United States Patent [19]

Koeleman

[11] **3,915,340**

[45] **Oct. 28, 1975**

[54] **INDICATOR FOR A DISPENSING DEVICE**

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[22] Filed: **Mar. 19, 1974**

[21] Appl. No.: **452,700**

[52] **U.S. Cl.** **222/23;** 222/167; 116/114; 335/205

[51] **Int. Cl.²** **B67D 5/06**

[58] **Field of Search** ..... 222/23, 36, 39, 64–66, 222/167, 169–172; 335/205, 207; 73/313, DIG. 5; 116/114

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[57] **ABSTRACT**

An indicating mechanism for a dispenser in a copier machine. The dispensing mechanism comprises a container designed to store and dispense a quantity of developer of the kind having a toner dispersed within a carrier containing iron filings. A magnetic switching device is magnetically attracted to the iron filings of said carrier, while developer still remains in the container. When the container empties of developer, the magnetic swtich is no longer held in an attracted position, thus signalling the depletion of the developer mix within the container. A jogging mechanism engageable with the magnetic switching device provides a novel mechanical means for providing a flashing signal.

8 Claims, 3 Drawing Figures

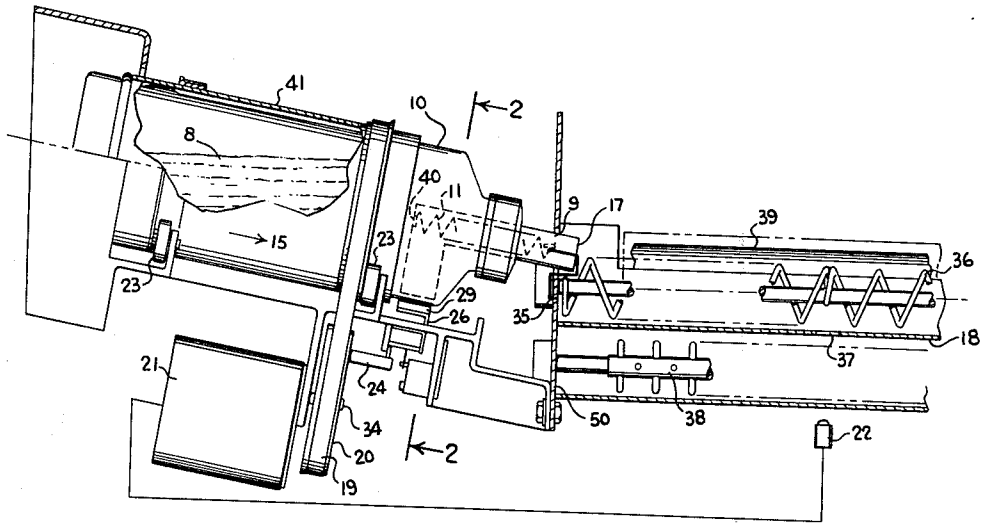
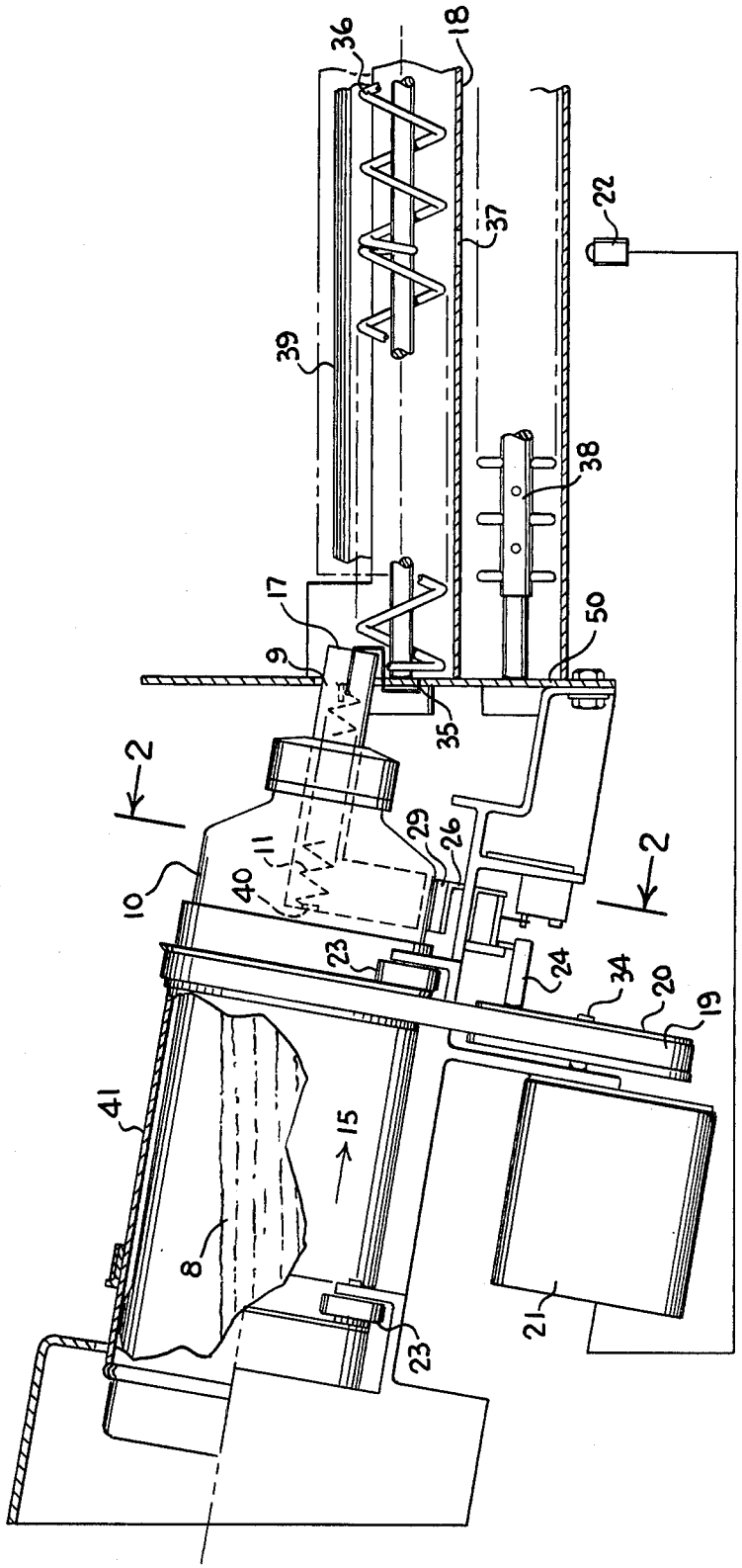


FIG. 1


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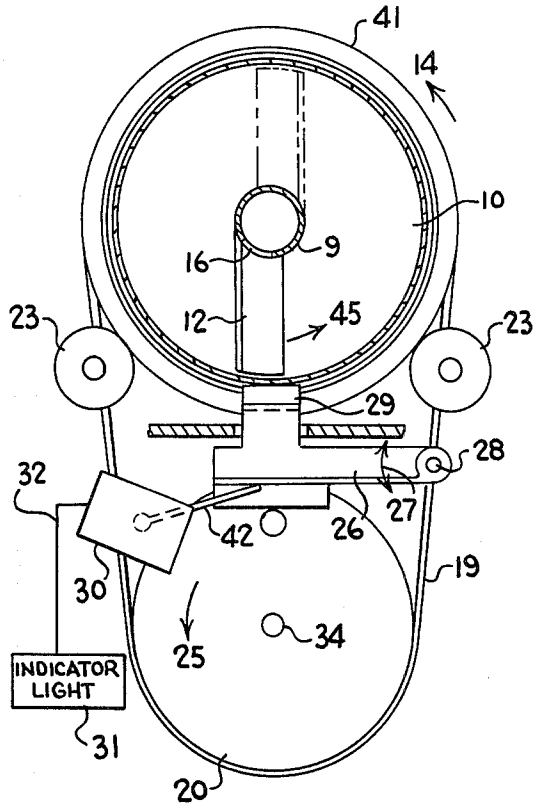

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INDICATOR LIGHT
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FIG. 2

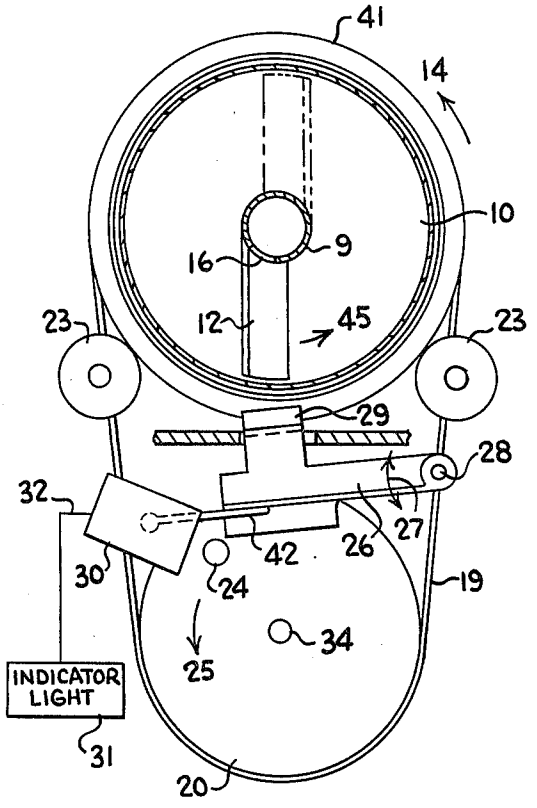

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FIG. 3

INDICATOR FOR A DISPENSING DEVICE

The invention pertains to dispensing mechanisms, and more particularly to an indicating device for a dispensing mechanism for supplying a copier machine with developer materials.

BACKGROUND OF THE INVENTION

Dispensing mechanisms for use in copier machines must be accurately and timely actuated when developer density drops below an acceptable level in the supply bin. If the supply of developer is not properly accomplished, then the quality of the reproductions will be visibly poor. In order to avoid this, many elaborate schemes have been devised to signal the operator to replenish the supply of developer in the copier. Many of the previous indicating methods are too complicated, expensive, and unreliable, for example:

a. Optical means have been used to sense toner remaining in a see-through supply bottle. This system has the serious drawback that the walls of the bottle can become caked with toner, which then provides and erroneous indication that the container is still full;

b. Weighing means have been used to determine the depletion of toner from a container. The drawbacks for this system are lack of accuracy, variations in toner formulations effecting the weight, the need for temperature and pressure compensators, etc.

The present inventive indicator mechanism is a simple means of accurately and reliabily indicating when a new supply of toner should be added to a copier dispensing system. The inventive indicator is primarily, but not exclusively, for use with copier machines employing magnetic brush development. A magnetic brush roller wipes the toner across the surface of a charged, imaged photoconductor. By means of magnetic attraction the toner which contains iron fillings, filings, caused to form a brush-like configuration upon the roller. Thus, as the photoconductor is moved by the roller, it becomes fully saturated with toner in the imaged areas.

SUMMARY OF THE INVENTION

The invention is for use in a copier systems using developer materials having a toner dispersed within a carrier containing iron filings. A novel approach to sensing the depletion of this type of developer is to use the magnetic or magnetizable qualities of the carrier material to activate a magnetic switch. When there is sufficient carrier material in the supply container, the magnetic switch element is maintained by magnetic attraction in the open position. When, however, the developer is depleted from the container, the switch is no longer magnetically held open and is allowed to close, thus signalling the copier operator of the deficiency, and the need to restore the developer supply.

The magnetic switch of this invention is periodically jogged towards its closed position when the developer is fully dispensed thus providing a flashing signal. If the switch is being maintained in its magnetically attracted closed position, then the jogging mechanism does not operate. If, however, the developer supply is depleted, thereby causing the switching element to assume its open unattracted position, then the periodic displacement of the switch towards its closed position, will cause the switch to provide a cyclic or flashing signal to the operator. This cyclic, or flashing signal, alerts the attendant that a new supply of developer is needed.

It is an object of this invention to provide an improved indicating mechanism for a developer dispensing device.

It is a further object of this invention to provide a novel means of detecting the depletion of a developer supply for a copier system.

It is another object of the invention to provide a signalling device for a developer dispensing system using a toner dispersed within a carrier comprising iron filings.

These and other objects of the invention will become more apparent and will be better understood with reference to the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side view of the dispensing and indicating mechanism of this invention, showing a container for developer in cutaway;

FIG. 2 is a sectional view of the invention of FIG. 1 taken along lines 2—2, with the magnetic switching device in its open magnetically attracted position; and

FIG. 3 is a sectional view of the invention similar to FIG. 2, with the magnetic switching device shown in its closed, developer proximity magnetically unattracted position.

Generally, speaking, the invention is for an indicating device for a developer dispensing mechanism for use in a copier machine of the type, which dispenses a developer comprising a toner and a magnetizable carrier material. The mechanism comprises a container for storing a quantity of the developeer for use in the copier machine. Dispensing means is provided for dispensing the developer from the container. The mechanism of this invenion additionally comprises sensing means disposed in poximity to the container for sensing when the container has substantially emptied of developer. The sensing means is movable between a first position indicative that developer still remains in the container, and a second position indicative that substantially all of the developer has been dispensing therefrom.

The sensing means remains in its first position while sufficient developer remains in the container, and moves to the second position after the developer has been dispensed. Means are provided for indicating the position of the sensing means, and hence, whether sufficient developer remains in the container, which is further indicative of whether there is need to replenish said copier machine with developer.

The sensing means is generally a magnetic which is held in its first position by means of magnetic holding attraction. The magnetic holding attraction is provided between the magnetic means and the magnetizable carrier material.

Means may also be provided for urging the sensing means towards said first position in a periodic fashion, as the dispensing means is caused to operate. This urging causes a flashing signal to be produced, when the container has substantially emptied.

Now referring to FIGS. 1 through 3, a container 10 is shown, which is adapted to contain a developer 8 having a toner dispersed within a magnetizable carrier material. The carrier material is generally of the type containing iron filings for magnetic brush development of an image. The container has a dispensing spout 9 and a scoop 12 disposed in the neck of the bottle. An auger 11 is rotatably connected to the scoop 12 by a suitable fastener 40 at one end thereof, and extends from the

mouth 17 of the spout 9 at its other end, where it is fastened to the stationary frame 50 at point 35. The container fits within a cylindrical housing 41, about which is wrapped a drive belt 19. The drive belt 19 also wraps about a drive pulley 20, which is keyed to shaft 34 of motor 21.

The housing 41 and the dispensing bottle 10 are mounted for rotation upon four free-spinning wheels 23, which are rotatively mounted to the frame.

A pivot arm 26 mounted in proximity to the container 10 and the drive pulley 20, is shown to be pivotal (arrows 27) about the pivot 28. An upper section of the arm 26 carries a magnet 29, which is closely adjacent the container 10.

The drive pulley 20 has a jogging pin 24 attached thereto, which rotates with the pulley 20 and engages the pivot arm 26, when it drops to its lower position as shown in FIG. 3.

An arm 42 of an electrical switch 30 is forced downward as the pivot arm drops to its lower position in FIG. 3, thus closing an indicator circuit 32.

OPERATION OF THE DEVICE

The housing 41 and the container 10 are made to rotate by means of the drive belt 19, which will be more fully explained hereinafter. When the bottle 10 is made to rotate, as shown by arrow 14 in FIGS. 2 and 3, the scoop 12, and the spout 9 are also made to rotate (arrow 45). When the scoop 12 reaches an upward extending position as shown in phantom in FIGS. 2 and 3, some developer 8 which has become trapped in the cradle of the scoop, will fall through aperture 16 into spout 9.

The auger 11 which remains stationarily in place as the spout 9 and scoop 12 rotate, causes the developer 8 to advance towards the mouth 17 of the spout 9, where it empties into a developer bin 18. A rotating worm 36 advances the developer within an upper portion of bin 18. When the developer reaches aperture 37 in the bin 18, the developer falls through the aperture 37 into the lower portion of the bin. A spoked mixing paddle 38 stirs the developer, from whence it is carried to the magnetic brush roller 39.

A photoelectric sensor 22 is positioned adjacent bin 18. When the density (blackness) of the developer decreases below a certain minimum level, as when sufficient toner has been drawn from the mix, the sensor 22 activates the motor 21, causing pulley 20 to rotate. This in turn causes the drive belt 19 to rotate housing 41 and container 10.

Developer 8 disposed in container 10 advances towards the spout 9 (arrow 15) where it is scooped-up upon scoop 12 and deposited in spout 9 via aperture 16. The developer 8 emerges spout 9 at its mouth 17, and is deposited in bin 18, thus replenishing the toner in the bin. When a sufficient amount of toner is inserted into the bin, the sensor 22 deactivates motor 21, causing the dispensing to cease.

Operation of this type of dispensing mechanism is explained more fully with reference to the published German Application No. 72.19,649; registered on Aug. 14, 1972.

The indicating mechanism of this invention operates to signal the operator of the copier machine that the bottle 10 of developer has emptied. This is accomplished by means of pivot arm 26. When sufficient developer still remains in the container 10 as illustrated in FIG. 2, the magnet 29 of the pivot arm 26 is attracted to the iron filings of the developer mix 8. In its attracted position, the magnet maintains the pivot arm 26 in its upper position, so that the indicating switch 30 is kept open, and indicator circuit 32 is kept incomplete.

When the developer is substantially emptied from container 10, the magnet 39 is no longer held in attraction to the iron filings, thus allowing pivot arm 26 to drop to its lower position as shown in FIG. 3.

When the pivot arm 26 assumes the position of FIG. 3, it depresses lever 42 of switch 30, causing circuit 32 to become a closed circuit. The closing of circuit 32 causes current to flow to the indicator light 31, which illuminates the indicator.

The indicator 31 is further caused to provide a flashing signal by a novel jogging mechanism, which cyclically opens and closes circuit 32. The jogging mechanism comprises a pin 24, which extends outwardly from the pulley 20, and rotates therewith (arrow 25).

When the sensor 22 activates the dispensing apparatus, the pulley 20 and the pin 24 are made to rotate. If the arm 26 is in its upper position (FIG. 2) as when developer is still remaining in bottle 10, then pin 24 bypasses arm 26 as it rotates about shaft 34. However, if the pivot arm 26 has dropped to its lower position, (FIG. 3) as when the bottle 10 is substantially empty of developer, then the pin 24 will engage arm 26, and urge the arm to its upper position.

Because the magnet 39 continues to no longer be attracted upwardly, the pivot arm will not remain in its upper position when it is jogged by the pin 24. Therefore, the arm will continue to rise and fall every time the pin 24 engages it. The result is, that a cyclic or periodic opening and closing of circuit 32 is provided by the jogging mechanism, thus producing a flashing signal to the operator. The flashing signal will continue until such time, as a new bottle of developer is inserted in housing 41 in replacement for the empty bottle. Now as the sensor 22 calls for more developer 8, a fresh supply of developer will be dumped into the bin 18, thus deactivating the sensor 22 and motor 21.

The drawings presented herein are deemed to be merely exemplary in nature, and are presented only to provide an understanding of this invention.

All modifications, variations or changes to this invention which are obviously contemplated by those skilled in the art, are deemed to be within the full scope and spirit of the invention.

The invention should be interpreted solely by the appended claims.

What is claimed is:

1. An indicating device for a developer dispensing mechanism for use in a copier machine, said dispensing mechanism dispensing a quantity of developer comprising a toner material and a magnetizable carrier material, said indicating device comprising:

a container for storing a quantity of said developer for use in said copier machine;

dispensing means associated with said container for dispensing said quantity of developer from said container to said copier machine;

magnetic means movably disposed with respect to said container between a first position and a second position, said first position being adjacent said container in sufficient proximity therewith to establish a magnetic holding attraction between said magnetic means and said magnetizable carrier material

when sufficient developer remains in said container, and said second position being of insufficient proximity to said container to establish a holding attraction between said magnetic means and said magnetizable carrier material;

indicating means responsive to movement of said magnetic means for indicating the position of said magnetic means with respect to said container, so as to provide an indication whether there is sufficient developer in said container to maintain said magnetic means in holding attraction with said carrier material, which is further indicative of whether there is need to replenish said copier machine with developer; and

jogging means to jog said magnetic means into said first position from said second position, when said developer is substantially fully dispensed from said container.

2. The indicating device of claim **1**, wherein said magnetic means is a permanent magnet pivotably disposed with respect to said container, and pivotably movable between said first and second positions.

3. The indicating device of claim **1**, wherein said indicating means comprises a switch which is operatively responsive to the position of said magnetic means, and which is operative to pass a signal every time said magnetic means moves from said first position to said second position.

4. The indicating device of claim **1**, wherein said dispensing means comprises a rotative drive mechanism for rotating said container in order to dispense said developer, and wherein said jogging means is a pin-like abutment operatively connected to said rotative drive mechanism and engageable with said magnetic means during every rotative cycle of said rotative drive mechanism.

5. A flashing indicator device for a developer dispensing mechanism for use in a copier machine, said dispensing mechanism dispensing a quantity of developer comprising a toner material and a carrier material, said developer dispensing mechanism providing a flashing signal indicating that substantially all of the developer has been dispensed, said indicator device comprising:

a container for storing a quantity of said developer for use in to said copier system;

dispensing means associated with said container for dispensing said quantity of developer from said container to said copier system;

sensing means disposed in proximity to said container for sensing when said container has substantially emptied of developer, said sensing means being movable between a first position indicative that developer still remains in said container, and a second position indicative that substantially all the developer has been dispensed from said container, said sensing means remaining in said first position while sufficient developer remains in said container, and moving to said second position when substantially all of the developer has been dispensed from said container;

signalling means engageable with said sensing means, for providing a signal each time said sensing means moves from said first position to said second position; and

urging means operatively connected to said dispensing mechanism for periodically engaging with said sensing means during operation of the dispensing means when substantially all of the developer has been dispensed, said urging means urging the sensing means towards said first position so as to provide a flashing signal indicating that substantially all of the developer has been dispensed.

6. The flashing indicator device of claim **5**, wherein said carrier material comprises magnetizable material, and said sensing means comprises a magnet which is magnetically attracted to said carrier material, said sensing means being in said first position during said attraction of the magnet to said carrier material, and wherein said magnet moves to said second position when said magnet is no longer magnetically attracted to said carrier material, as when said carrier and toner materials are fully dispensed from said container.

7. The flashing indicator device of claim **6**, wherein said signalling means comprises a switch and an indicator light, said switch being actuated to a closed circuit position every time said magnet moves to said second position, causing said indicator light to signal that said developer has been dispensed from said container.

8. The flashing indicator device of claim **5**, wherein said dispensing means comprises a mechanism for rotating said container for the purpose of dispensing said material, and said means for urging the sensing means comprises a jogging mechanism connected to said dispensing means for periodically jogging said sensing means every time said dispensing means rotates said container through one rotative cycle, when substantially all of said developer has been dispensed from said container.

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