March 6, 1951 E. H. LAND 2,544,268

PHOTOGRAPHIC PRODUCT

Filed Oct. 7, 1948

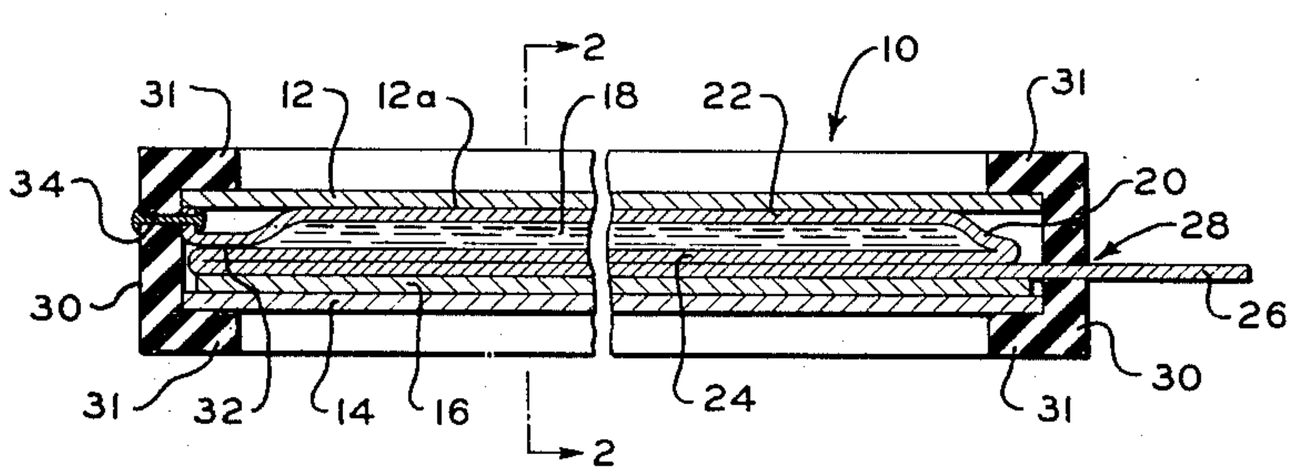

FIG. 1

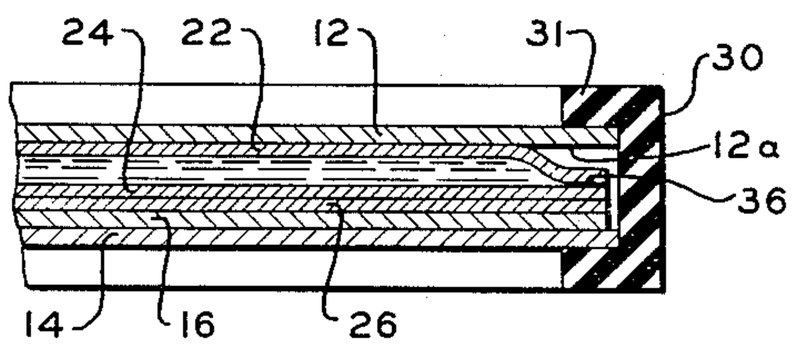

FIG. 2

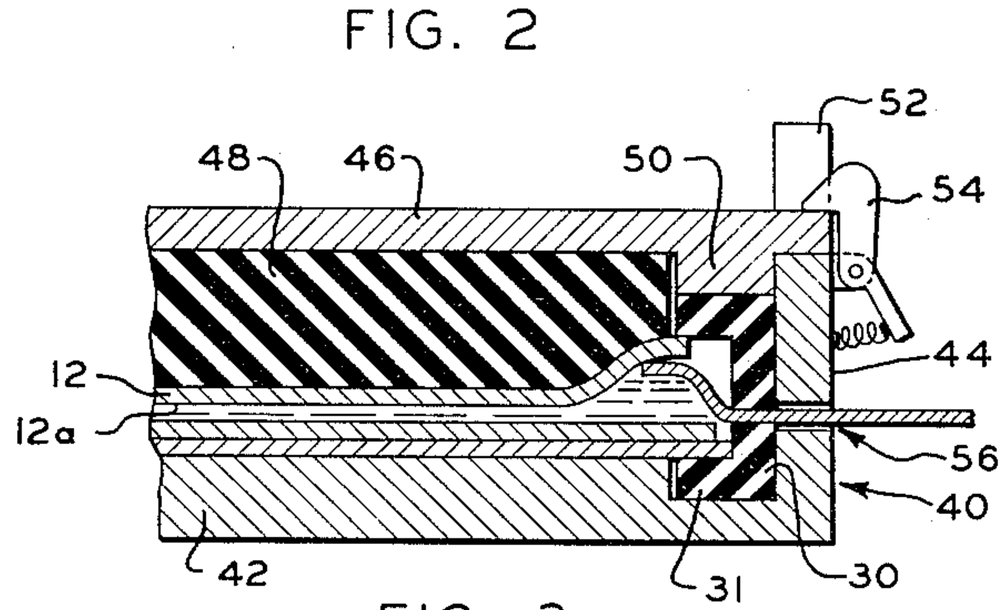

FIG. 3

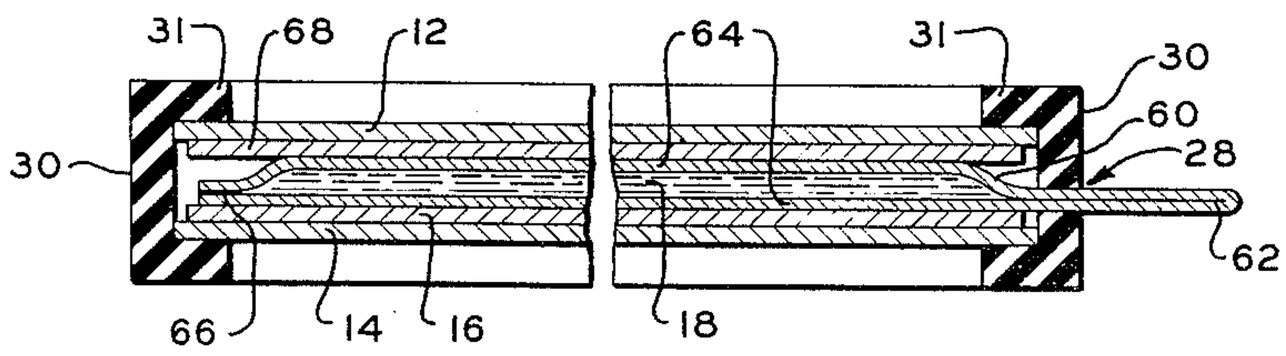

FIG. 4

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PHOTOGRAPHIC PRODUCT

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Application October 7, 1948, Serial No. 53,355

15 Claims. (Cl. 95—6)

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This invention relates to photography and more particularly to novel photographic products, and in particular such products which are useful in dental X-ray work. This application is in part a continuation of my copending application Serial No. 727,384, filed February 8, 1947, now abandoned and replaced by my copending application Serial No. 185,642, filed September 19, 1950.

A principal object of the present invention is to provide an improved photographic film unit which is simple to construct and use.

Another object of the invention is to provide an X-ray dental film pack wherein a processing liquid is provided in a suitable container therefor and a portion of the container serves as an anti-backscatter screen.

Still another object of the invention is to provide, in a film unit of the general type described above, a novel arrangement of the processing liquid which permits inclusion of a maximum amount of liquid without adding appreciably to the bulk of the film unit or increasing the stiffness of the film unit.

Still another object of the invention is to provide such a film unit which can be deformed during use to permit fitting into a patient's mouth, for example, without releasing its contained liquid but which can be processed in a single mechanical operation.

These and 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 diagrammatic exaggerated sectional view of one preferred type of dental film unit embodying the present invention;

Fig. 2 is a sectional view taken along line 2—2 of the film unit of Fig. 1;

Fig. 3 is a diagrammatic fragmentary sectional view, similar to Fig. 1, showing the film unit of Fig. 1 being processed in a preferred type of processing fixture; and

Fig. 4 is a diagrammatic exaggerated sectional view of another modification of the invention.

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In general this invention relates to new and improved film units of the type which can be processed merely by the application thereto of a mechanical stress. This invention is particularly directed to improvements in such film units which make them very suitable for use in dental X-ray or radium-ray photography. For such use the film unit should be as compact as possible. It should be thin and flexible. It must also be capable of withstanding considerable rough handling during insertion in position within the patient's mouth.

In one preferred form of the present invention the film unit comprises a photosensitive layer, such as a gelatino silver halide emulsion, carried by a suitable base, a container releasably confining a processing liquid, and an outer wall which is preferably opaque to visible light and transparent to X-rays and the like. The film unit also includes an edge frame for holding the various elements in their operative relationship. The container confines the liquid in a prespread layer, this liquid being preferably quite viscous and the layer of liquid preferably having an area substantially coextensive with the area of the photosensitive layer to be exposed to X-rays or radium rays. This layer of liquid is thus superposed with the area of the photosensitive layer to be processed thereby but is separated from the photosensitive layer by one wall of the container.

The container walls are preferably flexible and normally quite flat so that a relatively high compressive force may be applied to a rather large area thereof without rupturing the container seals, the liquid being displaced within the container without unduly increasing the hydraulic pressure in the liquid. Associated with the container is a portion thereof which may be manipulated so as to remove, from between the layer of liquid and the photosensitive layer, at least that wall of the container which isolates the liquid from the photosensitive layer. This manipulating portion preferably extends through an opening, such as a slit, in the edge frame of the film unit so as to be engaged by a user thereof. This opening in the edge frame is preferably arranged so as to be substantially liquid tight while permitting withdrawal of the container wall therethrough. The edge frame is preferably flexible so as to permit deformation of the film unit during use but it has sufficient rigidity so as to accomplish its liquid-sealing function, particularly when reinforced by a suitable fixture of the type described hereinafter.

The liquid container is preferably formed of a

paper-backed metal foil, such as lead foil, which includes an alkali-inert inner coating, this foil being folded upon itself and sealed, during filling, at the edge opposite the fold and along the two ends. With such a construction and arrangement of the container, the metal foil of the container lies on one side of the photosensitive layer and is coextensive with the area of the photosensitive layer to be exposed to the radium or X-rays. Thus the foil is positioned to serve as an anti-backscatter screen for the rays used to create a latent image in the photosensitive layer.

The arrangement of the manipulating portion of the container may take several forms. With one preferred form, this manipulating portion constitutes an extension of one of the walls of the container, this extension being led back along its wall and the end of the extension passing through the opening in the edge frame of the film unit adjacent the fold of the container. With such an arrangement, the mere pulling of the extension pulls the wall connected thereto from the contained layer of liquid and allows this liquid to contact and permeate the exposed photosensitive layer. In another form of the invention, the manipulating portion of the container comprises an extension of the container fold, this extension passing through the opening in the edge frame of the film unit adjacent the fold. With this arrangement, the whole container is withdrawn from the film unit while the liquid is forced to remain behind due to the narrowness of the withdrawal opening in the edge frame. This latter modification of the invention is particularly advantageous in those cases where a positive is desired of a latent negative image produced by exposure of the photosensitive layer. When such a positive image is desired, the container is positioned between the photosensitive layer and a positive image-carrying layer. Thus, when the container is withdrawn, the layer of liquid exists between the exposed negative and the positive image-carrying layer and the liquid concurrently develops a negative on one layer and a positive on the other.

Referring now to Figs. 1 and 2 there is shown one preferred embodiment of the invention wherein the container is provided with a manipulating tab which permits removal of just one wall of the container so as to accomplish the permeation of the exposed photosensitive area by the processing liquid.

The film unit 10 includes a top wall or layer 12, a bottom wall or layer 14, and a photosensitive assembly 16, a container 20 confining a predetermined quantity of a processing liquid 18, and a reinforcing edge frame 30 having inwardly extending flanges 31 for maintaining the various elements in the operative position shown. This edge frame additionally forms a substantially liquid-tight seal around the edges of the film unit. A preferred container 20 includes a top wall 22, a bottom wall 24 and a manipulating tab 26. This tab preferably extends through a slit 28 in edge frame 30, the slit 28 preferably having a transverse dimension substantially equal to the transverse dimension of the lower container wall 24 and a thickness substantially equal to the thickness of this container wall. The container walls 22, 24 and tab 26 are preferably formed of a single sheet which is folded over and sealed along the edge at 32 opposite the fold. The container is also sealed along the ends at 36 (see Fig. 2), the fold and the edge and end seals serving to form a liquid-confining space. That edge of the top container wall 22, closest to the seal 32, is preferably secured to the adjacent portion of the edge frame 30 by means such as a rivet 34.

When a developed and fixed negative is desired in a preferred type of film unit embodying the invention of Fig. 1, the photosensitive assembly 16 preferably comprises a silver halide photosensitive layer, such for example as a relatively thin-layered emulsion of rather fine grain size, such as that found in a fine grain motion picture release positive film, for example, Eastman Kodak's No. 1302 motion picture release positive. With such a negative emulsion, a preferred liquid 18 comprises the ingredients set forth in the following nonlimiting example:

Example 1

100 grams 5% water solution of sodium carboxymethyl cellulose
15 grams sodium sulfite
20 grams sodium hydroxide
12 grams hydroquinone
30 grams sodium thiosulfate

The container 20 is preferably formed of a single sheet of paper-backed lead foil whose inner surface is coated with a layer of an alkali-inert heat-sealable plastic such as polyvinyl butyral. A strip of a dissimilar plastic is preferably provided along that edge of the container blank which is to be formed into the seal 32, a preferred type of such dissimilar plastic being ethyl cellulose. Thus, when the inner polyvinyl butyral coating is brought into face-to-face relationship with itself, the end seals 36 of the container are formed by heat-sealing the polyvinyl butyral to itself while the edge seal 32 is formed by sealing the ethyl cellulose strip to the polyvinyl butyral, this edge seal being more easily broken than the two end seals. The tab 26 is preferably formed integrally with the container walls 22, 24. The two outer walls 12 and 14 are preferably formed of leader stock while the reinforcing edge frame 30 is formed of rubber, although this edge frame may be formed of other plastics or may even comprise a soft metal.

In the use of the above-described preferred form of the invention the film unit 10 is placed in the user's mouth, for example, lower wall 14 facing the source of radiation. The film unit is then exposed to radium rays, X-rays or other clinically useful ionizing rays, to create a latent negative image in the silver halide emulsion layer of the photosensitive assembly 16. The film unit is removed from the patient's mouth and the tab 26 is grasped by one hand while the film unit 10 is held in the other hand or in a suitable fixture which reinforces the edge frame 30 containing slit 28. The tab 26 is then pulled until the lower wall 24 of the container has been separated from the upper wall along the seal 32 and the whole wall has been withdrawn through the slit 28 in edge frame 30 of the film unit. The rivet 34 prevents movement of the upper container wall during movement of the lower container wall, thus assisting in breaking the container seals. Since slit 28 is very narrow and the liquid 18 is quite viscous, substantially none of liquid 18 is withdrawn as container wall 24 passes through slit 28. This removal of the lower container wall 24 allows the bulk of the processing liquid 18 to contact the exposed emulsion, this contact being aided if desired by pressing top wall 12 towards lower wall 14. After a minute or so the liquid 18 develops the exposed silver halide grains and dis-

solves the unexposed silver halide grains, transporting the dissolved silver complexes to the layer of liquid 18 where at least some of these complexes are reduced to silver by developer in the liquid layer. The film-forming sodium carboxymethyl cellulose being, under these circumstances, a poorer protective colloid than the gelatin of the silver halide emulsion layer, encourages this reduction of the silver complexes to silver within the liquid layer rather than in the gelatin emulsion, thus effectively fixing the developing negative.

At the completion of the photochemical processing, the film unit is taken apart and the layer of liquid, which has by this time formed a relatively solid layer due to absorption of water therefrom by the emulsion, is stripped from the developed and fixed negative.

When a positive image is desired with the film unit of Fig. 1 above, the top wall 12 of the film unit 10 is preferably provided with a lower surface 12*a* which is relatively white so as to form a good background for a dark image comprising silver. This surface may be formed by laminating to wall 12 a sheet of baryta paper which has been treated in accordance with the following nonlimiting example:

Example 2

A sheet of single-weight baryta paper is run through a bath containing 11 grams of cadmium acetate, .37 gram of lead acetate and 11 grams of zinc nitrate per 100 cc. of water, preferably only one side of the sheet being in contact with the bath and this contact being for about 10 seconds. A mixture is then prepared by thoroughly mixing the following ingredients:

2700 cc. of water
278 grams of cadmium acetate
278 grams of zinc nitrate
93 grams of lead acetate
300 grams of silica aerogel
927 grams of a 3% water solution of sodium sulfide

This mixture is then applied to the previously prepared baryta paper by running the paper through a bath of the mixture and removing excess by means of a soft rubber roll rotating counter to the direction of travel of the sheet.

With this modification of the invention the photosensitive assembly 16 preferably comprises a fast gelatino silver iodobromide emulsion on a suitable base such as paper. The liquid 18 preferably comprises the ingredients listed in the following nonlimiting example:

Example 3

1860 cc. of water
107 grams medium viscosity sodium carboxymethyl cellulose
12.1 grams high viscosity sodium carboxymethyl cellulose
78.0 grams of sodium sulfite
74.6 grams of sodium hydroxide
14.5 grams of sodium thiosulfate
38.5 grams of citric acid
52.0 grams of hydroquinone
1.5 grams of chlorobenzotriazole

In the use of the modification of the invention described above, exposure of the film unit is accomplished in the same manner and the processing thereof is accomplished by pulling the tab 26 to remove the lower wall 24, this pulling being continued so as to rupture the connection between rivet 34 and upper wall 22. The upper wall of the container is then also withdrawn through slit 28, thus leaving the liquid in a layer between negative 16 and the surface 12*a* of top wall 12 of the film unit. The liquid then develops the latent negative image and concurrently therewith forms a positive image on the treated surface 12*a*.

In order to get a uniformly thick liquid layer 18, the film unit described in Figs. 1 and 2 may be advantageously processed in a fixture of the type shown in Fig. 3 where like numbers refer to like elements in the preceding figures. This fixture 40 comprises a bottom pressure plate member 42, side walls 44 and a top member 46. The top member preferably includes a downwardly extending pressure member 48 shown, in one preferred form, as comprising rubber. The top member also preferably carries a downwardly extending member 50 for compressing the edge frame of the film unit adjacent the slit 28. Extensions 52 of the fixture side walls 44 serve as guides for the top member and a latch 54 is preferably included for holding the top member down in the position shown after it has been moved to this position. A slit 56 is provided in one of the fixture side walls 44 to coincide with the slit 28 in the edge frame of the film unit so as to allow the tab 26 to extend through both of these slits for manipulation during processing. In the use of the fixture of Fig. 3 the film unit, after exposure, is placed in the fixture 40, the film unit tab 26 is fed through slit 56 of the fixture and the fixture top member 46 is placed on top of the film unit. The top member 46 is preferably held on top of latch 54 so that it does not apply compression to the liquid contained in the film unit. The tab 26 is then pulled with a rapid motion so as to first remove the lower container wall, then to break the connection at rivet 34, and then to remove the top container wall completely from between the exposed photosensitive area and the image-carrying surface of the film unit. When the end of the container top wall 22 reaches the position shown in Fig. 3, the fixture top member 46 is pushed downwardly to the position shown. The latch then holds the top member 46 down, thus predeterminedly spacing the inner surfaces of the two pressure members 42, 48 and also compressing the slit 28 to prevent escape of liquid. This spacing is preferably equal to the thickness of the remaining layers of the film unit plus the desired thickness for the layer of spread liquid.

When the top pressure member 48 is resilient, as shown, it is initially compressed when it is first moved to operative position but its resilience soon narrows the spacing between the two pressure member surfaces to the desired amount. Since the two pressure members are preferably of approximately the area of the exposed portion of the photosensitive layer they create a high pressure in the liquid covering this area. Thus these two members 42, 48 force any excess liquid to the edges of the film unit, thereby leaving a uniform layer of liquid between the surface of the negative and the surface 12*a*, the edge frame 30 preventing escape of the excess liquid from the film unit. While this pressing is preferably accomplished as the top container wall is being removed, it may be accomplished after removal of the container wall, provided that the uniform layer of liquid is created prior to any substantial amount of positive image formation.

In still another modification of the invention,

the container carried by the film unit is arranged so that both walls of the container are removed simultaneously to permit permeation of the exposed photosensitive material by the contained liquid. This modification of the invention is shown in Fig. 4 wherein like numbers refer to like elements of the preceding figures, 16 indicating the photosensitive assembly, 12 and 14 indicating the top and bottom walls of the film unit, 30 indicating the edge frame, and 28 representing the slit. The liquid 18 is carried by a container 60 having an elongated tab 62 extending from the fold of the container walls 64 and through the slit 28. Slit 28 preferably has, as shown, a thickness substantially equal to the thickness of both container walls. The container mouth 66 is preferably less tightly sealed than the container ends to permit rupture of the container mouth seal upon a predetermined increase in the hydraulic pressure within the container. In Fig. 4 a separate layer 68 has been shown between the lower surface of top wall 12 and the container 60, this layer 68 serving the same purpose as the surface 12*a* previously described. The materials preferred for the film unit of Fig. 4 comprise those indicated as being preferable in the discussion of Fig. 1 above.

In the use of the invention of Fig. 4 the film unit is exposed to radiation passing through wall 14 and is then preferably placed in a fixture of the type shown in Fig. 3, the tab 62 being fed through slit 56 in the fixture side wall. In this case the film unit wall-compressing member 50 of the fixture may be made independently movable to operative position so as to reinforce the film unit edge frame adjacent the slit 28 and the pressure member 48 may be moved down so that it touches top wall 12 but does not compress the unit to any great extent. The tab 62 of the container 60 is now drawn through slit 28, thereby first increasing the hydraulic pressure in the container to the point where the container mouth 66 is ruptured, and then forcing the liquid from the container. During this withdrawal of the container, pressure member 48 prevents bowing of the container walls to any appreciable extent so that the liquid is left in the film unit in substantially the same position as it occupied prior to processing. If a uniform thin layer is desired, the pressure member 48 may be moved downwardly to compress the outer walls 12, 14 of the film unit and thus force excess liquid from the exposed area to the edges of the film unit. After a predetermined time, the various elements of the film unit are separated to reveal the final positive and/or negative images depending upon the processing materials employed.

The above-described modification of the invention has been discussed in connection with one preferred use thereof wherein it is particularly adapted to be employed as a dental X-ray film unit. In such use the outer walls 12 and 14 of the film unit are preferably formed of paper or other sheet material which is opaque to radiation and light normally encountered under usual conditions of natural or artificial illumination and relatively transparent to X-rays and the like. These walls may, however, pass numerous types of radiation other than X-rays, such as electrons, alpha particles and other analogous radiation associated with radioactive materials or radioactive isotopes. The film units are thus equally useful as badges to be worn by workers employed in the vicinity of such radiations, i. e., X-ray technicians and persons working with

radioactive materials. If desired, these walls may be made opaque to some of these radiations while being transparent to others, thereby permitting selective measurement of one type of radiation, where several types of such radiation are present. For example, the outer walls might include a sufficiently thick stratum of aluminum to absorb electrons while permitting the passage of gamma rays. One such use is in the selective measurement of radiation present associated with a nuclear reactor. Equally, one of the outer walls, or another stratum of the film unit, may include a photometric pattern, such as a step wedge. Such a step wedge for this use can be conveniently formed by providing a lamination of strips of aluminum of different length, the thickness of the composite lamination varying, in accordance with the desired pattern, from one end of the film unit to the other.

While preferred materials and uses thereof have been described above, these should not be considered as limiting the scope of the invention since it may be employed in numerous fields other than those specifically mentioned and may comprise other photosensitive materials and processing ingredients.

Since certain changes may be made in the above product 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.

What is claimed is:

1. A composite photographic film unit comprising, in combination, a frame, a first wall member, a second wall member, said wall members being mounted within said frame and forming with said frame a relatively flat, substantially liquid-tight chamber, said frame having a sheet-withdrawal passage in one wall thereof, a photosensitive layer contained within said chamber adjacent said first wall member, said photosensitive layer comprising a silver halide emulsion capable of being rendered developable upon exposure to ionizing rays, a liquid-impermeable sheet material located between said wall members within said chamber and cooperating with said second wall member to provide a liquid-tight container adjacent said second wall member, a processing liquid within said container and held thereby out of contact with said photosensitive layer, said liquid-impermeable sheet material preventing said liquid from permeating said photosensitive layer, a tab connected to said liquid-impermeable sheet material and extending through said passage to the exterior of said unit, at least so much of said liquid-impermeable sheet material as is located between said photosensitive layer and said liquid being removable through said passage by means of said tab, said sheet material cooperating with said passage during removal to prevent escape of liquid through said passage, said liquid remaining in the chamber to permeate said photosensitive layer, and image-transforming material, including a silver halide developer, contained within said chamber, said image-transforming material being rendered effective to develop said silver halide emulsion upon permeation of said emulsion with said liquid.

2. A composite photographic film unit comprising, in combination, a frame, a first wall member, a second wall member, said wall members being mounted within said frame and forming with said frame a relatively flat, substantially

liquid-tight chamber, said frame having a sheet-withdrawal passage in one wall thereof, a photosensitive layer contained within said chamber adjacent said first wall member, said photosensitive layer comprising a silver halide emulsion capable of being rendered developable upon exposure to ionizing rays, a liquid-carrying container mounted within said chamber adjacent said second wall member, a liquid within said container, one wall of said container being interposed between said liquid and said photosensitive layer to hold the liquid out of contact with said photosensitive layer, said last-named container wall being strippable relative to the remainder of said container, a tab extending through said sheet-withdrawal passage from the interior to the exterior of said unit, said tab being connected within said unit to said strippable wall of said container, said strippable wall being removable through said passage by means of said tab and cooperating with said passage during removal to prevent escape of liquid through said passage, the removal of said strippable wall causing the liquid in the container to be released for permeating the photosensitive layer, and image-transforming material, including a silver halide developer, contained within said chamber, said image-transforming material being rendered effective to develop said silver halide emulsion upon permeation of said emulsion with said liquid.

3. A composite photographic film unit comprising, in combination, a frame, a first wall member, a second wall member, said wall members being mounted within said frame and forming with said frame a relatively flat, substantially liquid-tight chamber, said frame having a sheet-withdrawal passage in one wall thereof, a photosensitive layer contained within said chamber adjacent said first wall member, said photosensitive layer comprising a silver halide emulsion capable of being rendered developable upon exposure to ionizing rays, a liquid-carrying container mounted within said chamber adjacent said second wall member, a liquid within said container, one wall of said container being interposed between said liquid and said photosensitive layer and holding the liquid out of contact with said photosensitive layer, said last-named container wall being strippable relative to the remainder of said container, a tab extending through said sheet-withdrawal passage and secured to the farther end of said strippable container wall, movement of said tab away from said unit peeling said strippable wall from the remainder of said container, said strippable wall being removable through said passage and cooperating with said passage during removal to prevent escape of said liquid through said passage, the peeling of said strippable wall causing the liquid in the container to be released for permeating the photosensitive layer, and image-transforming material, including a silver halide developer, contained within said chamber, said image-transforming material being rendered effective to develop said silver halide emulsion upon permeation of said emulsion with said liquid.

4. A composite photographic film unit comprising, in combination, a frame, a first wall member, a second wall member, said wall members being mounted within said frame and forming with said frame a relatively flat, substantially liquid-tight chamber, said frame having a sheet-withdrawal passage in one wall thereof, a photosensitive layer contained within said chamber adjacent said first wall member, said photosensitive

layer comprising a silver halide emulsion capable of being rendered developable upon exposure to ionizing rays, a liquid-carrying container mounted within said chamber adjacent said second wall member, a liquid within said container, said container comprising a pair of liquid-impervious walls between which the liquid is contained, one of said walls separating the liquid in the container from said photosensitive layer and being strippable from the other container wall to effect the release of the container contents in the direction of said photosensitive layer, the other container wall being secured within said chamber against movement with said strippable wall, a tab extending through said sheet-withdrawal passage from the interior to the exterior of said unit, said tab being connected within said unit to said strippable wall, said strippable wall being removable through said passage by means of said tab and cooperating with said passage during removal to prevent escape of liquid through said passage, the removal of said strippable wall causing the liquid in the container to be released for permeating the photosensitive layer, and image-transforming material, including a silver halide developer, contained within said chamber, said image-transforming material being rendered effective to develop said silver halide emulsion upon permeation of said emulsion with said liquid.

5. A composite photographic film unit comprising, in combination, a frame, a first wall member, a second wall member, said wall members being mounted within said frame and forming with said frame a relatively flat, substantially liquid-tight chamber, said frame having a sheet-withdrawal passage in one wall thereof, a photosensitive layer contained within said chamber adjacent said first wall member, said photosensitive layer comprising a silver halide emulsion capable of being rendered developable upon exposure to ionizing rays, a liquid-impervious sheet contained within said chamber and folded upon itself at least twice to provide at least three folds, the first and second of said three folds being closest to said second wall member and being secured together adjacent their marginal portions to form a liquid-carrying container, the free end of said first fold being secured to the wall of said frame opposite the wall containing said passage, said second fold being strippable relative to said first fold and the third fold having its free end extending through said passage to the exterior of the unit to provide a tab for peeling said second fold from said first fold, said passage being only sufficiently deep to permit the withdrawal of a single thickness of said sheet and cooperating with said sheet during withdrawal to prevent the escape of any appreciable quantity of the content of the container, a liquid within said container which is released to permeate said photosensitive layer upon the withdrawal of said second and third folds from said chamber, and image-transforming material, including a silver halide developer, contained within said chamber, said image-transforming material being rendered effective to develop said silver halide emulsion upon permeation of said emulsion with said liquid.

6. A composite photographic film unit comprising, in combination, a frame, a first wall member, a second wall member, said wall members being mounted within said frame and forming with said frame a relatively flat, substantially liquid-tight chamber, said frame having a

sheet-withdrawal passage in one wall thereof, a photosensitive layer contained within said chamber adjacent said first wall member, said photosensitive layer comprising a silver halide emulsion capable of being rendered developable upon exposure to ionizing rays, a liquid-impervious sheet contained within said chamber and folded upon itself at least once, the folds being secured together adjacent their marginal portions to form a liquid-carrying container, a liquid within said container and held thereby out of contact with said photosensitive layer, an extension of said folds projecting through said passage, the latter being only sufficiently deep to permit the withdrawal of said two folds, said folds cooperating with said passage during removal to cause the rupture of the container and the release of said liquid within said chamber for permeating said photosensitive layer, and image-transforming material, including a silver halide developer, contained within said chamber, said image-transforming material being rendered effective to develop said silver halide emulsion upon permeation of said emulsion with said liquid.

7. A composite photographic film unit comprising, in combination, a frame, a first wall member, a second wall member, said wall members being mounted within said frame and forming with said frame a relatively flat, substantially liquid-tight chamber, said frame having a sheet-withdrawal passage in one wall thereof, a photosensitive layer contained within said chamber adjacent said first wall member, said photosensitive layer comprising a silver halide emulsion capable of being rendered developable upon exposure to ionizing rays, a liquid container located to one side of said photosensitive layer, a liquid within said container and held thereby out of contact with said photosensitive layer, a tab extending through said sheet-withdrawal passage so that it may be pulled from the exterior of said unit, said tab being so connected to said container as to withdraw the walls of said container through said passage when pulled, said passage cooperating with said container walls during withdrawal thereof to cause the release therefrom of the liquid contained therewithin and to prevent the escape of any appreciable quantity of said liquid from said chamber, said liquid upon release permeating said photosensitive layer, and image-transforming material, including a silver halide developer, contained within said chamber, said image-transforming material being rendered effective to develop said silver halide emulsion upon permeation of said emulsion with said liquid.

8. A composite photographic film unit comprising, in combination, a frame, a first wall member, a second wall member, said wall members being mounted within said frame and forming with said frame a relatively flat, substantially liquid-tight chamber, said frame having a sheet-withdrawal passage in one wall thereof, a photosensitive layer contained within said chamber adjacent said first wall member, said photosensitive layer comprising a silver halide emulsion capable of being rendered developable upon exposure to ionizing rays, a print-receiving layer mounted within said chamber adjacent said second wall, a liquid container located between said print-receiving layer and said photosensitive layer, a liquid within said container and held thereby out of contact with said photosensitive

layer and said print-receiving layer, a tab extending through said sheet-withdrawal passage so that it may be pulled from the exterior of said unit, said tab being so connected to said container as to withdraw the walls of said container through said passage when pulled, said passage cooperating with said container walls during withdrawal thereof to cause the release therefrom of the liquid contained therewithin and to prevent the escape of any appreciable quantity of said liquid from said chamber, said liquid upon release permeating said photosensitive layer and said print-receiving layer, and image-transforming material, including a silver halide developer, contained within said chamber, said image-transforming material being rendered effective to develop said silver halide emulsion and to form a transfer print of an image in said emulsion on said print-receiving layer upon permeation of said emulsion with said liquid.

9. The film unit of claim 1 wherein said wall members and said frame cooperate to prevent the ingress into said chamber of light actinic to said photosensitive layer, said wall members being at least in part transparent to ionizing rays such as X-rays and the like.

10. The film unit of claim 9 wherein at least one of said walls of the container is substantially coextensive with the photosensitive layer and includes a stratum of material capable of absorbing ionizing rays.

11. The film unit of claim 10 wherein said frame and the materials mounted therein are deformable.

12. The film unit of claim 2 wherein the container in the chamber is flat and holds the liquid content thereof in a layer which is substantially coextensive with the area of the photosensitive layer within said frame.

13. The film unit of claim 12 wherein the liquid in the container is a viscous alkaline solution of a silver halide developer and a silver halide solvent.

14. The film unit of claim 7 wherein the container in the chamber is flat and holds the liquid content thereof in a layer which is substantially coextensive with the area of the photosensitive layer within said frame.

15. The film unit of claim 14 wherein the liquid in the container is a viscous alkaline solution of a silver halide developer and a silver halide solvent.

EDWIN H. LAND.

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Number	Country	Date
369,146	Germany	Oct. 13, 1920
370,821	Germany	May 25, 1921
502,014	Great Britain	Mar. 7, 1939
879,995	France	Dec. 10, 1942