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(54) **MEDIUM FEEDING DEVICE AND MEDIUM PROCESSING APPARATUS EQUIPPED WITH MEDIUM FEEDING DEVICE**

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(57) **ABSTRACT**

A medium feeding device includes: a load unit that is loaded with multiple media; a delivering unit that delivers an uppermost medium of the media loaded on the load unit in a predetermined feeding direction; an ascent-descent unit that causes at least a part of the load unit to ascend and descend about a pivot point defined by a position of the load unit located away from a leading edge of the media in the feeding direction; a regulating unit that is provided toward the feeding direction of the media on the load unit and that comes into contact with the leading edge, in the feeding direction, of the media loaded on the load unit to regulate a loading position of the media; and a blocking unit that allows the load unit to ascend and descend and that blocks at least a part of a gap between the load unit and the regulating unit at an arbitrary ascent or descent position of the load unit.

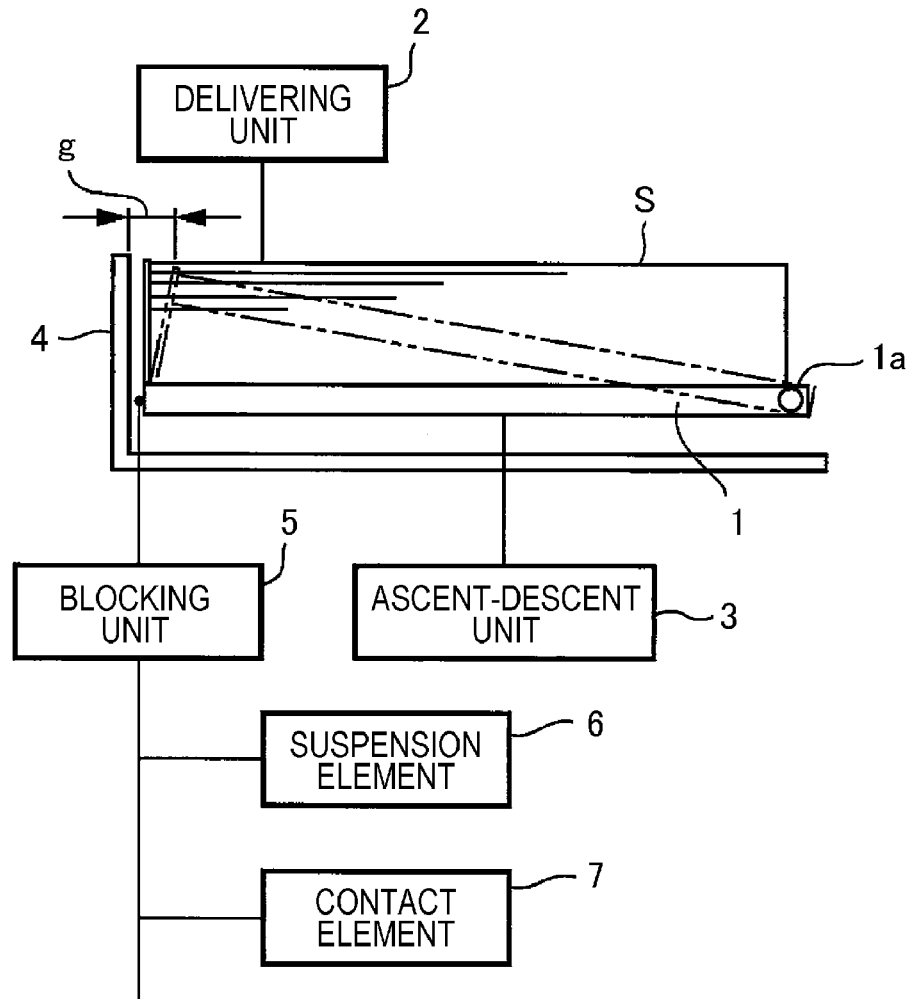


FIG. 1

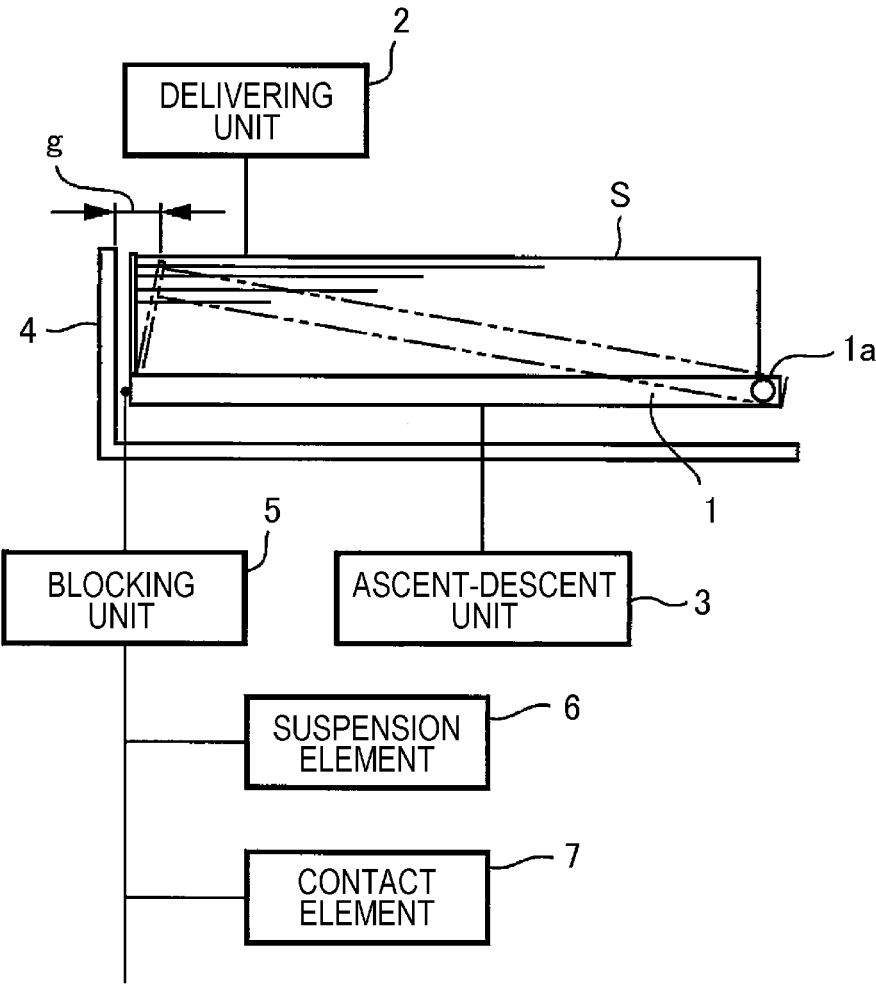


FIG. 2

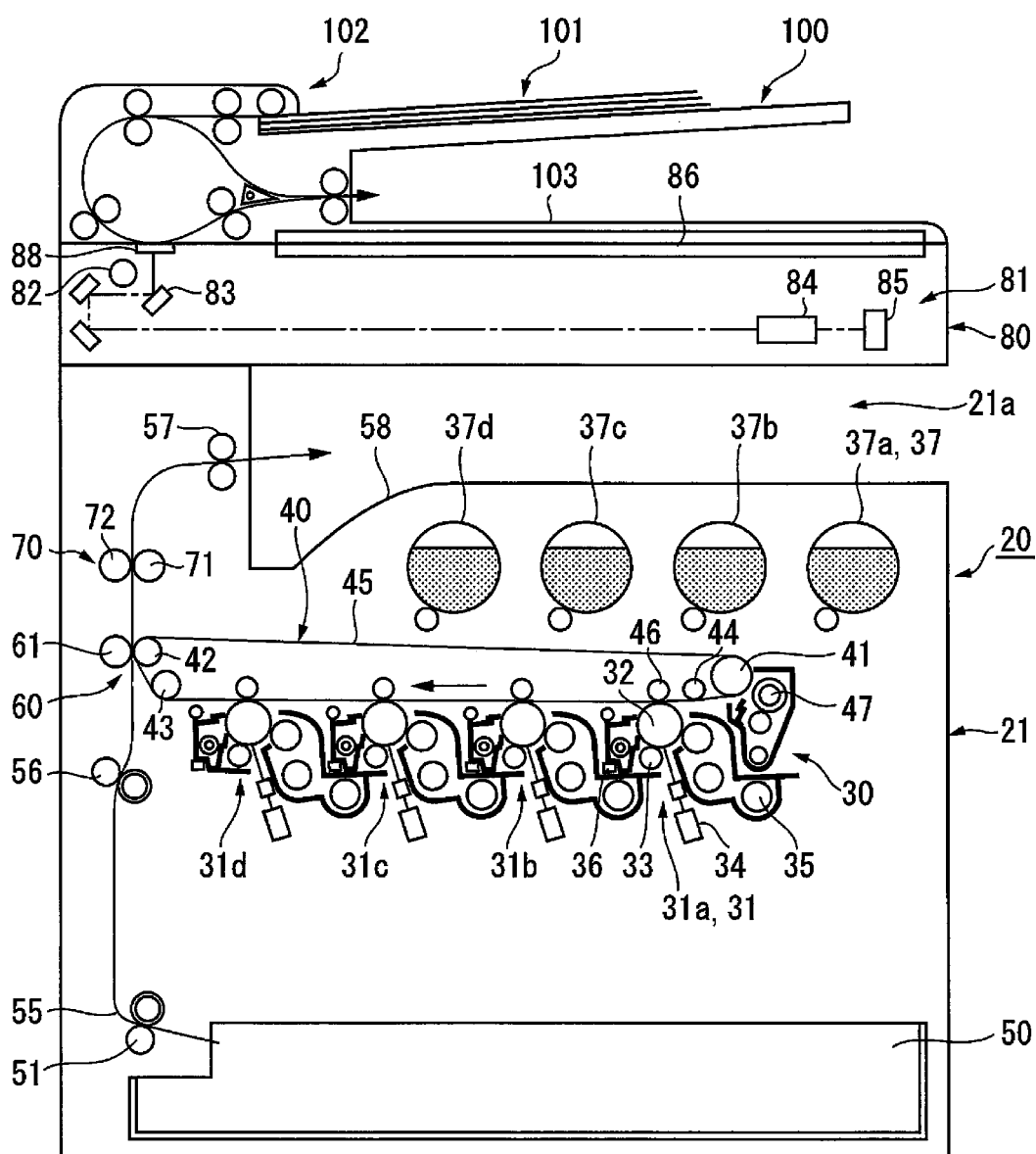


FIG. 3

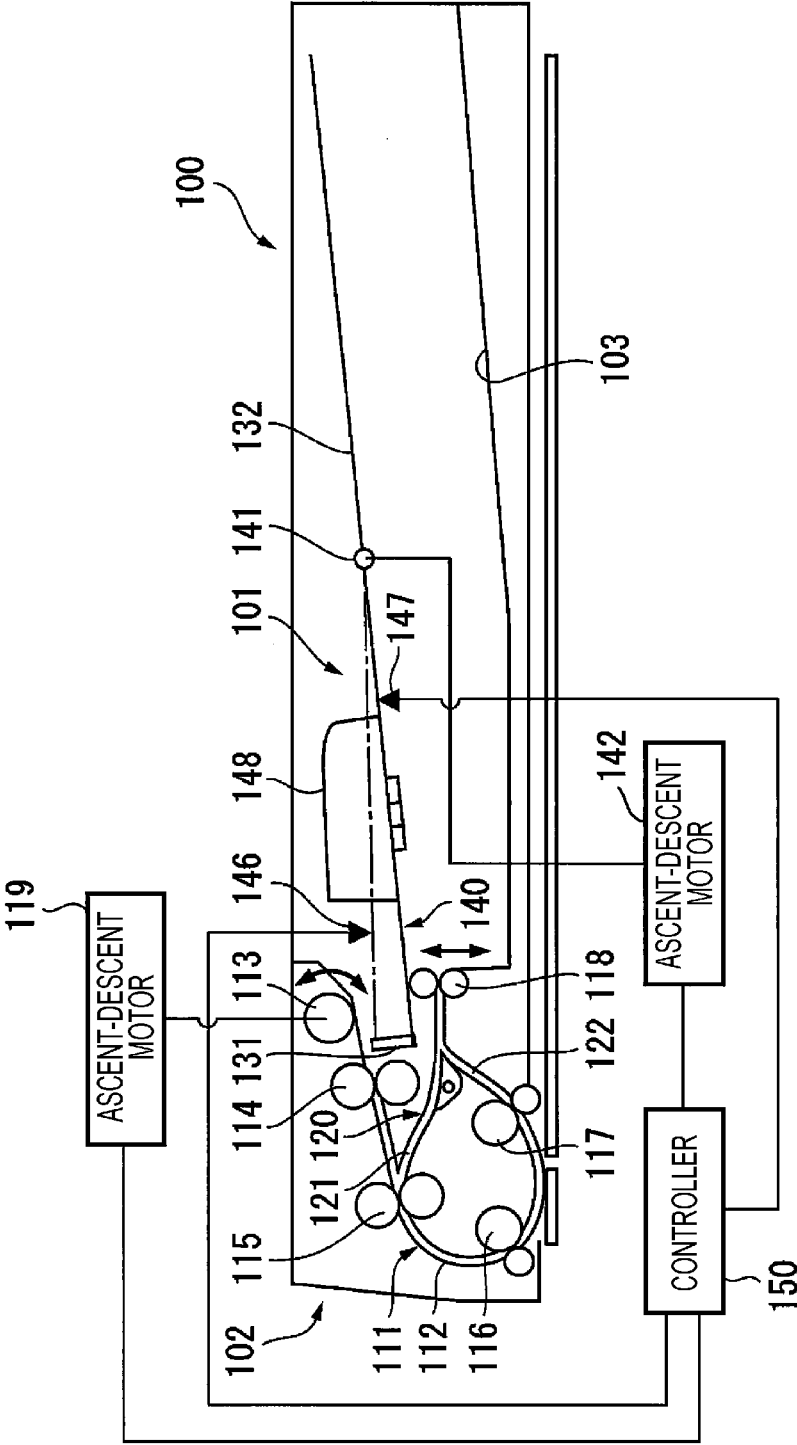


FIG. 4

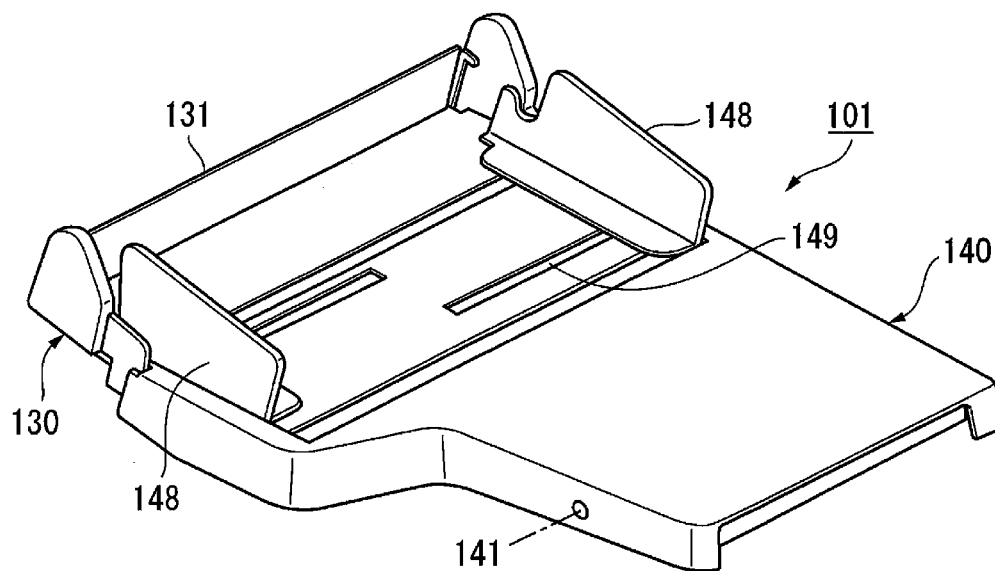


FIG. 5A

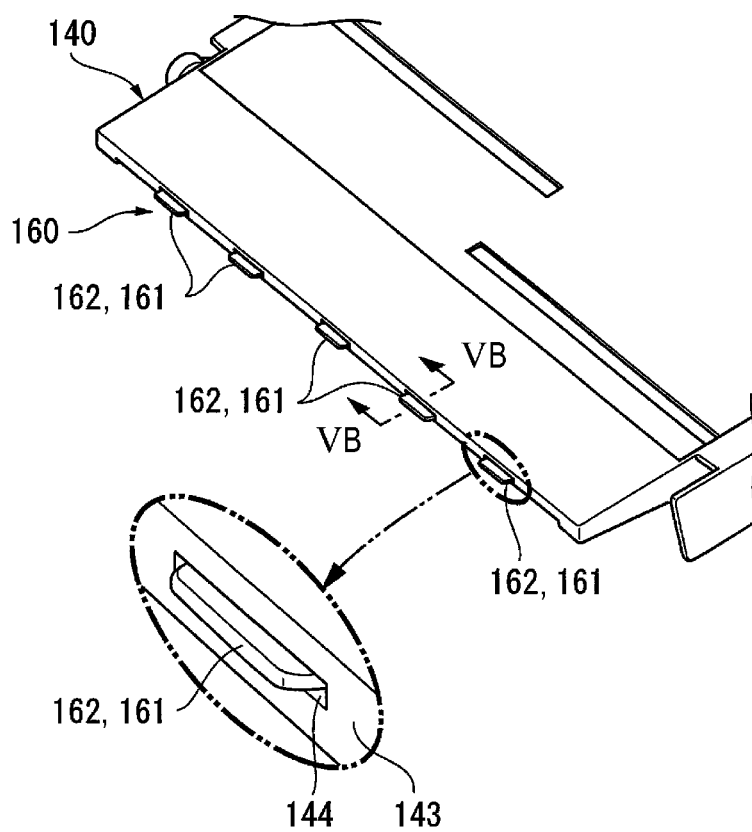


FIG. 5B

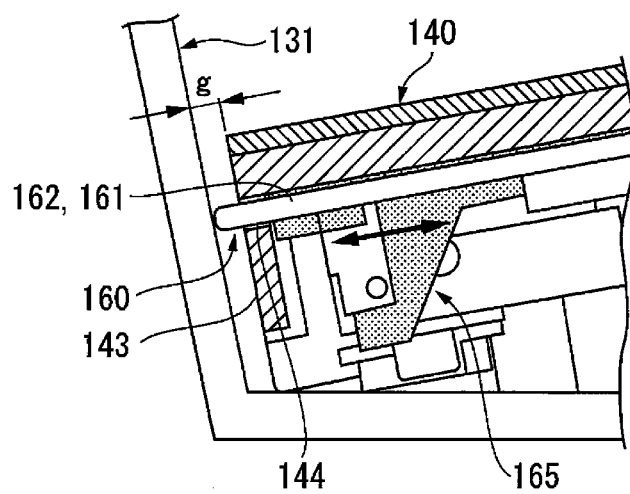


FIG. 6A

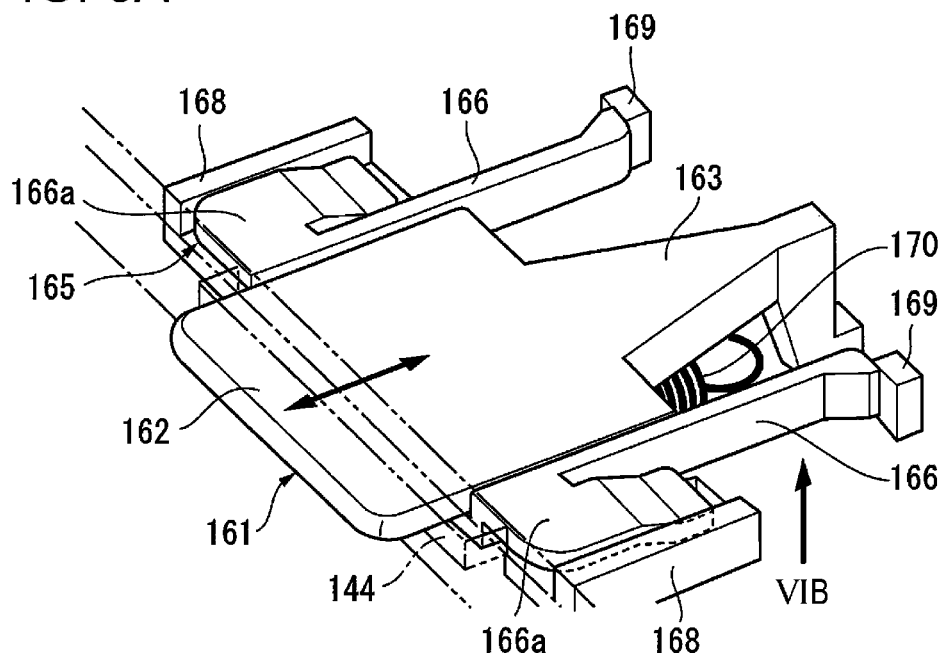


FIG. 6B

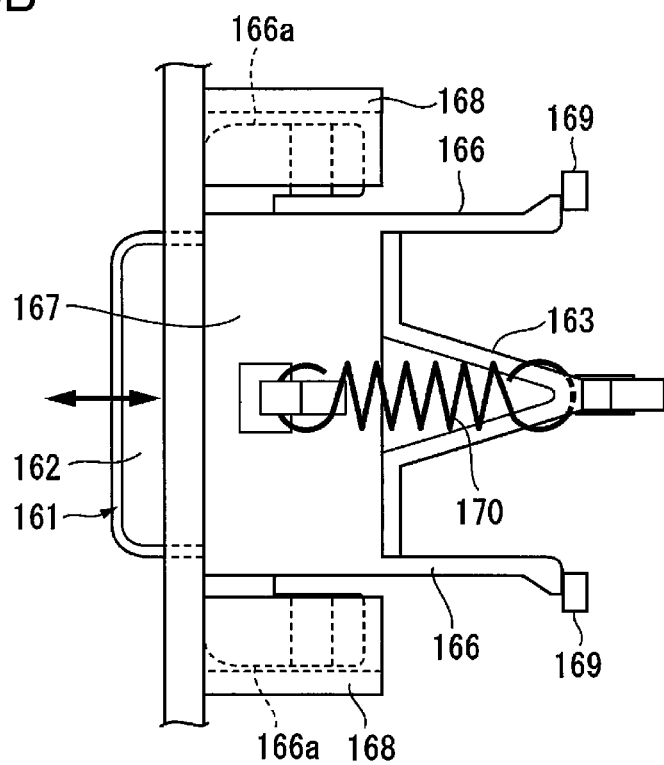


FIG. 7A

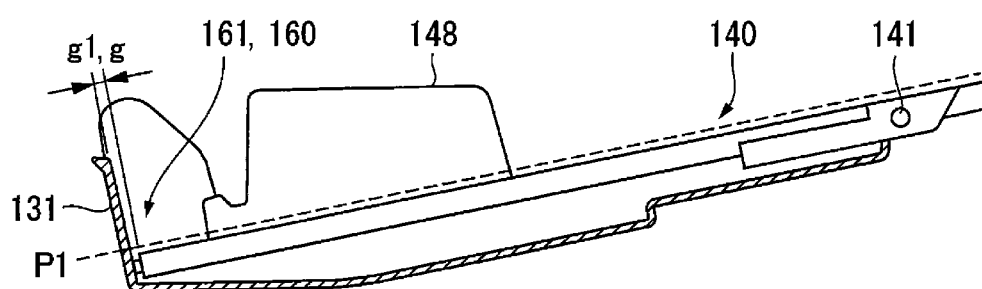


FIG. 7B

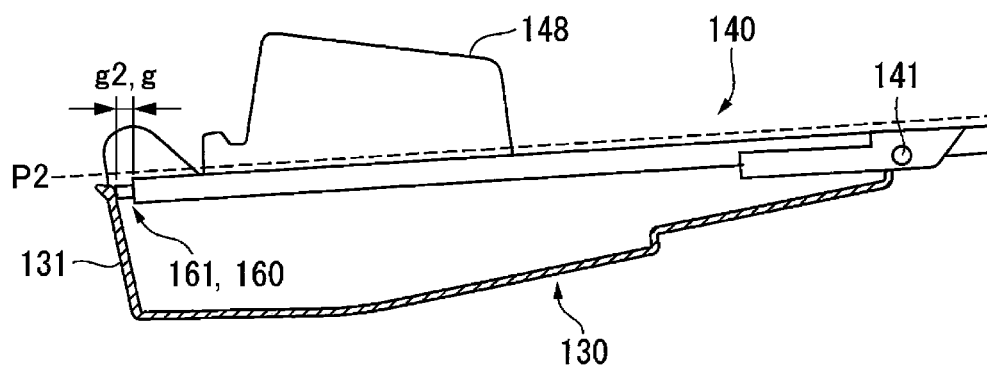


FIG. 8A

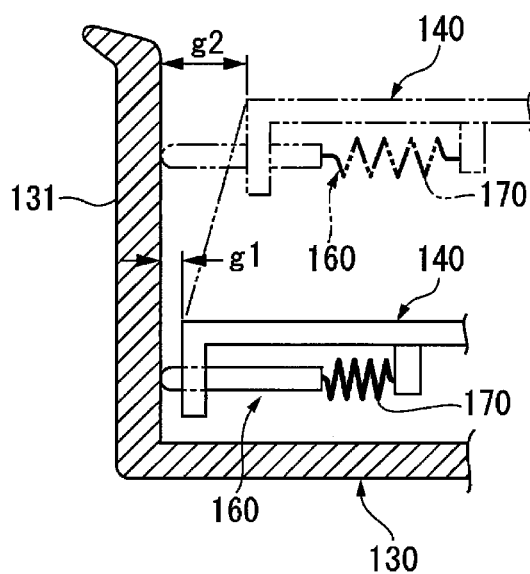


FIG. 8B

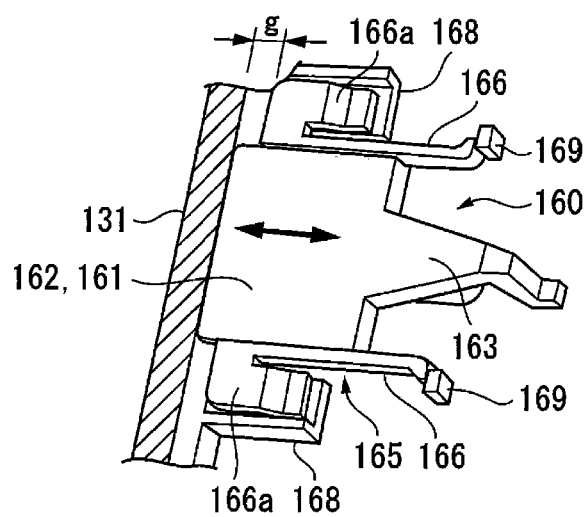


FIG. 9A

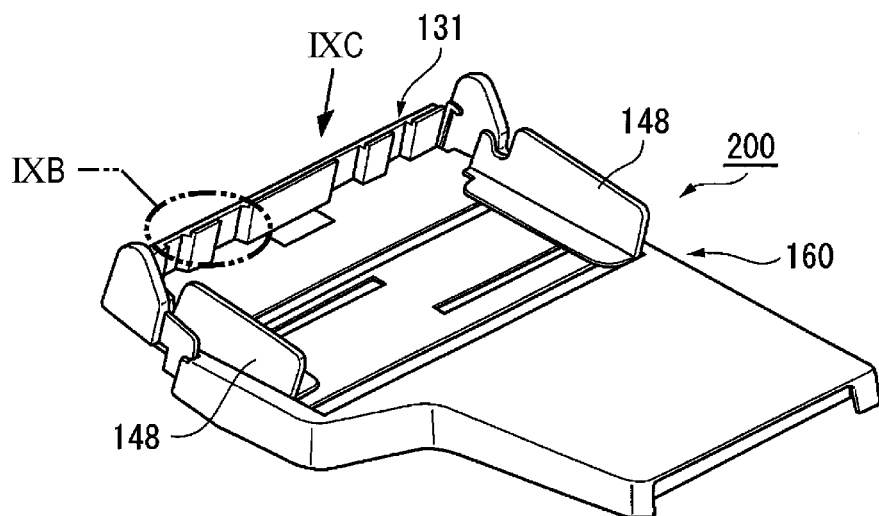


FIG. 9B

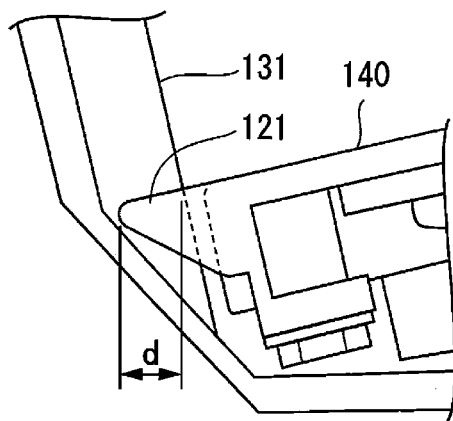


FIG. 9C

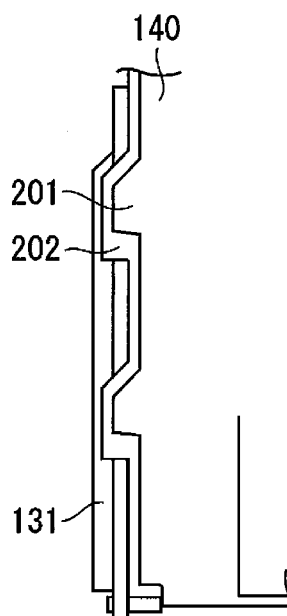


FIG. 10A

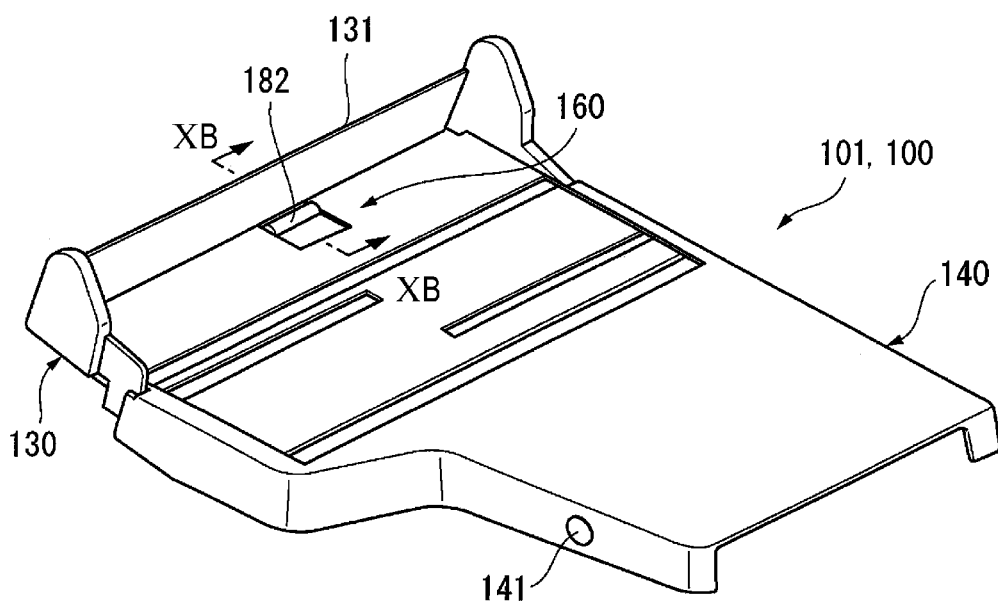


FIG. 10B

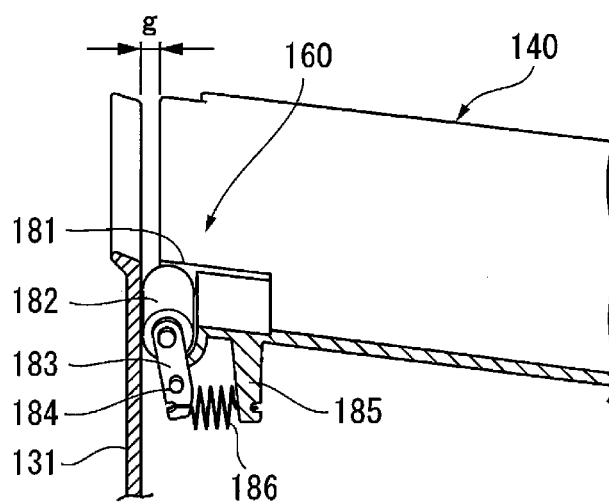


FIG. 11A

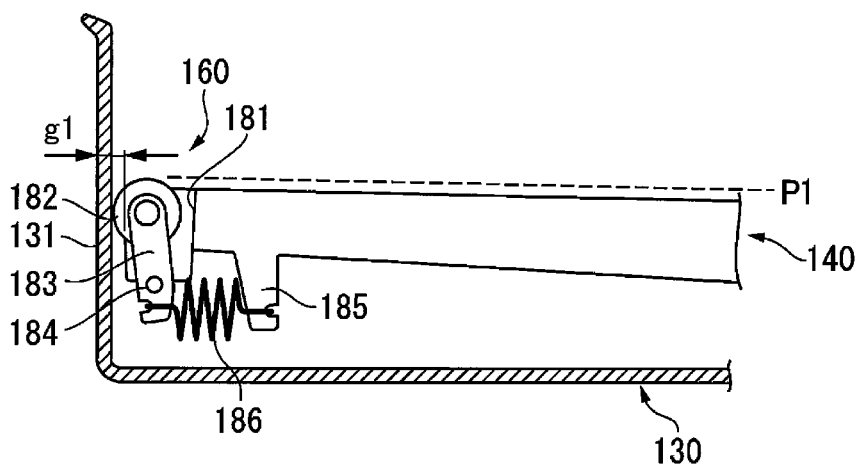


FIG. 11B

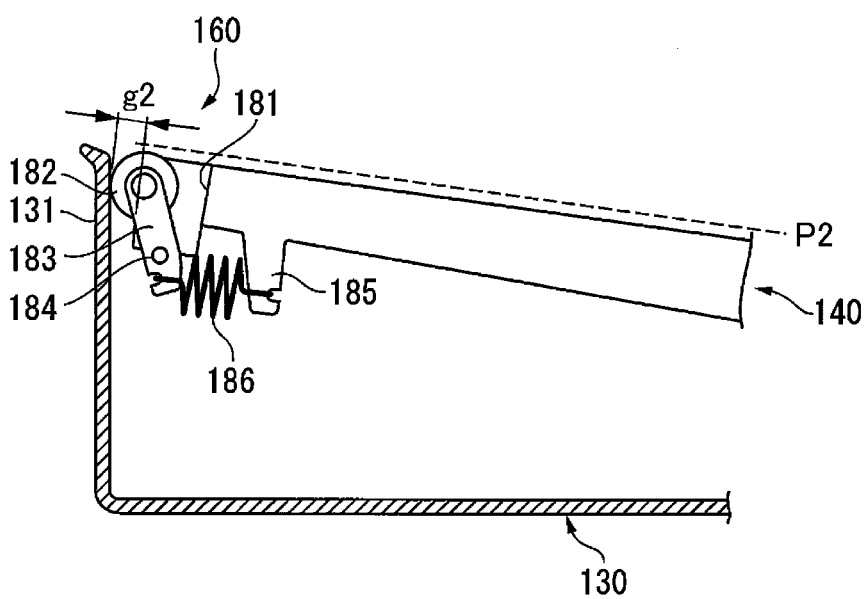


FIG. 12A

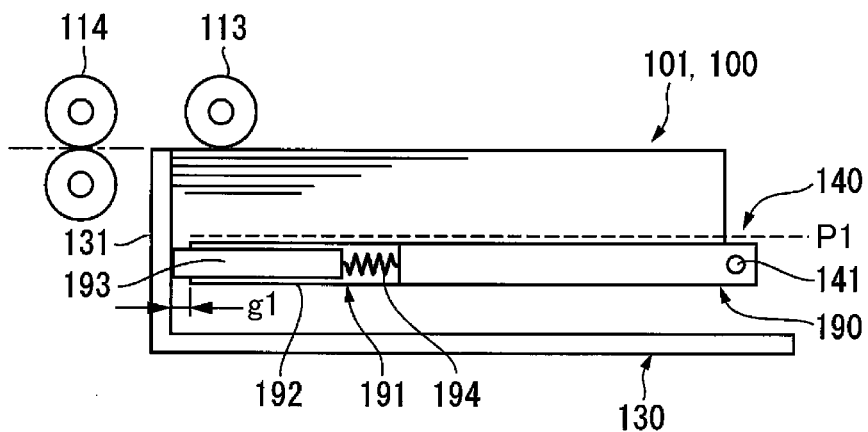


FIG. 12B

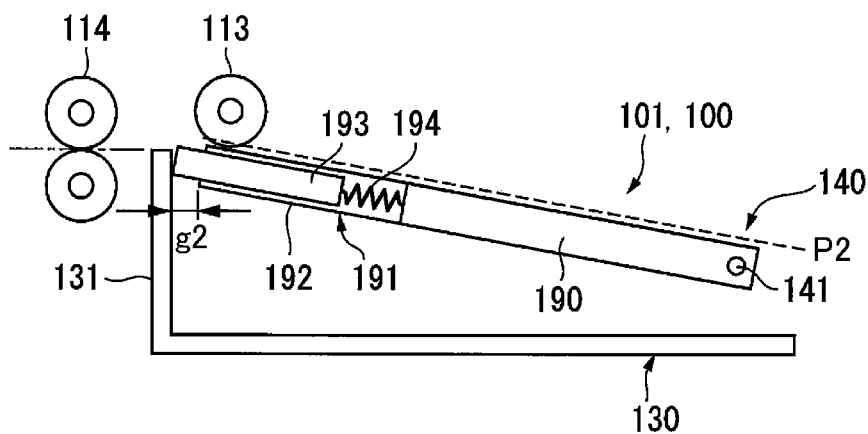


FIG. 12C

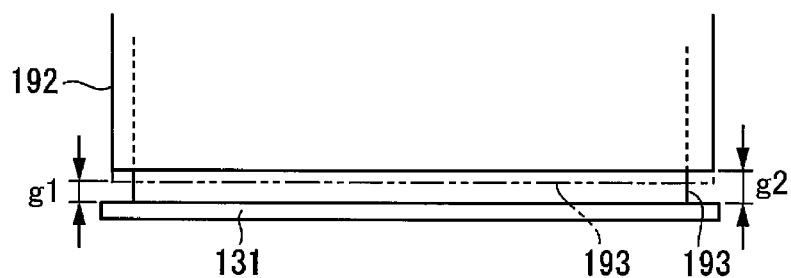


FIG. 13A

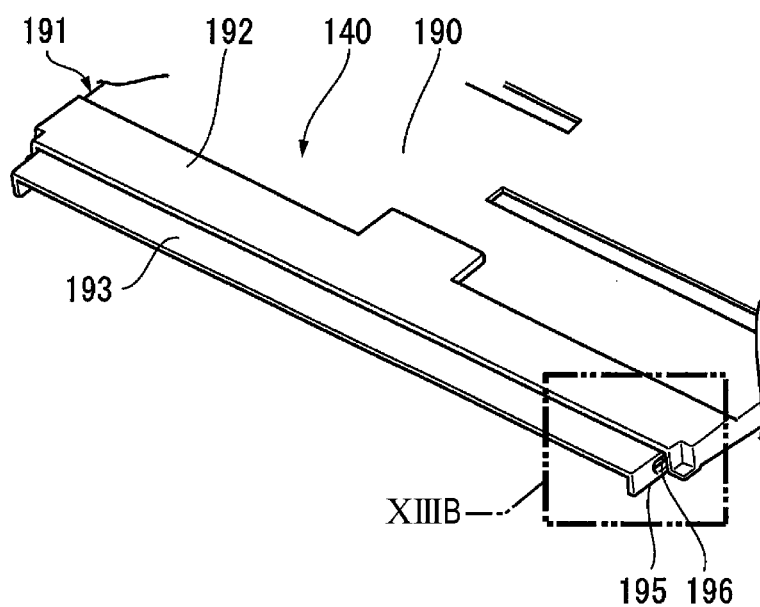


FIG. 13B

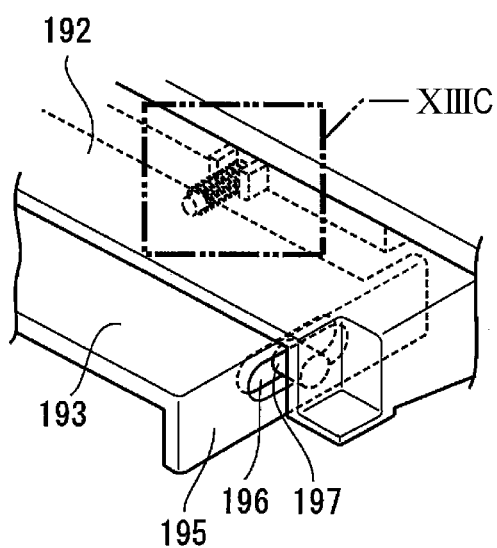


FIG. 13C

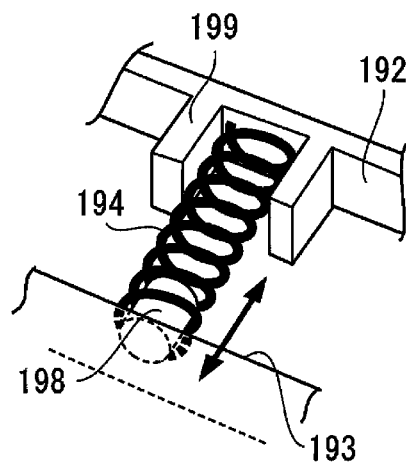


FIG. 14A

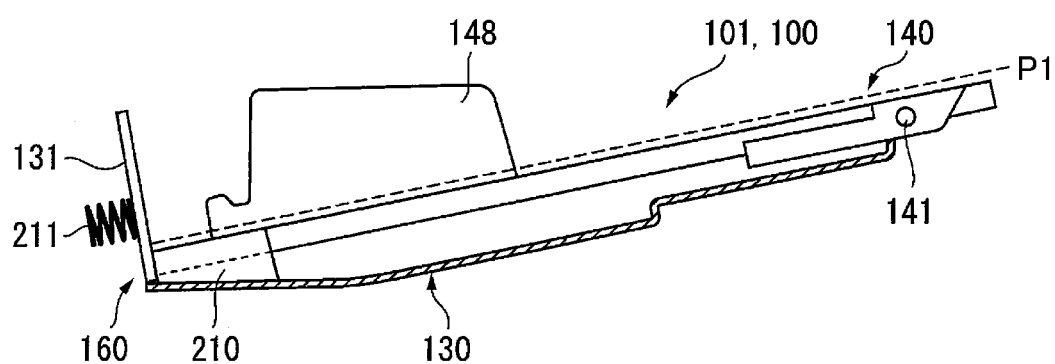


FIG. 14B

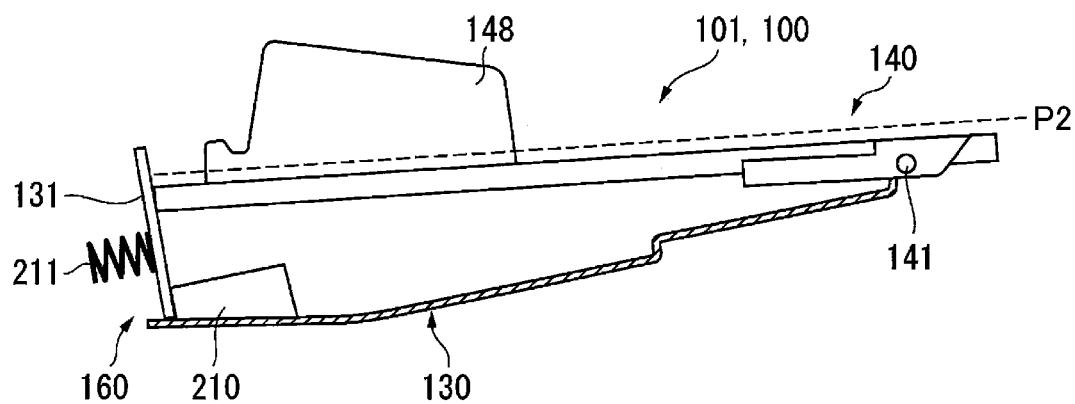


FIG. 15A

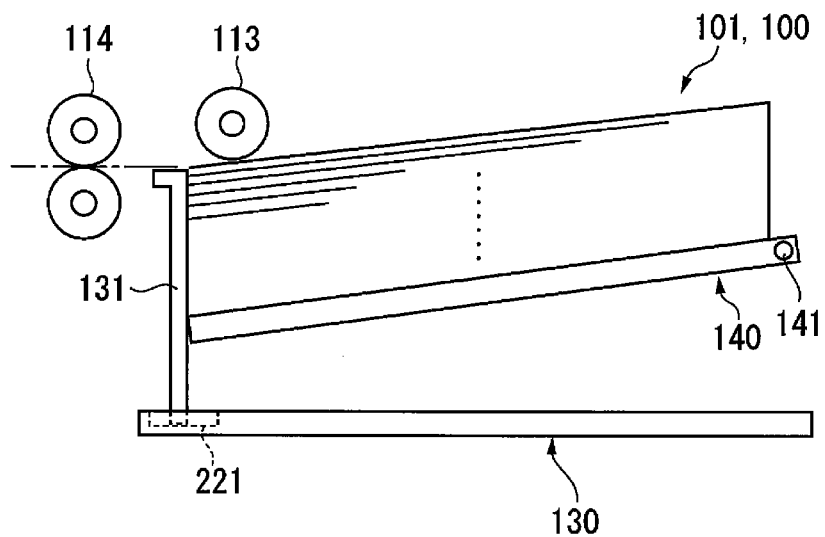


FIG. 15B

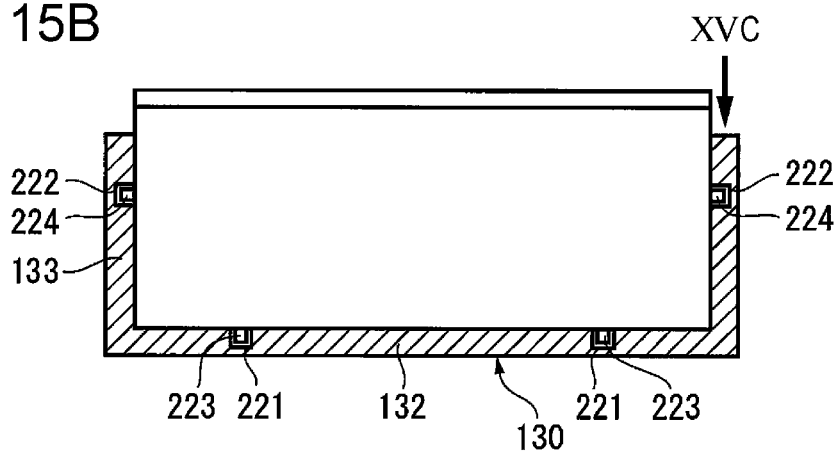


FIG. 15C

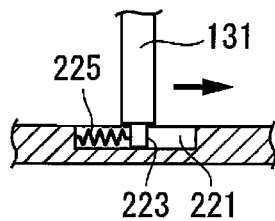


FIG. 16A

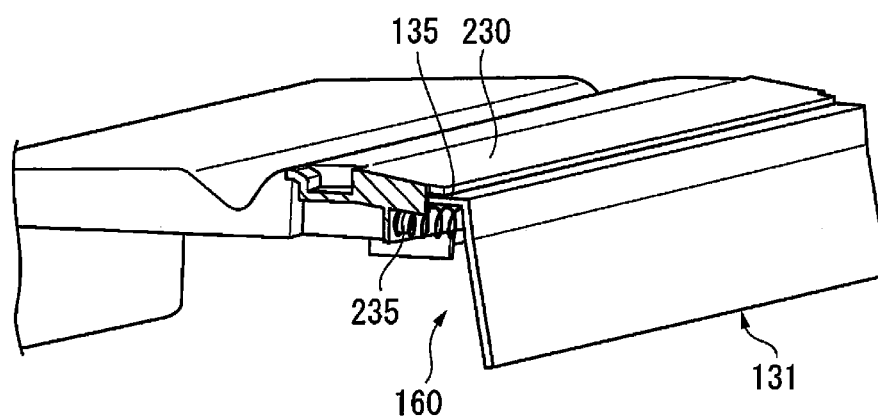


FIG. 16B

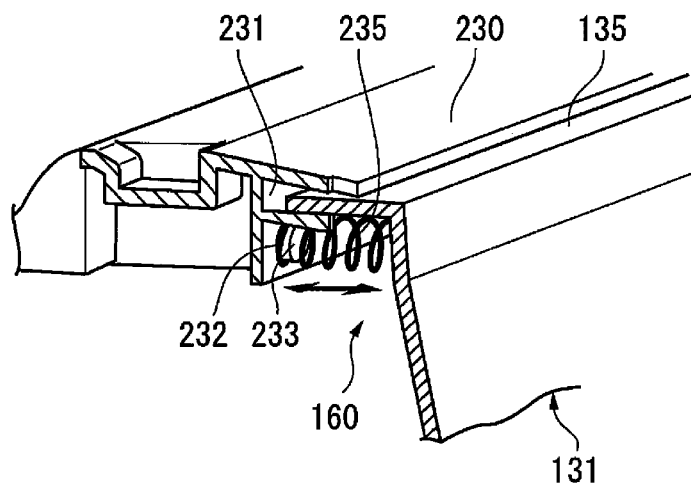


FIG. 17A

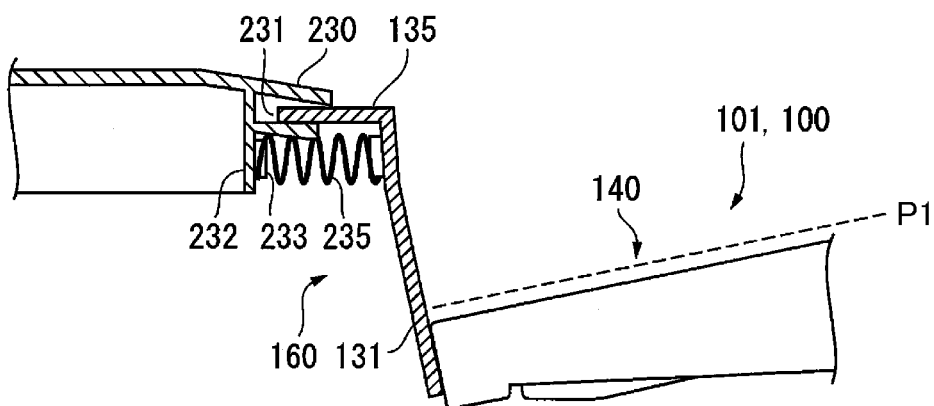
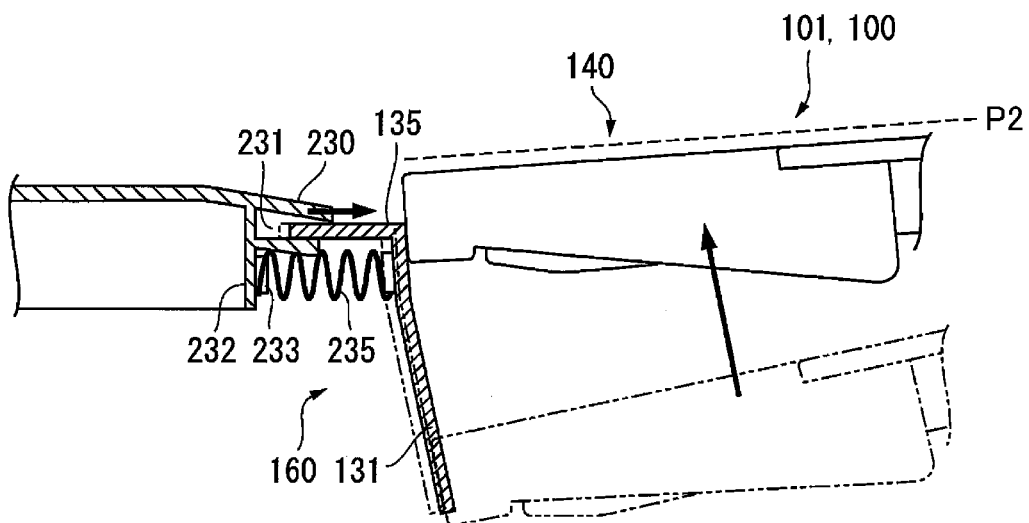


FIG. 17B



MEDIUM FEEDING DEVICE AND MEDIUM PROCESSING APPARATUS EQUIPPED WITH MEDIUM FEEDING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2022-155095 filed Sep. 28, 2022.

BACKGROUND

(i) Technical Field

[0002] The present disclosure relates to medium feeding devices and medium processing apparatuses equipped with such medium feeding devices.

(ii) Related Art

[0003] Japanese Unexamined Patent Application Publication Nos. 9-325531 and 11-236141 describe examples of known medium feeding devices in the related art.

[0004] Japanese Unexamined Patent Application Publication No. 9-325531 discloses an automatic document feeder that performs a document feeding process starting from an uppermost document and that has a stopper member with an abutment surface for regulating the leading edge of a document bundle. In this automatic document feeder, the upper surface of a pressure plate is provided with a tabular elastic member. When the document feeding process is not performed, the leading end of the elastic member protrudes forward away from the upper surface of the pressure plate at a forward position located beyond the apex of a bent section, and at least a part of the leading end of the elastic member protrudes forward relative to the abutment surface of the stopper member via a cutout.

[0005] Japanese Unexamined Patent Application Publication No. 11-236141 discloses an automatic document feeder having a base plate that lifts a document bundle set on a document table upward. At least a part of the base plate protrudes in the document feeding direction relative to a document abutment surface, so that a document may be prevented from entering a gap between the base plate and a document abutment member.

SUMMARY

[0006] Aspects of non-limiting embodiments of the present disclosure relate to a medium feeding device in which, even when an ascent or descent position of media loaded on an ascendible-descendible load unit changes, a situation where a medium is caught in a gap between the load unit and a medium-edge-position regulating unit may be suppressed and a stable medium feeding operation may be achieved while a compact device configuration is maintained, and to a medium processing apparatus equipped with the medium feeding device.

[0007] Aspects of certain non-limiting embodiments of the present disclosure address the above advantages and/or other advantages not described above. However, aspects of the non-limiting embodiments are not required to address the advantages described above, and aspects of the non-limiting embodiments of the present disclosure may not address advantages described above.

[0008] According to an aspect of the present disclosure, there is provided a medium feeding device comprising: a load unit that is loaded with a plurality of media; a delivering unit that delivers an uppermost medium of the media loaded on the load unit in a predetermined feeding direction; an ascent-descent unit that causes at least a part of the load unit to ascend and descend about a pivot point defined by a position of the load unit located away from a leading edge of the media in the feeding direction; a regulating unit that is provided toward the feeding direction of the media on the load unit and that comes into contact with the leading edge, in the feeding direction, of the media loaded on the load unit to regulate a loading position of the media; and a blocking unit that allows the load unit to ascend and descend and that blocks at least a part of a gap between the load unit and the regulating unit at an arbitrary ascent or descent position of the load unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Exemplary embodiments of the present disclosure will be described in detail based on the following figures, wherein:

[0010] FIG. 1 schematically illustrates a medium feeding device according to an exemplary embodiment of the present disclosure;

[0011] FIG. 2 illustrates the overall configuration of an image forming apparatus as a medium processing apparatus according to a first exemplary embodiment of the present disclosure;

[0012] FIG. 3 illustrates the overall configuration of a document feeding device as a medium feeding device used in the first exemplary embodiment;

[0013] FIG. 4 is a perspective view illustrating a peripheral structure of a document load unit of the document feeding device according to the first exemplary embodiment;

[0014] FIG. 5A illustrates a relevant part of the document feeding device according to the first exemplary embodiment, and FIG. 5B is a cross-sectional view taken along line VB-VB in FIG. 5A;

[0015] FIG. 6A illustrates a configuration example of a blocking mechanism shown in FIG. 5A, and FIG. 6B is a diagram as viewed from a direction VIB in FIG. 6A;

[0016] FIG. 7A illustrates a state where an ascending-descending tray is located in an initial position in the document feeding device according to the first exemplary embodiment, and FIG. 7B illustrates a state where the ascending-descending tray is located in an uppermost position;

[0017] FIG. 8A illustrates how a movable member behaves as the ascending-descending tray ascends in the document feeding device according to the first exemplary embodiment, and FIG. 8B illustrates the relationship between the movable member and a regulating member with respect to the behavior of the movable member shown in FIG. 8A;

[0018] FIG. 9A is a perspective view illustrating a relevant part of a document feeding device according to a first comparative example, FIG. 9B is a detailed diagram of an area IXB in FIG. 9A, and FIG. 9C is a diagram as viewed from a direction IXC in FIG. 9A;

[0019] FIG. 10A illustrates a relevant part of a document feeding device according to a second exemplary embodiment, and FIG. 10B is a cross-sectional view taken along line XB-XB in FIG. 10A;

[0020] FIG. 11A illustrates how a suspension mechanism behaves when the ascending-descending tray of the document feeding device according to the second exemplary embodiment is located in the initial position, and FIG. 11B illustrates in detail how the suspension mechanism behaves when the ascending-descending tray reaches the uppermost position;

[0021] FIG. 12A illustrates a relevant part of a document feeding device according to a third exemplary embodiment, FIG. 12B illustrates how a contact mechanism behaves when the ascending-descending tray of the document feeding device in FIG. 12A is located in the uppermost position, and FIG. 12C illustrates the relationship between the ascending-descending tray and the regulating member as the ascending-descending tray ascends;

[0022] FIG. 13A illustrates a configuration example of a blocking mechanism used in the third exemplary embodiment, FIG. 13B is a detailed diagram of an area XIII B in FIG. 13A, and FIG. 13C is a detailed diagram of an area XIII C in FIG. 13B;

[0023] FIG. 14A illustrates a relevant part of a document feeding device according to a fourth exemplary embodiment, and FIG. 14B illustrates how a blocking mechanism behaves when the ascending-descending tray of the document feeding device in FIG. 14A is located in the uppermost position;

[0024] FIG. 15A illustrates a relevant part of a document feeding device according to a modification of the fourth exemplary embodiment, FIG. 15B illustrates a configuration example of a blocking mechanism shown in FIG. 15A, and FIG. 15C is a diagram as viewed from a direction XVC in FIG. 15B;

[0025] FIG. 16A illustrates a relevant part of a document feeding device according to a fifth exemplary embodiment, and FIG. 16B is an enlarged view of a blocking mechanism; and

[0026] FIG. 17A illustrates how the blocking mechanism behaves when the ascending-descending tray of the document feeding device according to the fifth exemplary embodiment is located in the initial position, and FIG. 17B illustrates how the blocking mechanism behaves when the ascending-descending tray is located in the uppermost position.

DETAILED DESCRIPTION

Overview of Exemplary Embodiment

[0027] FIG. 1 schematically illustrates a medium feeding device according to an exemplary embodiment of the present disclosure.

[0028] In FIG. 1, the medium feeding device includes a load unit 1 loaded with multiple media S, a delivering unit 2 that delivers an uppermost medium S of the media S loaded on the load unit 1 in a predetermined feeding direction, an ascent-descent unit 3 that causes at least a part of the load unit 1 to ascend and descend about a pivot point 1a defined by a position of the load unit 1 located away from the leading edge of the media S in the feeding direction, a regulating unit 4 that is provided toward the feeding direction of the media S on the load unit 1 and that comes into contact with the leading edge, in the feeding direction, of the media S loaded on the load unit 1 to regulate the loading position of the media S, and a blocking unit 5 that allows the load unit 1 to ascend and descend and that blocks at least a

part of a gap g between the load unit 1 and the regulating unit 4 at an arbitrary ascent or descent position of the load unit 1.

[0029] This medium feeding device is applicable to a medium processing apparatus including a processing unit that performs a predetermined process on a medium.

[0030] With regard to this technical solution, an exemplary embodiment of the present disclosure is applied to a medium feeding device that feeds a medium S, such as a document or printing paper.

[0031] It is assumed that the ascent-descent unit 3 is of a type that pivots about the pivot point 1a defined by the position of the load unit 1 located away from the leading edge of the media S in the feeding direction and does not include a type that raises and lowers the multiple media S in a substantially parallel fashion.

[0032] Furthermore, the regulating unit 4 is provided for regulating the leading edge, in the feeding direction, of the media S loaded on the load unit 1 to eliminate variations in the initial position of the media S.

[0033] Moreover, the blocking unit 5 may be of any type that blocks at least a part of the gap g between the load unit 1 and the regulating unit 4 at an arbitrary ascent or descent position of the load unit 1.

[0034] Next, a representative example of the medium feeding device according to this exemplary embodiment will be described.

[0035] As a representative example, the blocking unit 5 has a suspension element 6 disposed in the gap g between the load unit 1 and the regulating unit 4 and suspended to block a part of the gap g. In this example, it is assumed that the gap g occurs, and that the suspension element 6 is suspended across a part of the gap g.

[0036] In this example, the suspension element 6 may have a movable member that is provided in an extendable-retractable manner at the leading end of the load unit 1 in the feeding direction of the media S and that extends and retracts in conformity to a change in the gap g.

[0037] In order for the movable member to be applicable to media S of various sizes, the movable member may include multiple movable members disposed with a distance therebetween in a width direction orthogonal to the feeding direction of the media S on the load unit 1.

[0038] In another example, the suspension element 6 may have a rotating member that is provided in a rotatable manner at the leading end of the load unit 1 in the feeding direction of the media S and that is disposed in contact with the gap g in conformity to a change in the gap g.

[0039] As another representative example, the blocking unit 5 has a contact element 7 that maintains the load unit 1 and the regulating unit 4 in contact with each other. This example prevents a gap from being formed.

[0040] In this example, the contact element 7 has a movable drawer that enables the load unit 1 to be drawable in the feeding direction of the media S, and biases the movable drawer toward the regulating unit 4. In this case, a biasing unit used may be a common biasing member, such as a spring, or may be configured to use its own weight to draw the movable drawer outward.

[0041] Another example of the contact element 7 enables the regulating unit 4 to be extendable and retractable toward the load unit 1 and biases the regulating unit 4 toward the load unit 1 by using a biasing unit.

[0042] In one example, the regulating unit 4 may have a flat surface at the side facing the load unit 1 or may be constituted of a regulating member formed of a flat plate. In other words, in this exemplary embodiment, the blocking unit 5 is provided so that, for example, a section where the load unit 1 and the regulating unit 4 face each other does not have to be a serrated uneven section with alternately engaging segments.

[0043] Exemplary embodiments of the present disclosure will be described in detail below with reference to the appended drawings.

First Exemplary Embodiment

[0044] FIG. 2 illustrates the overall configuration of an image forming apparatus as a medium processing apparatus according to an exemplary embodiment of the present disclosure.

[0045] Overall Configuration of Image Forming Apparatus

[0046] In FIG. 2, an image forming apparatus 20 is equipped with an image forming engine 30 that forms images of multiple colors (i.e., four colors, namely, yellow, magenta, cyan, and black, in this exemplary embodiment) within an apparatus housing 21. A medium feeding device 50 that accommodates media, such as sheets, is disposed at a lower section of the apparatus housing 21, an image reading device 80 is disposed at an upper section of the apparatus housing 21, and a document feeding device 100 for feeding a document to the image reading device 80 is disposed at an upper section of the image reading device 80.

[0047] Configuration Example of Image Forming Engine

[0048] In this exemplary embodiment, the image forming engine 30 includes image forming units 31 (i.e., 31a to 31d) that form images of multiple colors and that are arranged substantially in the horizontal direction, and a transfer module 40 disposed above the image forming units 31 and including, for example, a belt-like intermediate transfer member 45 that moves in a circulating fashion in the direction in which the image forming units 31 are arranged. The image forming engine 30 transfers the images of the multiple colors formed by the image forming units 31 onto a medium via the transfer module 40.

[0049] In this example, as shown in FIG. 2, the image forming units 31 (31a to 31d) form, for example, yellow, magenta, cyan, and black toner images (not necessarily arranged in this order) sequentially from the upstream side in the circulating direction of the intermediate transfer member 45, and each include a photoconductor 32, a charging device (i.e., a charging roller in this example) 33 that electrostatically charges the photoconductor 32 in advance, an exposure device (i.e., a light-emitting-diode (LED) write head in this example) 34 that writes an electrostatic latent image onto the photoconductor 32 electrostatically charged by the charging device 33, a developing device 35 that develops the electrostatic latent image formed on the photoconductor 32 by using a corresponding color-component toner (having, for example, negative polarity in this exemplary embodiment), and a cleaning device 36 that cleans the photoconductor 32 by removing a residue therefrom.

[0050] Reference signs 37 (i.e., 37a to 37d) denote toner cartridges for resupplying the respective developing devices 35 with the corresponding color-component toners.

[0051] In this exemplary embodiment, the transfer module 40 has the belt-like intermediate transfer member 45 com-

posed of, for example, polyimide resin wrapped around multiple tension rollers 41 to 44 and uses, for example, the tension roller 41 as a driving roller to cause the intermediate transfer member 45 to move in a circulating fashion. First transfer devices (i.e., transfer rollers in this example) 46 are disposed at the rear face of the intermediate transfer member 45 in correspondence with the photoconductors 32 of the image forming units 31. By applying a transfer voltage with a polarity opposite from the charge polarity of the toners to the first transfer devices 46, the toner images on the photoconductors 32 are electrostatically transferred onto the intermediate transfer member 45.

[0052] Furthermore, an intermediate-transfer-member cleaning device 47 for the intermediate transfer member 45 is disposed upstream of the upstream-most image forming unit 31a and removes residual toner from the intermediate transfer member 45.

[0053] In this exemplary embodiment, a second transfer device 60 is disposed in an area of the intermediate transfer member 45 corresponding to the tension roller 42 located downstream of the downstream-most image forming unit 31d, and second-transfers (collectively transfers) the first-transferred images on the intermediate transfer member 45 onto a medium.

[0054] In this example, the second transfer device 60 includes a second transfer roller 61 disposed in pressure contact with a toner-image bearing surface of the intermediate transfer member 45, and a backup roller (also used as the tension roller 42 in this example) disposed at the rear face of the intermediate transfer member 45 and serving as a counter electrode for the second transfer roller 61. For example, the second transfer roller 61 is connected to ground, and the backup roller (i.e., the tension roller 42) receives a second transfer voltage with the same polarity as the charge polarity of the toners.

[0055] The medium feeding device 50 is provided with a feed roller 51 that feeds a medium. A medium transport path 55 is provided with a transport roller (not shown). The medium transport path 55 located immediately before a second transfer position is provided with a positioning roller 56 that feeds a medium to the second transfer position at a predetermined timing.

[0056] The medium transport path 55 located downstream of the second transfer position is provided with a fixing device 70. The fixing device 70 includes, for example, a thermal fixing roller 71 that contains a thermal heater (not shown) therein and a pressure fixing roller 72 that is rotated by being disposed in pressure contact with the thermal fixing roller 71.

[0057] The apparatus housing 21 has a cavity 21a below the image reading device 80. The cavity 21a functions as a medium container-receiver 58.

[0058] An output roller 57 is provided downstream of the fixing device 70 and outputs a medium by nipping and transporting the medium. The medium is then accommodated in the medium container-receiver 58.

[0059] Although not shown in this example, a manual medium feeding device and a duplex recording module that enables duplex recording on a medium may be additionally provided.

[0060] Image Reading Device

[0061] In this example, as shown in FIG. 2, the image reading device 80 includes an optical system 81 that optically reads a document. The optical system 81 includes a

lamp **82** that irradiates the document with light, multiple reflective mirrors **83** that reflect the light from the document, a lens **84** that focuses the light from the reflective mirrors **83**, and a read sensor **85** that reads the light focused by the lens **84**. The optical system **81** has a function for reading a document delivered from the document feeding device **100** by radiating light from the lamp **82** onto a predetermined region of a reader **88**, and also has a function for reading a document placed on a platen **86** by moving the lamp **82** in a scanning fashion.

[0062] Document Feeding Device

[0063] In this example, as shown in FIGS. 2 and 3, the document feeding device **100** includes a document tray **101** to be loaded with multiple documents, a document transport system **102** that transports each document, and an output tray **103** onto which a document having undergone an image reading process is output.

[0064] Document Transport System

[0065] In this example, the document transport system **102** includes a first transport section **111** and an inverting section **120**.

[0066] The first transport section **111** has a U-shaped first transport path **112**. The first transport path **112** includes a pickup roller **113** that descends during a document feeding process to pick up the documents loaded on the document tray **101**, a feed roller **114** that separates the documents delivered from the pickup roller **113** from each other and feeds the uppermost document, a preregistration roller **115** that forms a loop by temporarily stopping the document fed from the feed roller **114** so as to perform skew correction, a registration roller **116** that determines a read timing toward the reader **88** by temporarily stopping the document fed from the preregistration roller **115**, an outward roller **117** provided downstream of the registration roller **116**, and an output roller **118** that rotates forward during a document output process to output the document by working together with the outward roller **117**.

[0067] The pickup roller **113** is caused to ascend and descend by an ascent-descent motor **119**, and is rotationally driven by a driving motor (not shown).

[0068] The inverting section **120** includes an inversion transport path **121** having one end connected to the first transport path **112** at a location between the outward roller **117** and the output roller **118** and another end connected to the first transport path **112** at the preregistration roller **115**. The end of the inversion transport path **121** near the output roller **118** is provided with an inversion gate **122**. In a case where the document is to be inverted, the output roller **118** is reversely rotated when the trailing edge of the document reaches a location near the output roller **118**, and the inversion gate **122** is switched such that the document is guided toward the inversion transport path **121**.

[0069] The reader **88** is located between the registration roller **116** and the outward roller **117** and presses the document against the platen **86** so as to read the document by using the image reading device **80**.

[0070] Document Tray

[0071] In this example, as shown in FIGS. 3 and 4, the document tray **101** includes a stationary tray **130** and an ascending-descending tray **140** that ascends and descends in a pivotable manner relative to the stationary tray **130**.

[0072] The stationary tray **130** includes a regulating member (corresponding to a document-leading-edge stopper member) **131** as a regulating unit that is provided toward the

leading edge of a document in the feeding direction and that positionally regulates the leading edge of the document. In this example, the regulating member **131** is provided integrally with or separately from a base **132** of the stationary tray **130** at the leading edge of the document in the feeding direction.

[0073] The ascending-descending tray **140** has a pivot point **141** located away from the leading edge of the document in the feeding direction, such that the side of the ascending-descending tray **140** located toward the leading edge of the document in the feeding direction moves upward and downward relative to the pickup roller **113**.

[0074] The ascending-descending tray **140** is caused to ascend and descend by an ascent-descent motor **142** that is rotatable in forward and reverse directions. A lift sensor **146** is provided near the leading end of the ascending-descending tray **140**, and a document sensor **147** that detects whether or not one or more documents are loaded on the ascending-descending tray **140** is provided. The lift sensor **146** detects whether or not the ascending-descending tray **140** has ascended to a predetermined position, specifically, whether or not the uppermost document loaded on the ascending-descending tray **140** has ascended to a document transport position.

[0075] The ascending-descending tray **140** is also provided with a pair of document guides **148** that guide a document to a loading position. The document guides **148** move in conjunction with each other via a linkage mechanism **149** in a width direction intersecting the document feeding direction, so as to positionally align the center of the document with the center.

[0076] Document Feed Control System

[0077] In this example, as shown in FIG. 3, a controller **150** for controlling the document feeding device **100** is provided.

[0078] The controller **150** is constituted of a microcomputer including various types of processors. The term “processor” refers to hardware in a broad sense. Examples of the processor include general processors (e.g., CPU: Central Processing Unit) and dedicated processors (e.g., GPU: Graphics Processing Unit, ASIC: Application Specific Integrated Circuit, FPGA: Field Programmable Gate Array, and programmable logic device).

[0079] The controller **150** receives detection information from various types of sensors, such as the lift sensor **146** and the document sensor **147**, and transmits control signals to the ascent-descent motors **119** and **142** so as to cause the pickup roller **113** and the ascending-descending tray **140** to ascend and descend based on the control signals.

[0080] For example, when the ascending-descending tray **140** is caused to ascend to a predetermined position by the ascent-descent motor **142** based on information from the lift sensor **146**, the pickup roller **113** is concurrently caused to descend by the ascent-descent motor **119**, so that the pickup roller **113** moves into contact with the uppermost document loaded on the ascending-descending tray **140**.

[0081] Relative Positional Relationship Between Regulating Member and Ascending-Descending Tray

[0082] In this example, as shown in FIGS. 3 and 4, the ascending-descending tray **140** ascends and descends in a pivotable manner about the pivot point **141**. Thus, for example, in a case where the initial position of the ascending-descending tray **140** is a substantially horizontal position, when the ascending-descending tray **140** ascends, the

pivotal end position of the ascending-descending tray 140 tends to gradually increase in gap relative to the regulating position of the regulating member 131. In this case, the leading edge of a document may possibly become caught in the gap when the document is being transported from the ascending-descending tray 140.

[0083] Thus, this exemplary embodiment is designed to prevent the gap formed between the ascending-descending tray 140 and the regulating member 131 from becoming a hindrance to the transporting of the document.

[0084] Blocking Mechanism

[0085] In this example, as shown in FIGS. 5A to 6B, the leading end of the ascending-descending tray 140 is provided with a blocking mechanism 160.

[0086] The blocking mechanism 160 serves as a suspension element that is disposed in the gap between the ascending-descending tray 140 and the regulating member 131 (corresponding to the document-leading-edge stopper member) and that is suspended to block a part of the gap.

[0087] In this example, the blocking mechanism 160 has a movable member 161 that is provided in an extendable-retractable manner at the leading end of the ascending-descending tray 140 in the document feeding direction and that extends and retracts in conformity to a change in the gap. In this example, multiple (i.e., five in this example) movable members 161 are disposed with a distance therebetween in the width direction intersecting the feeding direction of the document on the ascending-descending tray 140.

[0088] In this example, the ascending-descending tray 140 includes a bent section 143 bent downward at the leading end of the loading area of the document, and the movable members 161 are provided in an extendable-retractable manner at the underside of the bent section 143. Areas of the bent section 143 corresponding to the movable members 161 are provided with slits 144 in which the movable members 161 are fittable.

[0089] In this example, each movable member 161 includes a suspension member 162 formed of a rectangular flat plate fittable in the corresponding slit 144 and a substantially-L-shaped bent arm 163 integrated with the rear side of the suspension member 162.

[0090] A holder 165 that embraces the suspension member 162 of each movable member 161 in a slidable manner is also provided. The holder 165 includes a pair of guide members 166 extending along the opposite sides of the suspension member 162 and a coupling member 167 that integrally couples the pair of guide members 166 to each other at the lower surface of the suspension member 162. By using a positioning frame 168 and a stopper 169 provided at the ascending-descending tray 140, the guide members 166 are positionally secured in the extending-retracting direction of each movable member 161 and in a direction orthogonal thereto. In this example, positioned sections 166a bulge outward from the pair of guide members 166. The positioned sections 166a come into abutment with the positioning frame 168, and the leading ends of the pair of guide members 166 in the retracting direction of each movable member 161 come into abutment with the stopper 169.

[0091] A tension spring 170 formed of, for example, a coil spring is hooked between a part of the coupling member 167 of each holder 165 and the bent arm 163 of the corresponding movable member 161, so that the movable member 161

is pulled in a protruding direction from the corresponding slit 144 relative to the holder 165.

[0092] As an alternative to this example in which each movable member 161 is biased by using the tension spring 170, each movable member 161 may be biased by using a compression spring.

[0093] Operational Example of Blocking Mechanism

[0094] According to this exemplary embodiment, since the blocking mechanism 160 uses the tension springs 170 to pull the suspension members 162, serving as parts of the movable members 161, from the slits 144 in the ascending-descending tray 140, the suspension members 162 of the movable members 161 protrude from the slits 144.

[0095] In this case, for example, as shown in FIGS. 7A to 8B, since the suspension members 162 of the movable members 161 are biased by the biasing force applied by the tension springs 170, the suspension members 162 of the movable members 161 are suspended across the gap g in conformity to the size of the gap g even when the gap g between the leading end of the ascending-descending tray 140 and the regulating member 131 changes depending on the position of the ascending-descending tray 140, thereby blocking a part of the gap g.

[0096] For example, as shown in FIG. 7A, when the ascending-descending tray 140 is located in an initial position P1, the gap g between the ascending-descending tray 140 and the regulating member 131 is denoted by g1, and the suspension members 162 of the movable members 161 protrude by an amount that blocks the gap g1, as shown in FIG. 8A.

[0097] In contrast, as shown in FIG. 7B, when the ascending-descending tray 140 is located in an uppermost position P2, the gap g between the ascending-descending tray 140 and the regulating member 131 is denoted by g2 (>g1), and the suspension members 162 of the movable members 161 protrude by an amount that blocks the gap g2, as shown in FIG. 8A.

[0098] As a result, even when the gap g between the ascending-descending tray 140 and the regulating member 131 changes due to a positional change in the ascending-descending tray 140, the suspension members 162 of the movable members 161 block the gap g, so that there is a reduced possibility of a document being caught in the gap g when the document is being transported.

First Comparative Example

[0099] FIGS. 9A to 9C illustrate a relevant part of a document feeding device according to a first comparative example.

[0100] In FIGS. 9A to 9C, a document feeding device 200 is provided with a serrated uneven section 201 at the leading end of the ascending-descending tray 140 in the document feeding direction, and is also provided with a serrated uneven section 202 in an area of the regulating member 131 facing the ascending-descending tray 140. The uneven sections 201 and 202 overlap in engagement with each other.

[0101] In this example, even when the gap g between the ascending-descending tray 140 and the regulating member 131 changes due to a change in the ascent or descent position of the ascending-descending tray 140, there is a reduced possibility of a gap being formed between the uneven sections 201 and 202 since these two sections are engaged with each other.

[0102] However, since the regulating member 131 at least has the uneven section 202 engageable with the uneven section 201 of the ascending-descending tray 140, the regulating member 131 may possibly increase in thickness d.

Second Exemplary Embodiment

[0103] FIGS. 10A and 10B illustrate a relevant part of a document feeding device according to a second exemplary embodiment.

[0104] In FIGS. 10A and 10B, the document feeding device 100 is substantially similar to that in the first exemplary embodiment in terms of the basic configuration, but is different from the first exemplary embodiment in terms of the blocking mechanism 160. Elements identical to those in the first exemplary embodiment will be given the same reference signs as in the first exemplary embodiment, and detailed descriptions thereof will be omitted.

[0105] In FIGS. 10A and 10B, the blocking mechanism 160 has a recess 181 provided substantially at the center of the ascending-descending tray 140 and at the leading end thereof in the document feeding direction. The recess 181 accommodates a rotating roller 182 serving as a movable member. At the underside of the recess 181 in the ascending-descending tray 140, one end of a rod-like holder arm 183 holds the rotating roller 182 and pivotably supports the rotating roller 182 about an intermediate point of the holder arm 183 acting as a pivot point 184.

[0106] An area on the undersurface of the ascending-descending tray 140 located away from the leading end thereof relative to the holder arm 183 is provided with a protrusion 185 that protrudes downward. A compression spring 186 is hooked between the protrusion 185 and the other end of the holder arm 183. Therefore, the rotating roller 182 is disposed substantially fronting onto the surface of the ascending-descending tray 140 within the recess 181, and protrudes in the document feeding direction beyond the leading end of the ascending-descending tray 140.

[0107] As shown in FIGS. 11A and 11B, with the blocking mechanism 160 according to this exemplary embodiment, even when the gap g is formed between the ascending-descending tray 140 and the regulating member 131, the rotating roller 182 is accommodated within the recess 181 of the ascending-descending tray 140 and is biased in the document feeding direction so as to protrude beyond the leading end of the ascending-descending tray 140. Therefore, the rotating roller 182 is disposed in abutment with the regulating member 131, so that the rotating roller 182 functions as a suspension member that blocks the gap g between the regulating member 131 and the ascending-descending tray 140.

[0108] For example, as shown in FIG. 11A, when the ascending-descending tray 140 is located in the initial position P1, the gap g between the ascending-descending tray 140 and the regulating member 131 is denoted by g1, the rotating roller 182 is rotatably provided fronting onto the surface of the ascending-descending tray 140, and the rotating roller 182 protrudes from the leading end of the ascending-descending tray 140 by an amount that blocks the gap g1.

[0109] In contrast, as shown in FIG. 11B, when the ascending-descending tray 140 is located in the uppermost position P2, the gap g between the ascending-descending tray 140 and the regulating member 131 is denoted by g2 (>g1), the rotating roller 182 is rotatably provided fronting

onto the surface of the ascending-descending tray 140, and the rotating roller 182 protrudes from the leading end of the ascending-descending tray 140 by an amount that blocks the gap g2.

[0110] As a result, in this example, even when the gap g between the ascending-descending tray 140 and the regulating member 131 changes due to a positional change in the ascending-descending tray 140, the rotating roller 182 blocks the gap g, so that there is a reduced possibility of a document being caught in the gap g when the document is being transported. Furthermore, since the rotating roller 182 is rotatably provided fronting onto the surface of the ascending-descending tray 140, there is a reduced possibility of the rotating roller 182 acting as a resisting member that hinders the feeding of a document during a document feeding process.

Third Exemplary Embodiment

[0111] FIG. 12A illustrates a relevant part of a document feeding device according to a third exemplary embodiment.

[0112] In FIG. 12A, the document feeding device 100 is substantially similar to those in the first and second exemplary embodiments in terms of the basic configuration, but is different from the first and second exemplary embodiments in terms of the blocking mechanism 160. Elements identical to those in the first and second exemplary embodiments will be given the same reference signs as in the first exemplary embodiment, and detailed descriptions thereof will be omitted.

[0113] In this example, the blocking mechanism 160 includes a contact element that maintains the ascending-descending tray 140 and the regulating member 131 in contact with each other.

[0114] In this example, the blocking mechanism 160 includes, as the ascending-descending tray 140, a stationary ascending-descending tray 190 having the pivot point 141 and a movable ascending-descending tray 191 provided at the regulating-member-side of the stationary ascending-descending tray 190. The movable ascending-descending tray 191 slidably accommodates a movable drawer 193 that is drawable outward from a hollow accommodation casing 192 having an opening extending toward the regulating member 131, and has a compression spring 194 interposed between the movable drawer 193 and the rear base of the accommodation casing 192 such as to bias the movable drawer 193 toward the regulating member 131.

[0115] In this example, the movable drawer 193 of the movable ascending-descending tray 191 constantly protrudes from the accommodation casing 192 and moves in an extendable-retractable manner against the biasing force of the compression spring 194.

[0116] In this case, even when the gap g between the regulating member 131 and the ascending-descending tray 140 changes, if the amount by which the movable drawer 193 protrudes from the accommodation casing 192 is set to be larger than the gap g, the movable drawer 193 resiliently abuts onto the regulating member 131 against the biasing force of the compression spring 194, thereby blocking the gap g.

[0117] In this case, as shown in FIG. 12A, when the ascending-descending tray 140 is located in the initial position P1, the gap g between the movable drawer 193 and the regulating member 131 is denoted by g1, and the movable

drawer 193 protrudes from the accommodation casing 192 by an amount that blocks the gap g1.

[0118] In contrast, as shown in FIG. 12B, when the ascending-descending tray 140 is located in the uppermost position P2, the gap g between the movable drawer 193 and the regulating member 131 is denoted by g2 (>g1), and the movable drawer 193 protrudes from the accommodation casing 192 by an amount that blocks the gap g2.

[0119] Accordingly, in this example, as shown in FIG. 12C, even when the gap g between the accommodation casing 192 of the ascending-descending tray 140 and the regulating member 131 changes due to a positional change in the ascending-descending tray 140, the movable drawer 193 biased by the compression spring 194 protrudes toward the regulating member 131, thereby blocking the gap g. In this case, even if the gap g changes to g1 or g2, the movable drawer 193 blocks the gap g in conformity to the change in the gap g.

[0120] FIGS. 13A to 13C illustrate a configuration example of the movable ascending-descending tray 191 according to the third exemplary embodiment.

[0121] In FIGS. 13A to 13C, the movable drawer 193 is capable of being accommodated in the accommodation casing 192. In this example, holder pieces 195 protrude from the opposite widthwise edges of the opening of the accommodation casing 192. Each holder piece 195 has a long guide groove 196 extending in the same direction as the extending-retracting direction of the movable drawer 193. Guide pins 197 protrude outward from the opposite widthwise sides of the movable drawer 193. The guide pins 197 are slidably fitted in the guide grooves 196.

[0122] On the other hand, the compression spring 194 is interposed between the rear base of the accommodation casing 192 and the movable drawer 193. From the perspective of positionally attaching the compression spring 194 in a simple fashion, for example, the rear base surface of the movable drawer 193 may be provided with a positioning pin 198 for holding the compression spring 194, and the rear base of the accommodation casing 192 may be provided with positioning ribs 199 for positioning the compression spring 194 by sandwiching it from opposite sides thereof. The positioning structure of this type may employ either one of the positioning pin 198 and the positioning ribs 199 or may employ another technique.

Fourth Exemplary Embodiment

[0123] FIGS. 14A and 14B illustrate a relevant part of a document feeding device according to a fourth exemplary embodiment.

[0124] In FIGS. 14A and 14B, the basic configuration of the document feeding device is substantially similar to those in the first to third exemplary embodiments, but includes a blocking mechanism 160 different from those in the first to third exemplary embodiments.

[0125] This example is similar to the third exemplary embodiment in that the blocking mechanism 160 includes a contact element that maintains the ascending-descending tray 140 and the regulating member 131 in contact with each other, but is different from the third exemplary embodiment in that the contact element is provided at the regulating member 131 side. Elements identical to those in the first to third exemplary embodiments will be given the same reference signs as in the first to third exemplary embodiments, and detailed descriptions thereof will be omitted.

[0126] In FIGS. 14A and 14B, the blocking mechanism 160 is provided with, for example, sliders 210 that are located at the opposite widthwise sides of the stationary tray 130 of the document tray 101 and that are slidable in the document feeding direction relative to the stationary tray 130. The regulating member 131 is fixed to the sliders 210, and the regulating member 131 is biased toward the ascending-descending tray 140 by a bias spring 211.

[0127] According to this example, the ascending-descending tray 140 ascends or descends about the pivot point 141, so that even when the ascending-descending tray 140 positionally changes to, for example, the initial position P1 (see FIG. 14A) or the uppermost position P2 (see FIG. 14B), the regulating member 131 slides on the stationary tray 130 via the sliders 210 in accordance with the biasing force of the bias spring 211, whereby the regulating member 131 abuts on the ascending-descending tray 140 while being resiliently in contact therewith.

[0128] Therefore, even when the ascending-descending tray 140 positionally changes, the regulating member 131 and the ascending-descending tray 140 are maintained in contact with each other. Thus, a gap may be prevented from being formed between the regulating member 131 and the ascending-descending tray 140, whereby a situation where a document becomes caught in a gap between the regulating member 131 and the ascending-descending tray 140 may be effectively avoided during a document feeding process.

[0129] Although the leading edge of a document loaded on the ascending-descending tray 140 may positionally change due to a positional change in the regulating member 131, a document reading process may be performed smoothly by the reader 88 so long as the transport position of the document in the document transport system 102 is detected by using a positional sensor (not shown).

Modification of Fourth Exemplary Embodiment

[0130] FIGS. 15A to 15C illustrate a relevant part of a document feeding device according to a modification of the fourth exemplary embodiment.

[0131] In FIGS. 15A to 15C, the blocking mechanism 160 is similar to that in the fourth exemplary embodiment in that the regulating member 131 is pressed and biased toward the ascending-descending tray 140, but is different from the fourth exemplary embodiment in terms of the movable structure of the regulating member 131.

[0132] Referring to FIGS. 15A to 15C, as the movable structure of the regulating member 131, the base 132 and sides 133 of the stationary tray 130 are provided with guide grooves 221 and 222, the regulating member 131 is provided with guide pins 223 and 224 slidably fitted in the guide grooves 221 and 222, and the guide grooves 221 and 222 entirely or partially have fitted therein bias springs 225 (i.e., compression springs in this example) that apply a biasing force toward the ascending-descending tray 140.

[0133] In this example, a guide mechanism constituted of the guide grooves 221 and 222 and the guide pins 223 and 224 works in cooperation with the bias springs 225 so that the regulating member 131 is biased toward the ascending-descending tray 140 and is maintained in contact with the ascending-descending tray 140. In this case, although the distance from the pivot point 141 of the ascending-descending tray 140 to the leading end thereof changes as the ascending-descending tray 140 ascends or descends, the regulating member 131 is maintained in contact with the

leading end of the ascending-descending tray **140** as the position of the ascending-descending tray **140** changes. Thus, there is a reduced possibility of a document being caught in the gap between the regulating member **131** and the ascending-descending tray **140** during a document feeding process regardless of any position that the ascending-descending tray **140** is in.

Fifth Exemplary Embodiment

[0134] FIGS. **16A** and **16B** illustrate a relevant part of a document feeding device according to a fifth exemplary embodiment.

[0135] In FIGS. **16A** and **16B**, the basic configuration of the document feeding device is substantially similar to those in the first to third exemplary embodiments, but includes a blocking mechanism **160** different from those in the first to third exemplary embodiments.

[0136] This example is similar to the fourth exemplary embodiment in that the blocking mechanism **160** includes a contact element that maintains the ascending-descending tray **140** and the regulating member **131** in contact with each other and that is provided at the regulating member **131** side, but is different from the fourth exemplary embodiment in that the regulating member **131** is movable by utilizing a peripheral component of the document tray **101** instead of providing the regulating member **131** in a slidable manner relative to the stationary tray **130**.

[0137] The blocking mechanism **160** in this example has a U-shaped holder groove **231** having an opening extending toward the document tray **101** and located below an inlet of a travel guide member **230** included in the document transport system **102** and serving as a document travel path. A tabular receiver member **232** protruding downward is provided below the holder groove **231**. The receiver member **232** is provided with a positioning pin **233**.

[0138] The regulating member **131** has a bent piece **135** extending thereabove substantially in the horizontal direction, and is hooked to the holder groove **231** provided in the travel guide member **230**. Because the groove width of the holder groove **231** in the vertical direction is set with slight play relative to the thickness of the bent piece **135**, the bent piece **135** is hooked in a slidable manner to the holder groove **231**.

[0139] Furthermore, a bias spring **235** formed of a coil spring is attached in a compressed state to the positioning pin **233** of the receiver member **232**. The bias spring **235** applies a spreading force between the receiver member **232** and the regulating member **131**.

[0140] In the blocking mechanism **160** according to this example, the bent piece **135** is hooked to the holder groove **231** provided below the travel guide member **230**, and the regulating member **131** is biased toward the document tray **101** by the bias spring **235**.

[0141] In this case, when the bias spring **235** biases the regulating member **131** toward the document tray **101**, the regulating member **131** is pressed and spread outward by the biasing force of the bias spring **235**, so that the regulating member **131** is maintained in a predetermined orientation at the inlet of the travel guide member **230** in a state where the bent piece **135** is in abutment with the bottom surface of the travel guide member **230**.

[0142] In this state, the regulating member **131** is resiliently pressed by the biasing force of the bias spring **235**, so that the regulating member **131** moves in an extending-retracting fashion as the bias spring **235** resiliently deforms.

[0143] Therefore, in this example, when the ascending-descending tray **140** is located in the initial position P1, as shown in, for example, FIG. **17A**, the regulating member **131** is brought into abutment with the leading end of the ascending-descending tray **140** by the biasing force of the bias spring **235**.

[0144] In contrast, as shown in FIG. **17B**, when the ascending-descending tray **140** is located in the uppermost position P2, the regulating member **131** is also brought into abutment with the leading end of the ascending-descending tray **140** by the biasing force of the bias spring **235**.

[0145] Accordingly, even when the ascending-descending tray **140** positionally changes, the regulating member **131** is maintained in contact with the leading end of the ascending-descending tray **140** by the biasing force of the bias spring **235**. Therefore, no gap is formed between the ascending-descending tray **140** and the regulating member **131**, so that there is a reduced possibility of a document being caught in a gap during a document feeding process.

[0146] The foregoing description of the exemplary embodiments of the present disclosure has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of the disclosure and its practical applications, thereby enabling others skilled in the art to understand the disclosure for various embodiments and with the various modifications as are suited to the particular use contemplated. It is intended that the scope of the disclosure be defined by the following claims and their equivalents.

APPENDIX

[0147] (((1)))

[0148] A medium feeding device comprising:

[0149] a load unit that is loaded with a plurality of media;

[0150] a delivering unit that delivers an uppermost medium of the media loaded on the load unit in a predetermined feeding direction;

[0151] an ascent-descent unit that causes at least a part of the load unit to ascend and descend about a pivot point defined by a position of the load unit located away from a leading edge of the media in the feeding direction;

[0152] a regulating unit that is provided toward the feeding direction of the media on the load unit and that comes into contact with the leading edge, in the feeding direction, of the media loaded on the load unit to regulate a loading position of the media; and

[0153] a blocking unit that allows the load unit to ascend and descend and that blocks at least a part of a gap between the load unit and the regulating unit at an arbitrary ascent or descent position of the load unit.

((2))

[0154] The medium feeding device according to ((1)),

[0155] wherein the blocking unit includes a suspension element that is disposed in the gap between the load unit and the regulating unit and that is suspended to block the part of the gap.

((3))

[0156] The medium feeding device according to ((2)),

[0157] wherein the suspension element includes a movable member that is provided in an extendable-retractable manner at a leading end of the load unit in the feeding direction of the media and that extends and retracts in conformity to a change in the gap.

((4))

[0158] The medium feeding device according to ((3)),

[0159] wherein the movable member includes a plurality of movable members disposed with a distance therebetween in a width direction orthogonal to the feeding direction of the media on the load unit.

((5))

[0160] The medium feeding device according to ((2)),

[0161] wherein the suspension element includes a rotating member that is provided in a rotatable manner at a leading end of the load unit in the feeding direction of the media and that is disposed in contact with the gap in conformity to a change in the gap.

((6))

[0162] The medium feeding device according to ((1)),

[0163] wherein the blocking unit includes a contact element that maintains the load unit and the regulating unit in contact with each other.

((7))

[0164] The medium feeding device according to ((6)),

[0165] wherein the contact element includes a movable drawer that enables the load unit to be drawable in the feeding direction of the media, and biases the movable drawer toward the regulating unit.

((8))

[0166] The medium feeding device according to ((6)),

[0167] wherein the contact element is provided to enable the regulating unit to be extendable and retractable toward the load unit and biases the regulating unit toward the load unit by using a biasing unit.

((9))

[0168] The medium feeding device according to any one of ((1)) to ((8)),

[0169] wherein the regulating unit has a flat surface at a side facing the load unit.

((10))

[0170] The medium feeding device according to ((9)),

[0171] wherein the regulating unit includes a regulating member formed of a flat plate.

((11))

[0172] A medium processing apparatus comprising:

[0173] a processing unit that performs a predetermined process on a medium; and

[0174] the medium feeding device according to any one of ((1)) to ((10)) that feeds the medium to the processing unit.

What is claimed is:

1. A medium feeding device comprising:

a load unit that is loaded with a plurality of media;

a delivering unit that delivers an uppermost medium of the media loaded on the load unit in a predetermined feeding direction;

an ascent-descent unit that causes at least a part of the load unit to ascend and descend about a pivot point defined by a position of the load unit located away from a leading edge of the media in the feeding direction;

a regulating unit that is provided toward the feeding direction of the media on the load unit and that comes into contact with the leading edge, in the feeding direction, of the media loaded on the load unit to regulate a loading position of the media; and

a blocking unit that allows the load unit to ascend and descend and that blocks at least a part of a gap between the load unit and the regulating unit at an arbitrary ascent or descent position of the load unit.

2. The medium feeding device according to claim 1, wherein the blocking unit includes a suspension element that is disposed in the gap between the load unit and the regulating unit and that is suspended to block the part of the gap.

3. The medium feeding device according to claim 2, wherein the suspension element includes a movable member that is provided in an extendable-retractable manner at a leading end of the load unit in the feeding direction of the media and that extends and retracts in conformity to a change in the gap.

4. The medium feeding device according to claim 3, wherein the movable member includes a plurality of movable members disposed with a distance therebetween in a width direction orthogonal to the feeding direction of the media on the load unit.

5. The medium feeding device according to claim 2, wherein the suspension element includes a rotating member that is provided in a rotatable manner at a leading end of the load unit in the feeding direction of the media and that is disposed in contact with the gap in conformity to a change in the gap.

6. The medium feeding device according to claim 1, wherein the blocking unit includes a contact element that maintains the load unit and the regulating unit in contact with each other.

7. The medium feeding device according to claim 6, wherein the contact element includes a movable drawer that enables the load unit to be drawable in the feeding direction of the media, and biases the movable drawer toward the regulating unit.

8. The medium feeding device according to claim 6, wherein the contact element is provided to enable the regulating unit to be extendable and retractable toward the load unit and biases the regulating unit toward the load unit by using a biasing unit.

9. The medium feeding device according to claim 1, wherein the regulating unit has a flat surface at a side facing the load unit.

10. The medium feeding device according to claim 9, wherein the regulating unit includes a regulating member formed of a flat plate.

11. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 1 that feeds the medium to the processing unit.

12. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 2 that feeds the medium to the processing unit.

13. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 3 that feeds the medium to the processing unit.

14. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 4 that feeds the medium to the processing unit.

15. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 5 that feeds the medium to the processing unit.

16. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 6 that feeds the medium to the processing unit.

17. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 7 that feeds the medium to the processing unit.

18. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 8 that feeds the medium to the processing unit.

19. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 9 that feeds the medium to the processing unit.

20. A medium processing apparatus comprising:
a processing unit that performs a predetermined process on a medium; and

the medium feeding device according to claim 10 that feeds the medium to the processing unit.

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