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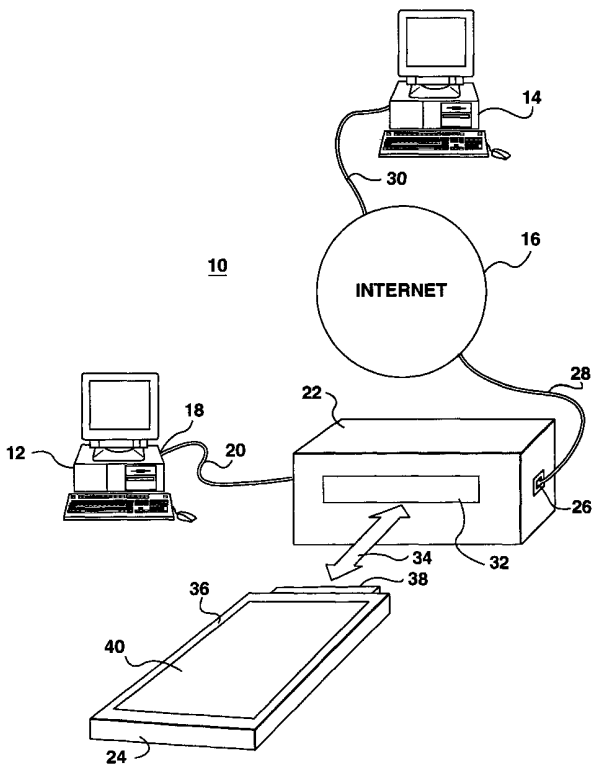
(54) Title: CRYPTOGRAPHIC TOKEN AND SECURITY SYSTEM



(57) Abstract: A secure internet telecommunications system (10) for transmitting, data has a security module (22) which is positioned between a first computer (12) and a network (16). The security module (22) has a cryptographic logic device that encrypts and decrypts data transmitted from the first computer (12) in accordance with known standard encrypting and decrypting protocols. The security module (22) is actuated by the insertion of a cryptographic token (24) bearing a user's cryptographic key information and/or other user information. This token (24) is first enabled to make this information available to the security module (22). The cryptographic token (24) is preferably a PC card, and IC card or a Smart Card having a contact sensitive graphical user interface (40). The token (24) captures through the interface (40) a template associated with a user's ideogram signature information and stores this template and other information in memory. The template is then compared with subsequent inputs of this ideogram signature information from the user and verified to enable the cryptographic token to function with the security module (22). The cryptographic token (24) may have either an independent power source permitting the token (24) to be enabled off-line from the security module (22) or alternatively relies on the power supply of the security module (22). The present invention has advantage in that user information is stored on a token device (24) which must be enabled by a user and temporarily connected with the security module (22) to permit the use of the user information.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CRYPTOGRAPHIC TOKEN AND SECURITY SYSTEM

Field of the Invention

The present invention relates to a cryptographic token and security system for use in securing transmission of data across communication systems.

Background of the Invention

With the growth of the communication of information across communications systems such as the internet, telecommunication systems, video and satellite communication systems, and the inter communication between these systems, more interest is being shown in securing the communication of data across such communication systems. Various different standard algorithm protocols have been developed and implemented by the communications industry to encrypt data at the point of origin of the transmission and decrypt the data at the final intended point of reception for the data.

In an internet communication system, the data is provided with an application header, a transport header, an internet header, and a data link

header. Link encryption occurs when the data link header includes an encryption method or algorithm that encrypts the remainder of the signal. The layers of encryption increase as the data link header, the internet header, the transport header and the application header introduce encryption protocols to encrypt the data. While these levels of encryption are currently the standard levels or layers of encryption associated with internet communications, there is continual movement in the industry to improve security protocols.

While these layers of security algorithms are standard protocols and have been adopted by the communications industry, it is the user's key that locks and unlocks the manner in which the standard protocol security algorithms encrypt and decrypt the data.

In the industry, it is known to submit a session key that is a symmetrical key that is generated for that session of data transmission between a point of origin and a receiving node. The symmetrical key is transmitted with the data from the point of origin to allow the party receiving the encrypted code to decrypt the data with the session key. The problem with using a session key is that the unauthorized reception of the transmission session may result in the session key being used by an unauthorized person to decrypt the data.

Alternatively, asymmetrical keys such as a public key and a private key may be used. When the private key and the public key are used, the public key is forwarded to an intended receiving party and subsequently the data is transmitted after encryption by the private key. The receiving party uses the public key to unlock or decrypt the encrypted data. With the asymmetrical key, only the public key is transmitted over the internet network and the private key remains private.

Consequently, the unauthorized decryption of the data requires an unauthorized party to receive or intercept the transmission of the public key and the encrypted data.

Another problem associated with the security of information transmitted over communication mediums relates to social engineering. It is common for users large and small to continue using the same asymmetrical keys for extended periods of time. Further, these keys are typically stored in a computer or other data bus storage means where the software for the encryption and decryption of the data is also stored. Consequently, it is possible for an unauthorized third party to copy the hard drive or storage medium and subsequently analyze the storage medium without time constraints to determine the user's asymmetrical and symmetrical keys. Once having obtained such key information, this third party can then intercept the communication and utilize the key to unlock or decrypt the transmitted data.

Accordingly, there is a need to improve the security of data communicated across communication systems where third parties may gain unauthorized access to the transmission of the data.

Summary Of The Invention

The present invention relates to a secure communication system for transmitting, encrypting, receiving and decrypting data. In the secure communication system of the present invention, a security module is used for encrypting and decrypting data in accordance with predetermined security protocol associated with the industry standards for that communication system. In order to effectively have the security module encrypt and decrypt the transmission of data across this communication system, the present invention utilizes a cryptographic

token which bears the user's cryptographic key information. The cryptographic key information is used or superimposed upon the encrypting and decrypting protocol used to encrypt and decrypt the data. By using a cryptographic token, the cryptographic key information of the user is stored on the token and not in the security module per se. This effectively increases the security of the secure communication system since the user cryptographic key is now stored remotely of the security system or the security module used in this security system.

It is contemplated within the realm of the present invention that the security module may be a separate device having an input port coupled to a communication port of a first data transceiver or the security module may form part of the first data transceiver in the secure communication system. The security module is contemplated to pass data through the module from the first data transceiver without encrypting or decrypting the data when the user cryptographic key is not present. Thus, in order for the security module to function, it must be provided with a cryptographic token which bears the cryptographic key information.

It is contemplated, that the cryptographic token may have a connection interface port for temporary connecting the token with the security module. When the token is connected to a hardware receiving interface port of the security module, the cryptographic token is able to make available the user's cryptographic key information to the security module to enable the security module or a cryptographic logic device located within the security module to encrypt and decrypt the data transmitted from and to the first transceiver in accordance with a predetermined security protocol for the communication system used. It

should be understood that the most secure practice of the present invention is to maintain the cryptographic key or private key within the cryptographic token. The security module routes the data, possibly already encrypted, through the cryptographic token and the cryptographic token applies the cryptographic key to encrypt and decrypt the data. In the lesser secure system, the cryptographic token may temporarily transfer the cryptographic key to the security module to have the security module perform all the encryption and decryption. However, this latter approach is less preferred.

It is contemplated that the security module may include a data broadcasting transceiver coupled between the cryptographic logic device and a second output device for transceiving the data over a transmission medium to a second data transceiver. This data broadcasting transceiver may be in the form of a modem. The first and second data transceivers may each be selected, for example, from one of a computer, a telephone, a video phone and a radio telephone such as, for example, cellular or satellite communication telephones.

It is within the realm of the present invention that the cryptographic token may include a user interface accessible by the user so as to enable the cryptographic token to function and transmit the user cryptographic key or other user information to the security module. To accomplish this, the cryptographic token includes an authentication processor connected to the user interface for verifying the authenticity of the user. This interface and authenticity check may be conducted off-line from the security module such that it is improbable to tap into the cryptographic token through the security module to gain unauthorized access to the user's cryptographic key information.

While the present invention has application with various communication systems, such as voice communication, video communications, and telecommunications, a preferred application for the secure communication system is via the internet. In accordance with the present invention the predetermined security protocol implemented by the security module cryptographic logic device comprises a standard security protocol which may include, for example, link encryption, network encryption, secure socket layer encryption, and application layer encryption.

It is contemplated within the realm of the present invention that the cryptographic token has a power source to operate the cryptographic token off-line from the security system. Alternatively, the cryptographic token may rely on its power being supplied from the security system when the cryptographic token is coupled to the security system. The token includes memory for storing the user cryptographic key information required by the security system for the encryption and decryption of data. The token further includes a connection interface port for transferring cryptographic key information to the security system when the cryptographic token is enabled and coupled to the security system. The token includes a contact sensitive graphical interface accessible to user for capturing and enrolling user ideogram signature information. The token further includes a user authentication processor for creating a user identification template from the user ideogram signature information, preferably off-line, from the security system and storing the user identification template in the memory. The authentication processor includes a comparison function or comparator for comparing receipt of user ideogram signature information with the

user identification template either off-line from the security system when the cryptographic token has its own power supply or in concert with the security system when the cryptographic token utilizes the power supply of the security system. The comparator generates an authentication signal when the comparison of the user ideogram signature information matches the user identification template. The authentication processor in response to receiving the authentication signal enables the cryptographic token. With the token now enabled, preferably off-line, it in turn enables the security module to encrypt and decrypt data in accordance with the cryptographic key information.

It is within the realm of the present invention that the cryptographic token can be in the form of a rectangular card such as, for example, a printed circuit card having an input/output port that is PC card compatible. Such a PC card may have its own power supply. Alternatively, the cryptographic token can be in the form of a card, such as an IC card or Smart Card. Such IC and Smart Cards typically do not have an independent power supply.

When reference is made to the term cryptographic key information in the present application, this refers to the key utilized by encryption/decryption protocol algorithms to encrypt data in accordance with the algorithm and the key information. The cryptographic key information may include either or and both symmetrical and asymmetrical keys. The symmetrical key may be used during data transmission and may be the only key information transmitted together with the data to the intended target receiver. The asymmetrical key may comprise a public key and a private key. The public key is normally transmitted to or received by the intended transmitter or receiver of the

data prior to the data being encrypted with the public key. Upon receipt of this encrypted data information, the public key is used decrypt the data. The cryptographic key information may comprise a bit stream of information in the range of 7 to 4096 bytes, for example.

The graphical interface is a contact sensitive interface that may be sensitive simply to contract or to contact and pressure contact. The graphical interface may include a graphical contact sensitive tablet, which is pressure sensitive, over which a stylus is manipulated by a user to enter an ideogram signature information. Alternatively a contact sensitive display may be used for the graphical interface that may or may not echo the ideogram signature information. It is further contemplated that the display may generate a menu of user selection activation prompts to guide a user in entering ideogram signature information to create a user identification template to be stored in the cryptographic token. The menu may further prompt the user to create or generate new cryptographic keys within the system and prompt the user for a password in addition to the other security levels. Preferably, the cryptographic token of the present invention may contain at least three authentication factors for encryption. The first factor is something the user knows such as, for example, the password. The second authentication factor is something the user has which is the token and the cryptographic key information stored on the token. The third authentication factor is something the user does which is provide ideogram signature information on the token. Additionally, the first and third authentication factors are something the user can change thereby adding a layer or level of security.

Throughout the disclosure and claims references is made to the term ideogram signature information. It should be understood that this term refers to a graphic representation made by user's on the contact sensitive graphic interface. The term signature is used to represent the user's graphic representation of it's personal signature or, is used in combination with the term ideogram to represent the personal characteristics of the user in creating an ideogram. This ideogram signature is referred to as information since it is codified and interrogated by the authentication processor of the cryptographic token to create an identification template of information that is subsequently used to verify the authenticity of a user.

It is further contemplated to be within the realm of the present invention that the cryptographic token includes a watchdog or tampering circuit which in the event of an intrusion erases from the memory of the cryptographic token the cryptographic key and ideogram signature template. Further, it is contemplated that the display or a light emitting diode display may be utilized by the cryptographic token to provide a visual indication of when the token is properly activated.

The cryptographic token may further include a buzzer for sounding alarms related to proper or improper activation of the token.

In accordance with another aspect of the present invention there is provided a secure communication system for transmitting, encrypting, receiving and decrypting data. The system comprises:

a first data transceiver for transmitting and receiving data to and from a first communication port;

a security module having a first input port coupled to the first communication port of the first data transceiver, the security module

having a second communication port from which data is transmitted and received with a second data transceiver, the security module having a cryptographic logic device coupled between the first input port and the second output port for encrypting and decrypting data transmitted between the first and second transceivers in accordance with a predetermined security protocol when the security module is enabled, and the security module having a hardware enabling receiving interface port connected with the cryptographic logic device; and,

a cryptographic token bearing user cryptographic key information and having a connection interface port for temporary coupling the cryptographic token to the hardware receiving interface port of the security module to make available the user cryptographic key information and to enable the cryptographic logic device of the security module to encrypt and decrypt data transmitted between the first and second transceivers in accordance the predetermined security protocol and the user cryptographic key information borne on the cryptographic token.

In accordance with one aspect of the present invention there is provided a cryptographic token operable with a security system to permit encryption and decryption of data communicated through the security system. The cryptographic token comprises:

memory for storing cryptographic key information required by the security system for the encryption and decryption of the data;

a connection interface port for communicating data with the security system when the cryptographic token is enabled and coupled to the security system;

a contact sensitive graphical interface accessible to a user for capturing user ideogram signature information;

a user authentication processor for creating a user identification template from the user ideogram signature information and storing the user identification template in the memory; and,

the authentication processor including a comparator for comparing receipt of user ideogram signature information with the user identification template, the comparator generating an authentication signal when the comparison of the user ideogram signature information matches the user identification template, and the authentication processor in response to the authentication signal enabling the cryptographic token.

It is also within the realm of the present invention to store user information on the cryptographic token that can be downloaded to or uploaded from the secure communication system when the cryptographic token has been enabled by a user authenticated by the cryptographic token. The user information may relate to personal user information such as bank account number, credit card numbers and or up to date account balances. In addition the personal information may include birth dates of family members and telephone numbers. In order to enable the cryptographic token to operate with the secure communication system the cryptograhpic token will have to be enabled by the user inputting user information already stored on the token for verification by the token. This user information may include information, such as, for example, passwords, personal identification numbers, personal information, and behavioral and physical biometric information including but not limited to finger prints, retina or iris scans, palm and face patterns, voice patterns, handwriting, blood type and DNA.

In accordance with yet another aspect of the present invention, there is provided a secure communication system for secure transmission of data across the secure communication system comprising:

a first data transceiver for transmitting and receiving data to and from a first communication port;

a security module having a first input port coupled to the first communication port of the first data transceiver, the security module having a cryptographic logic device coupled to the first input port for encrypting and decrypting data transmitted to and received from the first transceiver in accordance with a predetermined security protocol when the security module is enabled, and the security module having a hardware enabling receiving interface port connected with the cryptographic logic device; and,

a cryptographic token storing user information and having a connection interface port for temporary coupling the cryptographic token to the hardware receiving interface port of the security module, the cryptographic token including a user interface for receiving inputted user information and an authentication processor connected to the user interface to verify authenticity of the inputted user information with the stored user information and enable the cryptographic token when the inputted information is successfully verified to enable the cryptographic logic device of the security module to transmit and receive data with the first transceiver in accordance with the predetermined security protocol.

In accordance with yet another aspect of the present invention there is provided a cryptographic token operable with a secure communications system to permit secure transmission of data through

the secure communications systems when the cryptographic token is enabled by a user, the cryptographic token comprising:

a connection interface port for communicating data with the secure communications system when the cryptographic token is enabled and coupled to the secure communications system;

a contact sensitive graphical interface accessible to a user for capturing user ideogram signature information inputted from a user;

a user authentication processor for creating a user identification template from the user ideogram signature information and memory for storing the user identification template; and,

the authentication processor including a comparator for comparing receipt of a newly inputted user ideogram signature information with the user identification template, the comparator generating an authentication signal when the comparison of the inputted user ideogram signature information matches the user identification template, and the authentication processor in response to the authentication signal enabling the cryptographic token.

Brief Description Of The Drawings

For a better understanding of the nature and objects of the present invention reference may be had to the following detailed description when taken in conjunction with the accompanying diagrammatic drawings wherein:

Figure 1 is perspective view of the cryptographic token and security system used as an interface between a personal computer and an internet site;

Figure 2 is a block diagram of the cryptographic token with its own off-line power supply;

Figure 3 is a perspective view of the cryptographic token showing a preferred contact sensitive liquid crystal display and stylus;

Figures 4 and 5 show the display of the token prompting the user with menu selections;

Figure 6 is a block diagram of the internet security module utilizing the cryptographic token of Figure 2;

Figures 7 to 14 are flow charts showing the steps involved in setting up and logging into the cryptographic token; and,

Figure 15 is a block diagram of the cryptographic token dependent on a remote power supply.

Detailed Description Of The Preferred Embodiment

Referring to Figure 1 there is shown a preferred embodiment for the secure communication system 10 of the present invention. In the preferred embodiment the secure communication system 10 operates in conjunction with personal computers 12 and 14 to provide for secure transactions and data communication across the internet 16. The first personal computer or computer 12 is in effect a first data transceiver for transmitting and receiving data to and from a first communication port 18. The communication port 18 of computer 12 is connected via cable 20 to an internet security module 22. The internet security module has an output port 26 in the form of a telephone jack for connecting through standard telephone line 28 the internet security module 22 to the internet 16. The internet 16 then routes the data across the internet to the telephone or communication line 30 of the second computer 14. It should be understood that the second computer 14 may simply be another user in the system or may be a computer that provides a service through which a secure transaction and the exchange of money or credit

may flow from computer 12 through the internet security module 22, the internet 16, to the computer 14. It should be understood that the security module 22 may be alternatively connected to a single port for transmission of information with that single port. Such a single port arrangement would have application in an ATM banking machine environment.

In accordance with the present invention, in order to activate the internet security module 22 a cryptographic token card 24 is required to be inserted into a hardware enabling receiving interface port 32 of the internet security module 22. The cryptographic token 24 is a temporary coupling which may be inserted into the port 32 and removed from the port 32 as indicated by arrow 34.

The cryptographic token 24 is shown in Figure 1 to comprise a printed circuit card which has an outer casing 36, a connecting port 38, and a contact sensitive graphical interface 40.

The cryptographic token 24 bears cryptographic key information which is utilized by the internet security module 22 when the cryptographic token 24 is inserted into the receiving port 32 of the internet security module 22. The cryptographic key information includes either a symmetric or an asymmetric key. The asymmetric key includes both a public key and a private key. These keys are preferably maintained in the cryptographic token 24 away from the internet security module 22 for use by the internet security module 22 with standard internet security protocol algorithms. Such standard internet security protocol encrypting and decrypting algorithms are, for example, a link encryption, network encryption, secure socket layer encryption, and application layer encryption. In accordance with the present invention

the preferred encryption used by the internet security module 22 is secure socket layer encryption. Furthermore, the cryptographic token 24, once enabled with the security module 22, would be able to download and upload sensitive data to and from the security module and internet.

Referring to Figure 2 a block diagram of the cryptographic token has a battery 42 connected to a power conditioning circuit 44. The power conditioning circuit 44 is further connected to an input power connection 46 to the PC card host controller or hardware receiving port 32 of the internet security module 22. When the cryptographic token 24 is not connected to the internet security module 22 it is considered to be off-line from the internet security module 22 and power to the cryptographic token 24 is provided by battery 42. Upon insertion of the cryptographic token 24 into the host controller 32 of the internet security module 22, power is fed along line 46 through the power conditioning circuit 44. The power conditioning circuit 44 acts to regulate the power source of the cryptographic token 24 from the battery 42 to the internet security module 22. The power conditioning circuit 44 has an output power line 48 which provides an operating voltage to the other programmed operating hardware of the cryptographic token 24.

User defined information is communicated to the cryptographic token 24 through the contact sensitive graphical interface 40. The contact sensitive graphical interface 40 is shown to include a contact sensitive liquid crystal display 50 connected to a graphical interface 52. The graphical interface 52 converts information pressed onto the liquid crystal display into a graphic pattern and transmits this graphic pattern across the data bus 54 to the user authentication processor 56. The user authentication processor 56 may also be considered as a cryptographic

controller which controls the overall cryptographic operation of the cryptographic token 24. Prompts for information obtained from a user are transmitted across the bus 54 from the authentication processor 56 through the graphic interface 52 and echoed or displayed on the liquid crystal display 50. The user authentication processor 56 includes a comparator 58, and a real time clock and random number generator 60. The real time clock and random generator number is utilized by the authentication processor 56 to generate cryptographic key information such as symmetrical keys and asymmetrical keys in the form of private and public keys when so instructed or requested by a user.

The cryptographic token 24 also includes memory 62 in the form a flash memory 64 and a scratch pad random access memory 66. The flash memory 64 is connected to the authentication processor 56 by data transfer bus 68. The scratch pad RAM memory 66 is connected to the authentication processor 56 by data transfer bus 70. The operation of the authentication processor 56 is stepped and controlled by a control clock 72.

The authentication processor 56 communicates with the internet security module 22 through a data transfer bus 74 to the connection interface port 38 when the port is plugged into the PC host controller 32 of the internet security module 22. The PC card interface or a connection interface port 38 is a standard interface port and may comprise as computer compatible PC card.

The authentication processor is further connected to one or more LED's 76 and an audible transducer or buzzer 78.

The cryptographic token 24 further includes a tampering circuit 80 that detects an intrusion of the cryptographic token 24 and sends a signal

to the flash memory 64 to delete the program templates and cryptographic keys normally stored in this flash memory.

Referring to Figures 2 to 5 and 7 to 14, the operation of the cryptographic token 24 is described. One authentication factor of the cryptographic token 24 resides in the contact sensitive liquid crystal display 50 and the manner in which this display can capture information. In Figure 3 the display 50 is shown with the words "Jane Doe' ". This signature may be a written signature, a graph or symbol such as, for example, a dog or a house, or anything the user wishes to write onto the display 50. The user may utilize the stylus 90 to create the signature shown. This signature is in effect the ideogram signature information 92. The relative placement of the letters on the display in effect creates a signature unique to the handwriting characteristics of the user.

The cryptographic token 24 provides through the battery 42 an off-line token which stores a user's cryptographic keys in the flash memory 64 together with a template of the user's ideogram signature information. The flash memory 64 may also store the password of the user. The cryptographic token 24 prompts the user with menu selection once the card is activated. The main menu 82 is displayed on the display 40 to the user allowing the user to select the options of log in or setup. The main menu 82 is shown in Figure 4. In the event the user selects the setup menu, then the setup menu 84 shown in Figure 5 is displayed to the user. The setup menu includes five options of create new template, edit existing template, generate symmetrical key, generate asymmetrical key, and enter/change passwords.

Depending on the selection of the main menu shown in Figure 4 and the set up menu shown in Figure 5, the authentication processor

verifies the activation of the cryptographic token 24 by an authorized user. Once the activation of cryptographic token 24 is authenticated, the cryptographic token 24 is then enabled permitting the transference of data across data transfer bus 74 from the authentication processor 56 to the connection interface port 38.

Referring to Figures 7 through 14 the method of enabling and operating the cryptographic token 24 is shown.

In Figure 7, the cryptographic token 24 is activated at 160. This activation may simply comprise tapping the contact sensitive LCD display 50 three times in a row to have the authentication processor 56 prompt the cryptographic token 24 to have the main menu displayed as at step 82 in Figure 7. This main menu in Figure 7 is similar to the one shown in Figure 4. The user then has the option to select the login feature at 162 or go to the setup feature at 164.

In the event that the user chooses the setup feature 164, then the system shown in Figure 8 displays the setup menu 84 which is similar to the menu shown Figure 5. The user then has the ability to create a new template at 166 or edit an existing template 168, generate symmetrical key information 170, generate asymmetrical key information 172 or create/edit the password 174.

In the event the user determines that they wish to create the new template 166 then the template may be created in accordance with the methodology shown in Figure 9. The processor 56 sets a counter N=0 at 220. The authentication processor 56 then requests the display 50 to prompt the user to enter ideogram signature information (ISI), such as, for example, the ideogram signature information 92 shown in Figure 3. This information is entered on the contact sensitive graphical interface

50. Next, the authentication processor 56 at 224 applies a pattern recognition algorithm to the ideogram signature information and stores the pattern result in a memory 62. The processor then checks to see that the number count N=0 at 226 and in the event that the number count is N=0, it then moves to step 228 sets the program counter N=N+1 and returns to step 222 to step through the process a second time.

In the event N not equal to 0, at 226 is no, then the processor 56 applies a smoothing algorithm to start to weigh the pattern results with previous pattern results to create a user identification template at 230. The processor 56 then checks at 232 to determine if this counter has reached N=3 and in the event that it has not it then issues a command to increment the counter 228 and again go through the display prompt user steps 222 and 224.

In the event the inquiry at 232 is N=3, then the processor 56 stores the user identification template information in flash memory 64 at 234 and then proceeds to step 236 ending the creation of the template process. It should be understood that in the process for creating the new template may only occur when no template has been entered into the system. In the event that a template has been entered into the system, then a default to the edit routine occurs.

In the event the user requests to edit the existing template 168 from the display setup menu 84 in Figure 8, then the process in Figure 10 is implemented by the processor 56. At this point, the processor checks to determine if an identification template is already stored in the a flash memory 64 at 176. In the event that there is no template stored then the processor 56 returns to the setup menu 178. In the event there is an existing template stored in the flash memory 64, step 179 is performed

whereby the processor goes to the log in procedure to authenticate that this is in fact the authorized user wishing to change there ideogram signature information. The log in procedure is discussed subsequently in more detail with respect to Figure 15.

After the login procedure is accomplished at 179, the next step is at 180 to erase the existing template stored in the flash memory 64 and then the system returns to create the new template menu at 182.

In the event a user selects from Figure 8 the create/edit password 174 step, then the process of Figure 13 is enacted. First the processor 56 determines at step 196 if the password is stored in the flash memory 64. If the answer is yes then the step 198 displays an alphanumeric key pad and prompts the user to enter the password. The processor 56 then compares the entered password with the password stored in flash memory 64 at 200. The processor 56 determines if the passwords entered and stored match at 202 and in the event that there is no match the process either ends or returns to the main menu 204 thereby rejecting the request to create or edit the password. In the event the decision box 202 comes out in a positive answer or in the event the decision box 196 indicates that there is no existing password, then the process at 206 displays an alphanumeric keypad and prompts the user to enter a new password. The new password is then stored in the memory 60 at 208 and the process displays for a second time the alphanumeric keypad and prompts the user to re-enter the new password at 210. The processor compares the entered and re-entered passwords at 212. A decision on the password matching is made at step 214. In the event that these passwords do not match then the system initiates the password editing or creating procedure once again by returning to process box 206. In the

event the decision from the matching of the passwords at 214 is positive then the password is stored in a flash memory 64 at step 216 and the create/edit password routine is ended at 218.

In the event the user wishes to create a new or another symmetrical key in the process the user simply chooses this selection at 170 (Figure 11) which causes the processor 58 and random number generator 60 to generate the symmetrical key at 184. The symmetrical key is stored in a flash memory 64 at 186 and the process comes to an end at 188.

With respect to the generation of the asymmetrical keys the user selects item 172 from Figure 9 and Figure 12 shows the process of the processor 58 and random number generator 60 generating the asymmetrical keys or private and public keys at 190, and storing the keys information in flash memory 64 at 192 and bringing the procedure to an end at 194. There is no password protection associated with this procedure since this key information is a feature that is proprietary to the cryptographic token 24 and the more frequently the key is changed the better. Hence it is a step that is made simple for the user to effectively change the key.

Referring to Figure 7, when the log in procedure is chosen at 162 then a log in procedure or method is shown in Figure 14. The processor asks if the password is stored in the flash memory at 238 and in the event that there is an affirmative answer the processor at 240 displays the alphanumeric keypad and prompts the user to enter the password. At 242 the system compares the entered password with the stored password and if there is no match it brings the log in procedure to an end at 244 without enabling the cryptographic token 24. In the event that there is an affirmative decision from decision box 242 then the process continues to

step 246. In the event that there is no password stored in the memory to begin with at 238 then step 246 is implemented immediately. Step 246 calls for the user to be prompted to enter an ideogram signature information 92 on the contact sensitive graphical interface 50.

The authentication processor 56 at step 248 applies the pattern recognition algorithm to the ideogram signature information 92 to create the new pattern. The comparator 58 compares the new ideogram signature information pattern with the user identification template stored at the flash memory 64 at step 250. At decision box 252 a decision is made as to whether the pattern matches the user identification template and in the event the answer is no, then the system simply ends the login procedure without enabling the cryptographic token 24 at step 244. In the event there is a positive match at step 252 the processor enables itself at step 254 to communicate over the data bus 74 with the connection interface port 38 of the cryptographic token 24. Next the system brings the sign on or login procedure to an end at step 244. Once the cryptographic token 24 is enabled, then it is in a position to make available its cryptographic key information to the internet security module 32.

Referring now to Figure 6 the internet security module 22 is shown. The internet security module 22 has its own power conditioning circuit 100 connected to a battery backup 102 and through a power input line 104 to a wall plug adapter 106. The power conditioning circuit 100 regulates the power supply to the internet security module 22. The power conditioning circuit 100 has a power output line 108 which is connected to the hardware components located within the internet security module 22 to provide sufficient power to these components.

The internet security module 22 preferably had a touch sensitive liquid crystal display 110 connected through a data bus 114 to main processor 112. The liquid crystal display displays to the user the activities of the internet security module 22 during the operation of the internet security module 22. The main processor 112 is an xx86 class processor. This processor is connected through data bus 120 to a cryptographic co-processor 116 and a real time clock and random number generator 118. The cryptographic co-processor and real time clock and random number generator accelerate the application of the encrypting and decrypting protocols to the data main processor 112 to the telephone line 28. The main processor 112 is further connected through to LED 128 and an audible signal beeper 130. Memory for the main processor is connected through a flash memory 132 which stores programs and other keys. The internet security module 122 further includes a scratch pad and random access memory 134 for temporary storing calculations made by the main processor 112. The main processor 112 is further connected through signaling ports 124 to a universal serial bus interface 122 or an RS/232 serial interface 122. These interfaces are connected to the communication ports 18 to the first computer 12. The main processor 112 is further connected through a communication line 126 to the PC card host interface or having the hardware receiving slot 32. The diagram shows the cryptographic token 24 connected through the PC card interface for communicating data.

The main processor manipulates a data signal coming from the computer 12 through the input or interface port 122 and the communication lines 124 with an encrypting and decrypting algorithm provided in the co-processor 116 and random number generator 118.

This data is further encoded with the key information made available by the cryptographic token 24. The information encrypted is then transmitted from the main processor 112 through the modem 138 and the output 26 to the telephone line 28 and thus onto the internet. In the event the cryptographic token 24 is not present, then the main processor 112 performs no encryption or decryption of signals passing through the main processor between the telephone line 28 and the first computer 12. The main processor 112 also decrypts data received from the computer 12.

The flash memory 132 stores cryptographic keys received from the cryptographic token 24. When the token 24 is removed from the internet security module 22, the keys are erased from the flash memory 132. In the event the module 22 is subject to intrusion, the tamper circuit 136 sends a signal to the flash memory 132 to erase the memory 132.

Referring to Figure 15 a block diagram of an alternative embodiment for the cryptographic token 24 of Figure 2 is shown. The components of the cryptographic token card 24 of Figure 15, including their reference numerals and functionality are identical to that shown and described for Figure 2 except for the differences explained hereafter. In Figure 15 the block diagram of the cryptographic token card differs in that it relies on the power from the security module 22 of Figure 6 at line 46 of Figure 15. The power from security module 22 is fed through the hardware receiving port 32 of the security module at connecting line 46 into the power conditioning circuit 44 of the cryptographic token card 24. In this embodiment, the cryptographic token card 24 preferably comprises either an IC card or a Smart Card. As a result of the cryptographic token card 24 having to rely on a source of power from the

security module 22, or an other power source, the cryptographic token card 24 must be coupled to the security module 22, or the other power source, so as to operate the cryptographic token card 24 in accordance with the method of operation previously described for Figures 2 to 5 and 7 to 14.

As is apparent from the foregoing disclosure, various other embodiments and alterations and modifications which may differ from the embodiments disclosed may be readily apparent to one skilled in the art. It should be understood that the scope of the patent shall be defined by the claims and those embodiments which come within the scope of the claims that follow.

WHAT IS CLAIMED IS:

1. A secure communication system for transmitting, encrypting, receiving and decrypting data comprising:

a first data transceiver for transmitting and receiving data to and from a first communication port;

a security module having a first input port coupled to the first communication port of the first data transceiver, the security module having a second communication port from which data is transmitted and received with a second data transceiver, the security module having a cryptographic logic device coupled between the first input port and the second output port for encrypting and decrypting data transmitted between the first and second transceivers in accordance with a predetermined security protocol when the security module is enabled, and the security module having a hardware enabling receiving interface port connected with the cryptographic logic device; and,

a cryptographic token bearing user cryptographic key information and having a connection interface port for temporary coupling the cryptographic token to the hardware receiving interface port of the security module to make available the user cryptographic key information and to enable the cryptographic logic device of the security module to encrypt and decrypt data transmitted between the first and second transceivers in accordance the predetermined security protocol and the user cryptographic key information borne on the cryptographic token.

2. The secure communication system of claim 1 wherein the security module includes a data broadcasting transceiver coupled between the cryptographic logic device and the second output port for

transceiving the data over a transmission medium to the second data transceiver.

3. The secure communication system of claim 2 wherein the data broadcasting transceiver is a modem.

4. The secure communication system of claim 1 wherein the cryptographic token includes a user interface for enabling the cryptographic token and an authentication processor connected to the user interface to verify authenticity of the user to enable the cryptographic token.

5. The secure communication system of claim 1 wherein the first and second data transceivers are each one selected from the group consisting of a computer, a telephone, a video phone and a radio telephone.

6. The secure communications system of claim 1 wherein the security module forms part of the first transceiving device.

7. The secure communication system of claim 6 wherein the first and second data transceivers are each one selected from the group consisting of a computer, a telephone, a video phone and a radio telephone.

8. The secure communication system of claim 6 wherein the data broadcasting transceiver is a modem.

9. The secure communication system of claim 7 wherein the data broadcasting transceiver is a modem.

10. The secure communication system of claim 9 wherein the cryptographic token includes a user interface for enabling the cryptographic token and an authentication processor connected to the

user interface to verify authenticity of the user to enable the cryptographic token.

11. The secure communication system of claim 1 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

12. The secure communication system of claim 3 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

13. The secure communication system of claim 4 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

14. The secure communication system of claim 6 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

15. The secure communication system of claim 10 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

16. The secure communication system of claim 1 wherein the cryptographic token comprises:

a power source for operating the cryptographic token off-line from the security system;

memory for storing the user cryptographic key information required by the security system for the encryption and decryption of the data;

a contact sensitive graphical interface accessible to a user for capturing user ideogram signature information; and,

a user authentication processor for creating a user identification template from the user ideogram signature information and storing the user identification template in the memory; and

the authentication processor including a comparator for comparing receipt of user ideogram signature information with the user identification template, the comparator generating an authentication signal when the comparison of the user ideogram signature information matches the user identification template, and the authentication processor in response to the authentication signal enabling the cryptographic token.

17. The cryptographic token of claim 16 wherein the cryptographic token is in the form of a PC card.

18. The cryptographic token of claim 16 wherein graphical interface comprises a graphical contact sensitive tablet.

19. The cryptographic token of claim 16 wherein the graphical interface comprises a contact sensitive liquid crystal display.

20. The cryptographic token of claim 19 wherein the display further generates menu user selection activation prompts.

21. The cryptographic token of claim 19 wherein the display further presents operating information and data during activation and enabling operation.

22. The cryptographic token of claim 19 wherein authentication processor controls the display to prompt a user to enter ideogram signature information a predetermined number of times to create the user identification template.

23. The cryptographic token of claim 16 wherein authentication processor generates the cryptographic key information for storage in the memory.

24. The cryptographic token of claim 23 wherein the cryptographic key information includes symmetrical and asymmetrical keys.

25. The cryptographic token of claim 24 wherein asymmetrical keys comprise a public key and a private key.

26. The cryptographic token of claim 19 wherein the display is a liquid crystal contact sensitive display.

27. The secure communication system of claim 16 wherein the security module further includes a modem for transceiving data with the second transceiver.

28. The secure communications system of claim 16 wherein the security module forms part of the first transceiving device.

29. The secure communication system of claim 16 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

30. The secure communication system of claim 27 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

31. The secure communication system of claim 28 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

32. A cryptographic token operable with a security system to permit encryption and decryption of data communicated through the security system, the cryptographic token comprising:

a power source for operating the cryptographic token off-line from the security system;

memory for storing cryptographic key information required by the security system for the encryption and decryption of the data;

a connection interface port for communicating data with the security system when the cryptographic token is enabled and coupled to the security system;

a contact sensitive graphical interface accessible to a user for capturing user ideogram signature information;

a user authentication processor for creating a user identification template from the user ideogram signature information and storing the user identification template in the memory; and,

the authentication processor including a comparator for comparing receipt of user ideogram signature information with the user

identification template, the comparator generating an authentication signal when the comparison of the user ideogram signature information matches the user identification template, and the authentication processor in response to the authentication signal enabling the cryptographic token.

33. The cryptographic token of claim 32 wherein the cryptographic token is in the form of a card.

34. The cryptographic token of claim 33 wherein the cryptographic token is in the form of a PC card.

35. The cryptographic token of claim 32 wherein the cryptographic token is a flat surface for the graphical interface.

36. The cryptographic token of claim 35 wherein graphical interface comprises a graphical contact sensitive tablet.

37. The cryptographic token of claim 35 wherein the graphical interface comprises a contact sensitive liquid crystal display.

38. The cryptographic token of claim 37 wherein the display further generates menu user selection activation prompts.

39. The cryptographic token of claim 37 wherein the display further presents operating information and data during activation and enabling operation.

40. The cryptographic token of claim 37 wherein authentication processor controls the display to prompt a user to enter ideogram signature information a predetermined number of times to create the user identification template.

41. The cryptographic token of claim 32 further including at least one light emitting diode that provides a visual signal to the user when the user authentication signal is generated.

42. The cryptographic token of claim 32 further including a audible transducer that generators an audible signal to the user.

43. The cryptographic token of claim 32 further including a tamper circuit that is responsive to intrusive tampering of the cryptographic token to erase the cryptographic key information and the user identification template from memory.

44. The cryptographic token of claim 32 wherein authentication processor generates the cryptographic key information for storage in the memory.

45. The cryptographic token of claim 44 wherein the cryptographic key information includes symmetrical and asymmetrical keys.

46. The cryptographic token of claim 45 wherein asymmetrical keys comprise a public key and a private key.

47. The cryptographic token of claim 37 wherein the display is a liquid crystal contact sensitive display.

48. The cryptographic token of claim 37 wherein authentication processor generates the cryptographic key information for storage in the memory.

49. The cryptographic token of claim 48 wherein the cryptographic key information includes symmetrical and asymmetrical keys.

50. The cryptographic token of claim 49 wherein asymmetrical keys comprise a public key and a private key.

51. The cryptographic token of claim 32 wherein the user identification template is created and compared with the user ideogram signature information off-line from the security system.

52. The cryptographic token of claim 37 wherein the user identification template is created and compared with the user ideogram signature information off-line from the security system.

53. The cryptographic token of claim 16 wherein the user identification template is created and compared with the user ideogram signature information off-line from the security system.

54. The cryptographic token of claim 19 wherein the user identification template is created and compared with the user ideogram signature information off-line from the security system.

55. The secure communication system of claim 1 wherein the security module has a power supply operable to supply power to the cryptographic token when to the cryptographic token is temporarily coupled to hardware receiving interface port of the security module, and wherein the cryptographic token further comprises:

memory for storing the user cryptographic key information required by the security system for the encryption and decryption of the data;

a contact sensitive graphical interface accessible to a user for capturing user ideogram signature information; and,

a user authentication processor for creating a user identification template from the user ideogram signature information and storing the user identification template in the memory; and

the authentication processor including a comparator for comparing receipt of user ideogram signature information with the user identification template, the comparator generating an authentication signal when the comparison of the user ideogram signature information

matches the user identification template, and the authentication processor in response to the authentication signal enabling the cryptographic token.

56. The cryptographic token of claim 55 wherein the cryptographic token is in the form of s selected one of a smart card and an IC card.

57. The cryptographic token of claim 55 wherein graphical interface comprises a graphical contact sensitive tablet.

58. The cryptographic token of claim 55 wherein the graphical interface comprises a contact sensitive liquid crystal display.

59. The cryptographic token of claim 58 wherein the display further generates menu user selection activation prompts.

60. The cryptographic token of claim 58 wherein the display further presents operating information and data during activation and enabling operation.

61. The cryptographic token of claim 58 wherein authentication processor controls the display to prompt a user to enter ideogram signature information a predetermined number of times to create the user identification template.

62. The cryptographic token of claim 55 wherein authentication processor generates the cryptographic key information for storage in the memory.

63. The cryptographic token of claim 62 wherein the cryptographic key information includes symmetrical and asymmetrical keys.

64. The cryptographic token of claim 63 wherein asymmetrical keys comprise a public key and a private key.

65. The cryptographic token of claim 58 wherein the display is a liquid crystal contact sensitive display.

66. The secure communication system of claim 55 wherein the security module further includes a modem for transceiving data with the second transceiver.

67. The secure communications system of claim 55 wherein the security module forms part of the first transceiving device.

68. The secure communication system of claim 55 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

69. The secure communication system of claim 66 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

70. The secure communication system of claim 67 wherein the first predetermined security protocol is an internet security protocol selected from the group consisting of link encryption, network encryption, secure socket layer encryption, and application layer encryption.

71. A cryptographic token operable with a security system to permit encryption and decryption of data communicated through the security system, the cryptographic token comprising:

memory for storing cryptographic key information required by the security system for the encryption and decryption of the data;

a connection interface port for communicating data with the security system when the cryptographic token is enabled and coupled to the security system;

a contact sensitive graphical interface accessible to a user for capturing user ideogram signature information;

a user authentication processor for creating a user identification template from the user ideogram signature information and storing the user identification template in the memory; and,

the authentication processor including a comparator for comparing receipt of user ideogram signature information with the user identification template, the comparator generating an authentication signal when the comparison of the user ideogram signature information matches the user identification template, and the authentication processor in response to the authentication signal enabling the cryptographic token.

72. The cryptographic token of claim 71 wherein the cryptographic token is in the form of a card.

73. The cryptographic token of claim 72 wherein the cryptographic token is in the form of one selected from an IC card and a smart.

74. The cryptographic token of claim 71 wherein the cryptographic token is a flat surface for the graphical interface.

75. The cryptographic token of claim 74 wherein graphical interface comprises a graphical contact sensitive tablet.

76. The cryptographic token of claim 74 wherein the graphical interface comprises a contact sensitive liquid crystal display.

77. The cryptographic token of claim 76 wherein the display further generates menu user selection activation prompts.

78. The cryptographic token of claim 76 wherein the display further presents operating information and data during activation and enabling operation.

79. The cryptographic token of claim 76 wherein authentication processor controls the display to prompt a user to enter ideogram signature information a predetermined number of times to create the user identification template.

80. The cryptographic token of claim 71 further including at least one light emitting diode that provides a visual signal to the user when the user authentication signal is generated.

81. The cryptographic token of claim 71 further including a audible transducer that generators an audible signal to the user.

82. The cryptographic token of claim 71 further including a tamper circuit that is responsive to intrusive tampering of the cryptographic token to erase the cryptographic key information and the user identification template from memory.

83. The cryptographic token of claim 71 wherein authentication processor generates the cryptographic key information for storage in the memory.

84. The cryptographic token of claim 83 wherein the cryptographic key information includes symmetrical and asymmetrical keys.

85. The cryptographic token of claim 84 wherein asymmetrical keys comprise a public key and a private key.

86. The cryptographic token of claim 76 wherein the display is a liquid crystal contact sensitive display.

87. The cryptographic token of claim 76 wherein authentication processor generates the cryptographic key information for storage in the memory.

88. The cryptographic token of claim 87 wherein the cryptographic key information includes symmetrical and asymmetrical keys.

89. The cryptographic token of claim 88 wherein asymmetrical keys comprise a public key and a private key.

90. The cryptographic token of claim 31 wherein the security module has a power supply operable to supply power to the cryptographic token when to the cryptographic token is coupled to the security module.

91. The cryptographic token of claim 74 wherein the security module has a power supply operable to supply power to the cryptographic token when to the cryptographic token is coupled to the security module and wherein the cryptographic token is in the form of one selected from an IC card and a smart card.

92. The cryptographic token of claim 76 wherein the security module has a power supply operable to supply power to the cryptographic token when to the cryptographic token is coupled to the security module and wherein the cryptographic token is in the form of one selected from an IC card and a smart card.

93. The cryptographic token of claim 79 wherein the security module has a power supply operable to supply power to the cryptographic token when to the cryptographic token is coupled to the security module and wherein the cryptographic token is in the form of one selected from an IC card and a smart card.

94. A secure communication system for secure transmission of data across the secure communication system comprising:

a first data transceiver for transmitting and receiving data to and from a first communication port;

a security module having a first input port coupled to the first communication port of the first data transceiver, the security module having a cryptographic logic device coupled to the first input port for encrypting and decrypting data transmitted to and received from the first transceiver in accordance with a predetermined security protocol when the security module is enabled, and the security module having a hardware enabling receiving interface port connected with the cryptographic logic device; and,

a cryptographic token storing user information and having a connection interface port for temporary coupling the cryptographic token to the hardware receiving interface port of the security module, the cryptographic token including a user interface for receiving inputted user information and an authentication processor connected to the user interface to verify authenticity of the inputted user information with the stored user information and enable the cryptographic token when the inputted information is successfully verified to enable the cryptographic logic device of the security module to transmit and receive data with the first transceiver in accordance with the predetermined security protocol.

95. The secure communication system of claim 94 wherein the cryptographic token comprises:

memory for storing the user information required by the security system for enabling the secure transmission of data;

the user interface comprising a contact sensitive graphical interface accessible to a user for capturing user ideogram signature information; and,

a user authentication processor for creating a user identification template from the user ideogram signature information and storing the user identification template in the memory; and

the authentication processor including a comparator for comparing receipt of user ideogram signature information with the user identification template, the comparator generating an authentication signal when the comparison of the user ideogram signature information matches the user identification template, and the authentication processor in response to the authentication signal enabling the cryptographic token.

96. The cryptographic token of claim 95 wherein the cryptographic token is in the form of one selected from the group of a PC card, an IC card and a smart card.

97. The cryptographic token of claim 95 wherein graphical interface comprises a graphical contact sensitive tablet.

98. The cryptographic token of claim 95 wherein the graphical interface comprises a contact sensitive liquid crystal display.

99. The cryptographic token of claim 97 wherein the display further generates menu user selection activation prompts.

100. The cryptographic token of claim 97 wherein the display further presents operating information and data during activation and enabling operation.

101. The cryptographic token of claim 97 wherein authentication processor controls the display to prompt a user to enter ideogram

signature information a predetermined number of times to create the user identification template.

102. The cryptographic token of claim 95 wherein authentication processor generates user cryptographic key information for storage in the memory.

103. The cryptographic token of claim 102 wherein the cryptographic key information includes symmetrical and asymmetrical keys.

104. The cryptographic token of claim 103 wherein asymmetrical keys comprise a public key and a private key.

105. A cryptographic token operable with a secure communications system to permit secure transmission of data through the secure communications systems when the cryptographic token is enabled by a user, the cryptographic token comprising:

a connection interface port for communicating data with the secure communications system when the cryptographic token is enabled and coupled to the secure communications system;

a contact sensitive graphical interface accessible to a user for capturing user ideogram signature information inputted from a user;

a user authentication processor for creating a user identification template from the user ideogram signature information and memory for storing the user identification template; and,

the authentication processor including a comparator for comparing receipt of a newly inputted user ideogram signature information with the user identification template, the comparator generating an authentication signal when the comparison of the inputted user ideogram signature information matches the user identification template, and the

authentication processor in response to the authentication signal enabling the cryptographic token.

106. The cryptographic token of claim 105 wherein the cryptographic token is in the form of a card.

107. The cryptographic token of claim 106 wherein the cryptographic token is one card selected from a PC card, an IC card and a smart card.

108. The cryptographic token of claim 105 wherein the cryptographic token is a flat surface for the graphical interface.

109. The cryptographic token of claim 105 wherein graphical interface comprises a graphical contact sensitive tablet.

110. The cryptographic token of claim 105 wherein the graphical interface comprises a contact sensitive liquid crystal display.

111. The cryptographic token of claim 110 wherein the display further generates menu user selection activation prompts.

112. The cryptographic token of claim 111 wherein the display further presents operating information and data during activation and enabling operation.

113. The cryptographic token of claim 112 wherein authentication processor controls the display to prompt a user to enter ideogram signature information a predetermined number of times to create the user identification template.

114. The cryptographic token of claim 105 further including at least one light emitting diode that provides a visual signal to the user when the user authentication signal is generated.

115. The cryptographic token of claim 105 further including a audible transducer that generators an audible signal to the user.

116. The cryptographic token of claim 105 further including a tamper circuit that is responsive to intrusive tampering of the cryptographic token to erase the cryptographic key information and the user identification template from memory.

117. The cryptographic token of claim 106 wherein authentication processor generates cryptographic key information for storage in the memory.

118. The cryptographic token of claim 117 wherein the cryptographic key information includes symmetrical and asymmetrical keys.

119. The cryptographic token of claim 118 wherein asymmetrical keys comprise a public key and a private key.

120. The cryptographic token of claim 105 wherein the cryptographic token includes a battery power supply and the user identification template is created and compared with the user ideogram signature information off-line from the secure communications system.

121. The cryptographic token of claim 105 wherein the secure communications system includes a power supply operable to supply power to the cryptographic token when to the cryptographic token is coupled to the secure communications system and wherein the cryptographic token is in the form of one selected from an IC card and a smart card.

122. The cryptographic token of claim 105 wherein the memory further stores cryptographic key information.

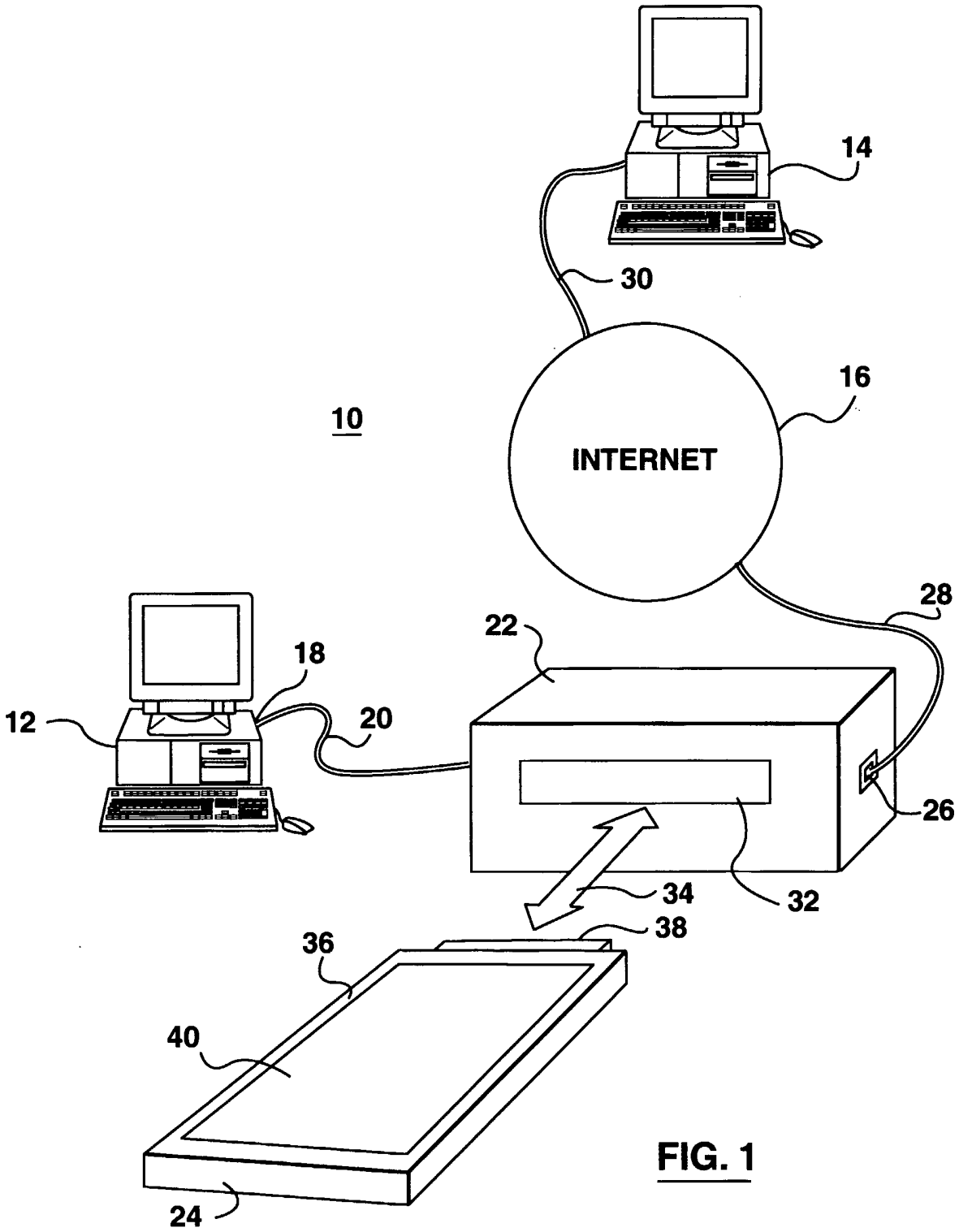

FIG. 1

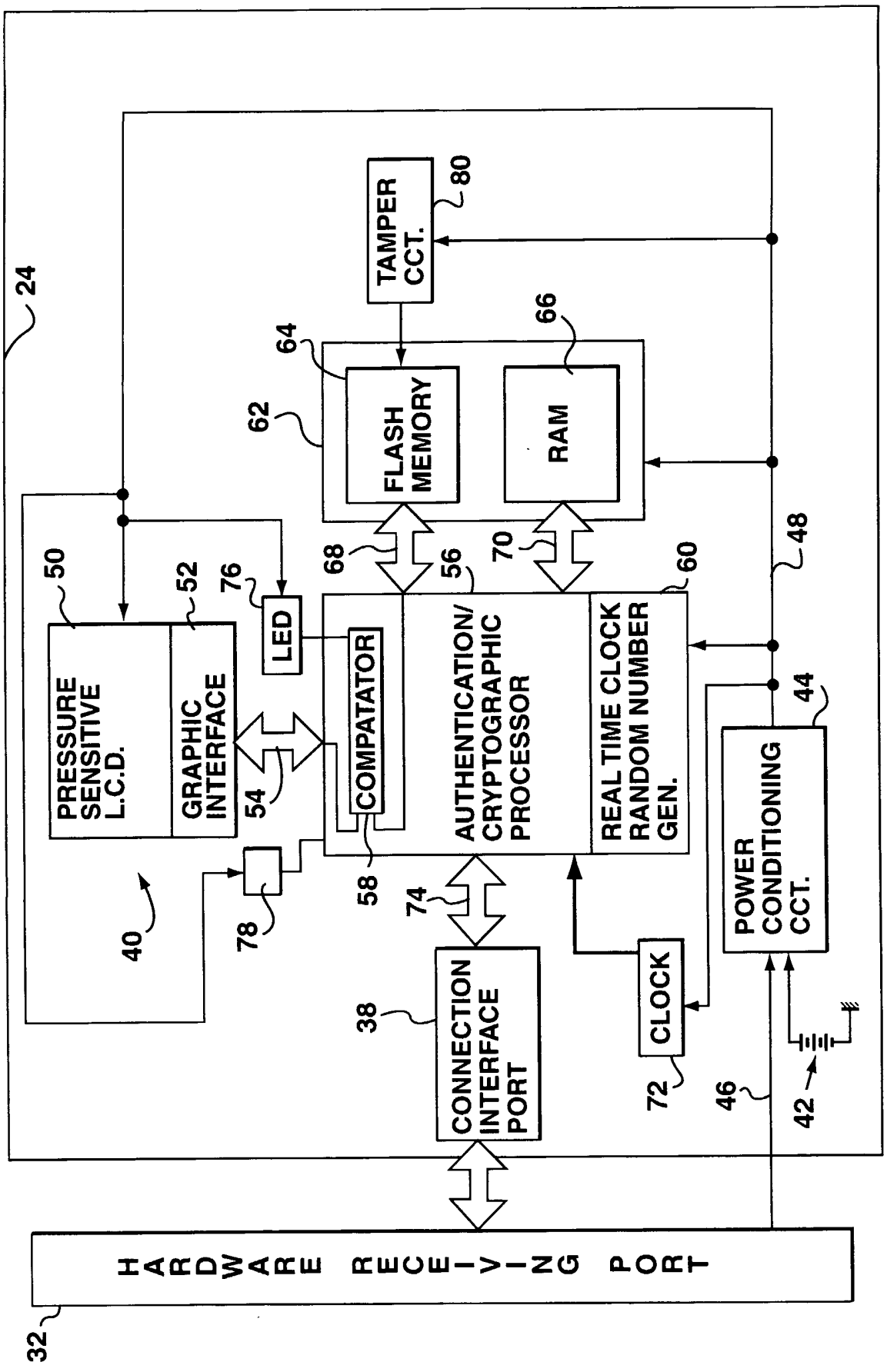
24
TAMPER CCT.
80
64
66
62
FLASH MEMORY
RAM
68
56
70
60
48
50
52
76
LED
PRESSURE SENSITIVE L.C.D.
GRAPHIC INTERFACE
COMPATATOR
AUTHENTICATION/ CRYPTOGRAPHIC PROCESSOR
REAL TIME CLOCK RANDOM NUMBER GEN.
54
44
POWER CONDITIONING CCT.
40
78
58
74
38
CONNECTION INTERFACE PORT
CLOCK
72
46
42
HARDWARE RECE-V-NG PORT
32

FIG. 2

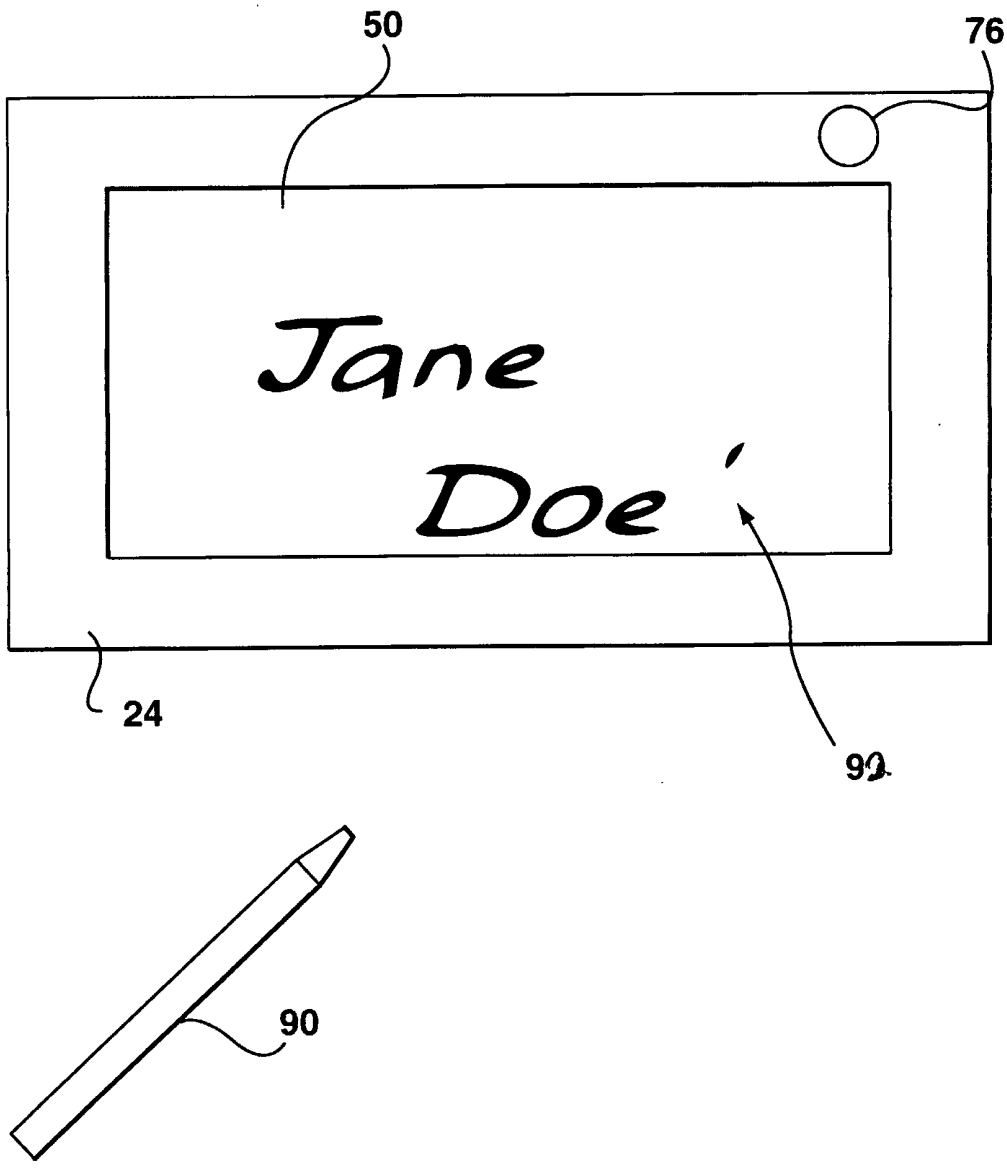

FIG. 3

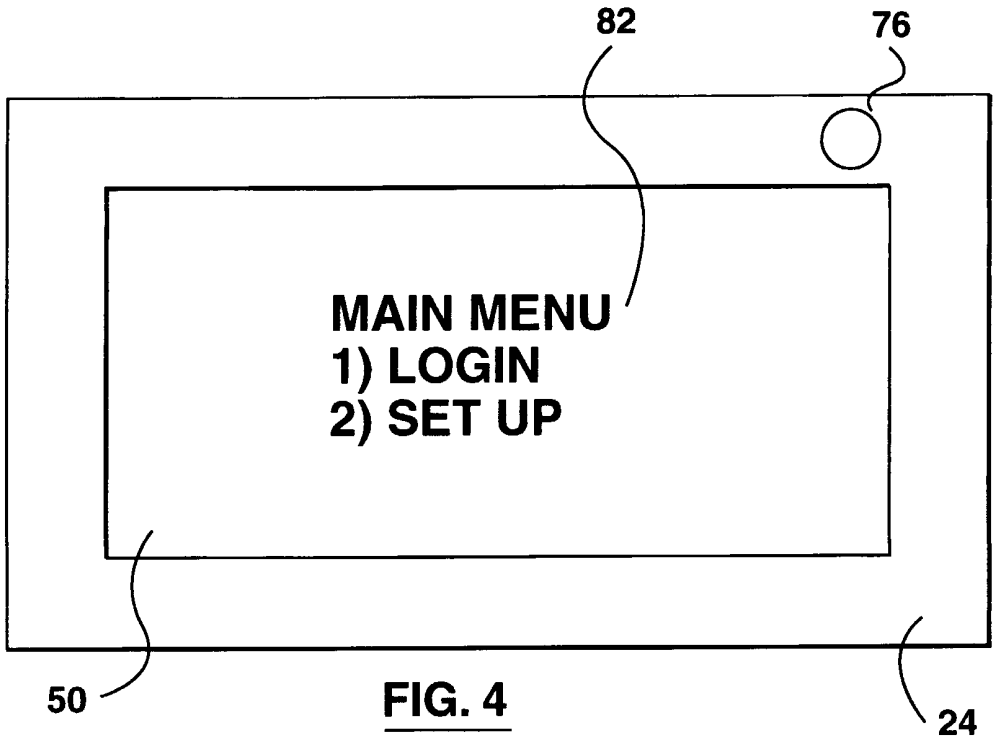
82
76
MAIN MENU
1) LOGIN
2) SET UP
50
24

FIG. 4

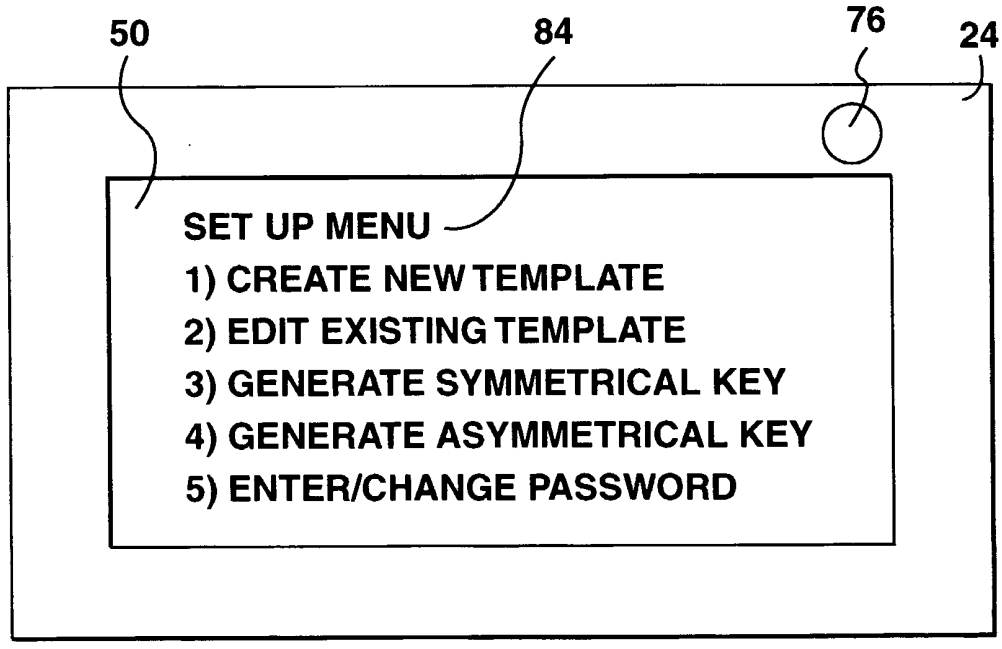
50
84
76
24
SET UP MENU
1) CREATE NEW TEMPLATE
2) EDIT EXISTING TEMPLATE
3) GENERATE SYMMETRICAL KEY
4) GENERATE ASYMMETRICAL KEY
5) ENTER/CHANGE PASSWORD

FIG. 5

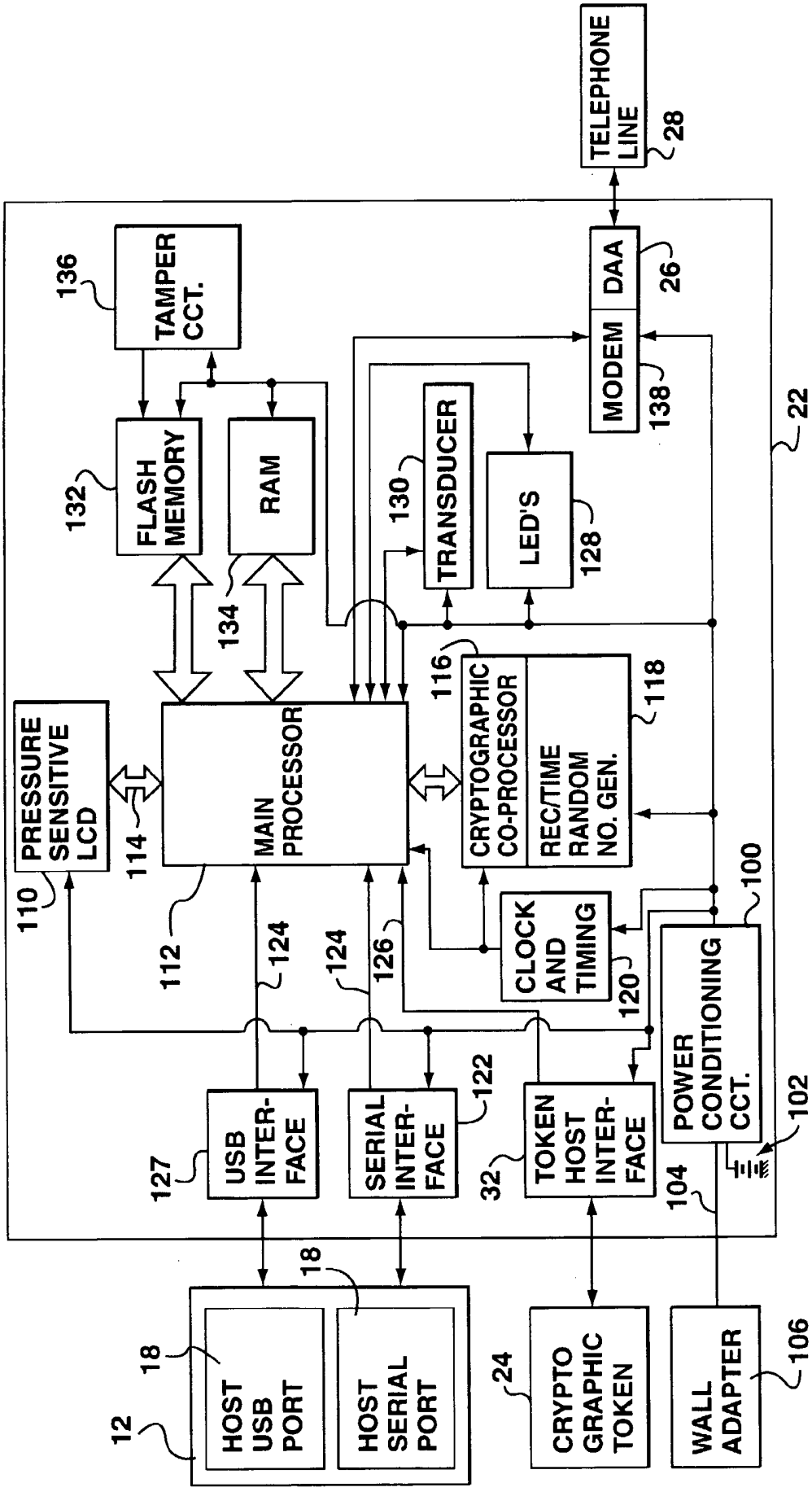
TELEPHONE LINE
28
DAA
26
MODEM
138
22
TAMPER CCT.
136
FLASH MEMORY
132
RAM
134
TRANSDUCER
130
LED'S
128
116
CRYPTOGRAPHIC CO-PROCESSOR
REC/TIME RANDOM NO. GEN.
118
PRESSURE SENSITIVE LCD
110
114
MAIN PROCESSOR
112
124
124
126
CLOCK AND TIMING
120
100
POWER CONDITIONING CCT.
102
104
USB INTER-FACE
127
SERIAL INTER-FACE
122
TOKEN HOST INTER-FACE
32
18
18
HOST USB PORT
HOST SERIAL PORT
12
24
CRYPTO GRAPHIC TOKEN
WALL ADAPTER
106

FIG. 6

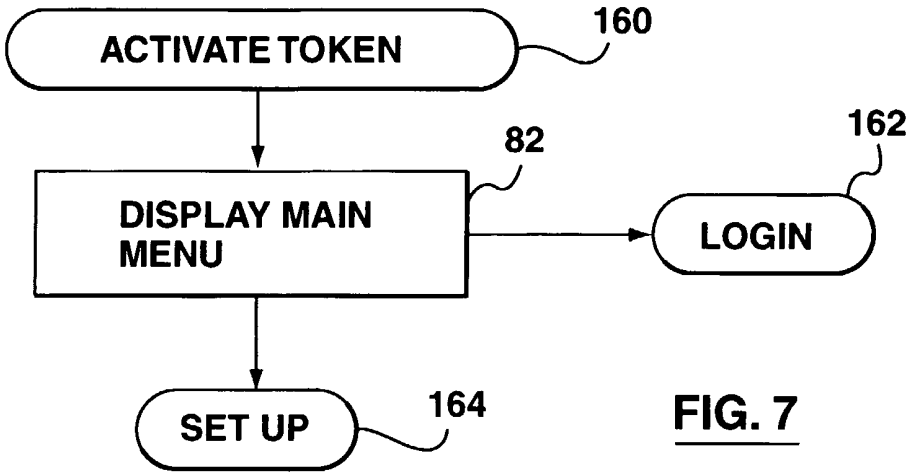
ACTIVATE TOKEN
160
82
DISPLAY MAIN MENU
162
LOGIN
SET UP
164

FIG. 7

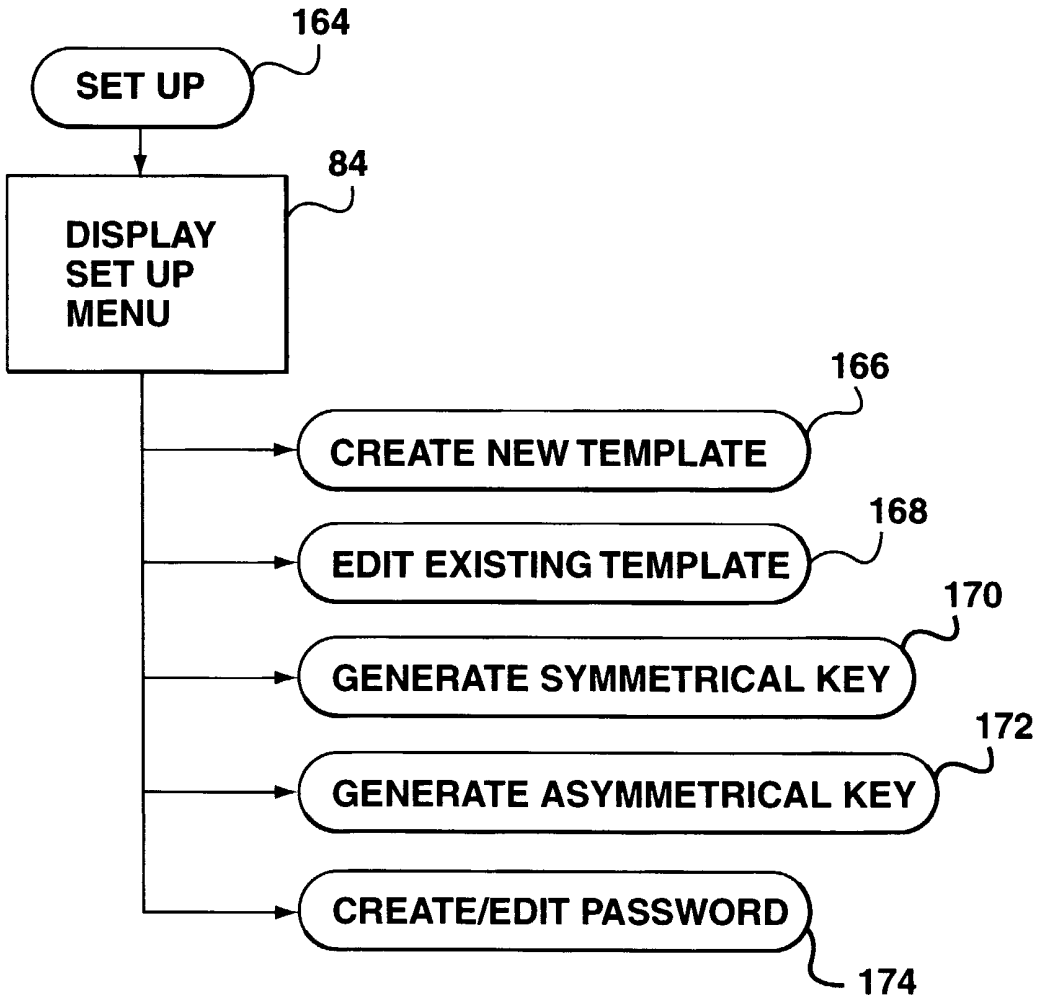
164
SET UP
84
DISPLAY SET UP MENU
166
CREATE NEW TEMPLATE
168
EDIT EXISTING TEMPLATE
170
GENERATE SYMMETRICAL KEY
172
GENERATE ASYMMETRICAL KEY
CREATE/EDIT PASSWORD
174

FIG. 8

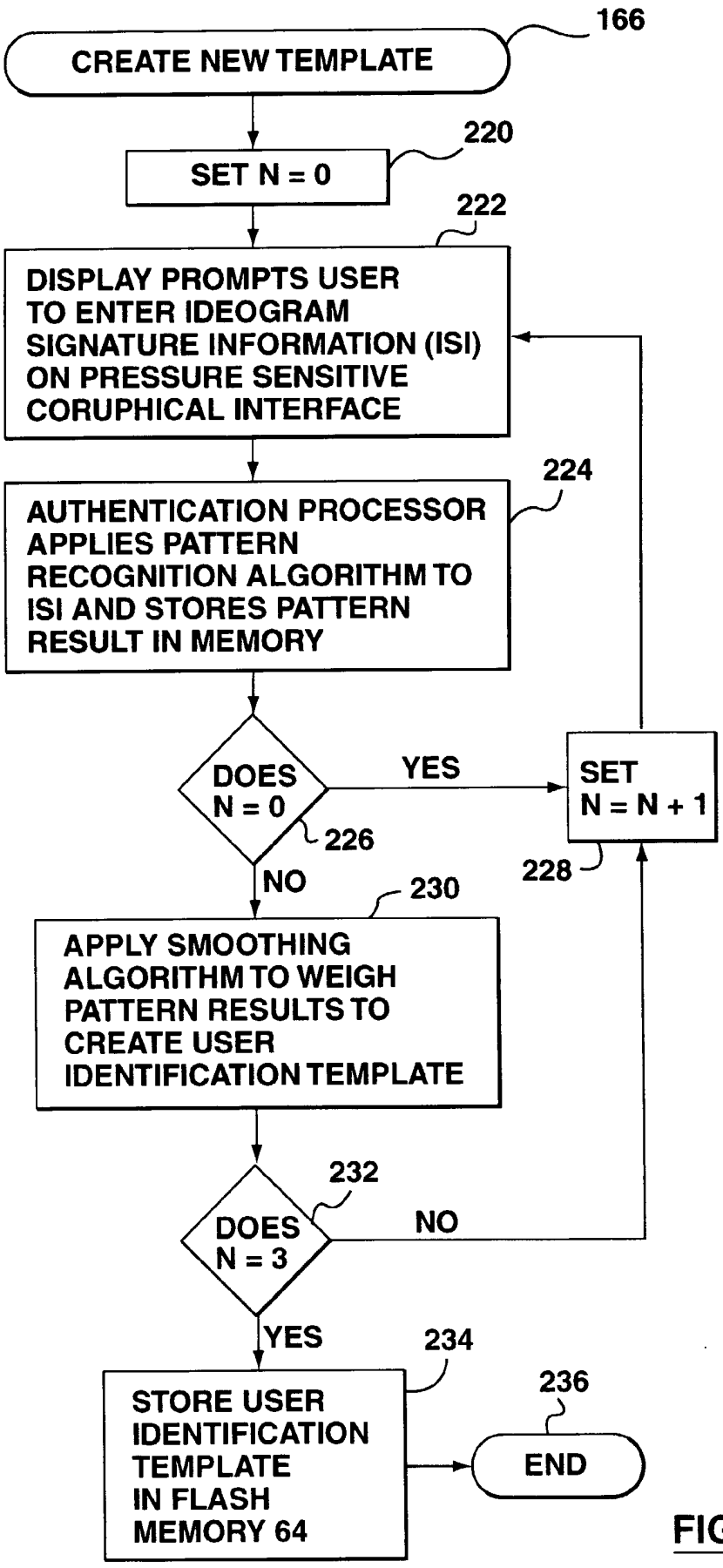
166
CREATE NEW TEMPLATE
220
SET N = 0
222
DISPLAY PROMPTS USER TO ENTER IDEOGRAM SIGNATURE INFORMATION (ISI) ON PRESSURE SENSITIVE CORUPHICAL INTERFACE
224
AUTHENTICATION PROCESSOR APPLIES PATTERN RECOGNITION ALGORITHM TO ISI AND STORES PATTERN RESULT IN MEMORY
DOES N = 0
226
YES
SET N = N + 1
228
NO
230
APPLY SMOOTHING ALGORITHM TO WEIGH PATTERN RESULTS TO CREATE USER IDENTIFICATION TEMPLATE
232
DOES N = 3
NO
YES
234
STORE USER IDENTIFICATION TEMPLATE IN FLASH MEMORY 64
236
END

FIG. 9

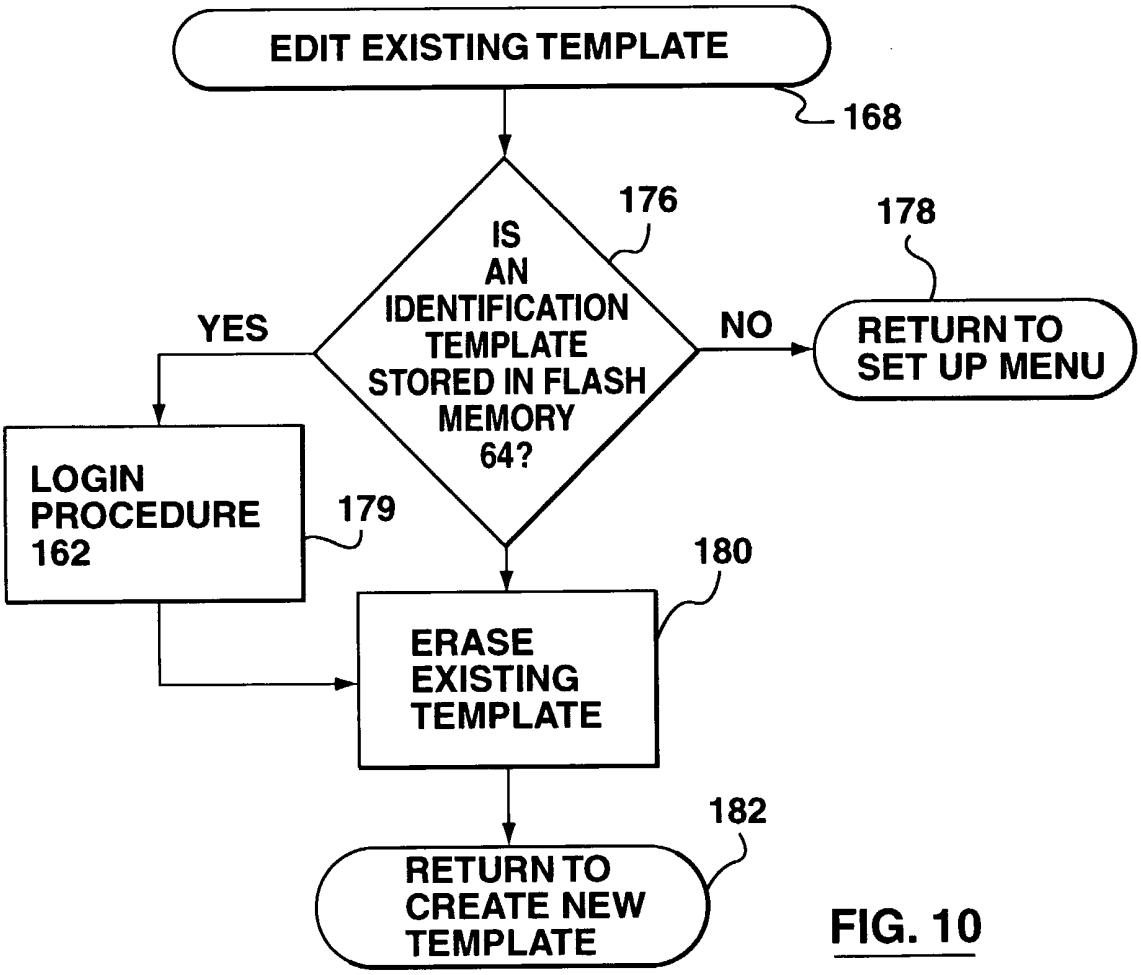
EDIT EXISTING TEMPLATE
168
176
IS AN IDENTIFICATION TEMPLATE STORED IN FLASH MEMORY 64?
YES
NO
178
RETURN TO SET UP MENU
LOGIN PROCEDURE 162
179
180
ERASE EXISTING TEMPLATE
182
RETURN TO CREATE NEW TEMPLATE

FIG. 10

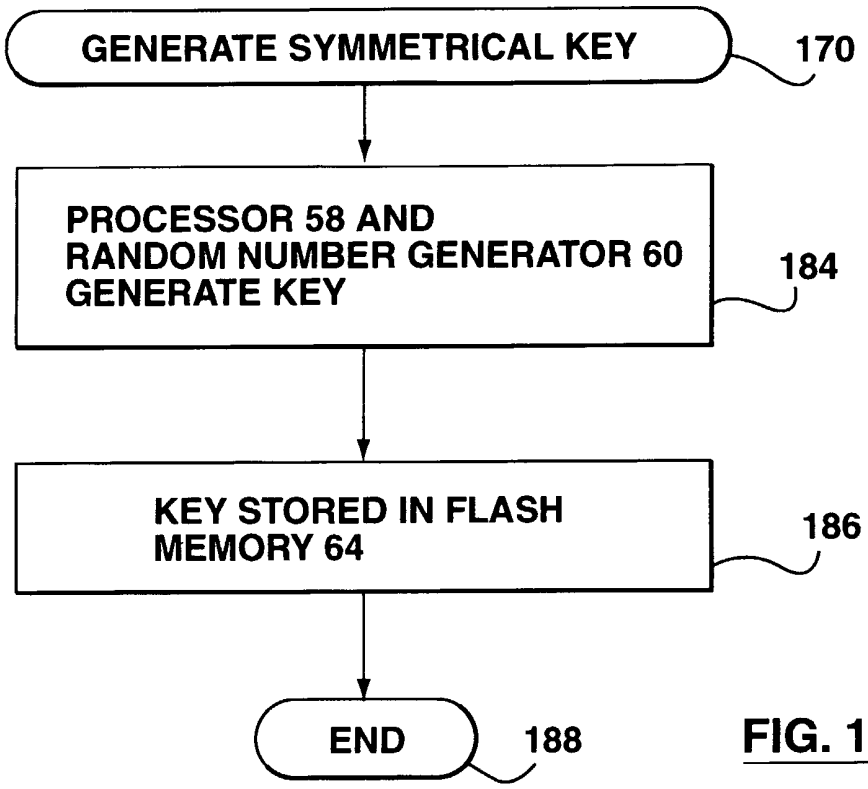
GENERATE SYMMETRICAL KEY
170
PROCESSOR 58 AND RANDOM NUMBER GENERATOR 60 GENERATE KEY
184
KEY STORED IN FLASH MEMORY 64
186
END
188

FIG. 11

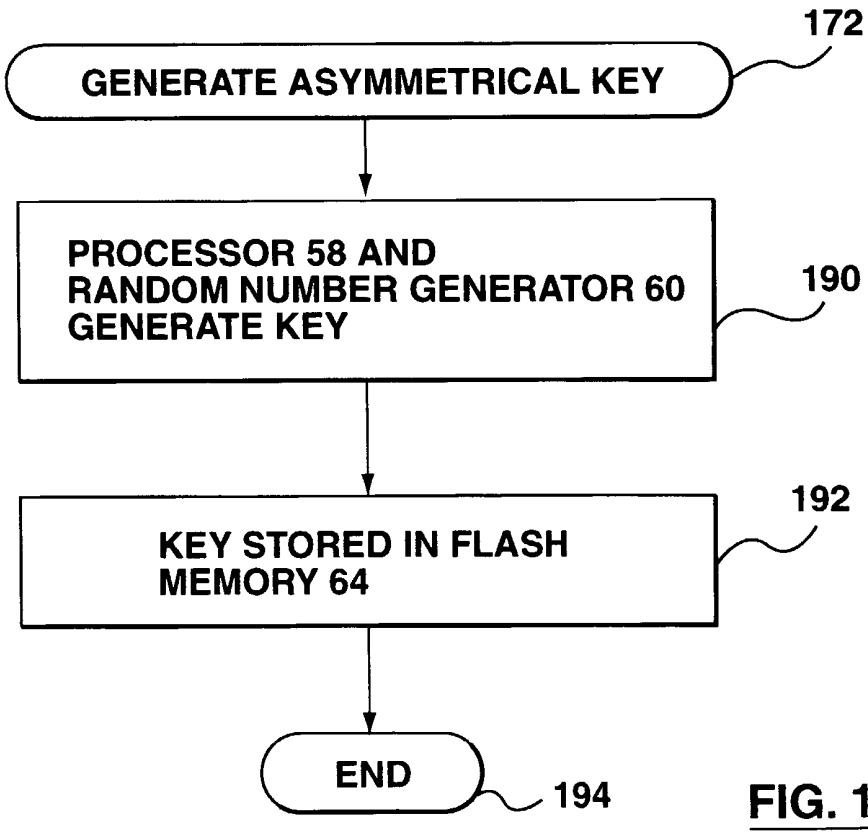
172
GENERATE ASYMMETRICAL KEY
PROCESSOR 58 AND RANDOM NUMBER GENERATOR 60 GENERATE KEY
190
KEY STORED IN FLASH MEMORY 64
192
END
194

FIG. 12

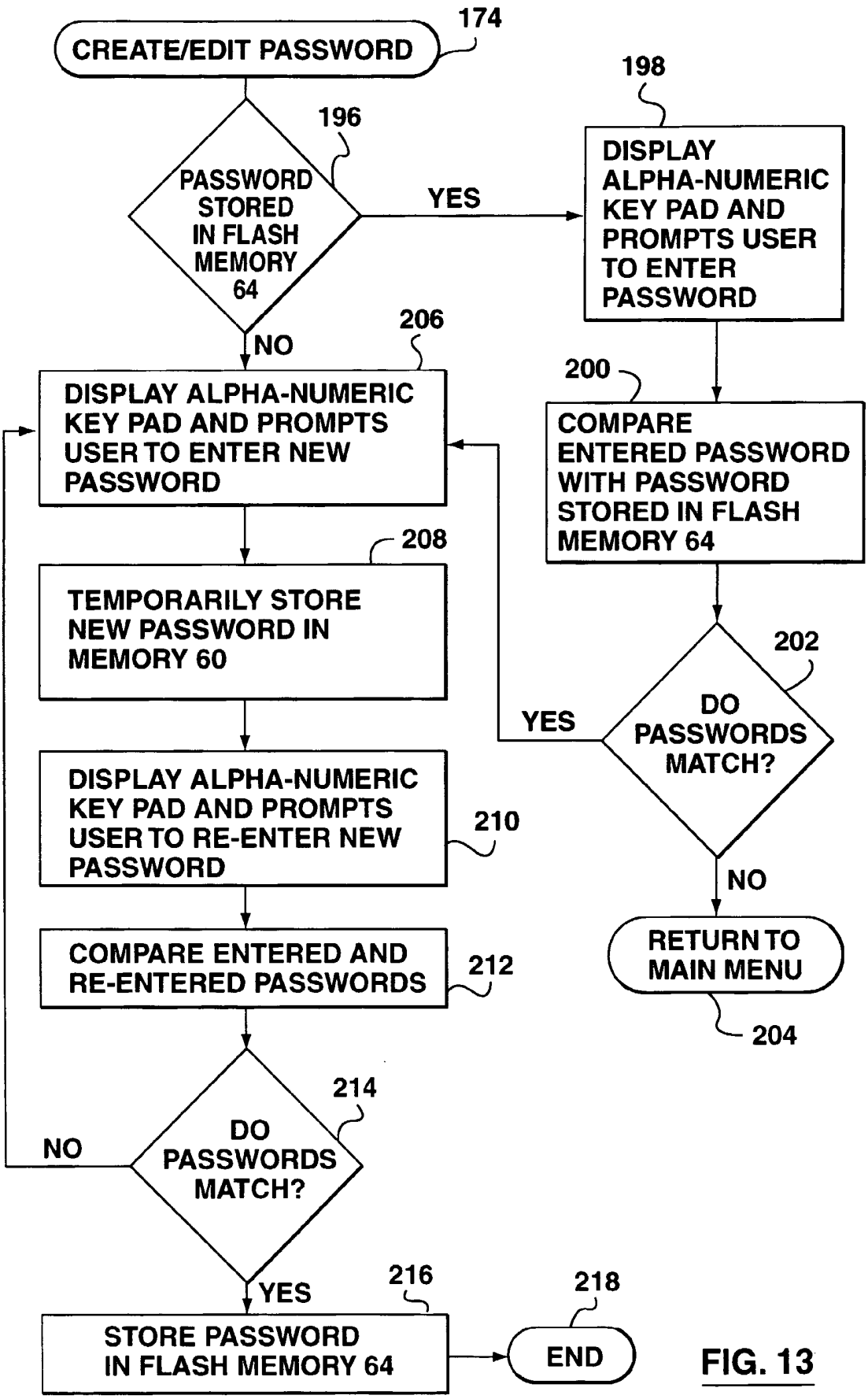
CREATE/EDIT PASSWORD
174
PASSWORD STORED IN FLASH MEMORY 64
196
YES
NO
198
DISPLAY ALPHA-NUMERIC KEY PAD AND PROMPTS USER TO ENTER PASSWORD
200
COMPARE ENTERED PASSWORD WITH PASSWORD STORED IN FLASH MEMORY 64
202
DO PASSWORDS MATCH?
YES
NO
RETURN TO MAIN MENU
204
206
DISPLAY ALPHA-NUMERIC KEY PAD AND PROMPTS USER TO ENTER NEW PASSWORD
208
TEMPORARILY STORE NEW PASSWORD IN MEMORY 60
DISPLAY ALPHA-NUMERIC KEY PAD AND PROMPTS USER TO RE-ENTER NEW PASSWORD
210
COMPARE ENTERED AND RE-ENTERED PASSWORDS
212
214
DO PASSWORDS MATCH?
NO
YES
216
STORE PASSWORD IN FLASH MEMORY 64
218
END

FIG. 13

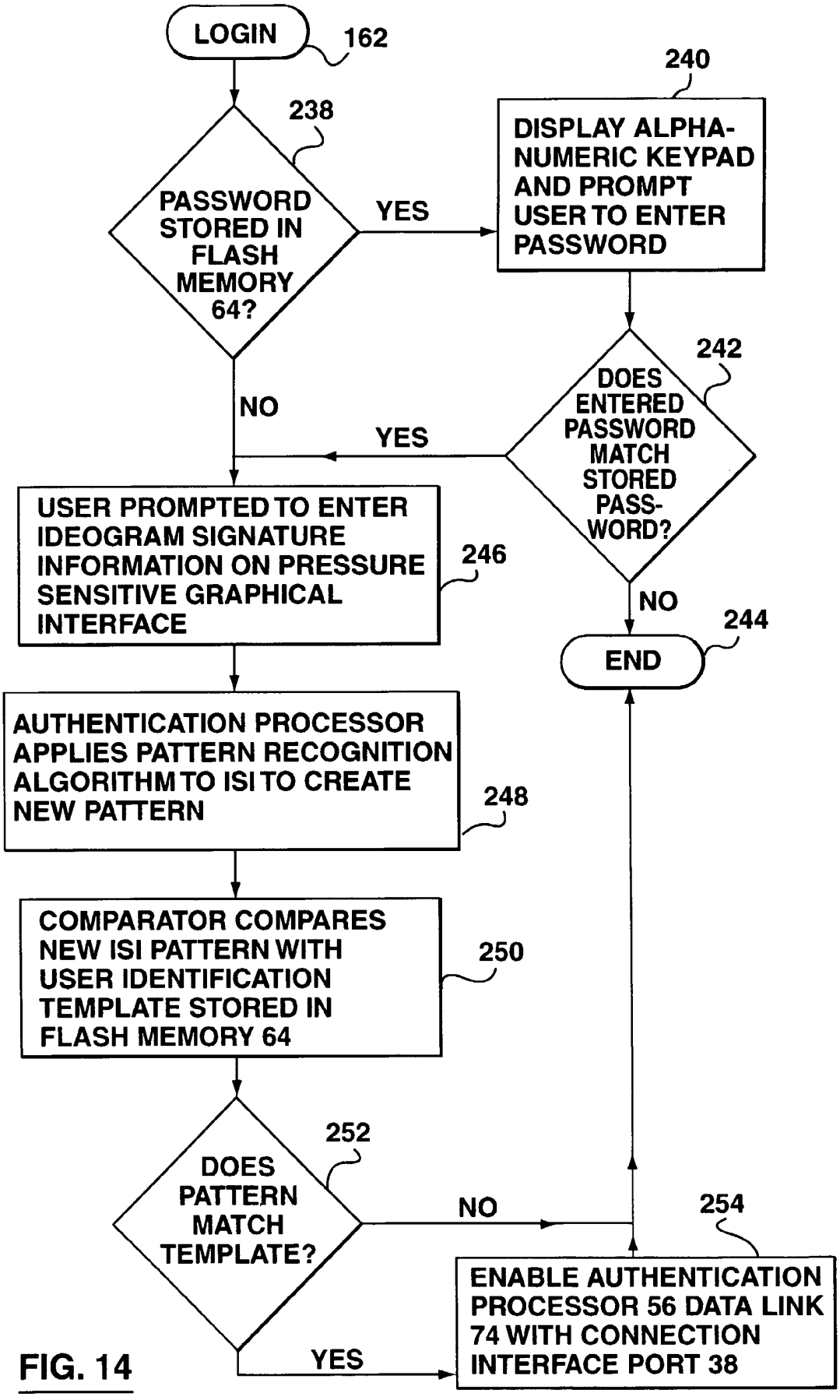
LOGIN
162
238
PASSWORD STORED IN FLASH MEMORY 64?
YES
240
DISPLAY ALPHA-NUMERIC KEYPAD AND PROMPT USER TO ENTER PASSWORD
242
DOES ENTERED PASSWORD MATCH STORED PASS-WORD?
NO
YES
USER PROMPTED TO ENTER IDEOGRAM SIGNATURE INFORMATION ON PRESSURE SENSITIVE GRAPHICAL INTERFACE
246
NO
244
END
AUTHENTICATION PROCESSOR APPLIES PATTERN RECOGNITION ALGORITHM TO ISI TO CREATE NEW PATTERN
248
COMPARATOR COMPARES NEW ISI PATTERN WITH USER IDENTIFICATION TEMPLATE STORED IN FLASH MEMORY 64
250
252
DOES PATTERN MATCH TEMPLATE?
NO
254
ENABLE AUTHENTICATION PROCESSOR 56 DATA LINK 74 WITH CONNECTION INTERFACE PORT 38
YES

FIG. 14

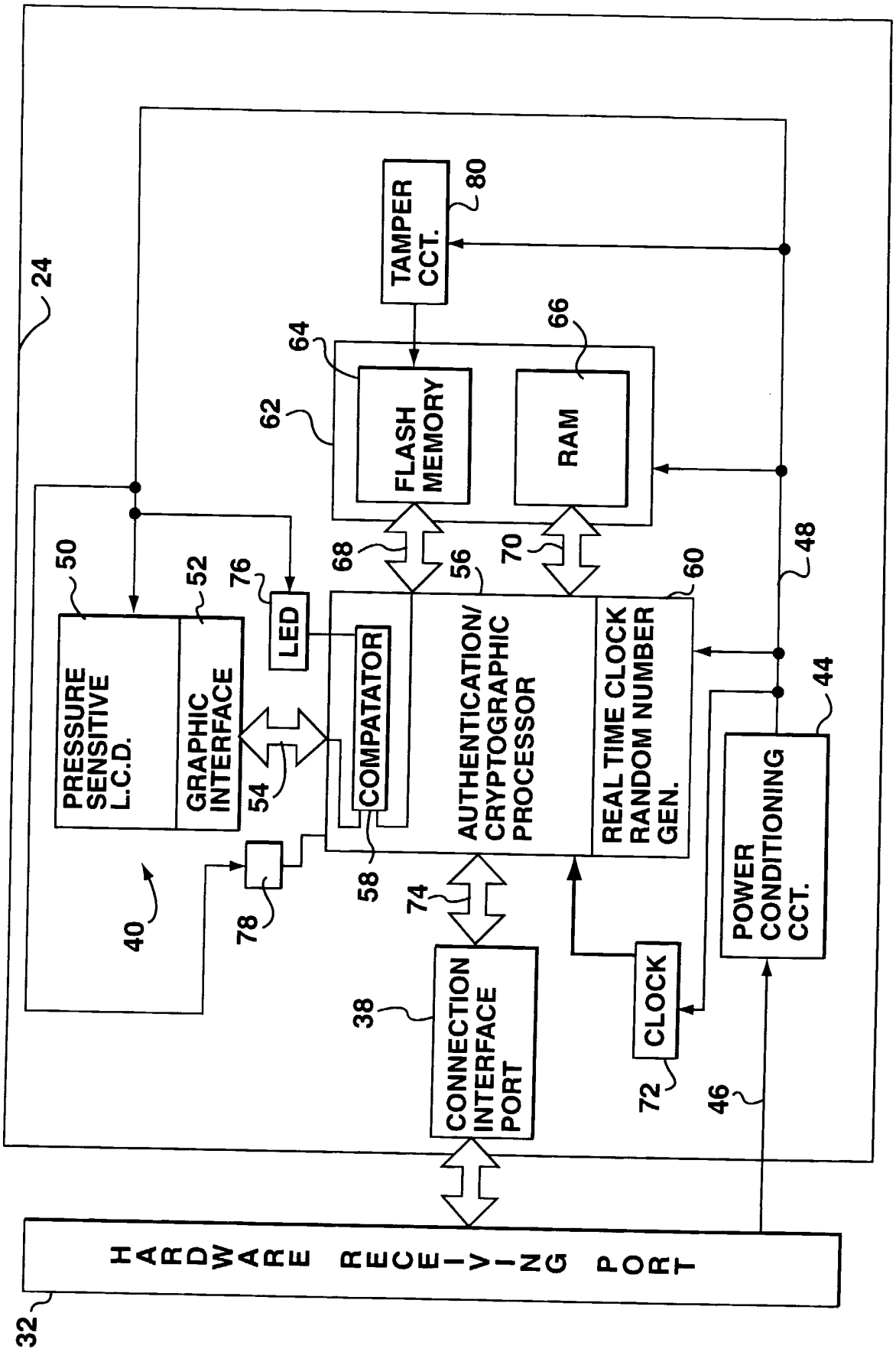
24
TAMPER CCT.
80
64
66
62
FLASH MEMORY
RAM
50
52
76
68
56
70
60
48
PRESSURE SENSITIVE L.C.D.
GRAPHIC INTERFACE
LED
COMPATATOR
AUTHENTICATION/ CRYPTOGRAPHIC PROCESSOR
REAL TIME CLOCK RANDOM NUMBER GEN.
44
54
POWER CONDITIONING CCT.
40
78
58
74
38
CONNECTION INTERFACE PORT
CLOCK
72
46
HARDWARE RECE-V-NG PORT
32

FIG. 15

INTERNATIONAL SEARCH REPORT

In onal Application No
PCT/CA 00/01481

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06F1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F G07F H04L G07C G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 98 07255 A (INFORMATION RESOURCE ENGINEERI) 19 February 1998 (1998-02-19) abstract page 8, line 17 -page 28, line 8 figures 1-3	1-3, 5-12,14, 15 4,13, 16-122
Y A	GB 2 201 125 A (DE LA RUE SYST) 24 August 1988 (1988-08-24) abstract page 3, line 28 -page 5, line 33 figures 1-3	4,13, 16-122 1

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"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 when the document is taken alone

"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

Date of the actual completion of the international search	Date of mailing of the international search report
27 March 2001	03/04/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Jacobs, P

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	WO 95 16238 A (TELEQUIP CORP) 15 June 1995 (1995-06-15) abstract page 4, line 3 -page 8, line 22 page 11, line 30 -page 12, line 35 figures 1-3	1-15,17, 23-25, 27-31, 33,34, 43-46, 48-50, 56, 62-64, 66-70, 72,73, 82-85, 87-94, 96, 102-104, 106,107, 116-119, 121,122
A	EP 0 752 635 A (SUN MICROSYSTEMS INC) 8 January 1997 (1997-01-08)	
A	WO 98 17029 A (TELIA AB) 23 April 1998 (1998-04-23)	

INTERNATIONAL SEARCH REPORT

Information on patent family members

Ir ional Application No
PCT/CA 00/01481

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WO 9817029 A	23-04-1998	SE 506628 C	19-01-1998
		EP 0932956 A	04-08-1999
		NO 991756 A	14-06-1999
		SE 9603825 A	19-01-1998