

March 5, 1963

R. R. WAREHAM
PHOTOGRAPHIC APPARATUS

3,079,849

Filed Feb. 14, 1958

3 Sheets-Sheet 1

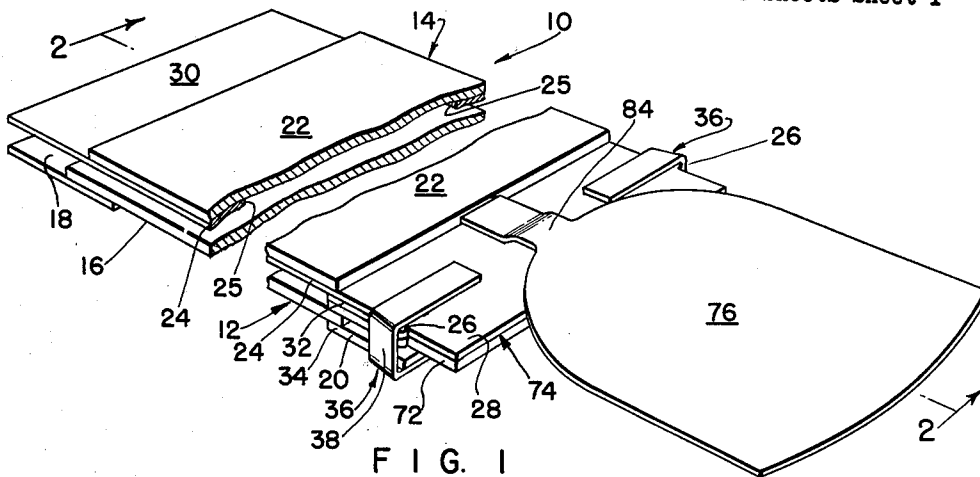


FIG. 1

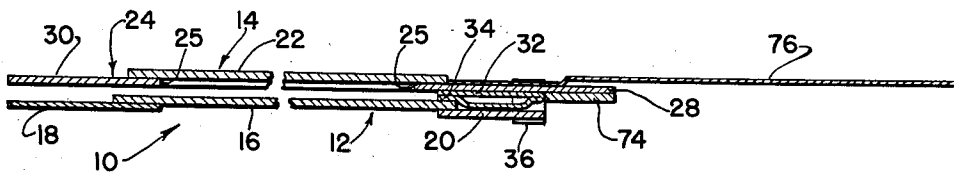


FIG. 2

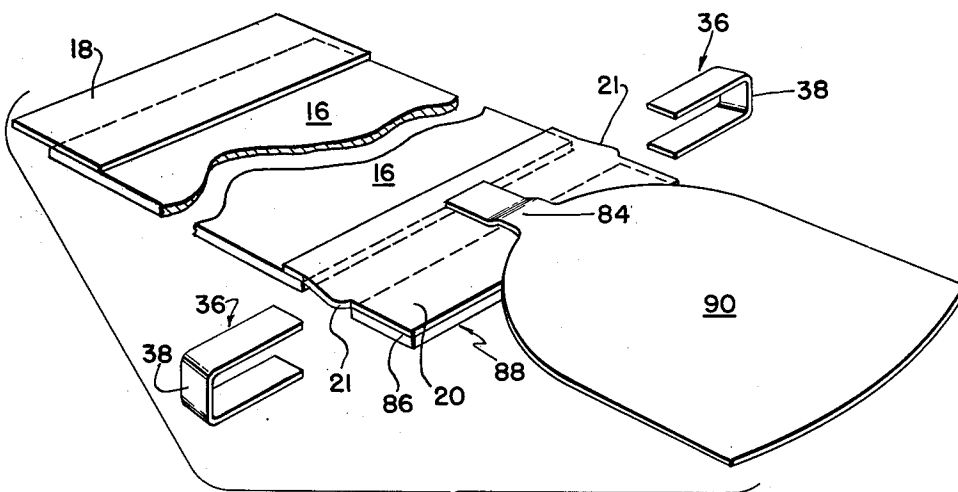


FIG. 3

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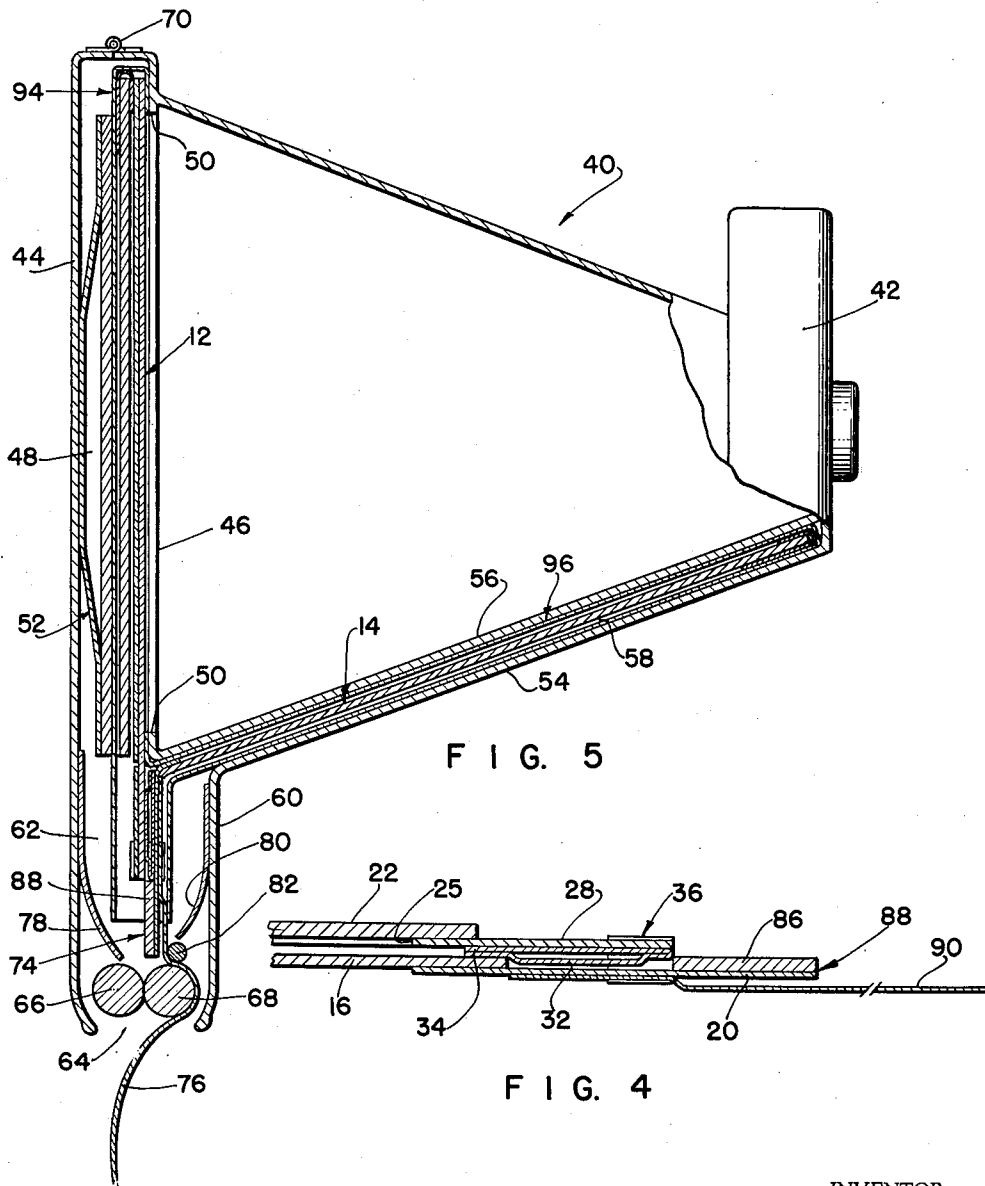
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

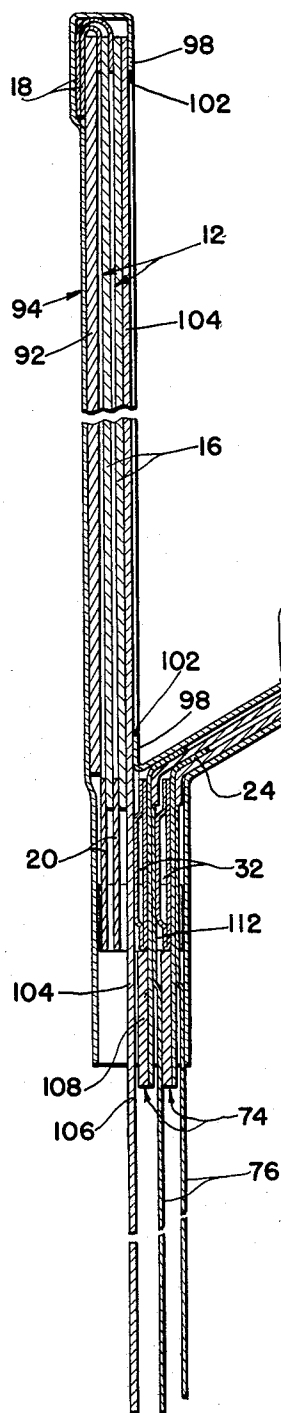


FIG. 7

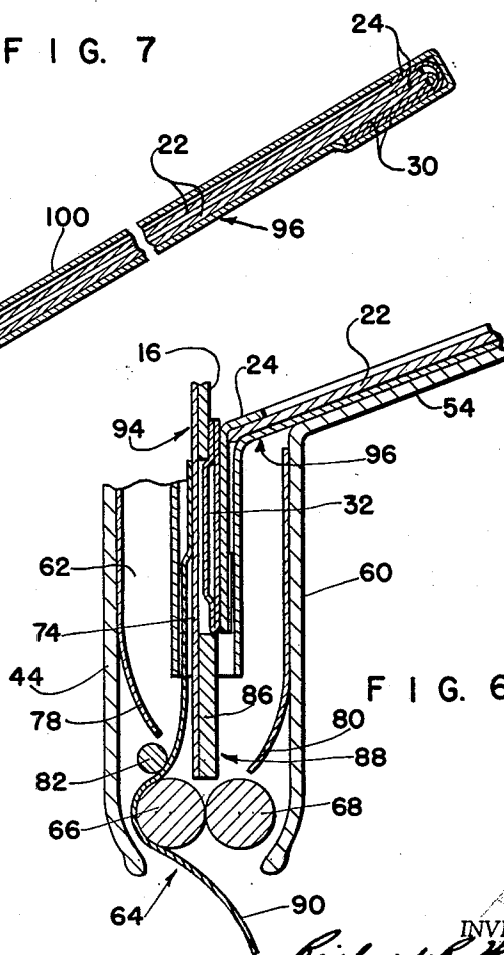


FIG. 6

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3,079,849

PHOTOGRAPHIC APPARATUS

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21 Claims. (Cl. 95-13)

This invention relates to photographic apparatus and products useful therein and, more particularly, to novel apparatus including photosensitive materials and means for exposing and processing said photosensitive materials, and to novel products useful in such apparatus.

Generally, the present invention is concerned with photographic products and apparatus of the type wherein a photosensitive sheet material, preferably comprising photosensitive silver halide, is exposed and is thereafter treated with a fluid reagent in conjunction with another sheet material to produce photographic prints, preferably by a process involving the transfer of image-forming substances resulting from the development of the latent image in the exposed photosensitive silver halide. A variety of forms of products and apparatus of this type, with which the present invention is concerned, have been proposed and as a general rule include means for storing and positioning for exposure one or more exposure frames of photosensitive sheet material, means for storing one or more areas of a second sheet material superposable with the exposure frames, means preferably in the form of a plurality of rupturable containers and containing a fluid processing reagent for distribution between each exposed frame of a photosensitive sheet and an area of a second sheet, and means for superposing one set or a succession of sets of frames and areas of the photosensitive and second sheets and distributing the fluid processing reagent from a container in a thin layer between each frame and area. This last-mentioned means for superposing an exposed frame and area of two sheets and distributing a fluid processing reagent therebetween comprises a pair of juxtaposed pressure-applying members, usually rolls, between which the sheets are moved in superposition for spreading the fluid, usually provided in a rupturable container located between the sheets, between the superposed frame and area.

In the form of product and apparatus of the type with which the present invention is concerned, the exposure frames of the photosensitive material are provided as individual sheets, the areas of a second sheet material to be superposed with the exposure frame are also provided as individual second sheets, and the fluid processing reagent is provided in a plurality of rupturable containers each adapted to be located between a photosensitive and second sheet during movement of the sheets in superposition between a pair of pressure-applying members. A photosensitive sheet may be exposed while it is located in superposition with a second sheet, or, as is the more common practice, the photosensitive and second sheets are provided in separate stacks, exposure of each photosensitive sheet being effected when it is spaced apart from its corresponding second sheet; and thereafter the two sheets are moved in superposition between a pair of pressure-applying members. For this purpose each sheet or pair of sheets is provided with an attached leader or leaders which projects from the product or apparatus within which the photosensitive sheet is exposed, and may be grasped for drawing each pair of sheets between the pressure-applying members.

Various expedients have been suggested for manipulating both the leaders and the pressure-applying members whereby the leaders may be made to extend between the pressure-applying members so that they can be en-

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gaged for drawing the sheets, one pair at a time, between the pressure-applying members. In one form of apparatus, for example shown in the copending U.S. application of Edwin H. Land et al., Serial No. 492,848, filed March 8, 1955, now Patent No. 2,854,903, this is accomplished by spacing apart the pressure-applying members and threading a leader or leaders connected to a photosensitive and second sheet between the pressure-applying members. This must be done each time a pair of sheets are to be withdrawn between the pressure-applying members to process the photosensitive sheet. One suggestion for eliminating the necessity for threading the leader or leaders attached to each pair of sheets between the pressure-applying members each time a pair of sheets are to be processed is made in the copending U.S. application of Edwin H. Land, Serial No. 537,982, filed October 3, 1955, now Patent No. 2,834,269, wherein all the leaders extend between the pressure-applying members and compressive pressure is applied thereby to each pair of superposed sheets through the leaders of the remaining pairs of sheets as the pair of sheets being processed is drawn between the pressure-applying members and between said other leaders. Another suggestion for providing leaders attached to the film units and extending between the pressure-applying members, but permitting the pressure-applying members to directly engage each pair of sheets as they are withdrawn between the leaders of the remaining pairs of sheets, is made in the copending U.S. application of Edwin H. Land, Serial No. 667,882, filed June 25, 1957, now Patent No. 2,903,951, wherein openings are provided in the leaders through which the pressure-applying members can project toward one another.

Objects of the invention are: to provide photographic apparatus including a pressure-applying device comprising a pair of members between which a succession of individual film units is withdrawn from said apparatus, which apparatus is so constructed that the leader by which each film unit is withdrawn can be located between the pressure-applying members without the necessity for spacing the pressure-applying members apart; and to provide photographic apparatus of this type including means for guiding a first leader of each film unit from the apparatus to one side of a pressure-applying member and means for guiding a second leader, attached to said first leader, to the other side of said pressure-applying member between it and another pressure-applying member juxtaposed therewith.

Another object of the invention is to provide a photographic film unit including a photosensitive sheet, which is adapted to be drawn manually from a photographic apparatus between a pair of pressure-applying members and including manually engageable means adapted to project from said apparatus adjacent one side of said pressure-applying members for drawing a leader portion of said unit, located within said apparatus, between said pressure-applying members, providing means whereby said unit can be grasped for withdrawing it from said apparatus between said pressure-applying members.

Further objects of the invention are: to provide a film unit of the type described including a sheetlike element having a relatively stiff leading end portion and a flexible leader tab secured to said element adjacent said leading end portion at a point spaced from the edge of said leading end portion toward the trailing end of said element; and to provide photographic film products embodying a plurality of film units of the type described, apparatus embodying said units, and apparatus useful therewith.

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

The invention accordingly comprises the products possessing the features, properties and the relation of components, and the apparatus possessing the construction, combination of elements and arrangement of parts 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 fragmentary, perspective view, partially in section, of a film unit embodying the invention;

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary, exploded, perspective view of components of another form of film unit embodying the invention;

FIG. 4 is a fragmentary, sectional view of the film unit of FIG. 3, including the components shown in FIG. 3;

FIG. 5 is an elevational view, partially in section, of photographic apparatus in the form of a camera embodying the invention and useful with the photographic film units of the invention;

FIG. 6 is a fragmentary, sectional view of a portion of the camera of FIG. 5 showing another embodiment thereof; and

FIG. 7 is a sectional view of an assemblage of film units, the section being taken substantially midway between the sides of the assemblage.

The photographic apparatus and products of the invention, in general, embody, or are adapted to be employed with, one or more film units each of which comprises a photosensitive element, a second or print-receiving element and leader means which may be grasped for drawing the film unit between a pair of pressure-applying members. Film units of this type may take a variety of forms, one of which is shown in FIGS. 1 and 2 of the drawings, wherein the thicknesses of the materials comprising the film units are exaggerated for purposes of clarity of illustration. The film unit, designated 10, comprises a photosensitive element 12 and a second or print-receiving element 14. Both the photosensitive and second elements are in the form of sheets with photosensitive element 12 comprising a photosensitive sheet 16 and a trailer sheet 18 secured to the trailing end of the photosensitive sheet. Photosensitive sheet 16 comprises a layer of photosensitive material, preferably containing a photosensitive heavy metal salt such as silver halide, carried on a suitable support such as paper or one of the organic plastic materials commonly used for film base and including cellulose acetate and the like. Trailer sheet 18 comprises a thin sheet material such as paper which is preferably substantially thinner than the overall thickness of photosensitive sheet 16. Photosensitive element 12 is provided with a relatively short leader sheet 20 secured at the leading end of the photosensitive sheet and having edge portions extending laterally slightly beyond the lateral edges of the photosensitive sheet. These last-mentioned lateral edge portions, designated 21, of leader sheet 20 are preferably provided with lateral edges which taper or converge slightly toward the trailing end of the photosensitive sheet.

Second or print-receiving element 14 comprises a second or print-receiving sheet 22, similar in shape to the photosensitive sheet and at least coextensive with the area or exposure frame thereof which is to be exposed. In the preferred form shown, second sheet 22 is of the same width as, and slightly shorter than, photosensitive sheet 16. Print-receiving sheet 22 is mounted on a leader or carrier sheet 24 which, like trailer sheet 18 and leader sheet 20, is formed of a thin sheet material such as paper which is comparatively thin yet strong. The print-receiving sheet is mounted on the side of the carrier sheet opposite the side thereof which is intended to be superposed

with the photosensitive element and at a position intermediate the ends of the carrier sheet. Carrier sheet 24 is provided with an aperture 25, preferably rectangular, overlying print-receiving sheet 22 and defining the area thereof in contact with which a fluid processing agent is spread and in which a transfer print is formed. Second sheet 22 preferably comprises an image-receiving layer carried on a suitable support. The support may be of any suitable sheet material such as paper and organic plastic materials used for photographic films and prints, the choice of material depending on the manner in which the print is to be viewed, that is, by reflected or by transmitted light. The image-receiving layer comprises a material layer formed on the support or as a stratum of the support for receiving and/or supporting the transfer image formed of a material produced as a result of development of a latent image in the photosensitive sheet. Carrier sheet 24 is also provided with a pair of lateral flanges 26 similar to lateral portions 21 of leader sheet 20 and located adjacent the leading edge of second sheet 22. Carrier sheet 24 includes a leading end section 28 which is preferably slightly longer than leader sheet 20 and a trailing end section 30 which, in the form shown, is substantially equal in length to trailer sheet 18.

The photosensitive element, following exposure, is adapted to be superposed with a print-receiving element and the two elements moved in superposition between a pair of pressure-applying members for spreading a fluid processing agent in a thin layer between the photosensitive and print-receiving sheets of the two elements. In the form shown in the drawings, the fluid processing agent is provided in a rupturable container 32 attached to leading end section 28 of carrier sheet 24 on the side thereof opposite second sheet 22 between the superposed elements adjacent the leading edge of the second sheet. Container 32 is preferably formed of an elongated rectangular blank of a multilayer sheet material which is impervious to air and the fluid processing agent. The blank is folded longitudinally upon itself and the end and longitudinal margins are sealed to one another to form a cavity in which a predetermined quantity of processing agent is contained. The longitudinal edge seal of the container is designated 34 and is weaker than the two end seals so that the application of compressive pressure to the walls of the container will cause rupture of the longitudinal seal and the unidirectional discharge of the fluid contents of the container. Container 32 is mounted on leading end section 28 of carrier sheet 24 with longitudinal sealed portion 34 extending transversely of the carrier sheet and located adjacent the leading edge of aperture 25 and print-receiving sheet 22 so that the application of compressive pressure to the container through leading end section 28 and leader sheet 20 will cause the discharge of the contents of the container in the direction of the area of sheets 18 and 22 between which said fluid is to be spread. For best results, the fluid-carrying cavity of the container should be substantially equal in length to the width of aperture 25 so that the fluid contents of the container will be released therefrom in an elongated mass extending substantially from side to side of the aperture.

The film unit, in one form, may comprise materials for effecting the formation of a positive print by a silver-transfer reversal process, the photosensitive sheet comprising a silver halide emulsion and the fluid processing agent including a silver halide developer and a silver halide solvent. Processes of this type and materials useful therein for producing transfer prints directly from exposed photosensitive materials are well known in the art and are described in United States Patents Nos. 2,543,181, issued February 27, 1951, 2,661,293, issued December 1, 1953, and 2,662,822, issued December 15, 1953, all in the name of Edwin H. Land. As previously noted, the photosensitive element is exposed within the housing of a camera or other apparatus and is thereafter super-

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posed with the second element and the two elements are moved, commencing in the region of their leading ends, between a pair of pressure-applying members for first rupturing the container located between the elements and then for spreading the fluid contents of the container in a layer therebetween to form a sandwich. As this sandwich comprising the photosensitive and second sheets and a layer of fluid processing agent is formed, it is removed from the camera or apparatus directly into the light. Accordingly, provision must be made for preventing exposure of the photosensitive layer of the photosensitive sheet. This may be accomplished, for example, by providing the supports for photosensitive sheet 16 and second sheet 22 with a layer of material or with a coating of a material which is opaque to actinic light. As the fluid processing agent is distributed between the two sheets, it functions as an adhesive for holding the photosensitive and print-receiving sheets in superposition. Prevention of the exposure of the photosensitive sheet by light entering between the margins of the sheets can be further assured by providing a light-absorbing dye or pigment in the fluid processing agent.

The photosensitive and second elements of film assemblage 10 are secured to one another to form a single unit which, along with one or more other units, may comprise a film assemblage. The second element of the film unit is adapted to be positioned apart from the photosensitive element during exposure of the latter and the film unit, following exposure, is processed by being withdrawn between a pair of pressure-applying members from the apparatus, usually a camera, in which the photosensitive element is exposed. The film units, when they comprise an assemblage, are arranged with the photosensitive elements in stacked relation and the second elements in stacked relation. The photosensitive and print-receiving layers of the photosensitive and second sheets are disposed innermost and it is the innermost film unit which is intended to be exposed and processed first with the photosensitive and second sheets of subsequent film units being arranged outwardly from the first film unit.

Each film unit comprises leader means whereby it may be withdrawn from the assemblage of film units between a pair of pressure-applying members and from the apparatus in which it was exposed. Accordingly, means must be provided for securing the photosensitive and second elements of each film unit together in such a manner that they can be withdrawn singly and in proper sequence from the assemblage between a pair of pressure-applying members and from the apparatus and yet in such a manner that the photosensitive and second sheets can be positioned apart during exposure, the photosensitive and second sheets are registered with one another when they are superposed and the inner photosensitive and second elements comprising a film unit can be withdrawn from the assemblage between the photosensitive and second sheets of subsequent film units. The photosensitive element 12 and second element 14 of each film unit are secured together adjacent the leading ends of photosensitive sheet 16 and second sheet 22 at lateral portions 21 and flanges 26. For this purpose there is provided a pair of connecting strips, designated 36, secured near the leading ends of photosensitive sheet 16 and second sheet 22 to the outer surfaces of leader sheet 20 and leading end section 28. Connecting strips 36 may comprise paper, fabric or plastic material coated with an adhesive, cellophane tape and "Mylar" tape being particularly suited for this purpose by virtue of their strength and resistance to tearing.

Connecting strips 36 include end portions secured to leader sheet 20 and leading end section 28 and intermediate connecting portions 38 which extend therebetween. Lateral portions 21 and flanges 26 cooperate with the connecting strips in several ways to facilitate withdrawal of the film units from the assemblage. They adhere to the adhesive on the connecting strips at connecting portions 38 to provide means for strengthening the strips at these

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portions and for preventing the adhesive from adhering to another film unit so as to resist withdrawal of the film units, one at a time, from the assemblage. Lateral portions 21 and flanges 26, by virtue of their tapered or divergent edges, cause connecting portions 38 to be spaced outward slightly from, and at an angle with respect to, the edges of the photosensitive and second sheets and thereby facilitate assembling of the assemblage of film units and withdrawal of each film unit from the assemblage between the connecting strips of succeeding film units, one at a time and in proper sequence.

In other forms of film units, lateral portions 21 and/or flanges 26 may themselves comprise the connecting strips. Alternatively, leader sheet 20 may be entirely eliminated, photosensitive sheet 16 may be longer and lateral portions 21 may comprise the photosensitive sheet itself.

Photographic apparatus in the form of a camera, typical of the type with which the film units of the invention and an assemblage of said film units are adapted to be employed, is illustrated diagrammatically in FIG. 5 of the drawings along with an assemblage of film units shown housed in the camera. Basically, the camera may be a folding-type camera wherein the lens and shutter assembly is mounted for movement relative to the means defining the focal plane for mounting the photosensitive material for exposure, or it may be a rigid, non-folding camera such as illustrated in FIG. 5. This camera, designated 40, comprises a housing on which is mounted a conventional lens and shutter assembly 42. The housing includes a rear wall 44 and an inner rear wall 46 cooperating to define a rear chamber 48 in which the photosensitive elements are housed and positioned for exposure. Inner rear wall 46 is shorter than rear wall 44, has its rear surface substantially at the focal surface of the lense of assembly 42 and is provided with an exposure aperture 50 through which light can be transmitted for exposing photosensitive sheets located within chamber 48. A spring and pressure plate assembly 52 is provided in rear chamber 48 for urging the photosensitive elements located therein forward into position for exposure against the rear surface of inner rear wall 46 across aperture 50. The camera housing includes a lower wall 54 and an inner lower wall 56, both extending forward at an angle with respect to rear wall 44 and inner rear wall 46 and cooperating to define a second chamber 58 adapted to contain print-receiving elements 14. The descriptive terms "upper" and "lower" are used herein solely for the purpose of convenience of description and not in a limiting sense. The camera is described as it appears in the drawings and not necessarily in the position that it would be employed, so that lower wall 54, for example, might just as well be described as a side wall.

Inner rear wall 46 and inner lower wall 56 are joined at their lower and rear ends, respectively, so that chambers 48 and 58 communicate with one another. The housing includes a lower section comprising the lower portion of rear wall 44 and a forward wall 60 extending downwardly from lower wall 54. This lower section provides a passage 62 communicating with chambers 48 and 58 and having an opening or slot 64 in its lower end. A pair of pressure-applying members in the form of elongated rolls 66 and 68 are mounted in juxtaposition in passage 62 adjacent opening 64. This opening preferably comprises an elongated slot just long enough to allow the passage of the film unit and just sufficiently wide to admit a film unit and a plurality of leader sheets. Slot 64 is preferably narrower than the aggregate thickness or diameter of the pressure-applying rolls so that the rolls block the slot against the admission of light. To permit loading of an assemblage of film units into the camera, the camera housing may comprise two relatively movable sections, one of which, in the form shown, comprises rear wall 44 and is pivoted at its upper end on a pivot or hinge means 70.

Heretofore, in cameras of the present type adapted to

be employed with film units having individual leaders which must be threaded between the pressure-applying members, means were required for mounting the pressure-applying members so that they could be spaced apart to permit threading of the leaders therebetween, either during the loading operation or following exposure of each individual film unit, so that it can be processed. The film unit of the invention makes possible a camera wherein the pressure-applying rolls are part of a single unit and need not be spaced apart for loading or threading of leaders therebetween. In the camera shown, both pressure-applying rolls 66 and 68 are mounted together with their axes substantially in a plane on the pivotable rear section of the camera so that, when the camera is opened, the rolls are displaced from wall 60, allowing a leader to be threaded between roll 68 and wall 60, rather than between the rolls.

A film unit construction which makes possible this novel camera construction is what amounts to a pair of leaders for each film unit. A stiffener sheet 72 of a comparatively inflexible material is secured to leading end section 28 to form, in conjunction therewith, a stiffened or substantially inflexible leader 74 adapted to be projected between the pressure-applying rolls and thereby provide means for drawing the film unit between the rolls. The other leader, designated 76, is secured to leading end section 28 adjacent the leading end of second sheet 22 and is relatively flexible and substantially longer than leading end section 28. A flexible leader 76 is adapted to extend through passage 62 between the roll 68 and forward wall 60 and project from the camera through slot 64 so that it can be manually grasped, while the leader comprising leading end section 28 and stiffener sheet 72 remains within passage 62 with its leading end located adjacent the nip of the rolls. Flexible leader 76 can be grasped and pulled for drawing or projecting the leading end of inflexible leader 74 between the pressure-applying rolls until leader 74 extends from the camera so that it can be grasped for withdrawing a film unit from the camera between the rolls.

Guide means are provided for insuring that inflexible leaders 74 go between the rolls and, in the form shown, comprise inflexible guide members 78 and 80, secured, respectively, to rear wall 44 and forward wall 60 within passage 62. Guide members 78 and 80 project downwardly and inwardly toward the nip of the rolls. A guide roll 82 is provided mounted on forward wall 60 adjacent pressure-applying roll 68 so that the flexible leaders are guided between roll 82 and roll 68 and around the latter along a tortuous path through opening 64. This arrangement not only insures that the inflexible leaders are guided between the rolls but facilitates light-sealing of passage 62. Pressure-applying rolls 66 and 68 block the entrance of light into passage 62 through opening 64 and do not have to be spread apart to permit threading of the leaders therebetween, while the flexible leaders extend around one pressure-applying roll rather than between the pressure-applying roll along a path which precludes the entrance of light. Except during actual withdrawal of a film unit between the pressure-applying rolls, no part of any film unit extends between the rolls, but the leaders extend around one pressure-applying roll and through slot 64.

Since the function of flexible leader 76 is to cause inflexible leader 74 to project between the pressure-applying rolls so that the film unit can be drawn therebetween, it becomes necessary to detach the flexible leader from the film unit after it has performed this function. To this end flexible leader 76 is provided with a relatively narrow, necked-down section 84 at its trailing end. It is at this necked-down section 84 that the flexible leader is secured to leading end section 28. The necked-down section, being substantially narrower than the remainder of flexible leader 76, is weaker and hence adapted to tear when the inflexible leader has been drawn between

the pressure-applying members. In an alternative embodiment, the flexible leader may be secured to the inflexible leader by a strippable adhesive, or one which forms a bond that can be broken. Flexible leader 76 need be only sufficiently long enough to project from the camera so that it may be grasped. When a plurality of film units are assembled together to form the film assemblage of the invention, the flexible leaders are preferably of different lengths so as to indicate the sequence in which the film units should be withdrawn. For example, the leader of the first film unit would be the longest and the leaders of each succeeding film unit would be shorter than that of the preceding film unit, so that the operator need only grasp the longest flexible leader which, incidentally, would be the easiest to grasp.

In the embodiment of the film unit described heretofore, both the flexible and inflexible leaders are attached to print-receiving element 14 with the result that the flexible leaders are stacked forwardly of the first leader toward the front of the camera and are required to extend between pressure-applying roll 68 and forward wall 60 of the camera. In another embodiment of the film unit shown in FIGS. 3 and 4, the leaders are attached to the photosensitive element 12 with the result that in the camera the flexible leader can extend between the rear-most pressure-applying roll 66 and rear wall 44.

This last-mentioned embodiment of the film unit may be substantially the same as film unit 10 except insofar as the leader arrangement is concerned. Leader sheet 20 is longer than leading end section 28, the latter being of sufficient length to mount a container 32 of the fluid processing agent and to permit attachment of connecting strips 36 thereto. A stiffening sheet 86 is secured to the leading end of leader sheet 20 to form an inflexible leader, designated 88, and a flexible leader 90 is secured to leader sheet 20 adjacent the leading edge of the photosensitive sheet.

A camera adapted to use with this last-mentioned embodiment of the film unit may be, for the most part, the same as camera 40 adapted for use with film unit 10. This embodiment of the camera, shown in FIG. 7, differs in that guide roll 82 is mounted on the rear section of the camera for movement along with rear wall 44 while the pressure-applying rolls are mounted on the other or forward section of the camera. This arrangement permits rear wall 44 and guide roll 82 to be displaced from pressure-applying roll 66 so that the assembly of film units may be loaded into the camera with flexible leaders 90 extending between rear wall 44 and guide roll 82 and pressure-applying roll 66. Operation of the two embodiments of the camera is substantially the same.

As a film unit is withdrawn from an assemblage of film units, frictional forces are generated between it and elements, particularly the photosensitive elements, of succeeding film units, tending to move the succeeding film units as well. Accordingly, means are provided for retaining the film units stationary as one of them is withdrawn, and, in the form shown, comprises a backing element 92 for the stack of photosensitive elements 12 to which are secured trailer sheets 18. Another backing element (not shown) may be provided for second elements 14 and trailing end sections 30 thereof may be secured to this last-mentioned backing element. In the interests of compactness, trailer sheets 18 extend around the trailing end of backing element 92 and are secured to its rear or outer surface, preferably in such a manner that they can be released readily. For example, the trailer sheets may be secured closely adjacent their trailing edges by a staple or other means which will tear out readily. The backing element is in turn adapted to be retained in the camera by suitable means provided for this purpose. Other arrangements may be made for retaining the film units in the apparatus during withdrawal of a film unit from the assemblage and apparatus and

may be employed in combination with the film unit described herein.

It is desirable, in order to insure complete spread of the fluid processing agent in a layer of desired thickness over the area of the photosensitive and second sheets defined by aperture 25, to provide the fluid processing agent in an amount which is greater than that required. It becomes important, therefore, to collect or trap any excess fluid which may be squeezed from between the trailing ends of the photosensitive and second sheets so that this excess fluid does not collect on the pressure-applying rolls. It is in this connection that trailer sheet 18 and trailing end section 30 cooperate to perform still another function. The sheet materials comprising trailer sheet 18 and trailing end section 30 are substantially thinner in aggregate than the combined thickness of the photosensitive and second elements in the region of the second sheet. By virtue of this construction, the pressure-applying rolls can be constructed so as to have a minimum gap width which approximates the thickness of the combined photosensitive and second elements, whereby a space is provided between trailer sheet 18 and trailing end section 30 as they are moved between the pressure-applying members. It is in this space between the trailer sheet and the trailing end section that any excess processing fluid is trapped and retained. The portions of the intermediate section of carrier sheet 24 bordering aperture 25 and secured to print-receiving sheet 22 function as a mask during spreading of the fluid and aid in controlling the thickness of the layer of fluid and the area of contact between the fluid and the print-receiving sheet whereby a border is formed on the transfer print produced on sheet 22.

Envelope means are provided for enclosing the film units of the assemblage to hold them together and prevent exposure of the photosensitive sheets. In the form shown, these means comprise a first envelope 94 for the stack of photosensitive elements 12 and a second envelope 96 for the stack of second elements 14. The inner walls of the envelopes, that is, walls designated 98 and 100 and located closest one another, are secured together adjacent the open ends of the envelope. Inner wall 98 of envelope 94 is provided with an exposure aperture 102 through which photosensitive sheets in the envelope can be exposed. A dark slide 104 is provided in envelope 94 across aperture 102 between inner wall 98 and the first photosensitive sheet for preventing light from entering the aperture and exposing the photosensitive sheets. Dark slide 104 is preferably formed of a sheet material such as paper which is opaque to actinic light. The dark slide includes a flexible leader 106 comprising the leading end portion of the dark slide.

The entire assemblage, including the envelopes, photosensitive and print-receiving elements and dark slide, is loaded into the camera with first envelope 94, containing the photosensitive elements, located in rear chamber 48, second envelope 96, containing the print-receiving elements, located in chamber 58 and the flexible leaders attached to the film units and the dark slide extending from the camera either in front of or behind the pressure-applying rolls. After the camera is closed, the first flexible leader, which will be leader 106, attached to the dark slide 104 is withdrawn from the camera, drawing the dark slide from the camera. The first film unit is then ready for exposure, and, following exposure, the flexible leader attached thereto is pulled from the camera and the inflexible leader is then grasped for withdrawing the entire film unit between the pressure-applying rolls.

Other modifications may be made in the construction of the film assemblage of the invention and are deemed to fall within the scope thereof. These modifications include changes in the means for trapping the excess processing fluid and may include, for example, folding the trailing end portion of the carrier sheet back upon itself and securing it together at its lateral margins to form an

envelope, open toward the leading end of the film unit, in which the excess fluid can collect. Other departures from the structure shown may include changes in the outer envelope of the assemblage, the dark slide arrangement and the means for retaining the film units stationary during withdrawal of a film unit.

The double leader arrangement of the present invention, that is, the arrangement of an elongated flexible leader adapted to extend to one side of the pressure-applying members for drawing a shorter and comparatively inflexible leader between the pressure-applying members, finds utility in other forms of film assemblages, for example in a film assemblage such as is shown and described in copending U.S. application Serial No. 696,505, filed November 14, 1957, in the name of William H. Eburn, Jr., now Patent No. 2,909,977. In that assemblage, each film unit includes a leader attached to the trailing end of the preceding film unit with the leader of the first film unit attached to the dark slide. However, the dark slide or a leader attached thereto must be threaded between the pressure-applying rolls initially during loading. By providing the double leader arrangement as a part of the dark slide of this type of film assemblage, the necessity for spacing apart the pressure-applying rolls and of providing structure for doing so could be eliminated.

While the camera of the invention has been illustrated as a non-folding camera, that is, a camera wherein the lens and shutter assembly and the film-holding means are in fixed relation, it may also comprise a folding camera, for example, of the type shown in the copending U.S. application of Edwin H. Land, Serial No. 636,624, filed January 28, 1957, now Patent No. 2,880,659. This camera comprises a rear housing section for holding the photosensitive elements and mounting the pressure-applying rolls and a forward housing section comprising a chamber for holding the print-receiving elements and mounting the lens and shutter assembly. The forward housing section is pivotally mounted on the rear housing section adjacent the lower end of the forward housing section. The lens and shutter assembly is mounted on the upper end of the forward housing section and the two sections are joined by a three-sided folding bellows.

Since certain changes may be made in the above apparatus and 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.

What is claimed is:

1. A photographic film assemblage comprising a housing for holding and enclosing a photographic film unit, means defining an opening in said housing through which said film unit is movable, a pair of juxtaposed pressure-applying members mounted within said housing adjacent said opening, extending across said opening and defining a passage between said members through which said film unit is movable, a photographic film unit held by and within said housing in a position at the opposite side of said pressure-applying members from said opening, said film unit including a leading end section extending within said housing toward said passage and having a leading edge located adjacent said pressure-applying members, and a flexible leader providing means for withdrawing said leading end section of said film unit through said passage between said pressure-applying members and from said housing through said opening, said flexible leader being secured to said film unit at a position thereon spaced from said leading edge thereof toward the opposite end of said film unit, said flexible leader extending through said housing past said members to one side of both of said members and from said housing through an opening therein located to the side of said members opposite said leading end section to permit said leader to be engaged outside of said housing for drawing said leading end sec-

tion of said film unit between said members and from said housing.

2. The photographic assemblage of claim 1 wherein said flexible leader is detachably secured to said film unit.

3. The photographic assemblage of claim 1 wherein said leading end section of said film unit is substantially wider than said leader, and means are provided in said housing for guiding said leader around said juxtaposed pressure-applying members and guiding said leading end section between said pressure-applying members.

4. A photographic assemblage comprising a housing for holding and enclosing a photographic film unit, means defining an opening in said housing through which said film unit is movable, a pair of juxtaposed pressure-applying members mounted within said housing adjacent said opening and extending across said opening, a photographic film unit held by and within said housing in a position at the opposite side of said pressure-applying members from said opening and adapted to be withdrawn from said housing through said opening between said pressure-applying members, said film unit including a stiffened leading end portion extending within said housing toward and adjacent said juxtaposed pressure-applying members, and a flexible leader providing means for withdrawing said film unit between said pressure-applying members from said housing through said opening, said flexible leader being secured to said film unit at a position spaced from the leading end thereof toward the trailing end of said film unit, said flexible leader extending past said members at one side thereof from said housing through said opening thereby providing said means for drawing said film unit between said members from said housing through said opening.

5. The photographic assemblage of claim 4 wherein means are provided for guiding said stiffened leading end portion of said film unit between said pressure-applying members from said housing through said opening.

6. The photographic assemblage of claim 4 wherein said juxtaposed members are substantially wider than said opening and are located in closing relation to said opening, and means are provided for guiding said flexible leader around said juxtaposed pressure-applying members to one side thereof through said opening.

7. The photographic assemblage of claim 6 wherein said opening comprises the end of a passage in said housing which is substantially wider than said opening, and said pressure-applying members are mounted within said passage.

8. The photographic assemblage of claim 6 wherein said juxtaposed pressure-applying members comprise a pair of elongated rolls mounted with their axes substantially in a plane and having combined diameters which substantially exceed said width of said opening.

9. The photographic assemblage of claim 5 wherein said flexible leader is constructed and secured to said film unit for causing at least a major portion of said flexible leader to become detached from said film unit when the latter has been drawn by said flexible leader between said juxtaposed members to the point on said film unit where said flexible leader is attached thereto.

10. The photographic assemblage of claim 5 wherein said flexible leader is secured to said film unit by a strip-pable adhesive.

11. The photographic assemblage of claim 5 wherein said flexible leader is tapered and is secured to said film unit at substantially the narrowest portion of said flexible leader.

12. A photographic assemblage comprising a housing for holding and enclosing a photographic film unit, means defining an opening in said housing through which said film unit is movable, a pair of juxtaposed pressure-applying members mounted within said housing adjacent said opening and extending across said opening in closing relation thereto, a plurality of photographic film units held by and within said housing in a position at the opposite side of said pressure-applying members from said open-

ing and being movable from said housing through said opening between said pressure-applying members, each of said film units comprising a flexible leader providing means whereby said each film unit can be withdrawn from said housing through said opening between said pressure-applying members, each of said film units including an inflexible leading end section located adjacent said pressure-applying members, said flexible leader of said each film unit being secured to said leading end section of said film unit at a position thereon spaced from the leading edge of said film unit toward the trailing end of said film unit, said flexible leaders being arranged in stacked relation and extending from said housing past said pressure-applying members to one side thereof through said opening from said housing, and means for guiding said inflexible leading end portion of each of said film units between said pressure-applying members from said housing through said opening as said film unit is moved toward said pressure-applying members by withdrawal of the flexible leader of said each film unit through said opening.

13. The photographic assemblage of claim 12 wherein each of said film units comprises a photosensitive element adapted to be exposed in said apparatus, a second element coupled with said photosensitive element for being superpositioned therewith during movement of said film unit between said pressure-applying members and means for securing said photosensitive and second elements together adjacent the leading ends of said elements, said film units being positioned in said apparatus with said photosensitive elements arranged in stacked relation in position for exposure, said second elements arranged in stacked relation apart from said photosensitive elements, with the photosensitive and second elements comprising the first film unit to be exposed and withdrawn from said housing located innermost, and with the elements of successive film units arranged in order outwardly therefrom.

14. In a method in which a plurality of unconnected photographic elements are loaded into photographic apparatus including a housing and a pair of juxtaposed pressure-applying members located within said housing and providing a passage between said members through which said elements are movable one at a time, and said elements are withdrawn one at a time and in predetermined succession from said housing through said passage between said members to effect the treatment of said elements, the steps of: positioning a plurality of said elements within said housing with the leading edge of a leading end portion of each of said elements located adjacent said passage between said pressure-applying members; threading a plurality of leaders, each secured to one of said elements at a position thereon spaced from the leading edge thereof toward the opposite end of said one element, past said pressure-applying members, to one side thereof and from said housing through an opening therein located to the side of said pressure-applying members opposite said leading edges of said elements; engaging said leader of the first of said elements to be withdrawn outside of said housing and applying tension to said leader for withdrawing said leader from said housing through said opening and moving said first element toward said pressure-applying members; during said movement of said element, guiding said leading end portion of said first element through said passage between said members and from said housing through an opening therein; and engaging said leading end portion of said first element outside of said housing and applying tension to said first element for withdrawing said first element from said housing between said pressure-applying members through the last-mentioned opening to effect the treatment of said first element.

15. The method of claim 14 wherein said leader of said first element is detached therefrom by continuing the application of tension to said leader after said lead-

ing end portion of said first element has been moved from said housing through said last-mentioned opening.

16. In a method in which a plurality of unconnected photographic film assemblages are loaded into photographic apparatus including a housing for enclosing said assemblages, an opening in said housing through which said assemblages are movable and a pair of juxtaposed pressure-applying members mounted within said housing adjacent said opening, and said assemblages are manually withdrawn one at a time and in predetermined succession from said housing between said members to effect the treatment of said assemblages, the steps of: positioning a plurality of said assemblages within said apparatus with the leading edges thereof located adjacent said pressure-applying members on the side thereof opposite said opening; threading a plurality of leaders, each secured to one of said assemblages at a position thereon spaced from said leading edge thereof toward the trailing end of said one assemblage, past said pressure-applying members to one side thereof and from said housing through said opening where said leaders can be engaged; engaging said leader of the first of said assemblages to be withdrawn, outside of said housing and applying tension to the last-mentioned leader to withdraw said last-mentioned leader from said housing through said opening for moving the leading end portion of said first assemblage toward said juxtaposed pressure-applying members; during the aforementioned movement of said first assemblage, guiding said leading end portion between said pressure-applying members and from said housing through said opening; and engaging said leading end portion and applying tension thereto for withdrawing said first assemblage from said housing between pressure-applying members to effect the treatment of said first assemblage.

17. The photographic method of claim 16 wherein at least the leading end portion of each of said assemblages is stiffened, said leader is detachably secured to said leading end portion of said each assemblage, and said leader of said first assemblage is detached therefrom when at least said leading end portion of said first assemblage has been moved by said first leader between said pressure-applying members to the extent permitted by said first leader, and said leading end portion is then engaged and drawn from said housing for withdrawing said first assemblage from said housing between said pressure-applying members prior to engagement and withdrawal of said leader comprising the next succeeding film assemblage.

18. The photographic method of claim 16 in which said leader of each of said assemblages is tapered and is secured to said leading end portion at the narrowest portion of said leader, and said leader of said first assemblage is detached from said leading end portion thereof by tearing the last-mentioned leader substantially at said narrowest portion thereof.

19. In a photographic method in which a plurality of unconnected photographic film assemblages are loaded into photographic apparatus including a housing for enclosing said film assemblages, an opening in said housing through which said film assemblages are movable and a pair of juxtaposed pressure-applying members mounted within said housing adjacent and extending across said opening, and said assemblages, each including a photosensitive element adapted to be photoexposed within said

housing and a second element adapted to be superposed with said photosensitive element for aiding in the distribution of a processing liquid between the superposed elements, are withdrawn one at a time and in predetermined succession from said housing between said members to superpose elements of each of said assemblages and distribute said processing liquid between said elements, the steps of: positioning a plurality of said film assemblages within said housing with said photosensitive elements thereof arranged in stacked relation in position for exposure, said second elements thereof arranged in stacked relation apart from said photosensitive elements and with the photosensitive and second elements comprising the first film assemblage located outermost with the elements of successive film assemblages arranged in the order of exposure inwardly therefrom; threading leaders, each coupled with one of said assemblages, past said pressure-applying members to one side thereof and through said opening from said housing; photoexposing said photosensitive element of said first film assemblage; engaging said leader of said first film assemblage outside of said housing and applying tension to the last-mentioned leader for withdrawing said last-mentioned leader from said housing and moving said photosensitive element of said first film assemblage into superposed relation with said second element thereof and moving said elements in superposition toward said photoexposed pressure-applying members; during said movement of said elements of said first assemblage, guiding a leading end portion thereof between said pressure-applying members from said housing through said opening so that said leading end portion can be engaged exterior of said housing; disengaging at least a major portion of said leader of said first assemblage therefrom; engaging said leading end portion of said first assemblage exterior of said housing and applying tension thereto for withdrawing said first assemblage from said housing between said pressure-applying members to distribute a processing liquid between said elements of said first assemblage.

20. The photographic method of claim 19 wherein said leading end portion of each of said film assemblages is substantially less flexible than said leader of said each assemblage, and said leader of said first assemblage is detached from said first assemblage after said leading end portion has been moved by said leader between said juxtaposed pressure-applying member to the extent permitted by said leader.

21. The photographic method of claim 19 wherein each of said leaders is tapered, is secured to one of said film assemblages at the narrowest end portion of said leader and said leader of said first assemblage is detached therefrom by tearing said leader substantially at its narrowest portion closely adjacent its point of detachment to said first film assemblage.

References Cited in the file of this patent

UNITED STATES PATENTS

2,112,605	Pless	Mar. 29, 1938
2,497,816	Greenhalgh	Feb. 14, 1950
2,520,641	Land	Aug. 29, 1950
2,562,877	Balluff	Aug. 7, 1951
2,565,377	Land	Aug. 21, 1951
2,609,296	Land	Sept. 2, 1952
2,819,662	Land	Jan. 14, 1958