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N. GOLD
 APPARATUS FOR TREATING PHOTOGRAPHIC SHEET
 MATERIALS WITH A PROCESSING FLUID
 Filed Feb. 23, 1962

3,120,794

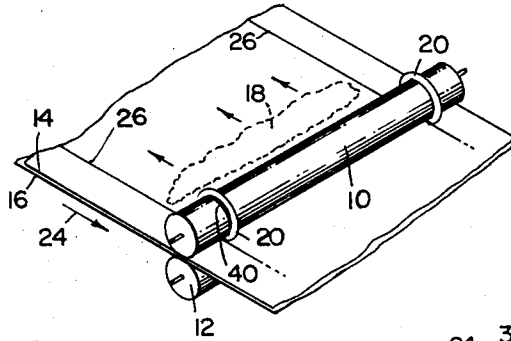


FIG. 1

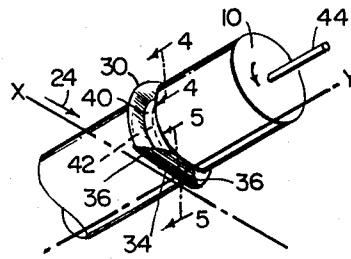


FIG. 3

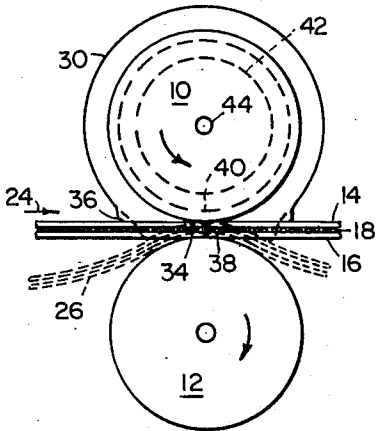


FIG. 2

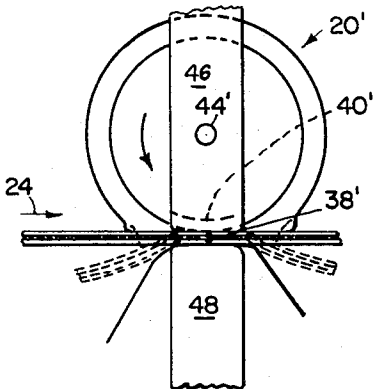


FIG. 6

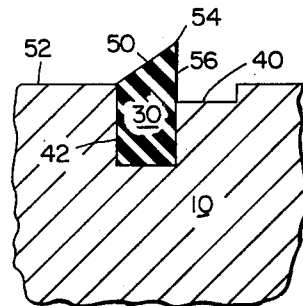


FIG. 4

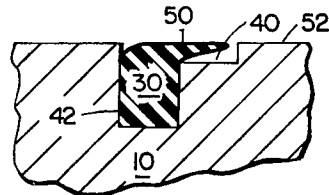


FIG. 5

INVENTOR
Nicholas Gold
 BY *Brown and Mikulka*
 ATTORNEYS

1

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APPARATUS FOR TREATING PHOTOGRAPHIC SHEET MATERIALS WITH A PROCESSING FLUID

Nicholas Gold, Arlington, Mass., assignor to Polaroid Corporation, Cambridge, Mass., a corporation of Delaware
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6 Claims. (Cl. 95—89)

This invention relates to photographic apparatus and more particularly to a novel and improved device for distributing a processing fluid in a layer between a pair of superposed photographic sheets.

An object of the invention is to provide, in photographic apparatus, including a pair of pressure-applying members between which a pair of superposed photographic sheets are moved to spread a fluid therebetween, a novel device to confine the distribution of the fluid between the lateral margins of said sheets.

Another object of the invention is to provide means as described above for preventing the escape of processing fluid which is dependable in operation and is characterized by a simple and inexpensive construction.

A further object of the invention is to provide means, as described above, wherein the device for preventing the escape of processing fluid is incorporated into the structure of the pressure-applying members and acts to seal the lateral margins of said sheets passing between the pressure-applying members in advance of such members and is independent of devices affecting or controlling the gap dimension between such pressure-applying members.

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 perspective view of an apparatus embodying the invention;

FIG. 2 is an enlarged end view of the apparatus shown in FIGURE 1;

FIG. 3 is an enlarged, partial perspective view of the apparatus shown in FIGURE 1;

FIG. 4 is a partial cross sectional view taken along lines 4—4 of FIG. 3;

FIG. 5 is a partial cross sectional view taken along lines 5—5 of FIG. 3; and

FIG. 6 is an end view of another form of the invention.

The present invention is suitable for incorporation in photographic apparatus such as a camera, wherein a photosensitive sheet is exposed and thereafter treated with a processing fluid spread in contact with the photosensitive sheet. In apparatus of this type, the photosensitive sheet is superposed upon another sheet; and the two sheets are moved in superposition between a pair of pressure-applying members for distributing a processing fluid in a thin layer between the sheets. The processing fluid may be incorporated within a rupturable container, as described in Patent No. 2,543,181, issued February 27, 1951, to Edwin H. Land, mounted on one of the sheets or it may be deposited between the sheets in advance of this entrance into the pressure-applying members by any of several devices, as, for example, by squeezing the fluid out of a straw-shaped container across the lateral surface of the sheet, as shown in the copending application Serial No. 820,266, filed June 15, 1959, in the name of Edwin

2

H. Land, now Patent No. 3,047,387. Movement of the sheets through the pressure-applying members may be controlled manually by a pulling action or automatically by driving a system of frictional rollers which engage the sheets therebetween.

Referring to FIGURE 1, it is seen that in one embodiment of the invention, a pair of pressure-applying rollers 10, 12 are fixed in position with relationship to one another by a known structure, not shown, within the housing of the apparatus. These members are rotatable about their fixed axes. A pair of photographic sheets 14, 16 are moved between the rollers to spread a mass of fluid 18 therebetween. This mass of fluid 18 is deposited between the sheets in advance of the pressure-applying rollers. In the so-called "dry process" developing in which the present invention is utilized, it is essential that this fluid be confined within the area of the photographic sheets upon which it is acting, both to effect an even action therein and to prevent extrusion of the fluid onto the interior of the apparatus housing. The means of confining this fluid within the sheet area are a pair of spaced identical rotating devices 20, positioned at the lateral ends of a pressure-applying member 10 so as to engage the lateral margins of sheet 14. As shown in this embodiment of the invention, the devices 20 are incorporated as part of the structure of pressure-applying roller 10. As the sheets are moved in direction 24 between the pressure-applying members, the edge sealing devices 20 engage the surface of the superposed sheets 14, 16 in advance of the pressure-applying members 10, 12 such that the sheets are pressed together and deformed into a crease 26 extending longitudinally along the lateral margins of the sheets from the point of contact of the pressure-applying members.

The operation of the above device is more clearly illustrated in FIG. 2 wherein an enlarged end view of the apparatus shown in FIGURE 1 is depicted. The edge-sealing device as shown here consists of an elastic circumferential member 30 mounted in a groove 42 within a pressure-applying roller 10 rotating in conjunction with a second pressure-applying roller 12. The elastic member 30 is such that it protrudes above the surface of roller 10. A parallel cavity 40 is provided adjacent to the elastic member within the roller 10. A pair of superposed sheets 14, 16 with a fluid 18 therebetween are moved in a direction 24 between the pressure-applying rollers 10, 12 so as to spread the fluid between the sheets at the bite 34 of the rollers. The rollers are positioned by a known structure, not shown, to maintain a predetermined gap 38 between the rollers. As the sheets 14, 16 are moved between the rollers, the rollers will rotate, causing the edge-sealing device to move simultaneously with the movement of the sheets such that the elastic member 30 will engage the sheets in advance of the pressure-applying members at point 36. The force exerted on the sheets, by the elastic member at the point of contact, causes the sheet sandwich to deform into a crease 26, a side view of which is shown in the illustration. This deformation extends along the lateral margins of the sheets on both sides of the pressure-applying members. The portion of the elastic member 30 contacting the sheets continues to move with the sheets between the pressure-applying rollers 10, 12. At the bite 34 of the rollers, a predetermined fixed gap 38 is previously set to control the thickness and spreading of the fluid 18 between the sheets 14, 16. When that portion of the elastic member 30 moves between the pressure-applying rollers, the pressure exerted therein causes this portion of the member to deform into the adjacent cavity 40 such that the critical gap dimension 38 is not interfered with by the edge sealing device.

FIG. 3 is an enlarged, partial perspective view of the apparatus shown in FIG. 1 wherein the deformation of the edge-sealing device is more clearly illustrated. For

purposes of this illustration the second roller 12 is not shown. As described above, the edge-sealing device consists of a ring of elastic material 30 mounted in a cavity 42 extending around the circumference of roller 10. A second parallel adjacent cavity 40 is also provided within roller 10. A pair of superposed sheets, which are not shown, are moved in direction 24 between the pressure-applying members. Roller 10 rotates simultaneously with the movement of the sheets such that a portion of the elastic member 30 engages the sheets at point 36 to press them together, effect a crease, and thus provide an effective edge seal along the lateral margins of the sheets in the immediate vicinity of the pressure-applying members. This same portion then moves along with the sheets to the bite 34 of the pressure members. As the portion of the elastic member 30 moves towards this point, a continuously increasing pressure is exerted upon it by the pressure-applying members. This pressure causes that portion of the elastic member 30 within the bite 34 of the pressure-applying members to deform into cavity 40 within one of the pressure rollers 10 at the pressure point 34. The effect of this deformation is that, at this point, the elastic member is substantially compressed below the surface of roller 10. There is therefore no interference with the gap of the rollers wherein this gap is a predetermined distance between the narrowest portion of passage between the pressure applying rollers, the dimension of this gap controlling the force exerted on the sheet sandwich passing therebetween.

FIG. 4 is a partial cross section taken along lines 4—4 of FIG. 3 where, in one embodiment of the invention, the elastic member of the edge-sealing device is in the form of a trapezoid. In this view of the invention, the edge-sealing device consists of an elastic member 30 mounted in a cavity 42 incorporated into a pressure-applying roller 10 with a parallel cavity 40 adjacent to the elastic member. In the undeformed configuration, the said member has a triangular right angle portion 50 extending above the surface 52 of the pressure-applying roller 10. The tip 54 of the said member will engage the sheets, as the roller is rotated in conjunction with movement of such sheets between the pressure-applying rollers, so as to press upon them and cause a creasing action which effectively seals the lateral margins of the sheets in advance of their passage through the rollers as more fully described above. As rotational movement of the rollers continues, pressure increases upon that portion 50 of the elastic member extending above the surface 52 of the rollers, as that portion approaches the pressure point of the rollers. In a preferred embodiment, the vertical side 56 of the extending elastic member is positioned toward the end of the roller 10 or away from the center of sheets passing between a pair of such rollers. As this pressure increases, the elastic member portion 50 begins to deform into cavity 40. The tip 54 of this member, along with an increasing portion of member 30, will move, in contact with the sheet, away from the center of the sheet into cavity 40. By selecting the elastic member 30 to have a relatively high coefficient of friction, this movement will exert a pulling force upon the sheets away from the center of the sheets, the effect of which will be to flatten and position the sheets with respect to the contacting surface 52 of the pressure-applying roller members.

As illustrated in FIG. 5, which is a partial cross-sectional view taken along the line 5—5 of FIG. 3, the elastic member 30, as described above will, at the pressure point of the pressure-applying members, be deformed into a cavity 40 such that portion 50, which in the undeformed state extended above the surface 52 of roller 10, is now substantially below the plane of surface 52 such that it does not protrude thereabove.

The pressure-applying members with which the device of the invention is incorporated may be one of several

forms. FIG. 2 illustrates the device incorporated with a pair of pressure-applying rollers 10, 12. When used with such roller members, the edge-sealing device may be incorporated directly onto one of the rollers wherein a circumferential elastic member 30 is mounted on the roller, preferably within a cavity 42 extending around said roller to hold the elastic member in a fixed vertical relationship to the axis of rotation of the roller, wherein the roller has a second parallel cavity 40 adjacent to the elastic member into which the member may deform at the point of contact of the pressure-applying members with the photographic sheet sandwich passing therebetween. The edge-sealing device may also be used with pressure-applying rollers wherein the device consists of an independent rigid rotary device 20 with a compressible member 30 attached to the circumference thereof, the rotary device being mounted so as to rotate about the same axis 44 as the pressure-applying roller 10. In this latter case, the movement of the edge-sealing device would be dependent upon the movement of the sheets 14, 16 between the pressure-applying members 10, 12 and independent of any movement of the rollers themselves. An adjacent parallel cavity 40 is then provided within the pressure rollers on either or both sides of the edge-sealing device to provide space into which the compressible member deforms at the point of contact 34 of the pressure-applying members.

Another method of incorporating the edge-sealing device is illustrated in FIG. 6 wherein the pressure-applying members are a pair of fixed pressure-applying bars 46, 48. In this case, the edge-sealing device 20' is mounted upon an axis 44' about which it rotates simultaneously with movement of the sheets 14, 16 between the pressure-applying bars, 46, 48, each of a pair of sealing devices 20' being positioned at the lateral margins of one of the bars so as to engage the lateral margins of the sheets as they move therebetween. The pressure-applying bars 46, 48 are part of a known fixed mechanical structure, which is not shown, wherein their orientation in a perpendicular axis with respect to the plane of the sheets passing therebetween and the gap dimension 38' are rigidly controlled. A parallel cavity 40' within the pressure-applying bar is positioned adjacent to the rotary edge-sealing device 20' at the gap end of one of the pressure-applying bars 46.

It should be understood that the above examples of structures wherein a pair of pressure-applying members are brought together so as to exert a force on superposed sheets moving between them are by no means limiting as to the various combinations of pressure-applying members with which the edge-sealing device of this invention may be incorporated.

The cross section of the elastic member of the edge-sealing device may be any one of several known geometric shapes, such as a circle, a square, a rectangle, or a triangle, in addition to that of a trapezoid given in the example above.

The elastic member of the edge-sealing device is preferably in the form of a continuous ring mounted on the circumference of a rigid rotary member, but it may also be a segment of such a ring member if intermittent sealing is desired.

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 apparatus including a pair of pressure-applying members between which a pair of sheets are moved in superposition for spreading a mass of fluid between said sheets, in combination, means for confining distribution of said fluid between the lateral margins of said sheets,

5

said means comprising a pair of spaced members located at the lateral margins of said pressure-applying members, each of said members including a deformable portion which contacts a surface of said sheets at a lateral margin thereof in advance of said pressure-applying members to press said sheets together substantially at the point of contact, said portions moving simultaneously with said sheets between said pressure-applying members, one of said pressure-applying members having a pair of cavities formed therein, each of said cavities being adjacent a corresponding deformable portion and extending in a direction parallel to the direction of movement of said sheets, said deformable portions occupying said cavities when passing between said pressure-applying members to thereby allow said pressure-applying members to contact the opposite outer surfaces of said sheets.

2. The invention defined by claim 1 wherein said spaced members comprise identical elastic members mounted on the circumference of a rigid, circular, rotatably mounted member, said rotatably mounted member rotating about a fixed axis as said sheets move, said axis lying in a plane passing perpendicularly through said sheets along the line of contact between the outer surfaces of said sheets and said pressure-applying members.

3. The invention defined by claim 2 wherein said rotatably mounted member comprises said one pressure-applying member and said cavities comprise ring-like recesses formed around the periphery of said rotatably mounted member.

4. The invention defined by claim 3 wherein each of said cavities is located between its adjacent elastic member and the corresponding lateral margin of said one pressure-applying member.

5. In photographic apparatus including a pair of pressure-applying members between which a pair of photographic sheets are moved in superposition for spreading a previously deposited fluid therebetween, in combination: means for confining distribution of said fluid between the lateral margins of said sheets, said means comprising a pair of identical spaced members located at the lateral margins of said pressure-applying members so as to engage the lateral margins of said sheets, each of said members consisting of a trapezoidal band of elastic material mounted on a rigid rotary device, each

6

of said members contacting a surface of said sheets in advance of said pressure-applying members to press said sheets together at the point of contact with said sheets, said elastic member moving simultaneously with said sheets between said pressure-applying members, the protruding surfaces of said elastic members deforming into adjacent coaxially parallel cavities within one of said pressure-applying members at the pressure-applying point, located between the pressure-applying members.

6. In photographic apparatus including a pair of pressure-applying members between which a pair of photographic sheets are moved in superposition for spreading a previously deposited fluid therebetween, in combination, means for confining distribution of said fluid between the lateral margins of said sheets, said means comprising a pair of identical spaced members located at the lateral margins of said pressure-applying members so as to engage the lateral margins of said sheets, each of said members consisting of a trapezoidal band of elastic material mounted on a rigid rotary device, each of said members contacting a surface of said sheets in advance of said pressure-applying members to press said sheets together at the point of contact with said sheets, said elastic member moving simultaneously with said sheets between said pressure-applying members, the protruding surfaces of said elastic members deforming into adjacent coaxially parallel cavities within one of said pressure-applying members at the pressure-applying point located between the pressure-applying members, the protruding surfaces of said elastic members being positioned such that a deforming pressure exerted thereon by said pressure-applying members causes said protruding surfaces to engage said sheets as said sheets pass between said pressure-applying members in a manner such that the lateral margins of said sheets are thereby forced away from the center of said sheets, said action substantially flattening said sheets and positioning said sheets within the bite of said pressure-applying members.

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