

[54] **CLEANING ROLL APPARATUS HAVING
REJUVENATED CLEANING SURFACE**

2,592,969 4/1952 Stachowiak..... 15/104 A
3,637,976 1/1972 Ohta et al. 15/256.5

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[57] **ABSTRACT**

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Roll cleaning apparatus for a dry heated pressure fusing system comprising a roll including a rigid core member having a slot formed therein to receive an endless flexible belt therearound. An elastomeric layer is bonded to the belt. A polyester polymer material positioned in contact with the elastomeric layer is disposed in roll form on the interior of the core member. Upon urging the roll into contact with a heated fuser roll the polymer material becomes tacky removing toner and other contaminants from the fuser roll. At predetermined intervals the polymer roll is advanced by driving the belt to provide a rejuvenated tacky surface for the cleaning roll apparatus.

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[52] **U.S. Cl.**..... **15/256.52; 15/104 A**

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

[58] **Field of Search** 15/256.52, 100, 1.5, 104 A;
101/425; 355/15, 3 R, 3 DP; 117/21, 17.5;
118/637, 70; 432/60; 219/244, 216, 388,
469; 96/1; 100/93 RP; 29/131, 132

[56] **References Cited**

UNITED STATES PATENTS

1,995,685 3/1935 Perkins 15/104 A

6 Claims, 4 Drawing Figures

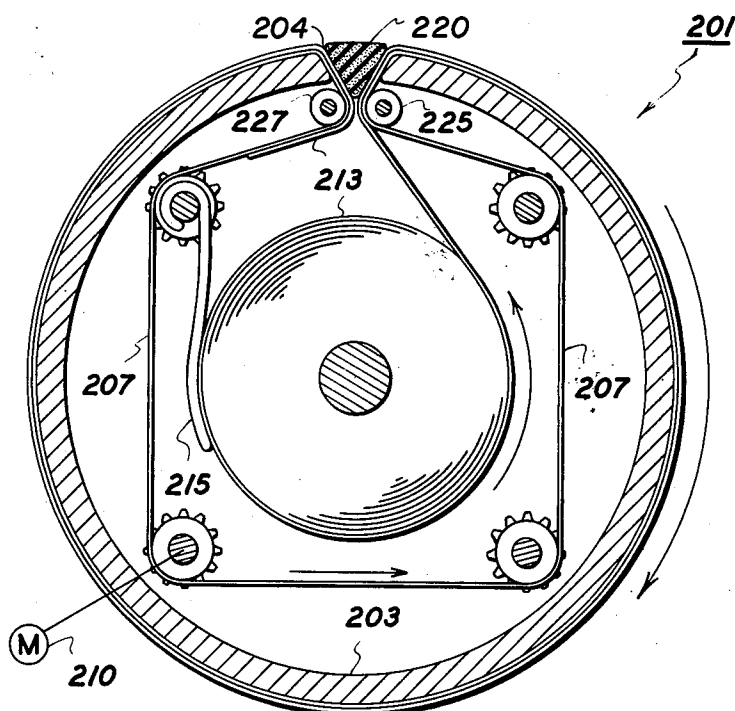


FIG. 1

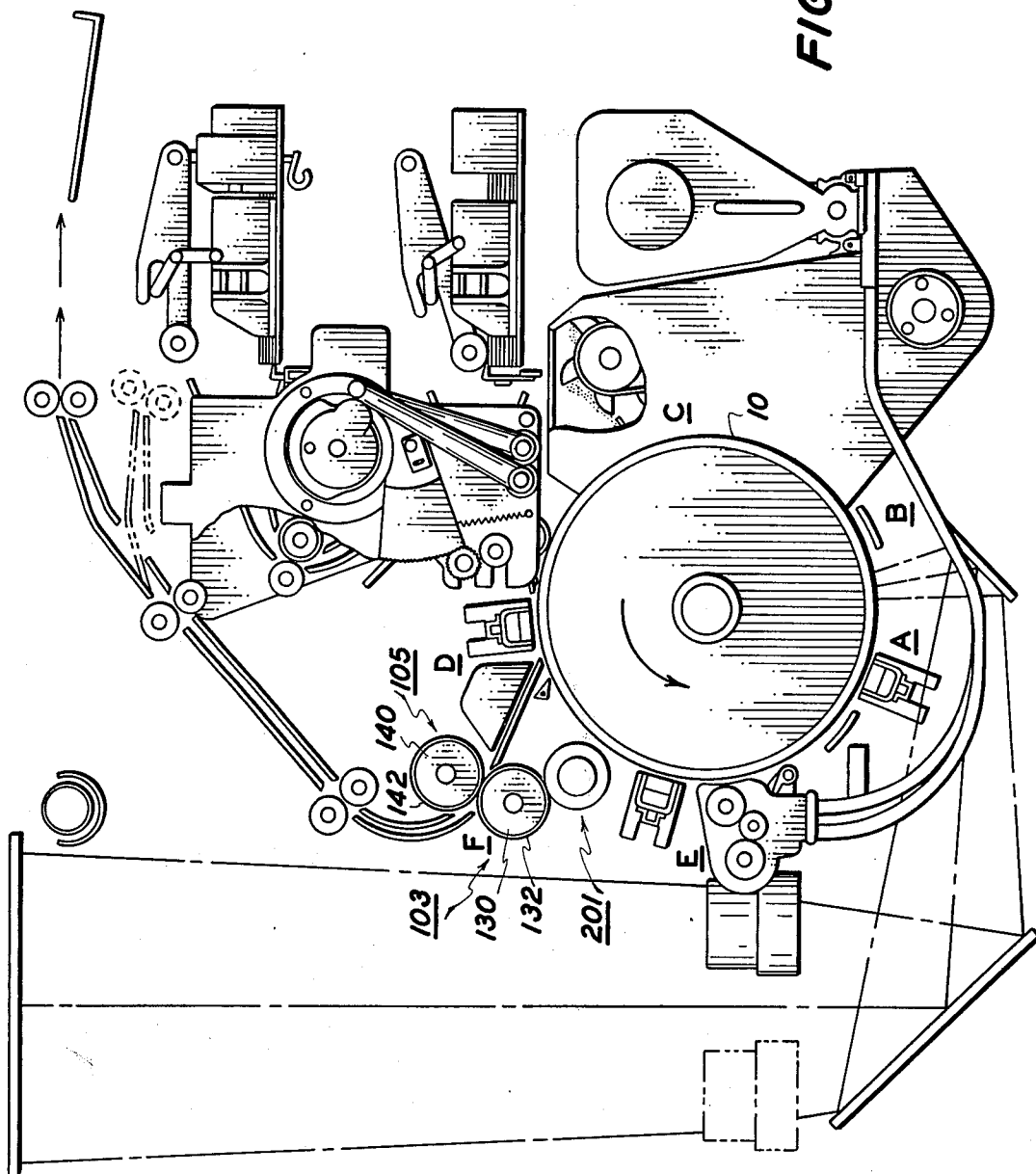


FIG. 2

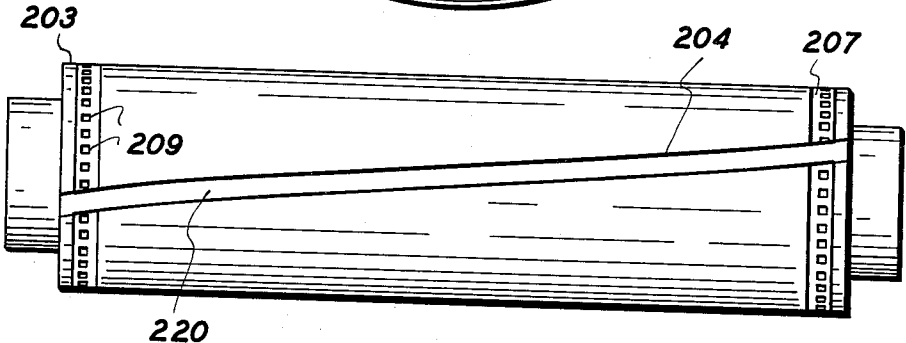
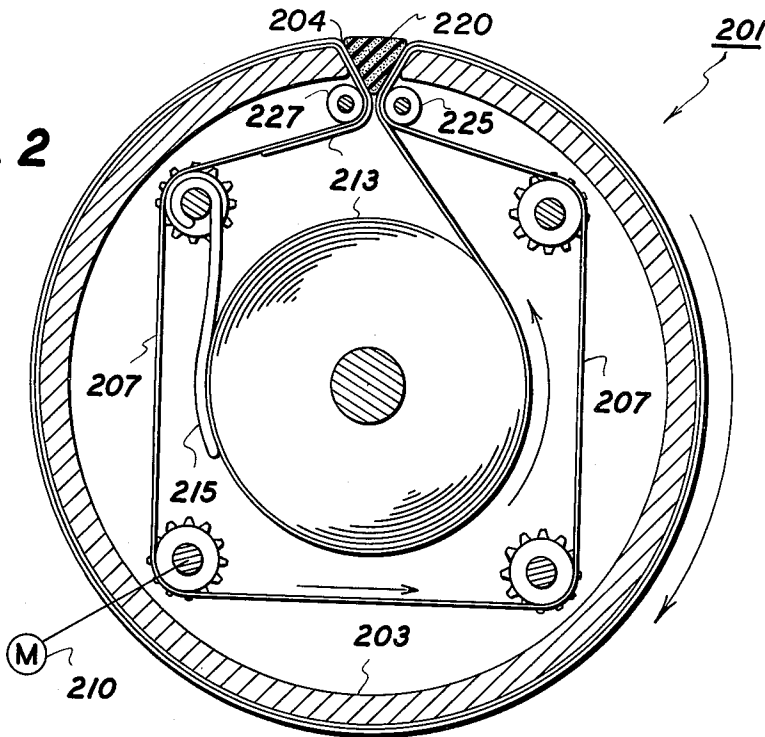


FIG. 3

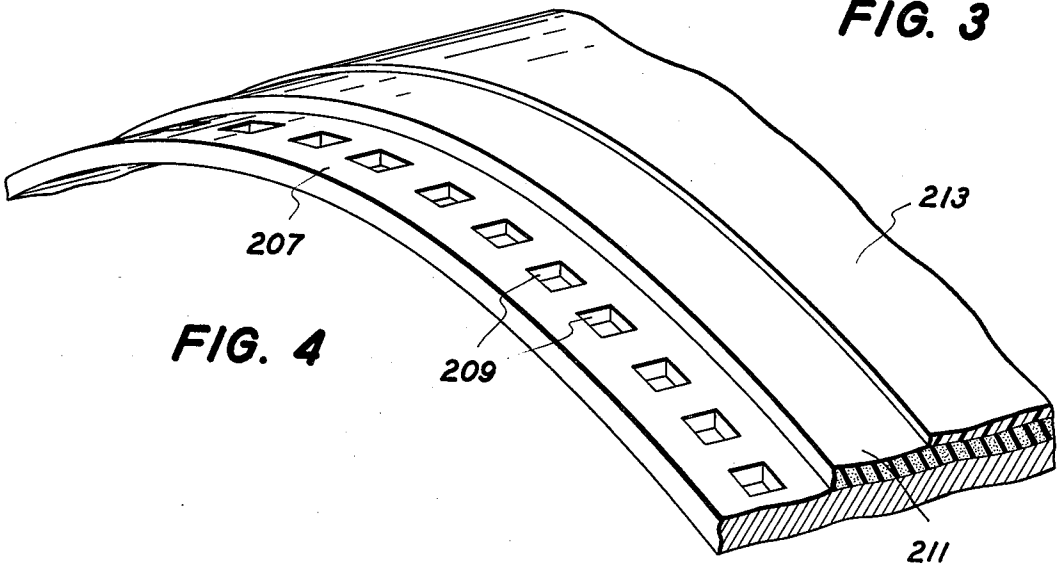


FIG. 4

CLEANING ROLL APPARATUS HAVING REJUVENATED CLEANING SURFACE

This invention relates to an improved cleaning roll apparatus for use with a dry heated pressure fusing system in an electrostatic reproduction system to produce high quality copies free of toner and contaminants.

It has been recognized that one of the preferred ways for fusing a powder image to a substrate is to bring the powder into direct contact with a hot surface, such as a heated roller. The roller surface may be dry, i.e. no application of a liquid release agent to the surface of that roller as described for example, in U.S. Pat. Nos. 3,498,596, 3,539,161, and 3,666,247. Alternatively, the fuser roller surface may be wetted with a release agent such as silicone oil as described in U.S. Pat. Nos. 3,268,351 and 3,256,002.

In the dry fusing system there is a tendency for the fuser roll to collect paper contamination and toner particles which in turn cause an offset to build up on the fuser roll surface and be deposited on the copy sheets. In the past cleaning roll surfaces have become loaded with toner and contaminants collected onto the cleaning roll surface resulting in a loss of cleaning efficiency and rapid replacement of the cleaning roll especially in the case of high speed duplicators.

The present invention is an improved cleaning roll apparatus for cleaning dry fuser rolls to maintain cleaning effectiveness of the roll cleaning surface and is especially an improvement over copending application Ser. No. 402,218 filed on Oct. 1, 1973 entitled Improved Dry Fuser Roll Cleaning Apparatus and commonly assigned herewith.

It is therefore the principle object of the present invention to improve cleaning of dry heated pressure fusing roll devices.

It is a further object of the present invention to maintain removal of paper contaminants and toner particles from a dry heated fuser roll without redeposit back to the fuser roll.

It is a further object of the present invention to prolong the life of cleaning roll surfaces used to remove toner and other contaminants from the fuser roll surfaces.

It is a further object of the present invention to improve copy quality of copy sheets fused by dry pressure heated fuser systems.

These as well as other objects of the invention and further features thereof will be better understood upon reference to the following detailed description of the invention to be read in connection with the drawings wherein:

FIG. 1 illustrates schematically a typical xerographic reproducing apparatus incorporating a heated pressure fuser roll apparatus cleaned by roll apparatus constructed in accordance with the present invention.

FIG. 2 is a cross-sectional view of the cleaning roll apparatus with parts removed to illustrate details thereof;

FIG. 3 is a plan view of the cleaning roll apparatus and

FIG. 4 is an exploded isometric view of layers comprising the cleaning roll surface.

Referring now to the drawings, there is shown in FIG. 1 a preferred embodiment of the subject invention in a suitable environment such as an automatic xerographic reproducing machine. The automatic xero-

graphic reproducing machine includes a xerographic plate or surface 10 formed in the shape of a drum. The plate has a photoconductive layer or light receiving surface on a conductive backing, journaled in a frame to rotate in the direction indicated by the arrow. The rotation will cause the plate surface to sequentially pass a series of xerographic processing stations. For the purpose of the present disclosure the several xerographic processing stations in the path of movement of the plate surface may be described functionally as follows:

A charging station A, at which a uniform electrostatic charge is deposited on the photoconductive plate;

An exposure station B, at which light or a radiation pattern of copies to be reproduced is projected onto the plate surface to dissipate the charge in the exposed areas thereof to thereby form a latent electrostatic image of the copy to be reproduced.

A developing station C, at which xerographic developing material, including toner particles having an electrostatic charge opposite that of the latent electrostatic image, is cascaded over the latent electrostatic image to form a toner powder image in configuration of the copy being reproduced;

A transfer station D at which the toner powder image is electrostatically transferred from the plate surface to a transfer material or a support surface; and

A drum cleaning and discharge station E at which the plate surface is brushed or doctored to remove residual toner particles remaining thereon after image transfer and at which the plate is exposed to a relatively bright light source to effect substantially complete discharge of any residual electrostatic charge remaining thereon.

The preceding description of the xerographic process is sufficient for an understanding of the instant invention. Further details may be had by reference to U.S. Pat. No. 3,578,859 filed July 3, 1969 and commonly assigned herewith.

At the fusing station F the fusing assembly 101 comprises a fuser roll 103 and pressure roll 105 through which the copy sheet to be fused is advanced through the nip formed by contact of the fuser roll and pressure roll. The copy sheet is stripped from the fuser roll 10 by natural release or by stripper finger. The fuser roll comprises a rotating member 130 having an elastic compressible coating 132 made of silicone rubber or any suitable heat resistant compressible material as described for example in the aforementioned patents. The rotating member may be internally heated by a heat source 134 as described in U.S. Pat. No. 3,666,247 or externally heated as described in U.S. Pat. Nos. 3,498,586 and 3,539,161. The pressure roll comprises a rotating member 140 which is covered with an elastic layer 142 or a slightly higher durometer and the fuser roll coating 132 as described in the aforementioned patents.

Referring specifically to FIGS. 2 - 4 in accordance with the present invention a cleaning roll apparatus 201 is positioned to clean fuser roll 103 of toner and paper contamination. Cleaning roll apparatus 201 includes a metal core member 203 which is formed with a slot 204 at an oblique angle at approximately 5° to effect proper cleaning as will be understood more fully hereinafter. Encircling core member 203 is a belt member 207. Belt member 207 is made of metallic or high temperature resistant plastic material. Preferred belt materials are tempered steel, and polyimide film manufactured

under the trademark of kapton^R by duPont Corporation of Wilmington, Delaware.

Belt member 207 has sprocket holes 209 formed therein for driving the belt member as will be explained more fully hereinafter. In overlying relationship with the belt 207 is an elastomeric layer 211 to provide a conformable cleaning roll structure. Threaded over the elastomeric layer 211 is a thin film of polyester polymer material which is coiled in a roll 213 disposed on the interior of the core member. The polyester polymer material is used for cleaning the surface of the heated fuser roll and was a melting or softening point ranging from about 120°C to about 275°C. Typical materials are aliphatic, aromatic or mixtures of aliphatic, aromatic polyesters. Examples of these classes of materials are polyethylene, oxalate, poly pp¹ xylene terephthalate, polyethylene/neopentyl terephthalate. Preferred materials of the mixed classes of polyesters are PE-100 or PE-200, trademarks of Goodyear Company of Akron, Ohio.

The polyester cleaning film material covers the outer surface of the cleaning roll apparatus 201 and serves to clean the toner as well as other contaminants from the fuser roll surface. In accordance with the present invention as the toner offset particles and paper contaminants begin to coat the polyester film material it is necessary to revitalize or rejuvenate the cleaning surface of the cleaning roll apparatus. To accomplish this belt 207 is driven by engaging sprocket holes 209 by a sprocket drive by any suitable drive mechanism as by a motor 210 causing the polymer film material to be advanced and unwound from its roll and wind around the outer surface of the cleaning roll apparatus. A pad 215 is positioned against the roll to effect a drag force on the fresh cleaning polymer material as it is advanced from the roll.

When sufficient polyester film material has been advanced to recover the outer surface of the cleaning roll apparatus the drive motor 210 of the belt 207 is de-energized. Tension on the belt member is maintained by idler rollers 225 and 227. The cleaning roll apparatus 201 is continually rejuvenated and is effective for cleaning the toner offset material and paper contaminants from the surface of the fuser roll. It will be further appreciated that due to the characteristics of the elastomeric layer 211 that good cleaning contact is maintained with the surface of the fuser roll during the cleaning operation to physically remove the toner particles and other contaminants onto the tackified polyester film material.

By the above invention cleaning of a dry heated fuser roll surface is maintained continuously during the cleaning mode of operation removing toner and other contaminants therefrom. The cleaning roll surface which is renewed or rejuvenated at periodic predetermined intervals is effective for maintaining a high level of cleaning efficiency to the fuser rolls. As such the fuser rolls are able to fuse the images of high speed duplicator machines producing high quality prints. More-

over the life of the cleaning roll is extended over a much greater period of time so that machine down time is minimized.

While there have been shown and pointed out the fundamental novel features of the invention as applied to a preferred embodiments, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. An improved cleaning roll apparatus for cleaning heated surfaces comprising:

a core member formed with a slot;

a flexible endless belt member encircling said core member;

A roll of thin polyester polymer film material disposed interior to the belt member and extending on overlying relationship with the belt member at one end thereof, said film material becoming tackified upon raising its temperature to a predetermined level;

means for driving said belt member causing said roll of material to unwind onto the outer surface overlying the belt member into contact with a heated surface to be cleaned at predetermined intervals to effect a rejuvenated cleaning surface.

2. Apparatus according to claim 1 including a drag pad positioned in contact with said roll of film material.

3. Apparatus according to claim 1 including a separator pad positioned in the slot of said core member.

4. Apparatus according to claim 1 wherein said belt member is formed with sprocket holes to effect drive thereof.

5. Apparatus according to claim 1 including an elastomeric coating positioned intermediate said belt member and said film material.

6. In a dry heated pressure fusing system for fusing toner images on an elastostatic copying machine in which a dry fuser roll and backup roll define a contact arc to fuse toner images onto copy sheets, an improved roll cleaning apparatus to release degrading contaminants and toner from the fuser roll surface comprising:

a core member formed with a slot;

a flexible belt member encircling said core member;

a roll of polyester polymer film material disposed interior to the belt member and extending in overlying relationship with the belt member at the one end thereof, said film material becoming tackified upon raising its temperature to a predetermined level;

means for driving said belt member causing said roll of material to unwind onto the outer surface overlying the belt member into contact with a fuser roll surface to be cleaned at predetermined intervals to effect a rejuvenated cleaning surface for cleaning the aforementioned.

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