



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.04.2000 Bulletin 2000/14

(51) Int Cl.7: **G07F 11/58, G07F 11/64**

(21) Application number: **99307755.1**

(22) Date of filing: **30.09.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
 Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **30.09.1998 JP 27674698**
30.09.1998 JP 27674798

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(54) **Commodity discharge apparatus for vending machine, in which a commodity can be successfully released from a suspension member**

(57) For suspending a commodity (100) in a commodity discharge apparatus for a vending machine, a commodity suspension member (3) is connected to an endless chain (2) forming an elongated shape. A suspension-releasing mechanism (1b) is operatively coupled to the commodity suspension member for releasing

the commodity from the commodity suspension member at end of the elongated shape. For enhancing the commodity to be released from the commodity suspension member, a release enhancement mechanism (5b) is placed adjacent to the end of the elongated shape and cooperated with the suspension-releasing mechanism.

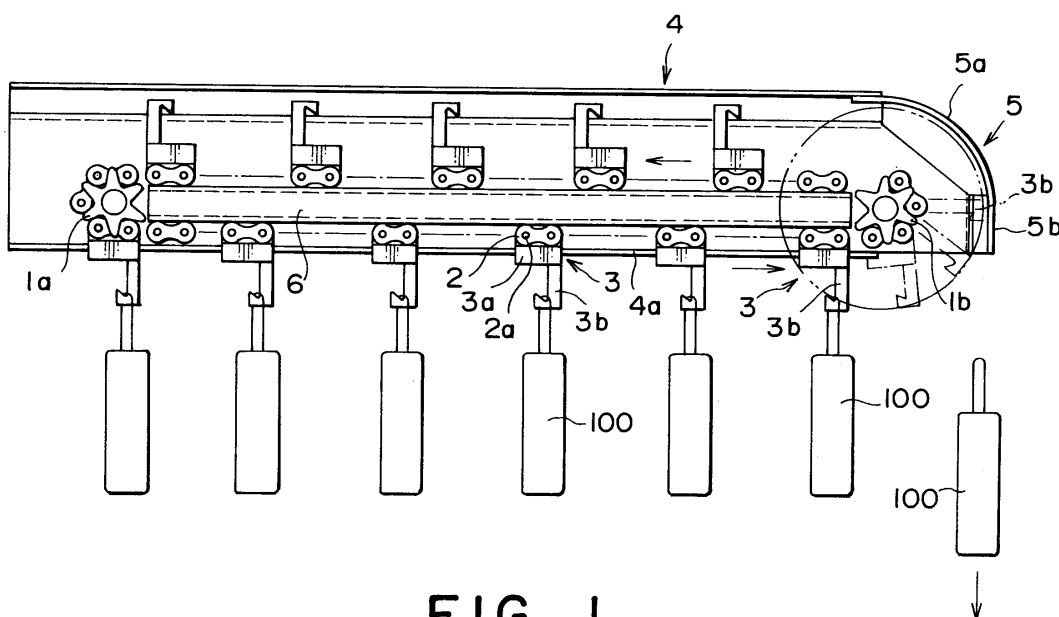


FIG. 1

Description

Background of the Invention:

[0001] The present invention relates in general to a vending machine and more particularly to a commodity discharge apparatus for a vending machine.

[0002] A conventional commodity discharge apparatus is shown in Japanese Unexamined Utility Model Publication (JP-U) No. 49-150,300. The conventional commodity discharge apparatus comprises an endless chain, a plurality of commodity suspension members fitted in a predetermined interval with each other to the endless chain for suspending or hanging goods (commodities), and a suspension-release mechanism for releasing the hanging condition of the suspension members at a position adjacent to one end portion of the endless chain.

[0003] In the commodity discharge apparatus, there have been cases, due to some failure or unsuccessful operation of the suspension-release mechanism, that a releasing operation of the suspended commodities at one side portion of the endless chain is not successfully carried out, with the result that the goods or commodities are caught in an upper feed portion of the endless chain.

Summary of the Invention:

[0004] It is therefore an object of the present invention to provide an improvement in the conventional commodity discharge apparatus for a vending machine.

[0005] It is another object of the present invention to provide a new commodity discharge apparatus which permits to successfully release a commodity from a suspension member at an one end portion of the endless chain.

[0006] Other objects of the present invention will become clear as the description proceeds.

[0007] According to the present invention, there is provided a commodity discharge apparatus for a vending machine, which comprises an endless chain forming an elongated shape, a commodity suspension member connected to the endless chain for suspending a commodity, a suspension-releasing mechanism operatively coupled to the commodity suspension member for releasing the commodity from the commodity suspension member at one of ends of the elongated shape, and a release enhancement mechanism placed adjacent to the one of the ends and cooperated with the suspension-releasing mechanism for enhancing the commodity to be released from the commodity suspension member.

[0008] It may be arranged that the commodity suspension member has a hole defining wall defining a through-hole which is for receiving therethrough a pin of the endless chain.

[0009] It may be arranged that the hole defining wall has a partly cut-out portion for receiving therethrough

the pin.

[0010] It may be arranged that the commodity suspension member is connected to the endless chain at one side of the endless chain.

[0011] It may be arranged that the commodity suspension member is connected to the endless chain at both sides of the endless chain.

[0012] It may be arranged that the commodity suspension member has a hook for hooking with the commodity.

[0013] It may be arranged that the commodity suspension member has a clip for clipping the commodity.

[0014] It may be arranged that the endless chain has an upper feed portion, the commodity suspension member being folded in a vertical direction at the upper feed portion.

[0015] It may be arranged that the endless chain has an upper feed portion, the commodity suspension member being connected to the upper feed portion, the commodity discharge apparatus further comprising a supporting member for vertically supporting the commodity suspension member.

[0016] It may be arranged that the commodity discharge apparatus further comprises a casing for covering an upper portion and opposed side portions of the endless chain, the casing having at side wall thereof a part which is releasable from another part of the side wall.

[0017] It may be arranged that the endless chain has a lower feed portion, the commodity discharge apparatus further comprising an endless chain supporting member, extending below and parallel with the endless chain, for vertically supporting the lower feed portion.

[0018] It may be arranged that the commodity discharge apparatus further comprises a supporting member for vertically supporting the commodity suspension member fitted to the lower feed portion of the endless chain.

[0019] It may be arranged that the commodity discharge apparatus further comprises an additional commodity suspension member connected to the endless chain for suspending an additional commodity, the a suspension-releasing mechanism being operatively coupled to the additional commodity suspension member to releasing the additional commodity from the additional commodity suspension member at one of ends of the elongated shape, the release enhancement mechanism enhancing the additional commodity to be released from the additional commodity suspension member.

Brief Description of the Drawing:

[0020]

Fig. 1 is a side view of a commodity discharge apparatus of a vending machine according to a first embodiment of the invention, with one side wall of

the casing being removed;

Fig. 2 is a perspective view of a commodity suspension members of the commodity discharge apparatus for the vending machine according to the first embodiment of the invention;

Fig. 3 is a sectional view of the commodity discharge apparatus for the vending machine according to the first embodiment of the invention;

Fig. 4 is a perspective view of an end of a casing and a cover for the commodity discharge apparatus according to the first embodiment of the invention, with the cover in the condition of pre-assembly;

Fig. 5 is a side view of the commodity discharge apparatus according to a second embodiment of the invention, with one side wall of the casing being removed;

Fig. 6 is a perspective view of the commodity suspension members for the commodity discharge apparatus according to the second embodiment of the invention;

Fig. 7 is a sectional view of the commodity discharge apparatus according to the second embodiment of the invention;

Fig. 8 is a perspective view of an end of a casing and a cover for the commodity discharge apparatus according to the second embodiment of the invention, with the cover in the condition of pre-assembly;

Fig. 9 is a side view of the commodity discharge apparatus according to the third embodiment of the invention, with one side wall of the casing being removed;

Fig. 10 is a perspective view of the commodity suspension members for the commodity discharge apparatus according to the third embodiment of the invention;

Fig. 11 is a sectional view of the commodity discharge apparatus according to the third embodiment of the invention;

Fig. 12 is a side view of the commodity discharge apparatus according to the fourth embodiment of the invention, with one side wall of the casing being removed;

Fig. 13 is a perspective view of the commodity suspension members for the commodity discharge apparatus according to the fourth embodiment of the invention;

Fig. 14 is a sectional view of the commodity discharge apparatus according to the fourth embodiment of the invention;

Fig. 15 is a view taken along line a-a in Fig. 12;

Fig. 16 is a side view of the commodity discharge apparatus according to a modification of the first embodiment of the invention, with one side wall of the casing being removed;

Fig. 17 is a perspective view of the commodity discharge apparatus according to a modification of the first embodiment of the invention;

Fig. 18 is a perspective view of the commodity sus-

pension members of the commodity discharge apparatus in a modification of the first embodiment of the invention;

Fig. 19 is a perspective view of the commodity suspension members of the commodity discharge apparatus in a further modification of the first embodiment of the invention; and

Fig. 20 is a perspective view of the commodity suspension members of the commodity discharge apparatus in another modification of the first embodiment of the invention.

Description of the Preferred Embodiments:

[0021] Preferred embodiments of the invention will be described with reference to figures of the accompanying drawings.

First Embodiment

[0022] With reference to Figs. 1 to 4, the description will be made as regards a commodity discharge apparatus for vending machine according to a first embodiment of the invention. The commodity discharge apparatus comprises an endless chain 2 which is extended around sprockets 1a and 1b to form an elongated shape extending in a predetermined or horizontal direction. The elongated shape has both ends in the horizontal direction. A motor rotates the sprocket 1a with an encoder, though not illustrated in the figures of the drawing.

[0023] The endless chain 2 is provided with a plurality of commodity suspension members 3 at a predetermined interval with each other. The commodity suspension members 3 each has a main body 3a and an L-shaped hook 3b integrally formed with the main body 3a. The main body 3a has two holes 3a'. The commodity suspension members 3 is fitted to the endless chain 2 at one side thereof in such a manner that two pins 2a of the endless chain 2 are inserted into the two holes 3a' of the main body.

[0024] The endless chain 2 is disposed in a cylindrical casing 4 having a rectangular cross section. The casing 4 has a bottom wall 4a which extends parallel to and below the endless chain 4. The bottom wall 4a has a gap or space 4b which extends in the longitudinal direction. A lower feed portion of the endless chain 2 and the commodity suspension members 3 below the lower feed portion are both supported in the vertical or up-down direction by the bottom wall 4a of the casing 4. The commodity suspension member 3 which is provided to the lower feed portion of the endless chain 2 extends outward of the casing 4 through the aforesaid space 4b.

[0025] At the end of the casing 4 located adjacent to the sprocket 1b, a curved top wall 5a and a cover 5 having a side wall of a U-shape in cross section are provided.

[0026] In the casing 4 is disposed a guide rail 6 which has a U-shape in cross section. The guide rail 6 extends

parallel to the endless chain 2. An upper feed portion of the endless chain 2 and the commodity suspension members 3 mounted to the upper feed portion are supported in the vertical or up-down direction by the guide rail 6. The hook 3b of the commodity suspension member 3 which is disposed on the upper feed portion of the endless chain 2 is disposed in the casing 4.

[0027] A plurality of commodity discharge apparatuses each of which has the construction as described above are arranged in a superposed relation with a vertical spaced relation with each other.

[0028] Different commodities 100 are suspended from the hook 3b of the commodity suspension member 3 of the discharge apparatus.

[0029] An operation of the commodity discharge apparatus in the first embodiment of the invention will be described.

[0030] If a user inserted a coin into a coin slot (not shown) of a vending machine and then pushes a commodity selection button (not shown), a motor (not shown) with an encoder device is driven to rotate the sprocket 1a at a predetermined angle so that the lower feed portion of the chain 2 is moved for a predetermined distance toward the sprocket 1b. Along with the movement of the lower feed portion of the chain 2, the commodity suspension members 3 fitted to the lower feed portion of the chain 2 are moved toward the sprocket 1b for a predetermined distance. At the time of the movement of the commodity suspension members 3 toward the sprocket 1b, all the weight of the chain 2, the weight of the commodity suspension members 3 and a load of the commodities or goods 100 are supported by the bottom wall 4a of the casing 4.

[0031] As shown by dot-dash lines in Fig. 1, the commodity suspension member 3 located adjacent to the sprocket 1b of the lower feed portion of the chain 2 is rotated and also revolved around the sprocket 1b so that the L-shaped hook 3b is made into a horizontal position. The commodity or goods 100 are released from hook 3b at one of the ends of the elongated shape by its own weight and dropped. In this event, the sprocket 1b is referred to as a suspension-releasing mechanism.

[0032] At the time of rotation as well as revolving of the commodity suspension member 3 around the sprocket 1b, an upper end of the commodity 100 suspended from the hook 3b of the suspension member 3 comes in contact with a lower end of the side wall 5b of the U-shaped cover 5, and an upward movement of the commodity 100 is prevented and, consequently, release of the commodity 100 from the hook 3b is enhanced so that the commodity 100 is prevented from being caught into the upper feed portion of the endless chain 2. In this event, the side wall 5b is referred to as a release enhancement mechanism.

[0033] The dropped commodity 100 is collided against the curve top wall of the cover 5 of the commodity discharge apparatus and moved in parallel along the top wall toward the end portion of the cover and then

dropped. The commodity 100 is dropped into a receiver (not shown), which is positioned at a lower portion of the commodity discharge members, without a contact or any engagement with the lower portions of the commodity discharge apparatus. Thus, the user can open a shutter (not shown) of the vending machine and takes out the commodity or goods in the receiver.

[0034] The commodity suspension member 3 released from the goods or commodity 100 is moved to the upper feed portion of the endless chain 2 along with the movement of the endless chain 2. In the way of the upper feed portion, the endless chain 2 and the commodity suspension member 3 are supported in the vertical direction by the guide rail 6.

[0035] In the commodity discharge apparatus in the embodiment of the invention described above, an upper end of the commodity 100 is contacted at the position adjacent to the sprocket 1b, with a lower end of the U-shaped side wall 5b of the cover 5 so that an upward movement of the commodity 100 is prevented and, therefore, the removal or release of the commodity 100 from the hook 3b is enhanced so that the release of the commodity 100 from the hook 3b is proceed smoothly as desired. Thus, the commodity can be prevented from being caught in the upper feed portion of the endless chain 2.

[0036] In this embodiment, both the endless chain 2 and the commodity suspension member 3 are supported in the vertical direction by the guide rail 6 in the upper feed portion of the endless chain 2 and, therefore, a motion of the running endless chain 2 and a motion of the commodity suspension member 3 are stabilized and, consequently, any generation of inconveniences such as stop of running or feeding of the endless chain 2 can be prevented.

[0037] In the embodiment described above, the commodity suspension member 3 is fitted to the endless chain 2 in such a manner that two pins 2a of the endless chain 2 are inserted into the through-holes 3a and, accordingly, the commodity suspension member 3 can be easily fitted to and released from the chain 2 and, this permits the fitting pitch of the suspension member 3 to be changed in accordance with the size of the goods or commodities to be suspended.

[0038] Additionally, in the embodiment of the invention, since the commodity 100 is suspended from the L-shaped hook 3b, a rotation and revolving of the commodity suspension member 3 around the sprocket 1b permits the L-shaped hook 3b to be in a horizontal relation and, therefore, the suspension of the goods 100 by the hook 3b is readily released by the weight of the commodity.

[0039] Further, in the embodiment of the invention, the lower feed portion of the endless chain 2 is supported vertically by the bottom wall 4a of the casing 4 and, therefore, the endless chain 2 is not dangled or loosened downwardly by receiving a load of the commodities. Thus, a regular engagement is assured between

the endless chain 2 and the sprockets 1a and 1b. Further, a smooth rotational operation of the sprockets 1a, 1b are assured and an increase in driving energy of the endless chain is restricted effectively. Further, the commodity suspension member 3 which is suspended from the lower feed portion of the endless chain is vertically supported by the bottom wall 4a of the casing and, therefore, any torsion at the lower feed portion of the endless chain 2 due to addition of a load of the commodity 100 can be prevented and thus a stable running operation of the endless chain 2 is obtained.

Second Embodiment

[0040] With reference to Figs. 5-8, the description will be made as regards a commodity discharge apparatus for vending machine according to a second embodiment of the present invention. The commodity discharge apparatus comprises an endless 12 wound around the sprockets 11a, 11b to form the elongated shape that extends in the horizontal direction. A motor having an encoder device is provided for driving the sprocket 11a.

[0041] A plurality of commodity suspension members 13 are fitted to the endless chain 12 in a spaced relation relative to the adjacent ones. The commodity suspension member 13 is provided with a main body 13a and an L-shaped hook 13b which is rotatably fixed to the main body 13a. The main body 13a has two through-holes 13a'. The hook 13b is biased by a spring 13c in the standing direction relative to the main body 13a. The commodity suspension member 13 is fitted, at one side of the endless chain 12, to the endless chain 12 in such a manner that the two pins 12a of the endless chain 12 are inserted through the through-holes 13a of the main body 13a.

[0042] The endless chain 12 is disposed in a cylindrical casing 14 having a rectangular cross section. The casing 14 has a bottom wall 14a which extends, at a lower of the endless chain 12, in a parallel relation with the endless chain 12. On the bottom wall 14a is provided a gap or a space 14b which extends in the longitudinal direction. The lower feed portion of the endless chain 12 and the commodity suspension member 13 fitted to the lower feed portion of the endless chain 12 are supported in the vertical direction by the bottom wall 14a of the casing 14. The hook 13b of the commodity suspension member 13, which is fitted to the lower feed portion of the endless chain 12, is raised in an upright position and extended in the downwardly and outwardly from the casing 14.

[0043] On the end portion of the casing 14 adjacent the sprocket 11b, a cover 15 having a curved top wall 15a and a side wall having a U-shaped cross section is provided.

[0044] Further, in the casing 14 is provided a guide rail 16 having a guide rail 16. The guide rail 16 extends in parallel with the endless chain 12. The upper feed portion of the endless chain 12 and the commodity suspen-

sion member 13 fitted to the upper feed portion are supported in the vertical direction by the guide rail 16. The hook 13b of the commodity suspension member 13 fitted to the upper feed portion of the endless chain 12 is disposed inside the casing 14.

[0045] A plurality of the commodity discharge apparatuses having the structure described above are superposed with a predetermined spaced relation with each other in a vending machine.

[0046] Different goods or commodities 100 are suspended from the hooks 13b of the commodity suspension members 13 for the commodity discharge apparatus.

[0047] An operation of the commodity discharge apparatus in the second embodiment of the invention will be described.

[0048] If a user inserted a coin into a coin slot (not shown) of a vending machine and then pushes a commodity selection button (not shown), a motor (not shown) with an encoder device is driven to rotate the sprocket 11a at a predetermined angle so that the lower feed portion of the chain 12 is moved for a predetermined distance toward the sprocket 11b. Along with the movement of the lower feed portion or the chain 12, the commodity suspension members 13 fitted to the lower feed portion of the chain 12 are moved toward the sprocket 11b for a predetermined distance. At the time of the movement of the commodity suspension members 3 toward the sprocket 11b, all the weight of the chain 12, the weight of the commodity suspension members 13 and a load of the commodities or goods 200 are supported by the bottom wall 14a of the casing 14.

[0049] As shown by dot-dash lines in Fig. 5, the commodity suspension member 13 located adjacent to the sprocket 11b of the lower feed portion of the chain 12 is rotated and also revolved around the sprocket 11b so that the L-shaped hook 13b is made into a horizontal position. The commodity or goods 200 are released from hook 13b at one of the ends of the elongated shape by its own weight and dropped. In this event, the sprocket 11b is referred to as the suspension-releasing mechanism.

[0050] At the time of rotation as well as revolving of the commodity suspension member 13 around the sprocket 11b, an upper end of the commodity 200 suspended from the hook 13b of the suspension member 13 comes in contact with a lower end of the side wall 15b of the U-shaped cover 15, and an upward movement of the commodity 200 is prevented and, consequently, release of the commodity 200 from the hook 13b is enhanced so that the commodity 200 is prevented from being caught into the upper feed portion of the endless chain 12. In this event, the side wall 15b is referred to as a release enhancement mechanism.

[0051] The dropped commodity 200 is collided against the curve top wall of the cover 15 of the commodity discharge apparatus and moved in parallel along the top wall toward the end portion of the cover and then

dropped. The commodity 200 is dropped into a receiver (not shown), which is positioned at a lower portion of the commodity discharge members, without a contact or any engagement with the lower portions of the commodity discharge apparatus. Thus, the user can open a shutter (not shown) of the vending machine and takes out the commodity or goods in the receiver.

[0052] The commodity suspension member 13 released from the goods or commodity 200 is moved to the upper feed portion of the endless chain 12 along with the movement of the endless chain 12. The top portion of the hook 13b comes into contact with the top wall of the casing 14. As a result, as shown in Fig. 5, the hook 13b which has been standing or placed in an upright position relative to the main body 13a is rotated against a biasing force of the spring 13c and the commodity suspension member 13 is folded in a vertical direction. In the way of the upper feed portion, the endless chain 12 and the commodity suspension member 3 are supported in the vertical direction by the guide rail 16.

[0053] In the commodity discharge apparatus in the embodiment of the invention described above, an upper end of the commodity 200 is contacted at the position adjacent to the sprocket 1b, with a lower end of the U-shaped side wall 15b of the cover 15 so that an upward movement of the commodity 200 is prevented and, therefore, the removal or release of the commodity 200 from the hook 13b is enhanced so that the release of the commodity 200 from the hook 13b is proceed smoothly as desired. Thus, the commodity can be prevented from being caught in the upper feed portion of the endless chain 12.

[0054] In the commodity discharge apparatus in the second embodiment described above, the commodity suspension member 13 is folded in the vertical direction in the upper feed portion of the endless chain 12 and, therefore, a height or the dimension "h" in the vertical direction can be made smaller than the conventional apparatus. Incorporation of the commodity discharge apparatus of this embodiment into the vending machine permits a realization of smaller size configuration with respect to the height thereof.

[0055] In this embodiment, both the endless chain 12 and the commodity suspension member 13 are supported in the vertical direction by the guide rail 16 in the upper feed portion of the endless chain 12, and therefore, a motion of the running endless chain 12 and a motion of the commodity suspension member 13 are stabilized and, consequently, any generation of inconveniences such as stop of running or feeding of the endless chain 12 can be prevented.

[0056] In the embodiment described above, the commodity suspension member 13 is fitted to the endless chain 12 in such a manner that two pins 2a of the endless chain 12 are inserted into the through-holes 13a' and, accordingly, the commodity suspension member 13 can be easily fitted to and released from the chain 12 and, this permits the fitting pitch of the suspension

member 13 to be changed in accordance with the size of the goods or commodities to be suspended.

[0057] Additionally, in the embodiment of the invention, since the commodity 200 is suspended from the L-shaped hook 13b, a rotation and revolving of the commodity suspension member 13 around the sprocket 1b permits the L-shaped hook 13b to be in a horizontal relation and, therefore, the suspension of the goods 200 by the hook 13b is readily released by the weight of the commodity.

[0058] Further, in the embodiment of the invention, the lower feed portion of the endless chain 12 is supported vertically by the bottom wall 14a of the casing 14 and, therefore, the endless chain 12 is not dangled or loosened downwardly by receiving a load of the commodities 200. Thus, a regular engagement is assured between the endless chain 12 and the sprockets 11a and 11b. Further, a smooth rotation of the sprockets 11a, 11b are assured and an increase in driving energy of the endless chain is restricted effectively. Further, since the commodity suspension member 13, which is suspended from the lower feed portion of the endless chain 12 is vertically supported by the bottom wall 14a of the casing and, therefore, any torsion at the lower feed portion of the endless chain 12 due to addition of a load of the commodity 200 can be prevented. Thus, a stable running operation of the endless chain 12 is obtained.

Third Embodiment

[0059] With reference to Figs. 9-11, the description will be made as regards a commodity discharge apparatus for vending machine according to a third embodiment of the invention. The commodity discharge apparatus comprises an endless chain 22 wound around the sprockets 21a, 21b to form the elongated shape that extends in the horizontal direction. A motor having an encoder device is provided for driving the sprocket 11a.

[0060] A plurality of commodity suspension members 23 are fitted to the endless chain 22 in a spaced relation relative to the adjacent ones. The commodity suspension member 23 has a main body 23a and pinch-like clip 23b. The main body 23a has two through-holes 23a'. The main body 23a has a sliding portion 23a1 of a semi-circular column shape. The clip 23b is rotatably and axially supported to the main body 23a. The clip 23b has a semi-circular sliding portion 23b1.

[0061] The commodity suspension member 23 is fitted, at one side of the endless chain 22, to the endless chain 22 in such a manner that the two pins 22a of the endless chain 22 are inserted through the through-holes 23a' of the main body 23a.

[0062] The endless chain 22 is disposed in a cylindrical casing 24 having a rectangular cross section. The casing 24 has a bottom wall 24a which extends, at a lower of the endless chain 22, in a parallel relation with the endless chain 22. On the bottom wall 24a is provided a gap or a space 24b which extends in the longitudinal

direction. The casing 24 is provided with a middle stepped portion 24c which extends in parallel with the endless chain 22.

[0063] The lower feed portion of the endless chain 22 and the commodity suspension member 23 fitted to the lower feed portion of the endless chain 22 are supported in the vertical direction by the bottom wall 24a of the casing 24.

[0064] The main body 23a of the commodity suspension member 23 fitted to the lower feed portion of the endless chain 22 are extended through the space 24b and further out of the casing 24, and the clip 23b is suspended from the main body 23a.

[0065] On the end portion of the casing 14 adjacent the sprocket 21b, a cover 25 having a curved top wall 25a and a side wall having a U-shaped cross section is provided.

[0066] Further, in the casing 24 is provided a guide rail 26 having a guide rail 26. The guide rail 26 extends in parallel with the endless chain 22. The upper feed portion of the endless chain 22 and the commodity suspension member 23 fitted to the upper feed portion are supported in the vertical direction by the guide rail 26 and the middle stepped portion 24c. The hook 23b of the commodity suspension member 23 fitted to the upper feed portion of the endless chain 22 is disposed inside the casing 24.

[0067] A plurality of the commodity discharge apparatuses having the structure described above are superposed with a predetermined spaced relation with each other in a vending machine.

[0068] Different goods or commodities 200 are suspended from the hooks 23b of the commodity suspension members 23 for the commodity discharge apparatus.

[0069] An operation of the commodity discharge apparatus in the third embodiment of the invention will be described.

[0070] If a user inserted a coin into a coin slot (not shown) of a vending machine and then pushes a commodity selection button (not shown), a motor (not shown) with an encoder device is driven to rotate the sprocket 21a at a predetermined angle so that the lower feed portion of the chain 22 is moved for a predetermined distance toward the sprocket 21b. Along with the movement of the lower feed portion of the chain 22, the commodity suspension members 23 fitted to the lower feed portion of the chain 22 are moved toward the sprocket 21b for a predetermined distance. At the time of the movement of the commodity suspension members 23 toward the sprocket 21b, all the weight of the chain 22, the weight of the commodity suspension members 23 and a load of the commodities or goods 300 are supported by the bottom wall 14a of the casing 24. The commodity 300 is held by the clip 23b and suspended therefrom and, therefore, the commodity 300 is held in a stable manner during its feeding operation with less swinging movement.

[0071] As clearly shown in Fig. 9, the commodity suspension member 23 located adjacent to the sprocket 21b of the lower feed portion of the chain 22 is rotated and also revolved around the sprocket 21b, and the sliding portion 23b1 of the clip 23b is forced against the side wall 25b of the cover 25 so that the clip 23b is opened. By a line contact of the sliding portion 23b1 against the side wall 25b of the cover 25, a smooth movement of the commodity suspension member 23 is assured. The commodity 300 is released from the engagement by the clip 23b and released from the clip 23b by its weight and dropped. In this event, the sprocket 21b is referred to as the suspension-releasing mechanism.

[0072] At the time of rotation as well as revolving of the commodity suspension member 23 around the sprocket 23b, an upper end of the commodity 300 suspended from the clip 23a of the suspension member 23 comes in contact with a lower end of the side wall 25b of the U-shaped cover 25, and an upward movement of the commodity 300 is prevented and, consequently, release of the commodity 300 from the clip 23b at one of the ends of the elongated shape is enhanced so that the commodity 200 is prevented from being caught into the upper feed portion of the endless chain 22. In this event, the side wall 25b is referred to as a release enhancement mechanism.

[0073] The dropped commodity 300 is collided against the curve top wall of the cover 25 of the commodity discharge apparatus and moved in parallel along the top wall toward the end portion of the cover and then dropped. The commodity 300 is dropped into a receiver (not shown), which is positioned at a lower portion of the commodity discharge members, without a contact or any engagement with the lower portions of the commodity discharge apparatus. Thus, the user can open a shutter (not shown) of the vending machine and takes out the commodity or goods in the receiver.

[0074] The commodity suspension member 23 released from the goods or commodity 300 is moved to the upper feed portion of the endless chain 22 along with the movement of the endless chain 22. The clip 23b is rotated by its weight and placed into a superposed relation with the main body 23a. As a result, as shown in Fig. 9, the commodity suspension member 23 is folded in a vertical direction. In the way of the upper feed portion, the endless chain 22 and the commodity suspension member 23 are supported in the vertical direction by the middle stepped portion 24c of the casing 24 and the guide rail 16. The sliding portion 23a of the main body 23a is come into a line contact with the middle stepped portion 24c of the casing 24.

[0075] In the commodity discharge apparatus in the embodiment of the invention described above, an upper end of the commodity 300 is contacted at the position adjacent to the sprocket 21b, with a lower end of the U-shaped side wall 15b of the cover 15 so that an upward movement of the commodity 300 is prevented and, therefore, the removal or release of the commodity 300

from the clip 23b is enhanced so that the release of the commodity 300 from the clip 23b is proceed smoothly as desired. Thus, the commodity can be prevented from being caught in the upper feed portion of the endless chain 22.

[0076] In the commodity discharge apparatus in the second embodiment described above, the commodity suspension member 23 is folded in the vertical direction in the upper feed portion of the endless chain 22 and, therefore, a height or the dimension h' in the vertical direction can be made smaller than the conventional apparatus. Incorporation of the commodity discharge apparatus of this embodiment into the vending machine permits a realization of smaller size configuration with respect to the height thereof.

[0077] In this embodiment, both the endless chain 22 and the commodity suspension member 23 are supported in the vertical direction by the middle stepped portion 24c and guide rail 26 in the upper feed portion of the endless chain 22 and, therefore, a motion of the running endless chain 22 and a motion of the commodity suspension member 23 are stabilized and, consequently, any generation of inconveniences such as stop of running or feeding of the endless chain 22 can be prevented. By a line contact of the sliding portion 23a1 of the main body 23a relative to the middle stepped portion 24c, a stable running of the commodity suspension member 23 is assured.

[0078] In the embodiment described above, the commodity suspension member 23 is fitted to the endless chain 22 in such a manner that two pins 22a of the endless chain 22 are inserted into the through-holes 23a' and, accordingly, the commodity suspension member 23 can be easily fitted to and released from the chain 22 and, this permits the fitting pitch of the suspension member 23 to be changed in accordance with the size of the goods or commodities 300 to be suspended.

[0079] Additionally, in the embodiment of the invention, since the commodity 300 is fitted to the endless chain 22 at one end portion thereof, the suspension member 23 can be easily attached and detached relative to the endless chain, and a pitch of the attachment of the commodity suspension member 23 can be readily changed.

[0080] In the embodiment described above, since the commodity 300 is grasped by and suspended from the clip 23b of the commodity suspension member 23, the state of the commodity 300 during feeding is stable with less swinging movement relative to the case that the commodity is suspended from and by the hook.

[0081] Further, in the embodiment of the invention, the lower feed portion of the endless chain 22 is supported vertically by the bottom wall 4a of the casing 24 and, therefore, the endless chain 22 is not dangled or loosened downwardly by receiving a load of the commodities. Thus, a regular engagement is assured between the endless chain 22 and the sprockets 21a and 21b. Further, a smooth rotational operation of the

sprockets 11a, 11b are assured and an increase in driving energy of the endless chain is restricted effectively. Further, the commodity suspension member 23 which is suspended from the lower feed portion of the endless chain is vertically supported by the bottom wall 24a of the casing and, therefore, any torsion at the lower feed portion of the endless chain 22 due to addition of a load of the commodity 300 can be prevented and, therefore, a stable running operation of the endless chain 22 can be obtained.

Fourth Embodiment

[0082] With reference to Figs. 12-15, the description will be made as regards a commodity discharge apparatus for vending machine according to a fourth embodiment of the invention. The commodity discharge apparatus comprises an endless chain 32 wound around the sprocket 31a, 31b to form the elongated shape that extends in the horizontal direction. A motor with an encoder device (not shown) is provided for driving the sprocket 31a.

[0083] A plurality of commodity suspension members 33 are fitted to an endless chain 32 at a predetermined interval with each the adjacent ones. The commodity suspension member 33 has a main body 33a, a pinch-like clip 33b, and a clip fixing plate 33c. The main body 33a has two through-holes 33a'. A half portion 33b1 of the clip 33b is integrally formed with the main body 33a and the other half portion 33b2 is biased in a clip-closing position by a spring 33d. The half portion 33b2 has a pair of curved engagement projecting portion 33b3 having a curved surface. The clip fixture plate 33c has two through-holes 33c'. The commodity suspension member 33 is fitted to the endless chain 32 in such a state that the two pins 32a of the endless chain 32 are inserted into the two through-holes 33a' of the main body 33a at one end portion of the endless chain, and that the two pins 32a of the endless chain 32 are inserted into the through-holes 33c' of the clip fixture plate 33c, and that clip fixture plate 33c is threadably engaged with the main body 33a.

[0084] The endless chain 32 is disposed in a cylindrical casing 34 having a rectangular cross section. On the end of the casing adjacent to the sprocket 31, a cover 35 having a curved top wall 35a and a side wall 35b having a U-shape in cross section. A bottom wall 34a of the casing 34 extends below, and in parallel with, the endless chain 32. A guide rail 36 of an U-shape in cross section is disposed in the casing 34. The guide rail 36 extends in parallel with the endless chain 32. The bottom wall 36a of the guide rail 36 extends below, and in parallel with, the endless chain 32. Between the bottom wall 34a of the casing 34 and the bottom wall 36a of the guide rail 36 is provided a space which extends in the longitudinal direction. The casing 34 is provided with a middle step portion 34c and a rail 34d. Both the middle stepped portion 34c and the rail 34d extend in substan-

tially parallel with the endless chain 32.

[0085] The lower feed portion of the endless chain 32 and the commodity suspension members 33 are vertically supported by the bottom wall 34a of the casing 34 and the bottom wall 36a of the guide rail 36. The commodity suspension member 33 fitted to the lower feed portion of the endless chain 32 and the clip fixture plate 33c are extended through the gap or space 34c and further outwardly relative to the casing 34 and the clip 33b is located below the casing 34.

[0086] Further, the upper feed portion of the endless chain 32 and the commodity suspension member 33 fitted to the upper feed portion are vertically supported by the guide rail 36, the middle stepped portion 34c of the casing 34 and the rail 34d. The commodity suspension member 33 fitted to the upper feed portion of the endless chain 32 is disposed in the casing 34.

[0087] A pair of rollers 37, 38 are disposed adjacent the sprocket 31b.

[0088] In the fourth embodiment of the invention described above, a plurality of the commodity discharge or feeding apparatuses are provided in the vending machine in a vertically spaced, superposed relation.

[0089] Different goods or commodities 400 are suspended from the clips 33b of the commodity suspension members 33 of the commodity discharge apparatus.

[0090] An operation of the commodity discharge apparatus in the fourth embodiment of the invention will be described.

[0091] When a user insert a coin into a coin slot of a vending machine (not shown) and pushes a commodity selection button, a motor (not shown) with a encoder device is driven to rotate the sprocket 31a at a predetermined angle so that the lower feed portion of the chain 32 is moved for a predetermined distance toward the sprocket 31b. Along with the movement of the lower feed portion of the chain 32, the commodity suspension members 33 fitted to the lower feed portion of the chain 32 are moved toward the sprocket 31b for a predetermined distance. At the time of the movement of the commodity suspension members 33 toward the sprocket 31b, all the weight of the chain 32, the weight of the commodity suspension members 33 and a load of the commodities or goods 400 are supported by the bottom wall 34a of the casing 34. The commodity 400 is held by the clip 33b and suspended therefrom and, therefore, the commodity 300 is held stable during its feeding operation with less swinging movement.

[0092] As clearly shown in Fig. 12, the commodity suspension member 33 located adjacent to the sprocket 31b of the lower feed portion of the chain 32 is rotated and also revolved around the sprocket 31b, and the paired engagement projecting member 33b3 of the clip 33b is forced against the rollers 37, 38 so that the clip 33b is opened. The commodity 400 is released from the clip 33b by its own weight and dropped. In this event, the sprocket 31b is referred to as the suspension-releasing mechanism. When the commodity suspension mem-

ber 33 is rotated and also revolved around the sprocket 31b, an upper end of the commodity 400 gasped by and suspended from the clip 33b of the suspension member 33 comes into contact with a lower end of the U-shaped side wall 35b of the cover 35 so that the commodity 400 is prevented from being moved upward. Consequently, release of the commodity 400 from the clip 33b at one ends of the elongated shape is enhanced so that the commodity can be prevented from being caught in the upper feed portion of the endless chain 32. In this event, the side wall 35b is referred to as a release enhancement mechanism.

[0093] The dropped commodity 400 is then collided with the curved top wall of the cover 35 and moved or fed horizontally along the top wall and toward the end of the cover 35 and finally dropped. The commodity 400 is dropped to the receiver (not shown) located at a lower portion of the commodity discharge apparatus without any contact with the lower parts of the commodity discharge apparatus. The user can take out the commodity 400 in the receiver in the vending machine after opening a shutter (not shown) of the machine.

[0094] The commodity suspension member 33 which has released the engagement with the commodity 400 is then moved to the upper feed portion of the chain 32 along with the movement of the chain 32. In the upper feed portion of the chain, both the endless chain 32 and the commodity suspension member 33 are vertically supported by the guide rail 36, the middle stepped portion 34c and the rail 34d.

[0095] In the commodity discharge apparatus of the fourth embodiment of the invention described above, the upper end of the commodity 400 is contacted, at the position adjacent to the sprocket 31b, with the lower end of the U-shaped side wall 35b of the cover 35 and thus the commodity 400 is prevented from being moved upward. Therefore, release of the commodity 400 from the clip 33b is enhanced so that a smooth operation of the release of the commodity can be attained. Thus, the commodity 400 can be prevented from being caught in the upper feed portion of the endless chain 32.

[0096] In the commodity discharge apparatus according to this embodiment of the invention, since the upper feed portion of the endless chain 32 and the commodity suspension member 33 fitted to the upper feed portion are vertically supported by the guide rail 36, the middle stepped portion 34c of the casing 34 and the rail 34d, a stable motion of the running endless chain 32 as well as the commodity suspension member 33 can be attained and any inconveniences such as inadvertent stop of the endless chain 32 can be prevented. Further, a contact between a pair of engagement projection portion 33b3 of the clip 33b and the rail 34d enhances a stable running of the commodity suspension member 33.

[0097] In the commodity discharge apparatus of this embodiment, the commodity suspension member 33 is affixed to the endless chain 32 in such a state that the two pins 32a of the endless chain 32 are inserted

through the two through-holes 33a' and the two through-holes 33e' of the clip fixture plate 33c. Therefore, attachment and detachment of the commodity suspension member 33 to the endless chain 32 is easily proceeded, and a pitch or interval of the adjacent commodity suspension members 33 can be easily changed in accordance with the size of the commodity.

[0098] In the commodity discharge apparatus of this embodiment, the commodity suspension member 33 is affixed to the endless chain 32 at the opposite ends of the endless chain 32 and, therefore, the commodities can be fed in a stable manner relative to a case that the commodity suspension member is affixed at one end of the endless chain 32 with less swinging movement of the commodities.

[0099] In the commodity discharge apparatus of this embodiment, the commodity 400 is grasped by and suspended from the clip 33b of the commodity suspension member 33 and, therefore, the commodity 400 is kept stable with less swinging movement during its travel, relative to the case in which the commodity 400 is suspended from the hook.

[0100] Further, in this embodiment of the invention, the lower feed portion of the endless chain 32 is supported vertically by the bottom wall 34a of the casing 34 and the bottom wall 36a of the guide rail 36 and, therefore, the endless chain 32 is not dangled or loosened downwardly by receiving a load of the commodities 400. Thus, a regular engagement is assured between the endless chain 32 and the sprockets 31a and 31b. Additionally, a smooth rotation of the sprockets 31a, 31b are assured and an increase in driving energy of the endless chain is restricted effectively. Further, since the commodity suspension member 33, which is suspended from the lower feed portion of the endless chain 32 is vertically supported by the bottom wall 34a of the casing and, therefore, any torsion at the lower feed portion of the endless chain 32 due to addition of a load of the commodity 400 can be prevented. Thus, a stable running operation of the endless chain 32 is obtained.

[0101] Although the present invention has been described with reference to the preferred embodiments only, many modification can be made.

[0102] For example, with respect to the first embodiment of the invention, as shown in Figs. 16 and 17, a part 4c of the side wall of the casing 4 adjacent to the sprocket 1a can be made removable from the remaining portion of the side wall. In this modification that the side wall is partly removable, attachment and detachment of the commodity suspension member 3 to and from the endless chain can be made smoothly without any difficulty and, moreover, a pitch change of the commodity suspension members 3 can be readily and successfully proceeded. The same is true of the second to third embodiment of the invention.

[0103] In the first embodiment of the invention, as shown in Fig. 18, an oblong through-hole 3a' a part of which is cut out can be formed to a main body 3a of the

commodity suspension member 3. In this modification, by inserting the two pins 2a of the endless chain 2 are inserted through the oblong through-hole 3a' through the cut-out portion thereof, the commodity suspension member 3 can be readily attached to and detached from the endless chain 2, and a pitch of the commodity suspension member 3 can be readily changed in accordance with the size of the commodity 100. The same is true of the second to third embodiments of the invention.

[0104] Further, in the first embodiment of the invention, as shown in Fig. 19, the commodity suspension member 3 can be formed such that its main body 3a is provided with a single through-hole 3a' and two shoulder portions 3a1, or otherwise, as shown in Fig. 20, it may be provided with a single through-hole 3a' and a single oblong through-hole 3a'. This modification can be applied also to the second to fourth embodiments of the invention.

[0105] As described above, in the commodity discharge apparatus according to the present invention, release of the commodity from the commodity suspension member at one end portion of the endless chain can be enhanced by means of the release enhancement mechanism so that the commodity can be released from the suspension members at one end portion of the endless chain. Thus, the commodity can be prevented from being caught in the upper feed portion of the endless chain.

[0106] Further, since the lower feed portion of the endless chain is vertically supported by the endless chain supporting member as described above, the endless chain is not dangled or loosened by loads of the suspended commodities. As a result, a reliable engagement between the endless chain and the sprocket can be assured as well as a smooth rotational movement of the sprocket and, further, an increase in driving energy of the endless chain can be restricted or minimized effectively.

Claims

1. A commodity discharge apparatus for a vending machine, comprising:

an endless chain forming an elongated shape;
a commodity suspension member connected to said endless chain for suspending a commodity;

a suspension-releasing mechanism operatively coupled to said commodity suspension member for releasing said commodity from said commodity suspension member at one of ends of said elongated shape; and

a release enhancement mechanism placed adjacent to said one of the ends and cooperated with said suspension-releasing mechanism for enhancing said commodity to be released from said commodity suspension member.

2. A commodity discharge apparatus as claimed in claim 1, wherein said commodity suspension member has a hole defining wall defining a through-hole which is for receiving therethrough a pin of the endless chain. 5
3. A commodity discharge apparatus as claimed in claim 2, wherein said hole defining wall has a partly cut-out portion for receiving therethrough said pin. 10
4. A commodity discharge apparatus as claimed in Claim 1, wherein said commodity suspension member is connected to said endless chain at one side of said endless chain. 15
5. A commodity discharge apparatus as claimed in claim 1, wherein said commodity suspension member is connected to said endless chain at both sides of said endless chain. 20
6. A commodity discharge apparatus as claimed in claim 1, wherein said commodity suspension member has a hook for hooking with said commodity.
7. A commodity discharge apparatus as claimed in claim 1, wherein said commodity suspension member has a clip for clipping said commodity. 25
8. A commodity discharge apparatus as claimed in claim 1, wherein said endless chain has an upper feed portion, said commodity suspension member being folded in a vertical direction at said upper feed portion. 30
9. A commodity discharge apparatus as claimed in claim 1, wherein said endless chain has an upper feed portion, said commodity suspension member being connected to said upper feed portion, said commodity discharge apparatus further comprising a supporting member for vertically supporting said commodity suspension member. 35 40
10. A commodity discharge apparatus as claimed in claim 1, further comprising a casing for covering an upper portion and opposed side portions of said endless chain, said casing having at side wall thereof a part which is releasable from another part of said side wall. 45
11. A commodity discharge apparatus as claimed in claim 1, wherein said endless chain has a lower feed portion, said commodity discharge apparatus further comprising an endless chain supporting member, extending below and parallel with said endless chain, for vertically supporting said lower feed portion. 50 55
12. A commodity discharge apparatus according to claim 11, further comprising a supporting member for vertically supporting said commodity suspension member fitted to said lower feed portion of the endless chain.
13. A commodity discharge apparatus according to claim 1, further comprising an additional commodity suspension member connected to said endless chain for suspending an additional commodity, said a suspension-releasing mechanism being operatively coupled to said additional commodity suspension member to releasing said additional commodity from said additional commodity suspension member at one of ends of said elongated shape, said release enhancement mechanism enhancing said additional commodity to be released from said additional commodity suspension member.

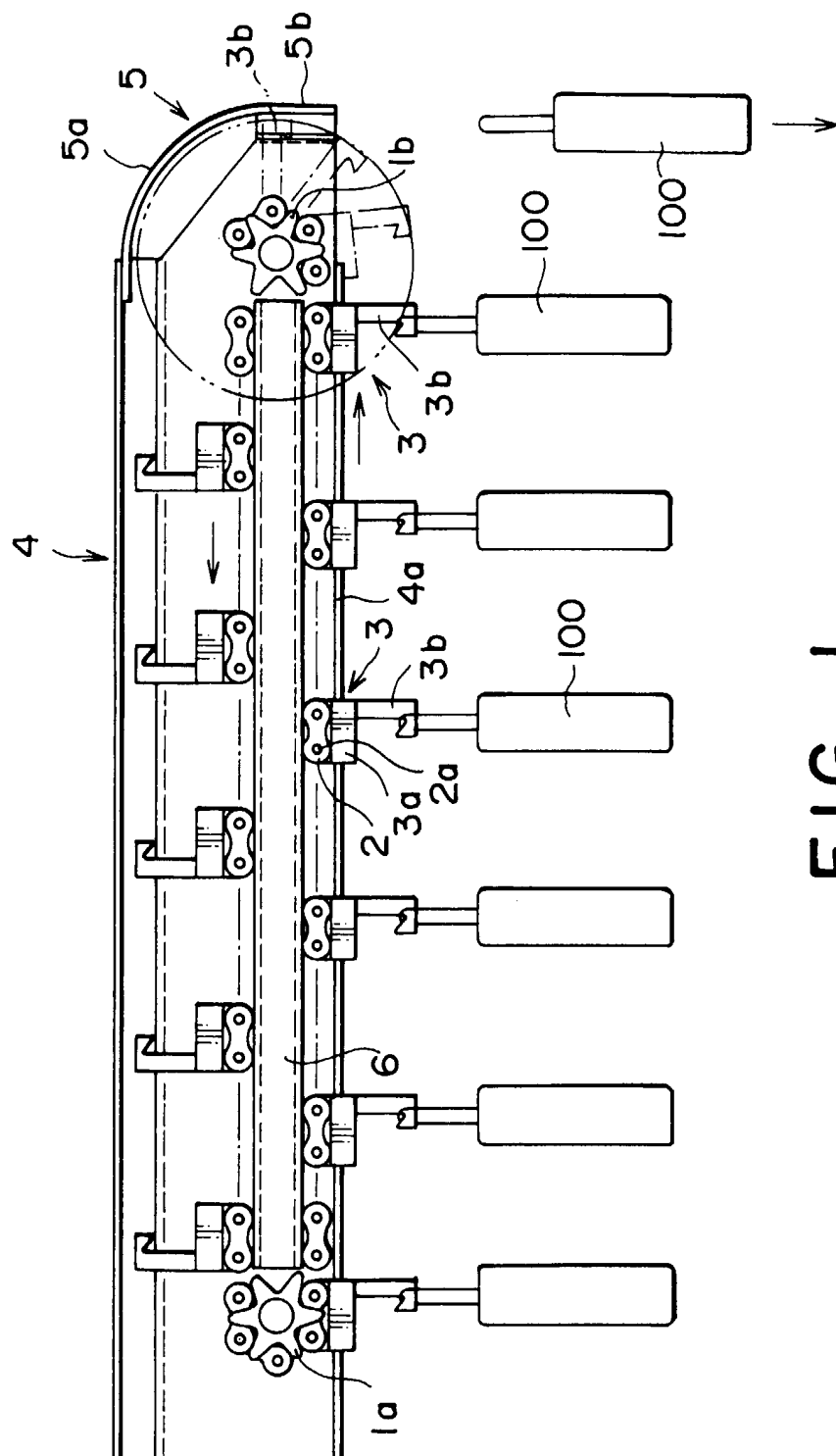


FIG. 1

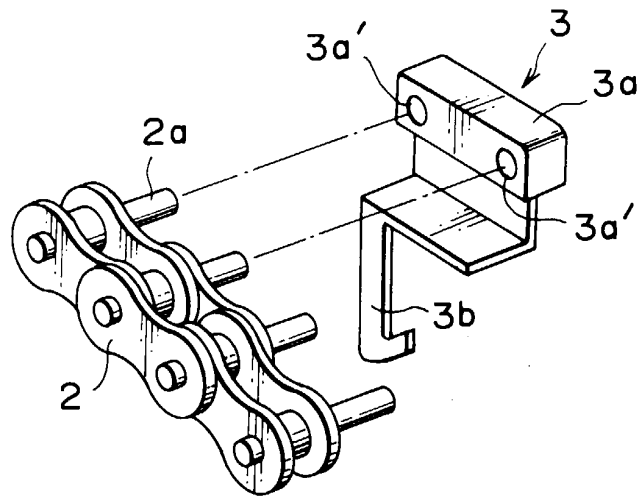


FIG. 2

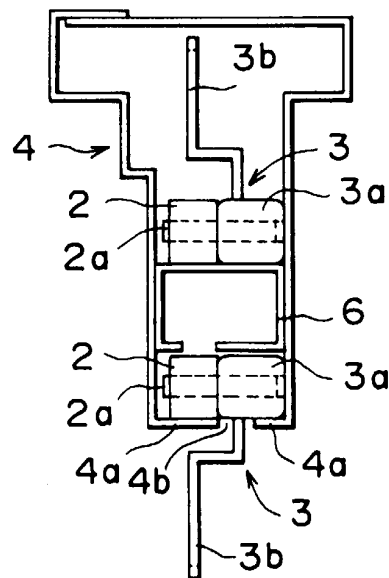


FIG. 3

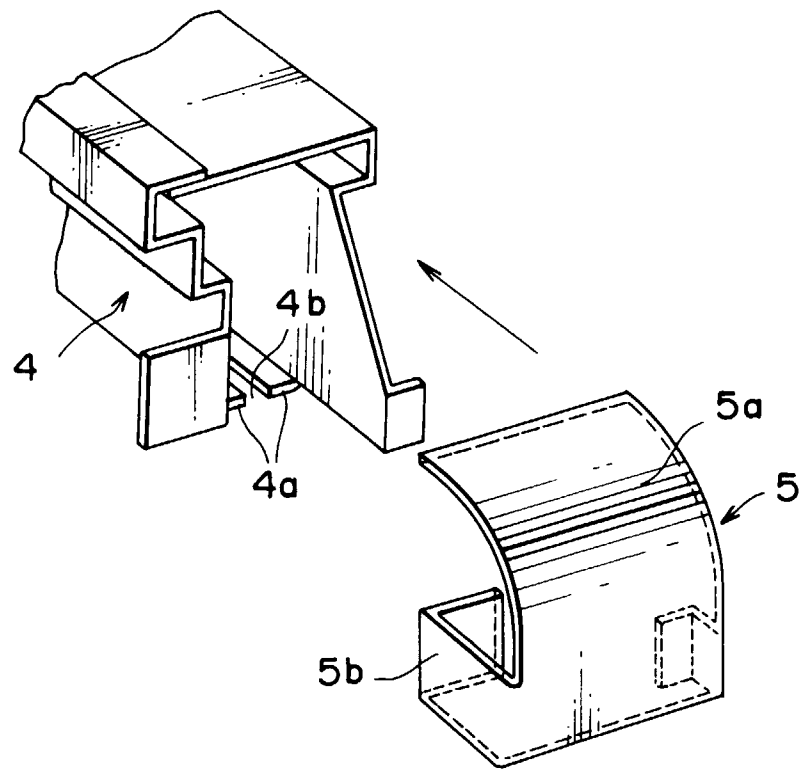


FIG. 4

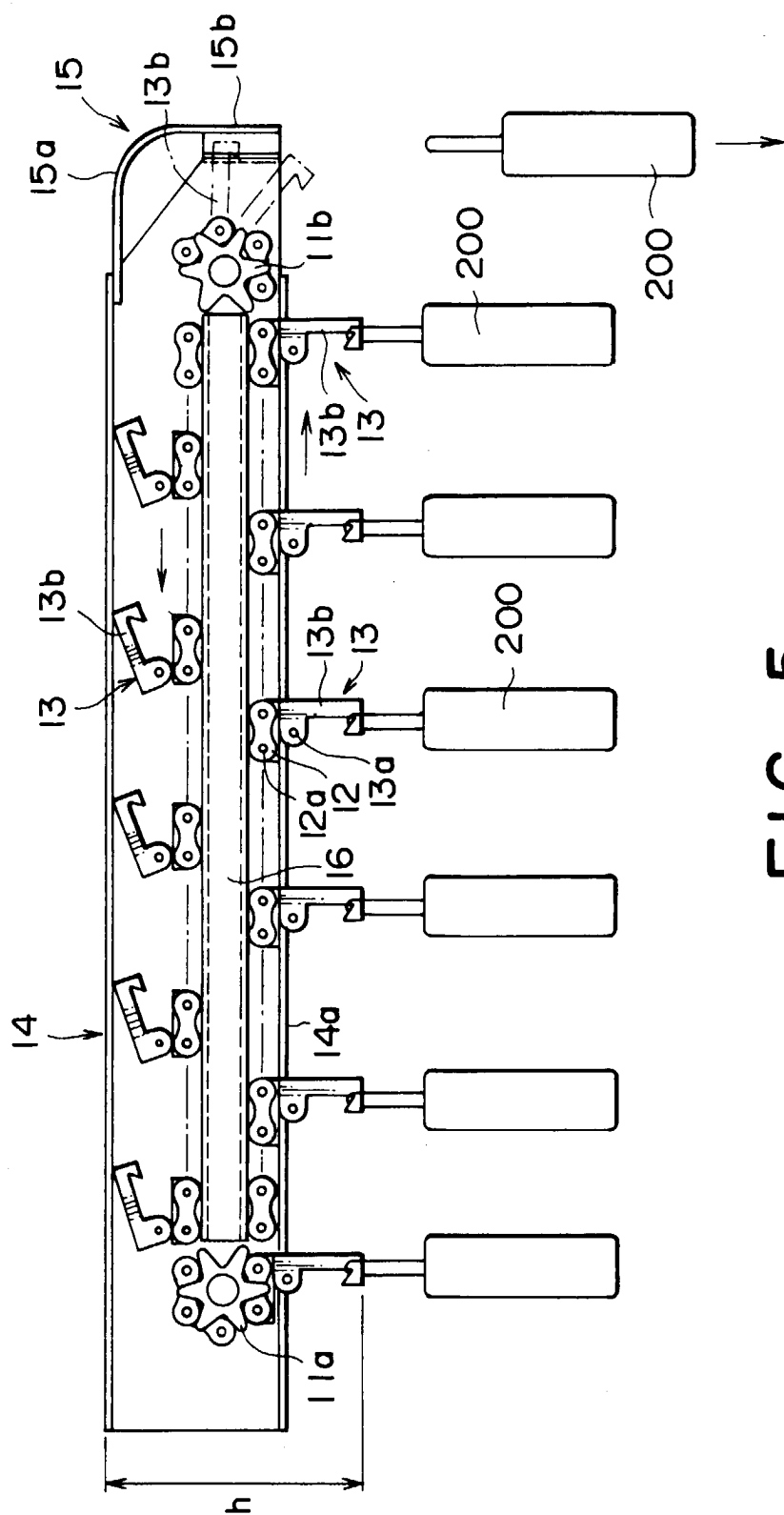


FIG. 5

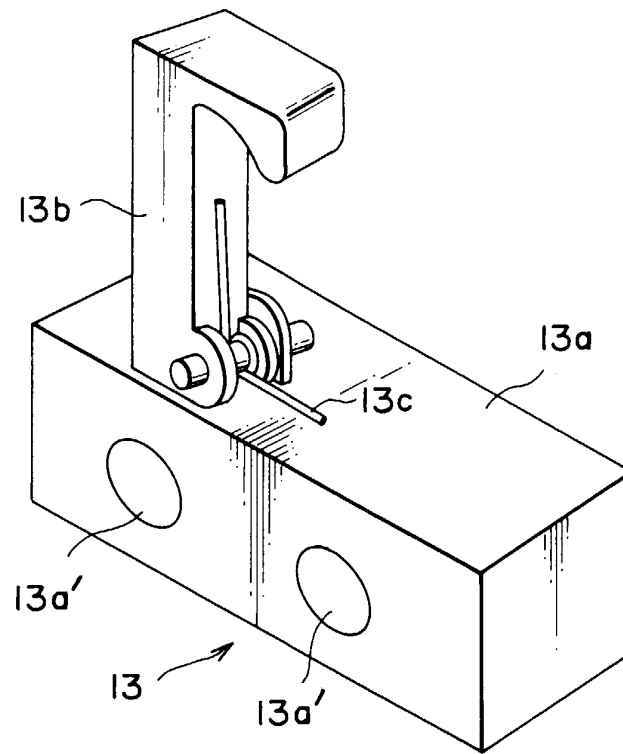


FIG. 6

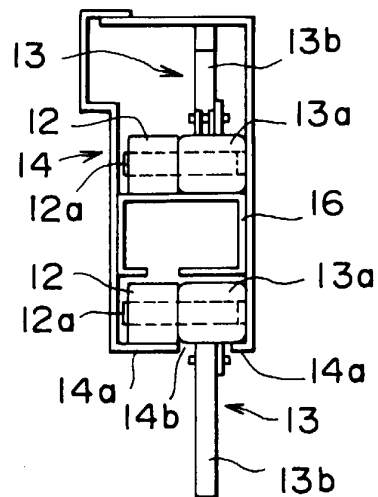


FIG. 7

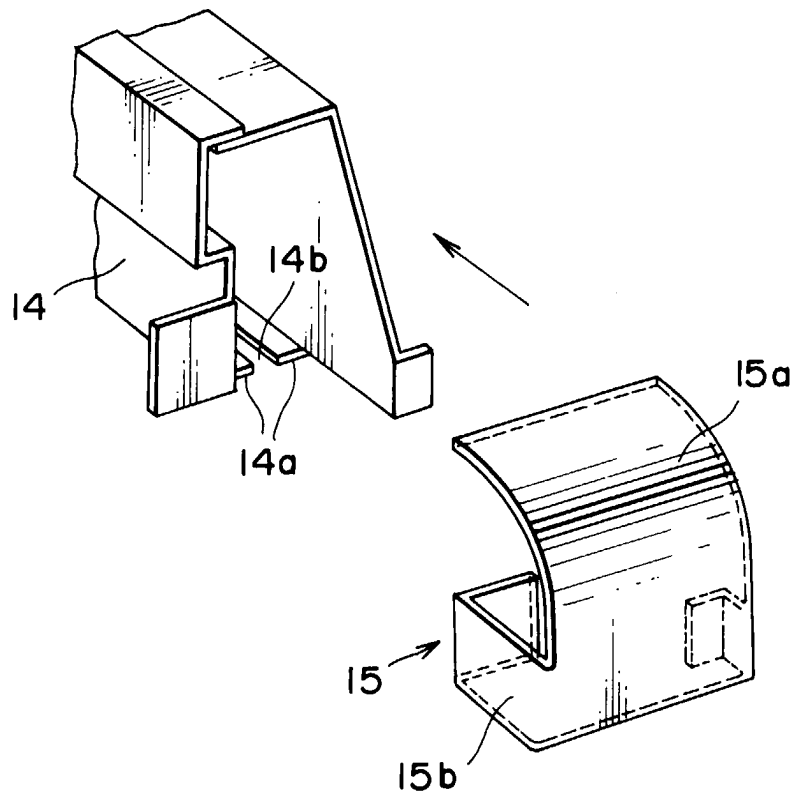


FIG. 8

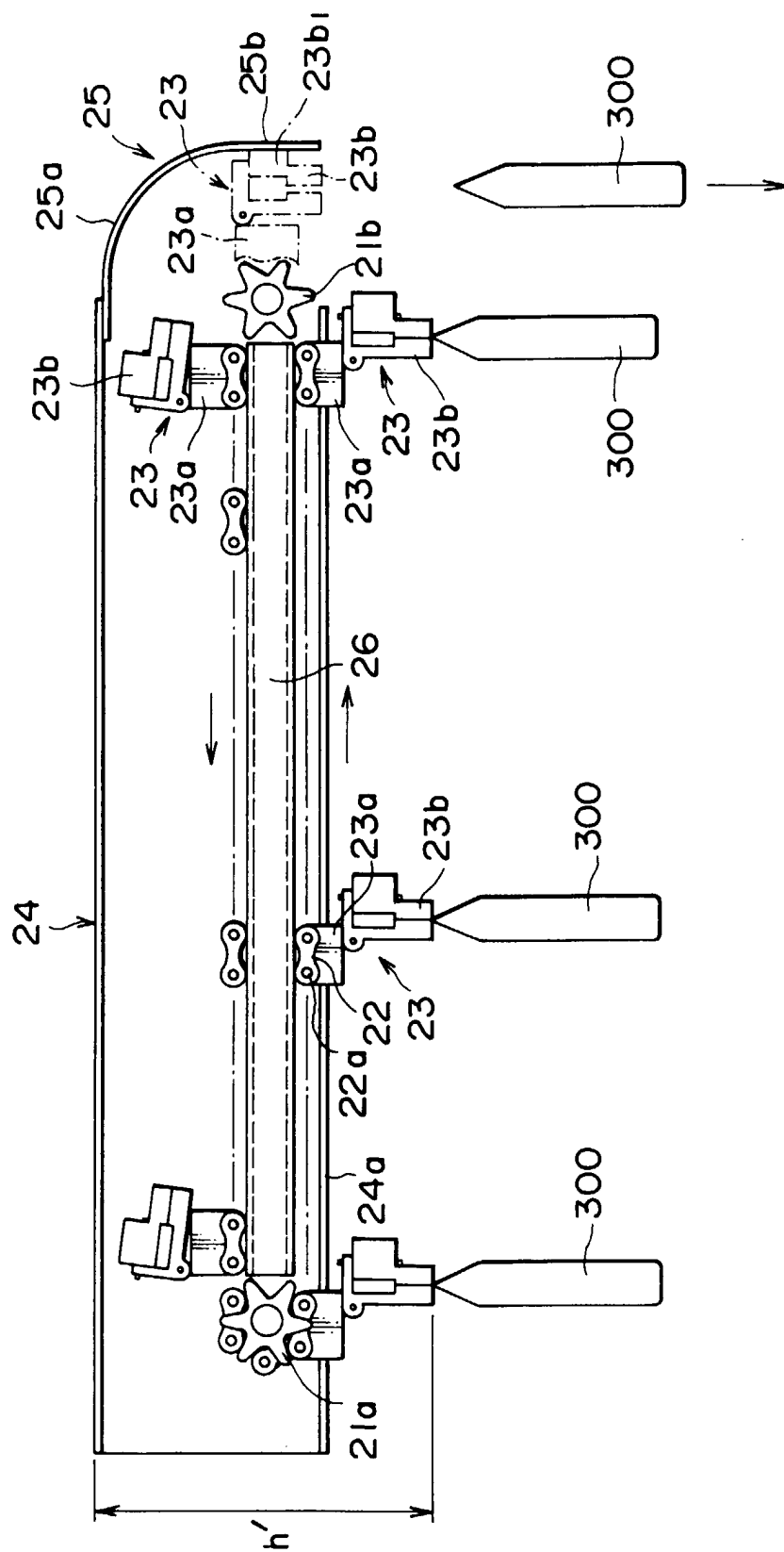


FIG. 9

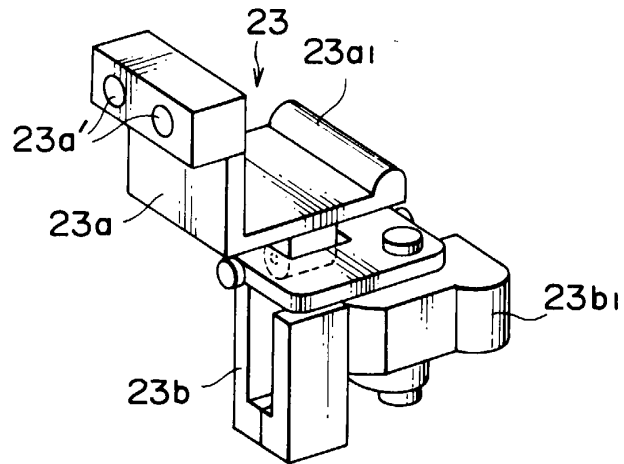


FIG. 10

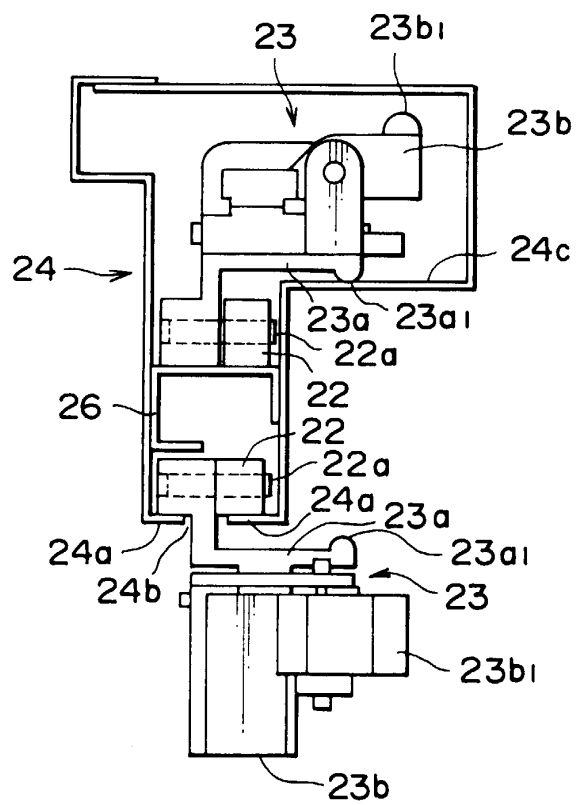


FIG. 11

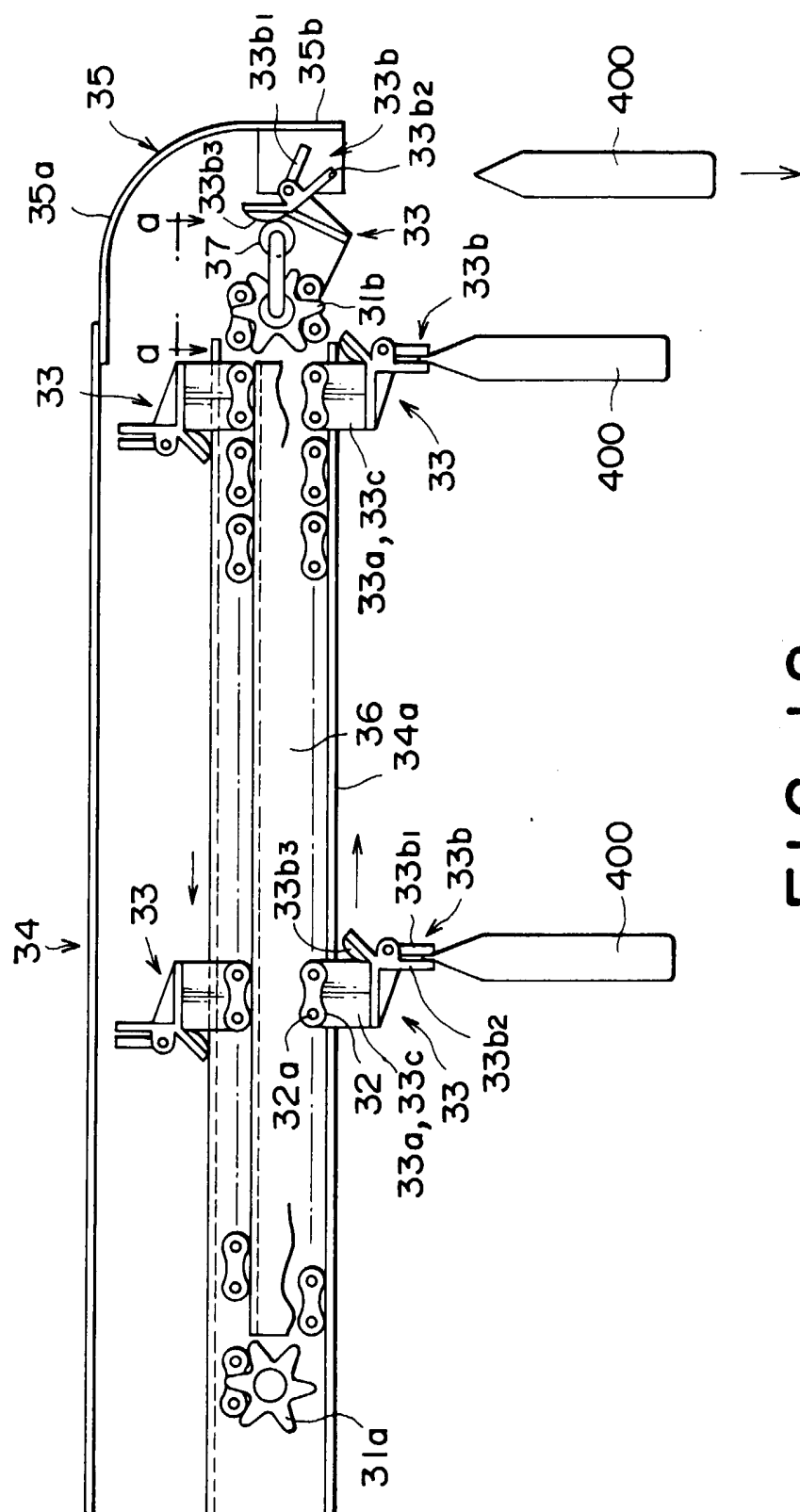


FIG. 12

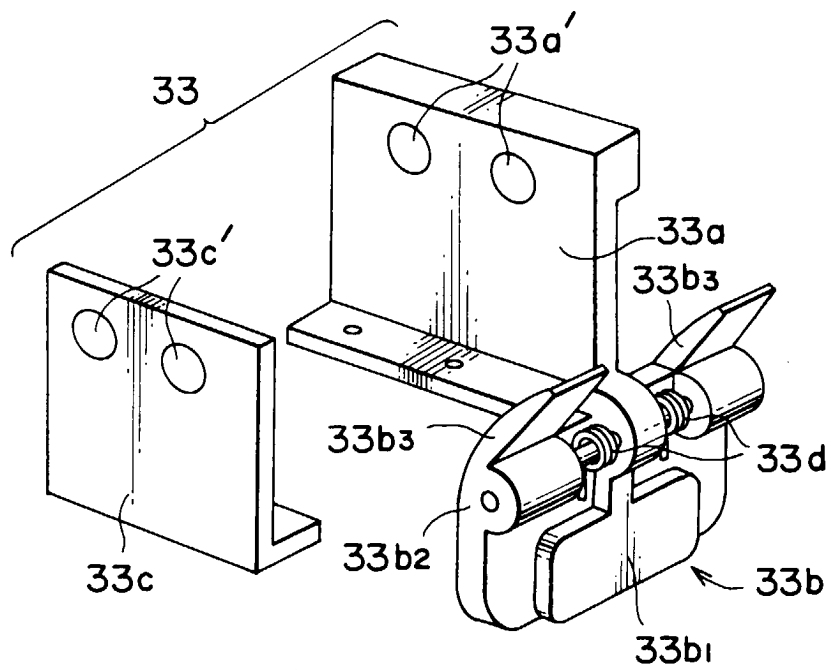


FIG. 13

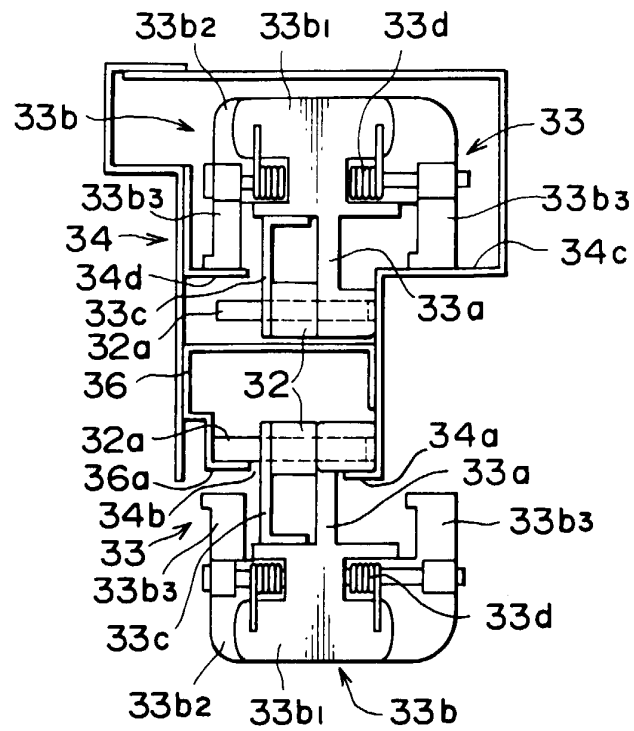


FIG. 14

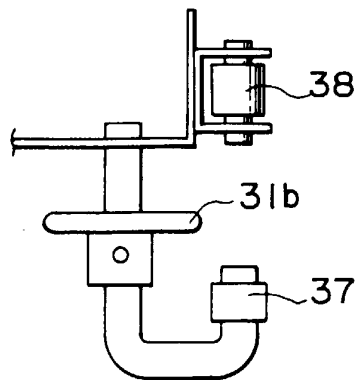


FIG. 15

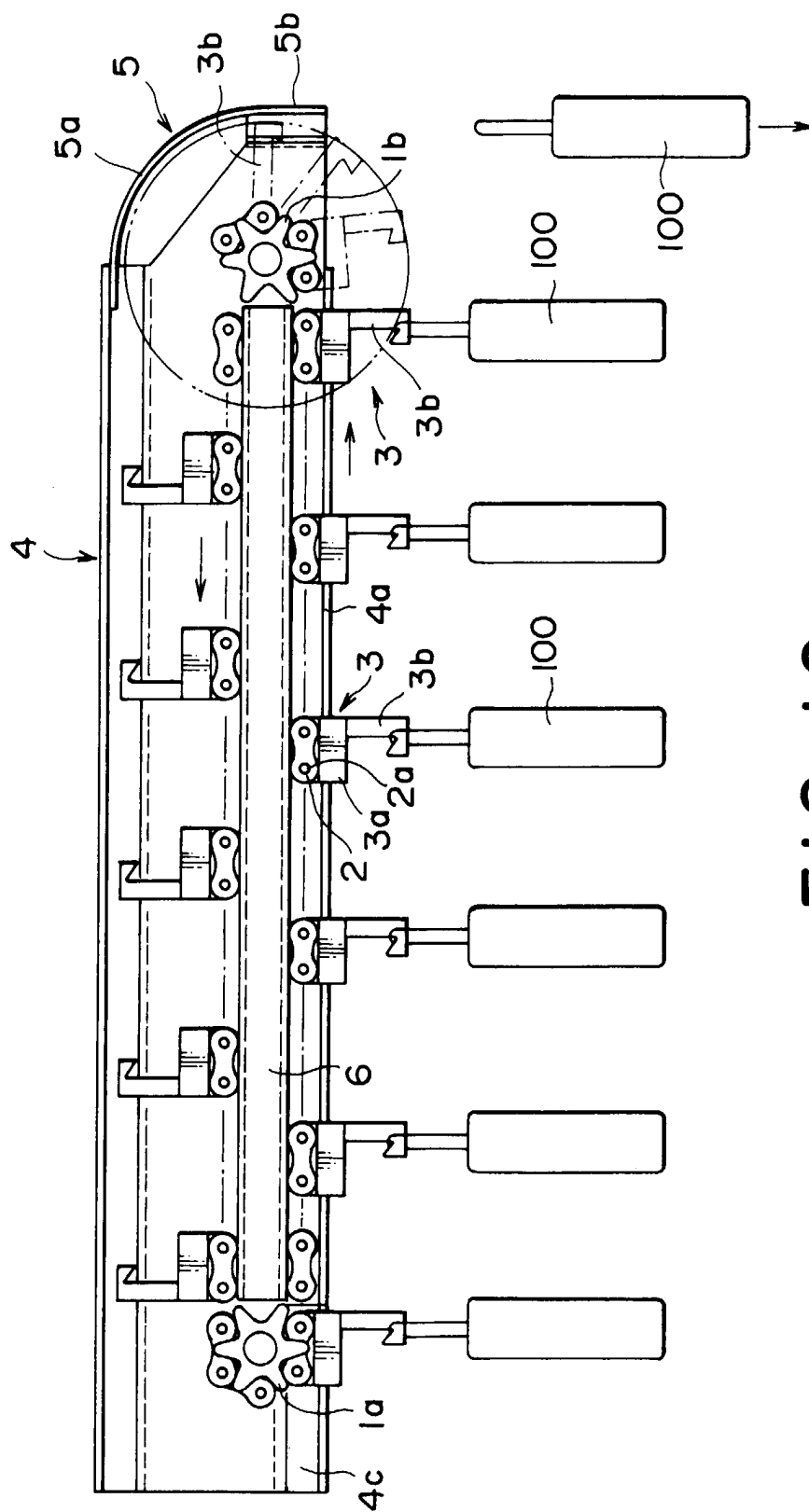


FIG. 16

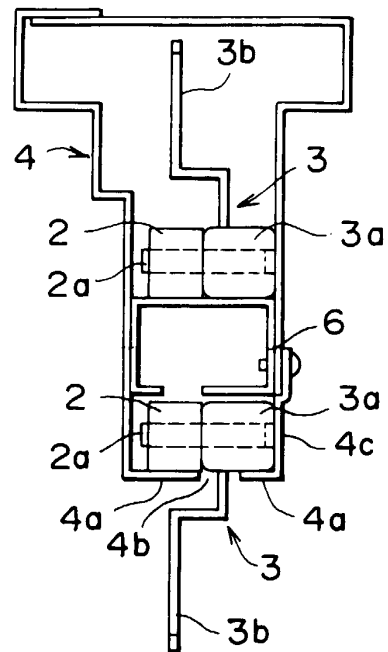


FIG. 17

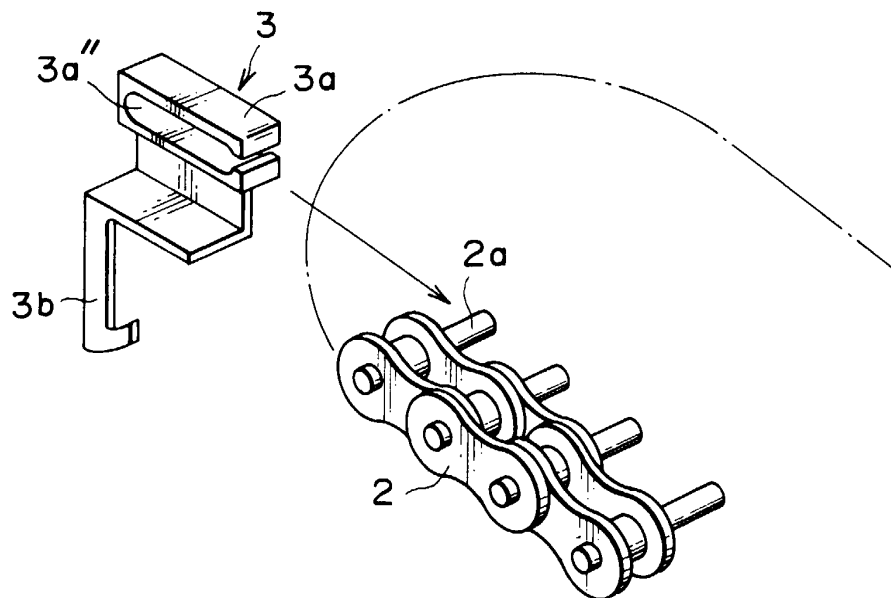


FIG. 18

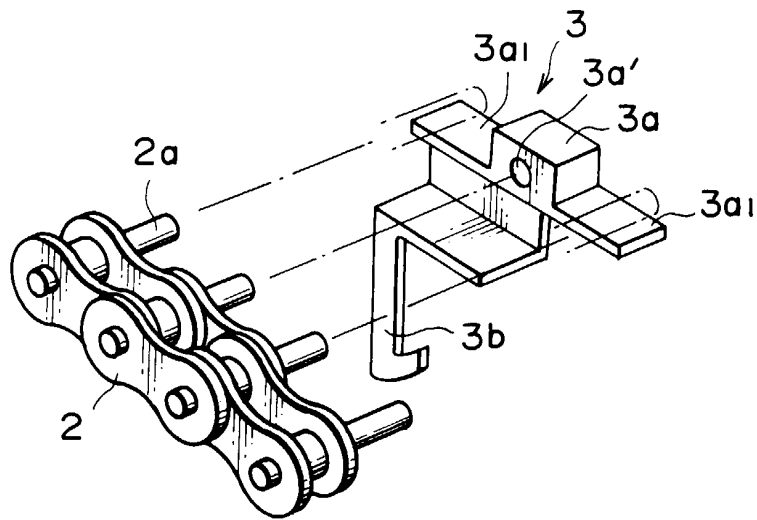


FIG. 19

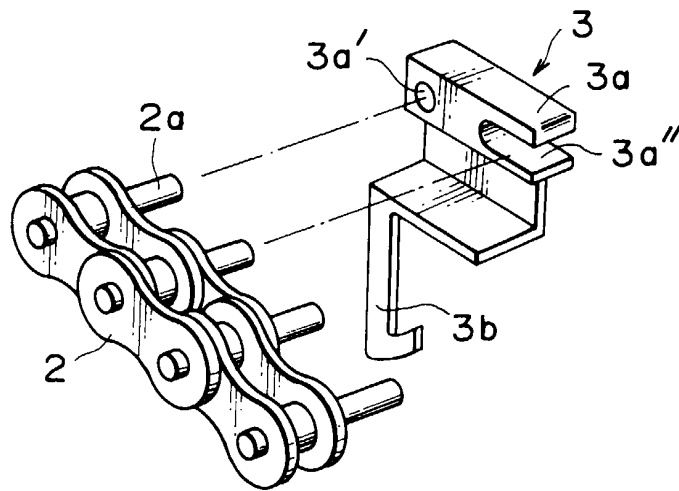


FIG. 20