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Glover

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[54] **SURFACE APPLICATION PROCESSING DEVICE**

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[52] **U.S. Cl.** **118/255,** 118/203, 118/414

[51] **Int. Cl.** **B05c 1/08**

[58] **Field of Search** ..... 118/223, 224, 255, 262, 118/414, 203; 95/89 A

[56] **References Cited**

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[57] **ABSTRACT**

A surface application processing device comprising one or more solution applying rollers, each having a resilient solution absorbing peripheral layer partially immersed in a processing solution, and a solution expelling roller cooperating with the solution applying roller to form and maintain a solution pool during rotation of the rollers. The material to be processed is transported in contact with the solution applying rollers and solution pool for processing.

7 Claims, 2 Drawing Figures

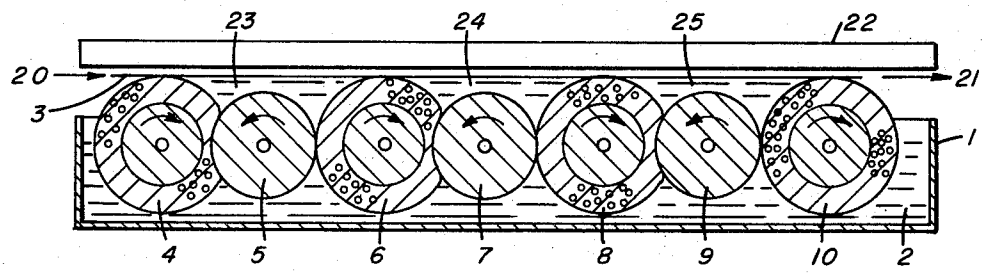


FIG. 1

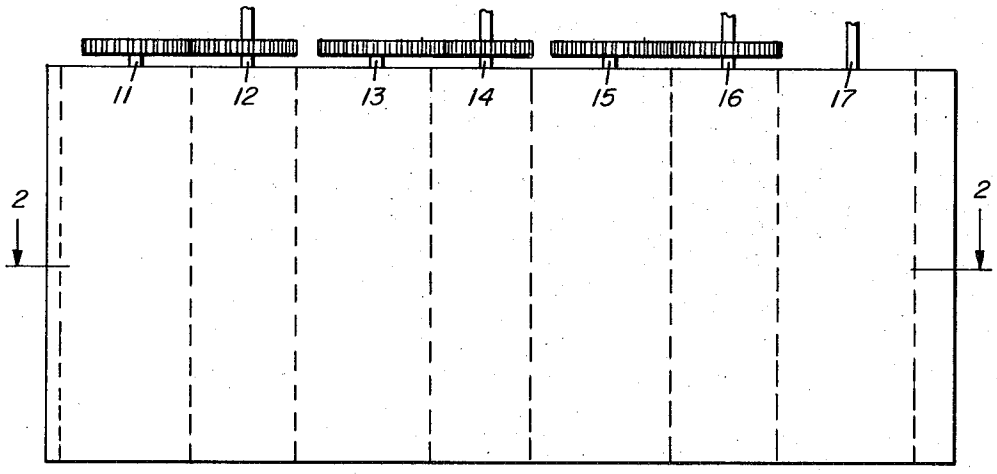
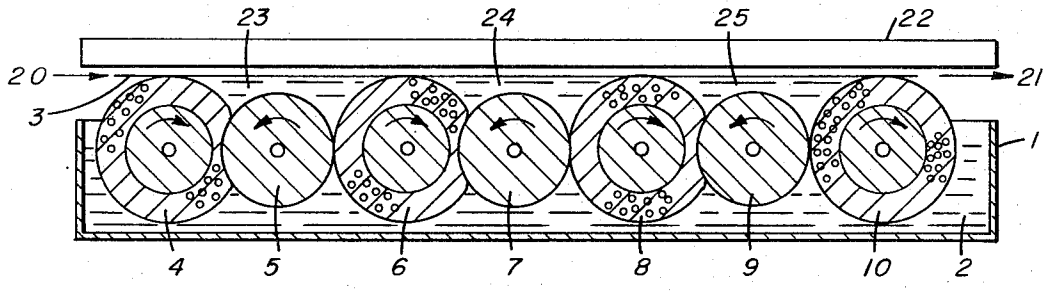


FIG. 2



SURFACE APPLICATION PROCESSING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to processing devices, and more specifically to a surface application roller processing device for applying processing solution to the surface of a material transported therethrough.

2. Description of the Prior Art

In many conventional surface application processing devices, the processing solution is applied to the lower surface of a sheet passing through a processing station by two rollers which are partially immersed in the solution, and rotated in a direction to transport the sheet through the device. This results in only those portions of the sheet engaged by the roller being wetted with solution. The length of sheet wetted at any instant by the rollers of the processor is considerably shorter than the length of the roller portion of the processor. The use in a processor of an additional counter-rotating roller for applying a solution to the undersurface of a sheet is also known, and enables a greater length of sheet to be wetted at any instant. Once applied, however, the film of solution remains relatively static until removed. Although the aforementioned surface application roller processing devices operate satisfactorily, they suffer from the disadvantage that a limited length or area of the sheet is actively wetted or processed at any instant of time as the sheet passes through the processing station. Another disadvantage is that there is no appreciable agitation of the processing solution as it is applied to the sheet.

SUMMARY OF THE INVENTION

In accordance with a preferred embodiment of the invention, a surface application roller processing device is disclosed in which a solution applying roller is mounted in a tray or the like with a portion of its periphery partially immersed in the solution within the tray. The processor is provided with guide means arranged to direct a material such as a sheet passing through the processor so that the undersurface of the sheet is contacted by the solution applying roller and wetted by solution carried from the tray by the roller. The roller is arranged to cooperate at its outer side with a solution pool support means to form a solution pool above the support means which can be contacted by the sheet for processing. The roller further replenishes the solution pool during operation.

It is, accordingly, one of the objects of the present invention to provide a surface application roller processing device for subjecting a large area of a sheet to processing solution as the sheet passes through the processing device.

Another object of the invention is to provide an improved surface application roller processing device in which the solution applied to the undersurface of a sheet is agitated.

Another object of the invention is to provide an improved surface application roller processing device that is of simple design and construction, thoroughly reliable and efficient in operation, and economical to manufacture.

The invention and its objects and advantages will become more apparent from the detailed description of the preferred embodiment presented below.

BRIEF DESCRIPTION OF THE DRAWING

In the detailed description of the preferred embodiment presented below, reference is made to the accompanying drawing, in which:

FIG. **1** is a plan view of a surface application roller processing device; and

FIG. **2** is a section view taken substantially along line **2—2** of FIG. **1**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Because photographic processing devices are well known, the present description will be directed in particular to elements forming part of, or cooperating more directly with, apparatus in accordance with the present invention. Processing device elements not specifically shown or described herein should be understood to be selectable from those known in the art.

With reference to FIGS. **1** and **2** of the drawing, solution support means such as a rectangular tray **1** contains processing solution **2** to be applied to the undersurface of a material such as a photographic sheet **3** during operation of the processing device. Supported above the tray for rotation about parallel axes in the same horizontal plane are a plurality of rollers **4** to **10** supported by axles **11** to **17** respectively. The axles are rotated by drive means, not shown, to rotate the solution applying rollers **4, 6, 8** and **10** in a direction to advance or transport sheet **3** from the inlet end **20** of the processing device to the outlet end **21.** The solution applying rollers **4, 6, 8** and **10** are of larger diameter than the remaining solution expelling rollers **5, 7** and **9,** and sheet guide means **22** are positioned adjacent the solution applying rollers to guide sheet **3** through the processing device and against the top of each of the rollers **4, 6, 8** and **10.** A suitable form of guide means is shown in British Pat. No. 960,413.

Each of the solution applying rollers **4, 6, 8** and **10** includes a substantial peripheral layer of solution absorbent material, for example, an open cell sponge-like material of plastic or natural material, and the adjacent smaller solution expelling roller **5, 7** and **9** respectively is positioned close thereto so as to compress a portion of the layer to expell solution therefrom. As shown, each of the solution expelling rollers **5, 7** and **9** is followed by a further solution applying roller **6, 8** or **10** respectively. The distance between such pair of the axles **12** and **13, 14** and **15,** and **16** and **17,** is substantially equal to the sum of the radii of the rollers carried thereby so as to insure that solution is carried upwardly by the solution applying roller.

Thus the arrangement of rollers provides a succession of solution pools **23, 24** and **25,** the levels of which are at substantially the level of the top of the rollers **4, 6, 8** and **10.** Each pool is formed by a pair of solution applying rollers and an associated solution expelling roller interposed therebetween, and forming a support means for solution. The absorbent layer of each of the solution applying rollers **4, 6** and **8** is compressed by the adjacent solution expelling roller **5, 7** or **9** respectively so that solution cannot drain therebetween from the solution pools above, and the spacing of each solution expelling roller **5, 7** or **9** and the succeeding solu-

tion applying rollers **6, 8** or **10** is such that solution can drain from each solution pool only at a relatively slow rate.

When the undersurface of a sheet **3** is to be processed, the drive means, not shown, is initially operated to cause the rollers to rotate and carry solution from the tray to form a plurality of solution pools substantially to the level of the top of the rollers **4, 6, 8** and **10.** The sheet is inserted by any suitable means into the inlet end **20** of the processing device, and is transported toward outlet end **21** by rollers **4, 6, 8** and **10.** Processing solution is applied to the undersurface of the sheet by the first of these rollers, and the sheet is maintained in contact with the upper surface of the rollers and solution in the pools, and is flooded for substantially the entire distance between the tops of rollers **4** and **10.** As solution is carried out of the pools, they are replenished by solution carried upwardly from the tray by the solution applying rollers **4, 6** and **8.** The solution in the pools is agitated by the movement of the rollers and the sheet as the sheet is transported through the processing device. This causes agitation of the solution in engagement with the sheet. This action appears to cause thorough processing, and has enabled the processing device to be operated at low sheet speeds of less than 7 one-half feet per minute.

To avoid permanent deformation of the solution absorbent layers of the solution applying rollers **4, 6, 8** and **10,** it may be desired to move the rollers relative to the solution expelling rollers **5, 7** and **9** to relieve pressure on the layers when the processing device is not used. The mounting arrangement for the roller axes can be designed to produce this differential movement on actuation of a control member.

It will be appreciated that the processing device illustrated may be used in combination with squeegee means for positively removing any solution from the undersurface of the sheet previously applied by the described processing device. Moreover, the device shown may comprise but one station of a series of stations for applying processing solution or solutions to the sheet.

Apparatus embodying the invention may be used in the processing of photographic paper of film in sheet or web form. In the processing of photographic paper, it has been found that a processing device embodying the invention operated successfully when sheets being processed were transported through the device at relatively low speeds.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove.

I claim:

1. In a surface application processing device for forming a pool of processing solution which is engageable with the under surface of a material transported therethrough, the combination comprising:

a tray for containing a processing solution;

a pair of spaced apart compressible solution applying rollers mounted for rotation within said tray and partially immersed within a processing solution within said tray for transporting a material through the processing device and applying solution thereto; and

an associated solution expelling roller interposed between said pair of solution applying rollers and arranged to compress one of said solution applying rollers and to substantially peripherally engage the other of said solution applying rollers to form, during rotation of said solution applying and expelling rollers, a pool of processing solution supported by said solution applying and expelling rollers, said pool of processing solution being engageable by the material transported through the processing device by said solution applying rollers.

2. The invention according to claim **1** wherein said solution applying rollers each have a solution absorbing resilient peripheral layer for absorbing solution.

3. The invention according to claim **2** wherein said layer is formed from a sponge-like material.

4. The invention according to claim **1** wherein each of said solution applying rollers has an axis and a normal uncompressed radius of one distance and said solution expelling roller has an axis and a radius of another distance, and said expelling roller is arranged relative to at least one of said solution applying rollers such that the distance between said axes of said expelling and applying rollers is less than the sum of said one and another distances whereby said one of said solution applying rollers is compressed.

5. In a surface application processing device for forming a plurality of successive pools of processing solution engageable by the undersurface of a material transported therethrough, the combination comprising:

a tray for containing a processing solution;

pairs of spaced apart compressible rollers mounted within said tray for transporting a material and applying solution thereto, each of said compressible rollers having an axis, a normal uncompressed radius of one distance, and a solution absorbing resilient peripheral layer partially immersed in the solution; and

a solution expelling roller having an axis and a normal radius of another distance and interposed between each pair of said compressible rollers and arranged to cooperate with said compressible rollers in such a way that the distance between an axis of one of said compressible rollers of each pair and the axis of said expelling roller interposed therebetween is less than the sum of said one and another distances whereby said one of said compressible rollers of each pair is compressed for expelling solution therefrom forming successive pools of solution supported by each pair of said compressible rollers and interposed expelling roller, which pools during operation of the processing device are engageable by a material transported through the processing device by said compressible rollers.

6. The invention according to claim **5,** and further comprising material guiding means spaced from said solution applying rollers for guiding and holding material in engagement with the top of said solution applying rollers and the upper surface of the pools of solution.

7. The invention according to claim **5** wherein said peripheral layer of each of said solution applying rollers is formed from a sponge-like material.

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