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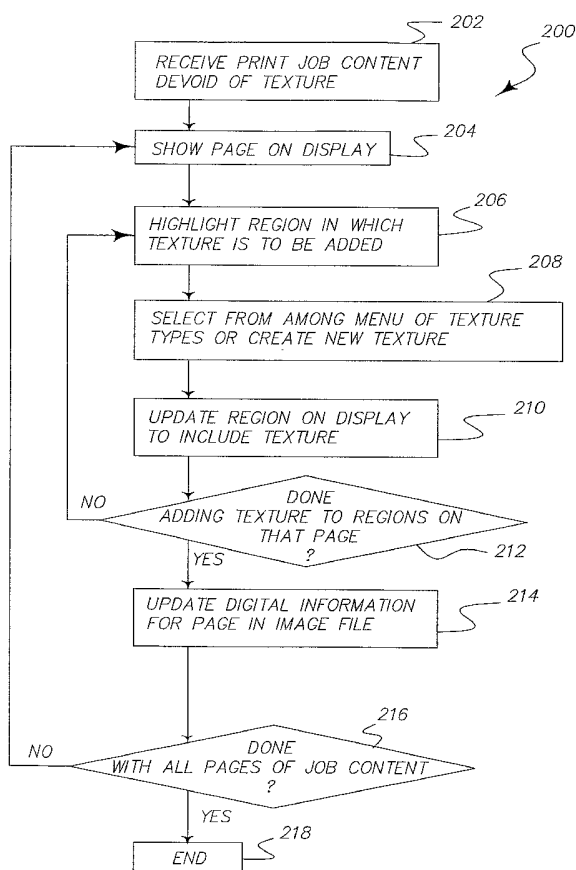
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[Continued on next page]

(54) Title: CREATING TEXTURE IN AN ELECTROPHOTOGRAPHIC IMAGE



(57) Abstract: An electrophotographic printer is configured to print a three-dimensional texture on a substrate by applying clear toner in locations corresponding to where texture is desired. The clear toner for texture may be applied either after, or before, other colors (e.g., CMYK) are applied to the substrate. The clear toner may be applied during the same pass as the other colors in an electrophotographic printer having five imaging units (20C, 20M, 20Y, 20K, and 20X). Alternatively, the clear toner may be applied during a second pass of the substrate through the electrophotographic printer if, on the first pass, all five imaging units are occupied with different colored toners. An electrophotographic printing system that includes a front-end station for scanning a document coupled to an electrophotographic printer allows an operator to add texture to a scanned document.



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## **CREATING TEXTURE IN AN ELECTROPHOTOGRAPHIC IMAGE**

### **FIELD OF THE INVENTION**

The present invention relates generally to a method and system for  
5 using clear toner to impart texture to a printed image in a digital printing process.

### **BACKGROUND OF THE INVENTION**

FIG. 1A shows a prior art electrophotographic (EP) printer 10, such  
as the NexPress<sup>®</sup> 2100. The electrophotographic (EP) printer 10 includes five  
imaging units (also referred to as development stations or electrostatographic  
10 image-forming modules) 20C, 20M, 20Y, 20K, and 20X. These stations are  
generally arranged in tandem and are shown in FIG. 1A in a specific arrangement  
with cyan, magenta, yellow, black, and a fifth station in order. Each station  
includes elements that are similar from station to station and are shown in FIG. 1A  
to have similar referenced numerals with a suffix of C, M, Y, and K to refer to the  
15 station to which such element is respectively associated. Since each station is  
identical in construction, the specific elements specified herein are shown in FIG.  
1A at one station only, but should be understood to apply in like manner to each  
station. Each station includes a primary image-forming member, for example, a  
drum or roller, 22. Each roller 22 has a respective photoconductive surface 24  
20 having one or more layers upon which an image or a series of images is formed.  
To form a toned image, the outer surface of the rollers 22 are uniformly charged  
by a primary charger such as a corona charging device 26, or by any other suitable  
charger such as a roller charger, a brush charger, etc. The uniformly charged  
surface 24, is typically exposed by an image writer or exposure device 28, which  
25 is generally an LED or other electro-optical exposure device. Any alternative  
exposure device may be used, such as an optical exposure device to selectively  
alter the charge on the surface 24 of the roller 22. The exposure device 28 creates  
an electrostatic image that corresponds to an image to be reproduced or generated.  
This electrostatic image is developed by applying marking particles to the latent  
30 image on the photoconductive drum 22 by a toner developing station 30. Each

toner development station 30 is associated with a particular type of toner marking particle and magnetic carrier particle, which is typically in a preferred toner concentration and is attracted by a certain voltage supplied by a power supply (not shown). The image is transferred onto a transfer drum 32. After the transfer is  
5 made from the photoconductive drum 22, the residual toner image is cleaned from the surface 24 of the drum 22 by a suitable cleaning device 34. The cleaning device 34 then prepares the surface 24 of the drum 22 for reuse to form subsequent toner images. The intermediate or transfer drum 32 likewise is coated by a transfer surface 36, which can include one or more layers. The intermediate  
10 transfer drums 32 are each cleaned by respective cleaning devices 44 to prepare the transfer drums for reuse.

The imaging units 20C, 20M, 20Y, 20K, and 20X generally are in contact with a transport device, such as the shown endless belt or web 38, which can include receiver members adhered thereto for receipt of the paper or other  
15 media 15 that is to receive the image. In the alternative, the belt or web provided should not be restricted to the belt or web shown in FIG. 1A since the image transfer can be made on any suitable surface capable of receiving paper or other media as it passes between the imaging units. The web 38 can also detachably retain the paper electrostatically or by mechanical devices such as grippers.  
20 Typically, receiver members are electrostatically adhered to belt 38 by the deposit of electrostatic charges from a charging device, such as, for example, by using a corona charger 40. A sheet of paper 15 is shown in FIG. 1A proceeding along the belt 38 through each of the five imaging stations.

As shown in FIG. 1A, the transfer drum 32 interacts with the paper  
25 15 along the belt 38 to transfer the electrostatic image from the transfer surface 36 of the transfer drum 32. The paper 15 then proceeds in tandem order through each developing station. Once the paper 15 has passed through each imaging unit 20, the paper 15 proceeds to a detach charger 42 to deposit a neutralizing charge on the paper 15 to separate the paper 15 from the belt 38. The paper 15 proceeds past  
30 the detach charger 42 and is transported to a remote location for operator retrieval.

The transfer of images in each imaging unit 20C, 20M, 20Y, 20K, and 20X are performed without the application of heat to negate any fusing or sintering of toner images transferred to the paper 15 until the paper 15 enters a fuser 44 downstream.

The paper 15 utilized herein can vary substantially in thickness and it is

5 contemplated that this paper should not be limiting in any manner. For example, the paper can be thin or thick, include various paper stocks, transparencies stock, plastic sheet materials, and foils.

Although not shown, appropriate sensors of any well-known type, such as mechanical, electrical, or optical sensors, for example, generally are  
10 utilized in the electrophotographic (EP) printer 10 to provide control signals for the electrophotographic (EP) printer 10. Such sensors may be located along the paper travel path, including along the belt 38, between the paper supply, and through the imaging units and the fusing station. Additional sensors may be associated with the photoconductive drums, the intermediate drums, any  
15 transferring mechanisms, and any of the image processing stations. Accordingly, the sensors can be provided to detect the location of the paper through its travel path in relation to each of the imaging units and can transmit appropriate signals indicative of the paper location. Such signals are input into a logic and control unit (not shown), which can include a microprocessor. Based on such signals and  
20 on the microprocessor, the control unit can output signals to the electrophotographic (EP) printer 10 to control the timing operations of the various development stations or imaging units to process images and to control a motor (not shown) that drives the various drums and belts.

An electrophotographic system may include a front-end station 150  
25 that is coupled either by wired, or wireless, connection, to the electrophotographic (EP) printer 10. As seen in FIG. 1B, the front-end station 150 may include a scanner 152 having a scanning head 154 for scanning documents. In addition, the front end station has a personal computer or the like, including a display 156, a keyboard 158 and a pointing device, such as a mouse 160 or the like, to interface  
30 with an operator. The front-end station may be a unit that is separate and distinct

form the electrophotographic (EP) printer 10, as shown in FIG. 1A, or it may be part stand-alone unit. Software in the front-end station allows one to receive and edit job tickets, print process information, print content information, and the like.

The present invention addresses the problem of how to apply a  
5 three-dimensional texture to an electrophotographic image using an electrophotographic (EP) printer 10.

### SUMMARY OF THE INVENTION

The present invention makes use of at least one imaging unit of an electrophotographic (EP) printer 10 to impart three-dimensional texture to a  
10 substrate. The texture is imparted by causing the least one imaging unit to apply clear toner to the substrate, as dictated by textural data representing information as to where on the substrate the image texture is to be printed.

In one embodiment, the texture is applied to the entire substrate, including areas where no image is present at the time the substrate encounters the  
15 at least one imaging unit. In another embodiment, the texture is applied to only certain portions of the substrate. These certain portions may correspond to selected regions where objects are present on the finished print product.

In another aspect, the present invention is also directed to an electrophotographic (EP) printing system having a front-end station and an  
20 electrophotographic (EP) printer 10 including a plurality of imaging units, at least one of which is configured to apply clear toner to a substrate. The front-end station is configured to scan a document and permit an operator to add texture before the document is sent to the electrophotographic (EP) printer 10.

In still another aspect, the present invention is directed to a method  
25 of applying a three dimensional texture to a substrate. The method includes providing an electrophotographic (EP) printer 10 having a single imaging unit configured to apply clear toner to the substrate, sending digital information to the electrophotographic (EP) printer 10, the digital information including textural data sufficient to cause the single imaging unit to apply clear toner onto the substrate in  
30 sufficient quantity and with sufficient spatial distribution so as to form a visually

and tactilely detectable three dimensional texture on the substrate, and applying clear toner to the substrate at the single imaging unit as dictated by the textural data to thereby create a three-dimensional texture.

An advantageous technical effect of the present invention is that  
5 textural information may be included in an image data file for an electrophotographic (EP) printer 10, to determine where a three-dimensional texture is to appear on a printed substrate.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1A shows a prior art electrophotographic (EP) printer 10 with  
10 five imaging units;

FIG. 1B shows a prior art front-end station for use with an electrophotographic (EP) printer 10;

FIG. 2 illustrates the process of adding textural information to pages of print job content in accordance with the present invention; and

15 FIG. 3 illustrates the process of scanning a document and adding textural information in accordance with the present invention.

### **DETAILED DESCRIPTION OF THE INVENTION**

The present invention is described with reference to an electrophotographic (EP) printer 10 having a plurality of imaging units of the sort  
20 discussed above with references to FIG. 1A. The electrophotographic (EP) printer 10 accepts substrate having two sides, such as a sheet of paper, linen, or the like, and the various imaging units each transfer one color to a side of the substrate. It is understood, however, that the general concept of applying three-dimensional texture using clear toner, can be performed using other printers, as well. For  
25 example, a single module unit for making texture on preprinted material, not even necessarily electrophotographically produced, may be employed. Furthermore, the texture could be printed over inkjet or lithography produced prints, color or black and white.

In one embodiment, the textural data may be added to an existing image file. This can be done by either creating an additional image layer, or modifying a pre-existing layer, using an application such as Adobe Photoshop®. This additional image layer would contain the clear imaging data. For example, in  
5 an image file having layers corresponding to cyan, magenta, yellow, and black, a fifth image layer corresponding to clear texture, may be added. Alternatively, where a fifth image layer of clear toner already exists, this fifth layer may be modified to include the textural data. The electrophotographic (EP) printer  
10 software, would then interpret the additional/modified layer and apply the clear toner, in due course.

FIG. 2 presents a flow chart 200 depicting an embodiment in which texture is added to an existing image file comprising print content to be printed over a number of pages. It is understood, however, that the number of pages that are to be printed is not critical and even one page would suffice. The image file,  
15 which typically has information corresponding to CMYK layers (and also perhaps a fifth, clear layer), is devoid of digital information corresponding to three-dimensional texture.

In step 202, an image file comprising print content is received at a pre-processing computer. The pre-processing computer preferably is a personal  
20 computer running one or more applications, such as the aforementioned Adobe Photoshop®, enhanced by a “texture plug-in” to facilitate use of the present invention.

In step 204, a first page of the print content is displayed on this computer. It is understood here that the original “CMYK” format is converted  
25 through known methods into RGB format for display. In step 206, the pre-processing computer receives input from an operator to select a first designated portion of the page where a first texture is to be added. In step 208, the computer displays a menu of textures from a tool bar or the like, permitting the operator to choose which “stock” texture to apply to the selected portion. Alternatively, the  
30 operator may be provided with the option of either using the underlying CMYK



image data to providing the textural information (a “data driven texture”) or creating an entirely new texture. In either case, the height of the textural features in the final print product may also be specified and received by the pre-processing computer. In step 210, the pre-processing computer displays the image with the  
5 textural pattern overlaying the designated portion.

As depicted by step 212, the operator is permitted to select additional designated portions and repeat steps 206, 208, and 210, it being understood that different features or portions of the same page may be provided with different textures. At step 214, the information in the image file is updated to  
10 reflect the changes to that page. As depicted by step 216, the operator is permitted to select another page and repeat the process until no additional texture remains to be added. The image file is then updated to include the textural data in the new/modified clear layer and is closed. The thus-modified image file may then be subjected to further editing prior to printing.

15 In a second embodiment, the textural information may be added at the printer level in a manner that is independent of the image file. If, for example, the electrophotographic (EP) printer 10 has five modules, of which the first four are for applying the standard CMYK colors and the fifth is designated a “spot color” module, the texture may be added at a scanning station.

20 FIG. 3 presents a flow chart 300 depicting an embodiment in which texture is added “on the fly” to a scanned page. In step, 302, a color document is scanned to obtain an RBG image. In step 304, the associated computer displays this image and CMYK layers are created in step 306 from the RGB information in a known manner. Next, in step 308, candidate textures to be added to an operator-  
25 designated portion of the scanned page are displayed in a pull-down menu, or the like. In step 310, the computer receives one or more texture selections, and creates a spot color layer corresponding to the textural information. In step 312, the CMYK layers created in step 306, along with the newly formed spot color layer are sent to the EP, which in step 314, prints all five layers.

30

In one embodiment, an operator is given the option of selecting from among a plurality of candidate textures, but chooses to create an entirely new textural pattern instead. For this, the menu of candidate texture patterns includes options to "create a new texture" or "import a new texture file". When the "create  
5 a new texture" option is selected, the display goes into a drawing mode, and the operator is allowed to draw a new texture. The newly drawn texture can be applied to any portion of the image, as determined by the operator. A further option allows the operator to save the new textural pattern and add it to the list of candidate textures for subsequent use. When the "import a new texture file"  
10 option is selected, the operator is allowed to identify a file, either on the local computer, a remote computer, and perhaps even specify a URL to import a texture file. Such an imported textural pattern may be saved and added to the list of candidate textures for subsequent use.

In one embodiment that uses an electrophotographic (EP) printer 10  
15 having at least five imaging units, four differently colored toners, e.g., cyan, magenta, yellow, and black (not necessarily in that order), are first applied to a first side of the substrate using four of the imaging units in accordance with digital information applied to the electrophotographic (EP) printer 10 for those corresponding colors. The substrate then enters a fifth imaging unit, which is  
20 configured to apply clear toner to the first side of the substrate in accordance with the textural data in the fifth layer within the image file. After clear toner is applied to the first side of the substrate, the substrate is presented to a fusing unit for fusing the four colors and clear toner on the first side of the substrate, all at the same time.

25 In another embodiment that uses an electrophotographic (EP) printer 10 having at least five imaging units, on a first pass of the substrate through the printer, four or five differently colored toners, e.g., cyan, magenta, yellow, black, and blue (when present) (and not necessarily in that order), are first applied to the first side of the substrate in accordance with digital information sent  
30 to the imaging unit for each corresponding color. On a second pass of the

substrate through the electrophotographic (EP) printer 10, one of the five imaging units is replaced, modified, etc. to apply clear toner to the first side of the substrate. During this second pass, null data may be sent to the other four imaging units so that no additional colored toner is applied. After the second pass, the colored and clear toners on the first side of the substrate are subject to fusing. Alternatively, a first fusing operation may be performed after the first pass, and a second fusing may be performed after the second pass.

In yet another embodiment, the clear toner is applied to a first side of the substrate during a first pass of the substrate through the electrophotographic (EP) printer 10, with the remaining imaging units being presented with null data so that no color is printed. In a second pass, four or five colored toners are applied to the same first side of the substrate, thereby imparting image(s) and/or text to the substrate.

In yet another embodiment, only a single color, e.g., black, is applied, and the clear toner is applied on top of the single color. The texture can thus be applied using an electrophotographic (EP) printer 10 having only two imaging units. The single color and the clear toner are then fused, as described above, thereby forming textural patterns on a monochrome image.

The second side of a substrate may also be printed on during additional pass(es) and so three-dimensional textural information may thus be provided on both sides of the substrate.

In all of the foregoing embodiments, the fusing is preferably done with one or more components having smooth surfaces so that they do not impart their own texture to the substrate.

The locations on the substrate at which the texture is applied, depends on the texture data. Generally speaking, however, the textural pattern may be applied to the entire printable area of the substrate, or only on a portion of the substrate. As to the latter, the clear toner may be applied only to those image regions of the substrate at which one or more of cyan, yellow, magenta, and black are to be applied (in case the clear toner is applied first), or have already been

applied (in case the clear toner is applied last). Alternatively, the clear toner may be applied only to some, but not all, image regions on the substrate. Another alternative is to apply the clear toner texture only to those non-image regions where none of CMYK, have been applied.

5                   Furthermore, the texture data may call for different clear toner textures to be applied to different portions of the substrate. Thus, a first image region on the substrate may receive a first textural pattern, while a second image region on the same substrate may receive a second textural pattern. This allows one to produce a substrate bearing textures of different types on various portions  
10 thereof. Thus, for example, one image on the substrate's first side may bear a first texture while a second image on the same side of the substrate may bear a second texture.

                  The amount of toner applied, and the textural pattern, helps determine the height of the texture features, which, in turn, helps determine the  
15 "feel" of the texture. To be both visible and tactilely detectable, sufficient clear toner should be applied when creating a three-dimensional texture. Testing has shown that clear toner quantities on the order of at least  $0.5 \text{ mg/cm}^2$  are sufficient for this. The upper quantity limit is determined by the capabilities of the electrophotographic (EP) printer 10 imaging unit and the fusing unit. Generally,  
20 however, the clear toner quantity should be less than  $5 \text{ mg/cm}^2$ , and more preferably less than  $1 \text{ mg/cm}^2$ .

                  To ensure that the textural features are both visible and tactilely detectable, the textural features preferably have a spatial frequency of approximately 50-75 lines/inch, for a "ribbed" or "checkered" pattern. In addition,  
25 the textural features preferably have a post-fusing height of at least 0.001 mm relative to the surrounding area, so that they can be felt, upon running a finger over the surface. More preferably, however, this post-fusing height is between 0.003 and 0.010 mm.

It is further noted that texture may also be applied with less than 100% clear toner coverage on a pixel-by-pixel basis to create the textural features. This allows one to create textural formations having varying height. One example of this is when the clear toner is applied in an amount that is data driven. For  
5 example, in the embodiment of FIG. 2, at step 206, if a page includes a brushstroke as a feature, the operator may select that brushstroke region as a region to which three-dimensional texture is to be applied in the final printed product. At step 208, the operator may then select that the texture to be applied is “data driven”. In such case, the clear toner layer is created based on the data in the  
10 CMYK layers for the brushstroke region. In one embodiment, clear toner is applied, pixel-by-pixel in the brushstroke region, in an amount corresponding to a normalized sum of the amounts in the CMYK layers for the corresponding pixels. This will likely result in the clear layer’s brushstroke region having less than 100% clear toner in at least some pixels. Since the textural data for pixels in the  
15 brushstroke region are derived from one or more of cyan data, magenta data, yellow data, and black data for corresponding pixels in the brushstroke region, the final printed product will then have a feel much like the underlying brushstroke.

While the foregoing parameters are sufficient for visual appreciation of the texture, it is understood that factors such as substrate  
20 roughness, lighting, and distance from the printed product also influence the ability of a viewer to see the texture.

It is further understood that three-dimensional texture may be applied with clear toner using devices other than the electrophotographic (EP) printer 10 of FIG. 1A. For instance, three-dimensional texture may be applied by  
25 a device having a single imaging unit, provisioned with clear toner, and receiving digital information having textural data. Such a stand-alone unit may thus be fed substrates, which have previously been printed on with CMYK text and imagery, the clear toner then being applied atop the previously printed-on substrates.

**PARTS LIST**

	10	electrophotographic (EP) printer
	15	paper
	20	imaging unit
5	22	drum/roller
	24	surface
	26	changer
	28	exposure device
	30	toner development station
10	32	transfer drum
	34	cleaning device
	36	transfer surface
	38	belt or web
	40	corona charger
15	42	detack charger
	44	cleaning devices
	46	fusing device
	150	front-end station
	152	scanner
20	154	scanning head
	156	display
	158	keyboard
	160	pointing device

**CLAIMS:**

1. A method of applying a three dimensional texture to a substrate comprising:
  - 5 providing an electrophotographic (EP) printer (10) having a plurality of imaging units (20C, 20M, 20Y, 20K, and 20X), at least one of said plurality of imaging units configured to apply clear toner to the substrate; sending digital information to the electrophotographic (EP) printer (10), the digital information having textural data sufficient to cause said at least one of said
  - 10 plurality of imaging units to apply clear toner onto the substrate in sufficient quantity and with sufficient spatial distribution so as to form a visually and tactilely detectable three dimensional texture on said substrate; and
  - applying clear toner to said substrate at said at least one of said plurality of imaging units as dictated by the textural data to thereby create a three-
  - 15 dimensional texture.
2. The method according to Claim 1, wherein the electrophotographic (EP) printer (10) has at least five imaging units, and further comprising:
  - 20 applying each of cyan, magenta, yellow, and black toners to said substrate prior to applying clear toner.
3. The method according to Claim 2, further comprising fusing the substrate bearing cyan, magenta, yellow, black, and clear toners all at the same
- 25 time.
4. The method according to Claim 2, comprising:
  - applying clear toner to provide three-dimensional texture to said substrate only at regions on the substrate at which one or more of cyan, magenta,
  - 30 yellow, and black toner have previously been applied.

5. The method according to Claim 2, comprising:  
applying clear toner to provide three-dimensional texture to said  
substrate only at regions on the substrate at which none of cyan, magenta, yellow,  
and black toner have been applied.

5

6. The method according to Claim 1, comprising:  
selecting from among a plurality of candidate textural patterns, a  
particular textural pattern to be applied to the substrate, wherein said textural data  
corresponds to said particular textural pattern.

10

7. The method according to Claim 1, comprising:  
creating a new textural pattern to be applied to the substrate,  
wherein said textural data corresponds to said new textural pattern, and the new  
textural pattern is not one from among a plurality of candidate textural patterns.

15

8. The method according to Claim 7, comprising:  
adding the new textural pattern to said plurality of candidate  
textural patterns for future use.

20

9. The method according to Claim 1, comprising:  
importing a new textural pattern to be applied to the substrate,  
wherein said textural data corresponds to the new textural pattern, and the new  
textural pattern is not one from among a plurality of candidate textural patterns.

25

10. The method according to Claim 9, comprising:  
adding the new textural pattern to said plurality of candidate  
textural patterns for future use.



11. The method according to Claim 1, comprising:  
deriving textural data, for pixels in a particular region, from one or more of cyan data, magenta data, yellow data, and black data for corresponding pixels in said particular region of the image.
- 5
12. The method according to Claim 11, wherein said step of deriving comprises taking a normalized sum of pixel values.
13. The method according to Claim 11, wherein the textural  
10 data corresponds to an image of a brushstroke.
14. The method according to Claim 1, comprising:  
sending digital information to the electrophotographic (EP) printer (10) comprising textural data sufficient to apply a plurality of different three-  
15 dimensional textures to said substrate.
15. An electrophotographic (EP) printer (10) system comprising  
a front end station (150) having a scanner (152) and an associated display (156),  
the front end station coupled to an electrophotographic (EP) printer (10) having a  
20 plurality of imaging units (20C, 20M, 20Y, 20K, and 20X), at least one of said  
imaging units configured to apply clear toner to a substrate, wherein the front end  
station is configured to:  
scan a color document;  
present a plurality of predetermined candidate textures that may be  
25 added to at least a portion of a scanned version of the document;  
accept input corresponding to a selected texture from among said  
predetermined candidate textures; and

send information to the electrophotographic (EP) printer (10) comprising textural data corresponding to the selected texture, the textural data being sufficient to cause said at least one of said plurality of imaging units to apply clear toner onto a substrate in sufficient quantity and with sufficient spatial distribution so as to form a visually and tactilely detectable three dimensional texture on said substrate.

16. The electrophotographic (EP) printer (10) system according to Claim 15, wherein the electrophotographic (EP) printer (10) is configured to:  
10 apply clear toner to said substrate at said at least one of said plurality of imaging units as dictated by the textural data to thereby create a three-dimensional texture.

17. A method of applying a three dimensional texture to a  
15 substrate comprising:  
providing an electrophotographic (EP) printer (10) having a single imaging unit configured to apply clear toner to the substrate;  
sending digital information to the electrophotographic (EP) printer (10), the digital information comprising textural data sufficient to cause said single  
20 imaging unit to apply clear toner onto the substrate in sufficient quantity and with sufficient spatial distribution so as to form a visually and tactilely detectable three dimensional texture on said substrate; and  
applying clear toner to said substrate at said single imaging unit as dictated by the textural data to thereby create a three-dimensional texture.

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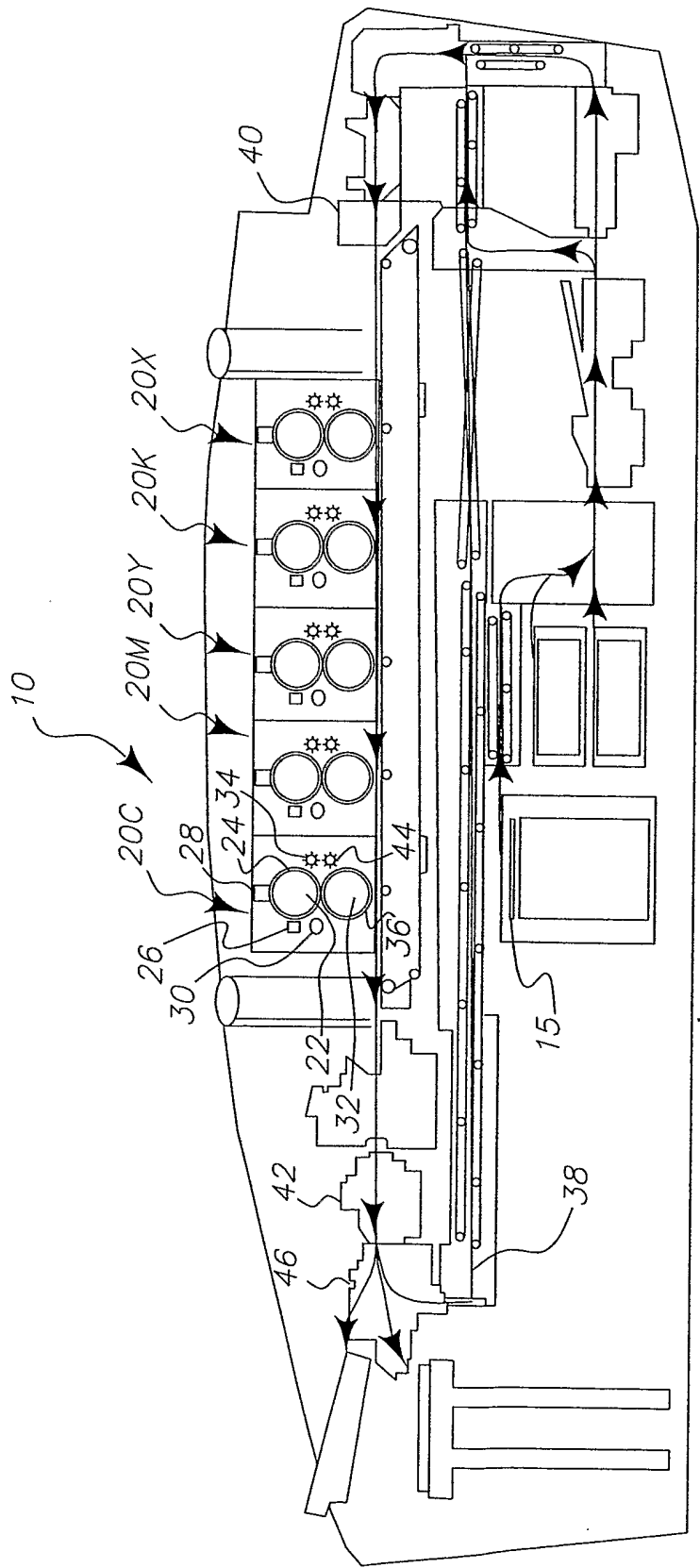


FIG. 1A  
(PRIOR ART)

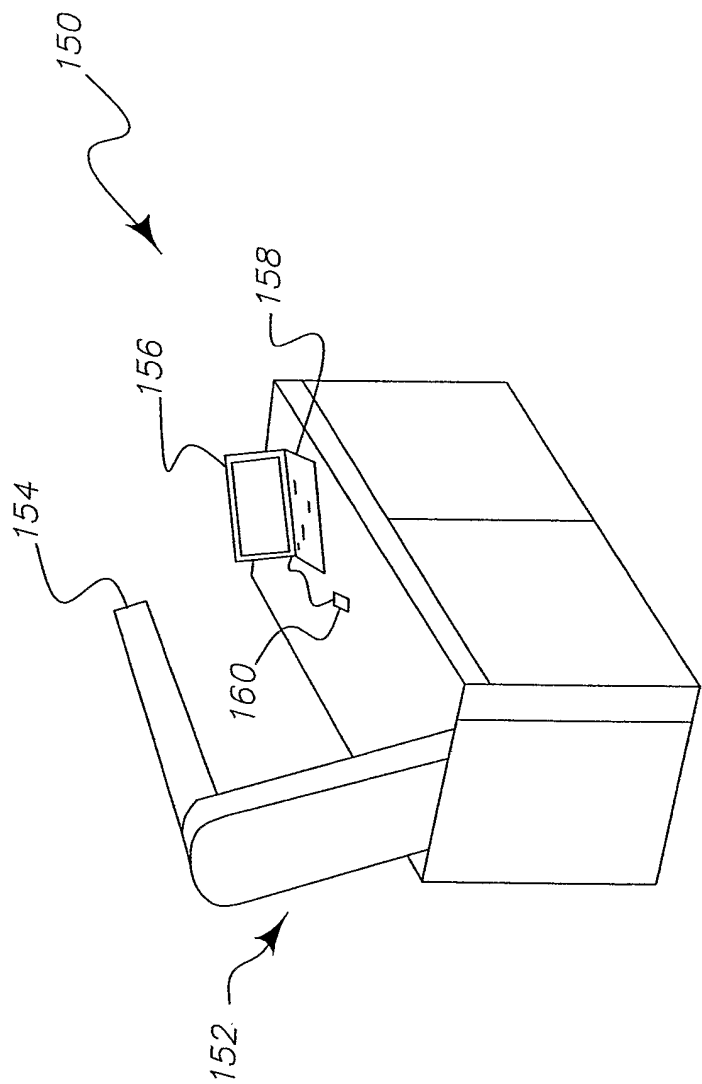


FIG. 1B  
(PRIOR ART)

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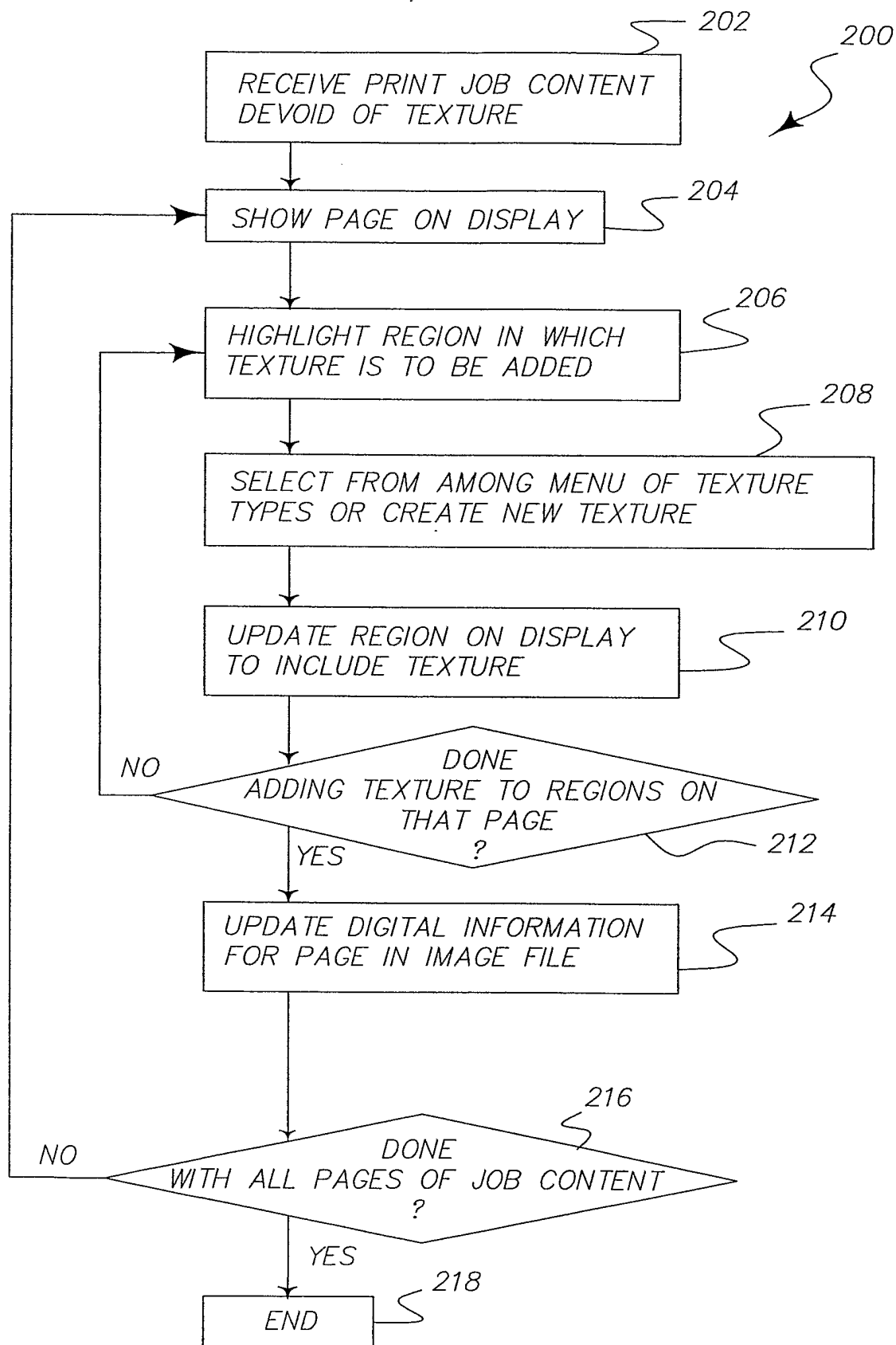


FIG. 2

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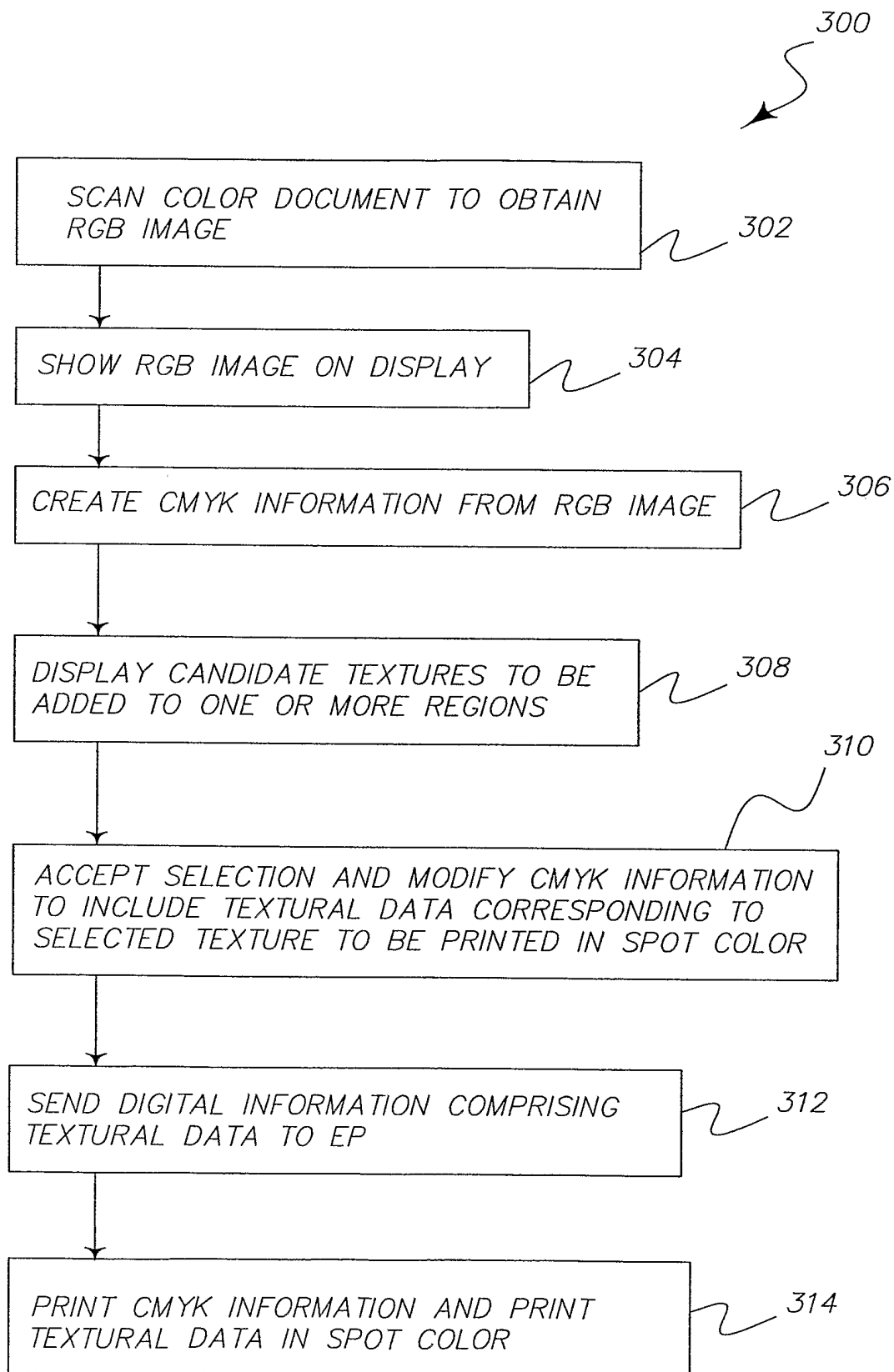


FIG. 3

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2006/004243

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. G03G15/01

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)  
G03G

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)

EPO-Internal, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 017, no. 267 (P-1543), 25 May 1993 (1993-05-25) -& JP 05 006033 A (KONICA CORP), 14 January 1993 (1993-01-14) abstract; figure 1	1-17
Y	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 06, 4 June 2002 (2002-06-04) -& JP 2002 049929 A (NAMCO LTD), 15 February 2002 (2002-02-15) abstract	1-3, 6-12, 14-17
	----- -/--	

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

☒ See patent family annex.

\* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search

7 June 2006

Date of mailing of the international search report

16/06/2006

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2006/004243

## C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	US 5 424 822 A (DANIELS ET AL) 13 June 1995 (1995-06-13) column 3, lines 34-52 -----	13
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 06, 30 April 1998 (1998-04-30) -& JP 10 055085 A (FUJI XEROX CO LTD), 24 February 1998 (1998-02-24) abstract paragraph [0069]; figure 1 -----	1-3
A	US 2003/099492 A1 (MAEYAMA RYUICHIRO ET AL) 29 May 2003 (2003-05-29) paragraphs [0100], [0101] -----	3



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Information on patent family members

International application No

PCT/US2006/004243

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