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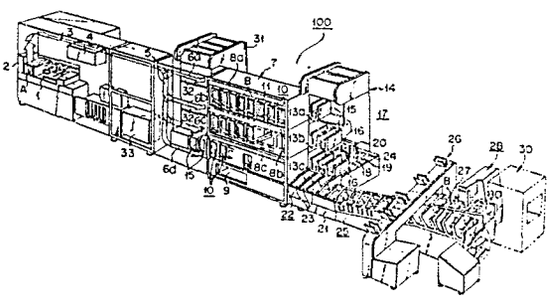
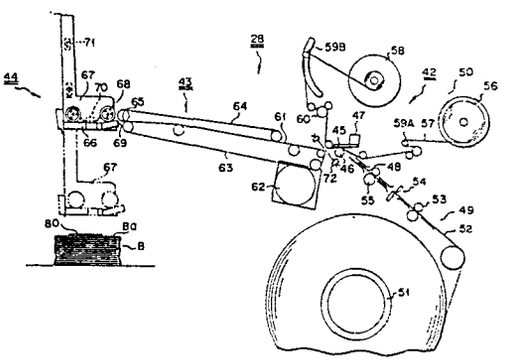
(54) Destination label printer.

(57) A destination label printer (28) is incorporated with an automatic postal matter processing apparatus (100). In the latter apparatus, a postal code of postal matter (A) such as cards, letters, etc. is optically read out and then stored in a memory as a postal code data. A quantity of postal matter is automatically sorted into a plurality of mail stacks (B), each of which has the same postal code, in accordance with the postal code data. Then the sorted mail stacks (B) are conveyed out from the processing apparatus (100). The destination label printer (28) comprises a printing section (42), a label convey section (43), and a label transfer section (44). This printer (28) operates as follows. Character patterns, bar codes and so on are printed on a blank label for the destination label (80) by the printing section based upon the contents of the sorting information obtained from the stored postal code data. The printed destination label (80) is transported from the printing section to the transfer section through the convey section. The label is transferred from the transfer section and attached to the mail stack designated by the corresponding postal code data.





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Destination label printer

This invention relates to a destination label printer incorporated in an automatic postal matter processor, which prints destination labels in accordance with postal code data such as the name of the appropriate post office for the outgoing mail, and attaches them to the proper stacks of mail that have been sorted and stacked in the processor.

Various automatic postal matter processors have recently been put to use for the purpose of streamlining post office operations. One automatic postal code reading-out/sorting machine belonging to the processors is capable of reading postal codes and sorting postal matter in accordance with specific designations. A post office worker must then manually pick up the mail stacks one by one from such a sorting machine and attach to each mail stack a destination label on which a corresponding postal code, and the name of destination post office are printed. The labeled mail stacks are then bundled by a belt. This automatic sorting machine has a major drawback in that it requires post office workers to select the proper destination labels for the respective mail stacks and then attach them to the stacks, which is both inconvenient and inefficient.

It is therefore an object of the present invention to eliminate the above-mentioned drawback, and to provide an automatic destination printer, thereby

automatically performing the destination labeling work.

The present invention provides a destination label printer incorporated in an automatic postal matter processing apparatus in which a postal code of postal matter is optically read out and stored as postal code data, a quantity of postal matter is sorted into a plurality of mail stacks in accordance with the postal code data in such a manner that each mail stack has the common postal code data, and the sorted mail stacks are in turn conveyed out therefrom, comprising:

print pattern processing means for processing the postal code data so as to obtain sorting information such as a name of the destination post office as print patterns;

printing means for printing said print patterns on a blank label for the destination label in accordance with said sorting information; and

transportation means for conveying the printed destination label from said printing means to the mail stack designated by said respective postal code data and conveyed by said automatic postal matter processing apparatus, and for attaching said destination label to said mail stack.

Through the use of the present invention, manual operation of the destination labeling work can be eliminated. Consequently, destination labeling work in the automatic postal matter processor can be performed quickly and precisely.

The present invention is best understood by reference to the accompanying drawings, of which:

Fig. 1 is a perspective view schematically illustrating a destination label printer incorporated in an automatic postal matter processor according to an embodiment of the present invention;

Fig. 2 shows a front view of a destination label printed by the printer of Fig. 1;

Fig. 3 is a schematic diagram of a destination

label printer according to an embodiment of the present invention; and

Fig. 4 schematically shows a block diagram of a control circuitry to be used with the destination label printer of Fig. 3.

Fig. 1 shows a postal matter processor 100 with a destination label printer of the present invention incorporated therein. The overall construction of the postal matter processor will first be described in general. It has a supplier unit 1 in which a stack "A" of postal matter such as postal cards and letters are set upright, a pick-up unit 2 for picking up the postal matter one by one from the front-most one of the stack "A" and feeding it sequentially along a feed-in convey path 3, and a read-out unit 4 along the latter for reading postal codes written or printed on it.

The processor further has a gating unit 5 for selectively directing individual postal matter to one of a vertically arranged plurality of sorting convey paths 6a, 6b, 6c or 6d according to the data read-out by the read-out unit 4, the postal matter being received thereafter in horizontal sorting convey paths 8a, 8b, 8c or 8d, or a reject pocket 9 disposed in the sorting unit 7 equipped with an automatic feed-out mechanism. The horizontal sorting convey paths each have a plurality of stacking units 10 along the underside thereof into which postal matter A can be sorted and stacked according to the data from the read-out unit 4. When a determined amount of postal matter "A" has been stacked in the stacking units 10 or when a compulsory push switch is depressed, the feed-out mechanism or, for instance, a push unit (to be described later in detail) is actuated to push out mail stacks "B" from the stacking units 10 to the rear side of the sorting unit 7.

In the rear side of the sorting unit 7 a tray circulation unit 14 is provided having three tiered-tray horizontal convey paths 13a, 13b and 13c corresponding

to groups of the stacking units 10 and trays 15 adapted to be successively and intermittently transported on the tray horizontal convey paths. Mail stacks "B" pushed out from the stacking units 10 can be transferred into the moving trays 15.

An elevator unit 17 has tray mounting tables 16 adapted to be intermittently circulated to successively rise to positions opposite to the terminal ends of the tray horizontal convey paths 13a, 13b and 13c so that trays 15, with or without mail stacks "B" delivered therein can be received and transferred thereby to a subsequent postal matter/tray separating unit 18. This separating unit has a pusher 19 for mail stacks and a puller 20 for vacant trays which are both reciprocally movable. When the pusher 19 moves in one direction, it engages and transfers mail stacks "B" in the trays 15 to the operating portion 23 of an aligned end converter unit 22 which constitutes a starting portion of a common convey line 21. And, when the puller 20 moves in the other direction, it pulls vacant trays rearwards to a starting portion of a tray return path 24 provided in the tray circulation unit 14.

After being delivered to the convey line 21, the mail stacks are carried by an aligning convey apparatus 25 (constituting the convey line 21), and have both their respective end and side edges aligned in the course of transportation. A transfer unit 26 transversing the convey line 21 transfers a mail stack "B" having been thus aligned to a separate convey line 27 opposite to which positioned is a destination label printer 28 according to the present invention which is adapted to attach a destination label 80 to the uppermost surface "Ba" of the mail stacks "B". Mail stacks "B" with the destination label 80 attached thereto are delivered to a bundler apparatus 30 at the terminal end of the convey line 27 where they are bundled by a belt.

Trays 15 fed in the tray return path 24 by means of the postal matter/tray separating unit 18 are moved toward the side of the elevator unit 31 placed at the starting position of the above-mentioned tray horizontal convey paths 8a, 8b and 8c. A tray transferring unit (not shown) placed at the terminal end of the tray return path 24 is adapted to transfer the trays to tray mounting tables 32 which are intermittently circulated by the elevator unit 31 to rise to positions opposite to the starting positions of the tray horizontal convey paths 13a, 13b and 13c successively. Trays 15 arriving in opposite positions to the starting positions thereof are pushed one by one onto the tray horizontal convey paths 13a, 13b and 13c by means of a pusher unit (not shown), with trays on the horizontal convey paths 13a, 13b and 13c being simultaneously carried one pitch. Trays arriving at the terminal ends are transferred to the tray mounting tables 16 in an elevator unit 17.

A central control unit 33 is shown for controlling the overall operation of the system.

Before proceeding with the detailed description of the destination label printer according to the invention, a fundamental operation thereof will now be described.

This printer is generally incorporated with the automatic postal matter processing apparatus in which a postal code is optically read-out and then stored as a postal code data; a quantity of postal matter is sorted into a plurality of mail stacks each having a common postal code data in accordance with the stored postal code data; and the sorted mail stacks are then conveyed out therefrom.

It should be noted that the above-described "common postal code number data" has two meanings in this specification. In general, the Japanese postal code is constituted by five Arabic numbers e.g. 100^{21}, the large three numbers (referred to "a group code")

being used for the main sorting operation and the remaining small two numbers for the auxiliary sorting operation. The meaning of the common postal code data is, on one hand, that the large three numbers of each postal matter are identical, and on the other hand, that all five numbers thereof are completely identical.

Under these conditions, the destination label printer according to the invention operates as follows.

Character patterns, bar codes and so on are printed on a blank label by printing means based upon the contents of the sorting information obtained from the stored postal code data. The printed destination label is conveyed by conveying means from the printing means to the mail stack designated by the relative postal code data and is attached to the mail stack.

Fig. 2 shows a sample of the destination label 80 printed by the printer according to the invention. Printed on this destination label 80 are the "group" postal code "100" for the destination post office 81, the name ("TOKYO CENTRAL POST OFFICE") of the destination post office 82, the bar code for the destination post office 83, the name ("YOKOHAMA CENTRAL POST OFFICE") of the post office for outgoing mail 84, and the postal code "220" for the latter post office 85.

Fig. 3 shows a schematic diagram of the destination label printer of the present invention. This printer 28 is mainly composed of the printing unit 42, the convey unit 43, and the transfer unit 44.

The detailed construction of each unit will now be described.

The printing unit 42 for printing the destination label 80 has a printing section 47 comprised of a printing head 45 with an array of dot-like heat emitting elements located substantially in the center of the unit, but not shown in detail, and a pressure feed roller 46 disposed opposite the printing head. A blank label supply section 49 is disposed below the printing

section 47 for supplying blanks 48 of the destination labels 28 to the latter section. An ink tape supply device 50 is located above the printing unit 42.

The blank label supply section 49 has a reel 51 on which a roll of paper 52 is mounted, feed roller pairs 53 for taking out a determined length of one end of the roll of paper, a cutter 54 for cutting therefrom the determined length of paper making a blank label 48, and feed roller pairs 55 for feeding the blank label 48 to the printing section 47 of the unit 42. The ink tape supply device 50 has a supply reel 56 on which an ink tape 57 is coiled, a take-up reel 58 for winding thereon one end of the ink tape 57, and a pair of tension rollers 59A and 59B for maintaining a portion of the ink tape running between the reels in a taut condition and in a position facing the printing face of the printing head 45 of the printing section. It further has a feed roller pair 60 actuated together with the operation of the printing section to transfer the ink tape 57 in the direction toward the take-up reel, so that a fresh, unused surface of the ink tape always faces the array of heat emitting elements in the printing head 45.

A blank 48 of the destination labels 80 fed to the printing unit 42 comes to overlie the printing face of the printing head 45, with the ink tape portion 57 interposed therebetween. The blank 48 is fed by rotation of the pressure feed roller 46 along with the ink tape 57 and simultaneously dot-printed by the heat-emitting element array disposed on the feed path of the blanks and the ink tape and operative to emit heat selectively in accordance with print signal to be described hereafter. A destination label 80 with required data printed thereon is then supplied to a label supplying convey path 61 in the convey unit 43.

The label supplying convey path 61 in the convey unit for transporting the destination label 80 printed

by the destination label printing unit 42 is constituted by the upperside of a lower convey belt 63 driven by a motor 62 in an endless path. An upper convey belt 64 extends in opposition to the lower convey belt, except for the starting portion of the label supplying convey path 61, so that the destination label 80 fed in the label supplying convey path is supported in a horizontal position while transported between the two convey belts.

A transfer unit 44 is provided for receiving the destination label 80 delivered by the convey unit 43 and transferring the same to a destination label mounting part Ba which constitutes the upperside of a mail stack B. The transfer unit 44 has a transfer head 67 adapted to receive and hold the destination label 80 arriving at a destination label supplying portion 65 constituting the terminal end of the supplying convey path 61. The transfer head is movable upward and downward and has a label receiving box 66 whose label receiving inlet 69 can be placed in opposition to the label supplying portion 65 for receiving destination label 80 when the head is in the upper position. The head can be lowered to a position where an optical sensor (not shown) mounted on the head 67 is spaced a predetermined distance from the destination label mounting part Ba. When the head is in the lower position, a release section 68 mounted on the head is actuated to release the destination label 80 in the receiving box for transferring the same onto the label mounting part Ba.

When the transfer head has been returned to the upper home position, this state is detected by a head upper position detector 71. A remaining label detector 70 with a reflector is provided for detecting the presence of a label not released from the box. When a detection signal is given, i.e., either that the head has not returned to the home position or that a

label remains in the receiving box, movement of the convey belts 63 and 64 constituting the label convey path 61 is suspended as soon as a label feed detector 72 adjacent to the starting portion of the label convey path 61 detects the feeding of the next printed label from the printer unit.

The destination label printer 28 shown in Fig. 3 is operated by an electric control system shown in Fig. 4 which will now be described below.

A central control section 91 of the printer controls the system overall in accordance with a control program in a main memory 92. An interface section 93 communicates with the automatic postal matter processing central control unit 33. A floppy disc section 94 stores data for determining postal codes, patterns of corresponding codes to group codes of mail stacks B, names of destination offices, bar codes, etc. A conversion table section 95 stores contents of the floppy disc section. A pattern memory section 96 stores various patterns for generation of characters and bar codes.

The central control section 91 of the printer reads out character data of the post office for outgoing mail, character data of the destination office and the appropriate bar code pattern of the latter office from the conversion table section 95 in response to the postal code supplied from the control unit of the processor 33. The data thus read out produces the corresponding patterns to be applied to the printing head 47 of the label printer 42, thereby serving to control the printing operation. The same section controls the convey unit 43 to move printed destination labels 80 from the printing unit 42 to the transfer unit 44, and also controls the operation of moving the destination labels from the transfer unit 44 to the destination label mounting part Ba of the mail stack B, releasing them and attaching them thereto.

The operation of the printer will now be described with reference to the block diagram of the control system of Fig. 4.

Turning on of a power switch (not shown) of the printer 28 starts the operation of a floppy disc device 112 of the floppy disc section 94, which is based on a program loading routine and floppy disc drive routine both stored in a program ROM in the central control section of the printer 91, referred to as the "control section" hereafter. The floppy disc device 112 stores a printer control program, a conversion table for the generation of character patterns to be defined by postal codes, and character pattern data, which are written therefrom through the CPU 102 in the program RAM, conversion table section 95 and pattern memory section 96, respectively.

When the mail stack B on the tray mounting table 16 was transferred to the convey line 21, the common, or group postal code "100" concerning this particular mail stack B was read-out and stored in the automatic postal matter processor 100. The stored data is then read-out from the central control unit of the automatic postal matter processor 33 to the control section 91. It should be understood that the present invention does not directly cover the central control unit of the processor 33. A data available flip-flop 124 is set under the control of the CPU 122 in the control unit 33. The CPU 102 in control section 91 determines whether or not the flip-flop 124 is set, and if it is set, allows the stored data of the postal code to be written through a bus gate 136 of the interface section 93. In other words, the CPU 102 causes the data to be transferred through the memory bus to the main memory section 92.

When mail stacks B, having sequentially passed through the convey line 21, transfer unit 26 and convey line 27, arrive in an operation zone of the label

printer 28 after a predetermined lapse of time, the control section 91 derives the corresponding conversion table for the related group postal code "100" from the conversion table section 95. In other words, the CPU 102 derives numeric data of the related postal code, character data of the destination post office, numeric data of the postal code relating to the office for outgoing mail, character data of the latter office, and bar code data of the designation office. Thus, from the pattern memory the control section 91 in the CPU 102 derives a character pattern ("100") corresponding to the numeric data of the destination office; a character pattern ("TOKYO CENTRAL POST OFFICE") corresponding to character data of the destination office; a bar code pattern corresponding to the bar code data; a character pattern ("220") corresponding to the numeric data of the outgoing mail post office; and a character pattern ("YOKOHAMA CENTRAL POST OFFICE") corresponding to the character data of the name of the latter office. These are all supplied to a print data register 132 of the printing unit 42 and temporarily stored in the same. The temporarily stored data are applied to a dot shift register 145 of a thermal printer head section 47. Desired character data are to be printed on a blank label 48 (see Fig. 2) by the thermal head 45 under the control of a printing voltage controller 134 in the printing section 42.

The pattern conversion step will now be described in detail. Postal code data stored in the main memory section 92 is read out through the CPU 102 and serves to derive conversion code data from the conversion table section 95. The conversion code data allows desired character patterns to be located in the pattern memory section 96 and then applied through the CPU 102 to the print data register 132 of the printing section 42 where data up to one line are temporarily retained. The character pattern data is referred to as sorting

data or information. In the case of searching the character patterns, each read-out sequence is arranged so as to have access to the desired character data in the main memory section 92 in a convenient sequence.

When one line of character pattern data is stored in the data register 132, that data is printed by means of a thermal printer head 45 in a determined position on a blank label 48 with the ink tape 57 interposed therebetween. Thereafter, the label is displaced by a distance of one line, and the above-stated sequence is repeated until printing of the label is completed.

Referring to the mechanical steps of the printing operation, the CPU 102 supplies control signals through the data bus to a magnet motor controller 142 of the convey unit 43, at the same time that the data is temporarily stored in print data register 132. The roll paper supply reel 51 thereby rotates and roll paper 52 is thus fed out continuously to a determined length and then cut off by the cutter 54. Control of the cutting operation is effected by a controller 142. The blank label produced by the cutting operation and the ink tape 57 are fed out intermittently to the thermal printer head section 47 under the control of a pulse motor controller 144. When the blank label 48 and the unused portion of the ink tape 57 are fed out synchronously at a determined velocity to a determined position of the head section 47, print data are supplied from the 352-dot shift register 145 to the thermal head 45 for printing the characters, i.e., the postal code 81, name of the destination post office 82, bar code 83, etc. on the blank until printing of the latter is completed.

Convey belts 63 and 64 start to be driven by turning on the motor 62 in the speed conversion section for the convey unit 43, whereby the printed destination label 80 is transported from the printing unit 42 to the transfer unit 44, which has a home position where

the unit rests in the upper portion of this drawing. In this position, the label receiving box 69 is positioned opposite a label supplying section 65 provided at the terminal end of the label supplying convey path 61 for receiving the label therefrom.

When the label 80 is transported onto the transfer unit 44, this is detected by a detector (not shown) which signals the CPU 122 of the central control unit 33. A transfer command signal is then generated thereby and temporarily stored in the data register 126. The CPU 102 of the central control section of the printer 91 is supplied with the transfer command signal through a bus gate 138 of the interface unit 93.

After a determined sequence is performed therein, a command signal is applied to the magnet motor controller 152 of the transfer unit 44, de-energizing a magnet means (not shown) to prevent the descent of the transfer head and actuate a clutch means (not shown). Simultaneously, the pulse motor controller thereby allows a pulse motor (not shown) to rotate in the positive direction, starting the descent of the transfer head.

The reflection-type mail stack detector (not shown), mounted on the bottom of the transfer head 67, optically detects the presence of a mail stack in the course of the descending movement of the head, and produces a detection signal which is then applied through a bus gate 156 of the transfer unit 44 to the CPU 102. The command signal is thereby supplied to the motor controller 154 to stop the descent of the head 67, as shown in Fig. 3 by a two-dot broken line.

At the completion of the downward movement, the CPU 102 supplies a label transfer release command signal to the magnet motor controller 152, whereby the label release section 68 in the head 67 transfers the label 80 from the head onto the label mounting part Ba.

The sequence of operation described above completes

the transfer and attachment of a destination label 80 onto a mail stack.

After a predetermined time has lapsed following the release of a label, the CPU supplies command signals through the data bus to the pulse motor control 154 of the transfer unit 44 to raise the head back to the home position. The pulse motor thus rotates in the reverse direction to that mentioned above to raise the transfer head 44. The raising of the transfer head is continued until the latter comes to turn on a microswitch for detection top dead center 71, when the head is thereby located at the home position.

The foregoing completes a sequence of operational steps of the printers 28 according to the present invention, and preparation for the printing and transferring of a subsequent label. This embodiment of the present invention also has a safety measure which has not been discussed.

In the event that the transfer of a label 80 is not properly performed, the embodiment can discontinue the transferring operation of a subsequent label. In other words, in the event that the head 67 fails to return to the home upper position, or that if the previous label remains in the label receiving box 66, and the latter printed label is detected by the detector 72 adjacent to the starting portion of belts 63 and 64, the detector 72 produces a detection signal through bus gate 146 of convey unit 43 to CPU 102, whereby operation of the drive motor 62 for the convey belts 63 and 64 is immediately stopped.

It should be apparent from the foregoing explanation that the present invention provides a destination label printer which can significantly decrease the work load of a post office staff.

While the invention has been described in terms of certain preferred embodiments, and exemplified with respect thereto, those skilled in the art will readily

appreciate that various modifications, changes, omissions and substitutions may be made without departing from the spirit of the invention.

For example, in the above embodiment the floppy disc device 112 was used as the outer memory device for the printer 28. It is possible to use other outer memory devices, e.g., the optical disc memory device.

Claims:

1. A destination label printer (28) incorporated in an automatic postal matter processing apparatus (100) in which a postal code of postal matter is optically read out and stored as postal code data, a quantity of postal matter is sorted into a plurality of mail stacks in accordance with the postal code data in such a manner that each of the sorted mail stacks has the common postal code, and the sorted mail stacks are in turn conveyed out therefrom, characterized by further comprising:

print pattern processing means for processing the common postal code data so as to obtain sorting information such as a name of the destination post office as print patterns;

printing means for printing said print patterns on a blank label for the destination label in accordance with said sorting information; and

transportation means for conveying the printed destination label from said printing means to the mail stack designated by said respective common postal code data and conveyed by said automatic postal matter processing means, and for attaching said destination label to said mail stack.

2. A destination label printer as claimed in claim 1, characterized in that said print pattern processing means includes:

a first memory section for storing a printer operation program;

a second memory section (92) for storing said postal code data sent from said print pattern processing means;

a third memory section (95, 96) for storing a conversion table which is used to convert said common postal code data into desired print pattern code, and for storing print pattern data which is searched based

upon said desired print pattern code so as to deliver given print pattern data; and

a central control section for communicating said first, second and third memory sections to process said postal code data by executing said printer operation program so as to obtain said sorting information.

3. A destination label printer as claimed in claim 1, characterized in that said printing means (42) includes a label supply section (49) for feeding a sheet of blank labels (52) to a printing head section (47) which prints said print patterns on the respective blank label.

4. A destination label printer as claimed in claim 1, characterized in that said transportation means includes:

a convey section (43) having belt members (63, 64) for conveying the printed destination label (80) from a printing head section (47) to a transfer section (44), said transfer section receiving said conveyed destination label and attaching the same to said mail stack designated by said corresponding common postal code data.

5. A destination label printer as claimed in claim 1, characterized in that said transportation means includes:

a first optical sensor (71) for detecting whether said destination label is carried from said print pattern processing means; and

a second optical sensor for detecting whether said mail stack is positioned at a given position under said transportation means.

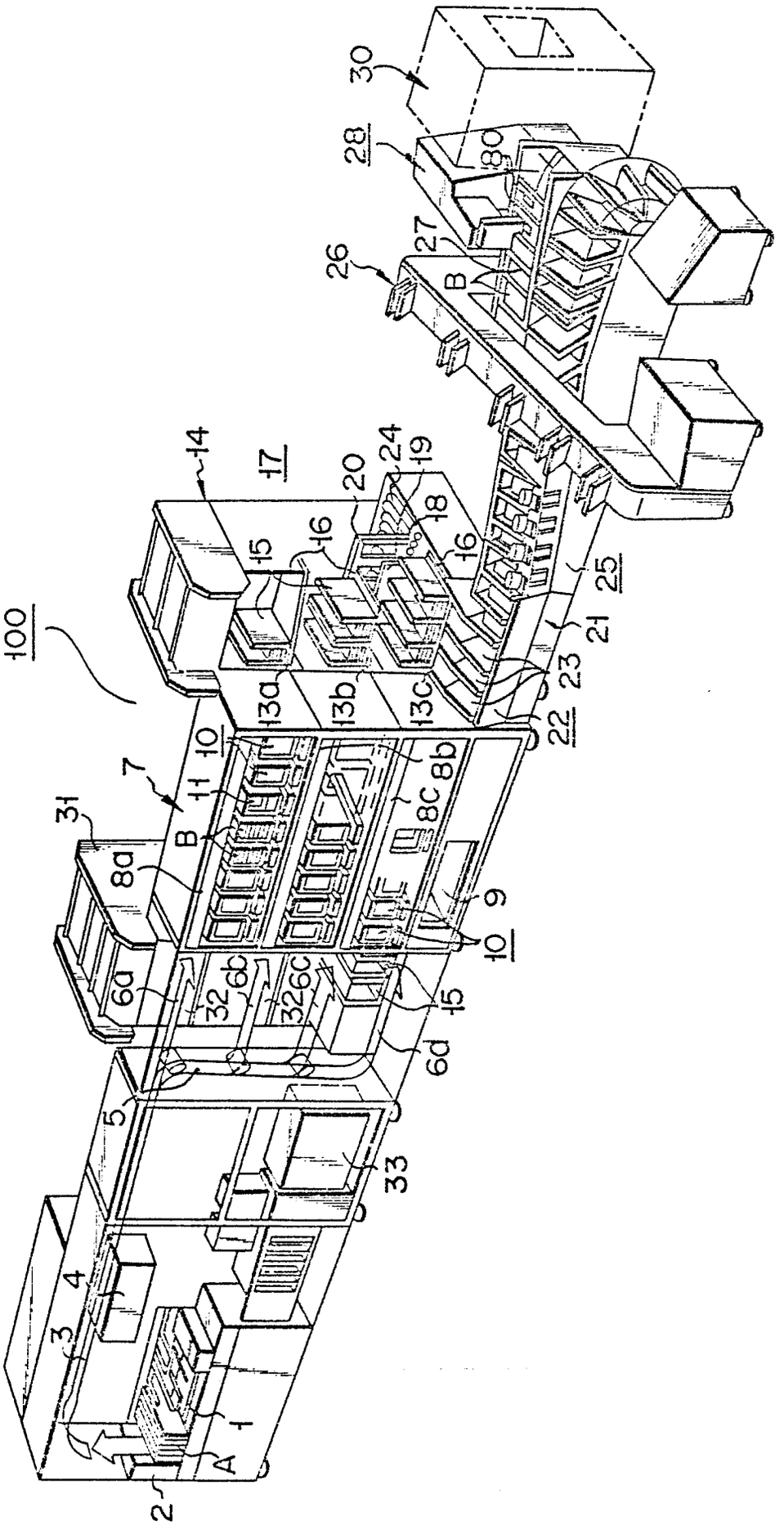
6. A destination label printer as claimed in claim 2, characterized in that:

said first memory section of the print pattern processing means includes a disc memory device (112) which stores said printer operation program; and

said central control section is a microprocessor (102).

7. A destination label printer as claimed in claim 3, characterized in that said printing head section of the printing means is a thermal head printer (45).

FIG. 1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6d
7
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13b
13c
14
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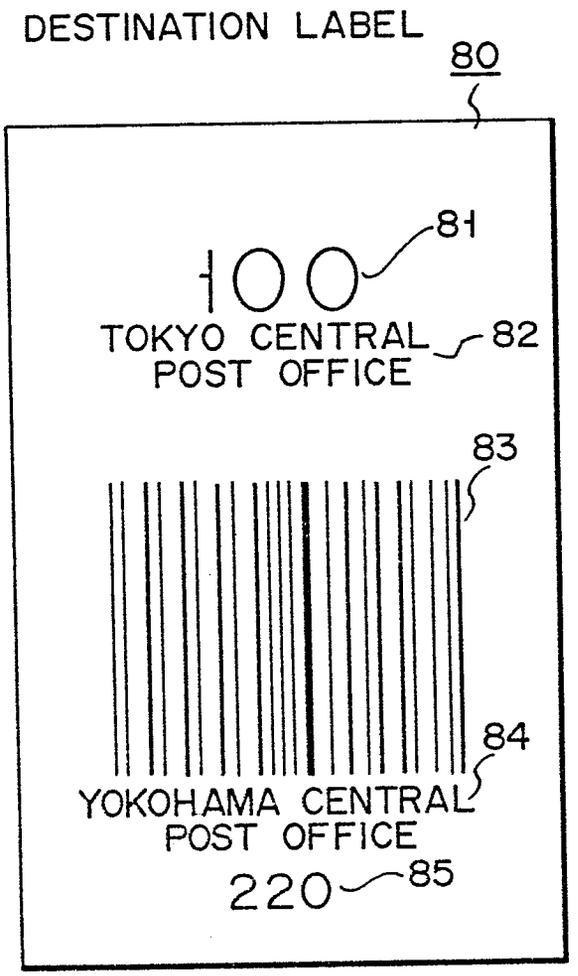
B

FIG. 2


DESTINATION LABEL
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POST OFFICE
82
83
84
YOKOHAMA CENTRAL
POST OFFICE
220
85

0095737

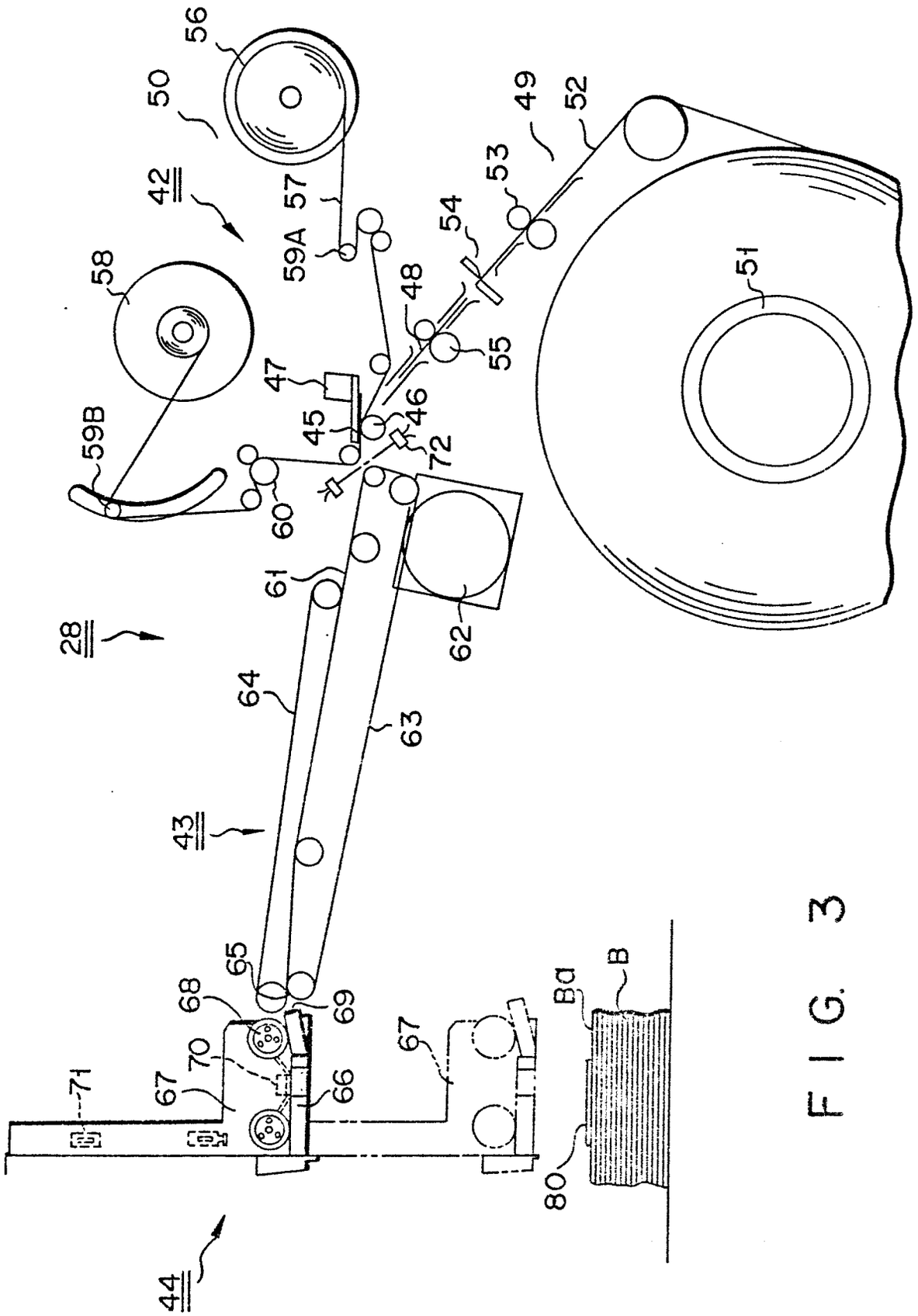
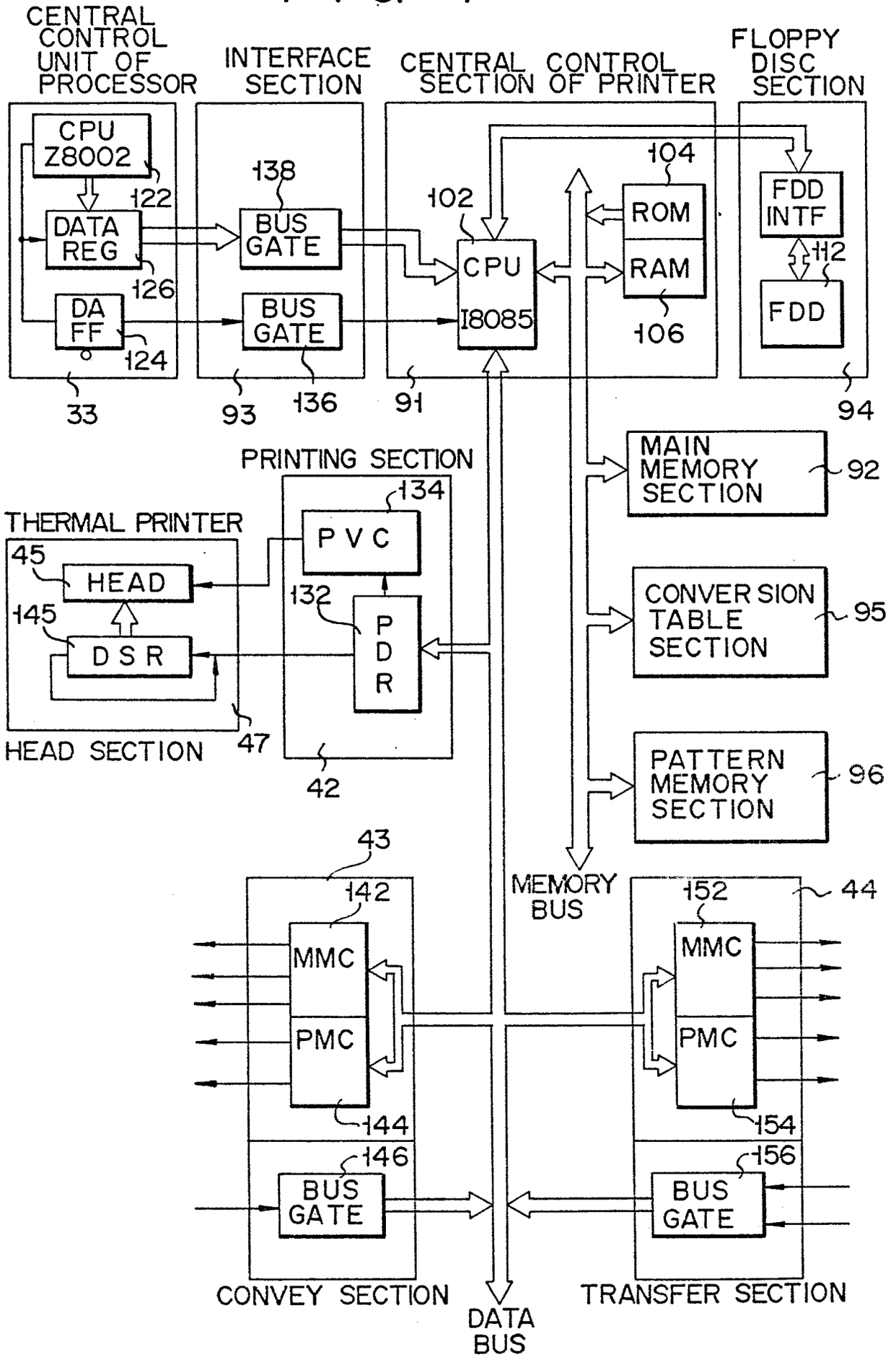


FIG. 3

FIG. 4


CENTRAL CONTROL UNIT OF PROCESSOR
INTERFACE SECTION
CENTRAL CONTROL SECTION OF PRINTER
FLOPPY DISC SECTION
CPU Z8002
122
DATA REG
126
DA FF
124
138
BUS GATE
BUS GATE
136
102
CPU I8085
104
ROM
RAM
106
FDD INTF
112
FDD
33
93
91
94
PRINTING SECTION
134
P V C
THERMAL PRINTER
45
HEAD
145
D S R
132
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HEAD SECTION
47
42
MAIN MEMORY SECTION
92
CONVERSION TABLE SECTION
95
PATTERN MEMORY SECTION
96
MEMORY BUS
43
142
MMC
PMC
144
146
BUS GATE
CONVEY SECTION
152
MMC
PMC
154
156
BUS GATE
TRANSFER SECTION
44
DATA BUS