United States Patent

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[54] **DOCUMENT HANDLING APPARATUS**
2 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **271/57**
[51] **Int. Cl.** **B65h 7/06**
[50] **Field of Search** 271/56, 57, 51, 47

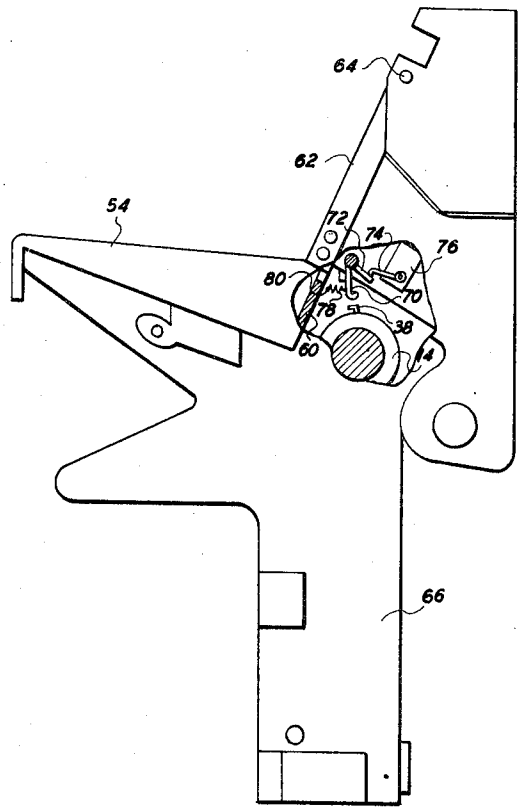
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ABSTRACT: Xerographic-reproducing apparatus including a front face having a fixed housing portion and a pivotal housing portion. The pivotal portion has an aperture for receiving the leading edge of a document to be copied. Adjacent the aperture is a bar extending the length thereof, whereby objects other than a flat document will pivot the bar to inactivate the machine. Movement of the pivotal portion gives an operator access to the document-handling apparatus interior of the machine for the clearing of jams.



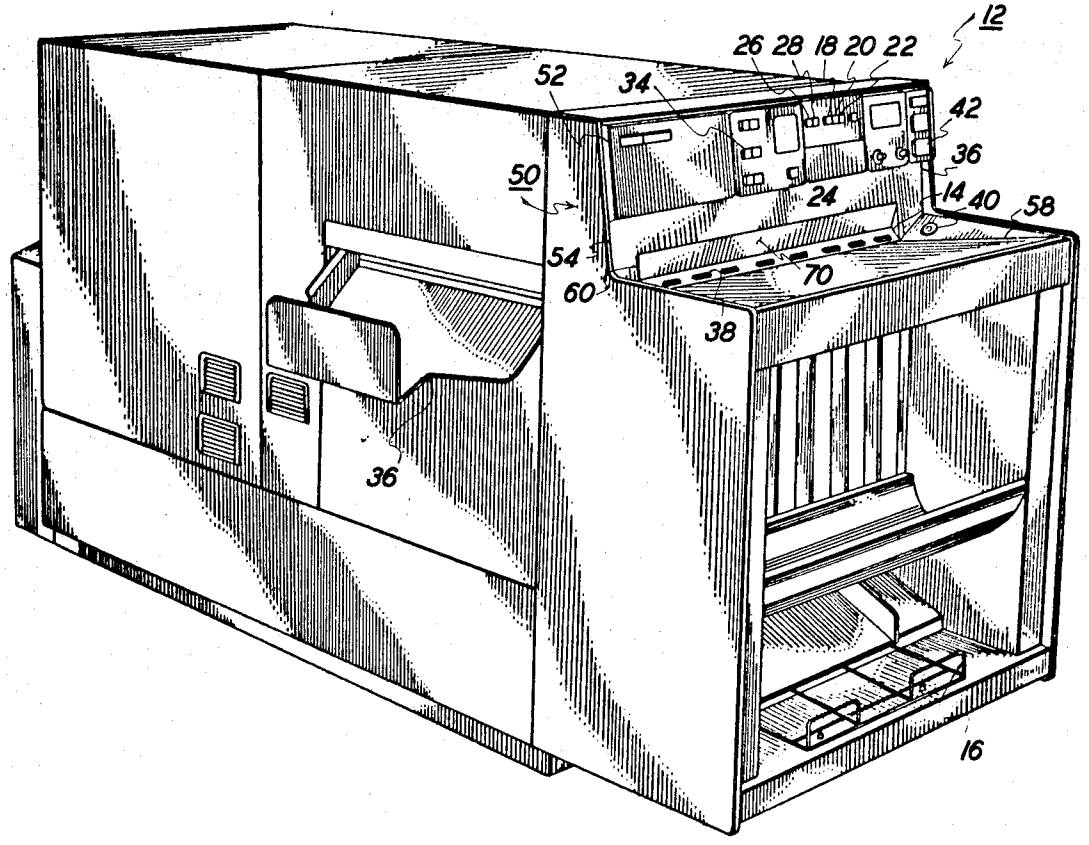


FIG. 1

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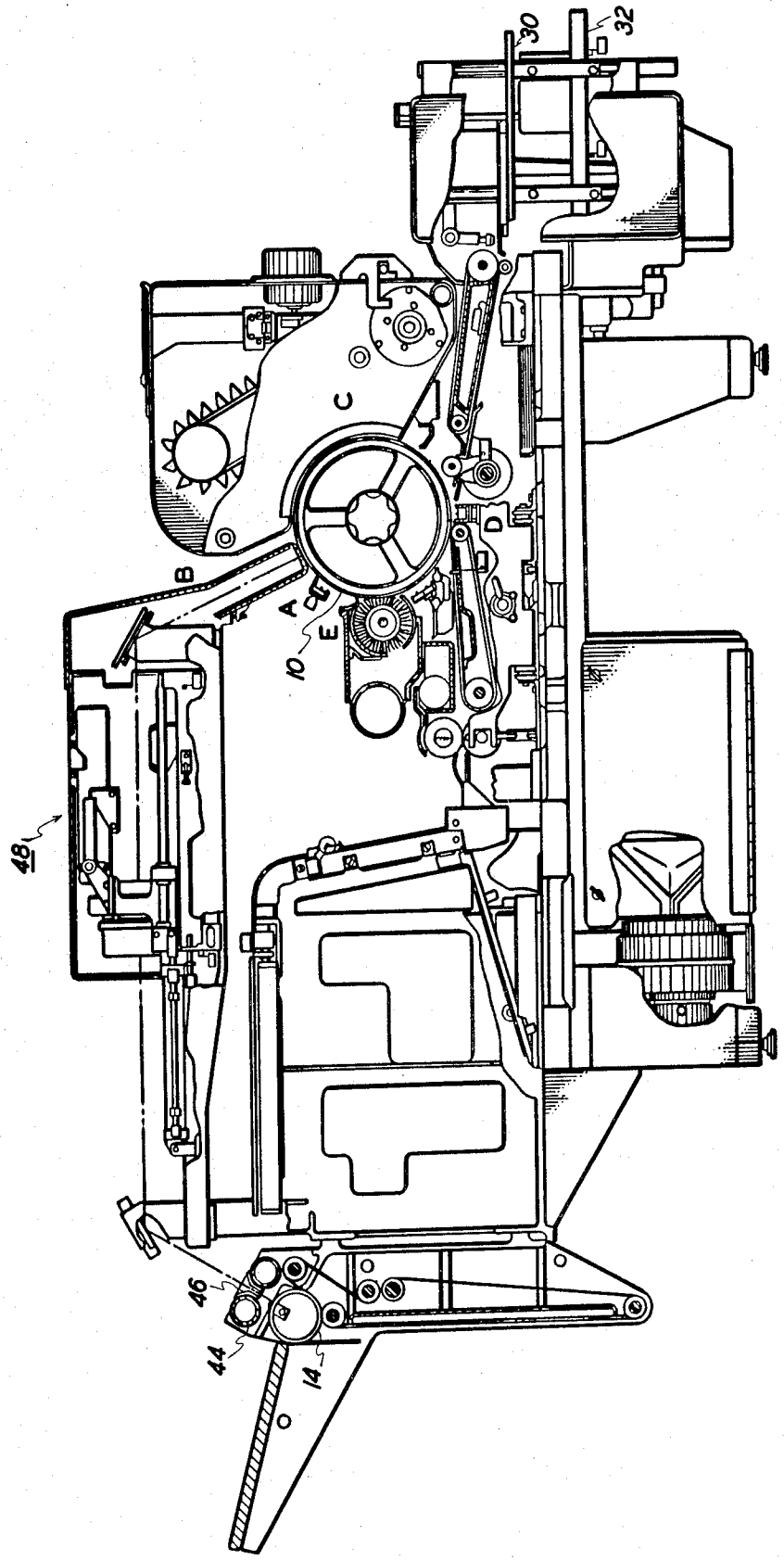


FIG. 2

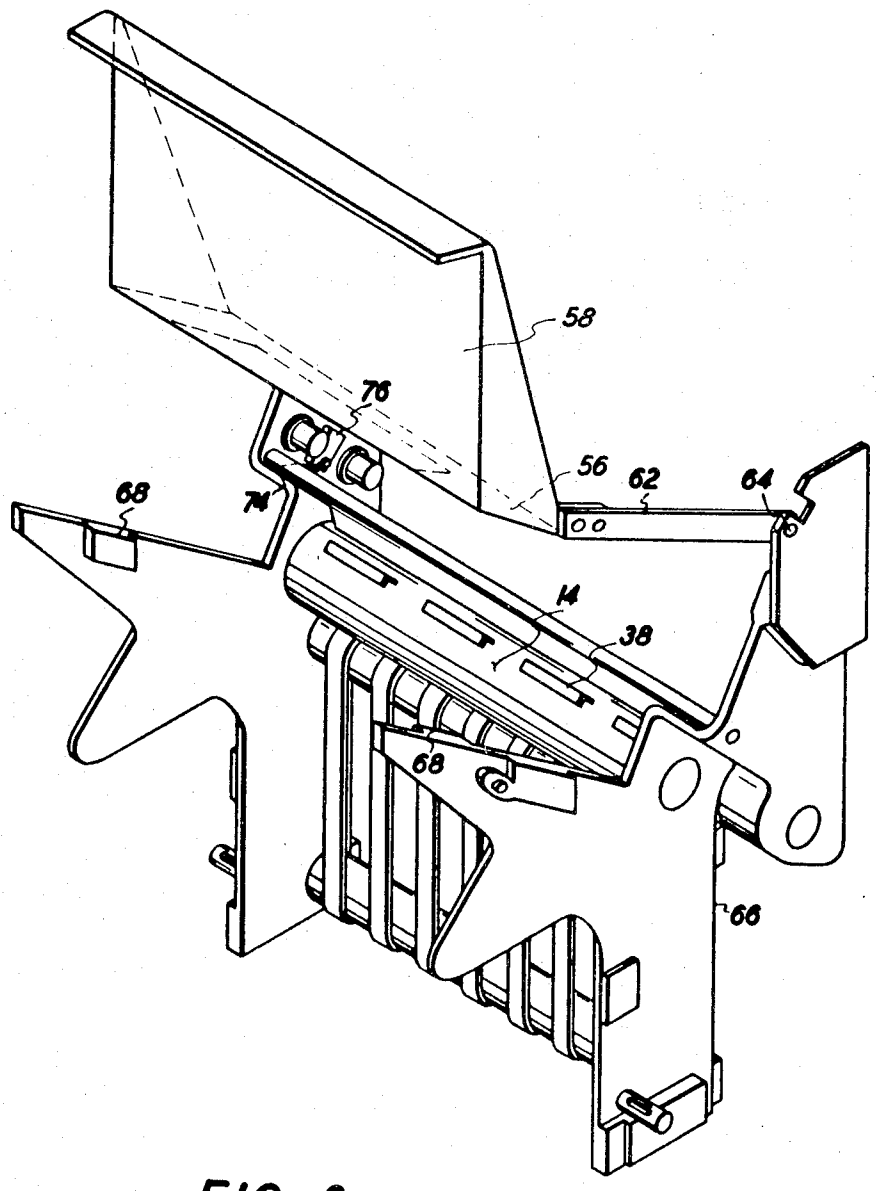


FIG. 3

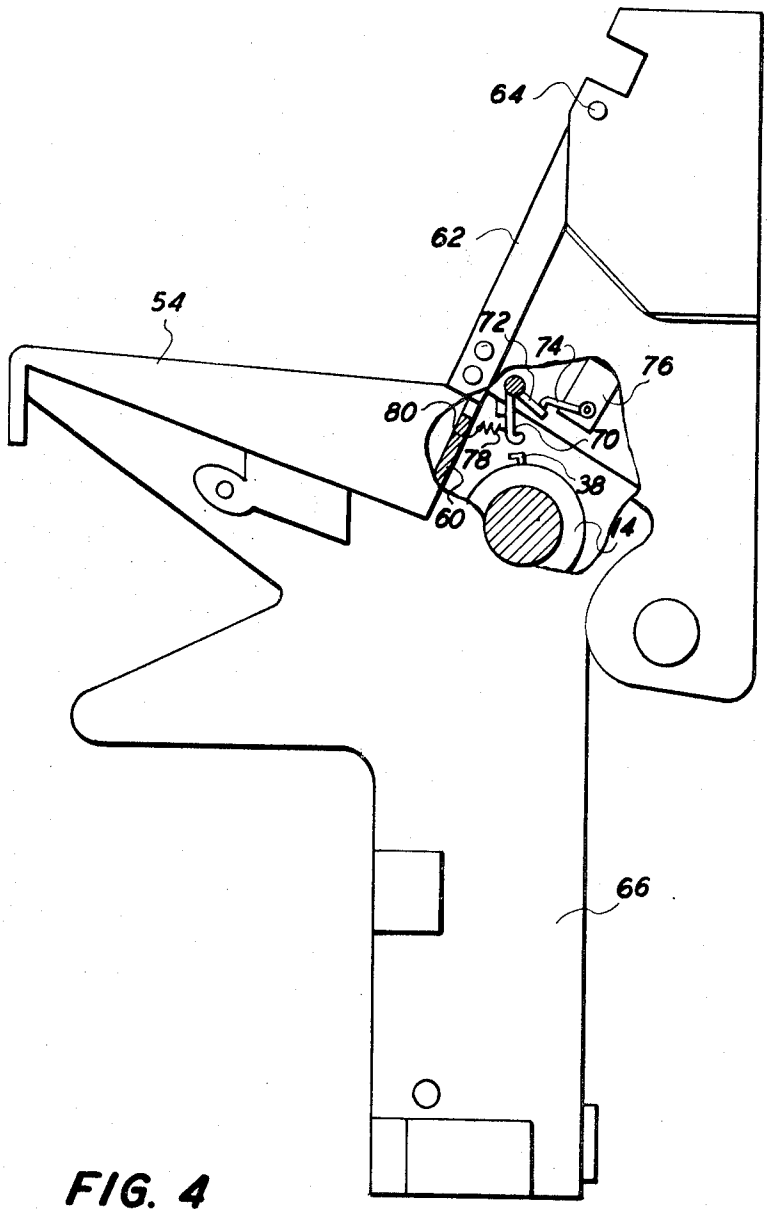


FIG. 4

DOCUMENT-HANDLING APPARATUS

This invention relates to reproducing machines and in particular the parts thereof adjacent to the apparatus to receive the leading edge of a document to be reproduced while being fed.

In the process of xerography as disclosed for example in U.S. Pat. No. 2,297,691 issued Oct. 6, 1942 to Chester F. Carlson, a xerographic plate comprising a layer of photoconductive insulating material on a conductive backing is given a uniform electrostatic charge over its surface. The surface is then exposed to a light or radiation pattern of the object to be reproduced to discharge the charge in the areas exposed to the light. This selected discharge of the xerographic plate will thus create a latent electrostatic image of the object to be reproduced. Development of the image is effected with developing material comprising, in general, a mixture of suitable pigmented or dyed electroscopic marking powder hereinafter referred to as "toner" and a larger granular material, hereinafter referred to as "carrier," with functions to generate triboelectric charges on the toner. In the development of the image, the toner particles are brought into surface contact with the latent electrostatic images whereupon the toner will adhere thereto in imagewise configuration. Thereafter the developed xerographic image is transferred to a support material such as paper as by electrostatic means. The xerographic surface and copy sheet are then separated to create, after fixing the toner to the support material, a permanent copy of the original object or document.

In some xerographic machines as described, for example, in pending application Ser. No. 829,608 filed June 2, 1969 in the name of George D. DelVecchio et al., the document to be reproduced is supported on a document drum whereafter movement thereof will convey sequential portions of the document past an exposure slot for imaging a rotating xerographic drum in accordance with the light pattern projected. In such types of machines, the operator looses physical control of the document during the times when it is being transported by the document drum. In such instances, the possibility exists that improperly gripped documents, misaligned documents or mutilated documents might become jammed adjacent the document drum which is normally out of reach of the operator. When this occurs, it becomes necessary for the operator to inactivate the machine, open it up and clear the jam.

An object of the instant invention is to permit the easy clearance of jams caused in the document handling area of reproducing machines.

It is a further object of the instant invention to permit the movement of at least a portion of the front face of a reproducing machine so as to facilitate operator access to areas adjacent to a document drum.

A further object of the instant invention is to inactivate reproducing machines if an operator should place her fingers, clothing or other foreign objects too close to a functioning document drum.

A further object of the instant invention is to inactivate a reproducing machine when a mutilated document is being fed, which mutilated document could otherwise jam or rip within the document handling apparatus.

These and other objects of the instant invention are attained by a reproducing machine having a front face which is secured thereto so as to permit its pivotal movement upwardly. This permits easy operator access to the document handling elements for the clearing of jams. Positioned in the pivotal portion is an aperture whereby documents may be fed therethrough for being gripped and fed by a document drum. The aperture is somewhat restricted due to a bar pivotal thereabove in such orientation that movement of the bar as by a torn document or other foreign object will inactivate the machine.

Other objects and advantages and further features of the instant invention will be understood when reading the following specification and claims and the accompanying drawing wherein:

FIG. 1 is an isometric illustration of a xerographic reproducing machine employing the elements of the instant invention.

FIG. 2 is a schematic view of the machine shown in FIG. 1.

FIG. 3 is an enlarged isometric illustration of the front face of the machine with parts removed to show internal construction and with the pivotal portion being positioned upwardly to permit the clearing of a jam and

FIG. 4 is an end view of the front face of FIG. 3 with parts shown in section.

A typical xerographic reproducing machine which is adaptable to employ the apparatus of the instant invention is shown in FIG. 1 and 2. The machine has a xerographic member including a photoconductive member on a conductive backing formed in the shape of drum **10**. The xerographic drum is mounted on a shaft journaled in the frame of the machine to rotate in the direction as indicated by the arrow. This movement causes the drum surface to move sequentially past the 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 A at which a uniform electrostatic charge is deposited on the photoconductive layer of the xerographic drum;

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

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

A transfer station D at which the xerographic powder image is electrostatically transferred from the drum surface to the backing sheet which is moved into contact with the drum surface in registration with the toner image thereon and

A drum cleaning and discharge station E at which the drum surface is brushed to remove residual toner particles remaining thereon 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.

The foregoing description is sufficient for the purpose of this application to show the general operation of the xerographic mechanisms. More complete descriptions of the various xerographic stations may be had by reference to U.S. Pat. No. 3,301,126 issued to Osborne et al.

In addition to the apparatus disclosed in the aforementioned Osborne et al. patent, the xerographic reproducing machine as illustrated herein is also provided with supplemental mechanisms to increase the overall utility of the machine. The operator's basic position in using the machine disclosed herein is facing the control panel **12**, the document support drum **14** of the document conveyor assembly and the first copy catch tray **16**. An array of operational control buttons and dials face the operator and include buttons **18**, **20** and **22** for controlling the optical reduction in association with the speed of rotation of a document-supporting drum. Dials **24** permit the selection of the number of copies to be made. Also in the control panel are buttons **26** and **28** whereby trays **30** and **32** supporting sheet material of different characteristics such as size are positioned for permitting the feeding of copy sheet material through the machine. Furthermore, a folder button **34** is provided whereby sheet material of a larger size may be folded prior to its movement to exterior of the machine at the second copy catch tray **36**.

In using the machine, the operator places and secures the leading edge of the document to be reproduced beneath gripper fingers **38** of the document drum. Gripper fingers while depression of the start print button **42** will then convey the original document past the illumination means **44** and exposure slot **46** and into belt transport **66**. This will flowingly

project an image by the optical assembly **48** onto the rotating xerographic drum **10** so that a latent electrostatic image may be created thereon. The image is then developed and transferred to a copy sheet fed through the transfer zone and the sheet then transported exterior the machine.

The front face **50** of the machine includes housing portions facing the operator which are generally for the reception of the document. The front face includes a fixed portion **52** which supports the operational controls for the machine. The front face also includes a movable or pivotal section **54** which may be pivoted upwardly from the machine to expose the interior portions of the document handling apparatus including a rotating document drum and a cooperating belt transport **66** as illustrated in FIG. **3**. The movable portion includes an upstanding section **56** and a generally horizontal shelf portion **58** abutting adjacent an aperture **60** formed therein. The shelf actually slops slightly toward the aperture whereby the leading edge of the document may be more easily fed to the gripper fingers **38** of the document drum **14**.

Upstanding from the vertical portion of the front face are a pair of supporting arms **62** journaled for the reception of pivot pins **64** receivable in the opposed side frames **66** of the machine above the aperture **60**. The side frames are shaped with ledge portion **68** for limiting the downward pivoting of the movable portions. Note is taken of the clear access the operator has to the document drum and feed belts when the pivotable portion is raised as illustrated in FIG. **3**. In the totally raised position, the pivotal portion will reset on the top surface of the machine.

As can be more clearly seen in FIG. **4**, the opening within the pivotable portion **54** is provided with support members on opposite sides of the pivotable portion. A pivotable J-shaped bar **70** is mounted for a swinging movement on the pivotable portion about an axes above the aperture. It is located to partially restrict the aperture. The aperture is preferably about 24 inches in width and about 1½ inches high. The J-shaped bar is located to effectively reduce this opening to a height of ½ inch but yet permit operator access to the gripper fingers. Thus, when torn or mutilated documents are inadvertently forwarded into the gripper fingers, they will cause the bar to be moved away from an abutment shoulder **78** against which the bar is normally held by the action of the light pressure exerted by spring **80**.

The pivotable bar has an extending rod **72** coupled with an actuator arm **74** of a limit switch **76** so that a pivoting motion of the bar in a counterclockwise direction as viewed in FIG. **4** will cause the tripping of the limit switch which, in turn is electrically coupled to the main machine logic and causes inactivation of the document feeding apparatus and as well as all other machine components.

In normal operations the document secured to the drum by the gripper fingers is passed into the belt transport **66** (FIG. **3**) and the drum programmed so that the gripper fingers are rotated less than 360° and then stopped at a location whereat the gripper fingers will not interfere with the sliding motion of the document as it is pulled across the fixed document drum by a belt transport as more particularly described in the aforementioned DelVecchio et al. application. After the trailing edge of the document has passed the exposure slot, the leading edge may be refed through the reactivation of the document drum. When, however, a document with a torn edge or wrinkled portion or otherwise mutilated copy is fed through the document handling apparatus, a jam is likely to occur. Because of this, the J-shaped pivot bar is located above the gripper fingers slanting in the direction of document feed so as to be contacted and readily pivoted by an improper document being fed. This motion of the pivot bar inactivates the document feeding apparatus and the machine so that the condition may be corrected after by the lifting of the pivotable section away from the document drum.

The pivotal section may also be provided with indicia marks beneath the aperture or in the shelf portion. In this manner, the shelf portion may act to support the leading edge of the document as it is accurately positioned under the gripper fingers.

While the instant invention as to its objects and advantages has been described being carried out in a specific embodiment hereof, it is not intended to be limited thereby but to be protected broadly within the scope of the appended claims.

What is claimed is:

1. In a reproduction machine wherein a document to be reproduced is gripped by a document drum and rotation therefore moves the document in a path of movement past an exposure slot including

a movable cover plate secured to said machine having an aperture therein to permit the passage of the leading edge of the document to adjacent the document drum and at least one surface thereon for guiding a document through said aperture into communication with said drum,

means pivotally supporting said movable cover plate in a first position with said surface arranged to guide a sheet into communication with the document drum and a second position with said aperture elevated above the document drum to permit operator access to said document drum upon the upward pivoting of said housing cover plate,

a bar mounted within the machine adjacent the aperture and extending downwardly to a point above the document drum when the cover plate is in a first sheet guiding position,

means resiliently biasing said bar toward said aperture and,

electrical means operatively connected to said bar and to said document drum activated by movement of said bar away from said aperture to cause inactivation of the document drum.

2. The apparatus as set forth in claim **1**, wherein said movable cover plate has an upstanding portion containing said aperture and a generally horizontal portion for supporting a document being fed through said aperture to the document drum.

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