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FILM UNIT FOR DENTAL X-RAY PHOTOGRAPHY HAVING A SELF-CONTAINED DEVELOPER MEANS

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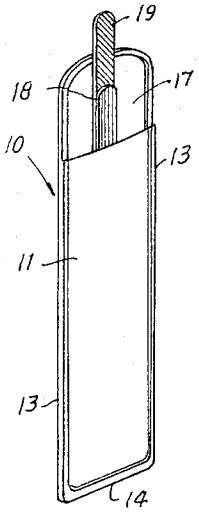


Fig. 1

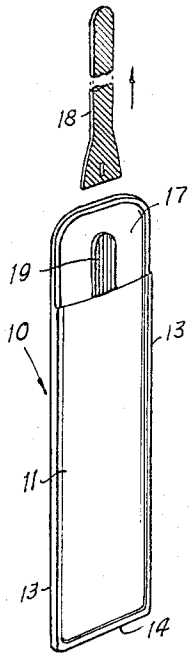


Fig. 2

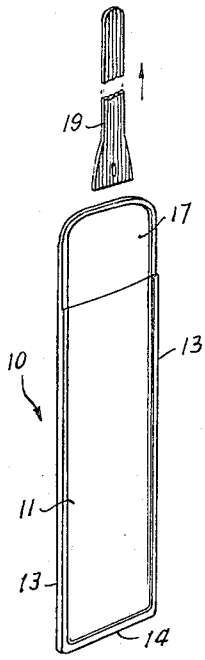


Fig. 3

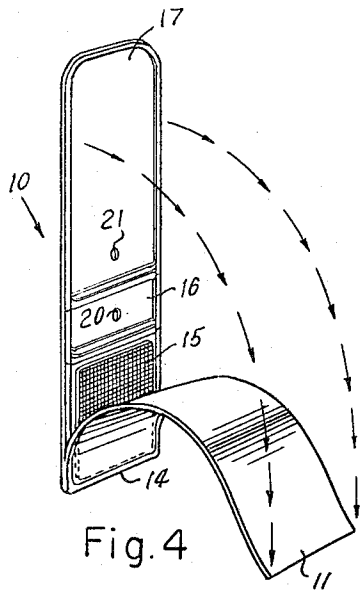


Fig. 4

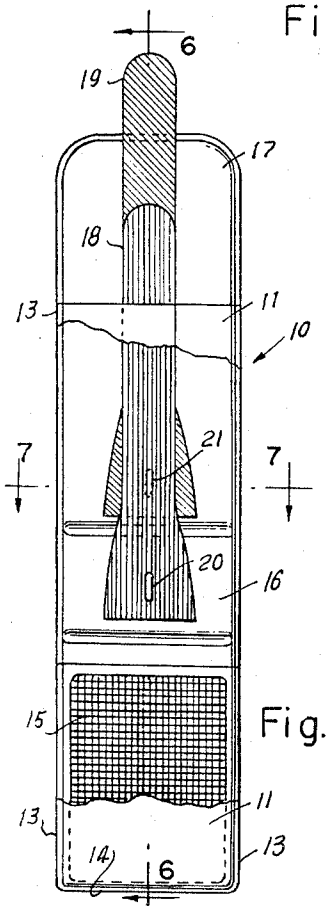


Fig. 5

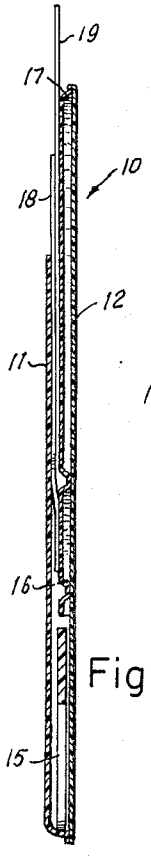


Fig. 6

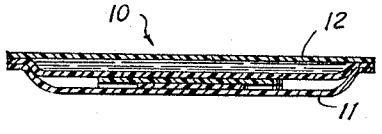


Fig. 7

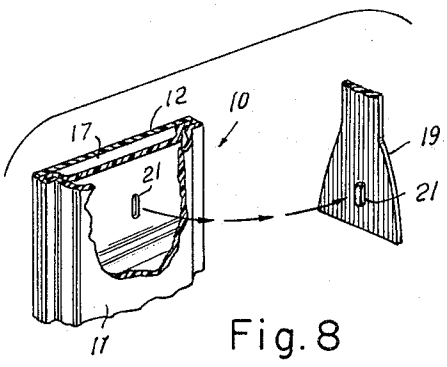


Fig. 8

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FILM UNIT FOR DENTAL X-RAY PHOTOGRAPHY HAVING A SELF-CONTAINED DEVELOPER MEANS

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4 Claims. (Cl. 250—65)

This invention relates to a film unit for use primarily in dental X-ray photography and having self-contained means for developing a photosensitive film after it has been exposed.

The invention contemplates a film unit including an envelope containing a single photosensitive film, suitable for ready use in making X-ray photographs, having self-contained means for developing the film, after it has been exposed.

In X-ray photography it has heretofore been proposed to employ film units each comprising two layers of material, opaque to ordinary light but permeable to X-rays and other radioactive rays, having arranged between them one or more layers of photosensitive material and one or more rupturable containers, each containing a liquid suitable for developing, or developing and fixing, photographic images on the photosensitive layers, after they have been exposed, upon rupturing the containers and spreading the liquid over the surfaces of the photosensitive layer or layers. Patent No. 2,565,378, issued to Edwin H. Land and assigned to Polaroid Corporation, for example, describes such a film unit and its use.

An advantageous feature of film units as described, which may comprise an envelope, or alternatively, two separate layers of material having one or more photosensitive layers, and the rupturable containers arranged between them, is that the material of the two outer layers, which may or may not comprise an envelope, is opaque to ordinary light so that no special apparatus is required for exposing the photosensitive layers to X-rays or other radioactive rays to produce the desired photographic images thereon, and no special care is needed to prevent them from being exposed inadvertently.

A disadvantageous feature of such conventional film units is that the rupturing of the container or containers containing the developing liquid, and the spreading of said liquid over the surfaces of the photosensitive layers, is accomplished by subjecting the containers to mechanical stress, as by passing the film units between pairs of rollers whereby pressure is applied to opposite sides thereof. According to the usual practice the film units may or may not be enclosed in a suitable receptacle therefor as they are squeezed between the rollers.

A prime object of this invention is that of providing a film unit as described in which the end product is a single photographic negative, and in its preferred form the invention comprises a film unit as described which includes an elongated envelope, open at one end, the material of which is opaque to ordinary light and at least one side of which is permeable to X-rays and other radioactive rays, having a photosensitive film therein which is relatively smaller than the envelope, in spaced apart relation to its open end, and having one or more rupturable containers therein, each containing a liquid for treating the photosensitive film, after it has been exposed, between the photosensitive film and the open end of the envelope.

The arrangement is such that upon rupturing the container or containers, while holding the envelope with its open end uppermost, the liquid draining from the container or containers is caused to spread over the surfaces of the photosensitive film to develop and set the image thereon.

A further object of the invention resides in the provision

of a film unit as described which further includes one or more elongated separable tabs, each having a frangible connection at one of its ends with one of the rupturable containers and extending outwardly beyond the open end of the envelope, the arrangement being such that the containers are adapted to be ruptured upon pulling the tabs to disengage them from the containers.

In one form thereof the invention contemplates an arrangement as described in which at least two of the rupturable containers are received in the envelope, in longitudinally spaced relation thereto, and in which the photosensitive film may be treated in a series of steps, after it has been exposed, using different liquids, each contained in one of the containers, upon pulling successively the several tabs corresponding to the respective containers.

While the foregoing objects are paramount, other and lesser objects will become apparent as the description proceeds, when considered in connection with the appended drawings wherein:

FIGURE 1 is a perspective view of a film unit embodying the invention having two of the rupturable containers, each having an elongated tab frangibly connected thereto, and extending outwardly beyond the open end of the envelope, showing both of the tabs in place.

FIGURE 2 is a view similar to FIGURE 1 showing one of the tabs in its detached position, leaving the second tab in place.

FIGURE 3 is a view similar to FIGURES 1 and 2 showing the second tab in its detached position.

FIGURE 4 shows one side of the envelope pulled away to expose the photosensitive film.

FIGURE 5 is a view on an enlarged scale showing the front side of the film unit as illustrated in FIGURE 1, showing the front side of the envelope broken away to expose the interior thereof, and showing the photosensitive film, the rupturable containers, and the elongated tabs.

FIGURE 6 is a longitudinal sectional view taken on the line 6—6 of FIGURE 5.

FIGURE 7 is a transverse sectional view taken on the line 7—7 at FIGURE 5, and

FIGURE 8 is an exploded fragmentary perspective view on an enlarged scale showing details of construction.

Referring to the drawing, the film unit embodying the invention includes an elongated envelope, designated generally by the numeral **10**, having front and back walls **11** and **12**. The envelope **10** is open at one end which is positioned uppermost as shown in FIGURES 1 to 6 of the drawing. The envelope **10** is preferably formed of plastic sheet material, for example, which is opaque to ordinary light rays but permeable to X-rays and other radioactive rays. The front wall **11**, which is relatively shorter than the back wall **12**, is removably connected thereto, as by heat sealing, along its longitudinal edges **13** and its bottom edge **14**. A photosensitive film **15**, which is relatively smaller than the envelope **10**, is received therein and is spaced from its open end.

A pair of rupturable containers **16** and **17**, each of which contains a liquid for treating the photosensitive film **15** after it has been exposed, are received in the envelope **10** between the photosensitive film **15** and the open end thereof.

The arrangement is such that upon rupturing the containers **16** and **17**, or either of them, while holding the envelope **10** with its open end uppermost, as shown, the liquid draining from the containers **16** and **17** is caused to spread over the surfaces of the photosensitive film **15**. Spreading of said liquid over said surfaces may be assisted somewhat by manipulation of the adjacent end portion of the envelope **10** between the fingers.

Each of a pair of elongated, separable tabs **18** and **19** has a frangible connection at one of its ends with one of the rupturable containers **16** and **17**, as at **20** and **21**,

and extends outwardly beyond the open end of the envelope **10**. By this arrangement the containers **16** and **17** are adapted to be ruptured upon pulling the tabs **18** and **19** to disengage them from the containers **16** and **17**.

The rupturable containers **16** and **17** are received in the envelope **10** in longitudinally spaced relation thereto, and the arrangement is such that the photosensitive film **15** may be treated in a series of steps, after it has been exposed, using the different liquids contained in each of the respective containers upon pulling the tabs **18** and **19** corresponding to the containers **16** and **17**.

The invention may be modified within certain limitations by persons skilled in the art without departing from the spirit and intent thereof or the scope of the appended claims.

What is claimed is:

1. In a film unit for use in X-ray photography having self-contained means for developing a photosensitive film after it has been exposed, the combination of an elongated flexible envelope, open at one end, the material of which is opaque to ordinary light and at least one side of which is permeable to X-rays and other radioactive rays; a photosensitive film, relatively smaller than said envelope, received therein, in spaced apart relation to its open end; a plurality of rupturable containers, each containing a liquid for the treatment of said photosensitive film, after it has been exposed, supported in said envelope, between said photosensitive film and the open end of said envelope and a plurality of pull tabs connected respectively to said containers and extending from said envelope for rupturing said containers.

2. The structure of claim **1**, the arrangement being such that upon rupturing said containers, while holding said envelope with its open end uppermost, the liquid draining from said containers is caused to spread over the surfaces of said photosensitive film.

3. The structure of claim **1**, wherein said pull tabs are separable tabs each having a frangible connection at one of its ends with one of said rupturable containers and extending outwardly beyond said open end of said envelope, the arrangement being such that said containers are adapted to be ruptured upon pulling said tabs to disengage them from said containers.

4. The structure of claim **3**, wherein said rupturable containers are supported in said envelope, in longitudinally spaced relation thereto, and the arrangement being such that said photosensitive film may be treated in a series of steps, after it has been exposed, using different liquids each contained in one of said containers, upon pulling successively the several tabs corresponding to said containers, respectively.

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