July 14, 1931. F. H. OWENS 1,814,525

CONTINUOUS PRINTER

Filed July 18, 1927 2 Sheets-Sheet 1

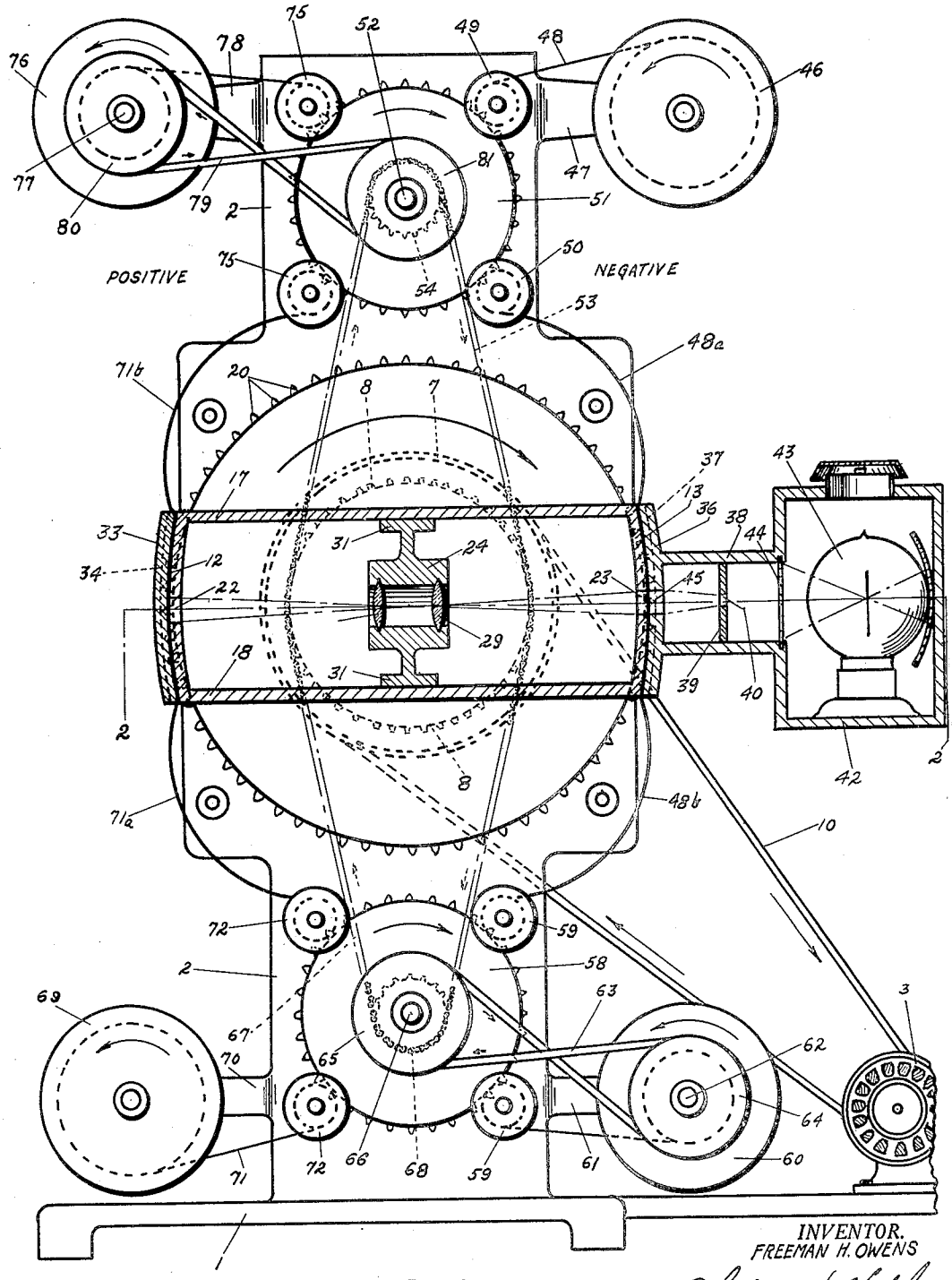


Fig. 1.

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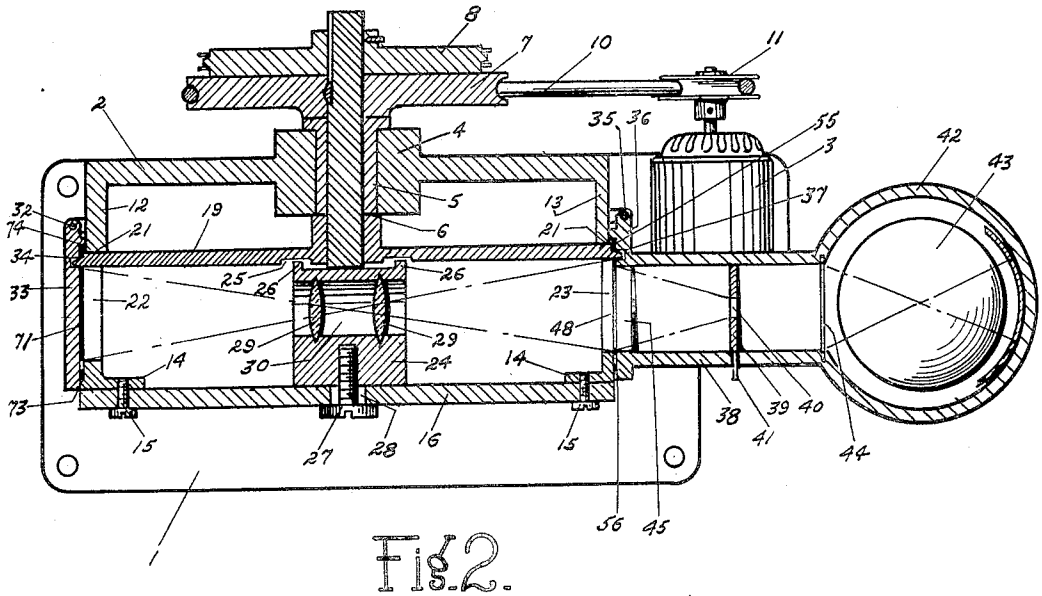


Fig. 2.

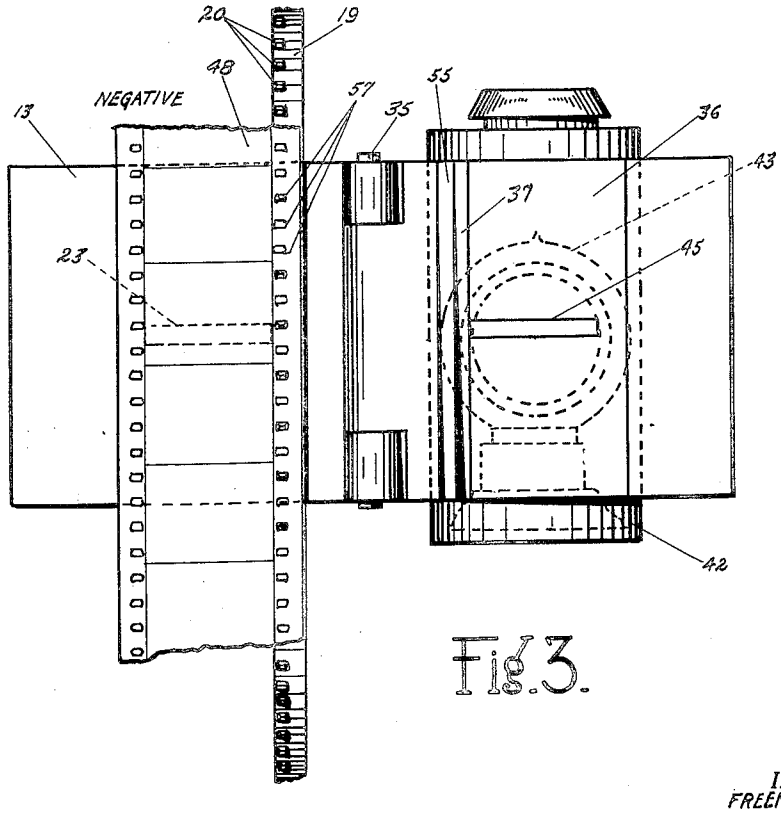


Fig. 3.

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Patented July 14, 1931

1,814,525

UNITED STATES PATENT OFFICE

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CONTINUOUS PRINTER

Application filed July 13, 1927. Serial No. 206,590.

My invention relates to printing machines, particularly for the printing at high speed of positives from a negative motion picture film, and including guiding and driving means, whereby the printing operation may take place during the continuous and uniform movement of the positive and negative film strips.

Another object of my invention is to provide a single driving sprocket for the two films, the films being supported in operative relation thereto by curved film guides and gates, through which the exposures may be made.

Still another object is to support the film strips in relation to the feed member or driving sprocket independently of such member, whereby said films may be driven from one side of the film only.

Other objects and advantages in details of construction and operation will be apparent as the description proceeds, reference now being had to the figures of the drawings wherein like reference numerals indicate like parts.

In the drawings:—

Figure 1 is a diagrammatic side view, partly in section, illustrating the assembly of my improved printing aparatus.

Figure 2 is a detail cross sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a detail view of one of the film gates.

There is provided a base member 1, supporting an upstanding frame member 2 and a motor or other source of power 3. The upstanding frame member 2 is provided centrally with an enlarged boss 4 hollowed out to receive a bushing 5 which serves as a bearing for the rotatable shaft 6 passing therethrough and having keyed thereto at its outer end in any suitable manner a relatively large pulley 7 and a relatively small sprocket 8. Belt 10 passes over the pulley 7 and around the pulley 11 of the motor 3 whereby upon operation of the motor, the shaft 6 will be rotated.

Extending forwardly of the wall or frame member 2 are film guides 12 and 13. These film guides 12 and 13 are provided at their free ends with inwardly turned ears 14 to which is secured as by means of the screws 15, a plate 16 thus forming a compartment on the frame member 2, the top and bottom of which may be closed by walls 17 and 18 (see Figure 1), which may be integral with the frame member 2 or suitably secured thereto.

The inner end of the shaft 6 projects into this compartment and carries at its end a feed member 19 provided with peripheral sprocket teeth 20 for a purpose to be described. The film guides 12 and 13 are recessed vertically as at 21 to permit the passage of the feed member 19 therethrough. These film guides are also provided with lateral openings 22 and 23 which serve as exposure openings in a manner to be described.

The plate 16 carries on its inner surface a lens mount 24 projecting inwardly to the sprocket 19. This feed member 19 is provided on its outer surface with a circular groove 25 adapted to receive the projection 26 on the inner end of the lens mount 24, whereby a light lock is provided between the lens mount and the feed member, thus preventing the passage of light between these two elements. The lens mount 24 is adjustable longitudinally within the compartment by means of the headed screw 27 passing through an elongated slot 28 on the wall 16. By loosening the screw 27, the lens mount may be moved longitudinally to properly focus the lenses 29 mounted within the bore 30 of the lens mount 24. When the proper focus has been made, the screw 27 is tightened thus clamping the lens mount securely into position. The circular groove 25 in the feed member 19 is wide enough to permit such adjustment. It will be noted that the lenses 29 are in direct alignment between the exposure openings 22 and 23. It will be also noted with reference to Figure 1 that the lens mount 24 is provided at top and bottom with shoe members 31 engaging with the top and bottom members 17 and 18 of the compartment, whereby to prevent the passage of light past the lens mount at these points, thus compelling the rays of the light to pass through the bore 30 and lenses 29.

Pivoted to the film guide 12 adjacent the vertical slot 21, as at 32, is a film gate 33 provided with a vertical groove 34 to receive the teeth 20 of the feed member 19.

Likewise, pivoted to the film guide 13 as at 35 is a film gate 36 also provided with a vertical groove 37 to receive the teeth 20 of the feed member 19. This film gate 36 carries an outwardly projecting casing 38 having therein a diaphragm member 39 provided with an aperture 40. This diaphragm member may be of any desired type but is preferably in the form of an iris diaphragm provided with an operating lever 41 by means of which the aperture 40 may be adjusted as to size.

The casing 38 carries at its outer end a lamp housing 42 within which is a lamp 43 connected to any suitable source of current. Between the lamp 43 and the diaphragm 39, there is located a plate of ground glass or other diffusing screen 44.

The film gate 36 which carries this lamp casing and housing is provided with a lateral slot or aperture 45 in alignment with the exposure opening 23 in the film guide. It will be understood, therefore, that light passing from the lamp 43 will first be diffused by the ground glass 44, then pass through the diaphragm 39, thence through the apertures 45 and 23 and through the lens 29, and then through the exposure aperture 22.

The purpose of this construction is as before stated to print images from a negative film to a positive film. With reference now to Figure 1, it will be understood how this is accomplished. A source of supply, such as a reel 46, is provided for the negative film, supported at the upper end of the frame member 2 on an extension 47 thereof, and from which the negative film 48 is drawn over a guide roller 49 which together with the guide roller 50 serves to hold the negative film 48 into engagement with the teeth on one side of a sprocket 51. This sprocket 51 is mounted upon a shaft 52 projecting from the frame member 2 and is driven by means of a chain 53 passing over a sprocket 54 on the shaft 52 and engaging the sprocket 8 on the shaft 6.

The negative film 48 is fed from the sprocket 51 downwardly into a loop 48*a* and thence over the curved film guide 13 into engagement therewith, and where it is held and supported by the curved film gate 36. The negative film in passing between the guide 13 and the gate 36, passes the exposure openings 45 and 23 and the images on said film are projected by means of the lamp 43 through the lenses 29 as before described. With reference again to Figure 2, it will be noted that the film gate 36 is shouldered as at 55 and 56 to receive and guide the negative film 48 as it passes over the guide. In such position, the perforations 57 along one side of the film are in position to be engaged by the teeth 20 of the feed member 19, whereby said film strip may be moved past the exposure openings 23 and 45.

After leaving this exposure station, the negative film passes downwardly and is looped as at 48*b*, from which it passes into engagement with the teeth on one side of a sprocket 58, the film being held into engagement with said sprocket by means of the guide rollers 59. This sprocket 58 serves as the take up for the negative film and from this sprocket, the film passes to a reel 60 mounted upon an extension 61 of the frame 2, provided with the shaft 62 upon which the reel is mounted. Motion is imparted to this take up reel 60 by means of a belt 63 passing over a pulley 64 on the shaft 62 and around a pulley 65 on the shaft 66 of the sprocket 58. This shaft 66 and the sprocket 58 receive their motion by means of the chain 53 passing around a sprocket 68 on the shaft 66 and around the sprocket 8 on the shaft 6.

The positive film upon which is to be printed the images from the negative film 48, is supplied from a reel 69 mounted upon an extension 70 at the lower end of the frame 2. This positive film 71 is fed from the reel 69 in an upward direction by means of the sprocket 58 around one side of which the positive film 71 is held in engagement by means of the guide rollers 72. After leaving the sprocket 58, this positive film is looped as at 71*a* and passes upwardly over the film guide 12 in engagement with which it is held by the pivoted film gate 33. In passing upwardly through this film guide and gate arrangement which supports the positive film, it passes the exposure opening 22 in the film guide 12 through which it receives the projected images from the negative film 48. The positive film is supported and guided through this printing station by means of the shouldered recess 73 in the film guide 12 and the shouldered recess 74 in the film gate 33. In such supported position, the perforations along one edge of the film 71 are in position to receive the teeth 20 of the feed member 19 passing through the vertical slot 21 in the film guide and into the vertical groove 34 in the film gate. Thus the same feed member 19 which moves the negative film 48 downwardly, also moves the positive film 71 upwardly.

Leaving the printing station just described, the positive film 71 is again looped as at 71*b* and passes upwardly into engagement with the teeth of the sprocket 51, held into engagement with said sprocket by the guide rollers 75, and from this sprocket, the positive film is wound upon a reel 76 mounted on a shaft 77 carried by an extension 78 of the frame 2. Motion is imparted to the take up reel 77 by means of a belt 79 passing

over a pulley 80 on the shaft 78 and passing over a pulley 81 on the shaft 52.

It will be noted with reference to Figure 1 that the film guides and gates are curved, which facilitates the supporting of the film strips in position to be engaged and moved by the sprocket 19. It will also be observed that the radius of the film gates and guides is greater than the radius of the sprocket. This provides for the engagement of the teeth of the sprocket with the film strips only at the points necessary for imparting movement to such strips.

Many of the details incident to an apparatus of this character have been omitted as they are well known in the art and form no part of this invention. It will also be understood that many changes may be made by way of detail in construction and arrangement of parts herein shown and described without departing from the spirit and scope of my invention. I do not limit myself therefore, to the exact structure shown and described other than by the appended claims.

I claim:

1. A printing apparatus comprising a feed member consisting of a circular rotary disk provided with peripheral teeth acting on a negative film at one side and on a positive film at the other side, curved film guides supporting said films in driving relation to said feed member and independently thereof, the radius of the arc of said film guides being greater than that of said feed member, a lens between said films adjacent said feed member, a light source outside said negative film and in alignment with said lens.

2. A printing apparatus comprising a feed member consisting of a circular rotary disk provided with peripheral teeth acting on a negative film at one side and on a positive film at the other side, curved film guides supporting said films in driving relation to said feed member and independently thereof, the radius of the arc of said film guides being greater than that of said feed member, a lens between said films adjacent said feed member, a light source outside said negative film and in alignment with said lens, and means for focusing said lens.

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