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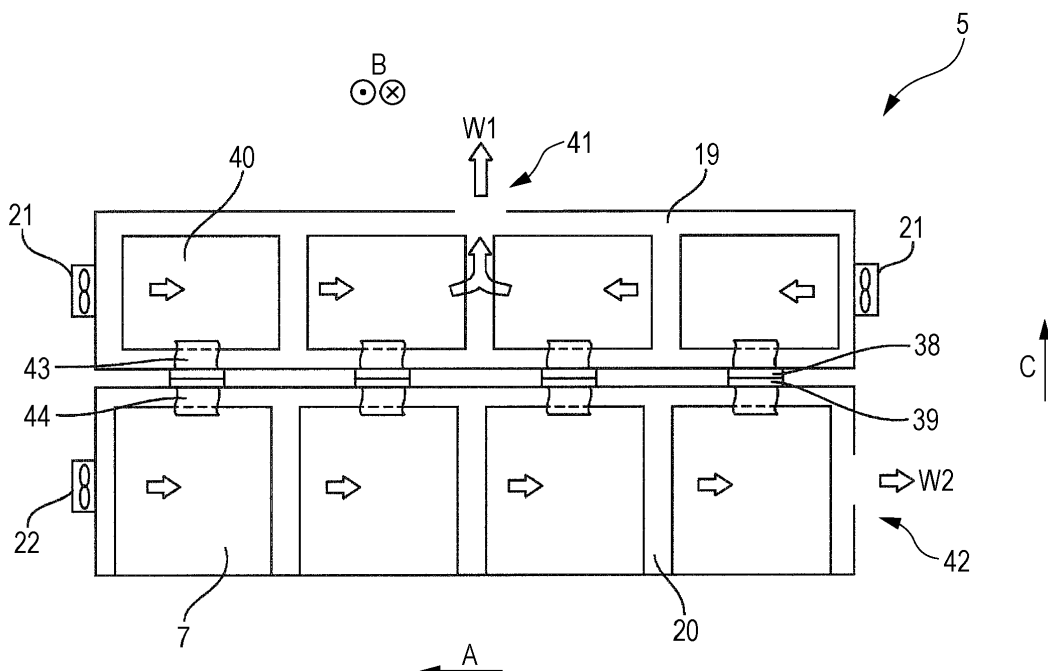
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(54) **LIQUID DISCHARGE APPARATUS**

(57) A liquid discharge apparatus includes a discharge unit that discharges liquid; a drive substrate for driving the discharge unit; a drive substrate accommodating unit that accommodates the drive substrate; a plurality of first air flow generating units that are provided in the drive substrate accommodating unit, and generate air flows; and an exhaust unit that is provided in the drive

substrate accommodating unit, and exhausts a synthesis air flow of air flows generated by the plurality of first air flow generating units. With the liquid discharge apparatus of such a configuration, it is possible to suppress the accumulation of heat in the drive substrate accommodating unit.

FIG. 7



Description

BACKGROUND

1. Technical Field

[0001] The present invention relates to a liquid discharge apparatus.

2. Related Art

[0002] In the related art, a liquid discharge apparatus such as a recording apparatus which performs recording on a medium by discharging liquid such as ink and the like, is disclosed. In such a liquid discharge apparatus, there is a case where the temperature of an accommodating unit for accommodating a liquid discharge unit and a drive substrate for driving the discharge unit increases due to heat generated from the liquid discharge unit and the drive substrate. Accordingly, a technology for suppressing the increase of temperature is disclosed.

[0003] For example, in JP-A-11-115170, a liquid discharge apparatus including a fan for suppressing the increment of temperature in the accommodating unit (carriage) of a discharge unit and the like, is disclosed.

[0004] In addition, in JP-A-2008-93849, a liquid discharge apparatus, which includes an air flow generating unit such as a fan and the like in the accommodating unit of the discharge unit and the like for a different purpose, is disclosed.

[0005] However, recently, as the liquid discharge apparatus, devices having a variety of configurations and sizes (device having a plurality of discharge units and a plurality of drive substrates, or the like) have been used, and in the configurations disclosed in JP-A-11-115170 and JP-A-2008-93849, there is a case where the increment of temperature of the accommodating unit (drive substrate accommodating unit) of the discharge unit and the like is not sufficiently suppressed.

SUMMARY

[0006] An advantage of some aspects of the invention is to suppress heat being accumulated in a drive substrate accommodating unit.

[0007] According to a first aspect of the invention, there is provided a liquid discharge apparatus including a discharge unit that discharges liquid; a drive substrate for driving the discharge unit; a drive substrate accommodating unit that accommodates the drive substrate; a plurality of first air flow generating units that are provided in the drive substrate accommodating unit, and generate air flows; and an exhaust unit that is provided in the drive substrate accommodating unit, and exhausts a synthesis air flow of air flows generated by the plurality of first air flow generating units.

[0008] According to the aspect, the plurality of first air flow generating units and the exhaust unit that exhausts

a synthesis air flow of air flows generated by the plurality of first air flow generating units are provided in the drive substrate accommodating unit. Therefore, it is possible to effectively release the air flow of which the temperature increases from the exhaust unit, by effectively transferring heat generated from the drive substrate using the plurality of first air flow generating units. Accordingly, it is possible to effectively suppress the accumulation of the heat in the drive substrate accommodating unit.

[0009] According to a second aspect of the invention, the exhaust unit may be provided on the opposite side of the discharge unit with respect to the drive substrate.

[0010] According to the aspect, the exhaust unit is provided on the opposite side of the discharge unit with respect to the drive substrate. Therefore, it is possible to suppress the increment of the temperature of the discharge unit caused by the synthesis air flow exhausted from the exhaust unit.

[0011] According to a third aspect of the invention, the plurality of first air flow generating units may be provided at positions facing each other.

[0012] According to the aspect, the plurality of first air flow generating units are provided at positions facing each other. Therefore, it is possible to easily grasp a synthesis position of the air flow or a travel direction of the synthesis air flow, and since the exhaust unit can be disposed at an appropriate position, it is possible to suppress the accumulation of the heat in the drive substrate accommodating unit caused by the synthesis air flow staying within the drive substrate accommodating unit.

[0013] According to a fourth aspect of the invention, air volumes of the plurality of first air flow generating units may be equivalent to each other.

[0014] According to the aspect, the air volumes (or volume of air blown per unit time) of the plurality of first air flow generating units are equivalent to each other. Therefore, it is possible to more simply grasp the synthesis position of the air flow or the travel direction of the synthesis air flow, and since the exhaust unit can be disposed at a more appropriate position, it is possible to particularly effectively suppress the accumulation of the heat in the drive substrate accommodating unit caused by the synthesis air flow staying within the drive substrate accommodating unit.

[0015] "Equivalent" does not mean to be the same in a strict sense, and also means a case where air volume of each of the plurality of first air flow generating units slightly differs.

[0016] According to a fifth aspect of the invention, the liquid discharge apparatus may further include a discharge unit accommodating unit that accommodates the discharge unit, and is provided separately from the drive substrate accommodating unit.

[0017] According to the aspect, the liquid discharge apparatus further includes a discharge unit accommodating unit that accommodates the discharge unit, and is provided separately from the drive substrate accommodating unit. That is, the drive substrate and the dis-

charge unit are accommodated in different accommodating units. Therefore, it is possible to effectively suppress the transmission of the heat generated by the drive substrate to the discharge unit.

[0018] According to a sixth aspect of the invention, the liquid discharge apparatus may further include a second air flow generating unit that is provided in the discharge unit accommodating unit, and generates air flows.

[0019] According to the aspect, the second air flow generating unit for generating the air flow is provided in the discharge unit accommodating unit. Therefore, it is possible to suppress the accumulation of the heat in the discharge unit accommodating unit.

[0020] According to a seventh aspect of the invention, the drive substrate may be provided by being disposed so as not to face the discharge unit.

[0021] According to the aspect, the drive substrate is provided by being disposed so as not to face the discharge unit. Therefore, it is possible to effectively suppress the transmission of the heat generated by the drive substrate to the discharge unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings, wherein like numbers reference like elements.

Fig. 1 is a schematic perspective view illustrating a recording apparatus of an embodiment of the invention.

Fig. 2 is a schematic plan view illustrating the recording apparatus of the embodiment of the invention.

Fig. 3 is a schematic front view illustrating the recording apparatus of the embodiment of the invention.

Fig. 4 is a schematic side view illustrating the recording apparatus of the embodiment of the invention.

Fig. 5 is a schematic rear view illustrating the recording apparatus of the embodiment of the invention.

Fig. 6 is a schematic front view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 7 is a schematic side perspective view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 8 is a block diagram illustrating the recording apparatus of the embodiment of the invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0023] Hereinafter, a recording apparatus according to one embodiment as a liquid discharge apparatus of the invention will be described in detail with reference to drawings.

[0024] First, an overview of a recording apparatus 1 according to the one embodiment of the invention will be

described.

[0025] Fig. 1 is a schematic perspective view the recording apparatus 1 of the embodiment. In addition, Fig. 2 is a schematic plan view of the recording apparatus 1 of the embodiment. In addition, Fig. 3 is a schematic front view of the recording apparatus 1 of the embodiment. In addition, Fig. 4 is a schematic side view of the recording apparatus 1 of the embodiment. In addition, Fig. 5 is a schematic rear view of the recording apparatus 1 of the embodiment. From Fig. 1 to Fig. 5, a state where a part of a configuration member is detached from the recording apparatus 1 of the embodiment is illustrated, and for example, a state where a sub-carriage 5 (see Fig. 6 to Fig. 7) is detached from a carriage 6 is illustrated.

[0026] The recording apparatus 1 of the embodiment includes a transportation mechanism 3 for transporting a target recording medium (medium) in a transportation direction A by an adhesive belt 2 (endless belt) for supporting the target recording medium on a supporting surface to which adhesive is attached. In addition, the recording apparatus 1 includes a feeding portion not illustrated capable of setting a roll shape target recording medium and feeding the target recording medium to the transportation mechanism 3. In addition, on a transportation region of the target recording medium by the transportation mechanism 3, the recording apparatus 1 includes a recording mechanism 4 for performing recording by reciprocally scanning the carriage 6 including a recording head 7 as a discharge unit in a reciprocation direction B intersecting the transportation direction A of the target recording medium. Furthermore, the recording apparatus 1 includes a winding mechanism not illustrated capable of winding the target recording medium recorded in the recording mechanism 4.

[0027] The transportation mechanism 3 of the embodiment includes the adhesive belt 2 for transporting the target recording medium by mounting the target recording medium fed from the feeding portion, a drive roller 8 for driving the adhesive belt 2, and a follower roller 9. The target recording medium is mounted by being attached to a supporting surface of the adhesive belt 2.

[0028] However, an endless belt as a transportation belt is not limited to the adhesive belt. For example, an electrostatic adsorption type endless belt may be used.

[0029] The recording apparatus 1 of the embodiment includes the transportation mechanism 3 of the configuration. However, the configuration is not limited to the transportation mechanism. A configuration in which the target recording medium is transported by being supported with a movement tray or the like, a configuration in which the target recording medium is transported by a pair of rollers or the like, or the like, may be implemented. Furthermore, the target recording medium is fixed by a supporting portion, and is recorded by moving the recording head 7 with respect to the fixed target recording medium. The target recording medium may be used as a so-called flat bed type recording apparatus.

[0030] The recording mechanism 4 includes a carriage

motor 30 (see Fig. 8) for reciprocally moving in the reciprocal movement direction B of the carriage 6 including the recording head 7 capable of discharge ink (liquid).

[0031] The recording apparatus 1 of the embodiment, at the time of recording, the recording is performed by reciprocally scanning the carriage 6 including the recording head 7. However, in the course of record scanning (in the course of movement of carriage 6), the transportation mechanism 3 stops the transportation of the target recording medium. Alternatively expressed, at the time of recording, the reciprocal scanning of the carriage 6 and the transportation of the target recording medium are alternately performed. That is, at the time of recording, the transportation mechanism 3 intermittently transports (intermittently transports adhesive belt 2) the target recording medium, corresponding to the reciprocal scanning of the carriage 6.

[0032] The recording apparatus 1 of the embodiment includes the recording head 7 that performing recording while reciprocally moving. However, the recording apparatus including a so-called line head in which a plurality of nozzles for discharging ink are provided in the intersecting direction intersecting the transportation direction A may be implemented.

[0033] Here, the "line head" is the recording head used in the recording apparatus in which a nozzle region formed in the intersecting direction intersecting the transportation direction A of the target recording medium is formed so as to cover most or the entirety of the intersecting direction of the target recording medium, and an image is formed by relatively moving a recording head or the target recording medium. A nozzle region of the intersecting direction of the line head need not cover the entirety of the intersecting direction of the entirety of the target recording medium corresponding to the recording apparatus.

[0034] In a pipe 11a constituting a frame portion of the recording apparatus 1 of the embodiment, a rail 10a extended in the reciprocal movement direction B is configured, and in a pipe 11b constituting the frame portion of the recording apparatus 1 of the embodiment, a rail 10b extended in the reciprocal movement direction B is configured. Accordingly, in the carriage 6 of the embodiment, by receiving a bearing portion not illustrated in the rail 10a and the rail 10b, the movement in the reciprocal movement direction B is guided to the rail 10a and the rail 10b.

[0035] In addition, at a position of a lower portion of the pipe 11b, a blower unit 12 extended in the reciprocal movement direction B, and blowing air from a plurality of air blowing ports not illustrated thereof in the opposite direction to the transportation direction A, is provided. Accordingly, at the position of the lower portion of the pipe 11a, a mist recovery unit 13, extended in the reciprocal movement direction B, capable of recovering the mist of the ink discharged from the recording head 7, is provided. In the mist recovery unit 13, a recovery port 16 extended in the reciprocal movement direction B is pro-

vided at the position of the lower portion of the pipe 11a.

[0036] In addition, in the downstream side in the transportation direction A of the recording apparatus 1 of the embodiment, as illustrated in Fig. 3, a plurality of blower fans 14 (three) for generating air blowing force by the blower unit 12 are installed. By the air blowing force generated from the blower fan 14, a blower unit 12 can blow air from an outside (position of downstream side in transportation direction A) of the recovery unit 13 toward the recovery port 16. Accordingly, in the upstream side in the transportation direction A of the recording apparatus 1 of the embodiment, as described in Fig. 5, a plurality of (three) suction fans 15 as a suction unit for generating an air stream from the recovery port 16 toward an inside of the recovery unit 13, furthermore, from the inside of the recovery unit 13 toward the outside of the recording apparatus 1, are provided.

[0037] Next, the carriage 6 that is a main part of the recording apparatus 1 of the embodiment and the sub-carriage 5 mounted in the carriage 6 will be described.

[0038] Here, Fig. 6 is a schematic front view of the carriage 6. Fig. 7 is a schematic side perspective view of the sub-carriage 5.

[0039] As illustrated in Fig. 6, the carriage 6 of the embodiment is configured so as to be able to reciprocally scan in the reciprocal movement direction B, by mounting a plurality of the sub-carriages 5.

[0040] In addition, as illustrated in Fig. 7, the sub-carriage 5 includes a discharge unit accommodating unit 20 in which the recording head 7 is accommodated and a drive substrate accommodating unit 19 in which a drive substrate 40 for driving the recording head 7 is accommodated. Accordingly, the drive substrate accommodating unit 19 and the discharge unit accommodating unit 20 are connected by a connection portion 38 (connector terminal) of the drive substrate accommodating unit 19 side and the connection portion 39 (connector terminal) of the discharge unit accommodating unit 20 side. Furthermore, the drive substrate 40 and the connection portion 38 are connected by an FFC (flexible flat cable) 43, and the recording head 7 and the connection portion 39 are connected by the FFC 44.

[0041] In addition, as illustrated in Fig. 7, in both end portions in the transportation direction A of the drive substrate accommodating unit 19, fans 21 as a first air flow generating unit capable of blowing air flows toward the inside of the drive substrate accommodating unit 19 are provided so as to face each other. Accordingly, in the end portion (opposite side to recording head 7) in the vertically upward direction C of the drive substrate accommodating unit 19, an exhaust port 41 as an exhaust unit for exhausting a synthesis air flow W1 of air flows generated by two opposing fans 21 is provided.

[0042] Meanwhile, in the downstream side end portion in the transportation direction A of the discharge unit accommodating unit 20, a fan 22 as a second air flow generating unit capable of blowing air flows toward the inside of the discharge unit accommodating unit 20, is provided.

Accordingly, in the upstream side end portion (position opposite to fan 22) in the transportation direction A of the discharge unit accommodating unit 20, an exhaust port 42 as an exhaust unit for exhausting air flows W2 generated by the fan 22 is provided.

[0043] Next, an electrical configuration in the recording apparatus 1 of the embodiment will be described.

[0044] Fig. 8 is a block diagram of the recording apparatus 1 of the embodiment.

[0045] A CPU 24 for controlling the entirety of the recording apparatus 1 is provided in a control unit 23. The CPU 24 is connected to a ROM 26 for storing various control programs or the like executed by the CPU 24 and to the RAM 27 which can temporally store data, through a system bus 25.

[0046] In addition, the CPU 24 is connected to a head drive unit 28 for driving the recording head 7, through the system bus 25.

[0047] In addition, the CPU 24 is connected to a motor drive unit 29 for driving the carriage motor 30, a transportation motor 31, a feeding motor 32, a winding motor 33, a blower fan motor 17, and a suction fan motor 18, a drive substrate accommodating unit fan motor 36, and a discharge unit accommodating unit fan motor 37, through the system bus 25.

[0048] Here, the carriage motor 30 is a motor for driving the carriage 6 including the recording head 7. In addition, the transportation motor 31 is a motor for driving the drive roller 8. In addition, the feeding motor 32 is a drive motor of a feeding unit for feeding the target recording medium set in the feeding unit not illustrated to the transportation mechanism 3. In addition, the winding motor 33 is a drive motor for driving a winding mechanism not illustrated to wind the target recording medium on which recording is performed. In addition, the blower fan motor 17 is a motor for driving the blower fan 14. In addition, the suction fan motor 18 is a motor for driving the suction fan 15. In addition, the drive substrate accommodating unit fan motor 36 is a motor for driving the fan 21 provided in the drive substrate accommodating unit 19. Similarly, the discharge unit accommodating unit fan motor 37 is a motor for driving the fan 22 provided in the discharge unit accommodating unit 20.

[0049] Furthermore, the CPU 24 is connected to an input and output unit 34 through the system bus 25, and the input and output unit 34 is connected to a PC 35 for performing the communication of data of recording data or the like and signals.

[0050] Here, when summarizing the recording apparatus 1 of the embodiment, the recording apparatus 1 of the embodiment includes the recording head 7 for discharging the ink, the drive substrate 40 for driving the recording head 7, and the drive substrate accommodating unit 19 for accommodating the drive substrate 40. Accordingly, the recording apparatus 1 includes a plurality of the fans 21 provided in the drive substrate accommodating unit 19 which generates air flows and the exhaust port 41 provided in the drive substrate accommo-

dating unit 19 which exhausts the synthesis air flow W1 of air flows generated by the plurality of fans 21. Therefore, the recording apparatus 1 includes a configuration which can effectively flow the air flow to the drive substrate 40 by the plurality of fans 21 and can effectively exhaust the air flow in which the heat is incremented from the exhaust port 41 by moving the heat generated from the drive substrate 40. Thus, the recording apparatus 1 of the embodiment includes a configuration which can effectively suppress that heat is accumulated in the drive substrate accommodating unit 19.

[0051] As illustrated in Fig. 7, the exhaust port 41 for exhausting the synthesis air flow W1 is formed in the drive substrate accommodating unit 19 of the embodiment. However, a suction fan (fan for generating air flow toward outside from inside of drive substrate accommodating unit 19) as an exhaust unit in place of the exhaust port 41, may be formed. By the configuration, the exhaust efficiency of the synthesis air flow W1 is further improved.

[0052] In addition, when the heat of the recording head 7 increases, there is a case where ink is easily evaporated from nozzles not illustrated such that the discharge stability is reduced. However, as illustrated Fig. 7, the exhaust port 41 of the embodiment is provided in the opposite side (vertically upward direction C side) to a direction (lower side) of the recording head 7 with respect to the drive substrate 40. Therefore, the embodiment includes a configuration which can suppress the increment of temperature of the recording head 7 in the synthesis air flow W1 (air flow heated by heat of drive substrate 40) exhausted from the exhaust port 41.

[0053] In addition, as illustrated in Fig. 7, the plurality of fans 21 of the embodiment provided in the drive substrate accommodating unit 19 are provided at positions where the fans 21 face each other. Therefore, it is possible to easily grasp a synthesis position of the air flow or a travel direction of the synthesis air flow W1. Since the exhaust port 41 can be disposed at an appropriate position, the embodiment includes a configuration which can suppress the accumulation of the heat in the drive substrate accommodating unit 19 by keeping the synthesis air flow W1 within the drive substrate accommodating unit 19.

[0054] Here, each of the plurality of fans 21 of the embodiment provided in the drive substrate accommodating unit 19 is the same. That is, fans having an air volume equivalent to each other are used. Therefore, since the synthesis position of the air flow or the traveling direction of the synthesis air flow W1 (in embodiment, central portion of drive substrate accommodating unit 19 in transportation direction A) can be easily grasped, and the exhaust port 41 is disposed in a more appropriate position, particularly the accumulation of the heat in the drive substrate accommodating unit 19 is effectively suppressed by keeping the synthesis air flow W1 within the drive substrate accommodating unit 19.

[0055] "Equivalent" does not mean to be the same in a strict sense, and means that a case where the air vol-

ume of each of the plurality of fans 21 slightly differs, for example due to variations in the design, is also included.

[0056] In addition, as illustrated in Fig. 6 and Fig. 7, the sub-carriage 5 of the embodiment accommodates the recording head 7 and the drive substrate 40 as a separate body. Alternatively expressed, the sub-carriage 5 of the embodiment includes the discharge unit accommodating unit 20 accommodating the recording head 7, apart from the drive substrate accommodating unit 19. In this manner, since the drive substrate 40 and the recording head 7 are respectively accommodated in different accommodating units, transmission of the heat generated by the drive substrate 40 to the recording head 7 is effectively suppressed.

[0057] However, it is needless to say that the invention also includes a configuration (configuration including drive substrate accommodating unit accommodating both recording head 7 and drive substrate 40) in which the recording head 7 and the drive substrate 40 are accommodated in one accommodating unit.

[0058] Accordingly, since the fan 22 for generating the air flow W2 is provided in the discharge unit accommodating unit 20, the embodiment includes a configuration which can suppress the accumulation of the heat in the discharge unit accommodating unit 20.

[0059] As illustrated in Fig. 7, in the discharge unit accommodating unit 20 of the embodiment, the exhaust port 42 is formed at a position facing the fan 22. However, the suction fan (fan for generating air flow from inside of discharge unit accommodating unit 20 toward outside) as the exhaust unit in place of the exhaust port 42 may be formed. By the configuration, the exhaust efficiency of the air flow W2 is further improved.

[0060] In addition, as illustrated in Fig. 7, the drive substrate 40 of the embodiment is provided along a direction (direction along vertically upward direction C) of the recording head 7 with respect to the drive substrate 40. Alternatively expressed, the drive substrate 40 of the embodiment is provided by being disposed so as to not be in contact with the recording head 7. Therefore, the embodiment includes a configuration which can effectively suppress the transmission of the heat generated by the drive substrate 40 to the recording head 7.

[0061] The invention is not limited to the above embodiments, various modifications are possible within the scope of the invention as defined by the appended claims, and it goes without saying that various modifications are also included within the scope of the invention.

Claims

1. A liquid discharge apparatus (1) comprising:

a discharge unit (7) for discharging liquid;
a drive substrate (40) for driving the discharge unit;
a drive substrate accommodating unit (19) that

accommodates the drive substrate;

a plurality of first air flow generating units (21) that are provided in the drive substrate accommodating unit, and are configured to generate air flows; and

an exhaust unit (41) that is provided in the drive substrate accommodating unit, and is configured to exhaust a synthesis air flow (W1) of air flows generated by the plurality of first air flow generating units.

2. The liquid discharge apparatus according to Claim 1, wherein the exhaust unit is provided on an opposite side of the discharge unit with respect to the drive substrate.

3. The liquid discharge apparatus according to Claim 1 or Claim 2, wherein the plurality of first air flow generating units are provided at positions facing each other.

4. The liquid discharge apparatus according to any one of the preceding claims, wherein air volumes of the plurality of first air flow generating units are equivalent to each other.

5. The liquid discharge apparatus according to any one of the preceding claims, further comprising:

a discharge unit accommodating unit (20) that accommodates the discharge unit, and is provided separately from the drive substrate accommodating unit.

6. The liquid discharge apparatus according to Claim 5, further comprising:

a second air flow generating unit (22) that is provided in the discharge unit accommodating unit, and is configured to generate air flows.

7. The liquid discharge apparatus according to any one of the preceding claims, wherein the drive substrate is provided by being disposed so as not to face the discharge unit.

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FIG. 1

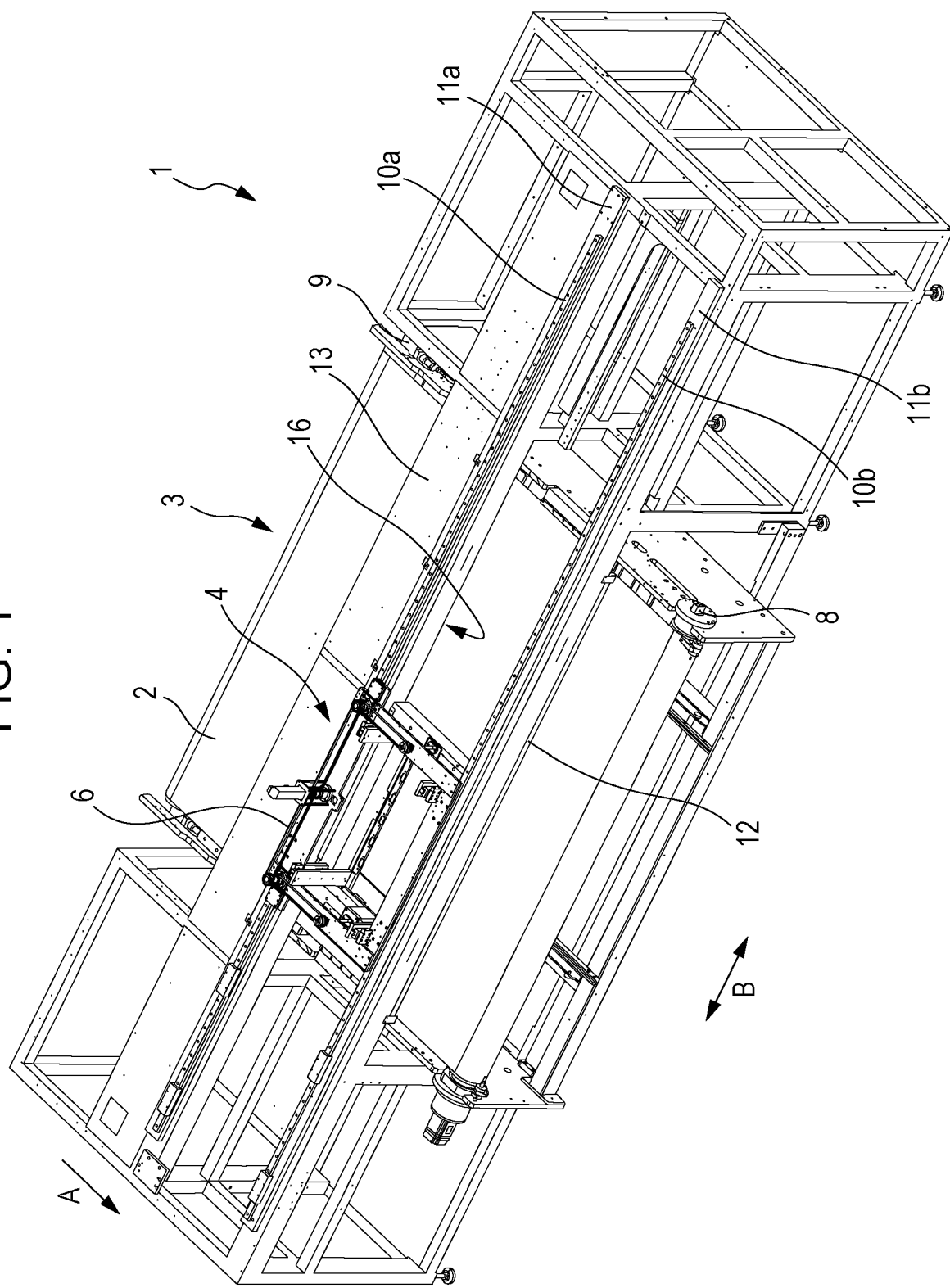


FIG. 2

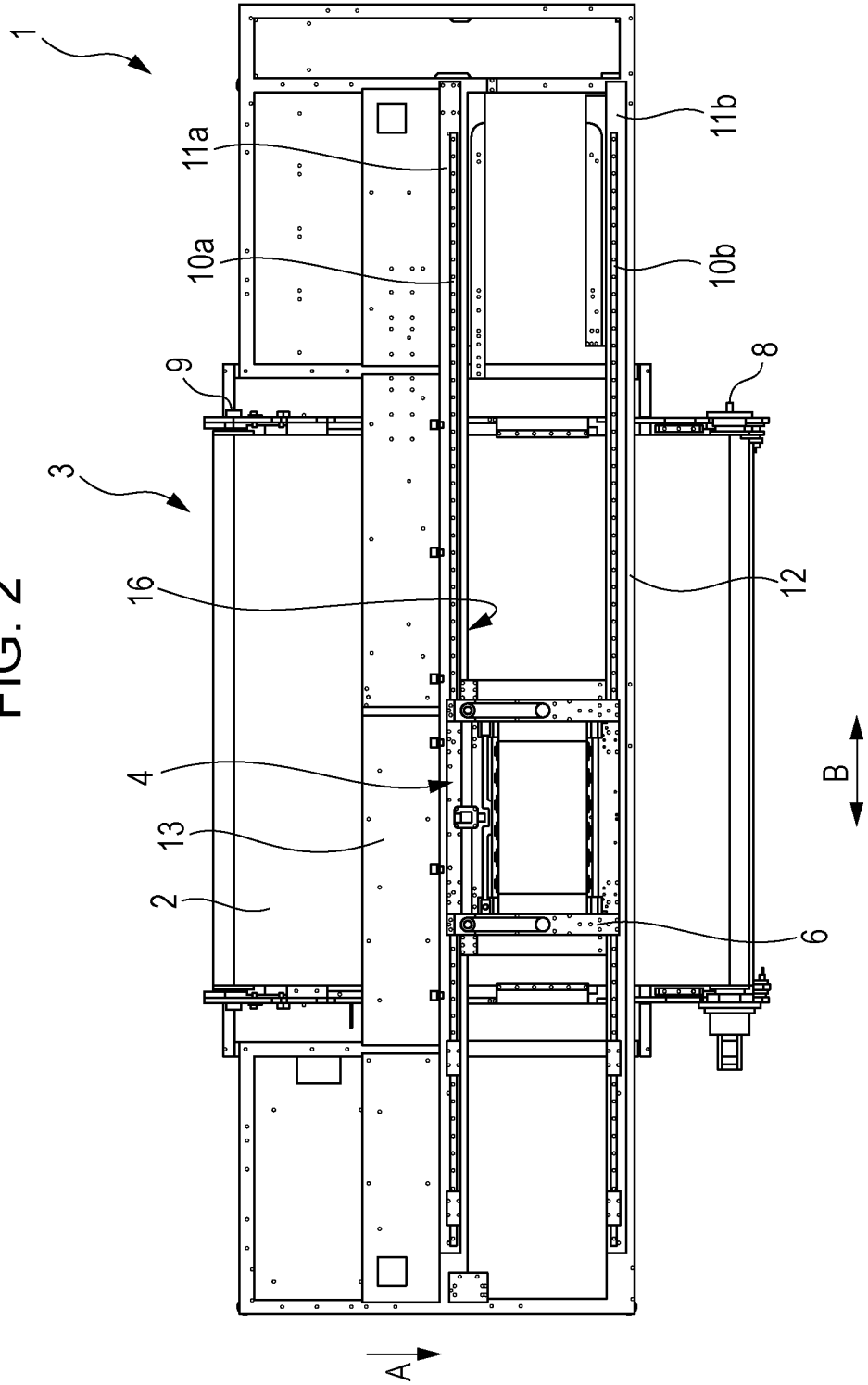


FIG. 3

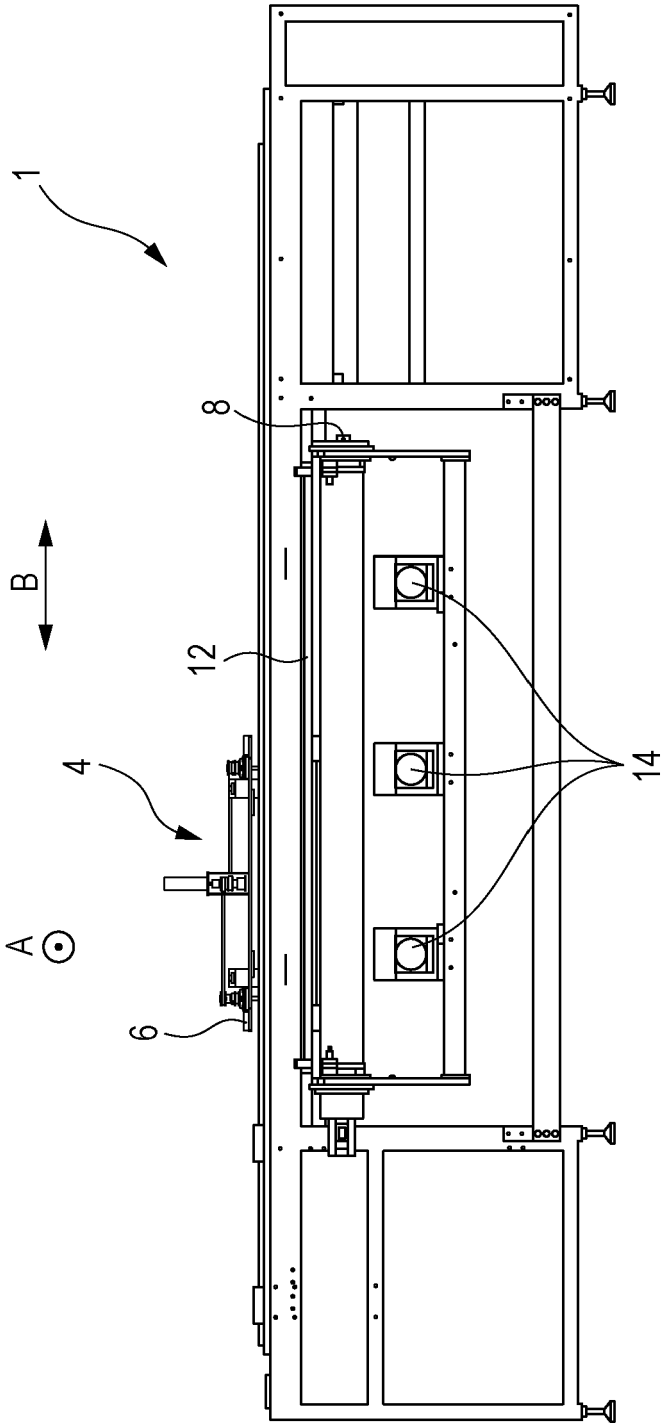


FIG. 4

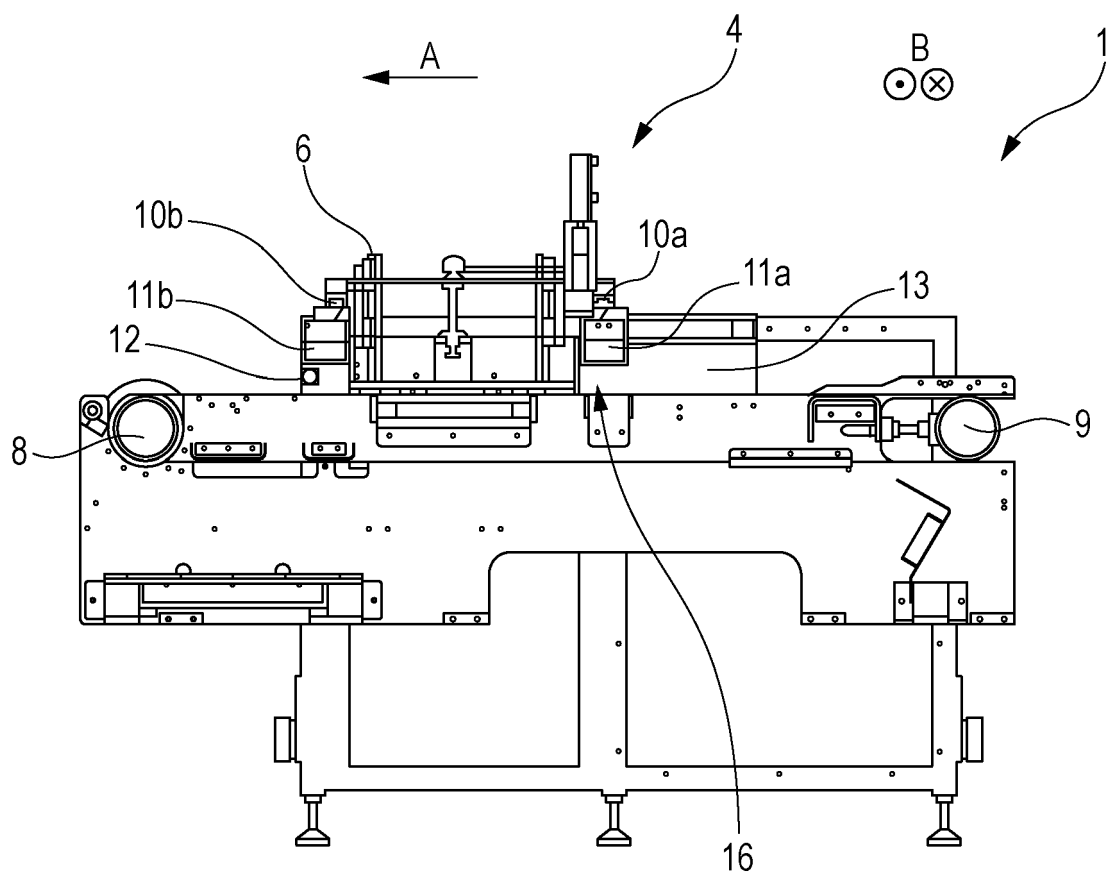


FIG. 5

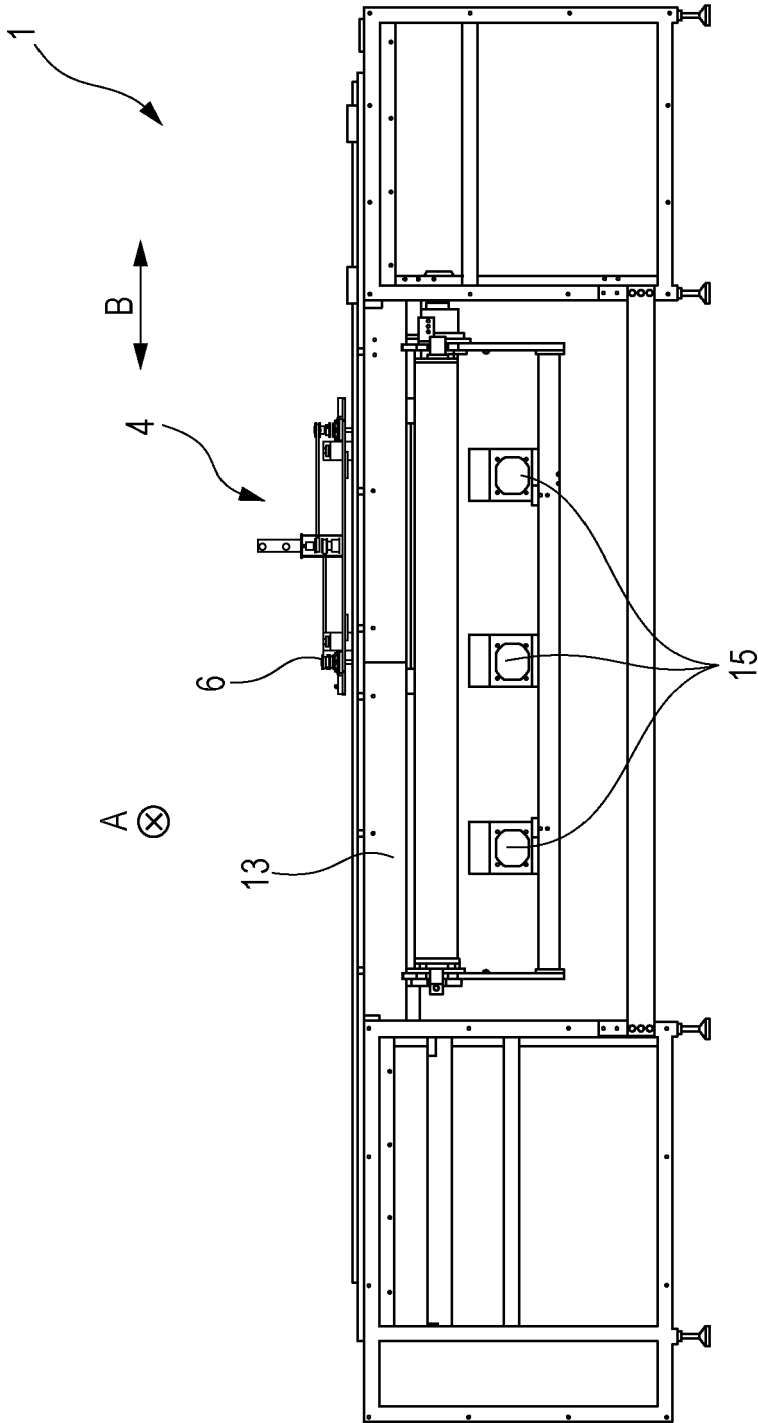


FIG. 6

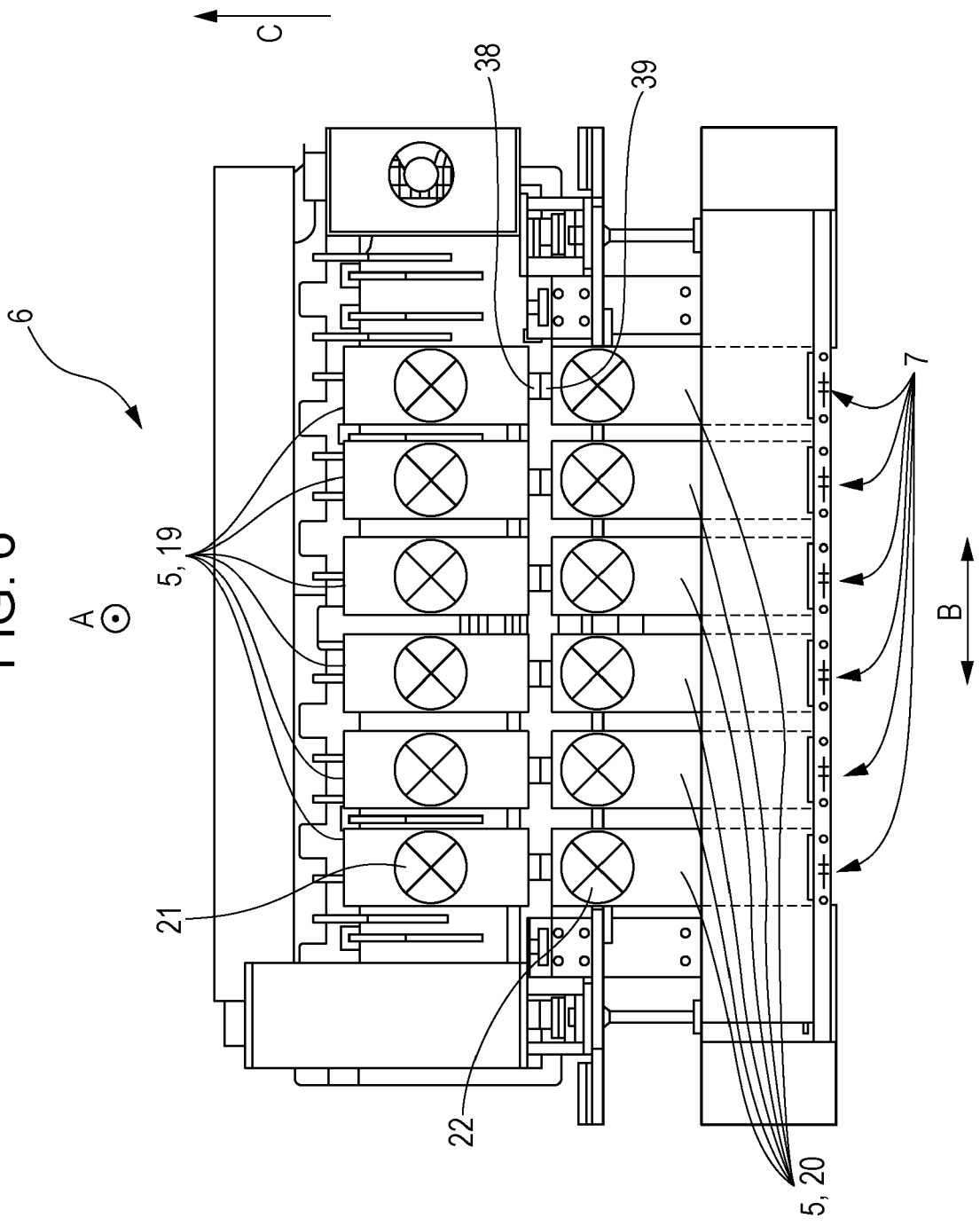


FIG. 7

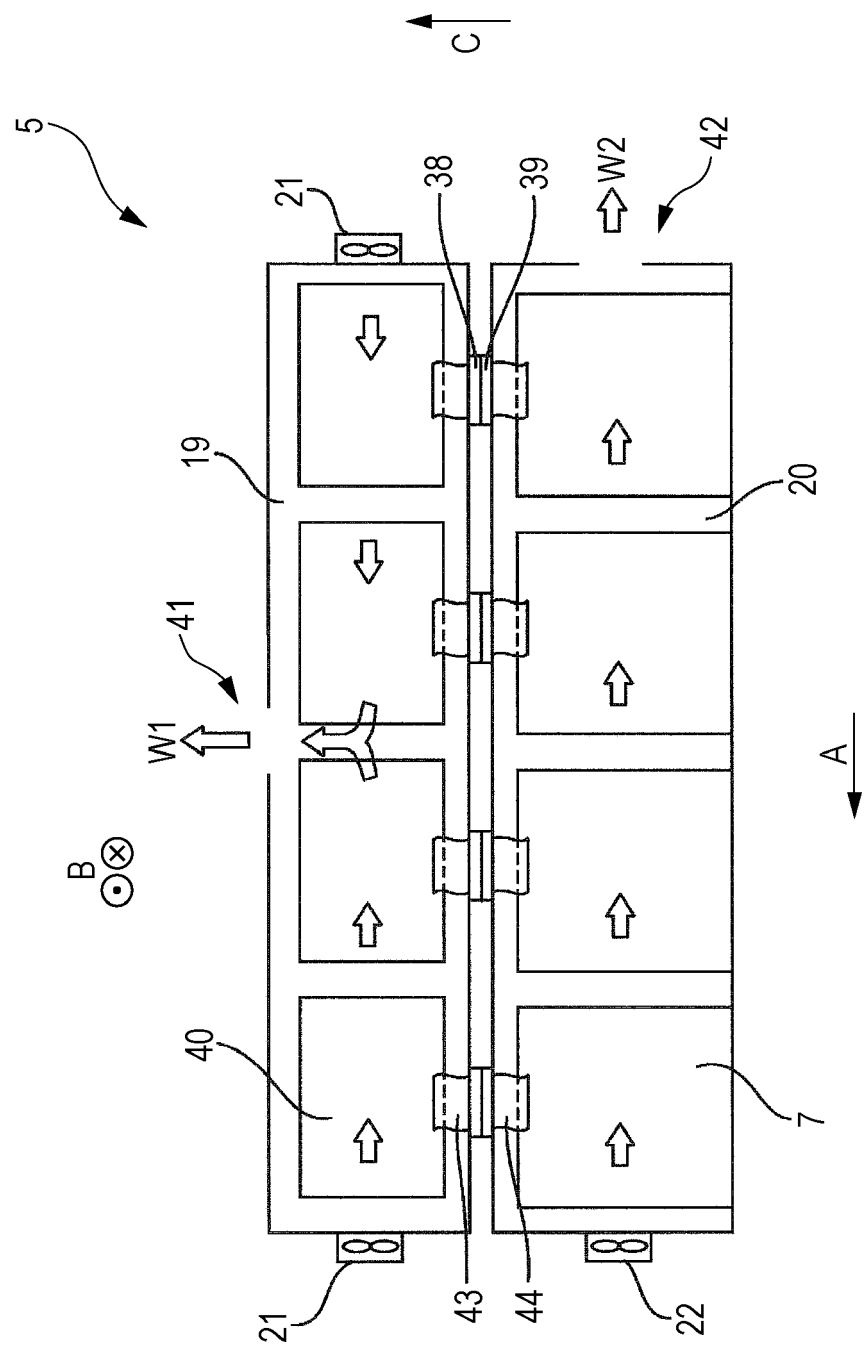
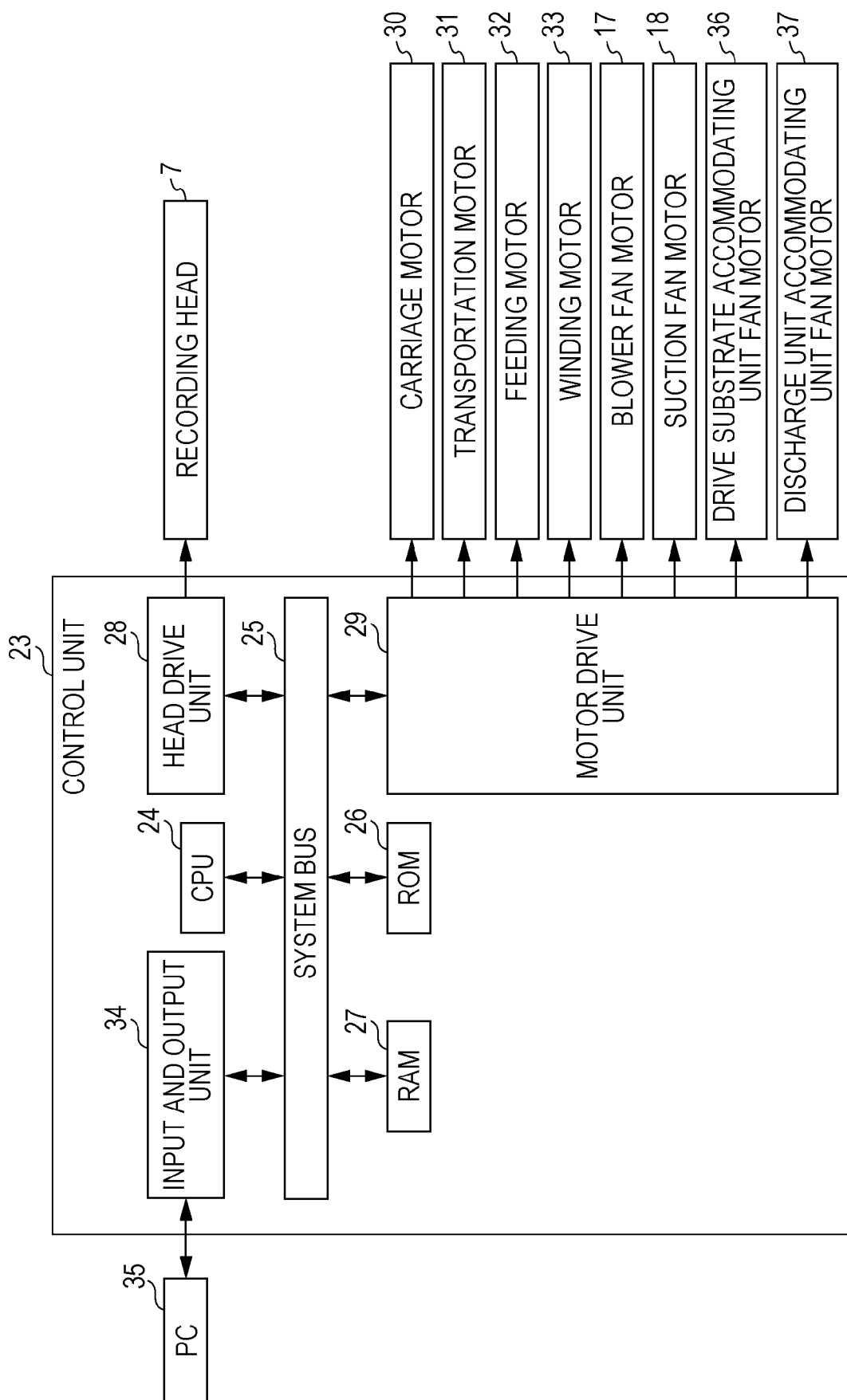


FIG. 8





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 Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 January 2017	Examiner Cavia Del Olmo, D
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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