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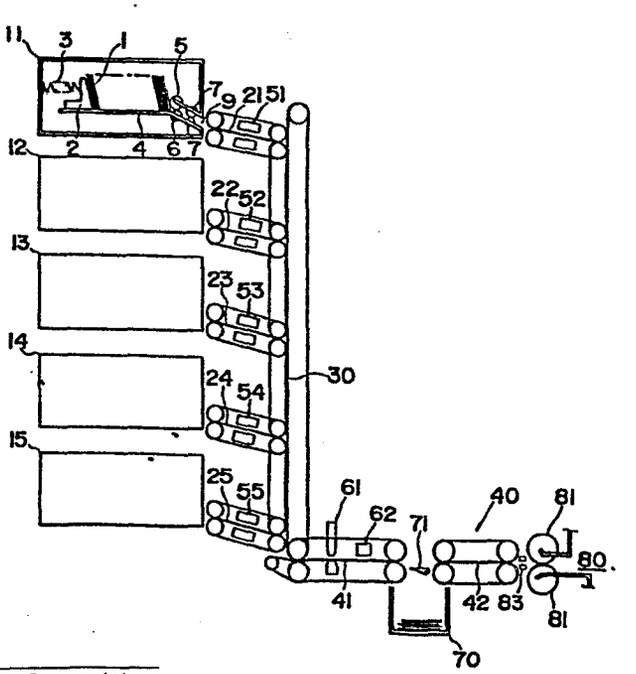
(54) Paper discharging apparatus.

(57) The paper discharging apparatus comprises a discharge outlet (80); plural paper containers (11 to 15) for accommodating papers of different kinds, separately; first plural paper delivery paths (5 to 7, 21 to 25) for carrying a paper let out from each of the containers, separately; second single common delivery path (40) for carrying papers carried through each of the first plural delivery paths to the discharge outlet (80), and an abnormal delivery detector (51 to 55) for inspecting whether each paper is being carried normally. In particular, since at least one of detection elements (double-paper detector and paper-kind detector) of the abnormal delivery detector is disposed separately for each of first plural delivery paths (40), it is possible to implement each abnormal delivery detection in parallel, thus markedly reducing the time required for inspecting bills, securities, etc. on the basis of pattern recognition, in particular.

Fig.1



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BACKGROND OF THE INVENTION

Field of the Invention

The present invention relates to a paper discharging or dispensing apparatus equipped in transaction processing systems such as automated teller machines, for instance. In this specification, paper or papers imply bank bills, checks, securities, or sheets to which some value is granted.

Description of the Prior Art

In an automated teller machine equipped in banks, financiers or other, a plurality of bill containers are usually arranged for accommodating bills of several kinds (e.g. 1000-yen bill, 5000-yen bill, 10000-yen bill, etc.), and bills of only a

single kind are accommodated in each bill container. Further, bill delivering means are provided extending from the bill containers to a bill discharge outlet in order to carry bills corresponding to an amount specified by a customer for withdrawal transaction from the bill containers to the bill discharge outlet. The delivering means is composed of first several separate delivery paths each extending from the outlet opening of each bill container classified according to the kinds of bills and a second single common delivery path extending from a junction between the first separate delivery paths and itself to the bill discharging outlet.

In the above bill delivering means, means for detecting abnormal bill delivery conditions is usually disposed. The abnormal bill delivery conditions to be checked are double-bill inspection for detecting whether or not two or more bills are carried one upon another, bill-kind inspection for detecting whether or not bills being carried all correspond to the kinds specified by a controller, bill delivery position or attitude inspection for detecting whether or not bills are being carried in parallel in the delivery direction, etc. As described above, the bill discharging apparatus is made up of a plurality of bill containers, bill delivering means, abnormal delivery detecting means, and a bill discharge outlet.

In the prior-art bill discharging apparatus, however, since the abnormal delivery detecting means is disposed only in the common delivery path of the delivering means, it has been necessary to inspect the bill abnormal delivery one by one. As

already explained, the abnormal delivery inspection includes bill-kind inspection and this bill-kind inspection is implemented on the basis of pattern recognition or pattern discrimination of optically or magnetically read bill pattern data. Since the pattern recognition is processed by a CPU in response to a great number of sensor-read signals, a relatively long processing time is required.

Additionally, since the delivery inspection is implemented one bill by one bill in serial method, there exists a problem in that it takes a long time to process the abnormal delivery inspection, in particular, when a great number of bills should be discharged.

On the other hand, in the present automated teller machines, banking transactions are mainly directed to cash handling business including bills. However, there also exists a strong demand for realizing an automated bank transaction processing system which can handle other papers or sheets to which some monetary value is granted, for instance, such as checks or securities, as well as bank bills. In these cases, at least a date, an amount of money, a serial number, etc. should be printed on the paper.

To satisfy the above printing functions, it may be possible to install a specially-ordered automated transaction processing system (check handling machine) provided with a printer, for instance, in order to handle checks, securities, etc. in addition to the automated bill transaction processing system. In this case, however, since two types of different

transaction processing systems are required to install side by side, a relatively wide space is required, necessitating a large sum of facility investment.

Further, although it may be possible to provide the bill transaction processing system with some printers so as to handle checks or securities by modifying the system for exclusive use for bills, this arises another serious problem as follows: It is almost impossible to use the same abnormal delivery detecting means for both bills and checks. In more detail, the abnormal delivery inspection includes the double-paper detection as already explained. This double-paper detection is realized by mechanically measuring the thickness of paper or by optically detecting the optical transmittance of paper. However, since bills are different from checks in thickness or optical transmittance, it is impossible to previously set both the reference threshold levels at a fixed constant level in performing the double-paper detection.

SUMMARY OF THE INVENTION

With these problems in mind, therefore, it is the prinmary object of the present invention to provide a paper discharging apparatus which can handle bills of several kinds at a high speed.

Further, it is the another object of the present invention to provide a paper discharging apparatus which can handle various kinds of papers such as checks, securities, etc. in addition to bills.

To achieve the above-mentioned object, the paper

discharging apparatus according to the present invention comprises a paper discharge outlet; a plurality of paper containing means for accommodating papers of different kinds, separately; a plurality of first delivering means for carrying a paper let out from each of said paper containing means, separately; second single common delivering means for carrying papers carried through each of said first plural delivering means to the discharge outlet; and abnormal delivery detecting means for inspecting whether each paper is being carried normally, at least one of detection elements of said abnormal delivery detecting means being disposed separately for each of said first plural delivering means.

The above detection elements included in the abnormal delivery detection means are double-paper detection means, paper-kind detecting means, and paper-delivery position detecting means. The above paper delivery position detecting means can be disposed in the second common delivering means; however, the other two means of double-paper detecting means and paper-kind detecting means are preferably disposed in each of the first delivering means.

According to the present invention, since at least one of the detection elements of the abnormal delivery detecting means is arranged in each of the first plural delivering means for carrying a paper dispensed from each of the paper containing means, it is possible to implement each abnormal delivery detection process in parallel fashion during the time while paper is carried through the first delivering means. Therefore, it is

possible to markedly reduce the time required for the abnormal delivery inspection for the discharged paper, when a number of papers of different kinds are handled.

Further, since the special inspection such as the double-paper inspection which requires different thresholds classified according to the kind of paper is performed by the double-paper detection means of the abnormal delivery detecting means each arranged in the first delivering means, it is possible to handle various kinds of papers as checks, securities, etc. at the same time.

Additionally, in the present invention, since a printer is provided in the second common delivering means, it is possible to print predetermined data on the carried paper, thus permitting the handling of various kinds of papers other than bills.

As a result, in the case where the paper discharging apparatus is applied to bank transaction processing systems, it is possible to reduce the cost and the installation space and further to promote automated paper handling systems or unmanned paper handling processes, without use of specially-ordered machines serviceable only for checks or securities. Since being arranged in the second common delivery means, the printer can print data on various kinds of papers on which printing is required.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the paper discharging apparatus according to the present invention will be more clearly appreciated from the following description taken in conjunction

with the accompanying drawings and in which:

Fig. 1 is a diagrammatical side view showing the whole construction of the paper discharging apparatus according to the present invention;

Fig. 2 is a diagrammatical side view showing an another arrangement of the abnormal delivery detecting means according to the present invention; and

Fig. 3 is an enlarged diagrammatical side view showing an exemplary paper collecting means.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Fig. 1, a plurality of paper containers 11, 12, 13, 14 and 15 for each accommodating different kinds of papers are arranged vertically. These papers accommodated within these containers are bills e.g. 1000-yen bill, 5000-yen bill and 10000-yen bill, checks on which no amount of money is printed securities, etc.

All the containers 11 to 15 are the same in structure, therefore only one container 11 will be described hereinbelow. Within the container 11, a support plate 4 is disposed. A number of papers 1 are arranged on the support plate 4 in a tilted state and are supported by a side push member 2 urged toward an let-out opening 9 with an elastic member 3 such as a spring. Near the let-out opening 9, there are disposed an dispenser roller 5 for feeding out the paper 1 one by one and other rollers 6 and 7 constituting a delivery path.

On each front side of the above paper containers 11 to 15, there are disposed delivery paths or delivering devices 21, 22,

23, 24 and 25 for delivering papers let out from each paper container separately. Each delivery path is made up of plural pulleys or rollers and upper and lower belts reeved around these pulleys (e.g. plural upper belts and plural lower belts). For the paper accommodated within the container 11, a first paper delivering means is composed of a path including rollers 5, 6 and 7 and the above-mentioned delivery path 21. In the same way, other first delivering means are arranged for other containers, separately.

On the midway of each of the delivery paths 21 to 25, each of abnormal delivery detecting devices 51, 52, 53, 54 and 55 is disposed, the detecting devices being described later in detail.

At a position a little lower than that of the lowermost paper container 15, a second common delivery path or device 40 is disposed, one end of which extends to a paper discharge outlet 80. This second common delivery path (common delivering means) 40 includes a rear common delivery path or device 41 and a front delivery path or device 42. These two delivery paths 41 and 42 are made up of plural rollers and upper and lower belts reeved therearound. Between these two delivery paths 41 and 42 a paper collecting means (described later) is disposed.

On the midway of rear common delivery path 41, there are disposed a printer 61 for printing a predetermined data at a predetermined position on a specified paper (e.g. check) carried and a print condition inspecting device 62 for inspecting the printed characters or digits.

At the paper discharge outlet 80, there are disposed upper

and lower discharge rollers 81 for discharging the carried papers. Between these rollers 81 and one end of the front common delivery path 42, there is disposed a paper extraction detector 83 of photosensor type for inspecting whether the carried paper is extracted by the customer.

The already-mentioned delivery paths 21 to 25 are connected to the common delivery path 40 through an intermediate delivery path or device 30 also made up of some rollers and some belts reeved around the rollers for carrying papers by sandwiching them therebetween.

At the position where the delivery paths 21 to 25, the intermediate delivery path 30 and the rear common delivery path 41 are overlapped with each other, the belts constituting each path are of course arranged alternately without interference.

The kinds of abnormal delivery detection inspected by the abnormal delivery detecting devices 51 to 55 are the double-paper detection for inspecting whether two or more papers are carried in an overlapped state, the paper-kind detection for inspecting whether the paper let out from the container and carried through the delivery path is of specified kind, the paper delivery position or attitude detection for inspecting whether the paper is being carried in parallel to the predetermined delivery direction, etc.

The double-paper detection can be performed by optical method or mechanical method. In mechanical method, a fixed roller and a movable roller urged toward the fixed roller are arranged so as to sandwich a paper being carried. An overlap of

two or more papers can be detected on the basis of the movement of the movable roller detected when papers are being passed between two fixed and movable rollers. In optical method, a light-emitting element and a light-receiving element are arranged so as to face to each other on the opposite side of the delivery path. An overlap of two or more papers can be detected on the basis of the intensity of light transmitted through papers. The threshold value for discriminating the double-paper delivery is determined according to the kind of paper, that is, thickness, material or optical transmittance, etc.. The threshold value is a displacement of the movable roller in the case of the mechanical method or an output signal level of the light-receiving element (intensity of transmitted light) in the case of the optical method.

The paper-kind detection can generally be performed by detecting a pattern or figure represented in paper and further by comparing the detected pattern optically and/or magnetically with a previously determined reference pattern. Therefore, the device 51 (or each of devices 52 to 55) includes a photosensor and/or a magnetic head. The pattern recognition is implemented by a CPU or preferably by a microprocessor. This CPU for pattern recognition can be used in common with a main CPU for controlling the entire operations of the transaction processing system including the paper discharge apparatus according to the present invention or for controlling the paper discharge apparatus. The paper kind detection can also be performed by simply detecting the size or dimensions of paper. That is, the paper size

detection can be performed on the basis of output signals generated from plural photosensors arranged under consideration of the dimensions of paper to be checked.

The paper delivery position detection can also be performed by use of plural photosensors arranged at predetermined position along the delivery path.

With respect to the double-paper detecting means and the paper kind detecting means, since the preset reference values (threshold values or photosensor positions) are diferent according to the kinds of paper to be inspected, it is particularly preferable to dispose these two detecting means in each of the delivery paths 21 to 25. Above all, when the paper kind detection is implemented on the basis of pattern recognition, since it takes much processing time, it is preferable to dispose the detecting means for each delivery path 21 to 25, so that plural processings for plural kinds of papers can be executed in parallel fashion. On the other hand, the paper delivery position detecting means may be disposed in either the intermediate delivery path 30 or the common delivery path 40. However, when the photosensors for this delivery position detecting means can be used in common with those of other detecting means, it is unnecessary to additionally provide the position detecting means.

In case where one of these detecting means outputs a signal indicative of abnormal paper delivery, the CPU controlling the whole paper discharging apparatus interrupts the paper delivery operation.

Fig. 2 shows another way of arranging the abnormal paper delivery detecting device 51, in which the device 51 is disposed in the path within the container 11, that is, between the rollers 5, 6 and 7. The other paper delivery detecting devices 52 to 55 are also disposed within the containers 12 to 15, respectively, in the same way. In general, the paper containers are so designed as to be removable from the paper discharging apparatus or the transaction processing system. Therefore, when the abnormal delivery detecting device is disposed within the container, there exists such an advantage that it is possible to easily alter or adjust the reference parameters or the reference values (the above-mentioned threshold levels or photosensor positions). Since these reference parameters or preset values are different according to the kinds of papers, the arrangement of the detecting device within the container is convenient when the kind of paper accommodated within the container is exchanged.

Well-known printers such as dot printer, wheel printer, etc. can be used as the printer 61. The data to be printed on a check, for instance, may be date, an amount of money or sum, a serial number, transaction history, a commercial message, etc..

The printed condition inspecting device 62 discriminate whether the print is acceptable or not, by optically reading the print such as characters and digits printed by the printer 61 on the paper (as by photosensor array) and by comparing the read data with a reference pattern previously stored. For this purpose, the CPU of the apparatus or the system can be used in common.

A paper extraction signal generated from the paper extraction detector 83 is applied to an extraction detection circuit or to the CPU. In response to the extraction signal, the CPU discriminates whether the papers carried to the discharge outlet 80 are extracted by a customer within a predetermined time.

Fig. 3 shows an enlarged structure of the paper collecting means. This paper collecting means collects all the papers when printed conditions are determined to be unacceptable by the printed condition inspecting device 62 or when the papers discharged to the outlet 80 are not extracted even after a predetermined time has elapsed.

This paper collecting means includes a collecting box 70 and a pivotal flappers 71 disposed over the collecting box 70 and in parallel with each other. Under the normal condition, this flappers 71 are kept horizontally so as to connect one end of the rear common delivery path 41 with one end of the front common delivery path 42, as depicted by the solid lines in Fig. 3. Therefore, the paper coming from the left side in Fig. 3 and determined that the printed condition is acceptable is carried from the rear common delivery path 41 to the front common delivery path 41 passing on the flappers 71.

However, in case where printed condition on the paper is determined to be unacceptable, the pivotal flappers 17 are pivoted clockwise in the direction that the free end thereof is raised upward as depicted by arrow A in Fig. 3. Therefore, the paper carried from the left side drops from the rear common

delivery path 41 into the collecting box 70.

Further, in case where the paper carried from the front common delivery path 42 to the discharge outlet 80 is not extracted from the outlet 80 until a predetermined time has elapsed, the discharge rollers 81 and both the rear and front common delivery paths 41 and 42 are driven in the reverse direction, so that the paper at the discharge outlet 80 is carried in the reverse direction from the front common delivery path 42 to the rear common delivery path 41 passing on the flappers 71. Thereafter, when the rear common delivery path 41 is driven in the forward (discharge) direction and the pivotal flappers 71 are pivoted to a position shown by the dot-dot-dashed lines 71a in Fig. 3, the paper is collected into the collecting box 70. The above collection operation serves to prevent the discharged paper from being stolen by another person, in case the customer forgets to extract the paper already discharged to the outlet 80 therefrom.

Lastly, the whole operations of the paper discharging apparatus according to the present invention will be described in brief. The operation of paper discharging apparatus is controlled by a CPU installed in the apparatus itself or by a CPU installed in a transaction processing system including the apparatus according to the present invention.

Once the numbers and the kinds of papers to be discharged are specified by the CPU, the dispenser rollers 5 of the paper containers corresponding to the specified papers are driven and one or more kinds of papers are let out one by one from each

container, being carried through each of the first delivery paths 51 to 55. During this delivery process, the paper delivery is inspected as to whether the delivery is normal or not with respect to items described hereinabove. In case of an abnormal delivery, the paper delivery operation is stopped at the moment.

In the normal delivery operation, the papers are carried from the first delivery paths 51 to 55 to the rear common delivery path 41 through the intermediate path 30. When a plurality of papers are let out from a plurality of containers simultaneously, the delivery operation is controlled at the rear common delivery path 41 so that the papers are not overlapped with each other. For instance, when a paper is carried through the intermediate delivery path 30, other papers let out from the containers are held at each corresponding first delivery path until the paper being carried in the intermediate path 30 reaches the rear common delivery path 41.

The paper on which no printing is required is directly fed from the rear common delivery path 41 to the front common delivery path 42 passing on the flappers 71, being discharged to the discharge outlet 80.

The paper on which some printing is required first stops at the printer 61, and then fed intermittently to print predetermined data at predetermined positions therein. Thereafter, the printed characters or digits are inspected by the printing condition inspecting device 62. When the printed letters are determined to be acceptable, the printed paper is carried to the discharge outlet 80. In case the printed letters

are determined to be unacceptable, the printed paper is collected into the collecting box 70.

Further, the paper carried to the discharge outlet 80 is also collected into the collecting box 70 only when not extracted from the outlet 80 by the customer within a predetermined time.

The present invention is also applicable to a paper handling device of circulation type having paper containers for accommodating received paper as classified according to the kind of paper and delivering the paper from the containers for discharging or dispensing.

WHAT IS CLAIMED IS:

1. A paper discharging apparatus, which comprises:

(a) a paper discharge outlet (80);

(b) a plurality of paper containing means (11 to 15) for accommodating papers of different kinds, separately;

(c) a plurality of first delivering means (5 to 7, 21 to 25) for carrying a paper dispensed from each of said paper containing means, separately;

(d) second single common delivering means (40) for carrying papers carried through each of said first plural delivering means to the discharge outlet; and

(e) abnormal delivery detecting means (51 to 55) for inspecting whether each paper is being carried normally, at least one of detection elements of said abnormal delivery detecting means being disposed separately for each of said first plural delivering means.

2. The paper discharging apparatus as set forth in claim 1, wherein said abnormal delivery detecting means (51 to 55) comprises detection elements of double-paper detecting means, paper-kind detecting means, and paper delivery position detecting means.

3. The paper discharging apparatus as set forth in claim 1, wherein a printer (61) for printing a predetermined data on a carried paper is provided in said second common delivering means (40).

4. The paper discharging apparatus as set forth in claim 3, wherein means (62) for inspecting whether the print printed by

said printer on the carried paper is acceptable is provided in said second common delivering means (40).

5. The paper discharging apparatus as set forth in claim 4, wherein paper collecting means (70, 71) for collecting the carried printed paper when the print is determined to be unacceptable is provided.

6. The paper discharging apparatus as set forth in claim 1, wherein means (83) for inspecting whether the paper carried to the discharge outlet is extracted within a predetermined time is provided.

7. The paper discharging apparatus as set forth in claim 6, wherein means (70, 71) for collecting the paper not extracted within a predetermined time is provided.

8. The paper discharging apparatus as set forth in claim 5, wherein said paper collecting means comprises a paper collecting container (70) and a pivotal flappers (71) disposed over said collecting container.

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Fig.1

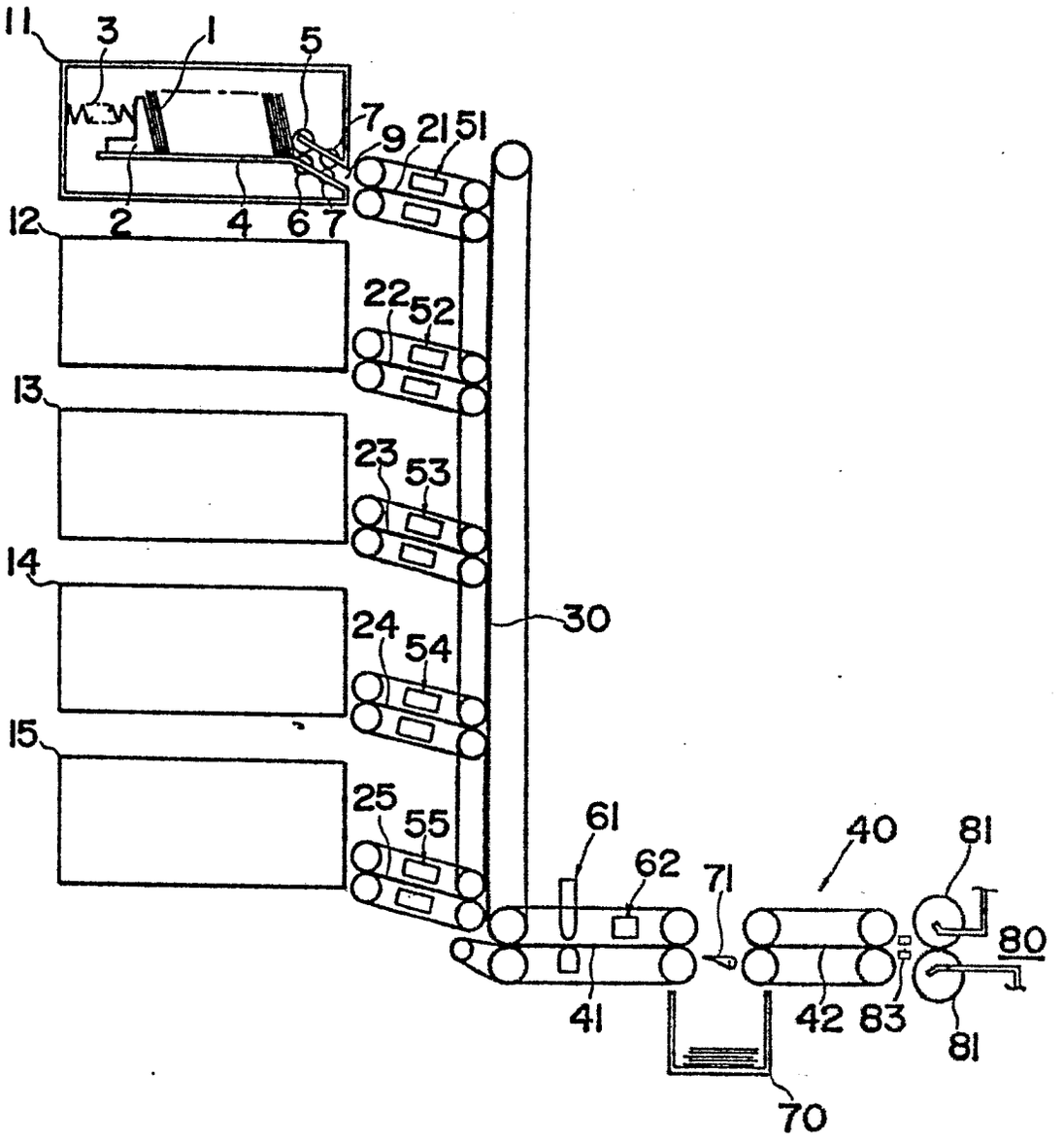

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Fig.2

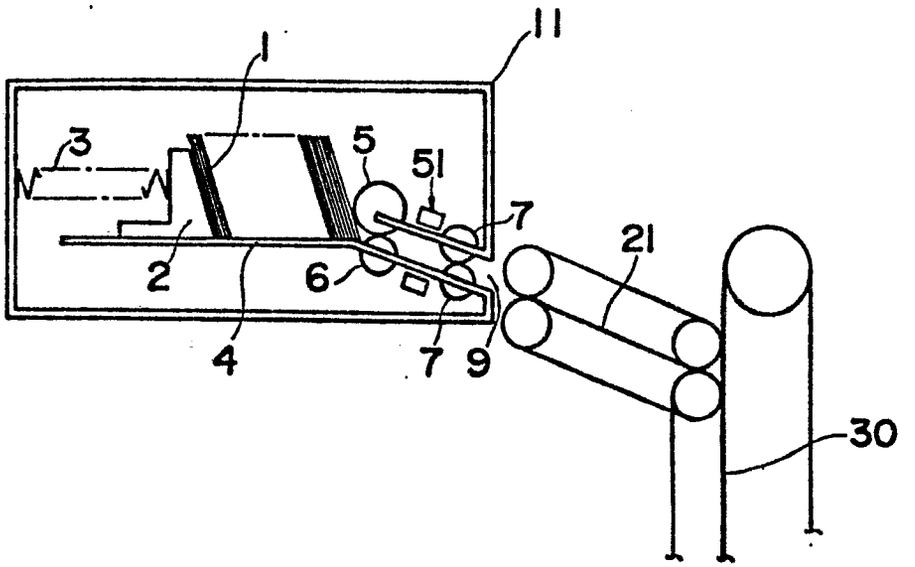

Fig.3