Feb. 12, 1957 M. N. FAIRBANK 2,780,972

PHOTOGRAPHIC APPARATUS AND PROCESS

Filed Sept. 29, 1953 2 Sheets-Sheet 1

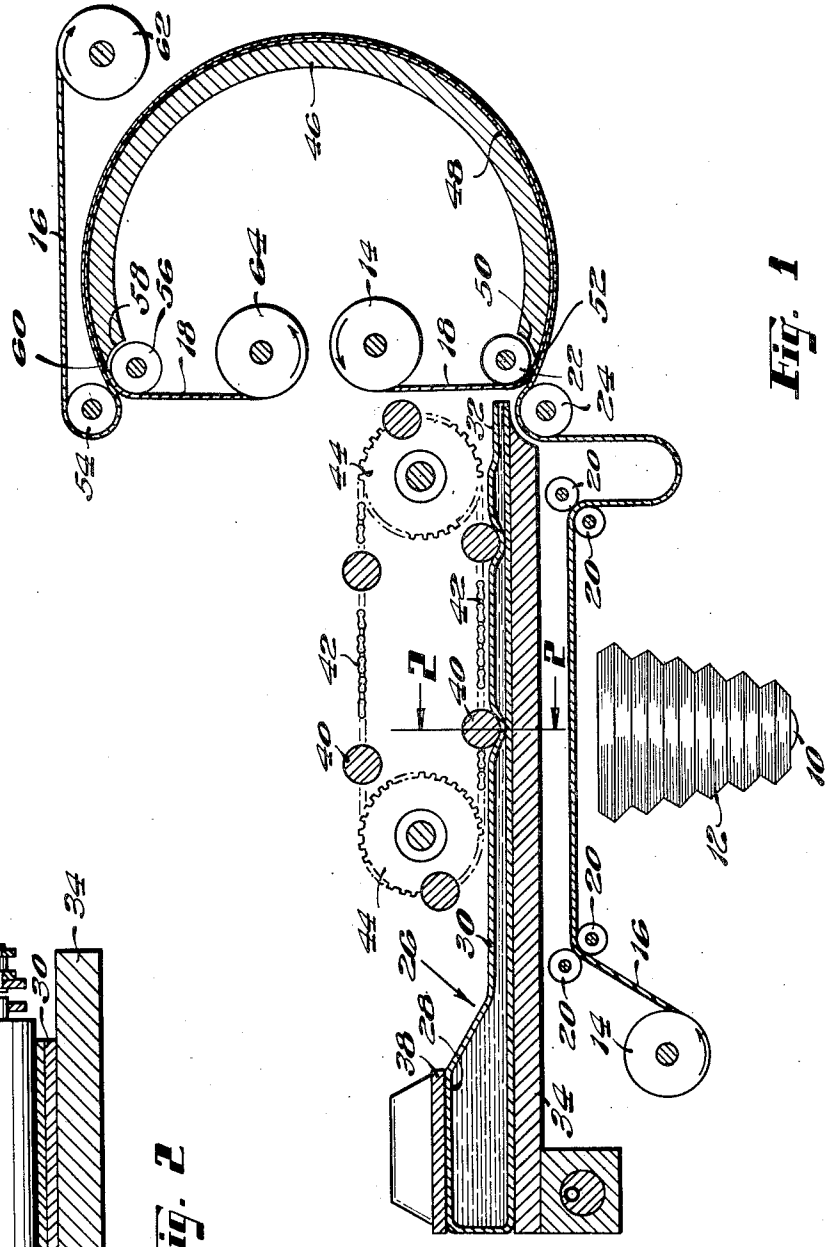


Fig. 1

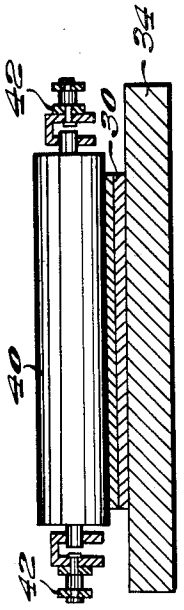


Fig. 2

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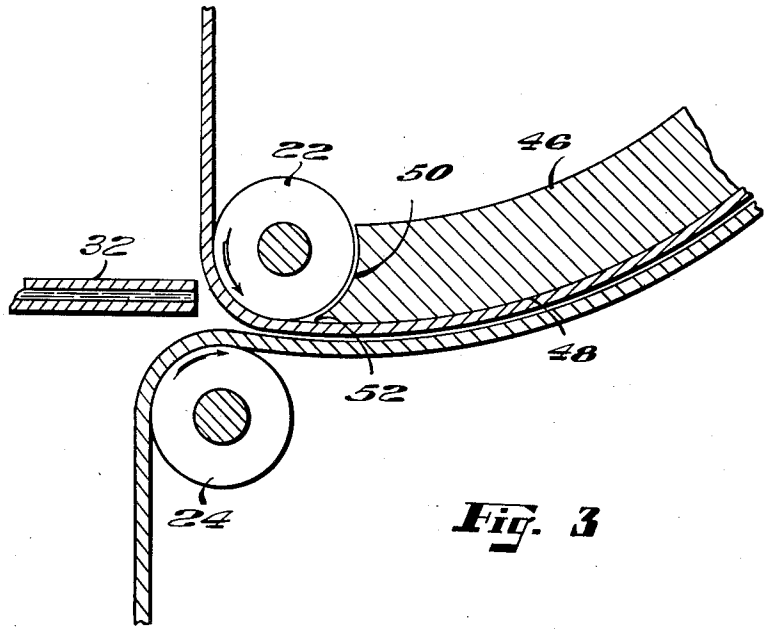


Fig. 3

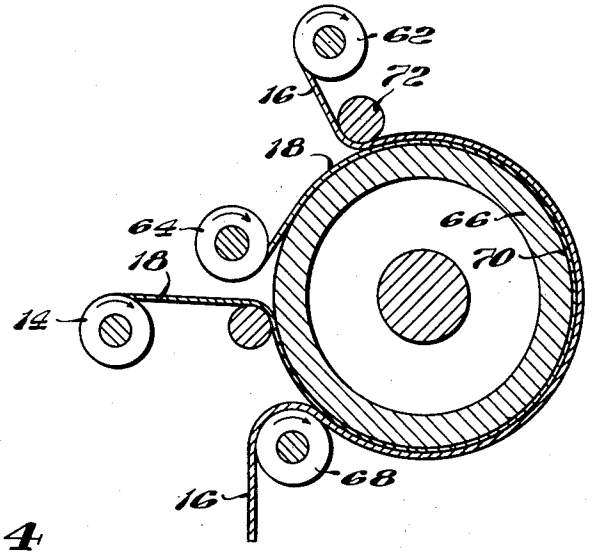


Fig. 4

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PHOTOGRAPHIC APPARATUS AND PROCESS

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Application September 29, 1953, Serial No. 382,944

11 Claims. (Cl. 95—13)

This invention relates to photography and more particularly to novel photographic apparatus.

An object of the invention is to provide a novel photographic apparatus which is adapted to expose a first strip of photosensitive material and to process said strip by superposing on said first strip a second strip with a layer of liquid processing composition between said strips, and maintaining the strips in superposed relation during a predetermined processing time.

Another object of the invention is to provide apparatus adapted to continuously guide an exposed strip of photosensitive material into superposition with a second strip and to spread a layer of liquid processing composition between the superposed strips.

Still another object of the invention is to provide, in apparatus of the above type, superposing means adapted to spread processing liquid between the first and second strips and to advance said superposed strips along a curved path.

A further object of the invention is to provide, in apparatus of the above type, means adapted to superpose and advance the strips along a curved path without relative movement between associated surfaces of the superposed strips.

Still further objects of the invention are to provide, in apparatus of the above type, means associated with said superposing means and defining a uniformly curved support surface whereon said superposed strips may be advanced in a curved path, and means for advancing said superposed sheets along said curved path and for separating said moving sheets at the end of a predetermined processing time.

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 diagrammatic, fragmentary, sectional view of photographic apparatus embodying the herein-disclosed invention;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic, fragmentary, sectional view illustrating, in detail, the herein-disclosed invention; and

Fig. 4 is a diagrammatic, fragmentary, sectional view illustrating another embodiment of the herein-disclosed invention.

The photographic apparatus herein disclosed generally includes means for exposing an elongated sheet or strip

of photosensitive material and accomplishing a predetermined processing of the sheet by providing on said sheet a layer of liquid capable of accomplishing said processing. The apparatus may comprise means defining a surface on which the exposed photosensitive sheet is superposed and means for spreading a layer of processing liquid between the surface and the sheet. In the preferred form of the apparatus the exposed photosensitive sheet is processed by superposing it on a second sheet or strip and spreading a thin layer of processing composition between the sheets. By way of example, the photosensitive sheet includes a silver halide layer, the second sheet includes a silver precipitating layer, and the processing composition includes a developer, a silver halide solvent and an alkali. In the presence of this layer of processing composition a latent image in the photosensitive sheet is developed to silver and a soluble silver complex is formed from unexposed silver halide, is transferred by imbibition to the second sheet and is there developed to silver to produce a silver image. The photographic process and various species and alternative forms of photosensitive and other sheets herein referred to are described in detail in Patent No. 2,543,181, issued to Edwin H. Land on February 27, 1951 for Photographic Product Comprising a Rupturable Container Carrying a Photographic Processing Liquid.

While the apparatus has been illustrated in the accompanying drawings as a photocopy camera, it is understood that the invention is adapted for use in other types of photographic apparatus such as motion picture cameras and the like wherein frames of a photosensitive strip are exposed in rapid succession, and is especially useful in apparatus of the type described in application Serial No. 245,692 filed September 8, 1951 by Edwin H. Land for Photographic Apparatus, now abandoned. The apparatus may also be used alone, without photographic exposure means, for processing strips of photosensitive material which have been exposed in inpendent apparatus.

As a means for superposing the first photosensitive strip on a second strip and spreading a layer of processing composition between the strips, there is provided a pair of surfaces between which and with respect to which the strips are adapted to be advanced in superposed relation with a liquid-receiving space therebetween. The superposing means is so arranged that as the two strips are superposed there is provided a V-shaped liquid-holding space converging to an apex connecting with the liquid-receiving space between the surfaces of two sheets. Means are provided for feeding the processing liquid directly into said liquid-holding space wherein it is held until withdrawn by the strips defining and passing by this space. The volume rate of flow of processing liquid is preferably adjusted with respect to the movement of the strips so that at all times the quantity of liquid in the liquid-holding space is the minimum sufficient to deposit a layer of the desired thickness between the strips. Various apparatus and means including disposable liquid containers for feeding the processing liquid and spreading a layer of said liquid between a photosensitive sheet and a second sheet are described in detail in Patents Nos. 2,520,641, issued August 25, 1950, 2,558,858, issued July 3, 1951 and 2,563,343 issued August 7, 1951 to Edwin H. Land for Photographic Apparatus.

To process the first strip, it is superposed on a second strip with a thin layer of processing liquid therebetween and the superposed strips advanced at a constant speed through the apparatus. The first strip continues in superposition with the second strip during a predetermined processing time after which it is separated from the second strip at the end of the predetermined processing period. It is thus apparent that the distance or length of the path

of the superposed sheets between the initial point of superposition and the terminal point of superposition is functionally related to both the speed of advancement of the superposed first and second strips and the time required for predeterminedly processing said strips. More precisely, the distance between the points of initial and terminal superposition is equal to the product of velocity at which the superposed strips are fed between their terminal points of superposition and the predetermined processing time required for superposition of particular first and second strips. It is also apparent that when the sheet materials and processing composition used are of the type which require a substantially long processing period, or it is necessary, as in a motion picture camera, to advance the strips at substantially rapid speeds, the path of the superposed strips between the initial point of superposition and the terminal point of superposition may become excessive, thereby requiring apparatus of considerable bulk. Since it is desirable to maintain the apparatus at a minimum size and preferably of a size which renders it portable, it is necessary to keep small the actual distance between the superposing means and the separating means. This actual distance may be kept at a minimum by providing means for advancing the superposed strips along a curved path between their initial and terminal points of superposition.

A curved path is provided for the strips between their initial and terminal points of superposition by means defining a curved support surface along which the sheets are advanced so that their path conforms to the curvature of said support surface. Since movement of the surface of the first strip with respect to an associated surface of the second strip on which it is superposed may result in disruption of the processing and distortion or blurring of the image formed, it is essential that the strips be superposed and advanced along a curved path without relative movement between associated surfaces of the superposed strips. It is important, therefore, that the support surface in contact with which the superposed strips are advanced be circular and that its diameter be uniform throughout its length. However, where the diameter of the support surface or the path of the sheets is relatively large, small variations in curvature will result in negligible movement between the strips, causing no appreciable disturbance of the contact between the associated surfaces of the first and second strips, and may be considered of no consequence.

The superposing means may be so constructed and arranged that the sheets are superposed and advanced therethrough in a curved configuration conforming to the curvature of the support surface, one end of which is adjacent the superposing means. Alternatively, the sheets may be superposed and advanced through the superposing means in a straight path and then be made to conform to a curved supporting surface. This may be accomplished, without causing disruption of the processing or distortion of the image due to relative movement of associated surfaces of the superposed strips, by maintaining at a minimum the distance between the initial point of superposition and the end of the curved surface at which the sheets assume a curved configuration. It is in this manner that the strips are curved immediately after being superposed and before processing has advanced to the extent where it is affected by relative movement of the sheets.

In another embodiment of the invention, the first strip of photosensitive material and the second strip are superposed on a curved support surface advancing at the same speed as the strips, and a layer of processing composition is spread between associated surfaces of the first and second strips. Further still, the first strip of photosensitive material and the second strip may be superposed and supported on a surface of uniform curvature and thereafter the processing liquid is spread between the strips after they are advanced along the curved support surface. In this embodiment, successive frames of the exposed first

strip are superposed on areas of the second strip and the processing liquid, carried in rupturable containers associated with areas of the second strip, is spread between the strips by advancing said strips between the curved support surface and a pressure-applying member.

Referring now to Figs. 1 and 2 of the drawings, there is shown, diagrammatically, a preferred form of apparatus embodying the present invention, this apparatus being illustrated as a photocopy camera comprising a housing, not shown, carrying a lens and shutter assembly schematically indicated at **10** supported by bellows **12**. As a means for positioning supplies of a photosensitive strip and a second strip, there are provided spools **14** of conventional design on which are coiled a first strip **16** of photosensitive material and a second strip **18**. Means are provided for positioning frames of the first strip in the focal plane of lens **10**, this means comprising, by way of example, two pairs of rollers or sprockets **20** between which the strip is advanced and held in position for exposure. In the form shown, either or both rollers of each pair may be driven and the strip may be advanced either intermittently for exposure of separate frames or advanced continuously.

As a means for feeding and guiding exposed photosensitive strip **16** into superposition with second strip **18**, there is preferably provided a pair of pressure-applying rolls **22** and **24** so positioned that as the sheets pass between them in face-to-face relation there exists a liquid-receiving space between the strips. This liquid-receiving space may be created by providing a space between the two rolls slightly greater than the combined thickness of the two strips. In another form of the invention, the two rolls may be resiliently urged toward one another so that the space may not exist in a static condition of the rolls, but may be created by the pressure of a viscous processing liquid passing between the strips, causing separation of the rolls or of the resilient surfaces thereof.

Means are provided for feeding a predetermined volume of processing liquid at a controlled rate into a liquid-holding space wherein it is held until withdrawn by the surfaces of the converging strips defining this space. The liquid-feeding means comprises a disposable container **26** having a body portion **28** and a deformable tubular neck **30** ending in a discharge nozzle **32** and means for forcing a predetermined volume of processing liquid to flow from body portion **28**, through neck portion **30** and nozzle **32**. The container, body and neck are formed of a flexible sheet material which is not affected by the processing liquid, for example a plastic such as plasticized ethyl cellulose or methyl methacrylate. Container **26** is supported on plate **34** with neck **30** being so supported that nozzle **32** extends into the liquid-holding space between the converging sheets. Means are provided for causing the liquid to flow from body portion **28** of the container into neck **30** and from there through nozzle **32** into the liquid-holding space. The liquid may be forced from said body portion by hydraulic pressure created in the liquid contained therein by such means as a weighted plate **38** adapted to rest on the container body portion. For impelling the processing liquid through neck **30**, there are provided a plurality of rollers **40** adapted to successively engage longitudinal portions of said neck to press together the walls thereof and squeeze the processing liquid toward nozzle **32**. A predetermined quantity of liquid is trapped in a portion of neck **30** between two of said rollers **40** and advanced at a controlled rate so that the processing liquid is fed to the superposed strips at the desired volume rate. In the form shown, a plurality of rollers **40** are rotatably mounted at their ends on a pair of parallel drive chains **42** supported on and driven by sprockets **44** mounted in a fixed relation to support member **36** so that the axes of rollers **40** move during a portion of their travel in a plane parallel to the surface of member **36**. The rollers are uniformly spaced along the drive chains in such a manner that at every moment there are at least two of said rollers in engagement with said neck. In

operation sprockets 44 and drive chains 42 are rotated in a counterclockwise direction, as viewed in Fig. 1, and rollers 40 are caused to engage the walls of neck 30 and press said walls together when moving from left to right. A predetermined volume of processing liquid trapped in the neck between a pair of said rollers is impelled toward nozzle 32 at a controlled rate until disengagement of the leading roller from the neck permits the liquid to be forced through said nozzle by the action of the following roller on the neck.

For superposing the first strip 16 on second strip 18 and advancing the two strips along a curved path, there are provided, in a preferred form of the invention, a pair of pressure-applying rolls 22 and 24 and a support member 46 defining a uniformly curved support surface 48 along which the superposed strips are advanced during processing. The first and second strips are superposed and advanced between rolls 22 and 24 for spreading the processing liquid between the strips, and then drawn in contact with support surface 48 so that the path of the strips conforms to the curvature of said support surface.

Inasmuch as it is essential to proper processing that there be no relative movement between associated surfaces of the superposed sheets during processing, it is desirable either that the sheets be in a curved configuration at the time they are superposed and the liquid spread therebetween or that the superposed sheets be made to conform to the curved surface 48 of support member 46 after the processing liquid has been spread but before processing has progressed materially. To effect the curvature of the sheets before processing has progressed materially, the end 50 of support member 46 is shaped, as shown in Fig. 3, so as to conform to the curvature of roll 22 and is positioned closely adjacent or in contact with roll 22 so that end 52 of support surface 48 is located between rolls 22 and 24, and the distance between the point of superposition of the sheets and the end 52 of support surface 48 on which they assume a curved path is maintained at an absolute minimum. The center of curvature of support surfaces 48 may be so positioned that the support surface lies in a curved surface which is substantially tanget with the surface of roll 22 at the point of superposition of the sheets. The sheets may then be superposed in a substantially straight path and immediately thereafter be made to assume a curved configuration conforming to support surface 48.

In a preferred embodiment of the invention illustrated in Fig. 1, pressure-applying rolls 22 and 24 are so positioned with respect to support surface 48 that the strips, as they are drawn between the pressure-applying rolls, assume a curved configuration during their passage between their initial point of superposition and the end 52 of support surface 48. Rolls 22 and 24 are so positioned, as shown in Fig. 1, that a plane through the axis of the rolls makes an acute angle with a plane through the point of superposition of the strips and the center of curvature of the support surface 48. In other words, the support surface lies in a curved surface which is not tangent to roll 22 at the point of superposition of the strips but is tangent thereto at a point arcurately spaced along the surface of roll 22 from the point of superposition of the strips. With 22 and 24 so positioned, the superposed strips passing between them and advancing into contact with support surface 48 are drawn around in contact with an arcuate portion of the surface of roll 22, thereby causing the strips to assume a curved configuration which may be so controlled as to approximate the curvature of surface 48. To advance superposed strips between rolls 22 and 24, either of said rolls may be driven by suitable means, or both of said rolls may be freely mounted to be rotated by the strips as the strips are drawn therebetween by means hereinafter described.

As a means for drawing the superposed strips along a curved path conforming to surface 48 of support member 46, there is provided a pair of drive rolls 54 and 56. These drive rolls also serve as a means for separating the first strip 16 from second strip 18 at the end of their predetermined processing time. The superposed strips follow a curved path from their initial point of superposition between pressure-applying rolls 22 and 24 positioned at end 50 of support member 46 to their terminal point of superposition between drive rolls 54 and 56 positioned at the other end 58 of support member 46. Drive rolls 54 and 56 are adapted to receive first and second strips 16 and 18 therebetween and to separate the strips from one another as they are advanced. Either or both rolls may be rotated by suitable drive means so as to advance the superposed strips at a constant speed. To facilitate drawing the superposed strips along surface 48, the surfaces of the drive rolls 54 and 56 may be formed of a friction-generating material such as rubber. To prevent any relative movement between associated surfaces of first and second strips 16 and 18 just prior to their separation from one another due to variation in the curvature of their path, end 58 of support member 46 is shaped to conform with the surface of drive roll 56 so that end 60 of support surface 48 extends into the bite of drive rolls 54 and 56.

To permit the superposed sheets to be advanced at a more rapid speed or to allow for a reduction in the length of the path between their initial and terminal points of superposition, the predetermined processing time required for a particular combination of first and second sheets and liquid processing composition may be varied by heating both the processing liquid and the superposed sheets as they are advanced along the surface 48 of support member 46. For this purpose suitable heating elements (not shown) may be provided for elevating the temperature of support member 46 and, if desired, pressure-applying rolls 22 and 24 as well.

After separation of the first and second strips 16 and 18, first strip 16 extends from roll 54 to take-up spool 62 and second strip 18 extends from roll 56 to take-up spool 64. Suitable drive means are provided for rotating the take-up spools 62 and 64 for coiling the first and second strips thereon.

In another embodiment of the invention the pressure-applying rolls are utilized for curving the first and second strips as they are being superposed and for advancing the strips in a curved path conforming to the curvature of a support surface. This curving of the strips as they are superposed may be effected by advancing one of the strips at a greater speed than the strip on which it is being superposed so that the associated surfaces of the two strips are advanced at the same speed while the outside surfaces of the strips in contact with the surfaces of the pressure-applying rolls are advanced at different speeds, thereby causing the superposed strips to curve toward the slower moving surface.

As illustrated in Fig. 3, a controlled curvature can be imparted to the superposed first and second sheets 16 and 18 by advancing the surface of sheet 16 which is in contact with roll 24 at a faster speed than the surface of sheet 18 in contact with roll 22, thereby causing the sheets to be curved toward sheet 18. This may be accomplished by rotating roll 24 at a greater speed than roll 22 when both rolls are, as shown, of equal diameter. Alternatively, the same result may be achieved by making roll 24 of a greater diameter than roll 22 and rotating both rolls at the same speed. It is apparent that when the curvature of the sheets is controlled by varying the relative surface speeds of the pressure-applying rolls 22 and 24, the radius of curvature of the sheets is inversely proportional to the difference between the surface speeds of said rolls. By superposing strips 16 and 18 and curving their path in this manner at their point of superposition and then advancing the superposed strips along a curved surface 48 of like curvature positioned in a surface

tangent to the surface of the slower moving roll **22** at the said point of superposition, the curvature of the strips remains constant throughout the processing period and there is no relative movement between associated surfaces of the strips.

Referring now to Fig. 4 there is illustrated still another embodiment of the invention wherein a rotatable drum **66** cooperates with a pressure-applying roll **68** to superpose an exposed first strip **16** of photosensitive material on a second strip **18**, to spread a layer of processing liquid between the strips, and to advance the strips along a curved path conforming to the surface **70** of said drum **66**. It is to be understood that the hereindisclosed embodiment of the apparatus includes means (not shown in Fig. 4) heretofore described for mounting a supply of a first strip of photosensitive material, for exposing said first strip, and for feeding a predetermined volume of processing liquid to the superposed strips.

In the form shown, first strip **16** and second strip **18** are advanced between roll **68** and drum **66** so that a liquid-holding space is defined and formed by the convergent surfaces of the two strips. Suitable liquid-feeding means (not shown) are provided for causing the processing liquid to be discharged through a nozzle into said liquid-holding space wherefrom it is withdrawn by the strips passing by and defining this space. The processing liquid forms a layer in a liquid-receiving space between associated surfaces of the two strips, said space being created either by providing a space between roll **68** and drum **66** slightly greater than the combined thickness of the two strips, or by causing roll **68** to be resiliently urged toward drum **66** so that the space is created by the pressure of a viscous processing liquid passing between the strips, causing separation of the roll and the drum or of the resilient surfaces thereof.

Drum **66** not only acts as one of a pair of pressure-applying members, but serves as a member having a curved surface **70** along which the strips are advanced in a curved path during processing. The superposed strips advanced between roll **68** and drum **66** are drawn around and in contact with the surface **70** of drum **66** so that the path of said strips conforms to the round surface of said drum.

As a means for separating the superposed strips from one another, there is provided at least one separating roll **72** positioned substantially tangent to the surface of said drum at a predetermined point of separation of the strips. The circumferential distance along the surface **70** of drum **66** from the point of superposition of the strips to said point of separation is adjusted so that the strips **16** and **18** are separated from one another when a predetermined processing has elapsed, this distance being functionally related to the processing time required and the constant speed of the strips. The first strip is separated from the second strip by drawing said first strip around roll **72** and coiling it on a take-up spool **62** while the second strip **18** is advanced in a direction tangent to the surface **70** of said drum and is coiled on take-up spool **64**.

Because the superposed strips conform to and are in contact with the surface of a circular drum from the time processing is initiated at their point of superposition until processing is completed at their point of separation, there can be no relatve movement between associated surfaces of the superposed strips with subsequent freedom from processing defects caused thereby. The superposed strips may be advanced through the apparatus by driving take-up spools **62** and **64** by suitable means, or by driving said spools and either drum **66**, pressure roll **68** or separating roll **72**, or any combination thereof.

While a preferred use of the apparatus has been described above wherein a processing liquid is spread between the surface of the photosensitive strip and the surface of a second strip, other uses of the apparatus are feasible in those cases where the processing liquid may be spread between the surface of the photosensitive strip and any second surface moving at the same speed. This processing may be accomplished by the apparatus shown in Fig. 4 by eliminating the second strip and spreading the processing liquid between photosensitive strip **16** and the surface **70** of drum **66**. In order that the apparatus may be so used, surface **70** of drum **66** is formed of a material to which the processing liquid does not readily adhere and which is inert to said processing liquid, for example polished stainless steel or an alkali-inert plastic. In this case, roll **68** and drum **66** are spaced a sufficient distance apart so that a liquid-receiving space exists between the surface of photosensitive strip **16** and surface **70** of drum **66**. The liquid is fed or carried into the liquid-holding space defined on one hand by the surface of the photosensitive strip and on the other hand by the surface **70** of drum **66**. As the photosensitive strip passes by this liquid-holding space, a thin layer of liquid is applied to the surface thereof and a layer of liquid adheres to or is absorbed by the photosensitive strip and accomplishes the desired processing.

While superposing means have been shown as comprising either a pair of pressure-applying rolls or a rotatable drum and a roll, it is to be understood that there may be provided other superposing surfaces such as curved plates or bars which are nonrotatable and the strips may be superposed by advancing them between a roll and a uniformly curved surface of a support member.

In the various forms of the invention, portions of the apparatus may be suitably hinged or removably mounted to facilitate loading thereof and suitable light seals are provided where necessary to prevent fogging of the photosensitive materials employed.

While the processing liquid has been shown as being supplied in a disposable container from which it is fed at a controlled volume rate into a liquid-holding space between the convergent surfaces of the sheets as they are superposed, the processing liquid also may be supplied in rupturable containers associated with and secured adjacent to areas of the second sheet. Frames of the photosensitive sheet are superposed on areas of a second sheet and the processing liquid contained in said containers is spread between the superposed sheets by passing said sheets between a pair of pressure-applying members. The photosensitive sheet may be advanced and processed in a curved path by superposing the sheets on the surface of a rotatable drum or on a uniformly curved surface of a stationary support member and advancing said sheets between said surface and a pressure-applying member capable of rupturing the containers and spreading the liquid therein between the sheets.

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

What is claimed is:

1. A photographic apparatus for exposing and processing a strip of photosentitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material on a second strip with a thin layer of processing composition therebetween, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at a predetermined initial point of superposition, separation means for separating said first and second strips at a predetermined terminal point of superposition, means for feeding said superposed first and second strips between said initial and terminal points

of superposition, support means providing a curved guide surface in contact with which said superposed first and second strips are advanced in a curved path between said initial and terminal points of superposition, said feeding means cooperating with said guide surface to advance said superposed strips along a curved path conforming to the curvature of said guide surface without variation in the curvature of said superposed strips and relative movement between associated surfaces of the superposed strips, and means for heating said support means to raise the temperature of the superposed first and second strips and the layer of processing composition therebetween as they are advanced in contact with said guide surface.

2. A photographic apparatus for exposing and processing a strip of photosensitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material on a second strip with a thin layer of processing composition therebetween, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at a predetermined initial point of superposition and to impart a curvature to said strips, said superposing means including a pair of surfaces between which said superposed first and second strips are adapted to move, said pair of surfaces being so positioned with respect to one another as to cause the external surface of one of said superposed strips in contact with one of said pair of surfaces to move with respect to the external surface of the other of said superposed strips in contact with the other of said pair of surfaces while associated internal surfaces of said superposed strips are substantially stationary with respect to one another, separation means for separating said first and second strips at a predetermined terminal point of superposition, means for feeding said superposed first and second strips between said initial and terminal points of superposition, and support means providing a curved guide surface between said initial and terminal points of superposition on which said superposed first and second strips are guided in a curved path, said support means being so positioned with respect to said superposing, feeding and separating means that said superposed strips are advanced without substantial variation in curvature and relative movement between associated surfaces of said superposed strips, the curvature of said guide surface conforming to the curvature imparted to said superposed strips by said superposing means.

3. A photographic apparatus for exposing and processing a strip of photosensitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material on a second strip with a thin layer of processing composition therebetween, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at a predetermined initial point of superposition and to impart a curvature to said strips, said superposing means comprising a pair of pressure-applying rolls of equal diameter between which said superposed first and second strips are moved and means for rotating at least one of said pressure-applying rolls at a different speed from that of the other of said pressure-applying rolls, the predetermined curvature imparted to the strips being a function of the difference in the relative rotational speeds of said pressure-applying rolls, separation means for separating said first and second strips at a predetermined terminal point of superposition, means for feeding said first and second strips between said initial and terminal points of superposition, and support means including a curved guide member having a curved guide surface of substantially uniform radius in contact with which said superposed first and second strips are advanced in a curved path between said initial and terminal points of superposition, one end of said guide member conforming to and being positioned closely adjacent one of said pressure-applying rolls, said guide member and the center of curvature of said guide surface being so positioned with respect to the axes of said pressure-applying rolls that the first and second strips are advanced into contact with said guide surface without variation in curvature and relative movement between associated surfaces of the superposed strips, the curvature of said guide surface conforming substantially to the initial curvature imparted to said superposed strips by said pressure-applying rolls.

4. A photographic apparatus for exposing and processing a strip of photosensitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material on a second strip with a thin layer of processing composition therebetween, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at an initial point of superposition and to impart a predetermined initial curvature to said strips, said superposing means comprising a pair of pressure-applying rolls of unequal diameter between which said superposed first and second strips are moved and means for rotating said pressure-applying rolls at the same speed, separation means for separating said first and second strips at a predetermined terminal point of superposition, means for feeding said superposed first and second strips between said initial and terminal points of superposition, and support means providing a curved guide surface extending between said initial and terminal points of superposition on which said superposed first and second strips are guided in a curved path, the curvature of said guide surface being substantially uniform and conforming to the initial curvature imparted to said strips, said support member being so constructed and positioned with respect to said pressure rolls as to advance said superposed strips into contact with said support surface without variation in curvature of said strips and relative movement between associated surfaces of said superposed strips.

5. A photographic apparatus for exposing and processing a strip of photosensitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material on a second strip with a thin layer of processing composition therebetween, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at a predetermined initial point of superposition, support means providing a curved guide surface, said superposing means being so positioned as to advance said superposed first and second strips into contact with said guide surface, and means for moving said guide means to advance said superposed strips positioned thereon in a curved path conforming to said guide surface between said initial point of superposition and a terminal point of superposition.

6. In photographic apparatus including means for exposing a strip of photosensitive material, in combination, means for processing a first strip of photosensitive material by superposing said first strip on a second strip with a layer of processing liquid therebetween, said processing means comprising support means providing a cylindrical support surface, means for guiding successive portions of one of said first and second strips into position on said support surface, superposing means comprising a pressure-applying member positioned adjacent said support surface for guiding the other of said first and second strips into superposition with said one of said first and second strips with a liquid-receiving space between said strips, means containing a quantity of processing liquid and adapted to feed said processing liquid into said liquid-receiving space at a controlled rate so as to deposit a layer of processing liquid of the desired thickness between the superposed first and second strips, said processing liquid being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at a predetermined initial point of superposition, and means for rotating said support means so as to advance said superposed strips positioned on said support surface in a uniformly curved path between said initial point of superposition and a terminal point of superposition.

7. In photographic apparatus including means for exposing a strip of photosensitive material, in combination, means for processing a first strip of photosensitive material by superposing said first strip on a second strip with a layer of processing liquid therebetween, said processing means comprising support means providing a cylindrical support surface, means for guiding successive portions of one of said first and second strips into position on said support surface, superposing means for guiding the other of said first and second strips into superposition with said one of said first and second strips and distributing a processing liquid carried by one of said strips in a layer between the superposed first and second strips, said superposing means comprising a pressure-applying roll positioned adjacent said support surface, said superposed strips being adapted to be advanced between said pressure-applying roll and said support surface, said processing liquid being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at a predetermined initial point of superposition, separation means for separating said first and second strips at a predetermined terminal point of superposition, and means for rotating said support means so as to advance said superposed strips positioned on said support surface in a uniformly curved path between said initial and terminal points of superposition.

8. A photographic apparatus for exposing and processing a strip of photosensitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material with a second strip with a thin layer of processing composition therebetween to form a sandwich, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time to effect the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips to form said sandwich at a predetermined initial point of superposition and being so constructed and arranged as to impart a predetermined curvature to said sandwich, said superposing means comprising a pair of pressure-applying rolls between which the superposed first and second strips are moved and means for rotating said pressure-applying rolls at different speeds, means for advancing said sandwich from said initial point of superposition to a terminal point of superposition, and support means having a curved guide surface extending substantially from said initial point of superposition to said terminal point of superposition, the curvature imparted to said sandwich by said superposing means being functionally related to the difference in rotational speed of said rolls so as to conform the curvature of said sandwich to the curvature of said guide surface, said means for advancing said sandwich and said pressure-applying rolls being so constructed and positioned with respect to one another and said guide surface as to cooperate with the latter to advance said sandwich in contact with said guide surface along a path conforming thereto while maintaining constant the curvature of said sandwich so as to preclude relative movement between the associated surfaces of said strips.

9. A photographic apparatus for exposing and processing a strip of photosensitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material on a second strip with a thin layer of processing composition therebetween, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, and processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at an initial point of superposition and to impart a predetermined initial curvature to said strips, said superposing means comprising a pair of members providing a pair of strip-engaging surfaces between which said superposed first and second strips are moved, said pair of strip-engaging surfaces being so positioned with respect to one another as to cause the external surface of one of said superpoosed strips, in contact with one of said pair of surfaces, to move with respect to the external surface of the other of said superposed strips in contact with the other of said pair of surfaces while associated internal surfaces of said superposed strips are substantially stationary with respect to one another, means for feeding said superposed first and second strips between said initial point of superposition and a terminal point of superposition, and support means providing a curved guide surface in contact with which said superposed first and second strips are advanced in a curved path between said initial and terminal points of superposition, said feeding means cooperating with said guide surface to advance said superposed strips along a curved path conforming to the curvature of said surface and said initial curvature imparted to said strips without variation in the curvature of said superposed strips and relative movement between associated surfaces of the superposed strips.

10. A photographic apparatus for exposing and processing a strip of photosensitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material on a second strip with a thin layer of processing composition therebetween, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at an initial point of superposition and to impart a predetermined initial curvature to said strips, said superposing means comprising a pair of pressure-applying rolls mounted for rotation and having strip-engaging surfaces between which said superposed first and second strips are moved, and means for rotating said pressure-applying rolls, the last-men-

tioned means and said rolls being so constructed and arranged as to effect the movement of said strip-engaging surfaces at different speeds relative to one another whereby the outer surfaces of the superposed strips are caused to be moved relative to one another so as to impart a predetermined curvature to the superposed strips as they are moved between and in contact with said strip-engaging surfaces, means for feeding said superposed first and second strips between said initial point of superposition and a terminal point of superposition, and support means providing a curved guide surface extending between said initial and terminal points of superposition on which said superposed first and second strips are guided in a curved path, the curvature of said guide surface being substantially uniform and conforming to the initial curvature imparted to said strips, said feeding means and said support member being so constructed and positioned with respect to said pressure-applying rolls as to advance said superposed strips into contact with said support surface without variation in curvature of said strips and relative movement between associated surfaces of said strips.

11. A photographic apparatus for exposing and processing a strip of photosensitive material, said apparatus comprising, in combination, means for superposing a first strip of photosensitive material on a second strip with a thin layer of processing composition therebetween, said processing composition being so constituted as to require the superposition of associated portions of said first and second strips for a predetermined processing time in order to effect the predetermined processing of said photosensitive strip, said predetermined processing including the transfer of reagents from said first strip to said second strip, said superposing means being adapted to superpose said first and second strips at a predetermined initial point

of superposition and to impart a curvature to said strips as they are superposed, said superposing means comprising a pair of pressure-applying rolls of equal diameter between which said superposed first and second strips are moved and means for rotating at least one of said pressure-applying rolls at a different speed from that of the other of said pressure-applying rolls, the predetermined curvature imparted to said strips being a function of the difference in the relative rotational speeds of said pressure-applying rolls, means for feeding said superposed first and second strips between said initial point of superposition and a terminal point of superposition, and support means providing a curved guide surface in contact with which said superposed first and second strips are advanced in a curved path between said initial and terminal points of superposition, the curvature of said guide surface being substantially uniform and conforming to the initial curvature imparted to said strips during superposition, said feeding means and said support means being so constructed and positioned with respect to said pressure-applying rolls as to cooperate for advancing said superposed strips along a curved path conforming to the curvature of said guide surface between said initial and terminal points of superposition without variation in the curvature of said superposed strips and relative movement between associated surfaces of said superposed strips.

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