DIFFUSION TRANSFER PROCESSING SOLUTION CARTRIDGE

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Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9

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This invention relates to a disposable cartridge for processing solutions used in diffusion transfer photocopy machines.

The diffusion transfer photocopy process is essentially a two-stage procedure wherein the first stage involves exposure of a light sensitive (silver halide) negative to a graphic original, and the second stage involves development of the exposed portions of the negative and transfer of its unexposed portions to a positive by diffusion.

The second stage of the process (development and diffusion transfer) requires a processing solution in a processing tray.

In recent years such processing solutions have been packaged in disposable plastic bags equipped with a tubular connection to a processing tray. In one tray filling and draining system, gravity is employed to empty the contents of the bag into the tray and then to return such contents to the bag. This is accomplished by elevating the bag above the tray and then lowering it below the tray. In both instances a gravity flow is induced. In another system, the bag is squeezed mechanically to force its contents into the tray and then released to provide a gravity return of the contents back into the bag. In this system the bag remains positioned below the tray.

A plastic bag suitable for use in connection with both tray filling and draining systems is disclosed and claimed in my above identified co-pending patent application. Other plastic bags of different construction may also be used for the same purpose, although without the features and advantages inherent in said disclosed and claimed bag.

The present invention relates to means for packaging plastic bags containing a processing solution of the character described, to shield them from exposure to light and thereby to prevent premature deterioration of their contents, to protect them against damage or loss of contents by reducing the risk of puncturing or bursting, to facilitate handling and storing with attendant economics resulting from space saving, and to provide adequate support when in use.

It is accordingly the principal object of this invention to provide a diffusion transfer processing solution cartridge which possesses all of the foregoing features and which may be used in connection with either of the above-described tray filling and draining systems.

Briefly stated, the invention comprises the combination of an inner plastic bag containing a processing solution, a cardboard sleeve or jacket encasing and supporting said plastic bag, and an outer plastic envelope enclosing said cardboard jacket and the plastic bag which it encases.

The cardboard jacket comprises a pair of generally rectangular walls joined along one side edge and adapted to receive the inner plastic bag between them. The outer plastic envelope encapsulates the cardboard jacket and holds it in closed position encasing the inner plastic bag. In connection with the first mentioned tray filling and draining system the cardboard jacket is capable of supporting the inner plastic bag in a generally horizontal lying position (as between a pair of co-acting platens).

An important feature of the invention resides in the tapered cross-sectional shape of the hereinabove described package, which permits stacking in alternately opposite directions.

The tapered jacket provides the necessary vertical stiffness and support for the hanging or standing positions above mentioned. In horizontal position between a pair of co-acting platens the tapered jacket flattens out, its opposing walls assuming a parallel relationship and squeezing the inner plastic bag between them to force its liquid contents into the processing tray.

The invention is illustrated in the accompanying drawing, in which:

FIGURE 1 is a plan view of a diffusion transfer processing solution cartridge made in accordance with this invention.

FIGURE 2 is an enlarged transverse section on the line 2—2 of FIGURE 1.

FIGURE 3 is a side view looking in the direction of arrows 3, 3 of FIGURE 1.

FIGURE 4 is an end view showing a plurality of said cartridges stacked one upon another in alternately oppositely oriented positions.

FIGURE 5 is a plan view of the inner plastic bag of said cartridge.

FIGURE 5a is a section of the line 5a—5a of FIGURE 5.

FIGURE 6 is a perspective view of the jacket component of said cartridge.

FIGURE 7 is a plan view of the blank from which said jacket is made.

FIGURE 8 is a perspective view of the outer plastic envelope of said cartridge.

FIGURE 9 is a fragmentary sectional view showing the cartridge in operative hanging position, its solution contents draining into a processing tray.

FIGURE 10 is a similar view but showing the cartridge in reversed position, the liquid contents of the tray draining into said cartridge.

FIGURE 11 is a fragmentary perspective view showing the cartridge herein described and claimed disposed in a horizontal position between a pair of platens in a machine employing the second tray filling and draining system above described.

FIGURE 12 is a fragmentary end view showing said cartridge in said machine.

Referring now to the details of the invention as illustrated in the drawing, it will be observed that a diffusion transfer processing solution cartridge 16, made in accordance with the principles of this invention, is shown in its application to both tray feeding and draining systems above described. Although, in the sequence of drawing figures, application to the first system is shown first and application to the second system is shown secondarily, this should not be taken as any indication of the relative importance of the two applications of this invention. Actually, the second application happens to be more important than the first. However, the same cartridge construction is used in either application and a description of such construction will apply equally as well to both applications.

As has above been indicated, the diffusion transfer processing solution cartridge which is herein claimed comprises an inner plastic bag 12 which is adapted to receive and hold processing solution 14, a tubular conduit 16 connected to and communicating with said inner plastic bag, a cardboard sleeve or jacket 18 encasing said inner plastic bag, and an outer plastic envelope 20 enclosing said sleeve or jacket and said inner plastic bag.
The construction of the inner plastic bag 12 is not critical in the sense that any flexible plastic bag may be used which is made of material that is relatively inert or non-reactive with respect to the processing solution, which is relatively non-porous, relatively strong, and heat- and chemical-resistant. An ideal inner plastic bag construction is disclosed and claimed in my pending patent application above identified and such construction is of course to be preferred. Nevertheless, the present invention is not to be construed as limited thereto and any suitable inner plastic bag construction will be acceptable in connection therewith.

Specifically, inner plastic bag 12 is made of either single ply or multiple ply construction, the single ply or the plural plies being heat-sealed along three edges 12a, 12b and 12c of the inner plastic bag. The fourth edge 12d thereof is merely a fold in the sheet material of which the bag is made. Tubular conduit 16 is made, preferably, of plastic tubing heat-sealed or welded to the back. A plastic combination plug and cap 22, serving as a plug or stopper, is supported at the free end of tubular conduit 16 by means of a looped connector 24. This plug or cap 22 closes the end of the tubular conduit 16 in order to seal in the processing solution contents of the inner plastic bag.

Sleeve or jacket 18 is die-cut out of a single sheet of relatively stiff paper or cardboard, although obviously other sheet material may also be used for the same purpose. It is to be observed that sleeve or jacket 18 is formed of a rectangular sheet 18e folded over transversely of itself adjacent its transverse center line. The result is a jacket having a pair of side walls 18b and 18c respectively joined allowing only one side edge by means of folded portion 18d. The remaining three side edges of the two side walls are free from each other. Since fold 18d is situated adjacent but not precisely upon the transverse center line of blank 18e, one of the walls 18b will be shorter than the other wall 18c, leaving a marginal strip 18e on wall 18c which extends beyond the end of wall 18b. The purpose of this marginal strip will shortly be described.

It will be seen that fold 18d is relatively wide or deep, its transverse dimension being such as to correspond to or exceed the transverse dimension of the inner plastic bag. The said bag contains a processing solution. Actually, when the jacket or sleeve 18 encases a full inner plastic bag 12, the two side walls 18b and 18c of said jacket or sleeve are disposed in converging relationship in the direction of their free ends. This will be apparent from the end view of a plurality of cartridges 10 shown stacked one upon another in alternately opposite orientation, as shown in FIGURE 4. It is clear from this figure that in end view cartridge 10 assumes a tapered shape and when a plurality of such cartridges are stacked one upon another alternate cartridges are positioned with their tapered configuration oriented in one direction and the remaining cartridges are situated with their tapered configuration oriented in the opposite direction. Aside from other advantages, this tapered configuration and method of packing conserves storing and shipping space.

Prior to fold 18d of sleeve or jacket 18 is a pair of openings 26 and 28 respectively. It will be seen that tubular conduit 16 of the inner plastic bag 12 projects outwardly through opening 26 and then inwardly through opening 28. This constitutes a method of holding the tubular conduit in place in close proximity to fold 18d of the sleeve or jacket 18. Holes 30, 32 and 34 are formed in marginal strip 18e of said sleeve or jacket. These holes are used only when the cartridge is suspended on hooks 36 in connection with the first method of filling and draining the solution tray. This operation will shortly be described, but for present purposes it will suffice to understand that holes 30 and 32 are intended to receive hooks 36 while 34 is intended to receive a latching device on the photocopy machine in which the cartridge is used.

There is nothing that holds the two walls 18b and 18c together except fold 18d and outer plastic envelope 20. This means that the sleeve or jacket 18 may assume this tapered shape (in end view) for use in conjunction with the first system of tray filling and draining, and it may also assume a flat compressed position when squeezed between the two platen of a photocopy machine utilizing the second system of tray filling and draining.

The outer plastic envelope 20 may be made of any suitable sheet plastic material and it may be made of one ply or multiple ply construction, depending upon the strength of the material and the particular requirements of the present invention. Specifically, outer plastic envelope 20 should be made of a flat single or multiple ply blank folded over upon itself along a fold line 20a and heat-sealed or welded together along side edges 20b, 20c and 20d. A pair of openings 20e and 20f are formed in fold portion 20a for the same reasons that openings 26 and 28 are formed in fold portion 18d of sleeve or jacket 18, namely to provide openings through which tubular conduit 16 may be brought out of the cartridge and then inserted therein. More precisely, the tubular conduit projects outwardly through opening 20e and inwardly through opening 20f.

The outer plastic envelope is illustrated in FIGURES 9 and 10 in connection with the first mentioned tray filling and draining system and in FIGURES 11 and 12 in connection with the second mentioned tray filling and draining system.

Referring in the first instance to FIGURES 9 and 10, it will be noted that processing solution tray 50 is mounted within a photocopy machine 52 which is provided with a hinged plate 54 which may serve as a closure for the back of the machine. This hinged plate is shown in its closed position in FIGURE 9 and in its open position in FIGURE 10. It is provided with a plurality of hooks 56 from which the herein described cartridge is adapted to hang. In order to mount the cartridge on said hooks, holes are punched in the outer envelope 20 to register with holes 30 and 32 in the jacket. This may be done by means of a pencil or pair of scissors. To hold a charge of processing solution in the event that a latch is provided on said hinged plate 54, a hole may be punched in the outer envelope to register with opening 34 in the jacket in order to receive the latch.

Hinged plate 54 may be or may not be provided with a ledge 58 adjacent its lower end. If such ledge, the cartridge would be supported in two ways: It would hang from hooks 36 and it would also stand on ledge 58. The ledge may be provided with an upwardly extending flange 60 to prevent the cartridge from slipping off.

It will now be observed that tube 16 of the inner bag 12 may be inserted into a receptacle 62 secured to processing solution tray 50. It is through said tube and said receptacle that the processing solution 14 will flow into the tray.

The machine is now in condition to be used. When it is desired to return to processing solution to the cartridge, the hinged plate 54 is lowered to its FIGURE 10 position. The contents of the tray will now flow back into the bag. A suitable valve (illustrated by clamp-type valve 64) is now operated to close the tube 16 or receptacle 62, and the hinged plate is thereupon raised to its FIGURE 9 position. The valve will prevent its contents from flowing back into the tray.

When the present device is used in connection with the second tray filling and draining system, it is placed between a pair of platen 70 and 72 of another kind of photocopy machine 74. Tube 16 is inserted into a receptacle 76, which is attached to a processing solution
tray 78. Platen 70 is fixed and stationary. Platen 72 is a vertically movable platen situated below an actuating bar 80. Manually operable crank handle 82 and appropriate linkages 84 and springs 86 may be used to depress bar 80 and thereby to lower platen 72. The cartridge 5 will thereby be squeezed between the two platens, and its solution contents will be forced upwardly through tube 16 and receptacle 76 into tray 78. The machine will now be ready to operate. When it is desired to return the tray contents to the cartridge, the crank handle 82 is worked in the opposite direction, thereby releasing bar 80 and platen 72, and the liquid contents of the tray will therefore flow back through receptacle 76 and tube 16 into the cartridge.

It is important to note that, although jacket 18 is relatively stiff along the plane of its larger dimensions, its fold 18d provides relatively little resistance to the platen squeezing action last above described. It is therefore possible for the same cartridge to be self-supporting in vertical position (see FIGURES 9 and 10) and yet to be compressible in horizontal position as illustrated in FIGURES 11 and 12. The foregoing is illustrative of a preferred form of the invention, and it will be understood that this form may be modified and other forms may be provided within the broad spirit of the invention and the broad scope of the claims.

What is claimed is:
1. A diffusion transfer processing solution cartridge, comprising:
   an inner bag adapted to hold a processing solution, a collapsible jacket having imperforate side walls enclosing said inner bag,
   an outer envelope enclosing said collapsible jacket, said outer envelope and said collapsible jacket having openings formed therein which are in registry,
   a tube connected to said inner bag for removing and replacing its contents, and said tube extending outwardly through said registered openings.
2. A diffusion transfer processing solution cartridge in accordance with claim 1, wherein:
   said inner bag is made of relatively flexible sheet plastics, and
   having upper and lower generally rectangular walls which are integral with each other along at least one side edge, and
   which are heat-sealed to each other along the remaining side edges.
3. A diffusion transfer processing solution cartridge in accordance with claim 1, wherein:
   said collapsible jacket is made of relatively stiff sheet material and comprises
   upper and lower generally rectangular walls which are integral with each other along one side edge, said upper and lower walls being free from each other along the remaining side edges.
4. A diffusion transfer processing solution cartridge in accordance with claim 3, wherein:
   said collapsible jacket is made of a generally rectangular sheet of cardboard folded transversely of itself along a transverse fold to for said upper and lower walls joined integrally with each other along said transverse fold and otherwise free from each other.
5. A diffusion transfer processing solution cartridge in accordance with claim 1, wherein:
   said outer envelope is made of relatively flexible sheet plastics and comprising generally rectangular upper and lower walls which are integral with each other along at least one side edge, and
   are heat-sealed to each other along all remaining side edges.
6. A diffusion transfer processing solution cartridge in accordance with claim 1, wherein:
   additional registered openings are formed in said collapsible jacket and outer envelope, the free end of said tube projecting into said additional openings and being held therein when not in use.
7. A diffusion transfer processing solution cartridge in accordance with claim 1, wherein:
   openings are formed in at least one free end of said collapsible jacket and registering openings are adapted to be formed in said outer envelope, said last-mentioned openings in said collapsible jacket and said registering openings in said outer envelope being engageable with supporting hooks to enable the cartridge as a whole to be supported therefrom in hanging position.

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