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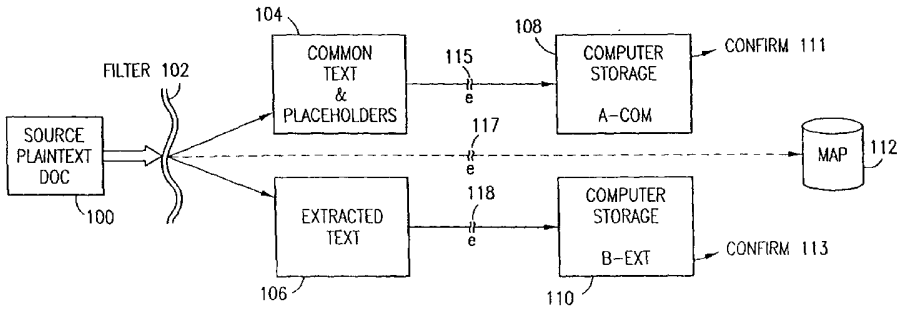
(54) Title: COMPUTER SOFTWARE PRODUCT FOR DATA SECURITY OF SENSITIVE WORDS CHARACTERS OR ICONS



(57) Abstract: The computer software product extracts security sensitive words, data, credits card or account numbers, icons, images or audio or video data from input data (100), thereby creating extract data (104) and reminder data (104). Extract data and remainder data are separately stored (110, 108, respectively) locally on a PC memory (116, 168, 160, 162) or on another computer in a LAN (142, 146) or WAN or on the Internet (154, 157). Encryption (238) and decryption (424, 425, 426, 430) may be utilized to enhance security (including transfers of data and memory map (158) location). Reconstruction of the data (FIG.1B and FIG. 3) is permitted only in the presence of predtermined security clearance levels (226) and full and partial reconstruction is possible with multiple levels of security (226). The data security system may be used to transparently establish and manage a separation of user-based communities of interest based upon crypto-graphically separated, need to know, security levels. The security system, as an adaptive system (FIG.8) protects against electronic attacks (460) and environmental events, generates attacks warnings (462) extracts security sensitive data, stores the data and permits full or partial reconstruction (478). Parsing (556) and dispersion (560) aspects enable users to maintain security (FIG.10). Data security for e-mail (FIG.11A) and browser programs (FIG.12A) is provided. Remainder data is sent to the e-mail addressee (624) or a browser target (712) (a designated web server). The addressee or intended recipient is permitted to retrieve the extracted data from said extract store only in the presence of a security clearance (628, 714) and hence, reconstruct the source e-mail or browser-input data with the extracted data. In other systems, the addressee reconstructs the email by decryption and integration (621, 623, 629). FIG. 1A is generally illustrative.

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COMPUTER SOFTWARE PRODUCT FOR DATA SECURITY OF SENSITIVE WORDS, CHARACTERS OR ICONS

Technical Field

The present invention relates to a computer software product for data security of sensitive words, characters, icons, images, audio and video data by granularly extracting and dispersal of the sensitive data. Reconstruction or the controlled release of data is permitted only in the presence of certain security protocols or clearances.

Background Art

The extensive use of computers and the continued expansion of telecommunications networks, particularly the Internet, enable businesses, governments and individuals to create documents (whether text, images, data streams audio or video files, or a combination thereof, sometimes identified as "data objects") and distribute those documents widely to others. Although the production, distribution and publication of documents is generally beneficial to society, there is a need to limit the distribution and publication of security sensitive words, characters or icons. Concerns regarding the privacy of certain data (for example, an individual's social security number, credit history, medical history, business trade secrets and financial data) is an important issue in society. In another words, individuals and businesses have a greater concern regarding maintaining the secrecy of certain information in view of the increasing ease of distribution of documents through computer networks and the Internet.

U.S. Patent No. 5,485,474 to Rabin discloses a scheme for information dispersal and reconstruction. Information to be transmitted or stored is represented as N elements of a field or a computational structure. These N characters of information are grouped into a set of n pieces, each containing m characters. col. 1, lines 37-46. The system is used for fault tolerance storage in a partitioned or distributed memory system. Information is disbursed into n pieces so that any m pieces suffice for reconstruction. The pieces are stored in different parts of the memory storage medium. A fairly complex mathematical algorithm is utilized to provide reconstruction of the information utilizing no fewer than m pieces.

U.S. Patent No. 6,192,472 B1 to Garay et al. discloses a method and apparatus for the secure distributed storage and retrieval of information. Garay '472 identifies the problem as how to store information in view of random hardware or telecommunications failures. Col. 1, lines 17-20. The initial solution is to replicate the stored data in multiple locations. Col. 1, lines 28-31. Another solution is to disburse the information utilizing in Information Disbursal Algorithm (IDA). The

basic approach taking in IDA is to distribute the information F being stored among n active processors in such a way that the retrieval of F is possible even in the presence of up to t failed (inactive) processors. Col. 1, lines 40-44. Another issue is the utilization of cryptographic tools. With the use of tools called distributed fingerprints (hashes), the stored data is distributed using the fingerprints and coding functions to determine errors. In this way, the correct processors are able to reconstruct the fingerprint using the code's decoding function, check whether the pieces of the file F were correctly returned, and finally reconstruct F from the correct pieces using the IDA algorithm. Col. 2, lines 50-59. Garay '472 also discloses the use of Secure Storage and Retrieval of Information (SSRI) with the added requirement of confidentiality of information. Col. 3, line 56. With this added requirement, any collision of up to t processors (except ones including the rightful owner of the information) should not be able to learn anything about the information. Confidentiality of information is easily achieved by encryption. Col. 3, lines 56-61. The issue involves encryption key management, that is, the safe deposit of cryptographic keys. Garay '472 discloses confidentiality protocol utilizing distributed key management features. This mechanism allows the user to keep his or her decryption key shared among several n servers in such a way that when the user wants to decrypt a given encrypted text, the user would have to interact with a single server (the gateway) to obtain the matching plaintext while none of the servers (including the gateway) gets any information about the plaintext. Col. 4, lines 5-14.

A publication entitled "Element-Wise XML Encryption" by H. Maruyama T. Imamura, published by IBM Research, Tokyo Research Laboratory, April 20, 2000 discloses a protocol or process wherein certain parts of an XML document are encrypted and the balance of the plaintext is not encrypted. The protocol is useful in three party transactions, for example, when a buyer sends an order in an XML document to a merchant which contains the buyer's credit card information. The credit card information is sent to a credit company and the merchant does not need to know the credit number as long as he obtains clearance or authorization from the credit card company. Another instance is an access control policy which requires a certain part of an XML document to be readable only by a privileged user (for example, a manager could access the salary field in an employee records but others could only access name, phone and office fields). The Imamura article discusses encryption protocol, the delivery of keys and the utilization of compression. The article does not discuss separate storage of the critical data apart from the plaintext of the XML document.

An article entitled "Survivable Information Storage Systems" by J. Wylie M. Bigrigg, J. Strunk, G. Ganger, H. Kiliccote, and P. Khosla, published August, 2000 in COMPUTER, pp. 61-67,

discloses a PASIS architecture which combines decentralized storage system technologies, data redundancy and encoding and dynamic self-maintenance to create survivable information storage. The Bigrigg article states that to achieve survivability, storage systems must be decentralized and must spread information among independent storage nodes. The decentralized storage systems partition information among nodes using data distribution and redundancy schemes commonly associated with disc array system such as RAID (redundancy array of independent discs) insuring scalable performance for tolerance. P. 61. Thresholding schemes - also known as secret sharing schemes or information disbursal protocols - offer an alternative to these approaches which provide both information confidentiality and availability. These schemes and codes, replicate, and divide information to multiple pieces or shares that can be stored at different storage nodes. The system can only reconstruct the information when enough shares are available. P. 62. The PASIS architecture combines decentralized storage systems, data redundancy and encoding and dynamic self-maintenance to achieve survivable information storage. The PASIS system uses threshold schemes to spread information across a decentralized collection of storage nodes. Client-side agents communicate with the collection of storage node to read and write information, hiding decentralization from the client system. P. 62. The device maintains unscrubable audit logs --that is, they cannot be erased by client-side intruders -- security personal can use the logs to partially identify the propagation of intruder-tainted information around the system. P. 63. The article states that, as with any distributed storage system, PASIS requires a mechanism that translates object names -- for example file names -- to storage locations. A directory service maps the names of information objects stored in a PASIS system to the names of the shares that comprised the information object. A share's name has two parts: the name of the storage node on which the share is located and the local name of the share on the storage node. A PASIS file system can embed the information needed for this translation in directory entries. P.63. To service a read request, the PASIS call client (a) looks up in the directory service the names of the n shares that comprise the object; (b) sends read requests to at least m of the n storage nodes; (c) collects the responses and continues to collect the responses until the client has collected m distinct shares; and (d) performs the appropriate threshold operation on the received shares to reconstruct the original information. P. 63. The p-m-n general threshold scheme breaks information into n shares so that (a) every shareholder has one of the n shares; (b) any m of the shareholders can reconstruct the information; and (c) a group of fewer than p shareholders gains no information. P. 64. Secret-sharing schemes are m-m-n threshold schemes that trade off information confidentiality and information availability: the higher the confidentiality

guaranty, the more shares are required to reconstruct the original information object. Secret sharing schemes can be thought of as a combination of splitting and replication techniques. P. 64. The article discusses the technique of decimation which divides information objects into n pieces and stores each piece separately. Decimation decreases information availability because all shares must be available. It offers no information theoretic confidentiality because each share expresses 1/n of the original information. P. 64. Short secret sharing encrypts the original information with a random key, stores the encryption key using secret sharing, and stores the encrypted information using information disbursal. P. 64. An extension to the threshold schemes is cheater detection. In a threshold scheme that provides cheater detection, shares are constructed in such a fashion that a client reconstructing the original information object can tell, with high probability, whether any shares have been modified. This technique allows strong information integrity guarantees. Cheater detection can also be implemented using cryptographic techniques such as adding digest to information before storing it. P. 65. For the highest architecture to be effective as possible, it must make the full flexibility of threshold schemes available to clients. The article believes this option requires automated selection of appropriate threshold schemes on a per object basis. This selection would combine object characteristics and observations about the current system environment. For example, a client would use short secret sharing protocol to store an object larger than a particular size and conventional secret sharing protocol to store smaller objects. The size that determines which threshold scheme to use could be a function of object type, current system performance, or both. P. 67.

Disclosure of the Invention

The software product secures data in a computer system in one embodiment by establishing a group of security sensitive words, characters, icons, data streams or data objects, filtering the data input from a data input device and extracting the security sensitive data. The extracted data is separated from the remainder data and is separately stored. In one embodiment on a personal computer (PC) system, the extracted data and the remainder or common data is stored in different, distributed memory segments. In a network implementation, the extracted data may be stored in one computer and the remainder or common data may be stored in another computer. In a client-server implementation, the server may direct storage of the extracted data to a different location than the remainder data, either on the server or on a further memory system (computer) interconnected to the server or on the client computer and in distributed memory segments. A map may be generated by a software module or sub-system indicating the location of the extracted data and the remainder data

in the network. The filter may be destroyed (via a deletion routine) or may be retained for future use by the user. If retained, encryption is preferred. The map may be stored on the client computer or the user's PC or may be stored on the server. Copies of the map may be removed (deleted) from the user's PC or the client computer. The map may be encrypted. The extracted data and/or the remainder data may be removed (deleted or scrubbed) from the originating computer. Encryption can be utilized to further enhance the security levels of the system. All transfers of the filter between the client to the server may be encrypted, and all data (whether extracted data or remainder data) may be encrypted prior to storage in the distributed memory. Any transfer of extracted data or remainder data or maps or filters may include an encryption feature. Reconstruction of the data is permitted only in the presence of a predetermined security clearance. A plurality of security clearances might be required which would enable a corresponding plurality of reconstructing users to view all or portions of the data. Persons with low level security clearance would only be permitted to have access to low level extracted data (low level security sensitive data) and the common data. Persons with high level security clearances would be permitted access to the entire document reconstituted from the extracted data and the remainder data.

In another embodiment, the product secures data in a computer network and transparently establishing and managing the separation of user-based communities of interest based upon cryptographically separated, need to know, security levels, by necessity, utilizes communities of interest representing a plurality of users having corresponding similar security levels, each with a respective security clearance. In other words, all members of Community A have the same security level and security clearance, which is different than the users of Community B which have a different security level and security clearance. The programming instructions include filtering data from the data input computer, extracting security sensitive words, phrases, characters, icons, or data objects and forming subsets of extracted data and remainder data. The subsets of extracted data are stored in one or more computer memories in the network identified as extracted stores. The remainder data is also stored in the network if necessary. Reconstruction of some or all of the data via one or more of the subsets of extracted data and the remainder data is permitted only in the presence of a predetermined security clearance from the plurality of security levels. The cryptographically separated, need to know, security levels correspond to respective ones of the plurality of security levels and the method includes, in one embodiment, encrypting subsets of extracted data with corresponding degrees of encryption associated with the plurality of security levels. During reconstruction, all or a portion of

the plaintext data is decrypted only in the presence of the respective security level. Multiple level encryption in one document is also available.

An adaptive method of securing data responsive to a plurality of hacking events utilizes a hacking monitor which generates a corresponding plurality of hack warnings dependent upon the severity of the hacking attack. Based upon respective ones of the hacking or hack warnings, data is filtered to extract security sensitive words, phrases etc. and the extracted data and the remainder data (if necessary) is stored based on the degree of hack warning. Reconstruction is permitted of some or all the data utilizing the extracted data and the remainder data only in the presence of the predetermined security clearance level. Automatic reconstruction is permitted after the hack attack terminates. The software product sometimes includes encrypting extracted data dependent upon the degree or severity of the hack warning and decrypting that data during reconstruction.

The parsing and dispersion aspects of the present invention enable the user to parse, disperse and reconstruct the data or data object thereby enabling secure storage of the data. The original data may be maintained in its original state and stored as is customary, encrypted or destroyed. For example, financial data maintained by an institute in its original state, and a copy thereof can be parsed with an algorithm, the parsed segments dispersed off-site, (that is, separated and stored in extract and remainder stores or computer memories), away from the financial institute, and, upon appropriate security clearance, the dispersed data can be reconstructed to duplicate the data. Large distribution of parsed data is contemplated by this aspect of the invention. The original data remains stable, operable and immediately useful in its stored location. The secured and dispersed data is a back-up of the original data. Destruction of the original source is also an alternative embodiment.

Another embodiment of the present invention operates in an e-mail or a web browser environment. In a specific embodiment, the invention operates as a credit card or financial data scrubber. The e-mail data has one or more security sensitive words, characters or icons and the method or computer program works in a distributed computer system with a remote memory designated as an extract store. The method extracts the security sensitive words, characters or icons from said e-mail data to obtain extracted data and remainder data therefrom. The extracted data is stored in the extract store. The methodology emails the remainder data to the addressee. the addresses is permitted to retrieve the extracted data from said extract store only in the presence of a predetermined security clearance and hence, reconstruct the e-mail data with said extracted data and remainder data. The program and method on the user's e-mail device extracts the security sensitive data, facilitates storage of the extracted data in said extract store and, emails the remainder

data to the addressee. Rather than extracting security data, the method and program may parse the data. The method and program for safeguarding data entered via a browser involves extracting security sensitive data, facilitating the storage of such data in the remote store, and forwarding the remainder data to a targeted destination in the distributed computer system. The scrubber may utilize a pop-up window to enable user activation of the scrubber on an email or a web browser communication.

The present invention can be configured in various forms. The following descriptions discuss various aspects of the invention.

Automatic classification and declassification of documents on the fly. The extraction process downgrades and declassifies documents on the fly (in real time) so that they are useless to unauthorized parties. Presentation by a user of a valid security clearance enables substantially instant and seamless reconstitution of the security sensitive content.

Automatically securing unstructured documents and freeform documents for example, e-mail, instant messaging, or Word documents (input documents).

Automatically securing structured documents and transactional documents for example, database records or XML documents (input documents).

Providing flexibility into security management, risk management of data, data storage, and data flows and enable automatic responsiveness to threats. The innovation enables automatic response to security challenges and threats. The innovation can maintain, upgrade and downgrade the levels of security through implementation of a leveled granular extraction process and a controlled-release mechanism. Attacks or other external events can trigger a response in the form of higher extraction levels, expanding the type of content extracted, and constricting the release of important and critical data control from storage. How much and what to extract depends on the level of threat or perceived risk. In same manner, the amount and type of content released from storage and reconstituted depends on the level of threat or risk perceived by the system. The system delivers a level of security protection specifically matched to meet security needs as dictated by the changing security threats, environment, policy and organizational needs.

Multiple levels and standards of security. It is common knowledge that the highest security is delivered through total separation. Whereas this concept has only been implemented physically or by isolating computer environments, the invention achieves this concept of total separation within open and networked computer environments. The invention can implement a total physical and logical separation of important and critical data from its context and can preclude access to that

information without a needed granular access permission. The invention is also effective for sounds and images (data objects or data streams with security words, characters, terms, icons or other data objects).

Monitor security sensitive content through a process of analysis and categorization of each word or character, in a document. The invention enables processing of every character, word, number, as they are entered into a document and categorizes each into one of many pre- set categories. Categories can include surnames, locations, currency, defined terminology, and unknown words or phrases.

Enables plain text extraction and dispersion of security sensitive data. Maximum security with traditional methods encumbers free flow of information and business efficiency. Encryption burdens computer systems with high performance overhead, and its use is limited to the parties who have decryption capabilities. The invention offers a new solution. It enables leveled security in plain-text format, in addition to none, some, or all of pre-existing encryption, decryption, firewalls, and other security infrastructure. The level of security is determined by the extent of the security sensitive items, selection process; the extent of dispersal to various distributed storage locations; the rules for controlled-release from storage; and the access rules governing the reconstitution of extracts into the secured document.

Extractions are dispersed to distributed storage on a granular level. The rest of the document can be stored at its original location and/or other storage locations. Dispersal of extractions introduces new barriers not existing in current security. In certain situations, an attacker has first to find the (encrypted) map to the locations, then locate and access the distributed storage, get the data released from the controlled-release storage, and finally reintegrate the extracts into the appropriate documents.

Targeted extraction and encryption of security sensitive items. The extraction capabilities of the system enable different workflow modes. The system enables extraction and encryption of important and critical content. In essence, only the critical content is extracted and/or encrypted, whereas the rest of the document remains as plaintext. This capability enables the following: advantages and flexibility; and the ability to share the document within the organization or transmit it to outsiders while still maintaining security over the most important and critical content of the document. This is an automatic process for controlling the content of outgoing e-mail. The document owner releases the important and critical content by enabling access to it to defined parties at defined times within defined threat modes.

Enables encrypting document or extractions with multiple encryption types. The invention can deliver the highest level of security by using multiple types of encryption (and/or multiple keys) for one line, paragraph or document. Maximum security is delivered through automatic selection of security sensitive items, and encrypting these extractions with one or more types of encryption. The remainder data can also be encrypted. Multiple encryption types within one document statistically precludes deciphering that document regardless of the available computer power. Common encryption methods are vulnerable through existing technologies, social engineering methods, carelessness, and workflow habits. Furthermore, simple encryption becomes more vulnerable (including triple DES) assuming future mathematical breakthroughs or quantum computing. Existing methods to crack block ciphers are being improved to compromise the future AES Rinjdael standard.

Enables content dispersion. The innovation enables control over specific important and critical content items within the general contents of documents or digital files in a computer or within a network. The immediate controlled-release of those important content items according to specific identification and access criteria proactively safeguards the security and the value of documents or digital files. The content control enables broad dissemination of the digital files in closed networks, as well as open networks including the Internet, without compromising the security of the important and critical information in the digital file. The dispersal channels can include any of all of the following: networks, Internet, Virtual Private Channel. Telephone lines, Optical lines, Wireless, Fax, Documents, Verbal communication.

Enhances the survivability capabilities of an organization and its networks. If networks get damaged, the decryption capability, such as PKI, is likely to be compromised, or at a minimum, suspended. In such instances, the invention enables continuation of work on channels, which need not be secure. In addition, the dispersion of information guarantees maximum partial reconstitution to documents and transactions, or total reconstitution to documents and transactions benefiting from backup at distributed storage facilities.

Provides security for inter-connecting networks. It enables security for closed networks connecting to the Internet and other open networks. The Internet infrastructure and open networks are not secure. Even secured closed networks, such as VPNs, are not secured enough. The critical content of documents is the critical asset of the organization and must be highly secured, with maximum reliability, full transparency and instant accessibility. To remain competitive, organizations must maximize utility of the critical data within their documents, files, databases and servers. The securing of such documents must not be at the expense of compromising the access or processing

speed of such documents. The invention enables work in plain text, as well as with encryption. Working in plain text reduces the computing performance overload.

Enables the delivering information flow control in decentralized environments. Protection of privacy and confidentiality of information represents a long-standing challenge, The challenge has become much bigger with the expansion of the Internet, which has created decentralized networks. Parties, who do not know or trust each other, have to exchange information. The invention enables free flow and sharing of information between parties by removing burdening security restrictions and creating top security with a controlled-release of the security sensitive content in the documents. The technology enables top security through introduction of user and organization's ownership and control of the critical granular data in documents.

Provides an additional layer of access controls at the granular level of the user document. In order to view the reconstructed critical information the user would need to be verified by additional access controls at the data storage level. The user access code or a physical key enables release of data from the storage. Today's access controls do not stop the user from distributing documents to other parties. The inventions fined grained controlled-release mechanism releases the critical information, only under a required set of circumstances and access validation. The invention enables the user ownership of his security sensitive critical data and conditions for its release and dissemination. The user has the option to hide the critical data through declassification process and release through a reclassification process in which the critical data would be reconstituted in the document.

Provides compartmentalization of security sensitive content by leveled access to users. The invention creates leveled sharing of information, for example such that persons with level 3 access will have keys for encryption type RSA persons with level access 2 will have access to Blowfish encryption within one document.

Enables the use of distributed and dispersed storage including ASPs (application service providers). There is a major human tendency to refrain from sending important documents to web storage locations because of potential security breaches. This cultural issue is both driven by psychological issues and well-founded security concerns. The retention of those documents as is in physical proximity or locked security, provides actual security but precludes gaining any utility from those documents in a functional business setting. Instead the invention enables functional distribution of those documents without the security sensitive data, and a controlled-release of some or all of the extractions in a granular way in order to support business activities while retaining security.

Reduces data storage costs. The extraction process declassifies and downgrades mission critical documents. The downgrading and transformation of a critical document into a non-critical document, enables storage in less secured and lower cost storage. Taking advantage of this security-initiated, extraction process can yield substantial storage cost savings. The invention enables a high return on investment ROI for system storage cost arbitrage. Splitting the data into critical and non-critical enables 20 to 90% savings on storage cost.

Provides an automated security risk management system that creates added in-depth security defenses at the semantic-level as well as creation of controlled-release mechanisms at the storage-level with significantly reduced performance overhead requirements.

Controls information flow in centralized and decentralized environments, through controlled-release of information within distributed systems.

Implements security measures while accommodating the performance needs of a network. The invention provides a method and apparatus to ease overhead performance on congested computer networks. It can adjust the security defenses based on the performance needs of the network. Many security systems overburden the already burdened computing environment in terms of computational overhead, labor, and training requirements. The invention enables to ease the overhead performance of a network by transforming from high overhead performance, encryption methods, and other security methods, to the method presented by this invention.

Minimizes the time of exposure of the important content within a document. The invention enables to separate the important content from the rest of the document for substantial periods of time, thereby minimizing substantially the exposure to risk. It is possible for example to extract the important content from the document and release it for reconstitution only when the user will open the document. In such situations the important content could for example be time and unexposed for over 99% of the time and exposed for less than 1% of the time, which lowers the risk substantially.

Provides a security risk management method and system to minimize security risks. The invention enables minimization of security risks by: Automatic separation and extraction of granular critical data from the core document. Dispersal of the extracted critical data groups to different secured storage locations. Reconstitution of the critical data in document for limited time, to minimize exposure to risk. Partial reconstitution, of the critical data, in core document, through a controlled release of granular critical data. Granular controlled release of data to specific authorized people only.

Enables a controlled release security mechanism to enable the release of content and granular content from storage locations in a centralized and decentralized environment. The controlled release mechanism enables release of the appropriate content to the authorized party at the right time under the right circumstances.

Provides a security solution against damage by insiders. Studies show that insiders cause 70%-85% of the damage. These nine innovations are described in detail as follows: The invention enables insiders and employees to work with documents while managers and owners control the release of the critical prioritized information. The control is granular, thereby enabling continued work with the rest of the content in the document. The objective is to empower the user with the highest security while enabling him maximum sharing and delivery flexibility. This enables free flow of information between closed networks and public networks, such as the Internet, without compromising the security through extraction of important and critical content. The user can transport documents through various networks and e-mail services knowing that the critical information, which is still under control, and is not compromised.

Provides an automatic security system in order to overcome human flaws that create security vulnerabilities and reduces human labor and training costs.. Human engineering flaws are the cause of 90% of security vulnerabilities. For example, passwords are exposed through human fault enabling reading of plain text before it is encrypted. The invention enables an automatic process of appropriate response to security threats in an objective way and on an on going basis.

Provides protection for important granular content within a document. A feature left out in computer development is the protection and automatic protection of granular important content in a document. In every facet of life critical assets are immediately protected. For example, credit cards and cash are protected in a wallet, important items at home are placed in closets, wall units, cabinets and safes. The present system extracts the digital equivalent of these items, e.g., extracts all credit card data, and stores the extracted data in secure location(s).

Enables an alternative method to encryption. Mathematical security and encryption could be broken. Discovery of a mathematical equation for a shortcut of the factoring of prime numbers would be make mathematical security and encryption extremely vulnerable.

Provides an automated security risk management system. The system automatically responds to attacks by matching the defenses level to the level of threats The system responds to security threats through the following mechanisms: (1) controlled extraction of sensitive security data: in normal circumstances, extractions will take place according to pre-set rules; in threat situations,

additional extractions will take place to deliver higher security; in an attack, additional substantial amounts of critical data will be extracted to deliver the highest security; (2) controlled dispersal to storage locations; in normal circumstances, dispersal to different storage locations according to pre-set rules will take place; in threat and attack situations, more dispersal to more storage locations, via additional communication channels will take place; and (3) controlled release of extracts for reconstitution; controlling amount of extracts released for reconstitution; controlling time of exposure of extracts in reconstitution; limiting access to specific people; and limiting access to specific times.

Defends against devices like keyboard sniffers and mouse sniffers that can read information keyed into the computer and transmit it to an adversary. The invention enables to input security sensitive items through data input devices other than the keyboard. For example credit card numbers can be inputted through a hand held wireless devise. The inputted data would be transferred to storage for possible reconstitution.

Defends against as devices that intercept electromagnetic signals from computers, monitors, printers, and keyboards. For example the Van Eck receptors which can read information off the screen the display screen. The invention enables separation contents of document into two or more displays thereby limiting the potential damage of electromagnetic eavesdropping.

Enables the controlled release of data objects, full or partial release of plaintext source documents to persons or organizations with the appropriate security clearances.

Brief Description of the Drawings

FIG. 1A diagrammatically illustrates a basic system diagram showing filtering and storing extracted data and remainder or common data and, in an enhanced embodiment, generating and storing a map.

FIG. 1B diagrammatically illustrates a system diagram showing reconstruction of the data, various security clearances and both electronic reconstruction and visual reconstruction.

FIG. 2 diagrammatically illustrates a system showing major components of a single personal computer (PC) system, a networked system with several PCs (a LAN or WAN) and the network coupled to a telecommunications system and the Internet and shows the interconnection with a server and multiple, Internet-connected memory units.

FIG. 3 diagrammatically illustrates a basic flowchart showing reconstruction for various security levels.

FIG. 3A diagrammatically illustrates interleaving distinct data into different memory locations in a video memory.

FIG. 4 diagrammatically illustrates a flowchart showing one embodiment of the principal portions of the data security program.

FIG. 5 diagrammatically illustrates a flowchart showing the basic elements of the reconstruction process for the data security program.

FIG. 6 is a computer network diagram showing various user communities.

FIG. 7 diagrammatically illustrates a flowchart showing the key component steps for the multiple layer security program for the community of users.

FIG. 8 diagrammatically illustrates a flowchart showing the key components of an adaptive security program adaptable to various levels of electronic attacks, hacker or hack attacks.

FIG. 9 diagrammatically illustrates a flowchart showing the key components of a multiple encryption program using multiple types of encryption in one document or data object.

FIG. 10 diagrammatically illustrates a chart showing the key components of the parsing, dispersion, multiple storage and reconstruction (under security clearance) of data.

FIGS. 11A and 11B diagrammatically illustrate a flowchart showing the key components of one embodiment of the e-mail security system (jump points 11-A and 11-B link the flow charts).

FIGS. 12A and 12B diagrammatically illustrate a flowchart showing the key components of one embodiment of the invention implements the security system on a web browser (jump point 12-A links the flow charts).

FIG. 13 diagrammatically shows several revenue systems which may be employed with the data security systems described herein.

Best Mode for Carrying Out the Invention

The present invention relates to a data security system, a methodology of securing data on a personal computer (PC) system, on a computer network (LAN or WAN) and over the Internet and computer programs and computer modules and an information processing system to accomplish this security system.

It is important to know that the embodiments illustrated herein and described herein below are only examples of the many advantageous uses of the innovative teachings set forth herein. In general, statements made in the specification of the present application do not necessarily limit any of the various claimed inventions. Moreover, some statements may apply to some inventive features but not to others. In general, unless otherwise indicated, singular elements may be in the plural and

vice versa with no loss of generality. In the drawings, like numerals refer to like parts or features throughout the several views.

The present invention could be produced in hardware or software, or in a combination of hardware and software, and these implementations would be known to one of ordinary skill in the art. The system, or method, according to the inventive principles as disclosed in connection with the preferred embodiment, may be produced in a single computer system having separate elements or means for performing the individual functions or steps described or claimed or one or more elements or means combining the performance of any of the functions or steps disclosed or claimed, or may be arranged in a distributed computer system, interconnected by any suitable means as would be known by one of ordinary skill in the art.

According to the inventive principles as disclosed in connection with the preferred embodiment, the invention and the inventive principles are not limited to any particular kind of computer system but may be used with any general purpose computer, as would be known to one of ordinary skill in the art, arranged to perform the functions described and the method steps described. The operations of such a computer, as described above, may be according to a computer program contained on a medium for use in the operation or control of the computer as would be known to one of ordinary skill in the art. The computer medium which may be used to hold or contain the computer program product, may be a fixture of the computer such as an embedded memory or may be on a transportable medium such as a disk, as would be known to one of ordinary skill in the art.

The invention is not limited to any particular computer program or logic or language, or instruction but may be practiced with any such suitable program, logic or language, or instructions as would be known to one of ordinary skill in the art. Without limiting the principles of the disclosed invention any such computing system can include, inter alia, at least a computer readable medium allowing a computer to read data, instructions, messages or message packets, and other computer readable information from the computer readable medium. The computer readable medium may include non-volatile memory, such as ROM, flash memory, floppy disk, disk drive memory, CD-ROM, and other permanent storage. Additionally, a computer readable medium may include, for example, volatile storage such as RAM, buffers, cache memory, and network circuits.

Furthermore, the computer readable medium may include computer readable information in a transitory state medium such as a network link and/or a network interface, including a wired network or a wireless network, that allow a computer to read such computer readable information.

In the drawings, and sometimes in the specification, reference is made to certain abbreviations. The following abbreviations provides a correspondence between the abbreviations and the item or feature: A-com - computer or memory store for common or remainder data ; ASP - application service provider - server on a network; B-ext - computer or memory store for extracted data; bd - board; CD-RW - compact disk drive with read/write feature for CD disk; comm. -- communications, typically telecommunications; CPU - central processing unit; doc - document; dr - drive, e.g., computer hard drive; DS - data storage; e - encryption; ext-data - extracted data; I/O - input/output; I-com - Internet storage for common or remainder data; I-ext - Internet storage for extracted data; loc - location; mem - memory; obj - object, for example, a data object; pgm - program; re - regarding or relating to; recon – reconstruct; rel - release; req - request; rev - review; sec - security; sys - system; t - time; tele-com - telecommunications system or network; URL - Uniform Resource Locator, x pointer, or other network locator;

FIG. 1A diagrammatically illustrates the basic processes for establishing a secure storage of information, generally identified herein as "data." "Data," as used herein, includes any data object, e.g., text, images, icons, moving images, multiple images, data representing sound, video etc. Sound bites and video images may also be extracted data. A source document 100, sometimes referred to as a "plaintext," is passed through a filter 102. Although it is convenient to discuss and understand the invention herein in connection with a plaintext document, the document 100 is a data object. It is not limited to an electronic document representing words. The document 100 represents a data object that may be e.g., text, images, icons, moving images, multiple images, data representing sound, video etc. The term "data object" as used in the claims is broadly defined as any items that can be represented in an electronic format such that the electronic format can be manipulated by a computer as described herein. The data object, or as discussed herein, the "plaintext" is sent to a filter. Filter 102, in a most basic sense, separates out common text or remainder data 104 from uncommon text, words, characters , icons or data objects. The security sensitive words, characters, icons or data objects are separated from remainder or common text 104 as extracted text 106. It should be noted that although the word "text" is utilized with respect to remainder text 104 and extracted text 106, the text is a data object and includes words, phrases, paragraphs, single characters, portions of words, characters, whole or partial images, icons or data objects. In a basic implementation, filter 102 may utilize a dictionary such that words present in the dictionary (common words) are separated from the source plaintext document 100 and placed into remainder document or common data file 104. The uncommon words (extracted-security sensitive words), not found in

the dictionary, would be placed in an extracted text or extracted data file 106. For example, a business may wish to impose a security system on a contract document such that the names of the contracting parties (not found in the dictionary) and the street names (not found in the dictionary) would be stored in extracted data text file 106. The common text or remainder data would be stored in remainder data file 104. In the illustrated embodiment, remainder data file 104 also includes place holders which enables the extracted data to be easily inserted or set back into the remainder data file.

The security sensitive words, characters, icons or data objects may be any word, phrase, letter, character, icon, data object (full or partial), image or whatever, as pre-defined or as established by the user. The user may specifically design the filter, begin with a dictionary to define common terms, identify any additional security sensitive words, letters, images, icon, data objects, partial versions of the foregoing or any other granular aspect of the plaintext. After defining the filter and accepting the data input, the system filters the plaintext and separates extracted data (security sensitive items) from the remainder data. The filter may also include elements of artificial intelligence (AI). For example, the user may select one word as a security word and the AI filter may automatically select all synonymous words. The AI filter may enable the user to define a filter is real time at the entry of data via a keyboard. For example, the user may select to secure (i.e., extract and store) some proper names and may instruct the filter to secure names such as Block, Smythe and Cherry. During input of the plaintext, the system may detect Smith and ask the user if he or she wants to secure (a) all proper names in a common name dictionary collection and/or (b) all names with spellings similar to the filter input data, Block, Smythe and Cherry. As is known in the art, AI typically uses inference engines to define one pathway or to outline a course of action. The filter or extraction engine discussed herein can be configured with AI, inference engines, neural network systems or other automatic systems to carry out the functionality described herein for the dynamic operation of the security system.

The system and methodology described herein also encompasses parsing the plain text document by bit count, word, word count, page count, line count, paragraph count and parsing based upon any identifiable document characteristic, capital letters, italics, underline, etc. Algorithms may be implemented to parse the plain text document. The target of the parsing algorithm (a bit count, word, letter, etc.) is equivalent to the "security word, character or icon, data object" discussed herein. The parsing occurs with the filtering of the plain text source document 100 and the subsequent storage of extracted data apart from remainder data.

In a basic configuration, the common text or the remainder data is stored in common storage memory 108. This common or remainder data store is identified as A-com generally referring to a segmented memory in a PC or a computer A in a network (LAN or WAN). Remainder data storage 108 may include a confirm storage signal function 111 to send back a confirm storage signal to the data input device generating source plaintext document 100. The extracted data file 106 is stored in a different memory computer storage 110 (B-ext). In a preferred embodiment, memory segment 108 (A-com) is at a different location than computer storage memory segment 110 (B-ext). In a PC embodiment, memory A-com is a different memory segment than memory B-ext. In a networked embodiment, computer storage 108 may be on a different computer as compared with computer storage 110. In an Internet embodiment, common text or cleansed text storage is at one web site (which may be one computer) and the extracted, high security data is stored at another web site, buried web page or other Internet-accessible memory store location. In any event, the remainder text is stored in a memory A-com and the extracted data or high security words, characters , icons or data objects are stored in memory B-ext. After storage of the extracted data in memory 110, a confirmation indicator 113 may be generated to the client computer or the computer handling source plaintext input document 100 (the originating computer system).

As a simple example, the program configured in accordance with the present invention, could automatically detect entry of all credit card numbers types into a user's computer. The filter is set to detect the unique credit card sequence and data string. Assuming that the user's computer is operating a browser and the user is communicating with a server on the Internet, the user's computer would filter out the credit card number and send the number to a secure storage site. The secure storage site is owned, operated or leased by a trusted party. The extracted data, i.e., the credit card data, is stored at the trusted site. The URL or other identifying data is sent to the vendor from which the user wants to purchase goods and services over the Internet. When the vendor seeks to complete the transaction, the vendor sends a request code to the secure site, the trusted party at the secure extracted data storage site debits the user's credit card account (or otherwise debits the user's bank account) and sends an approval code to the vendor. In this manner, the vendor is never given the user's credit card – the card number is sent to a trusted party automatically by the filter in the security program described herein. The security program may be incorporated in a browser to automatically protect credit card data, personal data (as a method to become anonymous on the Internet), etc. from being deliberately broadcast to others on the Internet or to block others from snooping into the user's personal data while the user communicates over the Internet.

In a further enhancement of the present invention, the computer or data input device handling source plaintext document 100 may also record the location of A-com 108 and B-ext 110. The location data is called herein a "map." A memory mapping function is utilized. The map may be stored in a third memory location 112. Memory location map 112 may be a segment of the memory of the data input computer originating plaintext 100. The map may be encrypted for security reasons.

As a further enhancement of the present invention, the user, prior to initiating the security system, may be given a choice of filtering out all the uncommon words or words not found in the dictionary and adding certain security sensitive words, characters , icons or data objects to filter 102. The added words or terms are filtered out with the uncommon words. Of course, the user may be required to manually input all security words or download the security word filter from the Internet or another system on the LAN. For security systems having multiple security levels, a plurality of filters would be created, each filter associated with a different security level. Further, multiple security levels would require, in addition to remainder text document or data 104, a plurality of extracted data documents 106. The common or remainder text document or data 104 would still be stored in remainder computer storage A-com 108. However, each extracted data document 106 would be stored in a respective, separate computer memory segment or computer B-ext 110. Separate storage of a plurality of extracted data at multiple, separate locations in B-ext is one of the many important features of the present invention.

In view of increasing levels of security relating to (a) the storage location A-com; (b) the transfer of remainder text document 104 to memory computer storage A-com 108; (c) the storage of map 112 (possibly encrypted); (d) the creation, storage or transfer of filter 102 (possibly encrypted); (e) the storage of extracted data at memory storage B-ext (whether singular or plural storage sites); and (f) the transfer of extracted data thereto, the system may include an encryption e feature. The encryption e function 115, 117 and 118 is diagrammatically illustrated in FIG. 1A.

The program of the present invention can be set to extract critical data (a) when the plaintext or the source document (data object) is created; (b) when the source document or data object is saved; (c) on a periodic basis; (d) automatically; (e) per user command; (f) per ascertainable or programmable event; and (g) a combination of the foregoing. Timing for storage of the extracted data is based on these aspects. Reconstruction of the data object or plaintext may be (a) automatic and substantially transparent to the user; (b) based upon manual entry of security clearance data; (c) periodic; or (d) a combination of the foregoing dependent upon outside events and who is the author of the data object or other definable aspects of the data object, its environment of origination, current

and anticipated security threats and its environment of proposed reconstruction. The timing for the extraction, storage and reconstruction is oftentimes dependent upon the level of security required by the user and/or his or her organization.

FIG. 1B generally diagrammatically illustrates the major features of a reconstruction routine or system. The user, typically at a computer terminal, inputs a reconstruction request 120. The system first executes a security clearance protocol routine 122 in order to determine whether the user has the proper security clearance. The security clearance may be thought of as a security clearance control. If multiple users are permitted access to the documents and those multiple users have different security clearances, the security clearance protocol determines the level of security clearance and, hence, the full or partial reconstruction of the plaintext. The security code input by the user is checked against a security code database or list 124. Clearance is provided in step 126. The location of the map and, hence, the location of the remainder data A-com 108 and extraction is provided to the user's computer in step 128. This may include obtaining a copy of the map 130 showing the location of memory segments in (a) the local computer; (b) the LAN or WAN; or (c) the Internet storage sites. The storage segments are A-com 108 and B-ext 110. The common or remainder data is downloaded or transferred or made available to the user's computer as shown at the output of map location and data step 128. Typically, the extracted or security sensitive data from B-ext is downloaded. As described hereinafter, the data can be reconstructed as a complete electronic document in function 130 or may be reconstructed only as a visual reconstruction in step 132. Visual reconstruction is discussed later. Function 130 operates as a compiler to gather the extracted data and remainder data into a single plaintext document. If the data object represents sound or audio signals, reconstruction and play back may require a speaker output in function block 130. In a telecommunications implementation of the present invention, the input would include a microphone or audio detector (supplemental to the input device for document 100), an analog to digital converter (possibly with a voice to digital converter), the filter, extractor, storage facilities at least for the extracted data, and at the output of the system, a converter to audio and an audio announcer. The recipient of the secured data stream or message would be required to clear a security clearance and possibly obtain a decoding key prior to listening to the entire, decoded message. The key and the security data is separately downloaded to the recipient's device.

If remainder data in A-com memory 108 and extracted data in B-ext computer memory 110 is encrypted, the reconstruction process includes a decryption step. Encryptors and decryptors are relatively well known by persons of ordinary skill in the art. Further, the filter 102 (FIG. 1A) may

include some encryption routine operating on the data object (plaintext) during the filtering. A simple encryption may include substituting "dummy" text or images for the security words and keeping a pointer to an encryption key document mapping the security words with the dummy words. The filter may be stored or may be destroyed at the option of the user. Storage of the filter impacts the degree of security of the entire data system but storage of the same filter enables the user to reuse the filter at a later time. Encryption of the stored filter increases the security of the data. Creation and storage of map in memory 112 also impacts the degree of security of the system. However, if the filter 102 is destroyed and all copies of the map are destroyed on the user's computer originating plaintext document data 100, and the map is stored offsite in a third computer memory location 112, this offsite map storage may enhance the degree of security of the data. The originating computer processing plaintext 100 may be scrubbed to remove all reference and copies of the plaintext, remainder text, extracted data map storage data, etc., i.e., a deletion routine may be employed on the data input computer.

FIG. 2 diagrammatically illustrates a personal computer or PC computer system 140, a second PC or computer 142, and a third PC -3. PCs 140, 142 and PC-3 are connected together via a network 145(LAN or WAN) and are also connected to an input/output device 146 that may be generally described as a router or a server to an outside communications system. The input/output device 146 is connected to a telecommunications system 148 which leads to Internet 150. The Internet is a global computer network. Internet 150 is coupled to a plurality of servers, one of which is server 152. Server 152 may be designated as an application service processor ASP. Internet 150 also includes various computer memory storage devices such as computer storage I-com 154, computer storage I-ext 156 and computer storage map 158. Computer storage enabling the store of extracted data includes a security level clearance module 157. Similarly, map computer storage 158 includes security level clearance module 159.

As stated earlier, the present data security system can be implemented on a single personal computer 140. In this case, different memory segments or hard drive 168 may be used for A-com and B-ext. Typically, PCs include a keyboard or data input device 161, a display 163, a central processing unit CPU 165, a video board 167 having video board memory 169, a fixed disc hard drive 168, a RAM 166, and input/output device 164, a removable memory media floppy drive 162 and a removable compact disk (CD) read-write (CD-RW) device or drive 160. The system may include other removable disk drives, tape drives, or flash memory units. Internal units CPU 165, video board 167, hard drive 168, RAM 166 input/output device 164, floppy drive 162 and ÇD-ROM device 160

are all coupled together via an internal bus 171. Bus 171 represents a plurality of buses as is known to persons of ordinary skill in the art.

One methodology of implementing the present invention utilizes distinct memory segments which may be designated in one or more of the following: hard drive 168, memory in a removable disk in floppy drive 162, memory in a removable CD disc in CD-RW device 160, and, to a very limited extend, RAM 166. In this manner, the user may select, generally at the outset of the process, that the extracted data memory storage B-ext 110 be stored on a floppy (removable memory) via floppy drive 162 or a CD via CD-RW drive 160. The user can then simply remove the floppy or the CD and carry it with him or her. To reconstruct the data, the operative program, generally discussed above would have access to the floppy or the CD and particularly the memory location of the data on the floppy and the CD in order to reconstruct the entire plaintext document 100 (see FIG. 1A). Alternatively, different portions of hard drive 168 may store A-com and B-ext. Of course, the computer system may utilize tape drives and memories or flash card, programmable memory.

In a local area network or wide area network implementation, PC 142 includes memory similar to memory units described in PC 140 and a memory segment may be set aside in PC 142 separate from the common data or remainder data storage typically placed on hard drive 168 in PC 140. As a further expansion of the present invention, the extracted data (that is, the high security data), may be stored on computer storage I-ext memory unit 156 via Internet 150, telecommunications system 148 and router/server 146. In this manner, the common data or remainder data is stored on hard drive 168 and the highly sensitive data is stored off site in a secured location. Access to that secured location may be limited via security layer 157. If the user implements an encryption system (see encryption e 118 in FIG. 1A), the extracted data is further secured by the encryption during the transfer from computer 140 through network 145, router/server 146, telecommunication system 148, Internet 150 and ultimately to computer storage I-ext 156.

The present invention may also be embodied utilizing an Application Service Provider on server 152 and in a client-server network.

An implementation of the present invention over Internet 150 most likely includes the use of a uniform research locator or URL for map memory computer 158, computer storage I-ext 156, computer storage I-com 158 and ASP server 152. In a client-server environment, server 152 acts as a server generally commanding the operation of client computer 140. Of course, persons of ordinary skill in the art recognize that the server may be located on the local area network 145 rather than

being interconnected with Internet 150 as shown in FIG. 2. The claims appended hereto are meant to cover the alternative embodiments.

As an example of a client-server or web-based implementation of the present invention, the user at computer 140 may define the filter 102 as described above, and input data (plaintext) via keyboard 161 or load plaintext data from floppy drive 162 or CD-ROM drive 160 into RAM 166. In any event, whether the plaintext data is input via keyboard 161 or copied or accessed from floppy drive 162 or CD-RW drive 160, the plaintext data is filtered as discussed above in connection with FIG. 1A. Prior to filtering, it would be appropriate for the user at computer 140 to identify where the remainder data or common data will be stored and where the extracted or high security data would be stored. A simple program may automatically select the secure store location. The system is sufficiently flexible to enable the user to select local storage on different memory segments of PC 140 (hard drive 168, floppy drive 162, CD-RW drive 160) or be flexible enough to enable user at computer 140 to designate off site storage of the high security data (extracted data) and/or the common or remainder data. An automatic store routine may only require the user to accept or reject to preferred first security level, second security level and higher security level stores. The off site data storage process may include activating server 152 and enabling the server to take over the process directly from user 140. In other words, the user at computer 140 could call up the URL of the server 152, the server could request certain user information (user name, password), and would request data from the client computer to establish the filter pursuant to input selected by the user. The client computer may (a) filter the plaintext thereat or (b) send the data to the server for filtering. The server could store data either locally on computer 140 or remotely at computer memories 154, 156. After storage of the data at any of these locations, the server 152 may establish a map and store the map in memory location 158. Of course, remainder data (cleansed, plaint-text data)and the map may be stored at ASP 152 or client computer 140. The map, if stored at map storage 158, may be downloaded to the user at computer 140. The filter may be stored at computer 140 or may be stored at a secured location on server 152. Alternatively, the map could be destroyed on user computer 140. The filter could also be destroyed on user computer 140. Of course, the filter could be stored in a fourth remote location (not shown), different from I-com 154, I-ext 156 and map computer memory 158. Storage of the map and decryption keys is a critical, high security task. Appropriate security measures should be utilized to protect those items. Local removable memory storage on disc in floppy drive 162 or disc in CD-RW 160 may be reasonable. All traces of the map, the filter, the encryption key, the extracted data, and possibly the remainder data may be scrubbed or deleted from

all computer memories (by write-over or disc reformat routines) other than the "com" and "ext" storage sites. Deletion of all URLs, links, x-pointers, etc. is also recommended for high security applications. Deletion systems are known to persons of ordinary skill in the art. For multiple security levels, multiple web site for storage of cleansed plaintext, first, second, third and higher security level extract text is preferable. Where the community of interest has access to the targeted and protected data via the Internet, multiple secured storage locations, multiple stores for filters, for encryption keys and for maps locating the secured stores is provided by multiple storage locations distributed throughout the Internet.

To reconstruct the document, the user at computer 140 would be required to call up the URL of server 152 and input the appropriate security code. The server 152 would then call up and download data from various memory locations whether they be memory locations on computer 140 or memory locations I-com 154, I-ext 156 and map memory 158. The system compiles the entirety of the plaintext document by gathering the dispersed components thereof or compiles partial reconstructious for different levels of security. By implementing different security levels, the system is dynamic enough such that server 152 can easily locate the various extracted data levels based upon various security codes representing different security levels, as those codes are input by the user at computer 140. Multiple security codes, at the inception and during the process, may be utilized. The user may be required to input security codes at multiple times during the reconstruction or compilation process.

It should be noted that computer storage 154, 156 and 158 may be located on the same computer or may be located on different computers spread throughout the Internet. If the storage units are different computers spread throughout the Internet, computer storage 154, 156 and 158 would each have their own URL or Uniform Resource Locator. In any event, during reconstruction, the server 152 gathers the information and downloads the information into RAM 166 of computer 140. This download may include a first download of the common or remainder data from I-com 154. At a separate time, which may or may not include a decryption routine, the extracted from I-ext 156 is downloaded. Preferably, other than inputting initial security codes and any required or desired intermediate security codes, the system operates automatically without further input from the operator at client computer 140. The download of both data sets may be simultaneous in that the download is not humanly perceivable. This is especially true if storage in different memory locations in PC 140 is utilized.

The role of server 152 may be expanded or reduced dependent upon the desires of the user and the degree of security necessary. For example, server 152 may only enable separate storage of extracted data in I-ext 156. In this limited role, server 152 would require the input of a proper security code and clearance prior to identifying and enabling the download of extracted data from I-ext 156.

In an expanded mode, server 152 may be involved in filtering the data, extracting the security sensitive words, characters , icons or data objects to obtain extracted data and remainder data thereat, separately storing the extracted data from the remainder data (extracted data being placed in computer memory I-ext 156 and remainder data being stored in common remainder data memory I-com 154) and then permitting reconstruction via separate or combined downloads of the remainder data and the extracted data into computer 140.

FIG. 3 diagrammatically illustrates a system diagram for various reconstruction routines. A complete reconstruction is shown as security level path A. This involves an electronic integration of plaintext in step 202 resulting from the complete electronic reconstruction of document 100. For example, a merge may occur between the extracted data and the remainder data or common text data. The document is completely compiled in this process. Placeholders in the remainder document are utilized to locate and insert the extracted data. Most likely, there will be no process controls imposed on the integrated document as shown in step 204. In other words, if the user at computer 140 has the proper security clearance, he or she could download or recreate the entire original source, plaintext document and the user would be entitled to edit the document or change it in any way or copy it and reproduce it.

The second level of security, path B, results in storage of the common or remainder data in a different memory location on the hard drive 168 as compared with the extracted data. This is noted in step 206. Another words, in a simple example, hard drive 168 or RAM 166 would hold a copy of a remainder data document and another copy of the extracted data document, that is, two separate documents. Since two documents are available in RAM 166 or hard drive 168, these documents are stored in different locations in the memory. In step 208, a map showing the memory location of the common or remainder document and the extracted data document is provided to computer 140. Step 210 commands the processor CPU 165 in computer 140 to interleave the extracted data with the common or remainder data in the video board memory. In this process, the extracted data would typically have placeholders for the missing remainder data. Otherwise, control codes to locate the extracted data into the remainder data would be executed by CPU 165 to properly place the extracted

data into the "visual space" of the placeholders in the remainder data document. The extracted data document may have placeholder for the remainder data. Some type of register between the two image documents may be necessary. The compiler, in this embodiment, gathers the document elements and visually compiles and presents the plaintext to the user.

FIG. 3A diagrammatically shows that video board memory 169 is loaded with remainder or common data 1 and a different location of the video memory is loaded with extracted data 1. The next video memory location is loaded with common data 2 and then a different video memory location is loaded with extraction data 2. Since the refresh rate of computer monitor 163 is fast, the display 163 will show the common or the remainder data and then show the extracted data such that the user could not humanly perceive a difference in the document. However, the user could not copy the document from display screen 163 (a "screen shot") since the document is never electronically integrated into a single document. There is only a visual presentation of the combined document by interleaving the extracted data with the common or remainder in the video memory 169. Step 212 notes that the user may be limited in his or her ability to process, edit and store the reconstructed and presented plaintext document.

Security level path C recognizes in step 214 that the data is stored in different memory or computer locations. In this situation, two video boards, video board A and video board B are shown as board 216 and 218. Video board 216 drives display monitor 220. Video board 218 drives display monitor 222. Display screens 220, 222 are overlaid atop each other. Video board 216 is fed with common or remainder data from the remainder data store (see I-com store 154 in FIG. 2) and video board 218 is fed with the extracted data from the extracted data store, for example, I-ext store 156. In this manner, as noted in step 224, the user is presented only with a visual presentation or compilation of the plaintext. Since there was physical separation between video monitor 222 and video monitor 220, there is no electronic integration at all of the plaintext document. Hence, the ability for the user to do any significant editing on the plaintext document is blocked or prohibited because the user only has access to either the data on video board 216 or the video board 218.

Security level path D shows that the extracted data may be parsed or further separated based on a plurality of security clearances in step 226. Step 228 recognizes that the system can repeat process and security process paths A, B and C only with portions of the extracted data presented to the user based upon the user's security clearance.

FIG. 4 diagrammatically illustrates the major components of a flowchart for the data security program. It should be noted that this flowchart may be truncated to limit user selection of certain

items. The system would be pre-set to contain these features. Step 230 initializes the system. Step 232 enables the user to designate various levels of security for the activity which he or she will soon engage. The system, in step 234, enables the user to define the levels of security parameters. The following Security Table gives some examples of the type of security that may be available to the user.

Security Table

to whom

to where

when (time of day, day of week, month, floating but predetermined time frame)

why (purpose, match purpose to other security parameters or to certain predetermined criteria)

how (through what medium (LAN, WAN, Internet, direct dial link), download to what site or destination)

how long (duration) the reconstruction process will be permitted per each security clearance level

how much (different security levels enable reconstitution of documents and data with different amounts of secure data therein)

timing systems may require synchronization for a standard clock (i.e., atomic clock)

As an example of a truncated or pre-set program, a client-server system over the Internet may have URLs designating storage sites and an ASP 152 (FIG. 2) controlling storage. In this pre-set system, the user does not select the sites. The sites may be randomly selected by ASP 152. The ASP may use artificial intelligence AI to locate secure extract data storage sites. AI or inference machines can ascertain (a) traffic on communications channels, (b) storage limit issues, (c) transmission failures in the communications links, and (d) the degree of security necessitated by exterior events, i.e., terrorism alerts, virus alerts, war, data security warnings posted by trusted sources, MicroSoft, Norton, NASA, DoD, CDC, FBI, etc. Higher security alerts trigger the AI configured storage locator and facilitator to locate memory stores in higher secured places. These higher security facilities may be more costly, may be located in more stable countries or on more stable servers and may have greater degrees of encryption capabilities.

The user, in step 326 can designate the location of the filter, the common storage area for the remainder data, the extraction data storage and potentially multiple data storage areas or segments. The user may enable an AI filter design. Step 238 permits the user to engage or disengage encryption and, if engaged, establish the degree of encryption for the system. Step 240 enables the user to define the parameters of the filter. The user can retrieve a preexisting filter or may define a new filter for each data security session. These filters may consist of dictionaries or any type of compilation of words, characters, icon, data objects or pixel formation or any indication that can be perceived by the computer system. Granular extraction of data elements in a data object may be permitted. Step 242 recognizes that the user either inputs a preexisting plaintext document or types data into the system. In any event, the plaintext document is fed through the filter. Step 246 extracts the security data from the input document. Step 248 stores the extracted data. The extracted data may be encrypted prior to storage. Step 250 conducts an error check on the extracted data. This error check is helpful in discerning problems in the storage of the data prior to closing down the data security system. Step 252 stores the common data or the remainder data. Step 254 conducts an error check on the common or remainder data. The decision step 256 determines whether the user has selected a "destroy filter" command. If not, the filter is stored with or without encryption in step 257. If YES, the filter is destroyed with a deletion routine. Typically, deletion is complete erasure of all traces of the file including, in high security systems multiple write-overs or disc reformatting. Step 258 stores a map. The map may be stored locally or remotely as described earlier. The system ends in step 260. All traces of these data elements or objects may be swiped clean or removed from whatever computer system generated the data objects or processed them, other than the memory storage locations. Deletion of data also includes the concept of deletion of data transmission paths, URLs, storage site locations and all temporary memory stores. Deletion of file location in the root directory of hard drive 168 of computer 140 is preferable in high security systems.

FIG. 5 diagrammatically illustrates basic flowchart features for the reconstruction process. Step 302 accepts a request to reconstruct the secured data. Step 304 queries a local map and the security system or protocol. In a preferred embodiment the user would have to input several passwords, one of them being a local password on computer 140. A local map which may be accessed only through the password, may simply identify the URL of server 152. Decision step 306 determines whether the local password is acceptable. If not, and error step is indicated in step 307, the attempt to log on to the security system is noted in step 309 (an audit trail), and the system either branches to repeat step 311 or bars the user from further activity in step 313.

Returning to decision step 306, if the password is locally acceptable, the YES branch is taken and the system executes step 308 which releases a reconstruction request to the common storage facility I-com 154 or A-com 108 (FIGS. 2 and 1A-B). The system in step 310 logs the user in, as well as time and date and the data regarding the request. In step 312, a download from the common data storage is provided to RAM 166 or hard drive 168.

In step 314, a query is made to obtain the remote map from the remote security system. The decision step 316 indicates that the user again successfully inputs his or her security code. If not, error routine 317 is activated, the password failure is noted in step 319 (an audit trial), and the user is given an opportunity to repeat in step 321 or is barred or prohibited from further activity in step 323. If the user has correctly input the security code, the system in step 318 releases the keys (to decrypt) and the map and releases the reconstruction request to the remote storage for the extracted data. This could be computer storage I-ext 156 or computer storage B-ext 110. In step 320, the user's access to the extracted data is logged in along with the time and day and type of data request. In step 322, the system downloads the extracted data into RAM 166 and/or hard drive 168 of computer 140. In step 324, an error routine is operated on the extracted data in order to insure that the extracted data properly matches the common or remainder previously stored. Decision step 326 determines whether the error routine properly generates the correct count or output. If not, the system in step 327 indicates an error, in step 329 the system deletes the common files and the extracted files and the system in step 331 logs in the failed attempt. If the error checking routine on the extracted data is acceptable, the YES branch is taken from decision step 326 and the system, in step 328, proceeds to display the plaintext document or to integrate the plaintext document pursuant to the security clearance initially input by the user. Step 330 ends this process. The end process may entail encrypting the data again and swiping clean all traces of data objects from the memory stores and computer handling units. Of course, every use of encryption requires decryption of the data prior to reconstruction.

The system may incorporate various types of security systems or routines.

pass word

pass phrase

multiple choice questions and answers

initial, intermediate and subsequent security clearance routines

biometric security routines (voice, fingerprint, signature, eye or retina scan)

The reconstruction routines may be interrupted or the security system automatically activated or initiated upon the occurrence of externally generated triggers or upon certain predetermined conditions or conditional events. Limited extraction, security clearance, release of data and reconstruction limits may be imposed. Artificial intelligence (AI) engines, inference engines or neural networks may be implemented to vary the permitted level of reconstruction via the security clearances. In other words, the AI system, as applied to reconstruction, may, relatively independent of the filter and storage processes, increase the necessary security levels permitted to access and generate full or partial plaintext recreation.

The display systems 220, 222 in FIG. 3 include CRT monitors, LCD screens, projection screens and combinations of those systems.

The audit trail to monitor reconstruct and reconstruction attempts may include adding a time/data stamp to the remainder data and/or the extracted data prior to storage and a cross-check to the audit trail log during the reconstruction process.

Placeholders in the remainder document may be:

blank spaces
data symbols or elements "---" or "xxx"
false data
clearly erroneous data "ABC Company" or "Baker"
chaff or hash marks
messages
bar code
serialization data
alerts
links to other data objects
null set indicators "[ ]"
URL or website addresses

It is believed that the present invention is faster, during reconstruction, than standard encryption techniques, on the order of 100 to 1,000 faster.

The system and method described herein may operate substantially automatically, that is, without operator intervention, other than the security clearance function. The clearance function does require some type of operator authentication prior to retrieval of the extracted and remainder data.

The system and the method may operate automatically in that the plaintext or originating data could be identified by a party desiring security. The system could obtain that data from any data input device (hard drive memory, floppy drive memory, flash card memory, personal data assistant (PDA), or any other type of data input device), filter the data, separate the extracted text or the remainder text, encrypt (or not encrypt) the data, separately store the extract and remainder data (all automatically, that is, without operator intervention). Hence, it is not necessary that the system operate with significant operator or manual intervention. Of course, the system may also operate on a plaintext document or data object that is being created "in real time" by an operator and keyboard, mouse or other type of data input device.

The automatic operation of the system and the method can be caused by a triggering event. This triggering event may be a security attack (generating a trigger to start the gathering of plaintext, filtering, extraction and storing) or may be any other type of trigger such as a building burglar alarm, door alarm, fire alarm, or virus detection algorithm trigger. The event may be a time of day, week or month. It may be n seconds after the user stops typing on a keyboard. It may be a timed back-up feature.

Multiple filters may be utilized in the system and in connection with the method. These multiple filters may be useful in the operation of the system with a plurality of security levels. Each filter could filter out different levels of security sensitive items and each bundle or group of security sensitive items (from each distinct filter) could be stored at different computer storage locations. Multiple filters, multiple security levels and multiple storage areas may also include multiple encryption routines and decryption routines. Encryption and decryption routines can be related to the level of security of a particular group of data.

Multiple maps may also be provided for singular or multiple storage of extracted data and remainder data. These maps may or may not indicate the originating point of the data. Maps can be parsed such that an intruder, upon discovery of a single map or map portion, could not locate the storage locations of all piece of the extracted data and remainder data. maps may also be encrypted. The map may also be stored at a distinct map store location.

The concept of partial reconstruction also includes the concept that a portion of the plaintext would be reconstructed and the unreconstructed portions of the plaintext could be encrypted or could show blanks or other symbolic indicators. See the placeholder table above.

Partial reconstruction of the plaintext also includes a concept that the security sensitive items or materials may be subject to different types of encryption. Hence, a single plaintext document may

have multiple levels of security and multiple levels of encryption wherein each encryption has a different level of security assigned to it.

The present invention can also be configured to provide a computer network which transparently establishes and manages the separation of user-based communities of interest. The separation is accomplished by extraction pursuant to security levels, dispersion of data into secure storage facilities (memory stores) and reconstruction based upon the assigned security level. A low level security clearance results in only partial reconstruction of the plain text or source document. These user-based communities of interest are a plurality of users each having respective security clearances. As described above, each successively higher level of security clearance permits the user to see greater degrees of reconstructed plain text obtained from the extracted data stored in extract stores and the remainder data from the remainder stores. By integrating encryption (and necessarily decryption), separation of user-based communities of interest are established such that the users in a particular community are permitted access to some or all of the plain text data based cryptographically separated communities and need to know security levels.

FIG. 6 is an exemplary computer network diagram showing various user communities. The telecommunications network 402 is connected to the server application server provider ASP 452 and to various networks and personal computers or PCs. the PCs may be computer work stations. Network A 404 is coupled to telecommunications network 402 via an input/output unit 406. Network A is coupled to various PCs identified in FIG. 6 as PC-4, PC-5 and PC-6. Of course, Network A could be coupled to other PCs not illustrated in FIG. 6. As described earlier, server 452 can facilitate remote or offsite storage of extract data and remainder data in store 1, store 2 and/or store 3. Further, the map showing the storage location may be encrypted and stored in any one or more of these stores. Also as described earlier, the memory in one of the PCs, for example PC-4, PC-5 could be utilized to store extract data and remainder data from PC-6 and PC-6 can be configured as the input data computer. Hence, the present system and methodology encompasses the concept of local storage and remote storage. On the local level, the storage begins by storing the extract data at different locations in the hard drive of the PC. The next level higher is storing the extract data in removable computer media such as floppy disk, removable tape drives, CDs etc. associated with the PC accepting data or associated with a server on Network A. The next higher level of extract store is storage of the extract data on a server or other computer in a particular network. If PC-6 is designated as the input computer, the extract data may be stored on PC-4. Of course, PC-4 could be designated as the server for Network A.

PC-7, PC-8 and PC-9 are coupled to telecommunications network 402. Network C 408 and Network B 410 is coupled to communications network 402. The lines, one of which is line 409 extending from Network C 408, represent a plurality of computers or workstations coupled to Network C. Line 411 represents a plurality of workstations or computers coupled to Network B 410. In an e-mail implementation of one embodiment of the present invention, PC-7, PC-8, etc. may represent computerized devices accepting e-mail (personal data assistant, pager, cell phone, etc.). The sender and the e-mail addressee may utilize simple computerized systems to communicated via e-mail. Further, the network may be any telecommunications network including wire, cable, cellular, wireless, satellite, IR or RF systems.

FIG. 7 diagrammatically illustrates a flow chart showing the key component steps for the multiple layer security program for the community of users. The "community of interest" system described herein enables persons and organizations at the same security level to share data on a peer to peer level. Further the security system may operate automatically, with respect to extraction, storage and reconstruction, such that the peer to peer dissemination of data objects is quickly and readily available to all at the same or higher security levels. Step 420 initializes the program. Step 422 enables the user, administrator or system operator to designate multiple levels of security, that is, multiple words, characters, icon, data objects, or whatever, for each security level and further to define encryption for each security level. The designation step 422 also includes identifying the communities of interest and the particular security level and security clearance for each community of interest. One example of various security levels for communities is set forth below in the Community Security Level Table which is keyed to the computer network diagram of FIG. 6.

Community Security Level Table

Security level	Community Group
High	PC-7; PC-8
Medium high	all high group plus Network B
Medium	all above plus Network A
Low	all with nominal clearance
Special set medium	PC-7; PC-9; Network B

Further, designation step 422 will include identifying the words, phrases, icons or data objects subject to security concerns and the potential location of the extract data and, if necessary the remainder data and the degree of encryption. The following Selection Table provides some examples.

Selection Table

Level of encryption/storage	type or category of word or phrase; input specific word, phrase
High, web-based storage	dollar values, names of streets, countries, "Smith" and 5 words about "Smith," "avocado"
Medium high, remote storage	all addresses, all names
Medium network storage	all family names, all client names
Low, encrypt and separate store in local memory	all items not in dictionary

As an example of various encryption methodologies, the following Encryption Table is illustrative.

Encryption Table

DES, random pad A ("r. pad A")
Huffman, r. pad B
Crypto API, r. pad 7
Two fish, r. pad C-2
Blowfish
RC4
Skipjack
Ghost

In FIG. 7, step 424 executes or enables the security program with multiple filters, multiple encryption levels and multiple storage levels. Each one of these filters, encryption levels and storage levels correspond to the security level for the various communities of interest. Step 425 responds to an inquiry from a user to reconstruct the document. Step 426 accesses the user's security clearance and the particular inquiry. Decision 428 determines whether the inquiring party is entitled to full or partial access to the source document. If not, the NO branch is taken and the system, in step 429 adds placeholder substitutions. Step 429 may be optional. If YES, the system reconstruct pursuant to the clearance level in step 430. The following provides an example of multiple level encryption utilizing placeholder substitution.

Multiple Level Encryption

Applicants must be _____ zzxx xx _____xxx ____ _____ _____ citizens and have a high school diploma or equivalent. They must possess a valid subsubsub driver's license and qualify for top SUBWORD_____ clearance.

With this multiple level encryption, substitutions may be utilized "subword" to indicate to the user with a less than superior security level that a certain word, term or phrase has been extracted and stored by he or she is entitled to know that substitute word, term or phrase has been inserted into the plain text document. Of course, any type of substitution character may be used for the placeholder.

In step 432, the system displays the plain text in a normal format or utilizing a split or bifurcated video memory or utilizing overlay display screen. FIG. 3 and the description of that figure set forth above describes the normal display in steps 202, 204, the split video memory display in steps 206, 208, 210 and 212 and the overlay display system in steps 214, 216, 218.

The system, in step 434, monitors and logs the location of the user making the inquiry, the type of inquiry, the time, day, date, clearance level and access level and logs all modifications to the plain text source document. One example of the log is set forth below in the Security Report Table.

Security Report Table

Privacy Scrubber Report

source file: path\filename

scrubbed file: path\filename-scrub

source file: date, time, size

process: date, time

user: name

system: name

Recovery File

(a) storage location, type of encryption, random key

(b) storage location B....

(c) store C .....

(d) store D .....

Step 436 enables the security program and parses and extracts the data per the security program, filters the data, extracts it and codes it disperses it and stores it as discussed above. The multiple layer security program ends in step 440.

The following Security Level Access Placeholder Table is another example of the type of placeholder substitutions that may be available. The example in the Security Table Access Placeholder Table may be used in conjunction with step 429.

Security Level Access Placeholder Table

[security level 2] intelligence located [security level 4] 20 miles from [security level 4]. He is using the name [security level 4], and dressed as a [security level 4] preacher. With him are his lieutenants, [security level 4] and [security level 4]. He is communicating with the international media through Mr. [security level 4], who resides at [security level 3], [security level 4], [security level 4]. Telephone is [security level 1] and Facsimile is [security level 1].

It should be noted that in order to reconstruct some or all of the plain text source data, some or all of the subsets of extracted data from the extract stores will be utilized dependent upon the respective security level of the inquiring party or user.

The present invention can also be configured as an adaptive security program which adapts and adjusts the security provisions based upon intrusion into a particular network or attempts to electronically attack or hack into that network or successful hack events. Programs are available to track electronic attacks or hacking attempts. One of these programs is manufactured by Cisco and identified as the Cisco Intrusion Detection System (IDS). The Cisco IDS system can work on a server or on PCs in a network. The Cisco IDS is an electronic intrusion detector, or an electronic attack detector or a hacking monitor. The hack or attack monitor is software loaded into a designated computer.

The output of the electronic attack or hacking monitor loaded into PC 142 (FIG. 2) for example, or loaded into PC-6 acting as a server for Network A 404 in FIG. 6, generates a plurality of attack warnings. The attack warnings progressively and incrementally indicate the severity and degree of intrusion and hacking attacks directed to the computer system. The following Security Level Table illustrates an example of various responses to increasing levels of attacks. These increasing security responses include engaging the filter and extracting critical data and storing it locally; the next level involves storing the critical data on removable storage media; the next higher level involves offsite storage of all security data; the subsequent security alert results in multiple offsite storage for multiple levels of security or critical data and the highest level involves offsite storage of both common data (remainder data) and security data. Of course, other combinations responsive to the hack attack may be provided. The electronic attack monitor may use artificial intelligence AI to (a) assess the severity of the attack, (b) plan an appropriate "secure data" response,

(c) select the degree of filter, extraction and/or encryption, and (d) locate secure extract data storage sites. AI or inference machines can ascertain (a) traffic on communications channels, both intra and inter network, (b) storage limit issues, (c) transmission failures in the communications links, and (d) the degree of security necessitated by exterior events, i.e., terrorism alerts, virus alerts, war, data security warnings posted by trusted sources, MicroSoft, Norton, NASA, DoD, CDC, FBI, etc. Higher security alerts trigger the AI security monitor to heighten the security level (or to decrease that security level in view of a reduction or withdrawal of an electronic attack). Aspects of AI systems, inference engines and neural networks are discussed above in conjunction with the AI configured filter. These AI aspects can be utilized with an AI configured security sensor.

Security Level Table

Attack (low threat level) Level One

engage filter

local storage - disk drive

encrypt map

Attack (moderate threat level) Level Two

same as Level One but use removable storage media (local)

Attack (nominal attack) Level Three

Engage higher level filter

Off site storage, single storage for all security data

Attack (moderate attack) Level Four

Multiple off site storage, multiple levels of security data

Attack (severe attack) Level Five

Off site storage both common data and security data

Hence, the filtering of data is based upon respective ones of the plurality of attack or hack warnings and the extraction of data and degree of extraction is dependent upon respective ones of the plurality of attack - hack warnings. Storage of the extracted data and the remainder data is also based upon the degree of attack which is reflected in the attack - hack warning issued by the monitor.

FIG. 8 diagrammatically illustrates a flow chart showing the key components of the adaptive security program adaptable to various levels of hacker of electronic attacks. Step 460 senses all intrusions and attempts, that is, electronic attacks, hack attacks or hacking actions on a computer or a computer network. This step is equivalent to the output of the attack - hack monitor. Step 462 assesses the current network performance, adjusts the storage location for the extract data (the

location of the extract store), the encryption level (the degree of encryption) and the storage of the map showing the extract data storage (if necessary) and storage of remainder data, if necessary given the severity of the attack. For example, during high utilization of the computer network (high utilization in a server computer in a server-client environment), local storage of extracted data may be preferable as compared with offsite storage of critical data. However, if the attack occurs during non-working hours, the performance of the network is very high, and the security system could utilize all the resources in the computer network to achieve the security goal of safe guarding the data during the attack. System resources include processing resources (for encryption/decryption), bandwidth resources to store extract data and any other resources that are critical for the utilization of the security system described herein. Decision step 464 determines whether a threat or attack as occurred. If not, the system takes the NO branch returns to step 460. If YES, the system in step 466 assigns an attack level or a hack warning level to the threat or attack. The system in decision step 468, monitors the network during the attack. If the network performance or the computer performance does not change, the YES branch is taken. If the computer performance or network performance changes based upon or during the attack, the NO branch is taken and the system returns to step 466 which reassigns an attack level or a warning level to the next higher or significantly higher warning levels.

After decision step 468, the system executes step 470 which assigns the security level and implements the security program based upon the attack. It should be noted that the administrator establishes the degree of security level, the encryption, the extract store and remainder store (if necessary) for various levels of attacks or hack warnings. The security level assigned to a particular attack warning is implemented in step 470. Decision step 472 determines whether the security program's communication path is clear. For offsite storage of extract and/or remainder data, a communication path is important. If the path is blocked or compromised by the attack, the NO branch is taken and the system in step 473 reassigns the security level to a next higher level or a different, safer security level and returns to step 470. If the security and communications path is clear, the YES branch is taken from decision step 472 and, in step 474, the system maintains the security program. Decision step 476 determines whether sufficient time has passed from the attack. If not, the system loops to step 474. If YES, the system executes step 478 which either permits reconstruction of the user operating the plain text or source document or automatically reconstructs those documents that were filtered, parsed, extracted, and subject to outside storage. The system ends in step 480. To provide additional security, the attack monitor can be configured to monitor

security warnings from trusted parties such as MicroSoft, Norton, NASA, DoD, CDC, FBI, etc. Emails or electronic communications from trusted parties can trigger higher levels of security. the attack monitor described above can be configured to accept messages from trusted parties. These messages are equivalent to detecting an electronic attack.

Further, the attack - hack monitor can be configured to monitor and assess other environmental conditions such as fire, power failure, equipment failure, unauthorized physical entry into the building, plant, or computer room. These exterior threats or events are monitored by the attack monitor since they may quickly develop into an electronic attack on the secured data retained by the computer system. In response to these exterior events, the attack monitor generates corresponding attack warnings similar in nature to the hack attack warnings discussed above.

There are various methodologies that may be utilized in the adaptive system. The tables that follow set forth these various security methodologies.

Standard Automatic Defenses Matrix

Mode	Normal	Threat	Attack
Encryption	Targeted Encryption	Full Encryption	Multi Type Encryption
Extraction	Plain-text Extraction	Extraction of Encrypted Data	Extraction of Multi Type Encryption
Distributed Dispersion	Single Storage Location	Several Storage Locations	Many Storage Locations
Display	Single display	Color/Dither Protection	Multiple Displays

Optional Automatic Defenses Matrix

Mode	Normal	Threat	Attack
Substitution of Code Words	None	Partial	Many
Substitution of Misinformation	None	Partial	Many
Controlled Release-Storage	Full	Partial	Conditional
Storage Locations	2	4	10 or more
Time for release	Anytime	Working Hours	Conditional
Authorized Users	Many	Partial	Conditional
What to Release	All	Partial	Conditional
Secret Sharing	None	Two Users	As Configured

Security Meter Module Table

	Normal Mode	Threat Mode	Attack Mode
ENCRYPTION	Targeted encryption (Secret sharing)	Full encryption (Secret sharing)	Multi layer encryption (Secret sharing)
EXTRACTION	Plain-text extraction	Extraction of encrypted Data	Extraction of multi encryption
Distributed Storage	1 critical storage	few critical storage	many critical storage
Controlled Release-Storage			
	Storage # ID		
	Time for release		
	Authorized Users		
	What to release		
	Special conditions	2 users online	3 or more users
Display	single display	single display	multiple displays
Substitution of code words	No	No	No

Normal Work Mode

	Extraction				Storage				
	Level 1	Level 2	Level 3	Level 4	Web	Offline	Remote	Removable	Local
social security	X						X		
credit card	X						X		
included	X						X		
last name	X						X		
number	X						X		
telephone			X					X	
name			X					X	
URL			X					X	
e-mail			X					X	
uppercase			X					X	
initial capital			X					X	

1	currency				X					X
2	postal code				X					X
3	address				X					X
4	location				X					X
5	date				X					X
6										
7					Threat Mode					
8		Extraction				Storage				
		Level 1	Level 2	Level 3	Level 4	Web	Offline	Remote	Removable	Local
9	social security	X							X	
10	credit card	X							X	
11	included	X							X	
12	last name	X							X	
13	number	X							X	
14	telephone		X						X	
15	name		X						X	
16	URL		X						X	
17	e-mail		X						X	
18	uppercase		X						X	
19	initial capital		X						X	
20	currency			X						X
21	postal code			X						X
22	address			X						X
23	location			X						X
24	date			X						X
25										
26					Attack Mode					
27		Extraction				Storage				
		Level 1	Level 2	Level 3	Level 4	Web	Offline	Remote	Removable	
28	social security	X					X			
29	credit card	X					X			
30	included	X					X			
31	last name	X					X			
32	number	X					X			
33	telephone	X						X		

name	X			X
URL	X			X
e-mail	X			X
uppercase	X			X
initial capital	X			X
currency		X		X
postal code		X		X
address		X		X
location		X		X
date		X		X

FIG. 9 diagrammatically illustrates a flowchart showing the key components of a multiple encryption program using multiple types of encryption in one document or data object. Multiple levels, types or modes of encryption are utilized in the same document or data object to enable securing data and transparently managing the separation of user-based communities of interest based upon crypto-graphically separated, need to know security levels. These security levels are associated with a plurality of encryption types or with different cipher keys using the same encryption. An example of a multiple level encrypted document is shown above in the Multiple Level Encryption sample. Different levels or modes or types of encryption are listed in the Encryption Table above.

Step 510 in FIG. 9 initializes the system by organizing different security levels with different encryption types and cipher keys. Also, the program sets filters to create the multiple encryption or ML document or data object. Step 512 filters the document or data object. Step 514 encrypts the extracted data for each security level. These steps 510, 512 and 514 utilize many of the routines discussed above in connection with FIGS. 4 and 7, steps 232, 234, 236, 238, 240, 422 and 424. Step 516 recognizes that the secured document or data object may be stored for later use (with associated multiple decryption), published, distributed, or otherwise utilized to achieve the primary purpose of the document, i.e., to communicate information or to safely store security critical information. Step 518 permits the user, with the proper security clearance to retrieve the document or data object. Step 520 illustrates that the user must retrieve his or her cipher key to decode all or a portion of the ML encrypted document or data object. This step may be manual which engages the user to into certain codes or may be automatic such that the user's computer automatically, without operator input, decodes all or part of the document or data object. Step 522 decrypts the document pursuant to the user's security clearance. Step 524 recognizes that the user may review, re-publish, store, comment

on, re-encrypt or otherwise deal and handle the full or partially decoded document or data object. The program ends or otherwise continues with other programs set forth herein. It should be noted that storage of the extracted data may be included in the flow path of the program in FIG. 9 is necessary.

FIG. 10 diagrammatically illustrates a chart showing the key components of the parsing, dispersion, multiple storage and reconstruction (under security clearance) of data. Document or data object 100, in function element 550, is created or obtained by the input computer device. The document is stored in a normal manner in customary data store 552. A parsing algorithm function 554 is utilized in parsing step 556. The parsing algorithm, as stated earlier, targets the plaintext document or data object 100 and splits, cuts and segments (that is, parses) the document by bit count, word, word count, page, line count, paragraph count, any identifiable document or icon characteristic, or other identifiable feature such as capital letters, italics, underline, etc. Hence, the parsed document 100 constitutes at least remainder data and data which is extracted or parsed or segmented out. A plurality of data extracts may be obtained. The parsed data (which is both the extract data and remainder data) is then dispersed into storage facilities data store DS 1, 2, 3, 4, etc. Preferably, the parsed documents are encrypted as shown by "e" in FIG. 10. In order to facilitate the potential reconstitution of document 100, a map is stored in a map storage 558. Hence, the dispersement 560 largely spreads out or distributes the parsed document 100 to a plurality of memories in the distributed computer system. These memories may be removable memory devices (floppy disc, removable tape drive, CDs) or may be more fixed devices such as hard drives, Internet storage facilities, etc. Preferably, the map is also encrypted.

Reconstruction step 562 enables a person with the appropriate security to obtain the map from map storage 558, decode the map, gather the dispersed, parsed segments of document 100 and compile the document. This is noted in function 564.

Since the original document 100 is stored in a customary manner in data storage 552, the parsed document stored in multiple data storage units DS1-DS4 provides a unique backup for document 100. The algorithm can employ many different mathematical constructions but is, in the current embodiment, primarily based upon one or more of a bit count, a word, a word count, a page count, a line count, a paragraph count, and identifiable document characteristic, and identifiable word characteristic, and identifiable icon characteristic and identifiable data object characteristic, capital letters, italics, and underline found in the plaintext document or data object. Further, the parsing algorithm can generate different security levels wherein parsed segments are stored at different

storage facilities having various degrees of security clearance. This establishes a hierarchy of data storage units and corresponding degrees of security clearances. The parsing algorithm may identify unique words or strings of data, i.e., credit card numbers. The hierarchy of security clearances may involve first a password, second a biometric confirmation such as a voice match and a third highly unique biometric characteristic such as a fingerprint or retinal scan. The parsing system enables a large distribution of data in a secured environment. In this manner, if the original data object 100 at customary data storage 552 is destroyed, a person with an appropriate security clearance can reconstitute the original data document 100 due to the secured parsing and dispersal of document 100 through data storage units DS1-DS4 and map storage 558. The parsing may occur on a granular level. In particular, the parsing may occur on a financial document in electronic form.

Financial Document Table

Startcode; Abel, Robert, NMI; 100567; TRANSFER803; To8900586943; FROM3897622891; $700.00; endcode

In the Financial Document Table, the start code and end code is typically represented by a digital code unique to the communications channel, the name on the account has no middle initial (NMI) and the various words "transfer 803" and "to 8900586943" and the words "from" and "$" are represented by predefined numeric or alpha numeric codes. The electronic financial document complies with an established protocol. In any event, financial documents are often times transmitted through electronic communications and telecommunications channels. The present invention, in one embodiment, enables a higher level of security by parsing the financial document or data stream. Further, a higher level of security may be employed by extracting identified text or characters and storing the extracted text as discussed above in connection with FIGS. 1A, 1B and 2.

To some extent, the present system can also be utilized for key management and encryption systems.

In a broad sense, the parsing methodology disclosed herein is not based upon the separation of critical versus non-critical or classified versus non-classified security information. The primary focus of the parsing methodology is (1) automatic transparent parsing of data content into granular data groups which are thereafter dispersed to different storage locations in order to maintain a very high level of security with or without encryption; (2) dispersal of the segmented data to different storage locations each which, potentially, demand additional identification or security clearance prior to the release of the stored segmented data, including, possibly, the creation of a digital bureaucracy, in order to hinder or circumvent digital attacks on the plaintext document or data object; (3)

proposing and implementing a system wherein the user has a very basic appliance since most of the user's data is stored both locally (customary data storage 552; FIG. 10) and parsed and stored in a distributed system (DS1-DS4) and wherein an important asset is the map stored in map location 558; (4) enabling an institutional system to parse highly confidential information and extract the same in granular form and disperse the same throughout the Internet or other storage locations with or without encryption without compromising the document's security privacy and integrity.

The process involves parsing the documents or content into granular data groups and optionally creating small groups of data wherein the data segments cannot be recognized even to the level of providing 2-4 data objects in each file; dispersing the granular data groups into different storage locations; creation of a map of dispersal to the different storage locations (wherein the map is secured and encrypted and stored); and reconstructing the documents or data content. The reconstruction utilizes the map of dispersed and distributed storage and requires the presentation of security clearances such as passwords, biometric information and/or physical identifiers for access at the storage level and potentially at all the other data storage sites. The data is compartmentalized through distributed storage and sometimes requires separate security clearance. This need for presenting additional security clearance at different storage locations (DS1-DS4) creates a digital bureaucratic process which enhances the security level of the entire system. The selection and extraction of data and dispersal of that data to select storage locations can be established under different criteria. For example, one level of criteria extracts last name, address and social security numbers. Another criteria extracts every other line, every third word, etc. The parsing algorithm can utilize random selection or systematic selection as long as the parsing algorithm is documented and utilized in reconstruct step 562. The parsing algorithm may be stored with map and map store 558 or may be stored separately. An additional feature, as discussed above, involves utilizing place holders or adding substitute content to the remainder data of the parsed document 100. The use of place holders and substitute content may be thought of as an algorithm for the parsing. By using place holders and substitute data, private or highly confidential data is masked insuring privacy, security, and confidentiality. The ability to parse the information and/or extract security information is important for financial transactions. The transactions which require account numbers (see Financial Document Table above) are useless without the account numbers. The security of the account numbers, whether identified and extracted or severely parsed and segmented, stored and reconstituted under security clearances, is enhanced by the present system.

To achieve a very high level of security, the system can optionally incorporate a two-men key system. The system automatically separates the selected data stream into one or more data groups and extracts one or more of these data groups and disperses them into data storage DS1-DS4. To release the extracted data groups and/or critical content, the reconstruct step 562 may require two persons submitting identification credentials or security clearances. This two-man key method is a further protection against identity theft and insider attacks. The two-men key system can be implemented on a regular basis or on an emergency basis when there is need for a higher level of security.

Financial documents sometimes include substantial amounts of numerical data such as financial projections, balance sheets, electronic funds transfer messages, etc. It should be noted that the extraction may be based upon a particular item such a digit and a nine digit number representing money or may be parsed automatically based upon some parsing facility. Of course, the financial document may also be viewed as a data stream with delimiters ";" separating fields in the data stream. The parsing algorithm may work on the data in each field as well as different fields in the entire data stream.

Most storage facility systems require a map in order to reconstruct the original plaintext document 100. The map may be encrypted and may require a secret key sharing scheme for access thereto. Further, the map may be a physical map (a printout) or may be stored on a removable data storage medium, rather than be an electronic representation. In some instances, a map is not necessary. For example, if the security data or the parsed or segmented data were automatically stored on a floppy disc, the originator of plaintext document 100 could move the floppy disc from the computer system thereby physically safeguarding the security data or the segmented, parsed data. Without the disc, another person or the originator of plaintext document 100 could not reconstitute the document. The originator may deliver the floppy disc to another in order to permit reconstitution. The same is true regarding removable tapes and CD-ROMs.

Advantages of the present parsing system, methodology and program, include the ability to connect to unsecured networks without adversely affecting the overall security of the plaintext document 100; less dependence on existing security system including fire walls; the reduction of the requirement to keep daily updates regarding vulnerabilities of the computer system originating plaintext document 100; the security of plaintext document 100 is not dependent upon the number of access points into the network or number of users located on the network originating plaintext document 100; there is no damage to the parsed and stored backup version of plaintext document 100

if new security systems are installed wrong or misconfigured and there is no damage if system administrators turn OFF the existing security systems or improperly install or operate the security systems.

The parsing system can operate as a main security operation or an emergency backup system or as a customary backup system. The plaintext source document or data object may be preserved with or without encryption, or destroyed as a further data security step. The parsing and disbursement of data protects plaintext document 100 and insures the survivability of plaintext document 100 if the system originating plaintext document 100 comes under significant electronic or physical attack. That is, if customary data storage 552 is destroyed electronically or physically, the survivability of data in the plaintext document 100 is established by the present system. The storage of granular data groups most likely would defeat any attempt to view the entire content of plaintext document 100. Only verified user users with a confirmed security clearances or identifications verified at reconstruct step 562 and in data storage sites DS1-DS4 are permitted to reconstruct plaintext document 100. Further, the parsing of the system can be triggered based upon an electronic attack, an electronic hack or a physical environmental detection scheme. This system immediately protects of the critical data plaintext document 100 with a transparent, automatic parsing, dispersal and storage system.

It should be noted that various aspects of the methodology and program described above in connection with FIGS. 1A-9 can be incorporated into the parsing methodology and program in order to enhance or modify the system.

FIGS. 11A and 11B diagrammatically illustrate a flowchart showing the key components of one embodiment of the present invention, that is, an e-mail security system. FIG. 11A is linked to FIG. 11B via jump points 11-A and 11-B. The method of securing e-mail data operates on a distributed computer system which at least includes a remote memory designated as an extract store. Of course, the extract store may comprise a plurality of extract stores operative in conjunction with a plurality of security clearance levels. A singular security level is identified in FIG. 11A. Further, the e-mail may be subject to a parsing algorithm which, as discussed above, is generally independent of the identification of security sensitive data. However, with respect to the parsing aspect of the present invention, the original e-mail data is split into extracted data and remainder data and the extracted data is stored in an extract store. Hence, the parsing algorithm operates essentially independent of the content whereas the secured e-mail program operates based upon content

identification. Although FIGS. 11A and 11B primarily relate to identification of security data, the same is true regarding the use of securing e-mail data with a parsing algorithm.

The e-mail security system begins with step 602 wherein the system or program is turned ON or is activated. Step 603 recognizes that the user originating plaintext document 100 (not shown) has set a security filter identifying one or more security sensitive words, characters or icons. In step 604, the user composes the e-mail representative of plaintext document 100. In step 606, the user selects the "send" command in the typical e-mail program. As is customary, the system in step 608 conducts a spell checking routine prior to sending the e-mail. In step 610, the system conducts a security check on the plaintext document or composed e-mail generated in step 604. The filter is used in step 604. In step 612, security words are highlighted or distinguished in the e-mail prior to the actual sending of the e-mail to the addressee. This step 612 is optional. In step 614, the user selects the security words for data to be extracted out. The highlighting step facilitates this selection. In step 616, the system extracts the security data and, preferably, in step 618, the security data is encrypted. Step 618 is optional. In a parsing application to secure e-mail, the parsing algorithm operates automatically at step 610 thereby eliminating steps 612 and 614. The extracting step 616 simply represents that the segmented data obtained from the original plaintext e-mail generated at step 604 is separated from remainder data.

After encryption step 618, the e-mail security system generally operates in one of three manners. Other systems may be formulated based upon the systems and subsystems discussed herein. In one methodology, a second e-mail is created (see step 629), in a second methodology the secured data in encrypted form is attached or appended to the original e-mail containing remainder data (step 621) or, in a third methodology, the encrypted security data is simply added to or inserted into the end of the remainder data of the e-mail (step 623). The methodology of generating a second e-mail is initially discussed.

A second e-mail having encrypted security data is created in step 620. Further, the system in step 622 adds a hyperlink to the remainder data in the original e-mail created in step 604. The hyperlink presents a pointer for the addressee to a secured application service provider or ASP. See the discussion of FIG. 2 above. The ASP represents a data storage facility for the secured e-mail data. In step 624, the remainder data from the original e-mail is sent to the addressee in a normal manner. This step also includes the concept that the second e-mail containing the encrypted security data is sent to the ASP. In step 626, the addressee receives the remainder e-mail which includes a hyperlink to the secured data ASP.

The system jumps at jump step 11-A from FIG. 11-A to FIG. 11-B.

In step 628, the addressee receives the remainder e-mail, visits the ASP via the hyperlink and clears the security levels at the secured ASP. In step 630, the secured data ASP obtains a map for each secured data e-mail (since the original e-mail may be broken up into a plurality of extracted, secured data e-mails) obtains all secured data e-mail and decrypts the same. In step 632, the secured ASP downloads the secured data as an e-mail to the addressee. In step 634, the addressee system compiles the original plaintext e-mail 100. A reconstruction program may be necessary to decode the secured data and insert the data into the document via the placeholders.

Optionally, the decryption could occur at the recipient's e-mail device somewhat prior to the reconstitution of the e-mail plaintext document 100 during step 634. This requires the addressee to have the encryption routine and the correct key or decrypt code. The e-mail security system described above may include many of the features discussed earlier in connection with FIGS. 1-9. For example, both the security data and the remainder e-mail data can be encrypted prior to transmission to the addressee and the secured data ASP. The encryption may include multiple levels of encryption and decryption may require multiple levels of security clearance. The encryption may be mixed in the remainder e-mail. Partial as well as full reconstruction is enabled as discussed above in connection with FIG. 3.

From the senders or originator's viewpoint, the e-mail facility described herein facilitates the storage of the extracted data at one or more secured sites.

Another implementation of the secured e-mail system attaches the encrypted and secured data to the remainder e-mail data as indicated in step 621. E-mail attachments are well known. Alternatively, the encrypted secured data may be embedded or copied in encrypted form at the end of the remainder data in the original e-mail as indicated in step 623. In either case, in step 625, the e-mail is sent to the addressee. In step 627, the addressee opens the attachment. In step 629, the system of the recipient decrypts the secured data attachment or the embedded data attachment. In step 631, the recipient's system integrates the now decrypted secured data with the remainder data. Of course, this a compilation step. Place holders or other position indicators are customarily utilized. Appending the encrypted security data is generally equivalent to attaching a file to the original e-mail which constitutes, after extraction, the remainder data. Including the encrypted security data is adding the security data to the original e-mail at a predetermined location (either the top of the e-mail, the bottom of the e-mail or some predetermined line number).

It should be appreciated that the e-mail security system may work automatically or may be selected manually by the user. The highlighting or special distinguishing manner for the security words in step 612 is optional. By highlighting the security words, the user may select or deselect those words for extraction. At the addressee's side, the addressee's system may be configured to automatically seek out the secured data ASP, enter security clearance data, download the secure data and integrate the secure data in the remainder data e-mail. The present invention contemplates automatic as well as manual steps in steps 626, 628, 630, 632 and 634. The hyperlink with the original remainder e-mail essentially maps the remainder data to the secured data and the remote storage locations handling the secure data. Multiple security clearances may be required of the recipient or addressee. The e-mail system can be combined with other features of the security system discussed above such as multiple security data locations, secret key sharing schemes, multiple encryption of the data in a single document, multiple security clearance levels required for a plurality of storage facilities, the two man key system, automation of key management and a plurality of levels of access to the data such as partial reconstruction in step 634 and full reconstruction.

FIGS. 12A and 12B diagrammatically illustrate a flowchart showing the key components of one embodiment of the system and the invention which implements the security system on a web browser. Jump point 12-A links FIG. 12A to FIG. 12B. The system, at step 700 is ON. The filters establishing either the parsing or the identification of security data are established in the filter set step 701. In step 702, the user inputs data into open field of an HTML display page which the user has previously downloaded from a web server. In step 704, the user may select "secure now" turning ON the system or the system may automatically be ON such that the filter is screening all the data input by the user in the open field. In step 706, the system scans all the open field data, locates security data and extracts security data. In step 708, place holders are added to replace the extracted security data in the remainder data and a hyperlink is added to the open field remainder data providing a link to the secure data ASP. In step 710, the user selects the "send button" or any other indicator on the HTML page triggering an operation which transmits the open field data (which is now remainder data) to the web server. In step 712, the web server and particularly the common gateway interface (CGI) receives the remainder data fields, identifies the place holders in the data and the hyperlink to the secure data ASP. In step 714, the web server receiving the data from user's browser goes to the secure data ASP, inputs and clears any security level, and obtains the secured data. In step 716, the web server reconstructs the open field data which generally is represented by plaintext document

100. In step 718, the web server processes the data as necessary. Many of the features discussed above in connection with FIGS. 1A-11A may be implemented on the browser system.

The credit card scrubber or financial data scrubber operates in a similar manner to the email and browser data security system described above. The credit card or financial data scrubber (herein collectively "CC scrubber") typically operates on a defined sequence of numbers. For example, if a credit card number is 17 digits, whenever the email or browser security system or program detects17 sequential numerical digits (a pre-set filter), a pop-up window may appear enabling the user to select or turn ON the scrubber. If ON, the data security program strips or parses the credit card number and sends, for example, five of the 17 digits to a secure store. Placeholders or substitute characters may be inserted into the remainder CC data. To reconstitute the entire CC data, the intended recipient would be required to pass security clearance levels at the secure store. Of course, the CC scrubber could be set to detect bank account numbers, personal or business account holder names, pre-set passwords, etc. In an OFF state, the CC scrubber would let pass the CC number, account number or pre-set data stream or string. The user may select (i) always ON; (ii) pop-up window, select ON or OFF per transaction; (iii) pop-up window to select OFF (default being ON); or (iv) always OFF but minor reminder (audible sound, icon appearance, etc.) of data security risk. The CC scrubber may encrypt the extracted data for security. Other visual ques may rather than a pop-up window may be used (for example, a drop down menu). The scrubber can also be deployed on wireless devices to scrub sensitive data such as credit card and other financial data.

FIG. 13 diagrammatically shows several revenue systems which may be employed with the data security systems described herein. Many types of revenue systems may be employed in conjunction with the present invention. FIG. 13 shows two basic systems, one at the data input stage and the second at the data output or reconstruction phase. Within each revenue subsystem are two types of revenue generators, an advertising revenue generator and a user charge generator. The user charge system contemplates charging or assessing a fee to the user's employer or organization. Therefore, the system operator may select up to four (4) revenue generation systems (ads at the input, charges at the input, ads at the output and charges at the output). It is well known that vendors selling goods and services over the Internet are willing to pay a certain percentage of their sales revenue to other entities referring customers to the vendor's web sites. The concept of display ads in FIG. 13 includes this revenue stream. The system operator may choose all, one, several or none of these revenue systems to be deployed in conjunction with the data security system described earlier herein. Other revenue system may also be utilized. The steps in the revenue system described

herein may be reorganized to attain higher consumer and user acceptance and/or to maximize the revenue to the system operator.

Decision step 730 determines whether the system is deployed at the data input phase or not. It is clear that the system operator may utilize the data reconstruction revenue system and hence the decision step 730 is not necessary. If the data input system is employed, step 732 displays the ad to the user. The user may be uploading a complete document to an application server on the Internet or may be using a application service provider on the Internet or an private LAN to secure his or her data. The display ad 732 step enables the user to click on the ad and visit the vendor, thereby potentially generating a referral fee. See referral fee branch 757. Step 734 requires password clearance. Step 736 processes the document or data object with the security system. The user may input the document real time or input it to the application server or may upload the complete document to the server. Alternatively, the ad could be buried in the email or application program run on the user's computer and the user would be shown an ad and given a link to the vendor's Internet site. Selecting the link points the user's browser to the vendor's site.

Step 738 shows display ad 2 to the user thereby potentially generating referral revenue for the system operator. Step 740 notes that the user exits the revenue system. Step 742 determines whether the system charges the user for the security service. If YES, the program processes the charge in step 745 (charge systems are known). If NO, the system ends or returns to other programs in step 747.

The NO branch from determination step 730 leads to the receipt of a reconstruction request by the user in step 750. Step 752 determines whether the user will be charged. If YES, the system executes step 745. If NO, the system displays the ad 1 in step 754. Referral generation is noted by branch 757 from step 754. In step 756, the user's password is subject to clearance. In step 758, the user's request is processed, the document or data object is reconstructed (fully or partially as described earlier), and in step 759 the system displays ad 2. In step 762, the user's activity is logged in to the system. Step 764 determines whether the charge to the user is reduced (because he or she viewed the ads) and if not, the system ends in step 747, if YES, the system processes the charge in step 745. Alternatively, the user may be shown display ads and/or charged for services upon storage of extracted data. Step 750 includes this concept.

The claims appended hereto are meant to cover modifications and changes within the scope and spirit of the present invention.

Industrial Applicability

The software product providing for data security can be used by persons and industry interested in safe guarding their sensitive electronic data.

What is claimed is:

1. A computer software product for securing data having one or more security sensitive words, characters or icons in a computer system with memories designated as a remainder store and an extract store, the computer product having instructions for a computer system for:

extracting said security sensitive words, characters or icons from said data to obtain extracted data and remainder data therefrom;

storing said extracted data and said remainder data in said extract store and said remainder store, respectively; and,

permitting reconstruction of said data via said extracted data and remainder data only in the presence of a predetermined security clearance.

2. A computer software product for securing data as claimed in claim 1 operative on an email program or a browser program and including instructions for facilitating said storage of extracted data rather than storing said extracted data, forwarding said remainder data to an email addressee or a targeted destination and permitting retrieval of said extracted data only in the presence of said predetermined security clearance prior to reconstruction.

3. A computer software product for securing data as claimed in claim 2 wherein said product operates in conjunction with the email program and includes instructions for encryption and decryption of one or all of the email, extracted data and remainder data.

4. A computer software product for securing data as claimed in claim 3 including

encrypting said extracted data and either appending or including said encrypted extracted data with said remainder data to form a composite email; and

emailing said composite email to an addressee.

5. A computer software product for securing data as claimed in claims 1 for transparently establishing and managing the separation of user-based communities of interest based upon cryptographically separated security levels, said user-based communities of interest representing a plurality of users having a corresponding a plurality of security levels each with a respective security clearance, the computer product having instructions for the computer system for:

obtaining subsets of extracted data and remainder data;

storing said subsets of extracted data and said remainder data; and,

permitting reconstruction of some or all of said data via one or more of said subsets of extracted data and remainder data only in the presence of a predetermined security clearance of said plurality of security levels.

6. A computer software product for securing data as claimed in claim 5 including

encrypting said subsets of extracted data with said plurality of encryption types to obtain multiple level encryption in one document or data object; and,

decrypting all or portions of said one document or data object with multiple level encryption only in the presence of a predetermined security clearance of said plurality of security levels.

7. A computer software product for securing data as claimed in claim 1, the data being secured against a plurality of computer events and used in connection with an electronic attack or alarm monitor generating a corresponding plurality of attack or alarm warnings, a plurality of users having a corresponding a plurality of security levels each with a respective security clearance, the computer product having instructions for the computer system for:

extracting data dependent upon respective ones of said plurality of attack or alarm warnings to obtain the extracted data and remainder data, the degree of extraction dependent upon respective ones of said plurality of attack or alarm warnings;

storing said extracted data and said remainder data based upon respective ones of said plurality of attack or alarm warnings; and,

permitting reconstruction of some or all of said data via said extracted data and remainder data only in the presence of a predetermined security clearance of said plurality of security levels.

8. A computer software product for securing data as claimed in claim 7 wherein said plurality of computer events includes hacking attacks, power loss, environmental conditions adverse to said computer network, said electronic attack monitor including sensory systems responsive to said plurality of computer events to generate said plurality of attack warnings, and the filtering and storing responsive to said plurality of computer events which include said hacking attacks, power loss, environmental conditions adverse to said computer network.

9. A computer software product for securing data as claimed in claim 1-8 wherein said computer system is one of (i) a data input device interconnected and operable with another computer system having a processor and a memory having distributed memory segments; (ii) a single personal computer, (iii) a network of computers linked together; (iv) a plurality of computers operative over the global computer network or Internet.

10. A computer software product for securing data as claimed in claim 1-9 wherein said data is an electronic document, data stream. data object, image, email, data from a browser program, audio or video file or a combination thereof.

11. A computer software product for securing data as claimed in claim 1-10 wherein said memories are floppy discs, flash memories, hard drive memories, ROMs, RAMs, CD ROM memories, integrated circuit memories, client computer memories, server memories, computer memories coupled to client computers, computer memories coupled to server computers, or distributed memory systems in an interconnected communications network.

12. A computer software product for securing data as claimed in claim 1-11 wherein said software product is deployed over a client-server computer system and said server stores one or both of said extracted and remainder data and permits reconstruction only in the presence of a predetermined security clearance as a download to the client computer.

13. A computer software product for securing data as claimed in claims 1-12 wherein the extracting operates on credit card data, financial data or account data.

14. A computer software product for securing data as claimed in claim 1-13 implemented on an information processing system.

15. A computer software product for securing data as claimed in claim 1-14 wherein the extraction utilizes a parsing algorithm without designation of said security sensitive words, characters or icons and said parsing algorithm based upon one or more of a bit count, a word, a word count, a page count, a line count, a paragraph count, an identifiable document characteristic, an identifiable word characteristic, an identifiable letter or number characteristic, an identifiable icon characteristic, an identifiable data object characteristic, capital letters, italics, and underline.

16. A computer software product for securing data as claimed in claim 1-15 including establishing a plurality of security levels each with a respective security clearance for subsets of said security sensitive words, characters or icons and including permitting either full or partial reconstruction in the presence of respective ones of said plurality of security clearance levels.

17. A computer software product for securing data as claimed in claim 1-16 including encrypting one or both of said extracted data and remainder data and decrypting during reconstruction as necessary and permitted based upon said security clearance.

18. A computer software product for securing data as claimed in claim 1-17 including instructions for deleting data, input into the software product, from a data input device after storing.

19. A computer software product for securing data as claimed in claim 1-18 including mapping said extract store and remainder store or plurality of extract stores, storing said map in a map store, and permitting access only in the presence of predetermined security clearance.

20. A computer software product for securing data as claimed in claim 1-19 including identifying said sensitive words, characters or icons prior to extraction including or excluding words in a dictionary.

21. A computer software product for securing data as claimed in claim 1-20 including utilizing placeholders in said remainder data representing non-reconstructed, extracted data during full or partial reconstruction, said placeholders being one from the group of characters, icons, substitute words, data objects, underline and blank space.

22. A computer software product for securing data as claimed in claim 1-21 including the use of one of an inference engine, neural network and artificial intelligence process to extract, store or permit reconstruction of said data.

23. A computer software product for securing data as claimed in claim 1-22 including one or multiple types of encryption and decryption of one or all of the extracted data and remainder data relative to the degree of security of said data.

24. A computer software product for securing data as claimed in claim 1-23 wherein the extraction and storing represents granular deconstruction and dispersal of said data.

25. A computer software product for securing data as claimed in claim 1-24 including displaying a vendor's advertisement prior to one or the other or both of said steps of extracting and permitting reconstruction and optionally displaying a link to a vendor's web site with said advertisement.

26. A computer software product for securing data as claimed in claim 1-25 including associating a monetary charge for one or more of said extracting, storing or permitting reconstruction.

27. A computer software product for securing data as claimed in claim 1-26 including displaying said security sensitive words, characters or icons in a distinguishing manner prior to extracting.

28. A computer software product for securing data as claimed in claim 1-27 wherein said software product is stored in a computer readable medium, CD ROM, in an integrated circuit, in a network or in a singular or a distributed computer system.

29. A computer software product for securing data as claimed in claim 1-27 wherein said computer system operable with the reconstruction portion of said software product includes a display fed from video memory having a plurality of frame memory segments, the reconstruction including interleaving extracted data and remainder data into respective ones of said plurality of frame memory segments.

30. A computer software product for securing data as claimed in claim 1-27 wherein said computer system operable with the reconstruction portion of said software product includes a data

display system with at least two separate but visually overlaid displays, the reconstruction including displaying said extracted data on one of said at least two displays and displaying said remainder data on another of said at least two displays.

31. A computer software product for securing email data having one or more security sensitive words, characters or icons, the method used in conjunction with an addressee email device having a decryption routine, the computer product having instructions for a computer system for:

extracting said security sensitive words, characters or icons from said email data to obtain extracted data and remainder data therefrom;

encrypting said extracted data and either appending or including said encrypted extracted data with said remainder data to form a composite email; and

emailing said composite email to an addressee.

32. A computer software product for securing data and transparently managing the separation of user-based communities of interest based upon crypto-graphically separated, need to know security levels with a plurality of encryption types, said data having one or more security sensitive words, data objects, characters or icons, said user-based communities of interest representing a plurality of users having a corresponding a plurality of security levels each with a respective security clearance, the computer product having instructions for a computer system for:

filtering data and extracting said security sensitive words, data objects, characters or icons from said data to obtain (a) subsets of extracted data and (b) remainder data;

encrypting said subsets of extracted data with said plurality of encryption types; and,

permitting reconstruction of some or all of said data via one or more of said subsets of encrypted extracted data and remainder data only in the presence of a predetermined security clearance of said plurality of security levels.

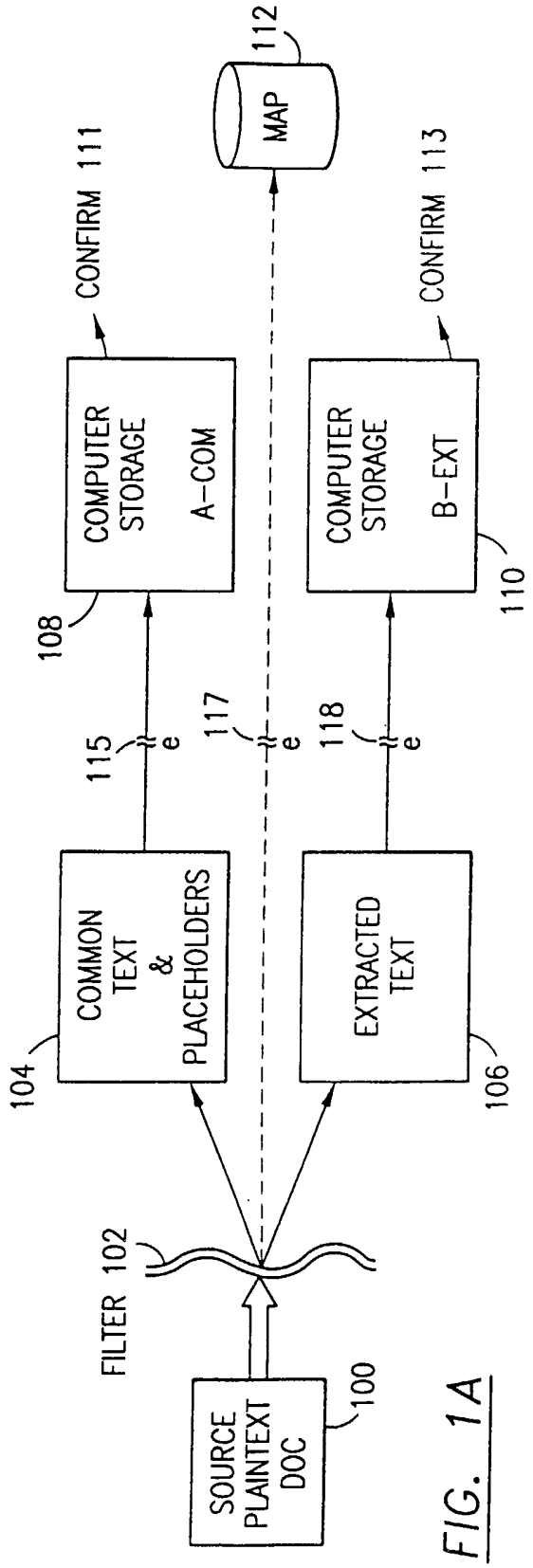

SOURCE PLAINTEXT DOC
100
FILTER 102
COMMON TEXT & PLACEHOLDERS
104
EXTRACTED TEXT
106
COMPUTER STORAGE A-COM
108
COMPUTER STORAGE B-EXT
110
MAP
112
CONFIRM 111
CONFIRM 113
115
117
118

FIG. 1A

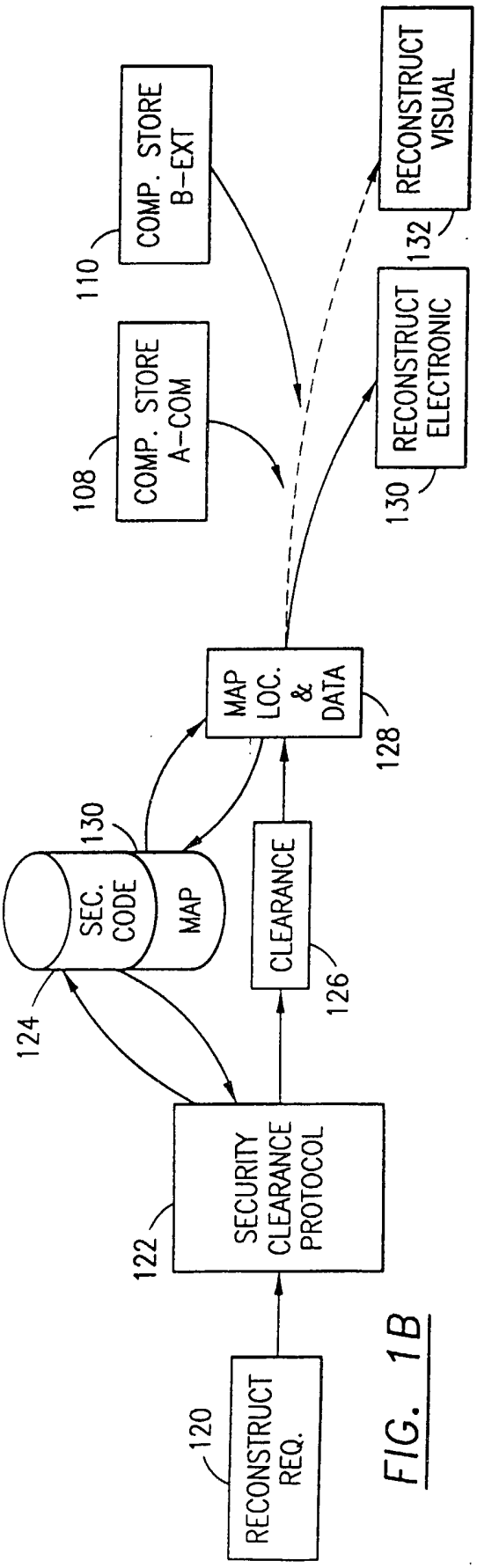

RECONSTRUCT REQ.
120
SECURITY CLEARANCE PROTOCOL
122
SEC. CODE MAP
124
130
CLEARANCE
126
MAP LOC. & DATA
128
COMP. STORE A-COM
108
COMP. STORE B-EXT
110
RECONSTRUCT ELECTRONIC
130
RECONSTRUCT VISUAL
132

FIG. 1B

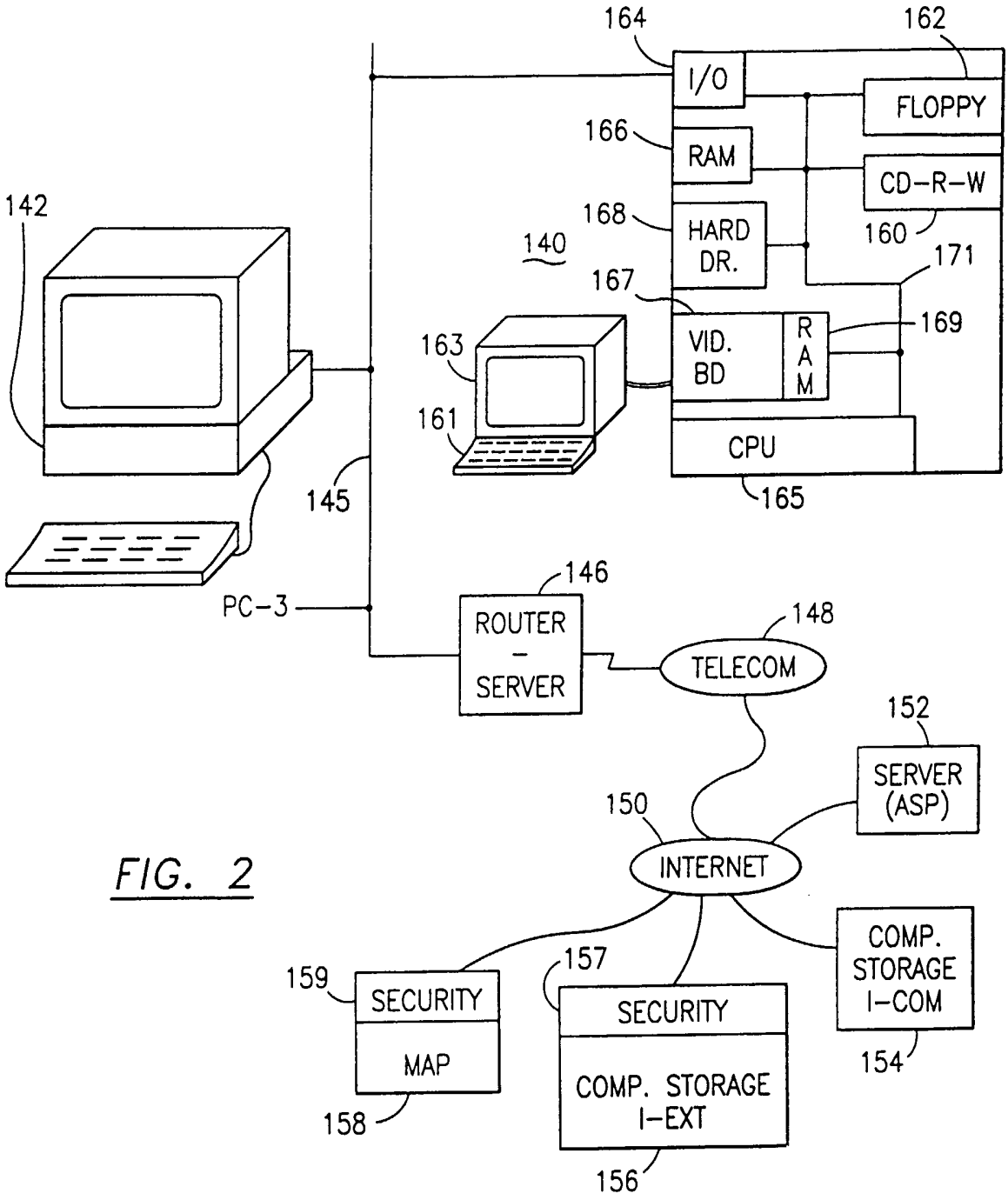
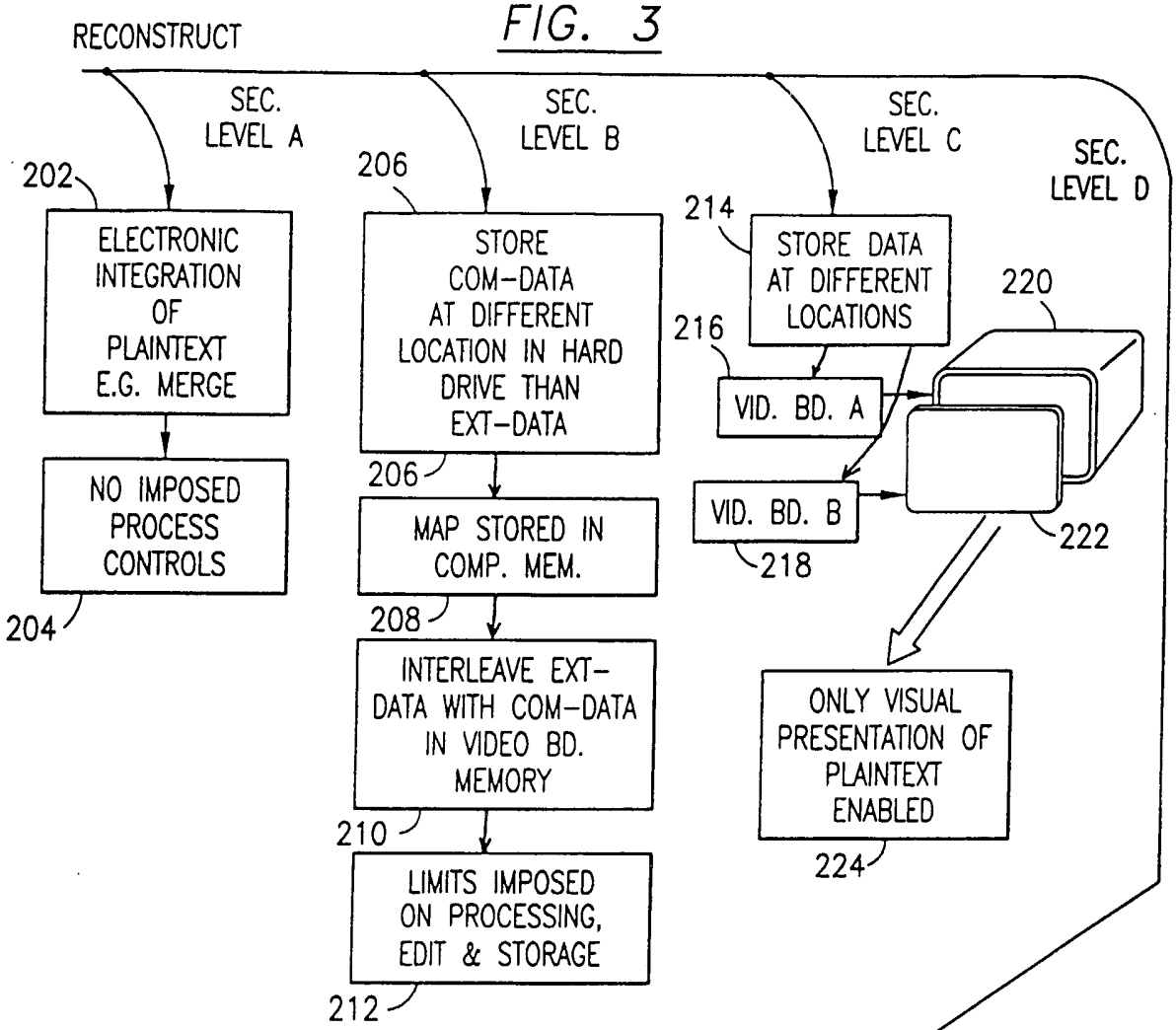

164
162
I/O
FLOPPY
166
RAM
CD-R-W
142
168
HARD DR.
160
140
171
167
169
VID. BD
R A M
163
161
CPU
165
145
PC-3
146
ROUTER – SERVER
148
TELECOM
152
SERVER (ASP)
150
INTERNET
COMP. STORAGE I-COM
154
159
SECURITY
MAP
158
157
SECURITY
COMP. STORAGE I-EXT
156

FIG. 2

FIG. 3


RECONSTRUCT
SEC. LEVEL A
SEC. LEVEL B
SEC. LEVEL C
SEC. LEVEL D
202
ELECTRONIC INTEGRATION OF PLAINTEXT E.G. MERGE
NO IMPOSED PROCESS CONTROLS
204
206
STORE COM-DATA AT DIFFERENT LOCATION IN HARD DRIVE THAN EXT-DATA
206
MAP STORED IN COMP. MEM.
208
INTERLEAVE EXT-DATA WITH COM-DATA IN VIDEO BD. MEMORY
210
LIMITS IMPOSED ON PROCESSING, EDIT & STORAGE
212
214
STORE DATA AT DIFFERENT LOCATIONS
216
VID. BD. A
VID. BD. B
218
220
222
ONLY VISUAL PRESENTATION OF PLAINTEXT ENABLED
224
228
PARSE EXT-DATA PER SECURITY CLEARANCE
226
REPEAT PROCESS A, B OR C WITH ONLY PORTIONS OF EXT-DATA PRESENTED TO USER BASED ON SEC. CLEARANCE

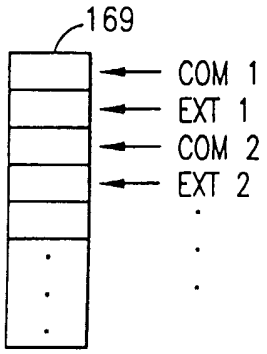

169
COM 1
EXT 1
COM 2
EXT 2

FIG. 3A

FIG. 4

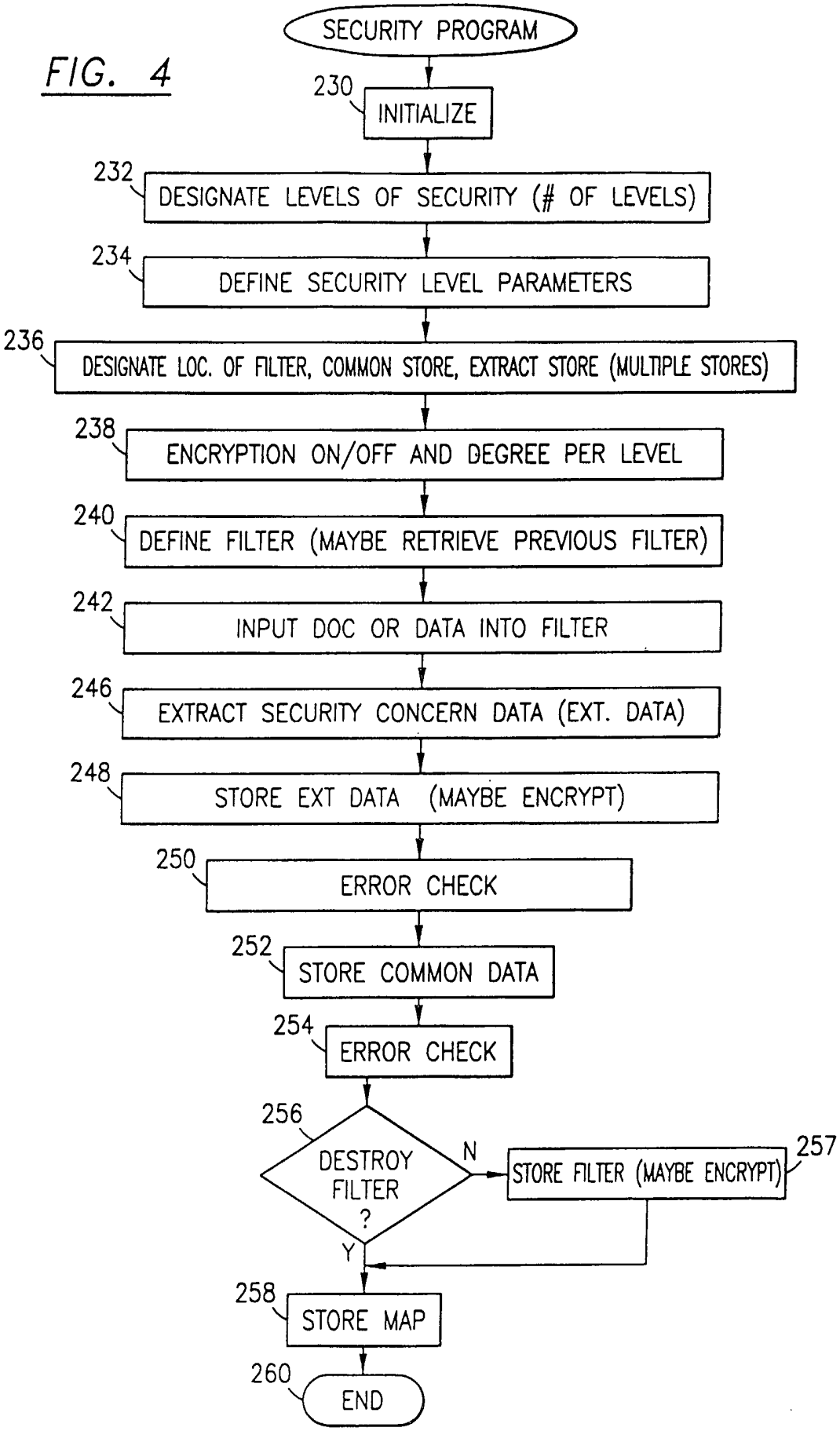
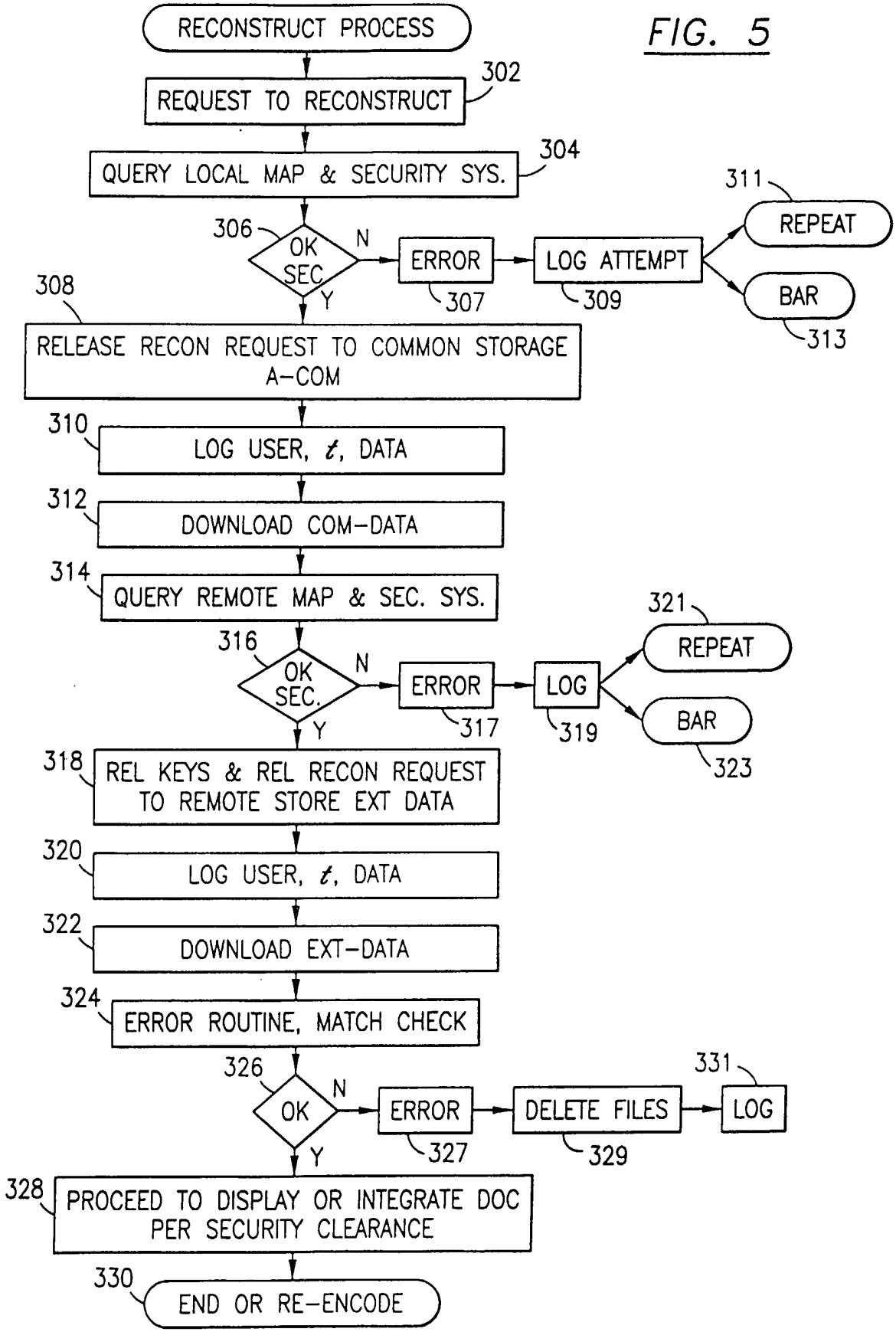

SECURITY PROGRAM
230
INITIALIZE
232
DESIGNATE LEVELS OF SECURITY (# OF LEVELS)
234
DEFINE SECURITY LEVEL PARAMETERS
236
DESIGNATE LOC. OF FILTER, COMMON STORE, EXTRACT STORE (MULTIPLE STORES)
238
ENCRYPTION ON/OFF AND DEGREE PER LEVEL
240
DEFINE FILTER (MAYBE RETRIEVE PREVIOUS FILTER)
242
INPUT DOC OR DATA INTO FILTER
246
EXTRACT SECURITY CONCERN DATA (EXT. DATA)
248
STORE EXT DATA (MAYBE ENCRYPT)
250
ERROR CHECK
252
STORE COMMON DATA
254
ERROR CHECK
256
DESTROY FILTER ?
N
257
STORE FILTER (MAYBE ENCRYPT)
Y
258
STORE MAP
260
END

FIG. 5


RECONSTRUCT PROCESS
REQUEST TO RECONSTRUCT
302
QUERY LOCAL MAP & SECURITY SYS.
304
306
OK SEC
N
Y
ERROR
307
LOG ATTEMPT
309
311
REPEAT
BAR
313
308
RELEASE RECON REQUEST TO COMMON STORAGE A-COM
310
LOG USER, t, DATA
312
DOWNLOAD COM-DATA
314
QUERY REMOTE MAP & SEC. SYS.
316
OK SEC.
N
Y
ERROR
317
LOG
319
321
REPEAT
BAR
323
318
REL KEYS & REL RECON REQUEST TO REMOTE STORE EXT DATA
320
LOG USER, t, DATA
322
DOWNLOAD EXT-DATA
324
ERROR ROUTINE, MATCH CHECK
326
OK
N
Y
ERROR
327
DELETE FILES
329
331
LOG
328
PROCEED TO DISPLAY OR INTEGRATE DOC PER SECURITY CLEARANCE
330
END OR RE-ENCODE

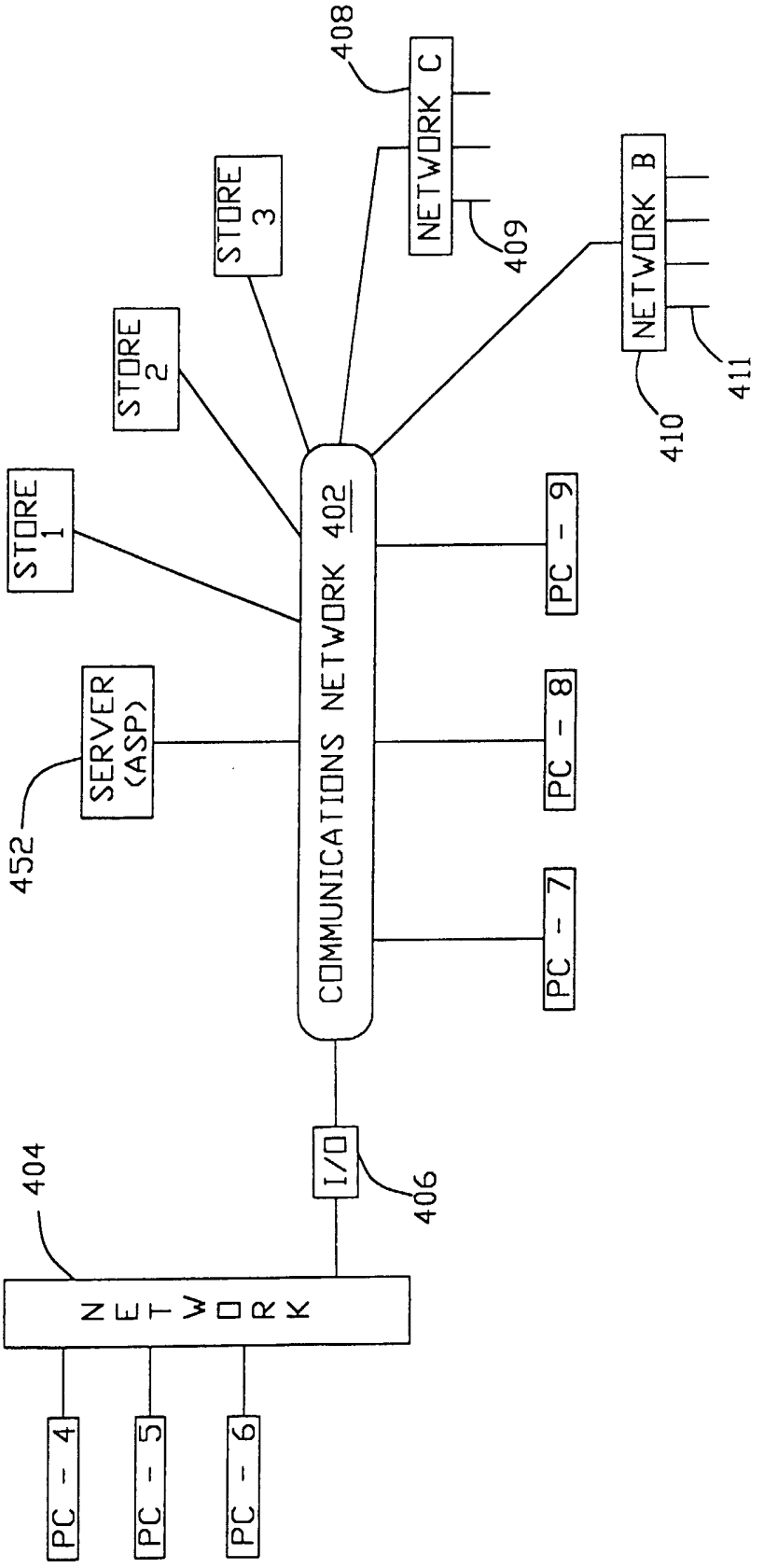

NETWORK
PC - 4
PC - 5
PC - 6
404
I/O
406
COMMUNICATIONS NETWORK 402
SERVER (ASP)
452
STORE 1
STORE 2
STORE 3
NETWORK C
408
409
NETWORK B
410
411
PC - 9
PC - 8
PC - 7

FIG.6

FIG. 7

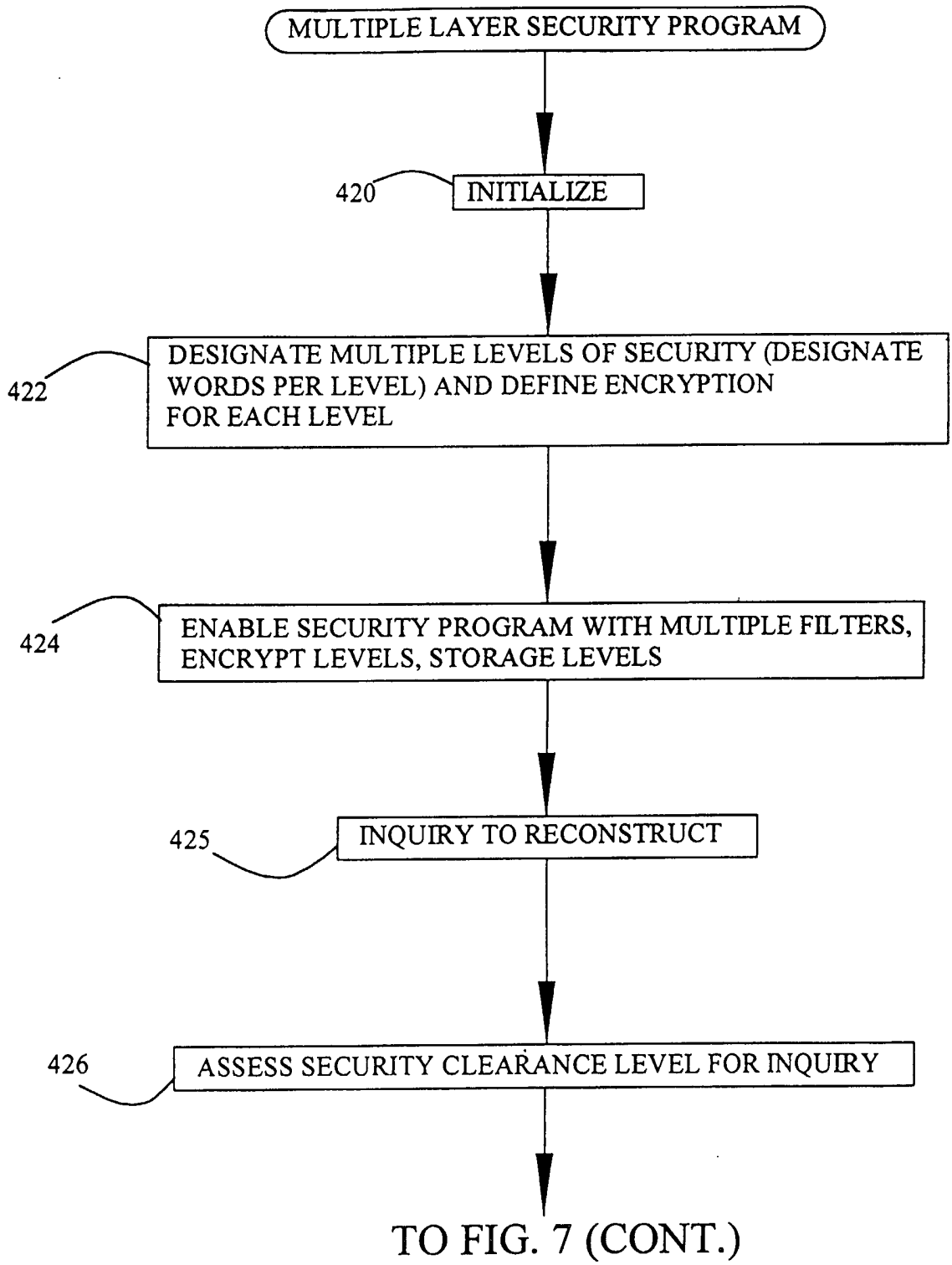

MULTIPLE LAYER SECURITY PROGRAM
420
INITIALIZE
422
DESIGNATE MULTIPLE LEVELS OF SECURITY (DESIGNATE WORDS PER LEVEL) AND DEFINE ENCRYPTION FOR EACH LEVEL
424
ENABLE SECURITY PROGRAM WITH MULTIPLE FILTERS, ENCRYPT LEVELS, STORAGE LEVELS
425
INQUIRY TO RECONSTRUCT
426
ASSESS SECURITY CLEARANCE LEVEL FOR INQUIRY
TO FIG. 7 (CONT.)

FIG. 7 (CONT.)

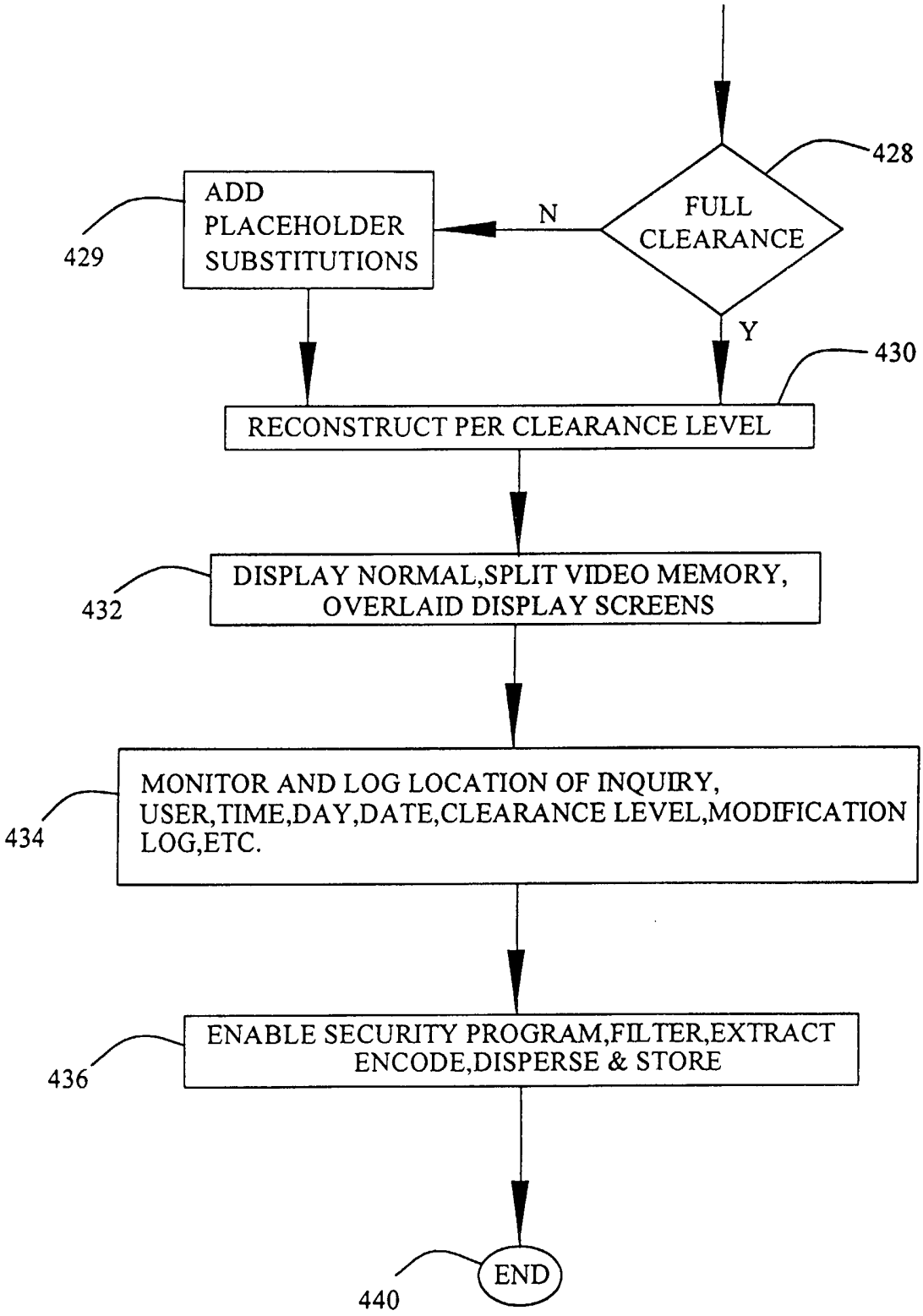

428
FULL CLEARANCE
N
ADD PLACEHOLDER SUBSTITUTIONS
429
Y
430
RECONSTRUCT PER CLEARANCE LEVEL
DISPLAY NORMAL,SPLIT VIDEO MEMORY, OVERLAID DISPLAY SCREENS
432
MONITOR AND LOG LOCATION OF INQUIRY, USER,TIME,DAY,DATE,CLEARANCE LEVEL,MODIFICATION LOG,ETC.
434
ENABLE SECURITY PROGRAM,FILTER,EXTRACT ENCODE,DISPERSE & STORE
436
END
440

FIG. 8

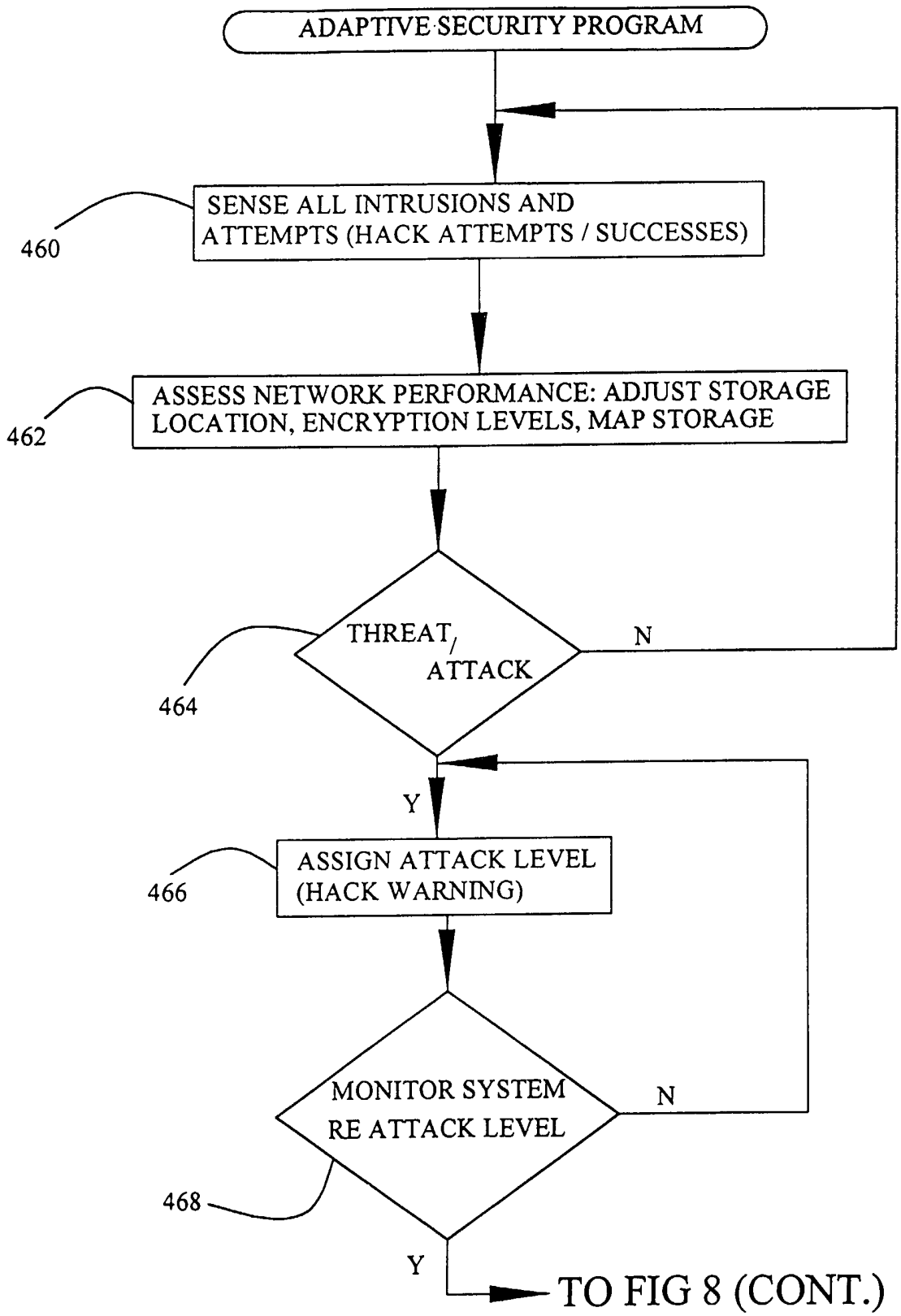

ADAPTIVE SECURITY PROGRAM
SENSE ALL INTRUSIONS AND ATTEMPTS (HACK ATTEMPTS / SUCCESSES)
460
ASSESS NETWORK PERFORMANCE: ADJUST STORAGE LOCATION, ENCRYPTION LEVELS, MAP STORAGE
462
THREAT / ATTACK
464
N
Y
ASSIGN ATTACK LEVEL (HACK WARNING)
466
MONITOR SYSTEM RE ATTACK LEVEL
468
N
Y
TO FIG 8 (CONT.)

FIG. 8 (CONT.)

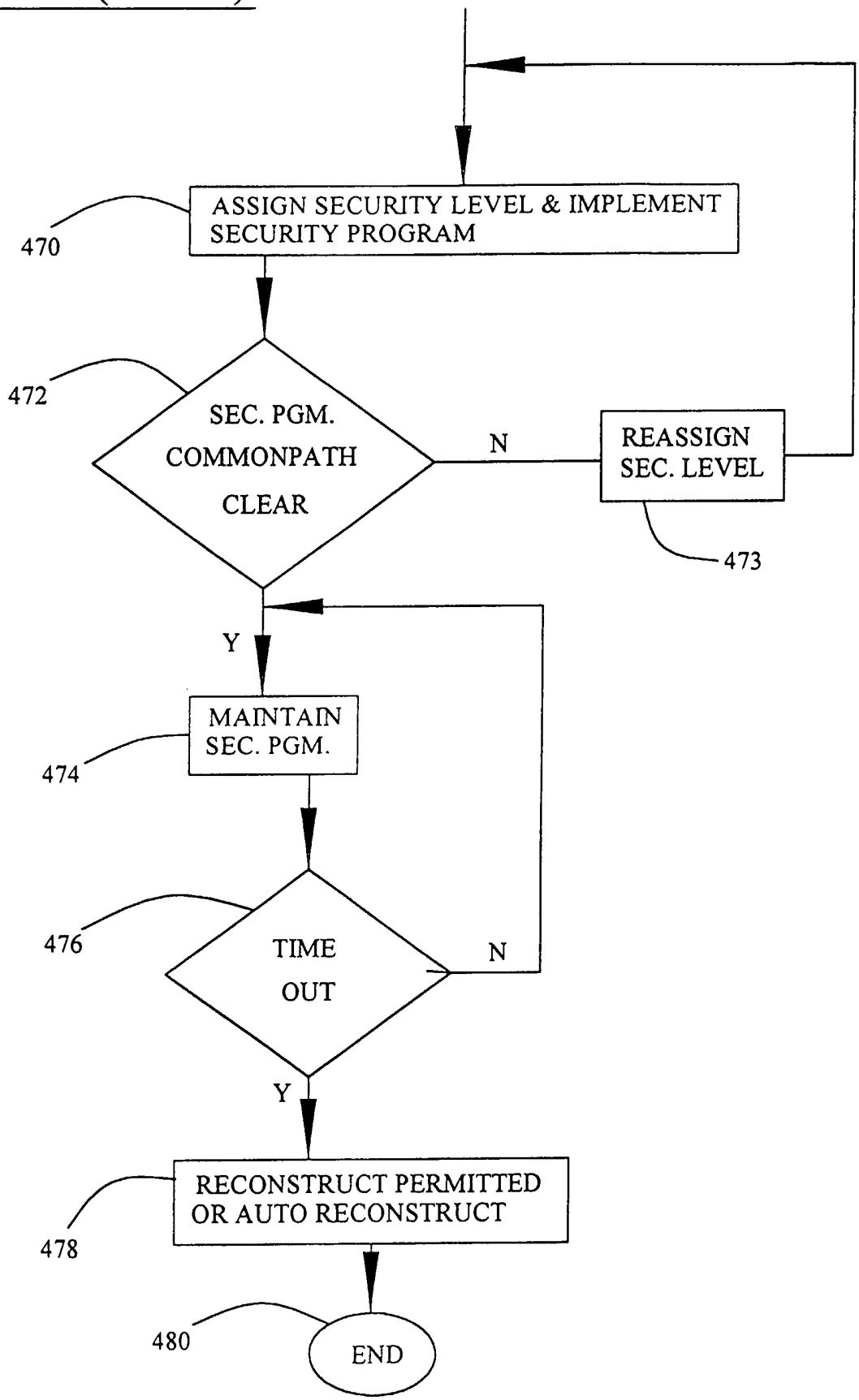

ASSIGN SECURITY LEVEL & IMPLEMENT SECURITY PROGRAM
470
SEC. PGM. COMMONPATH CLEAR
472
N
REASSIGN SEC. LEVEL
473
Y
MAINTAIN SEC. PGM.
474
TIME OUT
476
N
Y
RECONSTRUCT PERMITTED OR AUTO RECONSTRUCT
478
END
480

FIG. 9

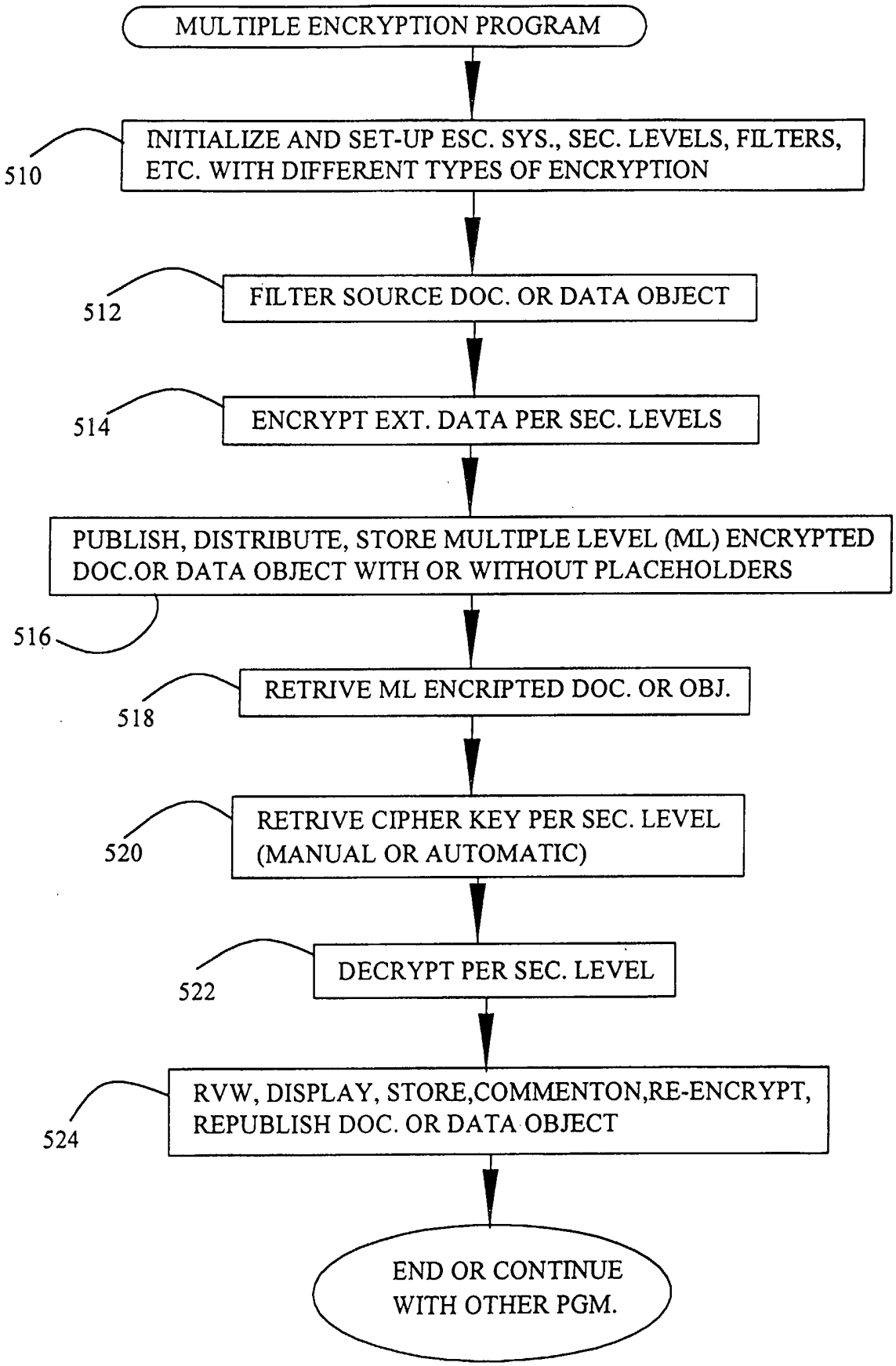

MULTIPLE ENCRYPTION PROGRAM
510
INITIALIZE AND SET-UP ESC. SYS., SEC. LEVELS, FILTERS, ETC. WITH DIFFERENT TYPES OF ENCRYPTION
512
FILTER SOURCE DOC. OR DATA OBJECT
514
ENCRYPT EXT. DATA PER SEC. LEVELS
PUBLISH, DISTRIBUTE, STORE MULTIPLE LEVEL (ML) ENCRYPTED DOC.OR DATA OBJECT WITH OR WITHOUT PLACEHOLDERS
516
518
RETRIVE ML ENCRIPTED DOC. OR OBJ.
520
RETRIVE CIPHER KEY PER SEC. LEVEL (MANUAL OR AUTOMATIC)
522
DECRYPT PER SEC. LEVEL
524
RVW, DISPLAY, STORE,COMMENTON,RE-ENCRYPT, REPUBLISH DOC. OR DATA OBJECT
END OR CONTINUE WITH OTHER PGM.

FIG. 10

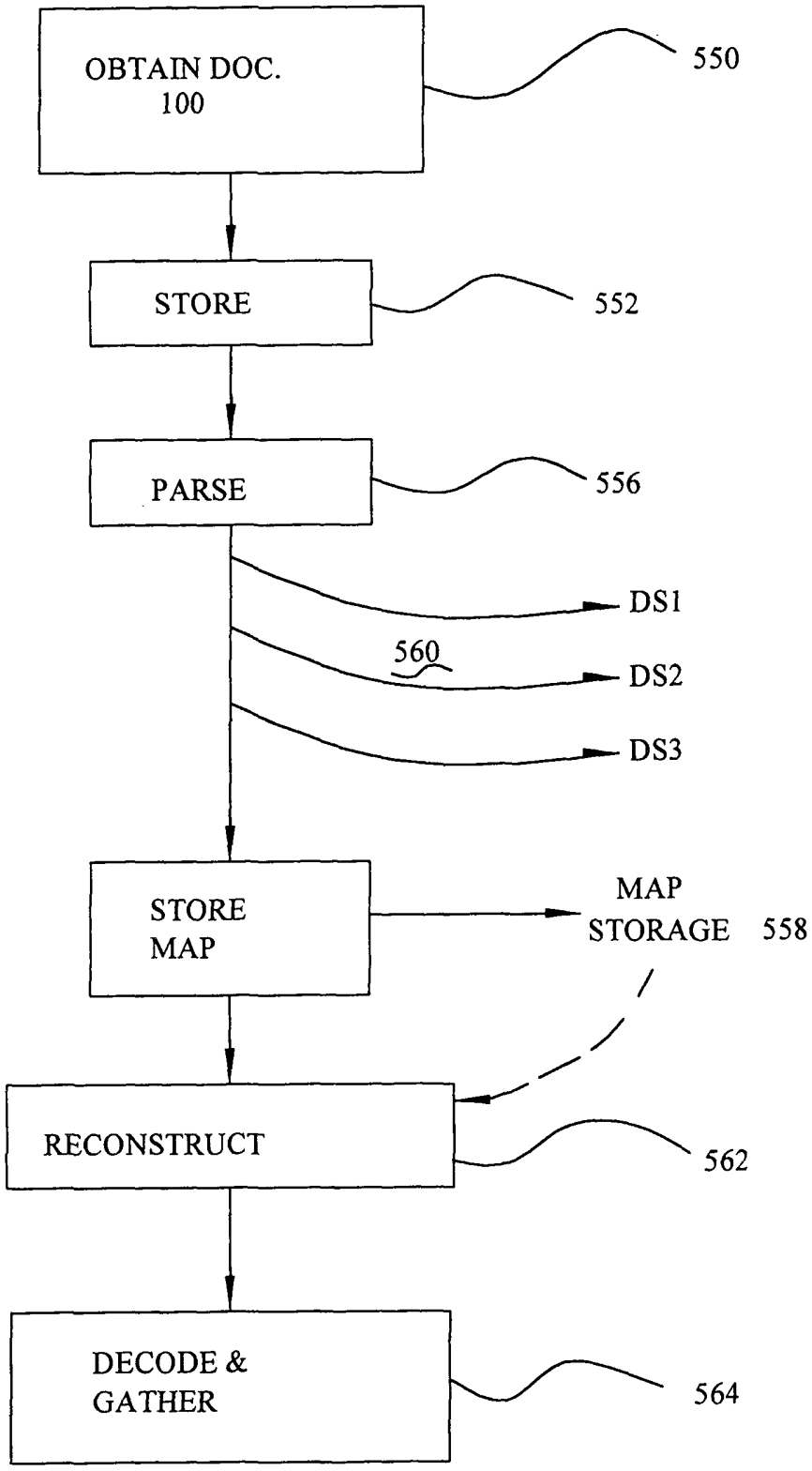

OBTAIN DOC.
100
550
STORE
552
PARSE
556
DS1
560
DS2
DS3
STORE
MAP
MAP
STORAGE
558
RECONSTRUCT
562
DECODE &
GATHER
564

FIG.11A

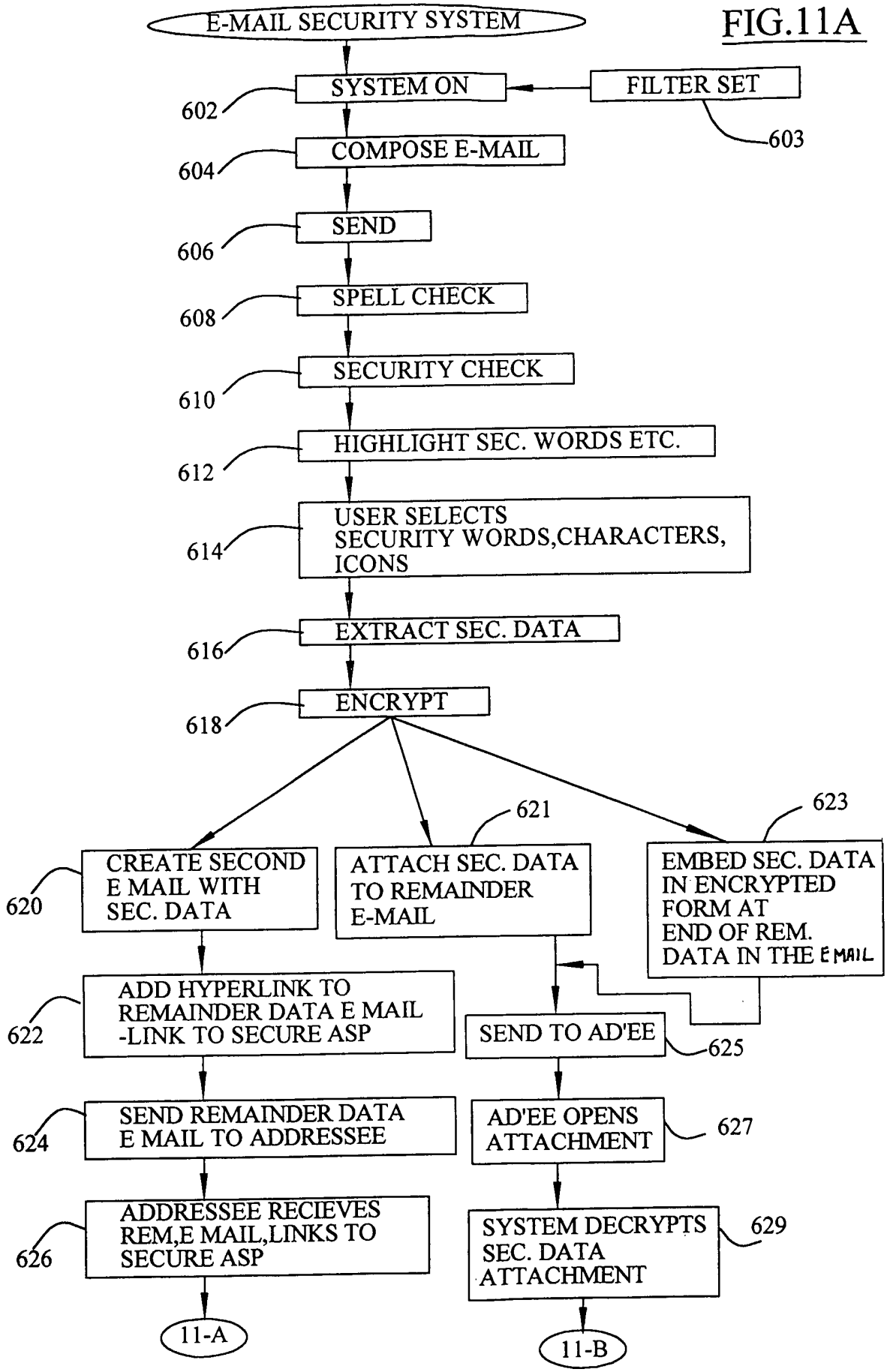

E-MAIL SECURITY SYSTEM
SYSTEM ON
FILTER SET
602
603
COMPOSE E-MAIL
604
SEND
606
SPELL CHECK
608
SECURITY CHECK
610
HIGHLIGHT SEC. WORDS ETC.
612
USER SELECTS SECURITY WORDS,CHARACTERS, ICONS
614
EXTRACT SEC. DATA
616
ENCRYPT
618
621
623
CREATE SECOND E MAIL WITH SEC. DATA
620
ATTACH SEC. DATA TO REMAINDER E-MAIL
EMBED SEC. DATA IN ENCRYPTED FORM AT END OF REM. DATA IN THE E MAIL
ADD HYPERLINK TO REMAINDER DATA E MAIL -LINK TO SECURE ASP
622
SEND TO AD'EE
625
SEND REMAINDER DATA E MAIL TO ADDRESSEE
624
AD'EE OPENS ATTACHMENT
627
ADDRESSEE RECIEVES REM,E MAIL,LINKS TO SECURE ASP
626
SYSTEM DECRYPTS SEC. DATA ATTACHMENT
629
11-A
11-B

FIG.11B

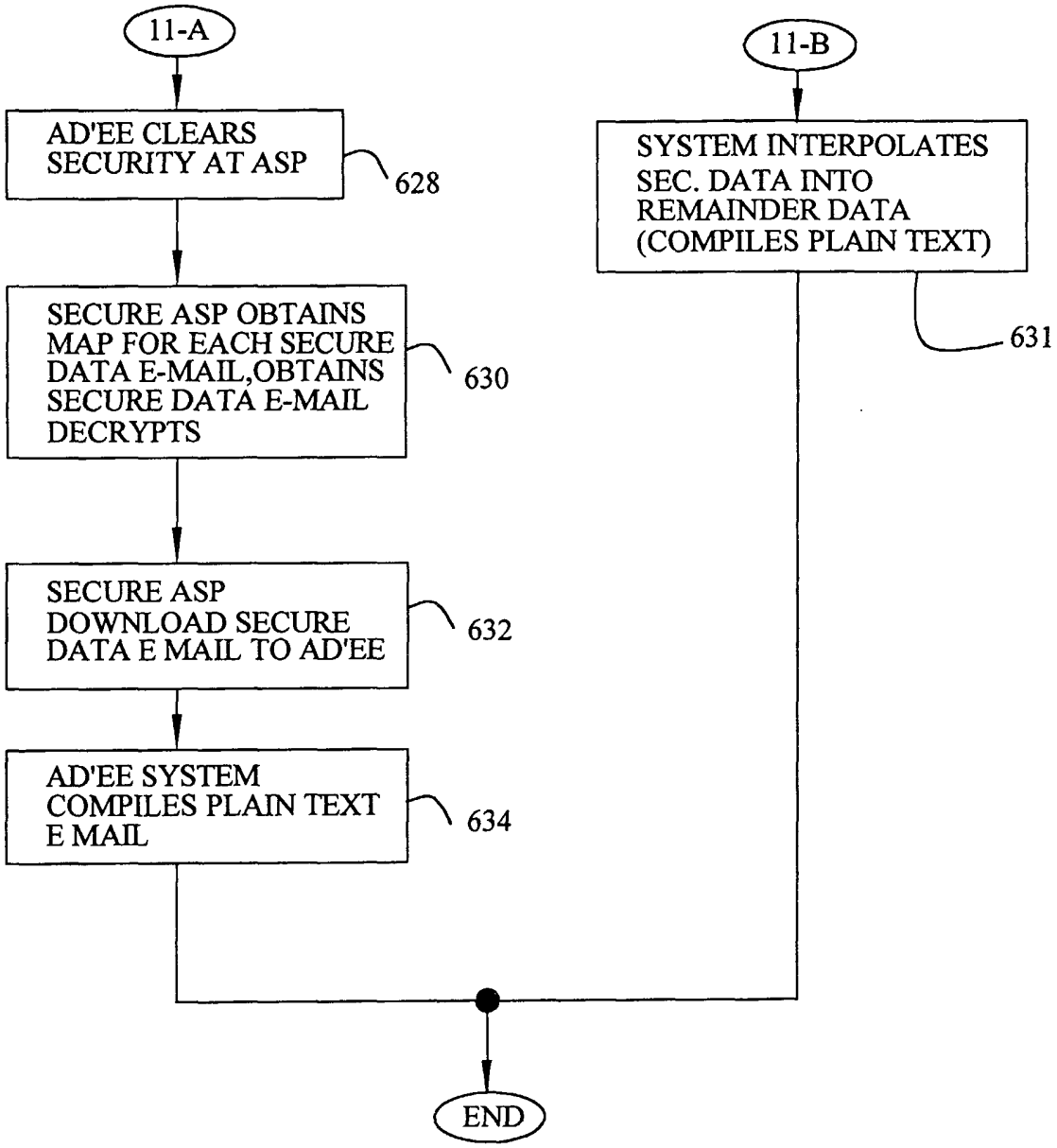

11-A
AD'EE CLEARS SECURITY AT ASP
628
SECURE ASP OBTAINS MAP FOR EACH SECURE DATA E-MAIL,OBTAINS SECURE DATA E-MAIL DECRYPTS
630
SECURE ASP DOWNLOAD SECURE DATA E MAIL TO AD'EE
632
AD'EE SYSTEM COMPILES PLAIN TEXT E MAIL
634
11-B
SYSTEM INTERPOLATES SEC. DATA INTO REMAINDER DATA (COMPILES PLAIN TEXT)
631
END

FIG.12A

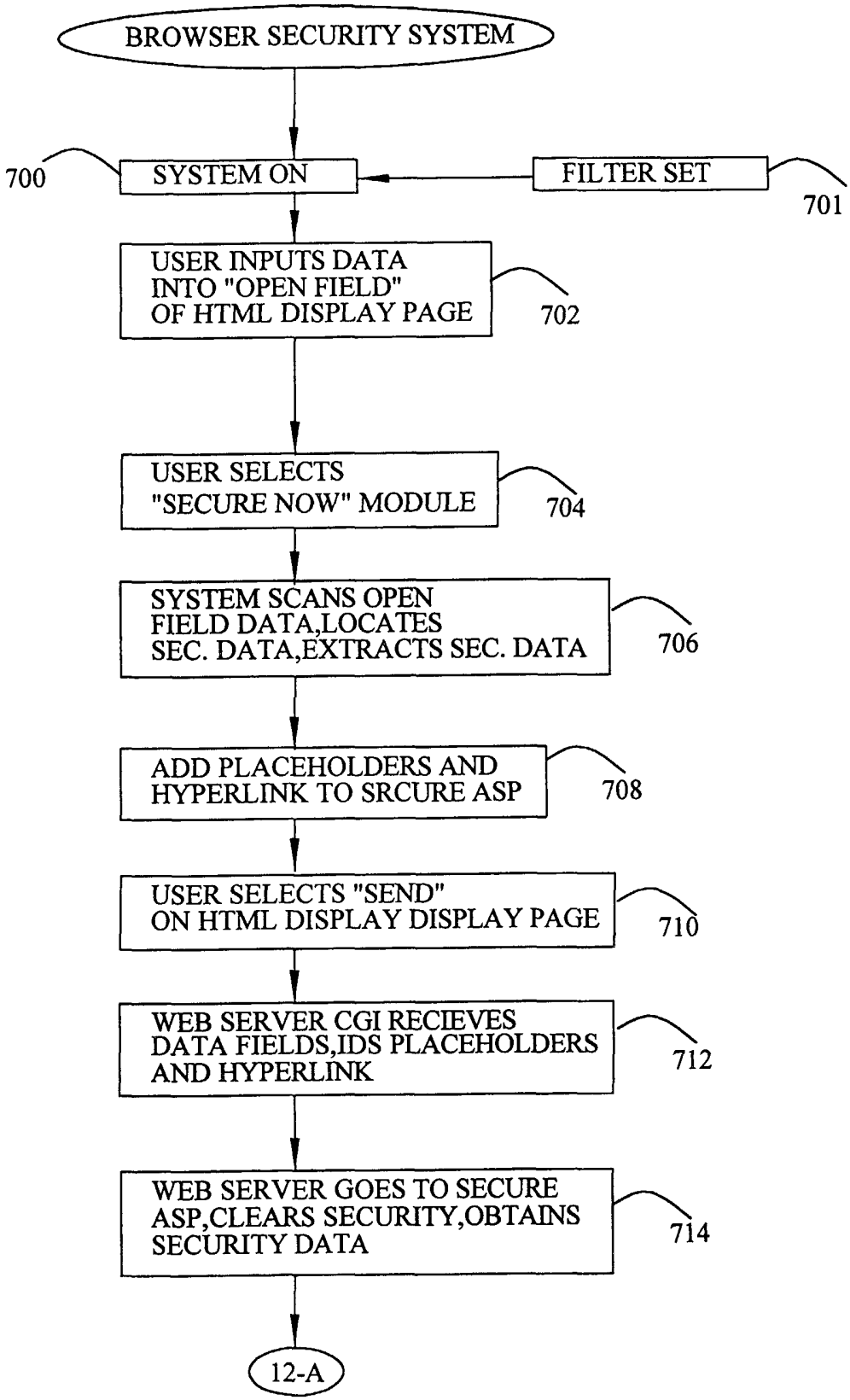

BROWSER SECURITY SYSTEM
700
SYSTEM ON
FILTER SET
701
USER INPUTS DATA INTO "OPEN FIELD" OF HTML DISPLAY PAGE
702
USER SELECTS "SECURE NOW" MODULE
704
SYSTEM SCANS OPEN FIELD DATA,LOCATES SEC. DATA,EXTRACTS SEC. DATA
706
ADD PLACEHOLDERS AND HYPERLINK TO SRCURE ASP
708
USER SELECTS "SEND" ON HTML DISPLAY DISPLAY PAGE
710
WEB SERVER CGI RECIEVES DATA FIELDS,IDS PLACEHOLDERS AND HYPERLINK
712
WEB SERVER GOES TO SECURE ASP,CLEARS SECURITY,OBTAINS SECURITY DATA
714
12-A

FIG.12B

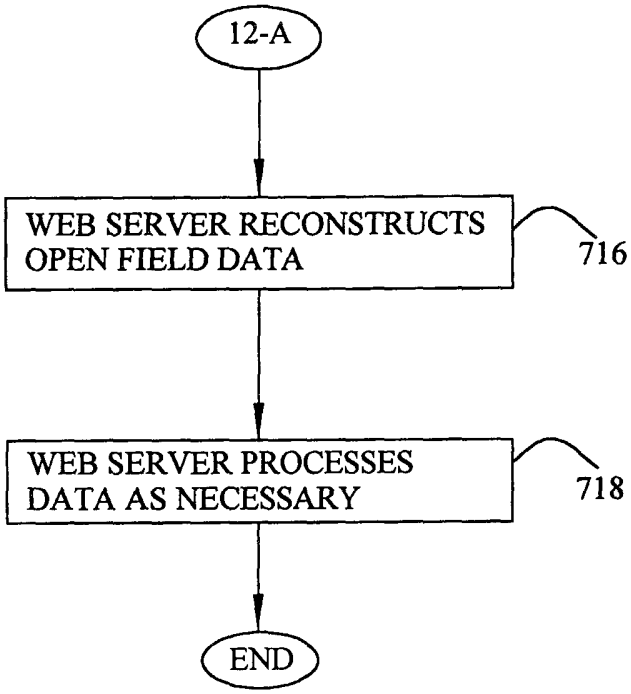
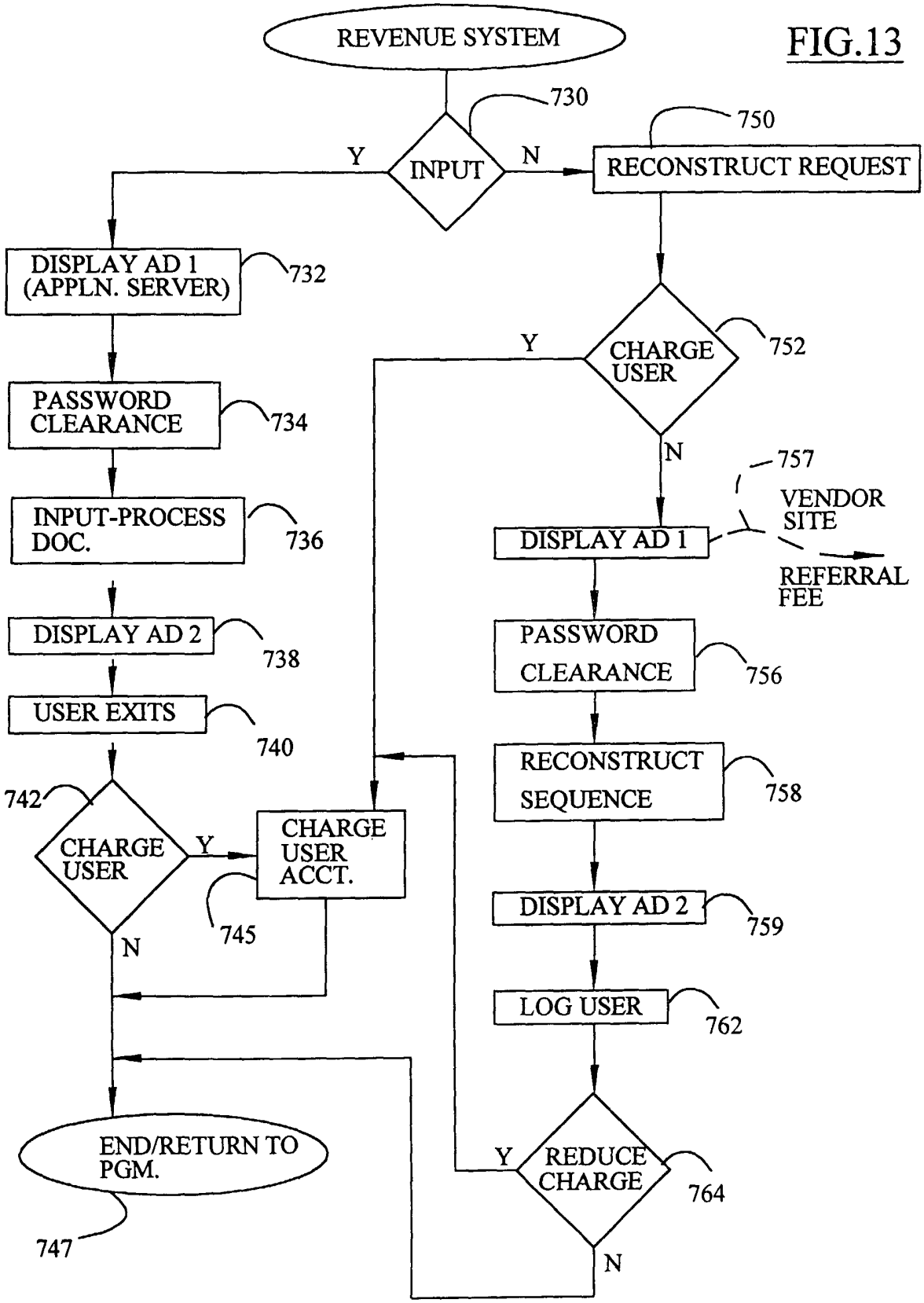

12-A
WEB SERVER RECONSTRUCTS OPEN FIELD DATA
716
WEB SERVER PROCESSES DATA AS NECESSARY
718
END

FIG.13


REVENUE SYSTEM
730
INPUT
Y
N
750
RECONSTRUCT REQUEST
DISPLAY AD 1 (APPLN. SERVER)
732
PASSWORD CLEARANCE
734
INPUT-PROCESS DOC.
736
DISPLAY AD 2
738
USER EXITS
740
742
CHARGE USER
Y
CHARGE USER ACCT.
745
N
END/RETURN TO PGM.
747
Y
CHARGE USER
752
N
757
VENDOR SITE
DISPLAY AD 1
REFERRAL FEE
PASSWORD CLEARANCE
756
RECONSTRUCT SEQUENCE
758
DISPLAY AD 2
759
LOG USER
762
Y
REDUCE CHARGE
764
N

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/21760

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 15/16, 17/00
US CL : 709/203, 206, 246; 707/515; 713/201

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)
U.S. : 709/203, 206, 213-214, 229, 246; 707/9, 514-515, 530; 713/201

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 practicable, search terms used)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,933,498 A (SCHNECK et al.) 03 August 1999 (03.08.1999) Figs. 21a & 21b; col. 31 lines 59-64, col. 33 lines 51-59.	1, 9-11, 14-15, 17, 28, 32
X	US 6,078,907 A (LAMM) 20 June 2000 (20.06.2000) Fig. 6, col. 4 lines 8-59.	1, 14-15, 17, 28, 32
A	US 5,581,682 A (ANDERSON et al.) 03 December 1996 (03.12.1996) col. 1 lines 25-46, col. 2 lines 38-47, col. 3 lines 48-54, col. 5 lines 3-14.	1-32
A	WO 00/75779 A2 (IWITNESS, INC.) 14 December 2000 (14.12.2000) pp. 10-33.	1-32
A,P	US 2002/0073313 A1 (BROWN et al.) 13 June 2002 (13.06.2002) pp. 1-9.	1-32

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"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
08 September 2002 (08.09.2002)	27 SEP 2002
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Andrew Caldwell Telephone No. 703-305-3900

Form PCT/ISA/210 (second sheet) (July 1998)

Continuation of B. FIELDS SEARCHED Item 3:
USPAT, USPGPUB, EPO, JPO, DERWENT, IBM TDB

search terms: redact, extracted information or data, remainder information or data, remaining information or data, separate storage