Jan. 14, 1969 R. B. DOWNEY ET AL 3,421,423

PHOTOGRAPHIC APPARATUS

Filed Oct. 21, 1966 Sheet 1 of 2

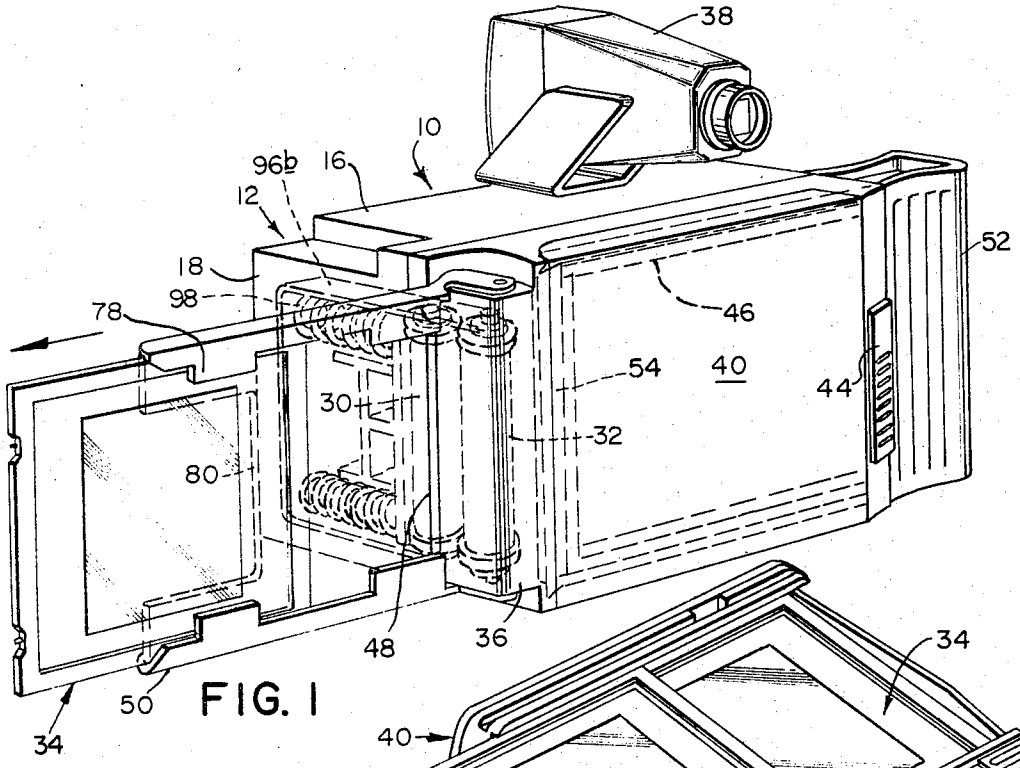


FIG. 1

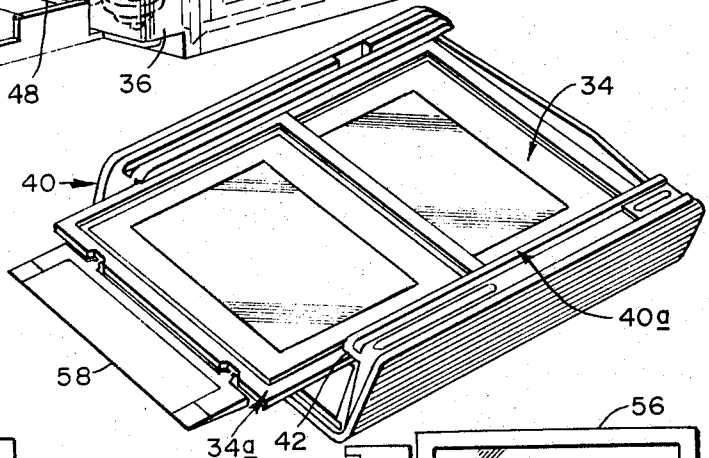


FIG. 9

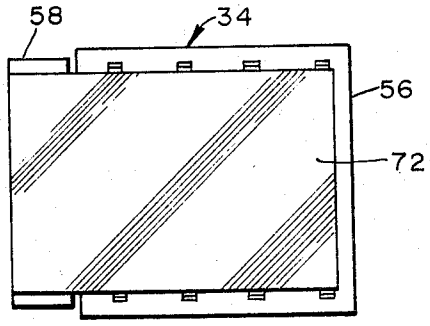


FIG. 6

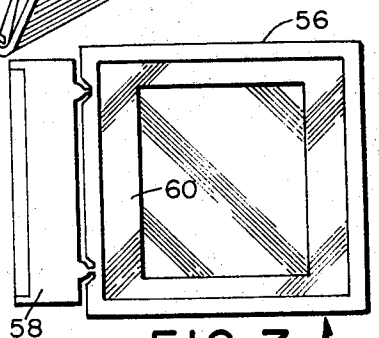


FIG. 7

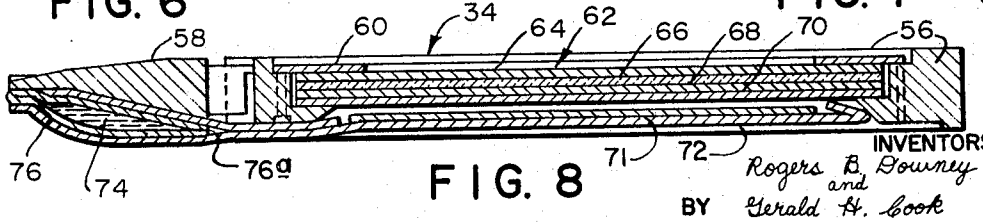


FIG. 8

INVENTORS
Rogers B. Downey
and
Gerald H. Cook
BY Brown and Mikulka
ATTORNEYS

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PHOTOGRAPHIC APPARATUS

Filed Oct. 21, 1966 Sheet 2 of 2

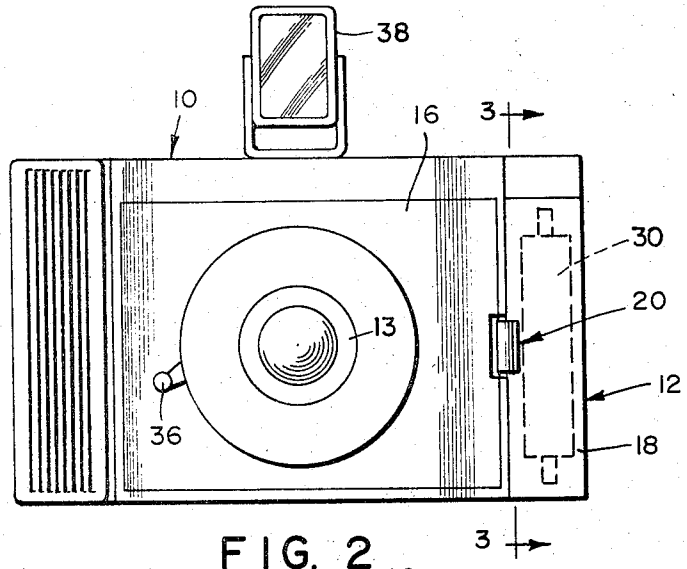


FIG. 2

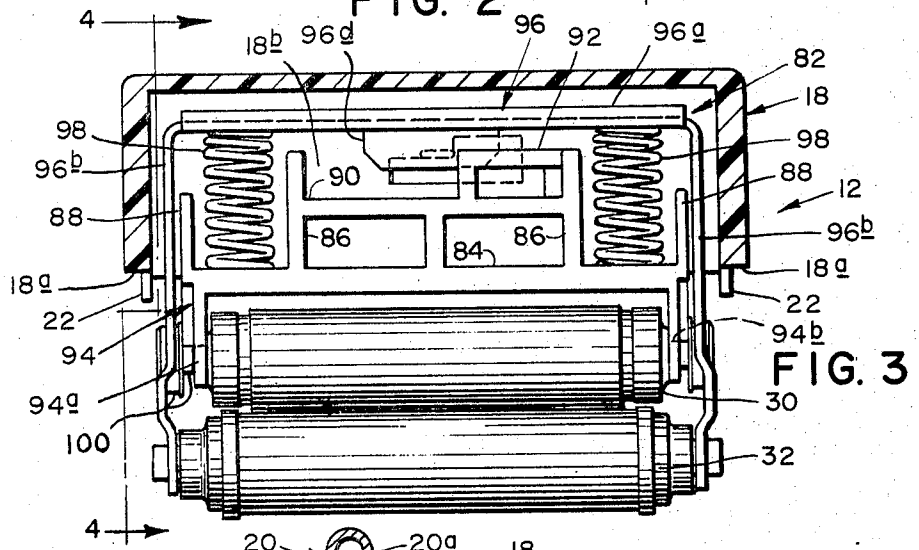


FIG. 3

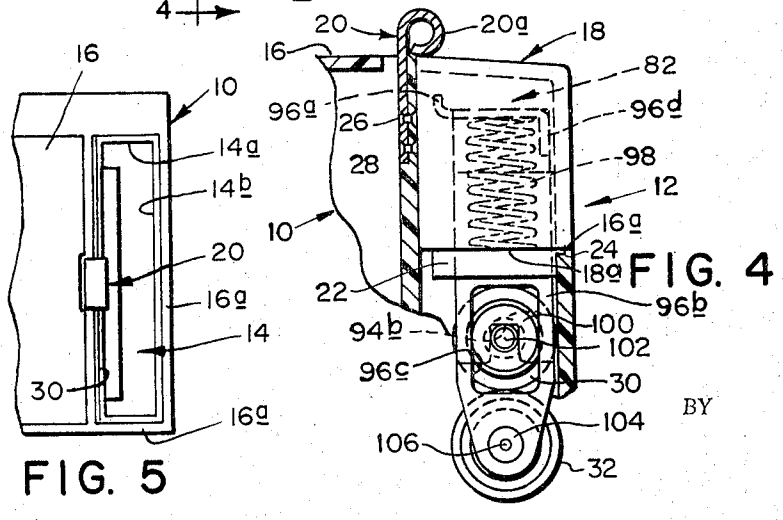


FIG. 5

FIG. 4

INVENTORS
Rogers B. Downey
and
Gerald H. Cook

BY

Brown and Mikulka
ATTORNEYS

United States Patent Office

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PHOTOGRAPHIC APPARATUS

Rogers B. Downey, Lexington, and Gerald H. Cook, Lynnfield, Mass., assignors to Polaroid Corporation, Cambridge, Mass., a corporation of Delaware

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U.S. Cl. 95—13 8 Claims

Int. Cl. G03b 17/50

This invention relates to a compact demountable pressure-roll assembly or unit for a camera of a type capable of processing a composite liquid-carrying film to deliver a finished photographic print. More particularly, the invention relates to a pressure-roll assembly of the character described which can be readily removed, without tools, as a unit, from the camera for inspection, maintenance, cleaning or any other purpose.

A film assembly of a type suitable for use with the pressure-roll unit of the present invention includes photosensitive and image-providing components and a releasably-contained processing liquid. It is of a multilayer structure such that after exposure, release of the liquid by the application of a compressive force to a liquid-containing element of the assembly, spreading of the liquid and imbibition thereof into predetermined layers, including an exposed silver halide emulsion layer, provide a visible image. The image is formed by the diffusion transfer of image-forming substances to a designated image-receiving surface. Such a process is associated with cameras and film materials sold by Polaroid Corporation, Cambridge, Mass., U.S.A. Processing is initiated by moving the film assembly between compressive means and involves mechanical transport means operating according to a predetermined program. A processing liquid suitable for use in forming the image may comprise an aqueous solution of a silver halide developer such as hydroquinone, a silver halide solvent of the type of sodium thiosulfate, and an alkaline substance such as sodium hydroxide. It may also preferably include a thickening or film-forming agent such as a synthetic polymer of the type of sodium carboxymethyl cellulose and, possibly, a high-molecular-weight polymeric mordant to facilitate the transfer process. In producing a black-and-white image, a latent image is developed; the exposed silver halide is reduced to silver, and the unreduced silver halide forms a soluble silver complex which is transferred from undeveloped areas to the image-receiving surface, the image being formed on the latter in silver. In the production of a color transparency, substances capable of forming dye images at the image-receiving surface such as dyes, color couplers, or the like, may be employed in the transfer process. Or, a black-and-white image in conjunction with a color screen may, advantageously, be employed to provide an image visible substantially in full color.

Cameras of a generally related category adapted to process film materials of the type above described, of a miniature format, are set forth in U.S. Patent 3,225,670 and in the copending patent applications Ser. No. 448,630, filed Apr. 16, 1965, under the names of Patrick L. Finelli and Herbert A. Bing for Camera Apparatus, and Ser. No. 516,416, filed Dec. 27, 1965, under the name of Rogers B. Downey for Camera Apparatus. In general, the pressure-roll components of these cameras, utilized to compress and fracture the liquid container and spread the processing liquid between given layers of the film assembly, are permanently mounted therewithin. The pressure rolls employed in the aforesaid cameras are, in general, formed of a metal as, for example, of a stainless steel.

As with any photographic mechanism involved in film transport, parts become fouled by such extraneous matter as fragments of the film, dust, humidity, etc. In cameras of the subject type, there is occasionally an additional possibility that a small portion of the processing liquid may inadvertently come into contact with the pressure rolls and if allowed to remain, it may cause slippage and uneven compression of subsequently processed film materials. If permitted to accumulate and harden, it will, of course, produce protuberances on the pressure roll surface. For the foregoing reasons, it is important to keep the pressure rolls completely clean and for this purpose frequent inspection thereof is highly desirable. The demountable pressure-roll feature of the present invention makes inspection readily possible.

In view of the foregoing considerations, objects of the invention are to provide a pressure-roll assembly or unit for a camera of the character described which is compact and both easily and practically-instantaneously demountable for inspection purposes; to provide a completely removable pressure-roll unit of the aforesaid category which includes positioning and latching parts cooperating with mating positioning and latching parts of the camera; to provide a pressure-roll unit, as characterized, which includes enclosing means constituting a housing portion or end-piece of the camera housing when mounted thereon; and to provide a pressure-roll unit of the type stated which includes one roll mounted for linear translational movement with respect to the other roll and biased toward the latter roll by compression spring means bearing against a mounting yoke.

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 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:

FIG. 1 is a diagrammatic rear view of a miniature camera embodying the demountable pressure-roll unit of the invention;

FIG. 2 is a diagrammatic front view of a camera showing the pressure-roll unit mounted thereon;

FIG. 3 is a diagrammatic elevation view, partly in section, of the pressure-roll unit, taken along the line 3—3 of FIG. 2;

FIG. 4 is a diagrammatic end view, partly in section, of the pressure-roll unit, taken along the line 4—4 of FIG. 3;

FIG. 5 is a diagrammatic top view of that end portion of the camera which is adapted to receive and hold the pressure-roll unit mounted thereon;

FIGS. 6 and 7 are diagrammatic front rear plan views, respectively, of a mounted film material or assembly adapted to be treated by the pressure roll assembly of the invention;

FIG. 8 is a sectional side view of the mounted film assembly; and

FIG. 9 is a diagrammatic perspective view of a film pack and magazine adapted to be employed with the camera and pressure-roll unit.

Referring now to the drawings, a miniature camera **10**, with the demountable pressure roll unit **12** of the invention incorporated therewith, is shown from the rear in FIG. 1 and from the front or lens-assembly **13** side in FIG. 2. The pressure-roll unit is in part held at correct mounted position relative to a slot-like receiving chamber **14** of the camera by cooperating frontal edge surfaces **16***a* of the camera housing **16**, serving as limit stops against which the rear edge surfaces **18***a* of the pressure-roll unit housing **18** are adapted to bear and by the spring-latch **20** affixed to the camera housing which engages a front surface of the housing **18**. The pressure-roll unit **12** is held against lateral displacement by the flange portions **22** and **24** which fit within the chamber **14** and are adapted to bear against the inner wall surfaces of the chamber at **14***a* and **14***b*, respectively. The latch **20** is composed of a flat spring having rolled-over extremity **20***a* and is attached, as by rivets **26**, to an end-wall **28** of the camera.

When the pressure-roll unit **12** is correctly mounted on the camera, as determined by contact of the aforesaid surfaces **16***a* and **18***a*, flanges **22** and **24**, surfaces **14***a* and **14***b* and latch **20**, the pressure rolls **30** and **32** thereof are automatically correctly positioned within the camera to perform their processing function. This involves their being so located within the camera housing **16** as to establish the bite of the rolls substantially in a plane along which each of a plurality of film assemblies **34** is advanced from its exposure position at the focal plane of the camera to accomplish its processing. Means associated with exposure of the film assemblies, although forming no part of the invention, are indicated by the lens assembly **13**, the shutter release lever **36** and the finder **38**.

A plurality of film assemblies **34**, in the form of a film pack, is contained in a magazine **40**. They are impelled forwardly or toward the substantially open face **40***a* of the magazine by suitable biasing means, not shown. Each foremost film assembly **34***a* of the film pack, that is, the film assembly nearest the open face of the magazine, is adapted to be slidably removed from the magazine along the guide flanges or channels **42**. The magazine, containing the film pack, is releasably mounted on the back of the camera, the latch being subject to release by actuation of the button **44**. With the magazine thus mounted, as shown, in FIG. 1, it is to be understood that the foremost film assembly, prior to its removal, is positioned at the focal plane of the camera, in readiness for a photographic exposure. Thereafter, the film assembly is adapted to be slidably advanced by the "pusher-type" advancing means **46** from the focal plane, between the pressure rolls **30** and **32**, through an exit aperture or slot **48** formed in the camera housing, and into a semi-enclosing processing chamber **50**. The film-assembly advancing mechanism **46** is a frame-like structure mounted for slidable movement in the camera. It is manually actuated by the handle **52** and includes a transverse bar component **54** for propelling each film assembly in the direction above indicated.

To better understand the operation of the pressure-roll unit when the latter is mounted on the camera, the physical structure of one type of film assembly, shown from the rear in FIG. 6, from the front in FIG. 7, and in section, in exaggerated thickness, in FIG. 8, will be briefly considered. The film assembly, from front-to-rear, comprises a rigid mount **56** including a break-off tab **58**, a mask **60**, a film component **62** which includes a transparent base layer **64**, a transparent light-transmitting additive color-screen layer **66**, a transparent image-receiving layer **68**, a photosensitive silver-halide emulsion **70**, an opaque stripping layer **71**, and a cover sheet **72**. A processing liquid **74**, held in a flexible container or pod **76**, is subject to release between the separable container edges **76***a* when the film assembly is subjected to compression, from left-to-right, between the pressure rolls **30** and **32**. After its release from the container **76**, the processing liquid is spread between the emulsion and stripping layers **70** and **71** by continued advancement of the film assembly between the pressure rolls into the semi-enclosing chamber **50** After remaining in the processing chamber **50** for a period of a few seconds, the liquid has permeated into the emulsion, diffusion transfer of image-forming substances to the image-receiving layer has occurred and the photographic image in black-and-white or in full color, depending upon the photographic characteristics of the film component **62**, has been produced at the image-receiving layer. The tab **58** is then grasped and broken off, the exhausted container **76**, emulsion, stripping layer, and cover sheet being stripped away therewith as a unit. The finished mounted print, in the form of a transparency is left in the chamber **50**, held by the flanges **78**, and can be easily removed by grasping it at the cut-away or slot portion **80** of the chamber. In FIG. 1, it is to be assumed that the stripping operation has been performed and that the film assembly **34**, in the form of a mounted transparency, is ready for removal. The mounted transparency is then ready for direct viewing or projection in a slide projector. As previously intimated, the film assembly is not limited to the category specifically described above but may be of a type for producing either a black-and-white image or one in color as, for example, by embodying one or more dye developers.

Again referring to the pressure-roll unit **12**, the inner structure of the housing **18** includes a chamber or cavity cavity **82**, a transverse partioning member or web **84** integral with the housing and including the unitary forwardly-projecting elements or sub-members **86** and **88**, the transverse elements or sub-members **90** and **92**, and the rearwardly projecting elements or sub-members **94**. The latter have forwardly extending forked or slotted extremities at **94***a* of a depth terminating at the surfaces **94***b*. A metallic yoke **96** is suspended in the chamber **82** through the medium of a pair of tensioned compression springs **98** which bear, respectively, against the fixed transverse web member **84** and the movable horizontal portion **96***a* of the yoke. The rearwardly-extending or depending yoke portions **96***b* serve as arms for mounting the pressure rolls **30** and **32**. The terms "forwardly" and "rearwardly," as used herein, refer to a relationship to the front and rear of the camera when the pressure-roll unit is mounted thereon.

The specific mounting means for the pressure-roll **30** includes a pair of dual-radius discs **100** composed of a plastic such as "nylon" or "Delrin," sold by E. I. du Pont de Nemours and Co., Wilmington, Del. Stub shafts **102** of the pressure roll **30** pass through the slotted extremities **94***a*, bear against the slot surfaces **94***b* under bias applied from pressure roll **32**, as explained below, and are mounted for rotation in the discs **100**. The cut-out areas **96***c* of the yoke arms **96***b* permit a rearward or forward movement of the arms, either against or with the bias applied by the springs **98**. The pressure roll **30** is maintained correctly positioned by virtue of the contact of the stub shafts **102** with the slotted portions **94***a* and slidable contact of the discs **100** with the inner and cutout arm portions **96***c*. A pair of bearing components in the form of inserts **104**, perferably composed of a plastic similar to that of the discs **100**, is located at the lower or rear extremities of the yoke arms **96***b*. Stub shafts **106** of the pressure roll **32** are rotatably mounted in the bearing components **104**. The slotted extremities **94***a* permit rotational freedom of pressure roll **30** and serve to maintain a correct sideways position of the roll. The aforesaid structure permits the pressure roll **32** to be moved away from the roll **30**, as by reason of the differential thickness or compressibility of the film assembly **34** when undergoing compression.

While a generally-linear translational movement of the pressure roll **32**, with respect to the pressure roll **30**, is

furthered by the structure above-described, such movement is further assured by additional guide means for the purpose. This means includes a flat metallic plate-like appendage **96***d* of the yoke which is positioned for slidable movement between an inner surface **18***b* of the housing and the sub-member **92**, thus providing an extremely low-frictional relation of a metal between two plastic surfaces. The plastic here involved, that is, in the structure of the housing **18** and its internal components including the sub-member **92**, may, again suitably be "Delrin", previously mentioned. The sub-members **86** and **88**, serve primarly as strut- or rib-like components for strengthening the housing **18** and thus enhancing its supporting function. The sub-members **94**, in conjunction with a reduced-diameter portion of the discs **100** bearing thereagainst, serve a lateral positioning function with respect to the yoke arms **96***b*, as indicated in FIG. 3. A freedom from restriction of the yoke in the mounting thereof, as described, is significant in relation to the freedom of translational movement of the pressure roll **32** thus provided, and contributes to a heightened compressive efficiency of the pressure-roll unit.

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. A demountable pressure-roll unit adapted to be mounted on a camera which includes cooperative retentive latching means therefor and which is of a type for advancing a film assembly embodying a releasably-contained processing substance between compressive elements of said pressure-roll unit to provide a completed photographic print, said pressure-roll unit comprising a pair of pressure rolls, a generally-rectangular housing forming therewithin a chamber and including rear surface areas for contacting mating forward surface areas of said camera to establish a correct front-to-rear location of said pressure-roll unit on said camera, flange means integral with and projecting from said housing for contacting mating side housing portions of said camera to establish a correct lateral location of said pressure-roll unit on said camera, latching means adapted to cooperate with said latching means of said camera for releasably holding said pressure-roll unit at mounted position, and means mounted in said chamber and partially extending rearwardly therefrom for mounting said pressure rolls for rotation and permitting substantially linear movement of one of said pressure rolls relative to the other.

2. A demountable pressure-roll unit, as defined in claim **1**, wherein said camera is of a miniature type which includes means for propelling said film assembly between said pressure rolls to effect its processing and wherein said film assembly is of a mounted type provided in the form of a film pack and adapted to become immediately viewable as a completed transparency when processed in said camera.

3. A demountable pressure-roll unit, as defined in claim **1**, wherein when said pressure-roll unit is mounted on said camera, the bite of said pressure rolls automatically lies in a plane which is substantially identical to that in which said film assembly is advanced from a focal plane of said camera toward said pressure rolls for processing purposes.

4. A demountable pressure-roll unit, as defined in claim **1**, wherein said housing thereof, when mounted on said camera, forms, in effect, a continuation of the housing of said camera.

5. A demountable pressure-roll unit adapted to be mounted on a camera which includes cooperative retentive latching means therefor and which is of a type for advancing a film assembly embodying a releasably-contained processing substance between compressive elements of said pressure-roll unit to provide a completed photographic print, said pressure-roll unit comprising a pair of pressure rolls, a generally-rectangular housing forming therewithin a chamber and including rear surface areas for contacting mating forward surface areas of said camera to establish a correct front-to-rear location of said pressure-roll unit on said camera, flange means integral with and projecting from said housing for contacting mating side housing portions of said camera to establish a correct lateral location of said pressure-roll unit on said camera, latching means adapted to cooperate with said latching means of said camera, a yoke including a plurality of integral arm means positioned partially within and extending outwardly from said chamber serving to mount between said arm means both said pressure rolls for rotation and to mount one of said pressure rolls for translational movement relative to the other, and compression-spring means so biasing said yoke that said pressure roll capable of translational movement is biased toward said other pressure roll.

6. A demountable pressure-roll unit adapted to be mounted on a camera which includes cooperative retentive latching means therefor and which is of a type for advancing a film assembly, embodying a releasably-contained processing substance, between compressive elements of said pressure-roll unit to provide a completed photographic print, said pressure-roll unit comprising a pair of pressure rolls, a generally-rectangular housing forming therewithin a chamber and including rear surface areas for contacting mating forward surface areas of said camera to establish a correct front-to-rear location of said pressure-roll unit on said camera, flange means integral with and projecting from said housing for contacting mating side housing portions of said camera to establish a correct lateral location of said pressure-roll unit on said camera, latching means adapted to cooperate with said latching means of said camera for releasably holding said pressure-roll unit at mounted position, a web located within said chamber integral with said housing composed of a plurality of horizontal and vertical members and including a principal fixed horizontal member, a yoke including a central horizontal portion and two depending arm-like portions, a pair of relatively-widely laterally-spaced compression springs positioned within said chamber between pairs of said vertical web members and mounted vertically, under tension, between said principal horizontal web member and said central horizontal yoke portion, means for so rotatably mounting one of said pressure rolls between said depending yoke portions in a pair of cut-out areas thereof that it is free to move in a pair of slots formed in said depending yoke portions and is adapted to remain translationally immovable during movement of said yoke, and means for so rotatably mounting the other of said rolls in said depending yoke portions that it is capable of translational movement in conformance with the movement of said yoke and is biased toward said one pressure roll by said compression springs.

7. Miniature camera apparatus of a type for advancing a film assembly, embodying a releasably-contained processing substance, between compressive elements to effect release and spreading of said substance for processing said film assembly and producing a completed photographic print, said camera apparatus comprising a main camera housing, film exposure means, means for advancing said film assembly from a focal plane, a demountable pressure-roll unit including a pair of pressure rolls, a housing for said pressure-roll unit forming therewithin a semi-enclosing chamber, mating complementary positioning means embodied in each of said housings for establishing a correct mounted position of said pressure-roll unit on said main housing, complementary latching means identified with each of said housings for releasably holding the

pressure-roll unit at said mounted position, means mounted in said chamber and partially extending rearwardly beyond said chamber for both mounting said pressure rolls for rotation and for permitting substantially-linear translational movement of one of said pressure rolls relative to the other, and spring means biasing said one pressure roll toward said other pressure roll.

8. A demountable pressure-roll unit, as defined in claim **6**, wherein said housing and web are composed of a plastic material and wherein said horizontal yoke portion includes an integral depending plate-like component in slidable contact at one side with an inner surface of said housing and at its other side with the surface of a

member of said web to provide an extremely low frictional relation of said plate-like element and surfaces.

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NORTON ANSHER, *Primary Examiner.*

C. B. FUNK, *Assistant Examiner.*