

PATENT SPECIFICATION



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COMPLETE SPECIFICATION.

Improvements in or relating to the Development and Finishing of Photographic Film Strips.

We, TECHNICAL MOTION PICTURE CORPORATION, a corporation organised under the laws of the State of Maine, United States of America, and JARVIS MELVIN ANDREWS, a citizen of the United States of America, both of 110, Brookline Avenue, Boston, Massachusetts, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the art of forming a series of relief pictures on an elongate photographic film by rendering the exposed and unexposed portions differentially soluble and flowing hot water or other etching liquid along the surface of the film to remove one or other of the portions.

The objects of the invention are to provide an improved method of and apparatus for etching cinematograph films.

According to this invention the film is fed longitudinally a considerable distance along an upwardly extending path and the etching liquid is flowed upon the film from its opposite edges by means of one or more orifices in such close juxtaposition to the film that a stream of liquid spreads entirely across both sides of the film and flows downwardly along the face of the film with little, if any overflow from the film until the stream reaches the lower end of said path.

Such films are useful in representing scenes in black and white or in color.

While the etching may be effected solely by a stream as aforesaid it is preferably first passed through a body of etching liquid to soften that part of the emulsion to be etched away and to start the etching

action. The extent to which the etching process advances in the body of liquid may be varied widely, but in any event it is completed by the aforesaid stream. When employing such a body of liquid the film is preferably fed upwardly from the surface of the body directly into and through the aforesaid stream, the stream flowing downwardly along the film into the body of liquid. The stream thus replenishes the body of liquid which preferably overflows from the bottom at the same rate as it is replenished. Incidentally the stream carries any matter floating on the surface of said body away from the place where the film emerges from the body, inasmuch as the stream tends to spread away from the film at said surface, whereby the floating matter is prevented from adhering to the film.

The aforesaid stream of liquid is agitated by its flow and this facilitates and improves the etching action. This agitation is accentuated by the film sprocket holes which tend to deflect the stream obliquely inwardly toward the center of the film.

After the film passes through the liquid stream the liquid superficially adhering to the film is preferably blown off in a direction both transversely and longitudinally oblique to the film, that is in a direction which is oblique to both the transverse and longitudinal dimensions of the film, this being peculiarly effective in thoroughly removing the superficial liquid without streaking the film, whereas an air jet which is oblique only transversely or only longitudinally of the film is ineffective thoroughly to remove the liquid and at the same time avoid streaks. The air is preferably directed to the film by an elongated nozzle or opening extending substantially across the film, the opening preferably

being adjustable to vary the obliquity of the jet relatively to the surface of the film.

The aforesaid stream of liquid is directed upon the film by nozzles, that is outlet orifices, located at the edges of the film; and in the case of double films or double-coated films the same orifices are arranged to direct the stream partly to one side and partly to the other side of the film.

For the purpose of illustration one concrete embodiment of the invention is shown in the accompanying drawings, in which:—

Fig. 1 is an elevational view;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a section on line 3—3 of Fig. 2;

Fig. 4 is a section on line 4—4 of Fig. 2;

Fig. 5 is a face view of one of the liquid nozzles; and

Fig. 6 is a section on line 6—6 of Fig. 2.

The particular embodiment of the invention chosen for the purpose of illustration is shown as applied to apparatus for continuously developing, bleaching and fixing cinematographic films. Such apparatus ordinarily comprises a series of tanks through which the film is continuously fed in succession. In Fig. 1 two such tanks are shown at 1 and 2, the others to the right being omitted. The film F enters tank 1 over rollers 3, thence passes downwardly around roller 4 thence upwardly over roller 5, thence downwardly in tank 2 over roller 6, and thence upwardly to roller 7 where it passes to the left into a drying chamber or to other film-treating apparatus. According to the present invention the tank 1 may be a wash tank and tank 2 an etching tank, the latter tank being provided with an overflow 8 which communicates with the tank at the bottom and overflows at 9.

The liquid nozzle above referred to preferably comprises an orifice 10 located at the edge of the film F so as to direct the liquid onto the film from the side. The orifice is so positioned that it is bisected by the plane of the film, as shown in Fig. 5, whereby the liquid is directed to both sides of the film from the same orifice. In order to position the film relatively to the orifice, guides are provided adjacent the orifice and in the preferred embodiment illustrated in the drawings these guides are mounted upon and formed integrally with the nozzle, the guides being in the form of flanges 11 and 12 forming a channel 13 therebetween to receive the film F. These flanges are preferably shaped and positioned to bear upon the film only at points 14 and 15, thereby to center the film relatively to

the orifice without engaging the film throughout a very large area. The flanges 11 and 12 preferably extend only to the sprocket holes of the film, the position of which is indicated at 16 in Fig. 2 so as not to rub against the image-bearing portion of the film. By inclining the nozzle relative to the path of the film, as shown in Fig. 5, the ends of the flanges serve as the bearings for guiding the film and the orifices are inclined to the path of the film so that an adequate quantity of water is directed to both sides of the film even though the film is somewhat warped and therefore does not lie wholly in the plane defined by the bearing edges 14 and 15. In the particular embodiment illustrated, identical nozzles are provided on opposite sides of the film, and they connect through branched ducts 17 and 18 with a common supply pipe 19.

The nozzles 10 are preferably located directly above the etching tank 2 so that the film extends substantially vertically from the tank to the nozzles. The distance of the nozzles above the tank depends upon the rate of liquid flow, its temperature, the rate of film travel, and the extent to which the etching progresses in the tank 2, but in any event the distance is sufficiently great so that the film is completely etched by the time it reaches the nozzles.

A suitable etching liquid comprises water at a temperature of about 120° F. the water being supplied at such a rate that a stream flows down each side of the film from the nozzles to the tank 2, the stream being relatively thin or shallow but extending the full width of the film. With the rate of flow properly adjusted both sides of the film can be fully covered throughout the entire distance between the nozzle and the tank without any of the liquid overflowing at the edges of the film.

In the illustrated embodiment the film passes between opposed air nozzles shortly after passing between the liquid nozzles 10. The preferred construction of the air nozzles comprises two tubular members extending in parallel relationship along opposite sides of the film, and joined at 21 with the two branches of larger tube 23, the end of which is formed as shown in Figs. 2 and 4 to fit the ends of the tubes 20. On the inner side of the tubes 20 are longitudinal slots 24 facing the opposite sides of the film. Fitting within the tubes 20 with a snug sliding fit, are tubes 25 which are provided with narrow longitudinal slots 26. The tubes 25 are open at their lower ends (Fig. 2) and closed at their

upper ends, the upper ends being provided with handles 27 which project beyond the open ends of the outer tubes 20. By means of handles 27 the inner tubes may be rotated to adjust the direction of slots 26, thereby to adjust the angularity of the jet of air from the nozzles to the film.

An improved feature of the invention involves the oblique arrangement of the air nozzles relatively to the film, the nozzles being oblique relatively to both the transverse and longitudinal dimensions of the film, the preferred degree of angularity being illustrated in Fig. 2. In addition to this oblique disposition of the tubes the slots 26 are preferably positioned by means of the handles 27 so that the air jets are directed downwardly and to the left (Fig. 2). With this arrangement substantially all of the superficial liquid is blown off the film and at the same time the streaks on the film, caused by the air jets heretofore used, are avoided. If the tubes 20 extended horizontally parallel to the transverse dimensions of the film so as to blow the water downwardly along the film, there would be a tendency for streaks longitudinally of the film to appear after the film is dry. If the air nozzles were located at one edge of the film to blow horizontally across the film, there would be a tendency toward unequal removal of the superficial liquid and in some cases a considerable amount of the liquid might not be blown off, especially near the edge of the film opposite to the air nozzles.

The operation of the apparatus is as follows: The film is fed continuously through the apparatus as aforesaid. As the film passes through the tank 2, the gelatin to be etched away is softened and may be etched away to some extent, this tank being filled with water at approximately 120° F. As the film passes upwardly from the surface of the body of liquid in tank 2 to the nozzles 10, both sides of the film are subjected to the action of a rapidly flowing stream of hot water. This stream of water is naturally agitated by its own flow and is further agitated by the sprocket holes which tend to divert the water inwardly from both sides toward the center thereby keeping it thoroughly stirred. The result is that the soft gelatin is rapidly carried away and the film, after passing nozzles 10, is entirely cleansed of soft gelatin leaving the hard gelatin in sharp relief. Inasmuch as the marginal portions of the film are never exposed, the gelatin on the margins entirely washes away leaving perfectly clean celluloid outside the

sprocket holes. After the film passes nozzles 10 it passes between nozzles 26 where the liquid superficially adhering to the film is blown off so that the film may be quickly dried when subsequently passed through a drying chamber. The tank 2 may be continuously replenished with hot water by a pipe opening thereinto either at the top or bottom or any intermediate position, but ordinarily the water flowing downwardly along the film from the nozzles 10 is sufficient for this purpose.

By virtue of the above-described method and apparatus, the film is etched rapidly and cleanly, and the amount of hot water required for the purpose is only a small fraction of the amount required by other known processes.

We are aware that it has been proposed to treat photographic films and the like with liquid applied from a jet in close proximity thereto so that the said liquid falls down the film. Also, that it has been proposed to remove moisture from the surface of a cinematograph film by moving the strip past one or more air jets directed close to and inclined to the surface of the strip and in a direction partially or wholly in opposition to that of the strip movement and we make no claim to any of these features, *per se*.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. The art of forming a series of relief pictures on an elongate photographic film by rendering the exposed and unexposed portions differentially soluble and flowing hot water or other etching liquid along the surface of the film, characterized in that the film is fed longitudinally a considerable distance along an upwardly extending path and the etching liquid is flowed upon the film from its opposite edges by means of one or more nozzles in such close juxtaposition to the film that a stream of liquid spreads entirely across both sides of the film and flows downwardly along the face of the film with little if any overflow from the film until the stream reaches the lower end of said path.

2. Apparatus for practising the method of Claim 1 characterized in that means are associated with the nozzles for guiding the film past the nozzles in predetermined relationship thereto.

3. Apparatus for practising the method of Claim 1 and/or Claim 2 characterized by an air nozzle having a long narrow orifice extending across the side of the film in advance of the liquid orifice for

removing the superficial liquid from the surface of the film after it passes the liquid orifice.

4. Apparatus according to Claim 3
5 further characterized in that said nozzle is rotatable about an axis extending in the same general direction as said slot

so that the slot may be directed toward the film at different angles.

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[This Drawing is a reproduction of the Original on a reduced scale.]

