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METHOD AND APPARATUS FOR STRIPING FILM

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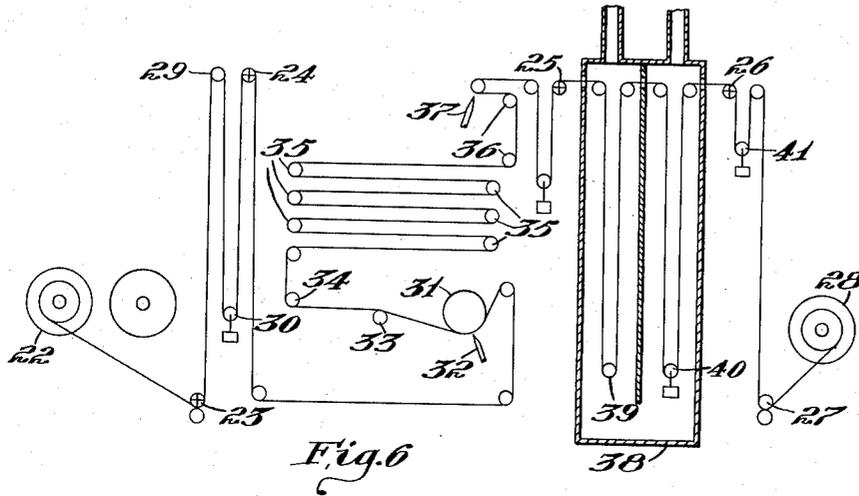


Fig. 6

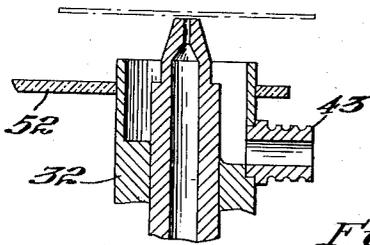


Fig. 8

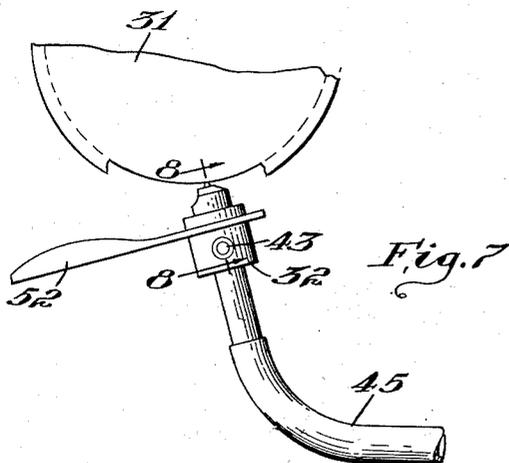
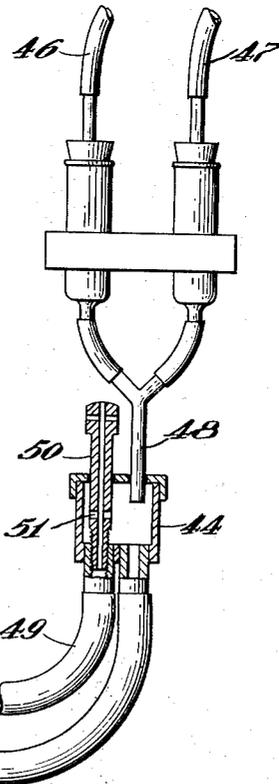


Fig. 7



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METHOD AND APPARATUS FOR STRIPING FILM

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8 Claims. (Cl. 117-44)

1

This invention relates to the art of applying a stripe of liquid to an elongate strip of material and more particularly to the application of a stripe of sensitizing solution to the sound-track zone of cinematographic film. For example, in printing motion pictures by imbibition the picture areas need not be sensitized but inasmuch as it is difficult to print a good sound-track by imbibition it is desirable to sensitize the sound-track zone of the film to receive photographic print of the sound-track.

Objects of the present invention are to apply to a film a liquid treatment which can be easily and accurately adjusted in degree and which affects the film throughout a zone whose width is accurately defined and can be adjusted precisely. Other objects are to apply a stripe of liquid which is uniform in width and which is straight and parallel to the edges of the film. Still other objects are to cause the liquid to be absorbed uniformly throughout the length and width of the stripe and to prevent the liquid from spreading laterally from the striped zone.

In one aspect the present invention involves a method of treatment which comprises guiding film along a predetermined path, at one location along the path applying a ridge of liquid to a longitudinal zone of the film and, at another location farther along the path, removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations. The stripe of liquid is preferably applied by directing a fountain of liquid upwardly against the underside of the film, and the superficial liquid is preferably removed by suction. In the preferred embodiment the stripe is applied by feeding the film over an upwardly directed nozzle in close juxtaposition thereto but in spaced relation therewith, creating at the top of the nozzle a bead of liquid high enough to bridge the gap between the nozzle and film, drawing liquid from the nozzle by capillary attraction as the film is fed past the nozzle, and supplying liquid to the nozzle at a rate sufficient to maintain the aforesaid bead without overflow.

In another aspect the invention involves apparatus comprising means for guiding film along a predetermined path, means at one location along the path for applying a ridge of liquid to a longitudinal zone of the film and, at another location farther along the path, means for removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations. In the preferred embodiment the apparatus comprises a coater

2

nozzle and means for passing the film over the nozzle with the film contacting the summit of the bead of liquid throughout the sound-track zone of the film. In normal operation the nozzle creates a liquid head sufficient to form a capillary bead of liquid between the nozzle and film without any overflow, whereby the width of the strip remains uniform throughout its length.

For the purpose of illustration typical embodiments of the invention are shown in the accompanying drawings in which

Fig. 1 is a diagram of an arrangement for treating the sound-track zone of motion picture film;

Fig. 2 is a plan view of a piece of motion picture film with a bubbler underneath;

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

Fig. 4 is a plan view of the film as it passes over the suction device;

Fig. 5 is a section on line 5-5 of Fig. 4;

Fig. 6 is a diagram like Fig. 1 showing a preferred embodiment;

Fig. 7 is a side elevation of the coating means for applying the strip of liquid, parts being shown in section; and

Fig. 8 is a section on line 8-8 of Fig. 7.

The particular embodiment of the invention shown in Figs. 1 to 5 comprises a water tank 1, rolls 2 and 3 for guiding film into and out of the tank, a coater nozzle 4 having a tip 6, an inlet 7 and an outlet 8, a suction device 9 for removing superficial liquid and rolls 11, 12, 13, 14, 15 and 16 for guiding the film along a predetermined path which extends into juxtaposition to the tip 6 and the suction device 9, with the emulsion or face side of the film directed downwardly in this portion of the path. Where the film passes the nozzle the path of the film is preferably inclined downwardly. The apparatus may also comprise a suction device intermediate the rolls 3 and 14 for removing water superficially adhering to the film after the film leaves the water tank 1 and before it reaches the nozzle. By first passing the film through the water tank, it absorbs considerable moisture. This facilitates the deposition of the ridge of liquid on the film also the absorption of the liquid by the film.

The nozzle 4, which constitutes the subject-matter of an application by David J. Johnson, Ser. No. 690,770, filed August 15, 1946, and now abandoned comprises two orifices 17 through which the film-treating liquid is fed at low pressure to produce a bead which extends only a short distance above the tip of the nozzle, excess material which overflows in getting the apparatus adjusted passing into a trough 18 and flowing

away through outlet 8. In the illustration the film is 32 mm. wide and provided with perforations like standard 16 mm. film so that, when split down the middle, it produces two standard 16 mm. films with a sound-track zone 19 along one edge of each film. While the apparatus may be adjusted to apply two separate stripes with the two outlets 17, preferably the two streams merge into one fountain which wets the film throughout the width of the entire sound-track area between the two rows of picture areas. While any suitable sensitizing solution may be used, the one disclosed in the application of Gerald F. Rackett, Ser. No. 594,249, filed May 17, 1945, and now abandoned, is recommended.

The suction device 9 has an inlet 21 in the form of a slot which extends approximately the width of the sound-track area of the film. As in the case of the nozzle 6, the device 9 extends into close juxtaposition to the film without contacting the film.

As the film passes the nozzle 4 it picks up a ridge of liquid the width of which is approximately equal to the distance between the two rows of picture areas on the film. In transit from the nozzle 4 to the device 9 some of the liquid is absorbed by the film. The superficial liquid remaining on the film is removed by the device 9. By regulating the distance between the nozzle 4 and the device 9 or by adjusting the speed of the film, the amount of liquid absorbed by the film can be regulated. By having the path of the film extend back over roll 16 after it leaves the suction device the film can be partly or wholly dried before the film leaves the machine.

The preferred embodiment of the invention shown in Figs. 6, 7 and 8 comprises a feed reel 22, feed sprockets 23, 24, 25, 26, a ratchet sprocket 27 and a take-up reel 28. Intermediate the sprocket wheels 23 and 24 is a guide roll 29 and a weighted elevator 30. After leaving the sprocket wheel 24 the film passes over three guide rolls to the coater roll 31 opposite the coating nozzle 32. Thence the film inclines upwardly to the guide roll 33, thence over guide roll 34 and thence over a series of rolls 35 which are so arranged that the portions of the film passing from one roll to the next succeeding roll extend horizontally and are too short to sag substantially. After passing back and forth over the rolls 35 the film passes over another guide roll 36, thence past the suction nozzle 37 and thence over two guide rolls and under an elevator roll. Between the sprocket wheels 25 and 26 the film extends in two depending loops within a drying chamber 38. At the lower end of the first loop the film is guided by a roller 39 journaled in the chamber but the lower end of the second loop is guided by a weighted roller 40 which is free to rise and fall to compensate for slight variations in the shrinkage of the film. Between the sprocket wheels 26 and 27 a weighted guide roll 41 is provided to serve as an elevator to descend when the sprocket wheel 27 is stopped while the take-up reel is being replaced with a new reel. The sprocket wheel 27 is of the ratchet type which can turn forwardly but not rearwardly, and it is driven by the film. Thus when the film is cut to replace the take-up reel the sprocket wheel 27 stops. Before the film reaches the coater nozzle it may be moistened as in Fig. 1 or in any other suitable way.

While the suction nozzle 37 may be substantially the same as the nozzle 9 of the first embodiment, the coater nozzle 32 differs from the

nozzle 4 in that it has only a single outlet large enough to wet the film throughout the entire width of the sound-track zone. As shown in Figs. 7 and 8 the nozzle 32 is provided with an overflow cup 42 and an outlet 43 for attachment to a drain hose. As shown in the same figures the roll 31 opposite the coater nozzle is provided with flanges to engage the edges of the film in the region of the coater nozzle, whereby the stripe of liquid is applied along a zone parallel to the edge of the film and always the same distance from the edge of the film.

As shown in Fig. 7 the means for supplying liquid to the coater nozzle comprises a chamber 44 in which the liquid is maintained at substantially the same level as that of the coater nozzle. The chamber 44 is connected with the nozzle through a tube 45. When the liquid comprises two components they may be supplied separately through tubes 46 and 47 and thence through the Y-shaped fitting 48 to the chamber. The chamber 44 has an outlet connected to the overflow tube 49. In this outlet is threaded a tube 50 having lateral inlets 51 through which liquid flows from the chamber to the overflow tube 49. By threading the tube 50 up and down the height of the liquid in the chamber may be varied, thereby to vary the rate of flow from the outlet of nozzle 32.

In operation the height of the liquid in chamber 44 should be so adjusted as to create a liquid head at the nozzle just sufficient to form a capillary bead of liquid between the coater tip and the film. If the film travel is stopped the normal and preferred adjustment of the liquid head is such that a full bead of liquid remains standing between the coater tip and the film. The liquid does not overflow and run down over the coater tip into the cup 42 after the liquid level is properly adjusted. As the film travels past the coater tip the liquid is drawn out into a stripe and the supply of liquid is automatically replenished by flowing from the constant level chamber. The rate of flow to the film should not be sufficient to result in overflow into the cup 42 as this would result in an irregular width of coating due to the occasional drips or blobs of liquid overflowing. In normal operation the capillary bead is drawn smoothly onto the film. When a splice passes the tip an excess of liquid may be brushed off to make a small blob, but this is not serious if the path of the film is upwardly inclined as it leaves the coater tip as the excess solution runs back along the film towards the nozzle and falls upon the shield 52 which serves as a trough to lead the drippings away from the nozzle. After the passing of a splice normal operation is quickly resumed without variation in the width of the strip except throughout a small distance immediately following the splice.

The upward inclination of the film after it leaves the coater nozzle is important; if the film path extended horizontally or downwardly any excess solution which inadvertently gets on the film during the passage of a splice or during a stop would tend to hang suspended from the film as an irregular, uncontrolled, running drip which might ruin many feet of film before the last of the excess solution is used up.

The coater wheel 31 is preferably an accurately machined and balanced bronze wheel mounted to turn smoothly in ball bearings when pulled along by the film. The coater wheel has accurately shaped flanges which fit the edges of the film and assure the film passing over the fixed coater.

tip in proper lateral position. By applying the liquid to the film while the film is drawn snugly around the coater wheel, the stripe is uniformly applied in a straight line parallel to the edge of the film even though the film is crooked or curved or buckled.

The rolls and sprocket wheels between the coater wheel 8 and the sprocket wheel 26 are undercut in the middle so that they engage the film only along the margins of the film, whereby they do not contact with the wetted zone. The distance between the coater wheel 31 and the suction nozzle 37 must be great enough to permit the liquid to soak into the emulsion of the film to the desired extent. The important requirement of this soaking or absorbing path is that the film must be restrained and held as level as possible by a large number of pulleys placed close together so that, even though the film is curled or buckled or crooked, there is never an opportunity for one edge of the film to be higher than the other as this would cause the stripes of liquid solution to flow irregularly toward the lower edge. The soaking path may have short vertical sections but any great length of vertical path is to be avoided as this also tends to produce a zone which is irregular in width and non-uniform in sensitivity.

At the suction nozzle 37 the liquid sensitizing solution remaining on the film surface is quickly drawn off, leaving the surface of the film moist but free from any liquid drops.

When the apparatus is used to apply to a narrow sound-track zone a thin sensitizing solution having a viscosity approximating that of water, the distance from the tip of the nozzle to the film may be approximately one-eighth of an inch.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

This is in part a continuation of my co-pending application #690,771 filed August 15, 1946, and now abandoned.

I claim:

1. In the art of cinematography the method which comprises guiding absorbent film along a predetermined path from one location to another with one side of the film directed downwardly in a portion of the path, at the first location applying to a longitudinal zone of said underside of the film a depending ridge of liquid of which the film is absorptive but in excess of that which the film will absorb in traveling from the first to the second location so that some of the liquid remains on the surface of the film until it reaches the second location, the liquid being applied by directing a fountain of the liquid upwardly against said zone, and at said second location removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations.

2. In the art of cinematography the method which comprises guiding absorbent film along a predetermined path from one location to another with one side of the film directed downwardly in a portion of the path, at the first location applying to a longitudinal zone of said underside of the film a depending ridge of liquid of which the film is absorptive but in excess of that which the film will absorb in traveling from the first to the second location so that some of the liquid remains on the surface of the film until it reaches the second location, the liquid being applied by directing

a fountain of the liquid upwardly against said zone, and at said second location removing by suction the superficial liquid which has not been absorbed by the film while traveling between the two locations.

3. In the art of cinematography the method which comprises guiding absorbent film along a predetermined path from one location to another with one side of the film directed downwardly in a portion of the path, at the first location applying to the sound-track zone of said underside of the film a depending ridge of sensitizing liquid of which the film is absorptive but in excess of that which the film will absorb in traveling from the first to the second location so that some of the liquid remains on the surface of the film until it reaches the second location, the liquid being applied by directing a fountain of the liquid upwardly against said zone, and at said second location removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations.

4. In the art of cinematography apparatus comprising means for guiding film along a predetermined path from one location to another with one side of the film directed downwardly, means at the first location for applying to a longitudinal zone of the underside of the film a ridge of liquid of which the film is absorptive but in excess of that which the film will absorb in traveling from the first to the second location so that some of the liquid remains on the surface of the film until it reaches the second location, the path of the film past the liquid applying means being directed downwardly, and at said second location means for removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations.

5. In the art of cinematography apparatus comprising means for guiding film along a predetermined path from one location to another with one side of the film directed downwardly at the first location, a bubbler at the first location for applying to a longitudinal zone of the underside of the film a ridge of liquid of which the film is absorptive but in excess of that which the film will absorb in traveling from the first to the second location so that some of the liquid remains on the surface of the film until it reaches the second location, and at said second location means for removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations, said bubbler being inclined in the direction of film travel.

6. In the art of cinematography apparatus comprising means for guiding film along a predetermined path from one location to another with one side of the film directed downwardly at the first location, a bubbler at the first location for applying to a longitudinal zone of the underside of the film a ridge of liquid of which the film is absorptive but in excess of that which the film will absorb in traveling from the first to the second location so that some of the liquid remains on the surface of the film until it reaches the second location, at said second location means for removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations, and intermediate said locations a series of pulleys arranged to cause the film to travel back and forth approximately horizontally, the pulleys be-

7

ing close enough together to prevent the film from tipping edgewise.

7. In the art of cinematography apparatus comprising means for guiding film along a pre-determined path from one location to another with one side of the film directed downwardly at the first location, a bubbler at the first location for applying to a longitudinal zone of the underside of the film a ridge of liquid of which the film is absorptive but in excess of that which the film will absorb in traveling from the first to the second location so that some of the liquid remains on the surface of the film until it reaches the second location, and at said second location means for removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations, the path of the film being upwardly inclined as it leaves said bubbler so that the bridge of liquid tends to flow along the film in the direction opposite to the direction of film travel.

8. In the art of cinematography apparatus comprising means for guiding film along a pre-determined path from one location to another with one side of the film directed downwardly at the first location, a bubbler at the first location for applying to a longitudinal zone of the underside of the film a ridge of liquid of which the film is absorptive but in excess of that which the film will absorb in traveling from the first to the second location so that some of the liquid

8

remains on the surface of the film until it reaches the second location, at said second location means for removing from the film the superficial liquid which has not been absorbed by the film while traveling between the two locations, a liquid reservoir at approximately the same level as said nozzle, and a duct connecting the reservoir with the bubbler, the reservoir being provided with an overflow which is adjustable in elevation to regulate the rate of liquid supply to the bubbler.

EVERETTE E. GRIFFITH, JR.

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