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Description

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a heat transfer recording apparatus and method for transferring the ink of an ink sheet to a recording medium to thereby record images on the recording medium.

In particular, such a heat transfer recording apparatus may be used in a facsimile apparatus. Furthermore, it may be used in an electronic typewriter, a copying apparatus, a printer apparatus, etc.

Related Background Art

Generally, a heat transfer printer uses an ink sheet having heat-meltable (or heat-sublimating) ink applied to a base film, and selectively heats the ink sheet by a thermal head correspondingly to an image signal and transfers the selectively melted (or sublimated) ink to recording paper to thereby accomplish image recording. Generally, this ink sheet is such that the ink is completely transferred to the recording paper by one time of image recording (so-called one-time sheet) and therefore, after the termination of the recording of one character or one line, it has been necessary to convey the ink sheet by an amount corresponding to the length of the record, and reliably bring an unused portion of the ink sheet to a position to be recorded next. This results to a consumption of ink sheets in a quantity which significantly increases the running costs of such a printer as compared with the running costs of an ordinary thermosensitive printer which effects recordings on thermosensitive paper.

In order to solve this problem, there has been proposed in US-A-4,456,392, JP-A-58-201686 or JP patent 62-58917 a heat transfer printer in which the recording paper and the ink sheet are conveyed with a velocity difference provided therebetween. As described there further, an ink sheet capable of plural (n) times of image recording (so-called multiprint sheet) is used. Thus, when a record length L is to be continuously recorded, recording can be accomplished with the length of conveyance of the ink sheet conveyed after or during each image recording being made smaller than the length L (L/n, with n > l). Thus, the efficiency of the ink sheet becomes n times as great as that before, which leads to a reduction in the running costs of a heat transfer printer. This recording system will hereinafter be called the multiprint system. Further, JP-A-60/48 379 and JP-A 60/48 388 deal with a thermal transfer recording apparatus in which a recording is performed repeatedly, while the ink sheet is stopped.

In the known multiprint system, in spite of recording information being not present at all or the ink sheet being not used n times, the ink sheet is conveyed by l/n of the length of conveyance of the recording paper each time the recording paper is conveyed. This may result in a waste of the ink sheet during the recording of image data having many blank portions, such as facsimile images.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a heat transfer recording apparatus and method which can improve the quality of images and, furthermore, decrease the quantity of ink sheets consumed, thus reduce the running cost.

In this connection it is also an object of the present invention to provide a heat transfer recording apparatus and method in which the number of times of image recording is counted and when the frequency of use of an ink sheet exceeds a predetermined frequency, the conveyance of the ink sheet is effected so that the ink sheet can be more economized.

According to the invention there is provided a thermal transfer recording apparatus and method as defined in claim 1 and claim 4, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram showing the connections of a control unit to a thermal head and a data detecting circuit in a facsimile apparatus according to an embodiment of the present invention.

Figure 2 is a block diagram schematically showing the construction of the facsimile apparatus according to the embodiment.

Figure 3A is a side cross-sectional view showing the mechanism portion of the facsimile apparatus according to the embodiment.

Figure 3B is a pictorial perspective view of the facsimile apparatus.

Figure 4 shows a conveying mechanism system for recording paper and an ink sheet in the recording unit of this embodiment.

Figure 5 is a block diagram schematically showing the construction of the data detecting circuit in this embodiment.

Figure 6 is a flow chart showing the recording process in the facsimile apparatus according to the embodiment.

Figure 7 shows the states of the recording paper and the ink sheet during recording.

Figure 8 is a cross-sectional view of the ink sheet used in this embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The embodiment which will now be described with respect to a specific example is a heat transfer recording apparatus which acts on an ink sheet remaining stopped and effects recording of images on a recording medium and in which the then number of times of image recording is counted to detect whether this number of times of image recording has reached a predetermined number of times and when in this manner, it is detected that the number of times of recording has reached the predetermined number of times with the ink sheet stopped during the recording of an image on the recording medium by recording means, the ink sheet is conveyed by a distance corresponding to the length of image recording. The embodiment is also a facsimile apparatus which acts on an ink sheet remaining stopped and effects recording of images on a recording medium on the basis of an image signal from image input means for inputting the image of an original or from transmitter-receiver means for transmitting and receiving image signals and in which the then number of times of image recording is counted to detect whether the number of times of image recording has reached a predetermined number of times and when in this manner, it is detected that the number of times of recording has reached the predetermined number of times with the ink sheet stopped during the recording of an image on the recording medium, the ink sheet is conveyed by a distance corresponding to the length of image recording.

A preferred embodiment of the present invention will hereinafter be described in detail with reference to the accompanying drawings.

[Description of Facsimile Apparatus (Figs. 1 - 4)]

Figures 1 to 4 show an example in which a heat transfer printer using an embodiment of the present invention is applied to a facsimile apparatus. Figure 1 shows the connections of a control unit to a thermal head and to a data detecting circuit for effecting the zero detection of data, Figure 2 is a block diagram schematically showing the construction of the facsimile apparatus, Figure 3A is a side cross-sectional view of the facsimile apparatus, and Figure 3B is a pictorial perspective view of the facsimile apparatus.

The construction will first be schematically described with reference to Figure 2. In Figure 2, the reference numeral 100 designates a reading unit for photoelectrically reading an original and outputting it as a digital image signal to a control unit 101, and the reading unit 100 is provided with an original conveying motor a CCD image sensor, etc.

The construction of the control unit 101 will now be described. The reference numeral 110 denotes a line memory storing therein the image data of each line of the image data. During the transmission or copying of an original, the image data corresponding to one line from the reading unit 100 is stored in the line memory 110, and during the reception of the image data, data corresponding to one line of the decoded received image data is stored in the line memory 110. The stored data is output to a recording unit, whereby image formation is effected. The reference numeral 111 designates a coding/decoding unit for coding the transmitted image information as by MH coding and decoding the received coded image data and converting it into image data. The reference numeral 112 denotes a buffer memory storing the transmitted or received coded image data therein. These various portions of the control unit 101 are controlled by a CPU 113 such as a microprocessor. Besides this CPU 113, the control unit 101 is provided with ROM 114 storing therein the control program of the CPU 113 and various data, RAM 115 for temporarily preserving various data as the work area of the CPU 113, etc.

The reference numeral 102 designates a recording unit provided with a thermal line head and effecting image recording on recording paper by the heat transfer recording method. The construction of this unit will be described in detail later with reference to Figures 1 and 3. The reference numeral 103 denotes an operation unit including keys for indicating various functions such as starting of transmission, a telephone number input key, etc., and the reference character 103a designates a switch for indicating the kind of the ink sheet 14 used. When it is ON, the switch 103a indicates that an ink sheet for multiprint is loaded, and when it is OFF, the switch 103a indicates that an ordinary one-time ink sheet 14 is loaded. Also, when the ink sheet for multiprint is loaded, the value of the aforementioned n is concretely indicated by the switch 103a in conformity with the performance of the ink sheet. The reference numeral 104 denotes an indicating unit for indicating various functions usually provided in the operation unit 103 and the state of the apparatus. The reference numeral 105 designates a voltage source unit for supplying electric power to the entire apparatus. The reference numeral 106 denotes a modem (modemodulator), the reference numeral 107 designates a net control unit (NCU), and the reference numeral 108 denotes a telephone set.

The construction of the recording unit 102 will now be described in detail with reference to Figure 3. In Figure 3, portions common to those in Figure 2 are designated by similar reference numerals.

In Figure 3, the reference numeral 10 designates a roll of paper comprising recording paper 11 which is plain paper wound in the form of a roll on a core 10a. This roll of paper 10 is rotatably contained in the apparatus so that the recording paper 11 can be supplied to a thermal head 13 by the rotation of a platen roller 12 in the direction of arrow. Denoted by 10b is a roll-of-paper loading portion in which the roll of paper 10 is removably loaded. Further, the platen roller 12 conveys the recording paper 11 in the direction of arrow b and also presses the ink sheet 14 and the recording paper 11 between it and the heat generating member 132 of the thermal head 13. The recording paper 11 on which image recording has been effected by the heat generation of the thermal head 13 is conveyed toward discharge rollers 16a and 16b by further rotation of the platen roller 12, and when image recording by one page is terminated, the recording paper is cut into a page unit by the meshing engagement between cutters 15a and 15b and is discharged.

The reference numeral 17 designates an ink sheet supply roll on which the ink sheet 14 is wound, and the reference numeral 18 denotes an ink sheet take-up roll driven by an ink sheet conveying motor which will be described later to take up the ink sheet 14 in the direction of arrow a. The ink sheet supply roll 17 and the ink sheet take-up roll 18 are removably loaded in an ink sheet loading portion 70 within the apparatus body. Further, the reference numeral 19 designates a sensor for detecting the remaining amount of the ink sheet 14 and detecting the conveyance velocity of the ink sheet 14. The reference numeral 20 denotes an ink sheet sensor for detecting the presence or absence of the ink sheet 14, and the reference numeral 21 designates a spring for urging the thermal head 13 against the platen roller 12 with the recording paper 11 and the ink sheet 14 interposed therebetween. The reference numeral 22 denotes a recording paper sensor for detecting the presence or absence of the recording paper. The reference numeral 72 designates a roller for guiding the ink sheet 14.

The construction of the reading unit 100 will now be described.

In Figure 3, the reference numeral 30 denotes a light source for irradiating an original 32, and the light reflected by the original 32 is input to a CCD sensor 31 through an optical system (mirrors 50 and 51 and a lens 52) and is converted into an electrical signal. The original 32 is conveyed correspondingly to the reading speed for the original 32 by conveying rollers 53, 54, 55 and 56 driven by an original conveying motor, not shown. The reference numeral 57 designates an original supporting table, and a plurality of originals 32 supported on the original supporting table 57 are separated one by one by the cooperation between the conveying roller 54 and a press-separating piece 58 while being guided by a slider 57a, and are conveyed to the reading unit 100 and are discharged onto a tray 77 after they are read.

The reference numeral 41 denotes a control base plate constituting the essential portion of the control unit 101, and various control signals are output from this control base plate 41 to the various portions of the apparatus. The reference numeral 106 designates a modem base plate unit, and the reference numeral 107 denotes an NCU base plate unit.

Further, Figure 4 shows the details of a conveying mechanism for the ink sheet 14 and the recording paper 11.

In Figure 4, the reference numeral 24 designates a recording paper conveying motor for rotatively driving the platen roller 12 to thereby convey the recording paper 11 in the direction of arrow b opposite to the direction of arrow a, and the reference numeral 25 denotes an ink sheet conveying motor for conveying the ink sheet 14 in the direction of arrow a. Further, the reference numerals 26 and 27 designate transmission gears for transmitting the rotation of the recording paper conveying motor 24 to the platen roller 12, and the reference numerals 28 and 29 denote transmission gears for transmitting the rotation of the ink sheet conveying motor 25 to the take-up roll 18.

Figure 1 shows the connections of the control unit 101 in the facsimile apparatus of this embodiment to the data detecting circuit 33 and the thermal head 13 of the recording unit 102, and in Figure 1, portions common to those in the other figures are designated by similar reference numerals.

In this embodiment, the thermal head 13 is a line head. This thermal head 13 is provided with a shift register 130 for inputting serial recording data 41 for one line from the control unit 101 in synchronism with a clock signal 43, a latch circuit 131 for latching the data of the shift register 130 by a latch signal 44, and p heat generating elements 132 comprising a heat generating resistance member for one line. Here, the heat generating resistance member 132 is divided into m blocks designated by 132-l to 132-m and driven.

The reference numeral 133 designates a temperature sensor mounted on the thermal head 13 for detecting the temperature of the thermal head 13. The output signal 42 of this temperature sensor 133 is A/D-converted in the control unit 101 and input to the CPU 113. Thus, the CPU 113 detects the temperature of the thermal head 13 and changes the pulse width of a strobe signal 47 or changes the driving voltage of the thermal head 13,

correspondingly to the detected temperature, thereby changing the applied energy to the thermal head 13 in conformity with the characteristic (the kind) of the ink sheet 14. The characteristic (the kind) of the ink sheet 14 (for example, whether the ink sheet 14 is an ordinary one-time ink sheet or an ink sheet for multiprint capable of many times of recording) is indicated by the aforementioned switch 103a of the operation unit 103. The kind or characteristic of the ink sheet 14 may be automatically discriminated by a mark printed on the ink sheet 14, or a mark, a cut-away or a projection formed on the cassette or cartridge of the ink sheet.

The reference numeral 46 designates a driving circuit for receiving as an input a driving signal for the thermal head 13 from the control unit 101 and outputting the strobe signal 47 for driving the thermal head 13 in each block unit. This driving circuit 46 can change the voltage supplied to a voltage source line 45 for supplying an electric current to the heat generating elements 132 of the thermal head 13, by the instruction from the control unit 101, thereby changing the applied energy to the thermal head 13.

The reference numeral 33 denotes a data detecting circuit, the details of which are shown in Figure 5. The data detecting circuit 33 receives as inputs serial recording data 41 and a shift clock 43 synchronized therewith, and further, number-of-times data and a latch signal 34 which will be described later, and detects the number of times of the data recorded on the ink sheet 14. When image recording is effected n times on the same position on the ink sheet 14, the data detecting circuit 33 outputs a conveyance instructing signal 37 to the control unit 101.

[Description of Data Detecting Circuit (Figs. 1 and 5)]

Figure 5 is a block diagram showing the construction of the data detecting circuit 33 in the present embodiment, and in Figure 5, portions common to those in Figure 1 are designated by similar reference numerals.

The reference numerals 60-l to 60-p designate latch and counting circuits for inputting and latching the serial data 41 output to the thermal head 13 and also counting the number of times of the outputting of each dot. These latch and counting circuits 60-l to 60-p are serially connected together and are similar in construction to one another. The value of this p is equal to the number of the heat generating elements of the heat generating resistance member 132 of the thermal head 13 (the total number of dots). That is, the latch and counting circuits 60 correspond to the respective heat generating elements. In 60-l, there is typically shown the construction of the latch and counting circuits 60-l to 60-p. That construction will be described hereinafter.

The reference numerals 61 and 62 designate D type flip-flops. The flip-flop 61 latches the serial data 41 sent from the control unit 101, in synchronism with a shift clock (CLK) 43. The output of the flip-flop 61 is put out to the flip-flop 62 and also is connected to the data input terminal of the next stage latch and counting circuit. Accordingly, the pulses of p clocks 43 are input with the serial data 41, the image recording data for one line are stored in the flip-flops 61 of the latch and counting circuits 60-l to 60-p.

When a latch signal (LATCH) 34 is then input, the data latched in the flip-flops 61 are stored in the flip-flops 62. This latch signal 34 may be common to a latch signal 44 output to the latch circuit 131 of the thermal head 13.

The reference numeral 63 denotes a down counter, the counted value by which is preset by the counter data 35 and set signal 36 from the control unit 101 and which counts down each time a clock signal from an AND circuit 64 is input. If the latch signal 34 is input when the data of the flip-flop 61 is "1", the AND circuit 64 outputs a clock signal to the counter 63. Thus, the counter 63 is decremented by 1 each time the data "1" is latched in the flip-flop 62.

Accordingly, when for example, "5" is set in the counter 63, if a signal in which the recording data is "1" (a signal for electrically energizing the heat generating resistance member 132) is input to the corresponding latch and counting circuit five times, a zero signal 65 (65-i) indicating that the counter 63 has become "0" is output at a high level. This can be detected by a conveyance instruction signal 37 which is the output signal of an OR circuit 67 assuming a high level. When in this manner, at least one of the plurality of heat generating elements 132 of the thermal head 13 is electrically energized five times and image recording is effected, it means that the ink sheet 14 has been recorded five times at the same position and therefore, the ink sheet 14 is conveyed by a predetermined amount, e.g. an amount corresponding to one line.

[Description of Recording Operation (Figs. 1 - 6)]

Figure 6 is a flow chart showing the image recording process for one page in the facsimile apparatus of the present embodiment, and a control program for executing this process is stored in the ROM 114 of the control unit 101.

This process is started by the image data for one line to be recorded being stored in the line

memory 110 to thereby bring about a state in which the image recording operation can be started. First, at step 51, the number of times n of multiprint is set in the counter 63 of the latch and counting circuit 60. This is accomplished by outputting "n" to the counter data 35 and outputting a set signal 36. At step 52, the recording data 41 for one line is serially output to the shift register 130 in synchronism with the shift clock 43. When the transportation of the recording data for one line is terminated, at step 53, latch signals 44 and 34 are output and the recording data for one line is stored in the latch circuit 131 and also the data is latched in the next stage flip-flop 62 of the latch and counting circuit 60. These latch signals 34 and 44 may be made common to each other.

Next, at step 54, whether a conveyance instruction signal 37 is at a high level is examined, and if the signal 37 is at a low level, advance is made to step S7. When the conveyance instruction signal 37 assumes a high level, it shows that the portion of the ink sheet 14 which has been used for image recording n times is present in the portion of the ink sheet 14 which is currently at the recording position and therefore, at step S5, the ink sheet conveying motor 25 is driven to convey the ink sheet 14 by an amount corresponding to one line in the direction of arrow a (Figure 3). At step S6, n is again set in the counter 63 and advance is made to step S7. At the step S7, the recording paper conveying motor 24 is driven to convey the recording paper 11 by an amount corresponding to one line in the direction of arrow b. This amount corresponding to one line is a length corresponding to the length of one dot recorded by the thermal head 13.

Subsequently, advance is made to step 58, where each block of the heat generating element 132 of the thermal head 13 is electrically energized. Then, at step S9, whether all of the blocks of the heat generating resistance member 132 have been electrically energized is examined, and when all of the blocks of the heat generating element 132 are electrically energized and image recording for one line is terminated, advance is made to step S10, where whether image recording for one page has been terminated is examined. If image recording for one page is not terminated, advance is made to step S11, where the recording data for the next line is transported to the thermal head 13 and return is made to step S3.

When image recording for one page is terminated at the step S10, advance is made to step S12, where the recording paper 11 is conveyed by a predetermined amount toward the discharge rollers 16a and 16b. Then, the cutters 15a and 15b are driven into meshing engagement with each other to thereby cut the recording paper 11 in page unit. Subsequently, the recording paper 11 is returned by a distance corresponding to the spacing between the thermal head 13 and the cutters 15, whereupon the image recording process for one page is terminated.

In the cutter operation of the step S12, the ink sheet 14 may be conveyed in the same manner as the recording paper 11 or may remain stopped.

[Description of the Principle of Recording (Fig. 7)]

Figure 7 shows the states of the recording paper 11 and the ink sheet 14 when image recording is effected in this embodiment.

As shown, the recording paper 11 and the ink sheet 14 are nipped between the platen roller 12 and the thermal head 13, and the thermal head 13 is urged against the platen roller 12 with a predetermined pressure by the spring 21. Here, the recording paper 11 is conveyed at a velocity V_P in the direction of arrow b by the rotation of the platen roller 12. On the other hand, the ink sheet 14 is conveyed in the direction of arrow a by the rotation of the ink sheet conveying motor 25.

When the heat generating resistance member 132 of the thermal head 13 is electrically energized and heated by the voltage source unit 105, the portion of the ink sheet 14 which is indicated by hatching 81 is heated. The reference character 14a designates the base film of the ink sheet 14, and the reference character 14b denotes the ink layer of the ink sheet 14. The ink of the ink layer 81 heated by the heat generating resistance member 132 being electrically energized is melted (sublimated), and the portion thereof which is designated by 82 is transferred to the recording paper 11. This transferred ink layer portion 82 corresponds to approximately 1/n of the ink layer indicated by 81.

[Description of Ink Sheet (Fig. 8)]

Figure 8 is a cross-sectional view of the ink sheet used in the multiprint of the present embodiment, and the ink sheet is constructed of four layers.

First, a second layer is a base film which provides a support for the ink sheet 14. In the case of multiprint, heat energy is applied to the same portion many times and therefore, aromatic polyamide film or condenser paper having a high heat resistance is advantageous, but conventional polyester film will also stand use. The smallest possible thickness of these is advantageous in respect of the quality of printing from the viewpoint of the role as a medium, and a thickness of 3 - 8 μm is desirable from the viewpoint of strength.

A third layer is an ink layer containing an amount of ink capable of being transferred n times to the recording paper (recording sheet). The chief components of this layer are resin such as EVA as an adhesive agent, carbon black or nigrosive dye for coloring, and carnauba wax or paraffin wax as a binding material, and these materials are combined so as to stand n times of use in the same portion. The amount of application of these materials is desirably 4 - 8 g/m^2, but can be arbitrarily selected because sensitivity or concentration differs depending on the amount of application.

A fourth layer is a top coating layer for preventing the ink of the third layer from being pressure-transferred to the recording paper in the portion thereof which is not to be printed, and is composed of transparent wax or the like. Thus, it is only the transparent fourth layer that is pressure-transferred, and the ground of the recording paper can be prevented from being stained. A first layer is a heat resisting coat layer for protecting the base film which is the second layer from the heat of the thermal head 13. This is suitable for multiprint in which heat energy for n lines may be applied to the same portion (when black information is continuous), but whether it is to be used or not to be used can be suitably chosen. Also, it is effective for a base film of relatively low heat resistance such as a polyester film.

The construction of the ink sheet 14 is not limited to this embodiment, but the ink sheet 14 may comprise, for example, a base layer and a porous ink retaining layer provided on one side of the base layer and containing ink therein, or may comprise a base film and a heat resisting ink layer having a fine porous net-like structure and provided on the base film, the ink layer containing ink therein. The material of the base film may be, for example, a film comprising polyamide, polyethylene, polyester, polyvinyl chloride, triacetyl cellulose, nylon or the like, or paper. Further, the heat resisting coat layer is not always necessary, but the material thereof may be, for example, silicone resin, epoxy resin, fluorine resin, etholocellulose or the like.

Also, as an example of the ink sheet having heat-sublimating ink mention may be made of an ink sheet comprising a base material formed of polyethylene terephthalate, polyethylene naphthalate, aromatic polyamide film or the like, and a coloring material layer containing spacer particles and a dye formed by guanamin resin and fluorine resin, said coloring material layer being provided on said base material.

The heating system is not limited to the aforedescribed thermal head system using a thermal head, but use may be made, for example, of the electrical energizing system or the laser transfer system.

Also, the recording medium is not limited to the recording paper, but for example, cloth, a plastic sheet or the like may be mentioned if they are capable of ink transfer. The ink sheet is not limited to the roll construction shown in the embodiment, but may be, for example, of the so-called ink sheet cassette type in which ink sheets are contained in a housing removably mountable with respect to the recording apparatus body and this housing is bodily mounted and dismounted with respect to the recording apparatus body.

Also, this embodiment has been described with respect to the case of the full line type, whereas this is not restrictive, but the so-called serial type may be adopted.

Also, this embodiment has been described with respect to a case where image recording is effected with the recording paper and the ink sheet being conveyed in opposite directions, whereas this is not restrictive, but recording may be effected with the recording paper and the ink sheet being conveyed in the same direction.

According to this embodiment, as described above, the ink sheet is conveyed only when the frequency of use of the ink sheet has reached a predetermined frequency and therefore, the waste of the ink sheet can be eliminated and the ink sheet can be efficiently used.

Also, this embodiment has been described with respect to a case where the present invention is applied to a facsimile apparatus, whereas of course, this is not restrictive, but the heat transfer recording apparatus of the present invention is also applicable, for example, to a word processor, a typewriter or a copying apparatus.

According to the present invention, as described above, the number of times of image recording is counted and when the frequency of use of the ink sheet exceeds a predetermined value, the conveyance of the ink sheet is effected, whereby the amount of the ink sheet used can be economized.

Claims

1. A thermal transfer recording apparatus for transferring ink from an ink sheet to a recording sheet having a recordable width so as to record an image thereon, said apparatus comprising:

- a thermal head having a plurality of heat generating elements disposed along said recordable width of said recording sheet,
- an ink sheet mounting section for mounting a multi-print ink sheet having said ink in an amount sufficient to permit recording a multiprint number of times on said

recording sheet,
- an input means for inputting said multiprint number of times that said ink sheet will be used for recording,
- a recording sheet conveying means for conveying a recording sheet,
- a measuring means for measuring a drive number representing a number of times each said heat generating element for recording has been driven to effect recording while said ink sheet is stopped,
- a determining means for determining whether said drive number of at least one said heat generating element is equal to said multiprint number inputted by said input means as measured by said measuring means, and
- an ink sheet conveying means for conveying said ink sheet by a length corresponding to a length of one line in a direction opposite to a conveyance direction of said recording sheet in a recording area when said determining means determines that for at least one said heat generating element said drive number is the same as said multiprint number.

2. Apparatus according to claim 1, wherein the speed of conveyance of the ink sheet is less than that of the recording medium.

3. Apparatus according to claim 1 or 2, wherein the ink of said ink sheet is heat-meltable or heat-sublimating.

4. A thermal transfer recording method for transferring ink from an ink sheet by means of a thermal head to a recording sheet having a recordable width so as to record an image thereon, the ink sheet and the recording sheet being conveyably past the thermal head, the latter having a plurality of heat generating elements disposed along the recordable width and the ink sheet being a multi-print ink sheet having ink in an amount sufficient to permit recording a multiprint number of times on the recording sheet, the method comprising:
- storing the multiprint number of times that said ink sheet will be used for recording,
- measuring a drive number representing the number of times each said heat generating element for recording has been driven to effect recording while said ink sheet is stopped,
- determining whether the drive number of at least one heat generating element is equal to the stored multiprint number, and
- conveying the ink sheet by a length corresponding to the length of one recording line in a direction opposite to the conveyance direction of the recording sheet, if for at least one heat generating element said drive number is the same as said multiprint number.

5. A facsimile apparatus comprising a thermal transfer recording apparatus according to anyone of claims 1 to 3.

6. The facsimile apparatus according to claim 5 and for performing the method according to claim 4.

Patentansprüche

1. Thermoübertragungs-Aufzeichnungsgerät zum Übertragen von Tinte auf ein Aufzeichnungsblatt, das eine Aufzeichnungsbreite für die Aufzeichnung eines Bildes hierauf besitzt, wobei das Gerät umfaßt
- einen Thermokopf mit einer Vielzahl Wärmeerzeugungselementen, die längs der Aufzeichnungsbreite des Aufzeichnungsblattes angeordnet sind,
- einen Tintentuch-Befestigungsabschnitt zur Befestigung eines Mehrfachdruck-Tintentuchs, das Tinte in einer genügenden Menge besitzt um Aufzeichnungen in einer Mehrfachdruck-Anzahl auf dem Aufzeichnungsblatt zu ermöglichen,
- eine Eingabeeinrichtung zum Eingeben der Mehrfachdruck-Anzahl, in der das Tintentuch bei der Aufzeichnung benutzt werden wird,
- eine Aufzeichnungsblatt-Fördereinrichtung zum Fördern eines Tintenblattes,
- eine Meßeinrichtung zum Messen der Anzahl Ansteuerungen, die die Anzahl darstellt, in der jedes Wärmeerzeugungselement zur Aufzeichnung angesteuert worden ist, um eine Aufzeichnung zu bewirken, während das Tintentuch angehalten ist,
- eine Bestimmungseinrichtung zum Bestimmen, ob die Ansteuerungsanzahl wenigstens eines Wärmeerzeugungselementes gleich der durch die Eingabeeinrichtung eingegebenen Mehrfachdruckanzahl, gemessen durch die Meßeinrichtung, ist, und
- eine Tintentuchfördereinrichtung zum Fördern des Tintentuchs um eine Länge, die der Länge einer Zeile in der zur

Förderrichtung des Aufzeichnungsblattes entgegengesetzten Richtung in einem Aufzeichnungsgebiet entspricht, wenn die Bestimmungseinrichtung bestimmt, daß für wenigstens ein Wärmeerzeugungselement die Ansteuerungsanzahl der Mehrfachdruckanzahl gleicht.

2. Gerät nach Anspruch 1, bei dem die Fördergeschwindigkeit des Tintentuchs kleiner ist als die des Aufzeichnungsmediums.

3. Gerät nach Anspruch 1 oder 2, bei dem die Tinte des Tintentuchs warmschmelzbar oder warmsublimierbar ist.

4. Thermoübertragungs-Aufzeichnungsverfahren zum Übertragen von Tinte eines Tintentuchs mit Hilfe eines Thermokopfes auf ein Aufzeichnungsblatt mit einer Aufzeichnungsbreite für eine Bildaufzeichnung hierauf, wobei Tintentuch und Aufzeichnungsblatt am Thermokopf vorbeigefördert werden können, der letztere eine Vielzahl Wärmeerzeugungselemente, die längs der Aufzeichnungsbreite angeordnet sind, besitzt und das Tintentuch ein Mehrfachdruck-Tintentuch ist das Tinte in einer ausreichenden Menge enthält, um Aufzeichnungen in einer Mehrfachdruck-Anzahl auf dem Aufzeichnungsblatt zu ermöglichen,
wobei das Verfahren umfaßt

- Speichern der Mehrfachdruckanzahl, in der das Tintentuch für Aufzeichnungen benutzt werden wird,
- Messen einer Ansteuerungsanzahl, die die Anzahl repräsentiert, in der jedes Wärmeerzeugungselement für eine Aufzeichnung angesteuert worden ist, um eine Aufzeichnung zu bewirken, während das Tintentuch angehalten wird,
- Bestimmen, ob die Ansteuerungsanzahl wenigstens eines Wärmeerzeugungselements der gespeicherten Mehrfachdruckanzahl gleicht, und
- Fördern des Tintentuchs um eine Länge entsprechend der Länge einer Aufzeichnungszeile in der zur Förderrichtung des Aufzeichnungsblattes entgegengesetzten Richtung, wenn für wenigstens ein Wärmeerzeugungselement die Ansteuerungsanzahl der Mehrfachdruckanzahl gleicht.

5. Faksimilegerät, umfassend ein Thermoübertragungsaufzeichnungsgerät nach einem der Ansprüche 1 bis 3.

6. Faksimilegerät nach Anspruch 5, sowie zur Durchführung des Verfahrens nach Anspruch 4.

Revendications

1. Appareil d'enregistrement par transfert thermique destiné à transférer de l'encre d'une feuille encreuse à une feuille d'enregistrement ayant une largeur enregistrable afin d'enregistrer une image sur cette feuille, ledit appareil comportant :

- une tête thermique ayant plusieurs éléments de génération de chaleur disposés le long de ladite largeur enregistrable de ladite feuille d'enregistrement,
- une section de montage d'une feuille encreuse pour le montage d'une feuille encreuse pour impressions multiples ayant ladite encre en quantité suffisante pour permettre un enregistrement d'un nombre d'impressions multiples sur ladite feuille d'enregistrement,
- un moyen d'entrée pour introduire ledit nombre d'impressions multiples que ladite feuille encreuse utilisera pour l'enregistrement,
- un moyen de transport de feuille d'enregistrement destiné à transporter une feuille d'enregistrement,
- un moyen de mesure destiné à mesurer un nombre de commandes représentant le nombre de fois que chacun desdits éléments de génération de chaleur pour un enregistrement a été commandé pour effectuer l'enregistrement alors que ladite feuille encreuse est arrêtée,
- un moyen de détermination destiné à déterminer si ledit nombre de commandes d'au moins l'un desdits éléments de génération de chaleur est égal audit nombre d'impressions multiples introduit par ledit moyen d'entrée, tel que mesuré par ledit moyen de mesure, et
- un moyen de transport de feuille encreuse destiné à transporter ladite feuille encreuse sur une longueur correspondant à la longueur d'une ligne dans un sens opposé à un sens de transport de ladite feuille d'enregistrement dans une zone d'enregistrement lorsque ledit moyen de détermination détermine que, pour au moins l'un desdits éléments de génération de chaleur, ledit nombre de commandes est égal audit nombre d'impressions multiples.

2. Appareil selon la revendication 1,
dans lequel la vitesse de transport de la feuille encreuse est inférieure à celle du support d'enregistrement.

3. Appareil selon la revendication 1 ou 2,
dans lequel l'encre de ladite feuille encreuse peut fondre sous l'effet de la chaleur ou se subblimer sous l'effet de la chaleur.

4. Procédé d'enregitrement par transfert thermique destiné à transférer une encre d'une feuille encreuse, au moyen d'une tête thermique, à une feuille d'enregistrement ayant une largeur enregistrable de façon à enregistrer une image sur cette feuille, la feuille encreuse et la feuille d'enregistrement pouvant être transportées devant la tête thermique, cette dernière ayant plusieurs éléments de génération de chaleur disposés le long de la largeur enregistrable et la feuille encreuse étant une feuille encreuse pour impressions multiples ayant de l'encre en quantité suffisante pour permettre un enregistrement d'un nombre d'impressions multiples sur la feuille d'enregistrement, le procédé comprenant les étapes qui consistent :
- à mémoriser le nombre d'impressions multiples que ladite feuille enregistreuse utilisera pour l'enregistrement,
- à mesurer un nombre de commandes représentant le nombre de fois que chacun desdits éléments de génération de chaleur pour un enregistrement a été commandé afin d'effectuer un enregistrement tandis que ladite feuille encreuse est arrêtée,
- à déterminer si le nombre de commandes d'au moins un élément de génération de chaleur est égal au nombre mémorisé d'impressions multiples, et
- à transporter la feuille encreuse sur une longueur correspondant à la longueur d'une ligne d'enregistrement dans un sens opposé au sens de transport de la feuille d'enregistrement si, pour au moins un élément de génération de chaleur, ledit nombre de commandes est égal audit nombre d'impressions multiples.

5. Appareil de télécopie comportant un appareil d'enregistrement par transfert thermique selon l'une quelconque des revendications 1 à 3.

6. Appareil de télécopie selon la revendication 5 et pour la mise en oeuvre du procédé selon la revendication 4.

FIG. 1

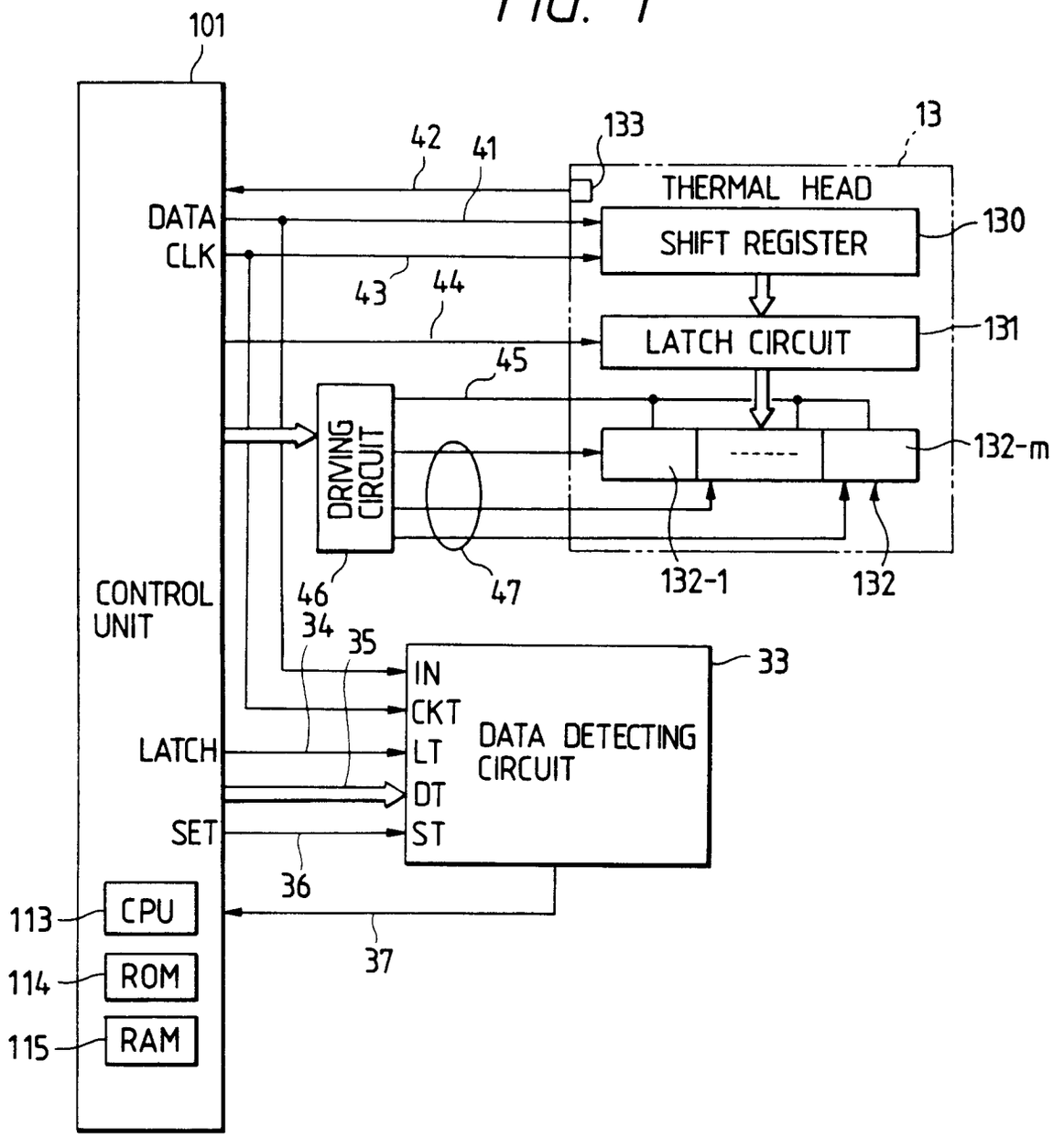

101
13
133
42
41
THERMAL HEAD
DATA
CLK
SHIFT REGISTER
130
43
44
LATCH CIRCUIT
131
45
DRIVING CIRCUIT
132-m
CONTROL UNIT
46
47
132-1
132
34
35
33
IN
CKT
LT
DT
ST
DATA DETECTING CIRCUIT
LATCH
SET
36
113
CPU
37
114
ROM
115
RAM

FIG. 2

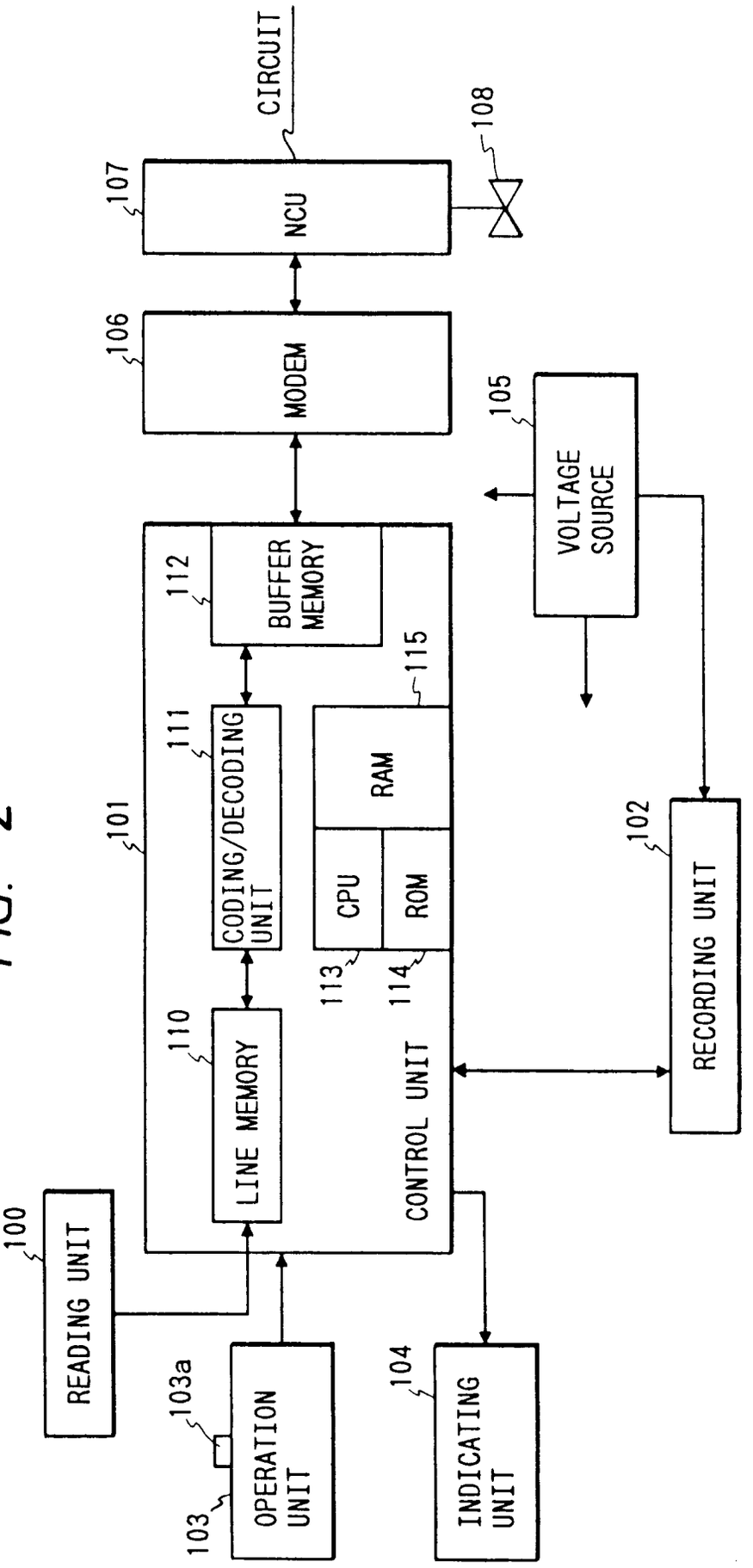

CIRCUIT
108
107
NCU
106
MODEM
105
VOLTAGE SOURCE
112
BUFFER MEMORY
111
CODING/DECODING UNIT
115
RAM
CPU
ROM
113
114
101
110
LINE MEMORY
CONTROL UNIT
102
RECORDING UNIT
100
READING UNIT
103a
OPERATION UNIT
103
104
INDICATING UNIT

FIG. 3A

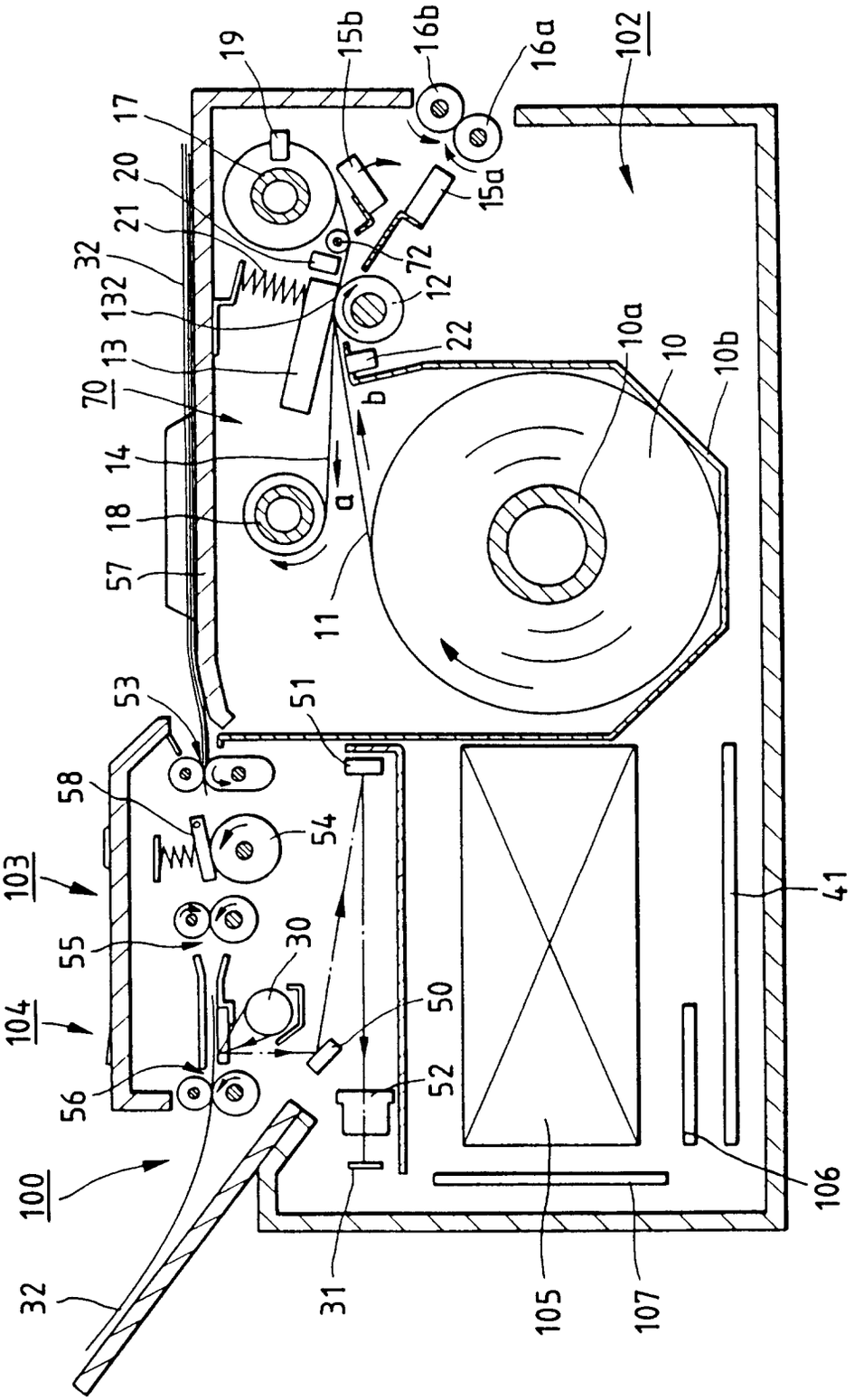

19
15b
16b
16a
102
17
20
21
32
132
13
70
14
18
57
72
12
22
10a
10
10b
a
b
11
53
51
58
54
103
55
30
104
56
50
52
100
32
31
105
107
106
41

FIG. 3B

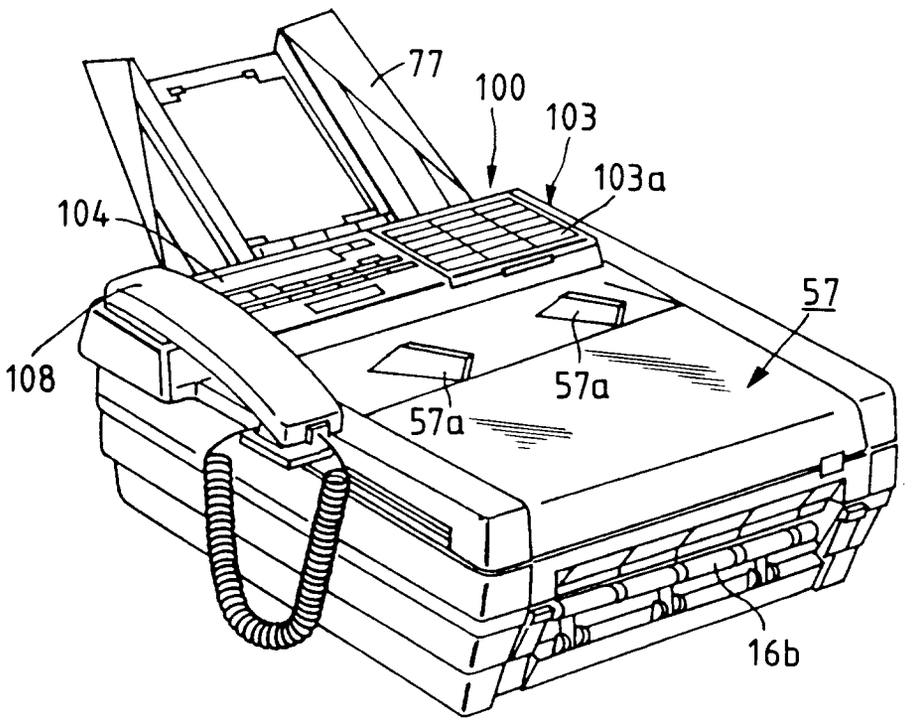

77
100
103
103a
104
57
108
57a
57a
16b

FIG. 4

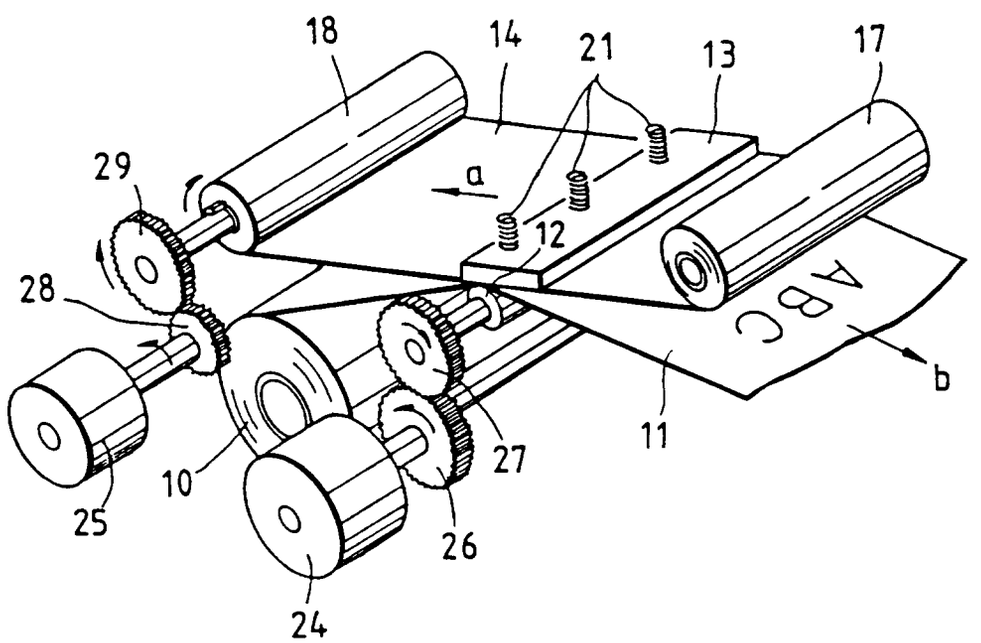

18
14
21
13
17
29
a
12
28
ABC
b
11
10
27
25
26
24

FIG. 5

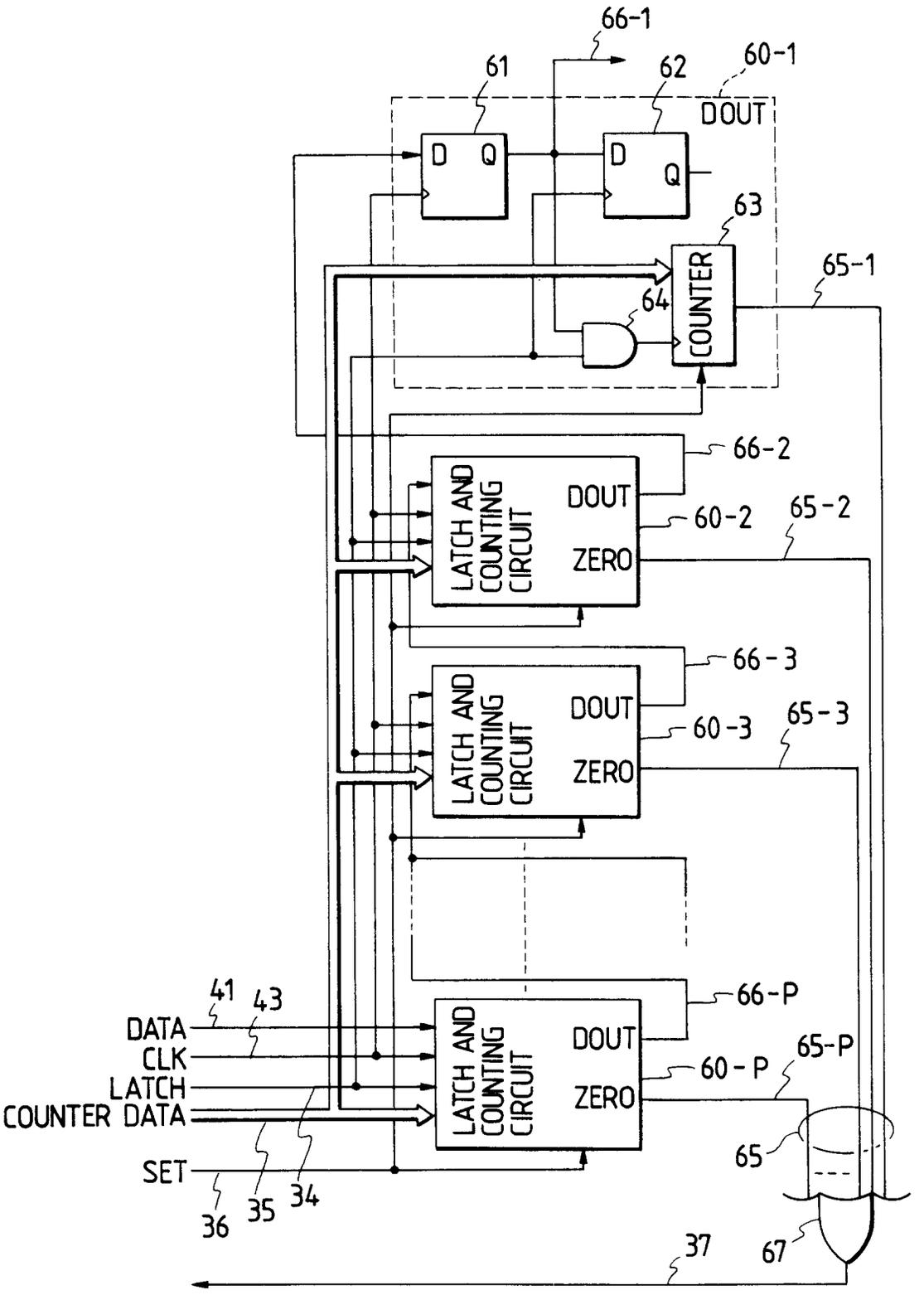

66-1
61
62
60-1
DOUT
D Q
D Q
63
65-1
64
COUNTER
66-2
LATCH AND COUNTING CIRCUIT
DOUT
ZERO
60-2
65-2
66-3
LATCH AND COUNTING CIRCUIT
DOUT
ZERO
60-3
65-3
66-P
LATCH AND COUNTING CIRCUIT
DOUT
ZERO
60-P
65-P
65
67
37
41
43
DATA
CLK
LATCH
COUNTER DATA
SET
36
35
34

FIG. 6

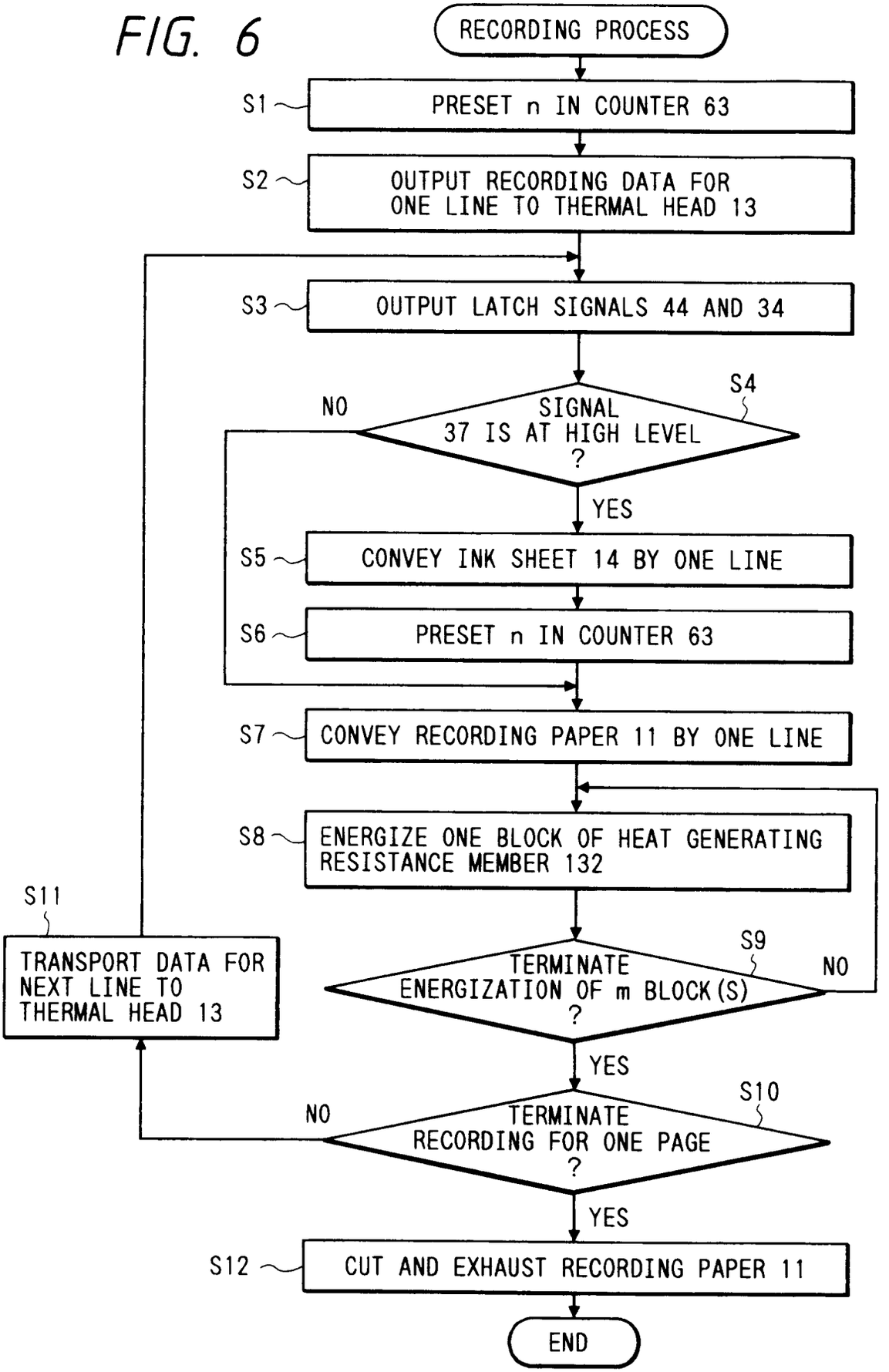

RECORDING PROCESS
S1
PRESET n IN COUNTER 63
S2
OUTPUT RECORDING DATA FOR ONE LINE TO THERMAL HEAD 13
S3
OUTPUT LATCH SIGNALS 44 AND 34
S4
SIGNAL 37 IS AT HIGH LEVEL ?
NO
YES
S5
CONVEY INK SHEET 14 BY ONE LINE
S6
PRESET n IN COUNTER 63
S7
CONVEY RECORDING PAPER 11 BY ONE LINE
S8
ENERGIZE ONE BLOCK OF HEAT GENERATING RESISTANCE MEMBER 132
S9
TERMINATE ENERGIZATION OF m BLOCK(S) ?
NO
YES
S10
TERMINATE RECORDING FOR ONE PAGE ?
NO
YES
S11
TRANSPORT DATA FOR NEXT LINE TO THERMAL HEAD 13
S12
CUT AND EXHAUST RECORDING PAPER 11
END

FIG. 7

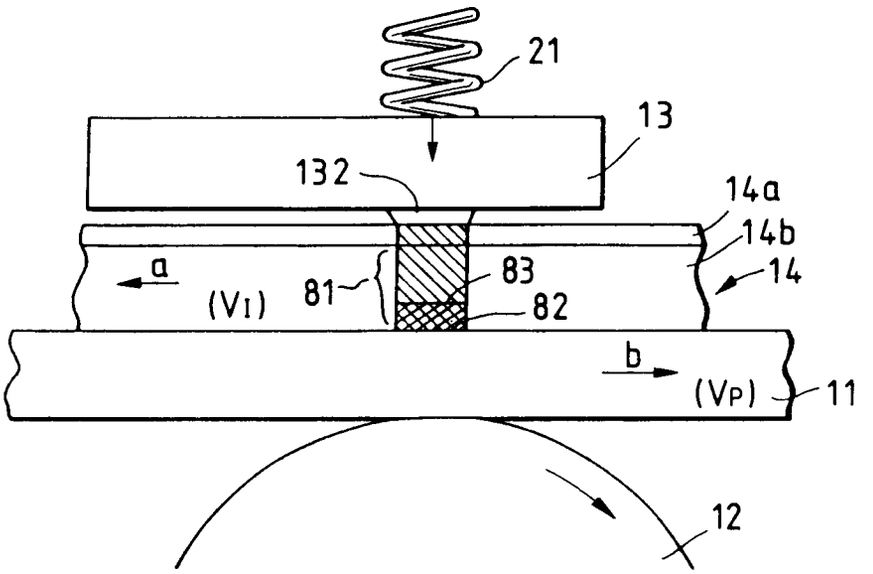
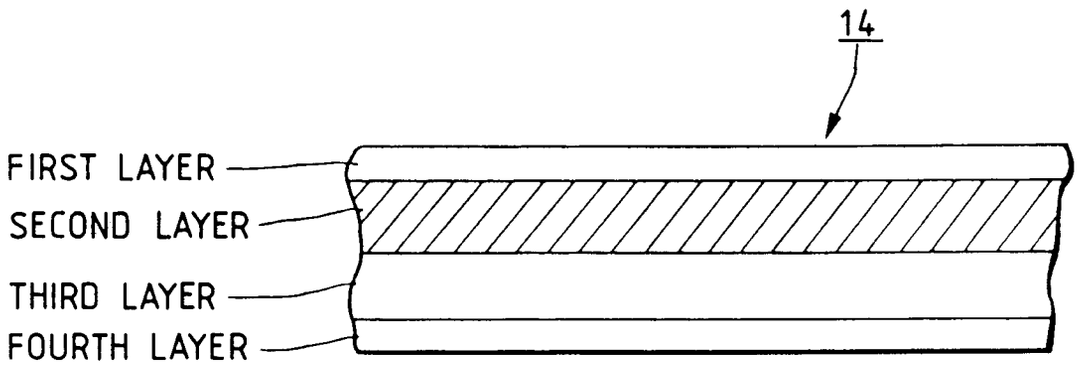

21
13
132
14a
14b
14
a
(VI)
81
83
82
b
(VP)
11
12

FIG. 8


14
FIRST LAYER
SECOND LAYER
THIRD LAYER
FOURTH LAYER