Oct. 28, 1941. M. CUENDET 2,260,561

PHOTOGRAPHIC APPARATUS

Filed Aug. 28, 1939 3 Sheets-Sheet 1

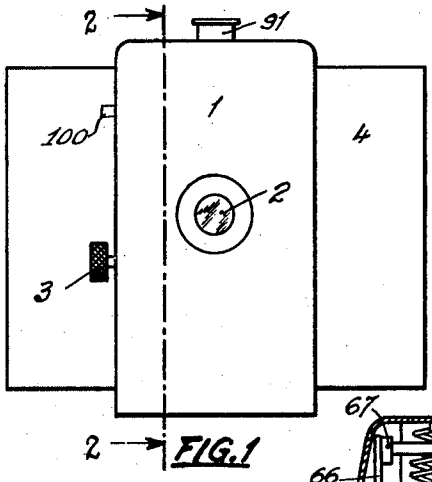



FIG.1

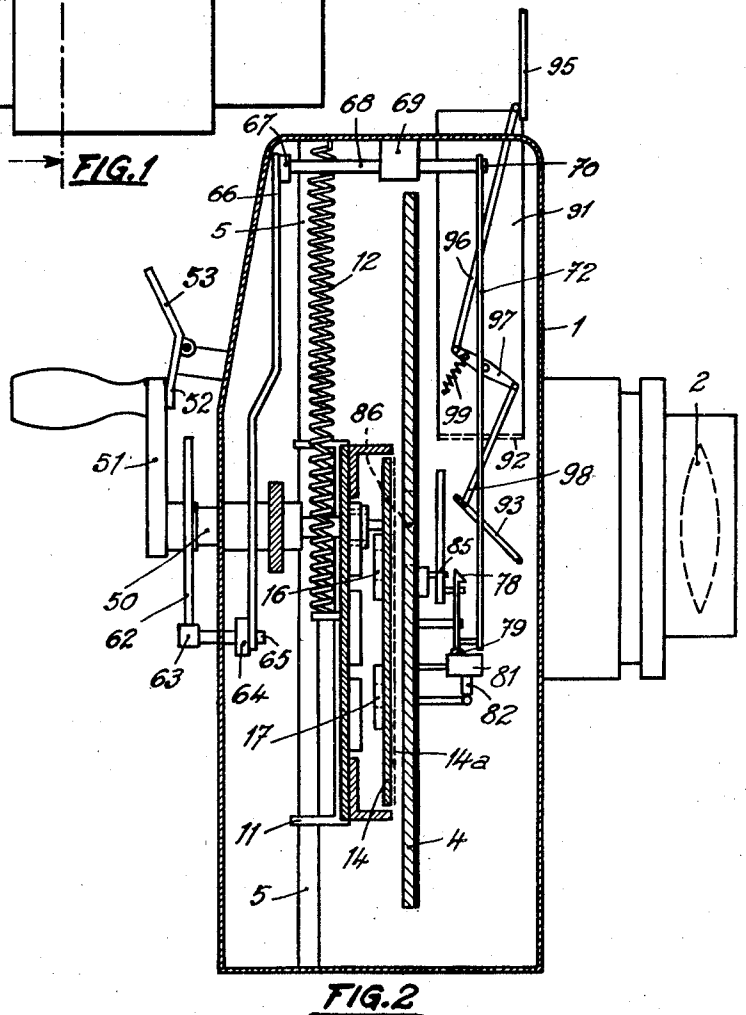



FIG.2

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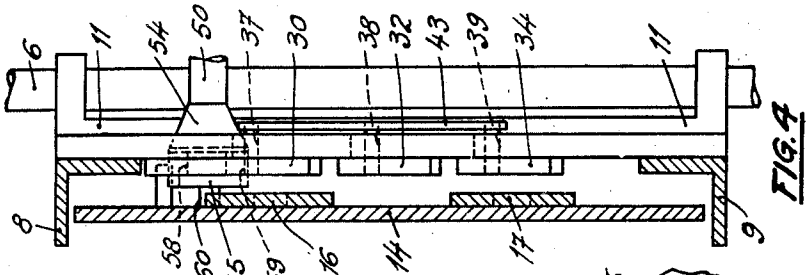


FIG. 4

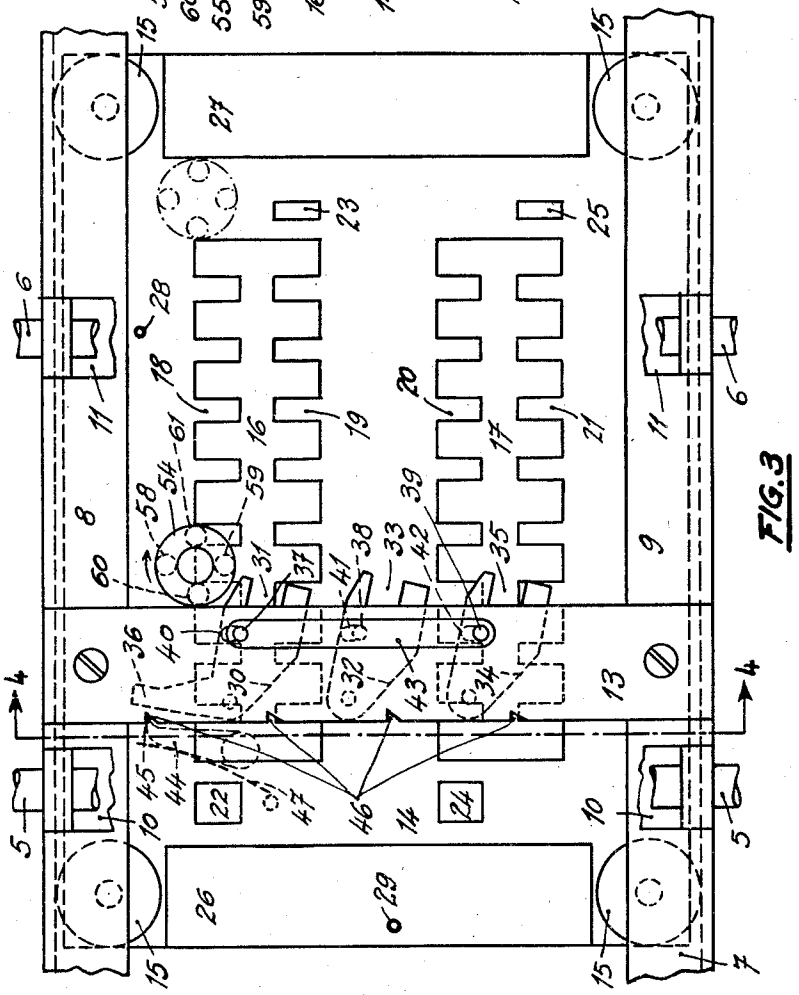


FIG. 3

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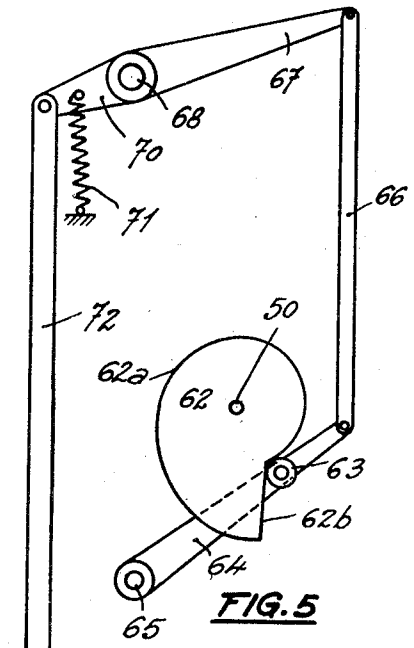
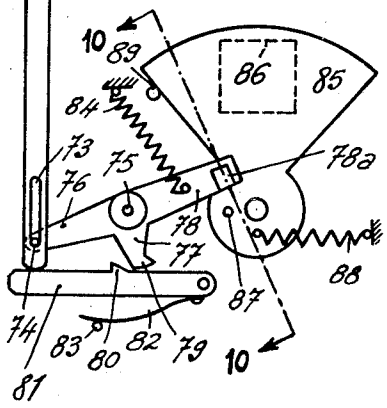



FIG. 5



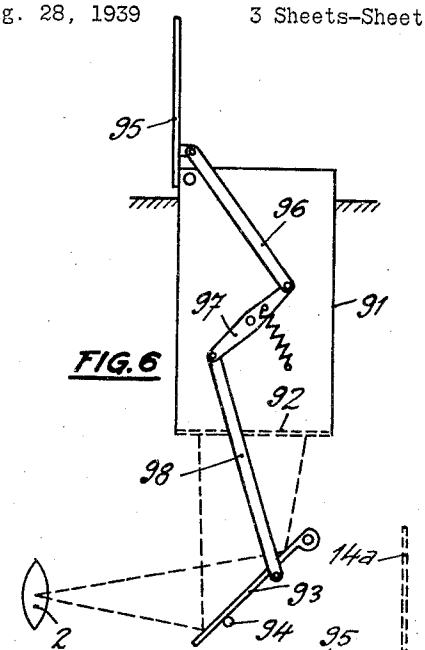




FIG. 6

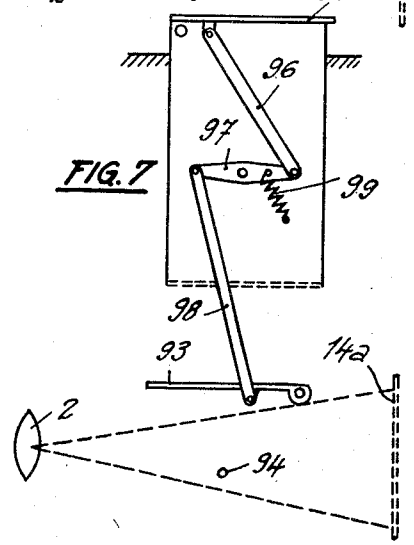



FIG. 7

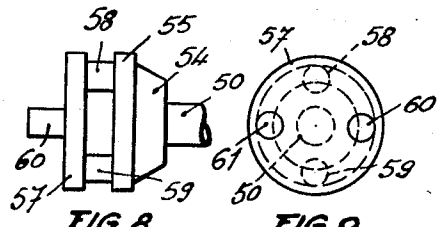



FIG. 8 FIG. 9

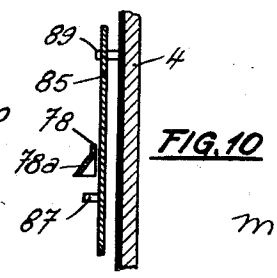



FIG. 10

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Patented Oct. 28, 1941 2,260,561

# UNITED STATES PATENT OFFICE

2,260,561

## PHOTOGRAPHIC APPARATUS

Maurice Cuendet, Renens, Switzerland, assignor of one-half to Alfred Buess, Lausanne, Switzerland

Application August 28, 1939, Serial No. 292,358
In Switzerland September 6, 1938

5 Claims. (Cl. 88—16)

The present invention relates to a photographic apparatus for successive photographs arranged in horizontal rows disposed one above the other on the same sensitive surface. This apparatus comprises a casing supporting a frame disposed in a plane perpendicular to the axis of the objective and capable of vertical motion, and a dark-slide carriage horizontally displaceable within the frame and adapted to carry the sensitive surface.

It is an object of the invention to expose the sensitive surface gradually in the field of the objective and to provide means for so controlling this exposure as to permit all parts of said surface to be exposed only once in a correct sequence.

Another object of the invention is to provide an apparatus with the above mentioned means having few and simple parts which are inexpensive to manufacture and which are durable, reliable and practical in use.

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described in their preferred embodiment, pointed out in the subjoined claims, and illustrated in the annexed drawing, wherein like parts are designated by like reference characters throughout the several views.

In the drawing:

Figure 1 is a front view of the apparatus according to the invention; Figure 2 is an enlarged half-schematic sectional view taken on the line 2—2 of Figure 1; Figure 3 shows in elevation a detail drawn on a larger scale; Fig. 4 is a sectional view taken on the line 4—4 of Figure 3; Figure 5 shows in elevation a second detail drawn on a larger scale; Figure 6 is a similar view of a third detail and Figure 7 a view of the same detail in another position; Figure 8 is a side elevation and Figure 9 a front view of a fourth detail drawn on a larger scale; Figure 10 is a sectional view along the line 10—10 of Figure 5.

The embodiment illustrated comprises a casing 1 upon which is mounted an objective 2 adjustable in the usual manner by the button 3. The casing 1 carries a plate 4 fixed thereto and consisting of a Bakelite plate juxtaposed to a plate of metal such as aluminium for instance. The casing carries also two metal bars 5 and 6 of cylindrical shape which form the guides of a frame 7 movable in the vertical direction and constructed of two parallel angle irons 8 and 9 rigidly connected to each other by the intermediary of flat metal rods 10 and 11. The ends of these rods are bent up at a right angle and traversed by the bars 5 and 6 so as to permit the frame to slide vertically on said bars. A coil spring 12 hooked to the casing and the frame respectively, compensates for the reaction of weight of the movable part. The frame 7 is provided, moreover, with a flat metal bar 13 secured to the angle irons 8 and 9.

Between the angle irons 8 and 9 is disposed a dark-slide carriage constructed of a rectangular metal plate 14 provided with horizontal rollers 15. The plate 14 is guided in its horizontal motion on the frame 7 by these rollers travelling on the angle irons 8 and 9.

The plate 14 carries the sensitive surface 14a (see Fig. 2); it carries further two horizontally disposed racks 16 and 17 (see Fig. 3), said racks being constructed of rectangular metal bands the width of which corresponds to the elementary vertical stroke of the frame 7. The bands are formed on either long side with a straight row of teeth 18, 19 and 20, 21, respectively, and are extended on both ends to form tappets 22, 23, 24 and 25 adjacent the end teeth of said teeth rows, whereby free gaps equal to the interval between two teeth are maintained between the racks and the tappets. The plate 14 is further provided with bands 26 and 27 and with pins 28 and 29.

Three pawls 30, 32 and 34 are pivoted to the metal bar 13 on the back side thereof, and are each provided with a notch 31, 33 and 35, respectively; the pawl 30 is extended by an arm 36 set approximately at a right angle to the pawl. The pawls are also provided with a pin 37, 38 and 39, respectively, fixed thereto and engaging with the grooves 40, 41 and 42, respectively, of the bar 13. The pins 37 and 39 are extended through the respective grooves 40 and 42, respectively, to project from the front side of the bar 13 for engaging a link 43 coupling the pawls 30 and 34.

The pawls 30, 32, and 34 on the frame and the pins 28 and 29 on the dark slide carriage constitute the means which permit of setting said frame to undergo a predetermined vertical displacement as will later appear, said pawls being also adapted to control said vertical displacement of the frame in cooperation with an operating device which will be hereinafter fully described.

A pawl 44 pivotally mounted on the casing and subjected to the action of a spring 47 cooperates with notches 46 of the bar 13 so as to permit the frame to be raised and held against down movement. This pawl can be released by hand

by the intermediary of an exterior pusher 100 (see Fig. 1), for lowering the frame in a sole descent.

A shaft 50 rotatably mounted on the back part of the casing and extending therethrough carries on its outside portion a handle 51 which can be held in the position shown in Figure 2 by the engagement of its finger 52 with an arresting lever 53. The inside portion of the shaft 50 carries two plates 55 and 57 between which are fixed two pins 58 and 59 disposed on opposite extremities of a diameter and adapted to cooperate with the pawls 30, 32 and 34; two more pins 60 and 61 are fixed to the plate 57 and disposed on opposite extremities of a diameter set at a right angle to the diameter of pins 58 and 59, and said pins 60 and 61 cooperate with the teeth rows 18, 19, 20 and 21.

The shaft 50 carries on its outside portion (Figure 2) also a cam 62 having a curvilinear portion 62*a* and a flank 62*b* (Figure 5); a roller 63 mounted on a lever 64 bears constantly upon the cam; the lever 64 is connected to a rod 72 by means of an articulated system 66 to 70 subjected to the action of a spring 71; this rod is provided with a slot 73 engaging a pin 74 of an elastic blade 75 pivotally mounted on the plate 4 and having three arms 76, 77 and 78, the pin 74 being fixed to the arm 76. The arm 77 is provided with a nose 79 cooperating with a peg 80 of a revolving lever 81 which is constantly urged upwards by a plate spring 82 resting on a pin 83. The end of said lever cooperates with the rod 72. The arm 78 affords a hollow ground inclined projection 78*a* and its end is cut out round to conform to the arc of a circle the centre of which coincides with the pivot of the blade 75.

The blade 75 is subjected to the action of a spring 84 tending to turn said blade in counterclockwise direction (Figure 5).

Upon the plate 4 is rotatably mounted a shutter 85 constructed to form a sector of a circle and adapted to close an aperture 86 of the plate. This aperture has its center on the axis of the objective, and its dimensions determine the size of the image wanted. The shutter 85 is provided with a pin 87 and subjected to the action of a spring 88 which constantly tends to place said shutter in front of the aperture 86 where it abuts against a pin 89 of the plate 4. In this position of the shutter, the pin 87 is placed on the path travelled over by the projection 78*a* upon turning of the blade 75.

In the casing (see Figures 6 and 7) is fixed a vertical tube 91 the axis of which cuts the axis of the objective. This tube is closed on the top by a pivotally mounted cover 95 and at the bottom by an opal glass 92. The cover is connected to a rotatable mirror 93 by the intermediary of an articulated device 96, 97 and 98 pivotally mounted on the tube wall and subjected to the action of a spring 99. In the closed position of the cover (Figure 7), the mirror is beyond the field of the objective, while when the cover is open (Figure 6), said mirror is placed in said field whereby it abuts the pin 94 and assumes a position inclined at an angle of 45°, and whereby its center coincides with the point of intersection of the axes of the objective and the tube.

This apparatus operates in the following manner:

At starting the organs of the apparatus may be in the position shown in Figure 3 whereby the sensitive surface 14*a* is ready for the third photograph of the first horizontal row. The handle 51 may be turned in the direction of the arrow (Figure 3); the pin 61 then pushes the rack 16 from the right to the left; as soon as the handle has effected half a revolution the opposite pin 60 meshes with the rack which continues its travel during the other half of the revolution; after a complete revolution of the handle, the dark-slide carriage has travelled to the left over a distance equal to twice the tooth pitch of the rack and corresponding to the distance between the centers of two successive images, and the sensitive surface has assumed a position in which it exposes a novel plot of image to the objective. When the handle has effected a complete revolution it will be in the raised position shown in Figure 2 whereby its finger 52 engages with the arresting lever 53 so as to lock the handle; it can be turned farther when pressing on the lever 53.

The handle when being turned, drives the cam 62; the roller 63 which started from the position shown in Figure 5, removes more and more from the center of the cam 62 and turns the blade 75 against the action of the spring 84 by the intermediary of the articulated system 66 to 74.

The arm 78 comes upon the pin 87 which will slide along the inclined plane of the projection 78*a* (see Figure 10) and repel the elastic arm 78 of the blade; this arm thus travels on the pin without acting upon the shutter, and upon reaching the end of its travel on said pin falls thereoff by reason of its elasticity and assumes a position beneath said pin. The nose 79 engages the peg 80 of the revolving lever 81 which by reason of its spring has followed the rod 72. The shutter has thus been loaded.

After a complete revolution of the handle, the roller 63 sliding along the flank 62*b* falls towards the center of the cam 62. This motion is imparted to the articulated system 66 to 70 which begins to turn while subjected to the action of the spring 71; the rod 72 then descends and acts upon the lever 81 the peg of which will release the nose 79. The blade 75 acted upon by the spring 84 turns and drives with its arm 78 the pin 87 and the shutter 85 against the spring 88 so as to unmask the aperture 86. The relative movement of the shutter and the blade 75 has displaced the pin 87 which slides on the arm 78 to the end of this arm; owing to the circular circumference of the end of the arm 78, the center of which coincides with the pivot of the blade 75, the shutter will be held fully open during the sliding motion of the pin 87; as soon as this pin gets off the arm 78, the spring 88 briskly returns the shutter to the pin 89 and the aperture 86 will be closed.

The exposing time of the shutter thus depends on the velocity of displacement of the blade 75 and on the width of its arm 78.

The shutter control is thus rendered automatic and the opening of the shutter occurs only when the sensitive surface is set immovable in the new position.

When the handle turns farther around, it gradually displaces the dark-slide carriage step by step over the whole length of a horizontal row of photographs. At the end of this travel the pins 60 and 61 assume the position shown in dot and dash lines in Figure 3; the pin 28 will contact with the arm 36 of the pawl 30 and tip said pawl so as to bring the notch 31 into engagement with the pin 59; the pin 37 then abuts the top of the groove 40, and a further revolution of the handle will raise the frame sliding on the bars 5 and 6 and place a new plot of the sensitive surface in the field of the objective; the first photograph of

the second horizontal row is then ready for exposure. The pins **60** and **61** have now reached the level of the teeth row **19** and engage therewith so as to cause the dark-slide carriage to travel over the second horizontal row of photographs.

At the end of the second row the pin **29** acts upon the pawl **32** and tips the same so as to bring the pin **59** into engagement with its notch; upon a further revolution of the handle, the frame will be raised another step so as to enable the pins **60** and **61** to engage with the teeth row **20** for displacing the dark-slide carriage on the third horizontal row of photographs. At the end of this row the pin **28** tips the pawl **30** which by means of the link **43** drives the pawl **34**, whereby the notch **35** of the latter reaches the pin **59** and engages therewith so as to raise the frame a further step upon operation of the handle; the teeth row **21** is then opposite the pins **60** and **61** and the dark-slide carriage can travel over the fourth horizontal row of photographs.

The diameter of the pins **60** and **61** being equal to the distance between two teeth of a teeth row, the horizontal motion of the dark-slide carriage is locked in every end position. Also the vertical descent of the frame is prevented by the pawl **44**.

The view finder, the movable mirror of which is positioned between the objective and the shutter, affords a controlling of the focussing between successive snapshots without provoking the exposure of the sensitive surface.

The above described embodiment is made for twenty-four photographs arranged in four horizontal rows of six photographs. Obviously, the mechanism could also be constructed to allow for twelve successive images arranged in two rows of six images. This mechanism would comprise only one rectangular metal band as at **16** provided with teeth as at **18** and **19**, the width of this band being again equal to the distance between two horizontal rows of photographs as is the case in the embodiment described. Furthermore, the means for setting the frame to undergo a predetermined vertical displacement would comprise but one pawl on the frame such as **30** and one pin on the carriage such as **28**.

The arrangements referred to above present several advantages: The construction is strong, simple and of little space, and reduces to a minimum the number of parts employed; it is consequently of reduced weight and inexpensive to manufacture. Besides, it will be appreciated that the simplicity of the displacing mechanism of the sensitive surface guarantees great accuracy of operation.

I claim:

1. A photographic apparatus for successive photographs arranged in horizontal rows disposed one above the other in the same sensitized surface, in combination a casing provided with an objective and carrying vertical guide bars, a frame mounted to slide on said casing along said guide bars in a plane perpendicular to the axis of said objective, horizontally disposed guides carried by said frame, a dark-slide carriage carrying the sensitized surface and being displaceable on said guides for effecting a horizontal step-by-step movement in said plane, horizontally disposed racks secured to said carriage and having teeth on either long side so as to form a series of straight rows of teeth equal in number to the horizontal rows of photographs on the sensitized surface, the distance between two successive rows of teeth being equal to the distance between the center lines of two successive horizontal rows of photographs, and the tooth pitch of each row of teeth being equal to half the distance between the centers of two successive images of a horizontal row of photographs, means for setting said frame to undergo a predetermined vertical displacement, said means comprising at least a pawl mounted on said frame and at least a pin fixed to said carriage and adapted to cooperate with said pawl, and an operating device adapted to cooperate, on the one hand, with the rows of teeth of said racks for the horizontal step-by-step movement of said carriage and, on the other hand, with said pawl for the vertical displacement of said frame over a distance equal to the distance between two successive rows of teeth when said carriage has travelled over a horizontal row of photographs.

2. A photographic apparatus for successive photographs arranged in horizontal rows disposed one above the other in the same sensitized surface, in combination a casing provided with an objective and carrying vertical guide bars, a frame mounted to slide on said casing along said guide bars in a plane perpendicular to the axis of said objective, horizontally disposed guides carried by said frame, a dark-slide carriage carrying the sensitized surface and being displaceable on said guides for effecting a horizontal step-by-step movement in said plane, horizontally disposed racks secured to said carriage and having teeth on either long side so as to form a series of straight rows of teeth equal in number to the horizontal rows of photographs on the sensitized surface, the distance between two successive rows of teeth being equal to the distance between the center lines of two successive horizontal rows of photographs, and the tooth pitch of each row of teeth being equal to half the distance between the centers of two successive images of a horizontal row of photographs, means for setting said frame to undergo a predetermined vertical displacement, said means comprising at least a pawl mounted on said frame and at least a pin fixed to said carriage and adapted to cooperate with said pawl, an operating device adapted to cooperate, on the one hand, with the rows of teeth of said racks for the horizontal step-by-step movement of said carriage and, on the other hand, with said pawl for the vertical displacement of said frame over a distance equal to the distance between two successive rows of teeth when said carriage has travelled over a horizontal row of photographs, an opaque plate mounted on the casing perpendicularly to the axis of the objective and having an aperture at the intersection of its plane with said axis, a shutter rotatably mounted on said plate and adapted to mask said aperture, a spring acting upon said shutter to hold the same in masking position, a cam fixed to the operating device, a movement transmitting device comprising a lever arrangement adapted to cooperate, on the one hand, with said cam and, on the other hand, with said shutter, whereby at the end of a revolution effected by said operating device, the said cam automatically causes said shutter to unmask said aperture during a lapse of time determined by the size and speed of motion of one of the levers of said movement transmitting device.

3. A photographic apparatus for successive photographs arranged in horizontal rows disposed

one above the other in the same sensitized surface, in combination a casing provided with an objective and carrying vertical guide bars, a frame mounted to slide on said casing along said guide bars in a plane perpendicular to the axis of said objective, horizontally disposed guides carried by said frame, a dark-slide carriage carrying the sensitized surface and being displaceable on said guides for effecting a horizontal step-by-step movement in said plane, horizontally disposed racks secured to said carriage and having teeth on either long side so as to form a series of straight rows of teeth equal in number to the horizontal rows of photographs on the sensitized surface, the distance between two successive rows of teeth being equal to the distance between the center lines of two successive horizontal rows of photographs, and the tooth pitch of each row of teeth being equal to half the distance between the centers of two successive images of a horizontal row of photographs, means for setting said frame to undergo a predetermined vertical displacement, said means comprising at least a pawl pivotally mounted on said frame and at least a pin fixed to said carriage and adapted to cooperate with said pawl, an operating device adapted to cooperate, on the one hand, with the rows of teeth of said racks for the horizontal step-by-step movement of said carriage and, on the other hand, with said pawl for the vertical displacement of said frame over a distance equal to the distance between two successive rows of teeth when said carriage has travelled over a horizontal row of photographs, an opaque plate mounted on the casing perpendicularly to the axis of the objective and having an aperture at the intersection of its plane with said axis, a shutter rotatably mounted on said plate and adapted to mask said aperture, a pin on said shutter, a spring acting upon said shutter to hold the same in masking position, a cam fixed to the operating device, a movement transmitting device formed of a lever arrangement cooperating with said cam and of a rod operatively connected at one end to said lever arrangement and presenting a slot at its other end, an elastic lever or blade pivotally mounted on the opaque plate, said blade being deformable in the direction perpendicular to its plane and constructed to provide arms, one of said arms having a pin adapted to engage the slot of said rod whereby said rod and blade are rendered fast to each other upon displacement of said rod in one direction and are free with respect to each other upon displacement of said rod in the opposite direction, and another of said arms of the blade being adapted to cooperate with the pin of the shutter so as to remove said shutter upon pivoting said blade in one direction, while when said blade is pivoted in the opposite direction said arm will be deformed on said pin so as to slide thereover without acting upon the shutter, and a spring fixed at one end to the opaque plate and at the other end to said blade so as to constantly force said blade to turn in the direction in which it entrains the shutter.

4. A photographic apparatus as claimed in claim 1, wherein the operating device comprises inside the casing an organ having two pairs of pins, the pins of each pair being disposed on the extremities of a diameter whereby said diameters cross each other at right angles, said pairs of pins being further arranged to lag with respect to each other in the direction of the axis of the device so as to enable one pair to engage the rows of teeth for the horizontal displacement of the carriage while enabling the other pair to engage said pawl for the vertical displacement of the frame when said carriage has travelled over a horizontal row of photographs.

5. Photographic apparatus as claimed in claim 1 having a pawl mounted on a shaft rotatable within said casing and presenting outside said casing an operating button, said pawl being provided with a nose adapted to engage with notches formed in the frame and spaced uniformly apart at distances equal to the distance between the center lines of two successive horizontal rows of photographs, said pawl being subjected to the action of a spring fixed to the frame and tending to bring the nose of the pawl into engagement with said notches so as to prevent said frame after its vertical displacement from descending under the action of its weight, whereby upon operating the shaft of said pawl the latter may be released from engagement with said notches for lowering the frame to its initial position in a sole descent.

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