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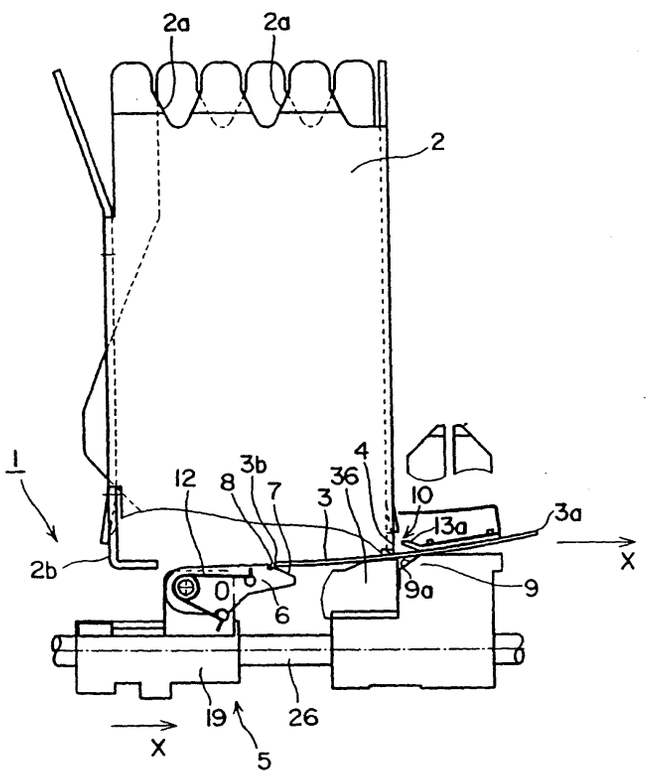
(54) Mechanism for and method of feeding cards

(57) A card feed (1) for feeding cards (3) from a hopper (2), the card feed (1) comprising a card feeding mechanism for feeding cards (3) one by one from a gate portion (4) at the bottom of the hopper (2), which card feeding mechanism is operable to engage the back end (3b) of each card (3), wherein the gate portion (4) is adapted so that the back end of the card (3b) is pressed against the card (3) feeding mechanism when a part of the card comes through the gate portion (4).

Fig. 6



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Description

[0001] The present invention relates to a card feed and a method for feeding cards. More specifically, it relates to improvements in feeding layered cards one by one in a card dispenser and the like.

[0002] In addition, the present invention relates to improvements in a mechanism to move a mechanism for feeding and holding a card in which cards layered in a hopper are fed out one by one. Further, the present invention relates to a card feed in a card dispenser, which performs an embossing treatment on pre-embossed cards.

[0003] Conventionally, a card feed is such that a card at the bottom of a stack is carried by a carriage. For example, in card feed 101 of Figure 24, hook 106 of carriage 105 is hooked to the back end of card 103, which is located at the bottom of layered cards in hopper 102, to feed it out from gate portion 104 (only card at the bottom of the stack is shown).

[0004] Engagement of hook 106 to the back end of card 103 is ensured by applying a downward load by mounting a weight (not shown) on the top of the stack of cards. Therefore, even when the card is warped, it can be carried out. Also, two hooks 106 are formed in the width direction of card 103 to ensure the engagement and to stabilize the feeding process.

[0005] In card feed 101 with a weight as described above, the weight needs to be removed before placing additional cards 103 in the hopper 102 and remounted thereon after placement of the cards. This process needs to be clearly stated in a manual and on the label of a card dispenser to remind a user to remount the weight after placing additional cards 103 in the hopper 102. Also, measures to prevent a loss of the weight, such as chaining the weight to the card dispenser, need to be employed. There is, therefore, a demand for a card dispenser with card feed 101 that can handle card 103 without a weight and enables a lower cost and improvement in readiness in operation. However, feeding of card 103 may not be guaranteed if the weight is removed. In other words, hook 106 of carriage 105 may not be completely hooked to the back end of card 103 if a downward load is not applied to layered cards 103. Further, some cards 103 are not flat. Warped cards will reduce the precision of the operation.

[0006] By having two hooks 106 adjacent to each other, it is possible that one hook 106 stays hooked to card 103 while another is disengaged. However, the position of card 103 is no longer symmetrical in relation to the axis such that rotational force is applied to it. Card 103 is still carried to gate portion 104 as card 103 is restricted by sidewalls of hopper 102 while being hooked to one hook. However, once card 103 passes through gate portion 104, nothing restricts the direction of the card. Hence, the stability of the operation is lowered. Also, the card is carried while banging against the sidewalls of the dispenser. This is a disadvantage.

[0007] In a conventional card feed 101, gate portion 104 is constantly open as shown in Figure 23. Therefore, card 103 is carried through gate portion 104 by simply moving it forward. Also, card guide 107 is formed on the top of carriage 105. This prevents card 103 from being stuck on the sidewalls of hopper 102 by shaking the next card 103 from the bottom while carriage 105 is moving back and forth. However, a part of card 103 may project through open gate portion 104 in such card feed 101. In other words, card 103 may be rocked by card guide 107 of carriage 105, which is intended to prevent congestion of cards thereat, when additional cards 103 are loaded or when carriage 105 is moving backward. In such a case, card 103, which now tilts down at its front, indicated with a solid line in the figure, may jump out from gate portion 104 by its own weight. The back end of card 103 then slides out from hook 106 when carriage 105 returns to a given position such that card 103 remains disengaged from hook 106.

[0008] In order to solve the above above, card feed 101 shown in Figure 24 comprises a card stopper 108, which blocks gate portion 104, and force applying means 109, such as a coil spring, which constantly applies force to card stopper 108. In this card feed, card stopper 108 is pushed down with the edge of card 103 such that card 103 can be carried through open gate portion 104. Nonetheless, the back end of card 103 can be disengaged from hook 106 as a counteraction when the card stopper 108 opens by being pushed with the front edge of card 103. This phenomena happens more often when the load on card 103 decreases as the number of cards 103 in the hopper 102 decreases.

[0009] Another problem with the above card feed is that some card dispensers have a configuration in which desired printing is performed on a card by moving the card to a given position while being clamped by a clamping carriage as a card holding mechanism. For example, in card feed 101 of the card dispenser shown in Figure 23, cards 103 at the bottom of the layered cards are carried out from hopper 102 one by one through gate portion 104 by hook 106 of carriage 105. The card is passed on to a card holding mechanism (not shown) at a given position then is carried to a position for printing (only the card at the bottom is shown in the figure).

[0010] The card holding mechanism is movable in the horizontal direction. To receive card 103, the card holding mechanism needs to be positioned at a given position behind gate portion 104. Conventionally, the clamp carriage of a card holding mechanism is pulled with a spring. After delivering the card by a belt drive and the like, the clamp carriage returns to the given position to receive the card by removing the drive. In this case, one end of the spring is connected to the clamp carriage and another end is connected to carriage 105 of card feed 101, for example.

[0011] The clamp carriage is formed of a toggle mechanism so that card 103 can be firmly held. The toggle mechanism, which can rotate, is operated while a cam

follower of the toggle mechanism follows a cam groove. Therefore, the clamp carriage loosely holds card 103, then holds it with pressure by using the toggle mechanism while the carriage is moving. Card 103 is carried while being firmly held such that the position thereof does not shift even after printing and the like. However, the toggle mechanism requires a large spring force, which exceeds the force required to open the clamp. Also, a motor is required to be large enough to have motor torque equal to the spring force and the force of the clamp. Further, when the cam follower is guided by the cam groove while the clamp carriage is moving, the card holding mechanism may be stopped before returning to the given position due to a friction load caused when the cam follower contacts the cam surface. In other words, if the friction load is larger than the force applied to the cam follower when the card holding mechanism is on the way to the given position, the cam follower cannot pass over the tilted surface of the cam surface such that the operation is stopped.

[0012] The above problem may be solved by simply increasing the force to apply thereto. However, if the spring is extremely strong, the force required to move the clamp carriage also becomes large. Therefore, this is not a preferable solution. Moreover, some card dispensers dispense a card one by one after performing an embossing treatment on a plastic card, such as a credit card. In such a dispenser, flat cards, which are unprocessed or which have some patterns, are layered in hopper 102 as shown in Figure 25. The card is fed from the hopper (cards 103 layered in hopper 102 are separated and carried out therefrom) by card feed 101 before further processing.

[0013] Among various hopping mechanisms, card feed 101 employs a configuration in which card 103 is carried in the direction X perpendicular to the length direction of the card, as shown in Figures 25 and 26 wherein the bottom surface of card 103 is supported by card support member 114 formed at the center of in the length direction of the bottom of hopper 102. In this case, upper gate opening 115 is placed at a position across from card support member 114, as shown in Figure 27, forming gate portion 116. In such card feed 101, card 103 is fed from the hopper in the feeding direction X while gate portion 116 establishes the position of card 103 in the vertical direction at the center of card 103 in the length direction. By positioning card 103 at its center, card 103 does not rock even when load is applied to card 103 by contacting it while feeding. Also, card holding stages 110,110 support the bottom of card 103 to prevent it from falling from hopper 102.

[0014] In card feed 101 as described above, it is preferable to establish a precise distance between card support member 114 and upper gate opening 115 such that card 103 can be carried out while maintaining a precise position in the vertical direction. Also, parts of card feed 101 are required to be rigid and strong in order to constantly position card 103. However, card support member 114 and facing upper gate opening 115 are placed at approximate center of the gate. Therefore, it is difficult to establish a precise distance therebetween. Additionally, the form and the size of card support member 114 and upper gate opening 115 tend to be complicated and large in order to obtain rigidity and strength. Furthermore, such a card feed may be required to perform embossing treatment on cards which are previously embossed on a given position, in addition to feeding unprocessed cards 103 one by one. However, card 103 may not be fed from the hopper as the area of the card previously embossed gets stuck at upper gate opening 115 as gate portion 116 is located at the center in the length direction of the card.

[0015] An object of the present invention is to provide a card feed and a method for feeding cards in which layered cards can be firmly hooked to a carriage without a downward load. A further object of the invention is to provide a card feed in which a card is firmly hooked to a card feeding hook without a card jumping out from a gate portion. A yet further object of the invention is to provide a card feed and a card support mechanism in which a clamp carriage can be moved to a given position without enlarging a spring and a motor wherein a card support mechanism is sufficiently functioned along with the movement of the clamp carriage. A still further object of the present invention is to provide a card feed in which a gate portion has rigidity and a configuration easily maintained wherein pre-embossed cards can be smoothly carried.

[0016] Various aspects of the present invention are defined in the independent claims. Some preferred features are defined in the dependent claims.

[0017] According to one aspect of the present invention, there is provided a card feed in which cards are layered in a hopper; cards are fed one by one from a gate portion at the bottom of said hopper by a card feeding hook positioned on a card feeding carriage mechanism; said card feeding carriage mechanism is movable back and forth in the card feeding direction by means of a drive; said card feeding carriage mechanism has two of said card feeding hooks which are hooked to the back end of said card; force is applied to said card feeding hooks to be able to rotate such that they are hooked to the back end of said card; said gate portion is formed such that the back end of said card is pressed against said card feeding hooks when a part of said card comes through said gate portion; and a portion to control movements of said card feeding carriage mechanism moves said card feeding carriage mechanism backward before moving it forward.

[0018] Preferably, said card feeding hooks have portions to hold the card bottom on their edges; said card feeding hooks also have engaging portions, which are hooked to the back end of said card, behind said portion to hold the card bottom; and the amount by which said card feeding carriage mechanism is moved backward is established to be within a range from the edge of said

portion to hold the card bottom to said engaging portions.

[0019] The card holding stage may be formed at the outside of a gate opening at the bottom part of said hopper such that the back end of said card passing through the gate opening is pressed against said card feeding hook.

[0020] According to another aspect of the invention, there is provided a method for feeding cards in which cards are layered in a hopper; cards are fed one by one from a gate portion at the bottom of said hopper by a card feeding hook positioned on a card feeding carriage mechanism; said card feeding carriage mechanism is movable back and forth in the card feeding direction by means of a drive; said card feeding carriage mechanism has two of said card feeding hooks which are hooked to the back end of said card; force is applied to said card feeding hooks to be able to rotate such that they are hooked to the back end of said card; and said gate portion is formed such that the back end of said card is pressed against said card feeding hooks when a part of said card comes through said gate portion wherein a portion to control movements of said card feeding carriage mechanism moves said card feeding carriage mechanism backward before feeding said card.

[0021] According to yet another aspect of the invention, there is provided a card feed in which cards are layered in a hopper; cards are fed one by one from a gate portion at the bottom of said hopper by a card feeding hook positioned on a card feeding carriage mechanism; said card feeding carriage mechanism is movable back and forth in the card feeding direction by means of a drive; said card feeding carriage mechanism has said card feeding hook which is hooked to the back end of said card; a card stopper is placed at said gate opening to close said gate opening; a card stopper moving mechanism opens a gate opening by moving said card stopper when at least the edge of said card passes through said gate opening while being carried by said card feeding hook.

[0022] Preferably, said card feeding hook has a portion to hold the card bottom at its edge; said card feeding hook also has a engaging portion, which is hooked to the back end of said card, behind said portion to hold the card bottom; and said card stopper moving mechanism moves said card stopper to open only when the edge of said card passes through said gate opening.

[0023] The card stopper may be operable to move between an obstructed position, at which said card stopping portion projects in said gate opening to prevent said card from passing therethrough, and an open position at which said card stopping portion moves away from said obstructed position to allow said card to pass therethrough; and said card feeding carriage mechanism and said card stopper may be hooked to each other such that said open position is the position of said engaging portion of said card stopper when said card feeding carriage mechanism is at a position to start feeding. Preferably, said card stopper is able to rotate; force is applied to said card stopper by a member to apply force toward said obstructed position; and either said card stopper or said card feeding carriage mechanism has an inclined portion which rotates said card stopper to open.

[0024] According to yet a further aspect of the invention, there is provided a mechanism for feeding and holding a card in which cards are layered in a hopper; cards are fed one by one from a gate portion at the bottom of said hopper by a card feeding hook positioned on a card feeding carriage mechanism while said card is held by a card holding member which is mounted to said card holding mechanism; said card feeding carriage mechanism is movable back and forth in the card feeding direction by means of a drive; said card feeding carriage mechanism and said card holding mechanism are connected to pull each other by a spring member; while said card feeding carriage mechanism and said card holding mechanism are connected by a connecting member, said card holding mechanism is moved to a given position in the card feeding direction.

[0025] The card holding mechanism may comprise a card holding stage, which holds a card, and card pressing member which loosely holds said card or firmly holds said card with pressure; said card, coming out through said hopper, may be loosely held between card holding stage and said card pressing member when said card holding mechanism may be at a position adjacent to said hopper while said card is held with pressure between said card holding stage and said card pressing member when said card holding mechanism is at a position apart from said hopper; and said card feeding carriage mechanism and said card holding mechanism may be connected by said engaging member at said position where said card is held with pressure. Preferably, said card pressing member controls its position with a cam surface; said engaging member is moved by said cam surface; and said card feeding carriage mechanism and said card holding mechanism are connected by said connecting member until passing a change position of said cam surface.

[0026] Preferably, the card feeding carriage mechanism and said card holding mechanism are movable back and forth in the card feeding direction wherein they are also movable back and forth in the direction perpendicular to the card feeding direction at said position apart from said hopper.

[0027] The engaging member may be able to change its position by means of a toggle mechanism wherein said card feeding carriage mechanism and said card holding mechanism are disconnected while said connecting member is guided by a slanted section of said cam surface.

[0028] According to a still further aspect of the invention, there is provided a card feed in which cards are layered in a hopper; cards are fed one by one from a gate portion at the bottom of said hopper by a card feed-

ing hook positioned on a card feeding carriage mechanism while said card is held by a card holding member which is mounted to said card holding mechanism; said card feeding carriage mechanism is movable back and forth in the card feeding direction, which is perpendicular to the direction of the card length, by means of a drive; two card support members to support the bottom surface of said card are placed at the exit of said hopper, that is on the sides of said hopper in the card feeding direction; and said gate portions are formed at both ends of said hopper.

[0029] The gate portions may be formed such that upper gate openings, which control the top surface of said card with two positions at the front side on both sides of said hopper, are placed across from said two card support members.

[0030] A card fed by said card sending hooks may be held between said card holding stage and said card holding member formed on said card holding mechanism wherein said card feeding carriage mechanism and said card holding mechanism are carried together by an X-Y drive mechanism.

[0031] Preferably, two of said card feeding hooks are formed; a card fed by said card feeding hooks is held between said card holding stage and said card holding member formed on said card holding mechanism; and the position of said card holding stage is higher than the position of the surface of said card support members at which said card is supported.

[0032] Various aspects of the invention will now be described by way of example only and with reference to the accompanying drawings, of which:

Figure 1 is a side view of a card dispenser having a card feed;
Figure 2 is a front view of the card dispenser in Figure 1;
Figure 3 is a plan view of the card dispenser in Figure 1;
Figure 4 is a side view of an embodiment of a card feed;
Figure 5 is a side view of the card feed;
Figure 6 is a side view of the card feed;
Figure 7 is a plan view of the card feed;
Figure 8 is a front view of the card feed;
Figure 9 is a side view of another embodiment of a card feed;
Figure 10 is the side view of the card feed;
Figure 11 is a partial side view of another configuration of a card stopper moving mechanism in the card feed;
Figure 12 is a plan view of a mechanism for feeding and holding of a card;
Figure 13 is a plan view of a mechanism for feeding and holding of a card;
Figure 14 is a plan view of a mechanism for feeding and holding of a card;
Figure 15 is a side view of a mechanism for feeding and holding of a card;
Figure 16 is a front view of a mechanism for feeding and holding of a card;
Figure 17 is a side view of yet another embodiment of a card feed;
Figure 18 is a front view of the card feed;
Figure 19 is a plan view of the card feed;
Figure 20 is a plan view of the card feed;
Figure 21 is a front view of the card feed;
Figure 22 is a side view of the card feed;
Figure 23 is a side view of a conventional card feed;
Figure 24 is a side view of a conventional card feed having a card stopper blocking a gate portion;
Figure 25 is a side view of the conventional card feed;
Figure 26 is a plan view of the conventional card feed, and
Figure 27 is a front view of the conventional card feed.

[0033] Figures 1 through 22 show a card feed 1, in which a plurality of cards 3 ... 3 are layered in hopper 2. Each card 3 is carried out individually through gate portion 4 at a bottom portion 2b of hopper 2 with card feeding hook 6 of card feeding carriage mechanism.

[0034] Card feed 1 is used as a mechanism that feeds card 3 one by one in card dispenser 40 as shown in Figures 1 through 3. Card dispenser 40 is comprised of: card feed 1; card holding mechanism 20; hoppers 2 ... 2 in which cards 3 are layered; card reader portion 41; portion to collect cancelled cards 42; indenting and embossing mechanism 43; topper mechanism 44; and controlling portion 45. Also, symbols in Figures 1 through 3 indicate as follows: numbers 26 and 27 are guide shafts; number 46 is a card supply portion; number 47 is a Y drive shaft; number 48 is a Y shaft drive motor; number 49 is a card dispensing slot; number 50 is a card carrying roller; number 51 is a sensor for detecting the position of cards; number 52 is a pulley for rotating the y shaft.

[0035] Hopper 2 stores a plurality of cards 3 ... 3 before a process of issuing cards starts. As shown in Figure 7, hopper 2 holds the edge of cards 3 with sidewall 2c. As shown in Figure 6, notches 2a ... 2a are formed at the top of hopper 2. Loading of additional cards 3 ... 3 is made easy by spreading the space between notches 2a ... 2a at the top of hopper 2 into a funnel shape. Bottom portion 2b of hopper 2 has gate portion 4 to feed out card 3. Gate 4 is comprised of gate opening 10 and card guide member 11, which guides card 3 to gate opening 10 and which ejects card 3 through gate opening 10 after carrying it to a given position. Gate portion 4 is a passage of card 3, which is carried by card feeding carriage mechanism 5.

[0036] Card feeding carriage mechanism 5 is formed movable back and forth in card feeding direction X. As shown in Figure 7, card 3 is carried while engaging portion 8 of card feeding hook 6 is hooked to back end 3b of the card. Card 3 then is carried to a given position

where card 3 is passed on to card holding mechanism 20. In this embodiment, card feeding carriage mechanism 5 is comprised of guide shafts 26 and 27 that extend in card feeding direction X; carriage 19, which rocks on the guide shafts and card feeding hook 6, which is formed on carriage 19. Card feeding hook 6 is fixed to timing belt 35 with screw 34 as shown in Figure 15 and drives the entire card feeding carriage mechanism 5 with a drive (not shown). As a drive, a stepping motor, in which the distance for the carriage to be carried is controlled according to the number of steps, is employed to move carriage 19 back and forth.

[0037] Card feeding carriage mechanism 5 has two card feeding hooks 6, which can be hooked to back end 3b of the card, as shown in Figure 7. Card feeding hooks 6 have a holding portion to hold the card bottom 7 at its end and an engaging portion 8 behind the holding portion, which engaging portion 8 is hooked to the back end 3b of the card. In this embodiment, a concavity is formed in the vicinity of the front end of card feeding hook 6 as shown in Figure 5. This concavity functions as engaging portion 8 which is hooked to back end 3b of card 3. However, the shape of the concavity is not limited as long as engagement to back end 3b of card 3 is ensured. Also, the size is not necessarily established large to ensure the engagement.

[0038] In card feed 1, card feeding hooks 6 (6a and 6b) are arranged to maintain a given distance from each other as shown in Figure 8. Also, force is applied to each of the hooks 6 by coil spring 12. If card 3 is warped as shown in Figure 8, at least one hook can be hooked to the back end 3b of card 3. If at least one of card feeding hooks 6 is hooked to the back end 3b of card 3, both card feeding hooks 6 can be firmly hooked to back end 3b of the card by shifting carriage 19. Also, a force can be applied to the card feeding hooks 6 to rotate such that they are firmly hooked to back end 3b of card 3. This embodiment employs torsion coil spring 12 as a means to apply force as shown in Figure 5. Torsion coil spring 12 is wound around the center of rotation of card feeding hooks 6. However, other means, such as applying upward force by using a compression coil spring, can be employed.

[0039] Further, this embodiment has gate portion 4 with a configuration as described below such that card feeding hooks 6 are not disengaged from back end 3b of card 3 while being carried. In other words, gate portion 4 is configured such that back end 3b of card 3 is pressed against card feeding hooks 6 while a part of card 3 is coming through gate portion 4. More specifically, card holding stage 9 is formed on the outside of gate opening 10 at the bottom of hopper 2, and card holding stage 9 has loose stop member 13 as shown in the figure. Loose stop member 13 is usually pressed against the top surface of card holding stage 9 as shown in Figure 5. However, when card 3 passes underneath loose stop member 13, the member tilts by the same degree as card 3 while pressing card 3 from the top as shown in Figure 4.

[0040] The front part of card holding stage 9 (toward gate opening 10) is inclined portion 9a. Also, the front part of loose stop member 13 is bent portion 13a corresponding to inclined portion 9a. Inclined portion 9a and bent portion 13a form a funnel-shaped guide portion, which guides the front end 3a of the card. The guide portion is located at a position higher than gate opening 10 as shown in Figures 4 and 5 such that the entire card 3 in contact with inclined portion 9a is slanted after the front end 3a of the card passes through gate opening 10. Therefore, card 3 is slanted as shown in Figure 4 after the front end 3a of the card is guided while being in contact with inclined portion 9a.

[0041] Upper gate portion 10a, which forms gate opening 10 together with the top surface of card support member 36, maintains a space through which card 3 can be carried to the card transferring path using hopper 2. Also, upper gate portion 10a applies a downward load to card 3 by coming in contact with the top surface of slanted card 3. In other words, card 3 passes through gate opening 10 and the front end 3a of the card is guided such that the slanted upper edge of gate opening 10 contacts the upper end of card 3, as shown in Figure 4. Consequently, a load is applied to the center of the card to warp it. When the load is applied, the front end 3a of the card is pressed against card holding stage 9 while the back end 3b of the card is pressed against card feeding hook 6 as shown in Figure 4. Since the back end 3b of the card is pressed against engaging portion 8 of card feeding hook 6 while card 3 is carried, card 3 is not easily disengaged from engaging portion 8 even when card 3 is warped.

[0042] How to move card feeding hook 6 (e.g. speed) is not limited to any form. For example, it can be moved at a constant speed. This embodiment has a portion to control movements of card feeding carriage mechanism 5 (not shown in the figure) which moves card feeding carriage mechanism 5 backward then forward. The portion to control movements of card feeding carriage mechanism 5 is a program stored on a substrate. However, one is not limited to this configuration.

[0043] Carriage 19 of card feeding carriage mechanism 5 is moved backward after the front end 3a of the card contacts card holding stage 9. More favorably, this occurs after a part of the front end 3a of the card is sandwiched between card holding stage 9 and loose stop member 13. Even when the back end 3b of the card and card feeding hook 6 are disengaged from each other due to the impact caused when the front end 3a of the card comes in contact with gate portion 4 or when a part of the card is sandwiched, as shown in Figure 4, the back end 3b of the card can be firmly hooked to the concavity of card feeding hook 6 by moving card feeding hook 6 of carriage mechanism 5 backward as the downward load is applied to the back end 3b of the card, as shown in Figure 6. As a result, feeding of card 3 is ensured by using two of card feeding members 6, 6. Addi-

tionally, since card 3 is sandwiched between card holding stage 9 and loose stop member 13, card feeding carriage mechanism 5 can be moved backward while maintaining the position of the card thereat.

[0044] It is preferable to establish the distance by which card feeding carriage mechanism 5 is moved backward to be a minimum within a necessary range. For example, such amount is established to be a distance between the front end of portion to hold the card bottom 7 of card feeding hook 6 and engaging portion 8 in this embodiment. Therefore, even when a large downward load is applied to card 3, the back end 3b of the card is not disengaged from portion to hold the card bottom 7.

[0045] In this embodiment, carriage 19 of card feeding carriage mechanism 5 is moved backward regardless of whether card feeding hook 6 is hooked to card 3. However, it may be moved backward only when disengagement thereat is detected by a sensor which detects whether card 3 is hooked to engaging portion 8 of card feeding hook 6.

[0046] Card feeding carriage mechanism 5 holds the bottom surface of card 3 at four points (a through d) as shown in Figure 20. If there is only one card is left in the hopper, instead of being layered, the force of twist coil spring 12, which pushes the back end 3b of card 3 upward, should be established to be larger than the weight of card 3.

[0047] Herein, card 3 is lifted from point (e) as a portion to hold the card.

[0048] The four points (a, b, c and d) of card feeding carriage mechanism 5, for example point (d) at which warped card 3 is held, do not contact card 3. As shown in Figure 22, stopper 53 limits the range in which card feeding hook 6 can rotate. Therefore, the heights of card feeding hooks 6a and 6b become identical such that card feeding hook 6b is lifted by a distance caused by a twist of card 3.

[0049] The height of card feeding hook 6 should be established to be lower than the thickness of card 3 such that the hook does not accidentally hook to the second card from the bottom among layered cards 3 ... 3. As a result, a slight twist of card 3 disables card feeding hook 6b to hook to card 3 (see Figures 21 and 22). On the other hand, card feeding hook 6a can firmly hook to card 3 since card 3 is supported at three points (a, b and c).

[0050] The following describes feeding of cards. Under a condition as shown in Figure 24 where one of the card feeding hooks is hooked to the back end of the card, card 3 does not have enough weight to apply downward force to card feeding hook 6. However, if feeding of card 3 starts under this condition, the card is tilted in relation to card feeding direction X, as shown in Figure 7. Load points of card feeding direction X are two points on loose stop member 13, 13a and 13b, which are inside card feeding hooks 6a and 6b. Therefore, when feeding of the card is performed by only card feeding hook 6a, rotational moment is applied to card 3 such that the card is slanted as shown in Figure 7.

[0051] In the above case, before the condition shown in Figure 24 occurs, card 3 applies force to card feeding hook 6 via card holding stage 9 and loose stop member 13 as shown in Figure 4. Engaging portion 8 of card feeding hook 6b can be firmly hooked to the back end of 3b of the card by a switch back operation, in which carriage 19 is retrieved once then moved forward, while the back end 3b of the card is positioned at approximately the center of the width of hopper 2. When both card feeding hooks 6a and 6b are hooked to card 3, feeding of card 3 starts. Since load points of the card 13a and 13b are positioned inside card feeding hooks 6a and 6b, feeding of the card can be performed while correcting the slanted position of the card.

[0052] If there is extra space, side wall 2c of hopper 2 can be extended in card feeding direction X. Herein, the number of card feeding hooks 6 can be one or two. In the case of one, it is preferred to locate card feeding hook 6 at the approximate center of card 3 in the width direction.

[0053] To feed card 3 by card feed 1 as described above, card feeding carriage mechanism 5 is driven such that engaging portion 8 of card feeding hook 6 is hooked to the back end 3b of a card at the bottom of cards 3 ... 3 layered in hopper 2, as shown in Figures 5 and 20. As a result, card 3 is carried in card feeding direction X. The front end 3a of card 3 is guided to gate opening 10 along the top surface of card guide member 11 while being carried and is carried further.

[0054] The front end 3a of the card contacts inclined portion 9a of card holding stage 9 behind gate portion 4 such that card 3 is guided between card holding stage 9 and loose stop member 13. Herein, the top surface of the card contacts the upper edge of gate opening 10 as shown in Figure 10 while the front edge 3a of the card is raised. As a result, card 3 receives a downward load such that the back end 3b of the card is pressed downward. Therefore, the back end 3b of the card is pressed to be firmly hooked to engaging portion 8 of card feeding hook 6. It is difficult that card 3 is disengaged from engaging portion 8 while being carried.

[0055] In card feed 1 described above, card feeding carriage mechanism 5 is once retrieved during feeding of card 3. Therefore, even when the back end 3b of the card is about to be disengaged from engaging portion 8 as shown in Figure 4, the engagement thereat is ensured by the retrieving motion. Since card 3 receives a downward load as described above, the back end 3b is hooked to card feeding hook 6 by pressing it against engaging portion 8.

[0056] In this case, card 3 is loosely held by loose stop member 13 as shown in Figure 6. Hence, when carriage 19 is retrieved after being pushed to a given position, card 3 remains as loosely held.

[0057] The following describes an embodiment of card feed 1 of the present invention with a partial modification. This card feed 1, as shown in Figure 9, is com-

prised of card stopper 14, which blocks gate opening 10, and card stopper moving mechanism 15, which moves card stopper 14.

[0058] Card stopper 14 extends in card feeding direction X as shown in Figure 9 and can rotate around center 18 on the bottom of hopper 2. Card stopper 14 has card stopping portion 14a, which covers gate opening 10, at its end in card feeding direction X. Card stopping portion 14a changes its position along the rotation of card stopper 14 between an obstructed position (shown in Figure 10), at which card stopping portion 14a projects in gate opening 10 to prevent card 3 from passing therethrough, and an open position (shown in Figure 9) at which card stopping portion 14a moves away from the obstructed position to allow card 3 to pass therethrough. Card stopper moving mechanism 15 moves card stopper 14 to open gate opening such that the front end of card 3 can pass through. In other words, card stopper moving mechanism 15 opens gate opening 10 by moving card stopper 14 when card feeding hook 6 carries the front end of card 3 through gate opening 10.

[0059] Card stopper 14 is positioned such that card stopping portion 14a is at the obstructed position except when card 3 passes through gate opening as shown in Figure 10. In this embodiment, force is applied to the base end of card stopper 14 with the member to apply force 16 formed of a compress coil spring such that card stopping portion 14a is positioned at the obstructed position. Also, in card feed 2 of this embodiment, the initial position of card feeding carriage mechanism 5 is toward the right in Figure 10. Therefore, force is applied to card stopper 14 counterclockwise around center 18 when card feeding carriage mechanism 5 is not retrieved to close gate opening 10 with card stopping portion 14a.

[0060] Further, card feeding carriage mechanism 5 and card stopper 14 are hooked to each other such that card stopping portion 14a is positioned at the open position when card feeding carriage mechanism 5 is at the position to start feeding of the card (or when hook 6 is hooked to the back end 3b of the card). In this embodiment, inclined portion 17 is formed on either card stopper 14 or card feeding carriage mechanism 5 to rotate card stopper 14 for opening of gate portion 10 such that card stopper 14 and card feeding carriage mechanism 5 are hooked to each other via inclined portion 17. As shown in Figure 10, inclined portion 17 is formed on the bottom surface of card stopper 14 towards the back end while contact portion 19a is formed at a position of card feeding carriage mechanism 5 at the back end which corresponds to inclined portion 17. Alternatively, inclined portion 17 is formed at the back end of carriage 19 of card feeding carriage mechanism 5 while contact portion 14b is formed at a position of the card stopper which corresponds to inclined portion 17 as shown in Figure 11.

[0061] In the case of the configuration shown in Figure 10, contact portion 19a contacts inclined portion 17 when card feeding carriage mechanism 5 moves toward the back end. Accordingly, card stopper 14 rotates clockwise against the force applied by member 16. Then, card stopping portion 14a moves backward from gate opening 10 to the open position. Therefore, card stopping portion 14a is always at the open position away from gate opening 10 as long as card feeding carriage mechanism 5 is backed such that feeding of card 3 can be performed.

[0062] The initial position of carriage 19 in this embodiment is on the right in Figure 10. Card stopper 14 is at the obstructed position when carriage 19 is at this position. Also, reloading of cards is performed at this position. When card stopper 14 is at the open position, card 3 at the bottom of the stack may jump out from gate opening 10 such that normal feeding operation may not be performed (card jam), which should be mentioned in a manual. However, this embodiment, in which cards are reloaded while gate opening 10 is closed, does not require such warning.

[0063] Card stopper moving mechanism 15 moves card stopping portion 14a to the open position at least when card feeding carriage mechanism 5 is at the position to start feeding of a card as shown in Figure 9. Also, card stopping portion 14a can be positioned to close the gate opening while card 3 is carried. Once contact portion 19a is parted from inclined portion 17 with beginning of feeding of card 3, card stopper 14 tends to return to the obstructed position. However, as long as even a part of card 3 projects through gate opening 10, card 3 can be carried while contacting card stopping portion 14a.

[0064] The above describes a configuration in which the position of card stopper 14, which is able to rotate, is varied depending on the position of card feeding carriage mechanism 5. However, the configuration of card stopper moving mechanism 15 is not limited to the above. For example, another configuration can have an opening and closing member which is movable between a position to open gate opening 10 and a position to obstruct feeding of card 3 by closing gate opening 10 such that gate opening 10 can be opened or closed as necessary by moving the opening and closing member with a solenoid. In other words, card stopper moving mechanism 15 as described above is one example, and as long as the configuration is such that gate opening 10 is opened only when the front end of card 3 passes therethrough.

[0065] In the above embodiment, card 3, which is fed by card feeding hook 6 one at a time, is held by a card holding member of card holding mechanism 20. The following describes a configuration of card holding mechanism 20 which is configured together with card feed 1 to hold card 3. The two mechanisms may be addressed as a mechanism for feeding and holding a card in this specification.

[0066] Card holding mechanism 20 is placed behind card feeding carriage mechanism 5 in card feeding direction X. It is movable in the horizontal direction while

holding card 3, which comes out from hopper 2, for embossing treatments. Therefore, card holding mechanism 20 can move back and forth in card feeding direction X and in the direction perpendicular to card feeding direction X (it may be indicated as direction Y in this specification) at a position apart from hopper 2.

[0067] To obtain the above function of card holding mechanism 20, this embodiment has two guide shafts 26 and 27, perpendicular to card feeding direction X as shown in Figure 12, and guide shaft 39 perpendicular to guide shafts 26 and 27 as shown in Figure 16. Although it is not clearly indicated in the figure, guide shaft 39 is preferably a D-cut shaft, for example, and precision in the angle thereof should be improved by assembling D-type bush 28 thereto such that bush 28 can rock. Bush 28 is driven by a drive means not shown in the figure to form an X-Y drive mechanism. Card feeding carriage mechanism 5 and card holding mechanism 20 perform feeding of cards together. It is not shown in detail in this embodiment, however, card feeding carriage mechanism 5 of card feed 1 can be configured such that it is movable back and forth in card feeding direction X and direction Y perpendicular to card feeding direction X.

[0068] Card holding mechanism 20 has a card holding member such that it can move in the horizontal direction while firmly clamping card 3 in the vertical direction. The card holding member in this embodiment is configured of card holding stage 23 and card pressing member 24 as shown in Figure 16. Card holding stage 23 is a member to which card 3 is mounted, and supports the bottom surface of card 3 as shown in Figure 16. Card holding stage 23 is movable in card feeding direction X along guide shafts 26 and 27. Card pressing member 24 is placed above card holding stage 23 across from it. It holds card 3 with pressure while moving in the vertical direction.

[0069] As shown in Figure 4, card holding mechanism 20 having such a card holding member loosely holds card 3, which is carried out from hopper 2, with card holding stage 9 and loose stop member 13 at a position adjacent to hopper 2 as indicated with a dotted line in Figure 15. Additionally, card holding mechanism 20 moves from the position adjacent to hopper 2 to a position apart from hopper 2 as indicated with a solid line in Figure 15, and holds card 3 with pressure using card holding stage 23 and card pressing member 24. In this embodiment, loose stop member 13, which is pressed against the top surface of card holding stage 9, loosely holds card 3. However, the configuration to loosely hold card 3 is not limited to the above. For example, a plate can be placed such that it projects from card holding stage 9 or loose stop member 13 to lightly press card 3.

[0070] Card holding mechanism 20 as configured above can perform loose holding (loose clamping) and firm holding (firm clamping) of card 3. Herein, the loose holding means a condition where card 3 is held with light pressure by means of a loose holding means. Therefore, card 3 can be carried while the plate is pressed against the card. Also, the firm holding means a condition where card 3 is held between card holding stage 23 and card pressing member 24 with pressure. In this case, pressure is applied to card 3 using a toggle mechanism such that card 3 is not easily removed from the clamp.

[0071] The card holding member holds card 3 with pressure using a toggle mechanism. In this embodiment, as shown in Figures 14 and 16, the card holding member is configured of: lever 29 which is placed underneath card holding stage 23 and which can rotate; second lever 30 which lies on the top of lever 29 and can rotate; and clamp lever 31 which rocks along with the motion of second lever 30, as shown in Figure 16. One end of clamp lever 31 is connected to card pressing member 24 as shown in Figure 16, and rocks along with the motion of second lever 30 to move card pressing member 24 in the vertical direction.

[0072] Lever 29 is mounted to the bottom of card holding stage 23 such that it can rotate as shown in Figures 13 and 16. Also, lever 29 has cam follower 32 on its bottom surface. Cam follower 32 is hooked to cam surface 25 as shown in Figure 14 and follows the shape of the cam to rotate lever 29.

[0073] Cam surface 25 is formed of a groove facing the back of card holding mechanism 20 as shown in the figure. The groove is configured of two parallel line portions and slanted section 25a which connects the two line portions wherein cam follower 32 is moved in the Y direction in the middle of the horizontal motion of the card. The two line portions are parallel to card feeding direction X. Therefore, cam follower 32, which is guided along cam surface 25, moves sideways (Y direction) perpendicular to card feeding direction X at slanted section 25a to rotate lever 29.

[0074] Spring member 21 applies pressure to card holding mechanism 20 to the left such that card holding mechanism 20 and card feeding carriage mechanism 5 pull each other as shown in Figure 15. The pressure is constantly applied to card holding mechanism 20 by spring member 21 in the direction opposite from card feeding direction X. Therefore, after card holding mechanism 20 performs a given motion while holding card 3, it returns to the position adjacent to hopper 2 as indicated with a dotted line in Figure 15.

[0075] Moreover, card feeding carriage mechanism 5 and card holding mechanism 20 move together while being connected by connecting member 22. In card feed 1 of this embodiment, a hook-shaped projection is formed on card holding mechanism 20 as connecting member 22 to connect card feeding carriage mechanism 5 and card holding mechanism 20 by engaging connecting member 22 to pin 33 formed on the bottom surface of card feeding carriage mechanism 5.

[0076] As described above, connecting member 22 is integrally formed on rotating lever 29. Therefore, the timing of card feeding carriage mechanism 5 and card holding mechanism 20 to be hooked to each other and the

timing of card holding mechanism 20 to start operation with the toggle mechanism are varied according to the timing of the rotation of lever 29. In this embodiment, the position of connecting member 22 is moved by cam surface 25 such that card feeding carriage mechanism 5 and card holding mechanism 20 are connected by connecting member 22 until the two mechanisms pass a change position of cam surface 25.

[0077] According to this embodiment, the change position of cam surface 25 is established to be a position which is about 2/3 of slanted section 25a of cam surface 25. When card holding mechanism 20 moves back to the position adjacent to hopper 2 after moving card 3 in the horizontal direction, card holding mechanism 20 and card feeding carriage mechanism 5 are hooked to each other via connecting member 22 for 2/3 of the way of slanted section 25a. Then, as soon as it passes the change position as shown in Figure 13, connecting member 22 is disengaged from pin 33 of card feeding carriage mechanism 5 such that card feeding carriage mechanism 5 is disengaged from card holding mechanism 20.

[0078] In the above card feed and card holding mechanism, card holding mechanism 20 receives pressure from spring member 21 while card holding mechanism 20 returns from the apart position shown in Figure 12 or as indicated with a solid line in Figure 15 to the adjacent position shown in Figures 14 and 15. Additionally, card holding mechanism 20 is continually pulled by card feeding carriage mechanism 5 while being connected to card feeding carriage mechanism 5 via connecting member 22. In other words, card feeding hook 6 of card feeding carriage mechanism 5 is driven by a motor (not shown) via timing belt 35 such that card holding mechanism 20, connected thereto, is also moved to the adjacent position together.

[0079] When connecting member 22 passes the change position such that connecting member 22 is disengaged from pin 33, card holding mechanism 20 is disconnected from card feeding carriage mechanism 5. In this case, card holding mechanism 20 has inertia in addition to a fact that force is continually applied thereto by spring member 21. Therefore, card holding mechanism 20 returns to the adjacent position after passing slanted section 25a while overcoming the load generated between cam follower 32 and cam surface 25, that is a counter force to keep the toggle mechanism clamped.

[0080] In this card feed and card holding mechanism, in other words, card holding mechanism 20 is moved within a required range together with card feeding carriage mechanism 5 by using a drive used for card feeding carriage mechanism 5. Therefore, card holding mechanism 20 can be returned to a given position in spite of the friction load caused when cam follower 32 contacts cam surface 25.

[0081] Connecting member 22 is disengaged from pin 33 at the change position along slanted section 25a. Also, connecting member 22 is completely retrieved from pin 33 as connecting member 22 is further rotated when lever 29 is guided for the rest of slanted section 25a. Hence, connecting member 22 can be hooked to pin 33 without interfering the path of pin 33 as shown in Figure 14 even when card feeding carriage mechanism 5 and card holding mechanism 20 are moved to the apart position once again.

[0082] Lever 29 rocks connecting member 22 in a synchronized motion while holding or releasing card 3 by means of card holding mechanism 20 with the toggle mechanism. In this embodiment, card pressing member, which clamps card 3 on its top surface, corresponds to the position of lever 29 in cam surface 25 such that the position thereof is controlled by cam surface 25. For example, when card 3 is carried from card feeding carriage mechanism 5 to card holding mechanism 20, card pressing member 24 is designed to clamp the back end of card 3 as card 3 almost passes the loose holding means as described above. In addition, card feeding carriage mechanism 5 and card holding mechanism 20 are connected by connecting member 22 at a position where the card is held with pressure.

[0083] The above described a configuration to ensure movement of card holding mechanism 20. Further, card feed 1 has a configuration to ensure hopping of pre-embossed cards one by one. The following describes the configuration. Herein, hopping means operation of feeding cards 3 ... 3 layered in hopper 2 one by one. In card feed 1, gate portion 4 is formed at both ends of card feeding direction X. This configuration enables cards to be fed from the hopper, regardless of whether or not the cards are pre-embossed.

[0084] Two card support members 36, 36, which support the bottom surface of card 3 as shown in Figure 18, are placed at the openings of hopper 2 on both sides thereof in relation to card feeding direction X. Card support members 36, 36 are to support the bottom surface of card 3 at the both ends of card 3 avoiding the pre-embossed area thereon, as shown in Figure 19, and function as a lower gate opening.

[0085] Upper gate openings 10a, 10a are formed at the position across from card support members 36, 36 as shown in Figures 17 and 18. In this embodiment, projections at both ends of the front portion of the hopper project downward as shown in the figures and is used as a member controlling the top surface of card 3. However, separate members can be adapted as upper gate openings 10a, 10a.

[0086] In this card feed 1, card 3, which is fed by card feeding hook 6, is held by card holding stage 9 and a card holding member (not shown) of card holding mechanism 20. The position of card holding stage 9 is arranged to be higher than the plane of card support members 36, 36 on which card 3 is held. Hence, even when card 3 is pre-embossed, upper gate opening 10a, card support member 36, card holding stage 9, card feeding hook 6 and a portion to hold the card bottom, as a part

of card feeding hook 6, apply a downward to card 3 such that the bottom end of card 3 can be pressed against the portion to hold the card bottom.

[0087] Even though gate portion 4 is formed of gate openings 10, 10, a downward load can be applied to card 3 via upper gate openings 10a, 10a as the front end 3a of the card contacts card holding stage 9 as shown in Figure 6.

[0088] Card feed 1 has card catchers 37, 37 to prevent card 3 from falling through the bottom portion 2b of hopper 2, which supports card 3 from the bottom. In this embodiment, as shown in Figure 19, blocks are placed at the bottom of hopper 2 as card catchers 37, 37 to support the both ends of card 3. It is possible to integrate card catcher 37 and card support member 36 to lower the cost and to simplify the assembly. Also, card catcher 37 can be formed by bending a part of the sidewall of the hopper.

[0089] Card catcher 37 also functions to prevent a card from falling while additional cards are loaded in hopper 2. Further, it is positioned to be lower than the position to support a card such that a deformed card (a warped card) can smoothly enter gate portion 4 as shown in Figure 18.

[0090] Member to loosely support a card 38 is to prevent card 3 in hopper 2 from falling when card feeding carriage mechanism 5 moves forward outside hopper 2. In this embodiment, as shown in Figure 19, the member to loosely support a card 38 is placed at bottom portion 2b of hopper 2 towards its base side and at the center of the long side of the card.

[0091] Card load points 13a and 13b between the pre-embossed area and loose stop member 13 superimpose each other. However, since loose stop member 13 has sufficient plasticity, no problem is caused in the motion of loose stop member 13 when contacting the embossed area or no damage is caused to the embossed area. After completing feeding of card 3, card 3 is supported at the area other than the embossed area. Therefore, there is no change in operation from operation dealing with non-embossed cards.

[0092] As described above, card feed 1 of this embodiment has two lower gate portions 4 of hopper 2 at both ends in the length of card 3 to prevent the embossed area to be restrained. Therefore, pre-embossed cards can be smoothly handled therewith. Moreover, gate portions 4 are formed of a part of the side walls of hopper 2. Therefore, strength of gate portions 4 is improved, and precise measurements of gate portions 4 can be easily obtained.

[0093] Additionally, card catchers 37, 37 are placed at the same positions to prevent card 3 from falling through bottom portion 2b of hopper 2. For example, when card 3 is largely tilted in the direction of the card length, card catchers 37, 37 of card feed 1 can successfully prevent a fall of the card.

[0094] Card feed 1 as described above has two of card feeding hooks 2. Therefore, card 3 can be fed individually while maintaining the balance of card 3 along the side wall of hopper 2 by supporting the bottom surface of the card at both ends with card support members 36, 36. Also, as shown in Figure 8, feeding of a warped card can be successfully performed.

[0095] If the front end of card 3 contacts card holding stage 9 and gate openings 10, 10 at both sides of card feed 1, a downward load can be applied to card 3 as shown in Figure 6. Therefore, the back end of card 3 can be firmly hooked to engaging portion 8 of card feeding hook 6.

[0096] The above is one of preferable embodiments of the present invention. However, one is not limited to the above, and various modifications can be adapted within the scope of the present invention. For example, the above embodiment has one card stopper moving mechanism 15 at gate portion 4 as shown in Figure 9. In the case of two gate portions 4, two card stopper moving mechanisms 15 can be arranged at gate openings 10, 10 to enhance the function to stop the card.

[0097] In the above embodiment, card feeding carriage mechanism 5 and card holding mechanism 20 are connected by connecting member 22 which can rotate. However, any configuration can be adapted as long as card holding mechanism 20 can be connected to card feeding carriage mechanism 5 driven via timing belt 35 when needed. For example, connection can be controlled by moving a shaft of solenoid placed on one of the mechanisms. Also, by using an electromagnetic force, connection may be established as necessary by placing an electromagnet on one of the mechanisms.

[0098] As obvious from the above, the card feed of the present invention provides a moment by restricting the top surface of a card with the upper edge of the opening of the gate portion while the back end of the card is supported from the bottom. As a result, the card feeding hook with rotational moment can be firmly hooked to the back end of the card. Therefore, feeding of cards can be successfully performed without a downward load, even when the card is warped.

[0099] The card feeding carriage mechanism is once retrieved then moved forward during the feeding operation. Hence, even when the card feeding hook is disengaged from the back end of the card, the engagement can be regained by the above motion of the card feeding carriage mechanism, and feeding of the card can be successfully performed.

[0100] Also, the portion to hold the card bottom guides the back end of the card such that the card feeding hook can be firmly hooked thereto. In addition, the amount of the card feeding carriage mechanism to be moved backward is established to be within the distance between the front end of the portion to hold the card bottom and the engaging portion. Therefore, the card will not fall through the space therein by losing support from the card feeding hook.

[0101] As the feeding operation proceeds while the card holding stage supports the front end of the card

from the bottom, the card is gradually guided upward such that the top surface of the card comes in contact with the upper edge of the gate opening. As a result, the engaging portion of the card feeding hook is firmly hooked to the back end of the card by giving a moment to the card.

[0102] According to the method for feeding cards of the present invention, a moment is given to the card by restricting the top surface of the card by the upper edge of the opening of the gate portion while the front end of the card is supported from the bottom. Consequently, the card feeding hook with a rotational moment can be firmly hooked to the back end of the card. Therefore, feeding of cards can be successfully performed without a downward load, even when the card is warped. Further, the card feeding carriage mechanism is once retrieved then moved forward during the feeding operation. Hence, even when the card feeding hook is disengaged from the back end of the card, the engagement can be regained by the above motion of the card feeding carriage mechanism, and feeding of the card can be successfully performed.

[0103] The card feed of the present invention can restrict the movement of the card by closing the gate opening until the card feeding operation starts. This configuration prevents cards from accidentally jumping out therefrom unless the card feeding operation is performed, for example, when the card is twisted. Therefore, the card feeding hook can be firmly hooked to the back end of the card. Also, application of force from the outside or counter force can be prevented by opening the card stopper when the card feeding hook is hooked to the card. On the other hand, the card stopper is closed when additional cards are loaded in the hopper, particular caution is not necessary.

[0104] In the card feed of the present invention, the back end of the card is guided by the portion to hold the card bottom to the engaging portion such that the card feeding hook can e firmly hooked to the card. Also, the card stopper is open only when the card passes through the gate opening. Therefore, the card does not accidentally jump out from the gate opening.

[0105] The engaging portion of the card stopper prevents the card from jumping out from the gate opening by blocking thereat except when the card is coming therethrough. Therefore, the card feeding hook can be firmly hooked to the back end of the card always at the same position. Additionally, the engagement is ensured by operating the card stopper together with the card feeding carriage mechanism.

[0106] According to the present invention, the inclined portion rotates the card stopper in the direction such that the gate opening is open. Therefore, if the rotational force is not applied to the card stopper, the gate opening is closed while the gate opening is open when the rotational force is applied to the card stopper. Further, the rotational force is generated by the inclined portion which is formed on either the card stopper or the card feeding carriage mechanism. Hence, the card stopper can open or block the gate opening at the constant positions.

[0107] According to the mechanism for feeding and holding a card of the present invention, a mechanism to connect or disconnect the card feeding carriage mechanism and the card holding mechanism is newly provided. Therefore, the card holding mechanism can be connected to the card feeding carriage mechanism in the area where the card is held with pressure. As a result, the card holding mechanism is moved together with the card feeding carriage mechanism, which is mechanically driven. Even when a force is applied to the card holding member from outside to interfere disengagement of the toggle mechanism while the card is carried, the card holding mechanism can be moved to a given position without stopping against the force. Also, a spring force is not necessary for disengaging the toggle mechanism. A spring only needs to be strong enough to retrieve the card holding member to the position adjacent to the hopper after the card holding member is disconnected from the card feeding carriage mechanism. Therefore, the size of a motor, which moves the card holding mechanism against the spring force, can be decreased such that clamping of the card can be improved and that durability of the D-type bush or the toggle mechanism can be increased.

[0108] Along with the forward and backward motion of the card holding mechanism, the card can be loosely held or held with pressure. Additionally, when the card is at a position to be held with pressure, the card holding mechanism is connected to the card feeding carriage mechanism. As a result, the card holding mechanism can be sufficiently moved with the card feeding carriage mechanism such that the toggle mechanism can effectively switch the mode between holding the card with pressure and loosely holding the card.

[0109] The card feeding carriage mechanism and the card holding mechanism are connected via the connecting member until passing the change position of the cam surface. Hence, the card holding mechanism can move back and force without stopping while the toggle mechanism can switch the mode between holding the card with pressure and loosely holding the card. Further, the connecting member is restrained in its motion according to the shape of the cam surface such that the operation to connect and disconnect the card holding mechanism and the card feeding carriage mechanism can be smoothly performed.

[0110] The card can be moved in the card feeding direction or the direction perpendicular thereto while being held by the card holding mechanism with pressure for performing embossing to a desired section of the card.

[0111] The position of the connecting member is varied by using the toggle mechanism, and the connection between the card feeding carriage mechanism and the card holding mechanism is disengaged while being guided by the slanted section of the cam surface. There-

fore, the connecting member can be completely retrieved from the connecting position when the toggle mechanism is in operation. As a result, the card feeding carriage mechanism and the card holding mechanism can be disconnected without interfering each other.

[0112] According to the card feed of the present invention, the card coming through the gate portion can be supported by the card support members on both ends of the gate such that the positioning of the card can be precisely performed. Also, a load caused by contacting the card support members does not result in a rocking motion of the card. Hence, the hopping operation can be sufficiently performed by controlling the position of the card in the hopper.

[0113] Moreover, the card support members are positioned on the both sides of the gate such that the card support members can be formed using the side walls of the hopper. A relatively simple shape can provide rigidity and strength of the card support members. Also, accurate size can be obtained for the gate.

[0114] Since a pre-embossed card can be supported from both sides, pre-embossed cards layered in the hopper can be effectively fed out from the hopper one by one. Further, the card can be carried while positioning by sandwiching the card between the upper gate opening and the card support member. In addition, the upper gate openings are formed on both sides of the gate such that positioning of the card can be precisely performed.

[0115] The card can be moved in the X direction and the Y direction, perpendicular to the X direction, while being held by the card holding mechanism. As a result, a desired treatment, such as embossing, can be provided to a given position on the card.

[0116] The card is fed by two of the card feeding hooks and held between the card holding stage of the card holding mechanism and card holding members. Therefore, feeding of the card is stable, and the card is continually passed to the card holding stage.

Claims

1. A card feed for feeding cards from a hopper, the card feed comprising a card feeding mechanism for feeding cards one by one from a gate portion at the bottom of the hopper, which card feeding mechanism is operable to engage the back end of each card, wherein the gate portion is adapted so that the back end of the card is pressed against the card feeding mechanism when a part of the card comes through the gate portion.

2. A card feed as claimed in claim 1, wherein the card feeding mechanism is adapted to move backward when the part of the card comes through the gate portion, before moving forward again to feed the card though the gate portion.

3. A card feed as claimed in claim 1 or claim 2, wherein the card feeding mechanism includes a card feeding hook for engaging the back end of the card.

4. A card feed as claimed in claim 3, wherein a plurality of hooks, preferably two, is provided.

5. A card feed as claimed in claim 4, wherein means are provided for moving, preferably rotating, the hooks, thereby to bring them into contact with the card.

6. A card feed as claimed in claim 3 or claim 4 or claim 5, wherein the or each card feeding hook has a portion to hold a bottom portion of the card bottom and an engaging portion for hooking to the back end of the card, behind the portion to hold the card bottom.

7. A card feed as claimed in claim 6, wherein the amount by which the card feeding mechanism is moved backward is established to be within a range from the edge of said portion to hold the card bottom to said engaging portions.

8. A card feed as claimed in any one of the preceding claims, in which the gate portion includes a card holding means for holding the card so that the back end of the card passing through the gate opening is pressed against said card feeding hook.

9. A method for feeding cards from a hopper, comprising feeding the cards one by one from a gate portion at the bottom of said hopper using a card feeding mechanism that is movable back and forth in the card feeding direction; and pressing the card against the card feeding mechanism when a part of said card comes through the gate portion.

10. A method as claimed in claim 9, further comprising moving the card feeding mechanism backward before moving it forwards again to feed the card through the gate portion.

11. A method as claimed in claim 9 or claim 10, wherein the step of pressing comprises holding the card so that the back end of the card is pressed against said card feeding mechanism.

12. A card feed for feeding cards from a hopper, the card feed comprising a card feeding mechanism for feeding cards one by one from a gate opening at the bottom of the hopper and a movable card stopper for selectively opening and closing the gate opening, wherein means are provided for activating the card stopper to open the gate opening dependant on a position of the card feeding mechanism.

13. A card feed for feeding cards from a hopper, the

card feed comprising a card feeding mechanism for feeding cards one by one from a gate opening at the bottom of the hopper and a movable card stopper for selectively opening and closing the gate opening, wherein means are provided for activating the card stopper to open the gate when at least an edge of the card reaches or passes through at least a portion of the gate opening.

14. A card feed as claimed in claim 12 or claim 13, wherein the card feeding mechanism and the card stopper are operably linked to each other via the means for activating the card stopper, wherein movement of the card feeding mechanism to a predetermined position automatically causes the card stopper to be moved to its open position.

15. A card feed as claimed in claim 14 in which the card stopper is rotatable into its open position.

16. A card feed as claimed in any one of claims 12 to 15, wherein the card feeding mechanism is adapted to move backward when the part of the card comes through the gate portion, before moving forward again to feed the card though the gate opening.

17. A card feed as claimed in any one of claims 12 to 16, wherein the card feeding mechanism includes a card feeding hook for engaging the back end of the card, preferably, wherein a plurality of hooks, preferably two, is provided.

18. A card feed as claimed in claim 18, wherein means are provided for moving, preferably rotating, the hooks, thereby to bring them into contact with the card.

19. A card feed as claimed in claim 17 or claim 18, wherein the or each card feeding hook has a portion to hold a bottom portion of the card bottom and an engaging portion for hooking to the back end of the card, behind the portion to hold the card bottom.

20. A card feed as claimed in claim 19 when dependent directly or indirectly on claim 16, wherein the amount by which the card feeding mechanism is moved backward is established to be within a range from the edge of said portion to hold the card bottom to said engaging portions.

21. A mechanism for feeding and holding a card comprising a card feeding mechanism for feeding cards one by one from the hopper, which card feeding mechanism is operable to engage the back end of each card, and card holding means, wherein means are provided for moving the card holding means into holding engagement with the card when the card feeding mechanism is moved in a card feeding direction.

22. A mechanism as claimed in claim 21, wherein the means for moving the card holding means into holding engagement with the card comprise a spring.

23. A mechanism as claimed in claim 21 or claim 22, in which the card holding means comprises a card holding mechanism having a card holding state and a card pressing member that loosely holds the card or firmly holds the card with pressure.

24. A mechanism as claimed in claim 23, wherein the card is loosely held between card holding stage and said card pressing member when said card holding mechanism is at a position adjacent to said hopper and with pressure when said card holding mechanism is at a position apart from said hopper.

25. A mechanism as claimed in claim 24, wherein the card feeding mechanism and said card holding mechanism are connected by an engaging member at the position where the card is held with pressure.

26. A mechanism as claimed in any one of claim 25, wherein the position of the card pressing member is determined by a cam surface, which surface acts in use to move the engaging member; and the card feeding mechanism and the card holding mechanism are connected member until passing a pre-determined position on the cam surface.

27. A mechanism as claimed in ant one of claims 23 to 26, wherein the card feeding mechanism and card holding mechanism are movable back and forth in the card feeding direction and in a direction perpendicular to the card feeding direction.

28. A mechanism as claimed in claim 26 in which the engaging member is operable to change its position by means of a toggle mechanism, wherein the card feeding mechanism and the card holding mechanism are disconnected while the connecting member is guided by a slanted section of said cam surface.

29. A card feed for feeding cards from a hopper, the card feed comprising a card feeding mechanism for feeding cards one by one from the bottom of the hopper and a card holding member mounted on a card holding mechanism, two card support members to support a bottom surface of the card are placed at an exit of the hopper in the card feeding direction and gate portions are formed at both ends of the hopper.

30. A card feed as claimed in claim 29, wherein the gate portions are formed such that upper gate openings,

for controlling the top surface of the card with two positions at the front side on both sides of said hopper, are placed across from said two card support members.

31. A card feed as claimed in claim 29 or claim 30, in which a card fed by said card sending hooks is held between a card holding stage and the card holding member, wherein the card feeding mechanism and said card holding mechanism are carried together by an X-Y drive mechanism.

32. A card feed as claimed in any one of claims 29 to 31, wherein the position of the card holding stage is higher than the position of the surface of said card support members at which the card is supported.

33. A card feed as claimed in any one of claims 29 to 32, in which the card feeding mechanism includes two of card feeding hooks.

Fig. 1

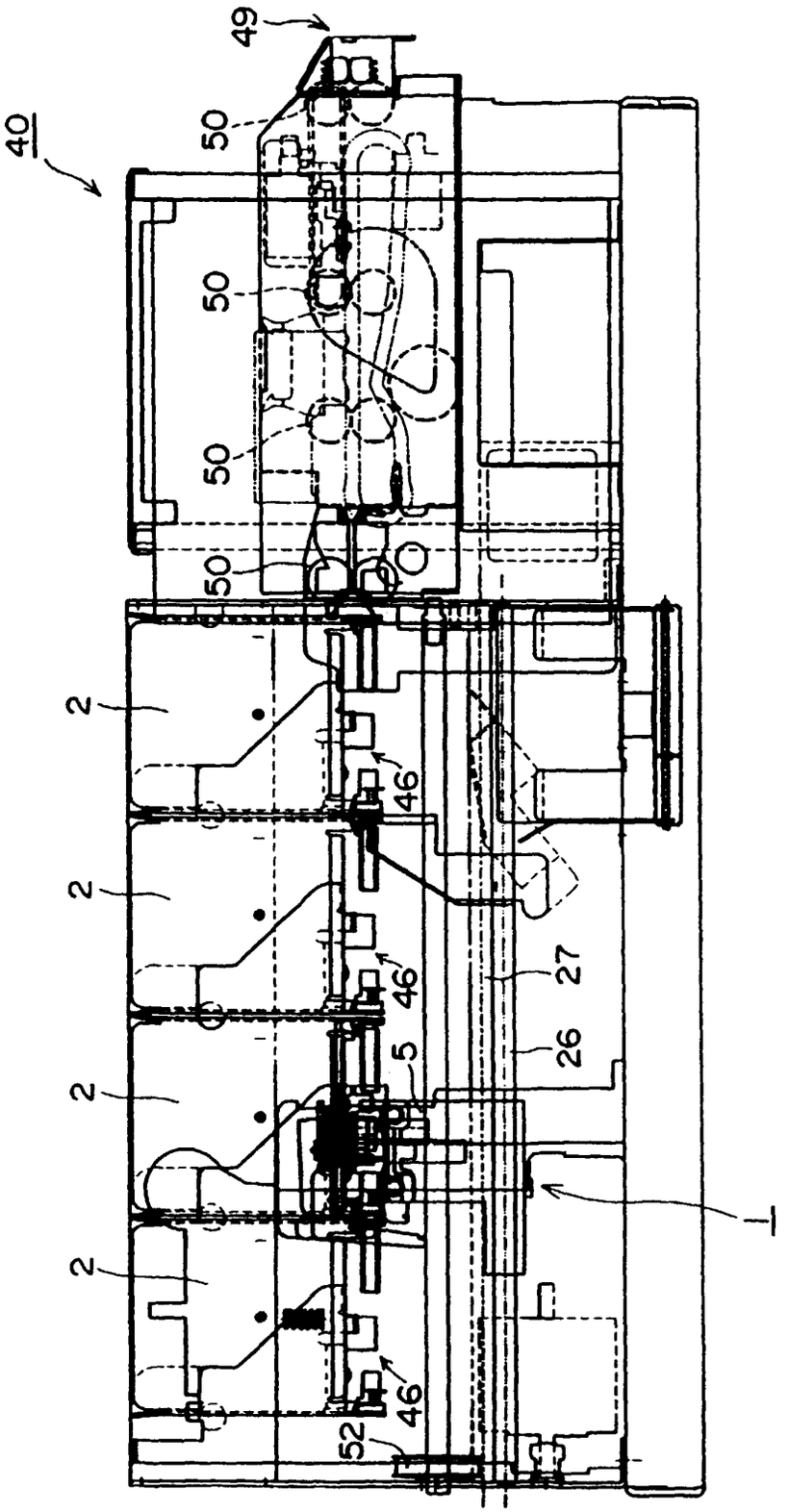


Fig. 2

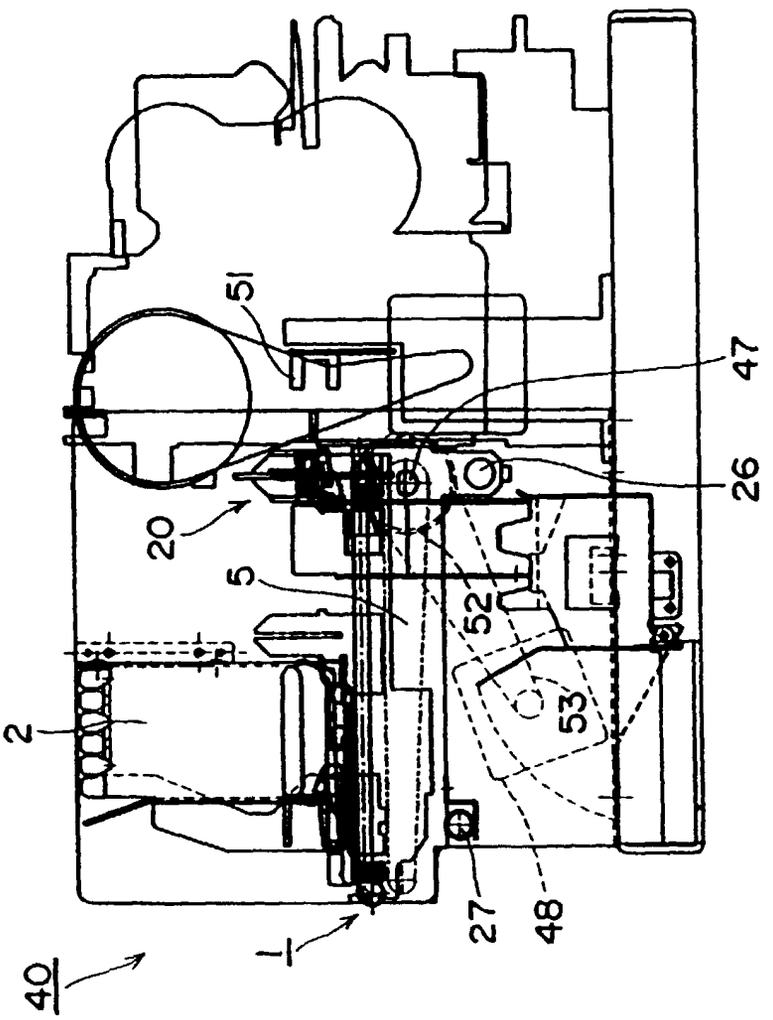
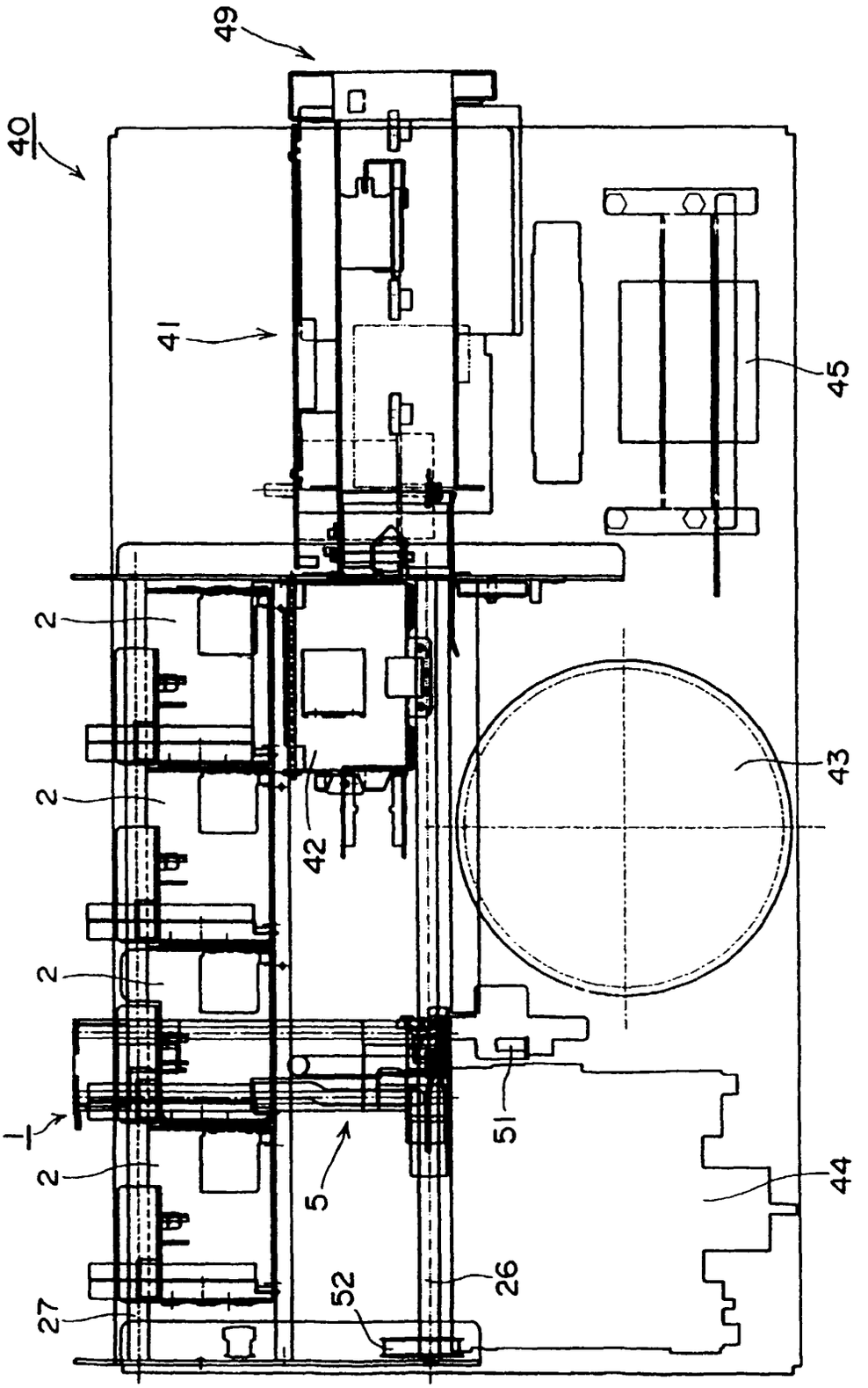


Fig. 3



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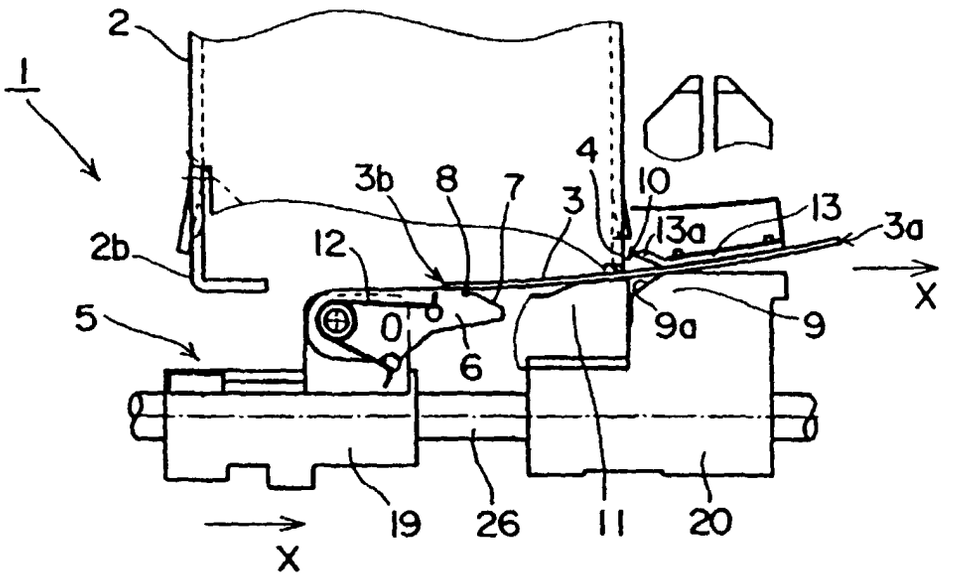
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Fig. 5

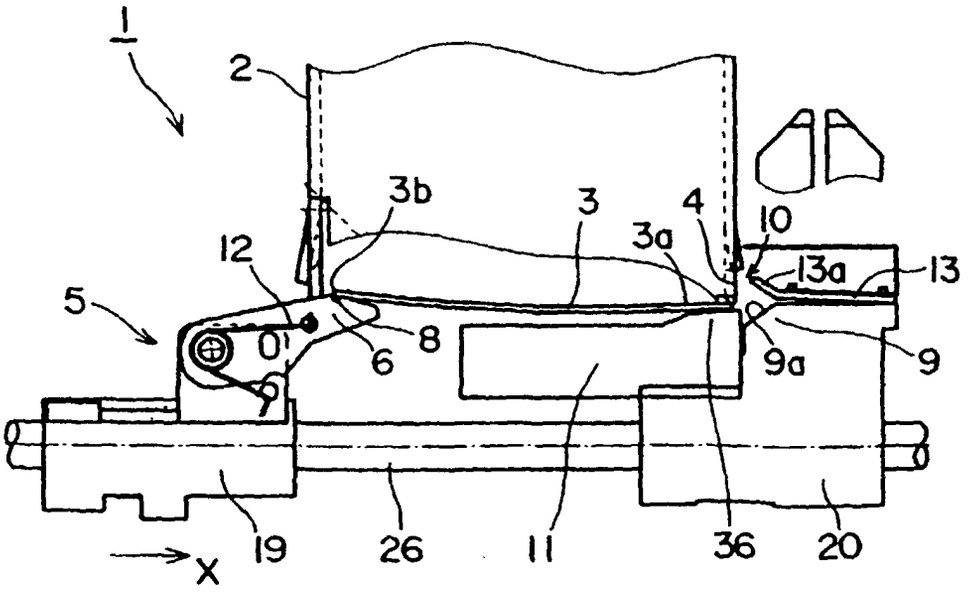
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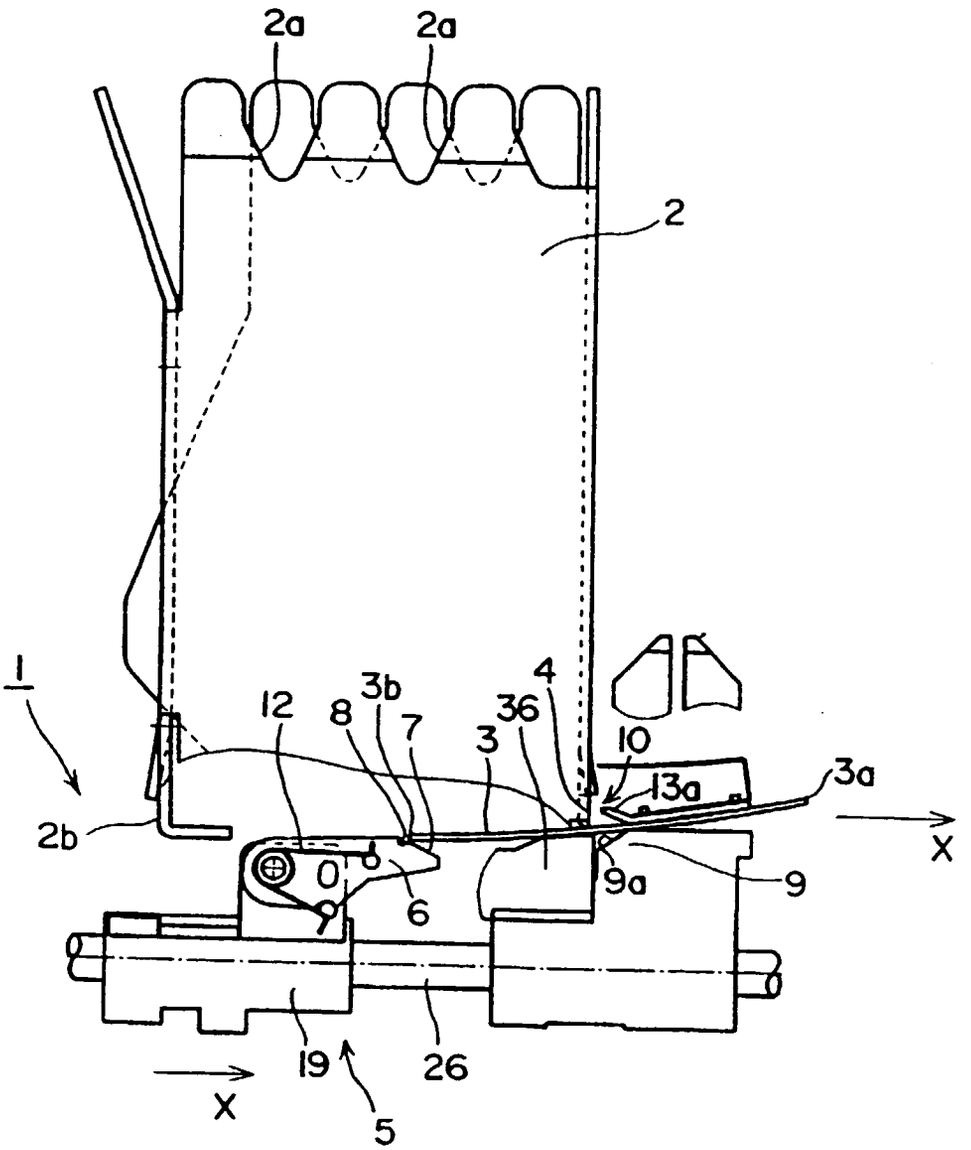
Fig. 6



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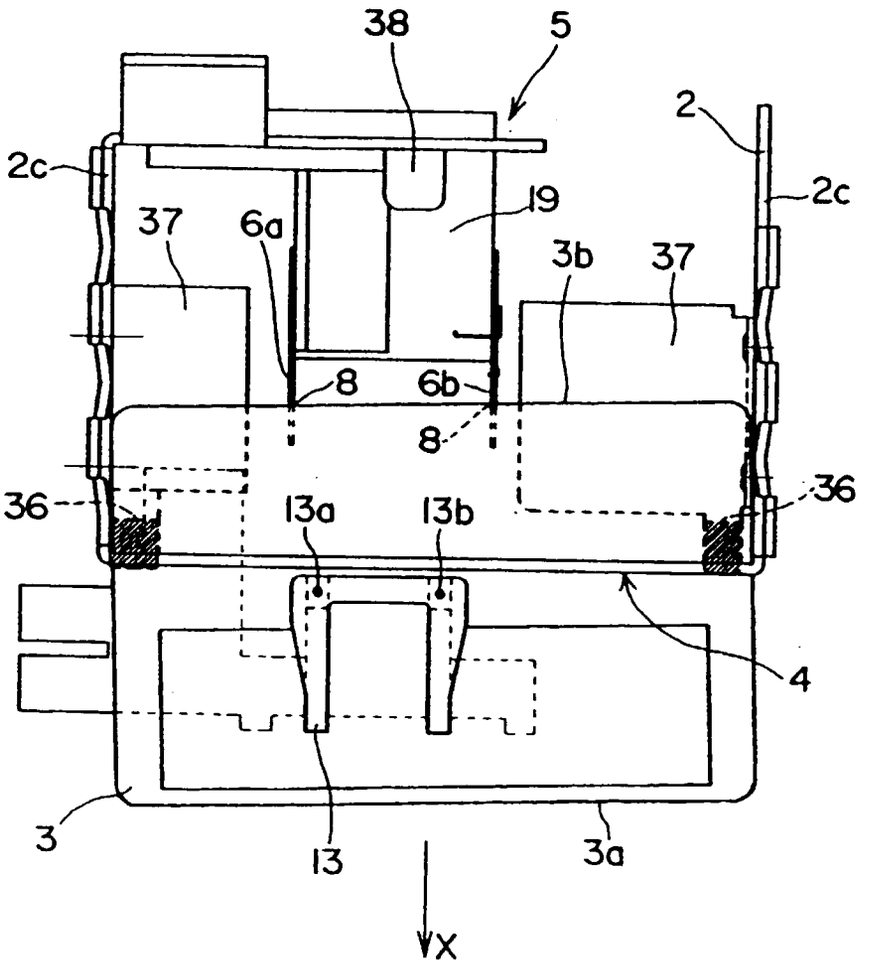

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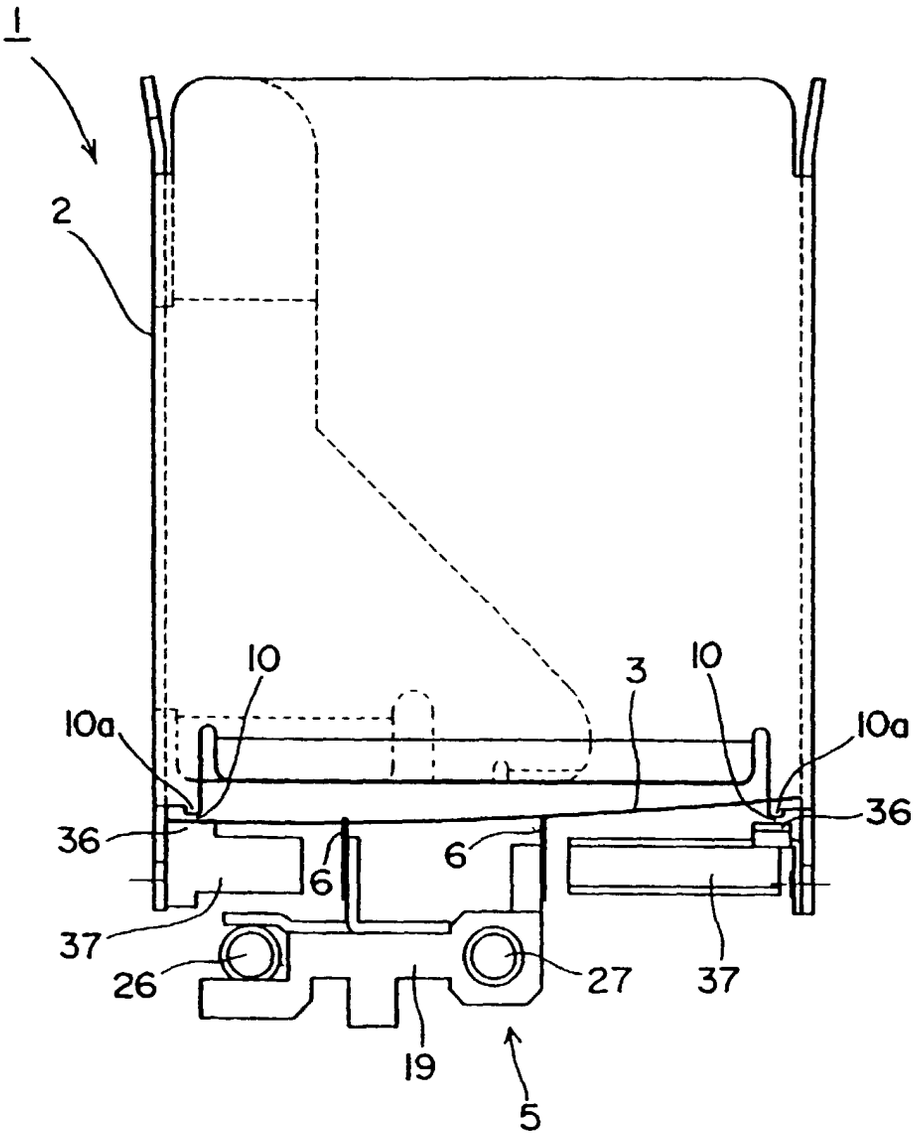

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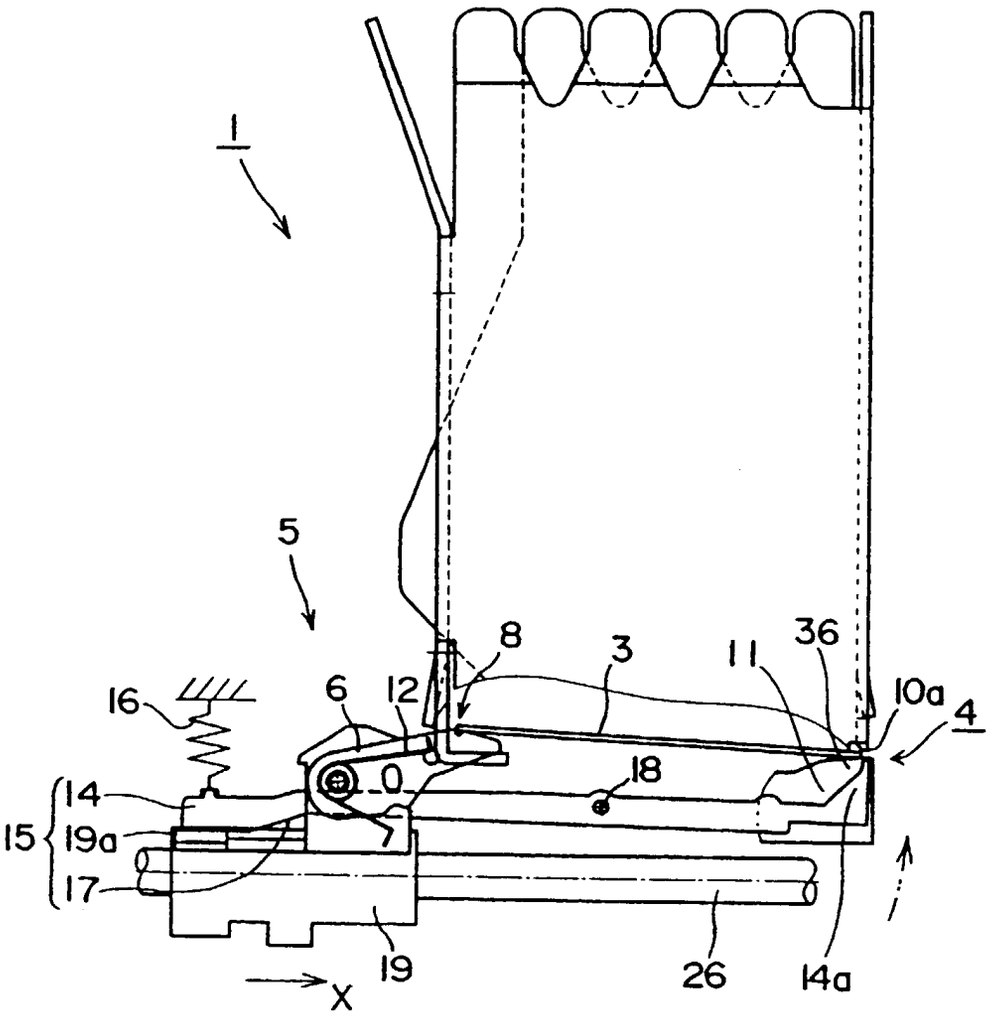

Fig. 10

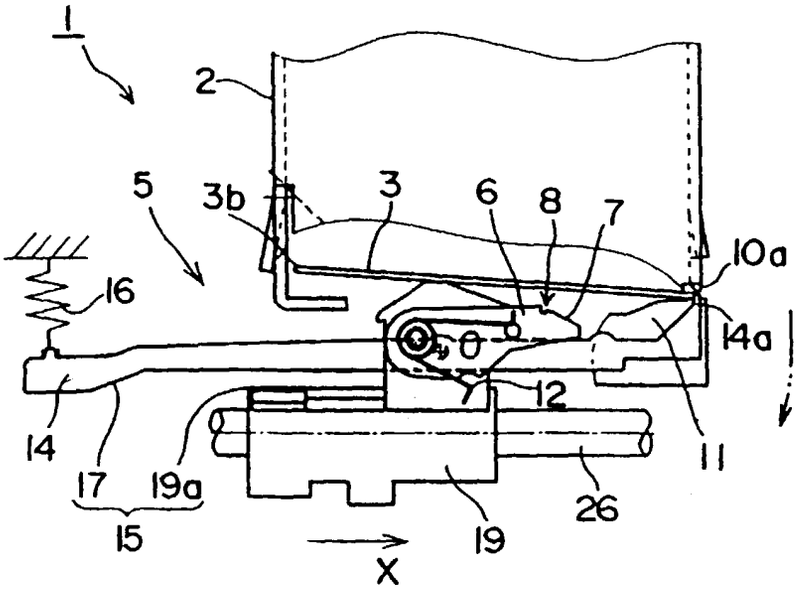
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Fig. 11

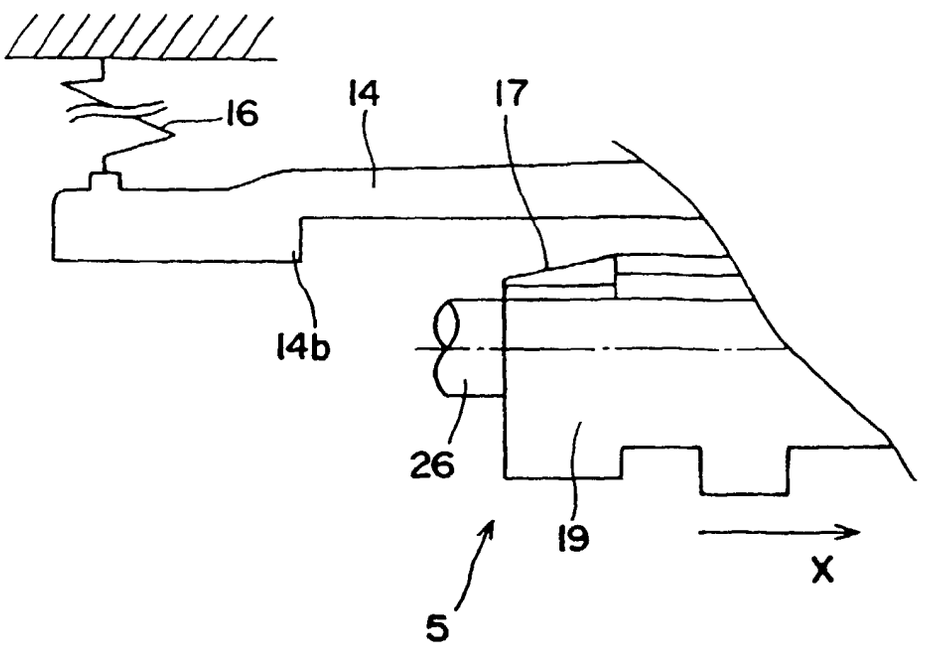
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Fig. 12

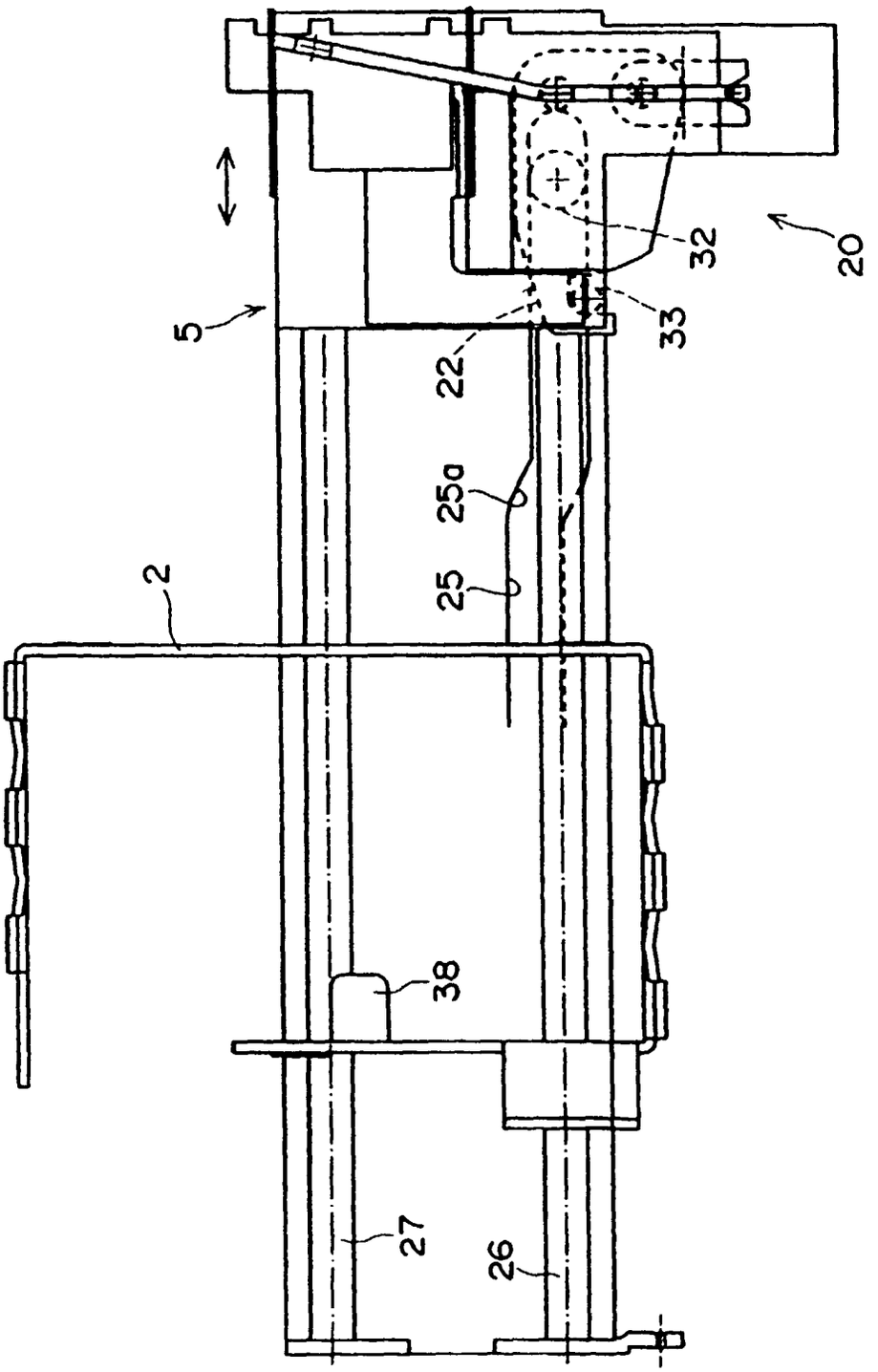
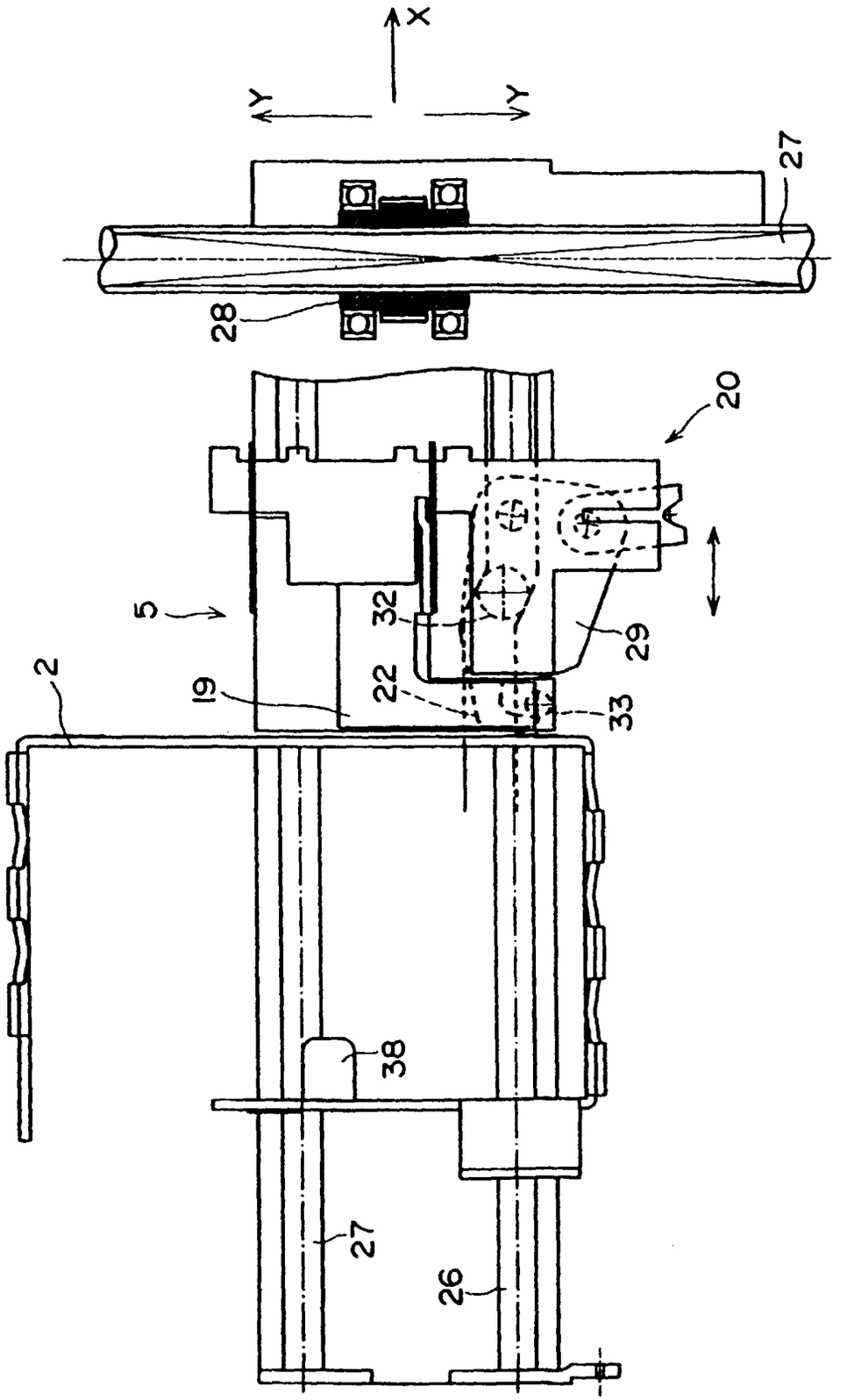


Fig. 13



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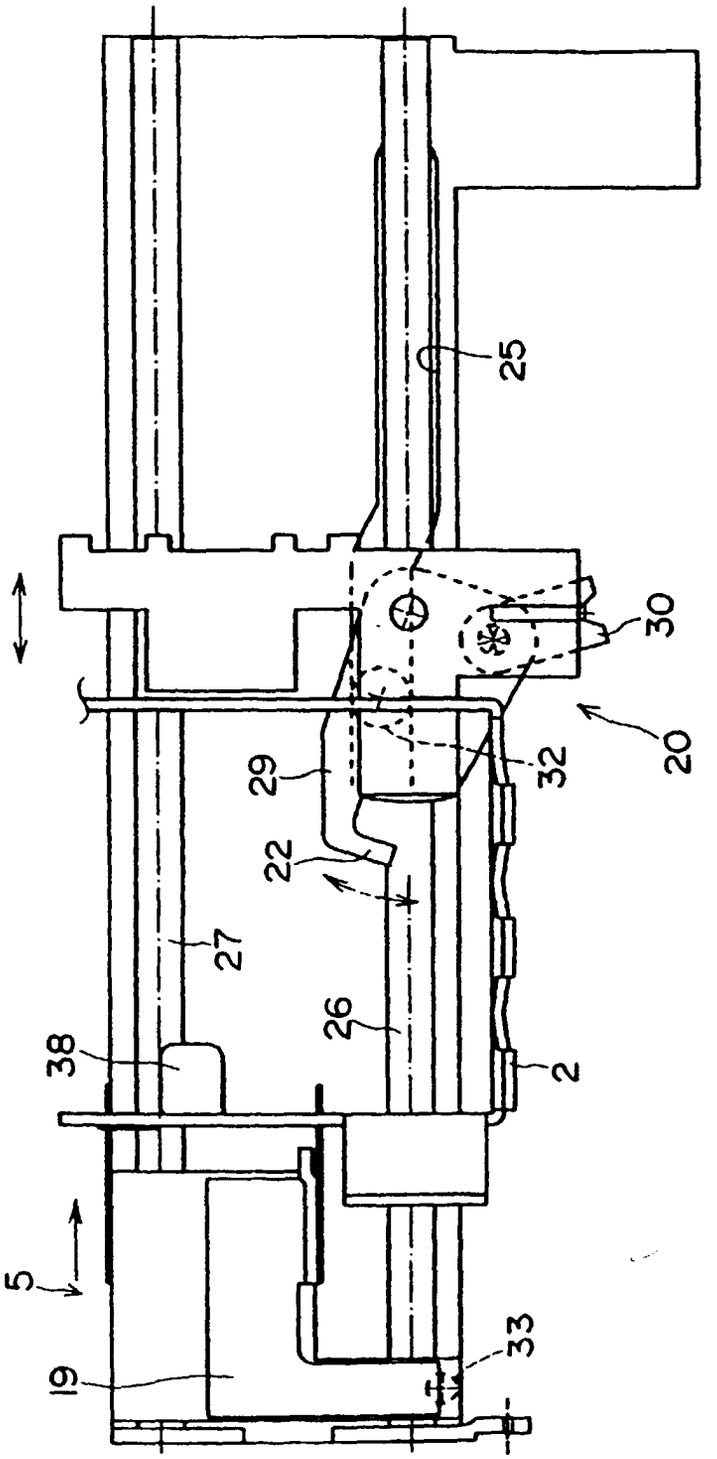

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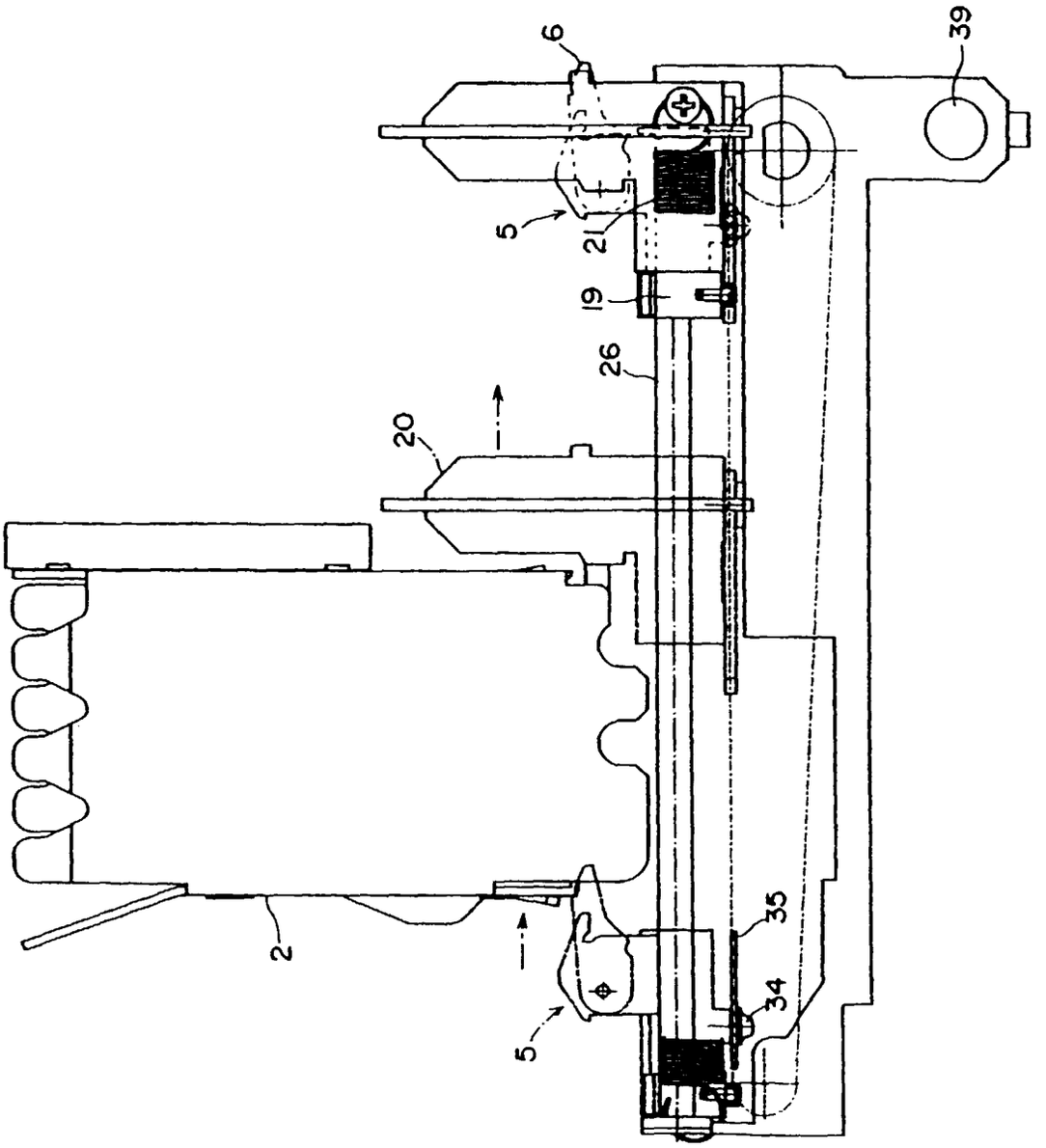

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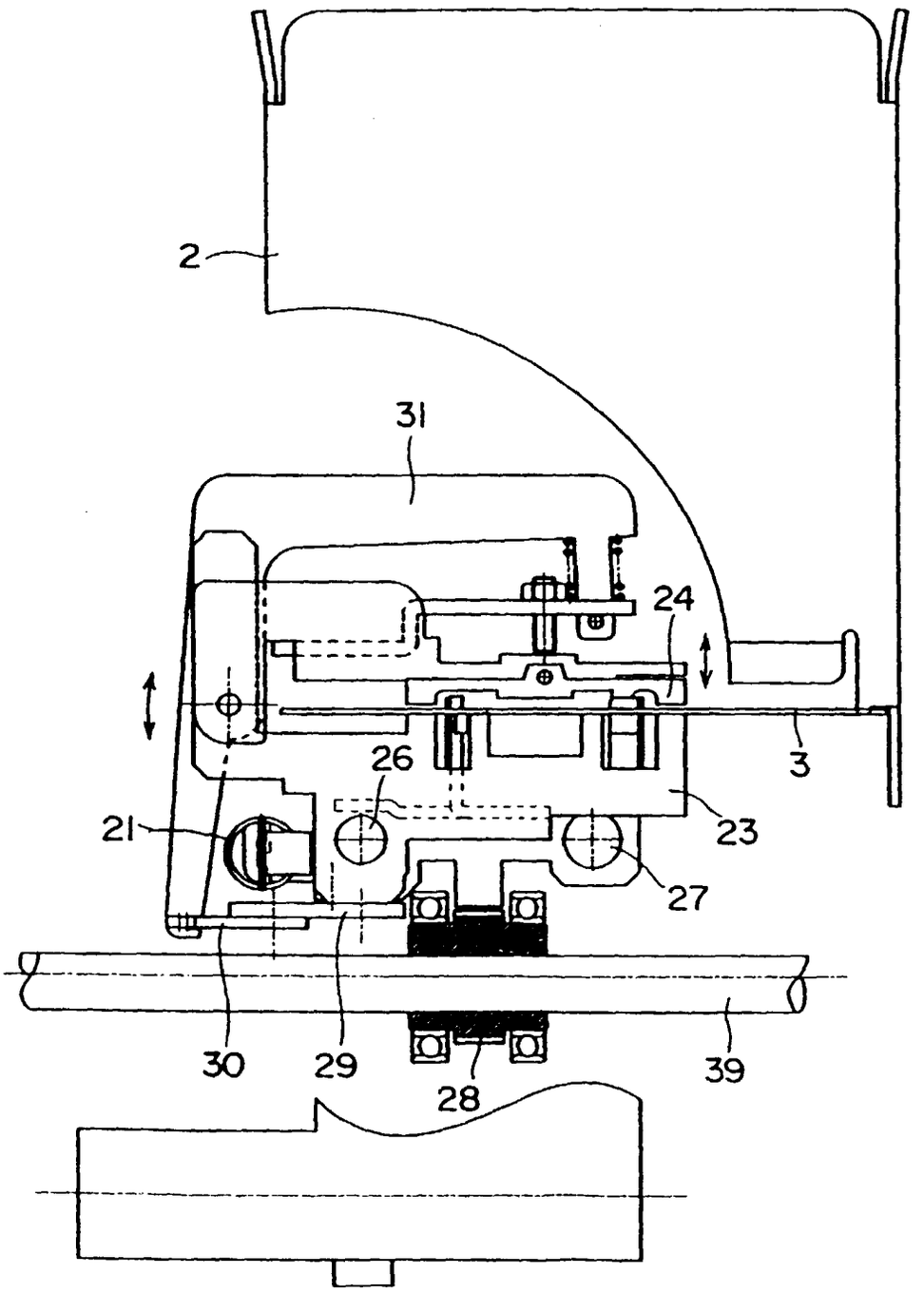

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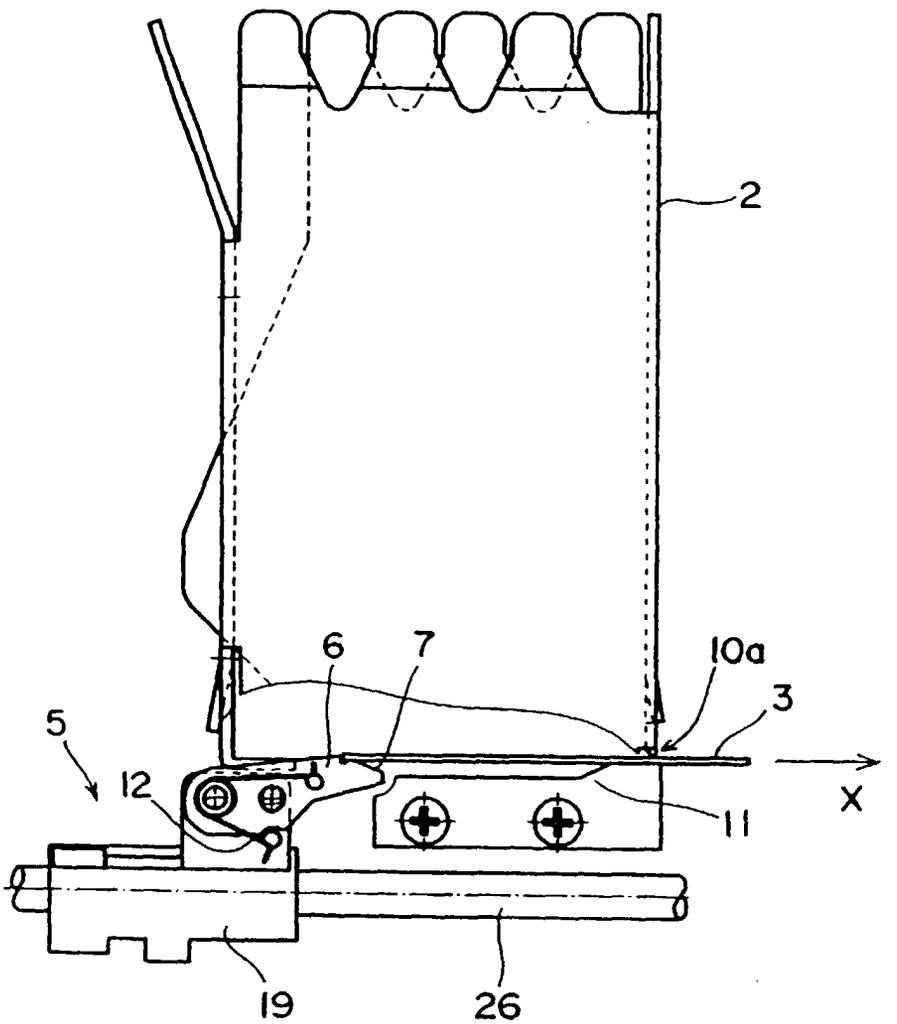

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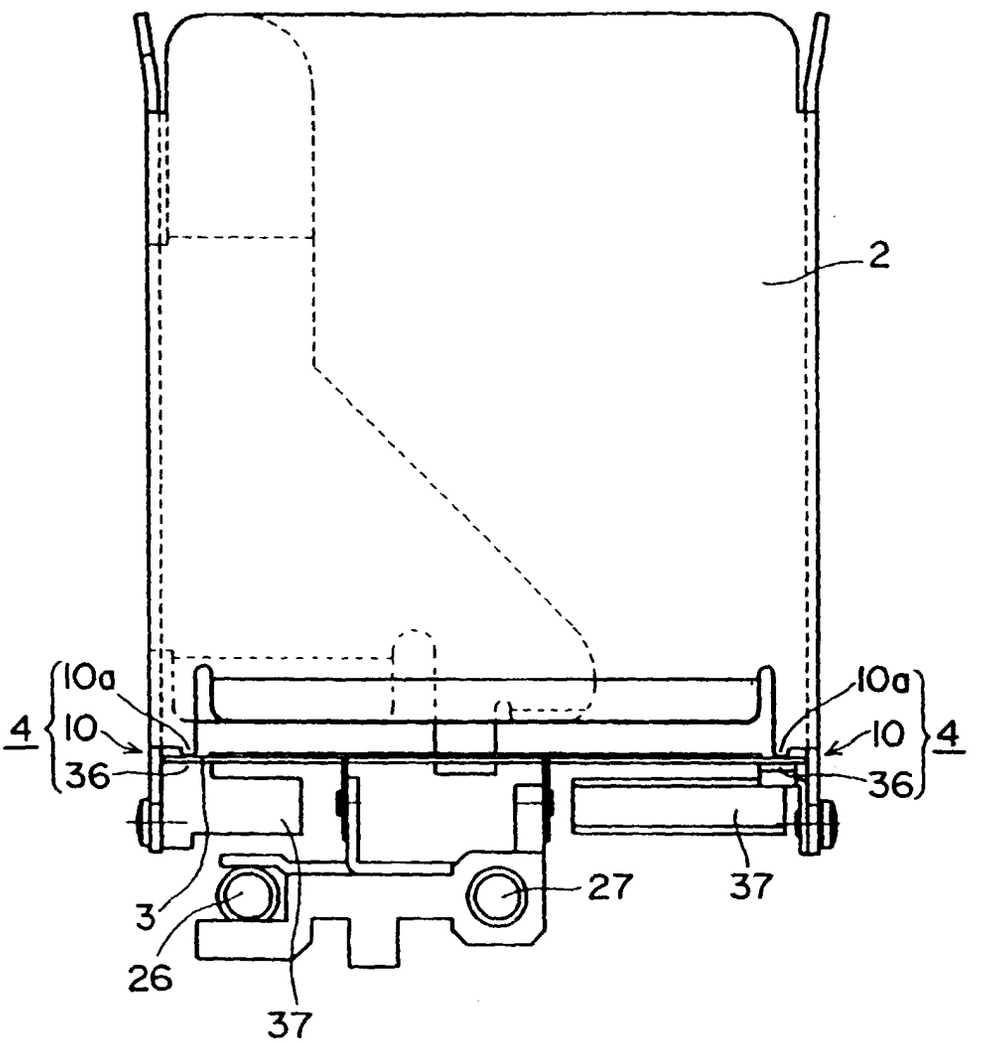

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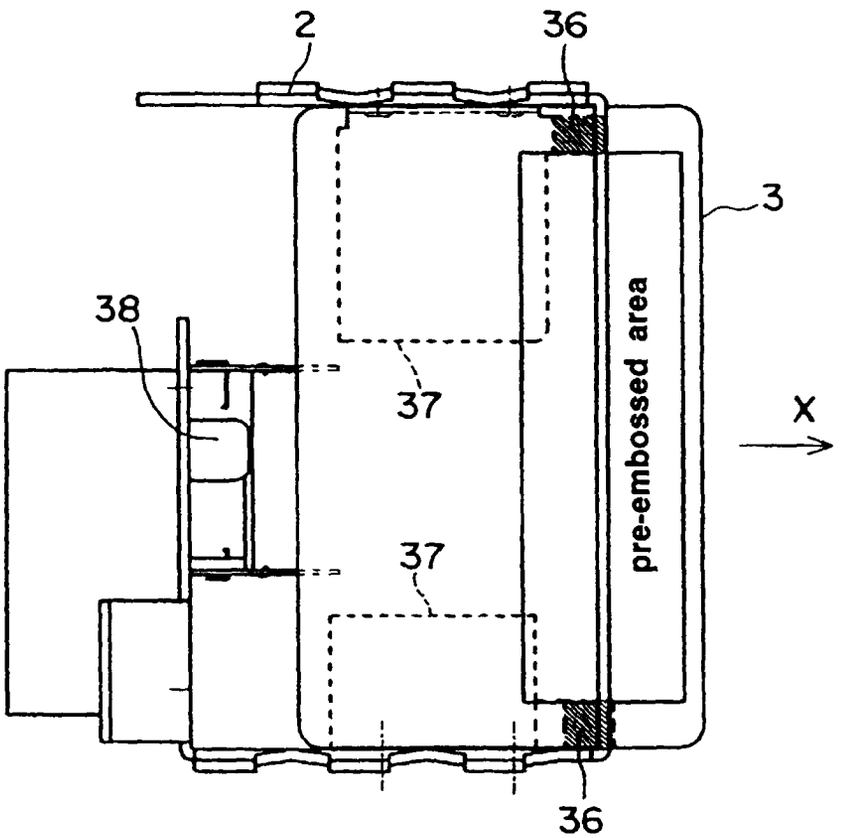

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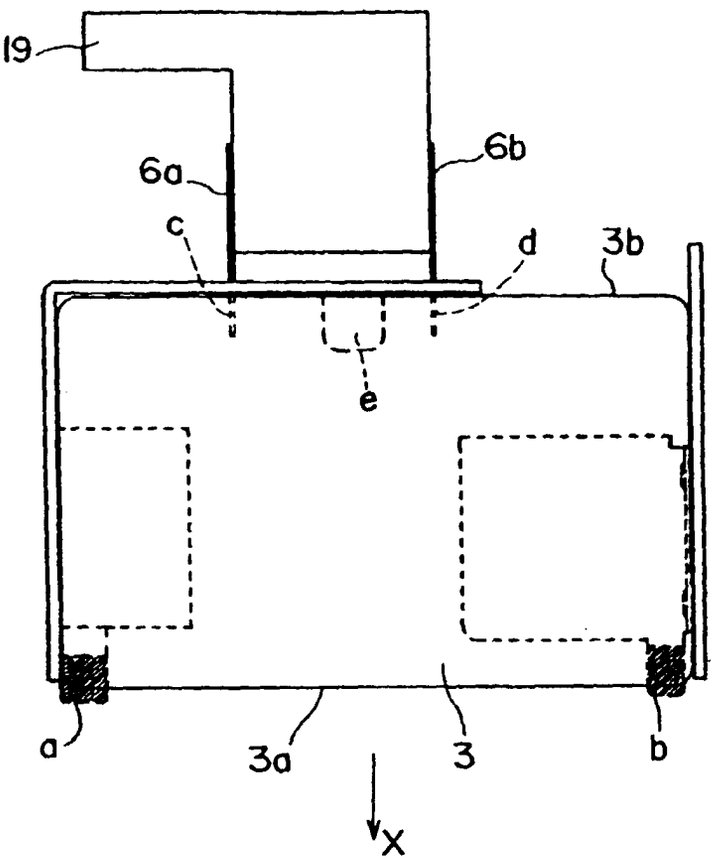

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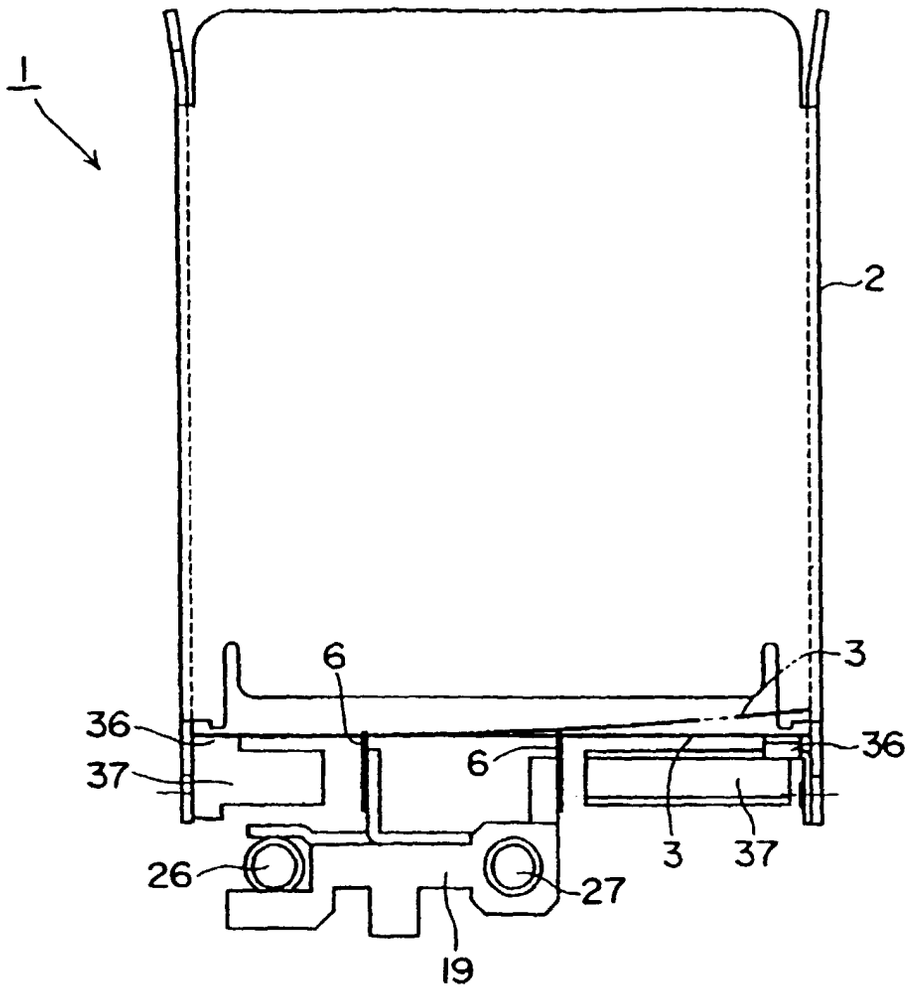

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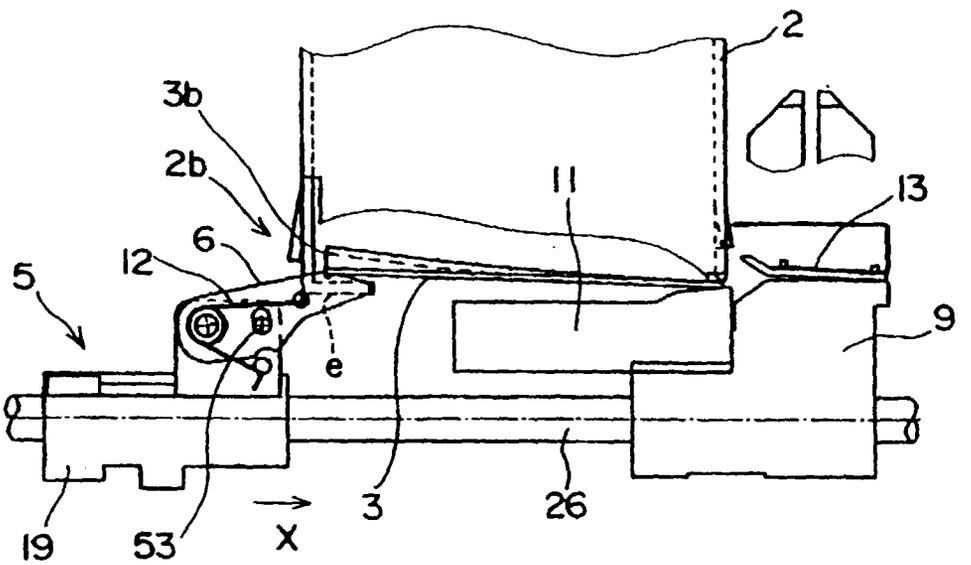
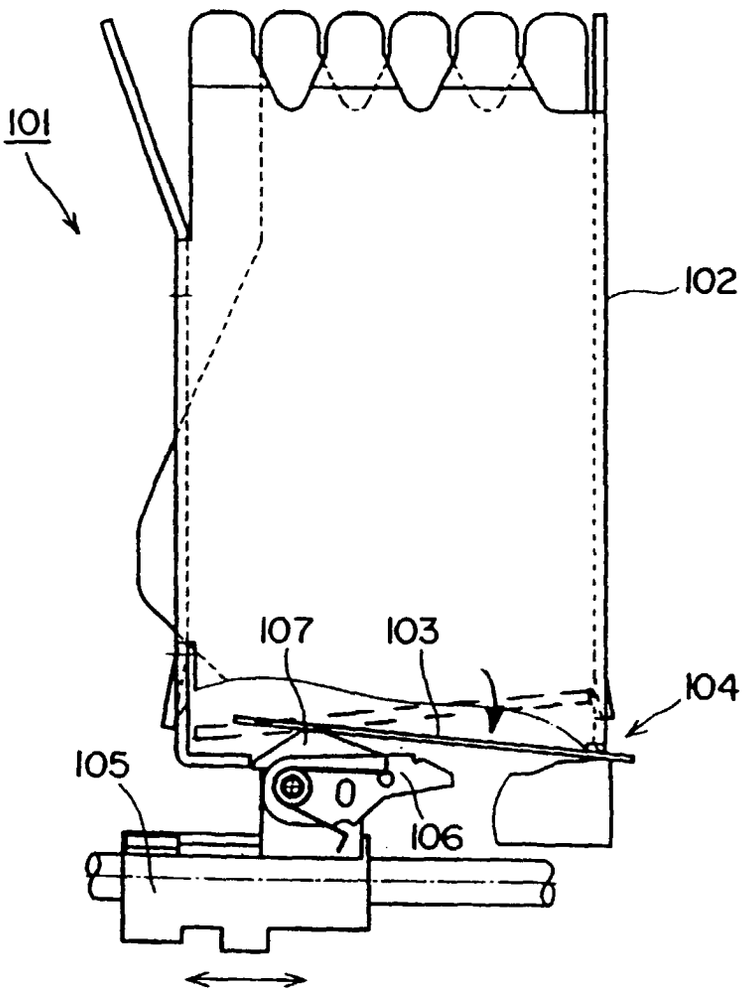


Fig. 23



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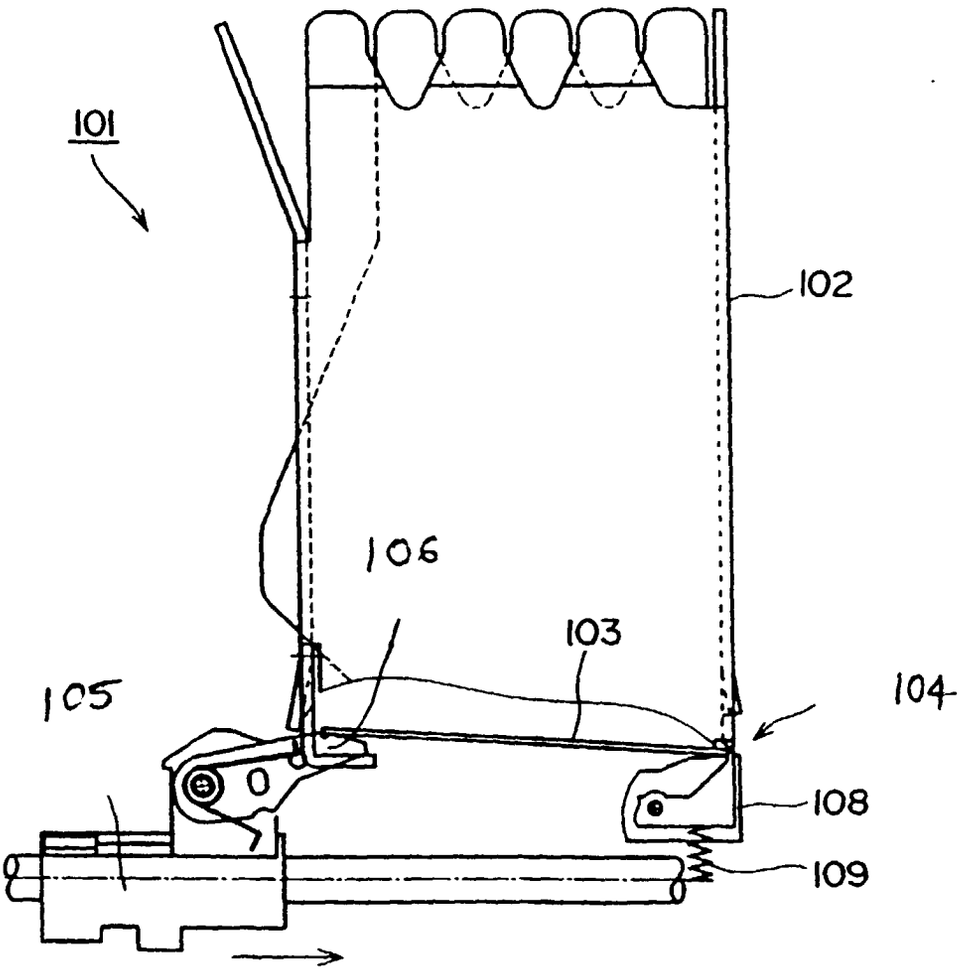

Fig. 25

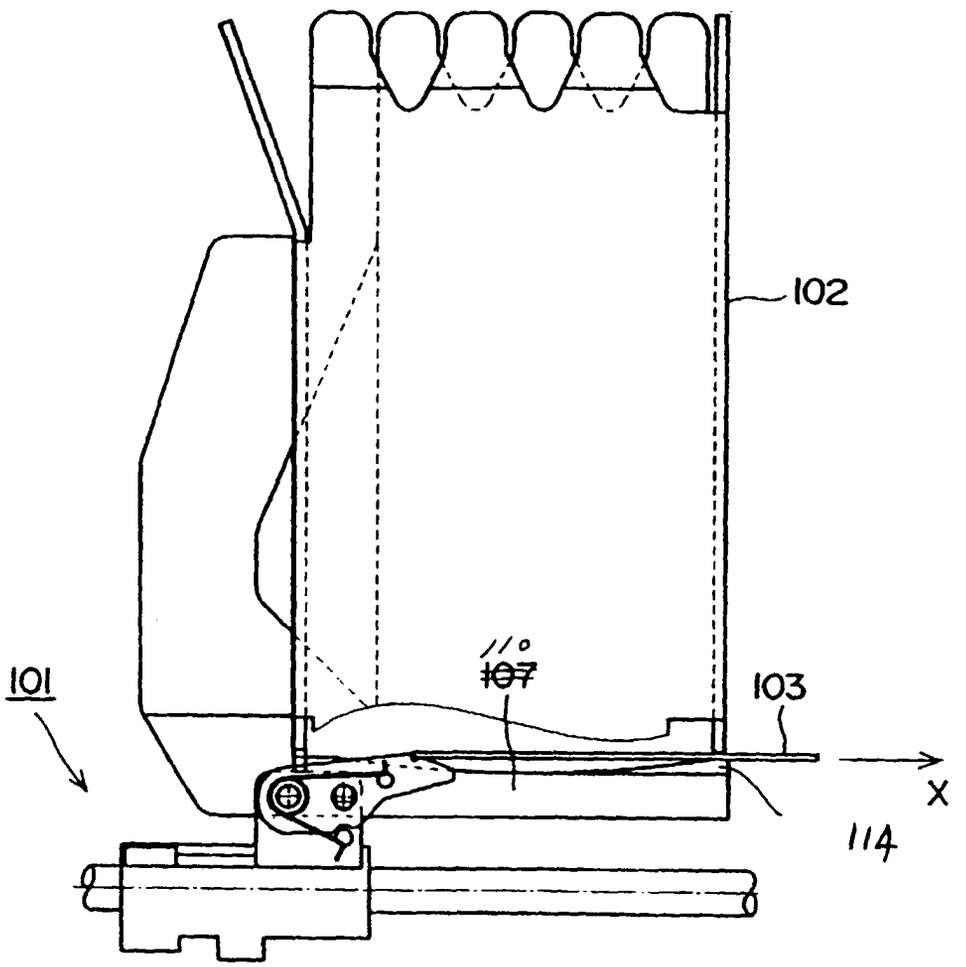

Fig. 26

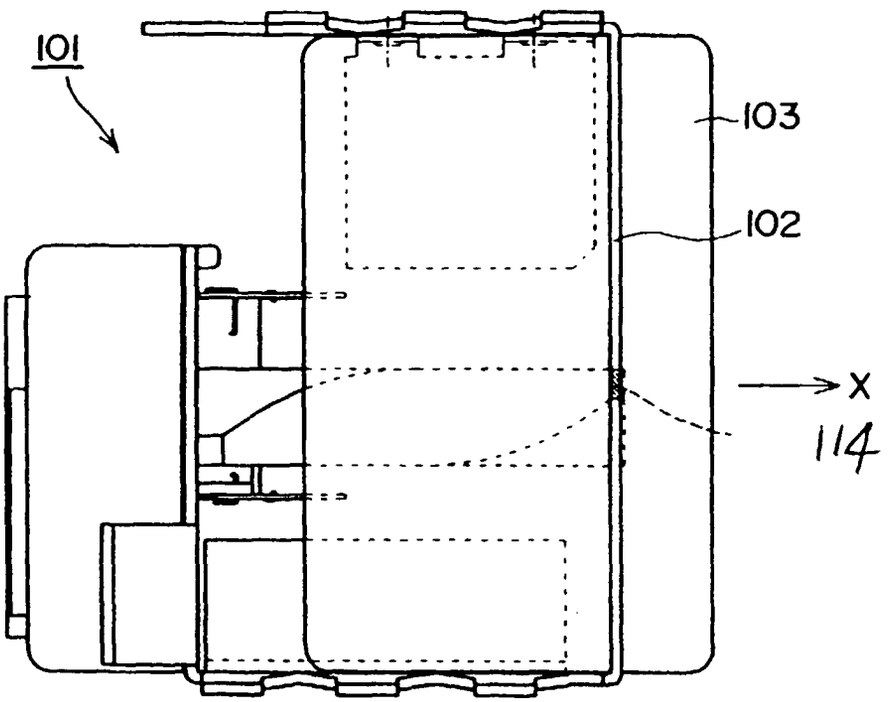

Fig. 27