Nov. 16, 1926. 1,607,440

D. F. COMSTOCK

CINEMATOGRAPHIC FILM TREATING APPARATUS

Filed May 1. 1923

Fig. 1

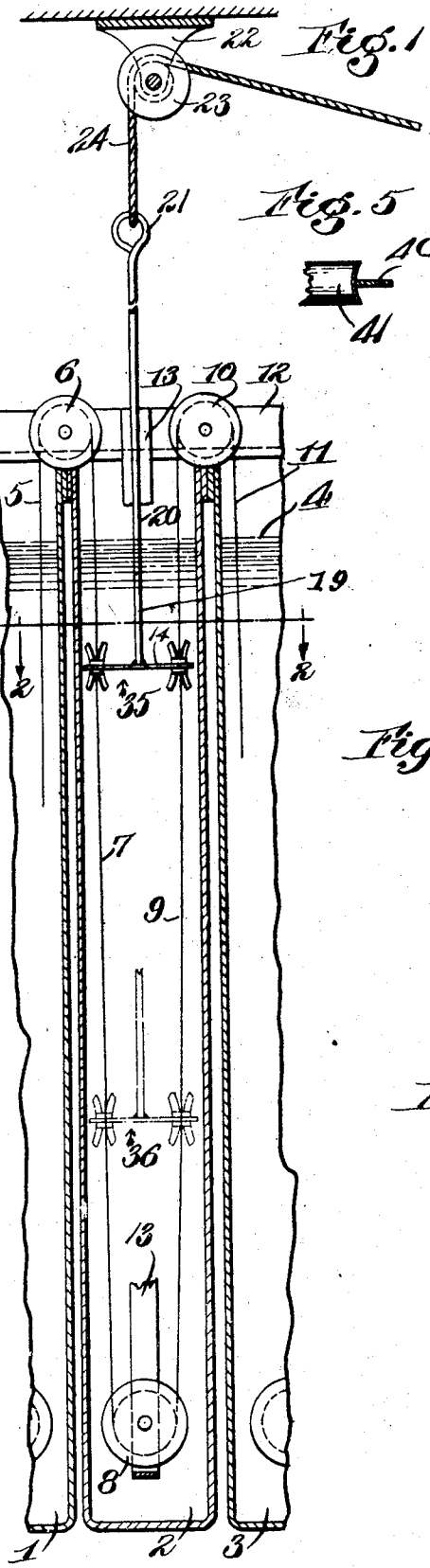


Fig. 5

Fig. 4

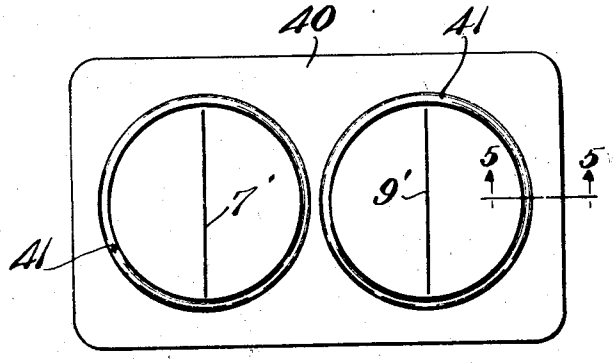


Fig. 2

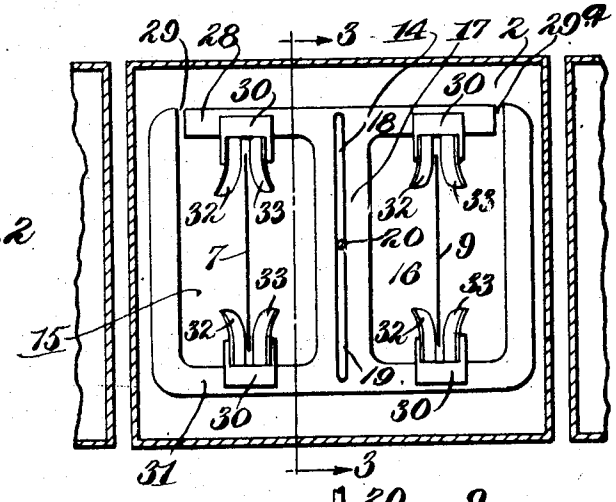
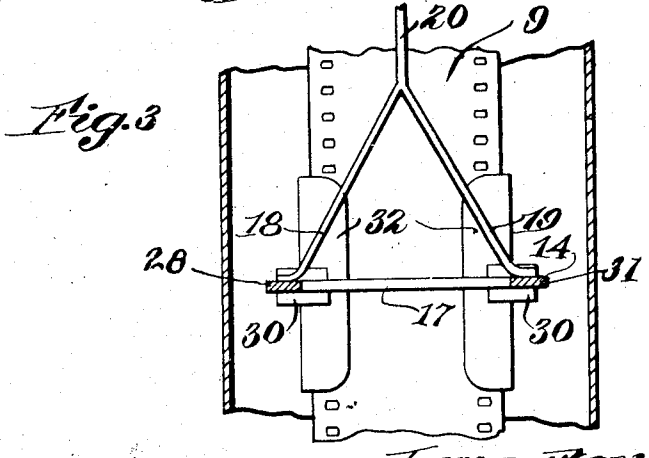


Fig. 3



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UNITED STATES PATENT OFFICE.

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CINEMATOGRAPHIC-FILM-TREATING APPARATUS.

Application filed May 1, 1923. Serial No. 635,997.

This invention pertains to apparatus for treating cinematographic films by means of liquid reagents such as developer, fixing solution, or wash-water, and wherein the several steps involved in the treatment are performed successively and continuously, and relates more specifically to agitating means useful in such an apparatus for stirring the liquid reagents employed to ensure uniform action of the same upon the film and the prevention of streaks or striæ.

In that process of development wherein the film is caused to pass successively through tanks containing the developer, fixing solution, wash water, etc., it has been found that streaks or striæ frequently appear upon the finished film. While the exact cause of the formation of such streaks or striæ is not wholly clear, it has been found after long experimentation that they may be avoided completely by a constant agitation of the wash water or other liquid in which such defects apparently originate, and the object of the present invention is accordingly to provide simple and effective means applicable to developing apparatus of the kind above referred to, without necessitating substantial change in the apparatus for continuously agitating the contents of one or more of the tanks through which the film is passed.

Best results appear to be secured by a relatively quiet, rather than a violent agitation of the liquid, and for attaining the desired object it is preferred to provide an agitator comprising an apertured plate or open frame normally occupying a horizontal position and suspended in the tank of liquid in such manner that it may be raised and lowered slowly without interfering with the normal movement or position of the film. Suitable guide means may be carried by the plate or frame engageable with the edges of the film to prevent damage to the exposed face of the latter by the agitator, and any suitable means may be provided for slowly raising and lowering the frame or plate in the tank, thus producing the desired movement of the liquid.

In the accompanying drawings, a preferred embodiment of the invention is illustrated by way of example, and in such drawings:—

Fig. 1 is a fragmentary vertical cross section through an apparatus of the type above referred to for treating continuous photographic films and having the device of the present invention applied thereto;

Fig. 2 is a horizontal cross-section on the line 2—2 of Fig. 1, but to larger scale;

Fig. 3 is a fragmentary vertical cross-section on the line 3—3 of Fig. 2;

Fig. 4 is a plan view of a modified stirrer; and

Fig. 5 is a section on line 5—5 of Fig. 4.

The numerals 1, 2, and 3 respectively indicate adjacent tanks of the series employed in the usual apparatus for treating moving picture films during the development thereof, tank 1 for example containing developer solution, tank 2 wash water, and tank 3 the fixing solution, it being understood, however, that the exact order in which the tanks are placed, or the reagents contained therein, form no essential part of the present invention. The numeral 4 indicates generally the level of the liquid contained in the several tanks, and a length of film is shown as emerging from the liquid in tank 1 at the point 5. The film then passes over a guide pulley 6, and down into the next tank 2, forming a substantially vertical run 7 in the latter. Near the bottom of the tank 2 the film passes below the guide pulley 8 and thence upward in a substantially vertical run 9 until it emerges from the tank. It then passes over a guide pulley 10 and downward as indicated at 11 into the next successive tank 3. The path thus followed by the film in passing through the tank 2 is that of an open, substantially U-shaped depending loop. As herein shown, the several guide pulleys 6 and 10 are journalled upon a frame 12 extending longitudinally over the tops of the several tanks, while the guide pulley 8 is mounted upon a support 13 depending into the tank from the frame 12. By thus mounting the several guide pulleys, it is possible to remove them from the tank to permit cleaning of the latter as well as to facilitate the threading of the film over the successive pulleys.

The agitating means forming the immediate subject matter of the present invention is herein indicated as associated with the tank 2, it being understood however that similar devices might be employed with any or all of the tanks constituting the treating

apparatus. This agitating means comprises a plate or frame 14 normally lying in a substantially horizontal plane and of a shape and size to fit loosely within the tank with which it is associated. This plate or frame is preferably formed from sheet material of a character to resist the action of the reagent with which it is to be employed and is provided with a pair of spaced apertures 15 and 16. These apertures are conveniently of rectangular contour and of a length somewhat greater than the width of the film. These apertures are separated by a spacer or web 17 to which the extremities of a pair of members 18, 19 are attached, said members respectively diverging from the lower end of a supporting rod 20 which is provided at its upper end with an eye 21. Immediately above the central portion of the tank a bracket 22 is secured to a convenient support and this bracket is provided with a guide pulley 23. A flexible member, such as a cord or chain 24, is secured at one end to the eye 21 of the rod 20, and after passing over the pulley 23 is secured at its opposite end to suitable means for raising and lowering the stirrer.

One end 28 of the agitator plate is provided with slots 29 and 29ª which lead from the outer edge of the plate into the respective apertures 15 and 16 at points adjacent to the outer corners thereof. Opposed brackets 30 are secured to the opposite end portions 28, 31 respectively of the agitator plate at points adjacent to the center of width of each of the apertures 15, 16 and each of the brackets 30 is provided with a pair of spaced guide members 32, 33 respectively.

In applying the agitator device to the tank, the film having first been passed about the guide pulleys, the runs 7 and 9 of the film are passed edgewise through the slots 29, 29ª respectively, permitting the runs of film to enter the apertures 15, 16. The edges of the respective runs of film are then placed between the guide members 32, 33 of opposed brackets 30 so that the guide members may serve to center the respective apertures relative to the film and prevent engagement of the edges of the apertures with the face of the film.

The modification shown in Figs. 4 and 5 comprises a plate 40 provided with two openings, which are preferably circular or elliptical, with ferrules 41 fast in the openings, the ferrules flaring outwardly as shown in Fig. 5. The inner diameters of the ferrules parallel with the film 7′ and 9′ may be slightly greater than the width of the film. The film is extended through this stirrer by threading the end of the film through the openings therein. This stirrer is quite effective and has no tendency to scratch the emulsion coating or coatings on the film. The reciprocation of the agitator in the tank produces a movement of the liquid therein which serves to prevent the formation of streaks upon the finished film. As the runs of film are embraced by elements of the agitator, the movement of the liquid must take place at both faces of the film, so that even through the film be of the type which is sensitized upon both surfaces, the agitation of the liquid is so thorough that both sides of the film will be free from defects. The agitating means herein disclosed produces a relatively slow movement of the liquid which for certain reasons appears to be desirable, but it is to be understood that in its broader aspects the invention is not limited to a slow moving agitator, but that modifications might well be made if circumstances should so warrant whereby the rapidity of agitation might be substantially increased.

I claim:

1. In combination in apparatus for treating cinematographic films having a liquid containing tank and means for guiding the film in a predetermined path through the tank, agitating means within the tank, and means for effecting bodily movement of translation of such agitating means to produce movement of the liquid in the tank.

2. In combination, in apparatus for treating cinematographic films having a liquid containing tank having a substantially unobstructed interior and means for guiding the film in a predetermined path throughout the tank, agitating means within the tank, and means for actuating such agitating means to produce movement of the liquid in the tank in the direction of the path of movement of the film.

3. In combination, in apparatus for treating cinematographic films having a liquid containing tank and means for guiding the film in a predetermined path through the tank, agitating means within the tank movable longitudinally of the predominant path of movement of the film, and means for actuating such agitating means to produce corresponding movement of the liquid in the tank relative to different parts of the film.

4. In combination, in apparatus for treating cinematographic film having a fluid containing tank through which the film is caused to pass in a U-shaped loop, agitating means comprising an element symmetrically arranged with respect to the legs of the loop and actuable to stir the liquid in the tank.

5. In combination, in apparatus for treating cinematographic film having a fluid containing tank through which the film is caused to pass in a U-shaped loop, agitating means comprising means surrounding the loop and actuable to stir the liquid in the tank.

6. In combination, in apparatus for treat-

ing cinematographic film having a fluid containing tank through which the film is caused to pass in a U-shaped loop, agitating means comprising portions respectively arranged between the legs of the loop and outside the latter, and actuable to stir the liquid in the tank.

7. In combination in apparatus for treating cinematographic film having a fluid containing tank through which the film is caused to pass in a U-shaped loop, agitating means comprising an element arranged between the legs of the loop and actuable to stir the liquid in the tank.

8. In combination with apparatus useful in treating cinematographic film by means of a liquid reagent and having a tank for the reagent and guide rolls for causing the film to pass through the tank in a depending U-shaped loop, agitating means arranged within the tank and having an element disposed between the legs of the loop, and means for actuating the agitating means to cause movement of the liquid longitudinally of the loop.

9. In combination in apparatus of the class described having a fluid containing receptacle and means for causing a film to be treated to pass through the receptacle in an open loop-like path, agitating means comprising a reciprocable element movable toward and from the open end of such path.

10. In combination in apparatus for treating cinematographic film having a liquid containing tank and means for causing the film to be treated to pass in a depending loop through the tank, a vertically reciprocating apertured plate within the tank, and means for imparting alternate upward and downward movement thereto.

11. In combination in apparatus for treating cinematographic films by means of a liquid reagent contained in a tank, means for causing the film to pass through the tank in a predetermined path, and an agitator movable vertically in the tank, said agitator being shaped to prevent contact with the face of the film.

12. In combination in apparatus for treating cinematographic film by means of a liquid contained in a tank, means for causing the film to pass through the tank in a predetermined path, an agitator comprising a frame having an aperture for the passage of a run of the film, means for preventing contact of the edges of such aperture with the face of the film, and means for imparting movement to the agitator.

13. In combination in apparatus for treating cinematographic film by means of a liquid reagent contained in a tank, means for causing the film to pass through the tank in a U-shaped path, an agitator comprising a frame having spaced apertures for the passage of the parallel runs of the film, means for centering the film with respect to the apertures, and means for reciprocating the agitator in the tank.

Signed by me at Boston, Massachusetts, this 28th day of April, 1923.

DANIEL F. COMSTOCK.