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METHOD OF TREATING THE SURFACE OF A XEROGRAPHIC PLATE WITH A METAL SALT OF A FATTY ACID TO IMPROVE IMAGE TRANSFER

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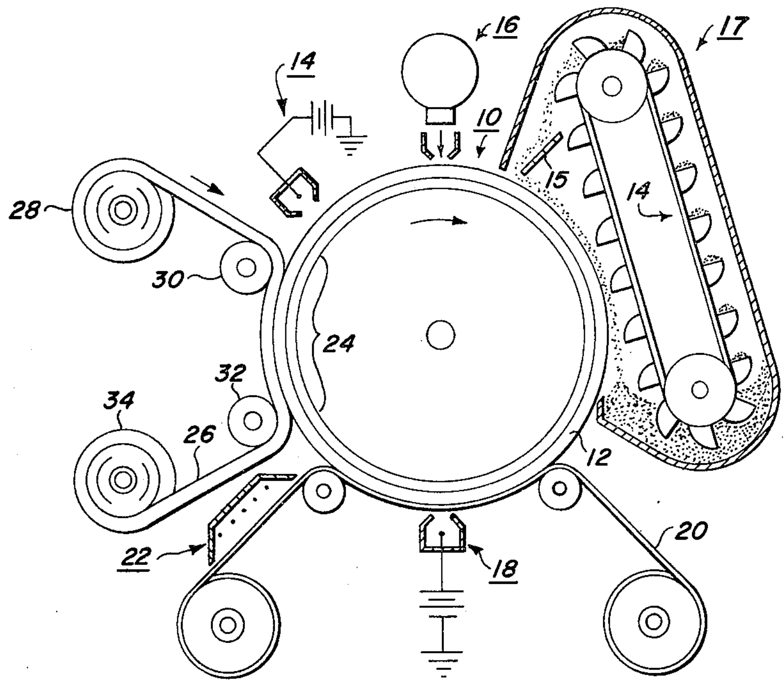

FIG. 1

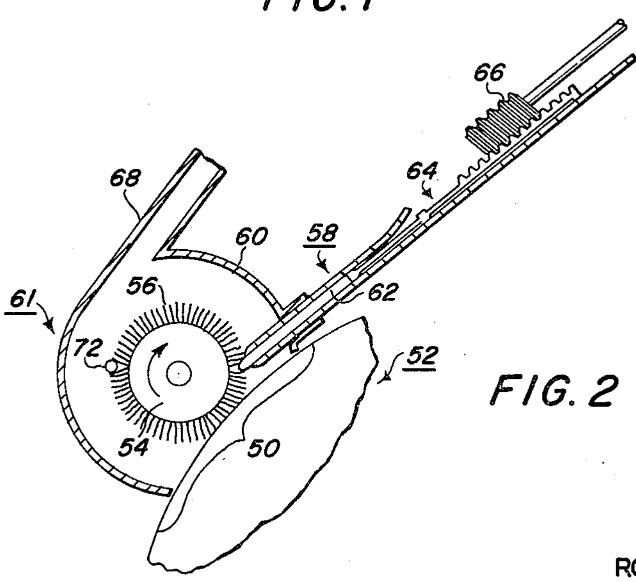

FIG. 2

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METHOD OF TREATING THE SURFACE OF A XEROGRAPHIC PLATE WITH A METAL SALT OF A FATTY ACID TO IMPROVE IMAGE TRANSFER

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ABSTRACT OF THE DISCLOSURE

A method of image reproduction is disclosed wherein the surface of a xerographic plate is treated with a metal salt of a fatty acid. The plate is then charged, exposed, and developed. The developed image is then transferred to a receiving sheet. The fatty acid salt is added to facilitate toner transfer.

This invention relates in general to imaging systems, and more particularly, to improved treating and cleaning devices, their manufacture and use.

The formation and development of images on the surface of photoconductive materials by electrostatic means is well known. The basic xerographic process, as taught by C. F. Carlson in U.S. Patent 2,297,691, involves placing a uniform electrostatic charge on a photoconductive insulating layer, exposing the layer to a light and shadow image to dissipate the charge on the areas of the layer exposed to the light and developing the resulting latent electrostatic image by depositing on the image a finely-divided electroscopic material referred to in the art as "toner." The toner will normally be attracted to those areas of the layer which retain a charge, thereby forming a toner image corresponding to the latent electrostatic image. This powder may then be transferred to a support surface such as paper. The transferred image may subsequently be permanently affixed to a support surface as by heat. Instead of latent image formation by uniformly charging the photoconductive layer and then exposing the layer to a light and shadow image, one may form the latent image by directly charging the layer in image configuration. Other suitable fixing means such as solvent or over-coating treatment may be substituted for the foregoing heat fixing step. Several methods are known for applying electroscopic particles to the latent electrostatic image to be developed.

One development method as disclosed by E. N. Wise, in U.S. Patent 2,618,552, is known as "cascade" development. In this method, a developer material comprising relatively large carrier particles having fine toner particles electrostatically coated thereon is conveyed to and rolled or cascaded across the electrostatic image-bearing surface. The composition of the carrier particles is so chosen as to triboelectrically charge the toner particles to the desired polarity. As the mixture cascades or rolls across the image-bearing surface, the toner particles are electrostatically deposited and secured to the charged portion of the latent image and are not deposited on the uncharged or background portions of the image. Most of the toner particles accidentally deposited in the background areas are removed by the rolling carrier, due apparently, to the greater electrostatic attraction between the toner and the carrier than between the toner and the discharged background. The carrier and excess toner are then recycled. This results in excellent toner line images with relatively few toner particles in the background portions.

Another method of developing electrostatic images is the "magnetic brush" process as disclosed, for example, in U.S. Patent 2,874,063. In this method, a developer material containing toner and magnetic carrier particles is carried by a magnet. The magnetic field of the magnet causes alignment of the magnetic carriers into a brush-like configuration. This "magnetic brush" is engaged with the electrostatic image-bearing surface and the toner particles are drawn from the brush to the latent image by electrostatic attraction. Still another technique for developing electrostatic latent images is the "powder cloud" process as disclosed by C. F. Carlson in U.S. 2,221,776. In this method, a developer material comprising electrically charged toner particles in a gaseous fluid is passed adjacent the surface bearing the latent electrostatic image. The toner particles are drawn by electrostatic attraction from the gaseous fluid to the latent image. This process is particularly useful in continuous tone development.

Any other development such as "Touchdown" development, as disclosed by C. R. Mayo in U.S. Patent 2,895,847, may be used where suitable.

In automatic xerographic equipment it is conventional to employ a xerographic plate in the form of a cylindrical drum which is continuously rotated through a cycle of sequential operations including charging, exposure, developing, transfer, and cleaning. The plate is usually charged with corona of positive polarity by means of a corona generating device of the type disclosed by L. E. Walkup in U.S. Patent 2,777,957 which is connected to a suitable source of high potential. After forming a powder image on the electrostatic latent image during the development step, the powder image is electrostatically transferred to a support surface by means of a corona generating device such as the corona device mentioned above. In automatic equipment employing a rotating drum, a support surface to which a powder image is to be transferred is moved through the equipment at the same rate as the periphery of the drum and contacts the drum at the transfer position interposed between the drum surface and the corona generating device. Transfer is effected by a corona generating device which imparts an electrostatic charge to attract the powder image from the drum to the support surface. The polarity of charge required to effect image transfer is dependent upon the visual form of the original copy relative to the reproduction and the electroscopic characteristics of the developing material employed to effect development. For example, where a positive reproduction is to be made of a positive original, it is conventional to employ a positive polarity corona to effect transfer of a negatively charged toner image to the support surface. When a positive reproduction from a negative original is desired, it is conventional to employ a positively charged developing material which is repelled by the charged areas on the plate to the discharged areas thereon to form a positive image which may be transferred by negative polarity corona. In either case, a residual powder image usually remains on the plate after transfer. Before the plate may be reused for a subsequent cycle, it is necessary that the residual image be removed to prevent "ghost images" from forming on subsequent copies. In the positive-to-positive reproduction process described above, the residual developer powder is tightly retained on the plate surface by a phenomenon that is not fully understood but believed caused by an electrical charge that prevents complete transfer of the powder to the support surface, particularly in the image areas. This charge is substantially neutralized by means of a corona generating device prior to contact of the residual powder image with a cleaning device. The neutralization of the charge enhances the cleaning efficiency of the cleaning device.

Typical electrostatographic plate cleaning devices include the "brush" type cleaning apparatus and the "web" type cleaning apparatus. A typical brush cleaning apparatus is disclosed by L. E. Walkup et al., in U.S. Patent 2,832,977. The brush type cleaning means usually comprises one or more rotating brushes which brush residual powder from the plate into a stream of air which is exhausted through a filtering system. These brushes may be treated with small amounts of oils such as hydrocarbon oils, waxes, silicone oils and the like to control the conductivity of the brush thereby rendering the brush more conductive or more non-conductive, as desired. However, in most cases, the brushes are normally untreated and grease-free prior to use. The grease and similar material are usually removed with conventional dry cleaning solvents. A typical web cleaning device is disclosed by W. P. Graff, Jr. et al., in U.S. Patent 3,186,838. As disclosed by Graff, Jr. et al., removal of the residual powder on the plate is effected by rubbing a web of fibrous material against the plate surface. These inexpensive and disposable webs of fibrous material are advanced into pressure and rubbing or wiping contact with the imaging surface and are gradually advanced to present a clean surface to the plate whereby substantially complete removal of residual powder from the plate is effected.

While ordinarily capable of producing good quality images, conventional developing systems suffer serious deficiencies in certain areas. The electrical and transfer characteristics of electrostatic image-bearing surfaces are adversely affected when relative humidity is high. Because of the influence of various forces such as electrostatic and van der Waal forces, many toner particles tend to form adherent deposits which reduces the density of transferred images and impairs proper cleaning of reusable imaging plates, belts, or drums. Numerous known carriers and toners are abrasive in nature. Abrasive contact between toner particles, carriers, and imaging surfaces accelerates mutual deterioration of these components. Rubbing contact between cleaning devices and the imaging surfaces also results in rapid erosion of the imaging surfaces. Attempts have been made to protect the imaging surfaces with thin coatings such as the coatings disclosed in U.S. Patent 2,901,348 to Dessauer et al. However, the protective overcoatings are merely temporary and eventually erode away leaving an unprotected imaging surface. Although thick coatings would protect the imaging surfaces for longer periods of time, the electrical properties of the photoconductive layer impose certain limitations as to the acceptable maximum thickness of the coating. Frequent replacement of deteriorated carriers and imaging plates is expensive, inconvenient, and time consuming. Fines former from the attrition of toner on rough imaging surfaces tend to drift and form unwanted deposits on critical machine parts. Electrostatographic copies should possess good line image contrast as well as acceptable solid area coverage. However, when a process is designed to improve either line image contrast or solid area coverage, reduced quality of the other can be expected. Attempts to increase image density by depositing greater quantities of toner particles on the latent electrostatic image usually increase undesirable background deposits. Further, for reasons not fully understood, image quality is often impaired by the appearance of powder deficient spots in the powder image. Thus, there is a continuing need for a better system for developing latent electrostatic images.

It is, therefore, an object of this invention to provide a system which overcomes the above noted deficiencies.

It is another object of this invention to provide a treatment system which promotes transfer of toner particles from an electrostatic imaging surface to a support surface.

It is a further object of this invention to provide a treatment system which promotes transfer of toner particles in background areas of imaged surfaces to carriers.

It is a further object of this invention to provide a treatment system which promotes removal of toner particles from imaging surfaces by cleaning devices.

It is a still further object of this invention to provide a treatment system which reduces mechanical abrasion of electrostatic imaging surfaces.

It is another object of this invention to provide a treatment system which allows the employment of low electrostatic plate potentials.

It is a further object of this invention to provide a treatment system which promotes the formation of dense toner images.

It is still another object of this invention to provide a treatment system which reduces physical degradation of developing materials.

It is a still further object of this invention to provide a treatment system which reduces or eliminates powder deficient spots.

It is another object of this invention to provide a treatment system which continually maintains the electrical stability of electrostatic imaging surfaces.

It is another object of this invention to provide an electrostatographic surface treatment system which provides electrostatographic surfaces having physical and chemical properties superior to those of known electrostatographic surfaces.

The above objects and others are accomplished, generally speaking, by providing a system for continuously or intermittently treating reusable electrostatographic surfaces with a stable solid hydrophobic salt of a fatty acid. Preferably, treatment is effected with a device having a fibrous surface which is employed to simultaneously clean and treat the reusable electrostatographic surface. The stable solid hydrophobic salt of a fatty acid may be carried on the treatment surface of the treatment device of this invention in any suitable form such as a loose powder, with a suitable binder, or as a homogeneous film.

Excellent results have been obtained with zinc stearate. However, any suitable stable solid hydrophobic metal salt of a fatty acid may be substituted for zinc stearate. The metal salt is preferably substantially insoluble in water. Water soluble metal salts lack the proper electrical properties and electrostatographic surfaces treated with such salts are adversely affected by humidity changes normally occurring in the ambient atmosphere. It should be noted however, that a large proportion of salts normally regarded as insoluble actually dissolve to a slight extent. To effectively carry out the purposes of this invention, the solubility of the salt should be negligible. The salts having the desired specific characteristics include many salts of saturated fatty acids, unsaturated fatty acids, partially hydrogenated fatty acids, substituted fatty acids and mixtures thereof. Typical fatty acids from which stable solid hydrophobic metal salts may be derived include: caproic acid, enanthylic acid, caprylic acid, pelargonic acid, capric acid, undecyclic acid, lauric acid, tridecoic acid, myristic acid, pentadecanoic acid, palmitic acid, magaric acid, stearic acid, nondecyclic acid, arachidic acid, behenic acid, stillingic acid, palmitoleic acid, oleic acid, ricinoleic acid, petroselinic acid, vaccenic acid, linoleic acid, linolenic acid, eleostearic acid, licanic acid, parinaric acid, gadoleic acid, arachidonic acid, cetoleic acid and mixtures thereof. Typical stable solid metal salts of fatty acids include: barium stearate, lead stearate, iron stearate, nickel stearate, cobalt stearate, copper stearate, strontium stearate, calcium stearate, cadmium stearate, magnesium stearate, zinc oleate, manganese oleate, iron oleate, cobalt oleate, copper oleate, lead oleate, magnesium oleate, zinc palmitate, cobalt palmitate, copper palmitate, magnesium palmitate, aluminum palmitate, calcium palmitate, lead caprylate, lead caproate, zinc linoleate, cobalt linoleate, calcium linoleate, zinc ricinoleate, cadmium ricinoleate and mixtures thereof.

The stable solid hydrophobic metal salts of this invention may be carried by any suitable treatment device. In a preferred embodiment, the treatment device comprises fibrous woven or non-woven webs. Fibrous webs are preferred because maximum uniformity of treatment is achieved. The configuration of the fiibrous treatment device may be of any suitable shape such as in the form of a continuous web, cylinder or belt. Any suitable fibrous material may be employed in the web, cylinder, or belt. Typical fiber material include furs, such as beaver fur, grey fox fur, rabbit fur, and the like; natural fibers such as cotton, wool, hair and the like; and synthetic fibers such as nylon, cellulose derivatives and the like. Any suitable coating method may be employed to apply the metal salt to the treatment surfaces of the devices of this invention. For example, the stable solid hydrophobic metal salts may be applied as a loose powder, a melt, a solution, an emulsion, a dispersion or as a component in a film-forming binder composition.

The metal salt may be applied to the surface of the treatment device of this invention immediately prior to contact of the treatment surface with the imaging surface to be treated. Application may be controlled by employing a dispenser which uniformly sprinkles the metal salt in the form of a powder onto the treating surface while the treatment device is in operation in an imaging machine. Alternatively, the treatment surface may be provided with a supply of metal salt by rubbing a solid bar of hydrophobic metal salt against the treatment surface. The metal salt bar may be formed by merely casting the metal salt in molten form in a mold, sintering particles of the metal salt or by binding metal salt particles together with a film-forming binder.

Further, where synthetic fibers are employed, the metal salts of this invention may be dispersed uniformly throughout the fiber during the fiber manufacturing process. When loose powder is employed, it may be applied by merely sprinkling the powder onto the treatment surfaces of the device of this invention. Liquids containing the metal salt may be applied to the treatment of this invention by any conventional coating method such as spraying or dip coating. The liquid may be a fugitive or permanent material. When fugitive liquids are employed, the liquid is preferably a low boiling point liquid which may easily be removed by conventional techniques after application. Generally, the non-fugitive liquids employed in this invention are film-forming binders. These film-forming binders may include natural resins, thermoplastic resins, and curable thermosetting resins. Typical natural resins include: caoutchouc, colophony, copal, dammar, dragon's blood, jalap, and the like. Typical thermoplastic resins include: the polyvinyls and polyvinylidenes such as polystyrene, polymethyl styrene, polymethyl methacrylate, polyacrylonitrile, polyvinyl acetate, polyvinyl alcohol, polyvinyl butyral, polyvinyl chloride, polyvinyl ethers, and polyvinyl ketones; polyamides such as polycaprolactams and polyhexamethylene adipamide; polyesters such as polyethylene terephthalate; polyurethanes; polysulfides and the like. Typical thermosetting resins include phenolic resins such as phenol-formaldehyde, phenol-furfural and resorcinol formaldehyde; amino resins such as urea-formaldehyde and melamine-formaldehyde; polyester resins; and the like. The quantity of metal salt necessary to provide the improved results of this invention depends on many factors including the manner in which the salt is applied to the treating surface of the device of this invention, the relative velocities of the treatment device surface and the electrostatographic surface being treated, the pressure employed to apply the metal salt to the electrostatographic surfaces, the type of material employed in the treatment device (e.g., length and number of fibers per unit area, and contact time between the treatment device and the electrostatographic surfaces). Generally speaking, satisfactory results are obtained when from about .005 gram to about 1 gram of metal salt per square foot is available at the treatment surface of this invention immediately prior to contact with electrostatographic imaging surface. Optimum results are obtained when from about 0.01 to about 0.2 gram of metal salt is available at the treatment surface because maximum physical degradation resistance, imaging surface cleanability and humidity insensitivity are achieved with a minimum occurrence of background toner deposits.

Although the treatment device of this invention may be given the sole function of treating the electrostatographic surface with solid hydrophobic salts of fatty acids, a combined cleaning and treatment device is preferred, particularly in contact high speed copying machines where machine components requiring less space and having simplicity of operation are highly desirable.

The advantages of the improved device will become even further apparent upon consideration of the following disclosure of the invention, particularly when taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a schematic illustration of an electrostatographic surface treating device according to one embodiment of this invention.

FIG. 2 is a schematic view of an electrostatographic surface treating device according to another embodiment of this invention.

Referring now to FIG. 1, reference character **10** designates a rotatable xerographic drum having an outer layer **12** of photoconductive insulating material such as vitreous selenium. The drum **10** is mounted to move in the direction indicated by the arrow. The surface of drum **10** is uniformly charged by a conventional corona charging device **14** and exposed to a pattern of activating electromagnetic radiation at **16**. The latent electrostatic image formed by the exposure means **16** is developed by rotating drum **10** past the developing apparatus **17**. In the developing apparatus **17**, developing material is carried up by conveyor **14** and released onto chute **15** wherefrom it cascades down over the drum surface. After developing, most of the developed image is transferred at a transfer station **18** to a moving paper web **20**. The transferred powdered image may be permanently fixed to the web **20** by any conventional means such as by the heat fuser **22**. The drum **10** then passes through a treatment station **24** whereat the drum surface is simultaneously cleaned of the residual powder image and treated with a solid hydrophobic metal salt thus completing the entire charging, exposing, developing, transferring, cleaning and treatment cycle. At treatment station **24**, a web of treating material **26** is drawn from a rotatable supply wheel **28** wherefrom it is continuously or intermittently advanced over a guide roll **30** into contact against the moving surface of drum **10**. The web **26** is usually advanced at a slower rate of movement than the movement rate of the drum surface, and preferably, although not necessarily, is advanced in a direction substantially opposite to the direction of the drum for the reasons described below. Rubbing contact of the web **26** against the drum surface is incurred for a sufficient predetermined length of time during which the web **26** simultaneously removes the residue of developing material from the drum **10** and treats the drum surface with a solid hydrophobic metal salt of a fatty acid. Maximum efficiency in a minimum of time has been found to accrue when the web **26** and drum **10** are moved in substantially opposite directions whereby the portion of the web **26** having the greatest concentration of metal salt contacts the cleanest portion of the drum surface. Thereafter the web **26** continues advancing over a guide roll **32** and onto a rotatable take-up reel **34**. After the supply of treatment material on supply reel **28** has been exhausted, the soiled web on take-up reel **34** may be disposed of and a fresh supply of material installed for continuance of operation. The rate at which a web of cleaning material is consumed is a function of the relative rate of plate and web movement required to yield satisfactory cleaning. This has been found to vary to some degree dependent upon the particular cleaning material employed. It should be apparent that the most economical consumption rate will be the minimum web velocity relative to the velocity of the plate at which good cleaning is still obtained. For most materials tested, relative web velocities were found to vary in the order of $1/40$ to $1/100$ of the plate velocity, or in other words, it is necessary to present one clean inch of web to clean and treat every 40 to 100 linear inches of electrostatographic plate surface.

In FIG. 2, another embodiment of the invention is shown wherein the combination treatment-cleaner device having a brush type configuration is employed. Only the treatment-cleaning station **50** adjacent to a segment of xerographic drum **52** is illustrated in FIG. 2. A cylinder **54** is provided with a brush **56**. The axial length of the cylinder **54** is dependent upon the axial length of the xerographic drum **52**. A passageway generally designated as **58** extends from adjacent the periphery of brush **56** through wall **60** of hood **61** and is adapted to admit an erodable plate **62** comprising a solid hydrophobic metal salt of a fatty acid. The erodable plate **62** is fed through passageway **58** at a predetermined rate by means of a piston-gear rack combination **64** driven by a plurality of worm gears **66**. Ridges (not shown) running perpendicular to the brush axis may be provided within passageway **58** to restrict plate **62** from passing freely through the passageway **58**. When the apparatus of FIG. 2 is utilized as a station in an automatic xerographic device, the cylinder **54** may optionally be constructed so that the brush may be removed from contact with xerographic drum **52**. The passageway **58** and erodable plate **62** are constructed so that they run along the entire axial length of cylinder **54**. The erodable plate **62** is positioned to compress the brush bristles along the exposed erodable plate edge. As each section of the brush is compressed by the edge of erodable plate **62**, the individual fibers of the brush pick up minute quantities of the solid hydrophobic metal salt of a fatty acid and immediately transfer at least a portion of the metal salt to the xerographic drum **52**. Although it is not entirely clear, it appears that the bristles of the brush tend to spring upright due to effects of centrifugal force immediately after compression along the edge of erodable plate **62**. Since the inherent resilience of the bristles and the effects of centrifugal force tend to cause the bristles to extend outward after being compressed, the bristles contact the surface of xerographic drum **52** with more than normal wiping force which seems to faciiltate the filling in and smoothing over of microscopic scratches and imperfections present in the surface of drum **52**. In addition to wiping the surface of drum **52** with hydrophobic metal salt material, the bristles also brush the residual powder image on the surface of xerographic drum **52** into a current of air which is drawn by suitable means (not shown) through outlet **68** of hood **61**. Any particles adhering to the brush may optionally be dislodged by bringing the brush into contact with a rod **72**. These dislodged particles are also carried away by the air exhausted through outlet **68**. The edge of hood **61** is constructed so as to be as close as possible to the surface of the xerographic drum **52** without making contact with the delicate surface. The negative pressure existing within hood **61** prevents toner particles removed from the xerographic drum surface from being expelled through the small opening that exists between the edge of the hood and the xerographic drum surface.

A relatively high brush speed is preferred for rapid and thorough treatment and cleaning. However, various factors affect the particular peripheral brush speed to be employed. These factors include the type of powder material being removed from the xerographic drum surface, the brush material being used, the area of contact between the brush and the xerographic drum surface, the relative speed between the plate surface and the brush periphery, the electrostatic attraction remaining between the residual powder and the xerographic drum surface and other related factors. Generally, a minimum peripheral brush velocity of about 15 feet per second is preferred because more effective cleaning and treatment is achieved.

Although the embodiments illustrated in the drawings depict the employment of the treatment apparatus of this invention as a combined treatment device and cleaning device, it is apparent that the treatment device may be employed solely as a treatment device. For example, the treatment device may be positioned in the imaging cycle immediately after the cleaning cycle.

The fundamental mechanism or mechanisms upon which the improved humidity resistance, better transfer performance, reduced plate abrasion, and elimination of powder deficient spots can be based have not been clearly established. It is postulated, however, that factors which contribute to the above described improvements include the continuous or intermittent formation of an ultra thin hydrophobic protective film on the surface of the electrostatographic imaging surface which stabilizes the electrical properties of the electrostatographic imaging surface; the filling in of any fine scratches present in the imaging surface; the reduction of friction during the development and cleaning processes; and the reduction of van der Waal sources between the toner particles and the imaging surface. When the solid hydrophobic metal salts of this invention are employed in the form of finely-divided particles, the particular salt employed is preferably transparent or light colored for conventional black on white copying systems because any stray metal salt particle transferred to a copy sheet with the black powder image is substantially invisable thereon.

The following examples further specifically define and describe the system of the present invention for treating electrostatographic surfaces with solid hydrophobic metal salts of fatty acids. Parts and percentages are by weight unless otherwise indicated. The examples below are intended to illustrate the various preferred embodiments for carrying out the invention.

EXAMPLE I

A comparative test is conducted with apparatus similar to that illustrated in FIG. 1. In the test, about one part colored styrene copolymer toner particles having an average particle size of about 10 to about 20 microns and about 99 parts coated carrier particles having an average particle size of about 600 microns is cascaded across an electrostatic image-bearing surface. The developed image is then transferred by electrostatic means to a sheet of paper whereon it is fused by heat. The residual powder is removed with a continuous web comprising rayon and cotton fibers manufactured by Chipopee Mills, Inc., Milltown, N.J. One half the web is untreated and the other half is dusted with zinc stearate having a particle size distribution from about 0.5 micron to about 40 microns. The excess powder deposited is removed by merely inverting the web and gently shaking it. After the copying process is repeated 1,500 times, the copies and electrostatic imaging surface are examined for quality and wear, respectively. The portion of the copy images associated with the treated web side of the machine possess markedly superior character definition and less background than copy images obtained on the untreated web side of the machine. Further, micrograph studies of the imaging surface reveal substantially less wear on the side in contact with the treated portion of the web than on the side in contact with the untreated portion of the web.

EXAMPLE II

The procedure of Example I is repeated except that cobalt palmitate having a particle size distribution from about 0.75 micron to about 50 microns is substituted for the zinc stearate particles. After the copying process is repeaed 1,500 times, the copies and electrostatic imaging surface are examined for quality and wear, respectively. The portion of the copy images associated with the treated web side of the machine possessed superior character definition and less background than copy images obtained on the untreated side of the machine. Further, micrograph studies of the imaging surface reveal substantially less wear on the side in contact with the treated portion of the web than on the side in contact with the untreated portion of the web.

EXAMPLE III

The procedure of Example I is repeated except that the treated half of the cleaning web is impregnated with a 10 percent dispersion of finely-divided particles of zinc stearate in a nitrocellulose solution. About 0.05 gram of dispersion solids is deposited on every 2 square feet of the treated portion of the web. After the copying process is repeated 1,500 times, the copies and electrostatic imaging the surface is examined for quality and wear, respectively. The portion of the copy images associated with the treated side of the machine possess better character definition and less background than copy images obtained on the untreated web side of the machine. Further, micrograph studies of the imaging surface reveal substantially less wear on the side in contact with the treated portion of the web than on the side in contact with the untreated portion of the web.

EXAMPLE IV

The procedure of Example I is repeated except that the treated half of the cleaning web is impregnated with about 15 parts manganese oleate dispersed in about 20 parts nitrocellulose solution. After the copying process is repeated 1,500 times, the copies and electrostatic imaging surface are examined for quality and wear, respectively. The portion of the copy images associated with the treated web side of the machine possess superior character definition, greater image density and less background than copy images obtained on the untreated web side of the machine. Further, micrograph studies of the imaging surface reveal substantially less wear on the side in contact with the treated portion of the web than on the side in contact with the untreated portion of the web.

EXAMPLE V

A comparative test is conducted with apparatus similar to that illustrated in FIG. 1. The entire test is conducted in a humidity chamber at about 80° F. and about 80 percent relative humidity. About 1 part colored styrene copolymer toner particles having an average particle size of about 10 to about 20 microns and about 99 parts coated carrier particles having an average particle size of about 600 microns is cascaded across an electrostatic image-bearing surface. The developed image is then transferred by electrostatic means to a sheet of paper whereon it is fused by heat. The residual powder is removed with a continuous web comprising cotton fibers. One-half the web is untreated and the other half is dusted with zinc stearate having a particle size distribution from about 0.5 micron to about 40 microns. The excess powder deposited is removed by merely inverting the web and gently shaking it. After the copying process is repeated 1,500 times, the copies and electrostatic imaging surface are examined for quality and wear, respectively. The portion of the copy images associated with the treated web side of the machine possess superior character definition, greater image density and less background than copy images obtained on the untreated web side of the machine. Further, micrograph studies of the imaging surface reveal substantially less wear on the side in contact with the treated portion of the web than on the side in contact with the untreated portion of the web.

EXAMPLE VI

The procedure of Example V is repeated except that the treated side of the cleaning web is impregnated with a mixture comprising 10 parts lead caprylate, 25 parts urea-formaldehyde resin and 30 parts of nitrocellulose dissolved in methyl isobutyl ketone. About 0.02 gram of dispersion solids is deposited on about every 2 square feet of the treated side of the cleaning web. After the copying process is repeated 1,500 times, the copies and electrostatic imaging surface are examined for quality and wear, respectively. The portion of the copy images associated with a treated web side of the machine possess superior character definition and less background than copy images obtained on the untreated web side of the machine. Further, micrograph studies on the imaging surface reveal substantially less wear on the side in contact with the treated portion of the web than on the side in contact with the untreated portion of the web.

EXAMPLE VII

A control run is made with apparatus similar to that illustrated in FIG. 2 except that the fur brush is not treated with a solid hydrophobic metal salt of a fatty acid. About one part colored styrene copolymer toner particles having an average particle size of about 10 to about 20 microns and about 99 parts coated carrier particles having an average particle size of about 600 microns is cascaded across an electrostatic image-bearing surface. The developed image is then transferred by electrostatic means to a sheet of paper whereon it is fused by heat. The residual powder is removed with a cylindrical fur brush manufactured from rabbit fur. The brush cylinder has a diameter of about 5 inches and is rotated at a linear velocity of about 25 linear feet per second. After the copying process is repeated 20,000 times, the copies and electrostatic imaging surface are examined for quality and wear, respectively. The copies possess sharp line contrast and minimal background deposition. However, large solid areas possess a washed out appearance. Micrograph studies of the electrostatic image-bearing surface reveal a large number of deep scratches.

EXAMPLE VIII

The procedure of Example VII is repeated except that the edge of a plate of sintered zinc stearate particles is maintained in contact with the rotating fur brush during the cleaning process. The edge of the zinc stearate plate is positioned to compress the brush hairs immediately prior to contact with the electrostatic latent image-bearing surface. After the copying process is repeated 22,000 times, the copies and electrostatic imaging surface are examined for quality and wear, respectively. The copies possess markedly superior character definition, greater solid area density and less background than the copy images obtained in the Example VII. Further, micrograph studies of the imaging surface reveals substantially fewer scratches than the imaging surface employed in Example VII.

The expression "electrostatographic plate" as employed herein is intended to include flat plates, cylinders, and continuous belts.

Although specific components, proportions and procedures have been stated in the above description of the preferred embodiments of the novel treatment system, other suitable materials, as listed above, may be used with similar results. Further, other materials and procedures may be employed to synergize, enhance or otherwise modify the novel system.

Other modifications and ramifications of the present invention will occur to those skilled in the art upon the reading of a disclosure. These are intended to be included within the scope of this invention.

What is claimed is:

1. In an imaging process comprising the steps of forming a latent electrostatic image on an imaging surface, applying developing material to said latent electrostatic image to form a powder image corresponding to said latent electrostatic image, and transferring said powder image from said imaging surface to a support surface, the improvement comprising treating said imaging surface

with a solid hydrophobic metal salt of a fatty acid prior to forming said electrostatic latent image and subsequent to transferring said powder image from said imaging surface to a support surface.

2. An imaging process according to claim 1 wherein said solid hydrophobic metal salt of a fatty acid is zinc stearate.

3. An imaging process comprising the steps of forming a latent electrostatic image on an imaging surface, applying developing material to said latent electrostatic image to form a powder image corresponding to said latent electrostatic image, transferring said powder image from said imaging surface to a support surface, presenting a treating surface of a fibrous web against said imaging surface at a predetermined rate relative to the rate of imaging surface movement, said treating surface carrying on at least the area adjacent said imaging surface a transferrable solid hydrophobic metal salt of a fatty acid, and removing said treating surface from said imaging surface

after a predetermined length of contact with said imaging surface.

4. An imaging process according to claim 3 wherein said area of said treating surface adjacent said imaging surface contains about .005 to about 1 gram of said solid hydrophobic metal salt of a fatty acid per square foot.

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