

July 12, 1949.

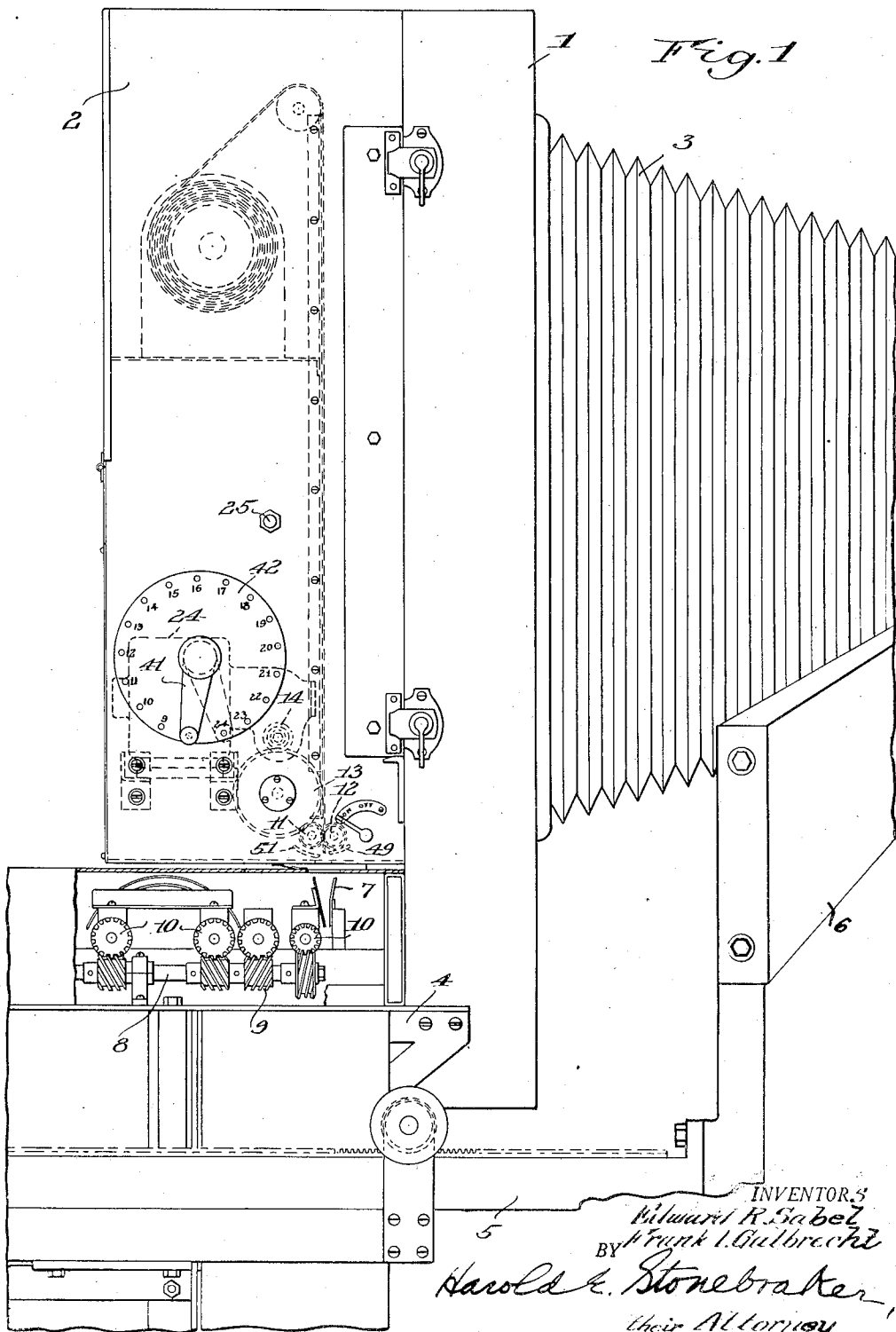
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2,475,722

WEB FEED CONTROL

Filed Sept. 18, 1946

4 Sheets-Sheet 1



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WEB FEED CONTROL

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4 Sheets-Sheet 2

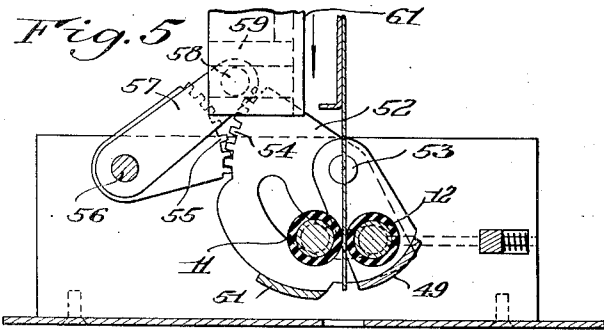
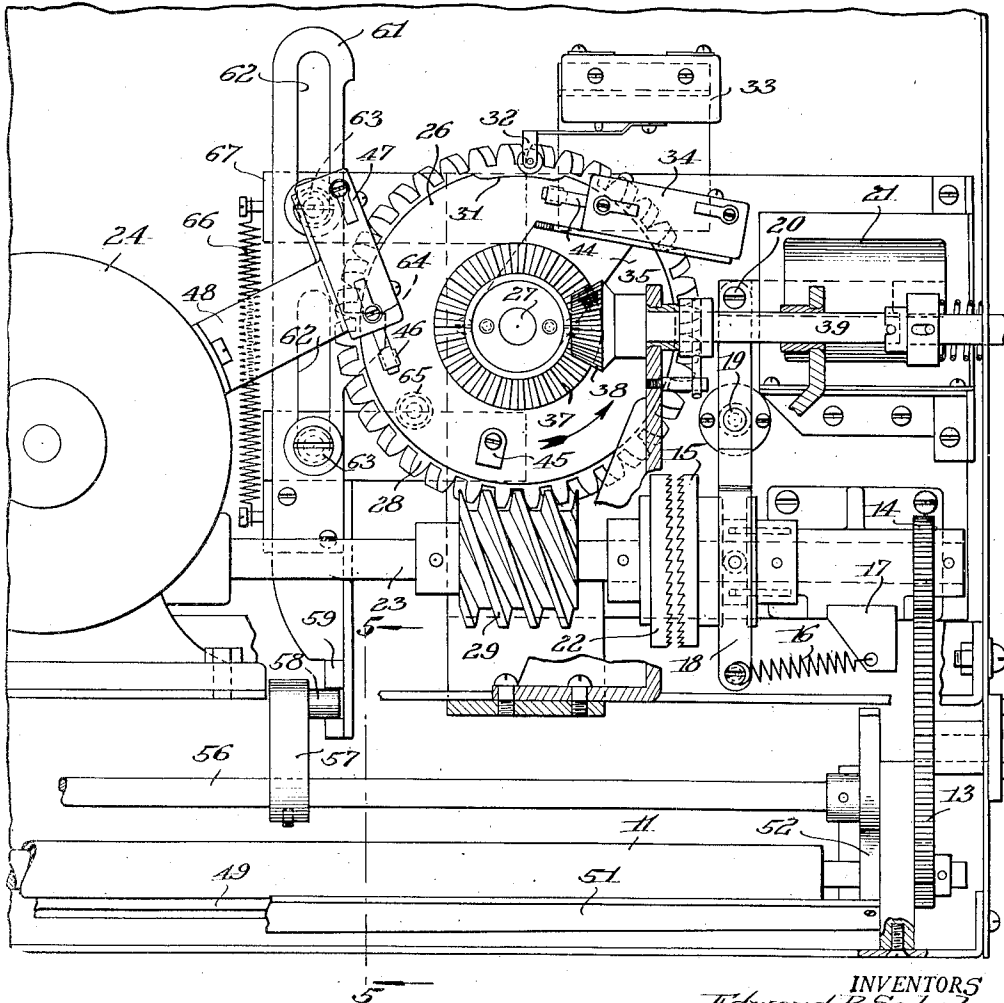


Fig. 2



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Fig. 3

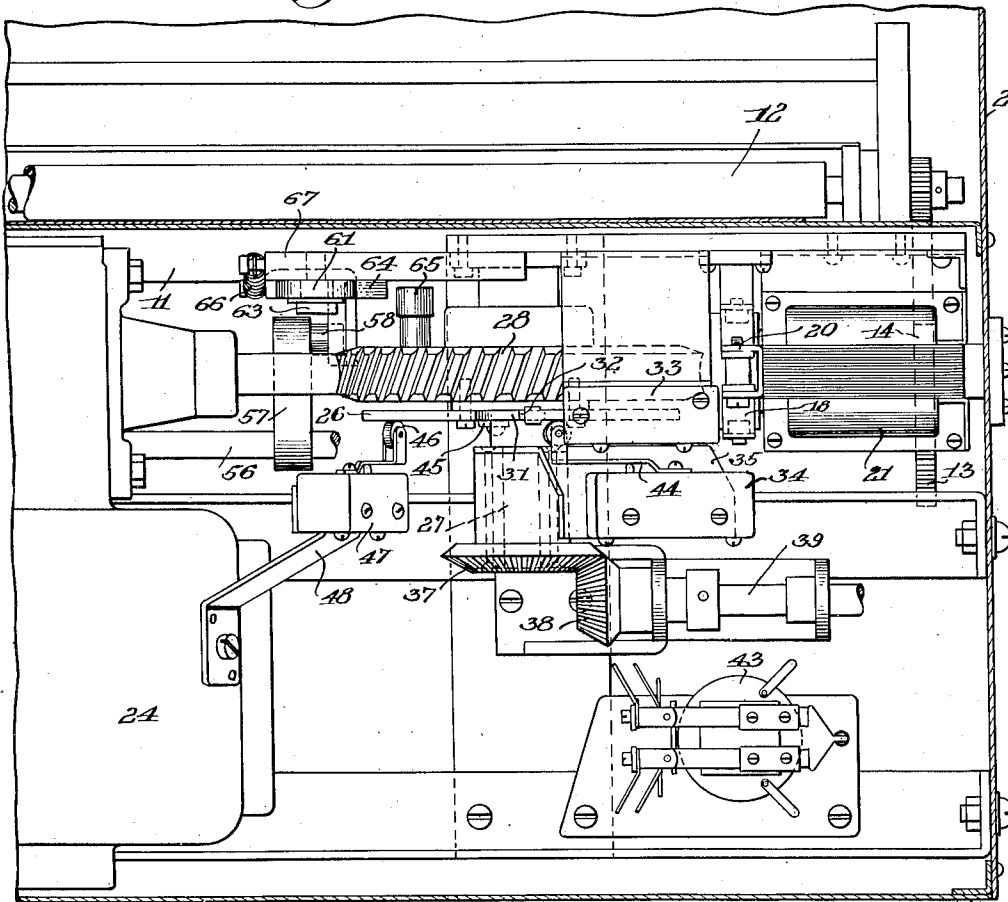
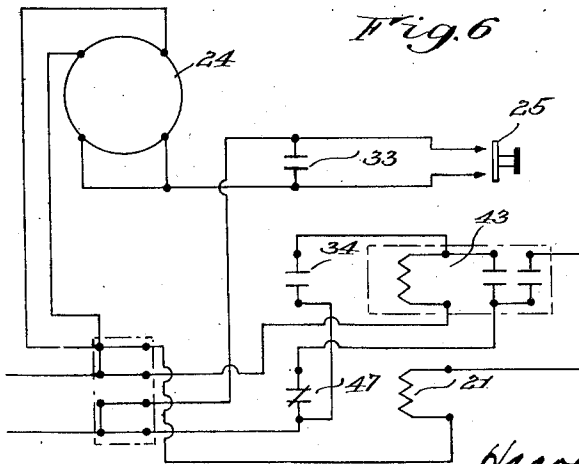


Fig. 6



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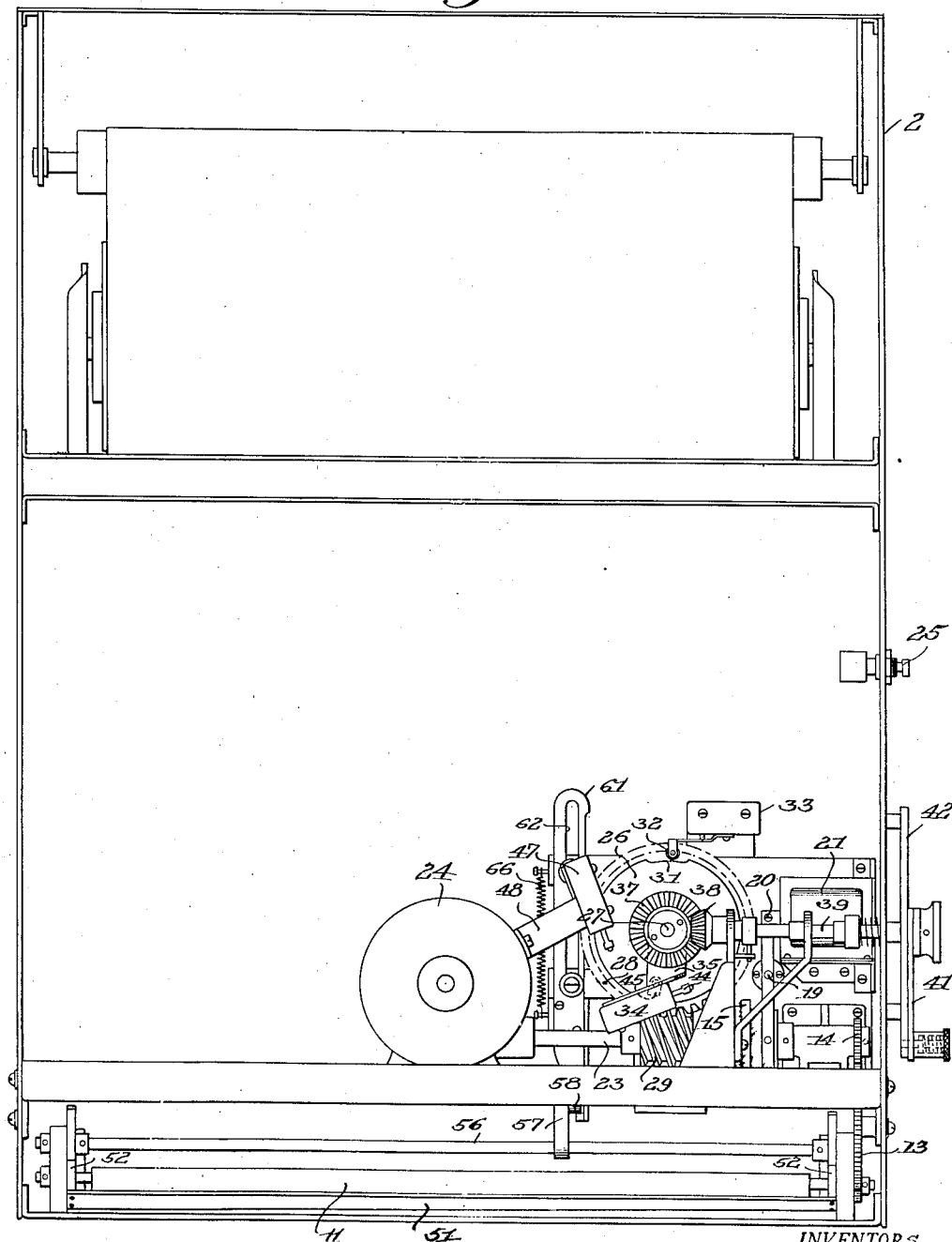
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Fig. 4



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WEB FEED CONTROL

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Application September 18, 1946, Serial No. 697,640

11 Claims. (Cl. 271-2.4)

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This invention relates to a photocopy machine of the general type used for making photographic copies of writings, maps, drawings, pages from books, and other records, in which sensitized paper after exposure is fed from a roll in a paper magazine of the camera for a predetermined distance following which the paper is cut off and carried through a processing mechanism, and it has for its purpose to afford simple and efficient means which enables an operator to make a manual adjustment to determine the amount of paper to be fed, after which upon operating a circuit-closing member, the mechanism functions automatically to feed the selected length of paper and cut it off for discharge into the processing mechanism.

One object of the invention is to provide mechanism that will feed paper quickly and accurately in accord with the predetermined length and cut the paper at the end of the feeding movement in such a way as to insure prints of a selected length being always the same size.

A further purpose of the invention is to afford a construction of simplified form and dependable operation, in which the starting and stopping of the paper feeding rolls and their consequent movement through the variable selected period is brought about by the operation of electric switches which control the roll operating means, resulting in a compact arrangement of few parts that is efficient and easy to adjust and service.

Another object of the invention is to afford mechanism employing an electric motor driven controller that makes one revolution at each operation, during which it operates an electric switch that is adjustably positioned to determine the starting of the paper feeding operation and a second electric switch that is permanently located and determines the stopping of the paper feeding operation, following which the paper cut-off mechanism is operated automatically from the drive and the motor circuit is opened to complete a cycle.

An additional purpose of the invention is to provide an arrangement whereby one electric motor operates the controller and the paper feed mechanism, which is automatically engaged and disengaged with the motor drive through a clutch member actuated by an electrical device that is operated through a normally open circuit-closing

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switch which is adjustably positioned in the path of the controller and a normally closed circuit-opening switch that is fixedly located in the path of the controller, thus determining the variable time of operation of the paper feeding mechanism in relation to one revolution of the controller.

Still another object of the invention is to provide mechanism in which the paper feeding rolls are operated from an electric motor drive through the instrumentality of a clutch that is engaged and disengaged at predetermined points in relation to the revolution of a controller which during its travel in a circular path effects engagement and disengagement of the clutch at predetermined points by means of an electrical unit and two electric switches, one of which is adjustably positioned around the path of travel of the controller to determine the length of paper feed.

To these and other ends, the invention consists in the construction and arrangement of parts that will appear clearly from the following description when read in conjunction with the accompanying drawings, the novel features being pointed out in the claims following the specification.

In the drawings:

Fig. 1 is a view in side elevation, partially broken away, illustrating a photocopy machine equipped with a preferred embodiment of the invention;

Fig. 2 is a transverse vertical sectional view through Fig. 1, and showing in side elevation the means for controlling the paper feeding and cut-off mechanism;

Fig. 3 is a horizontal sectional view, illustrating in plan the parts shown in Fig. 2;

Fig. 4 is an enlarged transverse vertical sectional view, illustrating in side elevation the adjusting means for the paper feeding mechanism;

Fig. 5 is an enlarged detail vertical sectional view taken on line 5-5 of Fig. 2, and

Fig. 6 is a diagrammatic view of the electrical controlling circuit.

Referring more particularly to the drawings in which like reference numerals refer to the same parts throughout the several views, the structure is illustrated in connection with a photocopy machine of the type shown in copending application Ser. No. 690,982, filed August 16, 1946, Patent

No. 2,430,687, dated November 11, 1947, and including a camera body 1, paper magazine 2, bellows 3, stationary supporting frame 4 on which the processing mechanism is mounted, and adjustable copy-board supporting frame 5 which is connected by means of arms 6 to the lens and prism mount, not shown, at the forward end of the bellows 3. The prints, after exposure, are fed downwardly through a discharge chute 7 into the processing mechanism which includes belt-feeding units, not shown, that are operated from a drive shaft 8 through suitable worms 9 and worm gears 10, the latter being arranged on the belt-feeding units which act to effect travel of the prints continuously through the processing mechanism.

The structure thus far described forms no part of the invention except as hereinafter indicated, and the subject matter of this application has to do with the mechanism for feeding downwardly from the paper magazine a variable predetermined length of paper, after exposure, and cutting it off, following which the paper is carried through the processing mechanism, and the means for adjustably determining the length of paper to be fed and for feeding and cutting it off after exposure will now be described in detail.

This structure comprises in general drive means operated from an electric motor that is set in operation by the manual closing of a switch, the operator having previously made the necessary adjustment for determining the length of paper to be fed, after which the mechanism operates automatically through the instrumentality of electrical switches to feed and cut off the selected length of paper, to effect which, the drive shaft operates a controller that makes one complete revolution for each cycle. During the initial part of each revolution, the controller closes a normally open switch which maintains the motor circuit closed throughout one revolution of the controller, and following the closing of said switch, the controller operates an adjustable normally open switch which closes the circuit to a solenoid or other electrical unit that actuates a clutch between the drive shaft and roll feeding means, said clutch remaining engaged and the feeding rolls continuing to operate until the controller in its rotation engages and operates a normally closed switch at a fixed point in the path of the controller to open the solenoid circuit and disengage the clutch. This stops movement of the feeding rolls, following which during the final part of its travel, the controller engages an actuator that effects movement of the cutting knife to sever the length of paper already fed down by the feeding rolls. The adjustable switch is positionable around the circular path of travel of the controller for engagement during the early or latter part of its travel, depending upon the length of paper to be fed.

The paper feeding rolls are indicated at 11 and 12 respectively, see Fig. 1, the feed roll 11 being mounted on a shaft carrying a pinion that is engaged and driven by an idler gear 13, operated by a pinion 14, see Fig. 2, that is mounted on a driven shaft arranged in suitable bearings and having keyed thereon a slidable clutch member 15 that is normally held in retracted position by a spring 16 fastened at one end to a stationary bracket 17 and at its other end to a clutch shifter 18 that is pivotally supported at 19, and has its upper end pivotally connected to the movable element 20 of a solenoid 21. When the solenoid is actuated by the closing of its circuit in the man-

ner to be described presently, the clutch element 15 is moved into engagement with a clutch element 22, see Fig. 2, on the drive shaft 23, that is operated from the electric motor 24. The circuit to motor 24 is normally open and is closed by the manual operation of a switch 25 that is of any suitable type and may be closed simultaneously with the operation of the switch to the exposure operating means, not shown. The switch 25 is closed momentarily by the operator and restored to its normal position upon release. The cycle of feeding and cut-off operations is initiated by the manual operation of the switch 25, which closes the motor circuit momentarily, and the mechanism by which the motor circuit is held closed, and the successive feeding and cut-off operations effected, will now be described.

To effect these functions, there is provided a rotary controller which may be in the form of a circular disk 26 that is fixed on a shaft 27 which also carries a worm gear 28, driven by the worm 29 on the drive shaft 23. The periphery of the controller or disk 26 is cut out or recessed at 31 to afford a pocket which receives an operating arm 32 of a normally open micro-switch 33, which may be of conventional construction, and is located in the circuit with motor 24. The motor circuit is closed momentarily by operation of the manual switch 25 already described, whereupon the controller 26 instantly moves far enough to actuate the switch operating arm 32 out of recess 31, and the operating arm 32 is held in such outward position by engagement with the outer edge or periphery of the controller disk 26 throughout one revolution of the latter, thus maintaining the motor in operation until the recess 31, upon completion of a rotation or cycle of the controller, again comes opposite the arm 32 and permits the latter to drop into the recess and open the motor circuit.

Movement of the controller through one revolution being thus effected, it is necessary to start operation of the paper feeding rolls at the predetermined selected point, and this is accomplished by a normally open micro-switch 34 that is mounted upon a bracket 35 rotatably supported for adjustment on the shaft 27. To accomplish such adjustment, the bracket 35 is mounted on a sleeve connected to a bevel pinion 37, see Fig. 3, that is operated by a bevel pinion 38 mounted on the arbor 39 which extends outside the paper magazine and is provided with a handle 41, see Fig. 1, movably positionable over the index plate 42, provided with suitable markings to indicate the length of paper print as from 8" to 24". By adjusting the handle 41 around the indicating scale 42, the micro-switch 34 is correspondingly adjusted around the circular path of the controller 26. The micro-switch 34 is a normally open switch in a circuit leading to relay 43 and to the aforementioned solenoid 21, and when the switch 34 is momentarily closed by travel of the controller 26 and its engagement with the switch at the preselected path in such travel, the solenoid 21 is operated through relay 43 and the paper feeding rolls are operated in the manner already described through shifting of the clutch element by the solenoid.

The relay 43 continues to hold the solenoid circuit closed and the paper feeding rolls in operation until the controller 26 reaches a further point in its travel, at which time the relay and solenoid circuits are opened and the movement of the paper feeding rolls is stopped. The micro-switch 34 includes a switch operating arm 44, see Figs. 2

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and 3, which lies in the path of and is engaged by an abutment or cam 45 mounted upon the face of the controller 26, and which acts to rock the arm 44 momentarily and close the switch 34 as the abutment 45 moves past the switch arm 44.

The paper feeding rolls continue to operate until the abutment 45 on the controller 26 engages a switch operating arm 46 of a micro-switch 47, which is fixedly mounted on a suitable bracket 48. The switch 47 is a normally closed switch located in the circuit with the relay 43 and solenoid 21, so that current continues to travel to these units until the switch arm 46 is engaged and actuated by the abutment 45, to momentarily open switch 47 and thus release relay 43 and open the circuit to solenoid 21. This releases the clutch shifter 18 and clutch element 15 is thereupon pulled away from the clutch 22 by means of the retracting spring 16 already mentioned, to stop movement of the paper feeding rolls.

Following the momentary opening of the micro-switch 47 and stopping of the paper feeding rolls, the controller 26 and worm gear 28 continue to rotate until the controller reaches its initial position, as shown in Fig. 2, to open the motor circuit, and during this final part of the rotational travel of the controller after the paper feeding rolls have stopped movement of the paper, the cut-off mechanism is operated, and the structure by which this is accomplished will now be described.

Referring to Fig. 5, 49 designates a stationary knife and 51 a movable knife that is actuated past the stationary knife 49 to sever the paper, the movable knife 51 being supported on plates 52 rotatably mounted on arbors 53 while the plates 52 include toothed segments 54 engaged by the toothed segments 55 mounted on a rock shaft 56 for actuating the movable knife. The rock shaft 56, see Fig. 2, has fixed thereon an arm 57 carrying a pin 58 which engages a horizontal slot 59 in a guide bracket mounted on the vertically reciprocating actuator or slide 61, that is slotted at 62 for vertical sliding movements on the guide pins 63. The actuator or slide 61 is provided with a lateral extension or nose 64, see Fig. 3, that lies in the path of a roller 65 carried by the worm gear 28, and as the worm gear rotates and approaches the limit of its movement, roller 65 engages the nose 64, after movement of the paper feeding rolls has stopped, and moves the actuator or slide 61 downwardly, to effect turning of the rock shaft 56 and operation of the movable knife. Continued movement of the worm gear causes the roller 65 to move past the nose 64, releasing the slide 61 which is retracted to its uppermost position by a spring 66 connected to the lower end of the slide 61 and to a fixed support 67.

The operation of the machine briefly is as follows: The operator first adjusts handle 41 to determine the amount of paper to be fed, in accordance with the usual adjustment for the size of the exposure, and the switch 25 is closed by the operator simultaneously with or upon exposure. Closing of switch 25 starts operation of the motor 24, drive shaft 23, clutch element 22, worm 29, worm gear 28, and controller 26. Immediately upon movement of the controller 26, the switch arm 32 is pushed out of its recess 31, engaging the periphery of the controller disk 26, and thereafter holding the motor circuit closed throughout a complete revolution of the controller. As the controller rotates, the abutment or cam 45 engages the switch arm 44 of switch 34, the position of which relatively to the path of travel of the controller has been determined by

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adjustment of the handle 41 over the dial 42. The normally open switch 34 is thus closed momentarily, operating the relay 43 and through it the solenoid 21 and movable clutch element 15, which is thus engaged with the driving clutch 22 to start movement of the paper feeding rolls. The switch 34 closes the circuit to relay 43 and solenoid 21 only momentarily, but this circuit is held closed by switch 47 and relay 43 after the abutment 45 has moved past the switch arm 44, and until abutment 45 engages switch arm 46 of the switch 47. When this occurs, the circuit to relay 43 is opened, the solenoid 21 is deenergized, and the driven clutch 15 is released and moves away from the driving clutch 22 under the impulse of spring 16, thus stopping movement of the paper feeding rolls. Continued movement of the controller and worm gear 28 causes the roller 65 to engage the nose 64 on actuator 61 and depress the latter immediately after the paper feeding rolls have stopped their movement. Downward movement of the actuator 61 causes a rocking motion of the arm 57 and rock shaft 56, and corresponding movement of the toothed segments 55 and 54, causing the movable knife 51 to move past the stationary knife 49 and cut off the previously fed portion of the sensitized paper, which drops through the chute 7 into the processing mechanism. By this time the rotating controller will have completed a revolution and reached a point where the recess 31 is opposite the switch arm 32, permitting the latter to drop into the recess and open the motor circuit, thus completing a cycle of operations.

While the invention has been described with reference to the particular construction illustrated, it is not confined to the details or exact arrangement shown herein, and this application is intended to cover such modifications or departures as may come within the purposes of the invention or the scope of the following claims.

We claim:

1. In a photocopy machine including paper feeding rolls and electrically controlled means operating the paper feeding rolls, a controller rotatable through one revolution at each operation, a manual switch operable to start the controller, a normally open switch operated by the controller and acting to complete one revolution of the controller, and a pair of switches arranged in the path of and operated by said controller, one of said last mentioned switches being normally open and the other normally closed and acting successively to start and stop said electrically controlled means, said normally open switch being rotatively adjustable to different points in the path of said controller, and a rotatively adjustable support on which the last mentioned switch is mounted.

2. In a photocopy machine including paper feeding rolls and electrically controlled means operating the paper feeding rolls, a controller operable through one revolution at each operation, an electric motor operatively connected to the controller, manually operated means for starting the motor, a switch in the path of the controller acting to stop said motor when the controller completes one revolution, and a pair of switches arranged in the path of and operated by said controller and acting successively to start and stop said electrically controlled means, one of said last mentioned switches being adjustable to different points in the path of the controller.

3. In a photocopy machine including paper

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and stop said electrically controlled means for starting and stopping said driven clutch, one of said switches being adjustable to different points in the path of the controller.

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Name	Date
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Longfield -----	Oct. 13, 1942

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