

[54] **TONER METER DEVICE**

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[51] Int. Cl. **G03g 13/00**, B05b 5/02

[58] Field of Search 118/637; 117/17.5; 101/DIG. 13; 222/353, 367, 456

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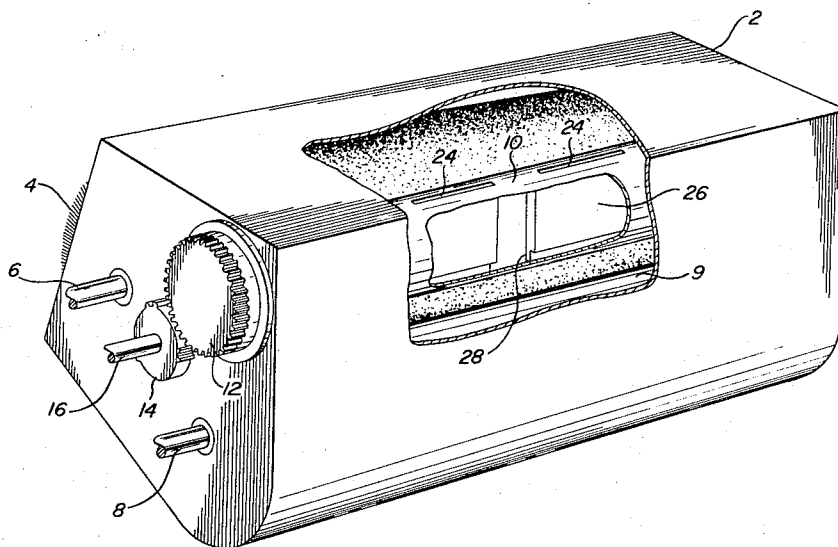
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[57] **ABSTRACT**

A cartridge dispenses toner through a plurality of chutes mounted inside the cartridge. The chutes communicate with openings in the body of the cartridge permitting measured amounts of toner to pass therethrough upon rotation of the cartridge by a suitable drive means.

4 Claims, 6 Drawing Figures



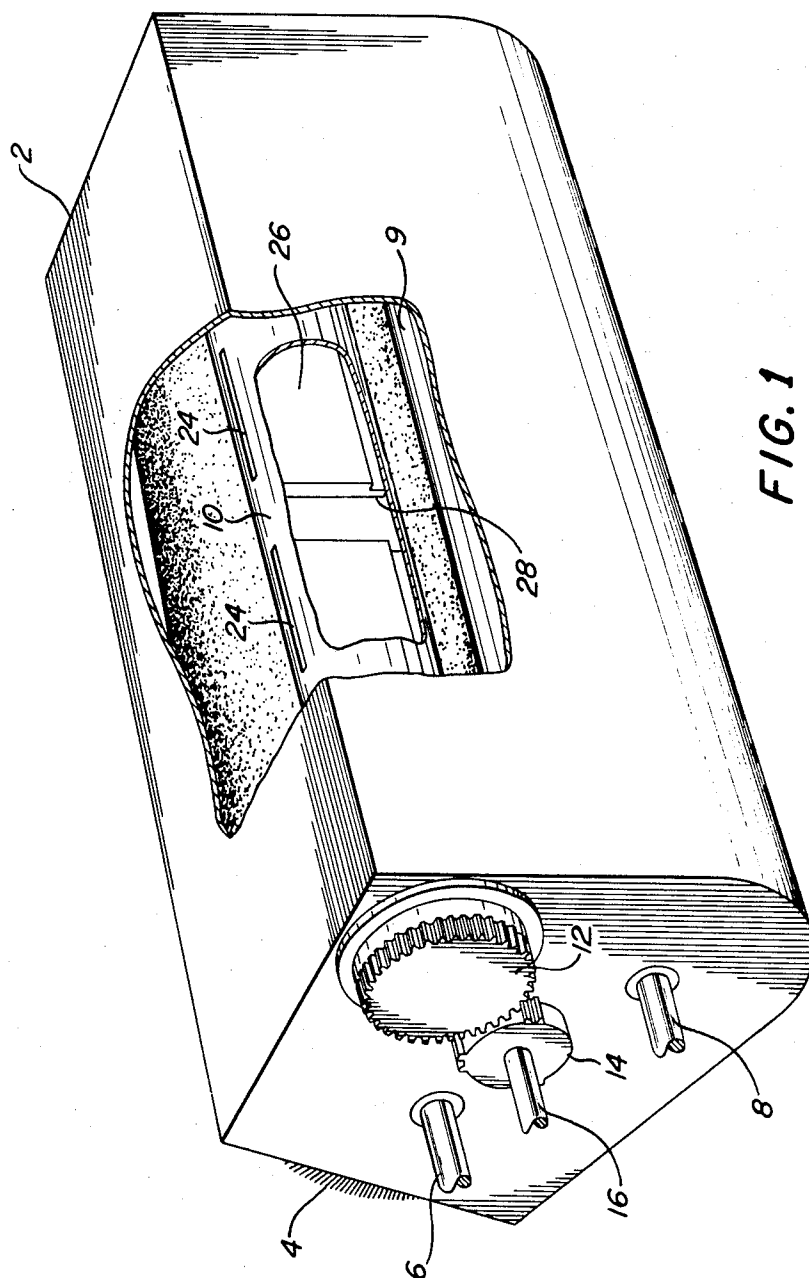


FIG. 1

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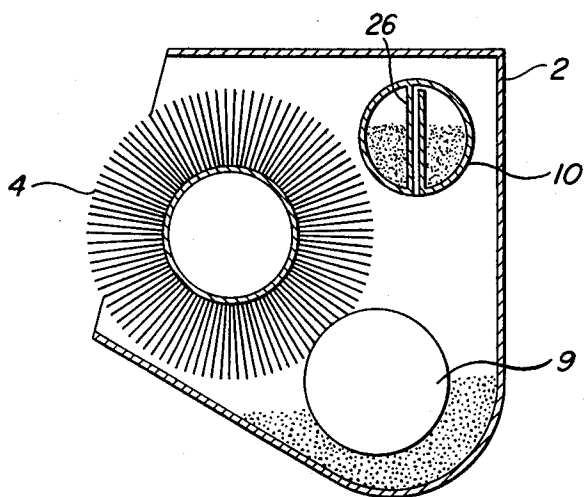


FIG. 2

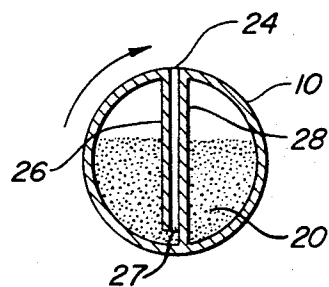


FIG. 4

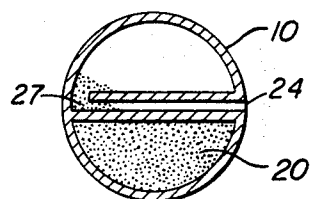


FIG. 5

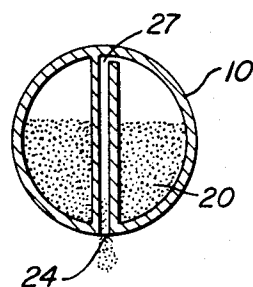


FIG. 6

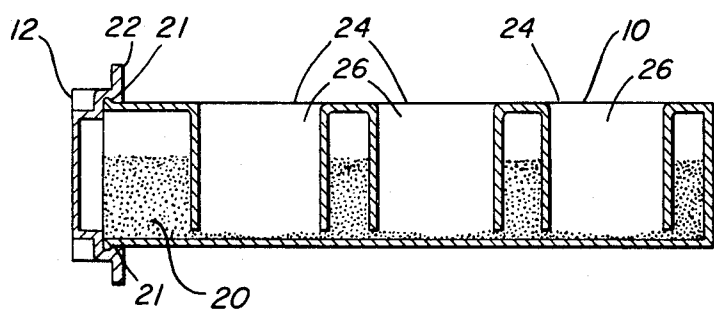


FIG. 3

TONER METER DEVICE

This invention relates to a dispenser device. More particularly, this invention relates to a toner dispensing apparatus which may be utilized in a xerographic reproducing apparatus.

BACKGROUND OF THE INVENTION

In a xerographic reproducing apparatus latent electrostatic images are formed on a dielectric or photoconductive surface. The images so formed are rendered visible by depositing developer material comprising finely divided fusible powder or toner and carrier particles in contact with the latent electrostatic images. The toner particles have an initial charge and are attracted to the image areas of the charged surface. The developed images may then be transferred to a permanent surface. The carrier particles or beads are normally larger in surface area than the toner particles and serve as a means for imparting a triboelectric charge to the toner particles as well as a means for preventing agglomeration of the toner particles. As the reproducing apparatus continues in operation, the toner supply is depleted and must be replenished from time to time in order to provide clear copies having good contrast. Also the toner must be dispensed in a manner so that background or deposition of toner in the non-image areas is avoided. In the past, toner dispensing was regulated by visual inspection by the machine operator. It is clear that this manner of toner dispensing requires too much operator time.

A page of line copy constitutes approximately 5 percent of the area of the page. With this knowledge it is possible to determine the average amount of toner used per copy and to add toner in proportion to the amount of copies made. Thus, a toner metering and dispensing device is useful either in a system where the number of copies is counted manually or automatically.

Accordingly, it is an object of this invention to provide a reusable toner dispenser cartridge.

It is another object of this invention to provide a dispenser which dispenses a metered amount of toner into the developer reservoir in proportion to the amount of toner consumed.

It is yet another object of this invention to provide a toner dispenser in which measured amounts of toner are separated from the main toner supply and deposited into the developer system by positive action of the dispenser.

BRIEF DESCRIPTION OF THE INVENTION

The present invention provides a cartridge type toner dispenser. The overall size of the cartridge depends upon the amount of toner to be dispensed. The cartridge is rotatably mounted over the developer reservoir so that metered amounts of toner are dispensed upon rotation of the cartridges at a prescribed rate. A plurality of chutes each communicating with an opening in the container are formed within the container or cartridge and separate a measured amount of toner from the main body of toner in order to provide enough toner for optimum development conditions.

In order to gain a better understanding of the invention as well as other objects and further features thereof, reference is made to the following detailed description of the invention to be read in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view of a fibrous applicator developing system with parts broken away to show the toner dispenser of the present invention;

FIG. 2 is a cross-sectional view of the developing system of FIG. 1;

FIG. 3 is a side elevational view through a section of the toner dispenser; and

FIGS. 4-6 are cross-sectional views showing the position of the toner dispenser during its dispensing operation.

Referring now to FIG. 1 developer housing 2 is partly broken away to show the inside thereof. A fur brush 4 is rotatably mounted on opposite walls of housing 2 by means of shaft 6. An input shaft 16 supports a segmented gear 14 on the exterior side wall of housing 2. Segmented gear 14 serves as the drive means for rotating dispenser cartridge 10. Segmented gear 14 also has the additional function of agitating the toner within cartridge 10. That is, segmented gear 14 because of the spaced teeth provides a jerking rotational motion to cartridge 10 preventing agglomeration of the toner therein. Also rotatably mounted on opposite walls of housing 2 is shaft 8 which drives a donor roll 9. As seen through the breakaway view cartridge dispenser 10 has a plurality of axially spaced openings or slots 24 from which a metered amount of toner may be dispensed. The breakaway view of cartridge 10 also shows that the openings 24 communicate with chutes 26 which conduct a quantity of toner to the opening 24. Removably connected to an end portion of cartridge 10 and rotatably supported on an end wall of housing 10 is gear 12 molded into a cap to fit over cartridge 10. Gear 12 is rotated by segmented gear 14.

Referring to FIG. 2, there is shown a side cross-sectional view of developer housing 2. The operation of the dispenser system begins with the rotation of gear molded cap 12 by segmented gear 14 (shown in FIG. 1). Cartridge 10 is rotated thereby so that a quantity of toner is conducted by chute 26 into the reservoir of housing 2. Donor roll 9 may be connected to the same driving means as is cartridge 10 and serves to prevent agglomeration of the toner in the reservoir by agitating it and also to present toner to brush applicator 4.

For optimum image development the toner 20, the donor roll 9 and the brush applicator 4 should be made from materials arranged in the triboelectric series. In this manner, any material placed in contact with another material which is below it in the triboelectric series will become positively charged and the other material will become negatively charged. Thus, if a positive charge electrostatic image on a surface is to be developed an electrostatically attractable powder is selected which is below the surface's material in the triboelectric series. The electrostatically attractable particles will then become charged to a negative polarity by contact with the materials of the surface above it in the triboelectric series and will be deposited upon the positively charged image by electrical attraction. It should be noted that fibrous member 4 may also be connected to the same drive means as cartridge 10. The rate of rotation and thus dispensing of cartridge 10 is pre-adjusted so that an amount of toner is dispensed into the reservoir of housing 2 in accordance with the amount of toner consumed. This is achieved by calculating the amount of toner used by a single copy or groups of copies per unit time and then rotating the

toner dispenser at a rate required to replenish the toner consumed.

FIG. 3 is a side elevational view of cartridge 10 showing the detail of cartridge 10. Gear molded cap 12 is removably fitted over nubs 21 at the open end of the body portion of cartridge 10. Flange 22 serves as a bearing surface for rotating cartridge 10 on the side wall of housing 2. In FIG. 3 toner 20 contained within cartridge 10 is conducted by a plurality of chutes 26 to openings 24. Turning to FIGS. 4-6 there is shown one of a plurality of chutes 26 inside of cartridge 10. Chutes 26 have an opening 27 remote from opening 24 of cartridge 10. As cartridge 10 is rotated in the direction shown by the arrow a quantity of toner is permitted to pass from bottom opening 27 in wall 26 to outside cartridge opening 24 by gravity flow as shown in FIG. 5. When the opening 24 reaches the downward position shown in FIG. 6 a metered amount of toner calibrated to that which has been consumed is deposited in the reservoir of housing 2.

The appropriate rate of dispensing toner and thus rotation rate of cartridge 10 can most easily be obtained from a gear train having some connection with the paper feed mechanism of the recording apparatus. The amount of toner dispensed per single rotation is made dependent upon the size of the gaps in the chute wall and the spacing between the chute walls. Cartridge 10 may be molded plastic and used to ship the toner itself, or it may be made of some sturdier material such as brass. In either case one end is plugged allowing toner to be added when necessary.

From the foregoing a metered toner dispenser has been described. It will occur to those skilled in the art that the present invention may be used generally as a dispenser means. Also, other variations, modifications and adaptations of the present invention will be apparent to those skilled in the art and such as come within the purview and scope of the appended claims are considered to be embraced by the present invention.

What is claimed is:

1. A toner dispenser comprising:

an enclosed container adapted to hold a quantity of toner material therein said container having two end portions and a body portion having means defining openings along one surface, one of said end portions being a removable cap having gear moldings about its periphery and adapted to cover

one end of said body portion for permitting replenishment of said toner within said container, the other end portion of said container being integral with said body portion, said body portion having a plurality of inner separate chutes communicating with said openings in said body portion, one of the walls of said chutes having an opening remote from the opening in said body portion, and drive means connectable to said gear molded cap end portion for rotating said container whereby a metered amount of toner is collected in said chutes and emitted from said cartridge.

2. In a developer system having a housing containing a quantity of toner, a donor roller for triboelectrically transferring the toner to a fibrous member for application to a charged surface for development thereof and having a toner dispenser comprising:

a cartridge adapted to hold a quantity of toner, said cartridge having a body portion enclosed by two end portions, said body portion having at least one opening on its surface, at least one chute inside said cartridge, said chute communicating with the opening in the surface of said cartridge, one of said chute walls having an opening at the end remote from said body opening whereby a metered amount of toner is collected and emitted from said body opening upon rotation of said cartridge.

3. The apparatus of claim 2 including means calibrated to rotate said cartridge to dispense a metered amount of toner in accordance with the amount of toner consumed by said developer system.

4. Apparatus adapted to dispense a metered amount of granular material comprising:

an enclosed container adapted to hold a quantity of granular material, said container having at least one opening in its surface and also having at least one inner chute adapted to contain said metered amount of granular material, said chute comprising a plurality of walls fixedly attached to said surface and having two apertures, the first of said apertures communicating with the interior of said container and the second of said apertures communicating with the opening in said container, and means for rotating said container whereby said metered amount of said granular material is collected in said chute through said first aperture and emitted from said container through said second aperture.

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