

April 5, 1932.

F. H. OWENS

1,852,894

MULTIPLE CONTINUOUS PRINTER

Filed July 18, 1927

2 Sheets-Sheet 1

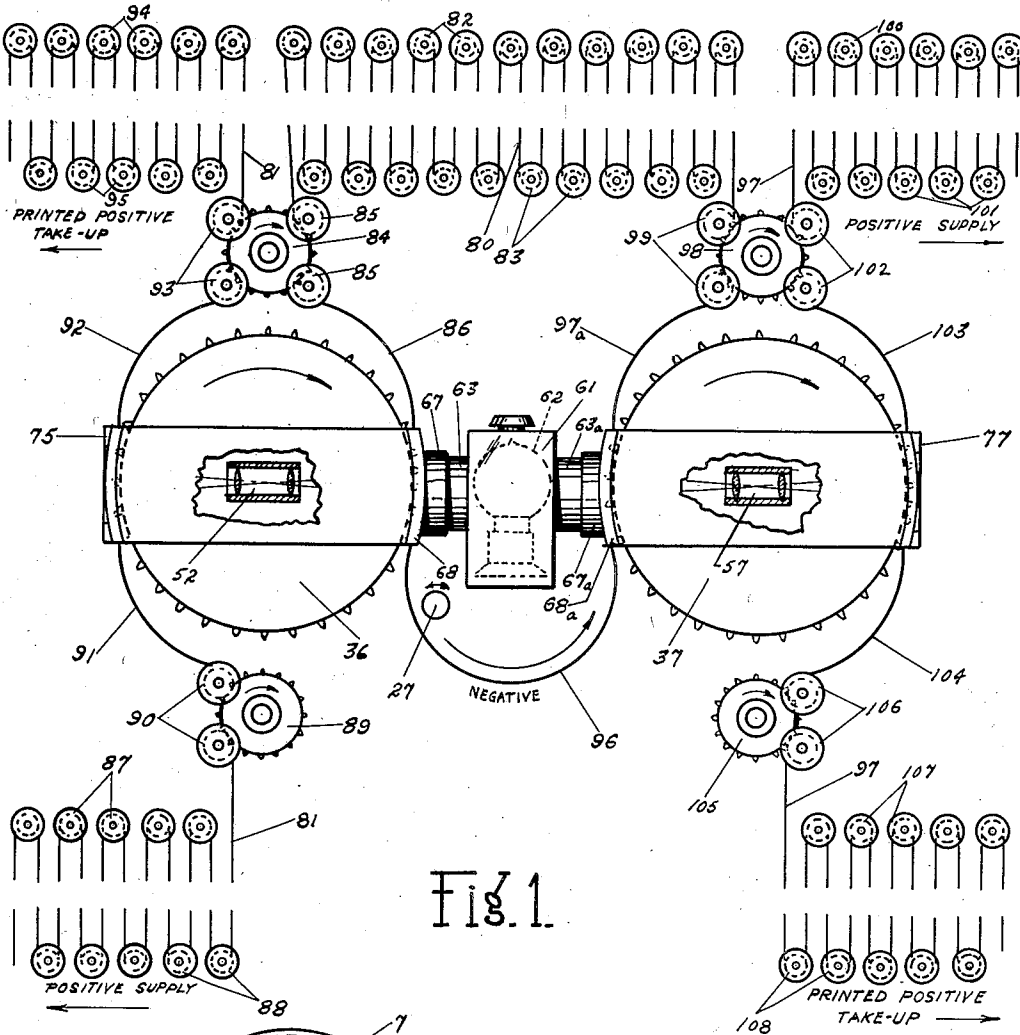


Fig. 1.

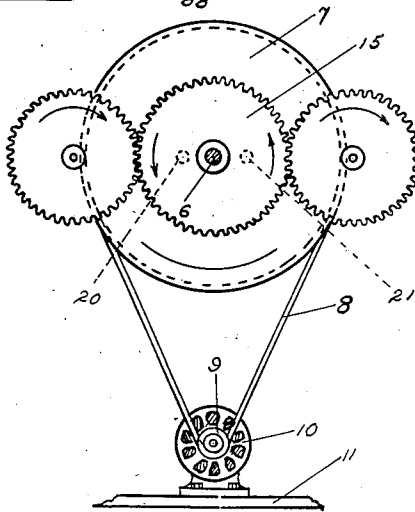


Fig. 2.

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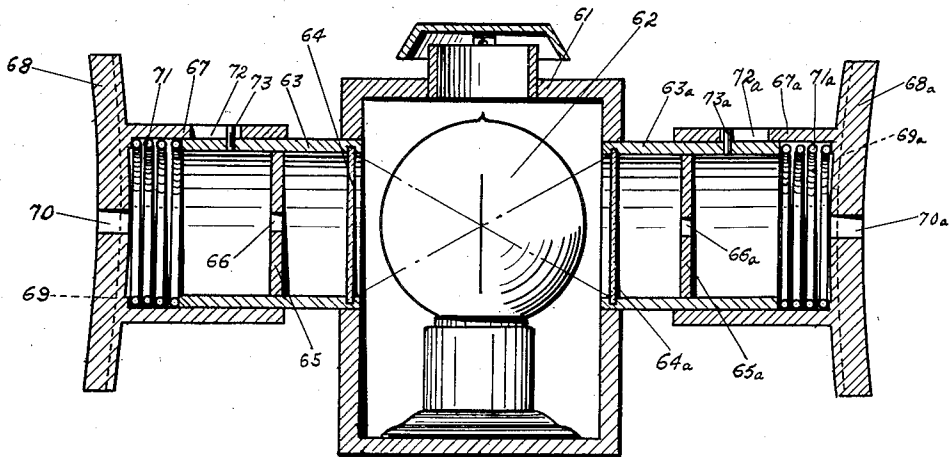


FIG. 3.

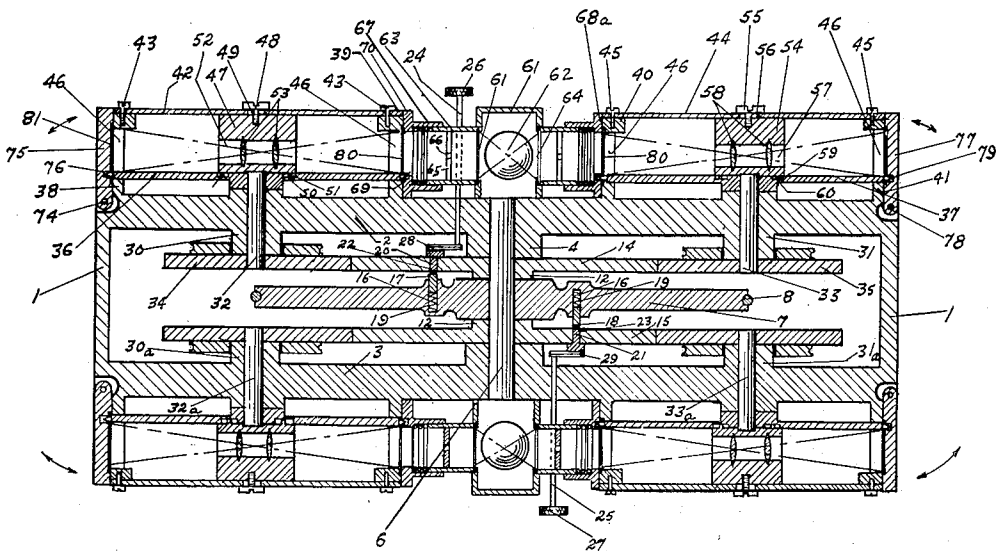


FIG. 4.

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MULTIPLE CONTINUOUS PRINTER

Application filed July 18, 1927. Serial No. 206,591.

My invention pertains generally to printing machines for motion picture films and has for its primary object the provision of an apparatus in which two positive prints may be made simultaneously from the same negative film.

A further and important object of my invention is to provide such a printer whereby in the same apparatus two negative films may be simultaneously run and two positive prints made from each of such negative films.

Still another object is to provide a novel driving means whereby all of said films may be moved thereby.

Another object is to provide means for at will connecting or disconnecting one of the printing units of this machine.

A still further object lies in the provision of novel illuminating means for simultaneously illuminating two different sections of a single negative film, whereby two positive prints may be made from said films simultaneously from the same light source.

Other objects and advantages in details of construction and operation may 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 of my new printing apparatus.

Figure 2 is a detail side view of the driving means therefor.

Figure 3 is a detail cross section of my improved illuminating means and film gates.

Figure 4 is a detail plan view in cross section, illustrating the construction and arrangement of my improved printing apparatus.

The reference numeral 1 refers to a casing, the side walls 2 and 3 of which are provided centrally with inwardly extending bosses 4 and 5 forming bearings for a shaft 6, extending between such side walls and rotatable

therein. Suitably keyed to this shaft for rotation therewith, is a pulley 7, around which passes a belt 8, which also passes around the pulley 9 of the motor 10 (Figure 2) which may be suitably located on the base 11 in the lower part of the machine. It will be clear therefore that when the motor 10 is operating, the pulley 7 will be rotated. This pulley 7 is the single driving means for all of the driven elements to be described.

Mounted for rotation upon the shaft 6 adjacent the bosses 4 and 5, and spaced from the pulley 7 by means of the washers 12 and 13, are gears 14 and 15. Suitable clutch connections between the pulley 7 and gears 14 and 15 are provided, whereby the operator may at will cause such pulley 7 to rotate either or both of the gears 14 and 15. Although I have shown and will describe one form of such clutch connection, it should be understood that I do not limit myself to this construction, as any suitable means for causing the rotation of the gears 14 and 15 by the pulley 7, may be utilized without departing from the spirit of my invention. In the form shown, however, the pulley 7 is provided with recesses 16, projecting from which on either side of the pulley 7, are the pins 17 and 18. Coil springs 19 in said recesses normally urged said pins outwardly against the surface of the gears 14 and 15. These gears 14 and 15 are provided with openings 20 and 21 respectively in such position as to receive the pins 17 and 18, whereby said gears and the pulley 7 are connected and will rotate together. Mounted in the openings 20 and 21 of the gears, are the headed pins 22 and 23, which when pushed inwardly into such openings completely fill the same and effectively prevent the pins 17 and 18 from engaging within the openings 20 and 21. Shafts 24 and 25 extend outwardly through the side walls 2 and 3 and are provided at their outer ends with finger pieces 26 and 27. The inner ends of these shafts

are provided with arms 28 and 29 which are bevelled to provide cam surfaces. These arms 28 and 29 when turned into engagement with the headed pins 22 and 23, tend to force said pins inwardly and thus prevent engagement of the pins 17 and 18 with the openings in the gears 14 and 15. If it is desired, however, to connect the pulley 7 with one or both of the gears 14 and 15, the shafts 24 or 25 are rotated to remove the arm from engagement with the pins 22 or 23, thus leaving the pins 17 and 18 free to engage within the openings 20 and 21 in the gears, the tension of the springs 19 forcing the pins 17 and 18 into such openings and the headed pins 22 and 23 outwardly therefrom. Such outward movement is very slight and when it is desired to again disconnect either of the gears 14 or 15 from the pulley, the arm 28 or the arm 29 is again turned so that its bevelled side engages with the head of the pin 22 or 23 and further rotation of the arm tends to force such pins inwardly and the pins 17 to 18, as the case may be, outwardly, thereby disengaging the gear and pulley.

The side wall 2 of the casing 1 is provided with bearings 30 and 31 in which are rotatably mounted the shafts 32 and 33. Carried at the inner ends of the shafts 32 and 33 are the gears 34 and 35 respectively, both meshing with the gear 14, whereby upon rotation of said gear 14, the gears 34 and 35 will be rotated and thus the shafts 32 and 33. The outer ends of the shafts 32 and 33 have secured thereto sprocket members 36 and 37 provided on their peripheries with sprocket teeth for a purpose to be described.

Extending outwardly from the side wall 2 at spaced points on either side of the shafts 32 and 33 are wall members 38 and 39 and 40 and 41. The wall members 38 and 39 comprise end walls of a casing, one side of which is closed by the outer surface of the wall 2, and the opposite side of which is closed by a plate 42 secured to the end walls 38 and 39, as by the screws 43. Similarly, the wall members 40 and 41 provide end walls for a casing, one side of which is also closed by the outer surface of the wall 2 and the opposite side of which is closed by a plate 44 secured to the end walls 40 and 41 as by the screws 45. Top and bottom members (not shown) may also be provided to close these casings just described. It will be observed with reference to Figure 4 that each of the end walls 38 and 39, 40 and 41 are provided with vertical recesses through which the sprocket members 36 and 37 project. Likewise, each of these end walls is provided with a horizontal slot or recess, indicated at 46, for a purpose to be described.

Slidably mounted on the inner surface of the wall or plate 42, is a lens mount 47 adapted to be secured in position by means of the headed screw 48 passing through an elongated slot 49 in the wall 42. This elongated slot provides for the slight longitudinal adjustment of the lens mount 47 when necessary for focusing. The opposite side of the lens mount is provided with a flange 50 engaging within a groove 51 in the outer surface of the sprocket member 36. This connection between the sprocket member and the lens mount provides against the passage of light around the sides of said lens mount between the same and the sprocket member. The lens mount 47 is provided with a central bore 52 within which are mounted suitable photographic lenses 53.

A similar construction is found in the casing enclosed by the outer wall 44 carrying on its inner side the lens mount 54 held in adjusted position by means of the headed screw 55, slidable within the slot 56 in the member 44. This lens mount is likewise provided with a bore 57, within which are mounted the photographic lenses 58, and on its opposite face, is provided with the flange 59 engaging in the groove 60 in the outer face of the sprocket member 37.

Suitably secured to the outer surface of the side wall 2 at a point directly between the inner end walls 39 and 40 is a lamp housing 61 within which is a lamp 62, connected to any suitable source of electricity. Projecting from one side of the lamp housing 61 is a casing 63 extending outwardly toward and adjacent to the end wall 39. This casing 63 opens into the lamp housing 61 and is provided at its inner end with a ground glass or other light diffusing screen 64. Between this ground glass 64 and the outer end of the housing, there is located within this housing a diaphragm 65 provided with an opening 66 to permit the passage of the light from the lamp 62 therethrough. This diaphragm 65 may be of any desired type, but is preferably adjustable so that the size of the aperture or opening 66 may be varied. A diaphragm of the iris type may be readily substituted for the fixed plate shown in the drawings. Slidably mounted upon the outer end of the casing 63 is a sleeve 67 telescopically mounted upon the casing 63. The outer end of this sleeve 67 carries a film gate or presser pad 68 adapted to engage against the end wall 39. This film gate 68 as shown clearly in Figure 3, is curved and is provided with a groove 69, adapted to receive the sprocket teeth of the sprocket member 36. The film gate 68 is provided centrally with an opening 70 in alignment with the diaphragm opening 66 through which the light from the lamp may pass. A coil spring 71 is carried within the sleeve 67 one end thereof bearing against the surface of the film gate 68 and the opposite end anchored against the end of the casing 53. The natural tendency of the spring 71 is to force the film gate 68 outwardly into engagement with the end wall 39. The sleeve 67 is slotted

as at 72 and a pin 73 carried by the casing 63 engages within said slot permitting sliding movement of said sleeve, but preventing rotation thereof.

5 Projecting from the lamp housing 61 directly opposite the casing 63, is a duplicate film gate structure of that just described (see Figure 3), and including the casing 63a, ground glass 64a, diaphragm 65a, sleeve 67a, and film gate or presser pad 68a adapted to engage the end wall 40, and provided with the groove 69a and opening 70a in alignment with the diaphragm opening 66a through which the light from the lamp passes. Coil 10 spring 71a, slot 72a and pin 73a, complete the duplicate structure just described.

15 Pivoted to the end of the side wall 2 as at 74 is a film gate 75 adapted to be closed against the end wall 38. This film gate 75 is provided with a groove 76 adapted to receive the projecting teeth of the sprocket member 36. A similar film gate 77 is pivoted at 78 from the opposite end of the side wall 2 and this film gate is likewise provided with a 25 groove 79 to receive the projecting sprocket teeth on the sprocket member 37. The function of the slidable film gates 68 and 68a, carried by the lamp housing 61, is to hold a strip of negative film 80 into engagement with the 30 end walls 39 and 40, which form film guides, over which such negative film 80 is moved by means of the sprocket members 36 and 37, the teeth thereof engaging the usual perforations in the film adjacent one edge thereof, and moving said strip of film downwardly 35 past the aperture 70 in the film gate 68 and the aperture 46 in the end wall 39, and upwardly past the aperture 70a in the film gate 68a and the aperture 46 in the end wall 40. The function of the pivoted film gates 75 and 77 is to hold strips of positive film 81 and 97 in contact with the end walls 38 and 41 respectively, acting as film guides for such strips of positive film, such film strips 81 and 45 97 being movable respectively by means of the sprocket members 36 and 37, the teeth thereof engaging in the perforations of such films.

50 It will be observed with relation to Figure 4, that the side wall 3 of the casing 1 is also provided with bosses 30a and 31a providing bearings for shafts 32a and 33a provided at their inner ends with gears 34a and 35a meshing with gear 15, and at their outer ends with sprocket members 36a and 37a. Without further repetition, it will be noted that the outer surface of side wall 3 is provided with a duplicate printing means with that shown and described in connection with side wall 2 and 60 including a lamp housing, film guides and gates, lenses, etc., all duplicates of those above described. It is believed unnecessary to go into detailed description of all these parts, but is sufficient to say that they are merely 65 counterparts of those just described.

With reference now to Figure 1, the purpose of the construction just described will be apparent. The negative film 80 is preferably made in the form of an endless strip trained over the upper guide rollers 82 and lower guide rollers 83, the latter of which 70 may be mobile, if desired, to permit stopping the film for a movement at a given point for adding a new strip thereto or for other purposes without delaying or interfering 75 with the continuous movement of the film past the printing apparatus.

The negative film 80 passes around one side of a driving sprocket 84 and may be held into engagement with the teeth of said sprocket 80 by means of the rollers 85. This sprocket 84 may be driven in any suitable manner as by a chain and sprocket connection (not shown) with the motor 10, or with the shaft 6.

After leaving the sprocket 84, the negative 85 film 80 is formed into a loop as at 86 and then enters between the film guide or end wall 39 and the slidable film gate 68, the latter holding the film against the guide. At this point, the teeth of the sprocket 36, passing 90 through the vertical slot in the end wall 39 and into the recess 69 of the film gate 68, engages with the perforations of the negative film on one side thereof and rotation of the sprocket serves to move the film downwardly 95 past the openings 70 and 46. At this point, the light from the lamp 62, passing through the diaphragm 65 projects the pictures on the negative film through the lenses 53 and through the recess 46 in the opposite end 100 wall 38 where they are received upon the strip of positive film 81. This strip of positive film is fed from any suitable source of supply over a series of guide rollers 87 and 88, similar to the rollers 82 and 83 and upwardly over one side of a sprocket 89, the 105 rollers 90 holding the film into engagement with said sprocket, where it is then formed into a loop 91 from which it is fed past the opening 46 in the end wall 38 and held 110 against such end wall by the pivoted film gate 75. At this point, the sprocket teeth of the sprocket 36, passing through the vertical slot in the end wall 38 and into the recess 36 in the film gate 75, engage with the perforations 115 of the positive film strip on one side thereof and move said film upwardly through the gate. After leaving this gate, the positive film is again looped as at 92 and passing around the sprocket 84, held into engagement 120 therewith by the rollers 93, it passes on upwardly over guide rollers 94 and 95 to any desired reel or other take up device.

It will thus be seen that the sprocket 84 serves the double purpose of feeding the 125 negative film downwardly and feeding the positive film upwardly, and that the sprocket 36 insures a steady and uniform movement of the positive and negative films past the exposure openings in the printing apparatus. 130

After the negative film 80 leaves the exposure station above described, it passes downwardly and is formed into a loop 96 from which it again passes upwardly between the end wall 40 and the slidable film gate 68a, past the openings therein, whereby the light from the lamp 62 again projects the pictures from said negative film outwardly, and this time in the opposite direction through the lenses 58 to the second positive film 97, which passes over the end wall 41 and held in engagement therewith by the pivoted film gate 77.

The teeth of the sprocket 37, in the same manner as before described, with respect to sprocket 36, moves the negative film upwardly and the positive film 97 downwardly at a continuous and uniform speed.

The negative film 80 after leaving the film gate 82 is again looped as at 97a and passes upwardly around one side of a sprocket 98, held into engagement with said sprocket by the rollers 99, and from thence to the guide rollers 82 and 83. The positive film 97 is fed downwardly from the source of supply after passing over guide rollers 100 and 101, around one side of the sprocket 98, held into engagement therewith by means of the rollers 102, and then looped as at 103, from which it passes downwardly past the printing station above described. After leaving this printing station, it is again looped at 104 and passes around one side of a sprocket 105, being held into engagement therewith by means of the rollers 106, and then to the guide rollers 107 and 108 and to the positive take up reel or other device.

From the foregoing, it will be apparent that a negative film may be formed into an endless strip and fed past both sides of the lamp housing 61 in the manner illustrated in Figure 1, whereby a single lamp projects the images from said negative strip in opposite directions to two separate positive film strips simultaneously and uniformly driven by the same sprocket members which move the negative strip. Thus two positive prints may be simultaneously made from a single negative film. It will be observed that the feeding of the film, both positive and negative, to the printing stations is independent of the sprockets 36 and 37, this being accomplished by the sprockets 84, 89, 98 and 105. It will be further noted that the film strips are supported at the various printing stations by film guides and gates, which, as shown clearly in Figure 1, are curved and are of a slightly greater radius than the arc of the sprockets. The function of the sprockets 36 and 37 therefore is purely that of insuring an absolutely uniform movement of the positive and negative films past the exposure apertures in the film gates and guides.

With the structure illustrated in Figure 4, it is possible not only to print two positives from a single negative, but with the same ap-

paratus to print a second pair of positives from a second negative film. Thus, on a given motion picture, the operator may print simultaneously two positives of for instance reel 1, and two positives of reel 2 of the picture, the single driving means serving to drive the entire apparatus. Duplicate light housings, film guides and gates, lenses and exposure openings are provided as before mentioned, on the outer surface of the side wall 3, and a duplicate arrangement of film guide rollers, sources of supply and take ups as shown in Figure 1, are likewise provided for this section of the apparatus. It is not deemed necessary that the details of these parts be shown and described as they would be mere repetition.

Furthermore, it will be noted that many details of construction such as supports, driving belts and pulleys for the various driving and take up sprockets and reels, and other elements have been omitted for the sake of clearness and to avoid confusion. Such elements can be of any desired or suitable construction well known in the art, and form no part of this invention.

Of course, many changes may be made in details of construction and operation without departing from the spirit and scope of my invention. I do not limit myself therefore to the exact construction shown and described other than by the appended claims.

I claim:

1. A printing apparatus comprising a lamp housing having a light source therein, means for moving a single negative film past opposite sides of said housing, comprising aligned sprockets for so moving said film, said sprockets also moving two positive films in alignment with said negative film and on opposite sides of said light source, film guides for supporting said films independent of said sprockets and in operative relation thereto, and means for holding said films against said guides, said means comprising gates movable into engagement with said guides, the gates for said negative film being slidable and carried by said lamp housing.

2. A printing apparatus comprising a lamp housing having a light source therein, means for moving a single negative film past opposite sides of said housing, comprising aligned sprockets for so moving said film, said sprockets also moving two positive films in alignment with said negative film and on opposite sides of said light source, film guides for supporting said films independent of said sprockets and in operative relation thereto, and means for holding said films against said guides, said means comprising gates movable into engagement with said guides, the gates for said negative film being slidable and carried by said lamp housing, and normally urged into engagement with said guides.

3. A printing apparatus comprising a

single driving means, two pair of aligned sprockets, each pair having driving connection with said driving means, a light source between each pair of sprockets, each pair of
5 said sprockets moving a separate negative film past opposite sides of the respective light sources, and each pair of sprockets also moving two positive films on opposite sides of
10 said respective light sources and in alignment with the respective negative films, whereby there may be simultaneously printed two positive films from each of two negative films, and means for selectively connecting or dis-
15 connecting either pair of sprockets from said single driving means.

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