Oct. 26, 1937. H. N. ENSIGN ET AL 2,097,059

RINSE TUBE FOR MOTION PICTURE DEVELOPING MACHINES

Filed May 9, 1936 2 Sheets-Sheet 1

Fig. 1.

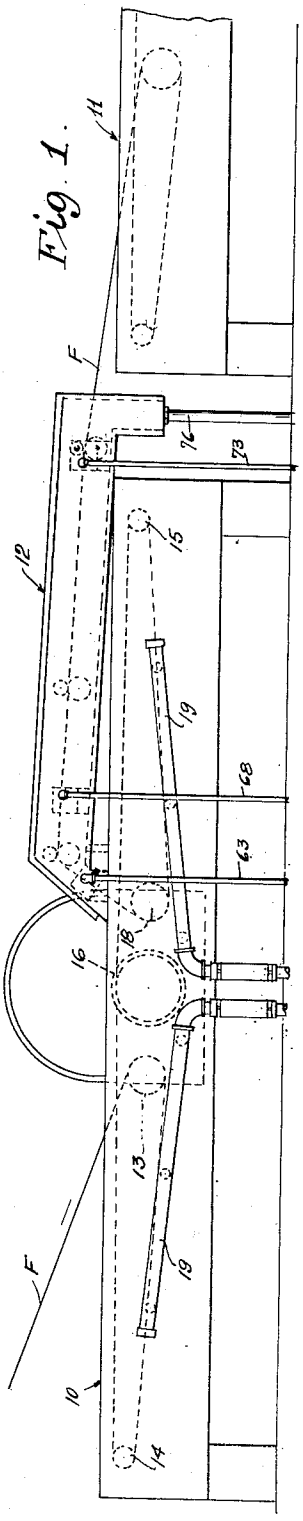


Fig. 4.

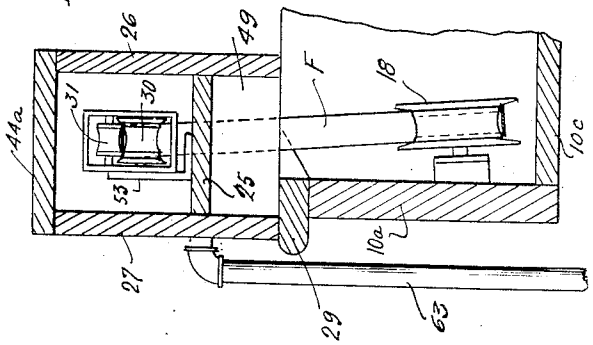
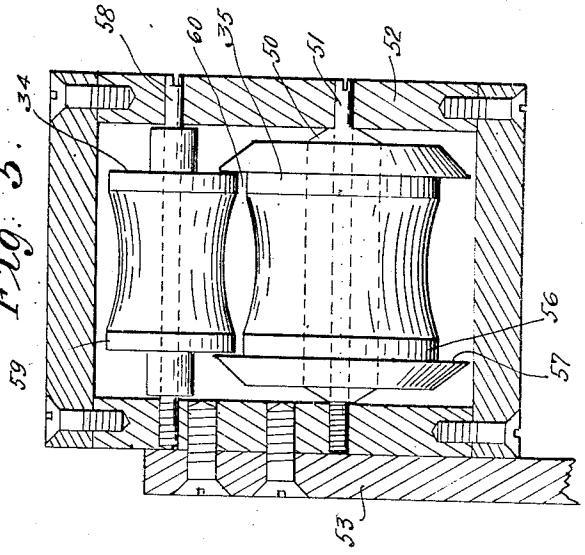


Fig. 5.



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Filed May 9, 1936 2 Sheets-Sheet 2

Fig. 2.

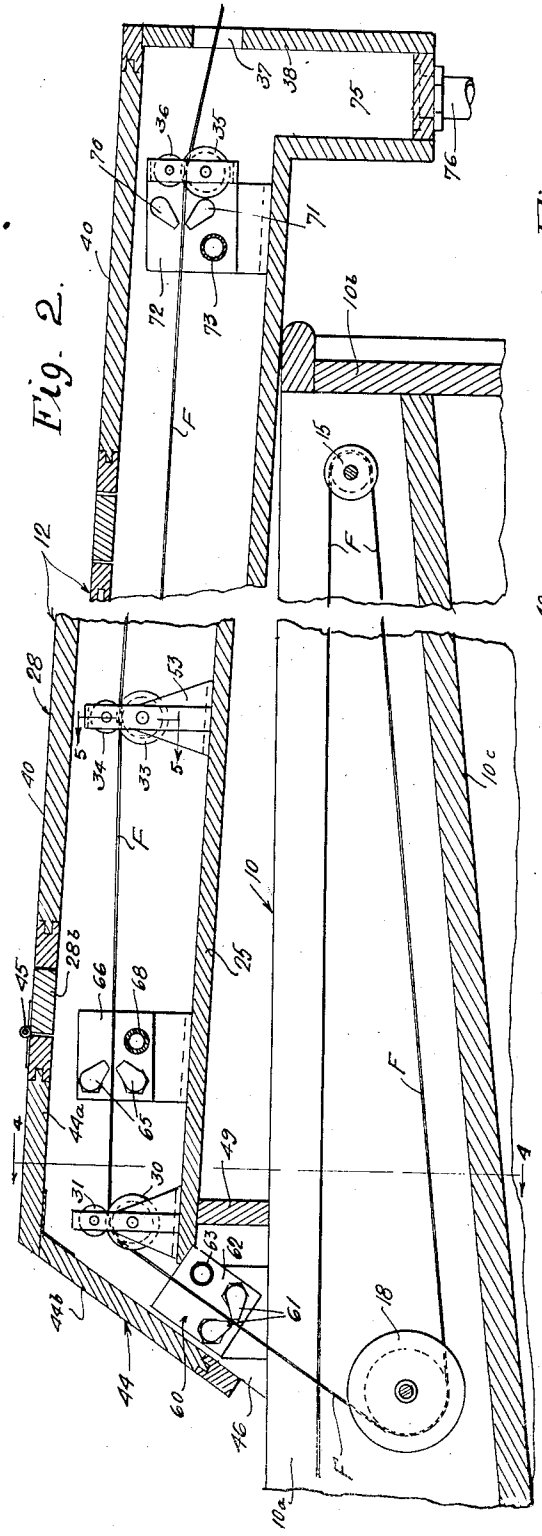
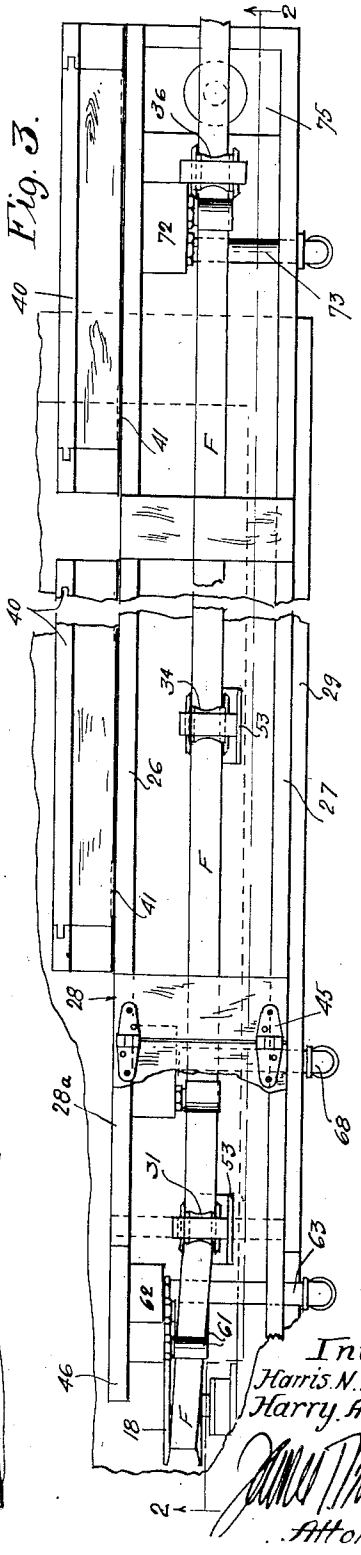


Fig. 3.



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UNITED STATES PATENT OFFICE

2,097,059

RINSE TUBE FOR MOTION PICTURE DEVELOPING MACHINES

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Application May 9, 1936, Serial No. 78,883

3 Claims. (Cl. 95—94)

This invention relates generally to motion picture film processing machines, and more particularly to means for rinsing a film strip between subsequent treatment tanks, as between the developing and hypo tanks of a developing machine.

As is well known, motion picture film is ordinarily developed by passing it continuously through a developing tank, a hypo tank, and a final water wash tank, in succession. The film is usually rinsed between the developing and hypo tanks by passing it through a tank of water. It is the general object of the present invention to provide improved and simplified means for rinsing the film strip between two treatment baths, as between the developing and hypo tanks.

In accordance with the present invention, the usual rinse tank is eliminated. The film strip coming from the developing tank is run upwardly into the higher end of a sloping tube or trough whose lower end is provided with a wash water drain. In its upward run to enter the high end of this trough the film passes through an air squeegee that forces the developing liquid back down the film into the developing tank, so that the film entering the sloping trough carries as little developer as possible. The film runs through the trough at a downward inclination. In its downward course within this trough, the film strip is washed by water discharged by nozzles mounted adjacent the film, the washings dropping to the sloping trough bottom and running to the drain at the lower end. At the lower end of the trough, just before the film passes the water drain, another air squeegee forces the water back on the film, so that the film carries as little water as possible out of the trough. From the lower end of the trough the film is taken on to the next treatment tank.

The invention will be better understood from the following detailed description of a present preferred embodiment thereof, reference for this purpose being had to accompanying drawings, in which:

Fig. 1 is a side elevation of a somewhat conventionally illustrated developing machine tank equipped with the present invention;

Fig. 2 is an enlarged vertical longitudinal section of the rinse tube and underlying portion of the developing machine seen in Fig. 1, being a section on line 2—2 of Fig. 3;

Fig. 3 is a plan view, being a view looking downwardly on the device seen in Fig. 2;

Fig. 4 is a cross section taken as indicated by line 4—4 of Fig. 2; and

Fig. 5 is a detail section of a film roller assembly, taken as indicated by line 5—5 of Fig. 2.

In the drawings numeral 10 designates generally a comparatively shallow developing tank, numeral 11 the forward portion of a similarly shaped hypo tank, and numeral 12 the rinse tube device of the present invention. The developing tank here shown for illustrative purposes is of horizontal type, comprising sides 10*a*, ends 10*b*, and bottom 10*c*, the film strip F entering by passing around and under a roller 13, and thence passing through horizontal convolutions defined by rows of end rollers 14 and 15 and a center driving drum 16. Drum 16 engages the film strands both at the top and at the bottom of the film convolutions, and may be driven in any suitable manner. The film leaves the solution in the tank after passing under a film roller 18 (Figs. 1 and 4), which is preferably mounted on a slightly inclined axis, as shown, so as to direct the film strip toward the open end of the rinse tube. The developing tank is supplied with developer solution through pipes 19, and the developer may be drained from the tank in any suitable manner, not here shown. A developing machine of the type here indicated is completely disclosed and claimed in our copending application entitled Horizontal type film developing and drying machine, filed May 9, 1936, Ser. No. 78,884, allowed April 2, 1937.

The film strip F passes upwardly from roller 18 in the developing tank at an angle, such as indicated in Figs. 2 and 3, to enter the high end of the sloping rinse tube or trough 12. This rinse trough, which embodies a sloping bottom wall 25, side walls 26 and 27, and a sloping top 28, along the upper edge of one of the side walls 10*a* of the developing tank, being here shown with its outside side wall 27 resting on a side rail 29 on the upper edge of side tank wall 10*a* (Fig. 4), and with its sloping bottom wall 25 resting across and extending beyond rear end tank wall 10*b* (Fig. 2). Thus the trough overhangs the open upper side of the developing tank.

The top side 28 of the trough includes a pair of doors 40, hinged at 41, through which the interior of the trough is accessible. At the forward end of the trough is a swinging door 44, comprising a top member 44*a* resting on the rearwardly sloping upper edges 28*a* of trough sides 26 and 27 and hinged at 45 to a stationary top member 28*b* on an axis transverse to the trough, and an end member 44*b* joined to mem-

ber 44a and extending angularly downwardly, as shown, member 44b resting on corresponding angular end edges 45 of the trough side walls. A vertical wall 49 is placed under the forward end of lower trough wall 25 and rests on tank rail 29.

The forward, or elevated, end of sloping trough bottom wall 25 is spaced as shown from slanting door member 44b, leaving an entrance for the film strip into the trough. The film strip rising from roller 18 passes upwardly through its entrance, beneath and substantially parallel to door member 44b, being received between a pair of film rollers 30 and 31 located in the forward end of the trough, as shown. From rollers 30 and 31, the film passes in a substantially horizontal direction to a pair of guide rollers 33 and 34, and from there passes at a downward inclination, parallel to the inclination of the trough, to a pair of guide rollers 35 and 36, and from there passes out of the rearward end of the trough by way of an aperture 37.

The film roller pairs 30 and 31, 33 and 34, and 35 and 36 are of substantially the same character, one pair being illustrated in Fig. 5. As there shown, lower roller 35 is mounted on a bushing 50 which is rotatable on a shaft 51 mounted in a frame 52 supported by bracket 53 resting on and secured down to trough bottom 25. Roller 35 is provided with film treads 56 and flanges 57. Upper roller 34 is rotatably mounted on a shaft 58 supported by frame 52, and is provided with film treads 59, but has no flanges, being received between the flanges of roller 35, so as to afford a film-confining guideway 60. Both rollers are freely rotatable, and the film strip passing therebetween moves freely, and is at the same time confined against running off the rollers.

The film strip entering the forward end of the trough passes upwardly through an air squeegee 60, comprising a pair of air nozzles 61 located on opposite sides of the film and supplied with air under pressure from a box 62 and an air supply pipe 63. The details of the air nozzles per se need not be here illustrated, as they may be of conventional construction. The air discharged by these squeegee nozzles forces the developing liquid back down the film strip into the developing tank, with the result that the film entering the trough carries a minimum of developer.

Located within the rinse trough, just beyond rollers 30 and 31, is a wash water unit comprising a pair of water discharge nozzles 65 one on each side of the film and directed angularly in the direction of film motion, these nozzles being mounted on and supplied with water from a box 66 and a water supply pipe 68. The water from nozzles 65 thoroughly rinses the film, and the washings drop onto the inclined surface of trough bottom 25 and run to its rearward end and into a sump 75, which is drained by drain pipe 76.

Near the end of the trough, just ahead of final guide rollers 35 and 36, is another air squeegee comprising a pair of air nozzles 70 and 71, arranged one on each side of the film, and angularly directed against the direction of film motion. Nozzles 70 and 71 are mounted on and supplied with air from a box 72 fed by air supply pipe 73. These nozzles force the water back on the film, so that the film carries as little water as possible out of the trough with it.

The film leaving the rearward end of the rinse trough has thus been water rinsed, and has also finally passed through an air squeegee, therefore carrying but a relatively small quantity of liquid over into the next bath.

A typical and preferred illustrative embodiment of the invention has now been described in some detail, it will be understood, however, that various modifications are possible without departing from the spirit and scope of the invention, and are contemplated within the meaning of the following claims.

We claim:

1. In a rinse device for a motion picture film strip, the combination of a trough, means for guiding a moving film strip longitudinally through said trough, said trough having a bottom wall that slopes downwardly toward the film outgoing end of said trough, an air squeegee for removing moisture from the film strip entering said trough, means within said trough adapted to discharge rinse water against the surface of the film strip moving through the trough, and an air squeegee within the trough near the film outgoing end thereof for removing water from the film strip leaving the film outgoing end of the trough.

2. In a device for rinsing a film strip coming from a liquid treatment tank, the combination of a trough arranged with one end over said tank, means for guiding the film strip from the treatment tank upwardly into the end of the trough that overlies the tank, means for guiding the film strip longitudinally through said trough, said trough having a bottom wall that slopes downwardly toward the film outgoing end of said trough, an air squeegee for causing moisture on the film strip rising into the trough from the liquid treatment tank to drop back into the tank, means within said trough adapted to discharge rinse water against the surface of the film strip moving through the trough, and an air squeegee within the trough near the film outgoing end thereof for removing water from the film strip leaving the film outgoing end of the trough.

3. In a device for rinsing a film strip coming from a liquid treatment tank, the combination of a trough arranged with one end over said tank, a series of film rollers in said trough adapted to guide a film strip longitudinally through said trough, said film strip being taken upwardly from said tank into one end of said trough and through said trough over the top sides of said rollers, said trough having a liquid collecting bottom wall provided with a liquid outlet, an air squeegee for causing moisture on the film strip rising into the trough from the liquid treatment tank to drop back into said tank, means within said trough adapted to discharge rinse water against the surface of the film strip moving through the trough, and an air squeegee within the trough near the film outgoing end thereof for removing water from the film strip leaving the film outgoing end of the trough.

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