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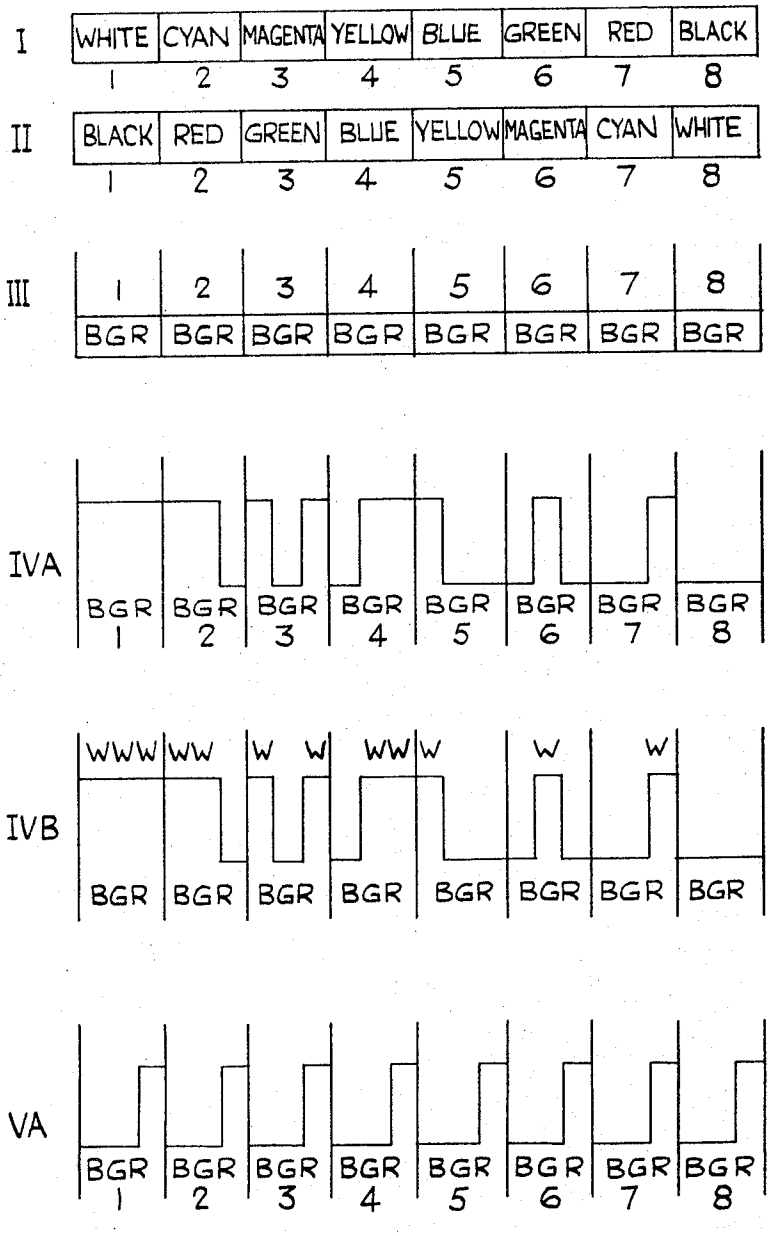
COLOR ELECTROPHOTOGRAPHY USING TONERS OF THE REPELLENT TYPE

Filed Dec. 9, 1971 2 Sheets-Sheet 1



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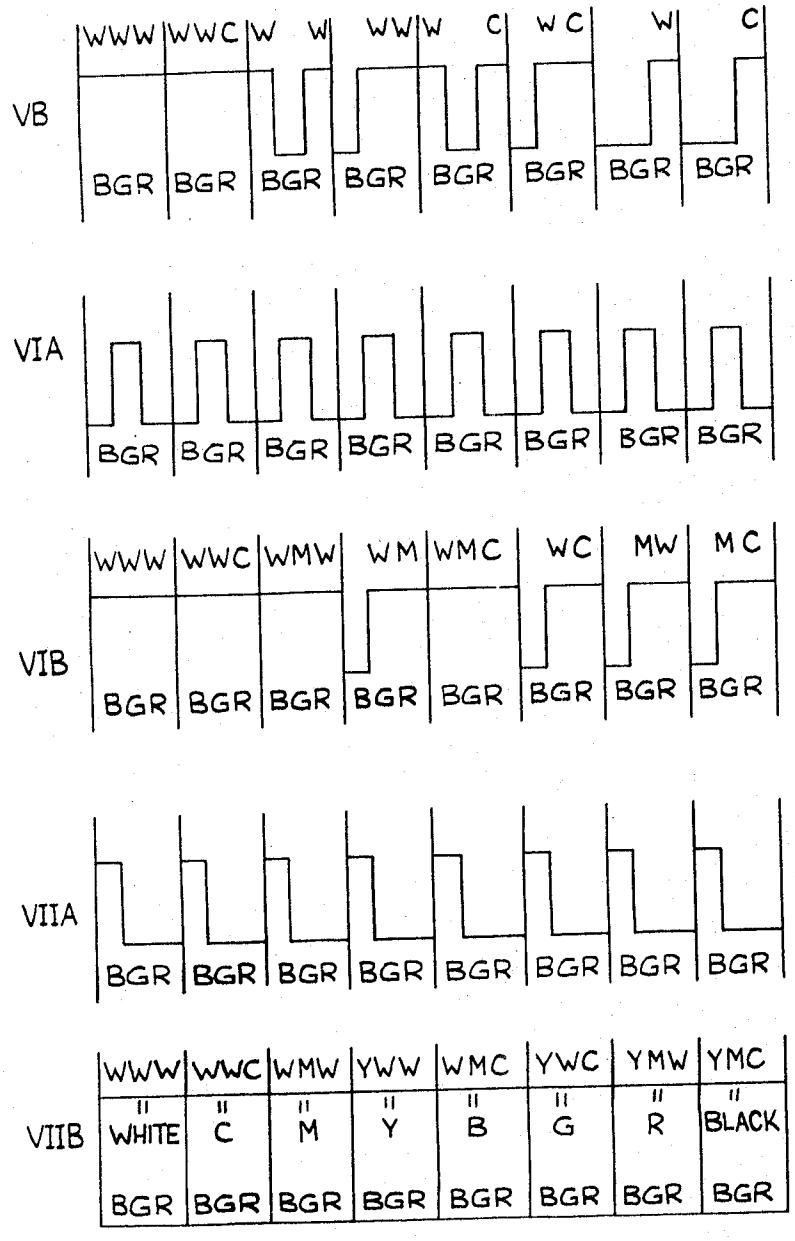

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COLOR ELECTROPHOTOGRAPHY USING TONERS OF THE REPELLENT TYPE

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ABSTRACT OF THE DISCLOSURE

This invention relates to the processing of colour electrophotographic material to yield a mutlicoloured image. Such image is produced by imagewise exposure of electrophotographic material of the mosaic type employing a latent image fixer and toners of the repellent type, which are so selected that they will not deposit on the areas covered by previously applied coloured toners, even though such areas have not been discharged by exposure to light.

Electrophotographic material usually comprises a layer of photoconductive material coated on to a support base which has been rendered electroconductive, or a layer of photoconductive material coated onto a layer of electroconductive material which is in its turn coated onto a support base. To produce an image on such electrophotographic material, the material is charged electrically, the charged material is then imagewise exposed to light and in the areas where the light strikes the charge is dissipated. The image is developed usually by applying to the material a toner which comprises particles which adhere to the photoconductive layer in the areas which are still charged. It is possible to produce colour electrophotographic material and in one proposed type of material the surface of the photoconductor layer comprises a mosaic of areas each of which have been selectively spectrally sensitised to light in one of the three regions of the spectrum red, green and blue. The term "spectrum" used herein refers to the visible spectrum unless otherwise identified.

The term "colour electrophotographic material of the mosaic type" as used hereinafter means electrophotographic material which comprises a photoconductive layer which has been spectrally sensitised to more than one region of the spectrum and in such a way that each discrete area of the surface is sensitive to light of only one region of the spectrum.

It is known that when a sensitising dye is applied to the top surface of an unsensitised photoconductive layer, the layer itself becomes sensitive to light absorbed by the sensitising dye even though the lower regions of the layer of the photoconductive substance contain no dye. It is thus possible to produce a mosaic of areas each sensitive to a different region of the spectrum by successively applying sensitising dyes to a photoconductive layer by use of a screen pattern, using conventional printing methods. It is also possible to produce such a mosaic pattern by electrophotographic means, for example in one such method a spectrally unsensitised photoconductive layer is charged and exposed to a screen pattern of light, the charge remaining on the surface is toned in a sensitising liquid which thus sensitises those areas of the photoconductor. Further screen exposures, which expose different areas of the material, followed by the application of different sensitisers, enable the mosaic pattern of dye sensitisation of discrete areas of the photoconductive layer to be built up.

It is an object of the present invention to provide a method for the production of a coloured electrophotographic image which makes use of electrophotographic material of the mosaic type as hereinbefore defined. When certain finely divided charged materials are deposited on a charged surface thereby neutralizing the surface, and the surface is then recharged, certain other finely divided materials, though they may be readily depositable on the originally charged surface, are not accepted by those areas of the surface which carry the first applied finely divided material. Because the mechanism of this phenomenon is uncertain, it is not possible to define *a priori* what particular finely divided materials will exhibit the phenomenon. Nevertheless the matter is susceptible to very simple testing, i.e. suitable materials are readily ascertainable by simple trial and error procedures.

In one process which makes use of the particle-repellent phenomenon to enable a coloured image to be obtained using colour electrophotographic material of the mosaic type and employing only one imagewise exposure a white pigment, for example magnesium carbonate, is laid down in the unexposed or partially exposed areas of the final image after the imagewise exposure. In subsequent toning operations which employ coloured toner particles the colour particles do not adhere to the areas in which the white pigment has been deposited.

In another and similar process a pan-sensitiser is laid down on the material after the imagewise exposure instead of the white pigment. Prior to every subsequent colour toning stage an exposure to light of an appropriate region of the spectrum is required thus all the areas which have been pan-sensitised will be discharged and will not be tone during the colour toning process.

By a "pan sensitiser" is meant sensitising material which is able to deposit on the charged areas of the photoconductive surface and render these areas subsequently sensitive to or dischargeable by light of all the regions of the visible spectrum. The sensitising material may be a charged dispersion of panchromatically dyed particles of the material which comprises the photoconductor, i.e. panchromatically dyed zinc oxide if zinc oxide is the photoconductive material. Alternatively, the sensitiser material may be a charged dispersion of a dye which is able to sensitise the photoconductor to light of all the regions of the visible spectrum or it might comprise a mixture of sensitising dyes. Therefore the overall effect is the same as depositing a white pigment of the particle repellent type, and both types are called latent image fixers.

It has now been discovered that certain particles used as colour toner particles may also act as particle-repellent particles. When such particles are used as coloured toners and are deposited on the electrophotographic material it is not required to discharge the areas on which these particles have been deposited in order to prevent particles used in a subsequent toning process from being deposited thereon. In the above summarised processes after the first colour toner had been deposited usually it was found that it was no longer possible to discharge the mosaic areas on which it had been deposited unless the subsequent light exposure or exposures were made through the back of the material. For example when a cyan toner was deposited on the red-sensitive areas of the mosaic material such areas absorbed red light and unless, as sometimes happens, the toner itself acts as a sensitiser the red-sensitised areas covered with the cyan toner had to be discharged by an exposure to red light through the back of the material. However by use of selected colour particle toners it is possible to obviate the need to expose the material through the back in order to discharge the areas in which colour particles have been deposited. The term "particle repellent toner" as used hereinafter means a toner which comprises coloured particles and which having been deposited on electrophotographic material inhibits other

charged particles being deposited thereon in a subsequent toning process even though the areas on which it is deposited may be still charged.

According to the present invention there is provided a process for the production of a coloured image record using electrophotographic material of the mosaic type which comprises

(A)

(1) Exposing the charged electrophotographic material to a coloured original,

(2) Developing the charge pattern so formed in the said electrophotographic material with a latent image fixer which is deposited only in the areas remaining charged after said exposure or in the areas complementary thereto,

(B)

(3) Recharging the electrophotographic material and exposing it overall to light of one of the regions of the spectrum to which some areas of the mosaic are sensitive.

(4) Developing the material by treatment with a colour particle toner.

The steps listed under (B) being carried out sequentially at least twice with the proviso that

(a) The regions of the spectrum to which the material is exposed are different from one another,

(b) At least the toners (4) used previous to the last sequence are of the particle repellent type.

According to a preferred embodiment of this aspect of the invention there is provided a process for the production of a colour image record of a coloured original using colour electrophotographic material of the mosaic type which comprises

(A)

(1) Imagewise exposing the charged electrophotographic material,

(2) Developing the charge pattern image so formed in the said electrophotographic material with a latent image fixer which is deposited only in the areas remaining charged after the said exposure or only in the areas complementary thereto,

(B)

(3) Recharging the electrophotographic material and exposing it overall to light of a first region of the spectrum to which some of the areas of the material are sensitive,

(4) Developing the product by treatment with a first colour particle toner, which is of the particle repellent type,

(C)

(5) Recharging the material and exposing it to light of a second region of the spectrum to which other areas of the mosaic are sensitive,

(6) Developing the product by treatment with a second colour particle toner, which is of the particle repellent type,

(D)

(7) Recharging the material and exposing it to light of the third region of the spectrum to which the remaining areas of the material which have not been toned are sensitive, and

(8) Developing the product by treatment with a third colour particle toner.

It is to be understood that the third coloured particle toner need not be of the particle repellent type because no further particles are applied to the material after the third colour development step.

The coloured particle toners may be pigment toners and in this case a pigment fixing process is often carried out on the material after the last toner has been applied. Alternatively film-forming polymers may be presently dissolved in the toner liquids, and when the material after the last toning process is dried a polymer layer is formed which fixes each pigment on the material. Another method is to include in each toner liquid a low melting point ploymer. After the last toning process the material is heated. This fuses the low melting point polymer forming a polymeric layer which fixes each pigment on the material.

Alternatively so-called dye particle toners may be used. Such dye particle toners are usually applied to the material as dispersed particles in an inert dispersant liquid.

The selection of suitable sets of particle repellent toners is mostly a matter of experiment it being required that the first deposited particle toner should repel the two particle toners laid down subsequently, on the other hand it is required only that the second deposited particle toner should repel the particle toner which is to be deposited last of all. In regard to pigment toners it has been found that phthalocyanine pigment toners which are in general cyan toners and quinacridone toners which are in general magenta toners both act as particle repellent toners. Thus in a process using these toners either the phthalocyanine toner or the quinacridone toner must first be deposited followed by the other one; subsequently any yellow pigment toner may then be deposited. However it is preferred that the phthalocyanine pigment toners are deposited first as they are better capable of repelling the subsequently applied quinacridone toners than quinacridone toners are capable of repelling phthalocyanine toners. Both toners however will repel any yellow pigment toner.

Therefore according to a most preferred embodiment of the present invention there is provided a process for the production of a tricolour image record of a colored original which comprises

(A)

(1) Imagewise exposing the charged electrophotographic material,

(2) Developing the charge pattern image so formed in said electrophotographic material with a latent image fixer which is deposited only in the areas remaining charged after the said exposure or only in the areas complementary thereto,

(B)

(3) Recharging the material and exposing it overall to light of a first region of the spectrum to which some of the areas of the material are sensitive,

(4) Developing the product by treatment with a phthalocyanine pigment toner,

(C)

(5) Recharging the material and exposing it to light of a second region of the spectrum to which other of the areas of the mosaic are sensitive,

(6) Developing the product by treatment with a quinacridone pigment toner,

(D)

(7) Recharging the material and exposing it to light of the third region of the spectrum to which the remaining areas of the material which have not been toned are sensitive, and

(8) Developing the product by treatment with a yellow pigment toner.

A suitable set of pigment toners comprises Microlith Blue 4G–T which is a phthalocyanine pigment, Sandorin Brilliant Red 5. B.L. which is a quinacridone pigment and Permanent Yellow F.G.L. which is a yellow pigment.

Suitable formulations to provide toners of use in the present invention from these pigments are as follows:

Cyan:

Microlith Blue 4G–T	g	4
Aluminium stearate	g	0.056
Isopar G	ml	500

Microlith is a Ciba-Geigy Limited Trademark. The pigment is copper phthalocyanine. Other copper phthalocyanine pigments give similar results, and may be used

in place of Microlith Blue 4G–T. Isopar G is an odourless paraffin manufactured by Esso Chemicals Limited.

Magenta:

Sandorin Brilliant Red 5BL	g--	2
Mitchalac 1092	g--	2
Isopar G	ml--	500

Sandorin Brilliant Red 5BL is a quinacridone pigment manufactured by Sandoz Products Limited. Other quinacridone pigment, such as Hostaperm Pink E manufactured by Hoechst-Cassella Dyestuffs Limited give similar results, and may also be used. Mitchalac 1092 is a long oil alkyd resin based on soyabean oil and is manufactured by W. A. Mitchell and Smith Limited of Mitcham, England.

Yellow:

Permanent Yellow FGL	g--	1
Mitchalac 1092	g--	2
Isopar G	ml--	500

Permanent Yellow FGL is manufactured by Hoechst-Cassella Dyestuffs Limited. Because there is no subsequent toning to the yellow, it does not matter whether this has rejecting properties or not. Many other yellow pigments, e.g. Microlith Yellow 2–T Irgacet Yellow 3GLC, Irgacet Yellow G, Irgacet Yellow 10G and Orasol 3GW all manufactured by Ciba-Geigy Limited, may be used equally well.

A suitable set of so-called dye particle toners is provided by the sequential use of toners which comprise Kiton Yellow 2GL, Neozapon Blue FLE and EDI Fastel Pink B.

Toners using these dye particles can be formulated as follows:

Kiton Yellow 2GL. This dye is manufactured by Ciba-Geigy and is classified in the Colour Index as Acid Yellow 17, CI 18965. It may be used in the following formulation:

Kiton Yellow 2GL	g--	2
Mitchalac 1092	g--	2
Aluminium stearate	g--	0.2
Isopar G	ml--	20

The above ingredients are ball-milled together for 20 hours and diluted to 500 ml. with Isopar G for use.

Mitchalac 1092 is long oil alkyd resin based on soyabean oil and manufactured by W. A. Mitchell & Smith Limited.

Isopar G is an odourless aliphatic hydrocarbon manufactured by Esso Chemicals Limited.

EDI Fastel Pink B. This is a phosphomolybdo-tungstate pigment manufactured by I.C.I Limited, but is also classified in the Colour Index as pigment Red 81, CI 45160. It may be used in the following formulation:

EDI Fastel Pink B	g--	2
Mitchalac 1092	g--	2
Isopar G	ml--	20

The above ingredients are ball-milled together for 20 hours and diluted to 500 ml. with Isopar G for use.

Neozapon Blue FLE. This is a copper phthalocyanine dye manufactured by BASF and listed in the Colour Index as Solvent Blue 70, CI 74400, but other soluble copper phthalocyanine dyes are also listed in the colour Index for example Solvent Blue 25, CI 74350, Solvent Blue 55, CI 74400, and Direct Blue 86, CI 74180. It may be used in the following formulation:

Neozapon Blue FLE	g--	1
Mitchalac 1092	g--	2
Aluminium stearate	g--	0.1
Isopar G	ml--	20

The above ingredients are ball-milled together for 40 hours and diluted to 500 ml. with Isopar G for use.

It is prefered that the Kiton Yellow toner is used first because when it is deposited on the electrophotographic material it repels very well both the Fastel Pink particles and the Neozapon Blue particles. Neozapon Blue when deposited will repel EDI Fastel Pink B particles but will not repel Kiton Yellow very effectively. EDI Fastel Pink B may act as a repellent toner but as it is used as the third toner it is immaterial whether it is a repellent toner or not.

Another set of pigment repellent toners is Neozapon Blue FLE, EDI Fastel Pink B and Irgacet Yellow 3GLG used in this order.

The Neozapon Blue FLE and the EDI Fastel Pink are formulated as just described.

Irgacet Yellow 3GLG which is manufactured by Ciba-Geigy Limited may be used in the following formulation:

Irgacet Yellow 3GLG	g--	2
Mitchalac 1092	g--	2
Isopar G	ml--	20

The above ingredients are ball-milled together for 24 hours and diluted with 500 ml. Isopar G for use.

The stages of the processes of the present invention are shown in the accompanying drawing which is a flow sheet of the process using an intermediate negative.

In the process described, the latent image fixer used had the following formulation:

Magnesium carbonate	g--	2
Mitchalac 716	g--	2
Isopar G	ml--	500

Mitchalac 716 is an alkyd resin based on linseed oil and dehydrated castor oil. It is manufactured by W. A. Mitchell and Smith Limited. Isopar G is a paraffinic hydrocarbon manufactured by Esso Petroleum Company.

This is referred to as the white pigment-repellent material A.

The cyan toner used was Microlith Blue 4G–T toner which was formulated as hereinbefore set forth.

The magenta toner used was Sandorin Brilliant Red 5BL which was formulated as hereinbefore set forth.

The yellow toner used was Permanent Yellow FGL which was formulated as hereinbefore set forth.

In the drawing the diagram I shows an original which has 8 regions the colours of which are respectively white (W), cyan (C), magenta (M), yellow (Y), blue (B), green (G), red (R) and black (S). From this is made the negative II which has also 8 regions which are the complementary colours of the colours of the original namely, black (S), red (R), green (G), blue (B), yellow (Y), magenta (M), cyan (C) ann white (W). Electrophotographic material of the mosaic type is shown in III. This material comprises 8 regions each of which comprises three areas, each area being sensitised to only one of the regions of the visible spectrum, blue (B) green (G) and (R). These areas are indicated in the Diagram III.

The electrophographic material of III is exposed through the negative II and then developed in the white pigment-repellent material A. Diagram IVA shows the charge pattern on the electrophotographic material after the exposure and Diagram IVB shows the white pigment deposition after the development step. Thus in region 1 which was exposed through the black region of the negative all the residual charge remained on the material and white pigment was deposited on the blue, green and red areas of region 1. In region 2 which was exposed through the red portion of the negative the red sensitive area was discharged while the blue and green areas kept the original charge.

Therefore the white pigment was deposited in these two areas. Similarly in region 3 the green area was discharged while the other two areas remained charged and white pigment was deposited thereon. In region 4 the blue area was discharged while the charge remained on the green and red areas and white pigment was deposited there-

on. In region 5 which was exposed to yellow light which comprises, green and red light, both the green and the red areas were discharged leaving the blue area only charged and thus white pigment was deposited only of this area. In region 6 which was exposed to the megenta region of the negative the blue and the red areas were discharged leaving the green area still charged and the white pigment was deposited in this area only. In area 7 which was exposed through the cyan region of the negative, the blue and green areas were discharged leaving only the red area charged and the white pigment was deposited only on the red area. In region 8 which was exposed to the white region of the negative all three areas were discharged and thus no white pigment was deposited in this region.

The electrophotographic material was then recharged and exposed overall to cyan light and then developed with the cyan pigment toner. Diagram VA shows the charge pattern remaining on the electrophotographic material after the exposure and Diagram VB shows the pigment build-up after the development step with the cyan pigment. In this diagram the small c indicates the areas in each region 1 to 8 in which cyan pigment has been deposited. In region 1 no cyan pigment has been deposited because in all three areas the white pigment repelling material has been deposited, thus even though the red sensitised area of this region carried a residual charge no cyan pigment was deposited thereon. In region 2 the red sensitised area carried a residual charge after the exposure and thus in this area the cyan pigment was deposited. Similarly in all the red sensitised areas of the other regions a residual charge remained after the exposure step but cyan pigment was deposited only on these areas where no white pigment had been deposited previously.

The electrophotographic material was then recharged and exposed overall to magenta light and then developed with the magenta pigment toner. Diagram VIA shows the residual charge remaining on the material, after the exposure and Diagram VIB shows the cumulative pigment deposition on the material after the magenta pigment development. Thus in all the green sensitised areas in the regions 1 to 8 a residual charge remains. However the magenta pigment could only be deposited on the green sensitised regions where no white pigment had been deposited previously.

The electrophotographic material was then exposed overall to yellow light and developed with the yellow pigment toner. Diagram VIIA shows the residual charge remaining on the material after the exposure and Diagram VIIB shows the deposition of the yellow pigment on the material after the development of the yellow pigment. This is the final development step. Thus in all the blue sensitised areas of the regions 1 to 8 a residual charge remains but yellow pigment could only be deposited in these blue sensitised areas where no white pigment had been deposited previously.

Because the cyan toner put down in the first colour toning step repels both the magenta and yellow toner particles which are applied subsequently it is not necessary that the areas of electrophotographic material on which the cyan toner has been deposited should be discharged during the exposures to either magenta or yellow light because even if it is not discharged no magenta or yellow particles can be deposited thereon. Thus no exposure of the material through the back to ensure complete discharge of the areas covered by the cyan toner is required.

Similarly because the magenta tone put down in the second colour toning step repels the yellow particles which are applied subsequently it is not necessary that the areas of the electrophotographic material on which the magneta toner has been deposited should be discharged during the subsequent yellow light exposure. Thus again no exposure of the material through the back thereof to ensure complete discharge of the areas covered by the magenta toner is required.

It is preferred that the electrophotographic material comprises zinc oxide as the photoconductor. Polyvinyl carbazole may also be used as a photoconductor. Preferably the red areas of the mosaic have been sensitised by use of Patent Blue V, the green sensitive areas of the mosaic have been made green sensitive by using a dye which imparts a green sensitivity to the green oxide for example Rose Bengal, and the blue sensitive regions a dye which imparts blue sensitivity such as 5-(1:4-dihydro-1 - ethyl - 4 - pyridylidene) - 4 - oxo-2-thio-3-thiazolidene acetic acid.

EXAMPLE

Preparation of unsensitized zinc oxide coated-electrophotographic material

Zinc oxide is ball-milled for 24 hours in the following formulation.

Zinc oxide	g.	30
E87–09 resin	g.	4.2
Toluene	ml.	20

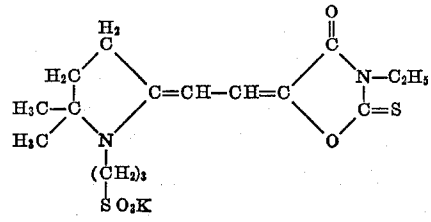
The zinc oxide is Imperial Smelting Fotofax, E 87–09 resin supplied by Cray Valley Products Ltd. of St. Mary Cray, England.

A further 15 ml. toluene is added and the zinc oxide suspension dip coated at 25 g./m.^{2} on Arjomari Prioux (of Usine de Rives, France) Conductive paper base.

Preparation of Sensitizers

Sensitizers for the blue, green and red regions of the spectrum are prepared as follows:

Blue sensitizer: 20 mg. of the dye of the formula



are dissolved in 40 ml. methanol. 20 g. Fotofax zinc oxide is stirred in, and the suspension evaporated to dryness.

After further drying for 24 hours at 50° C. the dye sensitized zinc oxide is ball-milled for 2 hours in the following formulation.

Dye sensitized zinc oxide	g.	5
Soya modified alkyd resin (Mitchalac 1092)	g.	2
Odourless paraffin (Isopar G)	ml.	20

The suspension is diluted to 500 ml. with Isopar G for use.

Green sensitizer: The green sensitizer is prepared in an identical manner to the blue sensitizer, except that the dye used is Rose Bengal (CI 45440), and 60 mg. are dissolved in 40 ml. methanol.

Red sensitizer: The red sensitizer is prepared in an identical manner to the blue sensitizer, except that the dye used is Patent Blue V (CI 42045),

60 mg. are dissolved in 40 ml. methanol, and the final formulation for ball-milling is as follows:

Dye sensitized zinc oxide	g.	2
Mitchalac 1092 resin	g.	2
Isopar G	ml.	20

Sensitization of zinc oxide paper to produce electrophotographic material of the mosaic type

The unsensitized zinc oxide paper is charged by passing it under a corona wire held at 10 kv. negative. The same

corona wire is used for all charging operations in this example, and normally gives a charge acceptance of 200 v. The paper is then exposed through a line screen to a 100 watt tungsten lamp held at a distance of 30 cm. inches for 0.25 sec. This lamp (with or without coloured filters) is used for all the exposures in the example. The line screen has black lines of half the width of the spaces between, and has a spacing of 120 lines/cm. The charge remaining is toned by holding the paper in the blue sensitizer for 2 sec. and drying in a stream of warm air.

The paper is recharged, exposed uniformly to cyan light (Ilford filters 303, 805 and 809 in combination) for 0.5 sec. and then exposed to a line screen held at right angles to the direction of the first screen using unfiltered light for 0.25 sec. This screen also has a spacing of 120 lines/cm., but the line width is equal to the space between. The charge remaining is toned by holding the paper in the green sensitizer for 2 sec. and drying in a stream of warm air.

The paper is again recharged and exposed uniformly to cyan light (Ilford filters 303, 805 and 809 in combination) for 1.5 sec. The charge remaining is toned by holding the paper in the red sensitizer for 2 sec. and drying in a stream of warm air.

The paper has now been sensitized with a mosaic of blue, green and red sensitive areas, and is ready for use.

Preparation of white Pigment Repellent Toner (Latent Image Fixer)

The following formulation is ball-milled for 20 hours and then diluted to 500 ml. with Isopar G for use.

Titanium dioxide	g--	8
Mitchalac 1092 resin	g--	8
Isopar G	ml--	40

Exposure to the image and latent image fixing

The sensitized paper is charged and exposed to a colour negative for 2 sec. Filters may be used to adjust the colour balance if required.

The charge remaining after exposure is toned by holding the paper in the pigment repellent toner for 2 sec. and drying in a stream of warm air. The paper now has an image in the form of latent image fixer (i.e. pigment repellent toner).

Preparation of coloured toners

Yellow, cyan and magenta toners are prepared as follows:

Yellow toner (particle repellent toner)

The following formulation is ball-milled for 20 hours and then diluted to 500 ml. with Isopar G for use.

Kiton Yellow 2GL (CI 18,965)	g--	2
Mitchalac 1092 resin	g--	2
Aluminium stearate	g--	0.2
Isopar G	ml--	20

Cyan toner (particle repellent toner)

The following formulation is ball-milled for 40 hours and then diluted to 500 ml. with Isopar G for use.

Neozapon Blue FLE (Cl 74,400)	g--	1
Mitchalac 1092 resin	g--	2
Aluminium stearate	g--	0.1
Isopar G	ml--	20

Magenta toner

The following formulation is ball-milled for 20 hours and then diluted to 500 ml. with Isopar G for use.

EDI Fastel Pink B (Cl 45,160)	g--	2
Mitchalac 1092 resin	g--	2
Aluminium stearate	g--	0.2
Isopar G	ml--	20

Toning using pigment repellent toners to produce multicolour image

The toners are used in the order as set forth above (i.e. yellow, cyan, magenta) so that the material may be exposed from the front. The yellow toner rejects both the cyan and the magenta toner, while the cyan toner also rejects the magenta toner.

The paper with a latent image fixer thereon, is toned so that the image becomes visible by means of the following sequence of steps.

The paper is charged, given an overall exposure to yellow light (Ilford filters 110, 805 and 809 in combination) for 0.5 sec., then held in the yellow toner for 2 sec., and finally dried in a stream of warm air.

The paper is recharged, given an overall exposure to cyan light (Ilford filters 303, 805 and 809 in combination) for 2.5 sec., held in the cyan toner for 2 sec., and finally dried in a stream of warm air. During this toning process no cyan particles deposit on areas in which the yellow particles have been deposited even though no exposure to cyan light through the back of the material has been carried out and thus these areas are still, in part at least, charged.

The paper is recharged again, given an overall exposure to red light (Ilford filters 205, 805 and 809 in combination) for 9 sec., followed by an overall exposure to blue light (Ilford filters 806, 805 and 809 in combination) for 9 sec., then held in magenta toner for 2 sec., and finally dried in a stream of warm air. During this last toning process no magenta particles deposit on the areas in which either yellow or cyan particles have been deposited even though no exposure to the red and the blue light through the back of the material has been carried out and these areas are still, in part at least, charged.

What is claimed is:

1. A process for the production of a three color xerographic print using photoconductive material of the mosaic type in which discrete particles or areas of said mosaic are sensitized individually to red, green or blue light which consists essentionally of (1) uniformly electrostatically charging said photoconductive material (2) exposing said charged photoconductive material to light from a three color original wherein no light filter is interposed between said original and said photoconductive material (3) developing the charge pattern image formed on said photoconductive material with a latent image fixer selected from the group consisting of magnesium carbonate toner and a toner which is a panchromatic sensitizer for said photoconductive material (4) recharging the developed surface of said photoconductive material uniformly and exposing the developed side of said photoconductive material to light from said original which first passes through a red filter (5) developing the charge pattern image formed on said photoconductive material with a cyan phthalocyanine pigment toner which repels other pigment toners (6) re-charging said developed surface of said photoconductive material uniformly and exposing said developed side of said photoconductive material to light from said original which first passes through a green filter (7) developing the charged image pattern formed on said photoconductive material with a magenta quinacridone pigment toner which repels other pigment toners (8) re-charging said developed surface of said photoconductive material uniformly and exposing said developed side of said photoconductive material to light from said original which first passes through a blue filter (9)developing the charge pattern image formed on said photoconductive material with a yellow pigment toner.

2. A process as in claim 1 wherein the pigment toners are fixed on said photoconductive material after development with the yellow pigment toner.

3. A process as in claim 1 wherein zinc oxide is the photoconductive material.

4. A process as in claim 1 wherein the photoconductive material is zinc oxide and said panchromatic sensitizer is panchromatically dyed zinc oxide particles.

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