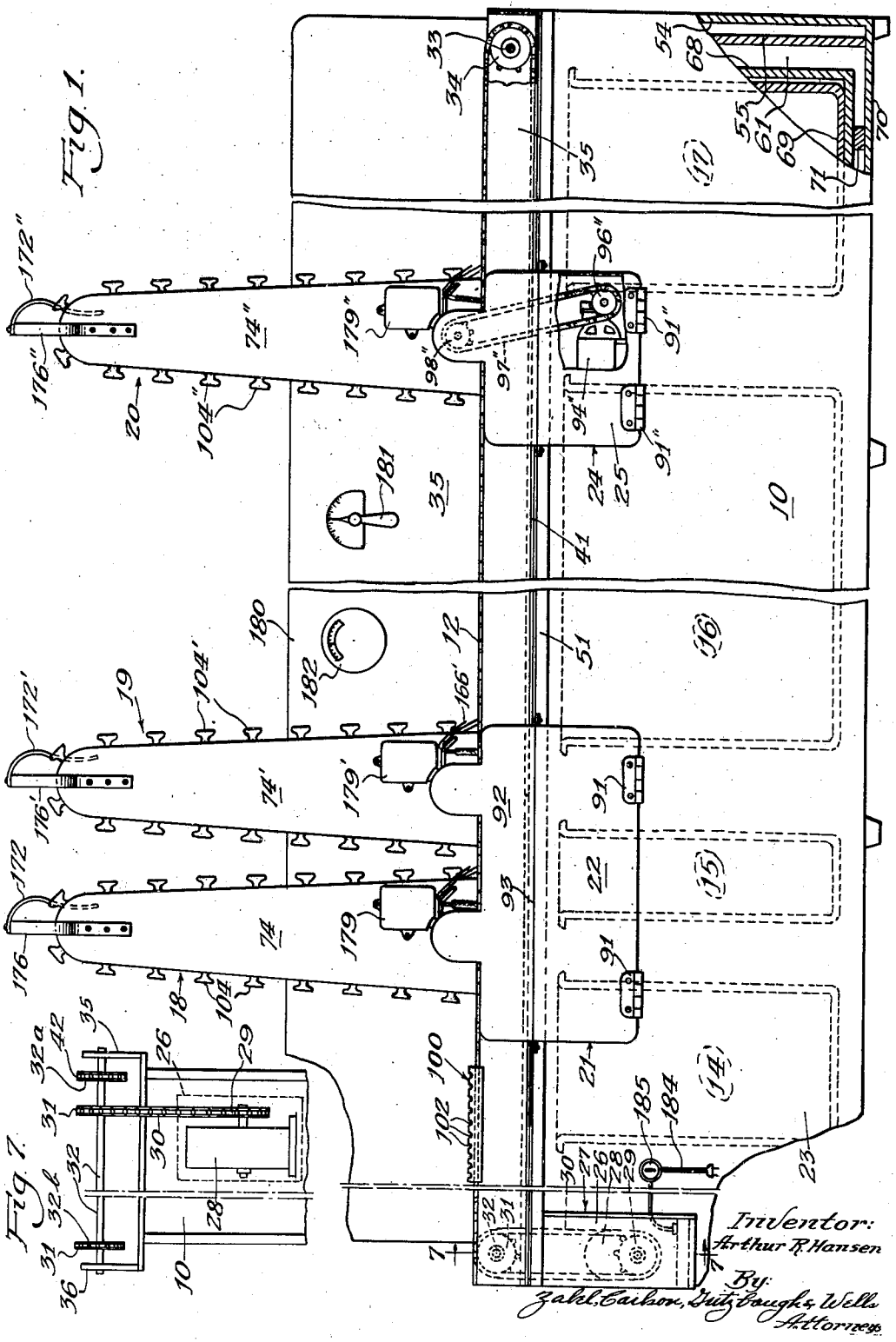
June 12, 1945. A. R. HANSEN 2,378,217

FILM PROCESSING APPARATUS

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FILM PROCESSING APPARATUS

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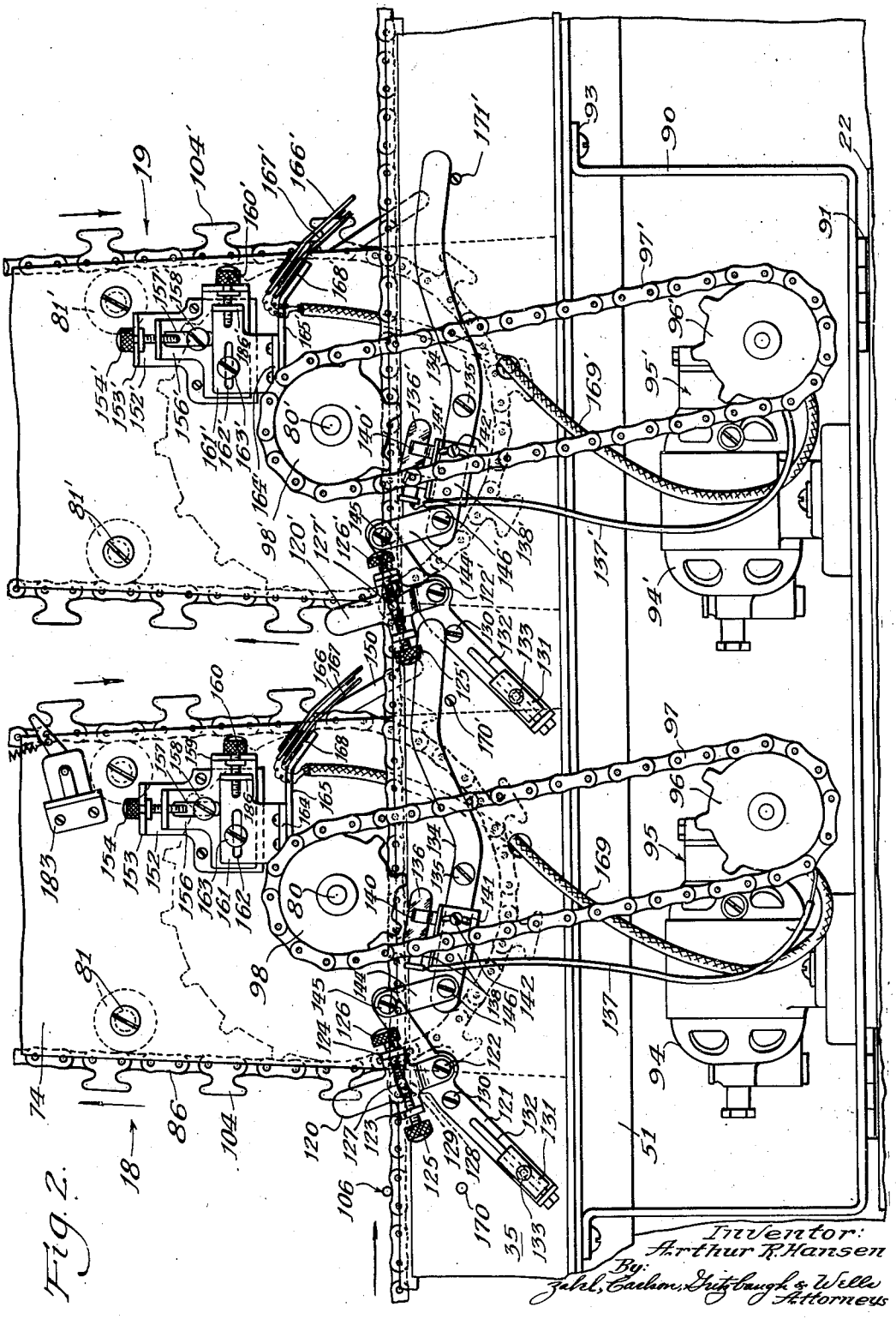


Fig. 2.

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FILM PROCESSING APPARATUS

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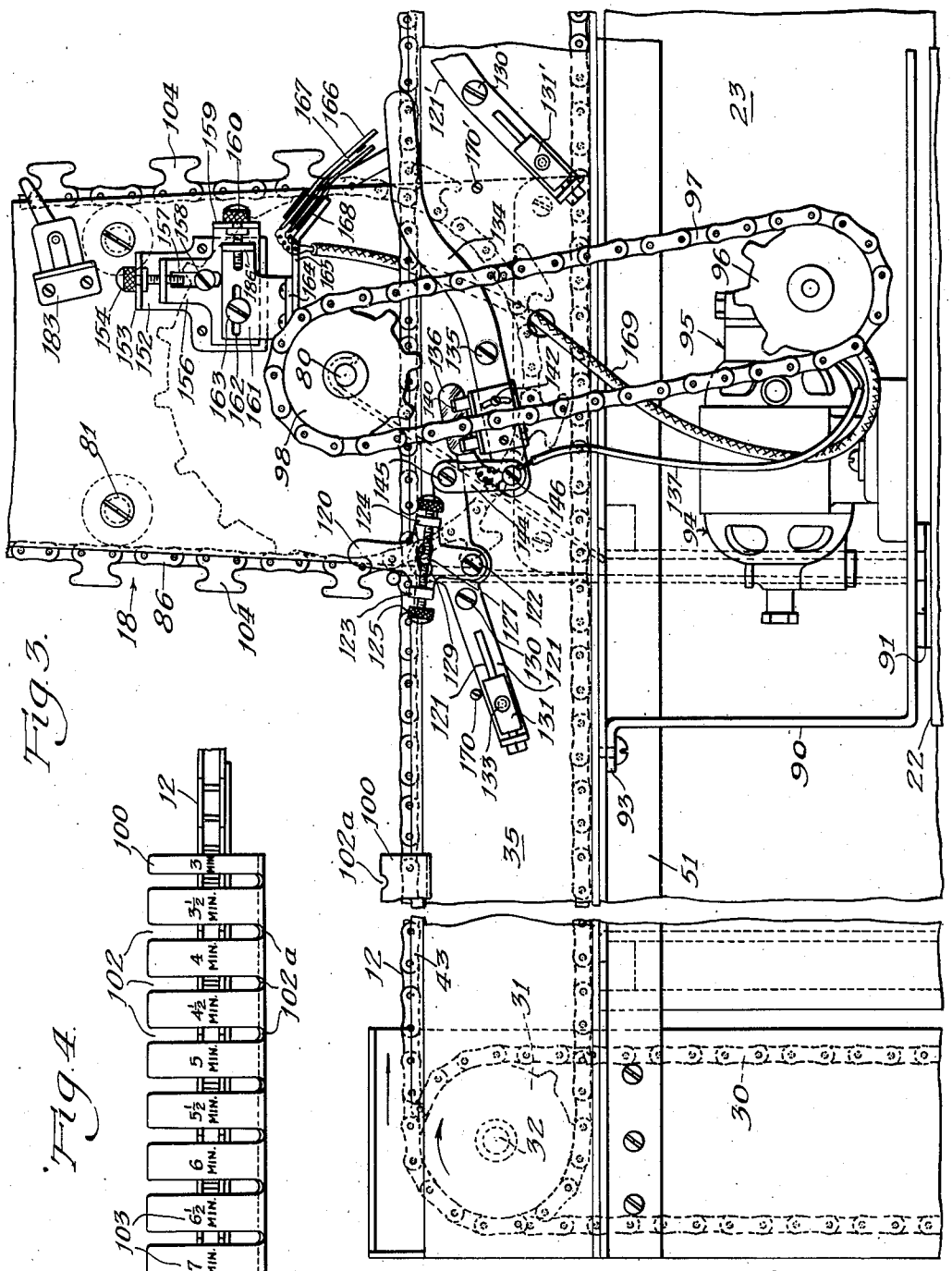


Fig. 3.

Fig. 4.

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FILM PROCESSING APPARATUS

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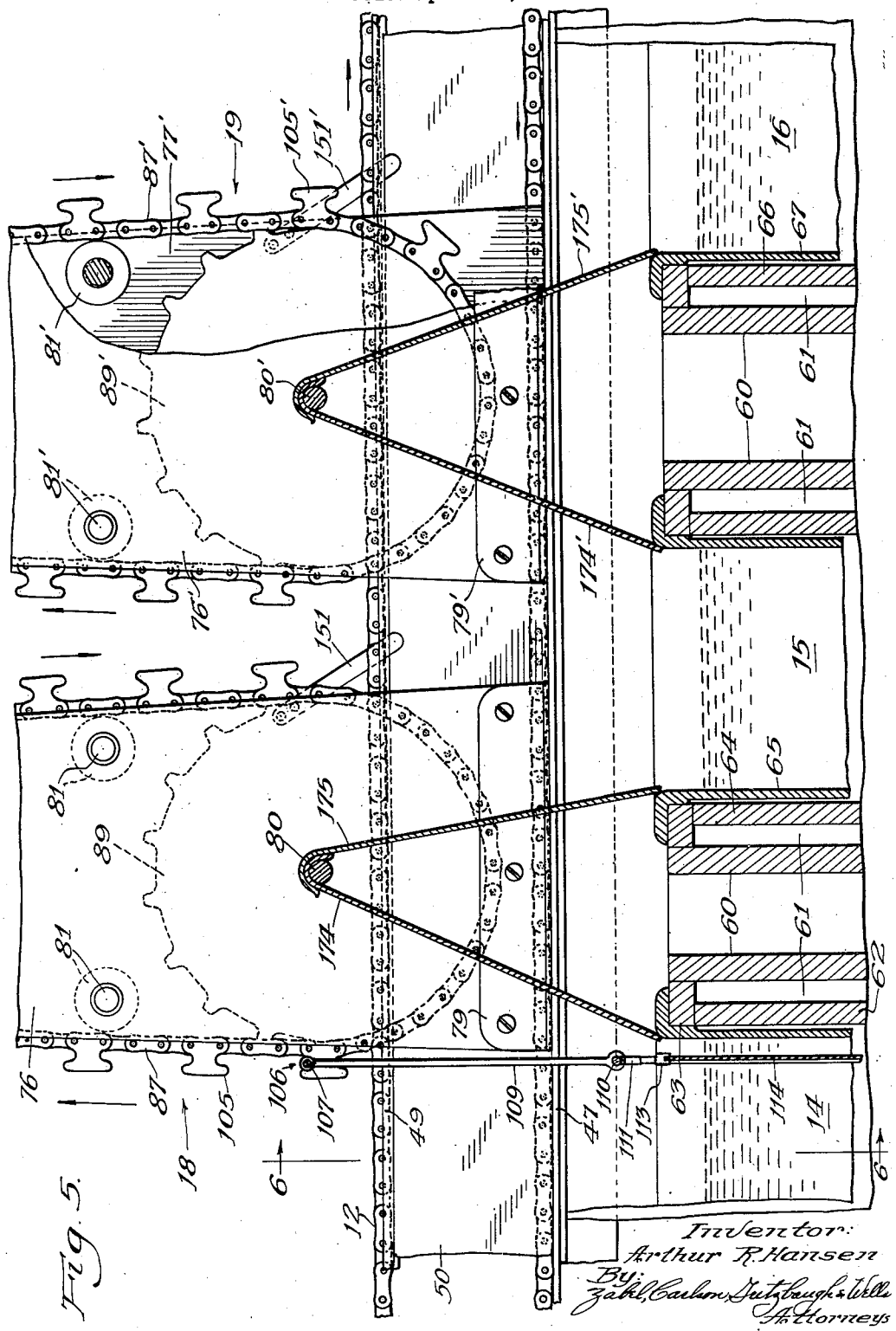


Fig. 5.

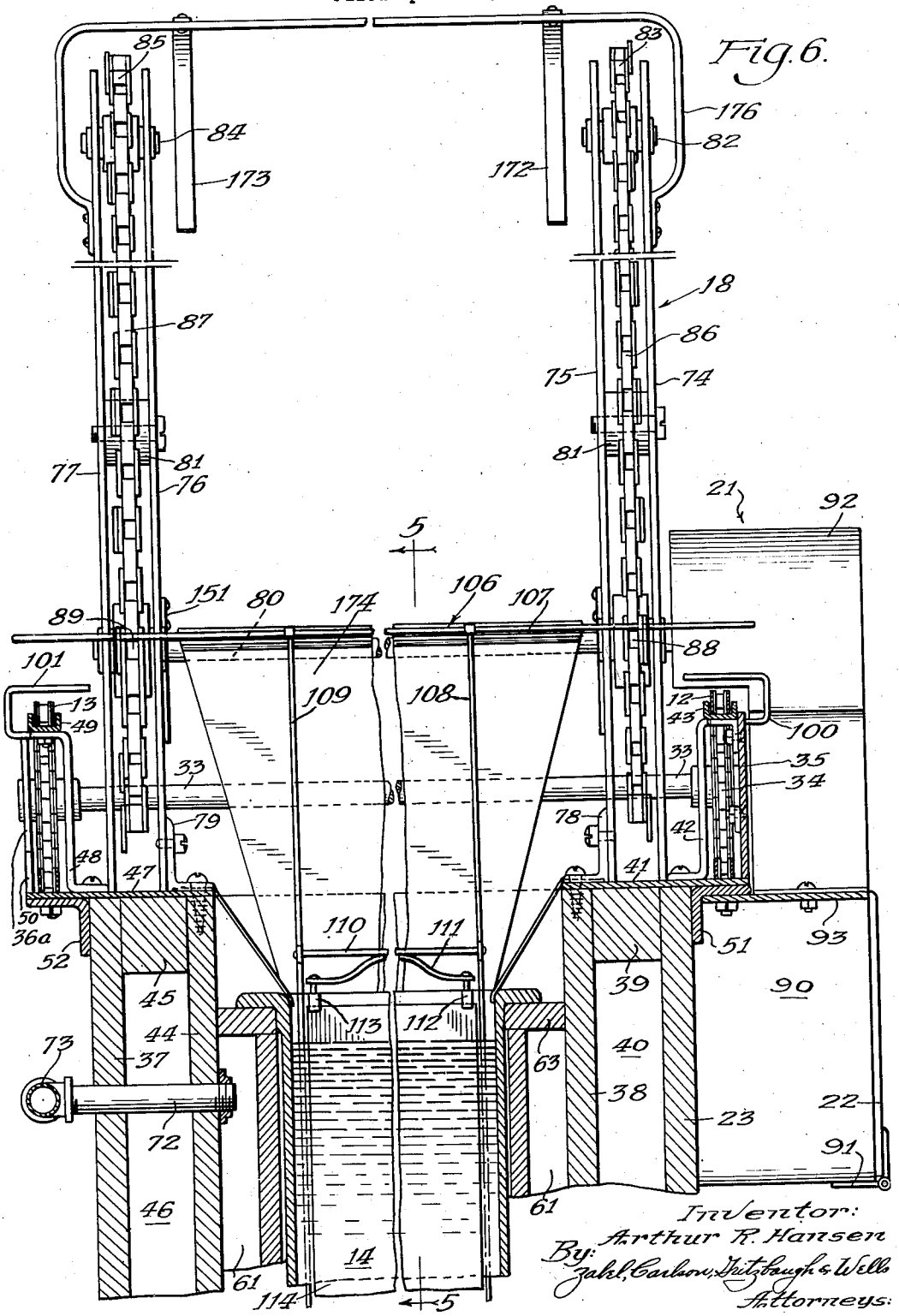
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FILM PROCESSING APPARATUS

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Fig. 6.



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UNITED STATES PATENT OFFICE

2,378,217

FILM PROCESSING APPARATUS

Arthur R. Hansen, Chicago, Ill.

Application April 15, 1943, Serial No. 483,124

14 Claims. (Cl. 95—89)

This invention relates to improvements in a film processing apparatus, and in particular to a device by means of which photographic films may be automatically subjected to the successive steps of developing, washing, fixing and washing.

In developing an exposed film, it is first placed in a developing solution, then rinsed, then placed in a fixing solution, and then rinsed again. These steps are usually effected by manual operations. In my invention, I provide a series of tanks containing the desired solutions and washes, which tanks are positioned adjacent one another in alignment. I preferably provide a continuous conveyor which operates at a constant speed and conveys the film through each of the tanks in succession, the length of time during which the film is subjected to the actions of the various solutions being roughly dependent upon the length of the tank.

It is a primary object of my invention to provide in connection with such device, a means for transferring the film from one tank to another. It is preferable that this transfer be effected quickly so that the small amount of developing or fixing solution which adheres to the surface of the film will not have an opportunity to react with the film to an extent which will affect the film in an undesirable manner.

It is a further object of my invention to provide a transferring means, such as that above indicated, which is intermittently operable, and to provide control means therefor which is responsive to the position of the film. That is, the transferring means operates only when a film has completed its course of travel through one tank and is in position to be engaged by the transferring means and to be transferred to an adjacent tank.

It is a further object of my invention to provide means for co-ordinating the intermittent operation of the transferring means to the operation of the horizontal conveyor so that the former, between successive operations, will always remain in a position wherein a succeeding film will be engaged and transferred at the proper time.

A still further object is to provide novel transferring means in the form of an elevator, which not only elevates the film so that its bottom edge will be clear of the wall of the tank, but also to control its descent into the succeeding tank.

A still further object is to provide improved film holding means which cooperates with the conveyor and the various transferring means.

Still another object is to provide improved means to facilitate the positioning of the film holding means at a predetermined point on the conveyor whereby the time that the film is subjected to the developing solution may be regulated.

The invention herein described is shown as adapted for use with a photographic film or plate of substantial size, such as an X-ray film, although it will be understood that my invention is equally well adapted for processing films of other sizes, types or forms.

With reference now to the drawings in which like reference numerals represent like parts,

Fig. 1 is an elevation of a preferred embodiment of my invention, portions thereof being broken away for purposes of clarity;

Fig. 2 is an enlarged detailed view of the elevator driving and control mechanism;

Fig. 3 is a detailed elevation, similar to Fig. 2, but showing certain parts in a changed position, and showing certain other parts which do not appear in Fig. 2;

Fig. 4 is an enlarged plan view of the timing selector bar;

Fig. 5 is a sectional elevation taken along line 5—5 of Fig. 6;

Fig. 6 is a section taken along line 6—6 of Fig. 5; and

Fig. 7 is a detailed view taken along line 7—7 of Fig. 1 showing the conveyor drive mechanism.

As shown in Fig. 1, the preferred embodiment of my invention herein disclosed comprises a body 10 which is mounted on legs 11. Along the upper edges of the body are conveyor chains 12 and 13, as shown more fully in Fig. 6. Disposed within the body 10, and shown in dotted lines in Fig. 1, are a series of tanks, a developing tank 14, a washing tank 15, a fixing tank 16, and another washing tank 17. Mounted on the body 10 are elevator mechanisms designated generally by the reference numerals 18, 19 and 20, the elevator 18 serving to transfer the film from the developing tank 14 to the washing tank 15, the elevator 19 serving as a transfer means between tanks 15 and 16, and the elevator 20 serving as transferring means between tanks 16 and 17.

The body 10 is provided with side walls 23 and 37, the former being hereinafter designated as the front wall and the latter as the rear wall, respectively. A housing 21 which encloses the drive and control mechanism for the elevators 18 and 19 is disposed on the front wall 23; this housing having a hinged wall 22. A similar housing 24,

having a hinged wall 25 is provided for the drive and control mechanism for the elevator 20. Mounted at the left end of the machine is a housing 26 enclosing the drive mechanism for the conveyors 12 and 13, this mechanism being designated generally by the reference numeral 27. This mechanism includes a motor 28 which drives a sprocket wheel 29. A shaft 32 is provided with a sprocket wheel 31 and is driven from the sprocket wheel 29 by means of a chain 30. The shaft 32 is provided with sprocket wheels 32a and 32b which engage and drive the conveyor chains 12 and 13, as shown in Fig. 7.

A similar shaft 33 is provided at the right-hand end of the machine, this shaft having a sprocket wheel 34 for the conveyor chain 12, and a sprocket wheel 34a for the conveyor chain 13.

The shafts 32 and 33 are journalled at their front ends in a plate 35 which is mounted above the front wall 23. At their rear ends they are journalled in suitable brackets 36 and 36a as shown in Figs. 7 and 6, respectively. An inner front wall 38 is placed from the front wall 23 by means of a spacer 39, this construction providing a cavity 40 between the two, which may act as temperature insulation, or if desired may be filled with rock wool. A plate 41 is horizontally disposed above the inner and outer front walls 38 and 23, on which plate the plate 35 rests. The plate 41 may be suitably secured to the walls 23 and 38 by means of screws. A shown the walls 23 and 38 are made of wood, but other materials may be used if desired. Plate 35 is suitably secured with respect to the horizontal plate 41 by means of a plurality of brackets 42. A channel 43 is carried on the brackets 42, and runs lengthwise of the machine and serves to carry the upper course of the conveyor chain 12. The lower course of the chain 12 rides on the horizontal plate 41.

The rear wall construction is similar to that described in respect to that of the front wall; there being a spaced inner wall 44 and a spacer 45 which forms a cavity 46 for purposes of insulation. A horizontal plate 47 is mounted on the upper edges of the inner and outer rear walls 44 and 37, respectively, and brackets 48 are mounted on the plate 47, which brackets carry a channel 49. The upper course of the conveyor chain 13 rides in the channel 49, and the lower course rides on the horizontal plate 47, this plate being provided with a plurality of guides 50 to confine the lower portion of the conveyor chain to the plate 47.

Angle irons 51 and 52 are mounted on the underside of the plates 41 and 47, respectively, being secured to such plate and to the outer, front and rear walls, respectively.

A similar double wall construction is provided at the ends of the machine. As shown in Fig. 1, the right end of the machine comprises an outer end wall 54, and a spaced inner wall 55. The left end wall construction is similar thereto but not shown.

The space between the inner side walls 38 and 54 and between the inner end walls 55 is divided by a plurality of transverse partitions 60 into a plurality of compartments in which the tanks 14 to 17 are disposed. The tanks in each instance comprise a container, here shown to be made of wood, and provided with a chemically resistant lining, the containers being spaced from the inner walls to provide a surrounding chamber 61 in which water may circulate. Thus the tank 14 comprises a container 62 having a lining 63, the wash tank 15 comprises a container 64 having a lining 65, the fixing tank 16 comprises a container 66 having a lining 67, and the washing tank 17 comprises a container 68 having a lining 69. I have found that certain plastic compositions serve well as a lining, but if preferred porcelain enamel ware, or other linings, may be used.

The body 10 of the apparatus is also provided with a bottom member 70, and the bottom walls of each of the containers 62, 64, 66 and 68 may preferably be spaced above the bottom member 70 by means of spacers 71, as shown in Fig. 1 with respect to the container 68.

The chamber 61 provides a water jacket around each of the containers in order that the temperature of the various solutions may be controlled. An inlet for each water jacket is provided in the form of a pipe 72 passing through the outer and inner rear walls 37 and 44, only one inlet being shown in Fig. 6. Pipe 72 and other inlet pipes are in communication with a supply pipe 73 which runs the length of the machine behind the outer rear wall 37. Outlets of similar construction are also provided, but not shown herein.

A pair of plates 74 and 75 is vertically mounted on the horizontal plate 41 by means of an angle iron 78. A similar pair of plates 76 and 77 is mounted on the horizontal plate 47 by means of an angle iron 79. The plates of each pair are held in spaced relationship with each other by spacers 81 and comprise the supporting structure of the elevator 18. The supporting structures of the elevators 19 and 20 are identical thereto, and are indicated by the same reference numerals which are primed and double primed, respectively, for elevators 19 and 20, the same system being hereinafter used with respect to the remaining elements of the elevator structures and the drive and control mechanisms therefor.

A shaft 80 is journalled in plates 75 and 76, and extends through plates 74 and 75, the front end of the shaft 80 extending into the housing 21. Sprocket wheels 88 and 89 are mounted on shaft 80 between plates 74 and 75 and between plates 76 and 77, respectively. A shaft 82 is journalled in plates 74 and 75 at a point near the top of said plates, this shaft carrying a sprocket wheel 83 positioned between the plates, and in alignment with the sprocket wheel 88. A similar shaft 84 is provided at the top of the plates 76 and 77, and a sprocket wheel 85 is mounted on shaft 84. An elevator chain 86 runs over the sprocket wheels 88 and 83, and a similar elevator chain 87 runs over the sprocket wheels 89 and 95.

The housing 21, into which the forward end of the shaft 80 extends, is formed in two parts. The lower part comprises a U-shaped strap 90 having bent over ends or flanges 93 by means of which this strap is secured to the underside of the angle iron 51. The hinged outer wall 22 is secured to the strap 90 by means of hinges 91. Similarly, with respect to housing 24, the hinged wall 25 is secured to the strap 90'' by means of hinges 91''. The upper portion of the housing 21 comprises a removable cover 92 which is bolted to the flanges 93 as shown in Figs. 1 and 6.

Disposed within the housing 21 are brake motors 94 and 94' for the elevators 18 and 19. Inasmuch as the mechanism for elevators 19 and 20 is identical to the mechanism for elevator 18, only one of the motors and associated mechanism will hereinafter be mentioned. The motor is mounted on the strap 90 and is provided with suitable reduction gears which are disposed with-

in an extended housing 85, which is unitary with the motor 84. A sprocket wheel 96 is driven by the motor 94, and meshes with a sprocket chain 97 which drives a sprocket 98 mounted on the forward end of shaft 80. When the motor circuit is closed, the motor, through the chain 97 will drive the shaft 80, which in turn will drive the elevator chains 86 and 87.

Timing selector bars 100 and 101 are suitably bolted to the underside of the channels 43 and 49 as shown in Fig. 6. These bars are generally of U-shape and are provided with a plurality of slots 102 in their top surface, these slots extending somewhat over into the connecting portion of the U-shaped member so as to make a slight depression, indicated by 102a, when the selector bar is viewed in side elevation as shown in Figs. 1 and 3. The top side portion of the U-shaped structure is provided with indicia 103, which are located on the tongues which are formed by adjacent slots 102. These indicia indicate the time in minutes which it takes for the conveyor chain 12 to travel from a point directly beneath the corresponding slot to a point adjacent to the elevator chain 86. The motor 28 drives the conveyor chain at a constant rate of speed. The construction of the timing selector bar 100' is substantially identical to the above mentioned construction of the timing selector bar 100.

The elevator chains 86 and 87 are provided with lugs 104 and 105 respectively, these lugs being generally of T-shape so that they will engage a film holder 106, which is resting on the conveyor chains 12 and 13, and elevate the same. The T-shape construction also permits the lugs to hold the film holder 106 during its descent into an adjacent tank.

The film holder 106 comprises an upper transverse bar 107 as shown in Fig. 6, to which are secured vertical depending bars 108 and 109. A reinforcing transverse bar 110 serves to join the parts in a rigid structure. A depending member 111 is secured to the reinforcing transverse bar 110 and is provided with clips 112 and 113 which serve to hold a film 114 in depending position therefrom.

In operation the upper transverse bar 107 of the film holder 106 rests in the depressed portion of the links of the conveyor chains 12 and 13. As the conveyor chain moves from left to right, the film holder 106 will be carried by the chain through one of the tanks. When the film holder has reached the right-hand end of any of the tanks 14, 15 or 16, it will be in a position to be engaged by a pair of the lugs 104, 105 and is lifted out of that particular tank and transferred into the next tank. As mentioned above, the time during which the film is subjected to the operation of the developing solution in tank 14 is predetermined by the position of the film holder when it is initially put in the tank, and the determination of this position is facilitated by the timing selector bars 100 and 101.

Means are provided to operate the elevators 18, 19 and 20 intermittently; that is, the operation of the motor 94 is controlled by the film holder 106 so that the elevator chains 86 and 87 will start to move only after the holder has arrived at the end of the tank and is in a position to be engaged by the lugs 104 and 105. These means further insure that the elevator will cease its operation when the film holder has been transferred to the next tank.

Such control means include a displaceable member 120 which is shown in Figs. 2 and 3, this displaceable member being mounted at the front side of the machine and projecting into the path of the front end of the bar 107 of the film holder 106. This displaceable member 120 is mounted on a lever 121 by means of a screw 122 in a manner to permit adjustment of the angular position of the displaceable member 120 with respect to the lever 121. The displaceable member is provided with forwardly turned ears 123 and 124 through which adjusting screws 125 and 126 extend, the ends of the adjusting screws engaging a pin 127 which extends forwardly from an underlying portion 128 of the lever 121. The displaceable member is provided with an arcuate slot 129 through which the pin 127 extends. It will be seen that the adjusting screw 125 may be loosened, and the adjusting screw 126 tightened by a corresponding amount which will cause the displaceable member to be shifted in a clockwise direction with respect to the position of the lever 121. Thus the operation of the elevator will be delayed for the reason that the displaceable member will not be engaged by the film holder as soon as it would be as if such adjustment had not been made. Similarly, the parts may be adjusted to advance the action of the elevator.

The lever 121 is pivotally mounted on the plate 35 by means of a screw 130. One end of the lever 121 is provided with a counterweight 131 which is slidingly mounted on a bar 132 which is disposed parallel to the lever 121. A set screw 133 provides means by which the position of the counterweight, and the effect thereof, may be adjusted.

A second lever 134 is pivotally mounted on a screw 135, the second lever carrying a mercury switch 136 which is connected in circuit with the motor 94 by means of a cable 137. The mercury switch 136 is mounted above the upper edge of a vertically disposed plate 138 by means of clips 140. The angular position of the plate and of the mercury switch is adjustable with respect to the position of the second lever 134 by means of a set screw 142 which takes into the second lever 134, and extends through an arcuate slot 141 in the plate 138, the head of the screw bearing against the plate 138. The left-hand end of the plate 138 is pivoted on the lever 134. A link 144 connects the first lever 121 with the second lever 134, the link being associated with the respective levers by screws 145 and 146.

In operation it will be seen that as the film holder is carried by the conveyor chains 12 and 13 to the right, just before the film holder reaches the end of the tank, it will engage the displaceable member 120 and rock the lever 121 in a clockwise direction, thereby rocking the second lever 134 in a counterclockwise direction and tilting the mercury switch 136 so as to close the motor circuit. This will start the elevator chains 86 and 87 in motion, and the film holder 106 will be engaged by lugs 104 and 105 and removed from tank 14 and transferred over to tank 15.

As shown in Figs. 5 and 6, slides 150 and 151 are secured to the inner surfaces of plates 75 and 76 respectively. These slides are merely strips of metal that are disposed at the right-hand edges of the plates 74 and 75 which will serve to disengage the bar 107 of the film holder 106 as it is descending, and to lift this bar clear of the lugs 104 and 105 of the elevator. Inasmuch as the conveyor chains 12 and 13 move at a much lower rate of speed than the elevator chains 86 and

87, it is necessary to provide some means for removing the film holder from the lugs 104 and 105 so that the film holder will not be engaged by the downward motion of the succeeding pair of lugs. The right-hand end of the second lever 134, as viewed in Figs. 2 and 3, is shaped so that when the parts are in closed circuit position, the lever 134 will be engaged by the film holder as it is sliding down the slides 150 and 151. The impact of the film holder on the lever 134 will serve to return the parts to their original open circuit position as shown in Fig. 2. The motor having stopped, the elevator will then remain stationary until the displaceable member 120 is engaged by another film holder.

A plate 152 is mounted on the forward side of the elevator structural plate 74, the plate 152 having a bent-over ear 153 at its upper portion, through which an adjusting screw 154 extends. The adjusting screw 154 is provided with a collar which serves to hold it in position on the ear 153, and the threaded portion of the adjusting screw takes into a bent-over ear 155 formed at the upper portion of a sliding plate 156. The vertically sliding plate 156 is provided with a vertically disposed slot 157, and is held in place against the plate 152 by means of a set screw 158. The vertically sliding plate is also provided with an ear 159 at its right-hand edge through which ear extends an adjusting screw 160 which cooperates with the ear 166 of a horizontally sliding plate 161. The horizontally sliding plate is held in position against the vertically sliding plate 156 by means of a set screw 163 which extends through a horizontally disposed slot 162 in the horizontally sliding plate 161. The lower edge of the horizontally sliding plate 161 is provided with a bent-over portion 164 to which is secured a strip of metal 165, on the right-hand portion of which is mounted a pair of contact strips 166 and 167 by means of a group of insulating blocks 168. The contact strips 166 and 167 are connected into the brake circuit of the brake motor 94 by means of conductors which are contained in a cable 169.

It will be seen from Fig. 2 that as the film holder 106 moves toward the elevator chain 86 that it will not hit one of the lugs 104; in other words the elevator chain has been stopped in a position in which the lugs 104 are clear of the path of the film holder. If the lug 104 were at a level where it would block further movement of the film holder 106, it is clear that the displaceable member 120 would not be displaced sufficiently to set the elevator chain in motion. This condition, however, is obviated by providing the contacts 166 and 167 which close the brake circuit of the brake motor 94, and consequently serve to prevent any overthrow of the armature of the motor. The position of the contacts 166 and 167 is determined by the adjusting screws 154 and 160 so that the motor will be braked at a time at which the path of the film holder 106 is not blocked by a lug 104. The contact member 166 extends into the path of the descending film holder 106 so that the brake circuit will be closed by the engagement of the film holder with the contact member 166. Inasmuch as the elevator chain 86 travels at a fairly rapid rate, the interval between the closing of the brake circuit and the opening of the motor circuit is so small that the armature will not have time to get into motion again. The adjusting mechanism for the contacts, namely, plates 152, 156 and 161, are preferably enclosed in a removable housing 179 as shown in Fig. 1.

The operation of the elevator drive and control means is shown in Figs. 2 and 3. In Fig. 2 the position of the film holder 106 is shown as resting on the conveyor chain 12, as the conveyor chain approaches the elevator chain 86. In order for the film holder 106 to move into a position wherein it will be engaged by one of the lugs 104 of the elevator chain 86, it is necessary that the displaceable member 120 be engaged and displaced by the film holder. The counterweight 131 balances the system of levers, 121 and 134, so that only a very slight force is required to move them from the position shown in Fig. 2 to that shown in Fig. 3. Due to the fact that the slope of the depressed portion of the links of the conveyor chain 12 is small, it will be seen that this counterbalancing is necessary. Otherwise the displaceable member 120 would not be displaced, but would only serve to move the film holder backwardly with respect to the link at the conveyor chain on which it rests by gravity.

After the film holder 106 has arrived in the position shown in Fig. 3, the motor circuit is closed and the elevator chain starts in motion. The film holder will be engaged by the next succeeding lug 104. At this time, it will be noted, the remote end of the lever 134 has been kicked upwardly so that it projects above the conveyor chain 12. A stop pin 170 serves to limit the motion of the levers 121 and 134 into the closed circuit position.

After the film holder has been carried upwardly by one of the lugs 104 to the top of the elevator, the film holder will begin to slide downwardly away from the lug by which it had been previously engaged, and into contact with the next preceding lug. In order to minimize the effect of the free movement of the film holder, and to prevent any rebound which might cause the film holder to bounce clear of the next preceding lug, spring members 172 and 173 are provided which, as shown in Figs. 1 and 6, will engage the film holder and serve to retard its motion. These spring members are mounted on a top cross member 176 which is secured at either end to the elevator structural plates 74 and 77.

As the film holder again approaches the horizontal conveyor chain 12, it will be disengaged from the lug 104 by means of the slide 150, after which it will slide downwardly and be positioned on the conveyor chain 12 at a point which will be clear of the lugs 104. At substantially the same time the contacts 166 and 167 will be closed by the film holder, thereby closing the brake circuit of the motor and causing the whole elevator mechanism to stop in a position wherein a succeeding film holder may later be engaged by one of the lugs 104. Immediately after the closing of the brake circuit, the film holder will engage the projecting remote end of the second lever 134, and cause it to be returned to the position shown in Fig. 2 wherein the motor circuit will be opened. The movement of the lever system 121 and 134 into open circuit position is determined by the pivot 130', and a stop 171' is provided for the lever 134'. The free sliding movement of the film holder on the slides 150 and 151 permits an impact of the film holder on the lever 134 of sufficient force so as to cause the lever to return to its open circuit position as shown in Fig. 2.

Drip plates 174 and 175 are provided, as shown in Fig. 5 to catch the drops of developing solution that may fall from the film 114 and the film holder 106 as it is being transferred from one tank to the next tank.

If desired, a backboard 180 may be provided at the rear end of the machine, above the body portion 10, as shown in Fig. 1. Upon this backboard may be mounted a mixing valve 181, together with a temperature indicator 182 and whatever automatic thermostatic control means may be desired. By means of the mixing valve 181, the temperature of the water circulating through the chambers 61 may be controlled. It is preferable to maintain this temperature at 65° F. By means of the constant temperature water jacket 61, the solutions in each of the tanks 14, 15, 16 and 17 will be maintained at the proper temperature.

The operation of my invention has been described above in connection with the operation of its component parts. After the tanks have been filled with rinsing water, developing and fixing solutions of the proper concentration, they may be brought to the proper temperature by manipulation of the mixing valve 181. A counter 183 is provided to count the number of films processed in the machine, and this counter is at this time set to zero.

The apparatus may then be connected to a suitable source of electrical power by means of the cord 184, and the horizontal conveyors 12 and 13 are set into motion by operation of the switch 185. The films to be developed are mounted in film holders, and after the proper length of time for processing in the developing solution had been determined, the films are successively placed upon the corresponding plates in the proper position on the conveyor chains 12 and 13, this position being determined by means of the timing selector bars 100 and 101.

The films are slowly conveyed successively through the developing, rinsing, fixing, and second rinsing tanks 14 to 17, inclusive, and they are transferred from one tank to the next by means of the elevator mechanisms 18, 19 and 20. The elevator mechanisms are operated at a much higher rate of speed than the conveyor chains 12 and 13 so that the entire transferring process preferably takes less than ten seconds. The time that the film is subjected to rinsing and fixing steps depends roughly on the lengths of the rinsing and fixing tanks.

As the film holder approaches the end of the second rinsing tank 17, the film will be completely processed and the film holder may be removed by the operator.

If strips of film are to be processed, the film holder 106 will be of somewhat different form, but otherwise the operation of the machine will be the same. Motion picture films can be developed in the apparatus herein shown and described by providing a holder which holds a reel, in which the successive convolutions of the motion picture films are spaced from one another by sufficient distance as to provide proper reaction with the various solutions.

Although I have shown but one preferred embodiment of my invention, it will be understood that various modifications and changes may be made therein without departing from the spirit of my invention. The above description is intended to be illustrative only, and my invention is to be limited only by the appended claims.

I claim:

1. In a film developing apparatus, mechanism to transfer a film holder from one tank to an adjacent tank comprising two elevator chains oppositely disposed at the sides of said tank, T-shaped lugs carried by said elevator chains in corresponding positions for holding the opposite ends of said film holder against said chains, means for driving said elevator chains, and snubber means disposed near the top of said elevator chains for engaging said film holder as it begins to slide on said chains downwardly away from one of said lugs and to retard its motion as it moves into engagement with a preceding lug.

2. In a film developing apparatus, a film holder, mechanism to transfer a film holder from one tank to an adjacent tank comprising two elevator chains oppositely disposed at the sides of said tank, lugs carried by said elevator chains in spaced relationship and cooperating therewith for holding the opposite ends of said film holder as it is lifted clear of said first tank and lowered into said second tank, means for driving said elevator chains, and means for limiting the free movement of said film holder with respect to said elevator chains as it changes its direction of motion.

3. In a film developing apparatus, means for transferring a film holder from one tank to an adjacent tank comprising a pair of elevator chains for engaging opposite ends of said film holder, driving means for said elevator chains, displaceable means extending into the path of said film holder for controlling the starting of said elevator driving means, and means extending into the path of said film holder for stopping said elevator chains in a predetermined position.

4. In a film developing apparatus, means for transferring a film holder from one tank to an adjacent tank comprising a pair of elevator chains for engaging opposite ends of said film holder, driving means for said elevator chains, a displaceable member extendig into the path of said film holder for controlling the starting of said elevator driving means, means extending into the path of said film holder for stopping said driving means, and additional means extending into the path of said film holder for restoring said displaceable member to its initial position.

5. In a developing apparatus having a series of tanks disposed in end to end relationship, means to cause a film holder to be moved through successive tanks, said means comprising a continuously operating horizontal conveyor running along the edges of said tanks, means comprising a pair of vertically disposed conveyors for engaging the opposite ends of a film holder as it reaches the end of one of said tanks and for lifting said film holder clear of the end wall of said tank and for depositing said film holder on said horizontal conveyor in a position wherein said film holder will be submerged in an adjacent tank, a control member actuated by the movement of said film holder as it is moved by said horizontal conveyor into a position proximate to said vertical conveyor for starting said vertical conveyor in motion, means actuated by the motion of said film holder as it leaves said vertical conveyor for causing said vertical conveyor to cease its operation, and additional means operated by the motion of said film holder as it leaves said vertical conveyor for restoring said control member to its original position.

6. In a film developing apparatus, a transferring device for a horizontally moving film holder comprising elevator mechanism, driving means therefor, and means for controlling the operation of said driving means including a control member capable of assuming an elevator operating position and a non-operating position and

a member extending into the path of said film holder and adapted to be displaced by the horizontal motion of said film holder, said displaceable member being associated with said control member to move the same into its operating position, said control member having a portion which extends into the path of said film holder as it leaves said elevator mechanism whereby it may be moved into its non-operating position to render said driving means inoperative at the conclusion of a transferring operation.

7. In a film developing apparatus, transferring means for a film holder comprising elevator mechanism, driving means therefor, a mercury switch for controlling the operation of said driving means, said mercury switch being mounted on a counterbalanced lever for rotation between two positions, a member extending into the path of said film holder and adapted to be displaced by the horizontal motion of said film holder, said member being associated with said lever to rock the same into its closed circuit position, said counterbalanced lever when it is in its closed circuit position being constructed so that it will be engaged by said film holder, and means to disengage said film holder from said elevator mechanism and to permit it to drop into contact with said counterbalanced lever whereby said lever will receive a blow of sufficient impact to cause it to return to its open circuit position.

8. Film developing apparatus comprising two adjacent tanks, a film holder adapted to hold a film submerged in one of said tanks, conveyor means for moving said film holder from one end of one of said tanks toward the other tank, said conveyor being provided with a plurality of spaced positions for holding a succession of film holders, a pair of elevator chains disposed at one end of said first-mentioned tank to transfer said film holder to said second tank, driving means for said conveyor to drive the same at a predetermined rate of speed, and control means for causing operation of said elevator chains when a film holder is moved into a position to be engaged by said elevator chains and for stopping said elevator chains in a position wherein a succeeding film holder can actuate said control means for initiating another cycle of operation.

9. Film developing apparatus comprising two adjacent tanks, a film holder adapted to hold a film submerged in one of said tanks, conveyor means for moving said film holder from one end of one of said tanks toward the other end, said conveyor being provided with a plurality of spaced positions for holding a succession of film holders in predetermined spaced relationship, a pair of elevator chains disposed at one end of said first-mentioned tank to transfer said film holders to said second tank, driving means for said conveyor to drive the same at a predetermined rate of speed, and control means for causing successive cycles of operations of said elevator chains when said control means is engaged by successive film holders positioned on said conveyor, each cycle of operation consuming less time than the time necessary for said conveyor to bring a succeeding film holder into cooperative engagement with said control means, said predetermined spaced relationship exceeding in extent the product of said predetermined rate of speed of the conveyor and the duration of said cycle of operation of said elevator chains.

10. In a film holder transferring mechanism of the class described having a brake motor for driving the same, a brake circuit and a power circuit for said motor, contact means for said brake circuit biased to open circuit position and adapted to be actuated by the movement of a film holder to closed circuit position, a second contact means for said power circuit adapted to be actuated by the subsequent movement of a film holder to open circuit position, and means for causing a film holder to fall freely in a path wherein it will successively actuate said first and second contact means whereby the time interval between actuation of said two contact means is insufficient to permit said brake motor to become operative before said power circuit is opened.

11. In an apparatus of the class described, mechanism for transferring a film holder from one tank to an adjacent tank, said mechanism comprising an elevator chain having elevating lugs spaced thereon, a brake motor for driving said chain and having a brake circuit and a power circuit, a slide positioned adjacent to said elevator chain to remove a film holder from engagement with one of said lugs during downward travel of the same, contact means in circuit with said brake circuit, said contact means extending into the path of said film holder as it slides down said slide whereby said elevator chain is caused to stop at a predetermined position, and additional means extending into the path of said film holder for subsequently opening said power circuit, said additional means being positioned close to said contact means whereby said motor circuit is opened before said motor again starts up.

12. Film developing apparatus comprising a tank, conveyor means running along the side edges thereof, driving means for said conveyor means, a film holder including a bar the opposite ends of which are adapted to rest on said conveyor means whereby a film is held submerged in said tank and carried toward one end thereof, means for removing said film holder from said tank when it reaches a predetermined position, and position determining means overlying said conveyor means comprising a slotted plate to prevent the placing of a film holder on said conveyor means at a certain area, except in one of several predetermined positions defined by the slots in said plate which correspond to predetermined periods of time during which said film will be maintained submerged in said tank prior to its removal therefrom.

13. In a film developing apparatus, a tank, a conveyor, pair of parallel chains associated therewith, a film holder including a bar adapted to rest on said conveyor chains, and positioning means to facilitate the initial positioning of said bar on said conveyor chains in perpendicular relationship, said means comprising a plate disposed above each of said chains and each provided with a plurality of slots therein which are of a width sufficient to permit the insertion of said bar therethrough, said slots being perpendicular to said chains and the slots of one of said plates being oppositely disposed to the slots of the other.

14. Developing apparatus comprising a series of tanks disposed in longitudinal alignment, conveyor means running along the upper edges thereof, a film holder adapted to be engaged by said conveyor and to hold a film submerged in one of said tanks as it travels from one end to the other end of said tank, mechanism to transfer said film holder from one tank to an adjacent tank comprising means to lift said film holder from said conveyor and to deposit said film holder on said conveyor in an advanced position

wherein said film is submerged in an adjacent tank, and control means for operating said transfer mechanism in a separate cycle of operation for each film holder transferred and independently of the operation of said conveyor means, said control means including means actuated upon engagement by said film holder when it reaches a predetermined position at the end of said first-mentioned tank to initiate the cycle of operation of said transfer mechanism, and means actuated upon engagement by said film holder as it is deposited on said conveyor in said advanced position to terminate said cycle of operation.

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