

July 24, 1956

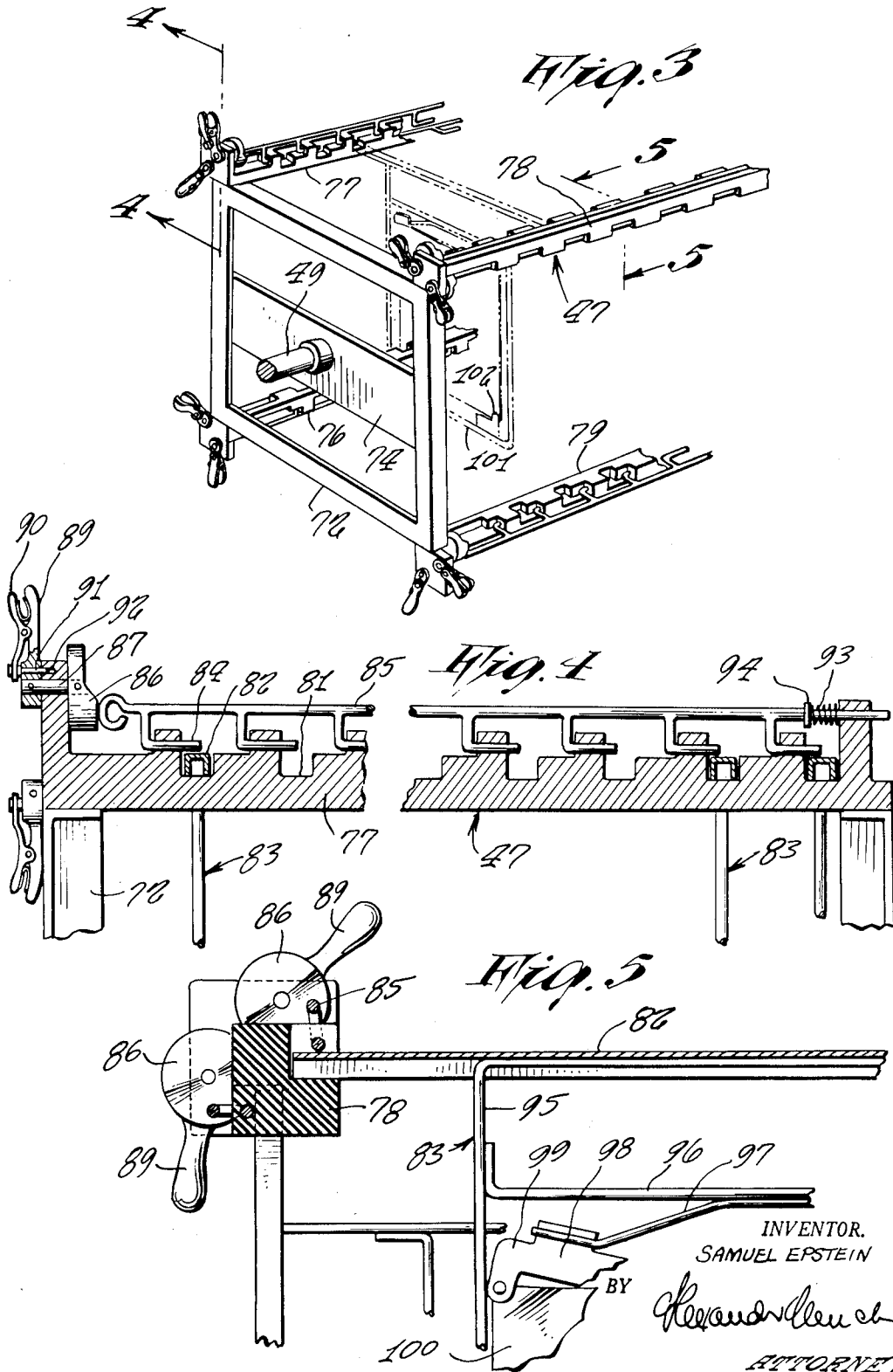
S. I. EPSTEIN

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FILM WASHING AND DRYING APPARATUS

Filed Feb. 27, 1953

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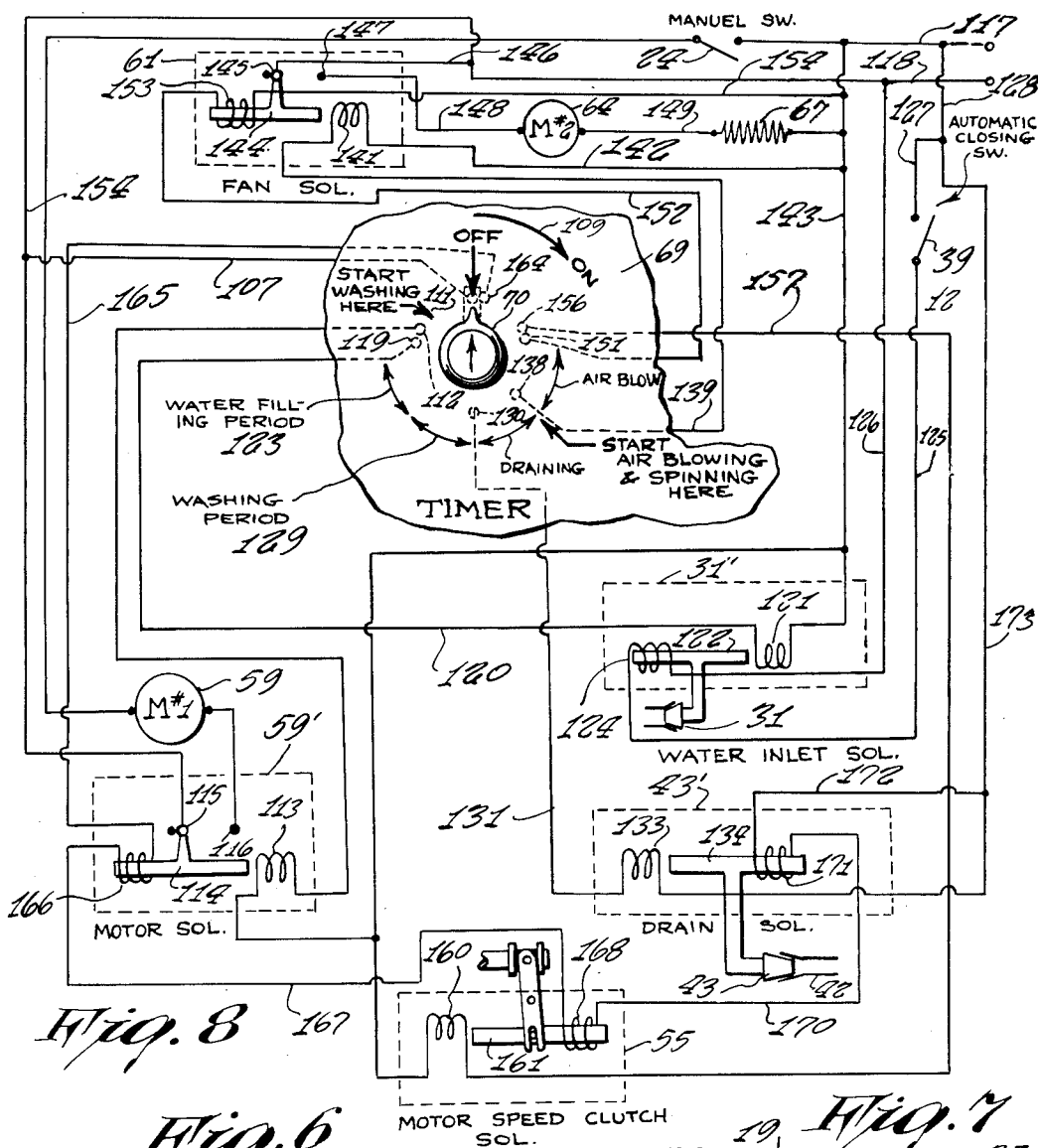


Fig. 8

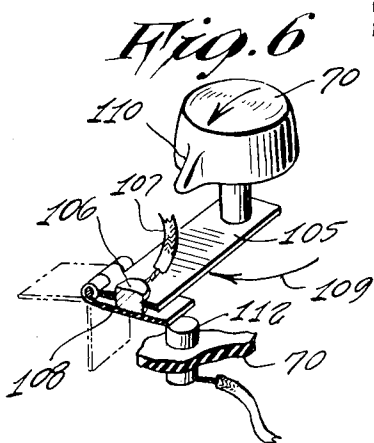


Fig. 6

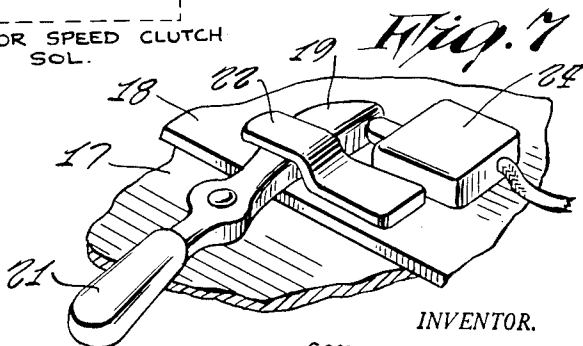


Fig. 7

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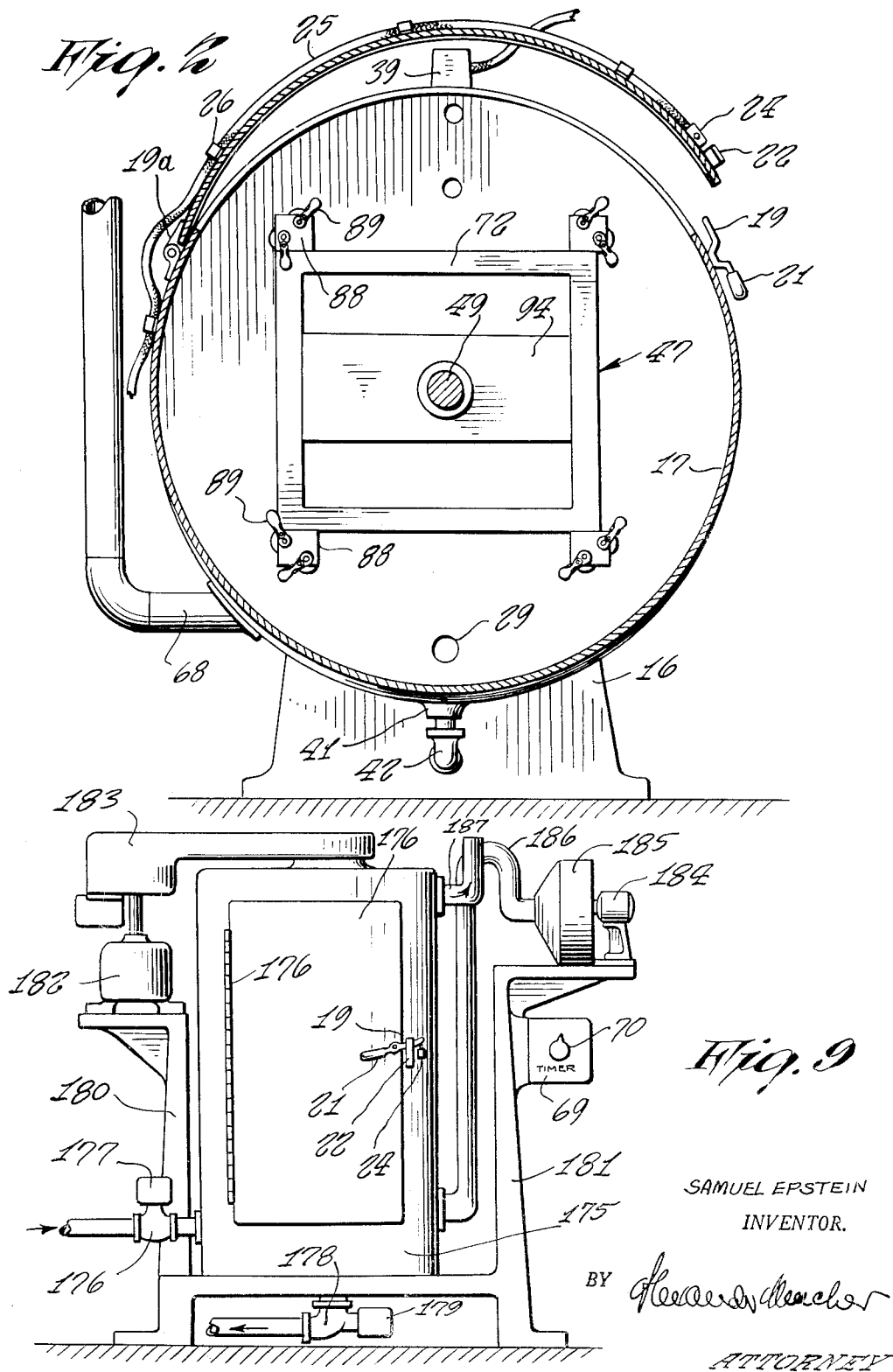
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FILM WASHING AND DRYING APPARATUS

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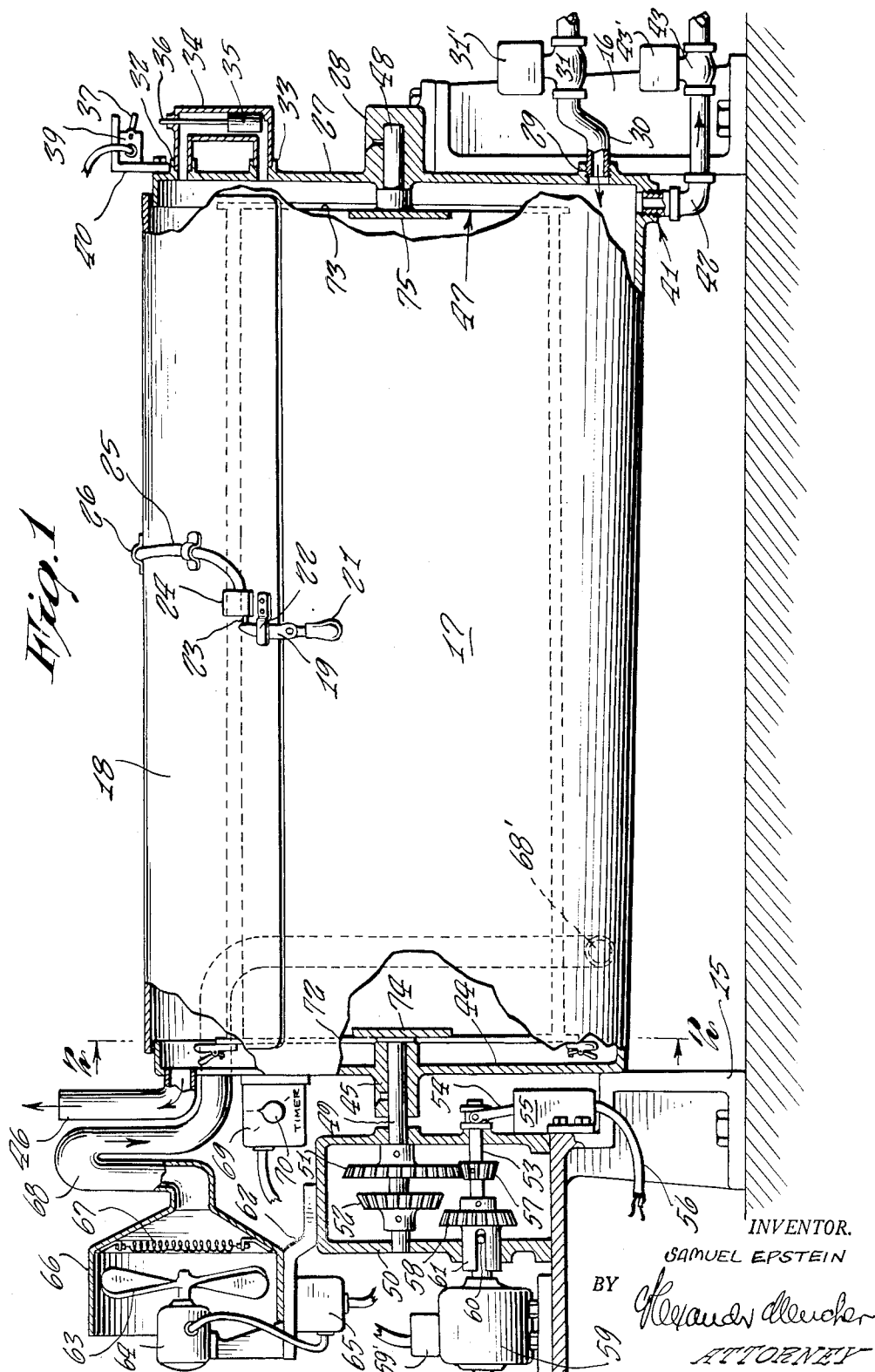
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FILM WASHING AND DRYING APPARATUS

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FILM WASHING AND DRYING APPARATUS

Samuel I. Epstein, New York, N. Y.

Application February 27, 1953, Serial No. 339,298

3 Claims. (Cl. 95—89)

This invention relates to a machine for treating X-ray films and the like.

It is an object of the present invention to provide a machine for treating X-ray films or the like which can be adapted for both the washing operations and for the drying operations, and wherein the timing of these operations is controlled automatically by an electric timing device operable upon various controls which control the flow of liquid in and out of the chamber and which control the rotation of the internal rack which contains the film.

It is another object of the invention to provide in a machine for treating X-ray films and the like a simple rack and attaching means by which the X-ray films can be fixed within the container and by which they can be rotated therewithin to insure a proper and efficient treating, cleaning and drying of the exposed surfaces of the film.

It is another object of the invention to provide in a machine for treating X-ray films and the like a control switch connected to the cover so that automatically as the cover is closed, the electrical controls will be set for automatic operation, and at the same time operation of the machine will be prevented unless the cover is closed, and thus, if the cover is opened, there will be little chance of the hands of the operator being injured and so that safe operation of the machine is provided.

It is another object of the invention to provide in an automatic washing and drying machine for X-ray films and the like a simple holder mechanism for holding the films spread transversely of the axis of rotation of the holder mechanism and in a tight manner, and whereby simultaneously all of the frames containing the respective films can be released.

Other objects of the invention are to provide a machine for treating X-ray films and the like which is automatic and which has the above objects in mind, which is of simple construction, inexpensive to manufacture, has a minimum number of parts, easy to control, requires only the setting of a timing mechanism to cause a continuous operation of all steps in the processing of the film, compact, easy to load and unload, durable, has long life, convenient and efficient in use.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a side elevational view of the machine embodying the features of the present invention with portions thereof broken away to show the interior construction thereof, and with the cover in the closed position;

Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary perspective view of the holder frame which is rotated within the tank and which is adapted to retain the frames bearing the films;

Fig. 4 is an enlarged longitudinal sectional view of the holder frame taken on line 4—4 of Fig. 3 and with the

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retaining cam adapted to hold and lock the respective film frames in place;

Fig. 5 is an enlarged perspective view taken generally on line 5—5 of Fig. 3 and looking in elevation on a portion of one of the film frames;

Fig. 6 is a fragmentary perspective view of the time control switch having the hinged insulating plate to permit rotation of the switch in one direction, free of the contacts but releasable upon rotation in the opposite direction for engagement with the contacts;

Fig. 7 is a fragmentary perspective view of the safety switch arrangement used with the cover so as to prevent operation of the machine as long as the cover is in the open position;

Fig. 8 is a wiring diagram of the electrical controls used in the automatic control of the machine;

Fig. 9 is an elevational view of a modified form of the invention wherein the axis of rotation of the film holder is extended vertically.

Referring now particularly to Figs. 1, 2 and 7, 15 and 16 represent respectively upstanding standard supports which are horizontally spaced from each other and on which tank 17 is supported. The tank 17 is open at the top and hinged to one side thereof is a cover 18 by means of hinges 19a on the back side of the tank. This cover is held in its closed position by a latch 19 having a handle 21. The latch 19 is frictionally retained by a clip 22 in its closed position and will engage a push button 23 of a switch 24 carried by the cover from which cable wires 25 extend. This cable 25 is held on the cover by retaining straps 26. The connection of these wires in the circuit will be described hereinafter. The switch 24 is the manual switch which conditions the circuit in readiness for automatic operation and which acts as a safety switch to prevent any operation so long as the cover 18 is in its open position.

The tank 17 has a closed end formation 27 having an enlargement 28 therein and an inlet boss 29 to which inlet pipe for the liquid being delivered to the tank is fixed. This inlet pipe is indicated at 30 and has a magnetically operated inlet valve 31. The end formation 27 also has bosses 32 and 33 between which there is connected a pipe 34 in communication with the top of the tank and in which there is a plunger 35 having a rod 36 extending outwardly of the pipe 34 and adapted to engage an arm 37 of a control switch 39 adapted to cut off automatically the flow of the liquid as it reaches the high level in the tank. Switch 39 is supported on a bracket 40. On the bottom of the tank 17 is a boss 41 to which is connected a pipe fitting arrangement 42 having a magnetically operated valve 43 for controlling the outward flow of liquid from the tank.

On the opposite end of the tank is an end formation 44 having a large central bearing portion 45. At the top of the end formation 44 is an air outlet pipe 46 through which the air which may be circulated through the tank is exhausted.

Within the tank 17 is a holder frame arrangement indicated generally at 47, Fig. 3, which has a shaft 48 at one end which is journaled in the bearing portion 28 and a drive shaft 49 at the opposite end which extends through the bearing portion 45. This shaft 49 extends into a gear housing 50 and is rigidly connected with large and small bevel gears 51 and 52. Below the shaft 49 and within the housing 50 is a slide shaft 53 which has an electrically operated gear shifter arm 54 for sliding it within the housing 50. This arm 54 has a magnetically operated actuator 55 having cable 56 connected thereto. Fixed to the slide shaft 53 is a small bevel pinion gear 57 which will mesh with the gear 51 when the shaft 53 is in one position, but when the shaft 53 is pulled to the opposite position, a large gear 58 is brought into mesh with gear 52. An electric motor 59

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carries the shaft 53. Shaft 53 has a pin 60 which extends into a slot of a sleeve extension 61 of the gear 58.

On top of the housing 50 is a bracket 62 that supports an electric fan 63 having a motor 64 that the operation of which is controlled by a control switch 65. Surrounding the fan 63 is a housing 66 having an electric heater 67 therein and to this housing 66 and at the small end thereof there is connected a pipe 68 that is connected to the end formation 44 for delivering drying air under pressure to the tank 17. This pipe 68 extends into the tank and downwardly to the bottom thereof as indicated by the dotted lines 68'.

An electric timer device 69 is also mounted on the end formation 44 and has a hand knob 70 which can be adjusted to set the device for the desired operations.

The holder structure 47 within the tank comprises generally two square shaped end frames 72 and 73 having respectively transverse plates 74 and 75 to which the respective shafts 49 and 48 are rigidly connected. The frames 72 and 73 are connected together at their corners by longitudinally extending holder bars 76, 77, 78 and 79. Each one of these bars is generally of square section having longitudinally extending and spaced recesses 81. In the bottom of these recesses there is fixed a transverse inverted channel member 82 of a film holding frame 83 over which projections 84 of a longitudinally extending rod 85 are extended to lock the inverted channel members 82 in place. This rod 85 is held in its locked position by a manually operated cam plate 86 fixed to a shaft 87 on a projection 88 of one of the longitudinally extending members. A handle 89 having a detent 90 is fixed to the shaft 87 and detent pin 91 can be released from a small hole 92 to free the shaft 87 so that the cam 86 can be turned to allow the longitudinally extending holding rod 85 to release the inverted channel bars 82 of the holder frame 83.

Each longitudinally extending member has two rows of slots 81 and a locking rod 85 and projections 84 associated with each set of recesses or rows of recesses thereof. There are two cams 86 on each of the longitudinally extending slotted members. On the end of the locking rod 85 is a return spring 93 that cooperates with a collar 84 so as to normally urge the rod 85 against the cam 86. It will be seen that the holder structure can be of rectangular shape if desired and that the holder film members 83 can be of different size and can be fitted to any one of the four sides of the structure and held by the locking rod projections 84. Each one of the film holders 83 is formed of a bent rod member 95 that is attached to the inverted channel member 82. A transverse rod 96 is connected between the sides of the bent rod 95. At the top part of the frame there is fixed a spring 97 that extends to the opposite sides of the frame and the opposite ends of which respectively carry a spring clip 98 having depending projections 99 between which one collar of a film 100 extends. By having the clips 98 mounted on spring ends 97 a certain amount of adjustment for irregular length of film is provided for. The lower end of the rod 95 is closed, as indicated at 101, and spring clips 102 are respectively connected to the opposite sides thereof. These spring clips 102 hold the film at the bottom of the holder frame. Once the films and their holders 83 are rigidly secured in the holder structure 47, the holder structure can be rotated in the tank, and films thereby rigidly held. To release the films, the cam 86 is turned in such a manner that the spring 93 can move the rod 85 so that the projections 84 will be removed from above the channel bars 82.

The timer knob 70 has an arm 105 attached to the same as shown in Fig. 6. On this arm is a contact 106 to which a wire 107 is connected. Also, on this arm 105 is a hinged member 108 adapted to cover the underside of contact 106 and prevent its engagement with any one

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of the contacts of the timer when the arm 105 is turned in the direction of the arrow 109. Upon the insulating member 108 being hinged to the dotted line position, the contact 106 may engage with any of the contacts of the timer 69. The timer is generally of the usual construction and will be driven in one direction by its own spring or power.

The hand knob 70 can be turned manually in the direction shown by the arrow 109 and the insulating member 108 released so that the spring of the timer can return the arm in the opposite direction. To set the timer, the knob can be turned in the direction of arrow 109 in Fig. 8 to set the timer in the usual manner and after the arm 105 has been set, the contact 106 will be exposed and will run over the other contacts of the timer. With the switch button or knob 70 turned so that its indicating arm 110 is at starting point 111, Fig. 8, the insulating member 108 will be released and the contact 106 will first ride onto stationary contact 112 which will be momentarily engaged so that magnetic coil 113 of motor switch 59' will be energized to cause contact armature 114 to be moved to the right, as viewed in Fig. 8, and contact 115 brought into engagement with contact 116 so that motor 59 will be placed in a circuit receiving power from source wires 117 and 118. The motor circuit is thus automatically closed and the film holder structure 47 will be rotated within the tank by the operation of the electric motor 59 acting through the several gears which are connected to shafts 53 and 49.

As the contact arm 105 continues to travel, its contact 106 will engage contact 119 so that current is passed through wire 120 to a solenoid coil 121 of inlet valve control mechanism 31'. This solenoid 121 will draw armature 122 to the right, as viewed in Fig. 8, and cause valve 31 to be opened whereby water will flow through pipe 30 into the tank 17. Water will continue to flow through the water filling period, as indicated at 123, and when the water or other washing liquid has been built up in the tank sufficient to cause plunger 35, Fig. 1, to rise and its rod 36 to engage switch arm 37 of switch 39, the switch 39 will be moved to a closed position so that current will flow to a solenoid 124 surrounding the water inlet control armature 122 and being stronger than the coil 121 will cause the armature 122 to be released and the water inlet valve to be closed. A wire 125 extends from the switch 39 to the solenoid 124 and a wire 126 extends from the solenoid to source wire 118. The switch 39 is connected by a wire 127 and wire 128 to source wire 117. By the end of the water filling period, the tank is filled and washing period indicated at 129 begins. This washing period continues until contact 106 of the arm 105 engages drain contact 130. The drain valve 43 is normally closed, but upon contact 130 being engaged, current will flow through wire 131 to energize solenoid 132 of drain valve control 43'. This will cause armature 134 to be moved to the left as viewed in Fig. 8 and valve 43 opened. Accordingly, water will flow through the drain pipe 42 and out of the tank 17. The rack or holder structure 47 will continue to rotate throughout the draining period. Thereafter the contact 106 will engage contact 136 so that the fan 64 is operated. The wire 139 extends from the contact 138 to solenoid 141 of control device 65 for the electric heater fan 64. The wire 142 extends from the solenoid 141 to a return wire 143 which leads to source wire 117. Armature 144 bearing contact 145 to which a wire 146 is connected will be pulled by the solenoid 141 to make contact with a contact element 147 so as to close the fan motor 64 and place it across source wires 117 and 118. A wire 148 leads to the motor 64 from the contact 147 and a wire 149 leads to a return wire 143.

For the next period the hot air is blown through the tank 17. This drying operation continues until the contact 106 on the arm 105 engages with a contact 151

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whereupon a circuit is established through a wire 152 with a solenoid 153 which is connected by a wire 154 with a return wire 143 so as to return the armature 144 to a position to turn off the blower motor.

The contact 106 will next engage with contact 155 which has a wire 157 that leads to motor speed clutch solenoid 160 that will cause armature 161 to be moved in a direction to effect the outward pull of shaft 153 and the engagement of gear 58 with gear 52 to reduce the speed of rotation of the holder structure 47. The gears 57 and 51 having previously been placed in engagement for slow rotation of the holder structure 47. Thereafter, the arm 105 will rotate further toward the "Off" position so that contact 106 will engage contact 164 so the current will pass to the return solenoids of the various devices. A wire 165 extends to solenoid 166 of the motor control 59' and from this solenoid 166 extends to wire 167 to solenoid 168 of the motor speed control clutch so as to return the gears to their original position shown in Fig. 1. From the solenoid 168 current extends through wire 170 to solenoid 171 in the drain control device 43' and from this solenoid current will pass through wire 172 to a return wire 173. The wire 107 connected to contact 106 of the arm 105 is grounded on wire 154 that leads to return wire 143 and finally on source wire 117 ahead of the manual switch 24.

It will now be apparent that once the operation is started automatically the various periods will be fulfilled from the filling with water to the final drying and re-setting of the various solenoid armatures.

For the next operation the arm 105 is again set so that the member 108 will lie under the contact 106.

Referring now particularly to Fig. 9, there is shown a washing device particularly adapted for the washing of films wherein the structure extends vertically. The vertically extending cylindrical tank 175 is provided with a door 176 hinged at 177 to one side of an opening of the tank. The latch, similar to the latch shown in Fig. 7, is used and similar numerals apply. This latch is held by clip 22 and will contact switch 24 to manually close the main circuit. The timer arrangement 69 similar to that above described is used.

A water inlet arrangement 176 having a control device 177 is used on one side of the tank 175, and a drain device, or outlet, 178 along with a control 179 is used. Standards 180 and 181 extend upwardly on the sides of the tank 175 and the standard 180 supports a driving motor 182 which is connected to a chain and sprocket arrangement 183 with a shaft, not shown, extending outwardly through the top of the tank 175. The holding frame structure 47 can be provided in the tank 175 to be rotated by the chain drive mechanism 183.

The standard 181 has a shelf on which is mounted a fan motor 184 having a heater box 185 that is connected by a pipe 186 to the bottom of the tank 175. This pipe extends downwardly on the side of the tank 175. Exhaust air leaves the tank through an exhaust pipe 187.

It should now be apparent that there has been provided a machine for washing and drying films which has a specially adapted and equipped inner rotating structure for the connection thereof of films which are retained in film holders that can be connected to the frame structure. The holder frame structure comprises generally longitudinally extending members of recesses and the film frames are individually placed in the recesses of the longitudinal members and are held by cam locked rods having pin projections adapted to lie over the transverse members of the individual film holders.

It will be further apparent that by a mere setting of the timing device to the point where the operations

are started and by leaving the same to continue in operation that a full cycle of washing and drying will be effected. The flow of the liquid to the tank is controlled automatically and likewise the discharge of the liquid by means of the drain valve is released automatically. A manual switch serves as a safety device to prevent the operation of the tank as long as the cover is in the open position.

To cut off any of the prior sequences such as air blowing or washing, it is merely necessary to turn the timer to a particular phase thereby eliminating preceding phases. Thus air drying and spinning or rotation are operable without prior sequences by quickly turning timer to that position before the main switch is turned on.

The holder frame 47 need not necessarily rotate along the axis of tank 17 but can have an axis through or outside of frame 47 within the tank.

While various changes may be made in the detail construction, it shall be understood that such changes shall be within the spirit and scope of the present invention, as defined by the appended claims.

What is claimed is:

1. In a machine for treating X-ray films and the like having a tank, that improvement which comprises a film holder structure for washing and drying the films within the tank, said film holder structure including end frames, shaft projections extending from said end frames and journaled in the ends of said tank, said end frames being of substantially rectangular shape, longitudinally extending members extending between the corners of said frames and connected thereto to provide a rack structure, each of said longitudinally extending members being recessed at longitudinally spaced locations thereon, transverse members, said recesses being adapted to receive therewithin the opposite ends of said transverse members, film holder means supported by each of said transverse members, latch rods slidably mounted above each of said longitudinally extending members, each of said latch rods having projections adapted to extend over said recesses to retain the transverse members of the film holder means therein, and means for operating said latch rods to release the film holder means or retain the same in place on the longitudinal members.

2. A machine according to claim 1, said operating means comprising a cam rotated on each of said longitudinal members and having an operating arm, a detent on said operating arm for holding said cam in an adjusted position and engageable with the longitudinal member, and spring means on said rod for normally urging said rod to a released position upon release of said cam.

3. In a machine according to claim 2, wherein said longitudinally extending members are recessed on two sides, a pair of latch rods associated with both sets of recesses of each longitudinal member, a second cam rotated on each of said longitudinal members and having a second operating arm, a second detent on said second operating arm for holding said second cam member in an adjusted position and engageable with the longitudinal member, and spring means on the second of said rods for normally urging said second rod to a released position upon release of said cam whereby said film holder means can be inserted through opposite sides of the rack structure.

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