TONER CONTAINER AND HOLDER FOR ELECTROSTATIC COPIERS

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Filed: May 3, 1972

Appl. No.: 249,819

U.S. Cl. .......... 222/181, 222/DIG. 1, 248/311
Int. Cl. ............. B67d 3/00
Field of Search ......... 222/181, 186, 504, 222/DIG. 1; 248/311

ABSTRACT

A liquid toner dispenser, adapted for installation as a unit in a new or pre-existing electrostatic copier, comprises a toner bottle provided with a metering valve assembly and associated with a supporting bracket adapted to be positioned adjacent an access door in the electrostatic copier. The bracket is provided with guideways adapted to receive the bottle through the opening created by the access door, and cooperating with the access door to properly position the valve assembly of the toner bottle adjacent a manually or automatically actuable electromechanical operator affixed to the bracket and functioning, when actuated, to dispense a predetermined amount of liquid toner from the toner bottle.

9 Claims, 4 Drawing Figures
TONER CONTAINER AND HOLDER FOR ELECTROSTATIC COPIERS

BACKGROUND OF THE INVENTION

The present invention relates to electrostatic copier machines of the type employing liquid toners for developing electro-fax copy paper and/or zinc oxide photo-conductive offset masters, and is more particularly concerned with a novel apparatus adapted to be mounted as a unit, e.g., as a replacement or "add-on" unit on a pre-existing copier, to guide, position, and retain a toner concentrate container or bottle within the copier for purposes of permitting predetermined amounts of toner concentrate to be dispensed when desired.

Electrostatic copiers which utilize liquid toners conventionally include a bottle or other container for toner concentrate, associated with an appropriate mechanism for dispensing quantities of said concentrate from the container when desired. In the past, the concentrate container has normally been associated with a series of hoses and/or adapters which are in turn connected to an air pump, or to a venturi assembly, operative to force a quantity of the liquid concentrate out of the container under either positive or negative pressure produced by the air pump or venturi. In practice, when the operator has been required to replenish the toner concentrate supply, the operator has had to disconnect the hoses and adapter from the existing emptied toner bottle or container, refill the bottle or container or otherwise provide a filled such container, and then reconnect the hoses and adapter to achieve an operative connection between the toner supply and air pump or venturi. This task, in its entirety, has been messy, has often produced spillage on clothing or carpets, is comparatively time consuming, and has sometimes resulted in improper connections between the toner supply and air pump or venturi whereby toner has not been properly dispensed thereby placing the entire equipment out of operation until the error is corrected, e.g., by a service call.

The present invention is intended to obviate all of the foregoing difficulties. More particularly, the present invention is concerned with an improved dispensing arrangement, for toner concentrate, adapted for installation in original copiers, or as a replacement unit in pre-existing copiers. The unit comprises a novel container associated with a novel supporting bracket, arranged to eliminate the need for hoses and/or adapters and simultaneously to eliminate the chance of spillage when the copier toner concentrate supply must be replenished. The arrangement is such that an emptied toner concentrate container can be rapidly and efficiently replaced by a completely enclosed filled container, with ambiguous insertion and accidental displacement of the filled container being positively prevented, and with the filled container being automatically positioned to achieve a desired dispensing function simply by inserting the container into place in its associated bracket. The copier equipment is not required to be shut down for any significant period of time to accomplish toner replenishment; and such replenishment can be accomplished in a clean and rapid fashion by unskilled personnel, with service calls due to difficulties arising out of improper replenishment being eliminated.

SUMMARY OF THE INVENTION

In accordance with the present invention, the dis-

penser unit comprises a toner concentrate supply taking the form of a completely enclosed, self-contained toner bottle having cross-sectional and length dimensions which are closely related to those provided by an associated supporting bracket adapted to receive, retain, and properly position the bottle for dispensing the contents thereof within the copier.

In the preferred embodiment of the invention, the toner bottle (which is preferably fabricated of plastic to reduce the chances of breakage) is of elongated, flat sided, configuration, has a substantially square or rectangular cross section, and is provided with a metering valve assembly projecting outwardly from one side of the bottle adjacent one end thereof, the valve assembly being so arranged that, when actuated, it dispenses a measured supply of toner concentrate. The toner bottle cooperates with a supporting bracket adapted to be attached to an interior side wall of a copier machine at a position closely adjacent an access door in said machine; and, when said access door is opened, the bracket in turn cooperates with the resultant access opening to form an entrance way for receiving the toner bottle and properly positioning the bottle valve assembly relative to an operator or actuator mechanism mounted on said bracket.

More particularly, the supporting bracket comprises a channel shaped member so arranged that it provides a pair of spaced guideways between which the valve assembly of the bottle may be slidably inserted. The spaced guideways are preferably provided with leaf-type compression springs which are adapted to engage spaced wall portions of the bottle as the bottle is slidably inserted into the bracket, and which act as a compensating device permitting a limited variation in size of the bottle while maintaining the bottle in firm engagement with an upper stop forming a portion of the bracket. A rearward stop is also preferably provided on the bracket to limit the extent to which the toner bottle can be inserted. The bottle and bracket dimensions are such that, if the bottle is not completely inserted into its associated bracket, final insertion to a desired registration position is achieved simply by closing the aforementioned access door. To this effect, the access door is preferably provided with a spacer which is adapted to bear upon the end of the toner bottle opposite to the valve assembly and thereof, to serve as a further compensating device permitting limited variations in the length of the bottle and operating to assure that the toner bottle valve assembly is disposed at a predetermined position relative to the bracket when the copier machine access door is closed.

The unit further includes an electromechanical operator of the solenoid type, comprising an actuator located at a predetermined position relative to the bracket guideways, for cooperation with the toner bottle valve assembly. The solenoid and actuator are preferably mounted on the bracket itself to achieve a completely self-contained assembly adapted for installation, as a unit, in new or pre-existing copiers. The solenoid actuator is adapted to be operated manually, e.g., by depression of a switch, or it can be operated automatically by an electronic sensing control; and, in either case, it functions when operated to depress and then release the metering valve assembly of the toner bottle, thereby to cause a measured supply of toner concentrate to be dispensed.
When the toner concentrate supply, in a copier employing the present invention, is depleted, the toner supply can be replenished simply by opening the copier access door, manually grasping and removing the empty bottle therefrom, slidably reinserting a filled bottle into place, and then closing the access door. This simple and unambiguous series of steps quickly and automatically assures that the toner supply is properly replenished for subsequent dispensing, and does this without requiring any disconnecting and reconnecting of hoses and/or adapters, and without exposing the user to the concentrate itself.

While the present invention finds particular application in connection with the dispensing of toner concentrate in electrostatic copiers, it will be understood by those skilled in the art that the structure can be employed in other dispensing applications as well, and therefore terms such as "toner" and "toner concentrate" used herein, and in the appended claims, are intended to be generic to various liquids which may require dispensing by use of the support and dispenser mechanism of the present invention.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a side view of a toner dispenser unit constructed in accordance with the present invention;

FIG. 2 is an end view of the unit shown in FIG. 1, taken on line 2—2 of FIG. 1;

FIG. 3 is a perspective view, at substantially full scale, of the valve assembly comprising a portion of the dispenser unit; and

FIG. 4 is an exploded perspective view, at reduced scale, of the toner dispenser unit.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring to the several figures, like numerals of which refer to like parts throughout, it will be seen that the present invention comprises a completely enclosed bottle or container 10 adapted to retain a supply of toner concentrate therein. In the preferred embodiment of the present invention, the container 10 is fabricated of an appropriate plastic material; and, preferably, is of elongated, flat-sided, substantially rectangular cross-sectional configuration. In order that the comparative dimensions of the various parts may be more fully appreciated, it should be noted that, in one embodiment of the invention, the toner container 10 has a length of substantially 5-1/4 inches, a width of substantially two inches, and a height of substantially 2-5/8 inches.

The bottom surface of container 10, adjacent one end of said container, is provided with an integral neck having external threads formed thereon, adapted to receive a valve assembly 11. The valve assembly is, in itself, of known construction and includes an interior stem 12 (see FIG. 3) on which are mounted a pair of conical valve members 13a, 13b, (see FIG. 1) in end to end relation. A spring 14 urges valve member 13a, 13b in a downward direction causing the member 13b to seat on an interior shoulder to keep the valve assembly in closed condition while, at the same time, positioning the valve member 13a below the discharge opening 15 of the valve assembly, in freely spaced relation thereto.

In a known fashion, if valve member 13a is urged upwardly against the force of spring 14, valve member 13a seals the discharge opening 15 while, at the same time, valve member 13b moves upwardly away from its interior shoulder; and this in turn permits a measured supply of liquid from the interior of container 10 to flow past valve member 13b for eventual discharge through opening 15 when valve members 13a and 13b are permitted to return, under the force of spring 14, to their original quiescent positions. By the arrangement shown, therefore, when the container 10 is positioned in substantially horizontal orientation with its valve assembly 11 in substantially vertical orientation, a measured amount of fluid may be discharged from the container 10 simply by pushing the valve members 13a, 13b upwardly against the force of spring 14, and thereafter releasing the valve members for return to their original position.

It must be understood of course, that the particular valve assembly shown in the drawings, and described above, represents part of the preferred embodiment of the present invention but does not, per se, characterize the invention. Variations in the type of valve assembly employed can readily be made by those skilled in the art without departing from the spirit of the present invention.

Container 10 is intended for support, within a new or pre-existing copier, at a position such that the valve assembly 11 may be appropriately manipulated to permit the dispensing operation described above, with the dispensed fluid then being discharged into an appropriate orifice 16 for use by the copier in developing a print. To assure that the valve assembly can be properly actuated, and to further assure that the dispensed fluid is properly directed into the equipment for utilization, it is necessary that the container 10 be properly positioned within the copier, and that such proper positioning be achieved in a simple and substantially foolproof manner. These considerations are realized by virtue of a special bracket, forming a portion of the present invention, which is so located and dimensioned that it satisfies the container positioning considerations described.

The supporting bracket comprises a substantially L-shaped metallic member 17 having a substantially vertically extending portion 17a and a substantially horizontally extending portion 17b the free end of which is bent to provide a flange 17c which is in turn welded to a vertical plate 18 which extends both above and below the level of horizontal portion 17b. The composite structure thus forms a channel-shaped bracket of substantially inverted U-shape comprising element 17b, forming the base of the U, and downwardly extending portions 17a and 18a which form the legs of the U.

The legs of the aforementioned U-shaped channel bracket are bent inwardly, toward one another, adjacent their free ends to form spaced, substantially coplanar guideways 19 and 20 between which the valve assembly 11 of container 10 can freely pass when the container 10 is inserted into the channel-shaped portion of the supporting bracket. The two guideways 19, 20 preferably have leaf-type compression springs 21 and 22 affixed thereto, e.g., by rivets 23. As illustrated in the drawings, the springs 21 and 22 are positioned above their respective guideways and are adapted to engage spaced portions of the underside of container 10, at opposite sides of valve assembly 11, to urge the container 10 into firm engagement with horizontal portion 17b of member 17, which horizontal portion acts as an upper stop for the toner bottle.
and 22 also act, of course, as compensating devices in that they permit the toner bottle height to be varied within limits without requiring any change in the dimensions of the supporting bracket. The forward edge of horizontal portion 17b merges into an upwardly inclined guide structure 24 which extends from said portion 17b toward the open front of the supporting bracket. The rear edge of portion 17a is also preferably provided with an inwardly extending rearward stop member 25 which closely parallels the corresponding end of the supporting bracket, and limits the extent to which the toner bottle can be slidably inserted into the bracket. Because of this arrangement of parts, the toner bottle 10 can be inserted into the bracket adjacent the open end thereof, i.e., adjacent the free end of inclined upper guide 24, and may then be slid rearwardly along guideways 19-21, 20-22 until the end of container 10 adjacent to valve assembly 11 engages rear stop 25. When this is done, the valve assembly 11, projecting downwardly from bottle 10 between the guideways 19, 20, reaches a predetermined registration position relative to said guideways. It will be understood that the foregoing registration position is achieved only if the valve assembly end of toner bottle 10 is first inserted into the channel bracket. This consideration is readily met simply by the provision of appropriate instructions to the operator of the device. If desired, however, the toner bottle and corresponding bracket can be so formed, e.g., by the provision of complementary keys and keyways on the corresponding side or top surfaces of said bottle and bracket, as to positively prevent reverse insertion of the toner bottle. It will further be noted that the desired registration position between valve assembly 11 and guideways 19, 20 is achieved only if the bottle 10 is inserted to a proper extent along said guideways. In practice, the overall mounting structure is adapted to be attached to an interior wall of the copier, e.g., through the provision of fastening apertures 26 at a position closely adjacent a hingedly mounted access door 27 in the copier housing. The access door 27 is preferably provided with a spacer 28 on its interior surface, adapted to engage the end of toner bottle 10 opposite to the valve end thereof, when the access door 27 is closed. When the door is opened, the bottle 10 may be slidably inserted through the resulting access opening and along the bracket between guideways 19, 20 and upper stop 17b; but if the bottle is not fully inserted, a final proper positioning of the bottle occurs automatically when the spacer 28 on access door 27 comes into contact with bottle 10 as the access door is moved to its fully closed position. By reason of this operation, spacer 28 assures that the bottle 10 is properly positioned along the guideways (thereby, in some instances, permitting the rearward stop 25 to be eliminated); and said spacer 28, if properly resilient (e.g., foam rubber or the like) acts as a further compensating device permitting limited variation in the length of the toner bottle. An electromechanical operator, having an actuator adapted to properly manipulate valve assembly 11, is affixed directly to the supporting bracket to give the overall structure a unitary configuration permitting it to be installed as a unit on new or pre-existing copiers. More particularly, the portion of member 18 above horizontal stop 17b acts as a mounting bracket on which a solenoid 30 and a microswitch 31 are affixed. Solenoid 30 and switch 31 are interconnected to one another by appropriate electrical connections, which are in turn adapted to be connected to an appropriate source of AC potential generally designated 32. A manual plunger 33 extending through the wall of the copier housing is adapted to be manually depressed, when desired, to close switch 31 thereby to energize solenoid 30; and depression and release of manual plunger 33 causes a corresponding energization and de-energization of solenoid 30 to effect a desired dispensing operation. Alternatively, energization control of solenoid 30 can be effected automatically by an appropriate sensing device. The armature 34 of solenoid 30 is positioned below the solenoid and, in the de-energized condition of solenoid 30, rests on a stop 35 formed integral with member 18. A bifurcated bracket 36 is attached to solenoid armature 34 for movement therewith, and includes a pin 37 which extends through the upper end of an elongated actuator arm 38. Actuator arm 38, as best shown in FIGS. 2 and 4, extends downwardly from the solenoid through an aperture 39 formed in horizontal member 17b, and through a further aperture 40 formed in member 18 above guideway 20, to a position vertically below guideway 19, 20. The lowermost end of actuator 38 is bent inwardly to provide a portion 38a which is positioned below and between the guideways 19, 20 at the registration position assumed by valve assembly 11 when toner bottle 10 is fully inserted into its supporting bracket. Since the actuator arm 38 passes through the aforementioned apertures 39 and 40 in the supporting bracket, this positioning of portion 38a adjacent the registration position of valve assembly 11 is positively assured and maintained. When switch 31 is closed (or an appropriate signal is received from an automatic sensing device) to energize solenoid 30, armature 34 is lifted upwardly off of its associated stop 35, thereby simultaneously drawing actuator arm 38 upwardly; and the portion 38a of said arm accordingly engages valve assembly 11 to move valve elements 13a, 13b thereof upwardly. When the switch 31 is thereafter opened (or the signal from the automatic sensing device ceases) the consequent de-energization of solenoid 30 permits the armature 34 to return to its lower stop position thereby releasing the valve members 13a, 13b for movement to their lower positions under the force of spring 14, and dispensing a measured quantity of toner concentrate. While I have thus described the preferred embodiment of the present invention, many variations will be suggested to those skilled in the art. It must therefore be understood that the foregoing description is intended to be illustrative only and not limiting of the invention. All such variations and modifications as are in accord with the principles described are meant to fall within the scope of the appended claims. Having thus described my invention, I claim:

1. A liquid dispenser comprising a bracket having a pair of spaced, substantially coplanar guideways, a stop structure overlying said guideways in spaced relation thereto, an enclosed liquid container supported by said bracket between said stop structure and said guideways in said spaced relation thereto with a first wall of said container bearing on said stop structure, spaced portions of a second wall of said container opposite to said first wall bearing on said spaced guideways, each of said
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7 guideways including spring means for urging said container toward said stop structure, a metering valve assembly extending outwardly of said container between said spaced portions of said second wall, said valve assembly being adapted to be positioned at a predetermined location between said guideways when said container is slidably inserted into said bracket, and a valve operator mounted on said bracket, said operator including an actuator having at least a portion thereof positioned adjacent said predetermined location for engagement with said valve assembly to permit the selective dispensing of a quantity of liquid from said container.

2. The dispenser of claim 1 wherein at least one end of said bracket is open to permit slidable insertion of said container into said open end and along said guideways, and a hingedly mounted access door located adjacent the open end of said bracket for selectively closing said open end.

3. The dispenser of claim 1 wherein said container is of elongated, flat-sided, substantially rectangular cross section, configuration.

4. The dispenser of claim 1 wherein said bracket has a substantially U-shaped cross section, said stop structure comprising the base of said U-shaped cross section, said pair of guideways comprising portions of the legs of said U-shaped cross section, adjacent the free ends of said legs, extending inwardly of said legs toward one another and positioned vertically below said stop structure.

5. The dispenser of claim 4 wherein said U-shaped cross section bracket is elongated in configuration and open at one end to permit insertion of said container through said open end, the opposite end of said bracket including a further stop structure for limiting the extent to which said container may be inserted into said bracket.

6. The dispenser of claim 1 wherein said operator comprises an electrically actuable solenoid operative selectively to move said actuator relative to said guideways into and out of engagement with said valve assembly, said solenoid being attached to said bracket at a position vertically above said stop structure, said actuator comprising an elongated arm passing in a vertically downward direction from said solenoid to a position vertically below said guideways.

7. The dispenser of claim 6 including a manually operable switch mounted on said bracket and electrically coupled to said solenoid for manually controlling the energization of said solenoid to effect movement of said actuator.

8. A dispenser comprising a bracket of substantially U-shaped cross section having a pair of spaced legs the free ends of which extend inwardly toward one another to define a pair of spaced, substantially coplanar guideways, the base of said U-shaped cross section comprising a stop structure overlying said guideways in vertically spaced relation thereto, an enclosed container for material to be dispensed, said container being supported by said bracket between said stop structure and said guideways in slidable relation thereto, a first wall of said container bearing on said stop structure, spaced portions of a second wall of said container opposite to said first wall bearing on said spaced guideways, said bracket including an upwardly inclined guide structure merging at its lower end into the base of said U-shaped cross section for guiding said container into said bracket to a position between said stop structure and said guideways, a valve assembly extending outwardly of said container between said spaced portions of said second wall, said valve assembly being adapted to be positioned at a predetermined location between said guideways when said container is slidably inserted into said bracket, and a valve operator mounted on said said bracket, said operator including an actuator having at least a portion thereof positioned adjacent said predetermined location for engagement with said valve assembly to permit the selective dispensing of a material from said container.

9. A dispenser comprising a bracket having a pair of spaced, substantially coplanar guideways, a stop structure overlying said guideways in spaced relation thereto, an enclosed container for material to be dispensed, said container being supported by said bracket between said stop structure and said guideways in slidable relation thereto with a first wall of said container bearing on said stop structure, spaced portions of a second wall of said container opposite to said first wall bearing on said spaced guideways, at least one end of said bracket being open to permit slidable insertion of said container into said open end and along said guideways, a hingedly mounted access door located adjacent the open end of said bracket for selectively closing said open end, said access door including a spacer member thereon operable when said door is closed to engage the end of said container closest to said door, a valve assembly extending outwardly of said container between said spaced portions of said second wall, said valve assembly being adapted to be positioned at a predetermined location between said guideways by the spacer member on said door by slidably inserting said container into said bracket and then closing said door, and a valve operator comprising an actuator having at least a portion thereof positioned adjacent said predetermined location for engagement with said valve assembly to permit the selective dispensing of material from said container.

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