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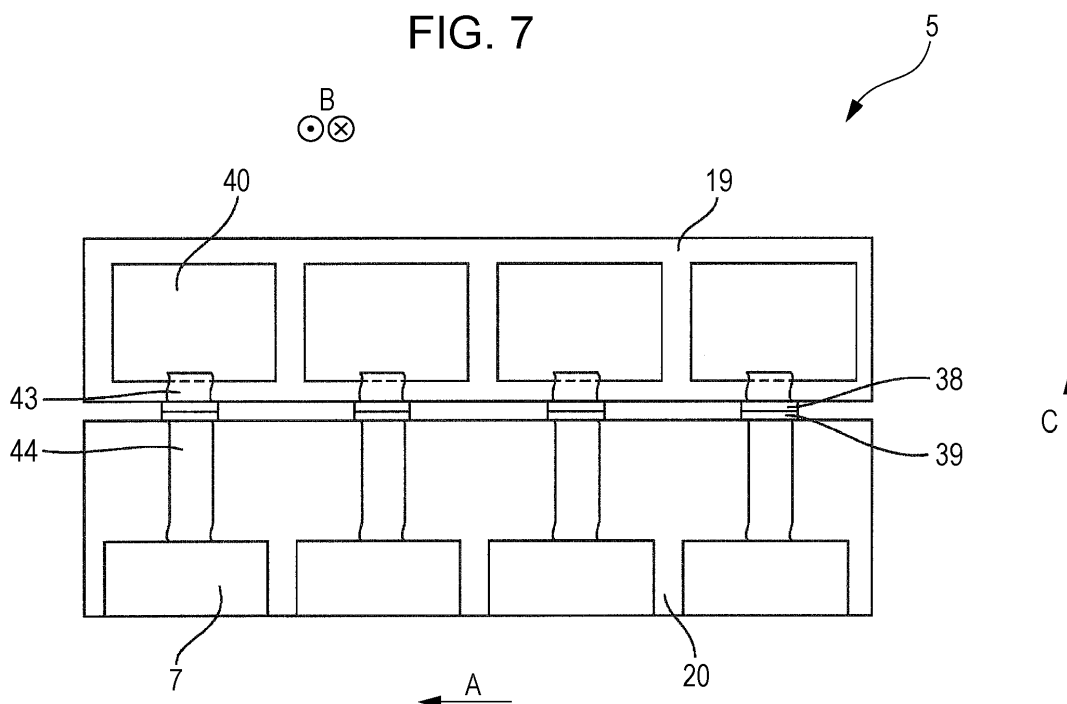
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(54) **LIQUID DISCHARGE APPARATUS**

(57) A liquid discharge apparatus includes a discharge unit that discharges liquid; a discharge unit accommodating unit that accommodates the discharge unit; a drive substrate that drives the discharge unit; and a drive substrate accommodating unit that is provided

separately from the discharge unit accommodating unit, and accommodates the drive substrate. With the liquid discharge apparatus of such a configuration, it is possible to suppress transmission of heat of the drive substrate to the discharge unit.

FIG. 7



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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 by discharging liquid such as ink and the like on a medium, is disclosed. Such a liquid discharge apparatus includes a liquid discharge unit and a drive substrate for driving the discharge unit.

[0003] For example, in JP-A-2010-179499 and JP-A-2014-94454, a liquid discharge apparatus including a liquid discharge unit and a drive substrate for driving the discharge unit is disclosed.

[0004] A drive substrate is heated when being driven. Meanwhile, there is a case where adverse effects such as a nozzle for discharging liquid being easily clogged, and the like occur, when the temperature of the discharge unit is increased. In addition, since the drive substrate is generally provided in the vicinity of the discharge unit, it is desired that heat generated due to driving of the drive substrate is not transmitted to the discharge unit.

SUMMARY

[0005] An advantage of some aspects of the invention is to suppress heat of the drive substrate transmitted to the discharge unit.

[0006] According to a first aspect of the invention, there is provided a liquid discharge apparatus including a discharge unit that discharges liquid; a discharge unit accommodating unit that accommodates the discharge unit; a drive substrate that drives the discharge unit; and a drive substrate accommodating unit that is provided separately from the discharge unit accommodating unit, and accommodates the drive substrate.

[0007] According to the aspect, the discharge unit accommodating unit that accommodates the discharge unit and the drive substrate accommodating unit that accommodates the drive substrate for driving the discharge unit may be provided separately. Therefore, it is possible to suppress the transmission of the heat of the drive substrate to the discharge unit.

[0008] According to a second aspect of the invention, the liquid discharge apparatus may further include a liquid flow path for supplying the liquid to the discharge unit, and the liquid flow path may be connected up to the discharge unit through the discharge unit accommodating unit, without being disposed in the drive substrate accommodating unit.

[0009] When liquid leaks from the liquid flow path and

the liquid adheres to the drive substrate, there is a possibility that the drive substrate is short-circuited. In addition, when the heat of the drive substrate is transmitted to the liquid flowing in the liquid flow path, there is a possibility that the discharge stability of the liquid from the discharge unit is reduced due to change in physical properties of the liquid such as viscosity or the like. Meanwhile, according to the aspect, the liquid flow path is connected up to the discharge unit through the discharge unit accommodating unit (from liquid accommodating unit or the like), without being disposed in the drive substrate accommodating unit. Therefore, it is possible to suppress that the liquid flowing in the liquid flow path adheres to the drive substrate or that the heat of the drive substrate is transmitted to the liquid flowing in the liquid flow path.

[0010] According to a third aspect of the invention, the discharge unit accommodating unit and the drive substrate accommodating unit may be connected by a connector terminal provided in the discharge unit accommodating unit and a connector terminal provided in the drive substrate accommodating unit.

[0011] When the transmission distance of signals (data) between the discharge unit and the drive substrate is long, there is a possibility that the loss of the transmission is generated at the time of transmitting the signals. However, according to the aspect, since the discharge unit accommodating unit and the drive substrate accommodating unit are connected by the connector terminal provided in the discharge unit accommodating unit and the connector terminal provided in the drive substrate accommodating unit (not connected by cable having long transmission distance), it is possible to shorten the transmission distance of signals between the discharge unit and the drive substrate. Therefore, it is possible to suppress the loss of the transmission at the time of transmitting the signals.

[0012] According to a fourth aspect of the invention, the discharge unit and the connector terminal provided in the discharge unit accommodating unit may be connected by a flexible flat cable, and the drive substrate and the connector terminal provided in the drive substrate accommodating unit may be connected by a flexible flat cable.

[0013] According to the aspect, the discharge unit and the connector terminal provided in the discharge unit accommodating unit are connected by the flexible flat cable, and the drive substrate and the connector terminal provided in the drive substrate accommodating unit are connected by the flexible flat cable. Therefore, it is possible to connect the discharge unit and the connector terminal provided in the discharge unit accommodating unit, and the drive substrate and the connector terminal provided in the drive substrate accommodating unit by using a simple configuration.

[0014] According to a fifth aspect of the invention, the drive substrate may be provided by being disposed so as not to face the discharge unit.

[0015] 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

[0016] Embodiments of the invention will now be described by way of example only and 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 schematic perspective view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 9 is a schematic perspective view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 10 is a schematic side view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 11 is a schematic perspective view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 12 is a schematic perspective view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 13 is a schematic perspective view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 14 is a schematic perspective view illustrating a main part of the recording apparatus of the embodiment of the invention.

Fig. 15 is a block diagram illustrating the recording apparatus of the embodiment of the invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0017] Hereinafter, a recording apparatus according to

an embodiment as a liquid discharge apparatus of the invention will be described in detail with reference to drawings.

[0018] First, an overview of a recording apparatus 1 according to the embodiment of the invention will be described.

[0019] Fig. 1 is a schematic perspective view of 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. 10) is detached from a carriage 6 is illustrated.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] The recording mechanism 4 includes a carriage motor 30 (see Fig. 15) for reciprocally moving in the reciprocal movement direction B of the carriage 6 including the recording head 7 capable of discharge ink (liquid).

[0025] In 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.

[0026] The recording apparatus 1 of the embodiment includes the recording head 7 that performs 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.

[0027] 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 of 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.

[0028] 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.

[0029] 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 provided at the position of the lower portion of the pipe 11a.

[0030] 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 the 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 the 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.

[0031] 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.

[0032] Here, Fig. 6 is a schematic front view of the carriage 6. In addition, Fig. 7 is a schematic side perspective view of the sub-carriage 5. In addition, Fig. 8 is a schematic perspective view of the sub-carriage 5. Fig. 9 is a schematic perspective view of the sub-carriage 5 in a state where housings 22 and 45 are removed.

[0033] 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.

[0034] 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.

[0035] In addition, as illustrated in Fig. 8, the drive substrate accommodating unit 19 includes a housing 22, and the discharge unit accommodating unit 20 includes a housing 45. So as to suppress the increment (heat is confined) of temperature inside the drive substrate accommodating unit 19 in accordance with the heat generation of the drive substrate 40, a plurality of holes 48 are provided in the housing 22.

[0036] In addition, as illustrated in Fig. 9, the drive substrate accommodating unit 19 includes a heat transfer plate 21 that is in contact with the housing 22 inside the housing 22 and the drive substrate 40 at the same time, and easily transmits the heat of the drive substrate 40 to the housing 22.

[0037] In addition, as illustrated in Fig. 8 and Fig. 9, inside the discharge unit accommodating unit 20, an ink flow path 46 (liquid flow path) for supplying the ink from the ink cartridge (liquid containing portion) not illustrated to the recording head 7 is provided. In the sub-carriage 5, the ink flow path 46 is configured in only the discharge unit accommodating unit 20 without going through the drive substrate accommodating unit 19 (disposed in only discharge unit accommodating unit 20, and not disposed in drive substrate accommodating unit 19).

[0038] In addition, as illustrated in Fig. 8 and Fig. 9, a protrusion portion 42 is formed in the discharge unit accommodating unit 20, and a fitting hole 41 fitted with the protrusion portion 42 is formed in the drive substrate accommodating unit 19. In addition, in the drive substrate accommodating unit 19, a handle 49 is formed on the opposite side (vertical direction on C side) to a side connected with the discharge unit accommodating unit 20. By the configuration, it is possible for the sub-carriage 5 of the embodiment to easily bond the discharge unit accommodating unit 20 and the drive substrate accommodating unit 19, and it is possible for the sub-carriage 5 of the embodiment to easily remove the drive substrate accommodating unit 19 from the discharge unit accommodating unit 20.

[0039] Next, the discharge unit accommodating unit 20 of the sub-carriage 5 will be described in more detail.

[0040] Here, Fig. 10 is a schematic side sectional view of the sub-carriage 5, and illustrates the drive substrate accommodating unit 19 in which the inside thereof is omitted. In addition, Fig. 11 is a schematic perspective view of the discharge unit accommodating unit 20. In addition, Fig. 12 is a schematic perspective view of the discharge unit accommodating unit 20 in a state where the housing 45 is removed. In addition, Fig. 13 is a schematic perspective view of a part of the discharge unit accommodating unit 20 in a state where a part of a head unit 47 is removed from the discharge unit accommodating unit 20. In addition, Fig. 14 is a schematic perspective view of a part of the discharge unit accommodating unit 20.

[0041] As illustrated in Fig. 10, Fig. 12, Fig. 13, and Fig. 14, the discharge unit accommodating unit 20 of the embodiment includes a plate shape portion 36 and a heat transfer plate 37. In addition, as illustrated in Fig. 10, the FFC 44 is connected with the connection portion 39 in a state where the FFC 44 is in contact with the plate shape portion 36, the plate shape portion 36 and the heat transfer plate 37 are in contact with each other, and the heat transfer plate 37 and the housing 45 are in contact with each other. By the configuration, a configuration where the heat of the FFC 44 (and recording head 7) can be transmitted (released) to the housing 45, can be imple-

mented.

[0042] In addition, as illustrated from Fig. 12 to Fig. 14, the discharge unit accommodating unit 20 of the embodiment is configured so as to be able to remove the head unit 47 of four pairs of the recording head 7 on a unit basis. As illustrated in Fig. 13, on the bottom portion of the discharge unit accommodating unit 20, mounting holes 50 for and corresponding to the recording heads 7 are formed. In addition, as illustrated in Fig. 14, by fixing the head unit 47 at a screw fixing portion 51, the head unit 47 can be fixed to the discharge unit accommodating unit 20.

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

[0044] Fig. 15 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 temporarily 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, through the system bus 25.

[0048] Here, the carriage motor 30 is a motor for moving 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 the feeding portion for feeding the target recording medium set to the feeding portion not illustrated to the transportation mechanism 3. In addition, the winding motor 33 is a drive motor for driving the winding mechanism not illustrated for winding 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. Similarly, the suction fan motor 18 is a motor for driving the suction fan 15.

[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 discharge unit accommodating unit 20 accommodating the recording head 7, the drive substrate 40 for driving the recording head 7, and the drive substrate accommodating unit 19 separately provided from the discharge unit accommodating unit 20 and accommodating the drive substrate 40. That is, the recording apparatus 1 includes the discharge unit accommo-

dating unit 20 accommodating the recording head 7, and the drive substrate accommodating unit 19 accommodating the drive substrate 40 for driving the recording head 7, as a separate body. Therefore, it is possible to implement a configuration which can suppress the heat of the drive substrate 40 transmitted to the recording head 7.

[0051] In the recording apparatus 1 of the embodiment, the position of the control unit 23 as a control substrate (substrate for controlling the entire driving of recording apparatus 1) is not apparent. However, for example, it is possible for the control unit 23 to be installed in the drive substrate accommodating unit 19.

[0052] In addition, the recording apparatus 1 of the embodiment includes the ink flow path 46 for supplying the ink to the recording head 7, and the ink flow path 46 is connected from the ink cartridge not illustrated to the recording head 7 through the discharge unit accommodating unit 20, without being disposed in the drive substrate accommodating unit 19.

[0053] There is a possibility that ink leaks from the ink flow path 46 and the drive substrate 40 is short-circuited when the ink is attached to the drive substrate 40. In addition, when the heat of the drive substrate 40 is transmitted to the ink flowing in the ink flow path 46, there is a possibility that the discharge stability of the ink from the recording head 7 is reduced by changing physical properties of the ink such as viscosity or the like. Meanwhile, in the recording apparatus 1 of the embodiment, the ink flow path 46 is connected from the ink cartridge not illustrated to the recording head 7 through the discharge unit accommodating unit 20, without being positioned in the drive substrate accommodating unit 19. Therefore, it is possible to implement a configuration which can suppress that the ink flowing in the ink flow path 46 is attached to the drive substrate 40 or the heat of the drive substrate 40 is transmitted to the ink flowing in the ink flow path 46.

[0054] In addition, as described above, in the recording apparatus 1 of the embodiment, the discharge unit accommodating unit 20 and the drive substrate accommodating unit 19 are connected by the connector terminal (connection portion 39) provided in the discharge unit accommodating unit 20 and the connector terminal (connection portion 38) provided in the drive substrate accommodating unit 19.

[0055] When the transmission distance of signals (data) between the recording head 7 and the drive substrate 40 is long, there is a possibility that the loss of transmission is generated at the time of transmitting the signals. However, in the recording apparatus 1 of the embodiment, since the discharge unit accommodating unit 20 and the drive substrate accommodating unit 19 are connected by the connector terminal (connection portion 39) provided in the discharge unit accommodating unit 20 and the connector terminal (connection portion 38) provided in the drive substrate accommodating unit 19 (not connected by cable having a long transmission distance),

it is possible to shorten the transmission distance of signals between the recording head 7 and the drive substrate 40. Therefore, the loss of signals at the time of transmitting signals is suppressed.

[0056] In addition, as illustrated in Fig. 7 or the like, in the recording apparatus 1 of the embodiment, the recording head 7 and the connection portion 39 provided in the discharge unit accommodating unit 20 are connected by the FFC 44, and the drive substrate 40 and the connection portion 38 provided in the drive substrate accommodating unit 19 are connected by an FFC 43. According to the configuration, the recording head 7 and the connection portion 39 provided in the discharge unit accommodating unit 20, and the drive substrate 40 and the connection portion 38 provided in the drive substrate accommodating unit 19 are connected by using a simple configuration.

[0057] In addition, as illustrated in Fig. 7 and Fig. 9, the drive substrate 40 of the embodiment is provided along a direction (vertically upward direction C) relative to the recording head 7. Expressed in another way, the drive substrate 40 of the embodiment is provided by being disposed so as not to face the recording head 7. Therefore, it is possible to effectively suppress the transmission of the heat generated by the drive substrate 40 to the recording head 7.

[0058] 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) configured to discharge liquid;
 a discharge unit accommodating unit (20) that accommodates the discharge unit;
 a drive substrate (40) configured to drive the discharge unit; and
 a drive substrate accommodating unit (19) that is provided separately from the discharge unit accommodating unit, and accommodates the drive substrate.

2. The liquid discharge apparatus according to Claim 1, further comprising:

a liquid flow path (46) for supplying the liquid to the discharge unit,

wherein the liquid flow path is connected up to the discharge unit through the discharge unit accommodating unit, without being disposed in the drive substrate accommodating unit.

- 3. The liquid discharge apparatus according to Claim 1 or Claim 2, wherein the discharge unit accommodating unit and the drive substrate accommodating unit are connected by a connector terminal (39) provided in the discharge unit accommodating unit and a connector terminal (38) provided in the drive substrate accommodating unit. 5

- 4. The liquid discharge apparatus according to Claim 3, wherein the discharge unit and the connector terminal provided in the discharge unit accommodating unit are connected by a flexible flat cable (44), and the drive substrate and the connector terminal provided in the drive substrate accommodating unit are connected by a flexible flat cable (43). 10 15

- 5. 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. 20

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FIG. 1

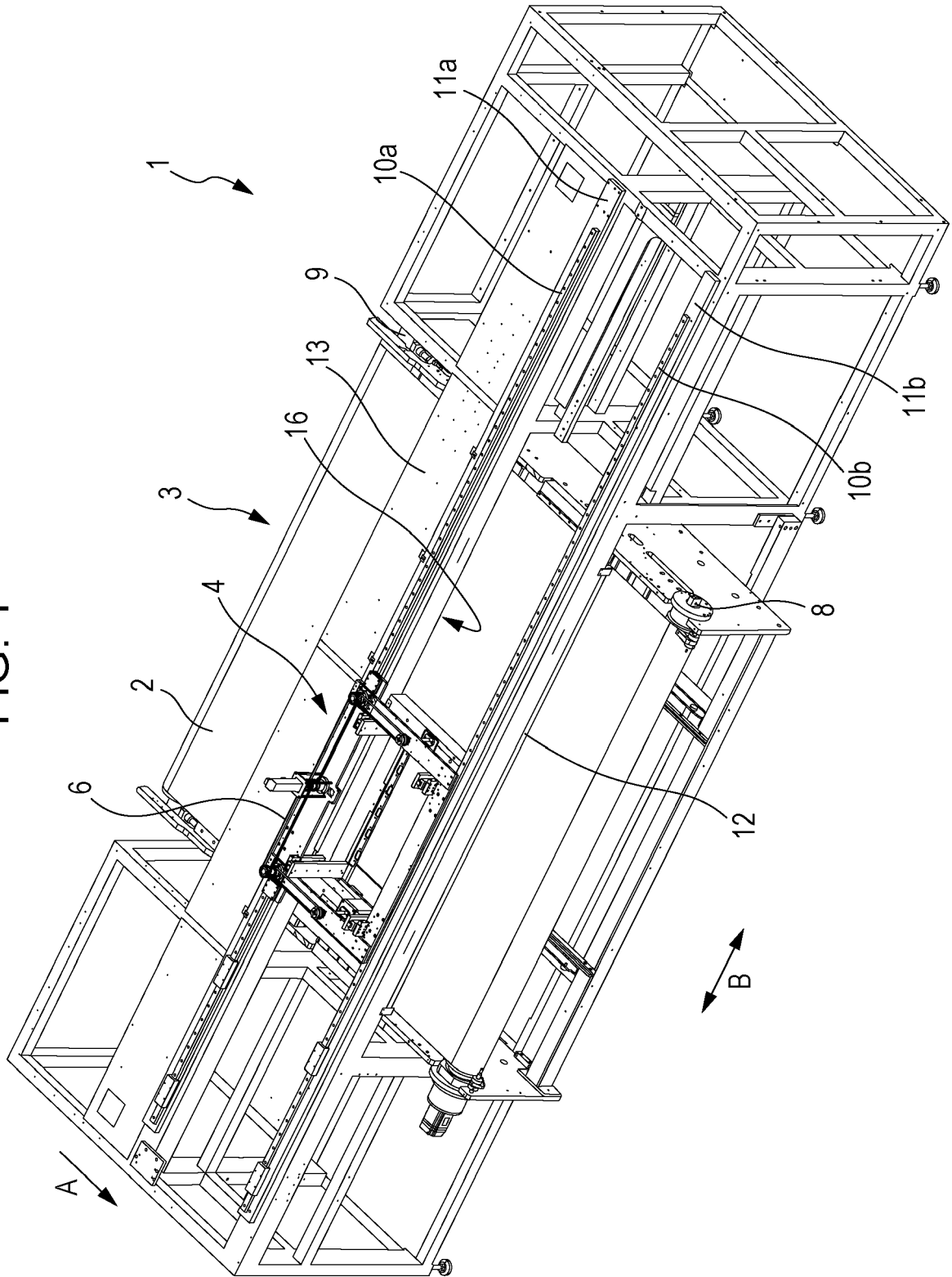


FIG. 2

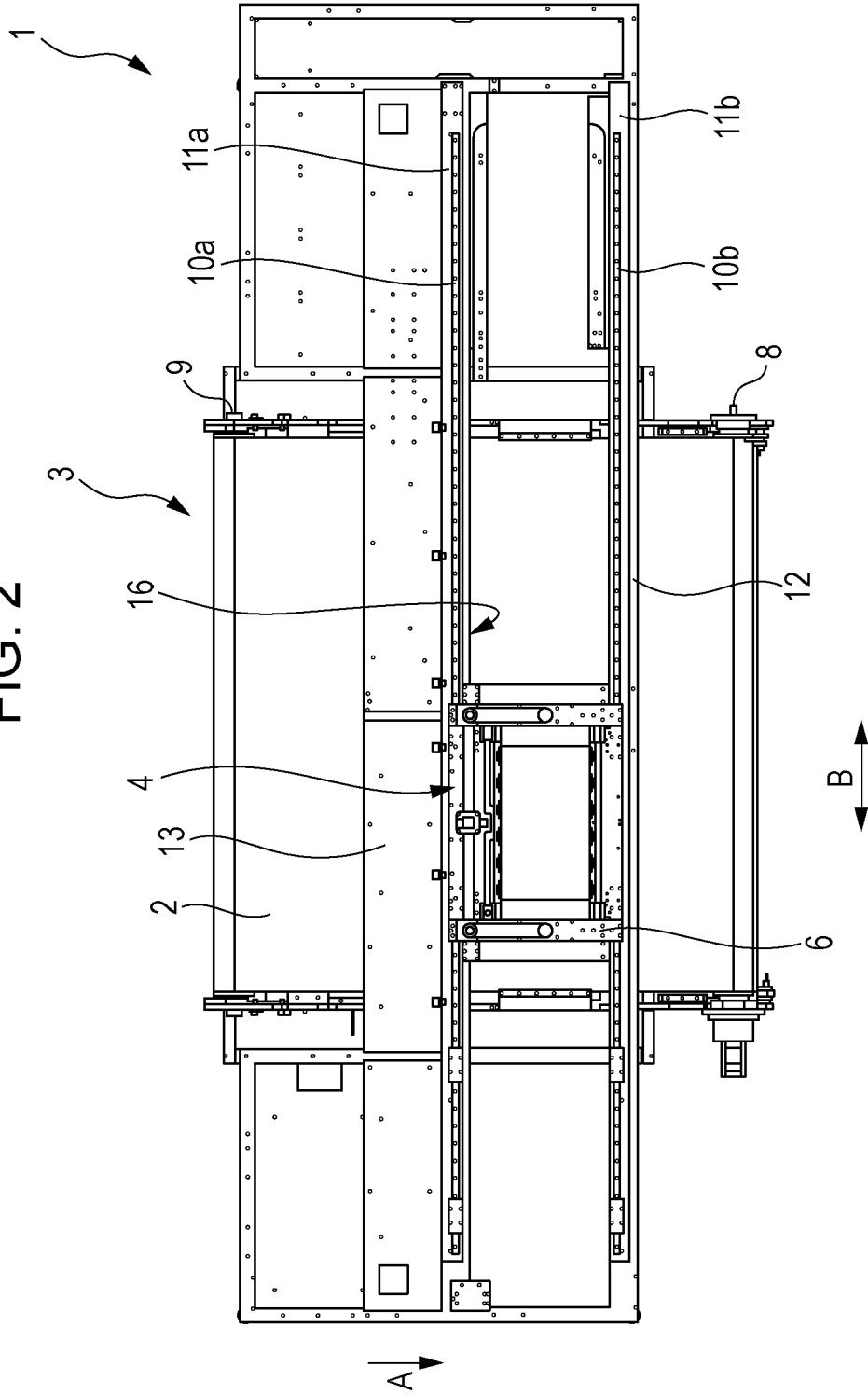


FIG. 3

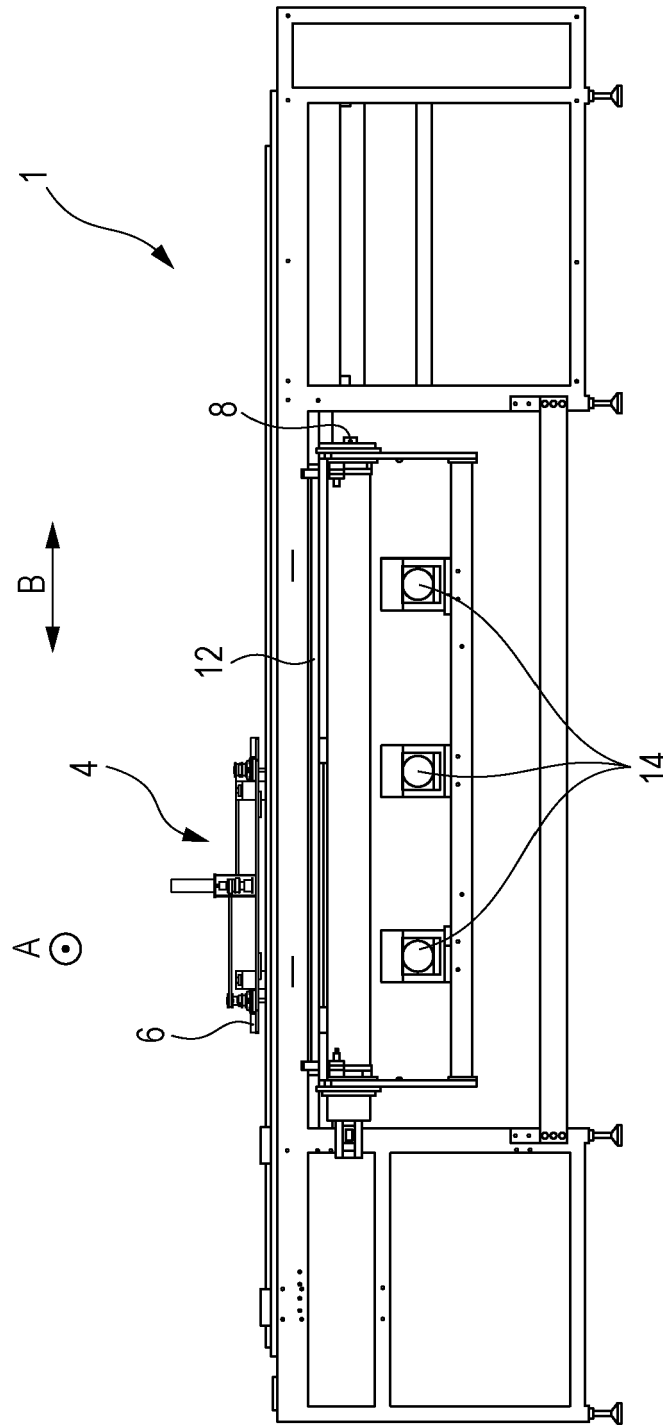
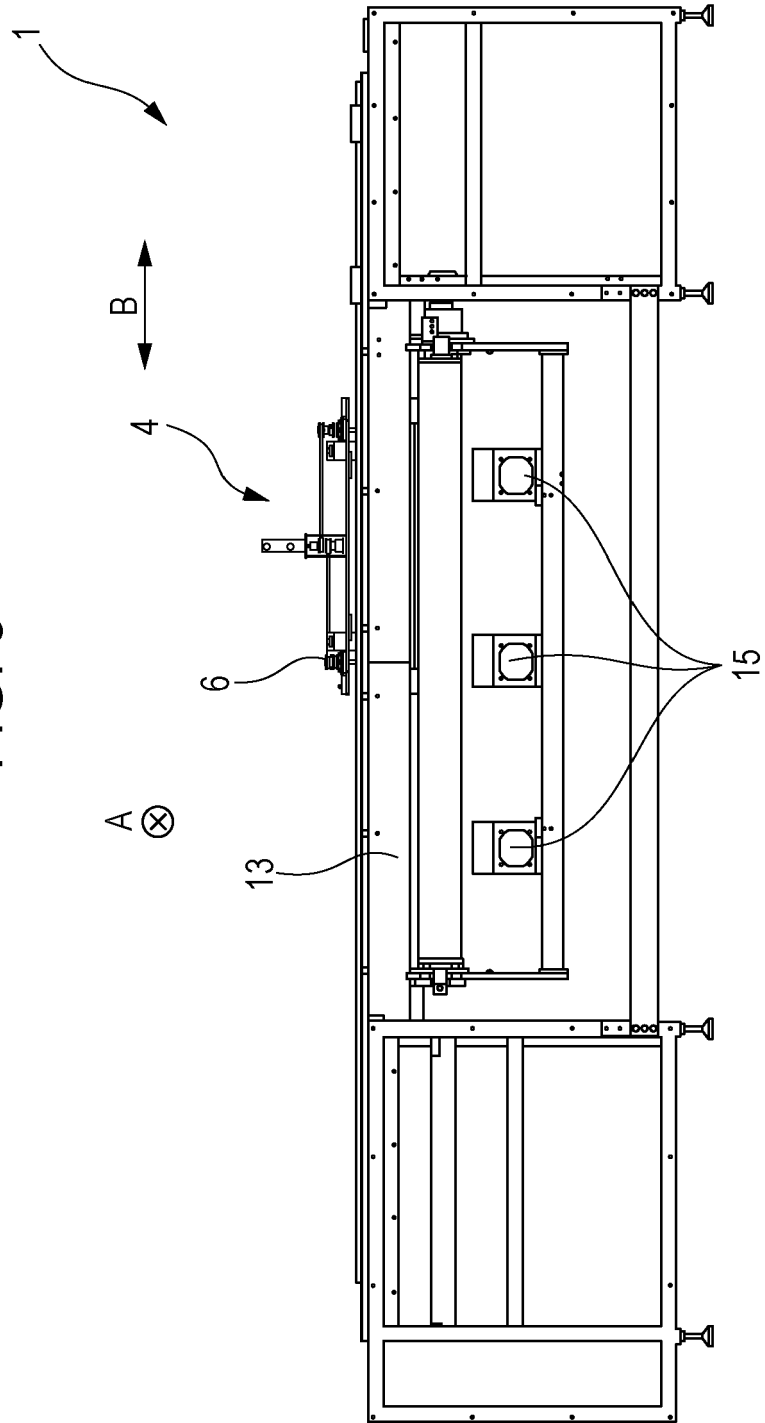
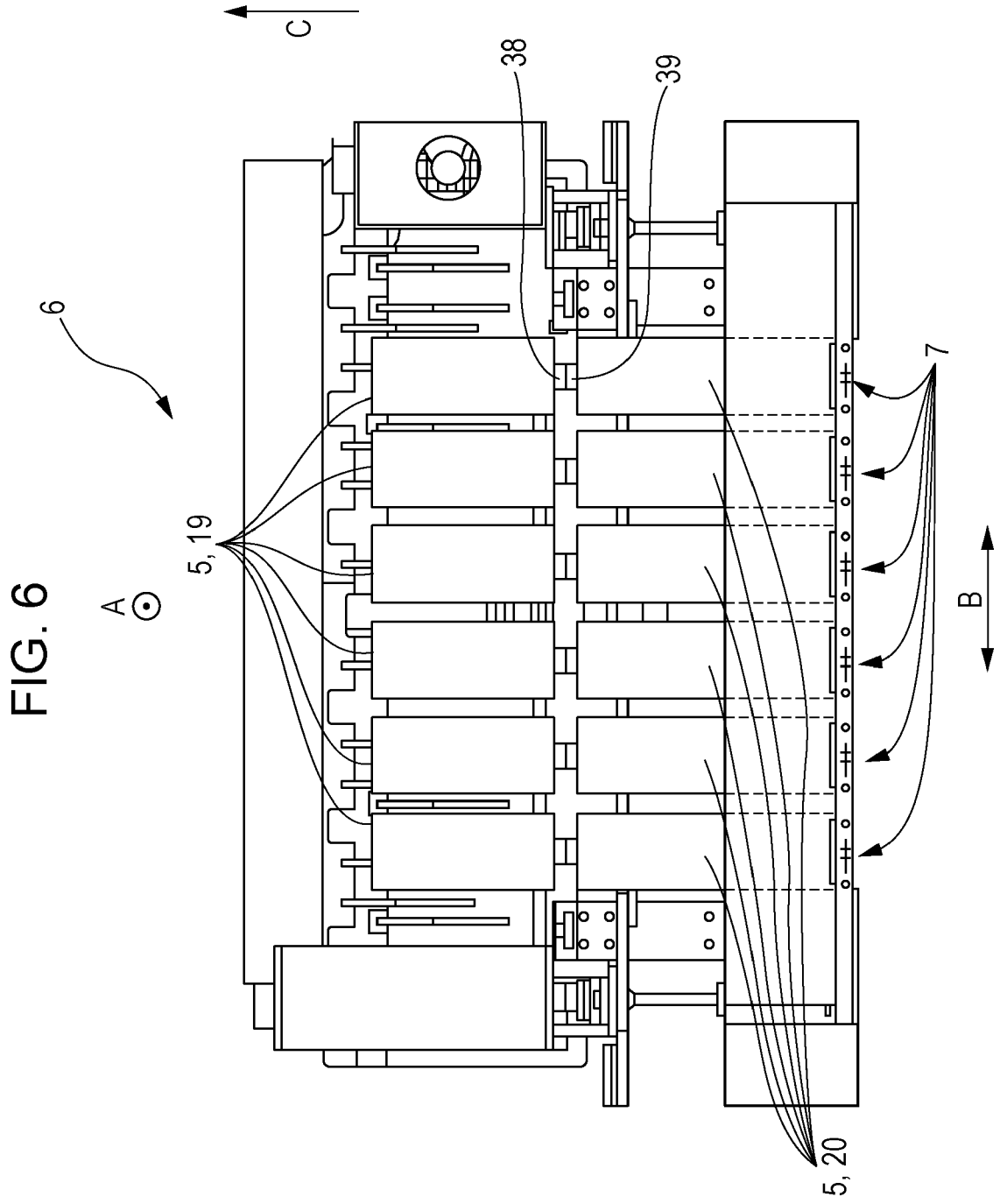


FIG. 5





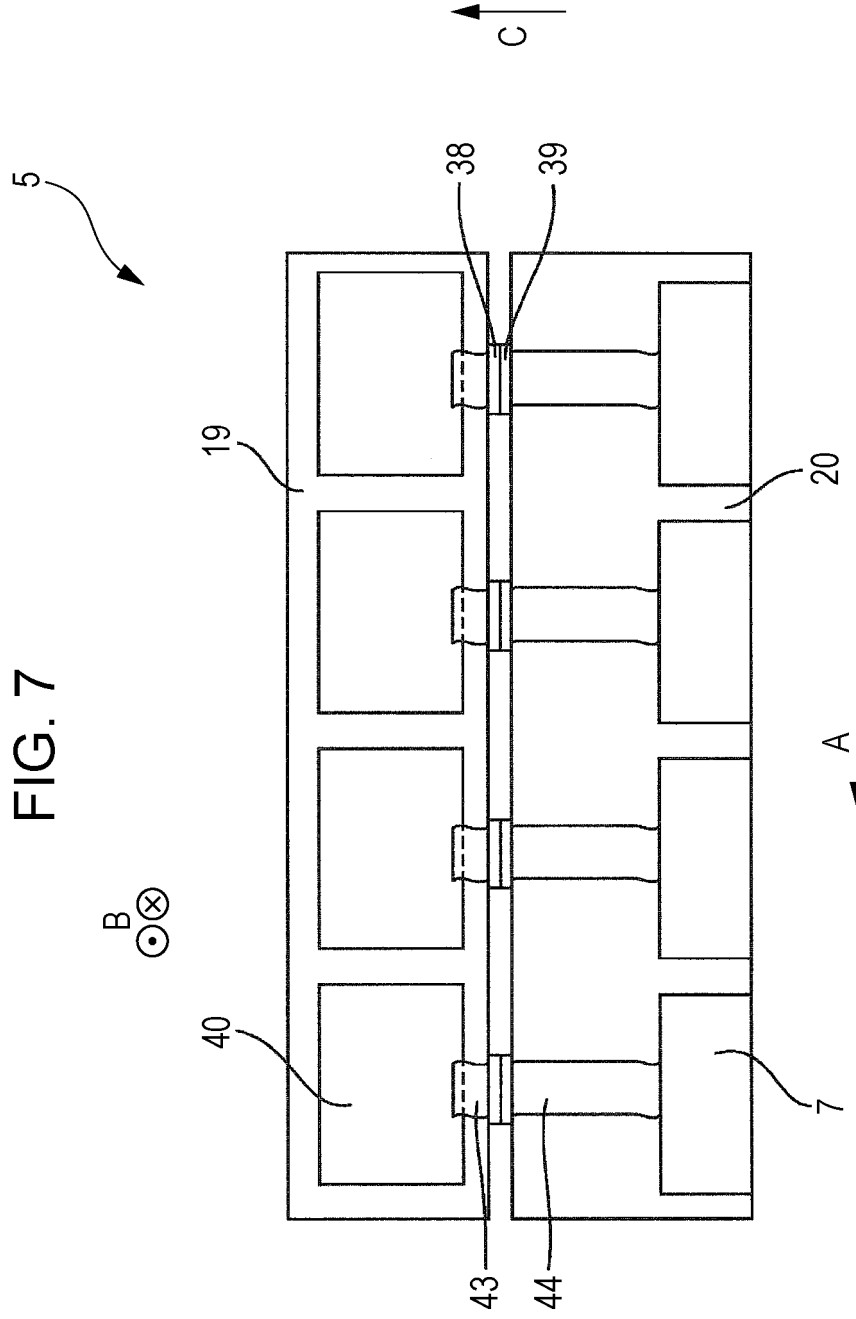


FIG. 8

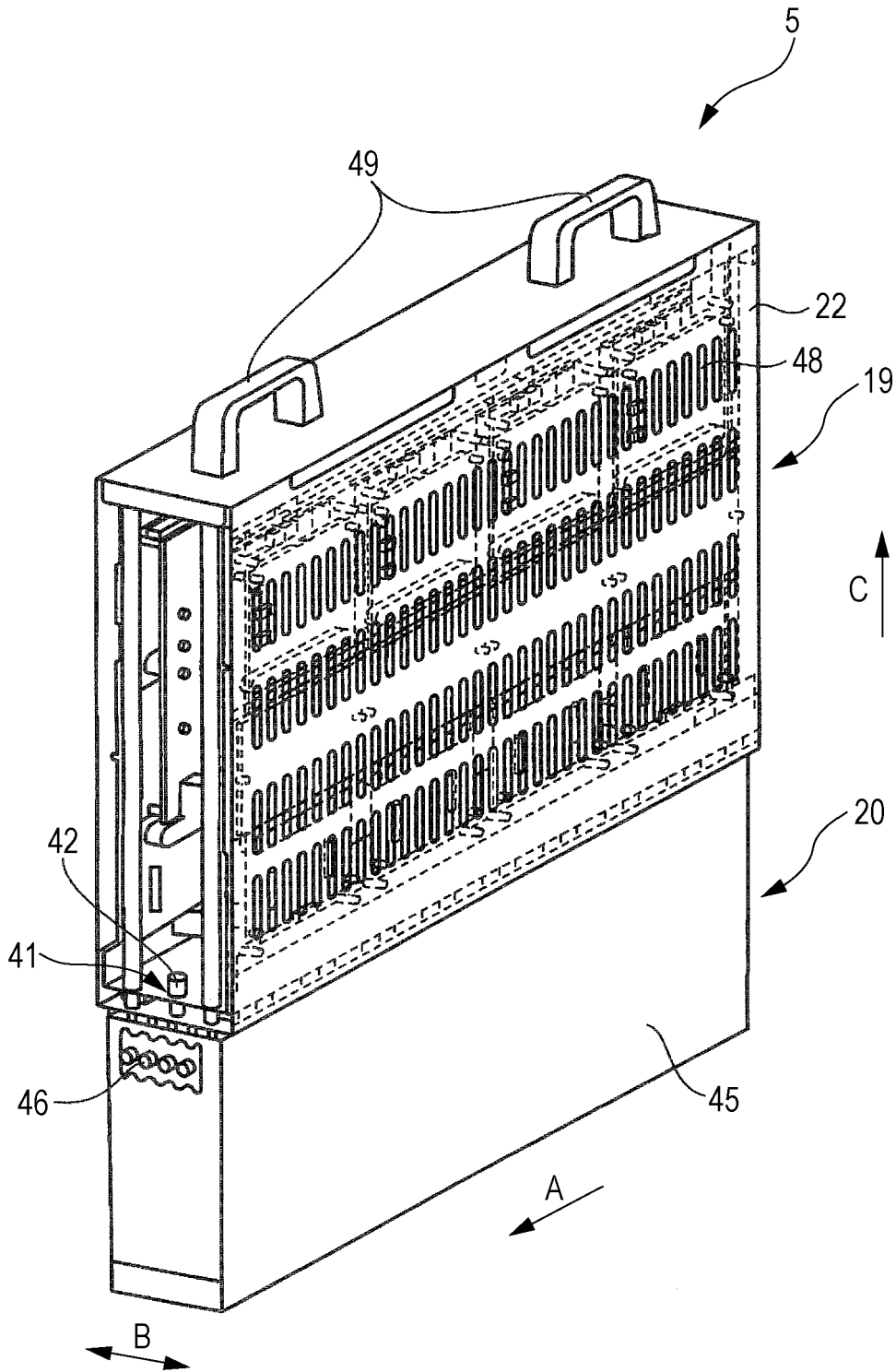


FIG. 9

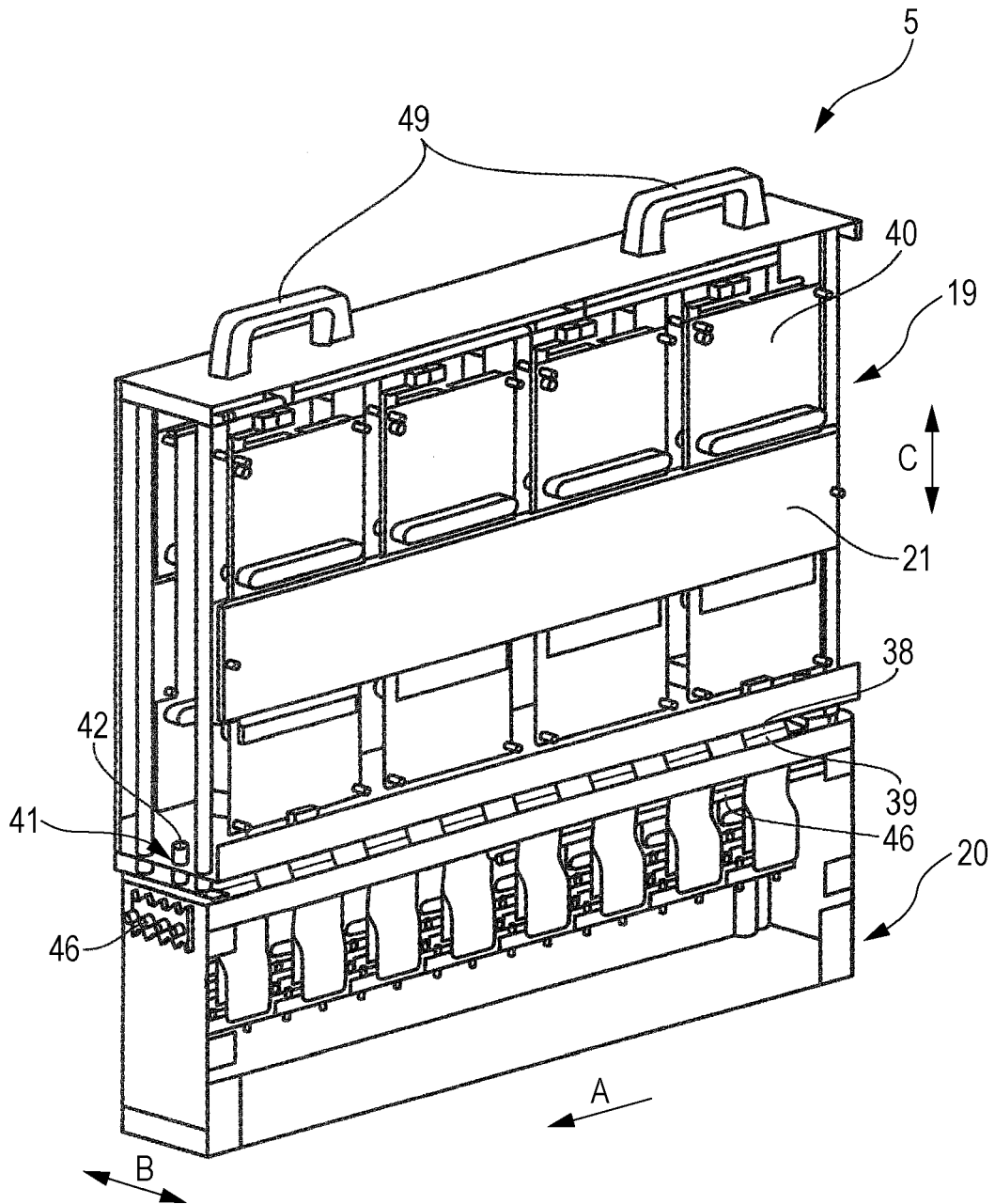


FIG. 10

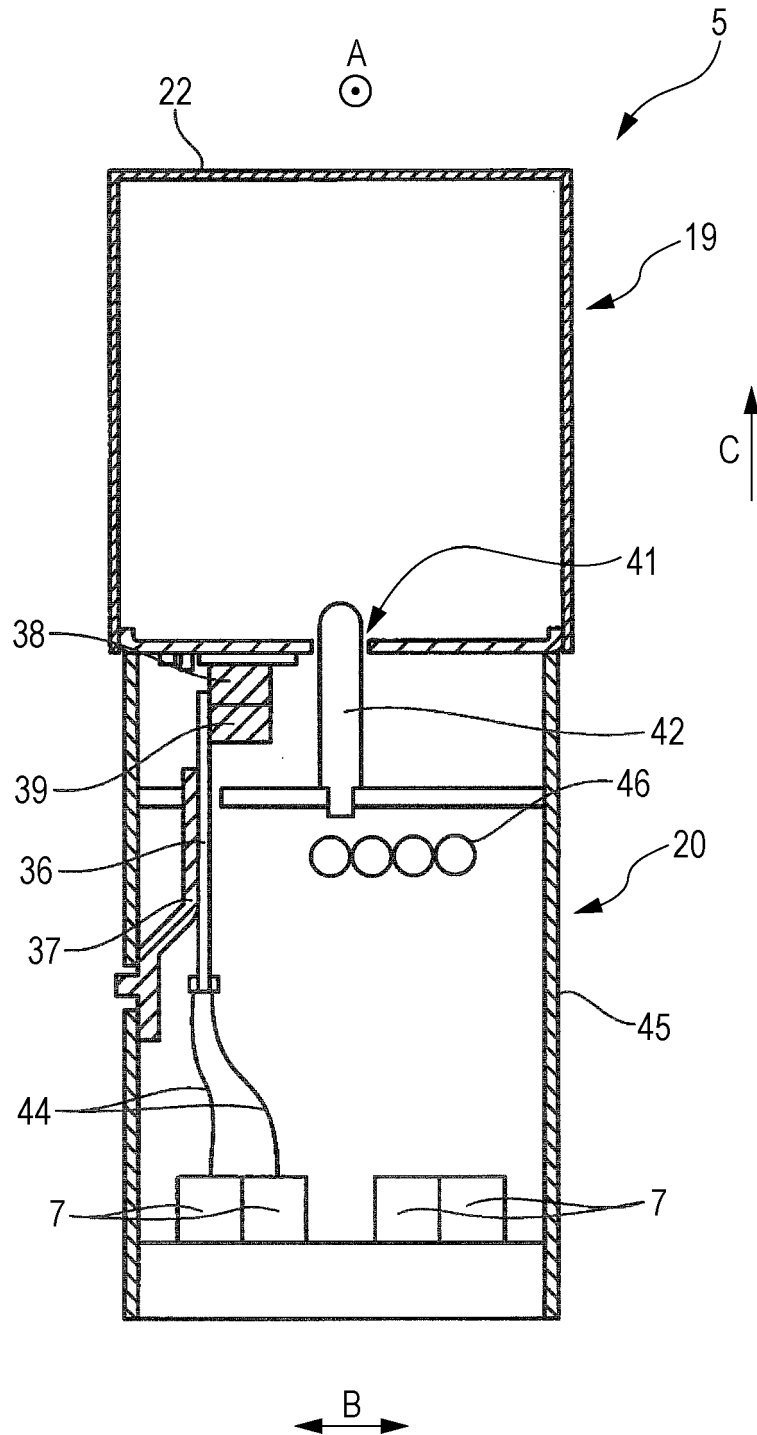


FIG. 11

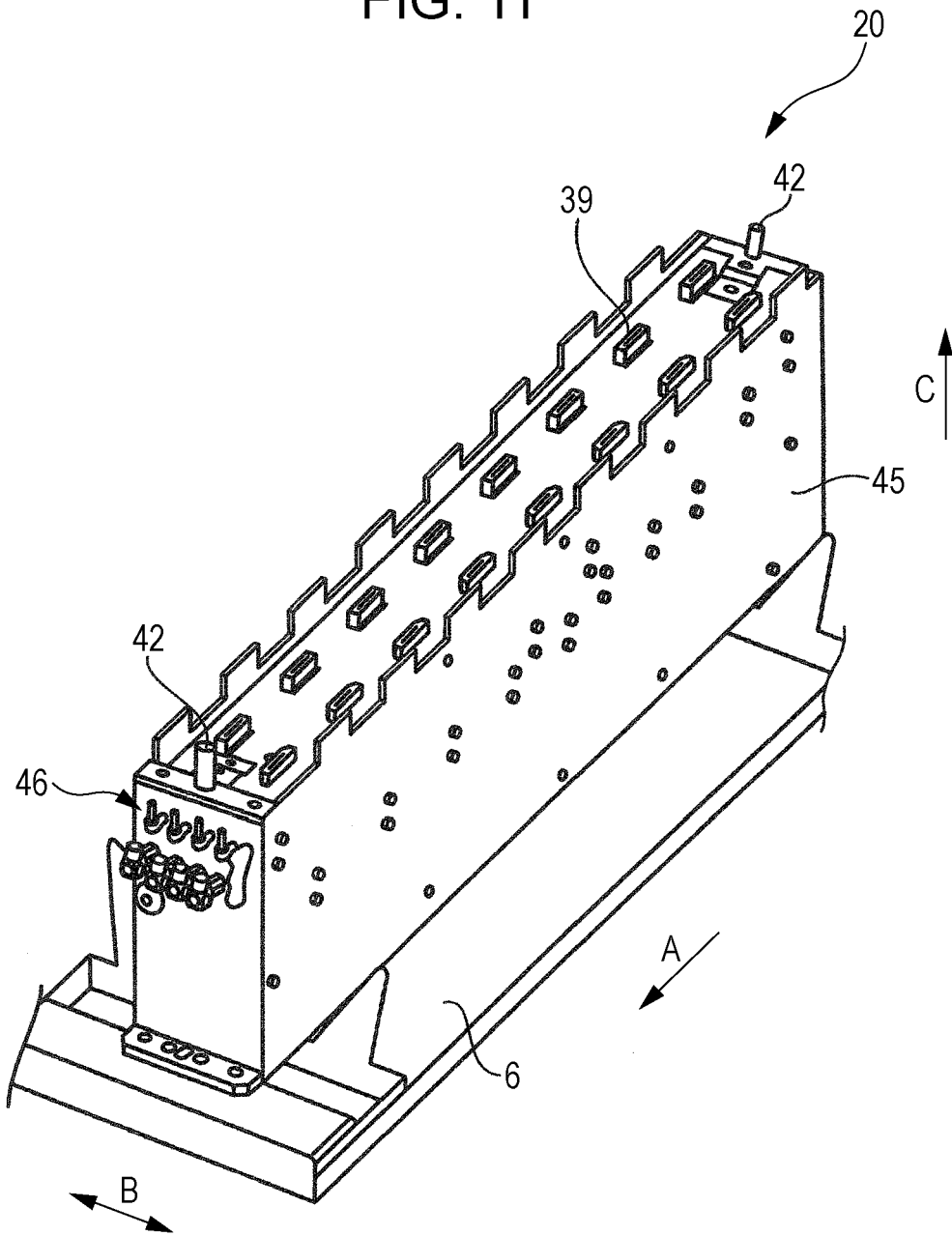


FIG. 12

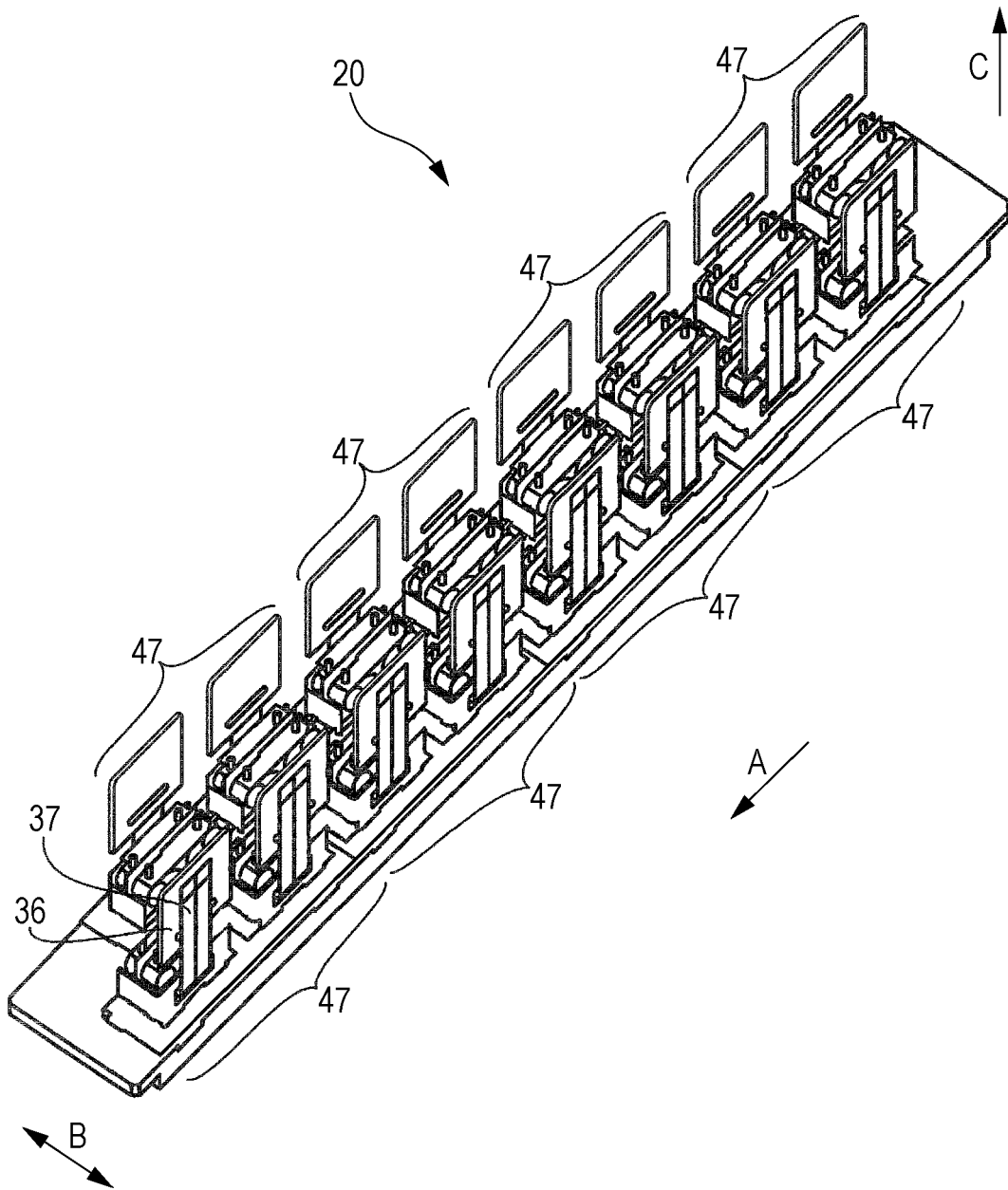


FIG. 13

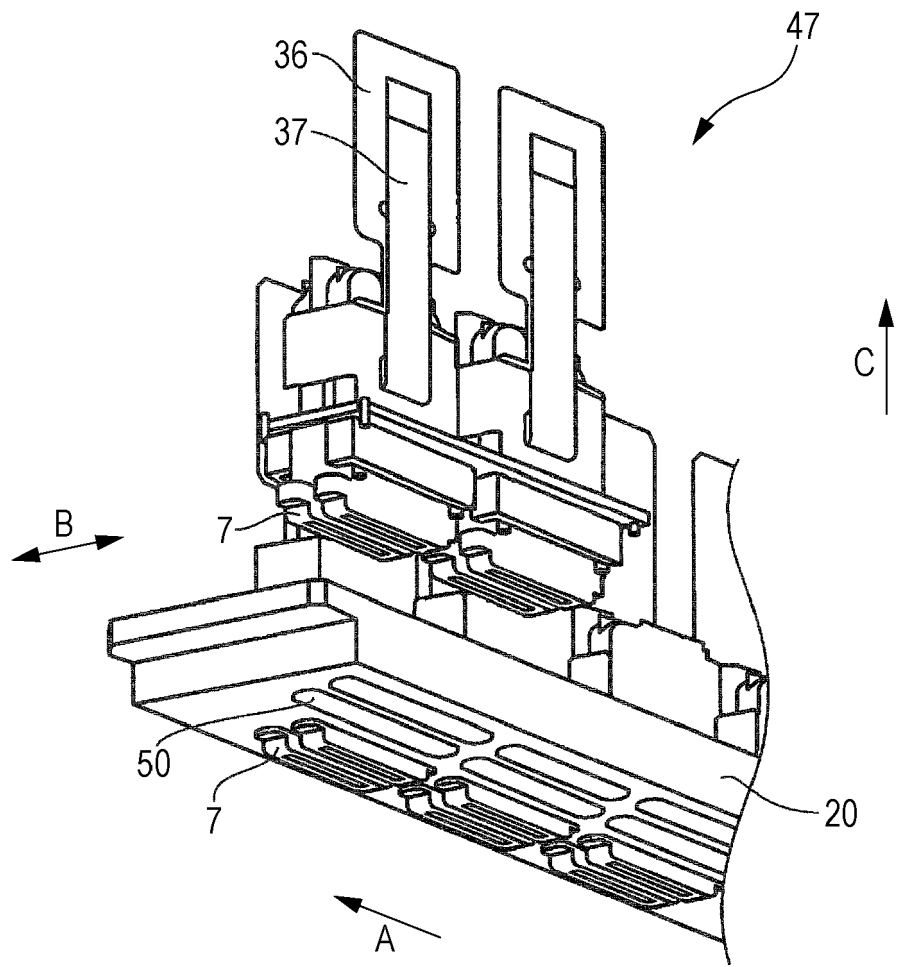


FIG. 14

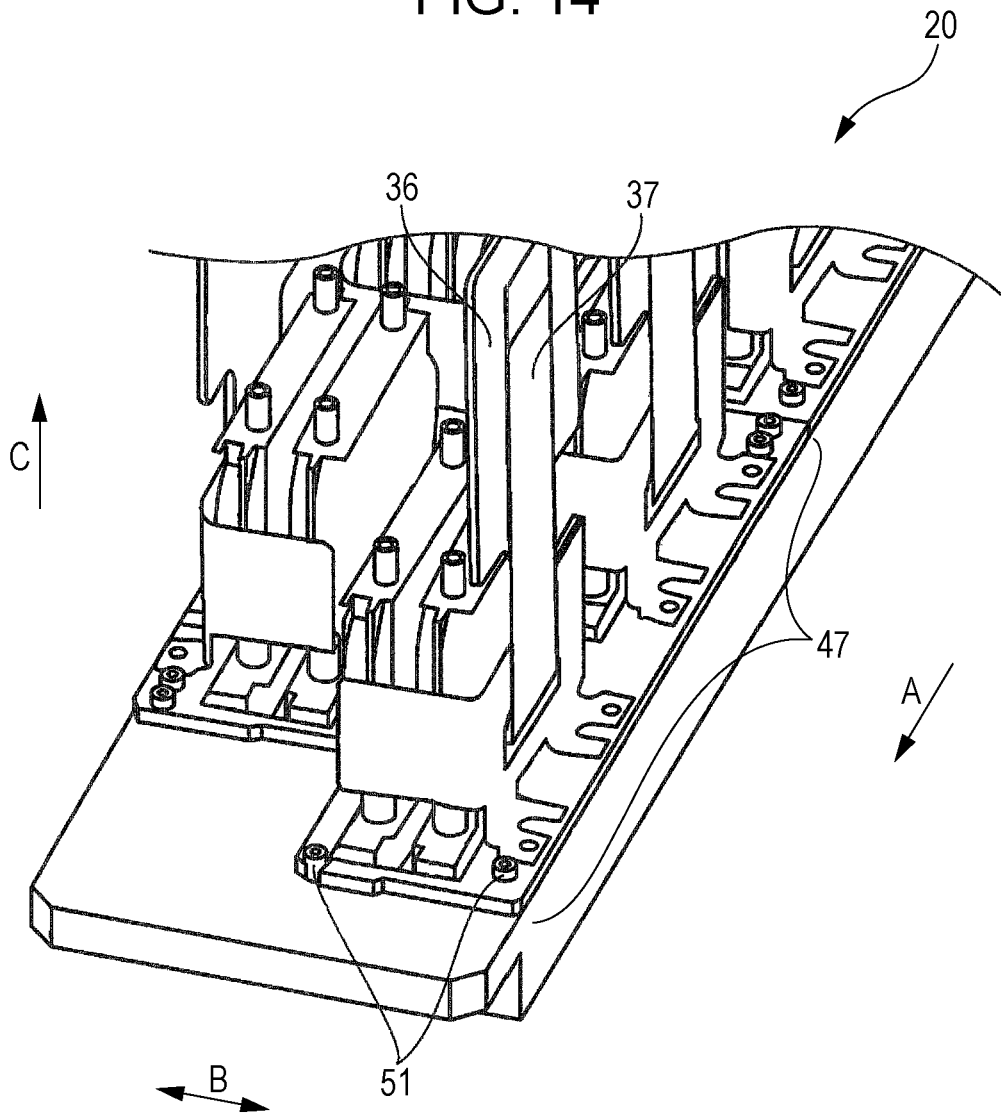
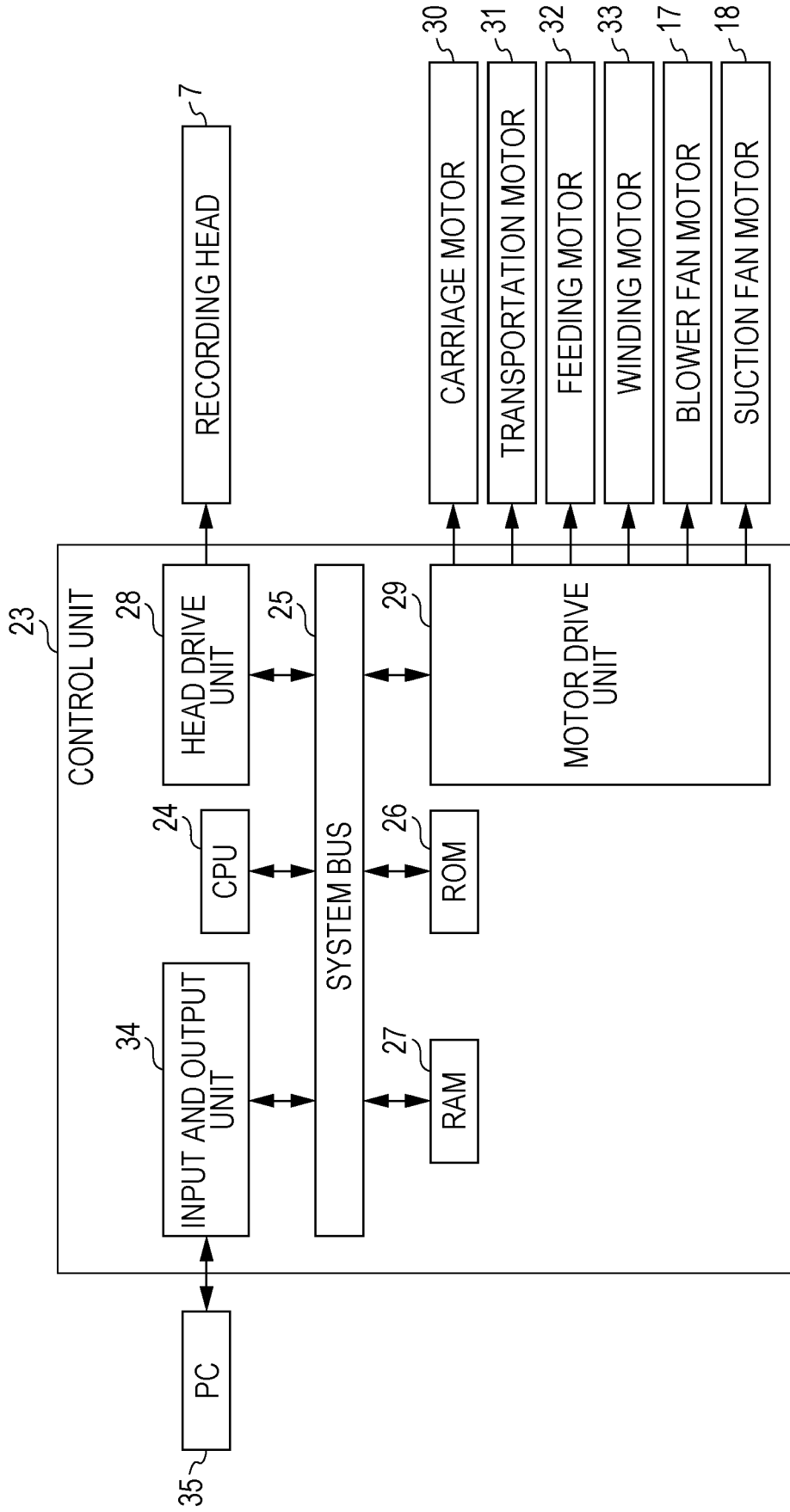


FIG. 15





EUROPEAN SEARCH REPORT

Application Number
EP 16 19 5922

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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