

Dec. 19, 1961

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3,013,703

POWDER DISPENSING APPARATUS

Filed Nov. 28. 1958

4 Sheets-Sheet 1

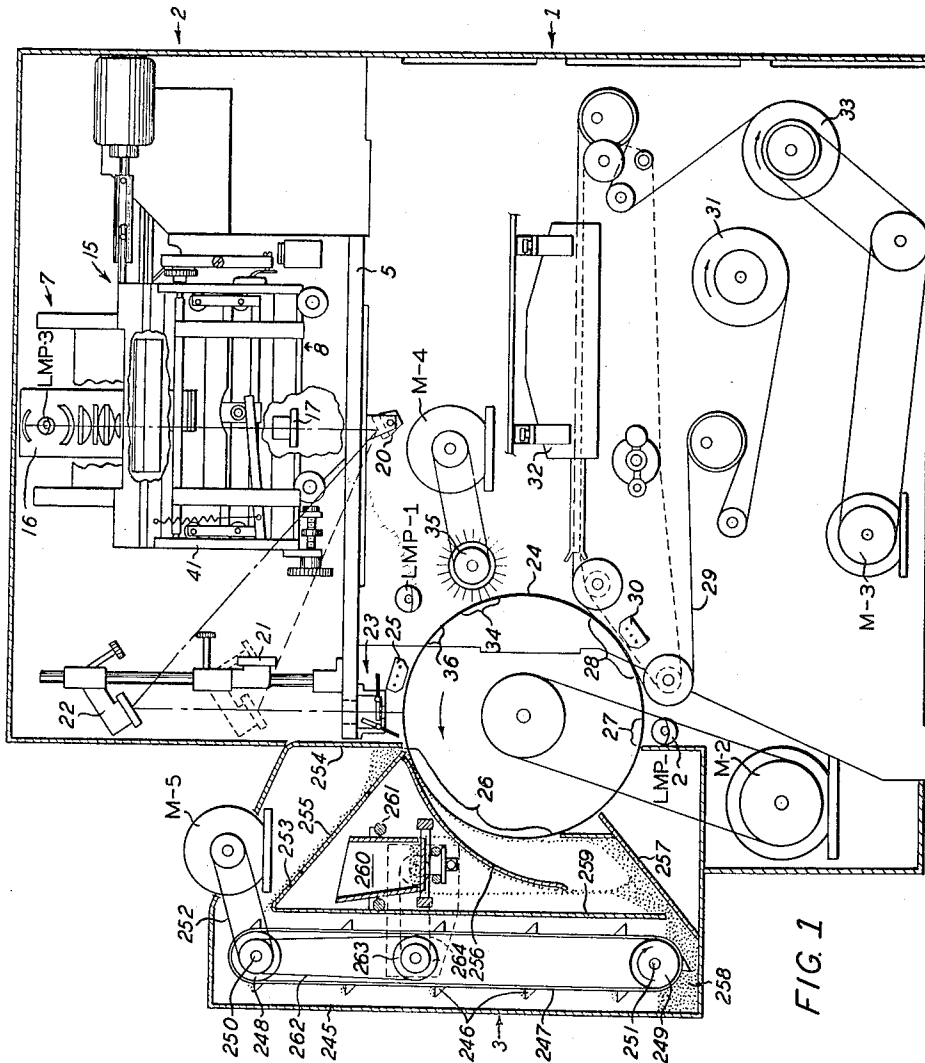


FIG. 1

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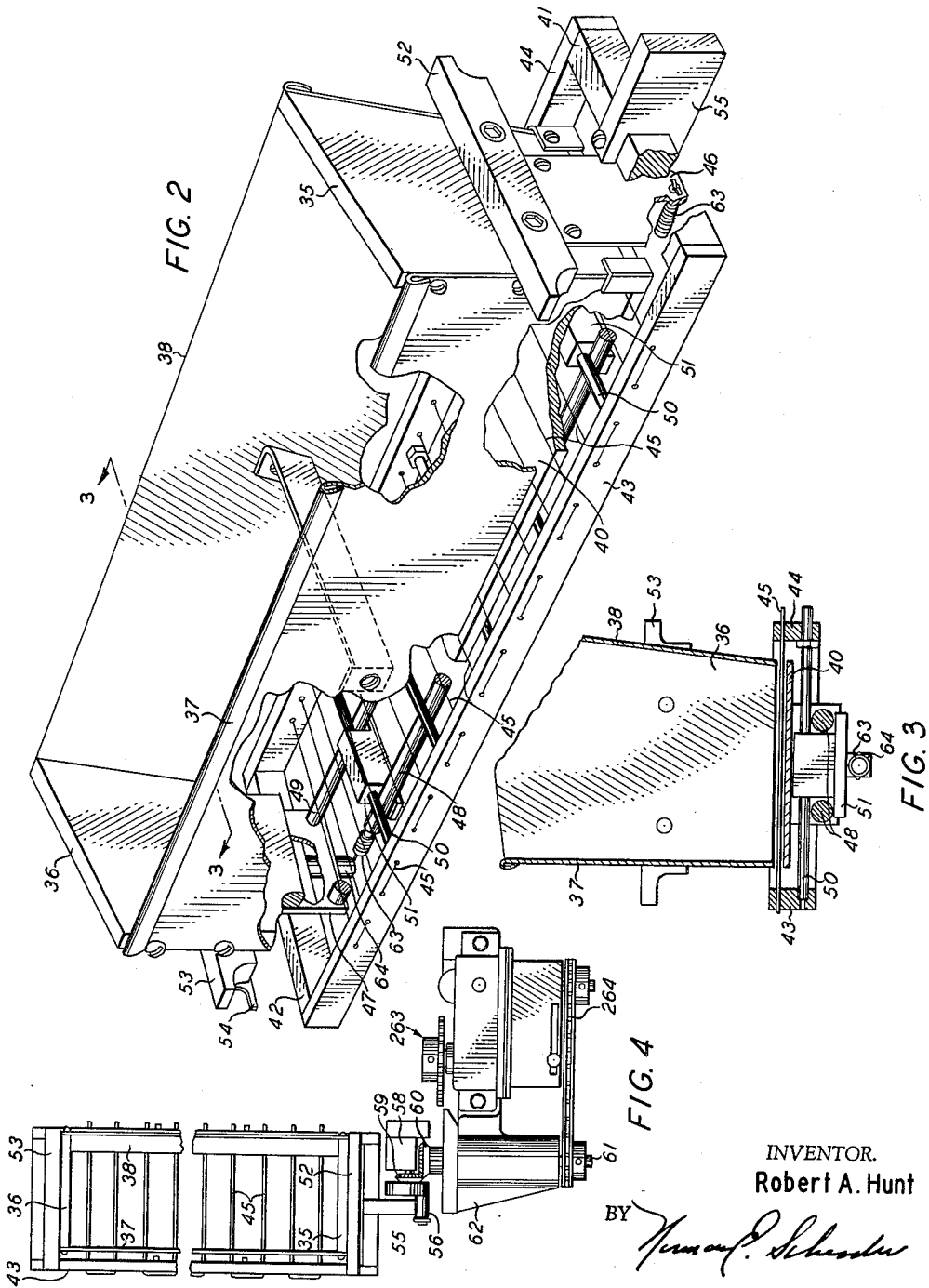
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4 Sheets-Sheet 2



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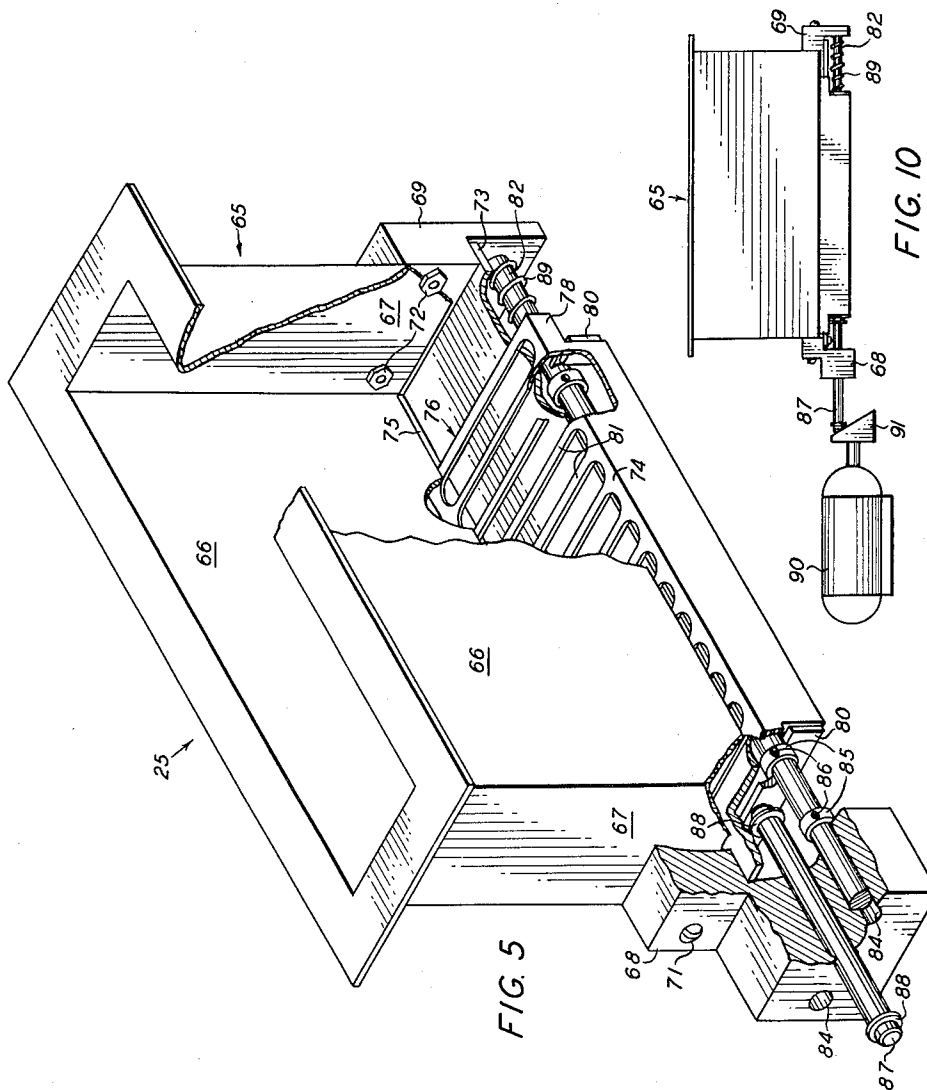
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POWDER DISPENSING APPARATUS

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4 Sheets-Sheet 3



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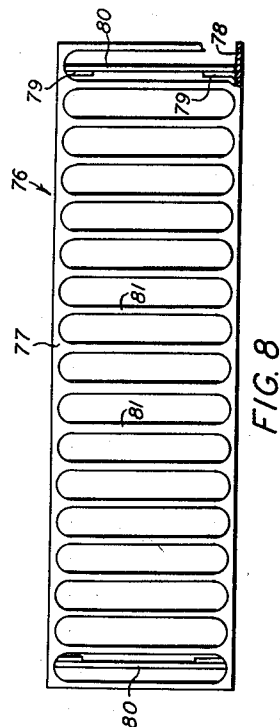
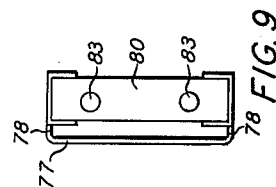
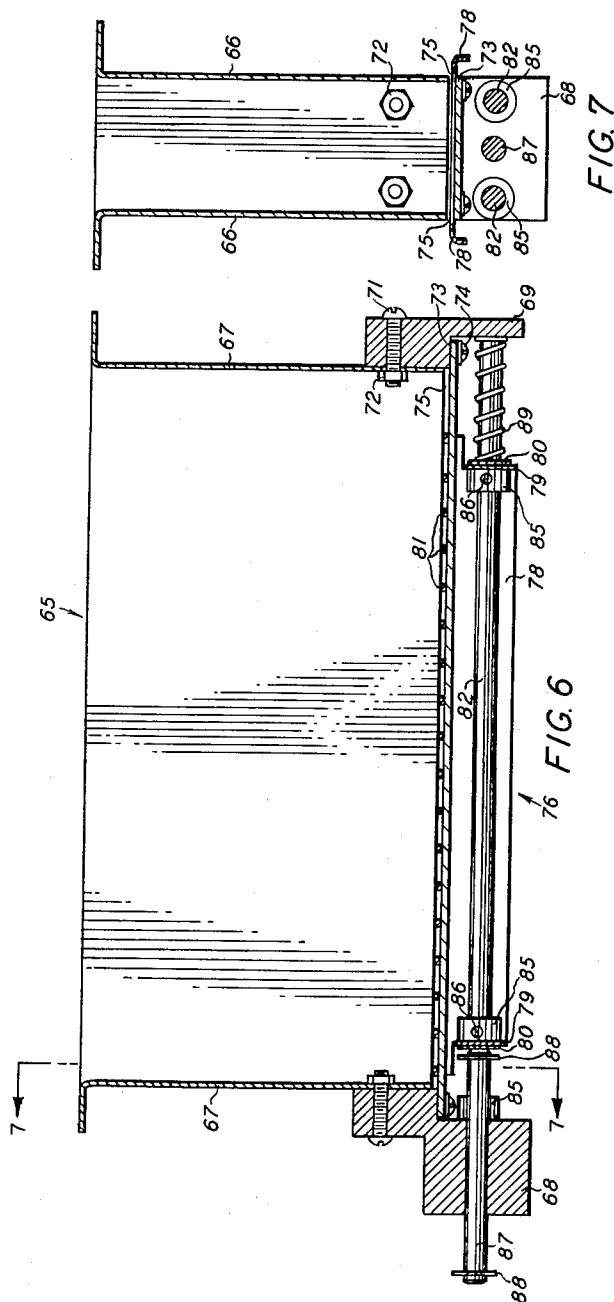
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POWDER DISPENSING APPARATUS

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4 Sheets-Sheet 4



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3,013,703

POWDER DISPENSING APPARATUS

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Filed Nov. 28, 1958, Ser. No. 776,976

6 Claims. (Cl. 222-409)

This invention relates to improvements in apparatus for dispensing powder or granulated material and, particularly, to improvements in xerographic toner dispensing apparatus.

More specifically, the invention relates to an improved toner dispenser that is particularly adapted for use in a xerographic developing apparatus wherein, in order to develop the electrostatic latent image formed on a xerographic plate, it is required to dust the image with a developer powder, whereby the powder particles are selectively attracted to the charged areas of the plate to form a visible powder particle image of the electrostatic latent image.

In the process of xerography, for example, as disclosed in Carlson Patent 2,297,691, issued October 6, 1942, a xerographic plate, comprising a layer of photoconductive insulating material on a conductive backing, is given a uniform electric charge over its surface and is then exposed to the subject matter to be reproduced, usually by conventional projection techniques. This exposure discharges the plate areas in accordance with the light intensity which reaches them and thereby creates an electrostatic latent image on or in the plate coating.

Development of the image is effected with developers which comprise, in general, a mixture of a suitable pigmented or dyed electrostatic powder, hereinafter referred to as toner, and a granular carrier material, which latter functions to carry and to generate triboelectric charges on the toner. In addition, the granular material functions to provide mechanical control to the powder, or to carry the powder to an image surface and, simultaneously, to provide almost complete homogeneity of charge polarity. In the development of the image, the toner powder is brought into surface contact with the coating and is held thereon electrostatically in a pattern corresponding to the electrostatic latent image. Thereafter, the developed xerographic image is usually transferred to a support material to which it may be fixed by any suitable means.

In the mixture of toner particles and carrier material, the toner particles, which are many times smaller than the carrier particles, adhere to and coat the surface of the carrier particles due to the electrostatic attraction between them. During development, as the powder-coated carrier particles roll or tumble over the xerographic plate carrying an electrostatic latent image of opposite polarity to the charge on the toner, toner particles are pulled away from the carrier by the charged latent image and deposit on the plate to form a powder image, while the partially denuded carrier particles pass off the plate. As toner powder images are formed, additional toner particles must be supplied to the developer mixture in proportion to the amount of toner deposited on the plate.

If prints, made by the xerographic process, have heavy deposits of toner in image areas of good contrast and non-image areas have a gray veiling, the toner concentration in the developer mixture is too great. If the prints have low contrast images, the quantity of toner particles in the developer mixture is insufficient. Thus, in order continually to obtain prints of good quality, the quantity of toner powder in the developer mixture must be held reasonably constant by the addition of toner to the developer mixture in proportion to the amount of toner deposited on the plate.

It is, therefore, the principal object of this invention to improve apparatus for dispensing powder or granulated

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material. Another object of this invention is to improve the operation of toner dispensing systems whereby accurately metered amounts of toner are added to the developer mixture in a xerographic machine in relation to the amount of toner used by the machine to make xerographic copy. A further object of the invention is to improve powder dispensing devices whereby an automatic metering arrangement controls the rate of discharge from the dispenser.

These and other objects of the invention are attained by means of a toner dispenser which includes a hopper having an opening at the bottom thereof, a dispensing plate mounted beneath the opening in the hopper and spaced from the hopper, and a perforated grid plate mounted for reciprocating movement between the hopper and the dispensing plate.

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description of the invention to be read in connection with the accompanying drawings, wherein:

FIG. 1 illustrates schematically a preferred embodiment of a xerographic apparatus adapted for continuous and automatic operation, and incorporating a toner dispenser in accordance with the invention;

FIG. 2 is a perspective view of a first form of the toner dispenser of the invention, partially broken away to illustrate the several elements of the mechanism;

FIG. 3 is a sectional view taken on the line 3-3 of FIG. 2;

FIG. 4 is a plan view of the toner dispensing grid of FIG. 2, together with its actuating mechanism;

FIG. 5 is a perspective view of a second form of the toner dispenser of the invention, partially broken away to illustrate the various elements of the device;

FIG. 6 is a detail vertical sectional view of the toner dispenser of FIG. 5;

FIG. 7 is a sectional view of the toner dispenser taken along line 7-7 of FIG. 6;

FIG. 8 is a plan view of the dispensing grid of the toner dispenser of FIG. 5;

FIG. 9 is an end view of the dispensing grid of FIG. 8; and

FIG. 10 illustrates a suitable drive for the toner dispenser of FIG. 5.

Although it forms no part of the subject invention, there is shown schematically in FIG. 1 a xerographic reproduction apparatus of the type disclosed in my copending application Serial No. 776,848, filed herewith, for the purpose of illustrating a suitable environment for the toner dispenser of the subject invention, the toner dispenser being used to replenish the toner consumed in the xerographic process.

As in all xerographic systems based on the concept disclosed in the above-cited Carlson patent, a light image of copy to be reproduced is projected onto the sensitized surface of a xerographic plate to form an electrostatic latent image thereon. Thereafter, the latent image is developed with an oppositely charged developing material to form a xerographic powder image, corresponding to the latent image, on the plate surface. The powder image is then electrostatically transferred to a support surface to which it may be fused by any suitable form of fusing device, whereby the powder image is caused permanently to adhere to the support surface.

In the system disclosed herein, microfilm cards are placed in a card magazine 7 from which they are fed serially to a card carriage of a card handling apparatus, generally designated by reference character 15, arranged to the rear of the card magazine assembly. Suitable driving means are provided for the card carriage whereby it is caused to move the card past the optical axis of

a projection system 16 that is illuminated by a projection lamp LMP-3 for the purpose of scanning the microfilm frame. The microfilm card image is projected downwardly through an adjustable objective lens assembly 17 and then reflected upwardly by an adjustable mirror element 20 to either of two transverse mirror assemblies 21 or 22, in order to vary the length of the optical path, depending on the magnification ratio employed. From mirror assemblies 21 or 22, the light image is projected downwardly through a variable slit aperture assembly 23 onto the surface of a xerographic plate in the form of a drum 24.

Xerographic drum 24 includes a cylindrical member mounted in suitable bearings in the frame of the machine and is driven in a counterclockwise direction by a motor M-2 at a constant rate that is proportional to the scan rate of the microfilm card, whereby the peripheral rate of the drum surface is identical to the rate of movement of the reflected light image. The drum surface comprises a layer of photoconductive material on a conductive backing that is sensitized prior to exposure by means of a screened corona generating device 25, which may be of the type disclosed in Walkup Patent 2,777,957, that is energized from a suitable high potential source.

The exposure of the drum to the light image discharges the photoconductive layer in the areas struck by light, whereby there remains on the drum a latent electrostatic image in image configuration corresponding to the light image projected from the microfilm card. As the drum surface continues its movement, the electrostatic latent image passes through a developing station 26 in which a two-component developing material, which may be of the type disclosed in Walkup Patent 2,638,416, is cascaded over the drum surface.

After developing, the xerographic powder image passes a discharge station 27 at which the drum surface is illuminated by a lamp LMP-2, whereby residual charges on the non-image areas of the drum surface are completely discharged. Thereafter, the powder image passes through an image transfer station 28 at which the powder image is electrostatically transferred to a support surface web 29 by means of a second corona generating device 30 similar to corona charging device 25, mentioned above.

The support surface to which the powder image is transferred may be of any convenient type and is obtained from a supply roll 31 and is fed over suitable guide and tensioning rolls and directed into surface contact with the drum in the immediate vicinity of transfer corona generating device 30. After transfer, the support surface is separated from the drum surface and guided through a suitable heat fusing apparatus 32, whereby the powder image is permanently affixed to the support surface. Thereafter, the support surface is fed over a further system of guide and tensioning rolls and onto a take-up roll 33 that is driven by motor M-3.

After transfer, the xerographic drum surface passes through a cleaning station 34 at which its surface is brushed by a cleaning brush assembly 35, rotated by a motor M-4, whereby any residual developing material remaining on the drum is removed. Thereafter, the drum surface passes through a second discharge station 36 at which it is illuminated by a fluorescent lamp LMP-1, whereby the drum surface in this region is completely flooded with light to remove any electrostatic charge that may remain thereon. Suitable light traps are provided in the system to prevent any light rays from reaching the drum surface, other than the projected microfilm image, during the period of drum travel immediately prior to sensitization by corona generating device 25 until after the drum surface is completely passed through the developing station 26.

In order to effect development of the electrostatic latent image formed on the xerographic drum, the invention disclosed in my above-cited copending application includes an improved developing system that is particularly adapted

to effect uniform and consistent development, regardless of drum width, and is specially suited to effect development on the 24" wide drum employed on the xerographic reproduction apparatus disclosed therein. The entire developing system is contained in an end section 3 of the apparatus and is formed of a plurality of sheet metal plates that are integrally connected to provide a completely dust-tight housing.

In the specific arrangement shown, the conveyor system includes a plurality of transverse buckets 246 that are horizontally supported between two endless belts 247 on opposite sides of the developer system housing and extend over pulleys 248 and 249 that are fixed respectively on transverse shafts 250 and 251. For actuating the conveyor system, upper shaft 250 is driven through a belt 252 by a motor M-5 that rotates constantly while the machine is in operation.

The developing material conveyed upwardly by the conveyor system is discharged onto an inclined plate 253 that extends transversely across the entire developing system structure, and extends downwardly to a point at which it forms a transverse slit orifice in conjunction with a sheet metal plate 254 of the developer system housing. The slot formed by plates 253 and 254 is of sufficient width to permit an adequate flow of developing material into contact with the xerographic drum surface, but is sufficiently narrow to impede the progress of the developing material and cause it to back up on plate 253 to form a substantial reserve of developing material while the machine is in operation. Thus, since the rate of developer flow is a function of slot width rather than head of material, a uniform flow of developing material is maintained at all times. For convenience of maintenance, an access door 255 is hinged in an aperture in plate 253 and, together with plate 253, forms a substantially continuous surface for transporting developing material.

To minimize undesired bouncing of the developing material within the system, a curved baffle plate 256 is secured along the lower edge of plate 253 and extends transversely across the machine in spaced relation to the xerographic drum. The spacing is such as to permit complete freedom of movement of the developing material between the plate and the xerographic drum, and the outward curve of plate 256 is effective to guide substantially all of the developing material downwardly onto an inclined transverse plate 257 whereby the developing material is guided into a collecting bin 258 formed by the cover plates of the apparatus wherein it may conveniently be scooped by conveyor buckets 246.

In order to limit the amount of developing material in collecting bin 258, the apparatus includes a catch baffle plate 259 that extends transversely across the entire developing system housing and has its lower edge spaced from the surface of plate 257 to control the flow of developing material into the collecting bin. By this arrangement the amount of developing material in bin 258 cannot exceed the height of the lower edge of baffle 259. Developing material in excess of this level backs up on the incline of plate 257 and is contained by the vertical face of baffle plate 259 to replace the developing material removed from bin 258 by buckets 246. By this means it is possible to keep a substantially constant supply of developing material in the collecting bin and to maintain a substantially constant load on the conveyor system.

As the developing material is cascaded over the xerographic drum, toner particles are pulled away from the carrier component thereof and deposited on the drum to form powder images, while the partially denuded carrier particles pass off the drum into the collecting bin. As toner powder images are formed, additional toner particles must be supplied to the developing material in proportion to the amount of toner deposited on the drum. To supply additional toner particles to the developing material, there is provided a toner dispensing mechanism 260, that constitutes one form of the subject matter of the inven-

tion. Toner dispenser 260 is supported on transverse rods 261 in the developing system housing, and is driven from shaft 250 via belt 262, pulley assembly 263 and belt 264.

In operation, the toner dispenser functions to sift toner particles onto the developing material that has cascaded over the xerographic drum surface. In order to ensure uniform distribution of new toner, the toner dispenser extends horizontally substantially across the drum surface and functions to distribute a uniform flow of toner particles throughout its entire width, in accordance with the dispensing rate required.

To ensure adequate mixing of the toner particles with the developing material, at least a portion of them are caused to deposit on curved baffle plate 256. To cause these particles to be mixed with the remaining developing material, a narrow slot is formed in access door 255 on guide plate 253 whereby a portion of the developing material supported by plate 255 is caused to pass through the slot and over the surface of plate 256 thereby flushing the toner particles into the developing material supply at the bottom of the housing.

In the form of the invention shown in FIGS. 2, 3 and 4, the toner dispenser includes a rectangular frame formed by end plates 35 and 36, and side plates 37 and 38 that are integrally connected at their respective corners. The lower edges of end plates 35 and 36 extend slightly below the lower edges of side plates 37 and 38 and are connected along their bottom edges by a base plate or dispensing platform 40 having its upper surface arranged in spaced relation to the lower edges of side plates 37 and 38. By this means there is formed a rectangular box-like toner hopper or reservoir having longitudinal slots between the lower edges of the side plates and the dispensing platform thereof.

For agitating and dispensing the supply of toner particles placed in the hopper, there is provided a rectangular frame comprising end rails 41 and 42 and side rails 43 and 44 for supporting a continuous wire 45 that is threaded through holes disposed in the side rails to form a plurality of substantially parallel wire struts extending therebetween. The several elements of the hopper and agitating and dispensing frame are so assembled that wire struts 45 extend through the lateral slots formed by the lower edges of side plates 37 and 38 and the top of dispensing platform 40.

To minimize undue friction between the parts and to prevent crushing of toner particles, the agitating frame is supported in a manner to hold wire struts 45 slightly above the upper surface of dispensing platform 40. For this purpose, extension plates or supporting members 46 and 47 are secured to the outer faces of end plates 35 and 36, respectively, and serve to support lateral rod members 48 and 49 therebetween that underlie base plate 40. Rod members 48 and 49 serve as supporting rails for a plurality of transverse rods 50 that are secured in the side rails 43 and 44 of the agitating frame. Motion limiting blocks 51 are secured on each of the end rods 50 to prevent transverse movement of the frame.

For supporting the toner dispenser frame within the developing system housing, notched bars 52 and 53 are secured respectively to the outer faces of end plates 35 and 36. The notches in bars 52 and 53 are employed to overlie transverse rods 261, secured in the developer system housing, as indicated in FIG. 1. A suitable locking means 54 are provided to maintain the toner dispenser assembly fixed on rods 261.

For actuating the agitating and dispensing frame relative to the hopper, the frame is provided with an extension member 55 that engages a stud 56 eccentrically mounted on a wheel 57 that is rotatably mounted on a stud fixed in a frame member 58 in the machine. Also fixed on wheel 57 is a bevel gear that meshes with a bevel gear 60 that is fixed on a shaft 61 that is suitably journaled in a frame piece 62 and is rotated by motor M-5,

as described above. The driving action of stud 56 against extension 55 moves the agitating frame to the left in FIG. 2, against the tension of a spring 63 that is extended between a pendant portion on extension plate 46 and a stud 64 that is secured in end rail 42 of the agitating frame. By this arrangement an oscillating motion is imparted to the agitating and dispensing frame relative to the toner hopper. When the hopper is filled with toner particles, this action is effective to cause the particles to move transversely of the hopper and to fall off the longitudinal edges of dispensing platform 40 at a uniform rate, whereby they are caused to mix with the developing material in the developing system housing, as described above.

For adjusting the rate of dispensing toner particles, stud 56 may conveniently be positioned at any desired off-center location on eccentric wheel 55 in order to vary the stroke imparted to the agitating and dispensing frame.

In connection with the function and manner of operation of the toner dispenser herein, it is deemed desirable briefly to discuss the problems and terms related to the handling of toner powder and similar finely divided substances.

The term "fluidized," as used herein and by those skilled in the art of handling very finely divided particles, simply means that these powder particles under certain conditions behave as if they were actually a fluid instead of being solid mass particles. This fluidized effect created in a mass of dry particles may be caused by having a sufficient quantity of aeriform fluid trapped around substantially the entire outside area of each of these finely divided particles, so that these particles are literally dispersed in the aeriform fluid. Another interesting characteristic of these minute powder particles is that under certain conditions they will agglomerate or pack together so tightly that they literally become a solid mass. This condition probably occurs when there is substantially no aeriform fluid surrounding the powder particles, a condition which could occur when there is sufficient powder in a pile force the aeriform fluid out of the bottom layers of powder particles in the pile. The agglomeration of the powder particles may also be effected as a result of cold flow, that is, although the particles may not be at a sufficiently high temperature to fuse together, they may be sufficiently viscous to cause the particles to weakly adhere to each other.

In the operation of the toner dispenser, a supply of toner powder is placed within the hopper, whereby the hopper and dispensing platform form a reservoir for the toner powder. Toner powder is retained within this reservoir, even though the discharge passages or gaps between the side walls of the hopper and dispensing plate are much larger in width than the largest dimension of any particle of toner, because the toner particles seem to agglomerate to form a bridge or breakable seal across these gaps.

With this in mind it is believed, although the theory of operation is not precisely known, that on reciprocation of the dispensing grid, the wires of said grid slice through the column of toner powder resting on the dispensing platform thereby pushing a small quantity of powder in front of them and, since the powder particles flow in the path of least resistance, they gravitate toward the sides of the powder column and spill off either edge of the dispensing platform.

As the grid wires pass through the column of toner powder they cut a path through the pile permitting powder particles to fall down behind the grid wires, thus agitating the column of powder particles. The wires in passing back and forth through the pile tend to carry air into the pile, the air filtering up and replacing air which has normally been lost through the settling action of the pile. The small quantity of air thus introduced into the pile is believed sufficient to aerate the column to prevent the caking or bridging over of the powder

particles; however, this small quantity of air is not sufficient to aerate the column of powder particles to the point where the powder particles become fluidized since obviously this latter condition would permit all of the toner powder to flow out of the discharge passages and thereby prevent accurate dispensing of the toner particles from the toner dispenser. Since this condition does not occur it is believed that the particular dispenser structures disclosed herein are effective repeatedly to break the toner seal across the discharge passages, but permit these openings in the seal immediately to be resealed as toner powder falls into the voids in the seals, and thereby provide an accurately controllable toner dispensing apparatus.

Referring now to the alternate form of the invention shown in FIGS. 5 through 10, inclusive, there is provided a hopper or container 65 for the toner particles to be dispensed. Although the hopper or container 65 may be made of any suitable material in any size or shape, the hopper shown is fabricated from sheet metal into a rectangular open-ended box having vertical side walls 66 and end walls 67, the upper ends of the walls being bent outward to form horizontal flanges by means of which the hopper may be attached to a suitable support, as described above in connection with the first form of the invention.

At opposite ends of the hopper are positioned depending bearing blocks or support members 68 and 69 for supporting the remaining elements of the toner dispenser, the bearing blocks or support members being attached to end walls 67 by screws 71 and nuts 72.

The bottom of the hopper is partially closed by a dispensing plate or platform 73 positioned in spaced vertical relation below the lower edges of the walls of the hopper. The dispensing plate or platform 73 which is as wide as the hopper is secured to the underside stepped portions of support members 68 and 69 by screws 74. The dispensing plate or platform 73 combines with the walls of the hopper 65 to provide a reservoir having narrow elongated discharge outlets or discharge passages 75 for the flow of toner particles.

To effect substantially uniform flow of toner particles through the outlets or passages 75 there is provided a metering element, generally designated 76, having a dispensing grid 77 positioned for reciprocating motion in the space between the dispensing platform 73 and the lower edges of the walls of the hopper 65. The metering element 76 as shown in FIGS. 8 and 9 has a dispensing grid 77 formed by a top wall having a series of transverse perforations or slots formed therein, and depending side walls 78, the ends of which are bent inward at right angles to form flanges 79 to which support plates 80 are secured as by spot welding. For ease and economy in manufacturing the metering element is formed as a sheet metal stamping, the slots being formed relatively close to each other and to the transverse edges of the top wall so that after the slots are formed there remains only narrow strips of metal simulating wires 81, the width of the metal remaining between slots being only sufficiently wide to prevent them from being bent out of shape in the stamping process.

The metering element 76 is supported by parallel guide rods or rod members 82 extending through holes 83 in support plates 80, the ends of the rod members being journaled for reciprocating motion in apertures 84 formed in bearing blocks 68 and 69. As seen in FIG. 6, the movement of rod members 82 to the left is limited by collars 85 adjustably secured thereto by set screws 86, while movement of the metering element 76 with respect to rod members 82 is prevented by collars 85 secured by set screws 86 to the guide rods inboard of the support plates 80.

For effecting movement of the metering element a plunger rod 87 is journaled in third aperture 84 in bearing block, to be actuated by a suitable power source such

as motor 90 driven cam 91 to effect the forward stroke of the metering element to the right, as shown in FIG. 6. To limit the movement of the plunger rod, retaining rings 88 are secured in suitable grooves at each end of the plunger rod. The return stroke of the metering element is effected by coiled springs 89 encircling the grid rods 82 and abutting at opposite ends against the bearing block 69 and a support plate 80 to bias the metering element to the left.

As shown, the dispensing grid is positioned between dispensing platform 73 and the lower edge of the walls of the hopper 65 in spaced relation to each other to permit free reciprocating movement of the grid. The space or clearance between each of the last-named elements may be varied during fabrication to accommodate the particle size of toner or other granular material to be dispensed. For example, it has been found that a very satisfactory uniform dispensing rate for toner having a particle size of from .7 to .9 micron can be had by a toner dispenser in which the spacing between the dispensing platform 73 and the lower edges of the walls of the hopper 65 is between .028 to .038 inch, preferably .033 inch, while the spacing between both the dispensing platform and the dispensing grid and the spacing between the dispensing grid and the lower edges of the walls of the hopper is between .007 to .010 inch, preferably .0075 inch when using .018 inch thick sheet metal for the dispensing grid 77.

In the operation of the toner dispenser, a supply of toner particles is placed within the hopper, the hopper and dispensing platform forming a reservoir for the toner particles. Upon reciprocation of the dispensing grid 77 toner particles fall onto the dispensing platform and are pushed forward by the individual wires 81. As the toner particles are pushed forward, either on the forward stroke or on the return stroke, they take the path of least resistance and gravitate toward the outer margins of the wires, falling through the open grid work of the dispensing grid and over the edge of the dispensing platform.

In FIG. 6, the dispensing grid 77 is shown sufficiently shorter than the length of the hopper 65 so that the collars 85 can be adjusted on rod members 82 to prevent the dispensing grid from striking support members 68 and 69 as it is reciprocated, the length of stroke also being adjusted so that the path of movement of a wire overlaps the path of movement of the next adjacent wire.

In the embodiment of the toner dispenser shown, the respective spacing between the dispensing platform, the dispensing grid and the lower edges of the walls of the hopper is fixed. However, it is often necessary to vary the amount of toner particles dispensed per unit of time and to accomplish this, this toner dispenser of the invention is adapted to control the dispensing rate in one of two ways.

Since the toner dispenser provides a uniform dispensing rate per stroke, the dispensing rate can be varied by varying the number of strokes per unit of time; thus, for example, the motor 90 shown in FIG. 10 may be a variable speed motor.

The dispensing rate may also be varied by changing the length of stroke of the dispensing grid 77, which, for example, may be accomplished in its simplest form by adjustment of the right-hand collars 85 on the grid rods 82, see FIG. 6, or by other suitable means common in the art.

While the toner dispenser of the invention is shown as being rectangular in shape, it is apparent that any suitable shape may be used without departing from the invention. It is also apparent that in lieu of having a stationary hopper with a moving dispensing grid a satisfactory toner dispenser may be constructed having a moving hopper positioned over a stationary dispensing grid. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A toner dispenser for a xerographic machine, said toner dispenser including a hopper having end walls and

side walls for retaining toner powder, said hopper having an open bottom, a dispensing platform mounted below and in spaced relation to said hopper to form opposed discharge outlets with the side walls of said hopper, a combined toner powder aerator and dispensing member disposed for reciprocating movement between said hopper and said dispensing platform and having a path of movement substantially parallel to the side walls, said aerator and dispensing member constituting a rigid assembly including an open grid frame having spaced grid members extending transversely thereof, said grid members extending through said discharge outlets, and means connected to said aerator and dispensing member for reciprocating said aerator and dispensing member.

2. A xerographic toner dispenser including a hopper having end walls and side walls for retaining granulated material, said hopper having an open bottom, a dispensing platform mounted below and in spaced relation to said hopper to form opposed discharge outlets with the side walls of said hopper, support members secured to opposite end walls of said hopper and extending below the walls of said hopper, rod members connected to said support members, a combined toner powder aerator and dispensing member supported on said rod members for reciprocating movement between said hopper and said dispensing platform and having a path of movement substantially parallel to the side walls, said aerator and dispensing member constituting a rigid assembly including parallel spaced transverse dispensing members extending through said discharge outlets, and means connected to said aerator and dispensing member for reciprocating said aerator and dispensing member.

3. A xerographic toner dispenser including a hopper having end walls and side walls for retaining granulated material, said hopper having an open bottom, a dispensing platform mounted below and in spaced relation to said hopper to form opposed discharge outlets with the side walls of said hopper, support members secured to opposite end walls of said hopper, rod members fixed to said support members, a combined aerator and dispensing member slidably mounted on said rod members for reciprocating movement between said hopper and said dispensing platform and having a path of movement substantially parallel to the side walls, said aerator and dispensing member including an open grid frame having parallel spaced grid members extending transversely thereof, said grid members extending through said discharge outlets, said grid members and said open frame being fixedly connected whereby said aerator and dispensing member constitutes a rigid assembly, and means connected to said aerator and dispensing member for reciprocating said aerator and dispensing member.

4. A xerographic toner dispenser including a hopper having end walls and side walls for retaining granulated material, said hopper having an open bottom, a dispensing platform mounted below and in spaced relation to said hopper to form opposed discharge outlets with the

side walls of said hopper, support members secured to opposite end walls of said hopper, rod members connected in spaced parallel relation to such other in said support members, a combined aerator and dispensing member connected to said rod members for reciprocating movement between said hopper and said dispensing platform and having a path of movement substantially parallel to the side walls, said aerator and dispensing member including a rigid plate member having relatively closely spaced transverse perforations therein with relatively narrow strips of plate member material remaining between said perforations, said strips of plate member material forming dispensing members extending through said discharge outlets, and means connected to said aerator and dispensing member for reciprocating said aerator and dispensing member.

5. A xerographic toner dispenser including a hopper open at top and bottom, support members secured to opposite walls of said hopper and extending below the walls of said hopper, a dispensing platform secured to said support members in spaced parallel relation to said hopper, rod members connected in spaced parallel relation to each other in said support members, a rigid dispensing grid slidably mounted on said rod members for reciprocating movement between said opposite walls and arranged in the space between said hopper and said dispensing platform, and means including a plunger rod journaled in one of said support members for imparting reciprocating movement to said dispensing grid.

6. A xerographic toner dispenser including a hopper open at top and bottom, support members secured to opposite walls of said hopper and extending below the walls of said hopper, a dispensing platform secured to said support members in spaced parallel relation to said hopper, rod members connected in spaced parallel relation to each other in said support members, a rigid dispensing grid slidably mounted on said rod members for reciprocating movement between said opposite walls and arranged in the space between said hopper and said dispensing platform, spring means to bias said dispensing grid in one direction, collars adjustably secured to said rod members to limit movement of said dispensing grid, and means including a plunger rod journaled in one of said support members for imparting reciprocating movement to said dispensing grid.

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