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CARD HANDLING-SCANNING DEVICE

Filed Aug. 23, 1966

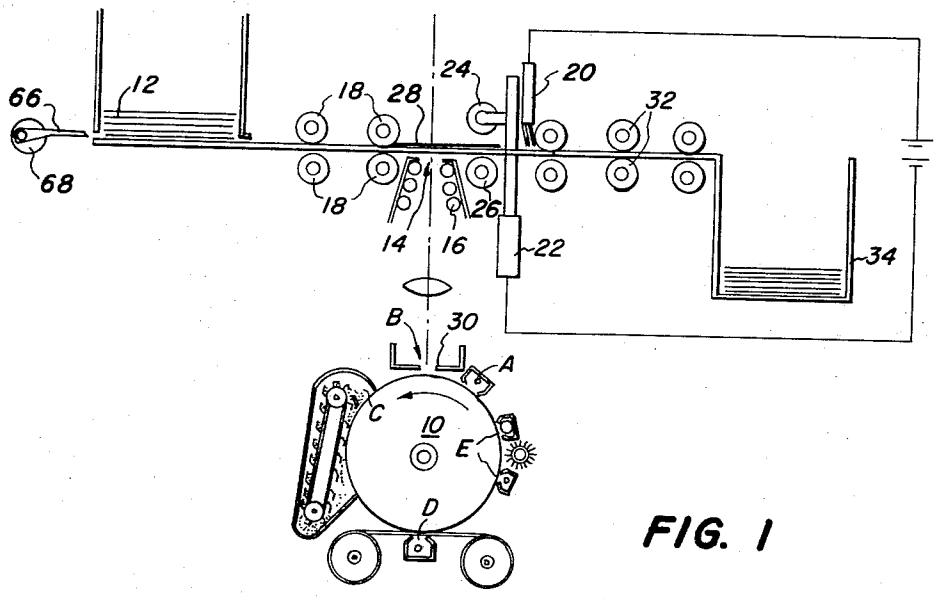

FIG. 1

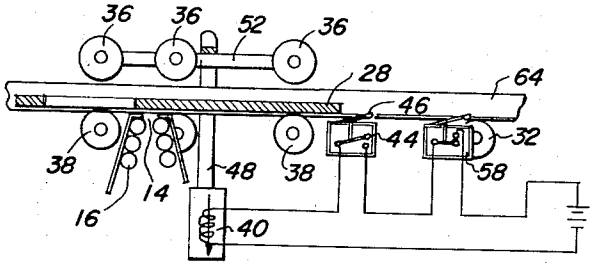

FIG. 2

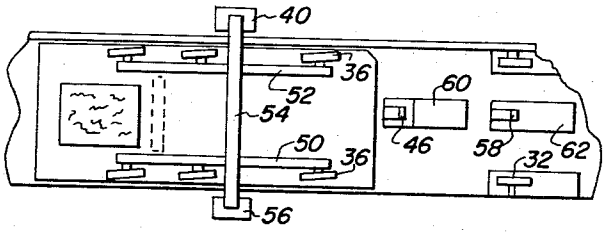

FIG. 3

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CARD HANDLING-SCANNING DEVICE

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This invention relates to a sheet feeding and scanning apparatus and in particular to a record card feeding and handling device for use with a data copying apparatus.

This invention pertains to the rapid feeding and scanning of image support material data processing cards for xerographic printing machines. The article bearing the image in conveniently reduced size is generally a data card containing image information on one segment while devoting the remainder of the card to data processing indices or various non-image information such as coded perforations for use in conventional card controlled machines. The data cards may be of the type used in a unitized microfilm system known as aperture cards. It may also be the semi-micro kind containing information reduced generally 3× from the original document. The outer dimension of both types of cards are the same, measuring approximately 7.325 inches by 3.250 inches. In the unitized microfilm system card, however, the aperture adapted to maintain a 35 mm. film frame strip with micro data placed thereon is 1.875 inches by 1.325 inches and located approximately 4.875 inches along the length, from an edge of the card. The semi-micro system of storing 3× reductions of originals is generally indexed to maintain the image .035 inch from the top and right edges of the data card, maintaining an image on approximately one-half of the card.

In forming xerographic enlarged reproductions of the images on the card, it is desirable to remove the non-record image area of the card from an image scan slit as quickly as possible in order to rapidly produce copies of the image area with card transportation causing as little delay as possible. If the cards containing the images are fed at a constant scanning speed past a scan slit, much time would be lost while non-image areas traversed the slit whereat the information to be enlarged and reproduced is optically presented to the xerographic printing machine.

It is an object of this invention to more rapidly produce copies from micro and semi-micro data contained on conventional data cards.

Another object of this invention is to cause conventional cards to rapidly traverse a scanning slit of a xerographic printing machine in order to more quickly present the data to be reproduced to the optical system of said machine.

Yet another object of this invention is to cause a multiple speed feed of data cards over a scan slit of a xerographic printing machine in order to rapidly introduce and remove non-image areas while moving image areas at a slower scan speed.

These and other objects of the present invention are obtained by means of an apparatus for feeding and engaging data cards at a first rapid speed, then re-engaging at a slower scanning speed while the information on said cards traverses a scanning slit, then engaging said cards for rapid removal from said scanning area.

For a better understanding of the invention, as well as other objects and further features thereof, reference is had to the following detailed description of the invention to be read in conjunction with the accompanying drawings wherein:

FIG. 1 is a side view schematic, of a xerographic apparatus with a double speed object feed;

FIG. 2 is a side view partly in section of the actuating apparatus to reduce a data card velocity to scanning speed;

FIG. 3 is a plan view of the data card with image area approaching the scanning slit and scan speed actuator means.

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Referring now to the drawings wherein like numerals designate like elements, there is shown in FIG. 1 a schematic depiction of a xerographic printing apparatus in conjunction with a card feeding and scanning apparatus incorporating this invention.

The xerographic apparatus comprises a plate including a photoconductive layer on a conductive backing and formed in the shape of a drum designated by the numeral **10**. The drum is mounted on a shaft permitting the drum 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 the several xerographic processing stations in the path of movement of the drum surface may be described functionally as follows:

A charging station, preferably located as indicated by reference character A, at which a uniform electrostatic charge is deposited on the photoconductive layer of the xerographic drum. Next subsequent thereto in the path of motion of the xerographic drum is exposure station B at which a light or radiation pattern of copy to be reproduced is projected onto the drum surface to dissipate the drum charge in the exposed areas thereof. Thereby, a latent electrostatic image of copy to be reproduced is formed.

Adjacent to the exposure station is a developing station C whereat the latent electrosatic image is developed by cascading a xerographic powder over the drum. Positioned next adjacent to the developing station is the image transfer station D at which the xerographic powder image is electrostatically transferred from the drum surface to a transfer material or support surface.

The final station E is a drum cleaning and discharge station at which the drum surface is brushed to remove residual xerographic powder particles remaining 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 remaining thereon. For a more complete detailed description of an automatic xerographic apparatus, see Mayo et al., Patent No. 3,062,109 issued Nov. 6, 1962.

At the exposure station B is the optical system for enlarging the image data located on the cards of stack **12** as the same serially pass scanning slit **14**. A bank of lamps **16** illuminate the exposure slit **14** and the data presented thereon. The cards from stack **12** placed with their image side down, are fed from that stack by any suitable means such as a picker arm and are engaged by pinch rollers **18** which rapidly bring the cards into contact with switch **20** as the image area of the card approaches the scanning slit **14**. The switch may be photoelectric, micro-switch, or a time device. The activation of switch **20** causes solenoid **22** to pull pinch rollers **24** into contact with their counterpart rollers **26** thereby engaging the card **28** passing therebetween. Rollers **24** and **26** rotate at a speed less than that of rollers **18** but are related to the speed of travel of the photosensitive surface of drum **10**.

The relationship between the rotational velocity of pinch rollers **24** and **26** to that of the photosensitive surface of drum **10** is such that the portion of the card **28** passing the scanning slit **14** moves at a velocity sufficient to eliminate relative motion between the image projected from such cards to slit **30** at the exposure station of the xerographic process and the photosensitive surface flowing beneath slit **30**. After a predetermined time, or predetermined distance traveled by card **28**, pinch rollers **24**

are caused to disengage the upper surface of said card and rollers **32** engage the leading edge of said card rapidly removing the card from a xerographic exposure slit and bringing it into position to be deposited into any suitable receptacle **34** for collecting processed cards. Switch **20** electrically controls solenoid **22** and may be further programmed to actuate the processing stations of the machine as the image area of card **28** approaches slit **14**, and thereafter inactivate the illumination lamps as the card is released from rollers **24** and **26** and the remainder of the stations as the image produced from the data on the card has been fully processed. The sequencing of operations is set such that only one card at a time is held in any set of rollers and such that there is a minimum distance between the trailing edge of the card acted upon by rollers **24** and the lead edge of the card next following. The index speed, that of pinch rollers **24** and **26** must be set according to the speed and abilities of the reproduction system for enlarging and copying the cards, in this case a xerographic processing system. The speed of rollers **18** and the frequency of the picker bar feeding the cards from stack **12** are determined on a basis relative to the speed of roller **24** so that there is no overlapping of, and there is a minimum of distance between, the card engaged by roller **24** and that being fed through rollers **18**. The velocity of rollers **32** must be greater than the other rollers of the system to prevent collisions between succeeding cards that have been exposed to the copier system.

It is optimum to feed the card sequentially so that the lead edge of the second card fed is as close as practicable to the trailing edge of the first card as the first is ejected from the rollers moving it past the scan slit. Relating a practical system to the apparatus as shown schematically in FIG. 1, we may have a kicker arm **66** operated by eccentric crank **68** continually turning one cycle per scan of a card. The first rapid contact rollers **18** would have a two speed drive system which could be controlled by suitable clutch means and made to operate at a first slower speed and second more rapid speed in order to maintain the lead edge of a card passing therethrough at some distance behind the trailing edge of the card being scanned and moved by rollers **24** past the stationary optical slit. There may also be a single speed for rollers **18** but a timing delay in the kicking out of a second card from supply stack **12** timed such that the lead edge of the second card ejected and fed through first feed rollers **18** would not contact or override the trailing edge of the first card fed therethrough but would optimally, approach the second set of pinch rollers just as the first card disengaged from the second set of rollers and was rapidly removed by the rollers **32** moving more rapidly than rollers **18** feeding the second card.

FIGS. 2 and 3 manifest another embodiment of the invention here showing a double switching means for activating and inactivating the scan pinch rollers **36** and their contact rollers **38** as well as an electrical system for activating and inactivating solenoid **40** and lamps **42** of the optical system.

The switch **44** for activating solenoid **40** is placed below the surface maintaining the card and in the path of travel of card **28** with the activating member **46** of the switch intruding into the path of card **28**. The switch may be a micro-switch actuated by arm **46** which is depressed as card **28** passes thereover. It may also be a photoelectric switch which would activate solenoid **40** as card **28** passes between the switch and a beam of light. The switch is maintained in a normally open position preventing activation of the solenoid **40** until switch member **46** is actuated, closing the solenoid power circuit.

As the switch **44** is activated, the electrical circuit shown produces an impulse to solenoid **40** which causes linkage arm **48** to be pulled downward bringing cross bars **50** and **52** with it. The cross bars are pivotally mounted on arm **54** which in turn is rigidly fastened to arm **48** activated by solenoid **40** and a similar arm (not shown) attached to solenoid **56**.

The solenoids may be adjusted to balance the pinch rollers **36** against their mating rollers **38** to insure an even pull on card **28** passing therebetween. Cross bars **50** and **52** are pivotally mounted to prevent excessive pressure at any of the rollers attached thereto with the card passing thereunder. There are three rollers mounted on the respective cross bars to prevent buckling of the card as it passes under the pressure of the rolls. If there were only two rollers and the lead roller caught the card at a different moment in time than the trailing roller there is a possibility that the card may buckle and pass the scan slit somewhat out of focus. The three rollers tend to prevent this undesirable event.

A second switch **58** is placed in the path of feed direction of the card in order to release the pinch rollers **36** from the card by de-actuating the solenoids **40** and **56**. This switch may be of the photoelectric type of a microswitch which can be actuated by the lead edge of the card **28**.

This switch is maintained in a normally closed position and breaks the power circuit to solenoid **40** when it is actuated. Therefore, the solenoid returns to its normally extended position when switch **58** is engaged. Since "normally open" switch **44** is disengaged before "normally closed" switch **58** is, the circuit will remain open from the time switch **58** is actuated by card **28** until the next card actuates switch **44**. The second switch **58** is further located at a position whereby any information on the card **28** that requires scanning shall have passed scan slit **14**. In order to give the system a greater flexibility in the use of input, whether it be microfilm aperture cards, 3× cards, etc., the apertures **60** and **62** in the casing along the path of travel of card **28** are longitudinally oversized to permit movement of the switches along the path of travel of the card allowing more extensive adjustment on the engaging and disengaging of the pinch rollers **36** with the card depending on the location of the information traversing the stationary scanning slit **14**.

The switch **58** is further located and maintained parallel to pinch rollers **32** used for rapidly removing card **28** from the scanning area and used for depositing it in a receptacle such as card holder **34**. The rollers **32** are adjustable along the path of travel of card **28** just as is the switch **58**.

The rollers **36** are canted at a slight angle to force the card not only along its path of feed direction toward switch **58** but to maintain it against a register wall **64** to assure proper location of the information on the card as it passes the scan slit **14**.

While the invention has been described with reference to the structure discosed herein, it is not confined to the details set forth; although the examples and description emphasis is on card feeding for xerographic copying machines, its use with other processes is to be reaized; and this application is intended to cover such modifications or changes as may come within the purpose of the improvement or the scope of the following claims.

What is claimed is:

1. A sheet moving apparatus for transporting sheets individually across a stationary scan slit in the path of movement of the sheet comprising

a first transport means for rapidly bringing a sheet toward a first predetermined position at a first predetermined speed;

a second transport means arranged to engage the sheet when the same has reached said first predetermined position and to transport the sheet at a second predetermined speed toward a second predetermined position, said second transport means also being arranged to cause the sheet to traverse the scan slit in its path;

a programmer adapted to activate said second transport means when said sheet is at said first predetermined position and to inactivate said second transport means when said sheet has reached a second predetermined position; and

a third transport means adapted to remove the sheet from said second predetermined position, said third transport means arranged such that it engages the sheet after inactivation of said second transport means, the speed of said first and third transport means being greater than the speed of said second transport means.

2. The apparatus of claim **1**, wherein said first, second, and third transport means include upper and lower pinch rollers located above and below the path of travel of the sheet, said second transport means pinch rollers being in a state separated from each other, actuating means operative with said second transport means and associated with said programmer to cause said second transport means pinch rollers when activated to move from the separated state to a contacting state to engage the sheet, and to return to the separated state when inactivated by said actuating means.

3. The apparatus of claim **2**, wherein said programmer includes a switch means located in the path of said sheet and activated by the lead edge thereof when the sheet reaches said first predetermined position.

4. The apparatus of claim **2**, wherein said actuator means includes a solenoid which when inactivated causes said second transport means pinch rollers to attain a separated state and when activated, causes the rollers to move to a contacting state; and

linkage attached to said solenoid and rotatably attached to said second transport means upper pinch rollers, said solenoid and said pinch rollers each at the opposite ends of said linkage, whereby said second transport means pinch rollers are maintained in their first separated state when said solenoid is in its inactivated state and said second transport means pinch rollers are in their second contacting state when said solenoid is in its activated state.

5. The apparatus of claim **2**, wherein said programmer includes

a power source,

a circuit adapted to bring power from said power source to said actuator means, said circuit having

a first switch interposed therein and maintained in a normally opened position thereby maintaining said actuator means in an inactivated state,

a second switch interposed therein, said second switch maintained in a normally closed position for continuously energizing said actuator means until said second switch is actuated,

means for closing said first switch and opening said second switch such that said first switch is closed at a time prior to the opening of said second switch and opened at a time prior to the closing of said second switch whereby, when the circuit is opened, it so remains until said first switch is re-energized.

6. The apparatus of claim **5** wherein said switches are positioned such that the means for closing said first switch and opening said second switch is the lead edge of the sheet being transported and the means for opening said first switch and closing said second switch is the trailing edge of said sheet.

7. The apparatus of claim **3**, wherein said transport means have a guide member associated therewith and said first, second, and third transport means include rollers canted toward said guide member thereby causing the sheet to be maintained against said guide member while being transported by said canted rollers.

8. The apparatus of claim **3**, wherein said second transport means pinch rollers include a plurality of roller pairs on substantially parallel axes, and the rollers of each pair being separated from each other by a distance at least equal to the image area on the sheets, said rollers engaging the sheet near the periphery thereof, thereby contacting nonimage areas of the sheet.

9. The apparatus of claim **8** wherein said plurality of roller pairs includes at least three pairs thereof.

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EDWARD A. SROKA, *Primary Examiner.*