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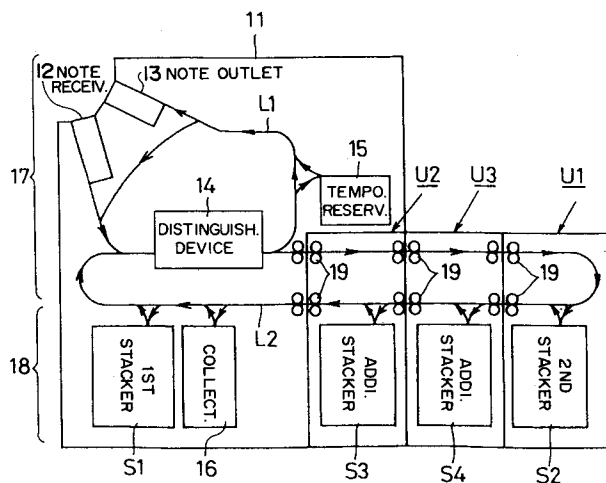
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D-87712 Mindelheim (DE)(54) **Sheet storage apparatus and transaction apparatus.**

(57) A sheet storage apparatus for storing sheets in a first sheet storage portion (S1) via a sheet transport path (L2) has an internal transport path (L2) which is formed in its body (11) and can be communicated with an external transport path (L2) communicated

with a second sheet storage portion (S2-S6). The number of sheet storage portions can be varied depending on the kinds of sheets or notes to be handled for effective utilization of the sheet storage portions.

Fig. 2**EP 0 675 465 A1**

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to a sheet storage apparatus installed in, for example, a note dispenser or a note transacting machine and, more particularly, to a sheet storage apparatus and a transaction apparatus having an improved capability of accommodating or handling sheets, for example, papers or cards, of a varying size such as monetary notes.

Description of Related Art

Fig. 11 depicts a conventional note transacting machine allowing transaction including deposit and withdrawal of notes. This note transacting machine has a body 101 formed with a note receiver 102 and a note outlet 106. The kinds of notes placed on the note receiver 102 are distinguished by a note distinguishing device 103, and the distinguished notes are reserved temporarily in a temporary note reservoir 104. After the deposit transaction is established, the notes are accommodated in associated stackers 105 accommodated in the body 101. In withdrawal, notes are fed out from an appropriate stacker or stackers 105, then distinguished by the note distinguishing device 103, and finally discharged to the note outlet 106. For this purpose, the note receiver 102 and the note outlet 106, both exposed outside, are communicated with all of the internal stackers 105 via a transport path 107 of a circulation type.

In the case of foreign notes, the dimensions thereof are different from each other depending on the kinds of notes. Thus, when the note transacting machine is utilized in a foreign country, it is necessary to alter the width of the transport path and the sizes of the stackers, depending on the sizes of notes. Consequently, an apparatus capable of handling many kinds of notes is required.

It is therefore conceivable to accommodate a considerable number of stackers 111 in correspondence to the kinds of notes inside a body 112 of an apparatus, as shown in Fig. 12. In this case, however, a transport path 113 of the circulation type and the body 112 inevitably become large, thus increasing the manufacturing cost of the apparatus. Also, this kind of apparatus is uneconomical because some stackers are not used when the number of the kinds of notes is smaller than that of the stackers prepared.

SUMMARY OF THE INVENTION

The present invention has been developed to overcome the above-described disadvantages.

It is accordingly an objective of the present invention to provide a sheet storage apparatus and a transaction apparatus to which additional stackers can be removably mounted for effective utilization of a required number of stackers.

In accomplishing the above and other objectives, the sheet storage apparatus according to the present invention is used to store sheets in a first sheet storage portion via a sheet transport path and is characterized in that an internal transport path formed in an apparatus body can be communicated with an external transport path communicated with a second sheet storage portion.

The sheet transport path comprises a first transport path required to transport the sheets to the sheet storage portions for the storage of the sheets therein and a second transport path required to feed the sheets therefrom to the outside.

Advantageously, a power transmission means is disposed at a connecting portion between the internal transport path and the external transport path to transmit a driving force.

Conveniently, a driving means is disposed near the external transport path to drive the external transport path.

Again conveniently, a branched connection path is provided for communicating between the first transport path and the second transport path to transport the sheets from the first transport path to the second transport path.

A direction-switching means is provided at a branched position of the branched connection path to switch the transport direction of the sheets introduced to the branched position.

The sheet storage apparatus of the above-described type can be incorporated into a transaction apparatus.

According to the present invention, in order to increase the sheet storage portions in consideration of the number of the kinds of sheets, the external transport path communicated with the second sheet storage portion is communicated with the internal transport path of the apparatus body.

In storing the sheets in the sheet storage portions, they are transported thereto via the first transport path communicated therewith. The sheets stored in the sheet storage portions are fed out therefrom via the second transport path communicated therewith.

In driving the external transport path provided outside the apparatus body, the driving force is transmitted to the external transport path by the power transmission means provided at the connecting portion between the internal transport path and the external transport path. The external transport path provided outside the apparatus body is driven by the driving means disposed near it.

In switching the transport direction of sheets introduced inside the apparatus, they are transported to arrive at the branched connection path branched from the first transport path to the second transport path so that the sheets may be fed either continuously along the first transport path or to the second transport path via the branched connection path. The direction-switching means is used to switch the transport direction of the sheets that have arrived at the branched connection path.

When the sheet storage apparatus is installed inside a transaction apparatus, the latter is effectively utilized for transaction such as, for example, deposit and withdrawal of notes.

According to the present invention, a required number of sheet storage portions can be provided outside the apparatus body, depending on the number of the kinds of sheets to be handled. Even if the number of the kinds of sheets varies, the sheet storage portions can be provided in correspondence thereto. Therefore, it does not occur that the number of the sheet storage portions is in excess or short. That is, the apparatus can be effectively used by providing an appropriate number of sheet storage portions in conformity to the object of utilization of the apparatus.

Furthermore, a single apparatus is applicable to various objects in which the required number of sheet storage portions differs, and the effective utilization of the sheet storage portions can reduce the size and the manufacturing cost of the apparatus.

Because sheets can be introduced in or fed out from the sheet storage portions via the first and second transport paths, effective transaction including deposit and withdrawal of monetary notes can be achieved.

Also, when the external transport path is communicated with the internal transport path, the external transport path is driven by the power transmission means disposed therebetween so that the sheets may be appropriately transported from the internal transport path to the external transport path. When the external transport path is provided with the driving means, the former is independently driven by the latter. In this case, the power transmission means for transmitting the driving force from the apparatus body to the external transport path is dispensed with.

The provision of the branched connection path allows sheets introduced to the first transport path to be directed either continuously to the first transport path or immediately to the second transport path. Accordingly, the sheets introduced into the apparatus can be transported at a high speed by appropriately selecting the transport direction, thus increasing the speed of various transport operations such as introduction of the sheets into the

sheet storage portions, collection of the sheets into, for example, a collection box or the like.

When the sheet storage apparatus is installed inside a transaction apparatus such as, for example, a note dispenser or a note transacting machine, transactions can be accomplished for various kinds of notes.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objectives and features of the present invention will become more apparent from the following description of preferred embodiments thereof with reference to the accompanying drawings, throughout which like parts are designated by like reference numerals, and wherein:

Fig. 1 is a schematic elevational view of a note transacting apparatus according to the present invention;

Fig. 2 is a view similar to Fig. 1, but indicating the apparatus to which additional stacker units have been mounted;

Fig. 3 is a schematic elevational view of an additional stacker unit;

Fig. 4 is a view similar to Fig. 3, but indicating another additional stacker unit;

Fig. 5 is a schematic elevational view of the additional stacker unit of Fig. 4, particularly indicating a line connection mechanism thereof;

Fig. 6 is a side view of the line connection mechanism indicating the manner in which the power is transmitted;

Fig. 7 is a fragmentary perspective view of two neighboring line connection mechanisms indicating the manner in which the power is transmitted;

Fig. 8 is an elevational view of one of stacker units including the additional stacker units;

Fig. 9 is a modification of the additional stacker units that has a driving motor;

Fig. 10 is another modification of the additional stacker units that has a curved connection line between feed-in and feed-out lines;

Fig. 11 is a schematic elevational view of a conventional note transacting apparatus; and

Fig. 12 is a view similar to Fig. 11, but indicating another conventional note transacting apparatus accommodating additional stackers.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 depicts a note transacting apparatus embodying the present invention which has a note receiver 12 and a note outlet 13 both provided at an upper front portion of an apparatus body 11. Notes received by the note receiver 12 are successively introduced inside the body 11 by means of a

feed roller 25 and a separation roller 26 opposed to each other and disposed immediately below the note receiver 12. The introduction of the notes inside the body 11 is assisted by an auxiliary roller 27 adjoining the note receiver 12. The note transacting apparatus accommodates a note distinguishing device 14 for distinguishing the kinds of notes, a temporary note reservoir 15 for temporarily reserving notes received or those to be paid, first and second stackers S1 and S2 for storing associated notes, and a collection box 16 for collecting notes decided as being undistinguishable, damaged, and forgotten to be picked up by customers. As shown in Fig. 1, the note distinguishing device 14 and the temporary note reservoir 15, both communicating with the note receiver 12 and the note outlet 13, are communicated with each other via a looped transport line L1, while the note distinguishing device 14, the first and second stackers S1 and S2, and the collection box 16 are communicated with one another via a looped transport line L2.

The note transacting apparatus of Fig. 1 is made up of a transport system 17 for transporting notes and a storage system 18 disposed below the transport system 17 for storing the notes. More specifically, the transport system 17 is constituted by connecting the note receiver 12, the note outlet 13, the note distinguishing device 14, and the temporary note reservoir 15 via the upper transport line L1, and by connecting the note distinguishing device 14, the first and second stackers S1 and S2, and the collection box 16 via the lower transport line L2. In deposit, notes placed on the note receiver 12 are stored in associated stackers S1 and S2 via the upper and lower transport lines L1 and L2. In withdrawal, desired notes are fed out from the corresponding stacker or stackers S1 and S2 to the note outlet 13 via the lower transport line L2 and the upper transport line L1.

In the storage system 18, the first stacker S1, the collection box 16, and the second stacker S2 are arranged in this order from the front side of the body 11 towards the rear side thereof. Of these components, the second stacker S2 is incorporated in a connection unit or stacker unit U1, which is removably mounted on the body 11 on the rear side thereof. Because the connection unit U1 is removably mounted on the body 11, if only one or two kinds of notes are transacted, they can be stored in one or both of the first and second stackers S1 and S2 shown in Fig. 1. If the number of the kinds of notes is more than two, for example, four, two additional stacker units U2 and U3 incorporating respective stackers S3 and S4 are sandwiched between the body 11 and the connection unit U1, as shown in Fig. 2, so that the number of stackers S1 through S4 may become equal to the

number of the kinds of notes to be transacted. The interposition of the additional stacker units U2 and U3 between the body 11 and the connection unit U1 allows deposit and withdrawal of four kinds of notes.

As shown in Fig. 3, the connection unit U1, removably mounted on the body 11, accommodates a side end portion of the looped lower transport line L2 at an upper portion thereof and the second stacker S2 at a lower portion thereof, with the lower transport line L2 and the second stacker S2 communicated with each other for the storage of notes from the lower transport line L2 into the second stacker S2 and for the payment of notes from the second stacker S2 via the lower transport line L2. The connection unit U1 has line connection mechanisms 19 located at open ends of feed-in and feed-out lines L21 and L22 of the lower transport line L2, remote from a curved end line thereof, inside the connection unit U1. The feed-in and feed-out lines L21 and L22 extend generally horizontally in parallel with each other at the open ends thereof to horizontally introduce notes therein and feed them therefrom.

Fig. 4 depicts the additional stacker unit U2. The lower transport line L2 of the additional unit U2 is positioned at the same level as that of the connection unit U1. The additional unit U2 has the third stacker S3 at a lower portion thereof. The lower transport line L2 and the second stacker S2 are communicated with each other for the storage of notes from the lower transport line L2 into the third stacker S3 and for the payment of notes from the third stacker S3 via the lower transport line L2. The lower transport line L2 inside the additional stacker unit U2 is made up of spaced feed-in and feed-out lines L21 and L22 extending generally horizontally in parallel with each other. The additional stacker unit U2 has line connection mechanisms 19 located at opposite open ends of the feed-in and feed-out lines L21 and L22 to introduce notes therein and feed them therefrom.

The additional stacker unit U3 has the same construction as the additional stacker unit U2 referred to above.

As shown in Figs. 5 through 7, the driving force required for transporting notes is transmitted from the body 11 to the removable stacker units U1 through U3 by the respective line connection mechanisms 19 disposed at mating portions between one unit and the next adjacent unit. Each line connection mechanism 19 comprises upper and lower rotary shafts 22 each having two laterally spaced pulleys 21 mounted thereon for rotation together therewith. As best shown in Fig. 7, two laterally spaced endless belts 20 are trained between associated upper pulleys 21 on the leading side and those on the trailing side with respect to

the direction of travel of notes. Likewise, two laterally spaced endless belts 20 are trained between associated lower pulleys 21 on the leading side and those 21 on the trailing side. Lower runs of the upper endless belts 20 are held in contact with associated upper runs of the lower endless belts 20 so that the notes can be successively transported with their side edges sandwiched between the lower runs of the upper endless belts 20 and the upper runs of the lower endless belts 20. At the mating portions, two obliquely positioned rotary shafts 22 has respective power transmission gears 23 securely mounted on outer ends thereof in mesh with each other for transmission of the power from one unit to the next adjacent unit.

The provision of the line connection mechanisms 19 at the mating portions between two units enables power transmission from the body 11 to the connection unit U1. In this case, the line connection mechanisms 19 have a common connection construction, and the lower transport line L2 inside the body 11 and that inside each stacker unit are driven synchronously, thus transporting notes stably irrespective of the number of units.

Fig. 8 depicts each stacker unit having a vertically elongated box-like housing 30. The stacker unit has a storage space 34 defined therein and delimited by the housing 30, a vertically extending side wall 34a disposed inside the housing 30, and a horizontally extending elevating plate 35 mounted vertically movably inside the housing 30. Notes Y introduced into the stacker unit are stored one above the other on the elevating plate 35 and are fed out therefrom by a feed mechanism 36 disposed at an upper open end of the housing 30.

The elevating plate 35 has a proximal end 35a vertically slidably mounted on a guide shaft 37 extending vertically along the side wall 34a of the storage space 34. The proximal end 35a of the elevating plate 35 is fixed to a belt 39 trained between upper and lower pulleys 38, which are rotatably mounted on upper and lower ends of the guide shaft 37, respectively. A drive motor (not shown) drives one of the pulleys 38 to rotate the belt 39 in an appropriate direction, thereby moving the elevating plate 35 up and down to allow storage of notes Y introduced in the storage space 34 or feed of such notes therefrom.

The notes Y introduced in the storage space 34 fall to the elevating plate 35 and are horizontally placed one above the other thereon. During storage, a space required to allow the successively introduced notes Y to fall to the elevating plate 35 is formed above the elevating plate 35 because the vertical position of the elevating plate 35 is determined in accordance with the amount of notes Y stored in the storage space 34.

The feed mechanism 36 comprises an auxiliary roller 40 disposed above the elevating plate 35 generally centrally of an open end of the storage space 34, a feed roller 41 disposed on the right-hand side of the open end of the storage space 34, as viewed in Fig. 8, a separation roller 42 disposed below and opposed to the feed roller 41, a contact roller (not shown) disposed immediately below the feed roller 41, and a pair of vaned discs 43 aligned with the contact roller on respective sides thereof and each having a plurality of radially extending vanes. The auxiliary roller 40 is allowed to intermittently rotate in only one direction to feed the notes Y placed on the elevating plate 35 with the topmost note held in contact with the auxiliary roller 40. The feed roller 41 is allowed to rotate in a direction to feed the notes Y into the storage space 34 and, also, in the opposite direction to feed the notes Y therefrom. The separation roller 42 can rotate in a direction to feed the notes Y into the storage space 34, but is prevented from rotating in the opposite direction. The contact roller and the vaned discs 43 can move vertically to move towards and away from the feed roller 41. During storage of the notes Y, the contact roller is brought into contact with the feed roller 41 so that the vaned discs 43 may rotate to knock off the notes Y onto the storage space 34. During payment of the notes Y, the contact roller and the vaned discs 43 are moved downwardly and are retained at a position spaced from the feed roller 41.

The note transacting apparatus of the above-described construction operates as follows.

When one or two kinds of notes are transacted, the note transacting apparatus shown in Fig. 1 and having only the first and second stackers S1 and S2 incorporated in the body 11 thereof can be satisfactorily used for desired automatic transaction including deposit and withdrawal of notes.

When the note transacting apparatus is required to transact four kinds of notes or to store a single kind of notes in four separate stackers, the connection unit U1 is first removed from the body 11, and the additional stacker units U2 and U3 are subsequently interposed between the body 11 and the connection unit U1, as shown in Fig. 2. By so doing, the number of stackers is made equal to that of the kinds of notes to be transacted or the single kind of notes can be stored in the four separate stackers, thus allowing an automatic transaction according to the object of utilization of the apparatus.

The number of additional stacker units is not limited to two, but a required number thereof may be provided outside the body 11, depending on the object of utilization of the apparatus. Thus, irrespective of a variation in the number of the kinds of notes, a required number of stackers can be

provided in correspondence to the number of the kinds of notes to be transacted. Therefore, it does not occur that the number of stackers is in excess or short. Further, the note transacting apparatus of the present invention can be made compact and inexpensive because it can be effectively utilized in conformity with the number of the kinds of notes to be transacted. In addition, even though the additional stacker units are positioned outside the body 11, the driving power is synchronously transmitted from the latter to the former, thus enabling a stable transport.

During storage of notes in the storage space 34 of one of the stacker units, the elevating plate 35 is first moved downwardly to form a space thereabove required for the notes to fall thereto. Subsequently, the feed roller 41, the contact roller, and the vaned discs 43 are rotated to introduce the notes into the storage space 34. When falling, the notes are knocked off by the vanes of the vaned discs 43 onto the elevating plate 35 for the storage thereof inside the storage space 34. The elevating plate 35 is appropriately moved downwardly with an increase of the notes inside the storage space 34.

On the other hand, during payment of the notes from the storage space 34, the elevating plate 35 is moved upwardly to a position suited to feed the notes, while the auxiliary roller 40 is moved downwardly and held in contact with the topmost note to press the notes placed on the elevating plate 35 downwardly. Then, a continuous rotation of the feed roller 41 along with an intermittent rotation of the auxiliary roller 40 feeds a required number of notes successively from the elevating plate 35 to the outside of the storage space 34 via a transport path (not shown) with the notes separated by the separation roller 42 not rotating in the direction of feed of the notes. At this moment, the elevating plate 35 is appropriately moved upwardly with a decrease of the notes inside the storage space 34.

Figs. 9 and 10 depict modifications of the additional stacker units. An additional stacker unit U4 shown in Fig. 9 accommodates a lower transport line L2, a stacker S5 disposed below the lower transport line L2, and a driving motor M for driving the lower transport line L2. The driving motor M is disposed near the lower transport line L2 of the additional stacker unit U4 to drive it independently of the transport line L2 inside the body 11. Because the additional stacker unit U4 can generate the driving power, it is not necessary to transmit the driving power generated in the body 11 to the additional stacker unit U4. Accordingly, the transmission mechanism such as the power transmission gears or the like is dispensed with.

An additional stacker unit U5 shown in Fig. 10 accommodates a lower transport line L2 made up of generally horizontally extending feed-in and feed-out lines L21 and L22, a stacker S6 disposed below the lower transport line L2, a curved connection line L23 branched from the feed-in line L21 to the feed-outline L22, and a direction-switching flapper F pivotally mounted at a branched position between the feed-in line L21 and the curved connection line L23. The direction-switching flapper F is operable to direct notes, that have arrived at the branched position, to either the horizontally extending feed-in line L21 or the curved connection line L23 extending downwardly therefrom.

With this construction, notes introduced into the apparatus can be transported at a high speed by appropriately selecting the transport direction, thus increasing the speed of various transport operations such as introduction of the notes into the stackers, collection of the notes into the collection box or the like. In other words, the curved connection line L23 provides a shortcut to the feed-out line L22.

As described above, a required number of stackers can be prepared depending on the number of the kinds of notes to be transacted, by appropriately adjusting the number of the additional stacker units interposed between the body 11 and the existing connection unit U1. Because it does not occur that the number of stackers is in excess or short, the note transacting apparatus of the present invention can be effectively used in accordance with the object of utilization thereof.

In particular, according to the present invention, a single sheet transacting apparatus is applicable to various transactions in which the number of notes to be used differs, and the effective utilization of the stackers can reduce the size and the manufacturing cost of the apparatus.

Constituent elements as claimed in appended claims correspond to those of the above-described embodiments as follows.

The claimed sheet storage apparatus corresponds to the body 11 of the apparatus. Similarly, the claimed internal and external transport paths correspond to the lower transport line L2 inside the body 11 and the lower transport path L2 of the connection unit U1 or the additional stacker units U2 - U5, respectively. The claimed sheet storage portions communicated with the external transport path correspond to the stackers S2-S6 of the stacker units U2 - U5. The claimed first and second transport paths correspond to the feed-in and feed-out lines L21 and L22, respectively. The claimed power transmission means corresponds to the line connection mechanisms 19, while the claimed driving means corresponds to the driving motor M. The claimed branched connection path corresponds to

the curved connection line L23, while the claimed direction-switching means corresponds to the direction-switching flapper F. The claimed transaction apparatus corresponds to the note transacting machine.

Although the present invention has been fully described by way of examples with reference to the accompanying drawings, it is to be noted here that various changes and modifications will be apparent to those skilled in the art. Therefore, unless such changes and modifications otherwise depart from the spirit and scope of the present invention, they should be construed as being included therein.

Claims

1. A sheet storage apparatus for storing sheets (Y) in a first sheet storage portion (S1) via a sheet transport path (L2), characterized in that an internal transport path (L2) formed in an apparatus body (11) can be communicated with an external transport path (L2) communicated with a second sheet storage portion (S2-S6).
2. The sheet storage apparatus according to claim 1, wherein said sheet transport path (L2) comprises a first transport path (L21) required to transport the sheets (Y) to the sheet storage portions (S1-S6) for the storage of the sheets (Y) therein and a second transport path (L22) required to feed the sheets (Y) therefrom to the outside.
3. The sheet storage apparatus according to claim 1 or 2, and further comprising a power transmission means (19) disposed at a connecting portion between said internal transport path (L2) and said external transport path (L2) to transmit a driving force.
4. The sheet storage apparatus according to any one of claims 1 to 3, and further comprising a driving means (M) disposed near the external transport path (L2) to drive the external transport path (L2).
5. The sheet storage apparatus according to claim 2, and further comprising a branched connection path (L23) for communicating between said first transport path (L21) and said second transport path (L22) to transport the sheets (Y) from said first transport path (L21) to said second transport path (L22).
6. The sheet storage apparatus according to claim 5, and further comprising a direction-

switching means (F) for switching the transport direction of the sheets (Y) introduced to a branched position of said branched connection path (L23).

7. A transaction apparatus comprising the sheet storage apparatus according to any one of claims 1 to 6.

Fig. 1

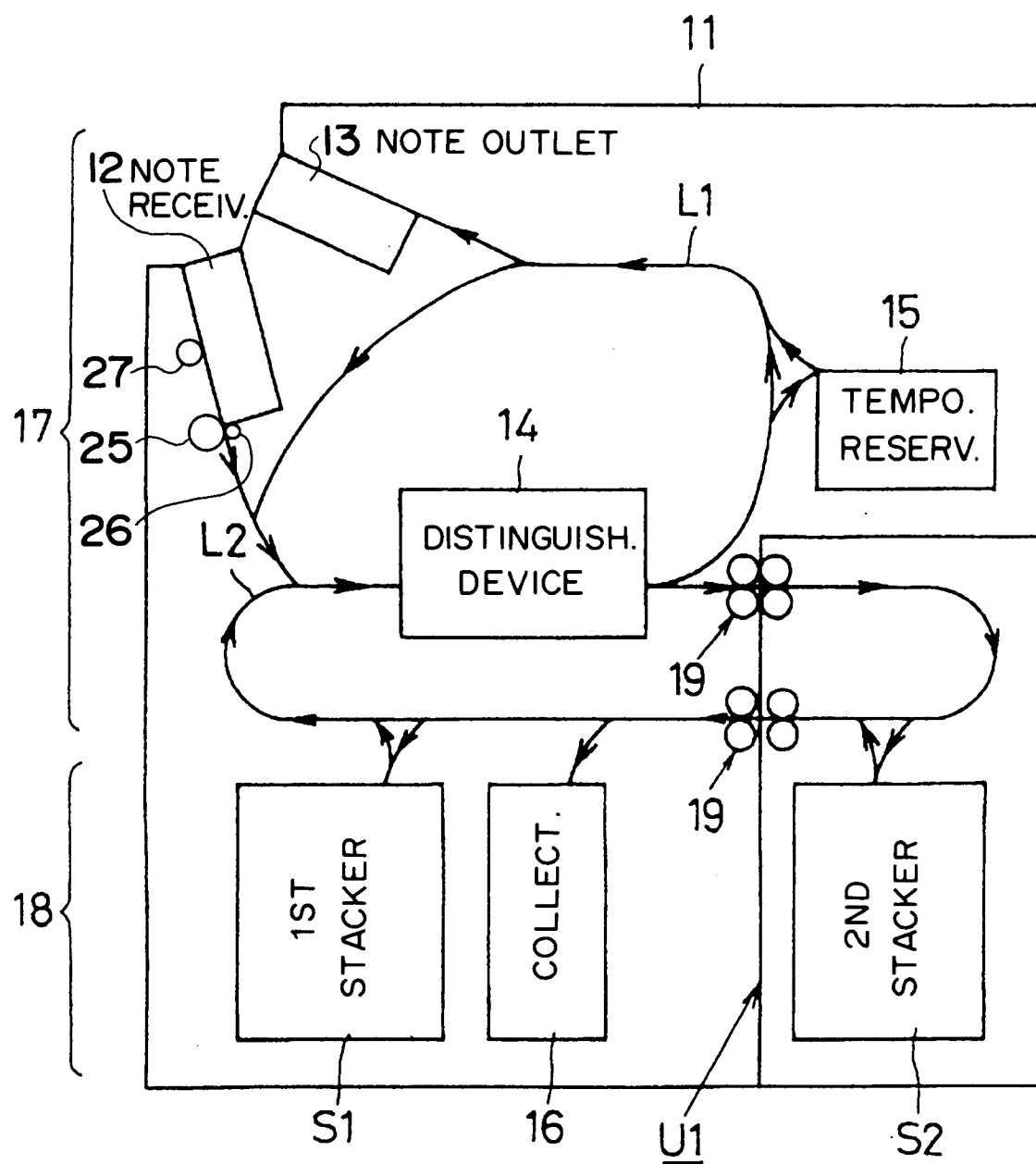


Fig. 2

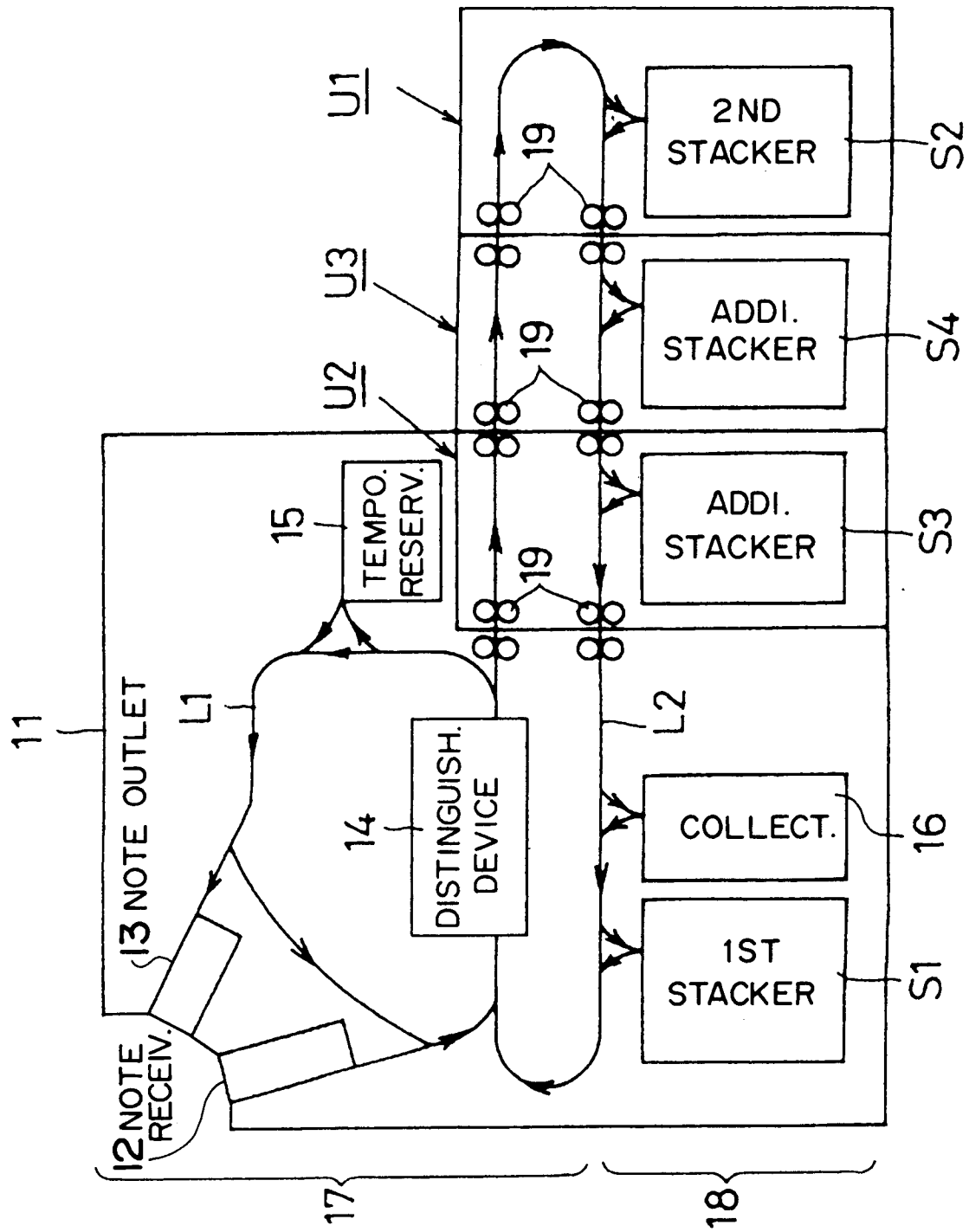


Fig. 3

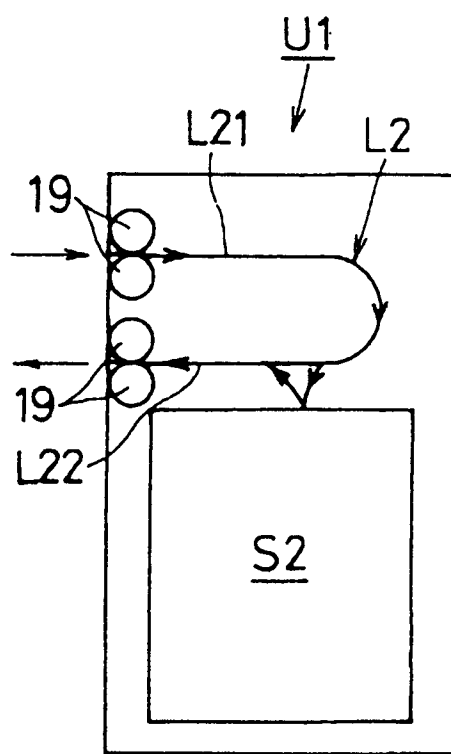


Fig. 4

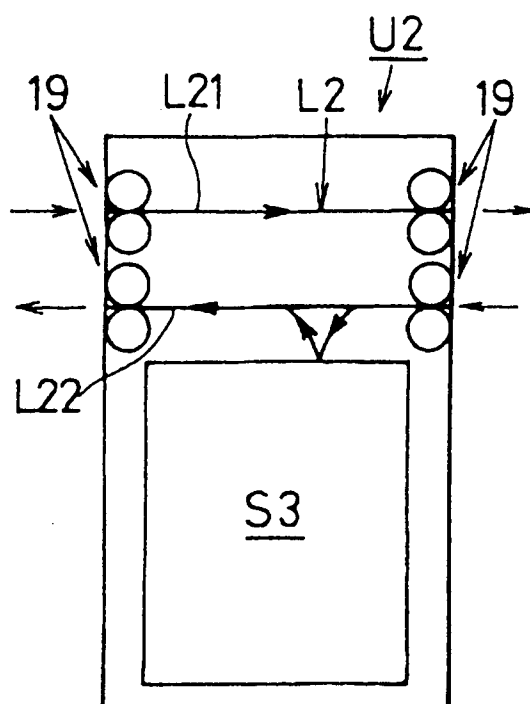


Fig. 5

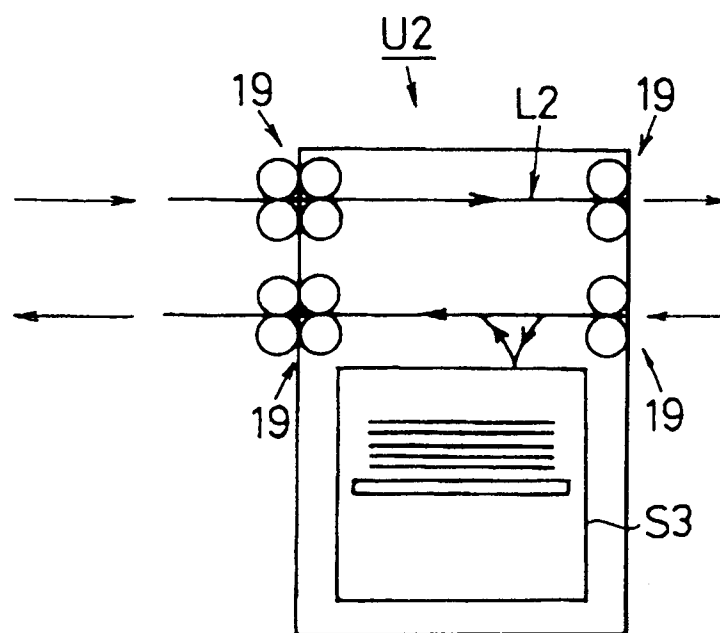
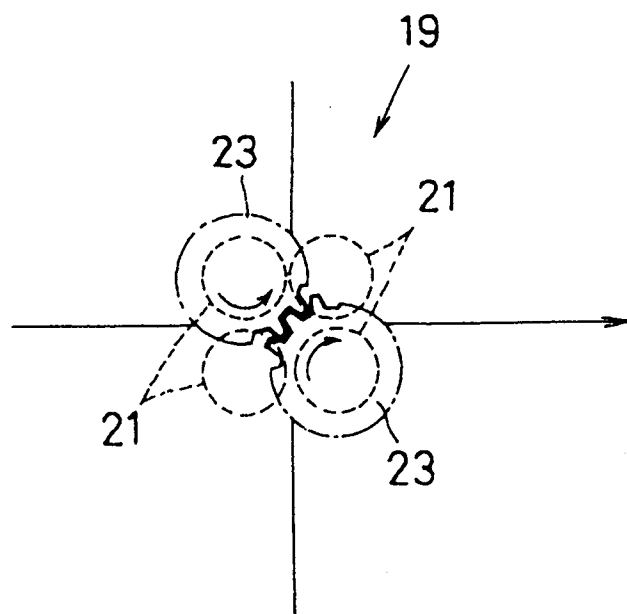


Fig. 6



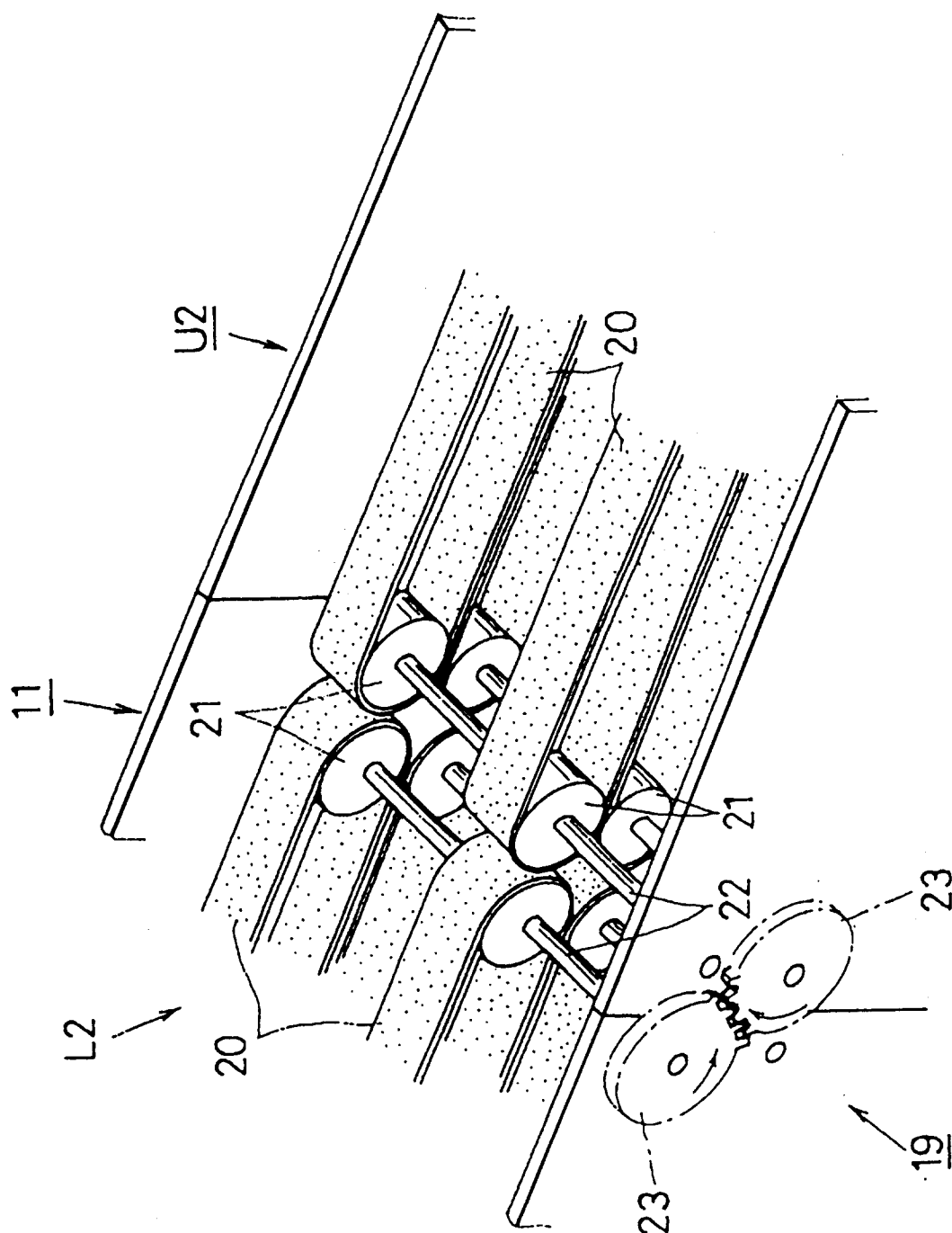


Fig. 7

Fig. 8

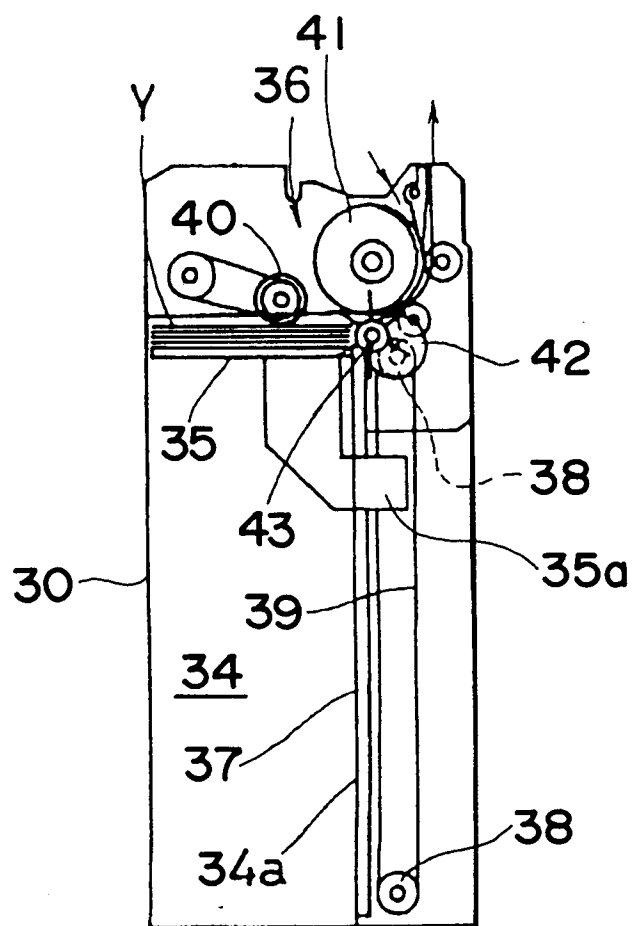


Fig. 9

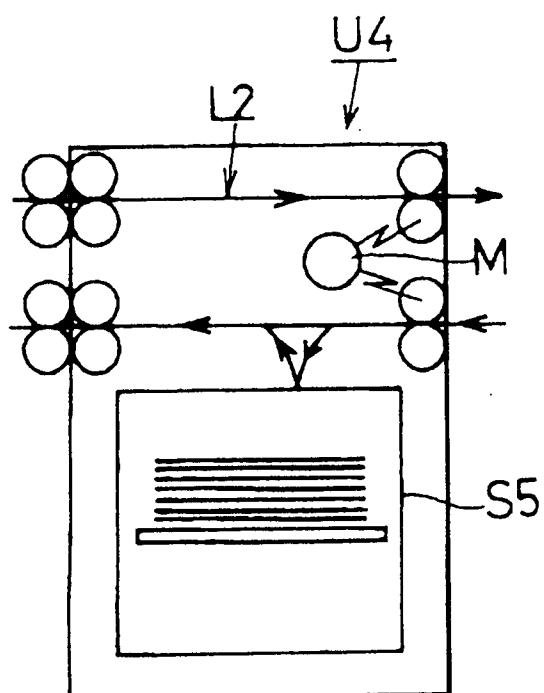


Fig. 10

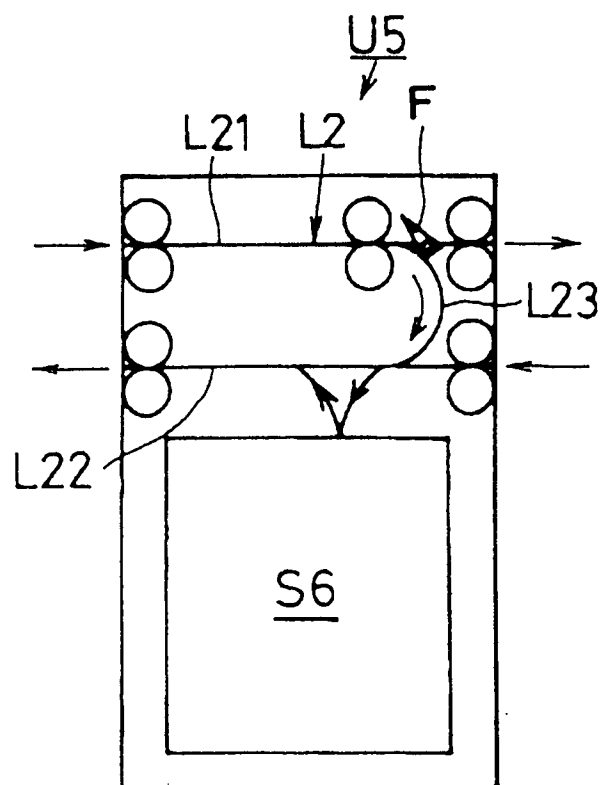
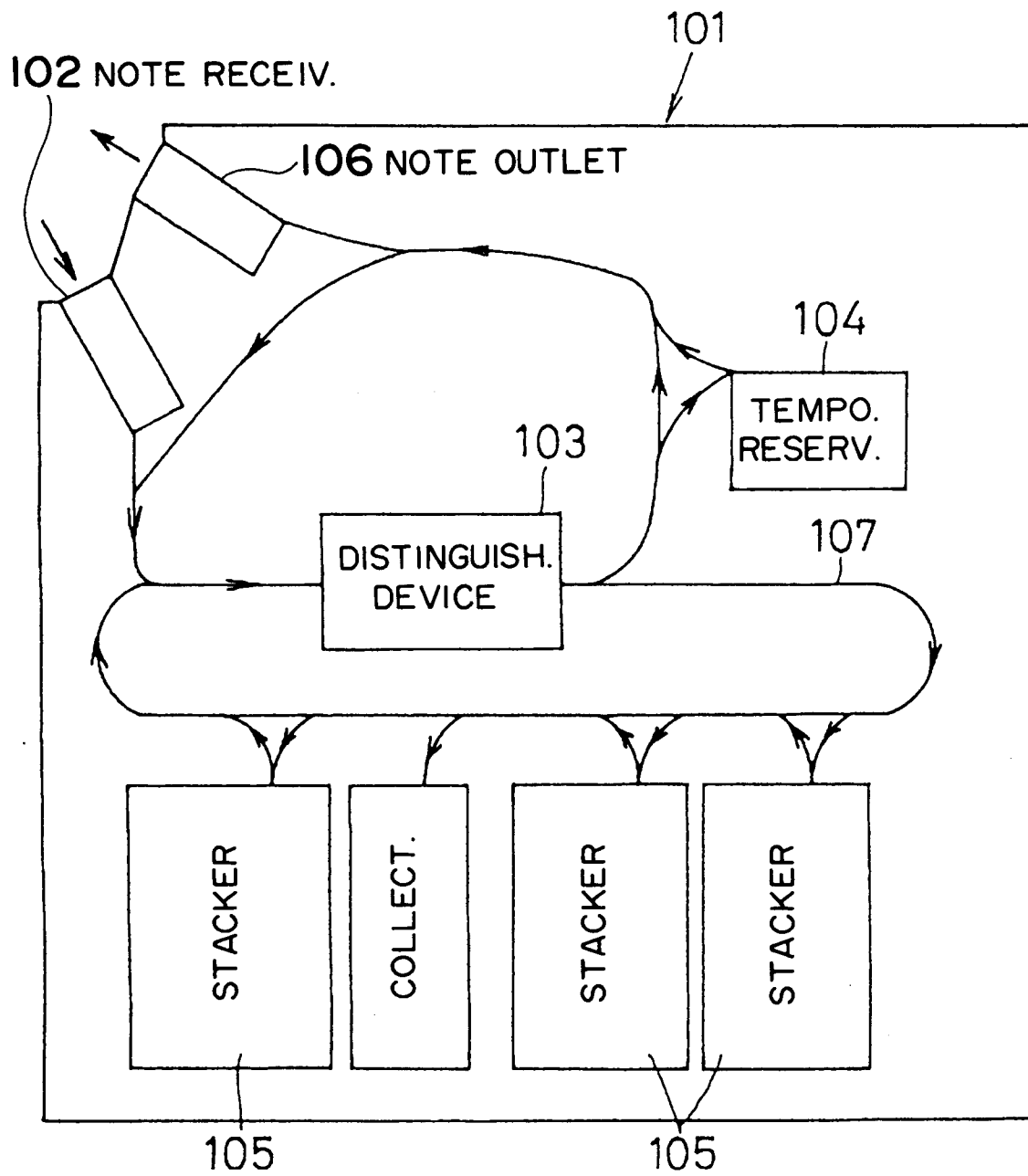
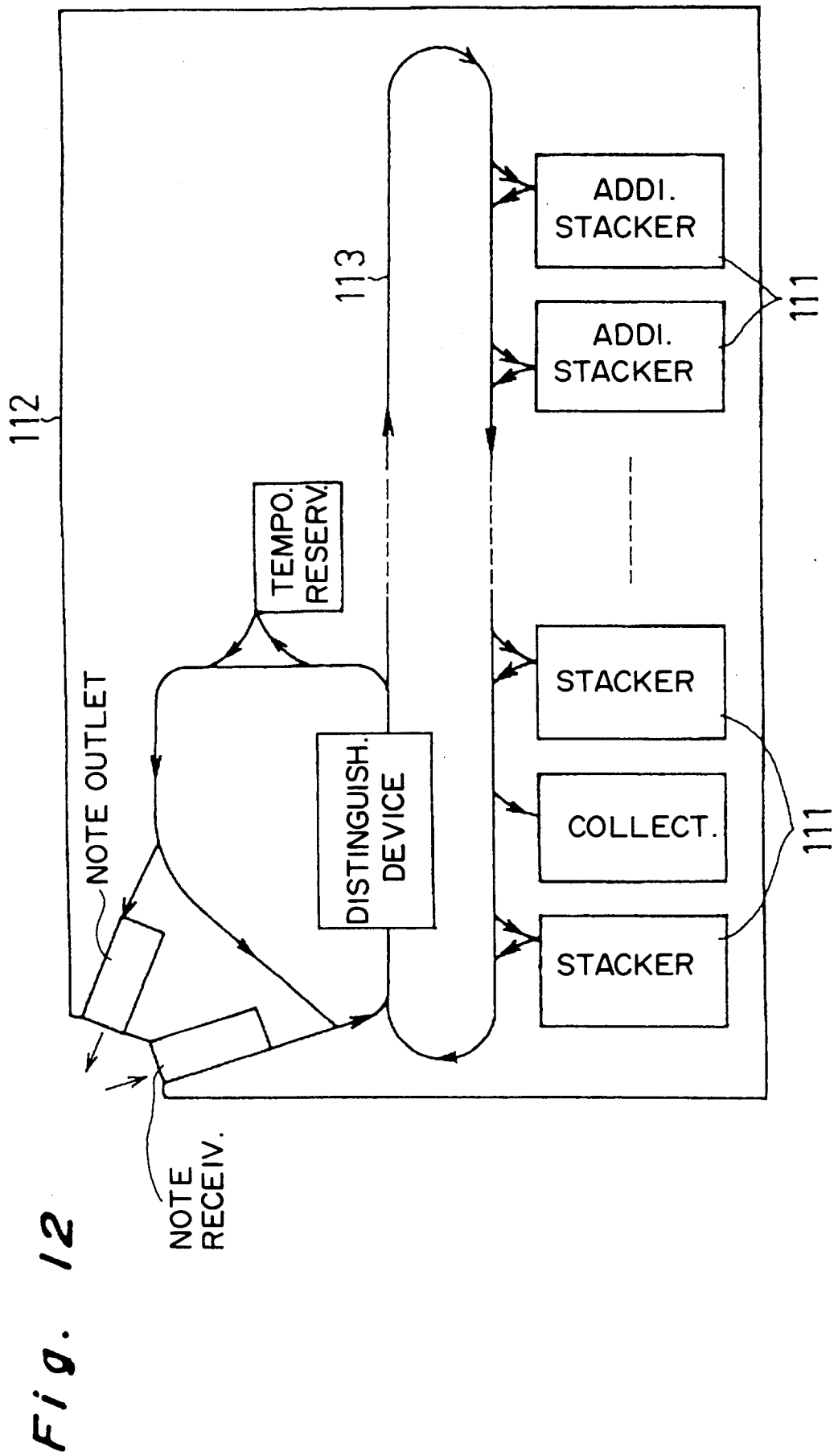


Fig.11







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 95104617.6
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
X	<u>DE - B - 2 653 979</u> (INTER INNOVATION AB) * Fig. 1; claims 1,2; column 2, lines 55-62; column 7, line 15 - column 8, line 8 *	1,3,4	G 07 D 1/00
Y	--	2,7	
Y	<u>EP - A - 0 109 743</u> (FUJITSU) * Abstract; fig. 2; page 1, lines 3-5 *	2,7	
A	<u>EP - A - 0 473 106</u> (HITACHI) * Fig. 2 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 6)
			G 07 D
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 28-06-1995	Examiner BURGHARDT
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			