

July 3, 1951

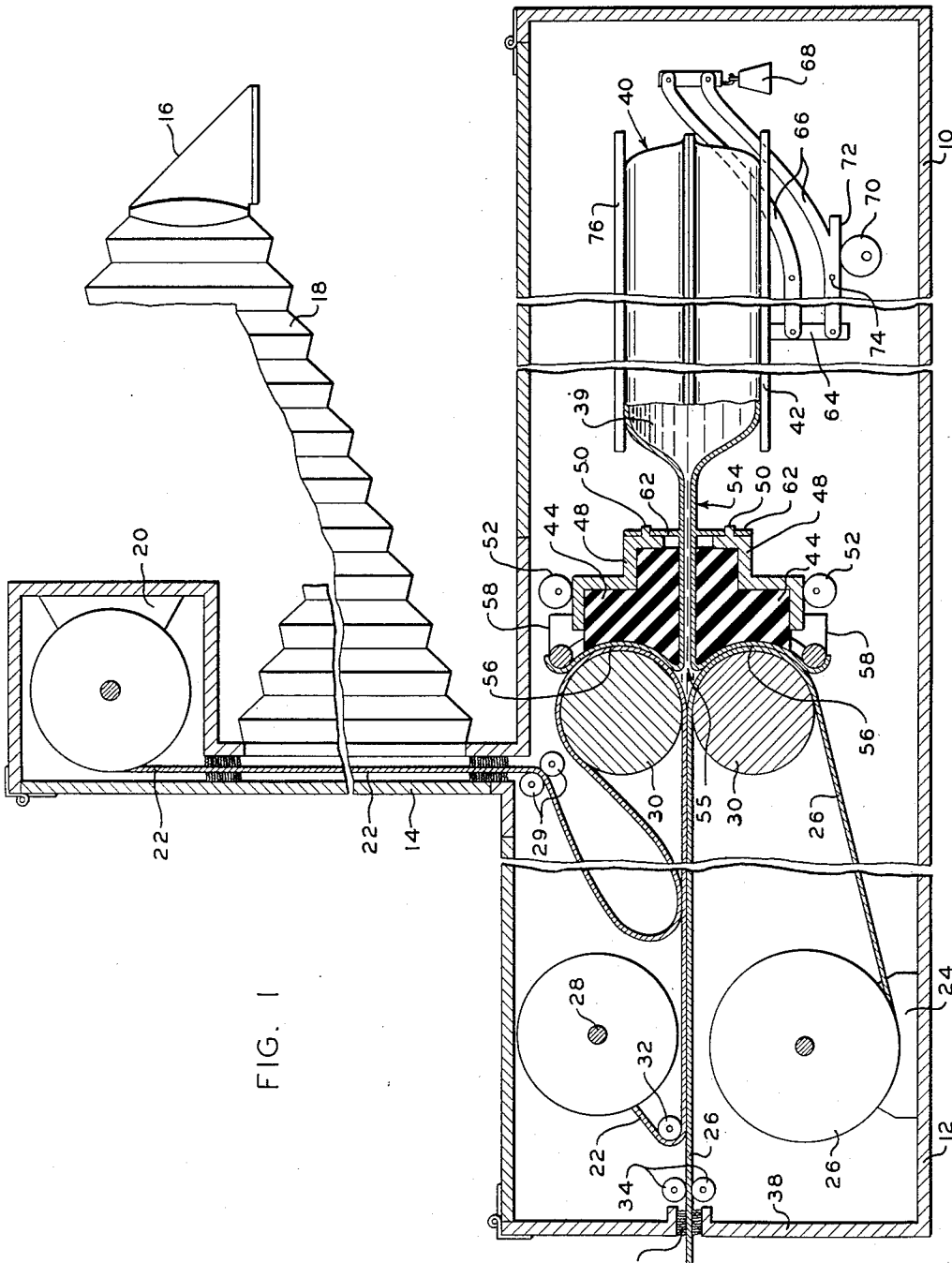
E. H. LAND

2,558,858

PHOTOGRAPHIC APPARATUS

Filed Feb. 3, 1948

2 Sheets-Sheet 1



INVENTOR

BY *Edwin H. Lund*
Donald L. Brown
and
Oliver H. Hayes
Attorneys

July 3, 1951

E. H. LAND

2,558,858

PHOTOGRAPHIC APPARATUS

Filed Feb. 3, 1948

2 Sheets-Sheet 2

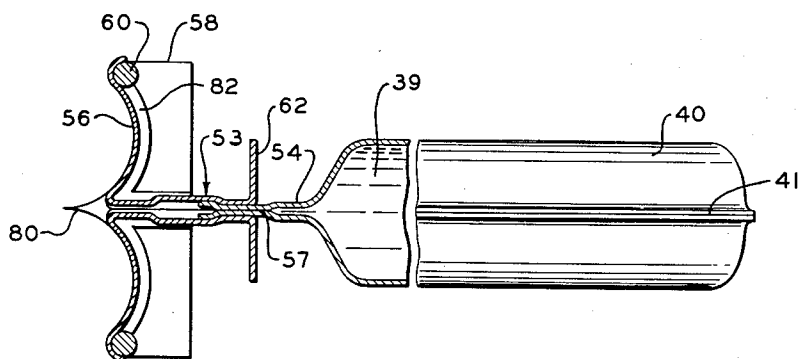


FIG. 2

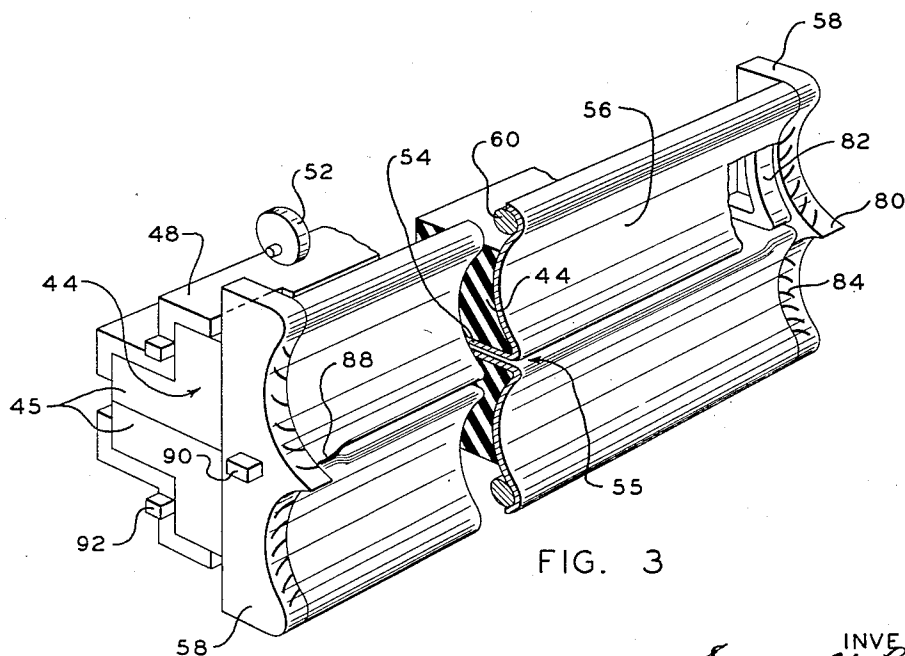


FIG. 3

INVENTOR
Edwin H. Land
BY *Donald R. Brown*
and
Oliver H. Hayes
Attorneys

UNITED STATES PATENT OFFICE

2,558,858

PHOTOGRAPHIC APPARATUS

Edwin H. Land, Cambridge, Mass., assignor to
Polaroid Corporation, Cambridge, Mass., a corporation of Delaware

Application February 3, 1948, Serial No. 5,928

14 Claims. (Cl. 95—13)

1

This invention relates to photography and in particular to novel photographic apparatus adapted for processing an exposed photosensitive sheet material. More particularly the present invention relates to improved apparatus, such as a camera, which is suitable for accomplishing a predetermined processing of an exposed photosensitive sheet by providing, between one surface of the exposed photosensitive sheet and another sheet, a thin layer of liquid capable of accomplishing such processing.

It is a principal object of the present invention to provide such an apparatus which is particularly useful with a novel disposable liquid container.

Another object of the invention is to provide such apparatus the various elements of which are so arranged that no part of the apparatus comes in direct contact with the processing liquid, this liquid being confined at all times by the disposable container or the sheets to be processed.

Still other objects of the invention are to provide apparatus of the above type wherein a cheap disposable container may be readily inserted in the apparatus; wherein a seal of the container may be ruptured while it is in the apparatus; wherein the liquid may be uniformly forced from the container and fed between the sheets while oxygen is substantially excluded from the liquid; and wherein the container may be positively sealed against escape of the liquid or ingress of oxygen during times when the apparatus is not being used.

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

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangement of parts which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

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

Figure 1 is a diagrammatic sectional view of one form of the invention which is particularly adapted for use as a photocopy machine;

Fig. 2 is a diagrammatic sectional view of the novel disposable container of the present invention; and

Fig. 3 is a fragmentary perspective end view of the novel container and a portion of the apparatus of the present invention.

2

In general the invention comprises a photographic apparatus for accomplishing a predetermined processing of a sheet, which sheet includes a photosensitive stratum, by providing between a surface of said sheet and another surface a layer of liquid capable of accomplishing said processing. The preferred form of apparatus comprises means for positioning a supply of said photosensitive sheet material, means for positioning a supply of another sheet material and means for guiding said two sheet materials from their respective supplies to a position wherein said sheet materials are in superimposed relation. The second sheet preferably furnishes the above-mentioned second surface. These guiding and superimposing means preferably comprise a pair of surfaces between which and with respect to which the sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween. There is also provided means for holding a disposable container having therein a quantity of the processing liquid preferably sufficient to accomplish a processing of a complete roll of said photosensitive material. This novel container preferably includes an elongated mouth adjacent a main body portion of the container, with sealing lips extending from the mouth of the container. The apparatus includes means for positioning the mouth of the container adjacent the two sheets as they are being superimposed so as to permit the mouth of the container to discharge liquid towards the liquid-receiving space between the two superimposed sheets. There are also provided means for creating resilient contact between the sealing lips of the container and the surfaces of the sheets to be superimposed. Means are also included for creating a hydraulic pressure in at least a portion of the liquid in the container so as to feed said liquid from the container mouth. Preferably there are provided means for controlling the flow of the liquid from the container so as to predeterminedly stop and start this flow. Additionally, the various elements, such as the guiding and holding means, are so arranged that the container lips and the two sheets protect the apparatus from contact with the liquid.

The apparatus also preferably includes means (preferably the superimposing means) for predeterminedly controlling the thickness of the liquid-receiving space between said sheet materials so as to predetermine the thickness of the layer of liquid confined between adjacent surfaces of said sheet materials.

In a preferred form of the invention, the ap-

paratus is particularly adapted for positioning a supply, such as a roll, of photographic film, including a gelatino silver halide emulsion. Means are provided for exposing the silver halide emulsion to a subject image such as a letter or page to be copied. With the preferred type of process, the other roll of sheet material comprises an image-carrying sheet preferably formed of a paper such as baryta paper, bond paper or any other relatively opaque papers. The two means for positioning the two rolls of material are so arranged that the photosensitive emulsion of the photosensitive sheet may be exposed after removal from its roll and the two sheets may be brought into superimposed relation with the exposed photosensitive emulsion being brought into face-to-face relation with that surface of the image-carrying sheet particularly adapted for having a positive image formed thereon. Adjacent the means for superimposing the two sheet materials is the means for positioning the mouth of the container adjacent the two sheets. This positioning means preferably includes as a part thereof a means for pressing the sealing lips against the surfaces of the sheets to be brought into face-to-face relation. In the preferred form of the invention, the superimposing means act to support the sheets so that a positive pressure may be applied between the sealing lips and the supported sheets by the pressing means.

In the preferred form of process, the liquid comprises a solution of a developer and a silver halide solvent, and is preferably quite viscous and quite alkaline. When such a layer of liquid is spread between the photosensitive emulsion and the image-carrying sheet, it preferably bonds these sheets together, develops the latent negative image and concurrently therewith forms a positive image on the surface of the image-carrying sheet. Such a processing may be accomplished in a time ranging anywhere from 5 seconds to somewhat more than 1 minute, depending upon the constituents of the liquid and the type of silver halide emulsion employed. At the end of the processing period, the negative image is preferably separated from the positive image by a suitable means and the final positive is fed from the apparatus through a suitable opening therefrom.

Referring now to Fig. 1, there is shown one preferred form of apparatus embodying the present invention, this apparatus being illustrated as a photocopy camera. The apparatus comprises a front lower housing 10, a rear lower housing 12 and an upper housing 14. Carried by the upper housing 14 is a lens and shutter assembly schematically indicated at 16 and supported by a bellows 18. In the upper part of the housing 14 is a positioning means 20 for holding a roll of photosensitive material 22. In the rear bottom housing 12 there is provided a positioning means 24 for holding a roll of image-carrying sheet 26. Also provided in this lower portion 12 is a take-up spool 28 on which the exposed and processed photosensitive emulsion may be rolled up for subsequent use or disposal. For intermittently advancing the exposed negative from the focal plane, there are provided a pair of rolls 29. For feeding and superimposing the two sheets, there are preferably provided a pair of rolls schematically indicated at 30 and between which the sheets pass in face-to-face relation with a liquid-receiving space therebetween. These rolls 30 are preferably so mounted that as the sheets pass therebetween there exists a liq-

uid-receiving space between the sheets. This space is created in the preferred form of the invention by providing a space between the two rolls slightly greater than the combined thickness of the two sheets. In other forms of the invention, the space may not exist in the static condition of use of the device but may be created by the pressure of the viscous liquid passing between the sheets causing the separation of the rolls or of resilient surfaces thereof.

There is also provided a roll 32 which pre-determines the position at which the take-up spool causes the negative sheet 22 to be separated from the positive sheet 26. For propelling the processed positive image from the apparatus through a light-tight opening 36 in a rear wall 38 of the camera, there is provided a pair of pressure rolls 34.

At 40, there is indicated the novel container of the present invention which is shown as being supported on a plate 42. The preferred form of container shown at 40 has a neck 54 which ends in a mouth 56 having sealing lips 58 extending therefrom, these sealing lips 58 being preferably formed of a flexible sheet material and being supported by relatively rigid end-sealing and spacing portions 52 shown more clearly in Figs. 2 and 3, where like numbers refer to like elements. For positioning the mouth of the container adjacent the liquid-receiving space between the two sheets, there is provided a means indicated schematically as a pair of members 44 which are shown, in a preferred form, as comprising resilient rubber-like material having concave surfaces matching the curvature of the pressure rolls 30 and adapted to press the two lips 58 against the two sheets 22 and 26 as they pass around these pressure rolls before superimposition. These two resilient pressing members 44 are shown as being supported by operating supports 48 which are preferably rigid. For the purpose of creating a relative movement between members 44 and thus compressing the throat of the container therebetween, there is provided an operating mechanism which, in a preferred form, comprises a pair of cams 52 adapted to move both of these members 44 towards each other by pressing against the supports 48. In a preferred form of the invention, the operating supports 48 include projections 50 adapted to engage tabs 62 extending normally from the throat 54 of the container 40. The function of these tabs is explained more fully hereinafter.

The apparatus also preferably includes means for creating a uniform hydraulic pressure in the liquid in the container and, as shown schematically, these means comprise an operating shaft 64 connected to the plate 42 which supports the container 40. This shaft is suitably connected by a pair of parallel arms 66 to a weight 68, the arms 66 being pivoted around point 74. As can be seen, the downward pull of the weight 68 tends to move the shaft 64 upwardly, thus compressing the outer walls of the container 40 between the plate 42 and a fixed plate 76 within the housing 10 and creating a hydraulic pressure in the liquid carried by the container. For the purpose of lifting the weight 68, and thus relieving the hydraulic pressure in the liquid, there is provided a cam 70 adapted to engage a stub 72 on one of the arms 66, this cam 70 being shown in its operative position. In a less preferred form of the invention the plate 76 may be weighted so as to normally bear on container 40. In this case, plate 42 is fixed and cam 70 is arranged

so as to lift plate 76 to relieve the pressure on the fluid whenever desired.

Referring now to Figs. 2 and 3, further details of the preferred novel container and positioning means are shown. As can be seen from Fig. 2, the throat 54 of the container 40 is formed of a flexible sheet material folded upon itself and sealed by a temporary seal schematically indicated at 57. This seal is preferably broken by pulling tabs 62, although it may be broken by increase in hydraulic pressure of the liquid within the container. In the preferred embodiment, two separate sheets 53 are used for portions of the throat, the mouth and the lips of the container, these separate sheets 53 being sealed to the outer surfaces of the throat 54. The pair of tabs 62 are preferably formed from sheets 53 and are positioned adjacent the temporary seal 57. The bond between the outer surfaces of the throat 54 and the sheets 53 is preferably very strong so that pulling on the tabs 62 will rupture the seal 57.

For holding the lips 56 against frictional movement by the sheets to be processed, for spacing the container mouth, and for forming an edge seal with these sheets to prevent edge leakage of the liquid, the end members 58 are preferably formed of a relatively rigid material. These two end members preferably have matching pairs of concave surfaces which merge into points 80 adapted to extend between the pressure rolls so as to seal the edges of the sheets as they are being superimposed. The two end members 58 are preferably predeterminedly fixedly spaced apart by means of bars 60 extending between the tops and bottoms thereof. Extending inwardly a short distance from each end member 58 are flanges 82, the lips 56 being securely united to these flanges 82 and also preferably to the cross bars 60. The concave roll-matching surfaces of the end members 58 preferably include grooves 84 (shown in Fig. 3) which act to pump back between the sheets any liquid tending to escape therefrom.

An examination of Fig. 3 shows, in a fragmentary perspective view, the arrangement between the lips 56, the end members 58 and the pressing and positioning members 44. As shown, these members 44 engage the end members 58 as well as the lips 56 and resiliently urge these respective elements against the sheets passing around the two pressure rolls. As shown in Fig. 3, the ends 45 of the resilient members 44 are preferably made thicker than the central portion, so that these ends 45 are in engagement even when the cams 52 are in the inoperative position shown in Figs. 1 and 3. Thus these thickened ends 45 tend to maintain the operating surfaces 43 in engagement with the cam 52 and provide a space between the central portion of members 44 to allow the throat 54 to expand so that the processing liquid may pass to and through the mouth 55 of the container. When the cams 52 are rotated to their operative position, all portions of the members 44 are compressed together, thus effectively and completely sealing the throat 54.

In the above-described apparatus, rolls 30 and 34 are preferably suitably driven, such as by means of a hand crank or electric motor, these rolls having the same surface speed of rotation. The means for driving these rolls also preferably drives the take-up spool 28 through a friction clutch so as to compensate for a decreasing speed of rotation with increasing diameter of the coil

of processed negative. Film-advancing rolls 29 are intermittently driven in timed relation to the other rolls through a suitable linkage such as a Geneva gear. While it is preferred that the various rolls be driven, it is not essential, and it is possible to have the movement of the positive sheet drive rolls 29 and 30 and spool 28. In this case the operator of the machine grasps that portion of the sheet 26 extending from the apparatus and, by pulling a processed positive from the apparatus, thus processes the succeeding negative area.

In the use of the modification of the invention shown in the three figures, a roll of photosensitive material 22 is inserted in the positioning means 20 and a portion of the sheet is fed past the focal plane of the camera, between rolls 29 and 30, past roll 32 and is attached to the take-up spool 28. Similarly, the roll of the positive sheet 26 is inserted in the holding means 24 and fed between rolls 30, between rolls 34 and through the light-tight opening 36. The members 44 are preferably removed from the apparatus during the loading thereof so as to simplify this operation. Container 40 is then positioned on the supporting plate 42 and the end members 58 thereof are pressed against the two sheets passing over the rolls, thus compressing the sealing lips 56 against these sheets. A lug 90 (shown in Fig. 3) may be provided on the end members 58 for holding the end members 58 in this position. The operating supports 48, carrying the resilient members 44, are then slid into the position shown in Fig. 1, being held in this position by lugs 92 (shown in Fig. 3). The two cams 52 are now rotated, thus compressing the resilient members 44 by moving the operating supports 48 towards each other. The tabs 62 are then suitably secured to the projections 50 and the cams 52 are next rotated to their inoperative position, allowing the operating supports 48 to be moved apart due to the compression of the thickened end portions 45 of the resilient members 44. Movement apart of the supports 48 causes the lugs 50 to exert tension on the tabs 62, thus rupturing the temporary seal 57 in the throat of the container. During the above sequence of operations, the cam 70 is preferably maintained in its operative position so that there is no pressure upon the fluid within the container 40. Exposure of an area of the photosensitive sheet 22 in the focal plane of the camera is now made and the cam 70 is rotated to its inoperative position preferably coincidentally with the commencement of rotation of rolls 30 which superimpose the negative sheet 22 in face-to-face relation with the positive sheet 26. As the hydraulic pressure is generated within the liquid in the container 40, the liquid is forced through the throat 54 and out of the mouth 55 and contacts the surfaces of the two sheets and passes into the liquid-receiving space existing between the two rolls as they are superimposed, thus providing a uniform layer of the processing liquid between these two sheets. The two sheets travel as a uniform sandwich from the rolls 30 to the roll 32 where the processed negative is stripped from the sandwich while the completed positive is propelled, by the rolls 34, through the light-tight discharge opening 36.

In a preferred form of the invention, cams 52 and 70 are moved to their inoperative position whenever the rolls 30 are rotating and these cams are moved to their operative position whenever these rolls are still, thus sealing the liquid in

container 40 from ingress of oxygen or egress of liquid. These cams can thus be controlled by the means which control the rotation of the rolls, such as a motor switch or clutch. It is preferred however, that an additional operating member be provided for the cam 70 so that it may be moved to its operative position during the loading of the container 40 into the camera.

A preferred form of the container 40 is made from a paper-backed lead foil coated on its inner surface with an alkali-inert heat-sealable plastic, such as polyvinyl butyral, this inner coating extending preferably as far as temporary seal 57, the remainder of the throat of the container beyond seal 57 being preferably coated with an alkali-inert material, such as a wax which does not as readily seal to itself. The seal 57 is preferably provided by coating the polyvinyl butyral with a strip of a plastic, such as ethyl cellulose, which does not form as strong a seal as that formed by bonding polyvinyl butyral to itself. The ends 41 of the container are preferably formed by heat-sealing the polyvinyl butyral lining to itself. This container is preferably manufactured by feeding a properly coated wide strip to an apparatus which folds the strip longitudinally, heat-seals the strip transversely to form the end seals 41, and seals the overlying edges of the strip to form the temporary seal 57 by the application of heat and pressure. The liquid is fed into the container after the formation of the first end seal and prior to the formation of the second end seal. The flexible sheet 53 which constitutes the mouth, lips and part of the throat of the container can be a plastic sheet having a relatively smooth surface characterized by alkaline inertness. It may comprise plasticized ethyl cellulose, methyl methacrylate, polyvinyl chloride, polyvinylidene chloride copolymers or other suitable plastics. The two sheets 53 may be heat-sealed, or otherwise secured, to the cross bar 60 and the flanges 82 of the relatively rigid end members 58 and then those portions of the two sheets extending beyond the right-hand end of member 58, as shown in Fig. 2, are sealed to the outer surfaces of the container by the interposition of a suitable plastic, adhesive or solvent. The end members 58 are preferably formed of a relatively rigid alkali-inert plastic such as ethyl cellulose or methyl methacrylate. It should be pointed out that Fig. 2 is a section taken on several different planes so as to more clearly illustrate the various features of the invention. It can be seen from this figure that the edges of the mouth 55 adjacent the ends 50 are sealed together while the rest of the mouth is left unsealed. In other modifications of the invention, sheets 53 may be integral with the walls of container 40, tabs 62 being omitted or suitably secured to the outer surface of these walls.

The various other portions of the apparatus are made of suitable materials such as metal, wood or plastic, the pressing members 44 being preferably formed of a soft, resilient, natural or synthetic rubber or other soft rubber-like material. The pressure rolls 30 in the preferred modification are formed of a relatively rigid material such as steel. The various propelling rolls such as 29 and 34 are preferably edge-engaging rolls having a frictional surface and thus may be formed of rubber. Various walls of the apparatus are hingedly secured with suitable light-seals adjacent the hinges so as to provide ready access to the interior portions of the camera to assist in loading

and unloading of the various materials processed therein.

While a preferred form of the invention has been described above, it may be considerably modified without departing from the scope of the invention. For example, the superimposing rolls 30, as mentioned previously, may be formed of a resilient material, in which case the pressing members 44 may be either resilient or may be rigid. These superimposing means may take numerous other shapes, they may comprise a double pair of rolls or members and may be nonrotatably mounted. Equally, the rolls 30 can be resiliently urged towards members 44 to accomplish the pressing function. It is possible to provide several members in place of the pressing member 44, one of these members acting to press the lips against the sheets and the other of these members acting to compress the throat of the container to seal this throat. The resilient pressure furnished by rubber members 44 may be equally supplied by hydraulic, spring or other means without departing from the scope of the invention. Also members 44 may be a part of the container assembly. For simplicity of construction and operation however, the form illustrated is preferred.

Also the method of exposure may be considerably modified and the device can be adapted for contact exposure for making copies, say of microfilm, in which case the photosensitive sheet 22 may be fed in contact and in synchronism with a strip of microfilm past a suitable light source. In this case, the drive rolls 29 could, if desired, be continuously operated. Equally, the drive rolls 29 may comprise other film-advancing means such as sprockets or reciprocating teeth. In addition, the two processing sheets 22 and 26 may be discharged out of the apparatus directly after formation into the sandwich in those cases where each of the sheets includes a light-opaque stratum. Equally, other means for applying pressure to the outer surfaces of the container may be employed, for example, a spring, gas pressure or other suitable means, and the container may be lifted high enough so that gravity will create a sufficient liquid pressure within the throat to force the liquid out of the mouth of the container.

When the apparatus is used for photocopying and a positive silver image is to be made with the above-described apparatus, the photosensitive layer is preferably a silver halide, and in particular a silver bromide or chloride such as "Contrast Process Ortho" or "Kodabromide." In such a case the image-carrying layer may comprise a sheet of baryta paper and the liquid may contain the ingredients listed in the following example:

Example 1

1860 cc. of water
93 grams of sodium carboxymethyl cellulose
78 grams of sodium sulfite
74.6 grams of sodium hydroxide
14.5 grams of sodium thiosulfate
38.5 grams of citric acid
52 grams of hydroquinone

While a preferred processing liquid and process have been described, numerous other modifications thereof are feasible. The liquid may comprise only a portion of the reactive ingredients and other portions thereof may be included in solid form in one or both of the two sheets. Equally, the process may comprise only the development, or development and fixation, of the negative. Similarly, other photosensitive materials such as diazonium compounds, ferric salts,

dichromated colloids, etc., may be employed, the liquid being capable of accomplishing a predetermined processing thereof.

Example 2

When a diazonium photosensitive material is employed the photosensitive layer may be formed by dipping a sheet of paper into a saturated water solution of Du Pont Naphthaniil Diazo Black B. The liquid 39, in this case, comprises a mixture including 1500 cc. of a 5% water solution of sodium carboxymethyl cellulose to which 10 grams of resorcinol and 1 gram of sodium hydroxide have been added.

Example 3

An image-carrying layer, for use with the liquid of Example 1 and a "fast" silver iodobromide emulsion (i. e., "Verichrome" or "Triple S Pan") is prepared by painting a sheet of baryta paper with a 1% water solution of dithiooxamide (rubeanic acid, $C_2H_4N_2S_2$).

Instead of the liquid composition of Example 1, one containing the following ingredients in the proportions listed below may be used:

Example 4

Water	cc	26040
Sodium carboxymethyl cellulose	grams	1624.0
Sodium sulfite	do	1092.0
Sodium hydroxide	do	1044.4
Sodium thiosulfate	do	203.0
Citric acid	do	539.0
Hydroquinone	do	728
Chlorobenzotriazole	do	21.0

In still another modification of the process, .03 gram of potassium dithiooxalate may be added to 45 grams of the above liquid. The resulting liquid may be used for forming a sepia positive image from an exposed "fast" silver iodobromide emulsion by spreading the liquid between such an emulsion and an image-carrying layer comprising a sheet of plain baryta. When a neutral positive image is desired, the image-carrying layer may be prepared by dipping for about 30 seconds in a water solution containing 40 grams of neutral lead acetate per 100 cc. of water.

Example 5

To 10 cc. of a 20% water solution of neutral lead acetate is added 20 cc. of a 5% water solution of sodium thiosulfate. A small amount of the resulting precipitate is then rubbed into the surface of a sheet of baryta paper to form an image-carrying layer useful with a "fast" emulsion and the liquid of Example 1.

While a preferred use of the apparatus has been described above wherein the processing liquid is spread between the surface of the photosensitive sheet and a second surface moving at the same speed as the photosensitive surface, other uses thereof are feasible in those cases where the photosensitive sheet 26 is the only sheet passing between the rolls 30 and the liquid need only be spread in contact with the photosensitive sheet. In order that the apparatus may be so used, the lower roll 30 preferably has a surface to which the processing liquid does not readily adhere and which is inert to the processing liquid. This surface may be polished stainless steel or an alkali-inert smooth plastic. In this case, the sealing lip 56, and the end sealing members 58, on the lower part of the container form a liquid-tight seal with lower roll 30 and the spacing between the two rolls 30 controls the thickness of

the layer of liquid applied to the surface of the photosensitive film. This layer of liquid adheres to, or is absorbed by, the surface of the film and accomplishes the desired processing. If desired, the apparatus may be modified for such alternative use by providing a drum or belt in place of lower roll 30, the surface of the drum or belt being preferably moved at the same speed as the photosensitive sheet.

The photosensitive material may have a "speed" ranging from the very fast films to the slowest, and its spectral response may vary from radium and X-rays to infrared rays. Copies may be made of books, images on television and other cathode ray screens, instrument panels, moving picture film, X-ray images and any other images, a copy of which is desired, and the apparatus may be used for portrait or landscape photography, etc.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In a photographic apparatus of the class comprising means for holding a supply of photosensitive sheet material, means for holding a supply of another sheet material and means for guiding said sheets from their respective supplies to a position where said sheets are in superimposed relation, said guiding means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said guiding means of means for holding a container, a container held by said holding means, said container having therein a processing liquid and including a liquid-confining body, an elongated mouth and sealing lips, at least a portion of the container body being deformable, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, said last-named means resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for compressing a portion of said container adjacent said mouth for controlling the flow of said liquid from said container towards said space, said guiding and positioning means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

2. In a photographic apparatus of the class comprising means for holding a supply of photosensitive sheet material, means for holding a supply of another sheet material and means for guiding said sheets from their respective supplies to a position where said sheets are in superimposed relation, said guiding means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said guiding means of means for holding a container, a container held by said holding means, said container having therein a processing liquid and

including a liquid-confining body, an elongated mouth, a temporary seal adjacent said mouth, and flexible sealing lips, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, means for breaking said temporary seal so that said mouth of said container will be capable of discharging liquid towards said space, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, means for creating a hydraulic pressure in at least a portion of the liquid in said container, and means for sealing off the main body of said liquid from said mouth of said container for controlling the flow of said liquid from said container towards said space, said guiding and holding means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

3. In a photographic apparatus of the class comprising means for holding a supply of photosensitive sheet material, means for holding a supply of another sheet material and means for guiding said sheets from their respective supplies to a position where said sheets are in superimposed relation, said guiding means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said guiding means of means for holding a container, a container held by said holding means, said container having therein a processing liquid and including a liquid-confining body, an elongated mouth, a temporary seal adjacent said mouth, and flexible sealing lips, at least a portion of the container body being deformable, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, means for breaking said temporary seal so that said mouth of said container will be capable of discharging liquid towards said space, means for applying resilient pressure between said sealing lips and the surfaces of said sheets to be superimposed, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for sealing off the main body of said liquid from said mouth of said container for controlling the flow of said liquid from said container towards said space, said guiding and holding means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

4. In a photographic apparatus of the class comprising means for holding a supply of photosensitive sheet material, means for holding a supply of another sheet material and means for guiding said sheets from their respective supplies to a position where said sheets are in superimposed relation, said guiding means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said guiding means of means for holding a container, a container held by said holding means, said container having therein a processing liquid and comprising a main body portion for storing said liquid, a mouth portion, a throat connecting said body and said mouth, and sealing lips adjacent said mouth, at least a portion of the container body being deformable, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for controlling the flow of said liquid from said container towards said space, said last-named means comprising a pair of surfaces at least one of which is movable towards the other for compressing said throat, said guiding and holding means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

posed, said mouth of said container being capable of discharging liquid towards said space, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for preventing passage of said liquid through said throat and thus controlling the flow of said liquid from said container towards said space, said guiding and holding means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

5. In a photographic apparatus of the class comprising means for holding a supply of photosensitive sheet material, means for holding a supply of another sheet material and means for guiding said sheets from their respective supplies to a position where said sheets are in superimposed relation, said guiding means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said guiding means of means for holding a container, a container held by said holding means, said container having therein a processing liquid and comprising a main body portion for storing said liquid, a mouth portion, a throat connecting said body and said mouth, and sealing lips adjacent said mouth, at least a portion of the container body being deformable, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for controlling the flow of said liquid from said container towards said space, said last-named means comprising a pair of surfaces at least one of which is movable towards the other for compressing said throat, said guiding and holding means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

6. In a photographic apparatus of the class wherein a photosensitive sheet is exposed and a predetermined processing of said exposed photosensitive sheet is accomplished by providing between said sheet and another sheet a layer of liquid capable of accomplishing said processing and wherein there is provided means for positioning a supply of said photosensitive sheet, means for positioning a supply of said other sheet, superimposing means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween and means providing at least an exposure area for exposure of said photosensitive sheet at some point in its passage from its supply to said superimposing means, the combination with said superimposing means of means for holding a container, a container held by said holding means, said container having therein said processing liquid and including a liquid-confining body, an elongated mouth and sealing lips, at least a portion of the container body being deformable, means for positioning said mouth of said container adjacent said two sheets as

they are superimposed, said mouth of said container being capable of discharging liquid towards said space, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for preventing passage of said liquid through said throat and thus controlling the flow of said liquid from said container, said guiding and positioning means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

7. In a photographic apparatus of the class wherein a photosensitive sheet is exposed and a predetermined processing of said exposed photosensitive sheet is accomplished by providing between said sheet and another sheet a layer of liquid capable of accomplishing said processing and wherein there is provided means for positioning a supply of said photosensitive sheet, means for positioning a supply of said other sheet and superimposing means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said superimposing means of means for holding a container, a container held by said holding means, said container having therein said processing liquid and including a liquid-confining body an elongated mouth and sealing lips, at least a portion of the container body being deformable, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, said last-named means comprising a pair of rubber-like backing members capable of resiliently pressing said lips against said sheets, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for controlling the flow of said liquid from said container, said guiding and positioning means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

8. In a photographic apparatus of the class wherein a photosensitive sheet is exposed and a predetermined processing of said exposed photosensitive sheet is accomplished by providing between said sheet and another sheet a layer of liquid capable of accomplishing said processing and wherein there is provided means for positioning a supply of said photosensitive sheet, means for positioning a supply of said other sheet and superimposing means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said superimposing means of means for holding a container, a container held by said holding means, said container having therein said processing liquid and including a liquid-confining body an elongated mouth and sealing lips, at least a portion of the container body being deformable, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, means for

resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, said last-named means comprising a pair of rubber-like backing members capable of resiliently pressing said lips against said sheets, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for controlling the flow of said liquid from said container, said two last-named means being interconnected so that when said flow-controlling means is operated to prevent flow of said liquid, said pressure-providing means is rendered inoperative to supply said pressure, said guiding and positioning means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

9. In a photographic apparatus of the class wherein a photosensitive sheet is exposed and a predetermined processing of said exposed photosensitive sheet is accomplished by providing between said sheet and another sheet a layer of liquid capable of accomplishing said processing and wherein there is provided means for positioning a supply of said photosensitive sheet, means for positioning a supply of said other sheet, superimposing means comprising a pair of relatively rigid rolls having surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween and means providing at least an exposure area for exposure of said photosensitive sheet at some point in its passage from its supply to said superimposing means, the combination with said superimposing mean of means for holding a container, a container held by said holding means, said container having therein said processing liquid and including a liquid-confining body, an elongated mouth and sealing lips, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, at least a portion of the container body being deformable, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, said pressing means comprising a pair of resilient rubber-like backing members having concave surfaces substantially matching surfaces of said rolls, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for controlling the flow of said liquid from said container, said guiding and positioning means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

10. In a photographic apparatus of the class wherein a photosensitive sheet is exposed and a predetermined processing of said exposed photosensitive sheet is accomplished by providing between said sheet and another sheet a layer of liquid capable of accomplishing said processing and wherein there is provided means for positioning a supply of said photosensitive sheet, means for positioning a supply of said other sheet, superimposing means comprising a pair of relatively rigid rolls having surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween and means providing at least an exposure area for exposure of said photosensitive sheet at some point in its passage from its supply to said superimposing

means, the combination with said superimposing means of means for holding a container, a container held by said holding means, said container having therein said processing liquid and including a liquid-confining body, an elongated mouth and sealing lips, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, at least a portion of the container body being deformable, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, said pressing means comprising a pair of resilient rubber-like backing members having concave surfaces substantially matching surfaces of said rolls, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, and means for controlling the flow of said liquid from said container, said controlling means comprising means for moving at least one of said resilient backing members towards the other backing member to compress said mouth, said guiding and positioning means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

11. In a photographic apparatus of the class wherein a photosensitive sheet is exposed and a predetermined processing of said exposed photosensitive sheet is accomplished by providing between said sheet and another sheet a layer of liquid capable of accomplishing said processing and wherein there is provided means for positioning a supply of said photosensitive sheet, means for positioning a supply of said other sheet, superimposing means comprising a pair of relatively rigid rolls having surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween and means providing at least an exposure area for exposure of said photosensitive sheet at some point in its passage from its supply to said superimposing means, the combination with said superimposing means of means for holding a container, a container held by said holding means, said container having therein said processing liquid and including a liquid-confining body, an elongated mouth and sealing lips, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, at least a portion of the container body being deformable, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, said pressing means comprising a pair of resilient rubber-like backing members having concave surfaces substantially matching surfaces of said rolls, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, said means for holding said container comprising a pair of surfaces between which said container may be positioned and said pressure-providing means comprising means for moving at least one of said surfaces towards the other of said surfaces to compress said container, and means for controlling the flow of said liquid from said container, said guiding and positioning means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

12. In a photographic apparatus of the class

wherein a photosensitive sheet is exposed and a predetermined processing of said exposed photosensitive sheet is accomplished by providing between said sheet and another sheet a layer of liquid capable of accomplishing said processing and wherein there is provided means for positioning a supply of said photosensitive sheet, means for positioning a supply of said other sheet, superimposing means comprising a pair of relatively rigid rolls having surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween and means providing at least an exposure area for exposure of said photosensitive sheet at some point in its passage from its supply to said superimposing means, the combination with said superimposing means of means for holding a container, a container held by said holding means, said container having therein said processing liquid and including a liquid-confining body, an elongated mouth and sealing lips, means for positioning said mouth of said container adjacent said two sheets as they are superimposed, said mouth of said container being capable of discharging liquid towards said space, at least a portion of the container body being deformable, means for resiliently pressing said sealing lips of said container against the surfaces of said sheets to be superimposed, said pressing means comprising a pair of resilient rubber-like backing members having concave surfaces substantially matching surfaces of said rolls, means for deforming said deformable body portion to increase the hydraulic pressure in at least a portion of the liquid in said container, said means for holding said container comprising a pair of surfaces between which said container may be positioned and said pressure-providing means comprising means for moving at least one of said surfaces towards the other of said surfaces to compress said container, said moving means being capable of applying a substantially uniform force to outer walls of said container, and means for controlling the flow of said liquid from said container, said guiding and positioning means being so arranged that said lips and said sheets protect said apparatus from contact with said liquid.

13. In a photographic device of the class comprising means for holding a supply of photosensitive sheet material, means for holding a supply of another sheet material and means for guiding said sheets from their respective supplies to a position where said sheets are in superimposed relation, said guiding means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said guiding means of a disposable container having therein a processing liquid, said container comprising a main body portion for storing said liquid, a mouth portion, a throat connecting said body and said mouth, and sealing lips adjacent said mouth, said lips being secured to relatively rigid end members having surfaces substantially corresponding to said pair of superimposing surfaces, said end members being adapted to bear against said two sheets to form a liquid-tight seal with marginal portions thereof, at least a portion of the container body being deformable, means for holding said container, means for positioning said mouth of said container with said mouth of said container in position to discharge liquid towards said space, means for pressing said sealing lips

17

of said container against the surfaces of said sheets to be superimposed, means for deforming said deformable body portion to increase the hydraulic pressure to at least a portion of the liquid in said container, means for creating resilient pressure between said end members and said surfaces, and means for compressing said throat for controlling the flow of said liquid from said container towards said space, said guiding and holding means being so arranged that said lips and said sheets protect said various means from contact with said liquid.

14. In a photographic device of the class comprising means for holding a supply of photosensitive sheet material, means for holding a supply of another sheet material and means for guiding said sheets from their respective supplies to a position where said sheets are in superimposed relation, said guiding means comprising a pair of surfaces between which and with respect to which said sheets are adapted to move in superimposed relation with a liquid-receiving space therebetween, the combination with said guiding means of a disposable container having therein a processing liquid, said container comprising a main body portion for storing said liquid, a mouth portion, a throat connecting said body and said mouth, and sealing lips adjacent said mouth, said lips being secured to relatively rigid end members having surfaces substantially corresponding to said pair of guiding surfaces, said end members

18

being adapted to bear against said two sheets to form a liquid-tight seal with marginal portions thereof, at least a portion of the container body being deformable, means for holding said container, means for positioning said mouth of said container adjacent said two sheets as they are superimposed with said mouth of said container in position to discharge liquid towards said space, a pair of resilient backing members, each said member having surfaces engaging said lips and said end members and a surface engaging said throat and supporting said mouth, a pair of relatively rigid supporting members carrying said resilient members and normally pressing said ends and lips against said sheets, means for moving said resilient members toward each other to compress said throat and close said mouth, and mean for deforming said deformable body portion to increase the hydraulic pressure in said liquid in said container.

EDWIN H. LAND.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,211,081	Case	Jan. 2, 1917
1,641,403	Derhoef	Sept. 6, 1927
1,677,310	Troland	July 17, 1928