

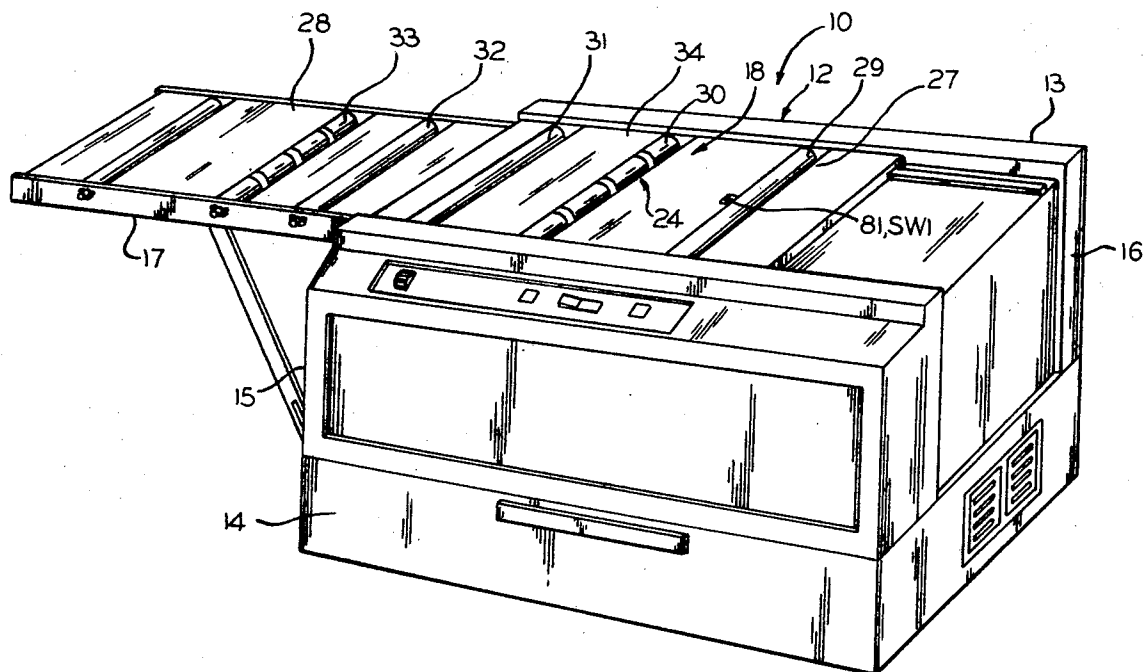
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 [21] Appl. No. **745,822**
 [22] Filed **July 18, 1968**
 [45] Patented **July 20, 1971**
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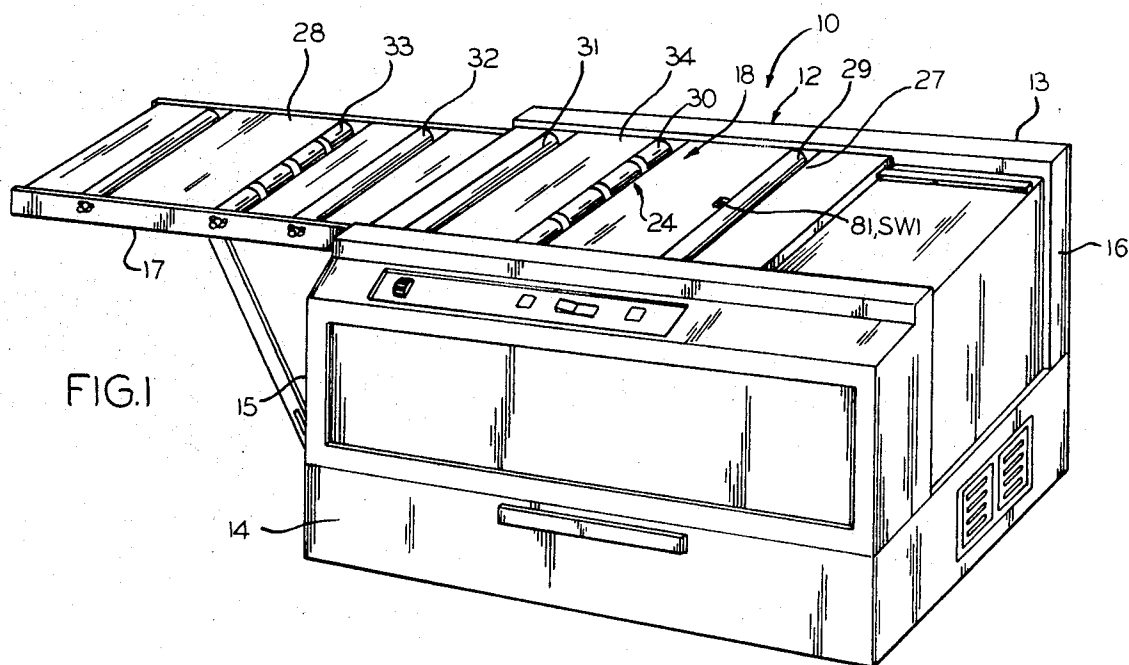
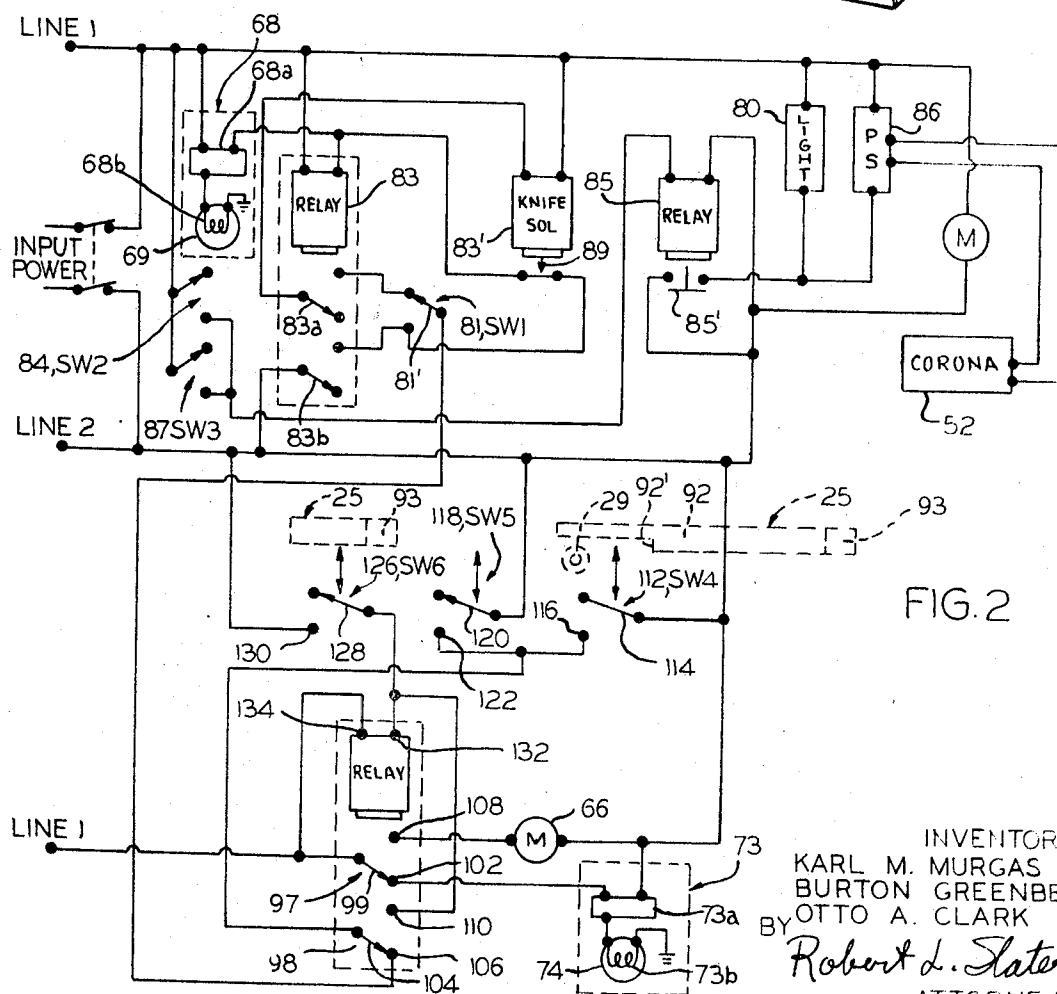
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[54] **BOOK COPIER WITH MOVABLE CARRIER**
5 Claims, 10 Drawing Figs.

[52] U.S. Cl..... **35.5/8,**
355/50
 [51] Int. Cl..... **G03g 15/00**
 [50] Field of Search..... **355/50, 51,**
75, 82, 25, 3, 8

ABSTRACT: A book copier machine having a carrier on which a book is positioned. A drive roller contacting the carrier moves the carrier in one direction from a first end toward a second end so that a page is reproduced as it moves past a scanning window, and reversing means reverses the direction of rotation of the drive roller when the carrier reaches the second end, to cause the carrier to move back toward said first end.





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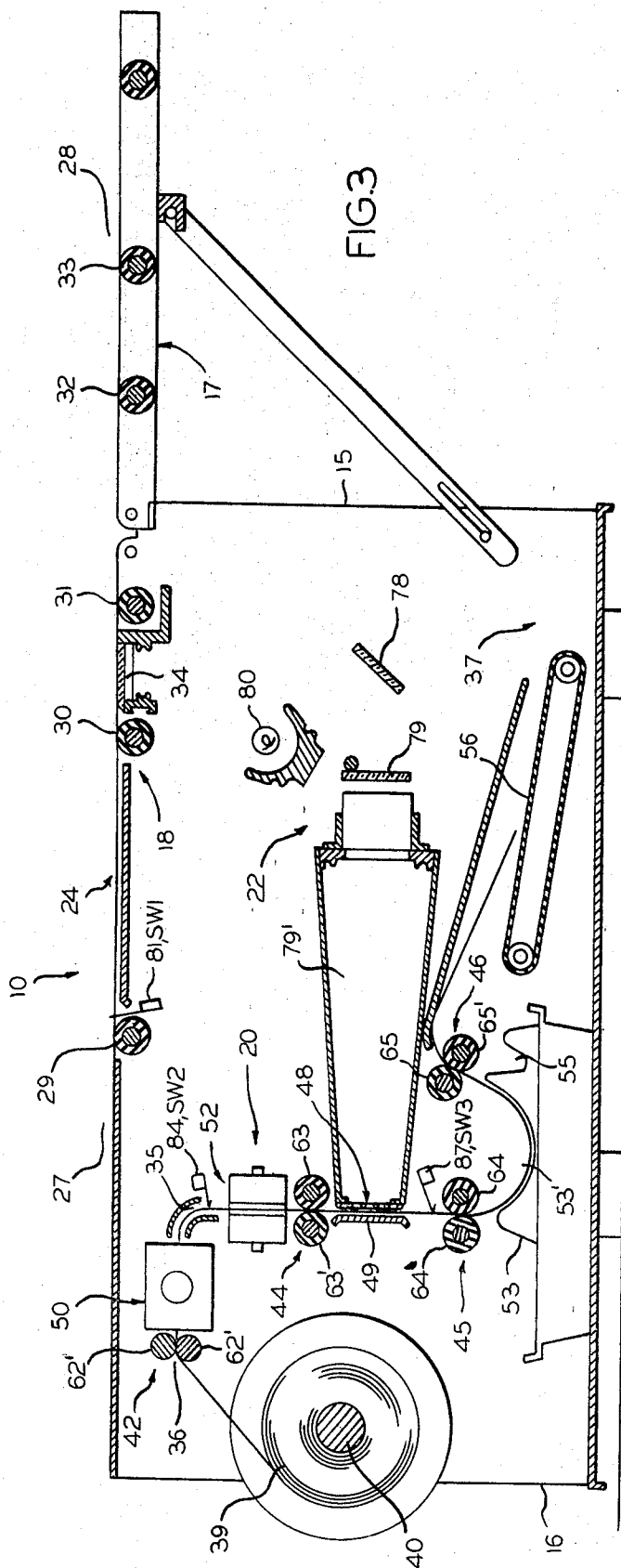


FIG. 3

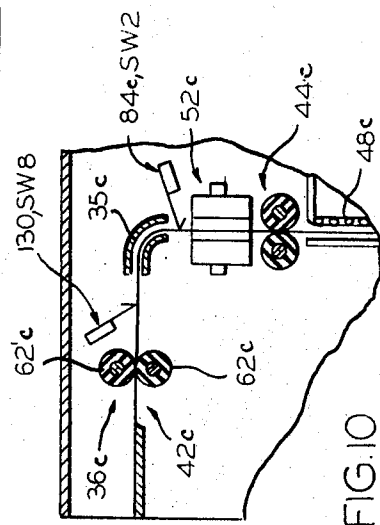


FIG. 10

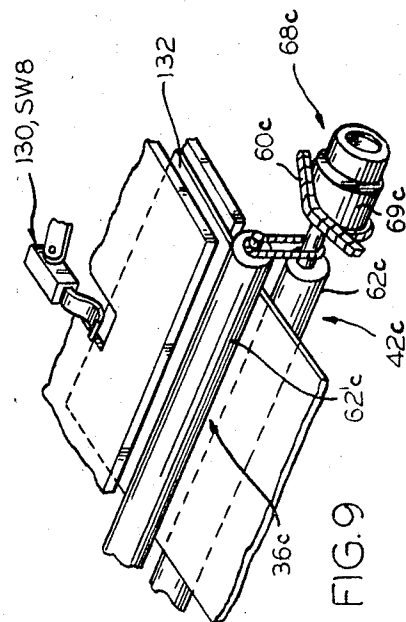


FIG. 9

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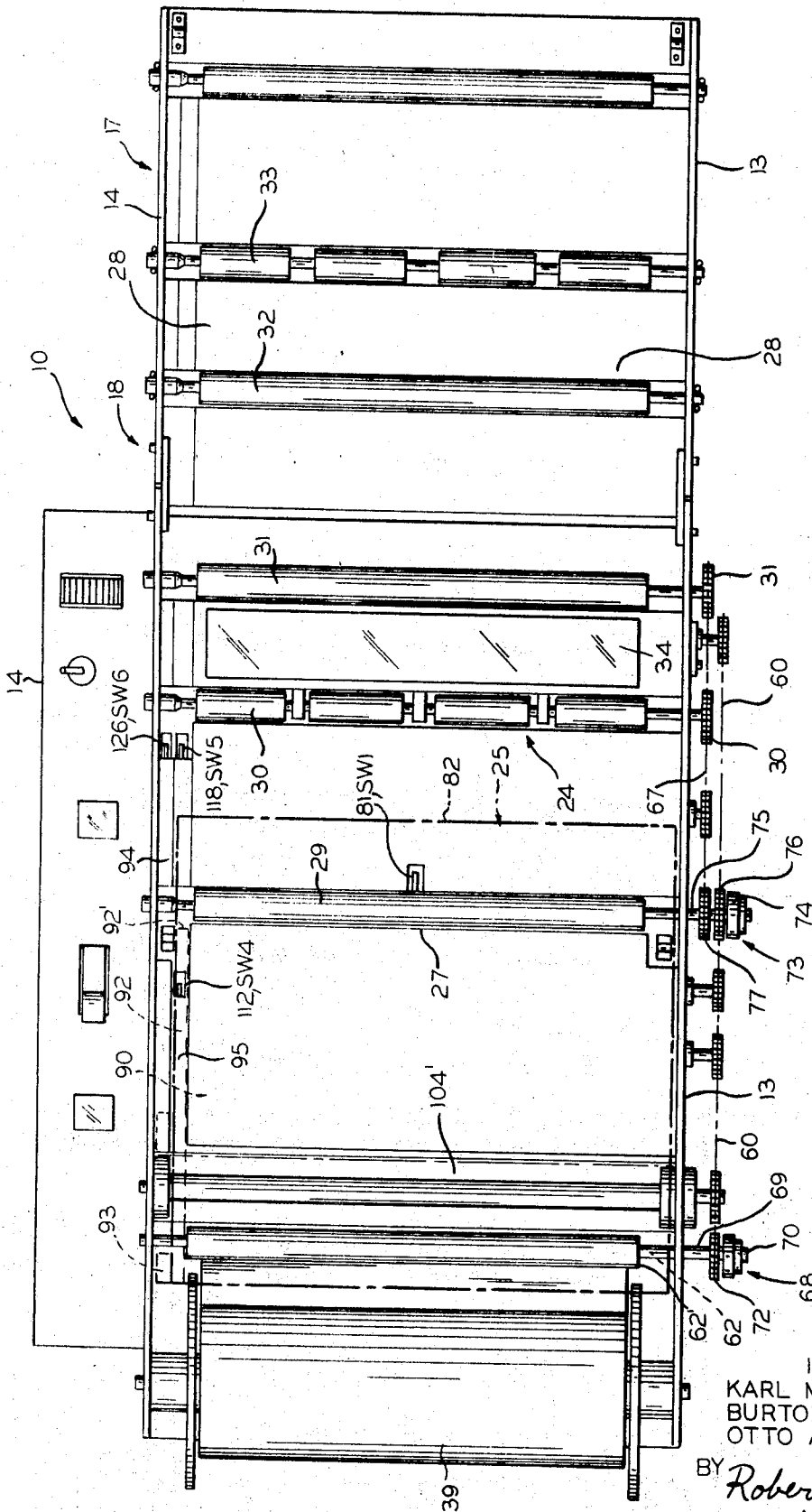


FIG. 4

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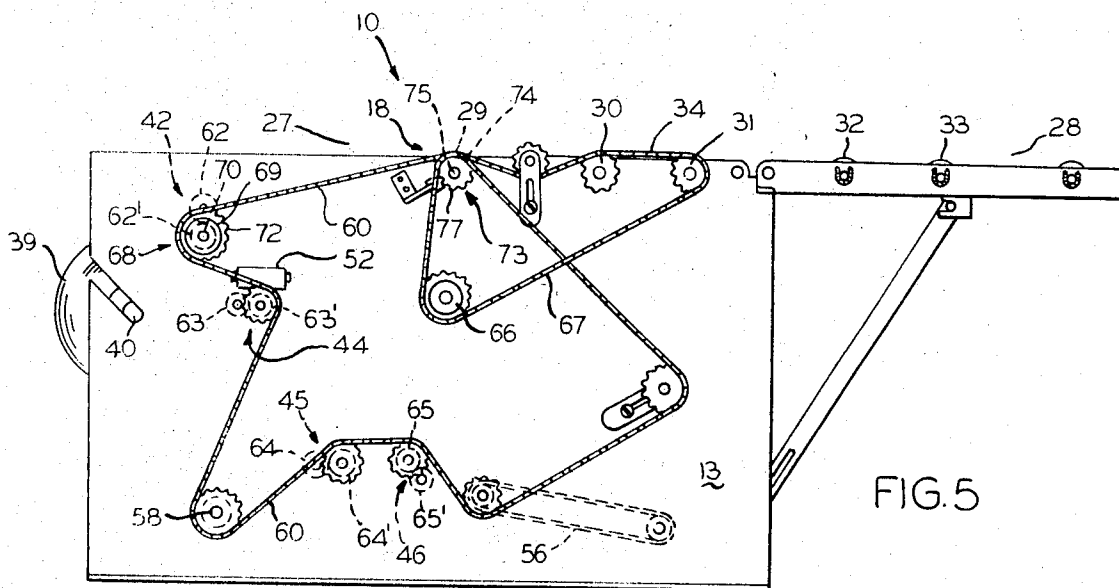


FIG. 5

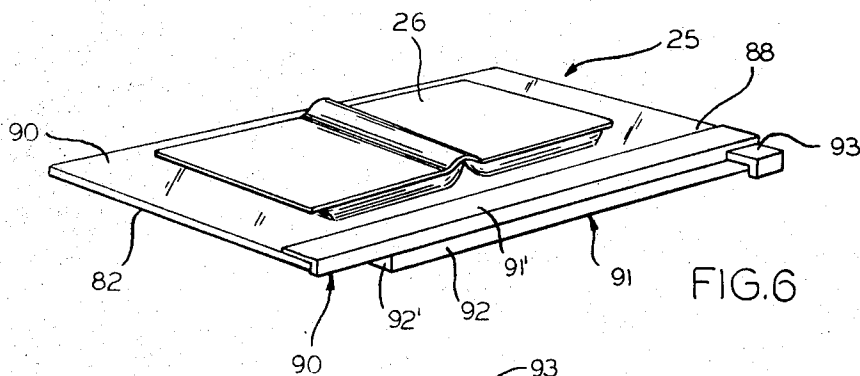


FIG. 6

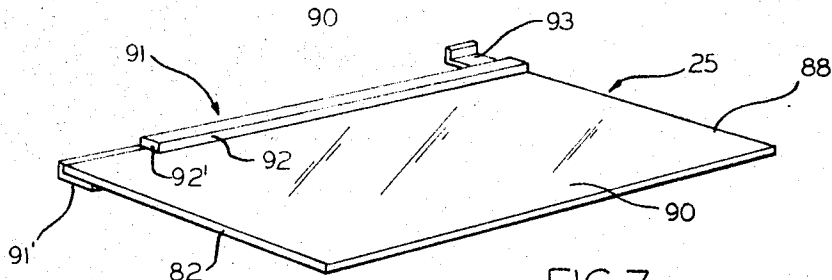


FIG. 7

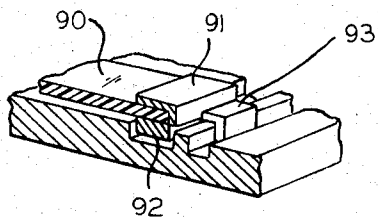


FIG. 8

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BOOK COPIER WITH MOVABLE CARRIER

BACKGROUND OF THE INVENTION

The present invention relates generally to a photocopy device including electrostatic photocopy devices for books or other articles having substantial thicknesses, and more particularly relates to a book copier device having a transparent carrier on which the article to be copied is positioned.

Electrostatic photocopy devices are commonly constructed to pass a specially coated and electrostatically charged sheet of copy paper through the focal plane of an optical conversion system. The original document to be copied is positioned before the objective camera lens. The image of the document is transferred through the optical camera system and onto the sensitized surface of the copy paper. The exposed or sensitive surface of the copy paper is then passed through a fluid suspension of ink particles suitably charged to react with the electrostatically charged image borne upon the copy paper surface.

It is both technically inconvenient and costly to view at one instant an entire original document page through an objective lens in a copy machine camera system in order to transfer at one instant the image of the entire document page to the sensitized copy paper. To view at one instant an entire sheet of an original document requires an exceptionally wide angle lens and large optical elements having inconveniently long focal lengths. This arrangement is further undesirable by the possible loss of resolution and edge distortion of the image transferred to the copy paper. Also, the cost of the optical components required for viewing a large area instantaneously are appreciably greater than the cost of optical components designed for viewing a relatively smaller area.

Previous photocopy machines avoided designs that require wide angle optical components, for instance, by passing a movable camera past a stationary original document which was positioned on a transparent scanning window. The sensitized paper was held fixed in the camera focal plane and the images were projected onto it in successive increments as the camera moved past the original document. A movable camera system required substantial space and mechanical complexity, and therefore photocopy machines so equipped were likely to be bulky in size, heavy, inherently slow and expensive to own or even lease. Furthermore, the moving camera system was not capable of being rapidly accelerated and was required to be returned after each cycle to the original or starting position before the next print cycle could be initiated.

A lighter, smaller and more rapid print cycle photocopy machine may be constructed if the original document is transported before the objective lens of the copy machine camera, and simultaneously sensitized copy paper is moved in the camera focal plane at a direction and speed coordinated with the changing image transferred through the camera optical system.

The invention herein utilizes the aforescribed principles of operation in a system in which an open book is transported on a moving carrier before the objective lens of the camera of the photocopy machine, and simultaneously a sheet of sensitized copy paper is moved in the camera focal plane at a direction and speed coordinated with the changing image of the book transferred through the camera optical system. Thus, the image or increments of the page or pages of the book are transferred onto the copy paper.

SUMMARY OF THE INVENTION

The present invention provides a system for reproducing increments of an open page of a book positioned on a transparent plate of a movable carrier. The carrier moves in a forward direction for reproducing the open page and in the opposite or reverse direction for returning the carrier back to its original or starting position.

The carrier includes trigger means sliding within grooved tracks for automatically controlling its forward and back movements.

Accordingly, a primary object of our invention is to provide a photocopy machine for reproducing books or other articles of substantial thickness.

Another object is to provide a photocopy machine which provides simplified pathways for transporting the book and the copy paper; thereby affording safeguards against jamming.

Another object is to provide a carrier having actuating means to control the movement of the carrier in the forward and reverse directions.

Still another object is to provide a reliable book transport system and a reliable copy paper transport system.

Still another object is to provide a substantially linear pathway for transporting a transparent book carrier across a scanning window.

These and other objects and advantages of the invention will become apparent from the illustrations in the accompanying drawings and the following specification and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings in which the same characters of reference are employed to indicate corresponding or similar parts throughout the several figures of the drawings.

FIG. 1 is a perspective view of a photocopy machine embodying the principles of the invention;

FIG. 2 is an electrical schematic layout showing the switching arrangement for controlling the photocopy reproduction and movement of the carrier on which the book to be copied is positioned;

FIG. 3 is an enlarged sectional, mechanical schematic elevational view of the photocopy machine in FIG. 1;

FIG. 4 is a top view of the book transport system and showing the book carrier in phantom;

FIG. 5 is a side elevational view showing the drive means and associated elements for controlling the rotation of the rollers of the book transport system and the copy paper transport system;

FIG. 6 is a perspective view of the book carrier;

FIG. 7 is a perspective view of the bottom of the carrier shown in FIG. 6;

FIG. 8 is a fragmentary, sectional perspective view of the carrier operatively in position on the top of the machine;

FIG. 9 is a fragmentary perspective view of the copy paper input feed means for manually feeding individual sheets of copy paper into the photocopy machine; and

FIG. 10 is a sectional fragmentary view of the copy paper transport system for manually feeding individual sheets of copy paper into the machine.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now particularly to FIGS. 1, 3 and 4 of the drawings, the reference numeral 10 indicates generally a book copier machine embodying the principles of the invention. The book copier 10 comprises a substantially rectangular frame 12 having a pair of opposed sidewalls 13 and 14, a front side 15 and a rear side 16. A movable platform 17 extends outward from the top of the front side 15 of the frame 12. The book copier 10 comprises a book transport system 18, a copy paper transport system 20 and a stationary camera means 22 (FIG. 3).

The book transport system 18 comprises a substantially linear pathway indicated generally by reference numeral 24 for transporting a book carrier 25 (see FIGS. 4, 6 and 7) on which a book 26 is positioned, from an input end 27 to an output end 28 on the platform 17, and back again to the input end 27.

The book carrier 25 is driven across the pathway 24 from the input end 27 by an input drive roller 29 and output drive rollers 30 and 31. Idler rollers 32 and 33 are rotatably mounted on the platform 17 and provide a smooth transition, as the book carrier 25 is transported by the output rollers 30 and 31 onto the platform 17.

A transparent glass scanning window 34 is positioned in the pathway 24 between the output drive rollers 30, 31. The

images of increments of the open page of book 26 moving across the scanning window 34 is transferred by the camera means 22 onto a length of photosensitive copy paper.

The copy paper transport system 20 (FIGS. 3 and 10) comprises a pathway 35 for transporting the length of copy paper from a copy paper input end 37 to a copy paper output end 37. The copy paper may be stored on a roll 39 supported on a spindle 40. Individual sheets of copy paper may be manually inserted into the pathway 35. The description immediately following will first describe a machine using the roll 39 supply of copy paper.

The copy paper transport system 20 includes an input pair of cooperating rollers 42 and cooperating pairs of rollers indicated respectively by the numerals 44, 45 and 46. The roller pairs 42, 44, 45 and 46 are spaced apart within the pathway 35 and move the copy paper from the input end 36 to the output end 37.

An image receiving section 48 (FIG. 3) is positioned in the copy paper pathway 35 between roller pairs 44 and 45. The image of the open page of the book moving across the scanning window 34 is conveyed by the camera means 22 onto the photocopy paper moving across the image receiving section 48. Section 48 may be a ladder type configuration formed from a nylon material, having a rectangular outer perimeter and spaced apart cords extending from one elongated side to the other, or other suitable configurations may be used which do not affect the sharpness or definition of the transferred image of the original document. A backup plate 49 is opposed to and spaced from the image receiving section 48. The copy paper moves between the backup plate 49 and the section 48.

A knife means (FIG. 3) indicated generally by the reference numeral 50 is positioned in the copy paper pathway 35 inward from and adjacent to the input pair of rollers 42. When the knife means 50 is actuated, it severs a length of copy paper from the roll 39 which is substantially the length of the carrier 25.

A corona section indicated generally by the reference numeral 52 (FIG. 3) is positioned between the knife means 50 and roller pair 44. Corona section 52 charges or sensitizes the photosensitive paper prior to its passage across the image receiving section 48.

After the camera means 22 has transferred the image of the open book page onto the photosensitive copy paper, the exposed copy paper then passes through a receptacle 53 containing toner solution 53'. The receptacle 53 has a toner overflow section 55 which receives toner solution after it has been squeezed from the copy paper passing between the roller pair 46. The toner solution develops the exposed copy paper. The output pair of rollers 46 transfers the copy paper to an output "O" ring conveyor 56 leading to the copy paper output 37.

Referring now particularly to FIGS. 2, 3, 4 and 5 of the drawings, the mechanical drive means for the book transport system 18 and copy paper transport system 20 will be described. A main motor 58 drives a main continuous revolving drive chain 60. The main chain 60 drives the input drive roller 29 of the book transport system 18 and the drive rollers 62, 63, 64 and 65 respectively of roller pairs 42, 44, 45 and 46 of the copy paper transport system 20 (FIG. 3). The idler rollers of these copy paper roller pairs 42, 44, 45 and 46 are designated respectively by the numerals 62', 63', 64' and 65'.

A reverse motor 66 drives a reverse continuous drive chain 67 in the opposite direction (counterclockwise in FIG. 5) with respect to the rotation of main chain 60. The reverse motor 66 is only "on" when the carrier 25 is returned from the output end 28 to the input end 27. During the interval when the reverse motor 66 is "on", reverse chain 67 drives the output rollers 30, 31.

The main chain 60 provides the driving power for transporting the carrier 25 from the input end 27 to the output end 28 of the book transport system 18 and the length of copy paper from the copy paper input end 36 to the copy paper output end 37. The reverse chain 67 provides the driving power to transport the carrier 25 from the output end 28 back to the input end 27.

A copy paper clutch means indicated generally by the reference numeral 68 couples and decouples the main drive chain 60 from the drive roller 62 of copy paper input roller pair 42. The clutch means 68 may comprise a rectifier means 68a to convert AC power to DC power for energizing an electromagnet 68b (FIG. 2) enclosed with a housing 69 mounted on a shaft 70 of the drive roller 62 of the input roller pair 42. The energizing of the electromagnet 68b causes a mechanical linking of the shaft 70 to a sprocket 72. The teeth of sprocket 72 engage the main drive chain 60. Thus, when the electromagnet 68b is energized the sprocket 72 is locked to the input drive roller 62, causing input roller pair 42 to rotate as the sprocket 72 is rotated by the main chain 60 and thereby pulling copy paper off from the roll 40. After the knife means 50 has severed the length of copy paper from the copy paper roll 39, the electromagnet 68b of clutch means 68 is deenergized to mechanically decouple the copy paper input roller pair 42 from the main chain 60. This prevents any further feeding of copy paper into the copy paper pathway.

A book clutch means indicated generally by the reference numeral 73 (FIGS. 3, 4, 5 and 8) couples and decouples the main chain 60 from the book input roller 29. Clutch means 73 may also comprise a rectifier means 73a (FIG. 3) to convert AC power to DC power for energizing an electromagnet 73b (FIG. 2) enclosed within a housing 74 which is mounted on a shaft 75 of the book input roller 29. The rectifier means 73 may be mounted to sidewall 13. The energizing of the electromagnet 73b mechanically couples the shaft 75 of the book input roller 29 to a main sprocket 76. The teeth of the sprocket 76 engage the main drive chain 60 (FIGS. 4 and 8). Normally, the electromagnet is energized and the sprocket 76 is locked to the input roller 29, causing the input roller 29 to rotate as the sprocket 76 is rotated by the main chain 60.

An auxiliary sprocket 77 is fixedly fastened on the shaft 75 of the book input roller 29. The teeth of sprocket 77 engage the reverse chain 67. When book input roller 29 is driven by the main chain 60, auxiliary sprocket 77 is simultaneously rotated to drive the reverse chain 67 in the forward direction or clockwise as viewed in FIG. 5, which is the same direction as the movement of main chain 60. The forward movement of the reverse chain drives book output rollers 30, 31 in the forward direction. After the carrier 25 has reached the output end 28, the electromagnet of book clutch means 73 is deenergized and reverse motor 66 is turned "on." The deenergizing of the electromagnet of book clutch means 73 mechanically decouples the book input drive roller 29 from the main chain 60. When the reverse motor 66 is turned "on," the reverse chain 67 drives the book drive rollers 29, 30 and 31 in the reverse direction or counterclockwise, which is opposite in direction to the rotation of main chain 60, causing the carrier 25 to return to the input end 27.

The camera means 22 (FIG. 3) comprises a reflecting mirror 78 positioned to receive the images of the open page of the book moving across the scanning window 34 and reflects the images into the focal plane of an objective lens 79.

The objective lens 79 focuses the images of the book through an image pathway 79' and onto the photosensitive copy paper moving across the image receiving section 48. The image reflection and sharpness of the photocopy is controlled by the light beamed to the mirror 78 from a high-intensity lamp 80. As shown, the image pathway from the mirror 78 is substantially parallel with respect to the book pathway 24 and extends toward the rear side 16 of the machine.

A control switch 81, SW1 (FIGS. 2, 3 and 4, is centrally positioned inward from book drive roller 29. Switching arm 81' (FIG. 2) of control switch 81, SW1 is switched from a normal or off-position to an on-position by the leading edge 82 (FIGS. 6 and 7) of the carrier 25.

In the on-position, control switch 81, SW1 causes the energizing of the electromagnet of the copy paper clutch means 68 and the energizing of a relay 83 (FIG. 2) which sets a knife solenoid 83' of the knife means 50 in a "go" or ready condition.

Relay 83 includes a switch 83A and a switch 83B (FIG. 2). Switch 83A provides an electrical connection to line 2 voltage for knife solenoid 83', when relay 83 is energized and switch 81, SW1 is in its off-position. Switch 83B provides an electrical connection to line 2 voltage for energizing relay 83 and clutch means 68. Relay 83 and clutch means 68 remain energized until the knife means 50 has severed the length of copy paper from roll 39.

An exposure switch 84, SW2 (FIGS. 2 and 3) is positioned adjacent the input to the corona section 52, as shown. The leading edge of the copy paper switches the exposure switch 84, SW2 from a normally off-position to an on-position. When switch 84, SW2 is in the on-position, a relay 85 is energized which closes relay switch 85'. Switch 85' in the closed position connects line 2 voltage to a high-voltage power supply 86 and the high-intensity lamp 80; thereby turning "on" the high-voltage supply 86 and the high-intensity lamp 80. Power supply 86 supplies high voltage to the corona section 52 to sensitize the copy paper as it passes through.

A hold switch 87, SW3 is positioned in the copy paper pathway 35 just above roller pair 45. The hold switch 87, SW3 is switched to an on-position from a normally off-position by the leading edge of the copy paper. Hold switch 87, SW3 remains in its on-position and maintains the lamp 80 and high-voltage power supply 86 "on" until the entire length of the severed copy paper has moved past the image receiving section 48. Therefore, after the trailing edge of the copy paper travels past the hold switch 87, SW3, the hold switch returns to its off-position and lamp 80 and power supply 86 turns "off."

The control switch 81, SW1 automatically returns to the off-position after the trailing end 88 of the carrier 25 has moved past. In the off-position, the control switch connects line 2 voltage to the knife solenoid 83', causing the knife means 50 to sever a length of the copy paper from the roll 39 having substantially the equivalent length as the carrier 25.

The cutting action of knife means 50 opens switch 89 (FIG. 2) which causes the deenergizing of the electromagnet of the copy paper clutch means 68 and relay 83, by severing their electrical connection with line 2 voltage.

The carrier 25 comprises a transparent plate 90 secured within an elongated holder 91 (see FIGS. 6 and 7). The plate 90 is formed from a nonscratchable material such as glass. The holder 91 comprises an upper section 91' and a lower section 92. The forward edge 92' of the lower section 92 is spaced inward from the front end 82 of the carrier 25. A substantially L-shaped trigger finger 93 extends perpendicularly outward from the holder 91 adjacent the trailing end 88 of the carrier 25. The lower section 92 and finger 93 provide actuating means to control the reverse movement of carrier 25 from the output end 28 back to input end 27.

An outer grooved track 94 (FIG. 4) extends lengthwise along the top of the machine adjacent side 14 from input end 27 to output end 28. The width of outer track 94 is slightly larger than the width of trigger finger 93.

An inner grooved track 95 is adjacent the outer track 94 and also extends lengthwise along the top of the machine from the input end 27 to the output end 28. The width of inner track 95 is slightly larger than the width of the lower section 92. When the carrier 25 is operatively in place, the trigger finger 93 is positioned in outer track 94 and lower section 92 is positioned in inner track 95. The finger 93 and lower section 92 slide within their respective tracks 94 and 95 as the carrier 25 moves in the forward or reverse directions.

Referring now particularly to FIG. 2, the energized or deenergized state for a reverse control relay 96 controls the voltage applied to the reverse motor 66, to the book clutch means 73 and to control switch 81, SW1. Relay 96 includes a relay switch 97 and a relay switch 98. In the deenergized condition for relay 96 as shown in FIG. 2, movable arm 99 of relay switch 97 contacts terminal 102 and movable arm 104 of relay switch 98 contacts terminal 106. Terminal 106 is connected to the switching arm 81' of control switch 81, SW1. When relay

96 is energized, movable arm 99 of switch 97 contacts terminal 108 and movable arm 104 of switch 98 contacts terminal 110.

A switch 112, SW4 (FIGS. 2 and 4) is positioned in the inner track 95 adjacent the input end 27 of the book copier transport system 18. Upon contact of the forward edge 92' of carrier 25 with switch 112, SW4, the movable arm 114 connects with terminal 116, which in turn is connected to movable arm 104 of relay switch 98 of relay 96. As may be seen from FIG. 2, line 2 voltage from switch 112, SW4 is applied to switching arm 81' of control switch 81, SW1 through switch 98 when relay 96 is in the deenergized state. Switch 112, SW4 is maintained "on" until the entire length of lower section 92 of the carrier 25 has passed over.

A hold switch 118, SW5 (FIGS. 2 and 4) is positioned in the inner track 95 adjacent drive roller 30 of the book transport system 18. The forward edge 92' of the lower section 92 of carrier 25 mechanically switches switch 118, SW5 from a normally off-position to an on-position by forcing the movable arm 120 into contact with terminal 122. Terminal 122 is connected to terminal 116 of switch 112, SW4. When switch 118, SW5 is switched "on," switch 112, SW4 is also "on." When the trailing end 88 of carrier 25 finally passes switch 112, SW4, the hold switch 118, SW5 provides line 2 voltage to control switch 81, SW1.

A switch 126, SW6, is positioned in the outer track 94 also adjacent drive roller 30. Trigger member 93 moves switch 126, SW6 to an "on" position from a normally "off" position, whereby its movable arm 128 contacts terminal 130 which is connected to line 2 voltage. Movable arm 128 is connected to terminal 132 of relay 96. The other terminal 134 of relay 96 is connected to line 1 voltage. Therefore, in the on-position for switch 126, SW6, relay 96 is energized, causing movable arm 99 of relay switch 97 to move from its off-position in contact with terminal 102, to its on-position in contact with terminal 108, and movable arm 104 of relay switch 98 to move from its off-position in contact with terminal 110.

The movement of arm 99 of switch 97 away from terminal 102 severs line 1 voltage from the book clutch means 73, causing drive roller 29 to be decoupled from the main chain 60. The contacting of arm 99 with terminal 108 connects line 1 voltage to the reverse motor 66, thereby turning the reverse motor 66 "on." Reverse chain 67 now rotates in a counter-clockwise direction as viewed in FIG. 5, driving rollers 29, 30 and 31 in the reverse direction.

The movement of arm 104 of switch 98 away from terminal 106 removes line 2 voltage from control switch 81, SW1. This prevents the electromagnet of the copy paper clutch means 68 from being energized when the trailing end 88 of the carrier 25 switches the switch 81, SW1 back to its on-position, during the reverse movement of carrier 25 toward the input end 27. The contact of arm 104 with terminal 110, which is connected to terminal 132 of relay 96, maintains line 2 voltage on the relay 96 when switch 126, SW6 returns to its off-position after trigger member 93 has passed over the switch in the reverse movement of carrier 25.

In the reverse movement of carrier 25, switch 112, SW4 is switched back to its on-position by the lower section 92 of carrier 25 prior to switch 118, SW5 returning to its off-position. Thus, switch 112, SW4 connects line 2 voltage to arm 104 of switch 98 to maintain relay 96 "on" after switch 118, SW5 returns to its off-position. When the trailing end 88 of carrier 25 moves past switch 112, SW4 it returns to its off-position, thereby removing line 2 voltage from relay 96. Relay 96 becomes deenergized, causing the reverse motor 66 to turn "off," book clutch means 73 to energize whereby drive roller 29 is again coupled to main chain 60, and line 2 voltage to be connected to arm 81' of the control switch 81, SW1. The machine is now ready for another operating cycle.

With reference to FIGS. 9 and 10 the manual copy paper sheet feed will be described. Similar parts to those in the other figures are identified in FIGS. 9 and 10 by the same reference numeral with a suffix "c."

For the manual copy paper sheet feed (FIGS. 9 and 10), the automatic knife means 50 is replaced in pathway 35c with switch 130, SW8 having a normal-position and a standby-position. In the normal-position, alternating current (AC) line voltage is connected to the clutch means 68c for energizing the magnetic means 68b (FIG. 2). In the standby-position, the AC line voltage connection with the magnetic means 68c is severed.

When the standby switch 130, SW8 is in the normal-position, the drive chain 60c is coupled to the drive roller 62c of the copy paper input roller pair 42c. In the standby-position before the original document is inserted into the system, the drive chain 60c is coupled to the drive roller 62c; thus preventing the copy paper sheet from penetrating further into the copy paper pathway 35c. The standby switch 130, SW8 is switched from the normal-position to the standby-position by the leading edge 132 of the copy paper sheet. FIG. 9 illustrates the position of the sheet of copy paper after the leading edge 132 of copy paper has moved switch 130, SW8 to its standby-position.

OPERATION

Turning now particularly to FIGS. 2, 3, 4 and 5, the sequence of operating cycle for the machine 10 will be described with greater detail. The operating cycle comprises a photocopy part and a reverse part. In the photocopy part of the operating cycle, the carrier 25 moves from the input end 27 to the output end 28 and the open book positioned on the carrier is scanned as it passes the scanning window 34. The images of the open book are reproduced onto photosensitive paper by the camera means 22. In the reverse part of the cycle, the carrier 25 is automatically returned to the input end 27 of the machine. The switches controlling the sequence of the operating cycle are all shown in their normally off-position in the various Figures of the drawings.

The carrier 25 is placed on top of the machine 10 whereby the lower section 92 is positioned in track 95 and trigger finger 93 is positioned in track 94. After the electrical power to the machine is turned "on," the automatic operating cycle begins when the carrier 25, with the open book thereon, is manually moved into contact with input drive roller 29 of the book transport system 18. Switch 112, SW4 is switched to the on-position by the forward edge 92' of the lower section 92 of the carrier, thereby providing line 2 voltage for movable arm 81' of control switch 81, SW1 when switch 98 of relay 96 is in the off-position.

The leading edge 82 of the carrier 25 turns control switch 81, SW1 to its on position to connect line 2 voltage to the electromagnet of copy paper clutch means 68 and to relay 83. The electromagnet becomes energized causing clutch means 68 to mechanically couple drive roller 62 of input roller pair 42 (FIG. 3) with the main chain 60. Roller pair 42 pulls copy paper from roll 39 into the copy paper pathway 35. Relay 83 also becomes energized and switch 83A and switch 83B move to their respective on-positions. Switch 83A in its on-position places the knife solenoid 83' in a standby-position. Switch 83B in its on-position provides a hold voltage (line 2) to maintain relay 83 energized when control switch 81, SW1 returns to its off-position. Relay 83 remains energized until after knife means 50 has completed its severing operation.

The copy paper passes through corona section 52 where it is sensitized. The leading edge of the sensitized copy paper switches exposure switch 84, SW2 "on" prior to reaching the corona section 52. In the on-position for the exposure switch 84, SW2, light relay 85 is energized causing the high-intensity lamp 80 and high-voltage power supply 86 to turn "on." The copy paper passes through the corona section 52 where it is sensitized. The images of the open book moving across scanning window 34 are transferred by the camera means 22 onto the sensitized copy paper moving simultaneously across the image receiving section 48 at substantially the same rate of speed.

The leading edge of the exposed copy paper turns the hold switch 87, SW3 to its on-position after passing across the image receiving section 48. When the trailing end of the carrier 25 moves past the control switch 81, SW1, the control switch returns to its off-position and provides a connection to line 2 voltage through switch 83A of relay 83 (which is energized) for knife solenoid 83'. Knife solenoid 83' becomes energized, causing knife means 50 to sever a length of copy paper corresponding to the length of the carrier 25.

The cutting action of knife means 50 opens switch 89 which breaks the electrical connection of line 2 voltage with the electromagnet of clutch means 68 and relay 83. The electromagnet and relay 83 becomes deenergized. Clutch means 68 decouples the drive roller 62 or input roller pair 42 from main chain 60 and thereby stops any further movement of copy paper from the roll 39 into pathway 35.

The forward edge 92' (FIGS. 6 and 7) of the lower section 92 of carrier 25 turns switch 118, SW5 (FIG. 2) to its on-position. At the same instant switch 112, SW4 is held in its on-position by the rear portion of lower section 92. Switch 118, SW5 provides line 2 voltage for control switch 81, SW1, when switch 112, SW4 has returned to its off-position after the entire lower section 92 has passed over and switch 98 of relay 96 is in its off-position.

At the instant when substantially the entire carrier 25 has passed the scanning window 34, the trigger finger 93 turns switch 126, SW6 to the on-position whereby line 2 voltage is impressed at terminal 132 to cause relay 96 to become energized. When this occurs, switch 118, SW5 is still in its on-position.

Switch 97 of relay 96 moving from the off-position to the on-position, breaks the line 1 voltage connection with book clutch 73 whereby roller 29 is decoupled from the main chain 60. Reverse motor 66 is turned "on" causing reverse chain 67 to move in the opposite direction with respect to main chain 60; thereby driving the drive rollers 29, 30 and 31 counterclockwise as viewed in FIGS. 3 and 5. The carrier 25 now moves into its reverse sweep back to input end 27.

Switch 98 moving from the off- to the on-position severs the connection of control switch 81, SW1 with line 2 voltage. Therefore, the movement of the carrier 25 across switch 81, SW1 in the reverse part of the operating cycle, has no effect. Switch 98 in the on-position connects a hold voltage (line 2) from switch 118, SW5 to terminal 132 of relay 96, to maintain relay 96 energized when switch 126, SW6 returns to the off-position after trigger finger 93 has passed over.

Switch 112, SW4 is turned on by the lower section 92 before switch 118, SW5 has returned to the off-position. When the lower section 92 has passed over switch 118, SW5 on the reverse sweep, switch 112, SW4 provides the line 2 hold voltage for relay 96. After the lower section of the carrier has passed over switch 112, SW4, relay 96 becomes deenergized, the carrier is at rest at input 27 and the operating cycle is completed.

In the manual copy paper sheet feed embodiment illustrated in FIGS. 9 and 10, the sheet of copy paper must be inserted into the machine first. The input pair of feed rollers 42c transports the copy paper from the copy paper input end 36c into the copy paper pathway 35c. The leading edge 132 of the copy paper switches the standby switch 130, SW8 from its normal-position to the standby-position, causing the deenergizing of the magnetic means 68b of the clutch means 68c. The deenergizing of the electromagnet 68b mechanically disassociates the drive roller 62c of the roller pair 42c from the drive chain 60c, which instantly stops any further movement of the copy paper. Thus, when switch 130, SW8 is in the standby-position, the copy paper is firmly and positively held in place by the input roller pair 42c. Now, the original document may be inserted into the machine at the convenience of the operator.

When the original document is inserted into the photocopy machine 10, its leading edge switches the control switch 81, SW1 (FIG. 3) from its normal or off-position to its on-position. In the on-position for control switch 81, SW1, the elec-

tromagnet 68b of the clutch means 68c is again energized to cause mechanical coupling of the drive roller 62c of input roller pair 42c to the drive chain 60c. Now the sheet of copy paper is automatically pulled inward by roller pair 42c and transported through the copy paper pathway 35c at substantially the same speed as the movement of the original document.

The distance from the standby switch 130, SW8 to the image receiving section 48c is substantially equal to the distance from the control switch 81, SW1 (FIG. 3), to the document scanning window 34. Thus, exact reproduction of the document onto a sheet of copy paper is achieved without simultaneously inserting the copy paper with the document. Hence, the operator is able to first insert the copy paper evenly into pathway 35c and then subsequently, at his convenience, insert the original document evenly into the original document pathway 24.

From the drawings and foregoing description, it should be apparent that a novel book copier has been provided which accomplished the aforesaid objects in an efficient and improved manner. The carrier 25 on which an open book is positioned, moves across the scanning window 34 for reproducing increments of the open book onto sensitized copy paper. The carrier includes actuating or trigger means which controls the sequence of operation of the machine, and also the forward and reverse movement of the carrier. Copy paper may be fed from a roll 39 as shown in FIG. 3, or sheets may be inserted manually as illustrated by FIGS. 9 and 10.

The description of the preferred embodiment of this invention is intended merely as illustrative of this invention, the scope and limits of which are set forth in the following claims.

We claim:

1. In a reproduction apparatus including copy paper, a book transport means for moving a book within a pathway from a first end to a second end, a scanning window being positioned in the pathway, a copy paper transport means for transporting copy paper through a copy paper pathway, power means for driving said transport means, means for reproducing an open page of said book onto the copy paper as it moves past the scanning window, said book transport means comprising:

at least one drive roller secured to the apparatus to rotate around its own axis in substantially the same plane, said drive roller contacting said carrier for moving said carrier between said first and second ends.

2. The reproduction apparatus of claim 1 wherein said power means comprises:

a main continuous rotating chain for driving said drive roller to move said carrier from the first end toward the second end;

a reverse chain for rotating said drive roller for moving said carrier from the second end back to the first end of the pathway; and

a reverse motor means for driving said reverse chain, said reverse motor being turned "on" after said carrier reaches the second end to cause said carrier to be transferred from the second end back to the input end of the pathway.

3. The reproduction apparatus of claim 1, wherein:

a book clutch means is associated with said drive roller, having a first position when the drive roller is coupled to the power means and a second position when the drive roller is decoupled from the power means, said book clutch means being switched from the first position to the second position when the carrier reaches the second end and thereby enabling the carrier to be conveyed back to the first end.

4. The reproduction apparatus of claim 3, wherein:

said copy paper transport means comprises an input pair of rollers, one of the rollers being a copy paper drive roller, a copy paper clutch means coupling and decoupling the copy paper drive roller from the main chain;

a control switch associated with the copy paper clutch means and having an on-position and off-position, said copy paper drive roller being coupled to the main chain when the control switch is in the on-position and decoupled from the main chain after the control switch returns to the off-position, said copy paper being pulled into the copy paper pathway when the control switch is in the on-position; and

a switch member associated with the book clutch means and having an on-position and an off-position, said lower section of the carrier switching the switch member from the off-position to the on-position and thereby causing the book clutch means to couple the book drive roller with the main chain to provide the drive for moving the carrier from the input end toward the output end, the carrier switching the control switch from the off-position to the on-position after the switch member is in its on-position.

5. In a reproduction apparatus including copy paper, a book transport means for moving a book to be copied along an original document pathway across a scanning window located between an input end and an output end of the document pathway, a copy paper transport means for transporting copy paper through a copy paper pathway, power means for driving said transport means, means for reproducing said book as it moves past the scanning window, said book transport means comprising:

a book carrier associated with the book transport means for supporting said book, said transport means moving the carrier across said scanning window from a first end to a second end;

a track means extending from the first end to the second end of the document pathway, said track means comprising an elongated groove, said carrier including a finger extending into the groove and moving therealong as the carrier moves from the first end to the second end of the document pathway;

a reverse switch positioned at the second end of the groove, said reverse switch having a normal-position and a reverse-position, said finger switching the reverse switch to said reverse-position, when the carrier reaches the output end; and

means for reversing the direction of movement of said carrier when said finger switches the reverse switch to said reverse-position.