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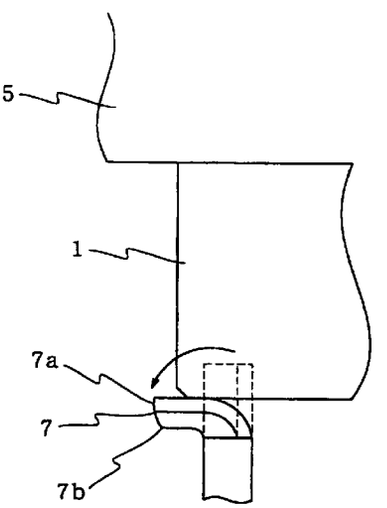
(54) Wiper structure

(57) The present invention provides a wiper structure capable of reducing parts costs as well as uniformly cleaning away. The wiper structure includes a spatula-shaped ink absorption/holding body (7) causing the capillary phenomenon and having on its one surface an absorption-reduced wall (7a) having reduced ink absorption ability.

FIG.4



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a wiper structure and in particular, to an ink jet printer wiper structure.

2. Description of the Related Art

[0002] A conventional wiper structure will be explained with reference to the attached drawings.

[0003] Figs. 6A, 6B, and 6C are cross sectional views showing a first conventional example.

[0004] Fig. 6A shows a wiper structure including a spatula-shaped wiper 103a having elasticity and a sliding member 103 having water absorption characteristics. Such a structure is disclosed, for example, in Japanese Patent Publication (unexamined) No. A-04-338552.

[0005] The spatula-shaped wiper 103a adheres to the sliding member 103b by an adhesive agent 103c. All of the spatula-shaped wiper 103a, the sliding member 103b, and the adhesive agent 103c should be made from materials that will not deteriorate or be denatured by ink. That is, the spatula-shaped wiper 103a is preferably made from silicon rubber or butyl rubber; and the adhesive agent 103c is preferably a silicone adhesive. The sliding member 103b should have, in addition to ink resistance, high friction resistance and high water absorption characteristics,and is preferably made from an unwoven cloth using fine fibers.

[0006] Fig. 6B shows a wiping operation. When the spatula-shaped wiper 103a is in contact with a nozzle plane 102a, the sliding member 103b is easily deformed. Accordingly, the contact occurs at weak force.

[0007] Fig. 6C shows a sliding operation. When the sliding member 103b is in contact with the nozzle plane 102a, the sliding member 103 b is supported by the spatula-shaped wiper 103a. Accordingly, the contact occurs at strong force.

[0008] The wiping operation and the sliding operation are especially effective for cleaning when the edge C1 of the spatula-shaped wiper 103a and the edge C2 of the sliding member 103b are brought into abutment with the nozzle plane 102a. That is, when a wiping operation is performed, dust and ink may easily remain after the spatula-shaped 103a has passed. Moreover, when a sliding operation is performed, the edge C2 is brought into abutment with the nozzle plane 102a, enabling to obtain a strong abutment force, assuring a contact with the nozzle plane 102a. This assures to absorb ink in the vicinity of fine nozzle holes.

[0009] Fig. 7 is a cross sectional view showing a second conventional example of wiper structure. A wiper 207 comprises a core body 207a and a cover body 207b. Such a wiper structure is disclosed, for example, in Japanese Patent Publication (unexamined) No. A-08-207292.

[0010] The core body 207a is made from a soft porous polyurethane which has been subjected to a treatment for improving the hydrophilic characteristics and has excellent water holding properties.

[0011] The cover body 207b is made from a fiber material having excellent water absorption properties.

[0012] The wiper 207 is made as a unitary block from the core body 207a covered with the cover body 207b which is subjected to heat to be melted to adhere to the core body 207a. Because of the cover body 207b having water absorption properties, the wiper 207 can absorb ink remaining on the nozzle plane and other places. Moreover, because of the core body 207a having water holding properties, the wiper 207 can hold the ink absorbed by the cover body 207b.

[0013] Figs. 8A, 8B, and 8C are cross sectional views showing a third conventional example. A wiper blade 344 is made from rubber whose hardness is adjusted to be in a range from 40 to 60 degrees defined by the JIS K6310 hardness. Such a wiper is disclosed, for example, in Japanese Patent Publication (unexamined) No. A-09-76517.

[0014] As a nozzle opening plane 303 is moved in a direction of arrow G in Fig. 8A, the wiper blade 344 is brought into contact with the nozzle opening plane 303a while being deformed, so that ink 307 adhering to the nozzle opening plane 303a is wiped off. When the nozzle opening plane 303a is moved apart from the wiper blade 344, the wiper blade 344 which has been curved as indicated by a dotted line in Fig. 8C is restored to its original configuration. The hardness of the blade is adjusted so that this restoration is performed comparatively slowly. Accordingly, the ink 307 adhering to a wiping portion 344b remains there without being scattered.

[0015] The wiper blade 344 is usually arranged to be vertical to the nozzle opening plane 303a but it is also possible to arrange the wiper blade 344 with inclination.

[0016] The aforementioned wiper structure includes a spatula-shaped wiper and a sliding member having water absorption properties. That is, two different materials are bonded by an adhesive. This requires a bonding technique and facility, and increases the parts' costs because two different materials are required.

[0017] Furthermore, the wiping performance is affected by the wiper edge material and configuration. If the two different materials are bonded to each other, there is the danger of bonding at a shifted position, reducing the wiping performance.

SUMMARY OF THE INVENTION

[0018] It is therefore an object of the present invention to provide a wiper structure including a spatula-shaped ink absorption/holding body causing the capillary phe-

nomenon and having on its at least one surface an absorption reduced wall having a lowered ink absorption power.

[0019] According to another aspect of the present invention, the absorption-reduced wall is formed by way of heat press.

[0020] According to yet another aspect of the present invention, the absorption-reduced wall is formed by using a solvent.

[0021] According to still another aspect of the present invention, the absorption-reduced wall is formed by way of light radiation.

[0022] According to still yet another aspect of the present invention, the absorption-reduced wall is formed by way of gas treatment.

[0023] According to yet another aspect of the present invention, the absorption-reduced wall is a skin layer.

[0024] According to still another aspect of the present invention, the absorption-reduced wall has a thickness equal to 50% or below of the entire wiper thickness.

[0025] According to still yet another aspect of the present invention, the wiper structure is arranged approximately in a vertical direction to a printer head and at an angle θ with respect to a relative movement between the wiper and the printer head.

[0026] According to yet still another aspect of the present invention, the aforementioned angle θ is in a range from 0 to 30 degrees.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

Fig. 1A and Fig. 1B show a wiper structure according to an embodiment of the present invention viewed from the top.

Fig. 2 is a side view showing an example using the wiper structure of the present invention.

Fig. 4 is a side view showing another example using the wiper structure of the present invention.

Fig. 5 shows an essential portion of the wiper structure according to the present invention.

Fig. 6A, Fig. 6B, and Fig. 6C are cross sectional views showing a first conventional example of wiper structure.

Fig. 7 is a cross sectional view showing a second conventional example of wiper structure.

Fig. 8 is a cross sectional view showing a third conventional example of wiper structure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Description will now be directed to preferred embodiments of the present invention with reference to the attached drawings.

[0029] Fig. 1A shows an arrangement of a wiper structure according to the present invention applied to a printer, viewed from the top. Fig. 1B shows the wiper structure viewed from the top. The wiper structure shown in Fig. 1A and Fig. 1B includes a spatula-shaped ink absorption/holding body 7 consisting of an absorption lowered wall 7a having reduced ink absorption ability and an ink absorption portion 7b having normal ink absorption ability.

[0030] The wiper structure shown in Fig. 1B is made from a porous material or a fiber material whose one side has been treated by a heat press, solvent, light radiation, gas, or the like, so as to minimize the ink absorption power. Moreover, the porous material may have one face as a skin layer. The skin layer is formed when forming a film. That is, a portion attached to a substrate delays solvent removal and becomes very dense, whereas a portion apart from the substrate actively evaporates the solvent, leaving holes, and becomes porous.

[0031] The aforementioned absorption-reduced wall 7a is set to have a thickness equal to 1 to 50 % of the entire wiper thickness.

[0032] The wiper 7 is made prom PVA having a hole diameter of 10 to 70 micrometers. This PVA material was subjected to a heat press up to the depth of 0.1 to 0.5 mm so as to have an entire thickness of 1.5 mm.

[0033] As shown in Fig. 1A, the wiper 8 can be arranged approximately in a vertical direction to a printer head 1 and at an angle θ against the relative movement between the wiper 8 and the printer head 1. The angle θ is selected in a range from 0 to 30 degrees. The reason why the wiper is arranged at an inclination is that in the case of a multi-color nozzle plate, color mixing during a wiping operation can be reduced. Moreover, the ink to be wiped off can be collected in one direction so that only one place serves as the portion stained by the ink.

[0034] Fig. 2 is a side view showing an example of the wiper structure of the present invention applied to a printer. The printer head 1 and the wiper structure 7 overlap by h = 1.8 mm

[0035] Fig. 3 is a side view showing another example of the wiper structure of the present invention applied to a printer. Fig. 4 and Fig. 5 are partially enlarged views for explanation of the operation of the wiper structure.

[0036] While a carrier 5 travels along a guide shaft 6 toward a recording medium 8, the wiper 7 is deformed to slide along the ink discharge plane. When the wiper 7 is brought into contact with the edge of the printer head 1, the wiper 7 is deformed in the direction shown by the arrow in Fig. 4. After this, as shown in Fig. 5, the wiper

7 starts to scratch the ink. Most of the ink scratched flows down along the wiper 7, and some o the ink stays as a front ink portion 15a between the absorption lowered wall 7a of the wiper 7 and the ink discharge plane. A very small portion of the ink goes over the edge of the wiper 7 to generate a rear ink portion 15b around the end surface of the wiper 7. However, the rear ink portion 15b is promptly absorbed by the ink absorption/holding body 7b and will not be transferred again to the surface cleaned by the wiper 7.

[0037] The wiper structure enables to reduce the parts costs as well as to uniformly clean away an ink discharge plane or the like.

[0038] The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative only and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

[0039] The entire disclosure of Japanese Patent Application No. 10-012340 (Filed on January 26th, 1997) including specification, claims, drawings and summary are incorporated herein by reference in its entirety.

Claims

1. A wiper structure including a spatula-shaped ink absorption/holding body causing the capillary phenomenon and having on at least one of its surfaces a wall of reduced absorption.

2. A wiper structure as claimed in claim 1, wherein said wall of reduced absorption is a non-absorption wall.

3. A wiper structure as claimed in claim 1 or 2, wherein said wall of reduced absorption is formed by way of heat pressurising.

4. A wiper structure as claimed in claim 1 or 2, wherein said wall of reduced absorption is formed using a solvent.

5. A wiper structure as claimed in claim 1 or 2, wherein said wall of reduced absorption is formed by way of light radiation.

6. A wiper structure as claimed in claim 1 or 2, wherein said wall of reduced absorption is formed by way of gas treatment.

7. A wiper structure as claimed in claim 1 or 2, wherein said wall of reduced absorption is a skin layer.

8. A wiper structure as claimed in claim 1 or 2, wherein said wall of reduced absorption has a thickness of a maximum of 50% of the entire thickness of said wiper structure.

9. A wiper structure as claimed in claim 1 or 2, wherein said wiper structure is arranged approximately in a vertical direction to a printer head and at an angle (θ) with respect to the relative movement between said wiper structure and said printer head.

10. A wiper structure as claimed in claim 9, wherein said angle (θ) is in a range from 0 to 30 degrees.

FIG.1A

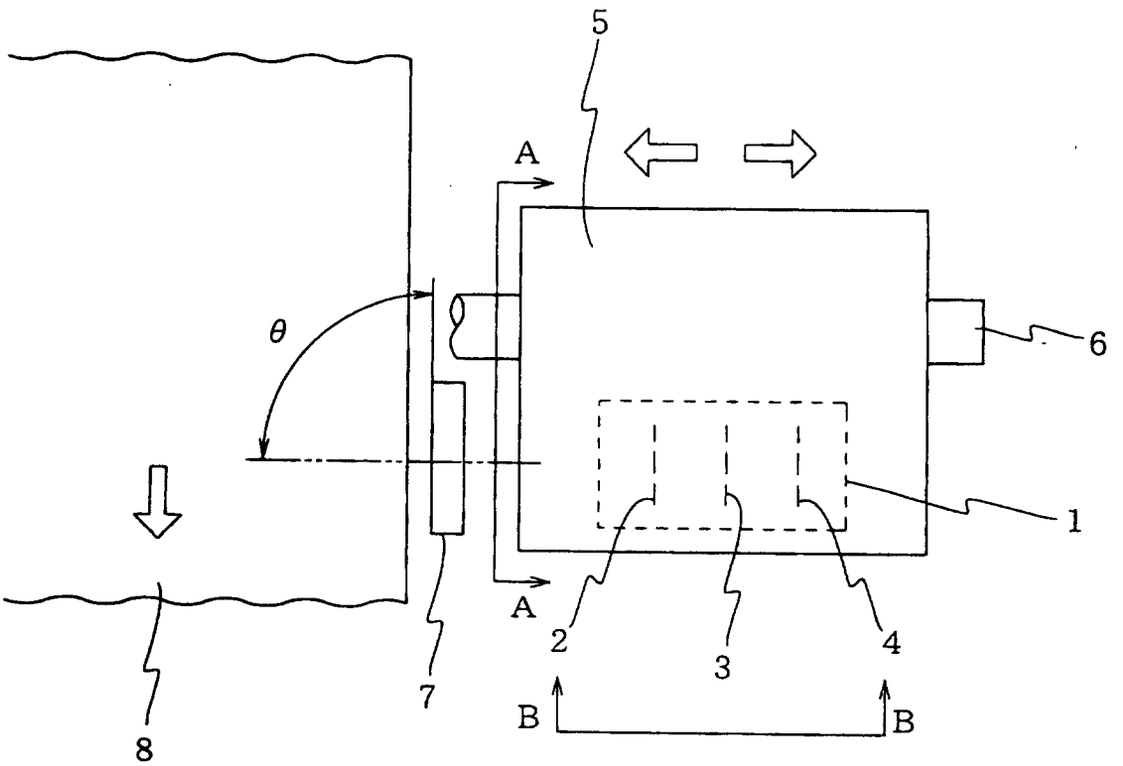


FIG.1B

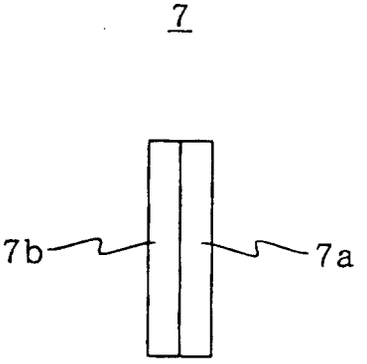
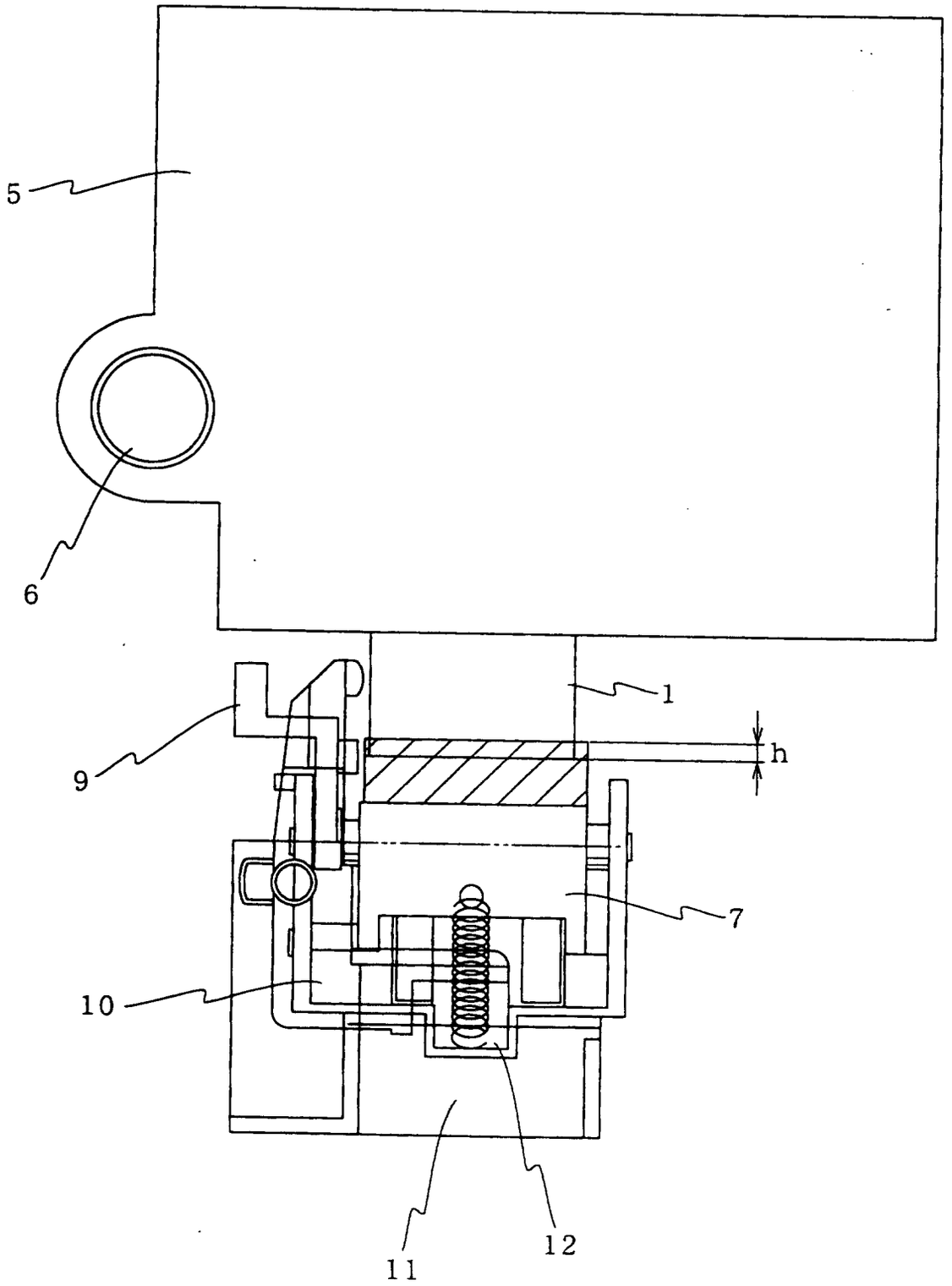


FIG.2



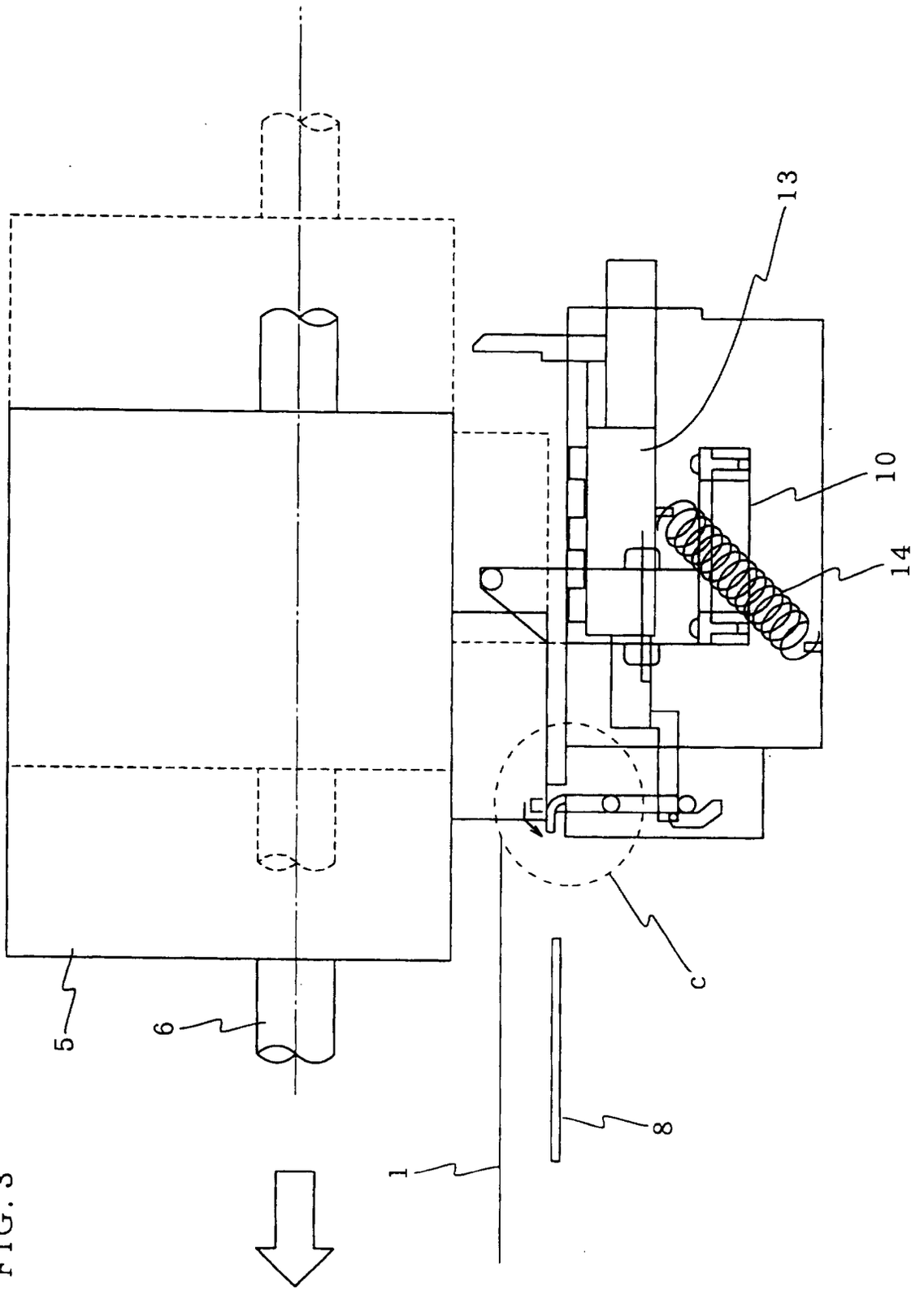


FIG. 3

FIG.4

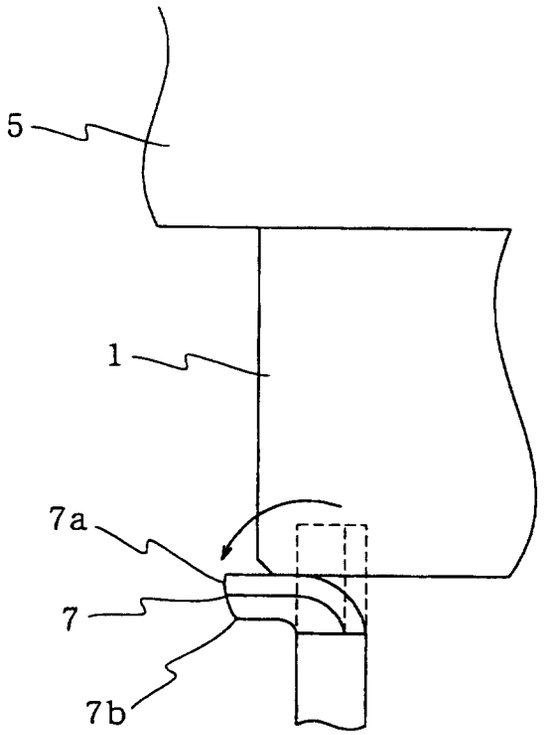


FIG.5

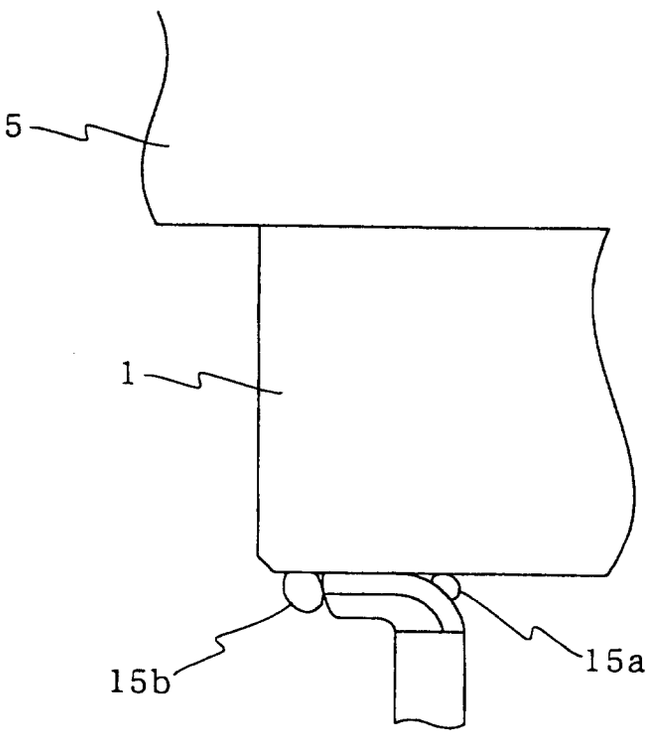


FIG.6A

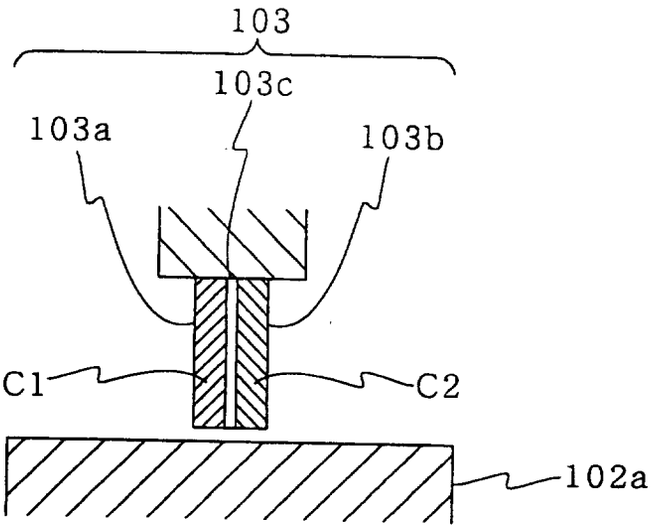


FIG.6B

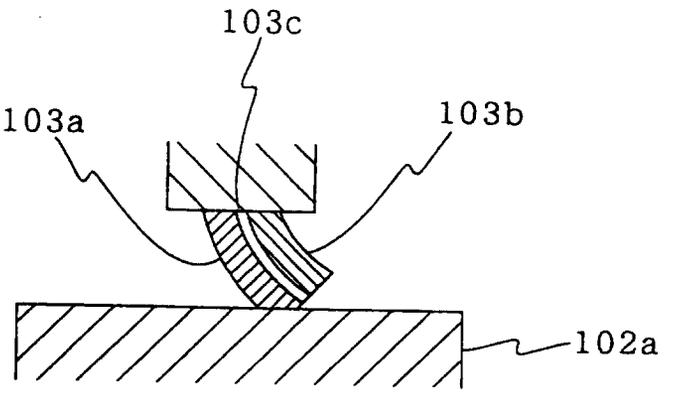


FIG.6C

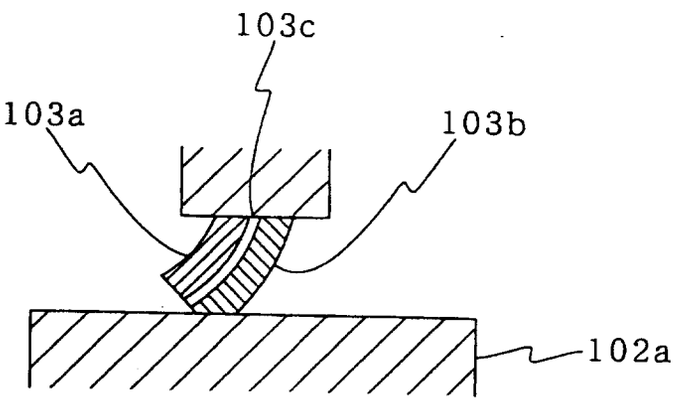


FIG.7

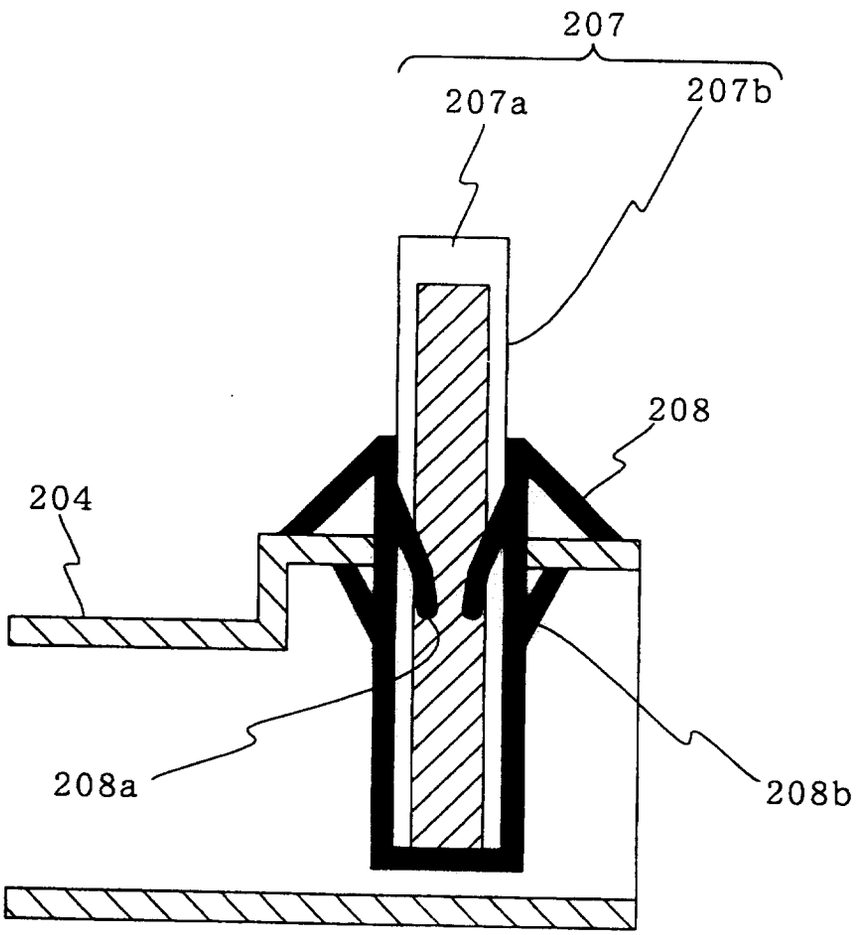


FIG.8A

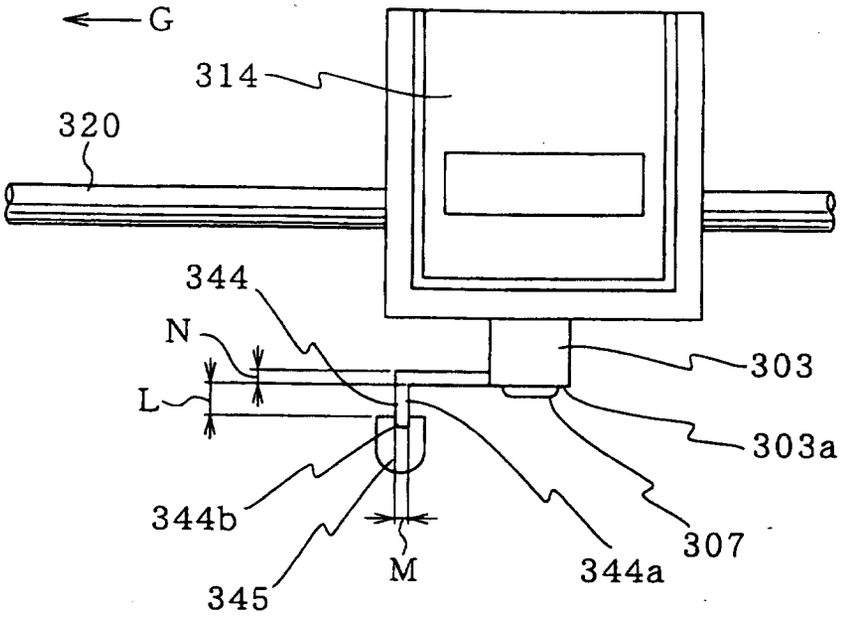


FIG.8B

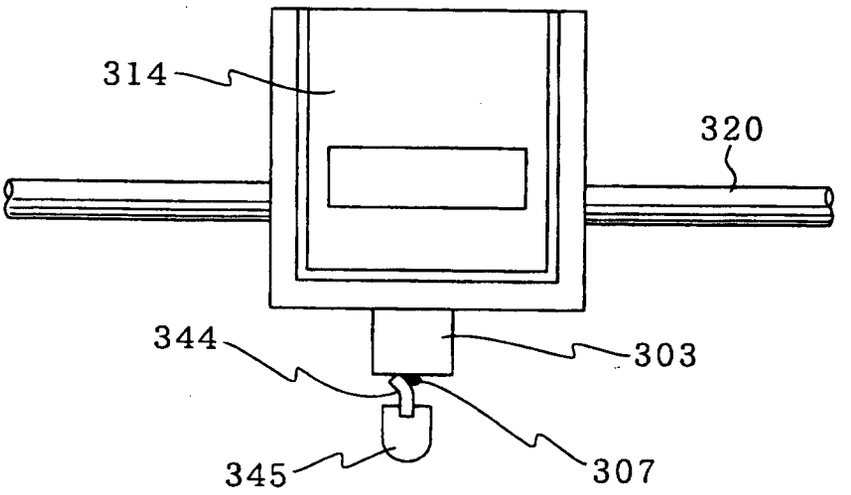


FIG.8C