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C. C. O. GOODALL ET AL

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PHOTOGRAPHIC PROCESSING APPARATUS

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FIG. 1

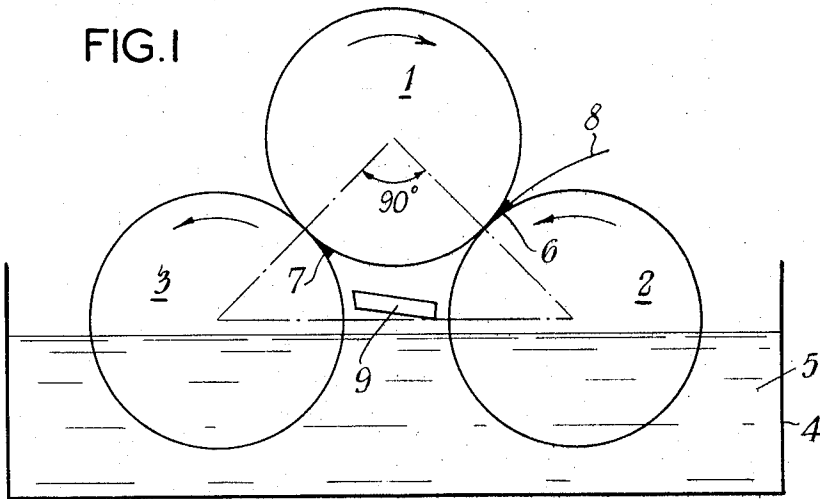
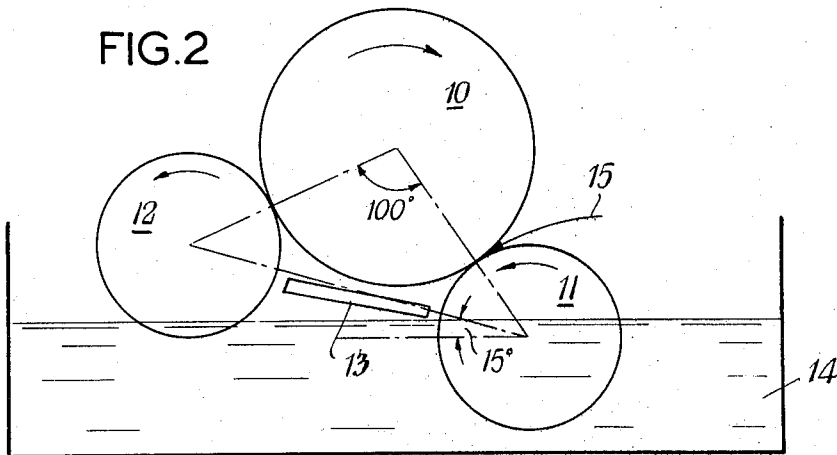


FIG. 2



Inventors
Charles Clifford Owen Goodall
John Rice
Cushman, Deady & Cushman
Attorneys

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PHOTOGRAPHIC PROCESSING APPARATUS

Charles Clifford Owen Goodall and John Rice, Ilford, Essex, England, assignors to Ilford Limited, Ilford, Essex, England, a company of Great Britain

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7 Claims. (Cl. 95—89)

This invention relates to photographic processing apparatus and in particular to apparatus for processing gelatino silver halide based material suitable for use in offices or the like.

When exposed silver halide emulsion material is processed, it is usually immersed in a developing solution to develop the latent image and then in a fixing bath to remove the unexposed silver halide. If the developing agent is included in the emulsion, the material can then be processed by merely wetting the emulsion with an activator solution, which is usually an alkaline solution of high pH, and then passing the material into a stabilizer solution which does not remove the unexposed silver halide but converts it to a complex which is unaffected by light. The latter type of material can be processed rapidly and conveniently and for this reason the material has been found to be of great value in the field of document copying for office use and also for the rapid production of positive prints from negatives.

In order to make use of the easy processing properties of developer-containing silver halide materials various machines have been designed. Generally the machines work on the principle of wetting the exposed material by passing it, emulsion face downwards, between a pair of rollers the bottom one of which is partially immersed in activator solution. Sufficient activator is transferred from the rollers onto the emulsion surface to wet it and so cause development to take place. The material is then guided through a bath of stabilizer solution and is picked up by a pair of rollers just above the stabilizer solution. These rollers squeeze off the excess stabilizer and the resultant print is obtained practically dry. Generally the difficulty with machines working as aforesaid has been to wet the emulsion sufficiently without immersing the material in the activator or without using a very complex series of rollers. For example, in one machine one pair of applicator rollers only are used and it has been found that unless a very slow high contrast emulsion is used insufficient activator can be applied to the emulsion to achieve complete development. In another machine two pairs of rollers are placed together; in this case sufficient development is obtained but there is a tendency for the material to become wrapped around the rollers or to become diverted from its desired path. In yet another machine five rollers are used arranged in an inverted V formation; sufficient development is then obtained but the drive for the rollers is complicated and it is difficult to ensure that the material is passed through the apparatus correctly.

It is an object of the invention to provide apparatus including an improved roller mechanism, for the application of activator solution to a gelatino silver halide emulsion material containing a developer.

According to the present invention there is provided an apparatus for the application of activator solution to an exposed developer-containing gelatino silver halide photographic material which comprises three resilient rollers mounted in an inverted V form, the upper roller being driven and in contact with the lower two rollers, and the lower two rollers being partially immersed in an activator solution, the diameter of the rollers being between 18 and 30 mm. and the angle of the apex of the triangle formed by the axes of the rollers being between 60° and

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100° and the angle made by the base of the triangle with the horizontal being not more than 20°, there being at least a 5 mm. gap between the lower two rollers and means located between the lower rollers for guiding the material successively between the nips formed between each lower and the upper roller.

In one preferred form of the invention three rubber or synthetic rubber surfaced rollers are provided each of substantially 25 mm. diameter, the angle at the apex of the triangle formed by the axes of the rollers is substantially 90° and the base of the triangle substantially horizontal.

The method and apparatus of the invention are illustrated in some useful embodiments in the accompanying drawings in which FIG. 1 is a diagrammatic representation of one form of the apparatus FIG. 2 is a variant of the apparatus.

In FIG. 1 three rollers 1, 2 and 3 are arranged so that the angle at the apex of the triangle formed by the axes of the rollers is 90° and the base of the triangle is parallel to the horizontal. The bottom half of each of the rollers 2 and 3 is immersed in an activator solution 5 contained in a trough 4. Roller 1 is caused to revolve (clockwise as illustrated) by means not shown and this movement causes rollers 2 and 3 to revolve in solution 5. A small amount of this solution is picked up by the rollers and is carried up as the rollers revolve to accumulate as a bead of solution 6 at the nip between roller 1 and roller 2 and as a smaller bead of solution 7 at the nip between roller 1 and roller 3. A sheet of exposed photographic material 8 is fed emulsion face downwards into the nip of the rollers 1 and 2. As the sheet is advanced into the nip it is gripped between the said rollers and urged forward by their revolving motion. The sheet of material 8 has to pass through the bead of solution 6 before it is gripped by the rollers which are themselves wet with the activator solution. As the sheet of material is urged forward by the rollers it reaches the guide 9 and it is then deflected upwards so that it is guided into the nip between the rollers 1 and 3 through the solution bead 7. It is then gripped between rollers 1 and 3 and urged forward by their revolving motion. Due to the angle of the rollers it leaves the apparatus travelling in an upward direction. Thus the emulsion of the exposed material is thoroughly wetted by the activator solution as it has to pass through two beads of activator solution 6 and 7 which are formed at the two nips of the rollers and it is also wetted by coming in contact with the rollers as the rollers themselves are wet with activator solution.

In FIG. 2 a large roller 10 which is driven (clockwise as shown), causes two smaller rollers 11 and 12 to revolve in solution 14. Owing to the distance separating the rollers 11 and 12 a longer material guide 13, than in FIG. 1, has to be provided. A sheet of material 15 enters the apparatus at the nip between rollers 10 and 11 and is urged through the apparatus being guided by 13 so that it enters the nip between rollers 10 and 12.

In this example of the apparatus the angle of the apex of the triangle formed by the axes of the rollers is 100° and the angle made by the base of the triangle with the horizontal is 15°.

The arrangement of the rollers as hereinbefore described, with special reference to the figures, makes it particularly suitable for use in small processing apparatus, designed to process developer-containing gelatino silver halide emulsion material, due to the following factors:

(a) Only three rollers are required. All these rollers can be of the same diameter.

(b) The driving mechanism of the apparatus is very simple as one roller only is driven.

(c) The material follows a simple path with a guide between the rollers to help it so that there is no danger of the material being submerged in the activator solution and it is guided exactly into the nip between the top and second lower roller.

(d) Sufficient wetting of the emulsion surface of the material is certain to take place as the material has to pass through a large bead of liquid before it is gripped by the first two rollers. Due to the fact that the apparatus is in the form of an inverted V a considerable reservoir of liquid builds up at the nip between the top and the first bottom roller, much more in fact than when the top roller is located immediately above the first bottom roller as occurs in some previously designed apparatus.

(e) In a photographic processing apparatus for processing developer containing gelatino silver halide emulsion material the sheet of material is first fed into a roller mechanism for applying activator solution, as hereinbefore described, and the sheet of material is then guided into a bath containing stabilizer solution and out of the stabilizer solution into the nip of two driven rollers which squeegee the sheet of material substantially free of liquid. There always occurs a momentary pause until the sheet of material is properly gripped by the squeegee rollers and passed through these rollers. This pause followed by the material being pulled rapidly out of the solution by the squeegee rollers causes surges of liquid to occur in the stabilizer bath. These surges of liquid cause uneven development to occur in the sheet of material being processed due to the fact that the sheet becomes prematurely wetted with stabilizer before complete development has taken place. This uneven development occurs especially if the sheet of material enters the stabilizer bath going in a downward or horizontal direction due to the large surface area of the sheet prematurely wetted by the stabilizer solution. It has been discovered that if a sheet of material leaves the activator applicator rollers travelling in an upward direction and is then guided downwards into the stabilizer solution then it enters the stabilizer solution vertically. Thus only a small area of the material can be prematurely wetted by surges occurring in the stabilizer solution. This means that almost no uneven development occurs due to surges of the stabilizer. In the hereinbefore described apparatus the sheet of material leaves the apparatus in an upward direction and provision is then made

to guide the sheet downwards into the stabilizer so that the sheet enters the stabilizer solution vertically.

Therefore it is an unexpected advantage of the arrangement of rollers as herein described that the sheet of material being processed leaves the apparatus in an upward direction.

We claim as our invention:

1. An apparatus for the application of activator solution to an exposed developer containing gelatino silver halide photographic material which comprises three resilient rollers mounted in an inverted V form, the upper roller being driven and in contact with the lower two rollers, and the lower two rollers being partially immersed in an activator solution, the diameter of the rollers being at least 18 mm. but not more than 30 mm. and the angle of the apex of the triangle formed by the axes of the rollers being between at least 60° but not more than 100° and the angle made by the base of the triangle with the horizontal being not more than 20°, there being at least a 5 mm. gap between the lower two rollers and means located between the lower rollers for guiding the material successively between the nips formed between each lower and upper roller.

2. An apparatus as in claim 1 wherein the resilient rollers each have a rubber surface.

3. An apparatus as in claim 1 wherein the resilient rollers each have a synthetic rubber surface.

4. An apparatus as in claim 1 wherein the three rollers each have a diameter of substantially 25 mm.

5. An apparatus as in claim 1 wherein the angle at the apex of the triangle formed by the axes of the rollers is substantially 90° and the base of the triangle is substantially horizontal.

6. An apparatus as in claim 5 wherein the rollers each have a rubber surface.

7. An apparatus as in claim 5 wherein the rollers each have a synthetic rubber surface.

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NORTON ANSHER, *Primary Examiner*.