United States Patent

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[54] **PHOTOGRAPHIC FILM UNIT**
11 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **95/13,**
95/89 R, 96/76
[51] **Int. Cl.** **G03b 17/50**
[50] **Field of Search** 95/13, 89
R; 96/76

[56] **References Cited**
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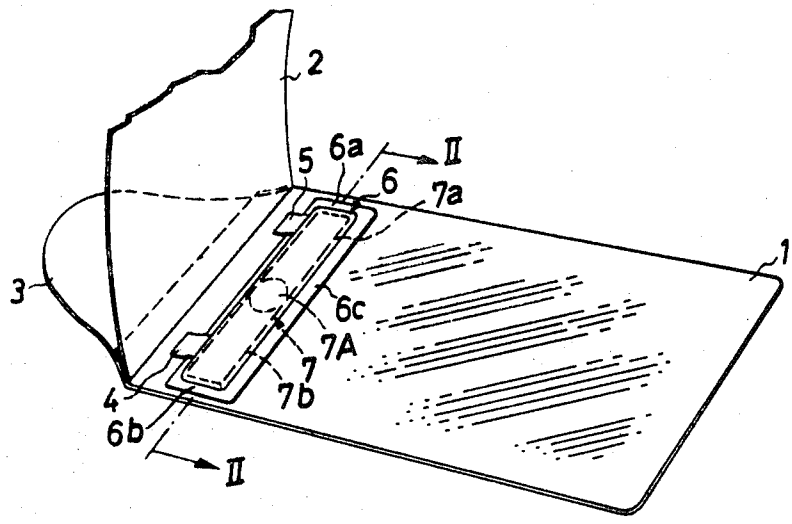
ABSTRACT: A photographic film unit for use in a camera which develops the film comprises an elongated rupturable container for processing fluid extending transversely between the photosensitive and print receiving sheets. The container is provided with a substantially centrally located gas-filled insert or with a substantially centrally located fluid-free portion which reduces the quantity of fluid in the corresponding part of the container to thus insure more satisfactory distribution of processing fluid upon rupture of the container when the film is caused to pass between two pressure-applying rolls.



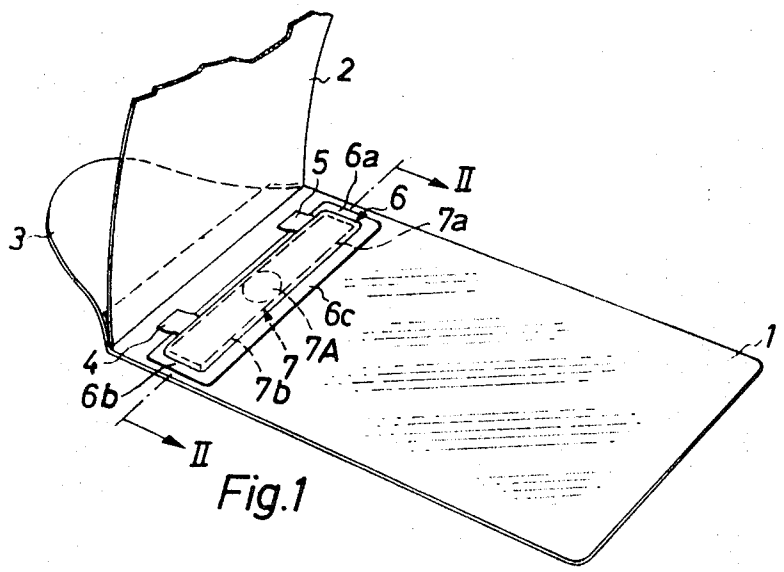


Fig.1

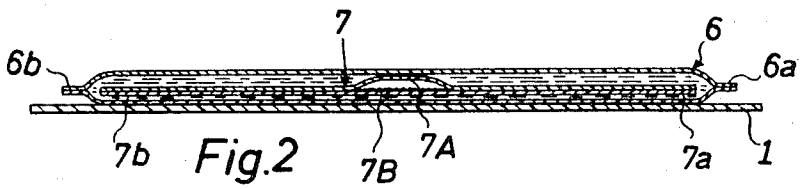


Fig.2

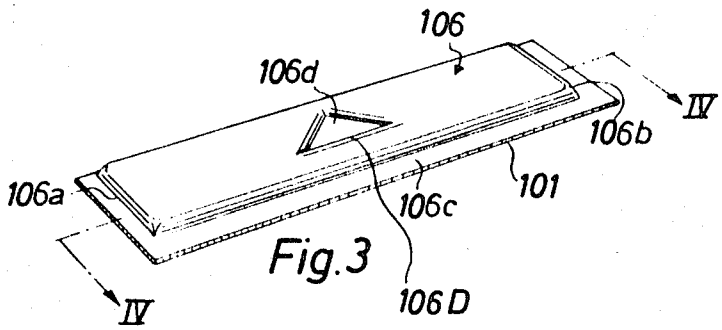


Fig.3

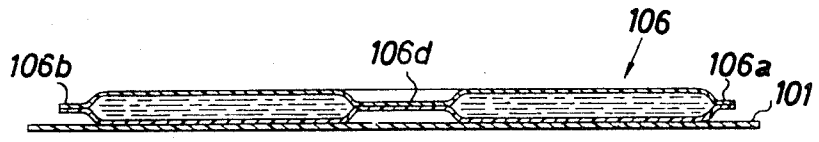


Fig.4

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PHOTOGRAPHIC FILM UNIT

BACKGROUND OF THE INVENTION

The present invention relates to photographic film units for use in cameras for instant photography, i.e., in cameras which can immediately develop the film. More particularly, the invention relates to improvements in the construction of rupturable containers for processing fluid which are utilized in photographic film units to distribute processing fluid between an exposed photosensitive sheet and a print receiving sheet when the film unit is caused to pass through the nip between two rolls or analogous pressure-applying members.

It is already known to provide a photographic film unit with some means which "brakes" the flow of processing fluid between the central portions of photosensitive and print receiving sheets. This is desirable because, in the absence of any flow regulation, the processing fluid which issues from a freshly ruptured container advances unevenly, i.e., its central portion forms a tongue which extends well ahead of the lateral portions of the fluid front while the film unit passes between the pressure-applying members. In certain conventional film units, the central part of the "weakened" edge which is intended to be destroyed in response to the application of pressure to thus spill the processing fluid between the sheets is made stronger than the remaining portions thereof so that it is not destroyed in response to application of pressure and insures that the fluid spreads more rapidly along the lateral portions of overlapping sheets. A drawback of such proposal is that the processing fluid leaves the ruptured container in the form of two separate streams and that the area directly behind the nondestructible portion of the weakened edge is not covered with processing fluid or receives such fluid for a shorter interval of time the the remaining area. This causes undesirable differences in the development of prints and thus affects the quality of images. In order to overcome the just-described drawbacks, film units embodying containers with weakened edges of nonuniform strength are normally longer than necessary so as to insure that the area not covered with processing fluid is not a part of the image. This, of course, brings about an increase in the overall size of the film unit and results in waste of valuable material.

It is also known to provide at the outlet of the rupturable container a hoselike guide member whose central portion constitutes a flow divider for processing fluid. By imparting to the flow divider a special shape, one can insure that the processing fluid covers the area which is immediately adjacent to the outlet; however, such film units are quite expensive and the incorporation of aforementioned guide members therein renders it necessary to employ sheets whose size is larger than absolutely necessary because the guide member is mounted externally of the container.

SUMMARY OF THE INVENTION

An object of our invention is to provide a photographic film unit which can be used in cameras for instant photography and which is simpler, less expensive and more reliable than presently known film units.

Another object of the invention is to provide the film unit with a novel and improved rupturable container for processing fluid.

A further object of the invention is to provide a rupturable container which insures uniform distribution of processing fluid between the photosensitive and print-receiving sheets of a film unit in such a way that the uniform distribution begins in the area which is immediately adjacent to the destructible portion of the container.

An additional object of the invention is to provide a container which is designed to insure immediate uniform spreading of processing fluid as soon as such fluid leaves the ruptured portion of the container.

An ancillary object of the invention is to provide the container with novel flow regulating means for the processing fluid.

The improved photographic film unit comprises a pair of sheets (one of which is photosensitive and the other of which receives the print) having adjacent front portions and arranged to overlap each other at least while their outer sides are subjected to pressure during travel of the film unit between a pair of pressure-applying members at a developing station, and a novel elongated rupturable container for a supply of processing fluid which is located between and extends transversely of the sheets in the region of their front portions. The container comprises a longitudinally extending weakened portion which is remote from the front portions of the sheets, and substantially centrally located flow regulating means arranged to reduce the quantity of processing fluid in the corresponding (central) part of the container.

The flow-regulating means may comprise a separately produced insert, e.g., a cushion of foamed plastic material or a gas-filled envelope which displaces processing fluid from the central part of the container, or an integral fluid-free portion of the container's envelope. Such fluid-free portion may be of polygonal outline and is preferably positioned in such a way that some processing fluid can be stored between its rearmost part and the adjoining central section of the weakened portion.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved photographic film unit itself, however, both as to its construction and the mode of assembling and utilizing the same, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary perspective view of a photographic film unit which embodies one form of the invention;

FIG. 2 is an enlarged transverse sectional view as seen in the direction of arrows from the line II—II of FIG. 1;

FIG. 3 is a perspective view of a portion of a second photographic film unit; and

FIG. 4 is an enlarged longitudinal sectional view as seen in the direction of arrows from the line IV—IV of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a photographic film unit comprising a photosensitive sheet 1 whose photosensitive surface is turned toward the observer. The front portion of the sheet 1 is connected to the front portion of a second or print receiving sheet 2. The print receiving surface of the sheet 2 is adjacent to the exposed photosensitive surface of the sheet 1 when the sheet 2 is folded over and overlies the sheet 1. Such folding is brought about during passage of the film unit through the nip between two juxtaposed pressure-applying members (not shown) which are located in front of the film unit, i.e., to the left, as viewed in FIG. 1. The sheet 1 is provided with a suitably configurated leader 3 which can be grasped by fingers to pull the film unit through the nip between the pressure-applying members in a manner well known from the art. The pressure-applying members in a manner are preferably rolls. A positive image developes on the print receiving surface of the sheet 2 subsequent to passage of the film unit through the developer, I.E., between the aforementioned pressure-applying rolls. The generation of image is due to the action of a processing fluid which is normally entrapped in a rupturable container 6 mounted on the sheet 1 in the region of its front portion in such a way that it is located between the sheets 1, 2 during travel between the pressure-applying rolls. The rupturable container 6 is secured to the sheet 1 by elastic strips 4, 5 so that such strips define a pivot axis about which the container 6 can turn at right angles to the longitudinal direction of the sheet 1. The container 6 includes an envelope preferably consisting of a single sheet or foil of synthetic plastic material which is folded over itself along that edge which is adjacent to the strips 4, 5 and whose overlapping edge portions 6*a*, 6*b*, 6*c*

are bonded to each other to normally prevent escape of processing fluid from the internal chamber of the container. The shorter edge portions **6***a*, **6***b* are substantially stronger than the elongated rear edge portion **6***c* so that, when the container **6** is caused to pass between the pressure-applying rolls at the developing station, the container bursts or is ruptured along its weakened edge portion **6***c* and spills the processing fluid onto the adjoining surfaces of the sheets **1** and **2**. Such ready destructibility of the edge portion **6***c* can be achieved by welding or otherwise bonding the corresponding edges of the sheet to each other with a force which is much weaker than the bond along the shorter edge portion **6***a* or **6***b*. The edge portion **6***c* can be said to constitute a weakened portion or seam of the rupturable container **6** and is remote from the front portions of the sheets **1**, **2**.

The container **6** accommodates a fluid flow regulating insert **7** which serves as a means for regulating the flow of processing fluid upon destruction of the weakened portion **6***c*. The insert **7** comprises a central portion **7A** whose cross-sectional area corresponds substantially to that of the central part of the container **6**. This central portion **7A** occupies between one-fifth and one-eighth of the overall length of the container **6** and insures that the central part of the chamber defined by the envelope of the container contains little (if any) processing fluid. The central portion **7A** preferably consists of a metallic or plastic foil which is impermeable to the processing fluid and which serves as an envelope for a supply or bubble of gaseous fluid (e.g., nitrogen). The internal surfaces of the envelope of the central portion **7A** are grooved (as at **7B**) in longitudinal direction of the film unit to insure that the entrapped gas can flow through the nip between the pressure-applying rolls when the front part of the central portion **7A** is already located downstream but the rear part of the central portion **7A** still remains upstream of the nip. Thus, the grooves **7B** permit substantial compression and deformation of the envelope of the portion **7A** without the danger of rupture of the envelope. Such rupturing could affect the quality of images because the gas would be free to penetrate into the processing fluid and would prevent uniform distribution of such fluid along the sheets **1** and **2**. If desired, the central portion **7A** of the insert **7** can be made of foamed synthetic plastic material with closed pores (at least along its external surface).

The central portion **7A** is provided with two extensions or wings **7***a*, **7***b* which extend in the longitudinal direction of the container **6**, i.e., toward the edge portions **6***a*, **6***b* and serve as a means for preventing sidewise movements of the central portion **7A**. The thickness of the extensions **7***a*, **7***b* equals or approximates the minimum thickness of the container **6** (i.e., the thickness of this container in flattened condition subsequent to expulsion of processing fluid). Such dimensioning of extensions **7***a*, **7***b* insures at least substantially complete expulsion of processing fluid upon rupture of the weakened portion **6***c* while the film unit is caused to pass between the pressure-applying rolls. During such passage of the film unit, the central portion **7A** of the insert **7** insures that relatively little processing fluid flows from the container **6** in the region of the central part of the weakened portion **6***c*. However, the central portion **7A** does not prevent destruction of the portion **6***c* along its entire length, i.e., the developing can begin and proceed from the weakened portion **6***c* toward the trailing ends of the sheets **1**, **2** and along the full width of each sheet.

The main advantage of the central portion **7A** of the insert **7** is that it reduces the quantity of processing fluid in the central part of the container **6** but without necessitating the provision of a weakened portion **6***c* of nonuniform strength. When the portion **6***c* is destroyed (all the way between the edge portions **6***a*, **6***b*), the front of the outflowing processing fluid is not a straight line immediately after the fluid is free to leave the container, i.e., the front has a depression in its central part; however, such front becomes straight shortly thereafter and remains substantially straight during further advance of the film unit between the pressure-applying rolls. The distance required for straightening of the front of the outflowing fluid is rather short.

FIGS. **3** and **4** illustrate a portion of a second photographic film unit which comprises two sheets (only the sheet **101** shown) and a different rupturable container **106**. This container again comprises two relatively strong lateral edge portions **106***a*, **106***b* and a weakened portion or seam **106***c* which is destroyed when the container is caused to pass between the pressure-applying rolls (not shown). The envelope of the container **106** preferably consists of synthetic plastic material. The insert **7** of FIGS. **1** and **2** is replaced with a modified flow-regulating means, namely with a specially designed and produced integral fluid-free portion **106***d* of the envelope of the container **106**. The fluid-free portion **106***d* is of triangular shape and occupies the central part of the container. It is obtained by welding the overlapping panels of the plastic envelope to each other so as to form a flat twin-walled section which contains no processing fluid. The strength of the bond between the welded-together sections of panels at **106***d* suffices to prevent their separation during passage between the pressure-applying rolls.

The rear side **106D** of the triangular portion **106***d* is preferably spaced from and at least substantially parallel to the weakened portion **106***c*. This insures that a small amount of processing fluid can be stored in front of the central part of the portion **106***c*. A triangular portion **106***d* has been found to be particularly advantageous because it occupies a relatively small part of the total volume of the container **106**, I.E., the latter can store a substantial amount of processing fluid. On the other hand, the flow-regulating effect of the triangular fluid-free portion **106***d* is the same as that of a rectangular portion having sides of the same length. The amount of processing fluid which is stored between the side **106D** and the adjoining part of the weakened portion **106***c* suffices to insure that the processing fluid spreads along the full width of the two sheets as soon as the portion **106***c* is destroyed. Fluid which flows inwardly from the marginal portions of the sheets compensates for lack of substantial amounts of fluid behind the side **106D**. Thus, as the film unit continues to move through the nip between the pressure-applying rolls, the fluid spreads toward the rear edges of overlapping exposed and print-receiving sheets in the form of a wide carpet which covers uniformly the adjoining internal surfaces of the sheets.

The fluid-free portion **106***d* can be obtained by welding together the panels of the container's envelope within the entire triangular area. However, it is normally sufficient to weld only the sides of the triangular area, preferably simultaneously with welding of the portions **106***a*, **106***b* and **106***c*.

It is clear that the fluid-free portion **106***d* may consist of several discrete fluid-free portions which together form a flow regulating means of preferably triangular outline. By properly distributing such discrete fluid-free portions (or "islands") in the central part of the rupturable container, one can insure even more predictable and even more satisfactory distribution of processing fluid on destruction of the weakened portion **106***c*.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. A photographic film unit, comprising a pair of sheets having adjacent front portions and arranged to overlap each other at least while the outer sides thereof are subjected to pressure during travel through a developing station; and an elongated rupturable container for a supply of processing fluid located between and extending transversely of said sheets in the region of said front portions, said container comprising a longitudinally extending weakened portion remote from said front portions and substantially centrally located flow regulating means including a deformable insert arranged to reduce the quantity of processing fluid in the corresponding part of the container.

2. A film unit as defined in claim 1, wherein said insert has an external surface which is impermeable to processing fluid.

3. A film unit as defined in claim 1, wherein said insert comprises a gas-filled envelope.

4. A film unit as defined in claim 3, wherein said envelope has internal surfaces provided with at least one groove extending substantially transversely of said container.

5. A film unit as defined in claim 1, wherein said insert comprises a deformable central portion and a pair of extensions each extending from said central portion and lengthwise of said container.

6. A film unit as defined in claim 5, wherein the thickness of said extensions at least approximates the thickness of said container in flattened condition.

7. A photographic film unit, comprising a pair of sheets having adjacent front portions and arranged to overlap each other at least while the outer sides thereof are subjected to pressure during travel through a developing station; and an elongated rupturable container comprising a flexible envelope for a supply of processing fluid located between and extending transversely of said sheets in the region of said front portions, said container further comprising a longitudinally extending weakened portion remote from said front portions and substantially centrally located flow-regulating means arranged to reduce the quantity of processing fluid in the corresponding part of the container, said flow regulating means constituting

an integral fluid-free portion of said envelope and said fluid-free portion having a substantially triangular outline.

8. A film unit as defined in claim 7, wherein said envelope consists of synthetic plastic material.

9. A film unit as defined in claim 7, wherein said envelope comprises a pair of panels which are bonded to each other at least along the outline of said fluid-free portions.

10. A film unit as defined in claim 7, wherein the apex of said fluid-free portion is remote from and one side thereof is adjacent and substantially parallel to said weakened portion.

11. A photographic film unit, comprising a pair of sheets having adjacent front portions and arranged to overlap each other at least while the outer sides thereof are subjected to pressure during travel through a developing station; and an elongated rupturable container comprising a flexible envelope for a supply of processing fluid located between and extending transversely of said sheets in the region of said front portions, said container further comprising a longitudinally extending weakened portion remote from said front portions and substantially centrally located flow-regulating means arranged to reduce the quantity of processing fluid in the corresponding part of the container, said flow regulating means constituting an integral fluid-free portion of said envelope adjacent to but spaced from said weakened portion so that some processing fluid is stored therebetween.