Jan. 4, 1949. B. E. LUBOSHEZ 2,458,394

FILM PROCESSING UNIT

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FIG. 1.

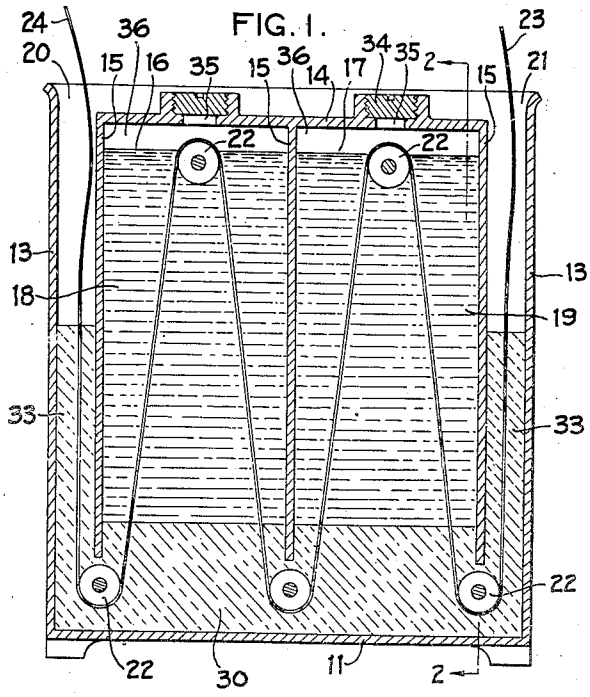


FIG. 2.

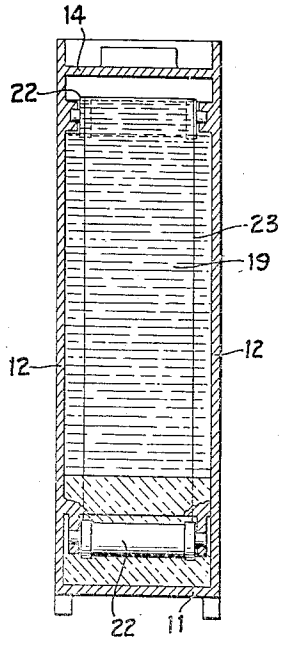
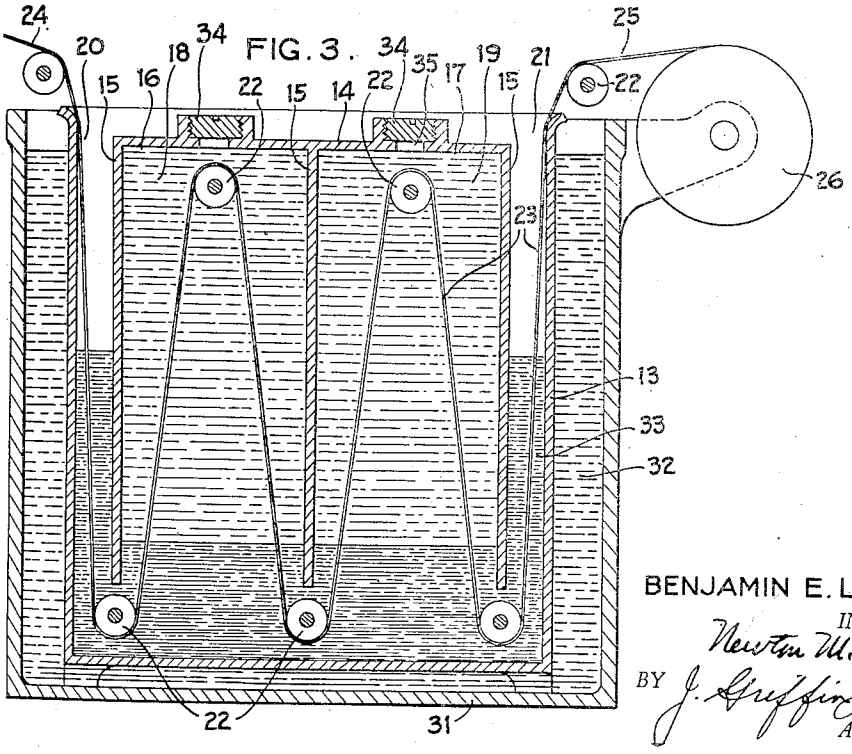


FIG. 3.



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FILM PROCESSING UNIT

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13 Claims. (Cl. 95—89)

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The present invention relates to photography, and more particularly to a processing unit for processing sensitized photographic film. According to the invention, the processing unit comprises a housing or body portion having one or more U-shaped compartments arranged with film guides for leading or guiding the film to be processed into the various compartments containing the treating liquids or solutions. A leader strip is threaded through the unit and is connectable to the film strip so that by drawing the leader strip, the film strip may be successively passed through the various treating liquids or solutions so as to be processed thereby.

The unit is filled, at the factory, with the necessary processing liquids or solutions so that the operator is relieved of the necessity of preparing and handling such solution, the advantages of which are readily apparent to those in the art. The compartments containing the liquids are sealed against liquid communication so as to prevent mixing or spilling of the liquids. In order that the unit may be readily and easily shipped or handled, the sealing means is preferably in the form of a fusible material which is solid at normal temperatures, i. e., the temperature at which the unit is subjected prior to processing. With such an arrangement, the processing liquids are sealed in their respective compartments, and the unit may be handled much in the manner of a dry battery without any danger of spilling or mixing of the solutions. When, however, the film is being processed, the unit is placed in a suitable heating bath which serves to fuse or melt the sealing material to convert the material to a liquid to permit the free passage of the leader strip into and out of the processing liquid. Even in its liquid stage, the sealing material still serves to seal the liquids against mixing. In addition, the liquid seal affords a wiping means or squeegee which removes the surface liquid from the film as the latter leaves each compartment. Also, the sealing means seals the film inlet and film outward to prevent air from reaching the processing liquids, the advantages of which are readily apparent to those in the art.

In practice, the processing unit could be quite small and separate from the heating bath so that it could be separately stored, handled and/or shipped. With such an arrangement, the treating solution can be readily and easily renewed merely by removing the used unit or block and replacing it with a new unit, much in the manner of replacing dry cells. The unit could be shipped as a block with the leader strip threaded

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therethrough and with the opposite ends of leader strip protruding so that they may be attached to the film and to a winding mechanism respectively. For each new roll of film, a fresh unit or block will be dropped into position in the heating bath where it would be surrounded by a suitable heating means and also associated with film supply and wind-up mechanism. After the roll is processed, the processing unit is removed and replaced by a new unit. The cost of the renewable units need not be prohibitive as they are used only once and may, therefore, be cheaply constructed. In size, the unit may be a little larger than a large match box.

The present invention has, therefore, as its principal object the provision of a replaceable unitary film processing unit.

Another object of the invention is the provision of such a unit in which the various treating liquids are sealed in their respective compartments or chambers to prevent accidental mixing or spilling of the liquids.

Yet another object of the invention is the provision in a unit of the class described of a sealing means which is normally solid but which becomes liquid at the processing temperature to permit the free passing of the film through the processing liquids, yet preventing the mixing of the liquids.

And another object of the invention is the provision of such a unit which is small, compact, inexpensive, easy to use and replace, but highly effective in use.

To these and other ends. the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a vertical sectional view through the processing unit, showing the arrangement of the parts when received by the user;

Fig. 2 is a transverse sectional view through the unit illustrated in Fig. 1, and taken substantially on line 2—2 of the latter; and

Fig. 3 is a view similar to Fig. 1 showing the processing unit in position in the heating bath, showing the relation of the treating liquids during the processing operation.

Similar reference numerals throughout the various views indicate the same parts.

The processing unit of the present invention comprises a hollow housing or body portion formed with a bottom 11 and upstanding side and end walls 12 and 13. A horizontal wall 14 having a length less than the distance between the end

walls 13 extends across and connects the side walls 12, as shown in Fig. 2. Three spaced walls 15 are secured to and depend from the wall 14 and terminate short of the bottom 11 to divide the interior or body portion into two separate compartments 16 and 17 adapted to receive the film processing liquid, such as developer 18 and fixer 19. The two outer walls 15 are spaced from the wall 13 to provide a film inlet 20 and a film outlet 21 through which the film strip may be fed to and drawn from the compartments 16 and 17. Film guides in the form of rollers 22 are positioned to guide the film into and out of the compartments so as to bring the film into contact with the treating liquids 18 and 19 positioned therein to process the film. A leader 23 is threaded through the unit and over guide rolls 22 and serves to guide the film during the passage through the unit, as is apparent from an inspection of Figs. 1 and 3. The ends 24 and 25 of the leader project from the unit and are adapted to be connected to the film strip and the winding mechanism respectively, the winding mechanism being diagrammatically shown as a winding reel 26. If desired, the processed film may be passed through a drying chamber, not shown, prior to being wound up on a take-up reel 26.

Prior to use, it is essential that the treating solutions be protected against spilling and/or mixing, and during the processing of the film, the solutions must be maintained separate, for obvious reasons. To secure this result, the present invention provides a sealing means 30 positioned in the bottom of the unit. This sealing material is normally solid and closes the lower ends of the compartments 16 and 17, as well as the film inlet and outlet 20 and 21, as shown in Fig. 1, thus enabling the unit to be freely handled without any danger of spilling or mixing the liquids 18 and 19. When, however, the film is to be processed, the unit is placed in a container 31 filled to the proper height with a heating medium 32 such, for example, as hot water. The heating medium is at such a temperature as to melt or fuse the material 30 to convert the latter to a liquid so as to permit the free passage of the leader strip and the film through the processing unit, yet providing a suitable sealing means to prevent mixing of the treating solutions, as shown in Fig. 3. The temperature of the water depends upon the type of material used. The latter should, however, be of a type which, when liquid, will have a specific gravity greater than that of the solutions 18 and 19 so as to remain at the bottom of the compartments to prevent mixing the solutions, as is apparent.

As the film strip leaves the compartments 16 and 17 it passes through a body of the melted or liquid material 30 which serves to wipe or squeegee the treating solution from the surfaces of the film. As the film leaves the compartment 17 and passes out through the exit outlet 21 it is desirable to provide a longer path through the material to effectively remove the excess liquid from the surfaces of the film so that the latter will be substantially dry as it leaves the processing unit. To secure this result, the sealing material is maintained in the outlet channel 21 at an elevation higher than in the bottoms of the compartments 16 and 17, as shown in Figs. 1 and 3. Of course, the sealing material is at the same height in the inlet channel 20. In order to secure this height differential, the chambers 16 and 17 are placed under slight pressure when the molten or liquid treating material is poured into the unit. When the liquid sealing material hardens or sets, the various levels thereof are as shown in Fig. 1. The screw closure caps 34 are then removed, and the treating solutions 18 and 19 are poured into the respective compartments 16 and 17 through the filling holes 35. The levels of the liquids in the compartments are slightly below the walls 14 to leave small air spaces 36 to permit the expansion of the treating liquids when the latter are heated by the heating medium 32. When the sealing material 30 melts, the hydrostatic heads of the treating liquids are sufficient to retain the sealing material in elevated relation in the channels 20 and 21, as shown in Fig. 3.

As mentioned above, the sealing material 30 must be of a composition which sets or solidifies at normal temperature so as to provide a seal against the spilling or mixing of the solutions, yet which melts or liquefies at operating temperatures to permit the free passage of the leader strip and film through the unit while still sealing the solution compartments. In order to provide an effective seal, when liquid, the sealing material must, of necessity, have a specific gravity greater than the treating solutions so as to remain at the bottom of the compartments 16 and 17, as shown in Fig. 3. The particular sealing material utilized depends, in part, on the treating temperatures to be used. It has been found, however, that a low melting point alloy is admirably adapted for this purpose. Such an alloy provides the desired seal both when solid and liquid, and also effectively wipes the film as it leaves the compartments. As the processing temperatures range between 100° and 200° F. any low melting point alloy which will fuse within this range is suitable. Examples of such alloys are as follows:

Example I

Woods metal which has a melting point of 163° F. and comprises 50% Bi, 25% Pb, 12½% Cd, and 12½% Sn.

Example II

Lipowitz metal which has a melting point of 160° F. and comprises 50% Bi, 26⅓% Pb, 13⅓% Sn, and 10% Cd.

Example III

Woods metal (Cerrobend) which has a melting point of 160° F. and comprises 50% Bi, 26.7% Pb, 10% Cd, and 13% Sn.

The present invention thus provides a small, compact, easily replaceable processing unit in which the treating liquids are sealed in the compartments so as to permit ready handling and/or shipping without danger of spilling or mixing of the liquids. The sealing material also protects the treating solutions against oxidation. When in use, the sealing material melts to permit the free passage of the film through the treating solutions, yet prevent mixing of solutions. After use, the unit may be discarded and replaced with a new unit.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is not, therefore, to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the scope of the appended claims.

I claim:

1. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of connected compartments having different photographic treating liquids positioned therein, and a fusible material positioned in the path of the film between said compartments for sealing said compartments against liquid communication.

2. A portable self-contained processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of connected compartments having different photographic treating liquids positioned therein through which film is progressively moved, and means positioned in the path of the film between said compartments for sealing said compartments against liquid communication, said sealing means being solid at normal temperatures but adapted to be converted to a liquid state during processing to prevent mixing of the liquids in said compartments.

3. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of connected compartments having different photographic treating liquids positioned therein through which film is progressively moved, a fusible material positioned in the path of the film between said compartments for sealing said compartments against liquid communication, and liquid means for wiping the liquid from the film as it leaves the compartments.

4. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of connected compartments having different photographic treating liquids positioned therein through which film is progressively moved, a fusible material positioned in the path of the film between said compartments for sealing said compartments against liquid communication, and film guides in said compartments, certain of said guides being positioned in said sealing material.

5. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of connected compartments having different photographic treating liquids positioned therein through which film is progressively moved, a fusible material positioned in the path of the film between said compartments for sealing said compartments against liquid communication, and a leader strip extending through said compartments and said sealing material.

6. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of connected compartments having different photographic treating liquids positioned therein through which film is progressively moved, a fusible material positioned in the path of the film between said compartments for sealing said compartments against liquid communication, film guides positioned in said compartments, certain of said guides being arranged in said sealing material, and a leader strip extending though said compartments and over said guides.

7. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of connected compartments having different photographic treating liquids positioned therein through which film is progressively moved, and a fusible material of a higher specific gravity than said liquids positioned in the path of the film between said compartments for sealing said compartments against liquid communication.

8. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of compartments open at their lower ends through which film is progressively moved, fusible means positioned in said body in the path of the film strip between said compartments for sealing the lower ends of said compartments to seal the latter against liquid communication, said means being solid at normal temperatures but fluid at processing temperatures, and different photographic processing liquids positioned in said compartments above and supported by said sealing means.

9. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of compartments open at their lower ends, fusible means positioned in said body in the path of the film strip between said compartments for sealing the lower ends of said compartments to seal the latter against liquid communication, said means being solid at normal temperatures but fluid at processing temperatures, different photographic processing liquids positioned in said compartments above and supported by said sealing means, and a leader strip extending through said compartments and connectable to said film to draw said film through said liquids and through said sealing means.

10. A portable self-contained film processing unit through which a photographic film strip may be drawn to process the latter comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of compartments open at their lower ends, fusible means positioned in said body in the path of the film strip between said compartments for sealing the lower ends of said compartments to seal the latter against liquid communication, said means being solid at normal temperatures but liquid at processing temperatures, different photographic processing liquids positioned in said compartments above and supported by said sealing means, and a leader strip threaded through said compartments and said fusible means and connectable to said film to draw said film through said liquids and through said sealing means, said sealing means when liquid serving to wipe the liquids from said film as the latter passes from said compartments.

11. A portable self-contained high temperature photographic film processing unit adapted to be positioned in a heating bath and comprising in

combination a hollow body portion having the interior thereof divided into a plurality of connected compartments adapted to hold different photographic processing liquid through which a film to be processed may be drawn, and means positioned in the path of the film between said compartments for sealing said compartments against liquid communication, said sealing means being normally solid but transformable to the liquid state when said unit is positioned in said bath to seal said compartments, yet permit the free passage of the film therethrough.

12. A portable self-contained high temperature photographic film processing unit adapted to be positioned in a heating bath and comprising in combination a hollow body portion having the interior thereof divided into a plurality of compartments adapted to hold different photographic processing liquids through which a film to be processed may be drawn, means positioned in the path of the film between said compartments for sealing said compartments against liquid communication, said sealing means being normally solid but transformable to the liquid state when said unit is positioned in said bath to seal said compartments, yet to permit the free passage of the film therethrough, and a leader strip to which said film is adapted to be attached extending through said compartments and passing through said sealing means so that the latter, when liquid, will serve to wipe the liquid from said film as it leaves each compartment.

13. A portable self-contained high temperature photographic film processing unit adapted to be positioned in a heating bath and comprising, in combination, a hollow body portion having the interior thereof divided into a plurality of liquid compartments and an inlet and an outlet channel all adapted to be in liquid communication, film guides positioned in said body for guiding a film strip through said compartments and in communication with the liquids therein to process said strip, and means having a specific gravity greater than said liquid for sealing said compartments and channels against liquid communication, said sealing means being solid at normal temperatures but fusing to a liquid when said unit is positioned in said bath, said liquid sealing means serving as a wiper to remove the liquids from said film as the latter leaves the compartments.

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