

June 8, 1965

C. O. EDENS ETAL  
DRUM PROCESSING DEVICE

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Filed May 8, 1964

3 Sheets-Sheet 1

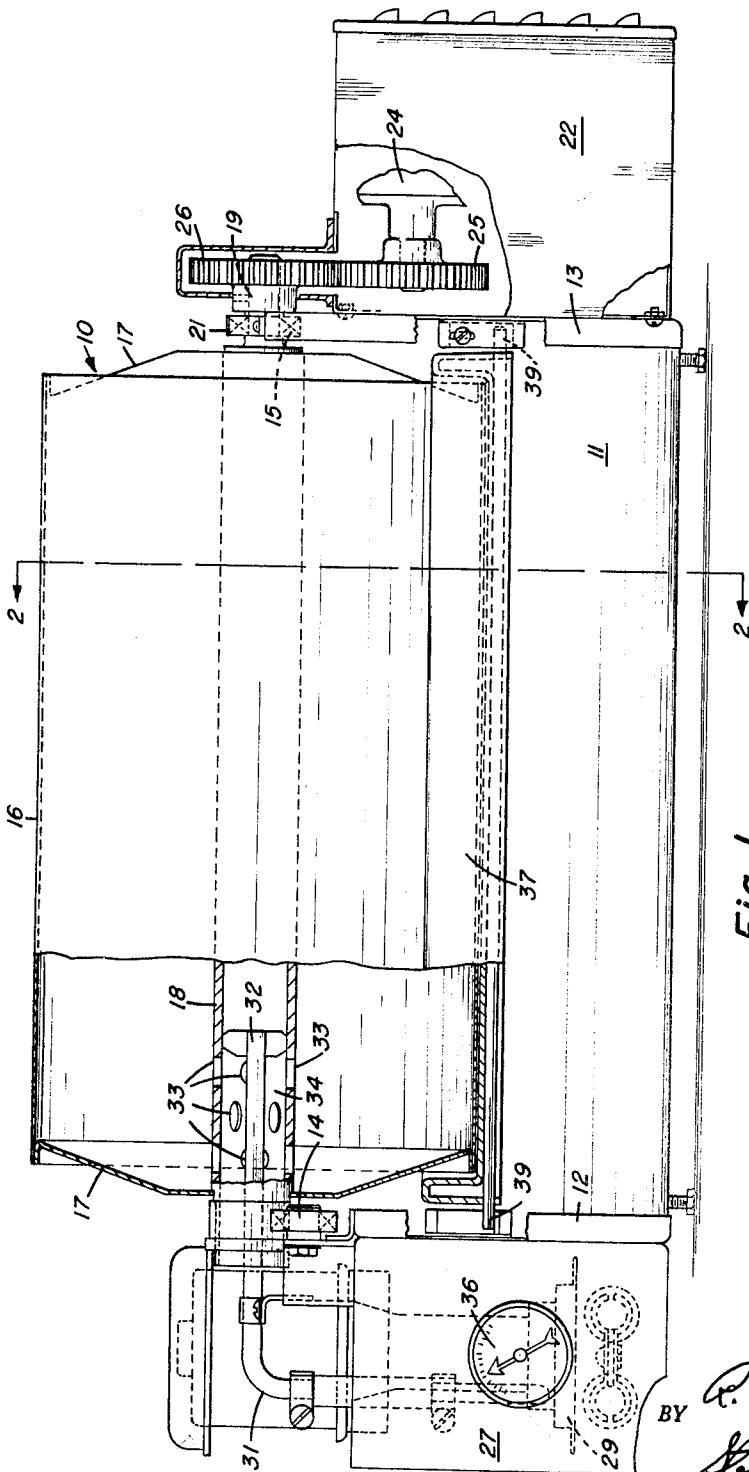


Fig. 1

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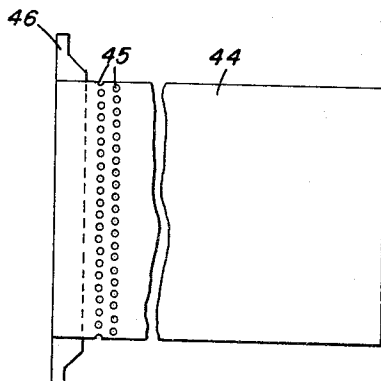
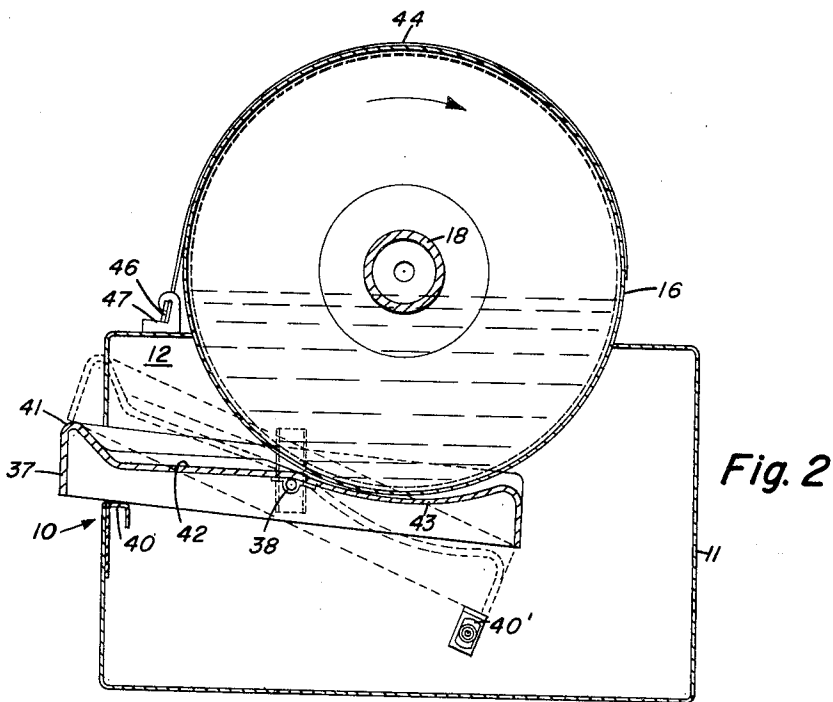
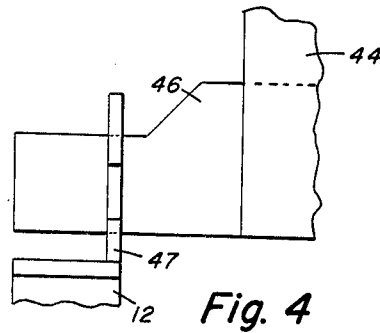
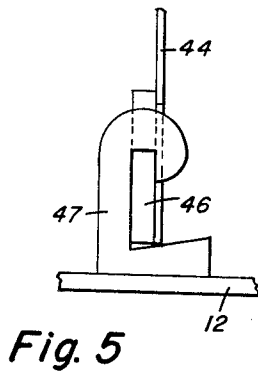
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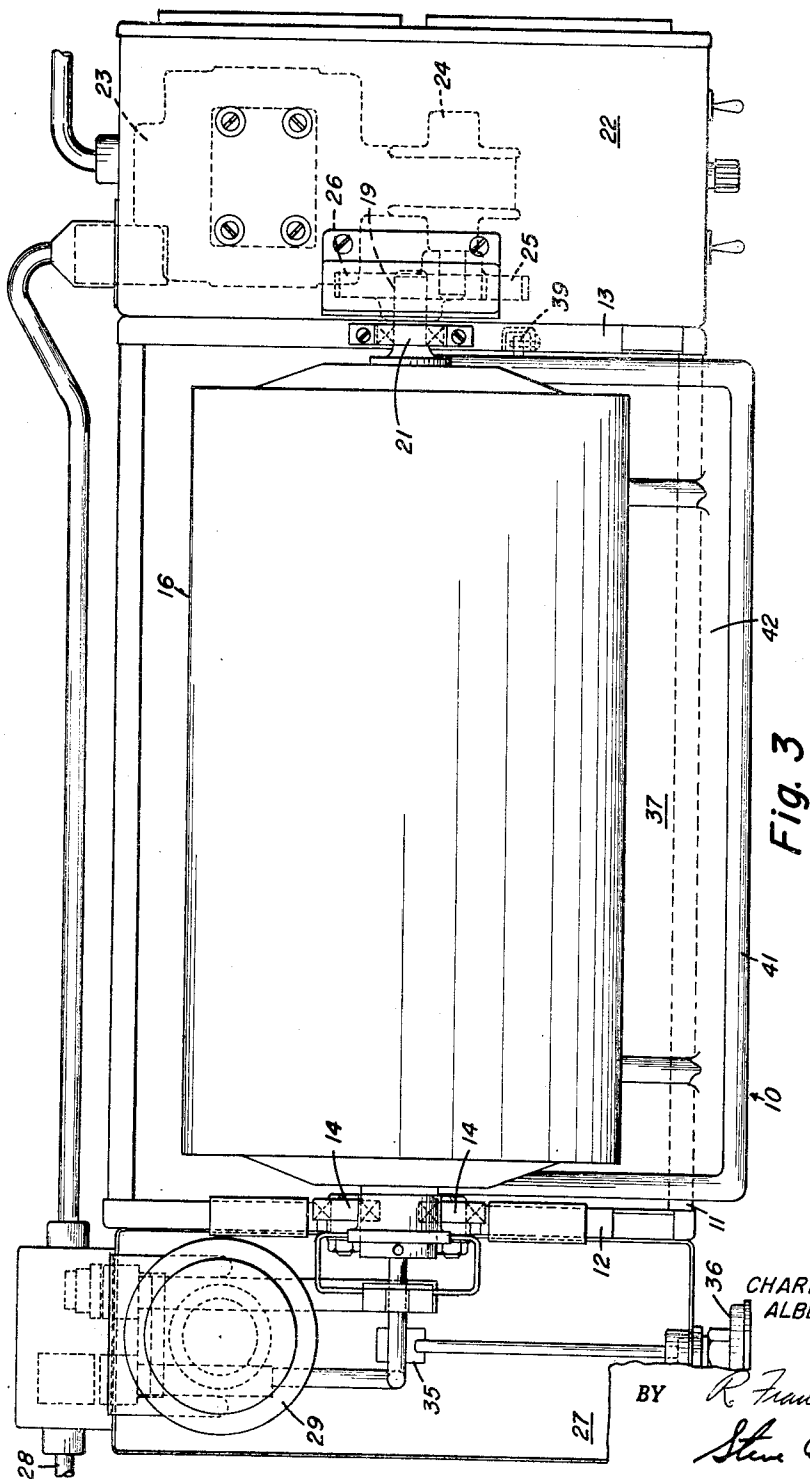
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3 Sheets-Sheet 3



**Fig. 3**

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1

3,187,659

## DRUM PROCESSING DEVICE

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Filed May 8, 1964, Ser. No. 366,692  
6 Claims. (Cl. 95—89)

This application is a continuation-in-part of application, Serial No. 257,953, filed February 12, 1963, now abandoned.

This invention relates generally to photographic processing, and more specifically to a drum processing apparatus and method for processing sheets of photographic material.

One of the primary objects of the present invention is to provide an improved drum processor and method for processing photographic sheet material.

Another object of the invention is to provide a method for processing sheets of photographic material in which a sheet is releasably held to a fixed member by surface tension and friction therebetween, and the held sheet is moved into engagement with a rotating drum having a layer of processing solution on its periphery.

Another object of the present invention is to provide an improved drum processor having improved means for holding a photographic material in a stationary position in engagement with a film of processing solution on the periphery of a rotatable drum.

Another object of this invention is the provision of an improved processing device having a moving surface for receiving and transporting a film of processing solution, and means for holding a photographic material in a stationary position in engagement with the film of solution.

A more specific object of the present invention is to provide an improved drum processor having a flexible blanket to which a photographic material adheres by surface tension and friction therebetween for holding the photographic material in a stationary position in engagement with a film of processing solution on the periphery of a rotatable drum.

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

The above and other objects and advantages will be apparent from the following description when read in connection with the accompanying drawings, in which:

FIG. 1 is a front elevation view with portions thereof broken away of a processing device in which the invention is embodied;

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

FIG. 3 is a top plan view of the processing device of FIG. 1;

FIG. 4 is an enlarged front elevation view showing one of the latch means for the flexible blanket;

FIG. 5 is an end view of the latch means of FIG. 4; and

FIG. 6 is a top plan view of the blanket.

With reference to the drawings, a processing device 10 is disclosed comprising a main support housing 11 having spaced apart, parallel side frames 12, 13 (see FIGS. 1 and 3). A pair of spaced apart, nylon rollers 14 are rotatably mounted on the upper edge of side frame 12, and a semi-cylindrical bearing 15 fixably secured to the upper edge of side frame 13. A cylindrical drum 16 is rigidly secured by circular end plates 17 to a hollow shaft 18, and one end of the shaft is supported by the nylon rollers 14. The opposite end of shaft 18 has a portion 19 of reduced diameter nesting in bearing 15, and rotatably supported therein by means of a semi-cylindrical bearing cap 21.

2

The drive means for the rotatable drum 16 is enclosed in a vented drive housing 22 secured to side plate 13. The drive means (see FIG. 3) comprises a motor 23 drivingly connected to a variable speed reducer 24. A pinion 25 is secured to the output shaft of speed reducer 24, and drives a gear 26 secured to portion 19 of drum shaft 18. With this arrangement, it is possible to drive the rotatable drum 16 at any desired revolutions per minute. Means may be provided, not shown, for regulating the output speed of the speed reducer 24 and hence the speed of the rotatable drum 16 as may be required for the processing of different types of photographic print material.

A tempering device as best seen in FIGS. 1 and 3 for maintaining the temperature of drum 16 at a predetermined value comprises a water sump or reservoir 27 secured to side frame 12. Water from a supply line 28 is introduced into reservoir 27, and may be maintained at a predetermined level therein by means of any commercial float-valve device, not shown. A water pump 29 of any suitable type is mounted in reservoir 27, and a flexible tubing 31 interconnects the outlet of pump 29 to a conduit 32 mounted in hollow shaft 18. The water pumped through conduit 18 passes through perforations 33 in the periphery of the hollow shaft 18 and into the hollow drum 16 which fills up until it is almost half full of tempering water. The overflow of tempering water from drum 16 is returned to reservoir 27 through the passageway 34 between conduit 33 and shaft 18. A thermostat 35 is mounted in the path of the water returning from drum 16 and is connected to a temperature gauge 36 for registering the temperature of the water leaving the drum. Any suitable heater, not shown, may be electrically connected to thermostat 35 for regulating the temperature of the water to any desired value as is well known in the art.

A rectangularly shaped processing tray 37 has a rod 38 secured to the underside thereof, the end portions 39 of which are journaled in the side frame 12, 13 of housing 11. The tray 37 is pivotally mounted about the end portions 39, and is movable between an operative position as seen in full lines in FIG. 2 in which tray 37 bears against a stop 40 and drum 16 is partially immersed in the processing solution, and in an inoperative position as seen dotted in FIG. 2 in which tray 37 bears against stop 40' for discarding the solution from tray 37. Any suitable detent means, not shown, may be provided for releasably holding tray 37 in its operative or inoperative positions. A portion of tray 37 has a peripheral lip 41 and an inclined floor surface 42 to form an enlarged spout into which a processing solution may be introduced by a beaker or the like. The introduced solution flows by gravity from the spout into a solution receptacle 43 of tray 37 which is contoured to match the surface of drum 16 as seen in FIG. 2. The tray 37 in its operative position provides only a very small clearance between drum 16 and receptacle 43 thereby requiring only a minimum amount of solution to wet the drum. While a drum 16 having a smooth periphery may give satisfactory results, in a preferred embodiment the periphery of drum 16 is provided with a roughened or textured surface to aid in the pick-up of solution from receptacle 43, to provide a high degree of agitation, and to maintain a layer of solution between the drum and a sheet of photographic material so that the only force tending to move the sheet away from a support holding the sheet on the drum is the viscous drag of the solution, which is very low. Constructing drum 16 from sheet metal having different sized diamond shaped bumps thereon, or spaced apart, parallel, longitudinally extending ribs has given good results. Also, a smooth drum 16 having spaced apart, parallel, longitudinally extending ribs constructed of Teflon secured thereto has been found to work well.

The photographic material holding means comprises a rectangularly shaped blanket 44 made of a flexible material such as polyethylene, rubberized fabric, neoprene coated nylon cloth, nylon netting, or the like, as best seen in FIG. 6. For best results, the blanket 44 is provided with perforations 45 to enable washing off the back surface of the photographic material during the processing cycle. One end of blanket 44 may be secured to a bar 46, the weight of which may be sufficient to hold the blanket in a stationary position against the rotation of drum 16. Hook-shaped latch elements 47 may be secured to the upper edge of each side frame 12, 13, and the ends of bar 46 may be inserted therein as seen in FIGS. 2, 4, and 5 for positively holding blanket 44 in a stationary position. To secure a sheet of photographic material to blanket 44, the blanket or material is wetted and the back surface of the material placed in contact with blanket 44. The photographic material adheres to blanket 44 by the surface tension and frictional force therebetween, and the blanket is then placed over drum 16 as it is rotating with the emulsion of the photographic material in contact with the film of processing solution on the periphery of the rotatable drum.

In the operation of this processing device using the improved method for processing sheets of photographic material, either an exposed sheet of photographic material or blanket 44 is preferably submerged in water to wet it completely, and the sheet is then centered on blanket 44 with its back surface in contact with the blanket and with its emulsion surface facing out. Wetting the sheet causes the sheet to become limp and to conform to the surface of the blanket, making the sheet more manageable to handle and to adhere to the blanket by virtue of the friction and surface tension therebetween. The developer solution is poured into tray receptacle 43 and distributed evenly over its entire length. The blanket 44 with the photographic material adhering thereto is placed on the drum 16 after it has started to rotate and becomes wetted with processing solution, and the ends of bar 46 are inserted into latch elements 47 to hold the blanket in a fixed position on the drum surface. The layer of processing solution on drum 16 prevents the development of surface tension between the sheet and drum so that the only force tending to move the sheet away from the support or blanket 44 is the viscous drag of the solution which is very low. Since the blanket to which the sheet of photographic material has been adhered is not wound down onto the drum until after it is rotating, the sheet will not be pulled off the blanket by the drum because the surface tension and friction between the blanket and sheet is greater than the viscous drag between the emulsion surface of the sheet and the moving drum surface. A short time interval before the development time is completed, the tray 37 is moved into its inoperative position to discharge the developer solution. The wash water is then introduced, usually from an independent water source, into tray 37, and the tray is tipped into its inoperative position two or three times during the washing cycle to empty the contaminated water therefrom and introduce new water. After the washing cycle is completed, the stop-fix solution is introduced into tray receptacle 43. Following the stop-fix cycle, wash water is once again introduced into the tray 37 for washing the stop-fix solution from the photographic material. The same procedure is repeated for any additional photographic steps such as bleaching and buffering. Furthermore, if a monobath processing solution is used containing developing and fixing ingredients, the number of steps to the method may be reduced. During the final two washes, water is introduced over the back of blanket 44 and passes through the perforations 45 therein to clean the back side of the print. The bar 46 is then disengaged from latch elements 47, and the

blanket 44 and photographic material removed from drum 16. If the processed sheet adheres to blanket 44, it may readily be manually separated therefrom. The water normally used during the processing cycle for the washing operations is normally supplied by a hose, not shown, connected to any suitable water supply which may be completely separate from the processing machine.

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.

We claim:

1. A device for applying processing liquids to a surface to be processed of a photographic material comprising:
  - (a) liquid supply means adapted to provide selected processing liquids, one at a time, for processing such surface of such photographic material;
  - (b) a drum having a liquid carrying peripheral surface which is partially immersed in said supply means;
  - (c) means for rotating said drum about a fixed axis to move said peripheral surface through said supply means so that liquid from said supply is received on said peripheral surface; and
  - (d) means for supporting, during rotation of said drum, said material in a stationary position relative to said fixed axis with said material surface disposed against the received liquid on said peripheral surface so that substantially all of said material surface is simultaneously in contact with such liquid;
 whereby the selected processing liquids provided by said supply means are transported by said peripheral surface and applied to said material surface.
2. A device in accordance with claim 1 and wherein said liquid carrying surface has an irregular surface configuration.
3. A device in accordance with claim 1 and wherein said material supporting means comprises a flexible member which conforms to said liquid carrying surface and which overlies said material to hold the same in contact with the liquid transported on the liquid carrying surface.
4. A device in accordance with claim 3 and wherein said flexible member is releasably fixed on one end relative to said device and is so disposed relative to said drum that the forces of gravity acting on the member hold the material, which is supported by the member, in contact with the liquid on said liquid carrying surface.
5. A device for applying processing liquid from a supply thereof to the surface to be processed of a photographic material comprising:
  - (a) tray means for containing a supply of processing liquid;
  - (b) a drum having a liquid carrying peripheral surface which is partially immersed in the liquid of said supply;
  - (c) means pivotally mounting said tray means for movement between a first position in which the liquid of said supply is supported in contact with said liquid carrying surface, and a second position in which the liquid of said supply drains from said tray means;
  - (d) means for rotating said drum about a fixed axis for transporting liquid on said liquid carrying surface from said supply to said material surface; and
  - (e) means for supporting said material in a stationary position, relative to said fixed axis, in which substantially all of said material surface is simultaneously in contact with the liquid on said liquid carrying surface;
 whereby the transported liquid on said liquid carrying surface is applied to said material surface.

5

6. A device in accordance with claim 5 and wherein:  
 (a) said liquid carrying surface has an irregular surface configuration; and

(b) said material supporting means comprises a flexible member for sandwiching the material between the liquid on the liquid carrying surface and the member, said member being releasably fixed on one end relative to the device and overlying the drum in such a way that the force of gravity acting on the member conforms the member to the liquid carrying surface and holds the material in contact with the liquid thereon.

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