

Description

FIELD OF THE INVENTION

The present invention relates to image transfer techniques and apparatus for use in electrostatic imaging using an intermediate transfer member.

BACKGROUND OF THE INVENTION

The use of an intermediate transfer member in electrostatic imaging is well known in the art.

Various types of intermediate transfer members are known and are described, for example in U.S. Patents 3,862,848, 4,684,238, 4,690,539 and 4,531,825.

Belt-type intermediate transfer members for use in electrophotography are known in the art and are described, inter alia, in U.S. Patents 3,893,761, 4,684,238 and 4,690,539.

The use of intermediate transfer members is well known in the printing art. In offset printing an image formed of a viscous ink is transferred from a drum to a second drum prior to transfer to the final substrate.

Conventional color electrostatic printers print three or four, partly transparent, color, generally half-tone, separations in cyan, magenta, yellow and (optionally) black to form a single full color image. The color density of these single color prints must be carefully controlled to produce the correct color in the final image.

An observer viewing an image printed on paper actually sees a color which is the result of light incident on the image, which passes through the image, is reflected from the paper and passes through the image again before being seen by the viewer. The light which the observer sees is thus filtered twice by the image. If the same conditions are used for printing on transparencies the colors appear to be washed out, i.e., they have a lower saturation than the same print on paper. This reduced saturation is caused by the fact that for transparencies light passes through the printed image only once before being viewed.

SUMMARY OF THE INVENTION

The present invention seeks to provide apparatus and techniques for improved electrostatic printing of transparencies. In a preferred embodiment of the invention transparencies and prints on opaque substrates can be produced utilizing the same developer system operating at the same voltages and utilizing the same developer liquid.

There is thus provided apparatus for electrostatic printing of transparencies as defined in claim 1.

There is further provided a method for electrostatic printing of transparencies as defined in claim 9.

Preferred embodiments are defined in the de-

pendent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawing in which:

Fig. 1 is a simplified sectional illustration of electrostatic imaging apparatus constructed and operative in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is now made to Fig. 1, which illustrates electrostatic imaging apparatus constructed and operative in accordance with a preferred embodiment of the present invention.

In a preferred embodiment of the invention the toner of Example 1 of U.S. Patent 4,794,651 is employed, but a variety of powder or liquid toner types are useful in the practice of the invention. For colors other than black, the carbon black in the toner particles is replaced by suitable pigments as is known in the art.

As in conventional electrophotographic systems, the apparatus of Fig. 1 comprises a drum 10 arranged for rotation about an axle 12 in a direction generally indicated by arrow 14. The drum 10 is formed with a cylindrical photoconductive surface 16.

A corona discharge device 18 is operative to generally uniformly charge the photoconductor surface 16 with a positive charge. Continued rotation of the drum 10 brings the charged photoconductor surface 16 into image receiving relationship with an exposure unit including a lens 20, which focuses a desired image onto the charged photoconductive surface 16, selectively discharging the photoconductive surface, thus producing an electrostatic latent image thereon. Lens 20 may be the lens of a photocopier, as illustrated, or alternatively, for example, the lens of a laser printer.

Continued rotation of the drum 10 brings the charged photoconductive surface 16 bearing the electrostatic latent image into a development unit 22, which is operative to apply a colored toners, such as a liquid developer comprising carrier liquid and colored toner particles to develop the electrostatic latent image. Preferred development systems are described in commonly assigned PCT Patent Application PCT/NL90/00069 filed May 14, 1990 and US Patent Application entitled LIQUID DEVELOPER SYSTEM which was filed on August 22, 1990. Other multicolor liquid toner development systems as known in the art may also be suitable.

Downstream of roller 26 there is preferably pro-

vided a rigidizing roller 30. The rigidizing roller 30 is preferably formed of a resilient polymeric material, such as conductive resilient polymeric materials as described in either or both of U.S. Patents 3,959,574 and 3,863,603 and is preferably maintained in contacting, pressured relationship with the photoconductive surface 16. Use of such rigidizing rollers in systems comprising intermediate transfer members is described in commonly assigned US Patent Application 7/306,076, filed June 2, 1989.

Downstream of rigidizing roller 30 there is provided an intermediate transfer member 40, which rotates, as shown by arrow 41, in a sense opposite to that of drum 10, and is operative for receiving the toner image from surface 16 and for transferring the toner image to a receiving substrate 42, such as paper or a transparency, which is supported by a roller 43. In accordance with a preferred embodiment of the invention, intermediate transfer member 40 is configured and mounted with respect to drum 10 for providing first transfer engagement between intermediate transfer member 40 and image bearing photoconductor surface 16 for transfer of an image from surface 16 to intermediate transfer member 40.

The configuration and arrangement of intermediate transfer member 40, substrate 42 and roller 43 is preferably such as to provide second transfer engagement between the intermediate transfer member 40 and the substrate 42 for transfer of the image from the intermediate transfer member 40 to the substrate 42.

Intermediate Transfer Members and methods for using same which are especially useful for carrying out the present invention are described in commonly assigned US Patent Application 7/446,877 filed December 26, 1989, and in the above mentioned PCT Patent Application PCT/NL90/00069 filed May 14, 1990.

Control apparatus 46 is provided, for governing the operation of the remainder of the apparatus of Fig. 1. In general when it is sought to print on a transparencies, each monochromatic image or each color separation of a polychromatic image is developed more than once. In a preferred embodiment of the invention, each separation is imaged, developed and transferred to intermediate transfer member 40 more than once before the second transfer to the transparent substrate occurs.

The control apparatus typically comprises a Central Processing Unit (CPU) 100, such as a microcontroller or a microprocessor. Since the control function described hereinbelow with reference to the present invention is very simple, CPU 100 will generally perform all of the control functions of the imaging machine, and the control functions described below may involve no more than a few lines of code.

CPU 100 typically receives input signals from either an operator controlled paper-transparency

switch 102 or from apparatus 44 for indicating whether a substrate sought to be printed is opaque, such as paper, or transparent. Typically apparatus 44 will shine light through the medium to be printed from a light source 104. If a relatively large amount of light is measured on a light detector 106, a transparency is to be printed on. Otherwise, a piece of paper is to be printed on.

In response to the signal from switch 102 or light detector 106, CPU 100 activates the following elements of the apparatus of the present invention; developer 22, imaging head 21, intermediate transfer member 40, a paper feeder 108 and backing roller 43.

The operation of color developers, imaging heads and intermediate transfer members is well known in the art. For the preferred embodiments which are described in documents incorporated herein by reference, the operation is described in those documents.

A preferred method of activation is as follows:

1) Imaging head 21 is activated to write a latent image representing a particular color onto photoreceptor 16.

2) Developer 22 is activated to develop the latent image on photoreceptor 16 using the proper color developer.

3) Intermediate transfer member 40 and photoreceptor 16 are activated to transfer the developed image from photoreceptor 16 to intermediate transfer member 40.

4) Steps 1 - 3 are repeated for each of the colors to be printed.

If an input signal to CPU 100 indicates that a piece of paper is present, then step 5 is performed. Otherwise, step 6 is performed.

5) CPU 100 activates the paper feed 108 to feed the piece of paper between backing roller 43 and intermediate transfer member 40 to cause the developed image to be transferred to the-piece of paper.

6) CPU 100 causes steps 1-4 to be repeated. It then effects step 5.

The toner is formulated, as is known in the art, to give proper color saturation when the image is printed on paper. The present apparatus and procedure is operative to produce prints on paper and transparencies having roughly equally saturated colors for the following reason: When a print on white paper is viewed, the observer actually sees light which has passed through the image once, been reflected from the paper, and then passed through the image a second time. Thus the incident, white, light is filtered twice by the printed layer. For transparencies, the printed layer for each color is twice as thick as the printed layer for paper prints. Thus while in projecting transparencies, light passes through the printed image only once, the effective filtration of the light is equal to that for the printed image, yielding similar saturation densities.

It is understood that this method does not require any changes in the development process itself or in the liquid developer when a transparency is produced. Any such changes result in complication of the apparatus and process and in uncertain results.

Following transfer of the developed toner image to the intermediate transfer member, photoconductive surface 16 is engaged by a cleaning roller assembly 50, including a pair of rollers 52, which typically rotate in opposite directions, and a nozzle 54. The cleaning roller assembly 50 is operative to scrub clean the surface 16. A cleaning material, such as liquid developer, may be supplied to the assembly 50 via nozzle 54. A suitable cleaning assembly is illustrated in U.S. Patent 4,439,035. Any residual charge left on the photoconductive surface 16 is removed by flooding the photoconductive surface 16 with light from a lamp 58.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the scope of the claims which follow.

Claims

1. Apparatus for providing, on either opaque or transparent substrates, images having substantially equal apparent color saturation when viewed, comprising:

means for marking (22, 16, 18, 20, 40, 43, 21, 108) an opaque substrate by depositing a given amount of pigmented material thereon during an imaging process, characterized in that it includes:

control apparatus (100, 102, 104, 106, 108), operative, when the substrate on which the image is to be printed is transparent, for causing the means for marking to deposit approximately twice the given amount of pigmented material thereon when the substrate is transparent.

2. Apparatus according to claim 1 wherein the control apparatus is operative, when the substrate on which the image is to be printed is transparent for causing the means for marking to repeat the imaging process, thereby depositing approximately twice the given amount of pigmented material thereon when the substrate is transparent.

3. Apparatus according to claim 1 or claim 2 wherein

the means for marking comprises:

an image bearing surface (16);

means for forming an electrostatic latent image on the image bearing surface (18,20);

developing apparatus (22) for causing the electrostatic latent image on the image bearing surface to be developed to form a given developed image thereon; and

means for transferring (40, 43, 108) the developed image to the substrate, and

the control apparatus is operative, when the substrate is transparent, for causing the developing apparatus to form a second developed image, essentially identical to the given developed image and for causing the means for transferring to transfer the second developed image to the transparent substrate.

4. Apparatus according to claim 3 wherein the means for transferring comprises an intermediate transfer member (40) for receiving the developed image from the image bearing surface before the image is transferred to the transparency.

5. Apparatus according to claim 4 and wherein the control apparatus is operative, when the image is a polychromatic image comprising a plurality of color separations and the substrate is transparent, for causing said second developed image for each color separation to be transferred, in superposition on the given developed image of that separation, to the intermediate transfer member, and then transferring the combined superimposed images for that separation on the intermediate transfer member to the transparency.

6. Apparatus according to claim 4 and wherein said control apparatus is operative, when the substrate is transparent, for causing said second developed images to be transferred, in superposition on the given image, to the intermediate transfer member, and then transferring the combined superimposed image on the intermediate transfer member to the transparency.

7. Apparatus according to any of claims 3-6 wherein the developing apparatus is operative to cause the latent image to be developed utilizing a liquid developer comprising charged toner particles and carrier liquid.

8. Apparatus according to any of claims 3-7 wherein the means for developing operates at a given development voltage for developing said electrostatic latent image, further characterized in that said means for development and voltages are the same for printing on both opaque and transparent substrates; and

the apparatus provides images on the opaque and transparent substrates that have substantially equal apparent color saturation when the opaque substrates are directly viewed



It is understood that this method does not require any changes in the development process itself or in the liquid developer when a transparency is produced. Any such changes result in complication of the apparatus and process and in uncertain results.

Following transfer of the developed toner image to the intermediate transfer member, photoconductive surface 16 is engaged by a cleaning roller assembly 50, including a pair of rollers 52, which typically rotate in opposite directions, and a nozzle 54. The cleaning roller assembly 50 is operative to scrub clean the surface 16. A cleaning material, such as liquid developer, may be supplied to the assembly 50 via nozzle 54. A suitable cleaning assembly is illustrated in U.S. Patent 4,439,035. Any residual charge left on the photoconductive surface 16 is removed by flooding the photoconductive surface 16 with light from a lamp 58.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the scope of the claims which follow.

Claims

1. Apparatus for providing, on either opaque or transparent substrates, images having substantially equal apparent color saturation when viewed, comprising:

means for marking (22, 16, 18, 20, 40, 43, 21, 108) an opaque substrate by depositing a given amount of pigmented material thereon during an imaging process, characterized in that it includes:

control apparatus (100, 102, 104, 106, 108), operative, when the substrate on which the image is to be printed is transparent, for causing the means for marking to deposit approximately twice the given amount of pigmented material thereon when the substrate is transparent.

2. Apparatus according to claim 1 wherein the control apparatus is operative, when the substrate on which the image is to be printed is transparent for causing the means for marking to repeat the imaging process, thereby depositing approximately twice the given amount of pigmented material thereon when the substrate is transparent.

3. Apparatus according to claim 1 or claim 2 wherein

the means for marking comprises:

an image bearing surface (16);

means for forming an electrostatic latent image on the image bearing surface (18,20);

developing apparatus (22) for causing the electrostatic latent image on the image bearing surface to be developed to form a given developed image thereon; and

means for transferring (40, 43, 108) the developed image to the substrate, and

the control apparatus is operative, when the substrate is transparent, for causing the developing apparatus to form a second developed image, essentially identical to the given developed image and for causing the means for transferring to transfer the second developed image to the transparent substrate.

4. Apparatus according to claim 3 wherein the means for transferring comprises an intermediate transfer member (40) for receiving the developed image from the image bearing surface before the image is transferred to the transparency.

5. Apparatus according to claim 4 and wherein the control apparatus is operative, when the image is a polychromatic image comprising a plurality of color separations and the substrate is transparent, for causing said second developed image for each color separation to be transferred, in superposition on the given developed image of that separation, to the intermediate transfer member, and then transferring the combined superimposed images for that separation on the intermediate transfer member to the transparency.

6. Apparatus according to claim 4 and wherein said control apparatus is operative, when the substrate is transparent, for causing said second developed images to be transferred, in superposition on the given image, to the intermediate transfer member, and then transferring the combined superimposed image on the intermediate transfer member to the transparency.

7. Apparatus according to any of claims 3-6 wherein the developing apparatus is operative to cause the latent image to be developed utilizing a liquid developer comprising charged toner particles and carrier liquid.

8. Apparatus according to any of claims 3-7 wherein the means for developing operates at a given development voltage for developing said electrostatic latent image, further characterized in that: said means for development and voltages are the same for printing on both opaque and transparent substrates; and

the apparatus provides images on the opaque and transparent substrates that have substantially equal apparent color saturation when the opaque substrates are directly viewed



and the transparent substrates are viewed by projection.

9. A method for providing, on either opaque or transparent substrates, images having substantially equal apparent color saturation when viewed, comprising the step of:

marking an opaque substrate by depositing a given amount of pigmented material thereon during an imaging process, the method characterized by the step of:

marking a transparent substrate by depositing approximately twice the given amount of pigmented material thereon.

10. A method according to claim 9 wherein the step of marking a transparent substrate comprises:

first marking the transparent substrate by depositing the given amount of pigmented material thereon during an imaging process; and

duplicating the step of first marking thereby depositing approximately twice the given amount of pigmented material on the substrate when the substrate is transparent than when it is opaque.

11. A method according to claim 10 wherein the step of first marking includes the steps of:

(a) providing an electrostatic image on an electrostatic image bearing surface; and
(b) developing the image on the electrostatic image bearing surface to form a developed image, and

the step of duplicating includes:
carrying out steps (a) and (b) at least twice for each image.

12. A method according to claim 10 or 11 wherein the step of marking further includes the step of:

(c) transferring the developed image to the substrate.

13. A method according to claim 12 wherein the step of transferring includes, when the substrate is transparent, the steps of:

transferring the separate developed images to an intermediate transfer member to form a built up superimposed image; and

subsequently transferring the superimposed image from the intermediate transfer member to the transparent substrate, thereby to enhance the color density of a resulting transparency.

14. A method according to claim 13 wherein said transparency is a polychromatic transparency and each color separation is imaged and developed on the image bearing surface and transfer-

red to the intermediate transfer member at least twice before the combined superimposed image for that color separation on the intermediate transfer member is transferred to the transparent substrate.

15. A method according to any of claims 11-14 wherein the step of developing includes using liquid developer comprising charged toner particles to develop the latent image.

16. A method according to any of claims 11-15 wherein the step of developing utilizes a developer system operating at given voltages, and further characterized in that:

said developer system and voltages are the same for printing on both opaque and transparent substrates and wherein the images on the opaque and transparent substrates have substantially equal apparent color saturation when the opaque substrates are directly viewed and the transparent substrates are viewed by projection.

Patentansprüche

1. Vorrichtung zum Erzeugen von Bildern auf lichtundurchlässigen oder lichtdurchlässigen Substraten, wobei die Bilder im wesentlichen eine gleiche sichtbare Farbsättigung bei Betrachtung derselben aufweisen, mit

einer Einrichtung (22, 16, 18, 20, 40, 43, 21, 108) zum Markieren eines lichtundurchlässigen Substrats durch Niederschlagen einer gegebenen Menge eines pigmentierten Materials auf dasselbe während eines Bilderzeugungsprozesses dadurch gekennzeichnet, daß die Vorrichtung folgendes enthält:

ein Steuergerät (100, 102, 104, 106, 108), welches betreibbar ist, wenn das Substrat, auf welchem das Bild aufzudrucken ist, lichtdurchlässig ist, um die Markierungseinrichtung zu veranlassen nahezu das Doppelte der gegebenen Menge des pigmentierten Materials auf demselben niederzuschlagen, wenn das Substrat lichtdurchlässig ist.

2. Vorrichtung nach Anspruch 1, bei der das Steuergerät betrieben werden kann, wenn das Substrat, auf welches das Bild aufzudrucken ist, lichtdurchlässig ist, um die Markierungseinrichtung zu veranlassen, den Bilderzeugungsprozeß zu wiederholen, um dadurch ca. das Zweifache der gegebenen Menge des pigmentierten Materials auf demselben niederzuschlagen, wenn das Substrat lichtdurchlässig ist.



3. Vorrichtung nach Anspruch 1 oder 2, bei der die Markierungseinrichtung aufweist:
 - eine bildtragende Fläche (16),
 - eine Einrichtung zur Herstellung eines elektrostatischen latenten Bildes auf der das Bild tragenden Fläche (18, 20),
 - eine Entwicklungsvorrichtung (22), um das elektrostatische latente Bild auf der bildtragenden Fläche zu entwickeln, um auf dieser ein gegebenes entwickeltes Bild auszubilden, und
 - eine Einrichtung (40, 43, 108) zum Übertragen des entwickelten Bildes auf das Substrat, wobei das Steuergerät betreibbar ist, wenn das Substrat lichtdurchlässig ist, um die Entwicklungsvorrichtung zu veranlassen ein zweites entwickeltes Bild auszubilden, welches im wesentlichen identisch mit dem gegebenen entwickelten Bild ist und um die Übertragungseinrichtung zu veranlassen, das zweite entwickelte Bild auf das lichtdurchlässige Substrat zu übertragen.
4. Vorrichtung nach Anspruch 3, bei der die Einrichtung zum Übertragen ein Zwischenübertragungsteil (40) aufweist, um das entwickelte Bild von der das Bild tragenden Fläche zu empfangen bevor das Bild auf das transparente Substrat übertragen wird.
5. Vorrichtung nach Anspruch 4, bei der das Steuergerät betreibbar ist, wenn das Bild ein polychromatisches Bild ist, welches eine Vielzahl von Farbtrennungen aufweist und wenn das Substrat lichtdurchlässig ist, um das zweite entwickelte Bild für jede Farbtrennung in Übereinanderlage auf dem gegebenen entwickelten Bild dieser Trennung auf das Zwischenübertragungsteil zu übertragen und um dann die kombinierten übereinandergelagerten Bilder für diese Trennung auf dem Zwischenübertragungsteil auf das transparente Substrat zu übertragen.
6. Vorrichtung nach Anspruch 4, bei der das Steuergerät betrieben werden kann, wenn das Substrat lichtdurchlässig ist, um die zweiten entwickelten Bilder in Überlagerung mit dem gegebenen Bild auf das Zwischenübertragungsteil zu übertragen und um dann das kombinierte überlagerte Bild auf dem Zwischenübertragungsteil auf das transparente Substrat zu übertragen.
7. Vorrichtung nach irgendeinem der Ansprüche 3 bis 6, bei der die Entwicklungsvorrichtung betreibbar ist, um das latente Bild unter Verwendung eines Flüssigentwicklers zu entwickeln, der geladene Tonerteilchen und eine Trägerflüssigkeit enthält.
8. Vorrichtung nach irgendeinem der Ansprüche 3 bis 7, bei der die Einrichtung zum Entwickeln bei einer gegebenen Entwicklungsspannung arbeitet, um das elektrostatische latente Bild zu entwickeln, dadurch gekennzeichnet, daß die Einrichtung zum Entwickeln und die Spannungen die gleichen sind für sowohl das Drucken auf lichtundurchlässigen als auch lichtdurchlässigen Substraten, und wobei die Vorrichtung Bilder auf den lichtundurchlässigen und auf den lichtdurchlässigen Substraten erzeugt, die im wesentlichen gleiche sichtbare Farbsättigung besitzen, wenn die lichtundurchlässigen Substrate direkt betrachtet werden und wenn die transparenten Substrate durch Projektion betrachtet werden.
9. Verfahren zum Erzeugen von Bildern auf entweder lichtundurchlässigen oder lichtdurchlässigem Substraten, die im wesentlichen die gleiche sichtbare Farbsättigung bei Betrachtung aufweisen, mit den folgenden Schritten:
 - Markieren eines lichtundurchlässigen Substrats durch Niederschlagen einer gegebenen Menge aus einem pigmentierten Material auf demselben während eines Bilderzeugungsprozesses, wobei das Verfahren durch den folgenden Schritt gekennzeichnet ist:
 - Markieren eines lichtdurchlässigen Substrats durch Niederschlagen von ca. der zweifachen gegebenen Menge des pigmentierten Materials auf demselben.
10. Verfahren nach Anspruch 9, bei dem der Schritt der Markierung eines lichtdurchlässigen Substrats folgende Schritte umfaßt:
 - zuerst Markieren des lichtdurchlässigen Substrats durch Niederschlagen einer gegebenen Menge aus pigmentiertem Material auf demselben während eines Bildherstellungsprozesses, und
 - Duplizieren des Schrittes der ersten Markierung, um dadurch ca. das Zweifache der gegebenen Menge des pigmentierten Materials auf dem Substrat niederschlagen, wenn das Substrat lichtdurchlässig ist, wie wenn es lichtundurchlässig ist.
11. Verfahren nach Anspruch 10, wonach der Schritt der ersten Markierung die folgenden Schritte umfaßt:
 - (a) Herstellen eines elektrostatischen Bildes auf einer ein elektrostatisches Bild tragenden Fläche, und
 - (b) Entwickeln des Bildes auf der das elektrostatische Bild tragenden Fläche, um ein entwickeltes Bild herzustellen, und wobei der Schritt der Duplizierung folgende Schritte umfaßt:



Durchführen der Schritte (a) und (b) wenigstens zweimal für jedes Bild.

12. Verfahren nach Anspruch 10 oder 11, wonach der Schritt der Markierung den folgenden Schritt umfaßt:

(c) Übertragen des entwickelten Bildes auf das Substrat.

13. Verfahren nach Anspruch 12, bei dem der Schritt des Übertragens die folgenden Schritte umfaßt, wenn das Substrat lichtdurchlässig ist:

Übertragen der getrennt entwickelten Bilder auf ein Zwischenübertragungsteil, um ein aufgebautes überlagertes Bild herzustellen, und anschließendes Übertragen des überlagerten Bildes von dem Zwischenübertragungsteil auf das lichtdurchlässige Substrat, um dadurch die Farbdichte eines resultierenden Transparentbildes zu erhöhen.

14. Verfahren nach Anspruch 13, wonach das Transparentbild aus einem polychromatischen Transparentbild besteht und jede Farbtrennung auf der das Bild tragenden Fläche abgebildet und entwickelt wird und auf das Zwischenübertragungsteil wenigstens zweimal übertragen wird bevor das kombinierte überlagerte Bild für diese Farbtrennung auf dem Zwischenübertragungsteil auf das transparente Substrat übertragen wird.

15. Verfahren nach irgendeinem der Ansprüche 11 bis 14, bei dem der Entwicklungsschritt die Verwendung eines Flüssigentwicklers umfaßt, der geladene Tonerteilchen enthält, um das latente Bild zu entwickeln.

16. Verfahren nach irgendeinem der Ansprüche 11 bis 15, bei dem der Entwicklungsschritt die Verwendung eines Entwicklersystems umfaßt, welches bei gegebenen Spannungswerten arbeitet und dadurch gekennzeichnet ist, daß das Entwicklersystem und die Spannungen die gleichen sind für das Aufdrucken auf sowohl lichtundurchlässige als auch lichtdurchlässige Substrate, und daß die auf den lichtundurchlässigen und auf den lichtdurchlässigen Substraten erzeugten Bilder im wesentlichen die gleiche sichtbare Farbsättigung besitzen, wenn die lichtundurchlässigen Substrate direkt betrachtet werden und wenn die lichtdurchlässigen Substrate durch Projektion betrachtet werden.

Revendications

1. Appareil qui donne, sur des supports soit transparents soit opaques, des images ayant à l'ob-

servation une saturation apparente des couleurs sensiblement identique, qui comprend :

- des moyens (22, 16, 18, 20, 40, 43, 21, 108) pour marquer un support opaque en y déposant une quantité donnée de matériau pigmenté pendant une opération de formation d'image, caractérisé en ce qu'il contient :
- un appareil de commande (100, 102, 104, 106, 108) agissant, quand le support sur lequel l'image doit être imprimée est transparent, pour amener lesdits moyens de marquage à y déposer approximativement le double de la quantité donnée de matériau pigmenté lorsque le support est transparent.

2. Appareil selon la revendication 1, dans lequel ledit appareil de commande agit, quand le support sur lequel l'image doit être imprimée est transparent, pour amener les moyens de marquage à répéter l'opération de formation de l'image, déposant ainsi sur celui-ci environ deux fois la quantité donnée de matériau pigmenté quand le support est transparent.

3. Appareil selon la revendication 1 ou la revendication 2, dans lequel :

- les moyens de marquage comprennent :
 - une surface (16) de support d'image,
 - un moyen (18, 20) pour former une image électrostatique latente sur la surface de support d'image,
 - un appareil de révélation (22) destiné à provoquer une révélation de l'image électrostatique latente sur la surface de support d'image afin d'y former une image révélée donnée, et
 - des moyens (40, 43, 108) pour transférer l'image révélée sur le support, et
- l'appareil de commande agit, quand le support est transparent, pour amener l'appareil de révélation à former une seconde image révélée, essentiellement identique à l'image révélée donnée, et pour amener les moyens de transfert à transférer la seconde image révélée sur le support transparent.

4. Appareil selon la revendication 3, dans lequel les moyens de transfert comprennent un organe (40) de transfert intermédiaire destiné à recevoir l'image révélée en provenance de la surface de support d'image avant que l'image ne soit transférée au support transparent.

5. Appareil selon la revendication 4, dans lequel l'appareil de commande agit, quand l'image est une image polychrome comprenant plusieurs séparations de couleurs et que le support est trans-



parent, pour provoquer un transfert vers l'organe de transfert intermédiaire de ladite seconde image révélée pour chaque séparation de couleurs, en superposition sur l'image révélée donnée correspondant à cette séparation, et pour trans-
férer ensuite au support transparent les images
superposées combinées correspondant à cette
séparation et se trouvant sur l'organe de transfert
intermédiaire.

6. Appareil selon la revendication 4, dans lequel l'appareil de commande agit, quand le support est transparent, pour provoquer un transfert vers l'organe de transfert intermédiaire desdites secondes images révélées en superposition sur l'image donnée, et pour transférer ensuite au support transparent l'image superposée combinée se trouvant sur l'organe de transfert intermédiaire.

7. Appareil selon l'une quelconque des revendications 3 à 6, dans lequel l'appareil de révélation agit pour provoquer une révélation de l'image latente par utilisation d'un révélateur liquide contenant des particules de toner chargées et un liquide porteur.

8. Appareil selon l'une quelconque des revendications 3 à 7, dans lequel le moyen de révélation fonctionne à une tension de révélation donnée pour révéler ladite image électrostatique latente, caractérisé en outre en ce que :

- ledit moyen de révélation et lesdites tensions sont les mêmes pour une impression sur des support transparents et sur des supports opaques, et
- l'appareil donne des images sur les supports transparents et opaques qui ont une saturation apparente des couleurs sensiblement identique quand on observe les supports opaques en direct et quand on observe les supports transparents par projection.

9. Procédé pour former, sur des supports soit transparents soit opaques, des images ayant à l'observation une saturation apparente des couleurs sensiblement identique, qui comprend l'étape consistant à :

- marquer un support opaque en y déposant une quantité donnée de matériau pigmenté pendant une opération de formation d'image, le procédé étant caractérisé par l'étape consistant à marquer un support transparent en y déposant approximativement le double de la quantité donnée de matériau pigmenté.

10. Procédé selon la revendication 9, dans lequel

l'étape de marquage d'un support transparent comprend :

- un premier marquage du support transparent par dépôt sur celui-ci de la quantité donnée de matériau pigmenté pendant une opération de formation d'image, et
- une répétition de la première étape de marquage pour déposer de ce fait environ le double de la quantité donnée de matériau pigmenté sur le support lorsque le support est transparent par rapport au cas où le support est opaque.

11. Procédé selon la revendication 10, dans lequel :

- la première étape de marquage comprend les étapes consistant à :
(a) fournir une image électrostatique sur une surface de support d'image électrostatique, et
(b) révéler l'image sur la surface de support d'image électrostatique pour former une image révélée, et
- l'étape de répétition comprend la mise en oeuvre des étapes (a) et (b) au moins deux fois pour chaque image.

12. Procédé selon la revendication 10 ou 11, dans lequel l'étape de marquage comprend en outre l'étape consistant à :

- (c) transférer l'image révélée sur le support.

13. Procédé selon la revendication 12, dans lequel l'étape de transfert comprend, quand le support est transparent, les étapes consistant à :

- transférer les images révélées séparées vers un organe de transfert intermédiaire pour former une image accumulée superposée, et
- transférer ensuite l'image superposée de l'organe de transfert intermédiaire au support transparent pour améliorer ainsi la densité de couleur du transparent résultant.

14. Procédé selon la revendication 13, dans lequel ledit transparent est un transparent polychrome et on réalise et révèle sur la surface de support d'image l'image de chaque séparation de couleurs, que l'on transfère à l'organe de transfert intermédiaire au moins deux fois avant que l'image superposée combinée correspondant à cette séparation de couleurs se trouvant sur l'organe de transfert intermédiaire ne soit transférée au support transparent.

15. Procédé selon l'une quelconque des revendications 11 à 14, dans lequel l'étape de révélation comprend l'utilisation d'un révélateur liquide



contenant des particules de toner chargées pour révéler l'image latente.

16. Procédé selon l'une quelconque des revendications 11 à 15, dans lequel l'étape de révélation utilise un dispositif de révélation fonctionnant à des tensions données, et caractérisé en outre en ce que :

- ledit moyen de révélation et lesdites tensions sont les mêmes pour une impression sur des support transparents et sur des supports opaques, et
- les images sur les supports transparents et opaques ont une saturation apparente des couleurs sensiblement identique quand on observe les supports opaques en direct et quand on observe les supports transparents par projection.

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