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RESEARCH DISCLOSURE, no. 150, October 1976, pages 23-24, disclosure no. 15030, Harvant, Hampshire, GB; M.G. REID et al.: "Apparatus for separating copies or sets of copies"

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Description

Technical Field

This invention relates to electrographic apparatus, and more particularly, to a method and apparatus in which copies of selected originals are produced with printed tabs.

Related Background Art

In producing a set of copy sheets, it is oftentimes desirable to insert copy sheets with printed tabs at selected intervals to produce visible divisions in the set.

In known copiers, oversized originals with printing along one edge have been copied onto similarly oversized copy sheets so that the printing is reproduced along the edge of the copy sheets to form printed tabs.

However, there is a problem in producing printed tabs in certain copiers in that the copy sheets with tabs are wider than the image area of the photoconductor. In such copiers, known e.g. from US—A—4 298 528, the printed information along the edge of an oversized original would fall outside the image area and not be reproduced.

Disclosure of the Invention

This invention will be described in detail hereunder with reference to the accompanying drawings.

Figure 1 is a schematic representation of an electrophotographic apparatus according to the present invention;

Figure 2 is a block diagram of the logic and control unit of the apparatus of Figure 1 and a schematic representation of the operator control panel of the apparatus of Figure 1;

Figure 2A is a perspective view of a printed tab as produced by the present invention;

Figure 3 is a flow chart of the operation of the apparatus of Figure 1 in a tab set-up mode;

Figure 4 is a flow chart of the operation of the apparatus of Figure 1 in one producing mode;

Figure 5 is a flow chart of the operation of the apparatus of Figure 1 in a second producing mode;

Figure 6 is a flow chart of the operation of the apparatus of Figure 1 in a letter to tab set-up mode; and

Figure 7 is a flow chart of the operation of the apparatus of Figure 1 in a third producing mode.

Figures 1, 2 and 2A are drawings showing the basic ideas of the invention, where 10 represents apparatus for producing copy sheets 76 with printed tabs 81. An image transfer member 12 is movable along a transport path and has a plurality of spaced nonoverlapping image areas. Means 63 produce an image in an image area of said transfer member in a timed relation to the movement of transfer member 12. A copy sheet 76 with a tab 81 is positioned relative to the image transfer member in transferable relationship therewith to receive an unfixed image, the copy sheet having a first area 79 generally equal in size to the image area and a tab area 81 outside of said first area and along one edge of the copy sheet.

Transfer of an image to tab area 81 to form a printed tab is effected by repositioning the copy sheet relative to the image area such that tab area 81 aligns with a portion of the image such repositioning can be effected by delaying exposure of the original document 34 relative to the normal operating cycle of the apparatus to shift the image toward an edge of the image area on image transfer member 12. The feeding of a tabbed copy sheet 76 into a position to receive the image from the image transfer member is also delayed to shift the image into the tab area 81 of the copy sheet. If the original is larger than the image area on the image transfer member, a reduction of the original image is effected to local all indicia on the original in the image area.

Description of Special Embodiments

Figure 1 shows an electrographic apparatus 10 having an image transfer member in the form of an photoconductive belt 12 trained about rollers 14, 16, 18, 20 and 22. Belt 12 is moved in a clockwise direction as represented by arrow 24, by means of a motor 26 mechanically linked to roller 22. Apparatus 10 includes an exposure platen 28 against which an original can be positioned in an exposure position for copying. Originals are fed to the platen 28 by recirculating document feeder 30 or by a document positioner 31.

Recirculating document feeder 30 is located on top of exposure platen 28 and includes a tray 32 for receiving a set of originals 34 in a receiving position. Feeder 30 circulates originals in sequence along a path 36 from the bottom of tray 32 to exposure platen 28 and then back up to the top of the set originals 34 in tray 32. This is effected by means of feed roller 38 which feeds the bottom-most original in tray 32 between guide roller 40 and guide 42 onto platen 28 where the original is stopped by a gate 44. After exposure of the original, gate 44 is moved out of path 36, and rollers 50, 52, 54, 56, and 58 move the original back to the top of the set of originals 34 in tray 32. As will be described in greater detail later, as an original moves along path 36 away from tray 32 a detector 60 generates a count signal which is applied to a logic and control unit 62. A set count finger 61 is adapted to rest on top of the set of originals 34 in tray 32 and series to indicate when all of the originals in a set of originals 34 have been circulated by feeder 30. A more detailed disclosure of the operation and structure of feeder 30 is disclosed in commonly-assigned U.S. Patent No. 4,099,860.

With reference to Fig. 1, there is shown an image-producing means 63 which includes a pair of flash lamps 46 and 48 for illuminating an original; upon illumination of the original, an image is produced which is projected by a mirror 64, a lens 66, and a mirror 68 onto belt 12 at an exposure station 70. Lens 66 is supported on a carriage 69 which is mounted for movement by a motor (not shown) to move lens 66 along its optical axis; lens 66 is moved to change the magnification of the projected image. The maxi-

imum magnification of lens 66 is such that light is projected over an area on belt 12 defined as an image area, or as a frame, which could be, for example, $8\frac{1}{2}$ inches wide. The terms "leading edge" and "trailing edge" of the image area, as used herein, refer respectively to the edge of an image area which passes an element in apparatus 10 first and the edge which passes the same element last, as the image area is moved in the direction of arrow 24 (Fig. 1).

The speed of belt 12 and the timing of flash lamps 46, 48, are controlled to locate an image on belt 12 and to provide a suitable distance between image areas. In advance of exposure station 70 is a charging station at which a corona charger 72 sensitizes belt 12 by applying an electrostatic charge thereon (for example, a negative electrostatic charge). At exposure station 70, the projected light image dissipates the electrostatic charge at the exposed areas of the photoconductive belt 12 to form a latent electrostatic image on belt 12 corresponding to the image on the original.

The latent electrostatic image on belt 12 is developed with toner at a magnetic brush developer station 73; at station 73 a developer is applied which includes iron carriers particles and electroscopic toner particles with an electrostatic charge (e.g. a positive charge) opposite to the charge of the latent electrostatic image. The toner image is then subjected to radiation by a post-development erase lamp 75 to reduce the electrical stress on photoconductive belt 12 and to reduce the attraction between the toner image and belt 12.

As the toner image on belt 12 approaches a transfer corona charger 74, a copy sheet 76 having a tab is fed from a supply 78 or a copy sheet 77 is fed from a supply 82. Copy sheet 76 and copy sheet 77 are fed by a positioning means which includes a feed roller 80 for copy sheets 76, a feed roller 84 for copy sheets 77, and a registration mechanism 86. A copy sheet 77 or copy sheet 76 is biased against mechanism 86 by the positioning means. Registration mechanism 86 is moved out of the path of a copy sheet 77 or copy sheet 76 at the appropriate point in the cycle of apparatus 10 to obtain the desired positioning of sheet 77 or copy sheet 76 relative to an image on belt 12. As shown in Fig. 2A, copy sheet 76 includes a first area 79 which is substantially the same size as copy sheet 77, for example, $8\frac{1}{2} \times 11$ inches and a tab area 81 outside of area 79 for receiving printing and which can be, for example, $\frac{1}{2}$ inch wide. Area 81 could be extended for the length of copy sheet 76 if a rectangular tab is desired.

In the discussion which follows, movement of copy sheet 76 through the apparatus 10 is described, it being understood that the described movement would apply equally well to a copy sheet 77. At the proper time in the apparatus cycle, the registration mechanism 86 releases copy sheet 76 so that it is moved into registration with the toner image on belt 12 in advance of

corona charger 74. Charger 74 serves as a means to effect the transfer of the toner image to copy sheet 76 by applying a charge opposite in polarity to that of the toner image. A detach charger 88 neutralizes the charge on copy sheet 76 so that it easily separates from belt 12 a roller 18. The copy sheet 76 bearing toner is then passed through a pair of heated fused rollers 90 and 92 to permanently fuse the toner image to copy sheet 76. After fusing, copy sheet 76 is transported to an upper output tray 94 or to a side output tray 96. Mechanical and electrical cleaning of photoconductive belt 12 is effected at a cleaning station 98 which includes a cleaning assist erase lamp 100. Lamp 100 exposes photoconductive belt 12 to radiation to substantially reduce any charge remaining on belt 12, and a cleaning assist charger 102 impresses an alternating current charge on belt 12 to neutralize the charges on untransferred toner particles. A brush 104 removes any residual toner from belt 12 so that it is ready for another cycle.

Timing of the movement of belt 12 in relation to the operation of the various elements of apparatus 10, including feeder 30, is controlled by means of a plurality of perforations (not shown) along one of the edges of belt 12. As an example, belt 12 can be divided into six image areas by a first set of perforations and each image area may be subdivided into 51 sections by a second set of perforations. The relationship of the two sets of perforations to the image area on belt 12 is disclosed in detail in commonly-assigned U.S. Patent No. 3,914,047. At a fixed location along the path of movement of belt 12, there is provided a detector 106 for detecting belt perforations and for providing timing pulses to logic and control unit 62. An encoder 108 is linked to roller 22 and provides a series of timing pulses to logic and control unit 62 which are used in conjunction with the pulses from detector 106 to control the operation of copier 10.

With reference to Figure 2, there is shown in greater detail an illustrative logic and control unit 62 which is connected to an operator control panel 110. Logic and control unit 62 has a programmable computer, such as a microcomputer, which for sequentially actuating the various elements of apparatus 10 as well as for controlling the operation of many other functions of apparatus 10 (as described in greater detail in the aforementioned U.S. Patent No. 3,914,047). Programming of commercially available microprocessors, such as Intel Model 8085 (which along with others can be used in accordance with the invention), is a conventional skill well understood in the art. The following disclosure is written to enable a programmer having ordinary skill in the art to produce an appropriate control program for the microprocessor. The particular details of any such program would of course depend on the architecture of the designated microprocessor.

As shown in Figure 2, LCU 62 includes temporary memory 112 which can be provided by

Read/Write Memory or Random Access Memory (RAM), a central processing unit 114, a timing and cycle control unit 116, and a stored program control unit 118 which comprises a Read-Only Memory (ROM). Data input and output are performed sequentially under program control. Input data is applied to LCU 62 either through an input signal buffers 120 to input data latches 122 or through an interrupt signal processor 124. The input signals are derived from operator control panel 110, from tiny pulses such as those from detector 106 and encoder 108, and from various analog to digital converters which process signals from monitoring devices (not shown) in apparatus 10. The output data and control signals are applied to output data storage latches 126 which provide inputs to suitable output drivers 128 which are connected to various elements of apparatus 10.

Operator control panel 100 includes a display 162 and a plurality of operator actuatable switches (buttons). For example, a numerical keyboard 130 includes ten buttons for "0"—"9" inclusive. A "c" button 132 is used to cancel or clear the previous instructions fed in from panel 110. A star "★" button 134 is actuated by the operator to indicate designated originals which are to be copied on copy sheets of a different characteristic than other originals, for example, copy sheets 76 with tabs. This function will be described in greater detail later. A start button 136 initiates operation of apparatus 10 and a stop button 138 terminates operation of apparatus 10.

Apparatus 10 can be operated in either a non-collate mode or a collate mode. In the noncollate mode, the output of apparatus 10 is sets of uncollated copies which must either be collated manually or collated by a sorter (not shown). In the collate mode, a set of collated copies is produced. If the noncollate mode is desired, a button 140 is depressed; and if the collate mode is desired, a button 142 is depressed. In the non-collate mode, each original in the set of originals 34 in feeder 30 is fed individually to copier platen 38 where the apparatus 10 makes the number of copies requested by the operator before making copies of the next original. On the other hand, in the collate mode, each original in a set of originals 34 is sequentially copied, and the set of originals 34 is recycled until the number of copies requested is completed.

Originals which are fed to exposure platen 28 may have images on two sides (duplex) or may have images on only one side (simplex). Similarly, the copies which are produced by apparatus 10 may have images on either one or two sides of the copy sheet. Thus, if simplex output is desired, button 144 is actuated. If duplex output is desired, the operator would either depress a button 146 (if one-sided originals were placed in feeder 30) or a button 148 if two-sided originals were placed in feeder 30.

Apparatus 10 may also be operated in a cover insertion mode in which special copy sheets may be provided from a supply to the front and/or back

of the copy set. If covers are not requested, then the operator would depress a button 150. Buttons 152, 154, and 156 respectively indicate to the copier whether covers are requested on the front, back, or both front and back of a copy set. Button 158 is actuated to effect output of copies to side output tray 96, while button 160 is actuated to effect output of copies to upper output tray 94. Other buttons (not shown) may also be provided on operator control panel 110 to regulate the exposure of a copy, to select reduction or enlargement of an original, etc. Display 162 shows messages indicating to the operator various conditions which occur in apparatus 10, for example, the mode the apparatus is operating in, what action should be taken next, where jams may be located, etc.

With reference to Figures 3 through 7, the operation of apparatus 10 will now be described in accordance with the present invention in which copy sheets with printed tabs are produced. In Fig. 3, there is shown a flow chart for a tab set-up mode. In this mode, copy sheets 76 with tabs are placed in supply 78, and copy sheets 77 are placed in supply 82. Sheets 77 from supply 82 may, for example, be sheets having a white color and of typewriter weight such as 16 lb bond paper. To enter the tab set-up mode, the operator must press 888(★) on panel 110. Upon pressing 888(★) the operator will be prompted with the introductory message on display 162 "Tab Printing Mode, Press Lighten for Selections, or Stop to Exit". The operator uses a "lighten copies" button 147 to scroll through the various tabs printing modes available. When the desired mode is displayed, a "normal copy" button 149 is pushed to select that particular mode. Thus, if tab to tab is requested in which 9 inch originals are reproduced on 9 inch copy sheets 76, the apparatus 10 will function as shown in Figure 4; if tab to letter size is selected, in which 9 inch originals are reproduced on 8½ inch copy sheets, apparatus 10 will function as shown in Figure 5, and if it is desired to make printed tabs from 8½ wide originals using feeder 30, the apparatus 10 will function as shown in Figure 7.

As shown in Figure 4, when it is desired to produce printed tabs from 9 inch originals, a reduction of 94% must be effected to fit the projected image in the image area of belt 12. Also, the exposure of the original is delayed sufficiently to shift the image approximately 0.25 inches towards the trailing edge of the copy. To correctly place the image on copy sheets 76, the feeding of a copy sheet 76 from supply 78 is delayed sufficiently by mechanism 86 to accomplish a second 0.25 inch shift of the image and thereby produce the printed tab with the image located such that the image is visible along the edge when interspersed in a set of copy sheets 77. The reduction, image shift, and delayed feed are effected automatically by LCU 62 in accordance with the mode selected.

As shown in Figure 5, the 8½ inch copy sheets from 9 inch originals can be produced, using 94%

reduction and top exit. The 9 inch originals are fed manually using document positioner 31.

A separate set-up mode (Fig. 6) is used when 9 inch copy sheets with tabs are desired from 8½ inch originals (letter size) using feeder 30. In the first step of the letter to tab set-up mode, the operator selects either the simplex-duplex or the simplex-simplex mode for the apparatus 10 by depressing either button 144 or button 146. Thus, the operator indicates whether two-sided copy is to be produced and also indicates whether the feeder 30 is to be operated in a collate or non-collate mode. For purposes of illustration, it will be assumed that a simplex set of originals 34 are placed in tray 32 of feeder 30, and that only one copy of the set of originals 34 is to be made.

The next step is for the operator to place the set of originals 34 in tray 32 of feeder 30 so that the pages are facing up with the last original in the set on the bottom and the first original on top. The image information to be placed on the tab should be towards the left hand edge of the originals. Set count finger 61 is initially on top of the first original. After the operator has entered the number of copies requested the "1" button is depressed to place feeder 30 under operator control so that each time the start button 136 is depressed, feeder 30 feeds the lowermost original past detector 60, around a circulation loop and back up onto the top of the set of originals 34. Detector 60 sends a copy count signal to be stored in temporary memory 112, and the circulated original is visible to the operator on top of the set. The operator continues to press start button 136 to sequentially circulate originals back to the top of the set until an original arrives which is to be copied onto a copy sheet 76 with tab; for this original, the operator presses the "★" button 134 which enters into the temporary memory 112 the location of such original within the set. The operator continues to press the start button 136 and to designate any further originals which are to be copied onto copy sheet 76. When the originals are back in the starting order, the letter to tab set-up mode is complete.

After the letter to tab set-up mode has been completed, the apparatus 10 is prepared to operate as shown in Figure 7. The operator pushes start button 136 to initiate copying. Apparatus 10 may also be programmed to start automatically (auto-start) after a certain delay. In either event, apparatus 10 is started and feeder 30 sequentially circulates originals from tray 32 to exposure platen 28. After each circulation of an original, the copy count detector 60 sends a signal to logic and control unit 62 which determines whether or not the original just fed was an original for a copy sheet 76. If not, a copy sheet is fed from lower supply 82. If the original just fed is a tab original, the apparatus 10 is programmed to skip a frame, i.e., form no image in the image area, before the original is exposed by flash lamps 46 and 48; the actuation of flash lamps 46 and 48 is delayed relative to the actuation point in the operating cycle for a copy sheet 77 to shift the operating

cycle for a copy sheet 77 to shift the image towards the trailing edge of the image area. A frame is also skipped after the exposed frame; the skipped frame before the exposure of the tab original and the skipped frame after exposure facilitate the conveying of the relatively wide copy sheet 76 through apparatus 10. A copy sheet 76 with tab is fed from upper supply 78, and the feeding is delayed to shift the image on belt 12 toward the trailing edge of copy sheet 76 and thereby locate the image on area 81 of copy sheet 76. The originals are recirculated sequentially one at a time from receiving tray 32 to exposure platen 28 and back to the top of receiving tray 32, with designated originals being copied onto copy sheets 76 from supply 78 and nondesignated originals being copied on copy sheet 77 from supply 82. When the uppermost original is fed onto platen 28, set count finger 61 indicates to LCU 62 that the set of originals 34 has been circulated and the original just fed is the first original in the set. Since only one copy has been requested, the copier job is completed, and apparatus 10 is turned off.

Effects of the Invention

In this invention, as explained above, there is provided apparatus for producing printed tabs in copiers wherein the copy sheets with tabs are wider than the image area of the photoconductor.

A principal advantage of the disclosed invention is that sets of copy sheets can be produced having copy sheets with printed tabs interspersed through the set of desired locations. The sets can be produced on-line at normal copier speeds, whereas previously, sets containing printed tabs required considerable time and intervention by the operator. The problem of printing on relatively wide copy sheets with tabs has been solved, without having to enlarge the image area on the photoconductor, by shifting the image into the edge area of the tabbed copy sheet. A particularly advantageous way to accomplish the image shift is in the use of both exposure delay and delay in feeding the tab. By using the combination of these techniques, the image shift can be accomplished without large changes in the apparatus operation cycle and feeding process.

Claims

1. A copier (10) adapted to produce an image of an original (34) on standard copy sheets (77) and on relatively wide copy sheets (76) with tabs (81) characterized by:

a transfer member (12) with an image area the width of which is that of standard copy sheets (77); and

means for automatically positioning a copy sheet (76) with tab relative to the image area such that an image portion of the image area is printed on the tab (81).

2. The copier as described in Claim 1, further characterized by said positioning means including means for controlling the timing of the

exposure of said original (34) to shift said image relative to the image area toward one edge of the image area.

3. The copier as described in Claim 1 or 2, further characterized by said positioning means including means for controlling said positioning means to shift the tabbed copy sheet (76) relative to the image area on the transfer member (12).

4. The copier as described in Claims 1 to 3, further characterized by said positioning means delaying exposure of the original (34).

5. The copier as described in Claims 1 to 4, further characterized by said positioning means delaying feeding the tabbed copy sheet (76).

Patentansprüche

1. Kopiervorrichtung (10) zur Herstellung von Kopien nach einer Vorlage (34) auf normalformatigen Kopierblättern (77) und überformatigen Registerblättern (76), gekennzeichnet durch

ein Bildübertragungselement (12) mit einem Bildfeld von der Breite eines normalformatigen Kopierblatts (77); und

Blattausrichtmittel zum automatischen Positionieren von Registerblättern (76), die bewirken, daß ein Abschnitt des Bildfeldes aus der Registerfahne (81) abgebildet wird.

2. Kopiervorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Positioniereinrichtung Mittel zur Taktsteuerung der Vorlagenbelichtung aufweist, um die Abbildung relativ zum Bildfeld in Richtung einer Bildfeldkante zu verschieben.

3. Kopiervorrichtung nach Anspruch 1 oder 2 mit Blattausrichtmitteln, dadurch gekennzeichnet durch Steuermittel zum Verschieben der Registerblätter (76) relativ zum Bildfeld auf dem Bildübertragungselement (12).

4. Kopiervorrichtung nach den Ansprüchen 1 bis 3, dadurch gekennzeichnet, daß die Blattausricht-

mittel eine Verzögerung der Vorlagenbelichtung bewirken.

5. Kopiervorrichtung nach den Ansprüchen 1 bis 4, dadurch gekennzeichnet, daß die Blattausrichtmittel eine Verzögerung der Zuführung von Registerblättern bewirken.

Revendications

1. Copieur (10) adapté pour produire une image d'un original (34) sur des feuilles de copie standard (77) et sur des feuilles de copie relativement larges (76) munies d'onglets (81) caractérisé par:

un élément de transfert (12) avec une surface image dont la largeur est égale à celle de feuilles de copie standard (77); et

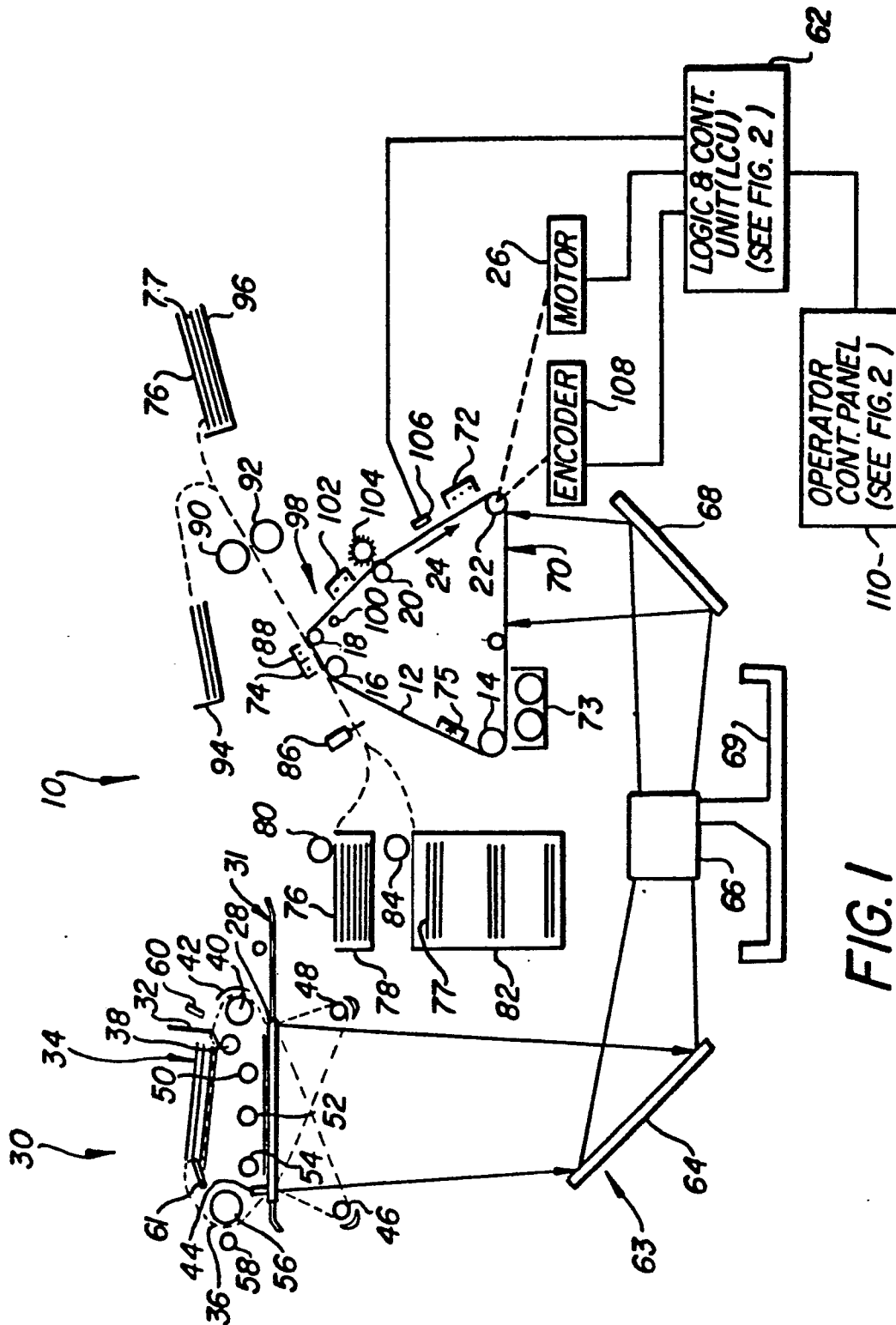
des moyens pour positionner automatiquement une feuille de copie (76) avec l'onglet par rapport à la surface image de telle sorte qu'une partie d'image de la surface image soit imprimée sur l'onglet (81).

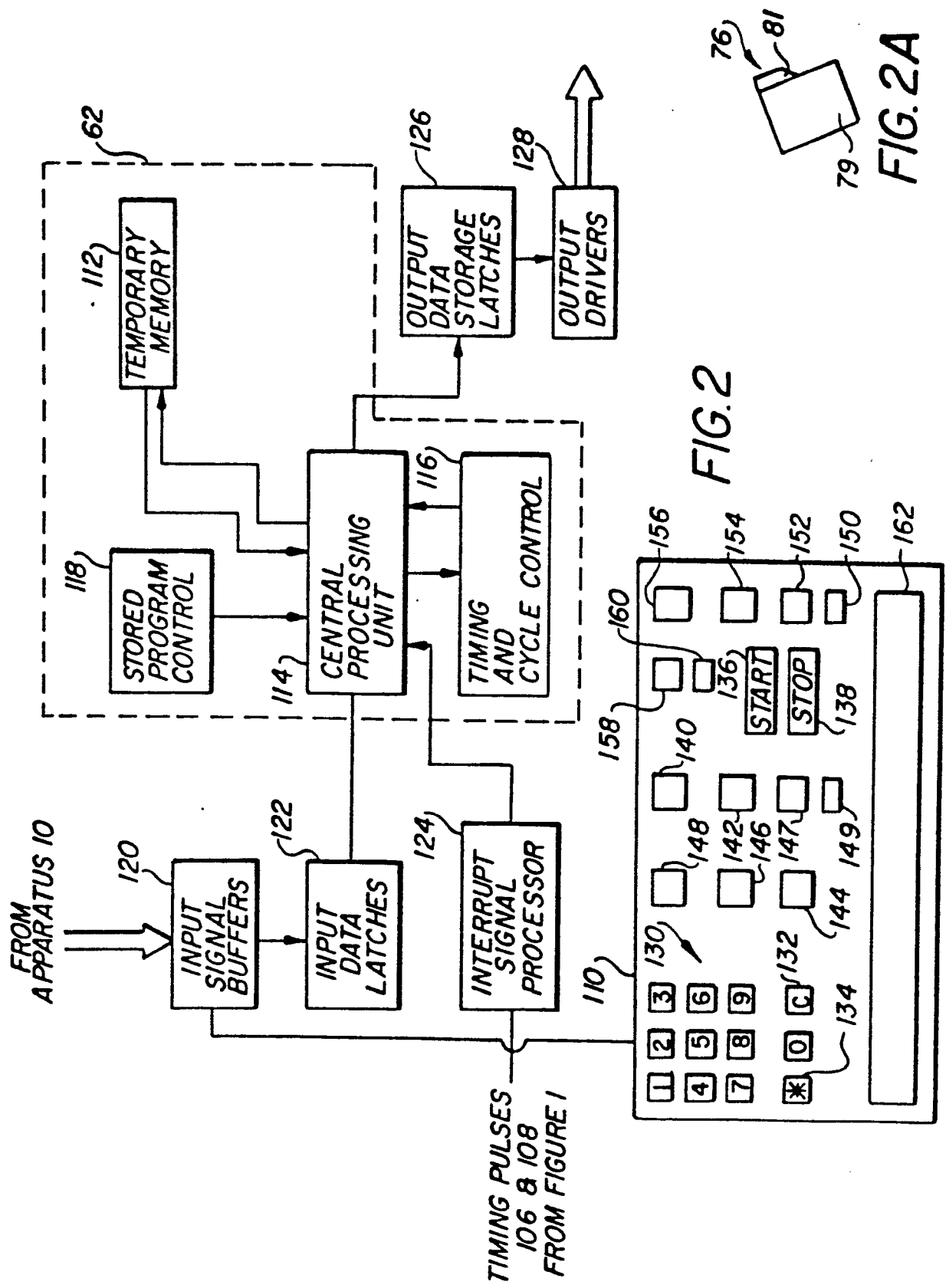
2. Copieur selon la revendication 1, caractérisé en ce que lesdits moyens de positionnement comprennent des moyens pour contrôler la séquence d'exposition dudit original (34) afin de décaler ladite image par rapport à la surface image vers un bord de la surface image.

3. Copieur selon la revendication 1 ou 2, caractérisé en ce que lesdits moyens de positionnement comprennent des moyens pour commander lesdits moyens de positionnement afin de décaler les feuilles de copie à onglets (76) par rapport à la surface image sur l'élément de transfert (12).

4. Copieur selon l'une quelconque des revendications 1 à 3, caractérisé en ce que lesdits moyens de positionnement retardent l'exposition de l'original (34).

5. Copieur selon l'une quelconque des revendications 1 à 4, caractérisé en ce que lesdits moyens de positionnement retardent l'alimentation en feuilles de copie à onglets.





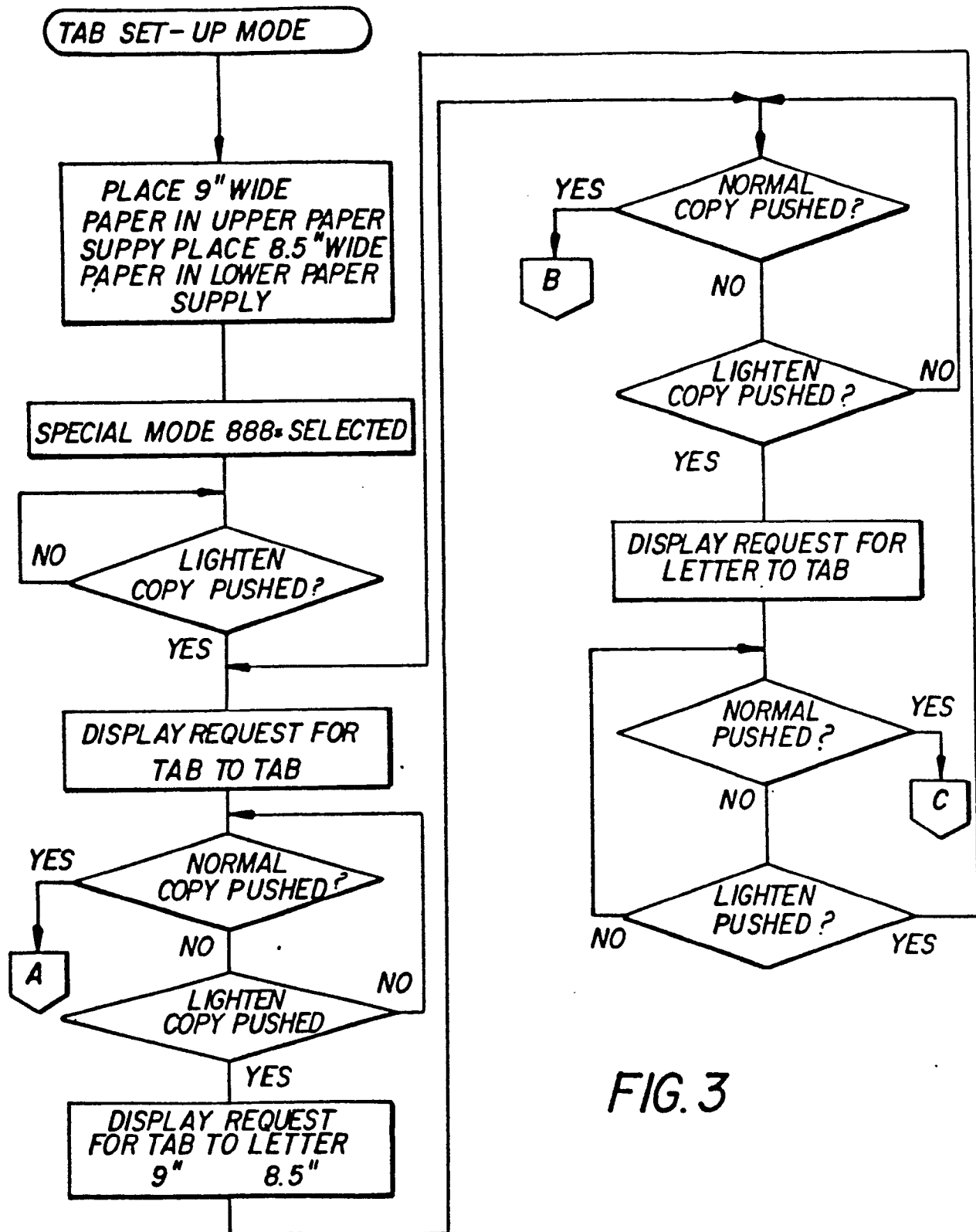
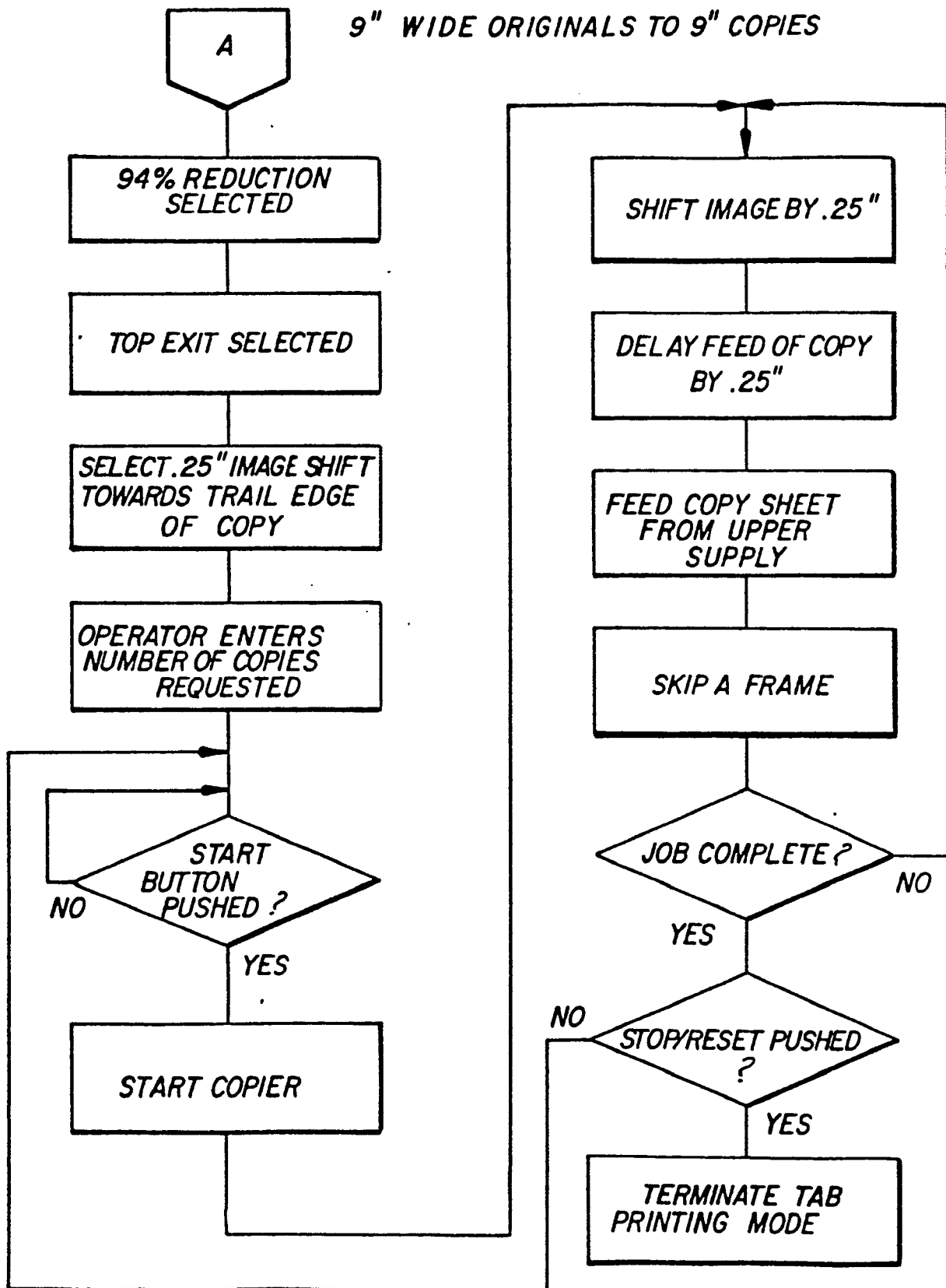


FIG. 3

FIG. 4



9" WIDE ORIGINALS TO 8.5" WIDE COPIES

FIG.5

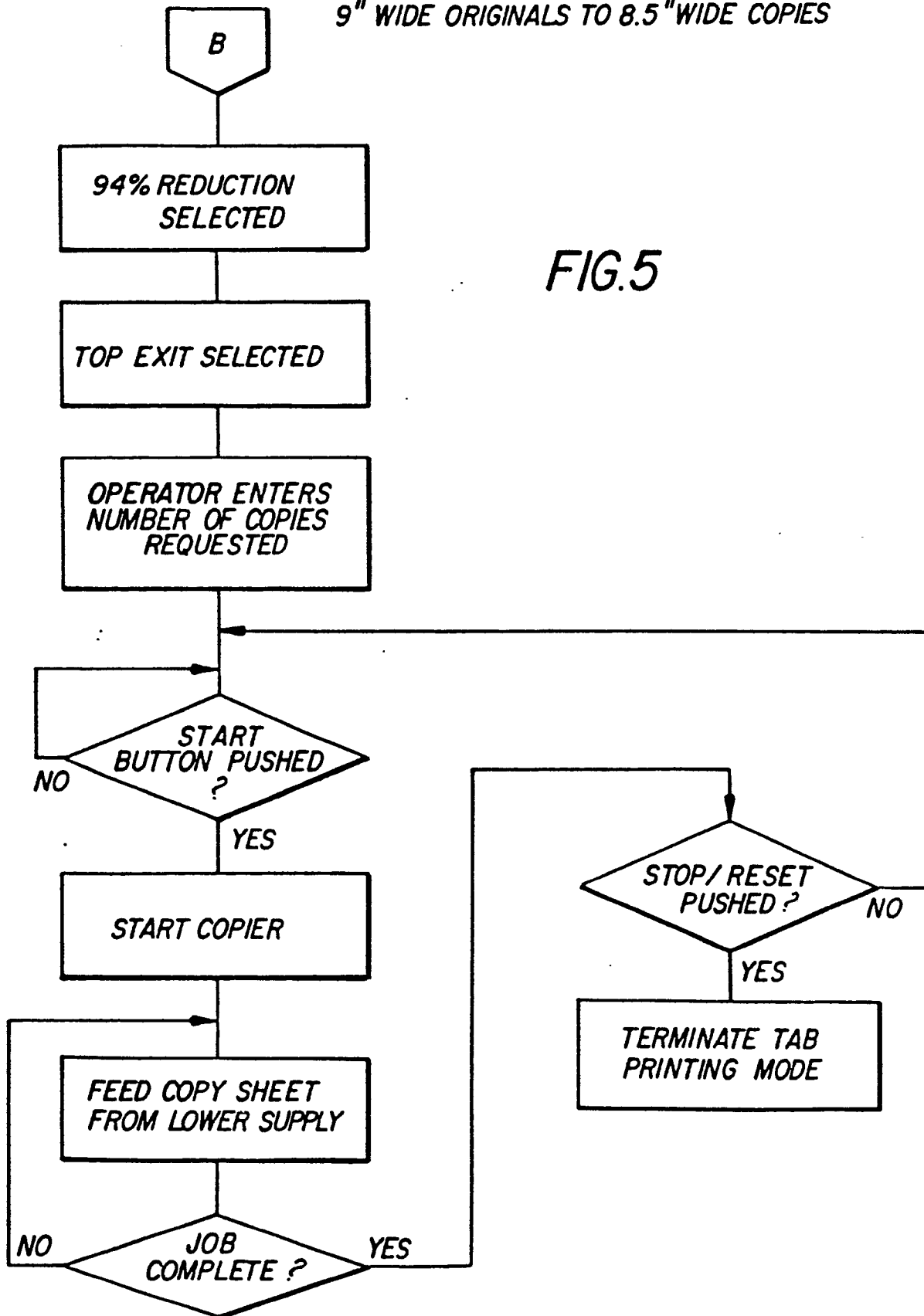


FIG. 6

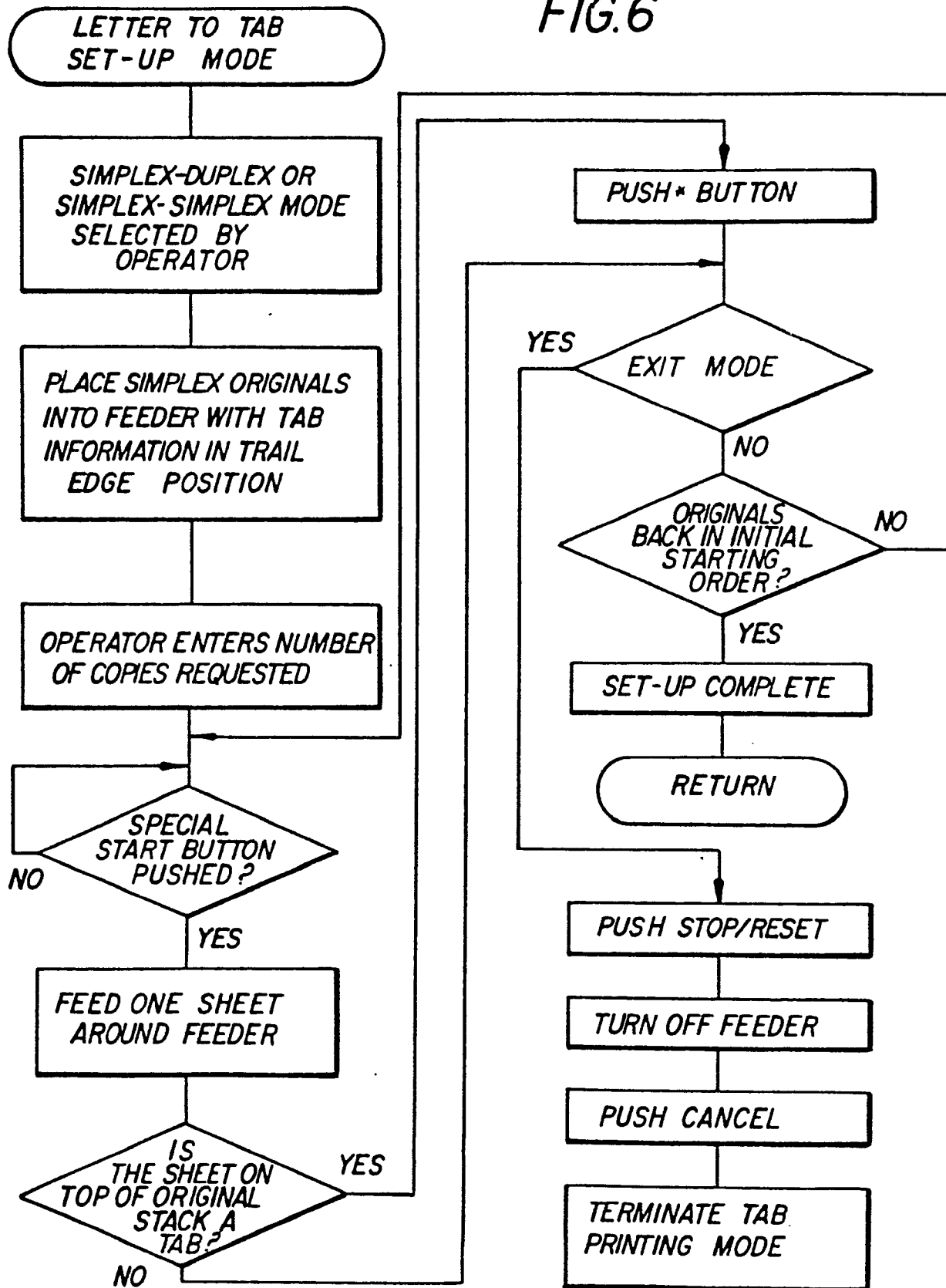


FIG. 7**8.5" WIDE ORIGINALS TO 9" WIDE COPIES**