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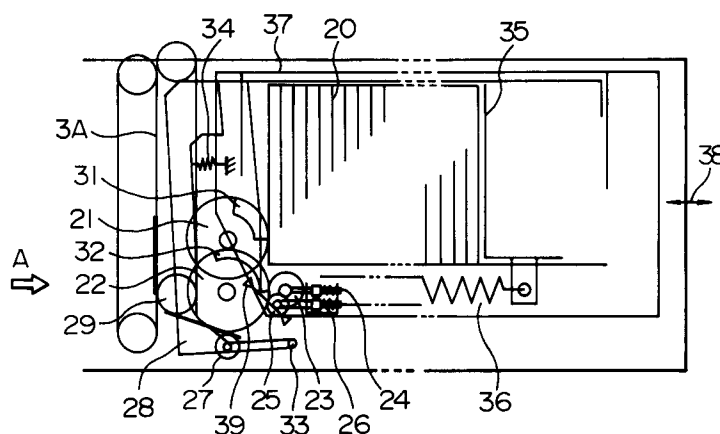
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54 **Paper separating/driving apparatus and its controlling method and automatic teller operating thereon.**

(57) In a paper separating/driving apparatus, there is provided with second pinching/carrying device (27) not less than one in a position where papers shortest in length in the direction where papers are driven to come within a predetermined range can be pinched between a point whereat papers are pinched by a first pinching/carrying device (25) constructed of pick-up rollers (21) and gate rollers (23) and a point whereat papers in a carrying pass (3A) on the rear stage are pinched, which is capable of carrying papers at the same rate as a circumferential speed

of feed rollers, and driven in interlocking with the feed rollers (22). The second pinching/carrying device (27) is then constructed transferably to actuation and non-actuation for pinching and carrying papers according to the length of papers to be handled. The paper separating/driving apparatus functions securely for separating and driving even such papers as are largely variant in length along a carrying direction, thus allowing a paper pinching point of the carrying pass on the rear stage to be disposed with a large degree of freedom.

FIG. 1



BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a paper separating/driving apparatus and its controlling method, and is particularly concerned with a paper separating/driving apparatus ensuring an operation for separating and driving even such papers as are varying largely in length along the direction in which they are carried, its controlling method, and an automatic teller operating using the apparatus and method. Description of the Prior Art

Apparatuses disclosed, for example, in Japanese Utility Model Unexamined Publication No. 63-71140, Japanese Patent Unexamined Publication No. 59-205694, Japanese Utility Model Unexamined Publication No. 3-28129 and others are known hitherto as a paper separating/driving apparatus comprising pick-up rollers coming in contact with paper on the endmost surface of those stacked and so set to provide a driving force periodically to the papers, feed rollers disposed opposite each other at positions where the driven papers can be pinched therebetween, gate rollers fixed in the direction where the papers are driven, and operating for separating the driven papers sheet by sheet and carrying to a pass on the rear stage.

The prior art apparatuses disclosed in each publication above then function subject to a length of papers to handle in the direction where they are driven being constant, or variant, if any, within the range of 20 to 30% at longest, and thus a handling of such papers as are variant largely in the length two or three times has not been taken into consideration.

That is, in general paper separating/driving apparatuses, a distance from the point whereat papers are pinched on feed rollers and gate rollers to the point whereat papers are pinched in a carrying pass on the rear stage has been set far shorter than that of being shortest in a length of workable papers in the driving direction. Therefore, pick-up rollers and feed rollers must be kept an driving for a long time after end of the operation for long papers coming two or three times as the shortest one in length of the driving direction, thus causing an erroneous drive of the ensuring papers.

In addition, since a distance from the point whereat papers are pinched on the feed rollers and the gate rollers to the point whereat the papers are pinched in a carrying pass on the rear stage must be set far shorter, as described above, than the shortest one in a length of workable papers in the driving direction, a problem is arisen such that a degree of freedom of the position of a paper pinched point in a carrying pass on the rear stage

is largely restricted.

The latter problem may bring about a restriction when a common bill carrying pass is obtained in case a plurality of paper (bill) separating/driving apparatuses are combined like an automatic teller.

SUMMARY OF THE INVENTION

The present invention has been done in view of the above circumstances, and in solving the aforementioned problems inherent in the conventional system, and the object of the invention is to provide a paper separating/driving apparatus ensuring an operation for separating and driving even such papers as are varying largely in length along the direction in which they are carried, and also capable of disposing the paper pinched point in the carrying pass on the rear stage with a large degree of freedom and its controlling method, and an automatic teller operating using the apparatus and method.

The above object of the invention can be achieved by a paper separating/driving apparatus having pick-up rollers for driving built-up papers, feed rollers for separating and carrying papers driven by the pick-up rollers, sheet by sheet, through a cooperative action with gate rollers, and first pinching/carrying means positioned in the vicinity of a pinching point of the gate rollers and the feed rollers, and interlocked and driven at the rate same as a circumferential speed of the feed rollers for pinching the driven papers and delivering to a carrying pass on the rear stage, and comprising driving a variety of papers with the length in the driving direction coming within a predetermined range, sheet by sheet, at every rotation of the feed rollers, wherein second pinching/carrying means capable of carrying papers at the same rate as a circumferential speed of the feed rollers and driven in interlocking with the feed rollers is provided in one or more at a position capable of pinching papers with the length in the driving direction shortest within a predetermined range between a point whereat the first pinching/carrying means pinches papers and a point whereat the carrying pass on the rear stage pinches papers, and an actuation of the second pinching/carrying means for pinching and carrying papers is controlled selectively according to the length of papers to be handled.

In the paper separating/driving apparatus relating to the present invention, a variety of papers with a length in the driving direction kept within a predetermined range can be driven sheet by sheet securely at every rotation of the feed rollers and carried to a carrying pass on the rear stage. Further, for stopping a drive of papers, a stop operation will not be retarded more than necessary for

papers long in the driving direction, therefore an erroneous driving of ensuring papers will never be incurred.

Still further, since a distance between a point whereat papers are pinched on the feed rollers and the gate rollers and a point whereat papers are pinched in the carrying pass on the rear stage becomes substantially variable, a degree of freedom of a position of the paper pinched point of the carrying pass on the rear stage can be enlarged, and thus a degree of freedom of the construction will largely be enhanced when utilizing this to an automatic teller.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view of a safe unit including a safe and a bill driving/separating portion used in an automatic teller according to one embodiment of the present invention;

Fig. 2 is a constructional view of the automatic teller provided with the safe unit of Fig. 1;

Fig. 3 is a side view of a main part viewed in the direction indicated by an arrow A of Fig. 1;

Fig. 4 is a perspective view showing a relative positional relation of a feed roller, a gate roller and a first pinch roller;

Figs. 5A and 5B are illustration of an operation of a bill separating/driving apparatus when bills are big longitudinally in the direction where they are driven;

Figs. 6A and 6B are illustrations of an operation of the bill separating/driving apparatus when bills are shortest longitudinally in the direction where they are driven;

Figs. 7A and 7B are illustrations of an operation when the bills are longitudinally shorter in the direction where they are driven than the length of bills of Figs. 5A and 5B; and

Figs. 8A and 8B are illustrations of an operation when the bills are longitudinally bigger in the direction where they are driven than the length of bills of Figs. 6A and 6B,

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the present invention will now be described in detail with reference to the accompanying drawings. The following description then exemplifies the case where the present invention is applied to a bill driving/separating portion of an automatic teller.

Fig. 2 is a constructional view of an automatic teller according to one preferred embodiment of the present invention. In the illustration, reference characters 1A to 1C denote safes, which are capable of corresponding, as described hereinlater, to

bills (for example, franc 50 to 100 mm in a short side length) with the short side length largely variant at every denominations. Here, let it be assumed that the safe 1A is packed with bills of 100 mm in the short side length, the safe 1B is packed with bills 70 mm, and the safe 1C is packed with bills 50 mm.

Reference characters 2A to 2C denote separating portions relating to the present invention, and at the time of payment in case, bills driven from each safe in order by predetermined number are accumulated in an outlet stacker 7 through carrying passes 3A to 3C, 5 and 6 driven by a main motor 4, discharged collectively from an outlet 8 to payment. In this case, if there are reject bills present in the bills driven out as above, then a transfer gate 10 is actuated to allow receiving of such bills into a reject box 12 through a reject carrying pass 11.

Fig. 1 shows a safe unit having the safe 1A and the bill driving/separating portion 2A in the automatic teller illustrated in Fig. 2. The bill driving/separating portion 2A comprises pick-up rollers 21 coming in contact with bills 20 to be stacked and so set, and having the outer peripheries partly constructed of a friction member 31 each, feed rollers 22 having the same diameter as that of the pick-up rollers 21, and having the outer peripheries constructed partly of a friction member 32 each, gate rollers 23 opposite to the feed rollers 22, energized by a compression spring 24, having the outer peripheries constructed of a friction member each, and regulated to run in the driving direction, and first pinch rollers 25 and second pinch rollers 27 which will be described hereinlater.

Fig. 3 is a side elevational view of a main part viewed in the direction indicated by an arrow A of Fig. 1, indicating a positional relation of the aforementioned pick-up rollers 21, feed rollers 22, gate rollers 23, first pinch rollers 25, second pinch rollers 27 and each friction member provided thereon. Then, Fig. 4 indicates a relative positional relation particularly of the feed roller 22, the gate roller 23 and the first pinch roller 25, and as illustrated, the gate roller 23 is brought into contact with the feed roller 22 on one side where its outer periphery is constructed partly of the friction member 32, and the first pinch roller 25 is brought into contact with the feed roller 22 on another side where its outer periphery is constructed entirely of the friction member 32, thus constructing first pinching/carrying means.

As described above, the first pinch roller 25 is brought into contact with the feed roller 22 on the side where its outer periphery is constructed entirely of the friction member 32, and is energized by a spring 26 toward the feed roller 22. Then, the aforementioned second pinch roller 27 is rotatable round a supporting point 33 serving as a center of

rotation, and supported rotatably on a lever 28 energized by a spring 34 clockwise in the illustration, and is pushed toward the feed roller 22. That is, the second pinch roller 27 functions as second pinching/carrying means, and when the lever 28 is turned counterclockwise in the illustration against the spring 34, it comes away from the feed roller 22, but when the force is removed, it is pushed to the feed roller 22.

In Fig. 2, reference characters 9A, 9B, 9C denote driving motors for the safes 1A, 1B, 1C respectively, and in Fig. 1, a reference numeral 29 denotes a bill pinching start point of the carrying pass 3A, 35 denotes a bill push plate of the safe 1A, and the push plate 35 pushes the bills 20 to the feed rollers 22 through a spring 36. A reference numeral 37 denotes a guide member corresponding to a size (short side length) of the bills 20 in the safe 1A, and as will be described hereinlater, an operation of the lever 28 is controlled by the guide member 37. Further, a reference numeral 38 indicates the direction in which the safes are moved, and 39 denotes a passage detection sensor for detecting the bills having passed a pinching point of the feed roller 22 and the first pinch roller 25.

The aforementioned lever 28, spring 34, guide member 37 and other construct an identification part of the length of the bills 20 along the driving direction, and as will be described hereinlater, the second pinch rollers 27 according to the length of the bills 20 are actuated thereby. Then, as described hereinbefore, the safe 1A is constructed to be detachable in the direction indicated by the arrow 38, and the gate rollers 23 and the first pinch rollers 25 are mounted on a lower portion of the safe 1A. That is, the construction is such that the gate rollers 23 and the first pinch rollers 25 are pressed to the feed rollers 22 provided on an apparatus body side by setting the safe 1A on the apparatus body of the present embodiment. Further, in the present embodiment, the construction is such that where the bills are not less than 75 mm in the short side length and when the safe 1A is installed, the guide member 37 thrusts the lever 28 on its nose, and detaches the second pinch rollers 27 from the feed rollers 22 to release pinching.

An operation of a bill driving/separating portion 2 of the present embodiment having the construction as mentioned above will be described with reference to Figs. 5A to 8B. In this connection, Figs. 5A and 5B illustrate an operation when the apparatus embodying the invention handles bills 201 longest at 100 mm, Figs. 6A and 6B illustrate an operation when the apparatus handles bills 202 shortest at 50 mm, Figs. 7A and 7B illustrates an operation when bills 203 of 75 mm in length are handled, and Figs. 8A and 8B illustrate an operation when bills 204 of 70 mm in length are handled.

Of those illustrations Figs. 5A to 8B, Fig. 5A, Fig. 6A, Fig. 7A and Fig. 8A indicate a condition midway of driving, and Fig. 5B, Fig. 6B, Fig. 7B and Fig. 8B indicate a condition when driving is stopped.

In Figs. 5A to 8B, there is no difference in mechanical construction, however, what is different is that in arrangement, a position of the aforementioned guide member 37 changes according to the length of bills, and thus a pinching force of the second pinch rollers 27 works as illustrated in Figs. 5A and 5B, Figs. 7A and 7B, but no such force works in Figs. 6A and 6B, Figs. 8A and 8B.

First, a size and an arrangement of the rollers will be taken up for description. Since one sheet of bill is driven per rotation, the feed rollers 22 and the pick-up roller 21 are 40 mm in diameter so as to have the outer periphery longer than a maximum bill length. Further, a distance from the first pinch roller 25 to the bill pinching start point 29 of the carrying pass 3A on the rear stage is about 70 mm so as to handle the bills 201, 203 not less than 75 mm in length in the state where a pinching force of the second pinch rollers 27 is not working. A distance from the second pinch roller 27 to the pinching start point 29 of the carrying pass 3A on the rear stage is about 45 mm so as to handle the bills 202 which are shortest in length at 50 mm.

Described next is an operation controlling method when the driving operation comes to stop at a predetermined number of sheets to drive after the operation is started.

A general operation is such that the feed rollers 22 and the pick-up rollers 21 are driven to rotate by the motor 9A, the bills separated and driven out sheet by sheet are pinched and carried on the feed rollers 22 and the first pinch rollers 25 only or the second pinch rollers 27 together, and are delivered to the carrying pass 3A on the rear stage at the pinching start point 29.

First, the case where the bills 201, 203 not less than 75 mm in length are handled will be described with reference to Figs. 5A and 5B, Figs. 7A and 7B. In this case, a pinching force of the second pinch rollers 27 will not work, as described above, for the state where the safe 1A has been set, therefore the number of passing bills is counted on the passage detection sensor 39, and when a passage of rear ends of the predetermined final bills 201, 203 is detected, the motor 9A is shut down instantaneously. Thus, the friction members 31 and 32 of the pick-up roller 21 and the feed roller 22 are not brought into contact with ensuing bills 201' and 203', therefore an operation for driving these bills will not be started.

Further, as shown in Figs. 6A and 6B, Figs. 8A and 8B, when handling the bills 202, 204 below 75 mm in length, since the pinching force of the

second pinch rollers 27 is ready for working, as described hereinbefore, the number of passing bills is counted on the passage detection sensor 39, and after the time required for rear ends of the bills to pass the pinching point of the second pinch rollers 27 passes from the point in time when passage of the rear ends of the predetermined final bills 201, 203 is detected, the motor 9A is shut down. In this case, an operation for driving the ensuing bills 201', 203' will also not be started.

According to the above-described embodiment, from loading bills coming within the range of 50 to 100 mm in the short side length in the three saves and adjusting the upper guide 37 of the safe 1A properly to cope with lengths of the bills, one sheet of the bill can securely be driven per rotation of the feed rollers and carried to the carrying pass 3A on the rear stage in case every bills are handled. Further, when stopping driving of a predetermined number of bills, the second pinch rollers 27 can be disposed according to the length of bills, therefore a stop operation for the long bills will not be retarded more than necessary, and a capability of the ensuing bills being driven can be minimized.

Then, the above-described embodiment is only to exemplify the present invention, and hence the invention is not necessarily limited, needless to say, to the embodiment. For example, the invention may be applied not only to the automatic teller but also extensively to other general paper handling apparatuses.

Further, subject to being not limited for the height of saves, the identification part comprising lever, guide member and others will be provided to come on a lower side of papers, and may function to control the second paper carrying means according to the length of papers in the direction where they are driven.

As described in detail above, according to the present invention, an advantage inherent therein is such that a paper separating/driving apparatus capable of separating and driving securely even such papers as are variant largely in length, and also disposing a paper pinching point of a carrying pass on the rear stage with a large degree of freedom, and its controlling method can be realized.

Additionally, since a distance from a paper pinching point of feed rollers and gate rollers to a paper pinching point of the carrying pass on the rear stage becomes variable substantially, a degree of freedom of the position of the paper pinching point of the carrying pass on the rear stage can be amplified, and thus a degree of freedom at the construction will largely be enhanced when utilizing this to an automatic teller.

Claims

1. A paper separating/driving apparatus comprising pick-up rollers (21) for driving built-up papers, feed rollers (22) for separating and carrying papers driven by said pick-up rollers (21), sheet by sheet, through a cooperative action with gate rollers (23), and first pinching/carrying means (25) positioned in the vicinity of a pinching point of said gate rollers (23) and feed rollers (22), and interlocked and driven at the same rate as a circumferential speed of said feed rollers (22) for pinching the driven papers and delivering to a carrying pass (3A-3C) on the rear stage, and a variety of papers with the length in the driving direction coming within a predetermined range being driven sheet by sheet at every rotation of said feed rollers (22), characterized in that:

second pinching/carrying means (27) driven in interlocking with said feed rollers (22) is provided in one or more at a position capable of pinching papers with the length in the driving direction shortest of all the papers present within a predetermined range between a point whereat said first pinching/carrying pass on the rear stage pinches papers; and

an actuation of said second pinching/carrying means (27) for pinching and carrying papers is controlled selectively according to the length of papers to be handled.
2. The apparatus as defined in claim 1, characterized in that means (39) for detecting papers having passed said first pinching/carrying means (25), and means (28,34,37) for detecting an actuation of said second pinching/carrying means (27) for pinching and carrying papers are provided in addition to said each means, and after a rear end of paper driven finally having passed said first pinching/carrying means (25) is detected by said detection means, motions of said feed rollers and said second pinching/carrying means (27) are stopped according to information from the means (28,34,37) for detecting actuation of said second pinching/carrying means for pinching and carrying the papers.
3. A method of controlling a paper separating/driving apparatus, which has pick-up rollers (21) for driving built-up papers, feed rollers (22) for separating and carrying papers driven by said pick-up rollers (21), sheet by sheet, through a cooperative action with gate rollers (23), and first pinching/carrying means (25) positioned in the vicinity of a pinching point of said gate rollers

(23) and feed rollers (22), interlocked and driven at the same rate as a circumferential speed of said feed rollers (22) for pinching the driven papers and delivering to a carrying pass (3A-3C) on the rear stage, said apparatus comprising a variety of papers with the length in a driving direction coming within a predetermined range being driven sheet by sheet at every rotation of said feed rollers (22), the papers being driven sheet by sheet at every rotation of said feed rollers (22) from a point whereat said first pinching/carrying means (25) pinches papers, in which second pinching/carrying means (27) of not less than one which is driven in interlocking with said feed rollers (22) is provided at a position where the shortest paper within said predetermined range can be pinched, or at the position coming in a length in the driving direction between a point whereat said first pinching/carrying means (25) pinches the papers and a point whereat the papers are pinched in the carrying pass (3A-3C) on the rear stage; and the papers are carried by the second pinching/carrying means (27) at the same rate as a circumferential speed of said feed rollers (22), characterized in that said second pinching/carrying means (27) is transferred to actuation and non-actuation for pinching and carrying papers according to the length of papers to be handled.

4. The method of controlling a paper separating/driving apparatus as defined in claim 3, characterized in that
 - said second pinching/carrying means (27) is actuated for pinching and carrying papers only in case the length of papers to be handled in the driving direction is shorter than a distance from a point whereat papers are pinched by said first pinching/carrying means (25) to a point whereat papers are pinched in the carrying pass (3A-3C) on the rear stage; and
 - said second pinching/carrying means (27) is not actuated for pinching and carrying papers in case the length of papers to be handled in the driving direction is longer than a distance from a point whereat papers are pinched by said first pinching/carrying means (25) to a point whereat papers are pinched by the carrying pass (3A-3C) on the rear stage.
5. An automatic teller in which the paper separating/driving apparatus defined in claim 1 is used as a bill separating/driving apparatus in saves, characterized in that:
 - an identification part (28,34,37) for iden-

tifying a length of bills contained in the saves in the driving direction is provided on said saves; and

when said saves are set on said automatic teller, said second pinching/carrying means (27) is transferred to actuation and non-actuation for pinching and carrying the bills by said identification part (28,34,37).

6. The automatic teller as defined in claim 5, characterized in that said identification part (28,34,37) includes a member for detecting a length of said papers in the driving direction, which is mounted with said second pinching/carrying means (27) and energized to turn round one supporting point.
7. The automatic teller as defined in claim 5, characterized in that said identification part (28,34,37) is provided so as to locate on a lower side of the papers on a counter side of said carrying pass (3A-3C) on a rear stage thereof.

FIG. 1

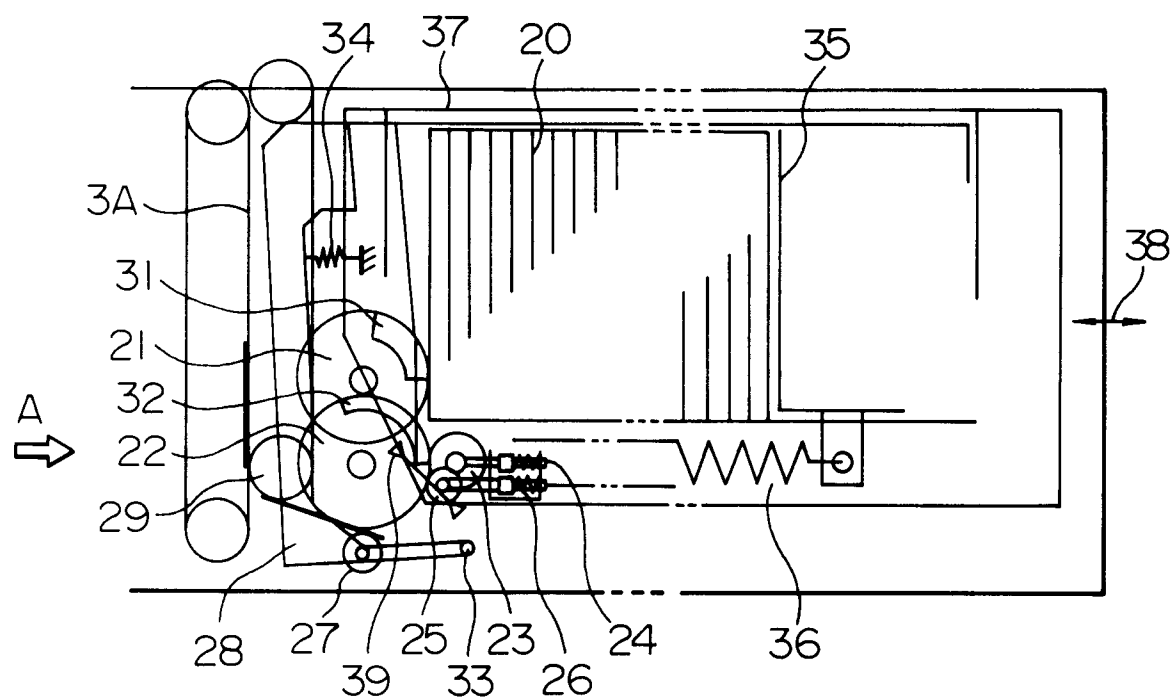


FIG. 2

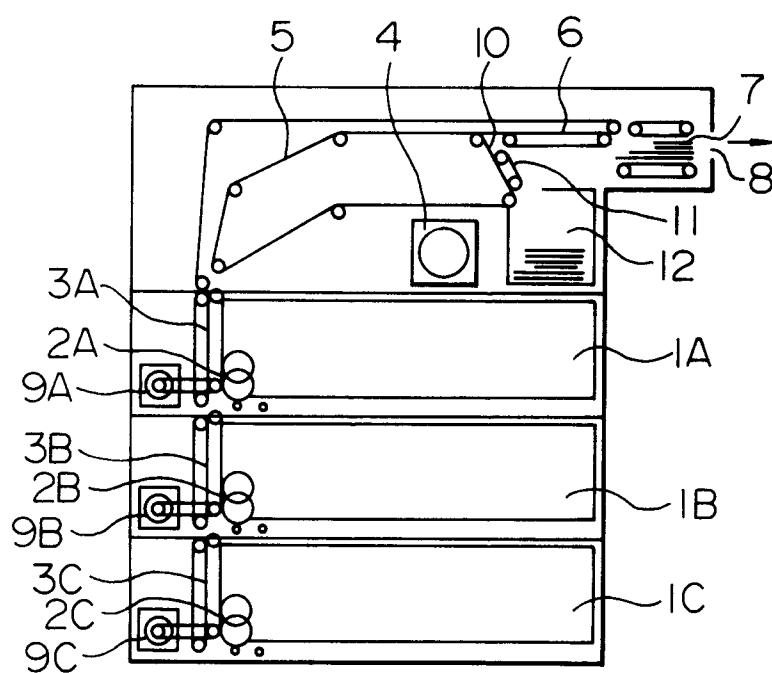


FIG. 3

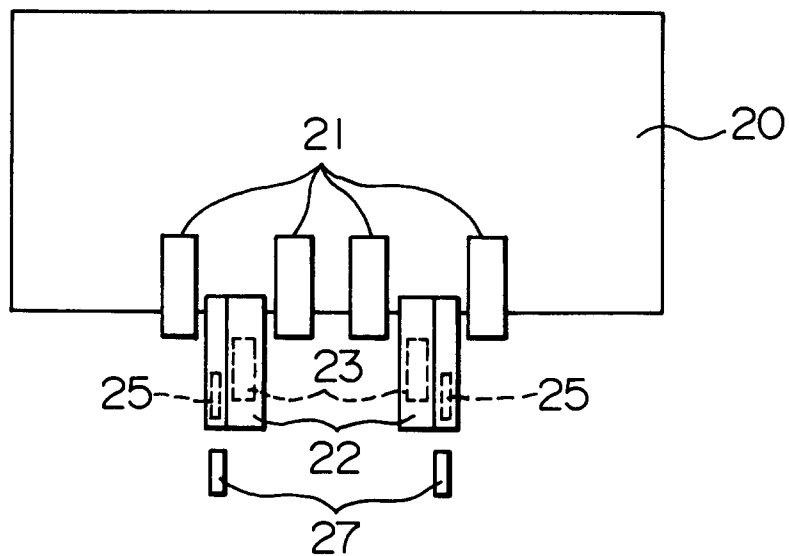


FIG. 4

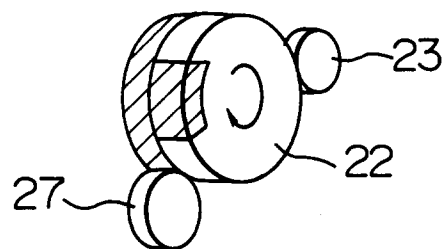


FIG. 5A

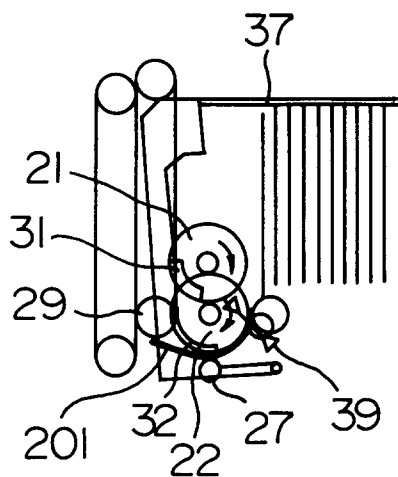


FIG. 5B

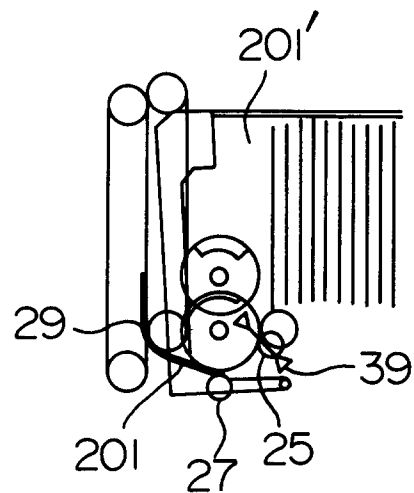


FIG. 6A

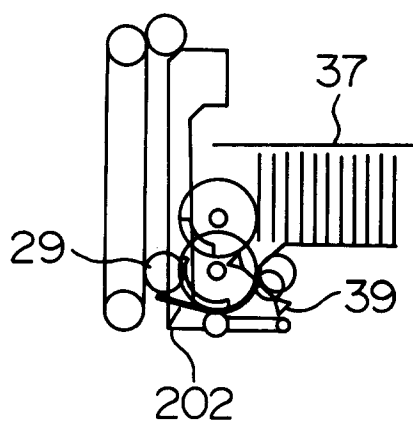


FIG. 6B

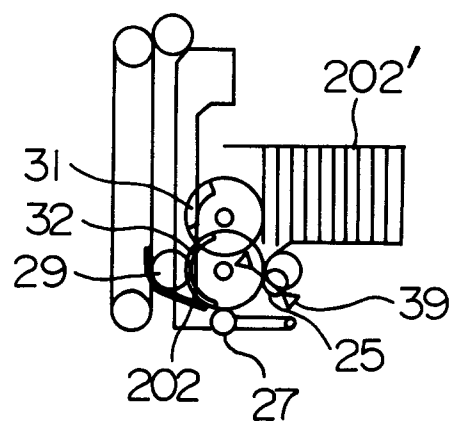


FIG. 7A

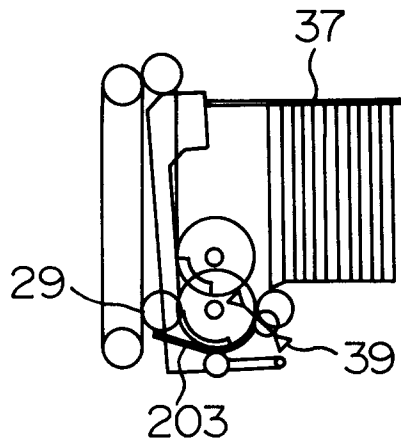


FIG. 7B

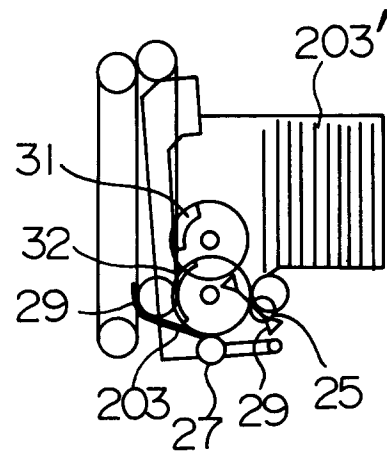


FIG. 8A

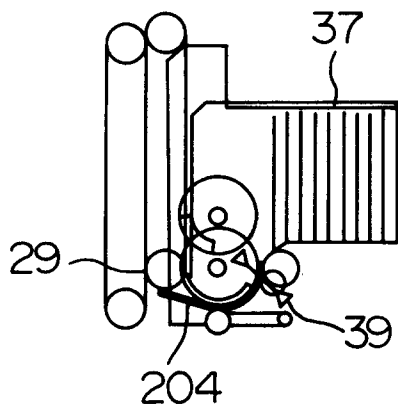
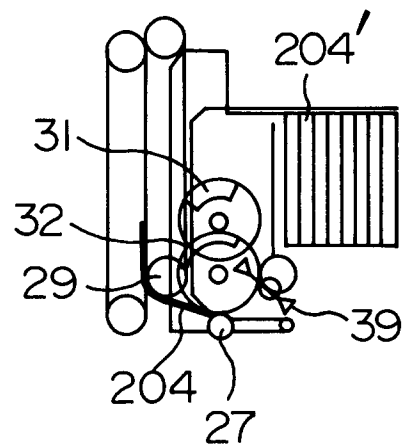


FIG. 8B





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 11 9287

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|---|---|--|---|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
| A | FR-A-2 388 353 (NIXDORF COMPUTER AG.) * the whole document * --- | | B65H5/06 B65H3/44 G07D1/00 |
| A | EP-A-0 294 055 (ORIENT WATCH CO. LTD. ET AL.) * column 9, line 13 - line 18; figures 6,7 * --- | | |
| A | US-A-4 158 456 (NIXDORF COMPUTER AG.) --- | | |
| A | PATENT ABSTRACTS OF JAPAN vol. 7, no. 85 (M-206)(1230) 9 April 1983 & JP-A-58 011 439 (HITACHI SESAKUSHO K.K.) 22 January 1983 * abstract * --- | | |
| A | PATENT ABSTRACTS OF JAPAN vol. 13, no. 485 (M-887)6 November 1989 & JP-A-11 92 630 (HITACHI LTD) 2 August 1989 * abstract * --- | | |
| A | EP-A-0 174 200 (DE LA RUE SYSTEMS LTD.) ----- | | |
| The present search report has been drawn up for all claims | | | TECHNICAL FIELDS SEARCHED (Int. Cl.5) |
| | | | B65H G07D |
| Place of search THE HAGUE | | Date of completion of the search 12 FEBRUARY 1993 | Examiner DIAZ-MAROTO V. |
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