AIR JET LOOM**

(57) A multi-color airjet loom (100, 200, 300) includes weft insertion systems (1, 2) each including at least one main nozzle (1a, 1b, 1c, 2a, 2b, 2c); main air tanks (11, 12, 13, 14) provided for the weft insertion systems (1, 2) and connected to the main nozzles (1a, 1b, 1c, 2a, 2b, 2c) via pipes (21a, 21b, 21c, 22a, 22b, 22c); and main

valves (31a, 31b, 31c, 32a, 32b, 32c, 33a, 33b, 33c, 34a, 34b, 34c) directly connected to the main air tanks (11, 12, 13, 14) and connected to the pipes (21a, 21b, 21c, 22a, 22b, 22c). At least two of the main air tanks (11, 12, 13, 14) are disposed so as to be stacked in a width direction (D) of the multi-color air jet loom (100, 200, 300).

FIG. 1

100



Description

BACKGROUND ART

[0001] The present disclosure relates to a multi-color air jet loom having a plurality of weft insertion systems.

[0002] According to a multi-color air jet loom disclosed in Japanese Patent Application Publication No. 2004-169266, a plurality of spaces each having a box shape with an opening is provided at a base portion of the multi-color air jet loom to thereby ensuring spaces for a plurality of air tanks corresponding to the number of colors of weft yarns. As shown in FIGS. 3 to 6 of the Publication, the spaces for the air tanks are arranged in a stacking manner in the vertical direction.

[0003] Further, a multi-color air jet loom disclosed in Japanese Patent Application Publication (translation of PCT application) No. 2002-517631 includes a compressed-air container which corresponds to a single air tank, and a plurality of air supply blocks are mounted to the air tank. The air supply blocks are connected to their corresponding main nozzles for weft insertion that are provided for the respective colors of the weft yarns. Each air supply block includes a throttle valve.

[0004] In the multi-color air jet loom of Japanese Patent Application Publication No. 2004-169266, while the air tanks are arranged or stacked in the vertical direction, the main nozzles are all disposed at the same height. This configuration requires different lengths of pipes to connect the air tanks and the main nozzles. The differences in the length of the pipes have been a problem, since the pressure loss that occurs in a pipe is generally greater as the pipe is longer.

[0005] Further, as is the case of the multi-color air jet loom of the Publication No. 2002-517631, there has been a problem that when the plurality of main nozzles is connected to the single air tank via throttle valves, it is difficult to accurately control air pressure for each of the main nozzles.

[0006] The present disclosure has been made in view of the above problems, and is directed to providing a multi-color air jet loom that reduces variations in the pressure loss of pipes connecting main nozzles and main air tanks and that achieves easy control of air pressure for each of main nozzles.

SUMMARY

[0007] In accordance with an aspect of the present disclosure, there is provided a multi-color air jet loom that includes a plurality of weft insertion systems each including at least one main nozzle, a plurality of main air tanks that are provided for the corresponding weft insertion systems and connected to the main nozzles via corresponding pipes, and a plurality of main valves that are directly connected to the corresponding main air tanks and connected to the corresponding pipes to adjust injection timings of air injected from the main nozzles. At least two of

the main air tanks are disposed so as to be stacked in a width direction of the multi-color air jet loom.

[0008] Other aspects and advantages of the disclosure will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The disclosure, together with objects and advantages thereof, may best be understood by reference to the following description of the embodiments together with the accompanying drawings in which:

FIG. 1 is a schematic view of a multi-color air jet loom according to a first embodiment of the present disclosure;

FIG. 2 is a perspective view of the multi-color air jet loom of FIG. 1, showing positions of main air tanks and main valves;

FIG. 3 is a top view schematically showing positions of the main air tanks and the main valves of the multi-color air jet loom of FIG. 1;

FIG. 4 is a perspective view of one of the main air tanks of the multi-color air jet loom of FIG. 1;

FIG. 5 is a top view schematically showing positions of main air tanks and main valves of a multi-color air jet loom according to another embodiment of the present disclosure; and

FIG. 6 is a top view schematically showing positions of main air tanks and main valves of a multi-color air jet loom according to still another embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0010] A first embodiment of the present disclosure will now be described with reference to the accompanying drawings.

[0011] It is to be noted that, although a multi-color air jet loom 100 according to the first embodiment has four weft insertion systems, only two of the weft insertion systems, namely, weft insertion systems 1 and 2, are illustrated in FIG. 1. FIG. 1 schematically shows positions of main nozzles 1a, 1b, and 1c, and a main air tank 11 that correspond to the weft insertion system 1, and positions of main nozzles 2a, 2b, and 2c, and a main air tank 12 that correspond to the weft insertion system 2. The weft insertion system 1 includes the main nozzles 1a, 1b, and 1c and a weft yarn measuring and storing device 8. The weft insertion system 2 includes the main nozzles 2a, 2b, and 2c and a weft yarn measuring and storing device 9. The main nozzles 1a, 1b, and 1c are connected to the

main air tank 11. The main nozzles 2a, 2b, and 2c are connected to the main air tank 12.

[0012] It is to be noted that the same configuration as above is applied to the rest of the weft insertion systems, which are not illustrated in FIG. 1, and main nozzles and main air tanks 13 and 14 corresponding to the unillustrated weft insertion systems are disposed in the same manner as above.

[0013] As illustrated in FIG. 1, a weft yarn Y1 stored in the weft yarn measuring and storing device 8 is let off and inserted into a weft insertion passage 6 while being assisted by air injected from the serially arranged three main nozzles 1a, 1b, and 1c. A weft yarn Y2 stored in the weft yarn measuring and storing device 9 is let off and inserted into the weft insertion passage 6 while being assisted by air injected from the serially arranged three main nozzles 2a, 2b, and 2c. It is to be noted that the main nozzle 1b located upstream of the main nozzle 1a is a first tandem nozzle. Also, the main nozzle 1c located upstream of the main nozzle 1b (the first tandem nozzle) is a second tandem nozzle. The main nozzle 2b located upstream of the main nozzle 2a is a first tandem nozzle. Also, the main nozzle 2c located upstream of the main nozzle 2b (the first tandem nozzle) is a second tandem nozzle.

[0014] The main nozzles 1a, 1b, and 1c are connected to the main air tank 11 via pipes 21a, 21b, and 21c, respectively. The main nozzles 2a, 2b, and 2c are connected to the main air tank 12 via pipes 22a, 22b, and 22c, respectively. Main valves 31a, 31b, and 31c are directly connected to the main air tank 11. The main valves 31a, 31b, and 31c are connected to the pipes 21a, 21b, and 21c, respectively, and adjust or control injection timings of air injected from the main nozzles 1a, 1b, and 1c. Also, main valves 32a, 32b, and 32c are directly connected to the main air tank 12. The main valves 32a, 32b, and 32c are connected to the pipes 22a, 22b, and 22c, respectively, and adjust or control injection timings of air injected from the main nozzles 2a, 2b, and 2c. The multi-color air jet loom 100 includes a side frame 7 configured to accommodate therein the main air tanks 11, 12, 13, and 14. The main air tanks 11 and 12 are accommodated in and attached to the side frame 7. The main nozzles 1a, 1b, and 1c and the main nozzles 2a, 2b, and 2c are located at positions higher than upper ends of the respective main air tanks 11 and 12.

[0015] The main valves 31a and 32a that correspond to the main nozzles 1a and 2a are disposed at the same height. The main valves 31b and 32b that correspond to the main nozzles 1b and 2b (the first tandem nozzles) are disposed at the same height. The main valves 31c and 32c that correspond to the main nozzles 1c and 2c (the second tandem nozzles) are disposed at the same height. In other words, the main valves that correspond to the main nozzles of the same type are disposed substantially at the same height.

[0016] Sixteen sub-nozzles 5 are arranged along the weft insertion passage 6. The sub-nozzles 5 are connect-

ed to a single sub-air tank 3. Each sub-nozzle 5 is configured to inject air toward the weft insertion passage 6 to transfer the weft yarns Y1 and Y2.

[0017] The specific arrangement of the four main air tanks 11, 12, 13, and 14 of the multi-color air jet loom 100 is illustrated in FIGS. 2 and 3.

[0018] Referring to FIGS. 2 and 3, in accordance with the number of weft insertion systems, four main air tanks 11, 12, 13, and 14 are mounted to the side frame 7 of the multi-color air jet loom 100. Each of the main air tanks 11, 12, 13, and 14 has a vertically-elongated shape. As illustrated in FIG. 3, the main air tank 11 and the main air tank 13 are disposed so as to be stacked in the width direction D of the multi-color air jet loom 100. The main air tank 12 and the main air tank 14 are disposed so as to be stacked in the width direction D of the multi-color air jet loom 100. The main air tank 12 and the main air tank 14 are disposed on the right side of the main air tank 11 and the right side of the main air tank 13, respectively, as viewed from the inner side of the side frame 7.

[0019] In the description, the width direction D of the multi-color air jet loom 100 (hereinafter, simply referred to as the width direction D of the loom) used in connection with the main air tanks 11, 12, 13, and 14 refers to the direction which is orthogonal to the height direction H (FIG. 4) of the multi-color air jet loom 100. Also, the width direction D of the loom illustrated in FIG. 2 is orthogonal to an inner surface of the side frame 7. In addition, the direction that is orthogonal to the width direction D of the loom and extends in the right-left direction across the inner surface of the side frame 7 is hereinafter referred to as the longitudinal direction W of the loom.

[0020] FIG. 4 shows the geometry of the main air tank 11 as viewed from the inner side of the side frame 7.

[0021] As illustrated in FIG. 4, the main air tank 11 has a vertically-elongated shape wherein the dimension in the height direction H is greater than the dimension in the longitudinal direction W or the width direction D of the loom. The main valves 31a, 31b, and 31c are directly connected to an upper end portion J of the main air tank 11. Specifically, the main valve 31b is connected to the left side of the upper end portion J of the main air tank 11 as viewed from the inner side of the side frame 7. The main valve 31c is connected to the right side of the upper end portion J of the main air tank 11 as viewed from the inner side of the side frame 7. The main valve 31a is connected below the main valve 31b. A regulator 41 is directly connected to the right side of a lower end portion K of the main air tank 11 as viewed from the inner side of the side frame 7. The main air tank 11, the main valves 31a, 31b, and 31c, and the regulator 41 are assembled into a unit, which is integrally attachable to and detachable from the side frame 7.

[0022] It is to be noted that the upper end portion J of the main air tank 11 herein has a dimension of about one third of the dimension of the main air tank 11 in a height direction H starting from the upper end of the main air tank 11. It is also to be noted that the lower end portion

K of the main air tank 11 herein has a dimension of about one third of the dimension of the main air tank 11 in the height direction H starting from the lower end of the main air tank 11.

[0023] Also, the main air tank 13 illustrated in FIGS. 2 and 3 has the same configuration as the main air tank 11. Therefore, main valves 33a, 33b, and 33c, and a regulator 43 are directly connected to the main air tank 13 and assembled into a unit in substantially the same manner as the assembled unit of the main valves 31a, 31b, and 31c, and the regulator 41 to the main air tank 11. Also, the main air tanks 12 and 14 each have a structure that is symmetrical to the structure of the main air tanks 11 and 13. That is, the main valves 32a, 32b, and 32c, and the regulator 42 are directly connected to the main air tank 12 and assembled into a unit of an arrangement that is symmetrical to the arrangement of the assembled unit of the main valves 31a, 31b, and 31c, and the regulator 41 to the main air tank 11. Similarly, the main valves 34a, 34b, and 34c, and a regulator 44 are directly connected to the main air tank 14 and assembled into a unit of the arrangement that is symmetrical to the arrangement of the assembled unit of the main valves 31a, 31b, and 31c and the regulator 41 to the main air tank 11. In other words, the main air tanks 12 and 14 having substantially the same structure as the main air tanks 11 and 13 are reversed and mounted.

[0024] It is to be noted that, as illustrated in FIG. 2, the regulators 41, 42, 43, and 44 of the main air tanks 11, 12, 13, and 14 are connected to a filter 50.

[0025] Further, the main nozzles corresponding to the respective weft insertion systems are located at positions higher than the upper ends of the main air tanks 11, 12, 13, and 14.

[0026] In this way, in the multi-color air jet loom 100 according to the present embodiment, at least two of the main air tanks 11, 12, 13, and 14 are disposed so as to be stacked in the width direction D of the loom. This configuration permits disposition of the main valve of each of the main air tanks at the same height as the main valves of the other main air tanks.

[0027] Specifically, the main valve 31a of the main air tank 11 is disposed at the same height as the main valve 32a of the main air tank 12, the main valve 33a of the main air tank 13, and the main valve 34a of the main air tank 14. Also, the main valve 31b and 31c of the main air tank 11 are disposed at the same height as the main valves 32b and 32c of the main air tank 12, the main valves 33b and 33c of the main air tank 13, and the main valves 34b and 34c of the main air tank 14.

[0028] As described above, the main valves 31a, 31b, and 31c; the main valves 32a, 32b, and 32c; the main valves 33a, 33b, and 33c; and the main valves 34a, 34b, and 34c that are directly connected to the main air tanks 11, 12, 13, and 14, respectively, are disposed at the same height, so that the differences in the length of the pipes connecting the main air tanks and the main nozzles are reduced. As a result, the variations in the pressure loss

in each pipe may be suppressed.

[0029] The main air tanks 11, 12, 13, and 14 are provided for their corresponding weft insertion systems, so that air pressure of the respective main nozzles connected to the main air tanks 11, 12, 13, and 14 may be controlled easily.

[0030] The regulators 41, 42, 43, and 44 are directly connected to the main air tanks 11, 12, 13, and 14, so that the pressure in the main air tanks 11, 12, 13, and 14 may be controlled individually. Furthermore, no pipe is provided between the main air tanks 11, 12, 13, and 14 and the regulators 41, 42, 43, and 44, which contributes to a reduction of the pressure loss.

[0031] The main air tanks 11, 12, 13, and 14 are provided with the main valves 31a, 31b, 31c, and the regulator 41; the main valves 32a, 32b, 33c, and the regulator 42; 33a, 33b, 33c, and the regulator 43; and the main valves 34a, 34b, 34c, and the regulator 44, respectively, assembled into units, and mounted to the multi-color air jet loom 100. This configuration reduces the man-hours associated with installation and maintenance work of the main air tanks 11, 12, 13, and 14. Furthermore, the number of pipes is reduced, so that the interior of the side frame 7 becomes visually simple, and installation and maintenance work of the main air tanks 11, 12, 13, and 14 are easier.

[0032] The main valves 31a, 31b, and 31c; the main valves 32a, 32b, and 32c; the main valves 33a, 33b, and 33c; and the main valves 34a, 34b, and 34c are mounted to the upper end portions J of the vertically-elongated main air tanks 11, 12, 13, and 14. This configuration reduces the distance between the main valves 31a, 31b, 31c; 32a, 32b, 32c; 33a, 33b, 33c; and 34a, 34b, 34c and the main nozzles, so that the pressure loss in the pipes connecting the main valves 31a, 31b, 31c; 32a, 32b, 32c; 33a, 33b, 33c; and 34a, 34b, 34c and the main nozzles are further reduced.

[0033] The main air tanks 11, 12, 13, and 14 are vertically elongated and the dimension of each of the main air tanks 11, 12, 13, and 14 in the height direction H is greater than the dimension in the longitudinal direction W or the dimension in the width direction D of the loom. This configuration saves the space in the longitudinal direction W or the width direction D of the loom, while permitting an increase in the capacity of the main air tanks 11, 12, 13, and 14.

[0034] In the present embodiment, although the main air tanks 11, 12, 13, and 14 are members that are provided separately from the side frame 7, the configuration is not limited thereto, and the main air tanks 11, 12, 13, and 14 may be formed integrally with a side frame 207, as illustrated in FIG. 5 showing a multi-color air jet loom 200. With this configuration, the main air tanks 11, 12, 13, and 14 and the side frame 7 may be integrally mounted to and detached from the multi-color air jet loom 200 without disassembling, which reduces the man-hours of the maintenance and assembling work.

[0035] Further, like a multi-color air jet loom 300 illus-

trated in FIG. 6, the main air tanks 11 and 12 may be formed integrally, and the main air tanks 13 and 14 may be formed integrally. With this configuration, the main air tanks that are in the stacked state in the width direction D of the multi-color air jet loom 300 may be integrally mounted to and detached from the multi-color air jet loom 300 without disassembling, which reduces the man-hours of the maintenance and assembling work.

[0036] The number of main air tanks that are stacked in the width direction D of the loom is not limited to two each, and three or more main air tanks may be stacked in accordance with the number of weft insertion systems.

[0037] In the present embodiment, although first and second tandem nozzles and a main nozzle are provided for each of the weft insertion systems, the tandem nozzles need not necessarily be provided.

[0038] In the present embodiment, there is no necessity of disposing the main valves 31a, 31b, and 31c; the main valves 32a, 32b, and 32c; the main valves 33a, 33b, and 33c; and the main valves 34a, 34b, and 34c that are directly connected to the main air tanks 11, 12, 13, and 14 at the same height as the main nozzles to be connected in accordance with the type of the main nozzles, and the main valves may be disposed at different heights within the range that reduces variations in the pressure loss more, as compared with the conventional structure.

[0039] A multi-color air jet loom (100, 200, 300) includes weft insertion systems (1, 2) each including at least one main nozzle (1a, 1b, 1c, 2a, 2b, 2c); main air tanks (11, 12, 13, 14) provided for the weft insertion systems (1, 2) and connected to the main nozzles (1a, 1b, 1c, 2a, 2b, 2c) via pipes (21a, 21b, 21c, 22a, 22b, 22c); and main valves (31a, 31b, 31c, 32a, 32b, 32c, 33a, 33b, 33c, 34a, 34b, 34c) directly connected to the main air tanks (11, 12, 13, 14) and connected to the pipes (21a, 21b, 21c, 22a, 22b, 22c). At least two of the main air tanks (11, 12, 13, 14) are disposed so as to be stacked in a width direction (D) of the multi-color air jet loom (100, 200, 300).

Claims

1. A multi-color air jet loom (100, 200, 300) comprising:
 - a plurality of weft insertion systems (1, 2) each including at least one main nozzle (1a, 1b, 1c, 2a, 2b, 2c);
 - a plurality of main air tanks (11, 12, 13, 14) that are provided for the corresponding weft insertion systems (1, 2) and connected to the main nozzles (1a, 1b, 1c, 2a, 2b, 2c) via corresponding pipes (21a, 21b, 21c, 22a, 22b, 22c); and
 - a plurality of main valves (31a, 31b, 31c, 32a, 32b, 32c, 33a, 33b, 33c, 34a, 34b, 34c) that are directly connected to the corresponding main air tanks (11, 12, 13, 14) and connected to the corresponding pipes (21a, 21b, 21c, 22a, 22b, 22c)

to adjust injection timings of air injected from the main nozzles (1a, 1b, 1c, 2a, 2b, 2c), **characterized in that**

at least two of the main air tanks (11, 12, 13, 14) are disposed so as to be stacked in a width direction (D) of the multi-color air jet loom (100, 200, 300).

2. The multi-color air jet loom (100, 200, 300) according to claim 1, **characterized in that** at least one of the main valves (31a, 31b, 31c, 32a, 32b, 32c, 33a, 33b, 33c, 34a, 34b, 34c) of one of the main air tanks (11, 12, 13, 14) is disposed at the same height as at least one of the main valves (31a, 31b, 31c, 32a, 32b, 32c, 33a, 33b, 33c, 34a, 34b, 34c) of the other respective main air tanks (11, 12, 13, 14).
3. The multi-color air jet loom (100, 200, 300) according to claim 1 or 2, **characterized in that** the multi-color air jet loom (100, 200, 300) further includes a plurality of regulators (41, 42, 43, 44) that are directly connected to the corresponding main air tanks (11, 12, 13, 14).
4. The multi-color air jet loom (100, 200, 300) according to claim 3, **characterized in that** each of the main air tanks (11, 12, 13, 14), and the main valve (31a, 31b, 31c, 32a, 32b, 32c, 33a, 33b, 33c, 34a, 34b, 34c) and the regulator (41, 42, 43, 44) that are connected to the main air tank (11, 12, 13, 14) are assembled into a unit.
5. The multi-color air jet loom (200) according to any one of claims 1 to 3, **characterized in that** the main air tanks (11, 12, 13, 14) are formed integrally with a side frame (7) of the multi-color air jet loom (200) that is configured to accommodate therein the main air tanks (11, 12, 13, 14).
6. The multi-color air jet loom (100, 200, 300) according to any one of claims 1 to 5, **characterized in that** the main air tanks (11, 12, 13, 14) each have a vertically-elongated shape, wherein a dimension in a height direction (H) of the multi-color air jet loom (100, 200, 300) is greater than a dimension in the width direction (D) of the multi-color air jet loom (100, 200, 300) or a dimension in a longitudinal direction (W) of the multi-color air jet loom (100, 200, 300), and the main valves (31a, 31b, 31c, 32a, 32b, 32c, 33a, 33b, 33c, 34a, 34b, 34c) are mounted to an upper end portion (J) of the corresponding main air tanks (11, 12, 13, 14).

FIG. 1

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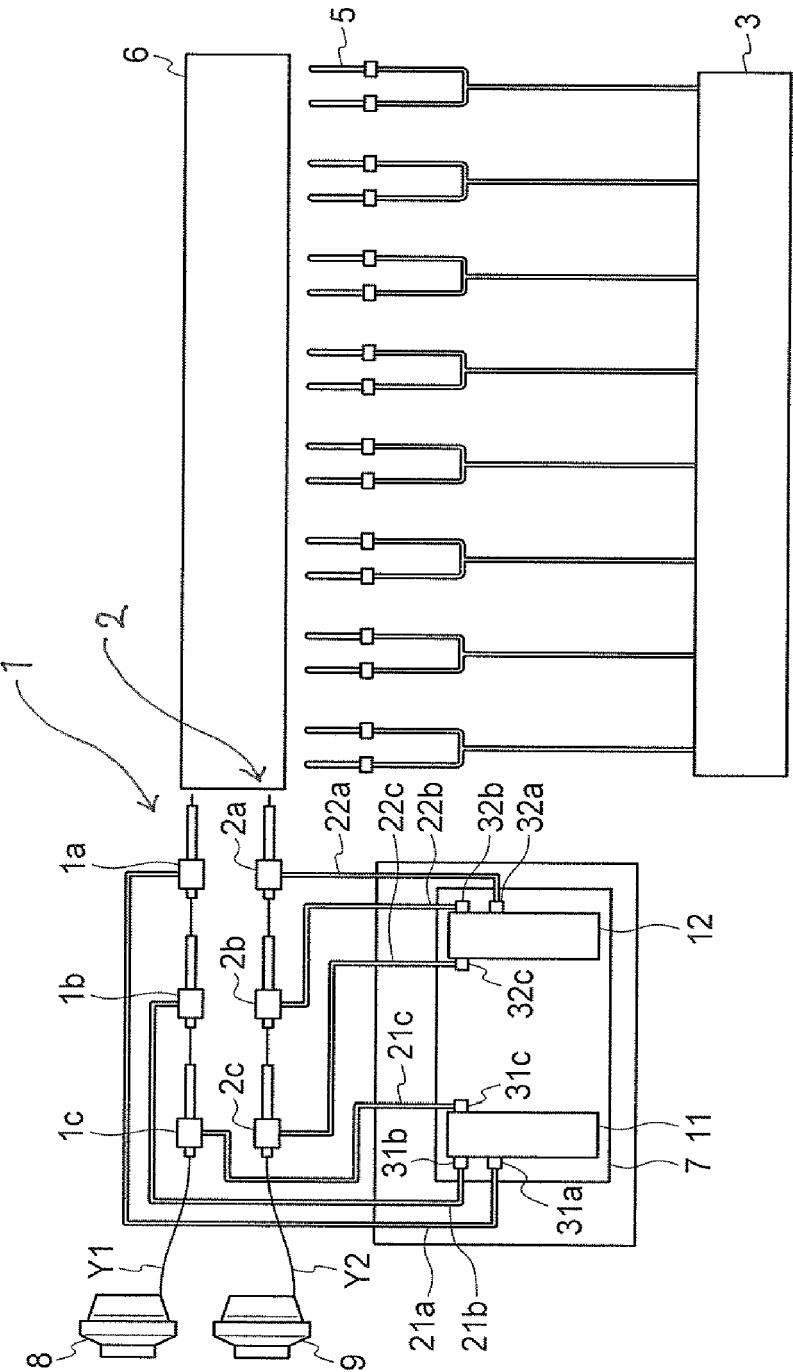


FIG. 2

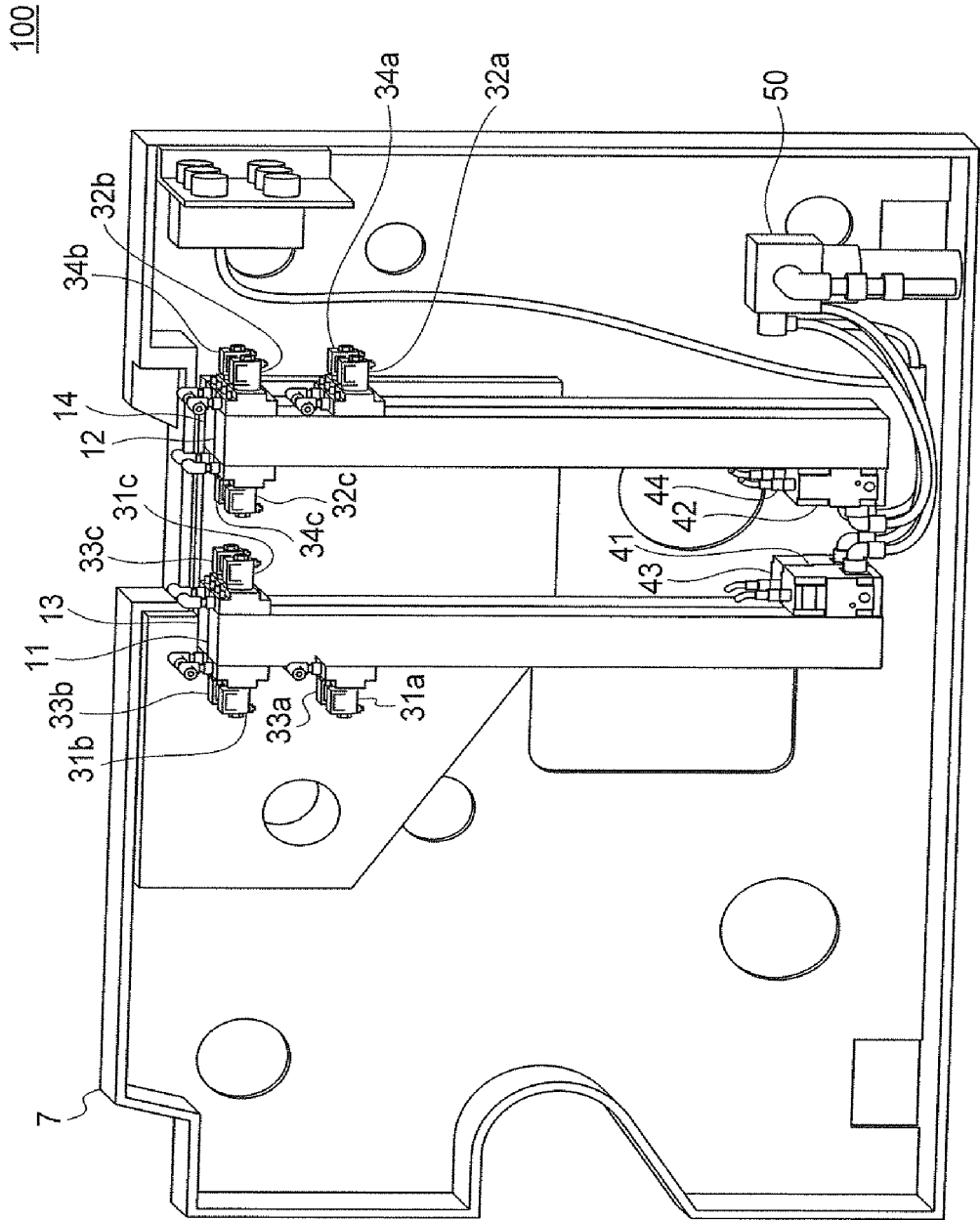


FIG. 3

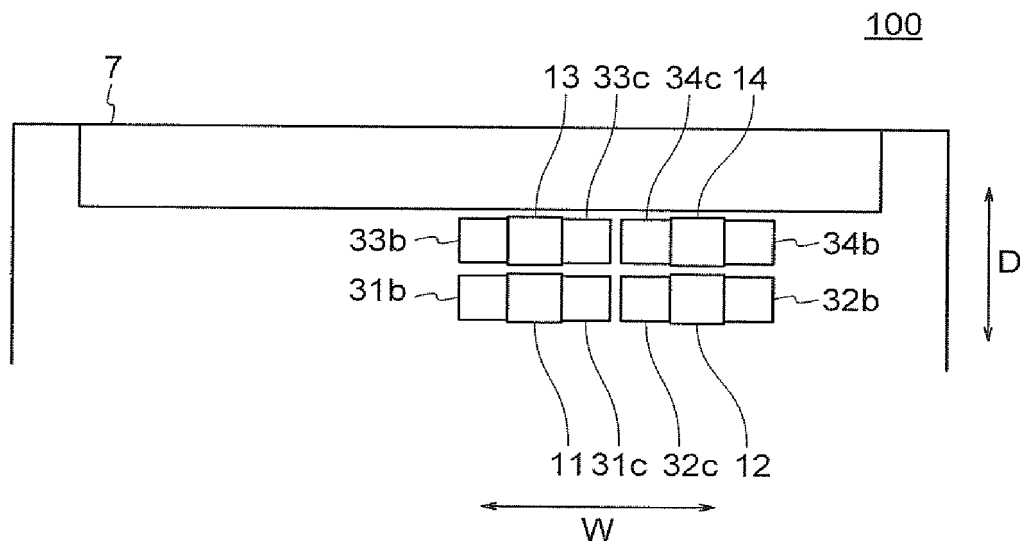


FIG. 4

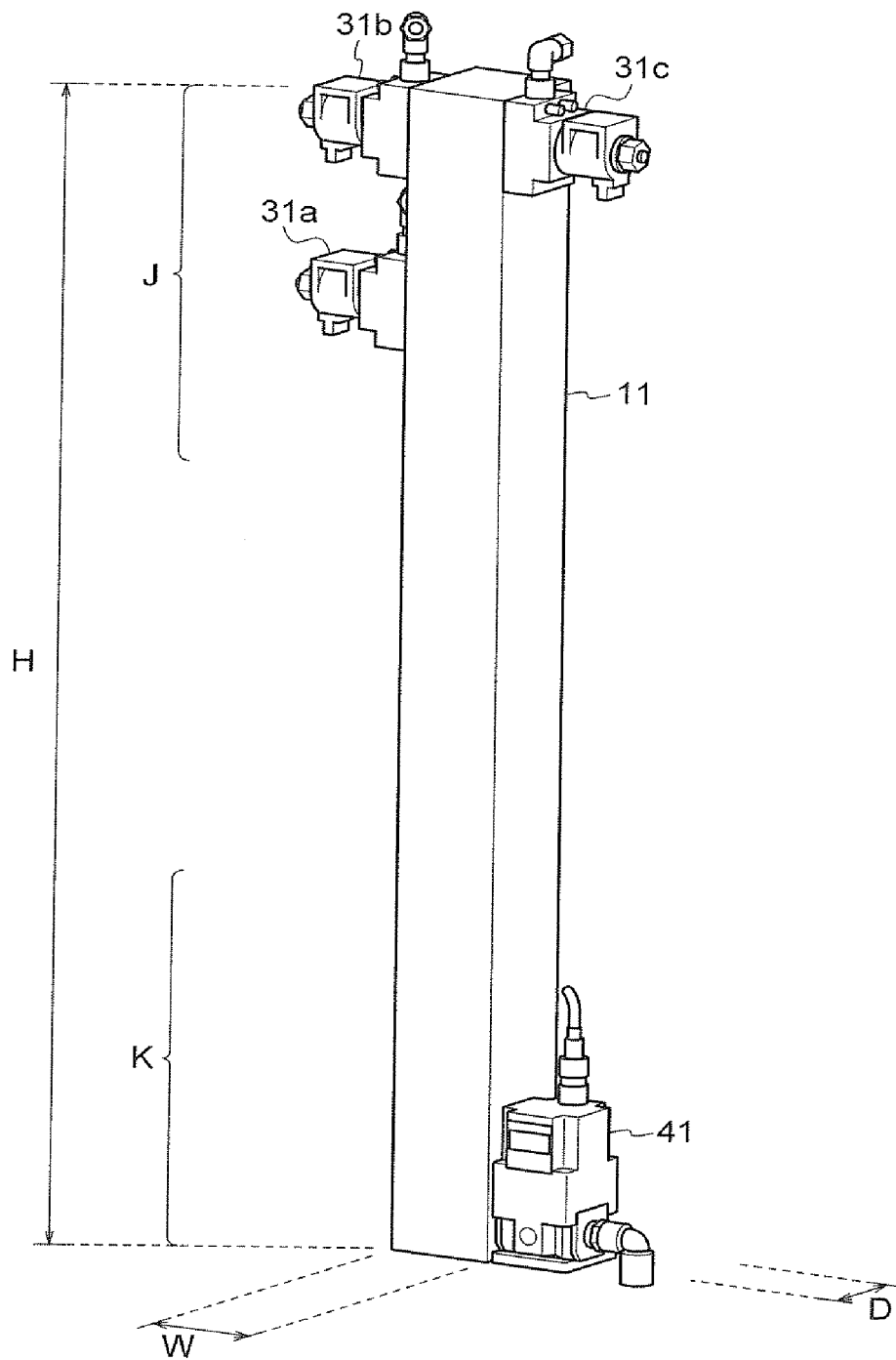


FIG. 5

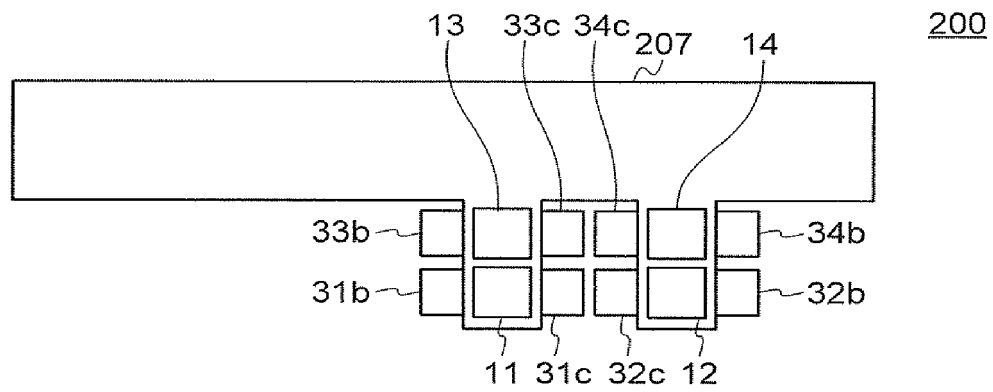
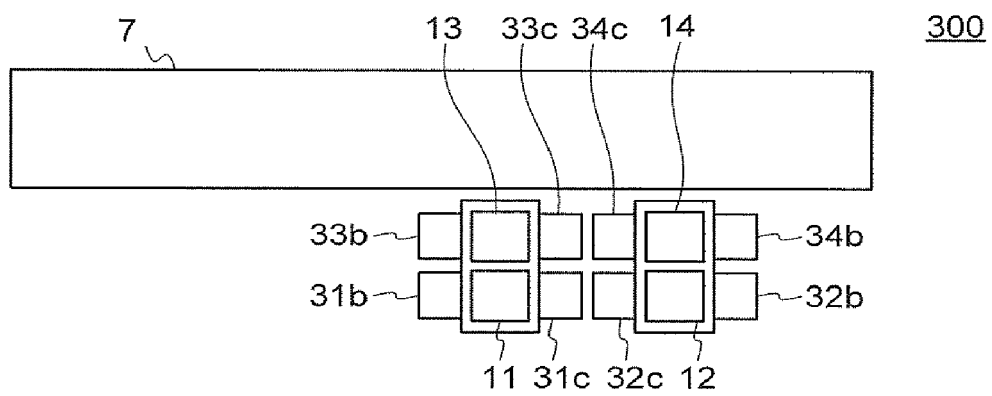


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 19 19 9113

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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