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C. E. WALL

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DRIVE MECHANISM FOR FILM PROCESSING MACHINES

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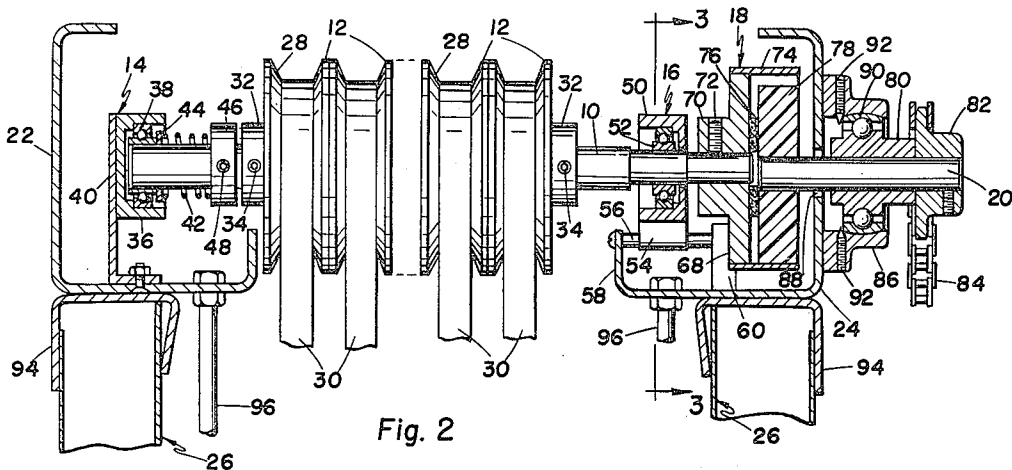


Fig. 2

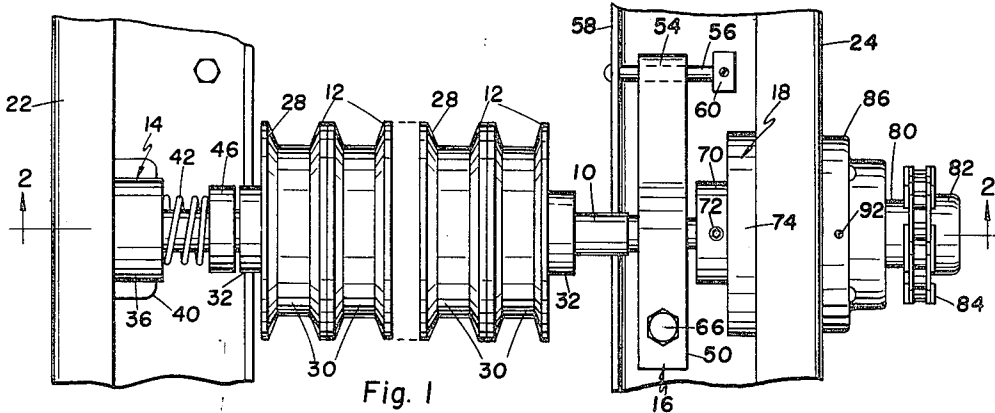


Fig. 1

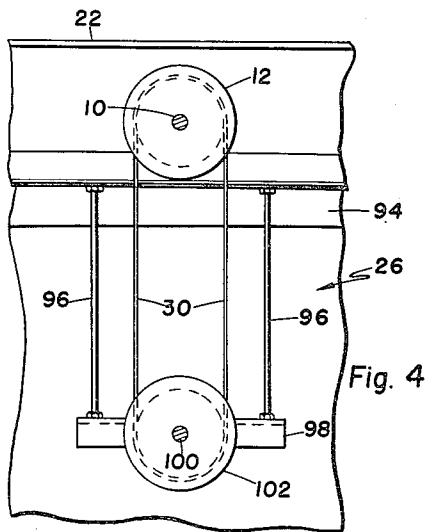


Fig. 4

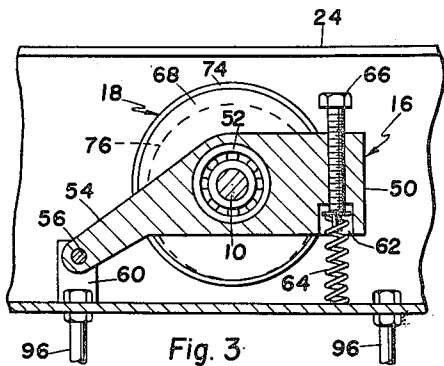


Fig. 3

INVENTOR.
CLAYTON E. WALL

BY

Knox & Knox

AGENTS FOR APPLICANT

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DRIVE MECHANISM FOR FILM PROCESSING MACHINES

Clayton E. Wall, San Diego, Calif.

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9 Claims. (Cl. 74—190.5)

The present invention relates generally to photographic film processing and more particularly to a drive mechanism for continuous strip film processing machines.

The mechanism is intended for use in film processing machines in which long lengths of film, such as motion picture film are threaded around banks of rollers and pass continuously through the necessary chemical solutions as the rollers revolve, the rollers, of course, being installed in a suitable tank or container. One such processing machine utilizes a bank of rollers secured to a driven shaft which is attached to the upper end of a chemical tank. The film is threaded around these rollers and around a bank of idler rollers which are suspended below the driven rollers and are immersed in the chemical solutions.

The various chemical solutions are, of course, contained in separate tanks which are arranged in consecutive order, each tank having a complete set of rollers. The film is threaded continuously through the rollers from tank to tank so that it passes through the solutions consecutively. During the processing, the wet film tends to stretch, the resulting slack and uneven winding causing distortion of the film. The slackening is compensated for by increasing the speed of the rollers in each consecutive tank, this being accomplished by changing the ratio of the drive mechanism in a simple manner which will be explained hereafter.

The primary object of this invention may, therefore, be considered the provision of a drive mechanism for a bank of film carrying rollers, including an eccentric clutch which allows for misalignment of the roller shaft while maintaining sufficient contact to rotate the rollers.

Another object of this invention is to provide a drive mechanism including an eccentric clutch which incorporates an impositive drive slip disc, the pressure on which is adjustable so that the amount of slippage may be controlled.

Another object of this invention is to provide a drive mechanism which may be applied to conventional types of film processing machines with the minimum of modification.

Another object of this invention is to provide a drive mechanism which is adapted for fabrication from many different materials, so that the choice of material can be according to price considerations and the dictates of availability, the exact sizes and proportions being matters easily determined to suit particular conditions and needs.

Another object of this invention is to provide a drive mechanism which is inexpensive and practicable to manufacture.

Finally it is an object to provide a drive mechanism of the aforementioned character which is simple, safe and convenient to operate, and which will give generally efficient and durable service.

With these and other objects definitely in view, this invention consists in the novel construction, combination and arrangement of elements and portions, as will be hereinafter fully described in the specification, par-

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ticularly pointed out in the claims, and illustrated in the drawing which forms a material part of this disclosure and wherein similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawing, and in which:

Fig. 1 is a plan view of the drive mechanism, portions of the film processing machine being shown fragmentarily.

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary diagrammatic view of the installation of the drive mechanism in a film developing machine.

Referring now to the drawing, the drive mechanism includes a driven shaft 10 on which are carried a plurality of driven rollers 12, the shaft being journaled at one end in a fixed bearing 14 and at the other end in a floating bearing 16. Attached to the shaft 10 adjacent the floating bearing is an eccentric clutch 18 having a drive shaft 20 which is connected to a suitable source of motive power. The mechanism is supported on a pair of frame rails 22 and 24 which are attached to the upper edges of a developing tank 26, the tank being shown fragmentarily for illustrative purposes.

The driven rollers 12 are each grooved as indicated at 28 to accommodate the film strip 30, the width of the groove being governed by the size of the film. The driven rollers are fitted on the shaft 10 and are aligned between retaining collars 32 which are secured by set screws 34. The fixed bearing 14 comprises a housing 36 containing a ball race 38, the housing being supported on a bracket 40 which is fastened to the frame rail 22. The shaft 10 is axially biased by a spring 42 for reasons which will be later described. The spring 42 bears on a washer 44 which rests against the ball race 38, the other end of the spring being held by an adjustable collar 46 having a set screw 48.

The floating bearing 16 comprises a bearing block 50 in which is fitted a ball race 52, the shaft 10 being mounted in said ball race. The bearing block 50 has an extended lug 54 which is pivotally and slidably supported on a bar 56, said bar being secured at one end to the flange 58 of the frame rail 24, and at the other end to a support block 60. The bearing block 50 is counterbored as indicated at 62 to receive a spring 64, the lower end of which rests on the frame rail 24. The spring 64 is adjusted by means of a screw 66 threaded into the bearing block and engaging the upper end of said spring.

The shaft 10 extends through the bearing block 50 and is fitted with a clutch housing 68 which constitutes a portion of the eccentric clutch 18. The clutch housing 68 has a hub 70 in which is inserted a set screw 72 for attachment to the shaft 10, said clutch housing having a friction rim 74 fitted around the periphery thereof. Secured to the inner face of the clutch housing is a slip disc 76 which provides for impositive but continuous and gentle driving connection between the shafts.

The shaft 10 is rotated by a driving disc 78, the periphery of which engages the inner surface of the friction rim 74, the face of said driving disc also bearing on the slip disc 76. The driving disc 78 is secured to one end of the drive shaft 20 which is mounted in an alignable ball bearing 80, the other end of said drive shaft being fitted with a sprocket 82 which is engaged by a drive chain 84. The drive chain is connected to a suitable source of power such as an electric motor or the like, the actual method of powering the drive shaft 20 not being considered essential to this disclosure.

The ball bearing 80 is mounted in a housing 86 which is fastened to the outside of the frame rail 24, said frame rail having a suitable aperture 88 to clear the shaft 20. The ball bearing 80 is fitted in a spherical groove 90 in the housing 86 to permit axial adjustment, and is locked after adjusting by means of locking screws 92.

It should be noted that the axis of the drive shaft 20 is slightly lower than the normal axis of the driven shaft 10 in order to obtain the eccentricity required for operation of the clutch.

The frame rails 22 and 24 are attached to the top members 94 of the tank 26 which may be of conventional construction. Extending downwardly from the frame rails 22 and 24 are suspension rods 96 on the lower ends of which are mounted support bars 98. Between the support bars 98 is secured a fixed shaft 100 on which are rotatably mounted a plurality of idler rollers 102 which are similar in configuration to the driven rollers 12.

It will be seen that the film strip 30 is wound substantially spirally around the driven rollers 12 and the idler rollers 102, the tank 26 being filled with the necessary chemical solution so that the film strip will be continually immersed as the rollers are rotated.

During processing, the wet film strip tends to stretch which causes a certain amount of slack in the film, which in turn causes uneven tension and possible distortion of the film. The floating bearing 16 allows the driven shaft 10 to move vertically and compensate for such slack or uneven tension. As the driven shaft 10 moves, the frictional contact between the driving disc 78 and the friction rim 74 will be broken, so that friction is maintained in the clutch only by the slip disc 76. The slip disc is held in contact with the driving disc 78 by pressure of the spring 42 which urges the shaft 10 axially toward the eccentric clutch, the actual pressure being controlled by adjustment of the collar 46. The imperfect clutch contact offered by the slip disc 76 allows the driving disc 78 to slip relative to the shaft 10, so that the rollers 12 are still driven without undue stress on the film strip. As soon as the uneven winding of the film strip has been relieved, the shaft 10 will be returned to its normal position by pressure of the spring 64 beneath the floating bearing. In this way, the frictional contact of the driving disc will be once more established so that full driving power is applied to the driven rollers. The film tension may, of course, be increased or decreased by means of the screw 66 on the spring 64.

It has been previously mentioned that the film is threaded around consecutive banks of rollers in the various tanks, each bank of rollers being rotated slightly faster than the previous bank to compensate for the slackening or stretching of the film when wet. This variation in speed is obtained by altering the size of the driving disc 78 in each successive eccentric clutch. As the diameter of the driving disc is increased, the rotational speed of the successive friction rims 74 and driven rollers will be correspondingly increased. Thus the successive eccentric clutches are arranged to provide a slight overdrive from tank to tank so maintaining tension in the film. It is noteworthy that, although different sized driving discs are used, only one size of friction rim 74 need be provided.

The operation of this invention will be clearly comprehended from a consideration of the foregoing description of the mechanical details thereof, taken in connection with the drawing and the above recited objects. It will be obvious that all said objects are amply achieved by this invention.

Further description would appear to be unnecessary.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the drawing and specification are to be considered as merely illustrative rather than limiting.

I claim:

1. A drive mechanism for a film processing machine

including a pair of spaced support members, a fixed bearing secured to one of said members, a floating bearing secured to the other of said members, said floating bearing comprising a housing pivotally attached at one end to said member, and adjustable spring means supporting the other end of said housing, a driven shaft having thereon film carrying roller, one end of said driven shaft being journaled in said fixed bearing, the other end of said driven shaft being journaled in said floating bearing, a clutch housing secured to said driven shaft adjacent said floating bearing, said clutch housing having an extended rim, a drive shaft having thereon a driving disc, the periphery of said driving disc frictionally engaging said rim, said drive shaft being eccentrically mounted in relation to said driven shaft.

2. A mechanism according to claim 1 wherein said means includes a friction disc between said discs and frictionally engaged thereby.

3. In a drive mechanism for film rolls, in combination, a driven shaft; a drive shaft; a friction clutch providing positive driving connection between the shafts when the clutch is operative; said clutch including opposed elements on said shafts; a means providing a continuous less positive driving connection between said shafts including a friction member between said elements and frictionally engaged thereby, and means yieldingly urging one of said shafts axially toward the other so that frictional pressure is maintained between said friction member and said elements.

4. A drive mechanism according to claim 3 and including means to adjust the last mentioned means to vary the power of said continuous driving connection.

5. In a drive mechanism for film rolls, in combination, a driven shaft; a drive shaft; a friction clutch including an element carried by one of said shafts and having radial surface and a peripheral surface and an element encircling and tangentially engaging with the peripheral surface of the first-mentioned element and carried by the other of said shafts, said second-mentioned element having a radial face confronting the radial face of the first-mentioned element; and means constantly yieldingly urging the radial face of one of said elements into frictional relationship with the confronting radial face of the other of said elements.

6. In a drive mechanism for film rolls, in combination, a driven shaft; a drive shaft; a friction clutch including an element carried by one of said shafts and having radial surface and a peripheral surface and an element encircling and tangentially engaging with the peripheral surface of the first-mentioned element and carried by the other of said shafts, said second-mentioned element having a radial face confronting the radial face of the first-mentioned element; a friction member between said radial faces of said elements; and means constantly yieldingly urging the radial faces against said friction member.

7. In a drive mechanism for film rolls in a film processing machine, a driven shaft; a drive shaft; a friction clutch providing positive driving connection between the shafts when the clutch is operative, means providing a continuous less-positive driving connection between said shafts, said clutch including an element carried by one of said shafts and having a peripheral surface and an element encircling and tangentially engageable with the peripheral surface of the first-mentioned element and carried by other of said shafts, a friction member between confronting radial faces of said elements and frictionally engaging both of said faces, and means yieldingly urging one of said shafts axially toward the other.

8. A drive mechanism for a film processing machine including a pair of spaced supporting members; a fixed bearing secured to one of said members; a floating bearing secured to the other of said members, said floating bearing being pivotally attached at one end to said member; yieldable means supporting the other end of the bearing; a driven shaft; one end of said driven shaft being

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journalled in said fixed bearing, the other end of said driven shaft being journalled in said floating bearing; a drive shaft eccentrically mounted in relation to the driven shaft; and a clutch between said shafts comprising an element carried by one of said shafts and having a peripheral surface and an element encircling and tangentially engageable with the peripheral surface of the first-mentioned element and carried by the other of said shafts.

9. A drive mechanism for a film processing machine including a pair of spaced support members, a fixed bearing secured to one of said members, a floating bearing secured to the second of said members, said floating bearing comprising a housing pivotally attached at one end to said second member, and adjustable spring means supporting the other end of said housing, a driven shaft for supporting a film carrying roller, one end of said driven shaft being journalled in said fixed bearing, the other end of said driven shaft being journalled in said floating bearing, a drive shaft disposed generally axially of said driven shaft so that said shafts have adjacent ends, and an eccentric clutch operatively connecting the adjacent ends of said shafts and comprising a disc fixed to one of said adjacent ends, a second disc fixed to the other of said adjacent ends

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and having a rim disposed radially of the first mentioned disc and engageable therewith when the driven shaft is shifted non-axially to one position, said clutch providing positive driving connection between the shafts when the clutch is operative, and means providing a continuous less positive driving connection between said shafts.

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