

June 20, 1972

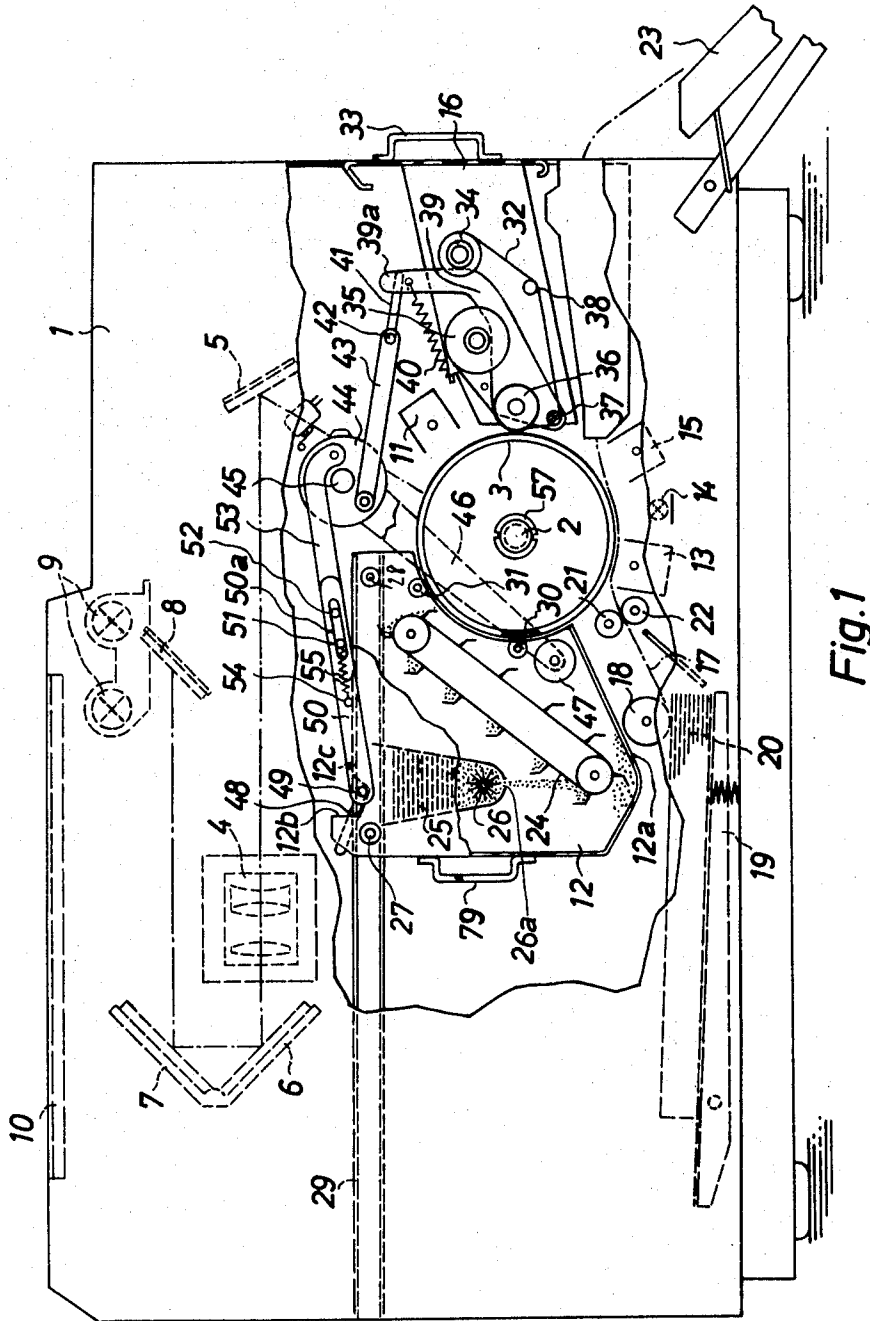
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3,671,119

ELECTROSTATIC COPYING APPARATUS

Filed Dec. 10, 1970

3 Sheets-Sheet 1



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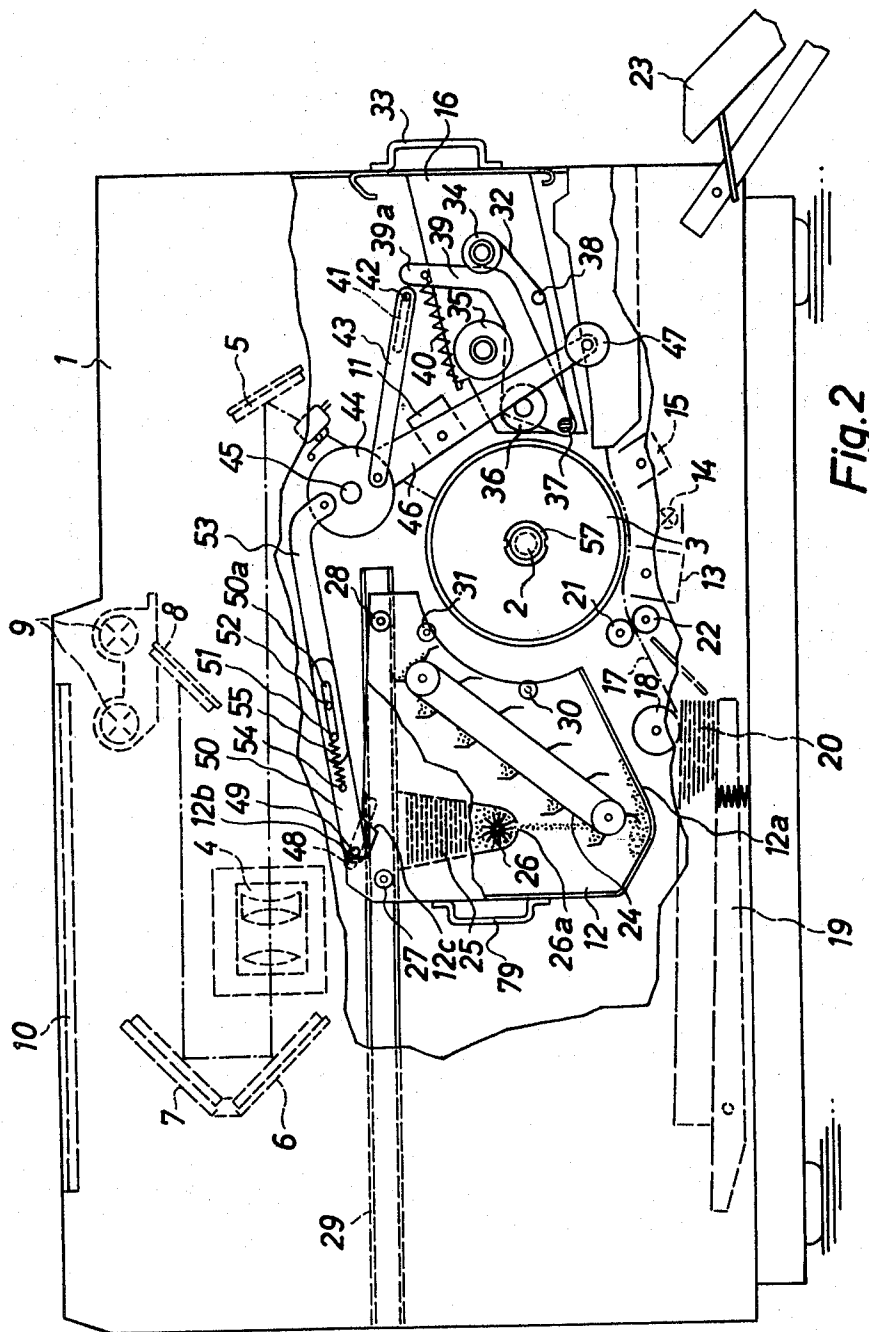
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3,671,119

ELECTROSTATIC COPYING APPARATUS

Filed Dec. 10, 1970

3 Sheets-Sheet 2



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ELECTROSTATIC COPYING APPARATUS

Filed Dec. 10, 1970

3 Sheets-Sheet 3

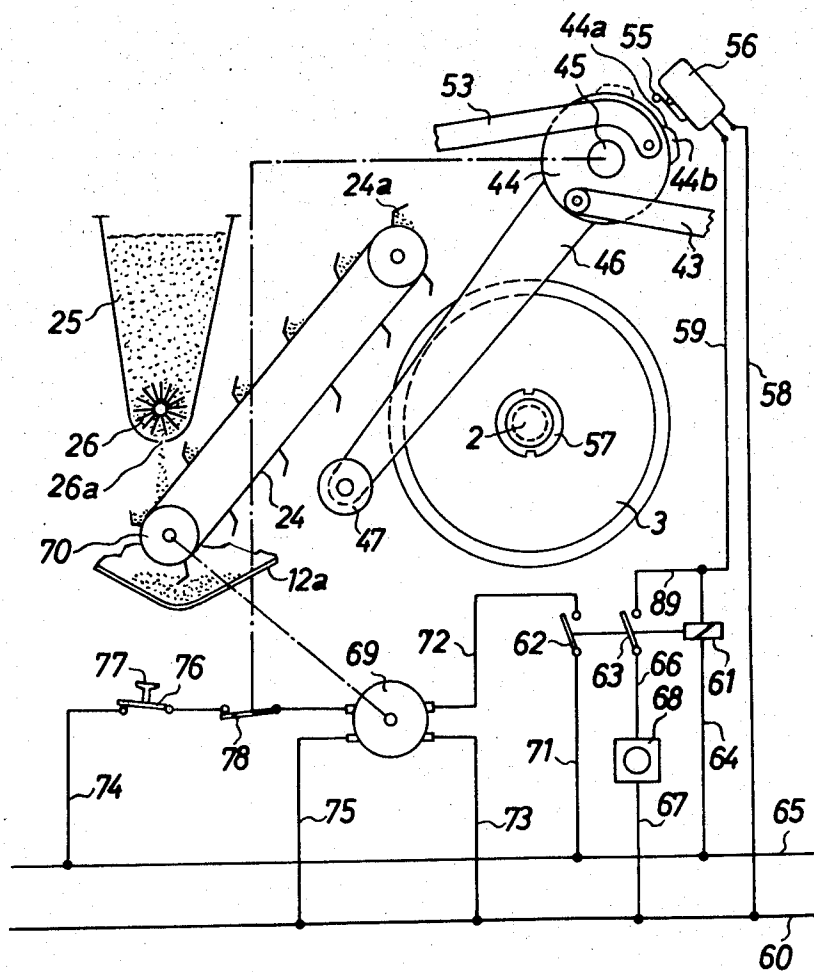


Fig.3

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ELECTROSTATIC COPYING APPARATUS

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Filed Dec. 10, 1970, Ser. No. 96,937

Claims priority, application Germany, Dec. 10, 1969,

P 19 61 834.9

Int. Cl. G03g 15/08

U.S. Cl. 355—3

10 Claims

ABSTRACT OF THE DISCLOSURE

A xerographic carrier has a photoconductive layer which is to be uniformly charged preliminary to transfer of latent images to the layer. A source of powdered electroscopic developer material supplies such material to a conveying device located adjacent the path and capable of displacement between two positions in one of which it is directly proximal to the layer and in the other of which it is remote therefrom so as to permit withdrawal of the carrier from its normal operating position. A reversible drive normally drives the conveying arrangement in a sense conveying the powdered developer material onto the layer of the carrier, and a displacing arrangement serves for displacing the conveying device from its normal operating position to its remote position. Reversing means is provided which serves to reverse briefly the drive when the displacing means is operated, for displacing the conveying arrangement from its normal operating position to its remote position.

BACKGROUND OF THE INVENTION

The present invention relates generally to electrophotographic copying apparatus, and more particularly to electrostatic copying apparatus.

In electrostatic copying apparatus a xerographic carrier, usually of drum-shaped configuration, travels in a predetermined path and carries an exposed photoconductive layer which moves past a series of xerographic processing stations, including a charging station, an exposure station, a developing station and an image transfer station. At the image transfer station a corona discharge or transfer device is provided which charges the outer sides of copy sheets to a predetermined potential to thereby generate substantial electrostatic forces which attract the copy sheets to the xerographic plate. This, in turn, results in the transfer of powder images consisting of previously applied pulverulent electroscopic developer material, from the xerographic plate onto the respective copy sheet.

The electroscopic developer material, also frequently known as the "toner," is applied to the xerographic plate or, more particularly, to the photoconductive layer thereon, after the layer has been charged to a predetermined potential and has subsequently had connected onto it a line copy image from a suitable original. This results in the production of a latent image on the photoconductive layer and this image is developed as the toner powder is deposited on the layer whereon it adheres to selected portions of the layer to form thereon a powder image.

In order to be able to properly deposit the toner powder on the xerographic drum, the conveying device which conveys the toner powder to the point or location of deposition must discharge the powder very closely adjacent to the layer of photoconductive material on the

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xerographic plate. On the other hand, it is fairly frequently necessary either to remove the plate from the machine for inspection, repair or replacement, or to remove or displace the toner conveying device so that toner can be refilled or the device can be cleaned, inspected or repaired. In any of these circumstances it is necessary to displace the toner conveying device away from the xerographic drum and, particularly if the conveying device is a conveyor utilizing scoops or the like, but also with other types of conveyors, the problem exists in the prior-art constructions that during such displacement of the conveyor device toner powder on the device proximal to the point of discharge—that is powder which is about to be discharged for deposition on the drum—will become dislodged as the conveying device is displaced and will drop into the interior of the copying apparatus. This will very rapidly lead to substantial contamination of the apparatus, a fact which is not only aesthetically displeasing but which may also adversely influence the proper operation of the apparatus.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to overcome these disadvantages of the prior art.

More particularly it is an object of the present invention to provide an improved electrostatic copying apparatus which is not possessed of these disadvantages.

Still more specifically it is an object of the present invention to provide such an improved electrostatic copying apparatus in which the problem of unintentional discharge of electroscopic pulverulent developer material from the conveying device provided for this purpose, at the time the conveying device is displaced in its position relative to the xerographic carrier, is precluded reliably.

At the same time it is an object of the invention to provide such an improved electrostatic copying apparatus which is relatively simple in the aspects relating to the improvements obtained according to the present invention.

In pursuance of the above objects, and others which will become apparent hereafter, one feature of the invention resides in an electrostatic copying apparatus which, briefly stated, comprises a combination of a xerographic carrier arranged to travel in a predetermined path and having an exposed photoconductive layer adapted to be uniformly charged precedent to transfer of latent images to said layer, and a source of pulverulent electrostatic developer material adapted for application to said layer so as to form powder images thereon. There is further provided conveying means mounted adjacent the aforementioned path for displacement between two positions in one of which it is proximal to and in the other of which it is remote from the photoconductive layer. Reversible drive means normally drives the conveying means in a direction and in a sense conveying the developer material onto the aforementioned layer and displacing means is operable for displacing the conveying means between the aforementioned positions thereof. Finally, there is provided reversing means connected with the drive means and with the displacing means for briefly reversing the drive means—and thereby the conveying means—in response to operation of the displacing means in a sense displacing the conveying means from the one to the other position thereof.

The displacing means may for instance control a reversing switch interposed in the electrical circuit of electrically operated drive means. The drive means may be in form of a tandem motor one section of which serves to drive the

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conveying means in normally forward direction, and the other section of which is energized by the reversing switch and at such time serves to drive the conveying means in reverse direction. A lever may be provided as part of the displacing means and may serve not only to displace the conveying means to its aforementioned other or remote position, but may be provided with a portion cooperating with the reversing switch in a sense actuating it when the lever is operated for displacing the conveying means.

In a construction according to the present invention displacing of the conveying means from its position proximal to the photoconductive layer to its position in which it is remote from this layer, results as an automatic consequence in a reversing of the drive for the conveying means so that any quantities of electroscopic developer material which are so located on the conveying means as to be in a position for immanent discharge, will be moved backwards from the point of discharge whereby the danger of undesired discharge into the interior of the machine is eliminated. It is emphasized again that, as pointed out before, the present invention is fully applicable not only to a copying apparatus utilizing as its conveying means a scoop conveyor, but also a different type of conveyor such as a belt conveyor, a screw-type conveyor or the like.

In many instances the purposes of the present invention can be fully attained by briefly energizing the drive in a reversed sense, that is in a sense reversing the normal direction of operation of the conveying means. This can take place during the operation of the displacing means, for instance the lever which is used for displacing the conveying means from its normal position proximal to the photoconductive layer to the remote position. In some circumstances this brief energization of the drive may, however, not be adequate to achieve the purposes of the invention, meaning that it may not be sufficient to withdraw the about-to-be discharged quantity of electroscopic developer powder sufficiently to avoid such discharge during movement or displacement of the conveying means. In such a case, and assuming that the switch effecting reversing of the drive is controlled by a cam provided on or acted upon by the displacing means, a cam track portion may be provided on the cam having such a length as to maintain the reversing switch actuated and thereby the drive energized in reversed direction, for a period of time requisite to obtain the desired result.

It is also possible according to the present invention to have the reversing switch act upon a holding relay the holding circuit of which is in turn controlled by a timer which may or may not be adjustable. In this case the period of time for which the drive is energized in reversed direction is entirely independent of the manner in which the displacing means is operated to displace the conveying means between its positions, so that an utterly constant reversing time can be obtained in each and every application.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a somewhat diagrammatic vertical section through an electrostatic copying apparatus embodying the invention, with a conveying means located in its position proximal to the photoconductive layer on the xerographic carrier;

FIG. 2 is a view similar to FIG. 1 but showing the conveying means located in a position remote from the photoconductive layer on the xerographic carrier; and

FIG. 3 is a fragmentary somewhat diagrammatic sectional detail view, on an enlarged scale, illustrating the

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reversing means in the embodiment of FIGS. 1 and 2, including the electrical circuitry.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing now the drawing in detail it will be seen that the illustrated apparatus has a housing 1 provided with a shaft 2. The xerographic copier is here provided in form of a grounded rotary drum 3 constituting a xerographic plate in known manner, and whose outer peripheral surface is coated with a photoconductive layer. The drum can be placed onto the shaft 2 as illustrated for rotation about the longitudinal axis of the shaft 2, and it is removable for inspection, replacement and repair. To do so it is simply necessary to unscrew the nut 57 threaded onto the free end of the shaft 2 and which normally holds the drum 3 in place.

The drum 3 travels in counterclockwise direction and located along its path of travel is a series of xerographic processing stations past which the drum 3 moves. Specifically, reference numeral 11 identifies a corona charging device of conventional design which effects uniform charging of successive increments of the photoconductive layer on the travelling drum 3 to a predetermined potential. The thus-charged increments of the photoconductive layer travel thereupon past an exposure station which is located close to and downstream of the corona charging device 11, the term "downstream" of course referring to the counterclockwise direction of rotation of the drum 3.

As illustrated, the exposure station comprises an objective 4, a stationary reflecting mirror 5 and a set of movable reflecting mirrors 6, 7 and 8. It further comprises light sources 9 and a transparent plate-shaped support 10 on which the original to be copied (not illustrated) is positioned. The light from the light sources 9 is reflected in known manner upon successive increments of an original located on the upper side of the plate-like transparent support 10, and the image is focused by the objective or lens 4 onto successive increments of the photoconductive layer on the travelling drum 3 at the exposure station, via the stationary reflector 5.

Downstream of the exposure station there is provided a developing station 12. The light reflected off the original to be copied produces on the photoconductive layer a latent image of the original and it is this image which is developed as the photoconductive layer travels past the developing station. Details of the developing station will be discussed subsequently and it may suffice at this point to recall that at the developing station a pulverulent electroscopic developer material—also known as a toner—is applied to the photoconductive layer to selected portions of which it will adhere to form thereon a powder image.

The thus-produced powder image now advances with continued rotation of the drum 3 to a transfer station where it is subjected to the action of a conventional corona transfer device 13 for transfer onto a copy sheet 11 which is withdrawn from a stack 20 accommodated on a spindle supporting table 19, and which is fed via transport rollers 21 and 22 between the corona transfer device 13 and the adjacent increment of the periphery of the rotating drum 3, to be subsequently deposited on the table 23. The corona transfer device 13 effects in known manner the transfer of the powder images from the photoconductive layer onto the respective copy sheets 17 which thereupon pass past a re-activating light source 14 and a corona discharge device 15 which serves to separate or release the thus-prepared copies or imprinted copy sheets 17 from the drum 3.

As illustrated in FIGS. 1-3, the developing station comprises a container 25 accommodating a pulverulent electroscopic developer material, namely the so-called toner. The container 25 is provided in the illustrated embodiment in its bottom region with outlet apertures 26a and a revolving applicator brush 26 is located in the con-

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tainer 25 and serves to expel controlled quantities of the toner powder through the apertures 26a. From these apertures the toner powder falls onto the inclined scoop conveyor 24 where it is retained by the respective illustrated scoops and conveyed upwardly to a point in the upper region of the drum 3, for controlled application to the charged photoconductive layer on the drum. The scoop conveyor 24 as well as the revolving applicator brush 26 are driven by an electromotor 69 which is illustrated in FIG. 3 and will be discussed in more detail with reference to that figure.

As pointed out before, the toner powder discharged by the scoop conveyor 24 onto the photoconductive layer of the rotating drum 3 adheres to certain portions of the charged photoconductive layer. Excess toner powder falls onto an inclined casing surface 12a of the developer station to slide to a lowermost point in this casing where it can again be engaged or scooped up by the scoops of the scoop conveyor 24.

Guide rails 29 (only one shown) are provided in the housing 1 and the developer station 12 is mounted for movement along the guide rails 29 via rollers 27 and 28. Thus, the developer station 12 can be displaced along the guide rails 29 in a direction substantially radially of the drum 3 (compare FIGS. 1 and 2) between a normal operating position in which it is located proximal to the drum 3 and a withdrawn position in which it is remote from the drum 3, the operating position being illustrated in FIG. 1 and the withdrawn position being illustrated in FIG. 2. When the station 12 is in its operating position shown in FIG. 1, supporting rollers 30 and 31 of the station 12 engage the outer peripheral surface of the drum 3 to support the station 12 in precisely predetermined requisite position relative to the drum 3. Thus, whenever the station 12 has been withdrawn to remote position as shown in FIG. 2, and is subsequently returned to operating position as shown in FIG. 1, a proper location of the station 12 with reference to the drum 3 is automatically obtained without necessitating any adjustments. It will be appreciated, of course, that when it is desired the station 12 can be withdrawn from the housing 1 along the guide rails 29, for instance to replenish the toner in the container 25, and/or to clean toner particles from such portions of the station 12 where they are not desired.

Reference numeral 16 identifies a drum cleaning device or station which removes the remaining toner powder from the photoconductive layer after a completed copy has been discharged or removed from the drum 3 and before the thus-cleaned increments of the photoconductive layer again reach the corona charging device 11 upon continued rotation of the drum 3. This is accomplished by means of a cleaning tape 32 replaceably accommodated in the cleaning device 16 which latter can be removed via a handle 33 from the housing 1, after a non-illustrated latching arrangement is released. The cleaning tape 32, which may consist of paper or another suitable material, is convoluted on a supply roller 35 and is withdrawn incrementally by a non-illustrated drive—preferably derived from the main drive of the copying apparatus—and wound onto a take-up roller 34. It is trained about and maintained taut by guide rollers 37 and 38 and a pressure roller 36 which presses increments of the tape 32 against the travelling photoconductive layer on the drum 3. The roller 36 is mounted on an arm 39 which is pivotable about the axis of the roller 37 and upon which there acts a tension spring 40 one end of which is connected to the portion 39a of the arm 39 whereas the other end is connected to a stationary component of the copying apparatus, for instance the housing 1.

As the drawing shows, the portion 39a of the arm 39 is in engagement with a pin 42 which is guided in a slot 41 provided for this purpose in the housing 1 of the copying apparatus; a linkage rod 43 carries the pin 42 and is

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pivoted at its other free end to a crank 44 which is mounted on an axis 45 fast with a stationary component of the apparatus, for instance the housing 1. An outer actuating lever 46 is mounted on the axis 45 and is provided with a handle 47, so that via the components 46 and 47 the arm 39 can be displaced in clockwise direction against the opposition of the spring 40, whereby the roller 36 is withdrawn from the surface of the drum 3.

As FIGS. 1 and 2 show, the lever 46 is so arranged that at least portions of the lever extend into the path along which the drum 3 must move when it is to be withdrawn from the shaft 2. Thus, it is impossible to withdraw the drum 3 from the shaft 2 unless the roller 36 has been previously withdrawn from contact with the outer surface of the drum 3, whereby assurance is obtained that any damage to the cleaning tape convoluted or trained about the roller 36, or damage to the very delicate photoconductive layer on the peripheral surface of the drum 3 due to careless withdrawal of the drum 3 from the shaft 2 with the drum cleaning device 16 in operative position in which the roller 36 engages the drum 3, is precluded. On the other hand it will be appreciated from the drawing that the device 16 can be removed from the housing 1 whenever it is desired, independent of the position of the lever 46 or the pressure roller 36, due to the engagement between the portion 39a of the arm 39 and the pin 42.

FIG. 1 also shows clearly that the developing station or device 12 also is provided with a portion 12b which cooperates with a pin 49 provided on a free end of a linkage rod and guided in an inclined slot 48 of the housing 1. This particularly linkage rod is composed of a portion 50 carrying the pin 49 and having remote from the pin 49 an elongated slot 50a in which two additional pins 51 and 52 are guided for longitudinal displacement which are secured to the rod portion 53. The rod portion 53 in turn is pivoted to the crank 44 as shown. A tension spring 55 is connected with its opposite ends to the pin 51 and the pin 54 provides on the portion 50. Thus, it has the permanent tendency to shorten the linkage rod composed of the portions 50 and 53 by drawing them together.

Because of the just-described construction, displacement of the developing device 12 via the handle 46 against the drum 3 to normal operating position, with the pin 49 being in abutment with the portion 12c, then the spring—always assuming that the length of the portions 50 and 53 is suitably selected—acts upon the support rollers 30 and 31 during the last portion of the displacement of the device 12 towards the drum 3. This assures that the device 12 will always assume automatically its precisely predetermined relative position with respect to the drum 3, given by the rollers 30 and 31, irrespective of manufacturing tolerances which may be inherent in the components 44, 50 and 53.

As the drawing also shows, the arrangement and positioning of the inclined slot 48 is such that the pin 49 will move into the path of the abutment portion 12c dictated by the guide 29 as the device 12 approaches its right-hand end position (close to its operating position); when the device approaches its left-hand end position—and therefore when the linkage rod 50, 53 is in the left-hand end position—the pin 49 will be located upwardly of the area in which it could be contacted by the portion 12c. Thus, when the device 12 is moved towards the left in FIGS. 1 and 2, to a position remote from the drum 3, the complete removal of the device 12 via a handle 79 is possible without having to operate any further release or latching devices.

FIG. 3 shows an exemplary embodiment of the reversing arrangement utilized in FIGS. 1 and 2. According to FIG. 3 the crank 44 is provided with a cam 44a which cooperates with an activating arm 55 of a micro-switch 56. The latter is connected with a power supply conductor 60 and a magnetic relay 61 via conductors 58 and 59. The relay 61 controls two switches 62 and 63 and is connected via a further conductor 64 with a second

power supply conductor 65. In the embodiment illustrated we have provided a timer 68—which may or may not be of the adjustable type—and which is connected via conductor 66 with switch 63, and via conductors 67 with the power supply conductor 60. The switch 63, which constitutes the holding switch for the relay 61, is further connected via a conductor 89 with the conductor 59 of the relay 61.

Switch 62 is a motor switch for that part of the tandem motor 69 which effects reversal of movement of the scoop conveyor 24 and which acts upon a drive roller 70 of the conveyor. For this purpose the switch 62 is connected via a conductor 71 with the power supply conductor 65, and via an additional conductor 72 with one pole of the drive motor 69 whose other pole is connected with the power supply conductor 60 via a conductor 73.

The other section of the tandem motor 69 which imparts forward movement to the scoop conveyor 24, is connected via conductors 74 and 75 to the power supply conductors 60 and 65. It is controlled by means of a main motor switch 76 which may for instance be activatable by an exteriorly accessible push button or similar switch 77 or in known manner via a motor relay or the like. A further switch 78 is connected in series with the switch 76 and interposed in the conductor 74; switch 78 is mechanically connected with the crank 44 to be controlled by the latter in a sense interrupting the operation of the section of the motor 69 which imparts forward movement to the conveyor 24, at such time at which the device 12 and/or the device 16 are displaced away from the drum 3 by means of the lever 46, so that the drum is free for withdrawing from the shaft 2.

It will be appreciated that as the lever 46 is operated, the cam 44a of the crank 44 briefly contacts the actuating lever 55 of the microswitch 56, so that the latter closes the circuit of the relay 61. This energizes that section of the tandem motor 69 which effects reversal of the movement of the scoop conveyor 24, as well as the timer 68 which is interposed in the holding circuit of the relay 61, with the energization being effected via the switches 62 and 63. In other words, the section of the motor 69 which effects reversal of the movement of the scoop conveyor 24 now turns the drive roller 70 in a sense in which the scoops of the conveyor 24 descend downwardly away from the drum 3 in counterclockwise direction, rather than moving towards the drum 3 in clockwise direction as is ordinarily the case. This reversal of movement continues for a period of time which is determined by the timer 68—and which may be varied, if desired, by adjusting the time if the latter is of the adjustable type—is so selected that the uppermost scoop 24a (see FIG. 3) is returned far enough in counterclockwise direction that no toner powder accompanied in the scoop 24a can fall off the conveyor 24 when the device 12 is moved from the position of FIG. 1 to the position shown in FIG. 2. After this predetermined time interval has expired, the timer 68 interrupts the holding circuit of the relay 61, causing the switch 62 to open and the reversing section of the tandem motor 69 to be de-activated.

In many applications it will be entirely sufficient to omit the timer 68, the switch 63 and the conductors 66, 67 and 77. The reason for this is that the displacement of the lever 46 in a sense moving the device 12 from the position of FIG. 1 to the position of FIG. 2 usually requires a rather constant time, so that in many cases it is sufficient to have the motor switch 62 or the relay 61 controlled only by the cam 44a. If the period of energization and return movement of the scoop conveyor 24, which can be obtained by controlling the reversing time only by the cam 44a is insufficient, then the cam 44a may be provided with an additional cam track portion 44b which increases the energization period and causes the scoop conveyor 24 to move in reverse direction for a longer period of time than would be provided by the cam 44a alone.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in an electrostatic copying apparatus, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

We claim:

1. In an electrostatic copying apparatus, in combination, a xerographic carrier arranged to travel in a predetermined path and having an exposed photoconductive layer adapted to be uniformly charged precedent to transfer of latent images to said layer; a source of pulverulent electroscopic developer material adapted for application to said layer so as to form powder images thereon; conveying means mounted adjacent said path for displacement between operative position in which it is proximal to said layer and a withdrawn position in which it is remote from said layer, so as to facilitate access to said carrier; reversible drive means for normally driving said conveying means in a sense conveying said developer material onto said layer; displacing means operable for displacing said conveying means between said positions thereof; and reversing means connected with said drive means and said displacing means for briefly reversing the former in response to operation of the latter in a sense displacing said conveying means from said operative to said withdrawn position thereof.

2. In an apparatus as defined in claim 1, wherein said carrier is a rotatable drum.

3. In an apparatus as defined in claim 1, wherein said conveying means comprises a scoop conveyor.

4. In an apparatus as defined in claim 1, wherein said drive means comprises a tandem motor having a first section for normally driving said conveying means in a direction conveying said developer onto said layer, and a second section for driving said conveying means in a reverse direction.

5. In an apparatus as defined in claim 1, said reversing means comprising a reversing switch; and wherein said displacing means comprises a displacing lever operable for displacing said conveying means, and a control portion actuated by said lever in response to operation of the latter in a sense displacing said conveying means from said one to said other position, said control portion acting upon said reversing switch in a sense effecting reversing of said conveying means.

6. In an apparatus as defined in claim 5, said control portion comprising a cam track section cooperating with said reversing switch in response to operation of said lever in a sense displacing said conveying means to said other position.

7. In an apparatus as defined in claim 6, said cam track section having a predetermined length selected in accordance with the length of time for which driving of said conveying means is desired to be reversed.

8. In an apparatus as defined in claim 1; and further comprising timer means operatively connected with said reversing means for operation of the same and for thereby

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controlling the length of time during which driving of said conveying means is reversed.

9. In an apparatus as defined in claim 8, wherein said timer means comprises an adjustable timer.

10. In an apparatus as defined in claim 8, said reversing means comprising a reversing switch in circuit with said drive means, and a holding relay interposed in said circuit and having a holding circuit; and wherein said timer means comprises a timer interposed in and controlling said holding circuit.

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References Cited

UNITED STATES PATENTS

3,251,706	5/1966	Walkup	355—3 X
3,062,095	11/1962	Rutkus, Jr. et al.	355—8
3,180,239	4/1965	Shearer et al.	355—3 X

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U.S. Cl. X.R.