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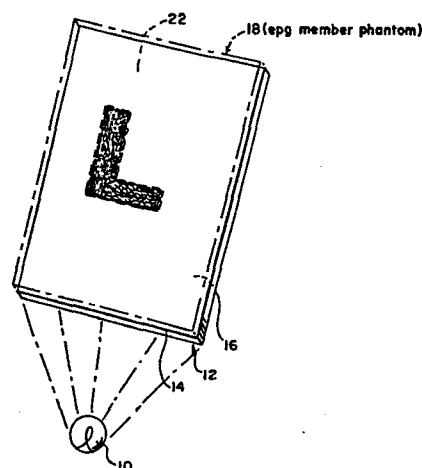
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54 **Method of electrophotographic imaging for proofing purposes.**

57 Electrophotographic imaging method particularly for duplicating a photographic image carried by a silver halide emulsion (16) bonded to a transparent base (14). The transparency (12) is brought into intimate engagement with the charged photoconductive surface (22) with the base in contact with the charged photoconductor. Radiant energy (10) is passed first through the transparency emulsion (16) and then across the base (14) in contact with the charged photoconductive surface (22) selectively to discharge the surface producing a right-way reading latent charge image which is toned for visibility.

FIG. 1A



This invention relates generally to electrophotographic imaging and more particularly provides an improved electrophotographic method for obtaining right way reading (nonreversed) images with minimal distortion, density loss, reduction in speed and improved economy.

Electrophotographic imaging apparatus includes an electrophotographic member having an exposed photoconductive surface, a plurality of functional stations arranged in sequential proximity to the photoconductive surface, and means to bring the functional stations into operative position relative the photoconductive surface. Known sequential operations on the photoconductive surface include the steps of charging, imaging, toning and transferring. The invention herein primarily is concerned with the imaging function.

U.S. Patent 3,862,848 provides one example of prior electrophotographic systems wherein the imaging of the photoconductive member is effected by contact exposure with the emulsion side of the transparency engaged with the charged surface of the member being imaged. According to this patent, reversing the position of the transparency, i.e., placing the emulsion side facing away from the photoconductive surface, results in a substantial loss of dot size when screened transparencies are employed as is customarily as for offset lithography. In extreme cases, complete loss of highlight dots may ensue.

U.S. Patent 4,182,266 teaches as necessary, the placement of the silver halide emulsion side of a transparency in engagement with the electrostatically charged surface so as to avoid loss in resolution. The

prior art, as typified by 3,862,848 and 4,182,266 electro-
photographically reproduces the image carried
by the emulsion side of the transparency by engaging the
emulsion side on the charged photographic surface and then
5 effecting exposure to radiant energy in that condition.

In order to produce a correct reading proof
or print according to 4,182,266, the developed image on the
photoconductive surface must be transferred to an
intermediate member and subsequently transferred therefrom
10 to an image receiving member. This requires complex
mechanisms to effect the intermediate and final transfers.
The registration requirements are complicated due to the
intermediate transfer step. Additionally, information is
lost during each transfer and image degradation occurs in
15 each transfer step.

The reproduction obtained must duplicate the
transparency exactly without distortion or loss. The
reproductions, normally employed as proofs are required
to show the printing craftsman the results of the transparency
20 and whether the transparencies are suitable for platemaking,
for example. The capability of accurate and reproducible
evaluation of factors such as color balance, toner
reproduction, shadow, detail image, sharpness and contrast
are important criteria which must be met, particularly for
25 printing or color proofing.

Accordingly, there is provided a method of electrophotographic duplicating an image pattern on a receptor from a transparency which is formed of a synthetic resinous substrate base and an emulsion side on the base

5 and carrying therein the image pattern to be duplicated, the method comprising the steps of providing a photoconductive coating placing the transparency in intimate contact engagement with the charged photoconductive coating, thereafter exposing the charged coating to radiant energy through
10 the transparency to form a latent image on the photoconductive coating, removing the transparency from the coating, toning the latent charge image and transferring the toner image to a receptor.

placing the transparency on the charged photoconductive
15 coating with the emulsion side thereof facing away from the photoconductive coating and the substrate base engaging said coating, and exposing while maintaining said relationship.

The preferred embodiments of this invention now will be described, by way of example, with reference to the drawings accompanying this specification in which:

FIGURE 1 is a diagrammatic representation illustrating the imaging process according to the invention.

FIGURE 2 is a diagram illustrating an imaging process according to prior art, and

FIGURE 3 is a fragmentary enlarged section taken through the engaged transparency and electrophotographic member during the imaging process of the invention.

Briefly, the invention provides an improved method for electrophotographically duplicating the image pattern carried by a photographic transparency comprising a film base and a silver halide emulsion in which the
5 image is distributed. . The transparency can carry a continuous image pattern or alternatively, may comprise a half-tone image pattern made up of dots.

The image pattern carried by the emulsion side of the transparency is in the form of a negative or reverse
10 reading image pattern. The desire is to provide a right-reading reproduction of such pattern so as to avoid multiple transfer as would be necessary to achieve the same result without the invention herein.

According to the invention, the charged
15 photoconductive surface of an electrophotographic member is placed in contact engagement with the film base with the emulsion side facing outward of or away from the photoconductive surface. In this step an accurate and reproducible right-reading print or proof is produced
20 requiring only one transfer of the toner image for each transparency, imaging being effected without distortion or loss in density.

Now, referring to Figure 1, the process according to the invention is illustrated; 1A representing
25 the exposing or imaging function; 1B representing the toning function and 1C representing the transfer function providing the completed reproduction. A radiant energy source in the forms of lamp 10 is provided below the engaged transparency 12 and electrophotographic member 18.

The transparency 12 comprises a film base layer 14 and a silver halide emulsion 16 coated on the base 14, said emulsion carrying an image pattern. As viewed through the film base, the image pattern is normal while as viewed
5 through the emulsion side 16, the image pattern will be read as "a reverse reading image". The term "transparency" as used herein includes both a half-tone transparency intended to be used to make a printing plate, and a continuous tone image such as used for color proofing. The half-tone
10 pattern is formed by photographing a scene through a screen or the like to define the image by dot formations. The image density of the transparency 12 is measured prior to uniformly charging the photoconductive surface 24 of photoconductive layer 22 of the electrophotographic member 18
15 so that a predetermined charge potential related to the density measurement is applied.

A preferred electrophotographic member for use herein is disclosed in U.S. Patent 4,025,339 and has unusually high speed and high resolution capabilities.
20 This electrophotographic member is provided with a thin film photoconductive coating bonded to a conductive substrate and formed as a wholly microcrystalline sputtered deposit, all crystallites of which being highly ordered and vertically oriented with the coating exhibiting single crystal
25 characteristics. Each crystal acts independently as an independent field comain. The photoconductive coating has an extremely high surface resistivity on the order of 10^{20} ohm centimeters, so that charge will not migrate laterally on the surface. The photoconductive coating 22 has high
30 quantum gain, high resolution capability and high speed capability, capable of high speed discharge by light on the

order of microseconds, and is capable of being rapidly charged and of retaining the charge sufficiently to be toned.

According to the herein invention, the transparency 12 is arranged with its emulsion side 16 facing away from the photoconductive surface 22 of the electrophotographic member 18 during the imaging function and its base 14 is placed in intimate contact engagement with the charged photoconductive surface 22. The film base 14 is maintained free of scratches or other discontinuities which would be reproduced.

Radiant energy, such as light from source 10 is collimated and projected with its intensity and for a duration in predetermined relation to the density measurement and the charge potential carried by the surface 22 through the transparency base 14 onto the charged photoconductive surface 22 thereby forming a latent electrostatic charge image of the pattern on the photoconductive surface 22.

It is believed that the thickness and slow speed of conventional photoconductors promotes scatter. In contrast, the preferred electrophotographic member has a photoconductive coating which substantially minimizes, if not eliminating scatter.

There is no diffusion due to the crystalline structure of the photoconductive coating 22, since each crystallite has its own boundaries and confines the spread of scatter to diffusion of light due to crystal structure. The latent electrostatic charge image produced is well defined and accurate without undercutting of the image pattern.

1B of Figure 1 illustrates an electrostatic toner image on the photoconductive coating 22 of the electrophotographic member 18 which comprises a reverse (reading) image pattern which is toned and transferred to a receptor medium.

5 The final reproduction, whether it be a print or a proof 24, carries a right-reading image. The toned electrostatic charge image on the photoconductive surface 22 of the electrophotographic member 18 is transferred directly to the image receptor to form the reproduction 24, shown in
10 1C of Figure 1.

 Attention now is directed to Figure 2 wherein the prior art process is illustrated. 2A of Figure 2 illustrates the exposing or imaging function. The silver halide emulsion side 16 of the transparency 12 is provided in contact
15 engagement with the photoconductor 22' of electrophotographic member 18', shown in phantom representation to above the transparency 12.

 2B of Figure 2 illustrates the "right-reading" image reading pattern defined by the toner electrostatic
20 charge image produced on the photoconductor surface 22'.

 2C of Figure 2 illustrates the toner image transferred to an intermediate image receptor 23 required to produce a final print or proof 24' forming the normal or right-reading pattern. 2D of Figure 2 illustrates the
25 final receptor 24' carrying the final reproduction, requiring the additional transfer step as compared with the method of the invention.

 The invention herein eliminates an intermediate transfer step which is required by the prior art process
30 if a right-reading print is to constitute the end print or

proof product that is an accurate forecast of what may be produced by the plates which result from the original transparencies. The single transfer results in less information lost during multiple transferring, as well as economics due to time saved with less equipment and maintenance required.

In Figure 3 the transparency 12 and the electrophotographic member 18 are shown engaged in an intimage contact engagement for imaging by projected light from source 10 being directed through the emulsion side 16 to the film base 14 of transparency 12 and onto the charged photoconductive layer 22 of the electrophotographic member 18; the emulsion side 16 of the transparency 12 facing away from the photoconductive layer 22 of the electrophotographic member 18.

CLAIMS:

1. A method of electrophotographic duplicating an image pattern on a receptor from a transparency which is formed of a synthetic resinous substrate base and an emulsion side on the base and carrying therein the image pattern to be duplicated, the method including providing a photoconductive coating, placing the transparency in intimate contact engagement with the charged photoconductive coating, thereafter exposing the charged coating to radiant energy through the transparency to form a latent image on the photoconductive coating, removing the transparency from the coating, toning the latent charge image and transferring the toner image to a receptor characterized by the steps of placing the transparency on the charged photoconductive coating with the emulsion side thereof facing away from the photoconductive coating and the substrate base engaging said coating, and exposing while maintaining said relationship.

FIG. 1A

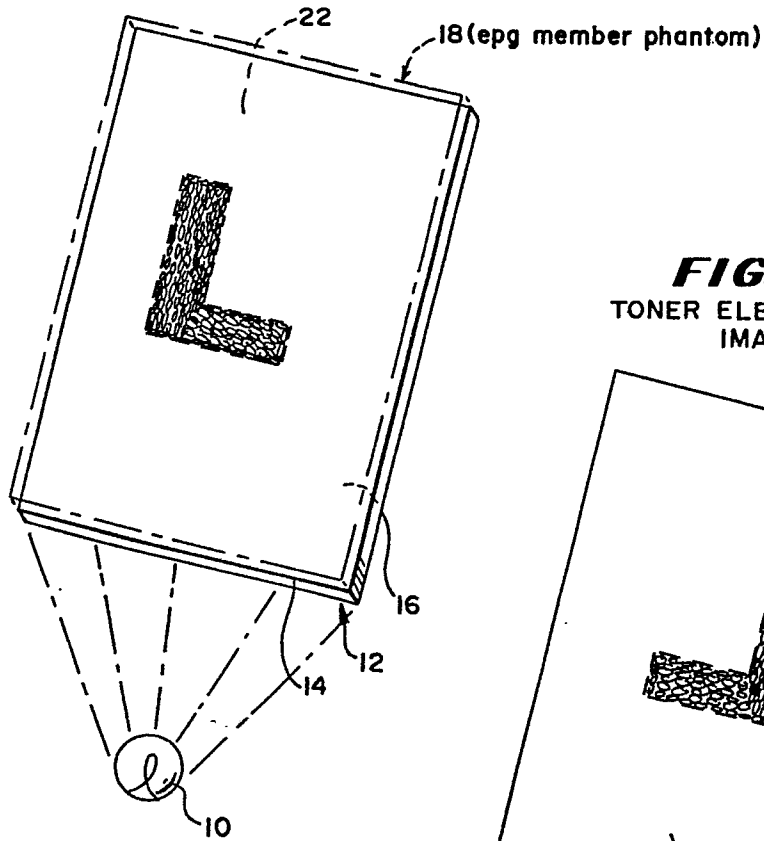


FIG. 1B
TONER ELECTROSTATIC
IMAGE

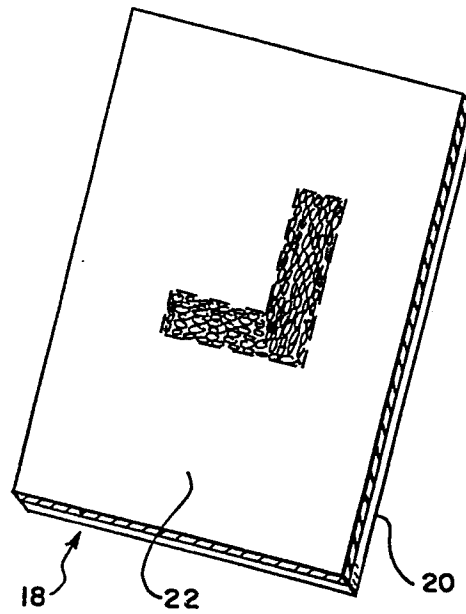


FIG. 1C
FINAL TRANSFERRED IMAGE

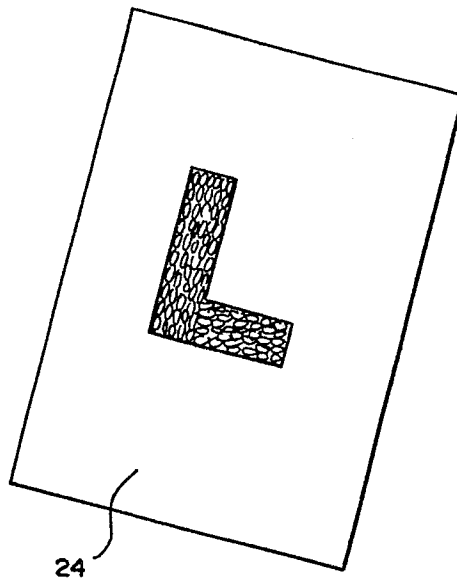


FIG. 1

FIG. 2A

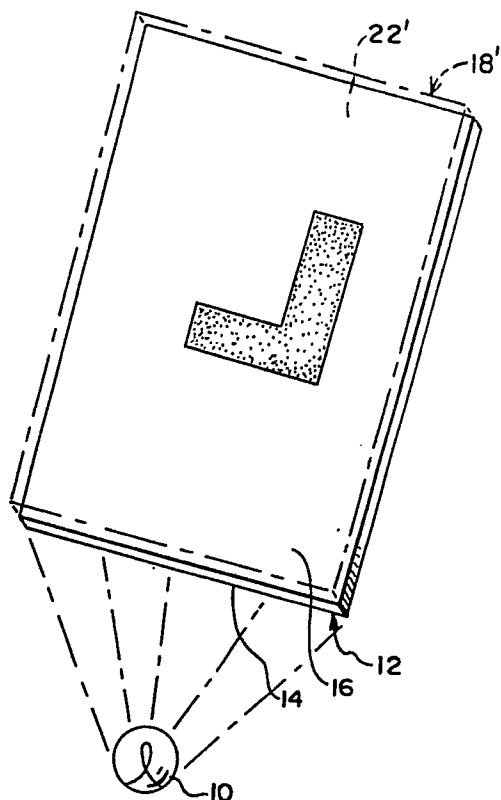


FIG. 2B
TONER ELECTROSTATIC
IMAGE

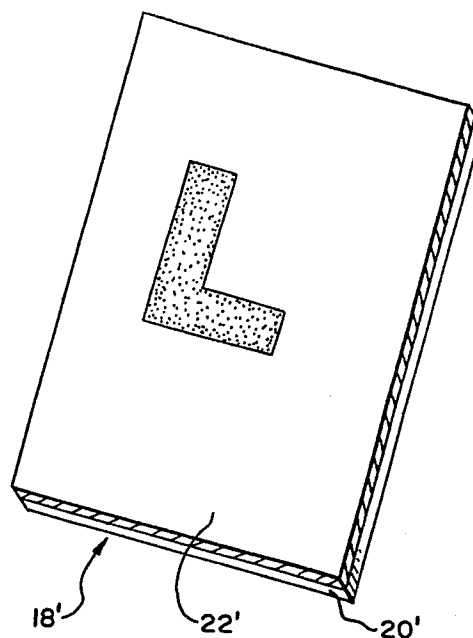


FIG. 2C
INTERMEDIATE
TRANSFERRED IMAGE

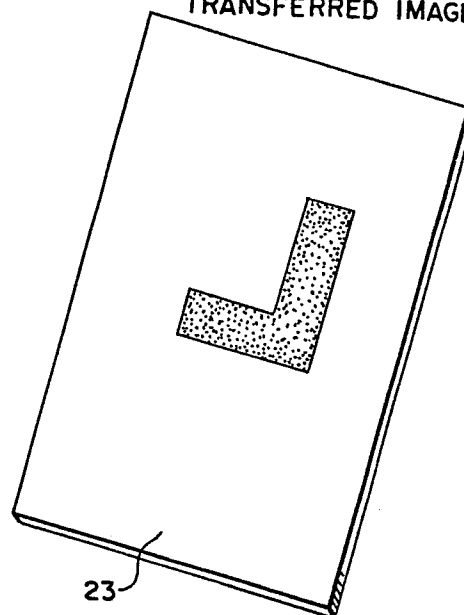


FIG. 2
PRIOR ART

FIG. 2D
FINAL TRANSFERRED
IMAGE

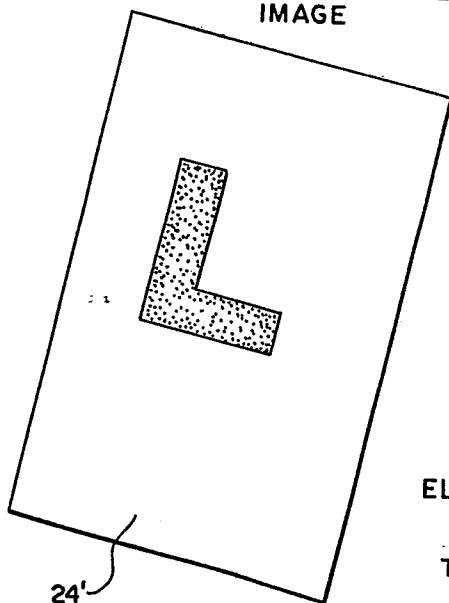
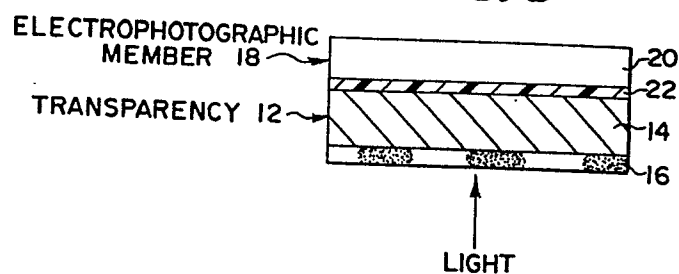


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

0112971

Application number

EP 83109495.8

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
A	<u>US - A - 3 945 822</u> (VERHILLE) * Abstract * --	1	G 03 G 13/22 G 03 G 13/04
A,D	<u>US - A - 3 862 848</u> (MARLEY) * Abstract * --	1	
A,D	<u>US - A - 4 182 266</u> (ALSTON) * Abstract * --	1	
A,D	<u>US - A - 4 025 339</u> (KUEHNLE) * Abstract * ----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			G 03 G
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 30-12-1983	Examiner SCHÄFER
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	