United States Patent

Yamaji et al.

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[54] COPYING APPARATUS

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[52] **U.S. Cl.** **355/4,** 355/16, 355/72, 96/1.2

[51] **Int. Cl.** **G03g 15/00**

[58] **Field of Search**.....355/3, 4, 14, 17, 16, 72–74; 96/1.2

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Attorney—Ward, McElhannon, Brooks & Fitzpatrick

[57] **ABSTRACT**

An electrophotographic copying apparatus for making a slide or microfilm record of an original image on a photosensitive member defined by a flexible photoconductive sheet and a relatively rigid frame supporting the photoconductive sheet. The copying apparatus includes a conveyor for supporting the relatively rigid frame of the photosensitive member and conveying same along a predetermined path. Charging, original image exposure and developing elements are disposed serially along the predetermined path in the direction in which the conveyor moves the photosensitive member and cooperate to form an electrophotographic image of the original image. A positioning arrangement, cooperable with the conveyor, is provided for selectively positioning the photosensitive member relative to the exposure element. A control arrangement for multicolor reproduction is also provided by which the conveyor is controlled to move the photosensitive member relative to the charging, exposure and developing elements a number of times corresponding to the number of color separation images utilized in the reproduction of said original image.

16 Claims, 10 Drawing Figures

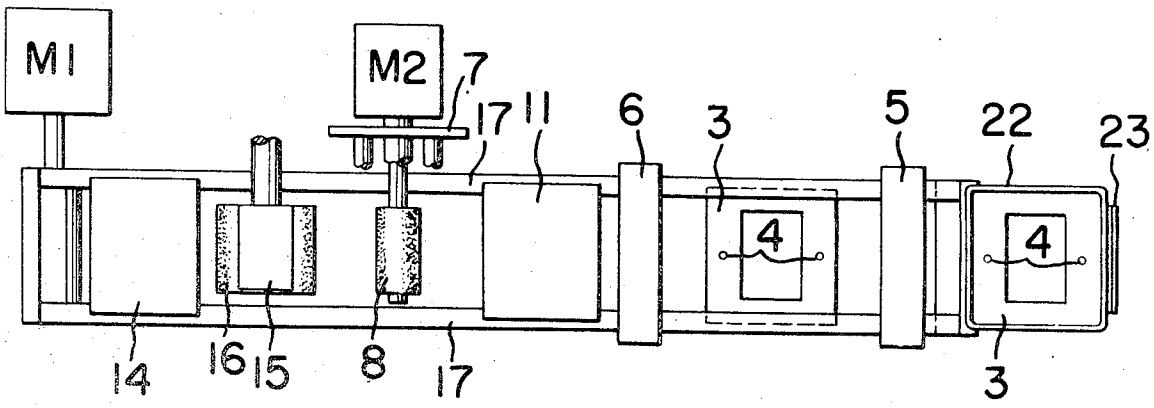


FIG. 1

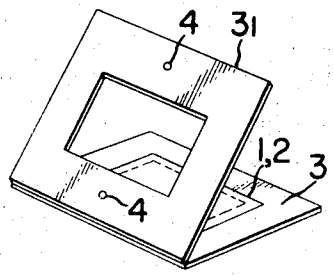


FIG. 2

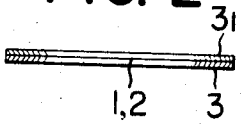


FIG. 3

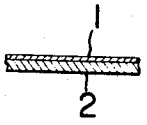


FIG. 4

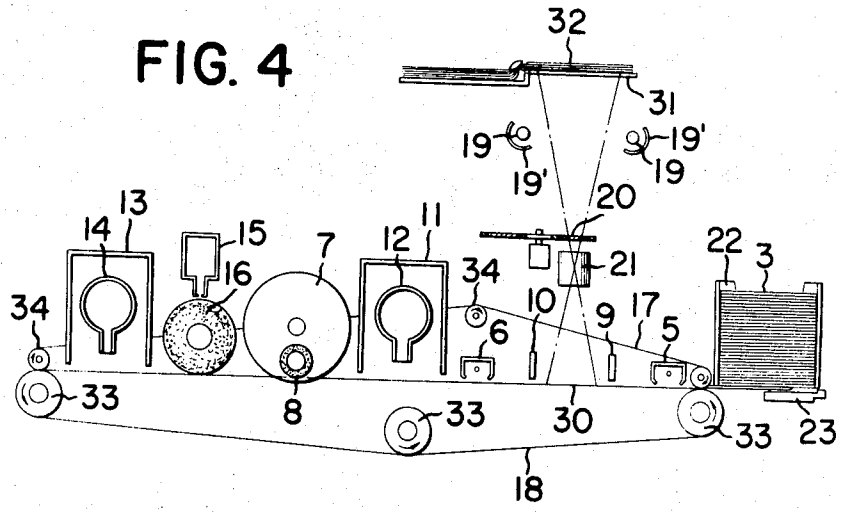


FIG. 5

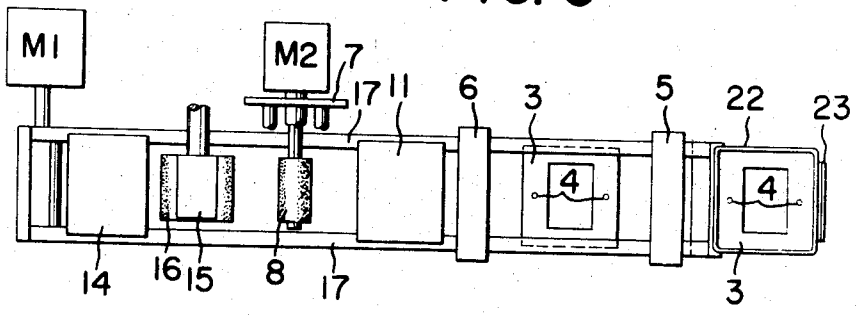


FIG. 6

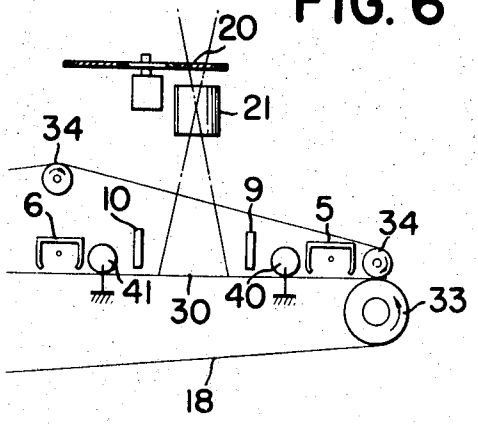


FIG. 7

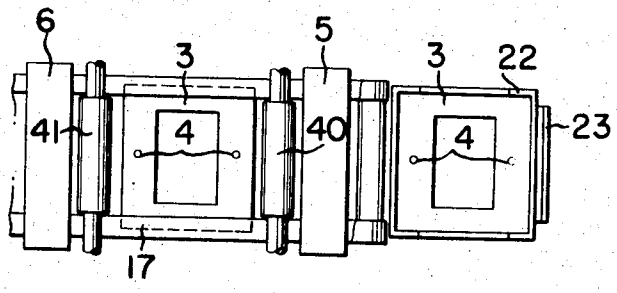


FIG. 8

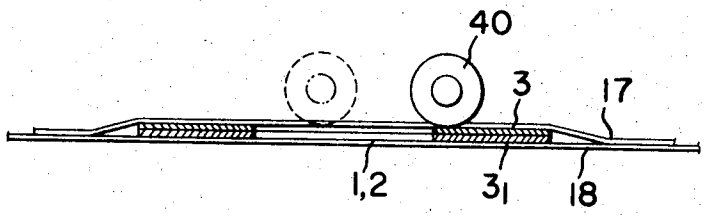


FIG. 9

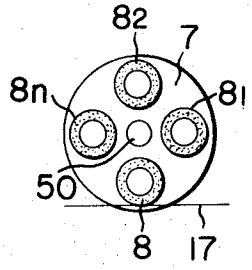
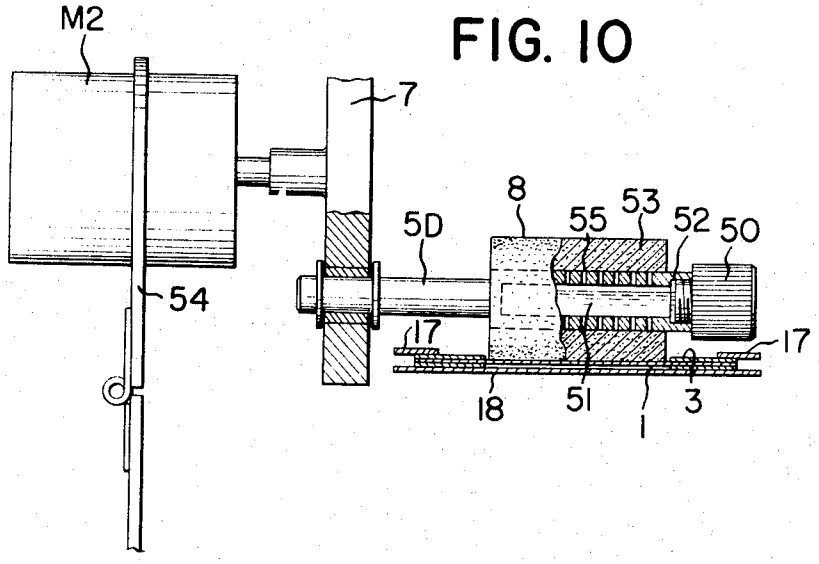


FIG. 10



COPYING APPARATUS

This invention relates to a copying apparatus, and more particularly, to an electrophotographic copying apparatus which comprises using a photosensitive member supported by a supporting frame, having an organic or inorganic photoconductive layer as the photosensitive member, and reproducing monochromic or multicolor original patterns continuously and rapidly. The framed photosensitive member may be a small size one such as that suitable for slides and microfilm.

Heretofore, there are known various photosensitive members such as a photoconductive material dispersed in a resin binder, and a photoconductive material sputtered or coated on a base support which is shaped in a plate or cylinder form, and further various modified photosensitive members depending upon the electrophotographic system to be used. These conventional photosensitive members are used for forming an electrostatic image thereon and making it visible directly thereon or transferring the visible image to other papers. However, these photosensitive members have rarely been used directly as a slide or microfilm and, for such specific purposes, an additional means is required. Furthermore, such direct image formation on a small size photosensitive member for a slide requires a complicated apparatus and, in addition, gives rise to various disadvantages such as color discrepancy and lower photosensitivity in multicolor photography. Furthermore, in a photosensitive member of such small size which is supported by a supporting frame, the supporting frame is also electrically charged during the electrically charging process and, therefore, toners are disadvantageously attracted and attached to the supporting frame by the electric charge therein during the development process.

It is an object of the present invention to overcome these disadvantages and provide a copying apparatus which can continuously produce images of excellent quality.

It is another object of the present invention to provide a copying apparatus capable of forming images of excellent quality on a photosensitive member supported by a supporting frame.

It is a further object of the present invention to provide a copying apparatus capable of forming images only on the photosensitive layer of a photosensitive member without injuring the photosensitive member itself.

It is a still further object of the present invention to provide a copying apparatus which can continuously effect multicolor reproduction of a colored original picture with high reliability and efficiency.

It is yet another object of the present invention to provide technical means which will become fully apparent from the following detailed description.

A further understanding of the invention will be presented in the following specification and in the drawings in which:

FIG. 1 is a perspective view showing a photosensitive member usable in the present invention;

FIG. 2 is a cross-sectional view of a photosensitive member of FIG. 1;

FIG. 3 is a cross-sectional view of a photosensitive member supported by a supporting film;

FIG. 4 is a diagrammatic illustration of an apparatus according to an embodiment of the present invention;

FIG. 5 is a horizontal view of the apparatus shown in FIG. 4;

FIG. 6 is fragmentary elevational view schematically showing an embodiment of the means for removing electric charge from the supporting frame of the photosensitive member;

FIG. 7 is a plan view showing the means of FIG. 6;

FIG. 8 is an enlarged sectional view of the means of FIG. 7 and particularly showing the manner in which the electric charge in the supporting frame is removed by the conductive roll;

FIG. 9 shows a cross sectional view of a developing portion of the present invention using different color developers for multicolor reproduction; and

FIG. 10 is a cross sectional view showing the developing in FIG. 9 as it is assembled to an apparatus of the present invention.

Referring to FIGS. 1, 2 and 3, a photosensitive member particularly suitable for the present invention comprises a single photosensitive layer of an organic or inorganic photoconductive material 1 or may comprise a double photosensitive layer composed of a photosensitive layer laminated on a supporting layer, preferably, a transparent insulating layer 2 (FIG. 3). A photosensitive layer 1 or a photosensitive layer 1 laminated on a supporting layer 2 is supported by a single supporting frame or is sandwiched between frame layers 3 and 3_1.

The use of an organic photoconductive material for the photosensitive layer 1 results in a much better resolving power than the use of the ordinary photosensitive material such as zinc oxide dispersed in resin. Accordingly, as developers used for such organic photoconductive material, a liquid form developer such as super finely divided particle or particle-free solution is far better than a powder form developer such as toner particles. However, a carrier in the developing solution is a petroleum-solvent and such solvent can possibly dissolve the supporting frame of the photosensitive member during the development process. To prevent this, the supporting frame 3 should be previously treated so as to impart oil-resistivity. Such treatment of the supporting frame for imparting oil-resistivity is in turn encountered by a problem that the treating agent is generally an electrically high resistor which would cause the supporting frame itself to be electrostatically charged when the photosensitive layer is electrostatically charged.

The electrostatic charge thus provided to the supporting frame itself results in a disadvantage that a portion of the developing solution is attracted and attached to the surface of the supporting frame. To obviate such unfavorable result, the supporting frame should be treated so as to impart electric conductivity while it is being subjected to the aforementioned treatment for imparting oil-resistivity.

The provision of electric conductivity to the supporting frame 3 is accomplished, for example, by impregnating or coating the supporting frame with an electrically conductive material or by using a supporting frame made of metal or other electroconductor.

Also, in a case that a photosensitive member should be subjected to continuously repeated copying operations, for example, in multicolor reproduction, the

photosensitive member should be set to an initially determined position upon each repeating exposure for good registration. In order to ensure the photosensitive member to be always set to a predetermined position, the supporting frame 3 should be provided with a detector means 4 which may, for example, take a form of small apertures cooperable with a corresponding detector means such as pins (see FIG. 1) or a form of indicia printed with magnetic ink or like material.

Means for forming an electrostatic or visible image on the photosensitive member of the above-mentioned construction may be a device as shown in FIGS. 4 and 5. Such a device includes a storage box 22 in which a required number of photosensitive members are set in place so that each photosensitive member is fed into the body of a copying machine by a feeder pawl 23. The photosensitive member thus fed is conveyed by a conveyor belt assembly comprising a main belt 18 and an auxiliary belt 17 both driven from a motor Ml through a drive wheel 33' so that the photosensitive member may be electrically charged over the entire surface thereof by an electric charger 5. The conveyor belt assembly is maintained at a required velocity by rotatable rolls 33 and 34. The main belt 18 is formed of a conductive material so as to serve as an opposite electrode.

The electric charger 5 may be of the single or double corona charging type or other suitable charging type.

The photosensitive member electrically charged by the electric charger 5 is further carried to an exposure portion 30, where the detection signals 4 in the photosensitive member are detected by a corresponding detector means 9 until the photosensitive member is once stopped so that the proper position thereof may be determined. Thereupon, a document or object to be copied 32 disposed on a document supporting table 31 is illuminated by an illuminating lamp 19 having a mirror 19', and thus the photosensitive member is subjected to exposure in accordance with the document or object 32 through a color separation filter 20 and a lens 21 so that an electrostatic image is formed on the exposed surface of the photosensitive member. After completion of the exposure, the photosensitive member is further carried into a developing portion of the machine through the rotation of the drive motor Ml. A developing roll 8 formed in a sponge-like shaped is supported by a roll supporting member 7 so that the developer liquid may be uniformly applied to the photosensitive member to visualize the electrostatic latent image formed thereon.

Subsequently the photosensitive member is carried to the fixing portion of the machine and is brought into contact with a fixing roll 16 containing therein a predetermined quantity of fixing agent supplied from a fixing agent feed box 15 and the visualized image on the photosensitive member is fixed. Thereafter, the photosensitive member is dried by a drier 14 shielded at 13 such as heater of radiation type, hot air type or other type, whereby there is provided a final image on the photosensitive member.

Multicolor reproduction or plural reproduction of monochromatic images can be carried out by repeating the electrophotographic procedure. In such cases, it is preferable to repeat the electrophotographic procedure except the fixing step and finally fix the formed multicolor image or combined monochromic image. For this purpose, another electric charger 6 is provided in such a stage of the machine that the photosensitive member once developed by the developing means 8 and carried back toward a drier 12 shielded at 11 is again electrically charged before it reaches the exposure portion 30. Thus, the photosensitive layer 1 of the photosensitive member can be uniformly charged, whereafter the photosensitive member is properly positioned in the exposure position 30 with the help of a corresponding detector means 10 so that an electrostatic image may be formed on the photosensitive layer in accordance with original picture 32. In this way, a further image formation is provided on the photosensitive member, which is again carried to the developing means 8 through the same process as the initial image forming process described previously.

If the repeated image formation is monochromatic, the same developing roll 8 can be used for each cycle. However, if a developer different from that used for the initial cycle is used in the following developing it is necessary to provide other developing rolls impregnated with other developers. To accomplish this, the developing portion of the present invention is composed of a rotatable member 7 and a plurality of developing rolls 8 to 8*n* rotatably mounted to the rotatable member 7 circumferentially thereof as shown in FIGS. 9 and 10. Each of the developing rolls 8 to 8n comprises a hollow cylinder 52 having fine apertures 55 therethrough and coated with an annular sponge-like porous rubber member 53 which is impregnated with a different color developer. A motor M_2 is provided to drive the rotatable member 7 and is mounted on a pivotally movable supporting member 54.

As noted above, the sensitive member is formed of an electrically conductive material or treated for imparting electroconductivity so that electric charge provided in the supporting frame 3 can be removed. However, the supporting frame 3 of the photosensitive member, which may take any desired shape, does not always allow all the electric charge therein to be completely removed therefrom, but sometimes the electric charge remains in the supporting frame irrespective of the shape thereof when the electric charge is of a great intensity.

It is therefore desirable to provide a means for completely removing such residual electrostatic charge from the supporting frame 3.

FIGS. 6 and 7 show an example of such means provided between the electric chargers 5 and 6 and the exposure portion 30. More specifically, such means for removing the electric charge from the once charged supporting frame 3 may effectively be an electrically conductive roll as indicated by 40 or 41 and interposed between the electric charger 5 or 6 and the exposure portion 30. Since the electrically charged photosensitive layer 1 of the photosensitive member underlies the supporting frame 3, the thickness of the supporting frame 3 acts to isolate the photosensitive layer 1 from the action of the electroconductive rolls 40 and 41 so that only the electric charge present in the supporting frame 3 may be effectively removed by the rolls 40 and 41. It is of course preferable that the photosensitive member is used in the above-described form to achieve the purposes of the present invention.

As shown more particularly in FIG. 8, the action of the electroconductive roll 40 is effective only for a portion of the supporting frame 3 not covered by the upper belt 17 which overlies the both end zones of the supporting frame 3. For this reason, electroconductive upper belts 7 are preferably used to remove the electric charge at the portion of the supporting frame covered by upper belts 7.

An example of the photosensitive member applicable to the present invention will be shown below.

1. The organic photoconductive material forming the photosensitive layer may be condensed polycyclic aromatic compounds such anthracene, anthraquinone, pyrene and benzanthrone; heterocyclic compounds such as imidazole, oxazole, thiazole, triazole, carbazole and acenaphthene; and organic polymers such as substituted unsubstituted polymer, poly-N-vinyl carbazole, α-alkylacrylic amide polymer, polyvinyl acridine, polyacenaphthylene, and polyvinyl Malachite Green (carbinol form).
2. The transparent supporting member may be formed of polyethylene terephthalate (for example, "Mylar," trade name).
3. The supporting frame may be thick paper.
4. The treatment for imparting oil-resistance and electroconductivity may be effected by coating or impregnating the supporting frame with one or more of the following materials: water-soluble vinyl series resin such as copolymer of acrylic acid and acrylic acid ester, copolymer of vinyl acetate and crotonic acid, copolymer of styrene and maleic acid, polyacrylic acid, polyacryl amide, polyethylene imine, polyvinyl alcohol, and polyvinylpyrrolidone; water soluble cellulose derivatives such as carboxymethyl cellulose, and methyl or ethyl cellulose; animal or vegetable proteins such as gelatin and casein; phytomucilage such as gum arabic and sodium alginate; inorganic salts such as sodium chloride, ammonium chloride, potassium chloride, calcium chloride, and sodium nitrate; surface active agents; polymers of quaternary ammonium salts such as poly(N,N-dimethyl-3,5-methylene)-piperidinium chloride, and polyvinylbenzyl trimethyl ammonium chloride.

As described above, a image is formed on the photosensitive member through a series of steps according to this invention. Particularly, when a multicolor reproduction is carried out, each portion of the copying apparatus works in an interlocking manner upon repeating the electrophotographic process.

As is clear from the foregoing, the electrophotographic copying apparatus of this invention is effective to carry out monochromic or multicolor reproduction continuously and efficiently and is particularly useful for reproduction of a slide or microfilm.

What is claimed is:

1. An electrophotographic copying apparatus for making a slide or microfilm record of an original image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, said conveying means comprising a main conveyor belt and an auxiliary conveyor belt for holding said photosensitive member between them with the photoconductive sheet of said photosensitive member being exposed, charging means in said path for charging said photosensitive member, exposure means in said path for forming at an exposure position, an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image thereon, developing means in said path for developing said electrostatic latent image, said charging means, exposure means and developing means being sequentially disposed in said predetermined path in the direction in which said conveying means moves said photosensitive member, and positioning means cooperable with said conveying means for positioning said photosensitive member properly at said exposure position.

2. An electrophotographic copying device as in claim 1, wherein said positioning means comprises detection signal means provided on said relatively rigid frame of the photosensitive member and corresponding detector means fixedly provided adjacent said conveying means for detecting said detection signal means.

3. An electrophotographic copying apparatus for making a slide or microfilm record of an original color image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, charging means in said path for charging said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image through a filter forming color separation images of said original color image, developing means in said path for developing said electrostatic latent image with a developer having a color corresponding to the color separation image formed by said filter, said charging means, exposure means and developing means being sequentially disposed in said predetermined path in the direction in which said conveying means moves said photosensitive member, positioning means cooperable with said conveying means for positioning said photosensitive member properly at said exposure position and means cooperable with said conveying means for moving said photosensitive member relative to said charging means, exposure means and said developing means in accordance with the number of color separation images formed by said filter thereby producing a multicolor reproduction of said original image.

4. An electrophotographic copying apparatus as in claim 3, wherein said developing means comprises a plurality of developing rolls rotatably mounted relative to said conveying means on a rotatable member circumferentially thereof and impregnated with different color developers, and means for intermittently rotating said rotatable member for each exposed color separation image whereby the developing rolls impregnated with color developers corresponding to the exposed colors are rolled in contact with said photosensitive member.

5. An electrophotographic copying apparatus for making a slide or microfilm record of an original image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, charging means in said path for charging said photosensitive member, discharging means in said path for discharging electric charge deposited on said rigid frame of said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image thereon, developing means in said path for developing said electrostatic latent image, said charging means, discharging means, exposure means and developing means being sequentially disposed in said predetermined path in the direction in which said conveying means moves said photosensitive member, and positioning means cooperable with said conveying means for positioning said photosensitive member properly at said exposure position.

6. An electrophotographic copying apparatus for making a slide or microfilm record of an original color image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, charging means in said path for charging said photosensitive member, discharging means in said path for discharging electric charge deposited on said rigid frame of said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image through a filter forming color separation images of said original color image, developing means in said path for developing said electrostatic latent image with a developer having a color corresponding to the color separation image formed by said filter, said charging means, discharging means, exposure means and developing means being sequentially disposed in said predetermined path in the direction in which said conveying means moves said photosensitive member, positioning means cooperable with said conveying means for positioning said photosensitive member properly at said exposure position and means cooperable with said conveying means for moving said photosensitive member relative to said charging means, discharging means, exposure means and said developing means in accordance with the number of color separation images formed by said filter thereby producing a multicolor reproduction of said original color image.

7. An electrophotographic copying apparatus for making a slide or microfilm record of an original color image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, primary charging means in said path for charging said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image through a filter forming color separation images of said original color image, secondary charging means in said path for charging said photosensitive member, developing means in said path for developing said electrostatic latent image with a developer having a color corresponding to the color separation image formed by said filter, said primary charging means, exposure means, secondary charging means, and developing means being sequentially disposed in said predetermined path in the direction in which said conveying means moves said photosensitive member, means for causing said conveying means to move said photosensitive means in said path, in turn to said primary charging means, said exposure means and said developing means whereby a first color separation image of said original color image is formed on said photosensitive member, and means for causing said conveying means to thereafter move said photosensitive member, in turn, to said secondary charging means, said exposure means and said developing means in accordance with the remaining number of color separation images formed by said filter thereby producing a multicolor reproduction of said original color image.

8. An electrophotographic copying apparatus as in claim 7, wherein said conveying means comprises a main conveyer belt and an auxiliary conveyer belt for holding said photosensitive member between them with the photoconductive sheet of said photosensitive member being exposed.

9. An electrophotographic copying apparatus as in claim 7, wherein said developing means comprises a plurality of developing rolls rotatably mounted relative to said conveying means on a rotatable member circumferentially thereof and impregnated with different color developers, and means for intermittently rotating said rotatable member for each exposed color separation image whereby the developing rolls impregnated with color developers corresponding to the exposed colors are rolled in contact with said photosensitive member.

10. An electrophotographic copying apparatus for making a slide or microfilm record of an original color image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, primary charging means in said path for charging said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on he photoconductive sheet of said charged photosensitive member by exposing said original image through a filter forming color separation images of said original color image, secondary charging means in said path for charging said photosensitive member, developing means in said path for developing said electrostatic latent image with

a developer having a color corresponding to the color separation image formed by said filter, fixing means for fixing the finally developed image on said photosensitive member, said primary charging means, exposure means, secondary charging means, developing means and fixing means being sequentially disposed in said predetermined path in the direction in which said conveying means moves said photosensitive member, means for causing said conveying means to move, in turn, said photosensitive means in said path to said primary charging means, said exposure means and said developing means whereby a first color separation image of said original color image is formed on said photosensitive member, means for causing said conveying means to thereafter move said photosensitive means, in turn, to said secondary charging means, said exposure means and said developing means in accordance with the remaining number of color separation images formed by said filter thereby producing a multicolor reproduction of said original color image, and means causing said conveying means to thereafter move said photosensitive member to said final fixing means. means

11. An electrophotographic copying apparatus for making a slide or microfilm record of an original color image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, primary charging means in said path for charging said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image through a filter forming color separation images of said original color image, secondary charging means in said path for charging said photosensitive member, primary drying means for drying said photosensitive member, developing means in said path for developing said electrostatic latent image with a developer having a color corresponding to the color separation image formed by said filter, fixing means for finally fixing the developed image on said photosensitive member, and final drying means for drying the finally fixed photosensitive member, said primary charging means, exposure means, secondary charging means, primary drying means, developing means, fixing means and final drying means being sequentially disposed in said predetermined path in the direction in which said conveying means moves said photosensitive member means for causing said conveying means to move, in turn, said photosensitive means in said path to said primary charging means, said exposure means, said developing means, and said primary drying means whereby a first color separation image of said original color image is formed on said photosensitive member, means for causing said conveying means to thereafter move, in turn, to said secondary charging means, said exposure means, said developing means and said primary drying means in accordance with all but the last of the number of color separation images formed by said filter and means for causing said conveying means to thereafter move, in turn, to said secondary charging means, said exposure means, said developing means, said fixing means and said final drying means thereby producing a multicolor reproduction of said original color image.

12. An electrophotographic copying apparatus for making a slide or microfilm record of an original color image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, primary charging means in said path for charging said photosensitive member, primary discharging means in said path for discharging electric charge deposited on said rigid frame of said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image through a filter forming color separation images of said original color image, secondary discharging means in said path for discharging electric charge deposited on said rigid frame of said photosensitive member, secondary charging means in said path for charging said photosensitive member, developing means in said path for developing said electrostatic latent image with a developer having a color corresponding to the color separation image formed by said filter, said primary charging means, primary discharging means, exposure means, secondary discharging means, secondary charging means, and said developing means being sequentially disposed in said predetermined path in the direction in which said conveying means moves said photosensitive member, means for causing said conveying means to move, in turn, said photosensitive means in said path to said primary charging means, said primary discharging means, said exposure means and said developing means whereby a first color separation image of said original color image is formed on said photosensitive member, and means causing said conveying means to thereafter move, in turn, to said secondary charging means, said secondary discharging means, said exposure means and said developing means in accordance with the number of color separation images formed by said filter thereby producing a multicolor reproduction of said original color image.

13. An electrophotographic copying apparatus as in claim 12, wherein said conveying means comprises a main conveyor belt and an auxiliary conveyer belt for holding said photosensitive member between them with the photoconductive sheet of said photosensitive member being exposed.

14. An electrophotograhic copying apparatus as in claim 12, wherein said developing means comprises a plurality of developing rolls rotatably mounted relative to said conveying means on a rotatable member circumferentially thereof and impregnated with different color developers, and means for intermittently rotating said rotatable member for each exposed color separation image whereby the developing rolls impregnated with color developers corresponding to the exposed colors are rolled in contact with said photosensitive member.

15. An electrophotographic copying apparatus for making a slide or microfilm record of an original color image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, primary charging means in said path for charging said photosensitive member, primary discharging means in said path for discharging electric charge deposited on said rigid frame of said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image, through a filter forming color separation images of said original color image, secondary discharging means in said path for discharging electric charge deposited on said rigid frame of said photosensitive member, secondary charging means in said path for charging said photosensitive member, means in said path for developing said electrostatic latent image with a developer having a color corresponding to the color separation image formed by said filter, and fixing means for fixing the finally developed image on said photosensitive member, said primary charging means, primary discharging means, secondary discharging means, exposure means, secondary charging means, developing means and said fixing means, being sequentially disposed in said predetermined path in the direction in which said conveyor means moves said photosensitive member, means for causing said conveying means to move, in turn, said photosensitive means in said path to said primary charging means, said primary discharging means, said exposure means and said developing means whereby a first color separation image of said original color image is formed on said photosensitive member, means causing said conveying means to thereafter move, in turn, to said secondary charging means, said secondary discharging means, said exposure means and said developing means in accordance with the number of color separation images formed by said filter thereby producing a multicolor reproduction of said original color image, and means causing said conveying means to thereafter move said photosensitive member to said fixing means.

16. An electrophotographic copying apparatus for making a slide or microfilm record of an original color image on a photosensitive member comprising a flexible photoconductive sheet and a relatively rigid frame for supporting said flexible photoconductive sheet, said apparatus including conveying means for supporting the relatively rigid frame of said photosensitive member and conveying said photosensitive member along a predetermined path, primary charging means in said path for charging said photosensitive member, primary discharging means in said path for discharging electric charge deposited on said rigid frame of said photosensitive member, exposure means in said path for forming at an exposure position an electrostatic latent image on the photoconductive sheet of said charged photosensitive member by exposing said original image through a filter forming color separation images of said original color image, secondary discharging means in said path for discharging electric charge deposited on said rigid frame of said photosensitive member, secondary charging means in said path for charging said photosensitive member, primary drying means in said path for drying said photosensitive member, developing means in said path for developing said electrostatic latent image with a developer having a color corresponding to the color separation image formed by said filter, fixing means for thereafter fixing the finally developed image on said photosensitive member and final drying means for drying the final fixed photosensitive member, said primary charging means, primary discharging means, exposure means, secondary discharging means, secondary charging means, primary drying means, developing means, fixing means and said final drying means being sequentially disposed in said predetermined path in the direction in which said conveyor means moves said photosensitive member, means for causing said conveyor means to move, in turn, said photosensitive means in said path to said primary charging means, primary discharging means, said exposure means, said developing means and said primary drying means, whereby a first color separation image of said original color image is formed on said photosensitive member, and means for causing said conveying means to thereafter move, in turn, to said secondary charging means, said secondary discharging means, said exposure means and said developing means and primary drying means in accordance with the all but the last of the number of color separation images formed by said filter and means for causing said conveying means to thereafter move, in turn, to said secondary charging means, said exposure means, said developing means, said fixing means and said final drying means, thereby producing a multicolor reproduction of said original color image.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,694,069 Dated September 26, 1972

Inventor(s) KEIZO YAMAJI and AKIRA KURAHASHI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Page 1, Item [73], change the Assignee's name from "Canon Kabushike Kaisha" to -- Canon Kabushiki Kaisha--.

Signed and sealed this 13th day of March 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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