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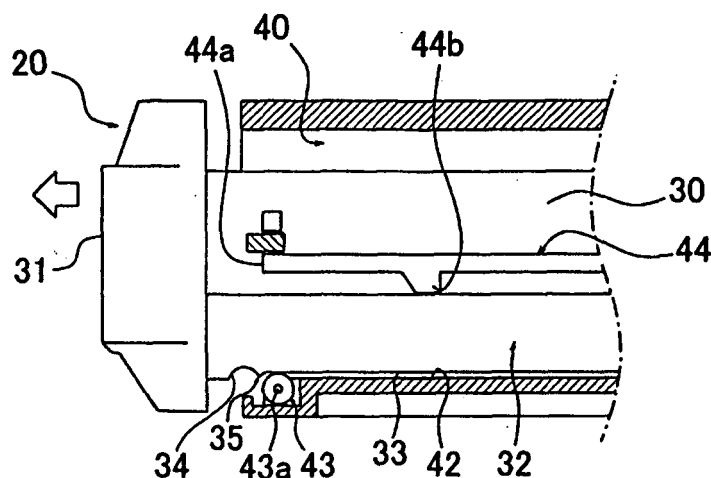
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(54) **Paper feeder and image forming device**

(57) A paper feeder includes a guide surface (33) arranged on a paper feed cassette (20) and a roller (43) arranged on a cassette storage unit (40). When the paper feed cassette (20) is moved along a storing direction thereof inside the cassette storage unit (40), the guide surface (33) placed on the roller (43) is slidably moved by rotation of the roller. In the paper feeder, since the

cassette storage portion includes a placement surface (42) on which the guide surface is placed by surface contact at a storage position where the paper feed cassette is stored in the cassette storage unit (40), the stored paper feed cassette (20) can be maintained in a stable condition, and oscillation of the paper feed cassette (20) generated when the papers are transported can be reduced.

**FIG. 6A**



## Description

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims priority to Japanese Patent Application No. 2006-309611, filed on November 15, 2006, which application is hereby incorporated by reference in its entirety.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

**[0002]** The present invention relates to a paper feeder in which a paper feed cassette for accommodating papers is slidably moved inside a cassette storage unit when the paper feed cassette is pushed into and drawn out from the cassette storage unit, and also relates to an image forming device including the above-described paper feeder.

#### 2. Description of the Related Art

**[0003]** A conventional image forming device such as a facsimile machine and a copier includes a paper feeder having a paper feed cassette for accommodating papers that are transported to a recording unit arranged to record an image. In the paper feeder, the paper feed cassette is stored in a drawer in the cassette storage unit arranged in a main body portion of the image forming device. In the paper feeder, a moving mechanism is arranged to move the paper feed cassette which is pushed into and drawn out from the cassette storage unit. In the moving mechanism, a rail-shaped guide portion formed on the paper feed cassette is placed on a roller (a rotating member) that is arranged on the cassette storage unit, and when pushing in and drawing out the paper feed cassette, the guide portion is slidably moved by rotation of the roller smoothly. Thus, the paper feed cassette can be quietly pushed in and drawn out with a light force.

**[0004]** Moreover, the paper feeder includes a paper-separating-and-feeding mechanism having a flapper on which the papers are placed inside the paper feed cassette, a paper feed roller arranged on a front end side (on a downstream side of transportation) of the flapper, and a separation pad arranged to be pressed against the paper feed roller. In such a paper feeder, a plurality of papers placed on the flapper inside the paper feed cassette are separated one sheet at a time by rotation of the paper feed roller at a press portion between the paper feed roller and the separation pad, and each paper is transported to a paper transportation path on a downstream side.

**[0005]** When transporting the paper in the above-described paper feeder, the paper and the separation pad are rubbed against each other by the rotation of the paper feed roller, the separation pad is oscillated, and the oscillation is transmitted to the paper feed cassette. As the

oscillation of the paper feed cassette increases, there arises a possibility of affecting an image quality, etc., of an image that is recorded at the recording unit. Therefore, in order to minimize the oscillation, it is necessary to maintain the paper feed cassette stored in the cassette storage unit in a stable condition. However, in the above-described moving mechanism, although the paper feed cassette can be smoothly pushed in and drawn out, sufficient measures have not been taken to maintain the paper feed cassette stored in the cassette storage unit in a stable condition.

### SUMMARY OF THE INVENTION

**[0006]** In order to overcome the problems described above, preferred embodiments of the present invention provide a paper feeder, which makes it possible for a paper feed cassette not only to be pushed into and drawn out from a paper storage unit smoothly, but also makes it possible for the paper feed cassette to be maintained in a stable condition when stored in the cassette storage unit; and an image forming device including the same paper feeder.

**[0007]** According to a preferred embodiment of the present invention, a paper feeder includes a paper feed cassette arranged to accommodate papers, a cassette storage unit arranged to store the paper feed cassette, a guide portion provided on the paper feed cassette, and a rotating member provided in the cassette storage unit. Moreover, in the above-described paper feeder, when the paper feed cassette is moved along a storing direction thereof inside the cassette storage unit, the guide portion placed on the rotating member is slidably moved by rotation of the rotating member. Further, the above-described paper feeder includes a placement portion in the cassette storage unit to place the guide portion at a storage position where the paper feed cassette is stored in the cassette storage unit.

**[0008]** According to another preferred embodiment of the present invention, the paper feeder is configured such that the guide portion is placed on the placement portion by surface contact and that a longitudinal size in the storing direction of a portion on which the guide portion is placed by surface contact is greater than a maximum width size in the storing direction of the paper accommodated inside the paper feed cassette.

**[0009]** According to another preferred embodiment of the present invention, in the paper feeder, the rotating member protrudes above the placement portion towards a guide portion side of the paper feed cassette, and the paper feed cassette includes a rotating-member engaging portion to be engaged with the rotating member at the storage position.

**[0010]** According to another preferred embodiment of the present invention, in the paper feeder, the rotating member is arranged on a rear side (near side) of the placement portion in the storing direction of the cassette storage unit.

**[0011]** According to another preferred embodiment of the present invention, the paper feeder includes a step portion arranged between the rotating-member engaging portion and the guide portion of the paper feed cassette such that the rotating member passes over the step portion when the paper feed cassette moves from the storage position.

**[0012]** According to another preferred embodiment of the present invention, the image forming device includes any of the above-described paper feeders.

**[0013]** According to the above-described preferred embodiments of the present invention, the paper feeder is preferably configured such that when the paper feed cassette is moved along the storing direction thereof inside the cassette storage unit, the guide portion placed on the rotating member is slidably moved by the rotation of the rotating member. In the above-described paper feeder, the cassette storage unit includes the placement portion on which the guide portion is placed at the storage position where the paper feed cassette is stored in the cassette storage unit. Therefore, the paper feed cassette can be pushed in and drawn out smoothly by being slidably moved inside the cassette storage unit, and since the guide portion is placed on the placement portion, the paper feed cassette stored at the storage position can be maintained in the stable condition. Accordingly, oscillation of the paper feed cassette generated when the paper is transported inside the paper feed cassette can be effectively reduced.

**[0014]** According to the above-described preferred embodiments of the present invention, since the paper feeder is configured such that the guide portion is placed on the placement portion by surface contact, the paper feed cassette stored at the storage position can be maintained in a more stable condition, and the oscillation of the paper feed cassette can be reduced more effectively. Moreover, since the longitudinal size in the storing direction of the portion on which the guide portion is placed by surface contact is greater than the maximum width size in the storing direction of the paper accommodated inside the paper feed cassette, the oscillation can be prevented from being transmitted from the paper feed cassette to a full width of the transported paper, and the paper can be accurately transported.

**[0015]** According to the above-described preferred embodiments of the present invention, the paper feeder is configured such that the rotating member protrudes above the placement portion towards the guide portion side of the paper feed cassette and that the paper feed cassette includes the rotating-member engaging portion to be engaged with the rotating member at the storage position. Therefore, when the paper feed cassette is moved inside the cassette storage unit, the guide portion is placed on the rotating member, and when the paper feed cassette is stored at the storage position, the guide portion is placed on the placement portion. Accordingly, with this simple configuration, the paper feed cassette can be slidably moved smoothly and also can be main-

tained stably at the storage position.

**[0016]** According to the above-described preferred embodiments of the present invention, in the paper feeder, since the rotating member is arranged on the rear side of the placement portion in the storing direction of the cassette storage unit, when pushing in and drawing out the paper feed cassette, the guide portion can be smoothly moved by the rotating member.

**[0017]** According to the above-described preferred embodiments of the present invention, the paper feeder includes the step portion arranged between the rotating-member engaging portion and the guide portion of the paper feed cassette such that the rotating member passes over the step portion when the paper feed cassette moves from the storage position. Accordingly, with this simple configuration, resistance can be applied to a force which moves the paper feed cassette when the paper feed cassette is pushed in and drawn out. Moreover, a possibility that the paper feed cassette stored at the storage position moves improperly can be reduced.

**[0018]** According to the above-described preferred embodiments of the present invention, the image forming device includes the above described paper feeder. Therefore, the paper feed cassette can be maintained in the stable condition, and an image quality of an image formed on the paper is improved.

**[0019]** Other features, elements, processes, steps, characteristics and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the present invention with reference to the attached drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0020]** Fig. 1 is a perspective view illustrating an external-configuration example of an image forming device including a paper feeder according to a preferred embodiment of the present invention.

**[0021]** Fig. 2 is a sectional side view illustrating a configuration example of a cassette storage unit and a paper feed cassette stored in the cassette storage unit.

**[0022]** Figs. 3A and 3B illustrate a configuration example of the paper feed cassette. Fig. 3A is a plan view, and Fig. 3B is a side view.

**[0023]** Fig. 4 is a sectional side view illustrating a configuration example of the cassette storage unit.

**[0024]** Fig. 5 is a partially enlarged view illustrating a portion on a side surface of the paper feed cassette stored in the cassette storage unit.

**[0025]** Fig. 6 illustrates operations performed when the paper feed cassette is drawn out from the cassette storage unit.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

**[0026]** With reference to the drawings, preferred embodiments of the present invention will be described in

detail. Fig. 1 is a perspective view illustrating an external-configuration example of an image forming device including a paper feeder according to a preferred embodiment of the present invention. First, with reference to Fig. 1, a description will be made of a schematic overall configuration of the image forming device. As long as the image forming device includes the paper feed cassette, the image forming device to which the present invention is applied may be any one of a copier, a facsimile machine, a printer, and/or a multi function peripheral having a copying function, a facsimile function, and a printer function, etc. An image forming device 1 illustrated in Fig. 1 includes a scanning unit 2 arranged on an upper side thereof and a recording unit 3 arranged on a lower side thereof.

[0027] The scanning unit 2 includes an image scanning device 4 arranged to read an image of an original document by scanning, an operation panel 5 attached to a front surface of the image scanning device 4, and an original-document-pressing cover 6 arranged such that one side thereof is attached to an upper portion of the image scanning device 4 by a hinge mechanism (not illustrated), which mechanism allows the cover 6 to be opened and closed. An Automatic Document Feeder (ADF) 7 that transports the original document to the image scanning device 4 is arranged on one end of the original-document-pressing cover 6. The ADF 7 sequentially transports a plurality of original documents placed on an original-document supply tray 8, and after an image of the original document is scanned at the image scanning device 4, discharges the original document onto an original-document discharge tray 9. The recording unit 3 includes a recording device 11 arranged to record the image on a paper and a paper feeder 10 arranged to supply the paper to the recording unit 11. The paper feeder 10 includes a paper feed cassette 20 arranged to accommodate the papers and a cassette storage unit 40 arranged in a main body casing 10a of the paper feeder 10 that stores the paper feed cassette 20. In the following description of the preferred embodiments of the present invention, a direction in which the paper feed cassette 20 is stored in the cassette storage unit 40 will be referred to as a storing direction, a direction in which the papers in the paper feed cassette 20 are transported will be referred to as a paper feeding direction, and the storing direction is perpendicular or substantially perpendicular to the paper feeding direction.

[0028] Fig. 2 is a schematic-sectional-side view of the paper feed cassette 20 stored in the cassette storage unit 40 viewed from a rear side (near side) in the storing direction. Figs. 3A and 3B illustrate the paper feed cassette 20, Fig. 3A is a plan view, and Fig. 3B is a side view viewed from the front of the paper feeding direction. Fig. 4 is a sectional side view illustrating the cassette storage unit 40 viewed from the front of the paper feeding direction. As illustrated in the drawings, the paper feed cassette 20 accommodating papers W is surrounded on all four sides by side walls 30 and has a rectangular box shape with its upper portion open. The paper feed cas-

sette 20 includes a front cover 31 attached to the side wall 30 arranged on the rear side in the storing direction, whereby the cassette 20 can be pushed into and drawn out from the cassette storage unit 40 in a drawer way that opens towards a front surface of the image forming device 1.

[0029] Inside the paper feed cassette 20, as illustrated in Fig. 2, a flapper 22 is arranged such that the flapper 22 having a pivot spindle 21 as a supporting point can pivot in a vertical direction, and a coil spring 23 is arranged on a lower surface side of the flapper 22 and is used as an urging member that urges an pivoting end of the flapper 22 upward. At a position adjacent to a rear end portion in the paper feeding direction of the flapper 22, a plate-like end guide 24 is arranged such that a trailing edge of the papers W placed on the flapper 22 makes contact with the end guide 24.

[0030] A shaft 25 extending in a horizontal direction which is perpendicular or substantially perpendicular to the paper feeding direction is arranged above a front end portion in the paper feeding direction of the flapper 22, and a paper feed roller 26 is attached to a middle portion of the shaft 25. Each end portion of the shaft 25 is axially supported on the respective side walls 30 of the paper feed cassette 20. Although a detailed illustration is omitted, when the paper feed cassette 20 is fully stored in the cassette storage unit 40, a drive transmission mechanism (not illustrated), which is arranged on the side of the cassette storage unit 40, engages with one end of the shaft 25, whereby power from a source of drive power such as a motor (not illustrated) arranged in the paper feeder 10 is transmitted to the shaft 25 to rotate the paper feed roller 26.

[0031] As illustrated in Fig. 2, a separation pad supporting member 27 with a separation pad 27a attached thereto is arranged at a position adjacent to the front end portion in the paper feeding direction of the flapper 22. The separation pad supporting member 27 is urged upward by a coil spring 27b arranged between the separation pad supporting member 27 and a bottom portion of the paper feed cassette 20, and the separation pad 27a attached to an upper surface of the separation pad supporting member 27 is pressed against a lower surface of the paper feed roller 26. A friction coefficient of the separation pad 27a with respect to the papers is lower than a friction coefficient of the paper feed roller 26 with respect to the papers, and is greater than a friction coefficient between the papers. For example, a sheet-shaped member composed of an urethane resin material or other suitable material can be used as the separation pad 27a. Accordingly, the paper feed roller 26 is pressed against an upper surface of a front end portion in the paper feeding direction of the papers W placed on the flapper 22 while the paper feed roller 26 is also pressed against the separation pad 27a. Thus, a paper-separating-and-feeding mechanism 29 that separates and feeds the papers W in the paper feed cassette 20 can be configured by the paper feed roller 26 and the separation pad 27a.

**[0032]** As illustrated in Figs. 2, 3A and 3B, a guide rail 32 is arranged on respective outer side surfaces of the side walls 30 on both sides with respect to the storing direction of the paper feed cassette 20. The guide rails 32 are projected or expanded in a substantially rectangular shape in their cross section and linearly extended along the storing direction. As illustrated in Fig. 3B, a plane guide surface (a guide portion) 33 that extends along the storing direction is arranged on a lower surface of the guide rail 32, and a roller engaging portion 34 that engages with a roller 43 to be described below is arranged on an end portion of the guide surface 33 that is adjacent to the front cover 31. The roller engaging portion 34 is a concave portion having a semicircular shape arranged along an outer peripheral surface of the roller 43. Between the guide surface 33 and the roller engaging portion 34, a small-protrusion-shaped step portion 35 is arranged such that the step portion 35 slightly protrudes downward below the guide surface 33 and the roller engaging portion 34.

**[0033]** A front side (an inner side) in the storing direction of the guide rail 32 protrudes from the side wall 30 that is arranged on a rear side of the paper feed cassette 20. A small-protrusion-shaped latching portion 36 is arranged on an upper surface of the protruded portion, and a slope portion 37 extended from the guide surface 33 is arranged on a lower surface of the protruded portion. The slope portion 37 has a slope shape that gradually slants upward from the rear side towards the front side in the storing direction. Fig. 3 illustrates only a side surface of the guide rail 32 that is arranged on the front in the paper feeding direction of the paper feed cassette 20, however, the other guide rail 32 that is arranged on the back in the paper feeding direction includes a similar configuration as that of the above-described guide rail 32.

**[0034]** Next, as illustrated in Figs. 2 and 4, the cassette storage unit 40 is a substantially-rectangular-concave portion that stores the paper feed cassette 20 in a drawer configuration. Hereupon, Fig. 4 illustrates only one side of the unit 40 and it is noted that the other (opposite) side of the unit 40 has a similar configuration as illustrated in Fig. 4. On each side with respect to the storing direction inside the cassette storage unit 40, a raised portion 41 extends along the storing direction, and the raised portion 41 has a plane placement surface (a placement portion) 42 on its upper surface. The placement surface 42 extends from a portion adjacent to an opening 40a towards an inner most portion of the cassette storage unit 40. A longitudinal size in the storing direction of a portion at which the guide surface 33 is placed on the placement surface 42 by surface contact is greater than a maximum width size (a width size of the paper of a maximum size that can be accommodated) in the storing direction of the papers W accommodated inside the paper feed cassette 20. The roller 43 is arranged on an end portion on the rear side in the storing direction of the placement surface 42 (i.e., an end portion adjacent to the opening 40a). The roller 43 is a cylindrical rotating member including a ro-

tating shaft 43a arranged in the horizontal direction that is perpendicular or substantially perpendicular to the storing direction, and an upper surface (i.e., an upper side surface with respect to the rotating shaft 43a) of the roller 43 is slightly projected upward from the placement surface 42.

**[0035]** A stick-shaped guide bar 44 extending along the storing direction is arranged above the placement surface 42. The guide bar 44 guides the corresponding guide rail 32 of the paper feed cassette 20, which is inserted between the placement surface 42 and the guide bar 44, along the storing direction. An end portion 44a on the rear side in the storing direction is supported in the cassette storage unit 40. A small-protrusion-shaped latching projection 44b projecting downward is arranged in the middle of the guide bar 44. The guide bar 44 is not steadily fixed in the cassette storage unit 40, but is arranged such that the guide bar 44 can slightly move in a vertical direction with the end portion 44a as a supporting point. The guide surface 33 of the guide rail 32 arranged on the paper feed cassette 20, the placement surface 42 and the roller 43 arranged on the cassette storage unit 40 together constitute a moving mechanism that slidably moves the paper feed cassette 20 arranged to be pushed into and drawn out from the cassette storage unit 40.

**[0036]** Now, a description will be made of a state in which the paper feed cassette 20 including the above-described configuration is stored in the cassette storage unit 40. Fig. 5 is a partially enlarged view illustrating a portion of a side surface of the paper feed cassette 20 stored in the cassette storage unit 40. In the following description, a position at which the paper feed cassette 20 is pushed into the inner most portion and fully stored in the cassette storage unit 40 will be referred to as a storage position of the paper feed cassette 20. Under the state illustrated in Fig. 5, the paper feed cassette 20 is at the storage position. In the above-described state, the roller 43 of the cassette storage unit 40 is engaged with the roller engaging portion 34 of the paper feed cassette 20, and the guide surface 33 of the paper feed cassette 20 is placed on the placement surface 42 of the cassette storage unit 40 by surface contact.

**[0037]** A description will be made of an operation performed when the papers accommodated in the paper feed cassette 20 are transported under the state in which the paper feed cassette 20 is positioned at the storage position. In the paper feed cassette 20, as illustrated in Fig. 2, the upper surface of the papers W placed on the flapper 22 is elastically in contact with the paper feed roller 26. When the paper feed roller 26 is rotated, the uppermost paper W is sequentially fed to a press portion 28 between the paper feed roller 26 and the separation pad 27a. At this time, if a plurality of layered papers W are fed together to the press portion 28, since the friction coefficient between the papers W and the separation pad 27a is greater than the friction coefficient between the papers W, the lowermost paper W that is in contact with the separation pad 27a is restrained by the separation

pad 27a, the uppermost paper W that is in contact with the paper feed roller 26 is sequentially separated one sheet at a time and transported to a downstream side, and the lowermost paper W that is in contact with the separation pad 27a is transported when the lowermost paper W comes on the top.

**[0038]** In the transportation of the papers W, when the paper W that is in contact with the separation pad 27a is transported, since the separation pad 27a and the paper W are rubbed against each other, the separation pad supporting member 27 is slightly oscillated by a restoring force of the coil spring 27b, and the oscillation is transmitted to the paper feed cassette 20. However, since the paper feed cassette 20 in the present preferred embodiment is arranged such that the guide surface 33 is placed on the placement surface 42 by surface contact at the storage position, the paper feed cassette 20 can be stably maintained at the storage position in the cassette storage unit 40. Accordingly, even if the separation pad supporting member 27 is oscillated when the papers W are transported, the paper feed cassette 20 can be effectively prevented from being oscillated (vibrated sympathetically) by the oscillation.

**[0039]** Next, a description will be made of a process of drawing out the paper feed cassette 20 from the storage position. Figs. 6A-6C illustrate the process. First, when the paper feed cassette 20 at the storage position as illustrated in Fig. 5 is drawn out towards the near side, the roller 43 that is engaged with the roller engaging portion 34 passes over the step portion 35. Consequently, resistance is applied to the force to draw out the paper feed cassette 20. When the roller 43 has passed over the step portion 35, as illustrated in Fig. 6A, the guide surface 33 of the paper feed cassette 20 is placed on the roller 43. Under the above-described state, when the paper feed cassette 20 is further drawn out towards the near side, the guide surface 33 placed on the roller 43 is slidably moved towards the near side along the storing direction by the rotation of the roller 43, and thus, the paper feed cassette 20 is drawn out. At this time, since an upper surface of the roller 43 slightly protrudes from the placement surface 42 (i.e., protrudes towards a side of the guide surface 33 of the paper feed cassette 20), the guide surface 33 placed on the roller 43 is positioned apart from the placement surface 42.

**[0040]** When the paper feed cassette is further drawn out, as illustrated in Fig. 6B, the latching portion 36 of the guide rail 32 makes contact with the latching projection 44b of the guide bar 44 and is latched, and the movement of the paper feed cassette 20 is stopped at the above-described position. Therefore, when the paper feed cassette 20 is drawn out, the paper feed cassette 20 can be prevented from improperly falling off of the cassette storage unit 40. When drawing out the paper feed cassette 20 further from the above-described position to extract the paper feed cassette 20 from the cassette storage unit 40, as illustrated in Fig. 6C, by holding the near side of the paper feed cassette 20 upward, the paper feed cas-

sette 20 is drawn out towards the near side while the latching portion 36 is moved to a lower side of the latching projection 44b. At this time, since the slope portion 37 is arranged on the lower surface of a rear end portion of the guide rail 32, the paper feed cassette 20 can be extracted without having the guide rail 32 make contact with the placement surface 42.

**[0041]** Contrary to the above-described process, when storing the paper feed cassette 20 in the cassette storage unit 40, while the paper feed cassette 20 is moved inside the cassette storage unit 40, the guide surface 33 placed on the roller 43 is slidably moved along the storing direction by the rotation of the roller 43. Then, the roller 43 passes over the step portion 35 before the paper feed cassette 20 is stored at the storage position. When the paper feed cassette 20 is stored at the storage position, the roller 43 is engaged with the roller engaging portion 34, whereby the guide surface 33 is placed on the placement surface 42.

**[0042]** As described above, in the moving mechanism of the paper feed cassette 20 of the present preferred embodiment, when the paper feed cassette 20 is moved along the storing direction inside the cassette storage unit 40, the guide surfaces 33 placed on the rollers 43 are slidably moved by the rotation of the rollers 43, and at the storage position where the paper feed cassette 20 is stored in the cassette storage unit 40, the guide surfaces 33 are placed on the placement surfaces 42 by surface contact. Accordingly, the paper feed cassette 20 can be pushed in and drawn out smoothly by being slidably moved inside the cassette storage unit 40, and moreover, the paper feed cassette 20 stored at the storage position can be stably maintained. Therefore, the oscillation of the paper feed cassette 20 generated when the papers inside the paper feed cassette 20 are transported can be effectively reduced, and consequently, problems caused by the oscillation of the paper feed cassette 20 can be prevented.

**[0043]** Further, since the rollers 43 protrude from the placement surfaces 42 towards the side of the guide surfaces 33, and the roller engaging portions 34 that are engaged with the rollers 43 at the storage position are arranged on the paper feed cassette 20, when the paper feed cassette 20 is moved inside the cassette storage unit 40, the guide surfaces 33 are placed on the rollers 43, and when the paper feed cassette 20 is stored at the storage position, the guide surfaces 33 are placed on the placement surfaces 42 by surface contact. Accordingly, with this simple configuration, the paper feed cassette 20 can be slidably moved smoothly, and the oscillation at the storage position can be reduced.

**[0044]** Furthermore, since the rollers 43 are arranged on the rear side of the placement surfaces 42 in the storing direction of the cassette storage unit 40, when pushing in and drawing out the paper feed cassette 20, the guide surfaces 33 can be smoothly moved by the rollers 43. In addition, in the simple configuration in which the step portions 35 are arranged between the roller engag-

ing portions 34 and the guide surfaces 33 of the paper feed cassette 20, the resistance can be applied to the force to push in and draw out the paper feed cassette 20. Therefore, the paper feed cassette 20 stored at the storage position can be effectively prevented from being improperly moved.

**[0045]** The preferred embodiments of the present invention have been described, however, the present invention is not limited to the above-described preferred embodiments and can be modified in numerous ways within the scope of the technical ideas described in the scope of claims, the specification, and the accompanying drawings. Therefore, any forms, structures, and materials which are not described in the specification and the drawings can be within the scope of the technical ideas of the present invention as long as such forms, structures, and materials include the functions and advantages of the present invention. For example, the guide portion and the rotating member arranged in the paper feeder of the present invention are not limited to the guide surfaces 33 and the rollers 43 described in the above-described preferred embodiments, and provided that the guide portion placed on the rotating member is arranged to be slidably moved by the rotation of the rotating member, specific forms, etc., of the guide portion and the rotating member may have other forms, etc. In addition, as long as that the placement portion included in the moving mechanism has a shape on which the guide portion of the paper feed cassette stored at the storage position can be placed, the placement portion may have other shapes, etc., that are different from that of the above-described preferred embodiments.

**[0046]** The configuration of the paper-separating-and-feeding mechanism 29 including the flapper 22, the paper feed roller 26, and the separation pad 27a arranged in the paper feed cassette 20 in the above-described preferred embodiments is just an example. Therefore, other than that disclosed in the paper-separating-and-feeding mechanism 29 in which the paper feed roller 26 is attached to the paper feed cassette 20, the paper feed roller 26 may be attached inside the cassette storage unit 40 such that when the paper feed cassette 20 is stored in the cassette storage unit 40, the paper feed roller 26 of the cassette storage unit 40 makes contact with the separation pad 27a of the paper feed cassette 20. In such a case, since the guide surfaces 33 are placed on the placement surfaces 42, the paper feed cassette 20 of the present preferred embodiment can be stably maintained at the storage position. Therefore, a contact state of the paper feed roller 26 and the separation pad 27a can be in good condition, the oscillation of the paper feed cassette 20 can be reduced, and the paper transportation can be stably performed. It is not necessarily required to provide the separation pad supporting member 27 of the paper-separating-and-feeding mechanism 29, and the separation pad 27a may be directly attached to the side wall 30, etc., of the paper feed cassette 20.

**[0047]** While the present invention has been described

with respect to preferred embodiments thereof, it will be apparent to those skilled in the art that the disclosed invention may be modified in numerous ways and may assume many embodiments other than those specifically set out and described above. Accordingly, the appended claims are intended to cover all modifications of the present invention that fall within the true spirit and scope of the present invention.

## Claims

### 1. A paper feeder 10 comprising:

a paper feed cassette 20 arranged to accommodate papers;  
a cassette storage unit 40 arranged to store the paper feed cassette 20;  
at least one guide portion 33 arranged on the paper feed cassette 20; and  
at least one rotating member arranged on the cassette storage unit 40,

wherein when the paper feed cassette 20 is moved along a storing direction of the paper feed cassette 20 inside the cassette storage unit 40, the guide portion 33 placed on the rotating member is slidably moved by rotation of the rotating member, and the cassette storage unit 40 includes at least one placement portion 42 on which the guide portion 33 is placed at a storage position where the paper feed cassette 20 is stored in the cassette storage unit 40.

2. The paper feeder 10 according to claim 1, wherein the guide portion 33 is placed on the placement portion 42 by surface contact.

3. The paper feeder 10 according to claim 2, wherein a longitudinal size in the storing direction of a portion on which the guide portion 33 is placed by surface contact is greater than a maximum width size in the storing direction of the papers accommodated in the paper feed cassette 20.

4. The paper feeder 10 according to claim 3, wherein the rotating member protrudes above the placement portion 42 towards a side of the guide portion 33 of the paper feed cassette 20.

5. The paper feeder 10 according to claim 4, wherein the rotating member is a cylindrical member including a rotating shaft arranged in a horizontal direction that is perpendicular to the storing direction.

6. The paper feeder 10 according to claim 5, wherein the paper feed cassette 20 includes a rotating member engaging portion to be engaged with the rotating member at the storage position.

7. The paper feeder 10 according to claim 6, wherein the rotating member engaging portion is a concave portion having a semicircular shape arranged along an outer peripheral surface of the rotating member.

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8. The paper feeder 10 according to claim 7, wherein the rotating member is arranged on a rear side of the placement portion 42 in the storing direction of the cassette storage unit 40.

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9. The paper feeder 10 according to claim 8, wherein at least one step portion 35 is arranged for the rotating member to pass over when the paper feed cassette 20 is moved from the storage position.

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10. The paper feeder 10 according to claim 9, wherein the step portion 35 is arranged between the rotating member engaging portion and the guide portion 33 of the paper feed cassette 20.

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11. An image forming device comprising the paper feeder 10 according to any one of claim 1 through claim 10.

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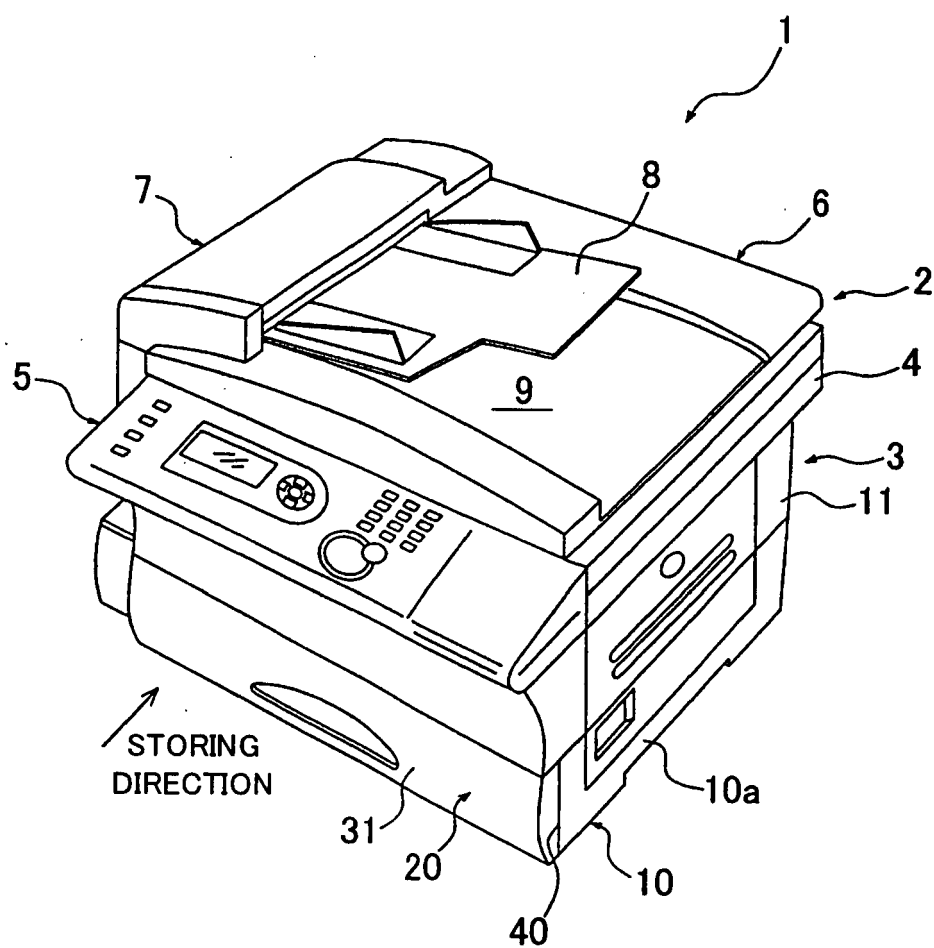
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FIG. 1



**FIG. 2**

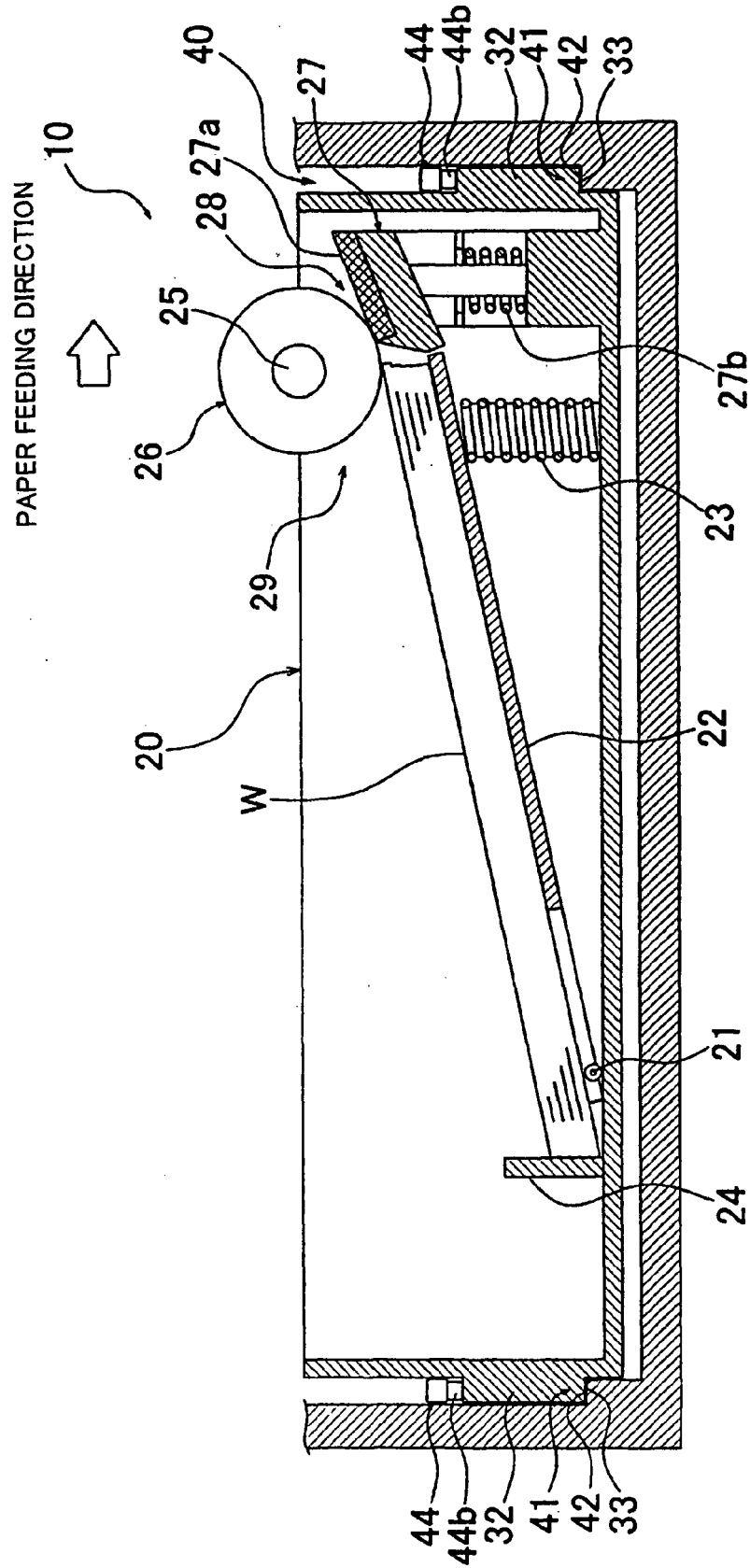


FIG. 3A

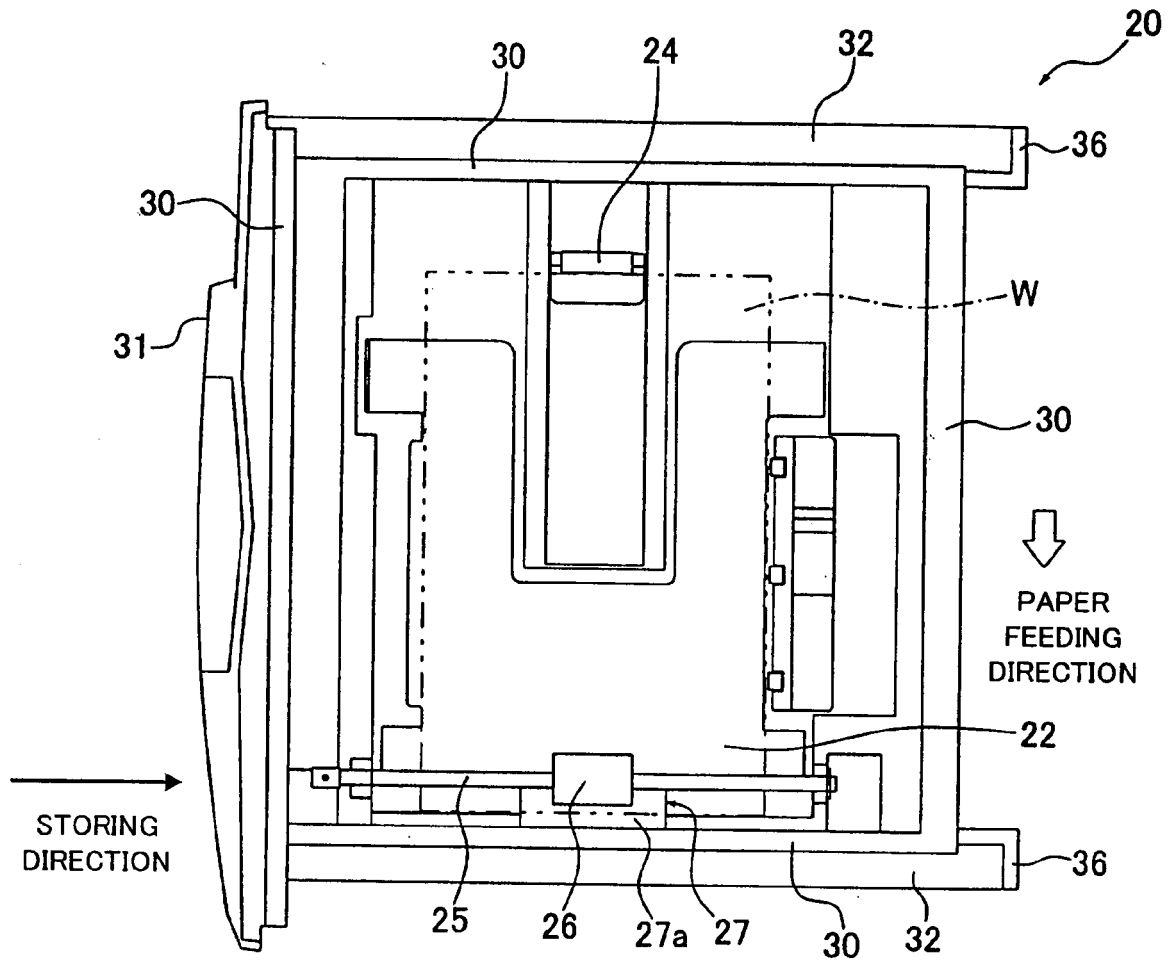


FIG. 3B

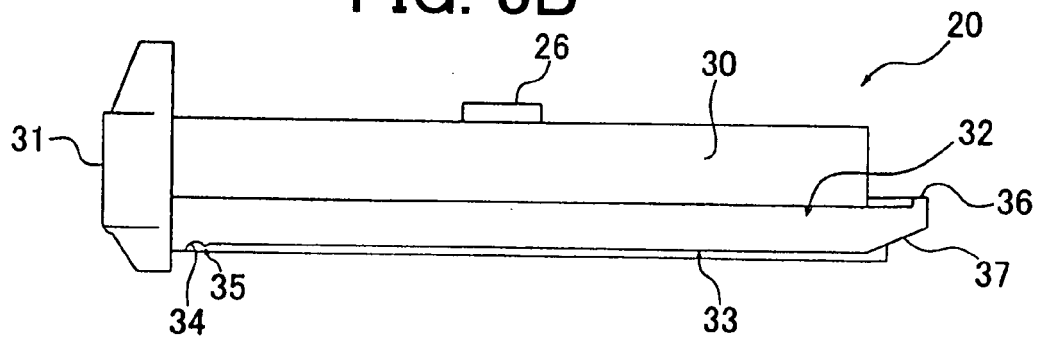


FIG. 4

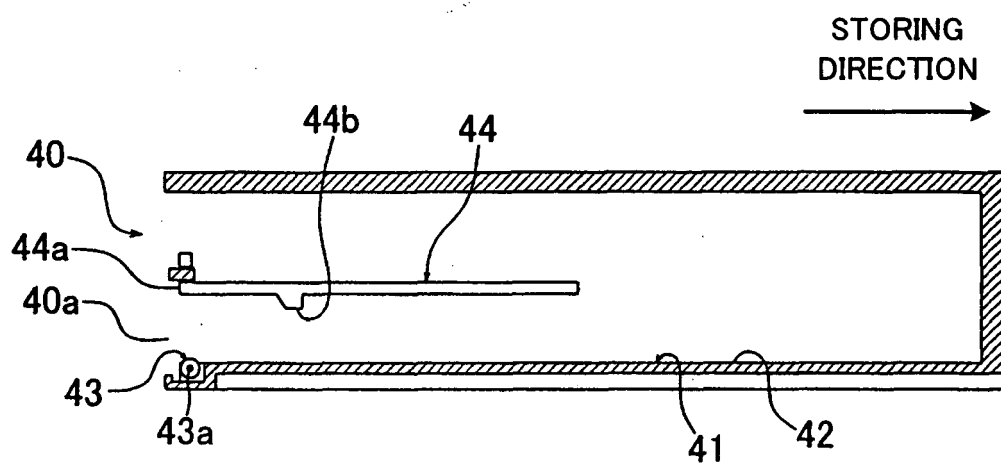


FIG. 5

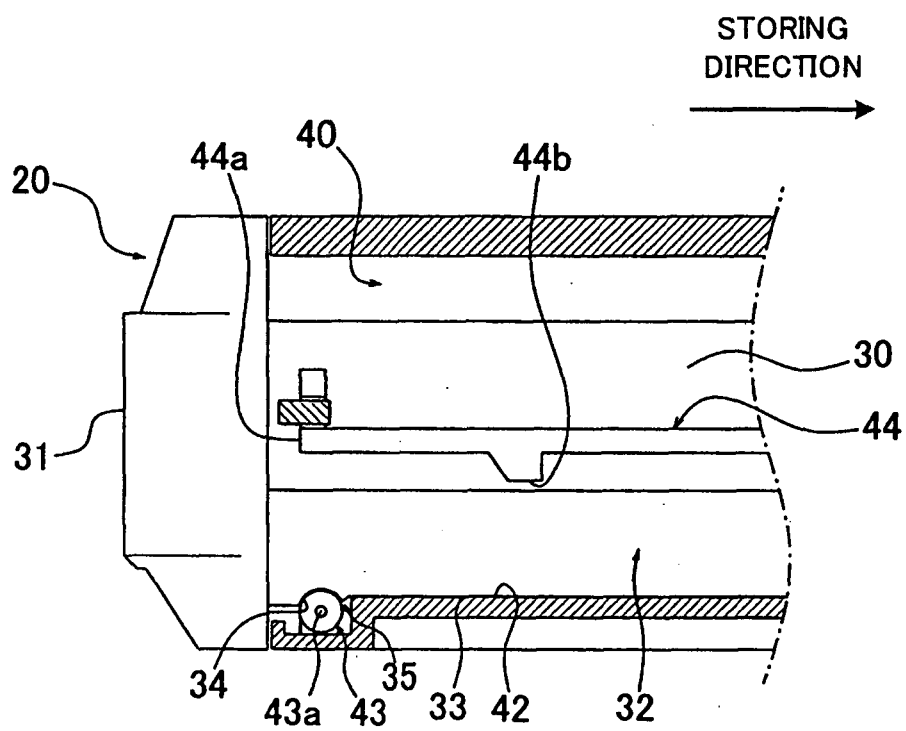


FIG. 6A

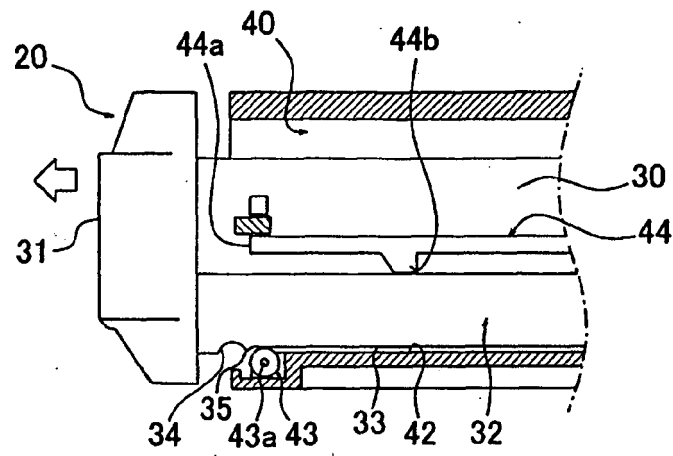


FIG. 6B

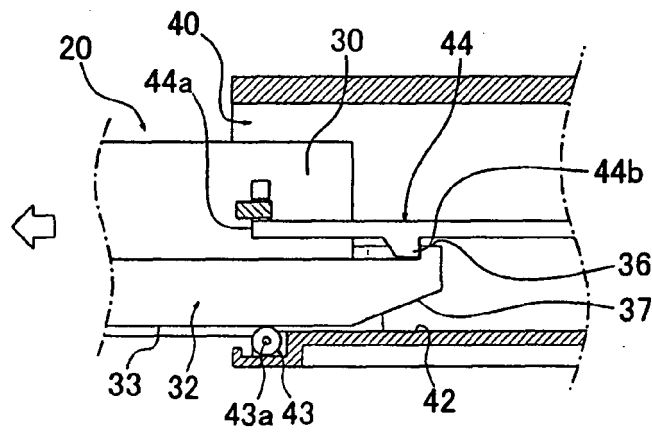
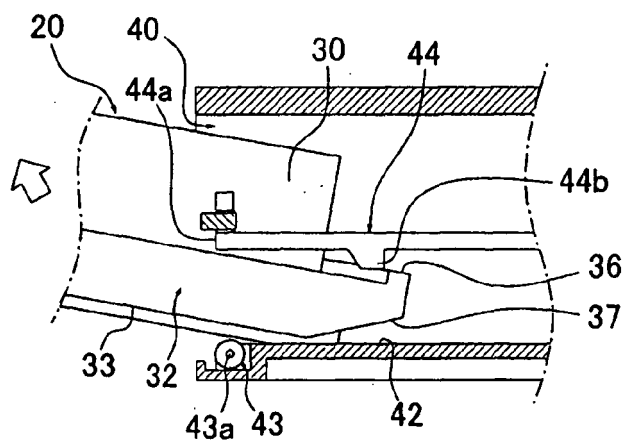


FIG. 6C



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP 2006309611 A [0001]