

J. R. HUNT.

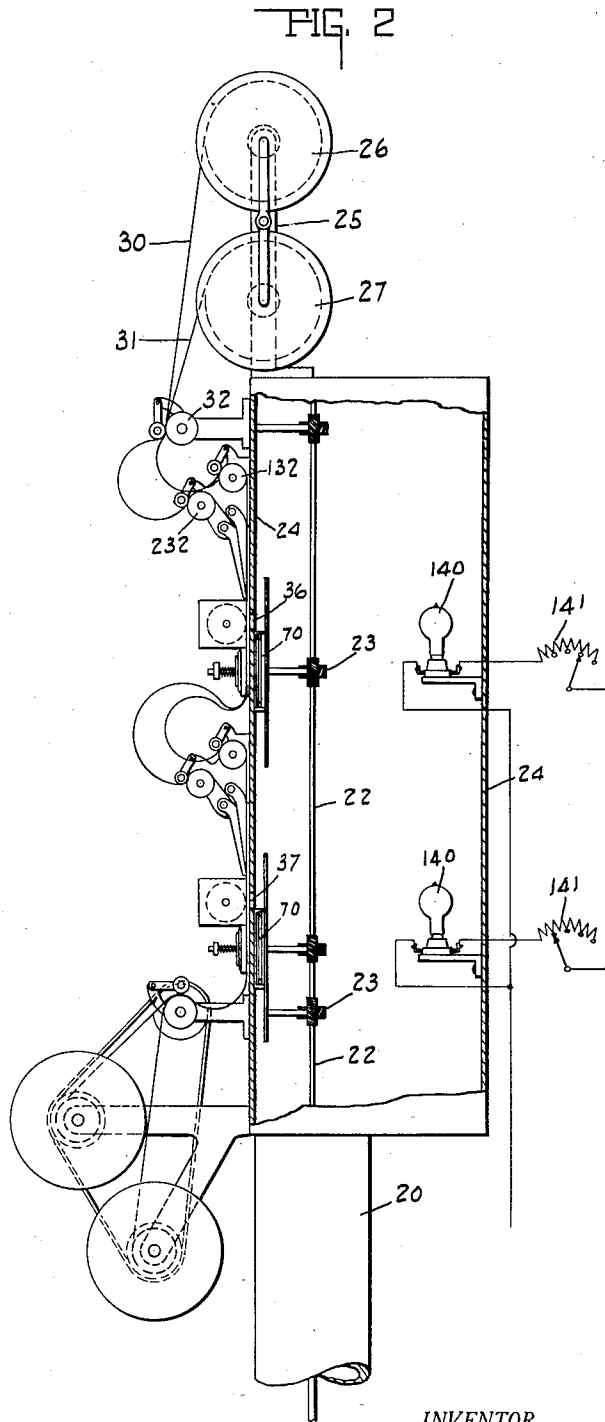
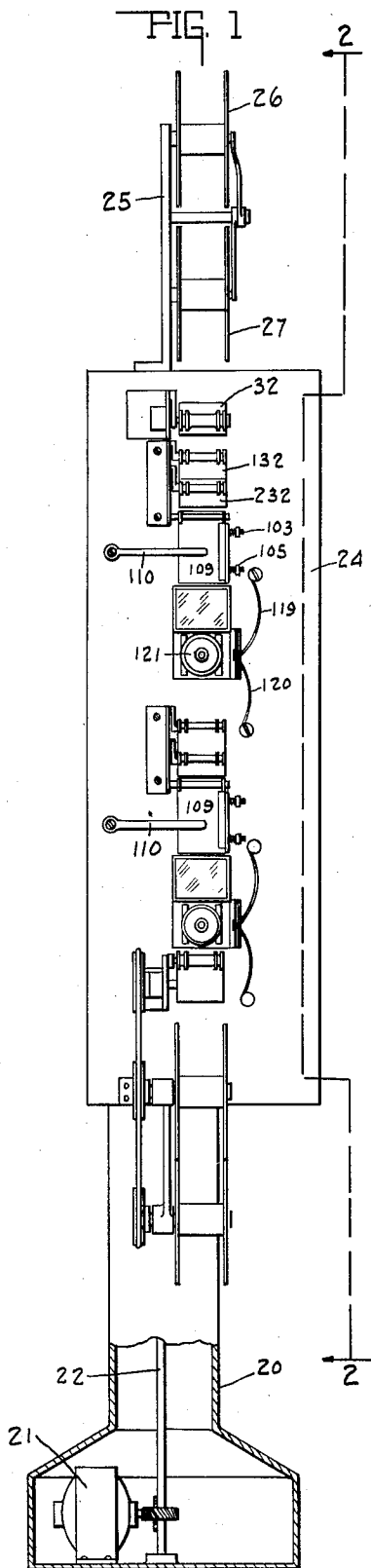
MACHINE FOR PRINTING FILMS FOR COLORED MOTION PICTURES.

APPLICATION FILED JUNE 16, 1919.

1,323,767.

Patented Dec. 2, 1919.

3 SHEETS—SHEET 1.



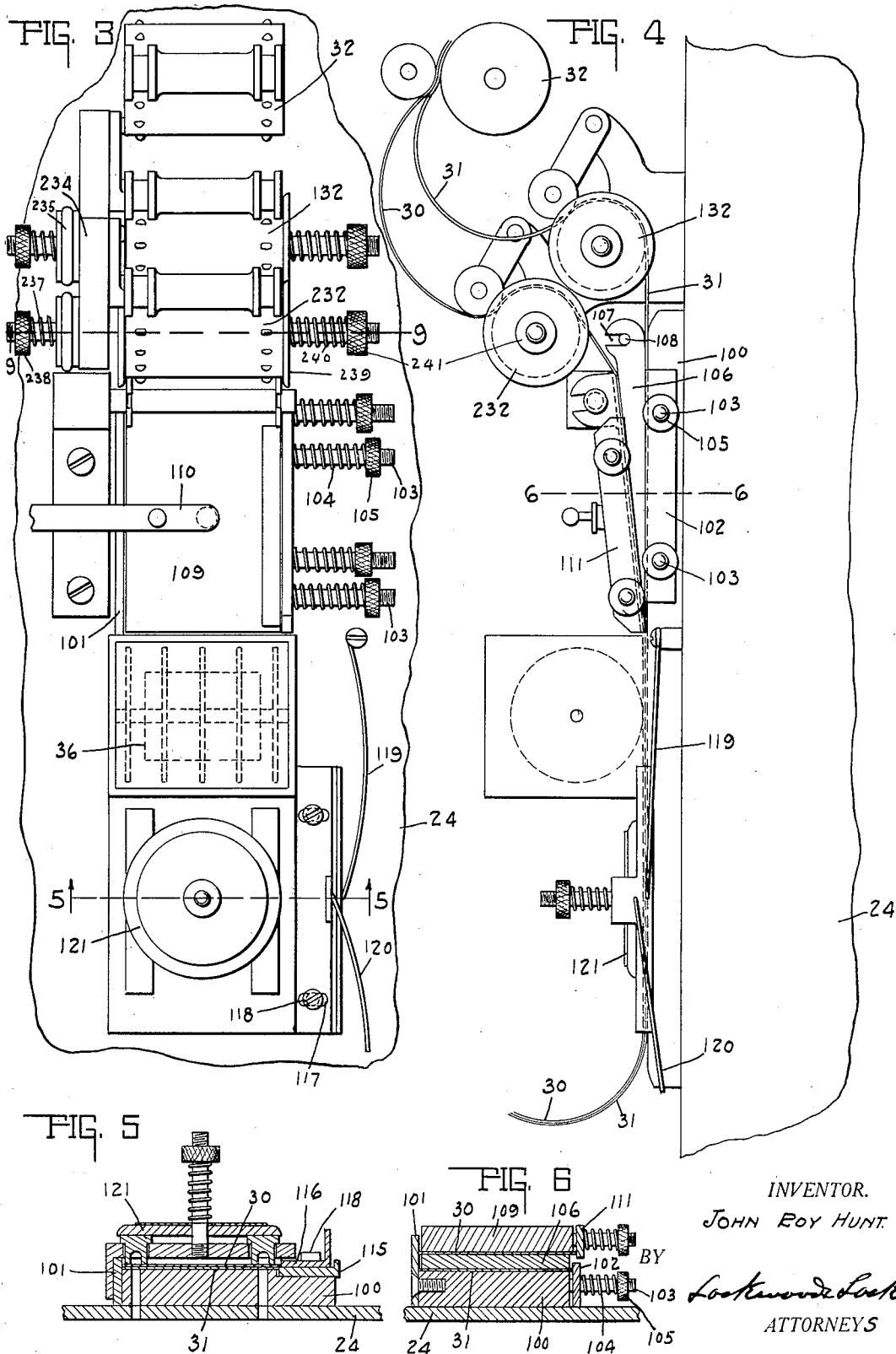
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FIG. 8

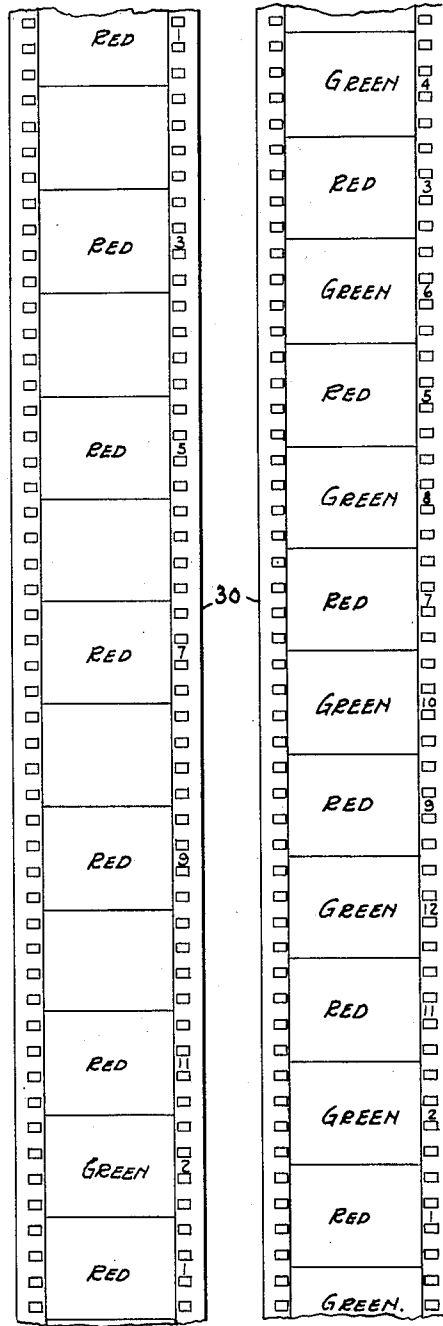
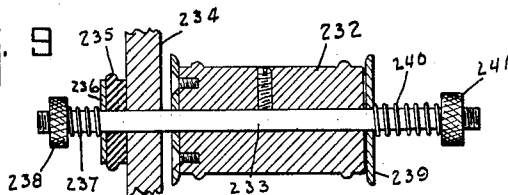


FIG. 9



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MACHINE FOR PRINTING FILMS FOR COLORED MOTION-PICTURES.

1,323,767.

Specification of Letters Patent.

Patented Dec. 2, 1919.

Application filed June 16, 1919. Serial No. 304,685.

To all whom it may concern:

Be it known that I, JOHN ROY HUNT, a citizen of the United States, and a resident of Indianapolis, county of Marion, and State of Indiana, have invented a certain new and useful Machine for Printing Films for Colored Motion-Pictures; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like numerals refer to like parts.

This invention relates to a machine for printing, from a negative film photographed through suitable color filters, a positive or other film for the projection of colored moving pictures. There have been many serious difficulties experienced by those experimenting in the art of natural color cinematography and one of the greatest obstacles has been the lack of adequate printing apparatus. In the process for which this particular film printing machine is adapted it has been impossible to obtain a dependable printed film which would synchronize and register accurately when projected. The shrinkage of the negative film during development, or the shrinkage of the positive film due to age, varies to such marked extent that it has been impossible heretofore to overcome the ill effects thus caused.

One feature of this invention consists in the provision of the printing machine with special trackers or guides which guide the negative and positive films independently of each other and in such manner as to give a perfect synchronizing or registry of the printed films regardless of the variations in the shrinkage of the negative and positive films.

Another feature of the invention is regulating the density of the color pictures in the positive film so as to make the density of the pictures for the two or a plurality of colors substantially the same, and this is done by regulating the intensity of the light passing through the different apertures during the printing process so as to equalize the density of the different pictures in the positive film.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings, Figure 1 is a front elevation of the printing machine with the lower part in vertical section. Fig. 2 is a side elevation of a portion of what is shown in Fig. 1 with the central portion shown partly in section on the line 2—2 of Fig. 1. Fig. 3 is a front elevation of a portion of the upper part of the machine shown in Fig. 1, on an enlarged scale. Fig. 4 is a side elevation of the machine on an enlarged scale. Fig. 5 is a horizontal section on the line 5—5 of Fig. 3. Fig. 6 is a horizontal section on the line 6—6 of Fig. 4. Fig. 7 is a plan view of a portion of the negative film with the color separation of the pictures indicated "red" and "green". Fig. 8 is a plan view of a portion of the positive film with the color separations indicated. Fig. 9 is a transverse section on the line 9—9 of Fig. 3.

There is shown herein a machine for printing positive films from negatives for colored moving pictures.

In this machine there is a frame 20 with a motor 21 at the lower end geared to a vertical shaft 22 that extends entirely through the machine and drives the various parts thereof. At various stages on it there are worms 23 that mesh with the worms on the parts to be driven, as hereafter explained. There is a large casing 24 on the frame 20 and upon said casing there is secured a bar 25 which carries two spools 26 and 27. The upper spool carries a blank film 35 which is to become the positive film and upon which are to be printed the pictures from the negative film 31, which is carried on the spool 27, as shown in Fig. 2. The negative film 31 has on it the pictures in their natural sequence with every other picture arranged to separate orange-red rays of light and the other alternating pictures arranged to separate blue-green rays of light, but in this specification these colors will be referred to for convenience as "red" and "green".

The negative film 31 is illustrated in Fig. 7 and is produced through suitable filters with a cinematograph camera on panchromatic negative film stock, by means and in a manner known to those skilled in the art, and this negative film, in itself, is not new. The pictures in this negative film appear in their natural order and are so numbered,

but the odd numbered pictures are made to separate red colors or shades and the even numbered pictures green colors or shades.

The two films 30 and 31 are fed in together and superimposed upon each other, as shown in Fig. 2. The pair of films are passed over feed sprockets 32, and a tension roller of the usual construction is associated therewith.

After the films pass the feed sprockets 32, the two films are separated and do not travel together all the way through the machine, for the purpose of separately and independently guiding the two films through the machine, although they travel at the same speed.

The negative film 31 passes from the feed sprocket 32 over a pilot tension sprocket 132 which is secured to the casing 24, and the positive film 30 passes over a pilot tension sprocket 232. Between the sprockets 32 and the sprockets 132 and 232 the two films are given ample slack or loop so that they can be intermittently fed or moved. The novel means for guiding the two films accurately and independently so as to provide for variations in width, is illustrated in Figs. 3, 4 and 6.

A cross section of the sprockets 132 and 232 is shown in Fig. 9. The sprocket is secured on a rod 233 that is mounted in the frame plates 234 so as to turn therein as the tension sprocket is turned by the film. The turning of said sprocket is resisted frictionally by a disk 235 which is secured on the rod 233 and bears against the frame plate 234. The disk 235 is frictionally pressed against the plate 234 by a washer 236 and a spring 237 on the rod 233, and the tension of the spring is adjusted by a nut 238. At the other end of the sprocket there is a loose flange 239 slidable on the rod 23 and yieldingly forced against the edge of the film as it travels over the sprocket by a spring 240, the tension of which is adjusted by a nut 241.

A bed plate 100 is secured to the frame and the negative film 31 passes over the surface of that plate, as shown in Fig. 6. On the left-hand side of Fig. 3 there is a stationary plate 101 that extends beside the plate 100 and guides the left-hand edge of the negative film. The other edge of the negative film is engaged and guided by a guide plate 102, mounted beside the bed plate 101 and loosely on rods 103 extending laterally from said plate 100, and on said rods there are tension springs 104 which press the plate 102 inward and hold it against the edge of the film. The tension of said springs is adjusted by the nuts 105 on the threaded ends of the rods 103.

A wedge-shaped plate 106 lies against the

negative film 31 on the opposite side from the plate 100. Its upper end is slotted at 107 so that it is caught on and is suspended and supported by a pin 108. The plate 106 also serves as a guide plate or bed plate for the positive film 30 in the same way that the plate 100 serves as a bed plate for the film 31. On the other side of the film 30 there is a plate 109 which is held against the film 30 by a flat spring 110. The stationary guide plate 101, heretofore referred to, also extends far enough to serve as a guide plate for one edge of the positive film 30, as seen in Fig. 6. The other edge of the positive film 30 is actuated by a guide plate 111 mounted in connection with the plate 109 exactly the same way as the guide plate 102 is mounted on the plate 100.

It will be understood from the foregoing description that the two films will thus be independently guided and, therefore, regard be had to the variations in width and the films come together below said guiding means just in time to pass over the aperture 36.

After passing the upper aperture 36, the films pass through a guiding means, shown in Figs. 3, 4 and 5. The left-hand edge of the film, as shown in Fig. 5, is guided still by the plate 101, and the right-hand edge of the film 31 is guided by a slidable guide plate 115, and the other film by a guide plate 116. These guide plates have transverse slots 117 through which guide screws 118 extend and the guide plates are independently pressed and held in engagement with the edges of the films by the springs 119 and 120, respectively, as shown in Fig. 3. The usual tension shoe construction 121 holds the films during travel against the plate 100, as shown in Fig. 5.

As the films travel downward, picture No. 1 of the negative assumes its place in front of the upper aperture 36. Said picture will be printed on the positive film 30. The leaders or advance portions of the films have been fed through the machine to the take-up mechanism below so as to leave slack in the films between the upper aperture 36 and the lower aperture 37. The slack of the positive film should exceed the slack of the negative film at this point, substantially as shown in Fig. 2. There is also slack provided between the feed sprockets 32 and the feed sprockets 132 and 232 above. The slack referred to is continuously maintained sufficiently to permit the intermittent feeding movement of the films, that is, a feeding movement passes across the upper aperture and thereafter across the lower aperture alternately. When No. 1 picture is ready to print, a maximum amount of slack is shown, as in Fig. 2, and then two films are

fed across the lower aperture 37, leaving a minimum amount of slack. Then the films are fed two sections across the upper aperture so as to bring them into position for printing picture No. 3, the intervening spaces on the printed film being left blank.

The foregoing operation is continued, alternately feeding the films two section across first the upper and then the lower apertures until No. 2 picture is brought into printing position in front of the lower aperture 37.

The result of this manner of printing the positive film from said negative film with two sets of color separations, is that each odd numbered picture in the positive film is formed for the red color separation and each even numbered picture for the green color separation, and the two kinds of colored pictures alternate in the positive film, but they are not in their natural sequence, as above explained, and as shown in Fig. 8.

As indicated in Fig. 2, the lamp 140 opposite each aperture is provided with means 141, like a rheostat, for regulating the intensity of the light, afforded by each lamp. Thus the intensity of the light in the two lamps is independently regulated. The purpose of this arrangement is to equalize the density of the two types or classes of color pictures in the positive film. It makes the density of the so-called red and green pictures in said positive film substantially the same, although they are not the same in the negative film. In the negative film, the red picture will be thinner than the green picture, and, on the other hand, the green picture will be more dense than the red picture. By rendering the light for the green pictures more intense than the light for the red pictures, the density of the two kinds of color pictures in the positive film will be equalized. The intensity of the light from each lamp is determined by the operator after inspecting the density of the colors in the film.

The invention claimed is:

1. Means for feeding a negative film and a positive film in a machine for printing colored moving pictures including a plate over which each film passes to an aperture, a stationary guide at one side of said plate adapted to engage and guide one edge of the film, and a yieldingly mounted guide at the other side of the plate for engaging the other edge of the film and guiding and holding it accurately against the stationary guide.

2. Means for feeding a negative film and a positive film in a machine for printing colored moving pictures including a plate over which each film passes to an aperture, a stationary guide at one side of said plate adapted to engage and guide one edge of the film, rods extending laterally beyond the other edge of the plate, a guide slidably mounted thereon to engage the other edge

of the film, springs surrounding said rods for pressing the slidable guide against the film, and nuts for adjusting the tension of the springs.

3. Means for feeding a negative film and a positive film in a machine for printing colored moving pictures including a frame, a rod rotatably mounted therein, a tension sprocket secured on the rod, a disk secured on the rod adjacent the frame, and yielding means for creating friction between said disk and frame for retarding the movement of the tension sprocket.

4. Means for feeding a negative film and a positive film in a machine for printing colored moving pictures including a tension sprocket, a rod on which it is mounted, a stationary guiding means located at one end of the tension sprocket for engaging and guiding one edge of the film, a flange slidably mounted on the rod at the other end of the tension sprocket, and yielding means for forcing said flange against the other edge of the film for holding the same against the stationary guide.

5. Means for feeding a negative film and a positive film in a machine for printing colored moving pictures including a frame, a rod rotatably mounted therein, a tension sprocket secured on the rod, a disk secured on the rod adjacent the frame, yielding means for creating friction between said disk and frame for retarding the movement of the tension sprocket, a stationary guide secured to one end of the sprocket, a flange slidably mounted on the rod at the other end of the sprocket, a spring on said rod for pressing said flange against the edge of the film, and a nut on said rod for adjusting the tension of said spring.

6. Means for feeding a negative film and a positive film in a machine for printing colored moving pictures including a plate over which a plurality of films pass, a stationary guide bar at one side of said plate for engaging one edge of said film, and independent means for engaging and guiding the other edge of each of said films, whereby each film will be accurately guided.

7. Means for feeding a negative film and a positive film in a machine for printing colored moving pictures including a plate over which a plurality of films pass, a stationary guide bar at one side of said plate for engaging one edge of said film, a laterally sliding guide bar on said plate for engaging the other edge of one of said films, another guide bar on said last-mentioned guide bar laterally slidable so as to engage and guide the edge of the other film, and means for yieldingly mounting said adjustable guide bars so that they will be independently adjusted and held against the edges of the respective films.

8. Means for feeding a negative film and

a positive film in a machine for printing colored moving pictures including a plate over which said plurality of films pass, a stationary guide bar at one side of said plate
5 for engaging one edge of said film, a laterally sliding guide bar on said plate for engaging the other edge of one of said films, another guide bar on said last-mentioned guide bar laterally slidable so as to engage and guide the edge of the other film, and a 10 spring pressing against each of said adjustable guide bars for forcing them against the edges of their respective films.

In witness whereof I have hereunto affixed my signature.

JOHN ROY HUNT.