United States Patent [19]

Szostak et al.

[11] **3,721,209**

[45] **March 20, 1973**

[54] **DEVELOPING UNIT FOR ELECTROSTATIC COPYING APPARATUS**

[75] Inventors: **Roland Szostak**, Grunwald; **Karl Hartwig**, Unterhaching; **Gunter Maurischat**; **Gunter Schnall**, both of Munich; **Jurgen Vossnacke**, Pullach, all of Germany

[73] Assignee: **Agfa-Gevaert Aktiengesellschaft**, Leverkusen, Germany

[22] Filed: **Oct. 7, 1971**

[21] Appl. No.: **187,405**

[30] **Foreign Application Priority Data**

Oct. 9, 1970 Germany.....P 20 49 650.8

[52] **U.S. Cl.** **118/2,** 117/17.5, 118/7, 118/636, 118/637, 222/DIG. 1

[51] **Int. Cl.**.....**B05c 11/00,** G03g 13/00

[58] **Field of Search**.....118/2, 3, 4, 6, 7, 8, 636, 118/637, DIG. 24; 222/DIG. 1, 76, 63

[56] **References Cited**

UNITED STATES PATENTS

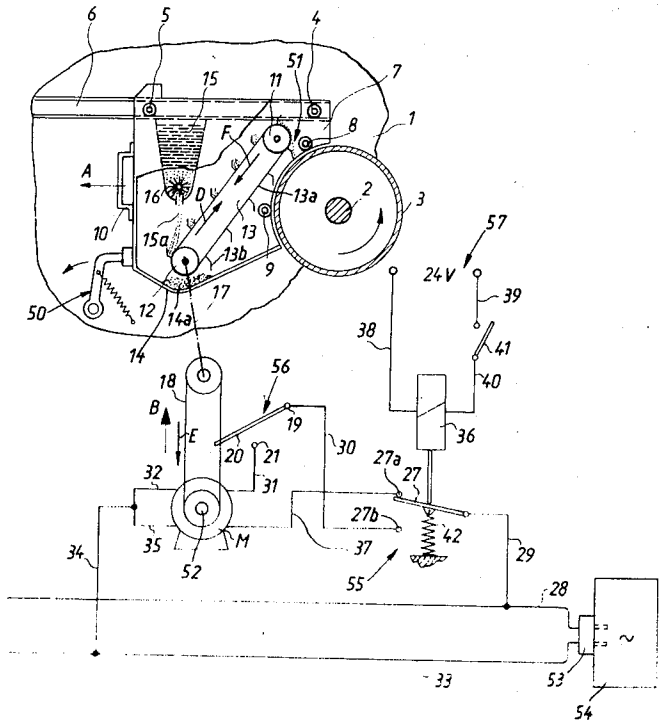
3,251,706	5/1966	Walkup	117/17.5
3,536,042	10/1970	Weiler	118/637
3,376,853	4/1968	Weiler et al.	118/637

Primary Examiner—Mervin Stein
Assistant Examiner—Leo Millstein
Attorney—Michael S. Striker

[57] **ABSTRACT**

An electrostatic copying apparatus wherein a driven xerographic surface which carries electrostatic latent images receives developer material from the buckets of a conveyor which is normally driven in a first direction but can be driven in a second direction to thereby retract the foremost filled bucket away from a dumping position. The conveyor is driven by a reversible electric motor which is automatically started in reverse in response to deenergization of a relay and is automatically arrested after a predetermined interval of operation in reverse to thus insure that the contents of filled buckets on the conveyor are unlikely to spill into the copying apparatus when a carriage which supports the conveyor and a magazine for developer material is moved to and from a retracted position. The circuit of the motor is opened by a switch which is held in closed position by a power train between the conveyor and the motor when the conveyor is driven in the first direction. The switch is caused to open in response to such operation of the power train that the conveyor is driven in the second direction.

11 Claims, 2 Drawing Figures



PATENTED MAR 20 1973

3,721,209

SHEET 1 OF 2

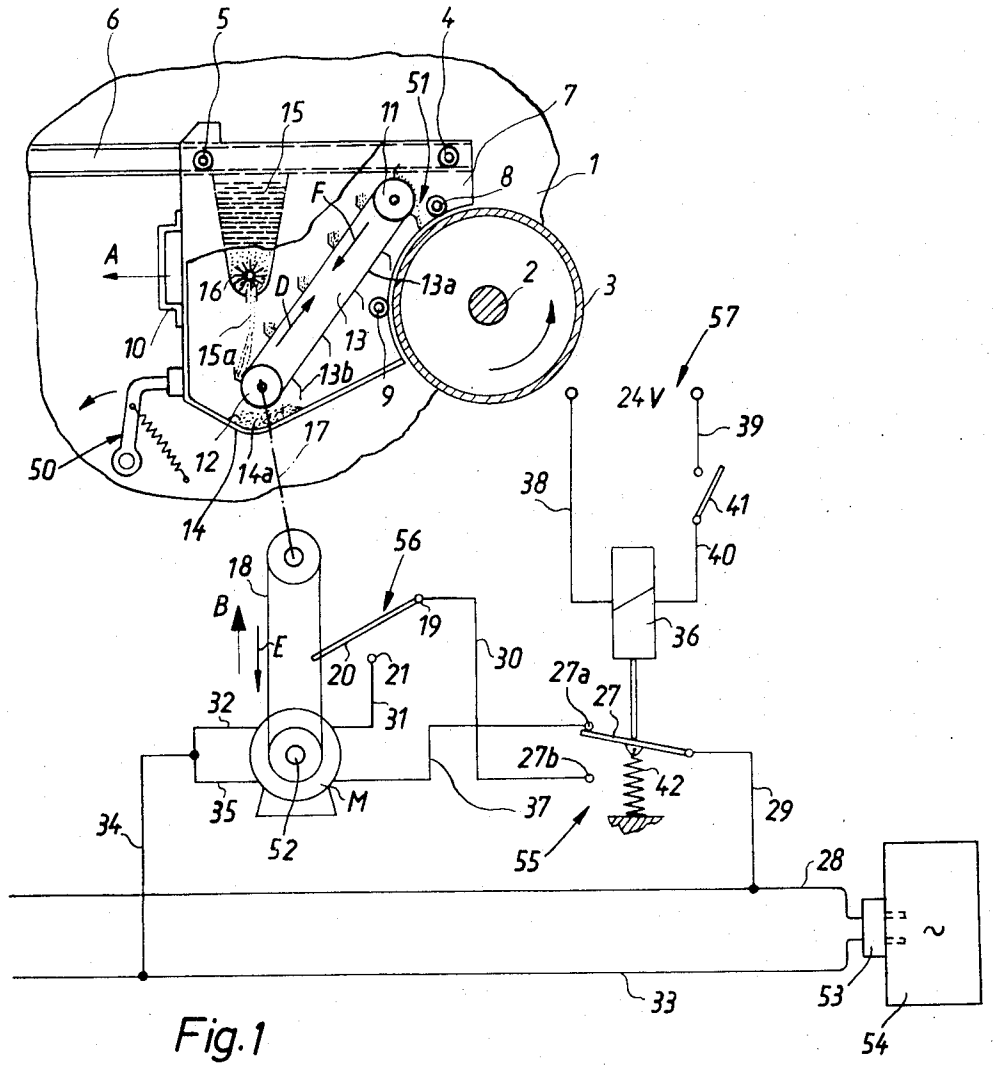


Fig. 1

INVENTOR

BY ROLAND SZOSTAK
KARL HARTWIG
GÜNTER MAURISCHAT
GÜNTHER SCHNALL
JÜRGEN VOSSNACKE

Attorneys

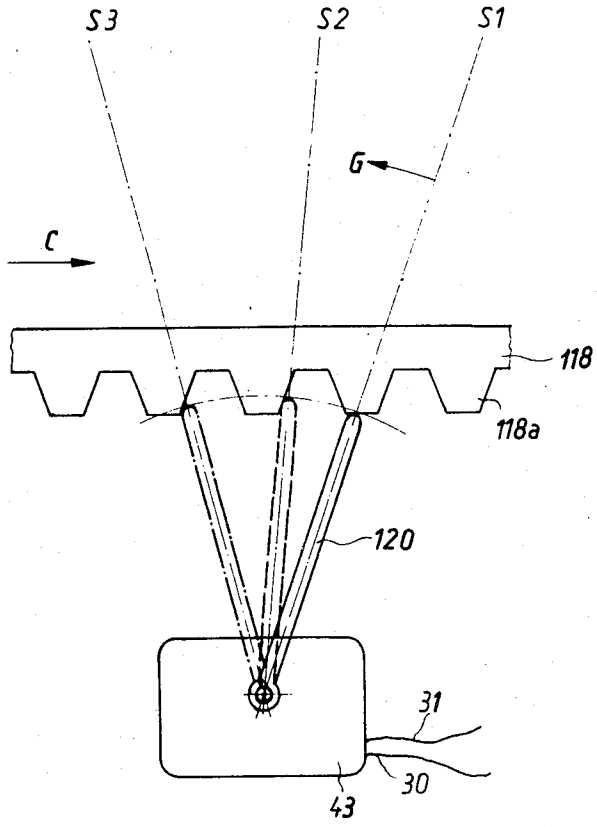


Fig. 2

INVENTOR
ROLAND SZOSTAK
KARL HARTWIG
GÜNTER MAURISCHAT
GÜNTHER SCHNALL
JÜRGEN VOSSNACKE

BY

DEVELOPING UNIT FOR ELECTROSTATIC COPYING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to improvements in electrostatic copying apparatus, and more particularly to improvements in that unit or component of an electrostatic copying apparatus which supplies flowable developer material to a driven xerographic surface to thereby convert electrostatic latent images on such surface into powder images.

It was already proposed to mount various parts of the developing unit in an electrostatic copying apparatus on a carriage or another suitable support which is movable with reference to the driven xerographic surface to and from an operative position. The parts of the developing unit include a source of developer material (such material preferably consists of electroscopic toner particles which are mixed with a suitable granular carrier) and a conveyor which delivers developer material from the source to the driven xerographic surface whereby the thus delivered toner converts electrostatic latent images on the xerographic surface into powder images which are thereupon transferred onto a sheet or web of paper or other transfer material and are fused to such transfer material to obtain permanent copies of the originals.

The conveyor of the developing unit is preferably (but not necessarily) a bucket type conveyor wherein an endless flexible element carries a series of fixedly mounted or pivotable receptacles in the form of buckets which remove developer material from the source and discharge their contents onto the driven xerographic surface at a transfer station. In accordance with a prior proposal, the bucket type conveyor is driven by a reversible motor which can be actuated to change the direction of movement of the conveyor prior to transport of the carriage from its operative position. Such movement of the bucket type conveyor in reverse is intended to prevent one or more filled buckets which dwell at or immediately upstream of the transfer station from discharging their contents into the copying apparatus during movement of the carriage from its operative position. Unnecessary dumping of developer material results in contamination of the copying apparatus as well as in losses in toner particles and carrier granules. In accordance with he aforementioned prior proposal, the motor for the bucket type conveyor must be reversed by hand, and such manipulation can also result in unlatching of the carriage so that the latter is free to move or to be moved from its operative position. The operation of the motor in reverse (i.e., in a direction to move the buckets of the conveyor in a direction which is necessary to prevent the foremost filled bucket or buckets from discharging their contents during movement of the carriage from its operative position) is terminated with a delay which is normally selected by the attendant. It was found that such mode of controlling the operation of drive means for the conveyor is not sufficiently reliable because the foremost receptacle or receptacles are still likely to discharge their contents in response to movement of the carriage from its operative position, for example, if an attendant forgets to start the motor in reverse or if the operation in reverse is not terminated prior to movement of the carriage from its operative position.

SUMMARY OF THE INVENTION

An object of the invention is to provide an electrostatic copying apparatus with a novel and improved developing unit wherein the conveyor which serves to deliver developer material from a source to the driven xerographic surface is less likely to unnecessarily spill developer material prior to and during transport of the developing unit from its operative position than in presently known copying apparatus.

Another object of the invention is to provide an electrostatic copying apparatus with a novel and improved control system which is capable of automatically reversing the direction of movement of the conveyor for developer material when the movement of the conveyor in the normal or forward direction is terminated and which insures that the movement of the conveyor in reverse is terminated with a delay which is necessary to insure that the conveyor is least likely to unnecessarily spill developer material onto the xerographic surface and/or onto or into other parts of the copying apparatus.

A further object of the invention is to provide a control system which embodies the above outlined features and which can be incorporated in presently known electrostatic copying apparatus without necessitating extensive changes in the construction and/or mounting of the developing unit.

The invention is embodied in an electrostatic copying apparatus which comprises a driven preferably drum-shaped xerographic surface, a developing unit including a support which is preferably movable to and from an operative position with reference to the xerographic surface, a source of flowable solid developer material provided on the support, conveyor means mounted on the support and actuatable to move in a first direction to thereby deliver developer material from the source to the xerographic surface and in a second direction at least substantially counter to the first direction, and reversible drive means which is preferably mounted on the support and can move the conveyor means in the first or second direction, and novel control means for the drive means. The control means comprises a reversing device (e.g., a device including a two-way electric switch which is controlled by a relay) a portion of which is movable between a first position in which the drive means is operated to move the conveyor means in the first direction and a second position in which the drive means is operated to move the conveyor means in the second direction, and arresting means for terminating the operation of the drive means with a predetermined delay following the movement of the movable portion of the reversing device to its second position. The arrangement is preferably such that the movable portion of the reversing device automatically assumes its second position when it is caused to leave the first position so that the reversal in direction of movement of the conveyor means from the first to the second direction and the termination of movement in the second direction take place in automatic response to movement of the movable portion of the reversing device from its first position.

If the conveyor means comprises a bucket type conveyor, the movement in the second direction is terminated with such a delay that the foremost filled bucket is invariably caused to assume a position in

which its contents cannot be spilled or dumped when the xerographic surface is arrested and/or when the support for the source and conveyor means is moved from and thereupon to its operative position with reference to the xerographic surface.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved copying apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary schematic partly elevational and partly sectional view of an electrostatic copying apparatus having a developing unit which embodies the invention; and

FIG. 2 is an enlarged elevational view of a detail in a modified developing unit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. 1, there is shown a portion of an electrostatic copying apparatus (also called xerographic developer apparatus) which comprises a frame or housing 1 supporting the shaft 2 of a drum-shaped xerographic surface 3 (hereinafter called drum). The periphery of the drum 3 is provided with a layer of photoconductive insulating material on a conductive backing, and this drum travels repeatedly past a series of xerographic processing stations in a manner well known from the art of electrostatic copying apparatus. FIG. 1 merely shows the developing station for a novel developing unit which is controlled by a novel control system. The drum 3 is assumed to rotate in a counterclockwise direction, as viewed in FIG. 1, and its photoconductive layer is assumed to be provided with an electrostatic latent image prior to travel past the developing station so that the latent image can be converted into a powder image which is thereupon transferred onto a sheet or web of paper or other transfer material and is fused to such transfer material.

The developing unit comprises a support 7 here shown as a carriage which is provided with wheels 4, 5 serving to travel along one or more guide rails 6 provided therefor on the frame 1 so that the carriage 7 can move with reference to the drum 3 to and from the illustrated operative position in which two idler rollers 8, 9 of the carriage abut against the periphery of the drum 3. The carriage 7 is normally held in the illustrated operative operative position by a spring-biased retaining member or latch 50 which can be moved in the direction indicated by the arrow to thereby allow retraction of the carriage 7 from its operative position by way of a handle 10. The direction in which the carriage 7 is movable from the illustrated operative position is indicated by an arrow A.

The carriage 7 supports a magazine, hopper or an analogous source 14 of flowable solid developer material 14*a*. This material consists of electroscopic pulverulent toner mixed with a suitable granular carrier. The size and color of toner particles depend on the intended purpose; such particles normally consist of an electroscopic resin and a colorant such as an organic or inorganic pigment or dye. The carrier granules attract toner to their surfaces.

The carriage 7 further supports a bucket type conveyor 13 which serves to deliver developer material 14*a* from the source 14 to the periphery of the drum 3 at a transfer station 51 which is shown as being adjacent to the idler roller 8. The conveyor 13 comprises one or more endless flexible chains or belts 13*a* which are trained over sprocket wheels or pulleys 11, 12 and carry a series of equidistant receptacles in the form of buckets 13*b*. Successive buckets 13*b* are filled with developer material 14*a* at the lower end turn of the conveyor 13 (i.e., in the region of the sprocket wheel or pulley 12) and their contents are discharged onto the peripheral surface of the drum 3 at the upper end turn of the conveyor 13, i.e., at the transfer station 51. A dispenser 15 for toner particles is mounted on the carriage 7 above the upwardly travelling stretch of the chain or belt 13*a* to discharge toner into successive receptacles 13*b* whereby the toner particles are attracted to the carrier granules. The lower end portion of the dispenser 15 accommodates a rotary brush 16 which discharges accurately metered quantities of toner through one or more outlet orifices 15*a* whereby the stream or streams of toner particles descend onto successive batches of developer material 14*a* in the upwardly moving filled receptacles 13*b*. The purpose of the dispenser 15 is to guarantee a satisfactory toner concentration (i.e., a desirable ratio of toner particles to carrier) which is best suited to insure acceptable quality of developed images on the transfer material. If there is a deficiency of toner in the developer material which is being transported toward the transfer station 51, the areas of the electrostatic latent image will be unable to attract sufficient toner to fully develop the powder image. If there is an excess of toner particles in the filled receptacles 13*b*, the image areas will become overly dark because toner particles are likely to adhere to non-image areas.

The developing unit of the copying apparatus shown in FIG. 1 further comprises a drive means for the conveyor 13. Such drive means comprises a prime mover M, here shown as a reversible electric motor which is preferably mounted on the carriage 7, and a power train 17 which connects the output shaft 52 of the motor M with the shaft for the sprocket wheel or pulley 12. The electric circuit of the motor M comprises two power leads 28, 33 connected with a plug 53 which is automatically coupled to an outlet 54 constituting a source of A-C current when the carriage 7 assumes the operative position of FIG. 1. The plug 53 is disconnected from the outlet 54 in response to movement of the carriage 7 in the direction indicated by the arrow A.

The power train 17 comprises a portion 18 (here shown as an endless flexible belt or chain) which is movable in a first direction (arrow B) to thereby drive the chain or belt 13*a* of the conveyor 13 in a first or forward direction (arrow D) so that the receptacles 13*b* travel from the source 14, below the outlet or outlets 15*a* of the dispenser 15, and toward the transfer station 51 where their contents are caused to cascade over the peripheral surface of the driven drum 3. The belt or chain 18 is further movable in a second direction (ar-

row E) to thereby drive the chain or belt 13*a* of the conveyor 13 in a direction indicated by the arrow F. During movement of the chain or belt 13*a* in the direction of arrow F, a filled receptacle 13*b* which is located at or immediately upstream of the transfer station 51 is moved rearwardly (i.e., downwardly as indicated by the arrow F) so that it safely retains its contents during movement of the carriage 7 in and thereupon counter to the direction indicated by the arrow A. This reduces the likelihood of contamination of the copying apparatus with developer material and unnecessary losses in toner particles and carrier granules during movement of the carriage 7 to and from an inoperative or retracted position in which the source 14 and dispenser 15 are readily accessible for refilling with developer material 14*a* and toner particles.

The control system for the drive means of the developing unit comprises a reversing device 55 for the electric motor M and an arresting device 56 which automatically terminates (with a predetermined delay) the operation of the motor M in reverse, namely, such operation of the motor M that the belt or chain 18 of the power train 17 is driven in the direction indicated by the arrow E. The arresting device 56 includes an electric switch having a movable contact 20 which is pivotable at 19 and a fixed contact 21 which is engaged by the movable contact 20 when the belt or chain 18 of the power train 17 is driven in the direction indicated by the arrow B. The movable contact 20 of the arresting device 56 constitutes a follower which extends into the path of movement of the righthand stretch of the chain or belt 18 and is urged against the fixed contact 21 when the belt or chain 18 moves in the direction indicated by the arrow B. When the direction of movement of the chain or belt 18 is reversed so that the latter moves in the direction indicated by the arrow E, a certain interval of time elapses before the movable contact or follower 20 is caused to assume the illustrated position in which the switch 20, 21 is open and the motor M is disconnected from the current source 54.

The aforementioned reversing device 55 comprises a two-way electric switch which is connected in series with the switch 20, 21 of the arresting device 56. The switch of the reversing device 55 comprises a movable member or contact 27 which can engage a first fixed contact 27*a* or a second fixed contact 27*b*. A helical spring 42 normally biases the movable contact 27 to one of its two positions, for example, toward engagement with the fixed contact 27*b*. The contact 27 can be moved into engagement with the fixed contact 27*a* in response to energization of a relay 36 which is connected to a source 57 of electrical energy (e.g., 24 volts) by conductors 38, 39 and 40. A switch 41 (which may constitute the master switch of the copying apparatus or is mechanically connected with such master switch) must be closed in order to energize the relay 36 and to thereby maintain the movable contact 27 in the illustrated position in which the motor M operates in a forward direction to drive the chain or belt 18 of the power train 17 in the direction indicated by the arrow B. The reference characters 29, 30, 31, 32, 34, 35, 37 denote conductors which connect the switches 20, 21 and 27, 27*a*, 27*b* with each other and with the power leads 28, 33.

THE OPERATION

In order to start the chain or belt 13*a* of the conveyor 13 in the direction indicated by the arrow D, the attendant must move the carriage 7 to the illustrated operative position (in which the idler rollers 8, 9 engage the periphery of the driven drum 3 and the plug 53 is operatively connected with the current source 54) and the switch 41 must be closed to energize the relay 36 and to thus maintain the movable member or contact 27 of the reversing device 55 in engagement with the fixed contact 27*a*. The circuit of the motor M is then completed by way of the power lead 28, conductor 29, contacts 27, 27*a*, conductors 37, 35, 34 and power lead 33. The motor M drives the chain or belt 13*a* of the conveyor 13 in the direction indicated by the arrow D, i.e., the chain or belt 18 of the power train 17 is driven in the direction indicated by the arrow B. The righthand stretch of the chain or belt 18 closes the switch of the arresting device 56 by causing the movable contact 20 to pivot at 19 in a counterclockwise direction, as viewed in FIG. 1, and to engage the fixed contact 21. Such closing of the switch 20, 21 has no effect on the operation of the motor M, as long as the movable contact 27 engages the fixed contact 27*a* of the two-way switch of the reversing device 55. The receptacles 13*b* of the conveyor 13 draw developer material 14*a* from the source 14 and transport such material (arrow D) below the outlet or outlets 15*a* of the dispenser 15 to enrich the developer material with toner particles. The receptacles 13*b* are caused to discharge batches of developer material at the transfer station 51 whereby such material converts the electrostatic latent image on the drum 3 into a powder image.

If the switch 41 is opened on purpose by an attendant or automatically, for example, in response to a signal which is produced by a detector of the copying apparatus, the relay 36 becomes deenergized and the spring 42 automatically moves the contact 27 into engagement with the fixed contact 27*b*. The operation of the motor M is thereby reversed in a fully automatic way because the motor circuit is completed by way of the power lead 33, conductors 34, 32, 31, contacts 21, 20 of the switch of the arresting device 56, conductor 30, contacts 27*b*, 27 of the switch of the reversing device 55, conductor 29 and power lead 28. The output shaft 52 of the motor M drives the power train 17 in such a way that the chains or belts 18, 13*a* respectively travel in the directions indicated by arrows E and F. Thus, the foremost filled receptacle 13*b* is moved downwardly and away from the transfer station 51 and the righthand stretch of the chain or belt 18 moves the contact 20 away from the contact 21 so that the motor M comes to a complete stop at a time when the filled receptacles 13*b* of the chain or belt 13*a* are held in positions in which they are unlikely to spill their contents due to eventual shaking during movement of the carriage 7 from and back toward the operative position shown in FIG. 1.

The motor M is immediately started in a forward direction, so that the chain or belt 13*a* is driven in the direction indicated by arrow D, when the relay 36 is energized on closing of the switch 41 because the operation of the motor M in a forward direction is not affected by the position of the movable contact 20 in

the arresting device **56**. When the motor M drives the chain or belt **18** in the direction indicated by the arrow B, the movable contact or follower **20** automatically returns into and is held in engagement with the fixed contact **21** so that the arresting device **56** is ready to interrupt the operation of the motor M with a desired delay as soon as the spring **42** is free to move the contact **27** into engagement with the fixed contact **27***b*.

FIG. **2** illustrates certain portions of the drive means and control means in a modified developing unit. The reference character **118** denotes an endless flexible belt which forms part of a power train corresponding to the power train **17** shown in FIG. **1**. When the motor M (not shown) which drives the power train including the belt **118** is operated in a forward direction, the belt **118** travels in the direction indicated by the arrow C. This belt is provided with a row of projections or teeth **118***a* which serve as entraining means for a pivotable follower or trip **120** forming part of a modified arresting device for the reversible prime mover of the drive which includes the belt **118**. The arresting device further includes a microswitch **43** which is connected in the circuit of the prime mover by conductors **30, 31** corresponding to the similarly referenced conductors shown in FIG. **1**. The microswitch **43** is closed and completes the circuit of the prime mover for operation in reverse when the belt **118** travels in the direction indicated by the arrow C. The entraining projections **118***a* then cause the follower **120** to move back and forth between the positions S1 and S2 in which the microswitch **43** is closed. A spring (not specifically shown) urges the follower **120** in a counterclockwise direction, as viewed in FIG. **2**, toward the position S3 in which the microswitch **43** is open and arrests the prime mover (i.e., the microswitch terminates the operation of the prime mover in reverse). The spring is free to move the follower or trip **120** to the position S3 when the direction of movement of the belt **118** is reversed (see the arrow G), i.e., when the belt **118** is driven in a direction corresponding to the direction indicated by the arrow E shown in FIG. **1**. The entraining projections **118***a* then assist the aforementioned spring in moving the follower **120** to the position S3 to thus open the microswitch **43** and to terminate the operation of the prime mover in reverse at a time when all of the filled receptacles **13***b* of the conveyor **13** (not shown in FIG. **2**) dwell in positions in which they are unlikely or less likely to discharge developer material during movement of the carriage from and back to its operative position. The microswitch **43** may be any commercially available microswitch which is capable of opening an electric circuit in response to movement of the follower **120** to or close to the position S3 shown in FIG. **2**. The belt **118** can be a commercially available toothed belt with a row of teeth which constitute the entraining projections **118***a*. The distance between the projections **118***a* and the pivot axis of the follower **120** is selected in such a way that the tip of the follower **120** rides over successive projections **118***a* when the follower assumes the position S1. These projections **118***a* are preferably capable of moving the follower **120** to the position S3 in automatic response to a change in the direction of movement of the belt **118** from that indicated by the arrow C to that which is indicated by arrow G. The normally very short delay with which the microswitch **43** opens in response to travel of the belt **118** in the direction indicated by the arrow G suffices to move the foremost filled receptacle **13***b* from the transfer station **51** so that such receptacle (as well as each filled receptacle behind it) is either incapable or less likely to discharge developer material onto the drum **3** and/or into the copying apparatus when the carriage **7** is being moved along the guide rail or rails **6**.

An important advantage of the improved developing unit is that the attendant need not be concerned with the rearward transport of the conveyor **13** because such rearward transport takes place in automatic response to termination of forward transport of the chain or belt **13***a*. Thus, all the operator (or an automatic detector) has to do is to terminate the forward operation of the motor M by deenergizing the relay **36**; the control system then takes over and first causes the motor M to drive the conveyor **13** in reverse (due to the provision of spring **42** which moves the contact **27** into engagement with the contact **27***b* as soon as the relay **36** is deenergized) and thereupon arrests the motor M with requisite delay (on opening of the switch in the arresting device) so that the uncontrolled discharge of developer material is either impossible or highly unlikely in spite of such mounting of the carriage **7** that it can move to and from an operative position, a movement which normally brings about some shaking of the receptacles **13***b* in the conveyor **13**. As a rule, the motor M will be arrested by the arresting device **56** of FIG. **1** or the arresting device including the microswitch **43** of FIG. **2** before the operator can unlatch the retaining device **50** so that the carriage **7** is free to move in the direction indicated by the arrow A.

It is further clear that the improved developing unit is susceptible of many additional modifications. For example, the follower **20** or **120** can be constructed and mounted in such a way that it is held in frictional engagement with the belt **18** or **118** or another movable portion of the power train between the motor M and the conveyor **13**. The structure which is shown in FIGS. **1** and **2** is preferred at this time because its reliability is not dependent on such variable factors as the coefficient of friction of the material of the movable portion of the power train and/or the coefficient of friction of the material of the follower in the arresting device. It is further clear that the follower **20** or **120** can be arranged to receive motion from the flexible element **13***a* of the conveyor **13** or from a gear, pulley or other movable part of the power train.

The motor M can be any one of a number of commercially available reversible-polarity electric motors, e.g., a conventional tandem motor which can drive its output shaft **52** in two directions, depending on the manner in which it is connected with the energy source.

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 which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

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

1. In an electrostatic copying apparatus, a combination comprising a driven xerographic surface; a developing unit including a support, a source of flowable developer material provided on said support, conveyor means mounted on said support and actuatable to move in a first direction and to thereby deliver developer material from said source to said surface and in a second direction at least substantially counter to said first direction, and reversible drive means for said conveyor means; and control means for said drive means comprising a reversing device including a member movable automatically upon leaving a first position in which said drive means is operated to move said conveyor means in said first direction to assume a second position in which said drive means is operated to move said conveyor means in said second direction, and arresting means for terminating the operation of said drive means with a predetermined delay following the movement of said member of said reversing device to said second position thereof.

2. A combination as defined in claim 1, wherein said support is movable with reference to said xerographic surface to and from an operative position in which the developer material delivered by said conveyor means can reach successive increments of said surface.

3. A combination as defined in claim 1, wherein said conveyor means comprises an endless flexible element having a plurality of receptacles arranged to discharge developer material onto said xerographic surface when said drive means moves said flexible element in said first direction.

4. A combination as defined in claim 3, wherein said predetermined delay is such that a receptacle which is about to discharge developer material is moved to a material retaining position in response to movement of said flexible element in said second direction.

5. A combination as defined in claim 1, wherein said drive means comprises a portion which moves in one direction when said drive means moves said conveyor means in said first direction and in another direction when said drive means moves said conveyor means in said second direction, said arresting means comprising follower means which is engaged by said portion of said drive means and arrests said drive means in response to movement of said portion of said drive means in said other direction.

6. A combination as defined in claim 5, wherein said drive means comprises a reversible prime mover and a power train connecting said prime mover with said conveyor means, said portion of said drive means forming part of said power train.

7. A combination as defined in claim 6, wherein said portion of said drive means comprises a plurality of entraining elements for said follower means.

8. A combination as defined in claim 1, wherein said drive means comprises a reversible electric motor and said reversing device comprises a two-way electric switch in circuit with said motor, said switch having first and second fixed contacts and a movable contact which respectively engages said first and second contacts when said motor is respectively operated to move said conveyor means in said first and second directions.

9. A combination as defined in claim 8, wherein said control means further comprises relay means actuatable to assume first and second conditions and to thereby respectively effect a movement of said movable contact into engagement with said first and second fixed contacts.

10. A combination as defined in claim 9, wherein said reversing device further comprises means for permanently biasing said movable contact into engagement with said second fixed contact.

11. A combination as defined in claim 1, wherein said drive means comprises a prime mover and a power train connecting said prime mover with said conveyor means, said power train including a portion arranged to move in one direction during movement of said conveyor means in said first direction and in another direction during movement of said conveyor means in said second direction, said arresting means comprising a microswitch and a follower extending into the path of movement of said portion of said power train and arranged to maintain said microswitch in a first condition in which the microswitch permits the operation of said prime mover during movement of said portion of said power train in said one direction and to cause said microswitch to assume a second condition with said predetermined delay following the start of movement of said portion of said power train in said other direction whereby said microswitch effects a termination of operation of said prime mover.

* * * * *