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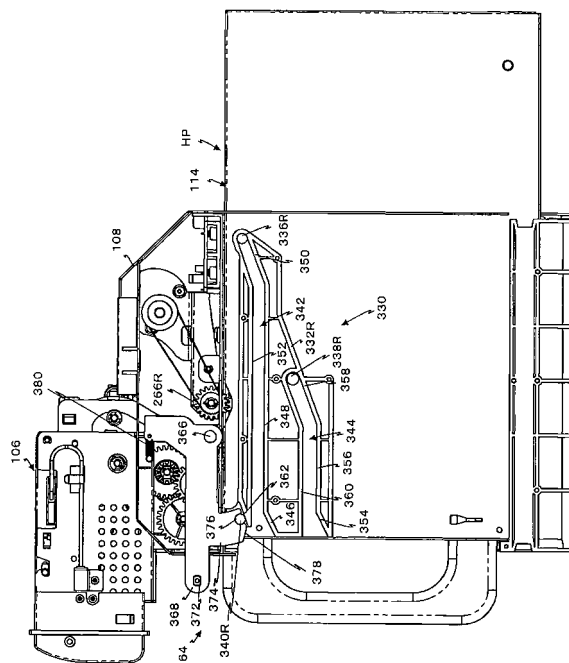
(54) **A banknote stacker**

(57) A first object of the present invention is to provide a bill storage apparatus which does not give a customer chafe and can increase the storage number of bills without introducing unnecessary size increase.

A second object of the present invention is to provide a bill storage apparatus which can increase the storage number of bills without being restricted regarding the arrangement position of the bill storage apparatus and without reinforcing a front face door.

The present invention is a bill storage apparatus including a bill discriminating apparatus which performs discrimination about real/false of bills received, and a bill storage box housing therein a stack apparatus moving real bills sent from the bill discriminating apparatus to a storing section and stacking bills moved by the stack apparatus in a stacking state, where the bill discriminating apparatus and a driving apparatus of the stack apparatus are attached to a frame, and the bill storage box is mounted on the frame attachably and detachably and the driving apparatus and a to-be-driven apparatus on the side of the bill storage box are drive-coupled to each other, thereby transmitting driving force to the stack apparatus, wherein the frame is formed in a gate shape and has a mounting hole extending through the frame in the same direction as a bill insertion direction of the bill discriminating apparatus, and the bill storage box is inserted in the mounting hole from the bill insertion direction so that the driving apparatus and the to-be-driven apparatus are drive-coupled to each other and the bill storage box is fixed in a state that the bill storage box has penetrated the mounting hole.

Fig. 10



Description

[0001] The present invention relates to a bill storage apparatus housed in an automatic vending machine or the like. Particularly, the present invention relates to a bill storage apparatus which performs discrimination about real/false of bills which have been inserted in the bill storage apparatus and, when a bill is a real bill, stores the same in a storage box but, when a bill is a false bill, returns the same, where the amount of stored bills can be increased easily.

[0002] Incidentally, the bill includes not only a bill which is currency but also a gift certificate, a coupon ticket, and the like.

[0003] As a first conventional art, a bill moving apparatus in a bill storage apparatus filed by the present applicant has been known (see Patent Document 1).

[0004] An outline of the bill storage apparatus will be explained with reference to FIG. 13.

[0005] A bill discriminating apparatus 2 is disposed on a frame 1, and a bill storage box 4 is housed in the frame 1 positioned below the bill discriminating apparatus 2.

[0006] A stack apparatus 6 is housed behind the bill storage box 4 and bills BN are conveyed from the bill discriminating apparatus 2 to the stack apparatus 6 by a conveying apparatus 8. After bills BN which have been discriminated to be real bills by the bill discriminating apparatus 2 are fed backward by a conveying apparatus 8 to be fed in the stack apparatus 6 housed in the bill storage box 4, they are stored in a storing portion 10 of the bill storage box 4 by the stack apparatus 6 and they are sandwiched between the stacking apparatus 6 and a pressing plate 14 biased toward the stacking apparatus 6 by a spring 12 to be stacked toward an insertion side of bills BN.

[0007] In the first conventional art, since the bills BN are stacked forward, a bill storage amount of the bill storage box 4 is determined depending on the position of the stack apparatus 6.

[0008] Incidentally, the bill storage box 4 can be carried out by a handle 16 fixed to an end face positioned on the side of the bill discriminating apparatus 2.

[0009] In a second conventional apparatus, a bill storage apparatus is installed on a right end portion of a front face door of an automatic vending machine or the like (Patent Document 2).

[0010] In explanation of an outline of the second conventional art with reference to FIG. 14, a bill storage apparatus 26 is installed on a back face of a front face door 24 of a main body case 22 of an automatic vending machine 20.

[0011] The bill storage apparatus 26 is configured such that a bill discriminating apparatus 30 is fixed on an upper portion of a frame 28, a stack driving apparatus 32 is disposed at a position adjacent to the frame 28 positioned below the bill discriminating apparatus 30, and a bill storage box 36 housing a stack apparatus 34 therein is installed on the frame 28 so as to face the stack driving

apparatus 32 attachably and detachably.

[0012] Bills BN which have been determined to be real bills by the bill discriminating apparatus 30 are fed in the stack apparatus 34 in the bill storage box 30 below the bill discriminating apparatus 30, they are stored in a storing section 38 of the bill storage box 36 according to activation of the stack driving apparatus 32, and they are sandwiched between the stack apparatus 34 and a pressing plate 42 biased toward the side of the stack apparatus 34 by a spring 40 to be stacked to backward of the bill storage apparatus 26 (Patent Document 3).

[0013] [Patent Document 1] JPA-2004-295868 (FIGS. 10 to 17, Paragraph Nos. 0051 to 0103)

[0014] [Patent Document 2] JPA-2001-101502 (FIG. 1, Paragraph Nos. 0016 to 0019)

[0015] [Patent Document 3] JPA-2002-133488 (FIGS. 1 to 6, Paragraph Nos. 0013 to 0027)

[0016] In the first conventional art, since the position of the stack apparatus 6 is determined depending on the maximum storage number of bills BN and a bill route from the bill discriminating apparatus 2 to the stack apparatus 6 becomes long so that a time from bill reception to bill storage is required, a customer feels excessive slowness and the first conventional art cannot be adopted readily.

[0017] Even if the bill storage number is small, the stack apparatus 6 is disposed at the position of the maximum storage number so that such a problem arises that the bill storage apparatus itself is increased in size unnecessarily.

[0018] In the second conventional apparatus, the bill storage box 36 stores bills BN behind the stack apparatus 34 in a stacked state.

[0019] Therefore, when the bill storage apparatus 26 is fixed to a back face of the front face door 24 of the automatic vending machine, the bill storage apparatus 26 must be disposed so as not to interfere with the main body case 22 when the front face door 24 is opened and closed.

[0020] In the second conventional art, when the storage number of the bill storage box 36 is increased, a projecting amount from the front face door 24 backward increases (represented by a reference numeral 26L in FIG. 14).

[0021] Since the front face door 24 is opened and closed according to pivoting movement, when the front face door 24 is opened and closed, a rear end of the bill storage box 26L interferes with the main body case 22 at an original mounting position of the bill storage apparatus 26.

[0022] In order to avoid the interference, the mounting position of the bill storage apparatus 26 to the front face door 24 must be arranged nearer the center, which results in such a problem that the arrangement is restricted.

[0023] Since the weight of the bill storage apparatus 26 also increases according to increase of the bill storage number, the front face door 24 must be reinforced in order to prevent deformation thereof, which results in such a problem as increase of cost.

[0024] A first object of the present invention is to provide a bill storage apparatus which can increase the storage number of bills without giving a customer excessive slowness and without causing unnecessary growth in size.

[0025] A second object of the present invention is to provide a bill storage apparatus which can increase the storage number of bills without being restricted regarding an arrangement position of the bill storage apparatus and without reinforcing the front face door.

[0026] This object is solved by the features of claim 1. Further developments are subject-matters of the dependent claims.

[0027] In order to achieve the above objects, the present invention has been configured as described below.

[0028] The present invention is a bill storage apparatus including a bill discriminating apparatus which performs discrimination about real/false of bills received, and a bill storage box housing therein a stack apparatus moving real bills sent from the bill discriminating apparatus to a storing section and stacking bills moved by the stack apparatus in a stacking state, where a driving apparatus of the stack apparatus is attached to a frame, and the bill storage box is mounted on the frame attachably and detachably and the driving apparatus and a to-be-driven apparatus on the side of the bill storage box are drive-coupled to each other, thereby transmitting driving force to the stack apparatus, wherein the frame is formed in a gate shape and has a mounting hole extending through the frame in the same direction as a bill insertion direction of the bill discriminating apparatus, and the bill storage box is inserted in the mounting hole from the bill insertion direction so that the driving apparatus and the to-be-driven apparatus are drive-coupled to each other and the bill storage box is fixed in a state that the bill storage box has penetrated the mounting hole.

[0029] The invention described in claim 2 is the bill storage apparatus according to claim 1, wherein the driving apparatus and the to-be-driven apparatus are drive-coupled by gears connection, and the bill storage box is gear-connected after the bill storage box is moved horizontally by a guide apparatus configured in the frame.

[0030] In the bill storage apparatus described in claim 1, the bill storage box extends through the mounting hole to be mounted to the frame.

[0031] Bills are discriminated regarding their real or false and real bills are supplied to the stack apparatus below the bill discriminating apparatus.

[0032] Thereafter, the bills are moved toward the insertion direction of bills to be stored in the storing chamber of the bill storage box.

[0033] Thereby, since the stack apparatus is positioned below the bill discriminating apparatus, a distance from the bill discriminating apparatus to the stack apparatus is short and a storing time is short, so that there is such a merit that a customer is not given chafe.

[0034] Since bills are sequentially stacked backward

from the side of the bill discriminating apparatus into the storing portion, the bill storage box can be formed to have a size corresponding to the bill storage number, so that the bill discriminating apparatus is not increased in size beyond necessity

[0035] Further, since the bill storage box is not attached to the front face door, there is such a merit that it is unnecessary to reinforce the front face door, an installation position based upon the bill storage apparatus is not subjected to restriction, and it is further unnecessary to reinforce the front face door.

[0036] In the invention described in claim 2, the bill storage box is guided by the guide apparatus attached to the frame.

[0037] When the bill storage box is guided by the horizontal portion of the guide apparatus, a to-be-driven gear is moved in a state that it is spaced from a driving gear, and the driving gear and the to-be-driven gear are caused to mesh with each other just before they are positioned at a predetermined mounting position so that they mesh with each other in a state suitable for gear driving.

[0038] Thereby, there is a merit that gear driving where transmission efficiency of driving force to the stack apparatus is high can be used.

[0039] The present invention is a bill storage apparatus including a bill discriminating apparatus which performs discrimination about real/false of bills received, and a bill storage box housing therein a stack apparatus moving real bills sent from the bill discriminating apparatus to a storing section and stacking bills moved by the stack apparatus in a stacking state, where a driving apparatus of the stack apparatus is attached to a frame, and the bill storage box is mounted on the frame attachably and detachably and the driving apparatus and a to-be-driven apparatus on the side of the bill storage box are drive-coupled to each other, thereby transmitting driving force to the stack apparatus, wherein the frame is formed in a gate shape and has a mounting hole extending through the frame in the same direction as a bill insertion direction of the bill discriminating apparatus, the driving apparatus and the to-be-driven apparatus are drive-coupled to each other by inserting the bill storage box in the mounting hole from the bill insertion direction and are fixed in a state that the bill storage box has penetrated the mounting hole, the driving apparatus and the to-be-driven apparatus are drive-coupled by gears connection, and the bill storage box is gear-connected after the bill storage box is moved horizontally by a guide apparatus configured in the frame.

FIG. 1 is a perspective view of a state that a front face door of an automatic vending machine on which a bill storage apparatus according to an embodiment of the present invention has been mounted has been opened;

FIG. 2 is a perspective view showing a state that a bill storage box relating to the bill storage apparatus according to the embodiment of the present inven-

tion has been taken out from a bill receiving apparatus;

FIG. 3 is a perspective view of the bill storage box according to the embodiment of the present invention;

FIG. 4 is a partially sectioned side view of a state that the bill storage box according to the embodiment of the present invention has been mounted on the bill receiving apparatus;

FIG. 5 is a vertically sectioned side view of a state that the bill storage box according to the embodiment of the present invention has been mounted on the bill receiving apparatus;

FIG. 6 is a perspective view of a state that a cover of the bill storage box according to the embodiment of the present invention has been removed, as viewed from right and front above;

FIG. 7 is a perspective view of a state that the cover of the bill storage box according to the embodiment of the present invention has been removed, as viewed from left and front above;

FIG. 8 is a cross sectional view of the bill storage box according to the embodiment of the present invention, taken along plane P in FIG. 2;

FIG. 9 is an explanatory view of halfway of mounting the bill storage box according to the embodiment of the present invention on a frame;

FIG. 10 is an explanatory view of a state that the bill storage box according to the embodiment of the present invention has been mounted on the frame; FIG. 11 is a block diagram of a control apparatus of the bill storage apparatus according to the embodiment of the present invention; and

FIG. 12 is a flowchart for actuation explanation of the bill storage apparatus according to the embodiment of the present invention.

FIG. 13 is a schematic view for explanation of a first conventional art; and

FIG. 14 is a schematic view for explanation of a second conventional art.

[0040] As shown in FIG. 1, a bill receiving apparatus 100 is fixed on an intermediate partition plate 105 of a box-shaped casing 104 of an automatic vending machine 102.

[0041] As shown in FIG. 2, in the bill receiving apparatus 100, a rectangular ring-shaped frame 108 is fixed on the intermediate partition plate 105, a bill discriminating apparatus 106 is disposed on a front and upper portion of the rectangular ring-shaped frame 108, and a bill storage box 114 is inserted in a mounting hole 112 of the frame 108 positioned below the bill discriminating apparatus 106 to be locked by a lock apparatus 116.

[0042] A front face door 118 of the automatic vending machine 102 is mounted on a left side of the casing 104 such that a left end thereof can perform a pivoting motion and when the front face door 118 is closed, a bill guide 124 of the bill discriminating apparatus 106 projects from

an opening 125 of the front face door 118.

[0043] Next, the bill receiving apparatus 100 will be explained with reference to FIG. 2 and FIG. 5.

[0044] The bill receiving apparatus 100 includes the bill discriminating apparatus 106, the frame 108, and a bill storage box 114.

[0045] First, the bill discriminating apparatus 106 will be explained with reference to FIG. 2 and FIG. 5.

[0046] The bill discriminating apparatus 106 has a function of discriminating real/false and money kind of a bill BN inserted in a bill insertion slot 122 to feed a real bill into the bill storage box 114 and return a false bill back to the insertion slot 122.

[0047] The bill discriminating apparatus 106 includes a conveying apparatus 128 conveying a bill BN inserted into the horizontally long bill insertion slot 122 along a bill guide 124 toward an outlet 126 or the bill insertion slot 122 and a bill feature acquiring apparatus 132 acquiring a feature of a bill BN optically or the like.

[0048] The conveying apparatus 128 comprising a belt and the like is driven in a pulling-in direction or in a returning direction by a first electric motor 134 selectively rotated forwardly or reversely.

[0049] A bill BN inserted into the insertion slot 122 is detected by a sensor (not shown) so that the conveying apparatus 128 is driven in the pulling-in direction.

[0050] Thereby, the bill BN is transported through a bill passage 136 to pass through the bill feature detecting apparatus 132.

[0051] Determination about real/false and money kind of a bill BN is performed based upon bill feature acquired by the bill feature acquiring apparatus 132 is performed, and when the bill is a real bill, it is pulled in as it is and it is stored in the bill storage box 114, but when the bill is a false bill, the conveying apparatus 128 is driven reversely by reverse rotation of the first electric motor 134 so that the bill BN is returned back to the insertion slot 122.

[0052] Next, the frame 108 will be explained with reference to FIG. 2 and FIG. 5.

[0053] The frame 108 has a function of attaching the bill storage box 114 attachably and detachably and holding the bill discriminating apparatus 106 at a predetermined position.

[0054] The frame 108 is a rectangular casing having a mounting laterally-facing hole 112 extending in an insertion direction of a bill BN at a central portion thereof.

[0055] The bill discriminating apparatus 106 and a bill guiding body 138 are fixed on an upper face of the frame 108, where a bill BN is guided in an arc by the bill guiding body 138 between the outlet 126 of the bill discriminating apparatus 106 and a receiving slot 142 of the bill storage box 114.

[0056] Next, the bill storage box 114 will be explained with reference to FIGS. 2 to 8.

[0057] The bill storage box 114 has a function of receiving bills BN which have been determined to be real at the bill discriminating apparatus 106 to store them in

a stacking state.

[0058] As shown in FIGS. 2 and 3, the bill storage box 114 has a box shape as a whole and it is configured by covering an outside of a chassis 144 made of a sheet metal with a box-shaped cover 146.

[0059] Next, a structure of the chassis 114 will be explained with reference to FIG. 6 and FIG. 7.

[0060] Incidentally, since FIG. 6 is a view as seen from a left direction, left and right in explanation is opposite to left and right in FIG. 7.

[0061] A right side wall 148 and a left side wall 152 are provided from both side end portions of a plate-shaped base 154 in a stood manner (they stand in a longitudinal direction in FIGS. 3, 6, and 7 for the sake of convenience but they are caused to fall sideways in use, as shown in FIG. 2).

[0062] A right top panel 156 and a left top panel 158 extend from the right side wall 148 and the left side wall 152 in parallel with the base 154 so as to face to each other, and a space 160 is formed between distal ends of the right top panel 156 and the left top panel 158.

[0063] A pulling-in apparatus 162 for pulling bills BN in, a stacker apparatus 165 for moving pulled-in bills BN to the storing portion 164, and a pressing apparatus 168 for holding the bills BN in the storing portion 164 are disposed in the space 160 surrounded by the base 154, the right side wall 148, the left side wall 152, and the right top panel 156 and the left top panel 158.

[0064] A to-be-driven apparatus 172 for driving the stack apparatus 165, specifically, a right to-be-driven apparatus 172R and a left to-be-driven apparatus 172L are disposed in a thin right to-be-driven apparatus space 170R and a thin left to-be-driven apparatus space 170L between the chassis 144 and the cover 146.

[0065] Either one of the right to-be-driven apparatus space 170R or the left to-be-driven apparatus space 170L can be provided.

[0066] Next, the cover 146 will be explained with reference to FIG. 2 and FIG. 8.

[0067] The cover 146 is made of a sheet metal, it is formed in a box shape as a whole, and the abovementioned chassis 144, pulling-in apparatus 162, stack apparatus 165, right to-be-driven apparatus 172R and left to-be-driven apparatus 172L are densely inserted in an internal space of the cover 146.

[0068] Next, the pulling-in apparatus 162 will be explained with reference to FIG. 6 to FIG. 8.

[0069] The pulling-in apparatus 162 has a function of pulling a bill BN fed out from the bill guiding body 138 into the bill storage box 114, specifically, the stack apparatus 165.

[0070] In the space 160, one end portion of a rectangular plate-shaped supporter 174 is fixed to the right top panel 156 and the left top panel 158.

[0071] The other end portion of the supporter 174 extends on the side of the storing portion 164 and the pulling-in apparatus 162 is attached to the other end portion.

[0072] The pulling-in apparatus 162 includes a pulley

apparatus 176 and a conveying body 178.

[0073] The pulley apparatus 176 includes a shaft 180 rotatably supported by the supporter 174 and a geared pulley 182 fixed to an end portion of the shaft 180.

5 **[0074]** However, the geared pulley 182 may be replaced by an ordinary grooved pulley or the like.

[0075] A plurality of units, five units in this embodiment, of the pulley apparatuses 176 is disposed along a longitudinal direction of the supporter 174.

10 **[0076]** A conveying body 178 is wound about the pulleys 182 at the both ends, and the pulleys 182 positioned in an intermediate portion restrict movement of the conveying body 178 such that the conveying body 178 maintains contacting with a bill BN.

15 **[0077]** Accordingly, when a bill BN can be conveyed reliably, the pulley apparatuses 176 in the intermediate portion may not be disposed.

[0078] The pulley apparatus 176 at one end portion is positioned near a slit-like receiving slot 142 positioned at a side wall 163 of the bill storage box 114, as shown in FIG. 5, and a shaft 184 to which the pulley 182 has been fixed extends in the right driving apparatus space 170R and a to-be-driven gear 186 is fixed to an end portion of the shaft 184, as shown in FIG. 8.

25 **[0079]** The shaft 184 is attached to a T-shaped bracket 185 made from resin and fixed to an end face of the supporter 174.

[0080] Since the bracket 185 is made from resin, it has predetermined elastic force, and when the shaft 184, in other words, the to-be-driven gear 186 can perform run-out action due to flexion of a neck portion 187 of the bracket 185 when a tooth tip of the gear 186 is opposed to a tooth chip of a driving gear.

30 **[0081]** As shown in FIG. 4, the to-be-driven gear 186 is drive-coupled to a driving gear 188 driven by the first electric motor for driving 134 of the convey apparatus 128 of the bill discrimination apparatus 106 via a transmission mechanism 190.

35 **[0082]** The conveying body 178 is a geared belt in the embodiment, but it can be replaced by a member formed in a ring shape from material having flexibility, such as a flat belt or a rope.

40 **[0083]** In other words, the conveying body 178 is only required to have a function of coming in frictional contact with a bill BN to convey the same in one direction.

45 **[0084]** A contacting site of the conveying body 178 with a bill BN is a conveying portion 192.

[0085] A roller 194 is disposed so as to contact with the conveying body 178 wound about the pulley apparatus 176 at the end portion elastically.

50 **[0086]** Accordingly, a real bill BN which has been discriminated by the bill discriminating apparatus 106 is sent to the receiving slot 142 and is nipped between the conveying body 178 and the roller 194 to be sent in a conveying direction of the conveying portion 192.

55 **[0087]** It is preferable that the pulling-in apparatuses 162 are disposed on both sides of the supporter 174 like the embodiment. This is because a frictional force be-

tween a bill BN and the pulling-in apparatuses is increased and frictional force is imparted to the bill BN in a flat manner so that the bill BN can be moved in parallel.

[0088] A temporary storing portion 195 for a bill BN is a position where the bill BN has been pulled in.

[0089] Next, the stack apparatus 165 will be explained with reference to FIG. 8.

[0090] The stack apparatus 165 has a function of moving a bill BN conveyed to the temporary storing portion 195 for a bill to the storing section 164 and it includes the pulling-in apparatus 162 and a moving body 166 in the embodiment.

[0091] First, the moving body 166 will be explained.

[0092] The moving body 166 has a function of moving a bill BN pulled in the bill storage box 114 by the pulling-in apparatus 162 to the storing section 164.

[0093] The moving body 166 includes a right moving body 196 and a left moving body 198 forming a channel shape and positioned laterally from the pulling-in apparatus 162.

[0094] Since the right moving body 196 and the left moving body 198 have the same structure and they are disposed in the space 160 symmetrically regarding the pulling-in apparatus 162, the right moving body 196 is explained on behalf thereof.

[0095] The right moving body 196 is formed in a T shape by a slider portion 199 and a first holding portion 202 positioned at an end portion of the slider portion 199 and extending in a direction orthogonal to the slider portion 199.

[0096] The first holding portion 202 is bent at a right angle to the slider portion 199 to be made approximately parallel to the base 154, in other words, a bill BN pulled in.

[0097] A plate-shaped second holding portion 204 formed from resin is fixed to the slider portion 199 to be spaced by a predetermined distance below the first holding portion 202.

[0098] The right holding portion 206 whose three sides are surrounded by the first holding portion 202, the second holding portion 204, and the slider portion 199 and which has predetermined width and height is configured (see FIG. 8).

[0099] It is preferable that a thickness of the right holding portion 206 is thin in a range allowing smooth movement of a bill BN as much as possible for size reduction of the bill storage box 114.

[0100] The second holding portion 204 is formed to have a predetermined thickness so as not to contact with a bill BN stored at the storing portion 164 when the bill BN is curved by the pulling-in apparatus 162.

[0101] The side of the receiving slot 142 of the second holding portion 204 is formed in an inclined face 208 so as to guide a bill BN to the right holding portion 206 (see FIG. 7).

[0102] A left holding portion 210 is similarly formed on the left moving body 198.

[0103] The slider portion 199 is disposed to be movable in a groove of a guide portion (not shown) fixed on

an inner face of the right side wall 148 and made from resin in a longitudinal direction of the groove (movable in a vertical direction in FIG. 7).

[0104] As shown in FIG. 4, guide pins 212A and 212B projecting outwardly from a left end portion and a right end portion of the slider portion 199 are slidably inserted into elongated holes 214A and 214B formed in the right side wall 148 (the left side wall 152 is also similar to the right side wall 148).

[0105] Accordingly, the right moving body 196 and the left moving body 198 can integrally reciprocate linearly while being guided by the elongated holes 214A and 214B.

[0106] As shown in FIG. 5, when the bill receiving apparatus 100 is in a standby state, the right holding portion 206 and the left holding portion 210 are set to be positioned on an extension of the receiving slot 142.

[0107] Accordingly, in the standby state, the left holding portion 206 and the right holding portion 210 are positioned on a virtual plane 216 extending subsequent to the receiving slot 142 (see FIG. 5), where an end portion of a bill BN conveyed by the pulling-in apparatus 162 is movable.

[0108] As apparent in FIG. 5, since the virtual plane 216 is approximately vertical in the embodiment, such an effect can be obtained that, when a bill BN is moved within the virtual plane 216, it is pulled down by gravity.

[0109] A sensor (not shown) detects that a rear end portion of a bill BN pulled in has passed through the roller 194 and stops the first electric motor 134 to stop conveyance of the bill BN performed by the pulling-in apparatus 162.

[0110] Thereby, the bill BN is temporarily stored in a state that left and right end portions of the bill BN are positioned on the right holding portion 206 and the left holding portion 210.

[0111] The right moving body 196 and the left moving body 198 are movable in a direction perpendicular to the virtual plane 216.

[0112] Thereby, the moving body 166 can move to a storage position approaching the right top panel 156 and the left top panel 158 along the supporter 174 such that an end portion of a bill BN is positioned nearer a bill holding member 222 than a right back face 218 and a left back face 220 of the second holding portion 204.

[0113] Next, the pressing apparatus 168 will be explained with reference to FIG. 7 and FIG. 8.

[0114] The pressing apparatus 168 includes the bill holding member 222 contacting with a bill BN and a biasing body 224 biasing the bill holding member 222 toward the right back face 218 and the left back face 220 of the second holding portion 204.

[0115] The bill holding member 222 is formed in a plate shape and it is disposed to be movable between the left and right slider portions 199.

[0116] One end of the biasing body 224 is fixed to the base 154 and the other end thereof is a spring 226 fixed to the bill holding member 222.

[0117] Biasing force of the biasing body 224 is set so as to decrease a stacking thickness of bills BN for increasing a storing amount of bills BN and hold the bills BN such that buckling of the bills BN stored in the storing portion 164 does not occur and such that, when both end portions of a bill BN nipped between the pulling-in apparatus 162 and a bill BN are moved by the moving body 166, the bill BN is held between the pulling-in apparatus 162 and the stored bill BN.

[0118] In the embodiment, the biasing body 224 is configured by arranging corn-shaped springs 226 in parallel and stacking these springs 226 in two stages via a flat plate-shaped stabilizer 228 interposed between the stages.

[0119] When the storage number has been increased, a stroke of the paper holding member 204 is increased, so that, when two corn-shaped springs arranged in parallel are used, buckling occurs, and the bill BN cannot be held.

[0120] When springs 226 having the same size are arranged in parallel and in two stages, such a merit can be obtained that manufacture can be performed at low cost owing to common use of parts.

[0121] Incidentally, the storing portion 164 is a space enclosed by the right back face 218, the left back face 220, the conveying portion 192, and the bill holding member 222.

[0122] Accordingly, when a bill BN is not stored, the bill holding member 222 comes in contact with the right back face 218 and the left back face 220.

[0123] Next, a structure of the to-be-driven apparatus 172 of the stack apparatus 165 will be explained with reference to FIG. 4 to FIG. 7.

[0124] The to-be-driven apparatus 172 is provided with the left to-be-driven apparatus 172L and the right to-be-driven apparatus 172R attached to the right side wall 148 and the left side wall 152, respectively.

[0125] Since the left to-be-driven apparatus 172L and the right to-be-driven apparatus 172R have the same structure, the right to-be-driven apparatus 172R will be explained on behalf thereof.

[0126] Same portions of the left to-be-driven apparatus 172L are indicated by same numerals attached with symbol R.

[0127] A crank gear 230 is rotatably attached to a fixing shaft 228 projecting from the right side wall 148 to the right to-be-driven apparatus space 170R.

[0128] One end of a con rod 236 serving as a link 234 is rotatably attached to a crank pin 232 projecting from a side face of the crank gear 230, and the other end of the con rod 236 is rotatably attached to a pin 238 projecting from the slider portion 199.

[0129] Thereby, the left holding portion 210 and the right holding portion 206 are positioned at a bill receiving position SP facing the receiving slot 142 near a bottom dead point of the crank pin 232 (position in FIG. 4) according to rotation of the crank gear 230.

[0130] At this time, a projection 243 projecting from the

crank gear 230 is latched by a first stopper 237 at a position where the crank pin 232 is rotated slightly beyond a line L1 connecting a pin 238 and a rotational center of the crank gear 230.

[0131] In other words, the crank pin 232 overruns slightly a bottom dead point which is a dead point to stop.

[0132] The first stopper 237 is fixed to an L-shaped bracket 238 fixed to the right side wall 148.

[0133] With this configuration, when the crank pin 232 is subjected to force acting leftward in FIG. 4 via the con rod 236, torque in a counterclockwise direction acts on the crank gear 230 but the projection 243 is prevented from rotating by the first stopper 237.

[0134] In other words, as described above, since only torque in the counterclockwise direction occurs, even if the moving body 166 is subjected to moving force acting leftward in FIG. 4 from the bill holding member 204 via the bill BN, clockwise torque does not occur, and the moving body 166 keeps a static state.

[0135] Incidentally, by connecting an encoder (not shown) to the crank gear 230 and stopping the crank pin 232 at the bottom dead point (the crank pin 232 is positioned on a line L1) accurately, rotational torque can be prevented from occurring in the crank gear 230 similarly.

[0136] However, by performing latching at a phase excessively rotated slightly beyond the bottom dead point by the first stopper 237 like the embodiment, the crank pin 232 can be prevented from rotating with a simple configuration and such a merit can be obtained that configuration can be achieved inexpensively.

[0137] Since torque generated by the bill holding member 204 when the crank pin 232 stops near the bottom dead point is extremely small, such a case that the torque does not exceed static force obtained by combining a second electric motor 254 and rotational resistance of reduction gears or a short brake of the second electric motor 254 can occur.

[0138] In other words, when the crank pin 232 is positioned near the bottom dead point, the position of the moving body 166 is not changed by external force.

[0139] When the crank pin 238 is positioned at a top dead point, it is positioned at a bill storage position most spaced from the conveying body 178.

[0140] At this time, the con rod 236 is latched by the second stopper 242 fixed to the left side wall 152.

[0141] The second stopper 242 is fixed to an L-shaped bracket 244 fixed to the left side wall 152.

[0142] Thereby, the crank pin 232 is prevented from rotating beyond the top dead point by the second stopper 242.

[0143] The crank gear 230 meshes with gears 248 disposed in the right to-be-driven apparatus space 170R and the left to-be-driven apparatus space 170L, respectively.

[0144] A gear 248R is fixed to an end portion of a rotational shaft 250 rotatably attached to the chassis 144, and a gear 248L fixed to the other end portion meshes with the crank gear 230 of the left to-be-driven apparatus

172L.

[0145] As shown in FIGS. 2 and 3, the respective gears 248R and 248L face openings 251R and 251L obtained by cutting the cover 146 partially, but they do not project from a plane including an end face 146T of the cover 146.

[0146] This is because the gears 248R and 248L are prevented from being damaged due to bump of the gears at a conveying time of the bill storage box 114.

[0147] Next, the driving apparatus 252 will be explained with reference to FIG. 4.

[0148] The driving apparatus 252 fixed on the upper face of the frame 108 has a function of driving the to-be-driven apparatus 172.

[0149] The driving apparatus 252 includes, for example, a geared belt 260 wound on a gear 266 fixed to an output shaft 256 of reduction gears of the second electric motor 254, a rotational shaft 264 rotatably held by the frame 108 via a timing pulley 262, and gears 266R and 266L (not shown) fixed to both end portions of the rotational shaft 264.

[0150] The respective gears 266R and 266L slightly project from an upper face of the mounting hole 112 into the mounting hole 112.

[0151] The to-be-driven gear 168 of the pulling-in apparatus 162 is disposed in an opening 265 provided in parallel with the opening 251R.

[0152] The to-be-driven gear 168 also does not project from a plane including the end face 146T of the cover 146.

[0153] When the bill storage box 114 is positioned at a predetermined position of the frame 108, the respective gears 266R and 266L mesh with the gears 248R and 248L to be drive-coupled with them, respectively.

[0154] As shown in FIG. 5, the rotational shaft 264 is stopped by a stopper 271 which is fixed to one end of a lever 267 rotatably supported by a shaft 265 fixed to the frame 108, is biased such that the gear 266 is projected into the mounting hole 112 by a spring 269, and is one portion of an inner wall face of the frame 108 in a state projected by a predetermined amount.

[0155] Portions of the gears 266R and 266L are positioned in the mounting hole 112.

[0156] In other words, setting is performed such that, when the bill storage box 114 is inserted into the mounting hole 112 and loaded at a predetermined position, the gears 248R and 248L mesh with the gears 266R and 266L, respectively.

[0157] Such a configuration is adopted that, when tooth tips of the gears 248R and 248L and the gears 266R and 266L are opposed to each other, the lever 267 is rotated against biasing force of the spring 269 in a clockwise direction in FIG. 5 so that runout motion can take place.

[0158] In this case, when the gear 266 is slightly rotated according to rotation of the second electric motor 254 and opposition of the tooth tips to each other is cancelled, the gears 248R and 248L and the gears 266R and 266L can mesh with each other by biasing force of the spring 269.

[0159] When the gears 266R and 266L rotate in the clockwise direction, the crank gear 230 is rotated in the clockwise direction in FIG. 4 to move the moving body 166 in a bill storing direction (in a left direction in FIG. 4) and move the same to a storing position.

[0160] Thereafter, the gears 266R and 266L are rotated in the counterclockwise direction and the crank gear 230 is rotated in the counterclockwise direction in FIG. 4 so that the moving body 166 is moved to the receiving position SP.

[0161] The to-be-driven apparatus 172 reciprocates the moving body 166 in a direction perpendicular to the virtual plane 216, in other words, a plane of a bill BN.

[0162] Next, a handle 270 will be explained with reference to FIGS. 2 and 3.

[0163] A gate-shaped handle 270 for the bill storage box 114 conveyance is attached on an outer face of a top plate 252 adjacent to the top panels 156 and 158 (see FIG. 6) of the cover 146.

[0164] As shown in FIG. 4, one end portion of a side wall 272 facing the side wall 163 of the bill storage box 114 is pivotally attached to a shaft 274 fixed to the chassis 144, and the side wall 272 can be opened for taking out bills BN stored in the storing portion 164 by unlocking lock of a locking apparatus 276.

[0165] Next, various detecting apparatuses will be explained.

[0166] First, a receiving position detecting apparatus 280 of the moving body 166 will be explained with reference to FIG. 6.

[0167] The receiving position detecting apparatus 280 includes a receiving position light projecting and receiving portion (not shown), a receiving light guiding body 282, and a receiving position detecting piece 284.

[0168] The receiving position light projecting and receiving portion is attached within the frame 108, and when the bill storage box 114 is loaded on the frame 108, the receiving position light projecting and receiving portion faces a light projecting and receiving face of the receiving light guiding body 282.

[0169] The receiving light guiding body 282 is fixed at an inner face of a side wall 183 coupling the left side wall 152 and the right side wall 148, and the receiving position detecting piece 284 is disposed in the left to-be-driven apparatus space 170L.

[0170] When projection light in the receiving light guiding body 282 is blocked by the receiving position detecting piece 284, the receiving position light projecting and receiving portion outputs a receiving position signal and when projection light is received, the receiving position light projecting and receiving portion outputs non-receiving position signal.

[0171] The receiving light guiding body 282 is formed in a gate shape, and it is fixed to a back face of the side wall 183 by a bracket (not shown) so as to face the receiving position light projecting and receiving portion.

[0172] A light receiving face 288 and a light projecting face 290 of the receiving light guiding body 282 are po-

sitioned so as to slightly form recesses to a surface of the side wall 163.

[0173] The receiving position detecting piece 284 is one end portion of a lever 294 whose intermediate portion is pivotally attached to a shaft 292 fixed to the left side wall 152.

[0174] The receiving position detecting piece 284 is biased to retreat from a detection area (not shown) of the receiving light guiding body 282 by a spring 298 hooked on the other end portion of the lever 294 and a latching piece 296 projecting from the left side wall 152.

[0175] The other end portion of the lever 294 is positioned on a movement route of a guide pin 212C, and when the moving body 166 is positioned at the receiving position SP, the other end portion is moved by the guide pin 212C so that the receiving position detecting piece 284 is positioned at the detection area of the receiving light guiding body 282 to block light, as shown in FIG. 6.

[0176] Thereby, since the receiving position light projecting and receiving portion does not receive projection light, it is determined that the moving body 166 is positioned at the receiving position SP (see FIG. 8).

[0177] When the moving body 166 moves toward the storage position, the lever 294 is pivoted in a counterclockwise direction in FIG. 6 by the spring 298 to be stopped at a predetermined position retreated from the detection area of the receiving light guiding body 282 by a stopper 299 projecting from the left side wall 152.

[0178] When the moving body 166 moves toward the receiving position SP, since the lever 294 is pressed by the guide pin 212C, the lever 294 is rotated in the clockwise direction in FIG. 6 and the receiving (position) detecting piece 284 advances to the detection area of the receiving light guiding body 282 to block projection light at the receiving position SP, so that the receiving position light projecting and receiving portion outputs a receiving position signal.

[0179] Based upon the receiving position signal, rotation of the second electric motor 254, therefore, the driving gears 266R and 266L is stopped, and the moving body 166 is held in the receiving position SP.

[0180] Next, a storage position detecting apparatus 300 will be explained with reference to FIG. 4 and FIG. 8.

[0181] The storage position detecting apparatus 300 includes a storage light projecting and receiving portion (not shown), a storage light guiding portion 302, and a storage detecting piece 304.

[0182] The storage light projecting and receiving portion has a light projecting portion and a light receiving portion like the receiving light projecting and receiving portion and it is disposed on an inner face of the frame 108.

[0183] The storage light guiding portion 302 is fixed to a back face of the side wall 163 by a bracket (not shown) so as to face the storage light projecting and receiving portion.

[0184] The storage light guiding portion 302 is formed in a gate shape, has a storage detection area 306, and

is further bent in an angle shape.

[0185] A storage light receiving face 308 and a storage light projecting face 310 of the storage light guiding portion 302 are arranged so as to form recesses to the side wall 163 slightly.

[0186] The storage detecting piece 304 is one end portion of a lever 314 pivotally attached to a shaft 312 projecting from the right side wall 148 in the right-to-be-driven apparatus space 170R.

[0187] The lever 314 is biased by a spring 318 hooked between the lever 314 and a latching piece 316 projecting from the right side wall 148 such that the storage detection piece 304 is retreated from the detection area 306 of the storage light guiding portion 302.

[0188] When the moving body 166 is at the storage position, the other end portion of the lever 314 is rotated in the clockwise direction in FIG. 4 by a guide pin 212B so that the storage detection piece 304 advances to the detection area 306 to block projection light at the detection area 306.

[0189] Accordingly, when light is not received on the storage light receiving face 308 of the storage light guiding body 302, it is determined that the moving body 166 is in the storage position.

[0190] When it is determined that the moving body 166 is in the storage position, after rotation of the second electric motor 254, therefore, the driving gear 266 in the clockwise direction in FIG. 4 is stopped, the driving gear 266 is rotated in the counterclockwise direction.

[0191] Thereby, the moving body 166 moves from the storage position toward the receiving position SP.

[0192] When the moving body 166 is in the receiving position SP, the lever 314 is latched by a stopper 320 projecting from the right side wall 148 and the storage detection piece 304 is held at a position deviated from the detection area 306.

[0193] Incidentally, an optical conductor 322 for bill storage box detection, a light projecting face 324 and a light receiving face 326 of a bill optical conductor of the bill position detecting apparatus, and a light projecting face 325 and a light receiving face 327 of an optical conductor of a full stacking detecting apparatus of the bill holding member 222 are arranged so as to configure recesses to the side wall 163 slightly.

[0194] In other words, the detection apparatuses, the gear 248 of the to-be-driven apparatus 172, and the to-be-driven gear 168 of the pulling-in apparatus 162 are arranged on one face of the bill storage box 114.

[0195] Next, a control apparatus 328 will be explained with reference to FIG. 11.

[0196] The control apparatus 328 controls forward rotation or reverse rotation of the second electric motor 254 and forward rotation and reverse rotation of the first electric motor 134 based upon a storage signal P and storage position signals from the receiving position detecting apparatus 280 and the storage position detecting apparatus 300.

[0197] Specifically, the control apparatus 328 compris-

es a microprocessor and the like.

[0198] The control apparatus 328 is controlled based upon a flowchart shown in FIG. 12.

[0199] Next, a load guiding apparatus 330 of the bill storage box 114 will be explained with reference to FIGS. 9 and 10.

[0200] The load guiding apparatus 330 has a function of guiding the bill storage box 114 at a loading position where the gears 266R and 266L and the driving gear 188 properly mesh with the gears 248R and 248L and the to-be-driven gear 168.

[0201] The load guiding apparatus 330 includes a left guiding apparatus 330L and a right guiding apparatus 330R, the left guiding apparatus 330L includes a left guide plate 332L fixed on a left side wall inner face of the mounting hole 112 of the frame 108 and guide pins 336L, 338L, 340L, and 341L fixed on a left side wall 334L of the cover 146 of the bill storage box 114 in a projecting manner, and the right guide apparatus 330R includes a right guide plate 332R and guide pins 336R, 338R, 340R, and 341R fixed on a right side wall 334R in a projecting manner.

[0202] Since the left guide apparatus 330L and the right guide apparatus 330R have the same configuration, the right guide apparatus 330R will be explained on behalf thereof.

[0203] An upper side of the right guide plate 332R is formed with a first guide groove 342 and a lower side thereof is formed with a second guide groove 344.

[0204] The first guide groove 342 includes an upward inclined guide portion 346, a horizontal portion 348, and a second inclined guide portion 350 which are positioned on a lower side, and a horizontal upper side guide portion 352 which is positioned on an upper side.

[0205] The second guide groove 344 includes an upward inclined guide portion 354, a horizontal portion 356, and a second inclined guide portion 358 which are positioned on a lower side, and a horizontal upper side guide portion 360 which is positioned on an upper side.

[0206] A third inclined guide portion 362 is disposed on an upper side of the inclined guide portion 346.

[0207] Inclined angles of the inclined guide portions 350, 358, and 362 are set to have the same angle.

[0208] Inclined angles of the inclined guide portions 346 and 354 are formed to have the same angle.

[0209] The guide pin 336R has a cylindrical shape, it projects from an intermediate upper portion of the right side wall 334R laterally, and it is disposed to be slidable in the first guide groove 342, while the guide pin 338R has a cylindrical shape and it is disposed to be slidable in the second guide groove 344.

[0210] A left slide base 108L and a right slide base 108R are disposed on a bottom face of the mounting hole 112 (see FIG. 2).

[0211] Next, a cashbox holding apparatus 364 will be explained with reference to FIGS. 9 and 10.

[0212] The cashbox holding apparatus 364 has a function of holding the bill storage box 114 at the loading

position, in other words, a function of fixing the bill storage box 114 at a predetermined position on the frame 108.

[0213] Specifically, levers 368 and 370 having the same shape are rotatably attached to a shaft 366 fixed in the frame 108 along a side wall of the frame 108.

[0214] Distal ends of the levers 368 and 370 projecting from the frame 108 are coupled by a bar 372 and the levers 368 and 370 are rotatable integrally.

[0215] Since the levers 368 and 370 have the same configuration, the lever 368 on the right side will be explained on behalf thereof.

[0216] When the bill storage box 114 is positioned at the loading position HP (see FIG. 10), a semi-circular recessed portion 376 receiving the pin 340R is formed at a lower end of a projection 374 extending downwardly from an intermediate portion of the lever 368.

[0217] A downward slope 378 guiding the pin 340R to the recessed portion 376 is formed outside the recessed portion 376.

[0218] The lever 368 is biased in a counterclockwise direction in FIG. 9 by a spring 380 spanned so as to connect a latching piece 379 projecting from the frame 108 and the lever 368.

[0219] When the pin 340R is received in the recessed portion 376, the lever 368 is latched by the pin 340R.

[0220] In other words, the bill storage box 114 is fixed to the frame 104 at the holding position where the gears 248R and 248L and the to-be-driven gear 186 properly mesh with the gears 266R and 248L and the driving gear 188.

[0221] In the other cases, the distal end of the projection 374 is latched by a third slope 362 and the downward slope 378 is stopped at a position where it is pressed up by the pin 340R.

[0222] When the bill storage box 114 is loaded in the frame 108, a lower face of a distal end of the bill storage box 114 is first placed on the left slide base 108L and the right slide base 108R, and the bill storage box 114 is pushed into the back of the mounting hole 112 while being slid.

[0223] In other words, the bill storage box 114 is moved in the same direction as the insertion direction of a bill BN.

[0224] In the movement course, the guide pin 341R projecting laterally from a distal end lower portion of the right side wall 334R of the bill storage box 114 advances in a right guide groove 384R formed on an inner face lower portion of the frame 108 horizontally and laterally and the guide pin 341L projecting laterally from a distal end lower portion of the left side wall 334L advances in the left guide groove (not shown) formed on an inner face of the frame 108 symmetrically to the guide groove 384R and the guide pin 341R and the guide pin 341L advance while upward movement thereof is being restricted.

[0225] The pin 336R is not positioned in the guide groove 342 until almost half of the bill storage box 114 is inserted.

[0226] When almost half of the bill storage box 114 is inserted, after the pin 336R contacts with the inclined

guide portion 346 to be guided, it is guided to the horizontal portion 348.

[0227] In this state, since the bill storage box 114 is guided by the horizontal portion 348, the left and right slide bases 108L and 108R, and the right guide groove 384R and the left guide groove, it moves approximately horizontally

[0228] In the course where the pin 336R is guided by the horizontal portion 348, after the pin 338R is guided to the inclined face 354, it is guided to the horizontal portion 356.

[0229] Since the position of the horizontal portion 356 is set to be rougher than a distance between the horizontal portion 348 and the slide bases 108L and 108R, the bill storage box 114 moves approximately horizontally while being guided by the horizontal portions 348 and 356, the right guide groove 384R, the left guide groove and the left and right slide bases 108L and 108R in a state that the pin 338R faces the horizontal portion 356.

[0230] According to subsequent advance of the bill storage box 114, simultaneous guides of the pins 336R and 338R to the second inclined portions 350 and 358 are started so that the pins 336R and 338R are pushed upwardly while moving upwardly (the state shown in FIG. 9).

[0231] At this time, since the inclined portions 350 and 358 have the same inclined angle, the bill storage box 114 moves upwardly and rightward in FIG. 9 while being kept approximately horizontal, even if the bill storage box 114 is not guided by the left and right guide grooves 384R and the slide bases 108L and 108R.

[0232] Next, the pin 340R is engaged with the downward slope 378 and it abuts on the third slope 362 to be guided while rotating the lever 368 in the clockwise direction in FIG. 9.

[0233] Simultaneously therewith, the bill storage box 114 is moved upward and rightward, while the pins 336R and 340R are guided by the slopes 350 and 362.

[0234] Thereby, lower ends of the gears 266R, 266L and 188 relatively advance to the openings 251L and 251R and the gears 248R and 248L, and 188 mesh with the gears 266R and 266L, and 168, respectively.

[0235] At the normal meshing position, the recessed portion 376 faces the pin 340R, the lever 368 is rotated in the counterclockwise direction in FIG. 9 by a spring 380, and the pin 340R, in other words, the bill storage box 114 is held at the loading position (see FIG. 10).

[0236] At this position, the pin 336R abuts on the distal end of the first guide groove 342, the pin 338R abuts on the distal end of the second guide groove 344, and return of the pin 340R is restricted by the recessed portion 376, so that the bill storage box 114 is fixed at the loading position.

[0237] When the storage box 114 is released from the frame 108, the lever 368 is rotated in the clockwise direction in FIG. 10 by pushing the bar 372 upwardly.

[0238] Thereby, since the recessed portion 376 disengages the pin 340R, after the pins 336R, 338R, and 340R

slide down on the slopes 350, 358, and 362, they are supported by the horizontal portions 348 and 356, thereby stopping.

[0239] By grasping the handle 270 from the stopped state to pull out the same leftward in FIG. 9, the bill storage box 114 can be finally drawn out of the mounting hole 112 while being guided by the slide bases 108R and 108L, and the guide plates 332R and 332L.

[0240] Next, an operation of the embodiment will be explained with reference to a flowchart shown in FIG. 12.

[0241] In a standby state where no bill BN is stored in the storing portion 164, the moving body 166 is held at the receiving position SP, the receiving position detecting piece 284 is positioned at the detection area of the receiving light guiding body 282, and the storage detecting piece 304 is deviated from the detection area 306.

[0242] As described above, after the bill storage box 114 is held at the loading position HP of the mounting hole 112 and locking is performed by the lock apparatus 116, power switch (not shown) of the bill receiving apparatus 100 is turned ON.

[0243] By the control apparatus 328, the second electric motor 254 is reversed at Step S1.

[0244] Thereby, the crank gear 230 is rotated in the counterclockwise direction in FIG. 4.

[0245] When the projection 243 is already stopped by the first stopper 237, it continues its stop position, and when the projection 243 is not latched by the first stopper 237, after the projection 243 is rotated until it is latched by the first stopper 237, the projection 243 continues the latched position.

[0246] Thereby, the slider portion 199, therefore, the moving body 166 is moved leftward in FIG. 5 via the pin 238, and it is moved to the receiving position SP.

[0247] When the crank pin 232 is positioned near the bottom dead point where the projection 243 is latched by the first stopper 237, the lever 294 is pivoted in the clockwise direction by the guide pin 212C.

[0248] Thereby, since the receiving position detecting piece 284 advances to the detection area of the receiving light guiding body 282 to block projection light, the receiving position detecting apparatus 280 outputs a receiving position signal.

[0249] When the receiving position signal from the receiving position detecting apparatus 280 is detected at Step S2, the control proceeds to Step S3, but when the receiving position signal is not detected, reverse rotation of the second electric motor 254 is continued.

[0250] At Step S3, the second electric motor 254 is stopped, and rotations of the gears 266R and 266L are stopped, so that the control comes in a standby state.

[0251] In the standby state, the right holding portion 206 and the left holding portion 210 of the right moving body 196 and the left moving body 198 are positioned just below the receiving slot 142 to extend approximately in a vertical direction, as shown in FIG. 5.

[0252] When a bill BN is inserted in the insertion slot 122 along the bill guide 124, the bill BN is detected by a

sensor (not shown) and the first electric motor 134 is rotated.

[0253] According to rotation of the first electric motor 134, the conveying apparatus 128 of the bill discriminating apparatus 106 is activated and the to-be-driven gear 186 is rotated via the transmission mechanism 190 and the driving gear 188.

[0254] Thereby, the shaft 184 is rotated and the pulling-in apparatus 162 starts pulling-in action of a bill BN into the temporary storing portion 195.

[0255] A bill BN which has been determined to be a real bill by the bill discriminating apparatus 106 is sent to the receiving slot 142 and a distal end thereof is nipped between the conveying body 178 and the roller 194.

[0256] Thereby, since the bill BN is fed into the temporary storing portion 195 by the conveying body 178 and the roller 194 and it is pulled in the temporary storing portion 195 by frictional contact with the advancing conveying portion 192, the bill BN advances without causing jamming.

[0257] The advancing bill BN is moved while the right end portion thereof is positioned on the right holding portion 206 and is guided by side faces of the first holding portion 202, the second holding portion 204, and the slider portion 199.

[0258] At this time, since three sides of the right end portion of the bill BN are surrounded, the bill BN is prevented from entering between other parts.

[0259] On the other hand, the left end portion of the bill BN advances on the left holding portion 210 of the left moving body 198.

[0260] When widths are different according to money kinds, a left end portion of a bill with a narrow width is guided by the first holding portion 202 and the second holding portion 204 of the left holding portion 210.

[0261] In this case, since bill lengths positioned on the left and right sides of the pulling-in apparatus 162 are different and contact areas on the first holding portion 202 and the second holding portion 204 are different, a face of the bill BN is subjected to rotational force.

[0262] However, since the right end portion of the bill BN is guided by a side face of the slider portion 199, the bill BN is prevented from moving obliquely to the advancing direction.

[0263] When detection is performed by the bill position detecting apparatus (not shown) and a storage signal is outputted just after the rear end portion of the bill BN has passed through the roller 194, rotation of the first electric motor 134 is stopped at Step S4, and the control then proceeds to Step S5.

[0264] Thereby, the received bill BN is temporarily stored in the temporary storing portion.

[0265] At Step S5, the second electric motor 254 is rotated forward and the control proceeds to Step S6.

[0266] Since the gears 266R and 266L are rotated in the clockwise direction according to the forward rotation of the second electric motor 254, the crank gear 230 rotates about the fixing shaft 228 in the clockwise direction

in FIG. 4 via the gears 248R and 248L, so that the crank pin 232 reaches the top dead point which is the dead point.

[0267] Thereby, the slider portion 199 is moved leftward in FIG. 5 via the pin 238.

[0268] The slider portion 199 moves in a direction perpendicular to the temporary storing portion 195 while the guide pin 212A is guided along the elongated hole 214A and the pin 212B is guided along the elongated hole 214B.

[0269] In other words, after the right moving body 196 and the left moving body 198 move integrally to pass beside the pulling-in apparatus 162, they move along the supporter 174.

[0270] In the middle of the movement, a central portion of the bill BN is nipped between the pulling-in apparatus 162 and the bill holding member 222 to be held by predetermined force.

[0271] Since the right moving body 196 and the left moving body 198 further move toward the right top panel 156 and the left top panel 158 after holding the bill BN, the left and right end portions of the bill BN move relative to the right moving body 196 and the left moving body 198.

[0272] In the middle of the movement, the left side end of a bill BN with a short length is deviated from the left holding portion 210 of the left moving body 198.

[0273] Since the right moving body 196 and the left moving body 198 move to the storage position near the right top panel 156 and the left top panel 158, the left end portion of the bill BN also deviates from the left holding portion 210 of the left moving body 198.

[0274] In a bill BN having the largest width, left and right end portions thereof approximately simultaneously come off from the right moving body 196 and the left moving body 198.

[0275] The bill BN moves to the storing portion 164 due to coming off from the right moving body 196 and the left moving body 198.

[0276] When the moving body 166 reaches the storage position, the lever 314 is pivoted in the clockwise direction by the guide pin 212B, and the storage detecting piece 304 moves to the storage detecting area 306 of the storage light guiding body 302 to block projection light.

[0277] Thereby, the storage position detecting apparatus 300 outputs a storage position signal.

[0278] After the storage position signal is detected at Step S6, the control proceeds to Step S7.

[0279] At Step S7, the second electric motor 254 is stopped and the control proceeds to Step S8.

[0280] At this time, even if the crank gear 230 is forced to rotate excessively due to any cause, the con rod 236 is latched by the second stopper 244 so that excessive rotation is prevented.

[0281] At Step S8, the second electric motor 254 is reversely rotated and the control proceeds to Step S9.

[0282] The gears 266R and 266L are rotated in the counterclockwise direction in FIG. 4 according to reverse

rotation of the second electric motor 254.

[0283] Thereby, the crank gear 230 is rotated in the counterclockwise direction in FIG. 4 and the crank pin 232 is rotated up to a position slightly beyond the bottom dead point which is the dead point.

[0284] According to rotation of the crank gear 230, the moving body 166 is moved from the storage position to the receiving position SP shown in FIG. 8.

[0285] Accordingly, the bill BN which has moved to the storing portion 164 is nipped between the right back face 218 and the left back face 220, and the bill holding member 222 to be stored.

[0286] Since the guide pin 212C presses the lever 294 to rotate the same in the clockwise direction in FIG. 6, the receiving position detecting piece 284 advances to the detection area of the receiving light guiding body 282 to block projection light.

[0287] The receiving position detecting apparatus 280 outputs a receiving position signal by the blocking.

[0288] After the receiving position detection signal is detected at Step S9, the control proceeds to Step S10.

[0289] Since the second electric motor 254 is stopped at Step 10, the moving body 166 holds the receiving position SP.

[0290] Since the projection 243 is latched by the first stopper 237 at the receiving position SP, as described above, and it is positioned near the bottom dead point of the crank pin 232, the crank pin 232 is not rotated by biasing force of the bill holding member 222.

[0291] Thereby, the moving body 166 holds the receiving position SP.

[0292] Incidentally, in order to assist understanding in this specification, explanation has been made using up, down, left, and right in the drawings, but the present invention is not limited by these words.

[0293] The receiving position detecting apparatus and the storage position detecting apparatus can be replaced by detection of positions of other moving bodies such as the crank gear.

[Description of Reference Numerals]

[0294]

BN:	bill	45
106:	bill discriminating apparatus	
164:	storing portion	
108:	frame	
112:	mounting hole	
114:	bill storage box	50
165:	stack apparatus	
172:	to-be-driven apparatus	
248, 266:	gear	
252:	driving apparatus	
330:	guiding apparatus	55

Claims

1. A bill storage apparatus including a bill discriminating apparatus (106) which performs discrimination about real/false of bills (BN) received, and a bill storage box (114) housing therein a stack apparatus (165) moving real bills sent from the bill discriminating apparatus to a storing section (164) and stacking bills moved by the stack apparatus in a stacking state, where
a driving apparatus (252) of the stack apparatus is attached to a frame (108), and the bill storage box is mounted on the frame attachably and detachably and the driving apparatus and a to-be-driven apparatus (172) on the side of the bill storage box are drive-coupled to each other, thereby transmitting driving force to the stack apparatus, wherein the frame is formed in a gate shape and has a mounting hole (112) extending through the frame in the same direction as a bill insertion direction of the bill discriminating apparatus, and the bill storage box is inserted in the mounting hole from the bill insertion direction so that the driving apparatus and the to-be-driven apparatus are drive-coupled to each other and the bill storage box is fixed in a state that the bill storage box has penetrated the mounting hole.
2. The bill storage apparatus according to claim 1, wherein the driving apparatus and the to-be-driven apparatus are drive-coupled by gears (248, 266) connection, and the bill storage box is gear-connected after the bill storage box is moved horizontally by a guide apparatus (330) configured in the frame.

Fig. 1

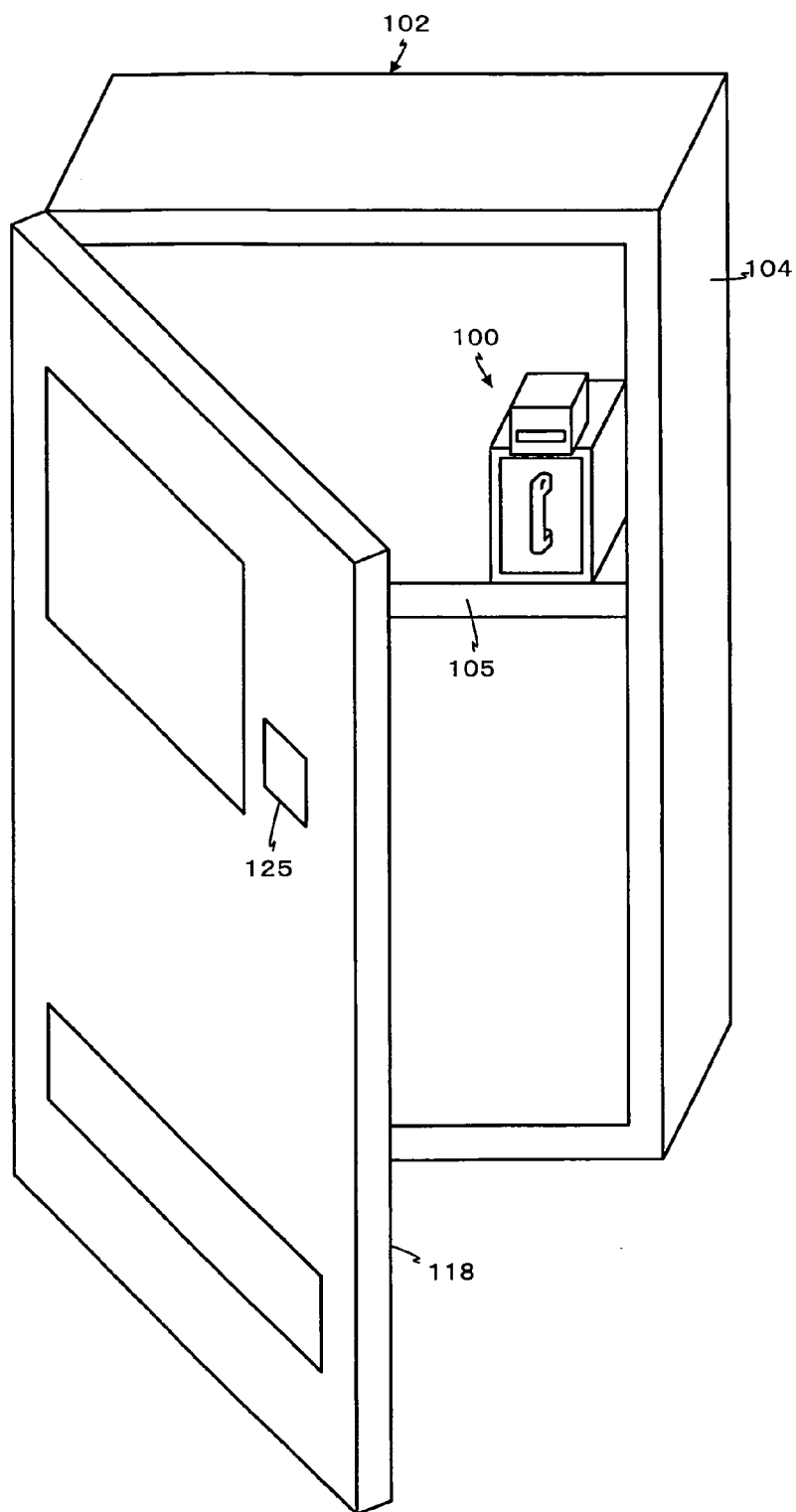


Fig. 2

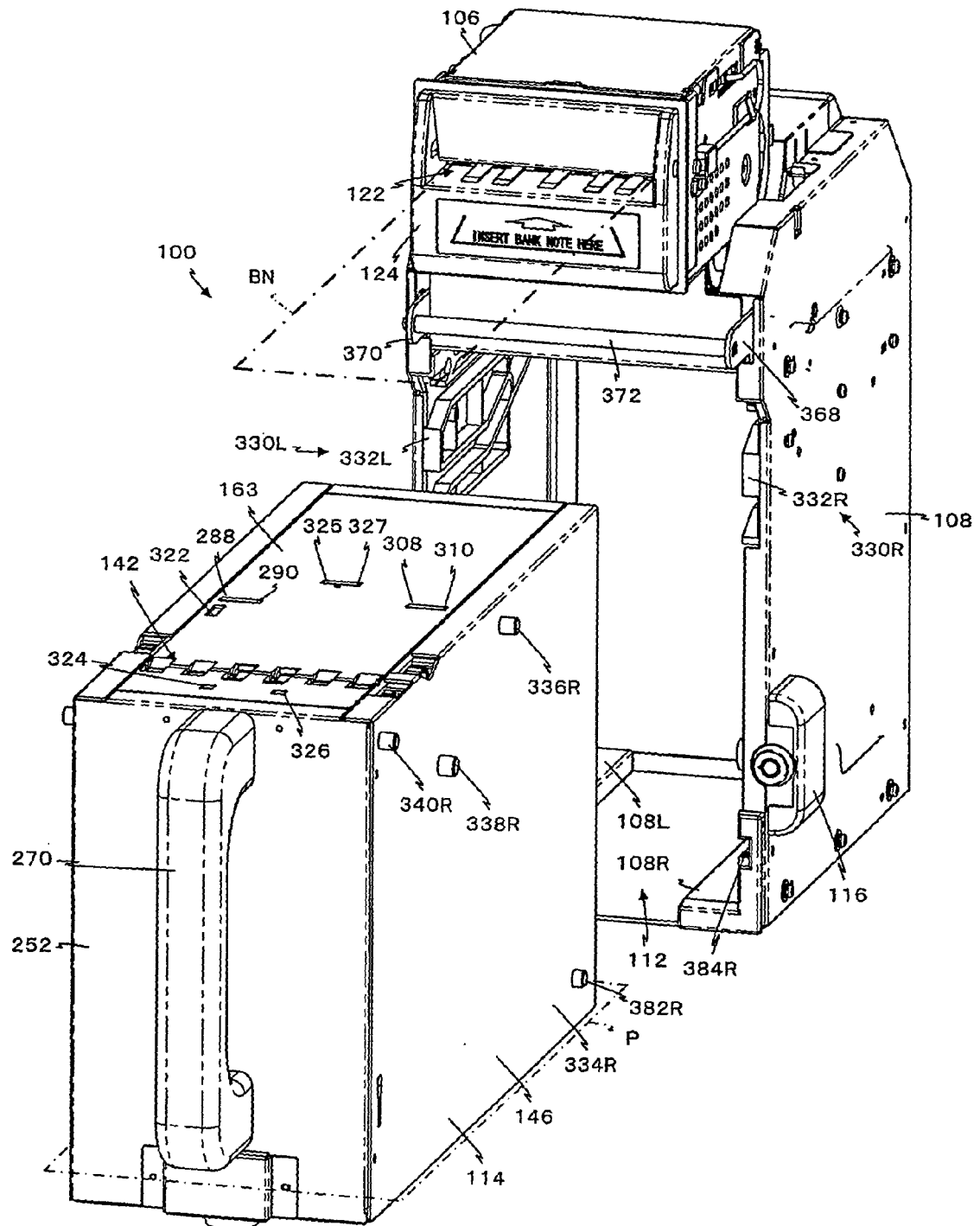


Fig. 3

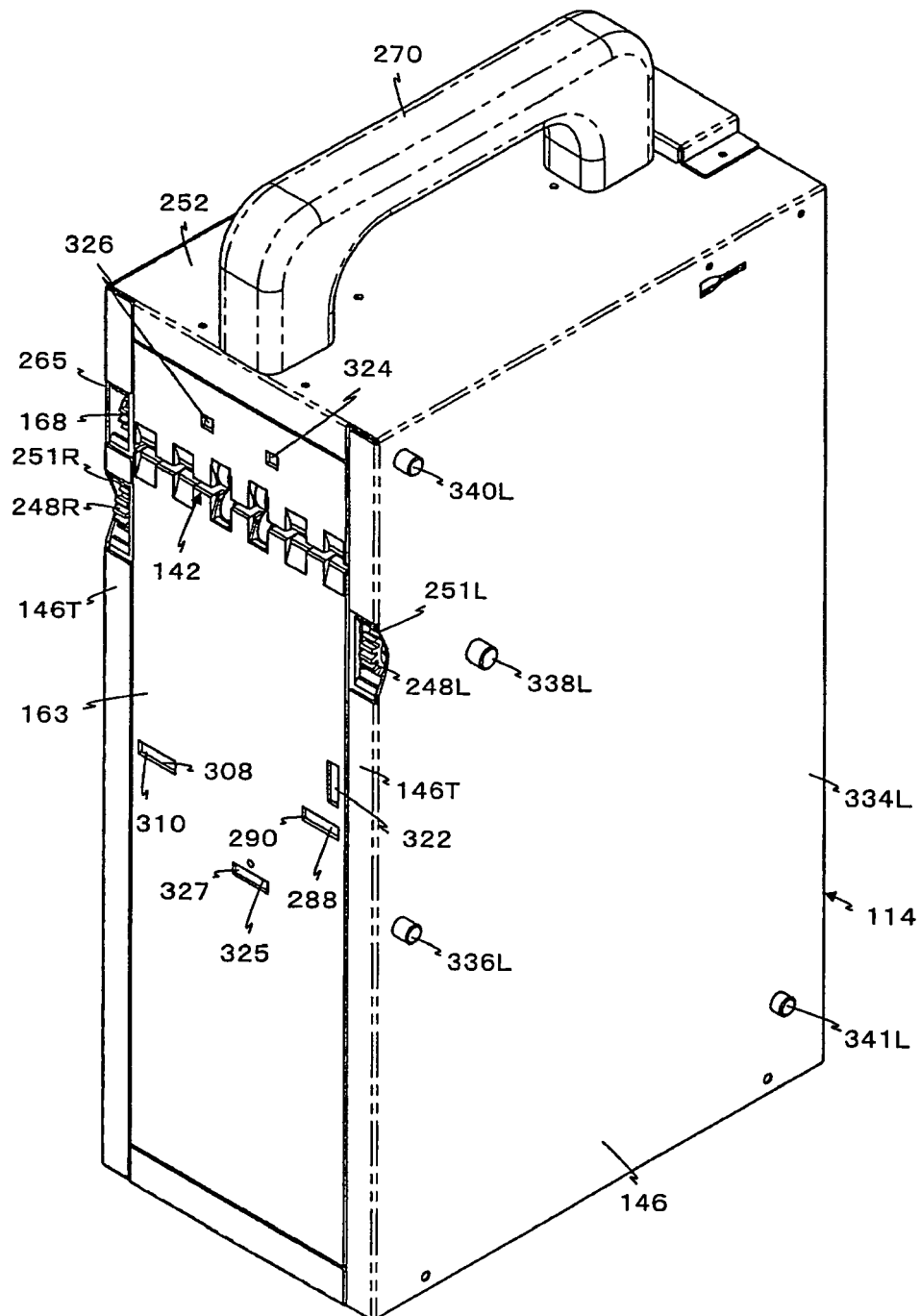


Fig. 4

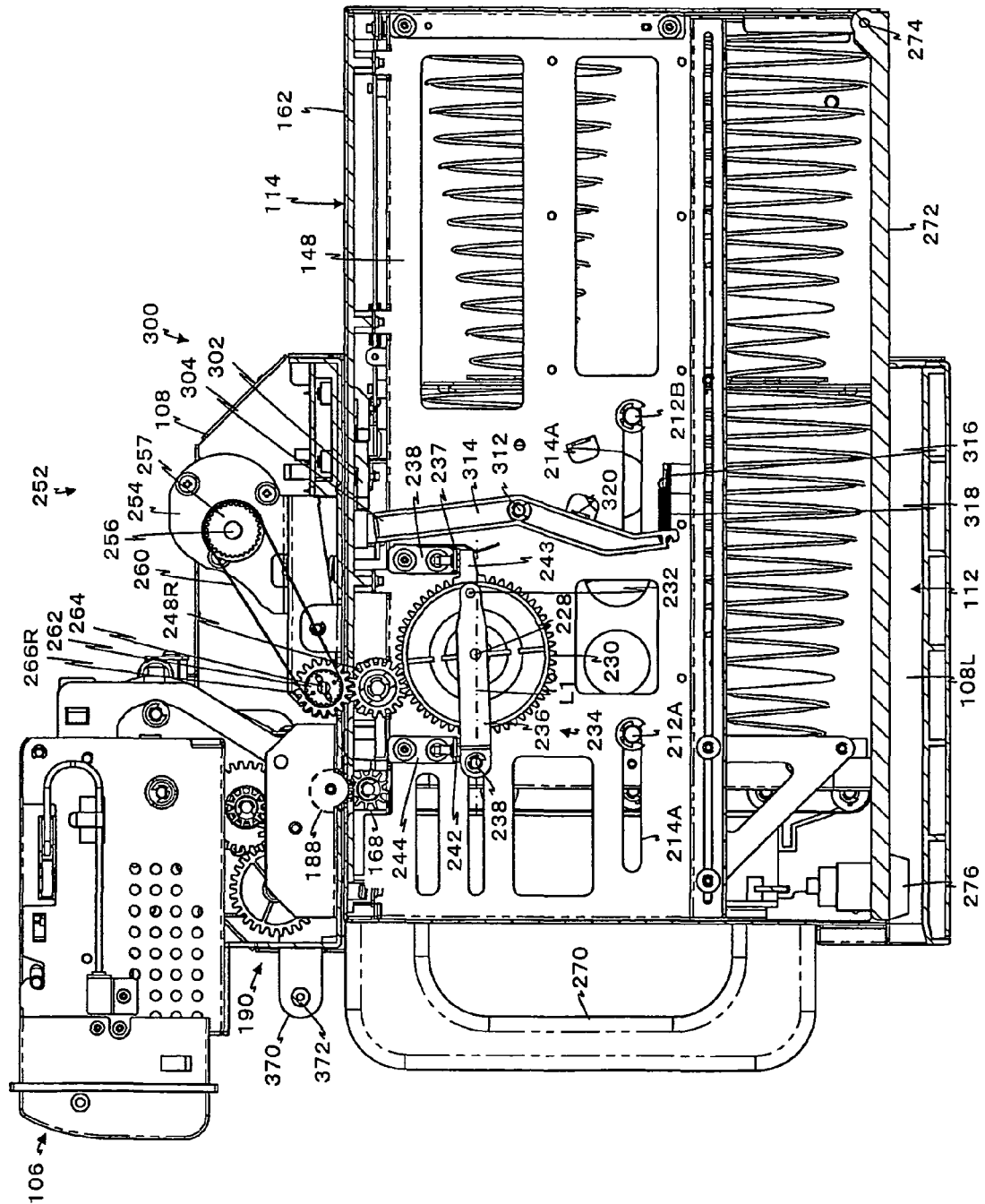


Fig. 5

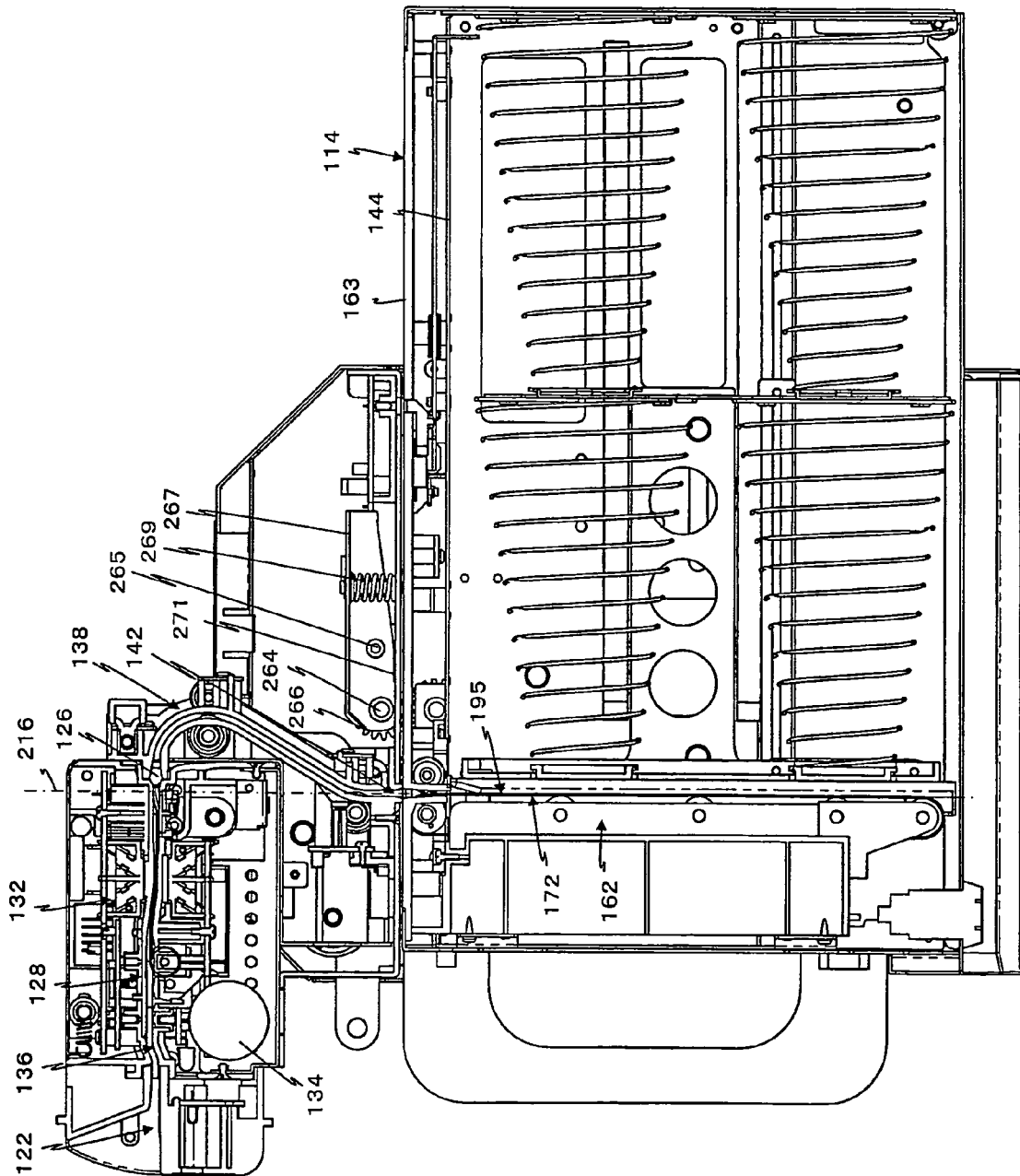


Fig. 6

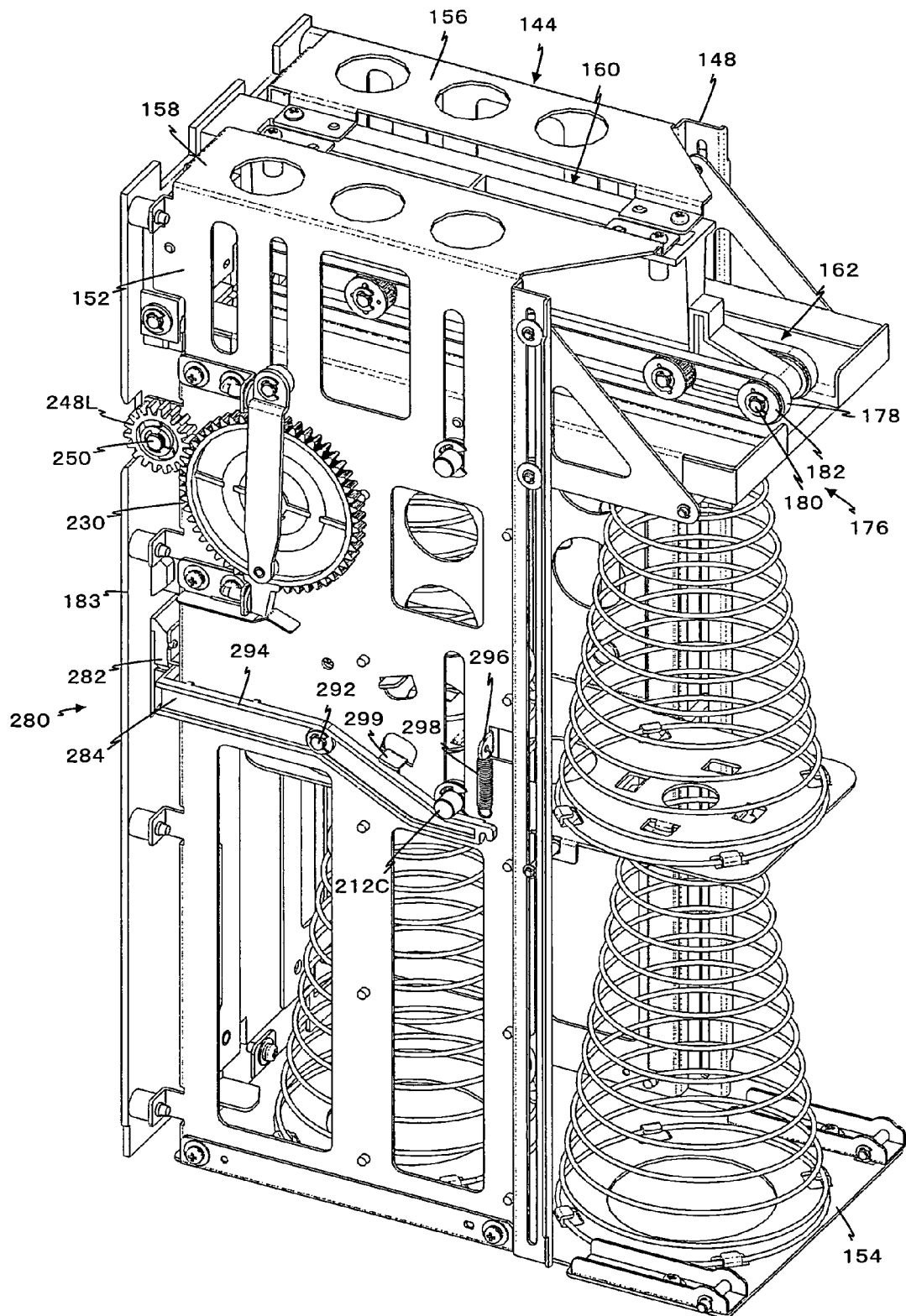


Fig. 7

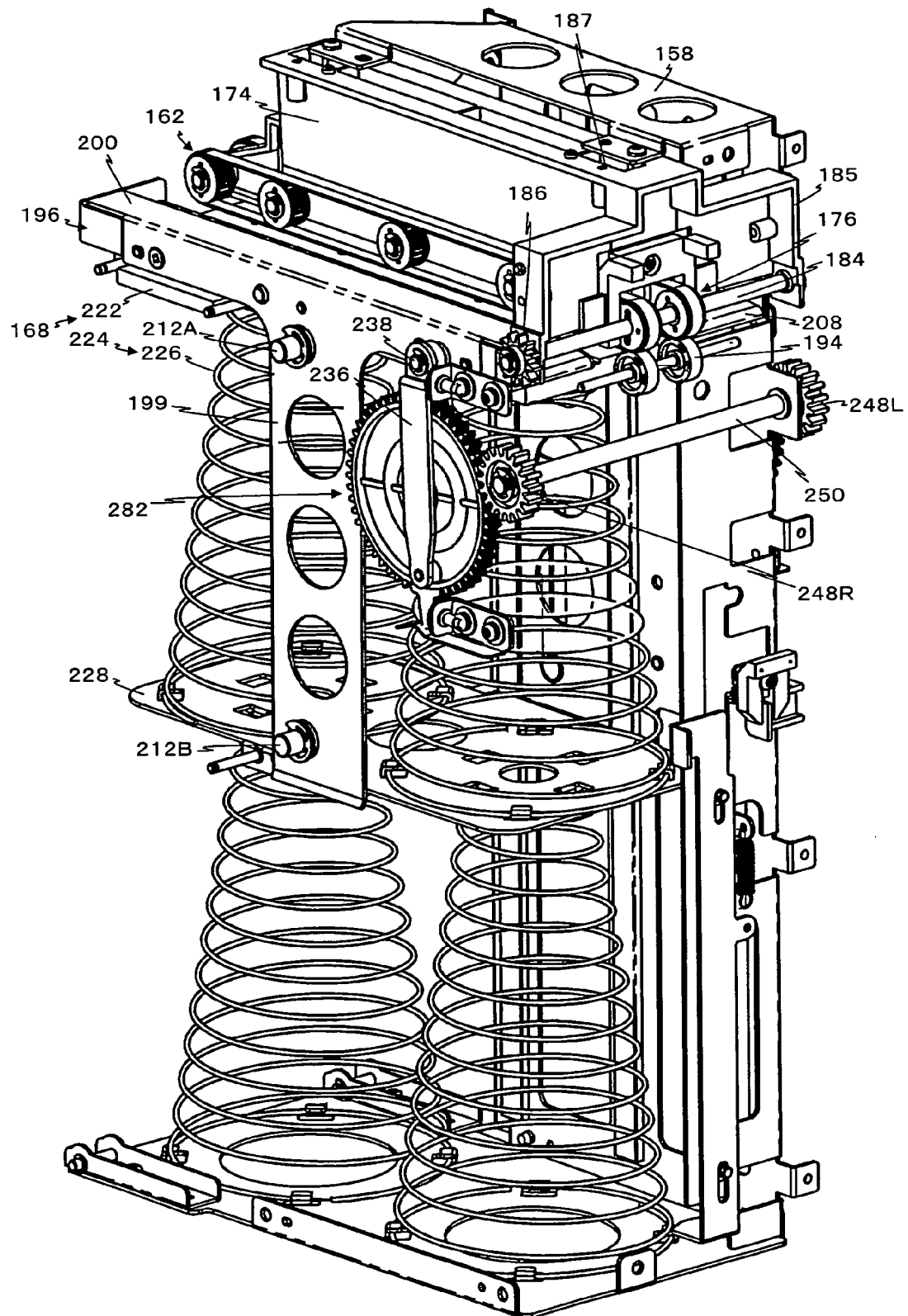


Fig. 8

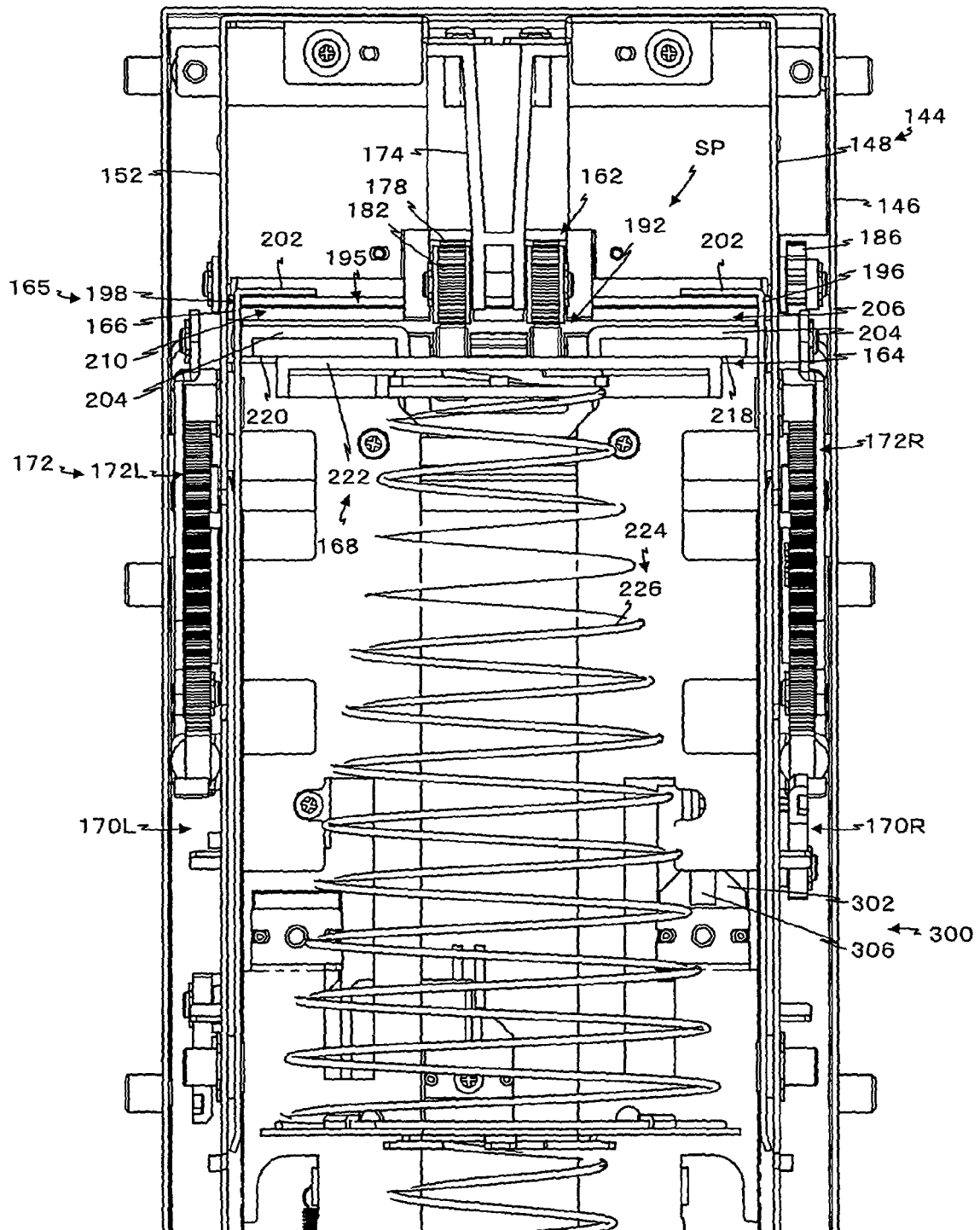


Fig. 9

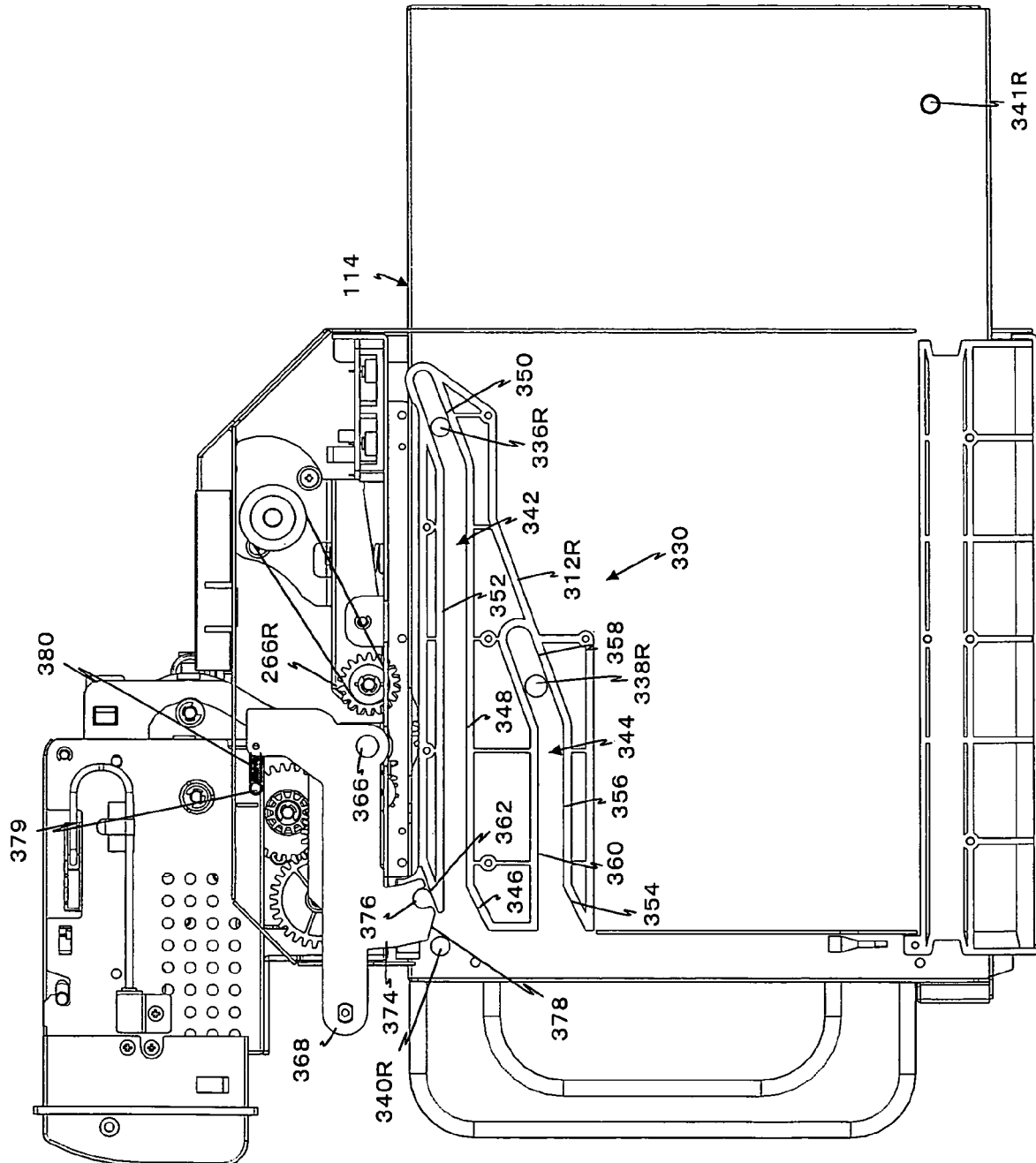


Fig. 10

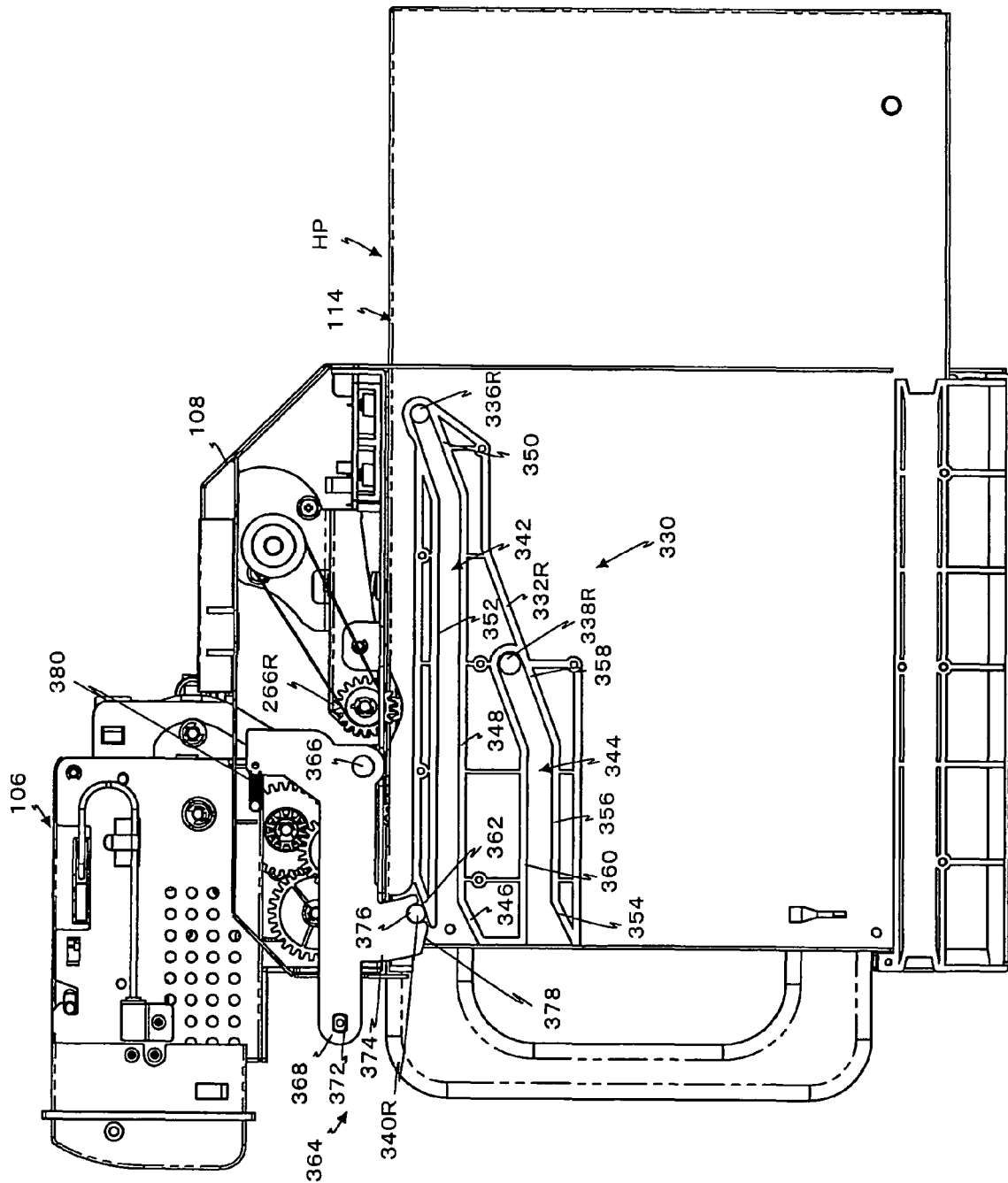


Fig. 11

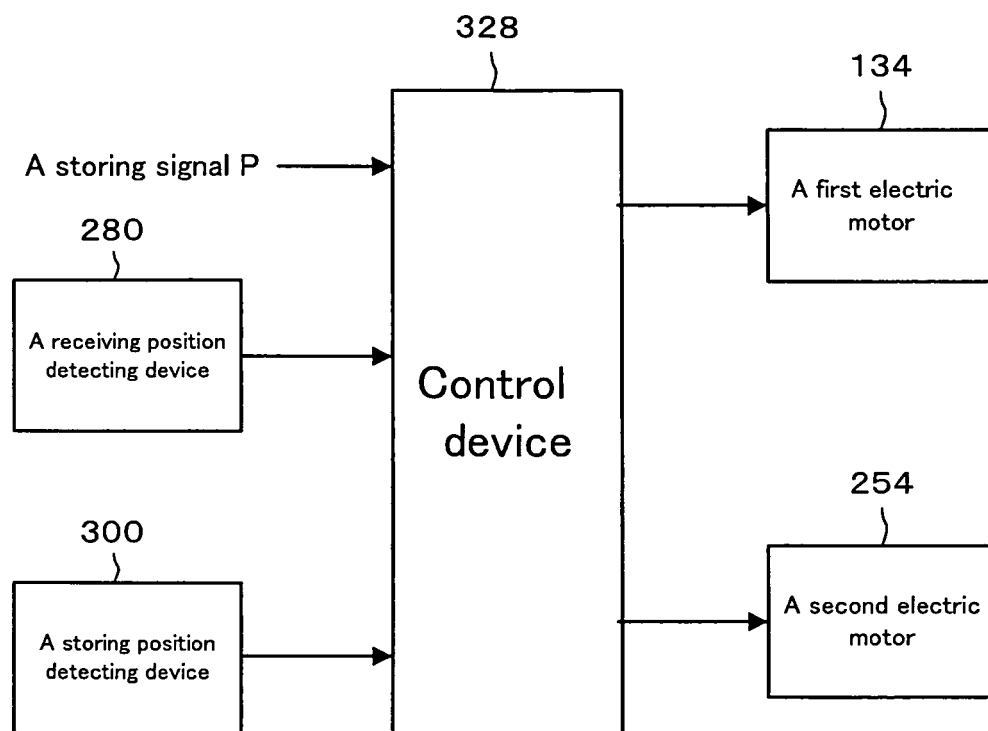


Fig. 12

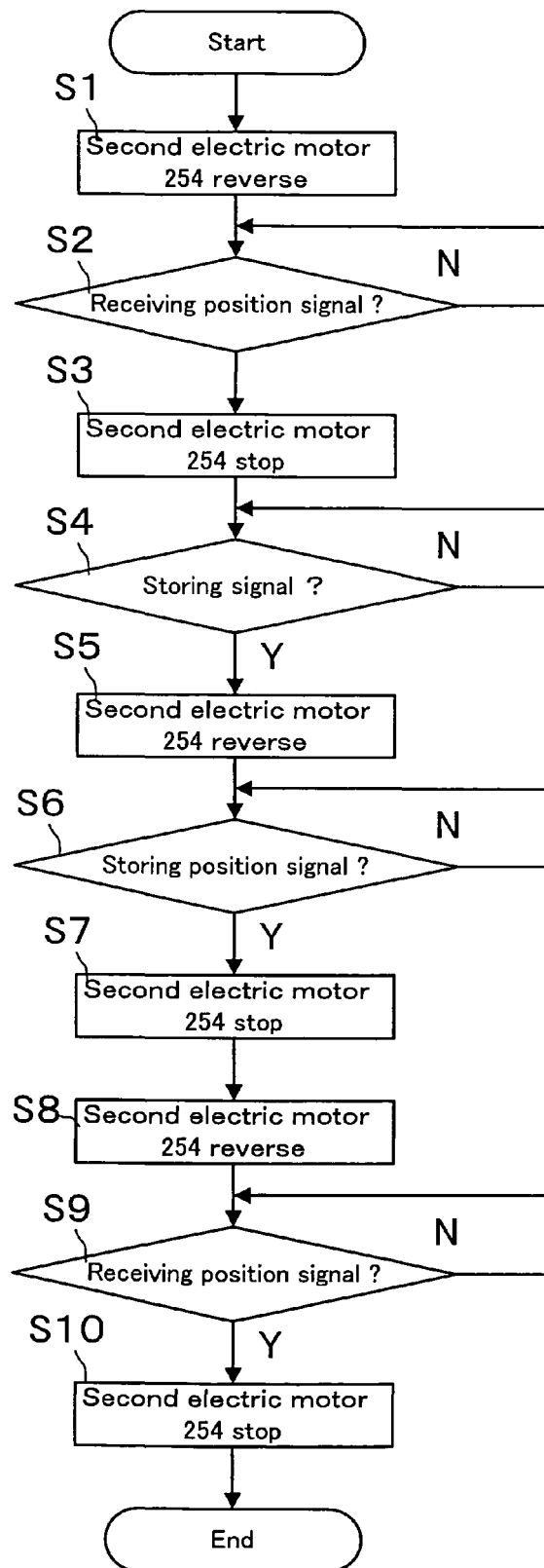


Fig. 13

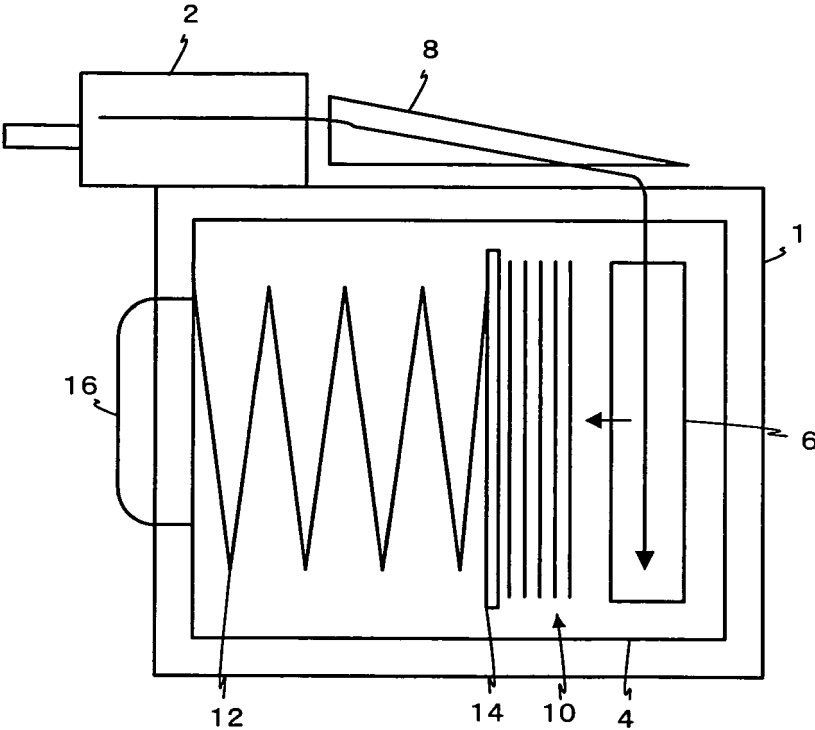
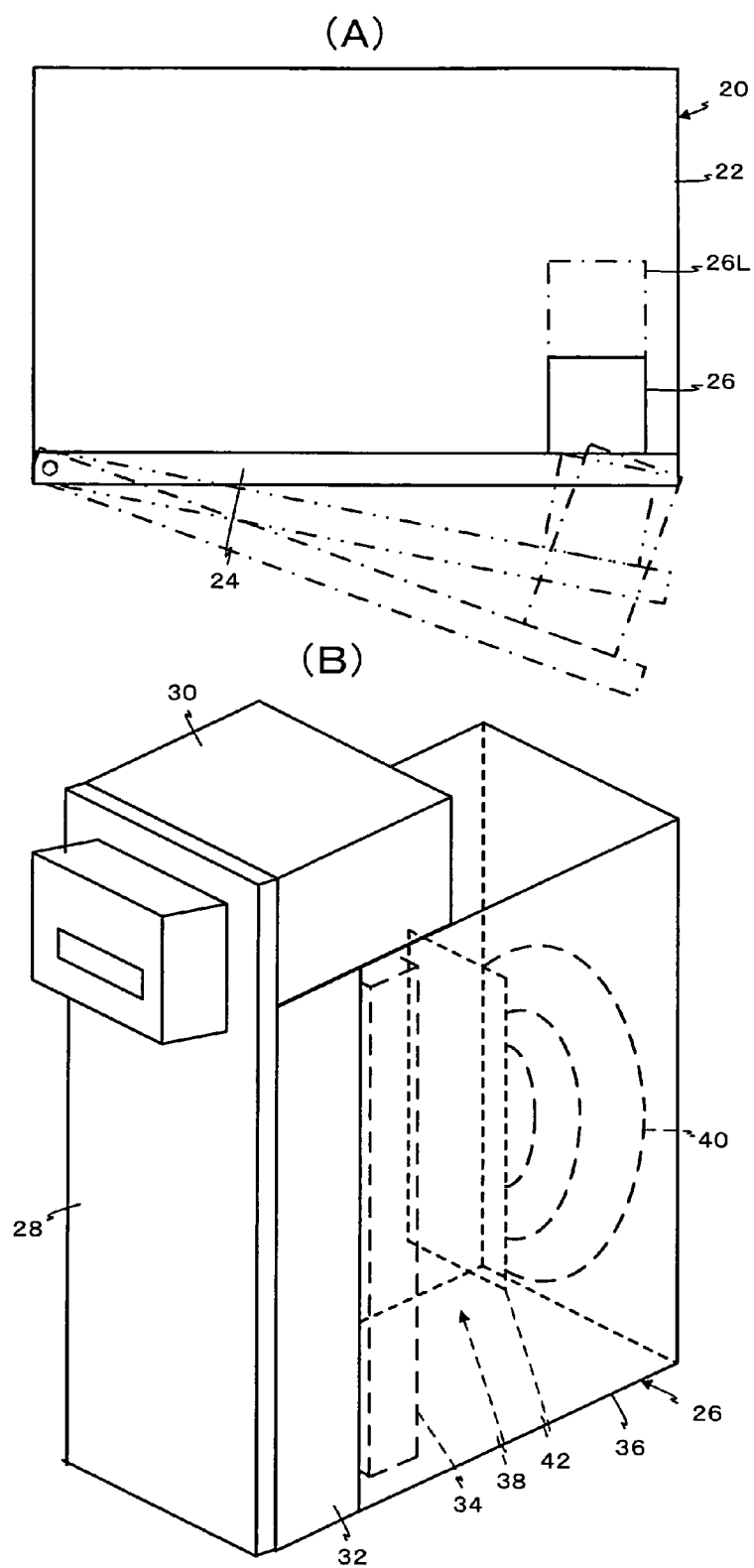


Fig. 14





EUROPEAN SEARCH REPORT

 Application Number
 EP 08 01 8265

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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1	Place of search Munich	Date of completion of the search 5 December 2008	Examiner Bocage, Stéphane
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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