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3,242,842

PHOTOGRAPHIC COPYING APPARATUS TIMING CONTROL SYSTEM

Filed Nov. 7, 1963

2 Sheets-Sheet 1

Fig. 1

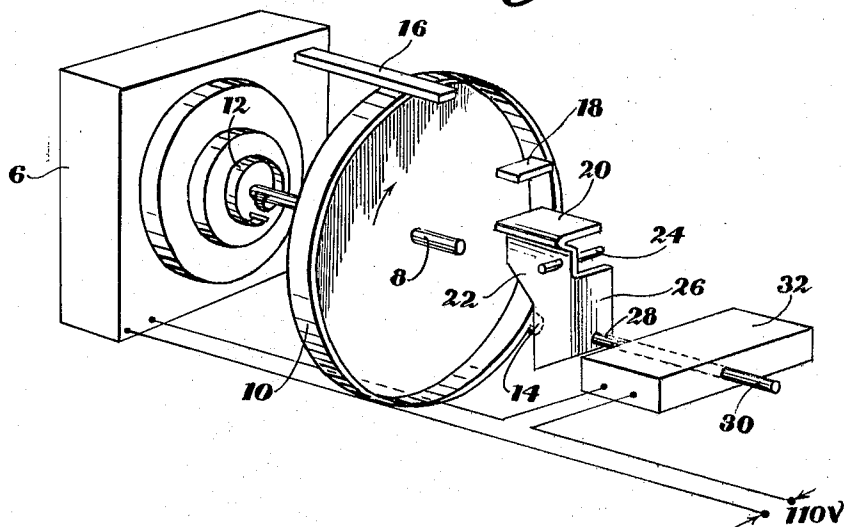
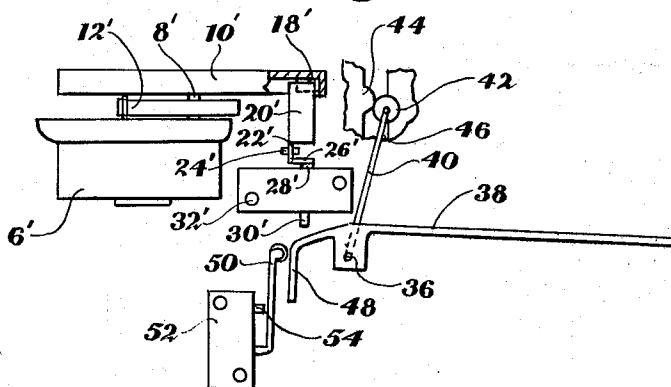


Fig. 2



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Fig. 4

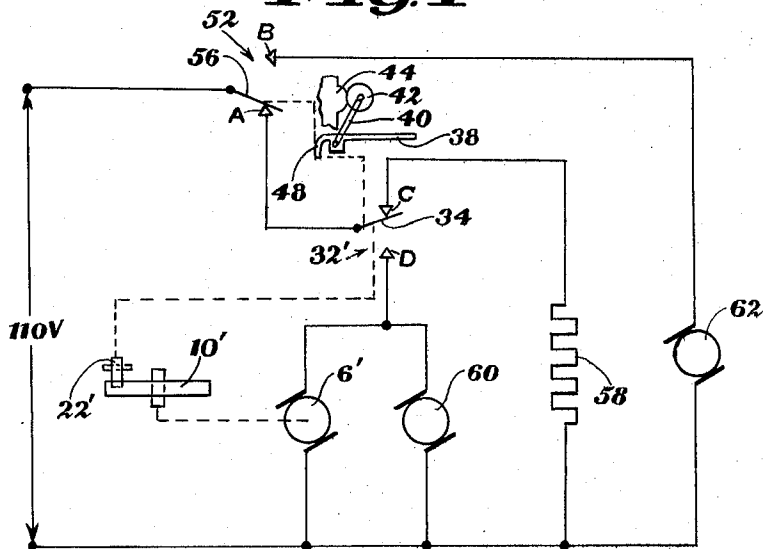
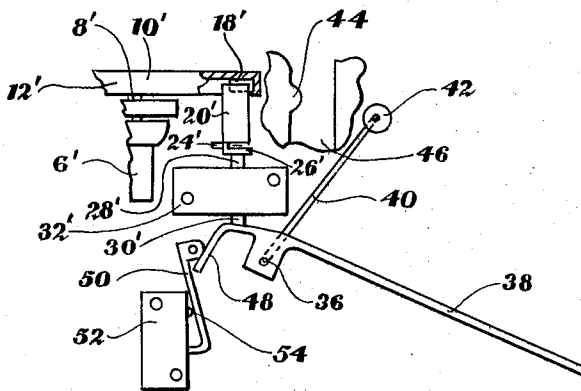


Fig. 3

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PHOTOGRAPHIC COPYING APPARATUS TIMING CONTROL SYSTEM

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4 Claims. (Cl. 95—89)

This invention relates generally to photographic copying apparatus, and more specifically to an improved photographic processing and image-transfer copying apparatus having a timing control system incorporated therein.

This invention is particularly applicable to photographic processing and image-transfer copying apparatus of the type disclosed in U.S. Patent Nos. 2,666,384 and 3,099,208. In apparatus of this type, an exposed sensitized photographic matrix is immersed in a processing solution for a predetermined time, a non-sensitized copy sheet is fed into register with the matrix, and the two are then pressed by a pressure mechanism into intimate contact to cause transfer of an image from the processed matrix to the copy sheet upon separation thereof. Apparatus of this general type may be equipped with a timing mechanism which is manually set by the operator to a preselected processing time value, and indicates to the operator when the selected time has passed.

The present invention involves an improved copying apparatus in which such manual setting of the timing mechanism is eliminated. Instead, the timing mechanism is automatically energized upon closing the pressure mechanism following the insertion of a matrix into the processing tray, and during its operation indicates to the operator when the matrix has been processed and then automatically deenergizes itself and returns to its original position.

Accordingly, one of the objects of the present invention is to provide an improved timing control system for timing an operation, and then automatically returning the timing control system to its original position.

Another object of the invention is to provide an improved photographic copying device having a timing control system incorporated therein, which upon movement of a part of the device between open and closed positions to admit a matrix into the processing tray, momentarily energizes a feed motor mechanism for feeding a copy sheet, and energizes a timing mechanism for indicating to the operator when the matrix has been processed, the timing mechanism then automatically deenergizing itself for return to its normal rest position.

A more specific object of the invention is to provide an improved photographic copying device having a copy sheet feeding mechanism, a matrix processing zone, a timing mechanism for the processing zone, a member movable between open and closed positions for opening and closing, respectively, the entrance to the processing zone, and a switch control system responsive to the movable member to energize the copy sheet feeding mechanism when the movable member is moved into an open position for insertion of a matrix into the processing zone, and to deenergize the copy sheet feeding mechanism and energize the timing mechanism when the movable member returns to its closed position, the switch control means further being responsive to the timing mechanism upon completion of its operation for returning the timing mechanism to its normal rest position.

Another object of the invention is to provide an improved photographic copying device having a timing control system incorporated therein, the device being of sim-

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ple design and construction, thoroughly reliable and efficient in operation, and economical to manufacture.

Objects and advantages other than those set forth above will be apparent from the following description when read in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic view in perspective of an automatically resetting timing mechanism constructed in accordance with one embodiment of the present invention;

FIG. 2 is a top plan view of an alternative form of automatically resetting timing mechanism incorporated in a photographic copying apparatus, with certain parts thereof omitted for purposes of clarity, other parts sectioned and some shown in fragmentary form, the pressure mechanism of the apparatus further being shown in a closed position;

FIG. 3 is a view similar to FIG. 2 showing the pressure mechanism of the copying device in an open position uncovering the processing tray for the insertion of a matrix therein; and

FIG. 4 is an electrical wiring diagram for the mechanism disclosed in FIGS. 2 and 3, and further diagrammatically including the portions of apparatus that actuate the switches.

Referring to FIG. 1, an electrically energized motor 6 is disclosed for driving a timing mechanism. The motor 6 may be of any well-known type in the art in which the output shaft is coupled by gears to a motor armature, and is free to rotate when the motor is deenergized. This action is normally achieved by means of an electromagnetic clutch between the output shaft and the gears; the clutch being so connected that it is energized simultaneously with the motor.

The timing motor 6 has an output shaft 8 upon which is mounted an indicating disk 10 of the timing mechanism bearing timing indicia, not shown, on its periphery. The indicia may be indicating marks, legends, protrusions, etc., to indicate time intervals, and may also, if desired, operate cooperating switches or other mechanical devices, not shown. When energized, the motor 6 drives disk 10 in the direction shown by the arrow causing the indicia thereon to pass a stationary viewing point, not shown, such as a window, or index mark visible to the operator. A spring 12, one end of which is fixed to shaft 8 and its other end is fixed to the body of the motor, urges the disk 10 and shaft 8 in a direction opposite to the direction of rotation of motor 6 when energized. A stop means defining the initial angular position of disk 10 comprises a boss 14 on its periphery which engages a stop 16 fixed to the body of motor 16, and prevents any rotation of disk 10 and shaft 8 past the point of engagement.

A resetting boss 18 mounted on the inner periphery of disk 10 engages one arm 20 of a bell crank 22 pivoted at 24 when disk 10 has been driven by motor 6 through a certain angle of rotation. During this angular rotation, the indicia on the periphery of disk 10 indicating the longest acceptable processing time is moved past the viewing point. The bell crank 22 has another arm 26 abutting one end 28 of a slidable operating pin 30 of a switch 32. The switch 32 has a blade, not shown, similar to a blade 34 shown schematically in FIG. 4, which is movable by pin 30 into and out of engagement with a contact, not shown, similar to the contact designated D of FIG. 4, depending on which direction the operating pin 30 is pushed into the body of switch 32. A suitable power source is connected to switch 32 for supplying power to motor 6 when the switch blade is in engagement with the contact.

When motor 6 is energized, disk 10 assumes a normal rest position with boss 14 abutting stop 16 under the in-

fluence of spring 12. A timing period is initiated when the end of switch pin 30 is manually engaged and the pin pushed into the body of switch 32 moving its blade into engagement with its contact. This action energizes motor 6 which drives shaft 8 and disk 10 in the direction of the arrow against the bias of spring 12, causing the indicia on its periphery to pass the viewing position, which may be located or positioned at any pre-selected angular position with respect to shaft 8. Shortly after the indicia corresponding to the selected processing time passes the viewing position, the resetting boss 18 engages arm 20 of bell crank lever 22 and rocks it about its pivot 24 causing its other arm 26 to push switch pin 30 into the body of switch 32. This moves its blade out of engagement with its contact deenergizing motor 6. As soon as motor 6 is deenergized, disk 10 is returned by spring 12 to its initial position with boss 14 abutting stop 16.

FIGS. 2-4 relate to a photographic processing and image-transfer copying device in which the automatic resetting timing mechanism is incorporated. Well-known components of the copying device, such as a copy sheet feeding mechanism, a processing tray, and a movable transfer mechanism mounted at the entrance of the processing tray have been omitted completely, or fragmentarily shown for purposes of clarity, a form of these components further being clearly shown or disclosed in the aforementioned U.S. patents. With respect to the specific apparatus disclosed in FIGS. 2 and 3, parts therein similar to parts disclosed in FIG. 1 will be denoted by the same reference characters primed. A shaft 36 is disclosed having an operating lever 38 secured thereto, and a pair of spaced arms 40, only one of which is shown, for supporting a roller 42 of a movable transfer mechanism. Accordingly, manual movement of lever 38 from its normal rest position shown in FIG. 2 to the position shown in FIG. 3 causes the transfer mechanism to move from its normally closed position, in which roller 42 is in pressure engagement with a ramp 44, to its open position in which roller 42 is withdrawn from ramp 44 permitting the insertion of an exposed matrix into a processing tray 46. A spring, not shown, urges the pressure mechanism and lever 38 into their normally closed and rest positions respectively. Upon movement of lever 38 to the position shown in FIG. 3, a portion of one end 48 thereof engages the end of switch pin 30' and moves blade 34 into engagement with contact D (see FIG. 4) and another portion of end 49 engages and depresses a pivotal arm 50 of a microswitch 52 for moving a switch pin 54 and blade 56 against the bias of a spring, not shown, into engagement with a contact designated B (see FIG. 4). In their normal rest positions, switch blades 56, 34 are in engagement with contacts A and C, respectively.

With reference to the wiring diagram of FIG. 4, the switch blades 56, 34 of respective switches 52, 32' are shown in their normal rest positions in engagement with contacts A and C in which the copying device is inoperative. In this inoperative condition, power is supplied from a suitable power source to a heating element 58 which, in conjunction with a thermostatic switch, not shown, maintains the processing solution in the apparatus at a desired temperature. The timing motor 6' is connected in parallel with a motor 60 for driving a cooling fan, not shown, for cooling printing lamps, not shown, of the copying apparatus, and the two motors 6', 60 are connected in series to contact D of switch 32'. A copy sheet feeding motor 62 for feeding copy sheet image receiving paper, not shown, from a stack in the copying device is connected to contact B of switch 52. When operating lever 38 is moved from the position shown in FIG. 2 to the position shown in FIG. 3 for moving transfer roller 42 to its open position allowing the immersion of an exposed matrix in processing tray 46, the switch blade 56 is moved into engagement with contact B energizing copy sheet feeding motor 62. At substantially the same time, switch blade 34 is moved into engagement

with contact D, but no action results since blade 56 is now out of engagement with contact A. When lever 38 is released, switch blade 56 returns to its normal position in engagement with contact A, thereby de-energizing the copy sheet feeding motor, and energizing the timer and fan motors 6', 60 respectively through blade 56 which is now in engagement with contact D. At the end of the required processing time, the operator will see a mark or legend such as "pull" on the periphery of disk 10' indicating that a transfer should be made in the normal way. If a second copy is to be made, the action of moving operating lever 38 to move the transfer mechanism into its open position for reinsertion of the matrix, again moves switch blade 56 against the bias of its spring into engagement with contact B. This action energizes the copy sheet feeding motor 62 to supply another sheet of transfer paper, and deenergizes timer motor 6' allowing disk 10' to be returned to its initial position under the action of spring 12'. When the operator has ceased making copies, the motor will continue to drive disk 10' until boss 18' engages arm 20' of bell crank lever 22' and rocks it about its pivot 24' causing its other arm 26' to engage the end 28' of switch pin 30' and return it to its normal rest position. This action moves switch blade 34 into engagement with contact C, reconnecting the power to heating element 58 and de-energizing timer motor 6', allowing disk 10' to return to its initial position.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

I claim:

1. In a photographic copying device having a copy sheet feeding means, a processing tray having a solution for processing a matrix, means for indicating the length of time said matrix is processed, a pressure mechanism at the entrance of said tray movable between an open position to allow insertion of a matrix into the solution in the tray and a closed position for pressing a copy sheet and matrix into intimate pressure contact upon removal of the two from the processing tray; the improvement comprising:

control means for said device including first and second switches responsive to movement of said pressure mechanism to its open position to energize said copy sheet feeding means to feed a copy sheet, and to connect said first switch in circuit with said indicating means, respectively, said pressure mechanism when returned to its closed position deenergizing said copy sheet feeding means and energizing said indicating means through said first switch,

said control means further including reset means interposed between said indicating means and said second switch and responsive to said indicating means after it has timed the processing period of said matrix to disconnect said first switch from and thereby de-energize said indicating means.

2. The invention according to claim 1 wherein said second switch is movable between a closed position connecting said first switch in circuit with said indicating means and an open position disconnecting the two, said second switch further being movable between its open and closed positions by a movable member, one end of which is engaged for movement by said pressure mechanism and the other end of which is engaged for movement by said reset means.

3. In a timing mechanism for timing an operation, the combination comprising:

a drive motor;

a driven shaft coupled to said motor for rotation in one direction when it is energized, and decoupled therefrom when said motor is deenergized;

a timing disk mounted on said shaft and having indicia

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on its periphery to indicate time with respect to a reference position upon rotation of said disk;
stop means for said disk;

resilient means for biasing said disk in the opposite rotational direction into engagement with said stop means; and

control means for said drive motor including a switch which is manually movable from an open position to a closed position for energizing said drive motor to drive said timing disk to time an operation, said switch further being returned to its open position by said timing disk and a portion of said control means upon movement of said timing disk through a predetermined angular distance whereupon said timing disk is returned by said resilient means into engagement with said stop means.

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4. The invention according to claim 3 wherein said switch is movable between open and closed positions by a reciprocally movable member, one end of which is manually engaged, and said portion of said control means comprises a pivotal bell crank having one arm in engagement with the other end of said member, and another arm engageable by a projection on said timing disk.

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