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PRESSURE ROLLER MECHANISM FOR CINEMATOGRAPHIC FILMS AND OTHER WEBS

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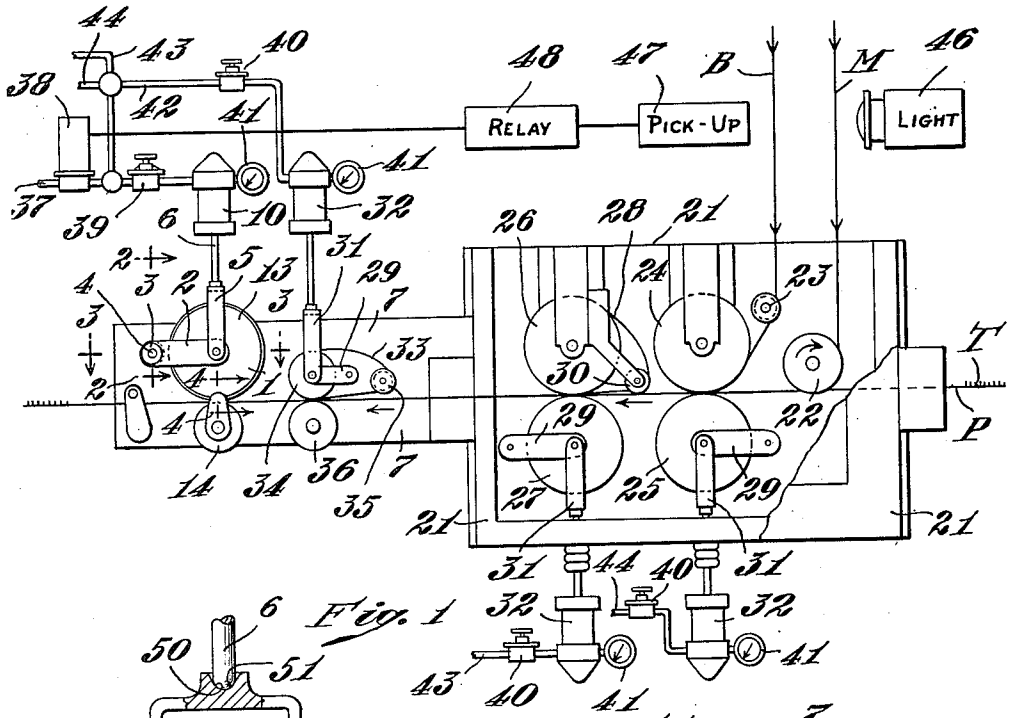


Fig. 1

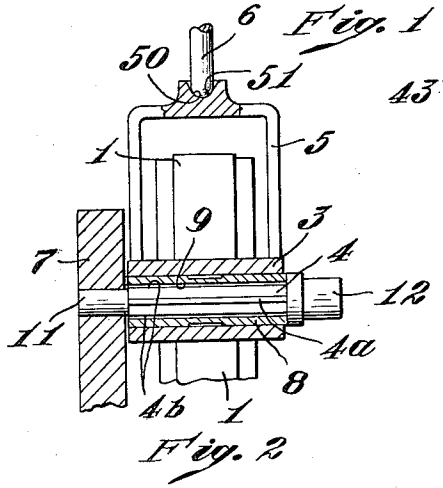


Fig. 2

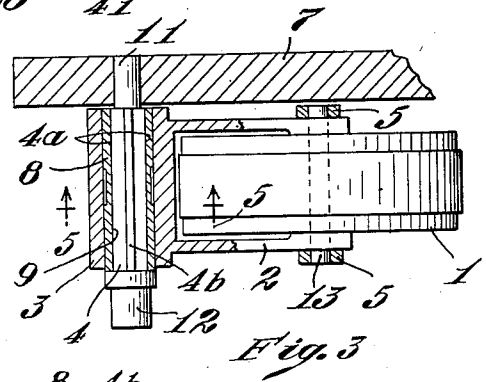


Fig. 3

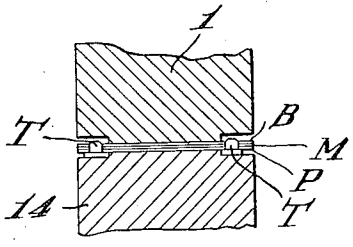


Fig. 4

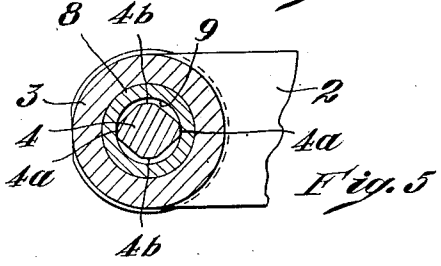


Fig. 5

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PRESSURE ROLLER MECHANISM FOR CINEMATOGRAPHIC FILMS AND OTHER WEBS

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5 Claims. (Cl. 101—130)

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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 roller 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 comprises a support for a pressure roller having at one end arms for supporting the roller and at its other end a bearing mounted on a shaft providing a pivoted mounting for the support, the shaft having a pair of narrow longitudinal surfaces spaced apart slightly less than the bore of the bearing, the diameter of the shaft between said surfaces being substantially less than the diameter of the bore so that the roller can tip transversely of the film on which it presses while it is restrained from swinging edgewise of the film. Preferably the pressure roller presses the film against a backing such as an endless belt or a companion roller, the support for the pressure roller permitting it to adjust into parallelism with the backing.

In a further aspect a forked member or yoke mounted to move normally to the plane of the

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web is disposed to transmit equal pressures to opposite ends of the roller, and yielding pressure means are provided to apply pressure centrally of the forked member whereby the equal pressures are applied at each end of the roller while the roller is permitted to tip to a position in which it applies a uniform pressure transversely of the web.

In a still further aspect the pivot shaft for the aforesaid bearing has a second pair of opposite surfaces disposed at angles to the first pair of narrow longitudinal surfaces, the second pair being spaced apart a distance less than the bore of the bearing which limits the angle to which the bearing may tip so that the first pair of surfaces do not wedge in the bore.

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 a section on line 2—2 of Fig 1;

Fig. 3 is a section on line 3—3 of Fig. 1;

Fig. 4 is a section on line 4—4 of Fig. 1; and

Fig. 5 is a section on line 5—5 of Fig. 3;

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 backing roller 24 and a seating roller 25 bring the blank and matrix film into close but not intimate contact on the pin belt. A seating belt 26 passing around a backing roller 26 and a guide roller 30 gradually brings the films into closer contact, further seating the films on the pin belt P. The seating 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 a pivoted arm 29 and receives pressure from an air cylinder 32 through a yoke 31. Similarly pressure roll 1, mounted on pivoted arms 2, receives pressure

transmitted through yoke 5 from a like cylinder 10. Each of the cylinders 10 and 32 has a meter 41 associated therewith for the purpose of observing the pressures 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 10 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 10 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 Fig. 3 the roller 1 is carried on a support comprising the arms 2 fixed to a bearing portion 3 which is mounted on a novel type of shaft 4. The shaft 4 has at one end a mounting pin 11 which may be press fitted or otherwise securely attached to a back plate 7. A conventional bushing 8 having a bore 9 fits in the bearing portion 3 around the shaft 4. As shown in Fig. 3, the arms 2 engage the shaft 13 of the roller 1. These arms are formed integrally with the bearing portion 3 and are fixed relatively to each other. A yoke 5 vertically above the roller also engages the shaft 13. At the top of the yoke is a socket 50 which with the rounded end 51 of the shaft 6 actuated by air cylinder 10 forms a universal ball and socket joint. The shaft 6, the yoke 5 and the roller 1 are aligned with the center line of the film strips, and the ball and socket joint is disposed centrally of the yoke, so that equal pressures are applied at each end of the shaft 13.

As shown in Fig. 5, the novel shaft 4 has a pair of surfaces 4*a* on opposite sides of the shaft which engage the bore 9 of the bushing 8. At right angles to the surfaces 4*a* is a second pair of surfaces 4*b* which are spaced apart appreciably less than the diameter of the bore 9 as is the remaining surface of the shaft 4. On the other hand, the pair of surfaces 4*a* are spaced apart only slightly less than the diameter of the bore 9. Thus the surfaces 4*a* engage or very nearly engage a narrow longitudinal area of the bore, while normally the surfaces 4*b* do not engage the bore, as shown in Figs. 2 and 5. Because the surfaces 4*a* substantially fit the bore 9 the bearing 3 is restrained from rotating in a plane which passes through the two surfaces 4*a*, for the reason that there is substantially no clearance between the surfaces 4*a* and the bore 9. On the other hand, between the remaining surface of the shaft 4, particularly the surfaces 4*b*, there is ample clearance to allow the bearing 3 to rotate in a plane normal to the plane through the surfaces 4*a*. The slight clearance at surfaces 4*a* permits appreciable tilting normal to the plane through these surfaces, while restricting rotation in the plane through surfaces 4*a* for the reason that two line contacts are normally maintained between the edges of the respective surfaces 4*a* and the bore 9 by the weight of the arms 2 and bearing 3. The two line contacts, prevent rotation in their own plane. However these line contacts will be in a plane offset from a diametric plane through the bearing axis so that the surfaces 4*a* are clear, owing to the curvature of the bore, to swing through the diametric plane in a plane normal thereto. The angle through which the bearing tips in the normal plane may be limited by the spacing between the surfaces 4*b* and the bore 9. Thus the bearing and the axle of the roller 1 are free to tip in the plane shown in Fig. 2 so that the roller may tilt to a position parallel to the roller 14 and produce the desired uniform rolling pressure on the blank and matrix film strips, as shown in Fig. 4. On the other hand the bearing and roller are prevented by the surfaces 4*a* from swinging in the plane of the surfaces 4*a* and hence the pressure roller 1 may not shift sidewise from the position shown in Fig. 4 to cause a misalignment of the rollers 1 and 14.

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.

I claim:

1. A pressure assembly for a moving web comprising a roller for pressing on the web, a support for the roller having at one end arms for positioning the roller and at the other end a cylindrical bearing parallel to the axis of the roller, and a shaft extending into said bearing, said shaft having on diametrically opposite sides thereof a pair of narrow, longitudinal surfaces for bearing on narrow areas of the bore of said bearing and spaced apart slightly less than the diameter of the bore, one of said surfaces facing in the direction of web travel at said roller, the diameter of the shaft intermediate said surfaces being not greater than the diameter of said shaft through said longitudinal surfaces, whereby the roller may tip transversely of the path of the web while being restrained from swinging edgewise of the web.

2. Cinematographic apparatus comprising a film backing, a roller for pressing film against the backing, a support for the roller having at one end arms for positioning the roller and at the other end a cylindrical bearing parallel to the axis of the roller, and a shaft extending into said bearing, said shaft having on diametrically opposite sides thereof a pair of narrow, longitudinal surfaces for bearing on narrow areas of the bore of said bearing and spaced apart slightly less than the diameter of the bore, one of said surfaces facing in the direction of film travel at said roller, the diameter of the shaft intermediate said surfaces

being not greater than the diameter of said shaft through said longitudinal surfaces, whereby the roller may tip transversely of the path of the film to parallel said backing, while being restrained from swinging edgewise of the film.

3. Cinematographic apparatus comprising a film backing, a roller for pressing film against the backing, a support for the roller having at one end arms for positioning the roller and at the other end a cylindrical bearing parallel to the axis of the roller, a shaft extending into said bearing, said shaft having on diametrically opposite sides thereof a pair of narrow longitudinal surfaces for bearing on narrow areas of the bore of said bearing and spaced apart slightly less than the diameter of the bore, one of said surfaces facing in the direction of film travel at said roller, the diameter of the shaft intermediate said surfaces being not greater than the diameter of said shaft through said longitudinal surfaces, a forked member movable normally to the film path at said roller for transmitting equal pressure to opposite ends of the roller, and yielding pressure means acting centrally of said member, whereby the roller may tip transversely of the path of the film to parallel said backing and apply even pressure on the film throughout its width while being restrained from swinging edgewise of the film.

4. A pressure assembly for a moving web comprising a roller for pressing on the web, a support for the roller having at one end arms for positioning the roller and at the other end a cylindrical bearing parallel to the axis of the roller, and a shaft extending into said bearing, said shaft having on diametrically opposite sides thereof a pair of narrow, longitudinal surfaces for bearing on narrow areas of the bore of said bearing and spaced apart slightly less than the diameter of the bore, one of said surfaces facing in the direction of web travel at said roller, the diameter of the shaft intermediate said surfaces being substantially less than the diameter of said shaft through said longitudinal surfaces, whereby the shaft and roller may tip transversely of the path of the web while being restrained from swinging edgewise of the web, said shaft having a second pair of diametrically opposite surfaces disposed at an angle to the first said pair and spaced apart to limit the angle said bearing may tip, thereby preventing said first pair of surfaces from wedging in said bore.

5. Cinematographic apparatus comprising a film backing, a roller for pressing film against the backing, a support for the roller having at one end arms for positioning the roller and at the other end a cylindrical bearing parallel to the axis of the roller, a shaft extending into said bearing, said shaft having on diametrically opposite sides thereof a pair of narrow longitudinal surfaces for bearing on narrow areas of the bore of said bearing and spaced apart slightly less than the diameter of the bore, one of said surfaces facing in the direction of film travel at said roller, the diameter of the shaft intermediate said surfaces being substantially less than the diameter of said shaft through said longitudinal surfaces, a forked member movable normally to the film path at said roller for transmitting equal pressure to opposite ends of the roller, and yielding pressure means acting centrally of said member, whereby the roller may tip transversely of the path of the film to parallel said backing and apply even pressure on the film throughout its width while being restrained from swinging edgewise of the film, said shaft having a second pair of diametrically opposite surfaces disposed at an angle to the first said pair and spaced apart to limit the angle said bearing may tip, thereby preventing said first pair of surfaces from wedging in said bore.

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