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(71) Applicant: **BROTHER KOGYO KABUSHIKI KAISHA**
Nagoya-shi, Aichi-ken (JP)

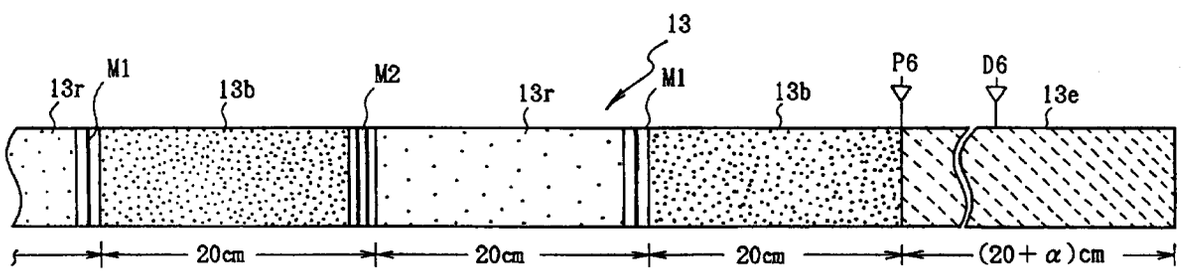
(72) Inventors:
- **Yamaguchi, Koshiro,**
  c/o Brother Kogyo K.K.
  Nagoya-shi, Aichi-ken (JP)
- **Shiota, Junji,**
  c/o Brother Kogyo K.K.
  Nagoya-shi, Aichi-ken (JP)

(74) Representative: **Prüfer, Lutz H. et al**
D-81545 München (DE)

(54) Tape-shaped label producing device

(57) An ink ribbon 13 includes a black ink 13b and red ink 13r coated alternately each to 20 cm and distinction marks M1 and M2 between each ink coated region. A end tape 13e with a length longer than 20 cm is connected to the end edge of the ink ribbon 13. Each time the ink ribbon 13 is fed the predetermined amount of 20 cm of the ink coated regions, one of the distinction marks M1 or M2 of the ink ribbon 13 is detected. The end portion can be accurately detected because a distinction mark will not be detected by a mark detection sensor when the end portion is aligned with the mark detection sensor even though the ink ribbon is fed the predetermined length of the ink coated portion.

FIG. 14



13b : BLACK INK
13r : RED INK
13e : END TAPE

M1 : DISTINCTION MARK
M2 : DISTINCTION MARK

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a tape-shaped label producing device capable of printing in color and to an ink ribbon and a print tape for use in the tape-shaped label producing device.

2. Description of the Related Art

Japanese Utility Model Application Publication No. HEI-1-85050 describes a tape printer for printing characters, symbols, and marks on a tape, which serves as the medium for printing. The printed tapes are well-suited for uses as labels adhered to the binding of files. The tape printer includes a keyboard, a display, and a thermal print type printing mechanism for monochromatically printing, such as in black, red, or green, characters and symbols on a tape with a width of, for example, 6, 9, 12, 18, or 24 mm at various character sizes and fonts.

SUMMARY OF THE INVENTION

It is conceivable that this tape printer is improved to be capable of printing characters and symbols inputted from a keyboard in two different colors, such as black and red, black and green, or red and green. The ink ribbon for this purpose is coated alternately with two colors of ink, each at a predetermined length of, for example, about 20 cm. Further, at the starting edge of each different color region, the tape is marked with barcode-shape marks, called ink-color distinction marks, for demarcating what colors of ink are coated on the ink ribbon. Also, the end of the ink ribbon is marked with different barcode-shaped marks, called end distinction marks, for demarcating the end of the ink ribbon. The ink-color distinction marks are formed by coating the ink ribbon with ink in the same process for coating the color regions with ink. On the other hand, the end distinction marks are printed on the ink ribbon using a special process different from the one used for coating the ink-color distinction marks.

In the tape printer, a mark detection sensor is provided for detecting existence of the end distinction marks to detect whether or not ink ribbon exists and for detecting the ink-color distinction marks to detect the ink-color, while printing control processes are being executed. A control device is also provided that constantly detects distinction signals outputted from the mark detection sensor and, according to the detected distinction signals, constantly controls an ink ribbon feed mechanism to transport the ink ribbon so that the color ink indicated by the print color designation data stored in the print data is constantly in confrontation with the printing area of the thermal head.

When the tape printer is thus printing in two colors of an ink ribbon coated alternately with two colors of ink, the control device must execute printing processes for driving the thermal head and control processes for controlling feed of the print tape and ink ribbon. Additionally, to print designated character trains in the designated color, the control device must execute detection processes for constantly detecting distinction signals from the mark detection sensor to detect the color and whether or not ink ribbon exists. These processes place a large load on the central processing unit (CPU) of the control device. This load slows down printing processes.

Additionally, production efficiency of the ink ribbon is low because the barcode-shaped end distinction mark is printed using special printing processes. This increases costs of producing the ink ribbon.

Similarly to detecting the end portion of the ink ribbon, detecting the end edge of a print tape, which serves as a printing medium, is preferable for achieving a good printing operation. It can also be conceived that the end of the tape is formed with an end tape that is either light-transmittant or non-light-transmittant. Providing the tape printer with a simple detection sensor, such as a photointerrupter, can detect the end of the print tape thus provided with the end tape.

Generally, laminate-type print tapes and receptor-type print tapes are used in the tape printers. A laminate-type print tape is made from a thin transparent laminate film. The laminate-type print tape has light-transmitting property. When the laminate film is colored with red, black, gold, or the like, however, the laminate-type print tape has non-light-transmitting property. Contrarily, a receptor-type print tape is constructed from a two-sided tape and a peel-away sheet adhered to the rear surface of the two-sided tape. The receptor-type print tape has therefore always non-light-transmittant property because of the peel-away sheet adhered to its rear surface. Therefore, ends of those tapes that have various different light-transmitting properties can not be detected, through merely providing end tapes that are either light-transmittant or non-light-transmittant.

It is therefore an objective of the present invention to solve the above-described problems and to provide a tape printer and an ink ribbon and a print tape for the tape printer so that the ends of the ink ribbon and the print tape can be simply and accurately detected.

It is another objective of the present invention to provide a tape printer and an ink ribbon with two or more color inks for the tape printer so that the end of the ink ribbon and the color distinction marks of the ink ribbon can be simply and accurately detected without reduction in print process efficiency.

It is a further objective of the present invention to provide a tape printer and a print tape so that the end of the print tape can be simply and accurately detected.

In order to achieve the above objective and other objectives, the present invention provides a tape-shaped label producing device for printing on a tape with an ink ribbon, at least one of the tape and the ink ribbon having an optical property that changes at an end portion thereof, the device comprising: print means including a

print head for printing, via an ink ribbon, on a tape, which serves as a print medium; tape feed means for feeding a tape; ink ribbon feed means for feeding an ink ribbon; print control means for controlling the print means, the tape feed means, and the ink ribbon feed means to thereby print an ink on the tape; and end detection means for optically detecting an end of at least one of the tape and the ink ribbon by detecting whether the optical property of the at least one of the tape and the ink ribbon changes.

According to another aspect, the present invention provides a tape-shaped label producing device for printing on a tape with an ink ribbon to produce a tape-shaped label, the ink ribbon including a plurality of ink coated portions formed by coating with a plurality of colors of ink cyclicly at a predetermined length in a predetermined order, distinction marks provided at a starting edge of each ink coated portion for distinguishing ink colors, and an end portion provided at the end of the ink ribbon to demarcate an end of the ink ribbon, the end portion being longer than the predetermined length of the ink coated portions, the device comprising: print means including a print head for printing, via the ink ribbon, on a tape, which serves as a print medium; tape feed means for feeding a tape; ink ribbon feed means for feeding the ink ribbon in synchronization with the tape; print control means for controlling the print means, the tape feed means, and the ink ribbon feed means; and mark detection means for detecting the distinction mark of the ink ribbon, the mark detection means being provided upstream from the print head.

According to a further aspect, the present invention provides a tape-shaped label producing device comprising: print means including a print head for printing on a tape, the tape serving as a print medium; tape feed means for feeding a tape; print control means for controlling the print means and the tape feed means; and a photointerrupter detecting the end of the tape via an end portion provided at the end of the tape, the end portion being formed by a non-light-transmitting nature region if the tape is light-transmitting nature and formed by a light-transmitting nature region if the tape is non-light-transmitting nature.

According to still another aspect, the present invention provides an ink ribbon for use in a tape-shaped label producing device, the tape-shaped label producing device having print means including a print head for printing on a tape, which serves as a print medium, tape feed means for feeding a tape, ink ribbon feed means for feeding ink ribbon in synchronization with the tape, print control means for controlling the print means, the tape feed means, and the ink ribbon feed means, and a mark detection means for detecting a distinction mark of the ink ribbon, the mark detection means being provided upstream from the print head, the ink ribbon comprising: a plurality of ink coated portions formed by coating with a plurality of colors of ink cyclicly at a predetermined length in a predetermined order; distinction marks for distinguishing ink colors, the distinction marks mark at a starting edge of each ink coated portion; and an end portion provided at the end of the ink ribbon to demarcate an end of the ink ribbon, the end portion being longer than the predetermined length of the ink coated portions.

According to a further aspect, the present invention provides a tape for use in a tape-shaped label producing device, the tape-shaped label producing device having print means including a print head for printing on a tape, the tape serving as a print medium, tape feed means for feeding a tape, print control means for controlling the print means and the tape feed means, and a photointerrupter detecting the end of the tape, the tape comprising: a tape region for being printed by the print head, the tape region being formed by one of a light-transmitting nature region and a non-light-transmitting nature region; and an end portion provided at the end of the tape region, the end portion being formed by a non-light-transmitting nature region if the tape region is light-transmitting nature and formed by a light-transmitting nature region if the tape region is non-light-transmitting nature.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the invention will become more apparent from reading the following description of the preferred embodiment taken in connection with the accompanying drawings in which:

Fig. 1 is a planar view showing a tape printer according to a first embodiment of the present invention;
Fig. 2 is a planar view of a receptor-type tape cassette used in the tape-shaped label producing device of the first embodiment;
Fig. 3 is a planer view showing a thermal print mechanism PM when a platen roller thereof is in a pressing position;
Fig. 4 is a planer view showing the thermal print mechanism when the platen roller is in a release position;
Fig. 5 is a schematic front view with a portion removed to show a part of the thermal print mechanism;
Fig. 6 is a schematic front view showing an essential portion of Fig. 5;
Fig. 7 is a side view showing a cutting mechanism of the thermal print mechanism;
Fig. 8 is a planar view showing the thermal print mechanism when the platen roller is in the position of Fig. 3 and a print tape is being fed therein;
Fig. 9 is a planar view showing the thermal print mechanism when the platen roller is in the position of Fig. 4 and the print tape is being reversely fed;
Fig. 10 is a block diagram showing a control system of the tape printer;
Fig. 11 is a table for explaining setting contents of a cassette-type determination table TB;
Fig. 12 is a perspective view of a receptor-type print tape divided into its component parts;

Fig. 13 is an explanatory view of a text memory storing color-designation data and character string codes;

Fig. 14 is a planar view of an ink ribbon;

Fig. 15 is a flowchart schematically representing a print position initialization control routine;

Fig. 16 is a portion of a flowchart schematically representing a label producing control routine;

Fig. 17 is a remaining portion of the flowchart schematically representing the label producing control routine;

Fig. 18 is a flowchart schematically representing a print tape reverse feed control routine;

Fig. 19 is a flowchart schematically representing a ribbon position correction control routine;

Fig. 20 is an explanatory view for explaining the correspondence relationship of the print position, the ink ribbon, and the print tape at the start of printing;

Fig. 21 is a view corresponding to Fig. 20 when a first row of a character string is printed in black ink.

Fig. 22 is a view corresponding to Fig. 20 when a second row of a character string is printed in red ink;

Fig. 23 is a view corresponding to Fig. 20 when a front edge of a tape-shaped label is cut;

Fig. 24 is a view corresponding to Fig. 20 when a rear edge of a tape-shaped label is cut and when the ribbon position for the next printing is corrected;

Fig. 25 is a planar view of a laminate-type tape cassette used in the tape-shaped label producing device of a second embodiment;

Fig. 26 is a planar view showing the thermal print mechanism when the tape cassette of Fig. 25 is mounted in the device of the second embodiment and the print tape is being fed with the platen roller being in the pressing position of Fig. 3;

Fig. 27 is a planar view of a receptor-type tape cassette used in the tape-shaped label producing device of the second embodiment;

Fig. 28 is a planar view of the laminate-type print tape;

Fig. 29 is a planar view of the receptor-type print tape; and

Fig. 30 is a flowchart schematically showing a tape end detection routine.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A tape-shaped label producing device according to preferred embodiments of the present invention will be described while referring to accompanying drawings.

First, a tape-shaped label producing device according to a first embodiment of the present invention will be described while referring to Figs. 1 through 24.

The present embodiment is related to a tape printer capable of printing a plurality of characters, such as symbols and alphanumeric characters, in two different colors on print tapes, which serve as a print medium.

As shown in Fig. 1, a keyboard 2 provided with a variety of function keys, such as a label production key, in addition to character keys, such as for symbols and alphanumeric characters, is provided to the front portion of the frame 8 of the tape printer 1. A liquid crystal display 3 capable of displaying inputted characters and symbols is provided directly to the rear of the keyboard 2. Also, a thermal printing mechanism PM having a thermal head 36 is provided at the rear of the display 3 internally to the frame 8.

Next, an explanation of the thermal printing mechanism PM will be provided while referring to Figs. 2 through 4.

First, an explanation will be provided for a receptor-type tape cassette 10 based on Fig. 2. The tape cassette 10 is for two-color printing and is detachably mountable to the thermal printing mechanism PM.

Internally to the cassette case 11 of the tape cassette 10 are disposed a tape spool 15 around which is wound a receptor-type print tape 12; a ribbon spool 16 around which is wound a two-colored ink ribbon 13; a ribbon retrieval spool 17 for winding up the ink ribbon 13; and a tape feed roller 18 for supplying the print tape 12. The tape spool 15, the ribbon spool 16, the ribbon retrieval spool 17, and the tape feed roller 18 are provided so as to be freely rotatable.

The print tape 12 is drawn from the tape spool 15 by the tape feed roller 18, and is guided around four guide rollers 19, through an opening 20, past the thermal head 36, and out of the tape cassette 10. On the other hand, the ink ribbon 13 is drawn from the ribbon spool 16 and is guided around a left guide wall 11a (of the pair of guide walls 11a and 11b formed to the cassette case 11) to the opening 20. After passing through the opening 20, the ink ribbon 13 is drawn temporarily parallel with the print tape 12 past the thermal head 36. The ink ribbon 13 is then guided by the partition wall 11c to be wound up by the ribbon retrieval spool 17.

It should be noted that a variety of receptor-type print tapes 12, for example, having different tape widths, and a variety of different color ink ribbon 13 are available for use in the tape cassette 10. Another variety of laminate-type print tapes 12, having different tape widths, for example, can also be mounted in the tape cassette 10, in place of the receptor-type tapes 12. For detecting which of the variety of print tapes 12 and ink ribbons 13 are in the tape cassette 10, a detection hole group formed by the presence or absence of any of six detection holes 21 through 26 is provided to the base of the cassette case 11.

Next, an explanation of the feed drive mechanism capable of moving the print tape 12 and the ink ribbon 13 in a printing direction, and also capable of reverse feeding the print tape 12 in a reverse printing direction, will be provided while referring to Figs. 3 through 4.

A tape reverse drive cam 30 for engaging the tape spool 15, a ribbon drive cam 31 for engaging the ribbon retrieval spool 17, and a tape drive cam 32 for engaging the tape feed roller 18 are disposed to the frame 8 so as

to be rotatable about their respective axes. A detection sensor 33 is provided to the frame 8. The detection sensor 33 is of a photointerrupter type, and includes a light-generating element 34 to be received in the guide wall 11a and a light-receiving element 35 to be received in the guide wall 11b. The thermal head 36 and a cassette switch 37 (not shown) are also disposed to the frame 8. The cassette switch 37 includes six switches (a first through sixth switches) for detecting the presence or absence of the six detection holes 21 through 26.

As shown in Figs. 2 and 3, the detection sensor 33 is positioned in the supply path of the ink ribbon 13 at a standard position that is upstream from the thermal head 36 and that is separated from the thermal head 36 by a predetermined distance (for example, about 6.5 cm). While the ink ribbon 13 passes this standard position, the detection sensor 33 detects distinction marks M1 and M2 (to be described later) that are marked on the ink ribbon 13.

A tape drive motor 39, made from a stepping motor, is attached to the right-rear corner of the frame 8. A train of gears 41 through 47 are rotatably supported to the frame 8 and are engaged in series starting with a drive gear 40 of the tape drive motor 39. A gear 48 fixed to the tape drive cam 32 is engaged with the gear 47. This train of gears 40 through 48 transmits rotation of the tape drive motor 39 to the tape drive cam 32.

A base tip of a swinging arm 50 is connected to the gear 45 via a slip mechanism. An orbit gear 51 is supported at a tip end of the swinging arm 50 so as to be rotatable about the axis of the orbit gear 51 and in constant engagement with the gear 45. When the gear 45 rotates in the direction for normal printing (i.e., counterclockwise in Fig. 3), the swinging arm 50 also rotates in the counterclockwise direction so that the orbit gear 51 engages with a ribbon-drive gear 52 that is connected to the ribbon drive cam 31 via a clutch spring (not shown). Rotation of the ribbon-drive gear 52 drives the ribbon retrieval spool 17 to rotate and wind up the ink ribbon 13 onto the ribbon retrieval spool 17.

Axial shafts 57 and 60 are disposed to the frame 8. A platen holder 56 is supported on the axial shaft 57 so as to be pivotable on the axial shaft 57. A rubber platen roller 55 is supported on the platen holder 56. A pressure roller holder 59 is supported on the axial shaft 60 so at to pivotable on the axial shaft 60. A rubber pressure roller 58 is supported on the pressure roller holder 59.

An opening 56a is formed to the platen holder 56. A platen-drive lever 61 is disposed to the base of the frame 8 aligned from front to rear of the frame 8, that is, from the bottom to the top of Fig. 3. An upright portion 61a at the front tip of the platen-drive lever 61 is engaged in the opening 56a. An association lever 62, which moves in association with a cover frame 9 (see Fig. 7), is connected at its lower tip attachment portion 62a with the rear tip of the platen-drive lever 61 via a pulling spring 63. Pulling force of the pulling spring 63, as transmitted by the platen-drive lever 61 and the platen holder 56, constantly presses the platen roller 55 against the thermal head 36.

Similarly, an opening 59a is formed in the pressure roller holder 59. A pressure roller drive lever 64 is disposed to the base of the frame 8 aligned from front to rear of the frame 8. An upright portion 64a at the front tip of the pressure roller drive lever 64 is engaged in the opening 59a. The association lever 62 is connected at its lower tip attachment portion 62a with the rear tip of the pressure roller drive lever 64 via a pulling spring 65. The pressure roller 58 is constantly pressed against the tape feed roller 18 by the spring force of the pulling spring 65 via the pressure roller drive lever 64 and the pressure roller holder 59.

When the platen roller 55 is in the pressing position shown in Fig. 3 for pressing the ink ribbon 13 and the print tape 12 together against the print head 36, a platen gear 66, which is fixed to the lower tip of the platen roller 55, is put in engagement with an intermediate gear 49, which is engaged with the gear 47. When the pressure roller 58 is in the pressing position shown in Fig. 3 for being pressed against the tape feed roller 18, a pressure roller gear 67 fixed to the lower tip of the pressure roller 58 is engaged with the gear 48.

When the tape drive motor 39 is driven to rotate in the direction for normal printing (i.e., clockwise in Fig. 3), the gears 40 through 49 are driven to rotate in the directions indicated by arrows in Figs. 3 and 8 so that the pressure roller 58 and the platen roller 55 are rotated in the counterclockwise direction in synchronization. This feeds the print tape 12 serially past the thermal head 36. Simultaneously with this, the ribbon drive cam 31 is rotated by the rotation of the ribbon-drive gear 52 so that the ribbon retrieval spool 17 rotates and winds up the ink ribbon 13.

As shown in Figs. 4 and 9, when the tape drive motor 39 is rotated in the direction opposite for normal printing (i.e., the counterclockwise direction in Figs. 4 and 9), the gears 40 through 49 are driven to rotate in a direction opposite that for normal printing. Rotation of the gears 40 through 49 in the directions shown causes the pressure roller 58 and the platen roller 55 to rotate in the clockwise direction and the gear 45 to rotate in the clockwise direction. The swinging arm 50 in association with the gear 45 also pivots in the clockwise direction so that the orbit gear 51 is brought into engagement with the intermediate gear 68. Counterclockwise rotation of the orbit gear 51 rotates the intermediate gear 68 clockwise, which rotates the reverse gear 69 counterclockwise. A tape reverse drive cam 30 attached to the axial shaft of the reverse gear 69 is reversely rotated in association with counterclockwise rotation of the reverse gear 69 via a clutch spring, not shown in the drawings. In this way, the print tape 12 only is reversely fed, without the ink ribbon 13 being reversely wound up while the print tape 12 is winding onto the tape spool 15. Associated movement of the pressure roller 58 and the tape feed roller 18 reversely winds the print tape 12 by a lesser amount than the amount the print tape 12 is taken up by the tape spool

15. This prevents the print tape 12 from crumpling up during reverse feed.

Next, an explanation of the platen drive mechanism 70 for moving the platen roller 55 into a release position, wherein the platen roller 55 is separated from the thermal head 36, will be provided while referring to Figs. 4 through 6.

A platen moving motor 71, made from a DC motor, is fixed to the front-right corner of the frame 8. A drive gear 72 is attached to the drive shaft of the platen moving motor 71. An intermediate gear 73 is engaged with the drive gear 72. Further, a cam drive gear 74 for engaging the intermediate gear 73 is rotatably supported on the frame 8. An eccentric cam 75 is integrally fixed to the cam drive gear 74.

The left tip of a platen association lever 77 is pivotally supported on a vertically-extending support shaft 76 fixed to the right tip of the platen holder 56. The platen association lever 77 is disposed between the eccentric cam 75 and an upwardly bent protruding wall 8a at the front tip of the frame 8 so as to be horizontally movable, that is, movable to the left and right Fig. 4. Further, a bent abutment portion 77a at the right tip of the platen association lever 77 protrudes rearward in confrontation with the right cam surface of the eccentric cam 75.

When the platen moving motor 71 is driven to rotate in the counterclockwise direction as viewed in Fig. 5, the eccentric cam 75 is rotated in the counterclockwise direction via the cam drive gear 74 and the intermediate gear 73. The abutment portion 77a of the platen association lever 77 slides along the cam surface of the eccentric cam 75 so that the platen association lever 77 is moved horizontally by the eccentric movement of the eccentric cam 75. When the platen association lever 77 moves maximally to the right, as shown in Figs. 4 and 9, the platen holder 56 pivots in the counterclockwise direction with the axial shaft 57 as the pivotal center. The platen roller 55 supported on the platen holder 56 moves away from the thermal head 36 into the release position.

A thin-plate-shaped switch drive cam 78 is fixed between the eccentric cam 75 and the cam drive gear 74. The switch drive cam 78 is driven to rotate integrally with the eccentric cam 75. Further, a phase detection switch 79 is provided below the switch drive cam 78 at a position where the switch 79 will be closed when pressed by a protruding cam portion of the switch drive cam 78. The phase detection switch 79 is opened, that is, in an off condition, when the platen association lever 77 is moved maximally leftward and the platen roller 55 is in the pressing position shown in Fig. 3 for pressing the tape 12 and the ribbon 13 against the head 36. Afterward, when the platen moving motor 71 is driven to rotate in the counterclockwise direction, the platen association lever 77 will be moved maximally right-ward, the platen roller 55 will be in the release position as shown in Fig. 4, and the phase detection switch 79 is closed, that is, in an ON condition, as shown in Fig. 6.

Next, an explanation of a tape cutting mechanism 80 for cutting the print tape 12 printed on and discharged from the tape cassette 10 by the associated movement of the pressure roller 58 and the tape feed roller 18 will be provided while referring to Figs. 3 and 7.

A fixed blade 81 is fixed to the left upright wall 8b of the frame 8. A mobile or movable blade 83 is pivotally supported to the support shaft 82 attached to the left upright wall 8b near the fixed blade 81.

On the other hand, a cutting motor 84 made from a stepping motor is fixed to the rear-left tip of the frame 8. A driven gear 88 is engaged with the drive gear 85 of the cutting motor 84 via the two engaged intermediate gears 86 and 87. A rotation plate 89 is attached to the driven gear 88. An engagement pin 90 attached to the rotation plate 89 is freely slidably engaged between the two prongs of a swinging arm 91 that extends from the base of the mobile blade 83. When the cutting motor 84 is driven to rotate in a predetermined direction shown in Fig. 7 and the rotation plate 89 is rotated once via the gears 85 through 88, the reciprocal swinging movement of the two prongs of the swinging arm 91 swings the mobile blade 83 from an open condition, that is a predetermined angle to the fixed blade 81 as indicated by the solid line in Fig. 7, to a cutting condition indicated by the two-dot chain line, and then again to the open condition.

It should be noted that a single notch 89a is formed in the rotation plate 89 and a detection switch 92 is provided adjacent to the rotation plate 89. When the mobile blade 83 is in the open condition after a single reciprocal swing of the mobile blade 83 in a cutting operation, the notch 89a turns the detection switch 92 off so that power for driving the cutting motor 84 is turned off.

The control system of the tape printer 1 is configured as shown in the block diagram shown in Fig. 10.

To an input/output interface 95 of the control device CD is connected the keyboard 2; the cassette switch 37; the detection sensor 33; a display controller (LCDC) 110 having a video RAM 111 for outputting display data to the liquid crystal display 3; a drive circuit 113 for a warning buzzer 112; a drive circuit 114 for driving the thermal head 36; a drive circuit 115 for driving the tape drive motor 39; a drive circuit 116 for the platen moving motor 71; and a drive circuit 117 for the cutting motor 84.

The control device CD includes a CPU 97; the input/output interface 95 connected to the CPU 97 via a bus 96 such as a data bus; a font RAM 98; a ROM 99; and a RAM 100.

The font RAM 98 stores display dot pattern data for each of a plurality of characters such as alphabetic characters and symbols. The print dot pattern data is stored categorized in a plurality of print character sizes.

The ROM 99 stores a variety of control programs including a display drive control program for controlling the display controller 110 according to code data of characters such as characters, symbols, and numbers, inputted through the keyboard 2; a print drive control program for serially outputting dot pattern data for each row of dots to the thermal head 36 and the tape drive motor 39 so as to perform printing operation; and a print position initialization control program and a label production con-

trol program (to be describe later) which are control programs particular to the present invention.

The ROM 99 also stores a cassette type determination table TB as shown in Fig. 11. The cassette type determination table TB is for determining the ink color, tape width, and tape type based on ON and OFF combinations of the first through sixth detection switches of the cassette switch 37. The table TB is also used for determining whether a tape cassette is actually mounted in the frame 8.

As shown in Fig. 12, the receptor-type print tape 12 is formed by coating an adhesive layer 12b to the rear surface of a printable laminate film tape 12a and adhering a peel-away sheet 12c to the adhesive layer 12b. Printing is performed on the front surface of the laminate film tape 12a. Although not shown in the drawings, a laminate-type print tape 12 is formed from a transparent laminate film. Printing is performed on the rear surface of the laminate film. After printing, an adhesive tape adhered with a peel-away sheet is adhered to the rear surface of the laminate film.

The RAM 100 includes a text memory 101 for storing, as text data, code data inputted from the keyboard 2; a print buffer 102 for developing and storing dot pattern data in correspondence with character codes stored in the text memory 101; and a flag memory 103 for storing flag data of a color flag CF indicating which color of the two colors (black and red) of the ink ribbon 13 is in confrontation with the thermal head 36. The color flag CF is set to one when a black ink 13b region of the ink ribbon 13 is in confrontation with the thermal head 36, and reset to zero when a red ink 13r region is in confrontation with the thermal head 36. The RAM 100 also includes a memory for temporarily storing results of calculations made in the CPU 97.

Next, an explanation of a print position initialization control routine and a label production control routine performed in the control device CD of the tape printer 1 will be provided while referring to the flowcharts in Figs. 15 through 19. Individual steps will be referred to as Si (wherein i = 10, 11, 12 and so on).

Assume that when this control routine is started, as shown in Fig. 13, black and red color-designation data are respectively added to code data for the two lines of character strings "ABCDEF" and "abcdef" desired to be printed on a print tape, and are stored in the text memory 101 as text data for a single block (a first block).

Further assume that a tape cassette 10 housing a two-color (i.e., black and red) ink ribbon 13 and a receptor-type print tape 12 is loaded in the thermal printing mechanism PM. The front margin amount FY and the rear margin amount RY desired to be provided respectively at the front edge and at the rear edge of each tape-shaped label produced in the thermal printing mechanism PM are previously determined using the keyboard 2. The maximum length of each tape-shaped label is restricted to about 20 cm.

As shown in Fig. 14, the ink ribbon 13 is coated alternately with black ink 13b and red ink 13r regions that are a predetermined length B. The predetermined length is 20 cm in this example. A single barcode-shaped distinction mark M1 is marked at the starting edge of each black ink 13b color region. A double barcode-shaped distinction mark M2 is marked at the starting edge of each red ink 13r color region. An end tape 13e having silver foil adhered thereto for demarcating the end edge of the ink ribbon 13 is connected to the end edge of the ink ribbon 13. The end tape 13e is longer than the black ink 13b and the red ink 13r coated regions, that is, longer than the predetermined length B (20 cm) by an amount α of, for example, 5 to 10 cm.

When producing the ink ribbon 13, a transparent base for the ink ribbon 13 is coated with the red and black inks, alternately. The starting edge of each ink coated region is not coated with the corresponding ink, but remained transparent. The barcode-shaped mark is coated on that transparent region.

Next, an explanation of the print position initialization control routine for aligning the print position P of the thermal head 36 with the starting edge of the black ink 13b or the red ink 13r of the ink ribbon 13 will be provided while referring to Fig. 15.

This control routine is started when the power source of the tape printer 1 is turned on, or when a tape cassette 10 is loaded into the tape printer 1. When a two-color tape cassette 10 is determined to be loaded in the tape printer 1 (S10:YES), the tape drive motor 39 is driven at a slow speed (S11). At this time, as shown in Figs. 3 and 8, the print tape 12 and the ink ribbon 13 are fed in synchronization by rotation of the tape feed roller 18 and the pressure roller 58. The determination in S10 is based on detection signals from the first through sixth detection switches of the cassette switch 37 and the cassette type determination table TB. For example, a YES determination in S10 could be produced by an ON detection signal from the first detection switch accompanied with an OFF detection signal from the second detection switch.

S12 through S14 are repeatedly performed as long as, based on the detection signals from the detection sensor 33, no color-distinction signal corresponding to the single barcode-shaped distinction mark M1 of a black ink 13b region is detected (S12:NO) and no color-distinction signal corresponding to the double barcode-shaped distinction mark M2 of a red ink 13r region is detected (S13:NO), and as long as the print tape 12 and the ink ribbon 13 have not been fed 20 cm since the start of feeding operations (S14:NO).

When a color-distinction signal corresponding to the distinction mark M1 is detected (S12:YES), feed of the print tape 12 and the ink ribbon 13 are stopped by stopping drive of the tape drive motor 39 (S17) and the color flag CF is set to one because the black ink 13b will be moved into confrontation with the thermal head 36 (S18). Further, the tape drive motor 39 is driven a predetermined number of steps to feed the print tape 12 and the ink ribbon 13 in synchronization a predetermined amount A (for example, 6.5 cm) corresponding to the dis-

tance from the detection sensor 33 and the thermal head 36 along the transport path of the ink ribbon 13 (S21). The program then returns to the main routine.

As a result, as shown in Fig. 20, the starting edge of the black ink 13b is positioned at the print position P of the thermal head 36. In this drawing, the letter C indicates a cutting position cut by cooperative movement between the fixed blade 81 and the mobile blade 83 and the letter D indicates a detection position detected by the detection sensor 33. Also, the letter L indicates the distance (for example, about 2.0 cm) between the print position P and the cutting position C and the letter M indicates a distance between the detection position D and the print position P. The distance M is, for example, slightly less than 6.5 cm and is slightly smaller than the predetermined amount A.

On the other hand, when a color-distinction signal corresponding to an distinction mark M2 is detected (S12:NO, S13:YES), the drive of the tape drive motor 39 is stopped (S19) and the color flag CF is reset to zero because a red ink 13r region will be in confrontation with the thermal head 36 (S20). Further, the print tape 12 and the ink ribbon 13 are fed in synchronization by the predetermined amount A (S21). The program then returns to the main routine.

If at the time the routine is started a two-color tape cassette 10 is not loaded in the thermal printing mechanism PM (S10:NO), an error message "A two-color tape cassette is not loaded" will appear on the display 3 (S22) and the program will return to the main routine.

When no color-distinction signal corresponding to a distinction mark M1 or a distinction mark M2 are detected, but the print tape 12 and the ink ribbon 13 have been fed more than 20 cm since the start of feed processes (S14:YES), the drive of the tape drive motor 39 is stopped (S15) and, because the ink ribbon 13 has been used to its end, an error message reading "End of Ribbon" will be displayed on the display 3 (S16). The program then returns to the main routine.

Next, an explanation of the label producing control routine will be provided while referring to Figs. 16 through 19. This program is started when a label production key is operated on the keyboard. When the color flag CF is set to one and it is determined that the starting edge of a black ink 13b region is aligned with the print position P of the thermal head 36 (S30:YES), and when black color designation data exists in the text data of the text memory 101 (S31:YES), dot pattern data for the character string indicated by the black color designation data is developed and stored in the print buffer 102 and the dot print data is serially printed on the print tape 12 by the thermal head 36 (S32). For example, as shown in Fig. 21, the character string "ABCDEF" indicated by black color designation data is printed on the first row of the print tape 12 in black ink 13b. As shown in Fig. 21, the print position P1 at the end of this printing is positioned to the right of the final character "F."

When the red color designation data exists in the print data in the same block of the text memory 101 (S33:YES), the print tape reverse feed control routine shown in Fig. 18 is executed (S34) to print the character string in red from the print starting position of the first block.

When this routine is started, as shown in Fig. 18, a remaining ink ribbon feed amount k is determined in order to print using the next red ink 13r region. The remaining ink ribbon feed amount k is determined by subtracting the feed amount of the print tape 12 when print processes were performed in S32, that is, the ink ribbon feed amount j (see Fig. 21) that the ink ribbon 13 was fed during print processes, from the predetermined amount B. Afterward, the print tape 12 and the ink ribbon 13 are fed by the remaining ink ribbon feed amount k (S60). As a result, the print position P2 is positioned at the starting edge of the next red ink 13r region. Thus, the ink ribbon has been totally fed by the predetermined amount B so that the print position has moved from P via P1 to P2.

Including this ribbon feed operation, each time the ink ribbon 13 is fed the predetermined amount B, the color distinction signal corresponding to the distinction mark M1 or M2 is detected and the ink color at the thermal head 36 changes, until the ribbon end arrives (S61:YES). Accordingly, when the color flag CF has been set to one (S62:YES), the color flag CF is reset to zero (S63). On the other hand, when the color flag CF has not been set (S62:NO), the color flag CF is set to one (S64). Next, the platen moving motor 71 is driven so that, as shown in Fig. 9, the platen association lever 77 moves maximally to the right and the platen roller 55 is moved to the release position (S65). Next, the tape drive motor 39 is driven to rotate in reverse a predetermined number of steps so that only the print tape 12 is fed in reverse by the predetermined amount B (S66). Afterward, the platen moving motor 71 is further driven so that, as shown in Fig. 8, the platen association lever 77 is moved maximally to the left and the platen roller 55 is returned to the pressing position (S67) for pressing the tape 12 and the ink ribbon 13 against the print head 36. This routine is then completed and the program returns to S37 of the label production control routine.

It is noted that when the print tape 12 and the ink ribbon 13 are fed by the remaining ink ribbon feed amount k (S60), the ink ribbon 13 has been totally fed the predetermined amount B. During this ribbon feed operation, if a color-distinction signal corresponding to the distinction mark M1 or M2 is not detected, that is, when the ribbon end has arrived (S61:NO), the program proceeds to S15 of the print position initialization control routine and "Ribbon End" error message is displayed on the display 3 (S15 and S16). The program then returns to the main routine. For example, as shown in Fig. 14, when the print tape 12 and the ink ribbon 13 are fed by the remaining ink ribbon feed amount k and the print position reaches P6 and the detection position reaches D6 at the end tape 13e, a color-distinction signal will not be detected even though the ink ribbon 13 is fed by the

predetermined amount B. In this way, the end of the ribbon can be detected accurately.

During the label production control routine, after the print tape reverse feed routine of S34 is completed, dot pattern data for the character string indicated by red-color designation data is developed and stored in the print buffer 102 and the dot pattern data is serially printed on the second row of the print tape 12 using the thermal head 36 (S37). For example, as shown in Fig. 22, the character string a to f indicated by red-color designation data is printed at the second row of the print tape 12 in red ink 13r. The print position P3 at the completion of printing is to the right of the final character "f" as shown in Fig. 22.

When no black-color designation data exists in the print data of the same block of the text memory 101 (S38:NO), S44 and on shown in Fig. 17 are executed. The front portions and the rear portions are cut to produce a two-color label having this text data across these two rows.

When the color flag CF is set to one (S30:YES), and red-color designating data exists (S31:NO, S35:YES), the print tape 12 and the ink ribbon 13 are fed the predetermined amount B so that the starting edge of the red ink 13r will be at the print position P of the thermal head 36 (S36). Also while the ribbon is being fed at this time, when the color-distinction signals corresponding to distinction marks M1 and M2 are detected and the ink color at the thermal head 36 properly changes (S36a:YES), the character string indicated by the red-color designation data is serially printed on the print tape 12 by the thermal head 36 (S37) and S38 and on are executed. On the other hand, when a color-distinction signal corresponding to a distinction mark M1 or M2 is not detected even though the ink ribbon 13 is fed by the predetermined amount B (S36a:NO), then S15 and on of the print position initialization control routine are executed.

On the other hand, if at the start of this routine the color flag CF is not set to one and the starting edge of a red ink 13r region is aligned with the print position P of the thermal head 36 (S30:NO), and if color-designation data for the color red is present in the text data (S40:YES), then S37 and on are executed. However, if color-designation data for the color black is present in the text data (S40:NO, S41:YES), then the print tape 12 and the ink ribbon 13 are fed the predetermined amount B so as that the starting edge of the black ink 13b is aligned with the print position P of the thermal head 36 (S42). If during this ribbon feeding process a color-distinction signal corresponding to a distinction mark M1 or M2 is detected and the ink color aligned with the thermal head 36 changes from red to black (S42a:YES), the character string indicated by the color-indication data for the color black is serially printed on the print tape 12 by the thermal head 36 in the manner described previously (S32) and S33 and on are performed. On the other hand, if during the processes of S42 no color-distinction signal corresponding to a distinction mark M1 or M2 is detected despite the ink ribbon 13 being fed the amount B (S42a:NO), then S15 and on of the print position initialization control routine are executed.

If no color-designation data for the colors red or black exists in the text data (S31 and S35:NO; or S40 and S41:NO), then the cutting motor 84 is driven so that the print tape 12 is cut by reciprocal movement of the mobile blade 83 (S43), whereupon this routine is completed and the program returns to the main routine.

In S44, a tape reverse feed amount Z, for cutting the front edge of the tape so that the resultant label is provided with the front margin amount FY, is determined by the following calculation:

$$Z = (L - FY) - ML$$

wherein

L = distance between printing and cutting positions,

ML = print length of the final character row. If the tape reverse feed amount Z is a negative number and the print tape 12 should be reversely fed (S45:YES), then the platen moving motor 71 is driven so that the platen association lever 77 moves maximally to the right and the platen roller 55 moves to the release position (S46). Then, the print tape 12 only is reversely fed the tape reverse feed amount Z by reverse rotation of the tape drive motor 39 (S47). The platen moving motor 71 is driven so that the platen association lever 77 is moved maximally to the left and the platen roller 55 is moved back to the pressing position (S48). Then, the cutting motor 84 is driven so that the print tape 12 is cut by reciprocal movement of the mobile blade 83 (S49). For example, as shown in Fig. 23, the print tape 12 is cut with a front margin amount FY after being fed by the tape reverse feed amount Z.

Next, the print tape 12 and the ink ribbon 13 are fed until a rear end cutting position (S50). If a color-distinction signal corresponding to a distinction mark M1 or M2 is detected during this feeding process (S50a:YES) the program proceeds directly to S51. If no signal is detected (S50a:NO), then the program proceeds to S51 after a mark flag MF is set to one. Then the print tape 12 is cut at the end edge cutting position (S51). For example, as shown in Fig. 24 the print tape 12 and the ink ribbon 13 are fed a label length LL determined by adding the front margin amount FY, the maximum character length PL in this block, and the rear end margin amount RY, and the print tape 12 is cut at the rear end cutting position. The print position at this point is P4 and the cutting position at this point is C4.

Next, a ribbon correction control routine for correcting the ink position of the ink ribbon 13 so that the print position P is aligned with the starting edge of the next ink region is executed (S52). The ribbon correction control routine is represented by the flowchart in Fig. 19.

At the start of this routine, if the total distance that the ink ribbon 13 was moved is 20 cm or more as determined by adding the character length of the final character row ML to the label length LL, that is, when the present

print position P is aligned with the next different ink color region (S70:YES), then a variable X is determined (S71) by the following formula also shown in the drawing:

$$X = (ML + LL) - 20.$$

Then, the print tape 12 and the ink ribbon 13 are fed by a length determined by subtracting the variable X from 20 cm, which is the length of the black ink 13b or red ink 13r region (S72). If during this ribbon feed process, either a color-distinction signal corresponding to a distinction mark M1 or M2 is detected (S72a:YES), or no color-distinction signal is detected (S72a:NO) when the mark flag MF has not been set to one (S72b:NO), then this routine is completed and the program returns to S53 of the label production control routine. At this time, the print position P5 is aligned with the starting edge of the next red ink 13r as shown in Fig. 24. In this case, the ink color corresponding to the print position P5 will be the same as the red ink 13r at the end of printing. It should be noted that if a color-distinction signal corresponding to a distinction mark M1 or M2 is not detected during the ribbon feeding operation of S72 (S72a:NO), and the mark flag MF has been set to one (S72b:YES), then the ink ribbon 13 will have been fed to its end tape 13e, so the mark flag MF is reset to zero (S72c) and S15 and on of the print position initialization control routine will be executed.

On the other hand, when the ink ribbon 13 has been fed a total amount less than 20 cm (S70:NO), the variable X is determined (S73) by the following formula:

$$X = 20 - (ML + LL),$$

and the print tape 12 and the ink ribbon 13 are fed by a distance equal to the variable X (S74). If a color-distinction signal corresponding to a distinction mark M1 or M2 is detected during this ribbon feeding process (S74a:YES) or the color-distinction signal is not detected but the mark flag MF has not been set to one (S78:NO) a S75 to be described later and succeeding steps will be executed. On the other hand, if no color-distinction signal is detected (S74a:NO), but the mark flag MF has been set to one (S78:YES), this means that the end tape 13e of the ink ribbon 13 is fed to the print position so that the mark flag MF is reset (S79) and S15 and on of the print position initialization control routine are executed. Next, because the ink color corresponding to the print position P5 is different from the ink color at the completion of printing in this case, when the color flag CF has been set to one (S75:YES), the color flag CF is reset to zero (S76). On the other hand, when the color flag CF has not been set to one (S75:NO), the color flag CF is set to one (S77). Then, this control routine is completed and the program returns to S53 in the same way as described previously.

When a subsequent block of data exists in the text memory 101 during the label production control routine (S53: Yes), S30 and on are repeatedly executed. When a subsequent block of data does not exist in the text memory 101 (S53: No), this control routine is completed and the program returns to the main routine.

An explanation will be provided for operations included in the above-described label production control routine for controlling detection of the distinction marks and the end portion.

The ink ribbon 13 is coated with black ink 13b and red ink 13r regions alternately at 20 cm lengths. The ink ribbon 13 also includes distinction marks M1 and M2 and an end tape 13e. Alignment of the black ink 13b and red ink 13r with the print position P of the thermal head 36 allows printing the print tape 12 at printing lengths shorter than the predetermined amount B of the ink-coated regions. A distinction mark M1 or M2 of the ink ribbon 13 can be detected each time the ink ribbon 13 is fed by the predetermined amount B of the ink coated regions. On the other hand, when the end tape 13e provided to the end edge of the ink ribbon 13 is aligned with the detection sensor 33, neither a distinction mark M1 nor M2 will be detected even if the ink ribbon 13 is fed the predetermined amount B of the ink coated regions, thereby allowing accurate detection of the end tape 13e. That is, the load on the CPU 97 of the control device C can be reduced without fear of reducing the performance of printing processes because there is no need to detect the distinction mark M1 or M2 during printing. The distinction marks M1 and M2 and the end tape 13e of the ink ribbon 13 can be accurately detected.

Further, because the distinction marks M1 and M2 of the red ink 13r and black ink 13b are formed from bar-code-shaped marks, they can be simply marked on the ribbon using the same processes as when coating the red and black ink to the ribbon. This increases the efficiency at which the ink ribbon 13 can be produced.

The ink ribbon 13 may be cyclically coated with two or more different colored inks, such as black, red and green inks, in a predetermined order. The ink ribbon 13 may be provided with a distinction mark at the starting edge of each different colored ink region. Each of the distinction marks M1 and M2 may be constructed from a plurality of barcode-shaped marks. The black ink 13b regions and the red ink 13r regions may be formed to a predetermined amount B of 20 cm or more. The present invention can be applied to any tape printer having a dot-type print mechanism for printing print tape 12 using ink ribbon 13 and to any ink ribbon for use in a tape printer.

As described above, the ink ribbon includes a plurality of ink coated portions formed by coating with a plurality of colors of ink cyclicly at a predetermined length in a predetermined order and distinction marks and an end portion. Color printing is possible, by serially aligning ink coated regions of desired colors with a print head.

The tape printer includes a mark detection sensor. Printing is performed on the tape in the color ink aligned with the print head, only to a print length that is shorter than the predetermined length of the ink coated regions. The ink ribbon distinction mark is detected each time the ribbon is fed the predetermined length of the ink coated regions. On the other hand, when the end portion pro-

vided to the end of the ink ribbon is aligned with the mark detection sensor, no distinction mark will be detected even when the ribbon is fed the predetermined length of the ink coated regions. End portion can therefore be accurately detected. Because the distinction marks do not need to be detected during printing processes, the burden on the CPU of the control device can be reduced without reducing performance of the printing processes. The end portion of the ink ribbon and the ink color distinction marks can be accurately detected.

Because the distinction marks are comprised of bar-code-shaped marks, the distinction marks can be mark on the ink ribbon using the same processes as for coating the plurality of ink regions. Because the distinction marks can be simply marked, the performance of processes for producing the ink ribbon can be improved.

As described above, the tape-shaped label producing device according to the present embodiment includes an ink ribbon with a plurality of ink coated portions and also with distinction marks for distinguishing the ink colors. The ink coated portions are formed by coating with a plurality of colors of ink cyclicly at a predetermined length in a predetermined order. The distinction marks mark a starting edge of each ink coated portion. Because these are provided to the ink ribbon, the mark detection sensor detects distinction marks of the ink ribbon at a position upstream from the print head while the ink ribbon feed unit and the tape feed unit executes ribbon feed of the ink ribbon in synchronization with that of the tape according to the control of the print control unit. When a distinction mark is detected, the ribbon is fed so that the ink in connection with the distinction mark is fed to the print head.

Afterwards, the print control unit controls the print unit, the tape feed unit, and the ribbon feed unit to perform print processes on the tape only to a print length shorter than the predetermined length of the portion coated with ink. Each time the ribbon feed unit feeds the ink ribbon a distance equal to the predetermined length of the ink coated portions, the mark detection unit detects a distinction mark of the ink ribbon. It should be noted that the end portion for demarcating the end of the ink ribbon is provided at the end of each ink ribbon to a length longer than the predetermined length of the ink coated portions. Therefore, when the end portion is at the mark detection sensor, even when the ink ribbon is fed the distance equal to the predetermined length of the ink coated portions, the mark detection sensor will not detect a distinction mark, thereby detecting end portion.

Printing processes are performed on the tape using the ink color at the print head, only at a printing length shorter than the predetermined length of the ink coated portions. Distinction marks on the ink ribbon are detected each time the ink ribbon is fed a length equal to the predetermined length of the ink coated portions. On the other hand, when the end portion provided at the end of the ink ribbon is at the mark detection sensor, because a distinction mark will not be detected even if the ink ribbon is fed only a distance equal to the predetermined length of the ink coated portion, the end portion will be accurately detected. That is, because it is not necessary to detect the distinction mark during printing processes, the load on the CPU of the control device is reduced. Efficiency of printing processes will not be reduced and the end portion and the ink color distinction marks of the ink ribbon can be accurately detected.

The ink ribbon of the present embodiment includes a plurality of ink coated portions and also with distinction marks for distinguishing the ink colors. The ink coated portions are formed by coating with a plurality of colors of ink cyclicly at a predetermined length in a predetermined order. The distinction marks mark a starting edge of each ink coated portion.

Those ink coated portions with desired colors are moved to the print head by the control of the tape feed unit and the ribbon feed unit and by the detection of distinction marks by the mark detection sensor. Printing can therefore be performed on the tape using a plurality of colors. Further, the end portion for demarcating the end of the tape is provided to the end of the tape at a length longer than the predetermined length of the ink coated portions. Therefore, when the end portion is at the mark detection sensor, the mark detection sensor will not detect a distinction mark even after the ink ribbon is fed the predetermined length of the ink ribbon coated portions, so that the end portion can be accurately detected.

Next, a tape-shaped label producing device according to a second preferred embodiment of the present invention will be described while referring to Figs. 25 through 30 wherein the same parts and components as those of the first embodiment are designated by the same reference numerals to avoid duplicating description.

The tape-shaped label producing device of the present embodiment is the same as that of the first embodiment shown in Fig. 1, except that the device performs monocolor printing with a normal monocolor ink ribbon and that the device executes the tape end detection control routines shown in Fig. 30 instead of the control routines of Figs. 15 - 19 of the first embodiment. While the device of the first embodiment performs printing operation while detecting whether the ink ribbon exists, the device of the present embodiment performs printing operation while detecting whether the print tape exists. The device of the present embodiment is therefore used in combination with tape cassettes having the following structures, as described below.

One example of the tape cassette used in this embodiment will be described below with reference to Figs. 25 and 26. This example is of a laminate-type tape cassette.

Internally to the cassette case 211 of the tape cassette 210 are disposed: a tape spool 214 with a print tape 212 made from laminate film wound thereon; a ribbon spool 215 with an ink ribbon 213 for printing wound thereon; a ribbon take-up spool 216 for winding up the ink ribbon 213, a supply spool 217 with two-sided tape 219 having a peel-away sheet adhered to one side wound

thereon so that the peel-away sheet faces outward; and a tape feed roller 18 for supplying print tape 212. Those spools and rollers are provided so as to be freely rotatable.

The laminate print tape 212 is a printable light-transmitting nature laminate film tape. Printing is performed on its rear surface. After printing, the side of the two-sided tape 219 to which the peel-away sheet is not adhered is adhered to the rear surface of the print tape 112. As shown in Fig. 28, the print tape 212 is formed from a printable print portion 212a and a tape end portion 212b provided to the end edge. The print portion 212a is light-transmitting nature and capable of transmitting light. The tape end 212b is blackened to obstruct light and is therefore non-light-transmitting nature and incapable of transmitting light.

It is noted that similarly to the tape cassette 10 of the first embodiment, a variety of laminate-type print tapes 212, for example, having different tape widths, and a variety of different color ink ribbon 213 are available for use in the tape cassette 210. As will be described later, other types of print tapes, such as receptor-type print tapes, can be mounted in the tape cassettes. For detecting which of the variety of print tapes 212 and ink ribbons 213 are in the tape cassette 210, a detection hole group formed by the presence or absence of any of six detection holes 21 through 26 is provided to the base of the cassette case 211, similarly to the first embodiment. Other components provided on the tape cassette are the same as those of the tape cassette 10 of the first embodiment shown in Fig. 2.

The printing mechanism PM provided in the tape-shaped label producing device of the present embodiment for mounting the cassette 210 is the same as that of the first embodiment. The feed drive mechanism of the present embodiment capable of moving the print tape 212 and the ink ribbon 213 in a printing direction is also the same as that of the first embodiment shown in Figs. 3 through 7. When the tape cassette 210 is mounted to the device of the embodiment, the cam 30 is engaged with the center of the supply spool 217. The ribbon drive cam 31 is engaged with the ribbon retrieval spool 216. The tape drive cam 32 is engaged with the tape feed roller 18. Similarly to the first embodiment, the detection sensor 33, the thermal head 36 and the cassette switch 37 are provided to the frame 8.

The print tape 212 is drawn from the tape spool 214 by the tape feed roller 18, and is guided around the left guide wall 11a (of the pair of guide walls 11a and 11b), through the opening 20, past the thermal head 36, and out of the tape cassette 210. The ink ribbon 213 is drawn from the ribbon spool 215 and to the opening 20. After passing through the opening 20, the ink ribbon 213 is drawn temporarily parallel with the print tape 212 past the thermal head 36. The ink ribbon 213 is then guided to be wound up by the ribbon retrieval spool 216. The two-sided tape 219 is drawn from the supply spool 217 by the tape feed roller 18.

According to the present embodiment, the detection sensor 33 is of a photointerrupter type and includes the light-generating element 34 and the light-receiving element 35, similarly to the first embodiment. According to the present embodiment, the detection sensor 33 is used for detecting the end portion 212b of print tape 212 as it passes by the standard position. The detection sensor 33 outputs a high level end portion detection signal ES when it detects the non-light-transmitting nature end portion 212b.

When the tape drive motor 39 is driven to rotate in the direction for normal printing (i.e., clockwise in Fig. 26), the gears 40 through 49 shown in Figs. 3 and 4 are driven to rotate in the directions indicated by arrows so that the pressure roller 58 and the platen roller 55 are rotated in the counterclockwise direction in synchronization. This feeds the print tape 212 serially past the thermal head 36. Simultaneously with this, the ribbon drive cam 31 is rotated by the rotation of the ribbon-drive gear 52 so that the ribbon retrieval spool 216 rotates and winds up the ink ribbon 213. The two-sided tape 219 fed out from the supply spool 217 is joined to the print tape 212 and discharged from the tape cassette 210. The tape cutting mechanism provided in the device of the present embodiment is the same as that in the first embodiment shown in Fig. 7, both in structure and in function. The print tape 212 joined with the two-sided tape 219 is therefore cut into a tape-shaped label.

It is noted that in the present embodiment, the motor 39 is controlled to be driven only in the above-described normal printing direction, contrarily to the first embodiment.

Additionally an explanation of another example of a tape cassette for use in combination with the device of the present embodiment will be provided while referring to Fig. 27. This example is a receptor type tape cassette 272.

The tape cassette 272 is structured from substantially the same components used in the above-described laminate type tape cassette 210. In this cassette, a receptor type print tape 274 is wound around the supply spool 217. The tape spool 214 is not necessary. The print tape 274 is drawn from the spool 217 by the tape feed roller 18, and is guided around the left guide wall 11a, through the opening 20, past the thermal head 36, and out of the tape cassette 272. Remaining parts of the tape cassette 272 are the same as those of the tape cassette 210.

A print portion 274a of the receptor type print tape 274 is a tape formed from a printable film tape on which a layer of adhesive is coated and a peel-away tape is adhered to the adhesive. As shown in Fig. 29, the print tape 274 is formed from the printable print portion 274a and a tape end portion 274b connected to the end edge of the print portion 274a. The print portion 274a is non-light-transmitting nature and incapable of transmitting light, while the end portion 274b is light-transmitting nature and capable of transmitting light. The detection

sensor 33 outputs a low level end portion detection signal when detecting the light-transmitting end portion 274b.

Thermal tape type tape cassettes also serve as receptor type tape cassettes in addition to the abovedescribed tape cassette 272. The thermal tape type tape cassette is structured substantially from the same components as the receptor type tape cassette 272, but differs in the following points. That is, the print tape wound on the supply spool is a thermal tape with a peel-away sheet adhered thereto via adhesive to the rear surface of a thermal sheet, which serves a print portion formed in a tape shape. Also, no ribbon spool 215, around which the ink ribbon 275 is wound, or no ribbon take-up spool 216 are housed in the tape cassette. In the same manner as the receptor type print tape 274, the print tape of the thermal tape type has a print portion made from thermal tape and constructed to be non-light transmitting and has an end portion connected to the print portion. The end portion is light-transmitting nature and so capable of transmitting light.

The control system provided in the device of the present embodiment is also the same as that of the first embodiment shown in Figs. 10 and 11, except that the ROM 99 does not store the print drive control program, the print position initialization program, and the label production control program of the first embodiment. Instead, the ROM 99 stores the tape end detection program of Fig. 30 and a printing control program for producing dot pattern data for characters and symbols of text data stored in the text memory 101 and then serially outputting the dot pattern data for each row of dots to the thermal head 36 and the motor 39 so as to perform printing operation.

According to the present embodiment, the CPU 99 executes the printing control program together with the tape end detection program. In the printing control program, when any text data exists in the text memory 101, dot pattern data for the text data is developed and temporarily stored in the print buffer 102. The dot pattern data is serially printed on the print tape 212 (or 274) by the thermal head 36 while the print tape 212 (or 274) are fed in the normal feed direction indicated by arrow in Figs. 25 and 27. While the printing is thus performed, the tape end detection program is executed.

Next, an explanation of the tape end detection routine performed in the control device CD of the tape printer 1 will be provided while referring to the flowchart in Fig. 30. Each step is referred to in the drawing as Si (wherein i = 110, 111, 112, ...).

This routine is started simultaneously with the printing control routine started.

First, whether or not the print portion 212a (or 274a) of the print tape 212 (or 274) of the tape cassette 210 (or 272) shows light transmitting properties is determined based on the detection signals from the first through sixth detection switches of the cassette switch 37 and based on the cassette type determination table TB (S110).

For example, a light-transmitting tape such as the laminate type print tape 212 shown in Fig. 28 with light-transmitting print portion 112a is detected by, for example, the detection signal of the fifth detection switch being ON and the detection signal of the sixth detection switch being OFF (S110:YES). In this case, when a line of dots has been printed (S111:YES) by the printing control process, but when the printing control processes have not been completed (S112:NO) and the non-light-transmitting end portion 212b has not been detected by the end portion detection signal ES from the detection sensor 33 being at a low level (S113:NO), then S111 through S113 are repeatedly executed. When printing control processes are completed before the end portion 212b of the print tape 212 is detected (S112:YES), the tape drive motor 39 is driven to feed the print tape 212 and the ink ribbon 213 forward by a predetermined amount (S119) and the tape-shaped label is produced by driving the cutting motor 84 to cut the print tape 212 with a single reciprocal movement of the mobile blade 83 (S120). Then this routine is completed and the program returns to the main routine.

When the non-light-transmitting end portion 212b is detected by the end portion detection signal ES from the detection sensor 33 switching to a high level during execution of the printing control processes in S111 through S113 (S113:YES), commands of termination of print control processes are forwarded to the printing control routine (S114) and an error message indicating that the end of the print portion 212a has been reached is displayed on the display 3 (S115). Then this routine is terminated and the program returns to the main routine.

On the other hand, a non-light-transmitting tape such as the receptor type print tape 274 shown in Fig. 29 with the non-light-transmitting print portion 274a is detected by, for example, the detection signal of the fifth detection switch being ON and the detection signal of the sixth detection switch being ON (S110:NO). When a line of dots has been printed (S116:YES), but when printing control processes have not been completed (S117:NO) and the light-transmitting end portion 274b has not been detected by the end portion detection signal ES from the detection sensor 33 being at a high level (S118:NO), then S116 through S118 are repeatedly executed.

When printing control processes are completed before the end portion 274b of the print tape 274 is detected (S117:YES), then S119 and S120 are executed and the program returns to the main routine.

When the light-transmitting end portion 274b is detected by the end portion detection signal ES from the detection sensor 33 switching to a low level during execution of the printing control processes in S116 through S118 (S118:YES), then S114 and S115 are executed and the program returns to the main routine.

Next, an explanation of the operations for controlling detection of the tape end portion will be provided.

The non-light-transmitting end portion 212b is provided to the end edge of the print tape 212, when the print portion 212a of the print tape 212 is of a light-transmitting nature. The light-transmitting end portion 274b is provided to the end of the print tape 274, when the print

portion 274a of the print tape 274 is of a non-light-transmitting nature. The detection sensor 33, made from a photointerrupter, detects the ends of print tapes 212 and 274 via the end portions 212b and 274b. Therefore, detection is simple and accurate by switching the light-transmitting nature or non-light-transmitting nature of the end portions 212b and 274b based on the light-transmitting nature of the print tapes 212 and 274.

In order to detect light-transmitting nature or non-light-nature of the print tape in S110, combinations of ON or OFF from all the first through sixth detection switches of the cassette switch 37 may be used.

It may be possible to provide an end portion with a non-light-transmitting nature or a light-transmitting nature to a variety of print tape other than the above-described laminate type or receptor type tapes.

The present invention can be applied to a variety of tape printer having a dot-type print mechanism for printing on a thermal type print tape without using an ink ribbon and to a tape for use in a thermal-type tape printer.

As described above, in the tape printer of the present embodiment, an end portion is provided at the end of the tape, which serves as a print medium. The end portion is made with a non-light-transmitting nature if the tape is light-transmitting and with a light-transmitting nature if the tape is non-light-transmitting. A photointerrupter detects the end edge of the tape by the end portion. Therefore, detection is simple and accurate by switching the light-transmitting nature or non-light-transmitting nature of the end portion based on the light-transmitting nature of the print tape. Even barcode-shaped distinguishing marks need not be printed.

Because the end portion for distinguishing the end of the tape is formed with a light-transmitting nature if the tape is of a non-light-transmitting nature and with a non-light-transmitting nature if the tape is of a light-transmitting nature, the photointerrupter can simply and accurately detect the end of the tape via the end portion, by switching whether the end portion is light-transmitting nature or non-light-transmitting nature based on the light-transmitting nature, or lack of light-transmitting nature, of the tape. Further, efficiency of production can be improved.

While the invention has been described in detail with reference to specific embodiments thereof, it would be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention, the scope of which is defined by the attached claims.

For example, the first embodiment is directed to detection of end portion of the ink ribbon, and the second embodiment is directed to detection of end portion of the print tape. However, two detection sensors 33 may be provided in the device for detecting both the end portions of the ink ribbon and the print tape.

The second embodiment may be applied to detection of an ink ribbon. For example, the ink ribbon may be continuously coated with ink to have a non-light transmitting nature, and a light transmitting end portion can be provided to the end of the non-light transmitting portion.

Claims

1. A tape-shaped label producing device for printing on a tape with an ink ribbon, at least one of the tape and the ink ribbon having an optical property that changes at an end portion thereof, the device comprising:

   print means including a print head for printing, via an ink ribbon, on a tape, which serves as a print medium;

   tape feed means for feeding a tape;

   ink ribbon feed means for feeding an ink ribbon;

   print control means for controlling the print means, the tape feed means, and the ink ribbon feed means to thereby print an ink on the tape; and

   end detection means for optically detecting an end of at least one of the tape and the ink ribbon by detecting whether the optical property of the at least one of the tape and the ink ribbon changes.

2. A tape-shaped label producing device as claimed in claim 1, wherein the end detection means includes a photointerrupter constructed from light-generating means and light-receiving means, the light-generating means and the light-receiving means being positioned upstream of the print head in the feeding direction of the at least one of the ink ribbon and the tape, the at least one of the ink ribbon fed by the ink ribbon feed means and the tape fed by the tape feed means passing between the light-generating means and light-receiving means, and

   wherein the end detection means preferably includes a display for displaying that the end of the at least one of the ink ribbon and the tape is arrived, when the photointerrupter detects the end of the at least one of the ink ribbon and the tape.

3. A tape-shaped label producing device as claimed in claim 1 or 2, wherein the ink ribbon is provided with a plurality of marks at a predetermined interval and an end portion provided at the end of the ink ribbon to demarcate an end of the ink ribbon, the end portion being longer than the predetermined interval, and

   wherein the end detection means detects the end of the ink ribbon by detecting no mark while the ink ribbon feed means feeds the ink ribbon by a length equal to the predetermined interval or more.

4. A tape-shaped label producing device as claimed in one of claims 1 to 3, wherein the ink ribbon includes:

   a plurality of ink coated portions formed by coating with a plurality of colors of ink cyclicly at a predetermined length in a predetermined order;

   distinction marks for distinguishing ink colors,

the distinction marks being provided at a starting edge of each ink coated portion; and

an end portion provided at the end of the ink ribbon to demarcate an end of the ink ribbon, the end portion being longer than the predetermined length of the ink coated portions, and

wherein the end detection means includes distinction mark detection means, provided upstream from the print head in the ink ribbon feeding direction, for detecting the distinction mark of the ink ribbon, the distinction mark detection means detecting the end of the ink ribbon by detecting no distinction mark while the ink ribbon feed means feeds the ink ribbon by a length equal to or longer than the predetermined length.

5. A tape-shaped label producing device as claimed in one of claims 2 to 4, wherein at least one of the ink ribbon and the tape is added with an end portion which has a light-transmitting property opposite to the light-transmitting property of the at least one of the ink ribbon and the tape, and

further comprising judging means for receiving a light-transmitting property detected by the photointerrupter and for judging whether the detected light-transmitting property is the same as or opposite to a light-transmitting property of the at least one of the ink ribbon and the tape.

6. A tape-shaped label producing device for printing on a tape with an ink ribbon to produce a tape-shaped label, the ink ribbon including a plurality of ink coated portions formed by coating with a plurality of colors of ink cyclicly at a predetermined length in a predetermined order, distinction marks provided at a starting edge of each ink coated portion for distinguishing ink colors, and an end portion provided at the end of the ink ribbon to demarcate an end of the ink ribbon, the end portion being longer than the predetermined length of the ink coated portions, the device comprising:

print means including a print head for printing, via the ink ribbon, on a tape, which serves as a print medium;

tape feed means for feeding a tape;

ink ribbon feed means for feeding the ink ribbon in synchronization with the tape;

print control means for controlling the print means, the tape feed means, and the ink ribbon feed means; and

mark detection means for detecting the distinction mark of the ink ribbon, the mark detection means being provided upstream from the print head.

7. A tape-shaped label producing device as claimed in one of claims 4 to 6, wherein the distinction marks are comprised of barcode-shaped marks.

8. A tape-shaped label producing device comprising:

print means including a print head for printing on a tape, the tape serving as a print medium;

tape feed means for feeding a tape;

print control means for controlling the print means and the tape feed means; and

a photointerrupter detecting the end of the tape via an end portion provided at the end of the tape, the end portion being formed by a non-light-transmitting nature region if the tape is light-transmitting nature and formed by a light-transmitting nature region if the tape is non-light-transmitting nature.

9. An ink ribbon for use in a tape-shaped label producing device, the tape-shaped label producing device having print means including a print head for printing on a tape, which serves as a print medium, tape feed means for feeding a tape, ink ribbon feed means for feeding ink ribbon in synchronization with the tape, print control means for controlling the print means, the tape feed means, and the ink ribbon feed means, and a mark detection means for detecting a distinction mark of the ink ribbon, the mark detection means being provided upstream from the print head, the ink ribbon comprising:

a plurality of ink coated portions formed by coating with a plurality of colors of ink cyclicly at a predetermined length in a predetermined order;

distinction marks for distinguishing ink colors, the distinction marks mark at a starting edge of each ink coated portion; and

an end portion provided at the end of the ink ribbon to demarcate an end of the ink ribbon, the end portion being longer than the predetermined length of the ink coated portions.

10. An ink ribbon as claimed in claim 9 wherein the distinction marks are comprised of barcode-shaped marks.

11. A tape for use in a tape-shaped label producing device, the tape-shaped label producing device having print means including a print head for printing on a tape, the tape serving as a print medium, tape feed means for feeding a tape, print control means for controlling the print means and the tape feed means, and a photointerrupter detecting the end of the tape, the tape comprising:

a tape region for being printed by the print head, the tape region being formed by one of a light-transmitting nature region and a non-light-transmitting nature region; and

an end portion provided at the end of the tape region, the end portion being formed by a non-light-transmitting nature region if the tape region is light-transmitting nature and formed by a light-transmitting nature region if the tape region is non-light-transmitting nature.

FIG. 1

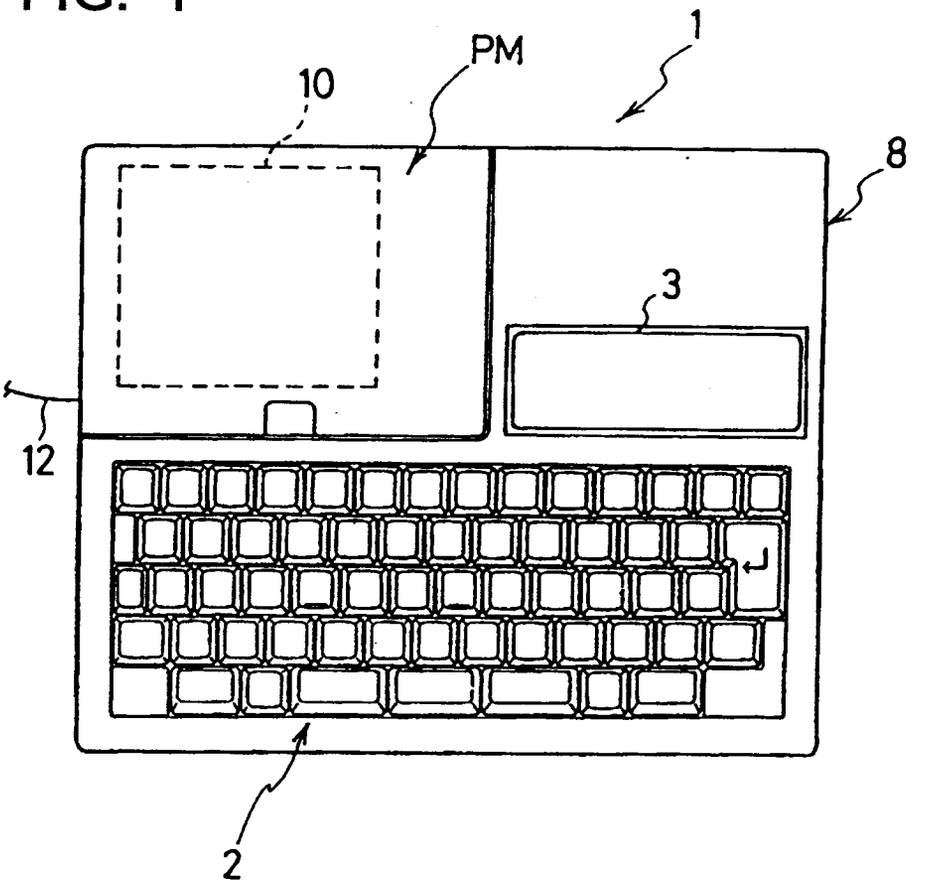

1
PM
10
8
3
12
2

FIG. 2

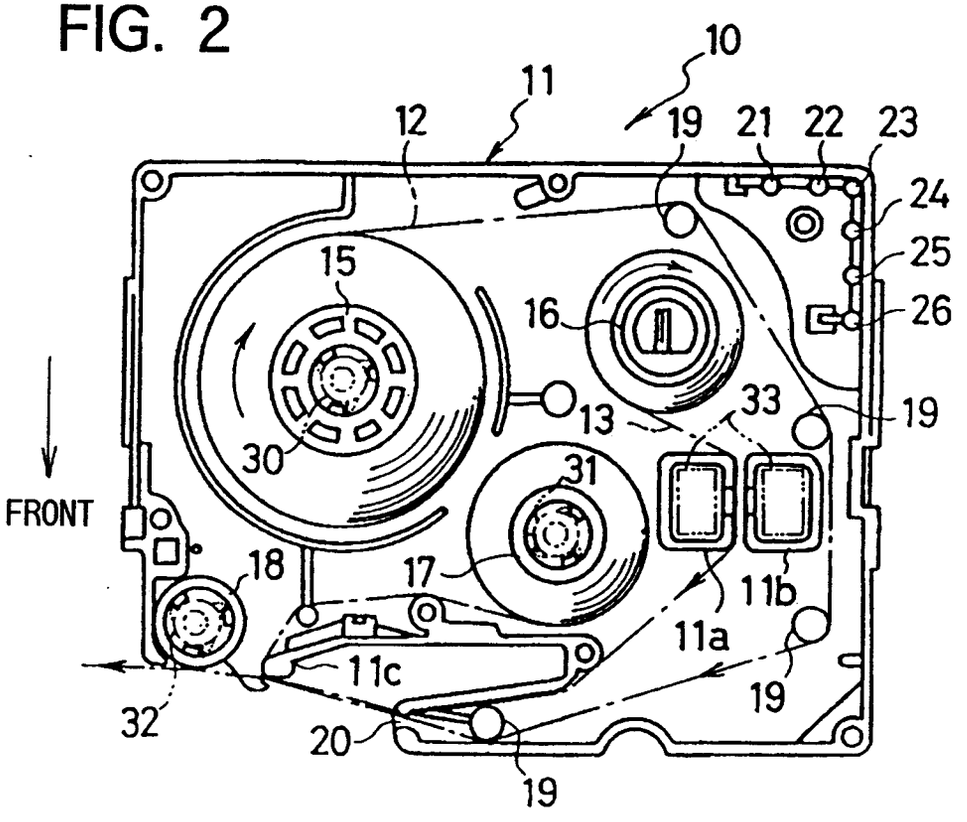

10
11
12
19
21
22
23
24
25
26
15
16
13
33
19
30
31
FRONT
18
17
11b
11a
11c
19
32
20
19

FIG. 3

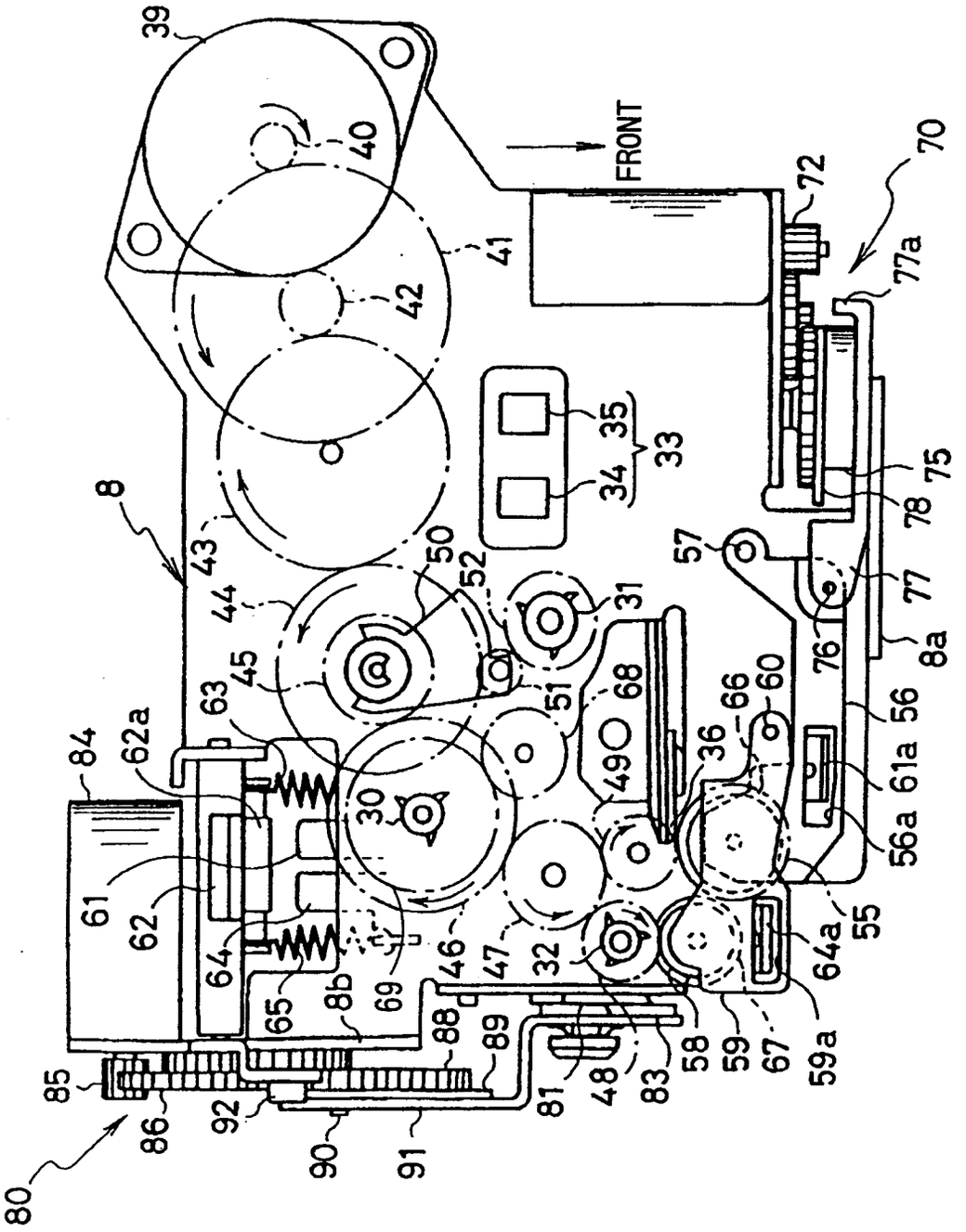

39
40
41
42
FRONT
72
70
77a
8
43
44
45
50
52
31
35
34
33
57
75
78
77
76
8a
56
60
66
68
49
36
63
62a
84
61
62
64
65
8b
69
30
46
47
32
55
64a
56a
61a
58
59
67
59a
88
89
81
48
83
85
86
92
90
91
80

FIG. 4

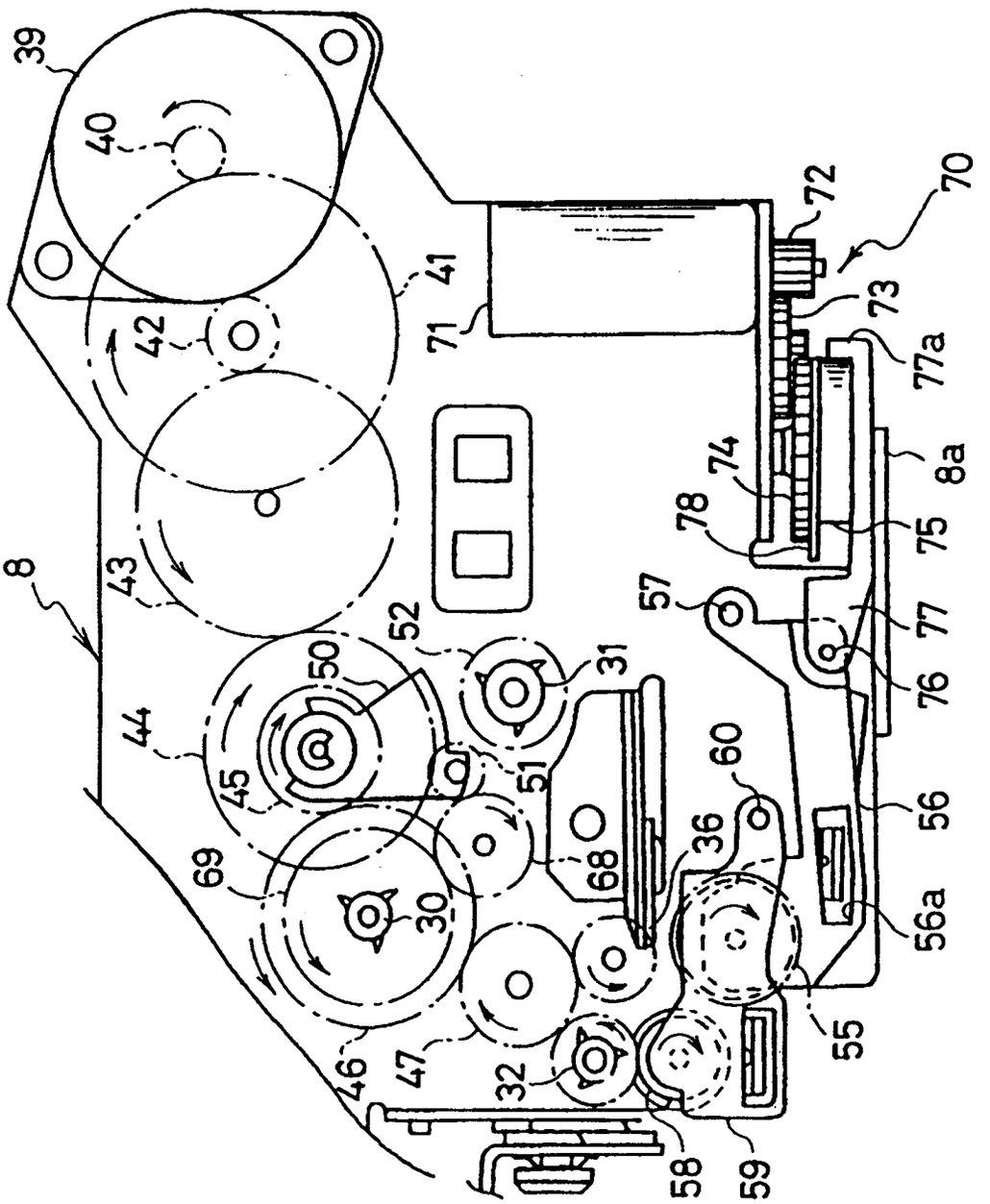

39
40
41
42
43
8
44
45
50
52
31
51
69
30
68
36
60
46
47
32
58
59
55
56
56a
57
77
76
78
74
75
8a
77a
73
72
70
71

FIG. 5

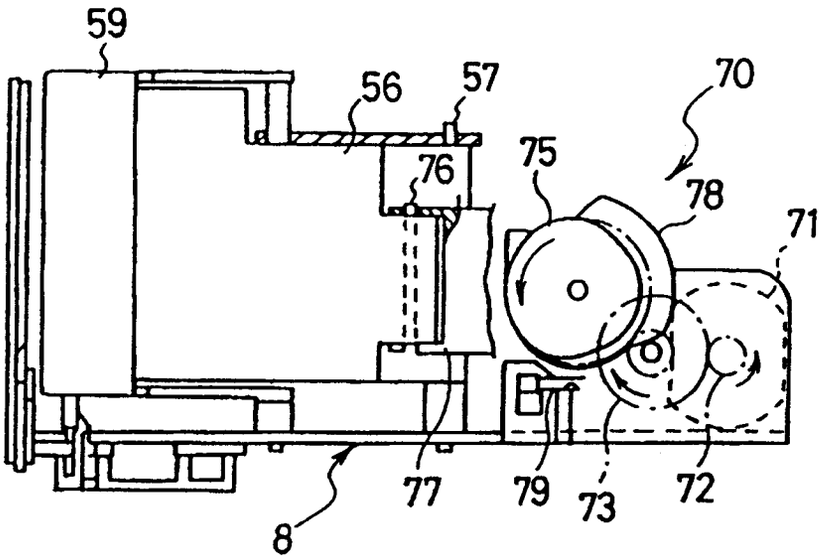


FIG. 6

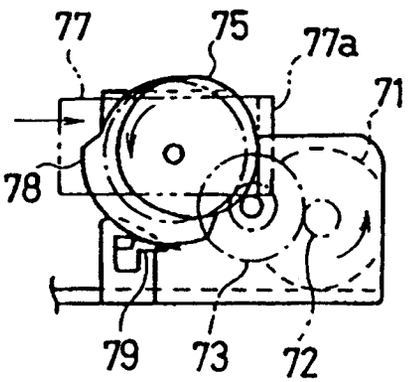


FIG. 7

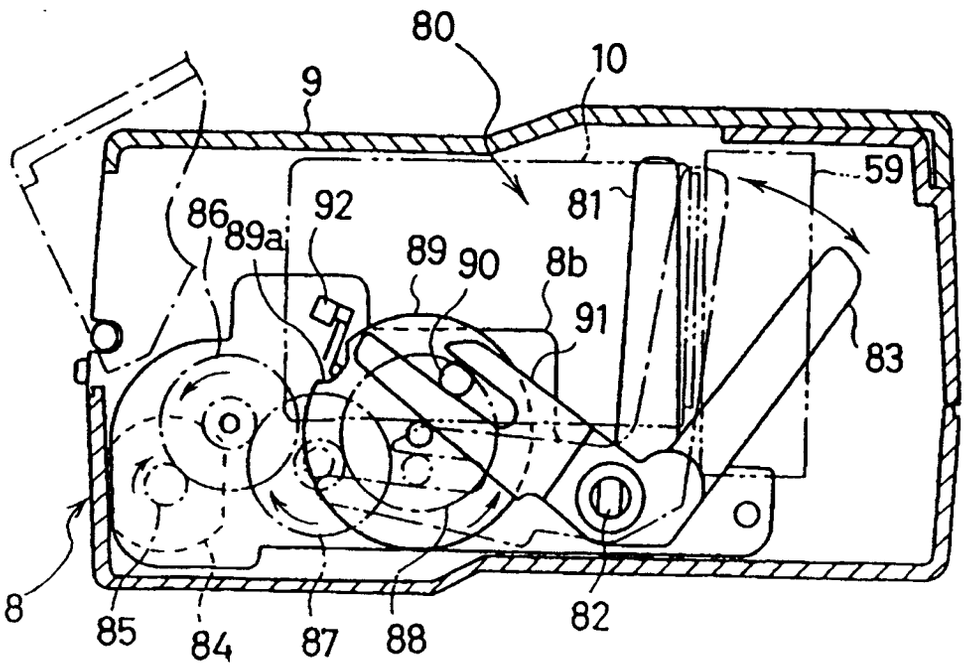


FIG. 8

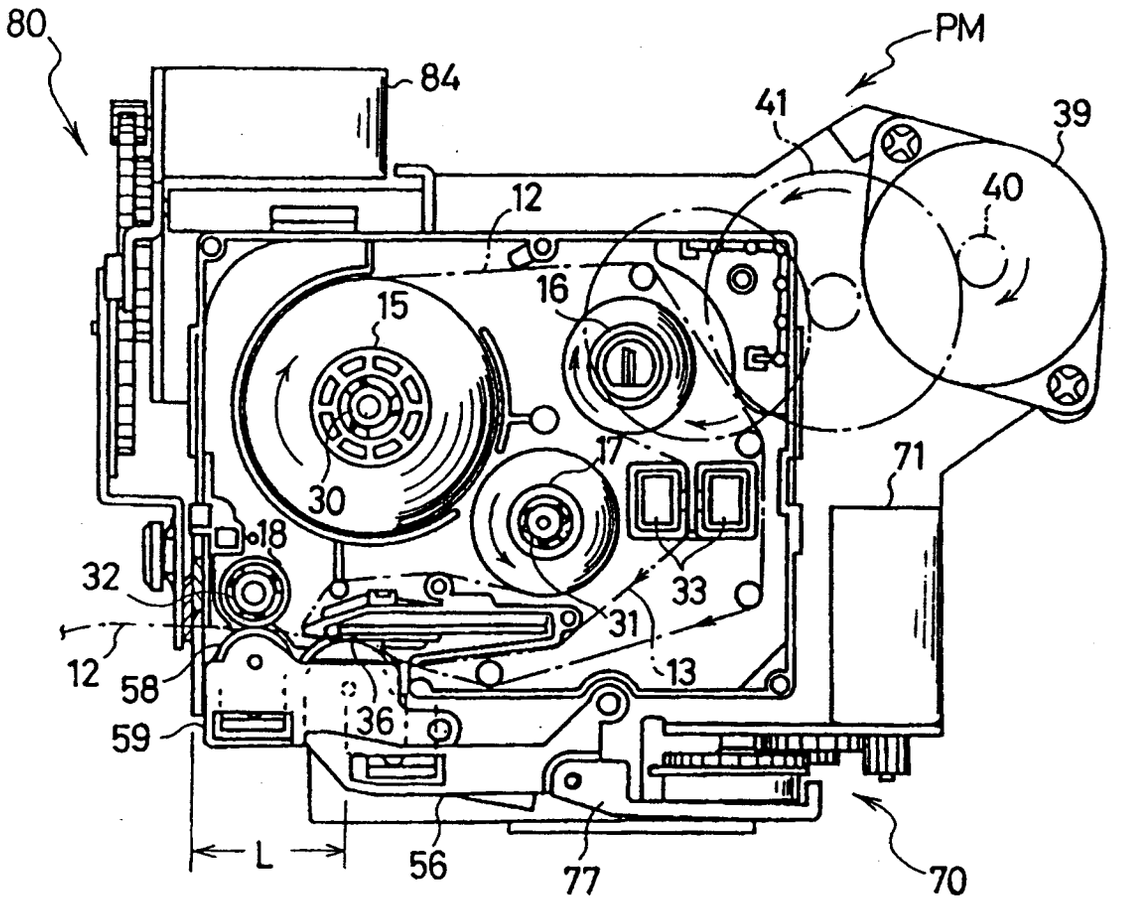


FIG. 9

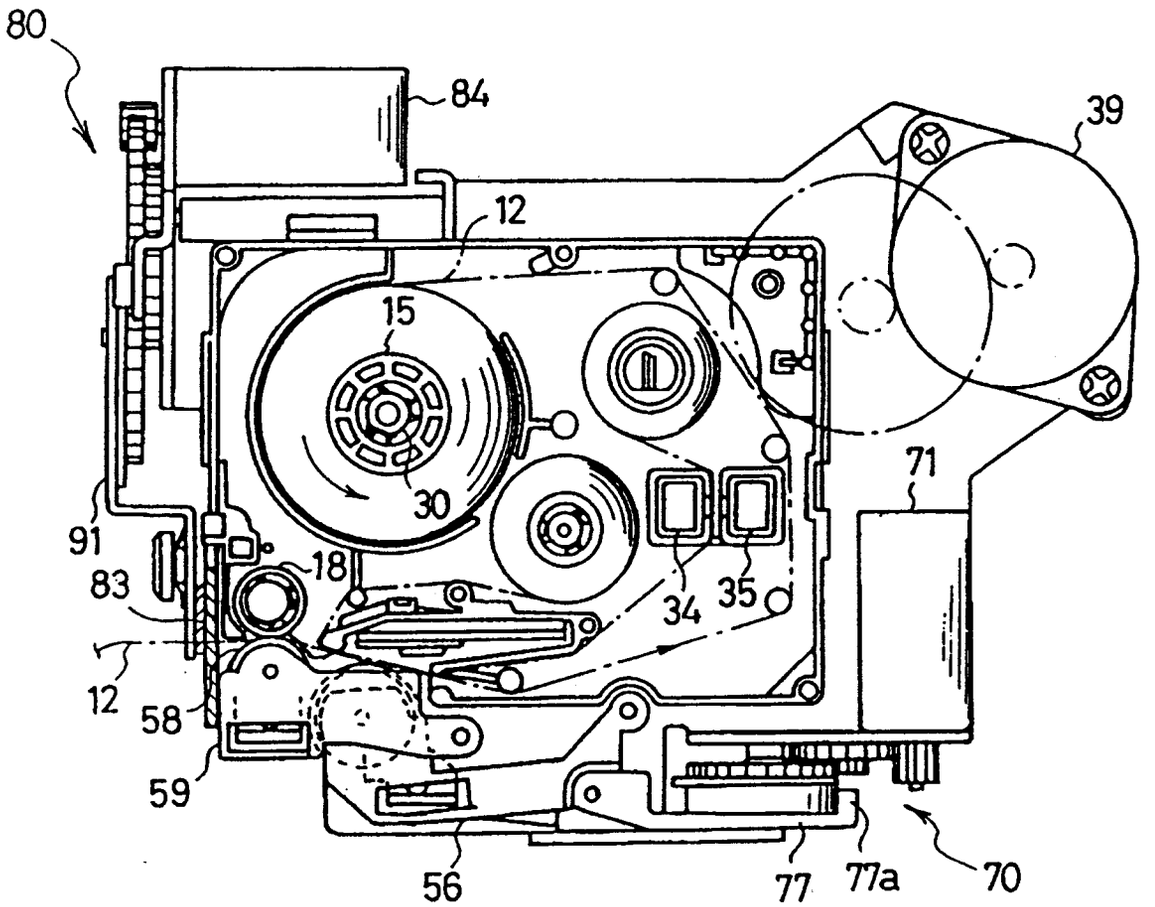


FIG. 10

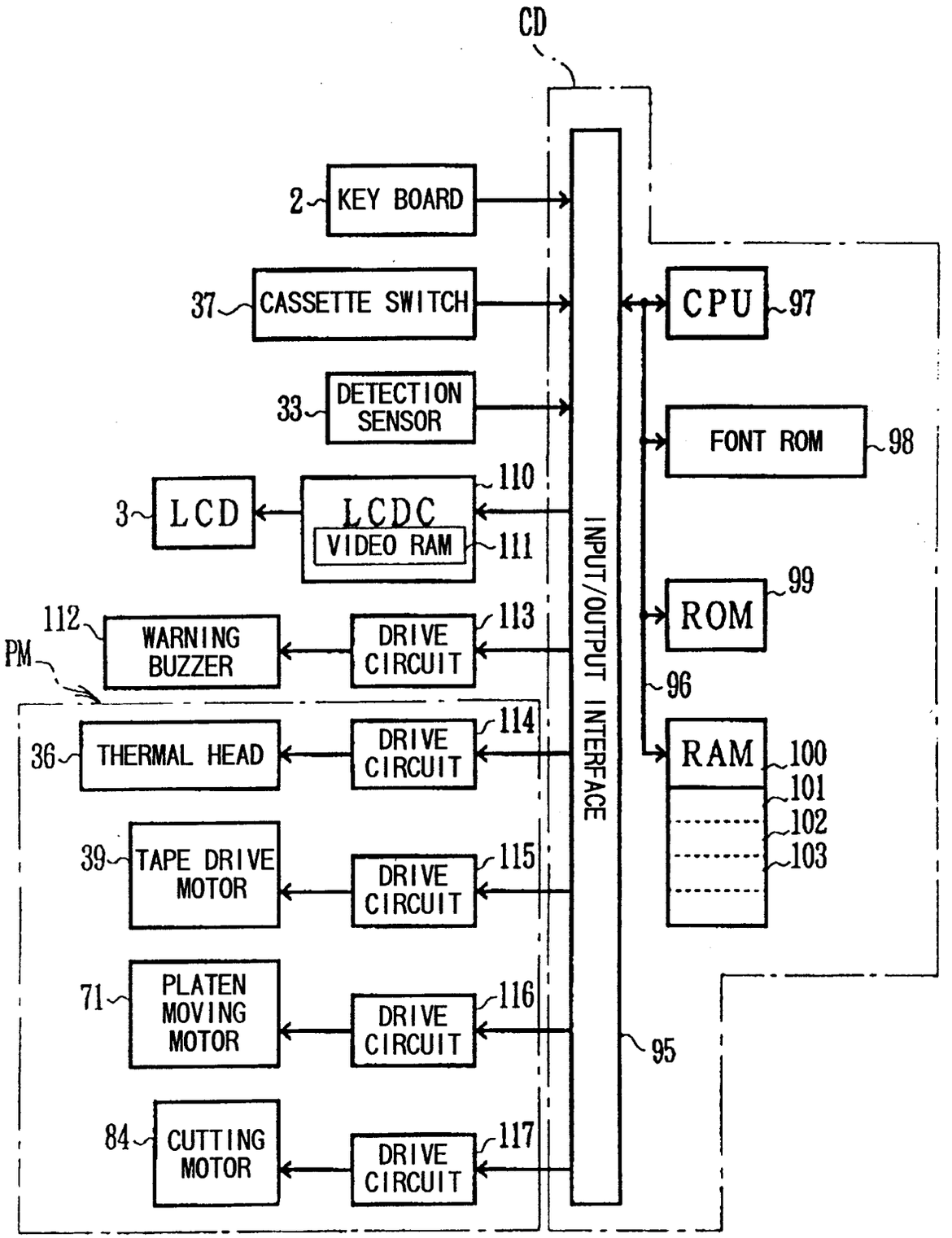

CD
2
KEY BOARD
37
CASSETTE SWITCH
33
DETECTION SENSOR
3
LCD
LCDC
110
VIDEO RAM
111
112
WARNING BUZZER
113
DRIVE CIRCUIT
PM
36
THERMAL HEAD
114
DRIVE CIRCUIT
39
TAPE DRIVE MOTOR
115
DRIVE CIRCUIT
71
PLATEN MOVING MOTOR
116
DRIVE CIRCUIT
84
CUTTING MOTOR
117
DRIVE CIRCUIT
INPUT/OUTPUT INTERFACE
95
CPU
97
FONT ROM
98
ROM
99
96
RAM
100
101
102
103

FIG. 11

TB

		FIRST DETECTION SWITCH	SECOND DETECTION SWITCH	THIRD DETECTION SWITCH	FOURTH DETECTION SWITCH	FIFTH DETECTION SWITCH	SIXTH DETECTION SWITCH
INK COLOR	MONO-COLOR	ON	ON	/	/	/	/
	BLACK/RED	ON	OFF	/	/	/	/
TAPE WIDTH	12mm	/	/	OFF	OFF	/	/
	18mm	/	/	OFF	ON	/	/
	24mm	/	/	ON	OFF	/	/
	32mm	/	/	ON	ON	/	/
TAPE TYPE	RECEPTOR	/	/	/	/	ON	ON
	LAMINATE	/	/	/	/	ON	OFF
	NO CASSETTE	/	/	/	/	OFF	OFF

FIG. 12

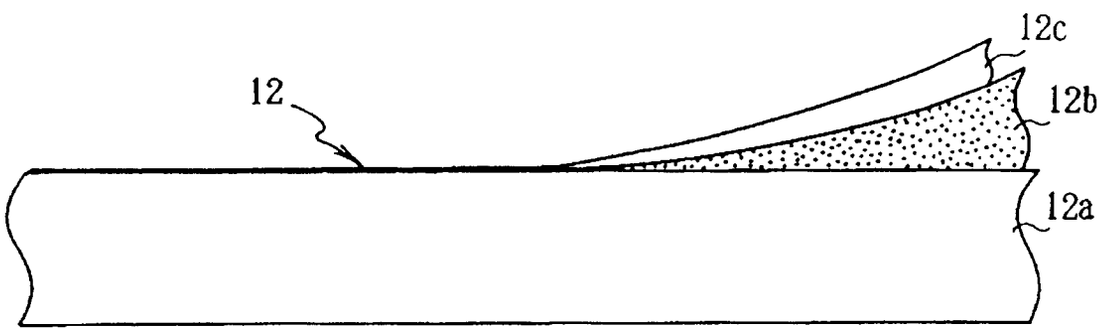


FIG. 13

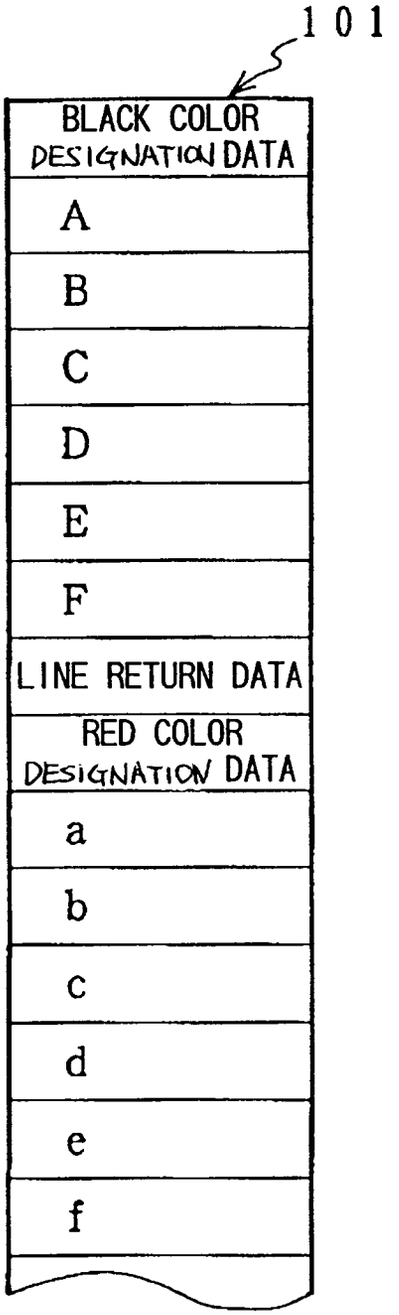

101
BLACK COLOR DESIGNATION DATA
A
B
C
D
E
F
LINE RETURN DATA
RED COLOR DESIGNATION DATA
a
b
c
d
e
f

FIG. 14

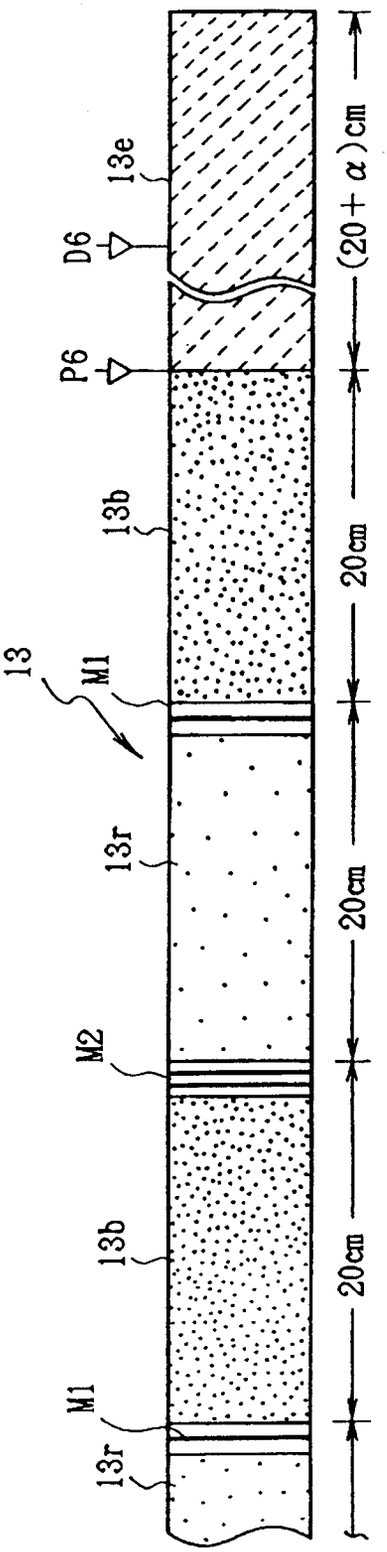

13
M1
13b
P6
D6
13e
(20+α)cm
20cm
20cm
20cm
M2
13r
M1
13b
13r
13b : BLACK INK
13r : RED INK
13e : END TAPE
M1 : DISTINCTION MARK
M2 : DISTINCTION MARK

FIG. 15

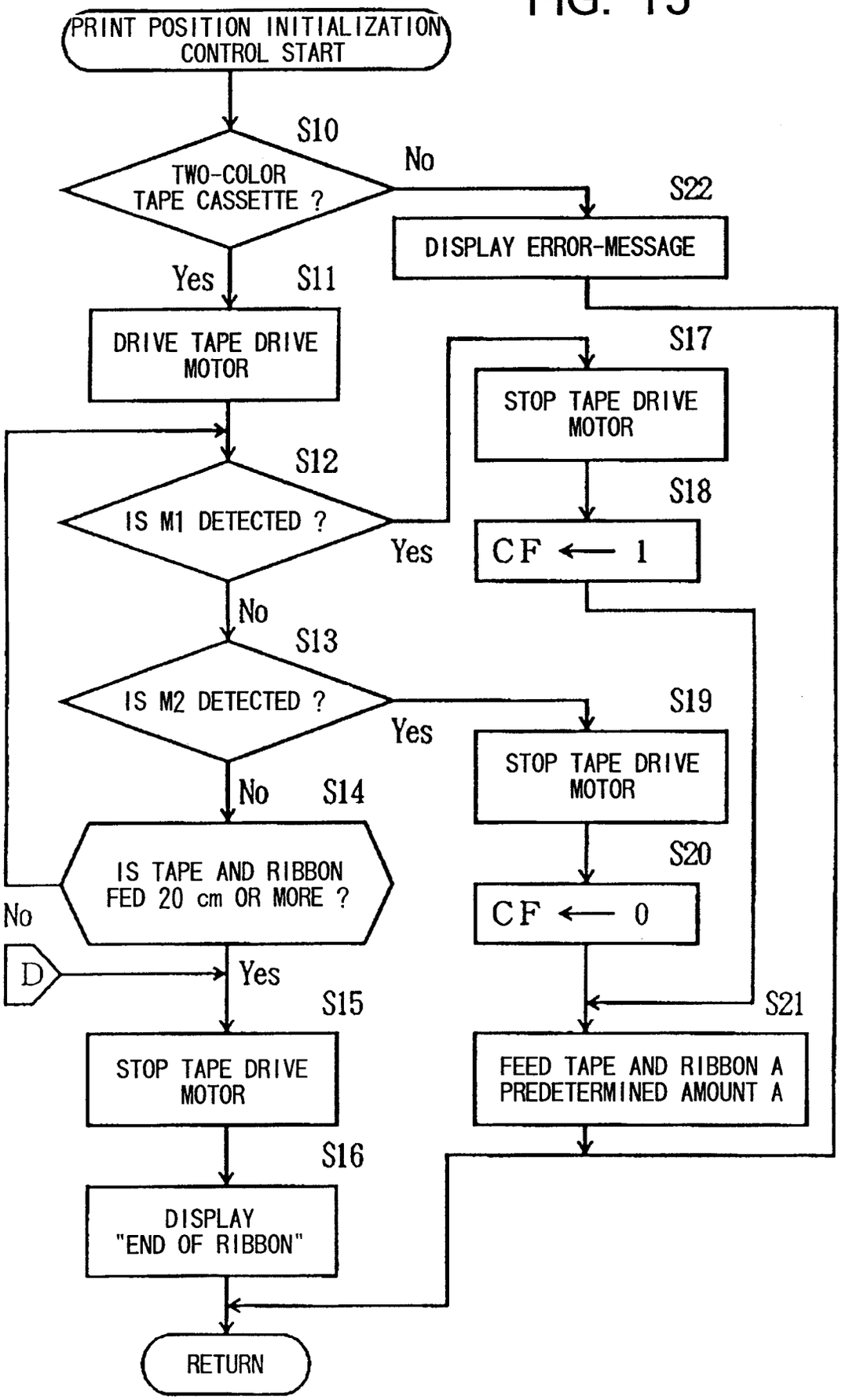

PRINT POSITION INITIALIZATION CONTROL START
S10
TWO-COLOR TAPE CASSETTE ?
No
S22
DISPLAY ERROR-MESSAGE
Yes
S11
DRIVE TAPE DRIVE MOTOR
S17
STOP TAPE DRIVE MOTOR
S12
IS M1 DETECTED ?
Yes
S18
CF ← 1
No
S13
IS M2 DETECTED ?
Yes
S19
STOP TAPE DRIVE MOTOR
No
S14
IS TAPE AND RIBBON FED 20 cm OR MORE ?
S20
CF ← 0
No
D
Yes
S15
S21
STOP TAPE DRIVE MOTOR
FEED TAPE AND RIBBON A PREDETERMINED AMOUNT A
S16
DISPLAY "END OF RIBBON"
RETURN

FIG. 16

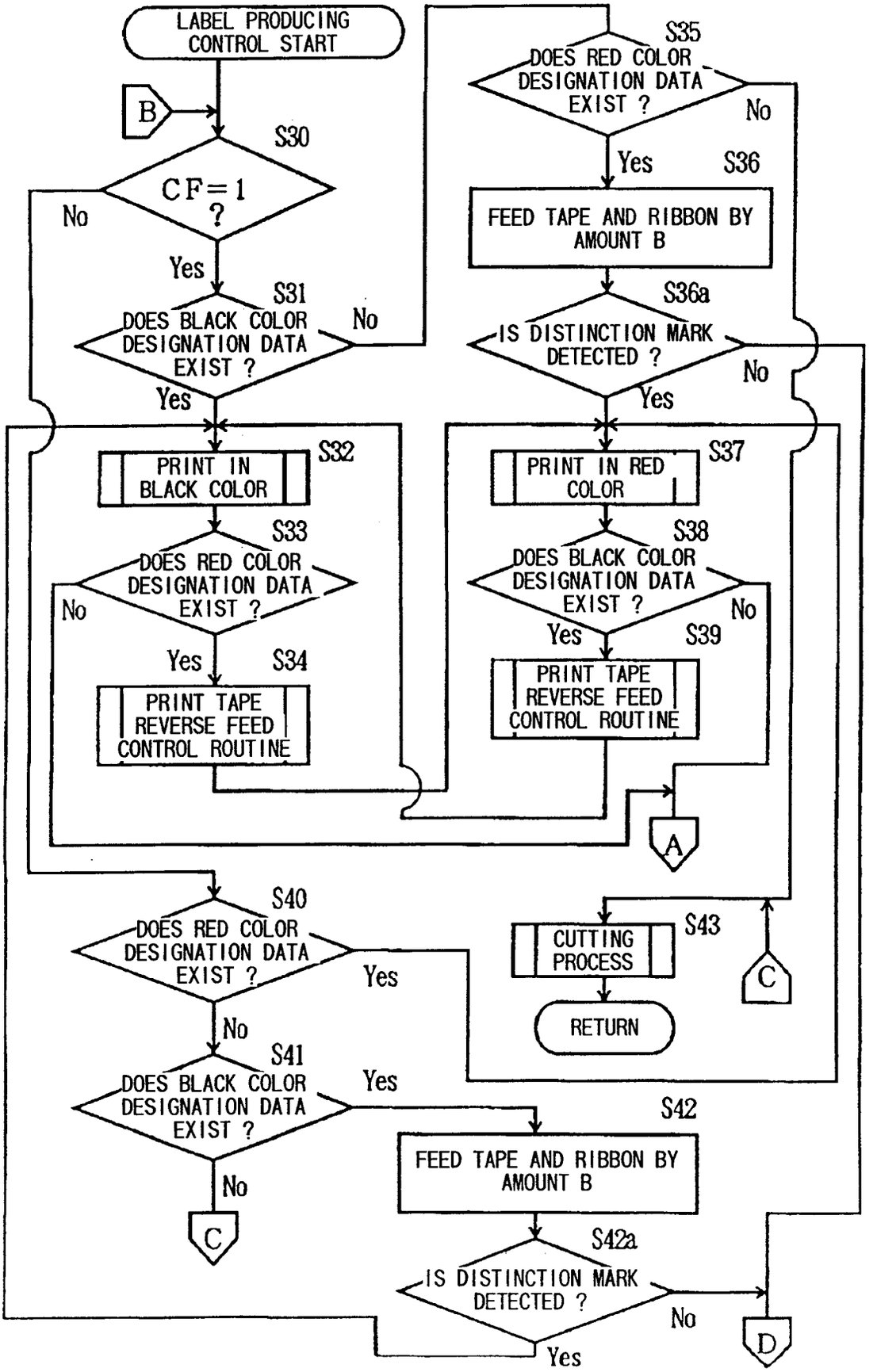

LABEL PRODUCING CONTROL START
B
S30
CF=1 ?
No
Yes
S31
DOES BLACK COLOR DESIGNATION DATA EXIST ?
No
Yes
S32
PRINT IN BLACK COLOR
S33
DOES RED COLOR DESIGNATION DATA EXIST ?
No
Yes
S34
PRINT TAPE REVERSE FEED CONTROL ROUTINE
S35
DOES RED COLOR DESIGNATION DATA EXIST ?
No
Yes
S36
FEED TAPE AND RIBBON BY AMOUNT B
S36a
IS DISTINCTION MARK DETECTED ?
No
Yes
S37
PRINT IN RED COLOR
S38
DOES BLACK COLOR DESIGNATION DATA EXIST ?
No
Yes
S39
PRINT TAPE REVERSE FEED CONTROL ROUTINE
A
S40
DOES RED COLOR DESIGNATION DATA EXIST ?
Yes
No
S41
DOES BLACK COLOR DESIGNATION DATA EXIST ?
Yes
No
C
S42
FEED TAPE AND RIBBON BY AMOUNT B
S42a
IS DISTINCTION MARK DETECTED ?
No
Yes
D
S43
CUTTING PROCESS
C
RETURN

FIG. 17

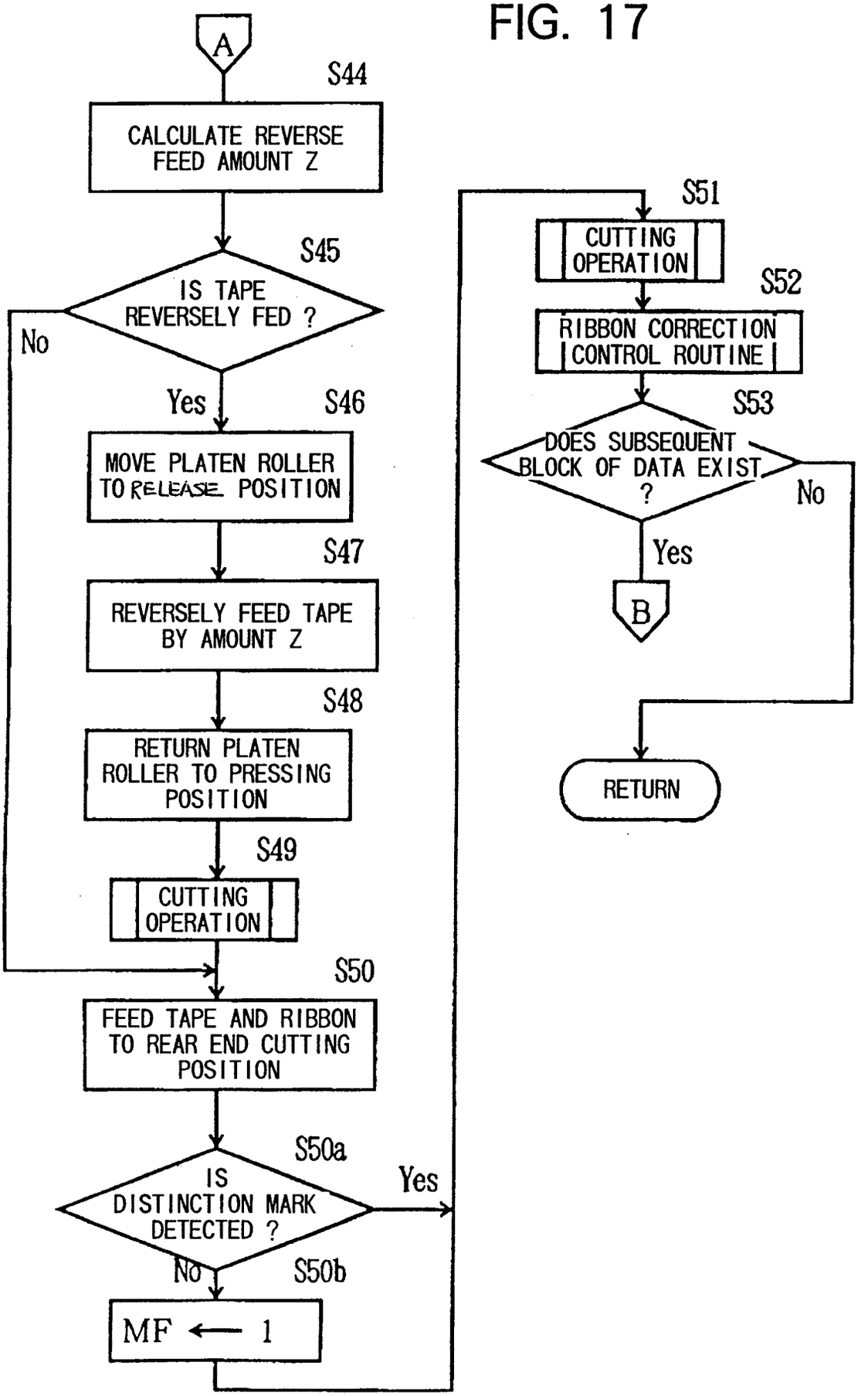

A
S44
CALCULATE REVERSE FEED AMOUNT Z
S45
IS TAPE REVERSELY FED ?
No
Yes
S46
MOVE PLATEN ROLLER TO RELEASE POSITION
S47
REVERSELY FEED TAPE BY AMOUNT Z
S48
RETURN PLATEN ROLLER TO PRESSING POSITION
S49
CUTTING OPERATION
S50
FEED TAPE AND RIBBON TO REAR END CUTTING POSITION
S50a
IS DISTINCTION MARK DETECTED ?
Yes
No
S50b
MF ← 1
S51
CUTTING OPERATION
S52
RIBBON CORRECTION CONTROL ROUTINE
S53
DOES SUBSEQUENT BLOCK OF DATA EXIST ?
No
Yes
B
RETURN

FIG. 18

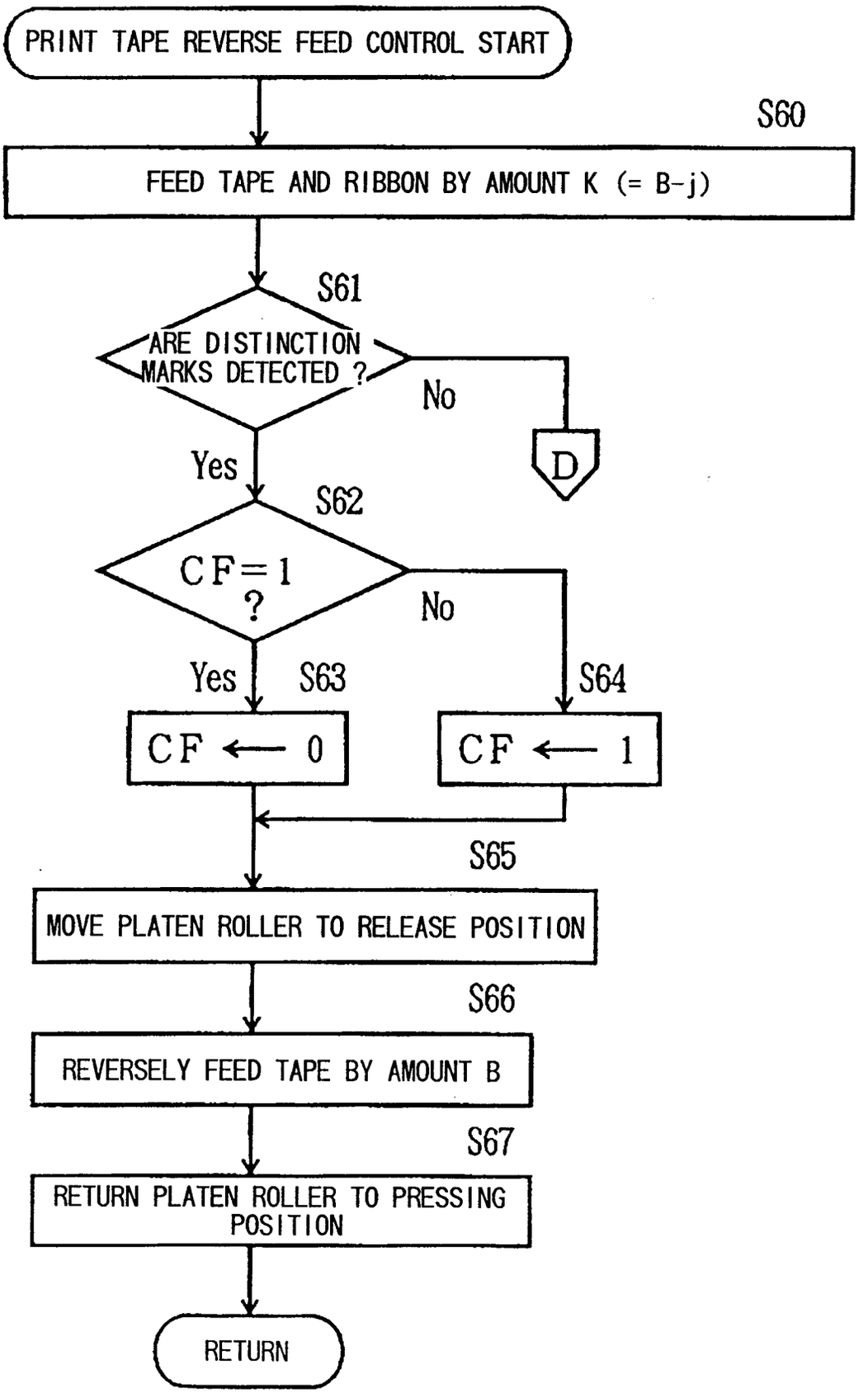

PRINT TAPE REVERSE FEED CONTROL START
S60
FEED TAPE AND RIBBON BY AMOUNT K (= B-j)
S61
ARE DISTINCTION MARKS DETECTED ?
No
D
Yes
S62
CF=1 ?
No
Yes
S63
S64
CF ← 0
CF ← 1
S65
MOVE PLATEN ROLLER TO RELEASE POSITION
S66
REVERSELY FEED TAPE BY AMOUNT B
S67
RETURN PLATEN ROLLER TO PRESSING POSITION
RETURN

FIG. 19

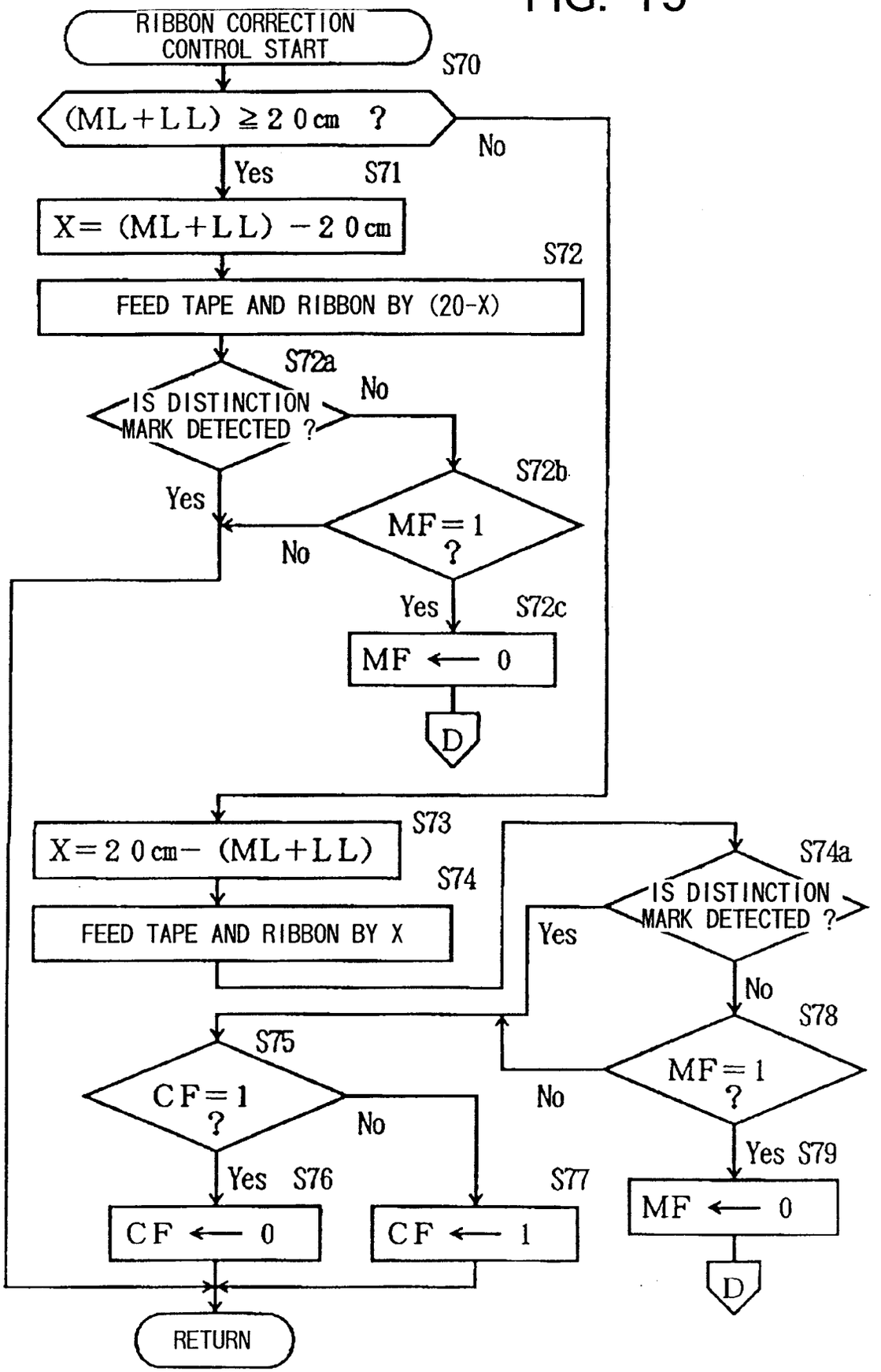

RIBBON CORRECTION CONTROL START
S70
(ML+LL) ≧ 20 cm ?
No
Yes
S71
X= (ML+LL) −20 cm
S72
FEED TAPE AND RIBBON BY (20-X)
S72a
IS DISTINCTION MARK DETECTED ?
No
Yes
S72b
MF = 1 ?
No
Yes
S72c
MF ← 0
D
S73
X= 20 cm− (ML+LL)
S74
FEED TAPE AND RIBBON BY X
S74a
IS DISTINCTION MARK DETECTED ?
Yes
No
S78
MF = 1 ?
No
Yes
S79
MF ← 0
D
S75
CF = 1 ?
No
Yes
S76
CF ← 0
S77
CF ← 1
RETURN

FIG. 20

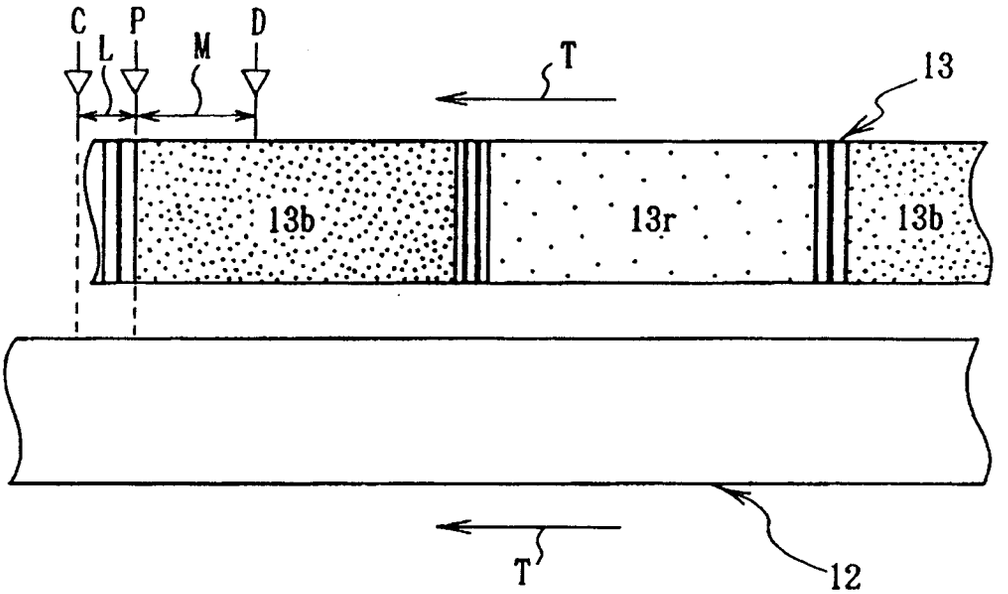


FIG. 21

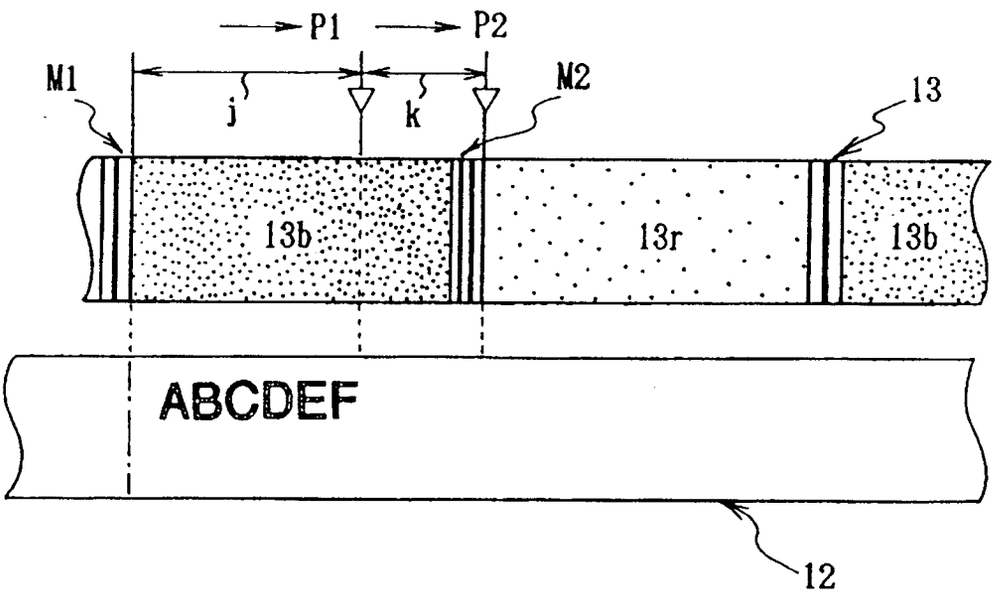


FIG. 22

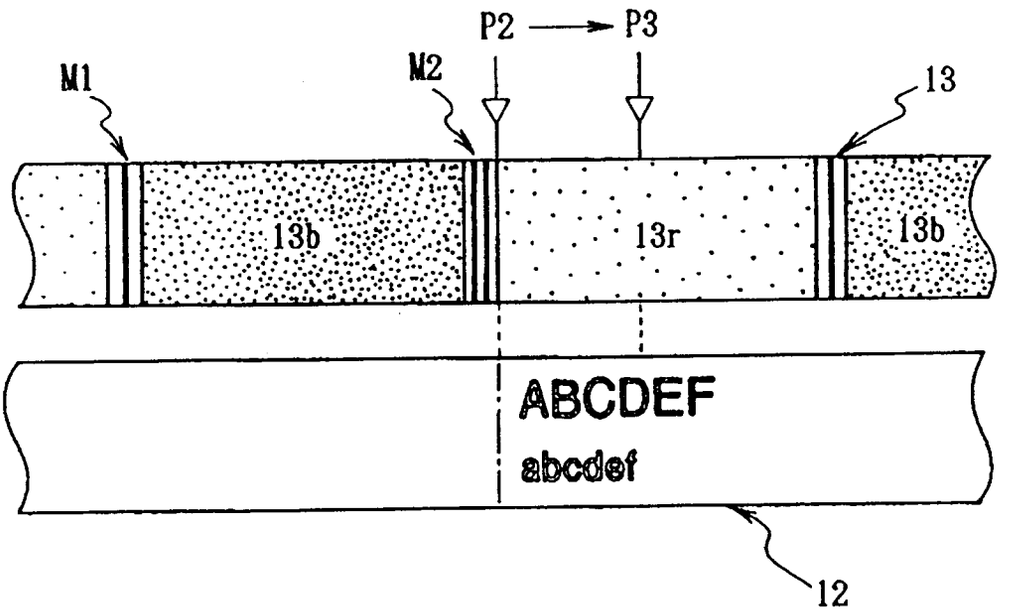

P2
P3
M1
M2
13
13b
13r
13b
ABCDEF
abcdef
12

FIG. 23

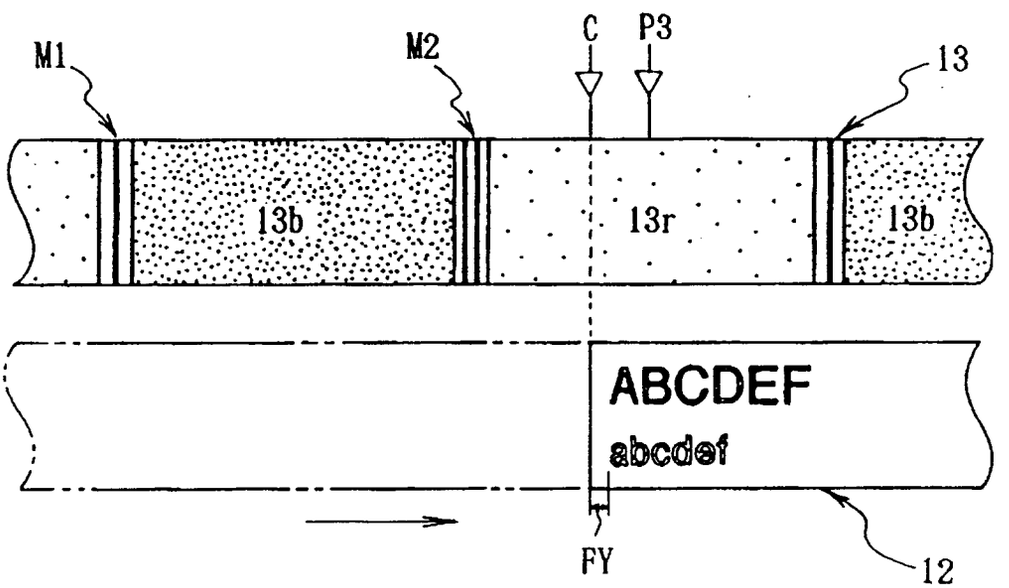

M1
M2
C
P3
13
13b
13r
13b
ABCDEF
abcdef
FY
12

FIG. 24

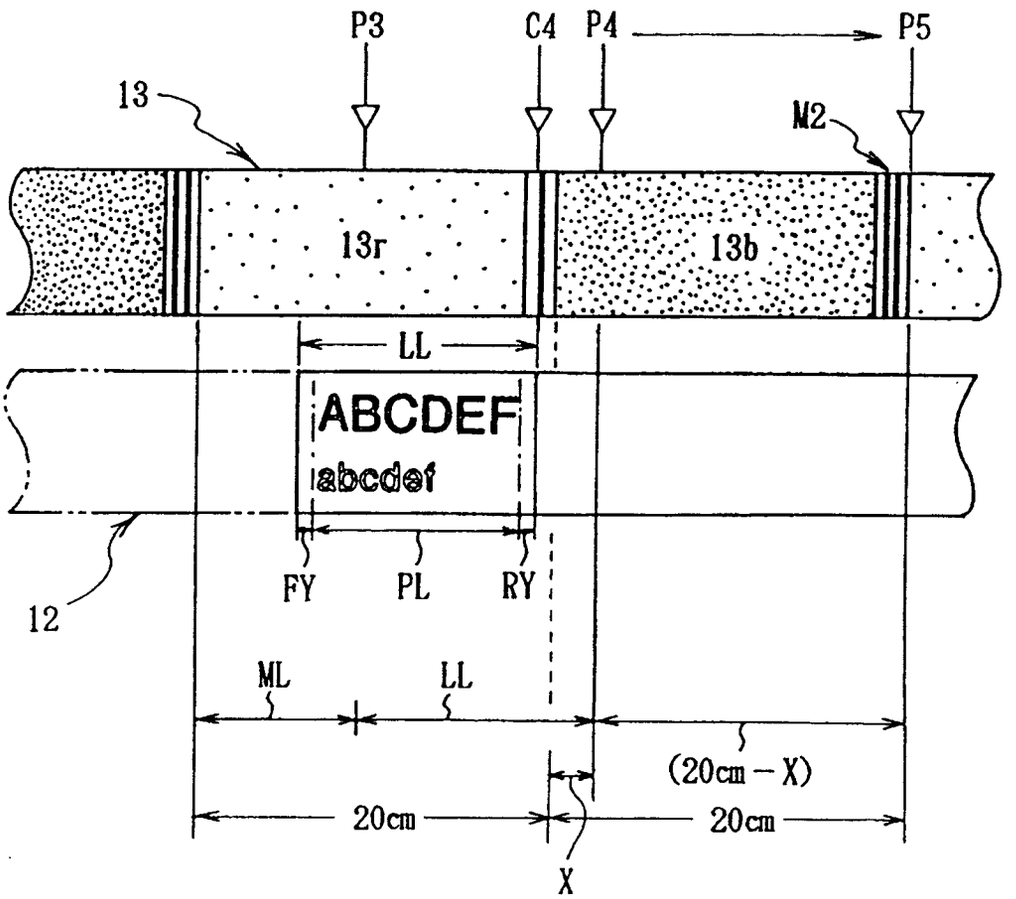

P3
C4
P4
P5
13
M2
13r
13b
LL
ABCDEF
abcdef
FY
PL
RY
12
ML
LL
(20cm − X)
20cm
20cm
X

FIG. 25

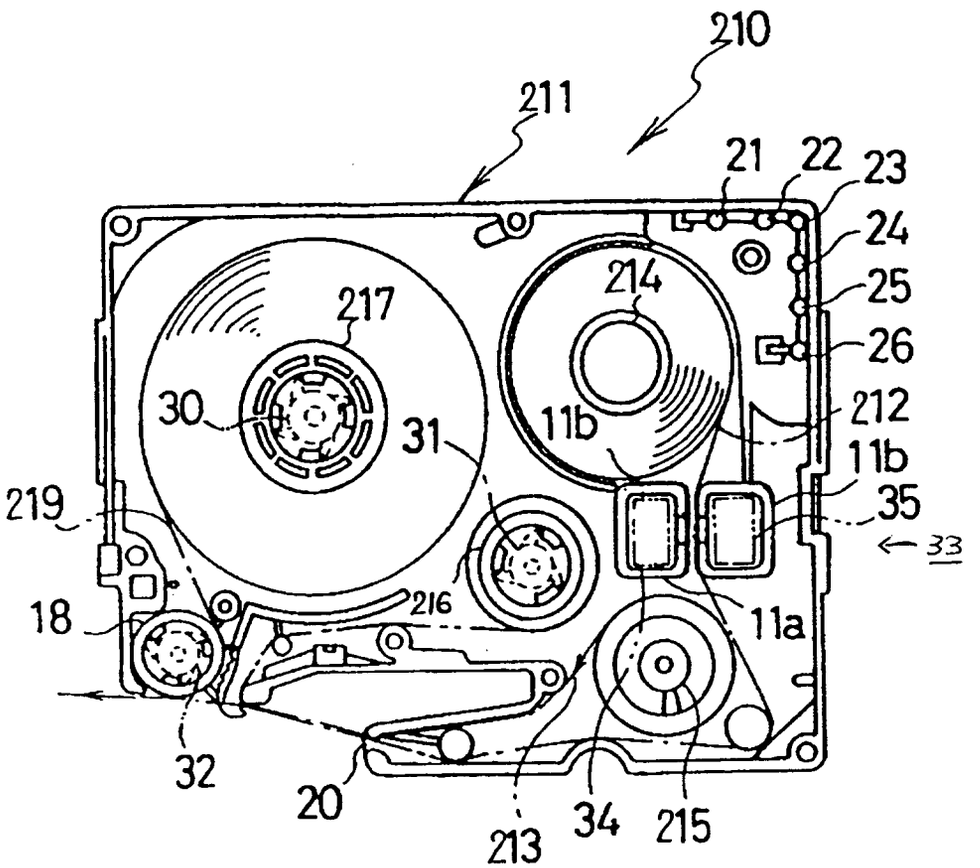

210
211
21
22
23
24
25
26
212
11b
35
33
214
217
30
31
11b
219
18
216
11a
32
20
213
34
215

FIG. 26

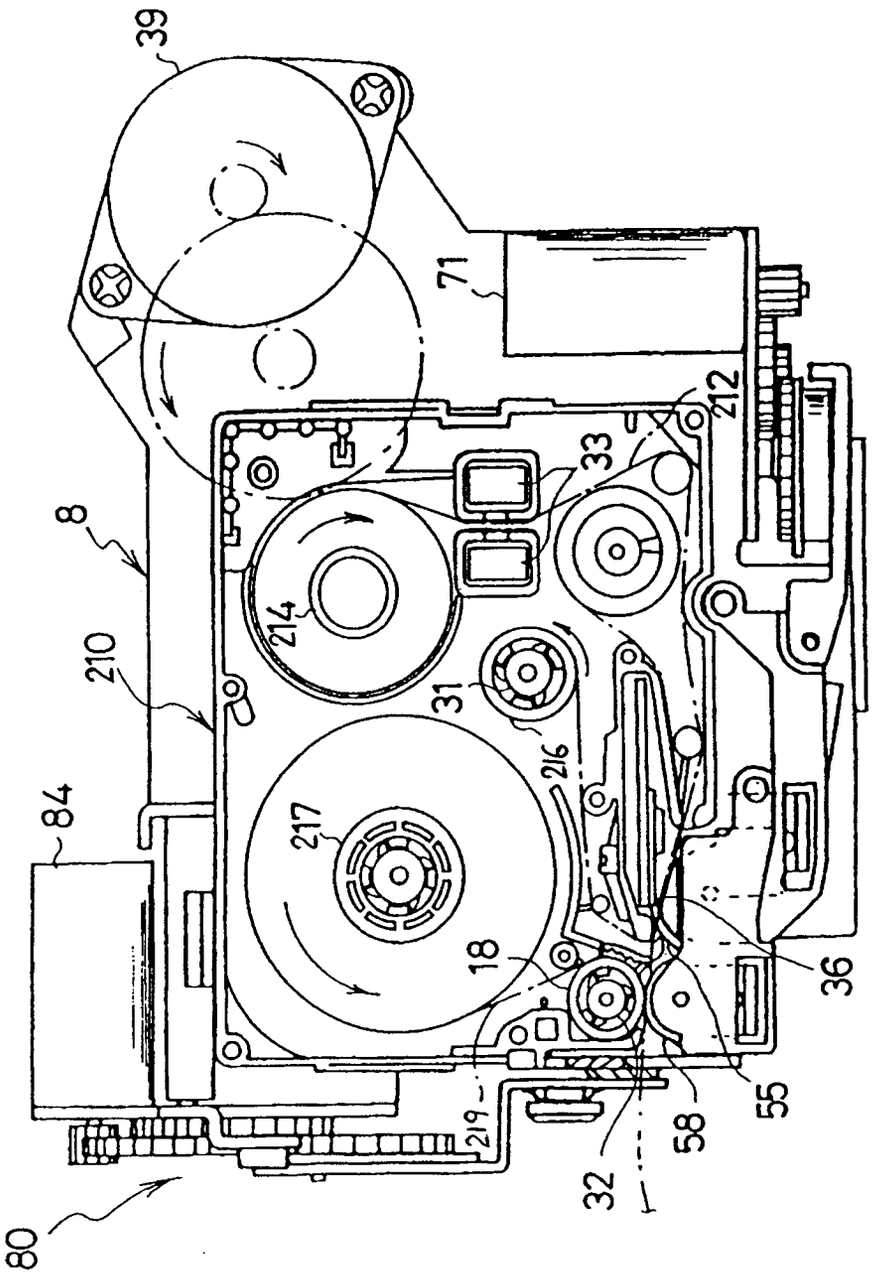


FIG. 27

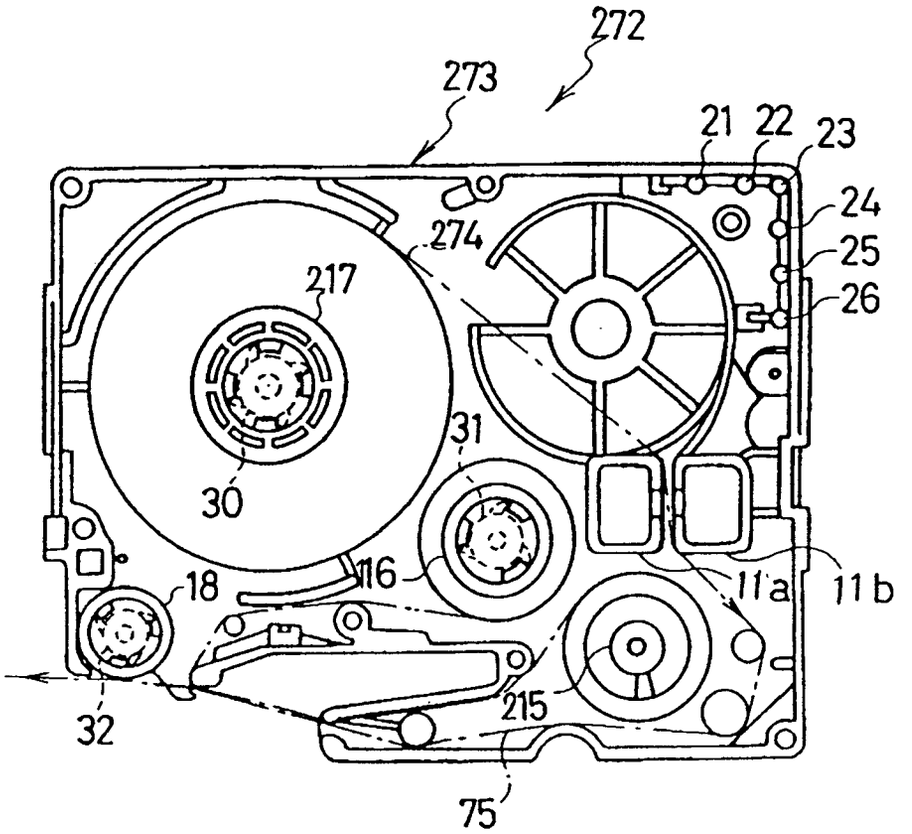


FIG. 28

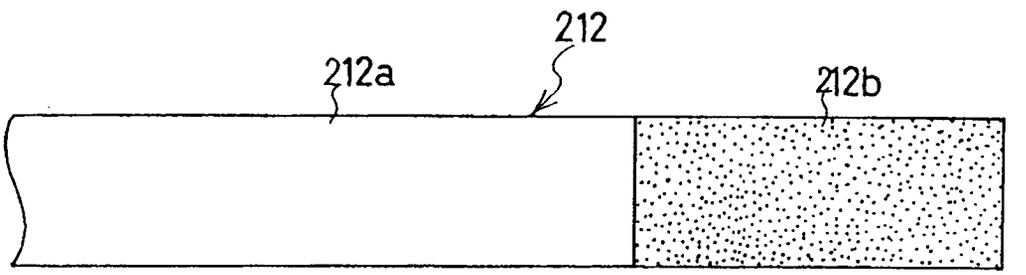


FIG. 29

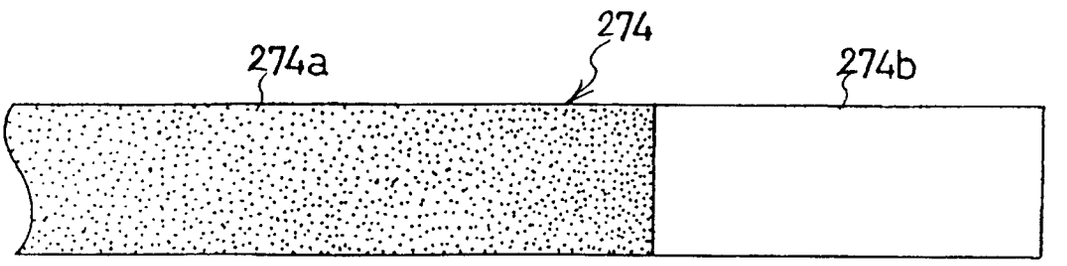
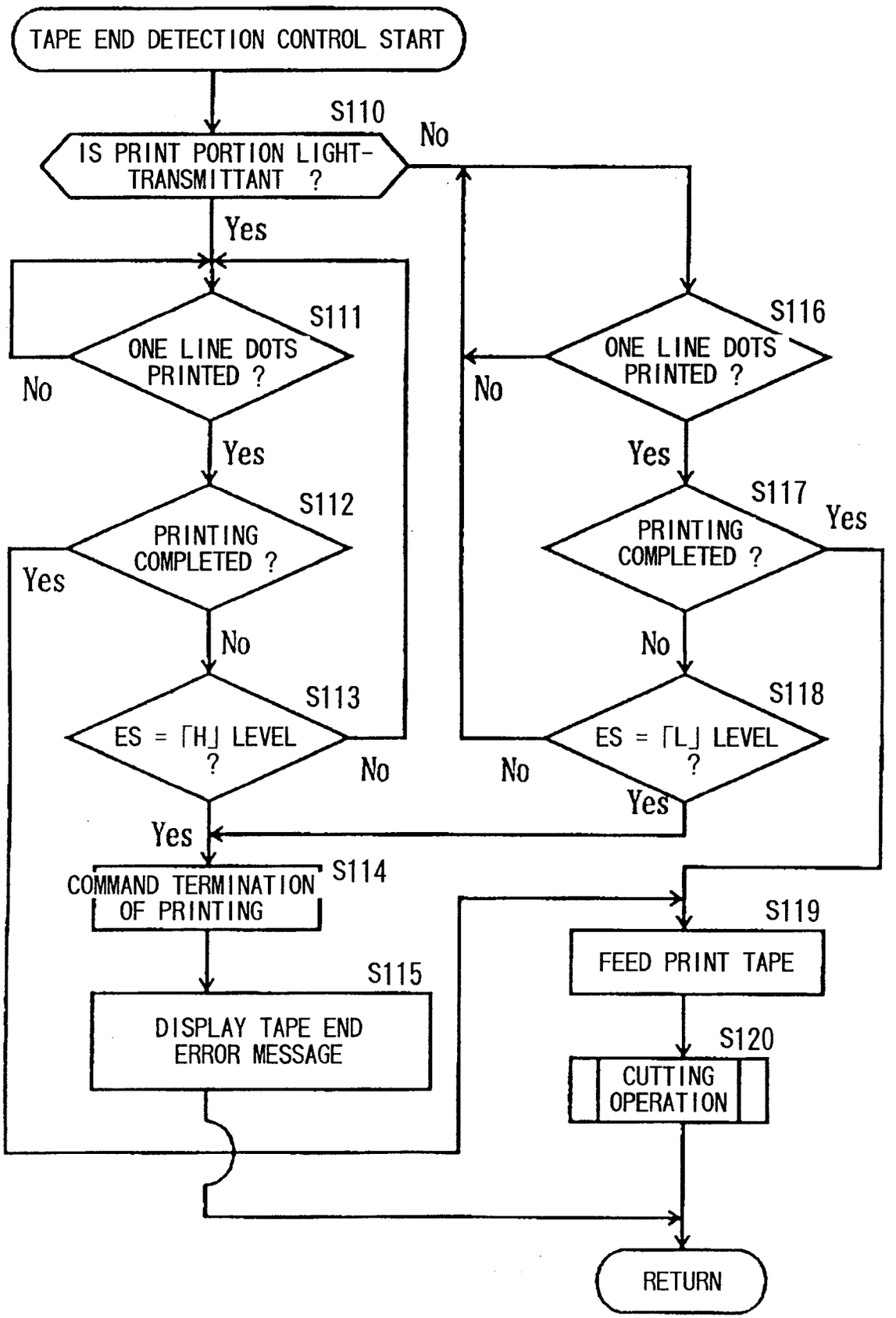


FIG. 30


TAPE END DETECTION CONTROL START
S110
IS PRINT PORTION LIGHT-TRANSMITTANT ?
No
Yes
S111
ONE LINE DOTS PRINTED ?
No
Yes
S112
PRINTING COMPLETED ?
Yes
No
S113
ES = ⌈H⌋ LEVEL ?
No
Yes
S116
ONE LINE DOTS PRINTED ?
No
Yes
S117
PRINTING COMPLETED ?
Yes
No
S118
ES = ⌈L⌋ LEVEL ?
No
Yes
S114
COMMAND TERMINATION OF PRINTING
S115
DISPLAY TAPE END ERROR MESSAGE
S119
FEED PRINT TAPE
S120
CUTTING OPERATION
RETURN

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 1019

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.6)
X	EP-A-0 386 937 (TOKYO ELECTRIC CO., LTD.) * the whole document *	1-11	B41J35/18 B41J35/36
A	US-A-2 174 351 (NEIDICH) * page 2, right column, line 1 - line 10 *	1,5,8,11	
A	PATENT ABSTRACTS OF JAPAN vol. 8 no. 280 (M-347) [1717] ,21 December 1984 & JP-A-59 150781 (MATSUSHITA DENKI SANGYO KABUSHIKI KAISHA) 29 August 1984, * abstract *	1,3-6,8,9	
A	US-A-4 502 057 (KAWANO ET AL.) * column 6, line 25 - line 30 *	1-11	
A	PATENT ABSTRACTS OF JAPAN vol. 13 no. 484 (M-886) [3832] ,2 November 1989 & JP-A-01 190480 (NEC NIIGATA LTD) 31 July 1989, * abstract *	1-11	
A	EP-A-0 077 218 (XEROX CORPORATION) * claim 1; figures 4,5 *	1-11	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B41J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 October 1995	Joosting, T

CATEGORY OF CITED DOCUMENTS

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