

Jan. 17, 1950

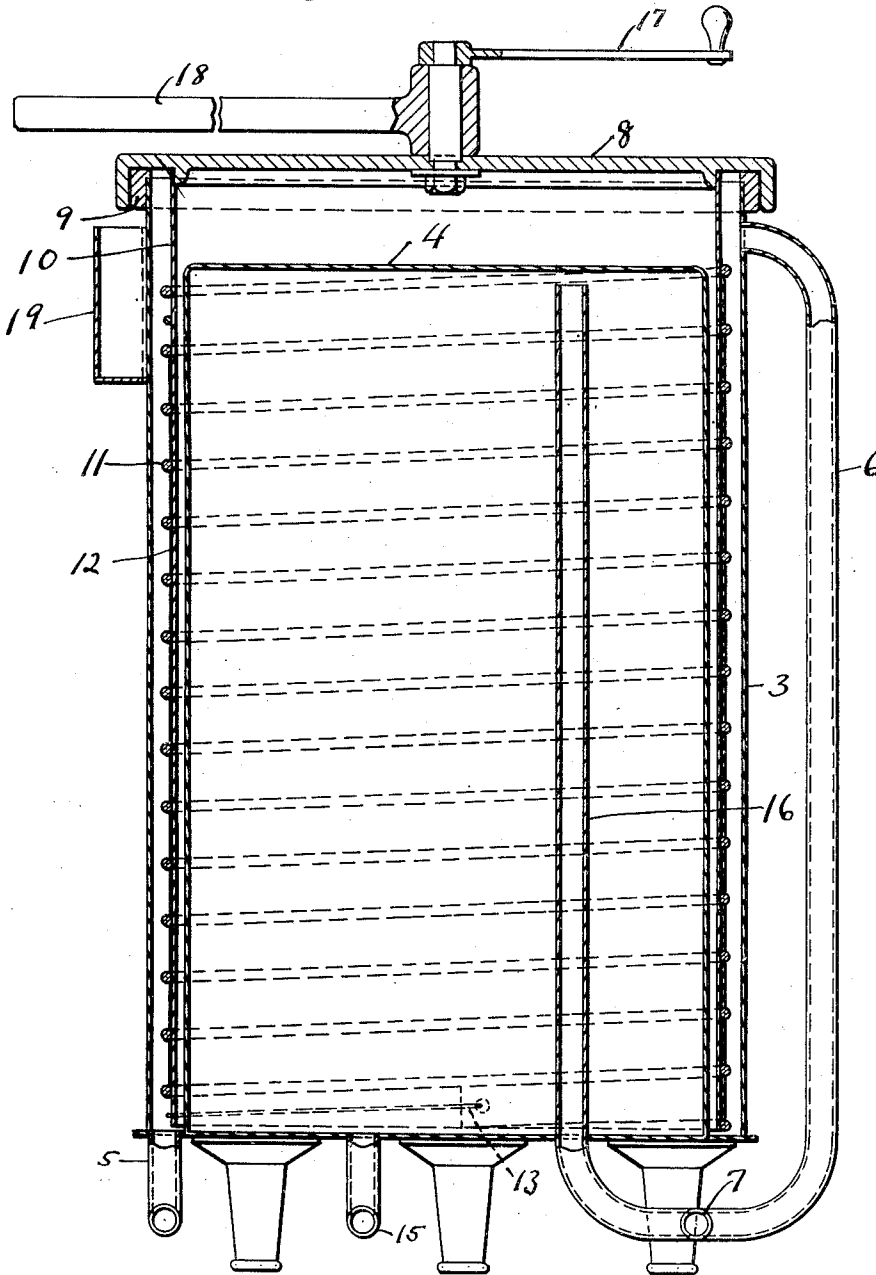
F. C. ARTHUR
DARK TANK WITH TEMPERATURE CONTROL
FOR CONTINUOUS FILMS

2,495,049

Filed Oct. 30, 1945

3 Sheets-Sheet 1

Fig. 1



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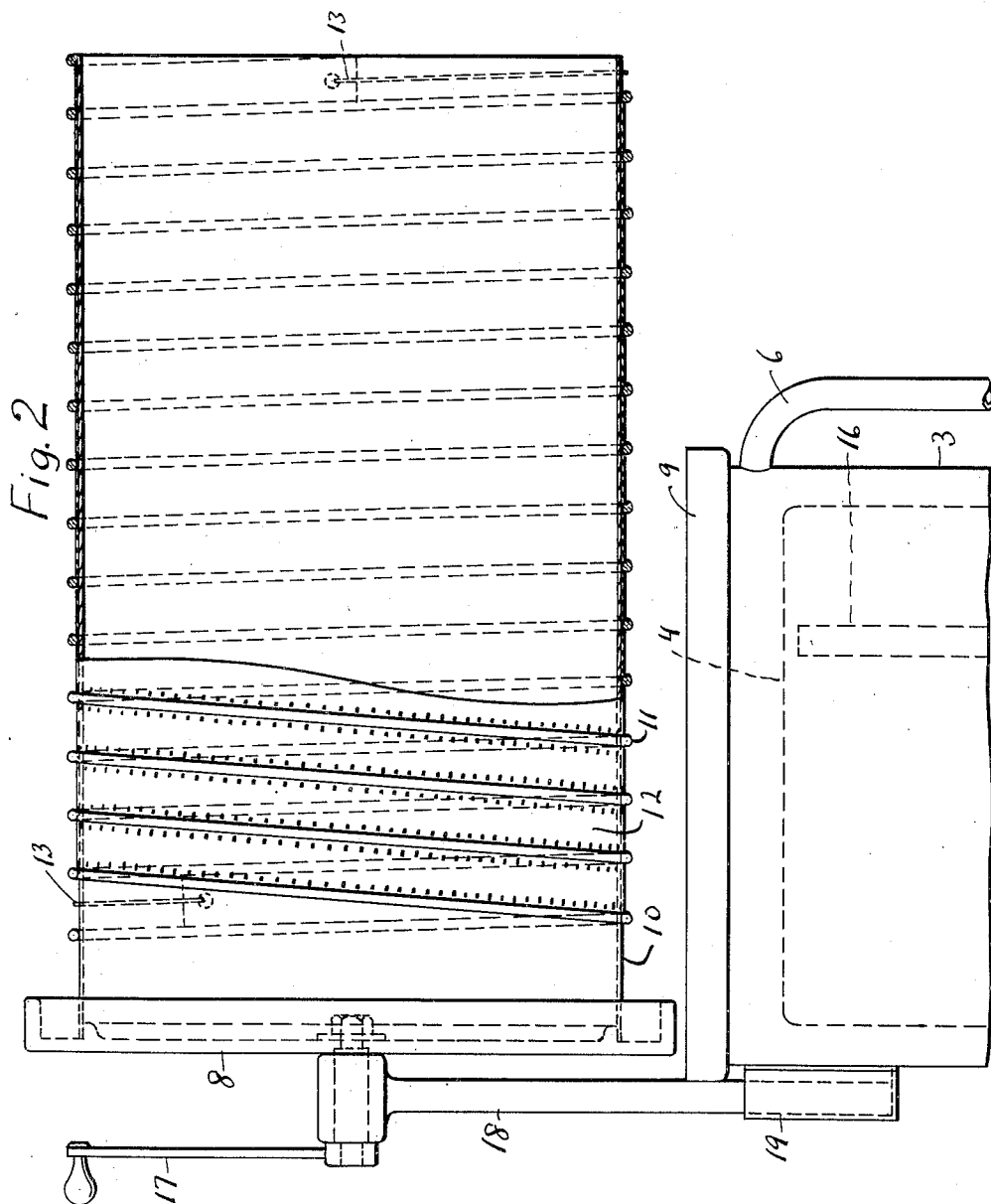
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Fig. 3

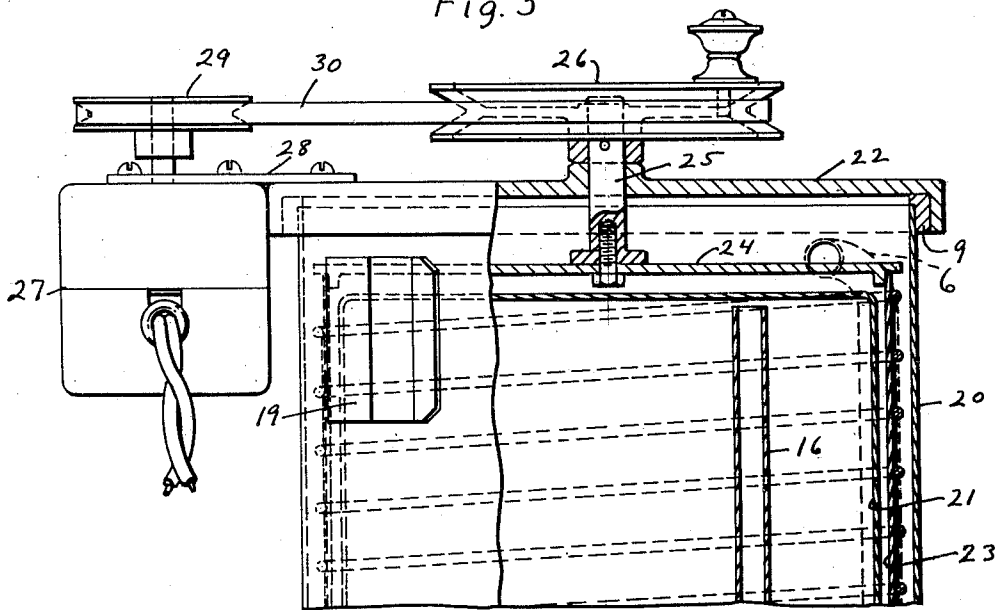
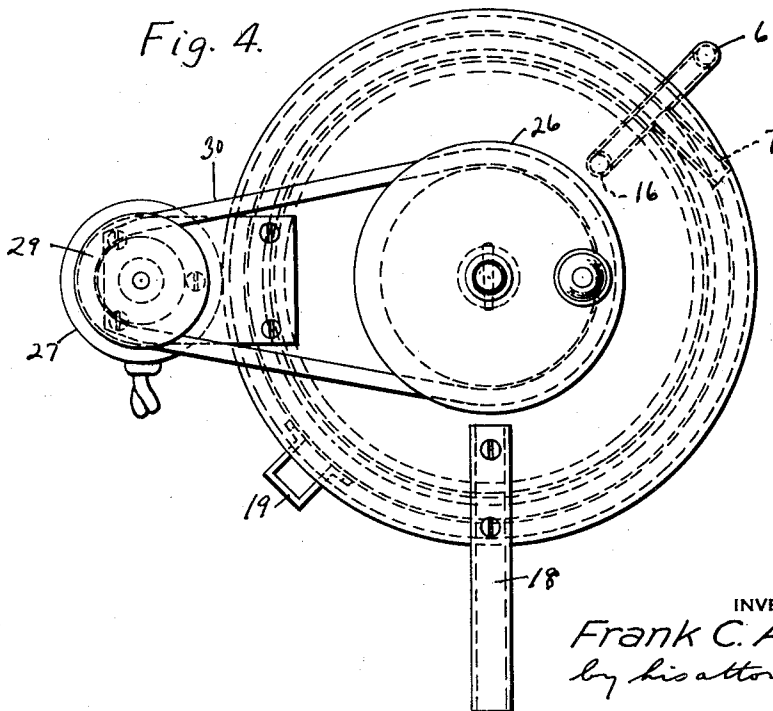


Fig. 4



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UNITED STATES PATENT OFFICE

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DARK TANK WITH TEMPERATURE
CONTROL FOR CONTINUOUS FILM

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Application October 30, 1945, Serial No. 625,511

2 Claims. (Cl. 95—90.5)

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My invention relates to film processing machines, and more particularly to a machine for subjecting photographic film in strip form to the action of developers and other chemical solutions, and for washing or otherwise treating film.

One object of my invention is to provide means for processing or treating photographic films adequately, with a smaller quantity of chemical solution than required by various methods heretofore employed.

Another object of my invention is to provide means for more effectively bringing the treating solution into engagement with the film, with consequent reduced danger of entrapment of air bubbles on the film.

A further object of my invention is to provide means for agitation of the chemical solution on a film surface in a manner whereby there is more uniformity of chemical action on the film than in the case of other methods heretofore employed.

Still another object of my invention is to provide means for controlling the temperature of the chemical solution in an improved manner.

In the accompanying drawings,

Figure 1 is a vertical sectional view through a treating tank and apparatus associated therewith embodying my invention;

Figure 2 is a side view of the upper portion of the tank of Figure 1, with the film-carrying drum removed therefrom and supported in position for the winding or unwinding of film;

Figure 3 is a partial section similar to Figure 1 showing a modification; and

Figure 4 is a plan view thereof.

The apparatus comprises a cylindrical tank 3 having a cylindrical chamber 4 mounted therein, of slightly smaller diameter than the tank. The space between the tank wall and chamber wall is adapted to contain a chemical solution. A single plate closes the space between the tank and chamber, and forms the bottom of the chamber. The film-treating solution is introduced into the tank 3 through a pipe 5, from a hose or the like. The pipe 5 may suitably be of flexible hose whose outer end is maintained at a level above the liquid level in the tank 3. The chemical solution will be replenished or replaced from time to time as it loses its potency. An overflow pipe 6 leading to a drain opening 7 will prevent filling of the tank 3 to a too high level.

The tank has a circular lid or cover 8 loosely surrounding a ring 9 that is secured to the upper end of the tank, so that the lid can have rotative movement on the tank. A drum 10 is firmly attached to the lid 8 so that it will rotate therewith

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when the lid is turned. A helical bead 11 is formed on or carried by the peripheral surface of the drum to serve as spacers for the convolutions of a film strip 12 that is spirally wrapped on the drum. The film is releasably connected at its upper and lower ends to the drum, by suitable clips or tie elements as indicated at 13. Preferably the tie means 13 are tensioned to take up any slack existing in the film.

Either a warm or a cold fluid such as water is introduced into the chamber 4 through a pipe 15, and there may be continuous flow of this temperature-controlling liquid during a film-treating operation. In this event, the water will flow off through an overflow pipe 16, to the drain opening 7. The tank may be provided with a layer of thermal insulation on the exterior thereof to reduce the loss of heat by convection.

With the parts in assembled relation as shown in Figure 2, and a film on the drum 10, the cover 8, together with the drum 10, may be turned or oscillated by a hand crank 17 that is rigidly secured to the cover to thus agitate the chemical solution that surrounds the drum 10 and the chamber 4. By reason of the helical rib 11, the solution will be agitated or stirred to make effective and uniform engagement thereof with the film 12.

Also, the presence of some of the solution between the wall of chamber 4 and the drum 10 will make for effective heat transfer as between the chemical solution and the temperature-modifying liquid in the chamber 4. It will be understood that water or other fluid that is of either lower temperature or higher temperature than the chemical solution will be introduced in the chamber 4 at sufficient rate to modify or change the temperature of the film and the chemical solution to a desired degree.

When it is desired to place a film on the drum 10, the lid 8 will be lifted from the tank and turned to a vertical plane at which position an arm 18 that is loosely supported on the shaft of the handle 17 can be inserted into a socket 19 formed on the side of the tank, as shown in Figure 2. The drum can then be rotated to wind a film thereon. This must be done in a dark room. When the film has been wound on the drum and the cover replaced on the tank, the latter may thereafter be operated in the light since the tank is light-tight. Thus the charging of the tank with developer and the supply of temperature-control water need not be done in the dark. Similarly, a treated film can be conveniently removed from the drum by rotating the drum.

A modified form of the invention shown in Figures 3 and 4 has the drum rotatably mounted on the cover and is provided with a motor for driving the drum. The construction of the modified form is generally similar to that described above including a tank 20, a cylindrical chamber 21 therein and a cover 22 removably disposed on the tank. The tank and chamber have inlet and outlet connections identical with those of the form of the invention already described. A film-carrying drum 23 has an end plate 24 secured to a shaft 25. The shaft is journaled centrally in the cover 22 and has a pulley 26 secured thereto.

A motor 27 is carried on a mounting bracket 28 secured to the cover 22. A pulley 29 on the motor shaft drives the pulley 26 through a belt 30. The cover 22 is also provided with an arm similar to that shown at 18 and the tank 20 with a socket 19 adapted to receive the arm. Thus, when the cover is disposed on the tank, as shown in Figure 2, the motor may be operated to wind the film on the drum. When the drum is disposed in the tank as shown in Figure 3, the motor may be operated to drive the drum during the processing of the film, affording continuous agitation of the developing solution, wash water, or the like.

It will be apparent from the foregoing that the invention is characterized by numerous advantages. The construction is simple and compact so that the device may be made at low cost and used by amateur photographers without difficulty. The liquid in the annular space between the tank and inner chamber may be changed quickly and replaced as desired with little or no loss. The movement of the drum whether by hand, as in the case of the device of Figures 1 and 2, or by the motor drive in the modified form, serves to dislodge any air bubbles forming on the film. The temperature of the treating liquid can easily be maintained at the desired value by the circulation of water through the inner chamber. In fact, a film on the drum may be maintained at a safe temperature during any interval in the processing, even though there is no solution in contact with the film.

Although I have described but two preferred embodiments of the invention, it will be understood that changes in the details thereof may be made without departing from the spirit of the invention of the scope of the appended claims. I claim:

1. Film-processing apparatus comprising an annular tank adapted to contain a chemical film-treating solution, said tank having a heat transmitting inner wall and an outer wall, an open-bottomed drum hanging in said tank intermediate said inner and outer walls and adapted to be immersed in said solution, means for rotating

said drum while so immersed, top and bottom closures for the space circumscribed by said inner wall and adapted thereby to form a closed cylindrical chamber having said inner wall as the outer peripheral surface thereof, an inlet pipe connection to said chamber adjacent said bottom closure, an outlet pipe connection adjacent said top closure, said pipe connections being adapted to maintain said chamber substantially filled with circulating fluid having a predetermined temperature to maintain said chemical solution at a preselected temperature by heat transmission through said inner wall, and means for supporting film to be processed on the periphery of said drum, whereby said film is treated in said solution at said preselected temperature.

2. Film-processing apparatus comprising an annular tank adapted to contain a chemical film-treating solution, said tank having a heat transmitting inner wall and an outer wall, an open-bottomed drum supported in said tank in dependent fashion intermediate said inner and outer walls and adapted to be immersed in said solution, a cover rotatably supported on said tank, said drum being affixed to the underside of said cover, top and bottom closures for the space circumscribed by said inner wall and adapted thereby to form a closed cylindrical chamber having said inner wall as the outer peripheral surface thereof, an inlet pipe connection to said chamber adjacent said bottom closure, an outlet pipe connection into said chamber adjacent said bottom closure and having its open end adjacent said top closure and within said chamber, said pipe connections being adapted to circulate a liquid having a predetermined temperature through said chamber and to maintain said chamber substantially filled therewith, said liquid being adapted to maintain said chemical solution at a preselected temperature by heat transmission through said inner wall, and means for supporting film to be processed on the periphery of said drum, whereby said film is treated in said solution at said preselected temperature.

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