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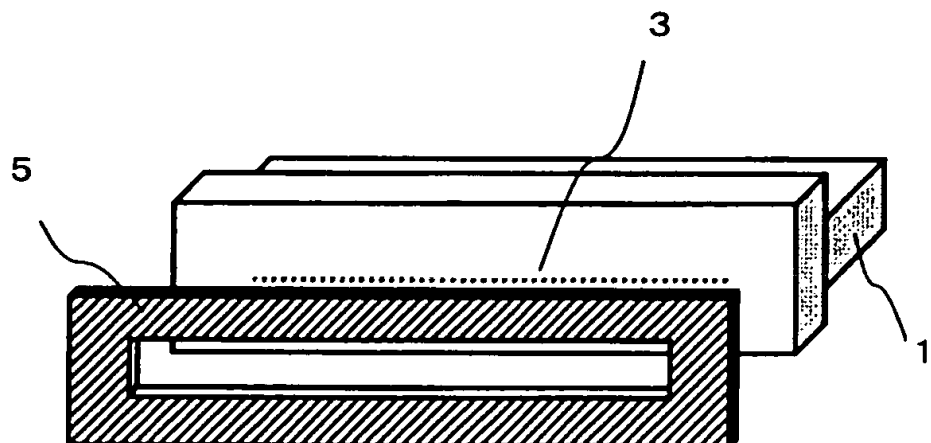
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(54) **Ink jet recorder**

(57) An ink jet recorder of the present invention provides an apparatus in which an ink drip from a nozzle plate is prevented, deterioration of image quality is suppressed, and damage to the nozzle plate is prevented. An ink jet recorder for performing recording by an ink jet head on a medium to be recorded is constructed by including a hydrophilic nozzle plate 4, an ink absorber 5 which absorbs ink, an absorber holding board 6, pressurizing means for supplying ink to the ink jet head, and a cap 9 which sucks ink in the ink absorber. Thus, ink is prevented from staying in the vicinity of nozzles, and the nozzle plate is prevented from being directly damaged, so it is possible to provide an ink jet recorder in which deterioration of image quality is prevented.

**FIG. 2**



**Description**

**[0001]** The present invention relates to an ink jet recorder capable of preventing deterioration of image quality of an ink jet print head having multiple nozzles for ejecting ink.

**[0002]** As a conventional ink jet recorder for performing recording, on a medium to be recorded, by an ink jet head for ejecting ink from multiple nozzles, there is known one in which an ink drip is prevented by devising a cap structure (for example, refer to JP 2002-301830 A (Fig. 1)).

**[0003]** In the following, a description will be made of a conventional ink jet recorder with reference to Fig. 7.

**[0004]** A cap of the conventional ink jet recorder is equipped with an ink introducing cap 101 for covering the nozzles of the ink jet head and introducing ink therein, and a waste ink removal cap 102 for removing waste ink 117 staying between the ink jet head 107 and a carriage 103. An ink introducing suction pump 105 is coupled to the ink introducing cap 101. The ink introducing cap 101, the waste ink removal cap 102, and the ink introducing suction pump 105 are included in a cap unit 104.

**[0005]** In the case of introducing ink into the ink jet head 107, the ink introducing cap 101 and the waste ink removal cap 102 are pressed against a nozzle plate 108 of the ink jet head 107 and the carriage 103 to come into intimate contact therewith by the cap unit 104. Then, the ink introducing pump 105 is driven, and ink is introduced into the ink jet head 107 by negative pressure.

**[0006]** At this time, as shown in Fig. 7, the waste ink removal cap 102 is constructed so as to remove the waste ink 117 present between the ink jet head 107 and the carriage 103 by an absorber 106 such as a sponge provided inside the cap. Further, the waste ink 117 staying in the cap passes through a tube 118 coupled to the waste ink removal cap 102 to accumulate in a waste ink tank (not shown).

**[0007]** As described above, when the cap is elevated, for example, in a printing standby state, it becomes possible to remove the waste ink 117 from between the ink jet head 107 and the carriage 103, thereby making it possible to prevent the medium to be recorded from being stained due to the ink drip.

**[0008]** In the conventional ink jet recorder described above, a cap structure with a complicated shape is necessary, and high-precision quality is required for a finished shape of the cap.

**[0009]** Further, while the recording on the medium to be recorded is performed by continuous or intermittent ejection of the ink from the multiple nozzles, satellites occur from the ink ejected at this time, a part of the satellites adhere onto the nozzle plate, and an ejection direction of the ink is deviated, leading to deterioration of image quality.

**[0010]** Further, the nozzle plate of the ink jet head on the carriage is directly exposed to a surface of the medium to be recorded, so the nozzle plate is prone to be damaged in the case where the nozzle plate accidentally contacts a wrinkle of the medium to be recorded and unexpected large dust on the medium to be recorded, resulting in the deterioration of the image quality.

**[0011]** The present invention is made in view of solving those problems inherent in such a conventional construction. It is an object of the present invention to provide an ink jet recorder in which the ink drip from the nozzle plate is prevented, the deterioration of the image quality is prevented, and damage to the nozzle plate is suppressed.

**[0012]** In order to achieve the above-described object, the present invention is an ink jet recorder for performing recording, on a medium to be recorded, by an ink jet head which ejects ink from multiple nozzles, the ink jet head including a hydrophilic nozzle plate. The ink jet recorder includes: an ink absorber which absorbs ink staying on the nozzle plate; absorber holding means for sandwiching and holding the ink absorber between the nozzle plate and the absorber holding means; pressurizing means for supplying ink to the ink jet head by pressurization; and suction means for sucking ink in the ink absorber.

**[0013]** Description will be made of its operation. The nozzle plate is made to be hydrophilic in the ink jet head. Further, the ink absorber is provided so as to contact the nozzle plate. Accordingly, unnecessary ink adhering onto the nozzle plate is diffused across the entire surface of the nozzle plate, and the ink absorber absorbs the ink. Therefore, the ink is prevented from staying in the vicinity of the nozzles, and the deterioration of the image quality is prevented. Further, the ink absorbed by the ink absorber is discharged to the outside by a suction operation performed by the suction means at a predetermined interval, so an ink drip from the absorber can be suppressed. Further, the absorber holding means holds the absorber between the nozzle plate and the absorber holding means itself, and covers the nozzle plate. Accordingly, the nozzle plate can be prevented from being directly damaged, and the deterioration of the image quality is prevented. Further, the ink jet head can be filled with ink by the pressurizing means.

**[0014]** According to a second means for solving the problem, in the inkjet recording apparatus of the present invention, the ink absorber is formed into such a frame shape that an opening is provided in a nozzle array portion on the nozzle plate.

**[0015]** Description will be made of its operation. The opening of the nozzle array portion enables ink ejection from the nozzles, and allow the ink absorber to efficiently absorb unnecessary ink which adheres onto the nozzle plate. Thus, the ink is suppressed from staying in the vicinity of the nozzles, and the deterioration of the image quality is prevented.

**[0016]** According to a third means for solving the problem, in the inkjet recording apparatus of the present invention, the ink absorber is made of a porous absorber.

**[0017]** Description will be made of its operation. The porous absorber can absorb ink more efficiently. As a result, the ink is prevented from staying in the vicinity of the nozzles, and the deterioration of the image quality is prevented.

**[0018]** According to a fourth means for solving the problem, in the ink jet recording apparatus of the present invention, the absorber holding means is formed into such a frame shape that an opening is provided in the nozzle array portion on the nozzle plate.

**[0019]** Description will be made of its operation. The opening of the absorber holding means enables the ink ejection from the nozzles, and the absorber holding means presses the ink absorber against the nozzle plate, thus making it possible for the ink absorber to absorb the ink. As a result, the ink is prevented from staying in the vicinity of the nozzles, and the deterioration of the image quality is prevented.

**[0020]** According to a fifth means for solving the problem, in the ink jet recording apparatus of the present invention, the opening of the nozzle array portion of the absorber holding means having a size set approximately equal to a size of the opening of the nozzle array portion of the ink absorber.

**[0021]** Description will be made of its operation. The size of the opening of the nozzle array portion of the absorber holding means is set approximately equal to the size of the opening of the nozzle array portion of the ink absorber, therefore preventing the ink absorber from being dragged out directly from outside.

**[0022]** According to a sixth means for solving the problem, in the ink jet recording apparatus of the present invention, the absorber holding means is constructed such that an outer periphery side of the ink absorber communicates with the atmosphere.

**[0023]** Description will be made of its operation. The outer periphery side of the ink absorber communicates with the atmosphere. Accordingly, the ink held by the ink absorber can be discharged from the outer periphery side of the ink absorber to the opening side by the suction means. Therefore, the ink drip from the absorber is suppressed, and the deterioration of the image quality is prevented.

**[0024]** According to a seventh means for solving the problem, in the ink jet recording apparatus of the present invention, the suction means includes cap means abutting on the absorber holding means.

**[0025]** Description will be made of its operation. When ink is sucked by the suction means, negative pressure is applied to the ink absorber by the absorber holding means and the cap means, so the ink in the ink absorber can be sucked to the outside.

**[0026]** According to an eighth means for solving the problem, in the ink jet recording apparatus of the present invention, the cap means formed of an elastic member.

**[0027]** Description will be made of its operation. The cap means is formed of the elastic member, so intimate contact property of the cap means with the absorber holding means is enhanced, thus making it possible to suck the ink more efficiently.

**[0028]** According to a ninth means for solving the problem, in the ink jet recording apparatus of the present invention, the cap means formed of a porous absorber and a housing portion of the absorber.

**[0029]** Description will be made of its operation. While the ninth means for solving the problem has an operation similar to that of the seventh means for solving the problem, the ninth means for solving the problem can realize the above operation with its simple construction.

**[0030]** As described above, in the ink jet recorder of the present invention, the ink is prevented from staying in the vicinity of the nozzles. As a result, it is possible to provide an ink jet recorder in which the deterioration of the image quality is prevented.

**[0031]** Further, the nozzle plate can be prevented from being directly damaged, so it is possible to provide an ink jet recorder in which the deterioration of the image quality is further prevented.

**[0032]** Embodiments of the present invention will now be described by way of further example only and with reference to the accompanying drawings, in which:

Fig. 1 is a partial cross-sectional view showing an ink jet recorder according to the present invention;

Fig. 2 is an appearance view showing an ink absorber shown in Fig. 1;

Fig. 3 is an explanatory view showing an operation of the ink absorber shown in Fig. 1;

Fig. 4 is a cross-sectional view showing another embodiment of the ink absorber according to the present invention;

Fig. 5 is a cross-sectional view showing another embodiment of an absorber holding board according to the present invention;

Fig. 6 is a cross-sectional view showing another embodiment of a cap unit according to the present invention; and

Fig. 7 is A partial cross-sectional view showing a conventional ink jet recorder.

**[0033]** An embodiment of the present invention will be described below based on Fig. 1 to Fig. 3.

**[0034]** This embodiment is one in which the present invention is applied to an ink jet recorder for performing recording, on a medium to be recorded, by an ink jet head mounted on a carriage. In Fig. 1, reference symbol 1 denotes a main portion of the ink jet head, with an actuator portion 2 and a hydrophilic nozzle plate 4 (made of polyimide as its material)

including multiple nozzles 3 being shown. Reference symbol 5 denotes an ink absorber which absorbs ink staying on the nozzle plate 4. Reference symbol 6 denotes an absorber holding board which sandwiches and holds the ink absorber 5 between the nozzle plate 4 and the absorber holding board itself. Reference symbol 7 denotes a carriage which includes the absorber holding board 6 and on which the ink jet head 1 is mounted. Reference symbol 8 denotes a main portion of a suction mechanism which sucks the ink staying in the ink absorber 5, and includes a cap 9 and a tube 10, which are rubber molded parts. The ink absorber 5 is formed into a frame shape in which an opening as shown in Fig. 2 is provided in a nozzle array portion of the multiple nozzles 3 on the nozzle plate 4. Further, also in the absorber holding board 6, an opening similar to that of the ink absorber 5 is provided.

**[0035]** In this embodiment, the ink absorber 5 is composed of an "A" series sponge sheet with a thickness of 1 mm, which is a porous member made by AION Co., Ltd. The absorber holding board 6 is composed of a SUS plate with a thickness of 0.2 mm.

**[0036]** Next, a description will be made of an operation of the ink jet recorder for performing recording by the ink jet head on the medium to be recorded. First, an initial filling operation which fills the ink jet head with ink is performed. That is, as is known, the ink is supplied to the ink jet head by pressurizing means, when the ink jet head 1 is filled with the ink, and the ink then starts to be ejected from the nozzles 3.

**[0037]** Simultaneously with the above operation, the ink to be discharged from the ink jet head is discharged in such a manner that the cap 9 is made to abut on the absorber holding board 6, thereby causing the ink to be sucked from the tube 10. Note that the ink on the nozzle plate 4 can be removed therefrom by sucking the ink for a while even after the filling operation using the pressurization is stopped.

**[0038]** Further, even if the ink to be absorbed into the ink absorber 5 is generated at the time of filling, an outer periphery side of the ink absorber 5 communicates with the atmosphere, so the air enters the outer periphery side of the ink absorber 5 as shown in Fig. 3 by the above-described suction operation, thereby making it possible to remove also the ink in the ink absorber 5 therefrom.

**[0039]** Then, after the initial filling operation is finished, the cap 9 comes off from the absorber holding board 6, the carriage 7 moves onto the medium to be recorded, and the recording is performed according to recording data given to the ink jet recorder.

**[0040]** Next, a description will be made of an operation of preventing deterioration of quality of an image under recording. The recording to the medium to be recorded is performed by continuous or intermittent ejection of the ink from the multiple nozzles 3 according to the recording data. Satellites occur from the ink ejected at this time, and a part of the satellites adheres onto the nozzle plate 4. However, the nozzle plate 4 is hydrophilic, so the satellites diffuse across the entire surface of the nozzle plate 4, and is absorbed by the ink absorber 5. Thus, ink accumulation due to satellites does not occur in the vicinity of the nozzles 3.

**[0041]** Further, even if a wrinkle is present in the medium to be recorded and unexpected large dust is present on the medium to be recorded, a possibility that the nozzle plate 4 will be damaged becomes extremely low since the nozzle plate 4 is covered with the absorber holding board 6.

**[0042]** Next, a description will be made of a cleaning operation performed at a predetermined interval during recording. When a large amount of the ink stays in the ink absorber 5, the recording is temporarily suspended, and the cap 9 is made to abut on the absorber holding board 6. As described in the initial filling operation stated above, the ink absorbed by the ink absorber 5 is discharged by being sucked from the tube 10.

**[0043]** Note that the ink absorber 5 is not limited to the shape of the above-described embodiment, and may also be one with a shape like an ink absorber 5a shown in Fig. 4. In Fig. 4, members denoted by the same reference symbols as those of Fig. 1 represent the same parts. When the ink absorber 5a is made larger than the ink absorber 5 as shown in Fig. 4, an amount of the ink absorbable thereby can be increased, so the time interval necessary for the cleaning operation can be lengthened. Therefore, an operating rate of the ink jet recorder can be raised.

**[0044]** At this time, in the case where it is necessary to strengthen also suction force for sucking ink from the absorber, there is a possibility that the ink will come out of the nozzles when being sucked. Therefore, it is recommended to provide a mechanism such as an electromagnetic valve in a system which supplies ink to the ink jet head.

**[0045]** Further, the absorber holding board 6 is not limited to the shape of the above-described embodiment, and an absorber holding board 6b may also be provided in the ink jet head as shown in Fig. 5. In Fig. 5, members denoted by the same reference symbols as those of Fig. 1 represent the same parts. In this case, an opening 6c is provided in an outer periphery side of the absorber holding board 6b, and the ink absorber 5b communicates with the atmosphere, so ink absorbed by the ink absorber 5b can be removed therefrom.

**[0046]** Further, the cap 9 is not limited to the shape of the above-described embodiment, and the cap 9 may also be configured by housing a porous absorber 9c in a plastic-made housing portion 9b as shown in Fig. 6. This is because the cap is not necessarily composed of a soft elastic member, since the housing portion 9b does not directly contact the nozzle plate 4 in the case where the ink contained in the ink absorber 5 is sucked. Still further, this is because, unlike in the case where ink is sucked from the nozzles, it is possible to suck the ink contained in the ink absorber 5 even if there is no complete air tightness when the absorber holding board 6 is capped.

## Claims

1. An ink jet recorder for performing recording, on a medium to be recorded, by an ink jet head for ejecting ink from multiple nozzles provided on a hydrophilic nozzle plate, the ink jet recorder being **characterized by** comprising:
  - an ink absorber which absorbs ink staying on the nozzle plate;
  - absorber holding means for sandwiching and holding the ink absorber between the nozzle plate and the absorber holding means; and
  - suction means for sucking ink from the ink absorber.
2. An ink jet recorder according to claim 1, **characterized in that** the ink absorber is formed into such a frame shape that an opening is provided in a nozzle array portion on the nozzle plate.
3. An ink jet recorder according to claim 1 or 2, **characterized in that** the ink absorber is made of a porous absorber.
4. An ink jet recorder according to claim 1, **characterized in that** the absorber holding means is formed into such a frame shape that an opening is provided in the nozzle array portion on the nozzle plate.
5. An ink jet recorder according to claim 4, **characterized in that** a size of the opening of the nozzle array portion of the absorber holding means is set substantially equal to a size of the opening of the nozzle array portion of the ink absorber.
6. An ink jet recorder according to claim 5, **characterized in that** the absorber holding means is constructed to allow an outer periphery side of the ink absorber to communicate with atmosphere.
7. An ink jet recorder according to claim 1, **characterized in that** the suction means includes cap means abutting on the absorber holding means.
8. An ink jet recorder according to claim 7, **characterized in that** the cap means is formed of an elastic member.
9. An ink jet recorder according to claim 7, **characterized in that** the cap means is formed of a porous absorber and a housing portion of the absorber.

FIG. 1

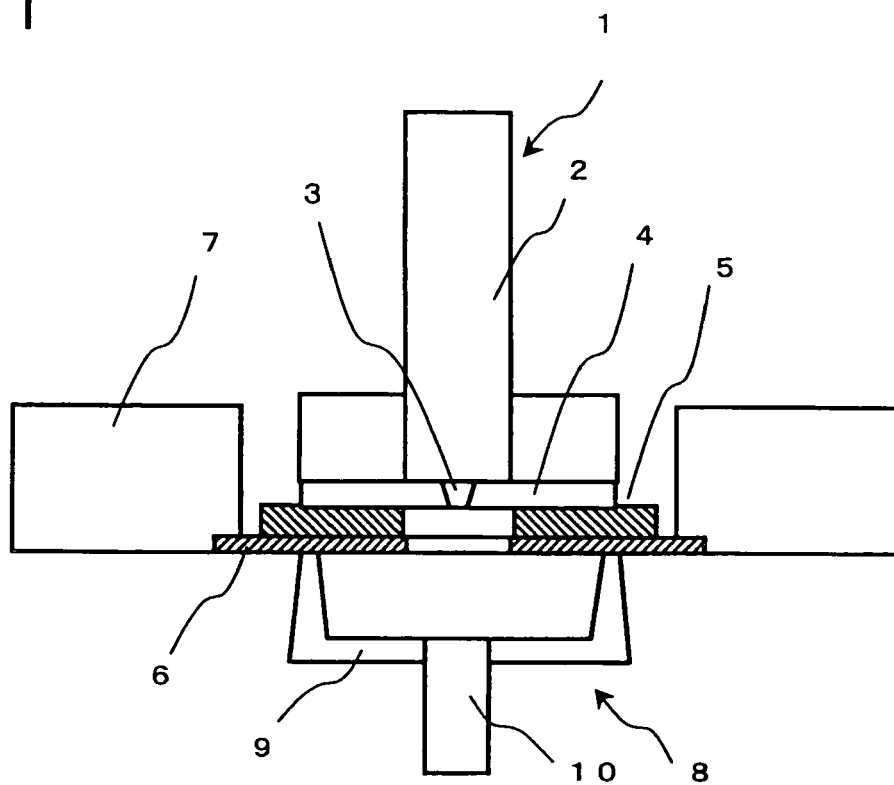


FIG. 2

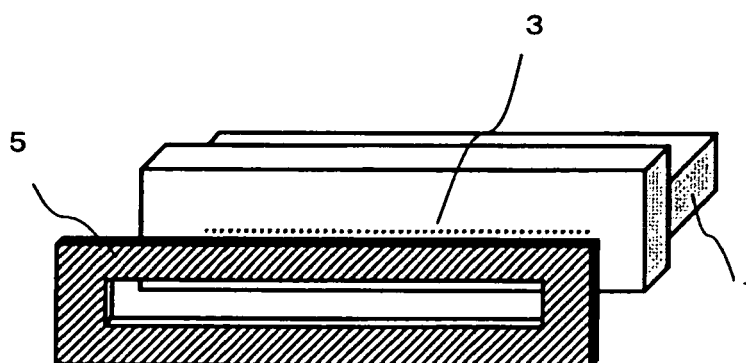


FIG. 3

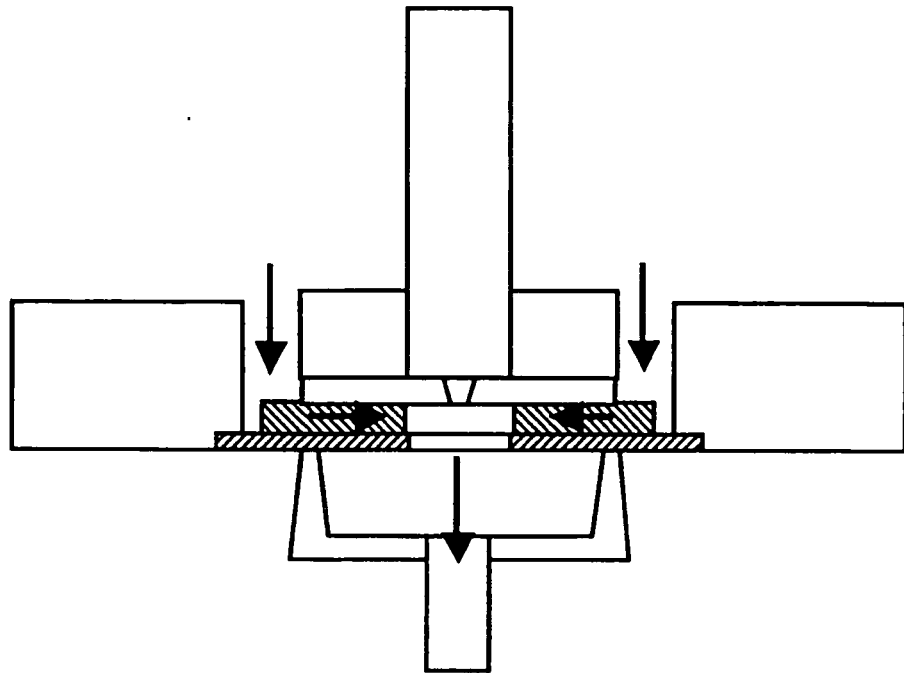


FIG. 4

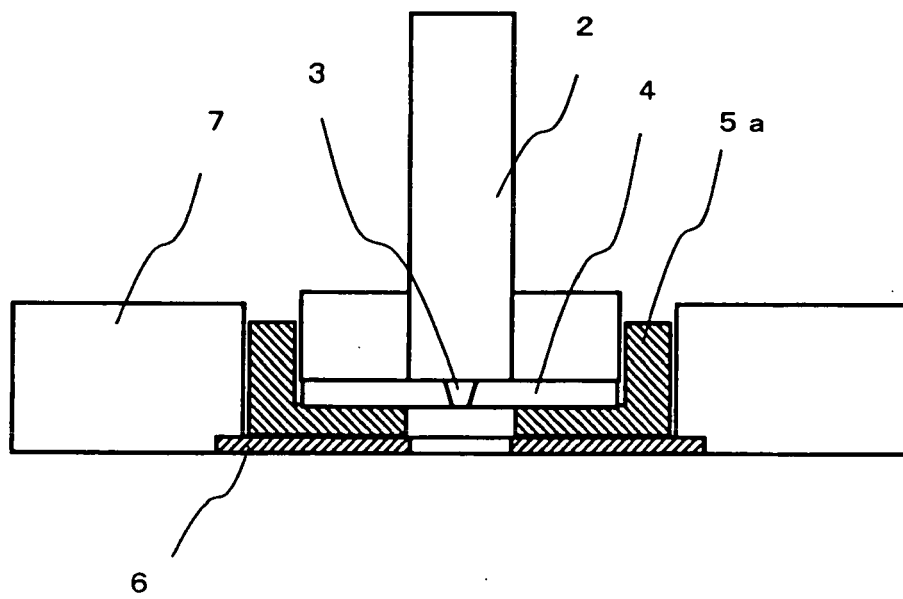


FIG. 5

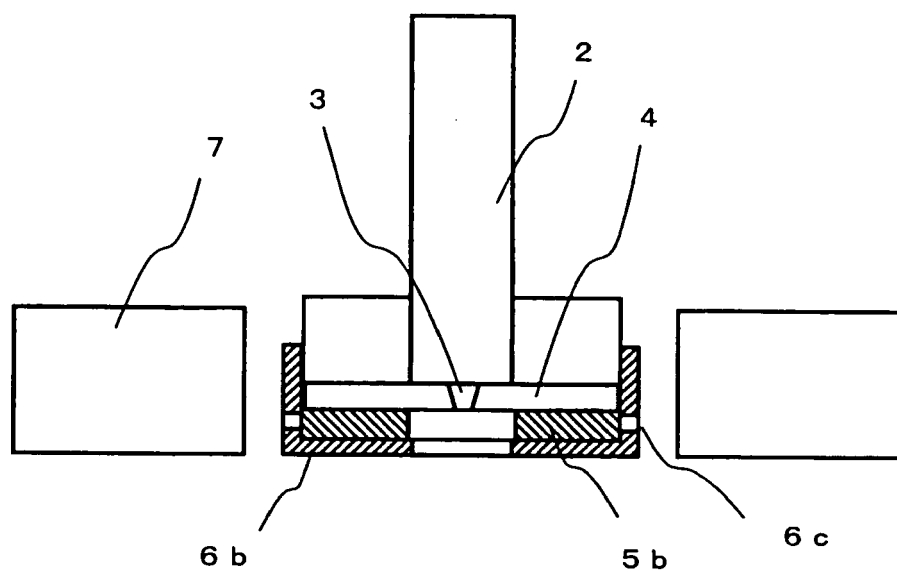


FIG. 6

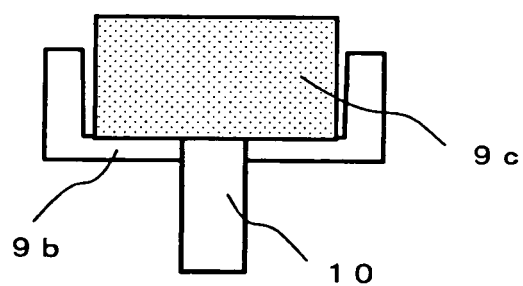
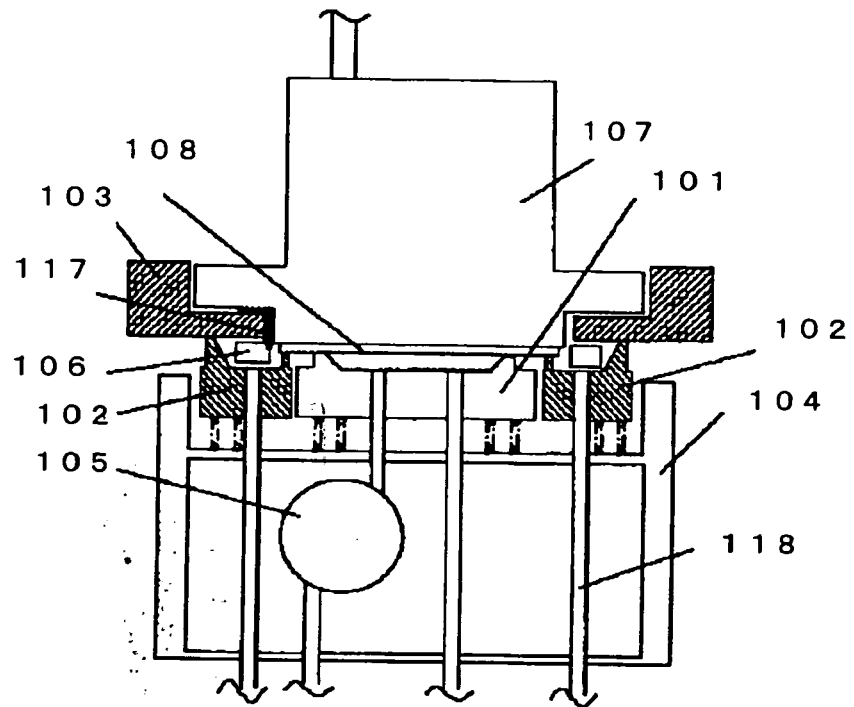




FIG. 7 PRIOR ART





European Patent  
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# EUROPEAN SEARCH REPORT

Application Number  
EP 06 25 0857

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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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 June 2006	Examiner Bardet, M
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 25 0857

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