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(54) **MACHINE AND METHOD FOR DISPENSING BANKNOTES**

MASCHINE UND VERFAHREN ZUM AUSGEBEN VON BANKNOTEN

MACHINE ET PROCEDE DE DISTRIBUTION DE BILLETS DE BANQUE

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Description

Technical Field

[0001] The present invention relates to a machine for dispensing banknotes loaded and contained therein, as well as a method for dispensing banknotes from this kind of machine.

[0002] A machine according to the present invention can be used for example for cash desks of supermarkets, shopping centres, gasoline stations etc., as well as for counter windows of banks and post offices, where cash money is handled both in entrance (deposits or payments) that in exit (payments, rests etc.).

Background Art

[0003] Such a machine has the purpose to protect inside its armoured metallic box (strongbox) the money from possible robberies, because the operator is able to access the banknotes contained therein only in the measure and in the rigorously correlated times of a single transaction.

[0004] Known machines performing such functions use different types of mechanisms, such as accepting devices of banknotes already divided in different denominations. Those banknotes are deposited in homogeneous bundles per denomination in respective storage containers from which the banknotes one by one are dispensed later by means of separating mechanisms for the withdrawal process. Some others of these devices are also able to accept bundles of mixed denomination's notes and to effect counting, authenticity checking and sorting of the banknotes. These sorted notes are delivered, one by one, to several storage containers, one for each denomination. From these containers, the banknotes are dispensed later, for withdrawal process.

[0005] For example, WO 94/14140 discloses a dispensing system having a dispensing device for each storage container, wherein each storage container houses banknotes of the same denomination, as well as systems for collecting the amounts dispensed at the exit of the machine. Banknotes are stacked, for denomination, in each storage container and then singly drawn out with different types of dispensing devices from the different stores up to reach the desired amount and the desired composition in denominations. In this type of machine, it happens as a rule that the first deposited banknote in each storage container will be the first one to be dispensed (First In First Out - FIFO).

[0006] In other known cases, each store container consists of rolled films within which presorted banknotes are wound, by denomination - one to one and one following the other. In this case the usual dispensing devices would not be necessary and banknotes previously stored one to one will be made available in the inverse order to that of introduction (Last In First Out - LIFO) by developing the rolled films, see for example EP 0 795 842. This kind of machine uses a plurality of high capacity containers with suitable dimensions in order to be filled with several notes per denomination in the beginning of working time. This means that in the opening the teller needs a lot of time for preparing the machine for work. Moreover, in some of those known machines, see for example EP 892 372 and US 4,905,841, notes are subjected to wear and tear for the several number of process. On the other hand, in the case in of rolls technology the major problem is related to the necessity to store a high quantity of banknotes in the rolls, which means that a complicated mechanism is required in order to guarantee a constant tape velocity and to keep the tape taut in spite of great changes in the rolls diameters. See EP-A1-795 842 and US-A-4871125.

[0007] Moreover, all these machines are expensive and require a lot of space.

[0008] The following example describes the anti robbery function according to the above mentioned known machines: when a customer requires to withdraw money from a deposit account at a bank desk, the cashier uses the dispensing machine (See EP-A1-795 842, EP-A1-892 732, US-A-4,828,243 and US-A-4,905,841) in order to dispense the required amount, provided that this amount does not exceed a preset maximum amount corresponding to the amount that should be held at the desk drawer in case of manual operation.

[0009] In case a further amount is immediately required by another customer, and this further amount added to the preceding one exceeds the maximum dispensable amount, the machine provides a preset delay time, in many cases proportional to the amount required, as a bar against robberies.

[0010] For these reasons, even if automatic dispensing machines have became more and more used in banks and the like over the last ten years, they are not yet commercially interesting due to the above identified drawbacks.

[0011] Other means of protection of the money are known, such as timed drawers or systems based on a rotating drum. However, these means, used mainly in bank offices, do not effect the counting of the banknotes at the loading nor at the dispensing stage. For example, a bank cashier is normally authorised to hold in the desk drawer a limited amount, e.g. 5,000 $, in different denominations. The remaining banknotes available to the cashier must be contained in an auxiliary safe box having a timed opening for avoiding robberies of larger amounts. The cashier performs deposit and delivery transactions using money in the desk drawer and banknotes obtained from deposits. Banknotes exceeding the 5,000 $, amount are deposited in the auxiliary safe box in a free-fall way and are no more readily available for further transactions.

[0012] If cashier needs more money, e.g. in case of more payments then deposits, he must require the opening of the timed safe box and therefore he must await the opening of the auxiliary safe box for a preset delay time. At the end of this delay time, the cashier can open the

safe box and withdraw only the required amount. However, this delay time is very large because, once the auxiliary safe box is open, a very large amount of money could be available also in case of robbery.

[0013] Some of these known anti robbery means are designed to avoid a long wait to dispense a money supply, as for example in EP-A1-0549546 and US-A-5,722,332. In this case, the content of the auxiliary safe box is divided and housed in different radial sectors of a drum, so that a cashier can withdraw the content of a single sector only, i.e. only a small amount. As a result, the delay time can be reduced since the remaining money in the auxiliary safe box is not available for the withdrawal. However, the amounts contained in such sectors are approximated to the amount needed. Machines like the ones described in US-A-5722332 and EP-A1-549 546 need to be filled up in the morning with small bundles of notes. Each bundle can consist of a single denomination or several different. Each bundle forms a predeterminate amount and is to be inserted manually into each slot of the drum. The cashier is also obliged to digit at least the amount inserted in each slot. This means a significant waste of time.

[0014] This being stated, an object of the present invention is to provide a machine and a method for dispensing banknotes that can reduce the waiting time for dispensing banknotes and for filling up the machine.

[0015] Another object of the present invention is to provide a banknote-dispensing machine with limited dimensions, simple construction, and which is safe and reliable during operation.

[0016] A further object of the present invention is to provide a banknote-dispensing machine for which production costs are reduced with respect to known machines.

Disclosure Of The Invention

[0017] These objects are achieved by the present invention, which relates to a machine for dispensing banknotes of one or more denomination contained therein, of the type comprising means for loading the banknotes in a first storage member, means for identifying at least the denomination of the banknotes, means for dispensing the banknotes at a withdrawing port of the machine, and means for transferring the banknotes at least from the first storage member to the dispensing means, characterised in that the dispensing means comprise a plurality of movable housings each of which is designed to hold one or more banknotes of at least one preset denomination. Said transferring means provide a first path for moving banknotes between said first storage member and said withdrawing port, a second path for moving banknotes between said plurality of movable housings and said withdrawing port and a third path for moving banknotes from said first storage member to said plurality of movable housings in order to fill or refill them, whereby a required amount can be selectively withdrawn either from the first storage member only, from both the first storage member and the movable housings or from the movable housings only to be transferred in the withdrawing port.

[0018] This solution allows to use the machine for withdrawing the required amount in at least three different ways, the first one involving the required amount to be drawn out from the first storage member only, the second one involving at least part of the required amount to be drawn out from the first storage member and the remaining from the movable housings, and the third one involving the whole required amount to be drawn out from the movable housings only.

[0019] According to a possible embodiment of the present invention, the movable housings consist of slots formed by adjacent walls mounted on a rotating support element and each of the walls is pivoted on the support element. This solution is useful for holding a large number of preset amounts in a small space.

[0020] The first storage member can be made as a container or a space having a shape and dimensions suitable for storing a stack of banknotes with a dispensing device at the bottom of the container. The banknotes are stacked in mixed way, i.e. without any order with respect to their denomination, within the first storage member.

[0021] A second storage member is provided for receiving banknotes that are not suitable to be held in the movable housings. According to a possible embodiment of the present invention, a drawer for loading banknotes in the first storage member can be advantageously used as second storage member.

[0022] In other embodiments of the present invention the movable housings, as well as the second storage member can consist of rolled films.

[0023] According to another possible embodiment of the present invention, the means for loading banknotes comprise an accepting device for checking and identifying banknotes before loading them into the first storage member.

[0024] An auxiliary box is provided for receiving banknotes that are not suitable to be dispensed, e.g. banknotes of large denominations or banknotes having some defects. In this case, transfer means are provided for moving banknotes along a fourth path from the accepting device to the auxiliary box.

[0025] The present invention also relates to a method according to claim 19.

[0026] Banknotes can be stored in a mixed way in the first storage member, without any order with respect to their denomination.

[0027] According to a possible aspect of the method, the required amount can be obtained by drawing out banknotes from the first storage member and identifying them until a rounded down amount with respect to the required amount is reached, the remaining banknotes for reaching the required amount being drawn out from one or more of the movable housings.

[0028] According to another aspect of the method, the

whole required amount can be obtained by drawing out a preset number of banknotes from one or more of the movable housings.

[0029] It is an advantage of the method according to the present invention that the number of banknotes drawn out from each of the movable housings is restored between one dispensing operation and the next one. The waiting time for the required amount is therefore reduced or, in many cases, eliminated.

[0030] According to a further aspect of the method, banknotes for restoring the preset number of banknotes in each of the movable housings are drawn out one by one from the first storage member and identified in their denomination, the banknotes identified as suitable for restoring the preset number in at least one of the emptied movable housings being placed in the respective movable housing, while banknotes drawn out from the first storage member but not suitable for restoring the preset number of banknotes in the movable housings are placed in a second storage member.

[0031] Banknotes in the second storage member can be subsequently transferred to the first storage member upon request of the operator or, alternatively, periodically in automatic manner.

[0032] The second storage member could also be used for collecting rejected banknotes, i.e. banknotes which are not recognised to be suitable to be dispensed in any case, as for example false, unrecognised or worn banknotes. In this case, the second storage member should not be used to restore the content of the first storage member, but its content should be unloaded periodically or at end of a working day for checking rejected banknotes.

[0033] In the following, a possible function of the invention is described:

> Bundles of mixed notes are inserted into a first storage member from which few notes are singly delivered to small and simple movable housings, adapted to have some note per denomination stored into them. The remaining part of the deposited bundle remains into the first storage member. In case of withdrawal the banknotes are delivered to the withdrawing port from the said first storage member. Along the path there are means for denomination and/or authenticity identification. When the required amount is close to be reached (with notes of different denomination) the remaining amount is delivered from the movable housings in order to reach the required amount exactly. During dead time after a transaction and before the next one the machine automatically fills up the movable housings of what has been used. The movable housing are arranged to contain few notes, consequently their construction is simple and cheap.

[0034] This invention saves dispensing time compared to known machines and dispenses exactly the required amount. It also saves time in filling up compared to the other dispensing machines. Into the slots it is possible to store one or more notes per slot. In the embodiments comprising rolls, a maximum of 100 notes can be stored compared to a minimum of 500 in the standard known rolls.

Brief Description Of The Drawings

[0035] Further features and advantages of the present invention will be apparent from the following description, made with reference to the attached schematic drawings in which:

- Figure 1 is a side elevation view in section of a first possible embodiment of a machine according to the present invention, with movable housings made as slots and placed in a first position;
- Figure 2 is a side elevation view in section of the machine of Figure 1 with slots place in a second position;
- Figure 3 is a side elevation view in section of the machine of Figure 1 with slots placed in a third position;
- Figure 4 is a side elevation view in section of a second possible embodiment of a machine according to the invention, some parts of which are not shown, provided with an accepting device and an auxiliary box;
- Figure 5 is a front elevation view in section of the machine according to the embodiment of Figure 4;
- Figures 6A and 6B are front and side views respectively of a wall forming the slots in a machine according to the present invention;
- Figure 7 is an enlarged side view of a slot assembly according to the invention;
- Figure 8 is a front view showing a mechanism for withdrawing banknotes from slots;
- Figure 9 is an enlarged side view showing a slot assembly when banknotes are drawn out from a slot;
- Figure 10 is a front elevation view of a descending device for a machine according to the present invention;
- Figure 11 is a side elevation view of the descending device of Figure 10;
- Figure 12 is a lateral elevation view in section showing some details of a third possible embodiment of the machine according to the present invention; and
- Figure 13 is a lateral elevation view in section showing other details of the machine of Figure 12.

Modes For Carrying Out The Invention

[0036] Even if not shown in the drawings for sake of simplicity, it should be understood that a machine according to all the embodiments of the present invention comprises an armoured metallic strongbox, which encloses all the mechanisms disclosed hereinafter.

[0037] With reference to Figures 1-3, a machine 1 according to a first embodiment of the present invention comprises a frame assembly 2 which supports all the mechanisms and define a first storage member 10 as a space designed to receive and store banknotes of different denominations in mixed way, i.e. without any particular order with respect to their denomination. Alternatively, the first storage member 10 can be made as a container separated from the frame assembly 2.

[0038] In this embodiment, banknotes are loaded by means of a loading member or drawer 5 provided with a mobile bottom wall. The loading member can be extracted (position 5') following a command of deposit made by an operator.

[0039] As known in the art, machine 1 can be operated in stand alone through keyboard and display means, with electronics (microprocessor etc.) that manages the machine. Interface means can also be provided for commanding the machine by means of computerised systems (personal computers or computer networks) without making use of the local keyboard.

[0040] In case of a deposit operation, a special key is pressed by cashier and the drawer is extracted from position 5 to 5'. He or she inserts a wad of banknotes, even if they have different denomination, and the drawer can be closed in manual or automatic way (from 5' to 5).

[0041] Once the loading member has been closed, i.e. moved in correspondence of the internal position 5, the mobile bottom wall of the loading member 5 can be opened, thus leaving that the introduced wad falls on a pair of supporting "forks" 15 (see Figs. 5 and 10) connected to a descending device 20 with a worm screw 21.

[0042] At this stage, the forks 15 are moved downwardly by the descending device 20 up to reach the base of the storage member 10 or the top of a possible stack of banknotes in the storage member 10 (for example: position 15' of the forks). The descending device 20 is then stopped under the control of a suitable sensor and the forks 15 are moved away to each other for a distance sufficient to cause the wad to be released on the top of a pre-existing stack or on the bottom of the storage member 10.

[0043] As loaded with the first deposit, the machine automatically begins to leaf through and singularise the banknotes by means of a dispensing device 30 in order to convey them along a starting path 50 in which the denomination of each banknote can be firstly detected by means of electronic controls positioned along this portion of path.

[0044] At the top of the machine 1, there is positioned an assembly 40 of movable housings or slots 41 formed by adj acent dividing plates or walls 42 and arranged in a book-shape configuration in order to keep divided the banknotes (see also Figs. 6-9).

[0045] The basic principle for loading the slots 41 can be the following:

one banknote of denomination A in a first slot;
two banknotes of denomination A in a second slot;
three banknotes of denomination A in a third slot...

and so on in relation to the number of slots needed by a client, therefore depending from the client to which the machine is destined and from its predictable requirements in term of the number of denomination to be treated.

[0046] For another denomination (e.g. denomination B), it is applied the same principle, that is:

one banknote of denomination B in a fourth slot;
two banknotes of denomination B in a fifth slot;
three banknotes of denomination B in sixth slot...

and so on for all the remaining banknotes of denomination B and all remaining banknotes of other possible denominations.

[0047] Some of the slots 41 can also remain empty for performing additional functions, e.g. for using the same as a rejecting store or as a temporary store during unloading of banknotes from the machine at the end of a working day.

[0048] It should be appreciated that by means of this technique it is possible to form any possible amount with the guarantee to use in any case the whole content of at least one slot 41.

[0049] The loading of all the banknotes in slots 41 is performed at the beginning of each working day, presumably in dead times.

[0050] Banknotes are firstly pre-loaded in the first storing member 10 by means of the loading element or drawer 5, wherein wads of banknotes can be accommodated. After the drawer 5 has been moved within the machine 1, the bottom wall of the drawer 5 is opened and banknotes are thus delivered on the forks 15 that bring the same down to the bottom of the first storage member. Subsequent wads or banknotes loaded in the drawer 5 are deposited on the top of the underlying stack.

[0051] The banknotes are therefore drawn out from first storage member 10 by means of the dispensing device 30, which singularises them and brings each banknote along the starting path 50. During passage along the path 50, the denomination of each banknote can be detected and counting is kept in order to know the number of banknotes passed along the path 50 for each denomination. If the denomination matches the same one of a slot 41 in which the preset composition is not yet completed, the banknote is subsequently directed along a path comprising portions 51 and 52 up to reaching guide means 61 oriented towards the slot assembly 40. Figures 1 and 2 show the slot assembly 40 in the two opposite ending positions of its movement, where some slots 41 are collapsed due to the contact of a last wall 42 against stop members 45, while Figure 3 shows the slot assembly 40 in an intermediate position.

[0052] Banknotes which are not suitable for loading the slots 41 are diverted along path 54 and returned in a

second storage member - in this case the drawer 5 - which is used at the same time as "reject cassette" for banknotes not identified during the passage along path 50. Examples of "rejected" banknotes are double or unknown banknotes and so on.

[0053] Supposing at this stage that all the designated slots 41 have been filled up as required, the machine can be set to operate in a first mode as follows.

[0054] During a transaction that needs some change, the machine will start immediately to dispense the banknotes available at the bottom of the stack in the first storage member 10 by means of the dispensing device 30. In this case, transfer means known per se in the art, such as belts 70, rollers 71 and guide elements 72, move banknotes along path portions 50, 51 and 53 up to a withdrawing port (not shown) oriented according arrow 56.

[0055] As soon as the machine reach an amount near to the one is needed, but less than what is needed, the machine stops to draw out banknotes from the first storage member 10 and the remaining banknotes will be drawn out from one or more of the slots 41 in order to reach the required total amount of the change. Banknotes drawn out by on or more slots 41 are moved along path 55 up to the withdrawing port indicated by arrow 56.

[0056] At this time, before the next transaction will happen, the machine starts again in dispensing banknotes from the first storage member 10 but only for searching the right notes to refill up the slots emptied during the previous dispensing operation. This deferred operation does not affect the time necessary to serve each customer.

[0057] The restoring operation of emptied slots 41 proceeds as already explained above. Also in this case, banknotes that are not suitable for loading the slots 41 are diverted along path 54 and returned in the drawer 5.

[0058] The operator has the possibility of opening the drawer 5 to get the notes contained and check them. In case he/she does not do that, after a certain preset time and/or in the moment of a next deposit request is made, in order not to risk the amount contained plus the amount to be deposited, for security reasons the machine will provide to re-deposit the contents of drawer 5 in the first storage member 10 before to be opened for the new deposit transaction.

[0059] A second operation mode of a dispensing machine according to the invention could be as follows.

[0060] With the pre-loading of the slots 41, banknotes are promptly available for the cashier. For example, as soon as a customer asks an amount or, in case of supermarket, he attends a rest, the banknotes are made immediately available in the slots 41. After that, between a customer and the following one, the machine restores all banknotes withdrawn by each slot 41. Also according to the second operation mode, this deferred stage does not affect the time necessary to serve each customer. This is a very important feature because the flexibility of the system according to the invention allows the cashier to immediately dispense a required amount through slots 41 and refill them in the "died times " between a customer and the following one.

[0061] Furthermore, according to the present invention, the machine can be designed to operate at a slow speed, with particular reference to the dispensing speed from the first storage member 10, without affecting the time required to serve a customer. This allow to obtain a less stressed and a more reliable operation of the machine.

[0062] An alternative embodiment of a machine 100 according to the present invention is shown in Figure 4, where some parts common to the previous embodiment (e.g. slot assembly 40, dispensing device 30, descending device 20, first storage member 10, etc.) have been omitted, as well as in the view of Figure 5. The same reference numbers identifies some common parts with respect to the previous embodiment.

[0063] With reference to Figure 4, the machine 100 is provided with a checking device 160, which is able to accept banknotes one by one and to count and verify (denomination and false or genuine) the banknotes that are introduced (complete accounting).

[0064] From the checking device 160 the banknotes are deposited in an underlying loading device 105 that is used to deposit the banknotes in the first storage member through the already disclosed descending device. Banknotes introduced through the checking device 160 and suitable to be dispensed are moved along a path 150 and 151 and deposited in a plane 106 of the loading device 105 from that they will be pushed on the underlying forks to be subsequently deposited over the stack of banknotes into the first storage member.

[0065] As shown in Figure 5, a pushing device 110 can be used to transfer a wad of banknotes W along the plane 106 up to the correct position over the forks 15 of the descending device 20.

[0066] The mechanisms shown in Figure 4, comprising the checking device 160, correspond substantially to the right portion of mechanisms of Figure 5, while the mechanisms of the left portion of Figure 5 are substantially the same of those already disclosed with reference to the embodiment of Figures 1-3. The machine 100 according to this second embodiment is thus composed of two different modules even though each one of those is useful per se without needing the other one. However, the two combined modules represent a very performing machine in a small embodiment and at a low cost.

[0067] It should be noted that machine 100 could also have additional features depending on installation of the same in a bank or in a supermarket. When a banknote of the maximum denomination (e.g. 500 Euro) is introduced into the machine through the checking device 160, it is clear that this denomination should be made available for subsequent dispensing of large amounts in a bank, while in a supermarket a similar denomination is unlikely to be reused for providing rests.

[0068] In the case of machine 100 installed in a super-

market, a banknote of maximum denomination introduced through checking device 160 should not be deposited in the first storage member 10 but in an auxiliary box 120 provided for collecting the exceeding deposits. In this case, a banknote introduced through the checking device 160 should be directed along path portions 150 and 152 into the auxiliary box 120 by transfer means substantially similar to those explained above.

[0069] When necessary, the auxiliary box 120 could be extracted from the strongbox of the machine, following suitable safety procedures, by qualified personnel only without stopping the machine and without opening the first storage member 10 containing the other banknotes.

[0070] A similar feature could also be useful however in a bank or in any other case in which a possible excess of banknotes of any denomination needs to be collected and removed by the stack of banknotes contained in the first storage member 10.

[0071] Again with reference to Figure 4, it should be noted that a checking device 160' could also be located between the slot area 140 and the loading device 105 as shown in dotted lines. In this case, banknotes introduced into the checking device 160' are immediately deposited onto the plane 106 of the loading device 105 before being loaded into the first storage member.

[0072] Figures 6A, 6B and 7 show some details of the slot assembly 40 according to the above-mentioned embodiments.

[0073] Figure 6A shows a dividing plate or wall 42 mounted on a support element 43 which can be rotated about an axis 44. The wall 42 is pivotally mounted about an axis 46 and kept in a radially extending position by means of two counteracting springs 47 which exert their forces F1 and F2 in opposite directions of the wall faces, as shown schematically in Figure 6B.

[0074] As will be better explained below, each wall 42 is provided with a window 48 that allows withdrawing means to be introduced in a slot for performing removal of the banknotes from that slot.

[0075] Some walls 42 and slots 41 of the slot assembly 40 are shown in Figure 7, where there are also evident two opposite stop members 49 for avoiding an exceeding rotation of the opposite end walls 42 during rotation of the whole assembly 40.

[0076] An example of means suitable for drawing out banknotes from slots 42 is shown in Figures 8 and 9. Unit 80 of Figure 8, which can also be seen in the view of Figure 5, comprises a driving group 81 acting on a screw 82 provided with a pair arms 83 (only one of which can be seen in Figure 8) which radially project from screw 82. A gripping member 84, e.g. a friction or vacuum member, is placed at the free end of each arm 83.

[0077] During the rotation movement of the slot assembly 40, the unit 80 is kept in a position such that arms 83 do not interfere with walls 42. This position of the unit 80 is shown in dotted lines in Figure 8.

[0078] With reference also to Figure 9, when one or more banknotes B must be removed from a certain slot 41', the rotation of slot assembly 40 is stopped in the correct required position, i.e. in a position in which the open end of the slot 41' is aligned with the guiding elements 62 annexed to transfer means 70, 71 providing the path 55.

[0079] Unit 80 is rotated up to a position in which gripping members 84 become aligned with the windows 48 of the pair of adjacent walls 42' defining the slot 41'. When alignment is reached, gripping members 84 are moved toward to each other (arrows C in figure 9) and then moved in the direction of arrow D in order to bring banknote(s) B up to transfer means 62, 70 and 71. The translation of gripping members 84 along windows 48 is performed by the driving group 81 acting on the screw 80.

[0080] In Figures 10 and 11 there is shown an example of a descending device 20 of the type used in the above disclosed embodiments of the present invention. Device 20 comprises an electric driving group acting on a screw 21 for moving a pair of forks (only one of which can be seen in Figures 10 and 11) along guides 22 from an upper (or waiting) position identified by reference number 15, and a lower (or delivering) position identified by reference number 15'.

[0081] Banknotes deposited on the forks in position 15 are thus lowered until the top of the stack (or the bottom of the first storage member) has been reached. In correspondence of the lowest position 15', forks are moved away from each other in order to allow banknotes to fall into the underlying first storage member 10.

[0082] This is caused by a mechanism comprising a pair of slotted plates 23, integral with respective forks, and a pinion 24 engaged in both the slots of the plates 23. When position 15' is reached, pinion 24 is further lowered by a second screw, driven by an its own motor (not shown for simplicity), and plates integral with forks are then pushed away until a limit switch or a sensing device detects a condition in which the distance of the forks is sufficient to cause banknotes to fall down.

[0083] Figures 12 and 13 show another possible embodiment of a machine 200 according to the present invention. Also in this case, some parts already disclosed in the previous embodiments are identified by the same reference numbers.

[0084] According to this embodiment, dispensing machine 200 comprises a plurality of movable housings each made as one or more rolled films. This kind of storage system is already known in the art and can advantageously be used in a machine of the present invention. Each rolled film unit can be used in this case for receiving a preset number of banknotes of a certain denomination provided that at least a rolled film unit could be used as second storage member.

[0085] In Figure 12 there are shown rolled film units 240-244 each formed by a pair of rolls around which films are wound and unwound for enclosing banknotes between the surfaces of the wound film(s). It should be understood that this embodiment of the present invention is not limited to the number of rolled film units shown

therein.

[0086] For example, unit 241 is shown with film(s) 210 partially wound on both rolls 211 and 212. Each roll is driven preferably by an independent electric motor in order to ensure that, when one of the motors is rolling, the other is braking at a reduced power. This is useful, for example, for duly tensioning the film or films during operation.

[0087] For the roll film unit 244 there are shown two positions 221a and 221b that roll 221 can assume with respect to roll 222 during loading or dispensing operations. For example, roll 221 is kept in position 221a during loading of banknotes into the roll unit 244, while it is moved to position 221b during a dispensing step. All the roll units 240, 241 and 242 of Figure 13 are all shown in dispensing position.

[0088] Roll film unit 240 is preferably designated to be used as second storage member or as "reject store" in order to allow the operation of machine 200 according to the modes already described above. In this case, the roll film unit 240 could also have a capacity larger than that of the other roll film units.

[0089] In particular, the preloading of machine 200 can be performed, as already disclosed, by means of drawer 5, descending device 20 and first storage member 10.

[0090] All the roll units are therefore filled up by drawing out banknotes from the first storage member 10 by a dispensing device 30, then detecting the denomination of each drawn banknote and counting the same in 201 and/or 202. Counting should preferably be kept for each denomination in order to know the number of banknotes loaded in each roll unit.

[0091] If the denomination matches the same one required for completing the composition of a certain roll unit, the banknote is moved up to the corresponding unit in order to be loaded in the same.

[0092] With reference to Figure 13, banknotes rejected or which are not suitable for loading the roll units are diverted toward roll unit 240 and subsequently returned in the drawer 5 as already explained fore the previously disclosed embodiments.

[0093] Also the dispensing operation of the machine is substantially the same of the previous embodiments. However, it is important in this case to count the number of banknotes drawn out from each roll unit in order to allow the correct restoration of the same.

[0094] With respect to the first two embodiments, it should be noted from Figures 12 and 13 that the withdrawing port can be oriented according to the arrow 56 at the front of the machine. In this case, it should also be noted that this latter embodiment can be used as an independent module, or used in combination with a module having a checking device 160, as already disclosed with reference to the embodiment of Figures 4 and 5, thus providing a dispensing machine with extended features in a very limited space.

Claims

1. A machine for dispensing banknotes of one or more denomination contained therein, of the type comprising means for loading said banknotes in a first storage member, means for identifying at least the denomination of said banknotes, means for dispensing said banknotes at a withdrawing port of said machine, and means for transferring said banknotes at least from said first storage member to said dispensing means, **characterised in that** said dispensing means comprise a plurality of movable housings, each of which is designed to hold one as well as more banknotes of at least one preset denomination, and that said transferring means provide a first path for moving banknotes between said first storage member and said withdrawing port, a second path for moving banknotes between said plurality of movable housings and said withdrawing port and a third path for moving banknotes from said first storage member to said plurality of movable housings in order to fill or refill said housing, whereby a required amount can be selectively withdrawn either from the first storage member only, from both the first storage member and the movable housings or from the movable housings only to be transferred to the withdrawing port.

2. A machine according to claim 1, wherein said housings consist of slots formed by adjacent walls mounted on a rotating support element.

3. A machine according to claim 2, wherein each of said walls is pivoted on said support element.

4. A machine according to claim 2 or 3, wherein elastic means act on each of said walls in opposite direction to each other in order to keep the walls in radially extending positions.

5. A machine according to claim 1, wherein each of said movable housings consists of one or more rolled films.

6. A machine according to claim 5, wherein each unit of said rolled film or films comprise at least a pair of rolls each driven by an independent electric motor.

7. A machine according to claim 6, wherein at least one of said rolls is movable from a loading position and a dispensing position of said banknotes.

8. A machine according to claim 1, wherein said first storage member consists of a container or a space having shape and dimensions suitable for storing a stack of said banknotes and wherein said transfer means comprise a dispensing device at the bottom of said container.

9. A machine according to claim 1, wherein said means for loading banknotes comprise at least a drawer in which wads of banknotes can be accommodated.

10. A machine according to claim 1 or 9, wherein said loading means comprise at least a descending device movable between the bottom of said drawer and the top of the stack of notes contained in said first storage member or the bottom thereof.

11. A machine according to claim 1, wherein a second storage member is provided for receiving banknotes which are not suitable to be held in said movable housings.

12. A machine according to claim 10 or 11, wherein said second storage member consists of said at least one drawer.

13. A machine according to claim 11, wherein said second storage member consists of one or more rolled films.

14. A machine according to claim 13, wherein each unit of said rolled film or films comprise at least a pair of rolls each driven by an independent electric motor.

15. A machine according to claim 14, wherein at least one of said rolls is movable from a loading position and a dispensing position of said banknotes.

16. A machine according to claim 1, wherein said means for loading banknotes comprise at least an accepting device.

17. A machine according to claim 1, wherein an auxiliary box is provided for receiving banknotes which are not suitable to be dispensed.

18. A machine according to claim 16 or 17, wherein said transfer means provide at least a fourth path for moving banknotes from said accepting device to said auxiliary box.

19. A method for dispensing a required amount in banknotes of one or more identified denominations, wherein banknotes are loaded in a first storage member of a dispensing machine and dispensed through a withdrawing port of said machine, **characterised in that** banknotes are transferred from the first storage member to a plurality of movable housings for filling or refilling said housings, and that said required amount can be selectively obtained by drawing out a preset number of banknotes either from the first storage member only, from both the first storage member and the movable housings or from the movable housings only to be transferred in said withdrawing port.

20. A method according to claim 19, wherein banknotes are stored in a mixed way in said first storage member.

21. A method according to claim 19 or 20, wherein the required amount is obtained by drawing out banknotes from said first storage member and identifying them until it is reached a rounded down amount with respect to the required amount, the remaining banknotes for reaching the required amount being drawn out from one or more of said movable housings.

22. A method according to claim 19, wherein the number of banknotes drawn out from each of said movable housings is restored between a dispensing operation and the next one.

23. A method according to claim 22, wherein banknotes for restoring the preset number of banknotes in each of said movable housings are drawn out one by one from said first storage member and identified in their denomination, the banknotes identified as suitable for restoring the preset number in at least one of the emptied movable housings being placed in the respective movable housing, while banknotes drawn out from said first storage member but not suitable for restoring the preset number of banknotes in said movable housings are placed in a second storage member.

24. A method according to claim 23, wherein banknotes are transferred from said second storage member to said first storage member upon request of an operator.

25. A method according to claim 23, wherein banknotes are periodically transferred from said second storage member to said first storage member in automatic manner.

26. A method according to claim 19, wherein banknotes are checked and identified in their denomination at the loading stage.

27. A method according to claim 26, wherein banknotes that are deemed not suitable to be dispensed are moved to an auxiliary box instead of said first storage member.

Patentansprüche

1. Maschine zum Ausgeben darin enthaltener Banknoten eines oder mehrerer Nennwerte mit Mitteln zum Einfüllen der Banknoten in einen ersten Speicher, Mitteln zur Bestimmung zumindest des Nennwerts der Banknoten, Mitteln zum Ausgeben der Banknoten an einer Entnahmeöffnung der Maschine und

Mitteln zur Überführung der Banknoten zumindest vom ersten Speicher zum Ausgabemittel, **dadurch gekennzeichnet, dass** die Ausgabemittel eine Anzahl beweglicher Fächer umfassen, welche jeweils zur Aufnahme einer sowie mehrerer Banknoten mindestens eines vorgegebenen Nennwerts bestimmt sind, und dass die Überführungsmittel eine erste Bahn zum Bewegen von Banknoten zwischen dem ersten Speicher und der Entnahmeöffnung beinhalten, eine zweite Bahn zum Bewegen von Banknoten zwischen der Anzahl beweglicher Fächer und der Entnahmeöffnung und eine dritte Bahn zum Bewegen von Banknoten vom ersten Speicher zur Anzahl beweglicher Fächer, um das Fach zu füllen oder nachzufüllen, wodurch ein angeforderter Betrag wahlweise entweder nur aus dem ersten Speicher, sowohl aus dem ersten Speicher und aus den beweglichen Fächern oder nur aus den beweglichen Fächern entnommen werden kann, um zur Entnahmeöffnung überführt zu werden.

2. Maschine nach Anspruch 1, worin die Fächer aus Schlitzen bestehen, welche von auf einem sich drehenden Träger montierten benachbarten Wänden gebildet werden.

3. Maschine nach Anspruch 2, worin die Wände jeweils schwenkbar auf dem Träger angebracht sind.

4. Maschine nach Anspruch 2 oder 3, worin elastische Mittel jeweils in entgegengesetzten Richtungen auf die Wände wirken, um die Wände in einer radial nach aussen weisenden Stellung zu halten.

5. Maschine nach Anspruch 1, worin die beweglichen Fächer jeweils aus einer oder mehreren aufgerollten Folien bestehen.

6. Maschine nach Anspruch 5, worin jede Einheit aufgerollten Films oder aufgerollter Filme mindestens ein Paar von Rollen beinhaltet, die jeweils von einem unabhängigen Elektromotor angetrieben werden.

7. Maschine nach Anspruch 6, worin mindestens eine der Rollen zwischen einer Einfüllstellung und einer Ausgabestellung für die Banknoten bewegbar ist.

8. Maschine nach Anspruch 1, worin der erste Speicher aus einem Behälter oder einem Raum geeigneter Form und geeigneter Abmessungen zum Speichern eines Stapels der Banknoten besteht und worin die Überführungsmittel eine unten am Behälter angeordnete Ausgabevorrichtung beinhalten.

9. Maschine nach Anspruch 1, worin die Mittel zum Einfüllen von Banknoten mindestens ein Schubfach zur Aufnahme von Banknotenbündeln beinhalten.

10. Maschine nach Anspruch 1 oder 9, worin die Einfüllmittel mindestens eine Absenkvorrichtung beinhalten, welche zwischen dem Boden des Schubfachs und dem oberen Ende des im ersten Speicher enthaltenen Notenstapels oder dessen unterem Ende bewegbar ist.

11. Maschine nach Anspruch 1, worin ein zweiter Speicher vorhanden ist zur Aufnahme von Banknoten, für welche die beweglichen Fächer nicht zur Aufnahme geeignet sind.

12. Maschine nach Anspruch 10 oder 11, worin der zweite Speicher aus dem mindestens einen Schubfach besteht.

13. Maschine nach Anspruch 11, worin der zweite Speicher aus einer oder mehreren aufgerollten Folien besteht.

14. Maschine nach Anspruch 13, worin jede Einheit aufgerollten Films oder aufgerollter Filme mindestens ein Paar von Rollen beinhaltet, die jeweils von einem unabhängigen Elektromotor angetrieben werden.

15. Maschine nach Anspruch 14, worin mindestens eine der Rollen zwischen einer Einfüllstellung und einer Ausgabestellung für die Banknoten bewegbar ist.

16. Maschine nach Anspruch 1, worin die Mittel zum Einfüllen von Banknoten mindestens eine Annahmevorrichtung beinhalten.

17. Maschine nach Anspruch 1, worin ein Hilfsbehälter vorhanden ist, um Banknoten aufzunehmen, welche für die Ausgabe nicht geeignet sind.

18. Maschine nach Anspruch 16 oder 17, worin die Überführungsmittel mindestens eine vierte Bahn zum Bewegen von Banknoten von der Annahmevorrichtung zum Hilfsbehälter beinhalten.

19. Verfahren zur Ausgabe eines angeforderten Betrags in Banknoten eines oder mehrerer bestimmter Nennwerte, worin Banknoten in ein erstes Speicherteil einer Ausgabemaschine eingefüllt und durch eine Entnahmeöffnung der Maschine ausgegeben werden, **dadurch gekennzeichnet, dass** Banknoten vom ersten Speicherteil zu einer Anzahl beweglicher Fächer überführt werden, um die Fächer zu füllen oder nachzufüllen, und dass der angeforderte Betrag wahlweise erhalten wird, indem eine vorgegebene Anzahl Banknoten entweder nur aus dem ersten Speicher, sowohl aus dem ersten Speicher und aus den beweglichen Fächern oder nur aus den beweglichen Fächern bezogen wird, um zur Entnahmeöffnung überführt zu werden.

20. Verfahren nach Anspruch 19, worin Banknoten gemischt im ersten Speicher gespeichert sind.

21. Verfahren nach Anspruch 19 oder 20, worin der angeforderte Betrag erhalten wird, indem Banknoten aus dem ersten Speicher bezogen und bestimmt werden, bis ein abgerundeter Betrag des angeforderten Betrags erreicht ist und die restlichen Banknoten zur Erreichung des angeforderten Betrags aus einem oder mehreren der genannten beweglichen Fächer bezogen werden.

22. Verfahren nach Anspruch 19, worin die Zahl der aus den beweglichen Fächern bezogenen Banknoten zwischen aufeinanderfolgenden Ausgabevorgängen jeweils ergänzt wird.

23. Verfahren nach Anspruch 22, worin Banknoten zum Ergänzen der vorgegebenen Anzahl Banknoten in jedem der beweglichen Fächer einzeln aus dem ersten Speicher entnommen werden und deren Nennwert bestimmt wird, wobei die zum Ergänzen der vorgegebenen Anzahl in mindestens einem der geleerten beweglichen Fächer als geeignet befundenen Banknoten in das entsprechende bewegliche Fach gelegt werden, während aus dem ersten Speicher entnommene, jedoch zum Ergänzen der vorgegebenen Anzahl Banknoten in den beweglichen Fächern ungeeignete Banknoten in einen zweiten Speicher gelegt werden.

24. Verfahren nach Anspruch 23, worin Banknoten auf Veranlassung einer Bedienungsperson vom zweiten Speicher in den ersten Speicher überführt werden.

25. Verfahren nach Anspruch 23, worin Banknoten automatisch periodisch vom zweiten Speicher in den ersten Speicher überführt werden.

26. Verfahren nach Anspruch 19, worin Banknoten beim Einfüllen geprüft werden und ihr Nennwert bestimmt wird.

27. Verfahren nach Anspruch 26, worin Banknoten, welche als für die Ausgabe ungeeignet erachtet werden, anstatt zum ersten Speicher zu einem Hilfsbehälter gelangen.

Revendications

1. Machine de distribution de billets de banque d'une ou de plusieurs coupures contenues dans la machine, du type comprenant des moyens pour charger lesdits billets de banque dans un premier organe de stockage, des moyens pour identifier du moins la coupure desdits billets de banque, des moyens pour distribuer lesdits billets de banque à une ouverture de retrait de ladite machine et des moyens pour transférer lesdits billets de banque au moins dudit premier organe de stockage auxdits moyens de distribution, **caractérisée en ce que** lesdits moyens de distribution comprennent une pluralité de casiers mobiles dont chacun est conçu pour contenir un tout comme plusieurs billets de banque d'au moins une coupure prédéterminée, et **en ce que** lesdits moyens de transfert forment une première voie pour déplacer des billets de banque entre ledit premier organe de stockage et ladite ouverture de retrait, une deuxième voie pour déplacer des billets de banque entre ladite pluralité de casiers mobiles et ladite ouverture de retrait et une troisième voie pour déplacer des billets de banque dudit premier organe de stockage vers ladite pluralité de casiers mobiles afin d'alimenter ou réalimenter ledit casier, un montant requis pouvant être sélectivement retiré soit du premier organe de stockage uniquement, soit à la fois du premier organe de stockage et des casiers mobiles, soit des casiers mobiles uniquement pour être transféré à l'ouverture de retrait.

2. Machine selon la revendication 1, où lesdits casiers sont constitués de fentes formées par des parois adjacentes montées sur un élément de support rotatif.

3. Machine selon la revendication 2, où chacune desdites parois pivote sur ledit élément de support.

4. Machine selon la revendication 2 ou 3, où des moyens élastiques agissent sur chacune desdites parois en directions opposées afin de maintenir les parois dans des positions radialement saillantes.

5. Machine selon la revendication 1, où chacun desdits casiers mobiles est constitué d'un ou de plusieurs films enroulés.

6. Machine selon la revendication 5, où chaque unité dudit film enroulé ou desdits films enroulés comprend au moins une paire de rouleaux entraînés chacun par un moteur électrique indépendant.

7. Machine selon la revendication 6, où l'un au moins desdits rouleaux est déplaçable entre une position de chargement et une position de distribution desdits billets de banque.

8. Machine selon la revendication 1, où ledit premier organe de stockage est constitué d'un récipient ou espace ayant une forme et des dimensions appropriées pour stocker une pile desdits billets de banque, et où lesdits moyens de transfert comprennent un dispositif de distribution au bas dudit récipient.

9. Machine selon la revendication 1, où lesdits moyens pour charger des billets de banque comprennent au

moins un tiroir dans lequel peuvent être logés des liasses de billets de banque.

10. Machine selon la revendication 1 ou 9, où lesdits moyens de chargement comprennent au moins un dispositif descendeur déplaçable entre le bas dudit tiroir et le haut de la pile de billets contenue dans ledit premier organe de stockage ou en bas de celuici.

11. Machine selon la revendication 1, où un deuxième organe de stockage est pourvu pour recevoir des billets de banque inappropriés pour être retenus dans lesdits casiers mobiles.

12. Machine selon la revendication 10 ou 11, où ledit deuxième organe de stockage est constitué dudit au moins un tiroir.

13. Machine selon la revendication 11, où ledit deuxième organe de stockage est constitué d'un ou de plusieurs films enroulés.

14. Machine selon la revendication 13, où chaque unité dudit film enroulé ou desdits films enroulés comprend au moins une paire de rouleaux entraînés chacun par un moteur électrique indépendant.

15. Machine selon la revendication 14, où l'un au moins desdits rouleaux est déplaçable entre une position de chargement et une position de distribution desdits billets de banque.

16. Machine selon la revendication 1, où lesdits moyens pour charger des billets de banque comprennent au moins un dispositif de réception.

17. Machine selon la revendication 1, où une boîte auxiliaire est pourvue pour recevoir des billets de banque inappropriés à la distribution.

18. Machine selon la revendication 16 ou 17, où lesdits moyens de transfert forment au moins une quatrième voie pour déplacer des billets de banque dudit dispositif de réception à ladite boîte auxiliaire.

19. Procédé de distribution d'un montant requis en billets de banque d'une ou de plusieurs coupures définies, où des billets de banque sont chargés dans un premier organe de stockage d'une machine de distribution et distribués par une ouverture de retrait de ladite machine, **caractérisé en ce que** des billets de banque sont transférés du premier organe de stockage à une pluralité de casiers mobiles pour alimenter ou réalimenter lesdits casiers, et **en ce que** ledit montant requis peut être sélectivement obtenu en retirant un nombre prédéfini de billets de banque soit du premier organe de stockage uniquement, soit à la fois du premier organe de stockage et des casiers mobiles, soit des casiers mobiles uniquement pour être transféré à ladite ouverture de retrait.

20. Procédé selon la revendication 19, où des billets de banque sont stockés de manière mélangée dans ledit premier organe de stockage.

21. Procédé selon la revendication 19 ou 20, où le montant requis est obtenu en retirant des billets de banque dudit premier organe de stockage et en les identifiant jusqu'à ce qu'un montant arrondi du montant requis ait été atteint, les billets de banque restants pour atteindre le montant requis étant retirés d'un ou de plusieurs desdits casiers mobiles.

22. Procédé selon la revendication 19, où le nombre de billets de banque retirés de chacun desdits casiers mobiles est complété entre une opération de distribution et la suivante.

23. Procédé selon la revendication 22, où des billets de banque pour compléter le nombre prédéfini de billets de banque dans chacun des casiers mobiles sont retirés un par un dudit premier organe de stockage et identifiés quant à leur coupure, les billets de banque identifiés comme étant appropriés pour compléter le nombre prédéfini dans au moins un des casiers mobiles vidés étant placés dans le casier mobile correspondant alors que des billets de banque retirés dudit premier organe de stockage mais inappropriés pour compléter le nombre prédéfini de billets de banque dans lesdits casiers mobiles sont placés dans un deuxième organe de stockage.

24. Procédé selon la revendication 23, où des billets de banque sont transférés dudit deuxième organe de stockage audit premier organe de stockage sur demande d'un opérateur.

25. Procédé selon la revendication 23, où des billets de banque sont périodiquement transférés dudit deuxième organe de stockage audit premier organe de stockage de manière automatique.

26. Procédé selon la revendication 19, où des billets de banque sont examinés et identifiés quant à leur coupure au stade du chargement.

27. Procédé selon la revendication 26, où des billets de banque jugés inappropriés à la distribution sont transférés dans une boîte auxiliaire au lieu de l'être dans ledit premier organe de stockage.

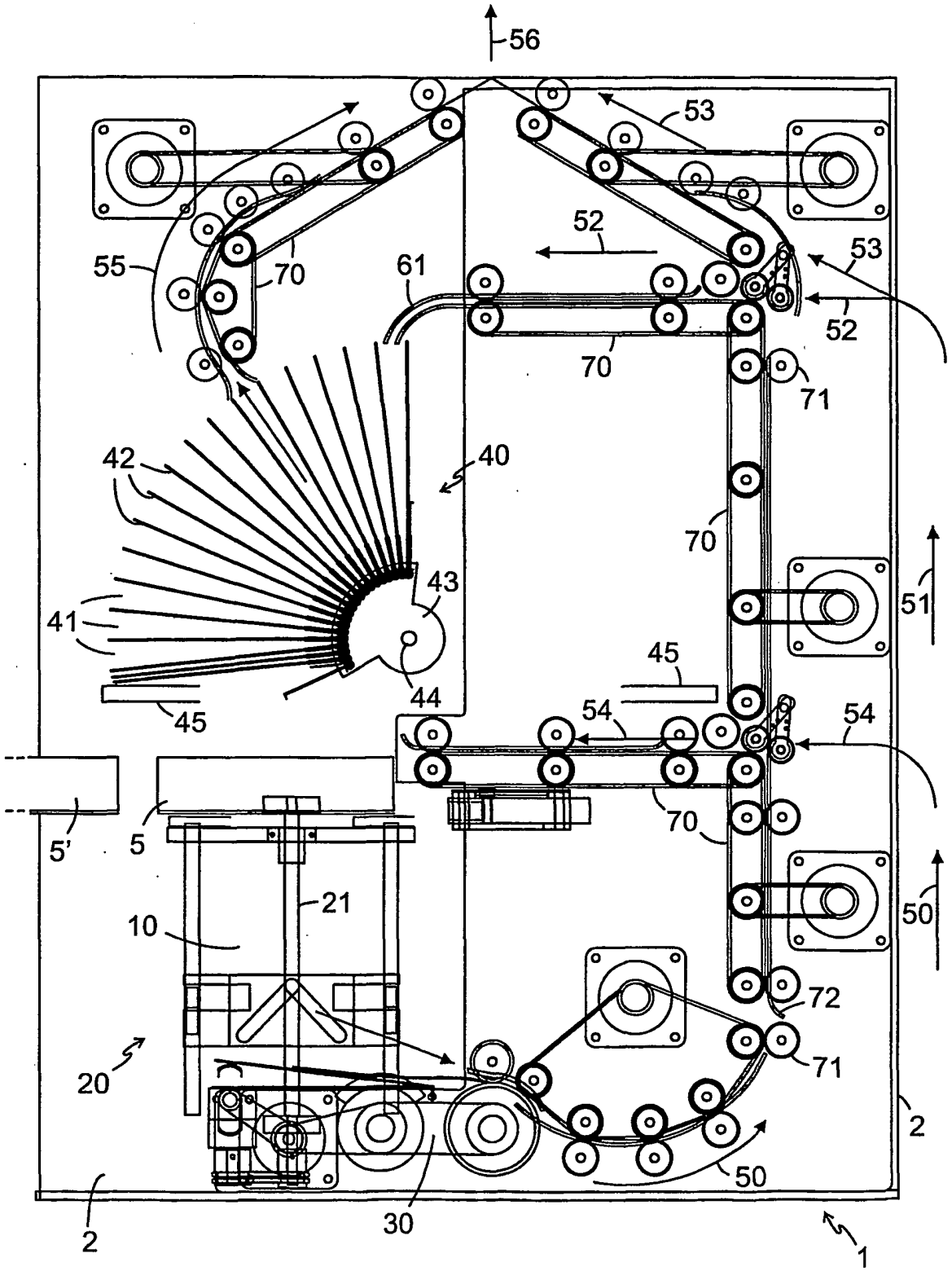
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FIG.1

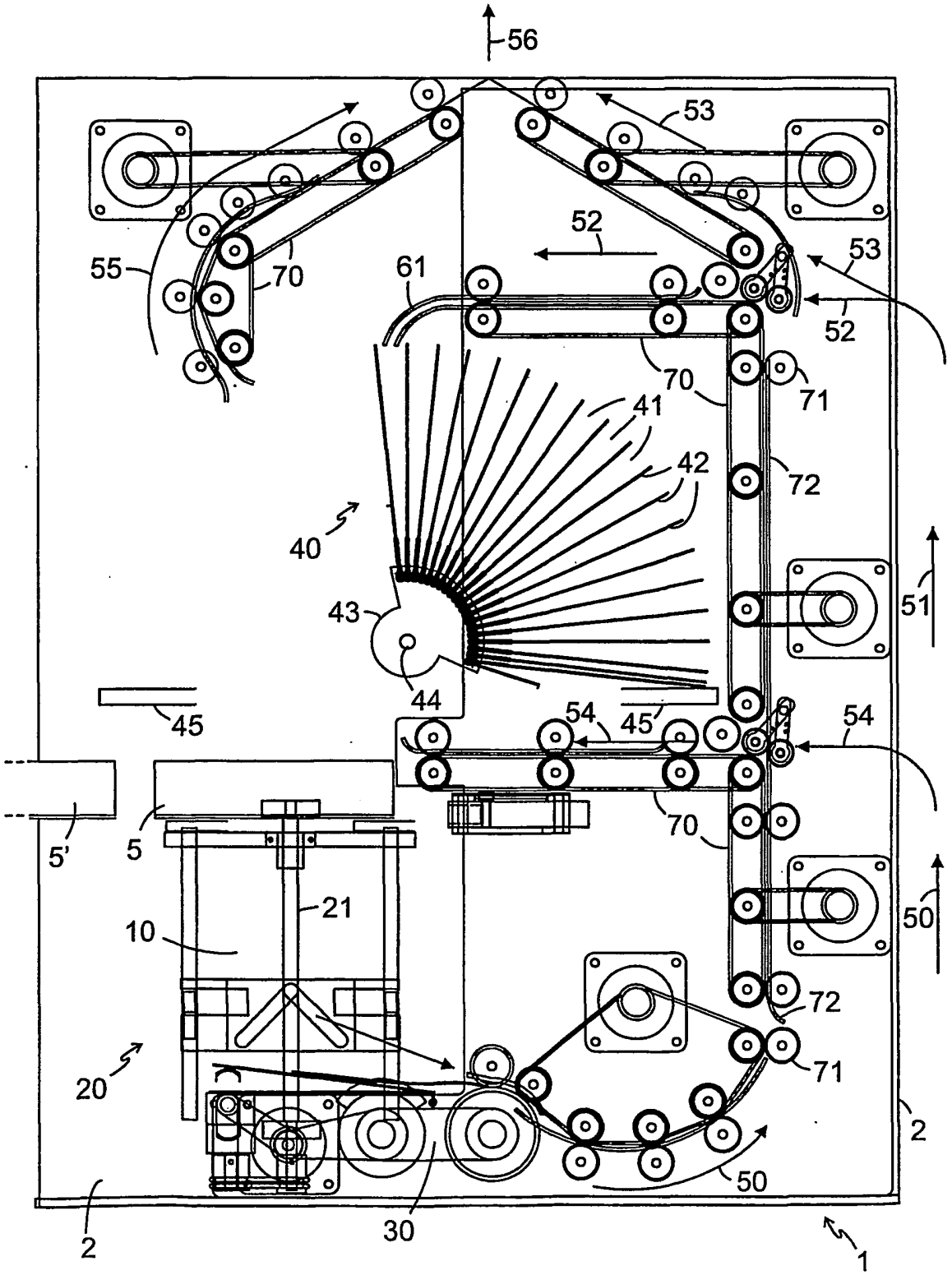
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FIG.2

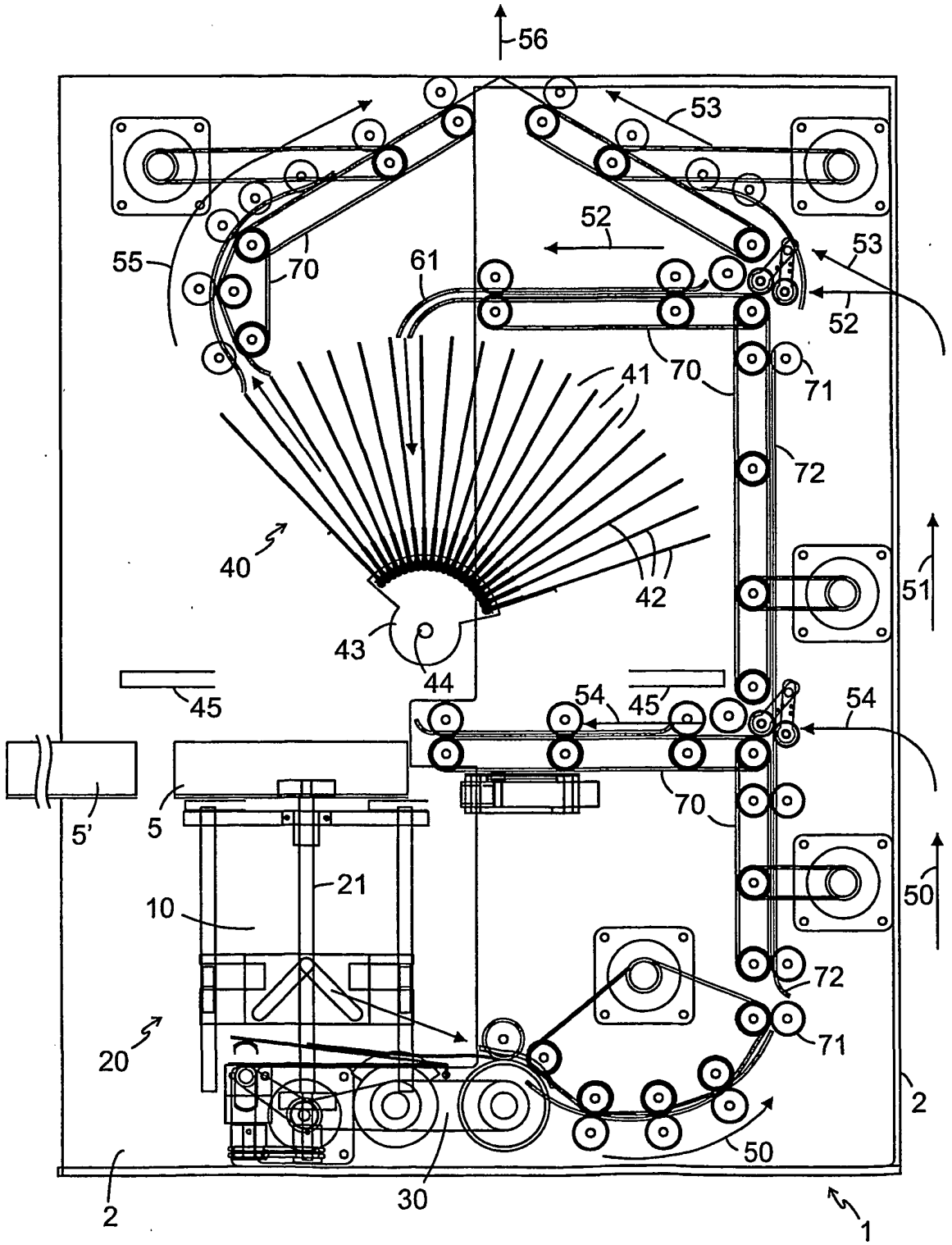
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FIG.3

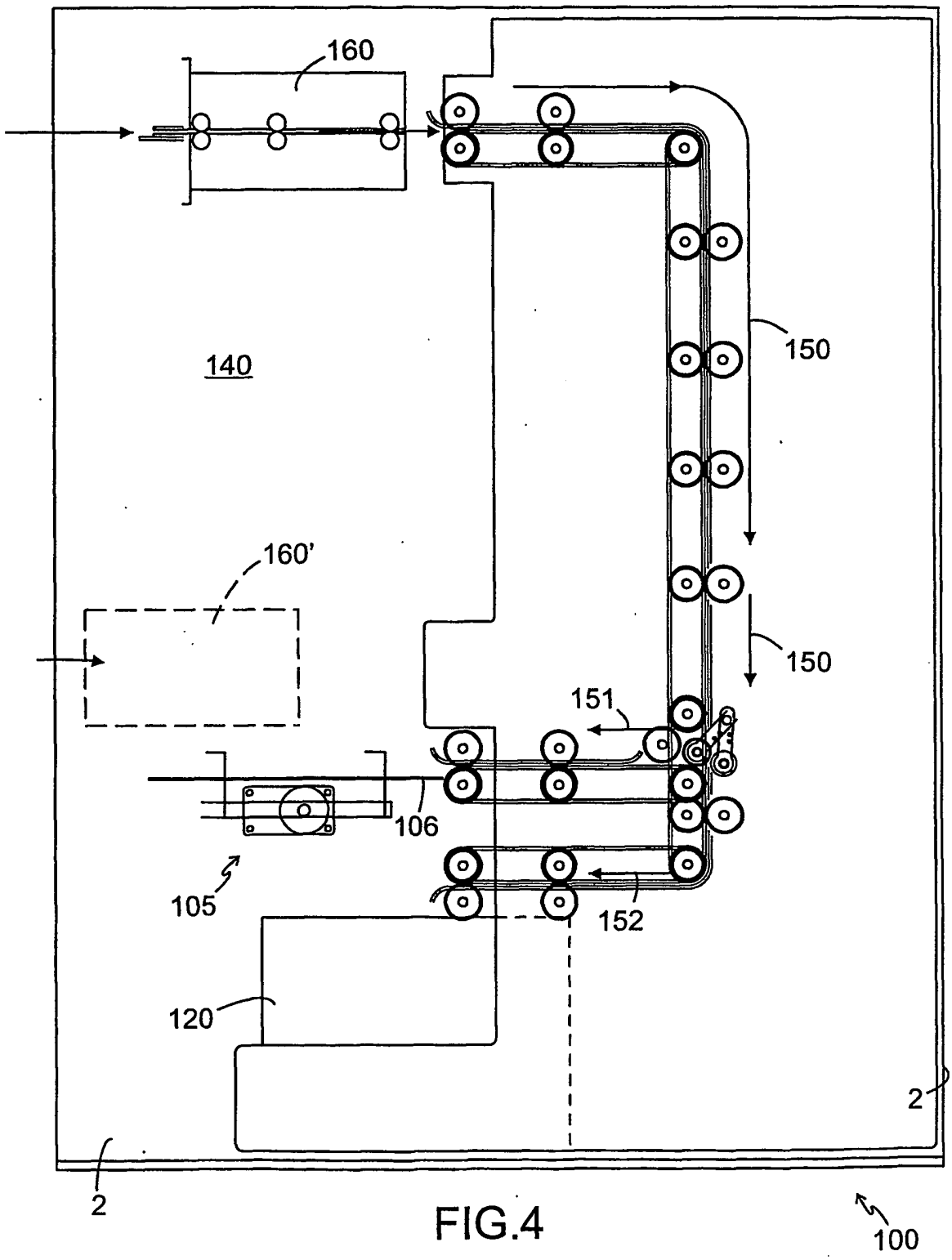


FIG.4

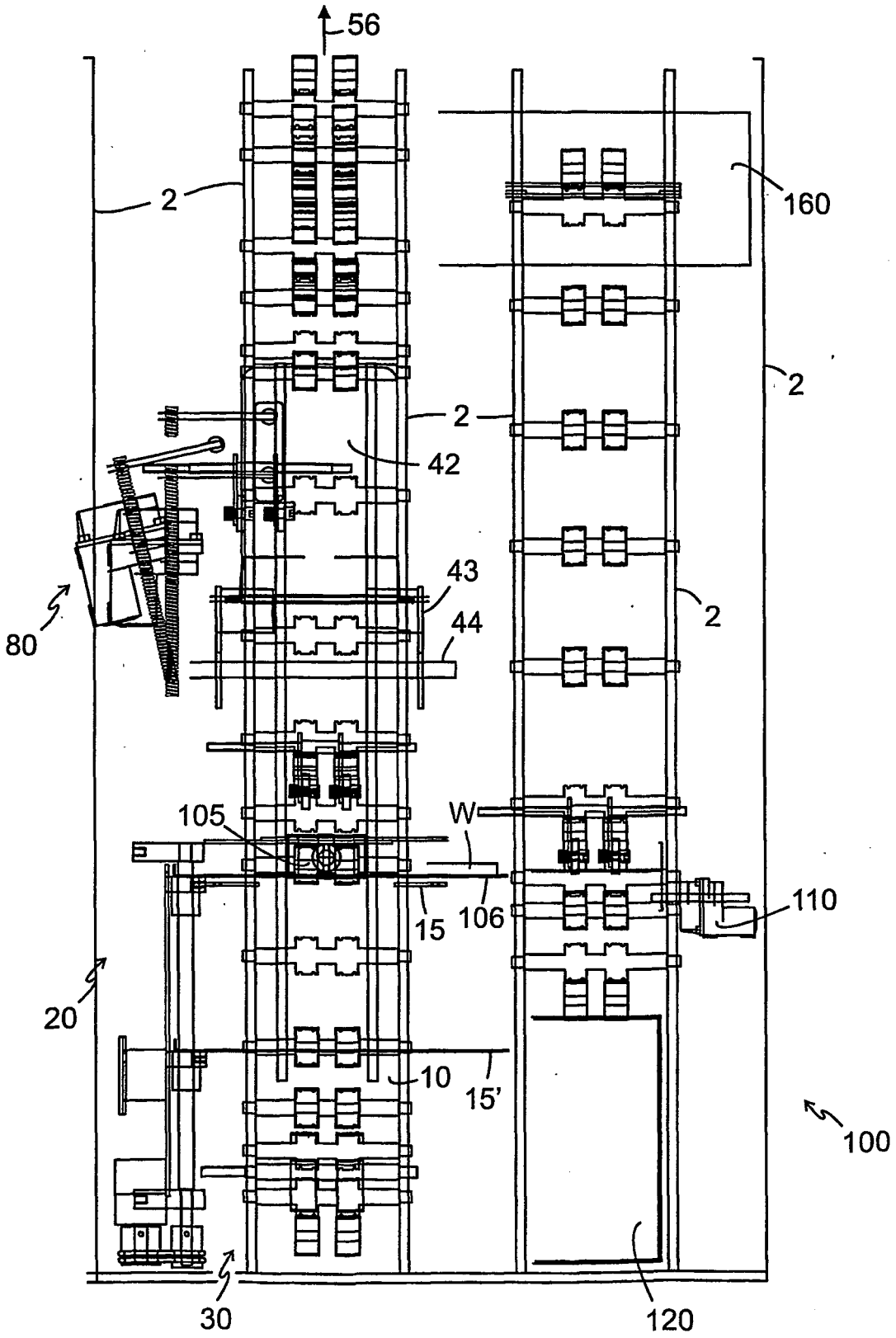


FIG.5

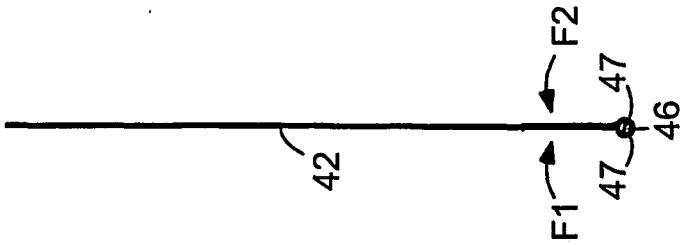


FIG.6B

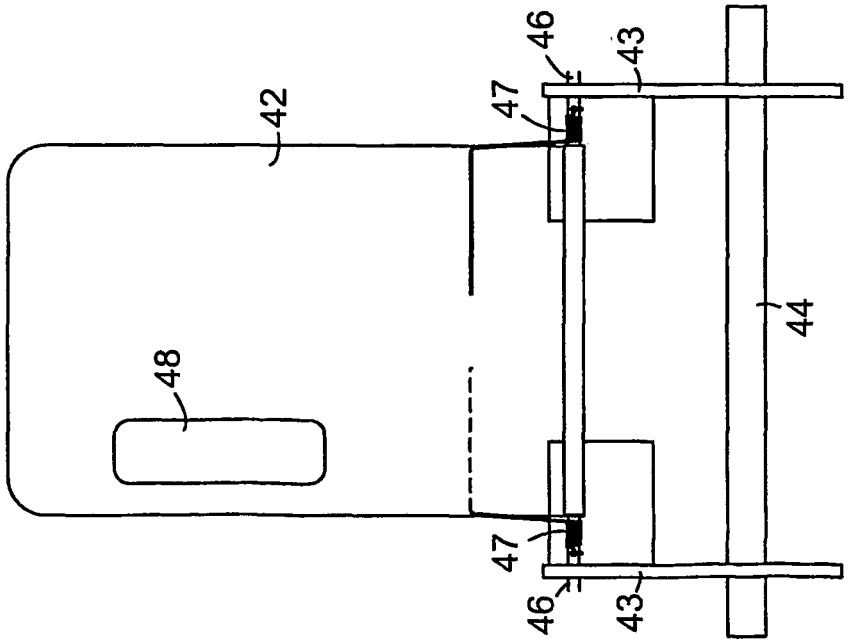


FIG.6A

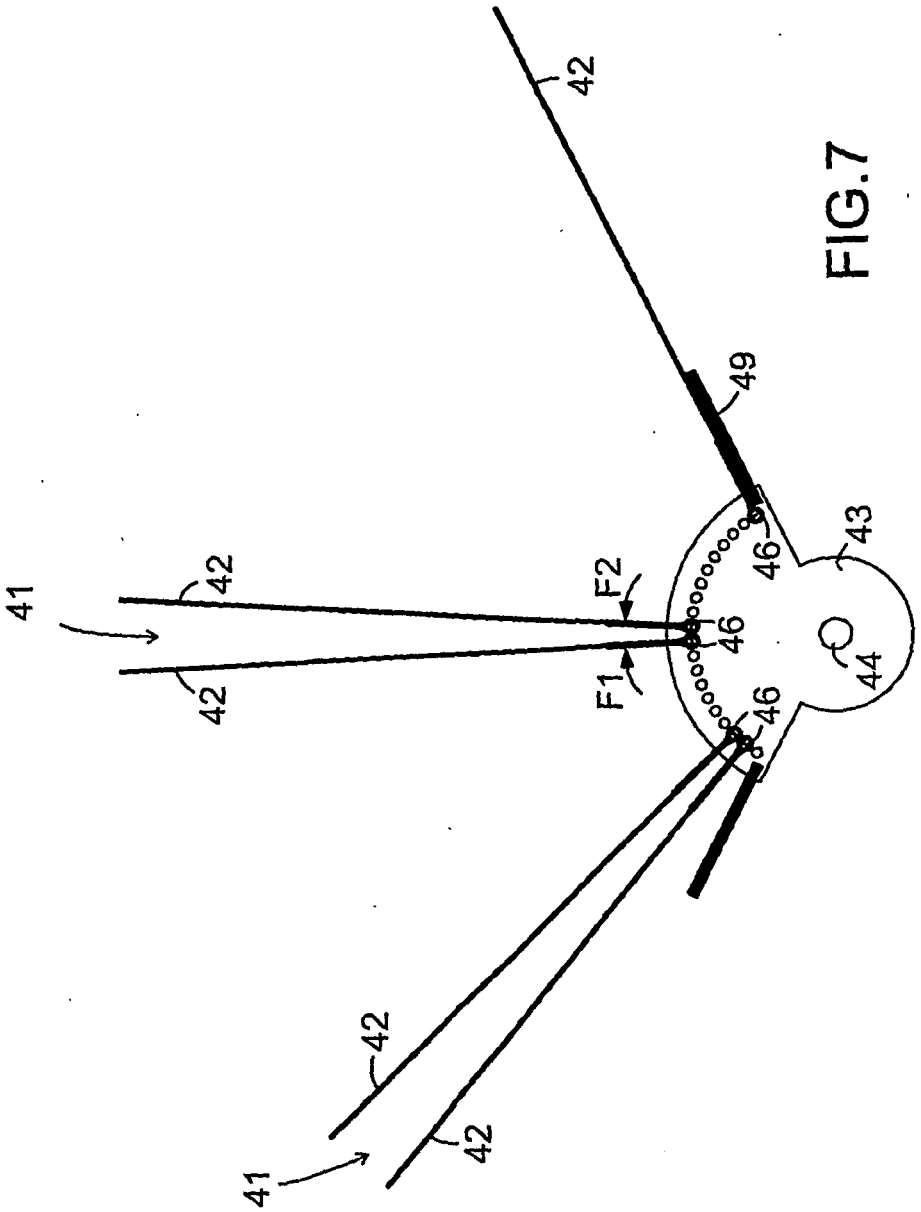


FIG.7

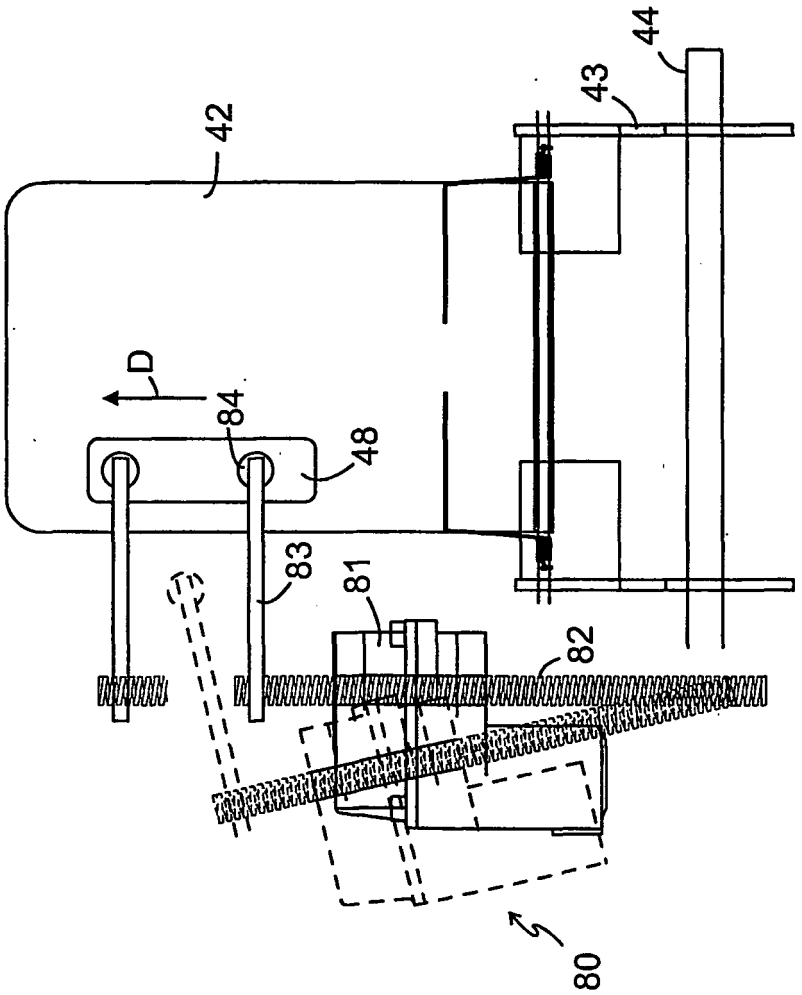


FIG.8

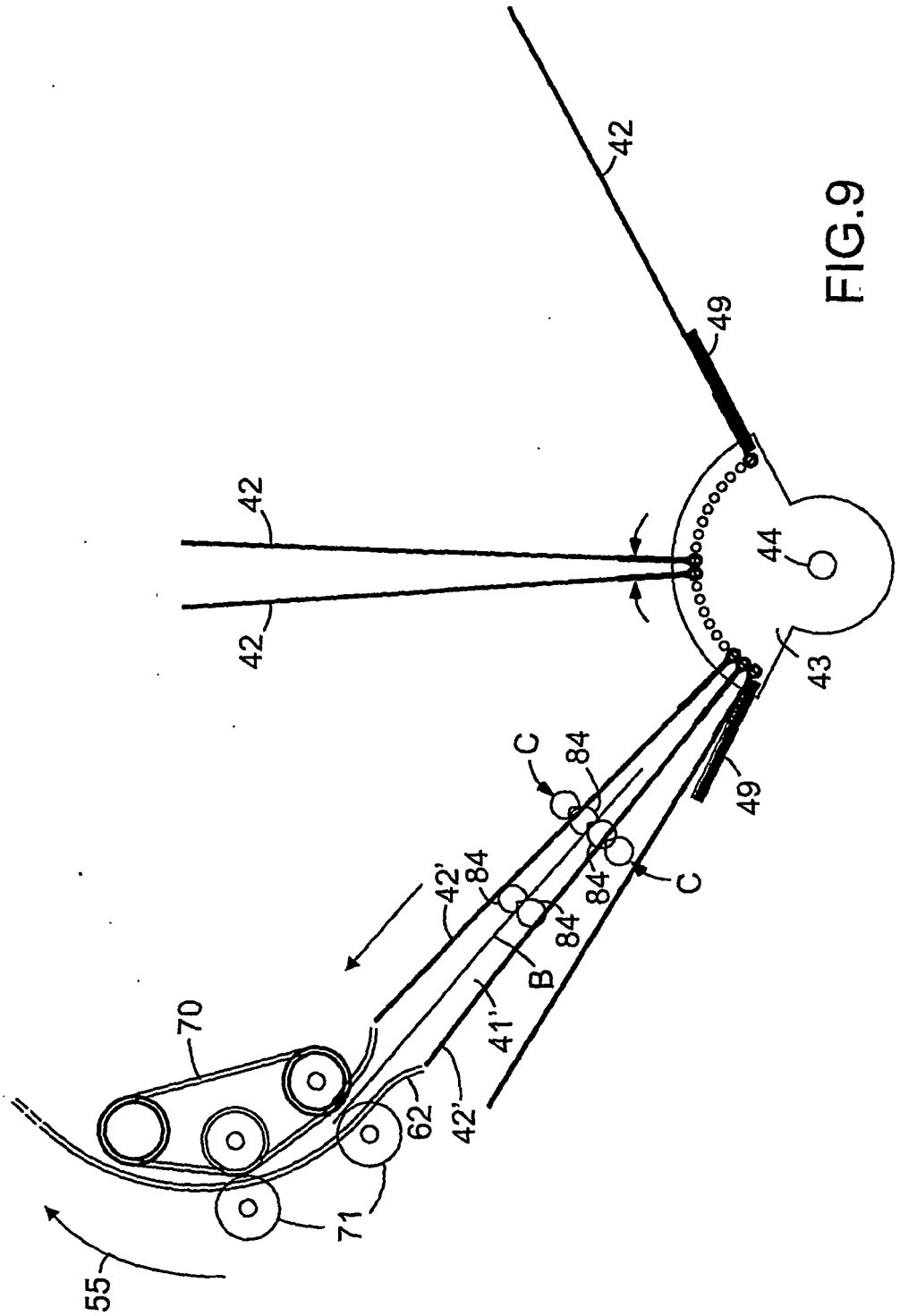


FIG.9

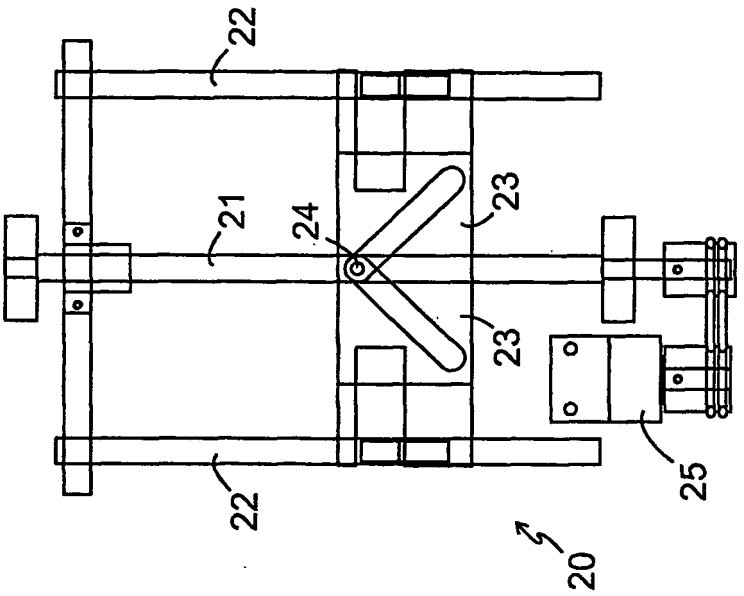


FIG.11

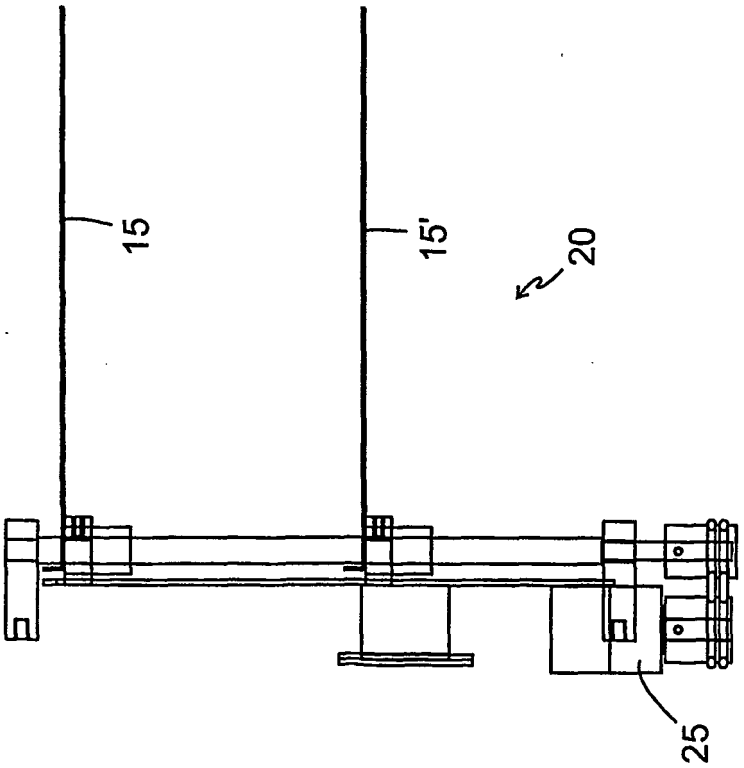
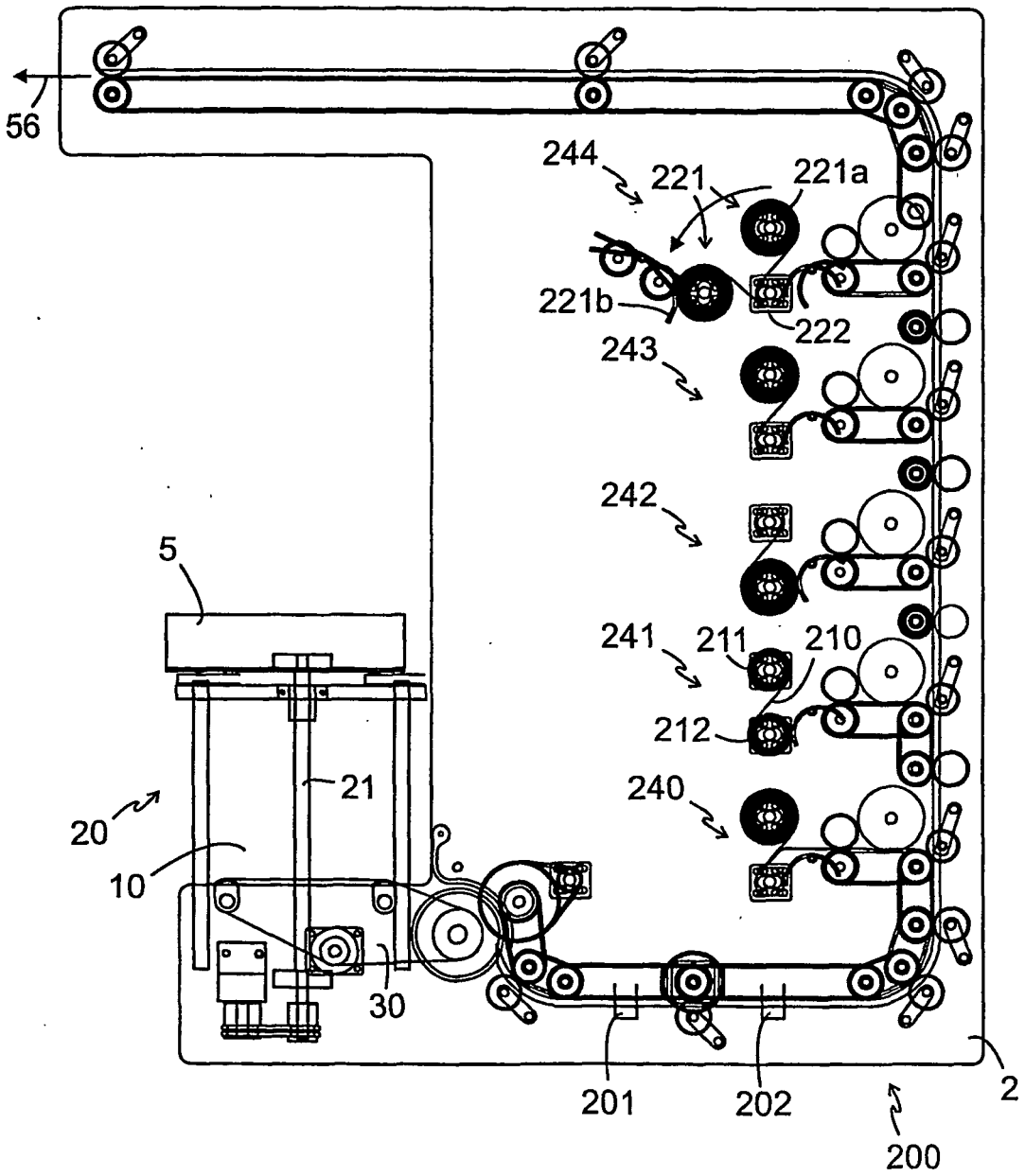


FIG.10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2

FIG.12

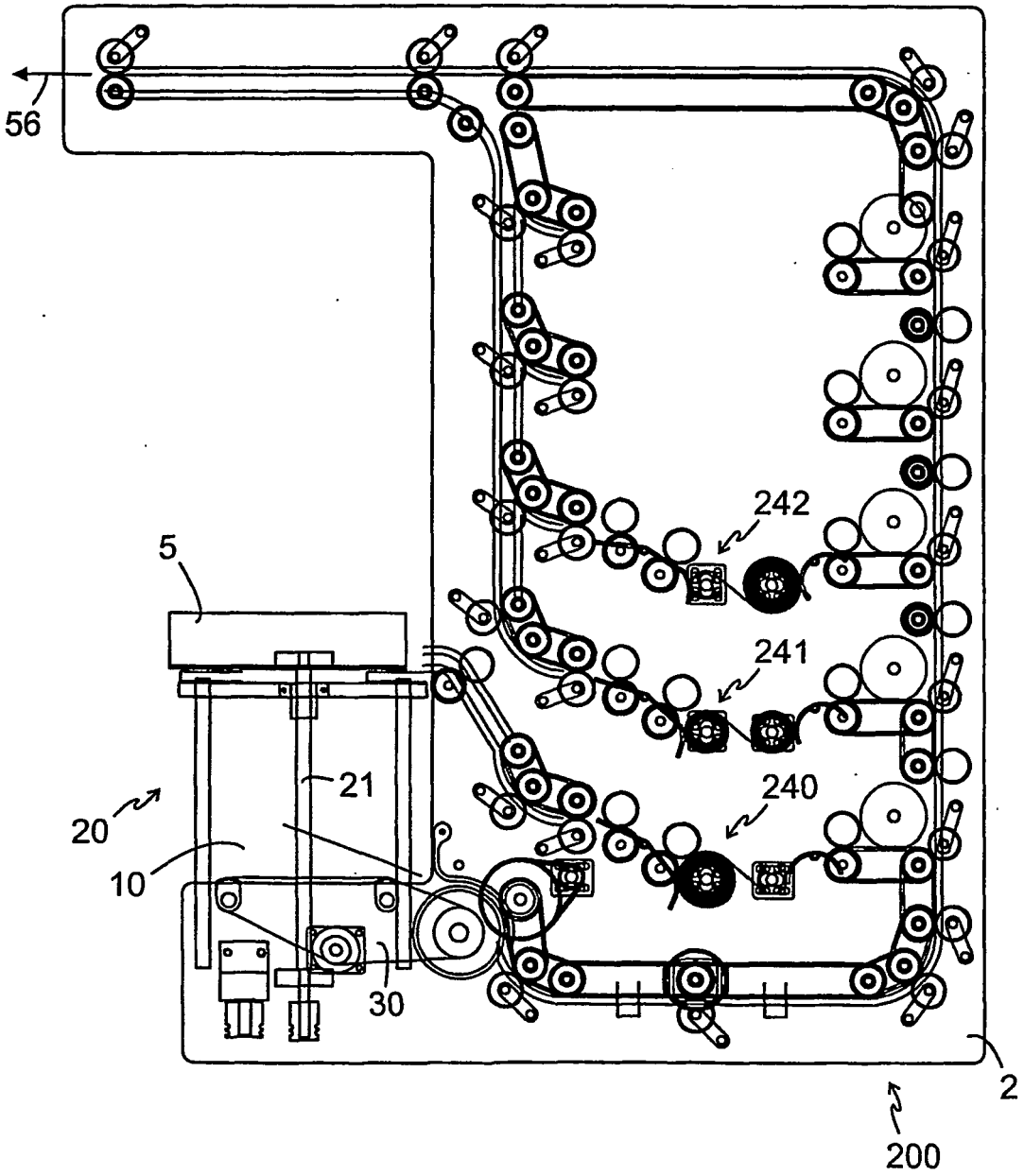

FIG.13