Feb. 9, 1932. L. S. RENNICK 1,844,180

AUTOMATIC TIMING DEVICE FOR PHOTOGRAPHIC PRINTING MACHINES

Original Filed Dec. 1, 1928

Fig. 1.

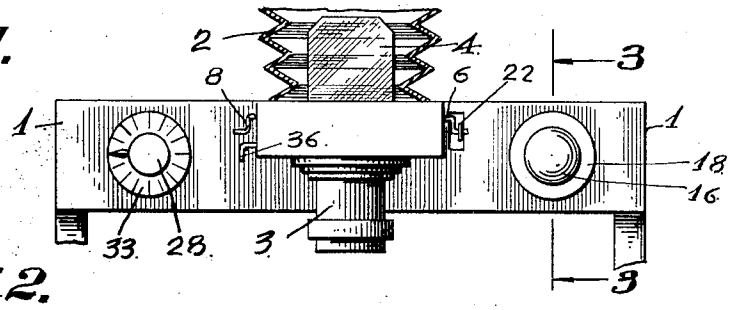


Fig. 2.

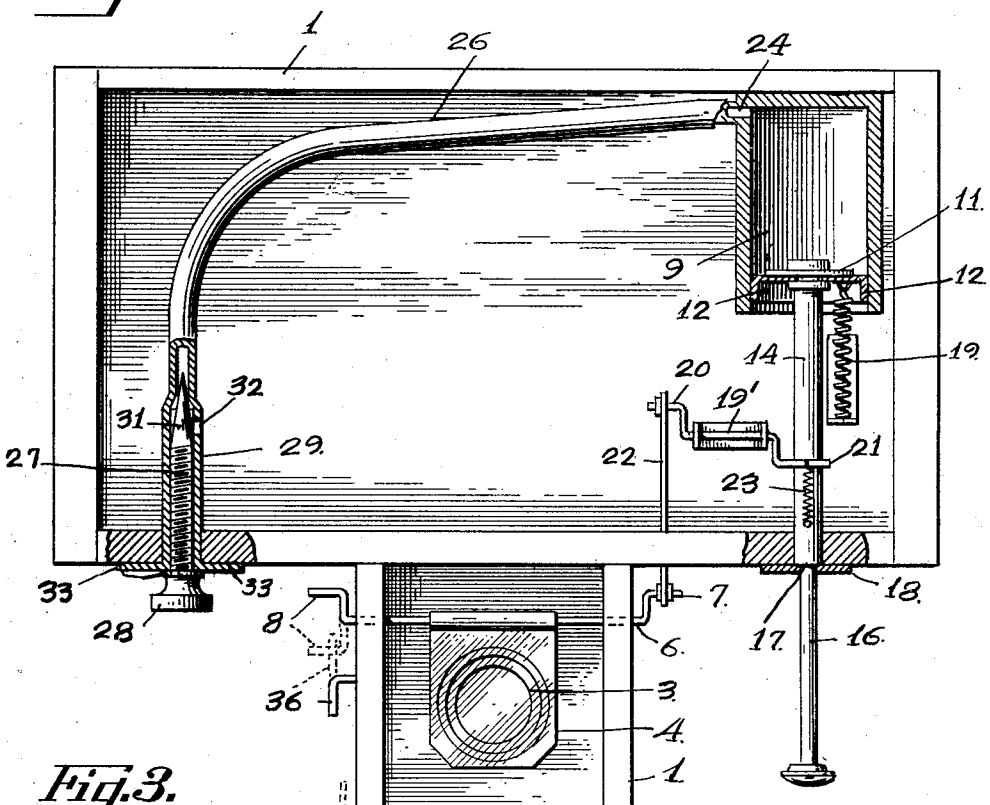
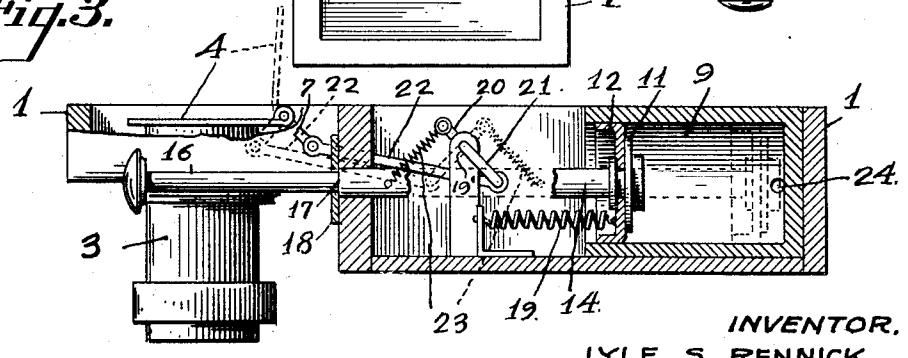


Fig. 3.



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UNITED STATES PATENT OFFICE

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AUTOMATIC TIMING DEVICE FOR PHOTOGRAPHIC PRINTING MACHINES

Original application filed December 1, 1928, Serial No. 323,162. Divided and this application filed October 28, 1929. Serial No. 402,990.

My invention relates to improvements in timing devices for photographic printing machines wherein a shutter mounted in connection with focusing means is arranged to be opened and automatically closed after a measured interval of exposure to obtain accurately timed and uniform exposure of photographic prints, and is a division of my pending application, Serial Number 323,162, filed December 1, 1927, reference to which is hereby made.

The present invention is directed primarily to an improved timing mechanism for use in connection with printing machines of the form disclosed in my co-pending applications, Serial No. 270,635, filed April 17, 1928, and Serial No. 323,161 filed December 1, 1929, wherein light, reflected from the inner face of a negative, is focused and projected upon the sensitized surface to be exposed and printed, said timing mechanism comprising a shutter arranged to normally intercept actinic light reflected from the negative and to permit the projection of said actinic light through the focusing means for measured intervals of exposure.

The primary object of my invention is to provide an improved timing device for regulating the interval of exposure in printing photographic prints.

Another object is to provide an improved timing device which will permit the lighting means to be operated without interruption and which operates to normally intercept actinic light except for desired intervals of exposure.

A further object is to provide an improved device which will automatically close the timing shutter and which may be accurately regulated to obtain an exposure of a desired duration when the shutter is opened.

A further object is to provide an improved timing mechanism of simple construction and which is accurate and efficient in its operation.

A still further object is to provide an improved mechanism which will obtain a very quick movement of the shutter, and which may be adjusted through a wide range to regulate the periods of exposure.

I accomplish these and other objects by means of the improved device disclosed in the drawings forming a part of the present application wherein like characters of reference are used to designate similar parts throughout the specification and drawings and in which—

Fig. 1 is a front elevation of the shutter and lens portion of a vertically disposed photographic printing machine, disclosing the timing and setting elements or members of my improved device;

Fig. 2 is an enlarged plan view of Fig. 1 and partly in section, disclosing the arrangement and operation of the several parts; and

Fig. 3 is a vertical transverse sectional view, on an enlarged scale, taken on line 3—3 of Fig. 1, in the direction indicated.

Referring to the drawings, the lens supporting portion 1 of a vertically disposed photographic printing machine is provided at the lower end of the bellows portion 2 to support the usual lens 3 having a preferably transparent shutter 4, said shutter being of a type to prevent the passage of actinic rays while permitting the passage of other light rays, the purpose of which will hereinafter be more fully set forth. The shutter 4 is pivotally mounted upon the inner or bellows side of the lens 3 by means of a transverse shaft 6 provided with crank portions 7 and 8 upon opposite ends thereof.

A suction cylinder 9 is mounted within the supporting member 1. A plunger 11 is slidably mounted within the cylinder 9, said plunger being provided with an outwardly faced cup washer 12 and having a stem 14 extending outwardly through the front of the supporting member 1. The stem 14 is provided with a reduced portion 16 forming a shoulder 17 arranged to engage a stop plate 18 to limit the outward movement of the said plunger and stem. The cup washer 12 is adapted to be displaced to permit the escape of air therepast when the plunger is moved inwardly into the cylinder 9, and to cling tightly to the sides of the cylinder and prevent the entrance of air past the washer when the plunger is moved outwardly, thereby causing a partial vacuum to be formed with-

in the cylinder when the plunger is moved outwardly. A spring 19 is connected to the plunger and arranged to normally move the plunger outwardly to its extreme outer position.

A crank member 19′ is mounted adjacent the plunger stem 14 and provided with crank arms 20 and 21 upon opposite ends thereof. The arm 20 is connected to the crank arm 7 by a connecting link 22. The arm 21 is connected to the plunger stem 14 by means of a spring 23 arranged to exert a resilient pull upon the crank arm 21 so that when the spring is carried past the center line of the crank in either direction the spring will operate to pull the crank quickly through an angle of approximately ninety degrees from one extreme position to its opposite extreme position. As the crank arm 21 is thus shifted, the link 22 actuates the arm 7 to move the shutter 4 through slightly more than ninety degrees between its closed and open position.

An air inlet 24 opens into the cylinder 9 adjacent its extreme inner end, said inlet being provided with a tubular connection 26 extending to the front of the supporting member 1. A needle valve 27 is mounted in the end of the connection 26, said needle valve being operable by means of a knob 28 to restrict the passage of air through the tubular connection 26. The needle members is preferably threaded into a sleeve portion 29 carried by the connection 26 and provided with a reduced tapered portion 31 engaging the reduced passage portion of the connection 26, an air vent 32 being provided in the sleeve portion 29 adjacent the tapered portion to admit air to the connection 26. The knob 28 is provided with a dial 33 calibrated in units of time to indicate the setting of the valve necessary for a desired interval of exposure.

The operation of my improved timing device is as follows:—The shutter 4 normally rests across the top of the focusing means 3 to intercept actinic light reflected by a negative not shown. Non-actinic light passing through the shutter or screen 4 is projected through the focusing means whereby the image projected may be observed and the printing machine adjusted to provide the desired size of image and the correct focus. When the machine has been adjusted to produce the desired image, a piece of sensitized paper or the like is placed in proper position said paper being unaffected by the non-actinic light passing through the shutter 4.

To expose the sensitized paper and print the image thereon, the plunger 11 is pressed inwardly to its extreme inner position by means of the outwardly extending portion of the stem 16. As the plunger is thus moved inwardly, the crank member 19′ is moved from its normal shutter closing position to the shutter opening position as indicated in dotted lines in Fig. 3 of the drawings.

As the plunger is moved into the cylinder 9, the air therein is forced outwardly past the edges of the cup washer 12. When the plunger is released, the spring 19 operates to pull the plunger back to normal shutter closing position. The action of the spring is opposed by suction due to the partial vacuum formed in the back of the suction cylinder 9, and the speed of the return movement of the plunger is regulated by adjusting the needle valve 27 to admit only a limited supply of air through the inlet 24.

When the valve 27 is fully closed, the vacuum formed within the back of the cylinder 9 will hold the plunger against the pull of the spring 19, and in the absence of any leakage past the valve 27 or the cup washer 12, the plunger will be held in shutter opening position. By slightly opening the valve 27, air is slowly admitted to the cylinder 9 to break the vacuum, and the plunger will be moved slowly outwardly, and as the plunger nears its outer extreme position, the spring 23 will be carried past the center of the crank 19′ and said crank will be shifted to close the shutter The speed of the return movement of the plunger may be regulated closely by a suitable adjustment of the needle valve 27 so that the shutter may be automatically closed after a predetermined interval of exposure ranging from a very few seconds to several minutes as desired. The dial 33 is calibrated to indicate the setting of the valve necessary to obtain a desired interval of exposure.

A latch 26 is arranged to be moved to engage the arm 8 to retain the shutter 4 in open position independently of the valve 27 when desired.

The interval of exposure is dependent upon the distance between the focusing means and the sensitized sheet as said focusing means is adjusted to various positions to obtain a desired enlargement or reduction of the size of image printed. Thus if the image is enlarged to double the area of the negative, the light reflected from said negative and focused through the focusing means is distributed over double the area, and the interval of exposure must be made twice as long as the interval required where the image printed is of the same size as the negative. The interval of exposure thus varies proportionately to the size of the image which in turn varies proportionately to the variation in position of the focusing means.

While I have illustrated and described my improved device only in what I now regard as its preferred embodiment, the specific details of construction and arrangement are of course subject to modification in numerous ways without departing from the spirit of my invention, and I therefore desire to avail myself of all modifications which may fall within the scope of the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A timing device for photographic printing machines comprising a pivotally mounted shutter; an arm connected to the shutter for moving the same to open and closed positions; a crank connected to the arm; a slidable plunger; means connecting the plunger and the crank for actuating the crank to quickly open or close the shutter when the plunger is moved from one extreme position to an opposite extreme position; means for normally moving the plunger to a shutter closing position; and means for retarding the closing movement of the plunger to regulate the period of exposure made while the shutter is in an open position.

2. A timing device for photographic printing machines comprising a shutter; an actuating crank; means connecting the crank with the shutter for moving the same to open and closed positions; a plunger; a spring connecting the crank with the plunger, said spring being adapted to impart a quick throw to the crank and shutter when the plunger is moved a predetermined amount in either direction; a plunger rod for manually moving the plunger to shutter opening position; means for normally moving the plunger to a shutter closing position; and means for retarding the closing movement of the plunger to regulate the period of exposure made while the shutter is in open position.

3. A timing device for photographic printing machines comprising a shutter; an actuating crank; means connecting the crank with the shutter for moving the same to open and closed positions; a plunger; a spring connecting the crank with the plunger, said spring being adapted to impart a quick throw to the crank and shutter when the plunger is moved past predetermined points in either direction; a plunger rod for moving the plunger to shutter opening position; means for normally moving the plunger to shutter closing position; and suction means regulating the closing movement of the plunger to time the period of exposure made while the shutter is open.

4. A timing device for photographic printing machines comprising a shutter; an actuating crank; means connecting the crank with the shutter for moving the same to open and closed positions; a suction cylinder; a plunger slidably mounted within the suction cylinder; a spring connecting the crank with the plunger, said spring being adapted to impart a quick throw to the crank and shutter when the plunger is moved past predetermined points in either direction; a plunger rod for moving the plunger to shutter opening position; means for normally moving the plunger to a shutter closing position, said plunger being moved outwardly against suction within the cylinder; and a valve controlled inlet opening into the cylinder in back of the plunger for regulating the time of movement of the plunger for closing the shutter.

In witness whereof, I hereunto set my signature.

LYLE S. RENNICK.