March 1, 1949. E. E. HOPPER 2,463,386

PHOTOGRAPHIC DEVELOPING MACHINE HAVING AN EXTENSIBLE LIGHT-SEALING HOOD AND AUTOMATIC FILM FEED

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Fig.1.

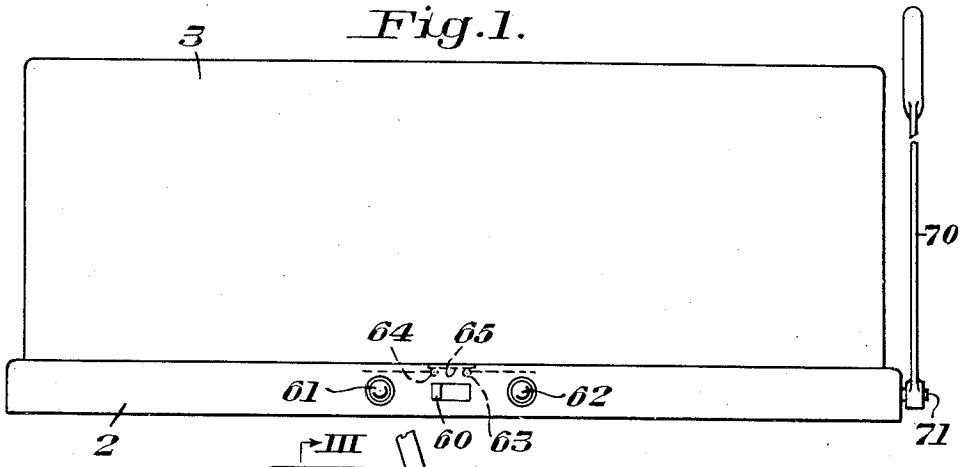


Fig.2.

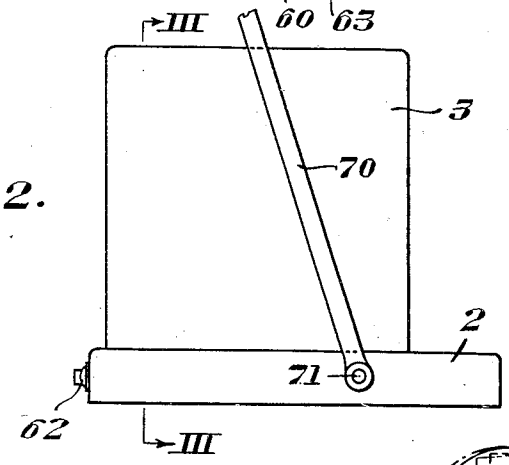
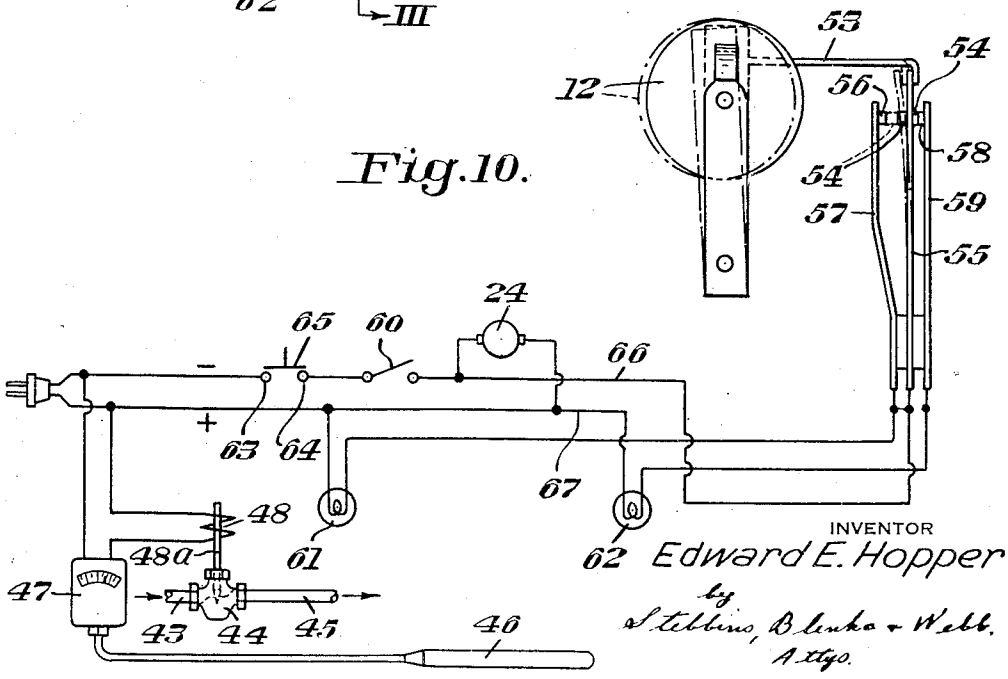


Fig.10.



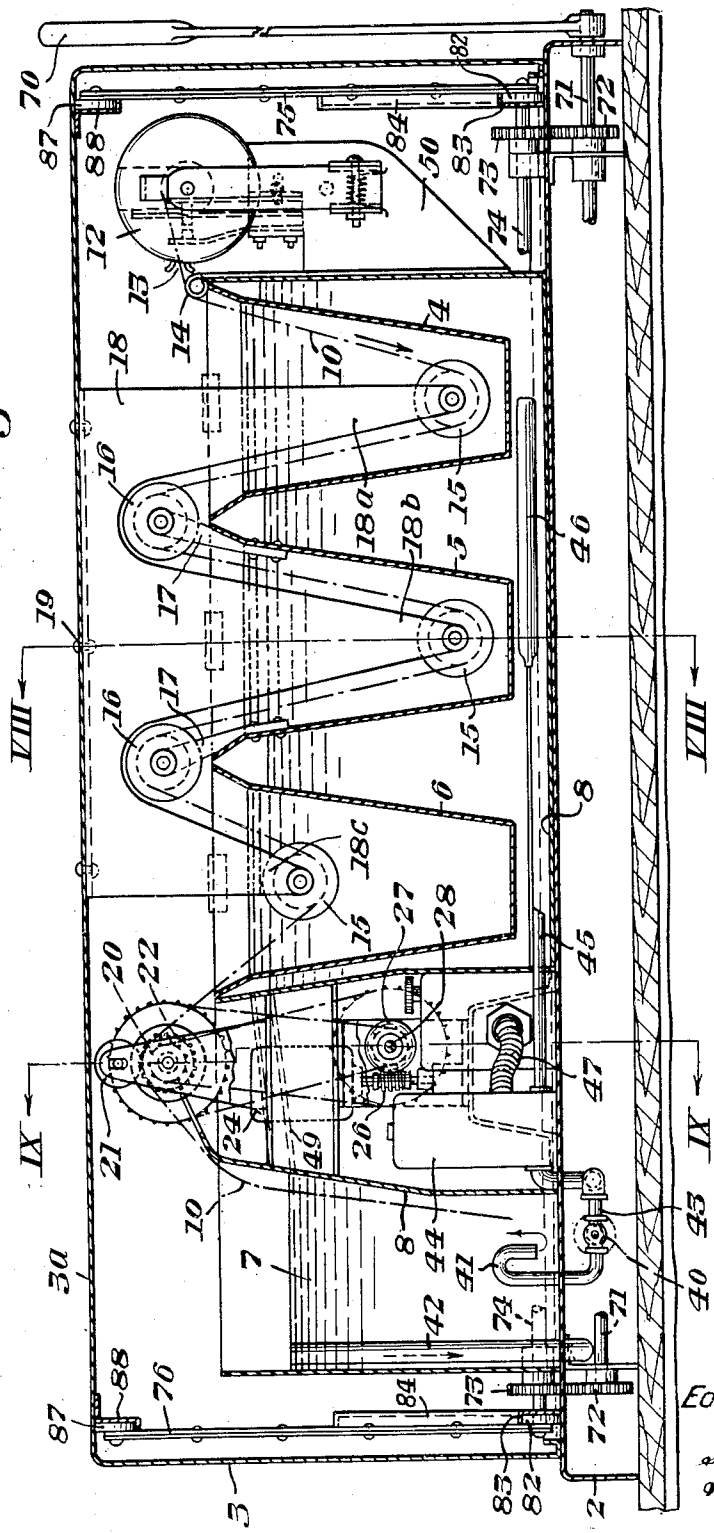
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Fig. 3.



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Fig. 4.

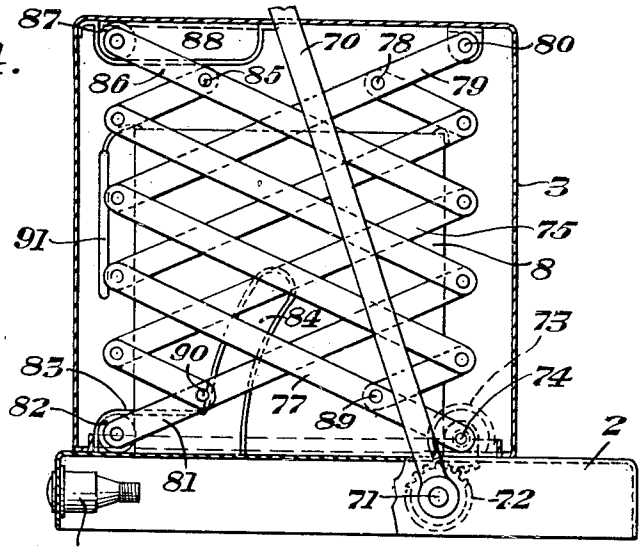
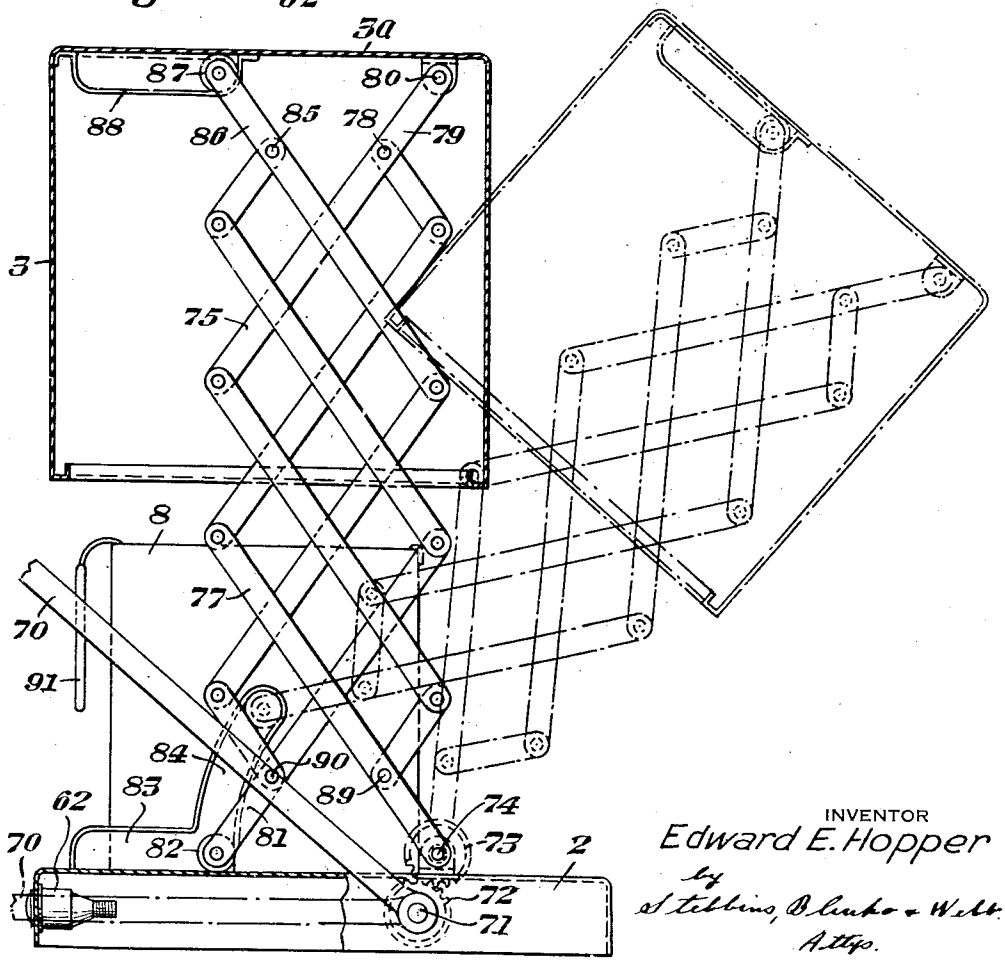


Fig. 5.



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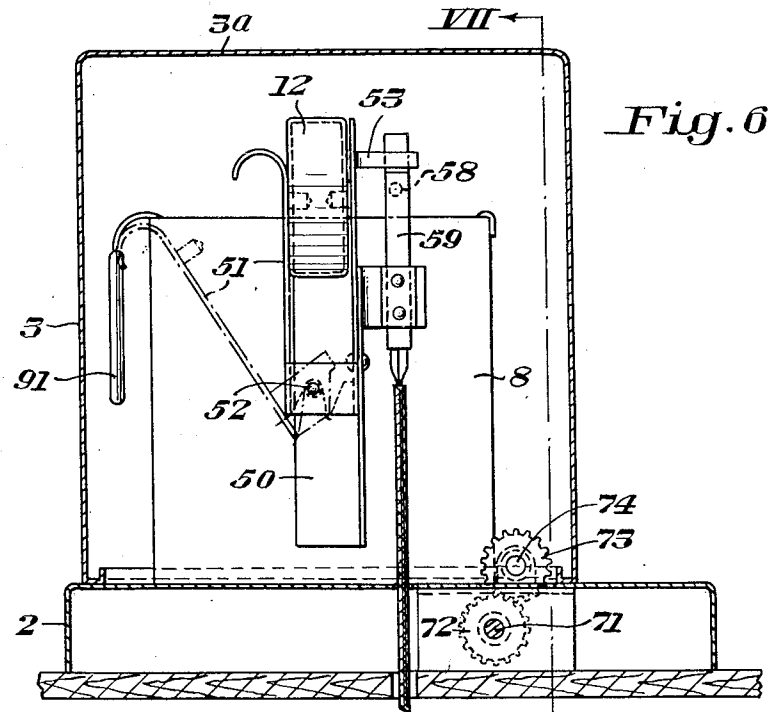


Fig. 6.

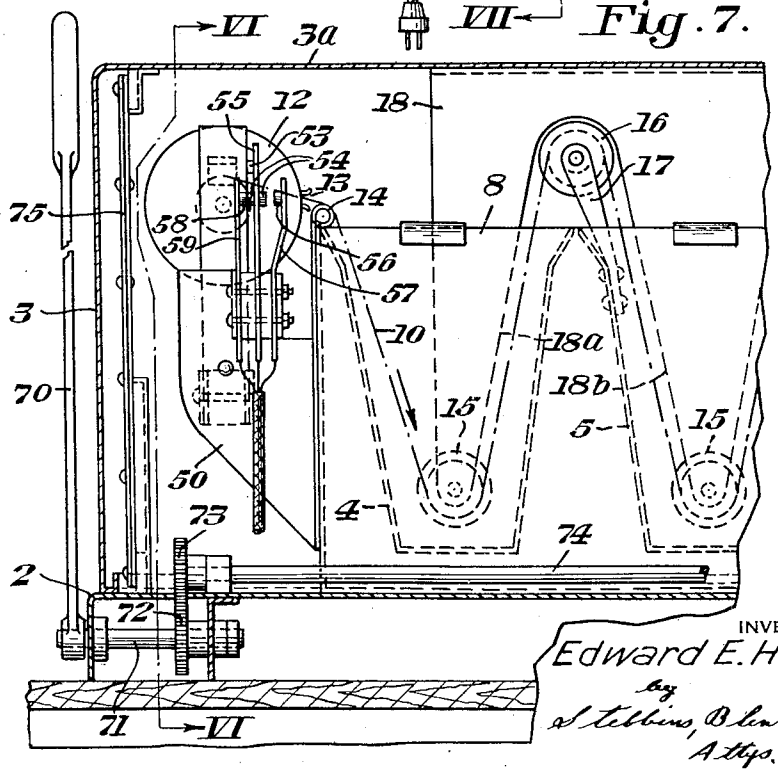


Fig. 7.

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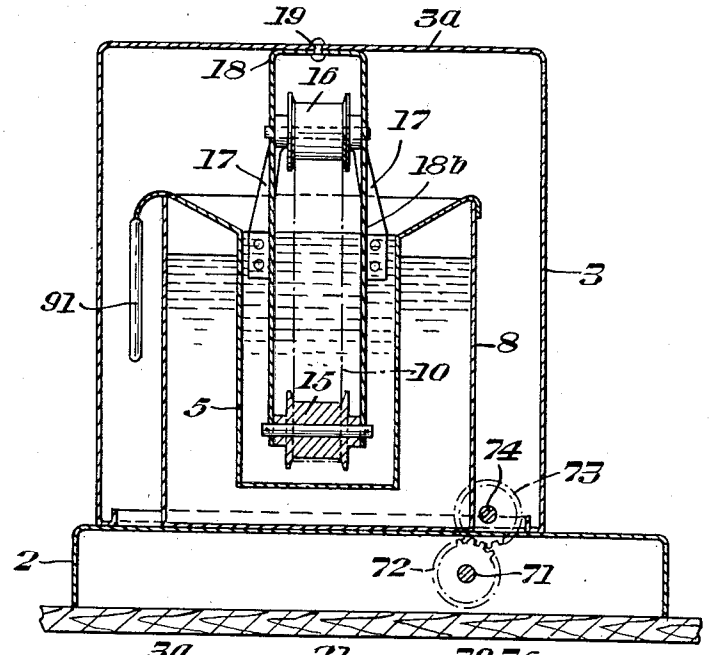
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Fig. 8.



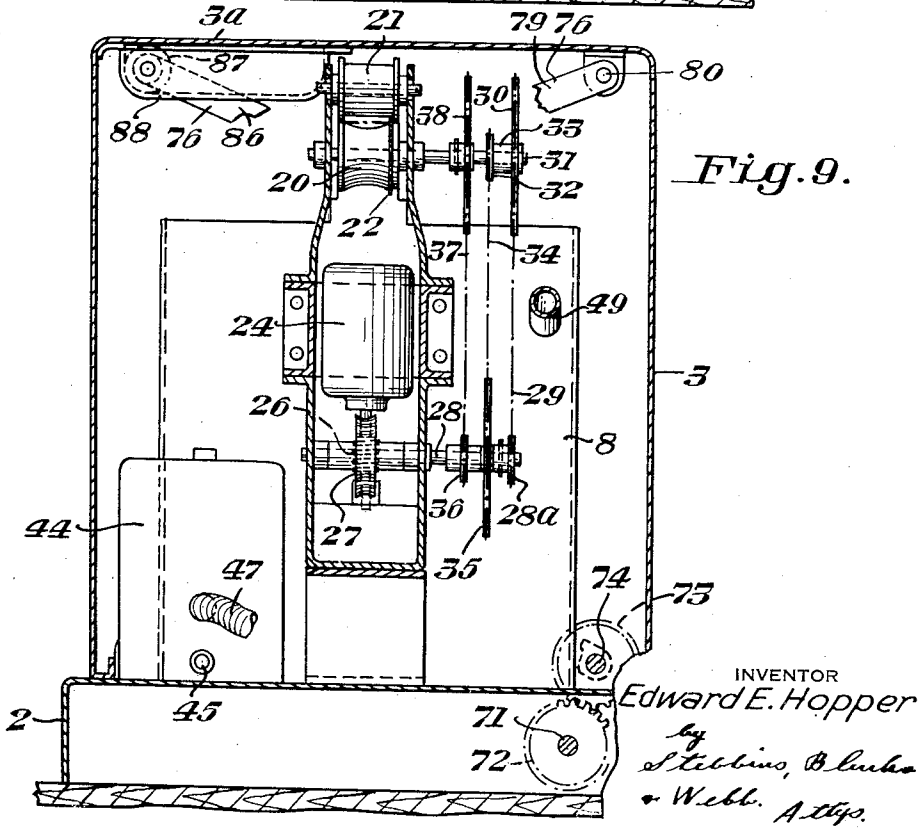


Fig. 9.

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PHOTOGRAPHIC DEVELOPING MACHINE HAVING AN EXTENSIBLE LIGHT-SEALING HOOD AND AUTOMATIC FILM FEED

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Application April 8, 1948, Serial No. 19,786

6 Claims. (Cl. 95—90.5)

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This invention relates to a photographic developing machine for continuously developing a reel of film in a light room while excluding light from the film.

In the accompanying drawings, which illustrate the present preferred embodiment of my invention—

Figure 1 is a front elevation with the light-excluding hood lowered on to the base;

Figure 2 is an end view of the apparatus shown in Figure 1;

Figure 3 is a vertical longitudinal section taken on the line III—III of Figure 2;

Figure 4 is an end view with the end of the hood and a portion of the base broken away to show the lazy tong device for raising and tilting the hood, this figure showing the hood in contact with the base;

Figure 5 is a view similar to Figure 4 but showing the hood in raised position and also showing the hood in tilted position in broken lines;

Figure 6 is a vertical section taken on the line VI—VI of Figure 7;

Figure 7 is a vertical section taken on the line VII—VII of Figure 6;

Figure 8 is a vertical section taken on the line VIII—VIII of Figure 3;

Figure 9 is a vertical section taken on the line IX—IX of Figure 3; and

Figure 10 is a wiring diagram including signal lights.

Referring more particularly to the accompanying drawings, the developing apparatus comprises a base 2 and a hood 3 which makes a light-tight seal with the base when the hood is lowered but which can be raised and tilted relative to the base. A series of treating solution containers 4, 5, 6 and 7 (Figures 3 and 8) are supported on the base. The container 4 contains a developing solution, container 5 contains a fixing solution, container 6 contains a die back remover, and container 7 contains wash water. Each of the containers 4, 5 and 6 is located within a tank 8 which contains cooling water.

The film 10 to be developed is fed from a reel 11 mounted within a reel box or magazine 12, passes through a slot 13 in the reel box over a guide roller 14 and then passes successively through the solutions in the containers 4, 5, 6 and 7. In its travel the film passes under a series of guide rollers 15 and over a series of guide rollers 16 which alternate with the rollers 15. The guide rollers 16 are supported at each end by brackets 17 secured to the solution container 5. The guide rollers 15 are carried by a one-piece

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bracket 18 which is of general inverted U-shape cross-section as shown in Figure 8. The bracket has two long fingers 18a and 18b for supporting the rollers 15 adjacent the bottom of containers 4 and 5 and a short finger 18c for supporting the roller 15 adjacent the top of the container 6. The web of the U is riveted as indicated at 19 to the under-surface of the top 3a of the hood 3.

The film 10 after passing beneath the roller 15 in container 6 then passes over a driving sprocket 20 on top of which an idler roller 21 is mounted, as shown in Figure 9. The driving sprocket 20 has teeth 22 which fit into perforations formed in the side of the film. After the film has passed over the driving sprocket 20, it passes into the water bath 7 from which it may be removed and dried in any usual manner.

The means for driving the sprocket 20 is shown in detail in Figure 9. A motor 24 is mounted in vertical position with its shaft 25 extending downwardly and provided with a worm 26 which meshes with a worm wheel 27 secured to a shaft 28. The shaft 28 has a sprocket wheel 28a fixed to it and a chain 29 passes around the sprocket wheel 28a and around a large sprocket wheel 30 which is mounted loosely on a shaft 31 connected to the sprocket 20. A smaller sprocket wheel 32, which is connected to the sprocket wheel 30 by a collar 33, is also mounted loosely on the shaft 31. A chain 34 passes around the sprocket wheel 32 and around a large sprocket wheel 35 which is loosely mounted on the shaft 28. A smaller sprocket wheel 36 is integral with the sprocket wheel 35 and also is loosely mounted on the shaft 28. A chain 37 passes around the sprocket wheel 36 and around a large sprocket wheel 38 which is fixed to the shaft 31 which drives the film sprocket 20.

Water for cooling the solutions in the containers 4, 5 and 6 and for washing the film in container 7 is supplied through an inlet 40 in the base as shown in Figure 3. A portion of the water flows through pipe 41 into the washing container 7 and drains through an overflow pipe 42 which carries it outside of the apparatus. Whenever required in order to maintain the solutions in the containers 4, 5 and 6 at the proper temperature, a portion of the water entering at 40 flows through a pipe 43, a thermostat-controlled valve 44 and through pipe 45 into the tank 8 which surrounds the solution containers 4, 5 and 6. A thermostat bulb 46 located adjacent the bottom of the cooling tank 8 actuates the thermostat 47, closing or opening its electric contacts which in turn actuates the valve 44 so as to open and shut the valve 44 in accord-

ance with the temperature of the cooling water in the tank 8. Expansion of mercury in the bulb 46 caused by increasing temperature closes contacts in thermostat 47 which energizes solenoid 48 and valve opening needle 48a and permits cold water to flow into the tank through pipe 45. When the temperature is reduced to normal, contraction of mercury in the bulb permits circuit brake in the thermostat and the needle closes the valve. These units are wired in ahead of the switches so that they operate uncontrolled. The cooling water passes from tank 8 through an overflow pipe 49 into container 7.

The magazine or reel box 12 containing the reel 11 of film is mounted on a support 50 at the right-hand end of the apparatus as shown in Figure 3. Details of the reel mounting are also shown in Figures 6 and 7. The reel box 12 is mounted on the support 50 by means of a clip 51 which is pivoted at its lower end as indicated by the reference numeral 52. The reel support 50 has an arm 53 connected to its upper end as shown in Figures 6 and 10. The reel support is made of material which is flexible enough so that when the lead-in portion of the film is threaded over the guide rollers 16 and on to the sprocket 20 and the hood is then lowered, the guide rollers 15 carried by the hood force the film down into the treating solutions and apply sufficient tension to the film so as to move the reel support 50 and reel magazine 12 to the broken line position shown in Figure 10. Movement of the reel support 50 to the dotted line position causes the movable contact 54 on arm 55 to make contact with the contact 56 on arm 57. When there is no tension on the film applied by the rollers 15, the magazine 12 is in its normal full line position shown in Figure 10 and the movable contact 54 is in contact with a contact 58 carried by arm 59.

Referring to Figures 1 and 10, there is a main snap switch 60 located on the front of the base, a red signal light 61 and a green signal light 62. Located in the base are two contact points 63 and 64. A contact 65 is carried at the lower edge of the hood 3 so that when the hood is lowered on to the base the contact 65 bridges the contact points 63 and 64. As shown in Figure 10, the motor 24 is wired in parallel between the leads 66 and 67. Thus with the main switch 60 closed, the motor does not operate until the contact 65 on the hood has bridged the contact points 63 and 64 on the base and the hood has made a light-tight seal with the base.

In carrying out a developing process, the film 10 is led from the reel 11 over the guide rollers 16 and sprocket 20 while the hood 3 is raised. This exposes to light only a part of the lead in portion of the film which is blank. The hood then is lowered by means described later so that the guide rollers 15 force the film down into the treating solutions and when the hood contacts the base 2 the contact 65 closes the gap between contact points 63 and 64, thereby completing the circuit and starting the motor in operation. So long as the developing process continues and the film is being fed through the machine, the film is under the tension of the guide rollers 15, the reel support 50 is in the dotted line position shown in Figure 10 and electrical contacts 54 and 56 are engaged. Accordingly, the red light glows, indicating that the film is still being fed through the machine and that the hood should not be lifted. After all of the film has passed through the machine, the tension on the film by the rollers 15 is relieved so that the support 50 assumes its full line position shown in Figure 10 and contact 54 engages contact 58. This completes the circuit through the green light 62 and causes it to glow, indicating that the developing process has been finished and the hood can be safely raised. Lifting of the hood from the base raises the contact 65 and stops the motor from operating. Thus the motor starts feeding film through the developing solutions only after the hood has been lowered on to the base to form a light-tight seal and the signal lights show when the process has been completed so that the hood may be safely raised again.

The lazy tong arrangement for raising the hood 3 from the base 2 and tilting it relative to the base is shown in Figures 3, 4 and 5. A hand lever 70 is located outside the right-hand end of the hood as shown in Figure 3, and is connected at its lower end to a shaft 71 which extends longitudinally of the machine. The shaft carries two gears 72 which mesh with two gears 73 secured to a shaft 74 which also extends lengthwise of the machine. Two lazy tongs 75 and 76 are actuated upon rotation of the gear 73. Each lazy tong has a leg 77 which is rigidly connected at its lower end to the shaft 74. The upper end of the leg 77 is pivoted at 78 to a leg 79 which is pivoted at its upper end 80 to the hood. Another leg 81 carries a roller 82 at its lower end which moves in a guide fixed to the base and having a straight portion 83 and a curved portion 84. The upper end of the leg 81 is pivoted at 85 to a leg 86 carrying a roller 87 at its upper end which moves in a guide 88 fixed to the hood. The lower end of the leg 79 is pivoted at 89 to the leg 77 and the lower end of the leg 86 is pivoted at 90 to the leg 81.

As the hand lever 70 is rotated in a counter-clockwise direction from the position shown in Figure 4 to that shown in full lines in Figure 5, the hood 3 is raised, the roller 82 moves in the straight portion 83 of the guide which is fixed to the base, and the roller 87 moves in the guide 88 fixed to the hood. As the lever 70 is further rotated to the horizontal position shown in chain lines in Figure 5, the roller 82 moves upwardly in the curved portion 84 of the guide, thus causing the lazy tongs and hood to pivot about the shaft 74 as an axis and to assume the tilted position shown in chain lines in Figure 5. The raising and tilting of the hood enables free access to the solution containers so that they may be removed and the solutions replenished. In order to aid in easy removal of the containers, they are provided with handles 91.

The invention is not limited to the preferred embodiment but may be otherwise embodied within the scope of the following claims.

I claim:

1. A machine for developing sensitized film and the like, comprising a base, a series of treating solution containers supported on the base, a hood and means for raising and lowering it, the hood forming a light-tight seal with the base, a series of guide rollers over which the film passes mounted in fixed position above the containers, a series of guide rollers under which the film passes secured to the hood and adapted to immerse the film in the treating solutions in the containers when the hood is lowered, and means within the hood when in lowered position for feeding the film through the treating solutions.

2. A machine for developing sensitized film and the like, comprising a base, a series of treating solution containers supported on the base, a tank

surrounding the solution containers and adapted to contain cooling liquid, a hood and means for raising and lowering it, the hood forming a light-tight seal with the base, a series of guide rollers over which the film passes mounted in fixed position above the containers, a series of guide rollers under which the film passes secured to the hood and adapted to immerse the film in the treating solutions in the containers when the hood is lowered, and means within the hood when in lowered position for feeding the film through the treating solutions.

3. A machine for developing sensitized film and the like, comprising a base, a series of treating solution containers supported on the base, a tank surrounding the solution containers and adapted to contain cooling liquid, means for flowing cooling liquid through said tank, a thermostat in the tank, a valve responsive to the thermostat for controlling the flow of cooling liquid through the tank, a hood and means for raising and lowering it, the hood forming a light-tight seal with the base, a series of guide rollers over which the film passes mounted in fixed position above the containers, a series of guide rollers under which the film passes secured to the hood and adapted to immerse the film in the treating solutions in the containers when the hood is lowered, and means within the hood when in lowered position for feeding the film through the treating solutions.

4. A machine for developing sensitized film and the like, comprising a base, a series of treating solution containers supported on the base, a hood and means for raising and lowering it, the hood forming a light-tight seal with the base, a series of guide rollers over which the film passes mounted in fixed position above the containers, a series of guide rollers under which the film passes secured to the hood and adapted to immerse the film in the treating solutions in the containers when the hood is lowered, means including an electric motor connected in an electric circuit for feeding a film through the treating solutions, and cooperating electric contacts on the hood and base so located as to complete the electric circuit only when the hood is in contact with the base.

5. A machine for developing sensitized film and the like, comprising a base, a series of treating solution containers supported on the base, a hood and means for raising and lowering it, the hood forming a light-tight seal with the base, a series of guide rollers over which the film passes mounted in fixed position above the containers, a series of guide rollers under which the film passes secured to the hood and adapted to immerse the film in the treating solutions in the containers when the hood is lowered, means including an electric motor connected in an electric circuit for feeding a film through the treating solutions, cooperating electric contacts on the hood and base so located as to complete the electric circuit only when the hood is in contact with the base, a film reel support adapted to be moved when tension is applied to the film by contact with the guide rollers secured to the hood as the hood is lowered, signal lights in the electric circuit, an electric contact point connected to each light, a movable signal light contact adapted to complete the circuit of each light, and means connecting the reel support with said movable signal light contact.

6. In a machine for developing sensitized film and the like and having a base, a series of treating solution containers supported on the base and a hood adapted to form a light-tight seal with the base and to be raised from the base, means for raising the hood and tilting it to provide access to the treating solution containers which comprises a pair of interconnected lazy tongs each located adjacent one end of the hood, means for actuating the lazy tongs to extend them, one leg of each lazy tong being pivoted at one end to the base and at the other end to the hood, the other leg of the lazy tong having one end movable in a guide fixed to the base and the other end movable in a guide fixed to the hood, the guide which is fixed to the base having a straight portion and a curved portion so that upon actuating the lazy tongs the hood is first raised and then tilted relative to the base.

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No references cited.