Dec. 12, 1933. L. G. SIMJIAN 1,939,144

AUTOMATIC DEVELOPING APPARATUS

Original Filed Dec. 16, 1931 2 Sheets-Sheet 1

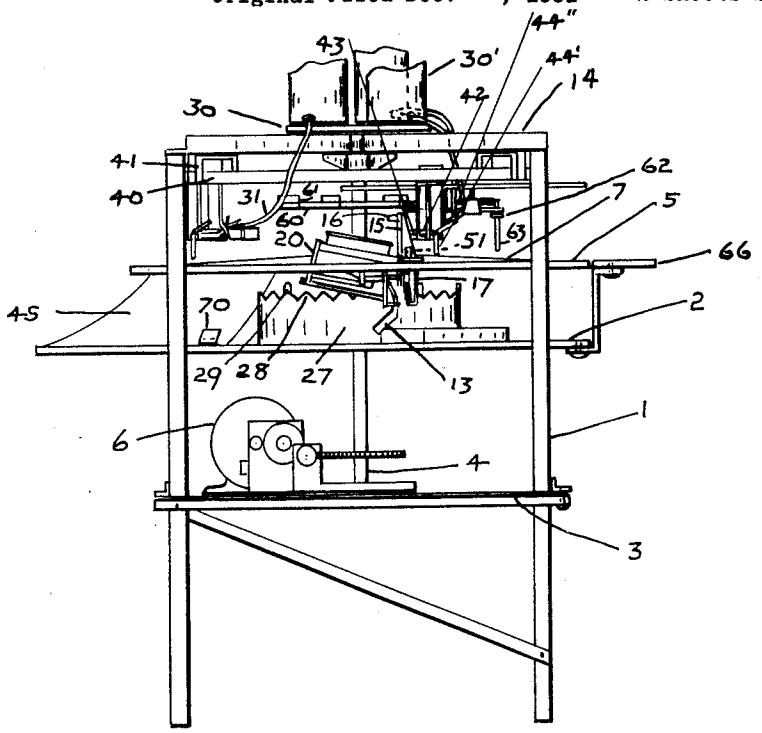


FIG 1

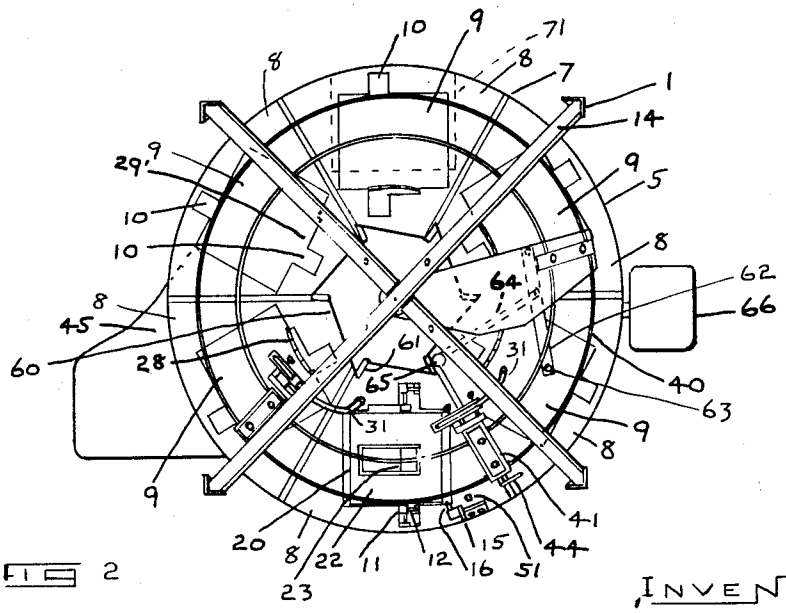


FIG 2

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AUTOMATIC DEVELOPING APPARATUS

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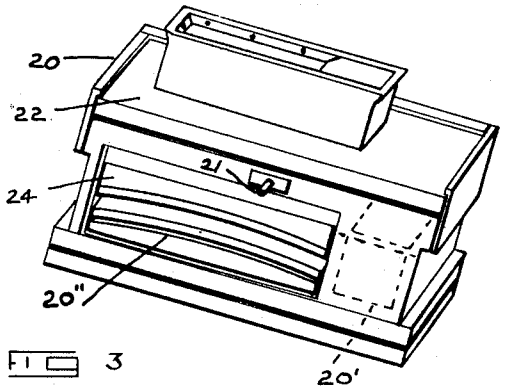


FIG 3

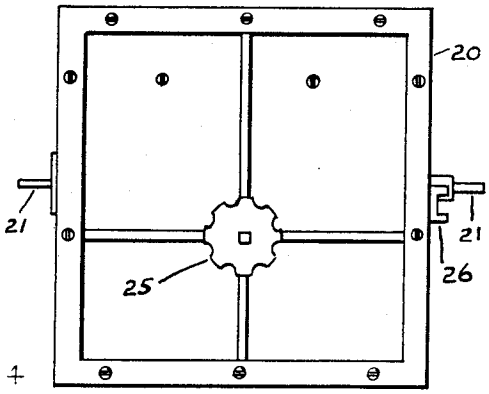


FIG 4

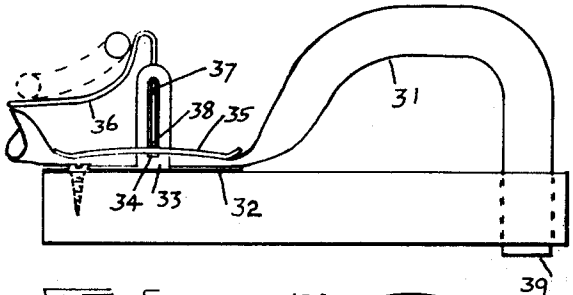


FIG 5

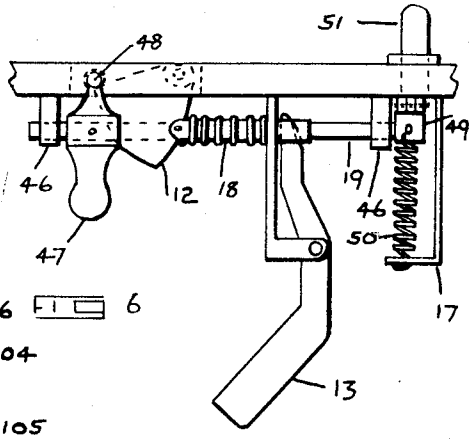


FIG 6

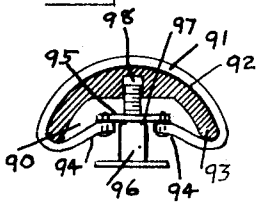


FIG 8

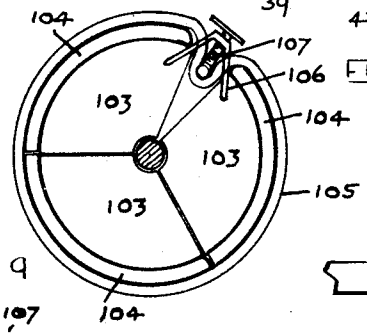


FIG 9

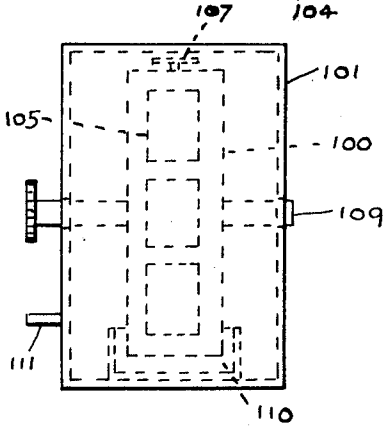


FIG 10

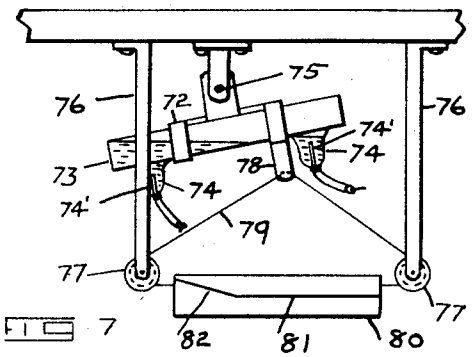


FIG 7

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AUTOMATIC DEVELOPING APPARATUS

Luther G. Simjian, New Haven, Conn.

Application December 16, 1931, Serial No. 581,405
Renewed May 12, 1933

12 Claims. (Cl. 95—93)

This invention relates to improvements in automatic developing apparatus and the objects of the invention are to provide automatic means whereby photographic material can be treated while enclosed within a light-proof carrier adapted to receive and agitate therein a fluid content automatically spilled and renewed while the photographic material remains within a darkened carrier; to provide automatic means for moving such carrier through different stations for automatic treatment of the photographic material therein contained; to provide such carrier with a holder adapted to so hold photographic material photographically exposed that only the face of such material is physically exposed to the fluid content of the carrier; and to provide such carrier with a cover adapted to be automatically removed to expose a photographic content to light.

That the character of the improvement may be understood, reference is made to one illustrative device embodying the invention herein pointed out and illustrated by the accompanying drawings of which the Figure 1 is an upright elevation of the device; the Figure 2 is a top view thereof; the Figure 3 is a perspective view of a carrier member illustrating a holder therein; the Figure 4 is a bottom view of the carrier member illustrating means for adjusting the holder; the Figure 5 is a detail view of a valve mechanism; the Figure 6 is a detail view of a tripping mechanism; and the Figure 7 is a detail view of an electric contact element, the Figures 8, 9 and 10 being modified forms of holder and carrier members.

Referring more particularly to the drawings, the apparatus comprises the supporting frame 1, the fixed upper and lower tables 2 and 3, respectively, supported by the frame 1, the central vertical shaft 4 extending upwardly from the lower table 3 and through an aperture in the upper table 2, the shaft 4 supporting the disk 5 for rotation therewith as the motor 6, having a low geared connection with the shaft 4, is made to slowly operate it. The upper surface of the disk 5 is radially divided by the ribs 7 into the integral sections 8, each section 8 having the marginal opening 9 extending through the disk 5, each opening 9 including the recesses 10, radially aligned one with the other as regards the disk 5. Mounted within each of the recesses 10 of each opening 9 are the adjustable bearings 11, each bearing 11 including a spring-pressed pivoted support 12 having a connection with a lever 13 depending below the disk 5 and adjacent the table 2 for a purpose to be explained. The carrier 20 has upon opposite sides thereof the axle posts 21 adapted to repose in the bearings 11 of the recesses 10 of any of the openings 9 into which the carrier 20 may be dropped from above the disk 5 to adapt the carrier 20 for a rocking movement within the opening 9. The carrier 20 is provided with an interior basin 20', illustrated in dotted lines by the Figure 3, and also with a sliding cover 22 having the protected opening 23 therethrough for admitting fluid but excluding light. Within the carrier 20 is a holder 24 of the type described in two earlier applications both filed by your petitioner July 13, 1931, Serial Numbers 550,541 and 550,542, excepting that the holder 24 herein described normally remains within the carrier 20 and is reached for filling through a lateral opening and for adjustment by the screw means 25 manually operable outside of the carrier 20, a sheet metal spring member 20'' being employed to separate the clamping means upon the release of the screw means 25. Adjacent to one of the axle posts 21 there is provided a short post 26 laterally spaced but extending parallel with the axle post 21. Centrally and fixedly arranged upon the fixed upper table 2 is a cylindrical wall 27 having a removed section, as at 30, the serrated upper edge 28 of the wall 27 lying in the path of travel of the short post 26 as the carrier 20 is moved with the rotating disk 5, thus, with the aid of gravity, compelling the post 26 to ride upon the serrated edge 28 to communicate to the carrier 20 a rocking movement for a purpose to be explained. At certain spaced intervals around the serrated wall 27 is provided a cam member 29 extending above the wall 27 also for a purpose to be explained. Upon the top of the frame 1 is centrally provided a fixed shelf 30 supporting the fluid containers 30', each container having a rubber pipe conduit 31 leading to distributive locations or stations at each of which the rubber pipe extends through a mechanism operable as a valve to check or control the flow of fluid through the conduit 31, the outlet of each conduit 31 lying in the path of the protected opening 23 of the cover 22 of the carrier 20 as it moves with the rotating disk 5. The valve mechanism comprises the flat base 32 having a pair of integral upright arms 33, each arm 33 having a slot 34. An arcuate clamping member 35 normally rests upon the flat base 32 between said arms 33, the rubber pipe of the conduit 31 lying between the base 32 and the arcuate clamping member 35. The curved lever 36 has a sliding pivotal movement by means of the

ears 37 engaging within the slots 34, a cam portion 38 of the lever 36 being adapted, as it is swung in one direction, to engage with, and assume a right-angled position relative to, the arcuate clamping member 35 whereby the portion 38 is jammed down upon the arcuate clamping member 35, and hence the rubber pipe of the conduit 31, the release of the mechanism being obtained by swinging the lever 36 in the other direction. Upon the overhead structure 14 of the frame 1 are mounted arcuate rods 40 upon which are mounted at spaced intervals the brackets 41, of which only two are illustrated. It is to these brackets 41 that the valve mechanism is secured, the outlets 39 of the conduits 31 each being directed downwardly. Movably mounted upon the brackets 41 is a horizontal shaft 42 upon one end of which is fixedly mounted the finger 43 extending eccentrically, as regards the shaft 42, and adapted to operatively engage either end portions of the curved lever 36 to move the cam portion 38 of the lever 36 down upon, or away from, the arcuate clamping member 35, the shaft 42 having fixedly mounted upon the opposite end a cam member 44 having the cam portions 44′ and 44″ for purposes about to be explained. Mounted upon the fixed table 2 is the vertical post 15 supporting the horizontal finger 16 and, below the table 2 and adjacent the post 15, is a trip mechanism 17 of which only one is illustrated and of which the depending lever 13 is a part. The trip mechanism 17 has two separate functions; for first, its connection with the pivoted support 12 of the adjustable bearings 11 is such that, by means of the spring-pressed sliding rod 18 connected at one end with the pivoted support 12 and at the other end with the depending lever 13, a movement of the lever 13 against the spring tension of the rod 18 will cause the support 12 to be withdrawn as a part of the bearings 11 to permit the carrier 20 to drop through the opening 9 of the disk 5 and upon the inclined chute 45 down which the carrier 20 may slide to the table 2; and second, its connection, by means of the rotatable rod 19 mounted upon the brackets 46 and fixedly carrying adjacent one end the manually operable member 47 having the finger 48, and likewise carrying at the other end the cam member 49 normally held in one position by means of the spring 50, the cam member 49 normally supporting a vertically movable tripping member 51 in its lower unextending position, but when the carrier 20 is placed within an opening 9 with the axle posts 21 resting upon the bearings 11, the member 47 must first be manually operated to move the finger 48 out of the way, the end of the finger 48 resting against the end of an axle post 21, thus causing the cam 49 to have lifted the tripping member 41 so that its upper end extends above the table 2 in the path of the lower cam portion 44′ of the cam 44 as the disk rotates, the cam 44 thereby being operated in one direction, the finger 16 of the vertical post 15 being engageable with the cam portion 44″ to operate the cam 44 in the opposite direction. The vertical power shaft 4 has fixed thereto, above the disk 5, a cam-edged member 60 having the radially disposed abrupt shoulders 61. Pivoted to the frame 1 is a swinging arm 62 at the free end of which is rigidly carried a downwardly directed finger 63. Intermediate the arm 62 there is pivoted an arm 64 having at its free end a roller 65 adapted to normally engage one of the radially disposed abrupt shoulders 61, but also adapted to travel the cam surfaces of the cam-edged member 60. The table 2 is provided with a fixed tripping member 70 located adjacent the inclined chute 45 and adapted to be engaged by the depending lever 13 operably connected with the pivoted support 12. The shed 71, the position of which is illustrated by the dotted lines in the Figure 2, extends over a portion of the disk 5, and directly under the shed 71 there is provided lighting units (not illustrated) for photographic printing at that particular station of travel of the disk 5. In connection with such lighting units a mercury switch 72 is provided. This switch comprises the container 73 having the integral pockets 74 each of which holds a terminal wire 74′ and both of which are filled with mercury of the mercury content of the container 73 regardless of the tipping angle of the container 73. The container 73 is pivotally suspended from a portion of the frame 1 by means of the pivotal connection 75. The rigid arms 76 are also suspended from the portion of the frame 1 and the free ends of the arms 76 are provided with the pulley wheels 77. Depending from the container 73 is the rigid arm 78 to which both ends of a cord 79 are attached, the cord 79 extending around both pulley wheels 77 and supporting therebetween a floating bar 80 having a shoulder 81 extending beyond the vertical plane of the pulley wheels 77 and having the bevelled end 82. Having described the several parts of the apparatus, it is to be understood that, while some of such parts have been described and illustrated with regard to certain of the openings 9, recesses 10, including valve and tripping mechanisms, the same are intended to be duplicated in connection with other openings 9, including a carrier 20 for each of said openings 9, as may be desired.

In operation, with regard to one carrier 20, photographically exposed film, together with printing-out paper, is placed while in a dark room in relative contact within the holder 24 between the arcuate clamping surfaces of flexible material of which the upper clamping surface is marginal only, thus exposing the face of the photographically exposed film to the interior of the carrier 20. The screw means 25 is then screwed up tightly so that the film and printing-out paper thereby are held in close contact. The carrier 20 is then brought out of the dark room with its cover 22 securely on, the carrier 20 being placed within one of the openings 9 so that the axle posts 21 may rest within the adjustable bearings 11, the end of the finger 48 resting against the end of an axle post 21, thus maintaining the tripping mechanism member 51 in its raised position extending above the table 2, and the short post 26 of the carrier 20 resting upon the serrated edge 28 of the cylindrical wall 27. The motor 6 is then started and the disk 5, thereby slowly rotated, moves the carrier 20 from the starting station, the carrier 20 being rocked as it moves along, the rocking movement being caused by the cooperating influences of gravity and the riding of said post 26 upon the serrated edge 28 of the wall 27. As the disk 5 advances the carrier 20 under each station of valve mechanism, the tripping member 51 operates the lower cam portion 44′ of the cam 44 and thus causes the finger 43 to operate the curved lever 36 to release the cam portion 38 from its jamming position as regards the arcuate clamping member 35 and the rubber pipe therebetween, thus opening a conduit 31 to supply the carrier 20, through

the protected opening 23 of the cover 22, with either a developing, fixing or rinsing fluid according to the source of supply from which that particular conduit leads. The finger 16 of the vertical post 15 then, by means of the advancing disk 5, operatively engages the upper cam portion 44'' of the cam member 44 to cause the finger 43 to operatively engage the curved lever 36 to bear down the cam portion 38 of said lever 36 upon the arcuate clamping member 35 to jam the same down upon the rubber pipe to close the flow of fluid therefrom. As the carrier 20 is rocked the fluids are each agitated in turn, the carrier 20 being tilted, following the agitation of each fluid content between stations, as the post 26 rides up and over a cam 29 with the desired effect of completely spilling and emptying the fluid content into the basin 20' of the carrier 20, the spilled fluid as held by the basin 20' being entirely segregated from the face of the photographic material held by the holder 24 within the carrier 20. Following the last emptying of fluid as aforesaid, the disk 5, together with the cam-edged member 60, has advanced sufficiently to engage the finger 63 with the sliding cover 22 to gradually push off the said cover 22 from the carrier 20 and upon the side shelf 66. The further advanced travel of the disk 5 brings the finger 16 of the vertical post 15 in engagement with the bevelled portion 82 of the shoulder 81 of the floating bar 80, and, as the disk 5 continues to advance the post 15, the finger 16 travels under the shoulder 81, thus lifting the floating bar 80 and, through the agency of the cord 79, pulling the container 73 of the mercury switch from its normal inclined position so that the mercury content, seeking its own level, covers both pockets 74 and conductively connects the terminal wires 74', thus completing an electrical circuit (not illustrated) to light the lighting units (not illustrated) located beneath the shed 71 at the printing station, under which shed 71 the carrier continues to rock as the still advancing disk 5 compels the post 26 to travel the serrated edge 28 of the wall 27. The photographic material being thus exposed to the light, the negative, developed upon the film at the previous stations, is printed upon the printing-out paper while the photographic material is still held within the holder 24. The carrier 20 passing with the advancing disk 5 from under the lighting units and the finger 16 passing beyond the shoulder 81, the floating bar 80 is permitted to drop to its normal low position and the mercury switch to return to its normal inclined position in which the mercury content of the container 73 is separated from one of the pockets 74 to open the circuit thereby switching off the light from the lighting units. The carrier then passes under another valve mechanism whereby a washing fluid is delivered to the carrier 20 in the manner aforesaid, and, following the agitation of the fluid content, the carrier 20 is again tipped to transfer the fluid content to the basin 20' by means of the travel of the post 26 up and over a cam 29, and the carrier 20 having reached, by the advance of the disk 5, the removed portion of the wall 27, as at 29', a depending lever 13 engages the fixed tripping member 70 located at the release station, and the lever 13 is thereby operated upon the further advancement of the disk 5 and thus operatively withdraws the pivoted support 12 from the bearings 11 to permit the carrier 20 to drop through the opening 9 down upon the chute 45 to slide thereon to the table 2 below that the finished negative and print may be removed from the holder 24.

The Figure 8 illustrates a modified form of holder 90, the same comprising a perforated strap 91 placed over the arcuate surface 92 of a filler element 93, the strap ends 94 being secured to a plate 95 having a bore for a screw element 96 having the shoulders 97 facing the plate 95, the filler element 93 having a threaded bore 98 for the screw 96. The tightening of the screw element 96 carries the plate 95 toward the filler element 93 and tightens the grip of the strap 91 against the arcuate surface 92, the photographic material being marginally held between the strap 91 and the arcuate surface 92 for physical exposure to development and light in the manner already described with regard to the preferred form of device.

The Figures 9 and 10 illustrate a still further modification of holder 100 and carrier 101 in which the holder 100 comprises the three segments 103 of a filler element encompassed by the arcuate sections 104 of glass plate and the perforated endless strap 105 encompassing the glass sections 104. Two of the segments 103 are marginally spaced, one from the other, and thus connected by the brace 106 having a threaded bore for the screw means 107 adapted when tightened to urge a slack portion of the endless strap 105 down between the spaced segments 103 to tighten the perforated endless strap against the arcuate contour of the segments 103. The modified carrier 101 is adapted to support the holder 100 upon the shaft 109 for revolution thereon within the carrier 101 and marginally running through the basin 110 provided within the carrier 101, the finger 111 engaging a carrier-tilting cam, as in the preferred form, to empty the basin 110. In this form of holder, the printing-out paper, if desired, may be placed in contact with the negative material under the perforated strap 105, or the printing-out paper may be placed under the glass sections 104, the negative material being superimposed outside of said glass sections and under the perforated strap. In place of the segments 103, a flexible air container might be used advantageously, if desired.

I claim:

1. An automatic developing apparatus comprising a carrier containing photographic material, means for moving the carrier through different stations, automatic means for supplying and changing a fluid content of said carrier at certain of said stations, and automatic means for agitating the fluid content, said carrier having a cover thereon automatically removable.

2. An automatic developing apparatus comprising a carrier having means for so holding photographically exposed photographic material that only the face of said material is physically exposed within the carrier, means for moving the carrier through different stations, automatic means for supplying and changing a fluid content of said carrier at certain of said stations, and automatic means for agitating the fluid content.

3. An automatic developing apparatus comprising a support, a light-proof carrier held by said support, said carrier having means for holding photographic material and a fluid content, automatic means for agitating the fluid content, and automatic means for spilling and renewing the supply of fluid while the photographic material is held within the light-proof carrier.

4. An automatic developing apparatus com-

prising a support, a light-proof carrier held by said support, a removable cover provided by said carrier, said carrier having means for holding photographic material and a fluid content, automatic means for agitating the fluid content, automatic means for spilling and renewing the supply of fluid while the photographic material is held within the light-proof carrier, and automatic means for removing the said cover and subjecting the photographic material to light.

5. An automatic developing apparatus, the combination of a rotating disk, a carrier thereon and adapted to hold a fluid content, a holder within the carrier, the holder being adapted to so hold photographic material that only the face of such material is exposed to the fluid content within the carrier, mechanism for imparting rocking and tilting movements to said carrier to agitate and spill the fluid content, and means for periodically delivering the fluid content to within said carrier while the carrier is being advanced by the rotation of said disk.

6. An automatic developing apparatus, the combination of a rotating disk, a covered carrier upon the disk, the carrier being adapted to hold a fluid content, a holder within the carrier, the holder being adapted to so hold photographic material that only the face thereof is exposed to the fluid content within the carrier, mechanism for imparting rocking and tilting movements to said carrier to agitate and spill the fluid content, sources of fluid supply, conduits from each of said sources, valve mechanism in the path of movement of said carrier, and means for operating said valve mechanism to deliver a fluid content to said covered carrier while being advanced by the rotation of said disk.

7. An automatic developing apparatus comprising a carrier having means for so holding photographically exposed photographic material that only the face of said material is physically exposed within the carrier, means for moving the carrier through different stations, automatic means for supplying and changing a fluid content of said carrier at certain of said stations, automatic means for agitating the fluid content, and a cover provided by the carrier, said cover having a protected opening adapted to exclude light from, but admit fluid to, said carrier.

8. An automatic developing apparatus comprising a support, a carrier held by said support, a removable cover provided by said carrier, said carrier having means for holding photographic material and a fluid content, automatic means for agitating the fluid content, automatic means for spilling and renewing the supply of fluid while the photographic material is held within the carrier, automatic means for removing the said cover and subjecting the photographic material to light, an electric switch element, and automatic means adapted to operate said switch.

9. An automatic developing apparatus, the combination of a rotating disk, a carrier thereon and adapted to so hold photographic material and a fluid content that only the face of such material is exposed to the fluid content within the carrier, mechanism for imparting rocking and tilting movement to said carrier to agitate and spill the fluid content, and means for periodically delivering the fluid content to within said carrier while the carrier is being advanced by the rotation of said disk.

10. An automatic developing apparatus, the combination of fixed and movable supports, the movable support providing an adjustable seat to receive a carrier movable with such support, a tripping member provided by the movable support and relatively and automatically movable to an operating position by the seating of the carrier, a valve mechanism mounted upon the fixed support and operatively engageable by the tripping member in its operating position.

11. An automatic developing apparatus, the combination of fixed and movable supports, the movable support providing an adjustable seat to receive a carrier movable with such support, a releasing mechanism provided by the movable support, and a fixed tripping member mounted upon the fixed support and adapted to be engaged by said mechanism to so readjust said seat as to unseat and release the carrier.

12. An automatic developing apparatus, the combination of fixed and movable supports, the movable support providing an adjustable seat to receive a carrier movable with such support, a releasing mechanism provided by the movable support, a fixed tripping member mounted upon the fixed support and adapted to be engaged by said mechanism to so readjust said seat as to unseat and release the carrier, and means adapted to guide and deposit said released carrier.

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