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(71) Applicant: **International Business Machines Corporation**
Old Orchard Road
Armonk, N.Y. 10504(US)

(72) Inventor: **Boman, Clark**
7411 Mt. Scherman Road
Longmont Colorado CO, 80501(US)

(72) Inventor: **Brannan, Robert Clark**
7158 Overbrook Drive
Longmont Colorado CO 80501(US)

(72) Inventor: **Hyde, Billy Dorris**
120 Baylor Drive
Longmont Colorado, CO 80501(US)

(72) Inventor: **Laliberty, Michael Alfred**
512 Mt. Evans St.
Longmont Colorado CO 80501(US)

(72) Inventor: **Underhill, Thomas Travis**
4642 Hampshire St.
Boulder Colorado CO 80301(US)

(72) Inventor: **Wedel, Marvin**
12370 Niwot Road
Longmont Colorado CO 80501(US)

(74) Representative: **Ekström, Gösta E.**
IBM Svenska AB Box 962
S-181 09 Lidingö(SE)

(54) Automatic checkout procedure for an electrophotographic copier machine.

(57) An automatic checkout procedure for an electrophotographic machine where maintenance personnel perform a special entry procedure after which the machine sequences through several different jobs with a variety of selected features and subsystems producing copies for each feature or subsystem tested in order to check for proper operation. In that manner, those features and subsystems which are beginning to operate in a degraded manner can be identified. Specific features and subsystems tested include the document feed, collator, duplex, alternate paper bin, separate, reduction, paper feed, edge erase lamp, interimage erase lamp, shutters, corona voltage and developer bias voltage subsystems.

EP 0 093 242 A1

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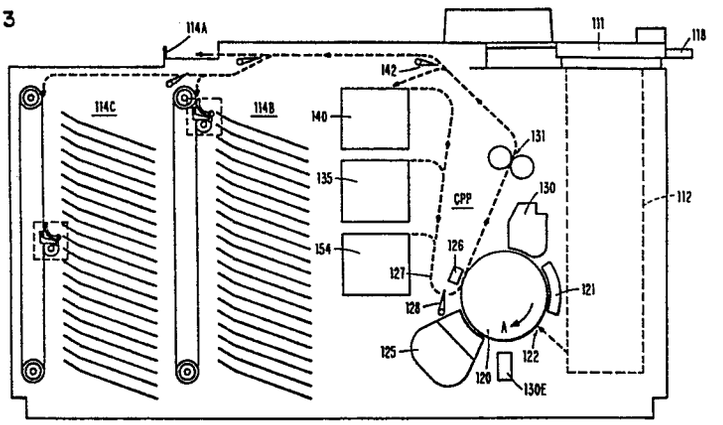
FIG. 3


114A
111
118
142
114C
114B
140
131
135
CPP
130
112
154
126
127
121
128
A
125
122
120
130E

Automatic checkout procedure for an electrophotographic copier machine.

The invention relates to an automatic checkout procedure for an electrophotographic machine by which procedure several subsystems and features of the machine is automatically tested.

In electrophotographic machines, copies of documents or other subjects are produced by creating an image of the subject on a photoreceptive surface, developing the image and then fusing the image to copy material. In machines which utilize plain bond copy paper or other ordinary image receiving material not specially coated, the electrophotographic process is of the transfer type where a photoreceptive material is placed around a rotating drum or arranged as a belt to be driven by a system of rollers. In the typical transfer process, photoreceptive material is passed under a stationary charge generating station to place a relatively uniform electrostatic charge, to a potential which is usually several hundred volts, across the entirety of the photoreceptive surface. Next, the photoreceptor is moved to an imaging station where it receives light rays reflected from the document to be copied. Since white areas of the original document reflect large amounts of light, the photoreceptive material is discharged in white areas to relatively low levels while the dark areas continue to contain high voltage levels even after exposure. In that manner, the photoreceptive material is caused to bear a charge pattern which corresponds to the printing, shading, etc. present on the original document and is therefore, an electrostatic image of that document.

Electrophotographic machines may also be organized to provide a printing function where the image on the photoreceptive surface results from character generation rather than from an optical review of an original document. Character generation may be produced, for example, by driving a light generating source from information held in digital memory. The generating source may be a laser gun, an array of light-emitting diodes, light modulators, etc. which direct light rays to the photoreceptor and cause it to bear a charge pattern which is an image of the information used to drive the generating source.

After producing an image on the photoreceptor, the next step in the process is to move the image to a developing station where developing material called toner is placed on the image. This material may be in the form of a black powder which carries a charge opposite in polarity to the charge pattern on the photoreceptor. Because of the attraction of the oppositely charged toner, it adheres to the surface of the photoreceptor in proportions related to the shading of the original. Thus, black character printing should receive heavy toner deposits, white background areas should receive none, and gray or otherwise shaded half-tone character portions of the original should receive intermediate amounts.

The developed image is moved from the developer to a transfer station where a copy receiving material, usually paper, is juxtaposed to the developed image on the photoreceptor. A charge is placed on the back-side of the copy paper so that when the paper is stripped from the photoreceptor, the toner material is held on the paper and removed from the photoreceptor. Unfortunately, the transfer operation seldom transfers 100% of the toner from the receptor to the copy paper.

Toner remaining on the photoreceptor after transfer is called residual toner.

The remaining process steps call for permanently bonding the transferred toner material to the copy paper and cleaning the residual toner left on the photoreceptor so that it can be reused for subsequent copy production.

In the cleaning step, it is customary to pass the photoreceptor under a preclean charge generating station to neutralize the charged areas on the photoreceptor. The photoreceptor may also be moved under an erase lamp to discharge any remaining charge. In that manner, the residual toner is no longer held by electrostatic attraction to the photoreceptive surface and thus it can be more easily removed at a cleaning station.

In order to avoid overburdening the cleaning station, it is customary to remove all charge present on the photoreceptive surface outside of the image area prior to the development step. This is usually done by using an interimage erase lamp to discharge photoreceptive material between the trailing edge of one image and the leading edge of the next. Also, erase lamps are used to erase charge along the edges of the photoreceptor outside of the image area. For example, if the original document is 8.5 X 11 inches in size, and if a full sized reproduction is desired, the dimensions of the image on the photoreceptor will also be 8.5 X 11 inches. The interimage and erase lamps remove charge outside of the 8.5 X 11-inch image area.

A common variation on the above-described process used in many electrophotographic machines involves the use of specially prepared paper where the copy paper itself carries a coating of photosensitive material. By utilizing that technique, the image is electrostatically

painted directly on the copy paper. The copy paper is sent through a developer and then to a fuser for permanent bonding. Machines of this type avoid the residual toner problem and therefore there is no need for cleaning stations, erase lamps, preclean generating coronas, etc. However, the resulting copy paper with its special photosensitive coating is much more expensive than plain bond copy paper and the special coating is considered to detract from the resulting product. As a consequence, coated paper machines are usually favored only for low volume applications or where quality product is not essential.

In addition to the fundamental mechanisms used for producing a copy or print, modern electrophotographic machines have been developed with many features which are designed to ease the difficulty of using the machines. For example, semiautomatic (SADF) and automatic (ADF) document feed devices ease the entry of originals. Collators are often added to the base machine so that collated sets of copies can be automatically produced. Many machines have a duplex feature so that copies can be produced on both sides of the copy sheet. Other features add to machine versatility such as the production of copies which are a reduced or magnified version of the original document. Other features improve copy quality such as mechanisms for controlling the concentration of toner in machines which utilize a carrier/toner development mix. Many modern electrophotographic machines are controlled by microprocessors rather than by hardwired analog or digital logic. The use of microprocessors has enabled the addition of many new innovative functions at low cost such as, for example, error logs and automatic diagnostic capabilities to ease troubleshooting and improve maintenance. Microprocessor routines have also aided in the establishment of a degree of "artificial intelligence" to anticipate

the operators needs in document feed operations, collate, and other areas. Additionally, microprocessors have made economical the addition of innovative functions such as the provision of separator sheets between different sets of copies within a collator.

As may be appreciated from the above, the basic electrophotographic machine involves the interaction of several important subsystems to produce a copy sheet or print and several other subsystems which control copy quality or which provide convenience functions. As a result, the modern electrophotographic machine, whether used as a copier or as a printer, can be a very complex amalgam of subsystems and features. Any one or more of these subsystems can gradually come to operate in a degraded fashion with the result that degraded copy quality begins to become apparent. Usually, one subsystem degrades more rapidly than others with the consequence that maintenance personnel are led to the improperly functioning subsystem and after fixing that problem, move on to other machines. However, other subsystems may also be in the process of gradually degraded operation and after a period of time, maintenance personnel will be back to remedy these subsequent problems.

The invention as claimed is intended to remedy these drawbacks.

Briefly stated, the present invention is a maintenance tool carried within the control mechanism of an electrophotographic copy or print machine to eanble the machine to automatically cycle through a series of distinct jobs to conduct an automatic test of the major functional areas of itself in a sequential fashion thereby producing test sheets or copies for each distinct job which can be visually inspected to determine the proper functioning of each of the several subsystems and features tested.

In a particular implementation described herein, the automatic resting process is related to the IBM Series III Copier/Duplicator and includes a test of features such as the document feed, the collator, the alternate paper bin, the duplex, the reduction function, the separate function, and subsystems such as a shutter used for toner concentration control, the erase lamps, the magnetic brush developer voltage bias control, and the charge corona grid voltage bias control.

The advantages offered by the invention are mainly that a tool has been created through which the ordinary machine user as well as maintenance personnel can ascertain the proper functioning of each of the major functional areas of the machine by instituting a series of distinct jobs within an automatic testing operation carried out by the machine itself to produce copies, each of which show information about a specific subsystem or function. In that manner, when maintenance personnel are called to correct a malfunctioning portion of a machine, they can, once the major problem is fixed, easily check the other major functional areas of a machine in order to ascertain any developing problems.

The automatic rest procedure of this invention has another major benefit where machines are located in remote geographic areas. In this case, the invention herein described makes it possible for the ordinary machine user of a remotely located machine to cause the machine to test itself and produce test sheets or copies showing the functioning of each of the major functional areas of the machine. In that manner, the user of the machine in the remote location can send the test copies to an expert, or can telephone a distant expert, describe the results of the test and receive directions to correct the improperly working subsustems without the need for dispatching special maintenance personnel to the remote location.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself which is defined in the attached claims will best be understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, the description of which follows.

FIG. 1 is a perspective view of one model of the IBM Series III Copier/Duplicator, which machine may incorporate the inventive test procedure.

FIG. 2 is a diagrammatic view of the major functional mechanisms used in an automatic/semiautomatic document feed device for use with the machine of FIG. 1.

FIG. 3 is a view of the paper path of the machine of FIG. 1 showing two collator modules attached to the base machine.

FIG. 4 is a detailed view of the paper path within the first collator module.

FIGS. 5-24 are flowcharts showing the sequential operation of the machine in accordance with the inventive test procedure.

FIG. 5, comprising FIGS. 5A-5F is a main routine providing a check of all machine conditions necessary to initiate a test procedure and continue its operation to conclusion.

FIG. 6, comprising FIGS. 6A and 6B, is a test controller called by the main routine to sequence each of the individual subsystem or feature test procedures.

FIG. 7, comprised of FIGS. 7A and 7B, is called by the main routine to provide for initial setup conditions.

FIG. 8, comprised of FIGS. 8A-8C, is called by the test controller and shows the automatic test procedure for ascertaining proper operation of the collator modules, including the collation of a duplex copy. The document feed device must also function properly for this test.

FIG. 9, comprised of FIGS. 9A and 9B, is called by the test controller and shows the test procedure for the duplex, reduction and separate functions with feeding from both paper bins.

FIG. 10 is called by the test controller and continues to test the reduction, separate, and paper feeding functions.

FIG. 11, comprised of FIGS. 11A and 11B, is called by the test controller and ascertains proper operation of the quality control patch shutter.

FIG. 12, comprised of FIGS. 12A and 12B, is called by the test controller to ascertain proper operation of the erase lamp subsystem.

FIG. 13 is called by the test controller to ascertain proper operation of the magnetic brush developer bias voltage control subsystem.

FIG. 14, comprised of FIGS. 14A and 14B, is called by the test controller to ascertain proper operation of the charge corona grid voltage subsystem.

FIG. 15, comprised of FIGS. 15A and 15B, is an exit routine called by either the main routine or the test controller to provide a check of machine conditions preparatory to exiting the automatic test procedure.

FIG. 16 is a procedure entered when the automatic test is halted due to a paper path or machine condition.

FIG. 17 is a procedure for testing all control panel indicators.

FIG. 18 is a routine for ascertaining the automatic feeding of a second document during the automatic test procedure.

FIG. 19 is a routine called to skip the collator test if the particular machine under test does not include a collator module.

FIG. 20 is a setup routine for the collator test procedure.

FIG. 21 is called by the exit routine and is a procedure for returning the machine to user-ready condition upon completion of the test procedure.

FIG. 22 is a routine for aborting the test procedure if machine conditions are not correct.

FIG. 23 is a special routine for creating a stripe on each of selected test copies produced during the test procedure.

FIG. 24 is a procedure for zeroing the error log.

Related Documents

This invention is to be described in the context of the IBM Series III Copier/Duplicator. For a complete description of the features and subsystems of this copier, reference should be made to Service Manual, P/N 1677450, or to P/N 1674073; for a description of the optical system including the mechanisms for moving into various reduction settings, reference may be made to U.S. Patent No. 3,897,148; a description of the collator module is contained in U.S. Patent No. 4,216,955; the duplex function is described in U.S. Patent No. 4,113,245; the separate function is described in U.S. Patent No. 4,285,591; U.S. Patent No. 4,183,657 and IBM Techncial Disclosure Bulletin, Oct. 1978, pages 1786-1787 describe the mechanisms, including the shutter, relating to toner concentration control; U.S. Patent No. 4,312,589 describes the charge corona and the application of various voltage levels thereon; IBM Technical Disclosure Bulletin, June 1981, pages 816-818, describes the copier control feature (CCF) which pertains to automatic billing; and U.S. Patent No. 4,170,414 describes the microprocessor used in the machine.

Detailed Description

FIG. 1 shows a perspective view of the IBM Series III Copier/Duplicator. Control tower 10 contains a set of keys or buttons 11 which may be selected by an operator to instruct the machine to perform various functions. For example, this set of keys contains a push button for a first reduction mode, another for a second reduction mode, one for the duplex operation, one for collate, another for separate, buttons for a light copy or dark copy mode, and others. The number of copies to be made is selected by the operator from the push buttons 12 with the number selected appearing in numeric display

13. Control tower 10 also contains a start button 14 and a stop reset button 15. Messages to instruct the operator to take corrective action appear in the area 16.

FIG. 1 also shows a tray 17 for the automatic document feed. A stack of original sheets may be fed one at a time automatically from this tray to the document processing station. Tray 18 is provided to accept sheets from the hand of the operator one at a time for semiautomatically feeding sheets to the processing station. After processing, the original documents are exited into an area 19 and the finished copy sheet is exited into a tray 20. FIG. 1 does not show a collator module with the machine.

FIG. 2 is a diagrammatic front view of the automatic document feed/semiautomatic document feed (ADF/SADF) used with the Series III Copier/Duplicator. To use the ADF, a stack of original documents is placed on the ADF tray 17 and pushed forwardly under a sheet feeding means 21 to a gate 22. When positioned, and when the ADF start button is pushed, gate 22 drops out of the way and original documents are fed one at a time by the paper feeding wheel 21 into nip rollers 24 and 25. When the leading edge of the first document is sensed by photosensor 23, the feed wheel 21 is lifted from the top surface of the first sheet and nip rollers 24 and 25 are halted. When the copying machine is ready to receive the first sheet, rollers 24 and 25 are reenergized to feed the first sheet through turnaround guides 26 and 27 to aligning rolls 28 and 29, pinch rolls 30 and 31A, and onto document glass 34. The original document is moved across document glass 34 under the influence of rollers 31, 32, and 33 which bear against the top of the document as it moves across the glass to its registration position at exit gate 38 where it is held

stationary during the copying operation. During the copying operation, feed wheel 21 is lowered onto the stack of documents for feeding the second sheet from the top of that stack through nip rollers 24 and 25 until the leading edge reaches photosensor 26. At that time, feed wheel 21 is lifted from the top of the stack and nip rollers 24 and 25 are deenergized. The second sheet remains in that staged position until completion of the copying of the first sheet. When the copy operation is completed, exit gate 38 drops and the first sheet is exited past photosensor 35 into the exit area 19. At this time, nip rollers 24 and 25 are reenergized and the second sheet is fed to the processing position on document glass 34.

When it is desired to utilize the semiautomatic document feed, the operator places a document onto tray 18 and inserts that document into the vicinity of photosensor 36 which energizes alignment rolls 28 and 29. The alignment rolls take the paper from the operator's hand and move it to entry gate 37. When the machine is ready to receive the document, entry gate 37 is dropped and the paper is fed to document glass 34 by the aligner rolls, by pinch rolls 30 and 31A, and across the document glass by rollers 31, 32, and 33 to the registration position at exit gate 38, where the document is held stationary during the copying operation. At the conclusion of the copying operation, exit gate 38 drops and the document exits past the exit sensor 35 into the exit area 19.

FIG. 3 is a drawing taken from U.S. Patent No. 4,170,414, referenced above, which shows the copy paper path (CPP) of the Series III Copier/Duplicator. Note that in this figure, two collator modules 114B and 114C have been attached to the basic operating unit. In this machine, a drum 120 rotates in a direction A past a corona

generator 121 which places a relatively uniform charge across the photoreceptive surface of the drum. Rotation of the drum brings the charged photoreceptive surface past an imaging station 122 where the image of the original document is placed on the photoreceptive surface. Erase lamps 130E erase the charged area of the photoreceptor outside of the defined image area. The image is developed by developer 125 and transferred to a sheet of copy receiving material under the influence of transfer corona 126. The photoreceptive surface continues to rotate to cleaning station 130 where the photoreceptor is cleaned and prepared for the next copying operation.

In order to produce an image at imaging station 122, an original document is placed at a processing station 111 either manually, by an automatic document feed, or by a semiautomatic document feed as described above. The image of the original document is taken by scanning the original document through an optics module 112 which is fully described in U.S. Patent No. 3,897,148 named above.

Copy receiving material is located in bins 135 and 154 and is fed from either one of those bins into the copy paper path 127 to gate 128. At the proper time in the operating cycle, gate 128 releases the copy sheet so that it can be moved through transfer station 126 to receive an image from the rotating drum 120. The copy paper continues through fusing rolls 131 to the exit tray 114A or into one of the two collator modules 114B or 114C. Should the duplexing function be selected, the copy sheet will be diverted by gate 142 into duplex bin 140 from which it is fed back into the copy paper path to receive the image of an original on the opposite side of the sheet.

FIG. 4 is a drawing taken from U.S. Patent No. 4,216,955 to explain the functioning of the collator. A paper entering the collator along the path 127 is directed along path 216, over closed gate 217, through throat 227, along the belt 228, and into the traveling distributor or vane 230 which sends the paper into the selected collator bin. When collating duplexed documents, gate 217 is open and the entering paper sheet is redirected into the inverter 224 before being fed through the throat 227 into the collator bins.

One of the notable features of the IBM Series III Copier/Duplicator is the separate function described in U.S. Patent No. 4,285,591. This function may be used if successive jobs are to be run on the machine using the collator or the exit pocket but it is desired to avoid removing the jobs until all of them are finished. Thus, for example, a first job, utilizing 8-1/2 X 11 inch copy paper is run placing sheets in the first five bins of the collator shown in FIG. 4 and then, at the end of that job, a separate sheet, that is, a sheet from the alternate paper bin, is fed into each one of the five bins. Since sheets from the alternate paper bin may be, for example, a legal size sheet, 8-1/2 X 14 inches, this "separate" sheet would clearly set apart the first job from the second collate job. It should be noted that the separate sheet may be run at the close of the first job in which case it is called a trailing separate sheet or at the beginning of the second job, at which time it is called a leading separate sheet. Whether a leading or a trailing separate sheet is run depends upon the time at which the operator pushes the separate button. If the button is pushed during running of the first job, a trailing separate sheet is provided. If the separate button is selected with the setup of the second job, a leading separate sheet is provided.

Most copy machines, including the IBM Series III Copier/ Duplicator, contain a control for producing a lighter than normal copy for use where the original document contains a high background or a darker than normal copy for use where the original is unusually light. In the IBM Series III, this control is affected by altering the bias voltage applied to the magnetic brush developer. This technique is well known in the art and will be described here only very briefly. Suppose for example, that after exposure, the discharged areas of the photoconductor are at a voltage level of approximately 150 volts while the black areas of the original are imaged on the photoconductor with a voltage of approximately 800 volts. In this instance, by using a magnetic brush bias level of approximately 300 volts, a voltage difference (800 - 300) of 500 volts is available for creating the electrostatic field which aids in the deposition of toner on the undischarged areas of the photoconductor. This voltage may be termed the black vector. However, in the discharged areas, a voltage difference (150 - 300) of -150 volts appears thus creating an electrostatic field in the opposite direction designed to prevent the deposition of toner in the discharged areas. This voltage may be termed a white vector. It is easy to appreciate that by altering the magnetic brush bias level from 300 volts to 400 volts, the white vector producing diminished background is increased while the black vector is decreased. In that manner, the copy will be lighter than it would at the normal setting. Conversely, by reducing the magnetic brush bias level from 300 volts to 250 volts, the resulting copy would be darker than normal. Thus, on the IBM Series III, the "lighter copy" button causes an increase from normal in magnetic brush bias voltage while the "darker copy" button causes a decrease.

Another feature selectable by the operator is the reduction feature which, in the case of the Series III Copier/Duplicator, has a first setting of approximately 75% reduction and a second setting of approximately 65% reduction.

Some Series III machines contain an automatic billing feature which involves keying a user code into the machine through buttons 12, FIG. 1. Until a recognizable user code is keyed into the machine, the copier will not operate. When it does operate, a count of the copies made is accumulated for that particular user code. This feature, called the copier control feature (CCF), is described in the IBM Technical Disclosure Bulletin mentioned above.

It may also be observed that all copier machines provide a timing control so that various sequential operations occur in a correct order and all operations are sequenced with respect to drum or scan or document position. In the Series III Copier/Duplicator, timing signals are derived with reference to drum position and synchronized therewith. For example, start of scan occurs at a unique timing cycle, the shutter for forming a test patch is moved into position at a unique timing cycle, erase lamps are turned on and off at unique cycles, etc. These unique timing points at which a special machine event occurs may be termed machine timing events (MTE) or simply event counts (EC).

The invention to be described herein automatically cycles through a series of distinct jobs to automatically perform a checkout of all of the operator selected functions mentioned above and the subsystems involved in accomplishing those functions; that is, the document feed, the collator, the alternate paper bin, the separate function, the duplex function, the light, normal and

dark copy, and the reduction function. In addition to these operator selected operations, the automatic checkout procedure also automatically cycles through another series of distinct jobs to exercise certain other subsystems of the machine which operate without selection by the machine operator. These are the shutters used in the toner concentration control subsystem, the erase lamp subsystem, and the charge corona subsystem. The inventive procedure cycles through both of these sets of jobs, when initiated, without intervention by the machine user.

In a copier which utilizes the triboelectric effect, a carrier material and a toner material are mixed together so that the toner material receives a charge opposite in polarity to that which is present on the photoconductor. In that manner, charged toner is attracted to undischarged areas of the photoconductor so that the image is developed. In so doing, toner is used up within the carrier/toner mixture and periodically the toner must be replaced in order to keep the carrier/toner mixture to a value which keeps the development of the images relatively consistent with time. In the Series III Copier/Duplicator, a technique is used whereby a patch of charge is produced on an otherwise completely discharged photoconductor. The patch is then developed and a reflectivity sensing measurement is taken to determine whether the concentration of toner was proper. A system for accomplishing this toner concentration control technique is fully described in U.S. Patent No. 4,183,657. See also IBM Technical Disclosure Bulletin, Oct. 1978, for a description of the shutter blade which is used in generating the test patch.

For many years, copier machines have customarily included erase lamps to erase the charge in all areas of the photoconductor outside of the image area. To accomplish

that, an interimage erase lamp is placed across the entire width of the photoconductor in order to erase that area of the photoconductor between the trailing edge of one image and the leading edge of the next. In addition, edge erase lamps are located to erase charge along left and right sides of the image area. Frequently edge erase lamps are segmented so that image areas corresponding to different width or different length originals can be tailored to size. The Series III Copier/Duplicator contains such a segmented array of erase lamps.

It has been found helpful to copy quality to increase the charge corona voltage in the Series III Copier/ Duplicator for a period of time after turning on the machine when the machine has been off for a significant period of time. By increasing the charge corona voltage level, copy quality during this first period of use is made consistent with later periods of use. This phenomenon is probably due to a bleeding away of charge from the toner during a long period of inactivity and the gradual replenishment of that charge after the machine is turned on. In order to compensate for that condition, an increased charge corona voltage level is used. For our purposes, that can simply be understood as a change in the voltage provided by the charge corona power supply and all details of the operation are disclosed in U.S. Patent No. 4,312,589.

The Procedure

A. In General

In order to provide an automated test procedure to verify that the major functional areas of a copier, described above, are working properly, a procedure will now be described which provides a detailed

description of the method. Since the method can be used by ordinary machine users as well as by skilled maintenance personnel, a particular entering technique is used which does not require special knowledge or access to the interior of the machine to place the machine in the automatic checkout mode. The entry technique calls for the user to open any copier or collator door and then depress the dark copy, light copy, and separate feature push buttons simultaneously. This causes an "888" to appear in the numeric display and also causes all of the various control panel messages to appear. In that manner, all of the control panel lights can be visually inspected to make sure that all of the messages are properly operating.

Once the "888" has appeared in the numeric display, the procedure provides an option of completely zeroing the machine error log. To zero the entire log, a "0" must be entered into the numeric display and the start button pushed. If this is not done, only the last failure code will be zeroed when the start button is pushed. Zeroing the error log is used to highlight any occurrences of "soft" failures during the automatic checkout run. A "soft" failure is an error that increments the error log but does not cause the copier to shut down; for example, if a copy sheet fails to feed out of the paper bin, a retry is executed and a hard failure, i.e., a machine shutdown, occurs only if the retry is unsuccessful. By zeroing the error log and viewing the incidence of "soft" failures during the checkout procedure, maintenance personnel can spot developing problems and take corrective action prior to the time when the machine operator would experience a high incidence of hard failures.

When the start button is pushed, the automatic test procedure turns off all the control panel lights, zeros the last failure code, zeros the error log if it has been requested, and automatically sets up the first job for the first functional test. The maintenance personnel must then close the open copier or collator door and enter two master documents into either the ADF or the SADF and upon feeding of the first master, the automatic test procedure begins to operate and continues without further operator assistance throughout all of the separate jobs required to perform the variety of tests included in the procedure.

The first test to be performed is a test of the collator and in doing so a "3" or "6" is automatically entered into the numeric display, a "3" if the machine has one collator module and a "6" if the machine has two modules. The collate feature button is automatically selected and the test begins. If no collators are attached to the particular machine under test, then the test procedure will automatically sequence to the next functional test.

To begin the test, the host machine will index the first original onto the document glass and run three copies for the first collator module. The test procedure will then cause a skip to the second collator module and three more copies are made and sent to that module. In that manner, the traveling distributor or vane 230, FIG. 4, is caused to index downwardly in each of the collator modules depositing one copy in each of the first three bins thereof. Next, the first master is indexed off of the document glass and the second

is indexed on. Three more copies are made and sent to the second collator module so that the traveling distributor or vane mechanism 230 indexes upwardly from bin 3 to bin 1. In that manner, proper indexing of the vane in both down and up directions is tested. Three more copies are made to test the upward indexing of the vane in module one.

When this portion of the test is complete, the test procedure automatically moves on to a second job wherein there is an automatic selection of the duplex feature and a "1" is entered into the numeric display to indicate the number of copies to be made. A duplex "side one" copy is run and then flushed from the duplex tray into the first collator module. In that manner, a check is performed on the collator inverter gate 217, FIG. 4.

When this collator test is complete, each of the collator traveling distributors or "vanes" should be in the home position and all copies in the collator bins should be facing in the same direction. Through visual inspection, the maintenance personnel or machine user can determine that the collator has operated properly.

Upon completion of the collator test, the test procedure automatically moves on to still another job wherein there is entered a "1" into the numeric display and the duplex feature, the alternate paper bin, the separate feature, and the reduce "1" feature are automatically selected. Of course, reduce 1 is selected only when the copier is a reduction machine.

During this test, the procedure runs a job with a leading separate sheet fed from the alternate paper bin followed by one duplex copy fed from the alternate paper bin. In the test, the separate sheet fed from the paper bin is placed into the exit pocket of the copier and the duplex sheet fed from the alternate paper bin receives an image of the original and is deposited in the duplex bin. That sheet is then fed out of the duplex bin to receive a side two copy from the same master. The copy is then fed into the exit pocket of the copier where it is deposited over the separate sheet.

With the duplex feature still active, the test procedure then automatically moves on to still another job wherein the reduce "2" feature is selected, the alternate paper bin is deselected, and the separate feature turns off in a normal manner without special intervention by the test procedure. One duplex copy is then run from the primary paper bin with a side two again made from the same master. During the process of the run, the "separate" feature is automatically reselected causing the feeding of a trailing separate sheet from the alternate paper bin upon the conclusion of creating the duplex copy. Both the duplex copy and the trailing separate sheet are fed into the exit pocket of the copier with the separate sheet deposited over the duplex copy.

To this point, the test procedure has involved the proper operation of either the automatic document feed or the semiautomatic document feed in order to move the original masters onto and off the document glass and has checked out the operation of the collator, the primary paper bin feed, the alternate paper bin feed, the duplex paper bin

feed, the operation of all components associated with the paper path and image formation, the duplex feature, the separate feature including both leading and trailing separate sheets, and both reduction mode features.

The next test to be performed involves running a job with one copy from the primary paper bin to check the operation of the toner concentration control shutter mechanism. This check is performed by activating the shutter through a portion of the image area of the copy being made. This causes the copy to exit with a black patch located thereon if the shutter is operating properly. By visual inspection of the copy, proper operation is determined.

The next job checks the erase lamps by automatically entering a "1" into the numeric display and by automatically selecting light copy and alternate paper feature buttons. When the run automatically begins, the document lamp is turned off in order to image an all black copy. However, the interimage erase lamp is turned on together with the edge erase lamps so that a white leading edge is produced on the copy sheet. At that point, the interimage lamp is turned off and the edge erase lamps are sequenced off to produce a stair-step image on the output copy. In performing this test, paper is picked out of the alternate paper bin since the alternate paper bin ordinarily contains legal size paper. If legal size paper is not in the alternate paper bin, instructions for use of the procedure call for placing such sheets in the bin prior to beginning the automated test procedure.

In order to check the proper operation of the light, normal and dark copy features, the next

test is automatically entered by placing a "2" into the numeric display and running two copies each with the light, normal and dark magnetic brush bias levels selected. Visual inspection of these copies will determine that these features operated properly.

The last procedure to be performed involves a test of the charge corona grid levels. In this instance, the procedure automatically enters a "2" into the numeric display and then runs two copies each at the three grid levels which are used in the operation of the Series III Copier/Duplicator. Visual inspection of the resulting copies will show that the grid level did change appropriately during the test procedure.

While performing the above tests, the test procedure automatically calls for a blinking of the interimage erase lamp so that a white erase stripe appears across test copies. This occurs on all test copies with the exception of those made during the shutter and edge erase lamp functional tests. In that manner, the operation of the interimage erase lamp is checked and in addition, the test copies are all identified.

B. In Detail

FIGS. 5 through 24 show a detailed flowchart of the microcode used to perform the procedure on the Series III Copier/Duplicator. In some cases, the procedure incorporates steps that are particular to the Series III Copier/Duplicator machine and to the particular processor used therein and therefore involves steps not of general interest or pertinent to the inventive test procedure. Most of those

peculiarities of the particular implementation have been restated in the flowcharted procedure in generalized form so that the inventive procedure can be described in a clear and concise manner.

The main routine is shown in FIG. 5, comprised of FIGS. 5A through 5F and is basically a housekeeping and setup routine to make sure that everything is in proper order for the automatic checkout procedure to be run. In describing the procedure in this specification, it will be assumed that the inquiries of FIG. 5 result in finding everything in order so that the procedure runs without unnecessary branches. It should be noted that the procedure of FIGS. 5A-5F is periodically checked by the machine processor to determine whether or not the test procedure is to be run, or if running, what is the next step. In following the flowcharted procedure, FIGS. 5-24, reference can be made to the Tables below for an explanation of the acronyms used.

TABLE I

FLAG BITS FOR AUTOMATIC CHECKOUT PROCEDURE

ACA	Automatic Checkout Abort
ACEOR	Automatic Checkout End of Run
ACEORA	Automatic Checkout End of Run Allowed
ACMOS	Automatic Checkout Mode Only Selected
ACR	Automatic Checkout Running
ACRS	Automatic Checkout Run Started
ACSBS	Automatic Checkout Start Button Selected
ACT1	Automatic Checkout Test 1
ACT2	Automatic Checkout Test 2
ACT3	Automatic Checkout Test 3
ACT4	Automatic Checkout Test 4

ACT5	Automatic Checkout Test 5
ACT6	Automatic Checkout Test 6
ACT7	Automatic Checkout Test 7
ACTC	Automatic Checkout Tests Completed
CEOR	Copier End of Run
CSR	Copier Start Request
DCC	Duplex Copy Complete
DFC	Duplex Flush Complete
DFEI	Document Feeder Entry Inhibit
DFM	Duplex Flush Mode
DS1S	Duplex Side 1 Started
EOT1	End of Test 1
EOT2	End of Test 2
EOT3	End of Test 3
EOT4	End of Test 4
EOT5	End of Test 5
EOFGT	End of First Grid Test
EOSGT	End of Second Grid Test
FDFE	First Document Feed Exit
IIPB3	Inhibit Indexing Past Bin 3
LSHR	Leading Separator Has Run
MTE	Machine Timing Event
SBI	Start Button Integration
SCT	Skip Collator Test
TAIOFF	Turn All Indicators Off
TAION	Turn All Indicators On
TSHR	Trailing Separator Has Run

TABLE II

SUBROUTINES USED IN AUTOMATIC CHECKOUT PROCEDURE

AUTMODES	Automatic Checkout Test Mode Procedure
AUTO 1	Automatic Test Procedure 1
AUTO 2	Automatic Test Procedure 2
AUTO 3	Automatic Test Procedure 3

AUTO 4	Automatic Test Procedure 4
AUTO 5	Automatic Test Procedure 5
AUTO 6	Automatic Test Procedure 6
AUTO 7	Automatic Test Procedure 7
AUTOEND	Automatic Checkout Exit Procedure
BCDRST	Zero Error Log Procedure
CESTPIND	Control Panel Lights Procedure
DISPYCTC	Numeric Display Symbol Procedure
EXIT 1	First Document Feed Start Procedure
FEATSLCT	Feature Selection Procedure
FETSLTCO	Collator Feature Selection Procedure
RSTAUTCK	Return Machine to User Ready Procedure
SETABORT	Automatic Checkout Abort Procedure
STRIPE	Erase Stripe Procedure
STRTSLCT	Start Button Selection Procedure

Entry by the processor is at block 300 on FIG. 5A and a consideration is made in step 301 whether the document feed lid is open. Assuming the document feed lid is closed, a query in step 302 determines whether the lamp test is on or off and whether any error messages are present in addition to those error messages which are expected, i.e., door open and low paper. If the answer is negative, a query is made as to whether the stop button is active at step 303. If it is not, then the "automatic checkout abort" flag is checked at step 304. If the abort flag is off, the procedure follows to FIG. 5C where at step 305 the processor checks to see if the "automatic checkout mode only selected" flag is active. At this time, the flag is inactive causing a branch to step 322 for a check of the "automatic checkout running" flag. This flag is also off at this point causing a branch to step 3220 for a query as to whether the automatic checkout mode entry procedure has been performed, i.e., has a door been opened and have the three

buttons been pushed simultaneously as explained above. Each time the processor enters the procedure at 300, the routine will continue to loop to step 3220 until the query is answered affirmatively. Step 3221 is then performed to ascertain whether any copies are present in the duplex tray -- if so, they must be flushed before the procedure can continue. Next, a query is made at step 3222 to ascertain whether the "copier end of job" flag is active. If it is off, the automatic checkout mode cannot be run and normally, an off flag here indicates that an automatic job recovery procedure has been instituted. To remedy this condition, the operator must push the "Stop/Reset" button which resets all flags in the machine. To perform the automatic test procedure, the operator must once again open the door and press the required buttons.

Assuming that all conditions are in readiness, the query at step 3222 is answered affirmatively, all of the control panel lights are turned on at step 3223, and an "888" appears on the numeric display at step 3224. The latter step also inhibits the timeout of information keyed into the control panel and activates the "automatic checkout mode only selected" flag.

Return is now made to step 300 and eventually to step 305 where this time the query causes a branch to step 306 for an activation of the copier control feature since, in a machine with this feature, copies cannot be run unless a recognizable code number is keyed into the machine. Step 306 performs an effective sign-on.

Next, at step 307, FIG. 5E, the query is whether the lamp test mode is active. If the operation is proceeding smoothly, the lamp test mode testing all error messages on the display port will be active and a new copy selection will be available to the machine operator at step 308. This enables the operator to enter a "0" and zero the error log, if desired.

At step 309, the processor query of the "start button integration" flag will show it to be inactive and cause a branch to step 310 where a query of the "automatic checkout start button selected" flag will receive a negative answer causing a branch to step 311 where an open copier door causes the routine to continue to loop back to this step until the operator presses the "start" button. When that happens, a branch is made at step 309 to the "Start Button Selection Procedure" at step 3091.

On FIGS. 7A and 7B, the Start Button Selection Procedure is shown and provides for a zeroing of the error log if the operator has so selected. This subroutine also turns off the control panel lights and determines whether there is no collator module, one collator module, or two collator modules attached to the machine under test. If there is no collator, the "first test end" flag is set causing the collator test to be skipped; if one collator module is attached, a copy select value of "3" is entered and if two collator modules are attached, a copy select value of "6" is entered. If there is no collator module, the "Feature Selection Procedure" of FIG. 19 is called at step 312 and with reference to FIG. 19, the copier is then automatically set up to perform a duplex function test, skipping the collator test.

Assuming that the machine has one or two collator modules attached, the "Collator Feature Selection Procedure" is called at step 313 or step 314. This subroutine is shown in FIG. 20 and involves automatically selecting the collate feature and loading into the numeric display the proper number of copies to be made.

Following this setup, return is made to the main routine where, at step 309, the query is now negative since the "start button integration" flag has now been reset at step 3090. At step 310, the query as to the "start button selected" flag will now be answered in the affirmative since that flag was set active during the Start Button Select Subroutine, FIG. 7A. At step 316, usage data collection will be inhibited since the operation of the automatic checkout procedure should not cause any usage data collection for which the user of the machine may be billed. In this manner, the checkout procedure is run without cost to the owner or user of the machine.

At step 317, FIG. 5F, a query is placed as to the positioning of the lens for the reduction feature. Assuming that the lens is in proper position and at step 318, that all copier doors are now closed, step 319 determines whether the copier run mode is active. Copier run mode will only become active after the operator has initiated a document feed. At that time, the host machine will have begun to enter the first document onto the document glass and this query will be affirmative causing a branch to step 320. At step 320, it is determined that there is a collator module present on the machine and therefore the "skip collator test" flag is off. At step 321 the "automatic checkout

running" flag is activated, the "run started" flag is activated, and the "test one" flag (collator test) is activated. Also, the "automatic checkout mode only selected" flag is reset and the "automatic checkout start button selected" flag is reset. Return is made through step 300 to step 305 where the "automatic checkout mode only selected" flag has now been reset and the branch is taken to step 322 where the "automatic checkout running" flag is active causing a branch to step 323 on FIG. 5D. At this point, it is determined that all copier doors have now been closed, that no reduction failure has occurred and the copier "end-of-run" flag is inactive causing a branch to step 324 for an activation of the "automatic checkout end-of-run allowed" flag.

All of the setup procedure has now been completed so that at step 325, the "Automatic Mode Test" is called. This test begins on FIG. 6A and at step 326, the toner patch sampling procedure is inhibited, billing meter counts are inhibited, and usage data collection is inhibited. The processor then queries the "automatic checkout test completed" flag at step 327 and finds it off, causing a branch to step 328 to check the "automatic checkout test 7" flag which will be found inactive. Similarly, steps 329 through 331 will find other test flags inactive causing a branch to step 332 on FIG. 6B which calls the "Stripe Procedure" shown in FIG. 23.

At step 333, FIG. 23, it will be found that the duplex flush and separate jobs are not in progress and the original is being scanned, causing a branch into the stripe procedure for turning on the interimage erase lamp if the image area is at

a certain position and turned off when the image area has advanced a brief distance. The result of this subroutine is to blink the interimage erase lamp during the passage of the image area so that a white stripe appears across the middle of each of the copies made during the collate test procedure.

After completing the stripe subroutine, the processor returns to FIG. 6B for a test of the "automatic checkout test 3" flag, the "test 2" flag, and the "automatic checkout running" flag at steps 336 through 338. At this point in the procedure, the processor will find the "automatic checkout running" flag is active at step 338 causing a branch to step 339 where the "First Automatic Test Procedure" is called.

FIG. 8A provides a description of the First Automatic Test Procedure with the first query at step 340 a determination that test 1 has not yet been completed, causing a branch to step 341 where it is determined that the copier run mode is active causing a further branch to step 342 for a query of whether the duplex feature is active. At this point in test 1 it is not active and a branch is made to step 343 in order to determine when the second master has been fed to the document glass at step 3430, FIG. 20. At this time the answer is no since the machine is in the process of producing copies from the first document. Therefore return is made to step 343 for entry into step 345, FIG. 8C. The procedure shown in FIG. 8C will query the vane position counters during the production of the first three copies which are fed into the first three bins of the first collator module. The query is made in order to switch over to the second module after delivery is made to bin 3. In

that manner, the collator test is compressed since ordinary operation calls for filling all 20 bins of the first module before the first bin of the second module is used. A complete description of the code necessary to perform this compression function is shown in the following Table.

TABLE III

Auto 1
Block No.

	Begin Segment B1 (Auto 1 Procedure)
345	IF a second collator module is attached to the machine
	THEN
3451	IF the collator traveling distributor position counter is equal to 2 and a copy has just left the vane switch of the traveling distributor located in the first collator module
	THEN
3452	Inhibit the traveling distributor from moving beyond collator bin #3 located in the first collator module.
	ELSE
3453	IF the collator traveling distributor position counter is equal to 3
	THEN
3454	change the traveling distributor position counter to 19. This causes subsequent collator copies to be directed to the second collator module.
	ELSE

3455 IF copies are being directed
to the second collator module
and the traveling distributor
position counter is equal to 20

THEN

3456 change the traveling distributor
position counter to 21. This
synchronizes the position counter
to bin #1 of the second collator

module.

ENDIF

ENDIF

ENDIF

ENDIF

After the three copies for bins 1-3 of the second collator module have been produced by the host machine, the first master is exited from the document glass and the second master is indexed onto the glass. Now when step 3430, FIG. 18, is executed, the query is answered in the affirmative causing the "first document feeder exit" flag to be activated at step 344. Return is made to step 345, FIG. 8C, and eventually back to step 341 where the query concerning copier run mode is answered in the negative. This occurs after the host machine has completed the production of copies for indexing the vanes of each module back to the home position. At this time, bins 1-3 of each module contain two copies each.

When step 341 is answered in the negative, a branch is taken to step 346 on FIG. 8B where the "first document feeder exit" flag is now found to

be set active causing a branch to step 348. Initially, the duplex feature is off at step 348 causing a branch to step 349 where the duplex feature is selected, a "1" is loaded into the number of copies desired display and the "copier start request" flag is activated so that the second job can now be started in order to complete the first test, i.e., the collator test. Return is made through step 300 to step 342 where the query concerning selection of the duplex feature is now answered in the affirmative setting the "duplex side 1 started" flag. Eventually, the duplex side 1 copy is made and deposited in the duplex tray. After this happens, the query at step 341 concerning copier run mode is answered in the negative causing a branch to step 348, to step 350, and to step 351 where the "duplex flush mode" flag and the "end of test 1" flag are activated.

After return to step 340 through step 300, a branch is now taken to step 352, to step 353, and into a loop until the flush operation producing a side 2 on the duplex copy is complete. When that happens, a branch is taken at step 352 to step 354 and onto step 355 for calling the "Feature Selection Procedure", FIG. 19. This subroutine de-selects the collate feature and sets up the machine for running the next job which begins the second test, which is for duplex, separate, alternate paper bins, and reduction. Next, at step 356, the "automatic checkout test 2" flag is activated and return is made through step 300 to the Automatic Mode Procedure at step 337, FIG. 6B.

In processing the Automatic Mode Procedure, a branch will be made at step 337 to call in the "Second Automatic Test Procedure" at step 357.

This subroutine is shown in FIGS. 9A and 9B to run in duplex mode with a leading separate sheet from the primary paper bin. Upon conclusion of this test, return is made to the Automatic Mode Procedure where a branch is made at step 336 to call for the "Third Automatic Test Procedure" shown in FIG. 10. Operation of this subroutine checks the proper operation of a trailing separate sheet which is fed from the alternate paper bin. A return is made to the Automatic Mode Procedure and on this trip through the procedure a branch is made at step 331 to call in the "Fourth Automatic Test Procedure" shown in FIGS. 11A and 11B. This test will activate the shutter mechanism to produce a patch on the middle of a copy sheet thus checking the proper operation of the shutter. After completion of the test, return is made to step 330 for a branch into the "Fifth Automatic Test Procedure" in FIG. 12A. In this test, the document lamp is turned off and all of the edge erase lamps are turned on and then sequenced off in order to produce a copy which shows the proper operation of the edge erase lamps. At the conclusion of test number five, return is made to the Automatic Mode Procedure where a branch is made at step 329 to call in the "Sixth Automatic Test Procedure" shown in FIG. 13. In this test, the lighter copy, normal copy and darker copy features are sequentially selected and copies are produced for each selection before branch is made back to the Automatic Mode Procedure in FIG. 6A. This time a branch is taken at step 328 for calling in the "Seventh Automatic Test Procedure". A branch is made to FIG. 14A where various grid voltage levels associated with the charge corona grid are set and copies produced at each grid voltage level. At the conclusion of this test, the "automatic checkout test completed"

flag is activated, creating a branch at step 327, FIG. 6A, to step 370 where, when all copier running is completed, a branch is taken to step 371 for calling in the "Automatic Test Exit Procedure" shown in FIG. 15A. This subroutine is another housekeeping routine which eventually returns the machine to a user ready condition by calling the subroutine shown in FIG. 21.

Thus in the manner that has been described above, various machine features are automatically selected in order to automatically cycle through a series of jobs each having different parameters, to activate various subsystems to perform the operations called for to test out the proper operation of each of these features and subsystems. Copies are produced during the course of the several jobs which comprise this procedure which when compared to that which is expected, inform the user of the procedure whether the various machine features and subsystems are operating properly. In this manner, maintenance personnel can be assured before they leave the copier, that there is nothing more that need be done and machine users can identify problems which may require calling maintenance personnel.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

Claims.

1. An automatic checkout procedure for an electrophotographic machine where said machine includes a control panel upon which keys are located for the selection of run parameters, said keys having selections including the number of copies desired, characterized by the steps of;

automatically checking for an entry code and upon finding said code, entering into an automatic checkout sequence of jobs, a portion of which includes test of features ordinarily selected by the machine operator and another portion of which includes tests of subsystems incapable of operator selection from said control panel;

automatically selecting run parameters ordinarily selected manually for each successive job; and

producing developed images on image receiving sheets.

2. The procedure of claim 1 wherein said sequence of jobs includes the selection of a collator feature and includes the selection of a collator feature and includes the step of inserting image receiving sheets into at least a portion of the collator bins.

3. The procedure of claim 2 wherein said machine contains a plurality of collator modules and includes the step of inserting image receiving sheets into at least a portion of the bins in each of the plurality of collator modules.

4. The procedure of claim 1 wherein said sequence of jobs includes the selection of a separate feature and includes the step of producing a separate sheet before or after the insertion of said image receiving sheets.

5. The procedure of claim 1 wherein said sequence of jobs includes the selection of a duplex feature and includes the selection of producing developed images on image receiving sheets with images on both sides of said sheets.

6. The procedure of claim 1 wherein said sequence of jobs includes the selection of a reduction feature and includes the step of producing reduced developed images on image receiving sheets.

7. The procedure of claim 1 wherein said sequence of jobs includes the selection of an alternate paper bin and includes the production of developed images on image receiving sheets fed from said alternate paper bin.

8. The procedure of claim 1 wherein said sequence of jobs includes the selection of light copy mode and includes the step of producing a developed image on an image receiving sheet in said light copy mode.

9. The procedure of claim 1 wehrein said sequence of jobs includes the selection of dark copy mode and includes the step of producing a developed image on an image receiving sheet in said dark copy mode.

10. The procedure of claims 2-9 wherein a stripe is placed across each image receiving sheet.

11. The procedure of claim 1 weherein said sequence of jobs includes the operation of a patch producing shutter and includes the step of producing a developed patch on an image receiving sheet.

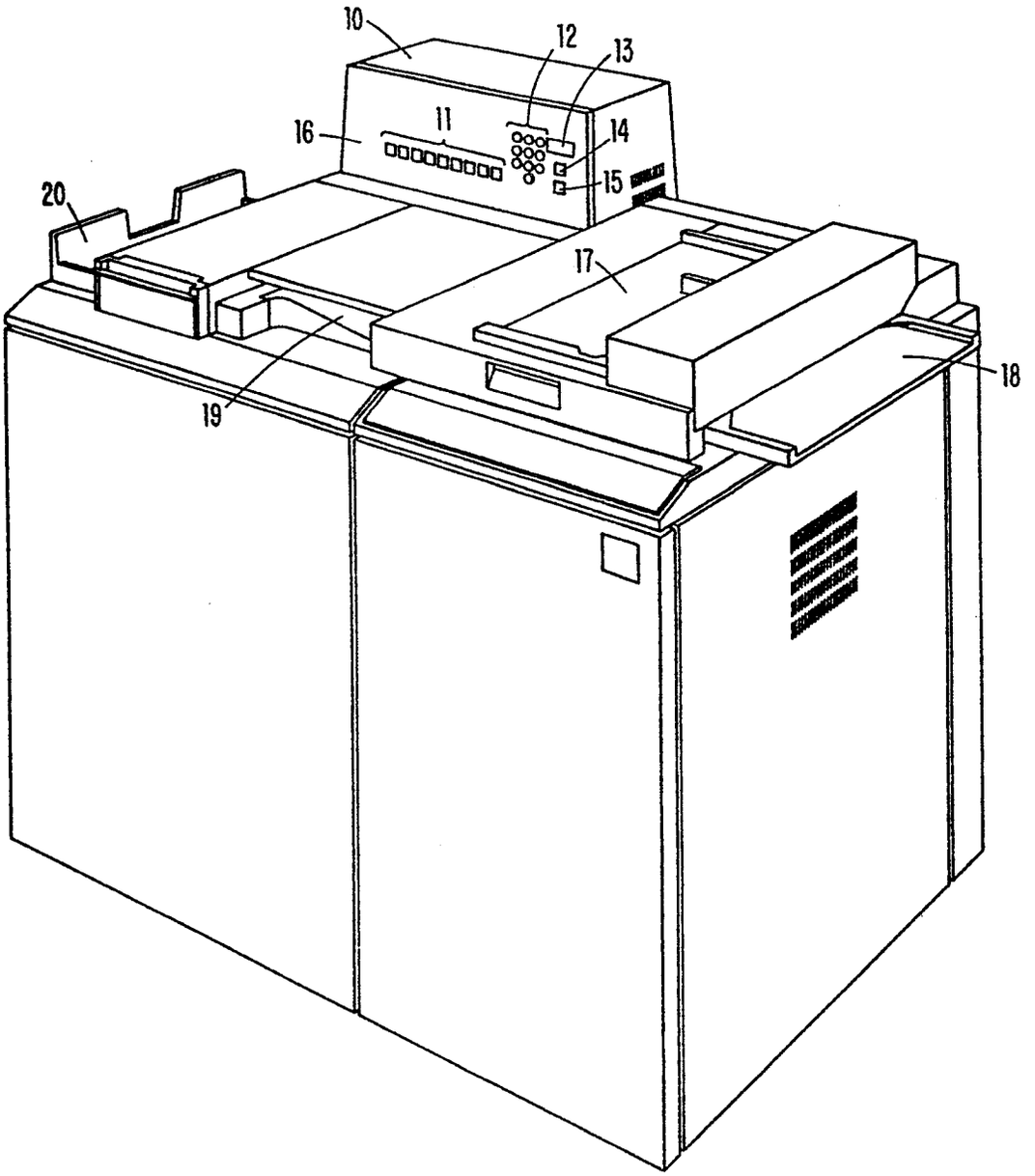
12. The procedure of claim 1 wherein said sequence of jobs includes the operation of the edge erase lamp subsystem and

includes the step of successively turning off edge erase lamps to produce a developed pattern on an image receiving sheet.

13. The procedure of claim 12 wherein said sequence of jobs includes the operation of the charge corona at various voltage levels and includes the step of producing a developed pattern on an image receiving sheet by operating said charge corona at said various voltages.

14. The procedure of claims 1-13 wherein said entry code may be entered by the ordinary machine user and does not require access to the interior of the machine.

FIG. 1



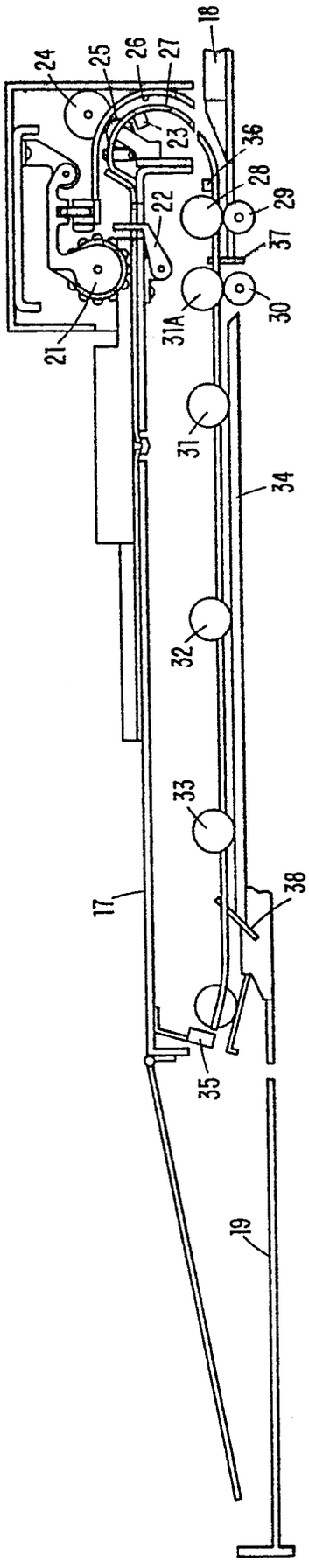


FIG. 2

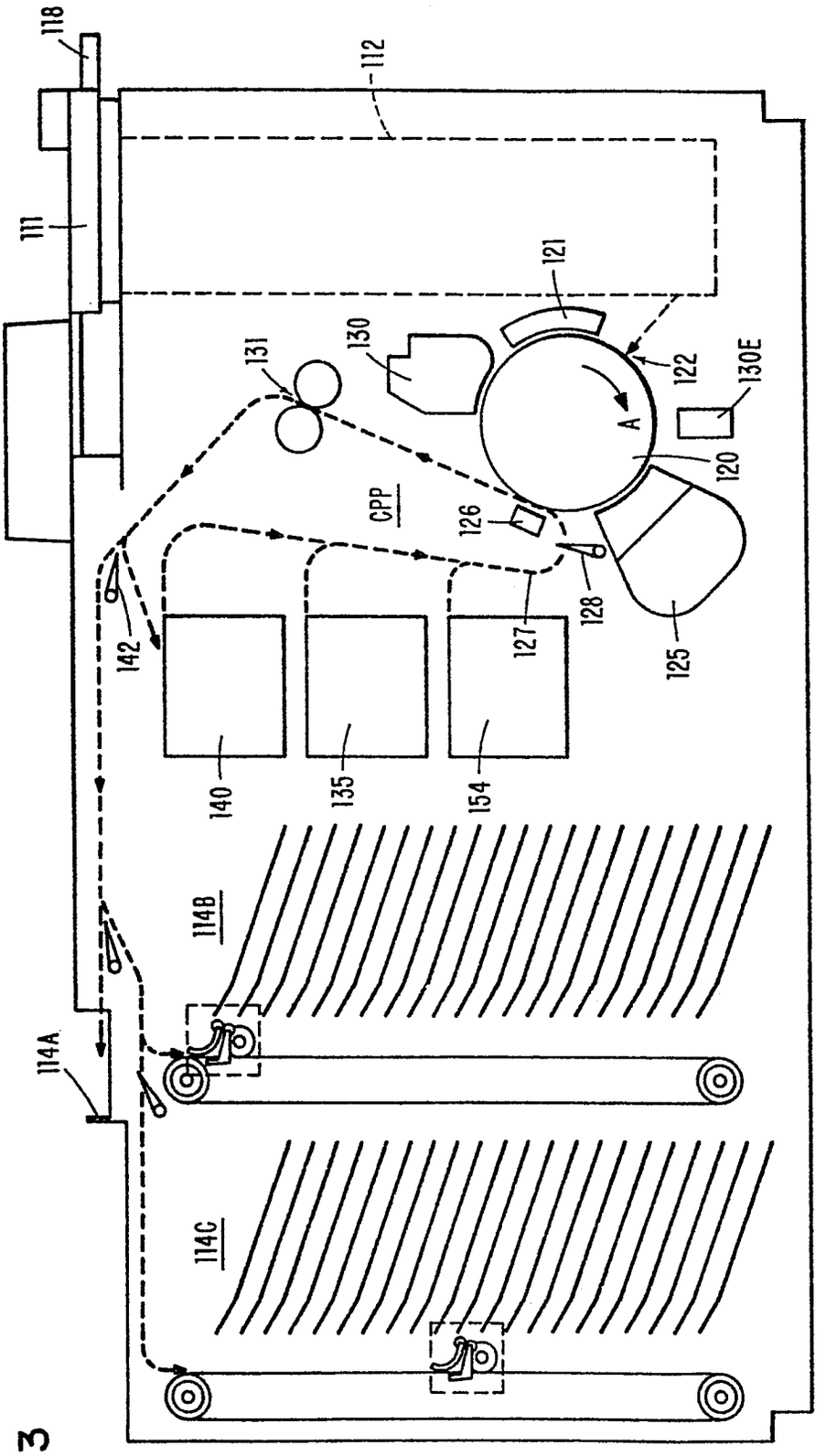

118
112
111
121
131
130
122
130E
A
120
CPP
126
128
127
125
142
140
135
154
114B
114A
114C

FIG. 3

FIG. 4

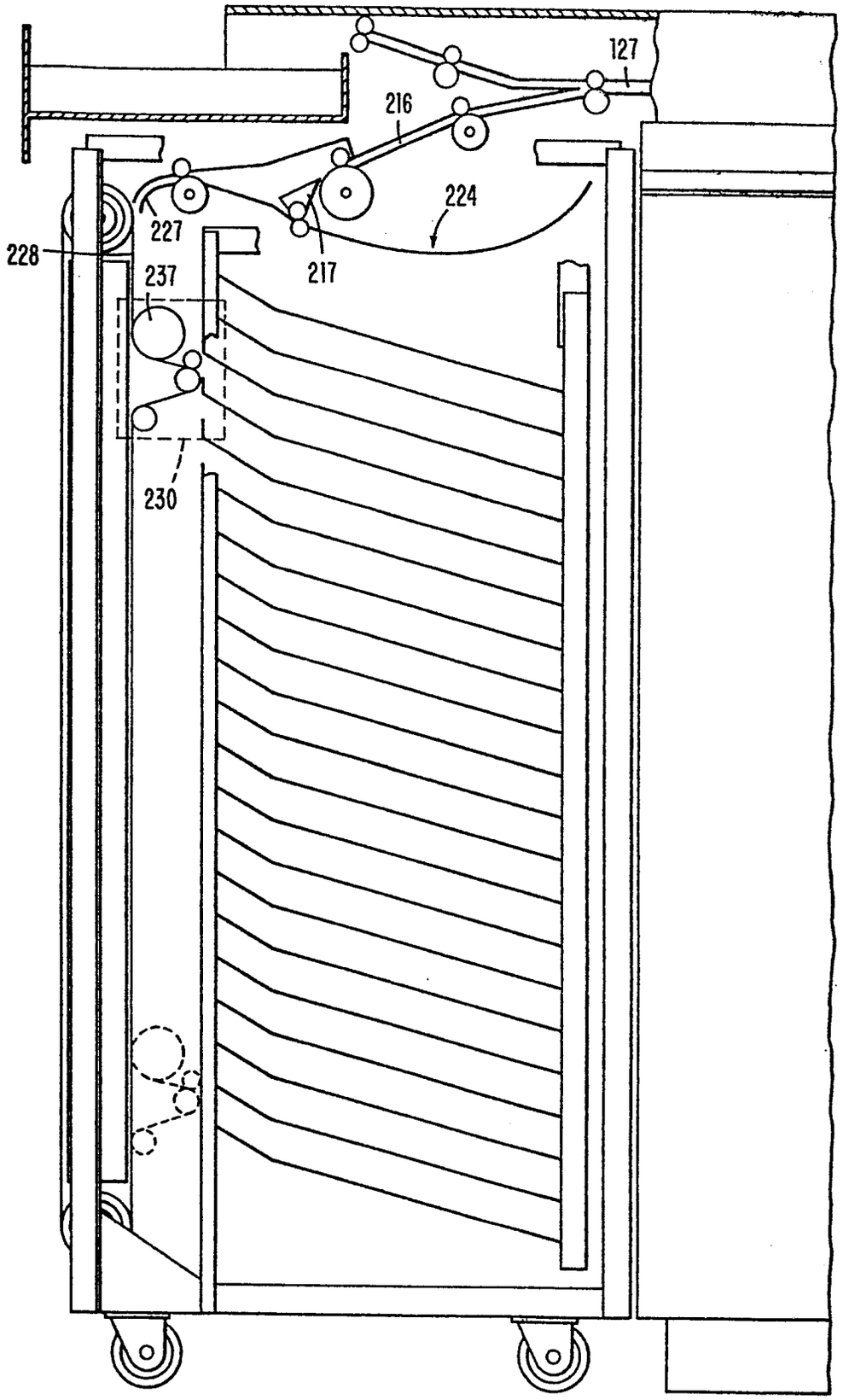


FIG. 5A

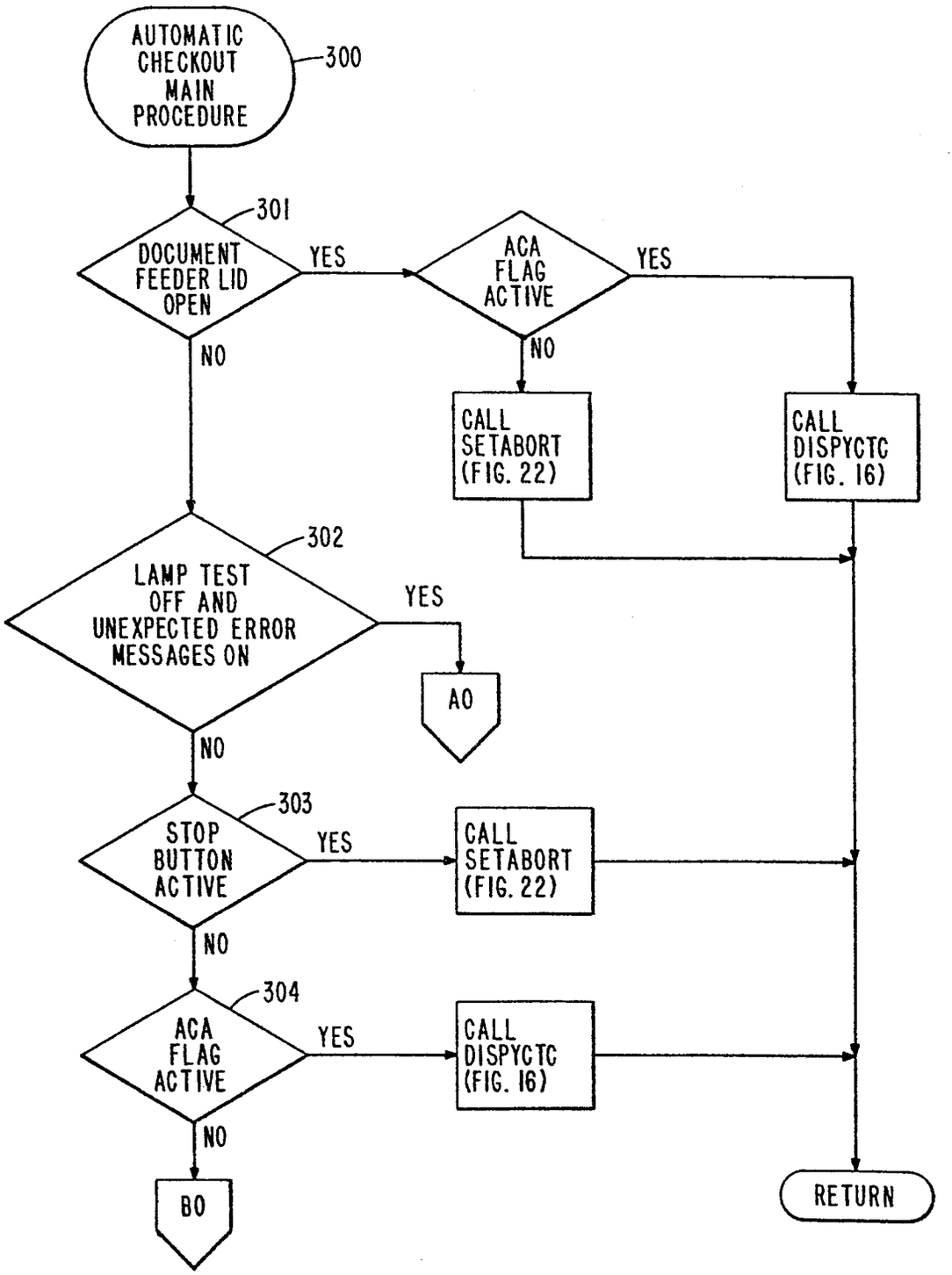

AUTOMATIC CHECKOUT MAIN PROCEDURE
300
301
DOCUMENT FEEDER LID OPEN
YES
ACA FLAG ACTIVE
YES
NO
NO
CALL SETABORT (FIG. 22)
CALL DISPYCTC (FIG. 16)
302
LAMP TEST OFF AND UNEXPECTED ERROR MESSAGES ON
YES
AO
NO
303
STOP BUTTON ACTIVE
YES
CALL SETABORT (FIG. 22)
NO
304
ACA FLAG ACTIVE
YES
CALL DISPYCTC (FIG. 16)
NO
BO
RETURN

FIG. 5B

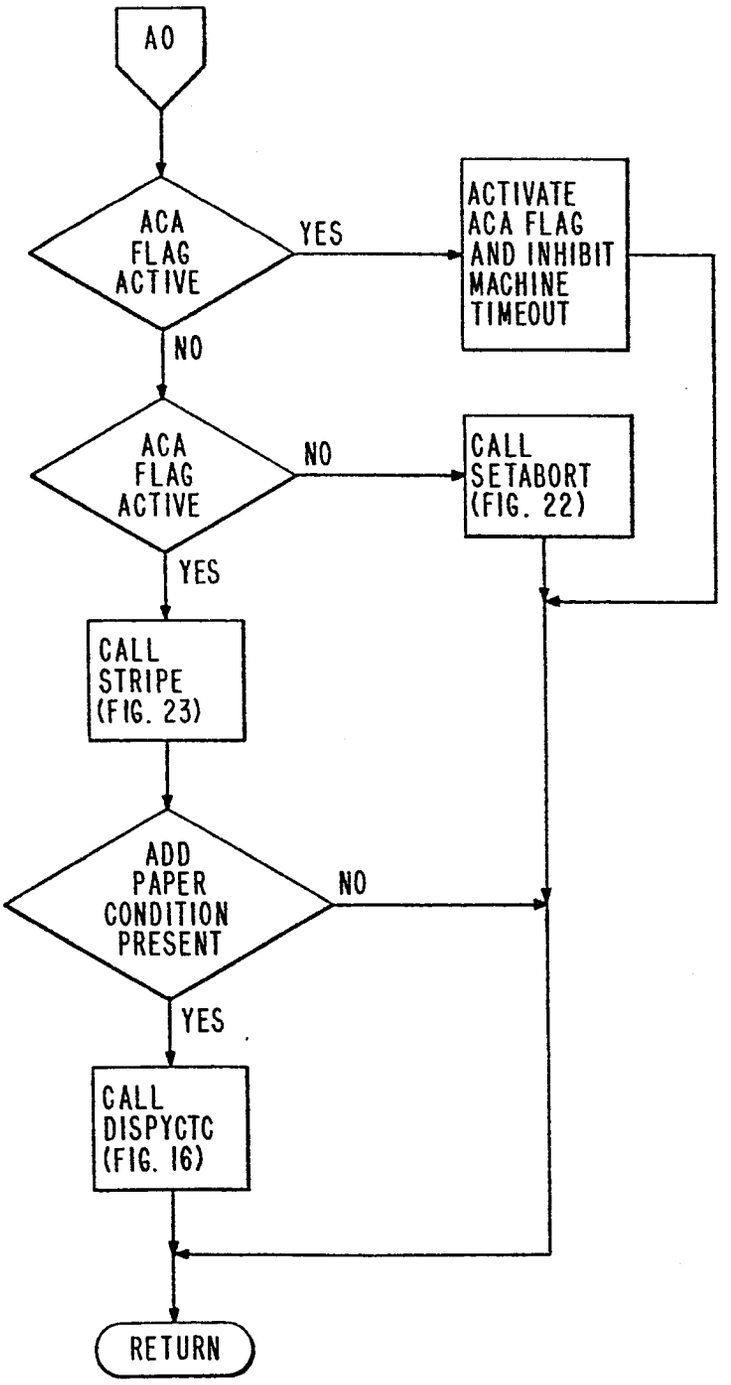

A0
ACA FLAG ACTIVE
YES
ACTIVATE ACA FLAG AND INHIBIT MACHINE TIMEOUT
NO
ACA FLAG ACTIVE
NO
CALL SETABORT (FIG. 22)
YES
CALL STRIPE (FIG. 23)
ADD PAPER CONDITION PRESENT
NO
YES
CALL DISPYCTC (FIG. 16)
RETURN

FIG. 5C

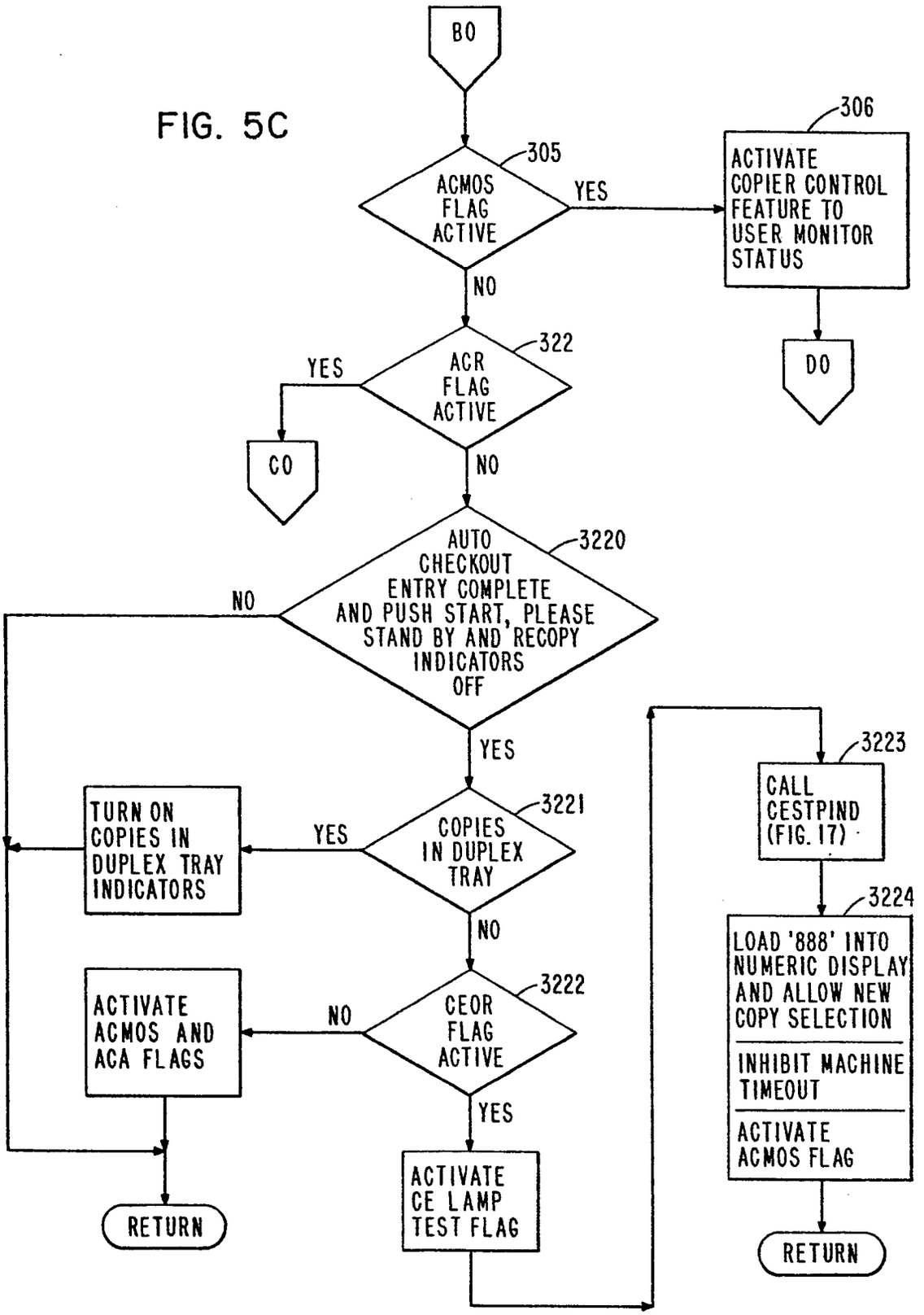

B0
305
ACMOS FLAG ACTIVE
YES
306
ACTIVATE COPIER CONTROL FEATURE TO USER MONITOR STATUS
D0
NO
322
ACR FLAG ACTIVE
YES
C0
NO
3220
AUTO CHECKOUT ENTRY COMPLETE AND PUSH START, PLEASE STAND BY AND RECOPY INDICATORS OFF
NO
YES
3221
COPIES IN DUPLEX TRAY
YES
TURN ON COPIES IN DUPLEX TRAY INDICATORS
NO
3222
CEOR FLAG ACTIVE
NO
ACTIVATE ACMOS AND ACA FLAGS
YES
ACTIVATE CE LAMP TEST FLAG
3223
CALL CESTPIND (FIG. 17)
3224
LOAD '888' INTO NUMERIC DISPLAY AND ALLOW NEW COPY SELECTION
INHIBIT MACHINE TIMEOUT
ACTIVATE ACMOS FLAG
RETURN
RETURN

FIG. 5D

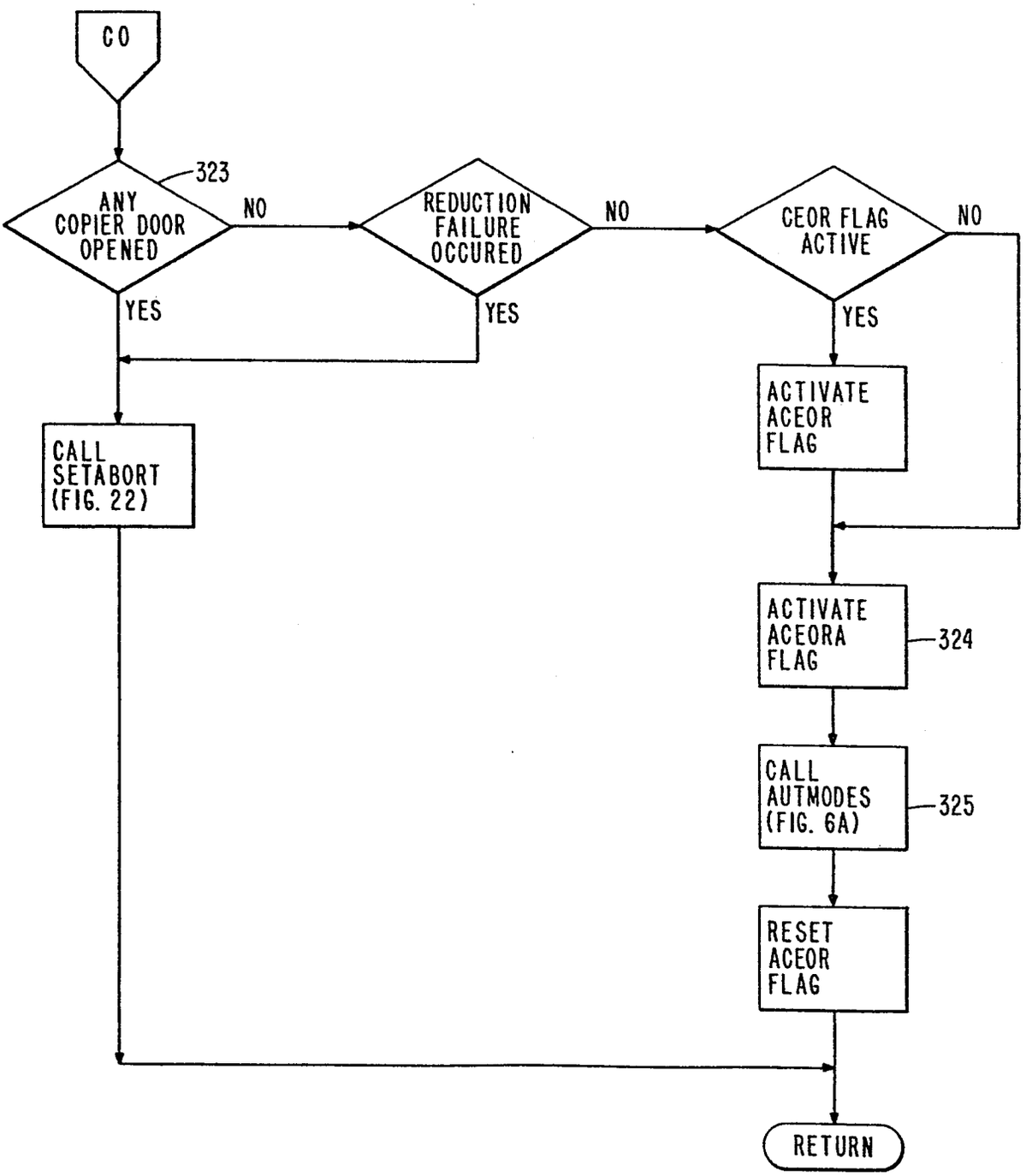

CO
323
ANY COPIER DOOR OPENED
NO
REDUCTION FAILURE OCCURED
NO
CEOR FLAG ACTIVE
NO
YES
YES
YES
CALL SETABORT (FIG. 22)
ACTIVATE ACEOR FLAG
ACTIVATE ACEORA FLAG
324
CALL AUTMODES (FIG. 6A)
325
RESET ACEOR FLAG
RETURN

FIG. 5E

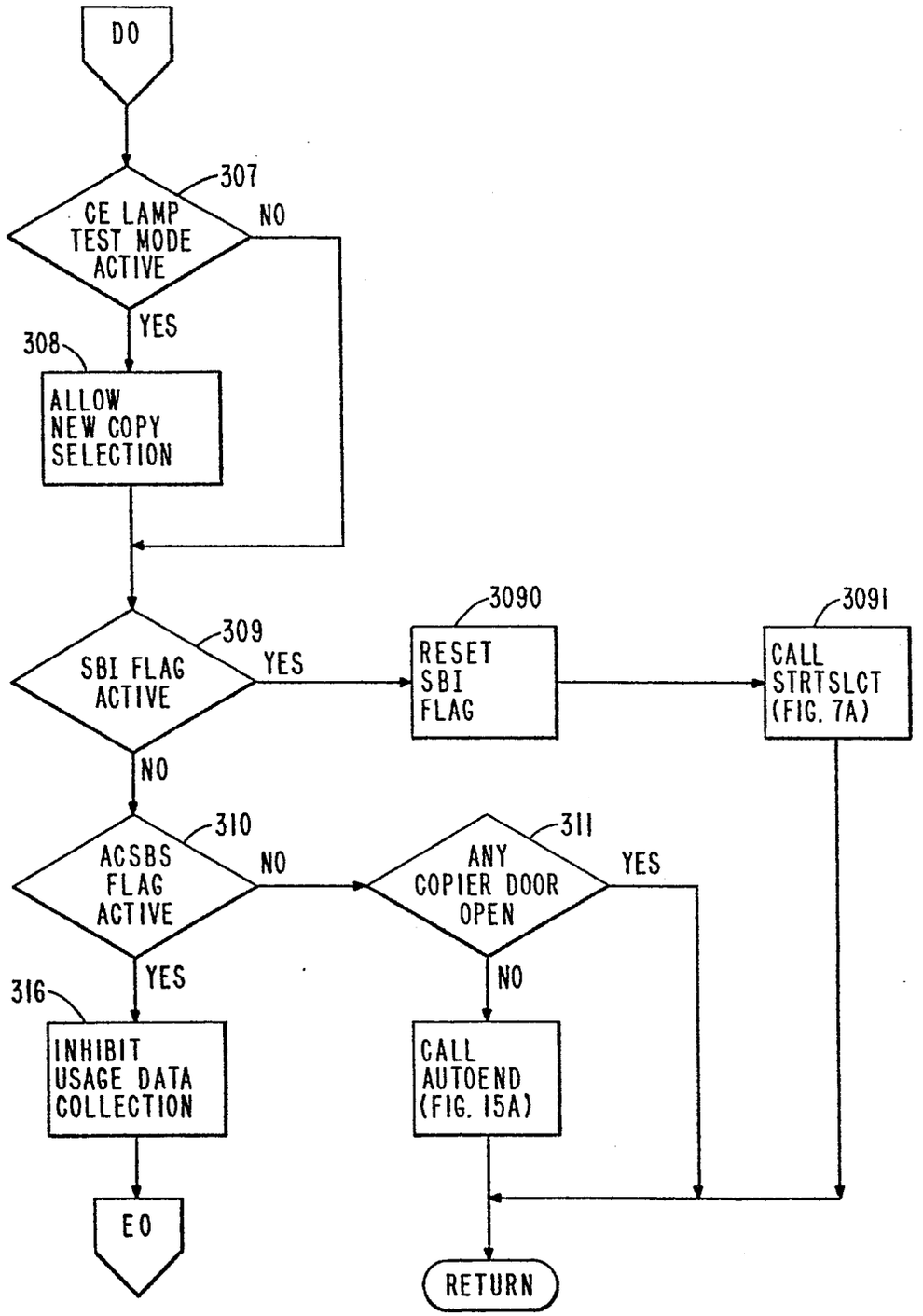

DO
307
CE LAMP TEST MODE ACTIVE
NO
YES
308
ALLOW NEW COPY SELECTION
309
SBI FLAG ACTIVE
YES
3090
RESET SBI FLAG
3091
CALL STRTSLCT (FIG. 7A)
NO
310
ACSBS FLAG ACTIVE
NO
311
ANY COPIER DOOR OPEN
YES
YES
NO
316
INHIBIT USAGE DATA COLLECTION
CALL AUTOEND (FIG. 15A)
EO
RETURN

FIG. 5F

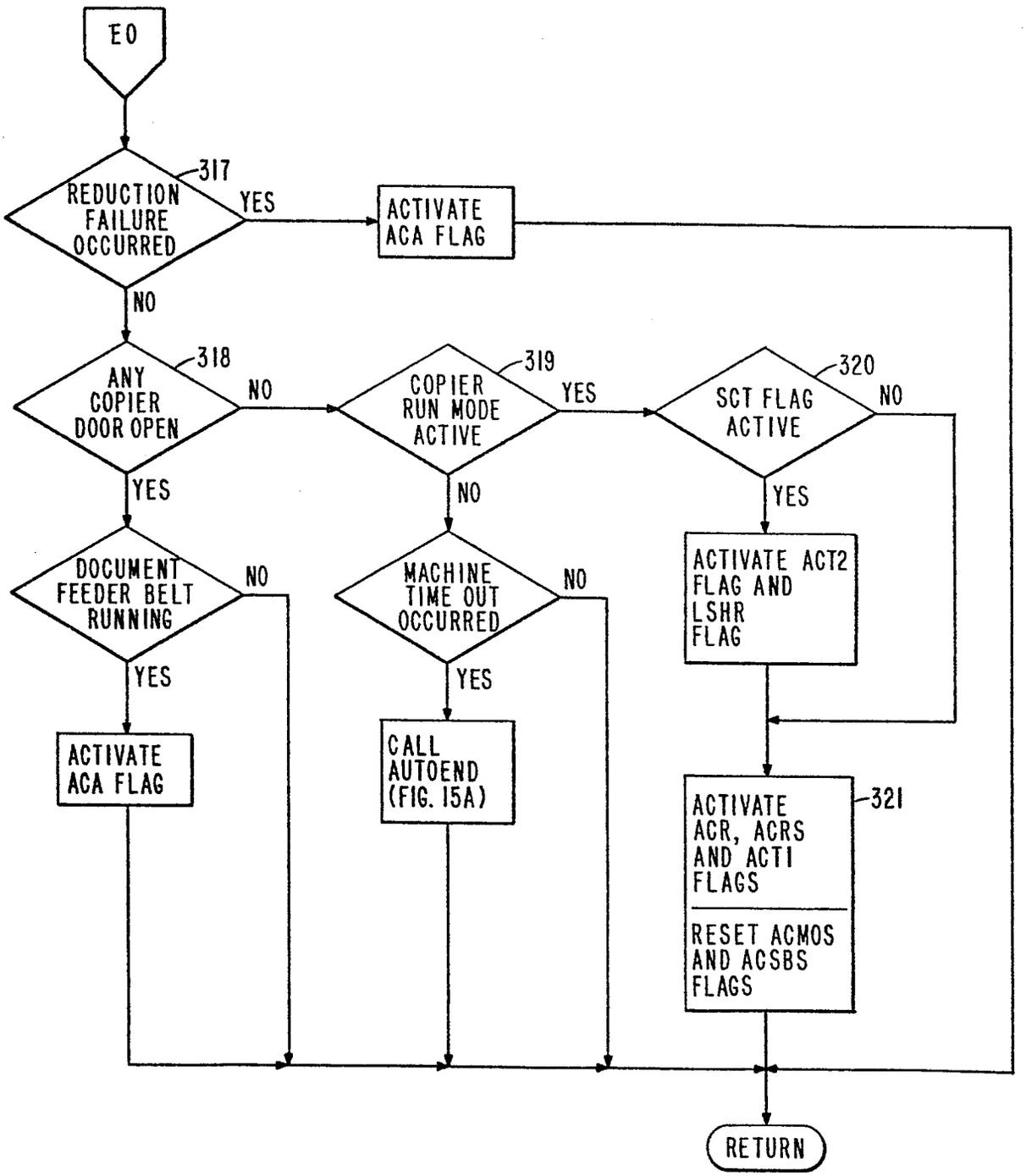

E0
317
REDUCTION FAILURE OCCURRED
YES
ACTIVATE ACA FLAG
NO
318
ANY COPIER DOOR OPEN
NO
319
COPIER RUN MODE ACTIVE
YES
320
SCT FLAG ACTIVE
NO
YES
NO
YES
DOCUMENT FEEDER BELT RUNNING
NO
MACHINE TIME OUT OCCURRED
NO
ACTIVATE ACT2 FLAG AND LSHR FLAG
YES
YES
ACTIVATE ACA FLAG
CALL AUTOEND (FIG. 15A)
321
ACTIVATE ACR, ACRS AND ACTI FLAGS
RESET ACMOS AND ACSBS FLAGS
RETURN

FIG. 6A

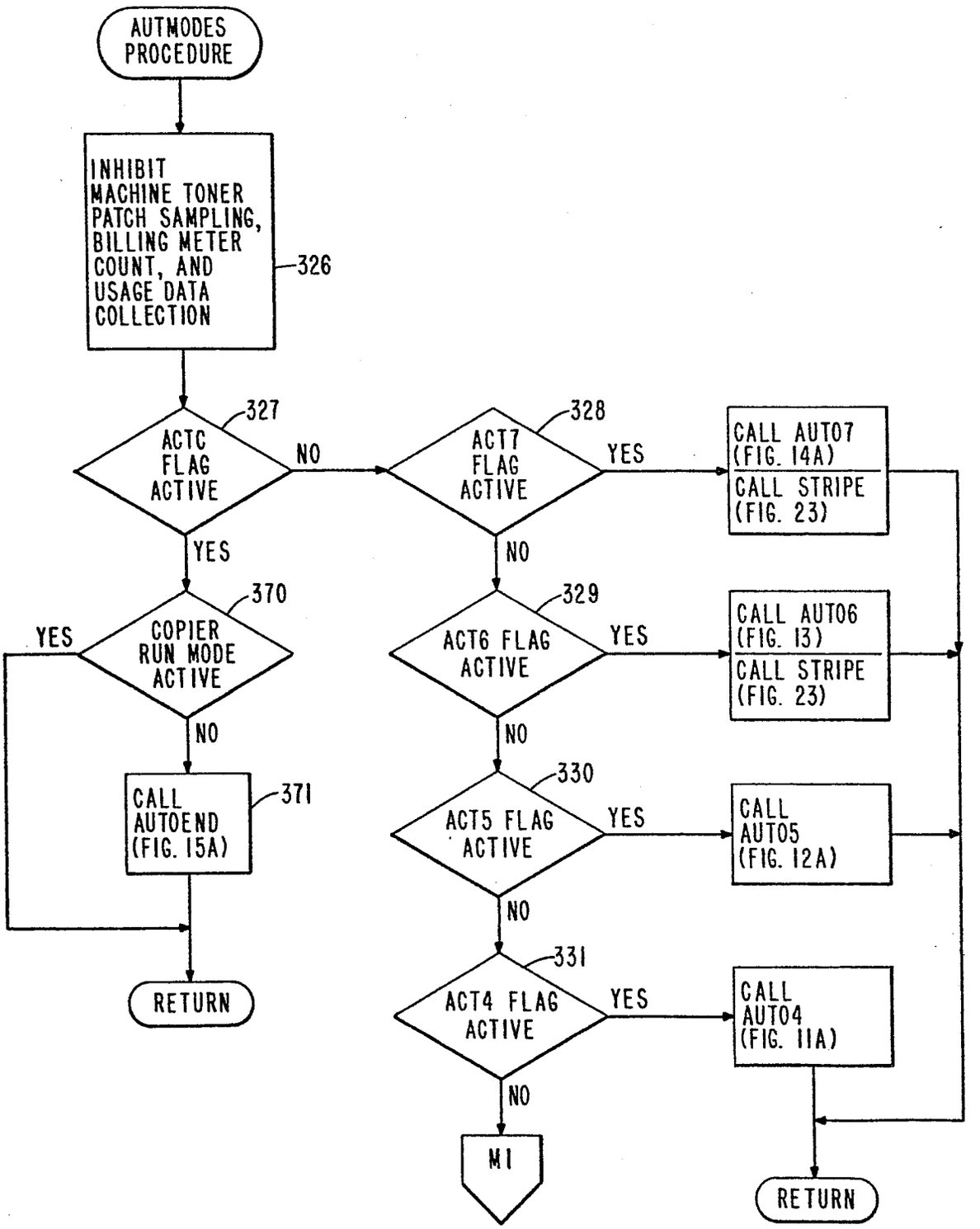

AUTMODES PROCEDURE
INHIBIT MACHINE TONER PATCH SAMPLING, BILLING METER COUNT, AND USAGE DATA COLLECTION
326
ACTC FLAG ACTIVE
327
NO
YES
ACT7 FLAG ACTIVE
328
YES
CALL AUT07 (FIG. 14A)
CALL STRIPE (FIG. 23)
NO
COPIER RUN MODE ACTIVE
370
YES
NO
ACT6 FLAG ACTIVE
329
YES
CALL AUT06 (FIG. 13)
CALL STRIPE (FIG. 23)
NO
CALL AUTOEND (FIG. 15A)
371
ACT5 FLAG ACTIVE
330
YES
CALL AUT05 (FIG. 12A)
NO
ACT4 FLAG ACTIVE
331
YES
CALL AUT04 (FIG. 11A)
NO
RETURN
M1
RETURN

FIG. 6B

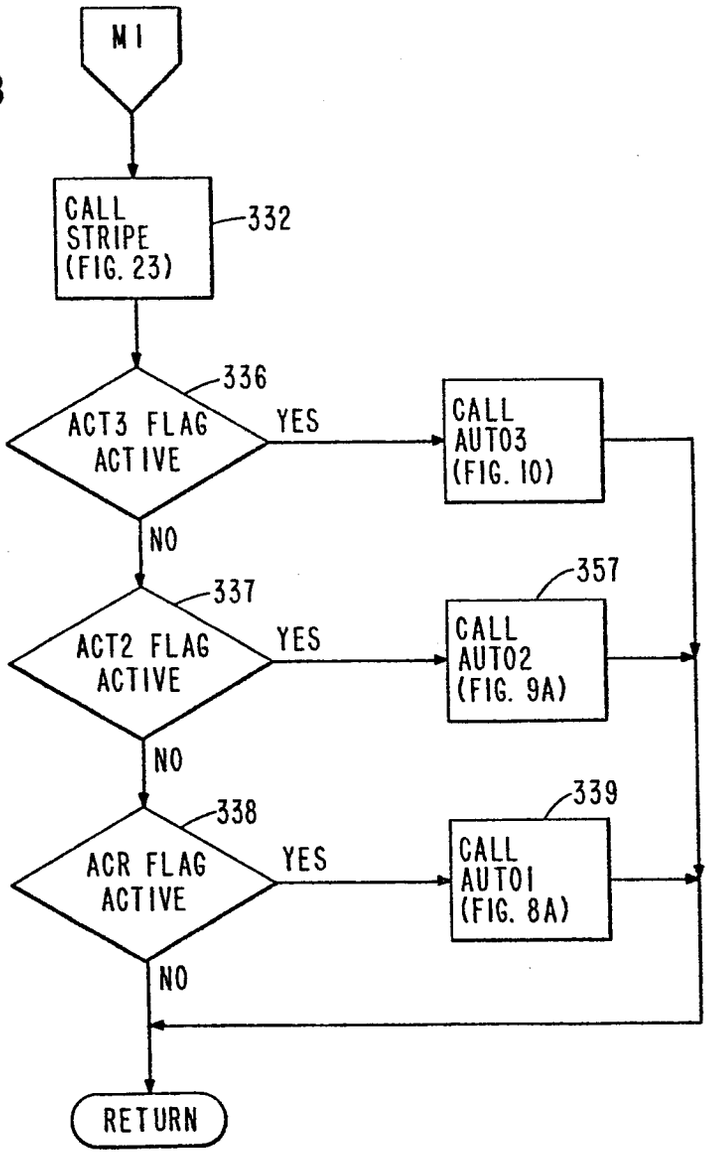

M1
CALL STRIPE (FIG. 23)
332
336
ACT3 FLAG ACTIVE
YES
CALL AUTO3 (FIG. 10)
NO
337
ACT2 FLAG ACTIVE
YES
357
CALL AUTO2 (FIG. 9A)
NO
338
ACR FLAG ACTIVE
YES
339
CALL AUTO1 (FIG. 8A)
NO
RETURN

FIG. 7A

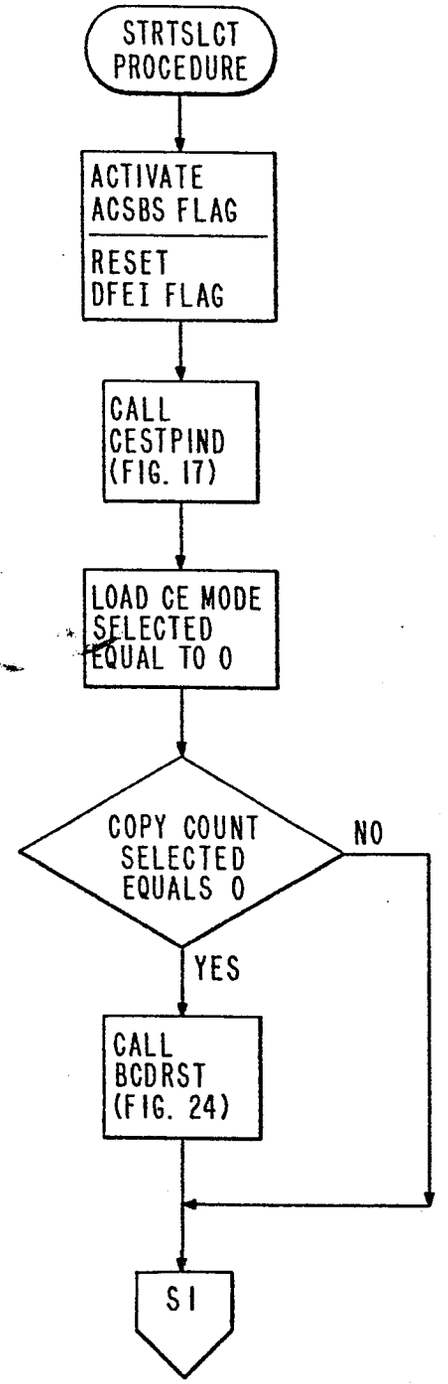

STRTSLCT PROCEDURE
ACTIVATE ACSBS FLAG
RESET DFEI FLAG
CALL CESTPIND (FIG. 17)
LOAD CE MODE SELECTED EQUAL TO 0
COPY COUNT SELECTED EQUALS 0
NO
YES
CALL BCDRST (FIG. 24)
S1

FIG. 7B

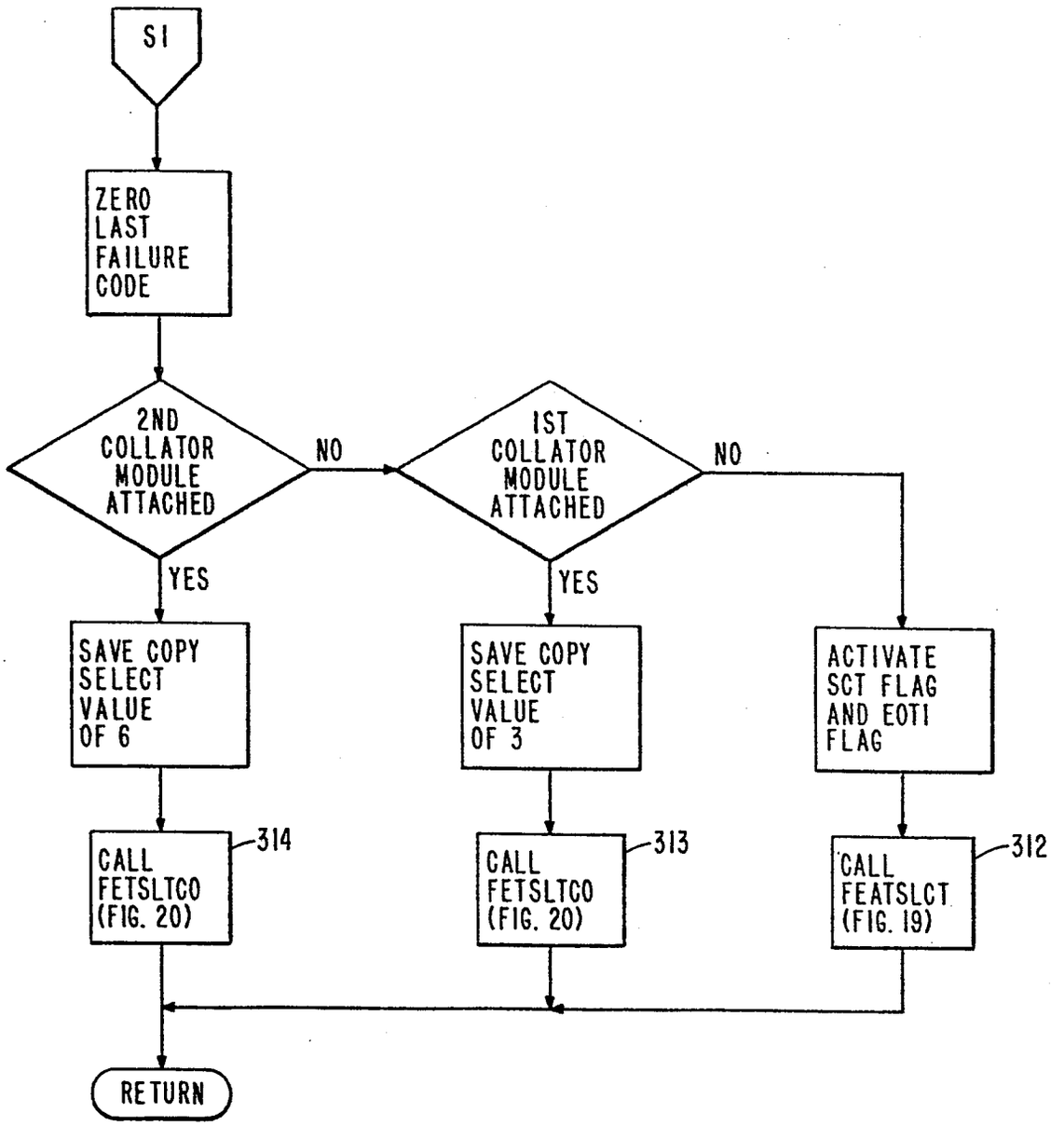

S1
ZERO LAST FAILURE CODE
2ND COLLATOR MODULE ATTACHED
NO
1ST COLLATOR MODULE ATTACHED
NO
YES
YES
SAVE COPY SELECT VALUE OF 6
SAVE COPY SELECT VALUE OF 3
ACTIVATE SCT FLAG AND EOTI FLAG
CALL FETSLTCO (FIG. 20)
314
CALL FETSLTCO (FIG. 20)
313
CALL FEATSLCT (FIG. 19)
312
RETURN

FIG. 8A

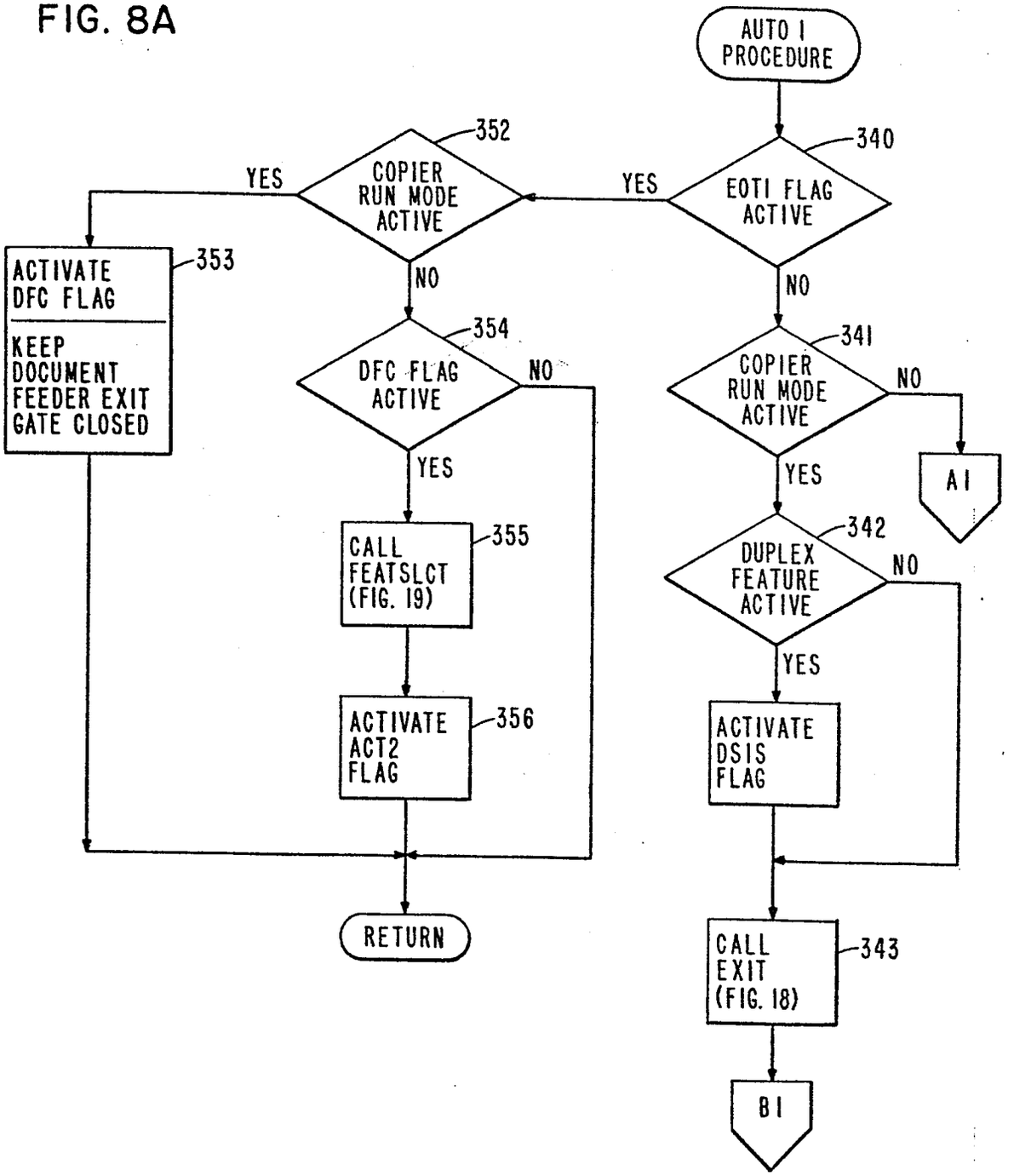

AUTO I PROCEDURE
340
EOTI FLAG ACTIVE
YES
352
COPIER RUN MODE ACTIVE
YES
NO
353
ACTIVATE DFC FLAG
KEEP DOCUMENT FEEDER EXIT GATE CLOSED
354
DFC FLAG ACTIVE
NO
YES
355
CALL FEATSLCT (FIG. 19)
356
ACTIVATE ACT2 FLAG
RETURN
NO
341
COPIER RUN MODE ACTIVE
NO
YES
A1
342
DUPLEX FEATURE ACTIVE
NO
YES
ACTIVATE DSIS FLAG
CALL EXIT (FIG. 18)
343
B1

FIG. 8B

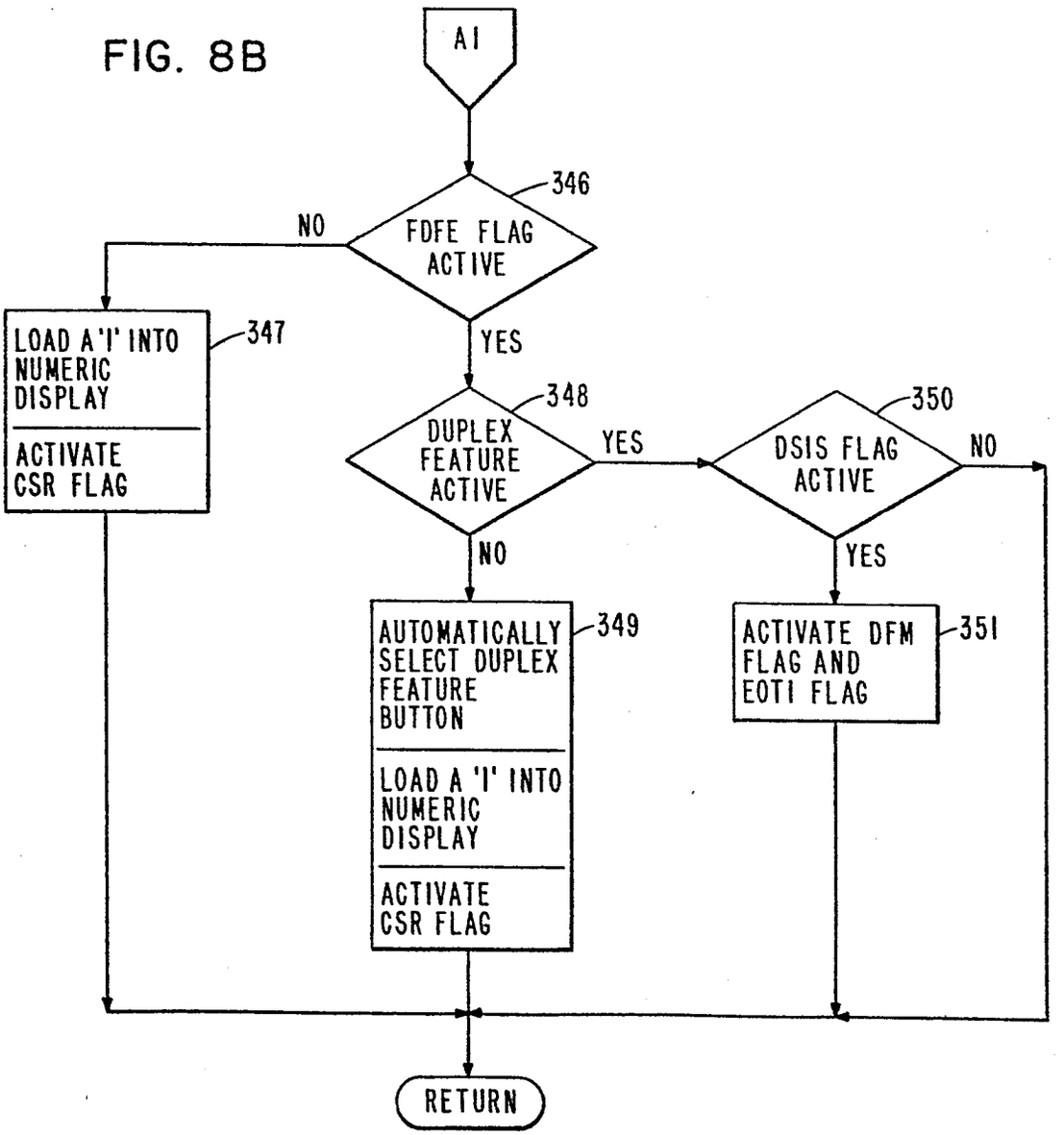

A1
346
FDFE FLAG ACTIVE
NO
YES
LOAD A 'I' INTO NUMERIC DISPLAY
347
ACTIVATE CSR FLAG
348
DUPLEX FEATURE ACTIVE
YES
350
DSIS FLAG ACTIVE
NO
NO
YES
AUTOMATICALLY SELECT DUPLEX FEATURE BUTTON
349
LOAD A 'I' INTO NUMERIC DISPLAY
ACTIVATE CSR FLAG
ACTIVATE DFM FLAG AND EOTI FLAG
351
RETURN

FIG. 8C

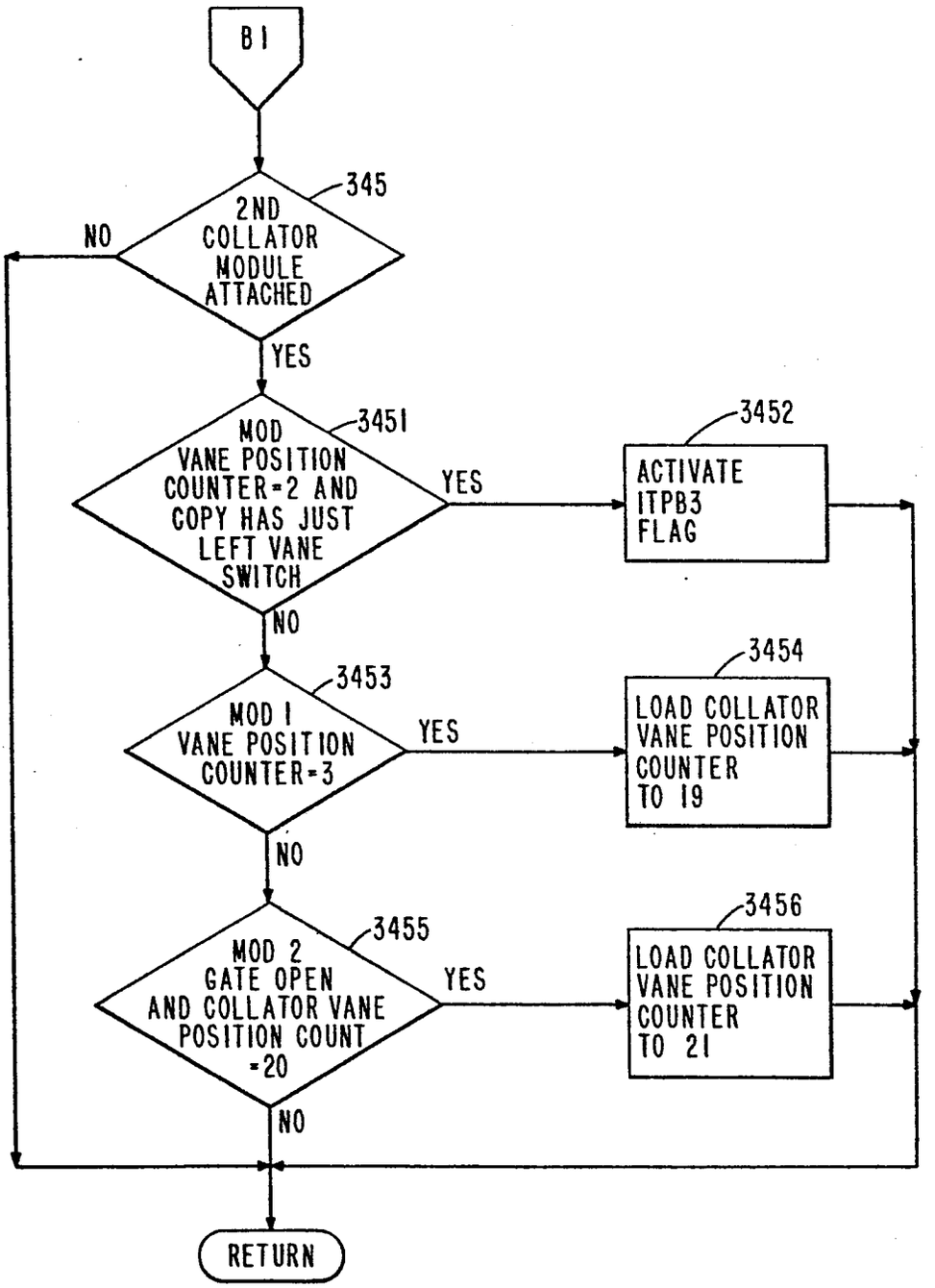

B1
345
2ND COLLATOR MODULE ATTACHED
NO
YES
3451
MOD VANE POSITION COUNTER=2 AND COPY HAS JUST LEFT VANE SWITCH
YES
3452
ACTIVATE ITPB3 FLAG
NO
3453
MOD 1 VANE POSITION COUNTER=3
YES
3454
LOAD COLLATOR VANE POSITION COUNTER TO 19
NO
3455
MOD 2 GATE OPEN AND COLLATOR VANE POSITION COUNT =20
YES
3456
LOAD COLLATOR VANE POSITION COUNTER TO 21
NO
RETURN

FIG. 9A

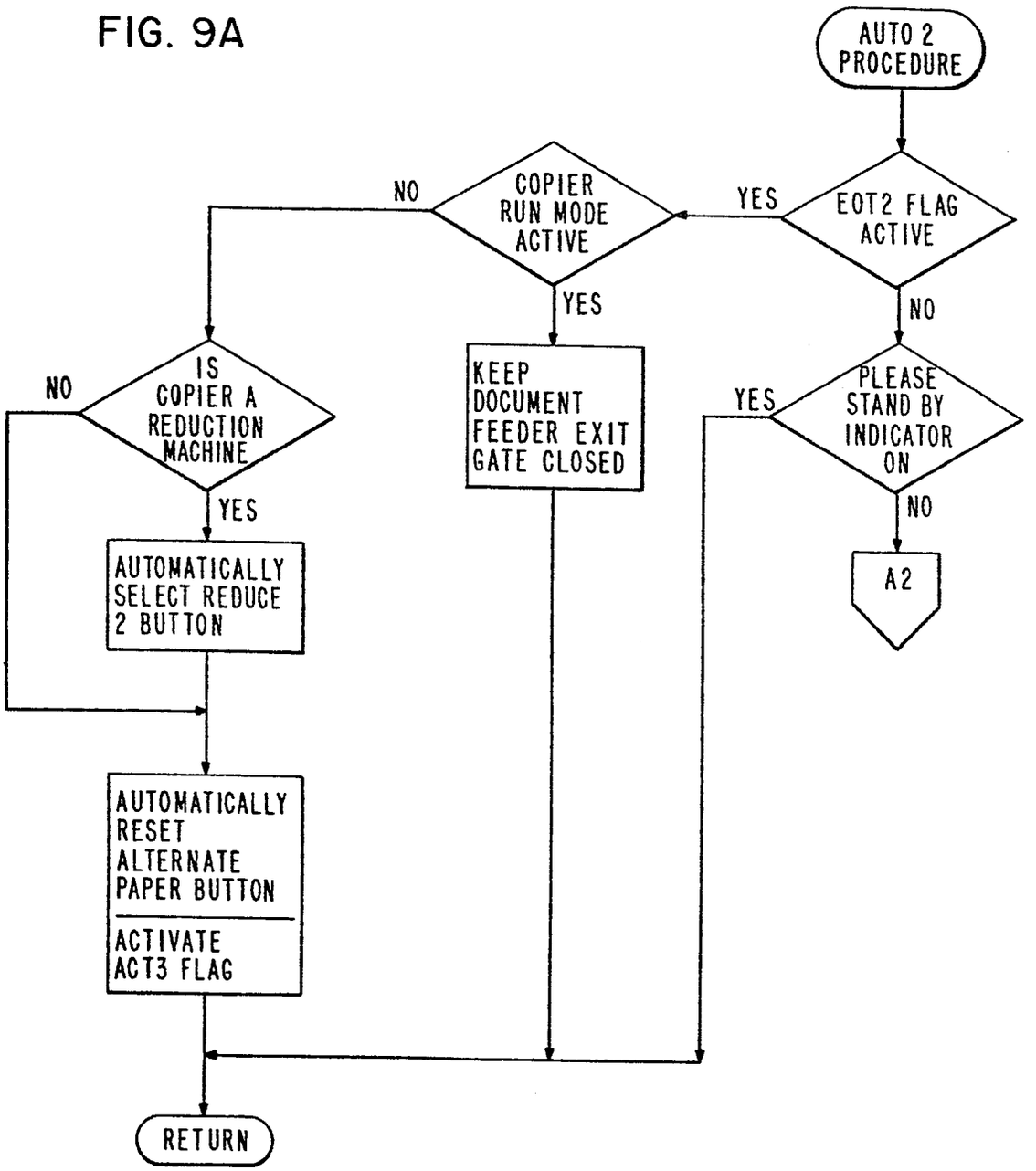

AUTO 2 PROCEDURE
EOT2 FLAG ACTIVE
YES
COPIER RUN MODE ACTIVE
NO
YES
KEEP DOCUMENT FEEDER EXIT GATE CLOSED
NO
PLEASE STAND BY INDICATOR ON
YES
NO
A2
IS COPIER A REDUCTION MACHINE
NO
YES
AUTOMATICALLY SELECT REDUCE 2 BUTTON
AUTOMATICALLY RESET ALTERNATE PAPER BUTTON
ACTIVATE ACT3 FLAG
RETURN

FIG. 9B

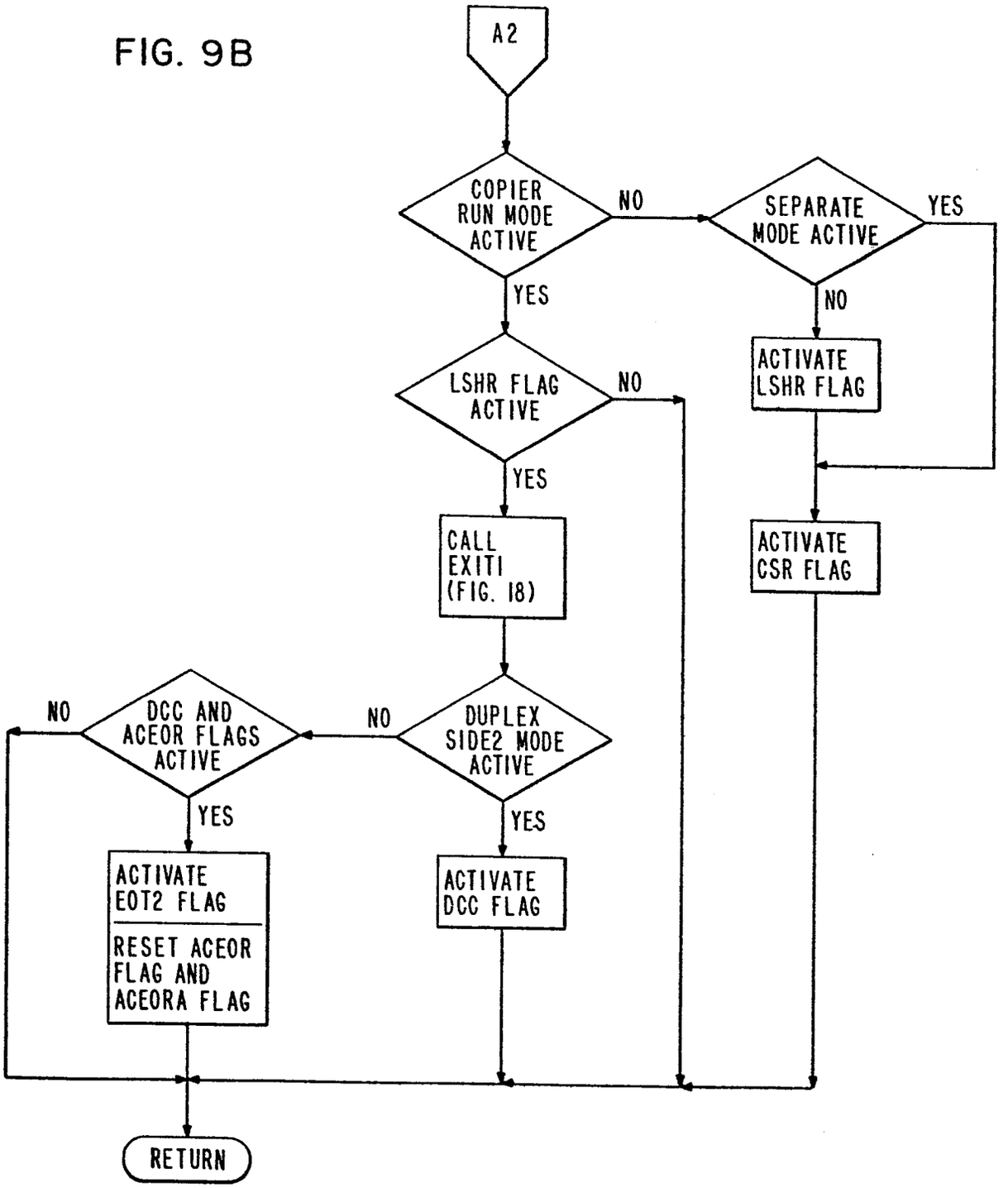

A2
COPIER RUN MODE ACTIVE
NO
SEPARATE MODE ACTIVE
YES
YES
NO
LSHR FLAG ACTIVE
NO
ACTIVATE LSHR FLAG
YES
CALL EXITI (FIG. 18)
ACTIVATE CSR FLAG
NO
DCC AND ACEOR FLAGS ACTIVE
NO
DUPLEX SIDE2 MODE ACTIVE
YES
YES
ACTIVATE EOT2 FLAG
RESET ACEOR FLAG AND ACEORA FLAG
ACTIVATE DCC FLAG
RETURN

FIG. 10

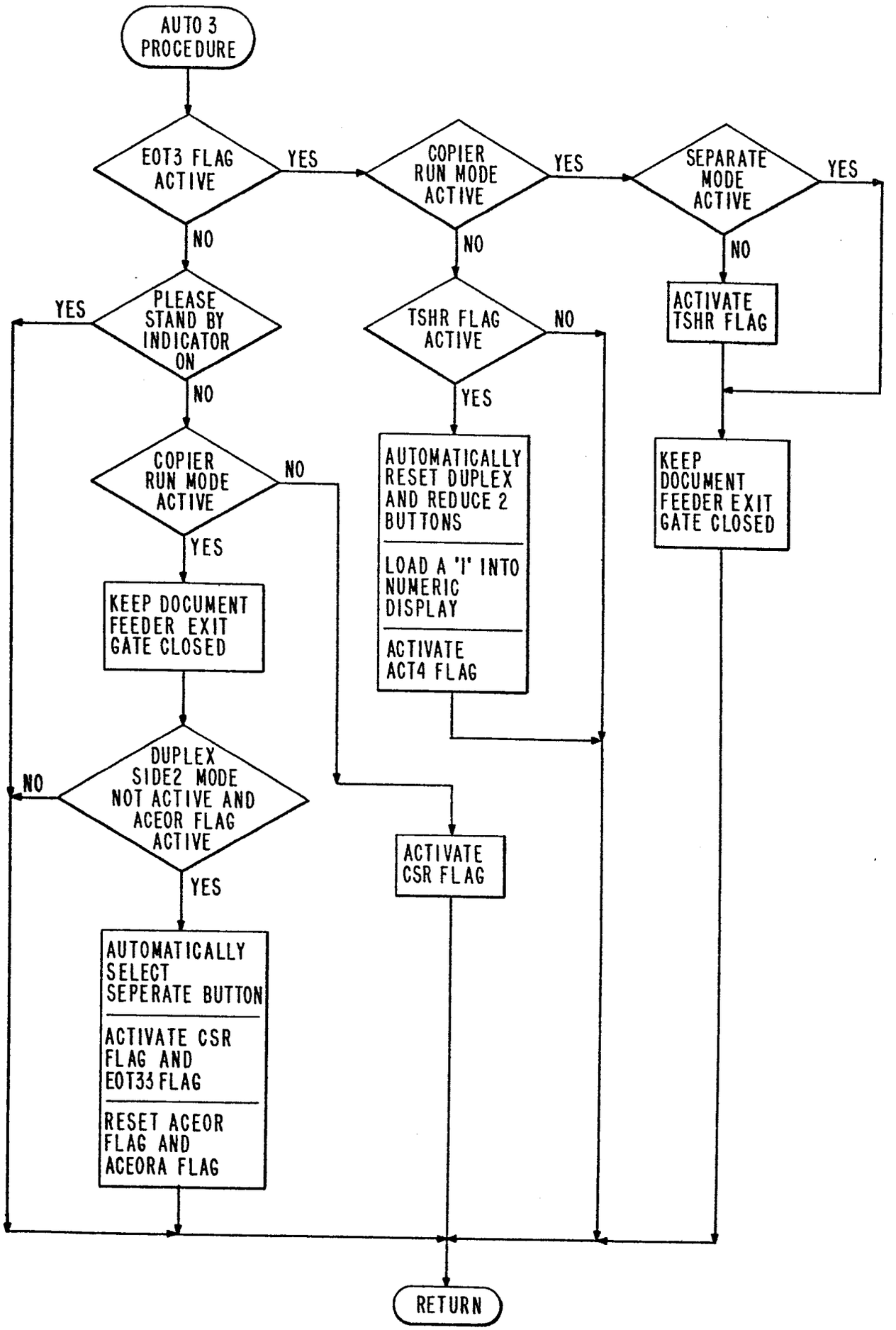

AUTO 3 PROCEDURE
EOT3 FLAG ACTIVE
YES
NO
COPIER RUN MODE ACTIVE
YES
NO
SEPARATE MODE ACTIVE
YES
NO
ACTIVATE TSHR FLAG
KEEP DOCUMENT FEEDER EXIT GATE CLOSED
PLEASE STAND BY INDICATOR ON
YES
NO
TSHR FLAG ACTIVE
NO
YES
AUTOMATICALLY RESET DUPLEX AND REDUCE 2 BUTTONS
LOAD A '1' INTO NUMERIC DISPLAY
ACTIVATE ACT4 FLAG
COPIER RUN MODE ACTIVE
NO
YES
KEEP DOCUMENT FEEDER EXIT GATE CLOSED
DUPLEX SIDE2 MODE NOT ACTIVE AND ACEOR FLAG ACTIVE
NO
YES
ACTIVATE CSR FLAG
AUTOMATICALLY SELECT SEPERATE BUTTON
ACTIVATE CSR FLAG AND EOT33 FLAG
RESET ACEOR FLAG AND ACEORA FLAG
RETURN

FIG. 11A

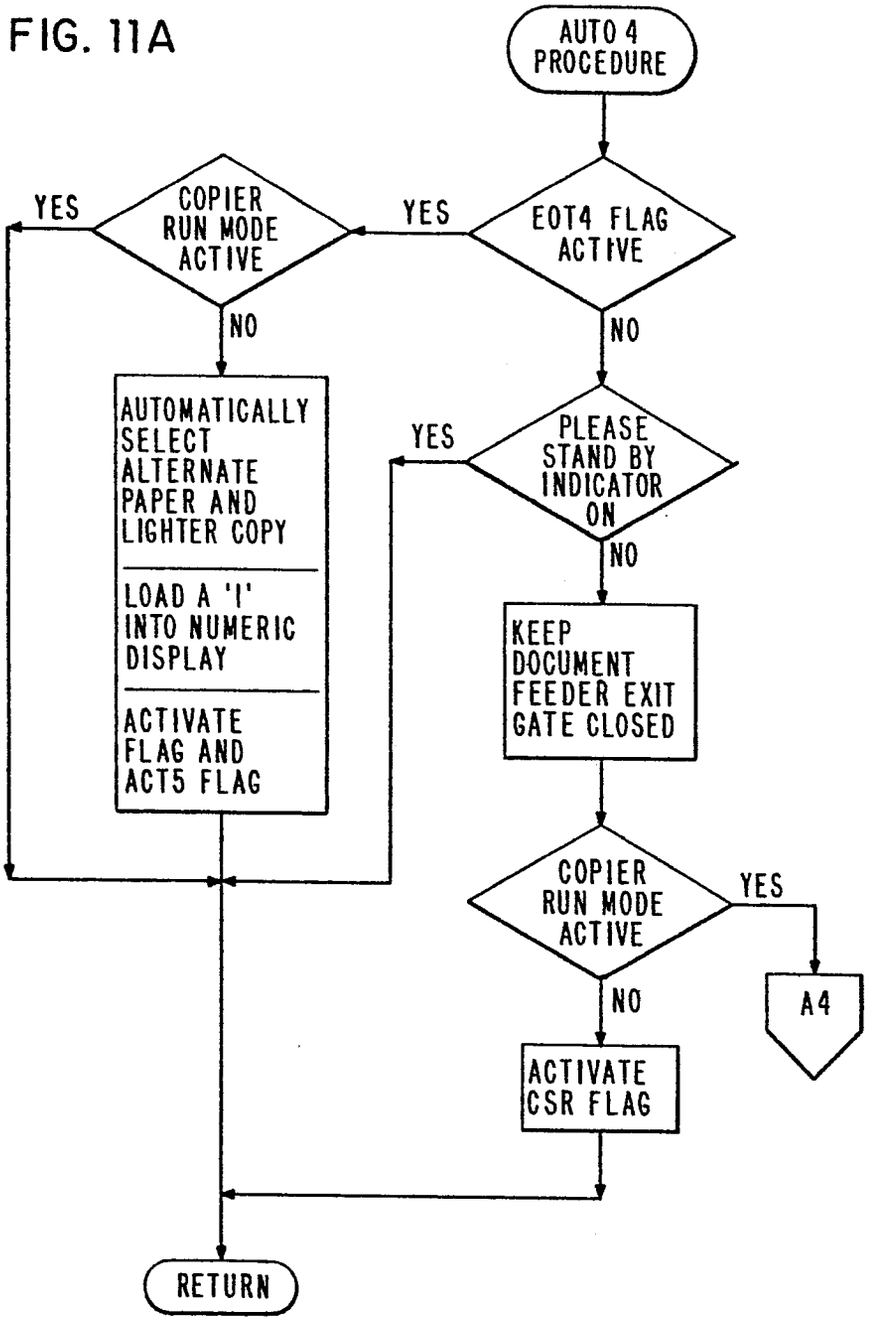

AUTO 4 PROCEDURE
EOT4 FLAG ACTIVE
YES
NO
COPIER RUN MODE ACTIVE
YES
NO
AUTOMATICALLY SELECT ALTERNATE PAPER AND LIGHTER COPY
LOAD A '1' INTO NUMERIC DISPLAY
ACTIVATE FLAG AND ACT5 FLAG
PLEASE STAND BY INDICATOR ON
YES
NO
KEEP DOCUMENT FEEDER EXIT GATE CLOSED
COPIER RUN MODE ACTIVE
YES
NO
A4
ACTIVATE CSR FLAG
RETURN

FIG. 11B

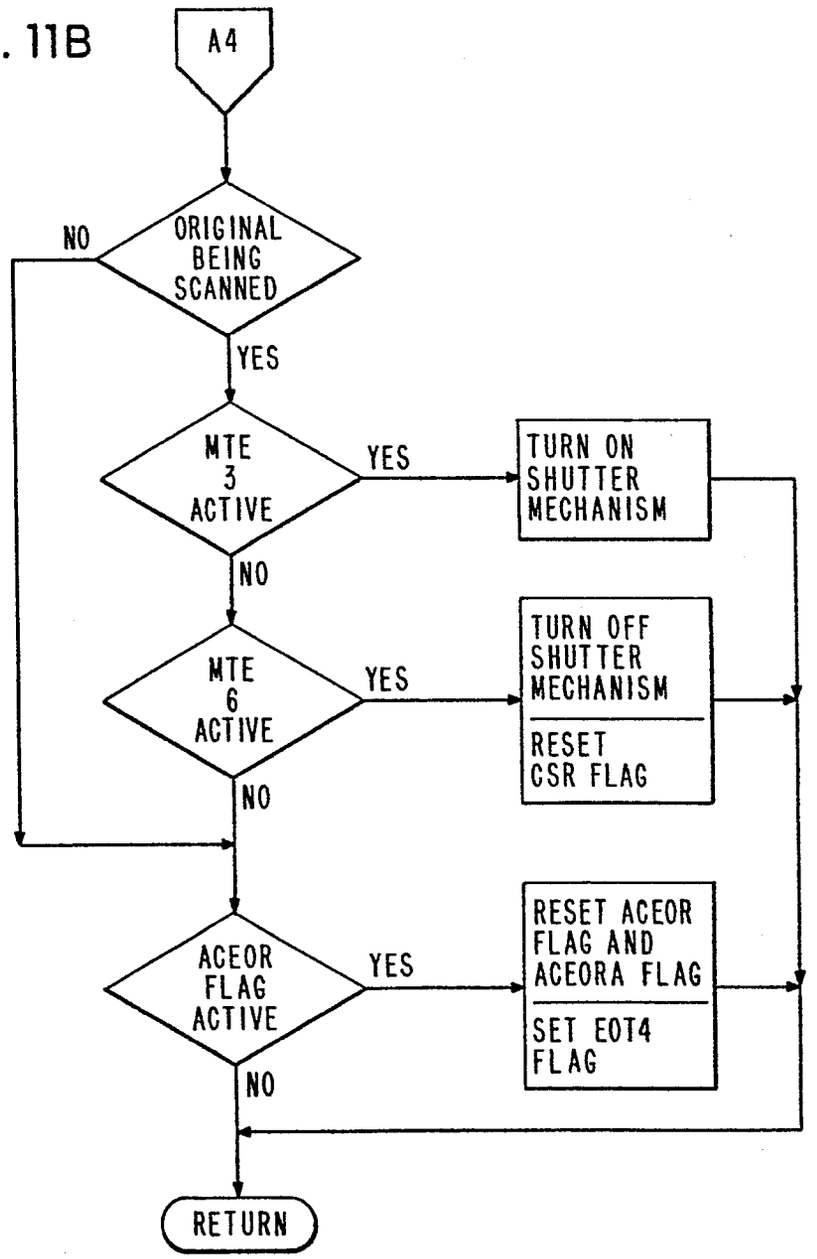

A4
ORIGINAL BEING SCANNED
NO
YES
MTE 3 ACTIVE
YES
TURN ON SHUTTER MECHANISM
NO
MTE 6 ACTIVE
YES
TURN OFF SHUTTER MECHANISM
RESET CSR FLAG
NO
ACEOR FLAG ACTIVE
YES
RESET ACEOR FLAG AND ACEORA FLAG
SET EOT4 FLAG
NO
RETURN

FIG. 12A

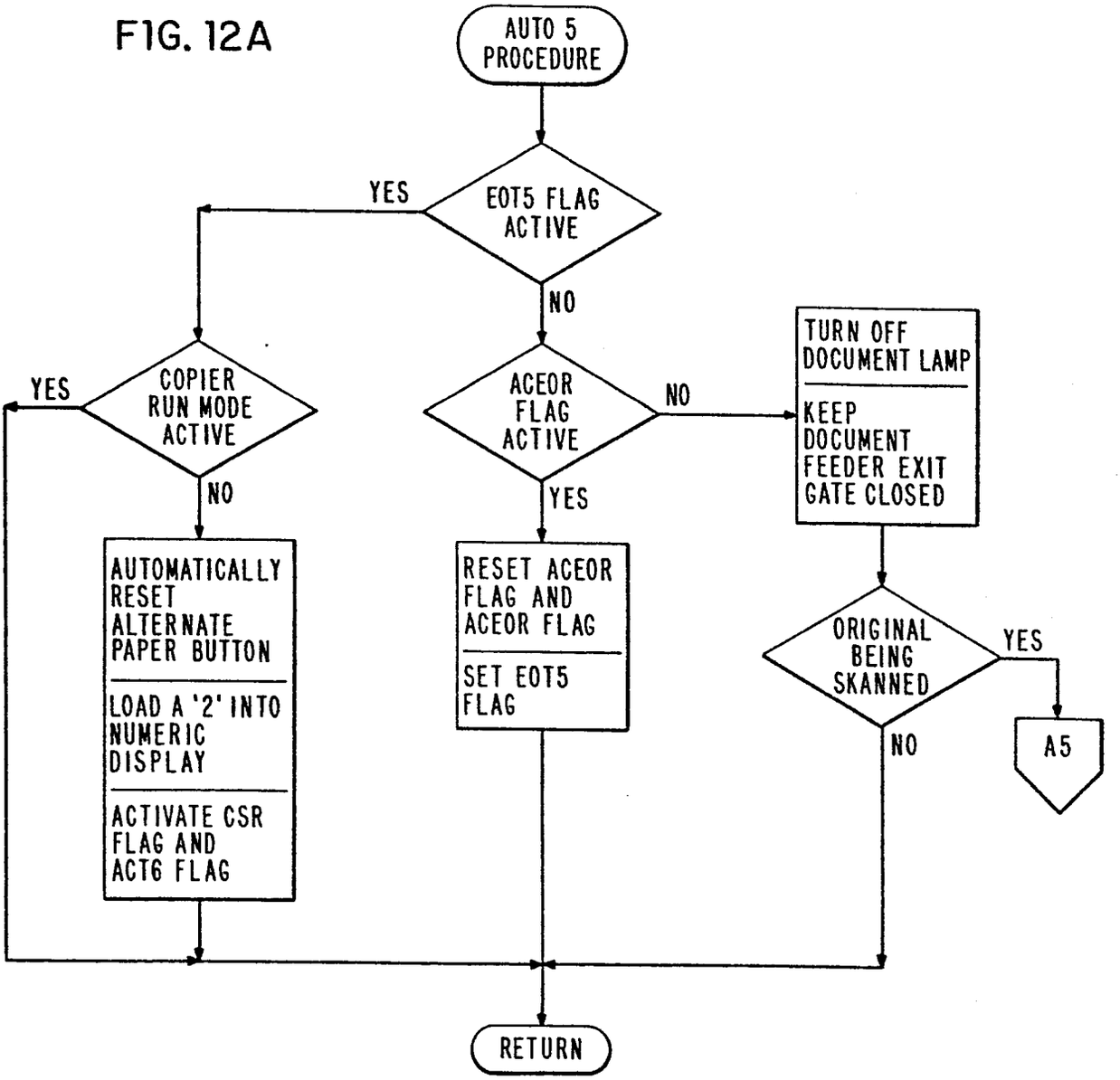

AUTO 5 PROCEDURE
EOT5 FLAG ACTIVE
YES
NO
COPIER RUN MODE ACTIVE
YES
NO
ACEOR FLAG ACTIVE
NO
YES
TURN OFF DOCUMENT LAMP
KEEP DOCUMENT FEEDER EXIT GATE CLOSED
AUTOMATICALLY RESET ALTERNATE PAPER BUTTON
LOAD A '2' INTO NUMERIC DISPLAY
ACTIVATE CSR FLAG AND ACT6 FLAG
RESET ACEOR FLAG AND ACEOR FLAG
SET EOT5 FLAG
ORIGINAL BEING SKANNED
YES
NO
A5
RETURN

FIG. 12B

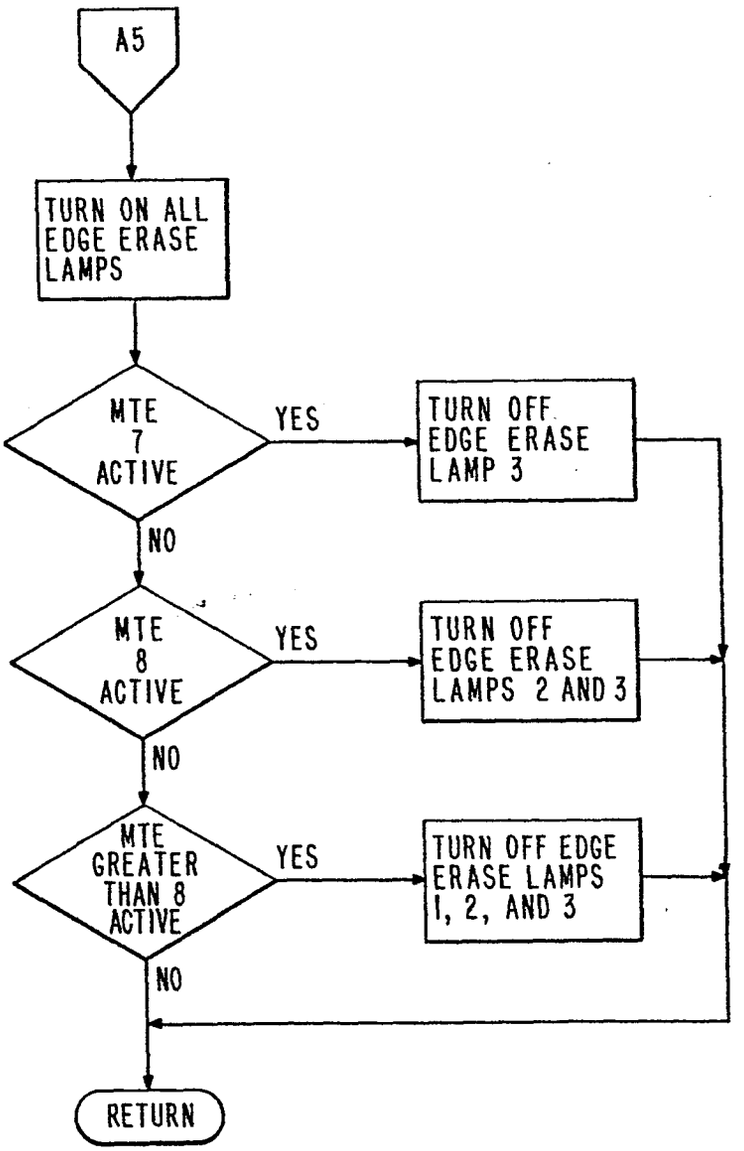

A5
TURN ON ALL EDGE ERASE LAMPS
MTE 7 ACTIVE
YES
TURN OFF EDGE ERASE LAMP 3
NO
MTE 8 ACTIVE
YES
TURN OFF EDGE ERASE LAMPS 2 AND 3
NO
MTE GREATER THAN 8 ACTIVE
YES
TURN OFF EDGE ERASE LAMPS 1, 2, AND 3
NO
RETURN

FIG. 13

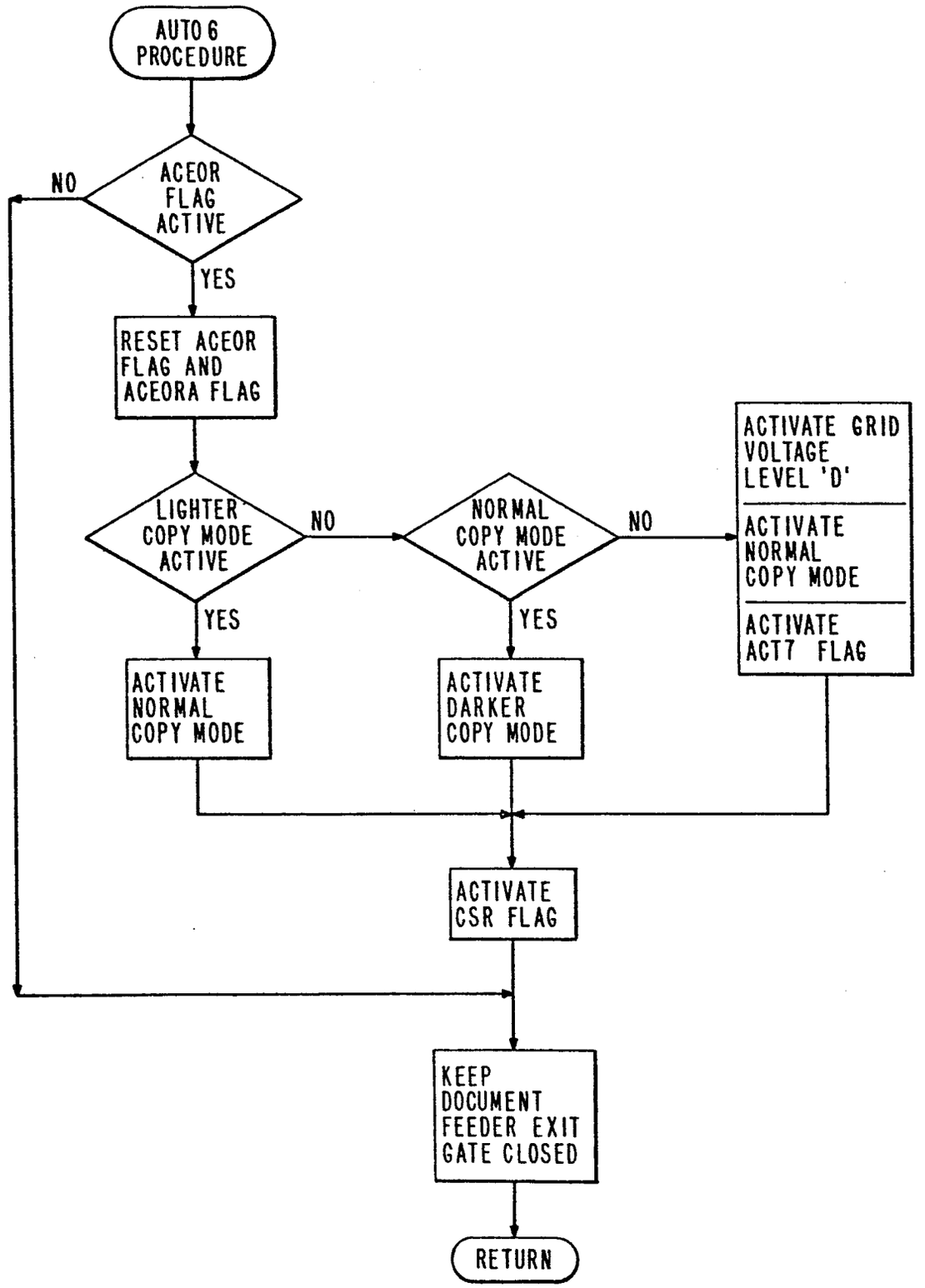

AUTO 6 PROCEDURE
ACEOR FLAG ACTIVE
NO
YES
RESET ACEOR FLAG AND ACEORA FLAG
LIGHTER COPY MODE ACTIVE
NO
NORMAL COPY MODE ACTIVE
NO
YES
YES
ACTIVATE GRID VOLTAGE LEVEL 'D'
ACTIVATE NORMAL COPY MODE
ACTIVATE ACT7 FLAG
ACTIVATE NORMAL COPY MODE
ACTIVATE DARKER COPY MODE
ACTIVATE CSR FLAG
KEEP DOCUMENT FEEDER EXIT GATE CLOSED
RETURN

FIG. 14

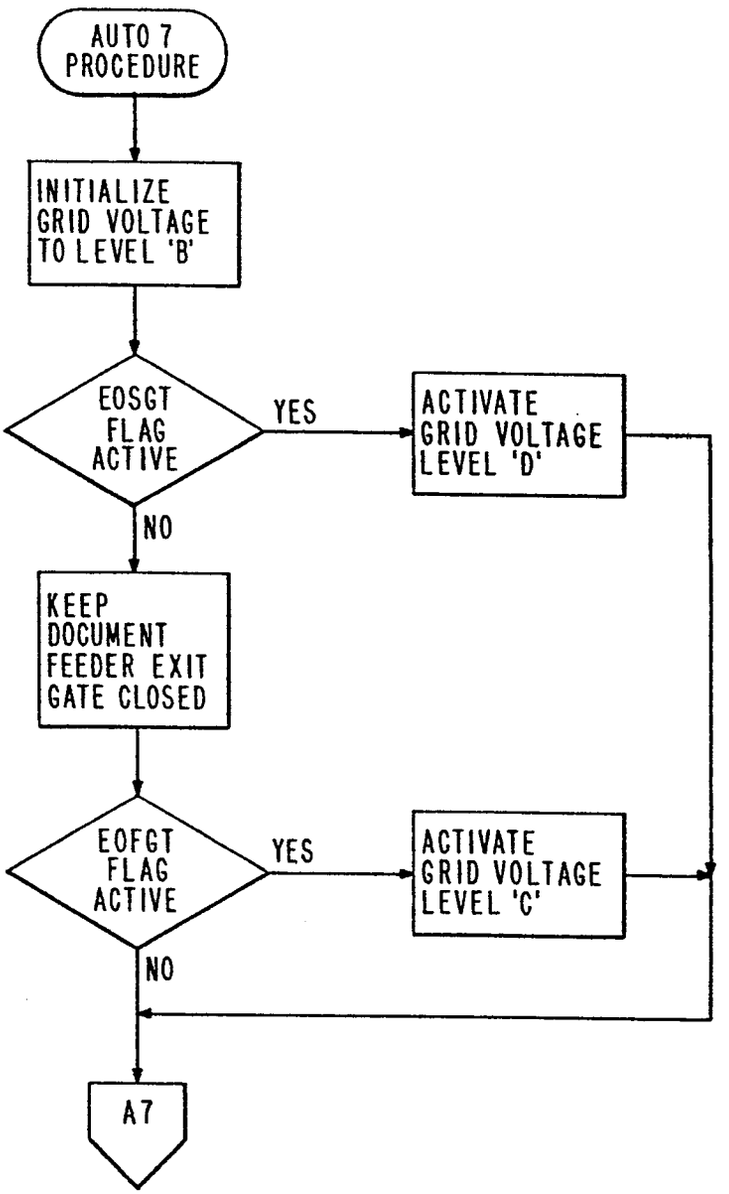

AUTO 7 PROCEDURE
INITIALIZE GRID VOLTAGE TO LEVEL 'B'
EOSGT FLAG ACTIVE
YES
ACTIVATE GRID VOLTAGE LEVEL 'D'
NO
KEEP DOCUMENT FEEDER EXIT GATE CLOSED
EOFGT FLAG ACTIVE
YES
ACTIVATE GRID VOLTAGE LEVEL 'C'
NO
A7

FIG. 14B

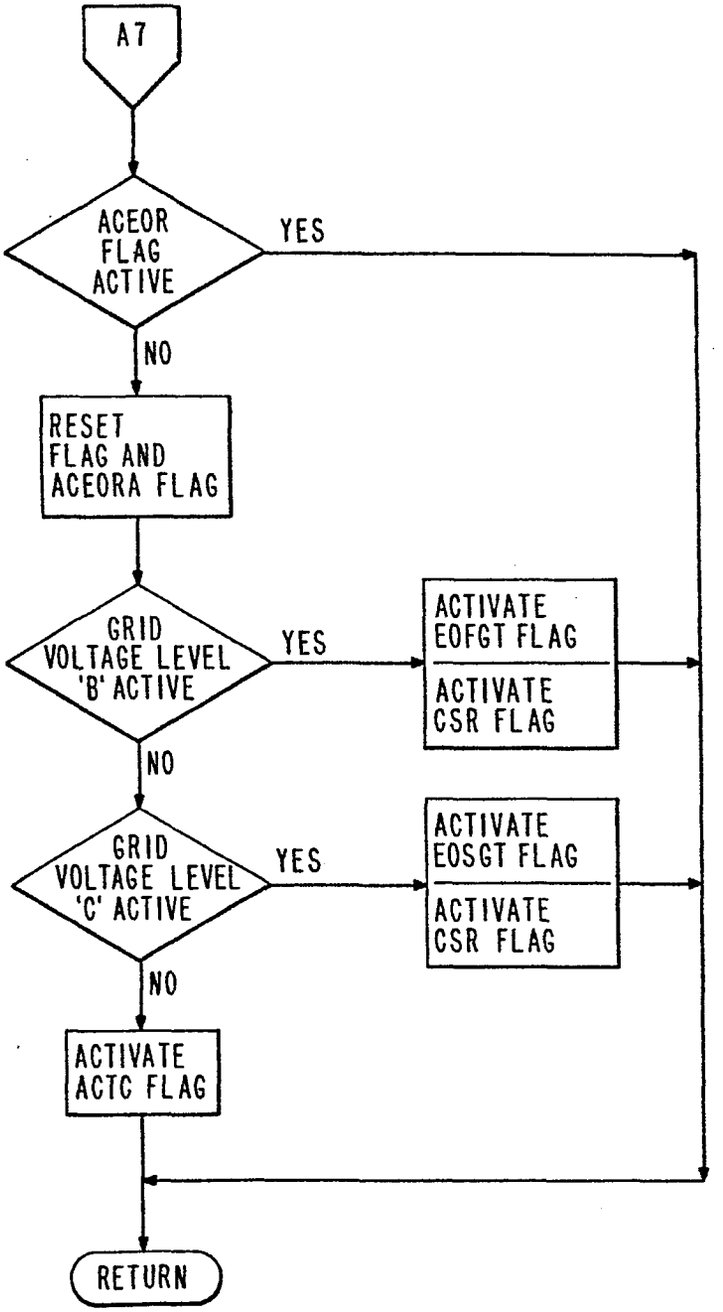

A7
ACEOR FLAG ACTIVE
YES
NO
RESET FLAG AND ACEORA FLAG
GRID VOLTAGE LEVEL 'B' ACTIVE
YES
ACTIVATE EOFGT FLAG
ACTIVATE CSR FLAG
NO
GRID VOLTAGE LEVEL 'C' ACTIVE
YES
ACTIVATE EOSGT FLAG
ACTIVATE CSR FLAG
NO
ACTIVATE ACTC FLAG
RETURN

FIG. 15A

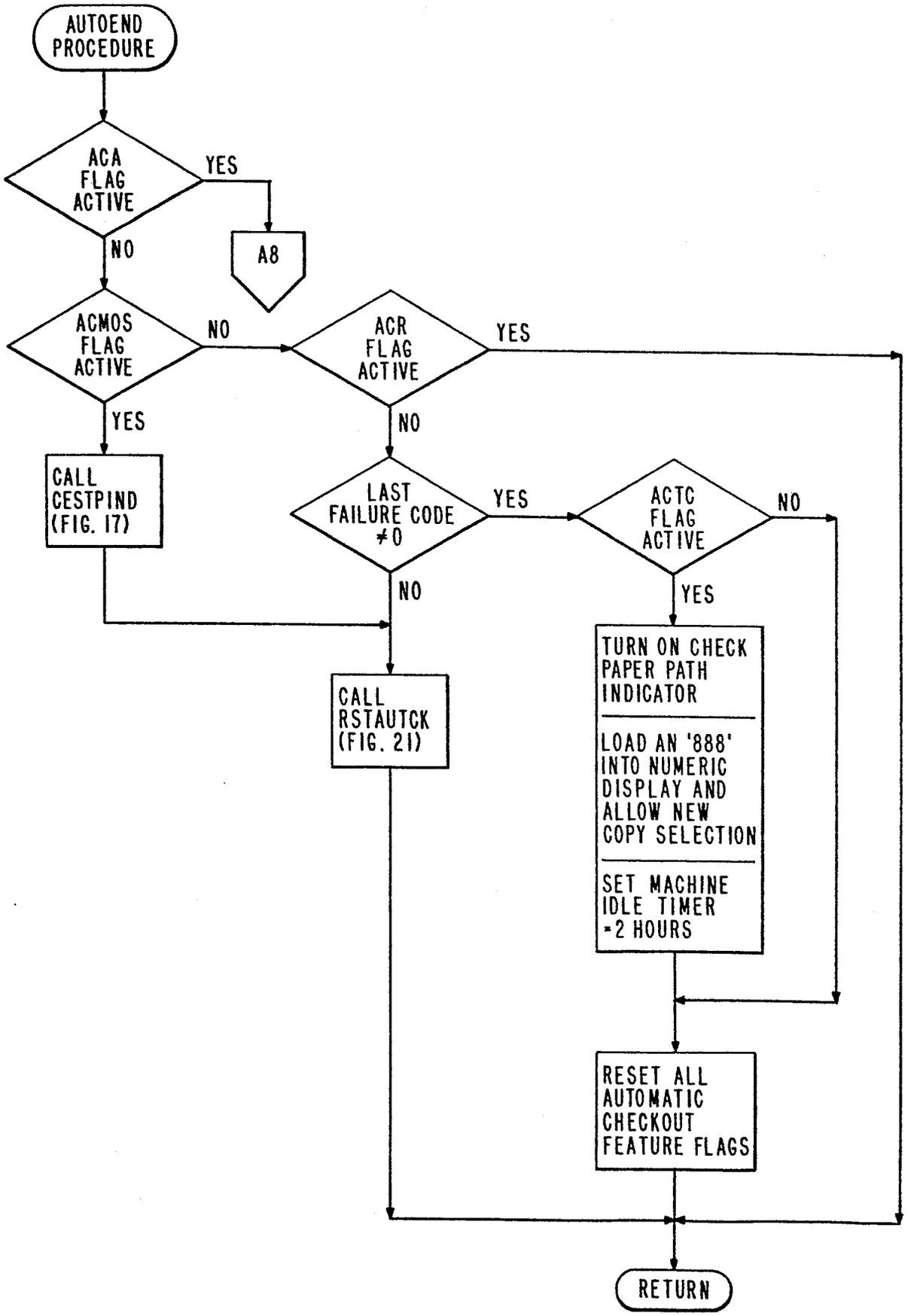

AUTOEND PROCEDURE
ACA FLAG ACTIVE
YES
A8
NO
ACMOS FLAG ACTIVE
NO
ACR FLAG ACTIVE
YES
YES
NO
CALL CESTPIND (FIG. 17)
LAST FAILURE CODE ≠0
YES
ACTC FLAG ACTIVE
NO
NO
YES
CALL RSTAUTCK (FIG. 21)
TURN ON CHECK PAPER PATH INDICATOR
LOAD AN '888' INTO NUMERIC DISPLAY AND ALLOW NEW COPY SELECTION
SET MACHINE IDLE TIMER =2 HOURS
RESET ALL AUTOMATIC CHECKOUT FEATURE FLAGS
RETURN

FIG. 15B

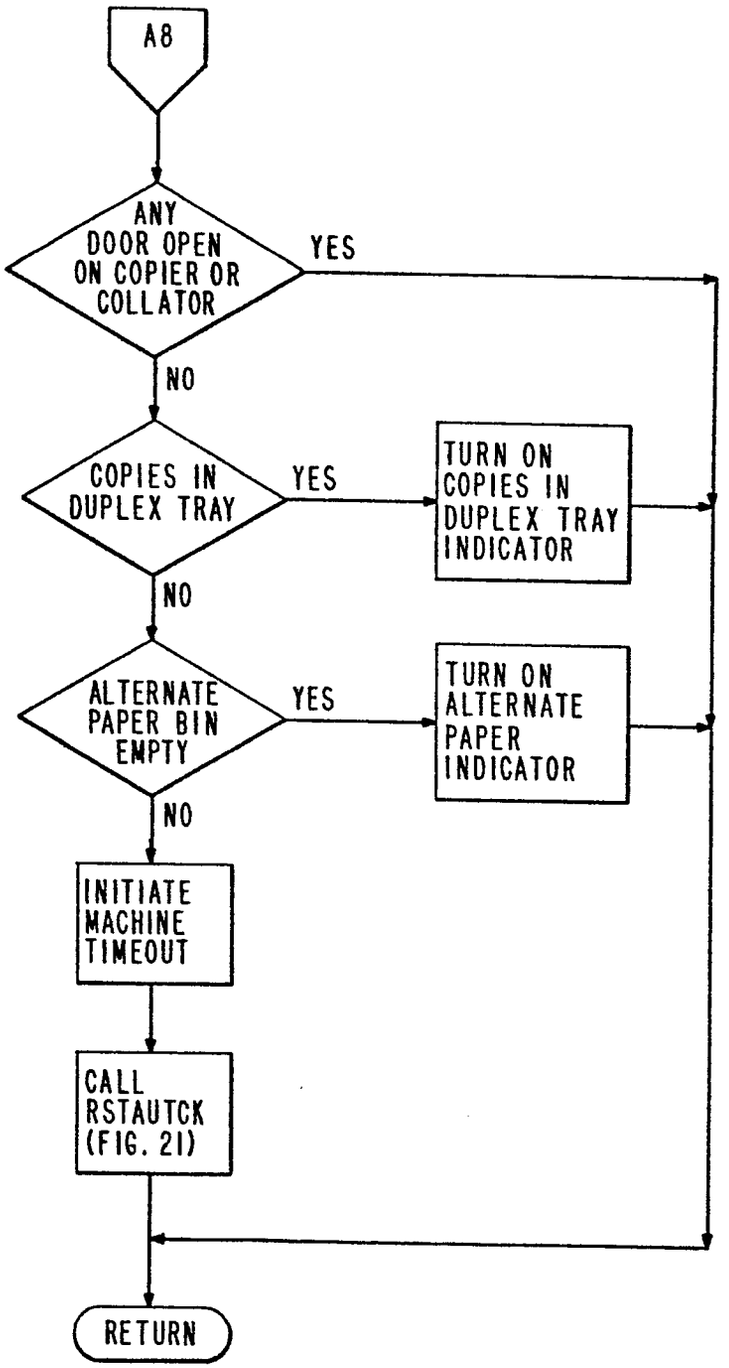


FIG. 16

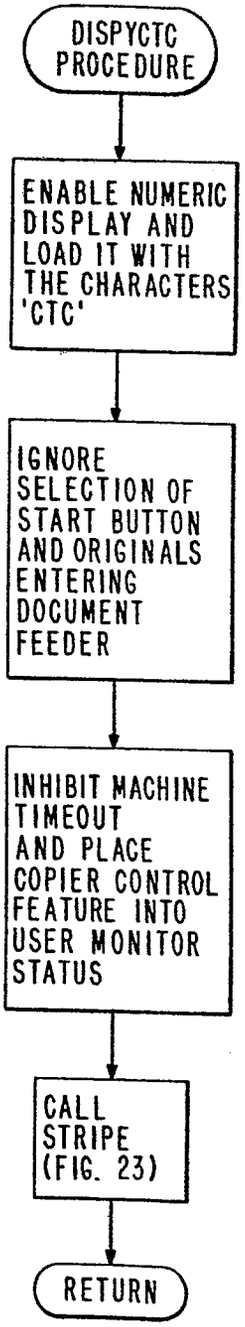


FIG. 17

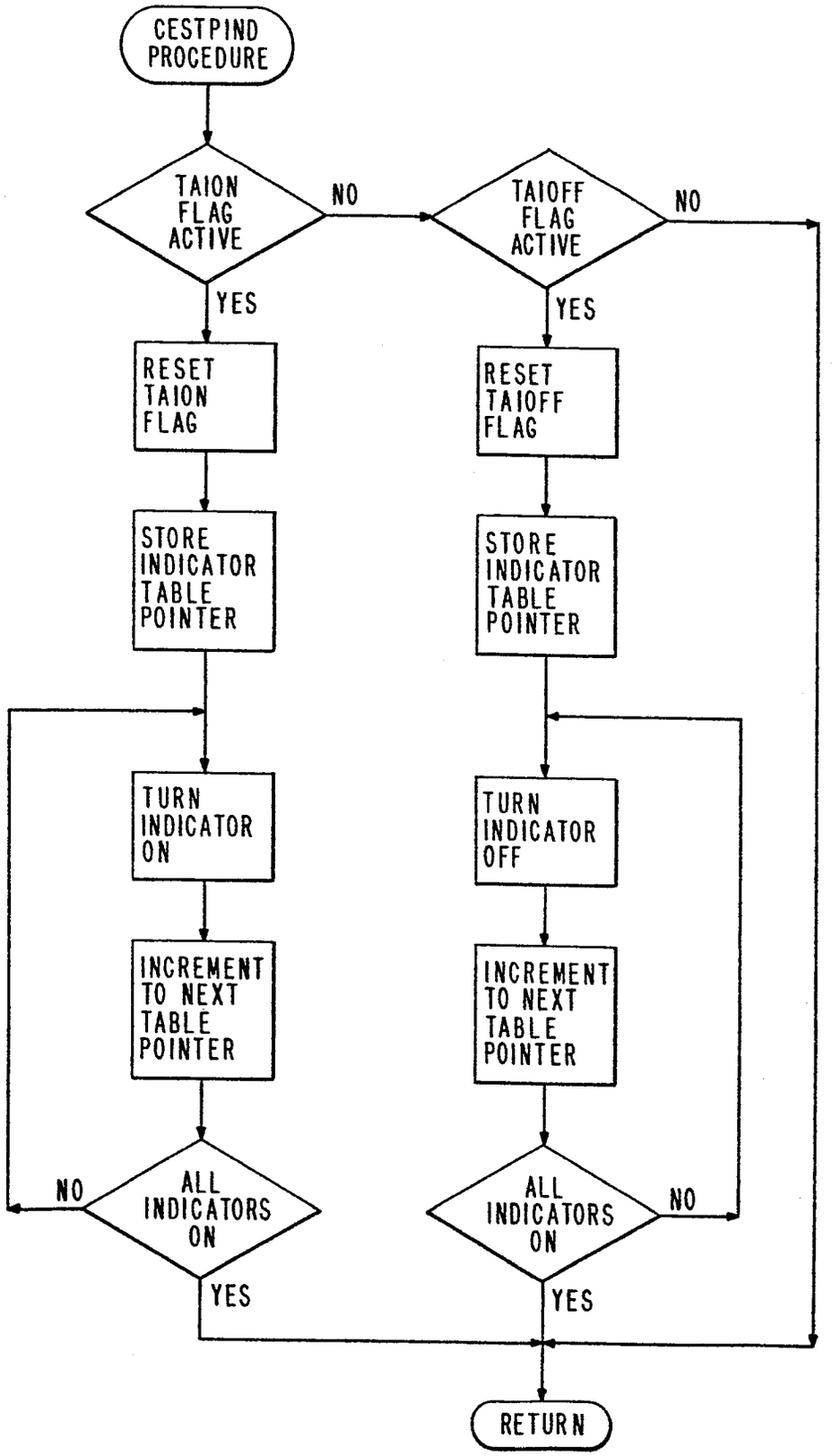

CESTPIND PROCEDURE
TAION FLAG ACTIVE
NO
TAIOFF FLAG ACTIVE
NO
YES
YES
RESET TAION FLAG
RESET TAIOFF FLAG
STORE INDICATOR TABLE POINTER
STORE INDICATOR TABLE POINTER
TURN INDICATOR ON
TURN INDICATOR OFF
INCREMENT TO NEXT TABLE POINTER
INCREMENT TO NEXT TABLE POINTER
NO
ALL INDICATORS ON
ALL INDICATORS ON
NO
YES
YES
RETURN

FIG. 18

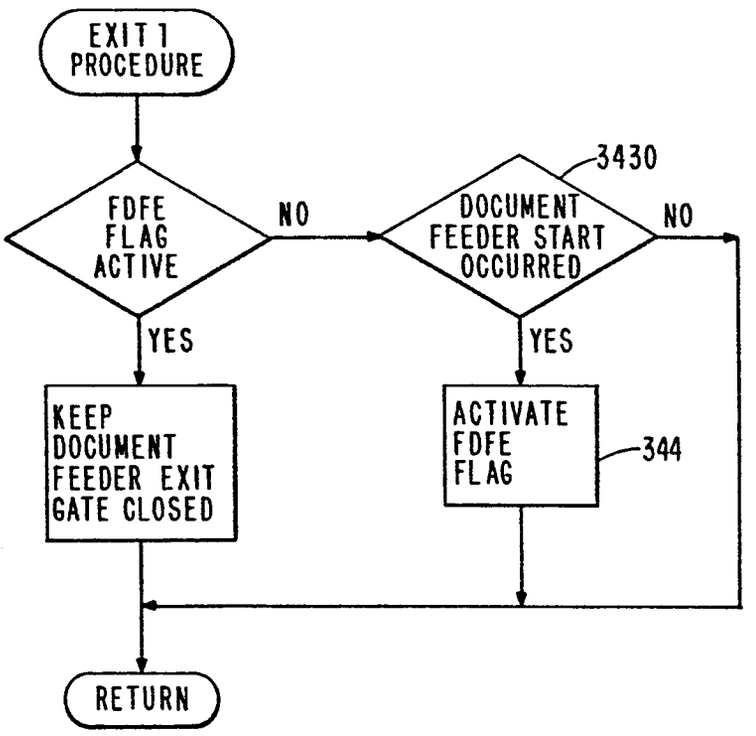

EXIT1
PROCEDURE
FDFE
FLAG
ACTIVE
NO
YES
3430
DOCUMENT
FEEDER START
OCCURRED
NO
YES
KEEP
DOCUMENT
FEEDER EXIT
GATE CLOSED
ACTIVATE
FDFE
FLAG
344
RETURN

FIG. 19

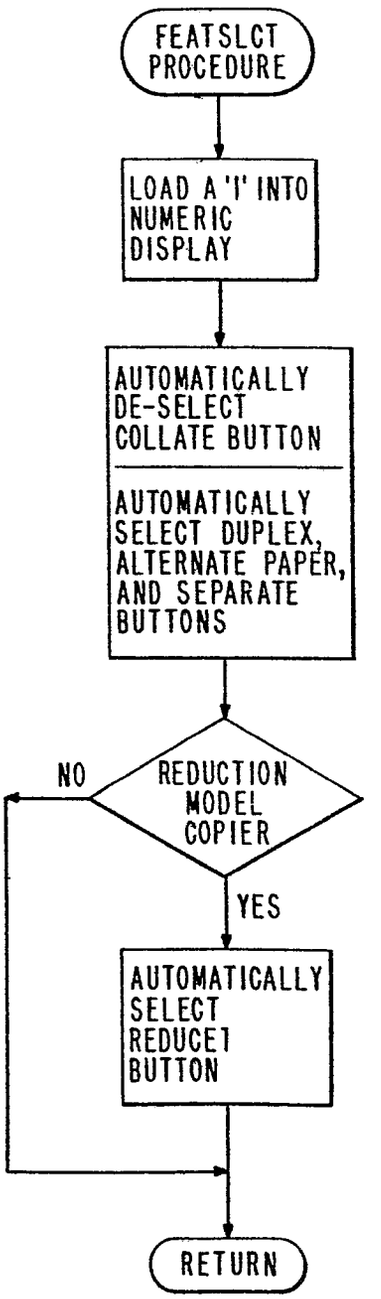

FEATSLCT
PROCEDURE
LOAD A '1' INTO
NUMERIC
DISPLAY
AUTOMATICALLY
DE-SELECT
COLLATE BUTTON
AUTOMATICALLY
SELECT DUPLEX,
ALTERNATE PAPER,
AND SEPARATE
BUTTONS
NO
REDUCTION
MODEL
COPIER
YES
AUTOMATICALLY
SELECT
REDUCE1
BUTTON
RETURN

FIG. 20

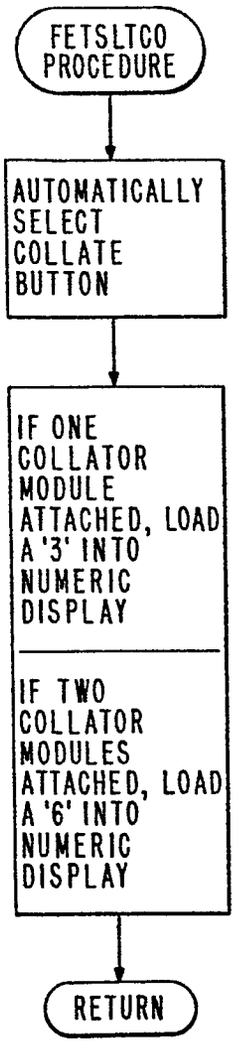

FETSLTCO PROCEDURE
AUTOMATICALLY SELECT COLLATE BUTTON
IF ONE COLLATOR MODULE ATTACHED, LOAD A '3' INTO NUMERIC DISPLAY
IF TWO COLLATOR MODULES ATTACHED, LOAD A '6' INTO NUMERIC DISPLAY
RETURN

FIG. 21

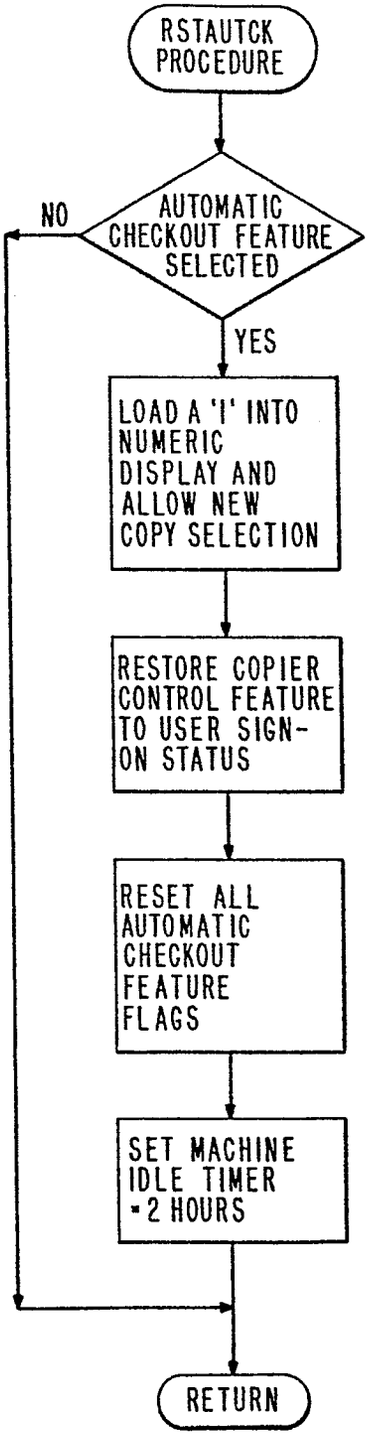

RSTAUTCK PROCEDURE
AUTOMATIC CHECKOUT FEATURE SELECTED
NO
YES
LOAD A '1' INTO NUMERIC DISPLAY AND ALLOW NEW COPY SELECTION
RESTORE COPIER CONTROL FEATURE TO USER SIGN-ON STATUS
RESET ALL AUTOMATIC CHECKOUT FEATURE FLAGS
SET MACHINE IDLE TIMER = 2 HOURS
RETURN

FIG. 22

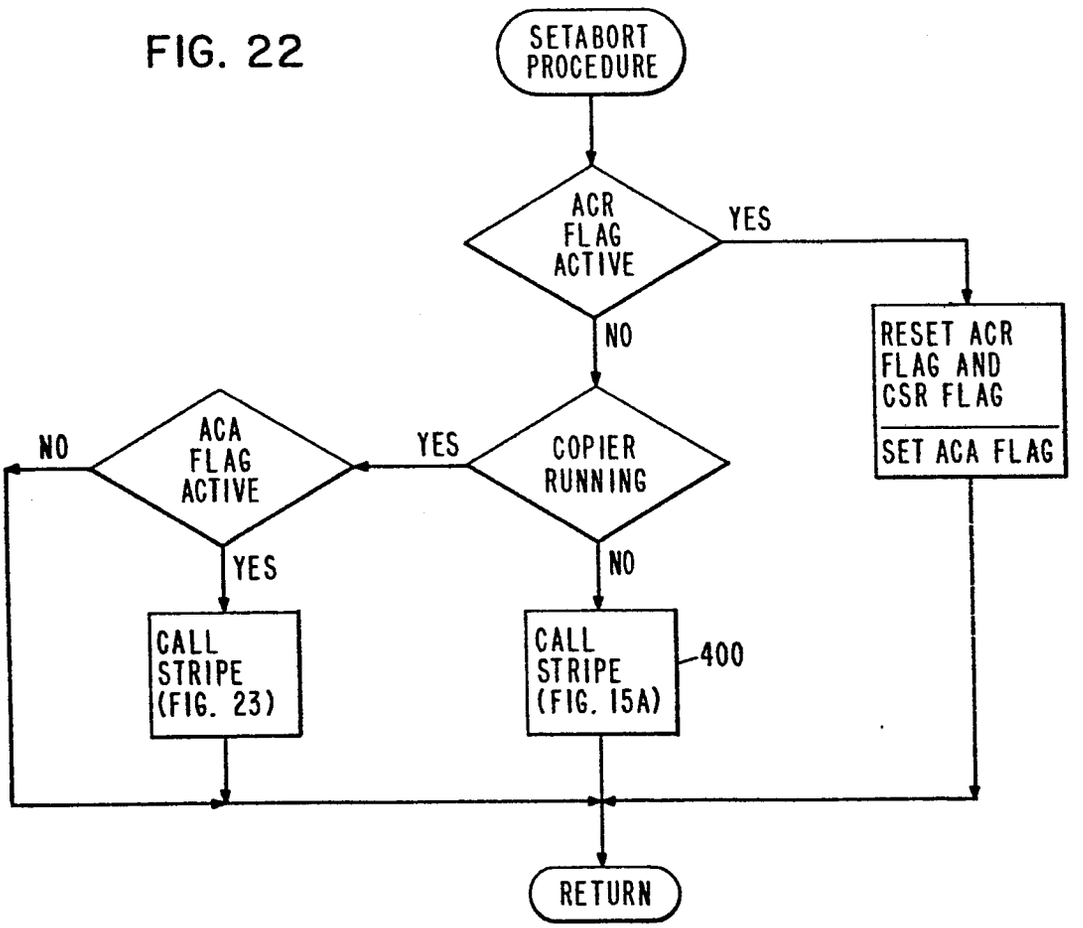

SETABORT PROCEDURE
ACR FLAG ACTIVE
YES
NO
RESET ACR FLAG AND CSR FLAG
SET ACA FLAG
COPIER RUNNING
YES
NO
ACA FLAG ACTIVE
NO
YES
CALL STRIPE (FIG. 23)
CALL STRIPE (FIG. 15A)
400
RETURN

FIG. 23

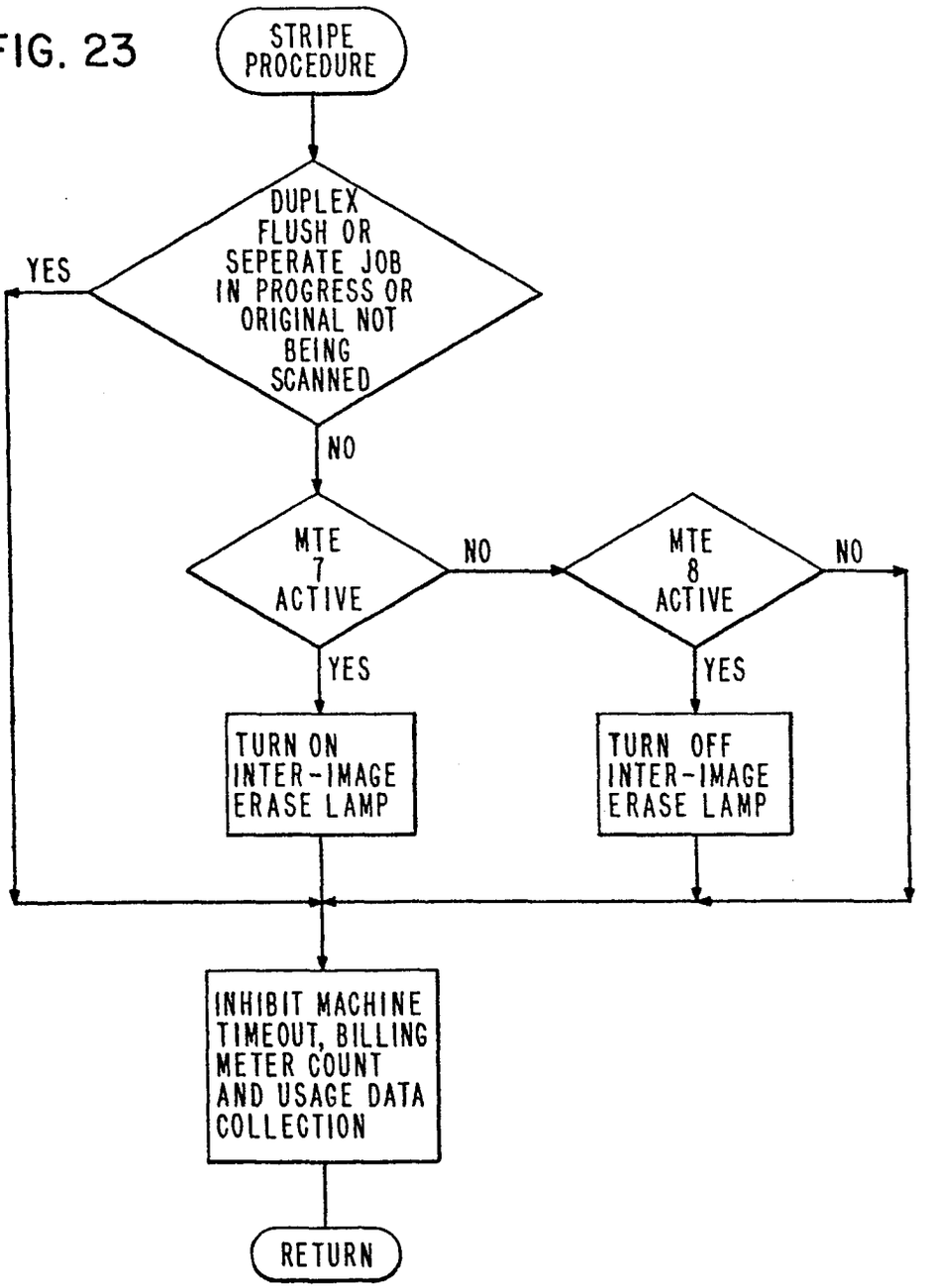
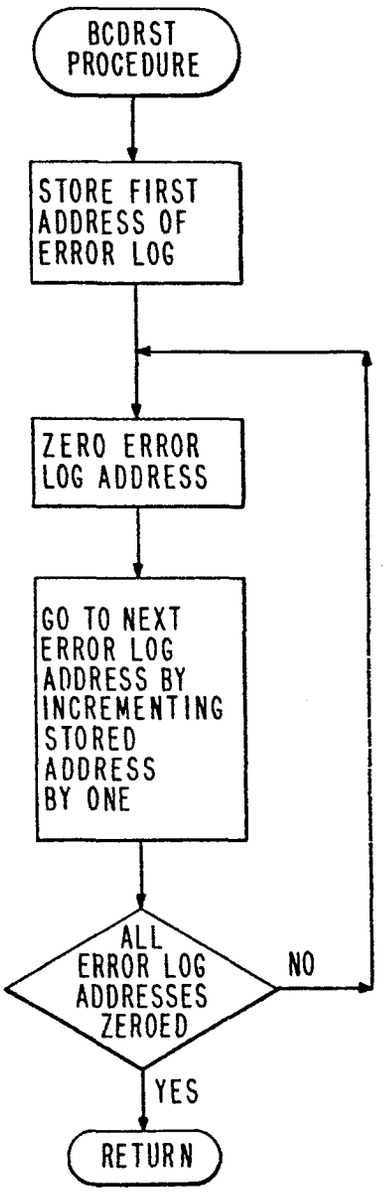

STRIPE PROCEDURE
DUPLEX FLUSH OR SEPERATE JOB IN PROGRESS OR ORIGINAL NOT BEING SCANNED
YES
NO
MTE 7 ACTIVE
NO
MTE 8 ACTIVE
NO
YES
YES
TURN ON INTER-IMAGE ERASE LAMP
TURN OFF INTER-IMAGE ERASE LAMP
INHIBIT MACHINE TIMEOUT, BILLING METER COUNT AND USAGE DATA COLLECTION
RETURN

FIG. 24


BCDRST PROCEDURE
STORE FIRST ADDRESS OF ERROR LOG
ZERO ERROR LOG ADDRESS
GO TO NEXT ERROR LOG ADDRESS BY INCREMENTING STORED ADDRESS BY ONE
ALL ERROR LOG ADDRESSES ZEROED
NO
YES
RETURN

0093242

European Patent Office

Application number

EP 83 10 1748

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	EP-A-0 047 855 (I.B.M.) * Page 1 - page 14; claims 1,4,7,10,11; figures 7,8 *	1,8,9, 12-14	G 03 G 15/22
Y	US-A-4 162 396 (G.J. HOWARD et al.) * Column 1 - column 2, line 16; claim 1 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl ³)

G 03 G 15/00
G 03 G 15/22

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06-09-1983	MENAGER H.C.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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