Sept. 26, 1933. B. BURNS ET AL 1,927,886

FILM COLORING MACHINE

Filed April 25, 1931 2 Sheets-Sheet 1

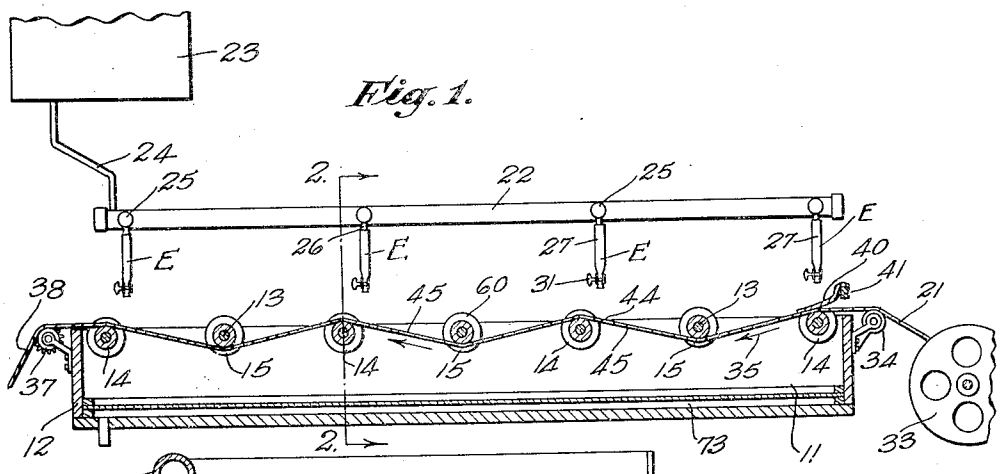


Fig. 1.

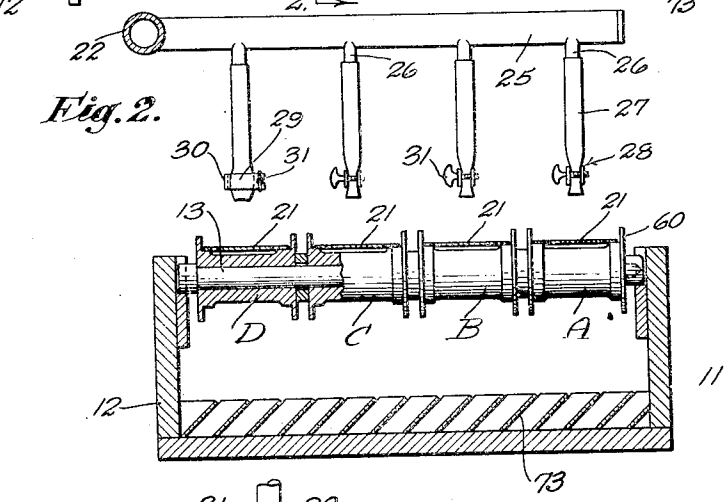


Fig. 2.

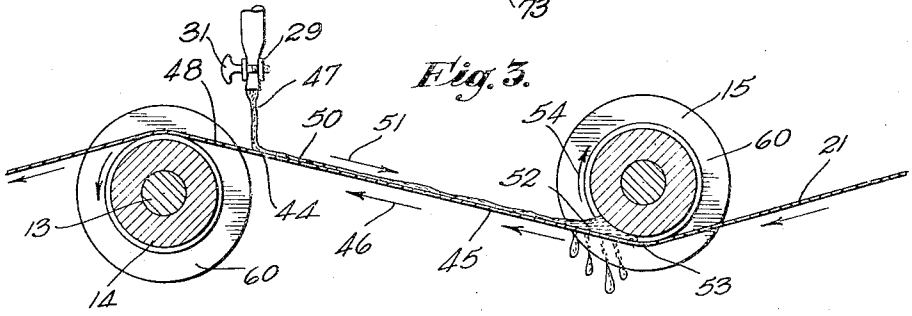


Fig. 3.

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Fig. 4.

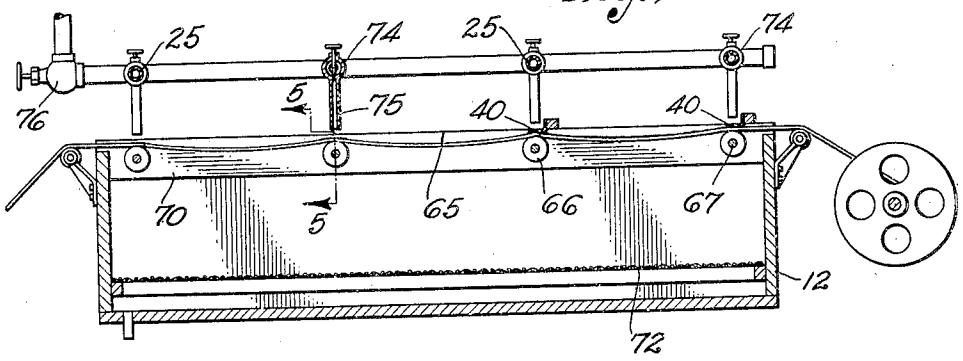


Fig. 5.

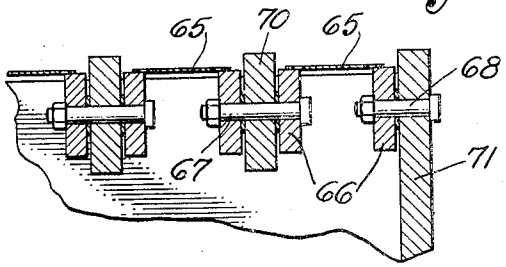


Fig. 6.

Fig. 7.

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FILM COLORING MACHINE

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Application April 25, 1931. Serial No. 532,807

23 Claims. (Cl. 95—94)

Our invention relates to the art of treating motion picture film and relates particularly to a method and apparatus for applying treating fluid to one side of a motion picture film.

The present principal utility of our invention in the coloring of motion picture film is in the coloring of double coated positives having complementary color images in separate layers of emulsion. For the purpose of simplicity in disclosing the utility and operation of the invention, we shall describe it in conjunction with the coloring of a color value positive having color value images in emulsion coatings on the opposite sides of the supporting base or celluloid strip commonly used in motion picture film. The color value positive is obtained from complementary color value negatives which in the preferred practice respectively have orange-red and blue-green color value images recorded thereon. The emulsion on one side of a double coated film is printed from the orange-red color value negative, and the emulsion on the other side thereof is printed from the blue-green color value negative. In the subtractive method of producing colored pictures this color value positive is then transformed into a colored positive by coloring blue or blue-green the color value images printed from the orange-red color value negative, and coloring orange-red the color value images printed from the blue-green color value negative.

Our invention comprehends a simple method and means for coloring one emulsion of a double coated film without such color being applied to the other side of the film.

It is an object of the invention to provide a method and means for flowing a treating fluid, such as a dye, mordant, or toning solution, on the upper surface of a film as it moves forwardly through a supporting structure in such a manner that effective penetration of the constituents of the treating fluid will be accomplished.

It is a further object of the invention to provide a simple form of a machine in which the film is carried on rollers so positioned that the face of the film to be treated will be disposed upwardly and the film will follow through a sinuous or undulating path so that the film will consecutively travel upwardly and downwardly, and means for applying a treating fluid to the upper face of the film in such a manner that the treating fluid will flow down the film and thereby be agitated in such a manner that a good contact of the constituents of the treating fluid with the upper face of the film will be obtained.

A further object of the invention is to provide a machine in which the film is held so as to form depressions therein in which a body of treating fluid of material quantity will collect and continuously move with a rolling motion. By this method of application we overcome the unsatisfactory results obtained in merely flowing a layer of fluid on the upper surface of a film maintained in perfectly horizontal position, by causing the fluid to flow down or along the surface of the film so that a rolling agitation of the fluid is accomplished to constantly bring active portions of the fluid into engagement with the surface of the film to be treated.

A further object of the invention is to provide a machine of the above character in which depressions are formed in the length of film by rollers under which the film travels, such rollers serving as agitating and spreading means for the fluid collecting at the bottoms of the depressions.

Further objects and advantages of the invention will be made evident throughout the following part of the specification.

Referring to the drawings, which are for illustrative purposes only,

Fig. 1 is a vertical longitudinal section through a simple form of device in which our simple method of treating one surface of the film may be practiced.

Fig. 2 is an enlarged cross section on a plane represented by the line 2—2 of Fig. 1.

Fig. 3 is an enlarged sectional detail showing the manner in which the fluid is applied to the upper surface of a film.

Fig. 4 is a longitudinal sectional view showing an alternative form of our invention in which the film is carried in a horizontal plane by the supporting rollers.

Fig. 5 is an enlarged fragmentary sectional view on a plane represented by the line 5—5 of Fig. 4.

Fig. 6 is a fragmentary longitudinal sectional view showing a form of our invention in which the film moves continuously uphill during the coloring operation.

Fig. 7 is a fragmentary perspective view showing a novel form of nozzle which may be employed to apply treating fluid to the surface of a film.

In Fig. 1, we show a supporting structure 11 including a tank 12 in which excess treating fluid may collect. By means of horizontal and laterally extending shafts 13, primary and secondary rollers 14 and 15 are supported in a substantially horizontal plane and are preferably centralized on a horizontal center line. As shown in Fig. 2,

a number of rows A, B, C, and D of rollers may be supported in the supporting structure 11 so that a plurality of films 21 may be simultaneously conducted through the film treating device. Above and along one side of the tank 12 is a header pipe 22 which may be fed from any suitable container 23 by means of an intercommunicating tube 24. Projecting laterally from the header pipe 22 are a plurality of branch pipes 25 having nipples 26 extending downwardly therefrom so as to support fluid delivery tubes 27 which may be conveniently made of rubber and may be equipped with valve means 28 consisting of cooperating pairs of plate members 29 hinged together at one end of each, as indicated at 30, and having screws 31 operative between their free ends whereby to cause the plates 29 to clamp the rubber tubes 27 in a manner to restrict the opening therethrough or to close the opening entirely as may be desired, these valve means 28 being of the character commonly employed in laboratory practice.

As clearly shown in Fig. 1, the films 21 are drawn from suitable containers or spools 33 over inlet guide means consisting of rollers 34 and pass over the first set of primary rollers 14. The films are then carried downwardly, as indicated by the arrow 35 of Fig. 1, under the secondary roller 15 adjacent and to the left of the first primary roller 14. The films are then carried consecutively over and under primary and secondary rollers 14 and 15. From the last of the primary rollers 14 situated at the leftward end of the tank 12, the films 21 may engage pulling sprockets 37, the function of which is to pull the film through the treating device. From the pulling sprocket, the films extend downwardly, as indicated at 38, into further treatment, such as washing. Felt pads 40 are supported by means of a cross bar 41 so that these felt pads will rest on the upper faces of the films 21 as they pass over the first of the primary rollers 14. Above the pads, the delivery tubes 27 are positioned so that controlled quantities of a treating fluid, such as a blue-toning solution, will flow down onto the felt pads 40 and be thereby distributed over the upper surfaces of the films 21, thoroughly moistening, coating, or wetting the upper faces of such films. As indicated by the numeral E, sets of treating fluid delivery tubes 27 are disposed above the films 21 at points adjacent and immediately before engagement of the films with the primary rollers 14 following after the first of the secondary rollers 15. The streams or flows of fluid from these delivery tubes drop onto the films 21 near the upper ends 44 of the upwardly sloping portions 45 thereof.

In Fig. 3 a single film 21 is shown passing under a secondary roller 15 and upwardly as indicated by an arrow 46 over the succeeding primary roller 14. During the use of the treating device, the film moves slowly in forward or leftward direction, and treating fluid 47 is delivered to the upper surface 48 thereof near the upper end 44 of the upwardly sloping and upwardly moving portion 45. This fluid spreads itself over the upper face of the film and flows downwardly in a surface coating or layer 50 in the direction indicated by the arrow 51. When this downwardly flowing layer of fluid reaches the lower end of the sloping portion 45, it forms a pool 52 in the depression 53, and due to the forward movement of the films 21 and the rolling motion of the roller 15 in the direction indicated by the arrow 54, the treating fluid in this pool 52 is thoroughly mixed or agitated with a rolling motion so that a continuous application of portions of the fluid to the upper surface 48 of the film is obtained. During the flow of the treating fluid down the sloping portion 45 in the form of a layer 50, there is a constant rolling or mixing action which produces a thorough treatment of the upper emulsion coating of the film. The rollers 14 are provided with flanges 60 which rest close to the edges of the film 21. We find that the excess of fluid from the pool 52 drips down the sides of the flanges and falls from the peripheral edges thereof into the tank 12, and a portion of the fluid drips through the perforations in the film.

In the alternative forms of our invention shown in Figs. 4 and 5, a film 65 is supported in a substantially horizontal plane by rollers 66 of plain disc or cylindrical form and mounted on shafts 67 and 68. The shafts 67 extend through longitudinal dividing strips 70 and support rollers 66 on both ends thereof. The shafts 68, as shown in Fig. 5, extend through the side walls 71 of the container or tank 12. The members 70 and 71 are so spaced that the film 65 may be placed therebetween in horizontal position and in engagement with the upper faces of the rollers 66. Tension exerted on the films in pulling them through the device is sufficient to hold them substantially straight so that when the rollers 66 are spaced apart any distance up to twelve inches, there will be practically no deflection of the film between the rollers due to the weight thereof. If the rollers are placed closer together than above indicated, smaller tension is required to hold the films straight, and where the rollers 66 are spaced at greater distance, the tension exerted on the films must be increased accordingly to hold them straight. In this form of the invention we show splash preventing means in the form of a wire screen 72 stretched horizontally near the bottom of the container, but in the practice of our invention other forms of splash preventing means may be employed, such as the longitudinal strips 73 placed adjacent the bottom of the container 12 disclosed in Figs. 1 and 2, with the cross sections of the longitudinal strips 73 diagonally placed in such position that the upper edges of the strips will overlap the lower edges thereof. This splash preventing means prevents treating or coloring fluid from splashing upwardly onto the under surfaces of the films and thereby prevents improper application of treating or coloring fluids to the under faces of the films.

In this alternative form of our invention shown in Figs. 4 and 5, many of the parts employed are duplicates of parts employed in the form of the invention disclosed in Figs. 1 and 2. Therefore, we have given such duplicate or corresponding parts similar numbers. We have, however, deviated from Figs. 1 and 2 in the use of valves 74 in the laterally extending pipes 25 so that the feeding of fluid to the downwardly projecting tubes 75 may be adjustably controlled. Also, we have shown a main control valve 76 at the forward end of the pipes 22 for turning on and off the entire fluid feeding system, thereby making it unnecessary to manipulate the valves 74 when the device is placed in or removed from service. In this alternative form of the invention we may also employ spreader means in the form of felt pads 40 or we may employ fluid delivery and distributing means of the character shown in Fig. 7. In both forms of our invention

previously described, we reduce friction which tends to retard movement of the film to a minimum by the provision of freely rotating rollers as the supporting means for the films, thereby contributing to the safety and ease of operation of the device. Furthermore, the use of simple rollers in a device of this character greatly reduces the cost of construction due to the small amount of material required and the ease with which such materials can be assembled.

Relative to the form of the invention shown in Figs. 4 and 5, reduction of the tension on the films to a small amount will result in the weight of the feeding liquid depressing the films in such a manner that lakes or puddles of the treating fluid will form on the depressed portions of the films intermediate the rollers. This has the effect of giving a sinuous path to the films, and the puddling effect accomplished in this manner is similar to the puddling or lake forming effect described relative to Fig. 3. Therefore, when the invention is practiced in the form disclosed in Figs. 4 and 5, a turbulent and mixing effect in the treating fluid may be accomplished. However, such a method, while partaking of the spirit of the invention, does not produce such accurate and thoroughly satisfactory operation as does the preferred form of the invention shown in Figs. 1 to 3.

In the alternative form of our invention shown in Fig. 6, the films are carried continuously upwardly through a sloping path, such films as indicated by the numeral 80 being guided by rollers 81, 82, 83, and 84. Adjacent the upper roller 84 we show a pulling sprocket 85 for producing movement of the films 80 in the direction indicated by an arrow 86. A header 87 has laterally extending pipes 88 projecting therefrom, and projecting downwardly from the lateral pipes 88 are fluid delivery nozzles 90 for feeding treating fluid to the upwardly and diagonally moving films 80 at required intervals. As shown in Fig. 7, the delivery nozzles 90 have laterally flattened lower ends 92 so shaped that flat streams of treating fluid, as indicated at 93, will be delivered in laterally extending relationship to the upper faces of the films 80, the upper faces of the films being thereby entirely covered with treating fluid which flows downwardly as indicated at 94. From the plurality of nozzles 90, the treating fluid flows down the films 80 with a turbulent and rolling motion, thus accomplishing the desired effect of bringing all parts of the treating fluid into intimate contact with the films and thereby maintaining maximum treatment of the films in a minimum period of engagement of the treating fluid with the films.

While we have shown and described the use of felt pads 40, it is found that such felt pads are not essential to the successful practice of the invention but are rather in the nature of an added refinement in assuring that the entire upper surfaces of the films will be moistened as soon as the films enter the treating device. Equivalent means for spreading the treating and coloring solution entirely across the surface of a film consists of the flattened nozzles 90 disclosed in Figs. 6 and 7 or spreader rollers 89 placed adjacent the upper faces of the films, as shown in Fig. 6. The nozzles 90, the rollers 89, or a combination thereof, may be employed as the fluid delivery means in both forms of the invention shown in Figs. 1 to 5 inclusive.

Although we have herein shown and described our invention in simple and practical form, it is recognized that certain parts or elements thereof are representative of other parts, elements, or mechanisms which may be used in substantially the same manner to accomplish substantially the same results; therefore, it is to be understood that the invention is not to be limited to the details disclosed herein but is to be accorded the full scope of the following claims.

We claim as our invention:

1. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; rollers for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly; means for initially moistening the upper surface of said film; and means for applying a quantity of treating fluid to the upper surface of said film.

2. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; rollers for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly at all times, and following a path which is sinuous in a vertical plane; and means for applying a quantity of treating fluid to the upper surface of said film as it moves through said device.

3. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; rollers for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly, and following a path which is sinuous in a vertical plane; means for initially moistening the upper surface of said film; and means for applying a quantity of treating fluid to the upper surface of said film.

4. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; rollers for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly, and through a sloping path; means for applying a quantity of treating fluid to the upper surface of said film as it moves through said device; and means causing said fluid to collect in bodies on the upper face of said film.

5. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; rollers for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly, and through a sloping path; means for initially moistening the upper surface of said film; and means for applying a quantity of treating fluid to the upper surface of said film.

6. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; guide means for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly at all times, and following a path which is sinuous in a vertical plane; means for initially moistening the upper surface of said film; and means for applying a quantity of treating fluid to the upper surface of said film.

7. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; guide means for guiding said film through said supporting structure with the face

thereof to be treated disposed upwardly, and through a sloping path; means for applying a quantity of treating fluid to the upper surface of said film as it moves through said device; and means causing said fluid to collect in bodies on the upper face of said film.

8. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; guide means for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly, and through a sloping path; means for initially moistening the upper surface of said film; means for applying a quantity of treating fluid to the upper surface of said film; and means causing said fluid to collect in bodies on the upper face of said film.

9. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; rollers for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly at all times, and following a path which is sinuous in a vertical plane; and means for applying a flow of treating fluid to the upper surface of said film as it moves through said device.

10. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; guide means for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly and without any portion thereof being moved in a reverse direction, and following a path which is sinuous in a vertical plane; and means for applying a flow of treating fluid to the upper surface of said film as it moves through said device.

11. A film treating device of the character described, including: a supporting structure; a plurality of rollers rotatably supported in said supporting structure in such positions that a film carried over and under consecutive rollers will have a face thereof disposed upwardly and will follow a path consecutively sloping upwardly and downwardly; and fluid delivery tubes so disposed that streams of treating fluid issuing therefrom will flow rearwardly down the upwardly sloping portions of said film.

12. A method of the character described for applying a treating fluid to one side of a film, including: moving the film lengthwise with the face thereof to be treated disposed upwardly; and causing a layer of treating fluid to flow along the upper surface of the film and to collect in a body at a predetermined point along said film.

13. A method of the character described for applying a treating fluid to one side of a film, including: moving the film forwardly through an upwardly sloping path; and flowing a layer of treating fluid down the sloping film in opposite direction to the movement of said film to collect in a body at a predetermined point along said film.

14. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; rollers for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly; a moisture-saturated member engaging the upper face of said film for initially moistening said upper face of said film; and means for applying a quantity of treating fluid to the upper surface of said film.

15. A film treating device of the character described, including: a supporting structure; means for guiding a film into and out of said supporting structure; rollers for guiding said film through said supporting structure with the face thereof to be treated disposed upwardly at all times, and following a path which is sinuous in a vertical plane; and means for applying a quantity of treating fluid to the upper surface of said film as it moves through said device so that said treating fluid collects in bodies at the depressions formed along said film by reason of its being passed through a sinuous path.

16. A treating device of the character described, the combination of: a film handling means for handling a film in such a manner that said film is alternately fed downward and upward; and fluid supply means for delivering treating fluid to the upper face of said film so that said fluid will flow rearwardly and downwardly along said upwardly fed portion of said film.

17. A film treating device of the character described, including: a supporting structure; a plurality of rollers rotatably supported in said supporting structure in such positions that a film carried over and under consecutive rollers will have a face thereof disposed upwardly and will follow a path having upwardly sloping portions; and fluid delivery tubes so disposed that streams of treating fluid issuing therefrom will flow rearwardly down the upwardly sloping portions of said film.

18. A film treating device of the character described, including: a supporting structure; a plurality of film supporting means supported in said supporting structure in such positions that a film carried over and under consecutive film supporting means will have a face thereof disposed upwardly and will follow a path consecutively sloping upwardly and downwardly; and fluid delivery tubes so disposed that streams of treating fluid issuing therefrom will flow rearwardly down the upwardly sloping portions of said film.

19. A treating device of the character described, the combination of: a film handling means for handling a film in such a manner that said film is alternately fed through a plurality of upwardly sloping portions; and fluid supply means for delivering treating fluid to the upper face of said film so that said fluid will flow rearwardly and downwardly along said upwardly fed portion of said film.

20. A film treating device of the character described, including: a supporting structure; a plurality of rollers rotatably supported in said supporting structure in such positions that a film carried over and under consecutive rollers will have a face thereof disposed upwardly and will follow a path consecutively sloping upwardly and downwardly; fluid delivery tubes so disposed that streams of treating fluid issuing therefrom will flow rearwardly down the upwardly sloping portions of said film; and flange means on certain of said rollers for carrying said fluid from said film.

21. A film treating device of the character described, including: a supporting structure; a plurality of rollers rotatably supported in said supporting structure in such positions that a film carried over and under consecutive rollers will have a face thereof disposed upwardly and will follow a path having upwardly sloping portions;

fluid delivery tubes so disposed that streams of treating fluid issuing therefrom will flow rearwardly down the upwardly sloping portions of said film; and flange means on certain of said rollers for carrying said fluid from said film.

22. A method of the character described for applying a treating fluid to one side of a film, including: Moving the film forwardly through a path sinuous in a vertical plane; and flowing a layer of treating fluid down the sloping portions of said film to collect in a body at a predetermined point along said film.

23. A method of the character described for applying a treating fluid to one side of a film, including: moving the film lengthwise in a sloping path with the face thereof to be treated disposed upwardly; and causing a layer of treating fluid to flow along the upper surface of said film and to collect in a body at a predetermined point along said film.

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