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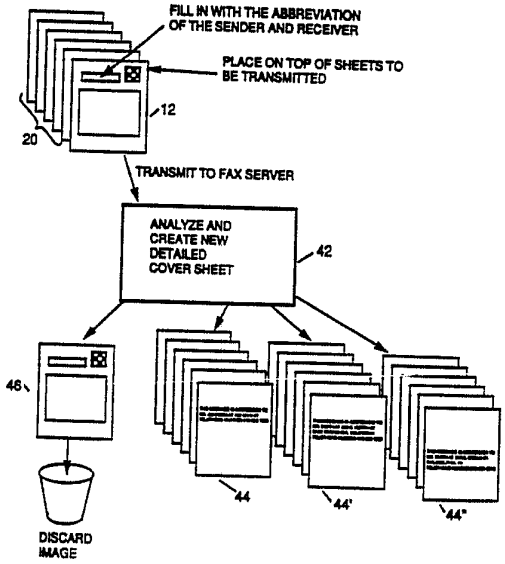
(57) Abstract

The present invention includes an open-ended set of cover sheet forms (20) that may be readily interpreted by the fax server system. In this system a first standardized cover sheet (12) is designed to accept hand printed characters. This first cover sheet is then transmitted to special fax server (42) to create an alternative, fully detached cover sheet for automatic transmission to its specific recipient. Labor is minimized by allowing the sender to hand print a minimal amount of highly constrained telephone numbers, or the initials of the recipient onto a draft cover sheet when a mailing list has been previously stored in memory. The first cover sheet is optionally automatically replaced by a final neatly printer cover sheet (44) in which the abbreviated information is expanded using prestored information to provide sufficient information to allow the secondary fax message cover sheets to be routed by a human or a machine. The present invention acts as a bridge between today's manually prepared cover sheets and E-mail systems that automatically route and store messages.



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METHOD AND APPARATUS FOR THE PRIMARY AND SECONDARY ROUTING OF FAX MESSAGES USING HAND PRINTED CHARACTERS

Cross Reference

This application is related to co-pending U.S. Patent Application entitled "Dot Constrained Hand Printed Character Recognition System And Method" having serial number 07/563,198, filed on August 3, 1990, and U. S. Patent number 4,893,333 issued January 9, 1990 entitled "Interactive Facsimile System And Method Of Information Retrieval" both of which are assigned to the same assignee as the present application.

Field of the Invention

This invention relates to the automatic routing of facsimile (fax) messages by automatically preparing fax routing sheets and to interfacing fax messages with electronic mail (E-mail).

Background of the Invention

There are two categories of fax message routing, commonly called primary and secondary routing. Primary routing is the process whereby fax messages are sent directly to their final fax telephone number. Since many users share a common fax telephone number, a second, or secondary, level of routing is required to send the message to its correct shared device user. Primary routing of fax messages today is generally performed by either manually dialing telephone numbers, sometimes

abbreviated by "speed dialing". Secondary routing is most commonly done manually, wherein the incoming cover sheet containing the name and organization of the intended recipient of the fax message is read by a human and the message is hand delivered by a messenger.

It is customary to use a pre-printed cover sheet as the first page of a multi-page facsimile message so that the message is delivered to its intended addressee, since many people tend to share a facsimile unit. Cover sheets are filled in with information such as the name, organizational name, telephone number of the sender, and the name and address of the intended recipient. Also, the number of pages to be sent is included to enable the recipient to determine if any pages are missing from the transmitted document.

Primary cover sheets are prepared automatically today when the message to be transmitted is created using a computer. For a fax message transmitted by MCI or E-mail, the computer will transmit an automatically prepared cover sheet.

Facsimile messages may be routed to end recipients sharing a single telephone number by the combined use of computer-added digital information in the header of fax messages generated by the computer and the manual use of touch-tone signal generation and the OCR reading of a cover sheet.

While the optical character reading of the cover sheet is known art, there are a number of limitations. Typewriting is required in most cases, since the state of the art of the reading of

hand printed characters is presently limited.

Summary of the Invention

In accordance with the preferred embodiment of the present invention there is disclosed an open-ended set of cover sheet forms that may be readily interpreted by the fax server system. In this system a first standardized cover sheet is designed to accept hand printed characters. This first cover sheet is then transmitted to a special fax server as part of this invention to create an alternative, fully automated detached cover sheet for automatic transmission to its specific recipient. Labor is minimized by allowing the sender to hand print a minimal amount of highly constrained telephone numbers, or the initials of the recipient onto a draft cover sheet when a mailing list has been previously stored in the memory associated with the special fax server. The major problem of constrained writing is that it is slow, so it is necessary to minimize the number of characters written.

The first cover sheet is optionally automatically replaced by a second and final neatly printed cover sheet in which the abbreviated information is expanded using pre-stored information to provide sufficient information to allow both primary routing to a specific telephone number or the secondary fax message cover sheets to be routed by a human or a machine to be delivered to the intended recipient.

The present invention acts as a bridge between today's manually prepared cover sheets and those

capabilities found in E-mail systems that automatically route and store messages as well as processing other non-obvious features.

Brief Description of the Figures

Figure 1 shows one form of a standardized cover sheet 12 for use with the present invention.

Figure 2A shows an alternative cover sheet to that of Figure 1.

Figure 2B shows another variant of the cover sheet of Figure 1.

Figure 3 shows a form for the entry of a mailing list into the memory of the fax server.

Figure 4 shows a graphical representation of one function of the present invention.

Figure 5 is a flow chart that illustrates the "Analyze And Create" function of the fax server illustrated in block diagram form in Figure 4.

Figure 6 is a flow chart that is more detailed than Figure 5.

Figure 7 shows a typical block diagram of a fax server with which the present invention can be utilized.

Figure 8 is a simplified flow chart of the operation of the fax server in the mode of the present invention.

Figure 9 represents a form to present the

status of received fax mail to a fax mail box user.

Figure 10 is a block diagram that illustrates the connection of the described fax server to a conventional voice PBX.

Figure 11 is a sub-routine for checking the validity of an identification pattern of a received form and to load the form identification format into the fax server for automatic reading of the received form.

Description of the Preferred Embodiment

Figure 1 shows one form of a standardized cover sheet 12 for use with the present invention. The layout of this form is similar to an envelope and includes several features. In the upper right corner 10, in the location of a stamp on an envelope, is a binary coded form identification pattern 14. This pattern includes 63 binary interior bits in 9 rows of 7 columns with 2^{63} different combinations surrounded along each of the four edges of the identification pattern 14 by a single bit wide row or column of alternating black and white squares. These outer edge bits are provided to determine the orientation of a transmitted form since pages are often feed through a fax machine crooked and thus received skewed. With that many possible different forms, it is possible to permit each user to customize their own cover sheets. Also, if there are more forms that are desired than there are possible numbers, another row or column can be easily added to identification pattern 14 which will increase the number of possible form numbers by a factor equal to the number of the columns or rows in the

direction that the pattern was not increased. This thus results in the number of form numbers being virtually open-ended.

Identification pattern 14, with its many possible designs, is very distinctive thus allowing each form layout to have its own identification pattern. Also, the identification pattern can be recognize by the receiving fax server regardless of its location on the form or whether the form is sent to the fax server either top edge or bottom edge first. To simplify and speed up the reading of each of the standard forms that can be developed, it is suggested that the identification pattern on each form be placed on each form in the same location. Thus, since the fax server expects to always find the identification pattern 14 in the same corner of each of the different types of cover sheets, the fax server will be able to determine if the transmitted cover sheet is right-side up or up-side down upon examination the location of pattern 14 on the received form given the expected location of the identification pattern 14.

The selection of a rectangular shape for identification pattern 14 with square bits provides two advantages to the rapid identification of the cover sheet 12 when it is received. One advantage is the ease with which the fax server can locate the identification pattern 14. A second advantage is that by using square bits in identification pattern 14 will allow the fax server to size the overall document, or to correct for any horizontal or vertical distortions that might occur that make the square bits rectangular instead of square.

Cover sheet 12 also includes three fields 16

each designed to accept dot constrained hand printed characters, and a larger message field 18 along the bottom to accept typed or written messages. The technique of reading hand printed characters is described more fully in a co-pending U.S. Patent Application entitled "Dot Constrained Hand Printed Character Recognition System And Method" having serial number 07/563,198, filed on August 3, 1990, and assigned to the same assignee as the present application. The details of the invention of the co-pending application are incorporated herein by reference.

Referring next to Figure 2A there is an alternative cover sheet 12' which includes an identification pattern 14', dot constrained fields 16', and mark sense squares 20. Identification pattern 14' is in the same location as identification pattern 14 on cover sheet 12. Not only does identification pattern 14' identify the type of form transmitted to the fax server, it also identifies the location and type of each other field on the form for easy recognition by the fax reader subsystem of the fax server. For example, cover sheet 12' includes fields 16' to accept hand printed characters and mark sense squares 20 that may be filled in by the user. Various ones of the mark sense squares 20 could be used for the party transmitting the fax to selected various services or special treatment that is desired, or the final receiving party. For example, each of mark sense squares 20 could be used for the user to identify whether the fax mail being send is to be private, how long it is to be retained on the system, to whom a blind copy of the message should be sent, to select recipient(s) of the message from a predefined distribution list, or to select a

standard stored message that may be timely to send to the named recipient.

Figure 2B shows another variant of the cover sheet 12" with a different form identification pattern 14" and two dot constrained character fields 16". With this form the areas of the form that are not within the fields 14" and 16" are available for conveying additional information, if desired. For example, the left field 16" could be used to designate a standard message prestored in the fax server that is to be sent to a recipient identified in the right most filed 16".

In all cases the form identification pattern 14 identifies a unique form layout. This allows for the creation of a single basic standard while retaining the freedom to customize cover sheets for each user's application and avoids the need for an inflexible single standard for the format of the initial cover sheet.

As new forms are added, the software definition of each different form is then added to the fax server system. Depending of the scope of the service which the owner of a fax server wishes to offer, each user can either be required to use the set of forms that have been predefined by the owner of the fax server, or the user can be allowed to generate their own variety of cover sheets. In either case the system will probably be able to identify each of the forms from identification pattern 14 alone. However, if there are more forms on the system than the identification pattern allow will identify, the form identification can be performed by reading both the identification pattern and the "From" line for the identification

of the user from the cover sheet.

The form identification pattern was shown as a bar code in Fig. 2b of U. S. Patent 4,893,333, which is assigned to the same assignee as the present application. While other patterns can be used, it has been found that the checkerboard type pattern of the present invention is particularly suitable for applications where the form may be being read at an angle or upside down from the expected orientation. This arrangement provides the look and feel of a letter envelope where the checkerboard pattern 14 had the appearance of a stamp and the "To" and "From" blocks 16 are the addresses and the senders identification. Additionally, the checkerboard pattern is compact and readable even with distortions and noise found with today's facsimile transmissions.

Although the identification pattern 14 has been discussed above with respect to various cover sheets, it also lends itself to the specification of a sheet that serves other functions, such as a sheet that is a communications vehicle between a user and a fax server, as seen in Figure 3.

Referring to Figure 3 there is shown a form for providing a mailing list 30 to be stored in the memory of the fax server with each mailing list that is created being associated with a particular user. When a user is accepted onto the fax server system they are permitted to input a private mailing list of as many names as permitted. Once the mailing list is entered into the system the amount of information that a user must provide on subsequent cover sheets is reduced, thus minimizing the amount of time necessary for the fax server to

read and act on incoming fax messages. This is possible since abbreviations can be used in future transmissions, and since the number of characters to be read is fewer the time to read the fax message is shorter.

Included in this form are fields to accept abbreviations for the name of a mailing list 40 that contains a series of name fields 32, 32', etc., each described by name abbreviations 34, 34', etc. Along with each name field 32, 32', etc. there is a telephone number field 36, 36', etc., and an extension or local box filed 38, 38', etc. The inclusion of abbreviations 34, 34', etc., the user may use the abbreviations to route fax messages using standard cover sheets once the mailing list is provided so that the fax server can automatically convert the user imputed abbreviation into telephone numbers 36 and extensions 38 which are retained by the fax server from the previously read mailing list form 30. Given mailing list form 30, a user in subsequent messages to link with their previously entered mailing lists must either use the mailing list abbreviation or identify themselves on the cover sheet so that the fax server will utilize the prestored mailing list for that user.

Additionally, a user can add to, or delete from, their prestored mailing list by submitting a new form 30. If the abbreviation for the mailing list entry is on that had not been used before it is considered an addition and if the abbreviation was used before the earlier entry is overwritten thus allowing corrections to be made for changes of address, etc.

Figure 4 shows a graphical representation of one function of the present invention. Initially the user prepares a cover sheet by hand with their name or abbreviation of the desired mailing list of the "From" line and the abbreviations of the intended recipients on the "TO" line, perhaps one of those as shown in Figure 1, and then places that sheet ahead of the document 20 to be transmitted. Fax server 42 reads cover sheet 12, converting identification pattern 14 to a character string that is used as the address to a look-up table when the format information of the cover sheet is store. That format information is inputed to the processor for further analysis of the cover sheet. Following that, if document 20 is to be sent to several different parties on a mailing list, fax server 42 prepares those secondary cover sheets 44, 44', 44", etc., and transmits them to the intended recipient followed by a copy of document 20. Then the received original, or the image of the, cover sheet 46 is discarded (e.g. erased from memory of fax server 42). To prepare the secondary cover sheets 44 with full names and telephone numbers, fax server 42 uses the information on an earlier transmitted mailing lists like that of Figure 3 that has been stored in the memory of fax server 42. Though the use of a service which uses a fax server of the present invention a user having a low end fax machine without all of the bells and whistles can have all of the features of the upper end fax machines, and then some, including abbreviated speed dialing to send messages to long mailing lists and deferred transmission on all messages on a message by message basis. The present invention thus also makes it possible for all fax user to take advantage of the least cost routing algorithms to minimize communications

costs. Additionally, if the fax server is tied into a PBX system as discussed below with respect to Figure 10 trunk charges can be reduced further since the fax server can be tied to an extension of the PBX system instead of to a dedicated trunk telephone line.

Figure 5 is a flow chart that illustrates the "Analyze And Create" function of the fax server 42 that is illustrated in block diagram form in Figure 4. An input cover sheet 48 is received by fax server 42 and the handwritten information in fields 16 is interpreted by techniques described in co-pending patent application entitled "Dot Constrained Hand Printed Character Recognition System And Method" having serial number 07/563,198, filed on August 3, 1990, and assigned to the same assignee as the present application. Then at block 52 fax server 42 checks its memory for previously stored mailing lists for any abbreviations that may have been included on cover sheet 48. Using those abbreviations together with that previously stored information, fax server 42 maps the abbreviations into the fax telephone numbers and names of the intended recipients (block 54), generates the necessary expanded cover sheets (block 56), and routes them with their associated document 20 to each of the intended recipients (blocks 58, 58', 58", etc.) without human intervention.

Figure 6 is a more detailed flow chart than that shown in Figure 5. Here, starting at block 60 the incoming cover sheet is read (block 62). Next, the received form is examined for the identification pattern 14 to determine if the cover sheet is a form which the fax server is programed

to recognize (block 64). If it is not a recognizable form, then the process continues at block 82 where a "non-delivery message" is sent to the user using a prestored fax telephone number for the user followed by an exit from the routine. If the cover sheet is a recognizable form, the process continues at block 66 where all of the abbreviations used on he cover sheet are translated to complete alphabetic names using the prestored address lists in the fax server. Next, at block 68, each of the associated telephone numbers are checked for validity, and then the numbers are called either immediately or at a later stated time. At block 72 fax server 42 generates the secondary routing information electronically to be transmitted to the list of recipients which is done at block 74. Next the system tests the telephone line at block 76 to see if a the message is deliverable, i.e. is there a telephone company intercept when the number is dialed that indicates that the call will not go through. If the message is not deliverable, then the routine goes to block 82 and the routine continues as discussed above. If the message is deliverable, then the routine adds the message to the outgoing queue (block 78), and then the queue is tested to see if any message has been there more than the allowable maximum time. If it hasn't, it is routed back to the beginning of the queue. If it has been in queue more than the allowable time, then the routine continues at block 82 and the routine is exited at block 84. This is all accomplished automatically without human intervention.

Figure 7 shows the block diagram of a version of a fax server that can utilize all of the features of the present invention. The actual fax

server for each implementation may be tailored for the actual application which may have as few as one fax line. The actual implementation shown here is built around a typical personal computer. The heart of the computer is processor 100 with a parallel interface 110, a serial interface 112, an optional mouse 114, a display 116 and a keyboard 118. Processor 100 interfaces with the remainder of the items shown by means of bus 102. Also coupled to bus 102 is a disk controller 104 which controls floppy disk 106 for inputing files and programs as necessary and a hard disk for storing data files and providing quick access to them. Custom compressor card 120 and image card 122 are provided to compress data for fax transmission and to decompress received fax data. Additional fax modems 128-142 are tied to bus 102 to provide multi-channel fax capability with a quad voice board 124 and 126 for audio communication with a caller when there is a problem with the fax channel or if a caller accidentally calls a fax telephone number. The multiple fax cards also make it possible for processor 100 to send or receive the same or different messages at the same time. The last block shown in Figure 7 is an Ethernet card 144 to tie the fax server into an E-mail system. Typical fax modem are made by Gammalink (CP cards) or by Hayes (JT fax), and a typical voice card is a Dialogic D40 quad voice card.

In the example system shown in Figure 7, eight separate fax lines connect incoming and outgoing fax telephone lines to the overall fax server unit. Each telephone line terminates to a fax modem which converts the analog transmitted signals to their original digital patterns. Then the compressed digital data/image is expanded by the compressor

card 120 and image card 122 into a full bit mapped image for analysis. After decompression, the expanded images are examined in processor 100 under the control of OCR software as described in the co-pending application and issued patent both cross-referenced above.

Figure 8 is a simplified operational flow chart of the software operation of the fax server which illustrates the features of the present invention, as well as the prior art touch tone input method. The system of Figure 8 breaks down into three methods of input; fax input 150, audio (touch tone) input 170, and direct terminal input 186. This permits the distant user to direct fax messages by using paper inputs, as described above, as well as touch-tone inputs, and the fax server operator to enter messages and control information directly without requiring machine reading of any images.

The focus of the present invention is upon fax messages received as manual paper input which the cover sheet is translated by machine readable means to create subsequent printed image messages. In Figure 8 the incoming paper messages 150 are read by the fax decode 152 which decompresses (expands) the image. From decoder 152 the fax input is directed to a secondary operation depending on the purpose of the input. It may be provided for the purpose of retrieving data from or updating data in hard drive 108 (Figure 7), to broadcast 158 the fax message to specified additional fax machines or fax-mail boxes, to receive or send a fax 160 as described with respect to the flow chart of Figure 6, or for a user specific purpose 162. The output of decode 152 and operations 154-160 are also

provided to a fax output queue 164 from which fax messages are used to update fax-mail boxes 166 or then transmitted 168 in accordance with the order the fax lines are free. In some cases, traffic is delayed to obtain lower cost transmission rates.

The audio input portion of Figure 8 operates in a similar fashion to the fax input portion with the addition of the possibility of audio output 184. The direct input and control option is provided for system maintenance 188, as well as the broadcast 190 and fax mail send and receive 192 options. Each of these options also can produce an output on the terminal 202, with the system maintenance option having the capability of generating a report 194, maintaining the database 196, and the generation of diagrams, each of which can be directed to a printer 200 or the terminal 202 for display.

The present invention opens a range of new capabilities demonstrated by fax mail form 204 shown in Figure 9. If the fax server includes an Ethernet card 144, as shown in the block diagram of Figure 7, the fax user can have access to fax mail (E-mail) generated and read by computer. Additionally, Ethernet card 144 also makes it possible to tie the fax mail system of the present invention into an existing E-mail system to totally automate the sending of E-mail messages in a secondary stage as was described above for sending secondary fax messages using a single input cover sheet and perhaps a following document that is to be transmitted to numerous parties. Form 204 is sent to a box holder on a particular fax server system when fax mail is received and stored in the box holders box on that system with form 204

presenting the status of received fax mail to the fax mail box holder. The fax server of the present invention translates a minimum amount of input information to create form 204 with essentially the same look and feel for fax mail as is provided by current E-mail systems which require keyboard inputs to generate a similar status report.

Additionally, if the sender has a pre-stored name abbreviation on the fax server this could be shown on form 204 as well. The date and time of each fax transmission is determined by the fax server system, as is the sequential message number, and the number of pages transmitted. Privacy requests initiated by the fax mail sender are indicated by a mark in the privacy column, and the status column indicates whether the message has previously been read by the recipient, or perhaps an indication that the message is to be permanently filed and not to be destroyed. The control input arrangement is by writing a letter in the action column. Allowable action items might include:

A = Acknowledge; send a return acknowledgement that the message has been received, or read;

S = Save; retain this message;

D = Duplicate this message and send it to the following people...;

R = Reply; in the space below;

E = Erase; erases the copy of the fax from memory; or

P = Privacy; invoke privacy on the incoming message (Requires the use of a password for interpretation).

Form 204 can also be used as a cover sheet to send messages, thus there are separate columns for

"To" and "From" fields, as well as a field labeled "Subject". There are two approaches to the labeling of the message subject matter. The first is the use of machine readable fields, in which constrained lettering is used. The second approach is the use of "clipping" wherein the image field is duplicated and printed out in the "Clip Area". Either of these two approaches can be used in this application.

Referring next to Figure 10 the connection of the described fax server 208 to a conventional voice PBX 206 is shown in block diagram form. The invention is supported for both inward (primary) 210 or secondary 212 routing which allows fax machines to be connected as extensions on the PBX rather than tying up full period trunks. When the locally connected fax machine (lines 212) goes off hook, its presence on the line triggers the PBX 206 to connect that extension to fax server 208. The fax traffic is buffered and the hand printed cover sheet is then read. The new outgoing cover sheet is prepared and replaces the hand printed cover sheet, allowing PBX 206 to provide such features as minimum cost routing and shared outgoing trunks with the heavier cross section voice carrying trunks.

If incoming traffic had been generated by a fax server 208 using this invention, then it would be accepted and routed to its target extension fax printer via lines 212. Additional features could also be supported such as dialing the voice telephone of the end users informing him or her by use of a prerecorded message that a fax message is awaiting receipt.

Lastly, Figure 11 is a flow chart for a subroutine for checking the validity of an identification pattern 14 of a form received by the fax server and to load the form identification format into the fax server for automatic reading of the received form. Block 214 is the start of the i^{th} process of the subroutine with block 216 indicating the test for the buffer holding one or more lines of compressed incoming data. If it does not then the process goes to the i+1 mod 8 process for the next line of data (block 240). If the buffer has one or more lines of compressed data then the data is decompressed (block 218) and tested for whether or not there are enough lines to correct for skew of the received document, if any (block 220). If there are not enough lines, then the process goes to block 240, if there are enough lines then the process continues at block 222 where the form identification pattern 14 is read to determine the form number of the received form. Following identification of the form number, that number is tested to determine if it is a valid form number on the receiving fax server system (block 224). If it is not a valid number, then an error exit 1 is generated (block 236) and the process continues at block 240. If the number is a valid number, a look-up table is consulted (block 226) and the subfields of that form as recorded are examined (block 228). Next, a test is performed as to whether or not those subfields can be found on the received document (block 230). If those subfields can not be found, an error exit 2 (block 238) is generated and the process continues at block 240. If those subfields are found, each subfield is read (block 232) and a packet containing the decoded page data is generated (block 234) and the process continues at block 240.

While this invention has been described in several modes of operation, it is contemplated that persons reading the preceding descriptions and studying the drawings will realize various alterations and modifications. It is therefore intended that the following appended claims be interpreted as including all such alterations and modifications as fall within the true spirit and scope of the present invention.

What is claimed is:

1. A machine recognizable fax data sheet to be read automatically by a receiving fax server, said data sheet comprising:

a web for receiving information to be transmitted to said receiving fax server;

at least one preprinted information receiving area on said web having a preselected location and format; and

a machine readable identification pattern that is keyed to the location and format of the preprinted information of the specific fax data sheet.

2. A fax data sheet as in claim 1 wherein said identification pattern includes:

an interior binary pattern of n rows and m columns of bits with a unique pattern being selected for each of the various data sheets; and

a one bit wide edge of an alternating bit pattern surrounding said interior binary pattern to determine the orientation of the data sheet when received by the fax server.

3. A fax data sheet as in claim 1 wherein said at least one preprinted information receiving area includes dot constrained data entry fields for entering handwritten data to be read by the receiving fax server.

4. A fax data sheet as in claim 1 wherein said at least one preprinted information receiving area includes mark sense entry fields for entering responses to questions preprinted on the data sheet so that those responses can be read by the receiving fax server.

5. A fax data sheet as in claim 2 wherein each of the binary bits of said interior and edge binary patterns is a square.

6. A fax data sheet as in claim 3 wherein:

a first data receiving area is for providing information as to the sender of the fax; and

a second data receiving area for receiving information to be stored in the fax server.

7. A fax data sheet as in claim 1 wherein said at least one preprinted information receiving area includes:

a first data receiving area being a dot constrained field for receiving hand written characters that designated the source of the fax data sheet;

a second data receiving area being a dot constrained field for receiving hand written characters that designated the destination of a message on the fax data sheet; and

a third data receiving area for receiving a message to be automatically secondarily transmitted to the destination identified in the second data area.

8. A fax data sheet as in claim 7 wherein said third data receiving area is dot constrained to receive a hand written message.

9. A fax data sheet as in claim 7 wherein said third data receiving area is unconstrained to receive a clipped message.

10. A fax data sheet as in claim 1 wherein said at least one preprinted information receiving area includes:

a first area for individually naming said data sheet to serve as a pointer to memory locations of the fax server where the information recorded on the data sheet is stored; and

a plurality of identical second fields for user entry of a name, a fax telephone number, and a name abbreviation in corresponding subfields to create a personalized mailing list for storage in the fax server.

11. A fax data sheet as in claim 10 wherein each of said plurality of second fields further includes a subfield for entry of a fax mail box number.

12. A fax data sheet as in claim 1 wherein said at least one preprinted information receiving area includes:

a first area containing the name, box number and fax telephone number of a fax mail user; and

a second area containing a first plurality of lines each divided into a second plurality of columns to report to the user identified in said first area the arrival and status of fax mail messages on the fax server system for that user.

13. A method for entering a machine recognizable fax data sheet to be read automatically by a receiving fax server, said method comprising the steps of:

a. providing a web for receiving information to be transmitted to said receiving fax server, said web defining thereon a machine readable identification pattern that is keyed to the location and format of the preprinted information of the specific fax data sheet and at least one preprinted information receiving area having a

preselected location and format;

b. selectively entering data into said at least one information receiving area defined by said web;

c. optically scanning said web;

d. generating an electrical signal corresponding to said machine readable identification pattern on said web;

e. decoding the location and format of said at least one preprinted information receiving area; and

f. reading the data entered into said at least one information receiving area.

14. A method as in claim 13 wherein:

said identification pattern of step a. includes:

an interior binary pattern of n rows and m columns of bits with a unique pattern being selected for each of the various data sheets; and

a one bit wide edge of an alternating bit pattern surrounding said interior binary pattern to determine the orientation of the data sheet when received by the fax server; and

step d. includes the steps of:

g. determining the orientation of the received fax by identifying the location of the identification pattern on the received fax;

h. reorienting the received fax data sheet using the information of step g.; and

i. generating a serial bit stream representative of the form number encoded in the identification pattern by reading the reoriented identification pattern left to right, top to bottom.

15. A method for the automatic secondary

routing of fax messages with a fax server, the method comprising the steps of:

a. completing a preprinted fax data sheet, said data sheet defining thereon a machine readable identification pattern that is keyed to the location and format of the preprinted information of the specific fax data sheet and at least one preprinted information receiving area having a preselected location and format that includes information indicative of the identity of the intended recipient of the secondarily routed fax message;

b. transmitting said data sheet of step a. via a fax machine to the fax server;

c. said fax server generating an electrical signal corresponding to said machine readable identification pattern on said fax data sheet;

d. said fax server decoding the location and format of said at least one preprinted information receiving area;

e. said fax server reading the data entered into said at least one information receiving area;

f. said fax server automatically identifying the fax telephone number of the intended recipient from the memory of the fax server using the information provided on the received fax data sheet;

g. formatting the identified message to the identified recipient; and

h. delivering the message to the intended recipient.

16. A method as in claim 15 wherein:

said identification pattern of step a. includes:

an interior binary pattern of n rows and m columns of bits with a unique pattern being

selected for each of the various data sheets; and

a one bit wide edge of an alternating bit pattern surrounding said interior binary pattern to determine the orientation of the data sheet when received by the fax server; and

step d. includes the steps of:

i. determining the orientation of the received fax by identifying the location of the identification pattern on the received fax data sheet;

j. reorienting the received fax data sheet using the information of step i.; and

k. generating a serial bit stream representative of the form number encoded in the identification pattern by reading the reoriented identification pattern left to right, top to bottom.

17. A method as in claim 16 further including the step of:

l. determining the ratio of size of the images on the received fax data sheet to those of the transmitted data sheet by examining the size relationship between the alternating edge bits of the identification pattern in the received fax data sheet to the known size of the edge bits of the identification pattern on the transmitted fax data sheet.

18. A method as in claim 15 prior to step a. further including the steps of:

m. completing a fax mailing list data sheet containing a first area for individually naming said data sheet to serve as a pointer to memory locations of the fax server where the information recorded on the data sheet is stored, and a plurality of identical second fields for user

entry of a name, a fax telephone number, and a name abbreviation in corresponding subfields to create a personalized mailing list for storage in the fax server;

n. transmitting the completed mailing list of step m. to the fax server;

o. said fax server decoding said transmitted mailing list; and

p. said fax server storing said decoded mailing list of step o. in the memory of the fax server.

19. A system for automatically secondarily routing of fax messages comprising:

a machine recognizable fax data sheet including:

a web for receiving information to be transmitted to said receiving fax server;

at least one preprinted information receiving area on said web having a preselected location and format; and

a machine readable identification pattern that is keyed to the location and format of the preprinted information of the specific fax data sheet;

a user controlled fax machine for primary transmission of said data sheet;

a fax serve including:

means for decoding said identification pattern of said data sheet:

means for reading the information in said at least one preprinted information receiving area;

means for automatic preparation of said secondary message in response to said primary message transmission; and

means for sending said secondary message

to the desired recipient.

20. A system as in claim 19 wherein said fax server further includes:

means for defining fax mail box locations; and

means for secondarily delivering the desired message to the recipient's fax mail box.

21. A system as in claim 19 wherein said fax server secondarily delivers the desired message to the recipient's fax machine.

22. A system as in claim 19 further including a PBX system to which said fax server is connected to a countable number of extension lines for receiving primary transmissions from and transmitting secondary transmissions to external lines and other extensions of said PBX system.

23. A system as in claim 19 further including a PBX system to which said fax server is connected to a countable number of extension lines for receiving primary transmissions from external lines and other extensions of said PBX system, for making secondarily providing the selected recipient with the desired message in the recipient's fax mail box that is available either from an external line or another extension on the PBX system.

24. A fax data sheet as in claim wherein said machine readable identification pattern is located in the upper right hand corner of the fax data sheet, and said at least one preprinted information receiving area is located to the left of said machine readable identification pattern to give the fax data sheet the look and feel of an envelope with the identification pattern in the position of

a stamp and the information receiving area in the position of an address.

25. A method as in claim 13 wherein said machine readable identification pattern on the web of step a. is located in the upper right hand corner of the web, and said at least one preprinted information receiving area of the web of step a. is located to the left of said machine readable identification pattern to give the web the look and feel of an envelope with the identification pattern in the position of a stamp and the information receiving area in the position of an address.

26. A method as in claim 15 wherein step h. includes the step of:

q. delivering the message to the intended recipient's fax mail box.

27. A method as in claim 15 wherein step h. includes the step of:

r. delivering the message to the intended recipient's electronic mail box.

28. A system as in claim 19 wherein said fax server further includes input/output means for interfacing said fax server to an electronic mail system.

29. A method as in claim 14 before step a. further including the steps of:

s. allocating a countable number of said identification patterns to at least one user; and

t. storing the layout of each of the user defined fax data sheets associated with said countable number of identification patterns from step s. in the fax server.

30. A fax data sheet as in claim 2 wherein the location and type of information receiving areas are user definable for a countable number of identification patterns that are reserved for said user.

FIG. 1

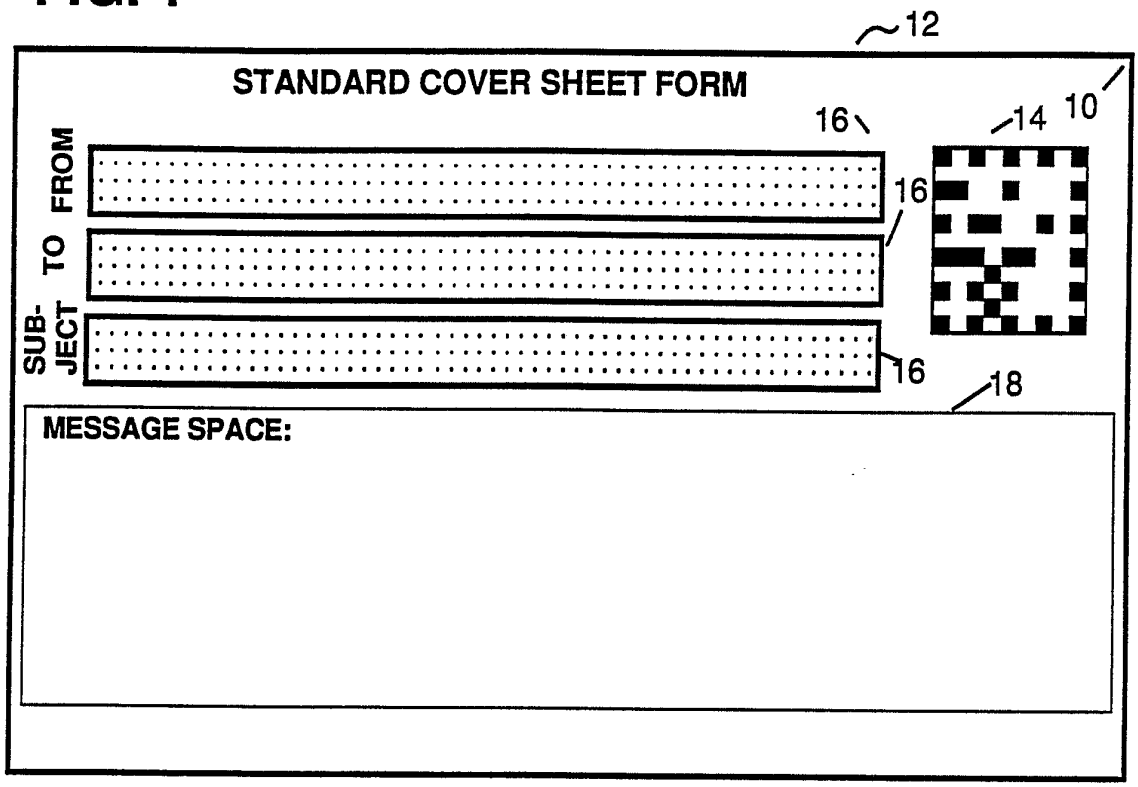

12
STANDARD COVER SHEET FORM
10
16
14
FROM
TO
SUB-
JECT
16
16
18
MESSAGE SPACE:

FIG. 2A

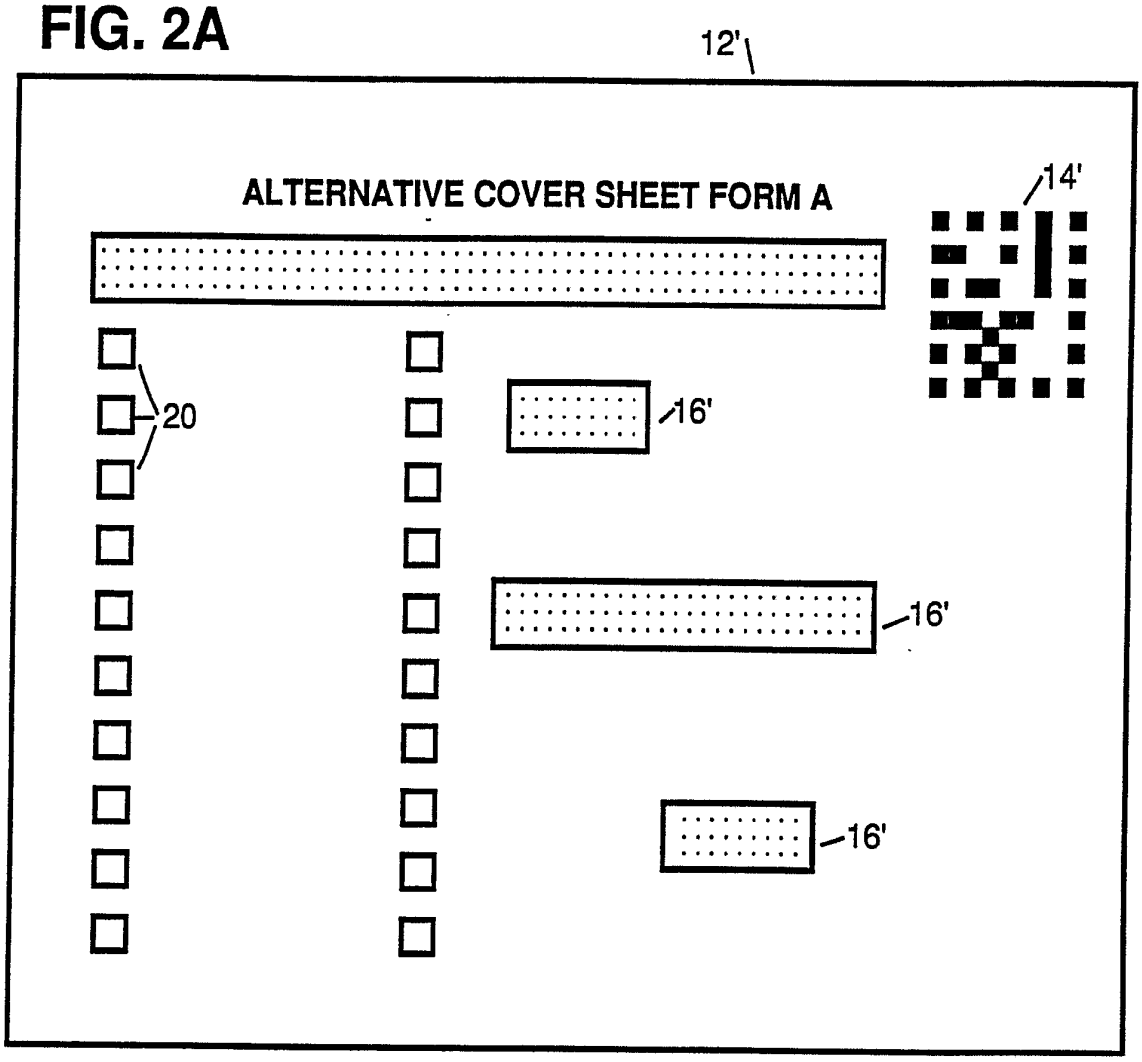

12'
ALTERNATIVE COVER SHEET FORM A
14'
20
16'
16'
16'

FIG. 2B

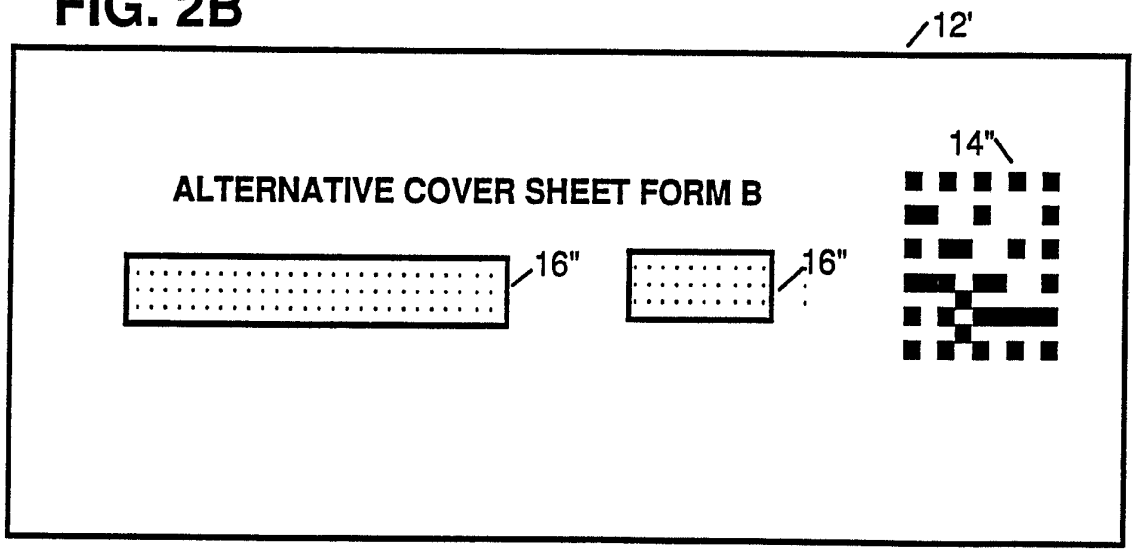

12'
14"
ALTERNATIVE COVER SHEET FORM B
16"
16"

FIG. 3

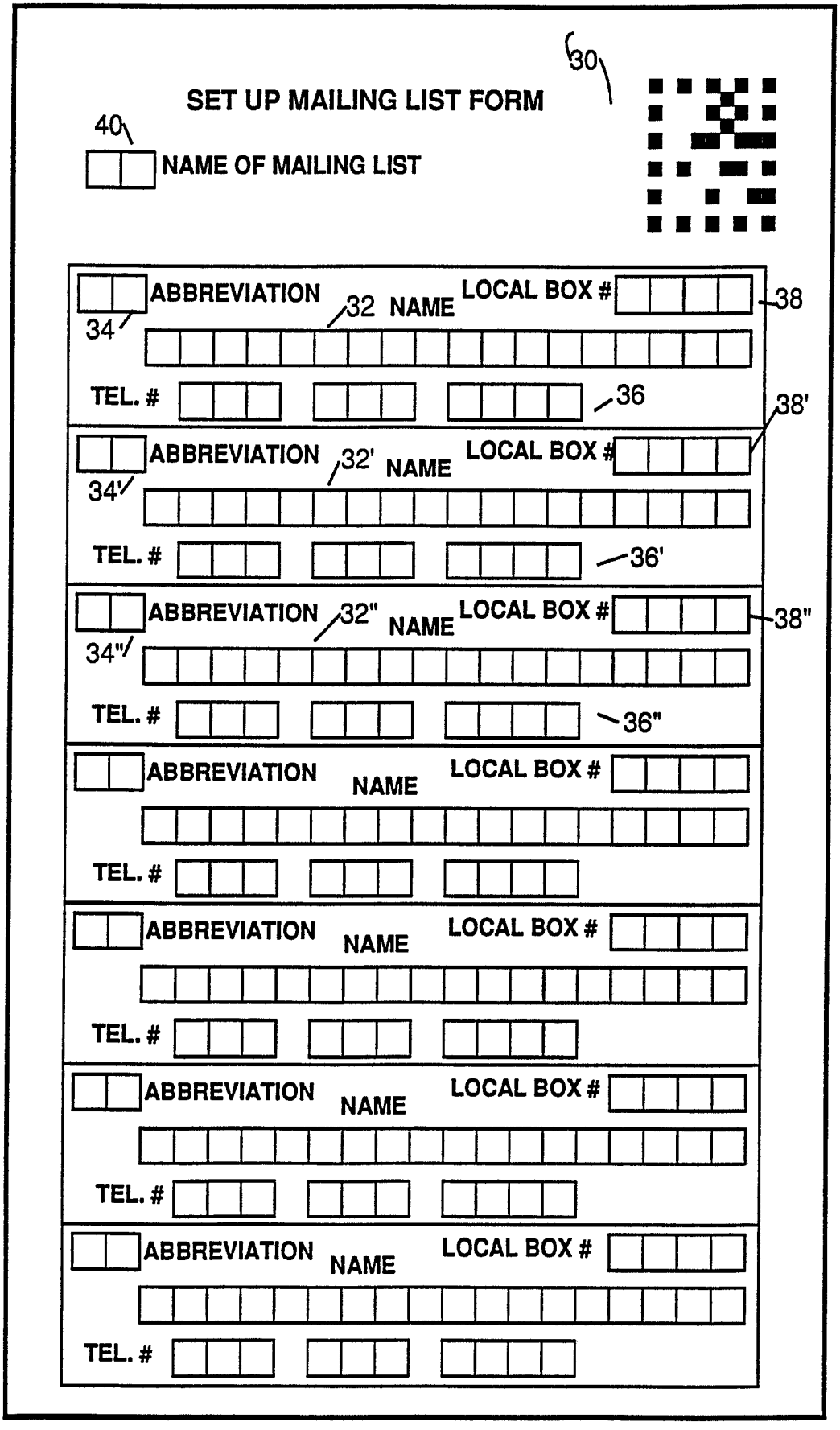

30
SET UP MAILING LIST FORM
40
NAME OF MAILING LIST
ABBREVIATION
32 NAME
LOCAL BOX #
38
34
TEL. #
36
38'
ABBREVIATION
32' NAME
LOCAL BOX #
34'
TEL. #
36'
ABBREVIATION
32" NAME
LOCAL BOX #
38"
34"
TEL. #
36"
ABBREVIATION
NAME
LOCAL BOX #
TEL. #
ABBREVIATION
NAME
LOCAL BOX #
TEL. #
ABBREVIATION
NAME
LOCAL BOX #
TEL. #
ABBREVIATION
NAME
LOCAL BOX #
TEL. #

FIG. 4

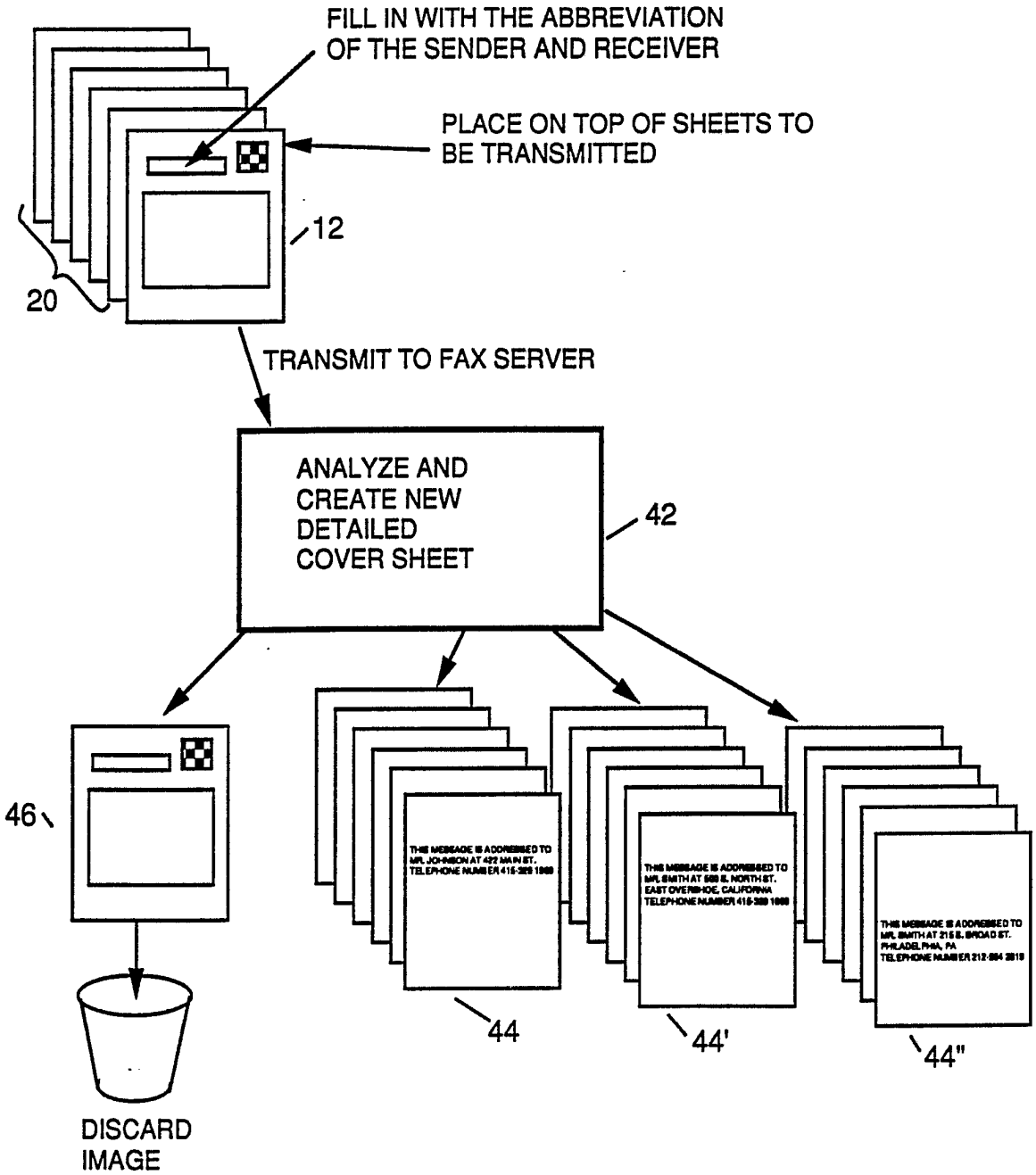

FILL IN WITH THE ABBREVIATION
OF THE SENDER AND RECEIVER
PLACE ON TOP OF SHEETS TO
BE TRANSMITTED
12
20
TRANSMIT TO FAX SERVER
ANALYZE AND
CREATE NEW
DETAILED
COVER SHEET
42
46
DISCARD
IMAGE
44
44'
44"

FIG. 5

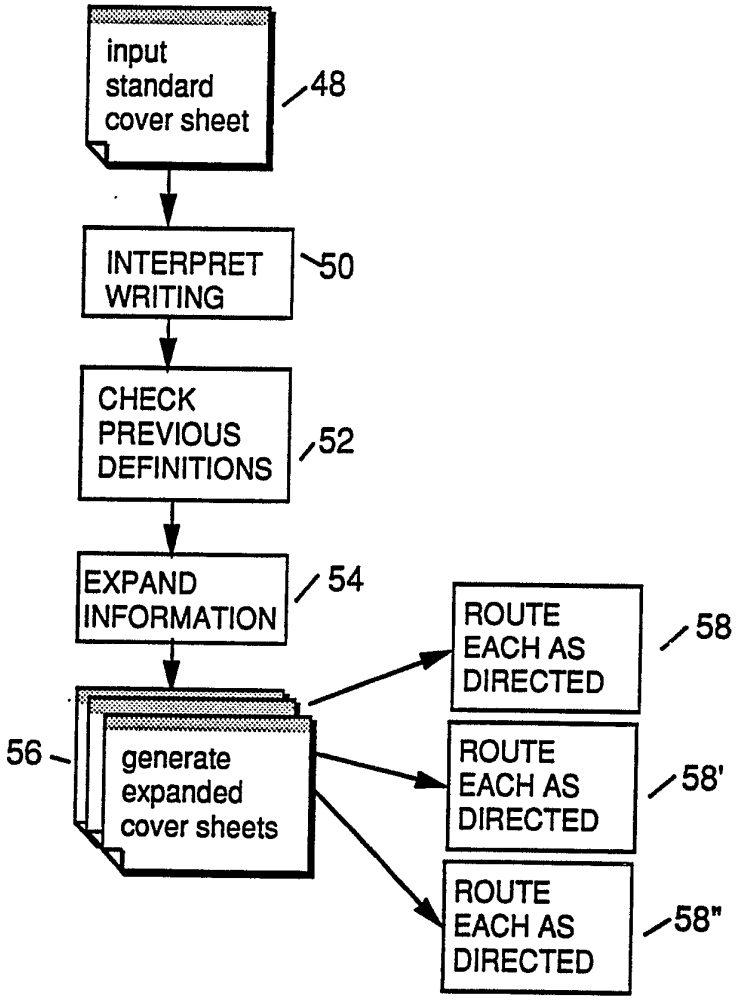

input standard cover sheet
48
INTERPRET WRITING
50
CHECK PREVIOUS DEFINITIONS
52
EXPAND INFORMATION
54
56
generate expanded cover sheets
ROUTE EACH AS DIRECTED
58
ROUTE EACH AS DIRECTED
58'
ROUTE EACH AS DIRECTED
58"

FIG. 6

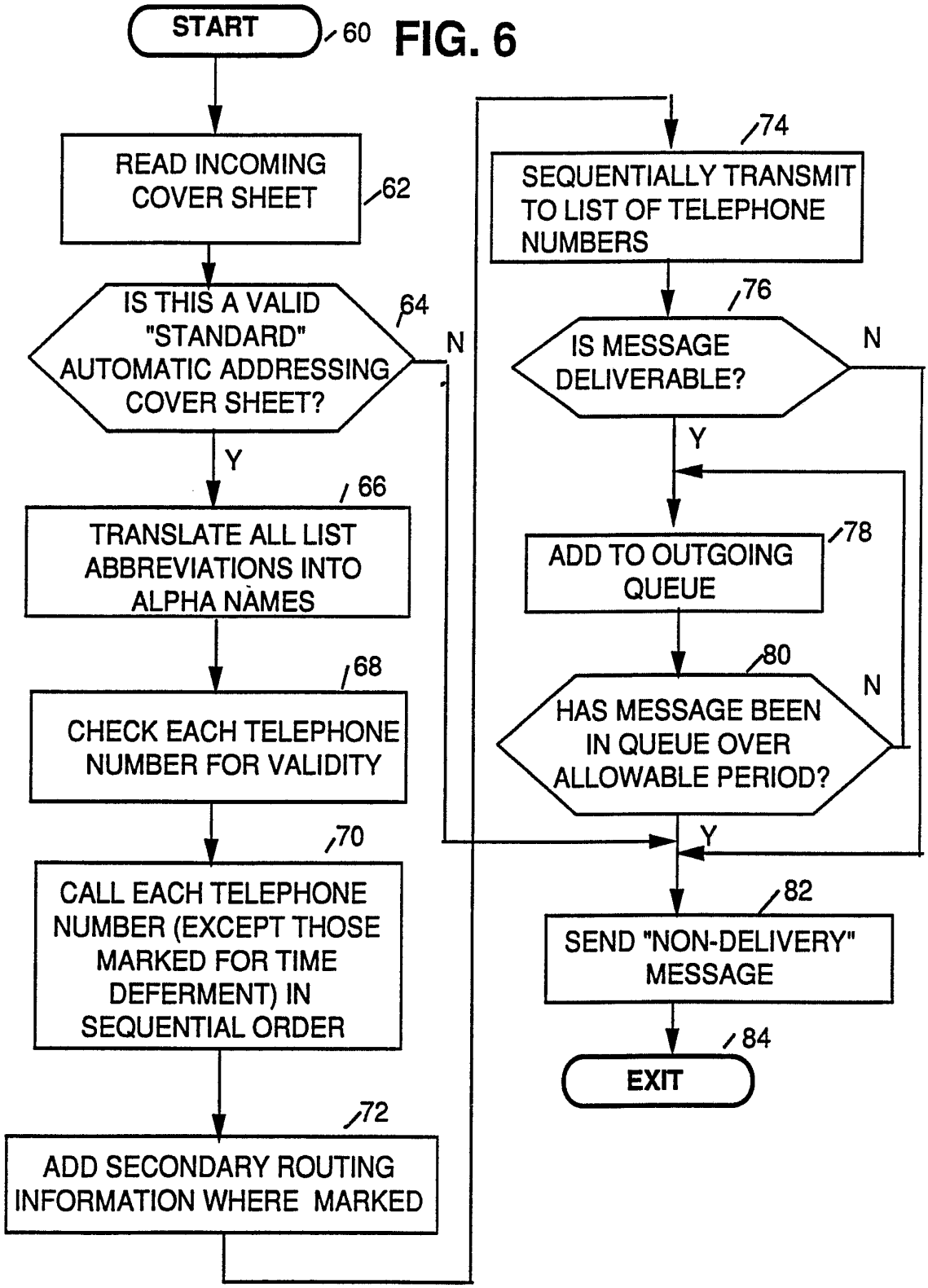

START
60
READ INCOMING COVER SHEET
62
IS THIS A VALID "STANDARD" AUTOMATIC ADDRESSING COVER SHEET?
64
N
Y
TRANSLATE ALL LIST ABBREVIATIONS INTO ALPHA NAMES
66
CHECK EACH TELEPHONE NUMBER FOR VALIDITY
68
CALL EACH TELEPHONE NUMBER (EXCEPT THOSE MARKED FOR TIME DEFERMENT) IN SEQUENTIAL ORDER
70
ADD SECONDARY ROUTING INFORMATION WHERE MARKED
72
SEQUENTIALLY TRANSMIT TO LIST OF TELEPHONE NUMBERS
74
IS MESSAGE DELIVERABLE?
76
N
Y
ADD TO OUTGOING QUEUE
78
HAS MESSAGE BEEN IN QUEUE OVER ALLOWABLE PERIOD?
80
N
Y
SEND "NON-DELIVERY" MESSAGE
82
EXIT
84

FIG. 7

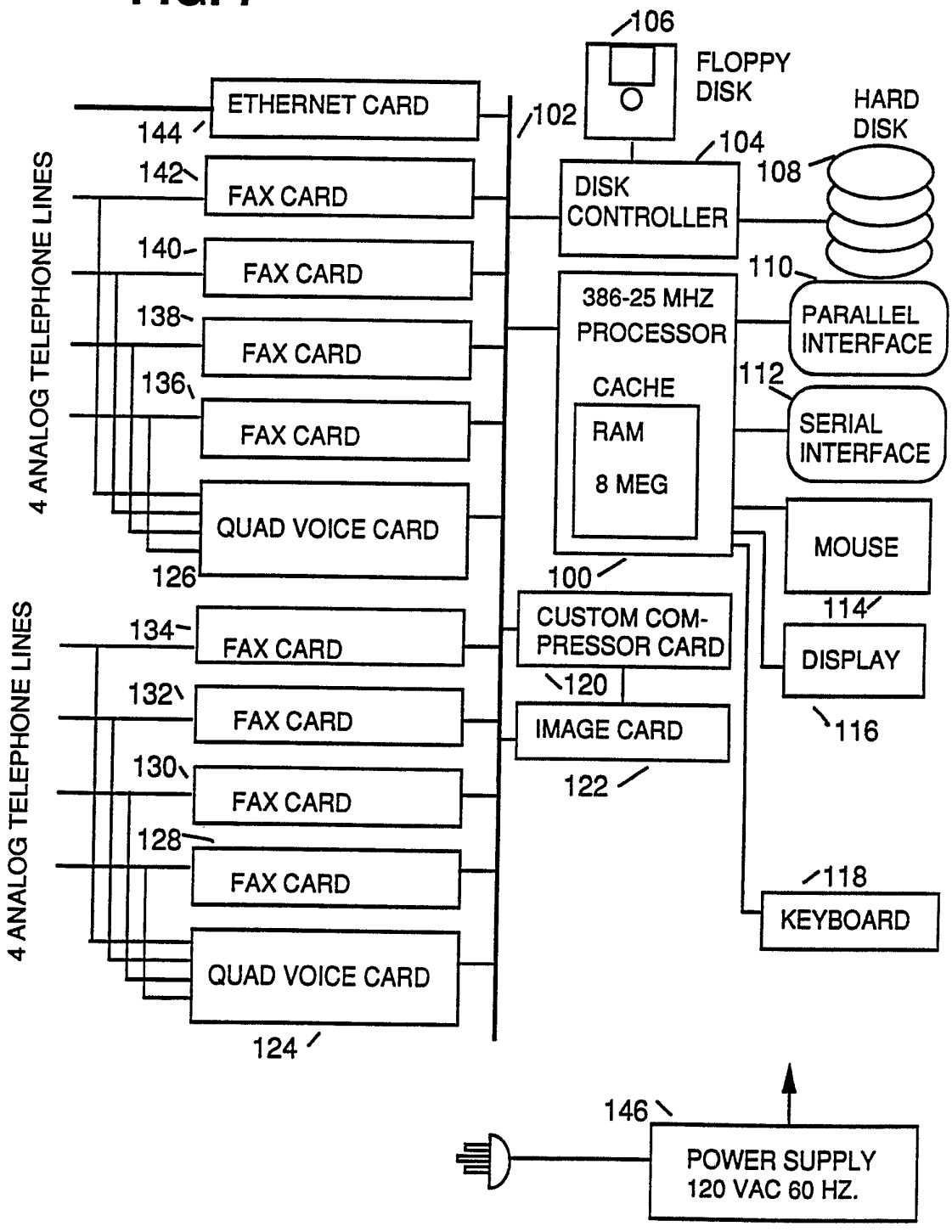

106
FLOPPY DISK
HARD DISK
ETHERNET CARD
144
102
104
108
DISK CONTROLLER
142
FAX CARD
140
FAX CARD
110
386-25 MHZ PROCESSOR
PARALLEL INTERFACE
138
FAX CARD
CACHE
112
136
FAX CARD
RAM
8 MEG
SERIAL INTERFACE
4 ANALOG TELEPHONE LINES
QUAD VOICE CARD
126
MOUSE
100
114
134
FAX CARD
CUSTOM COM-PRESSOR CARD
DISPLAY
120
132
FAX CARD
IMAGE CARD
116
122
130
FAX CARD
128
FAX CARD
118
KEYBOARD
4 ANALOG TELEPHONE LINES
QUAD VOICE CARD
124
146
POWER SUPPLY
120 VAC 60 HZ.

FIG. 8

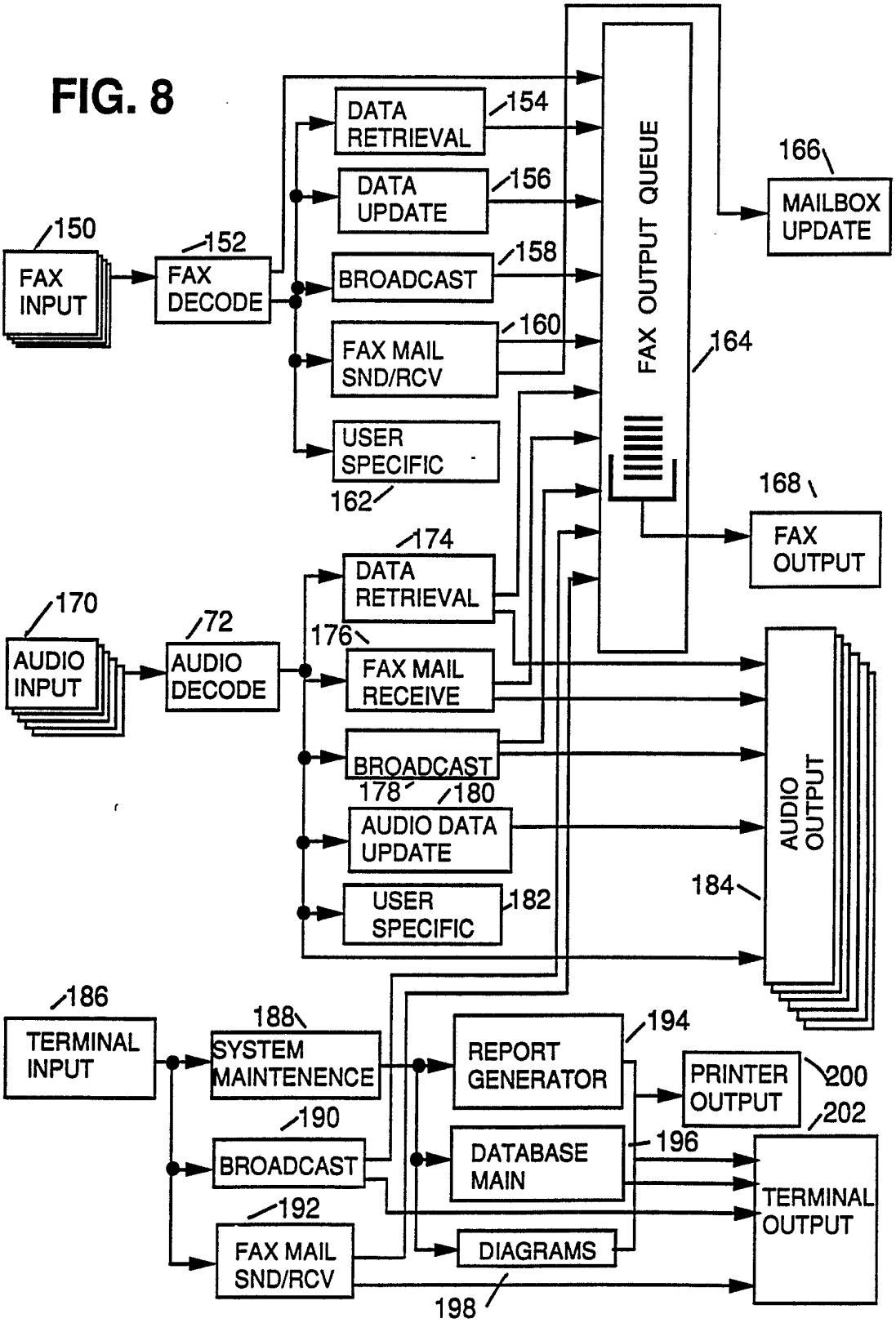

FAX INPUT
150
FAX DECODE
152
DATA RETRIEVAL
154
DATA UPDATE
156
BROADCAST
158
FAX MAIL SND/RCV
160
USER SPECIFIC
162
FAX OUTPUT QUEUE
164
MAILBOX UPDATE
166
FAX OUTPUT
168
AUDIO INPUT
170
AUDIO DECODE
172
DATA RETRIEVAL
174
FAX MAIL RECEIVE
176
BROADCAST
178
AUDIO DATA UPDATE
180
USER SPECIFIC
182
AUDIO OUTPUT
184
TERMINAL INPUT
186
SYSTEM MAINTENENCE
188
BROADCAST
190
FAX MAIL SND/RCV
192
REPORT GENERATOR
194
DATABASE MAIN
196
DIAGRAMS
198
PRINTER OUTPUT
200
TERMINAL OUTPUT
202

FIG. 9

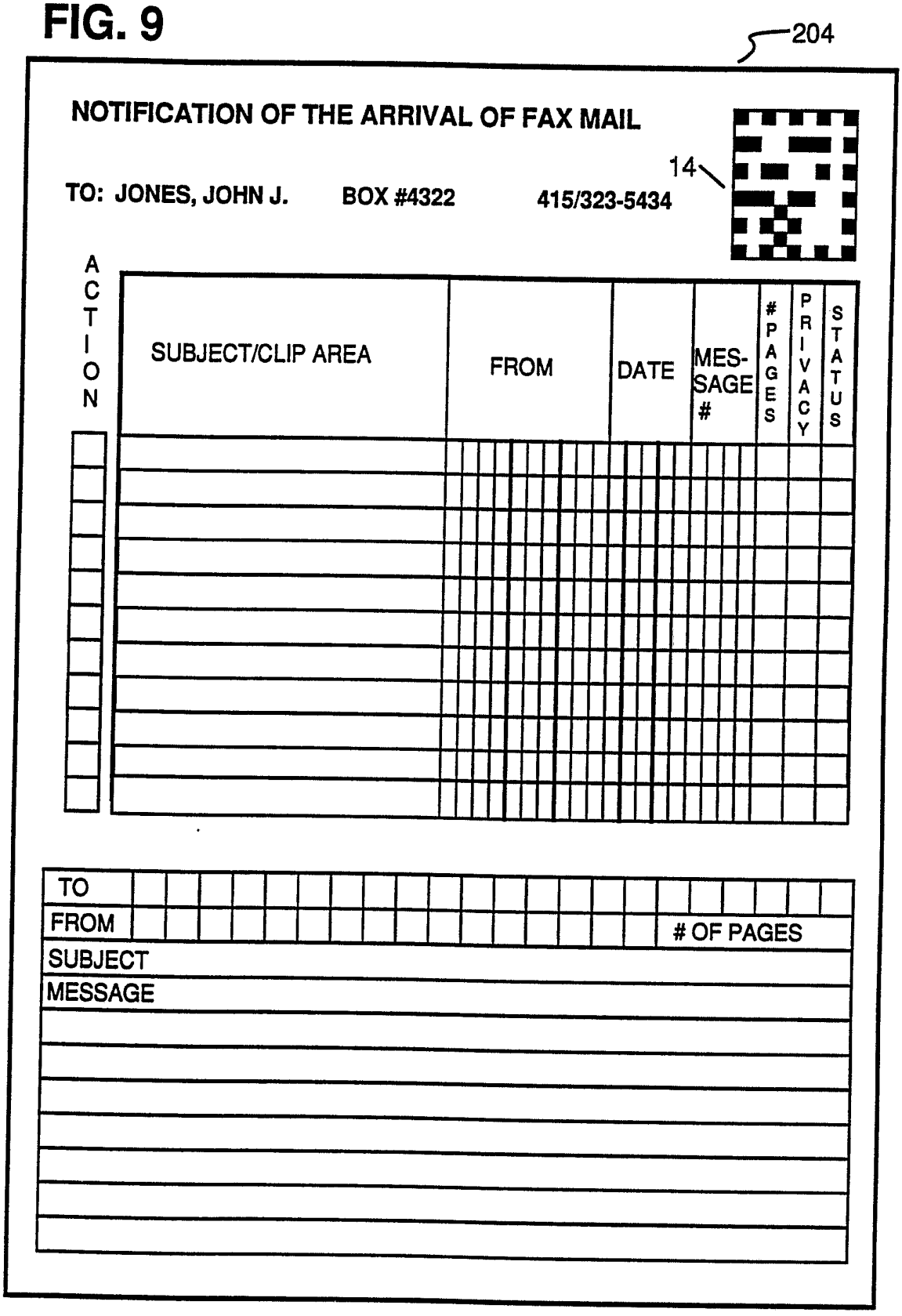
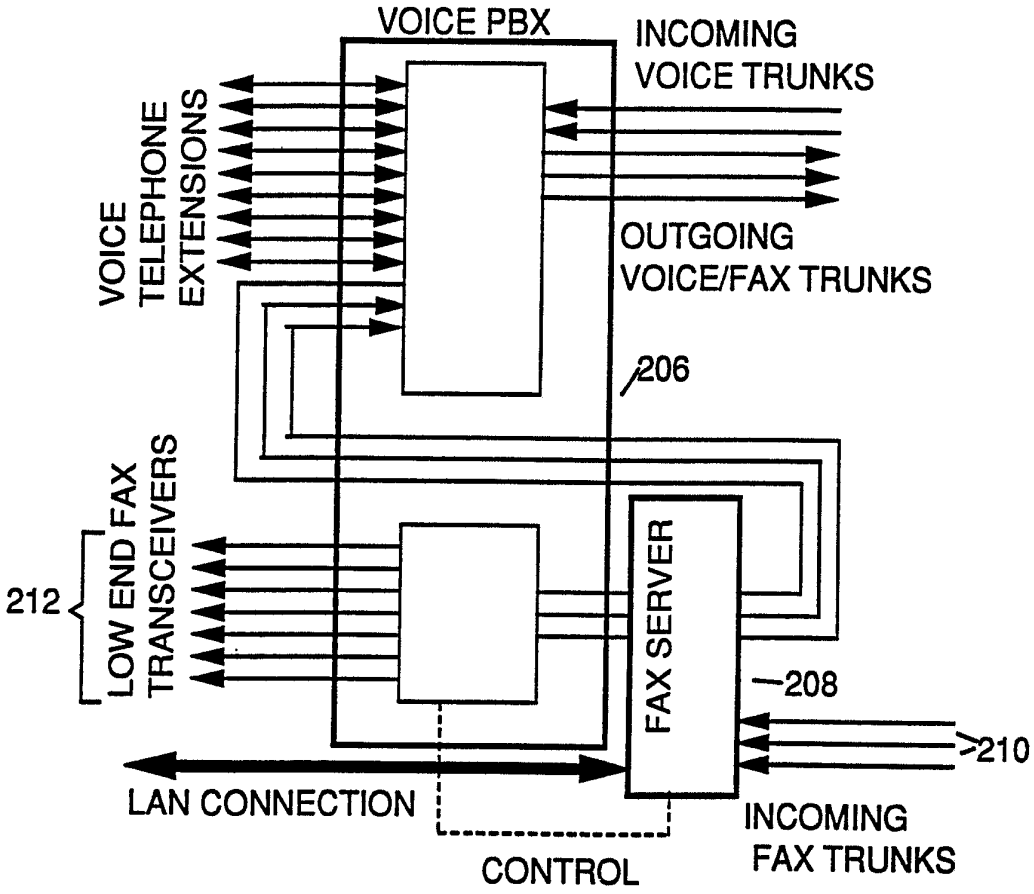

204
NOTIFICATION OF THE ARRIVAL OF FAX MAIL
14
TO: JONES, JOHN J. BOX #4322 415/323-5434
ACTION
SUBJECT/CLIP AREA
FROM
DATE
MES-SAGE #
PAGES
PRIVACY
STATUS
TO
FROM
OF PAGES
SUBJECT
MESSAGE

FIG. 10


VOICE PBX
INCOMING
VOICE TRUNKS
VOICE
TELEPHONE
EXTENSIONS
OUTGOING
VOICE/FAX TRUNKS
206
LOW END FAX
TRANSCEIVERS
212
FAX SERVER
208
210
LAN CONNECTION
CONTROL
INCOMING
FAX TRUNKS

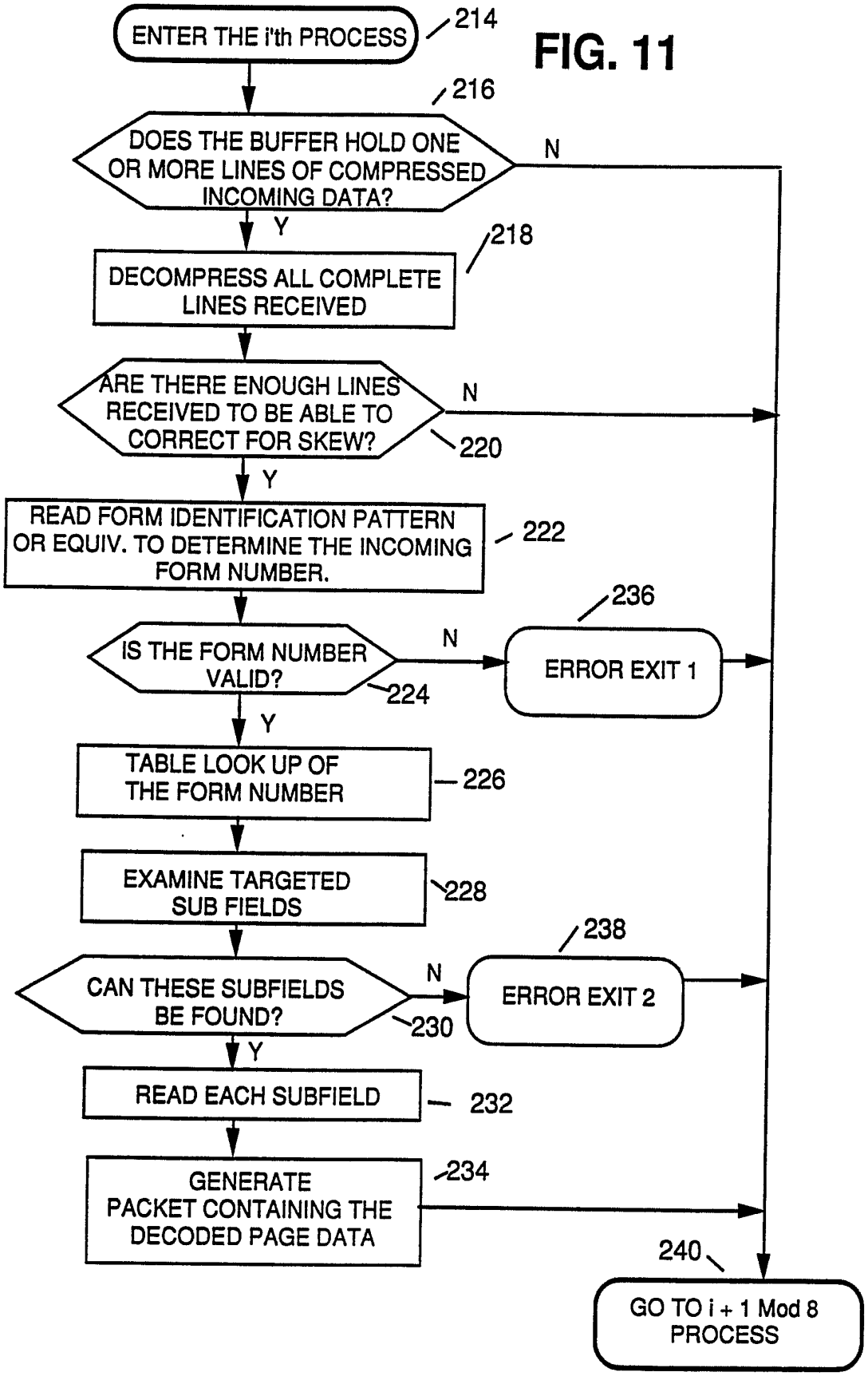

ENTER THE i'th PROCESS
214
DOES THE BUFFER HOLD ONE OR MORE LINES OF COMPRESSED INCOMING DATA?
216
N
Y
DECOMPRESS ALL COMPLETE LINES RECEIVED
218
ARE THERE ENOUGH LINES RECEIVED TO BE ABLE TO CORRECT FOR SKEW?
N
220
Y
READ FORM IDENTIFICATION PATTERN OR EQUIV. TO DETERMINE THE INCOMING FORM NUMBER.
222
IS THE FORM NUMBER VALID?
N
236
ERROR EXIT 1
224
Y
TABLE LOOK UP OF THE FORM NUMBER
226
EXAMINE TARGETED SUB FIELDS
228
CAN THESE SUBFIELDS BE FOUND?
N
238
ERROR EXIT 2
230
Y
READ EACH SUBFIELD
232
GENERATE PACKET CONTAINING THE DECODED PAGE DATA
234
240
GO TO i + 1 Mod 8 PROCESS

FIG. 11

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US91/07289

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

INT. CL.(5): H04N 1/00

U.S. CL.: 358/440, 382/61,283/61

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
U.S.	382/61,11,13 358/440,434,403,402 283/61,62,117 209/3.1,3.3

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US,A, 4,352,012 (VERDERBER ET AL) 28 SEPTEMBER 1982 See whole document.	1-4,13,15,30
Y		5-12,14,16-18
Y,P	US, A, 5,001,572 (HASHIMOTO ET AL.) 19 MARCH 1991 See summary.	1-30
Y,P	US,A, 4,978,145 (MIKHAIL) 18 DECEMBER 1990 SEE COLUMN 3, LINE 12,TO COLUMN 4, LINE 33.	1,3,6,8,9,13
Y	US,A, 3,995,741 (HENDERSON) 07, DECEMBER 1976, SEE FIGURE 1.	1,2,16,24,25
A	US,A, 4,776,464 (MILLER ET AL.) 11, OCTOBER 1988 SEE FIGURE 2 AND ABSTRACT.	1-30

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
20 DECEMBER 1991	09MAR 1992
International Searching Authority	**Signature of Authorized Officer**
ISA/US	STEVEN P. KLOCINSKI

Form PCT/ISA/210 (second sheet) (Rev.11-87)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 3,558,859 (DILSNER ET AL.) 26 JANUARY 1971) SEE WHOLE DOCUMENT.	1-30