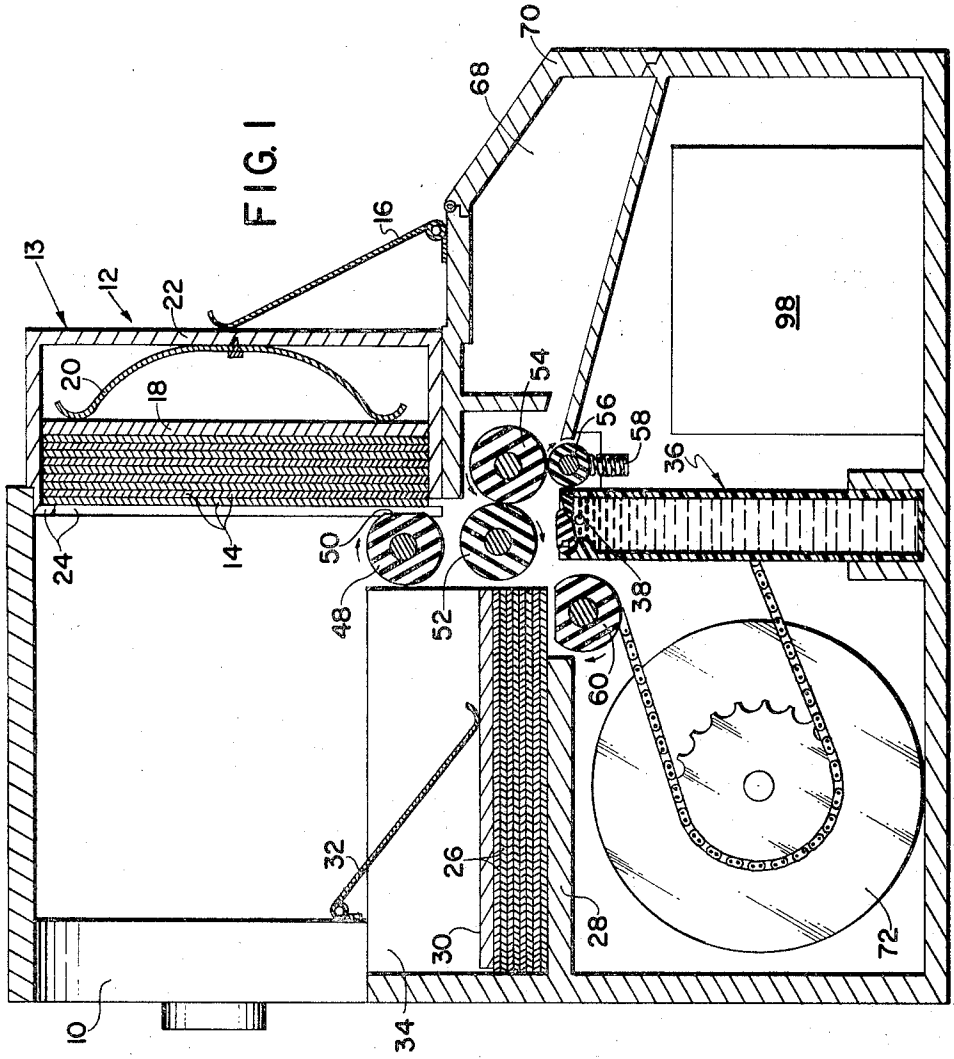
Oct. 15, 1968 E. H. LAND ETAL 3,405,618

PHOTOGRAPHIC APPARATUS AND PROCESSES

Filed Nov. 26. 1965 5 Sheets-Sheet 1

FIG. 1



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PHOTOGRAPHIC APPARATUS AND PROCESSES

Filed Nov. 26. 1965 5 Sheets-Sheet 2

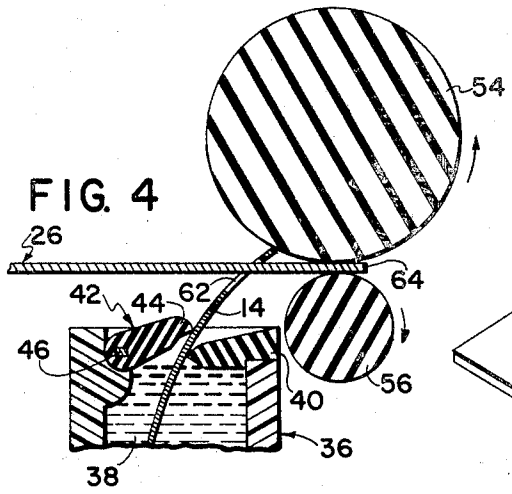

FIG. 4

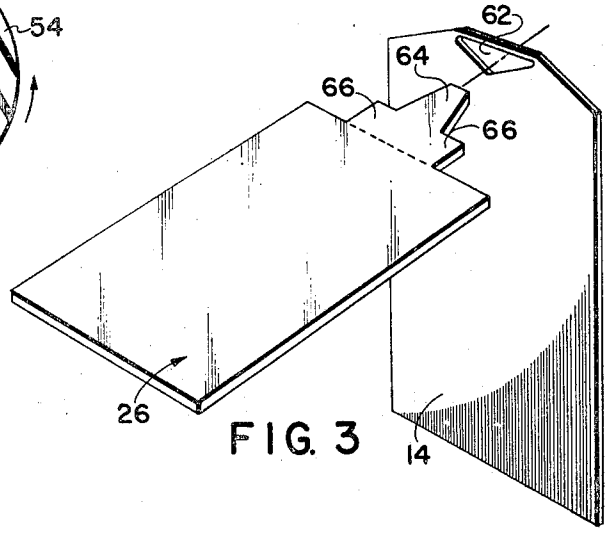

FIG. 3

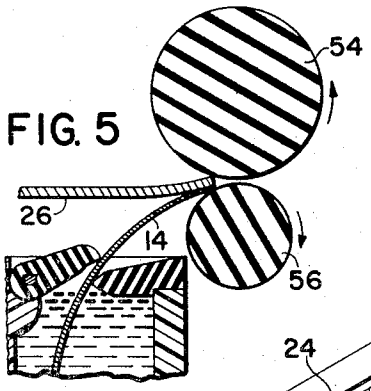

FIG. 5

FIG. 2

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PHOTOGRAPHIC APPARATUS AND PROCESSES

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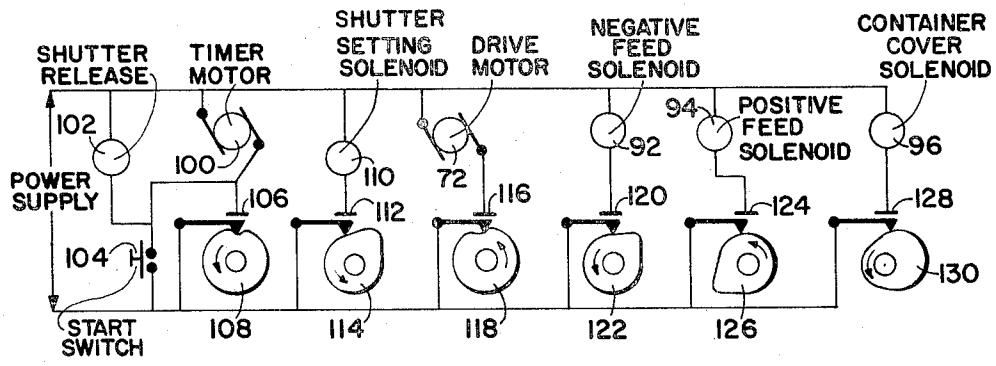

FIG. 7

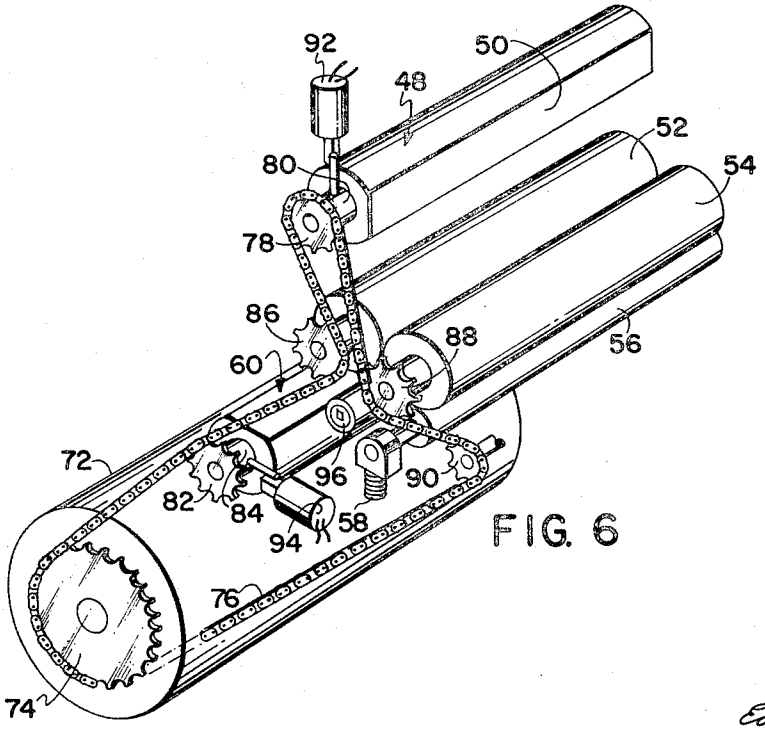

FIG. 6

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PHOTOGRAPHIC APPARATUS AND PROCESSES

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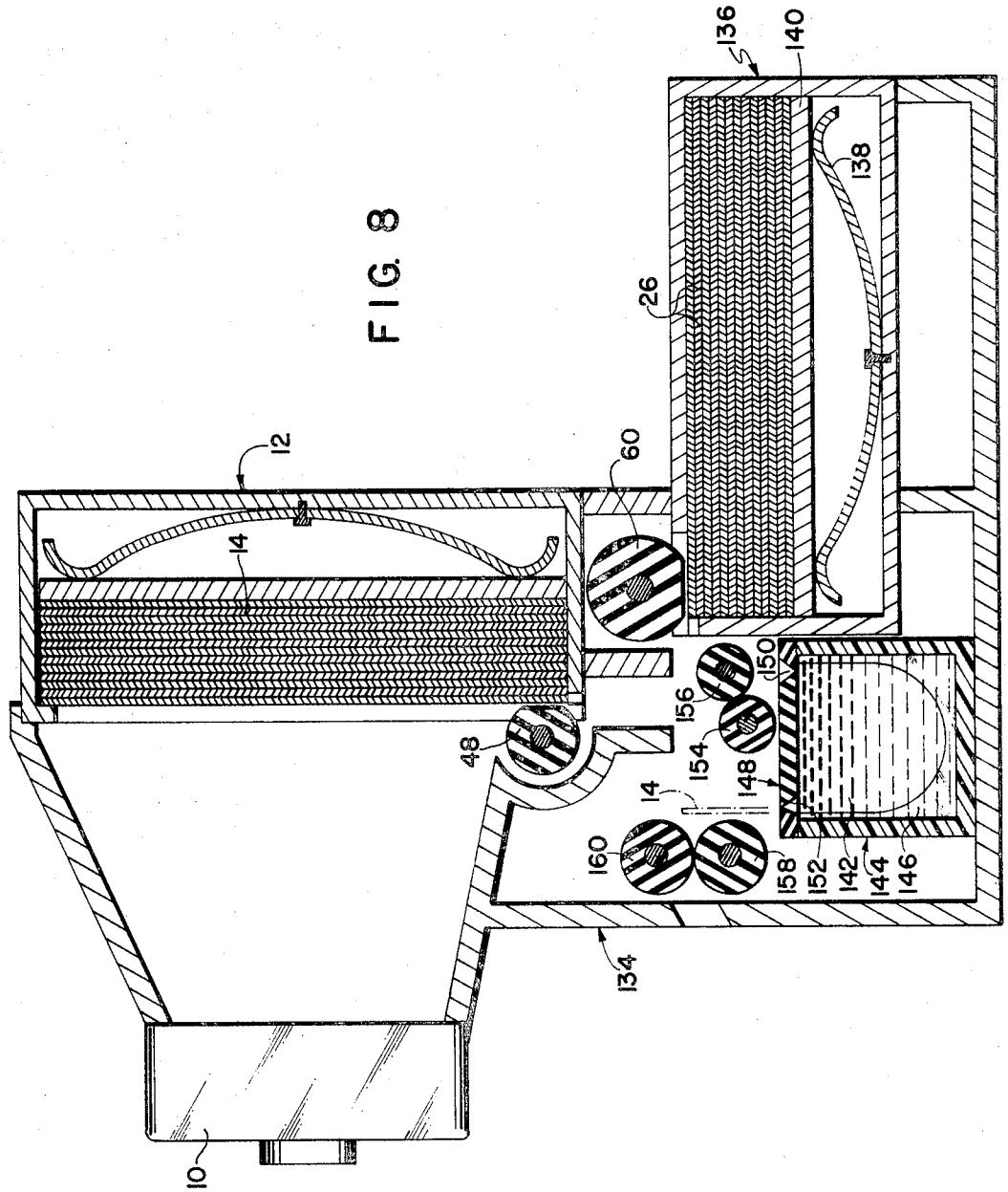
FIG. 8



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PHOTOGRAPHIC APPARATUS AND PROCESSES

Filed Nov. 26. 1965 5 Sheets-Sheet 5

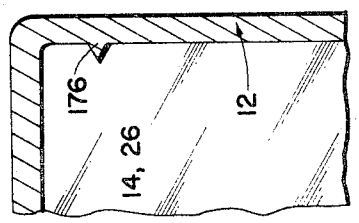

FIG. 12

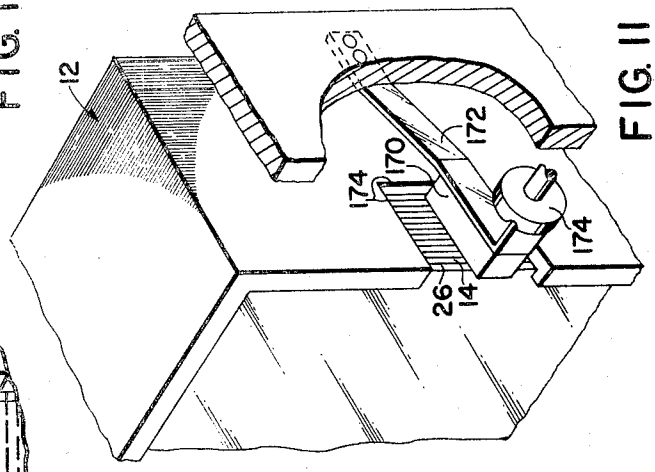

FIG. 11

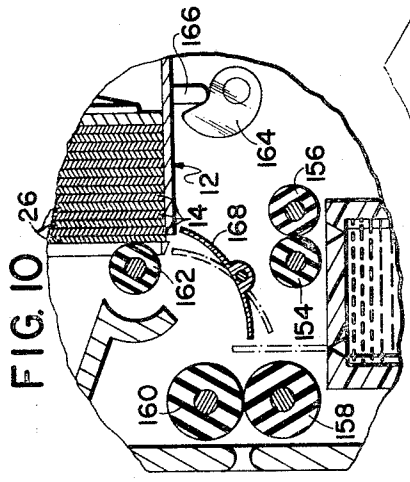

FIG. 10

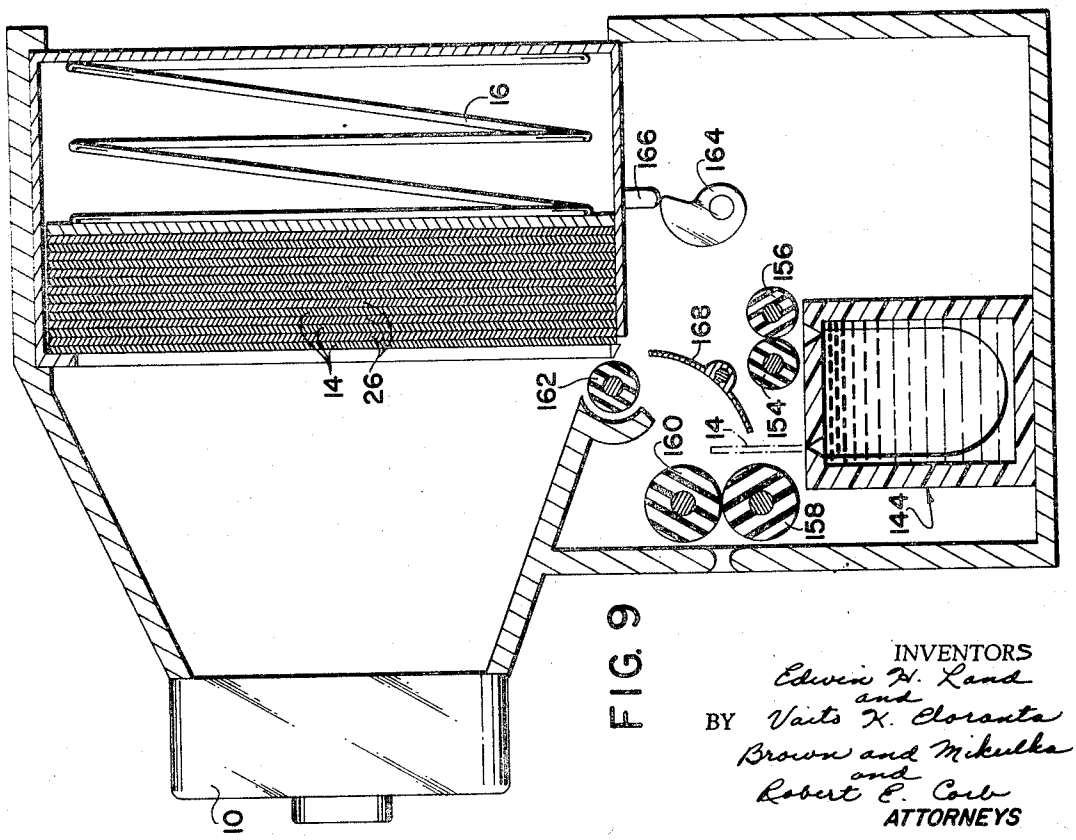

FIG. 9

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United States Patent Office 3,405,618 Patented Oct. 15, 1968

3,405,618 PHOTOGRAPHIC APPARATUS AND PROCESSES

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Filed Nov. 26, 1965, Ser. No. 509,957
27 Claims. (Cl. 95—13)

ABSTRACT OF THE DISCLOSURE

Photographic apparatus in the form of a camera, and a process in which a photosensitive sheet is exposed, is immersed in a body of processing liquid, and is pressed into superposition with a second sheet after processing has advanced to a predetermined extent. The photosensitive sheet is moved into the container until an end section extends therefrom to one side of a pair of pressure rolls and the second sheet is moved outside of the container toward the pressure rolls so as to engage and move the end section of the photosensitive sheet into the bite of the pressure rolls which are rotated to withdraw the photosensitive sheet from the processing liquid and superpose the two sheets.

This invention relates to novel photographic apparatus for and methods of exposing and processing photographic sheet material and particularly to photographic apparatus for and methods of exposing a succession of photosensitive image-recording sheets and treating each exposed sheet with a liquid in conjunction with a second sheet to produce a transfer image on the second sheet.

Photographic apparatus, such as cameras, and photographic processes of the type with which the present invention is concerned generally involve photoexposure of an area of a photosensitive, image-recording sheet to form an image therein, superposition of the exposed area of the image-recording sheet with a second sheet and distribution of a liquid processing agent in contact with adjacent surfaces of the superposed sheets. While a number of image-forming processes may be effected in this manner, the processing liquid preferably effectuates a diffusion-transfer process in which an imagewise distribution of diffusible image-forming substances is formed in the exposed image-recording sheet and transferred by diffusion to the second sheet to form a visible positive image on the second sheet. The apparatus of the invention is specially adapted to produce color prints by a process in which a multilayer image-recording sheet is photoexposed to form a latent image, an aqueous alkaline processing liquid is permeated into the exposed image-recording sheet to render other reagents, particularly developers, reactive to develop the latent image, immobilize diffusible image-forming dyes in exposed areas of the image-recording sheet and transfer image-forming dyes by diffusion from unexposed areas to an image-(dye) receiving layer on the second sheet to form an image in said image-receiving layer. Heretofore it has been the practice with apparatus, particularly cameras, of this type to expose and process successive areas of a single image-recording sheet and to provide a plurality of film units each including the requisite two sheets coupled with one another and including, in most cases, a container filled with sufficient processing liquid to process the single film unit. Each film unit is thus an assemblage of several components including, in addition to the two sheets and container, other elements such as masks, liquid traps, connecting sheets, leaders and the like, for manipulating the two sheets and aiding in the distribution of the processing liquid.

Substantially simpler and less expensive processes of this type have been proposed utilizing separate, individual image-recording and image-receiving sheets and methods of liquid application which do not require the presence of other elements attached to or associated with the image-recording and image-receiving sheets. Such processes and the present invention are particularly concerned with the production of multicolor photographic transfer prints according to the process described in U.S. Patent No. 2,983,606, issued May 9, 1961 to Howard G. Rogers, and utilizing integral multilayer image-recording sheets incorporating dye developers such as are disclosed in the copending U.S. application of Edwin H. Land et al., Ser. No. 565,135, filed Feb. 13, 1956. As pointed out in the copending U.S. patent application Ser. No. 471,665, filed July 13, 1965 in the name of Edwin H. Land, entitled Photographic Processes, print quality can be improved and processing time reduced by permeating the liquid processing agent into the photosensitive dye developer-containing layers of the image-recording sheet to advance development of the exposed photosensitive material to a predetermined extent prior to pressing the image-recording sheet into superposition with the image-receiving sheet. This is partially explained by the fact that prior practice has been to spread a layer of viscous processing liquid between the sheets making it necessary for the liquid to be absorbed from this layer and the image-forming substances to transfer by diffusion through this layer. The most commonly proposed method of treating photosensitive sheet materials was liquids which are not viscous and contain no film-forming agents is to immerse the sheets in a container of the liquid. However, such practices present a number of problems particularly relating to the handling and manipulation of a succession of individual sheets, accurate timing of the various processing operations, the storage of non-viscous liquids subject to spillage etc., and the protection of the liquid processing agents against deterioration due, for example, to exposure to the atmosphere.

An object of the invention is to provide novel and improved photographic apparatus for and methods of exposing a succession of image-recording sheets and following exposure, processing each exposed image-recording sheet to produce a transfer print by applying a non-viscous liquid processing agent to the exposed image-recording sheet to cause a predetermined quantity of the liquid to be absorbed therein, allowing processing (development) of the image-recording sheet to progress to a predetermined extent and then pressing the liquid impregnated image-recording sheet into superposition with an image-receiving sheet.

Another object of the invention is to provide apparatus of the type described which is simple and compact in construction, substantially automatic and reliable in operation, and exposes and manipulates two separate, individual sheets (i.e., a photosensitive image-recording sheet and an image-receiving sheet) to produce each photographic print.

A further object of the invention is to provide a photographic method of the type described for producing photographic prints utilizing two sheets and a non-viscous liquid, capable of being performed in a relatively small compact apparatus such as a hand-held camera and facilitating variation of the processing and the charter of the print produced.

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 and the process involving the several steps and the relation and order of one or more of such steps with respect to each of the others, which are

exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIGURE 1 is a somewhat diagrammatic sectional view of photographic apparatus embodying the invention;

FIG. 2 is a perspective view, partially in section, illustrating a component of the apparatus;

FIG. 3 is a perspective view showing the image-recording and image-receiving sheets employed in the apparatus;

FIGS. 4 and 5 are enlarged sectional views of a portion of the apparatus illustrating two modes of operation thereof;

FIG. 6 is a somewhat schematic perspective view of the operating components of the apparatus;

FIG. 7 is a diagram showing the control and drive system of the apparatus;

FIG. 8 is a view similar to FIG. 1, illustrating another embodiment of the invention;

FIG. 9 is a sectional view similar to FIG. 8 illustrating still another embodiment of the apparatus;

FIG. 10 is a fragmentary sectional view showing the operation of the apparatus of FIG. 9;

FIG. 11 is a fragmentary perspective view, partially in section, illustrating components of the apparatus; and

FIG. 12 is a fragmentary sectional view showing the construction of a film container useful in the apparatus.

The apparatus of the invention is illustrated in FIGURE 1 as being incorporated in a camera which is substantially automatic in its operation and, although it is shown as being driven by an electric motor, can be operated manually. While such a camera is ideally suited for incorporation in a photo-identification system, or to be coin operated to automatically produce photographic prints, it should be apparent that a major portion of the camera shown in FIG. 1 comprises the drive and control means and that the basic components of the camera, that is, those which expose the photosensitive sheets and actually handle and manipulate the sheets may be operated by hand or, for example, by a battery operated drive, and incorporated in a hand-held camera, such as disclosed in the copending U.S. application of Edwin H. Land et al., Ser. No. 509,713 filed Nov. 26, 1965, entitled Photographic Apparatus, Product and Process. Of course, in a camera of this type designed to be hand-held and operated, special provision is made for preventing spillage of the liquid processing agent employed in the camera and, preferably, for insuring that the camera is properly oriented during processing.

The camera generally includes a housing having a conventional lens and shutter mechanism **10** mounted in the upper forward portion of the camera housing. Means are provided in the upper rear portion of the camera housing for mounting a film pack or cassette **12**, shown in detail in FIG. 2, containing a plurality of photosensitive image-recording sheets **14** in position for exposure to light transmitted by lens and shutter mechanism **10**. These means include an opening in the rear of the camera housing in which the forward portion of cassette **12** is engaged, and a spring **16** provided for retaining the cassette in proper position within the opening with the foremost image-recording sheet located substantially in a plane (vertical) and disposed perpendicularly to the axis of the lens of mechanism **10**.

Cassette **12** comprises a generally parallelepiped shaped box or container **13** open at its front in which is mounted a rectangular pressure plate **18** biased toward the front of the box by a leaf spring **20** mounted on the rear wall **22** of the box. The container includes side walls and one end wall provided with inwardly projecting flanges **24** for retaining image-recording sheets **14** within the box between the flanges and pressure plate **18**, and cooperating to define a rectangular opening through which light is transmitted for exposing the first or foremost of the image-recording sheets disposed in stacked relation within the cassette. The inner or rear faces of flanges **24** are disposed substantially in a plane and cooperate with pressure plate **18** to support the photosensitive image-recording sheets in a plane during exposure while the flanges on the side walls of the box cooperate to guide the image-recording sheets in a plane during withdrawal movement of each image-recording sheet from the cassette.

The apparatus includes means for holding a plurality of generally rectangular second or image-receiving sheets, designated **26**, in stacked relation with the sheets disposed in planes generally perpendicular to the planes of image-recording sheets **14** and below and forwardly of the stack of image-recording sheets. The image-receiving sheets may be provided in a cassette similar to the cassette in which the image-recording sheets are supplied; or, since they are not photosensitive, the image-receiving sheets may be held in stacked relation by means which are part of the apparatus and in the form shown, comprise a generally horizontal support plate **28** on which the stack of sheets is mounted side plates **34**, a backing plate **30** on top of the stack between the side plates and extending horizontally beyond the end of the support plate and a spring **32** for urging the backing plate toward the support plate. Side plates **34** function to hold the stack of image-receiving sheets between the support and backing plates and guide the lowermost image-receiving sheet as it is withdrawn from the stack.

The apparatus includes means providing a processing or liquid treatment station in which the image-recording sheets are contacted with the processing liquid. This liquid treatment station includes a container **36** for holding a liquid processing agent **38** and an image-recording sheet **14** immersed, except for the upper end portion thereof, in the processing liquid. Container **36** may comprise a component of the apparatus or a separate, expendable element which may be discarded when its liquid contents are depleted. It is generally parallelepiped in shape, is relatively narrow from front to back, at least equal in width to the width of the image-recording sheets, and has a depth slightly less than the length of the image-recording sheets so that when an image-recording sheet is disposed within the container with the lower edge of the sheet resting on the bottom of the container, the upper end portion of the sheet will project from and above the container. Container **36** has a relatively narrow opening to limit as much as possible the amount of surface area of the liquid available to contact with the atmosphere, and it is provided with means for closing the container against the admission of air when the apparatus is not in use. These last-mentioned means, in the form shown in FIGS. 1 and 4, comprise a lip **40** mounted on the upper edge of one (the rearmost) wall of the container and extending (forwardly) part way across the opening in the upper portion of the container. Lip **40** is preferably formed of a resiliently deformable material, such as rubber, extends from side to side of the container and includes a sharpened end edge portion which functions as a squeegee for removing liquid from the rear surface of image-recording sheets **14** during withdrawal of the sheets from the container. A cover member **42** is pivotally mounted adjacent the opposite (forward) wall of container **36** and extends toward lip **40** so as to overlap the lip in the closed position of the cover member shown in FIGURE 1. Cover member **42** is also formed of a relatively rigid, resiliently deformable material such as rubber and includes a sharpened edge section **44** which overlaps lip **40** to seal the container and functions as a squeegee for removing liquid **38** from the forward surfaces of sheets **14** during withdrawal thereof from the container between lip **40** and cover member **42**. Cover member **42** is engaged at its ends between the end walls of the container and is pivotally mounted on

a shaft **46** journaled in the end walls of the container and having a non-cylindrical end portion extending beyond one of the end walls of the container which may be engaged (by means to be described more fully hereinafter) for pivoting cover member **42** in a counterclockwise direction (viewing FIGS. 1 and 4) to an open position to permit introduction of a sheet **14** between the cover member and lip **40** into the container.

Means are provided for moving the foremost image-recording sheet **14** following exposure thereof downwardly from cassette **12** into the container and in the form shown, these means comprise a first feed roll **48** pivotally mounted forward of and adjacent the lower portion of cassette **12**. Feed roll **48** is shorter than the spacing between flanges **24** on the side walls of cassette **12** so as to extend between the flanges into the cassette into contact with the foremost image-recording sheet, and is formed with at least a surface layer of a material such as an elastomer or polymeric foam (e.g., polyurethane), having a relatively high coefficient of friction. The feed roll is basically cylindrical in cross section and includes a flat surface portion **50** normally disposed in facing closely adjacent relation (without contacting) the forwardmost image-recording sheet, as shown in FIGURE 1.

The means for feeding the image-recording sheets downwardly into container **36** includes first and second drive rolls **52** and **54** mounted in juxtaposition with their axes disposed in a generally horizontal plane so that the nip of the rolls is located beneath and in substantial alignment with the plane of downward movement of the forwardmost image-recording sheet. Rolls **52** and **54** also include at least surface layers formed of a material such as an elastomer having a high coefficient of friction and during the processing cycle of the apparatus, are rotated continuously so as to feed an image-recording sheet **14** between rolls **52** and **54** into container **36**. At the beginning of an operating cycle of the appaartus, first feed roll **48** is rotated through a single revolution to bring the cylindrical peripheral surface of the feed roll into frictional engagement with the forwardmost image-recording sheet and advance the lower edge of the sheet downwardly into the nip of the first and second drive rolls which then continue the withdrawal movement of the image-recording sheet from the cassette and move it into container **36**. The circumference of the cylindrical peripheral surface of feed roll **48** is sufficient to advance the image-recording sheets into the bite of the drive rolls so that at the end of its single revolution, feed roll **48** is located out of contact with the forwardmost photosensitive sheet **14** and at least the leading edge of which is engaged between the first and second drive rolls. This arrangement obviates the necessity for synchronism between the operation of the feed and drive rolls and permits substantially continuous operation of the drive rolls, preferred for reasons that will appear hereinafter.

Each exposed image-recording sheet is preferably processed to produce a full color transfer print by impregnating the photosensitive layer of the image-recording sheet with a liquid reagent to initiate processing which is allowed to progress to a predetermined extent and then pressing the liquid-impregnated layer of the image-recording sheet into face-to-face contact with an image-receiving sheet to form a sandwhich which is retained intact during a processing period of predetermined duration. Image-recording sheets **14** each include a plurality of layers including a support of a conventional film base material such as cellulose acetate and a photosensitive layer comprising a multiplicity of strata containing photosentitive material adapted to be photoexposed to form a latent image, and dye developers for the photosensitive material which are rendered reactive by the imhibition of an aqueous alkaline liquid reagent into the strata containing the dye developers. Typical multilayer negatives of this type are disclosed, for example, in FIG. 9 of the aforementioned U.S. Patent No. 2,983,606 and, when employed in the apparatus of the invention, include a layer which is impervious to actinic light thereby permitting the forwardmost of a stack of image-recording sheets to be exposed and the sandwich comprising the superposed photosensitive and image-receiving sheets to be advanced into the light during processing. The image-receiving sheets each comprise a support preferably of a material which is inert and impermeable to aqueous alkaline liquids, an opaque layer or material and an image-receiving layer of a material receptive to the aforementioned dye developers, securely adhered to the support. Aqueous alkaline processing liquids suitable for imbibition into the multilayer image-recording sheet to render the reagents, particularly the dye developers, reactive therein, as well as the composition of the receiving sheets are disclosed in detail in the aforementioned U.S. Patent No. 2,983,606.

During the processing cycle of the apparatus, an image-recording sheet is immersed in liquid **38** in container **36** for a predetermined period during which the liquid is absorbed into the layers containing the photosensitive material and other reagents including the dye developers, and formation of an imagewise distribution of transferable image-forming substances (dyes) is allowed to progress to a predetermined extent, whereupon the image-recording sheet is withdrawn from the container and immediately pressed into face-to-face contact with an image-receiving sheet. The nature and character of the transfer image produced in the image-receiving sheet can be controlled by varying the length of the period of immersion of the image-recording sheet in liquid **38** and for this reason the operation of the components of the apparatus which withdraw the image-recording sheet from the liquid and press it into contact with the image-receiving sheet are made independent of the operation of first feed roll **48** in order to facilitate varying the length of this imbibition period.

The means for withdrawing the image-recording sheet from the container **36** and pressing it into contact with an image-receiving sheet including second drive roll **54** and a third drive roll **56** mounted for rotation beneath the second drive roll and biased upwardly into juxtaposition with the second drive roll by suitable means such as springs **58**. At least the surface layer of third drive roll **56** is also formed of a resiliently deformable material such as an elastomer, having a high coefficient of friction to facilitate and insure gripping and advancement of the sandwich comprising the two sheets between the second and third drive rolls. A second feed roll **60**, similar to first feed roll **48**, is provided beneath the stack of image-receiving sheets adjacent the end of support plate **28** between the latter and container **36** for advancing the lowermost image-receiving sheet from the stack in a generally horizontal plane across the top of the container toward and into the nip of second and third drive rolls **54** and **56**. Second feed roll **60** is similar in construction and operation to the first feed roll in that it includes at least an outer layer formed of a material having a relatively high coefficient of friction, and a flat surface portion normally disposed in face-to-face spaced relation with the lowermost image-receiving sheet. Feed roll **60** is rotated through a single revolution in order to feed an image-receiving sheet into the nip of the second and third drive rolls which are rotated continuously throughout the processing cycle of the apparatus.

In order to withdraw an image-recording sheet from container **36** and press it into face-to-face contact with an image-receiving sheet, the leading end portions of the two sheets must be moved into the nip of rolls **54** and **56** so as to be gripped and advanced by the rolls. This may be accomplished, as shown in FIG. 5, by advancing the leading end portion of the lowermost image-receiving sheet toward the nip of the second and third drive rolls so that the image-receiving sheet deflects the upper end portion of the image-recording sheet, from its path of move-

ment until this point, into the nip of the drive rolls causing the end portions of both sheets to be engaged thereby. It is possible, by careful design of the apparatus and sheets, to properly orient the image-recording and image-receiving sheets with respect to one another when they are superposed. However to insure correct orientation of the superposed sheets, the form of sheets shown in FIGS. 2, 3 and 4 may be preferred. In this form, image-recording sheet **14** includes an end section, which projects above the container, provided with an opening **62** and each image-receiving sheet **26** is provided at its leading end with a tongue **64** having a tapered section adapted to enter and become engaged in opening **62** and shoulders **66** which engage the image-recording sheet for properly locating the sheets with respect to one another. In the operation of the apparatus with this form of image-recording and image-receiving sheets, the tongue **64** of each image-receiving sheet is advanced along a path across the top of the container through opening **62** in the upper end portion of the image-recording sheet disposed in the container and into the nip of drive rolls **54** and **56** where the tongue is engaged and advanced until shoulders **66**, which are unable to pass through opening **62** engage the image-recording sheet at the edges of the opening and draw the image-recording sheet into the nip of the rolls. Opening **62** may be generally triangular in shape to facilitate entry of tongue **64** which is tapered for this purpose and for the purpose of properly orienting the two sheets with respect to one another. Advancement of the image-recording sheet into and from the container are at substantially rapid rates such that the time required is small compared with the period of immersion in the liquid so that, effectively, all portions of the image recording sheets are immersed for the same time and absorb equal amounts of the liquid.

The housing of the apparatus includes a chamber, generally designated **68**, into which the sandwich comprising the superposed image-recording and image-receiving sheets are advanced by rolls **54** and **56**, and a door **70** that may be opened in order to remove the processed sandwich from chamber **68**. Chamber **68** and door **70** are not essential features, since the sheets comprising the sandwich are opaque to actinic light and permit the sandwich to be advanced directly into the light; but are desirable to insure exclusion of light from the apparatus and because they make possible the provision of a latch for door **70** permitting opening of the door only after a processing period of predetermined duration has elapsed.

The apparatus of the camera of the invention, as previously noted, is designed to be automatic in its operation and to be powered preferably by an electric motor. A suitable drive mechanism is illustrated in FIG. 6 as comprising an electric motor **72** for driving a sprocket **74** meshed with a chain **76** for transmitting motive power from the motor through a sprocket **78** coupled by a single revolution clutch **80** to first feed roll **48**, a sprocket **82** coupled through a single revolution clutch **84** to second feed roll **60** and sprockets **86** and **88** coupled, respectively, with drive rolls **52** and **54**. An idler sprocket **90** is provided for insuring engagement of driving chain **76** with sprocket **88** and guiding the drive chain around sprocket **74**. Solenoids **92** and **94** are provided for operating, respectively, single revolution clutches **80** and **84**, and a rotary solenoid **96** having an armature with an opening for engaging shaft **46**, is provided for pivoting cover member **42** between its open and closed position. For the sake of compactness, motor **72** is mounted beneath support plate **28** and the control means, designated **98**, is mounted beneath chamber **68**, both in the lower part of the housing on opposite sides of container **36**.

Control means **98** are illustrated in FIG. 7 in a condition prior to commencement of an exposure and processing cycle and comprise a timer motor **100** for rotating a plurality of timing cams which control switches to regulate the exposure and processing cycles of the apparatus. The shutter of the camera may be operated by a solenoid **102** coupled across the power supply through a starting switch shown as a push button **104** which may be manually depressed momentarily to make an exposure and initiate an exposure and processing cycle of the apparatus. Timer motor **100** is coupled across the power supply through starter switch **104** and through a switch **106** in parallel with starter switch **104**. Switch **106** is open at the commencement of an exposure and processing cycle and is controlled by a cam **108** mounted on the shaft of motor **100** which closes switch **106** immediately as the timer motor starts to rotate in response to closing of starter switch **104** and keeps the timer motor energized thereafter even through starter **104** is opened. The processing cycle is terminated when cam **108** allows switch **106** to reopen terminating the flow of current to the timer motor. The shutter may be of the type which is required to be reset following release and the control means include a solenoid **110** coupled to the power supply through a switch **112** controlled by cam **114** for setting the shutter immediately following its release during the early portion of the operation of the timer motor. Drive motor **72** is connected to the power supply through a switch **116** operated by a cam **118** which energizes the drive motor immediately after the exposure is made and de-energizes the motor before the timing motor is de-energized. The processing cycle is initiated by solenoid **92** which is coupled to the power supply through a switch **120** controlled by a cam **122** which closes the switch shortly after drive motor **72** commences to rotate. At the end of a predetermined period following energization of solenoid **92** and the commencement of the processing cycle, solenoid **94** controlled through a switch **124** by a cam **126** is energized to rotate feed roll **60** and thereby move an image-receiving sheet into engagement with an image-recording sheet in the container and advance both sheets into the nip of drive rolls **54** and **56**. The interval during which an image-recording sheet is permitted to remain in container **36** in the liquid therein can be very easily varied by changing the angular position of cam **126** relative to cam **122**, both of which are coaxially mounted on the shaft of the timer motor. Rotary solenoid **96** is controlled by a switch **128** and cam **130** which energizes the rotary solenoid to open cover member **42** prior to energization of solenoid **92** and close the cover member so as to bring it into engagement with an image-recording sheet in the container prior to energization of solenoid **94**. In this manner, the container cover is only open for a relatively short period during each processing cycle and functions as a squeegee during withdrawal of an image-recording sheet from the container. If desired, still another solenoid, switch and cam may be provided for controlling the operation of a latch coupled with door **70** for preventing opening of the door or otherwise giving a signal at the end of a predetermined period following advancement of the sandwich comprising the image-recording and image-receiving sheets into chamber **68**.

It is desirable to maintain the liquid in container **36** at a predetermined level to insure imbibition of the liquid into the desired area of the image-recording sheet and for this purpose there may be provided a reservoir (not shown) of the processing liquid mounted above the level of the liquid within container **36** and coupled therewith by a suitable conduit and valve of a type well known in the art, for automatically maintaining the level of the liquid within the container.

Various modifications and additions to the apparatus may be desirable and include, for example, mounting the stack of image-receiving sheets beneath rather than above feed roll **60** so that the uppermost image-receiving sheet is the one which is moved toward the nip of the second and third drive rolls. When the camera is to be employed as part of an identification system, e.g., to provide a photograph constituting a motor vehicle operator's license, in which it is desirable to simultaneously photo-

graph both a person and printed information, the camera may include means for illuminating the printed information to be included in the photograph and optical means for forming an image of the printed information on the foremost image-recording sheet positioned for exposure within cassette **12**. Additionally, it may be desirable to make various components of the apparatus, particularly the drive rolls and container **36**, readily removable for cleaning and/or replenishment of the processing liquid. In a typical arrangement, the first, second and third drive rolls and spring **58** may be mounted as a unit on a suitable chassis which may be readily removed from the apparatus and includes means for coupling rolls **52** and **54** with, respectively, sprockets **86** and **88**.

The operation of the apparatus is quite simple requiring only that the operator properly aim the camera at the subject to be photographed and momentarily close starter switch **104**. As the starter switch is closed an exposure is made and timer motor **100** commences to operate, rotating cams, **108**, **114**, **118**, **122**, **126** and **130**. During the initial portion of the rotation of the cams, switch **106** closes to continue the operation of the timer motor and switch **116** closes to energize the drive motor and rotate drive rolls **52**, **54** and **56**. Shortly after commencement of rotation of drive motor **72** switch **128** closes energizing the rotary solenoid to open the container closure and then switch **120** closes energizing solenoid **92** engaging single revolution clutch **80** causing rotation of feed roll **48** which feeds the exposed image-recording sheet into the nip of drive rolls **52** and **54** which feed the image-recording sheet into container **36**. Switch **128** then opens and at the end of a predetermined interval after closing of switch **120**, switch **124** is closed energizing solenoid **94** to drive feed roll **60** and advance an image-receiving sheet into engagement with the image-recording sheet projecting from container **36** and advance both sheets into the nip of second and third drive rolls **54** and **56** which press the two sheets into superposition to form a sandwich and advance the sandwich into chamber **68**. At the end of a predetermined interval following energization of solenoid **94**, switches **116** and **106** open in order to de-energize the drive and timing motors and leave the apparatus in readiness for another exposure and processing cycle. At some time during the initial portion of the processing cycle, solenoid **110** is actuated to reset the shutter.

Another form of camera embodying the invention is illustrated in FIG. 8 of the drawings as comprising many of the same basic components as the apparatus shown in FIGURE 1, including a lens and shutter mechanism **10**, film pack or cassette **12** for holding a plurality of image-recording sheets **14**, a first feed roll **48** for advancing sheets **14** downwardly from exposure position, and a housing generally designated **134**, for mounting and enclosing the components of the apparatus. Image-receiving sheets **26** are mounted in stacked relation beneath and to the side (rear) of the image-recording sheets with the surfaces of the image-receiving sheets adapted to be superposed with the image-recording sheets facing downwardly away from the stack of image-recording sheets. The image-receiving sheets are shown as mounted in a container or box **136** including a spring **138** and pressure plate **140** for supporting the image-receiving sheets against a second feed roll **60**, which may be rotated for advancing the uppermost image-receiving sheet (to the left viewing FIG. 8) across the path of movement of the image-recording sheets.

Many of the distinctions between the cameras of FIGS. 1 and 8 are to be seen in the liquid treatment station, particularly the container of processing liquid and the manner in which the image-recording sheets are advanced into, through and from the liquid to impregnate the sheets with the liquid, and the means for performing these functions. In the apparatus of FIG. 8, the image-recording sheets are advanced in a single direction along a U-shaped path into, through and from the processing liquid at a substantially constant predetermined rate such that every portion of each sheet remains in the liquid for substantially the same length of time and, accordingly, absorbs the same amount of liquid, and formation of image-forming substances in each portion advances to the same predetermined extent prior to superposition of the image-recording sheet with an image-receiving sheet. The processing liquid, designated **142**, is provided in an open container **144** having guide tracks **146** for guiding each sheet along a U-shaped path downwardly adjacent one side of the container across the bottom thereof and upwardly adjacent the opposite side of the container. The container is provided with a closure **148** preferably formed of a resilient, flexible material, for example, an elastomer or a polymer such as polyethylene and polypropylene; and is formed with a pair of V-shaped passages **150** and **152** through which the image-recording sheets are, respectively, introduced and withdrawn. The sides of each of passages **150** and **152** converge to a slit that is normally closed and function to guide the image-recording sheets between the sides of the normally closed slits. Passage **150** constitutes an entrance or ingress passage with the sides thereof converging inwardly and passage **152** constitutes an exit or egress passage with the sides thereof converging outwardly. The sides of passage **152** also function as a squeegee for engaging and removing liquid from the surfaces of a sheet as the sheet is withdrawn from the container through passage **152**.

The apparatus includes a pair of juxtaposed feed rolls **154** and **156** mounted above container **144** between passage **150** and first feed roll **48** in position to engage the leading edge portion of a sheet **14** advanced downwardly from container **12** by feed roll **48** following exposure of the image-recording sheet. Feed rolls **154** and **156** are preferably rotated continuously during a processing cycle of the apparatus at a speed calculated to advance a sheet **14** into and through the container at the desired predetermined rate. The rotational axes of feed rolls **154** and **156** are positioned so as to feed a sheet **14** into and between the convergent sides of passage **150** whereupon the sheet is guided along a U-shaped path through the processing liquid by guide tracks **146** which engage the surface of sheet **14** opposite the photosensitive layer thereon.

A pair of juxtaposed pressure rolls **158** and **160** are provided above container **144** to one side of passage **152** and the length of the path of movement of each sheet **14** from feed rolls **154** and **156** through container **144** is so related to the length of the image-recording sheet that the latter is moved from engagement with the feed rolls when the leading end portion of the sheet has been advanced from the container through opening **152** to a position (shown in broken lines) adjacent and to one side of pressure rolls **158** and **160** with the leading edge of sheet **14** extending past the nip of the pressure rolls. When sheet **14** reaches this position, movement thereof is discontinued since the motive force for the sheet is applied by drive rolls **154** and **156** which, at this point, no longer engage the sheet. During the terminal portion (at least) of movement of sheet **14** by drive rolls **154** and **156**, feed roll **60** is rotated to advance an image-receiving sheet **26** from container **136** across the path of downward movement of sheet **14** toward the nip of pressure rolls **158** and **160**. Rotation of roll **60** is preferably timed so that the leading edge of sheet **26** engages the leading end portion of sheet **14** at approximately the same instant movement of sheet **14** is discontinued. The circumference of the cylindrical, peripheral portion of feed roll **60** is at least equal to the distance between the leading edge of sheet **26** positioned in container **136** and the nip of pressure rolls **158** and **160** so that sheet **26** deflects sheet **14** from its path of movement into the nip of the pressure rolls immediately as movement of sheet **14** by feed rolls **154** and **156** is discontinued.

Pressure rolls **158** and **160** are rotated continuously

during and after at least the terminal portion of movement of sheet **14** through and from the container, so that movement of sheet **14** is recommenced by pressure rolls **158** and **160** immediately as movement of the sheet by feed rolls **154** and **156** is discontinued. Pressure rolls **158** and **160** are constructed and operated at a speed calculated to withdraw sheet **14** from container **144** at the same rate the sheet is fed into the container by feed rolls **154** and **156** so that movement of sheet **14** into, through and from the container is effected at a substantially constant predetermined speed and is substantially continuous and without interruption. It should be noted that during the advancement of the photosensitive sheet from exposure position to a position adjacent pressure rolls **158** and **160** by feed rolls **48** and **154** and **156**, the direction in which the sheet faces is reversed and the sheet is superposed with the side of a second sheet initially facing away from the photosensitive sheet. The image-receiving sheets are advanced from container **136** along a path toward the pressure rolls converging at an angle of at least 90° with respect to the path of movement of the image-recording sheets from the container of processing liquid. It may be desirable to vary the initial positions of the image-receiving sheets and the container **136** in which they are held, from the position shown, for example, by including the container with the leading ends of the sheets disposed lower than the trailing ends of the sheets.

Other modifications of the apparatus are possible and are considered to fall within the scope of the invention. These include the provision of means for guiding sheets **14** from feed roll **48** into the nip of feed rolls **154** and **156** and guiding sheets **26** from feed roll **60** toward the nip of pressure rolls **158** and **160**. The camera shown in FIG. 8 may be operated manually or it may include a suitably powered drive and control mechanism for rotating the feed and pressure rolls and coordinating the operations of the feed rolls to provide for the desired processing cycle. The duration of the period during which each portion of the image-recording sheet is immersed in the processing liquid can be varied by changing the rates of rotation of feed rolls **154** and **156** and pressure rolls **158** and **160**, and the interval between actuation of feed roll **48** to advance an image-recording sheet into the nip of feed rolls **154** and **156** and the actuation of feed roll **60** to advance an image-receiving sheet into engagement with photosensitive sheet **14** and pressure rolls **158** and **160**. By varying the relationship between the speeds of feed rolls **154** and **156** and the time of actuation of feed roll **60**, it is possible to alter the positions of the sheets relative to one another during movement of the sheets in superposition between pressure rolls **158** and **160**. The relative positions of the sheets also may be varied by changing the length of the path of movement of sheet **14** and/or the position of pressure rolls **158** and **160** relative thereto.

The embodiment of the camera shown in FIGS. 9 and 10, is constructed to provide for exposure of a much greater area of the image-recording sheets and can be generally smaller and more compact than the embodiments described heretofore. This camera is designed to employ a film assemblage including container **12** of substantially the same construction as previously described, but containing both the image-recording sheets **14** and image-receiving sheets **26** arranged in stacked relation in alternating order. By providing both sheets of each pair in the same container, the means for holding a second container as well as the means for feeding the sheets therefrom can be eliminated thereby permitting a reduction in size, cost, and complexity of the camera.

The image-recording and image-receiving sheets are fed from container **12** alternately by a single, generally cylindrical, feed roll **162** located out of (beneath) the path of light from the lens of assembly **12** in order to provide for exposure of the maximum possible area of the image-recording sheets, that is, substantially the entire area of each image-recording sheet. Container **12** is mounted for movement between a first or exposure position shown in FIG. 9, at which feed roll **162** is located out of the path of light between the lens and the lower (leading) edge portion of the forwardmost image-recording sheet so that the feed roll does not interpose its bulk and prevent exposure of the end portion; and a second or feeding position, shown in FIG. 10, at which the container is displaced downwardly from the exposure position and feed roll **162** is juxtaposed with the lower or leading end portion of the sheets within the container. A cam **164** and follower **166** are provided mounted on the container (or on means for holding the container) for moving the container upwardly and downwardly between the positions shown. Feed roll **162** is mounted for movement toward and away from the container between an inoperative position, shown in FIG. 9, at which the roll is spaced from engagement with the container to permit movement of the container and an operative position, shown in FIG. 10, at which the feed roll extends into the container into engagement with the lower end portion of the forwardmost sheet.

In the operation of the camera shown in FIGS. 9 and 10, container **12** is displaced upwardly to exposure position, the forwardmost image-recording sheet **14** is exposed, the container is displaced downwardly, and roll **162** is moved into engagement with the exposed image-recording sheet to feed the leading end portion of the image-recording sheet downwardly into the nip of rolls **154** and **156**. The camera includes a curved guide plate **168** pivotally mounted beneath the container for guiding the image-receiving sheets **26** from the container toward the nip of rolls **158** and **160**, and for pivoting guide plate **168** from the position shown in FIG. 9 at which the guide plate located forward and out of the path of movement of the sheets from the container permitting the image-recording sheets to be fed from the container into the nip of rolls **154** and **156**; and the position shown in FIG. 10 at which the guide plate extends into and to the rear of the path of movement of the sheets from the container for guiding the image-receiving sheets into the nip of rolls **158** and **160**. A suitable cam mechanism (not shown) may be provided for pivoting the upper portion of guide plate **168** into its forward position during movement of an image-recording sheet from the container and to its rearmost position for engaging an image-receiving sheet during movement of the latter from the container. The proper timing of the processing operation, that is, movement of the image-recording and image-receiving sheets, in this embodiment of the camera is achieved by controlling the interval between rotations of roll **162** to advance first an image-recording sheet and then an image-receiving sheet.

The camera also includes means for insuring retention of all but the first or forwardmost sheet in the container during withdrawal movement of the forwardmost sheet. These means, shown in FIG. 11, include a pad **170** of a resilient material having a high work efficiency of friction, e.g., polyurethane foam, mounted on a resilient arm **172** for movement into engagement with the edge portions of sheets **14** and **26** in container **12**. The camera preferably includes two pads and the opposite side walls of container **12** are provided with openings **174** into which pads **170** project. Cams **174** are provided for urging pads **170** into engagement with the sheets during movement of the forwardmost sheet from the container while permitting the sheets to be displaced forwardly within the container under the bias of spring **16**. The operation of cams **174** is, of course, synchronized with the rotation of feed roll **162** so that the pads engage the sheets during rotation of the feed roll.

Another and very effective means for retaining the sheets within container **12** is illustrated in FIG. 12 and includes the provision of very small notches in an edge of the sheets adapted to be engaged by a knife edge projection **176** on a side wall of the container extending from front to back thereof. The notches in the sheets are so

small as to go unnoticed except for the most critical inspection, and retain the sheets with a force which may be overcome by the frictional engagement between the forwardmost sheet and feed roll **162**, while permitting the sheets freedom to move forwardly in the container.

The invention contemplates further modifications to the apparatus and the incorporation of additional structural features contributing to improved and automatic operation. These include, for example, means within the container of processing liquid for controlling the temperature thereof to produce optimum results. Means sensitive to the ambient temperature and/or the temperature of the processing liquid may be provided for automatically varying the length of the period of imbibition of the image-recording sheets in the processing liquid and/or signalling to the operator that the period during which the sheets are required to remain in superposition has elapsed and the sheets may be separated.

Since certain changes may be made in the above process and 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. Photographic apparatus for exposing a photosensitive sheet and treating the exposed photosensitive sheet with a liquid in conjunction with a second sheet, said apparatus comprising, in combination:

means for supporting a photosenstive sheet in position for exposure;

means for exposing said photosensitive sheet;

means providing a liquid treating station in which said photosensitive sheet is contacted with a liquid;

first sheet advancing means for engaging and moving said photosensitive sheet along a first path into said liquid treating station to a position at which said sheet is disengaged from said first sheet advancing means and an end portion of said photosensitive sheet extends from said station;

second sheet advancing means for engaging said end portion and an end portion of a second sheet, withdrawing said photosensitive sheet from said liquid treating station and moving said sheets in superposition;

said liquid treating station including means for locating said photosensitive sheet with said end portion thereof extending from said liquid treating station in a direction to one side of said second sheet advancing means and with no portion of said photosensitive sheet in engagement with said first or second sheet advancing means; and

means for moving said second sheet along a second path outside of said liquid treating station toward and into engagement with photosensitive sheet to deflect said end portion from said first path into engagement with said second sheet advancing means.

2. Photographic apparatus for exposing a photosensitive sheet and treating the exposed photosensitive sheet with a liquid in conjunction with a second sheet, said apparatus comprising, in combination:

means for supporting a photosensitive sheet in position for exposure, constructed for holding a plurality of said photosensitive sheets in stacked relation with an end sheet of the stack located in position for exposure and including means for retaining all but said end sheet stationary during movement of said end sheet from exposure position in said stack;

first sheet advancing means for engaging and moving said photosensitive sheet along a first path into said liquid treating station to a position at which an end portion of said photosensitive sheet projects from said station;

second sheet advancing means for engaging said end portion and an end portion of the other of said sheet, withdrawing said photosensitive sheet from said liquid treating station and moving said sheets in superposition; and

means for moving said other sheet along a second path apart from said liquid treating station toward and into engagement with said end portion of said photosensitive sheet to deflect said end portion from said first path into engagement with said second sheet advancing means.

3. Photographic apparatus as defined in claim **1** wherein said liquid treating station includes a container for holding a processing liquid and said one sheet with the major portion thereof immersed in said liquid and said end portion of said one sheet extending from said container at a location spaced from the point of entry by a distance substantially less than the length of said one sheet.

4. Photographic processing apparatus for treating an exposed photosensitive sheet with a liquid in conjunction with a second sheet superposed with said photosensitive sheet, said apparatus comprising, in combination:

means providing a liquid treating station in which a sheet is contacted with a liquid;

first sheet advancing means for moving one of said photosensitive and second sheets along a first path into said liquid treating station to a position at which said one sheet is disengaged from said first sheet advancing means and an end portion of said one sheet extends from said station;

second sheet advancing means for engaging said end portion and an end portion of the other of said sheets, withdrawing said one sheet from said liquid treating station and moving said sheets in superposition;

said liquid treating station including means for locating said one sheet with said end portion thereof extending from said liquid treating station in a direction to one side of said second sheet advancing means and with no portion of said one sheet in engagement with said first or said second sheet advancing means; and

means for moving said other sheet along a second path outside of said liquid treating station toward and into engagement with said end portion of said one sheet to deflect the latter from said first path toward and into engagement with said second sheet advancing means.

5. Photographic apparatus as defined in claim **4** including means for locating a photosensitive sheet in position for exposure and wherein said first sheet advancing means include means for engaging and moving said photosensitive sheet from exposure position along said first path into said liquid treating station.

6. Photographic apparatus as defined in claim **4** wherein said means including in said liquid treating station locate said one sheet with said end section extending at an angle of at least 90° with respect to said second path in the vicinity of said second sheet advancing means.

7. Photographic apparatus as defined in claim **4** wherein said second sheet advancing means include a pair of juxtaposed rolls for engaging said sheets therebetween and pressing said sheets together, and said liquid treating station includes means for guiding said one sheet into a position within said liquid treating station in which said end portion of said one sheet extends therefrom in a direction to one side of the nip of said juxtaposed rolls.

8. Photographic apparatus as defined in claim **7** wherein said one sheet advancing means are constructed for moving said one sheet along said first path with said end portion foremost into, through and from said liquid treating station at a substantially constant, predetermined rate.

9. Photographic processing apparatus for treating an exposed photosensitive sheet with a liquid in conjunction with a second sheet superposed with said photosensitive sheet, said apparatus comprising, in combination:

means providing a liquid treating station in which a sheet is contacted with a liquid;

first sheet advancing means for moving one of said sheets along a first path into said liquid treating station to a position at which an end portion of said one sheet projects from said station;

second sheet advancing means for engaging said end portion and an end portion of the other of said sheets, withdrawing said one sheet from said liquid treating station and moving said sheets in superposition;

means for moving said other sheet along a second path apart from said liquid treating station toward and into engagement with said end portion of said one sheet to deflect said end portion from said first path into engagement with said second sheet advancing means; and

means for commencing movement of said other sheet along said second path into engagement with said one sheet at the end of a predetermined interval following commencement of movement of said one sheet into said liquid treating station.

10. Photographic processing apparatus for treating an exposed photosensitive sheet with a liquid in conjunction with a second sheet superposed with said photosensitive sheet, said apparatus comprising, in combination:

means providing a liquid treating station in which a sheet is contacted with a liquid;

first sheet advancing means for moving one of said sheets along a first path into said liquid treating station to a position at which an end portion of said one sheet projects from said station;

second sheet advancing means for engaging said end portion and an end portion of the other of said sheets, withdrawing said one sheet from said liquid treating station and moving said sheets in superposition;

means for moving said other sheet along a second path apart from said liquid treating station toward and into engagement with said end portion of said one sheet to deflect said end portion from said first path into engagement with said second sheet advancing means; and

means for varying the length of the interval between commencement of movement of said one sheet and said other sheet.

11. Photographic apparatus as defined in claim **4** wherein said first sheet advancing means are operative to move said one sheet along said first path in a first direction into said liquid treating station to a position at which said one sheet remains until withdrawn by said second sheet advancing means, and said second advancing means are operative to engage and advance said one sheet in the opposite direction from said station.

12. Photographic processing apparatus for treating an exposed photosensitive sheet with a liquid in conjunction with a second sheet superposed with said sensitive sheet, said apparatus comprising, in combination:

holding means for supporting said photosensitive sheet during exposure thereof;

means providing a liquid treating station for contacting said photosensitive sheet with a liquid;

first sheet advancing means for moving said photosensitive sheet along a first path into said liquid treating station to a position at which an end portion of said photosensitive sheet projects from said station, said first sheet advancing means including a member for engaging an end section of said photosensitive sheet supported by said holding means to move said photosensitive sheet from said holding means;

means for moving said holding means between a first position at which said photosensitive sheet is located in position for exposure and a second position at which said end section of said photosensitive sheet is juxtaposed with said member for engagement thereby;

second sheet advancing means for engaging said end portion and an end portion of a second sheet, withdrawing said photosensitive sheet from said liquid treating station and moving said sheets in superposition; and

means for moving said second sheet along a second path outside of said liquid treating station toward and into an engagement with said end portion of said second sheet to deflect said end portion from said first path into engagement with said second sheet advancing means.

13. Photographic apparatus as defined in claim **12** including means for moving said member toward and into engagement with said photosensitive sheet when said holding means is in said second position and moving said member from engagement with said photosensitive sheet to permit movement of said holding means into said first position.

14. Photographic apparatus as defined in claim **12** wherein said holding means include means for holding said second sheet in superposed relation with said photosensitive sheet, and first advancing means include guide means for guiding said photosensitive sheet from a position in said holding means along said first path and guiding said second sheet from substantially the same position in said holding means along said second path.

15. Photographic apparatus as defined in claim **4** wherein said liquid treating station includes a container for holding a processing liquid with a major portion of said one sheet immersed in said liquid and said end portion of said one sheet extending from said container at a location spaced from the point of entry by a distance substantially less than the length of said one sheet.

16. Photographic processing apparatus for treating an exposed photosensitive sheet with a liquid in conjunction with a second sheet superposed with said photosensitive sheet, said apparatus comprising, in combination:

means providing a liquid treating station in which a sheet is contacted with a liquid;

first sheet advancing means for moving one of said photosensitive and second sheets in a first direction along a first path into said liquid treating station;

means for holding the other of said sheets in a stationary position during at least a portion of said movement of said first sheet; and

second sheet advancing means for engaging and moving said one sheet from said liquid treating station in superposition with said other sheet;

said first sheet advancing means including means for advancing said other sheet along a portion of said first path and guide means for diverting said other sheet from said first path outside of said liquid treating station toward said second sheet advancing means along a second path intersecting said first path adjacent said second sheet advancing means.

17. Photographic apparatus as defined in claim **16** wherein said liquid treating station includes means for locating said one sheet with an end portion extending from said liquid treating station and said guide means direct said other sheet into engagement with said end portion of said one sheet extending from said liquid treating station to move said end portion into engagement with said second sheet advancing means.

18. Photographic apparatus as defined in claim **16** wherein said second advancing means comprise a pair of rolls mounted in juxtaposition with the nip of said rolls located in said second path adjacent and to one side of said first path.

19. Photographic apparatus as defined in claim **16** wherein said liquid treating station includes a container for holding processing liquid and said one sheet with the major portion thereof immersed in said liquid, including means for operating said first and second sheet advancement means to move said one sheet into and from said container at a rate such that the total time required for

introductory and withdrawal movement of said one sheet is small compared with the length of time said major portion of said one sheet is immersed within said liquid.

20. Photographic apparatus as defined in claim **19** including closure means for said container comprising squeegees and means for retaining said closure means in a closed position, moving said closure means to an open position during movement of said one sheet into said container, and moving said squeegees into engagement with said one sheet immediately following introductory movement of said one sheet into said container.

21. Photographic processing apparatus for treating an exposed photosensitive sheet with a liquid in conjunction with a second sheet superposed with said photosensitive sheet, said apparatus comprising, in combination:

means providing a liquid treating station in which a sheet is contacted with a liquid;

first sheet advancing means for moving one of said sheets in a first direction along a first path into said liquid treating station;

means for holding said other sheet in a stationary position during at least a portion of such movement of said first sheet;

second sheet advancing means for engaging and moving said one sheet in a second direction, along a second path, which includes a part of said first path, out of said liquid treating station and moving said other sheet in superposition with said one sheet along said second path; and

means for controlling the interval between commencement of movement of said one sheet into said liquid treating station and commencement of movement of said other sheet from said stationary position into engagement with said end portion.

22. In a process of producing a photographic image wherein a first sheet containing a photosensitive material as a layer thereof is exposed and subjected to treatment with a liquid processing composition in conjunction with a second sheet to form a transfer image by diffusion, the steps of:

moving said first sheet into a body of said liquid processing composition to provide for absorption of said liquid into said layer of photosensitive material and to initiate formation of image-forming substances;

continuing the movement of said first sheet into said body of liquid until at least the major portion of the exposed area of said layer of photosensitive material has been immersed in and subjected to treatment by said liquid and an end portion of said first sheet extends from said body of liquid along a first path and thereupon discontinuing the movement of said first sheet;

moving said second sheet from an initial position above and adjacent said body of liquid with an edge portion foremost outside of said body of liquid along a second path into engagement with said end portion of said first sheet to deflect the latter from said first path along a third path, said second sheet being moved into engagement with said first sheet to deflect latter immediately as movement of said first sheet is discontinued;

immediately upon deflection of said first sheet from said first path, moving said first sheet along said third path to withdraw said first sheet from said body of liquid;

during with drawal movement of said first sheet from said body of liquid superposing said second sheet with said first sheet so that said liquid absorbed by said photosensitive layer has access to the adjacent surface of said second sheet; and

coordinating the rates of movement of said first sheet into and from said body of liquid and the timing of movement of said edge portion of said second sheet into engagement with said end portion of said first sheet so that every portion of said exposed area of said layer of photosensitive material is immersed in said liquid for substantially the same predetermined period and absorbs substantially the same quantity of said liquid.

23. In a process of producing a photographic image wherein a first sheet including a photosensitive material as a layer thereof is exposed and subjected to treatment with a liquid processing composition in conjunction with a second sheet to form a transfer image by diffusion, the steps of:

moving said first sheet into a body of said liquid processing composition to provide for absorption of said liquid into said layer of photosensitive material and to initiate formation of image-forming substances;

continuing the movement of said first sheet into said body of liquid until at least the major portion of the exposed area of said layer of photosensitive material has been immersed in and subjected to treatment by said liquid and an end portion of said first sheet projects from said body of liquid adjacent means for engaging and moving said sheets together and thereupon discontinuing the movement of said first sheet;

moving said second sheet from an initial position above and adjacent said body of liquid with an edge portion foremost outside of said body of liquid toward and into engagement with said end portion of said first sheet to move said first sheet into engagement with said means, said second sheet being moved into engagement with said first sheet to move the latter into engagement with said means immediately as movement of said first sheet is discontinued;

thereafter by said means, moving said first sheet together with said second sheet to withdraw said first sheet from said body of liquid;

during withdrawal movement of said first sheets, superposing said first sheet with said second sheet so that said liquid absorbed by said photosensitive layer has access to the adjacent surface of said second sheet; and

coordinating the rates of movement of said first sheet into and from said body of liquid and the timing of movement of said edge portion of said second sheet into engagement with said end portion of said first sheet so that every portion of said exposed area of said layer of photosensitive material is immersed in said liquid for substantially the same predetermined time and absorbs substantially the same quantity of said liquid.

24. In a process of producing a photographic image wherein a first sheet including a photosensitive material as a layer thereof is exposed and subjected to treatment with a liquid processing composition in conjunction with a second sheet to form a transfer image by diffusion, the steps of:

moving said first sheet into a body of said liquid processing composition to provide for absorption of said liquid into said layer of photosensitive material and to initiate formation of image-forming substances;

continuing the movement of said first sheet into said body of liquid until at least the major portion of the exposed area of said layer of photosensitive material has been immersed in and subjected to treatment by said liquid and an end portion of said first sheet projects from said body of liquid adjacent means for engaging and moving said sheets together;

moving said second sheet from said position adjacent said body of liquid with an edge portion foremost toward and into engagement with said end portion of said first sheet to move said first sheet into engagement with said means;

thereafter by said means, moving said first sheet together with said second sheet to withdraw said first sheet from said body of liquid at the same rate as during introduction;

during withdrawal movement of said first sheets, super-

posing said first sheet with said second sheet so that said liquid absorbed by said photosensitive layer has access to the adjacent surface of said second sheet; and

coordinating the rates of movement of said first sheet into and from said body of liquid and the timing of movement of said edge portion of said second sheet into engagement with said end portion of said first sheet so that every portion of said exposed area of said layer of photosensitive material is immersed in said liquid for substantially the same predetermined time and absorbs substantially the same quantity of said liquid;

said end portion of said first sheet being formed with an opening for receiving said edge portion of said second sheet, said edge portion of said second sheet being moved toward said means through said opening into engagement with said means to predeterminedly orient said sheets with respect to one another during movement of said sheets into superposition.

25. The method of claim **24** wherein said end portion of said first sheet is moved along a first path into a position adjacent said means and extending to one side thereof and said second sheet is moved toward said means along a second path converging with said first path into engagement with said end portion adjacent said means to deflect said first sheet from said first path into engagement with said means.

26 The method of claim **24** wherein said first sheet is moved rapidly into said container until substantially said entire exposed area is immersed in said liquid whereupon movement of said first sheet is discontinued:

the period during which said first sheet remains immersed in said liquid is terminated by moving said second sheet into engagement with said end portion of said first sheet to move said first sheet into engagement with said means;

said first sheet is withdrawn by said means rapidly from said liquid in a direction substantially opposite to the direction of introductory movement; and

said first sheet is moved into and withdrawn from said liquid at rates such that the total time required for introduction and withdrawal is small compared to the length of time during which said first sheet is immersed in said liquid.

27. The method of claim **24** wherein said first sheet is moved within said liquid in the same direction and at substantially the same rate during introduction into and withdrawal from said liquid.

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