

[54] **COMPUTERIZED FACSIMILE (FAX) SYSTEM AND METHOD OF OPERATION**

5,287,199 2/1994 Zoccolillo 358/402

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[57] **ABSTRACT**

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A fax system is automated herein by using a modem (10), a computer (12), and an office network which coupled the computer (12) to a plurality of end-user computers (26). A fax is received by the computer (12) through the modem (10). Once the fax is received by the computer (12), a program (14) stores the fax in a computer file (15) in a non-text format. Code (18) converts the non-text format of file (15) to a text format (17) which is read by a pattern recognition program (18). The program (18) determines, from the file (17), a destination of the fax document. The destination can be one or more of a printer (24), a computer in the plurality of computers (26), a default computer, or a default storage location (e.g., disk storage). A log file (19) is kept by computer (12) to record the operations of the computer (12) and receipt and routing information regarding received faxes. The control code (22) coordinates the other programs in memory (13).

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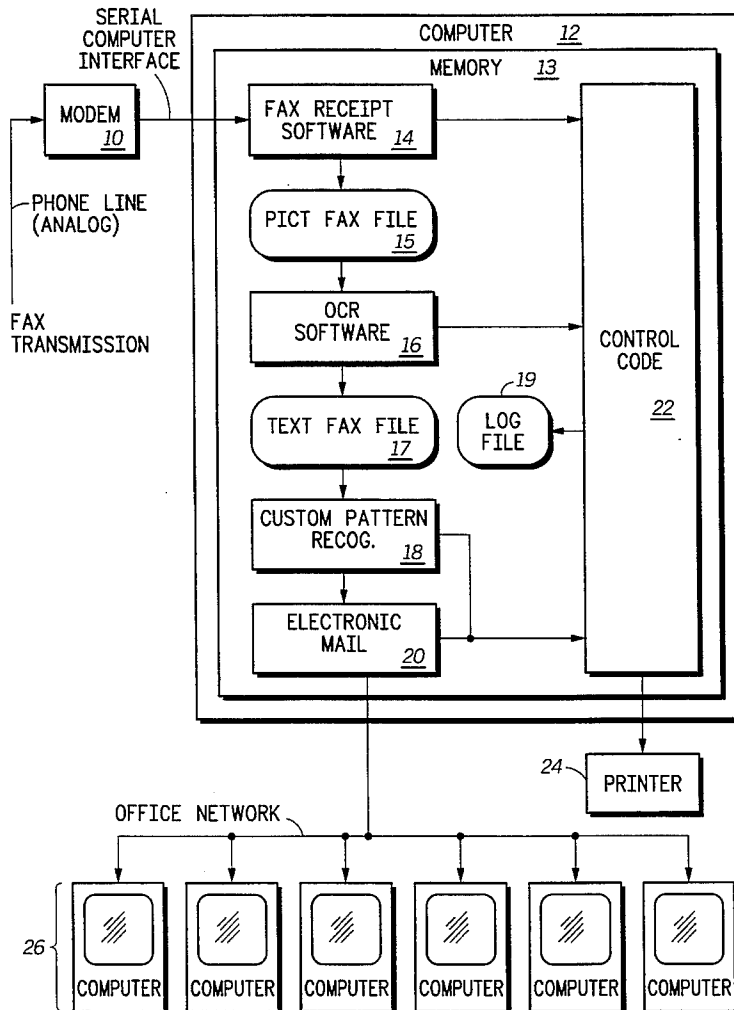
[58] Field of Search 358/402, 407; 358/434, 440, 468, 442, 444; 379/100; 395/200, 325

[56] **References Cited**

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39 Claims, 2 Drawing Sheets



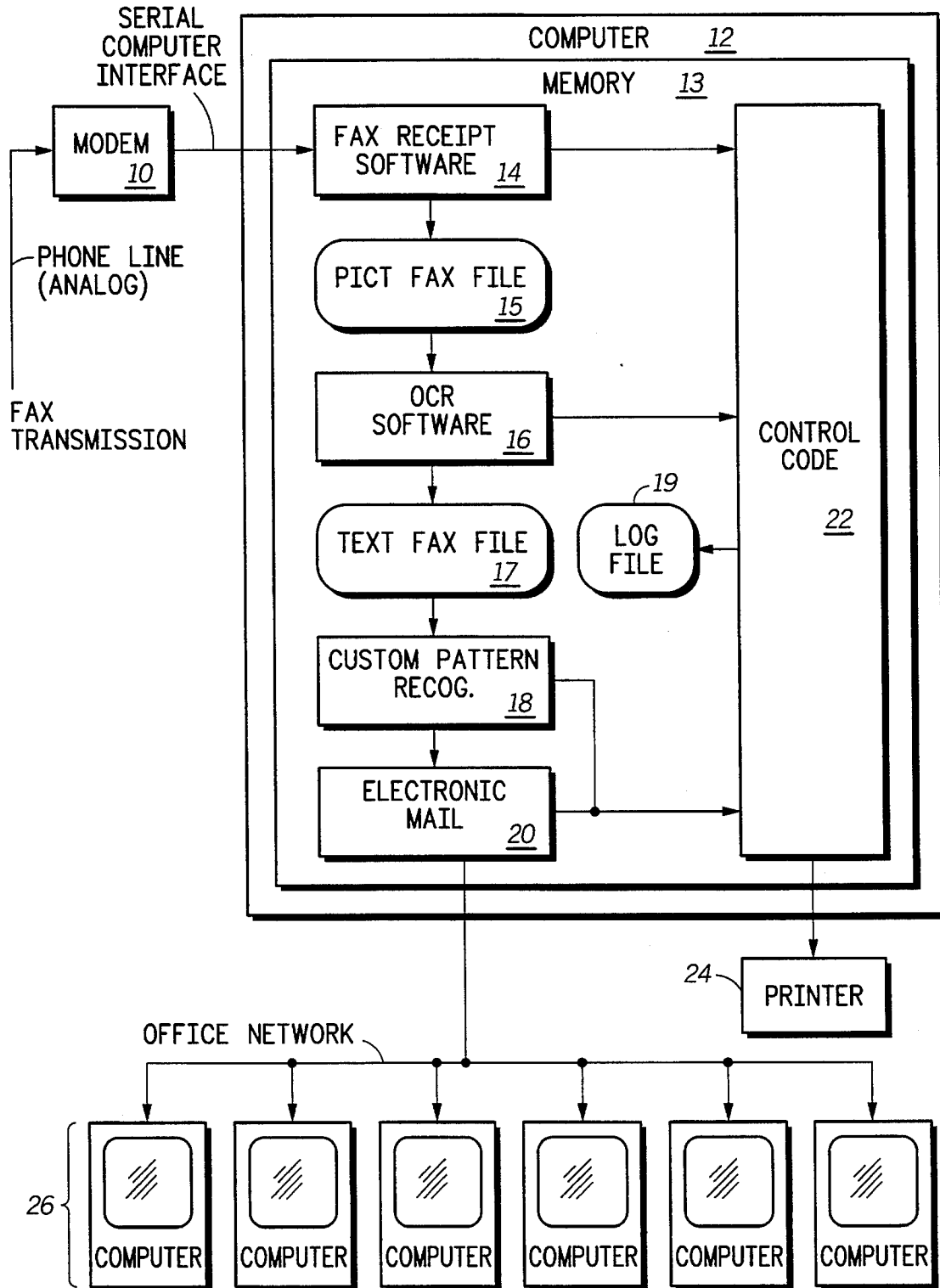


FIG. 1

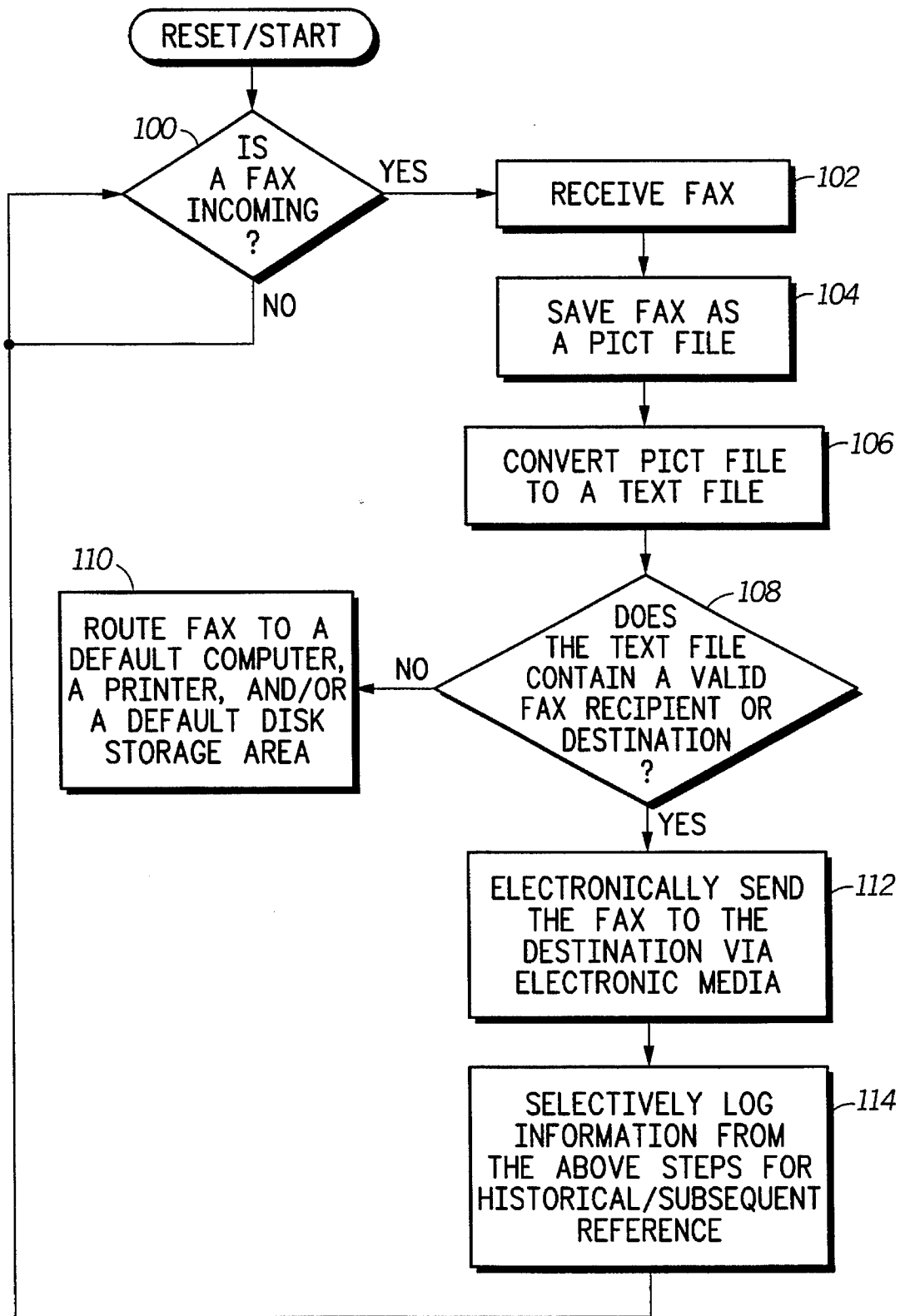


FIG.2

COMPUTERIZED FACSIMILE (FAX) SYSTEM AND METHOD OF OPERATION

FIELD OF THE INVENTION

The present invention relates generally to computerized or data processing systems, and more particularly, to computerized facsimile routing and logging systems and methods.

BACKGROUND OF THE INVENTION

Thus use of facsimile (Fax) transmissions is becoming increasingly popular as companies and business expands to nation-wide and global-wide markets. The need to communicate with remote locations is an increasingly important function. In the past, Fax machines have been used to receive Fax transmissions from a phone line and print the Fax transmission to paper. The paper was then hand routed by a human user to a proper destination.

In many cases, the Fax could be lost in the recipient's in-basket, mis-routed, or routed long after the Fax was sent. In some cases, Faxes need to be logged on paper or in a database for future reference which takes a considerable amount of man hours. In addition, the Fax document, which are received in a paper format, cannot be electronically modified or changed by a recipient in a time efficient and easy manner. In addition, some Faxes are sent simply to pass information which need not be permanently fixed on paper. Due to the above complications, a more automated Fax logging and routing system is needed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates, in a block diagram, a fax data processing system in accordance with the present invention; and

FIG. 2 illustrates, in a flowchart, a method for performing computerized routing and tracking of fax documents in accordance with the present invention.

It will be appreciated that for simplicity and clarity of illustration, elements illustrated in the FIGURES have not necessarily been drawn to scale. For example, the dimensions of some of the elements are exaggerated relative to other elements for clarity. Further, where considered appropriate, reference numerals have been repeated among the FIGURES to indicate corresponding or analogous elements.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. 1 illustrates a system used to automate facsimile ("fax") logging and routing via a computerized system. FIG. 1 illustrates a modem 10. Modem 10 (a serial communication device) has an input, which is illustrated in FIG. 1 as being an analog phone line. In general, any compatible telecommunication or communication protocol may be used as input to the modem 10. The modem 10 can be any serial communication device which can interface data from a phone line, communication line, and/or network to a computer. The modem 10 can operate at any speed, from 300 baud to 28.8 baud or above. The modem 10 is coupled to a computer 12 via a serial computer interface. Any serial computer interface which is either parallel or serial in nature can be used for the serial computer interface in FIG. 1. Typically, the serial computer interface in FIG. 1 contains a plurality of conductors to either transmit a plurality of data bits, a plurality of control signals, and/or handshaking signals.

FIG. 1 illustrates a computer 12. Computer 12 is also

referred to as a control computer and is any device which either manipulates, stores, routes, or transmits data in any manner. In one form, computer 12 can be any computer which comprises one or more of a display screen, a keyboard, a mouse, or a CPU/Memory unit. In other forms, the computer 12 may be a microcontroller, a DSP, a microcontrolling unit, a plurality of microprocessors, a mainframe, a supercomputer, or any like computer device. The computer has either external to it or internal to it access to a memory 13, illustrated in FIG. 1. Memory 13 is comprised of one or more of disk storage, tape storage, magnetic media, non-volatile memory, EPROM memory, EEPROM memory, FLASH memory, DRAM memory, SRAM memory, ROM, CD memory, computer memory, and/or any like memory system or device.

Within memory 13 is a fax receipt software program 14. Program 14 is generally used to receive data from the serial computer interface and store it into a pict fax file 15. The pict fax file 15 stores information received which is received through the modem 10 and processed by program 14. The information in fax file 15 is typically one or more fax transmissions or fax documents received through modem 10 via the serial computer interface. In general, the fax receipt software 14 allows the computer 12 to simulate or "look like" a fax machine to another fax machine coupled to the modem 10 via the phone line. The fax software 14 is designed to primarily receive fax transmissions of the CCITT group III type. Other transmission forms and protocols may also be supported and recognized by fax receipt software 14. Fax software 14 also recognizes various fax and coding schemes, such as Huffman encoding, and can be used to communicate at any standard telecommunication speed such as 14.4 kBaud, 12 kBaud, 9.6 kBaud, 7.2 kBaud, 4.8 kBaud, 2.4 kBaud, etc. Also, the fax receipt software 14 is coded to dynamically and automatically match the transmission speed of the data coming in through the modem 10. The fax receipt software program 14 has the primary purpose of receiving one or more fax transmissions through the modem 10 and processing that fax transmission into a data format stored in the pict fax file 15, which can be subsequently processed.

In some cases, many faxed transmissions will be received in a short period of time and multiple pict fax files 15 will be created. A control code portion 22 is typically used to monitor the fax receipt software program 14 to insure data is not lost and that proper management of multiple files is carried out by the computer 12. The pict fax files 15 may either be prioritized by time or by a fax transmitting urgency or a like priority. Once one or more pict fax files 15 have been formed via program 14, optical character recognition (OCR) 16 is used to process the pict fax file 15. If more than one fax file 15 exists within memory 13 at one point in time, control code 22 determines via the priority scheme discussed above, which pict fax file 15 is processed in which order by the software 16. The primary purpose of the OCR software 16 is to scan one or more pict fax files 15 and translate those pict fax files 15 from a non-text format to a text format. The text format, which is stored in text fax file 17, may be represented in one of many manners such as ASCII, binary, BCD, and/or the like. In one form, the OCR software 16 converts only a portion of the pict fax file 15 to text, and in another form the OCR software 16 will convert the entire pict fax file 15 to text fax file 17. In either case, the OCR software 16 is converting the pict fax file 15 to a text fax file for at least one primary purpose. This primary purpose is to determine from the faxed data any information which is needed to electronically log or track the fax transmission and

determines where to properly route the fax transmission (i.e., a fax destination).

All fax documents contain a cover sheet, or a like sheet, which communicates to a human user: (1) who the fax is from; and (2) where the fax is to be sent, along with other optional information. For example, a fax from Company A may have Company B's name on the cover sheet as a recipient. A fax sent from a John Smith to a Bill Johnson would have John Smith as the sender on the cover sheet and a Bill Johnson as the recipient on the cover sheet. In addition, the cover sheet may contain additional information such as a legal clause of legal confidentiality, a number of pages transmitted, phone numbers in which to contact individuals, and like information. In some cases, a fax document will contain high resolution or low resolution graphics which may be drawings, figures, company logos, or the like. Typically, these drawings within the pict fax file are not converted to text by the OCR software 16, but remain in a graphics format. The OCR software 16 is typically looking for one or more pieces of information from this "cover sheet".

Once the OCR software 16 has generated the text fax file 17, the control code 22 initiates custom pattern recognition via custom pattern recognition code 18. Custom pattern recognition code 18 contains a plurality of predetermined or preselected text or text strings. These text strings contain names which identify a destination of all potential faxes that can be received by computer 12. For example, if four people can receive faxes from the link establishes via computer 12 and the office network, four names will be stored in the custom pattern recognition code 18 to determine which of the four recipients should receive the fax. In many cases, one person or one destination will be the recipient of a fax, but in certain circumstances custom pattern recognition code 18 may find that several or multiple destinations are needed in order to route the fax properly.

In many cases, when writing a cover sheet for a fax, or when generating a fax cover sheet via computer, mistakes are made. For example, typos may occur, names may be misspelled, or the OCR software may not have properly recognized the name on the coversheet. In this case, the custom pattern recognition 18 either contains multiple strings which identify a particular user (i.e., "David Johnson", "Dave", "Johnson", "Dave Johnson", "Johnson", "dave", "david", "Jonson", "Jonson" etc.) or employs a pattern recognition scheme which is used in spelling checkers to identify misspelled words in a "error minimization" manner. This error scheme which is used in spelling checker matches misspelled or mis-recognized words to a list of valid words and determines which valid word in the list of valid words either closely matches or significantly matches the misspelled word read from file 17. This error correction system is typically performed by a numerical weight factor which is generated on a character-by-character comparison basis between strings stored via code 18 and strings parsed in the text fax file 17. For example, the parsed string from the text fax file 17 may be, for example, "Reik". In the database accessed by code 18, no "Reik" exists. Instead, the code 18 identifies a "Rick", "Rich", "Rieker", etc. The code 18 uses a numerical error weight scheme to determine which, if any, string from "Rick", "Rich", "Rieker", etc. is closest to the parsed term "Reik" from the file 17.

Once the code 18 recognizes one or more destinations of the fax received via the modem 10, the fax is routed via an electronic mail program 20 to the proper destination. The proper destination may be identified by the E-mail program 20 via an address, a user name, a numerical value, a network

identifier, or any like identification means which can be found or identified via one or more of code 18 and E-mail program 20. E-mail program 20 can communicate across either telecommunication lines, local area networks, token passing networks, serial computer interfaces, parallel computer interfaces, buses, or any like computer communication means to transmit the faxes received by modem 10 to the destinations identified by the customer pattern recognition code 18.

In FIG. 1, six possible destinations are illustrated via six computers 26. In a preferred form, more than one destination is attached to the office network through the E-mail program 20. It is important to note that any number N of destinations, computers, or users can be coupled to the e-mail code 20 via the office network wherein N is a finite positive integer. In addition, the end user may not always be a computer 26, but a specific folder, directory, or disk area on a computer, a default computer, a disk drive/tape drive, a computer screen, a printer, or the like.

The control code 22 will interact with one or more of software 14, software 16, pattern recognition code 18, and E-mail program 20 to coordinate the execution of these software programs and to record information regarding the processes performed by computer 12. For example, control code 22 can prioritize, memory manage, and garage collect pict fax files 15 as they are processed by software 14 and software 16. In addition, the control code can communicate with the pattern recognition code 18 and the E-mail program 20 to store fax receipt times, processing errors, information regarding destination identification, and time of transmission along the office network.

Since the control code 22 functions as a coordinator for the entire system illustrated in computer 12, the control code contains valuable information as to the receipt and transmission of faxed documents. This information can be stored in a log file 19 for subsequent reference and future use. The log file 19 is generated by the control code 22 and has optional or required (depending upon a system set-up) entries for each fax received by the modem 10 and processed by the computer 12. It is important to note that some fax receipts may be intended for logging, while other fax receipts or transmissions may be indicated as transmissions which should not be logged in another form. In most cases, the fax transmission will be logged so that the receipt and routing of the fax can be determined at a later date. The log file 19 will contain, per fax, information such as the time and date of receipt by the program 14, the time of the generation of file 15, any complications or information regarding the OCR software 16, the time the text fax file 17 was generated, the destinations determined by the code 18, the time and destinations transmitted by the e-mail program 20, user information from computers 26 when logging onto or accessing the computer 12, number of pages received per faxed transmission, the sender of the fax, phone numbers, addresses, and any other information which could be regarded as useful to a facsimile user or sender.

In some cases, either the OCR software 16 will not properly convert the pict faxed file 15, or the custom pattern recognition 18 will either not notice a user connected via the office network or not be able to determine a user within the proper error tolerances (see above). In these cases, the fax will either be stored by the control code in a default storage location for access at a subsequent time or will be transmitted via the office network to a default computer which can be accessed by a system administrator or secretary who is then responsible for the hand-routing of the faxes which are not properly handled by computer 12. In another form, the

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