Feb. 3, 1942. G. F. RACKETT 2,271,572

CINEMATOGRAPHIC PRINTING APPARATUS

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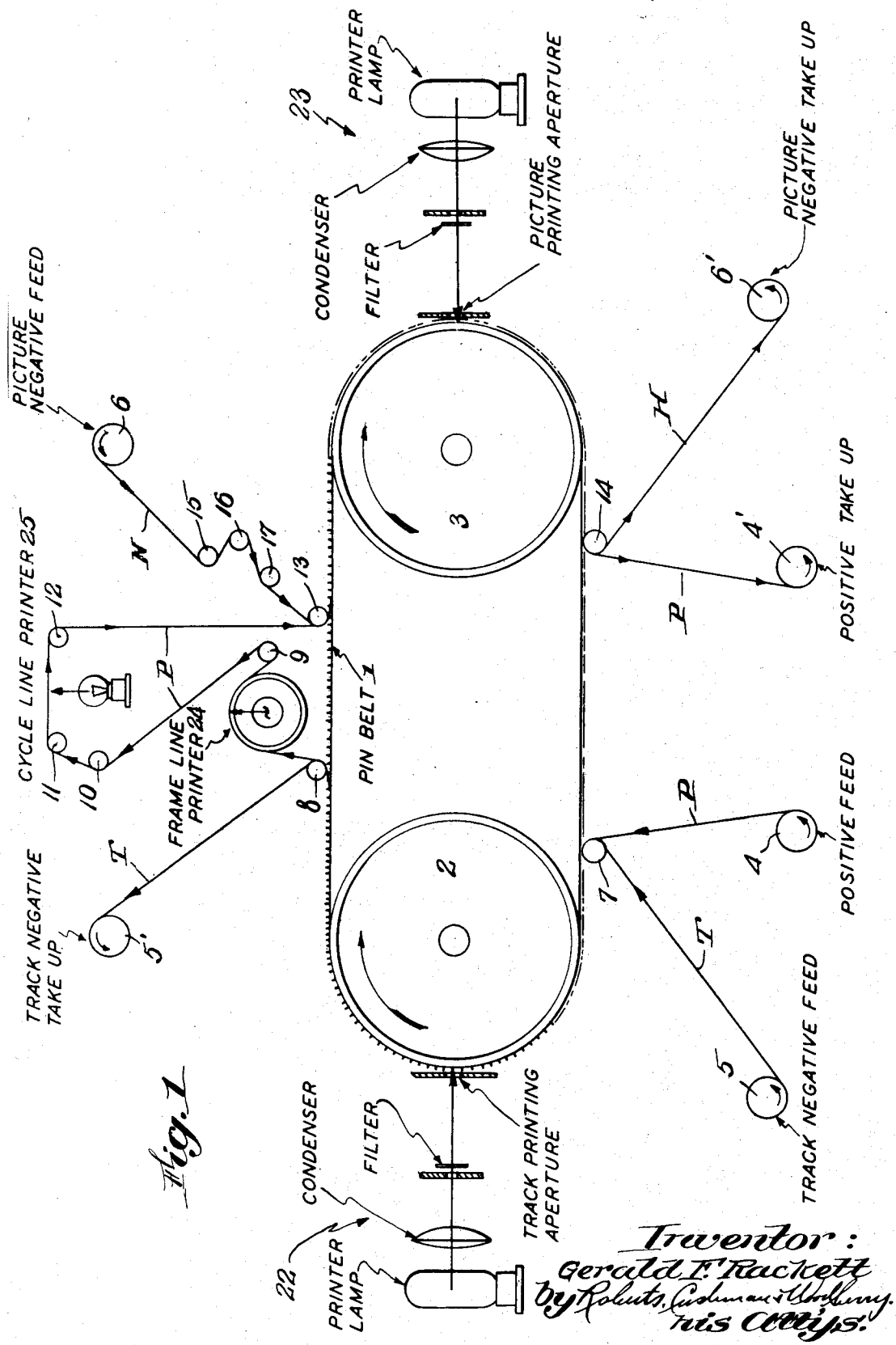

Fig. 1

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CINEMATOGRAPHIC PRINTING APPARATUS

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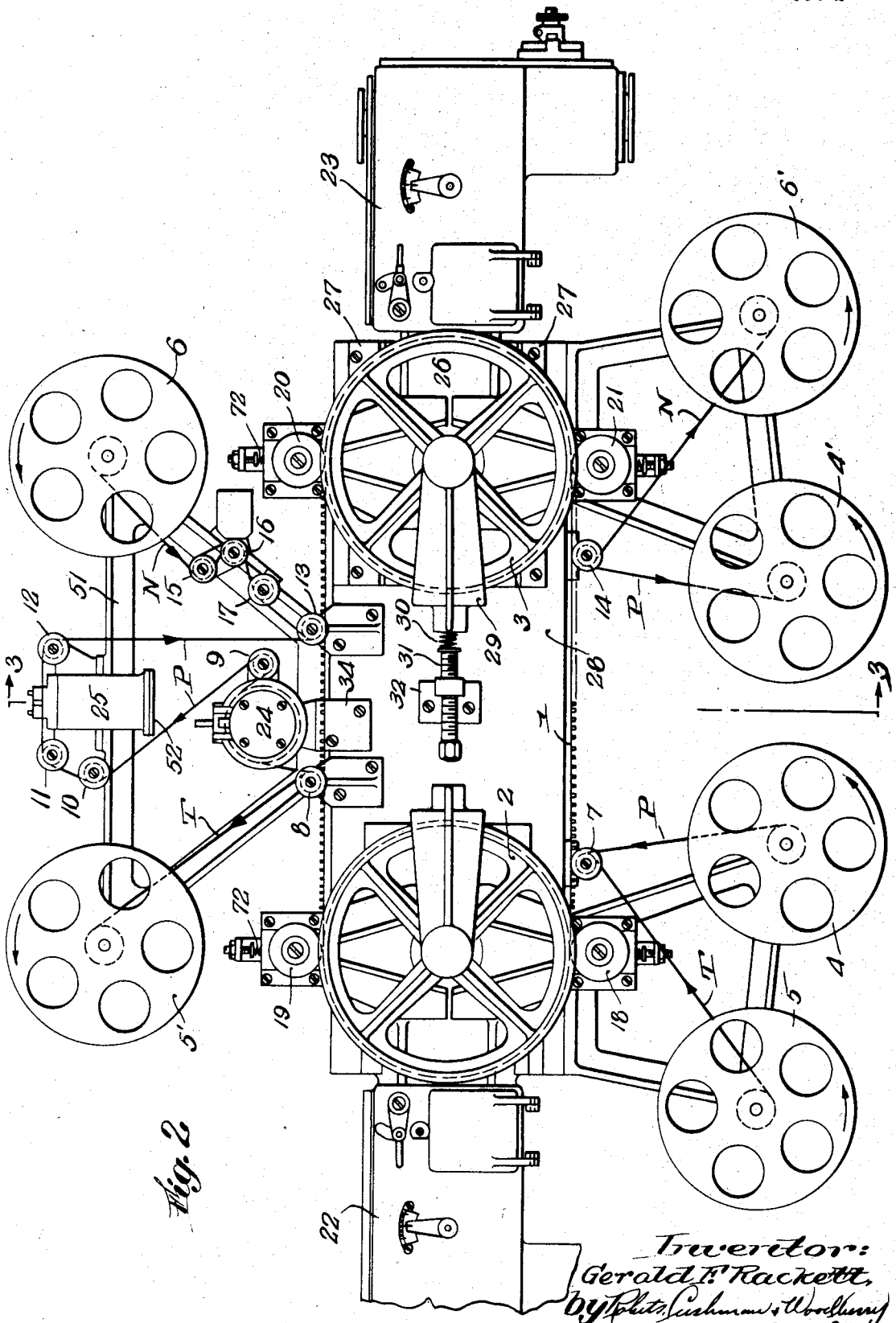

Fig. 2.

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CINEMATOGRAPHIC PRINTING APPARATUS

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Fig. 3

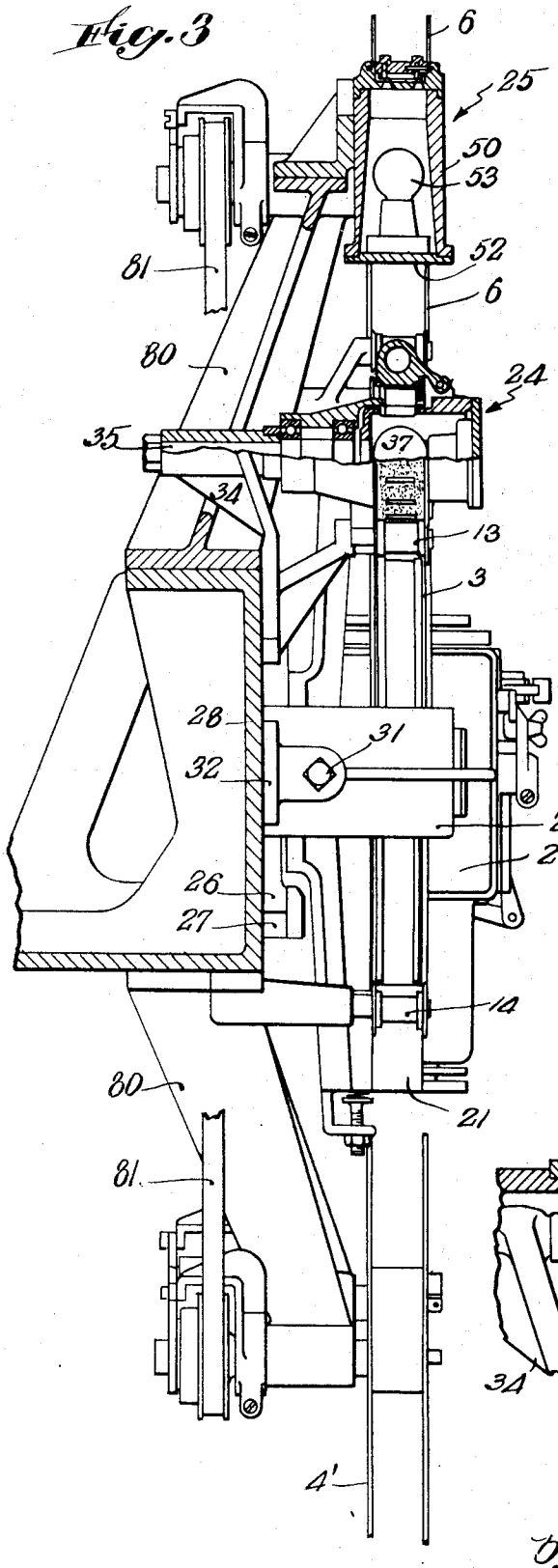


Fig. 4

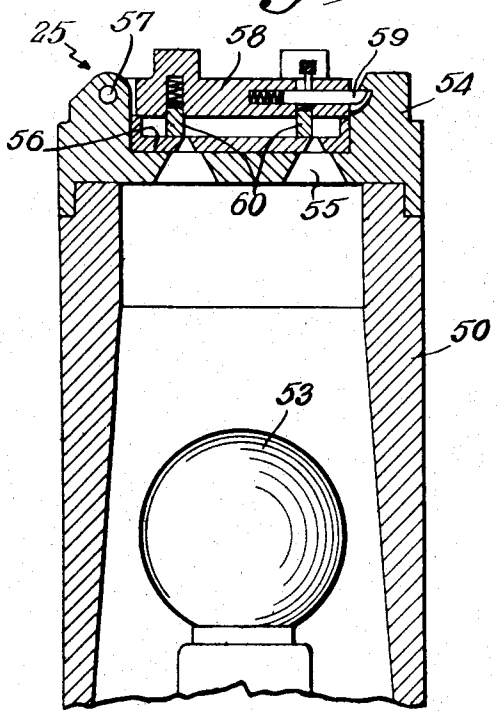
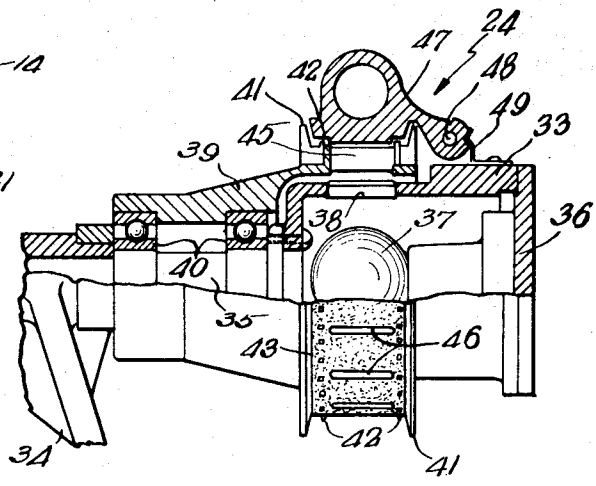


Fig. 5



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CINEMATOGRAPHIC PRINTING APPARATUS

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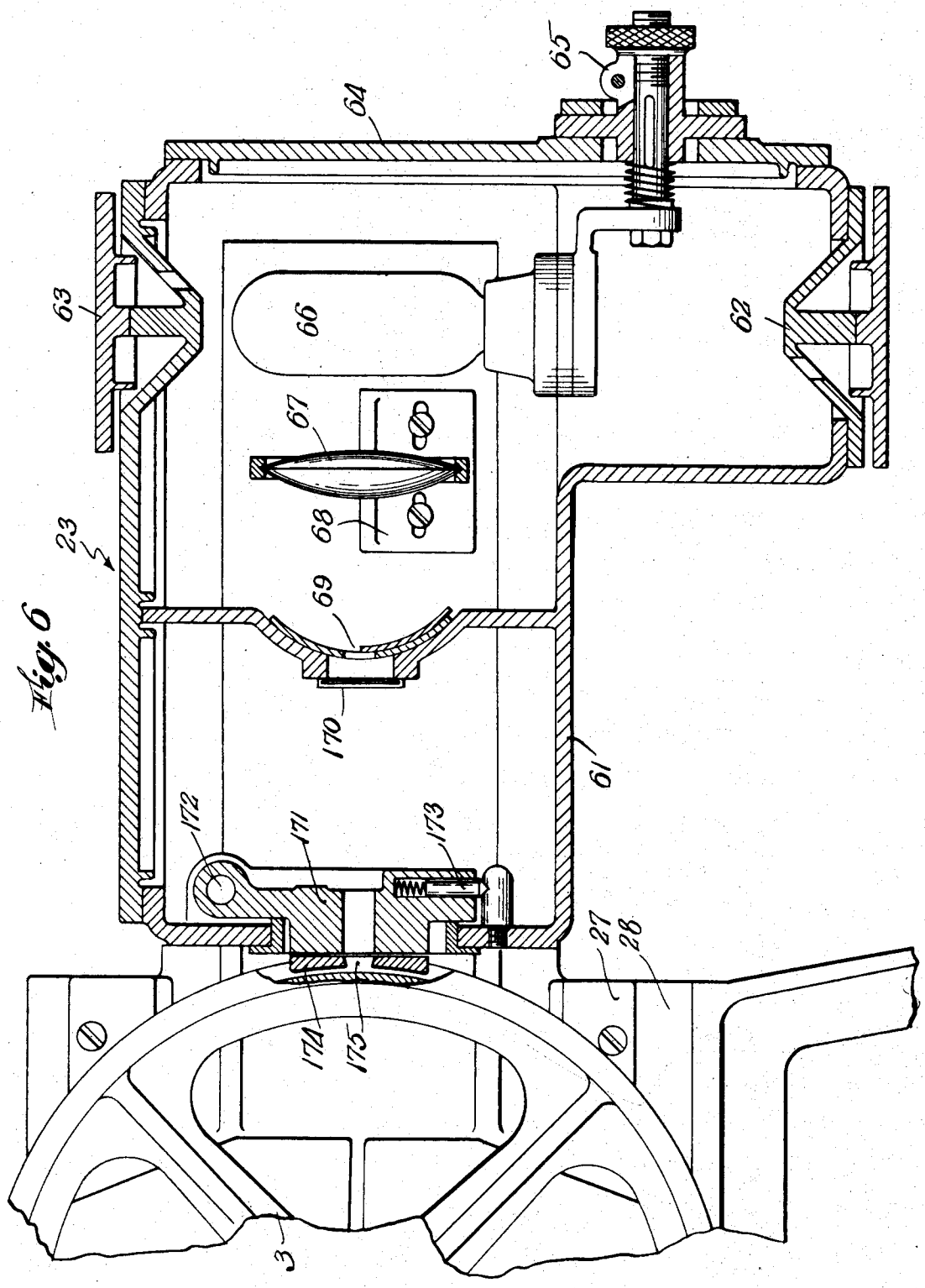

Fig. 6

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CINEMATOGRAPHIC PRINTING APPARATUS

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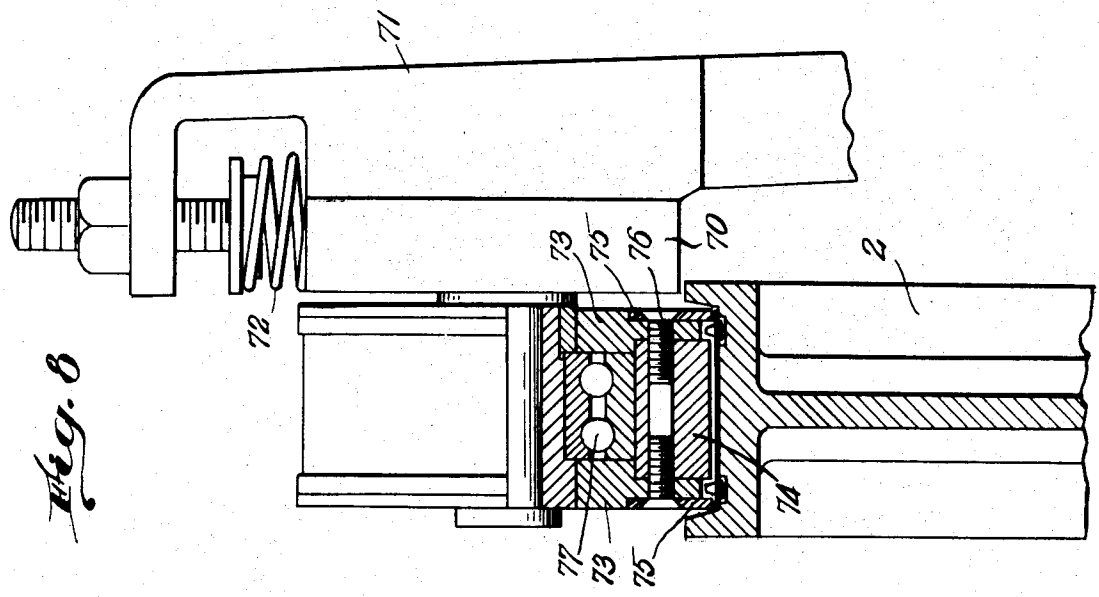

Fig. 8

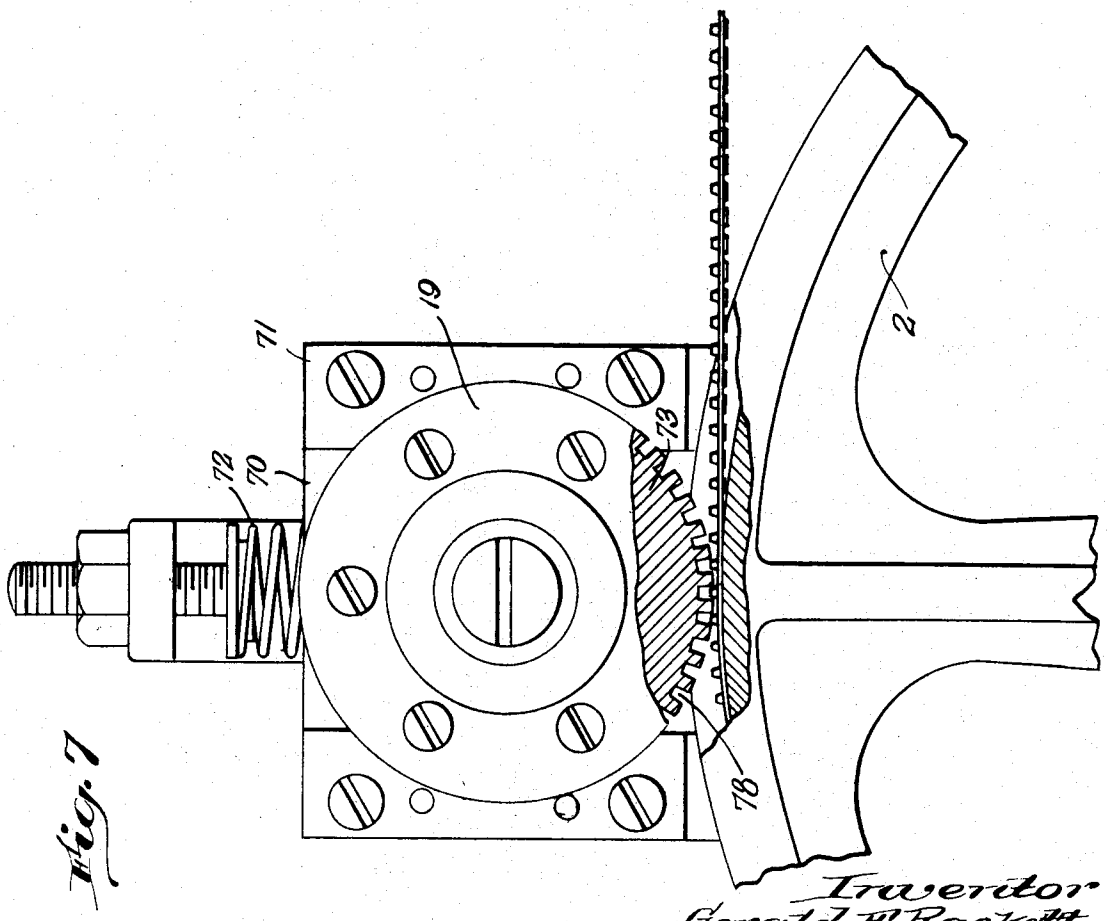

Fig. 7

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Fig. 9

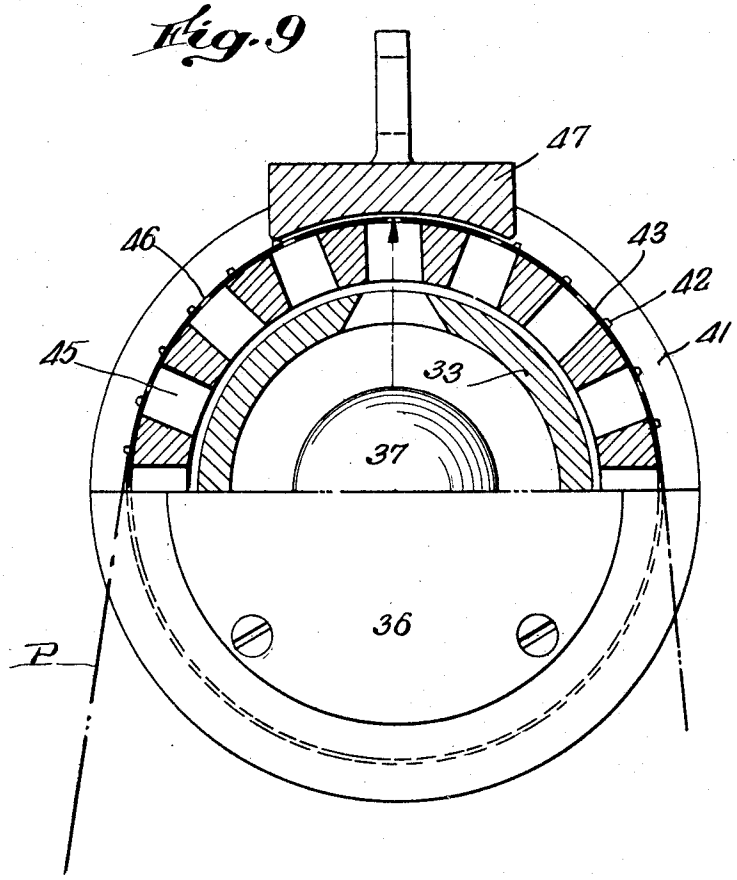
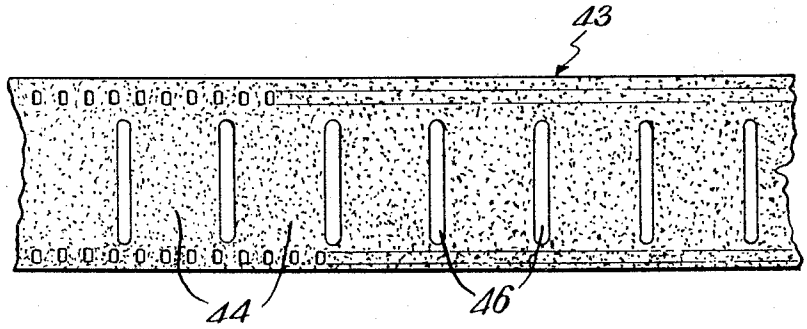


Fig. 10



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Feb. 3, 1942. G. F. RACKETT 2,271,572

CINEMATOGRAPHIC PRINTING APPARATUS

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Fig. 13

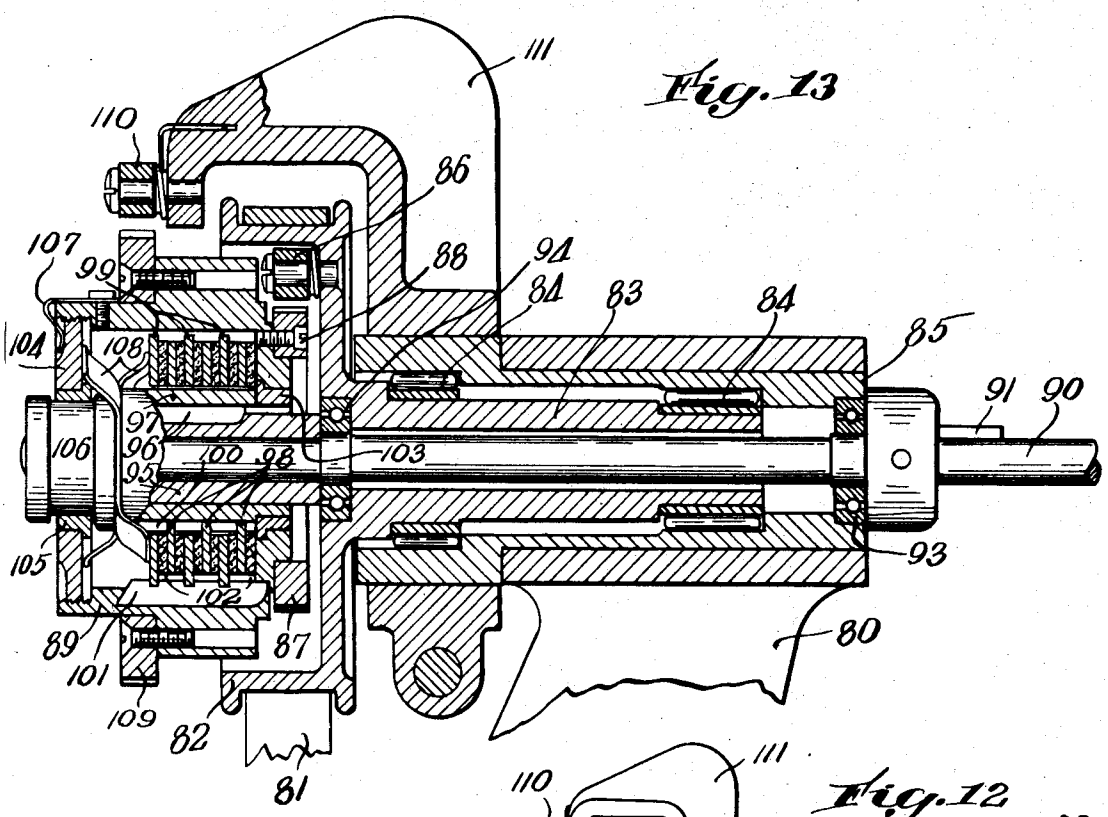


Fig. 12

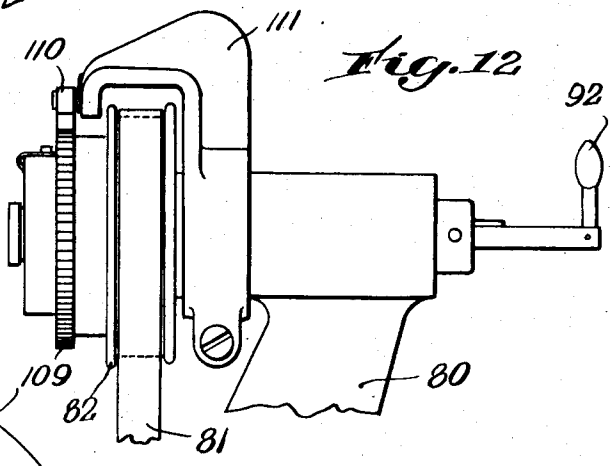
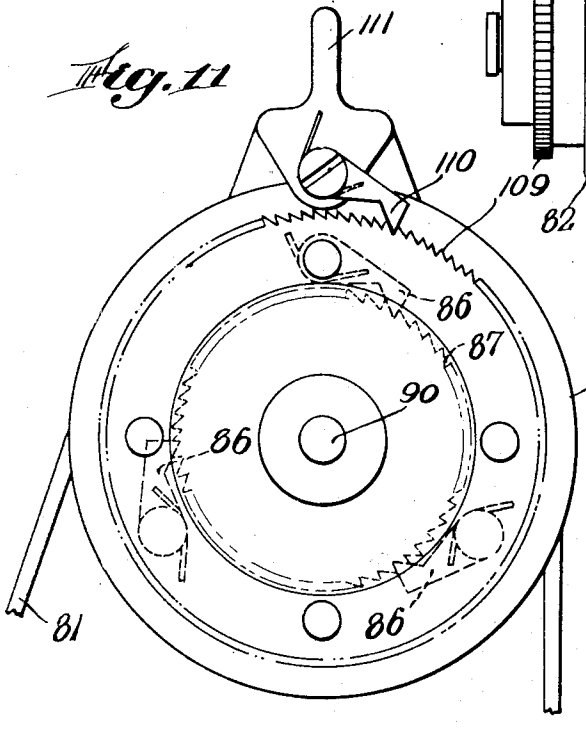


Fig. 11



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CINEMATOGRAPHIC PRINTING APPARATUS

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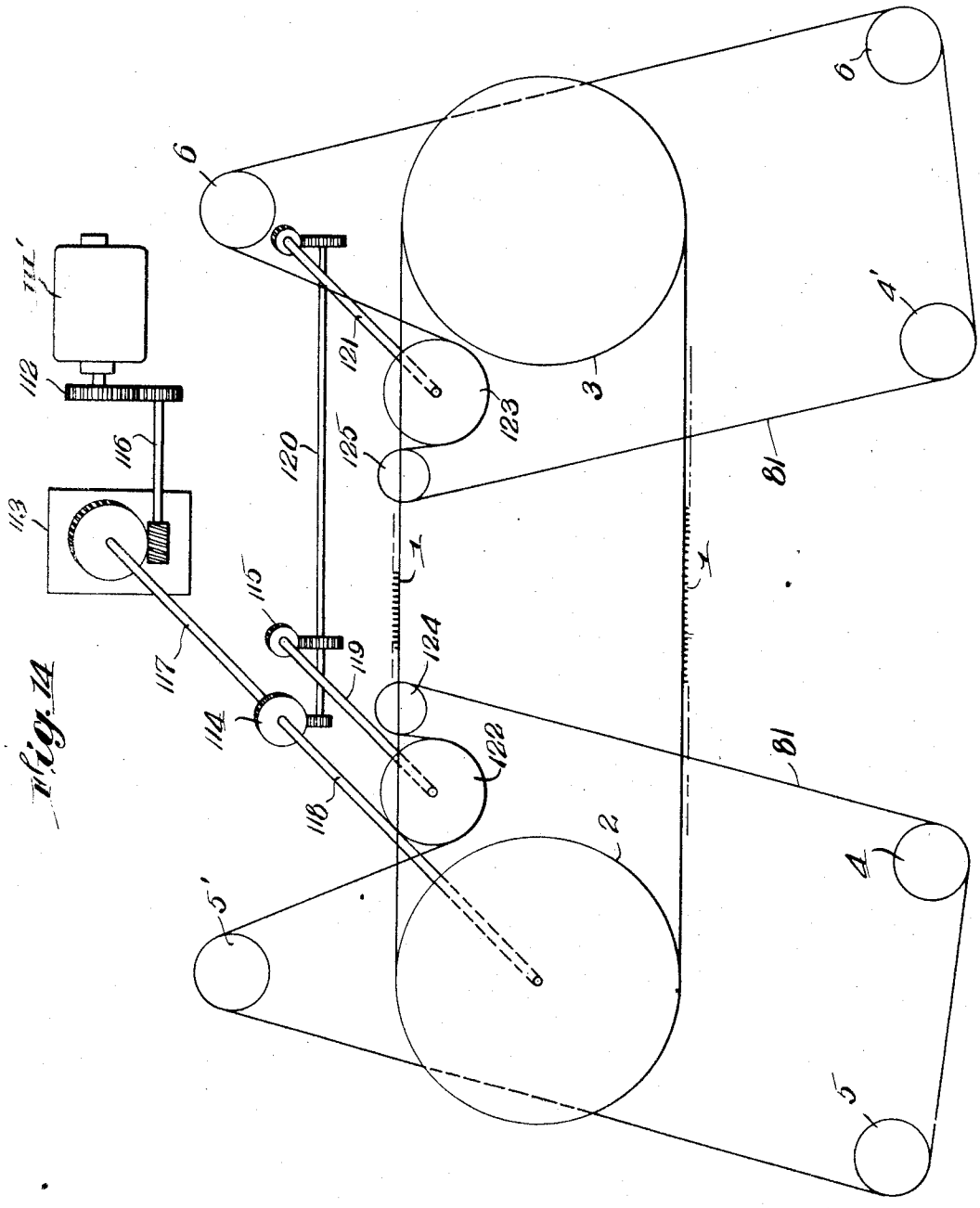

Fig. 14

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CINEMATOGRAPHIC PRINTING APPARATUS

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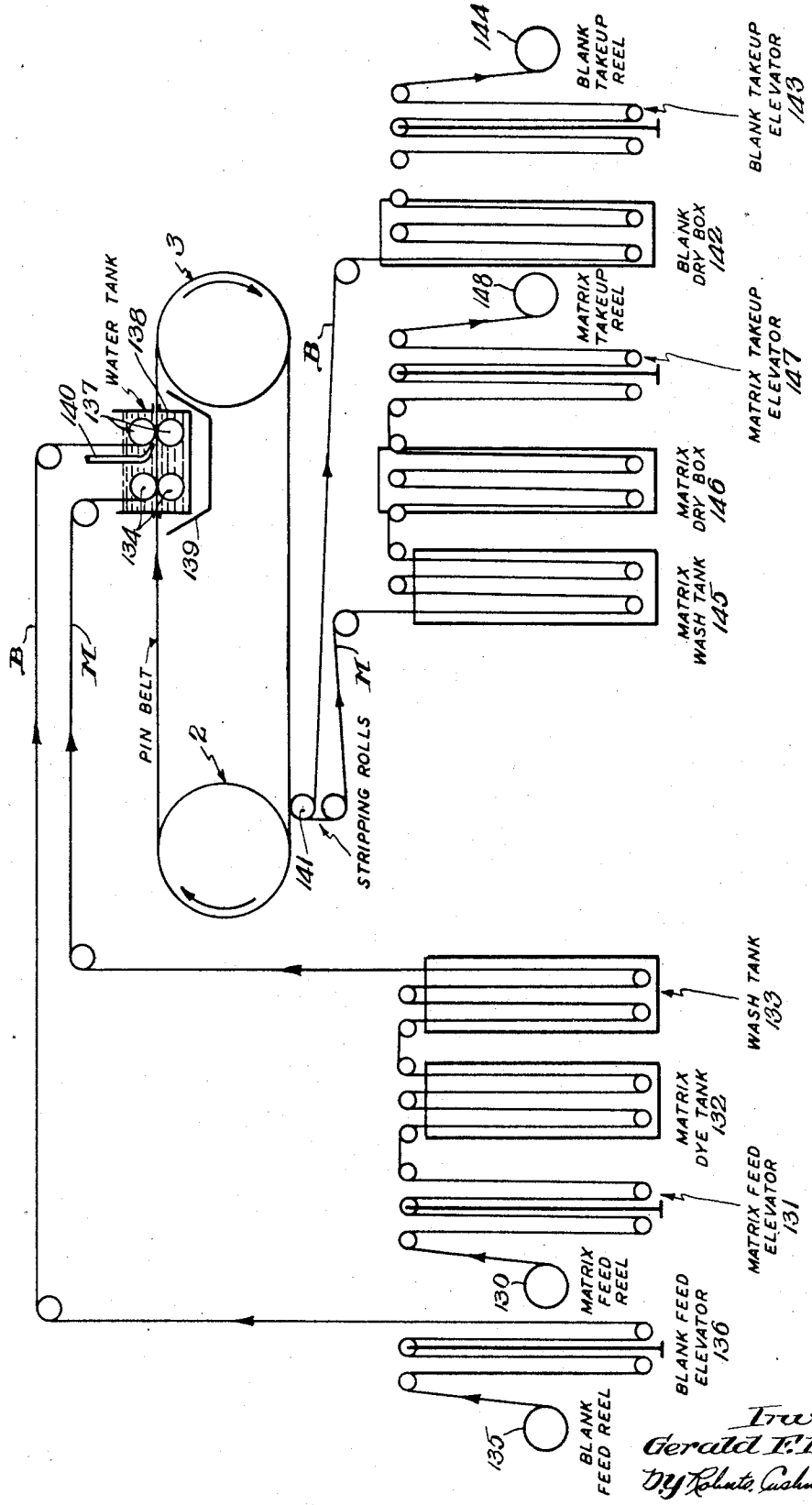

Fig. 15

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Patented Feb. 3, 1942

2,271,572

UNITED STATES PATENT OFFICE

2,271,572

CINEMATOGRAPHIC PRINTING APPARATUS

Gerald F. Rackett, Los Angeles, Calif., assignor to Technicolor Motion Picture Corporation, Hollywood, Calif., a corporation of Maine

Application June 12, 1940, Serial No. 340,120

17 Claims. (Cl. 95—75)

In the art of cinematography it is always desirable to print the pictures in accurate relationship to the sprocket holes of the film, and in the case of motion pictures in natural colors this accuracy is particularly desirable in order to secure accurate registration of the different color components of the pictures. In some cases it is also desirable to print around the pictures border lines such as so-called frame lines between the pictures and so-called cycle lines along each side of the row of pictures, one cycle line usually being located between the row of pictures and the sound track.

The principal objects of this invention are to increase the accuracy with which the pictures can be located on the film and at the same time to increase the rate at which pictures can be printed with accuracy. Other objects are to prevent slippage of two films relatively to each other and to eliminate all air spaces between the films while printing one film from the other. Still further objects are to effect successive printings, of sound-track, pictures and border lines for example, in a single machine, and to provide a machine which is simple and compact in construction, which can be threaded and adjusted with facility, which can be operated with the films feeding in either direction, and which is reliable and durable in use.

In one aspect the present invention involves a printing machine provided with a belt, preferably made of Monel or stainless steel ribbon, having teeth for engagement with the sprocket holes (or other registering openings) in the film. The belt is fed around a drum or otherwise along a path having a curved portion, in which the teeth project from the convex side of the belt, preceded by a relatively straight portion. The film is fed tangentially upon the belt in the relatively straight portion and then, in the curved portion, the film is drawn snugly against the belt or against an underlying film on the belt. By making the pitch of the teeth approximately an even integral multiple (one or more) of the pitch of the sprocket holes, the film feeds smoothly upon the belt teeth in the relatively straight run of the belt and then the film is slightly stretched by the teeth as the belt and film pass over the drum due to the movement apart of the successive teeth as the belt curves over the drum. This relative movement of the teeth also tends to draw the printing film and film to be printed snugly together against the periphery of the drum because the tips of the teeth move farther apart than their bases.

The aforesaid belt is preferably an endless belt trained around two or more drums (pulleys, rollers or other curved surfaces) and means are preferably provided adjustably to tension the belt after it is applied to the drums, thereby accurately to regulate the pitch of the teeth. In a more specific aspect the tensioning means comprises a sub-frame carrying one drum and its associated printing apparatus so that, in adjusting the belt, the drum and printer move together as a unit.

In photographically printing one film from another film the printer is preferably located at approximately the center of the curved portion of the path of the film, where the tension of the film is most uniform and is substantially the same in each direction of film travel. In machine having an endless belt and two printers the latter are preferably located at opposite ends of the belt orbit with their optical axes substantially in the plane defined by the axes of the two belt drums.

The aforesaid frame lines and border lines may be printed by one of the aforesaid printers, as for example the picture printer, or they may be separately printed with one or more border printers. When separately printed the frame lines and the cycle lines may be printed with separate printers or with a single printer, and each of the border line printers is preferably located in a branch path leading from the belt to the printer or printers and thence back to the belt. For example, the film to be printed may be fed tangentially to the belt on one side of the belt orbit, thence around one drum, thence tangentially from the belt on the other side of its orbit, thence to the border printer or printers, thence tangentially back to the belt, thence around the other drum, and thence tangentially from the belt to a take-up reel.

In printing by imbibition from a dyed matrix to an absorptive blank film the films are brought together in the relatively straight portion and then pressed together in the curved portion as above described. In this case the imbibition printing begins as soon as the films are pressed together, and continues until the dye reaches equilibrium in the two films or until the films are peeled apart. By wetting the gelatin coatings of the two films and then pressing them firmly together they adhere in intimate contact after they leave the aforesaid curved portion.

For the purpose of illustration typical embodiments of the invention are shown in the accompanying drawings in which

Fig. 1 is a diagrammatic view of one embodiment;

Fig. 2 is a side elevation of the same embodiment;

Figs. 3, 4 and 5 are sectional views on line 3—3 of Fig. 2;

Fig. 6 is an enlarged vertical longitudinal central section through one of the optical printers, showing parts in elevation;

Figs. 7 and 8 are enlarged views of one belt drum and seating roll, parts being broken away;

Fig. 9 is an enlarged view of the frame-line printer;

Fig. 10 is a plan view of a part of an endless film constituting a part of the frame-line printer;

Figs. 11 and 12 are end and side views of one of the ratchet drive mechanisms;

Fig. 13 is a vertical axial section of the ratchet drive mechanism;

Fig. 14 is a schematic view of the reversible driving mechanism for the various film reels; and

Fig. 15 is a diagrammatic representation of the invention applied to an imbibition printer.

The particular embodiment of the invention shown in Figs. 1 to 14 comprises an endless belt 1 trained over drums 2 and 3, feed and take-up reels 4, 4', 5, 5', 6 and 6' for the three films P, T and N, which may for example comprise a positive film to be printed, a sound-track negative and a picture negative respectively, guide rolls 7 to 17 inclusive, pressure rolls 18 to 21 for pressing the films upon the teeth of the belt 1, printers 22 and 23, which may for example be of any suitable type for printing sound-tracks and pictures respectively, a frame-line printer 24 and a cycle-line printer 25.

With the films running in the direction of the arrows the film P to be printed feeds from the reel 4 over the roll 7, thence tangentially to the belt 1 through a short stretch where the teeth of the belt gradually move into the sprocket holes of the film, thence over the roll 18 which snugly seats the film against the belt, thence through an arc of 180° around the drum 2, the film being printed by printer 22 at the middle of this arc, thence past rollers 19 and 8, thence approximately half way around the frame-line printer 24 where the frame lines are printed between the picture spaces, thence over rolls 9, 10 and 11 to the cycle-line printer 25 where the cycle lines are printed along the sides of the picture spaces, thence over rolls 12 and 13 back to the pin belt, thence under pressure roll 20 where the film is again pressed tightly against the belt, thence through an arc of 180° around the drum 3, the film being printed by printer 23 at the middle of this arc, and thence over rolls 21 and 14 to the take-up reel 4'. The film T feeds from reel 5 past rolls 7 and 18, drum 2, rolls 19 and 8 and thence to the take-up reel 5', this film being seated snugly on the toothed belt over film P by the pressure roll 18 and serving to print the film T at the aperture of the printer 22 as the two films pass the aperture in non-slip contact with each other. The film N feeds from reel 6 over rolls 15, 16, 17, 13 to the belt 1, thence under the pressure roll 20 where the film is seated snugly against the film P, thence over the drum 3 where the images from this film are printed upon the film P by the printer 23, and thence over rolls 21 and 14 to the take-up reel 6'. When the machine is operated in reverse direction reels 4', 5' and 6' serve as feed reels, the reels 4, 5 and 6 serve as take-up reels and the films are seated on the belt by the pressure rolls 19 and 21 instead of the rolls 18 and 20. Otherwise the operation of the machine is the same, except of course the order of printing is reversed, the film P being successively printed at 23, 25, 24 and 22.

As shown in Fig. 1 the rolls 7, 8, 13 and 14 are preferably spaced from the belt a distance greater than the length of the teeth so that the teeth move into the sprocket holes of the films while the films approach the belt tangentially throughout the short stretch between each of said rolls and the next succeeding pressure or seating roll (18, 19, 20 or 21). Thus the films feed freely upon the belt teeth without danger of damage to the sprocket holes. As shown in detail in Figs. 7 and 8 the belt teeth are preferably in the form of pins inserted from the back of the belt with heads seating against the back of the belt and soldered or brazed thereto, the belt drums being grooved to accommodate the heads of the pins.

Each of the seating roll assemblies 18, 19, 20 and 21 (Figs. 2, 7 and 8) comprises a roller journaled in a head 70 which slides vertically in a bracket 71 and which is pressed toward the belt by a spring 72. Each roller comprises two end rings 73 having annular recesses to receive the rings 74 and 75, the rings being fastened together by screws 76 and mounted on a ball bearing 77. The rings 73 are provided with recesses 78 (Fig. 7) to receive the belt teeth and the outer diameter of ring 74 is less than that of rings 73 and 75 so that only the rings 73 and 75 press the films, thereby to seat them snugly on the belt. In Figs. 7 and 8 the roller is spaced from the belt a distance approximately equal to the thickness of the films but in practice the spring 72 would of course press the roller against the belt in the absence of films therebetween.

As shown in Figs. 2 and 3 the drum 3 is journaled in a sub-frame comprising a back plate 26, sliding in gibs 27 mounted on the main frame 28, and a bracket 29 fast to the plate 26. To hold the belt taut the sub-frame is yieldingly urged to the right by a spring 30 interposed between the bracket 29 and an adjustable screw 31 threading through a bracket 32 mounted on the main frame 28. By adjusting the screw 31 the belt 1 may be stretched more or less to adjust the pitch of the teeth as aforesaid, thereby to adjust the force with which the two films are drawn into intimate non-slip contact with each other as the teeth of the belt separate fan-wise in entering the curved portions of the belt orbit. The printer 23 is also mounted on the plate 26, which extends to the right (Fig. 2) beyond the main frame 28, so that the drum 3 and printer 23 are adjustable as a unit.

The particular frame-line printer illustrated in Figs. 2, 3, 5, 9 and 10 comprises a circular lamp housing 33 fixedly mounted on the main frame through an upstanding bracket 34 and a tubular member 35, the housing having a detachable cover 36 carrying the lamp 37 and having an opening 38 in its upper side through which the film is printed. Surrounding the housing 33 is a rotor 39 which rotates on ball bearings 40 surrounding the member 35. The rotor 39 has flanges 41 to guide the marginal edges of the film and teeth 42 to engage the sprocket holes in the film. Snugly surrounding the rotor 39 is an endless film 43 which has sprocket holes to receive the teeth 42 and which is opaque except for the transparent frame lines 46 between the areas 44 corresponding to the picture areas of the film P to be printed. The periphery of the rotor 39 is solid except for slits 45 which are disposed in

axial planes corresponding to the transparent spaces 46 and which are wider and slightly longer than the transparent lines 46. A light stop 47 is pivotally mounted on the housing 33 at 48, spring 49 being provided to hold the stop either in open or closed position. As the film P passes over the top of the housing 33 the frame lines are printed by light passing from lamp 37 through the aperture 38 thence through the slits in the rotor and thence through the transparent lines 46 on the film 43, the width of the frame lines being determined by the width of the lines 46 on film 43.

The particular cycle-line printer illustrated in Figs. 2, 3 and 4 comprises a housing 50 mounted on the main frame through the medium of the same bracket 51 which carries the reels 5' and 6, a removable bottom 52 which carries the lamp 53 and a removable cover 54 having tapered light openings 55. Mounted in a recess in the top of the cover 54 is a liner 56 also having tapered light slits in line with the slits 55. Pivotally mounted at 57 on the cover 54 is a pressure shoe 58 which is provided with a detent 59 for holding it in closed position and which carries spring-pressed pressure bars 60 adjacent the light openings 55 to hold the film in close contact with the liner 56 while the cycle lines are being printed on the film through the slits 55.

The particular picture printer chosen for the purpose of illustration (Fig. 6) comprises a casing 61, light-trap ventilators 62 and 63, a removable cover 64 having means 65 for adjustably supporting a lamp 66, a condenser lens 67 adjustably mounted at 68, an adjustable aperture 69, a filter holder 170 and a gate 171 pivotally mounted at 172, the gate being provided with a detent 173 for holding it in closed position and an aperture plate 174 having an accurately dimensioned aperture 175 corresponding to the size of the pictures to be printed from the film N upon the film P. By making the aperture 175 larger than the pictures to be printed, dimensioning the apertures with sufficient accuracy and positioning the plate 174 with sufficient accuracy transversely of the films on the drum 3, the frame lines and/or cycle lines may be printed by the printer 23, in which case the frame-line and cycle-line printers may be omitted and the film P need not leave the belt along the branch path 9—10—11—12—13. However for maximum accuracy the frame lines and cycle lines are preferably printed with separate printers as herein disclosed.

Associated with each of the feed and take-up reels 4, 4', 5, 5', 6 and 6' is a ratchet drive mechanism constructed and arranged as shown in Figs. 3, 11, 12 and 13. Each of these mechanisms is mounted on the main frame 28 by means of a bracket 80 and is driven by a belt 81 connected to the main drive associated with drum 2. The belt 81 trains over a pulley 82 which is journaled in the bracket 80 through the medium of a hub 83, roller bearings 84 and a fixed sleeve 85. Mounted on the side of the pulley 82 are three spring-pressed pawls 86 which engage the teeth of a ratchet ring 87. The ring 87 is mounted by means of screws 88 on the outer cylindrical part 89 of a clutch assembly.

Coaxial with the pulley 82 is a film reel spindle 90 having a key 91 to prevent rotation of the reel on the spindle and having a detent 92 to hold the reel on the spindle. The spindle is journaled in ball bearings 93 and 94, bearing 93 being mounted in the stationary sleeve 85 and the bearing 94 being mounted in the pulley 82.

Fast to the left-hand end of the spindle (Fig. 13) is a sleeve 95. Surrounding this sleeve and keyed thereto with a key 96 is another sleeve 97. Surrounding the sleeve 97 are two sets of clutch rings 98 and 99, rings 98 being keyed to the sleeve 97 by means of internal lugs projecting into the keyway 100 in the sleeve 97 and the rings 99 being keyed to the outside ring 89 by means of key 101. Loosely mounted between the rings 98 and 99 are friction rings 102. The right-hand end of the outside ring 89 (Fig. 13) is rotatably mounted through the medium of a bushing 103 and the left-hand end of the ring is rotatably supported on the spindle 90 through the medium of an end ring 104, a bushing 105 and a sleeve 106. The ring 104 is threaded into the ring 89 and is held in position by a spring 107 seating in one of a series of recesses in the outer face of the ring. Interposed between the ring 104 and the friction rings 98 and 99 is a spring 108 which presses the friction rings together, the right-hand end of the ring 89 counteracting the thrust of the spring 108. Thus the parts of the clutch which are keyed to the spindle 90 comprise 95, 96, 97 and 98 and the parts of the clutch assembly which rotate with the spindle 90 only through frictional engagement comprise 89, 99, 102 and 104. Fast to the outside of the ring 89 is a ratchet ring 109 engageable with a pawl 110 mounted on the stationary bracket 111. This mechanism is claimed in the application of Harold H. Klemola, Serial No. 260,322, filed March 7, 1939.

The operation of the ratchet mechanism is as follows: When the reel on spindle 90 is functioning as a take-up reel the spindle 90 is driven in a clockwise direction (Fig. 11) through the medium of the belt 81, pulley 82, pawls 86, ratchet ring 87 and the clutch assembly, thereby tending to drive the reel at a somewhat greater rate than that of the film, the clutch slipping enough to maintain a constant pull on the film. During this clockwise rotation pawl 110 rides idly over the teeth of ring 109. When the machine is reversed to feed all films in reverse direction, belt 81 is reversed thereby driving the pawls 86 in a counterclockwise direction (Fig. 11). However, pawls 86 are inoperative during this reverse drive, riding idly over the teeth on the ratchet ring 87. The pull on the film rotates the spindle 90 and the inner portion of the clutch assembly counterclockwise but the outer portion of the clutch assembly is held against rotation by the pawl 110 in engagement with the teeth of ratchet ring 109, thereby serving as a brake on the film.

The belts 81 of the various feed and take-up reels 4, 4', 5, 5', 6 and 6' are connected directly or indirectly to a common reversible motor or other driver so that all the reels may be reversed simultaneously. While the film reels may be driven in various ways the driving connections shown in Fig. 14 have been found highly satisfactory. This arrangement comprises a reversible motor 111', change-speed gears 112, speed-reduction gears 113, spiral gears 114 and 115, shafts 116, 117, 118, 119, 120 and 121, drive pulleys 122 and 123, belt-tensioning pulleys 124 and 125, and the aforesaid belts 81 for driving the pulleys 82 of the film reels 4, 4', 5, 5', 6 and 6'. Either or both of the drums 2 and 3 may be driven directly by the motor. Thus, in Fig. 14, drum 2 is connected to the motor through shaft 118, etc. However, for most purposes it is preferable to omit this connection, permitting the

drums to be driven solely by the films through the medium of the toothed belt 1.

The typical application of the invention to imbibition printing illustrated in Fig. 15 comprises, in addition to the pin belt 1 and drums 2 and 3 shown and described in connection with the first embodiment, means for treating a blank film B and a matrix film M. The latter film feeds from a supply reel 130, through an elevator 131, dye tank 132, wash tank 133 for rinsing off the superficial dye, and thence to the belt 1 at the pressure rolls 134. The blank film feeds from the supply reel 135 through an elevator 136 to the belt 1 between the pressure rolls 137 where it is seated against the matrix with the coated sides of the films in contact. To avoid inclusion of air bubbles between the films they are brought together under water in tank 138. The water which leaks out through the slits for the belt may be caught in a drain pan 139 and constantly replenished through an inlet 140. After the films are brought together along the straight portion of the belt they pass into the curved portion over drum 3 where they are drawn into intimate contact as above described. With this arrangement it is unnecessary to exert much if any pressure on the films between rolls 134 and 137. Indeed they may be brought together with a single roller as at 7 in Fig. 1. After being drawn into intimate contact the films stick tightly together until peeled apart at roller 141, whence blank B passes to a dry box 142, elevator 143 and take-up reel 144 and the matrix M passes through wash tank 145, dry box 146, elevator 147 and thence to take-up reel 148. From the foregoing it will be evident that dye is imbibed by the blank B from the matrix M from the time the films are pressed into intimate contact until the dye reaches equilibrium in the two films or the films are peeled apart.

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. Apparatus for printing one film from another film, comprising a belt having teeth fitting into sprocket holes in the films, means associated with the belt for stretching at least one of the films, means for seating one film against the belt and the other film against the first film, means for feeding the belt and films past a printing station, and means at said station for printing said film while said teeth hold the films in non-slip relationship.

2. Apparatus for printing one film from another film, comprising a belt having teeth fitting into sprocket holes in the films, means for feeding the belt along a path having a curved portion in which the teeth project from the convex side of the belt preceded by a relatively straight portion, means for tangentially feeding film upon said belt in said relatively straight portion, means for seating one film against the belt and the other film against the first film, and means for printing said film in said curved portion.

3. Apparatus for printing one film from another film, comprising a belt having teeth fitting into sprocket holes in the films, a drum, means for feeding the belt along a path having a relatively straight portion and thence over said drum, means for tangentially feeding film upon said belt in said relatively straight portion, means for seating one film against the belt and the other film against the first film, and means at said drum for printing said film while curved, the pitch of said teeth being approximately an integral multiple of the pitch of said sprocket holes so that the film feeds smoothly upon the teeth in said relatively straight portion and is then stretched by the teeth in passing over said drum.

4. Apparatus for printing one film from another film, comprising a belt having teeth fitting into sprocket holes in the films, means for feeding the belt along a path having a curved portion in which the teeth project from the convex side of the belt preceded by a relatively straight portion, means for tangentially feeding film upon said belt in said relatively straight portion, means for seating one film against the belt and the other film against the first film, and means substantially at the center of said curved portion for printing said film.

5. Apparatus for printing film of the type having sprocket holes, comprising spaced drums, an endless belt trained around the drums with external teeth for engagement with said sprocket holes, means for feeding two films tangentially upon the belt between said drums with one film seating against the belt and the other film seating against the first film, and means for printing said film while on a portion of the belt which is on one of said drums.

6. Apparatus for printing film of the type having sprocket holes, comprising spaced drums, an endless belt trained around the drums with external teeth for engagement with said sprocket holes, means for feeding two films tangentially upon the belt between said drums with one film seating against the belt and the other film seating against the first film, means for printing said film while on a portion of the belt which is on one of the drums, and means for maintaining the belt under a predetermined degree of tension.

7. Apparatus for printing film of the type having sprocket holes, comprising spaced drums, an endless belt trained around the drums with external teeth for engagement with said sprocket holes, means for feeding two films tangentially upon the belt between said drum with one film seating against the belt and the other film seating against the first film, means for printing said film while on a portion of the belt which is on one of the drums, and means for adjusting one drum relatively to the other drum to vary the tension of the belt.

8. Apparatus for printing film of the type having sprocket holes, comprising spaced drums, an endless belt trained around the drums with external teeth engaging in said sprocket holes, a printer at one of said drums, a frame, a sub-frame for mounting the printer and associated drum on the frame, and means for moving the sub-frame relatively to the frame, thereby to adjust the tension of said belt.

9. Apparatus for printing film of the type having sprocket holes, comprising spaced drums, an endless belt trained around the drums with external teeth for engagement with said sprocket holes, means for feeding two films tangentially upon the belt between said drums with one film seating against the belt and the other film seating against the first film, and means adjacent each drum for printing the film while held by said teeth around the peripheries of the drums.

10. Apparatus for printing one film from another film, comprising spaced drums having their axes in the same plane, an endless belt trained

around the drums with external teeth extending into the sprocket holes of said films with one film seating against the belt and the other film seating against the first film, and a printer having its optical axis approximately in said plane at each end of the belt orbit for printing said film while trained around the drums respectively.

11. Apparatus for printing one film from another film, comprising spaced drums having their axes in the same plane, an endless belt trained around the drums with external teeth extending into the sprocket holes of said films with one film seating against the belt and the other film seating against the first film, and means in said plane at one end of the belt orbit for printing a sound track on said film, and means in said plane at the other end of said orbit for printing pictures on the film.

12. Apparatus for printing film of the type having sprocket holes, comprising spaced drums, an endless belt trained around the drums with external teeth for engagement with said sprocket holes, printing means distributed around the orbit of said belt for printing on the film a sound track and pictures and border lines, at least one of said printing means being located at one of said drums to print the film while trained around the drum, and means for feeding another film around the latter drum in superposed contact with said first film.

13. Apparatus for printing film of the type having sprocket holes, comprising spaced drums, an endless belt trained around the drums with external teeth for engagement with said sprocket holes, means for feeding two films in superposed relationship upon the belt in one side of the belt orbit, means for printing one of said films from the other film while on a portion of the belt which is on one of said drums, means for tangentially feeding the printing film from the belt on the other side of the belt orbit, means on the latter side of the belt orbit in advance of said last means for feeding the printed film from the belt along a branch path and thence back to the belt, means for printing frame lines on the printed film in said branch path, means for feeding another film upon said belt over said printed film between said branch path and the second drum, and means for printing from said third film upon said printed film while on a portion of the belt which is on the second drum.

14. Apparatus for printing one film from another film comprising an endless belt having teeth for engagement in the sprocket holes of the films, means for guiding the belt along an orbital path including a curved part and a portion leading to the curved part, means for feeding the films to the belt in said portion and thence around the curved part, the pitch of said teeth being approximately an integral multiple of the pitch of the sprocket holes so that, in said curved part, one film is drawn snugly against the belt and the other film is drawn snugly against the first film due to the movement apart of the successive teeth as the belt is curved, and means for printing said film in said curved part of the belt path.

15. Apparatus for printing one film from another film comprising an endless belt having teeth for engagement in the sprocket holes of the films, means for guiding the belt along an orbital path including a curved part and a portion leading to the curved part, means for feeding the films to the belt in said portion and thence around the curved part, the pitch of said teeth being approximately an integral multiple of the pitch of the sprocket holes so that, in said curved part, one film is drawn snugly against the belt and the other film is drawn snugly against the first film due to the movement apart of the successive teeth as the belt is curved, and means for wetting the films before they are brought together, whereby they adhere in intimate contact after they are drawn together in said curved part.

16. Apparatus for printing one film from another film comprising an endless belt having teeth for engagement in the sprocket holes of the films, means for guiding the belt along an orbital path including a curved part and a portion leading to the curved part, and means for feeding the films to the belt in said portion and thence around the curved part, the pitch of said teeth being approximately an integral multiple of the pitch of the sprocket holes so that, in said curved part, one film is drawn snugly against the belt and the other film is drawn snugly against the first film due to the movement apart of the successive teeth as the belt is curved, whereby the films are brought into intimate contact for printing purposes.

17. Apparatus for printing one film from another film comprising an endless belt having teeth for engagement in the sprocket holes of the films, means for guiding the belt along an orbital path including a curved part and a portion leading to the curved part and a relatively straight part leading from the curved part, and means for feeding the films to the belt in said portion and thence around the curved part and thence along said straight part, the pitch of said teeth being approximately an integral multiple of the pitch of the sprocket holes so that, in said curved part, one film is drawn sungly against the belt and the other film is drawn snugly against the first film due to the movement apart of the successive teeth as the belt is curved, whereby the films are brought into intimate contact for printing purposes.

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