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(71) Applicant: **Fujitsu Component Limited**
Tokyo 141-8630 (JP)

(72) Inventors:
- **TSUCHIYA, Masahiro**
Tokyo 141-8630 (JP)
- **MORI, Yukihiro**
Tokyo 141-8630 (JP)

(74) Representative: **Stebbing, Timothy Charles et al**
Haseltine Lake LLP
Lincoln House, 5th Floor
300 High Holborn
London WC1V 7JH (GB)

(54) **AUTO-CUTTER APPARATUS AND PRINTER UNIT**

(57) An automatic cutting apparatus including a fixed blade module to cut printed paper, a movable blade module, and a drive module to drive the movable blade module, and characterized in that the fixed blade module includes a fixed blade, the movable blade module includes a movable blade, the paper is cut by the fixed blade and the movable blade when the movable blade slides, and the fixed blade module, the movable blade module, and the drive module are connected in a mutually detachable state, in order to solve the problem described above.

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Description

TECHNICAL FIELD

[0001] The present invention relates to automatic cutting apparatuses and printer units.

BACKGROUND ART

[0002] A POS terminal or a ticket issuing apparatus may include a compact thermal printer unit. The thermal printer unit may include a function to automatically cut a continuous-feed paper, a function to help manual cutting of the continuous-feed paper, or the like.

[0003] In the case of the thermal printer unit including the function to automatically cut the continuous-feed paper, an automatic cutting apparatus is mounted on a main body of the thermal printer unit. The main body of the thermal printer unit includes a thermal head, a platen, a motor, and the like. The cutting apparatus includes a movable blade mechanism having a fixed blade, a movable blade, and a motor or the like that moves the movable blade.

[0004] On the other hand, in the case of the thermal printer unit configured to manually cut the continuous-feed paper, a fixed blade is mounted on the main body of the thermal printer unit. The continuous-feed paper is cut by the fixed blade when the continuous-feed paper is pulled in a predetermined direction relative to the fixed blade.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0005]

Patent Document 1: Japanese Laid-Open Patent Publication No. 2005-271204

Patent Document 2: Japanese Laid-Open Patent Publication No. 2009-143100

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0006] As illustrated in FIG. 1, a printer unit (printer unit including a cutter) 100 having the function to automatically cut the continuous-feed paper is formed by combining of a printer unit 101 and a cutting apparatus 102 that automatically cuts the paper. The printer unit 101 includes a thermal head, for example. The printer unit 101, that has a thermal head, and the cutting apparatus 102, are integrally formed, and the two are fixed by screws or the like to form the printer unit 100 including the cutter. For this reason, the printer unit 100 including the cutter becomes bulky, and it becomes necessary to disassemble the inside of the printer unit 100 in order to simply replace a cutter blade of the cutting apparatus 102, for example. Alternatively, the entire cutting apparatus 102 would have to be replaced by a new cutting apparatus. In either case, it takes time and cost to replace the cutter blade or the entire cutting apparatus 102. As a result, the maintenance cost of the printer unit 100 including the cutter is high.

[0007] In another structure of the printer unit including the cutter, a fixed blade and an automatic cutter driving part (movable blade driving part) are mounted on the main body of the printer unit that includes the thermal head. The print unit including the cutter is formed by combining and connecting the main body and a movable blade module. The automatic cutter driving part integrally includes a motor, a gear part, and the like. In this case, it may be possible to reduce the size of the printer unit as a whole because the cutter driving part is mounted on the main body of the printer unit. However, it is difficult to replace only the cutter driving part, and the maintenance cost of the printer unit including the cutter is high.

[0008] Further, as described above, the thermal printer including the movable blade and having the function to automatically cut the continuous-feed paper, and the thermal printer including only the fixed blade to cut the paper that is manually pulled, have main bodies and the like that are similar. For this reason, if the main body may be shared and used for both the two kinds of thermal printers, it would be preferable in that the cost of both the printers may be reduced.

[0009] Accordingly, it is an object of the present invention to provide an automatic cutting apparatus and a printer unit, which may facilitate maintenance, such as replacement of a fixed blade, a movable blade, and a movable blade driving part, in order to reduce both the time and cost of the maintenance.

MEANS OF SOLVING THE PROBLEM

[0010] The present invention may provide an automatic cutting apparatus including a fixed blade module to cut printed paper, a movable blade module, and a drive module to drive the movable blade module, characterized in that the fixed blade module includes a fixed blade, the movable blade module includes a movable blade, and the paper is cut by the fixed blade and the movable blade when the movable blade slides; and the fixed blade module, the movable blade module, and the drive module are connected in a mutually detachable state.

[0011] The prevent invention may be characterized in that the mutually detachable state is an interfitted state.

[0012] The prevent invention may be characterized in that the drive module includes a motor module including a motor for the movable blade, and a drive gear module to transmit rotation of the motor; and the motor module and the drive gear module are connected in a mutually detachable state.

[0013] The present invention may provide a printer unit including a printer head to print on paper, and a platen

roller to feed the paper, characterized in that the printer unit includes a printer module having the printer head, a fixed blade module, a movable blade module, and a drive module to drive the movable blade module; the fixed blade includes a fixed blade, the movable blade includes a movable blade, and the paper printed by the printer head is cut by the fixed blade and the movable blade when the movable blade slides; and the printer module, the fixed blade module, the movable blade module, and the drive module are connected in a mutually detachable state.

[0014] The present invention may be characterized in that the mutually detachable state is an interfitted state.

[0015] The present invention may be characterized in that a printer unit having no automatic cutter function is formed by connecting the printer module and the fixed blade module in the mutually detachable state.

[0016] The present invention may be characterized in that the drive module includes a motor module including a motor for the movable blade, and a drive gear module to transmit rotation of the motor; and the motor module and the drive gear module are connected in a mutually detachable state.

[0017] The present invention may be characterized in that the printer module includes a motor to rotate the platen roller and feed the paper.

[0018] The present invention may be characterized in that the fixed blade module includes the platen roller.

EFFECTS OF THE INVENTION

[0019] According to the present invention, it is possible to provide an automatic cutting apparatus and a printer unit, which may facilitate maintenance, such as replacement of a fixed blade, a movable blade, and a movable blade driving part, in order to reduce both the time and cost of the maintenance.

BRIEF DESCRIPTION OF THE DRAWING

[0020]

FIG. 1 is a diagram explaining a conventional printer unit;
FIG. 2 is a perspective view illustrating a printer unit of the present invention having a movable blade;
FIG. 3 is a disassembled perspective view illustrating modules of the printer unit in a first embodiment;
FIG. 4 is a diagram (1) for explaining a method of assembling the printer unit in the first embodiment;
FIG. 5 is a diagram (2) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 6 is a diagram (3) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 7 is a diagram (4) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 8 is a diagram (5) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 9 is a diagram (6) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 10 is a diagram (7) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 11 is a diagram (8) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 12 is a diagram (9) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 13 is a diagram (10) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 14 is a diagram (11) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 15 is a diagram (12) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 16 is a diagram (13) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 17 is a diagram (14) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 18 is a diagram (15) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 19 is a diagram (16) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 20 is a diagram (17) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 21 is a diagram (18) for explaining the method of assembling the printer unit in the first embodiment;
FIG. 22 is a diagram for explaining a method of assembling a printer unit only having a fixed blade;
FIG. 23 is a perspective view of the printer unit only having the fixed blade; and
FIG. 24A is a diagram (1) for explaining a printer unit in a second embodiment; and
FIG. 24B is a diagram (2) for explaining the printer unit in the second embodiment.

MODE OF CARRYING OUT THE INVENTION

[0021] A description will be given of embodiments of the present invention.

[First Embodiment]

[0022] A description will be given of the printer unit in a first embodiment of the present invention, by referring to FIGs. 2 and 3. FIG. 2 is a perspective view illustrating a printer unit 10 in the first embodiment, and FIG. 3 is a disassembled perspective view illustrating modules of the printer unit 10 in the first embodiment.

[0023] In this embodiment, the printer unit 10 includes a printer module 20 having a thermal head which is a printer head, a fixed blade module 40, a drive module 50, and a movable blade module 60, and each of the modules is independent of each other. The printer unit 10 includes a function of automatically cutting continuous-feed paper, and may be formed by combining and connecting all of the printer module 20, the fixed blade module 40, the drive module 50, and the movable blade module 60. As will be described later, a printer unit (fixed

blade printer unit) which cuts the paper when the paper is pulled manually, may also be formed by combining the printer module 20 and the fixed blade module 40. In this case, the blade of the fixed blade module 40 may be sawtooth shaped or the like. Hence, the printer module 20 and the fixed blade module 40 may be shared and used for both the printer unit 10 of this embodiment and the fixed blade printer unit.

[0024] Next, a description will be given of a method of assembling the printer unit in this embodiment. As described above, the printer unit 10 in this embodiment may be formed by successively and detachably connecting the printer module 20, the fixed blade module 40, the drive module 50, and the movable blade module 60.

[0025] First, the printer module 20 and the drive module 50 are connected, as illustrated in FIGs. 4 and 5. The printer module 20 includes a motor (paper feed motor) 21 to feed paper, and a gear part 22. The drive module 50 includes a motor 51 to drive a movable blade which will be described later, and a gear part 52. The motor 21 and the gear part 22 of the printer module 20 are provided on a side surface at one end of the printer module 20 along a width direction of the paper (paper roll) that is not illustrated. The drive module 50 is connected to a side surface at the other end of the printer module 20 along the width direction of the paper that is not illustrated.

[0026] More particularly, a groove 23 having an inverted mesa shape is formed in the side surface of the printer module 20, and a rail 53 having an inverted mesa shape (inverted trapezoidal shape) corresponding to that of the groove 23 is formed on the side surface of the drive module 50. The drive module 50 is arranged on top of the printer module 20, and the drive module 50 and the printer module 20 are caused to slide relative to each other in a state in which the rail 53 is inserted into the groove 23, in order to connect the drive module 50 and the printer module 20 in a state in which the rail 53 is essentially fitted into the groove 23. A spring-loaded lock part 54 is provided on and is movable along the side surface direction of the printer module 20. In a state in which the rail 53 is almost completely inserted into the groove 23, the lock part 54 engages an engaging part provided on the printer module 20 in order to prevent the printer module 20 from disengaging from the drive module 50. When removing the printer module 20 and the drive module 50 from each other, the lock part 54 is pushed into the side surface of the drive module 50, the rail 53 and the groove 23 are caused to slide in a direction opposite to that at the time of the insertion, and allow the printer module 20 and the drive module 50 to be removed from each other.

[0027] Accordingly, the printer module 20 and the drive module 50 may be connected as illustrated in FIGs. 6 and 7. In this state, the printer module 20 and the drive module 50 are connected in the interfitted state, and are in a mutually detachable state. However, as illustrated in FIG. 7, the lock part 54 of the drive module 50 engages the engaging part 24 provided on the printer module 20, and the printer module 20 and the drive module 50 will not be disconnected from each other unless the operation described above is performed to remove the printer module 20 and the drive module 50 be removed from each other.

[0028] Next, a description will be given of the fixed blade module 40. A method of connecting the fixed blade module 40 will be described, by referring to FIGs. 8, 9, and 10. The fixed blade module 40 includes a fixed blade 41. The fixed blade module 40 further includes a lock part 42, a positioning projection 43, and an engaging part 44 to be used for connection to the printer module 20. On the other hand, the printer module 20 includes a lock part inserting part 25, a positioning projection inserting part 26, and an engaging part 27. When connecting the fixed blade module 40 to the printer module 20, the lock part 42 is inserted into the lock part inserting part 25, the positioning projection 43 is inserted into the positioning projection inserting part 26, and the engaging part 44 engages the engaging part 27. In this state, the printer module 20 and the fixed blade module 40 are connected in the interfitted state, and are in a mutually detachable state. Hence, a combination structure illustrated in FIG. 11 is obtained by connecting the fixed blade module 40 to the combination of the printer module 20 and the drive module 50. In the state in which the printer module 20 and the fixed blade module 40 are connected in the interfitted state, the engaging part 27 of the printer module 20 engages the engaging part 44 of the fixed blade module 40 as illustrated in FIG. 12, and the lock part 42 of the fixed blade module 40 is inserted into the lock part inserting part 25 of the printer module 20 as illustrated in FIG. 13.

[0029] Next, a description will be given of a method of connecting the movable blade module 60. More particularly, the movable blade module 60 is connected to the combination of the printer module 20, the drive module 50, and the fixed blade module 40, as illustrated in FIGs. 14 and 15. The movable blade module 60 includes the movable blade 61, a gear part 62 to drive the movable blade 61, and a mechanism part 63, as illustrated in FIGs. 16 and 17. When the gear part 62 rotates, the mechanism part 63 which meshes with the gear part 62 is rotated in order to slide the movable blade 61. In addition, the movable blade module 60 further includes a platen roller 64 which rotates about a center axis thereof, a shaft part 65 concentrically provided with respect to the center axis of the platen roller 64, and a gear 66 connected to the shaft part 65. The movable blade module 60 also includes a bearing guide projection 67 and an inclination preventing stopper 68. On the other hand, the printer module 20 includes a bearing guide projection receiving part 28, a bearing part 29, and a stopper engaging part 30 illustrated in FIG. 18 for use in assembling the movable blade 60 to the printer module 20.

[0030] As illustrated in FIGs. 19, 20, and 21, the movable blade module 60 is connected to the printer module 20 by inserting the bearing guide projection 67 from the

bearing part 29, and fitting the bearing guide projection 67 into the bearing guide projection receiving part 28. As a result, the shaft part 65 of the movable blade module 60 is inserted into the bearing part 29, and the shaft part 65 is supported in a state rotatable within the bearing part 29. In this state, the gear 66 meshes with the gear part 22 illustrated in FIGs. 4 and 5. Hence, the gear 66 is rotated via the gear part 22 when the motor 21 of the printer module 20 rotates. In addition, in this state, the inclination preventing stopper 68 of the movable blade module 60 makes contact with the stopper engaging part 30 of the printer module 20. In this state, the movable blade module 60 and the printer module 20 are connected in a interfitted state, and are in a mutually detachable state.

[0031] As described above, in the printer unit 10 in this embodiment, the printer module 20, the fixed blade module 40, the drive module 50, and the movable blade module 60 may be connected in an interfitted state, and are in a mutually detachable state.

[0032] The printer module 20 and the fixed blade module 40 may be interfitted and connected in the manner similar to that described above, as illustrated in FIG. 22, so that the printer module 20 and the fixed blade module 40 are detachable relative to each other. In this case, it is possible to form a printer unit 70 including only the fixed blade 41 which cuts the paper when the paper is pulled manually, by the combination of the printer module 20 and the fixed blade module 40 as illustrated in FIG. 23.

[Second Embodiment]

[0033] Next, a description will be given of a second embodiment. In this embodiment, as illustrated in FIGs. 24A and 24B, the drive module 50 has a structure that includes a drive gear module 110 and a motor module 120 that are detachably connected to each other. FIG. 24A illustrates a state in which the drive gear module 110 and the motor module 120 are connected, and FIG. 24B illustrates a state in which the drive gear module 110 and the motor module 120 are disconnected. By making the drive gear module 110 and the motor module 120 detachable with respect to each other, it becomes possible to easily replace only the drive gear module 110 or only the motor module 120. Hence, the maintenance of the drive module 50 may be performed within a short time at a low cost. In this example, the drive gear module 110 includes a gear unit 111 that is rotated by a motor 121 of the motor module 120, and the motor module 120 includes a wiring part 122 to supply power to rotate the motor (motor for movable blade) 121.

[0034] Further, the present invention is not limited to these embodiments, but various variations and modifications may be made without departing from the scope of the present invention.

DESCRIPTION OF THE REFERENCE NUMERALS

[0035]

10	Printer Unit
20	Printer Module
21	Motor (Paper Feeding Motor)
22	Gear Part
23	Groove
24	Engaging Part
25	Lock Part Inserting Part
26	Positioning Projection Inserting Part
27	Engaging Part
28	Bearing Guide Projection Receiving Part
29	Bearing Part
30	Stopper Engaging Part
40	Fixed Blade Module
41	Fixed Blade
42	Lock Part
43	Positioning Projection
44	Engaging Part
50	Drive Module
51	Motor
52	Gear Part
53	Rail
54	Lock Part
60	Movable Blade Module
61	Movable Blade
62	Gear Part
63	Mechanism Part
64	Platen Roller

65 Shaft Part

66 Gear

67 Bearing Guide Projection

68 Inclination Preventing Stopper

110 Drive Gear Module

120 Motor Module

Claims

1. An automatic cutting apparatus comprising a fixed blade module to cut printed paper, a movable blade module, and a drive module to drive the movable blade module, **characterized in that**:

   the fixed blade module includes a fixed blade, the movable blade module includes a movable blade, and the paper is cut by the fixed blade and the movable blade when the movable blade slides; and
   the fixed blade module, the movable blade module, and the drive module are connected in a mutually detachable state.

2. The automatic cutting apparatus as claimed in claim 1, **characterized in that** the mutually detachable state is an interfitted state.

3. The automatic cutting apparatus as claimed in claim 1 or 2, **characterized in that**
   the drive module includes a motor module including a motor for the movable blade, and a drive gear module to transmit rotation of the motor; and
   the motor module and the drive gear module are connected in a mutually detachable state.

4. A printer unit comprising a printer head to print on paper, and a platen roller to feed the paper, **characterized in that**:

   the printer unit includes a printer module having the printer head, a fixed blade module, a movable blade module, and a drive module to drive the movable blade module;
   the fixed blade includes a fixed blade, the movable blade includes a movable blade, and the paper printed by the printer head is cut by the fixed blade and the movable blade when the movable blade slides; and
   the printer module, the fixed blade module, the movable blade module, and the drive module are connected in a mutually detachable state.

5. The printer unit as claimed in claim 4, **characterized in that** the mutually detachable state is an interfitted state.

6. The printer unit as claimed in claim 4 or 5, **characterized in that** a printer unit having no automatic cutter function is formed by connecting the printer module and the fixed blade module in the mutually detachable state.

7. The printer unit as claimed in any of claims 4 to 6, **characterized in that**
   the drive module includes a motor module including a motor for the movable blade, and a drive gear module to transmit rotation of the motor; and
   the motor module and the drive gear module are connected in a mutually detachable state.

8. The printer unit as claimed in any of claims 4 to 7, **characterized in that** the printer module includes a motor to rotate the platen roller and feed the paper.

9. The printer unit as claimed in any of claims 4 to 8, **characterized in that** the fixed blade module includes the platen roller.

FIG.1

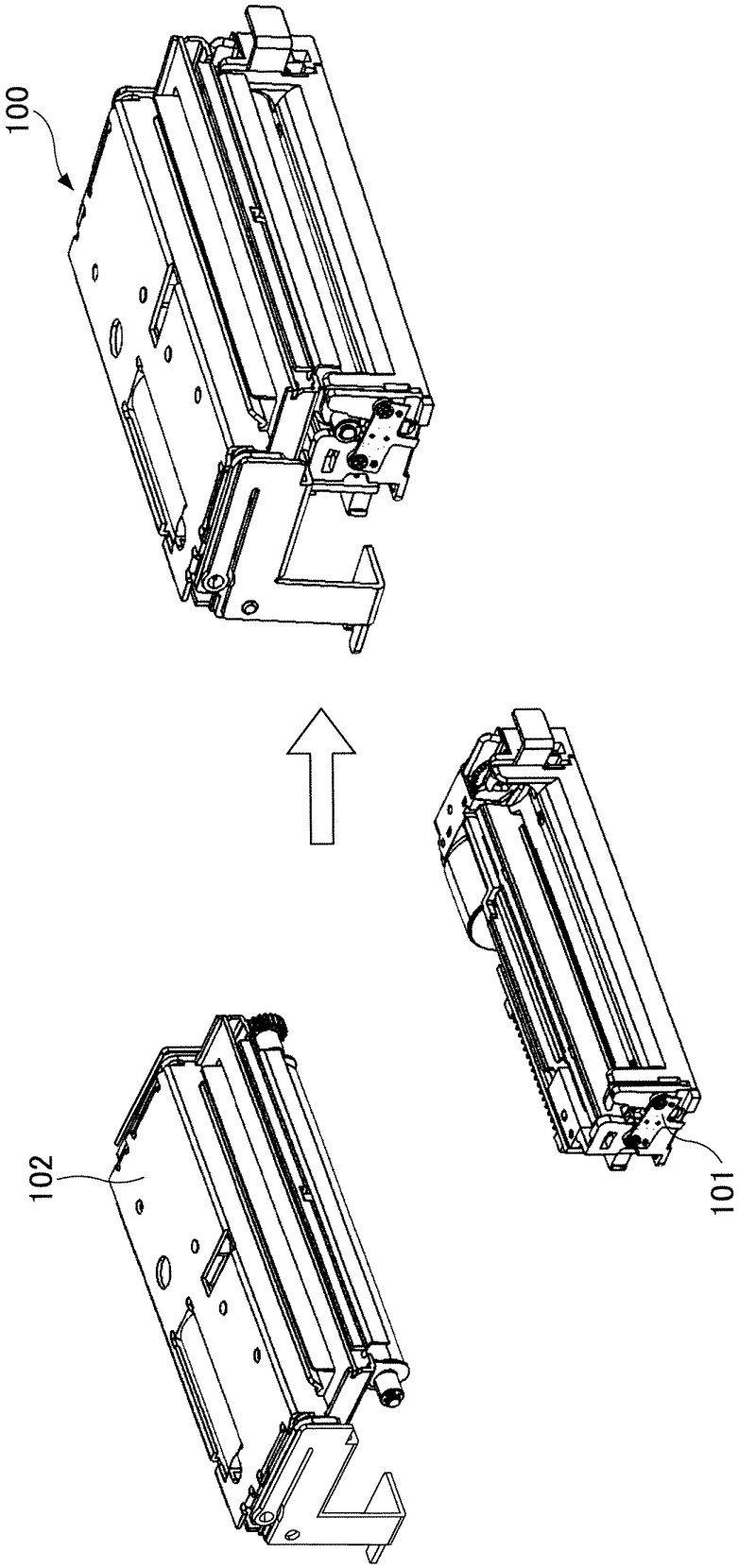


FIG.2

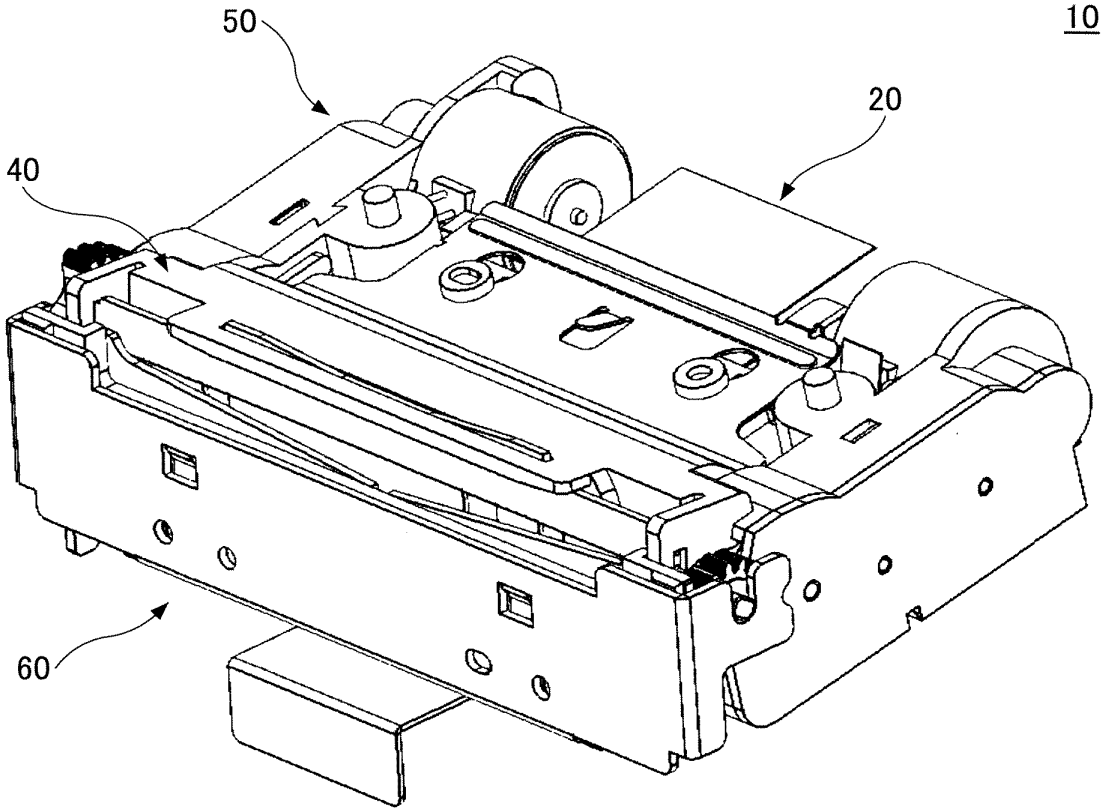


FIG.3

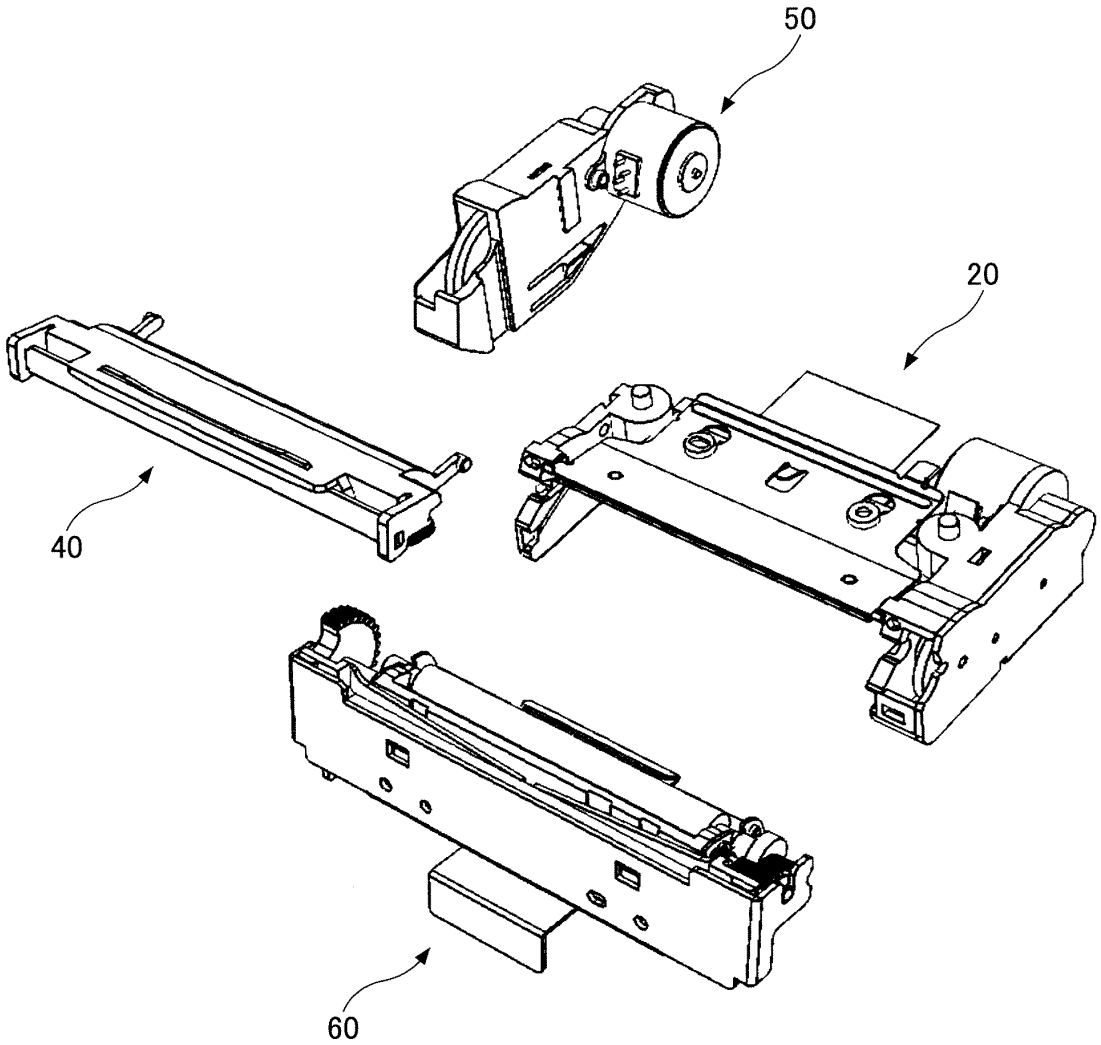


FIG.4

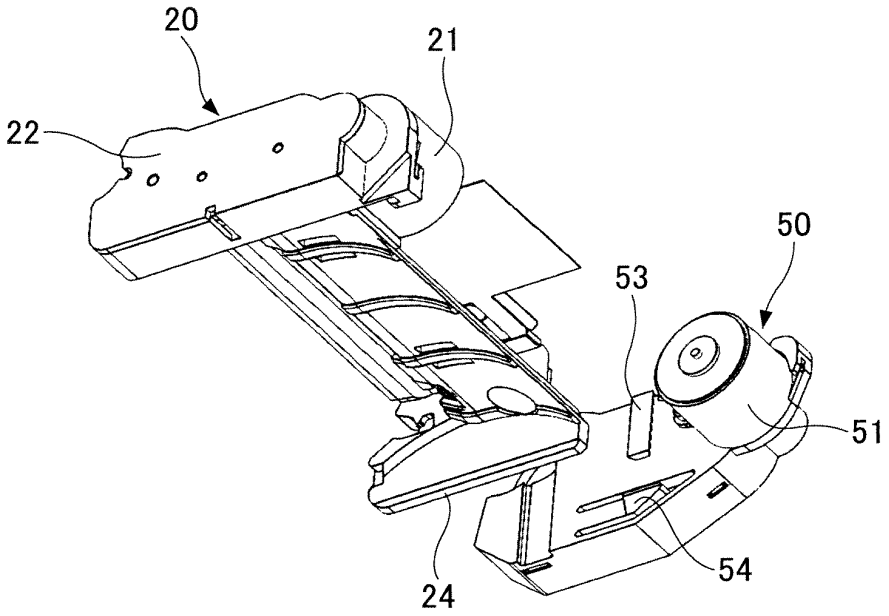


FIG.5

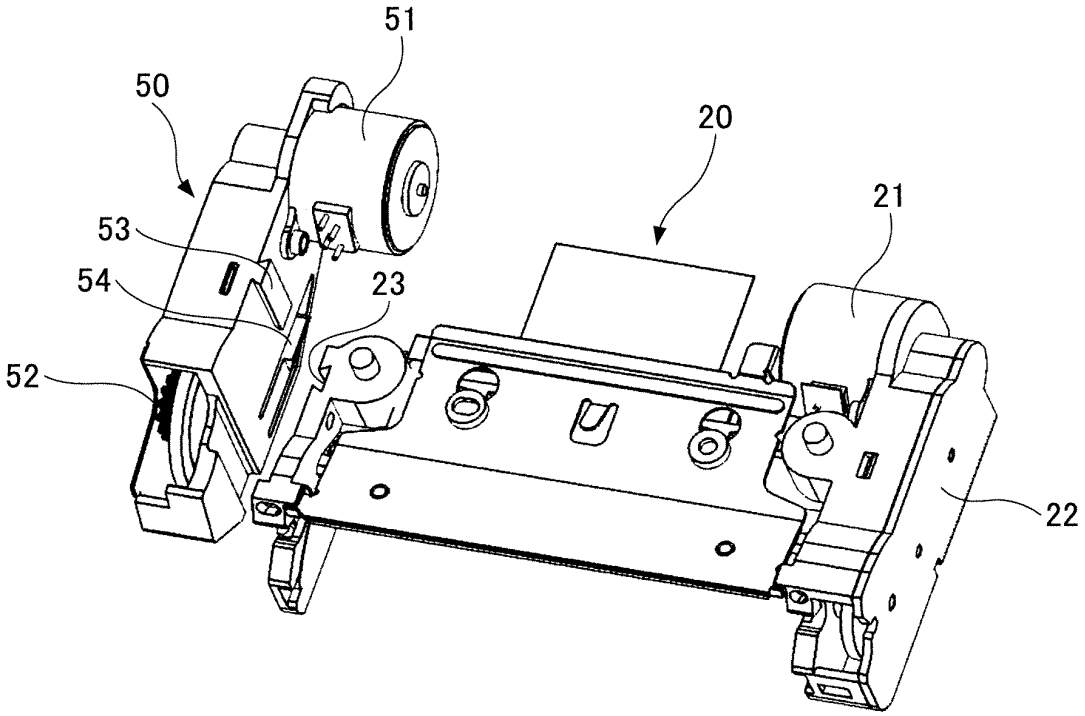


FIG.6

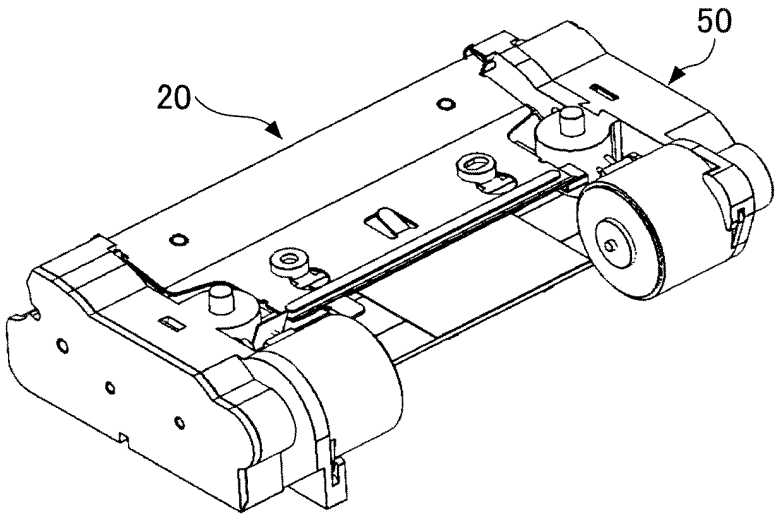


FIG.7

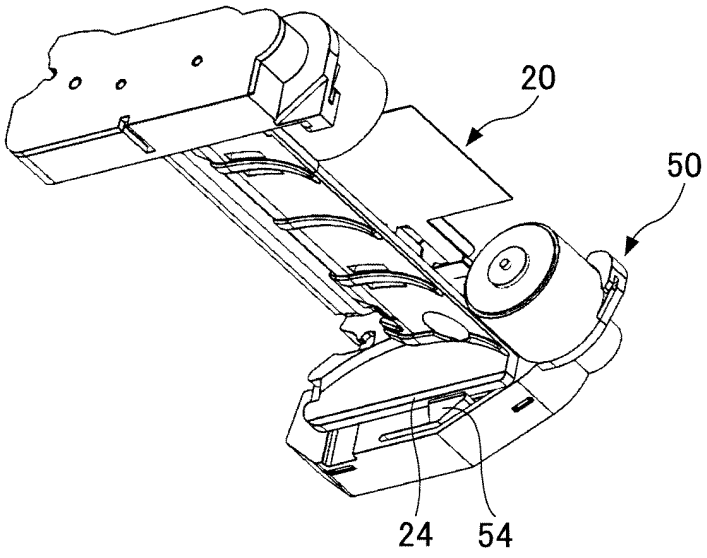


FIG.8

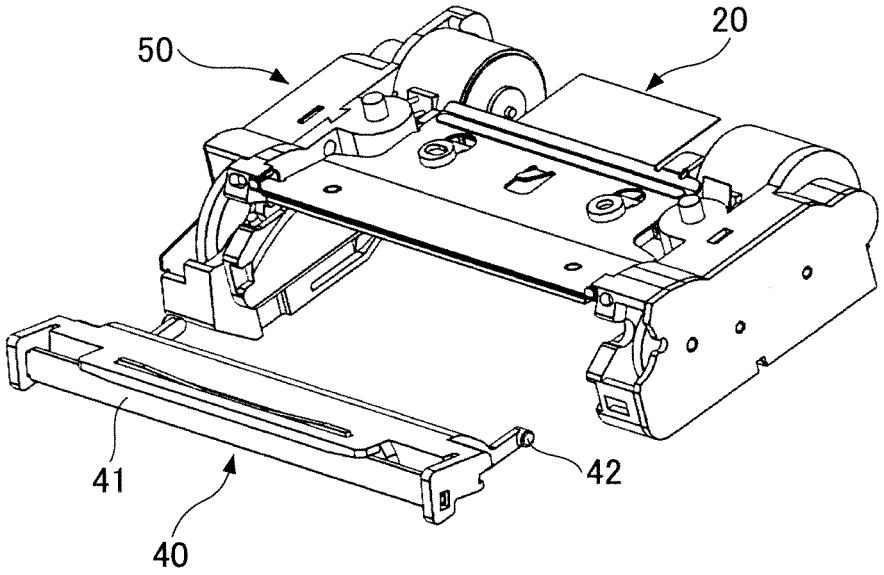


FIG.9

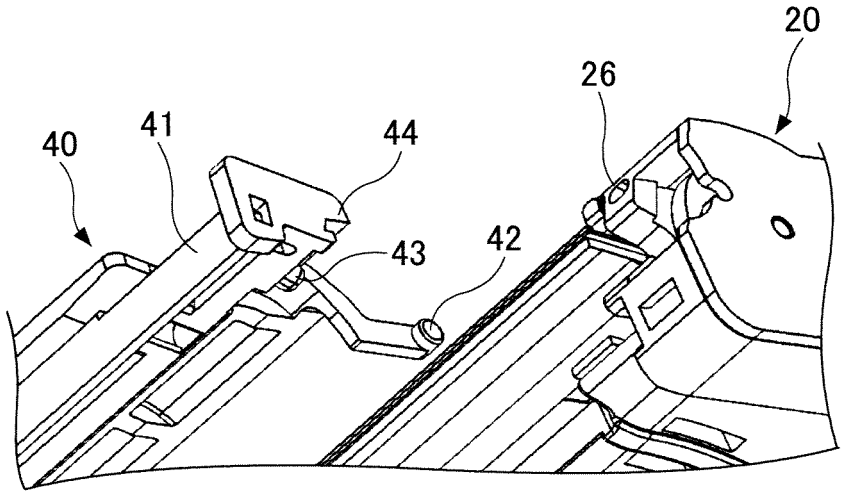


FIG.10

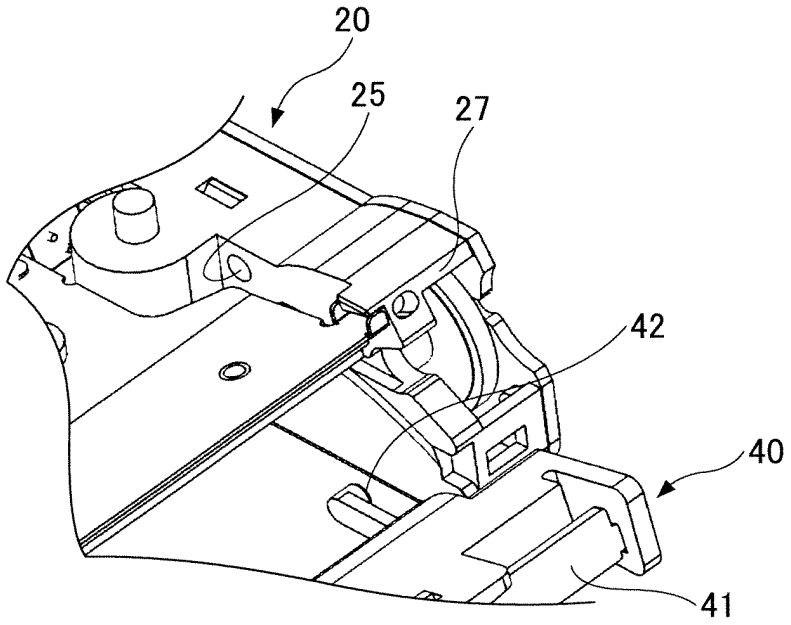


FIG.11

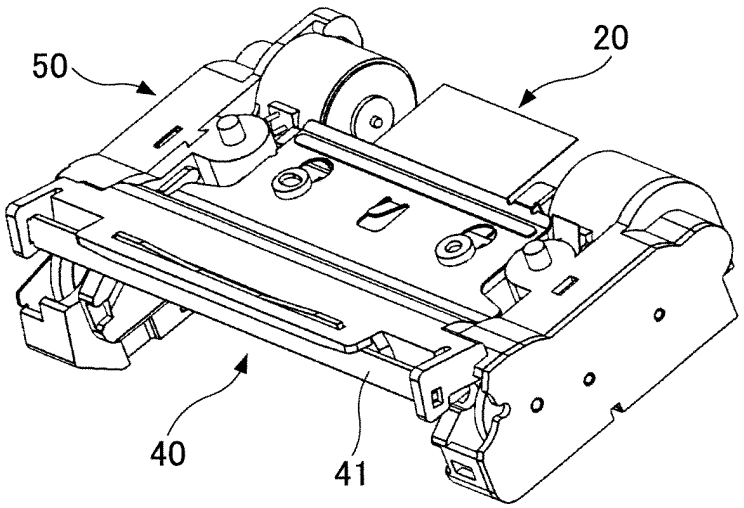


FIG.12

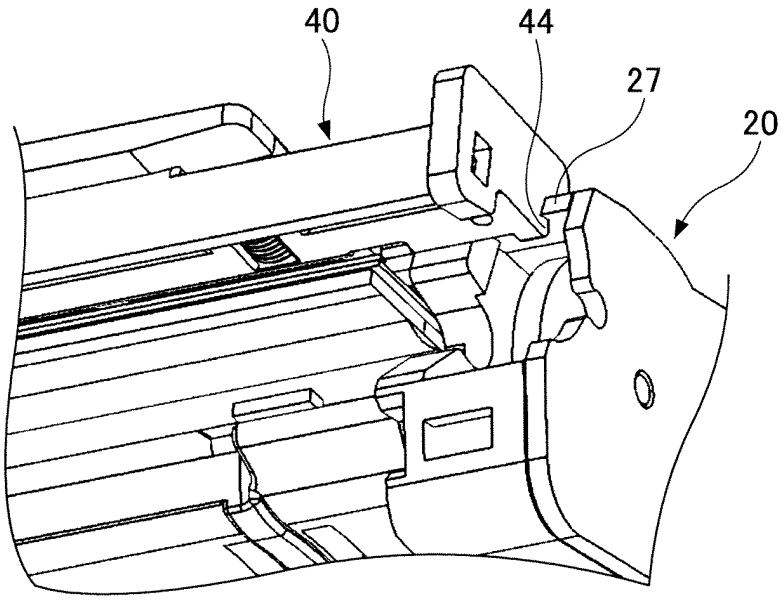


FIG.13

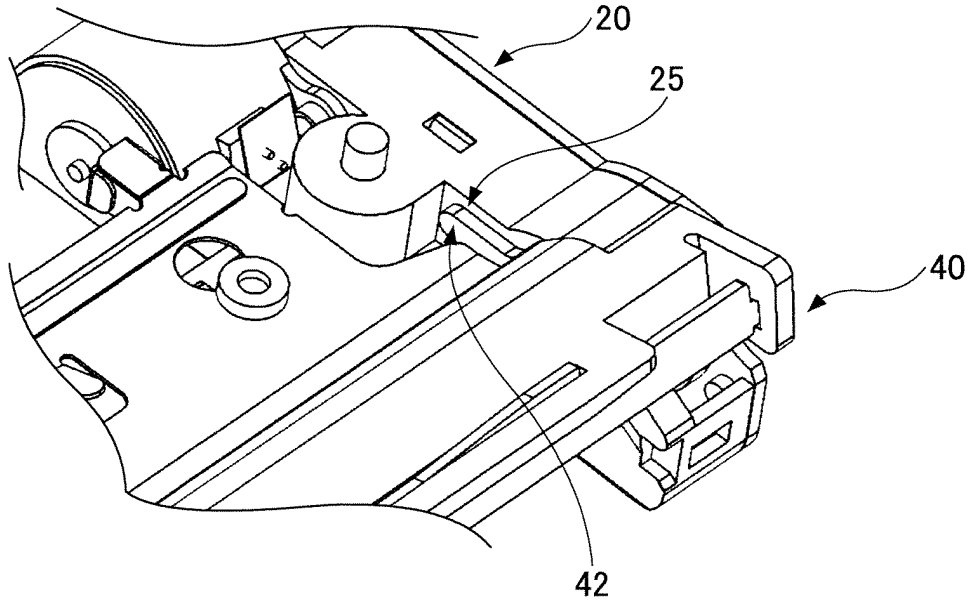


FIG.14

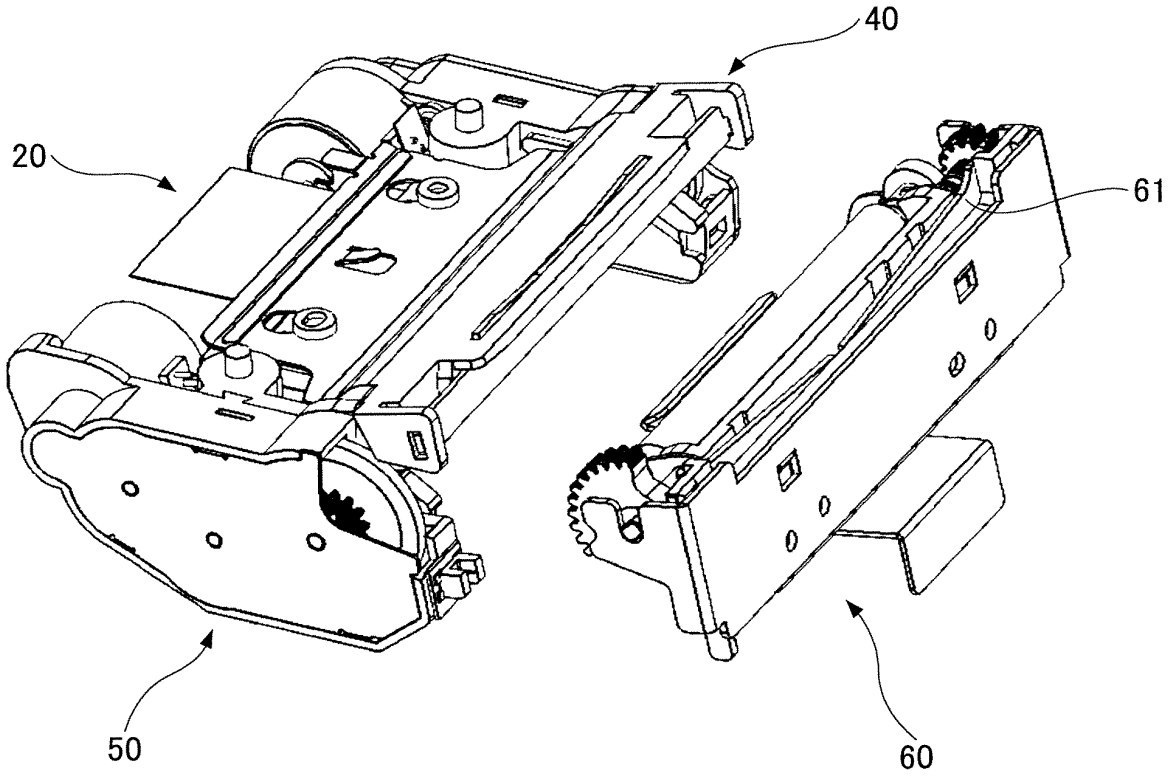


FIG.15

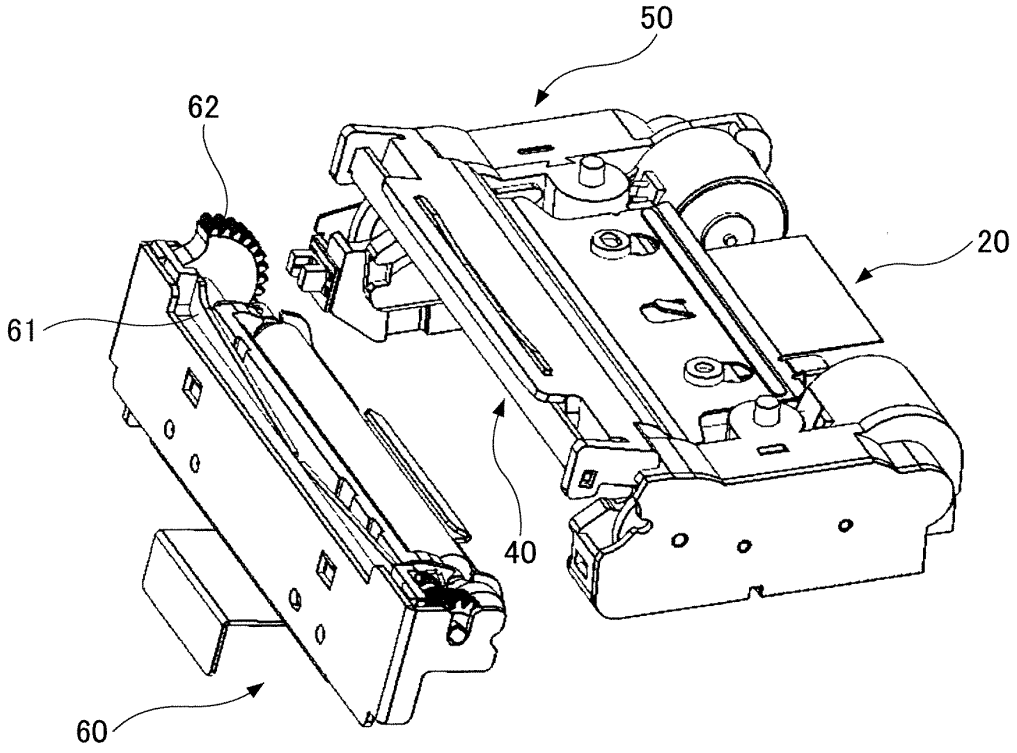


FIG.16

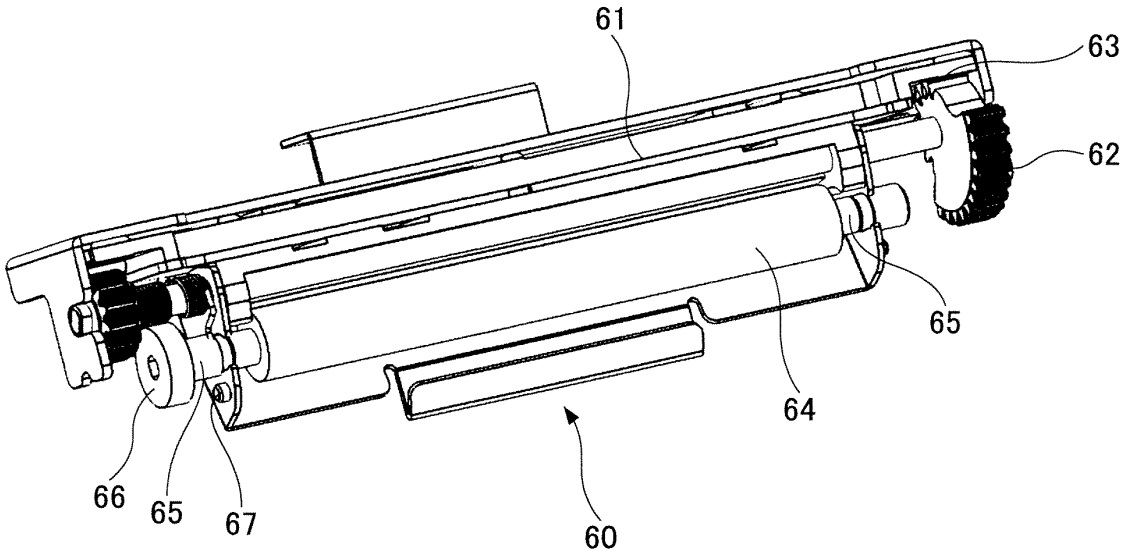


FIG.17

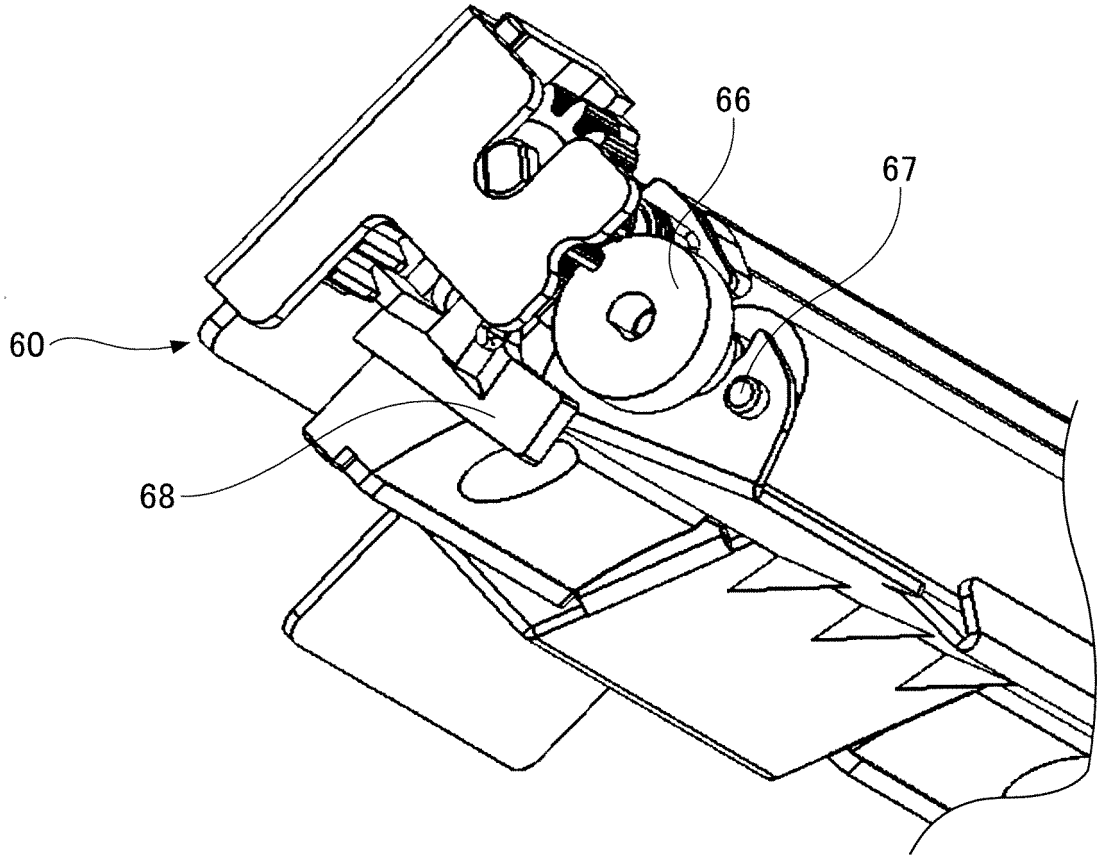


FIG.18

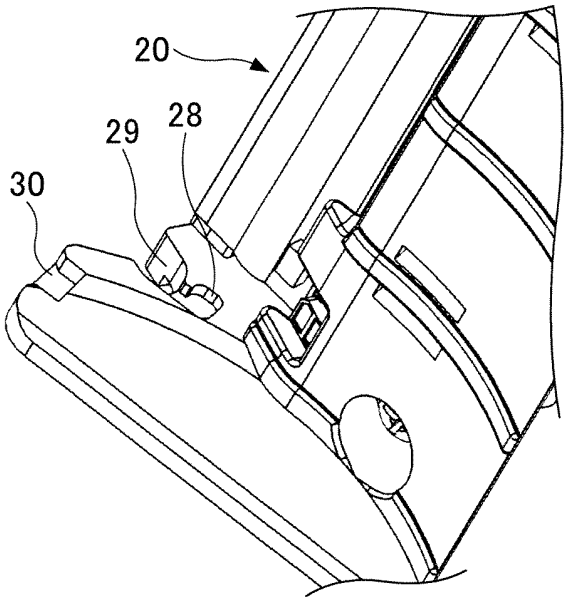


FIG.19

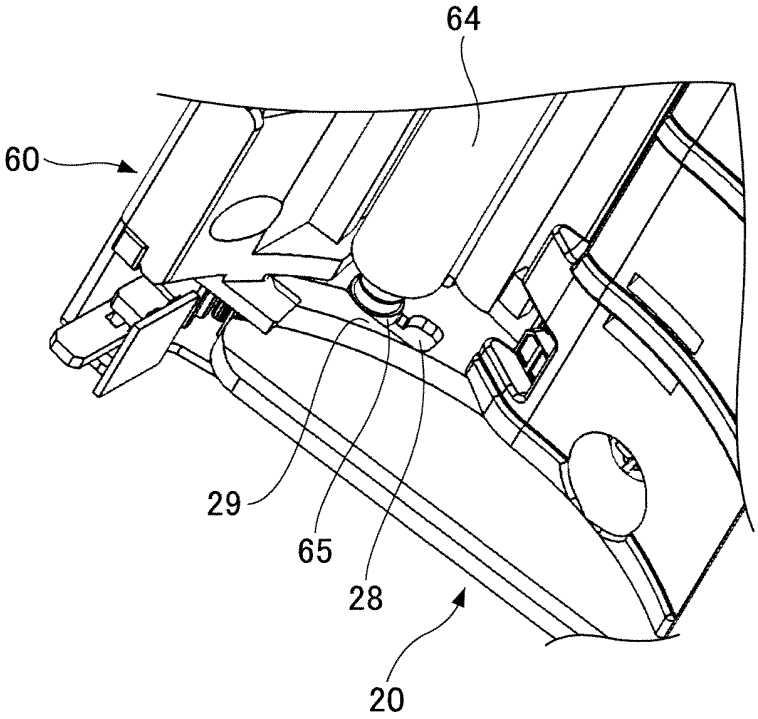


FIG.20

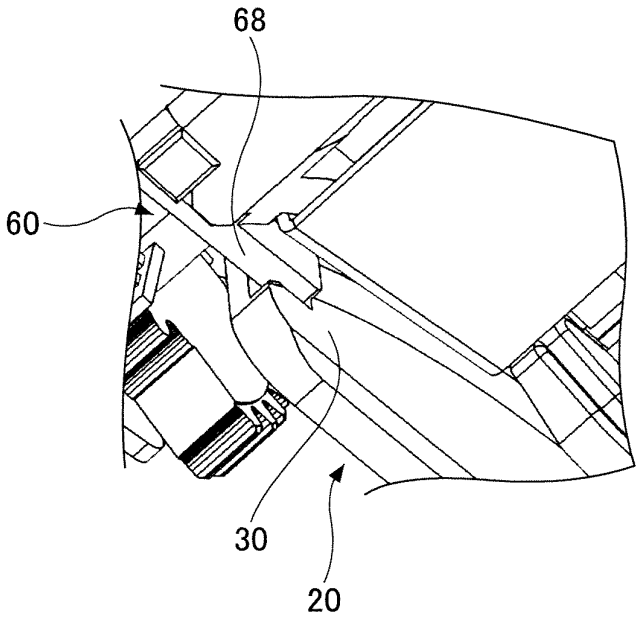


FIG.21

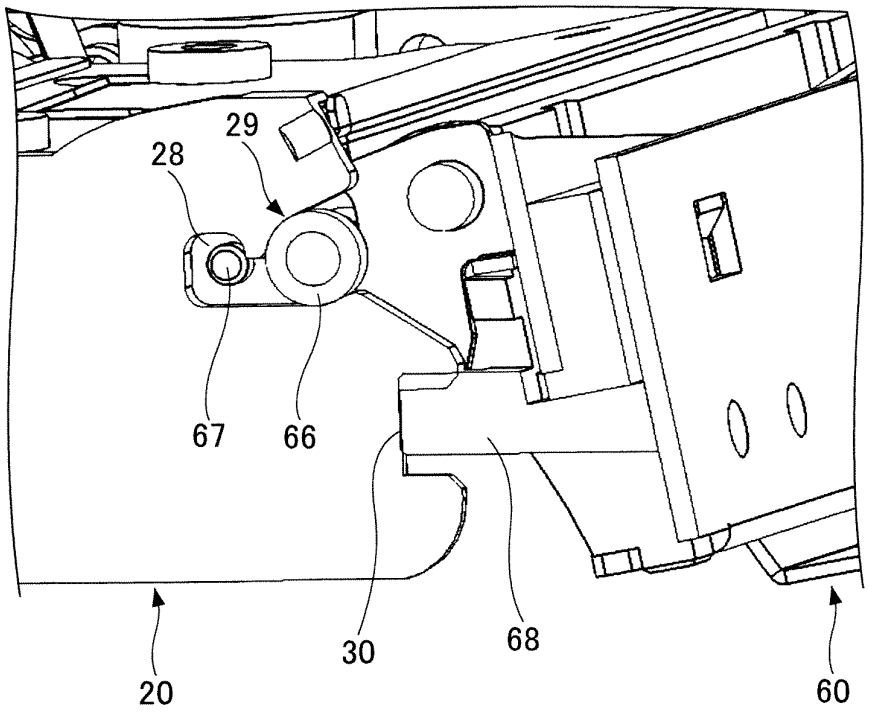


FIG.22

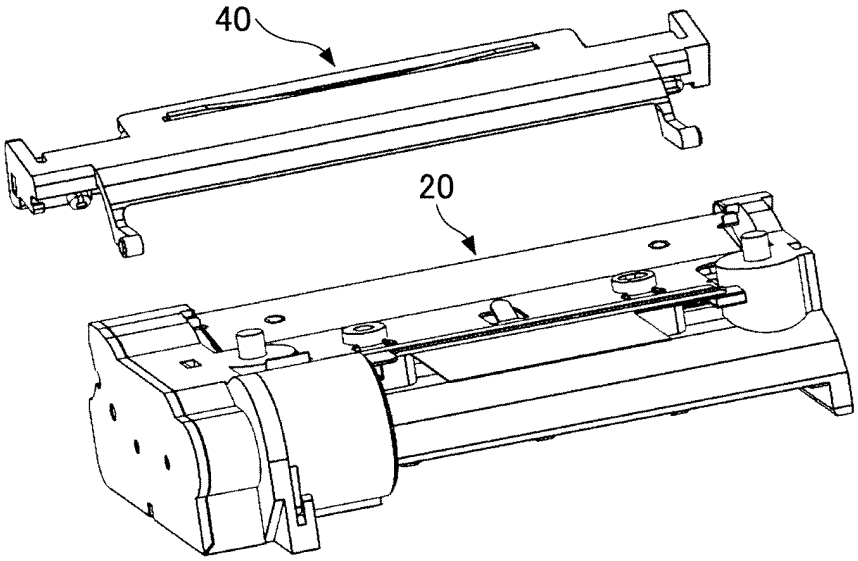


FIG.23

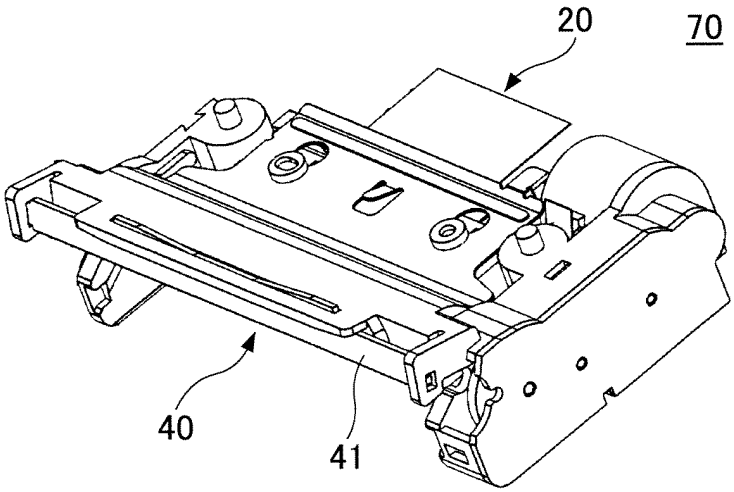


FIG.24A

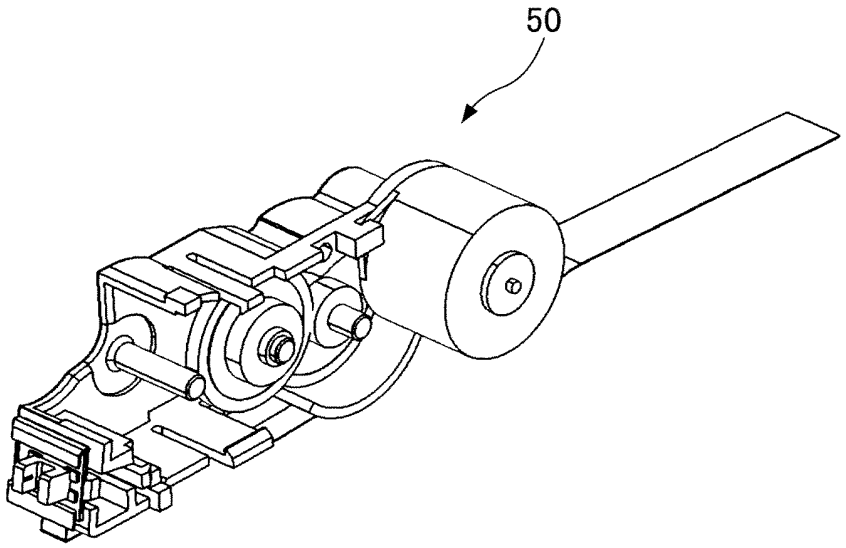
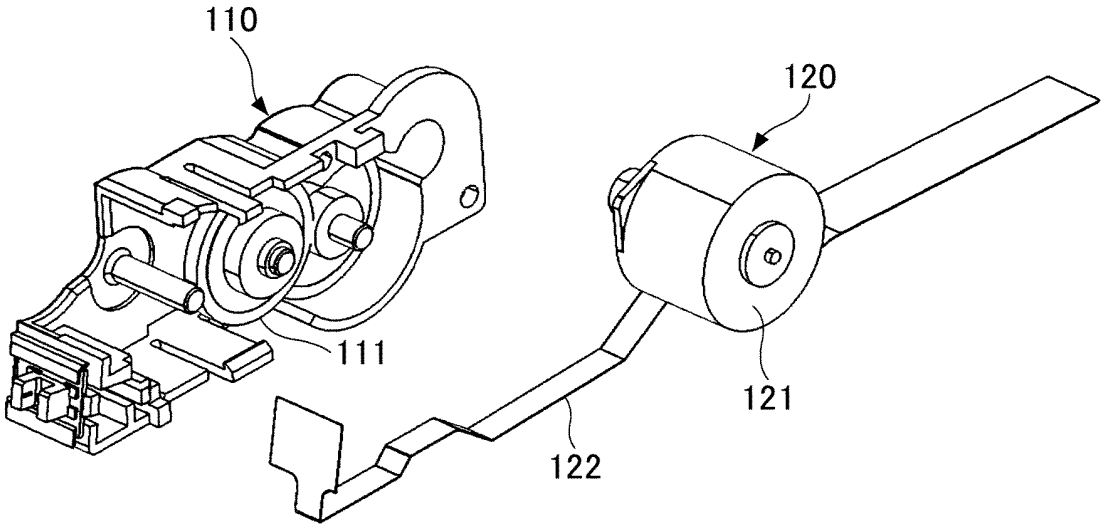


FIG.24B



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/062772

A. CLASSIFICATION OF SUBJECT MATTER
B26D1/08(2006.01)i, *B41J11/70*(2006.01)i, *B41J29/00*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B26D1/08, B41J11/70, B41J29/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2011
Kokai Jitsuyo Shinan Koho	1971-2011	Toroku Jitsuyo Shinan Koho	1994-2011

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2008-265200 A (Fujitsu Component Ltd.), 06 November 2008 (06.11.2008), entire text; all drawings & US 2008/0260448 A1 & EP 1985456 A1 & EP 2070711 A1 & DE 602007007297 D & KR 10-2008-0095164 A & CN 101293429 A & KR 10-2009-0091095 A	1-9
A	JP 2008-194828 A (Seiko Instruments Inc.), 28 August 2008 (28.08.2008), entire text; all drawings & US 2008/0199239 A1 & EP 1955833 A1 & KR 10-2008-0074752 A	1-9

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search 01 August, 2011 (01.08.11)	Date of mailing of the international search report 16 August, 2011 (16.08.11)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/062772

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-271204 A (Fujitsu Component Ltd.), 06 October 2005 (06.10.2005), entire text; all drawings & US 2005/0207818 A1	1-9
A	JP 4-246559 A (Fujitsu Ltd.), 02 September 1992 (02.09.1992), entire text; all drawings (Family: none)	1-9

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005271204 A **[0005]**
- JP 2009143100 A **[0005]**