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H. E. ERIKSON

3,201,248

FILM UNIT

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2 Sheets-Sheet 1

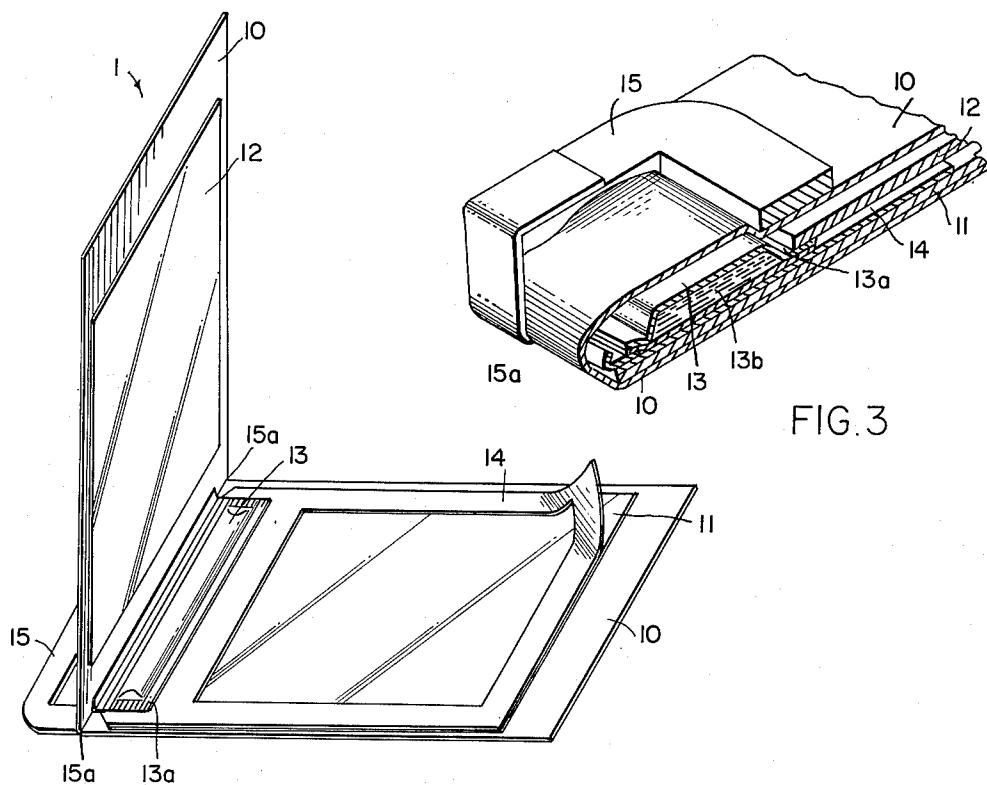


FIG. 1

FIG. 3

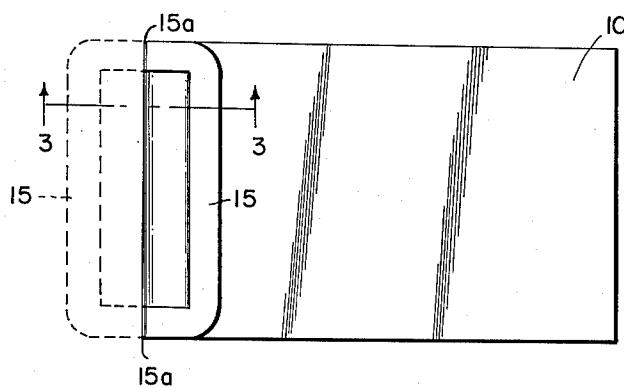


FIG. 2

Herman E. Erikson
INVENTOR

BY *Benson and Nichols*
and
Alvin Sease

ATTORNEYS

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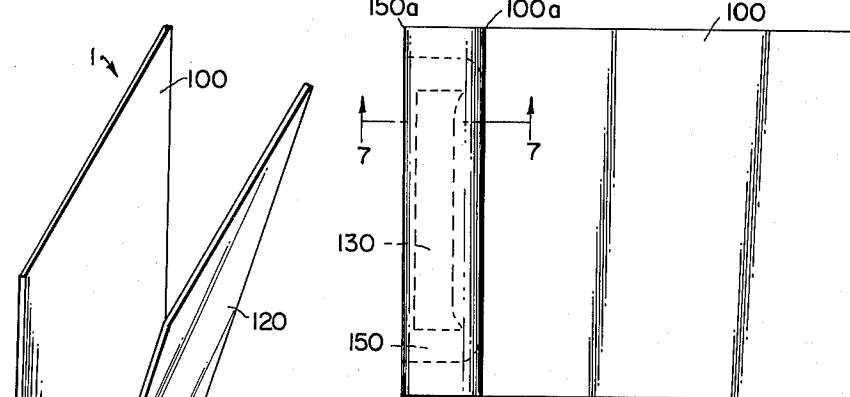


FIG. 6

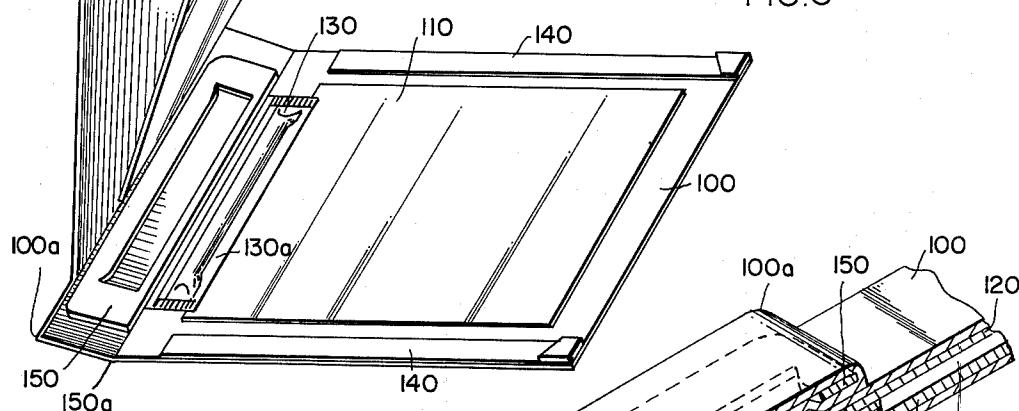


FIG. 4

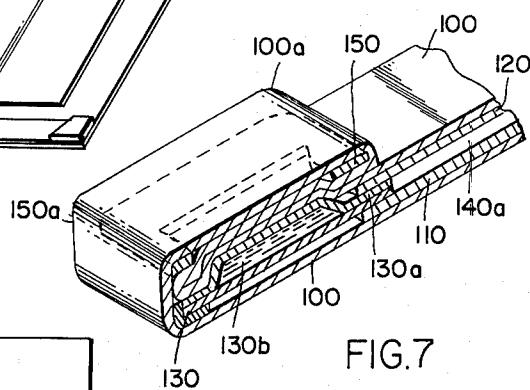


FIG. 7

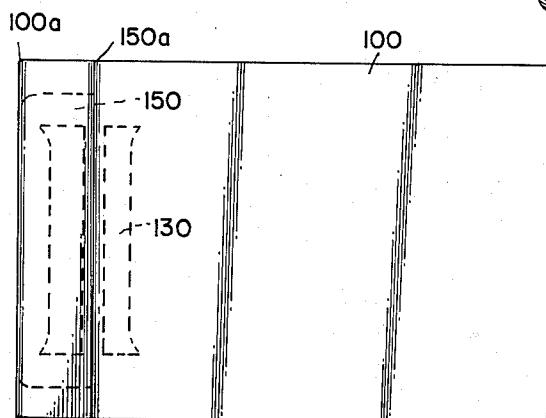


FIG. 5

Herman E. Erikson
INVENTOR

BY *Brown and Nichols*
and
Alvin Isaacs

ATTORNEYS

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FILM UNIT

Herman E. Erikson, Winchester, Mass., assignor to Polaroid Corporation, Cambridge, Mass., a corporation of Delaware

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10 Claims. (Cl. 96—76)

This invention relates to photography and more particularly to novel composite film units.

A primary object of the invention is to provide a novel, flexible, photographic, film unit of improved strength and stability against external mechanical forces.

Another object of the invention is to provide a novel, photographic, film unit, comprising a photosensitive stratum, an image-receiving layer and a frangible container of a processing solution disposed therebetween.

Yet another object of the invention is to provide a novel, photographic, film unit of the foregoing description having pivotable means which in one position protects the 20 frangible container from premature rupturing due to external mechanical pressures, and in another position provides gripping means for processing the film unit.

Still another object of the invention is to provide a novel film unit which is particularly adaptable for use in 25 roentgenography.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the product possessing the features, properties and the relation of components which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIGURE 1 is a perspective view of one form of the composite film unit of this invention;

FIG. 2 is a plan view of the film unit of FIGURE 1, showing the pivotable means in its closed or protective position;

FIG. 3 is a sectional view taken along lines 3—3 of FIG. 2;

FIG. 4 is a perspective view of another form of the novel composite film unit of this invention;

FIG. 5 is a plan view of the film unit of FIG. 4, showing the pivotable means in its open or processing position;

FIG. 6 is a plan view of the novel film unit of FIG. 4, showing the pivotable means in its closed or protective position; and

FIG. 7 is a sectional view taken along lines 7—7 of FIG. 6.

Composite film units comprising a photosensitive stratum, e.g., a light-sensitive silver halide emulsion, an image-receiving layer, and a developing solution confined in a frangible or rupturable container positioned between the photosensitive stratum and the image-receiving layer, are well known in the art. Generally speaking, the photo-sensitive element and the image-receiving layer are formed on a common flexible support, or one or both of the said elements are hinged so that they may be in superposed relationship with one another during at least the developing step. A frangible container confining the developing or processing solution is disposed in the film unit in such a position that upon applying a suitable pressure, as for example by passing through a pair of rollers, the container is ruptured and the processing solution confined therein is spread uniformly between the exposed photosensitive stratum and the superposed image-receiving layer. The film units of the foregoing description have been found

2

particularly useful in radiography as well as in the recording of visible images by photoexposure in a camera to actinic light. In operation, the photosensitive stratum of the composite film unit is exposed and at some time subsequent to exposure the frangible container is ruptured, for example, by passing the assembly through a pair of pressure rollers. As is well known in the art, the processing solution spread between the photosensitive stratum and the image-receiving layer reduces the silver in exposed areas and transfers the unexposed silver, by imbibition, to the image-receiving layer to form a positive image thereon. As an illustration of prior patents describing in more detail composite film units of the foregoing description, mention may be made, for example, of U.S. Patent Nos. 2,609,296, 2,627,459, 2,855,302, and 2,898,208.

While composite film units such as described and claimed in the aforementioned patents are completely satisfactory for most purposes, it has been found that premature or unintentional rupturing of the container resulting in at least partial release of the processing solution sometimes occurs due to the application of external mechanical forces. For example, in shipment and/or storage, a plurality of such film units are frequently stacked one on top of the other. It sometimes happens that the weight of the stack is so great as to cause rupturing of the frangible container or containers in the bottommost film unit or units of the stack. Moreover, in preparing radiographs, it is often desirable to place a heavy object to be X-rayed on top of the film unit. The weight of this object may rupture the frangible container. The net result of this premature rupturing is to make the film unit useless for its intended purpose.

The essence of the present invention is the provision of pivotable means which performs the dual function of protecting the pod from premature rupturing and also serves as gripping means to facilitate processing.

The invention may be more fully understood by reference to the accompanying drawings.

As shown in FIGS. 1 to 3, a film pack 1 is provided comprising an outer envelope 10 made of a suitable material opaque to actinic light and enclosing an image-receiving layer 11, a light-sensitive element 12 and a frangible container 13 which is provided with a rupturable seal 13a to permit spreading of a liquid-processing solution 13b contained therein between image-receiving layer 11, and light-sensitive element 12 at some time subsequent to exposure. Although envelope 10 is shown to be folded over or pivoted substantially in the middle and open on three sides, it will be appreciated that the three sides shown in FIGURE 1 to be open may be fastened together by suitable fastening means (not shown) prior to exposure and development to provide an effective light-tight seal. The open sides may be lightly heat sealed in face-to-face relationship, in a manner to provide easy separation in order to open the envelope and to obtain access to the contents thereof. Where desired or found expedient to do so, envelope 10 may be provided with fractured areas or score lines along at least one side to facilitate opening. Other sealing means, such as staples and the like, may obviously be provided where the film pack is intended for use in radiography. It will be appreciated that the outer envelope, while opaque to actinic light, must be transparent to X-rays or other radiation emanating from a radioactive source. Film pack 1 also preferably but not necessarily includes masking means 14. As shown in FIGURE 1, masking means 14 provides a border around receiving layer 11. Masking means 14, which is of a suitable thickness, also serves to provide a suitable gap or area of separation between the superposed faces of the light-sensitive element and the image-receiving sheet to permit

or facilitate uniform spreading of the processing solution therebetween during development. It also aids in effecting a lighttight seal.

Film packs of the foregoing nature are known in the art and patentable novelty per se is not predicated upon the aforementioned combination of elements. The essence of the embodiment of the invention illustrated in FIGS. 1-3 is the provision of a multiple handle 15 which in one position protects frangible container 13 from premature rupturing and in a second position is away from and out of contact with container 13 and serves as a gripping means to facilitate processing. Handle 15 is made of a material of suitable strength and rigidity, and may, if desired, be flexible. As examples of such materials, mention may be made of cardboard, plastic, metals, such as aluminum, etc. As shown in the drawings, handle 15 is pivoted at 15a. FIG. 2 shows handle 15 (solid lines) in the closed or protective position wherein one of its inner longitudinal portions abuts the portion of envelope 10 lying directly over and corresponding with seal 13a of frangible container 13. In this position, handle 15, which preferably is of substantially the same thickness as container 13, confines and protects the container from external pressure and thereby precludes premature and unintentional rupturing of the container and spreading of its content. While it is not necessary that handle 15 abut the portion of envelope 10 lying directly over seal 13a, this has been found to be preferable since it serves further to reinforce seal 13a against premature rupturing. When the film pack is ready for processing, handle 15 is pivoted free of its protective position, as shown by the dotted lines in FIG. 2, and now functions as gripping means during the processing step.

In the embodiment of the present invention as shown in FIGS. 4 to 7, the pivotable protecting means is situated within the film pack. As shown in FIGS. 4 to 7, film pack 1 comprises an outer envelope 100 enclosing a receiving sheet 110, a light-sensitive element 120, and a frangible container 130 provided with a rupturable seal 130a to spread a liquid processing solution 130b contained therein between the image-receiving layer 110 and light-sensitive element 120 at some time subsequent to exposure. The film pack also preferably but not necessarily contains a pair of strips 140 of suitable thickness which serve to control the gap and ensure a lighttight seal in the manner previously discussed. Protecting means 150 is provided, similar to handle 15 in the embodiment illustrated in FIGS. 1 to 3. As shown in FIG. 4, protecting means 150 is securely mounted on the internal surface of envelope 100 by suitable fastening means (not shown). Envelope 100 is folded or pivotable at two points 100a and 150a. In the closed or protective position, envelope 100 is folded at 150a (as shown in FIG. 6) so that the inner longitudinal portions of protecting means 150 confine frangible container 130 in a manner similar to the embodiment illustrated in FIGS. 1 to 3. In the open or processing position (shown in FIG. 5), the portion of the film pack folded over at 150a is opened and the portion of the film pack between points 100a and 150a, being of greater strength and rigidity, may be used as gripping means during the processing step.

It will be apparent from the foregoing description that the novel pivotable protecting means of this invention is preferably maintained in the closed or protective position during all phases of the shipment, storage, and other handling steps, including exposure, prior to the development step. In this manner, unintentional or premature rupturing of the frangible container and spreading of its contents is effectively prevented. During the development step, which is preferably accomplished by passing the film unit through a pair of pressure rollers, the pivotable protecting means is in its grip-providing position and is therefore free from contact with the frangible container. In this position, the pivotable protecting means functions as

suitable gripping means to facilitate pulling the film unit through the pressure rollers at a steady, even rate which in turn insures a uniform spreading of a processing solution between the exposed photosensitive element and the superposed image-receiving layer.

While the embodiments shown in the drawings have been described for purposes of illustration, it will be appreciated that the invention is not limited thereto. Obviously, changes in modifications may be made without departing from the spirit of the present invention. For example, it is contemplated that the outer envelope may be dispensed with and the image-receiving layer and photosensitive stratum provided with suitable supports hinged together at one end thereof. In like manner, the outer envelope need not be opaque to actinic light but may be made of any suitable material. Other means for protecting the film unit from undesirable exposure to actinic light will be readily suggested to those skilled in the art.

Since certain changes may be made in the above products without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

25 5. What is claimed is:

1. In a film unit comprising a first sheet material containing a light-sensitive layer, a second sheet material and a frangible container having a rupturable seal for releasing a processing composition between said first and second sheet materials as said unit is advanced through a pressure-providing processing device, the improvement which comprises an element secured to said unit and movable between a first position therein said element is arranged in an overlying relationship with said container to protect the latter from rupturing, and a second position away from said overlying relationship to provide means for gripping said film unit.

2. A film unit as defined in claim 1 wherein said element is pivotally mounted on said unit about an axis substantially parallel to the major dimension of said container and spaced from the leading edge thereof, whereby to be movable about said pivotal mounting between said first and second positions.

3. A film unit as defined in claim 2 wherein said frangible container is positioned with the major dimension thereof lying transverse to the direction of advancement of said unit during processing.

4. A film unit as defined in claim 1 wherein said element is of at least substantially the same thickness as said container and has an open center portion of substantially the same dimensions as and slightly larger than the periphery of said container, whereby when said element is in said first position, said open center portion is in overlying relationship with said container.

5. A film unit including a first sheet material having a light-sensitive layer positioned thereon; a second sheet material; a frangible container having a photographic processing composition confined therein, said container being positioned so as to be capable of releasing its contents between said first and second sheet materials when said sheet materials are in superposed relationship with one another; a third sheet material enveloping said first and second sheet materials and said container, said third sheet material being opaque to visible light but transparent to radiation from a radioactive source; and an element having a hollow center portion of substantially the same dimension as and slightly larger than the periphery of said frangible container, said element being secured to the outer surface of said third sheet material and movable between a first position wherein the hollow center portion of said element is arranged in an overlying relationship with said container and separated therefrom by said third sheet material, whereby to protect said container from rupturing, and a second position away

from said overlying relationship to provide means for gripping said film unit.

6. A film unit as defined in claim 5 including masking means associated with said second sheet material.

7. A film unit including a first sheet material having a light-sensitive layer positioned thereon; a second sheet material; a frangible container having a photographic processing composition confined therein, said container being positioned so as to be capable upon rupturing of releasing its contents between said first and second sheet materials when said sheet materials are in superposed relationship with one another; an element having a hollow center portion of substantially the same dimensions as and slightly larger than the periphery of said frangible container, said element being positioned adjacent to said container and spaced from the leading edge thereof, said element further being movable about a pivotal mounting between a first position wherein said element is arranged in overlying relationship with said container to protect said container from collapsing and a second position wherein said element is away from said overlying relationship to provide means for gripping said element.

8. A film unit as defined in claim 7 including a third

15

sheet material enveloping said first and second sheet material, said container and said element, said third sheet material being opaque to visible light but transparent to radiation from a radioactive source.

5 9. A film unit as defined in claim 8 wherein said element is mounted on the inner surface of said third sheet material about an axis substantially parallel to the major dimension of said container and said third sheet material is pivotal at said axis between said first and second positions.

10 10. A film unit as defined in claim 8 including masking means associated with said second sheet material.

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NORMAN G. TORCHIN, Primary Examiner.