

Sept. 8, 1964
PR
Filed May 26, 1961

J. A. HAMILTON
PRESSURE-APPLYING STRUCTURE FOR DISTRIBUTING
PROCESSING FLUID

3,147,685

2 Sheets-Sheet 1

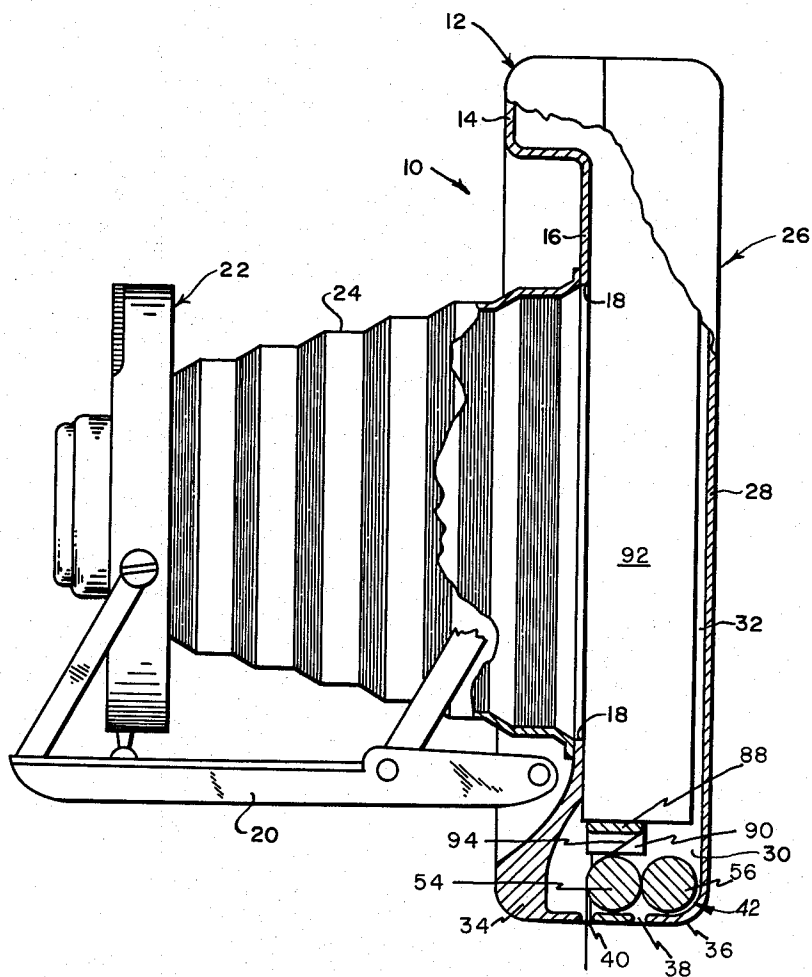


FIG. 1

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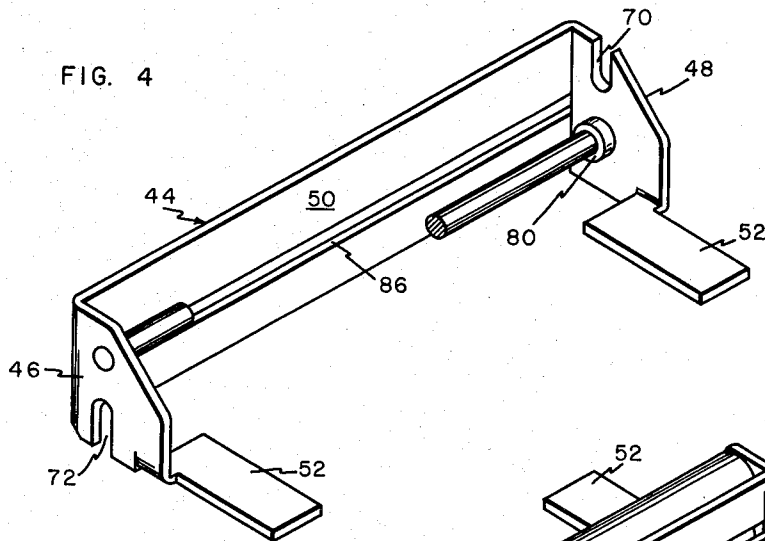
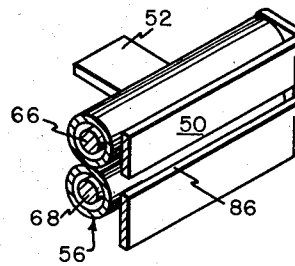


FIG. 2

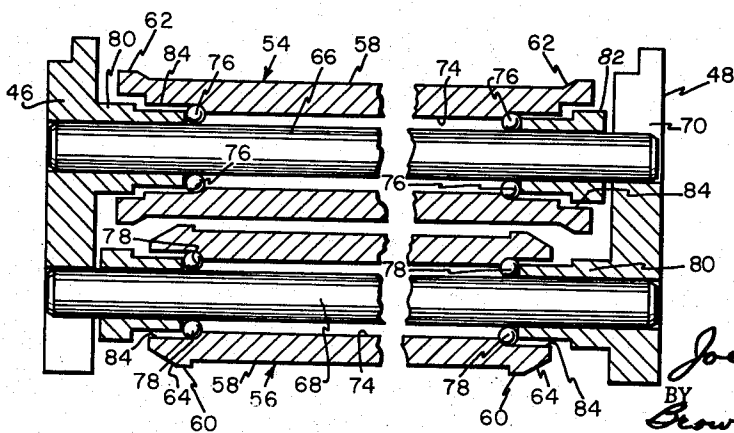


FIG. 3

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3,147,685

PRESSURE-APPLYING STRUCTURE FOR DISTRIBUTING PROCESSING FLUID

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Filed May 26, 1961, Ser. No. 112,951

9 Claims. (Cl. 95—89)

This invention relates to photographic apparatus and particularly to novel and improved apparatus for distributing a processing fluid between a pair of superposed sheets.

A number of photographic processes have been proposed which are effected by distributing a processing fluid between a pair of superposed sheets. These processes include, for example, silver halide diffusion transfer-reversal processes in which a positive photographic print is formed on one of a pair of superposed sheets from an exposed photosensitive silver halide layer located between the sheets. In these processes, the photographic processing fluid is usually spread in a layer between the superposed sheets by moving the sheets relative to and between a pair of juxtaposed pressure-applying members; and because fluid is confined between the sheets so that it does not contact the pressure-applying members, the process is essentially dry, and the pressure-applying members are incorporated in the photographic apparatus (such as a camera) employed to photographically expose the photosensitive material.

An object of the invention is to provide, in photographic apparatus for processing photosensitive materials, a novel and improved device for distributing a photographic processing fluid between a pair of superposed sheets, the device being characterized by its simplicity and compactness of construction and its uniform and dependable operation.

Another object of the invention is to provide a fluid distributing device of the type described comprising a pair of juxtaposed pressure-applying members mounted on a pair of cantilever springs each mounted adjacent the opposite end of the other and biased toward the other.

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

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangements 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 an elevational view, partially in section, of photographic apparatus in the form of a camera embodying the invention, the section being taken substantially midway between the sides of the camera;

FIG. 2 is a fragmentary perspective view of the fluid-distributing device of the invention;

FIG. 3 is a sectional view of the fluid-distributing device, the section being taken along a plane through the axes of the pressure-applying members; and

FIG. 4 is a perspective view of a component of the fluid-distributing device.

The fluid-distributing device of the invention is designed for incorporation in photographic apparatus such as a camera in which a photosensitive sheet is exposed, is superposed with a second sheet and a processing fluid is distributed between the superposed sheets for effecting the formation of an image in the photosensitive sheet. The fluid-distributing device of the invention is illustrat-

ed in FIG. 1 incorporated in the structure of a hand-held camera of the type disclosed in the copending application of Joel A. Hamilton Serial No. 112,941, filed May 26, 1961, now Patent No. 3,080,805. The camera, designated 10, comprises a housing including a forward section 12 having a forward wall 14 with a recessed or reentrant section 16 in which is formed an exposure aperture 18, through which light is transmitted for exposing photosensitive sheet materials within the camera. A hinged door 20 is provided for covering recessed section 16 and for mounting a conventional lens and shutter assembly 22, the latter being connected to recessed section 16 by a collapsible bellows 24 secured at one end to the lens and shutter assembly and secured at its other end to the recessed section in surrounding relation to aperture 18. In lieu of door 20, lens and shutter assembly 22 and bellows 24, the camera housing could be constructed in the form of a camera back or film pack holder intended to be mounted on or coupled with the rear of a camera or other device for exposing photosensitive materials.

The camera housing includes a rear section 26 having a rear wall 28 and side walls 30 cooperating with the forward housing section to provide a chamber 32 to the rear of aperture 18 for containing a photographic film pack, such as is shown and described in the aforementioned copending application, in position for exposure. Rear housing section 26 is preferably pivotably secured to forward housing section 12 adjacent one end of the housing, herein shown and designated for purposes of description as the upper end, by a hinge which permits the opening of the two housing sections for loading of a film pack into chamber 32. The camera housing includes a lower end wall defined by a forward end wall section 34 comprising forward housing section 12 and a rear end wall section 36 comprising rear housing section 26. A film withdrawal opening 38 is provided in rear end wall section 36 to permit withdrawal of photographic film units comprising a film pack from the camera housing. A leader withdrawal opening 40 is provided in the lower end of the camera housing adjacent opening 38 intermediate forward end wall section 34 and rear end wall section 36 and is defined by portions of both of said end wall sections. Opening 40 is provided for permitting the withdrawal of leaders from the camera housing in a manner to be described hereinafter. Suitable latch means (not shown) of a conventional type are also provided in the lower portion of the housing for retaining the two housing sections together in the closed or operative position shown in FIG. 1 of the drawings.

Film units of the type adapted to be exposed and processed in camera 10 generally comprise a photosensitive sheet, a second sheet which is superposed with the photosensitive sheet, and a rupturable container of processing fluid located between the sheets. Typical photographic film units of this general type are described in detail in the aforementioned copending U.S. patent application and in U.S. Patent No. 2,978,971, issued April 11, 1961, in the name of William H. Eburn, Jr. The processing fluid is released from the container and spread in a layer between the photosensitive and second sheets by advancement of the sheets relative to and between a pair of juxtaposed pressure-applying members. In accordance with the invention, these pressure-applying members comprise a unitary fluid-distributing device, designated 42, and shown in detail in FIGS. 2 through 4. The fluid-distributing device comprises a support frame 44 designed to be fabricated from a single blank of sheet metal, and includes a pair of support members 46 and 48 joined by an elongated connecting member 50. Each of support members 46 and 48 is provided with a foot 52 at which the support frame 44 is mounted within the photographic

apparatus, in this case, on rear wall 28 of the housing of camera 10.

The pressure-applying members, in the form shown, comprise a pair of rolls 54 and 56 which engage the superposed sheets for distributing the processing fluid therebetween. Rolls 54 and 56 each include generally cylindrical intermediate sections 58, which are elongated and of substantially uniform diameter throughout their lengths, for engaging and applying compressive pressure to the superposed photographic sheets. Roll 56 is provided with slightly raised shoulders 60 at the ends of intermediate section 58 for spacing apart the intermediate sections 58 of the two rolls and aiding in controlling the thickness of the layer of processing fluid spread between the two sheets. Roll 54 is provided with outwardly flared end sections or collars 62 at its ends, and roll 56 is provided with correspondingly tapered end sections 64. The flared end sections 62 and tapered end sections 64 of the rolls cooperate to deform the margins of the superposed sheets and prevent escape of the processing fluid from between the margins of the sheets. For a more detailed description of the construction and fluid-confining function of the pressure-applying rolls, reference may be had to the copending U.S. patent application of Joel A. Hamilton, Serial No. 112,950, filed May 26, 1961.

As a means for mounting rolls 54 and 56 in juxtaposition and biasing the rolls toward one another, there is provided a pair of spring shafts 66 and 68. Spring shaft 66 is rigidly secured at one end on support member 46 and extends toward support member 48 where the other (free) end of spring shaft 66 is engaged in a slot 70 in support member 48. Spring shaft 68 is similarly rigidly mounted at one end on support member 48 and extends toward support member 46 where the other (free) end of spring shaft 68 is engaged in a slot 72 in support member 46. Spring shafts 66 and 68 are mounted on the support members with their axes substantially in a common plane, and the free ends of the spring shafts are constrained by slots 70 and 72 for movement substantially only in this common plane. Spring shafts 66 and 68 are bent or curved toward one another so as to bias rolls 54 and 56 into superposition.

Rolls 54 and 56 are in the form of tubes, each having a cylindrical bore 74 extending therethrough and within which spring shafts 66 and 68 extend. Roll 54 is mounted on spring shaft 66 adjacent the ends of the roll on ball bearings 76, and roll 56 is similarly mounted on spring shaft 68 on ball bearings 78. Means are provided for retaining balls 76 and 78 in position and for preventing lengthwise movement (axial) of the rolls on the spring shafts. In the form shown, these means include bearing-retaining collars 80 and 82. Each bearing-retaining collar 80 is secured at the fixed end of a spring shaft to the support member on which that spring shaft is mounted. Bearing-retaining collars 80 cooperate with the support members to lend rigidity to the mounting of the fixed ends of the spring shafts, and extend into the bores of the rolls where the collars abut against ball bearings 76 and 78. The bores of each of rolls 54 and 56 are provided with enlarged sections 84 at the ends of the rolls for receiving the ball bearings and providing shoulders against which the ball bearings are retained. Bearing-retaining collars 82 are provided adjacent the free ends of spring shafts 66 and 68. Collars 82 are pressed onto the shafts and extend into enlarged sections 84 of the bores through the shaft for retaining the ball bearings within the enlarged sections, and preventing axial movement of the rolls.

The adjacent portions of intermediate sections 58 of the two rolls cooperate to define a passage, which converges and diverges and has substantially straight, parallel sides. The mounting of the pressure-applying rolls is such as to permit movement of the rolls toward and away from one another while retaining the axes of the rolls in a common plane. The springs for biasing the rolls

toward one another are enclosed entirely within the rolls themselves, thus making for a compact arrangement in which the springs are made to perform a dual function; and the arrangement of the spring shafts as cantilever springs permits the rolls to be displaced apart from one another while their axes remain in substantially parallel relation, so that the thickness of the layer of fluid spread between the superposed sheets is uniform from side to side of the sheets.

Fluid-distributing device 42 is mounted at feet 52 on rear wall 28 of the camera housing adjacent the lower end of the camera housing, with the passage between the rolls aligned with film withdrawal opening 38. Connecting member 50 is located between the rolls and rear end wall section 36 may be secured to the rear end wall section, and is provided with a slot 86 aligned with the passage between the rolls and opening 38 to permit movement of film units between the rolls and through opening 38.

The film pack employed in camera 10 generally comprises a box-like container 92 which is mounted in chamber 32 and supported against forward wall 14. The container of the pack includes an opening in its forward wall which is aligned with exposure aperture 18 and an opening in its lower end wall through which film units contained in the container are withdrawn. Each film unit includes an elongated leader 94 attached to a leading end section of the film unit at a position thereon spaced from the leading edge of the leading end section toward the opposite end of the film unit. The leaders of the film unit extend from the opening in the lower end of the pack container and the pack is loaded into the camera with the leaders projecting from the camera through opening 40. When it is desired to process a film unit following exposure of the photosensitive material of the film unit, the leader of that film unit is pulled through opening 40, thereby advancing the leading end of the film unit between pressure-applying rolls 54 and 56 through opening 38, where the leading end of the film unit may be grasped for withdrawing the film unit from the camera between the pressure-applying rolls.

The camera includes means (described in detail in the aforementioned U.S. application Serial No. 112,941 for guiding each leader 94 forward and to one side of pressure-applying roll 54 through opening 40 while guiding the leading end of the film unit between pressure-applying rolls 54 and 56 and through opening 38. This last-mentioned guide means comprises a guide bar 88 mounted on forward housing section 12 adjacent roll 54. Guide bar 88 includes a rearmost edge disposed in alignment with the passage between rolls 54 and 56, and leaders 94 of the film pack are loaded into the camera so as to extend to the rear of guide bar 88 and between the latter and roll 54 through passage 40 (as shown in FIG. 1). A pair of guide members 90 are mounted on guide bar 88 with their rear surfaces in the plane of the rear edge of the guide bar for cooperating with the rear edge of the guide bar to guide the leading ends of the film unit into the passage between rolls 54 and 56. The leading end section of each film unit is substantially wider than the leader, and guide members 90 are spaced from one another by a distance approximately equal to the width of the leader, but less than the width of the leading end section of the film unit, so that only the leader will pass between the guide members, guide bar 88 and roll 54, and the leading end section is guided between the rolls.

Since certain changes may be made in the above apparatus 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. In photographic apparatus for processing photosensitive materials, means for distributing a photographic

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processing fluid between a pair of superposed sheets, and means comprising, in combination, a pair of spaced supports, a first cantilever spring mounted on one of said supports and extending toward the other of said supports, a second cantilever spring mounted on said other support and extending toward said one support, said cantilever springs being biased toward one another, a first sheet-engaging member mounted on said first cantilever spring and constrained against movement in any plane relative to said first cantilever spring, a second sheet-engaging member mounted on said second cantilever spring in juxtaposition with said first sheet-engaging member and constrained against movement in any plane relative to said second cantilever spring, said sheet-engaging members having adjacent opposed surface portions which are substantially straight and parallel for engaging a pair of superposed sheets during movement of said sheets relative to and between said sheet-engaging members for applying compressive pressure to said sheets to distribute a photographic processing fluid therebetween, said cantilever springs having free ends movable in a common plane and being constrained against movement in the direction of movement of sheets between said sheet-engaging members.

2. The photographic apparatus of claim 1 wherein said surface portions of said sheet-engaging members are cylindrical and are of substantially uniform radius throughout their lengths.

3. The photographic apparatus of claim 1 wherein said sheet-engaging members comprise cylindrical tubes mounted adjacent their ends for rotation about their axes on said cantilever springs with said axes lying substantially in a common plane, and with said springs enclosed within said tubes.

4. In photographic apparatus for processing photosensitive materials, means for distributing a photographic processing fluid between a pair of superposed sheets, said means comprising, in combination, a pair of spaced supports fixedly positioned with respect to one another, a first elongated spring member rigidly mounted at one end on one of said supports with the other end of said first spring member movably engaged by the other of said supports, a second elongated spring member rigidly mounted at one end on said other support with the other end of said second spring member movably engaged by said one support, said other end of each of said spring members being biased toward said one end of the other of said spring members, a first engagement member mounted on said first spring member intermediate said supports and constrained against movement in any plane relative to said first spring member, a second engagement member mounted on said second spring member intermediate said supports in juxtaposition with said first engagement member and constrained against movement in any plane relative to said second spring member, said engagement members having adjacent surface portions which are substantially straight and disposed in generally parallel relation for engaging a pair of superposed photographic sheets during movement of said sheets relative to and between said engagement members for applying compressive

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sive pressure to said sheets and distributing a photographic processing fluid therebetween, said other ends of said spring members being substantially freely movable in a common plane and being constrained against movement in the direction of movement of said sheets.

5. The photographic apparatus of claim 4 wherein said surface portions of said engagement members are cylindrical and of substantially uniform radius throughout their lengths.

6. The photographic apparatus of claim 4 wherein said engagement members comprise cylindrical rolls mounted adjacent their ends for rotation about their axes on said spring members with said axes located substantially in said common plane, each of said rolls including an axial bore in which is located the spring on which said each roll is mounted.

7. In photographic apparatus for processing photosensitive materials, means for distributing a photographic processing fluid between a pair of superposed sheets, said means comprising, in combination, a pair of spaced supports fixedly positioned with respect to one another, a first elongated resilient shaft rigidly mounted at one end on one of said supports, a second elongated resilient shaft rigidly mounted on said other support, the other ends of said shafts being engaged by said supports for movement in a common plane, each of said shafts being bent in said common plane toward the other of said shafts, a first elongated roll mounted for rotation about its axis on said first shaft between said supports with said axis in said common plane and constrained against movement in any plane relative to said first shaft, a second elongated roll mounted for rotation about its axis on said second shaft in juxtaposition with said first roll between said supports and constrained against movement in any plane relative to said second shaft, said axis of said second roll being located in said common plane, said rolls having substantially cylindrical surface portions of uniform diameter for engaging a pair of superposed photographic sheets during movement of said sheets relative to and between said rolls for applying compressive pressure to said sheets and distributing a photographic processing fluid therebetween, said other ends of said shafts being constrained by said supports against movement in the direction of movement of said sheets.

8. The photographic apparatus of claim 7 wherein each of said rolls is mounted on one of said shafts at bearings located adjacent the ends of said each roll.

9. The photographic apparatus of claim 7 wherein each of said shafts is cylindrical, said shafts are mounted with their axes in said common plane, and each of said rolls is mounted on one of said shafts for rotation about the axis thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

2,618,144	Buckell et al.	Nov. 18, 1952
2,719,472	Land	Oct. 4, 1955
2,722,871	Whittier	Nov. 8, 1955
2,804,812	Wolff	Sept. 3, 1957