

United States Patent

Marshall et al.

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[54] **COMBINED DOCUMENT FEED AND BOOK COPYING APPARATUS**

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[52] U.S. Cl.**355/75, 355/8, 355/82**

[51] Int. Cl.**G03b 27/62**

[58] Field of Search.....**355/75, 76, 82, 3, 8**

[56] **References Cited**

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Primary Examiner—Samuel S. Matthews

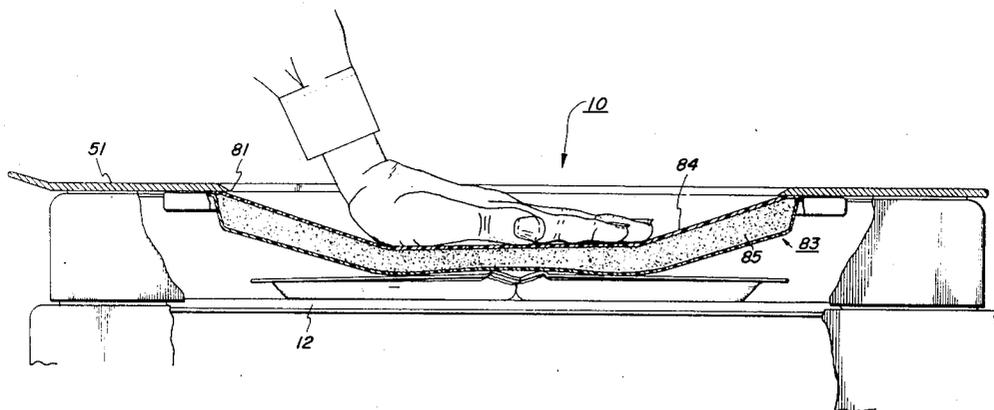
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[57] **ABSTRACT**

Apparatus for copying documents and/or books. A book-like housing is pivotally mounted in overlying relationship to a copying machine. The top wall of the housing is pivotally mounted also to obtain free access to the platen and has a diaphragm assembly mounted therein for restraining books placed in the housing against the platen of the copying machine. A document transport co-extensive with the platen is pivotally mounted on the housing for movement from a first position wherein the document transport feeds documents into overlying relationship with said platen to a second position away from said platen where books may be positioned in overlying relationship thereto.

5 Claims, 8 Drawing Figures



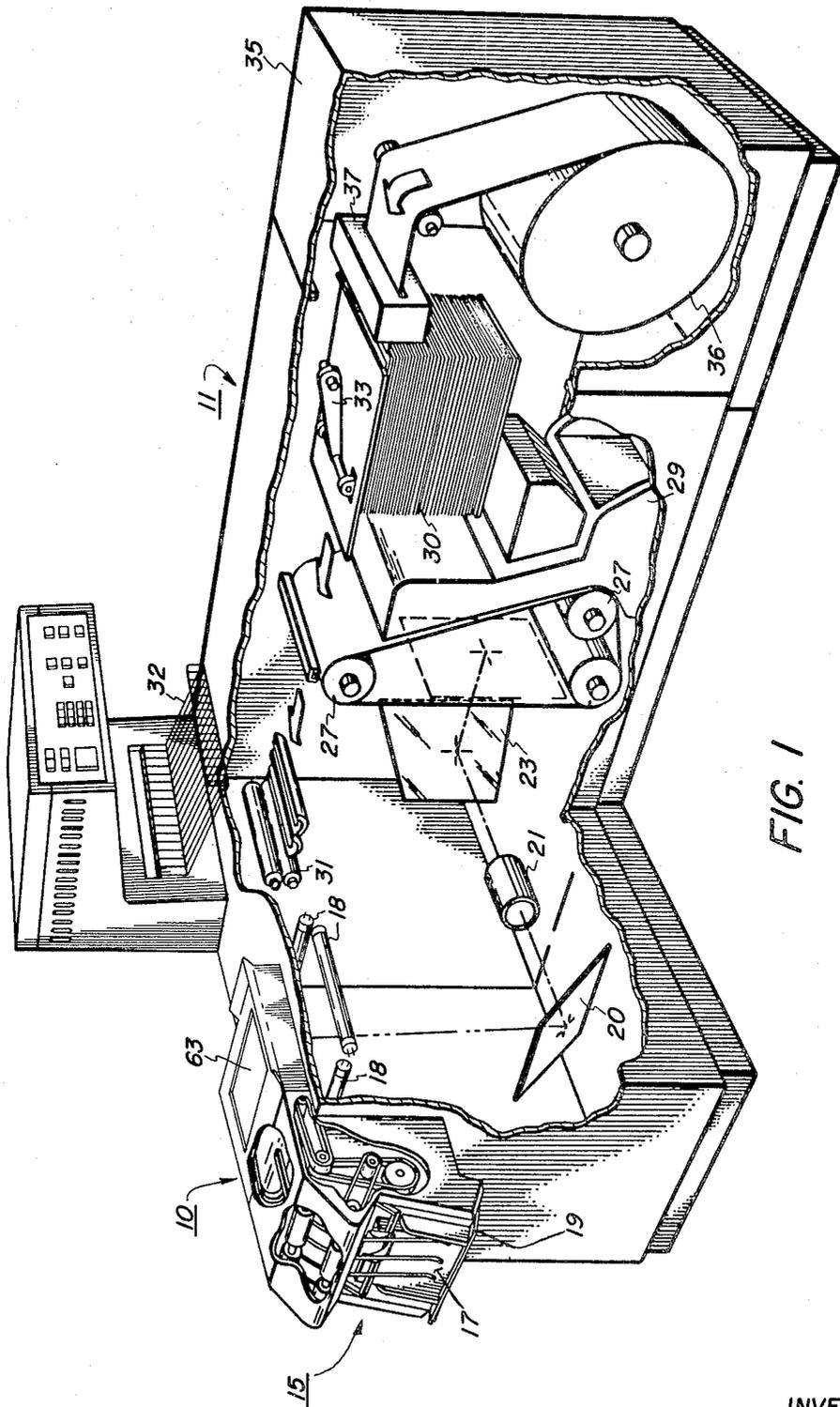
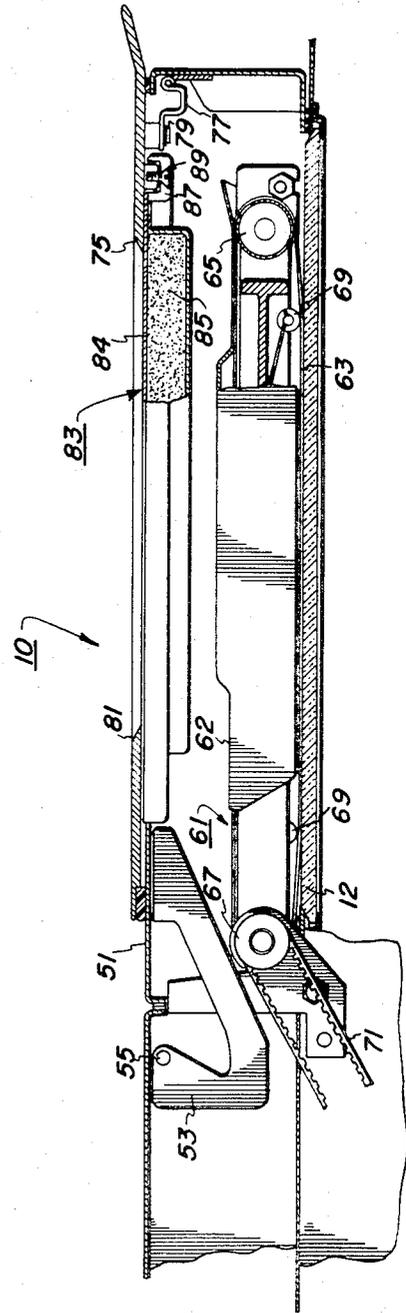
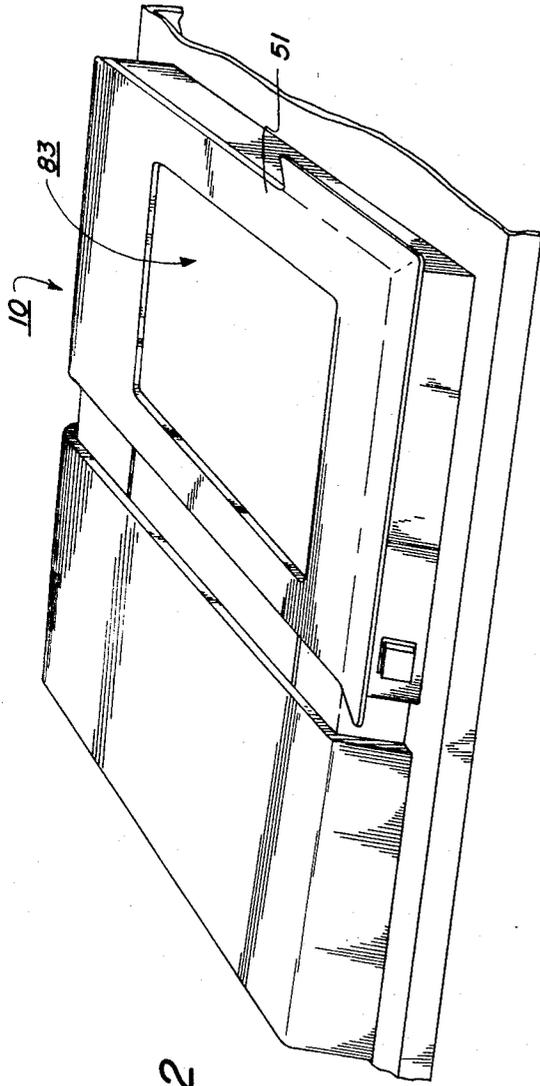


FIG. 1

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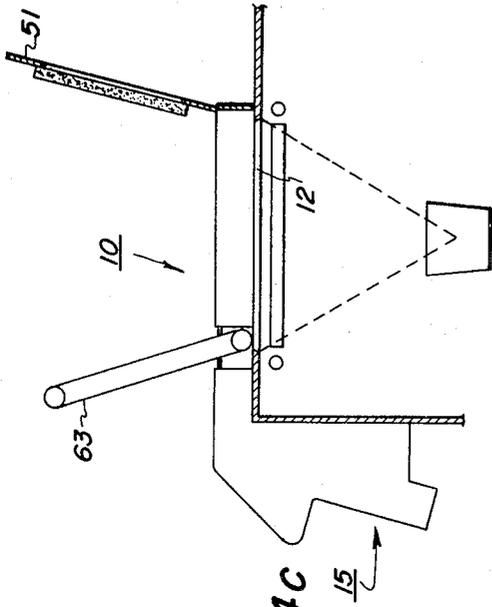


FIG. 4c

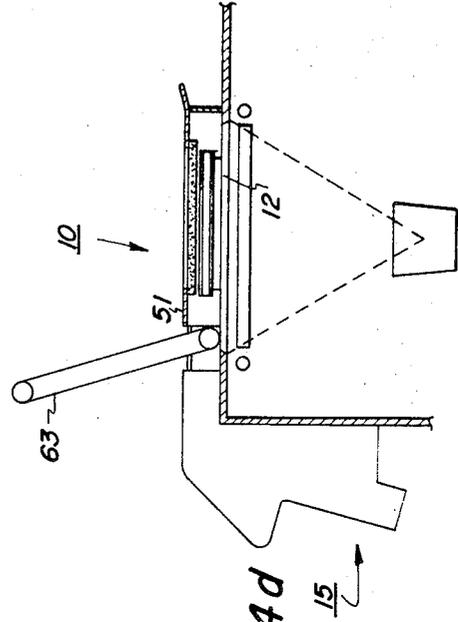


FIG. 4d

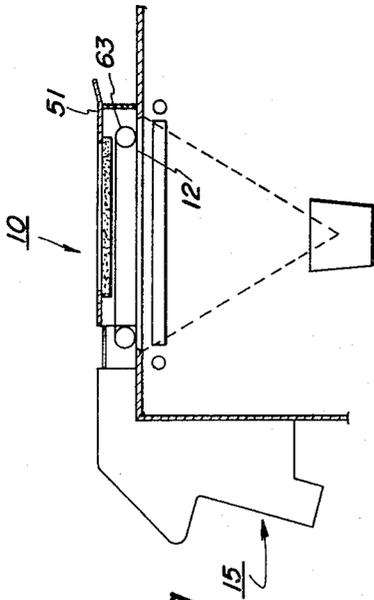


FIG. 4a

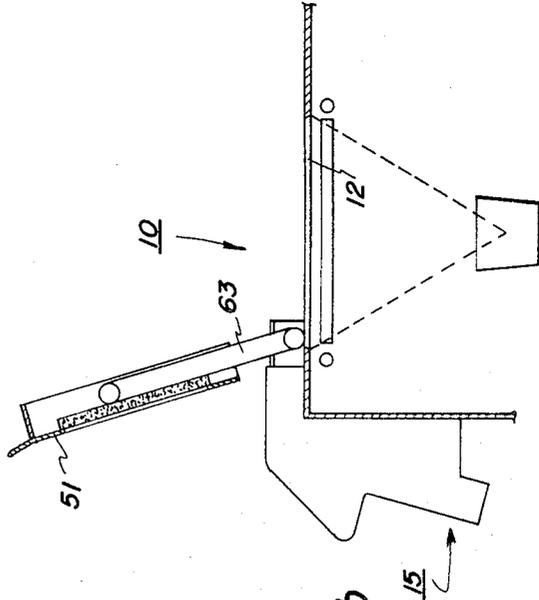


FIG. 4b

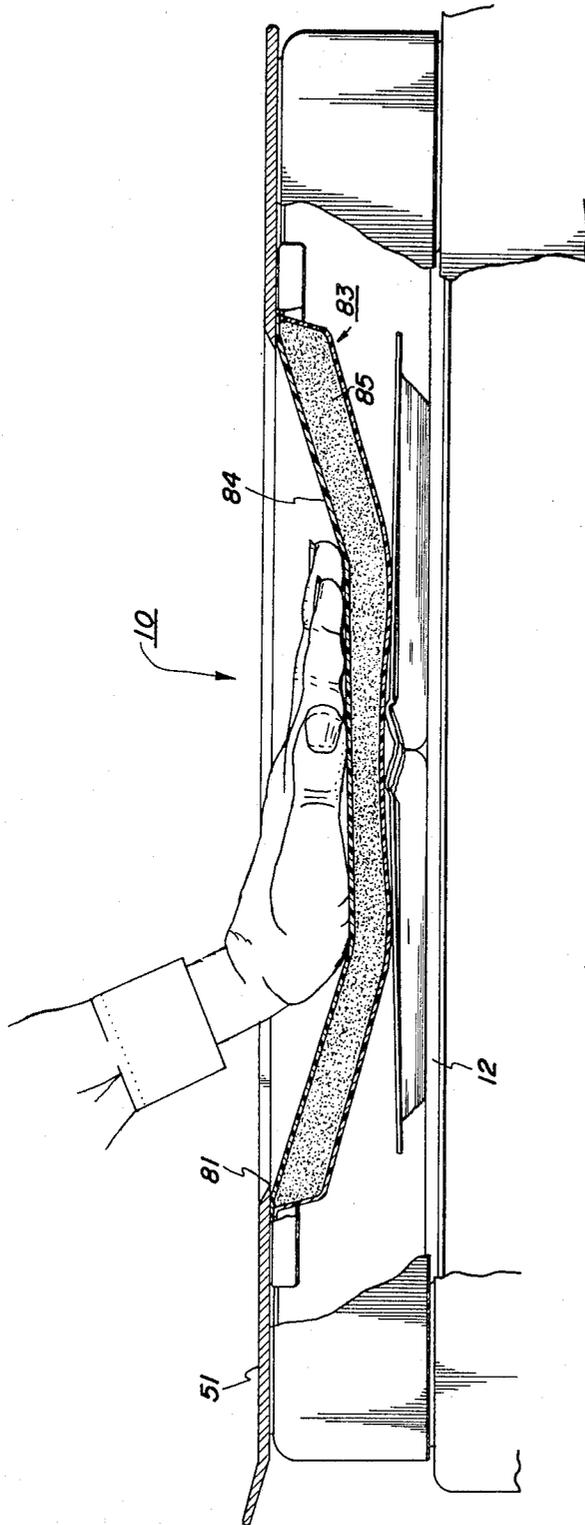


FIG. 5

COMBINED DOCUMENT FEED AND BOOK COPYING APPARATUS

This invention relates to a combined document and book copying apparatus which enables feeding of single sheets in overlying relationship to the platen of a reproduction machine as well as restraining of bound volumes or books on the platen in a safe and reliable manner.

Heretofore, there has been available for use with reproduction machines flexible platen members which can accommodate both a single sheet of material and bound volumes or books. Usually, the flexible platen members adapt to the curve of the book or object to be reproduced but are not altogether sealed in a light-tight relationship over the platen area as described, for example, in U.S. Pat. Nos. 2,638,827 or 2,737,099.

On the other hand, there are printer systems which transport documents from a stack to the platen area for light-tight exposure in automatic fashion as described, for example, in U.S. Pat. No. 3,556,512. A problem with this type of document feed apparatus is that it does not readily permit the copying of bound volumes or books and therefore limits the capacity of copying which can be accomplished by the printer system.

It is therefore an object of the present invention to provide a new and improved combined document and book copying apparatus for reproduction machines.

It is a further object of the invention to provide an improved cover apparatus for covering a platen overlying the source of radiation to ensure shielding of radiation during the copying operation.

It is still another object of the invention to ensure that document material and bound volumes or books are positioned firmly against a platen during a copying operation.

It is another object of the present invention to produce high quality copies of single sheets and/or bound volumes alike from a single platen area.

It is another object of the invention to ensure safety of machine operators from radiation hazard during the copying of document material and/or books.

These as well as other objects of the invention will become apparent from the following description which is to be read in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of a duplicating machine incorporating the combined document and book copying apparatus according to the present invention;

FIG. 2 is an isometric view of the exterior of the combined document and book copying apparatus;

FIG. 3 is a side sectional view of the combined document and book copying apparatus with certain parts in section to show certain details thereof;

FIGS. 4a through 4d illustrate the different positions of the apparatus of the invention for the different modes of operation wherein FIG. 4a illustrates the position for the document feed; FIG. 4b illustrates the position for inserting single oversize documents and FIGS. 4c and 4d illustrate the open and closed positions of the book copying mode of operation, respectively; and

FIG. 5 illustrates the combined document feed and book copying apparatus in the book mode of operation with the diaphragm assembly extended.

For a general understanding of the duplicating machine incorporating the present invention reference is made to FIG. 1 wherein various components of a typ-

ical electrostatic printer system are illustrated. The printer system is of the xerographic type and utilizes a document and book copying apparatus generally designated with the reference numeral 10. As in all xerographic systems, a light image of an original to be reproduced is projected onto the sensitized surface of a xerographic plate to form an electrostatic latent image. Thereafter, the latent image is developed with toner material to form a xerographic powder image corresponding to the latent image on the plate surface. The powder image is then electrostatically transferred to a record material such as a sheet or web of paper or the like to which it may be fused by a fusing device whereby the powder image is caused permanently to adhere to the surface of the record material.

The xerographic processor indicated by the reference numeral 11 is arranged as a self-contained unit having all of its processing stations located in a unitary enclosure or cabinet. In accordance with the present invention, the printer system includes a combined document and book copying apparatus 10 at an exposure station at which a light radiation pattern of document information to be reproduced may be positioned on a glass platen 12 (FIG. 3). The document information may be a single sheet or alternatively a bound volume or book positioned for projection onto a photoconductive surface in the form of a xerographic belt 13 as will be explained more fully hereinafter. A document sheet is transported to and from the document and book copying apparatus 10 by a recirculating document feed apparatus 15 from the bottom of a stack 17 positioned on a supply tray 19 until the entire stack has been copied at which time the cycle may be repeated as described in U.S. Pat. No. 3,556,512 to George E. Fackler entitled Document Feed Apparatus and commonly assigned with the present invention. The present invention is an improvement over the aforementioned patent to enable the copying of bound volumes or books as well as documents.

Imaging light rays from the document as flash illuminated by lamps 18 are projected by a first mirror 20 and a projection lens 21 and another mirror 23 onto the belt 13 at the focal plane for the lens 21 at a position indicated by the dotted line 25.

As an interface structure and for unobstructive optical projections, the side of the cabinet is formed with an enlarged rectangular opening to permit the projection of image light rays from the lens 21 to the mirror 23. Similarly, the cabinet supporting the document plane is formed with a corresponding rectangular opening that mates with the opening in the printer cabinet when the two cabinets are operatively joined together for copy/duplicating purposes. Suitable light-type gaskets may be utilized adjacent the exterior of each opening in the cabinets in order to minimize the leakage of unwanted extraneous light.

The xerographic belt 13 is mounted for movement around three parallel arranged rollers 27 suitably mounted in the frame of processor 11. The belt may be continuously driven by a suitable motor (not shown) and at an appropriate speed corresponding to the discharge responsive the photoconductive material that comprises the belt and the intensity of the imaging light rays from the document. The exposure of the belt to the imaging light rays from the document discharges

the photoconductive layer in the area struck by light whereby there remains on the belt an electrostatic latent image of configuration corresponding to the light image projected from the document. As the belt continues its movement, the electrostatic latent image passes a developing station at which there is positioned a developer apparatus 29 for developing the electrostatic latent image. After development, the powdered image is moved to an image transfer station whereat record material or sheet of paper just previously separated from a stack of sheets 30 is held against the surface of the belt to receive the developed powder image therefrom. The sheet is moved in synchronism with the movement of the belt during transfer of the developed image. After transfer, the sheet of paper is conveyed to a fusing station where a fuser device 31 is positioned to receive the sheet of paper for fusing the powder thereon. After fusing of the powder image the sheet is conveyed to a copy tray. The sheets are separated from the stack and fed from the top of the stack by means of a separator roll device 33 and timed sequence of the movement of the developed latent images on the belt 13.

Further details of the processing devices and stations in the printer system are not necessary to understand the principals of the present invention. However, a detailed description of these processing stations and components along with the other structures of the machine printer are disclosed in copending application Ser. Nos. 731,934, filed May 24, 1968, and 756,598, filed Aug. 30, 1968, now U.S. Pat. No. 3,597,071 which are commonly assigned with the present invention.

It will be appreciated that the printer system may be operated in conjunction with a roll converter unit indicated by the reference numeral 35. The roll converter unit 35 is adapted to covert a relatively large roll of paper 36 into various sizes of sheets of paper by means of a cutter device 37 and a suitable control system (not shown) arranged to control cutting and feeding of the individual sheets into operative cooperation with the separator roller 26. It will be appreciated that operative cooperation is assured between the various units operating with the printer system by the physical association of the cabinets for the units and the matching openings which enable full cooperation of the imaging light rays and sheet transport path between the units. In this regard, locking clamps may be provided on all the units for preventing the inadvertent movement of such units during use and interlocks which is an alignment device may be utilized on each unit for ensuring upper alignment and to terminate or suspend operation in the event misalignment or separation of the units occur. For facility and needs of operation, each of the units provided with caster wheels and locking brakes thereby aiding in the movement of the units into and out of cooperative engagement.

COMBINED DOCUMENT AND BOOK COPYING APPARATUS

Referring now to FIGS. 2 through 5 the combined document and book copying apparatus 10 comprises a box-like frame 51 which is pivotally hinged to the machine frame by one or more hinge members 53 on hinge pivot pins 55. Housed within the box-like frame

51 is a drive belt assembly 61 which includes a frame 62 housing one or more drive belts 63 mounted on rollers 65 and 67 and suitably biased by pressure roll members 69 so as to maintain good pressure contact between a sheet being fed with the platen 12. It will be appreciated that the belts 63 are driven by the drive mechanism for the document feed apparatus 53 through a timing belt 71. In this manner there is continuous feeding of a document from the stack 17 to the platen 12 as described in the aforementioned patent.

In accordance with the present invention, box-like housing 51 includes a pivotable top cover member 75 which is hinged to the housing 51 by one or more hinge members 77 and suitable fastening screws 79. Top cover member 75 is formed with an opening 81 across which is positioned a diaphragm assembly 83. Diaphragm assembly 83 is formed from an elastic light weight rubber membrane 84 which is preferably made of a hyplon rubber for flexibility and strength and is colored white to reflect light rays through the machine optical system. Enclosed within the membrane 84 is a pad member 85 to facilitate copying a book as will be explained hereinafter. Diaphragm assembly 83 is secured to the underside of the top cover member 75 by one or more clamping members 87 extending around the periphery thereof which are suitably secured to the top cover member by means of screws 89 to form a light-tight fitting with the box-like housing. Desirably, the membrane has thickness ranging from about 20 to about 30 mils so as to enable stretching for holding the book or bound volume tight to the platen as best shown in FIG. 5.

Referring now specifically to FIGS. 4a through 4d, the operation will now be explained. When in the automatic document copying mode, the combined document and book copying apparatus is positioned as shown in FIG. 4a, with the belt 63 being driven by the document feed apparatus for feeding the documents onto the platen. With the combined document and book copying apparatus in the raised position as shown in FIG. 4b the operation of the printer system would be for the reproduction of a single oversized sheet which may be inserted onto the platen with the combined document and book copying apparatus pivoted upwardly on hinge 53 and then repositioned as shown in FIG. 4a. In this case, the document feed belt 63 is not energized.

When it is desired to go into a book copying mode of operation, the top cover member is pivoted on hinge 77 to a raised position and the document feed belt lifted from the platen and pivoted on roll 67 into a rest position against the frame. The book or bound volume is then inserted onto the platen and the top cover member closed as shown in FIGS. 4d and 5. The machine is now ready to copy in the book mode of operation. It will be appreciated that due to an operator's hand pressing against the diaphragm assembly a firm pressure is maintained on the book against the platen and high quality prints are ensured.

While the invention has been described and illustrated herein as preferred form of the invention, it will be apparent to those skilled in the art that changes and modifications may be made thereto without departing from the spirit and intent of the invention which is to be limited only to the scope of the appended claims.

What is claimed is:

- 1. Apparatus for copying documents and books comprising:
 - a frame;
 - a platen positioned on said frame;
 - contiguous walls defining a hollow box-like housing 5
mounted on said frame in overlying relationship to said platen;
 - a one of said walls forming a top cover for said housing and being pivotally mounted to said housing to obtain free access to said platen; 10
 - document transport means pivotally mounted within said housing for movement between a first position in which it is co-extensive with and overlies said platen for feeding documents into overlying relationship with said platen and a second position in 15
which said transport means is pivoted away from said platen and outside said housing with said housing top cover being closed over said platen such that a book may be placed on said platen and held by said top cover. 20
- 2. Apparatus according to claim 1 wherein said box-like housing is pivotally mounted on said frame for movement toward and away from said platen for positioning oversize sheets thereon.
- 3. Apparatus for copying documents and books comprising: 25
 - a frame;
 - a platen positioned on said frame;
 - contiguous walls defining a hollow box-like housing 30

- mounted on said frame in overlying relationship to said platen;
- a one of said walls forming a top cover for said housing and being pivotally mounted to said housing to obtain free access to said platen;
- document transport means co-extensive with said platen and pivotally mounted on said housing for movement from a first position wherein said document transport means feeds documents into overlying relationship with said platen to a second position away from said platen where books may be positioned in overlying relationship thereto;
- wherein said top wall of said housing is formed with an opening and a diaphragm means is secured to said top wall member and arranged co-extensive therewith whereby pressure exerted on said diaphragm means may be imparted to a book overlying said platen area.
- 4. Apparatus according to claim 3 wherein said diaphragm means includes a membrane made of an elastomeric material having a thickness ranging from about 20 to about 30 mils to enable forming over objects of a predetermined thickness and then resuming a planar position upon release.
- 5. Apparatus according to claim 4 wherein said diaphragm membrane has a hollow chamber to receive a pad member.

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