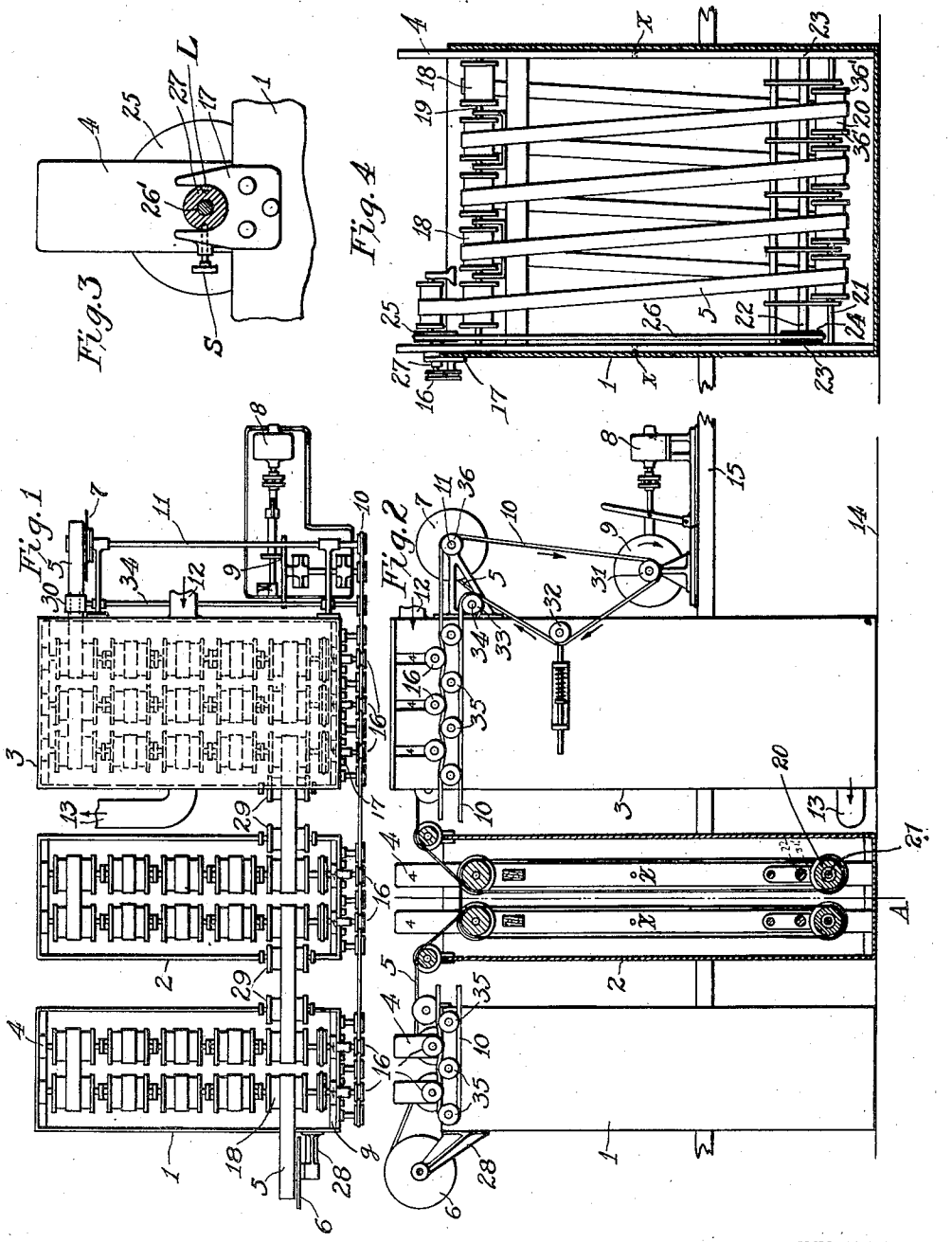
June 1, 1926. 1,586,710

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FILM TREATING AND HANDLING DEVICE

Filed Nov. 20, 1923



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Patented June 1, 1926. 1,586,710

UNITED STATES PATENT OFFICE.

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FILM TREATING AND HANDLING DEVICE.

Application filed November 20, 1923. Serial No. 675,806.

My invention is intended, for example, to obviate resort to the expensive hand process in the developing of motion picture film, etc., effecting great economy, enhancing the speed of production, insuring great freedom from damage due to the old methods, as well as insuring a clean product. My invention accomplishes these objects by providing automatic, mechanical means for handling the film through, for example, developing tanks, fixing tanks, and drying chambers, taking the film from an intake reel and finally winding it, finished and dry upon a take-up reel. Other objects and advantages of my invention are indicated in the following description and in the appended claims.

My invention is illustrated by the accompanying drawings, which with their reference numerals form a part of this specification, all figures being somewhat diagrammatic, preferred details in bearing construction being shown only in a large-scale figure.

Fig. 1 is a plan view, with preferred details of bearing construction omitted, of a machine illustrating my invention, looking down on Fig. 2, in which 1 and 2 may be suitable tanks for containing developing solution, fixing solution, or wash, and 3 may be a drying oven, in all of which may be removably inserted one or more racks 4, supporting spools suitably arranged to carry the film 5 into and out of the tanks and oven.

Fig. 2 is an elevational view of the same machine, partially in section.

Fig. 3 shows a detail of the bearing for one advantageous type of shafts carrying the pulleys 16 each shaft being removably retained in a bracket 17, secured to a wall of a tank. The pulley 16 is not shown.

Fig. 4 is a sectional view of the tank 2 at A looking from right to left showing a rack 4 in position, a series of spools 18 on a common shaft 19 carried at the top of the rack, and corresponding spools 20, hereinafter referred to as semi-floating guide spools, carried on a shaft 21 at the bottom of the rack.

As shown, a suitable intake reel 6 may be secured to the tank 1, and a takeup reel 7 may be secured to the oven 3. Means such as an electric motor 8 may transmit driving power to the takeup reel 7, as through the variable friction transmission 9, the belt 10, and the shaft 11. Suitable inlets and outlets, shown in part at 12 and 13, may be provided for connecting the oven 3 to any suitable means for providing heated or otherwise conditioned air, for the production of which any of the commercial machines for this purpose will suffice.

Frames 4, shown in Fig. 1 as spaced apart by vertical guide cleats "g," may be substantially rectangular in elevational outline, and each may be provided with a subsidiary highspeed driving shaft 22 near the lower end thereof, this shaft being independently engageable by semi-floating spools 20. The shafts 22 may be rotatably mounted as at 23 in the sides of the racks 4; and I may provide power transmitting means therefor, such as pulleys 24 on the shafts 22. Pulleys 25 may be provided on short shafts 26', each carrying a pulley 16, a belt 26 being employed to connect the pulleys 24 and 25. Each shaft 26', instead of being permitted to rotate directly in a notch or bearing in a tank, or the like, may be provided with a removable bearing 27 which may be engageable by means such as a lug L or a set screw S shown as extending from a bracket 17.

I do not deem it necessary to restrict myself to any specific details as to power supply and transmission, nor to emphasize any specific method of securing fixed or rotating elements in place. The whole may be mounted on a floor or the like, the motor being shown as secured to a sub-floor or platform. It is, however, desirable, as in the construction illustrated, to permit the shafts 26, carrying pulleys 16 and 25, to be lifted with and by the racks 4, carrying pulleys 18 and 20, the elevation of the latter being thus roughly dependent upon the position of the mentioned frames.

From the intake reel 6, shown as carried by a bracket 28, suitable film may be threaded through tanks or compartments such as the tank 1, therein preferably passing over a first roller 18 and then forming a loop by passing under a freely rotatable and bodily movable or semi-floating dependent spool 20 at the bottom of a rack and continuing up and down about pairs of spools substantially as shown in Fig. 4, preferably coming out at the top over the last spool 18 on a rack and thence passing over the various spools on a second rack, and over idlers 29 into a second tank or compartment 2, con-

tinuing therein in the same way, and again passing from the latter tank or compartment into, for example, the oven 3. This oven is shown as provided with idlers 29; and the film, in a similar manner, may advance from the idlers 29, over which the film may pass, being threaded about spools upon frames of general character already described, and be finally advanced to takeup reel 7, as by passing under a primary drive such as a feed sprocket 30.

Referring to the subsidiary driving and compensating arrangement best shown in Figs. 2 and 4, when the driving belt 10, or its equivalent, is set in motion, as by the motor 8, this belt 10 being shown as carried around a driven pulley 31 on the variable transmission 9, said belt may run over a tightener pulley 32 in the direction shown by the arrow, thence around a pulley 33 on the sprocket shaft 34, passing along under the idler 35 until it reaches or passes over the first idler on the tank 1, returning over all the idlers 35 in a manner favorable to the driving of the pulleys 16, and finally over a pulley 36 on the takeup reel shaft 11, thus transmitting power not only to each of the pulleys 16 but to the sprocket 30, or its equivalent normal or primary advancing means, and to the takeup reel 7.

The takeup reel 7 may be of an ordinary type, having a suitable friction clutch within it so that when the roll of film therein becomes large, a sufficient slippage may occur to compensate for the constant rate of speed of the sprocket.

In the organization illustrated, the pulleys 16 in contact with the driving belt 10 transmit power to the pulleys 25, and thereby to the super-speed driving shafts 22, one of which may be provided at or near the bottom of each rack. Thus we have the shafts 22 available as a constant source of power, one or more near the bottom of each tank, one of these shafts being adjacent to and directly over each of the guide spools 20, which are referred to as semi-floating guide spools for the reason that each is provided with a central hole considerably larger than the shaft 21, upon which said spools are mounted so as to permit the spools to fall away from the driving shaft 22 by gravity, when the particular loop controlled by a spool is for any reason slack. In the latter case, the flanges 36 remain out of contact with the super-speed driving shaft 22, as shown, and no pulling power is applied therethrough to a particular loop. However, if and when the feed sprocket 30, or equivalent primary advancing means, draws even slightly upon the film coming from the last loop, such action automatically brings the semi-floating guide spool 20 of this loop through the mentioned flanges 36′ into contact with the shaft 22; and the consequent acceleration of this spool may, in turn, transmit similar action to one or more additional loops successively, part or all the way back through the system until finally the first loop on the intake side of the machine will draw film more rapidly from the intake reel. Obviously, the duration of this acceleration need be only momentary, unless the film on leaving the organization is actually of a different length than when it entered the same.

The relation of speed between the primary feed sprocket 30 and the auxiliary shafts 22 positioned in advance thereof is intended to be such that if any spool remains in positive contact with its auxiliary driving shaft, the spool must be driven fast enough to move the film at a greater rate than the maximum speed established by the feed sprocket, as may be done by giving the shafts 22 a greater peripheral speed than the normal speed of the flanges 36′. It will, however, be seen that only as need therefor may arise will the spools remain in frictional engagement with the conditionally engageable super-speed auxiliary driving shafts 22, because motion imparted to a spool will lower the tension thereon in the region of the frictional contact, thus making each loop of film throughout the system self-selective and self-determining in so far as concerns the motion necessary to balance it with each other loop and to maintain the established rate of motion set up in the feed sprocket 30 or its equivalent. The need for this automatic adjustment of motion and tension arises in part from the fact that almost any material, when subjected to a protracted soaking and then to a drying, must expand and contract; and it is an important merit of the self adjusting compensatory organization, just described, that it involves no direct frictional engagement of the surface of the film, local advance of the film being effected by an engagement of the periphery of the submerged semi-floating guide spool. Assuming tanks 1 and 2 to contain solutions, the film, upon entering these tanks, may tend to expand and the loop while therein may tend to become unduly elongated in relationship to the loop in the drying oven; in this case, the spools 20 in the tanks 1 and 2, which may be weighted, may tend to fall away from the driving shaft and thus maintain a comparatively loose driving contact, while those in the oven 3, the loop therein being relatively shorter, may be drawn into engagement with the super-speed auxiliary shaft and operate in such manner as to take up slack and compensate for the changes above referred to.

It will be noted that the disclosed racks with their associated shafts, pulleys, belts and spools may be separately or simultaneously lifted from a tank or tanks, leaving the

drive belt 10 undisturbed; and also that the restoration of the rack and the return of a bearing 27 to its place in a bracket 17 may be sufficient to initiate movement in the super-speed shaft 22 thereof, by means of the pulleys 16, engaging the belt 10 and transmitting power through shaft 27 and pulleys 24 and 25, connection being maintained by means of belt 26.

In Fig. 4 are shown by the dotted lines X, holes in the sides of the rack 4, these holes being provided to permit the passage of a spindle upon which the racks can be turned, as in initially winding the film on the spools, before the racks are inserted in the tanks or compartments.

I claim as my invention:

1. A film treating organization, comprising: primary means for advancing a film in the form of loops; bodily movable separate guide spools, engaging said film in advance of said primary means and about which said loops depend; and independent means for imparting compensatory acceleration to one or more of said spools in case of a variation in the length of a loop.

2. A film treating organization, comprising: a primary film feeding means; a treating compartment in which a film may undergo a local change in length; and means comprising a super-speed drive, near the bottom of said compartment, engaging said film in advance of said primary means and for locally accelerating part of said film whenever a loop of said film diminishes in length and in such manner as to then increase the length of said loop.

3. A film treating organization, comprising: a compartment adapted to receive a loop of continuously advancing film; and a loop-supporting frame, substantially rectangular in elevational outline, independently movable to and from said compartment, said frame being provided with a subsidiary film advancing means comprising a conditionally engageable super-speed shaft whose actuation depends on the positioning of said frame.

4. A film treating organization, comprising: a film treating compartment; semi-floating film-guiding spools independently movable therein, and each provided with means including a conditionally engageable super-speed shaft for a compensatory acceleration of the rotation thereof in response to a contraction of a part of the film.

5. A film treating organization, comprising: a plurality of compartments, primary means for longitudinally advancing a film while maintaining separate loops of the same in said compartments; and additional advancing means comprising subsidiary drives effective only when a loop diminishes to a predetermined extent, whereby the shortening of any loop of said film may relatively accelerate the longitudinal advance of the same.

6. In a film treating organization comprising means for advancing a film, the combination of: primary driving means; super-speed driving shafts; semi-floating spools adjacent to said shafts engaging said film in advance of said primary means; and means controlled by film slack for bringing said spools into driving contact with said shafts.

7. In a film treating organization comprising means for advancing a film relatively to dependent spools carrying loops of said film, the combination of: a primary driving means; spools within loops of said film; subsidiary driving shafts adjacent to some of said spools which engage said film in advance of said primary means, the mounting of said spools permitting a bringing of the same into driving contact with said shafts, the operation of said spool movement being determined by a change in the length of a loop; and means for conducting driving power from an exterior source to said driving shafts.

8. In a film treating organization comprising means for advancing a film relatively to dependent semi-floating spools guiding loops of said film, the combination of: driving shafts adjacent to some of said spools and so positioned that film shrinkage brings said spools into driving contact with said shafts, said contact being selectively determined by the length of a loop; and means for conducting driving power from a common exterior source to said driving shafts.

9. In a film treating machine comprising racks with spools, fixed pulleys, belts and super-speed shafts thereon, the combination of: means on said racks for so supporting the same within tanks as to drive said belts and shafts when within said tanks; and additional means thereon for so mounting said racks upon a spindle as to facilitate the initial winding of film about said spools.

10. Web-handling means comprising: means for advancing a web longitudinally while maintaining loops therein; spools bodily movable and revoluble in said loops, said spools being adapted alternatively either to be rotated by or to accelerate the respective loops contacting therewith; and means whereby a change in the length of a loop is effective to cause a spool to accelerate the loop surrounding the same.

In testimony thereof I affix my signature.

RAY W. SCOTT.