

Jan. 12, 1943.

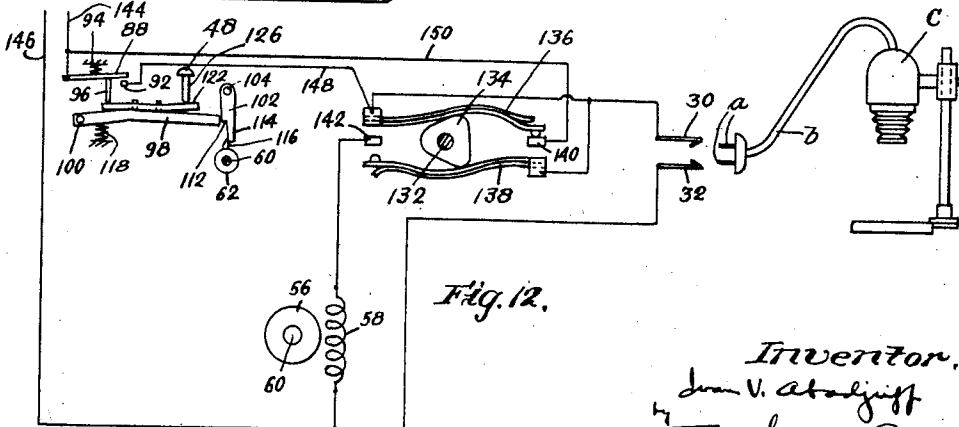
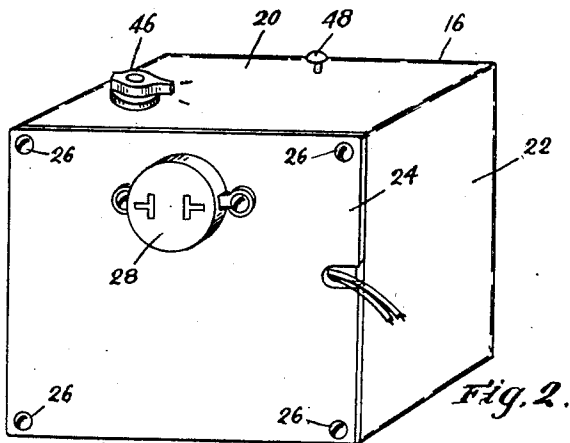
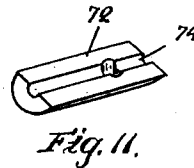
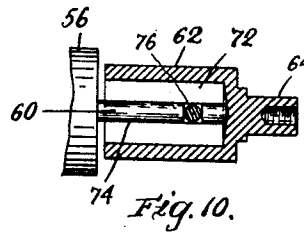
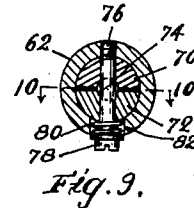
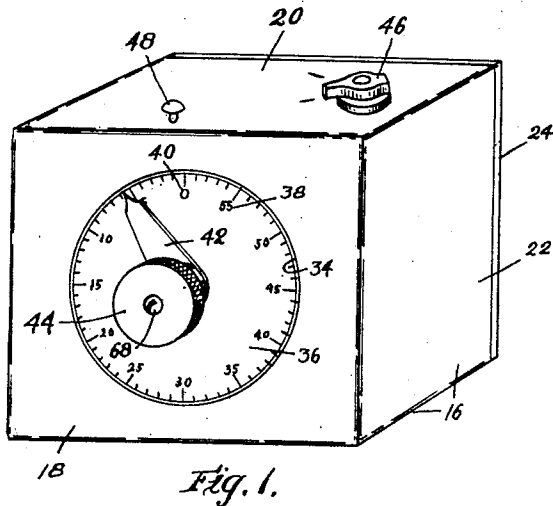
I. V. ABADJIEFF

2,308,037

INTERVAL TIMER

Filed Jan. 20, 1939

3 Sheets-Sheet 1



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[Signature]

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INTERVAL TIMER

Filed Jan. 20, 1939

3 Sheets-Sheet 2

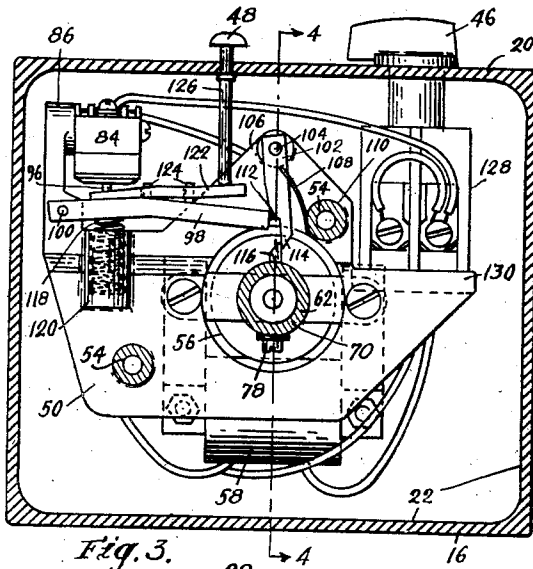


Fig. 3.

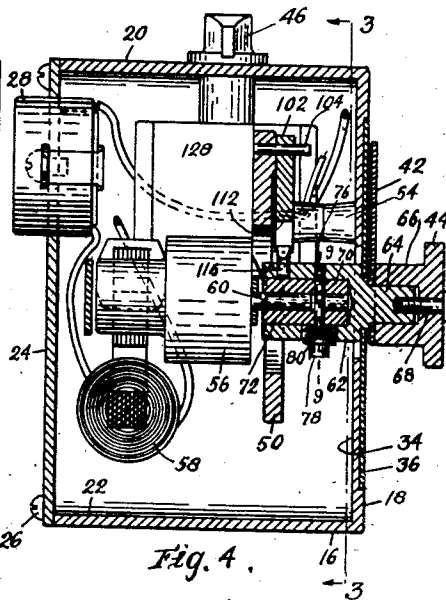


Fig. 4.

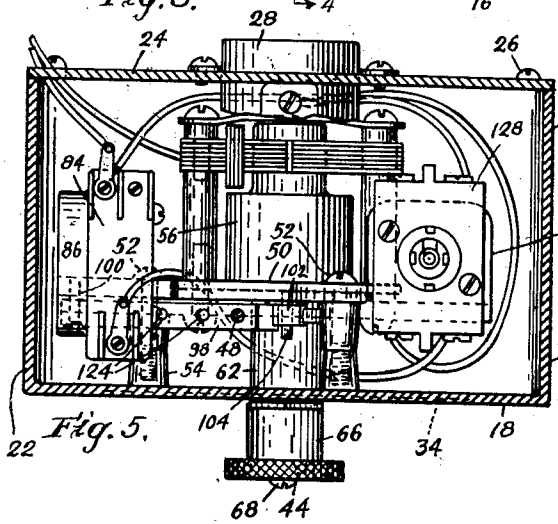


Fig. 5.

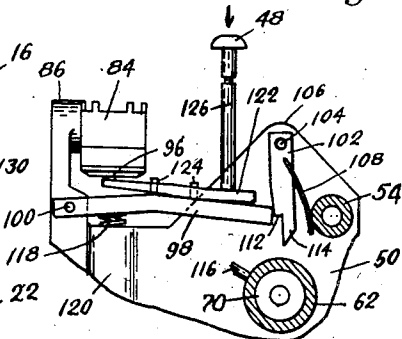


Fig. 6.

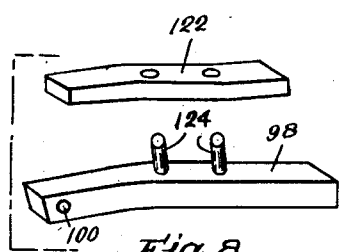


Fig. 8.

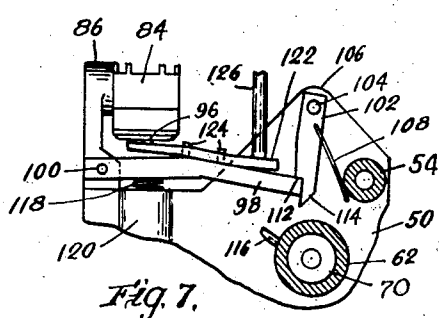


Fig. 7.

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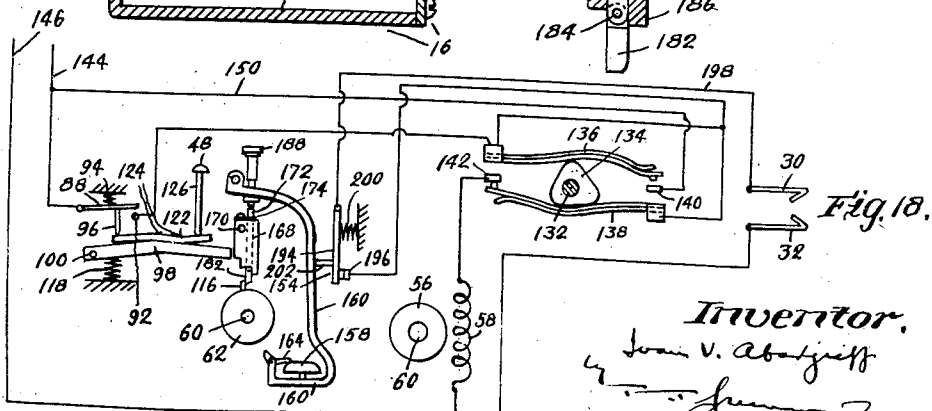
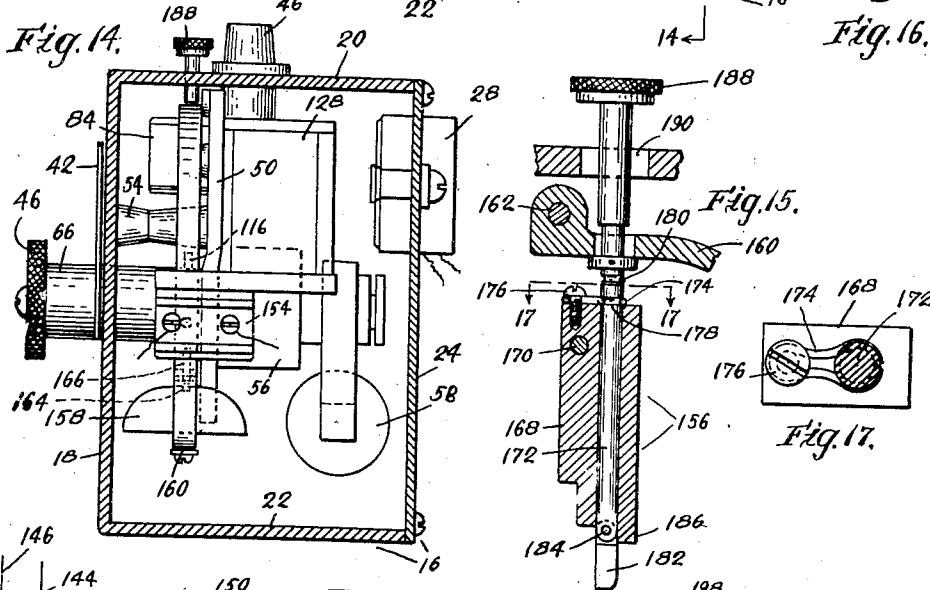
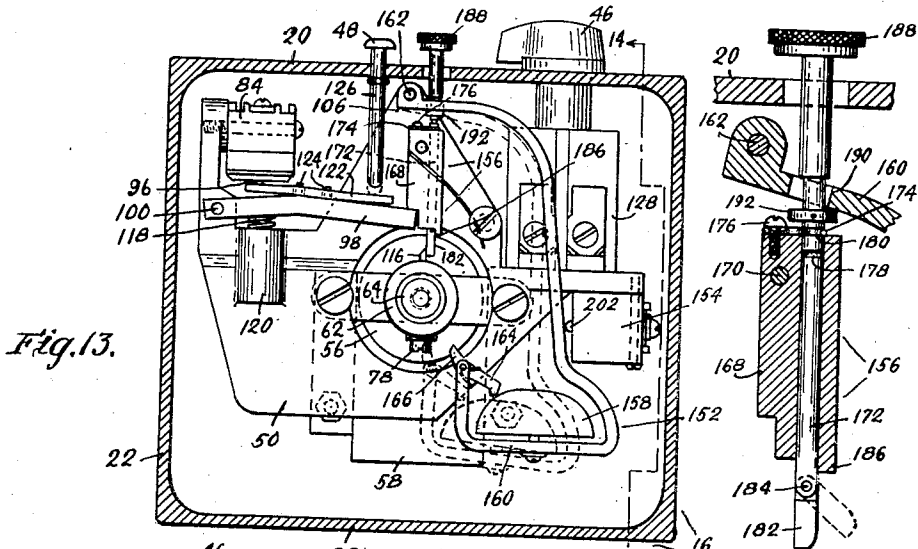
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2,308,037

INTERVAL TIMER

Filed Jan. 20, 1939

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,308,037

INTERVAL TIMER

Ivan V. Abadjieff, Worcester, Mass.

Application January 20, 1939, Serial No. 252,609

20 Claims. (Cl. 161—23)

This invention relates to time controlled electric switch mechanisms so arranged as to open or otherwise control an electric circuit following a predetermined time interval, which can be varied, after the initial closing or other control of the circuit and is particularly intended for photographic purposes to automatically control the amount of exposure of a light sensitive paper or surface to the printing light.

One of the objects of the present invention is the provision of an interval timer having an indicator movable over a time indicating scale and adapted to be adjusted to any selected part of the scale to adjust circuit controlling mechanism to open or otherwise control a circuit upon the expiration of the time indicated by the setting of the indicator.

A further object of the invention is the provision of an interval timer having means for setting the mechanism to effect a control of the associated circuit at the expiration of the period of time for which the device may be set, and means for effecting an initial control of the circuit and the initiation of operation of the device.

Another object of the invention is the provision of an interval timer having a circuit controlling switch, time governed mechanism for controlling the opening of the switch, and manual means for effecting the closing of the switch and the start of operation of the time control mechanism.

The interval timer of the present invention includes a normally closed circuit controlling switch, an operating arm constantly biased for movement in a direction to open the switch, a latch operative to hold the arm from such movement, a constant speed motor for operating the latch to release the arm and effect circuit opening movement of the switch, and manually operated setting mechanism for effecting the latching of the arm while maintaining the switch open. Such construction comprises an object of the present invention.

A further object of the invention is the provision of an interval timer in which the time interval as determined by the setting of the device cannot in effect be modified by the manner of starting the device in operation. That is to say, the device is started in operation by the depression and subsequent release of a manually depressible member, and not merely by the depression alone of the member. Hence it is not possible to cause the device to over run, or the printing light to be energized for more than the time setting of the device by holding the starting member depressed. This arrangement constitutes a further object of the invention.

Another object of the invention is the provision of an interval timer so arranged that the print exposure light circuit can be energized manually

for focusing and other purpose and at such time the interval timer is automatically rendered inoperative.

A photographic print, after having been exposed for a proper interval of time, is well adapted for timed development. Hence a further object of the present invention is the provision of an interval timer for exposure control also so constructed and arranged as to be useful for timing the development of the print and, specifically, to give out a signal following the expiration of a selected time interval.

Another object of the invention is the provision of an interval timer arranged to emit a signal at predetermined intervals, the first signal at the expiration of a time period that, with proper print exposure, should indicate the first showing of the image being developed, and the second signal at the end of a time interval representing the completion of print development.

A yet further object is the provision of an interval timer having switch mechanism controlling a print-exposure circuit and development-signaling mechanism having other switch mechanism for rendering inoperative the effective control of the circuit by the first switch mechanism.

A further object is generally to improve the construction and operation of interval timers.

Fig. 1 is a perspective front view of the interval timer of the present invention.

Fig. 2 is a perspective rear view of the timer.

Fig. 3 is a front elevation of the operating mechanism on a section taken along the line 3—3 of Fig. 4 of the enclosing casing.

Fig. 4 is a section taken along line 4—4 of Fig. 3.

Fig. 5 is a plan view of the mechanism of Figs. 3 and 4.

Fig. 6 is a detail view similar to Fig. 3 of the switch controlling mechanism illustrating the means for maintaining the switch open during the latching of the mechanism.

Fig. 7 is a detail similar to Fig. 6 but illustrating the mechanism in latched condition with the switch still open.

Fig. 8 is a perspective detail of the double switch controlling lever.

Fig. 9 is a section taken along line 9—9 of Fig. 4, and illustrating the clutch mechanism between the motor drive shaft and the time setting sleeve.

Fig. 10 is an enlarged longitudinal section taken along line 10—10 of Fig. 9.

Fig. 11 is a perspective view of one of the clutch members.

Fig. 12 is a diagram of the electric circuits of the device of Figs. 1 through 12.

Fig. 13 is a sectional elevation similar to Fig. 3, but illustrating a modified form of the invention adapted both to print exposure and development timing.

Fig. 14 is a sectional elevation taken along line 14—14 of Fig. 13.

Fig. 15 is an enlarged sectional detail of the latch and bell control mechanism of Fig. 13 in the position of the parts wherein the bell signal mechanism is in an unoperated position.

Fig. 16 is a detail of the parts of Fig. 15 in the position for operation of the bell signal mechanism.

Fig. 17 is a section of the rod-holding mechanism of Fig. 15 taken along line 17—17 of Fig. 15.

Fig. 18 is a diagram of the electric circuits of the modification of Fig. 13.

The interval timer embodying the present invention, and as illustrated in Figs. 1 through 12, comprises a casing 16 having a front wall 18 and integral therewith a top wall 20 and side and bottom walls 22. The casing is open at the rear end and is closed by a back plate 24 secured removably to the casing by screws 26. The back plate is provided with an outlet socket 28 having contacts 30 and 32, see Fig. 12, which are adapted to receive the plug terminals *a* of the electric light circuit *b* of the photographic enlarger or other printing device *c*.

The front plate 18 is provided with a circular recess 34 in which a circular dial 36 is fixed, the dial being graduated in time intervals 38 distributed in counter-clockwise fashion around the periphery of the dial starting from a vertical zero mark 40. An indicator or pointer 42 is movable over the face of the dial by a knob 44 and can be positioned to register with any selected time mark on the dial by rotation of the knob. A manually operated switch knob 46 projects above the top wall 20 of the casing and is movable into one position where the timing mechanism circuit is de-energized and the enlarger circuit is closed to illuminate the lamp of the enlarger for focusing and other purposes. The knob 45 is also movable in an opposite direction into a second position where the light circuit is shifted to the control of the timing mechanism and is opened until closed by the operation of the timing mechanism. A starting knob or button 48 also projects through and above the top wall 20 and controls the starting of the timing mechanism.

The elements of the timing mechanism are carried by a bracket plate 50 secured by screws 52 detachably to the inwardly projecting lugs 54 of the front wall 18 of the casing. The bracket plate on its rear face supports a constant speed motor 56 which can be a self-starting synchronous motor having the energizing winding 58 and the operating shaft 60 which in this instance rotates at a speed to make one complete revolution per minute. The shaft 60 is co-axial with the dial and projects forwardly and loosely through the supporting plate 50 and into a sleeve 62 which has a reduced end portion 64 that projects loosely through the front plate and the dial thereon and into the hub 66 of the knob 44 and is fixed removably to the knob by the screw 68.

The shaft 60 is frictionally clutched to the sleeve 62 by a pair of half-bushing clutch members 70 and 72 which are located within the axial recess of the sleeve 62 and have cooperating semi-circular axially disposed recesses 74 that surround the motor shaft 60. A screw 76 passes loosely through the bushing members and is screw-threaded into the sleeve thereby establishing a driving connection between the bushing members and the sleeve. The screw has an enlarged head 78 which presses a helical spring 80 contained in a spring recess 82 of the sleeve against

one of the bushing members thereby to press the bushing members in frictional driving engagement with the motor shaft. The frictional engagement is sufficient to cause the sleeve and the associated pointer 42 to rotate in unison with the motor shaft although the pointer can be moved over the cooperating time scale manually without rotating the motor shaft.

The motor controls a circuit controlling switch contained within an enclosing casing 84 secured to an upstanding ear 86 of the supporting plate 50 at one side thereof and above the horizontal line of the motor shaft. The switch, shown diagrammatically in Fig. 12, comprises, in effect, a movable switch member 88 and a cooperating stationary switch member 92. The two switch members are normally held in engagement or in circuit closed position by suitable spring means illustrated by the compression spring 94. Opening and closing movements of the switch are effected by a pin 96 which projects downwardly through the casing 84.

The mechanism for operating the switch comprises an operating lever 98 located under the pin 96 and pivoted at one end on a pin 100 carried by the ear 86. The free end of the lever 98 extends toward the motor shaft and cooperates with a vertical latch member 102 pivoted at 104 to an upstanding ear 106 of the supporting plate 50. The latch member is urged toward the lever 98 by a spring finger 108 carried by the latch member and bearing against a boss 110 of the supporting plate.

The latch member is provided with a shoulder 112 which is adapted to overlie the end of the lever 98 in the latched position of the lever, see Fig. 7. The latch member also has a projection 114 which extends downwardly toward the motor shaft and is adapted to cooperate with a trip pin 116 carried by and projecting laterally from the sleeve 62. Since the latch pin is carried by the sleeve 62 it is displaced in the counter-clockwise direction away from the latch member when the indicator 42 is set for some time period of operation of the device and when the motor shaft rotates the pin is moved toward the latch lever and ultimately engages it and presses it in a direction to release the lever 98. The pin and the time indicator 42 are intended to be so positioned relatively to each other that the pin engages and depresses the latch member at the expiration of the time interval determined by the setting of the indicator.

The lever 98 is urged constantly upwardly toward the control switch 84 and the operating pin 96 thereof by a compression spring 118 located in a socket 120 of the supporting plate. Thus when the lever 98 is latched the pin is free from pressure and the control switch is consequently closed. The lever 98 is latched manually by the aforesaid button 48 but the control switch is not desired to be closed until after the lever is latched and pressure is removed from the button.

To effect this result a supplemental lever 122 is positioned upon the upper face of the lever 98 and is pivotally connected therewith by pins 124 which are secured in the lever 98 in spaced relation along the length of the lever and are located loosely in holes in the supplemental lever 122. That end of the supplemental lever nearest the latch member is located under the stem 126 of the button 48 while the other end of the lever is located under and in engagement

with the switch pin 96 and also bears normally on the lever 98.

With this arrangement, when the lever 98 is unlatched, the spring 118 presses the two levers against the switch pin 96 and holds the switch in circuit open position against its bias towards closing. When the button 48 is depressed to effect the latching of the lever 98 the pressure of the button on the supplemental lever 122 causes said lever to rock on the main lever 98 so that its pin engaging end maintains pressure on the pin to keep the switch open while an intermediate part of the supplemental lever bears on the main lever to move it downwardly and effect its latching engagement with the latch member 102. When, however, pressure is removed from the button 48 the restraint on the switch is removed and hence the switch automatically closes. This operation of the two levers is illustrated in Figs. 6 and 7. In Fig. 6 the main lever 98 has moved part way toward a latched position but the switch is still held open by the supplemental lever. In Fig. 7 the main lever is shown as engaged by the latch but pressure is still on the button 48 and hence the control switch is still maintained open.

The energizing coil 58 of the timing motor is controlled by the switch 84, as is illustrated in Fig. 12, and the closing of the switch causes the concurrent energization of the motor and the energization of the lamp circuit of the enlarger so that the timer starts in operation concurrently with the illumination of the enlarger and operates to open the enlarger circuit and also to effect the de-energization of the timing motor at the expiration of the period of time for which the device has been set.

The switch knob 46 controls a pair of switches contained in a casing 128 supported on a shelf 130 of the supporting plate 50 on the side thereof opposite the circuit controlling switch 34. The switches are so arranged that one of them is closed while the other is open and the closing of either one effects the opening of the other switch. The knob 46 controls a switch operating shaft 132, see Fig. 12, having an insulating cam member 134 thereon which operates the movable switch members 136 and 138 of the two switches, the switch members cooperating with fixed contacts 140 and 142, respectively. The cam is so arranged that it is held releasably in either one of its two positions. In one position it holds the movable switch member 138 in open circuit position and permits the other switch member 136 to be in closed position. On rotation of the cam in the opposite or counter-clockwise direction, Fig. 12, the movable switch member 136 is caused to be moved into open position while the other switch member 138 is permitted to move into closed position. The two movable switch members are constantly biased for movement in a closed position. The movable switch member 138 controls the motor winding 58 and is in series with the circuit controlling switch 34. The other movable switch member 136 controls the energization of the enlarger lamp circuit to permit the operation of the lamp at the time the timer is inoperative.

The electric power enters the timer through the circuit conductors 144 and 146. The conductor 144 is connected directly to one of the terminals of the timer controlled switch 84, as, for instance, to the movable switch member 88. The other conductor is connected directly to one terminal of the motor winding 58 and also to

one terminal 32 of the lamp circuit. The other terminal of the timer controlled switch 84, as its fixed contact member 92, is connected through a conductor 148 with the movable switch member 136 while the associated fixed contact member 140 is connected through a conductor 150 with the other terminal or movable switch member 88 of the timer controlled switch. The switch members 136 and 140 are thus in shunt with the timer switch members. Thus when the timer is unoperated and the timer controlled switch 84 is consequently open, the enlarger lamp can be illuminated by closing the switch contacts 136, 140. At the same time the switch contacts 138, 142 are separated so that the timer motor cannot operate. The timer is conditioned for operation by reversing the position of the cam 134 so that the contacts 138, 142 are closed and the contacts 136, 140 are opened. The motor winding 58 is thus placed in series with the timer controlled switch 84 and when this switch is closed by the release of the button 48 following the latching of the operating lever 98 it effects the operation of the motor and also the energization of the enlarger lamp.

If for any reason it is found desirable to interrupt the operation of the enlarger at some point during the time interval this can be done by depressing the button 48 and holding it depressed. This de-energizes both the timing motor and the enlarger circuit. When the button is released the timer will again operate to energize the enlarger circuit for the remaining period of time for which the timer has been set.

The arrangement of the switches is also such that following the operation of the timer if the operative believes that the setting of the timer has been incorrect and that an insufficient exposure has been given he can either reset the timer for a second operation at some selected time interval or he can turn on the manually controlled switch for some estimated period of time.

A properly exposed print is well adapted for timed development. Hence mechanism illustrated in Figs. 13 et seq. is herein provided for timing both the exposure of the print and the development thereof. The mechanism illustrated in these figures is essentially the same as heretofore described with the addition of an audible signalling device 152, an additional control switch 154 for the circuit of the enlarger, and a somewhat different latch mechanism.

The audible signalling mechanism includes a bell 153 supported upon a frame 160 pivoted at 162 to the upper part of the upstanding ear 106 of the supporting plate 50. The frame 160 is provided with a pivoted bell striker 164 having a projection 166 adapted when the frame is in the dotted line position illustrated in Fig. 13 to be engaged and subsequently released by the trip pin 116, thereby to sound the bell.

For the purpose of sounding the bell the trip pin is permitted to be rotated beyond the zero or latch engaging position of the mechanism of Fig. 3. For this purpose the latch mechanism 156 includes a latch block 168 pivoted at 170 to the ear 106 of the supporting frame and depending below the pivot pin and adapted to releasably engage the switch operating lever 98 as heretofore. A rod 172 is slidable vertically in said block 168 and is held yieldingly in either one of two vertically displaced positions by a spring clip 174 secured to the block 168 by a screw 176 and releasably entering annular

grooves 178, 180 of the rod. A latch finger 182 is pivoted at 184 to the lower end of the rod. The latch block 168 has a projection 186 which when the rod is elevated into the position illustrated in Figs. 13 and 15 is disposed behind and below the pivot or hinge joint 184 and thus prevents the turning of the latch finger about its pivot. The latch finger is disposed in the path of rotation of the trip pin 116. Thus when the rod 172 is in its elevated position so that the latch finger cannot move about its pivot the trip pin can engage the latch finger and swing the block 168 about its pivot and thereby effect the release of the switch lever 98 and the opening of the enlarger circuit in the manner explained heretofore. When, however, the rod 172 is in its depressed or lower position the pivot point 184 for the latch finger 182 is below the end of the projection 186 and consequently the latch finger can pivot and permit the trip pin 116 to swing by the latch block without releasing the block 168 from its hold on the switch lever 98.

The depressed position of the rod 172 is the position which sets the mechanism for the operation of the audible signalling device 152. The rod 172 projects suitably through the top of the enclosing casing and terminates in a knob 188. The rod passes loosely through a hole 190 in the bell frame 160 and is provided with a collar 192 under said frame by which the frame can be swung into and out of operative position. When the rod is in its elevated position the collar 192 causes the bell frame to be held in the full line position of Fig. 13 where the striker 164 is out of the path of rotation of the trip pin 116. When, however, the rod 172 is depressed the trip frame is permitted to swing by its weight into the dotted line position of Fig. 13 where the end of the striker 164 is in the path of movement of the trip pin.

The striker is located below the motor shaft and in a position where the trip pin operates the striker to cause the bell to sound at the expiration of a thirty second interval following the start of operation of the motor with the trip pin in its initial or zero position. This interval of thirty seconds represents the time of first showing of the image on a properly exposed print from the start of the development thereof. The motor continues to operate and will again sound the bell after another interval of one minute, which represents the time at which the properly exposed print in a properly adjusted developing solution should have received full development and should be removed from the solution.

Assuming that the mechanism as above described has been used to control the length of exposure of a paper print and is desired to be operated to time the development of the print, the latch block 168 will be disengaged from the switch lever 98 and the switch 84 will be open. The button 48 will then be depressed to lower the switch arm 98 into re-latching position and will be held depressed while the rod 172 is depressed. The downward movement of this rod frees the latch finger 182 for pivotal movement and since the rod is in the latch block 168 on the side of the latch block pivot 170 opposite the switch arm 98 the depression of the rod 172 will move the latch block into holding relation with the switch arm, where the latch block will remain by its weight. The pressure on the rod 172 can be removed and when pressure on the button 48 is removed the switch 84 will be closed and

the motor will start in operation and sound the bell in the manner hereinbefore described.

Since the closing of the switch 84 would ordinarily turn on the enlarger light the switch 154 is employed to prevent the energization of the enlarger light circuit when the device is used for development timing. The switch 154 is or can be similar in construction to the switch 84 except that it is a normally circuit-open switch having a movable contact 194 and a stationary contact 196 included in the circuit conductor 198 leading to a socket contact 30, the switch contacts being normally maintained in open circuit or disengaged position by suitable means as the spring 200. The position of the contacts is controlled by a switch-operating pin 202 which is disposed in the path of movement of the bell frame 160 and the arrangement is such that when the bell frame is in an out-of-use position it engages the pin 202 and maintains the contacts engaged so that the lamp circuit can be controlled by the timer controlled switch 84. When the bell frame is in the operating position the spring 200 maintains the contacts operated so that the enlarger circuit is de-energized.

I claim:

1. An interval timer including a circuit controlling switch, operating means therefor including an operating member biased for movement in a switch opening direction, latching means for holding said member in a switch closed position, a tripping member for the latching means movable from tripping relation therewith into a displaced position selectable at will independently of control of the switch, a timing motor energized through said switch for moving said tripping member at a constant rate of motion into operating relation with said latching means, and manual means independent of the tripping means for initiating the closing of said switch and the concurrent energization of the motor.

2. An interval timer including a circuit controlling switch, operating means therefor including an operating arm biased for movement in a switch opening direction, latching means engageable with said arm for holding it in an unoperated position, a tripping member for said latching means displaceable from said latching means different distances selected at will, a timing motor connected with said tripping member for driving it toward said latching means at a predetermined rate of motion to effect the unlatching of said operating arm and the opening of the switch, said motor being energized in response to the closing of said switch, and manual means operative to effect the latching of said arm and also operative to hold the switch open during the latching of said arm.

3. An interval timer including a circuit controlling switch, operating means therefor including an operating arm biased for movement in a switch opening direction, latching means engageable with said arm for holding it in an unoperated position, a tripping member for said latching means displaceable from said latching means different distances selected at will, a timing motor connected with said tripping member for driving it toward said latching means at a predetermined rate of motion to effect the unlatching of said operating arm and the opening of the switch, said motor being energized in response to the closing of said switch, manual means operative to effect the latching of said arm and also operative to hold the switch open during the latching of said arm, and means responsive to the

release of said manual means to effect the closing of said switch and the operation of said motor.

4. An interval timer comprising a normally closed switch, a switch operating arm normally biased for movement in a switch opening direction, a latch operative to hold said arm releasably in an unoperated position, a displaceable latch-operating timing member movable into a position to trip said latch and effect the operating movement of said arm, a timing motor operative to drive said timing member at a predetermined rate of motion from a displaced position thereof into engagement with said latch, means responsive to the closing of said switch for effecting the energization of said motor, and manual means for moving said arm into latched position and for effecting the closing of said switch only following the manual release of said manual means.

5. In an interval timer, a normally closed circuit controlling switch, operating mechanism therefor including an operating arm constantly biased for movement in a switch opening direction, latching means for holding said arm releasably in an unoperated position, and manually controlled means for moving said arm from a switch operated to a latched position and having a member operative to maintain said switch open during such movement of said arm.

6. An interval timer comprising a normally closed circuit controlling switch, operating mechanism therefor including an operating arm constantly biased for movement in a switch opening direction, latching means for holding said arm releasably in an unoperated switch closed position, a time controlled tripping member for said latching means movable into operating engagement with said latching means from any displaced position thereof selected at will, a timing motor for driving said tripping member from said displaced position into tripping position, manual means for moving said operating arm from a switch open position into a latched position and having a member operative to maintain said switch open during such movement of said arm, and means operative upon release of said manual means to effect the operation of said member to close said switch to effect the energization of said timing motor.

7. In an interval timer, a normally closed circuit controlling switch, operating mechanism therefor including a pivoted operating arm constantly biased for movement in a switch opening direction, means for releasably restraining said arm in an unoperated switch closed position, timing means for releasing the restraint on said arm and permitting the movement thereof in a switch opening direction, and manually controlled means for resetting said arm to an unoperated position following an operation thereof, including a lever pivoted to and carried by said arm having one end part interposed between said arm and said switch, and a manually operable member engageable with the other end part of said lever and operative to fulcrum it on said switch and exert pressure on said arm in a resetting direction and maintain the switch open during the resetting operation of said arm.

8. In an interval timer, a circuit controlling switch having an operating member normally biased for movement in a switch closing direction, operating mechanism for said switch including a pivoted arm constantly biased for movement in a switch opening direction, means for

releasably restraining said arm in an unoperated and switch closed position, timing means for releasing the restraint on said arm and permitting its movement in a switch opening direction, said timing means being energized concurrently with the closing of said switch, and manual resetting means for said arm including a lever having an end part interposed between said switch operating member and arm and an intermediate part pivoted to and carried by said arm and a free end part, a manually operated member engageable with said free end part and operative to cause the opposite end part to exert pressure on said switch operating member and hold the switch in open position and also to cause said lever to exert pressure on said arm in a resetting direction, said switch being movable into circuit closed position following the manual release of said manually operable member.

9. In an interval timer, a normally closed circuit controlling switch having a longitudinally movable operating pin biased for movement in a circuit closing direction, a switch operating arm pivoted at one side of said pin and having means biasing it constantly for movement toward said pin to effect the switch opening movement of said pin, means for restraining said arm releasably in an unoperated switch closed position, timing means for releasing the restraint on said arm for effecting movement thereof in a switch opening direction, a lever pivoted to and carried by said arm having an end part interposed between said arm and operating pin and engaged by both, said lever having an opposite end part spaced from said arm, and a manually depressible button engageable with said last end part and operative to effect fulcruming movement of said lever on said pin to hold said switch open while exerting pressure on said arm to move it into a restrained switch closed position.

10. An interval timer comprising a timing motor having a rotatable operating shaft, a sleeve carried by said shaft and having a frictional driving engagement therewith operative to effect conjoint rotation of said sleeve and shaft in one direction and independent rotation of said sleeve in the opposite direction, a time setting member carried by and rotatable with said sleeve, a trip member carried by and rotatable with said sleeve, a latch member disposed in position to be engaged and operated by said trip member, a switch operating arm adapted to be held in an unoperated position by said latch and constantly biased for movement in a switch operating direction, a circuit controlling switch operated by said arm, and manual means for latching said arm and effecting an operation of said switch.

11. An interval timer comprising a timing motor having a rotatable operating shaft, a sleeve carried by said shaft and having a frictional driving engagement therewith operative to effect conjoint rotation of said sleeve and shaft in one direction and independent rotation of said sleeve in the opposite direction, a time setting member carried by and rotatable with said sleeve, a trip member carried by and rotatable with said sleeve, a latch member disposed in position to be engaged and operated by said trip member, a switch operating arm adapted to be held in an unoperated position by said latch and constantly biased for movement in a switch operating direction, a circuit controlling switch operated by said arm, and manual means for resetting said arm into engagement with said latch independently of said shaft and sleeve.

12. In an interval timer, a switch, an audible alarm, a timing motor controlled by said switch and having means for operating said switch and also said alarm, and manually operated means for conditioning said alarm for operation by said motor and for preventing the operation of said switch by said motor.

13. In an interval timer, a switch, a switch operating arm, latch mechanism for releasably holding said arm in an unoperated position thereof, a timing motor having a projection rotatable against said latch mechanism to release it from holding engagement with said switch arm, audible signalling mechanism having an operating member adapted to be disposed in the path of movement of said projection, and means for conditioning said latching mechanism to permit said projection to move out from engagement therewith and into engagement with said operating member.

14. In an interval timer, a switch, an operating arm therefor, latching mechanism for holding said switch arm releasably in an unoperated position including a movable latch block engageable with said arm and having a projection, a movable member carried by said latch block having a latch finger pivoted thereto, said movable member being movable to position the pivot of said latch finger outwardly of said projection to permit said finger to pivot freely and also being movable to position the pivot of said latch finger inwardly of said projection to hold said finger against pivotal movement, a timing motor having a projection rotatable into engagement with said finger when said finger is held against pivotal movement to disengage said latch block from said operating arm and being also movable under said latch finger when said latch finger is free for pivotal movement, a bell, a striker therefor, a pivotally supported frame carrying said striker, said frame having a connection with said movable member operative to position said striker in the path of movement of said projection when said latch finger is free for pivotal movement and to position said striker out of the path of movement of said projection when said latch finger is held against pivotal movement.

15. In an interval timer, a switch, an operating arm therefor, latch mechanism for releasably holding said arm in an unoperated position thereof, a timing motor having a projection normally rotatable into operative engagement with said latch mechanism to effect its release of said operating arm, an audible signal device including a bell, a striker therefor adapted to be positioned in the path of movement of said projection and engaged and operated thereby, a movable frame carrying said striker, and means for disabling said latching mechanism and moving said frame to position said striker for engagement by said projection.

16. In an interval timer, input and output terminals, a timing motor, a motor switch for connecting said motor and output terminals to said input terminals, mechanism for effecting the control of said switch by said motor, a frame having an audible signal device mounted thereon and operated by said motor to indicate the termination of a time interval, mechanism for rendering effective and also ineffective at will the control of said device by said motor, and a second electric switch controlled by the frame of said device for disconnecting said input and output terminals when said device is in effective condition.

17. In an interval timer, a normally closed circuit controlling switch, operating mechanism therefor having means biasing said mechanism for movement in a direction to effect opening of the switch, means for holding said operating mechanism releasably in a switch unoperated and switch closed position against said bias, manually operated means for moving said operating mechanism against its bias into the engagement of said holding means and during such movement and until manual pressure thereon is released being operative to hold said switch against closing, and electrically driven timing means responsive to the closing of said switch, operative after a predetermined time to effect the release of said holding means from said switch mechanism and the opening of said switch.

18. In an interval timer, timing means, a circuit controlling switch controlling the operation of and operated by said timing means, resettable operating mechanism for said switch movable from a switch closed position to a switch open position, said timing means having an element for effecting such movement of said mechanism, a manually operable starting member operative to move said mechanism from a switch open to a switch closed position, and means operative to maintain the switch open when said mechanism is in switch closed position until the release of manual pressure on said starting member.

19. An interval timer including a circuit controlling switch, switch operating mechanism having means tending to open said switch when it is closed, manual means for moving said mechanism to a position corresponding to switch closed position while maintaining said switch open, a displaceable member movable manually away from a predetermined switch controlling position different distances at will, a timing motor energized through said switch for driving said member into said predetermined position from any displaced position, and means operated by said displaceable member in said predetermined position operative to effect the operation of said switch operating mechanism and the opening of said switch.

20. A photographic timer comprising a unitary device having input terminals adapted to be connected to an electric current source, output terminals adapted to be connected to the electric light of a photographic enlarger, a manually displaceable timing member, a timing motor for driving said timing member from any displaced position to an initial position, a switch controlling said motor and output terminals and controlled by said timing member in its said initial position and then operative to de-energize said motor and output terminals, means releasably holding said switch in its motor de-energized condition when the timing member is away from said initial position, manual means for operating said holding means to effect the operation of said switch to energize said output terminals and also to energize said motor to return said timing member to said initial position, and a second manually operated switch controlling the operation of said motor and the energization of said output terminals and having one position wherein the aforesaid energization of said motor is permitted through said first switch and another position wherein the output terminals are energized and at such time the energization of the motor is prevented irrespective of the condition of said first switch.

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