United States Patent [19]

Harvey

[11] **3,741,095**

[45] **June 26, 1973**

[54] **PHOTOGRAPHIC APPARATUS FOR HANDLING FILM UNITS OF THE SELF-PROCESSING TYPE**

[75] Inventor: **Donald M. Harvey**, Webster, N.Y.

[73] Assignee: **Eastman Kodak Company**, Rochester, N.Y.

[22] Filed: **Mar. 17, 1972**

[21] Appl. No.: **235,699**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 205,993, Dec. 10, 1971, abandoned, which is a continuation-in-part of Ser. No. 111,467, Feb. 1, 1971, abandoned.

[52] **U.S. Cl.** **95/13**, 95/22

[51] **Int. Cl.** **G03b 17/50**

[58] **Field of Search** 95/13, 22, 19

[56] **References Cited**

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Primary Examiner—Richard L. Moses

Attorney—W. H. J. Kline et al.

[57] **ABSTRACT**

Photographic apparatus for exposing and handling film units of the self-processing type, and especially such film units that each include a resiliently flexible card for facilitating handling that includes the separation of waste materials from an image-recording portion of the unit after its processing has been initiated. The apparatus includes a pair of juxtaposed pressure-applying members, and various transporting mechanisms, for sequentially engaging and moving each film unit from an exposure position, through the pressure-applying members and to a deflecting element that separates the waste materials from the image-recording portion. The deflecting element effects movement of the waste materials in an arcuate path to a storage chamber, while the image-recording portion moves along a generally rectilinear path to a position accessible from the exterior of the apparatus.

26 Claims, 13 Drawing Figures

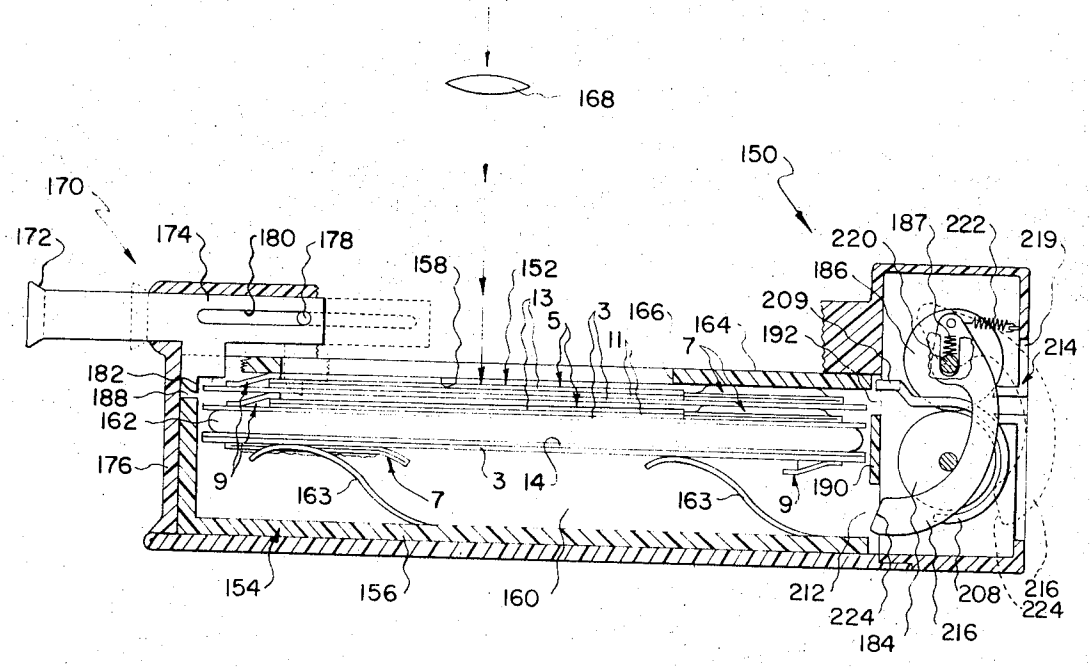


FIG.1

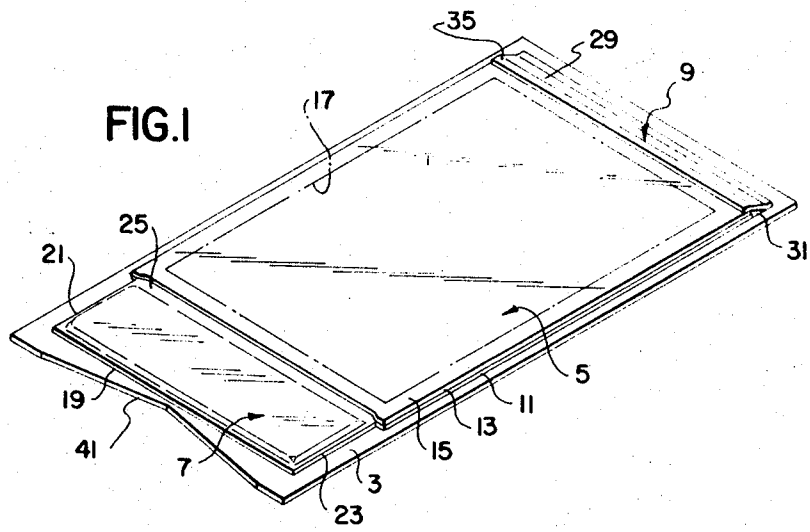
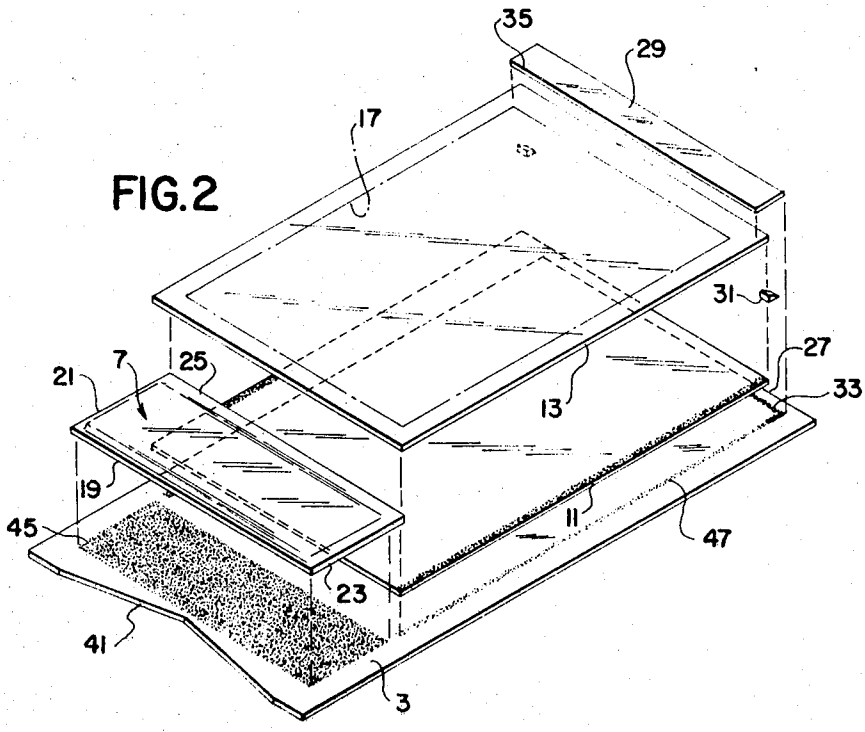

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FIG.2


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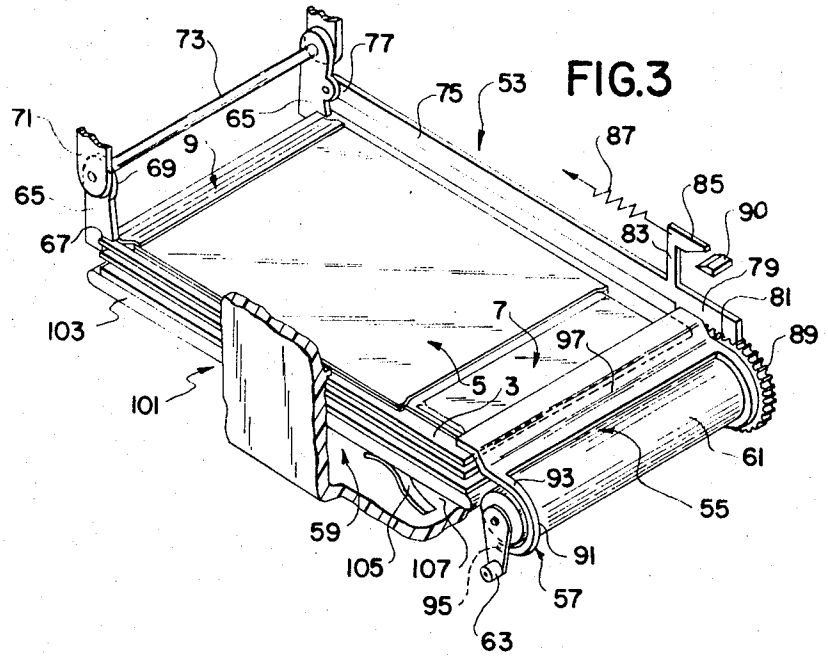

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FIG.3

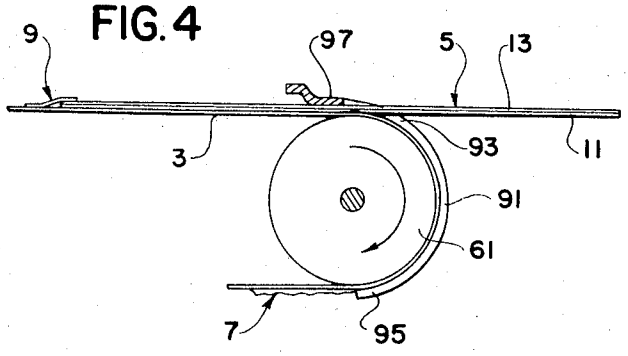

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FIG.4

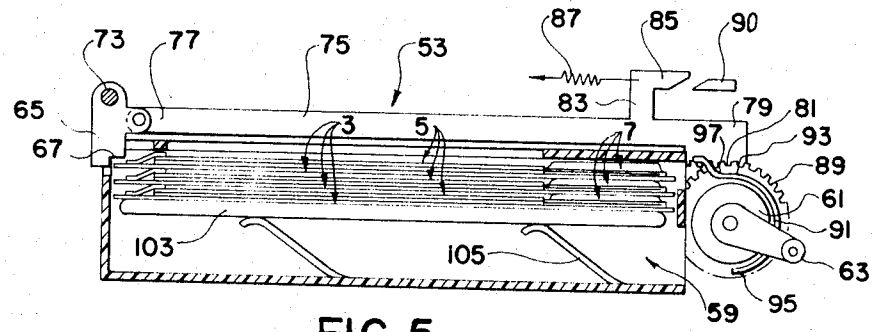


FIG.5

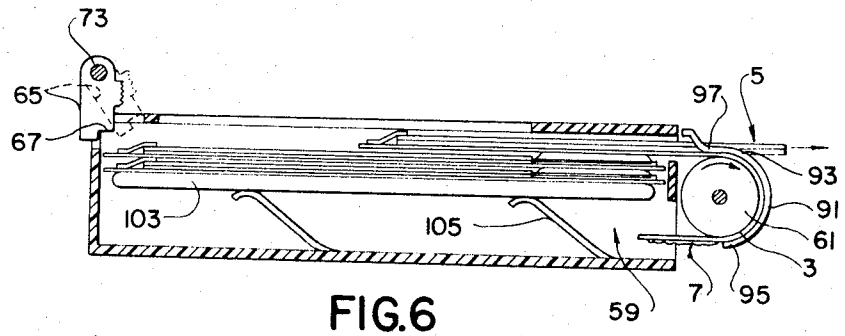


FIG.6

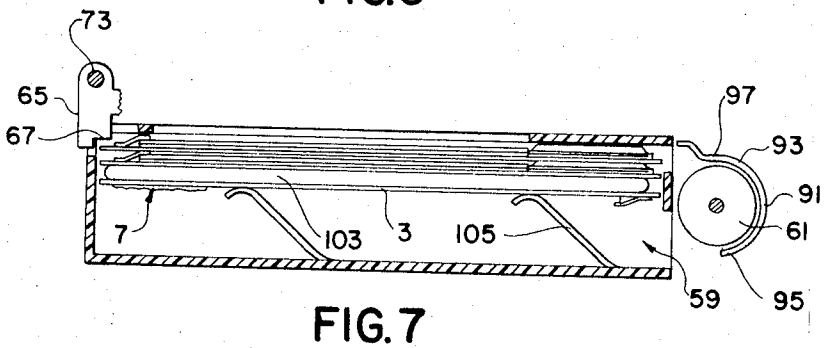


FIG.7

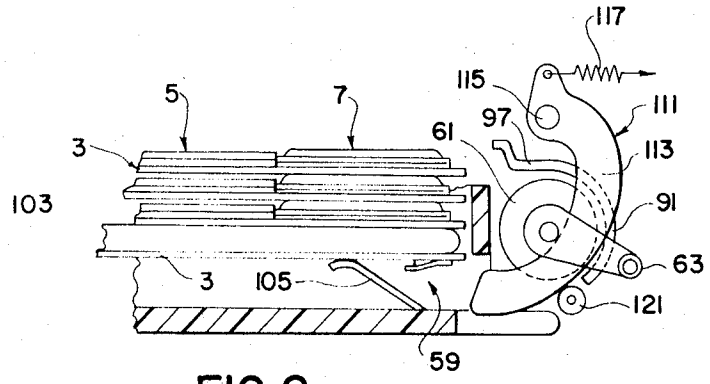


FIG. 8

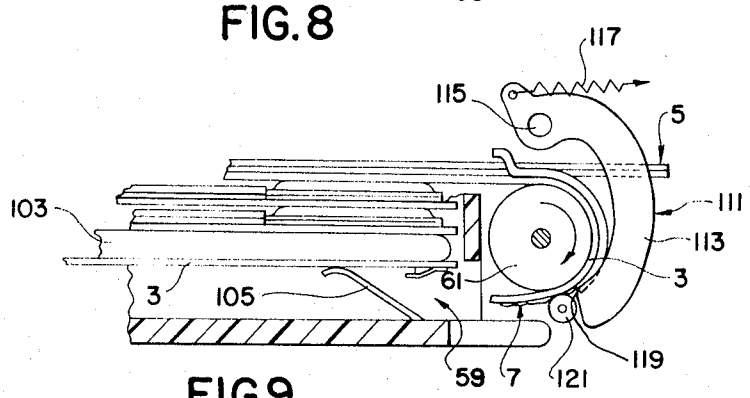


FIG. 9

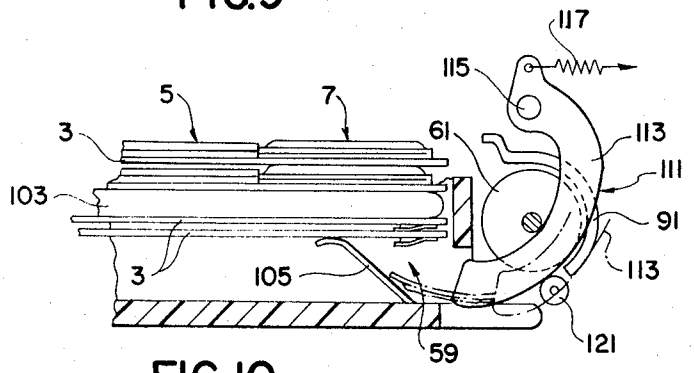


FIG. 10

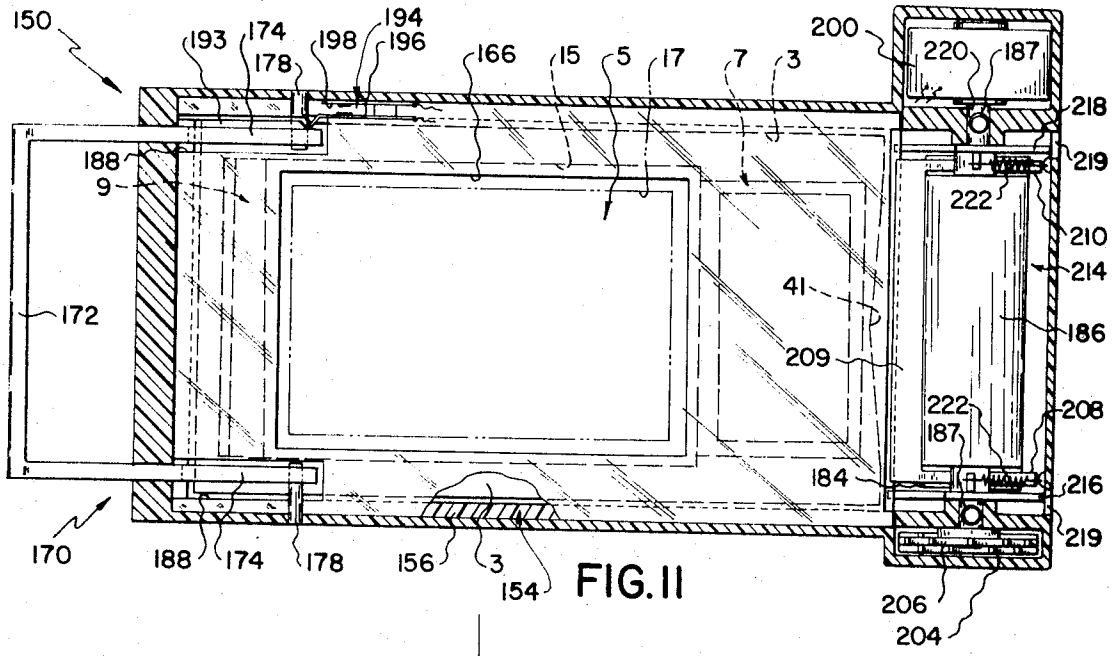


FIG. 11

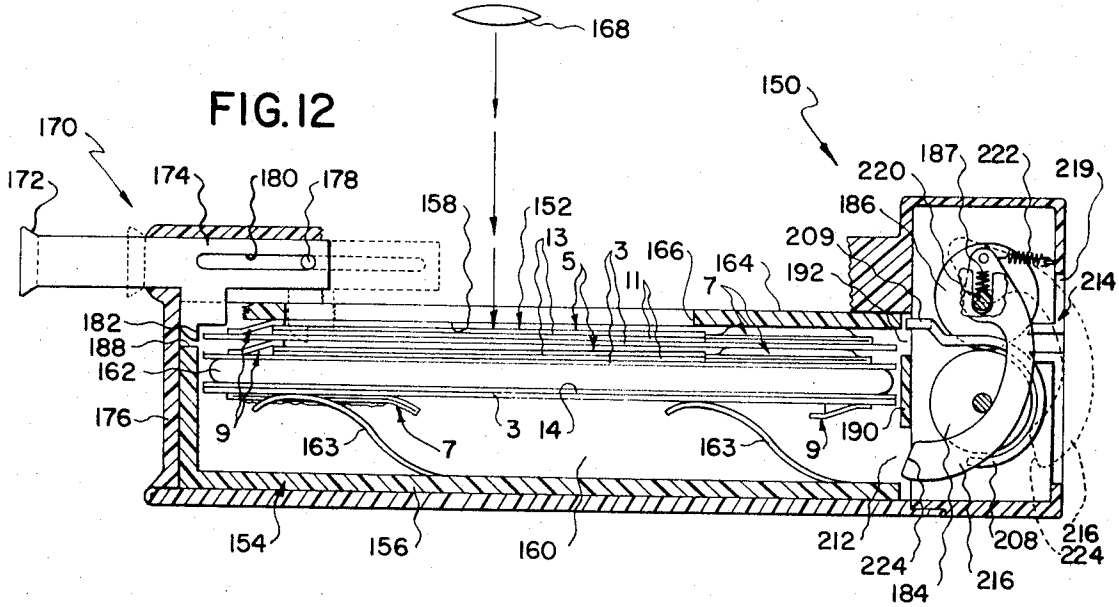


FIG. 12

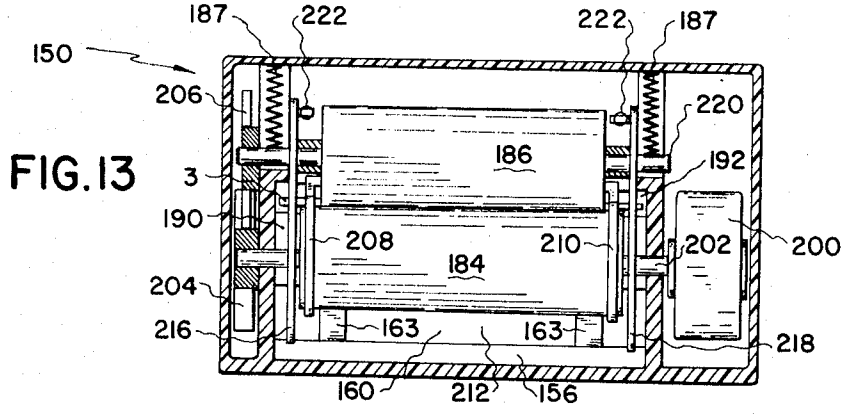


FIG. 13

PHOTOGRAPHIC APPARATUS FOR HANDLING FILM UNITS OF THE SELF-PROCESSING TYPE

This application is a continuation-in-part of U.S. application Ser. No. 205,993, filed Dec. 10, 1971 and now abandoned, which is a continuation-in-part of U.S. application Ser. No. 111,467, filed Feb. 1, 1971 and now abandoned.

CROSS-REFERENCE TO RELATED APPLICATIONS

Reference is made to commonly assigned U.S. Patent applications Ser. No. 33,677, entitled PHOTOGRAPHIC APPARATUS, filed in my name on May 1, 1970 and still pending; Ser. No. 77,515, entitled STRIPPING MECHANISM, filed in the name of Hubert Nerwin on Oct. 2, 1970 and U.S. Pat. No. 3,690,238; and Ser. No. 111,471, entitled FILM UNIT, filed in my name on Feb. 1, 1971 and now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to photographic apparatus for handling film units of the "self-processing" type; and more particularly to such apparatus for transporting the film units and for separating waste materials from image-recording portions of the units after their processing has been initiated.

The commercial development of self-processing film units has presented a plethora of unique problems that have long avoided fully satisfactory solutions. Convenient handling of the film units has been particularly troublesome, especially when it is attempted to provide mechanisms for automatically separating waste materials from picture-recording portions of the units after their processing has been initiated.

Numerous different approaches to film handling have been tried, and many have been considered successful when weighed against the important advantages they permit in self-processing photography. However, none of these previously tried approaches have been able to provide the convenience, complexity and reliability desired, such as presently is available in conventional photography.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide photographic apparatus for handling self-processing film units in a convenient, uncomplicated and reliable manner.

It is a further object of the invention to provide photographic apparatus that is particularly well adapted for the separation of image-recording portions of self-processing film units from other portions thereof, after their processing has been initiated.

Still another object is to provide photographic apparatus wherein processing waste materials can be separated automatically from the rest of a self-processing film unit, and stored for later disposal, without requiring direct contact of such materials by the photographer.

In accordance with the preferred embodiment of the invention, a processing camera, or other photographic apparatus, is provided with an improved mechanism for handling self-processing film units by sequentially transporting such units from a first or exposure position, between a pair of juxtaposed pressure-applying members, and to final positions where the processing waste materials of each film unit are separated from the image-recording portion thereof. As a film unit passes between the pressure members, a deflecting mechanism in the apparatus directs the waste materials away from the image-recording portion and into an arcuate path to a waste storage chamber. At the same time, however, the deflecting mechanism permits movement of the image-recording portion along a generally straight-line path exiting from the camera. A plurality of unconnected individual film units are adapted to be received in the apparatus in stacked relationship, and, as one of the film units is removed from the front of the stack, the other film units move forward to make room in the back of the stack for receiving the waste materials from the one film unit after its processing has been initiated.

The apparatus has particular utility with film units of the type having an image-recording portion that is releasably coupled to a resiliently flexible card for facilitating handling of the film unit and the processing waste materials. The image-recording portion of such a film unit comprises a photosensitive element, and a permanently attached process sheet, that together define a preregistered, integral structure adapted to cooperate with a container or pod for supplying a fluid processing composition and/or a fluid collecting trap for receiving any excess of the composition. The pod and trap are permanently attached to the card, while the image-recording portion is only strippably coupled thereto, such that the card, pod and trap easily can be separated from the recording portion, after processing has been initiated, to provide a print of pleasing aesthetic appearance that is not incumbered by such materials.

When used with such a film unit, the transporting mechanism directs the card from a first generally flat, initial or exposure position, between a pair of juxtaposed pressure-applying members, and in an arcuate path to a second generally flat position behind the first position. During such movement, the processing composition is distributed between the photo-sensitive element and process sheet, and the card, pod and trap automatically are deflected away from the image-recording portion, while the latter is permitted to move along a generally straight-line path to a position accessible from the exterior of the apparatus. This operation further can be facilitated by providing the card with a width dimension that is greater than the corresponding dimension of the recording portion.

The invention, and its objects and advantages, will become more apparent in the detailed description of the preferred and alternative embodiments of the invention presented below.

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred and alternative embodiments of the invention presented below, reference is made to the accompanying drawings, in which:

FIG. 1 is a pictorial view of a film unit suitable for use with apparatus in accordance with the present invention;

FIG. 2 is an exploded view of the film unit depicted in FIG. 1;

FIG. 3 is a pictorial view of a portion of the mechanism in photographic apparatus for transporting film units in accordance with the preferred embodiment of the present invention;

FIG. 4 is a schematic view of a portion of the apparatus depicted in FIG. 3, illustrating the manner in which the image-recording portion of each film unit is separated from processing waste materials after processing has been initiated;

FIGS. 5–7 are cross-sectional views of a portion of the apparatus, depicted in FIGS. 3 and 4 illustrating various stages in the operation of such apparatus for handling the film unit and for separating processing waste materials from the image-recording portion of the unit;

FIGS. 8–10 are partial cross-sectional views of an additional photographic mechanism in the apparatus fo FIGS. 3—7 for handling film units in accordance with the preferred embodiment of the present invention, illustrating the manner in which processing waste materials are moved into their final location in a waste storage chamber; and

FIGS. 11–13 are top, side and end cross-sectional views, respectively, of an alternative embodiment of the invention that corresponds substantially to the preferred embodiment of FIGS. 3–10, but utilizes a somewhat different feeding and pressure applying mechanism.

DESCRIPTION OF THE PREFERRED AND ALTERNATIVE EMBODIMENTS

Because photographic cameras and film units of the self-processing type are well known, the present description will be directed in particular to elements forming part of, or cooperating directly with, the present invention. Camera and film elements not specifically shown or described herein are selectable from those known in the art.

Film Unit

Referring now to the drawings, and particularly to FIGS. 1 and 2, a preferred film unit for use with the invention is illustrated comprising a resiliently flexible card 3 for mounting an image-recording portion 5, a container 7 for fluid processing composition, and a fluid collector 9 for receiving any excess of the composition. As will be described more fully hereinafter, the image-recording portion 5 of the film unit is only strippably coupled to the resiliently flexible card 3 and to the container 7 and fluid collector 9 while the container and collector permanently are attached to the card. This arrangement permits separation of the card, container and collector from the image-recording portion of the unit, to provide a finished print that is unincumbered by such materials that have served their purpose after processing has been initiated.

Referring to the film unit more specifically, and again to FIGS. 1 and 2, the image-recording portion or smaller unit 5 includes a photosensitive element 11 and a process sheet 13 that are preregistered and permanently secured together along their lateral marginal edges 15 to define an integral film unit. As used in the present application, the term "preregistered" refers to a film unit in which the photosensitive element and process sheet are superposed or registered prior to exposure, preferably at some stage during manufacture of the film unit or before its sale to the customer. The term "integral," on the other hand, is intended to connote a film unit wherein the photosensitive element and process sheet are permanently maintained in superposed or registered relationship during and after processing. Thus, in a film unit that is both preregistered and integral, the photosensitive element and process sheet are superposed prior to exposure and define a composite permanently registered structure that remains substantially in the same physical form after processing.

Generally, such image-recording units include one or more layers of photosensitive material, such a silver halide, for recording a developable latent image, a mechanism for distributing a processing composition to effect development of the latent image and a mordant layer for supporting or receiving a visible image representative of the developed latent image.

These various materials and mechanisms can be associated in any number of different arrangements, but generally have taken either of two forms. In one form, illustrated and described in French Pats. Nos. 2,006,255 and 2,006,256, the photosensitive material is included in a photosensitive element; the distributing mechanism includes a second element or process sheet; and the mordant layer is located in the second element, to which materials for establishing the visible image diffuse. The second and preferred form is illustrated and described in commonly assigned U.S. application Ser. No. 027,990, entitled PHOTOGRAPHIC FILM UNIT FOR DIFFUSION TRANSFER PROCESSING, filed Apr. 13, 1970 in the name of Harold E. Cole (now abandoned). In this form, the photosensitive and mordant layers both are in a single element, often referred to as an integral-negative-receiver (INR), while a second element is provided for distributing the processing composition. It is with the second and preferred form of image-recording unit that the present invention will be described.

In the preferred form, photosensitive element 11 comprises a substantially flat, resilient support of transparent cellulose triacetate film base or other suitable material. At least the central portion supports respective layers of image-receiving material, opaque reflecting material, and a silver-halide emulsion with associated dye-image providing material. Such layers preferably are arranged in the sequence given with the support located near a first face, not visible in FIGS. 1 and 2, where it can protect that side of the unit, and the silver-halide emulsion located near the opposite or inside face, where it is protected by the process sheet 13. As will become more apparent hereinafter, the silver-halide emulsion is adapted to be exposed through the process sheet, from the top side of the unit, and the developed print is adapted to be viewed through the transparent support, from the bottom side of the unit.

The photosensitive element further includes appropriate means depicted schematically as a border or margin 17 that extends entirely around the circumferential portions of the element. Such border or margin provides a sharp boundary defining both an exposure frame, within which the latent image is adapted to be recorded, and a print frame, that preferably is white and within which the finished print is adapted to be formed.

The process sheet or second element 13 also defines a resilient, substantially flat sheet, formed of transparent cellulose triacetate film base or other suitable material, for distributing the processing composition and protecting the top side of the photosensitive element while permitting exposure of the silver-halide emulsion.

The photosensitive element and process sheet 11 and 13 accurately are constructed to define straight edges,

square corners and appropriate borders, and properly are registered during manufacture to provide a uniformly flat, aesthetically pleasing structure that will maintain its integrity after processing. Except for the pod, trap and card, included in the more comprehensive structure to be described hereinafter, the image-recording portion of the unit is intended to be supplied with all parts necessary for processing by the intended apparatus, and all such parts permanently are retained together without adversely affecting the finished print.

Photosensitive element **11** and process sheet **13** preferably are coextensive with one another, and can be maintained in registered or superposed facing relationship by any permanent seal or connection to define the image-recording portion **5.** Preferably, the connection extends in a longitudinal direction at the lateral edges of the recording unit from its leading end to its trailing end, for securing the element and sheet in direct contacting relationship, or the equivalent, while permitting resilient separation of the elements during distribution of the processing composition.

Additional features and advantages of this preferred form of image-recording portion ot the unit are illustrated and described more fully in commonly assigned copending U.S. application Ser. No. 70,836, entitled FILM UNIT, filed on Sept. 9, 1970 in the name of Hubert Nerwin.

The image-recording portion of the unit described above, comprising the photosensitive element **11** and process sheet **13,** particularly is adapted to cooperate with various elements of the more comprehensive film unit with which it has been illustrated. The latter unit includes the supporting card **3,** the container **7,** and the excess fluid collector **9,** all of which cooperate for recording and developing a latent image when used with the apparatus in accordance with the present invention.

The container **7,** often referred to as a pod, can include various cooperating parts together defining a suitable processing composition supplying mechanism, and preferably including a rupturable containing part generally comprising a rectangular blank of vapor-impervious material that is folded along a first side edge **19** and is securely sealed or closed along its ends **21** and **23.** A second side **25,** opposite from the folded side, is provided along substantially its entire length with a rupturable seal adapted to release a fluid compositon from the container upon the applcation of hydraulic forces generated by passing the container between a pair of juxtaposed pressure-applying members. The containing part is coupled to or cooperates with a leading end of the image-recording unit in a suitable manner for discharging its fluid contents between the photosensitive element and process sheet. For this purpose, the container has been illustrated with lips merely inserted into a space or slot provided between the photosensitive element and process sheet at the leading end of the image-recording unit.

The fluid collector **9,** often referred to as a trap, generally comprises a first part **27** (FIG. **2**) defined by a trailing end or skirt portion of card **3,** a second part **29** for covering the first part and defining a collecting void or chamber, and lifters **31** adapted to separate the pressure-applying members of associated photographic apparatus and to maintain the collecting void or chamber as the trap passes between the pressure-applying members. Preferably, one or more apertures or holes may be provided in the trap or between the trap parts to permit the escape of air from the image-recording unit and from the trap as the processing composition is spread and the trap is filled. The first and second trap parts permanently are secured together by a suitable adhesive depicted at **33** in FIG. **2,** while a leading portion **35** of the second part is adapted to overlie the trailing end of the image-recording unit to enclose or confine that trailing end in a manner insuring that all of the excess processing composition expelled from the image-recording unit will be directed into the trap.

The card **3** is adapted for supporting the pod **7,** trap **9** and image-recording portion **5,** to facilitate handling of the film unit, as well as separation of the image-recording portion **5** from the other portions of the unit that comprise waste material after processing has been initiated. For this purpose, the card is defined by a substantially flat imperforate sheet of resiliently flexible material, such as plastic sheeting

The dimensions of the card preferably are selected to be somewhat wider than the image-recording portion of the unit and longer than the image-recording portion with its attached pod and trap, for cooperating with the transporting mechanisms of the associated photographic apparatus to be described more fully hereinafter. Similarly, the leading end of the card includes a V-shaped cutout or perimeter **41.** A more detailed description of this card, and its relation to the other elements of the film unit, is set forth in commonly assigned U.S. application Ser. No. 111,471, entitled FILM UNIT, filed in my name on Feb. 1, 1972 now abandoned.

The pod **7** and trap **9** permanently are attached to the card, but only releasably are coupled to the image-recording unit **5.** Similarly, the image-recording unit is only releasably or strippably coupled to the card. Such couplings can be effected by an appropriate adhesive, cohesive or seals depicted schematically at **45, 33** and **47** on the attached drawings. As will become more apparent hereinafter, such an arrangement of permanent and releasable couplings permits stripping, after processing has been initiated, of the image-recording unit (then defining or developing into the finishedd print) from the card, pod and trap. The latter three elements, comprising waste material after processing has been initiated, then can be collected in one packet, preferably by directing them in an arcuate path to a chamber behind the other film units in the pack, and can be discarded after exhaustion of the exposed film units in the pack with little possibility of damage to any sensitive environment (e.g. clothing or person) by any remaining processing composition in the waste material.

Photographic Apparatus The Preferred Embodiment

The above described film unit, or a pack including a plurality of such film units, is particularly well adapted for use in photographic apparatus in accordance with the present invention. The preferred embodiment of such apparatus is disclosed as a camera in FIGS. **3** and **4,** generally comprising a film transporting mechanism **53,** a pair of juxtaposed pressure-applying members **55,** stripping and guiding fingers **57** and a waste storage chamber **59.** These elements are intended to cooperate with the film unit for transporting the card **3** from a first substantially planar position, through the pressure-applying members and then in an arcuate path to the waste storage chamber. During such movement of the card, the image-recording portion of the film unit travels with the card until its leading end passes between

the pressure-applying members, but then continues to move along a substantially straight path exiting from the apparatus as depicted in FIG. 4. In this manner the card, container and fluid collector are stripped from the image-recording portion and directed into the waste storage chamber, while the recording portion is directed from the camera or to some other position where it will be accessible to the camera operator.

Movement of the film units within and from the photographic apparatus is effected mainly by frictional contact between one of the pressure members 61 and the film unit. For this purpose the pressure member 61 comprises a roller adapted to be rotated by a motor or other appropriate means, such as the winding lever 63, activatable from the camera exterior. An additional mechanism is provided, however, for effecting initial movement of the film units from their supply and exposure positions to the bite or nip between the pressure members. This additional mechanism comprises a pair of movable lever arms or kickers 65 including a first notched end 67 for engaging the trailing end of the film unit and a second end 69 mounted on the body of the apparatus 71 for pivotal movement between a first position illustrated in FIGS. 3 and 5 and a second or extended position illustrated in broken lines in FIG. 6. Simultaneous movement of the arms is ensured by a connecting bar 73 that is secured to each of the arms and further defines their pivotal axis. Movement of the lever arms 65, for effecting initial movement of the film units, is accomplished and controlled by a connecting arm 75 that includes a first end 77 coupled to one of the lever arms, a second end 79 having a gear rack 81, and a disabling arm 83 for supporting a disabling cam 85 and a return spring 87. The gear rack 81 is adapted to engage a driving gear 80, that is attached to and rotates with the pressure roller 61, for imparting reciprocating movement to the connecting arm 75, and corresponding pivotal movement to the lever arms 65, in response to rotation of the pressure roller. The disabling cam 85 of arm 83, on the other hand, is adapted to engage a second cam 90 secured to the body of the apparatus, for disengaging the rack 81 of the control arm from the gear 89 of the pressure roller after the lever arms of kickers have served their function. In operation, the pressure roller 61 is rotated in a clockwise direction (as viewed in FIG. 3) to effect initial advancement of the film unit into the bite between the pressure members, after which the initial advancing mechanism is disengaged by cams 85 and 90. The connecting arm can be held in the disengaged position by a mechanism, not shown, that is adapted to be released to permit return of the arm, for example, in response to movement of the shutter release.

The stripping and guiding fingers 57 are most clearly illustrated in FIGS. 3 and 4, and comprise arcuate guide means such as guiding portions 91 having surfaces defining a concave boundary that substantially follows the curvature of rotatable pressure member 61 for approximately 180° from the first ends 93 of the fingers, adjacent to the bite of the pressure members, to the second ends 95 of the fingers, adjacent to the entrance to waste storage chamber 59. The fingers are spaced from the rotatable pressure member by an amount slightly greater than the thickness of flexible card 3, for engaging the card as or soon after it exits from the bite of the pressure members, and for directing or deflecting the card in an arcuate path defined between the rotatable pressure member and the fingers. The fingers also are spaced from each other by an amount greater than the width of the image-recording portion 5, but less than the width of card 3, for engaging the lateral edges of the card to direct the card along the previously mentioned arcuate path while permitting substantially straight line movement between the fingers of the image-recording portion 5 (see FIG. 4).

Actual stripping or separation of the image-recording portion 5 from the flexible card 3 is most clearly illustrated in FIG. 4 and results from the fact that the card is directed in the abovementioned arcuate path while the inherent resiliency of the image-recording portion resists such bending. The recording portion thus travels in a substantially straight line path between the fingers from the pressure members tothe camera exterior. While it has not been found necessary to provide a support for the recording portion at the exit from the pressure members, such a support could be added to insure positively that the recording portion does not follow the arcuate path of the card. Similarly, such a support, if added, could have a sharp frontal surface for entering between the recording portion and the card to skive them apart in a more positive manner than that illustrated.

The pressure members 55 can be of any suitable type and will not be described in detail. Briefly, however, the second pressure member 97 has been illustrated as a plate shaped from sheet material into the proper configuration. Additionally, the stripping fingers 57 extend from the same plate as an integral part thereof.

The waste collecting and storage chamber 59 is part of a larger chamber 101 that is divided into two parts by a floating platen 103. The first or uppermost portion of the larger chamber is adapted to hold a plurality of unexposed film units, and, as these film units are withdrawn after exposure, the floating platen moves forwardly under the action of springs 105 to provide more room in the second or lowermost portion for waste materials separated from the withdrawn film unit. In this manner, a very compact chamber can be utilized that need not be much larger than the original stack of unexposed film units.

It also should be apparent, and actually is preferred, that the film units be supplied in a cartridge. In such case, the cartridge would define both the upper or supply and lower or waste collecting portions of the larger chamber and also would include the floating platen 103.

Waste material is directed into an entrance 107 of the waste storage chamber 59 by the second or distal end 95 of the stripping fingers, and thereafter is resiliently urged forwardly against platen 103 by the springs 105. In this manner, the entrance to the chamber is left unobstructed for receiving waste from the next successive film unit.

In referring to waste material above, and to the stripping of such material from the image-recording portion of the film unit, the detailed description has referred mainly to the resiliently flexible card 3. However, if provided as part of the film unit, the pod 7 and trap 9 also comprise material that can be separated from the image-recording portion and disposed of as waste processing has been initiated. As briefly mentioned in connection with the detailed description of the film unit, this is accomplished by permanently attaching the pod

and trap to the card, and by only releasably coupling the same elements to the image-recording portion.

Additional Waste Handling Mechanisms of The Preferred Embodiment

An additional waste handling mechanism has been illustrated in FIGS. **8–10.** This additional mechanism **111** includes a supplemental arm or kicker **113** that is pivotally attached at one end **115** to the camera body and is resiliently urged in a clock1ise direction (as viewed in FIG. **8**) by the spring **117.** The kicker **113** is urged into the arcuate path defined by guiding portions **91** where it will be engaged by the lateral edges of the card as the card moves in its arcuate path from the exposure position to the waste storage chamber. During such movement the card will engage and move the additional kicker in a counterclockwise direction against the action of the resilient spring from the first position of the kicker, illustrated in FIG. **8,** to a second set or energized position illustrated in FIG. **9.** In this manner the card sets or cocks and holds the additional kicker in its set or cocked condition until the trailing end of the card passes beyond a predetermined point **119** (FIG. **9**) where the additional kicker is released to impart an additional final movement of the card into the waste storage chamber.

For similar purposes, an additional roller **121** has been illustrated in FIGS. **8–10.** Roller **121** is spaced from pressure roller **61** by an amount approximately equal to the thickness of the card to define the final portion of the arcuate path. This permits use of shorter stripping fingers and reduces frictional forces tending to restrain movement of the card.

While these additional waste handling mechanisms are not necessarily required in connection with all features of the present invention, they do enhance the operation of the apparatus in its final stages of moving waste material into the waste collecting chamber, at which time the card is no longer in driving contact with the rotatable pressure member.

Operation of the Preferred Embodiment

Referring now to the operation of the preferred embodiment, and to FIGS. **5–7,** a plurality of the film units are positioned in the photographic apparatus with the forwardmost unit located in a film plane of the apparatus. After exposure in the usual manner, the driven pressure-applying roller **61** is rotated through winding knob **63,** and initial movement of the film unit into the bite of the pressure-applying members is effected by the kickers or lever arms **65** operated through arm **75,** rack **81** and gear **89.** Once the film unit has entered between the pressure members the cooperating cams **85** and **90** disengage arm **75** and rack **81** from gear **89.** The arm then is retained in the disengaged position until released by the body release, or other appropriate mechanism, and returned under the action of spring **87** to its original position illustrated in FIG. **5.** Once the film unit has entered between the pressure-applying members, further movement of the unit is effected by frictional pressure between the driven pressure roller **61** and the film unit card **3.** This frictional contact is sufficient to pull the card from the stack and to push the card in an arcuate path defined by the guiding portions **91** and into the waste storage chamber **59** defined behind the remaining film units in the pack. At the same time, and because of the coupling between the image-recording portion of the unit and the card, the recording portion is pulled from the stack and between the pressure-applying members for rupturing the pod and distributing the processing composition between the photosensitive element and process sheet. Immediately, or soon after passing between the pressure-applying members, however, the image-recording portion of the unit continues to move in a substantially straight line through an exit and to the exterior of the apparatus. In this manner the image-recording portion of the unit is separated from the card without any intervention by the camera operator. Moreover, since the pod and trap permanently are attached to the card, but only releasably are coupled to the image-recording portion, the pod and trap also will be separated from the recording portion and will follow the card into the waste storage chamber behind the remaining units in the pack. As the spent pod, card and trap are directed into the waste storage chamber, the resilient springs **105** engage the then lowermost surface of the card and urge the card in an upward direction against platen **103** which provides the dividing wall defining the uppermost portion of the waste storage chamber. Thus, the spent card, pod and trap are moved to a position where they will not interfere with entrance of similar cards from successive film units into the waste storage chamber.

PHOTOGRAPHIC APPARATUS - AN ALTERNATIVE EMBODIMENT

An alternative embodiment of photographic apparatus incorporating the invention is illustrated in FIGS. **11–13,** depicting a processing camera **150,** for exposing and handling an assemblage **152** of self-processing film units. The film units are substantially identical to those described in connection with the preferred embodiment, and are identified by the same reference numerals. Instead of being received directly in the camera, however, the assemblage is supplied in a pack **154,** that includes a cartridge casing **156** for confining the film units in a light-tight environment prior to their use in the apparatus.

The cartridge casing includes a first or front chamber part **158,** for receiving the film units in a generally flat condition prior to their exposure, and a second or back chamber part **160,** for receiving at least a portion of the film units after their processing has been initiated. The first and second chamber parts are separated by a floating platen **162** that is resiliently urged by springs **163** to move toward the front wall **164** of the cartridge casing as the film units in the first chamber part are exposed and removed for processing. In this manner, the internal volume of the cartridge can be utilized efficiently, since the second chamber part increases in volume to accommodate various portions of processed film units, such as the processing waste materials, at the same rate the first chamber part decreases in volume from the removal of film units for processing.

As in the case of the preferred embodiment, the film units are adapted to be moved by the apparatus from a first generally flat position in the first chamber part **158,** through the nip defined by a pair of juxtaposed pressure-applying members, and to final positions wherein the image-recording portion of the film unit can be grasped for removal from the apparatus and at least certain of the processing waste materials are received in the second chamber part **160.** In its first position the film unit is located at a film plane of the apparatus in optical alignment with lens **168** for exposure

through the aperture **166** in the cartridge casing front wall. In their final positions the image-recording portion is entirely removed from the cartridge while the processing waste materials are repositioned in the cartridge after being removed and passed between the pressure-applying members with the image-recording portion. Thus, the waste materials easily can be disposed of with the cartridge after the supply of unexposed film units is exhausted.

Movement of the film units from their exposure position to the pressure-applying members is effected by a feeding mechanism **170,** including a manually operable handle or cross-bar **172** that is adapted to be engaged from the camera exterior for effecting reciprocation of a slider or feeding member **174.** A pin **178** and slot **180** mount the slider or feeding member on the camera body **176** in a manner permitting movement from a first or set position (depicted in solid lines in FIG. **12**) to a second or feeding position (depicted in dotted lines), such that a film engaging surface **182** on the feeding member will push the film unit from the cartridge and into the nip or bite between the juxtaposed pressure-applying members **184** and **186.** By reference to FIGS. **11** and **12,** it can be seen that the feeding mechanism extends from the camera into the cartridge through a pair of slots **188** in the front and one end wall of the cartridge casing. The opposite end **190** of the cartridge is provided with a slot or other suitable aperture **192** through which the film units can exit sequentially from the cartridge for entering between the pressure-applying members.

The feeding mechanism **170** also is provided with a cam **193** for actuating electrical switching means **194,** including first and second electrical contacts **196** and **198,** to effect the energization of an electric motor **200.** As the feeding mechanism **170** is moved from its first to its second position, the cam engages the first contact **196,** and urges it into electrical engagement with the second contact **198,** to effect energization of the motor **200** through an appropriate circuit (not shown) including a battery or other source of electrical energy. In turn, the motor rotatably drives the rollers **184** and **186,** comprising the pressure-applying members, through the shaft **202** affixed to the lowermost roller and through mating gears **204** and **206** fixed respectively to each roller. It should be understood that the gears **204** and **206** are provided with teeth that will remain in driving engagement as the rollers are separated somewhat by movement of the film unit therebetween.

Once the film unit is fed into engagement with the rollers, and the motor **200** has been energized, rotation of the rollers will transport the film unit from the cartridge and between the pressure-applying rollers for initiating processing of the film unit.

As the film unit exits from the nip between the rollers, continued rotation of the rollers will apply a transporting force tangential to both rollers, and in the plane defined by the film unit, tending to push the entire unit along a substantially straight line path away from the cartridge. Instead of permitting such straight line movement of the entire film unit, however, a pair of spaced arcuate fenders or shoes **208** and **210** are arranged to engage the lateral edges of the card **3** for flexing the card into a semi-cylindrical configuration such that its continued movement will evert the card and change its direction of movement by approximately 180°, or other suitable amount, causing its re-entry into the cartridge through a second aperture **212** provided in end wall **190.** The image-recording portion **5** of the film unit, on the other hand, is narrower than the card or carrier **3,** and the fenders or shoes **208** and **210** are spaced apart sufficiently to permit its passage therebetween, such that the image-recording portion will be transported by the rotating rollers along a generally straight line path to a position accessible from the camera exterior. Thus, the card, and with it the permanently attached pod and/or trap, are directed in an arcuate path away from the plane of the image-recording portion to strip or separate such materials, then essentially comprising waste, from the image-recording portion.

As the card or carrier **3** is deflected into its previously mentioned arcuate path between the fenders and the lowermost pressure-applying member, it will engage and energize an additional feeding mechanism **214,** including a pair of pivotally mounted elements or kickers **216** and **218.** After engaging the kickers, continued movement of the card translates some of the driving force from rollers **184** and **186,** through the card, and to the kickers, to pivot the kickers in a counterclockwise direction (FIG. **12**) about pivot point **220** and against resilient springs **222.** As in the case of the preferred embodiment, the resulting energy in springs **222** can then be translated back to the film unit, as it passes beyond ends **224** of the kickers, to push the film unit into its final position in the cartridge. In the alternative embodiment illustrated, the pivot point **220** is affixed to a shaft fixed to the uppermost pressure-applying member, and, therefore, the kicker elements include a vertically oriented slot depicted in FIG. **12** for permitting relative movement between the kicker elements and the shaft in addition to the above-mentioned pivotal movement.

It should now be apparent to those skilled in the art that an unusually adaptable photographic apparatus has been provided for use with self-processing film units, that greatly facilitates the handling of such units, especially where image-recording portions of the units are intended to be separated from other portions comprising waste material after processing has been initiated.

The invention has been described in detail with particular reference to the illustrated preferred and alternative embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

I claim:

1. Photographic apparatus for effecting an exposure of a self-processing film unit, including a bendable portion, and for initiating a processing of the film unit after the exposure, said apparatus comprising:

means defining a first chamber section for receiving the film unit prior to the exposure and a second chamber section for receiving at least the bendable portion of the film unit after the exposure, said first chamber section including an exposure aperture, said second chamber section being located generally behind said first chamber section relative to said exposure aperture;

means for effecting the exposure of the film unit through said exposure aperture;

means for initiating the processing of the film unit after the exposure, said processing initiating means including a pair of pressure-applying members for

engaging and applying compressive pressure to the film unit; and

film handling means for moving the film unit from said first chamber section to said processing initiating means and for moving the bendable portion of the film unit from said processing initiating means into said second chamber section, said film handling means including guide means defining a concave boundary for bending the bendable portion into an arcuate path between said first and second chamber sections.

2. Photographic apparatus as claimed in claim **1** wherein said pressure-applying members define a processing nip therebetween, and wherein said guide means includes a pair of spaced guide shoes extending from locations adjacent to said processing nip to locations adjacent to said second chamber section.

3. Photographic apparatus for effecting an exposure and initiating processing of a self-processing film unit, said apparatus comprising:

a casing defining a first generally rectangular chamber section for receiving the film unit in a generally planar position for the exposure and a second generally rectangular chamber section for receiving at least a portion of the film unit after the exposure, said first and second chamber sections being in adjacent relationship and having an exit and entrance, respectively, that are spaced at least in a first direction perpendicular to said generally planar position;

means for initiating the processing of the film unit, said processing initiating means including a first member disposed between said exit and entrance in said first direction and a second member defining a nip between said members for engaging and applying compressive pressure to the film unit;

means for causing movement of the film unit from said first chamber section, through said exit, and between said members for applying compressive pressure to the film unit, said movement causing means including means for applying a force to the film unit in a second direction for moving the film unit along a rectilinear path between said members; and

means for intercepting movement of the film unit along said rectilinear path and for applying a deflecting force to the portion of the film unit receivable in said second chamber section for reversing direction of movement of that portion by deflecting that portion into an arcuate configuration partially around said first member between said exit and entrance.

4. A photographic processing camera for exposing and initiating processing of a self-processing film unit, the film unit including an image-recording portion and materials strippably coupled to the image-recording portion, said camera comprising:

a casing defining a camera exterior and an internal chamber including a first chamber part and a second chamber part, said first chamber part having an exposure aperture and means for receiving the film unit with the image-recording portion in laid-out condition to be exposed through said aperture, said second chamber part being located adjacent to and generally behind said first chamber part relative to said exposure aperture and having means for receiving the strippably coupled materials after processing of the film unit has been initiated;

means for effecting movement of the image-recording portion from said first chamber part to said camera exterior along a first path;

a processing mechanism in said first path for initiating processing of the image-recording portion, said processing mechanism including a pair of pressure-applying members; and

means for effecting movement of the strippably coupled materials from said first chamber part to said second chamber part along a second path, said first and second paths having a coincident portion from said first chamber part to said processing mechanism and then relatively diverging portions to said camera exterior and to said second chamber part, respectively, said means for effecting movement of the strippably coupled materials along said second path including means extending into said first path and adapted to intercept the strippably coupled materials for directing the strippably coupled materials away from the image-recording portion and from said first path into said diverging portion of said second path.

5. A photographic processing camera as claimed in claim **4** wherein one of said pressure applying members comprises a cylindrical member, and wherein said second path diverges from said first path in an arc extending partially around said cylindrical member between said cylindrical member and said directing means.

6. A photographic processing camera as claimed in claim **5** wherein said directing means includes a guide member extending into said first path and having an arcuate surface extending approximately 180° around said cylindrical member.

7. A photographic processing camera as claimed in claim **6** wherein said arcuate surface is spaced closely adjacent to said cylindrical member over substantially all of said approximately 180° to define said second path.

8. A photographic processing camera as claimed in claim **4** wherein said pressure-applying members define a nip therebetween, and wherein said directing means extends in an arc from a first location adjacent to said nip to a second location adjacent to said second chamber part for directing the strippably coupled materials from said first path along said second path and toward said second chamber part in a direction substantially opposite to said first path.

9. Photographic apparatus for exposing and initiating processing of a pre-cut self-processing film unit, the film unit including an image-recording portion and processing materials separably coupled to the image-recording portion, said apparatus comprising:

a generally rigid casing including means for receiving the film unit in an exposure position and means for collecting the processing materials after exposure of the film unit, the film unit being movable out of the receiving means in a first direction and the processing materials being movable into the collecting means in a second direction generally opposite to said first direction;

processing means adjacent to said receiving means for initiating processing of the film unit, said processing means including a cylindrical member mounted for rotation and a second member cooperating with said cylindrical member for receiving

therebetween, and for applying compressive pressure to, the film unit;

means for moving the film unit in said first direction along a predetermined path from said receiving means and between said cylindrical and second members, said moving means including means for rotating said cylindrical member in engagement with the film unit; and

means extending across said predetermined path, on the opposite side of said cylindrical and second members from said receiving means, for separating the processing materials from the image-recording portion and for directing the processing materials, when separated, in a path curving away from said first direction toward said second direction and said collecting means, said curving path being confined entirely within said casing.

10. Photographic apparatus as claimed in claim **9** wherein said separating and directing means includes spaced guide shoes having concave surfaces curved partially around said cylindrical member for guiding the processing materials, when separated, partially around said cylindrical member from said first direction toward said second direction.

11. A camera for use with a plurality of unconnected self-processing film units, each such unit including an image-recording portion and supply means separably coupled thereto for supplying a processing composition to the image-recording portion, said camera comprising:

a casing including means defining a chamber for receiving the film units in stacked relationship and for collecting the supply means in stacked relationship;

means defining a generally rectilinear path extending from said chamber and out of said casing;

means for applying a force to each film unit in succession in a direction for moving that film unit from said chamber along said rectilinear path;

means extendable into said rectilinear path for separating the supply means from the image-recording portion and for deflecting the supply means from said rectilinear path back toward said chamber; and

means in said rectilinear path for initiating processing of each film unit prior to separation of the supply means from the image-recording portion.

12. Photographic apparatus for initiating processing of a self-processing film unit, and for separating processing waste materials from an image-recording portion of the film unit, said apparatus comprising:

a pair of juxtaposed pressure-applying members for applying compressive pressure to the film unit to initiate the processing of the film unit, one of said pressure-applying members including a driving roller;

means including said driving roller for moving the film unit between and from said pressure-applying members in a predetermined direction; and

means positioned closely adjacent to said pressure-applying members in said predetermined direction for intercepting the waste materials of the film unit when moved from between said pressure-applying members and for separating the waste materials from the image-recording portion.

13. Photographic apparatus as claimed in claim **12** wherein said intercepting and separating means includes a stripping member positioned to be engaged by the waste materials when moved in said predetermined direction without being engaged by the image-recording portion when moved in said predetermined direction.

14. Photographic apparatus as claimed in claim **13** wherein said stripping member includes an arcuate surface extending partially around said driving roller in close proximity thereto.

15. A photographic film handling mechanism for use with self-processing film units, each unit including an image-recording portion having a first width, a container for supplying a processing fluid to the image-recording portion, and a carrier for strippably coupling the container to the image-recording portion, the carrier including a section having a second width greater than the first width, said mechanism comprising:

a processing mechanism for initiating processing of each film unit;

means for causing rectilinear movement of each film unit in a direction away from said processing mechanism; and

means for stripping the container and carrier from the image-recording portion, said stripping means including a pair of arcuate guide members spaced from each other by an amount greater than the first width but less than the second width so as to be engaged by the carrier and thus direct the carrier in an arcuate path for stripping the carrier and container from the image-recording portion while permitting rectilinear movement of the image-recording portion between said guide members.

16. Photographic apparatus for effecting exposure and initiating processing of a self-processing film unit, the film unit including a relatively stiff image-recording portion, a bendable container for supplying a processing composition to the image-recording portion, and means separably coupling the container to the image-recording portion, said apparatus comprising:

a casing including means defining a chamber for receiving the film unit before the exposure has been effected and for receiving the container after the processing has been initiated, said chamber having an end including exit and extrance apertures, respectively, through which the film unit can be transported from said chamber in a first direction and the conatiner can be transported into said chamber in a second direction, said second direction being substantially opposite to said first direction;

processing means for initiating the processing of the film unit, said processing means including an elongated rotatable member having first and second ends and an elongated second member located in opposed relationship relative to said rotatable member for engaging the film unit between said rotatable and second members and for applying compressive pressure to the film unit to initiate the processing thereof;

transporting means for transporting the film unit from said chamber through said exit aperture in said first direction, said transporting means including a driving member for rotating said rotatable member in engagement with the film unit to transport the film unit between said rotatable and second members; and

deflecting means for deflecting the container away from said first direction and away from said image-recording portion, during transport of the film unit in said first direction, to separate the container from the image-recording portion, said deflecting means including first and second deflecting members spaced from each other and located adjacent to said first and second ends of said rotatable member, respectively, said deflecting members extending partially around said rotatable member from a location adjacent to said second member toward said entrance aperture, said deflecting members being effective to evert the container and to direct the container in said second direction toward said entrance aperture.

17. Photographic apparatus for exposing and handling a self-processing film unit, the film unit including a resiliently flexible card and an image-recording portion strippably coupled to the card for recording a latent image that is processing to establish a visible image by passing the film unit between a pair of pressure-applying members, said apparatus comprising:

means for locating the film unit in an exposure position to record the latent image in the image-recording portion;

a pair of pressure-applying members for initiating processing of the latent image to establish the visible image; and

a film handling mechanism including first means for establishing substantially rectilinear movement of the film unit from the exposure position between said pressure-applying members and second means for bending the resiliently flexible card in an arcuate path away from the image-recording portion to strip the resiliently flexible card from the image-recording portion.

18. An improvement in photographic apparatus for handling a preregistered, integral, self-processing film unit, the film unit including an image-recording portion strippably coupled to a flexible supporting card wherein the image-recording portion defines a first width and the card defines a second width greater than the first width, said improvement comprising:

means for causing movement of the film unit along a predetermined path; and

a stripping mechanism for stripping the card from the image-recording portion, said mechanism including a pair of stripping fingers extending into said path, said stripping fingers being spaced apart by an amount greater than the first width but less than the second width for engaging the card and for directing the card out of said path to strip the card from the image-recording portion while permitting passage of the image-recording portion between said fingers for continued movement along said path.

19. Photographic apparatus for use in cooperation with a self-processing film unit, the film unit including a first portion for recording a developable latent image and a second portion separable from the first portion for effecting development of the latent image in response to movement of the film unit in said apparatus, said apparatus comprising:

means defining a first location for receiving the film unit to record the latent image;

a pressure-applying mechanism including a rotatable roller for initiating the development of the latent image;

a separating mechanism for effecting separation of the second portion of the film unit from the first portion;

means defining a second location for receiving the second portion of the film unit after the separation of the second portion from the first portion; and

a transporting mechanism including first means for moving the film unit from the first location to said pressure-applying mechanism and second means for rotating said roller to move the film unit through said pressure-applying mechanism to said separating mechanism and then to move the second portion of the film unit to the second location after the separation of the second portion from the first portion.

20. Apparatus for handling a self-processing film unit, the film unit including a preregistered, integral, image-recording portion and a resiliently flexible card removably coupled to the image-recording portion, said apparatus comprising:

means including a pressure-applying member engageable with the film unit for initiating processing of the unit;

means including a first movable member engageable with the film unit for effecting initial movement of the unit to said processing initiating means;

means including a second movable member engageable with the film unit for effecting further movement of the unit through said processing initiating means; and

means including a removing member engageable with the film unit for effecting removal of the resiliently flexible card from the image-recording portion in response to said further movement of the unit through said processing initiating means.

21. Apparatus as claimed in claim **20** wherein said removing member is engageable with the resiliently flexible card and is adapted to direct the card in an arcuate path away from the image-recording portion in response to said further movement of the unit.

22. Apparatus as claimed in claim **20** further comprising means defining a waste collecting chamber and means engageable with the resiliently flexible card for directing the card toward said chamber after said removal of the card from the image-recording portion.

23. Apparatus as claimed in claim **22** further comprising means including a third movable member engageable with the resiliently flexible card for effecting final movement of the card into said waste collecting chamber.

24. Apparatus as claimed in claim **23** wherein said third movable member is movable to an energized position in response to said further movement of the unit.

25. A mechanism for transporting a film element in photographic apparatus, said mechanism comprising:

first means for moving the film element along a predetermined path to a position in which said first means is no longer effective to move the film element; and

second means for moving the film element to a further position after said first means is no longer effective, said second means including a movable member resiliently urged into said path where it is engageable by the film element for moving said

member out of said path in response to movement of the film element by said first means and for holding said member out of said path until the film element reaches said position in which said first means is no longer effective, said member then being releasable by the film element for moving the film element to said further position.

26. A transporting mechanism as claimed in claim **25** wherein said movable member is mounted for pivotal movement into and out of said path.

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