FIG. 3.

INVENTOR
Mario Merolli
Edoardo Paniccia

BY
Harvey & Harvey

ATTORNEYS
APPARATUS FOR PROCESSING PHOTOGRAPHIC FILM

Mario Merolli, 40 Ring St., Providence, R.I. 02909, and Edoardo Paniccia, Via Carbonaro 28, Ceprano, Frosinone, Italy

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3 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for processing photographic film including a developing tank, a plurality of containers for developing solutions in communication with the tank, a feeding mechanism for feeding solutions from the containers to the tank, a control means for maintaining the liquids in the containers and the tank at a predetermined temperature. The processor has a device including a frame mounted in the bottom of the developing tank for holding the film to be processed, a rack removabley engaged by the frame, and a power source engageable with the rack for oscillating the same about a point of pivotal engagement with the tank. The removable rack has a plurality of film-supporting elements thereon for holding a plurality of film processing spools at spaced intervals along the rack.

This invention relates to apparatus for processing photographic film, an object of which is the continuous and automatic development of black and white or color film in a predetermined sequence of processing steps.

Another object is to provide apparatus for processing photographic film which is compact and requires a minimum of space, but yet is capable of holding and developing a large quantity of film at one time.

Other objects of the invention are to provide a film processing machine requiring no attention while operating and signals when the operational cycle is completed; to provide a machine in which rolls of film are stacked in superimposed relation in a cradle movably mounted in a processing tank which selectively receives the various processing solutions in which the film is immersed; to provide a plurality of containers for developing solutions in communication with the tank, control means feeding the solutions from the containers to the tank in predetermined sequence; and to provide a machine in which the contents of each container, after use in the tank, is collected and returned to the same container for reuse.

It is also an object of the present invention to provide a machine in which the processing tank is encompassed by a thermostatically controlled heater water jacket to regulate the temperature of the processing solutions and wash water for optimum results.

A further object of the invention is to provide a wash water container provided with automatic supply and cutoff means to maintain the container full for supplying water to the tank to wash the film during the operational cycle.

Another further object of the present invention is to provide an electrical control station which is in circuit with the timing valves, pumps and motor for operating the cradle, the station including a clock to operate the different valves, etc., at predetermined intervals and in predetermined sequence, so that the machine operates until the films are completely processed, including washing, and may then be removed from the processing tank to permit the tank to be re-loaded.

Other objects of the invention will be manifest from the following description of the present preferred form of the invention taken in connection with the accompanying drawings, wherein:

FIG. 1 is a perspective view of a machine constructed in accordance with the present invention;

FIG. 2 is a vertical sectional view of the same, taken along the lines 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is a transverse sectional view taken along the lines 3—3 of FIG. 1, looking in the direction of the arrows;

FIG. 4 is a sectional view taken along the lines 4—4 of FIG. 2, looking in the direction of the arrows;

FIG. 5 is a perspective view of the processing tank crusade including the rack for supporting the film rolls; and

FIG. 6 is a fragmentary sectional view of one of the legs of the machine, illustrating the manner in which the base or foot is adjustably mounted therein.

The apparatus of the present invention includes a supporting base 10, on which is mounted a processing tank 11, and a multi-compartmented cabinet 12, all of which compartments are in communication with tank 11. A water jacket 13 is located around the tank and extends upwardly into engagement with walls of cabinet 12. A cradle 14, within processing tank 11, supports the black and white or color film negatives which are to be developed.

The base 10 of the assembly comprises front and back legs 15 and 16 respectively, each of which carries a discal leveling foot 17 mounted on the lower end of a screw threaded shank 18 carried by a complemental bearing 19 secured to the lower end of each leg, as shown in FIG. 6. The upper ends of the front legs 15, are connected by a flat plate 20, the lower edge of which is bent inwardly at right angles to provide a supporting flange 21 upon which the fore part of the assembly superstructure rests, as shown to advantage in FIG. 2.

The aft part of said superstructure is supported by enlargements 22 which are bent to conform to the angularity of the part of the superstructure with which they are engaged, as also shown to advantage in FIG. 2. The lower ends of the legs 15 and 16 are connected by an arrow flat plates 23 which extend transversely and longitudinally in the frame to support a multi-compartment collector vat 24.

The superstructure of the assembly embodies an outer shell 25 which extends upwardly from the base 10 and encases the processing tank 11, and forms the front, back and end walls of cabinet 12, as well as the outer wall of water jacket 13. The inner wall of the jacket, as shown advantageously in FIGS. 2 and 3, also constitutes the side walls 26 and end walls 27 of processing tank 11.

Tank 11 is provided with a top or cover 28, hinged thereto at 29, a portion thereof extending into the tank to exclude light and air. The bottom wall of the tank is indicated at 30, which wall is inclined from the central part thereof to the side and end walls of the tank, to permit gravitation of liquids towards a central outlet 31.

Cradle 14 includes a horizontally-disposed rectangular frame 32 which is shown to advantage in FIG. 5 and further embodies a cross piece 33 extending transversely of the central portion thereof. The lower face of cross piece 33 is pivotally connected at 34 to tank bottom 30, to support the cradle above the tank bottom and allow oscillatory motion of the same. The members of frame 32 are provided with inwardly directed flanges 35 adapted for supporting engagement with spaced transverse supports 36 and spaced longitudinal supports 37 of the tank rack. Vertical spindles 38 are mounted on the supports for holding conventional film processing spools 39 of a type to provide spacing between adjacent film surfaces, to permit
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passage of developing solutions therebetween for engagement with both faces of the film. Inverted U-shaped members 40 are engaged with the terminals of lateral longitudinal members 37, thereby permitting the rack to be readily removed from and deposited on the frame 32 in the manner illustrated in FIG. 5.

Oscillation or rocking of cradle 14 about pivot point 34 is effected by means of an electric motor 41, the shaft of which carries a disc 42, to which are eccentrically connected articulate levers 43, the lowermost lever being pivoted to a lug 44 engaged with a terminal of an operating arm 45. The lower terminal of arm 45 is fixedly secured to frame 32.

Cabinet 12 comprises a plurality of compartments 46, formed by spaced vertical partitions 47 extending between the upper and lower walls of the cabinet. Each compartment 46 is accessible by means of a hinged lid 48 which excludes light and air when the latter is closed. At one end of cabinet 12, there is provided a compartment 49 which is adapted to store wash water which rinses any chemical solutions from the processed film at the conclusion of the developing cycle. Compartment 49 is preferably in communication with water jacket 13 to permit water to be fed into the water jacket.

The chemical solutions are permitted to gravitate from each compartment 46 into tank 11, through pipes 50 at preselected time intervals, the flow of the chemical solution being controlled by an electrically operated valve 51. From tank 11, the chemical solution is permitted to gravitate into its own compartment 52 of collector vat 24, by means of pipes 53, electrically operated valves 54 being provided in each pipe for directing the flow of the chemical solution into the proper compartment.

The bottom wall of each compartment 52 is inclined downwardly from front to rear, and a manually operated valve 55 is provided at the lowest point to permit the solution to be drawn off when it is desired to discard the same.

The apparatus of the present invention is further provided with a recirculation pipe 56, which extends upwardly from each vat compartment to its respective cabinet compartment. A pump 57 in recirculation pipe 56 is operable to return the chemical solution in vat compartment 52 to the originating compartment 46, thereby permitting use of the respective solutions in succeeding developing cycles. Wash water compartment 49 is provided with a valve inlet line 58 which is controlled by a float 59 for automatically controlling the compartment when the water is permitted to gravitate through a feed line 60 to tank 11. An electrically operated valve 61 controls the egress of water from the compartment. A water drain pipe 62 is located in the bottom of tank 11 for permitting the wash water to flow therethrough for discarding, after rinsing the film on spools 39. An electrically operated valve 63 controls the flow of water through drain pipe 62. As shown in FIG. 3, tank 11 is provided with an overflow pipe 64 which is joined to drain pipe 62 at a point below valve 63. Additionally, there is provided in the bottom of tank 11, a drain conduit 65 in which is located a manually operated valve, the drain conduit also being in communication with drain pipe 62 to permit water to be drained from water jacket 13.

A heating arrangement 67 is suitably located in water jacket 13 for maintaining the water at a predetermined uniform temperature, in order to maintain the chemical solutions at a constant temperature for optimum results in processing. A thermostat 68 controls operation of a heating element 67. The present invention further includes an electrical timing control station 69 for operating the various electrical valves, pumps and motor of the apparatus at predetermined sequence and for predetermined periods. Timing control station 69 is of conventional structure, including a moving arm 70 adapted for engagement with electrical contacts for completing circuits in which the various valves and pumps are located.

In order to maintain processing tank 11 in a horizontal plane for the proper operation of the present apparatus, there is provided, a spirit level 71 mounted in or on the top 28. Leveling of the unit is effected in a well known manner by adjustment of feet 17 attached to legs 15 and 16.

In use, the present apparatus is placed in a dark room and the exposed film is loosely convoluted on spools 39 which are placed on vertical spindles 38, following which the rack is placed in the tank on supporting frame 32 in the manner illustrated in FIGS. 2 and 3, and hinged top 25 is then closed, to exclude light and air. The chemical solutions required for developing either black and white or color film is poured into compartments 46, following which hinged lids 48 are closed. Operation of timing station 69 is then initiated for starting the operational cycle by admitting the first chemical solution into tank 11. Timing control station 69 also initiates motor 41 to oscillate cradle 14 to effect complete surface contact of the chemical solution with both sides of the film wound on each spool. The first chemical solution is then permitted to drain from tank 11 by operation of selected valve 54 which is also controlled by timing station 69. This permits the chemical solution to be deposited into preselected compartment 52 of collector vat 24, the timing station further serving to actuate selected pump 57 for returning the solution through conduit 56 to its original container 46. This same procedure is successively followed for each of the chemical solutions in the various compartments 46 until the processing of the film is completed. In the case of black and white film, processing takes approximately fifteen minutes, and in the case of color film, the process takes approximately forty-five minutes. At the end of the developing cycle, timing station 69 is equipped to give a signal such as the ringing of a bell, to indicate completion of the processing, following which the rack holding the film is removed from the tank. The present apparatus is immediately available to repeat the operational cycle upon placement of undeveloped film on the rack and placement in tank 11. Therefore, a minimum of time is required between processing cycles, so that a large quantity of film can be processed within a given period of time.

It is of course to be understood that the assembly herein shown and described is a preferred form of the invention which has been used advantageously in the manner herein described. However, it is to be understood that various changes may be made therein, within the scope of the claims hereeto appended.

We claim:

1. Apparatus for processing photographic film including:
   (a) a developing tank,
   (b) a plurality of containers for developing solutions in communication with said tank,
   (c) control means for feeding solutions from the containers to the developing tank in predetermined sequence,
   (d) collectors subjacent the tank,
   (e) valved outlet pipes running from the bottom of the tank to each of said collectors for receiving the solutions from the tank after use,
   (f) a wash water container in communication with said tank,
   (g) means for admitting and cutting off the flow of water from said container to said tank,
   (h) automatic supply and cut-off means for maintaining the wash water container full,
   (i) a cradle in said developing tank for holding the film, said cradle including:
      (j) a horizontally disposed rectangular frame,
      (k) a cross piece extending transversely of the central portion of said rectangular frame,
      (l) pivot means connecting the lower face of said cross piece to the bottom of said developing tank, for
supporting the rectangular frame above the tank bottom and allowing oscillatory motion,
(m) said cradle further including a film rack comprising interconnected spaced transverse and longitudinal supports,
(n) vertical spindles mounted on said supports for holding film spools,
(o) inverted U-shaped members engaged with the terminals of the lateral longitudinal members, thereby permitting the rack to be removed from, and deposited on, said rectangular frame and
(p) power means engaged with said cradle for oscillating the latter about said pivot means.
2. The apparatus of claim 1, with the addition of
(a) a conduit connecting each of said collectors to a container for returning the solutions to the containers for reuse.
3. The apparatus of claim 1, with the addition of
(a) time control means operatively connected to said valved outlet pipes for opening the latter at predetermined intervals.

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NORTON ANSHER, Primary Examiner.
F. L. BRAUN, Assistant Examiner.

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