Sept. 14, 1965 E. L. ALLEN ETAL 3,206,193

XEROGRAPHIC REPRODUCING MACHINE CONTROL

Filed March 1, 1962 3 Sheets-Sheet 1

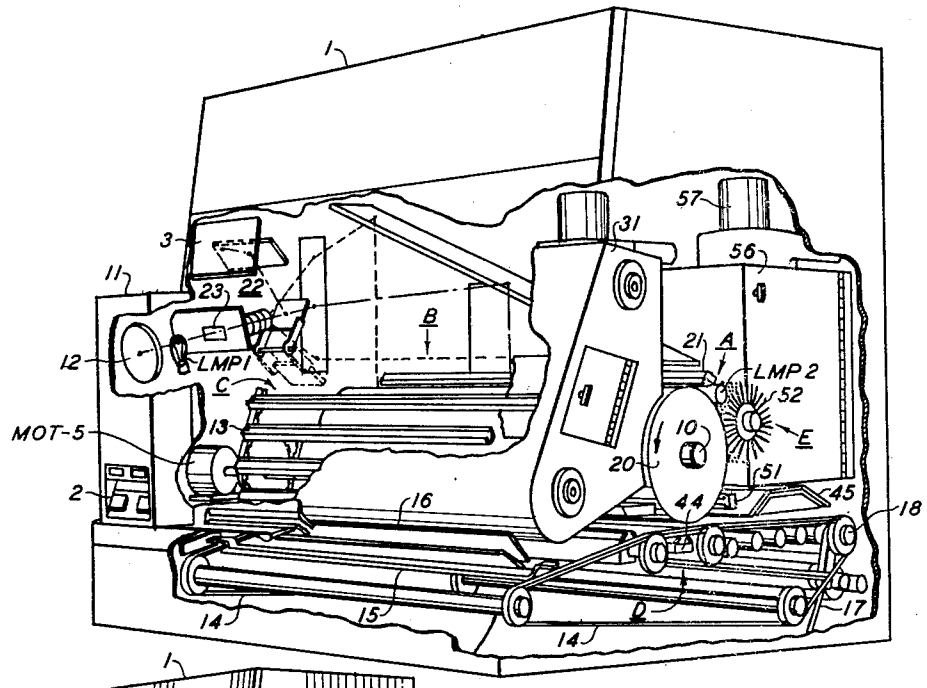


FIG. 2

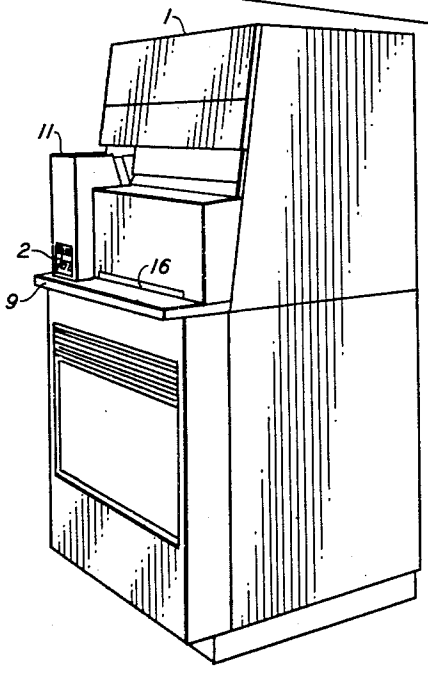


FIG. 1

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XEROGRAPHIC REPRODUCING MACHINE CONTROL

Filed March 1, 1962 3 Sheets-Sheet 2

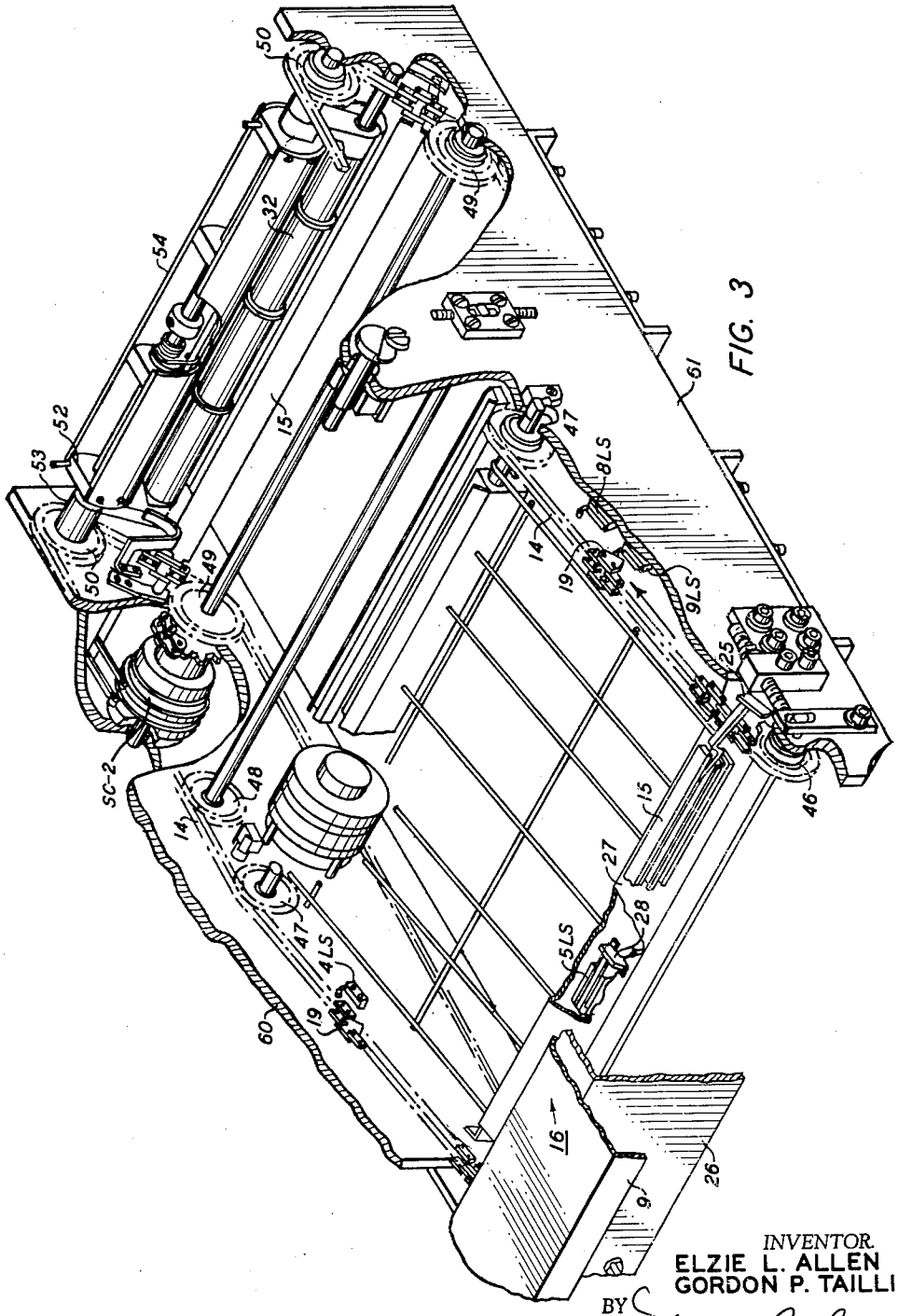


FIG. 3

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XEROGRAPHIC REPRODUCING MACHINE CONTROL

Filed March 1, 1962 3 Sheets-Sheet 3

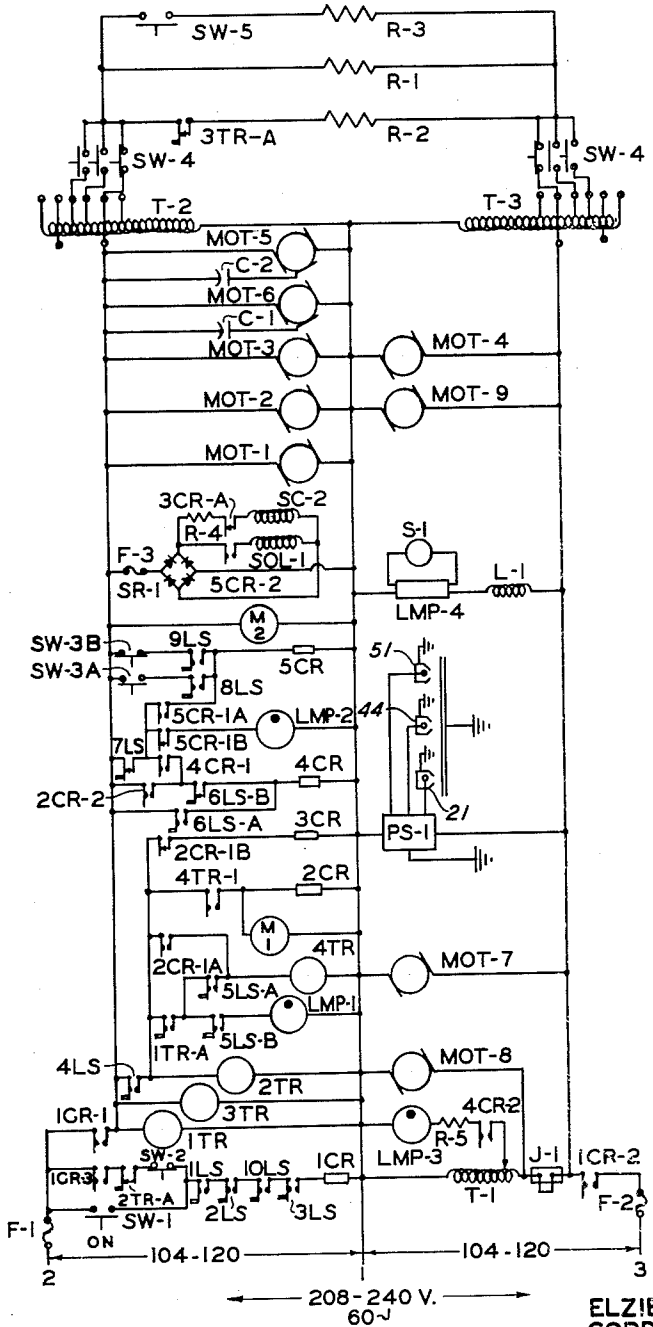


FIG. 4

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United States Patent Office 3,206,193 Patented Sept. 14, 1965

3,206,193

XEROGRAPHIC REPRODUCING MACHINE CONTROL

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Filed Mar. 1, 1962, Ser. No. 176,531
1 Claim. (Cl. 271—47)

This invention relates to improvements in paper feed mechanisms for sheet conveyor apparatus of xerographic reproducing machines or similar devices.

More specifically, the invention relates to an improved electrical circuit controlling the gripper bar mechanism in a conveyor system of an automatic xerographic reproducing machine.

In the process of xerography, an electrostatic latent image of the copy to be reproduced is formed on a xerographic plate, usually in the form of a rotating drum, and is developed with a toner material to form a powder image of the copy on the drum. The powder image is then transferred to a sheet of support or transfer material, usually paper, which is fed into the front of the machine by an operator, grasped by a gripper mechanism and carried into contact with the xerographic plate.

In an automatic xerographic reproducing machine, an operator feeds a sheet of paper or transfer material into the front of the machine. The sheet of paper is carried through the machine by a conveyor mechanism. This conveyor mechanism usually consists of a pair of chains mounted on parallel sprockets and carrying a sheet gripper mechanism. As the sheet is put into the machine, it trips a microswitch which activates a circuit initiating movement of the conveyor mechanism. As movement of the conveyor mechanism starts, the gripper mechanism closes, grasping the paper and carrying it away from the operator. Since the gripper mechanism extends transversely across the leading edge of the paper and the paper must slide uniformly into the gripper mechanism, the paper must be squared with respect to the gripper mechanism or the proper gripping action will not take place. If the paper is not gripped properly, it will be carried through the machine at an angle and not receive the transfer image from the xerographic drum in the proper registration to the image being reproduced. There is also the possibility of the paper jamming in the machine and interfering with the normal operation of the machine. Removal of paper so jammed is not only costly and time consuming, but may result in damage to the machine.

An experienced operator, with one continuous movement, can feed paper into the front of the machine, properly aligned with the gripper bar mechanism, so that the closing of the gripper mechanism will grasp the paper and carry it away from the operator. However, the average operator has difficulty in properly aligning the paper in the first movement toward the gripper mechanism. It is, therefore, necessary that the operator be given time to align the paper after the microswitch has been tripped and the conveyor mechanism activated, so that necessary adjustments of the paper alignment may be made before the gripper mechanism grasps the paper and pulls it away from the operator.

It is, therefore, the primary object of this invention to provide an electrical circuit, whereby, after insertion of the paper into the machine, there is predetermined time delay, allowing proper alignment of the paper prior to the activation of the gripper mechanism.

It is a further object of this invention to improve the conveyor system of an automatic xerographic machine whereby the possibility of carrying an improperly aligned sheet of material through the machine is reduced.

It is a further object of this invention to improve sheet gripper mechanisms and conveyor systems in automatic xerographic machines whereby the possibility of misfeeds and damage to the machine, by inexperienced operators, is reduced.

These and other objects of the invention are attained by means of a sheet gripper mechanism responsive to a microswitch which is tripped upon the insertion of the sheet of material into the machine, and a two-second timing device delaying the activation of the gripper mechanism after the tripping of the microswitch. The two-second time delay allows the operator to make any minor adjustments in the alignment of the paper with respect to the gripper mechanism that may be required.

The invention is disclosed in the appended drawings, in which:

FIG. 1 is an isometric view of a type of automatic xerographic reproducing machine in which the present invention is particularly adapted for utilization,

FIG. 2 is an isometric view, with cover partly removed, of a portion of the paper handling mechanism of the machine of FIG. 1,

FIG. 3 is an enlarged isometric view of the paper conveyor system disclosed in FIG. 2, and embodying the present invention; and,

FIG. 4 is a wiring diagram of a circuit embodying the present invention.

Referring now to FIGS. 1 and 2, there is shown an automatic xerographic reproducing machine of the type disclosed in copending application Serial No. 46,463, filed August 1, 1960, in the name of Robert A. Hunt and Gordon P. Taillie, now Patent No. 3,078,770, in which the paper feed delay circuit of the invention may advantageously be employed.

The xerographic apparatus comprises a xerographic plate **20**, shaped in the form of a rotating cylindrical drum. The xerographic plate includes a photoconductive layer of light receiving surface on a conductive backing and is positioned on a shaft **10** to rotate in the direction indicated by the arrow to cause the drum surface sequentially to pass a plurality of xerographic processing stations.

For the purpose of the present disclosure, several xerographic processing stations in the path of movement upon the surface may be described functionally, as follows:

A charging station A, at which a uniform elctrostatic charge is deposited on the photoconductive layer of the xerographic drum;

An exposure station B, at which a light or radiation pattern of the copy to be reproduced is projected onto the drum surface to dissipate the drum charge on the exposed areas thereof, and thereby form a latent elcetrostatic image of the copy to be reproduced;

A developing station C, at which a xerographic developing material, including toner particles having an electrostatic charge opposite to that of the electrostatic latent image, are cascaded over the drum surface whereby the toner particles adhere to the electrostatic image to form a xerographic powder image in the configuration to be reproduced;

A transfer station D, at which the xerographic powder image is electrostatically transferred from the drum surface to a transfer material or support surface; and,

A drum cleaning and discharge station E, at which the

drum surface is brushed to remove residual toner particles remaining on the drum after image transfer, and at which the drum surface is exposed to a relatively bright light source to effect substantially complete discharge of any residual electrostatic charge thereon.

At charging station A there is a corona discharge array **21** of one or more discharge electrodes that extend transversely across the drum surface and are energized from a high potential source. Charging apparatus may be of the type disclosed in Vyverberg Patent No. 2,836,725, issued May 27, 1958.

Next subsequent thereto in the path of motion of the xerographic drum is exposure station B, which contains an optical scanning or projection mechanism generally designated **11**. The projector consists of a lamp LMP1, a reflector **12** and a series of lenses **22**. A data processing card containing an aperture and referred to herein as the aperture card, is placed in a carriage (not shown), between the lamp LMP1 and the lens **22**. The aperture in the data processing card contains a microfilm **23** containing an image of a copy to be reproduced. The lamp LMP1 projects the image on the microfilm **23** through lens **22** onto a series of object mirrors which reflect the image onto the surface of the xerographic drum. A viewing plate **3** is provided whereby the image to be flashed on the xerographic drum may be viewed prior to the operation of the machine. The aperture card is arranged in a film holder and a movable carriage which moves in a path traversing the optical path of the lens whereby the subject image of the film is scanned in timed relation to the movement of the light receiving surface of the xerographic drum and a light image corresponding to the subject image is transferred to the surface of the xerographic drum.

Adjacent to the exposure station is a developing station in which there is positioned a housing **31** containing a suitable "two component" developing medium. In this arrangement, a bucket-type conveyor **13** driven by motor MOT5 is used to carry developing material to the upper part of the housing where it is cascaded down onto the xerographic drum.

As the developing material is cascaded over the xerographic drum, toner particles are pulled away from the carrier component of the developing material by the electrostatic charge on the drum, and form powder images of the copy being reproduced. The carrier components pass off the drum into the lower portion of the housing **31** for recycling. As powder images are formed, additional toner material may be supplied to the developing material in proportion to the amount of toner deposited on the drum surface.

After passing developing station C, the xerographic drum rotates past image transfer station D. At the transfer station, a sheet feeding mechanism is adapted to feed sheets of transfer material, usually paper, successively to the xerographic drum in registration with the formed xerographic powder image on the drum surface.

In the embodiment shown, the conveyor system includes a pair of chains **14** carrying one or more paper grippers **15** in a circuit between sheet feeding station **16** and a sheet delivery station **17**. Actuating cams **25** (see FIG. 3) are provided to activate the grippers to take hold of the front edge of a sheet of support material at station **16**, and to hold the sheet while traveling to the delivery station **17**, and there to release the sheet for removal from the machine. The sheet of transfer material is fed manually by an operator to paper gripper **15** and is forwarded by the paper gripper into contact with the xerographic drum at image transfer station D.

The transfer of a xerographic powder image from the drum surface to the support material is effected by means of a corona transfer device **44** located at or immediately after the point of contact of the support material and the xerographic drum. The corona transfer device is substantially similar to the corona discharge device **21** that is employed at charging station A, in that it includes an array of one or more corona discharge electrodes that are energized from a suitable high potential source and extend transversely across the drum surface. In operation, the electrostatic field created by the corona discharge device is effective to cause the transfer material to electrostatically adhere to the drum surface, whereby the transfer material moves synchronously with the drum surface in contact therewith. The electrostatic field is also effective to attract the toner particles comprising the powder image from the drum surface and cause them to adhere electrostatically to the surface of the transfer material.

As the paper gripper is advanced by the chain conveyor it strips the sheet of transfer material from the drum and transports it to a fixing device, such as heat fuser **45**, where the xerographic powder images previously transferred to the support surface are permanently fixed thereto. A series of suitable support rods **18** are provided to guide the trailing edge of the sheet of support material in proper relation to the heat fuser. The heat fuser **45** contains electrical heating elements which are connected to a suitable source of power (not shown). After fusing, the finished copy is discharged from the appartus at sheet delivery station **17**.

After the image is transferred from the xerographic drum to the support surface, the xerographic drum rotates past cleaning station E to remove any residual charge and developing material that may remain on the xerographic drum. A corona precleaning device **51**, similar to corona charging device **21**, is positioned to impose an electrostatic charge of suitable polarity on the drum and the powder adhering thereto, to aid in effecting removal of the powder from the drum surface.

A rotatable brush **52** is positioned to effect removal of the residual powder from the drum and a source of light, such as lamp LMP2 floods the drum surface with light to cause dissipation of any residual electric charge remaining on the drum. Any powder particles removed by brush **52** are collected in tank **56** by means of exhaust blower **57**.

The automatic xerographic machine is suitably enclosed in a housing generally designated **1** and contains a control panel designated **2**. To operate the machine, the operator faces feed-in station **16** and presses the appropriate switch to initiate operation of the machine. A sheet of transfer material is fed into feed-in station **16** initiating operation of the conveyor system and projector mechanism. The projector scans the microfilm **23** and gripper bar **15** grips the sheet of transfer material and draws it into the machine to receive the powder image from the xerographic drum. The feed-in station **16** is more clearly seen in FIG. 3 and contains a suitable counter **9**, mounted on frame member **26**, for use in positioning the sheet of transfer material as it is being entered into the machine.

Referring now to FIG. 3, the conveyor chains **14** are mounted on parallel pairs of sprockets **46**, **47**, **48**, **49** and **50**, which are mounted on side frame members **60** and **61**. Each gripper bar **15** is mounted on chains **14** and is carried in a continuous path around each of the sprockets back to the original position. Mounted between the pair of sprockets **50** on a shaft **53** is a paper guide roll **54**. Paper guide roll **54** provides a support surface for the sheet of transfer material as it is carried around sprockets **50** by gripper mechanism **15**.

Mounted on side frame **60** is a limit switch 4LS which, when activated by an actuator **19** mounted on chain **14**, stops the conveyor mechanism so that gripper bar **15** is in position to receive a sheet of transfer material. Limit switches 8LS and 9LS are mounted on side frame **61** and also are activated by an actuator **19** mounted on chain **14**. These switches 8LS and 9LS are described more fully

below with respect to the circuit diagram shown in FIG. 4. A limit switch 5LS is mounted on the underneath side of frame member 27 and is activated through arm 28, by the insertion of a sheet of paper into feed-in station 16. Limit switch 5LS initiates the operation of the conveyor mechanism and the gripper mechanism and is more fully described below with respect to the circuit diagram.

The operation of the machine is best illustrated by reference to the schematic wiring diagram as shown in FIG. 4. Before the xerographic apparatus may be actuated, the doors of the cabinet 1 must be closed to actuate the interlock switches 1LS, 2LS and 3LS, mounted on the cabinet frame. These interlock switches are used so that the machine may be operated only when the doors of the cabinet are closed. This provision is made not only from the standpoint of safety, but also to assure proper circulation of air throughout the interior of the machine to dissipate heat generated by the apparatus. A paper gripper 15 must also be in position to receive a sheet of support material. The switch actuator 19 on the conveyor contacts the end-of-cycle limit switch 4LS, stops the conveyor with a paper gripper at the receiving station in position to receive a sheet of support material.

The entire assembly of the apparatus is energized by momentarily closing main power switch SW1, connecting the assembly to a suitable source of power, such as a commercial 220 volt alternating current outlet. Switch SW1 is closed by depressing the button on the control panel 2 marked "ON."

Upon closure of switch SW1, control relay 1CR is energized to close its contacts CR1, CR2 and CR3. With the closure of contact CR3, the switch SW1 may be released, the circuit then being maintained through the normally closed contact 2TR–A of thermal timer 2TR, and normally closed switch SW2 to supply power to the control relay 1CR to keep its contacts closed. Switch SW2 is controlled by the button on the control panel 2 marked "OFF." At the same time transformers T1, T2 and T3, clock meter M2 and the power supply TS1 are energized, the latter supplying high voltage power to the corona charging device 21, the corona transfer device 44 and the corona precleaning device 51 to energize these units. The clock meter M2 is mounted on any suitable location on the cabinet frame and is used to indicate total elapsed operating time of the machine. Fluorescent lamp LMP4 is also energized through a conventional starter S1 and ballast L1 circuits.

Switch SW4, which is a mechanically interlocked three-position push button switch is used to control the voltage applied to the resistance elements of the heat fuser. Switch SW4 is mounted in a suitable location on the apparatus accessible by the operator. As shown, the different contacts of switch SW4 are connected to different secondary taps of the multiple tap transformers T2 and T3 to obtain preselected voltages to the resistance elements R1, R2 and R3 of heat fuser 45.

As transformers T2 and T3 are energized, power is supplied directly to the resistance element R1, which is the heating element of the fuser normally used, and through the normally closed contact 3TR–A of the thermal timer 3TR to the resistance element R2. Resistance element R2 is used as an auxiliary heating element to aid in bringing the heat fuser up to its normal operating temperature rapidly. Thermal timer 3TR, which is also energized upon the closure of switch SW1 and closed contact 1CR–1 is preferably a three-minute timer, that is, three minutes after it is energized, while at ambient room temperature, it will heat up sufficiently to open its contact 3TR–A thereby de-energizing resistance element R2.

If the machine is operated for a sufficient period of time to permit the heat fuser to be brought up to its normal operating temperature and then the machine is shut down, there is considerable time delay before the heat fuser cools sufficiently to reach ambient room temperature. Now, if the machine is again energized and the resistance element R2 is again energized for a three minute interval, there would be sufficient heat capacity left in the fuser so that with the additional heat supplied by resistance element R2, the fuser would become overheated to the extent that a support material, such as paper, passing thereneath, would be scorched. To prevent this, a thermal timer 3TR is chosen with a characteristic curve such that it too will have an extended period of time in which to cool down sufficiently to close its contacts 3TR–A. With a timer of this type, it is then possible to re-energize the machine after a brief shutdown interval without overheating the fuser because a three-minute cycle will no longer be necessary to heat up the timer 3TR to open its contact 3TR–A.

The third resistance element R3 can be connected by an operator, if required, in order to fuse powder images on card stock or heavy transfer material for which a higher heat output is necessary. For this purpose, there is provided a switch SW5, suitably positioned on the apparatus for access by the operator.

Simultaneously with the closure of switch SW1, the following motors are energized: The main drive motor MOT6 for driving the drum 10 and the conveyor mechanism; a brush cleaner motor MOT7, suitably connetced for rotating the cleaning brush 52; the motor MOT5 for operating the developer conveyor 13; and the motor MOT1 for operating a blower at discharge station 17; motors MOT2 and MOT3 for fan units 57, motors MOT4 and MOT9 for exhaust fan units (not shown); and motor MOT8 for a blower unit in projector 11.

As contact 1CR–1 is closed a 20-second timer 1TR is energized as is the two-minute shutdown thermal timer 2TR. Timer 2TR, if left energized for two minutes, would heat sufficiently to open its contact 2TR–A to de-energize the machine circuit. Control relay 3CR energized through normally closed contact 2CR–1B of control relay 2CR at this time causes its normally closed contact 3CR–A to be opened thereby preventing the solenoid SOL2 of the clutch drive to be energized. At this time, limit switch 7LS and contact 5CR–1B of control relay 5CR, which are normally closed, permit the reload lamp LMP2 to be energized at this time.

Twenty seconds after the closure of switch SW1, the thermal timer 1TR is heated sufficiently to close its contact 1TR–A thereby permitting the print lamp LMP1 to be energized, thus indicating to the operator that the machine is in readiness to make a xerographic reproduction.

Upon the insertion of a sheet of support material in a paper gripper 15, the leading edge of the support material trips the gripper switch 5LS (as seen in FIG. 3). This action opens 5LS–B, de-energizing the print lamp, and closes 5LS–A, energizing the gripper delay timer 4TR. Delay timer 4TR provides a two-second delay permitting the operator to adjust the paper, if necessary, and allows sufficient time for the paper to be properly seated before it is gripped and carried into the printer. After the two-second delay, contacts 4TR–1 close, energizing relay 2CR and the billing counter M1. As control relay 2CR is energized, its contacts 2CR–1A and 2CR–2 are closed and its normally closed contact 2CR–1B is opened. The closing of contact 2CR–1A provides a lock-in circuit for 4TR coil in the event that 5LS is released before 4LS. The opening of contact 2CR–1B de-energizes relay 3CR with the following results: Contact 3CR–A closes to energize the magnetic clutch SC–2 to the drive chain. The clutch receives direct current through a bridge rectifier SR1. The closure of contact 2CR–2 permits the control relay 4CR to be energized through normally closed limit switch 6LS–B in the projector assembly. With power applied to control relay 4CR, its holding contact 4CR–1 is closed as is its contact 4CR–2 to energize the projector lamp LMP3 through resistor R5 for projecting a light image onto the drum.

With the closure of contact 2CR–1A contact 2CR–1B is opened thereby de-energizing control relay 3CR closing

its contact to permit the clutch SC2 to be energized through resistor R4 and a conventional selenium rectifier circuit SR1. Clutch SC2 when energized connects the paper conveyor through a previously described drive mechanism to motor MOT6. As the chains on the conveyor are rotated, the paper gripper bar levers slide off their respective actuating cams 25, as seen in FIG. 3, to permit the paper to be gripped by the gripper bar, and as it moves away, the paper is conveyed out of contact with the limit switch 5LS, permitting its release. At this time, control relay 2CR remains energized through its own own holding circuit previously described. As the chain on the paper conveyor continues to move, the actuator 19 on the chain is withdrawn from the end-of-scan limit switch 4LS to release it, thereby breaking the circuit to the timer 2TR, lamp LMP1 and meter M1.

Referring now to switch SW3, this is a mechanical interlock two-position push button switch used to connect the circuit either to a limit switch 8LS or a limit switch 9LS, depending on which way the switch SW3 is thrown. The only difference between these two limit switches is that they are positioned to be tripped a fixed distance of time with respect to each other from the start of operation. If the switch 8LS is placed in the system by closure of switch contact SW3–A, the transfer material is forwarded to the drum to place the leading edge of the transfer material about ¾" in advance of the leading edge of the copy image. This is used for duplicating masters or other large sheets where it is desirable to leave ¾" edge so that the master can be bound into a press. Normally, as shown, the limit switch 9LS is used through closure of contact SW3–B because the most common transfer material is paper.

As the chain continues to move, the actuator 38 thereon will momentarily trip first the limit switch 9LS and then the limit switch 8LS. As the contact of the limit switch 9LS is closed, he actuator control relay 5CR is energized to close its contact 5CR–2 to supply power to solenoid SOL1. As solenoid SOL1 is energized, its plunger activates the film carriage of projector 11 to effect operation of the scan cycle of the projector. As an image is scanned, an electrostatic latent image is formed on the drum, developed and then as this portion of the drum passes through the transfer station, the xerographic powder image is transferred from the drum to the sheet of transfer material which initiated the xerographic operation. The paper is fed by the paper conveyor in timed relation to the movement of the drum so that the paper is delivered to the drum to coincide with the image formed thereon. The same results occur if switch SW3–B is open and SW3–A is closed except, switch 8LS activates relay 5CR at a later point on the cycle.

The normally closed end-of-scan switch 7LS on the projector carriage (not shown) is depressed to break the circuit to control relay 4CR and relay 5CR thereby de-energizing solenoid SOL1 and lamp LMP3. With the release of the solenoid SOL1, the carriage of the optical scanning mechanism is free to be returned to its starting position and releases limit switch 7LS to re-energize lamp LMP2 through the closed contact 5CR1–B.

In the meantime, the paper conveyor forwards the paper with the transfer xerographic powder image thereon to the heat fuser where the powder forming the image on the paper is permanently fixed thereto, and then the paper is forwarded to discharge station 17.

The chain conveyor continues to operate until an actuator 19 thereon depresses the limit switch 4LS. As the limit switch 4LS is closed, timer 2TR and control relay 3CR are energized, the latter thereby opening its normally closed contact 3CR–A to de-energize clutch SC2 which disengages the drive to the paper conveyor, stopping it with a gripper bar in position to receive the next sheet of support material. At the same time, lamp LMP1 is energized to indicate to the operator that the machine is ready to start another xerographic processing cycle.

At this time, the operator may insert another sheet of paper to initiate another reproduction cycle starting with the closure of limit switch 5LS as just described. If so desired, he may also wish to make a reproduction on a duplicating master in lieu of paper as a support material. To do this, switches SW3 and SW5 must be depressed to their "Master" position in preparation for making a master reproduction. Switch SW5 is a mechanically interlocked two-position push button switch used to connect the resistance element R3 into the circuit. This additional resistance element is required because it is necessary to supply more heat to fuse a powder image on a duplicating master than on an ordinary sheet of paper.

As previously described, switch SW3, when pushed into the "Master" position, opens contact SW3–B and closes contact SW3–A which connects a limit switch 8LS in the circuit. The machine is now set to make a master in the same manner described above in relation to making xerographic reproductions on paper.

If, on the other hand, the machine is not used for a period of two minutes, the time 2TR heats sufficiently to open its contact 2TR–A to de-energize the entire circuit. The timer 2TR requires a two minute interval which is specifically chosen so that if the operator does not use the machine for a period of two minutes, the machine will automatically shut down. The operator will not normally push the "OFF" button or switch SW2; he will just stop using the machine and it will turn off itself. However, the two minute interval gives the operator sufficient time to change copies or to effect other supervisory operations before automatic shut-off. In the event of a malfunction, the "OFF" switch SW2 is provided on the control panel to enable the operator to stop the machine immediately.

Limit switch 6LS, previously described only in relation to its normally closed contact 6LS–B, is a switch normally actuated by the operator to enable him to view a frame or frames on a web of microfilm without necessarily initiating a complete xerographic reproduction cycle. Thus, if the operator wishes to scan the web of microfilm to locate a particular frame desired and then to center this frame on the film carriage, the operator need only depress the limit switch to close its contact 6LS–A, to energize the projector lamp LMP3 to permit the operator to view the projected image on the viewing platen 3. Closure of contact 6LS–A energizes lamp LMP3, through control relay 4CR and its contact 4CR–2.

Although the invention is described as used with a conveyor system of an automatic xerographic reproduction machine, it will be apparent to those skilled in this or related arts, that it may readily be applied to any system in which it is required to handle sheets of material by means of a conveyor system. Therefore, since changes could be made in the above construction, and different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the specification and drawings be interpreted as illustrative and not in a limiting sense.

What is claimed is:

In a sheet conveyor system wherein a sheet of material is manually inserted into a positive acting sheet gripper mechanism and carried by said gripper mechanism through a flow path, an improved control apparatus providing a predetermined time delay to permit insertion and alignment of the sheet material into the gripper mechanism before the operation of the conveyor system is initiated consisting of

an electrical motor for operating said conveyor system,

a clutch connecting said motor to the conveyor system,

means to disengage said clutch to stop said conveyor system in predetermined positions so that the gripper mechanism is in position to receive sheet material inserted therein,

first switch means containing normally open contacts positioned relative to said gripper mechanism so that

the leading edge of a sheet material will close said contacts upon insertion of the sheet material into the gripper mechanism,

a delay timer connected to said apparatus to be actuated by the closing of the contacts of said first switch means by the sheet material,

and second switch means actuated by said delay timer a predetermined time after the closing of the contacts of said first switch means,

said second switch means positioned in said apparatus to cause engagement of said clutch and to thereby initiate operation of said conveyor system when said second switch is actuated in response to said delay timer.

References Cited by the Examiner

UNITED STATES PATENTS

2,130,897	9/38	Ogden	101—235
2,195,219	3/40	McGoldrick	318—471 X
2,363,310	11/44	Fritz	318—471 X
2,391,274	12/45	Schubert et al.	318—484 X
2,444,170	6/48	Sabel et al.	271—79 X
2,641,998	6/53	Donald	101—235
2,827,822	3/58	Timms.	
2,960,377	11/60	Simjian.	

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