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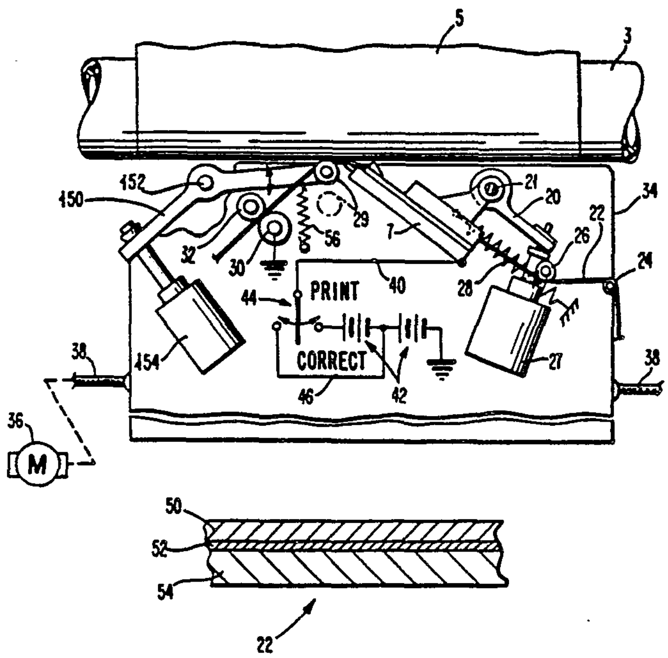
(71) Applicant: International Business Machines Corporation, Armonk, N.Y. 10504 (US)

(72) Inventor: Anderson, Clifford Wilhelm, 1542 Grant Drive, Lexington Kentucky 40511 (US)
Inventor: Findlay, Hugh Thomas, 1603 Auburn Drive, Lexington Kentucky 40505 (US)
Inventor: Watkins, Nancy Chapman, 1 Warwick Lane, Frankfort Kentucky 40601 (US)
Inventor: Applegate, Steven Lewis, 3426 Winthrop Drive, Lexington Kentucky 40503 (US)
Inventor: Molloy, James John, 1412 Pipestone Court, Lexington Kentucky 40502 (US)
Inventor: Walker, Donald Abbott, 3504 Gunbow Court, Lexington Kentucky 40502 (US)

(74) Representative: Siccardi, Louis, COMPAGNIE IBM FRANCE Département de Propriété Industrielle, F-06610 La Gaude (FR)

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

(57) A ribbon (22) in thermal printing has an active layer (50) which adheres to printed characters at somewhat elevated temperatures but is non-tacky at room temperatures. The active layer (50) is made of an ethylene vinyl acetate copolymer, an acrylic polymer, and carbon black. Thermal printing is conducted by setting a switch (44) for heating to temperatures higher than the lift-off correction temperature. Lift-off correction is accomplished by returning to the printing position of the error and setting the switch (44) for lower voltage to the printing electrodes of printhead (7). During correction, guide member (29) is brought against ribbon (22) thereby positioning same flat with paper (5) at the printing print and for a predetermined distance priot to the printing point. This creates an extra space for printhead movement during correction, said extra space providing a delay for ribbon cooling prior to the peeling of ribbon (22) with erased character attached from paper (5).



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LAMINATED ELEMENT, THERMAL PRINTER AND PROCESS FOR LIFT-OFF CORRECTION

TITLE MODIFIED
see front page

Description

Technical Field

This invention relates to thermal printing and, more particularly, it relates to a laminated 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 paper 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 typing. U. S. patent no. 3,744,611 is illustrative of the basic printing system and U. S. patent no. 4,103,066 describes a ribbon with a polycarbonate resistive layer for thermal printing. Neither of these patents mentions 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 reduction 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 element for thermal printing and correcting said printing by lift-off correction is characterized in that it comprises 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 and 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 and 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 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 6mm prior to the printing point. In a typical printing operation 6mm 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 printhead 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 printhead 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 38, 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 counterclockwise 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 of 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 Angstrom 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 polycarbonate with carbon black being the substrate 54. It is slit to the desired width and wound into a spool.

<u>Active Layer Formulation</u>

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 at 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 of 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 characteristics. 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 6mm 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.

Mechanism 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 6mm, 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 element (22) for thermal printing and correcting said printing by lift-off correction, characterized in that it comprises 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 and 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 and below temperatures at which thermal printing by said element (22) is effected.

2. A laminated 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 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 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 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 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 selectably activated in the form of a character to be printed while in contact with the laminated 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 the character being erased.

9. A thermal printer according to claim 7 or 8 also comprising a mechanism (29, 150, 152, 154, 56) operative on said laminated element during said correction to modify laminated element feed relative to laminated element feed during printing to allow said active layer (50) 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 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 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, characterized in that it comprises a printhead (9) and a paper receving platen (3) and in that, during printing, said printhead (7) contacts said laminated element (22) and said laminated element (22) contacts paper (5) received on said platen (3), said guide member (29) during lift-off correction positioning said laminated element (22) in contact with said paper (5) at least one character width past the point of printing.

14. A thermal printer according to claim 10, 11 or 12, characterized in that it comprises a printhead (7) and a paper receiving platen (3) and in that, during printing, said printhead (7) contacts said laminated element (22) and said laminated element contacts paper (5) received on said platen (3), said guide member (29), during

lift-off correction, positioning 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 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.

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FIG. 1

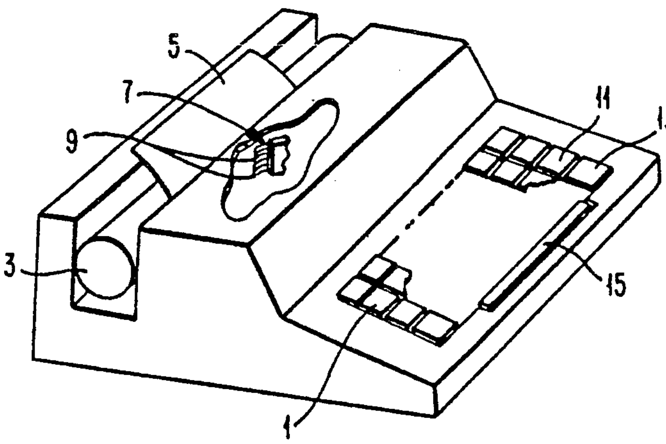

FIG. 2

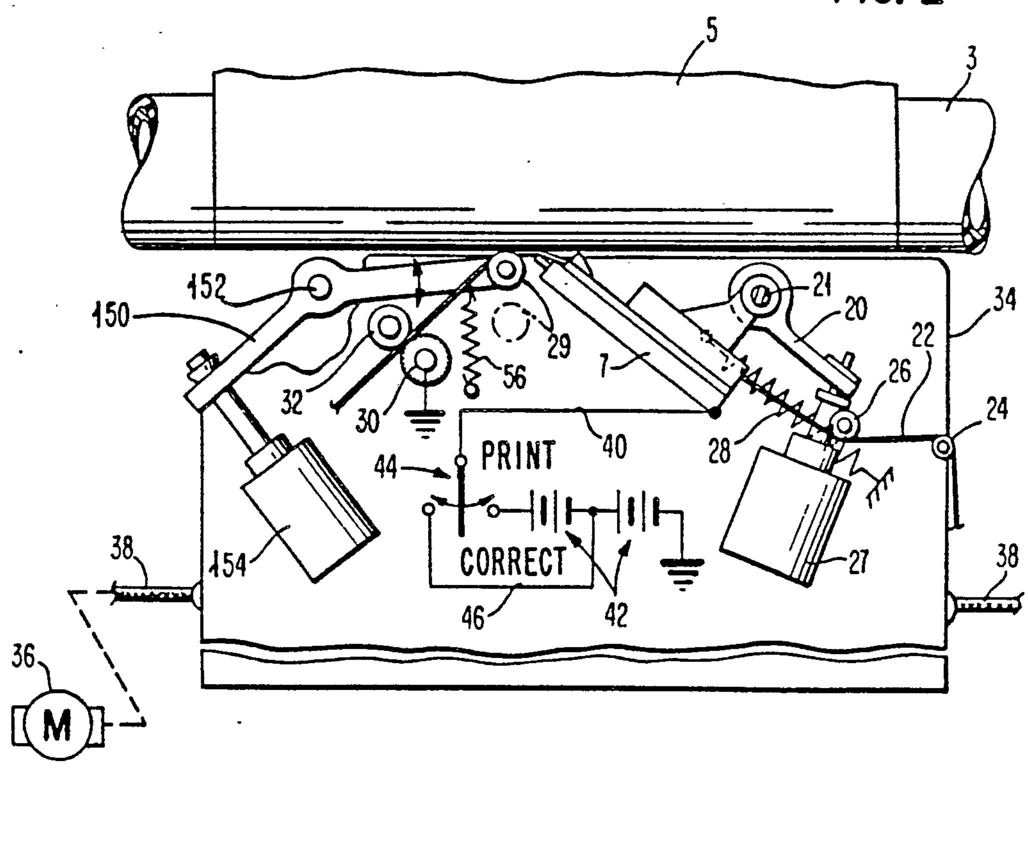

FIG. 3

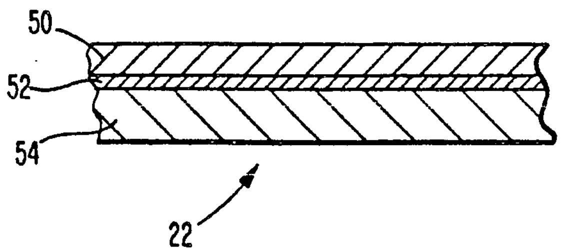

FIG. 4a

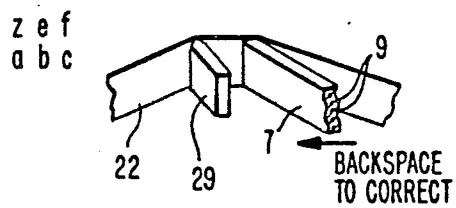

FIG. 4b

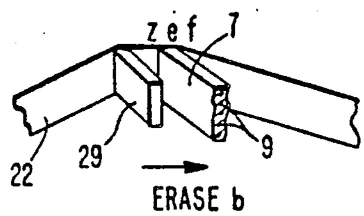

FIG. 4c

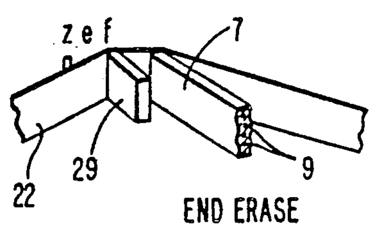

FIG. 4d