June 22, 1954 C. H. WARME 2,681,618

PRESSURE DEVICE FOR CINEMATOGRAPHIC FILMS

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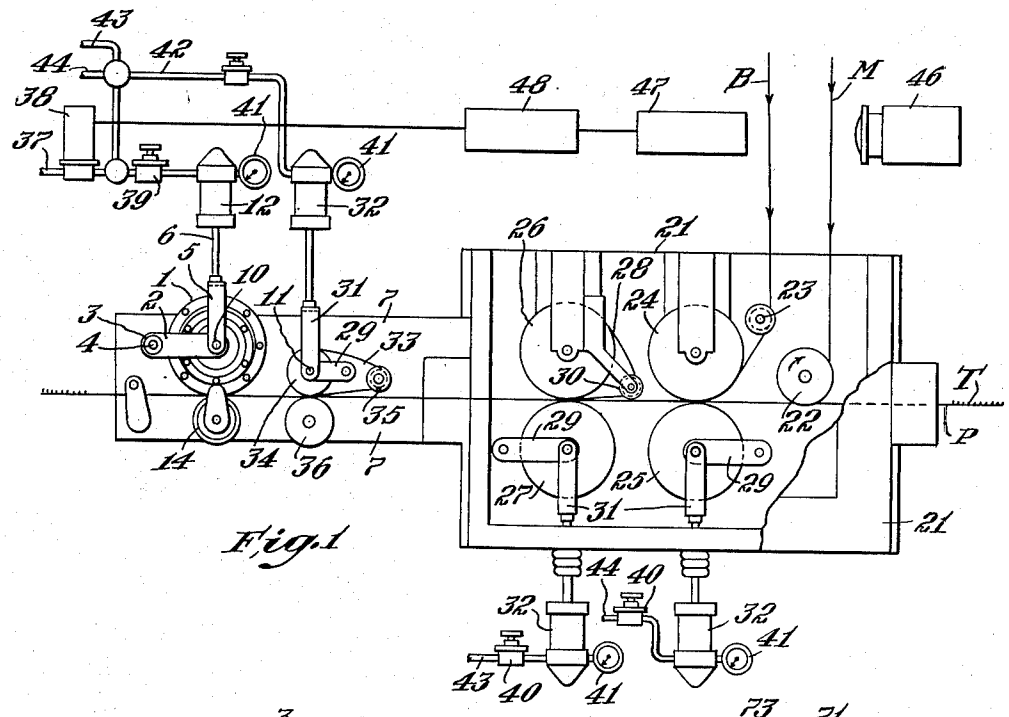



Fig. 1

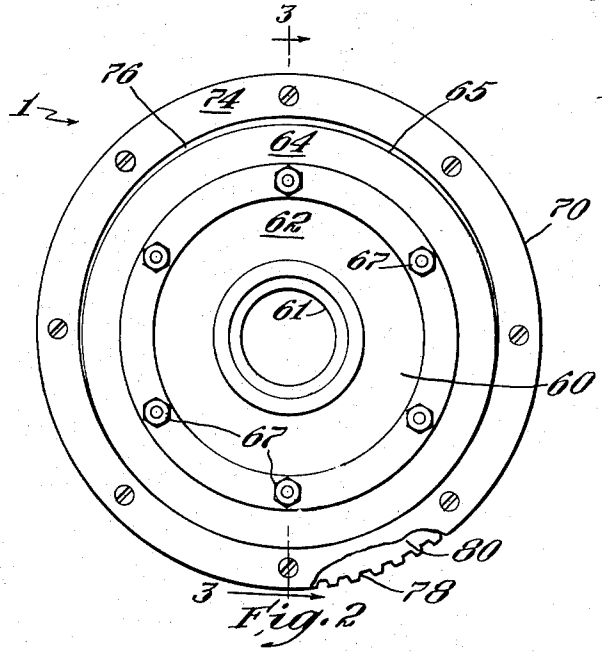



Fig. 2

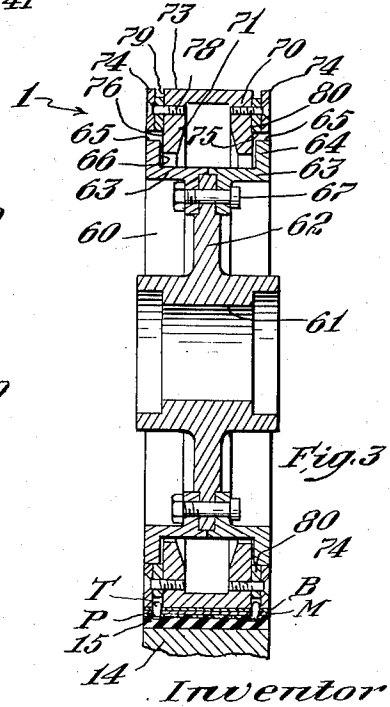



Fig. 3

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## PRESSURE DEVICE FOR CINEMATOGRAPHIC FILMS

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5 Claims. (Cl. 101—407)

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This invention relates to apparatus for applying an even pressure transversely of a moving web, and particularly to a roller device for pressing on motion picture film.

In various stages of processing web material such as film it is necessary precisionally to squeeze the moving web between a roller and a suitable backing. For example, in printing motion picture prints by imbibition, a gelatin relief matrix carrying a dye is brought into intimate contact with a dye absorptive blank film by feeding the films between a pressure roller and a backing roller which provide a completely uniform rolling pressure across the picture area of the film. Uniform pressure is required to produce a satisfactory print.

Previously it has been necessary to mount the rollers with their respective axes exactly parallel to achieve the desired uniformity of pressure. Where one of the rollers is supported by a pivoted shaft, the cumulative tolerances in alignment of the pivot for the shaft and of the rollers become so close as to be impractical, since the slightest misalignment will destroy the precise parallelism necessary for uniform pressure.

One object of the present invention is to provide a support for one of the pressure rollers which allows angular adjustment of the rollers so that it applies uniform pressure throughout the width of the picture frame, and yet prevents the roller from shifting transversely of the film.

Another object is to provide a roller support which is readily adjustable to transmit various pressures to the film but which does not require close tolerances in manufacture or assembly and hence is economical and simple in manufacture.

In one aspect the invention relates to a pressure assembly for a moving web comprising a rotor and an annular roller mounted on the rotor for pressing on the web, both the rotor and the roller having axial bearing surfaces which limit axial movement of the roller relative to the rotor, the rotor and roller also having peripheral bearing surfaces which limit radial movement of the roller relative to the rotor, the axial bearing surfaces of the rotor and roller being spaced with an axial clearance therebetween and the diameter of the peripheral bearing surface on the roller being greater than that of the corresponding peripheral bearing surface on the rotor so as to provide clearance between said peripheral bearing surfaces, whereby the roller may tip relative to the rotor so as to maintain a uniform pressure across the web without allowing the rotor to shift substantially edgewise of the web.

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Preferably, the pressure assembly is opposed by a resilient support for the web against which the web is pressed by the roller, the resilient support being deformable to accommodate irregularities in the web and the roller tipping to adjusted position relative to the deformed support. Preferably, the aforesaid support comprises a backing roll having a peripheral surface of resilient material.

Preferably, the aforesaid peripheral clearance is substantially greater than the said axial clearance.

In a more specific aspect the pressure assembly is designed for use with a pin belt supporting two or more motion picture film strips, and comprises a rotor having peripheral shoulders forming an annular recess therebetween, a roller having a surface for pressing on the web and an annular tongue portion extending into said recess with a slight axial clearance from said shoulders, annular plates attached to each side of the roller having peripheral bearing surfaces radially aligned with the aforesaid shoulders, the plate bearing surfaces being of greater diameter than the external diameter of the rotor shoulders so as to allow the ring to tip relatively to the rotor while preventing the ring from shifting edgewise of the pin belt, and between said plate and said roller a pair of annular members having external pockets for receiving the pins of said belt so as to prevent peripheral slippage of the roller relative to the belt.

For the purpose of illustration a typical embodiment of the invention is shown in the accompanying drawing in which

Fig. 1 is a diagrammatic view of cinematographic apparatus;

Fig. 2 is an elevation of the pressure device; and

Fig. 3 is a section on line 3—3 of Fig. 2.

The apparatus shown in Fig. 1 is designed to feed a gelatin relief matrix film strip M soaked with a dye and a blank gelatin coated film B into register on the pin belt P having teeth T engaging the sprocket holes of the film, and then roll the two films into intimate contact. The matrix and blank films are seated on the pin belt P in a roll tank 21 after passing over rollers 22, and rollers 23 and 24, respectively. The seating roller 24 and a backing roller 25 bring the blank and matrix film into close but not intimate contact on the pin belt. A seating belt 28 passing around a seating roller 26 and a guide roller 30 gradually brings the films into closer contact, further seating the films on the pin belt P. The backing

rollers 25 and 27 are supported on pivoted arms 29 permitting the rollers to move vertically relative to the horizontal path of the films. Various pneumatic pressures are transmitted to the pressure rollers through yokes 31 from pneumatic cylinders 32. Beyond the roll tank is a backing roller 36 and another seating belt 33 looped over a pressure roller 34 and a guide roller 35, and finally a pressure roller 1 and backing roller 14 for bringing the films into intimate contact. The pressure roller 34 is supported on an axle 11 of a pivoted arm 29 and receives pressure from an air cylinder 32 through a yoke 31. Similarly pressure roller 1, mounted on pivoted arm 2, receives pressure transmitted through yoke 5 from a like cylinder 12. Each of the cylinders 12 and 32 has a meter 41 associated therewith for the purpose of observing the pressure transmitted to each pressure roller.

Pneumatic pressure for the air cylinders 32 controlling the first three pressure rollers 25, 27 and 34 is transmitted from a source (not shown) through pipe 37, through an electrically controlled valve 38 for reducing the pressure transmitted, through pipes 42, 43 and 44 and thence through adjustable valves 40 for limiting the amount of pressure in each pneumatic cylinder 32, and thence to the cylinders. As previously explained, the three rollers 25, 27 and 34 do not press on the film with as great a force as the roller 1, and hence are operated at a lower pressure. From the electrically operated valve 38 pressure is transmitted to the cylinder 12 through the adjustable valve 39. The valves 39 and 40 are regulated according to the pressure required on the film as determined by the requirements of the relief record on the matrix and other conditions of the matrix and blank. The valve 38 is operated by a photoelectric system for detecting metal splices which increase the thickness of the strip. Before entering the roll tank 21 the films pass between a light source 46 and a pick-up 47. Passage of the splice causes the pick-up 47 to actuate a time delay relay 48. After a predetermined interval the time delay relay will energize the electric valve 38, releasing pressure on the air cylinders 12 and 32 before the splice reaches the rollers 25, 27, 34 and 1 and restoring pressure after the splice has passed the rollers. With the pressure released the pressure rollers will ride over the splice without damage to the films.

While the rollers 25, 27 and 34 as previously explained press on the film strips only with such force as is necessary to seat the films in registry on the pin belt P, the roller 1 presses with greater force and hence must be mounted with much greater precision relative to the backing roller 14.

As shown in Figs. 2 and 3 the precision pressure assembly comprises a rotor 60 having a central bearing 61 for receiving the axle 10 and a radial web 62. Attached by bolts 67 to the radial web 62 are a pair of rim members 63 having shoulders 64, the shoulders 64 have peripheral bearing surfaces 65 and axial bearing surfaces 66. A roller 70 having a tongue formation 71 fits between the rim members with the tongue extending between the shoulders 64. The roller has axial bearing surfaces 76 opposed to the axial bearing surfaces 66 of the rotor 60 and spaced therefrom with a very small clearance in the order of 1/30 second of an inch and a peripheral pressure surface 73. Flush with the pressure surface 73 of the roller 70 are a pair of plates 74



attached to the rollers by screws 78. Between the plate 74 and the roller 70 are a second pair of plates 80 having notches 79 conforming in depth and spacing to the pins T of the pin belt P. The inside surfaces of the plates 74 and 80 form bearing surfaces 75 opposed to the peripheral bearing surfaces 65 of the rotor 60. The rotor and roller bearing surfaces are of different diameter allowing the roller 70 to move radially relative to the rotor 60, the difference in diameter or peripheral clearance being in the order of 1/8 of an inch. The aforesaid peripheral and axial clearances permit the roller to float freely between the bearing surfaces and tip relative to the rotor, but the axial clearance is so small as to prevent substantial axial shifting of the roller relative to the rotor.

As shown in Fig. 3 the pressure surface 73 of the roller is adapted to bear on the picture area between the sprocket holes of the blank and matrix films B and M respectively while the films are carried on the pin belt P with the pins of the belt engaging the sprocket holes of the film. The films and pin belt are pressed between the backing roller 14 and the bearing surface 73, the backing roller 14 having a surface 15 of rubber or similar resilient material which yields to accommodate irregularities in the pin belt. The pins T of the pin belt enter the sockets 78 of the annular plate 80, and the edge of the film strips outside the sprocket holes are thus held down by the annular plate 74.

As the pin belt and film strips are fed between the pressure rollers 70 and the backing roller 14 the roller 70 will continually tilt back and forth due to irregularities in the pin belt and film strips so that the pressure of the roller 70 is distributed substantially uniformly crosswise of the films. At the same time the roller 70 does not shift edgewise of the films to a position where the edges of the roller might roll on the picture area of the film.

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. For example instead of employing the novel pressure device as a roller 1 outside the roll tank 21 it may be used as one of the pressure rollers 24 or 26 within the tank or in other positions.

I claim:

1. A pressure assembly for a moving web comprising a rotor and an annular roller mounted thereon for pressing on the web, said roller being unconnected to the rotor so as to float freely thereon, said rotor and roller having axial bearing surfaces limiting axial movement of the roller relative to the rotor, and said rotor and roller having peripheral bearing surfaces limiting radial movement of the roller relative to the rotor, said axial bearing surfaces of the rotor and roller having axial clearance therebetween and the diameter of the peripheral bearing surface of the roller being greater than that of the rotor to provide clearance therebetween, whereby the roller may tip relative to the rotor so as to maintain a uniform pressure across the web without shifting substantially edgewise of the web.

2. A pressure assembly for a moving web comprising a resilient support for the web, a rotor and an annular roller mounted thereon for pressing the web against said support, said rotor and roller having axial bearing surfaces limiting axial movement of the roller relative to the rotor, and

said rotor and roller having peripheral bearing surfaces limiting radial movement of the roller relative to the rotor, said axial bearing surfaces of the rotor and roller having axial clearance therebetween and the diameter of the peripheral bearing surface of the roller being greater than that of the rotor to provide clearance therebetween, whereby the roller may tip relative to the rotor so as to adjust its position relative to the support and maintain a uniform pressure across the web without shifting substantially edgewise of the web.

3. Assembly according to claim 2 characterized in that said support comprises a backing roll having a peripheral surface of resilient material deformable to accommodate irregularities in said web, said roller tilting according to deformation of the roll.

4. A pressure assembly for a pin belt carrying a plurality of motion picture film strips comprising a rotor having peripheral shoulders forming an annular recess therebetween, a roller having a surface for pressing the film strips against the web and an annular tongue portion extending into said recess with a slight axial clearance from said shoulders, annular plates attached at each side of said roller having peripheral surfaces radially aligned with said shoulders, said plate bearing surfaces being of greater diameter than the external diameter of the shoulders so as to allow the roller to tip relatively to the rotor while preventing the ring from shifting edgewise of



the belt, and between said plates and said roller a pair of annular members having external sockets for receiving the pins of said pin belt so as to prevent peripheral slippage of said roller relative to the belt.

5. A pressure assembly for a moving web comprising a rotor and an annular roller mounted thereon for pressing on the web, said rotor and roller having axial bearing surfaces limiting axial movement of the roller relative to the rotor, and said rotor and roller having peripheral bearing surfaces limiting radial movement of the roller relative to the rotor, said axial bearing surfaces of the rotor and roller having axial clearance therebetween and the diameter of the peripheral bearing surface of the roller being greater than that of the rotor to provide clearance therebetween, said peripheral clearance being substantially greater than said axial clearance, whereby the roller may tip relative to the rotor so as to maintain a uniform pressure across the web without shifting substantially edgewise of the web.

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