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(54) **Laminated ribbon element for thermal printing, thermal printer and process for lift-off correction.**

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Description

Technical field

This invention relates to thermal printing and, more particularly, it relates to a laminated ribbon element which functions both for printing and lift-off correction, to a thermal printer using said element, and to a process for lift-off correction.

Background art

Thermal printing of the kind involved is by flow of melted material from a transfer medium which appears similar to a one-use typewriter ribbon. A lower lamination of the ribbon is heated, and printing is achieved by transferring ink from the ribbon to papper by means of local heating. Lift-off correction is the physical stripping of a printed character from the paper or other surface on which it is printed.

Lift-off correction of printing by conventional typewriters is now a standard option. To achieve such correction, the cohesion of the ink must be greater than the affinity of the ink for the paper or other surface upon which it is applied. The ink is formulated so that the adhesion is one of surface adhesion between the ink and the paper rather than a viscous penetration of the paper fibers or wetting of the paper fibers with the ink layer. With such ink, as the printing material, correction of erroneously typed characters is accomplished by adhesive removal from the surface of the paper, using a piece of correction material having an adhesive surface which is impacted onto the erroneously typed character. This adheres the adhesive surface of the correction material to the character, and the correction material is pulled from the paper, thereby pulling the erroneously typed character bodily with it. This now-standard lift-off correction with conventional typewriters is illustrated by U.S. patent No. 3,825,437 and U.S. patent 3,825,470.

Conventionally, the character erroneously typed is the character once again impacted during lift-off erasure. This form of impact minimizes adhesion to the paper surrounding and in internal uninked parts of the character. Abrasion and other marking of the paper is thereby minimized.

Thermal printing of the kind here involved is known and described in the prior art, but is very much less common than conventional impact type. U.S. patent no. 3,744,611 is illustrative of the basic printing system and U.S. patent no. 4,103,066 describes a laminated ribbon with a polycarbonate resistive layer for thermal printing having a construction in accordance with the preamble of claim 1. A similar arrangement is disclosed in EP—A—0 033 364. Neither of these patents mentions however correction of erroneously printed characters. *IBM Technical Disclosure Bulletin,* Vol. 23, No. 5, (October 1980) page 2012, "Electrothermal Ribbon Path", by S. L. Applegate et al discloses thermal printing in which the ribbon is directed away from print area while still warm so as to minimize adhesion to the ribbon after printing found to occur with cooling.

A non-tacky roll is easier to feed and otherwise handle within the typewriter, and reductoin and elimination of tack in a lift-off correction ribbon except during the correction step is now a commonly recognized design objective. U.S. patent No. 3,855,448 and *IBM Technical Disclosure Bulletin,* Vol. 19, No. 2, (July 1978), page 672, "Delayed Tack Ribbon for Laser Transfer and Other Printing," by C. A. Bruce et al, both are to thermal printing and both describe their transfer layer as an adhesive material which is non-adhesive until the temperature is raised during printing. Neither have any mention of lift-off correction. In U.S. patent No. 4,093,772 and U.S. Patent 3,924,728 a lift-off correction tape is part of the typewriter ribbon and is said to be non-tacky during feeding. The coating in these patents is said to be not sticky to touch and not adherent to itself, but to become sticky in response to pressure, specifically the pressure of impact typing. U.S. patent No. 3,998,314 is to the same general effect, but describes the lift-off layer only as impact compressible. Typically, in the prior art, the lift-off correction tape is fed by mechanisms separate from the imaging ribbon feed mechanisms. Desirable aspects of a combined or single ribbon feed are recognized. Thus, the above-mentioned U.S. patents 4,093,772 and 3,924,728 show a dual ribbon with lengthwise strips, one of marking material and one of lift-off correction material. This is said to be a conventional split correction ribbon with a lift-off coating rather than a masking coating. The normally non-tacky nature of the lift-off strip is said to make possible the feeding and handling of the dual ribbon by a single mechanism in the typewriter. U.S. patent No. 4,034,843 similarly discloses a split, lift-off correction-imaging ribbon for impact typing, with emphasis on techniques of joining the two strips.

Disclosure of the invention

It is an object of the invention to provide a single ribbon element which functions both for printing and lift-off correction.

It is a further object of the invention to provide a thermal printer and related process to heat the ribbon element at one temperature to effect printing and at an intermediate temperature to effect lift-off correction.

In accordance with the present invention, a laminated ribbon element for thermal printing comprising an electrically resistive supporting substrate carrying an active layer, said active layer being pigmented for visual recognition when printed and being a thermoplastic which is non-tacky and cohesive at ordinary room temperatures is characterized in that for correcting said printing by a lift-off correction, said

active layer is made of a material which forms a bond for lift-off correction of thermal printing made by said element after having been raised to temperatures above ordinary room temperatures but below temperatures at which said thermal printing by said element is effected.

According to a further feature of the invention, said active layer is a blend comprising an ethylene vinyl acetate copolymer, a compatible acrylic polymer, and carbon black.

The thermal printer according to the invention, is of the type which has a power source to power heat-producing elements which can be selectably activated in the form of a character to be printed while in contact with said laminated element from which marking material flows when heated by said elements, and is characterized in that it comprises control means adapted to be set during a lift-off correction operation to apply power from said power source to said laminated element in a substantial amount, said amount being less than power to effect said printing, while activating selected ones of said elements.

In accordance with the present invention, a process of correcting a printed image which has been thermally printed from said laminated element, is characterized in that it comprises the steps of:

1) positioning an unused portion of said laminated element as is characterized above over a character printed by said element, then
2) heating said substrate until the active layer develops an adhesion to said character while not flowing from said element, then
3) allowing said active layer to cool, until a bond forms between said character and said active layer, and then
4) moving said laminated element away from the location at which said character is printed to lift said character away.

Non-tackyness of the laminated element, except at the lift-off step, not only simplifies the feeding of said element, but simplifies incidental handling and, should the correction material dislodge into the printer, the material does not tend to stick to important areas and is generally more easily cleaned away.

The laminated element of the invention feeds well with low drag and does not require separate mounting and feed mechanisms.

The printer of the invention has the capability of generating heat in the image of the character to be erased. This capability is used and the thermal activation of the correction material corresponds in form to the ink image of the character. This minimizes adhesion to the paper surrounding and internal to the character, thereby minimizing subsequent abrasion or other marking of the paper. This advantage corresponds to conventional erasure by impact printing, in which the printing element for the character to be lifted off is the one impacted against the paper. Correction by this thermal technique is largely noiseless as it involves no impact or abrasion.

Brief description of the drawings

Fig. 1 shows an illustrative printer system, and

Fig. 2 shows a top view of such a system including the ribbon;

Fig. 3 shows an intermediate section of the preferred ribbon from the side;

Fig. 4a through Fig. 4d show steps in an erasure operation.

Detailed description of the invention

As shown illustratively in Fig. 1, the printer is a typewriter having the usual keyboard 1, a platen 3 upon which paper 5 to be printed upon is supported and a thermal printing element or printhead 7 with a group of small electrodes 9 to effect printing of a selected character image. Selection of individual electrodes 9, as the printhead 7 is moved across the paper, makes possible the combination of minute dots of image to form virtually any image.

One of the keybuttons 11 effects ordinary backspacing while another keybutton 13 effects the erasure operation to be described. Another key 15 effects forward spacing. Sequencing and other control of typewriter operations in response to operation of keyboard 1 is under control of electric logic and digital processing circuits as is now conventional in general respects in electronic typewriters.

In Fig. 1 the printhead 7 is shown broken away on the side toward the keyboard. The remaining structure is sufficiently indicated in Fig. 2. Toward the platen 3, the supporting structure of printhead 7 is shown broken away to emphasize the single vertical row of electrodes 9 which are mounted within the printhead 7. During normal printing, each electrode 9 is either connected to printing potential or not connected, depending upon the pattern to be printed.

Fig. 2 is a top view, also generally illustrative only, of the printing and erase area. Positioning member 20 pivoted at point 21, is attached to printhead 7. A ribbon 22 is unwound from a supply spool (not shown) around tensioning roller 24, across a guide roller 26, and to the end of printhead 7. Solenoid 27 is linked to an arm of positioning member 20, and, when activated, pulls member 20 clockwise to force the end of printhead 7 against paper 5 mounted on platen 3. When solenoid 27 is de-energized, spring 28, connected to member 20 and to a point on the mechanism frame, pulls member 20 counterclockwise to thereby move printhead 7 away from paper 5.

Ribbon 22 is pressed between the end of printhead 7 and paper 5 when solenoid 27 is

activated. Ribbon 22 is then in contact with the ends of the vertical column of electrodes 9 (Fig. 1), which are mounted in printhead 7. A guide member 29 is selectably movable toward and away from platen 3. During correction, guide member 29 is moved toward platen 3 to present a face at paper 5 a distance selected to be about 6 millimeters prior to the printing position. When member 29 is in the erase position, shown in Fig. 2, ribbon 22 is thereby positioned flat with the paper at the printing point and for about 6 mm prior to the printing point. In a typical printing operation 6 mm is about the width of two to four characters.

Metering of the ribbon 22 is effected by cooperating metering rollers 30 and 32 located on the take-up side of printhead 7. Roller 30 is arranged on the side of the ribbon 20 that faces printhead 7 and is mounted at a fixed position with respect to printhead 7. Firm pressure contact with ribbon 22 is achieved by mounting roller 32 such that it is movable toward roller 30 and biased to provide a nipping force. Roller 30 is driven with each printing operation an amount approximately equal to the width of printing movement effected, so that the print-head 7 moves across paper 5 with unused ribbon 22 opposite the printing position and with the ribbon 22 having no substantial motion in the direction of printing movement relative to paper 5.

Roller 30 is formed of a conducting material such as brass and is preferably knurled to assure intimate contact and firm gripping. Current from the electrodes 9 in printhead 7 is collected by the electrically grounded roller 30 through contact with the side of the ribbon 22 which it contacts, which side is resistive as will be more fully discussed. To improve the connection further, roller 32 may be grounded and used to establish a connection through voids in the ink layer left by printing.

Such operation and design of a thermal printer may be conventional, except for the guide member 29. Typically, the print-head 7 and ribbon-guide rollers 24, 26, 30 and 32 are mounted on a carrier 34 which moves across the length of a stationary platen 3. The guide member 29 may similarly be mounted on carrier 34, along with a suitable mechanism to move it toward the platen during correction. For movement across the print line, carrier 34 is attached to an electrical motor 36, which drives a belt or cable 28, the ends of which are connected to opposite sides of carrier 34.

Guide member 29 presents a smooth, surface upon which ribbon 22 rests. Member 29 is mounted on the end of arm 150 (see Fig. 2), which is pivoted to carrier 34 at point 152. The other side of arm 150 is linked to solenoid 154. Spring 56 connects to arm 150 near member 29, with the other end connected to the frame of carrier 34. (It will be apparent that this structure is effective and simple, but that in a commercial machine a design would be chosen which is dictated by space available and which avoids the use of a solenoid just for the movement of guide member 29).

The assembly constitutes motive means linked to guide member 29 to render guide member 29 selectably movable toward and away from platen 3. During printing solenoid 154 is not activated. Spring 56 therefore pulls arm 150 clockwise to bring guide member 29 away from platen 3 to the position shown in dotted outline in Fig. 2. Therefore, during printing, ribbon 22 is pulled away from paper 5 while still hot. During lift-off correction, solenoid 154 is activated pivoting arm 150 counter-clockwise and bringing guide member 29 toward platen 3 so that ribbon 22 is held against paper 5 in the span between printhead 7 and guide member 29.

An electrical lead, shown illustratively as a single wire 40, connects the electrodes 9 (Fig. 1) of printhead 7 to an electrical power supply 42. A switch 44 has two positions, a print position at which the full potential of power supply 42 is connected to the electrodes 9 and a correct position at which a connection is made to line 46 which results in a portion of the power supply 42 being applied to the electrodes 9. These electrical elements and connections are shown entirely illustratively as they may be implemented by a vast number of entirely acceptable alternatives within the skill of the art involved.

As shown in Fig. 3, the ribbon is a three layer element of an active material 50 of typically 4 to 6 microns in thickness, an aluminum layer 52 of about 1000 Angstroms in thickness which serves as current return path, and a resistive substrate 54 of typically 15 microns in thickness. The ribbon is, of course, wide enough to fit across the entire vertical row of electrodes 9.

Since printing is by complete release, ribbon 22 must be incremented with each printing step. Printing is effected by energizing selected ones of the electrodes 9 while those electrodes are in contact with substrate 54. Substrate 54 is also in contact with a broad, conductive area of roller 30, which disperses current beyond the location of electrodes 9. The high current densities in the areas near the energized point electrodes 9 produce intense local heating which causes, during printing, melting of active material 50 and resulting flow onto paper 5. During printing, guide member 29 is away from platen 3 so that ribbon 22 is pulled away from paper 5 while still hot. During lift-off correction, guide member 29 is moved to paper 5 so that ribbon 22 is held against paper 5 in the span between printhead 7 and guide member 29. During lift-off correction, as will be explained, the electrical potential and corresponding current is reduced, to thereby cause a heating which brings out adhesion without flow of the character printed.

The fabrication and the specific form of the resistive substrate 54 forms no essential part of

this invention and any substrate with adequate physical and electrical characteristics may be employed. Polycarbonate is used as the resin material of the substrate of the preferred embodiment. A representative teaching of the fabrication of a polycarbonate substrate for this purpose is disclosed in the above-mentioned U.S. Patent No. 4,103,066. Three parts of a polycarbonate resin (which may be Mobay Chemical Corporation Merlon or Makrolon or mixtures thereof and with a smaller amount of General Electric Co. GE3320 a polycarbonate block copolymer) is dissolved in approximately 93 parts of dichloromethane. Added to this mixture is approximately one part of conductive carbon (XC-72 from Cabot Corporation). This is first mixed in a shaker and then dispersed in a ball-mill jar containing steel balls. The dispersion is reverse roll coated onto a 0.125 mm Mylar substrate to the desired dry thickness. (Mylar is a trademark of DuPont for polyethylene terephthalate). The solvent is then evaporated away.

An electrically conducting intermediate layer 52 of aluminum of 1000 Angstrom thickness is vacuum deposited upon this substrate. The aluminum is then overcoated, using a reverse roll coater, by a dispersion of the material of the active layer, the preferred embodiment being the aqueous formulation described below, to the desired dry thickness. Upon evaporation of the water vehicle, the combined polycarbonate layer with aqueous-coated layer is stripped from the Mylar substrate. This is the final ribbon 22, with active material 50 being the water-applied layer, and the carbonate with carbon black being the substrate 54. It is slit to the desired width and wound into a spool.

Active layer formulation

The following formula is the presently preferred formula for the active or marking layer 50. It yields the desired printing characteristics of being bodily releasable from paper 5 while being non-tacky at ordinary ambient temperatures, flowable to effect printing a high temperature, and developing adhesion or tack for printed characters at intermediate temperatures.

Component	Parts by weight	% Solids
Adcote 37JD610 (An ethylene vinyl acetate copolymer of 6300 weight average molecular weight; approximately 90% by weight being the polyethylene component; with about 6% by weight rosin acids as dispersants; 40% total solids in water; trademark product of Morton Chemical Co.)	6	73.4
Hycar 2600X120 (Polyethylacrylate, with about 4% by weight polyacrylonitrile, some dispersant; 50% solids in water; trademark product of B. F. Goodrich Chemical Co.)	1	15.3
Aquablack 140 (Carbon black, 7% by weight naphthalene sulfonic acid dispersant; 37% solids in water; trademark product of Bordon Chemical, Division of Bordon Inc.)	1	11.3
Water (distilled, additional to water in foregoing)	1	—

Lift-off erasure operation

Upon discovery by the operator of a character which is incorrect, lift-off correction is effected by first positioning the printhead 7 to act as in printing at the location of the incorrect character. In Fig. 4, the character "b" in the bottom of the two lines of printing shown is to be corrected. Printhead 7 is shown as being on the same line as that character. If not, the platen 3 is rotated to select the line.

In the status shown in Fig. 4a, the printhead is on the desired line and has moved past the "b". Backspace key 11 is then operated until the printhead 7 is positioned to print at the location occupied by the "b", this position being shown in Fig. 4b. Backspacing is then terminated and the machine operator depresses the erase key 13. (The relationship of the static position with respect to printing in a typical system is optional, since the machine may be designed to move left initially so as to achieve a steady operating speed. Thus, it is a matter of choice whether the printhead should be positioned over the "b" or some location in a predetermined relationship to the "b".)

Depression of the erase key, followed by the key on keyboard 1 for "b", the symbol to be erased, effects the operations of normal printing of "b" with five exceptions as follows in the specific embodiment being described. (In a memory-assisted embodiment, the character to be erased would be known automatically, so no key on keyboard 1 for that character need be depressed after erase key 13 is depressed).

1) Solenoid 154 is energized, thereby

pivoting arm 150 to bring guide member 29 to the position near platen 3.

2) Current to electrodes 9 is reduced. In the simplified and largely symbolic illustration of Fig. 2, switch 40 is brought to the leftward position, thereby contacting line 46 and providing only a part of the potential of power supply 42 to the electrodes 9.
3) The speed of movement of printhead 7 and, correspondingly, movement of ribbon 22 may be reduced. However, speed reduction is not necessary with the specific embodiment disclosed and the same speed as printing is employed to simplify machine requirements.
4) Print movement is across the character being corrected and for 6 more millimeters spaces, the electrodes 9 not being powered after being powered to form the "b" to be erased. A typical location upon termination of the erase operation is suggested in Fig. 4c. The extra space provides a delay for cooling prior to the peeling of the ribbon with erased character attached from the page. And,
5) Printhead 7 may be automatically returned to a position for printing in the now-clean space previously occupied by the "b". A character desired in that space may be printed by depressing the key associated with it. Printhead 7 may be moved forward at any time by operating space key 15, or by operating other keys or keyboard 1 as is conventional.

Parameters of the embodiments

It will be recognized that the specific parameters are interdependent and that selection of one in a specific implementation can be as desired so long as the other parameters have corresponding charaacteristics. Thus, a thicker ribbon 22 tends to require higher current at electrodes 9, although an active layer 50 which melts easily might negate this. Such adjustments are simply a matter of ordinary optimization of design.

Accordingly, the parameters to be mentioned are those of one embodiment as described and should be considered basically illustrative, rather than particularly significant to any embodiment. The normal printing current at each electrode 20 is 26 milliamperes (ma). During lift-off correction, the current to each electrode is 6—12 ma. The speed of movement of printhead 7 during normal printing is 6.35 cm per second. When the speed of movement of printhead 7 is reduced during lift-off correction, a typical speed is 3.81 cm per second. Return of printhead 7 after correction uses ordinary printer mechanisms. The 6 mm span between printhead 7 and guide member 29 was the result of available space in the specific implementation and might desirably be less in other embodiments.

Mechanisms of lift-off

During the erasure operation, the ribbon 22 is held in contact with printing on paper 5 after the initial heating. This is accomplished by guide member 29 which is then contiguous to paper 5, as is the end of printhead 7. Accordingly, the intermediate heat for erasure is applied, but the ribbon 22 stays in contact with paper 5 for the time of printing movement through about 6 mm, at which point ribbon 22 clears member 29 and is directed away from paper 5 toward the nip of rollers 30 and 32 (Fig. 2).

This period of contact with the character to be lifted off permits a bond to be formed between the outer layer 50 of ribbon 22 and the printed character. No such bond is observed if ribbon 22 is pulled away immediately after the application of the intermediate heat. The bond is therefore dependent upon both the heating and the cooling.

The lower level of heat supplied during erasure does not cause layer 50 of ribbon 22 to flow, but does produce an affinity or tack toward the printed character, which is, of course, of the same material since the characters are printed from the same ribbon 22 The subsequent cooling sets the adhesive bond.

It is known from experience that correction is sometimes facilitated using the disclosed embodiment when movement during correction is slower than movement during printing. This is not thought to be fundamental to the mechanism of all suitable implementations in accordance with this invention. The slower movement provides added time, and cooling time is known to be needed for the bond for correction to set. Also, the slower movement results is a less vigorous pulling away when ribbon 22 does clear member 29 and is pulled away from paper 5. These and other such factors would not necessarily be significant in other implementations.

It will be apparent that the essential characteristics of these blends may be realized or, in the future, exceeded by other materials and blends. Similarly, the physical structure involved may take a multitude of forms, but all within the spirit and scope of the invention as herein described. Special purpose modifications might be employed with this basic invention, such as the incorporation of an agent slowly operative on the paper to produce a permanent mark, after which undetectable lift-off correction is not possible.

Claims

1. A laminated ribbon element (22) for thermal printing comprising an electrically resistive supporting substrate (54) carrying an active layer (50), said active layer being pigmented for visual recognition when printed and being a thermoplastic which is non-tacky and cohesive at ordinary room temperatures charac-

terized in that for correcting skid printing by a lift-off correction, said active layer (50), is made of a material which forms a bond for lift-off correction of thermal printing made by said element (22) after having been raised to temperatures above ordinary room temperatures but below temperatures at which thermal printing by said element (22) is effected.

2. A laminated ribbon element (22) according to claim 1 characterized in that said substrate (54) is a solid polymer with conductive particles dispersed throughout said substrate.

3. A laminated ribbon element claim (22) according to claim 1 or 2, characterized in that said active layer (50) is a blend comprising an ethylene vinyl acetate copolymer, a compatible acrylic polymer, and carbon black,

4. A laminated ribbon element (22) according to any one of claims 1 to 3, characterized in that said active layer (50) and said substrate (54) are separated by an aluminum layer (52) of thickness in the order of magnitude of 1000 Angstrom.

5. A laminated ribbon element (22) according to any one of claims 1 to 4, characterized in that said substrate (54) is a solid polycarbonate polymer with conductive particles dispersed throughout said substrate.

6. A laminated ribbon element (22) according to claim 5 characterized in that said active layer (50) is a blend of about 69 parts by weight ethylene vinyl acetate copolymer, about 15 parts by weight of a compatible acrylic polymer, and about 11 parts by weight carbon black.

7. A thermal printer of the kind having a power source (42) to power heat-producing elements (9) which can be selectively activated in the form of a character to be printed while in contact with the laminated ribbon element (22) of any one of claims 1 to 6 from which marking material flows when heated by said elements (9), said printer being characterized in that it comprises control means (44) adapted to be set during a lift-off correction operation to apply power from said power source (42) to said laminated element (22) in a substantial amount, said amount being less than power to effect said printing, while activating selected ones of said elements (9).

8. A thermal printer according to claim 7 characterized in that said elements (9) are activated in the form of a character being erased.

9. A thermal printer according to claim 7 or 8 characterized by a mechanism (29, 150, 152, 154, 56) operative on said laminated ribbon element during said correction to allow said active layer (50) to stay in contact with paper (5) beyond the normal time of printing of a character to be corrected and to form a bond with said character being erased subsequent to said applying of power for lift-off correction.

10. A thermal printer according to claim 9, characterized in that said mechanism (29, 150, 152, 154, 56) comprises a guide member (29) positionable to guide said laminated element in further contact with printing made by said printer a distance past the point of printing sufficient to permit a bond for lift-off correction to form.

11. A thermal printer according to claim 10, characterized in that said guide member (29) is mounted for movement to a first position to guide said laminated element in further contact with printing made and a second position away from said first position, said mechanism (29, 150, 152, 154, 56) including motive means (154), 150, 152, 56) linked to said guide member (29) to move same to said first and said second position and control means for operating said motive means to move said guide member (29) to said first position during correction and to said second position during printing.

12. A thermal printer according to claim 11, characterized in that said motive means (154), 150, 152, 56) comprise biasing means (56) normally positioning said guide member (29) in one of said first and second positions, a solenoid (154) and means (150) connecting said solenoid (154) to said guide member (29), activation of said solenoid (154) overcoming said biasing means (56) and positioning said guide member (29) in the other of said first and second positions.

13. A thermal printer according to claim 10, 11 or 12, comprising a printhead (9) and a paper receiving platen (3), wherein, during printing said printhead (7) contacts said laminated element (22) and said laminated element (22) contacts paper (5) received on said platen (3), characterized in that said guide member (29), during lift-off correction positions said laminated element (22) in further contact with said paper (5) at least one character width past the point of printing.

14. A thermal printer according to claim 13, characterized in that said guide member (29), during lift-off correction, positions said laminated element (22) in contact with said paper (5) about 6 millimeters past the point of printing.

15. The process of correcting a printed character which has been thermally printed on a receiving medium (5) from the laminated ribbon element (22) of any one of claims 1 to 6, characterized in that it comprises the steps of:

1) positioning an unused portion of said laminated element (22) over said character, then
2) heating said substrate (54) until said active layer (50) develops an adhesion to said character while not flowing from said laminated element (22), then
3) allowing said active layer (50) to cool until a bond forms between said character and said active layer (50), and then
4) moving said laminated element (22)

away from the location at which said character is printed to lift said character away

16. A process according to claim 15 characterized in that said heating is done in the pattern of the character to be corrected.

17. A process according to Claim 15 or 16 characterized in that said moving said laminated element (22) during correction is at a speed substantially slower than the corresponding movement during printing.

Patentansprüche

1. Kunststoffüberzogenes Band (22) für den Thermodruck mit einem elektrisch widerstandsfähigen Trägersubstrat (54), der eine aktive Schicht (50) trägt, welche zur Sichtkontrolle während des Druckvorgangs pigmentiert ist und aus einem thermoplatischen Material besteht, welches nicht klebt und bei den gewöhnlichen Umgebungstemperaturen kohärent bleibt, dadurch gekennzeichnet, dass zur Korrektur durch Entfernen des Druckes die aktive Schicht (50) aus einem Material besteht, welches zur Korrektur durch Entfernen des durch das Band (22) ausgeführten Thermodruckes nach Erhöhung auf Temperaturen, die höher als die gewöhnlichen Umgebungstemperaturen, aber niedriger als die Temperaturen sind, bei welchen der von dem Band (22) ausgeführte Thermodruck stattfindet, eine Verbindung herstellt.

2. Kunstoffüberzogenes Band (22) nach Anspruch 1, dadurch gekennzeichnet, dass das Substrat (54) ein festes, aus über das ganze Substrat verstreuten leitenden Teilchen bestehendes Polymer ist.

3. Kunstoffüberzogenes Band (22) nach einem der Ansprüche 1 oder 2, dadurch gekennzeichnet, dass die aktive Schicht (50) ein Gemisch ist, welches aus einem Äthylen-Vinyl-Azetat-Copolymer, einem kompatiblen Acrylpolymer und Carbon-Black besteht.

4. Kunststoffüberzogenes Band (22) nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, dass die aktive Schicht (50) und das Substrat (54) durch eine Aluminiumschicht (52) getrennt sind, deren Dicke der Grössenordnung von 1000 Ångström liegt.

5. Kunstoffüberzogenes Band (22) nach einem der Ansprüche 1 bis 4 dadurch gekennzeichnet, dass das Substrat (54) ein festes, aus über das ganze Substrat verstreuten leitenden Teilchen bestehendes Polycarbonat-Polymer ist.

6. Kunststoffüberzogenes Band (22) dadurch gekennzeichnet, dass die aktive Schicht (50) ein Gemisch aus etwa 69 Äthylen-Vinyl-Azetat-Copolymer-Gewichsteilen, etwa 15 kompatiblen Acrylpolymer-Gewichtsteilen und etwa 11 Carbon-Black-Gewichsteilen besteht.

7. Thermodrucker von der Art, welche eine Leistungsquelle (42) aufweist, die an wärmeerzeugende Elemente (9) angeschlossen ist, die selektiv in der Form eines zu druckenden Zeichens aktiviert werden können, wobei sie gleichzeitig mit dem einem der Ansprüche 1 bis 6 entsprechenden kunststoffüberzogenen Band (22) in Kontakt bleiden, aus welchem das Durchmaterial fliesst, wenn es von den Elementen (9) erhitzt wird, wobei der Drucker dadurch gekennzeichnet ist, dass er Steuermittel (4) enthält, die während einer Korrektur durch Entfernen ausgelöst werden können damit eine ausreichende von der Leistungsquell (42) stammende Leistung an das kunststoffüberzogene Band (22) angelegt werden kann, wobei die angelegte Menge kleiner ist als die den Druck ausführende Leistung, bei dem die ausgewählten Elemente (9) betätigt werden.

8. Thermodrucker nach Anspruch 7, dadurch gekennzeichnet, dass die Elemente (9) in der Form des in der Löschung befindlichen Zeichens betätigt werden.

9. Thermodrucker nach Anspruch 7 oder 8 gekennzeichnet durch einen Mechanismus (29, 150, 152, 154, 56), der während der Korrektur auf das kunststoffüberzogene Band einwirkt, um der aktiven Schicht (50) zu ermöglichen, über die normale Druckzeit eines zu korrigierenden Zeichens hinaus mit dem Papier (5) in Kontakt zu bleiben, und eine Verbindung mit dem in der Löschung befindlichen Zeichen infolge der Leistungsanlegung zur Korrektur durch Entfernen herzustellen.

10. Thermodrucker nach Anspruch 9 dadurch gekennzeichnet, dass der Mechanismus (29, 150, 152, 154, 56) ein einstellbares Führungsglied (29) aufweist, um das kunststoffüberzogene Band mit dem vom Drucker ausgeführten Druck weiter entfernt in Kontakt zu halten, wobei eine über die Druckstelle hinausgehende Distanz ausreichend ist, um die Herstellung einer Verbindung zur Korrektur durch Entfernen zu ermöglichen.

11. Thermodrucker nach Anspruch 10, dadurch gekennzeichnet, dass das Führungsglied (29) in eine erste Stellung verschiebbar angebracht ist, um das kunststoffüberzogene Band in weiter entferntem Kontakt zu halten, und in eine zweite, von der ersten entfernten Stellung, wobei der Mechanismus (29, 150, 152, 154, 56) Antriebsmittel (154, 150, 152, 56) enthält, die mit einem Führungsglied (29) verbunden sind, um dieses Glied (29) in die erste und zweite Stellung zur verschieben, und Steuermittel enthält, welche die Antriebsmittel zur Verschiebung des Führungsgliedes (29) in die erste Stellung während der Korrektur und in die zweite Stellung während des Druckvorgangs in Betrieb setzen.

12. Thermodrucker nach Anspruch 11, dadurch gekennzeichnet, dass die Antriebsmittel (154, 150, 152, 56) ein Verstellmittel (56) enthalten, welches normalerweise das Führungsglied (29) in eine der genannten ersten und zweiten Stellungen positioniert, ein Solenoid (154) und ein Mittel (150), welches

das Solenoid (154) mit dem Fuhrungsglied (29) verbindet, wobei die Auslösung des Solenoids (154) die Wirkung des Verstellmittels (56) aufhebt und das Führungsglied (29) in die andere der ersten und zweiten Stellungen positioniert.

13. Thermodrucker nach den Ansprüchen 10, 11 oder 12 mit einem Druckkopf (7) und einer Papieraufnahmeplatte (3), bei welchem während des Druckvorgangs der Druckkopf (7) mit dem kunststoffüberzogenen Band (22) und das kunststoffüberzogene Band (22) mit dem auf der Platte (3) aufliegenden Papier (5) in Kontakt gebracht wird, wobei der Drucker dadurch gekennzeichnet ist, dass das Führungsglied (29) während der Korrektur durch Entfernen das kunststoffüberzogene Band (22) positioniert und es mit dem Papier (5) in entfernten Kontakt bringt, wobei die Distanz mindestens der Breite eines Zeichens jenseits der Druckstelle entspricht.

14. Thermodrucker nach Anspruch 13, dadurch gekennzeichnet, dass das Führungsglied (29) während der Korrektur durch Entfernen das kunststoffüberzogene Band (22) mit dem Papier (5) etwa 6 Millimeter jenseits der Druckstelle positioniert.

15. Dieser Korrekturvorgang eines Zeichens das über ein kunststoffüberzogenes Band (22) nach einem der Ansprüche 1 bis 6 thermisch auf einem Aufnahmemittel (5) gedruck wird, ist dadurch gekennzeichnet, dass er folgende Schritte enthält:

1) Positionierung eines nicht benutzten Teils des kunststoffüberzogenen Bandes (22) auf das genannte Zeichen, ferner
2) Erhitzung des genannten Substrats (54), bis die aktive Schicht (50) eine Haftung mit dem Zeichen herstellt, ohne aus dem kunststoffüberzogen Band (22) auszufliessen, ferner
3) Abkühlung der aktiven Schicht (50) zu ermöglichen bis zur Entstehung einer Verbindung zwischen dem Zeichen und der aktiven Schicht (50), und ferner
4) Abhebung des kunststoffüberzogenen Bandes (22) von der Stelle, an der das Zeichen gedruckt ist, um dieses Zeichen zu entfernen.

16. Verfahren nach Anspruch 15, dadurch gekennzeichnet, das die Erhitzung in der Form des zu korrigierenden Zeichens stattfindet.

17. Verfahren nach Anspruch 15 oder 16 dadurch gekennzeichnet, dass die Verschiebung des kunststoffüberzogenen Bandes (22) während der Korrektur wesentlich langsamer erfolgt als die entsprechende Verschiebung während des Druckvorgangs.

Revendications

1. Un ruban laminé (22) pour impression thermique comprenant un substrat électriquement résistif (54) portant une couche active (50), ladite couche active étant pigmentée pour la rendre visible lorsqu'elle est imprimée et consistant en une matère thermoplastique non collante de cohésion à températures ambiantes courants, caractérisé en ce que pour la correction de ladite impression par retrait, ladite couche active (50) est constituée d'un matériau qui forme un liaison pour la correction par retrait de l'impression thermique assurée par ledit élément (22) après avoir été élevé à des températures supérieures aux températures ambiants courants mais inférieures aux températures auxquelles est effectée l'impression thermique par ledit élément (22).

2. Un ruban laminé (22) selon la revendication 1 caractérisé en ce que ledit substrat (54) est un polymère solide avec des particules conductrices dispersées dans ledit substrat.

3. Un ruban laminé (22) selon la revendication 1 ou 2 caractérisé en ce qui ladite couche active (50) est un mélange comprenant un copolymère d'éthylène et d'acétate, de vinyle, un polymère acrylique compatible et du noir de carbone.

4. Un ruban laminé (22) selon l'une quelconque des revendications 1 à 3 caractérisé en ce que ladite couche active (50) et ledit substrate (54) sont séparés par une couche d'aluminium (52) d'une épaisseur de l'ordre de 1000 Angstroms.

5. Un ruban laminé (22) selon l'une quelconque des revendications 1 à 4, caractérisé en ce que ledit substrat (54) est un polymère de polycarbonate solide avec des particules conductrices dispersées dans ledit substrat.

6. Un ruban laminée (22) selon la revendication 5 caractérisé en ce que ladite couche active (50) est un mélange approximativement composé de 69 parts en poids de copolymère d'éthylène et d'acétate, de vinyle de 15 parts en poids d'un copolymère acrylique compatible et de 11 parts en poids de noir de carbone.

7. Une imprimante thermique du type comportant une source de puissance (42) pour alimenter des éléments générant de la chaleur (9) pouvant être actionnés sélectivement selon la forme d'un caractére à imprimer lorsqu'ils sont en contact avec le ruban laminé (22) de l'une des revendications 1 à 6 duquel s'écoule du matériau de marquage lorsqu'il est chauffé par lesdits éléments (9), ladite imprimante étant caractérisée en ce qu'elle comprend des moyens de commande (44) conçus pour être conditionnés pendant une opération de correction par retrait pour appliquer une quantité substantielle de puissance de ladite source de puissance (42) audit ruban laminé (22), ladite quantité étant moindre que la puissance nécessaire à l'impression, tandis que des éléments sélectionnés desdits éléments (9) sont actionnés.

8. Une imprimante thermique selon la revendication 7 caractérisé en ce que lesdits

éléments (9) sont actionnés selon la forme du caractère à effacer.

9. Une imprimante thermique selon la revendication 7 ou 8 caractérisée par un mécanisme (29, 150, 152, 154, 56) agissant sur ledit ruban laminé pendant ladite correction pour permettre à ladite couche active (50) de rester en contact avec le papier (a) au delà du temps normal d'impression d'un caractère à corriger et pour former une liaison avec ledit caractère en cours d'effacement à la suite de ladite application de puissance pour la correction par retrait.

10. Une imprimante thermique selon la revendication 9, caractérisée en ce que ledit mécanisme (29, 150, 152, 154, 56) comprend un élément de guidage (29) pouvant être positionné de façon à guider ledit ruban laminé en contact avec l'impression effectuée par ladite imprimante sur une distance suffisante au delà du point d'impression pour permettre la formation d'une liaison pour la correction par retrait.

11. Une imprimante thermique selon la revendication 10 caractérisée en ce que ledit élément de guidage (29) est monté pour se déplacer à une première position pour guider ledit ruban laminé en contact avec l'impression effectuée et à une seconde position différente de ladite première position, ledit mécanisme (29, 150, 152, 154, 56) comprenant des moyens d'entrainment (154, 150, 152, 56) raccordés audit élément de guidage (29) pour entraîner celui-ci auxdites première et seconde positions et des moyens de commande pour actionner lesdits moyens d'entraînement pour amener ledit élément de guidage (29) à ladite seconde position pendant l'impression.

12. Une imprimante thermique selon la revendication 11 caractérisée en ce que lesdits moyens d'entraînement (154, 150, 152, 56) comprennent des moyens de rappel (56) positionnant normalement ledit élément de guidage (29) dans l'une desdits première et seconde positions, un solénoïde (154) et des moyens (150) connectant ledit solénoïde (154) audit élément de guidage (29), l'excitation dudit solénoïde (154) suppassant la force exercée par lesdits moyens de rappel (56) et positionnant ledit élément de guidage (29) dans l'autre desdites première et seconde positions.

13. Une imprimante thermique selon la revendication 10, 11 ou 12 comprenant une tête impression (9) et une platine porte papier (3), dans laquelle, pendant l'impression, ladite tête d'impression (7) entre en contact avec ledit ruban laminé (22) et ledit ruban laminé (22) entre en contact avec le papier (7) porté par ladite platine (3), caractérisée en ce que ledit élément de guidage (29) pendant la correction par retrait, positionne ledit ruban laminé (22) en contact prolongé avec ledit papier (5) sur au moins la largeur d'un caractère au delà du point d'impression.

14. Une imprimante thermique selon la revendication 13 caractérisée en ce que ledit élément de guidage (29), pendant la correction par retrait, positionné ledite ruban laminé (22) en contact avec ladite paper (5) sur approximativement 6 millimètres au delà du point d'impression.

15. Une procédé de correction d'un caractére imprimé qui a été thermiquement imprimé sur un milieu de réception (5) à partir du ruban laminé (22) de l'une quelconque de revendications 1 à 6, caractérise en ce qu'il comprend les étapes suivantes:

1) le positionnement d'une partie inutilisée dudit ruban laminé (22) sur ledit caractère, puis,
2) le chauffage dudit substrat (54) jusqu'à ce que ladite couche active (50) adhère audit caractère sans s'écouler dudit ruban laminé (22), puis,
3) le refroidissement de ladite couche active (50) jusqu'à ce qu'une liaison se forme entre ledit caractère et ladite couche active (50), et puis,
4) le retrait dudit ruban laminé (22) de la position où ledit caractère est imprimé pour retirer par soulévement ledit caractère.

16. Un procédé selon la revendication 15 caractérisé en ce que ledit chauffage est assuré selon la configuration du caractère à corriger.

17. Un procédé selon la revendication 15 ou 16 caractérisé en ce que ledit mouvement dudit ruban laminé (22) pendant la correction est exécuté à une vitesse substantiellement inférieure à celle du mouvement correspondant pendant l'impression.

FIG. 1

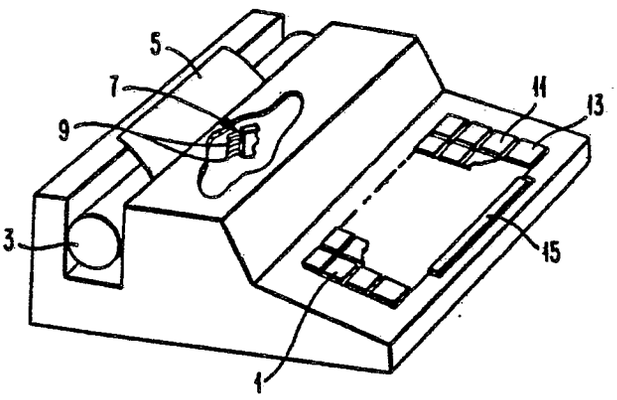
5
7
9
11
13
3
15
1

FIG. 2

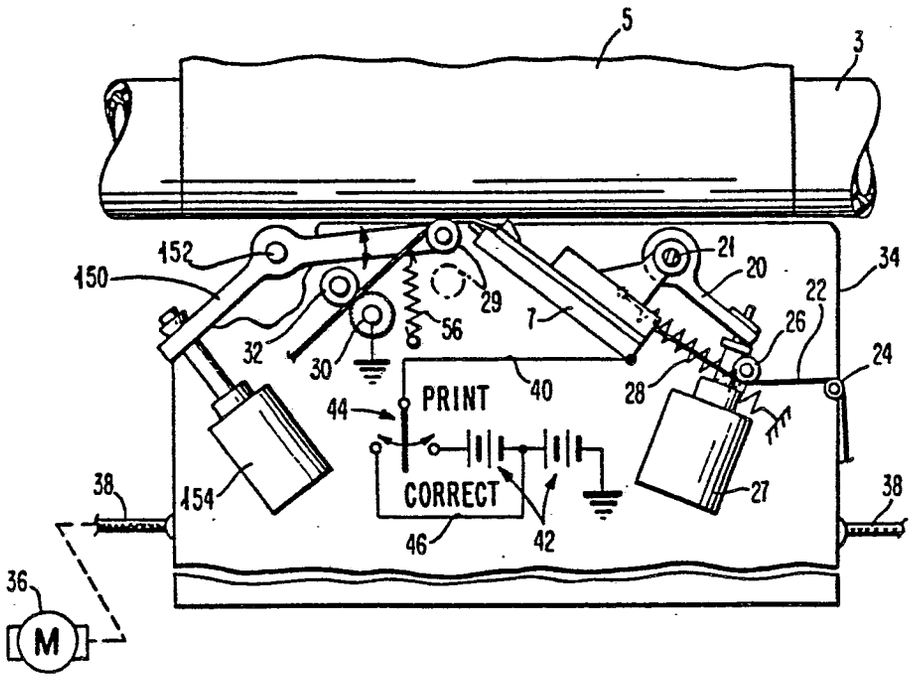
5
3
152
150
29
56
7
21
20
34
22
26
24
32
30
40
28
44
PRINT
38
154
CORRECT
46
42
27
38
36
M

FIG. 3

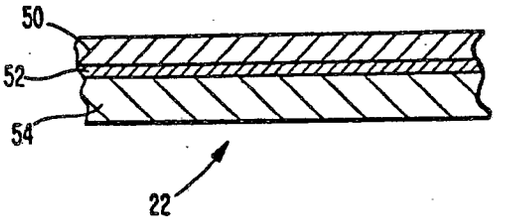

FIG. 4a

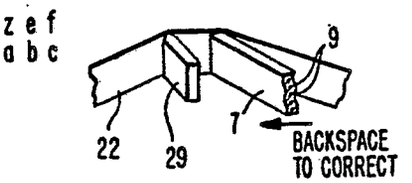

FIG. 4b

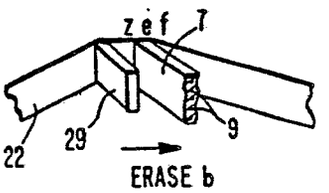

FIG. 4c

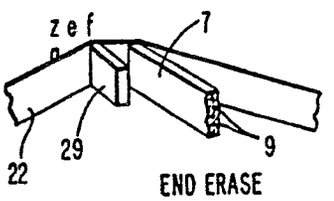

FIG. 4d