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54 TITULO RESISTOR TERMOSENSOR PARA UN COMPONENTE REEMPLAZABLE DE IMPRESORA

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74 APODERADO RAMIRO CASTRO DUQUE

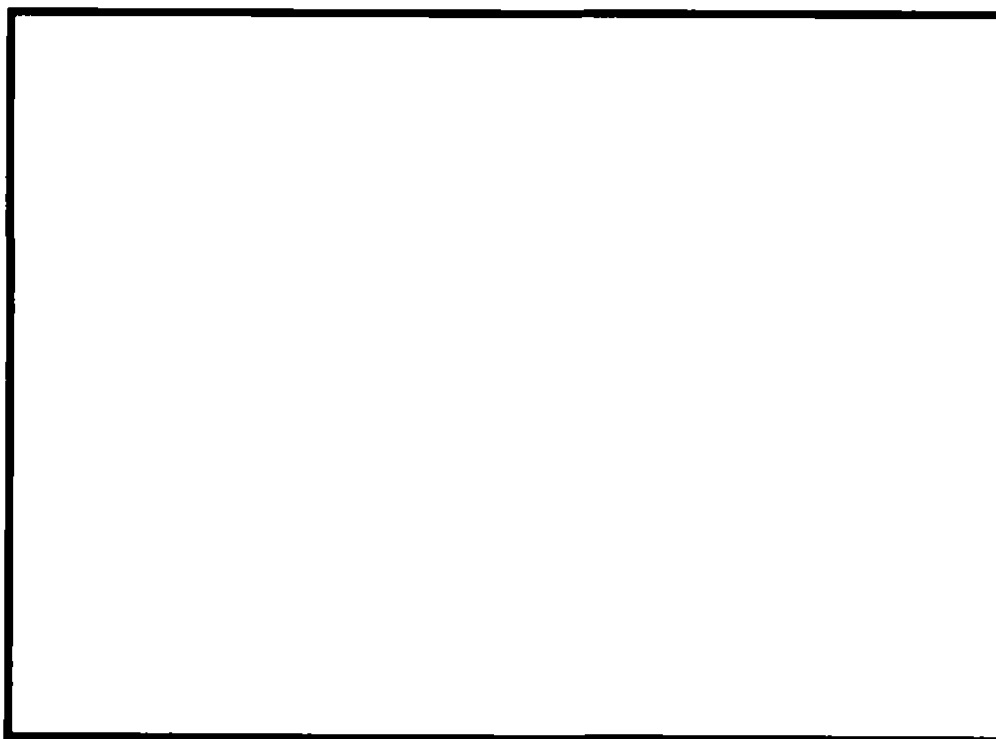
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ANEXOS

- ☒ Comprobante de pago de la tasa de presentación de la solicitud. \$422.000
- ☐ Documento que acredite la existencia y representación legal cuando el solicitante sea persona jurídica.
- ☐ Poderes, si fuere el caso.
- ☐ Documento de cesión del inventor al solicitante o a su causante.
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- ☒ Copia de la solicitud internacional. (Resumen, descripción, reivindicaciones, dibujos)
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- ☒ Otros Tarjeta de propietarios.

11 FIGURA CARACTERÍSTICA:



12 Solicito la concesión de la patente

NOMBRE: RAMIRO CASTRO DUQUE

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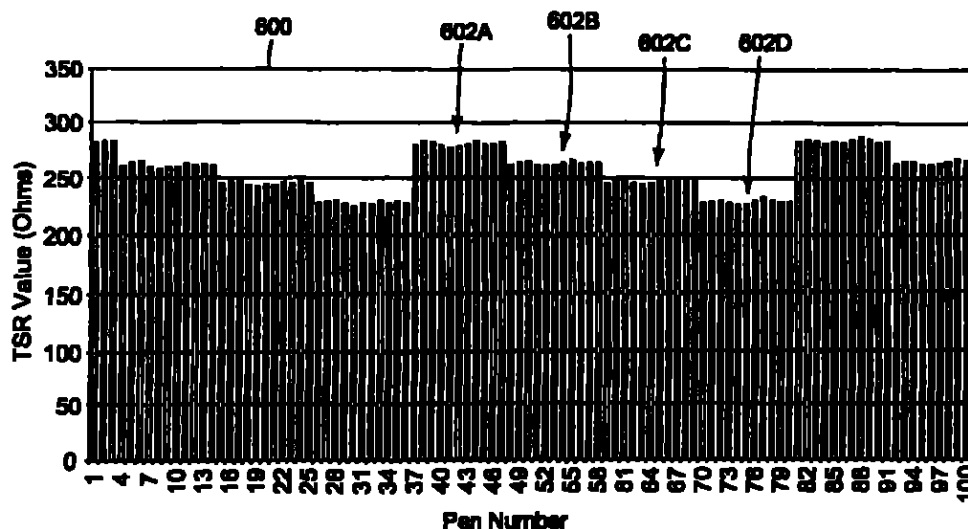
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- (71) Applicant (for all designated States except US): **HEWLETT-PACKARD COMPANY** [US/US]; Intellectual Property Administration, P.O. Box 273400, M/S 35, Fort Collins, CO 80527-2400 (US).
- (72) Inventor: and
- (73) Inventor/Applicant (for US only): **DODD, Simon** [GB/US]; 216 N.H. Plymouth Circle, Corvallis, OR 97330 (US).
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(54) Title: VARIABLE THERMAL SENSE RESISTOR FOR A REPLACEABLE PRINTER COMPONENT



(57) Abstract: A replaceable printer component (14) includes a thermal sense resistor (14B) having a first resistance. A resistance modifier (510) coupled to the thermal sense resistor modifies the first resistance. A memory (16A) stores a resistance value representing a magnitude of the modified first resistance.

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THERMAL SENSE RESISTOR FOR A REPLACEABLE PRINTER COMPONENT

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The Field of the Invention

The present invention relates to printers. More particularly, the invention relates to a variable thermal sense resistor for a replaceable printer component.

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Background of the Invention

The art of inkjet technology is relatively well developed. Commercial products such as computer printers, graphics plotters, and facsimile machines have been implemented with inkjet technology for producing printed media. Generally, an inkjet image is formed pursuant to precise placement on a print medium of ink drops emitted by an ink drop generating device known as an inkjet printhead assembly. An inkjet printhead assembly includes at least one printhead. Typically, an inkjet printhead assembly is supported on a movable carriage that traverses over the surface of the print medium and is controlled to eject drops of ink at appropriate times pursuant to command of a microcomputer or other controller, wherein the timing of the application of the ink drops is intended to correspond to a pattern of pixels of the image being printed.

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Inkjet printers have at least one ink supply. An ink supply includes an ink container having an ink reservoir. The ink supply can be housed together with the inkjet printhead assembly in an inkjet cartridge or pen, or can be housed separately. When the ink supply is housed separately from the inkjet printhead assembly, users can replace the ink supply without replacing the inkjet printhead assembly. The inkjet printhead assembly is then replaced at or near the end of the printhead life, and not when the ink supply is replaced.

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Current printer systems typically include one or more replaceable printer components, including inkjet cartridges, inkjet printhead assemblies, and ink supplies. Some existing systems provide these replaceable printer components

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with on-board memory to communicate information to a printer about the replaceable component. The on-board memory, for an inkjet cartridge for example, typically stores information such as manufacture date (to ensure that excessively old ink does not damage the printhead,) ink color (to prevent
5 misinstallation,) and product identifying codes (to ensure that incompatible or inferior source ink does not enter and damage other printer parts.). Such a memory may also store other information about the ink container, such as ink level information. The ink level information can be transmitted to the printer to indicate the amount of ink remaining. A user can observe the ink level
10 information and anticipate the need for replacing a depleted ink container.

Some replaceable printer components, such as some inkjet printhead assemblies, include a thermal sense resistor (TSR). A purpose of the TSR is to allow a printer to determine the temperature of the printhead assembly. Knowledge of the consistency of the TSR material allows a thermal coefficient
15 of resistance (TCR) to be determined. The printer can determine the temperature of the printhead assembly based on the TCR and a measured resistance of the TSR.

Generally, the printhead assembly heats up in operation. A printer can monitor the TSR and change the printing algorithm to either add or subtract
20 energy, thereby changing the size of the ink drops coming out. In the case of a cold die (e.g., a new cartridge has just been placed in the printer), the printer will recognize that the printhead assembly is cold and will provide extra energy so that the ink drops become a little bigger. As the die heats up, the printer will provide less and less energy. In some systems, the temperature of the printhead
25 assemblies is monitored to prevent overheating. If the temperature reaches a certain threshold, the printer may go into a wait mode, where the printer pauses briefly to allow the printhead assembly to cool down.

In existing printer systems, analog hardware is used to measure the resistance of the TSR at a known temperature to use as a starting point for later
30 temperature determinations. The initial resistance measurement is an analog



measurement, which is not very precise. In addition, the analog measurement hardware is an expensive part of the printer.

It would be desirable to encode and store the TSR resistance at a certain temperature in the replaceable printer component, and thereby eliminate the need
5 for analog measurement hardware and the associated cost. The printer would then be able to use the encoded data along with additional factors to determine the printhead assembly temperature, without performing the initial analog measurement of the TSR resistance.

There are typically a limited number of available bits in a replaceable
10 printer component memory. Additional bits could be implemented if space is available, but additional bits would increase the cost of the replaceable printer component. It would be desirable to "double use" certain bits of the memory, such that bits that represent one type of information are also used to represent encoded TSR information.

For certain types of bits in replaceable printer component memories, such
15 as "pen uniqueness" bits, it is desirable to have a relatively random distribution of bit values, such that the same bit values are not often (if ever) duplicated, and each memory stores a unique value for pen uniqueness. However, if all of the TSRs on a particular wafer are designed to have the same nominal resistance, the
20 bit values representing the measured resistance of the TSRs will cover a relatively narrow range, and will not provide the randomness desired if the bit values are to represent both pen uniqueness and TSR information. It would be desirable to vary the nominal resistance of the TSRs in manufacturing to increase the range of TSR bit values, and thereby provide more randomness or
25 uniqueness for the pen uniqueness values.

Summary of the Invention

One form of the present invention provides a replaceable printer
component including a thermal sense resistor having a first resistance. A
30 resistance modifier coupled to the thermal sense resistor modifies the first

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resistance. In one embodiment, a memory stores a resistance value representing a magnitude of the modified first resistance.

Brief Description of the Drawings

5 Figure 1 is an electrical block diagram of major components of an inkjet printer according to one embodiment of the present invention.

Figure 2 is a diagram of a lookup table illustrating bit values associated with TSR resistance values.

10 Figure 3A is a schematic diagram of a circuit for defining the state of a fusible bit of an inkjet cartridge memory.

Figure 3B is a schematic diagram of a circuit for defining the state of a masked bit of an inkjet cartridge memory.

Figure 4 is a diagram of a table illustrating information stored in an inkjet cartridge memory according to one embodiment of the present invention.

15 Figure 5A is an enlarged top view of a variable length portion of a TSR according to one embodiment of the present invention.

Figure 5B is an enlarged top view of the variable length TSR portion illustrated in Figure 5A with a shorting bar added to vary the nominal TSR resistance.

20 Figure 6 is a bar graph illustrating the measured TSR resistance from a plurality of inkjet printhead assemblies on a single wafer.

Description of the Preferred Embodiments

25 In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present invention. The following detailed description, therefore, is not to be taken in a limiting sense, and the scope of the present
30 invention is defined by the appended claims.

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L INKJET PRINTER

Figure 1 is an electrical block diagram of major components of an inkjet printer according to one embodiment of the present invention. Inkjet printer 10 includes removable inkjet cartridge 12, which includes inkjet printhead assembly 14, memory 16, and ink supply 26. Inkjet cartridge 12 is pluggably removable from printer 10. Inkjet printhead assembly 14 includes at least one printhead 14A, and thermal sense resistor (TSR) 14B. Memory 16 may include multiple forms of memory, including RAM, ROM and EEPROM, and stores data associated with inkjet printhead assembly 14 and ink supply 26. In one embodiment, memory 16 includes factory-written data and printer-recorded data. In one embodiment, memory 16 specifically includes a 26-bit ROM 16A, having 13 "fusible" bits and 13 "masked" bits. In an alternative embodiment, all 26 bits in ROM 16A are fusible bits. With fusible bits, at any point in the product's life, the fusible bits can be blown with the correct equipment. Thus, the use of fusible bits provides a great deal of flexibility. In contrast, masked bits are "hard-coded" bits that are defined during the fabrication process.

Each fusible bit may be set by blowing a resistor in a circuit 300A (shown in Figure 3A) representing the fusible bit. Each masked bit may be set by adding a resistor in a circuit 300B (shown in Figure 3B) representing the masked bit. In one embodiment, ROM 16A is integrated with inkjet printhead assembly 14. In an alternative embodiment, ROM 16A may be integrated with ink supply 26. It will be understood by one of ordinary skill in the art that, rather than incorporating inkjet printhead assembly 14 and ink supply 26 into an inkjet cartridge 12, inkjet printhead assembly 14 and ink supply 26 may be separately housed and may include separate memories.

Printer 10 includes communication lines 20 for communications between inkjet cartridge 12 and controller 34. Communication lines 20 include address lines 20A, first encode enable line 20B, second encode enable line 20C, and output line 20D, which are all connected to ROM 16A in one embodiment. In one form of the invention, address lines 20A include 13 address lines. First encode enable line 20B is used to select fusible bits in ROM 16A, and second

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encode enable line 20C is used to select masked bits in ROM 16A. Address lines 20A are used to select a particular fusible bit or masked bit. The value of a selected fusible or masked bit is read by sensing the output on output line 20D.

Inkjet printhead assembly 14, memory 16, and ink supply 26 are
5 connected to controller 34, which includes both electronics and firmware for the control of the various printer components or sub-assemblies. A print control procedure 35, which may be incorporated in the printer driver, causes the
10 reading of data from memory 16 and adjusts printer operation in accordance with the data accessed from memory 16. Controller 34 controls inkjet printhead
10 assembly 14 and ink supply 26 to cause ink droplets to be ejected in a controlled fashion on print media 32.

A host processor 36 is connected to controller 34, and includes a central processing unit (CPU) 38 and a software printer driver 40. A monitor 41 is
15 connected to host processor 36, and is used to display various messages that are indicative of the state of inkjet printer 10. Alternatively, printer 10 can be
15 configured for stand-alone or networked operation wherein messages are displayed on a front panel of the printer.

II. ENCODING TSR INFORMATION

20 As shown in Figure 1, inkjet printhead assembly 14 includes TSR 14B. In one embodiment, TSR 14B is 0.5 percent copper, and 99.5 percent aluminum. The resistance of TSR 14B is measured during the fabrication process, and then some bits are "blown" in ROM 16A to store an encoded value representing the measured resistance.

25 In one embodiment, the resistance of the TSR 14B on each printhead assembly 14 on a wafer is measured at 32 degrees Celsius. In one form of the invention, 280 printhead assemblies 14 are formed on a single wafer. The measured resistance value is truncated (e.g., 258.9 ohms becomes 258 ohms). The truncated resistance value is then found in resistance-to-encode value
30 lookup table 200, shown in Figure 2.

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Lookup table 200 includes columns 202A and 202B, and a plurality of entries 204. Each entry 204 in lookup table 200 associates a set of bit values (shown in column 202B) with a resistance value (shown in column 202A). Based on the bit values found in column 202B for the measured resistance value, corresponding bits are blown in ROM 16A to store the TSR resistance information. The blown bits in ROM 16A are later tested to ensure that the correct encoded TSR resistance values have been stored. In one form of the invention, to protect against error, if none of the TSR bits are blown (i.e., changed from 0 to 1), the part is rejected at the wafer level. If none of the TSR bits are changed, it indicates that the part was somehow skipped during the bit blowing process, or the bit blowing process did not work correctly for the particular part.

III. ROM CIRCUITS

15 The bit blowing process for ROM 16A varies depending upon whether the bit is a fusible bit or a masked bit. Figure 3A is a schematic diagram of a circuit for defining the state of a fusible bit in ROM 16A. Circuit 300A includes first encode enable input (E_on) 302, output (id_out) 304, address input 306, transistor 308, resistor 310, transistor 312, second encode enable input (E_off) 20 314, transistor 316, and ground (p_gnd) 318. Address input 306 is coupled to one of address lines 20A (shown in Figure 1). First encode enable input 302 is coupled to first encode enable line 20B (shown in Figure 1). Second encode enable input 314 is coupled to second encode enable line 20C (shown in Figure 1). Output 304 is coupled to output line 20D (shown in Figure 1).

25 In one embodiment, each of transistors 308, 312 and 316 is a field effect transistor (FET). Address input 306 is coupled to the drain of transistor 308. First encode enable input 302 is coupled to the gate of transistor 308. The source of transistor 308 is coupled to the gate of transistor 312 and the drain of transistor 316. The gate of transistor 316 is coupled to second encode enable input 314. The drain of transistor 316 is coupled to the source of transistor 308 and the gate of transistor 312. The source of transistor 316 is coupled to ground 30

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318. Resistor 310 is positioned between output 304 and the drain of transistor 312. The source of transistor 312 is coupled to ground 318.

A fusible bit in ROM 16A, such as the bit represented by circuit 300A, is read by setting first encode enable input 302 high, setting address input 306 high, and sensing the signal at output 304. First encode enable input 302 is set high by controller 34 by setting first encode enable line 20B high. Address input 306 is set high by controller 34 by setting the address line 20A coupled to address input 306 high. The output voltage at output 304 is sensed by controller 34 by sensing the voltage on output line 20D.

Transistor 308 acts as an AND gate, with inputs 302 and 306. If inputs 302 and 306 are both high, a current flows through transistor 308, turning on transistor 312. Transistor 312 acts as a drive transistor, driving output 304. If resistor 310 is blown, the voltage at output 304 will be high, indicating a logical 1. If resistor 310 is not blown, the voltage at output 304 will be low, indicating a logical 0. In one embodiment, resistor 310 is blown by driving a large current through resistor 310. Transistor 316 is used as an active pull down to prevent leakage current from transistor 308 from turning on transistor 312 when transistor 312 should be off. Transistor 316 is turned on by setting second encode enable input 314 high. When turned on, transistor 316 diverts current from transistor 308 to ground.

In addition to blowing resistor 310, other methods may be used to create an open circuit to define the state of a bit in ROM 16A, including mechanical cutting, laser cutting, as well as other methods.

Figure 3B is a schematic diagram of a circuit for defining the state of a masked bit in ROM 16A. Circuit 300B is substantially the same as circuit 300A shown in Figure 3A, with the exceptions that resistor 310 is replaced by switch 320, and transistor 322 has a narrow width than transistor 312. In one embodiment, switch 320 is not an actual physical switch, but represents either the presence or absence of a resistor. In one form of the invention, a resistor 320 is added during the fabrication process to provide a logical 1 bit value. If a resistor is present in place of switch 320, the resistor has sufficient resistance to

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act as an open circuit between output 304 and transistor 322. If a resistor is not present in place of switch 320, there is no additional resistance between output 304 and transistor 322.

Address input 306 is coupled to one of address lines 20A (shown in Figure 1). First encode enable input 302 is coupled to second encode enable line 20C (shown in Figure 1). Second encode enable input 314 is coupled to first encode enable line 20B (shown in Figure 1). Output 304 is coupled to output line 20D (shown in Figure 1).

Address input 306 is coupled to the drain of transistor 308. First encode enable input 302 is coupled to the gate of transistor 308. The source of transistor 308 is coupled to the gate of transistor 322 and the drain of transistor 316. The gate of transistor 316 is coupled to second encode enable input 314. The drain of transistor 316 is coupled to the source of transistor 308 and the gate of transistor 322. The source of transistor 316 is coupled to ground 318. Switch 310 is positioned between output 304 and the drain of transistor 322. The source of transistor 322 is coupled to ground 318.

A masked bit in ROM 16A, such as the bit represented by circuit 300B, is read by setting first encode enable input 302 high, setting address input 306 high, and sensing the signal at output 304. First encode enable input 302 is set high by controller 34 by setting second encode enable line 20C high. Address input 306 is set high by controller 34 by setting the address line 20A coupled to address input 306 high. The output voltage at output 304 is sensed by controller 34 by sensing the voltage on output line 20D.

Transistor 308 acts as an AND gate, with inputs 302 and 306. If inputs 302 and 306 are both high, a current flows through transistor 308, turning on transistor 322. Transistor 322 acts as a drive transistor, driving output 304. If switch 310 is open (i.e., resistor present), the voltage at output 304 will be high, indicating a logical 1. If switch 310 is closed (i.e., resistor not present), the voltage at output 304 will be low, indicating a logical 0. Transistor 316 is used as an active pull down to prevent leakage current from transistor 308 from turning on transistor 322 when transistor 322 should be off. Transistor 316 is

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turned on by setting second encode enable input 314 high. When turned on, transistor 316 diverts current from transistor 308 to ground.

IV. ROM CONTENTS

5 Figure 4 is a table illustrating information stored in ROM 16A according to one embodiment of the present invention. Table 400 includes address line identifiers 402, encode enable line identifiers 404, bit type identifiers 406A and 406B (collectively referred to as bit type identifiers 406), bit values 408, and fields 410A-410J (collectively referred to as fields 410). Table 400 is divided
10 into portion 412 and portion 414. Portion 412 of table 400 represents information associated with fusible bits, as indicated by fusible type identifier 406A. Portion 414 of table 400 represents information associated with masked bits, as indicated by masked type identifier 406B. Each one of the address line identifiers 402 represents one of address lines 20A (shown in Figure 1), and
15 corresponds to either a fusible bit or a masked bit. Both the fusible and the masked bits are numbered 1-13, indicating the particular address line 20A associated with the bit. Encode enable line identifiers 404 indicate the encode enable line 20B or 20C that must be set in order to select the corresponding bit. A "1" in encode enable line identifiers 404 corresponds to first encode enable
20 line 20B, which is used to select fusible bits. A "2" in encode enable line identifiers 404 corresponds to second encode enable line 20C, which is used to select masked bits.

Fusible bits 1-13 and masked bits 1-13 are divided into a plurality of fields 410. Each bit in a particular field 410 includes a bit value 408. When a
25 bit is set, it has the value indicated in its corresponding bit value 408. When a bit is not set, it has a value of 0. In one embodiment, fusible bits 1-13 and masked bits 1-13 are set during manufacture of ROM 16A. In an alternative embodiment, fusible bits 1-13 are set post-manufacture of ROM 16A. Also, as mentioned above, ROM 16A includes all fusible bits in an alternative
30 embodiment, so all bits can be set post-manufacture.

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TSR/Pen uniqueness field 410A includes fusible bits 11-13. In one embodiment, fusible bits 11-13 are the most significant 3 bits representing the measured resistance of TSR 14B. As mentioned above, the bits representing the measured resistance of TSR 14B are taken from column 202B of lookup table 200. As will be described further below, the TSR bits are also used to provide pen uniqueness information.

Ink fill field 410B includes fusible bits 9-10. In one embodiment, fusible bits 9-10 provide a reference level or trigger level to determine when a low ink warning should be displayed.

Marketing field 410C includes fusible bits 5-8. In one embodiment, fusible bits 5-8 are used to identify whether an inkjet cartridge can be used in a particular printer.

TSR/Pen uniqueness field 410D includes fusible bits 1-4. In one embodiment, fusible bits 1-4 are the least significant 4 bits representing the measured resistance of TSR 14B. As mentioned above, the bits representing the measured resistance of TSR 14B are taken from column 202B of lookup table 200. As will be described further below, the TSR bits are also used to provide pen uniqueness information.

Pen uniqueness field 410E includes masked bits 12-13. In one embodiment, masked bits 12-13 are the most significant two bits of a random number that is used in conjunction with TSR/Pen uniqueness fields 410A and 410D to provide a pen uniqueness value for inkjet cartridge 12.

Field 410F includes masked bit 11. In one embodiment, masked bit 11 is not used to store data, so field 410F includes the letters "NA" (i.e., not assigned).

Field 410G includes masked bit 10. In one embodiment, masked bit 10 provides nozzle location information.

Field 410H includes masked bit 9. In one embodiment, masked bit 9 is a parity bit used in association with the bits corresponding to pen type field 410I.

Pen type field 410I includes masked bits 5-8. In one embodiment, masked bits 5-8 provide an identification of the type of inkjet cartridge that is associated with ROM 16A.

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Pen uniqueness field 410J includes masked bits 1-4. In one embodiment, masked bits 1-4 are the least significant 4 bits of a random number that is used in conjunction with TSR/Pen uniqueness fields 410A and 410D to provide a pen uniqueness value for inkjet cartridge 12. The pen uniqueness value, comprising
5 fields 410A, 410D, 410E, and 410J, uniquely identifies an inkjet cartridge 12, which allows printer controller 34 to determine when a new inkjet cartridge has been installed. In one embodiment, if the pen uniqueness value of a newly inserted cartridge is different than the last three cartridges inserted, the printer will behave as if a new cartridge has been inserted, and may perform an
10 alignment scheme, an ink level sense reset and energy calibration.

Printer 10 obtains TSR resistance information from fields 410A and 410D in ROM 16A, and can determine the temperature of inkjet printhead assembly 14. Unlike previous printing systems, printer 10 does not have to perform an initial analog measurement of the resistance of TSR 14B. By
15 knowing the thermal coefficient of resistance (TCR), and the resistance of TSR 14B at a certain temperature (which is encoded in fields 410A and 410D in ROM 16A), printer 10 can determine from other factors the temperature of inkjet printhead assembly 14. Printer 10 can also obtain a pen uniqueness value from ROM 16A, which includes the encoded TSR information in fields 410A and
20 410D, as well as a random number from fields 410E and 410J.

In prior printer products, the TSRs have been designed to have the same length for every inkjet printhead assembly die on a wafer, and have been designed to have the same nominal resistance of about 240-250 ohms. To provide a greater degree of randomness to the pen uniqueness values, in one
25 embodiment of the present invention, the range of TSR values in fields 410A and 410D is extended by fabricating TSRs 14B with different nominal resistance values, as described in further detail below.

V. VARIABLE TSR

30 Figure 5A is an enlarged top view of a variable length portion 500 of TSR 14B. In one embodiment, variable length portion 500 is positioned near a

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lower left corner of the inkjet printhead assembly die. In one form of the invention, TSR 14B also includes other portions coupled to variable portion 500 that extend to other regions of the inkjet printhead assembly die.

Variable TSR portion 500 includes serpentine-shaped region 502 having
5 a plurality of transition regions 506 near the top and the bottom of serpentine region 502. In one embodiment, current enters TSR portion 500 through conductor 508, moves up and down through the multiple legs of serpentine region 502, and then exits through conductor 504.

In one form of the invention, the design for TSR portion 500 is included
10 in the die database for inkjet printhead assembly 14. TSR portion 500 is formed using standard fabrication techniques that include depositing a metal layer, and etching the metal layer using an appropriate photomask to generate the serpentine shape 502 shown in Figure 5A.

1 µC -

Figure 5B is an enlarged top view of the variable TSR portion 500 shown
15 in Figure 5A, with a shorting bar or jumper 510 added to vary the resistance of portion 500, and correspondingly, the resistance of the entire TSR 14B. Shorting bar 510 effectively shortens TSR portion 500 by shorting the first few transition regions 506 near the bottom of TSR portion 500, thereby changing the nominal resistance of TSR 14B. So instead of going up and down through the
20 first few legs of serpentine portion 502, most of the current will flow horizontally through shorting bar 510 until the current reaches about halfway across serpentine portion 502, and then the current will start flowing up and down through the remaining legs of serpentine portion 502 and exit through conductor 504.

25 In one embodiment, four different lengths of TSR 14B (and four different nominal resistance values) are provided on a wafer by modifying the length of variable TSR portion 500 with a variable length shorting bar 510. In an alternative embodiment, five different lengths of TSR 14B (and five different nominal resistance values) are provided on a wafer. Other numbers of TSR
30 lengths may be provided in additional alternative embodiments.

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One form of the present invention provides a method of fabricating variable resistance TSRs in inkjet printhead assemblies, without the need to design a unique inkjet printhead assembly die for each desired TSR nominal resistance value. In one embodiment, variable length shorting bars 510 are added in the mask frame instead of the inkjet printhead assembly die. Thus, mask frame data (rather than die data) is used to make minor modifications to the length of the TSRs 14B on a wafer.

One generic inkjet printhead assembly die design is replicated multiple times on a wafer (or multiple wafers). In one form of the invention, there are 280 inkjet printhead assembly die formed on a wafer. A database contains soft copies of the generic die design. The inkjet printhead assembly die is designed once, and the design is put in 280 times into a full wafer photomask. In addition to die data, the photomask also includes frame data. The frame is generally a border around each individual die. The frame data is stored separately from the die data. The frame is relatively large, has only a few features in it, and has spots for 280 die. The frame is populated with 280 copies of the generic inkjet printhead assembly die contained in the die database. The frame includes features for generating variable length shorting bars 510.

In an alternative embodiment, a photomask with four or five die spots is used. So four or five inkjet printhead assembly die would be printed, the photomask would be moved, four or five more die would be printed, and the process would be repeated until 280 die have been generated. Alternatively, the four or five die in the photomask could be inserted into a larger photomask, such as a full wafer photomask. The four or five die in the photomask would be substantially identical, except that the overlaid frame adds shorting bars 510 of varying length to produce TSRs 14B of varying nominal resistance.

Figure 6 is a bar graph 600 illustrating the measured TSR resistance from a plurality of inkjet printhead assemblies 14 on a single wafer. On the horizontal axis, there is a list of pen numbers ranging from 1 to 100, each of which represents one inkjet printhead assembly 14 on a single wafer. In one embodiment, there are up to 280 inkjet printhead assemblies on a wafer, but only

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100 are shown in Figure 6. The vertical axis shows resistance values in ohms for TSRs 14B.

As indicated by graph 600, there are four different lengths of TSRs 14B (and four different nominal resistance values) for the inkjet printhead assemblies 14 on the wafer (which are identified by reference numbers 602A, 602B, 602C, and 602D). Despite being designed for the same nominal resistance, the TSR resistance varies within each one of the four groups 602A, 602B, 602C, and 602D, because of manufacturing tolerances. Thus, in addition to the designed four (or five) nominal resistance differences, there is a range of TSR resistance values within each group 602A, 602B, 602C, and 602D of TSRs 14B. The thickness, line width, and material composition of the TSRs 14B may vary across the wafer. So even though the TSRs 14B are designed for a nominal point, there is a certain range of measurements that will occur in the normal manufacture of these parts.

Within each group 602A, 602B, 602C, or 602D of TSRs 14B, if the truncated resistance value of one TSR 14B varies enough from another TSR 14B (e.g., one ohm or more), the two TSRs 14B will be assigned a different set of TSR bits (which are stored in fields 410A and 410D of ROM 16A. If there is not more than one ohm separation between the truncated resistance values of TSRs 14B, the TSRs 14B will have the same set of seven bits in fields 410A and 410D, but the additional bits in fields 410E and 410J will cause a variation in the pen uniqueness value. Graph 600 also indicates that, if the nominal resistance of the TSRs 14B were not variable, the only variation in fields 410A and 410D would be the relatively minor resistance variation that occurs within a single group 602A, 602B, 602C, or 602D. And the likelihood of getting pen uniqueness values that are the same would go up.

One embodiment of the present invention encodes and stores the TSR resistance at a certain temperature in a replaceable printer component, and thereby eliminates the need for analog measurement hardware and the associated cost. Printer 10 is, therefore, able to use the encoded data along with additional factors to determine the temperature of printhead assembly 14, without

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performing the previously required initial analog measurement of the TSR resistance.

Embodiments of the present invention also address the problem of the limited number of bits that are typically available in a replaceable printer component memory by double using certain bits, and thereby avoid the additional cost for adding more bits. In one embodiment, bits that represent one type of information (e.g., pen uniqueness information) are also used to represent encoded TSR information. Also, in embodiments of the present invention, the nominal resistance of the TSRs is varied in manufacturing to increase the range of TSR bit values, and thereby provide more randomness or uniqueness for the pen uniqueness values.

Although specific embodiments have been illustrated and described herein for purposes of description of the preferred embodiment, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent implementations may be substituted for the specific embodiments shown and described without departing from the scope of the present invention. Those with skill in the chemical, mechanical, electro-mechanical, electrical, and computer arts will readily appreciate that the present invention may be implemented in a very wide variety of embodiments. This application is intended to cover any adaptations or variations of the preferred embodiments discussed herein. Therefore, it is manifestly intended that this invention be limited only by the claims and the equivalents thereof.

WHAT IS CLAIMED IS:

1. A replaceable printer component (14) comprising:
a thermal sense resistor (14B) having a first resistance; and
a resistance modifier (510) coupled to the thermal sense resistor for
modifying the first resistance.
2. The replaceable printer component of claim 1, and further comprising:
a memory (16A) for storing a resistance value representing a magnitude
of the modified first resistance.
3. The replaceable printer component of claim 2, wherein the memory is a
ROM.
4. The replaceable printer component of claim 2, wherein the stored
resistance value also represents at least a portion of a second type of component
information.
5. The replaceable printer component of claim 1, wherein the resistance
modifier is a conductor for shorting a portion of the thermal sense resistor.
6. A method of forming a plurality of replaceable printer components (14)
with thermal sense resistors (14B) having varying nominal resistance values, the
method comprising:
providing a wafer;
forming the plurality of replaceable printer components on the wafer, the
plurality of replaceable printer components each including a thermal sense
resistor, each thermal sense resistor having substantially the same nominal
resistance; and
forming a plurality of resistance modifiers (510) on the wafer, the
plurality of resistance modifiers configured to modify the nominal resistance of

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the plurality of thermal sense resistors, thereby forming thermal sense resistors having varying nominal resistance values.

7. The method of claim 6, and further comprising:
 - providing a plurality of memories (16A), each memory associated with one of the plurality of replaceable printer components;
 - measuring the resistance of each of the thermal sense resistors; and
 - storing a resistance value in each of the plurality of memories, the resistance value in each memory representing a magnitude of the measured resistance of the thermal sense resistor associated with the memory.
8. The method of claim 6, wherein each of the plurality of replaceable printer components is formed based on a single set of generic die data.
9. The method of claim 8, wherein each of the plurality of resistance modifiers is formed based on mask frame data.
10. A printing system comprising:
 - an inkjet printhead assembly (14) including at least one inkjet printhead (14A) for selectively depositing ink drops on print media (32);
 - an ink supply (26) for storing ink to be provided to the at least one inkjet printhead;
 - a thermal sense resistor (14B) having a first resistance;
 - a resistance modifier (510) coupled to the thermal sense resistor for modifying the first resistance;
 - a memory device (16A) for storing a resistance value representing a magnitude of the modified first resistance; and
 - a controller (34) coupled to the memory device and responsive to output of the memory device, the controller configured to determine a temperature of a component within the printing system based at least in part on the stored resistance value.

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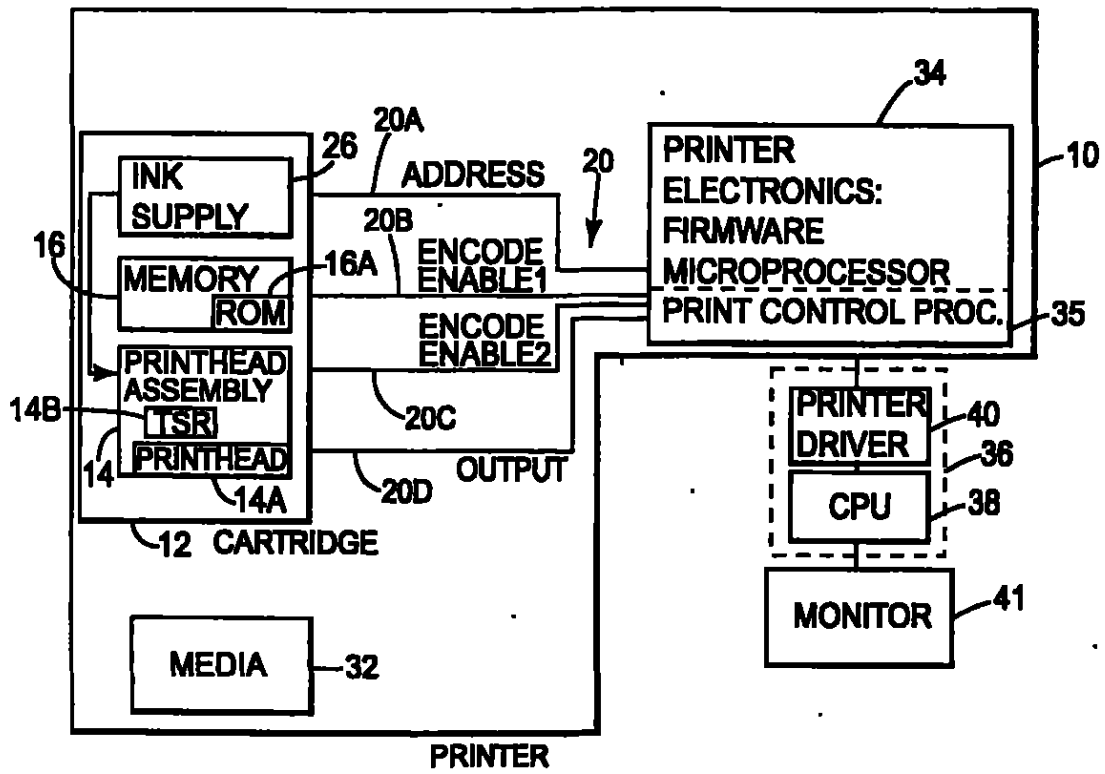


Fig. 1

25
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200

202A

202B

204

Thermal Sense Resistance(Ohms)	Bit Values
not blown	0000000
178	0000001
179	0000010
180	0000011
181	0000100
182	0000101
183	0000110
184	0000111
185	0001000
Etc...	Etc...

Fig. 2

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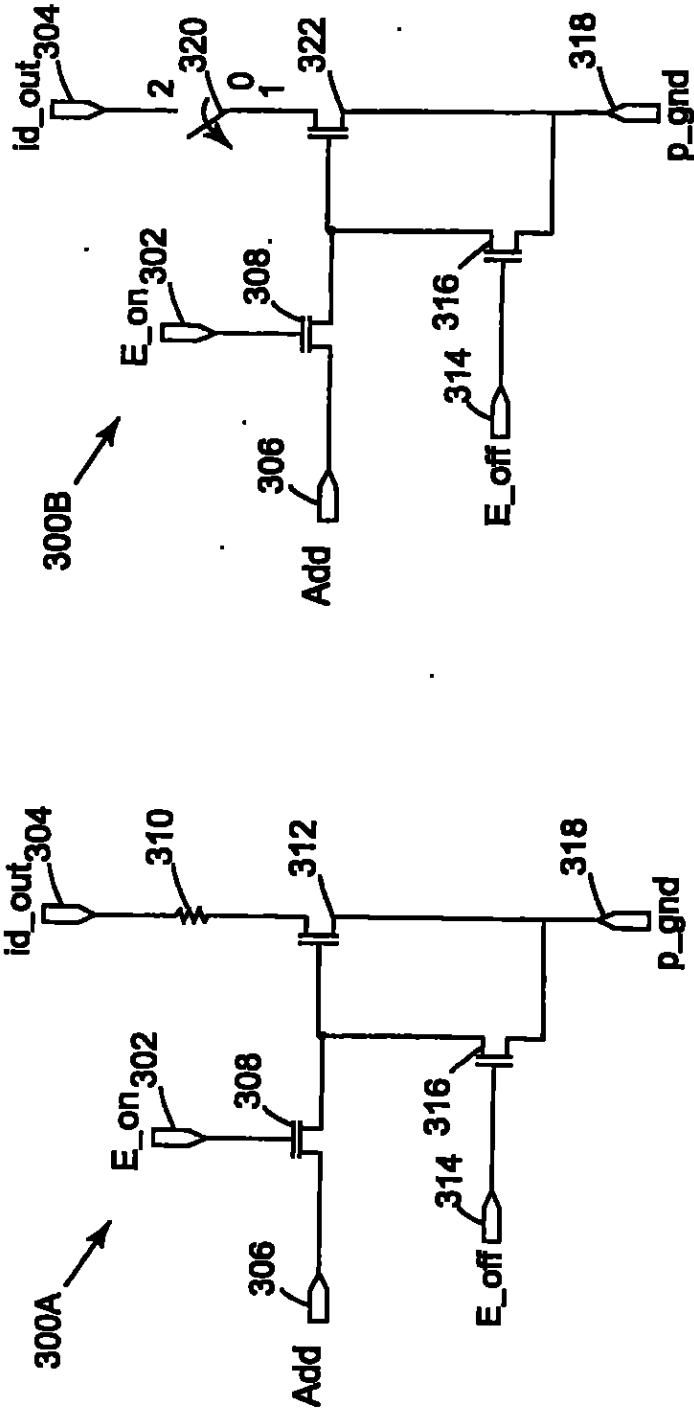


Fig. 3B

Fig. 3A

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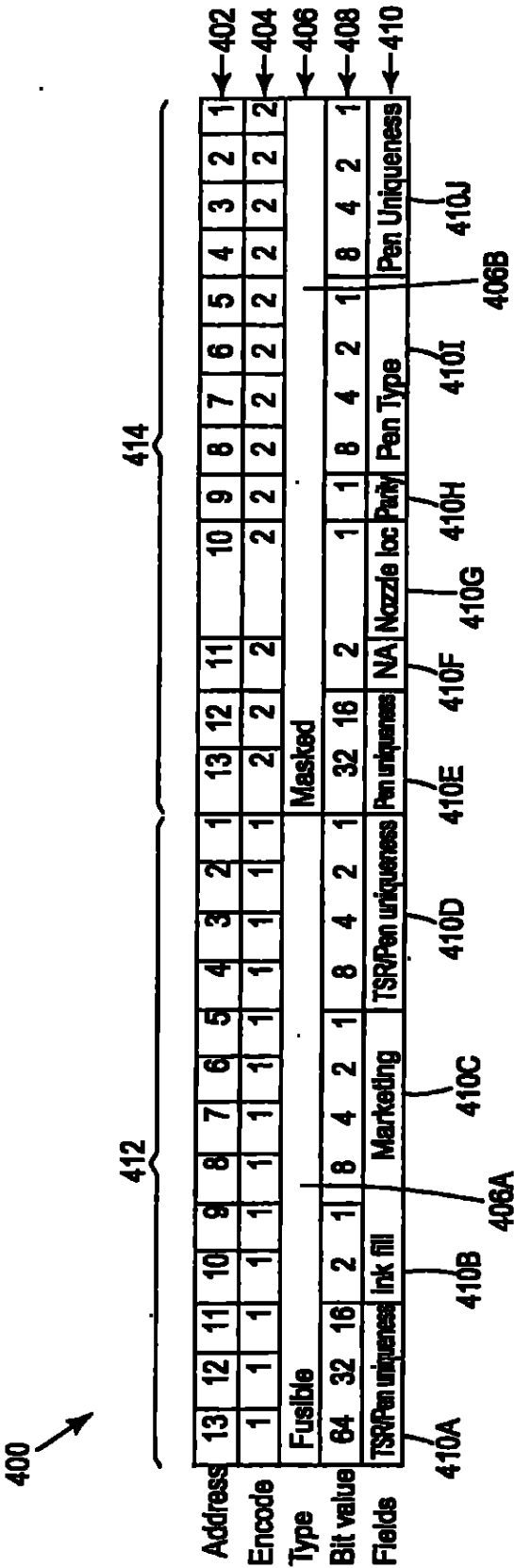


Fig. 4

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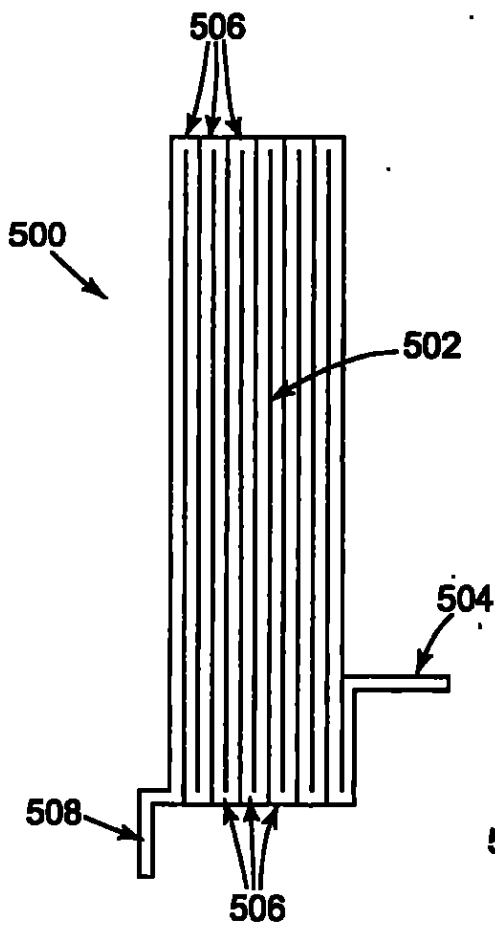


Fig. 5A

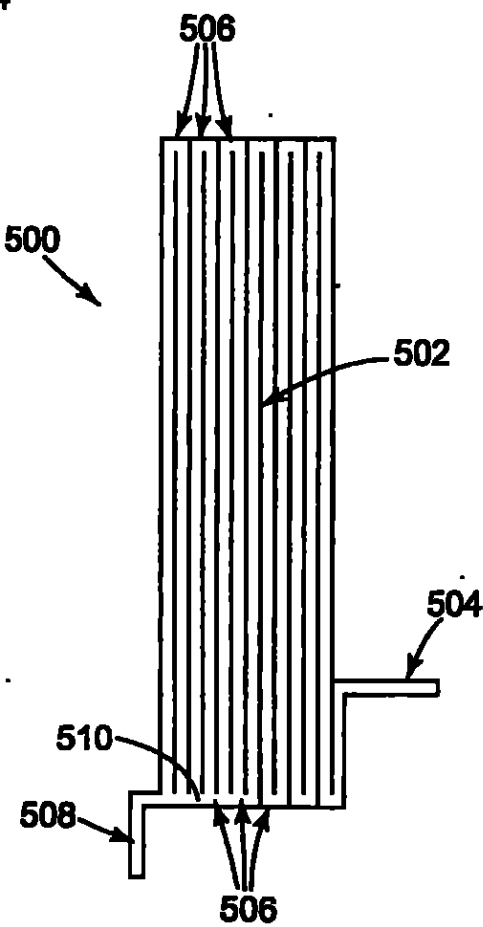


Fig. 5B

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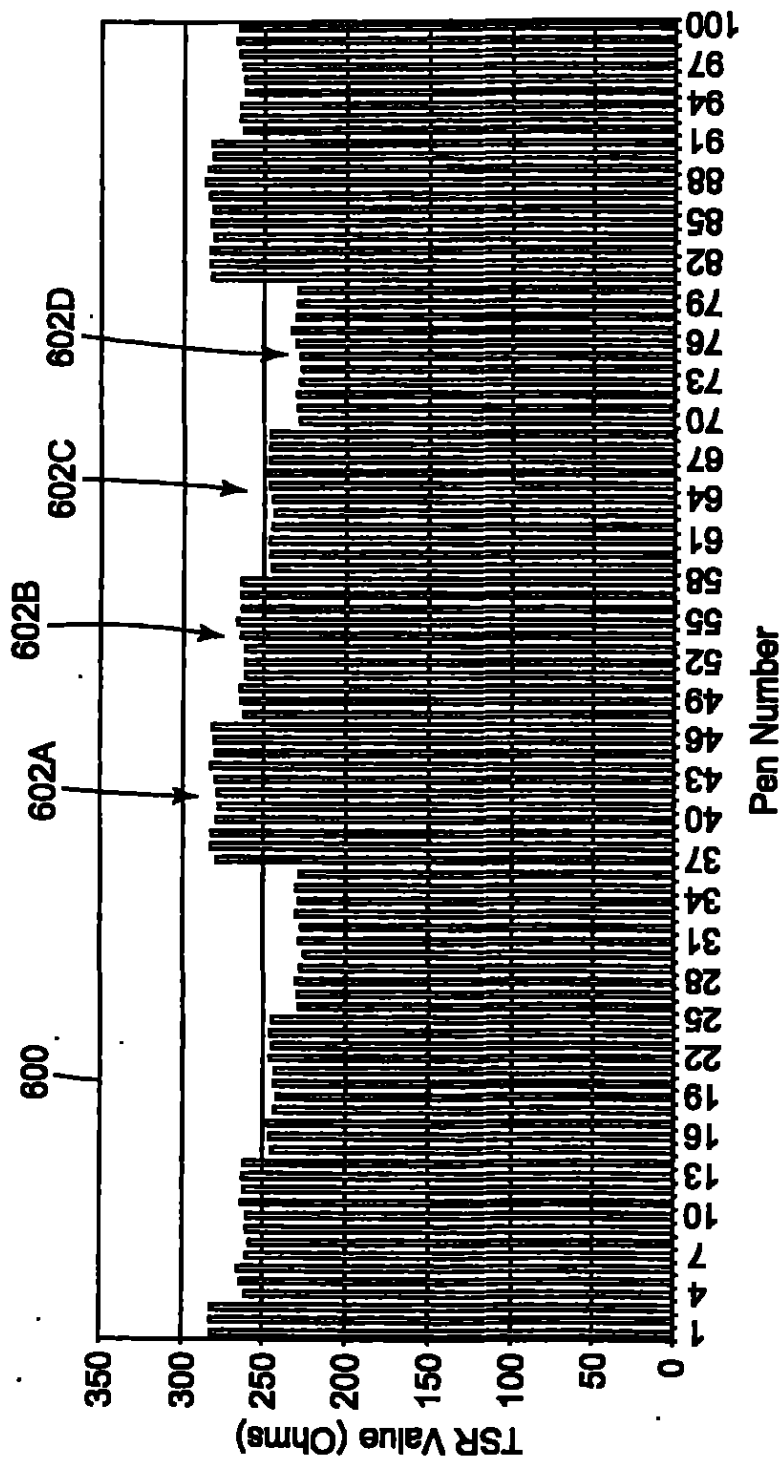


Fig. 6

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(72) Inventor: y	
(75) Inventor/Solicitante (solo para US): DODD, Simon [GB/US]; 218 N.E. Plymouth Circle, Corvallis, OR 97330 (US).	

(54) Título: RESISTOR TERMOSENSOR VARIABLE PARA UN COMPONENTE REEMPLAZABLE DE IMPRESORA

(57) Resumen: Un componente reemplazable de impresora (14) incluye un resistor termosensor (14B) que tiene una primera resistencia. Un modificador de resistencia (510) unido al resistor termosensor modifica la primera resistencia. Una memoria (16A) almacena un valor de resistencia que representa una magnitud de la primera resistencia modificada.

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Declaraciones bajo la Regla 4.17:

- *en cuanto al derecho del solicitante para solicitar y que se le conceda una patente (Regla 4-17 (ii)) para las siguientes designaciones AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZM, ZW, Patente ARIPO (GH, GM, KE, LS, ME, MZ, SD, SI, SZ, TZ, UG, ZM, ZW), Patente euroasiática (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Patente europea (AT, BG, BE, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), Patente OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GO, GW, ML, MR, NE, SN, TD, TG)*
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GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, Patente ARIPO (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Patente euroasiática (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Patente europea (AT, BE, BG, CH, CY, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), Patente OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, QGQ, GW, MI, MR, NE, SN, TD, TG)

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RESISTOR TERMOSENSOR PARA UN COMPONENTE REEMPLAZABLE DE IMPRESORA

El Campo de la Invención

La presente invención se relaciona con impresoras. Más particularmente, la invención se relaciona con un resistor termosensor variable para un componente reemplazable de impresora.

Antecedentes de la Invención

El arte de la tecnología de inyección de tinta está relativamente bien desarrollado. Productos comerciales tales como impresoras para computador, graficadores y máquinas de facsímil han sido implementados con tecnología de inyección de tinta para producir medios impresos. Generalmente, una imagen de inyección de tinta se forma de acuerdo con una ubicación precisa de gotas de tinta en un medio de impresión emitidas por un dispositivo generador de gotas de tinta conocido como un ensamblaje del cabezal de impresión de inyección de tinta. Un ensamblaje del cabezal de impresión de inyección de tinta incluye al menos un cabezal de impresión. Típicamente, un ensamblaje del cabezal de impresión de inyección de tinta está soportado en un carro móvil que atraviesa sobre la superficie del medio de impresión y es controlado para eyectar gotas de tinta en tiempos apropiados de acuerdo con un comando de un microcomputador u otro controlador, en donde el temporizado de la aplicación de las gotas de tinta es el deseado para corresponder con un patrón de píxeles correspondiente de la imagen a imprimir.

Las impresoras de inyección de tinta tienen al menos un suministro de tinta.

Un suministro de tinta incluye un contenedor de tinta que tiene un reservorio

de tinta. El suministro de tinta puede estar en la misma carcasa con el

ensamblaje del cabezal de impresión de inyección de tinta en un cartucho de tinta de inyección o pluma, o puede estar en una carcasa aparte. Cuando el

suministro de tinta se encuentra en una carcasa aparte del ensamblaje del

cabezal de impresión de inyección de tinta, los usuarios pueden reemplazar

el suministro de tinta sin reemplazar el ensamblaje del cabezal de impresión

de inyección de tinta. El ensamblaje del cabezal de impresión de inyección

de tinta se reemplaza entonces en o cerca del final de la vida del cabezal de

impresión, y no cuando se reemplaza el suministro de tinta.

Los sistemas de impresión actuales típicamente incluyen uno o más

componentes reemplazables de la impresora, incluyendo cartuchos de

inyección de tinta, ensamblajes de cabezal de impresión de inyección de

tinta, y suministros de tinta. Algunos sistemas existentes proporcionan estos

componentes reemplazables de impresora con memoria a bordo para

comunicar información a una impresora sobre el componente reemplazable.

La memoria a bordo, por ejemplo para un cartucho de tinta de inyección,

típicamente almacena información tal como fecha de fabricación (para

asegurar que la tinta excesivamente vieja no dañe el cabezal de impresión),

color de tinta (para prevenir una instalación incorrecta) y códigos

identificadores del producto (para asegurar que no ingrese tinta incompatible

o de una fuente inferior y dañe otras partes de la impresora). Una memoria

tal también puede almacenar otra información sobre el contenedor de tinta,

tal como información del nivel de tinta. La información del nivel de tinta

puede ser transmitida a la impresora para indicar la cantidad de tinta

restante. Un usuario puede observar la información del nivel de tinta y anticipar la necesidad de reemplazar el contenedor de tinta agotado.

Algunos componentes reemplazables de impresora, tal como algunos ensamblajes de cabezal de impresión de inyección de tinta, incluyen un resistor termosensor (TSR). Un propósito del TSR es permitir a una impresora determinar la temperatura del ensamblaje del cabezal de impresión. El conocimiento de la consistencia del material del TSR permite determinar un coeficiente térmico de resistencia (TCR). La impresora puede determinar la temperatura del ensamblaje del cabezal de impresión basándose en el TCR y una resistencia medida del TSR.

Generalmente, el ensamblaje del cabezal de impresión se calienta durante la operación. Una impresora puede monitorear el TSR y cambiar el algoritmo de impresión ya sea para agregar o remover energía, cambiando por lo tanto el tamaño de las gotas de tinta que salen. En el caso de una matriz fría (por ejemplo cuando se acaba de colocar un cartucho nuevo en la impresora), la impresora reconocerá que el ensamblaje del cabezal de impresión está frío y proporcionará energía adicional de tal forma que las gotas de tinta se hacen un poco más grandes. A medida que la matriz se calienta, la impresora proporcionará menos y menos energía. En algunos sistemas, la temperatura de los ensamblajes de cabezal de impresión se monitorea para prevenir el sobrecalentamiento. Si la temperatura alcanza un cierto umbral, la impresora puede entrar en un modo de espera, donde la impresora hace una pausa breve para permitir al ensamblaje del cabezal de impresión enfriarse.

En sistemas de impresión existentes, se emplea hardware análogo para medir la resistencia del TSR a una temperatura conocida para usarla como

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un punto inicial para las determinaciones posteriores de la temperatura. La medición inicial de la resistencia es una medición análoga, la cual no es muy precisa. Además, el hardware análogo de medición es una parte costosa de la impresora.

Sería deseable codificar y almacenar la resistencia del TSR a una cierta temperatura en el componente reemplazable de la impresora, y por lo tanto eliminar la necesidad de un hardware análogo de medición y el costo asociado. La impresora sería entonces capaz de usar los datos codificados junto con factores adicionales para determinar la temperatura del ensamblaje del cabezal de impresión, sin realizar las mediciones análogas iniciales de la resistencia del TSR.

Típicamente hay un número limitado de bits disponibles en una memoria de un componente reemplazable de impresora. Se pueden implementar bits adicionales si hay espacio disponible, pero los bits adicionales incrementarían el costo del componente reemplazable de impresora. Sería deseable dar "doble uso" a ciertos bits de la memoria, tal que los bits que representan un tipo de información también sean utilizados para representar información codificada de TSR.

Para ciertos tipos de bits en memorias de componentes reemplazables de impresora, tal como los bits de la "singularidad de la pluma", es deseable tener una distribución relativamente aleatoria de valores de bit, tal que los mismos valores de bit no se dupliquen regularmente (si se da el caso), y cada memoria almacena un valor único para la singularidad de la pluma. Sin embargo, si todos los TSRs en una microplaqueta particular están diseñados para tener la misma resistencia nominal, los valores de bits que representan

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la resistencia medida de los TSRs cubrirán un rango relativamente estrecho, y no proporcionarán la aleatoriedad deseada si los valores de bits han de representar tanto la singularidad de la pluma como la información del TSR. Sería deseable variar la resistencia nominal de los TSRs en la fabricación para incrementar el rango de valores de bits del TSR, y por lo tanto proporcionar mayor aleatoriedad o singularidad para los valores de singularidad de la pluma.

Resumen de la Invención

Una forma de la presente invención proporciona un componente reemplazable de impresora que incluye un resistor termosensor que tiene una primera resistencia. Un modificador de resistencia acoplado al resistor termosensor modifica la primera resistencia. En una modalidad, una memoria almacena un valor de resistencia que representa una magnitud de la primera resistencia modificada.

Descripción Breve de los Dibujos

La Figura 1 es un diagrama de bloque eléctrico de los componentes principales de una impresora de inyección de tinta de acuerdo con una modalidad de la presente invención.

La Figura 2 es un diagrama de una tabla de observación que ilustra los valores de bits asociados con los valores de resistencia del TSR.

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La Figura 3A es un diagrama esquemático de un circuito para definir el estado de un bit fusible de una memoria de un cartucho de tinta de inyección.

La Figura 3B es un diagrama esquemático de un circuito para definir el estado de un bit enmascarado de la memoria de un cartucho de tinta de inyección.

La Figura 4 es un diagrama de una tabla que ilustra la información almacenada en la memoria de un cartucho de tinta de inyección de acuerdo con una modalidad de la presente invención.

La Figura 5A es una vista superior aumentada de una porción de longitud variable de un TSR de acuerdo con una modalidad de la presente invención.

La Figura 5B es una vista superior aumentada de la porción de longitud variable del TSR ilustrado en la Figura 5A con una barra de cortocircuito agregada para variar la resistencia nominal del TSR.

La Figura 6 es una gráfica de barras que ilustra la resistencia medida del TSR de una pluralidad de ensamblajes del cabezal de impresión de inyección de tinta en una sola microplaqueta.

Descripción de las Modalidades Preferidas

En la siguiente descripción detallada de las modalidades preferidas, se hace referencia a los dibujos acompañantes que forman parte de la misma, y en la

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cual se muestran por medio de ilustración modalidades específicas en la cuales se puede practicar la invención. Se debe entender que se pueden utilizar otras modalidades y se pueden efectuar cambios estructurales o lógicos sin desviarse del alcance de la presente invención. La siguiente descripción detallada, por lo tanto, no debe ser tomada en el sentido limitante, y el alcance de la presente invención está definido por las reivindicaciones agregadas.

I. IMPRESORA DE INYECCION DE TINTA

La Figura 1 es un diagrama de bloque eléctrico de los principales componentes de una impresora de inyección de tinta de acuerdo con una modalidad de la presente invención. La impresora de inyección de tinta 10 incluye cartucho de tinta de inyección removible 12, el cual incluye ensamblaje del cabezal de impresión de inyección de tinta 14, memoria 16, y suministro de tinta 26. El cartucho de tinta de inyección 12 se conecta en forma removible a la impresora 10. El ensamblaje del cabezal de impresión de inyección de tinta 14 incluye al menos un cabezal de impresión 14A, y un resistor termosensor (TSR) 14B. La memoria 16 puede incluir múltiples formas de memoria, incluyendo RAM, ROM y EEPROM, y almacena datos asociados con el ensamblaje del cabezal de impresión de inyección de tinta 14 y suministro de tinta 26. En una modalidad, la memoria 16 incluye datos escritos en la planta y datos grabados por la impresora. En una modalidad, la memoria 16 específicamente incluye un ROM de 26 bits 16A, que tiene 13 bits "fusibles" y 13 bits "enmascarados". En una modalidad, alternativa, todos los 26 bits en el ROM 16A son bits fusibles. Con bits fusibles, en cualquier punto de la vida del producto, los bits fusibles pueden ser fundidos con el

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equipo correcto. Por lo tanto, el uso de bits fusibles proporciona una gran cantidad de flexibilidad. En contraste, los bits enmascarados son bits de "clave dura" que se definen durante el proceso de fabricación.

Cada bit fusible puede ser fijado al fundir un resistor en un circuito 300A (mostrado en la Figura 3A) que representa el bit fusible. Cada bit enmascarado puede ser fijado agregando un resistor en un circuito 300B (mostrado en la Figura 3B) que representa el bit enmascarado. En una modalidad, el ROM 16A está integrado con el ensamblaje del cabezal de impresión de inyección de tinta 14. En una modalidad alternativa, el ROM 16A puede estar integrado con el suministro de tinta 26. Será entendido por alguien con habilidad en el arte que, en lugar de incorporar el ensamblaje del cabezal de impresión de inyección de tinta 14 y el suministro de tinta 26 en un cartucho de tinta de inyección 12, el ensamblaje del cabezal de impresión de inyección de tinta 14 y el suministro de tinta 26 pueden estar en carcasas separadas y pueden incluir memorias separadas.

La impresora 10 incluye líneas de comunicación 20 para las comunicaciones entre el cartucho de tinta de inyección 12 y el controlador 34. Las líneas de comunicación 20 incluyen líneas de dirección 20A, primera línea habilitadora de codificación 20B, segunda línea habilitadora de codificación 20C, y línea de salida 20D, las cuales están conectadas al ROM 16A en una modalidad. En una forma de la invención, las líneas de dirección 20A incluyen 13 líneas de dirección. La primera línea habilitadora de codificación 20B se usa para seleccionar bits fusibles en el ROM 16A, y la segunda línea habilitadora de codificación 20C se usa para seleccionar bits enmascarados en el ROM 16A. Las líneas de dirección 20A se usan para seleccionar un bit fusible o un bit

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enmascarado particular. El valor de un bit fusible o enmascarado seleccionado es leído sensando la salida de una línea de salida 20D.

El ensamblaje del cabezal de impresión de inyección de tinta 14, la memoria 16, y el suministro de tinta 26 son conectados a un controlador 34, el cual incluye tanto accesorios permanentes como electrónicos para el control de los varios componentes de la impresora o sub-ensamblajes. Un procedimiento de control de impresión 35, el cual puede estar incorporado en el programa controlador de la impresora, ocasiona la lectura de datos de la memoria 16 y ajusta la operación de la impresora de acuerdo con los datos accesados desde la memoria 16. El controlador 34 controla el ensamblaje del cabezal de impresión de inyección de tinta 14 y el suministro de tinta 26 para hacer que las gotas de tinta sean eyectadas en una manera controlada en un medio de impresión 32.

Un procesador anfitrión 36 está conectado al controlador 34, e incluye una unidad central de procesamiento (CPU) 38 y un software controlador de la impresora 40. Un monitor 41 está conectado al procesador anfitrión 36, y se utiliza para visualizar varios mensajes que indican el estado de la impresora de inyección de tinta 10. Alternativamente, la impresora 10 puede ser configurada para operación en solitario o en red en donde los mensajes son visualizados en un panel frontal de la impresora.

II. CODIFICANDO INFORMACIÓN TSR

Como se muestra en la Figura 1, el ensamblaje del cabezal de impresión de inyección de tinta 14 incluye el TSR 14B. En una modalidad, el TSR 14B es

0,5 por ciento cobre, y 99,5 por ciento aluminio. La resistencia del TSR 14B es medida durante el proceso de fabricación, y luego algunos bits son fundidos en el ROM 16A para almacenar un valor codificado que representa la resistencia medida.

En una modalidad, la resistencia del TSR 14B en cada ensamblaje del cabezal de impresión 14 sobre una microplaqueta es medida a 32 grados Celsius. En una forma de la invención, 280 ensamblajes del cabezal de impresión 14 son formados en una sola microplaqueta. El valor medido de la resistencia es truncado (por ejemplo 258.9 ohmios se vuelven 258 ohmios).

El valor truncado de la resistencia se encuentra después en la tabla de observación del valor de resistencia a codificación 200, mostrada en la figura 2.

La tabla de observación 200 incluye las columnas 202A y 202B, y una pluralidad de entradas 204. Cada entrada 204 en la tabla de observación 200 asocia un conjunto de valores de bits (mostrados en la columna 202B) con un valor de resistencia (mostrado en la columna 202A). Basándose en los valores de bits hallados en la columna 202B para el valor de resistencia medido, se funden los bits correspondientes en el ROM 16A para almacenar la información de la resistencia del TSR. Estos bits fundidos en el ROM 16A son luego probados para asegurar que se han almacenado los valores correctos de la resistencia del TRS. En una forma de la invención, para protegerse contra el error, si ninguno de los bits del TSR es fundido (en otras palabras, cambiado de 0 a 1), la parte es rechazada a nivel de la microplaqueta. Sin ninguno de los bits del TSR son cambiados, esto quiere decir que la parte fue saltada de alguna manera durante el proceso de

fundido del bit, o que el proceso de fundido del bit no funcionó correctamente para la parte en particular.

III. CIRCUITOS ROM

El proceso de fundido de bits para el ROM 16A varía dependiendo de si el bit es un bit fusible o un bit enmascarado. La Figura 3A es un diagrama esquemático de un circuito para definir el estado de un bit fusible en el ROM 16A. El circuito 300A incluye primera entrada habilitadora de codificación (E_on) 302, salida (id_out) 304, entrada de dirección 306, transistor 308, resistencia 310, transistor 312, segunda entrada habilitadora de codificación (E_off) 314, transistor 316, y tierra (p_gnd) 318. La entrada de dirección 306 está acoplada a una de las líneas de dirección 20A (mostradas en la Figura 1). La primera entrada habilitadora de codificación 302 está acoplada a la primera línea habilitadora de codificación 20B (mostrada en la Figura 1). La segunda entrada habilitadora de codificación 314 está acoplada a la segunda línea habilitadora de codificación 20C (mostrada en la Figura 1). La salida 304 está acoplada a una línea de salida 20D (mostrada en la Figura 1).

En una modalidad, cada uno de los transistores 308, 312 y 316 es un transistor de efecto de campo (FET). La entrada de dirección 306 está acoplada a la descarga del transistor 308. La primera entrada de habilitación de codificación 302 está acoplada a la salida del transistor 308. La fuente del transistor 308 está acoplada a la salida del transistor 312 y a la descarga del transistor 316. La salida del transistor 316 está acoplada a la segunda entrada habilitadora de codificación 314. La descarga del transistor 316 está acoplada a la fuente del transistor 308 y a la salida del transistor 312. La

fuerza del transistor 316 está acoplada a tierra 318. La resistencia 310 está posicionada entre la salida 304 y la descarga del transistor 312. La fuente del transistor 312 está acoplada a tierra 318.

Un bit fusible en el ROM 16A, tal como el bit representado por el circuito 300A, es leído fijando la primera entrada habilitadora de codificación 302 en alto, fijando la entrada de dirección 306 en alto, y sensando la señal en la salida 304. La primera entrada habilitadora de codificación 302 es fijada en alto por el controlador 34 al fijar la primera línea habilitadora de codificación 20B en alto. La entrada de dirección 306 es fijada en alto por el controlador 34 al fijar la línea de dirección 20A acoplada a la entrada de dirección 306 en alto. El voltaje de salida en la salida 304 es sensado por el controlador 34 sensando el voltaje en la línea de salida 20D.

El transistor 308 actúa como una salida AND, con las entradas 302 y 306. Si las entradas 302 y 306 están ambas en alto, fluye una corriente por el transistor 308, prendiendo el transistor 312. El transistor 312 actúa como un transistor controlador, controlando la salida 304. Si se funde la resistencia 310, el voltaje en la salida 304 será alto, indicando un 1 lógico. Si no se funde la resistencia 310, el voltaje en la salida 304 será bajo, indicando un 0 lógico. En una modalidad, la resistencia 310 es fundida al dirigir una corriente grande a través de la resistencia 310. El transistor 316 es usado como un reductor de energía activo para prevenir que fugas de corriente del transistor 308 prendan el transistor 312 cuando el transistor 312 debe estar apagado. El transistor 316 es prendido al fijar la segunda entrada habilitadora de codificación 314 en alto. Cuando se prende, el transistor 316 desvía la corriente del transistor 308 a tierra.

Prendido
Fusible
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Adicionalmente al fundir la resistencia 310, se pueden emplear otros métodos para crear un circuito abierto para definir el estado de un bit en el ROM 16A, incluyendo cortado mecánico, cortado con láser, así como otros métodos.

La Figura 3B es un diagrama esquemático de un circuito para definir el estado de un bit enmascarado en el ROM 16A. El circuito 300B es sustancialmente lo mismo que el circuito 300A mostrado en la Figura 3A, con las excepciones que el resistor 310 es reemplazado por un interruptor 320, y el transistor 322 tiene un ancho más estrecho que el transistor 312. En una modalidad, el interruptor 320 no es un interruptor físico en realidad, pero representa ya sea la presencia o la ausencia de una resistencia. En una forma de la invención, una resistencia 320 es agregada durante el proceso de fabricación para proporcionar un valor lógico de bit de 1. Si hay una resistencia presente en lugar del interruptor 320, la resistencia tiene suficiente resistencia para actuar como un circuito abierto entre la salida 304 y el transistor 322. Si la resistencia no está presente en lugar del interruptor 320, no hay una resistencia adicional entre la salida 304 y el transistor 22.

La entrada de dirección 306 está acoplada a una de las líneas de dirección 20A (mostradas en la Figura 1). La primera entrada habilitadora de codificación 302 está acoplada a la segunda línea habilitadora de codificación 20C (mostrada en la Figura 1). La segunda entrada habilitadora de codificación 314 está acoplada a la primera línea habilitadora de codificación 20B (mostrada en la Figura 1). La salida 304 está acoplada a la línea de salida 20D (mostrada en la Figura 1).

La entrada de dirección 306 está acoplada a la descarga del transistor 308.

La primera línea habilitadora de codificación 302 está acoplada a la salida del

transistor 308. La fuente del transistor 308 está acoplada a la salida del

transistor 322 y a la descarga del transistor 316. La salida del transistor 316

está acoplada a la segunda entrada habilitadora de codificación 314. La

descarga del transistor 316 está acoplada a la fuente del transistor 308 y a la

salida del transistor 322. La fuente del transistor 316 está acoplada a tierra

318. El interruptor 310 está posicionado entre la salida 304 y la descarga del

transistor 322. La fuente del transistor 322 está acoplada a tierra 318. Un bit

enmascarado en el ROM 16A, tal como el bit representado en el circuito

300B, es leído fijando la primera entrada habilitadora de codificación 302 en

alto, fijando la entrada de dirección 306 en alto, y sensando la señal en la

salida 304. La primera entrada habilitadora de codificación 302 es fijada en

alto por el controlador 34 al fijar la segunda línea habilitadora de codificación

20C en alto. La entrada de dirección 306 es fijada en alto por el controlador

34 fijando la línea de entrada 20A acoplada a la entrada de dirección 306 en

alto. El voltaje de salida en la salida 304 es sensado por el controlador 34

sensando el voltaje en la línea de salida 20D.

El transistor 308 actúa como una salida AND, con las entradas 302 y 306. Si

ambas entradas 302 y 306 están en alto, una corriente fluye por el transistor

308, prendiendo el transistor 322. El transistor 322 actúa como un transistor

controlador, controlando la salida 304. Si el interruptor 310 está abierto (en

otras palabras, hay una resistencia presente), el voltaje en la salida 304 será

alto, indicando un 1 lógico. Si el interruptor 310 está cerrado (en otras

palabras, no hay resistencia presente), el voltaje en la salida 304 será bajo,

indicando un 0 lógico. El transistor 316 es usado como un reductor de

energía activo para prevenir que fugas de corriente del transistor 308 prendan el transistor 322 cuando el transistor 322 debe estar apagado. El transistor 316 es prendido al fijar la segunda entrada habilitadora de codificación 314 en alto. Cuando está prendido, el transistor 316 desvía corriente del transistor 308 a tierra.

IV. CONTENIDOS DEL ROM

La Figura 4 es una tabla que ilustra la información almacenada en el ROM 16A de acuerdo con una modalidad de la presente invención. La tabla 400 incluye identificadores de la línea de dirección 402, identificadores de la línea habilitadora de codificación 404, identificadores de tipo de bit 406A y 406B (referidos colectivamente como identificadores de tipo de bit 406) y valores de bit 408, y campos 410A-410J (colectivamente referenciados como campos 410). La tabla 400 es dividida en la porción 412 y la porción 414. La porción 412 de la tabla 400 representa información asociada con los bits fusible, como se indica por el identificador de tipo fusible 406A. La porción 414 de la tabla 400 representa información asociada con bits enmascarados, como lo indica el identificador tipo enmascarado 406B. Cada uno de los identificadores de línea de dirección 402 representa una de las líneas de dirección 20A (mostradas en la Figura 1), y corresponde ya sea a un bit fusible o a un bit enmascarado. Tanto el bit fusible como el enmascarado están numerados de 1-13, indicando la línea de dirección particular 20A asociada con el bit. Los identificadores de la línea habilitadora de codificación 404 indican a la línea habilitadora de codificación 20B o 20C que debe estar fijada con el fin de seleccionar el bit correspondiente. Un "1" en los identificadores de línea habilitadora de codificado 404 corresponde a la

primera línea habilitadora de codificación 20B, la cual es usada para seleccionar los bits fusible. Un "2" en los identificadores de la línea habilitadora de codificación 404 corresponde a la segunda línea habilitadora de codificación 20C, la cual es usada para seleccionar los bits enmascarados.

Los bits fusible 1-13 y los bits enmascarados 1-13 están divididos en una pluralidad de campos 410. Cada bit en un campo particular 410 incluye un valor de bit 408. Cuando se fija un bit, éste tiene el valor indicado en su valor de bit 408 correspondiente. Cuando no se fija un bit, éste tiene un valor de 0. En una modalidad, los bits fusible 1-13 y los bits enmascarados 1-13 se fijan durante la fabricación del ROM 16A. En una modalidad alternativa, los bits fusible 1-13 se fijan después de la fabricación del ROM 16A. También, como se mencionó arriba, El ROM 16A incluye todos los bits fusible en una modalidad alternativa, de tal forma que todos los bits pueden ser fijados después de la fabricación.

El campo de singularidad de pluma/TSR 410A incluye los bits fusible 11-13. En una modalidad, los bits fusible 11-13 son los tres bits más significativos que representan la resistencia medida del TSR 14B. Como se mencionó arriba, los bits que representan la resistencia medida del TSR 14B se toman de la columna 202B de la tabla de observación 200. Como se describirá más adelante, los bits TSR también se emplean para proporcionar información sobre la singularidad de la pluma.

El campo de llenado de tinta 410B incluye los bits fusible 9-10. En una modalidad, los bits fusible 9-10 proporcionan un nivel de referencia o nivel

activador para determinar cuando se debe visualizar una advertencia de bajo nivel de tinta.

El campo de mercadeo 410C incluye los bits fusible 5-8. En una modalidad, los bits fusible 5-8 se emplean para identificar si un cartucho de inyección de tinta puede ser utilizado en una impresora particular.

El campo de singularidad de pluma/TSR 410D incluye los bits fusible 1-4. En una modalidad, los bits fusible 1-4 son los cuatro bits menos significativos que representan la resistencia medida del TSR 14B. Como se mencionó arriba, los bits que representan la resistencia medida del TSR 14B se toman de la columna 202B de la tabla de observación 200. Como se describirá más adelante, los bits del TSR también se emplean para proporcionar información de la singularidad de la pluma.

El campo de singularidad de la pluma 410E incluye los bits enmascarados 12-13. En una modalidad, los bits enmascarados 12-13 son los dos bits más significativos de un número aleatorio que se usa en conjunción con los campos de singularidad de pluma/TSR 410A y 410D para proporcionar un valor de singularidad de pluma para el cartucho de inyección de tinta 12.

El campo 410F incluye el bit enmascarado 11. En una modalidad, el bit enmascarado 11 no se usa para almacenar datos, así que el campo 410F incluye las letras "NA" (en otras palabras, no asignado).

El campo 410G incluye el bit enmascarado 10. En una modalidad, el bit enmascarado 10 proporciona información sobre la ubicación de la boquilla.

El campo 410H incluye el bit enmascarado 9. En una modalidad, el bit enmascarado 9 es un bit de paridad usado en asociación con los bits correspondientes al campo de tipo de pluma 410I.

El campo de tipo de pluma 410I incluye los bits enmascarados 5-8. En una modalidad, los bits enmascarados 5-8 proporcionan una identificación del tipo de cartucho de tinta que está asociado con el ROM 16A.

El campo de singularidad de pluma 410J incluye los bits enmascarados 1-4.

En una modalidad, los bits enmascarados 1-4 son los cuatro bits menos significativos de un número aleatorio que se emplea en conjunción con los campos de singularidad de pluma TSR 410A y 410D para proporcionar un valor de singularidad de pluma para el cartucho de tinta 12. El valor de singularidad de pluma, que comprende los campos 410A, 410D, 410E y 410J, identifica de forma singular un cartucho de inyección de tinta 12, lo cual

le permite al controlador de impresora 34 determinar cuando se ha instalado un cartucho de tinta nuevo. En una modalidad, si el valor de singularidad de la pluma de un cartucho recientemente insertado es diferente que el de los tres últimos cartuchos insertados, la impresora se comportará como si se hubiera insertado un cartucho nuevo, y puede realizar un esquema de alineación, un reestablecimiento del nivel de tinta y una calibración de energía.

La impresora 10 obtiene información de la resistencia del TSR de los campos 410A y 410D en el ROM 16A, y puede determinar la temperatura del ensamblaje del cabezal de impresión de inyección de tinta 14. Contrario a sistemas de impresión anteriores, la impresora 10 no tiene que realizar una medición análoga inicial de la resistencia del TSR 14B. Al conocer el

coeficiente de resistencia térmica (TCR), y la resistencia del TSR 14B a una cierta temperatura (la cual está codificada en los campos 410A y 410D en el ROM 16A), la impresora 10 puede determinar a partir de otros factores la temperatura del ensamblaje del cabezal de impresión de inyección de tinta 14. La impresora 10 también puede obtener un valor de singularidad de pluma del ROM 16A, el cual incluye la información codificada del TSR en los campos 410A y 410D, así como un número aleatorio de los campos 410E y 410J.

En productos de impresora anteriores, los TSRs han sido diseñados para tener la misma longitud para toda matriz de ensamblaje del cabezal de impresión de inyección de tinta sobre una microplaqueta, y han sido diseñados para tener la misma resistencia nominal de alrededor de 240-250 ohmios. Para proporcionar un mayor grado de aleatoriedad a los valores de singularidad de la pluma, en una modalidad de la presente invención, el rango de los valores TSR en los campos 410A y 410D se extiende fabricando TSRs 14B con diferentes valores de resistencia nominal, como se describirá en más detalle a continuación.

V. TSR VARIABLE

La Figura 5A es una vista superior aumentada de una porción de longitud variable 500 del TSR 14B. En una modalidad, la porción de longitud variable 500 está posicionada cerca de una esquina inferior izquierda de la matriz de ensamblaje del cabezal de impresión de inyección de tinta. En una forma de la invención, el TSR 14B también incluye otras porciones acopladas a la

porción variable 500 que se extienden a otras regiones de la matriz de ensamblaje del cabezal de impresión de inyección de tinta.

La porción de TSR variable 500 incluye una región en forma serpentina 502 que tiene una pluralidad de regiones de transición 506 cerca de las partes superior e inferior de la región serpentina 502. En una modalidad, la corriente entra a la porción TSR 500 por el conductor 508, se mueve hacia arriba y hacia abajo por los múltiples tramos de la región serpentina 502, y luego sale por el conductor 504.

En una forma de la invención, el diseño para la porción TSR 500 está incluido en la base de datos de la matriz para el ensamblaje del cabezal de impresión de inyección de tinta 14. La porción TSR 500 es formada usando técnicas de fabricación estándar que incluyen depositar una capa de metal, grabando la capa de metal usando una fotomascarilla apropiada para generar la forma serpentina 502 mostrada en la figura 5A.

La Figura 5B es una vista superior aumentada de la porción de TSR variable 500 mostrada en la Figura 5A, con una barra de cortocircuito o puente 510 agregada para variar la resistencia de la porción 500, y correspondientemente la resistencia de la totalidad del TSR 14B. La barra de cortocircuito 510 reduce efectivamente la porción TSR 500 al poner en corto las primeras regiones de transición 506 cerca de la base de la porción TSR 500, cambiando así la resistencia nominal del TSR 14B. Así que en lugar de ir arriba y abajo por los primeros tramos de la porción serpentina 502, la mayoría de la corriente fluirá horizontalmente a través de la barra de cortocircuito 510 hasta que la corriente alcanza mas o menos la mitad del

camino a través de la región serpentina 502, y entonces la corriente comenzará a fluir hacia arriba y hacia abajo por los tramos restantes de la porción serpentina 502 y saldrá por el conductor 504.

En una modalidad, se proporcionan cuatro longitudes diferentes del TSR 14B (y cuatro valores nominales de resistencia diferentes) sobre una microplaqueta al modificar la longitud de la porción de TSR variable 500 con una barra de cortocircuito de longitud variable 510. En una modalidad alternativa, se proporcionan cinco longitudes diferentes de TSR 14B (y cinco valores nominales de resistencia diferentes) sobre una microplaqueta. Se pueden proporcionar otros números de longitudes del TSR en modalidades alternativas.

Una forma de la presente invención proporciona un método de fabricar TSRs de resistencia variable en ensamblajes del cabezal de impresión de inyección de tinta, sin la necesidad de diseñar una única matriz del ensamblaje del cabezal de impresión de inyección de tinta para cada valor nominal de resistencia del TSR deseado. En una modalidad, se adicionan barras de cortocircuito de longitud variable 510 en el marco de la mascarilla en lugar de la matriz del ensamblaje del cabezal de impresión de inyección de tinta. Por lo tanto, se utilizan los datos del marco de la mascarilla (en lugar de los datos de la matriz) para hacer modificaciones menores a la longitud de los TSRs 14B en una microplaqueta.

Un diseño de matriz del ensamblaje del cabezal de impresión de inyección de tinta genérico es replicado múltiples veces sobre una microplaqueta (o múltiples microplaquetas). En una forma de la invención, hay 280 matrices

del ensamblaje del cabezal de impresión de inyección de tinta en una microplaqueta. Una base de datos contiene copias blandas del diseño de la matriz genérica. La matriz del ensamblaje del cabezal de impresión de inyección de tinta es diseñado una vez, y el diseño es puesto 280 veces en una fotomascarilla completa para una microplaqueta. Adicionalmente a los datos de la matriz, la fotomascarilla también incluye datos del marco. El marco generalmente es un borde alrededor de cada matriz individual. Los datos del marco son almacenados separadamente de los datos de la matriz.

El marco es relativamente grande, solo tiene unas cuantas características en él, y tiene lugares para 280 matrices. El marco está poblado de 280 copias de la matriz del ensamblaje del cabezal de impresión de inyección de tinta genérico contenidas en la base de datos. El marco incluye características para generar barras de cortocircuito 510 de longitud variable.

En una modalidad alternativa, se usa una fotomascarilla con cuatro o cinco lugares para la matriz. De tal forma que se imprimirían cuatro o cinco matrices del ensamblaje del cabezal de impresión de inyección de tinta, se movería la fotomascarilla, se imprimirían cuatro o cinco matrices más, y el proceso se repetiría hasta que se hubieran generado 280 matrices. Alternativamente, los cuatro o cinco matrices en la fotomascarilla podrían ser insertados en una fotomascarilla más grande, tal como una fotomascarilla de microplaqueta entera. Los cuatro o cinco matrices en la fotomascarilla serían sustancialmente iguales, excepto que el marco sobrepuesto agrega barras de cortocircuito 510 de longitudes variables para producir TSRs 14B de resistencia nominal variable.

La Figura 6 es un gráfico de barras 600 que ilustra la resistencia TSR medida de una pluralidad de ensamblajes del cabezal de impresión de inyección de tinta 14 sobre una sola microplaqueta. En el eje horizontal, hay una lista de números de pluma que va de 1 a 100, cada uno de los cuales representa un ensamblaje del cabezal de impresión de inyección de tinta 14 sobre una sola microplaqueta. En una modalidad, hay hasta 280 ensamblajes del cabezal de impresión de inyección de tinta sobre una microplaqueta, pero solo se muestran 100 en la Figura 6. El eje vertical muestra valores de resistencia en ohmios para los TSRs 14B.

Como lo indica el gráfico 600, hay cuatro longitudes diferentes de TSRs 14B (y cuatro valores nominales de resistencia diferentes) para los ensamblajes del cabezal de impresión de inyección de tinta 14 sobre la microplaqueta (los cuales se identifican por los números de referencia 602A, 602B, 602C, y 602D). A pesar de haber sido diseñados para la misma resistencia nominal, la resistencia del TSR varía entre cada uno de los cuatro grupos 602A, 602B, 602C, y 602D, debido a tolerancias de fabricación. Por lo tanto, además de las cuatro (o cinco) diferencias nominales de resistencia, hay un rango de valores de resistencia del TSR dentro de cada grupo 602A, 602B, 602C, y 602D de los TSRs 14B. El espesor, ancho de línea, y composición del material de los TSRs 14B puede variar a través de la microplaqueta. Así que aunque los TSRs 14B están diseñados para un punto nominal, hay un cierto rango de mediciones que ocurrirían en la fabricación normal de estas partes.

Dentro de cada grupo 602A, 602B, 602C, o 602D de los TSRs 14B, si el valor truncado de la resistencia de un TSR 14B varía lo suficiente al de otro TSR

14B (por ejemplo, un ohmio o más), los dos TSRs 14B serán asignados a un conjunto diferente de bits de TSR (los cuales son almacenados en los campos 410A y 410D del ROM 16A). Si no hay más de un ohmio de separación entre los valores truncados de las resistencias de los TSRs 14B, los TSRs 14B tendrán el mismo conjunto de siete bits en los campos 410A y 410D, pero los bits adicionales en los campos 410E y 410J causarán una variación en el valor de singularidad de la pluma. La gráfica 600 también indica que, si la resistencia nominal de los TSRs 14B no fuera variable, la única variación en los campos 410A y 410D sería la variación relativamente menor de la resistencia que ocurre en un solo grupo 602A, 602B, 602C o 602D. Y la posibilidad de obtener valores de singularidad semejantes subiría.

Una modalidad de la presente invención codifica y almacena la resistencia del TSR a cierta temperatura en un componente de impresora reemplazable, y por lo tanto elimina la necesidad de hardware análogo de medición y el costo asociado. La impresora 10, es por lo tanto capaz de usar los datos codificados junto con los factores adicionales para determinar la temperatura de ensamblaje del cabezal de impresión 14, sin realizar las mediciones análogas iniciales previamente requeridas de la resistencia del TSR.

Las modalidades de la presente invención también enfrentan el problema del número limitado de bits que hay típicamente disponibles en la memoria de un componente reemplazable de impresora usando ciertos bits dos veces, y por lo tanto evitando el costo adicional de adicionar más bits. En una modalidad, los bits que representan un tipo de información (por ejemplo, la información de singularidad de pluma) también se usan para representar información del

TSR codificada. Así mismo, en modalidades de la presente invención, la resistencia nominal de los TSRs es variada en la fabricación para incrementar el rango de los valores de los bits del TSR, proporcionando por lo tanto mayor aleatoriedad o singularidad a los valores de singularidad de pluma.

Aunque anteriormente se han ilustrado y descrito aquí modalidades específicas para propósitos de descripción de la modalidad preferida, se apreciará por aquellos con habilidad en el arte que se pueden sustituir una gran variedad de implementaciones alternativas y/o equivalentes por las modalidades específicas mostradas y descritas sin alejarse del alcance de la presente invención. Aquellos con habilidad en el arte químico, mecánico, electromecánico, eléctrico, y de computadores apreciarán rápidamente que la presente invención puede ser implementada en una amplia variedad de modalidades. Esta solicitud tiene la intención de cubrir cualquier adaptación o variación de las modalidades preferidas aquí discutidas. Por lo tanto, es manifiesta la intención de que esta invención esté limitada solo por las reivindicaciones y los equivalentes de las mismas.

REIVINDICACIONES**LO QUE SE REIVINDICA ES:**

1. Un componente reemplazable de impresora (14) que comprende:
un resistor termosensor (14B) que tiene una primera resistencia; y
un modificador de resistencia (510) acoplado al resistor termosensor
para modificar la primera resistencia.
2. El componente reemplazable de impresora de la reivindicación 1 y que
además comprende:
una memoria (16A) para almacenar un valor de resistencia que
representa una magnitud de la primera resistencia modificada.
3. El componente reemplazable de impresora de la reivindicación 2, en
donde la memoria es un ROM:
4. El componente reemplazable de impresora de la reivindicación 2, en
donde el valor de resistencia almacenado también representa al menos
una porción de un segundo tipo de información del componente.
5. El componente reemplazable de impresora de la reivindicación 1, en
donde el modificador de la resistencia es un conductor para poner en
cortocircuito una porción del resistor termosensor.

6. Un método para formar una pluralidad de componentes reemplazables de impresora (14) con resistencias termosensoras (14B) que tienen valores nominales de resistencia variables, el método comprende:

proporcionar una microplaqueta;

formar la pluralidad de componentes reemplazables de impresora sobre la microplaqueta, cada uno de la pluralidad de componentes reemplazables de impresora incluye un resistor termosensor, cada resistor termosensor tiene sustancialmente la misma resistencia nominal; y

formar una pluralidad de modificadores de resistencia (510) sobre la microplaqueta, la pluralidad de modificadores de resistencia configurados para modificar la resistencia nominal de la pluralidad de resistores termosensores, formando así resistores termosensores que tienen valores nominales de resistencia variables.

7. El método de la reivindicación 6, que además comprende:

proporcionar una pluralidad de memorias (16A), cada memoria asociada con una de la pluralidad de componentes reemplazables de impresora;

medir la resistencia de cada uno de los resistores termosensores; y

almacenar un valor de resistencia en cada una de la pluralidad de memorias, el valor de resistencia en cada memoria representa una magnitud de la resistencia medida del resistor termosensor asociada con la memoria.

8. El método de la reivindicación 6, en donde cada una de la pluralidad de componentes reemplazables de impresora es formado basado en un solo conjunto de datos de matriz genéricos.

9. El método de la reivindicación 8, en donde cada uno de la pluralidad de modificadores de resistencia es formado en base a datos de marco de mascarilla.

10. Un sistema de impresión que comprende:

un ensamblaje de cabezal de impresión de inyección de tinta (14) que incluye al menos un cabezal de impresión de inyección de tinta (14A) para depositar selectivamente gotas de tinta en medios de impresión (32);

un suministro de tinta (26) para almacenar la tinta que será proporcionada al por lo menos un cabezal de impresión de inyección de tinta;

un resistor termosensor (14B) que tiene una primera resistencia;

un modificador de resistencia (510) acoplado al resistor termosensor para modificar la primera resistencia;

un dispositivo de memoria (16A) para almacenar un valor de resistencia que representa una magnitud de la primera resistencia modificada; y

un controlador (34) acoplado al dispositivo de memoria y que responde a la salida del dispositivo de memoria, el controlador configurado para determinar una temperatura de un componente dentro del sistema de impresión basado al menos en parte en el valor de resistencia almacenado.

6/69

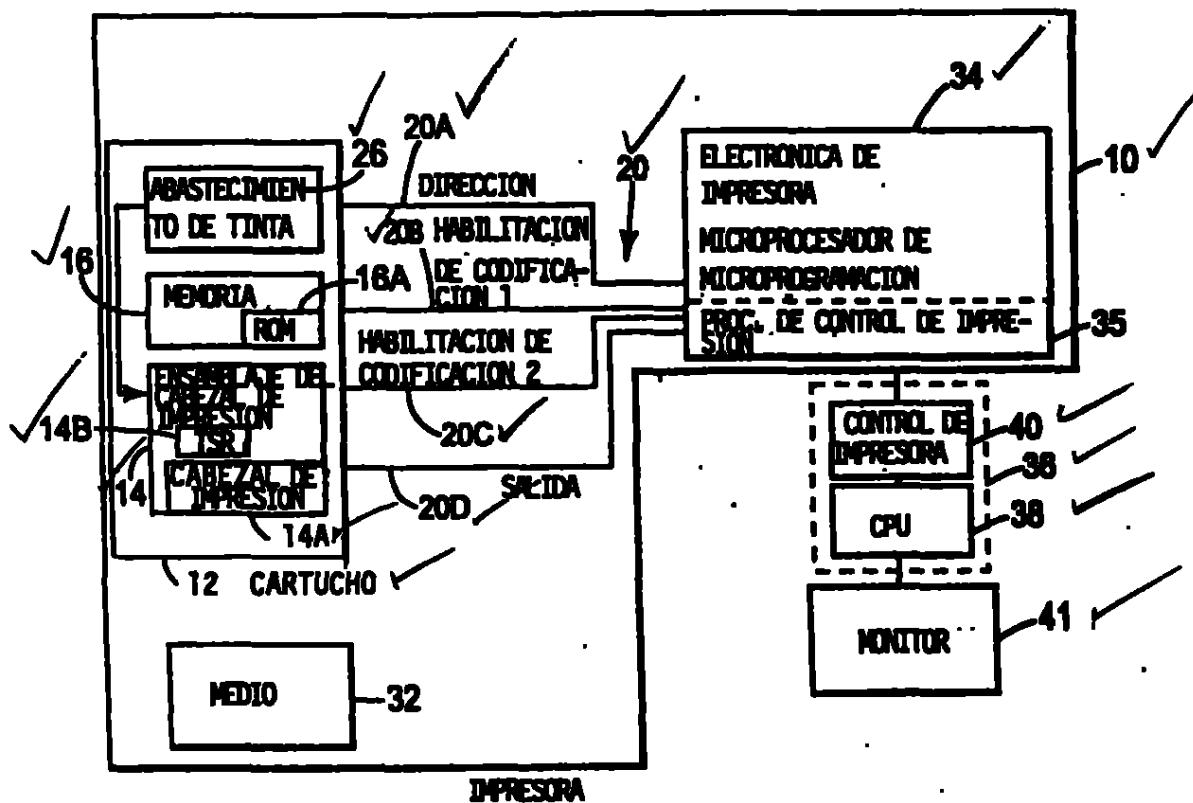


Fig. 1

61
2
6

✓ 200

202A

202B

204

RESISTENCIA DE SENSADO TERMICO (OHMS)	VALORES DE BIT
(not blown)	0000000
178	0000001
179	0000010
180	0000011
181	0000100
182	0000101
183	0000110
184	0000111
185	0001000
Etc...	Etc...

?

Fig. 2

62
63

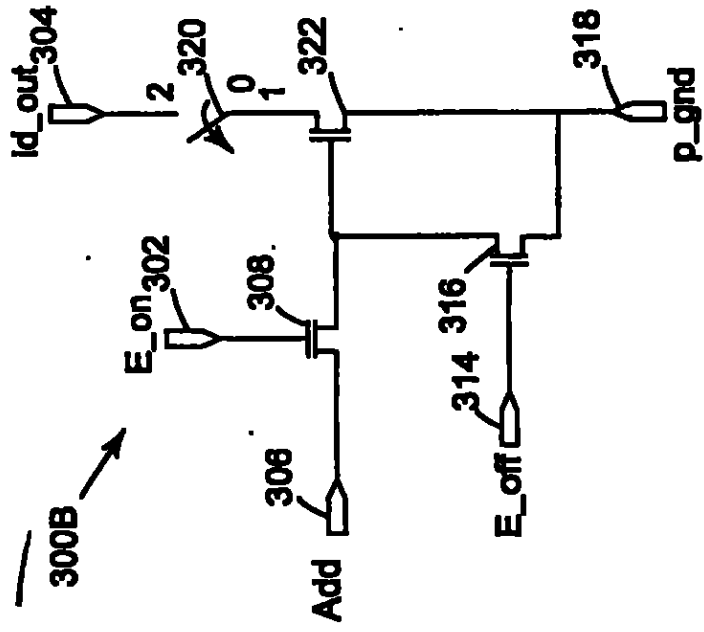


Fig. 3B

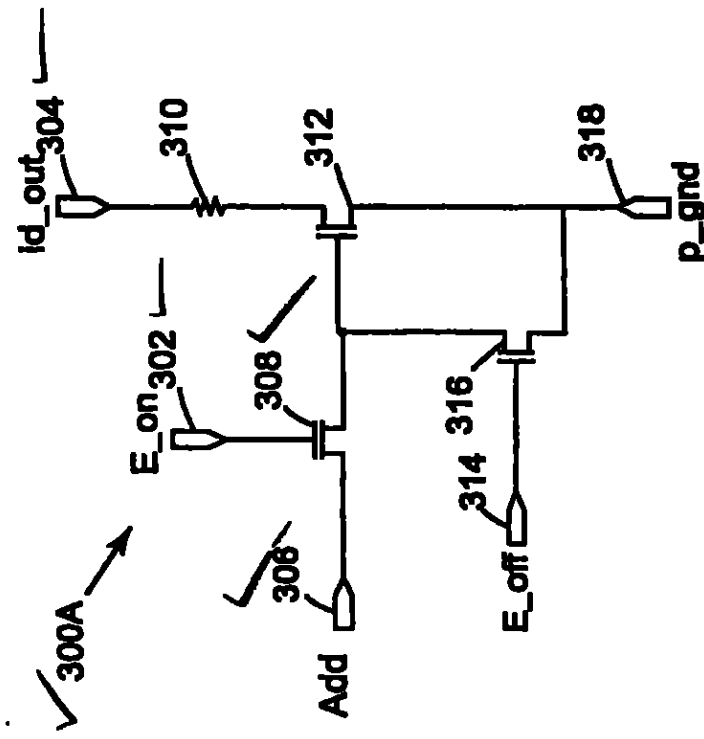
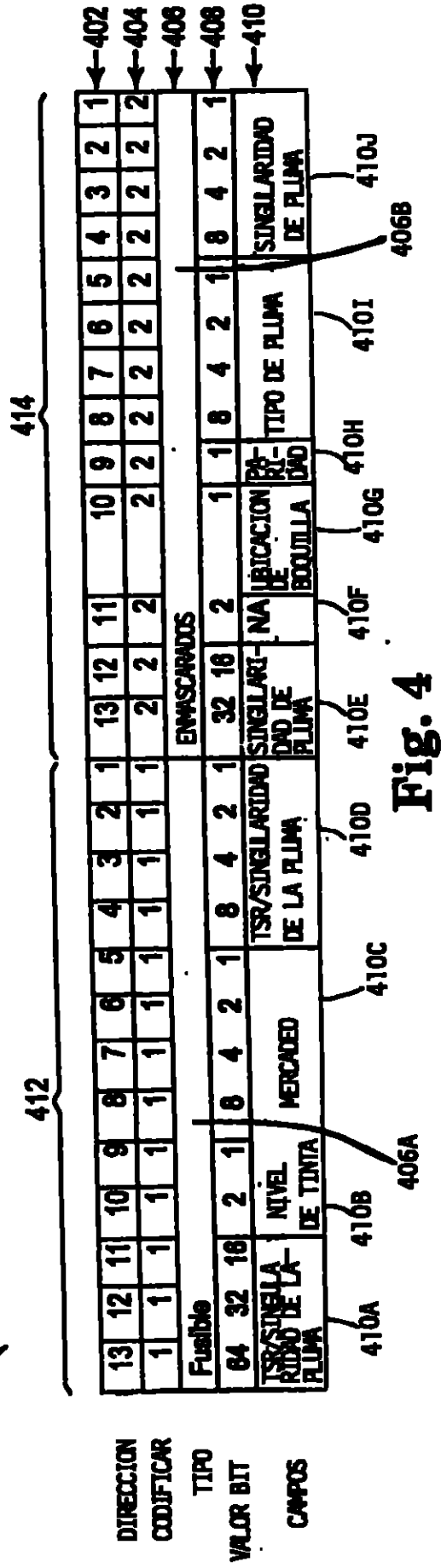


Fig. 3A

400 →



63
64

64
60

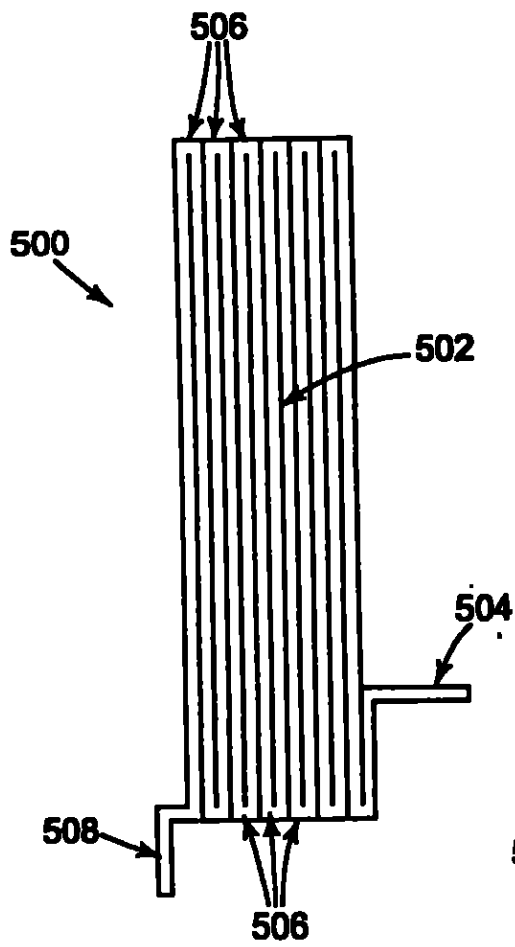


Fig. 5A

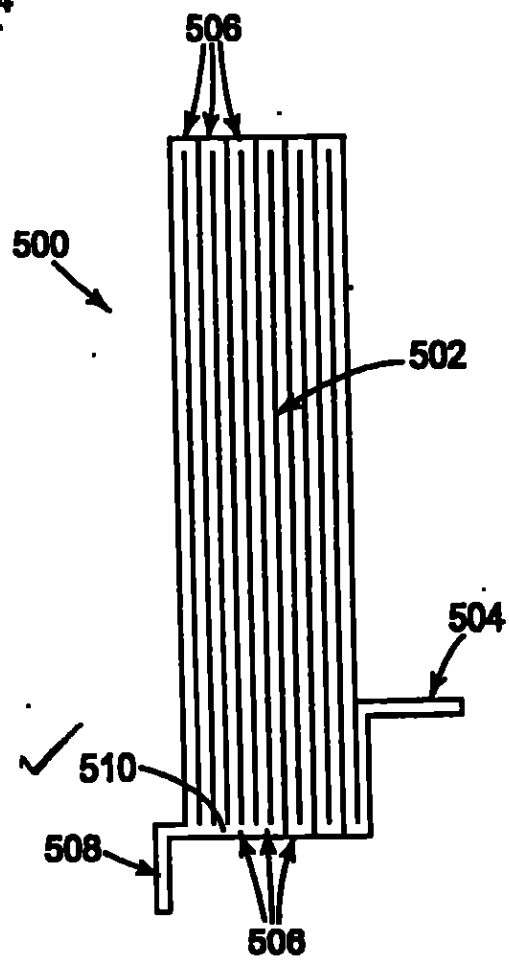
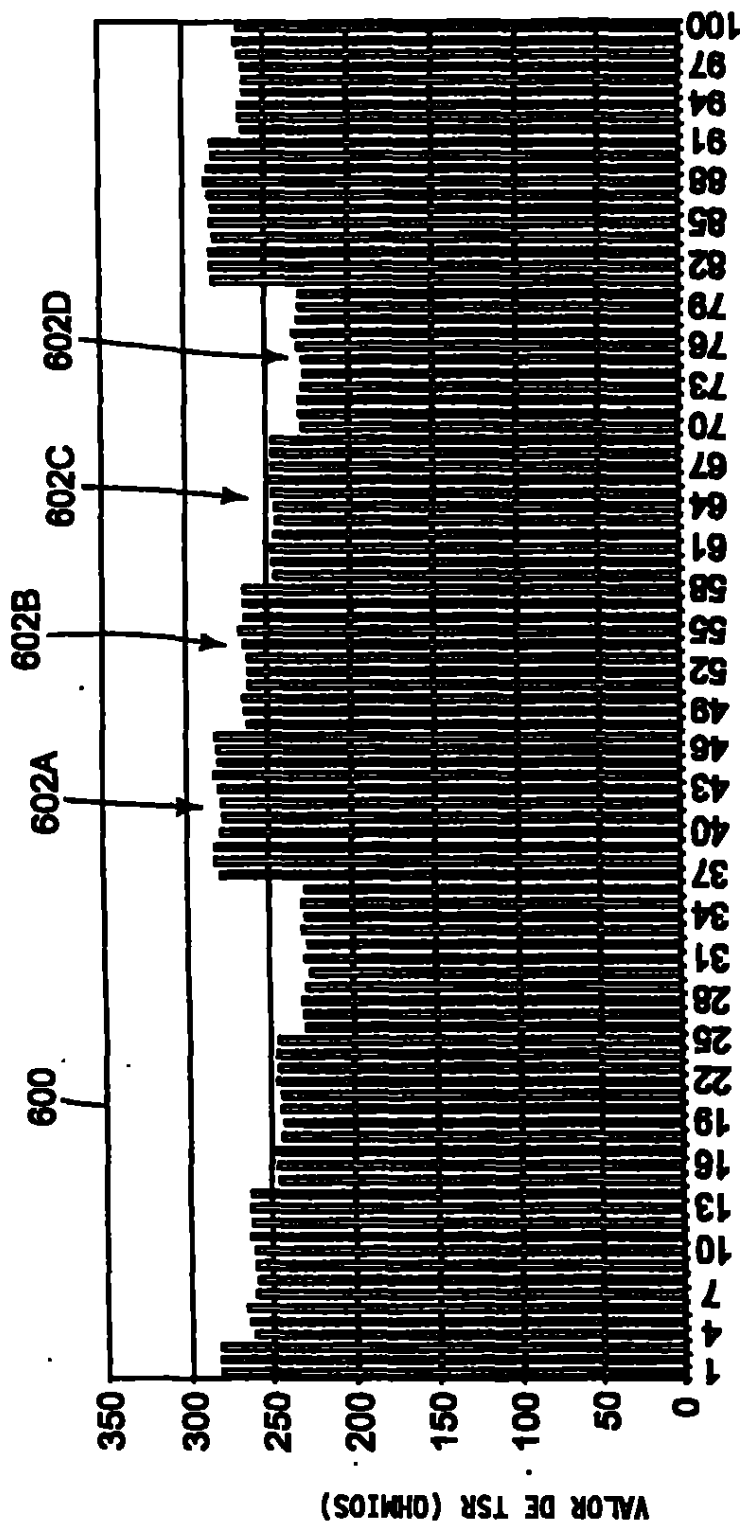


Fig. 5B

59
60



NUMERO DE PLUMA

Fig. 6

PATENT COOPERATION TREATY

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AUG 19 2003

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

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IPA

66
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PR-110

NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

To: Price, Lucinda G. HEWLETT-PACKARD COMPANY Intellectual Property Adm. P.O. Box 272400 Fort Collins, Colorado 80527-2400 ETATS-UNIS D'AMERIQUE		Date of mailing (day/month/year) 11/08/2003
Applicant's or agent's file reference 10013432-2 ✓		IMPORTANT NOTIFICATION
International application No. PCT/US 02/ 27849 ✓	International filing date (day/month/year) 30/08/2002 ✓	Priority date (day/month/year) 28/09/2001 ✓
Applicant HEWLETT-PACKARD COMPANY et Al.		

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

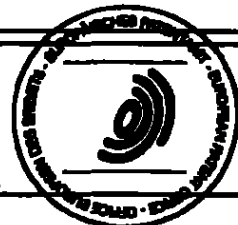
The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the IPEA/  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Netherlands Tel.: (+31-70) 340-2040 Fax: (+31-70) 340-3016	Authorized officer RASMUSSEN S O Tel. (+49-89) 2399 2828
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

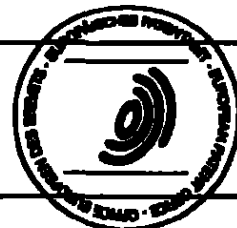
(Rationalized Report according to the Notice of the President of the EPO published in the OJ11/2001)

Applicant's or agent's file reference 10013432-2	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPRA/416)	
International application No. PCT/US 02/ 27849	International filing date (day/month/year) 30/08/2002	Priority date (day/month/year) 28/09/2001
International Patent Classification (IPC) or national classification and IPC B41J2/00		
Applicant HEWLETT-PACKARD COMPANY et Al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>2</u> sheets, including this cover sheet. ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consists of a total of _____ sheets.
3. This report contains indications relating to the following items: I ☒ Basis of the report II ☐ Priority III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV ☐ Lack of unity of invention V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI ☐ Certain documents cited VII ☐ Certain defects in the international application VIII ☐ Certain observations on the international application

Date of submission of the demand 28/04/2003	Date of completion of this report 06/08/2003
Name and mailing address of the IPRA/  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Netherlands Tel.: (+31-70) 340-2040 Fax: (+31-70) 340-3016	Authorized officer LAUE F M Tel. (+49-89) 2399 2828

Form PCT/IPRA/409 (cover sheet) P20476 (October 2002)



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No PCT/US 02/ 27849

60
4
6

I. Basis of the report

The basis of this international preliminary examination is the application as originally filed.

V. Reasoned statement under Rule 68.2(a)(II) with regard to novelty, inventive step or industrial applicability

In light of the documents cited in the international search report, it is considered that the invention as defined in at least some of the claims does not appear to meet the criteria mentioned in Article 33(1) PCT, i.e. does not appear to be novel and/or to involve an inventive step (see international search report, in particular the documents cited X and/or Y and corresponding claim references).

TRATADO DE COOPERACIÓN DE PATENTES

69



Remitente:

OFICINA ENCARGADA DEL EXAMEN PRELIMINAR INTERNACIONAL

PCT

A:

Price, Lucinda G.
HEWLETT-PACKARD COMPANY
Adm. de Propiedad Intelectual
P.O. Box 272400
Fort Collins, Colorado 80527-2400
ESTADOS UNIDOS DE AMERICA

NOTIFICACION DE TRANSMISION DEL REPORTE DEL EXAMEN PRELIMINAR INTERNACIONAL

(Regla 71.1 PCT)

Fecha de envío
(Día/Mes/Año)

11/08/2003

No. de Expediente del Solicitante o Apoderado

10013432-2

COMUNICACIÓN IMPORTANTE

No. de Solicitud Internacional

PCT/US 02/27849

Fecha Internacional de Presentación
(día/mes/año)

30/08/2002

Fecha de Prioridad (día/mes/año)

28/09/2001

Solicitante

HEWLETT-PACKARD COMPANY y colaboradores

1. Se comunica al solicitante que la oficina encargada del examen preliminar internacional le envía con el presente el informe de examen preliminar internacional, elaborado para la solicitud internacional, en caso dado con los anexos correspondientes.

2. Una copia del informe, en caso dado con los anexos correspondientes, se hace llegar a la Oficina Internacional para su envío posterior a todas las oficinas seleccionadas.

3. A solicitud de una oficina seleccionada, la Oficina Internacional preparará una traducción del informe (pero no de los anexos) al inglés y la remitirá a esta oficina.

4. RECORDATORIO,

Para ingresar en la fase nacional el solicitante, dentro de los 30 meses a partir de la fecha de prioridad (o en algunas oficinas incluso después), tiene que realizar ante cada oficina seleccionada ciertos actos (entrega de traducciones y desembolso de honorarios nacionales) (Artículo 39 (1)) (véase también la información remitida por la Oficina Internacional en el Formulario PCT/IB/301).

Si se tiene que enviar a una oficina seleccionada una traducción de la solicitud internacional, entonces esta traducción tiene que incluir traducciones de todos los anexos al informe de examen preliminar internacional. Es obligación del solicitante elaborar dichas traducciones y hacerlas llegar directamente a las oficinas seleccionadas respectivas.

Mayores detalles en cuanto a los plazos normativos y los requisitos de las oficinas seleccionadas se desprenden del Volumen II de la guía PCT para solicitantes.

Nombre y dirección postal de la IPEA/

Oficina Europea de Patentes, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Países Bajos
Tel. (+ 31-70) 340-2040
Fax: (+31-70) 340-3016

Empleado Autorizado

RASMUSSEN S O

Teléfono No. (+49-89) 2399 2828

TRATADO SOBRE COOPERACIÓN INTERNACIONAL
EN MATERIA DE PATENTES

PCT

INFORME DE EXAMEN PRELIMINAR INTERNACIONAL
(Artículo 38 y Regla 70 PCT)

No. de Expediente del Solicitante o Apoderado 10013432-2	PROCEDIMIENTO POSTERIOR Véase comunicación sobre el envío del informe de examen preliminar Internacional (Formulario PCT/IPEA/416)	
No. Solicitud Internacional PCT/US 02/27849	Fecha Internacional de Presentación (día/mes/año) 30/08/2002	Fecha de Prioridad (día/mes/año) 28/09/2001
Clasificación Internacional de Patente (IPC) o Clasificación Nacional e IPC B41J2/00		
Solicitante HEWLETT-PACKARD COMPANY y colaboradores		

1. Este Informe de examen preliminar internacional fue elaborado por la Oficina Encargada del Examen Preliminar Internacional y se envía al solicitante según Artículo 38.
2. Este INFORME comprende un total de 2 hojas, incluye esta portada
- ☐ Además se adjuntan ANEXOS al informe; en este caso se trata de hojas con descripciones, reivindicaciones y/o dibujos, que se modificaron y que sirven de base a este informe, y/o hojas con correcciones efectuadas por esta oficina (véase Regla 70.16 y Sección 607 de las Instrucciones administrativas al PCT).
- Estos anexos comprenden en total de 0 hojas.

3. Este informe contiene datos con respecto a los siguientes puntos:

- I ☒ Base del Informe
- II ☐ Prioridad
- III ☐ Sin elaboración de un dictamen sobre novedad, actividad inventiva y posibilidad de aplicación industrial
- IV ☐ Uniformidad deficiente de la invención
- V ☒ Declaración justificada según Artículo 35(2) con respecto a la novedad, la actividad inventiva y la posibilidad de aplicación industrial; documentos y explicaciones que sustentan esta declaración
- VI ☐ Ciertos documentos enumerados
- VII ☐ Ciertas deficiencias del registro internacional
- VIII ☐ Ciertas observaciones relacionadas con la solicitud internacional

Fecha de presentación de la petición 28/04/2003	Fecha de la preparación de este informe 08/08/2003
Nombre y dirección postal de la IPEA/ Oficina Europea de Patentes P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk – Países Bajos Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	Empleado Autorizado LAUE F M Teléfono No. (+49 89) 2399 2828

INFORME DEL EXAMEN

PRELIMINAR INTERNACIONAL

Solicitud Internacional No. PCT/US 02/27849

71 72

I. Base para este Informe

La base para este examen preliminar internacional es la solicitud como se entregó originalmente.

V. Afirmación razonada bajo la Regla 68.2(a)(II) respecto a novedad, nivel inventivo o aplicabilidad Industrial.

A la luz de los documentos citados en el Informe de búsqueda internacional, se considera que la invención como se define en al menos algunas de sus reivindicaciones no parece cumplir con los criterios mencionados en el Artículo 33(1) del PCT, en otras palabras no parece ser novedoso y/o involucrar nivel inventivo (ver informe de búsqueda internacional, en particular los documentos citados X y/o Y y las reivindicaciones referenciadas correspondientes)

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 10013432-2

Box No. I TITLE OF INVENTION THERMAL SENSE RESISTOR FOR A REPLACEABLE PRINTER COMPONENT	
Box No. II APPLICANT ☐ This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
HEWLETT-PACKARD COMPANY Intellectual Property Administration P.O. Box 272400, M/S 35 Fort Collins, Colorado 80527-2400 United States of America	
Telephone No. (650) 857-1501	
Facsimile No.	
Teleprinter No.	
Applicant's registration No. with the Office	
State (that is, country) of nationality: US	State (that is, country) of residence: US
This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
DODD, Simon 216 N.E. Plymouth Circle Corvallis, Oregon 97330 United States of America	
This person is: ☐ applicant only ☒ applicant and inventor ☐ inventor only (If this check-box is marked, do not fill in below.)	
Applicant's registration No. with the Office	
State (that is, country) of nationality: UK	State (that is, country) of residence: US
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box	
☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
LUND, Scott A. Hewlett-Packard Company Intellectual Property Administration P.O. Box 272400 Fort Collins, Colorado 80527-2400 United States of America	
Telephone No. (612) 573-2006	
Facsimile No. (612) 573-2005	
Teleprinter No.	
Agent's registration No. with the Office 41,166	
☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

73

Box No. V DESIGNATION OF STATES

Mark the applicable check-boxes below; at least one must be marked.

The following designations are hereby made under Rule 4.9(a):

Regional Patent

- ☐ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZM Zambia, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT (if other kind of protection or treatment desired, specify on dotted line)
- ☐ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☐ EP European Patent: AT Austria, BE Belgium, CH & LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, TR Turkey, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GQ Equatorial Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | | |
|--|---|---|
| ☐ AE United Arab Emirates | ☐ GM Gambia | ☐ NZ New Zealand |
| ☐ AG Antigua and Barbuda | ☐ HR Croatia | ☐ OM Oman |
| ☐ AL Albania | ☐ HU Hungary | ☐ PH Philippines |
| ☐ AM Armenia | ☐ ID Indonesia | ☐ PL Poland |
| ☐ AT Austria | ☐ IL Israel | ☐ PT Portugal |
| ☐ AU Australia | ☐ IN India | ☐ RO Romania |
| ☐ AZ Azerbaijan | ☐ IS Iceland | ☐ RU Russian Federation |
| ☐ BA Bosnia and Herzegovina | ☐ JP Japan | |
| ☐ BB Barbados | ☐ KE Kenya | ☐ SD Sudan |
| ☐ BG Bulgaria | ☐ KG Kyrgyzstan | ☐ SE Sweden |
| ☐ BR Brazil | ☐ KP Democratic People's Republic of Korea | ☐ SG Singapore |
| ☐ BY Belarus | ☐ KR Republic of Korea | ☐ SI Slovenia |
| ☐ BZ Belize | ☐ KZ Kazakhstan | ☐ SK Slovakia |
| ☐ CA Canada | ☐ LC Saint Lucia | ☐ SL Sierra Leone |
| ☐ CH & LI Switzerland and Liechtenstein | ☐ LK Sri Lanka | ☐ TJ Tajikistan |
| ☐ CN China | ☐ LR Liberia | ☐ TM Turkmenistan |
| ☐ CO Colombia | ☐ LS Lesotho | ☐ TN Tunisia |
| ☐ CR Costa Rica | ☐ LT Lithuania | ☐ TR Turkey |
| ☐ CU Cuba | ☐ LU Luxembourg | ☐ TT Trinidad and Tobago |
| ☐ CZ Czech Republic | ☐ LV Latvia | |
| ☐ DE Germany | ☐ MA Morocco | ☐ TZ United Republic of Tanzania |
| ☐ DK Denmark | ☐ MD Republic of Moldova | ☐ UA Ukraine |
| ☐ DM Dominica | ☐ MG Madagascar | ☐ UG Uganda |
| ☐ DZ Algeria | ☐ MK The former Yugoslav Republic of Macedonia | ☐ US United States of America |
| ☐ EC Ecuador | ☐ MN Mongolia | |
| ☐ EE Estonia | ☐ MW Malawi | ☐ UZ Uzbekistan |
| ☐ ES Spain | ☐ MX Mexico | ☐ VN Viet Nam |
| ☐ FI Finland | ☐ MZ Mozambique | ☐ YU Yugoslavia |
| ☐ GB United Kingdom | ☐ NO Norway | ☐ ZA South Africa |
| ☐ GD Grenada | | ☐ ZM Zambia |
| ☐ GE Georgia | | ☐ ZW Zimbabwe |
| ☐ GH Ghana | | |

Check-boxes below reserved for designating States which have become party to the PCT after issuance of this sheet:

- ☐ .YC Saint Vincent and the Grenadines ☐
- ☐

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that these additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

74
K

Box No. VI PRIORITY CLAIM				
The priority of the following earlier application(s) is hereby claimed:				
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 28 September 2001 (28/09/01)	09/967,028	US		
item (2)				
item (3)				
item (4)				
item (5)				

☐ Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office) identified above as:

☐ all items ☒ item (1) ☐ item (2) ☐ item (3) ☐ item (4) ☐ item (5) ☐ other, see Supplemental Box

* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(ii)):

Box No. VII INTERNATIONAL SEARCHING AUTHORITY	
Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):	
ISA / EP	
Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):	
Date (day/month/year)	Number Country (or regional Office)

Box No. VIII DECLARATIONS		
The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):		Number of declarations
☐ Box No. VIII (i)	Declaration as to the identity of the inventor	:
☒ Box No. VIII (ii)	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	: 1
☒ Box No. VIII (iii)	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	: 1
☐ Box No. VIII (iv)	Declaration of inventorship (only for the purposes of the designation of the United States of America)	:
☐ Box No. VIII (v)	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	:

75 80

Box No. VIII (1) DECLARATION: ENTITLEMENT TO APPLY FOR AND BE GRANTED A PATENT

The declaration must conform to the standardized wording provided for in Section 212; see Notes to Boxes Nos. VIII, VIII (1) to (4) (in general) and the specific Notes to Box No. VIII (4). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis 1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

in relation to this International application,

HEWLETT-PACKARD COMPANY is entitled to apply for and be granted a patent by virtue of the following:

an assignment from

DODD, Simon, 216 N.E. Plymouth Circle, Corvallis, Oregon 97330, United States of America

to **HEWLETT-PACKARD COMPANY**, dated 5 November 2001

This declaration is made for the purposes of all designations, except the designation of the United States of America

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (1)".

Box No. VIII (III) DECLARATION: ENTITLEMENT TO CLAIM PRIORITY

The declaration must conform to the standardized wording provided for in Section 213; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (III). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(II) and 51bis.1(a)(ii)):

In relation to this international application,

HEWLETT-PACKARD COMPANY is entitled to claim priority of earlier application

No. 09/967,028

by virtue of the following:

an assignment from **DODD, Simon**, to **HEWLETT-PACKARD COMPANY**, dated 5 November 2001

This declaration is made for the purposes of all designations, except the designation of the United States of America

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (III)".

Box No. IX CHECK LIST; LANGUAGE OF FILING

This international application contains:

(a) the following number of sheets in paper form:

request (including declaration sheets) : 8
 description (excluding sequence listing part) : 18
 claims : 2
 abstract : 1
 drawings : 8

Sub-total number of sheets : 31

sequence listing part of description (actual number of sheets if filed in paper form, whether or not also filed in computer readable form; see (b) below) :

Total number of sheets : 31

(b) sequence listing part of description filed in computer readable form

(i) ☐ only (under Section 801(a)(i))(ii) ☐ in addition to being filed in paper form (under Section 801(a)(ii))

Type and number of carriers (diskette, CD-ROM, CD-R or other) on which the sequence listing part is contained (additional copies to be indicated under item 9(i), in right column):

This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):

- | | | |
|---|---|---|
| 1. ☒ fee calculation sheet | : | 1 |
| 2. ☒ NOTARIAL separate power of attorney | : | 1 |
| 3. ☐ original general power of attorney | : | |
| 4. ☒ copy of general power of attorney; reference number, if any: | : | 1 |
| 5. ☐ statement explaining lack of signature | : | |
| 6. ☐ priority document(s) identified in Box No. VI as item(s): | : | |
| 7. ☐ translation of international application into (language): | : | |
| 8. ☐ separate indications concerning deposited microorganism or other biological material | : | |
| 9. ☐ sequence listing in computer readable form (indicate also type and number of carriers (diskette, CD-ROM, CD-R or other)) | : | |
| (i) ☐ copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application) | : | |
| (ii) ☐ (only where check-box (b)(i) or (b)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter | : | |
| (iii) ☐ together with relevant statement as to the identity of the copy or copies with the sequence listing part mentioned in left column | : | |
| 10. ☒ other (specify): Appointment of Sub-Agent | : | 1 |

Figure of the drawings which should accompany the abstract: 68

Language of filing of the international application: English

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



Scott A. Lund

For receiving Office use only

1. Date of actual receipt of the purported international application:

3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:

4. Date of timely receipt of the required corrections under PCT Article 11(2):

5. International Searching Authority (if two or more are competent): ISA /

6. ☐ Transmittal of search copy delayed until search fee is paid

2. Drawings:

☐ received:☐ not received:

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

PATENT COOPERATION TREATY
SAN DIEGO LEGAL DEPT.

RECEIVED

SEP 24 2002

From the RECEIVING OFFICE

To
SCOTT A. LUND
HEWLETT-PACKARD COMPANY
INTELLECTUAL PROPERTY ADMINISTRATION
P.O. BOX 272400
FORT COLLINS, COLORADO 80527-2400

SEP 25 2002
RECEIVED

HP LEGAL
IPA

NOTIFICATION OF THE INTERNATIONAL
APPLICATION NUMBER AND OF THE
INTERNATIONAL FILING DATE

(PCT Rule 20.5(c))

LGH CGP
TTP: for

Date of mailing (day/month/year)		17 Sep 2002
Applicant's or agent's file reference 10013432-2		IMPORTANT NOTIFICATION
International application No. PCT/US02/27848	International filing date (day/month/year) 20 Aug 2002	Priority date (day/month/year) 26 Sep 2001
Applicant HEWLETT-PACKARD COMPANY		
Title of the invention THERMAL SENSE RESISTOR FOR A REPLACEABLE PRINTER COMPONENT		

1 The applicant is hereby notified that the international application has been recorded the international application number and the international filing date indicated above.

2 The applicant is further notified that the record copy of the international application:

- ☒ was transmitted to the International Bureau on 17 Sep 2002
- ☐ has not yet been transmitted to the International Bureau for the reason indicated below and a copy of this notification has been sent to the International Bureau*:
- ☐ because the necessary national security clearance has not yet been obtained.
- ☐ because of reason to be specified:

* The International Bureau monitors the transmission of the record copy by the receiving Office and will notify the applicant (with Form PCT/IB/301) of its receipt. Should the record copy not have been received by the expiration of 14 months from the priority date, the International Bureau will notify the applicant (Rule 22.1(c)).

J. FOREIGN TRANSMITTAL LICENSE INFORMATION

Completed by: EB

- ☐ Additional license for foreign transmittal not required. This subject matter is covered by a license already granted or the equivalent U.S. national application. Refer to that license for information concerning its scope.
- ☐ License for foreign transmittal not required. 37 CFR 5.11(c)(1) or 37 CFR 5.11(c)(2). However, a license may be required for additional subject matter. See 37 CFR 5.15(b).
- ☒ Foreign transmittal license granted. 35 U.S.C. 184; 37 CFR 5.11 on 12 Sep 2002 (date):
- ☒ 37 CFR 5.15(a) ☐ 37 CFR 5.15(b)

Name and mailing address of the receiving Office
Assistant Commissioner for Patent, Box PCT
Washington, D.C. 20231 Att:RO/US

Facsimile No. 703-305-3230

Authorized officer
Eric Simms

Telephone No. 703-305-3781

Form PCT/IB/301 (July 1992)

PATENT C OPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 10013432-2	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 02/ 27849	International filing date (day/month/year) 30/08/2002	(Earliest) Priority Date (day/month/year) 28/09/2001
Applicant HEWLETT-PACKARD COMPANY		
This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau. This International Search Report consists of a total of <u>3</u> sheets. ☒ It is also accompanied by a copy of each prior art document cited in this report.		
1. Basis of the report a. With regard to the language, the International search was carried out on the basis of the International application in the language in which it was filed, unless otherwise indicated under this item. ☐ the International search was carried out on the basis of a translation of the International application furnished to this Authority (Rule 29.1(b)). b. With regard to any nucleotide and/or amino acid sequence disclosed in the International application, the International search was carried out on the basis of the sequence listing: ☐ contained in the International application in written form. ☐ filed together with the International application in computer readable form. ☐ furnished subsequently to this Authority in written form. ☐ furnished subsequently to this Authority in computer readable form. ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the International application as filed has been furnished. ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished. 2. ☐ Certain claims were found unsearchable (See Box I). 3. ☐ Unity of invention is lacking (see Box II). 4. With regard to the title, ☒ the text is approved as submitted by the applicant. ☐ the text has been established by this Authority to read as follows: 5. With regard to the abstract, ☒ the text is approved as submitted by the applicant. ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International search report, submit comments to this Authority. 6. The figure of the drawings to be published with the abstract is Figure No. <u>1</u> ☐ as suggested by the applicant. ☐ None of the figures. ☐ because the applicant failed to suggest a figure. ☒ because this figure better characterizes the invention.		

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/27849

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B41J2/175

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B41J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, IBM-TDB, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 04, 31 August 2000 (2000-08-31) & JP 2000 006459 A (SANYO ELECTRIC CO LTD), 11 January 2000 (2000-01-11) abstract ---	1-10
X	GANIH: "Print Hammer Flight Time Temperature Compensation Circuit. February 1981." IBM TECHNICAL DISCLOSURE BULLETIN, vol. 23, no. 9, 1 February 1981 (1981-02-01), pages 4107-4109, XP002219413 New York, US the whole document --- -/--	1,5,6,10

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document relating to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

Date of the actual completion of the international search

25 October 2002

Date of mailing of the international search report

13 11 2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentkan 2
NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040, Tx. 31 051 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Adam, E

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/27849

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 473 (P-799), 12 December 1988 (1988-12-12) & JP 63 192058 A (MATSUSHITA ELECTRIC IND CO LTD), 9 August 1988 (1988-08-09) abstract	1,5,6,10
A	--- PATENT ABSTRACTS OF JAPAN vol. 009, no. 033 (P-334), 13 February 1985 (1985-02-13) & JP 59 177620 A (MATSUSHITA DENKI SANGYO KK), 8 October 1984 (1984-10-08) abstract	1,6,10
A	--- PATENT ABSTRACTS OF JAPAN vol. 013, no. 418 (M-871), 18 September 1989 (1989-09-18) & JP 01 156079 A (MITSUBISHI ELECTRIC CORP), 19 June 1989 (1989-06-19) abstract	1,6,10
A	--- PATENT ABSTRACTS OF JAPAN vol. 1998, no. 13, 30 November 1998 (1998-11-30) & JP 10 214702 A (SUSUMU KOGYO KK), 11 August 1998 (1998-08-11) abstract	1,6,10
A	--- PATENT ABSTRACTS OF JAPAN vol. 015, no. 045 (M-1077), 4 February 1991 (1991-02-04) & JP 02 281969 A (MATSUSHITA ELECTRIC IND CO LTD), 19 November 1990 (1990-11-19) abstract	
A	--- US 5 072 235 A (SLOWIK JOHN H ET AL) 10 December 1991 (1991-12-10) -----	

INTERNATIONAL SEARCH REPORT
Information on patent family members

International Application No
PCT/US 02/27849

82
25
A

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000006459 A	11-01-2000	NONE	
JP 63192058 9 A		NONE	
JP 59177620 9 A		NONE	
JP 01156079 9 A		NONE	
JP 10214702 9 A		NONE	
JP 02281969 9 A		NONE	
US 5072235 A	10-12-1991	JP 3025055 B2 JP 4232753 A	27-03-2000 21-08-1992

Gravallia
PATENT COOPERATION TREATY

PCT/US02/27849

LOP
JTRCOR

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**NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT**

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

LUND, Scott, A.
Hewlett-Packard Comp
Intellectual Property
Administration
P.O. Box 272400
Fort Collins, CO 80527-2400
United States of America

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NOV 20 2002

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Date of mailing (day/month/year) 08 November 2002 (08.11.02)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 10013432-2 ✓	
International application No. PCT/US02/27849 ✓	International filing date (day/month/year) 30 August 2002 (30.08.02) ✓
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 28 September 2001 (28.09.01) ✓
Applicant HEWLETT-PACKARD COMPANY et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
28 Sept 2001 (28.09.01) ✓	09/967,028 ✓	US	24 Sept 2002 (24.09.02)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 29, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer SUAREZ Javier Telephone No. (41-22) 338.83.38
--	---

Form PCT/IB/304 (July 1999)

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PATENT COOPERATION TREATY

WO 03/029006
PCT/US02/27849

APR 29 2003

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NOTICE INFORMING THE APPLICANT OF THE
COMMUNICATION OF THE INTERNATIONAL
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

LUND, Scott, A.
Hewlett-Packard Company
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400
ETATS-UNIS D'AMERIQUEDate of mailing(day/month/year)
10 April 2003 (10.04.03)Applicant's or agent's file reference
10013432-2 ✓

IMPORTANT NOTICE

International application No.
PCT/US02/27849 ✓International filing date(day/month/year)
30 August 2002 (30.08.02) ✓Priority date(day/month/year)
28 September 2001 (28.09.01)

Applicant

HEWLETT-PACKARD COMPANY

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this notice:

KP, KR, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE, AG, AL, AM, AP, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EA, EC, EE, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OA, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a)-(d)).

3. Included with this notice is a copy of the international application as published by the International Bureau on 10 April 2003 (10.04.03) under No. 03/029006

4. **TIME LIMITS for filing a demand for international preliminary examination and for entry into the national phase**

The applicable time limit for entering the national phase will, subject to what is said in the following paragraph, be 30 MONTHS from the priority date, not only in respect of any elected Office if a demand for international preliminary examination is filed before the expiration of 19 months from the priority date, but also in respect of any designated Office, in the absence of filing of such demand, where Article 22(1) as modified with effect from 1 April 2002 applies in respect of that designated Office. For further details, see *PCT Gazette* No. 4-2/2001 of 1 November 2001, pages 19926, 19932 and 19934, as well as the *PCT Newsletter*, October and November 2001 and February 2002 issues.

In practice, time limits other than the 30-month time limit will continue to apply, for various periods of time, in respect of certain designated or elected Offices. For regular updates on the applicable time limits (20, 21, 30 or 31 months, or other time limit), Office by Office, refer to the *PCT Gazette*, the *PCT Newsletter* and the *PCT Applicant's Guide*, Volume II, National Chapters, all available from WIPO's Internet site, at <http://www.wipo.int/pct/en/index.html>.

For filing a demand for international preliminary examination, see the *PCT Applicant's Guide*, Volume I/A, Chapter IX. Only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

It is the applicant's sole responsibility to monitor all these time limits.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Judith Zahra

Facsimile No.(41-22) 740.14.35

Telephone No.(41-22) 338.91.11

Form PCT/IB/308 (April 2002)

PATENT COOPERATION TREATY

Due 7-19 85
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MAY 28 2003

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

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To: Price, Lucinda G. HEWLETT-PACKARD COMPANY Intellectual Property Adm. P.O. Box 272400 Fort Collins, Colorado 80527-2400 ETATS-UNIS D'AMERIQUE		FOREIGN ACTION DUE DATE <u>19 JUL 03</u> Assign <u> </u> Dwgs <u> </u> OA <u> </u> Exam <u> </u> Fee <u> </u> WRITTEN OPINION Resp Ltr Dtd <u> </u> Comments/Instr <u> </u> Other <u>WRITTEN OPINION</u> Text/Desig Chy <u> </u>	
		Date of mailing (day/month/year) 19/05/2003	
Applicant's or agent's file reference 10013432-2 ✓		REPLY DUE within 2 / 00 months/days from the above date of mailing	
International application No. PCT/US 02/ 27849 ✓	International filing date (day/month/year) 30/08/2002 ✓	Priority date (day/month/year) 28/09/2001	
International Patent Classification (IPC) or both national classification and IPC B41J2/00			
Applicant HEWLETT-PACKARD COMPANY et Al.			

- This written opinion is the first drawn up by this International Preliminary Examining Authority.
- This opinion contains indications relating to the following items:
 - ☒ Basis of the opinion
 - ☐ Priority
 - ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - ☐ Lack of unity of invention
 - ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - ☐ Certain documents cited
 - ☐ Certain defects in the international application
 - ☐ Certain observations on the international application
- The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

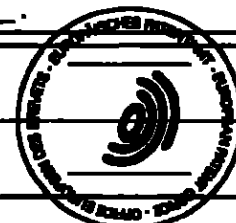
How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
 For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis.
 For an informal communication with the examiner, see Rule 66.5.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
- The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **28/01/2004**

Name and mailing address of the IPEA/  European Patent Office, P.B. 3818 Patentlaan 2 NL-2280 HV Rijswijk - Netherlands Tel: (+31-70) 340-2040 Fax: (+31-70) 340-3016	Authorized officer Examiner Formalities officer (incl. extension of time limits) Tel. (+49-89) 2399 2828
--	--

Form PCT/IPBA/408 (cover sheet) (march 2002)



86
↑
2.**I. Basis of the opinion**

1. The basis of this written opinion is the application as originally filed.

V. Reasoned statement under Rule 66.2(a)(II) with regard to novelty, inventive step or industrial applicability

1. In light of the documents cited in the international search report, it is considered that the invention as defined in at least some of the claims does not appear to meet the criteria mentioned in Article 33(1) PCT, i.e. does not appear to be novel and/or to involve an inventive step (see international search report, in particular the documents cited X and/or Y and corresponding claims references).
2. If amendments are filed, the applicant should comply with the requirements of Rule 66.8 PCT and indicate the basis of the amendments in the documents of the application as originally filed (Article 34 (2) (b) PCT) otherwise these amendments may not be taken into consideration for the establishment of the international preliminary examination report. The attention of the applicant is drawn to the fact that if the application contains an unnecessary plurality of independent claims, no examination of any of the claims will be carried out.

NB: Should the applicant decide to request detailed substantive examination, then an international preliminary examination report will normally be established directly. Exceptionally the examiner may draw up a second written opinion, should this be explicitly requested.



APPLICATION NUMBER	FLING DATE	GRP ART UNIT	FL FEE RCPTD	ATTY DOCKET NO	DRAWINGS	TOT CLAIMS	IND CLAIMS
09/987.028 ✓	09/28/2001 ✓	2185	854	10013432-1 ✓	6	28	3

CONFIRMATION NO. 4221

LGR-
ISS-208

FILING RECEIPT

Date Mailed: 10/23/2001

Receipt is acknowledged of this nonprovisional Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Customer Service Center. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).

Applicant(s)

Simon Dodd, Corvallis, OR:

Domestic Priority data as claimed by applicant

Foreign Applications

If Required, Foreign Filing License Granted 10/23/2001

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

Thermal sense resistor for a replaceable printer component

Preliminary Class

711

LICENSE F R FOREIGN FILING UNDER

DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATIONATTORNEY DOCKET NO. 10013432-1

As a below named inventor, I hereby declare that:

My residence/post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Thermal Sense Resistor For A Replaceable Printer Component

the specification of which is attached hereto unless the following box is checked:

(X) was filed on Sep 28, 2001 as US Application No. or PCT International Application
Number 09/867028 and was amended on _____ (if applicable).

I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose all information which is material to patentability as defined in 37 CFR 1.56.

Foreign Application(s) and/or Claim of Foreign Priority

I hereby claim foreign priority benefits under Title 35, United States Code Section 119 of any foreign application(s) for patent or inventor(s) certificate listed below and have also identified below any foreign application for patent or inventor(s) certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE FILED	PRIORITY CLAIMED UNDER 35 U.S.C. 119
			YES: _____ NO: _____
			YES: _____ NO: _____

Provisional Application

I hereby claim the benefit under Title 35, United States Code Section 119(a) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILED DATE

U. S. Priority Claim

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT International filing date of this application:

APPLICATION NUMBER	FILED DATE	STATUS (patented/pending/abandoned)

POWER OF ATTORNEY:

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

Customer Number 022878Place Customer
Number Bar Code
Label hereSend Correspondence to:
HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

Direct Telephone Calls To:

Lucinda G. Aurdelle
(841) 715-7038

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Inventor: Simon DoddCitizenship: GBResidence: 216 NE Plymouth Circle, Corvallis OR 97330Post Office Address: Same as Residence

Inventor's Signature

Date

89
26

Dear Sir:

Please acknowledge receipt of the following document(s) re U.S. Patent Application

PD No 0013432-1, Atty LEA

Serial No 091967028, Filed 9/28/01

Inventor(s): E. Dodd

Continuation application of S/N _____ dated _____

☒ Transmittal letter (duplicated) _____ Assignment(s) _____

☒ Declaration & Power of Attorney and copy of Notice of Missing Parts

Response to Office Action dated _____

Petition for Extension of Time

☒ Authorization to charge fees to Deposit Account

Issue fee transmittal and advance order for _____ copies

☒ Certificate of Mailing

☒ First Class _____ Express Mail No. _____ dated 11/13/01

1001 3438-1 90
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To: Name: HEWLETT-PACKARD COMPANY
Company: LUCINDA G. AUCIELLO
Fax Number: 18586555859
Voice Phone:

Fax Notes:

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1	Cover Page
2	196.TXT
3	Document 1, Batch 214838

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SAN DIEGO CAUNITED STATES PATENT AND TRADEMARK OFFICE
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THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERROR, OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 03/27/2002

REEL/FRAME: 012522/0591
NUMBER OF PAGES: 2

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:

DODD, SIMON

DOC DATE: 11/05/2001

ASSIGNEE:

HEWLETT-PACKARD COMPANY
INTELLECTUAL PROPERTY
ADMINISTRATION
P.O. BOX 271400
FORT COLLINS, COLORADO 80527-2400SERIAL NUMBER: 09967028
PATENT NUMBER:FILING DATE: 09/28/2001
ISSUE DATE:DOROTHY RILEY, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

1. Name of conveying party(ies):

Simon Dodd 11/5/01

2. Name and address of receiving party(ies):

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 271400
Fort Collins, Colorado 80527-1400

Additional name(s) of conveying party(ies) attached ☐ Yes ☒ No

Additional name(s) & address(es) attached? ☐ Yes ☒ No

3. Nature of Conveyance:

☒ Assignment

☐ Merger

☐ Change of Name

☐ Security Agreement

☐ Other

Execution Date(s): November 5, 2001

4. Application number(s) or patent number(s):

If this document is being filed together with a new application, execution date of the application is:

A. Patent Application No.(s)

B. Patent No.(s)

Application No.: 09/067,028

Date Filed: 9/26/01

Confirmation No.: 4221

Additional numbers attached? NO

5. Name and address of party to whom correspondence concerning document should be mailed:

Records Manager
HEWLETT-PACKARD COMPANY
Rick de la Torre MS 88-838
10399 W Bernardo Drive
San Diego CA

6. Total number of applications and patents involved: 1

7. Total Fee (37 CFR 3.41): . . . \$40.00

☐ Enclosed

☒ Authorization to be charged to deposit account.

8. Deposit Account Number: 88-2025

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9. Statement and signature.

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

Lynnda G. Aualilio

Name of Person Signing

Signature

Mar 28, 2002

Date

Total number of pages including cover sheet, attachments, and document: 2

OMB No. 0851-0011 (exp. 4/94)

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***** -HP SD LEPL - ***** 050 055 3030- *****

FORM PTO-1095 1-91-02		U.S. DEPARTMENT OF COMMERCE Patent and Trademark Office	
RECORDATION FORM COVER SHEET		PATENTS ONLY	
1. Name of conveying party(ies): Simon Dodd 11/8/01		2. Name and address of receiving party(ies): HEWLETT-PACKARD COMPANY Intellectual Property Administration P.O. Box 273400 Fort Collins, Colorado 80537-2400	
Additional name(s) of conveying party(ies) attached? Yes ☒ No		Additional name(s) & address(es) attached? Yes ☒ No	
3. Nature of Conveyance: ☒ Assignment ☐ Merger ☐ Change of Name ☐ Security Agreement ☐ Other			
Execution Date(s): November 8, 2001			
4. Application number(s) or patent number(s): If this document is being filed together with a new application, execution date of the application is: A. Patent Application No.(s) B. Patent No.(s) Application No.: 09/007,028 Date Filed: 9/28/01 Confirmation No.: 4221 Additional numbers attached? NO			
5. Name and address of party to whom correspondence concerning document should be mailed: Records Manager HEWLETT-PACKARD COMPANY Rick de la Torre MS 00-438 16400 W Bernardo Drive San Diego CA		6. Total number of applications and patents involved: 1 7. Total Fee (37 CFR 3.41): \$40.00 ☐ Enclosed ☒ Authorization to be charged to deposit account. 8. Deposit Account Number: 00-0000	
DO NOT USE THIS SPACE			
9. Statement and signature. To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document. Lucinda G. Ausoleto  Mar 20, 2002 Name of Person Signing Signature Date Total number of pages including cover sheet, attachments, and document: 2			
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Attorney Docket No. 10013432-1

94
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1. Name of conveying party(ies):
Simon Dodd 11/5/01

2. Name and address of receiving party(ies):
HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

Additional name(s) of conveying party(ies) attached ☐ Yes ☒ No

Additional name(s) & address(es) attached? ☐ Yes ☒ No

3. Nature of Conveyance:

☒ Assignment

☐ Merger

☐ Change of Name

☐ Security Agreement

☐ Other

Execution Date(s): November 5, 2001

4. Application number(s) or patent number(s):

If this document is being filed together with a new application, execution date of the application is:

A. Patent Application No.(s)

B. Patent No.(s)

Application No.: 09/967,028

Date Filed: 9/28/01

Confirmation No.: 4221

Additional numbers attached? NO

5. Name and address of party to whom correspondence concerning document should be mailed:

Records Manager
HEWLETT-PACKARD COMPANY
Rick de la Torre MS 66-838
16399 W Bernardo Drive
San Diego CA

6. Total number of applications and patents involved: 1

7. Total Fee (37 CFR 3.41): \$40.00

☐ Enclosed

☒ Authorization to be charged to deposit account.

8. Deposit Account Number: 08-2025

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9. Statement and signature.

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

Lucinda G. Auciello

Name of Person Signing

Signature

Mar 26, 2002

Date

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Fort Collins, Colorado 80527-2400

PATENT APPLICATION
ATTORNEY DOCKET NO. 10013432 -1

95
JP

ASSIGNMENT OF PATENT APPLICATION

I/We, the undersigned (each) have agreed and hereby agree to assign to HEWLETT-PACKARD COMPANY, a Delaware corporation having its principal place of business in Palo Alto, California, (hereinafter HP), in furtherance of my/our obligations to HP, and do hereby assign and transfer to HP, its successors and assigns, the entire right, title and interest, including the right of priority, in, to and under an application for Letters Patent of the United States entitled:

Thermal Sense Resistor For A Replaceable Printer Component

Filing date: Sept. 28, 2001

Application No.: 09/967,028

and the invention(s) and improvement(s) set forth therein, and any and all continuations, continuations-in-part (C-I-P's), divisionals, and renewals of and substitutes for said application for said Letters Patent, and any and all Letters Patent of the United States and of countries foreign thereto which may be granted thereon or therefor; and any reissues, or reexaminations, or extensions of said Letters Patent.

I/we additionally authorize HP to file applications in my/our name for Letters Patent in any country, to be held and enjoyed by HP, its successors, assigns, nominees or legal representatives, to the full end of the term or terms for which said Letters Patent respectively may be granted, reissued or extended, as fully and entirely as the same would have been held and enjoyed by me/us had this assignment, and transfer not been made;

AND I/we hereby covenant that I/we have full right to convey the entire interest herein assigned, and that I/we have not executed and will not execute any agreement in conflict herewith, and I/we further covenant and agree that I/we will, each time a request is made, and without undue delay, execute and deliver all such papers as may be necessary or desirable to perfect the title to said invention(s) or improvement(s), said application and said Letters Patent, to HP, its successors, assigns, nominees or legal representatives, and I/we agree to communicate to HP, or to its nominee, all known facts respecting said invention(s) or improvement(s), said application and said Letters Patent, to testify in any legal proceedings, to sign all lawful papers, to execute all disclaimers and divisionals, continuations, C-I-P's, reissue and foreign applications, to make all rightful oaths and declarations, and generally to do everything possible to aid HP, its successors, assigns, nominees and legal representatives to obtain and enforce, for its or their own benefit, proper patent protection for said invention(s) or improvement(s) in any and all countries provided the expenses which may be incurred by me/us in lending such cooperation and assistance are paid by HP;

AND I/we hereby authorize and request the Commissioner of Patents and Trademarks of the United States and any official of any country or countries foreign to the United States whose duty it is to issue patents on applications as aforesaid, to issue to HP, as assignee of the entire right, title and interest, any and all Letters Patent for said invention(s) or improvement(s), including any and all Letters Patent of the United States which may be issued and granted on or as a result of the application aforesaid, in accordance with the terms of this assignment.

I/we further authorize and direct HP attorneys to insert the serial number and filing date of said application now identified by the attorney docket number and title set forth above as soon as the same shall have been made known to them by the United States Patent and Trademark Office.

IN WITNESS WHEREOF, I/we hereunto set my/our hand(s) and seal(s):

[Signature] Date Assignment Signed: November 5, 2001
Inventor's Signature (Seal)

Inventor's Typed Name: Simon Daddi Date Application Signed: November 5, 2001

State of _____)
County of _____) ss.:

Before me this _____ day of _____, personally appeared Simon Daddi who is personally known or proved to me on the basis of satisfactory evidence to be the person who acknowledged the foregoing instrument of assignment to be his/her free act and deed.

Notary Public
My commission expires _____

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96

Radicación : 04029706 00000000
Fecha (MS): 2004-03-26 17:00:47
Trámite : 011 PL1-PATENT 3/9 FASE INCL 411 PRESENTAC
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

REQUISITOS NECESARIOS PARA PRESENTACION Y AGILIZACION DEL TRAMITE

	USUARIO	RADICADOR
PATENTE DE INVENCION ✓		
MODELO DE UTILIDAD	()	()
- Indicación de que se solicita la concesión de una patente.	()	()
- Datos de identificación del solicitante o de la persona que se presenta la solicitud.	()	()
- Descripción de la invención.	()	()
- Dibujos de ser estos pertinentes.	()	()
- Comprobante de Pago de las tasas establecidas.	()	()
COMPLETA ()		
INCOMPLETA ()		
DISEÑO INDUSTRIAL ()		
- Indicación de que se solicita el registro de Diseño Industrial	()	()
- Datos de identificación del solicitante o de la persona que presenta la solicitud.	()	()
- Representación gráfica o fotográfica del Diseño Industrial o muestra del Material que incorpora el diseño.	()	()
- Comprobante de pago de las tasas establecidas	()	()
COMPLETA ()		
INCOMPLETA ()		
ESQUEMA DE TRAZADO ()		
- Indicación de que solicita el registro de un Esquema de trazado.	()	()
- Datos de identificación del solicitante o de la persona que presenta La solicitud.	()	()
- Representación gráfica del esquema de trazado	()	()
- Comprobante de pago de las tasas establecidas.	()	()
COMPLETA ()		
INCOMPLETA ()		

Firma Responsable: *Jaqueline M. Nava*

Fecha:



99
97

2020
Bogotá, D.C.,

05201

Doctor:
RAMIRO CASTRO DUQUE
Apoderado

Oficio N°

ASUNTO:	Radicación N°	0428788
	Solicitud internacional	PCT/US02/27849
	Fecha Inicio fase nacional	28/04/2004
	Trámite	011
	Evento	379
	Actuación	430
	Folios	001

Como resultado del examen de forma, realizado con fundamento en el artículo 38 de la Decisión 486 de la Comisión de la Comunidad Andina, artículo 27 del Tratado de Cooperación en Materia de Patentes (PCT), regla 51 bis del Reglamento y Circular Única de la Superintendencia de Industria y Comercio, se le comunica que:

- ☐ La solicitud no contiene el poder debidamente otorgado, con el lleno de los requisitos exigidos por los artículos 63 y subsiguientes del Código de Procedimiento Civil. Adicionalmente, deberá presentar el documento que acredita la existencia y representación legal de la sociedad solicitante, cuando ésta fuere persona jurídica.
- ☐

En cumplimiento de lo dispuesto por el artículo 39 de la Decisión 486, se le requiere para que dentro del término de dos meses siguientes a la fecha de notificación del presente oficio, complete los requisitos anteriormente enunciados. En caso de no dar cumplimiento al presente requerimiento, la solicitud se considerará abandonada y perderá su prelación.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única N° 10 de 2001.

ALIX CARMENZA CESPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones.

El anterior requerimiento fue notificado por fijación en lista de fecha

27 MAYO 2004