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Nakano et al.

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[54] **DEVELOPER PARTICLE SUPPLY DEVICE**

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[52] **U.S. Cl.** **222/407**, 222/414, 222/DIG. 1

[51] **Int. Cl.** **G01f 11/26**

[58] **Field of Search** 222/406, 407, 414; 118/308; 272/342

[56] **References Cited**

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[57] **ABSTRACT**

A developer particle supply device for supplying electrostatic developer particles into a developer storage chamber of an electrophotographic developing device. The supply device comprises a supply box in which the developer particles are stored and a supply roller serving as a bottom of the supply box. A space is formed between the roller and a lower end of the box to let the particles fall down therethrough. The surface of the roller is made of resilient material and a part thereof is pressed against another lower end of the box. By rotation of the roller, the particles are supplied through the space into the chamber.

4 Claims, 3 Drawing Figures

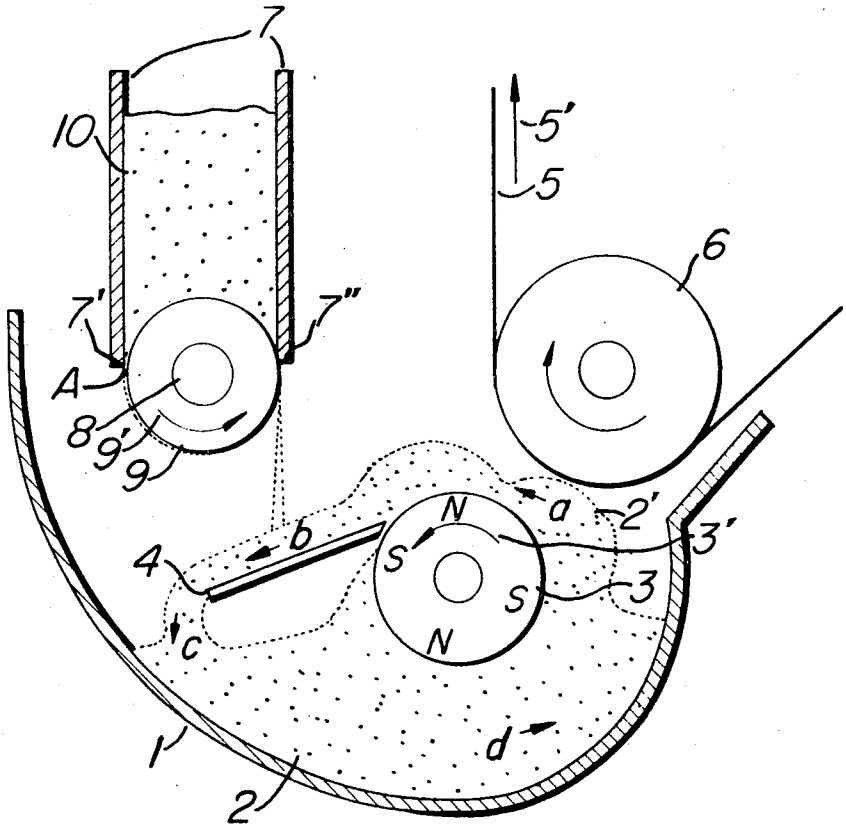


FIG. 1

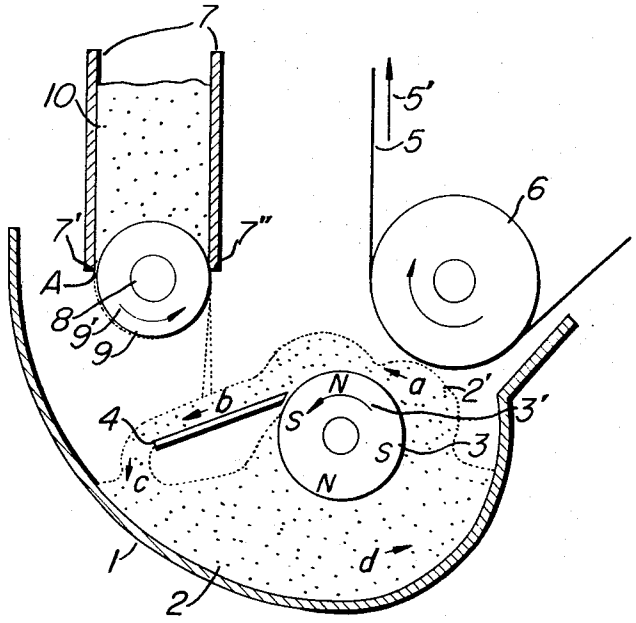


FIG. 2

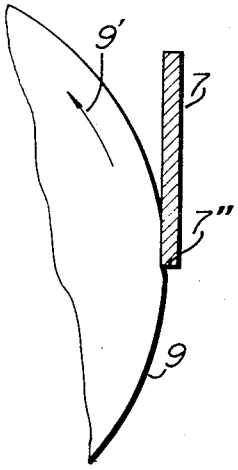
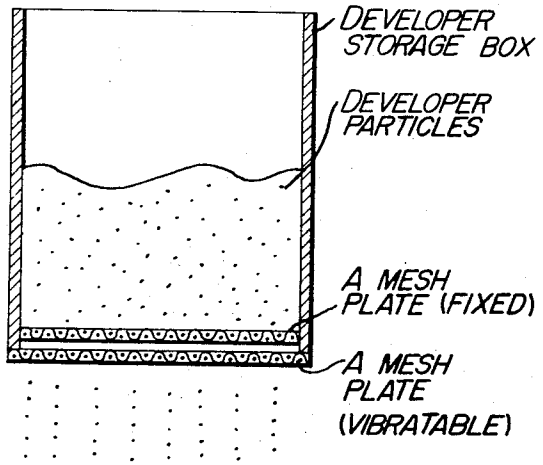


FIG. 3



DEVELOPER PARTICLE SUPPLY DEVICE

This invention relates to a developer powder supplying device in a facsimile receiver of electrophotographic or electrostatic recording type, and in particular to a developer powder supplying device which supplies developer powder or particles automatically and continuously under optimum conditions in case where developing process is conducted automatically and continuously.

In the facsimile receiver of electrophotographic type or electrostatic recording type, an electrostatic latent image formed on a recording medium is developed by developer particles attached thereto and fixed by fusing or other processes to obtain a permanent image thereon. The attaching of developer to the recording medium is carried out for example by a magnetic brush method in which developer particles are supplied to the surface of the electrostatic latent image by means of a magnetic brush a part of which is in a developer particle storage chamber. Since the developer particles are consumed as will be apparent from the above, the particles should be supplied or replenished. A developer powder storage box for supply is accordingly disposed above the developer powder storage chamber. The developer particle supply storage box is provided at the bottom thereof with two superposed mesh plates one of which is reciprocated by means of a vibrator or the like and the other of which is stationary. By the vibration of one of the mesh plates, the particles in the box are sifted through the plates and fall on the powder in the developer storage chamber. In the supply operation of the developer particles in the conventional supply box as described above, it has been disadvantageous that the meshes of the mesh plate are liable to be plugged with particles due to viscosity of the developer particles. Another disadvantage inherent in the conventional developer supply device is the complexity in the mechanism for vibrating the mesh plate.

One of the objects of the present invention is to provide a developer particle supply device which automatically and constantly supplies the developer particles in a stable manner by using a developer particle supply roller made of resilient material such as rubber and the like.

Another object of the present invention is to provide a developer particle supply device which is of simple construction and can be easily assembled by using a developer particle supply roller made of resilient material such as rubber and the like.

FIG. 1 is a side sectional view of an example of a developing device of a magnetic brush type in which one embodiment of the developer supply device in accordance with the present invention is employed,

FIG. 2 is an enlarged sectional view showing a part of the developer supply device shown in FIG. 1, and

FIG. 3 is a side sectional view showing an embodiment of the prior art developer supply device.

Prior to the description of the embodiment of the present invention, description will be made with respect to a developing device in which the embodiment of the invention is applied to a magnetic brush type developing method referring to FIG. 1. After the construction of the whole system for developing and operation thereof are described, one embodiment of the developer supply device in accordance with the present invention will be described in detail.

In FIG. 1, the reference numeral 1 indicates a developer chamber, 2 indicates a developer or mixture of toners and carriers, 3 indicates a magnet for developing which rotates in the direction of an arrow 3' and forms a magnetic brush 2' with developer attached to the surface thereof, and 4 indicates a scraper plate which scrapes the developer off the magnet 3 when the magnet 3 is rotated. A recording paper 5 on which an electrostatic latent image is formed moves along a roller 6 in the direction of an arrow 5'. In the construction as described above, the developing process is carried out as follows. Accompanying the rotation of the magnet 3, the developer particles 2 formed in the shape of a magnetic brush 2' on the magnet 3 are brought into contact with the recording paper 5. The developer particles or toners in the developer which have been charged through the friction with the magnetic particles or carriers are attracted to the latent image on the recording paper 5 by an electrostatic attractive force to form a visible image thereon. The developer particles are scraped off the magnet by the scraper plate 4 and returned to the developer storage chamber. By repeating such operations, the developer 2 is stirred by being circulated in the direction of the arrows *a*, *b*, *c* and *d* in FIG. 1. By selecting properly the rotational speed of the magnet 3, therefore, the recording paper moving in the direction of 5' is continuously developed.

As apparent from the above description, it is developer 2 that is spent for making a visible image on the recording paper and it is required to supply the developer for maintaining a definite level of density in development.

The feature of the device in accordance with the present invention is that a sponge roller is used to supply the developer utilizing its property to well attract the developer particles and its elasticity. By utilizing the resilient material for the developer supply roller, a simple construction and operation of the developer supply device can be realized.

Now the construction of the embodiment of the developer supply device will be described in detail. The developer particle supply device is provided above the developer particle storage chamber 1. The reference numeral 7 indicates a developer particle supply box which has an open bottom at which a developer particle supply roller 9 made of sponge is rotatably mounted on a stationary shaft 8. The roller 9 serves also as the bottom of the box 7. One edge 7' of the lower end of the supply box 7 is slightly (about 50 μ in the embodiment) spaced from the surface of the supply roller 9. The spacing A between the edge 7' and the surface of the roller 9 is so selected that the developer particles 10 may not fall down therethrough when the particles are attracted to and carried by the roller 9 there. On the other side of the roller 9, the other edge 7'' of the lower end of the supply box 7 is somewhat pressed on the surface of the roller 9. When the roller 9 is rotated in the direction indicated by an arrow 9' in the drawing by a proper driving means (not shown) under such circumstances as above, the developer particles 10 in contact with the upper surface of the supply roller 9 in the developer particle supply box 7 are forwarded to the spacing A and a predetermined amount of developer particles 10 defined by the spacing A is carried out of the box 7 on the surface of the roller 9. Then, the developer particles 10 are carried to the other edge 7'' where the developer particles are scraped off and drop

into the developer particle storage chamber **1**. The developer particles **10** are circulated in the chamber **1** as mentioned hereinabove after dropping on the scraper plate **4**.

Since the material forming the surface of the supply roller **9** is resilient, the roller **9** is able to rotate in such a condition that the surface thereof is pressed by the lower edge **7''** of the supply box **7** as clearly shown in FIG. **2**.

We claim:

1. A developer particle supply device comprising a supply box for developer particles, said box having a pair of vertically directed spaced side walls the lower edges of which are spaced from one another to define an open bottom for said supply box, a developer particle supply roller mounted for rotation adjacent said open bottom to substantially close said open bottom, said roller being mounted for rotation on an axis disposed adjacent the plane defined by said lower edges, an upper portion of said roller extending above said lower edges of said side walls and into said box and being in contact with a supply of developer particles urged by gravity into engagement with said upper portion of said roller, the remainder of said roller extending below said lower edges of said side walls externally of said supply box, said roller being provided with a resilient surface having a viscosity operative to attract developer particles thereto and to retain developer particles thereon, said roller being positioned relative to said lower edges so as to define a space between the outer periphery of said roller and one of said lower edges operative to prevent any distortion of said resilient surface adjacent said one edge and through which space developer particles adherent to said resilient roller surface may pass from the interior of said box to the exterior of said box as said roller is rotated, said space being dimensioned to prevent developer particles in said supply from falling therethrough when said roller is not rotating, the other of said lower edges being in forcible pressure contact with a portion of the outer periphery of said roller to distort said resilient surface adjacent said other edge, whereby developer particles attracted to the surface of the said upper portion of said rotating roller are guided outwardly on the surface of said roller through said space, are retained on the surface of said roller as said roller surface moves externally of said box from said space toward said other edge, and are then scraped from said roller surface by said other lower edge to provide a measured supply of developer particles which drops from said resilient surface at a position adjacent said other edge.

2. The device of claim **1** wherein said resilient surface comprises sponge rubber.

3. The device of claim **1** wherein said space has a dimension of substantially 50 μ.

4. The device of claim **1** wherein said lower edges are disposed adjacent substantially diametrically opposite portions of said roller surface respectively.

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