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1,924,994 8/1933 Knapp, Jr. 95/94UX
2,460,282 2/1949 Gardner 95/89UX
3,134,314 5/1964 Greenwold 95/94X

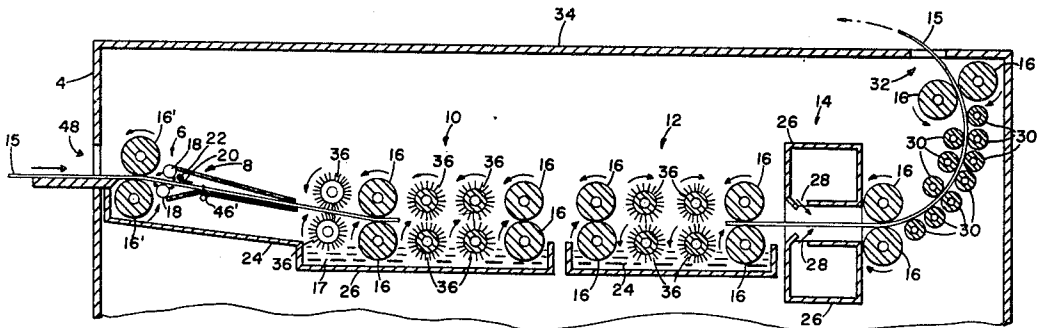
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[54] WEB PROCESSING DEVICE
9 Claims, 2 Drawing Figs.

[52] U.S. Cl. 95/94,
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[51] Int. Cl. G03d 3/12
[50] Field of Search 95/94, 89

[56] References Cited
UNITED STATES PATENTS
1,825,728 10/1931 Hall 95/94

ABSTRACT: A photographic processing device or the like in which a web being transported is engageable at one or more stations by processing rollers having a nonsmooth or roughened periphery, and whose peripheral speed exceeds the transport speed of the web. The processing device includes mechanism for driving the rollers in one direction so that the portion of the periphery thereof engageable with the leading end of the web is moving in the direction of web transport, and for reversing the direction of rotation of the rollers so that the portion of the periphery thereof engageable with the trailing end of the web is moving in the opposite direction of web transport.



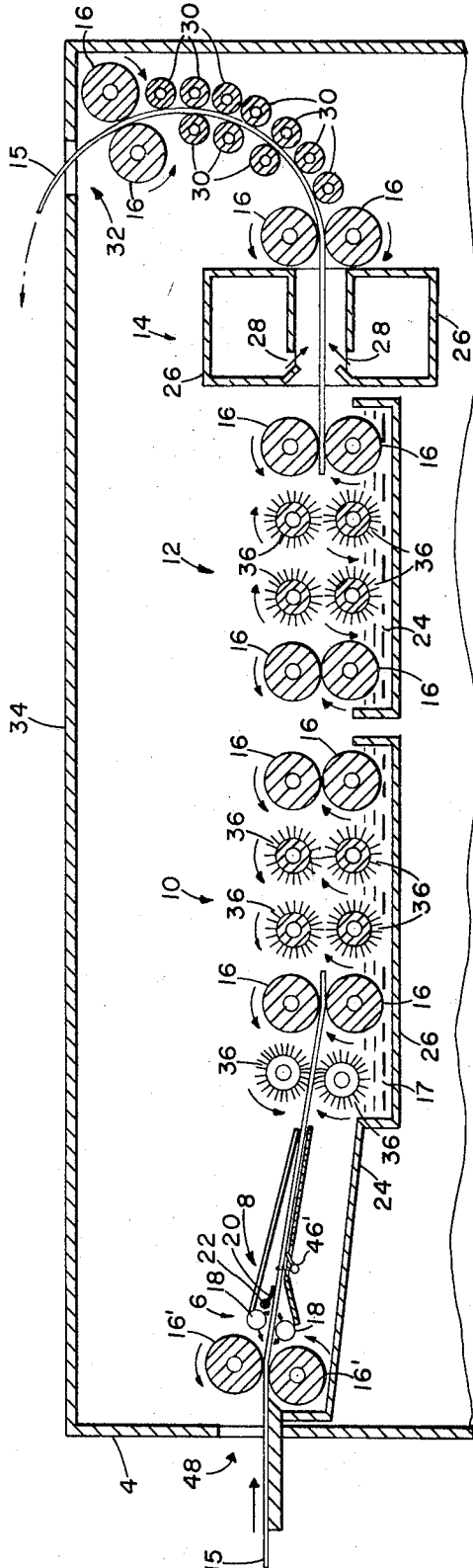


FIG. 1.

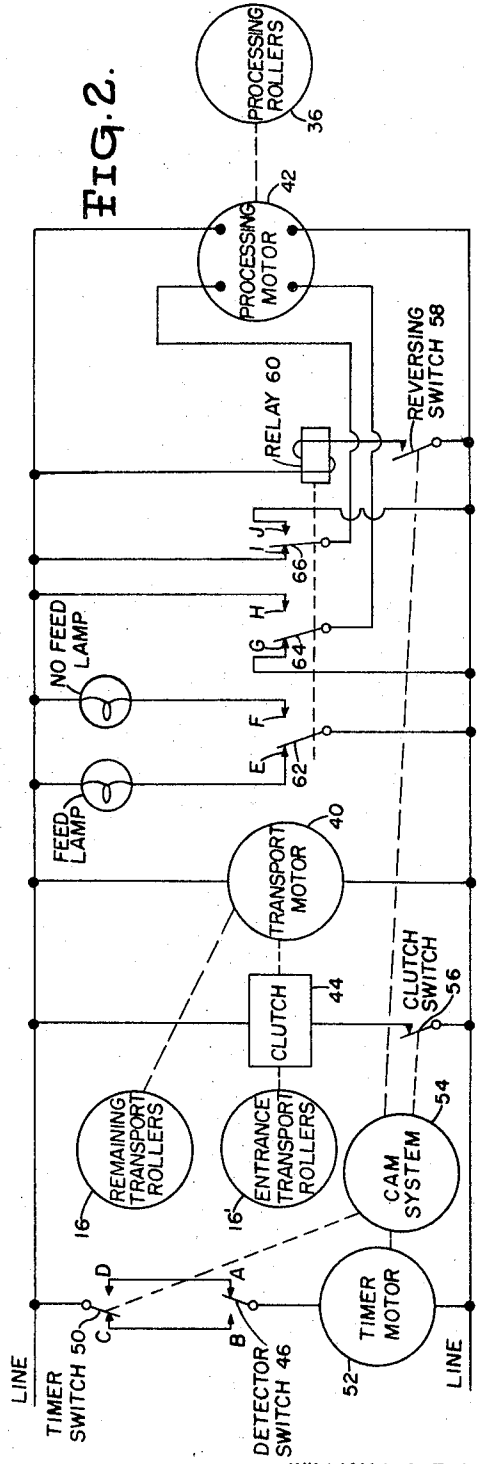


FIG. 2.

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WEB PROCESSING DEVICE

BACKGROUND OF THE INVENTION

This invention relates generally to processing machines, and more specifically to an improved web processing device or the like.

In processing metal plates to be used as masters in a printing operation, it is desirable to scrub a sensitized sheet to remove dissolved polymer therefrom. This exposes the undersurface of the plate to the developing solution and enhances the development action. For this purpose, rollers having a roughened or nonsmooth scrub surface have been used with the scrub surface moving at a speed faster than the transport speed of the plate. However, such differential movement has a tendency to damage the leading or trailing end of the plate in those situations where the scrub surface is moving in a direction opposite to the plate movement. This problem has been solved by providing an improved processing device in which the direction of rotation of the processing rollers is automatically altered in relation to the leading and trailing ends of a sheet so that the ends thereof are not damaged as the sheets are transported through the processing rollers.

SUMMARY OF THE INVENTION

This invention includes within its scope an improved web processing device in which the peripheral speed of nonsmooth processing rollers exceeds the transport speed of a web such as sheet or the like, and the direction of rotation of the processing rollers is periodically altered in relation to the leading and trailing ends of the sheet to prevent damage thereto.

One of the objects of the present invention is to provide a processing device for a web in which the direction of rotation of the processing rollers is controlled in relation to the leading and trailing ends of the web so that no damage results thereto.

Another object of the invention is to process webs with rollers having relative motion between the web and roller surface in engagement therewith without damaging the trailing or leading ends of the web.

Objects and advantages other than those set forth above will be apparent from the following description when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a schematic view in side elevation of a processing device in which a preferred embodiment of this invention is incorporated; and

FIG. 2 is an electrical circuit diagram for the processing device of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, this invention is shown in connection with a film processing device 4 having in succession a solution applying station 6, a sheet detecting station 8, a developing station 10, a desensitizing station 12, and a drying station 14. A processing device of this type is particularly useful for the processing of metal plates for use as masters in a printing operation. The processing device 4 has a transport mechanism for transporting a web such as a sheet of photographic material 15 or the like which is to be processed through the aforementioned stations of the processing device. The transport mechanism comprises a plurality of opposed, engaged pairs of transport rollers 16, 16' spaced such that the distance between the pairs of transport rollers 16, 16' are less than the length of a sheet. Accordingly, at least one pair of transport rollers is in engagement with a sheet 15 or plate at all times. A sheet 15 of photographic material introduced into the nip of the entrance transport rollers 16' is transported through the solution applying station 6 where a developing solution 17 is applied to the sheet by any well known solution applying devices such as spray heads shown schematically at 18. The solution is spread evenly on the sheet by a resilient flap 20

pivotaly secured to a rod 22 at one end and having its free end urged by gravity into engagement with the sheet. Any excess solution 17 from sheet 15 drops into an inclined catch pan 24, and is returned by gravity into a developer tank 26 at the developing station 10. The catch pan 24 is shown integral with tank 26, although it may be separately fabricated and secured to pan 24 by any suitable means. Two pairs of the aforementioned transport rollers 16 are positioned at the developing station 10 with the lower rollers thereof partially immersed in the developing solution 17 for applying solution to the sheets 15 and transporting the sheets therethrough.

At the desensitizing station 12, pairs of opposed, engaged transport rollers 16 are positioned at the entrance and exit of the desensitizing station, the lower roller of each pair being partially immersed in a desensitizing solution 24. In metal plate processing devices, the desensitizing solution may be a gum solution for applying gum arabic to the processed plate to protect it.

The drying station 14 may comprise any suitable dryer, in this instance shown as a pair of opposed plenums 26 having nozzles 28 therein for directing heated air into engagement with opposite surfaces of the processed sheet 15 for guiding the sheet through the drying station and into the nip of a pair of transport rollers 16. The dried sheet 15 is guided around a curved path by a plurality of idler rollers 30 and into the nip of a pair of exit rollers 16 which transport the sheet through an exit opening 32 in the device 4 and onto the top 34 of the device.

A first pair of opposed, engaged processing rollers 36 is positioned at the entrance of the developing station 10 with the lower roller partially immersed in the developing solution 17 for applying solution to the nip of the rollers. In this application, the processing rollers 36 have a roughened periphery for scrubbing the sensitized sheet 15 to remove dissolved polymer in the case of metal plates, to increase agitation, and to flood the sheet with solution. Two other similar pairs of opposed, nonsmooth processing rollers 36 are interposed between the aforementioned pair of transport rollers 16 at the developing station 10 with the lower rollers thereof also partially immersed in the processing solution 17.

At the desensitizing station 12, a pair of opposed, nonsmooth processing rollers 36 similar to the aforementioned processing rollers are interposed between the transport rollers with the lower roller of each pair partially immersed in the desensitizing solution 24. In the case of metal plates, these rollers 36 remove developer from the plate, and apply thereto a gum arabic protective coating.

The transport and processing rollers 16, 36 are driven by separate drive motors 40, 42 respectively of any suitable type under the control of a timer mechanism of known type. The entrance transport rollers 16 into which the sheet is first introduced are connected to the transport drive motor 40 through a clutch 44. The operation of the transport and processing rollers 16, 36 in relation to a sheet 15 being transported through the processor 4 is controlled by a control system shown in FIG. 2 which includes any suitable sheet detector switch 46 shown in FIG. 2 as a single pole, double throw switch, and having an arm 46' positioned between the entrance transport rollers 16' and the first pair of processing rollers 36 and engageable by the leading end of a sheet 15 for a purpose to be explained hereinafter.

The operation of the photographic processing device 4 will now be described in relation to FIGS. 1 and 2 of the drawings. Initially, turning on the processing device by closing any suitable on-off switch, not shown, connects the power supply to the transport and processing motors 40, 42 respectively for driving the transport and processing rollers. A sheet 15 of exposed photographic material is initially introduced into the processing device 4 through an inlet opening 48, and fed into the nip of the entrance transport rollers 16' which are driven in a direction shown by the arrow to transport the sheet through the processing device. The sheet 15 is transported through the spraying apparatus 18 which directs developing

solution on both sides of the sheet. The leading edge of sheet 15 moves detector arm 46' and switch 46 from its normal position A to a position B. This electrically connects the power source through a normal position C of a single-pole, double-throw timer switch 50 to a timer mechanism including a timer motor 52 and a cam system 54 driven thereby to initiate operation of the timer motor 52. The sheet 15 is transported by transport rollers 16 between the processing rollers 36 at the developing station 10 subjecting the sheet to the action of the processing rollers 36 which are operating at a speed in excess of the transport speed of the sheet. As soon as sufficient time has elapsed to permit sheet 15 to enter the first pair of transport rollers 16 at developing station 10, the cam system opens a normally closed clutch switch 56 deenergizing clutch 44 and disconnecting the transport motor 40 from the entrance transport rollers 26, allowing them to idle. This prevents the introduction of another sheet 15 into the processor until the entrance transport rollers 16' are reenergized. Substantially simultaneously, the cam system actuates a single-pole, single-throw reversing switch 58 moving it from its normally open position to its closed position actuating a relay 60. The relay 60 moves a single-pole, double-throw switch 62 from its normal position E to a position F turning off a "feed" lamp and turning on a "no feed" lamp. The relay 60 further actuates two single-pole, double-throw switches 64, 66 moving switch 64 from normal position G to position H, and the other switch 66 from normal position I to position J for reversing the power leads to the processing roller drive motor 42 for driving all of the processing rollers 36 in a reverse direction. Accordingly, as the trailing end of sheet 15 passes between the pairs 16 of processing rollers at the developing station 10, the periphery of the processing rollers 36 in engagement with the sheet will be moving in a direction opposite to the direction of movement of the sheet so that the roughened surface of the processing rollers 36 will not damage the trailing end of the sheet as it passes therethrough. Also, as the leading end of sheet 15 arrives at the nip of the first pair of processing rollers 36 at the desensitizing station 12, the portion of the periphery of the processing rollers 36 engageable with the sheets will now be moving in the same direction as the sheet, and hence will not damage the leading end of the sheet as it enters the nip of the rollers. Following reversal of the processing roller drive motor 42, the cam system moves timer switch to position D deenergizing the timer motor 52.

When the trailing end of sheet 15 passes the detector switch 46, the detector switch is returned from position B to its normal position A reactivating the timer mechanism through timer switch 50, now in position D. When sufficient time has elapsed for the trailing end of sheet 15 to clear the processing rollers 36 at the developing station 10, the cam system returns the reversing switch 58 to its normally open position deenergizing relay 60 and returning switches 64, 66 to their normal positions E, G respectively to again reverse the direction of rotation of all of the processing rollers 36 to their normal direction of rotation. Accordingly, as the trailing end of sheet 15 passes between the processing rollers 36 at the desensitizing station 12, the portion of the periphery of the processing rollers 36 in engagement with the sheet will now be moving in the opposite direction of the sheet, and hence will not damage the trailing end as it passes therethrough. The processed sheet 15 enters the drying station 14 where it is subjected to heated air for drying the sheet and guiding the leading end thereof into the nip of transport rollers 16. The dried sheet 15 is transported around the turn-around idler rollers 30, through exit opening 32 and onto the top 34 of the processing device 4.

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, and as defined in the appended claims.

I claim:

1. In a processing device having a processing station, the combination comprising:

means for transporting a web having leading and trailing ends through the processing station in one direction;

movable processing means at the processing station having a web engaging portion for processing the web as it is transported therethrough in said one direction; and

means coupled to said processing means for controlling the direction of movement of said processing means in timed relation to a web transported through said processing device in said one direction so that said web engaging portion when in engagement with the leading end of the web is moving in said one direction of web transport, and said web engaging portion when in engagement with the trailing end of the web is moving in the opposite direction whereby damage to the leading and trailing ends of the web is prevented as the web is transported through the processing device in said one direction.

2. The invention according to claim 1 wherein said movable processing means comprises rollers having a roughened material engaging surface.

3. The invention according to claim 1 wherein said movable processing means comprises a pair of opposed engageable rollers through which the web is transported, said rollers having a roughened web engaging surface.

4. The invention according to claim 1 wherein said controlling means comprises a reversible motor drivingly connected to said movable processing means, a reversing switch for said motor, and means for actuating said reversing switch.

5. The invention according to claim 4 wherein said actuating means comprises a cam connected to said switch, and a timer motor for driving said cam.

6. In a processing device having first and second processing stations, and means for transporting a web through the stations in one direction and in succession for processing the web, the combination comprising:

first means at the first station having a web engaging portion movable in the direction of web transport for engaging and processing the web as it is transported therethrough; second means at the second station having a web engaging portion movable in the opposite direction of web transport for engaging and processing the web as it is transported therethrough; and

means coupled to said first and second processing means for reversing the direction of movement of said first and second processing means in timed relation during transport of the web whereby when said portions of said first and second processing means engage the leading end of the web they are moving in the direction of web transport, and when said portions of said first and second processing means engage the trailing end of the web they are moving in the opposite direction of web transport.

7. The invention according to claim 6 wherein said reversing means comprises a reversible motor drivingly connected to said first and second processing means, a reversing switch for said motor, and means for actuating said reversing switch.

8. The invention according to claim 7 wherein said actuating means comprises a cam connected to said switch, and a timer motor for driving said cam.

9. The invention according to claim 6 wherein said web transporting means comprises a transport motor, and transport rollers including entrance transport rollers driven by said transport motor; said reversing means comprises a reversible motor drivingly connected to said first and second processing means, a reversing switch for said reversible motor, a cam connected to said reversing switch, and a timer motor for driving said cam; said transporting means further having a clutch interconnecting said entrance transport rollers to said transport motor, and a clutch switch for said clutch actuable by said cam in timed relation to the transport of the web for disabling said entrance transport rollers to prevent the introduction of another web into the processing device until said entrance transport rollers are enabled.