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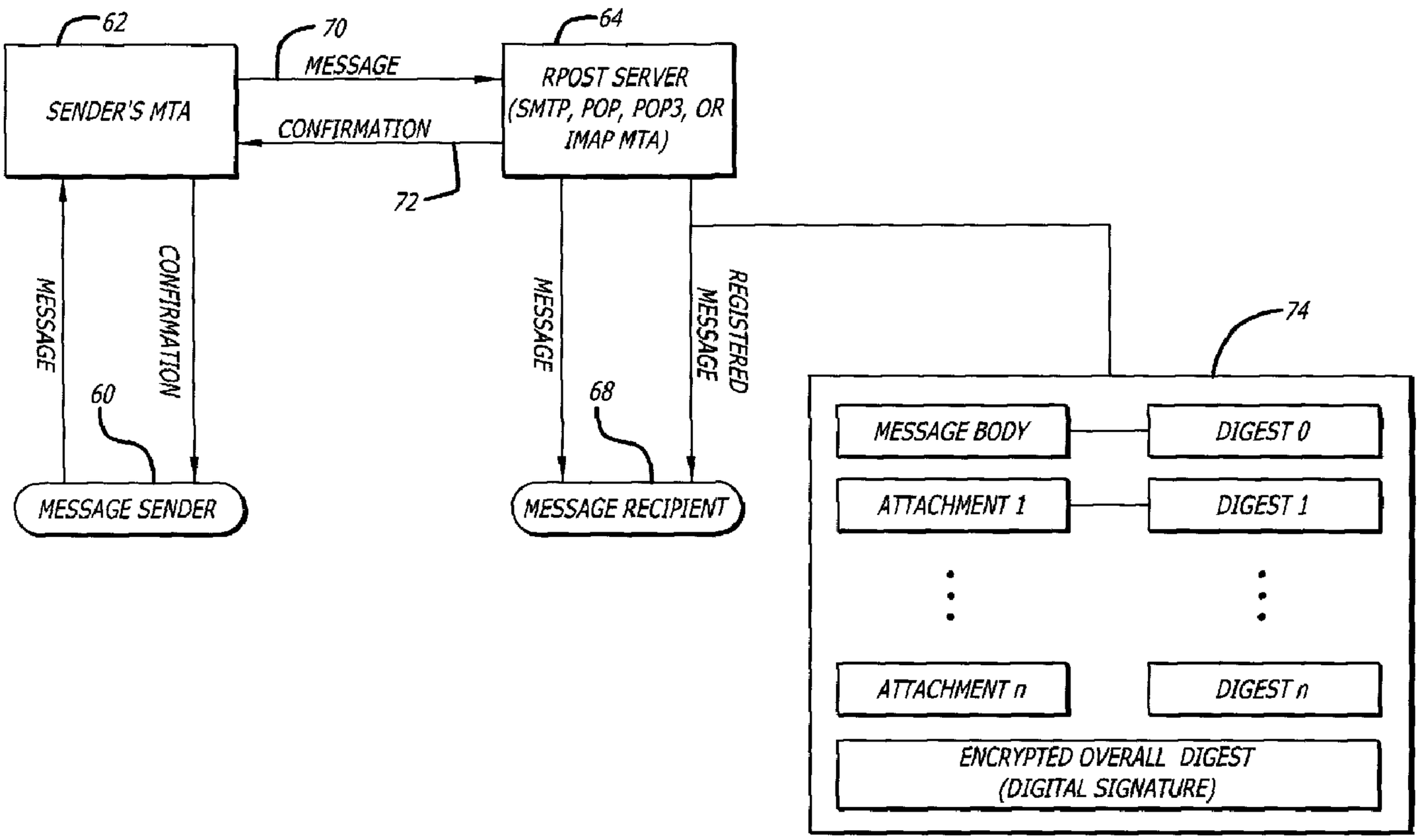
(54) Titre : SYSTEME ET PROCEDE POUR VERIFIER L'EXPEDITION ET L'INTEGRITE DES MESSAGES ELECTRONIQUES
(54) Title: SYSTEM AND METHOD FOR VERIFYING DELIVERY AND INTEGRITY OF ELECTRONIC MESSAGES



(57) Abrégé/Abstract:
A server receives a message from a sender and transmits the message through the Internet to a recipient. The server normally transmits the message in a first path through the Internet to the recipient. When the sender indicates at a particular position in the message that the message is registered, the server transmits the message in a second path through the Internet to the recipient. The sender can also provide additional indications in the message to have the server handle the message in other special ways not

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(57) Abrégé(suite)/Abstract(continued):
normally provided by the server. After learning from the receipt or the recipient's agent through the Internet that the message was successfully received, the server creates, and forwards to the sender, an electronic receipt. The receipt includes at least one, and preferably all: the message and any attachments, a delivery success/failure table listing the receipts, and the receipt times, of the message by the recipient's specific agents, and the failure of other agents of the recipient to receive the message and a digital signature of the message and attachments subsequently. By verifying that the digital signature on the sender's receipt matches the digital receipt at the server, the server can verify, without retaining the message, that the receipt is genuine and that the message is accurate.

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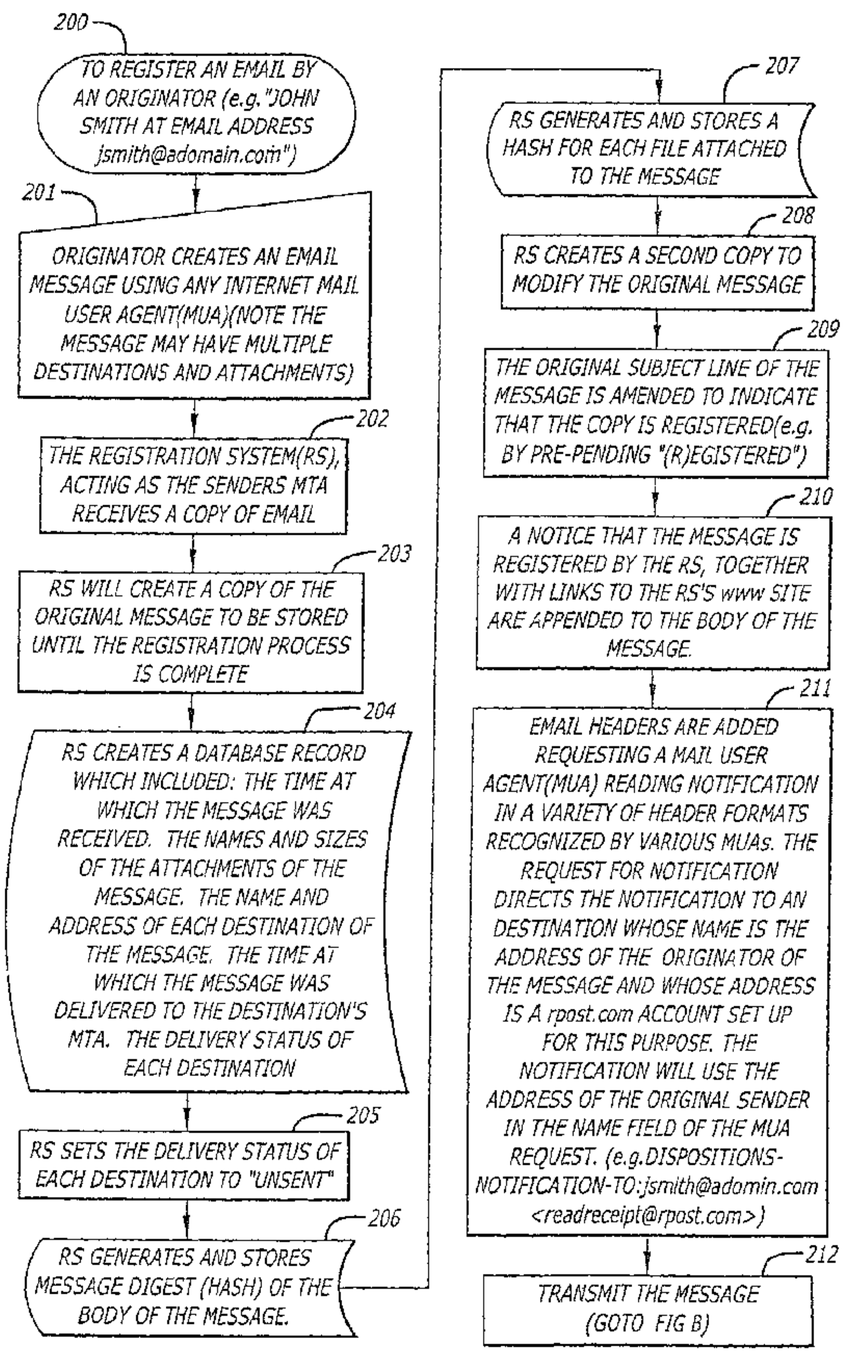
(54) Title: SYSTEM AND METHOD FOR VERIFYING DELIVERY AND INTEGRITY OF ELECTRONIC MESSAGES



(57) Abstract: A server receives a message from a sender and transmits the message through the Internet to a recipient. The server normally transmits the message in a first path through the Internet to the recipient. When the sender indicates at a particular position in the message that the message is registered, the server transmits the message in a second path through the Internet to the recipient. The sender can also provide additional indications in the message to have the server handle the message in other special ways not normally provided by the server. After learning from the receipt or the recipient's agent through the Internet that the message was successfully received, the server creates, and forwards to the sender, an electronic receipt. The receipt includes at least one, and preferably all: the message and any attachments, a delivery success/failure table listing the receipts, and the receipt times, of the message by the recipient's specific agents, and the failure of other agents of the recipient to receive the message and a digital signature of the message and attachments subsequently. By verifying that the digital signature on the sender's receipt matches the digital receipt at the server, the server can verify, without retaining the message, that the receipt is genuine and that the message is accurate.

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SYSTEM AND METHOD FOR VERIFYING DELIVERY AND INTEGRITY OF ELECTRONIC MESSAGES

BACKGROUND OF PREFERRED EMBODIMENTS OF THE INVENTION

I. FIELD OF THE INVENTION:

This invention relates generally to a system and method for verifying delivery and content of an electronic message and, more particularly, to a system and method of later providing proof regarding the delivery and content of an e-mail message. More specifically, the invention relates to a system and method for sending registered mail through the internet while verifying delivery and content of an electronic message and later providing proof regarding the delivery and content of the registered e-mail message.

II. DESCRIPTION OF RELATED ART:

In recent years e-mail has become an indispensable business tool. E-mail has replaced "snail mail" for many business practices because it is faster, cheaper and generally more reliable. But there remain some mail applications where hard copy is still dominant, such as registered and certified mail. For example, when a letter is sent by certified mail the sender is provided with a receipt to prove that the letter was mailed. A returned registered mail receipt adds the Postal Service's confirmation that the letter was successfully delivered to the addressee or the addressee's authorized agent. Additionally, private couriers such as Federal Express ® and United Parcel Service ® (UPS) provide some type of delivery confirmation. Since every piece of courier mail is, in effect, registered it is natural for consumers to turn to these services when they want proof of delivery.

Many existing e-mail systems and e-mail programs already provide for some form of proof of delivery. For instance, some e-mail systems today allow a sender to mark a message with "request for notifications" tags. Such tags allow a sender to request notification that the message was delivered and/or when the message was opened. When a sender requests delivery notification, the internet e-mail system may provide the sender with an e-mail receipt that the message was delivered to the mail server or electronic in-box of the recipient. The receipt message may include the title of the message, the destination address, and the time of delivery. It may also include (depending on the types of "flags" that are provided and activated in the mailing software) a list of all the internet "stations" that the message passed through en route to its destination. This form of reporting is built into some of the rules and protocols which implement e-mail. Furthermore, when a message is sent with a "read notification" request, the recipient's e-mail program may send to the sender an e-mail notification that the recipient opened that message for reading. Many electronic mail clients can and do support this kind of reporting; however, Internet protocols do not make this mandatory.

However, this does not mean that an e-mail sent with a notification request is as effective in all respects as registered mail. People certify and register letters because they want proof of delivery, e.g., proof that can be used in a civil or criminal proceeding, or proof that will satisfy a supervisor or a client or a government agency that a message has been sent, a job has been done, an order placed, or a contract requirement satisfied.

A registration receipt from the United States Postal Service (USPS) constitutes proof of delivery because the USPS stands behind it. The receipt represents the Post Office's confirmation that the letter or package in question was actually delivered to the addressee or his authorized representative. On the other hand, with the e-mail receipt various hurdles exist to an e-mail receipt being admitted and relied upon as persuasive evidence in a court of law as a proof that the message was delivered. After all, the receipt may be just another e-mail message that could have been altered or created by anyone, at any time.

There exists a need for an e-mail system and/or method that can provide reliable proof of the content and delivery of an e-mail message in order to take fuller advantage of the convenience and low cost of communicating via e-mail.

To meet this need some systems have been established whereby senders may receive third party proof of delivery by enrolling in services whereby:

a) The sender transmits an electronic message to a third party together with a list of the document's intended recipients.

b) The third party sends a notification to each of the message's intended recipients inviting them to visit the third party's web site where the message can be viewed.

c) If the intended recipient visits the third party's web site to view the message, the third party records this visit so that the sender may know that his message has been read by the recipient.

The drawbacks of such systems are manifold. In the first place, they rely essentially on the co-operation of the recipient of the e-mail to collect his messages from the third party's service. But the circumstances in which a sender may want proof of delivery of a message are often ones in which it cannot be assumed that the intended recipient will co-operate in receiving the message. In such cases, e.g. where acknowledging receipt of the message would place a financial or legal burden on the recipient, the recipient can simply ignore the notification that mail is available for him to receive. Note that there is nothing in such a system to guarantee that the intended recipient has received notification of waiting mail. In the second place, such systems are cumbersome and slow to use as compared to regular e-mail insofar as it can require the sender and/or the recipient to connect to a World Wide Web site to send, collect and verify the delivery of each message. Moreover, transmission of documents by such methods may require both sender and receiver to upload and download files to a web site. Finally, because these methods require the third party to retain a copy of the whole of each message until such time as they are collected or expired, the methods can require its provider to devote substantial computational resources to data storage and data tracking over an

extended period of time. As an alternative method of providing proof of delivery, some systems provide proprietary e-mail clients or web-browser plug-ins that will notify senders when a message has been received provided that a recipient uses the same e-mail client. The obvious disadvantage of such systems is that they require both sender and recipient to use the same e-mail client.

Therefore, there exists a need for an e-mail system/method that can provide reliable proof of the content and delivery of electronic messages which does not require the compliance or co-operation of the recipient, which requires no special e-mail software on the part of sender or recipient, which operates with the same or nearly the same convenience and speed of use as conventional e-mail, and which can be operated economically by a service provider. A general object of the invention disclosed and claimed in PCT Publication No. WO/2002/011025, filed by Terrance A. Tomkow on July 25,2001 and assigned of record to the assignee of record in this application, is to provide a system and method for reliably verifying via secure and tamper-proof documentation the content and delivery of an electronic message such as an e-mail.

Ideally, the invention disclosed and claimed in WO/2002/011025 will give e-mail and other electronic messages a legal status on a par with, if not superior to, that of registered United States mail. However, it is not necessary to the invention that any particular legal status is accorded to messages sent according to the methods taught herein, as the invention provides useful information and verification regardless.

The invention disclosed and claimed in WO/2002/011025 includes an electronic message system that creates and records a digital signature of each electronic message sent through the system. An originator may send a copy of the electronic message to the system or generate the electronic message within the system itself. The system then forwards and delivers the electronic message to all recipients (or to the designated message handlers associated with the recipients), including "to" addressees and "cc" addressees. Thereafter, the system returns a receipt of delivery to the originator of the electronic message. The receipt includes, among other things: the original message, the digital signature of the message, and a handshaking and delivery history including times of delivery to the recipients. To later verify and authenticate information contained in the receipt, the originator or user sends a copy of the receipt

to the system. The system then verifies that the digital signature matches the original message and the rest of the receipt. If the two match, then the system sends a letter or provides other confirmation of authenticity verifying that the electronic message has not been altered.

The system disclosed and claimed in WO/2002/011025 may include a form of e-mail server connected to the Internet, which can be utilized in many ways. For instance, individual users can register their electronic messages, such as e-mails, by sending a "carbon copy" (cc:) to the system or composing the message within the system itself. For corporate or e- commerce users, these users can change their server to a server incorporating the present invention and have all of their external electronic messages registered, with the option of having the system retain and archive the receipts. The system can accept and verify encrypted electronic messages and manage the electronic messages within and/or outside a "fire wall. "For web-based users, i. e. , individuals or corporations using web-based e-mails, such as MSN Hotmail® or Yahoo Mail®, such users could check a box or otherwise set a flag within their e-mail programs to select on a case-by-case basis whether to make the e-mails of record and/or to archive the messages using the system disclosed and claimed in WO/2002/011025.

The digital signature can be created using known digital signature techniques, such as by performing a hash function on the message to produce a message digest and then encrypting the message digest. Separate digital signatures can be created for the body of the message, any attachments, and for the overall message including the body, the attachments, and the individual message digests. The encrypted message digest provides one type of message authentication or validation code, or secure documentation. Other message authentication and/or validation codes may also be generated and used.

In one aspect, the invention disclosed and claimed in WO/2002/011025 is a method of providing proof regarding the delivery and content of an electronic message, comprising: receiving from a sender across a computer network an electronic message, the message having a delivery address associated therewith; computing a message digest according to the message; encrypting the message digest; sending the message electronically to a destination corresponding to the delivery

address; recording the Simple Mail Transport Protocol (SMTP) or Extended SMTP (ESMTP) dialog which effects the delivery of the message; receiving Delivery Status Notification information associated with the message and the delivery address; providing to the sender an electronic receipt, the receipt comprising: a copy of the message, the encrypted message digest, the (E) SMTP transcripts, and at least a subset of the Delivery Status notification information, and, at a future date, receiving electronically the electronic receipt from the sender, verifying that the encrypted message digest corresponds to the message, and verifying that the message was received by an electronic message handler associated with the delivery address.

In another aspect, the invention disclosed and claimed in WO/2002/011025 includes a method of verifying delivery of an electronic message, comprising: in a wide area network computer system, receiving an electronic message from a message sender for routing to a destination address; establishing communication with an electronic message server associated with the destination address, the server defining a destination server; querying the destination server to determine whether the destination server supports Delivery Status Notification (DSN) functionality; receiving a response to the query, the query and response together defining an SMTP dialog; requesting Delivery Status notification information from the destination server according to results of the SMTP dialog; transmitting the electronic message to the destination address; receiving DSN information from the destination server with respect to delivery of the electronic message; and providing to the message sender at least a portion of the SMTP dialog, and at least a portion of the DSN information.

In yet another aspect, the invention disclosed and claimed in WO/2002/011025 includes a method of verifying content of a received electronic message, comprising: receiving the electronic message; generating a digital signature corresponding to the content of the received message; providing the message and the digital signature to a designated addressee; and, at a later time, verifying that the digital signature corresponds to the message.

In accordance with still another aspect of the invention disclosed and claimed in WO/2002/011025, the method includes establishing whether a message was electronically received by a recipient, comprising: providing a message to be dispatched electronically along with a recipient's address from a sender; creating a

signature associated with the message; dispatching the message electronically to the recipient's address; tracking the message to determine a final Delivery Status of the message dispatched to the recipient's address; upon receiving final Delivery Status of the message, generating a receipt, the receipt including a copy of the message, the signature, and the final Delivery Status for the message; and providing the receipt to the sender for later establishing that the message was electronically received by the recipient.

In accordance with yet another aspect of the invention disclosed and claimed in WO/2002/011025, a method is provided for proving that an electronic message sent to a recipient was read, comprising: providing an electronic message along with a recipient's address; calculating a digital signature corresponding to the electronic message; dispatching the electronic message electronically to the recipient's address; requesting a Mail User Agent (email client "reading") notification from the recipient; upon receiving the reading notification, generating a reading receipt, the reading receipt including a copy of the message, the digital signature for the corresponding electronic message, and a second digital signature for the reading receipt from the recipient; and providing the reading receipt for later verification that said message was received by the recipient.

In accordance with another aspect of the invention disclosed and claimed in WO/2002/011025, a method is provided for validating the integrity of a purported copy of an electronic message, comprising: receiving the purported electronic message copy, said purported copy including an encrypted message digest associated therewith; decrypting the message digest; generating a second message digest based on content of the purported copy; and validating the purported copy by comparing the decrypted message digest and the second message digest to determine whether the two message digests match.

In accordance with a still further aspect of the invention disclosed and claimed in WO/2002/011025, a method is provided for validating a received registered e-mail, comprising: receiving an electronic receipt, said receipt including a base message and an encrypted message digest; decrypting the encrypted message digest; generating a second message digest from the base message; and validating the e-mail if the decrypted message digest matches the second message digest.

In yet another aspect, the invention disclosed and claimed in WO/2002/011025 includes a website at which users can go to send and receive secure messages, with the website host acting as an independent third party which will send and receive the messages and provide secure documentation regarding the content and delivery of the messages.

The above-described invention, disclosed and claimed in WO/2002/011025 and other features and benefits of the present invention will become clear to those skilled in the art when read in conjunction with the following detailed description of a preferred illustrative embodiment and viewed in conjunction with the attached drawings in which like numbers refer to like parts, and the appended claims.

BRIEF DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

A server receives a message from a sender and transmits the message through the Internet to a recipient. The server normally transmits the message in a first path through the Internet to the recipient. When the sender indicates at a particular position in the message that the message is registered, the server transmits the message in a second path through the Internet to the recipient. The sender can also provide additional indications in the message to have the server handle the message in other special ways not normally provided by the server.

After learning from the receipt or the recipient's agent through the Internet that the message was successfully received, the server creates, and forwards to the sender, an electronic receipt. The receipt includes at least one, and preferably all: the message and any attachments, a delivery success/failure table listing the receipts, and the receipt times, of the message by the recipient's specific agents, and the failure of other agents of the recipient to receive the message and a digital signature of the message and attachments subsequently. By verifying that the digital signature on the sender's receipt matches the digital receipt at the server, the server can verify, without retaining the message, that the receipt is genuine and that the message is accurate.

Accordingly, in an embodiment, the present invention provides a method of transmitting a message from a sender to a recipient through a server displaced from

the recipient, including the steps of: receiving the message at the server from the sender, the message including an indication from the sender that the sender wishes to send the message to the recipient in a different manner special and individual to the recipient than the manner normally used by the server to the send the message to the recipient; transmitting the message from the server to the recipient in the different manner special and individual to the recipient in accordance with the indication from the sender.

The present invention also provides a method of transmitting a message from a sender to a recipient through a server displaced from the recipient, including the steps at the server of: receiving the message at the server from the sender, receiving at the server, wit the message from the sender, an indication from the sender that the message is to be transmitted by the server in a manner special and individual to the recipient and different from the manner normally provided by the server in transmitting messages, transmitting from the server to the recipient, in the manner special and individual to the recipient and indicated by the sender to the server and different from the manner normally provided by the server in sending messages, the message and an identification and address of the server and an indication representing the identity of the sender, receiving at the server from the recipient a handshaking and delivery history of the transmission of the message from the server to the recipient, transmitting from the server to the sender, before any authentication of the message, information including the message and an encrypted hash of the message and the handshaking and delivery history of the message received by the server from the recipient and transmitting from the sender to the server the information previously received by the sender from the server when the server requests to have the message authenticated.

The present invention also provides in a method of transmitting a message electronically to a recipient through a server displaced from the recipient, the steps at the server of: receiving from the sender at the server the message and an encrypted hash of the message, the message including an indication added by the sender before the message is sent to the server that the message is to be handled by the server in a manner special and individual to the recipient and different from a normal handling of the message by the server for the recipient, and handling the message at the server in the manner special

and individual to the recipient, including transmitting the message to the recipient, in accordance with the indication from the sender to the server, generating a hash constituting a synopsis of the message in coded form, encrypting the hash with a particular encryption code to generate an encrypted hash of the message, providing at the server, after the transmittal of the message to the recipient but before authentication of the message, the message, the encrypted hash of the message, the name of the sender, the identity and address of the server and the identity and address of the recipient, and transmitting from the server to the sender for storage by the sender, before the authentication of the message, the message, the encrypted hash of the message, the name of the sender, the identity and address of the server and the identity and address of the recipient, and thereafter transmitting to the server from the sender information including the information previously transmitted from the server to the sender, when the sender requests to have the message authenticated, the transmission occurring before any authentication of the message, and thereafter processing the information transmitted to the server from the sender to authenticate the message.

The present invention also provides a method of transmitting a message from a sender to a recipient through a server displaced from the recipient, including the steps of: providing the message from the sender at the server, and also providing an indication at the server from the sender that the message from the sender should be transmitted by the server to the recipient in a second route different from a first route over which messages from the server are normally sent; providing at the server a verification of the message and the identity of the sender and the identity and address of the server; transmitting the message from the server to the recipient through the second route in accordance with the indication provided to the server from the sender; providing at the recipient an indication of the status of the reception at the recipient of the transmittal from the server to the recipient of the message and the identity of the sender and the identity and the address of the server; and transmitting to the server from the recipient, in the individual one of the first and second routes indicated by the server to the recipient, information including the message and the identity and address of the recipient and the status of the reception of the message at the recipient and the identity of the sender and the identity and address of the

server before any authentication of the message; sending to the sender from the server, before any authentication of the message, the message and the verification of the message and the information received by the server from the recipient; and thereafter sending the information including the message, and the verification of the message from the sender to the server before any authentication of the message by the server when the sender requests to have the message authenticated.

The present invention also provides a method of transmitting a message from a sender to a recipient through a server displaced from the recipient, including the steps

at the server of: receiving at the server from the sender a message and an indication that the message should be sent by the server to the recipient through a second path different from a first path, transmitting at the server to the recipient information including the message and an identity of the sender and an identity and address of the server through the second path different from the first path in accordance with the indication from the sender to the server, receiving at the server from the recipient an indication of the identity of the sender and the identity and address of the server and the identity and address of the recipient and an indication of the status of the reception of the message at the recipient, providing at the server a verification of the message and the identity of the sender and the identity and the address of the server, and transmitting to the sender from the server information including the message and the verification of the message and the information received by the recipient relating to the message before any authentication of the message at the server, and transmitting to the server from the sender the information including the message and the verification of the message and the information received by the server from the recipient relating to the message when the sender requests the message to be authenticated.

BRIEF DESCRIPTION OF THE DRAWINGS

A detailed description of the preferred embodiment of the invention will be made with reference to the accompanying drawings:

FIG. 1 is a system diagram of a first embodiment of the invention disclosed and claimed in WO/2002/011025, in which embodiment outgoing messages are made of record by being transmitted by a special Mail Transport Agent (MTA).

FIGS. 2-2F constitute a representative flow diagram for making an outgoing e-mail of record according to the embodiment of FIG. 1.

FIG. 3 is a system diagram of a second embodiment of the invention disclosed and claimed in WO/2002/011025, in which embodiment senders may direct a Mail Transport Agent to transmit selected messages through a separate Mail Transport Agent constructed to make the selected messages of record.

FIG. 4 is a system diagram of a third embodiment of the invention disclosed and claimed in WO/2002/011025, in which carbon copies (cc's) of outgoing messages are sent to a special server to be made of record.

FIG. 5 is a system diagram of a fourth embodiment of the invention disclosed and claimed in WO/2002/011025, in which embodiment users compose outgoing messages to be made of record at a designated website.

FIG. 6 is a system diagram of a fifth embodiment of the invention disclosed and claimed in WO/2002/011025 in which users may send e-mails made of record and store receipts from within a Web Based Mail User Agent (MUA).

FIG. 7 is a flow diagram for validating an e-mail receipt made of record.

FIG. 8 is a system diagram of an embodiment of the present invention for making of record incoming messages.

FIG. 9 is a flow diagram for making of record incoming messages.

FIG. 10 is a flow diagram for validating received messages made of record.

FIG. 11 is a system diagram showing an exemplary use of the invention disclosed and claimed in WO/2002/011025 by an e-business to make of record and acknowledge incoming and outgoing communications.

FIG. 12 is a block diagram showing a flow chart for a method of making of record mail in a system such as shown in individual ones of the different embodiments shown in the previous Figures and showing how a message from a sender to a server with an indication representing made of record mail provides for the transmission of the message by the server to a recipient through a special route different from the route in which the message is normally transmitted by the server to the recipient;

FIG. 13 is a block diagram showing a flow chart similar to that shown in Figure 12 but with additional blocks for providing special functions in addition to the functions provided by the flow chart in Figure 12; and

FIG. 14 is a partial view of a form which is used by the sender to make of record a message to be sent by the server to the recipient.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

This description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the invention. The section titles and overall organization of the present detailed description are for the purpose of convenience only and are not intended to limit the present invention. Accordingly, the invention will be described with respect to e-mail messaging systems that use the Internet network architecture and infrastructure. It is to be understood that the particular message type and network architecture described herein is for illustration only; the invention also applies to other electronic message protocols and message types using other computer network architectures, including wired and wireless networks. For convenience of discussion, messages that are processed according to the invention disclosed and claimed in WO/2002/011025 may be referred to herein as being "made of record "messages. In the discussion which follows, the term "RPost" will refer in general terms to a third party entity which creates and/or operates software and/or hardware implementing the present invention, and/or acts as a disinterested third party message verifier. Messages that are processed according to the present inventions are referred to as"registered" inventions. The term is used for convenience of exemplary discussion only, and is not to be understood as limiting the invention.

Rpost as outgoing mail server embodiment

FIG. 1 is a system diagram of a first embodiment of the present invention, wherein outgoing e-mails are made of record according to the invention disclosed and claimed in WO/2002/011025. In this embodiment, the RPost server 14 serves as the primary outgoing Mail Transport Agent (MTA) for a message sender's Mail User Agent (MUA) 13. Although message recipient 18 is technically the addressee and is therefore merely the intended recipient or intended destination at this point in time, for simplicity of discussion this entity will be referred to herein as the recipient,

addressee, or destination. Note that a single message may have many different destinations and that each of these may be reached through a different MTA. The method of sending messages made of record may divided into three parts:

1) *Preprocessing*: Steps to be taken before a message is transmitted;

2) *Transmission*: The method of delivering messages to addressees;

3) *Post Processing*: Procedures for gathering information about messages after their delivery, the creation of receipts, and the validation of receipts.

1.1 Preprocessing

On receiving a message for transmission, the Rpost server 14 will create records in a database for each message that will be used to store such information as:

a) the time at which the message was received;

b) the names of the attachments of the message; and

c) the number of addresses of the message.

For each destination of the message the database will record:

a) the name of the destination (if available);

b) the internet address of the destination;

c) the time at which the message was delivered to the destination's Mail Server; and

d) the *Delivery Status* of this destination.

Recipient Delivery Statuses used by the system will include:

UNSENT

This status indicates that the message has not been sent.

DELIVERED-AND-WAITING-FOR-DSN

This status indicates that the message has been delivered to an ESMTP compliant MTA that supports Delivery Status Notification (DSN) so that a success/failure notification can be expected.

DELIVERED

This status signifies that the copy of the message sent to this recipient has been successfully delivered to a server that does not support ESMTP DSN.

DELIVERED-TO- MAILBOX

This status signifies that a DSN message has been received which indicates that the copy of the message sent to this recipient was delivered to the mailbox of the recipient.

RELAYED

This status signifies that an MTA DSN has been received which indicates that the copy of the message sent to this recipient has been relayed onward to another server.

UNDELIVERABLE

This status indicates that after repeated attempts RPost has been unable to connect to an MTA to deliver the messages to this recipient.

FAILED

This status signifies that an MTA DSN has been received that indicates a failure to deliver a copy of the message to this recipient.

At this time the system will also perform *hashing* functions on the message's contents.

RPost server 14 employs a hash function and an encryption algorithm. The hash function may be one of any well-known hash functions, including MD2, MD5, the Secure Hashing Algorithm (SHA), or other hash functions which may be developed in the future. Hash algorithms and methods are described in Bruce Schneider, *Applied Cryptography : Protocols, Algorithms, and Source Code in C*, John Wiley & Sons, Inc. (New York) 1993; *Federal Information Processing Standard Publication 180-1 (FIPS PUB 180-1) Secure Hash Standard*, National Institute of Standards and Technology ; and U. S. Pat. No. 5,530, 757 issued to Krawczyk, entitled "Distributed Fingerprints for Information Integrity Verification,". Other known or new methods of detecting whether the contents of the message have been altered may be used.

A good hash function *H* is one-way; that is, it is hard to invert where "hard to invert" means that given a hash value *h*, it is computationally infeasible to find some input *x* such that *H (x) = h*. Furthermore, the hash function should be at least weakly collision-free, which means that, given a message x, it is computationally infeasible to find some input y such that *H (x) = H (y)*. The consequence of this is that a would-be forger who knows the algorithm used and the resulting hash value or message digest will nevertheless not be able to create a counterfeit message that will hash to the same number. The hash value *h* returned by a hash function is generally referred to as a message digest. The message digest is sometimes referred to as a "digital fingerprint" of the message *x*. Currently, it is recommended that one-way hash functions produce outputs that are at least 128 bits long in order to ensure that the results are secure and not forgeable. As the current state of the art advances, the recommended length for secure hash functions may increase.

RPost server 14 computes a message digest for the message body, and a separate message digest for each of the attachments of the message and stores these in a manner in which they may be later included in a receipt for the message.

Before the message is altered in the ways that registration will require, a copy of the original message and its attachments are stored in a manner in which they can be later retrieved by the system.

The RPost server 14 may alter a message in several ways before transmission to the recipient's MTA.

Although such is not necessary to the practice of the invention, the message may be tagged to denote the fact that the message has been made of record, such as by inserting the words "Made of Record" or at the beginning of the "subject" line of the message, by appending a tag such as,

"This message has been made of record with RPost. Visit our web site at www.RPost.com for additional information."

at the end of the original message or other tagging. Additionally, the tag may contain instructions, World Wide Web addresses, or links that invite and allow the recipient to send a reply made of record to the message by linking to a Web Page from which messages made of record may be composed and sent.

Although tagging is optional, the delivered message will generally be referred to herein as the tagged message.

Internet protocols provide two forms of receipt for e-mail messages:

MTA NOTIFICATIONS

These are e-mails that are sent by a recipient's MTA notifying the nominal sender of the message that various events have occurred. MTAs that conform to the SMTP protocol will typically only send a notification in the event that the mailer cannot deliver a message to the mailbox of the addressee (as might happen if the address is not valid or if the addressee's mailbox has exceeded its allotted storage quota).

With the introduction of the Extended SMTP standard it became possible for sending MTAs to request notices of success and failure in the delivery of messages.

These Delivery Status Notifications (DSNs) are e-mails which are sent by a receiving MTA to the nominal sender of the message when certain events occur: e.g. the message has been successfully deposited into the mailbox of the recipient; the message cannot be delivered to the recipient's mailbox for some reason; the recipient's message has been relayed on to another server which does not give DSN receipts.

Note that only e-mail servers that support the Extended SMTP (ESMTP) protocol support this form of DSN and that support for this function is optional for ESMTP servers and depends on the configuration selected by the server's administrators.

Although DSN is a term that only came into use with the advent of ESMTP, we will, in what follows, use 'DSN' to refer to any MTA generated message relating to the status of a received message whether or not it is in conformity to the ESMTP protocol.

MUA NOTICES (READING NOTIFICATIONS)

These are emails that are sent to the (nominal) author of a message by the recipient's Mail User Agent (MUA) (e-mail program) when certain events occur: e.g. the message is opened for reading, or deleted from the system without being read. By Internet convention (RFC 1891), no MUA program can be forced to generate such notifications. Whether an MUA will generate these receipts will depend upon the configuration chosen by its user.

The RPost server 14 will configure and transmit messages in a way that attempts to elicit both MTA DSNs and MUA notices from compliant MTAs and MUAs. In order to elicit a Reading Receipt from compliant MUAs, certain headers should be included in the header section of an e-mail message. Different MUAs respond to different headers; hence Server 14 will add several different headers to each message requesting a read notification in a form recognized by various MUAs. These headers all take the form:

Header label: user name <user address>

For example:

Disposition-notification-to: john smith

<jsmith@adomain.com>
read-notification-to: john smith
<jsmith@adomain.com>

where 'john smith' is the name of the user to whom an MUA notification is to be sent and '<jsmith@adomain.com>' is that user's internet address. Normally such headers would refer to the author of the message but in the case of the present method it is required that the notification be returned to RPost so that the notification can be processed by RPost. To assure that this is so Server 14 will insert headers that request that MUA receipts be sent to an address where they can be processed by the RPost server, for example: "readreceipt@RPost.com". This will direct any compliant recipient MUAs to send their notifications to an RPost address for processing.

The task of processing returned MUA notifications raises another problem that must be dealt with at this stage. There are no standards governing the format or content of MUA notifications. Often they will quote the subject of the original message and the time of the event (e.g. "opened for reading") that they are reporting. But even if this information is included in the notification it is rarely sufficient to uniquely identify the message that prompts it or to identify the author of that message. When the system receives a MUA notification it should be able to identify the message that prompts it, so as to include the notification information in the receipt that RPost will generate for the sender. Alternatively, the system should at least be able to reliably identify the sender of the message to which the MUA notification refers so that the notification information can be passed on to the sender in the form of an RPost Reading receipt (see below).

To accomplish the latter goal, the system can take advantage of the fact that internet addresses have two components: a name field and an address field, where the address field is set off by corner quotes "<>". Most MUAs will include both fields in the destination address of their MUA notifications. In composing its requests for MUA receipts, the RPost system will include the server 14 read receipt-handling address as the address for the notification but will use the *address* of the original sender in the name field of the header. For example, where the original

sender of the message is user John Smith with internet address jsmith@adomain.com, the RPost server 14 will include headers of the form:

Disposition-notification-to: jsmith@adomain.com <readreceipts@RPost.com>

This will typically result in the compliant MUA sending a notification to readreceipts@RPost.com addressed as:

jsmith@adomain.com <readreceipts@RPost.com>

On receipt of such a notification at the address *"readreceipts@RPost.com"*, the server can, by parsing the addressee's field, determine that the notification concerns a message originally sent by *jsmith@adomain.com*, even if this could not be determined by any examination of the contents of the notification. With this information in hand, the server can then package the contents of the notification in a digitally signed RPost Reading receipt and send the receipt to the address jsmith@adomain.com

The RPost system will also endeavor to elicit and collect MTA DSN notices generated by recipient MTAs. Since such notifications are always sent to the address listed in the "FROM:" field of the message header, the server 14 will alter each message header so that the message is received as "FROM:" an RPost address at which DSNs may be processed.

However the problem of processing DSNs raises another issue, which will be dealt with at this stage. DSNs do not have any standard content or format; often it is impossible to determine, merely by examining the contents of these e-mails, what message their contents are giving notification of. This problem was supposed to have been addressed for DSNs generated in compliance with the ESMTP protocol by the use of DSN envelope ID numbers (see RFC 1869). According to the protocol, a transmitting MTA can include a reference number along with its request for a DSN. This number would be quoted in any returning DSN, allowing the sender to identify the subject message of the DSN. However, as a matter of fact, many MTAs that report themselves as supporting ESMTP DSN do not return a DSN envelope ID or any other information sufficient to reliably identify the subject message. Finally, even where a DSN does return information sufficient to identify

the message it is giving notice of, it often will not contain sufficient information to identify the specific addressee of the message that has prompted the notification. Thus, a single message might be sent to two addressees at a domain; one might be successfully delivered to the addressee's mailbox; the other, not. The MTA for the domain may report these events in a DSN in ways that provide no way for the recipient of the DSN to determine which addressee was successfully delivered and which was not (as, for example, may happen if the DSN reports the recipient's addresses as their local alias names rather than by the addresses contained in the original message).

The present invention solves this problem in four steps:

1) A unique identification number is generated for each outgoing message (e.g. based upon a time stamp). This number is stored in a database.

2) The recipients of each message are enumerated and the identifying numbers are stored in a database.

3) The message is sent separately to each intended recipient's MTA. (Even when two recipients have a common domain name and MTA, the server 14 will transmit the message to that MTA in two separate SMTP telnet sessions.)

4) When the server 14 transmits the message to a recipient's MTA it augments the message's "FROM" field to show the message as having been sent from an address which incorporates the message's unique ID and the identifying number of the sender. The address also contains a substring (e.g. "rcpt") that enables the server to identify return messages as DSNs.

Thus, a single message denominated "mmyyddss" by the server 14, from the sender named John Smith, might be sent to its first intended recipient (denominated "a" by the system) with a header reading:

From: John Smith <rcptmmddyyssa@RPost.com>

The same message would be sent to the second recipient with a header reading:

From: John Smith <rcptmmddyyssb@RPost.com>

Many e-mail MUAs will only display the name of the sender of a message and thus the special address will be unseen by most recipients.

The upshot of this form of addressing is that when the recipient MTAs issue DSNs (whether ESMTP compliant or not) they will address those DSNs to different RPost addressees. On receiving these DSNs, the server 14 can identify them as DSN messages by their "RCPT" prefix and, by parsing the addressees, can determine which message and which recipient is the subject of the DSN.

The server 14 will alter the 'FROM' field of each message to refer to a recipient of the message each time it attempts to transmit the message to that recipient's MTA.

To insure that recipient replies to transmitted messages are directed properly the server 14 will add an explicit "reply-to:" message header into the message listing the original sender's name and internet address. In the case of the present example this would be:

Reply-to: john smith <jsmith@adomain.com>

This will lead recipient MUAs to address replies to a received message to the actual sender's address, rather than the constructed RPost address.

I.2 Transmission

As noted above, it is part of the method that the RPost server 14 transmits a separate copy of an outgoing message to each addressee of that message. Moreover RPost will attempt to make each such delivery through a direct SMTP connection with a mail eXchanger (MX) of record for each destination.

Note: Each valid internet e-mail address includes an internet domain name or IP address. Each domain name/address has associated with it an e-mail server(s) authorized to receive mail for addresses in that domain. It will be noted that some domains have more than one server. The Domain Name Server responsible for each domain broadcasts the identity of its mail servers across the Internet. This information is publicly available and is managed and transmitted in ways that conform to rules and conventions which govern internet e-mail and Domain Name service.

Before transmitting a copy of a message to any destination the RPost server 14 will perform an Internet Name Server Lookup to identify an MTA associated with the destination's domain. Having identified the MTA responsible for receiving mail on behalf of a destination address, the system will attempt to open a telnet connection with the destination's local MTA.

It is common practice for internet e-mails to be relayed from MTA to MTA until they reach their final destination. The primary purpose for providing a direct connection between the RPost server 14 and the destination's MTA is so that the RPost server can record delivery of the message, (this record taking the form of an SMTP dialogue) with the e-mail server which has proprietary responsibility for receiving e-mail for the recipient domain name.

The existence of this record provides helpful evidence that the message was delivered, in much the same way that a registered mail receipt provides evidence of delivery. USPS Registered mail is treated as verifiably delivered if it can be proved to have been delivered to the addressee's authorized agent (e.g. a secretary, or mail room clerk). In the event of any legal challenge to the evidentiary merit of an RPost delivery receipt, it will be recognized that in selecting an internet e-mail service provider, the recipient has authorized that provider to collect electronic messages on his behalf. In turn, that service provider has acknowledged its status as the authorized agent for e-mail recipients of that domain name by broadcasting the address of its MTAs as the receptive e-mail servers for this domain.

Accordingly, having delivered messages directly to the mail server responsible for receiving the recipient's e-mail, RPost will have delivered the message to an agent the recipient has legally authorized to receive his mail. By recording the delivery transaction (that transaction taking the form of an SMTP dialogue) RPost can claim to have proof of delivery to the recipient's authorized agent.

Note that while the method herein described attempts to collect other forms of proof of delivery to each destination, whether or not these attempts succeed will depend upon factors that will not be in the control of RPost, (e.g. the form of SMTP

support deployed on the recipient's mail server). On the other hand, every successful delivery direct to a recipient's mail server will always generate an SMTP record. Recording this record allows RPost to provide proof of delivery to any valid internet destination that complies with the minimum protocols (SMTP) for internet mail. This represents an important advantage of the current method over other methods that might attempt to prove delivery by reliance on ESMTP DSN.

Having identified the MTA for a destination of a message, the RPost server 14 will attempt to open an ESMTP connection with the destination MTA by issuing an "EHLO" handshake in compliance with RFC 1869. If SERVER 16 supports ESMTP, it will respond by listing which ESMTP services it supports.

If SERVER 16 supports ESMTP, the RPost server 14 will first determine if SERVER 16 supports the ESMTP Service "VERIFY". The Verify service allows a calling SMTP server to determine, among other things, if an address in an MTA's domain is genuine. If the RPost server 14 determines by these means that the address it is attempting to deliver its message to is not valid, it will terminate the connection, cease attempting to deliver a message to this addressee, and record, in its database, the status of this message destination as UNDELIVERABLE.

Whatever its result, the RPost server 14 will record the ESMTP VERIFY dialogue in a file and store it so that it may be later attached to or included in the Delivery Receipt for this message. It should be noted that, out of concern for security, few ESMTP servers support the VERIFY function.

If System 16 does not support the VERIFY method, then the RPost server 14 will nevertheless attempt to deliver the message to System 16. Typically an MTA will accept messages for any address nominally in its domain and will later send a DSN if the address is invalid.

The RPost server 14 will then attempt to determine if the destination server supports the ESMTP service DSN. If it does, RPost will transmit the message with a request that SERVER 16 notify the sender of the message with an ESMTP DSN if the delivery to the addressee succeeds or fails. After the successful transmission of

the message to this destination the system will record the Delivery Status of this destination as DELIVERED-WAITING-FOR-DSN.

If Server 16 replies to the "EHLO" handshake in a way that indicates that it does not support ESMTP, the RPost server 14 will issue a "HELO" message to initiate an SMTP connection. If this connection is achieved, the RPost server 14 will transmit the message in compliance with the SMTP protocol and will record the Delivery Status of the destination as DELIVERED.

Whether the connection is SMTP or ESMTP, the RPost server 14 will record the entire protocol dialogue between the two servers. Typically this dialogue will include protocol messages in which, among other things, the destination server identifies itself, grants permission to upload a message for a named recipient, and acknowledges that the message was received. RPost will save the record of this transaction in such way that it may be later retrieved and included in or attached to the RPost Delivery Receipt for this message.

For various reasons RPost may not be able to achieve an SMTP connection with an MTA of a recipient or it may achieve such a connection but be denied permission to transmit the message by the recipient. In that case, if the internet DNS lookup reveals that the destination address is served by multiple MTAs, the RPost server 14 will attempt to deliver its message to each of these in turn. RPost will continue to attempt to deliver to an appropriate MTA as often as system resources permit. If, after a length of time, RPost cannot deliver the message to an address, it will mark the status of this recipient of this message as "UNDELIVERABLE" and stop attempting to send this message to this destination address.

When the RPost server 14 succeeds in transmitting a message to a destination Server that explicitly supports ESMTP DSN, RPost will record the status of this recipient for this message as "DELIVERED-AND-WAITING-FOR-DSN".

When the RPost server 14 succeeds in transmitting a message to the destination Server via a connection that does not explicitly support ESMTP DSN, RPost will record the status of this recipient for this message as "DELIVERED."

I.3. Postprocessing

DSN Processing

MTA DSNs will be returned to the RPost server 14 addressed to fictitious addresses in its proprietary domain (e.g. "RPost.com"), these addresses having been constructed as described above. The RPost server 14 will scan all inbound mail addressed to the domain and detect DSN messages by their identifying substring (e.g. "rcpt"). By parsing these addresses in the manner described above, the system can identify the message and the recipient that has prompted the DSN notification.

There is no standard format for DSN messages; neither is there any standard lexicon in which they report their results. To evaluate a received DSN the system should look in the subject line and the body of DSN messages for words and phrases that express the DSN's meaning. For example, such phrases as "successful delivery" or "delivered to mailbox" or "was delivered" normally signal that the message the DSN concerns was deposited to the mailbox of the destination. When it detects such phrases the System will change the Delivery Status of this destination of the message to "DELIVERED TO MAILBOX".

Phrases such as "could not be delivered", "fatal error", "failure" and "unsuccessful" typically signal a DSN that reports a failure by the MTA to deliver the message to the destination. When it detects phrases such as these in the DSN, the system will change the record of the recipient's Delivery Status to "FAILED".

Though the system always delivers mail to a proprietary MTA for the destination's domain, these MTAs will sometimes relay the message to a different server (as may be the case, for example, if the receiving MTA sends mail behind a firewall). In this case the DSN will contain such phrases as "relayed" or "relayed onward". In such cases the system will change the recipient's Delivery Status to "RELAYED".

Having evaluated the DSN and updated the recipient's Delivery Status accordingly, the system will save the DSN and any attachments it may contain in such a way that this message(s) may be included in and/or attached to an RPost Delivery Receipt.

Message Management

From time to time the system will scan each sent message and examine the status of each destination of that message in order to determine if the system has completed processing of that destination's delivery. The criteria for completion depend upon the destination's Delivery Status:

DELIVERED: This status indicates that a copy of the message for this recipient has been delivered to an MTA that does not support ESMTP DSN. Such an MTA may nevertheless send a form of Delivery Status Notification in the event that the message could not be delivered to the Mailbox of the addressee (as might happen, for example, if the destination address does not correspond to a valid account within the domain). Accordingly, the system will not treat the delivery for such a recipient as completed until a period of time has elapsed since the delivery to the recipient MTA. This time period--typically two to twenty-four hours--represents an estimate of the maximum time required for a majority of servers to return a notification of a failure to deliver and it may be adjusted if the specific destination domain is remote or known to be prompt or tardy in producing such notifications.

RELAYED: This status signifies that a DSN has been received that indicates that the recipient MTA has forwarded the message to another MTA that does not support ESMTP DSN. In this case it is nevertheless possible that the MTA to which the message has been delivered will send a notification of failure to deliver in due course. Accordingly recipients with this status are treated as complete under the same conditions as recipients with the status DELIVERED.

DELIVERED-AND-WAITING-FOR-DSN: This status indicates that the recipient's MTA supports ESMTP DSN and that a DSN has been solicited but not yet received. It may sometimes happen that although an MTA identifies itself as supporting this service it will nevertheless not provide DSNs even in the event of successful delivery. Accordingly, the system will regard deliveries to a destination with this status as completed even if no DSN is received after an interval of time. This interval--typically six to twenty-four hours--represents an estimate of the maximum time typically required for a compliant MTA to return a DSN.

DELIVERED-TO-MAILBOX: This status indicates that a DSN indicating successful delivery has been received for this recipient and hence the delivery of the message to this destination is completed.

FAILED, UNDELIVERABLE: Deliveries to recipients with this status are always treated as complete.

When the system finds that delivery to all recipients of a message has been completed the system will construct a Delivery Receipt for the message.

Creation of Delivery Receipts

Delivery receipts are e-mails sent to the original sender of the made-of-record message. The receipt 20 may contain:

1. an identifier for administrative purposes. This identifier may be or may include reference to the sender's ID and/or the value of the Internet Message-ID of the sender's message as received by the system;
2. the date and time at which the receipt was generated;
3. the quoted body of the original message together with the e-mail addresses of its intended recipients;
4. the date and time at which the RPost server received the message;
5. a table for each destination listing:

(i) the time at which the recipient's MTA received the message and/or the time at which the system received a DSN report from the recipient's MTA;

(ii) a Delivery Status of the message for that destination. The Delivery Status quoted in a Delivery Receipt is based upon the system's internal record of the destination's Delivery Status. They may be transcribed as follows:

- Deliveries to destinations whose status is FAILED or UNDELIVER ABLE will be recorded in the receipt as "failed".
- Deliveries to destinations whose status is DELIVERED or DELIVERED-AND-WAITING-FOR DSN will be recorded in the receipt as "delivered to mail server".
- Deliveries to recipients whose status is DELIVERED-TO-MAILBOX will be recorded in the receipt as "delivered to mail box".

The purpose of these reports is to accurately apprise the reader of the form of verification of delivery the system has been able to achieve.

6. a list of the original attachments of the e-mail together with the separate message digests of those attachments;

7. copies of the attachments to the original message, each original attachment being attached as an attachment to the receipt;

8. transcripts, summaries, or abstractions of the transcripts of all of the SMTP dialogs involved in the delivery of the message to each destination;

9. quotations from the bodies and the attachments of all received DSN reports including whatever details of

delivery or disposition of the message that they might reveal; and

10. any files that were returned to the system as attachments to DSN reports.

All of these separate elements of the receipt may have their own message digests or digital signatures included within the receipt. Additionally, the receipt may include a single overall encrypted message digest or digital signature computed and appended as part of the receipt, thus providing a single message authentication code which could be used to authenticate all of the information contained within the receipt. Since the receipt itself and SMTP dialogs and DSN reports within the receipt contain time-stamps, the receipt includes a non-forgeable record of the message recipient(s), the message content, and the time(s) and route(s) of delivery.

MUA Notification Processing

MUA Notifications could be collected and incorporated within RPost Delivery receipts in the same manner as MTA DSNs. However, MTA notifications are typically issued by receiving MTAs within a few hours of delivery whereas MUA Notifications will not be generated, if ever, until the recipient opens his MUA e-mail client and takes some action with respect to the received mail. For this reason, in this embodiment of the invention MUA notifications are collected separately from MTA notifications and reported in "RPost Reading Receipts" separate from RPost Delivery Receipts.

MUA notifications elicited by message headers constructed in the manner described above will be returned to a common RPost address (e.g. "readreceipts@RPost.com") and each notification will contain-- in the name field of its address-- the address of the original sender of this message. Because this is the only information required to generate an RPost reading receipt in the manner described below, the system can deal with MUA notices whenever these notices

may arrive and without any need to have stored any information about the original message in its databanks.

MUA notices may report, among other things, that a message has been read by a recipient, that a message has been displayed on the recipient's terminal (whether or not read), that a message has been deleted without having been opened. There is no protocol-governed standard for the content or format of MUA messages. The system could be configured so as to examine the text of MUAs to interpret their reports in the same fashion as the system uses for MTA DSNs. However, in the current embodiment of the invention, MUAs are not evaluated or interpreted by the RPost server 14 but are, instead, passed on to the sender for his own evaluation in a form that can be authenticated by RPost. To accomplish this the system will create an e-mail message styled as an "RPost Reading Notice" which may include, among other items:

1. subject line of the received MUA notice;
2. the body of the received MUA notice quoted as the body of the Reading Notice;
3. the received MUA notice included as an attachment;
4. any attachment(s) to the received MUA notice included as an attachment(s).
5. message digests of the received MUA notice and of any attachment(s) to that notice;
6. a date and time stamp;
7. an encrypted hash of at least items 5 and 6 providing an authenticatible date stamped digital signature for the document and all of its contents.

Receipt Disposition

In the case of the current embodiment of the invention, both RPost delivery receipts and Reading Notices are sent to the original sender of the made-of-record message. Since these receipts are digitally signed with an encrypted hash, RPost

can authenticate the information contained in these messages any time they are presented to RPost for this purpose, in the manner described below. This means that once it has transmitted a copy of the receipt to its sender (with instructions to the sender to retain the receipt for his records), RPost has no further need to retain any data concerning the message or its delivery and may expunge all such records from its system. Thus, RPost need not keep any copy of the original message or the receipt. This economy of archival memory gives the present invention an advantage over various prior art message authentication systems that required large amounts of data storage at the service provider side.

In this case the burden of retaining receipt data falls on the original sender of the message. Alternatively or additionally, third party verifier RPost may, perhaps for an additional fee, store a permanent copy of the receipt or of some or all receipt data. The receipt or part(s) thereof may be kept on any suitable archival storage devices including magnetic tape, CD ROM, or other storage device types. Additionally or alternatively, RPost may return receipts or parts thereof to a storage system devoted to this purpose within the control of the sender or the sender's organization.

As described above, RPost receipt information includes all of the data from the original sender's message and its attachments. There are circumstances in which users of the system might not wish to undertake the burden of retaining receipts in their records (e.g., out of fear of accidental data loss) but might also not wish to have the contents of their message in the hands of the RPost third party. Accordingly RPost might discard the contents of messages but store in its database only such information (e.g. sender, date of composition, message digests, destinations and Delivery Statuses) as might be provided by RPost to authenticate and verify the delivery of a message when presented with a copy of the message retained by the sender.

Verification

In the event that the originator of a message requires evidence at a later date that an e-mail was sent, delivered, and/or read, the originator presents the receipt(s) for the message to the operators of the system.

For example, in order to prove that a particular message was sent from sender 10 to recipient 18, sender 10 sends to RPost a copy of receipt 20 with a request to verify the information contained within the receipt. This could be done by sending the receipt to a predefined mailbox at RPost, e.g., verify@RPost.com. RPost then determines whether or not the receipt is a valid receipt. A receipt is a valid receipt if the digital signature matches the remainder of the receipt, and the message digests match the corresponding respective portions of the original message. Specifically, RPost performs the hash function on the various portions of the message including the message body, the attachments, and the overall message including the SMTP dialog and DSN reports, to produce one or more message digests corresponding to the purported message copy. RPost compares the message digests in the purported copy, including the overall message digest, with the message digests which RPost has computed from the purported message copy. The overall message digest can be compared by either decrypting the overall message digest received as the digital signature in the purported receipt, or by encrypting the overall message digest which was calculated from the purported message copy. If the message digests including the digital signature match, then the receipt is an authentic RPost-generated receipt. Assuming that a good hash function was used and that the keys used in the cryptographic hash function and the digital signature encryption algorithm have not been divulged to others, it is virtually impossible that the receipt has been "forged" by the person presenting the receipt. That is, the receipt must have been a receipt that was generated by RPost, and therefore the message contained in the receipt, the to/from information, the date and time of delivery, the fact of successful delivery, the route by which the message traveled, and any DSN information contained within the receipt, must be a true copy of that

information and is accurate. RPost can then provide authentication, verification, and confirmation of the information contained within the receipt. This confirmation can take the form of an e-mail confirmation, affidavit testimony from RPost employees familiar with the methods used by RPost, live sworn testimony in depositions and in court, and other forms of testimony. RPost can charge sender 10, recipient 18, or any other entity, fees for the various respective confirmation services. RPost can also provide testimony or other confirmation with regard to the non-authenticity of a purported receipt. Testimony may be provided in accordance with Federal Rules of Evidence 901(9), 901(10), 803(6), 803(7), 1001-1004, 1006, 702-706, corresponding state rules of evidence, and other applicable rules.

In sum, the system provides reliable evidence based on the testimony of a disinterested third party that a particular message having a particular content was sent, when it was sent, who sent it, who received it, when it was opened for reading, and when it was deleted. This evidence can be presented any time a dispute arises regarding the content and delivery of messages, as for example in contract formation, the timing of stock buy or sell orders, and many other applications. The operators of the system can attest to the accuracy of the information contained in the receipt itself without the need for the operators to preserve any record or copy of the information contained in the receipt.

A significant advantage of the system is that it can be used by existing MUAs without any change thereto. Because all the computation, encryption, ESMTP interrogation and dialog, DSN report collection, and receipt compilation, are performed by the third party RPost server 14, none of these functions need to be implemented within any of the user's equipment. Thus, users can take advantage of the system quickly and easily.

In the embodiment of the invention described above, the RPost server 14 makes of record the delivery of all messages passing through it. Alternatively, an RPost server 14 might make of record only those messages having certain destinations (e.g. external to an organization) or from certain senders (e.g. a customer relations group). Alternatively or additionally, the RPost server 14 might

make of record only those messages that had distinguishing characters or strings in the subject or body of the message. For example, the server might make of record only messages that the sender had included "(Make of Record)" or "(MR)" in the subject of the message. All other messages might be delivered by the RPost server 14 or some other server function as an ordinary internet MTA.

In this embodiment, RPost can raise revenue in a variety of ways. For instance: RPost can charge message sender 10 or her organization a fee on a per-message basis, on a per-kilobyte basis, on a flat fee periodic basis such as monthly, or on a combination of the above. RPost can also charge fees for authenticating and verifying a receipt, with a schedule of charges depending on whether the verification sought is a simple return e-mail, a written affidavit or declaration, sworn fact testimony in deposition or in court, or sworn expert testimony in deposition or in court. If the users opt to have RPost retain copies of the receipts, RPost can charge per item and /or per-kilobyte per month storage fees.

FLOW DIAGRAM FOR MAKING OF RECORD AN OUTGOING MESSAGE

FIGS. 2A-2G constitute a flow chart showing an exemplary operation of the first embodiment of the system. Modifying this flow chart to apply to other embodiments is within the skill of one familiar with software and e-mail protocols.

FIG 3A, Pre-processing, illustrates the steps taken with a message before it will be transmitted by the Making of Record Server (the System).

To make of record an e-mail message, in step 201 an originator/sender/user creates an e-mail message using any internet Mail User Agent (MUA). Possible MUAs include: (1) client side e-mail programs; (2) server based e-mail programs; (3) web based e-mail services; and (4) HTML forms submitted through web pages. The message may contain attached files as described in the Requests for Comments (RFCs) 822, 2046, and 2047, which are hereby incorporated by reference. RFCs are a series of notes regarding the Internet that discuss many aspects of computer

communication, focusing on networking protocols, procedures, programs, and concepts.

In this embodiment, the system functions as the sender's outgoing mail server and hence the sender's message will be directly transferred to the RPost server by the sender's MUA (step 202).

In step 203, the system creates a copy of the original message to be stored for later processing.

In step 204, the system creates a record in a database which may include such information as: the time at which the message was received by the server, the names and size(s) of the file attachment(s) of the message, the name (if known) of each destination of the message; the internet address of each destination; the time at which the message was delivered to the destination's MTA (initially this value is null) and a unit which records the Delivery Status of each destination.

In step 205, the Delivery Status of each destination is set to "UNSENT".

In step 206, the system generates and stores a message digest or digital fingerprint generated from the message body.

In step 207, the system generates and stores a hash or message digest for each attachment included in the message.

In step 208, the system may create a modified copy of the original message. In this second copy (step 209), the original subject line of the message may be amended to indicate that this copy is made of record (e.g. by pre-pending "Made of Record").

In step 210, a notice that the message is made of record by the system together with links to the system's Word Wide Web site may be appended to the body of the message.

In step 211, the e-mail headers may be added requesting reading notification in a variety of header formats recognized by various MUAs. The requests for notification direct the return notification to an address associated with the system: for example, "readreceipt@RPost.com". These headers will also include the

address of the original sender of the message in the name field of the address to which the MUA notification should be sent.

Preprocessing having been completed, the system will now transmit a copy of the message to each of its destinations as illustrated in FIG 2B.

Fig 2B illustrates the steps provided to transmit a message made of record. As step 220 indicates, the process provides a separate transmission for each recipient of the message.

In step 221, the system changes the header field of its working copy of the message to show the message as being "FROM:" a sender whose name is the original sender of the message but whose address is an "RPost.com" address constructed from:

a) a string used to identify returning MTA notifications (e.g. "RCPT");

b) a string which uniquely identifies the message being sent;

c) a tag which uniquely identifies the destination this copy of the message is being sent to.

In step 222, using the domain name of the destination currently being sent to, the system does a Domain Name Server Mail exchange lookup to find the address of the MTA(s) responsible for collecting mail for addresses in this domain.

In step 223, the system attempts to make a direct telnet connection to the MTA of the destination. If the connection fails, the system will try to make the connection again. Provided that the system has not exceed a maximum number of retries (227) for this destination, the system will try to remake the connection perhaps using another MX server for the destination's domain (228).

If, after a maximum number of retries, the system cannot connect to an MTA for this destination, the system will, as in step 226, record this destination's Delivery Status as "UNDELIVERABLE" and cease attempting to deliver this message to this destination.

On connecting to the destination's MTA, the system will begin making a record of its (E)SMTP dialog with the MTA (225).

In step 229, the system attempts to initiate an Extended SMTP (ESMTP) exchange with the destination MTA by issuing an "EHLO" greeting.

If the destination's MTS supports ESMTP, the system will then (230) determine if the destination MTA supports the SMTP function VERIFY. If the MTA supports VERIFY, the system will attempt to determine if the destination address is a valid address within the domain (231).

If the address is not valid, then, as in step 232, the system will record the Delivery Status of this destination as "FAILURE" and will cease attempting to deliver this message to this destination.

If the address is valid or if the ESMTP server does not support VERIFY, the system will then (233) determine if the receiving MTA supports the ESMTP service DSN (Delivery Status Notification).

If the MTA does support ESMTP DSN, the system will transmit the message with ESMTP requests to notify the nominal sender of the message of delivery success or failure (234). Having transmitted the message, the system will record the Delivery Status of this destination as "DELIVERED-AND-WAITING-FOR-DSN" (235).

If the receiving MTA does not support Extended SMTP, the system will transmit the message using SMTP (236) and record the destination's status as "DELIVERED" (237).

Having delivered the message, the system will then store the (E)SMTP dialog, recording the delivery in a manner in which it can later be recovered (238) and attempt to send the message to another destination.

Having transmitted a message to its destination(s), the system must perform several functions in order to gather information about the message's disposition. Fig. 2C illustrates the process by which the system processes MTA Notifications returned by recipient MTAs.

Because of the format used in the headers of sent messages illustrated in Fig 2B step 221, MTA message notifications will be delivered to a fictional local address at the server. The system will be able to detect these notifications by a

string (e.g. "rcpt") embedded in their addresses (241). By parsing the address, as illustrated in 242, the system can determine which message to which destination prompted the received notification.

In step 243, the system scans the subject line and the body of received MTAs for phrases that indicate whether the MTA is reporting a successful delivery, a failed delivery, or that the message has been relayed to another server.

In the event that the process at step 243 reveals that the notification is reporting a successful delivery, the system will, as illustrated in step 245, change the Delivery Status of the relevant destination of the relevant message to "DELIVERED-TO-MAILBOX".

If the system determines that the MTA notice is reporting a delivery failure, the system will (247) change the Delivery Status of the relevant destination of the relevant message to "FAILURE".

In the event that the system determines that the MTA notification indicates that the message was relayed to another server, the system will, as illustrated in step 249, change the Delivery Status of the relevant destination of the relevant message to "RELAYED".

Having processed the MTA Notification, the system will save this message and all of its attachments in such manner that they may be later recalled and used in construction of a receipt for this destination (250).

From time to time, as illustrated in Fig. 2D, the system will examine the status of each message to determine if the system has recovered all of the MTA notifications it is likely to receive for each destination of message and may hence proceed to construct a receipt for the message.

The system will examine the Delivery Status of each destination of the message.

If any destination has the Delivery Status "UNSENT", then the processing of the message is not complete. (252).

If the Delivery Status of a destination is "DELIVERED-AND-WAITING-FOR-DSN", then the system will not regard the processing for this destination as

complete unless, as is illustrated in step 254, the time since delivery of the message has exceeded the system's waiting period (e.g. 24 hrs.).

If the Delivery Status of a destination is "DELIVERED", (257) then the system will regard the processing of this destination as complete provided (258) that a period of time has elapsed which the operators of the system treat as sufficient to have received notice of delivery failure from the destination's MTA. (e.g. 2 hours).

Any other destination Delivery Status (e.g. "FAILED", "UNDELIVERABLE", "DELIVERED TO MAILBOX") is treated as having completed processing.

If processing of any of a message's destinations is not complete the system takes no action but moves to consider other messages in the system (step 255).

However, as illustrated in step 259, if processing of every destination of the message is complete, the system will generate a Delivery Receipt for the message.

As illustrated by way of example in FIG. 2E, the receipt may include:

An identifier for administrative purposes as in block 271. This identifier may be, or may include, reference to the sender's ID and/or the value of the Internet Message-ID of the sender's message as received by the system.

As in block 272, the quoted body of the original message 12 together with the e-mail addresses of its intended recipients may also be included.

As in block 273, a table for each recipient listing may include:

a) the time at which the recipient's MTA received the message and/or the time at which the system received DSN from the recipient's MTA;

b) the Delivery Status report of the message for that destination, i.e., "Delivered to Mail Server", "Delivered to Mail Box", Relayed", "Delivery Failure", or "Undeliverable".

As in block 274, a list of the original attachments of the e-mail together with their separate hash values or message digests.

As in block 275, transcripts or abstractions of the transcripts of all of the SMTP dialogs involved in the delivery of the message to each destination.

As in block 276, quotations from the bodies and the attachments of all received DSNs including whatever details of delivery or disposition of the message that they might reveal.

As in block 277, the system may attach to the receipt copies of all of the attachments of the original message, and, as in block 278, the system may additionally attach files returned to the system as attachments to DSNs.

In step 279, having generated the text of the receipt so far, the system then generates a first hash for the e-mail message and a second hash(es) for any attachments to the body of the receipt and calculates a digital signature for each of the hash(es) using an encryption key known only to the operators of the system. Encryption can employ, for example, the Data Encryption Standard described in Federal Information Processing Standard Publication 4-2 (FIPS PUB 46-2), the Data Encryption Standard, National Institute of Standards and Technology, which is hereby incorporated by reference. Alternatively, other known or new methods of encrypting the hash value may be used.

In step 280, the encrypted hash is then appended to the end of the message as the "document digital signature".

In step 281, the receipt 20, now being complete, may be sent by e-mail to the sender with the advice that it be kept for the sender's records. In step 282, the system may now delete all copies of the original message, attachments, and DSNs. Alternatively, rather than sending the receipt to the sender, the system may store the receipt, or both the sender and system can store the receipt.

Because MUA notifications are returned only at the option of the recipient and only when the recipient takes some action with respect to the received message, embodiments of the system may choose to treat these return messages differently than MTA notifications.

FIG. 2F illustrates how these MUA notifications may be treated by the system. MUA notifications are solicited by the system by including various headers in outgoing messages in the manner of Fig 2A, step 211. These headers direct compliant MUAs to send notifications to a system address (e.g.

"readreciept@RPost.com") set aside for this purpose. The headers also use, in the "name" field of this return address, the e-mail address of the original sender of the message. Accordingly, in step 286, when MUA notifications are returned to readreceipt@RPost.com the system can, by examining the address of the notification, determine the address to which a reading notification should be sent.

Upon the arrival of a read receipt from a destination's MUA, the system, in step 287, generates a reading receipt that contains the subject of the received MUA notification as its subject and incorporates, in its message body, the body of the received MUA Notification.

In step 288, the system attaches to the receipt any files that may accompany the MUA's receipt (typically these may include details of delivery or disposition and identifying references to the original e-mail.)

In step 289, the system generates a hash for any files attached to the receipt and records this hash in the body of the receipt.

In step 290, the system generates a hash for the body of the receipt and its attachments, encrypts this hash, and appends the result to the message as a "document digital signature".

In step 291, the system sends the resulting receipt to the sender of the message. In step 292, having sent this receipt, the system may delete all internal records of the transaction.

III. RPOST AS SECONDARY MAIL SERVER EMBODIMENT

FIG. 3 is a system diagram of a second embodiment of the present invention wherein the RPost server 14 does not serve as the user's primary MTA but rather works in collaboration with another MTA. In this embodiment, the sender may elect to make of record a particular outgoing message by including some form of flag in an outgoing message, message subject, or message addresses. For example, if and only if a sender includes the symbol "(Made of Record)" or '(MR)" in the subject of the message the sender's MTA will direct the message to be transmitted through the RPost server 14 to generate a receipt.

In this embodiment the operators of RPost receive revenues from the operator of the sender's MTA per message and/or per kilobyte transmitted.

IV. CC TO RPOST EMBODIMENT

FIG. 4 is a system diagram of a third embodiment in which a carbon copy ("cc") is sent to the RPost server 14. In this embodiment, the user or message sender 10 can use a standard MUA and standard MTA without modification. Message sender 10 composes the e-mail having a message body and any number of attachments, and addresses it to message recipient 18, along with any carbon copies (cc's) and blind carbon copies (bcc's) as desired. Additionally, message sender 10 addresses a cc to RPost. RPost server 14 tags the message as before, and sends the tagged message including attachments to the recipient's MTA 16 and any designated cc's. On receipt of such a copy RPost server 14 may send an e-mail acknowledging receipt of the copy.

Recipient 18 and other destinations of the message will now receive two versions of the same message: a first version of the message received directly from sender 10, and a second and tagged version which was forwarded from RPost. Once RPost receives confirmation from recipient MTA 16 that the tagged version of the message was successfully received by recipient MTA 16, RPost server 14 composes message receipt 20 as before and sends the receipt to sender 10 for his records.

Revenue can be generated by establishing accounts for message originating domains or individual message senders, and charging the users' accounts per message, per kilobyte, per month, or a combination of these. Revenue can also be generated for the placement of advertisements on receipts and from authentication and verification services as previously described.

V. WEBSITE EMBODIMENT

FIG. 5 is a system diagram of a fourth embodiment. In this embodiment, RPost server 14 is associated with a website at which a user composes messages. Message sender 10 visits the RPost Website and composes his message at the

website by entering the desired "to", "cc", "bcc", "Subject", and message text information. Attachments can be added by using features available on standard browsers and web servers. In this embodiment, the sender additionally provides an address to which the made-of-record receipt may be sent. RPost server 14 sends the receipt to sender 10 through sender's MTA.

Revenue can be generated by establishing accounts for message originating domains or individual message senders, and charging the users' accounts per message, per kilobyte, per month, or a combination of these. Revenue can also be generated for the placement of advertisements on receipts and from authentication and verification services as previously described.

VI. WEB BASED MUA EMBODIMENT

FIG. 6 is a system diagram of a fifth embodiment. In this embodiment, the RPost server 14 is associated with a web based Mail User Agent. In addition to allowing users to compose mail through a web browser, such a MUA provides subscribers with browser viewable mailboxes that display messages stored on the Web server site. Subscribers to such a service gain access to mail accounts with user names and passwords. In this embodiment, message sender 10 visits the RPost Website, accesses a Web Based e-mail account by entering a user name and password, and composes his message which is transported for delivery to RPost server 14. Receipts generated by the RPost server 14 are returned to a web based mailbox associated with the subscriber's account.

In addition to the revenue sources available in other embodiments, in this embodiment the operators can charge storage fees for receipts held in the web based mailbox.

In all of these embodiments, the receipt may serve as evidence that:

(1) the originator sent an e-mail message;

(2) the message was sent at a certain time;

(3) the e-mail was addressed to certain recipient(s);

(4) the e-mail was delivered to the e-mail mailbox of each of its intended recipient(s);

(5) the e-mail was delivered at a certain time;

(6) the e-mail was delivered by a certain network route; and

(7) the e-mail message and its attachments had the specific content recorded in the receipt.

Furthermore, the system under certain circumstances generates a separate receipt, which may be used as evidence that:

(1) the e-mail was inspected through the recipient's Mail User Agent (MUA); and

(2) the recipient took certain actions in response to the message, e.g., read or deleted the e-mail, at a particular time.

As with the other embodiments, this embodiment produces documented evidence which may be attested to and verified by the disinterested third party operators of the system concerning the delivery and integrity of an electronic message. In other words, the system can be thought of as transforming the e-mail to a made-of-record e-mail that can later be used to prove that a particular e-mail message was sent, that it was successfully delivered, and when and how.

Should a dispute ever arise, the dispute can be resolved through the receipt generated by the system because the receipt is so encoded that the operators of the system can determine the authenticity of the receipt as the product of the system. Thereafter, operators of the system can attest to the accuracy of the information contained in an authentic receipt, relying only on information contained in the receipt itself and without the need for the operators to preserve any record or copy of the information contained in the receipt.

In addition to these benefits, the receipts generated by the system may also be useful as evidence of the existence and authorship of such materials as might be transmitted through the system. Moreover, the system is easy to use, as the system can be used from any internet e-mail client program/MUA, so that there is no additional software required.

FLOW DIAGRAM FOR VALIDATING A RECEIPT

FIG. 7 is a flow diagram illustrating an exemplary method for validating a receipt. In the event that the sender of a message should require evidence that an e-mail was sent and delivered (and/or read) the sender presents the receipt(s) corresponding to the message to the operators of the system in step 700. The operators of the system then, in step 702, detach and decrypt the document digital signature appended to the receipt. In step 703, the operators generate a hash of the balance of the document, including attachments.

In step 704, if the current hash value does not match the decrypted hash value, then the system generates a report stating that RPost cannot authenticate the receipt as an accurate record of the delivery or the contents of the message described in the receipt.

If the decrypted hash is equivalent to the current hash of the message, the system can, as in step 706, warrant that the information contained in the body of the message is unchanged since the receipt passed through the system. If the original message contained no attachments, the system may now generate a report that warrants that the receipt is an accurate record of the message's contents and its delivery by the RPost server.

If the receipt reports that the original message contained attachments, then the receipt will also record the name and hash value of each attachment. In generating the receipt all attachments of the original message are attached unchanged to the receipt. Accordingly, the system will, for each such attached file, generate a hash of the attached file (708) and compare it to the hash value recorded in the body of the receipt (709).

If the calculated hash value of a file matches the value included in the receipt, the system can warrant that the file attached to the receipt is identical to that attached to the message as originally delivered. If the hashes do not match, then the system will report that it cannot warrant that the file attached to the receipt is identical to the file attached to the original message.

Having performed this calculation for each file attached to the original message, the system prepares a report which reports on the authenticity of the receipt and each of its attached files (710) or which reports the failure of validation (712).

Having completed its evaluation, the system will then append a copy of the receipt and all of its attachments to the report it has generated and send it via e-mail to the return address of the user who submitted the report for validation.

Registering Inbound E-mails

FIG. 8 is a system diagram illustrating another embodiment of the invention in which incoming e-mails are made of record. In this embodiment, a message sender 60 sends an e-mail message 70. Sender's MTA 62 sends message 70 onto the internet as usual. However, in this embodiment RPost contracts with service subscriber/recipient 68 to make incoming e-mails of record. According to the agreement, RPost is designated with Network Solutions, Inc. (NSI) or other domain name authority as the mail recipient (MX server) for recipient 68. This causes the Domain Name Service (DNS) request performed by the sender's MTA 62 to return the IP address of RPost as the IP address for the recipient, which in turn causes sender's MTA 62 to send the e-mail message to RPost server 64. RPost server 64 acts as an SMTP, POP, POP3 or IMAP MTA (collectively, "POP mail server") for recipient 68. SMTP, POP and IMAP MTAs are governed by RFC 821, the SMTP protocol, RFC 1939 Post Office Protocol - Version 3 (which obsoleted RFC1725), and RFC 2060 IMAP (Internet Message Access Protocol) Version 4 rev 1 (which obsoleted RFC1730), which are hereby incorporated by reference.

RPost server 64 prepares a made-of-record version 74 of the original message 70, and places this made-of-record version 74 into recipient 68's in-box instead of, or in addition to, the original message 70. The made-of-record version may have all of the verification and informational features and options discussed earlier in connection with e-mail receipts. This information can include, but is not limited to: individual message digests for each of the message body and text, the

to/from information, other header information, each attachment, an overall message digest and digital signature and message routing information and tags. Made-of-record version 74 of message 70 as shown in FIG. 6 includes the message body including the header information, an attachment, separate message digests for each, and a digital signature or encrypted message digest. The hash functions and encryption are performed using private phrases or private keys known only to the operators of the system. The made-of-record version 74 is made available to recipient 68 for inspection or downloading through the recipient's MUA.

RPost server 64 can optionally send a confirming e-mail 72 to message sender 60. Confirmation message 72 can be a simple text message indicating that a message was received and made of record. Confirmation message 72 could also include a message such as, "Your e-mail message was received on March 24, 2000 at 2:05 p.m. The digital signature of the message was [128-bit digital signature]. For more information, visit our website at www.RPost.com." Alternatively, or additionally, confirmation message 72 could include all of the information contained in the made-of-record version 74.

Thus, the system may provide to message recipient 68 a receipt 74 or other verifiable confirmation that:

(1) the recipient received an e-mail message;

(2) the message was received at a certain time;

(3) the e-mail was addressed from a certain sender;

(4) the message purports to be delivered via a certain network route; and

(5) the e-mail message and its attachments had a specific content.

Accordingly, the system provides evidence, which may be attested to by the operators of the system, that particular electronic messages and documents were delivered to recipients having certain content and representing themselves as having come from certain senders.

FIG. 9 is a flow chart illustrating one example of making of record in-bound mail. In step 901, RPost server 64 receives a new e-mail message. In step 902, the system generates a hash/digital signature of the message's contents including the message's headers and attachments. Additionally, the system may generate a separate hash for each message attachment. In step 903, the system encrypts the hash(es) using an encryption key known only to the operators of the system. In step 904, the resulting encrypted hash(es) is then appended to the body of the message. Then, in step 905, the modified message may be made available for inspection or downloading through the recipient's MUA.

FIG. 10 is a flow chart of one example of validating a received made-of-record e-mail message. In step 1000, in the event that the recipient of a message should require evidence that an e-mail with a specific content was received at a particular time, the recipient can present a copy of the made-of-record version 74 (FIG. 8) of e-mail message 70 to the operators of the system for verification. To verify the message, in step 1001 the system detaches and decrypts the document digital signature appended to the message. In step 1002, the system generates a hash of the balance of the document, and one for each file attached to the message. In steps 1003 and 1004, the hashes are compared. If the document hash(es) matches the decrypted hash(es), then the message and its attachments have passed through the system and have not been altered since their delivery to the recipient.

Having determined that the e-mail is unaltered, the operators of the system can warrant that:

(1) the e-mail was received by the system at a certain time;

(2) the e-mail purported to arrive at the system via a certain internet route;

(3) the e-mail purported to be from a certain sender; and

(4) the e-mail and its attachments were delivered with the specific content they currently contain.

On the other hand, in step 1006, if the hash values do not match, then the operator cannot warrant that the e-mail is authentic, i.e., that the e-mail is an accurate version of an e-mail that was received by the system.

FIG. 11 illustrates how the invention may be used by a business which utilizes electronic tools (an "e-business"). E-business 30 can utilize the system to make of record all incoming and outgoing e-mail messages from its customers 34. In this case, the system includes Post Office Protocol (POP) server 36 and Simple Mail Transfer Protocol (SMTP) server 38. For example, the e-business 30 can set up its website to e-mail forms to customers, and to forward queries and complaints 40 from customers 34. The made-of-record queries, complaints, orders, offers to purchase, and other information 46 are sent to the e-business 30 by the system. Receipts are then provided to the customers 34 via SMPT server 38. This way there is no question regarding whether or not the customer sent the communication and what it contained. Moreover, the e-business can set up a web site 32 through the RPost server so that every communication with the customers can be made of record. In other words, through the web site form data orders 42 and automated responses 44 can be made of record through the system server; furthermore, any confirmation, collections notices, customer support, and special offers 48 sent by the e-business to customers 34 can be made of record and the confirmation sent to the customer to eliminate arguments about what was ordered, when, or by whom. If desired, identical receipts can be provided to both the customers 34 and to e-business 30. Alternatively, the functions of POP server 36 and SMTP server 38 may be combined in a single system server.

POP is a protocol used to retrieve e-mail from an e-mail server. Many e-mail applications (sometimes called e-mail clients) use the POP protocol, although some can use the newer Internet Message Access Protocol (IMAP). One version of POP, called POP2, requires SMTP to send messages. A newer version, POP3, can be used with or without SMTP. SMTP is a protocol for sending e-mail messages between servers. Many e-mail systems that send e-mail over the Internet use SMTP

to send messages from one server to another; the messages can then be retrieved with an e-mail client using either POP or IMAP. In addition, SMTP is generally used to send messages from a mail client to a mail server. E-mail servers may use a variety of protocols to communicate with the Internet. Commonly used protocols include SMTP, POP3 and IMAP4. Mail readers are at the opposite end of the server. Since mail servers receive messages via SMTP, e-mail readers send e-mail to a mail server using SMPT. Likewise, since mail servers send messages using POP3 and optionally IMAP4, mail readers receive messages from mail servers by using the POP3 or IMAP4 protocol.

Although the above generally describes a system and method of verifying that an e-mail was sent and/or received, the invention disclosed and claimed in WO/2002/011025 may apply to any electronic message that can be transmitted through an electronic message network or through any electronic gate. Electronic messages may include text, audio, video, graphics, data, and attachments of various file types. The methods and techniques taught herein can be programmed into servers and other computers, and computer programs implementing the invention can be written onto computer readable media including but not limited to CD ROMs, RAM, hard drives, and magnetic tape. E-mail made-of-record services according to the present invention can be bundled with internet service provider (ISP) services to provide a single provider ISP solution to corporate and other institutional clients. Implementing the above-described invention is within the skill of the ordinary practitioner of the software arts.

As previously indicated, Figures 1-11 show, and the specification describes, systems in which the server receives a message from a sender and transmits this message in a first path to a recipient or to a Mail Transport Agent (MTA) of the recipient. There are times when the sender may wish to have the server send the message to the recipient or to a Mail Transport Agent of the recipient or to the Mail Transport Agent for the recipient by a more traveled path or a less traveled route, or at least a different path, than the first path. To accomplish this, the sender marks a message form 1200 (Fig. 14) with a particular indication such as "(R)" in a

particular position such as the "subject" line of the message. This particular position is indicated at 1202 in the message form 1200 in Figure 14. The step of marking "(R)" in the "subject" line 1202 of the message is shown at 1206 in Figure 12.

The message with the "(R)" in the "subject" line is transmitted by the sender to the server 14 which constitutes the sender's Mail Transport Agent. This is indicated at 1208 in Figure 12. As indicated at 1210, the server scans the "subject" line to determine if there is an "(R)" in the line. If the answer is "No" (see 1211), the server transmits the message to the recipient or the recipient's Mail Transport Agent through the route shown in Figures 1-11 and indicated in Figure 12 as "the ordinary route" and discussed above in the specification. This is indicated at 1212 in Figure 12. If the answer is "Yes" (see 1213), the message is transmitted through a special network route as indicated at 1214 in Figure 14.

Figure 13 is identical in a number of respects to Figure 12. However, Figure 13 includes additional blocks to perform additional functions other than those shown in Figure 12. These include, but are not limited to, the following:

(1) The sender may wish that a copy of the message should be archived. This may be accomplished by adding a coding such as the number "1" after "(R)" in the "subject" line so that the coding is "R1".

(2) The sender may desire that a record of the transmission should be recorded by the server 14 constituting the sender's mail transport agent. This may be accomplished by providing a coding such as "(R2)" in the "subject" line of the message.

(3) The sender may desire that a record of the message transmission should be recorded in a data base. This may be accomplished by providing a coding such as "(R3)" in the "subject" line of the message.

(4) The sender may wish that a record of the message transmission should be recorded in a database with a special annotation or

additional reference. This may be accomplished by providing a coding such as "(R4)" in the "subject" line of the message.

Figure 13 provides a method where the server constituting the sender's Mail Transport Agent processes selected e-mail messages such as those specified in this paragraph.

Figure 13 is particularly limited to a coding "(xyz)" in the "subject" line of the message. In Figure 13, the sender is shown at 1300 as composing an electronic message including "(xyz)" in the "subject" line of the message. As indicated at 1210 in Figures 12 and 13, the server 14 constituting the mail transport agent scans the "subject" line in the outbound message. If the "subject" line in the message does not contain the code "(R)", the server transmits the message though the route shown in Figure 1-11 and discussed above (see 1212 in Figures 12 and 13). If the code "(R)" is detected by the server in the "subject" line of the message, the server transmits the message through the special network route as indicated at 1214 in Figures 12 and 13.

Figure 13 indicates at 1304 that the code "(xyz)" is stripped by the server from the "subject" line of the message. If the delimiter "xyz" is detected, a copy of the message is saved. This is indicated at 1308 in Figure 13. If the delimiter "xyz" is not identified, a copy of the message is not saved.

Although the present invention has thus been described in detail with regard to the preferred embodiments and drawings thereof, it should be apparent to those skilled in the art that various adaptations and modifications of the present invention may be accomplished without departing from the spirit and the scope of the invention. Accordingly, it is to be understood that the detailed description and the accompanying drawings as set forth hereinabove are not intended to limit the breadth of the present invention, which should be inferred only from the following claims and their appropriately construed legal equivalents.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method of transmitting a message from a sender to a recipient through a server displaced from the recipient, including the steps of:

receiving the message at the server from the sender, the message including an indication from the sender that the sender wishes to send the message to the recipient in a different manner special and individual to the recipient than the manner normally used by the server to the send the message to the recipient;

transmitting the message from the server to the recipient in the different manner special and individual to the recipient in accordance with the indication from the sender.

2. A method as set forth in claim 1 wherein

the indication received by the server from the recipient includes an identification under the control of the server, of the recipient and any transferring agents through whom the message has passed between the server and the recipient.

3. A method as set forth in claim 2, wherein

an encrypted hash of the message is also provided by the server to the sender as a plurality of digits in a unique sequence and is sent by the server to the sender with the message after the indication is received by the server from the recipient but before the message is authenticated by the server.

4. A method as set forth in claim 2 wherein

an encrypted hash of the message is provided by the server to the sender as a plurality of digits in a unique sequence and is sent by the server to the sender with the message after the indication is received by the server from the

recipient.

5. A method as set forth in claim 1 wherein

an additional indication is provided to the server with the message from the sender, the additional indication indicating that a high priority should be provided by the server to the sending of the message by the server tote recipient and wherein

the server provides the high priority in sending the message, in the manner special and individual to the recipient in accordance with the additional indication.

6. A method as set forth in claim 1 wherein

an additional indication is provided to the server with the message from the sender that the sending of the message by the server to the recipient in the manner special and unique to the recipient, should be recorded by the server and wherein

the server records the sending of the message to the recipient, in the manner special and unique to the recipient, in accordance with the additional indication.

7. A method of transmitting a message from a sender to a recipient through a server displaced from the recipient, including the steps at the server of:

receiving the message at the server from the sender,

receiving at the server, wit the message from the sender, an indication from the sender that the message is to be transmitted by the server in a manner special and individual to the recipient and different from the manner normally provided by the server in transmitting messages,

transmitting from the server to the recipient, in the manner special and

individual to the recipient and indicated by the sender to the server and different from the manner normally provided by the server in sending messages, the message and an identification and address of the server and an indication representing the identity of the sender,

receiving at the server from the recipient a handshaking and delivery history of the transmission of the message from the server to the recipient,

transmitting from the server to the sender, before any authentication of the message, information including the message and an encrypted hash of the message and the handshaking and delivery history of the message received by the server from the recipient and

transmitting from the sender to the server the information previously received by the sender from the server when the server requests to have the message authenticated.

8. A method as set forth in claim 7, including the steps of:

the indication from the sender to the server being a first indication,

receiving at the server from the sender, with the message from the sender, an indication, in addition to the first indication, from the sender of an additional function to be performed in the transmission of the message from the server to the recipient, and

providing the additional function in the transmission of the message from the server to the recipient in accordance with the additional indication provided by the sender to the server.

9. A method as set forth in claim 8, wherein

the message and an encrypted hash of the message are sent by the server to the sender after the server receives from the recipient the handshaking and the delivery history of the transmission of the message from the server to the recipient

but before the authentication of the message and wherein

the server does not retain the message and the encrypted hash after it sends the message and the encrypted hash to the sender and before the authentication of the message and wherein

the sender sends the message and the encrypted hash to the server for authentication of the message by the server after the server does not retain the message and the encrypted hash of the message.

10. A method as set forth in claim 8 wherein

the additional indication from the sender to the server provides for a recording of the transmission of the message and wherein

the transmission of the message is recorded in accordance with the additional indication from the sender to the server.

11. A method as set forth in claim 8 wherein

the additional indication from the sender to the server provides for an archiving of the message and

wherein the message is archived in accordance with the additional indication from the sender to the server.

12. A method as set forth in claim 8 wherein

the additional indication from the sender to the server provides for the message to be sent by the server to the recipient by a special route and wherein

the message is sent by the special route from the server to the recipient in accordance with the additional indication from the sender to the server.

14. A method as set forth in claim 8 wherein

the additional indication from the sender to the server provides for the

message to be specially handled by the server in the transmission of the message from the server to the recipient and wherein

the message is specially handled by the server in the transmission of the message from the server to the recipient in accordance with the additional indication from the sender to the server

15. A method as set forth in claim 8 wherein

the additional indication from the sender to the server provides for a transmission of the message with a high priority from the server to the recipient and wherein

the message is transmitted from the server to the recipient with the high priority in accordance with the additional indication from the sender to the server.

16. A method as set forth in claim 8 wherein

the server destroys the message and the encrypted hash of the message after the server transmits to the sender the message, the encrypted hash of the message and the handshaking and delivery history of the message but before it authenticates the message,

the handshaking and delivery history of the message having been provided by the recipient to the server before the server authenticates the message.

17. A method as set forth in claim 16 wherein

when the sender requests to authenticate the message after the message has been sent by the server to the recipient, the sender sends to the server the message and the encrypted hash of the message and wherein

the server operates upon the message and the encrypted hash of the message from the sender to authenticate the message.

18. A method as set forth in claim 8 wherein

the server requests a delivery status notification from the recipient relating to the message when it transmits the message to the recipient and wherein

the server receives the delivery status notification from the recipient when it requests the delivery status notification.

19. In a method of transmitting a message electronically to a recipient through a server displaced from the recipient, the steps at the server of:

receiving from the sender at the server the message and an encrypted hash of the message, the message including an indication added by the sender before the message is sent to the server that the message is to be handled by the server in a manner special and individual to the recipient and different from a normal handling of the message by the server for the recipient, and

handling the message at the server in the manner special and individual to the recipient, including transmitting the message to the recipient, in accordance with the indication from the sender to the server,

generating a hash constituting a synopsis of the message in coded form,

encrypting the hash with a particular encryption code to generate an encrypted hash of the message,

providing at the server, after the transmittal of the message to the recipient but before authentication of the message, the message, the encrypted hash of the message, the name of the sender, the identity and address of the server and the identity and address of the recipient, and

transmitting from the server to the sender for storage by the sender, before the authentication of the message, the message, the encrypted hash of the message, the name of the sender, the identity and address of the server and the identity and address of the recipient, and

thereafter transmitting to the server from the sender information including the information previously transmitted from the server to the sender, when the sender requests to have the message authenticated, the transmission occurring before any authentication of the message, and

thereafter processing the information transmitted to the server from the sender to authenticate the message.

20. In a method as set forth in claim 19, the step of:

transmitting at the server the encrypted hash of the message to the sender at the same time, and in the same manner, that the message is transmitted at the server to the sender.

21. In a method as set forth in claim 19 wherein

the message is processed by the server in a first path when the indication of the manner special and individual to the recipient and different from a normal handing of the message by the server is not provided by the sender to the server with the message and wherein

the message is processed by the server in a second path different from the first path when the indication of the manner special and individual to the recipient and different from the normal handling of the message by the server is provided by the sender to the server with the message.

22. In a method as set forth in claim 19, the steps of:

discarding the message and the encrypted hash of the message at the server after the message and the encrypted hash of the message has been transmitted from the server to the sender but before the authentication of the message by the server.

23. In a message as set forth in claim 19 wherein

the message is transmitted by the server in a first path to the recipient before the authentication of the message, when the indication of the manner special and individual to the recipient is not provided by the sender to the server with the message and wherein

the message is transmitted by the server to the recipient in a second path different from the first path when the indication of the manner special and individual to the recipient is provided by the sender to the server before the authentication of the message, and wherein

the message, the encrypted hash of the message, the name of the sender, the identity and address of the server and the identity and address of the recipient are stored at the server after the transmission of the message to the recipient, and wherein

the message, the encrypted hash of the message, the name of the sender, the identity and address of the server and the identity and address of the recipient are thereafter transmitted by the server to the sender for storage by the sender before any authentication of the message and wherein

the message and the encrypted hash of the message are thereafter discarded at the server before the authentication of the message and wherein

the message and the encrypted hash of the message are thereafter transmitted from the sender to the server when the sender requests to authenticate the message.

24. A method of transmitting a message from a sender to a recipient through a server displaced from the recipient, including the steps of:

providing the message from the sender at the server, and also

providing an indication at the server from the sender that the message from the sender

should be transmitted by the server to the recipient in a second route different from a first route over which messages from the server are normally sent;

providing at the server a verification of the message and the identity of the sender and the identity and address of the server;

transmitting the message from the server to the recipient through the second route in accordance with the indication provided to the server from the sender;

providing at the recipient an indication of the status of the reception at the recipient of the transmittal from the server to the recipient of the message and the identity of the sender and the identity and the address of the server; and

transmitting to the server from the recipient, in the individual one of the first and second routes indicated by the server to the recipient, information including the message and the identity and address of the recipient and the status of the reception of the message at the recipient and the identity of the sender and the identity and address of the server before any authentication of the message;

sending to the sender from the server, before any authentication of the message, the message and the verification of the message and the information received by the server from the recipient; and

thereafter sending the information including the message, and the verification of the message from the sender to the server before any authentication of the message by the server when the sender requests to have the message authenticated.

25. A method as set forth in claim 24 wherein

the verification constitutes an encrypted hash of the message and the encrypted hash of the message includes a hash of the message and an encryption of the hash and wherein

the message and the encrypted hash of the message and the identity of the sender and the identity and address of the server and the identity and the address of the recipient and the status at the recipient of the reception of the message are

transmitted by the server to the sender before any authentication of the message.

26. A method as set forth in claim 24 wherein

the sender provides at the server an additional indication of an additional function to be performed at the server and wherein

the server performs the additional function in accordance with the additional indication from the sender.

27. A method as set forth in claim 26 wherein

the additional indication at the server provides for the message to be specially handled in the transmission of the message from the server to the recipient and wherein

the message is specially handled in the transmission of the message from the server to the recipient in accordance with the additional indication at the server.

28. A method of transmitting a message from a sender to a recipient through a server displaced from the recipient, including the steps at the server of:

receiving at the server from the sender a message and an indication that the message should be sent by the server to the recipient through a second path different from a first path,

transmitting at the server to the recipient information including the message and an identity of the sender and an identity and address of the server through the second path different from the first path in accordance with the indication from the sender to the server,

receiving at the server from the recipient an indication of the identity of the sender and the identity and address of the server and the identity and address of the recipient and an indication of the status of the reception of the message at the recipient,

providing at the server a verification of the message and the identity of

the sender and the identity and the address of the server, and

transmitting to the sender from the server information including the message and the verification of the message and the information received by the server from the recipient relating to the message before any authentication of the message at the server, and

transmitting to the server from the sender the information including the message and the verification of the message and the information received by the server from the recipient relating to the message when the sender requests the message to be authenticated.

29. A method as set forth in claim 28 wherein

the verification of the message is an encrypted hash and wherein after the server transmits the message and the encrypted hash of the message to the sender but before the server authenticates the message and wherein

the sender thereafter sends the message and the encrypted hash to the server when the sender requests to have the message authenticated after the server has destroyed the message and the encrypted hash and wherein

the server produces hashes from the message and the encrypted hash and wherein

the server authenticates the message by comparing the hashes to determine if they are identical.

30. A method as set forth in claim 28 wherein

the server receives additional information from the sender relating to additional functions to be performed by the server on the message in the transmission of the message from the server to the recipient before the authentication of the message

and wherein

the server performs the additional functions on the message, in accordance with the additional information received by the server from the sender, in

the transmission of the message from the server to the recipient.

31. A method as set forth in claim 30 wherein

the indication received by the server from the sender constitutes a first coding of the message from the sender and wherein

the additional information received by the server from the sender of the additional functions to be performed by the server constitutes a second coding, added to the first coding, of the message from the sender.

32. A method set forth in claim 29 wherein

the server receives additional information from the sender relating to additional functions to be performed by the server on the message in the transmission of the message from the server to the recipient and wherein

the server performs the additional functions on the message, in accordance with the additional information received by the server from the sender, in the transmission of the message from the server to the recipient and wherein

the indication received by the server from the sender constitutes a first coding of the message from the sender and wherein

the additional information received by the server from the sender of the additional function to be performed by the server constitutes a second coding, added to the first coding, of the message from the sender.

33. A method as set forth in claim 32 wherein

the sender transmits the message and the encrypted hash of the message to the server when the sender requests to have the message authenticated and wherein

the server operates upon the message, and the encrypted hash of the message, transmitted from the sender, to have the message authenticated.

34. A method as set forth in claim 33 wherein

the server provides a first hash of the message and decrypts the encrypted hash to provide a second hash of the message and compares the first and second hashes to authenticate the message.

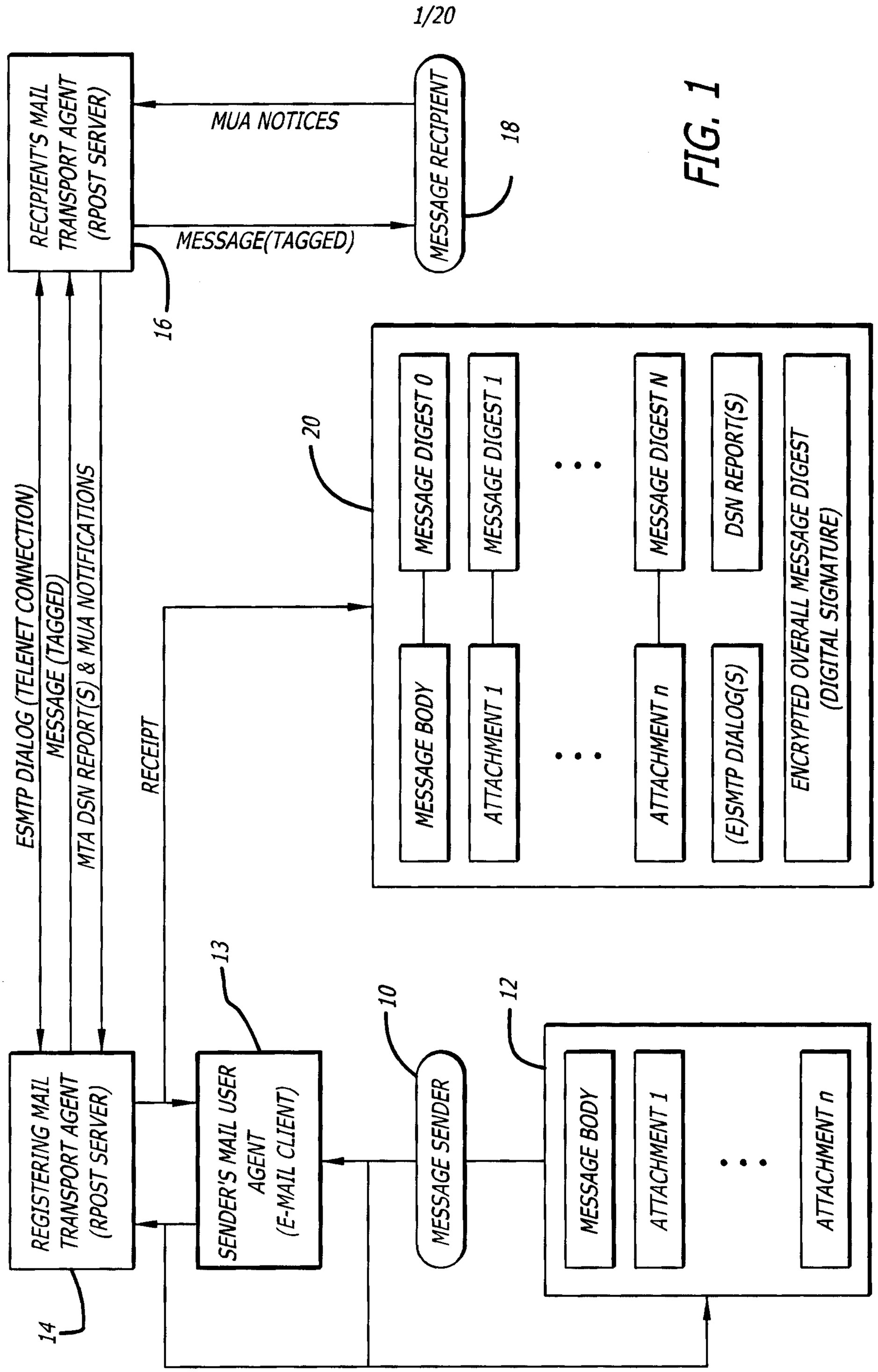

RECIPIENT'S MAIL TRANSPORT AGENT (RPOST SERVER)
MUA NOTICES
MESSAGE RECIPIENT
18
MESSAGE(TAGGED)
16
20
MESSAGE DIGEST 0
MESSAGE DIGEST 1
MESSAGE DIGEST N
DSN REPORT(S)
MESSAGE BODY
ATTACHMENT 1
ATTACHMENT n
(E)SMTP DIALOG(S)
ENCRYPTED OVERALL MESSAGE DIGEST (DIGITAL SIGNATURE)
ESMTP DIALOG (TELENET CONNECTION)
MESSAGE (TAGGED)
MTA DSN REPORT(S) & MUA NOTIFICATIONS
RECEIPT
13
10
12
REGISTERING MAIL TRANSPORT AGENT (RPOST SERVER)
SENDER'S MAIL USER AGENT (E-MAIL CLIENT)
MESSAGE SENDER
MESSAGE BODY
ATTACHMENT 1
ATTACHMENT n
14

FIG. 1

FIG. 2A

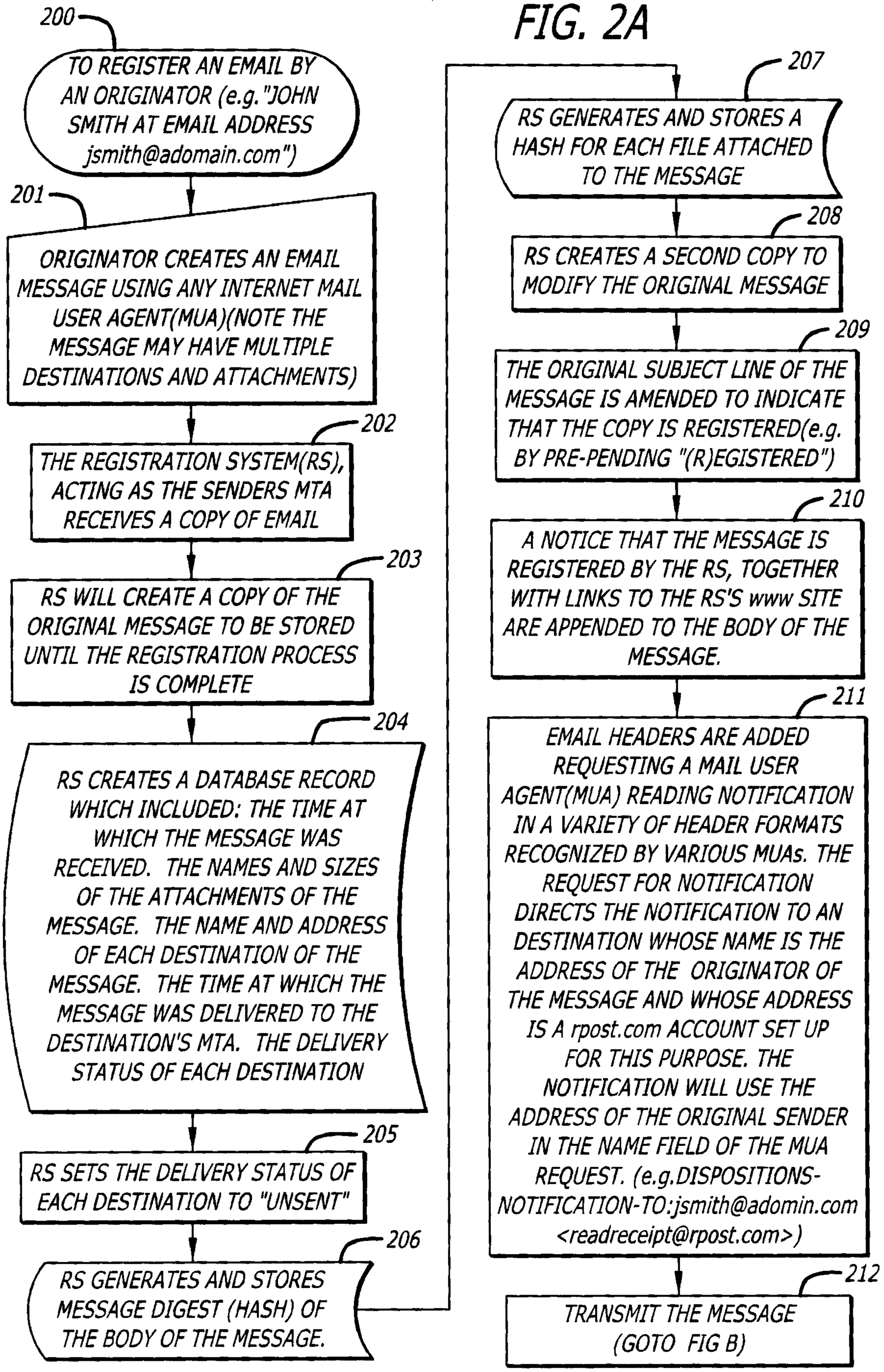
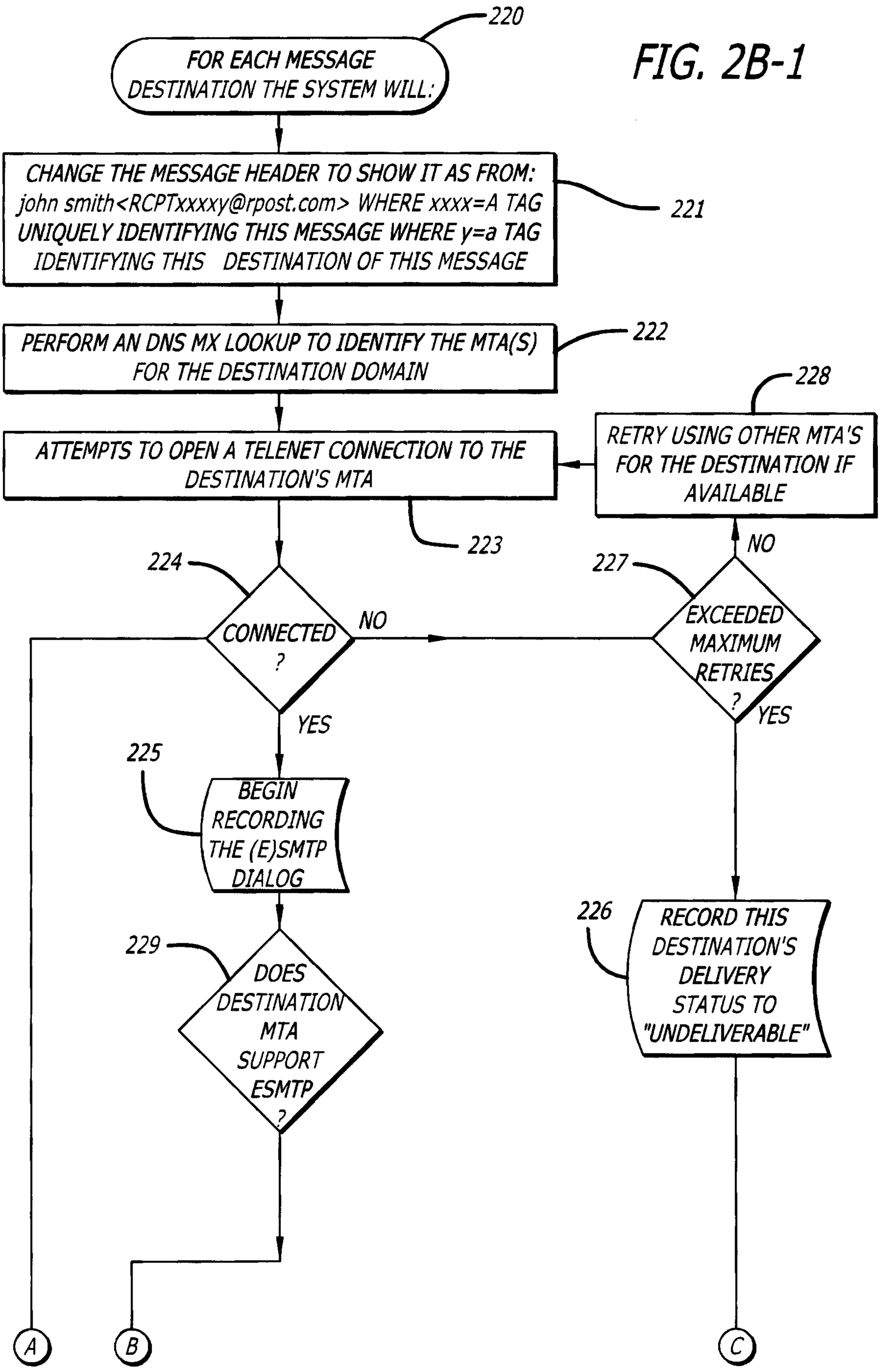

200
TO REGISTER AN EMAIL BY AN ORIGINATOR (e.g."JOHN SMITH AT EMAIL ADDRESS jsmith@adomain.com")
201
ORIGINATOR CREATES AN EMAIL MESSAGE USING ANY INTERNET MAIL USER AGENT(MUA)(NOTE THE MESSAGE MAY HAVE MULTIPLE DESTINATIONS AND ATTACHMENTS)
202
THE REGISTRATION SYSTEM(RS), ACTING AS THE SENDERS MTA RECEIVES A COPY OF EMAIL
203
RS WILL CREATE A COPY OF THE ORIGINAL MESSAGE TO BE STORED UNTIL THE REGISTRATION PROCESS IS COMPLETE
204
RS CREATES A DATABASE RECORD WHICH INCLUDED: THE TIME AT WHICH THE MESSAGE WAS RECEIVED. THE NAMES AND SIZES OF THE ATTACHMENTS OF THE MESSAGE. THE NAME AND ADDRESS OF EACH DESTINATION OF THE MESSAGE. THE TIME AT WHICH THE MESSAGE WAS DELIVERED TO THE DESTINATION'S MTA. THE DELIVERY STATUS OF EACH DESTINATION
205
RS SETS THE DELIVERY STATUS OF EACH DESTINATION TO "UNSENT"
206
RS GENERATES AND STORES MESSAGE DIGEST (HASH) OF THE BODY OF THE MESSAGE.
207
RS GENERATES AND STORES A HASH FOR EACH FILE ATTACHED TO THE MESSAGE
208
RS CREATES A SECOND COPY TO MODIFY THE ORIGINAL MESSAGE
209
THE ORIGINAL SUBJECT LINE OF THE MESSAGE IS AMENDED TO INDICATE THAT THE COPY IS REGISTERED(e.g. BY PRE-PENDING "(R)EGISTERED")
210
A NOTICE THAT THE MESSAGE IS REGISTERED BY THE RS, TOGETHER WITH LINKS TO THE RS'S www SITE ARE APPENDED TO THE BODY OF THE MESSAGE.
211
EMAIL HEADERS ARE ADDED REQUESTING A MAIL USER AGENT(MUA) READING NOTIFICATION IN A VARIETY OF HEADER FORMATS RECOGNIZED BY VARIOUS MUAs. THE REQUEST FOR NOTIFICATION DIRECTS THE NOTIFICATION TO AN DESTINATION WHOSE NAME IS THE ADDRESS OF THE ORIGINATOR OF THE MESSAGE AND WHOSE ADDRESS IS A rpost.com ACCOUNT SET UP FOR THIS PURPOSE. THE NOTIFICATION WILL USE THE ADDRESS OF THE ORIGINAL SENDER IN THE NAME FIELD OF THE MUA REQUEST. (e.g.DISPOSITIONS-NOTIFICATION-TO:jsmith@adomin.com <readreceipt@rpost.com>)
212
TRANSMIT THE MESSAGE (GOTO FIG B)

FIG. 2B-1


220
FOR EACH MESSAGE DESTINATION THE SYSTEM WILL:
CHANGE THE MESSAGE HEADER TO SHOW IT AS FROM: john smith<RCPTxxxxy@rpost.com> WHERE xxxx=A TAG UNIQUELY IDENTIFYING THIS MESSAGE WHERE y=a TAG IDENTIFYING THIS DESTINATION OF THIS MESSAGE
221
PERFORM AN DNS MX LOOKUP TO IDENTIFY THE MTA(S) FOR THE DESTINATION DOMAIN
222
ATTEMPTS TO OPEN A TELENET CONNECTION TO THE DESTINATION'S MTA
223
224
CONNECTED ?
NO
YES
225
BEGIN RECORDING THE (E)SMTP DIALOG
229
DOES DESTINATION MTA SUPPORT ESMTP ?
228
RETRY USING OTHER MTA'S FOR THE DESTINATION IF AVAILABLE
NO
227
EXCEEDED MAXIMUM RETRIES ?
YES
226
RECORD THIS DESTINATION'S DELIVERY STATUS TO "UNDELIVERABLE"
A
B
C

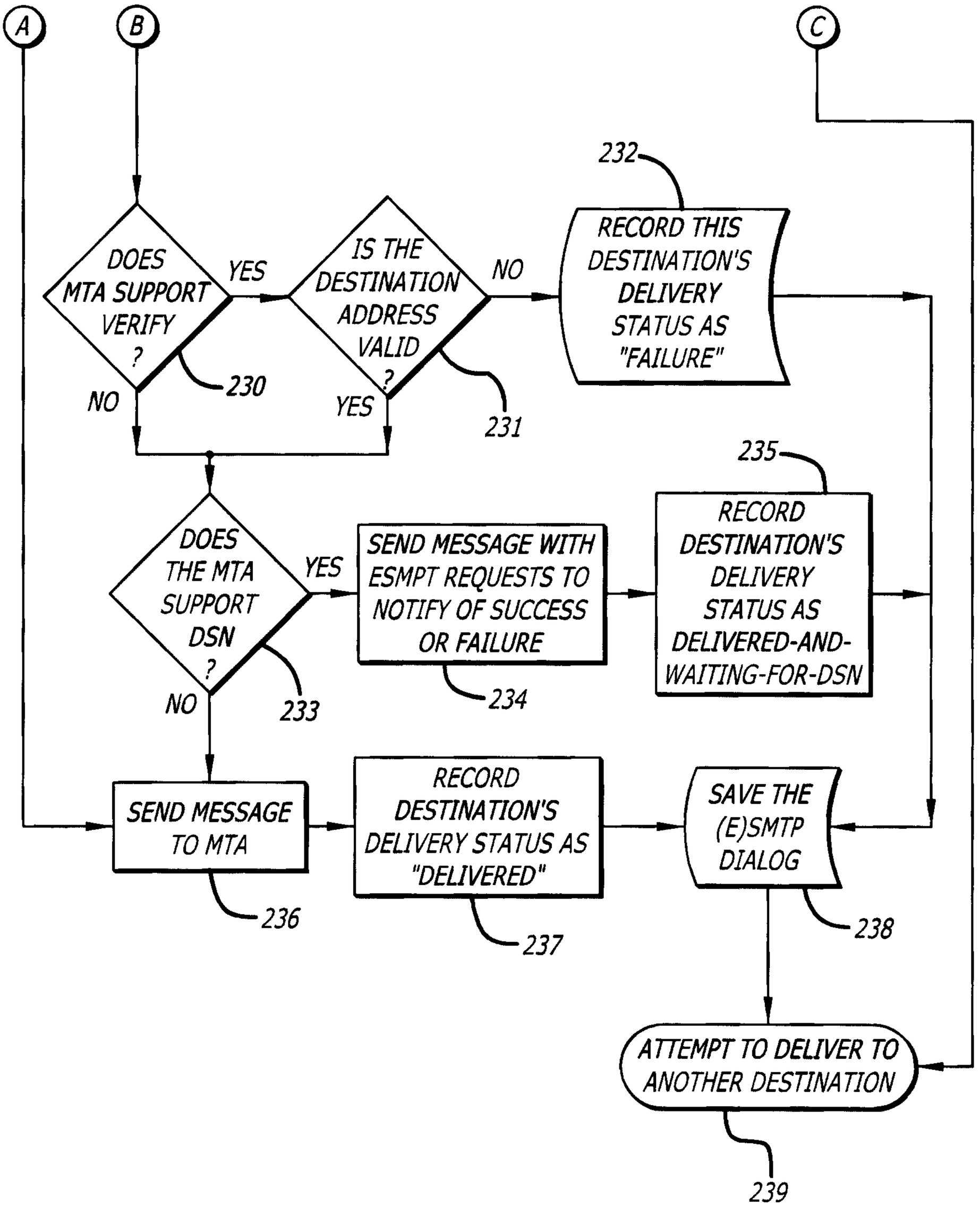

A
B
C
DOES MTA SUPPORT VERIFY ?
YES
IS THE DESTINATION ADDRESS VALID ?
NO
RECORD THIS DESTINATION'S DELIVERY STATUS AS "FAILURE"
232
230
NO
YES
231
DOES THE MTA SUPPORT DSN ?
YES
SEND MESSAGE WITH ESMPT REQUESTS TO NOTIFY OF SUCCESS OR FAILURE
RECORD DESTINATION'S DELIVERY STATUS AS DELIVERED-AND-WAITING-FOR-DSN
235
NO
233
234
SEND MESSAGE TO MTA
RECORD DESTINATION'S DELIVERY STATUS AS "DELIVERED"
SAVE THE (E)SMTP DIALOG
236
237
238
ATTEMPT TO DELIVER TO ANOTHER DESTINATION
239

FIG. 2B-2

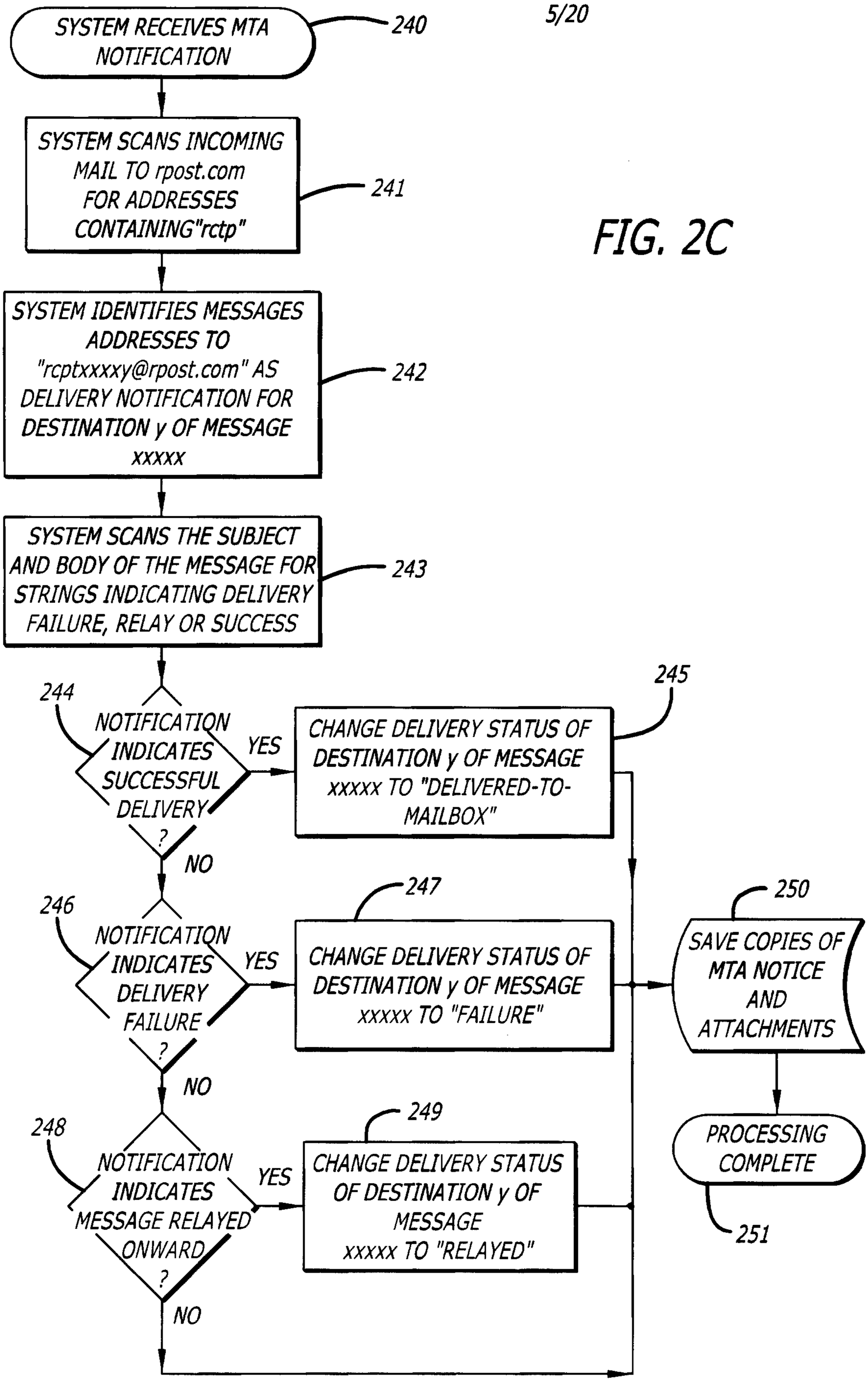

SYSTEM RECEIVES MTA NOTIFICATION
240
SYSTEM SCANS INCOMING MAIL TO rpost.com FOR ADDRESSES CONTAINING"rctp"
241
SYSTEM IDENTIFIES MESSAGES ADDRESSES TO "rcptxxxxy@rpost.com" AS DELIVERY NOTIFICATION FOR DESTINATION y OF MESSAGE xxxxx
242
SYSTEM SCANS THE SUBJECT AND BODY OF THE MESSAGE FOR STRINGS INDICATING DELIVERY FAILURE, RELAY OR SUCCESS
243
244
NOTIFICATION INDICATES SUCCESSFUL DELIVERY ?
YES
NO
245
CHANGE DELIVERY STATUS OF DESTINATION y OF MESSAGE xxxxx TO "DELIVERED-TO-MAILBOX"
246
NOTIFICATION INDICATES DELIVERY FAILURE ?
YES
NO
247
CHANGE DELIVERY STATUS OF DESTINATION y OF MESSAGE xxxxx TO "FAILURE"
248
NOTIFICATION INDICATES MESSAGE RELAYED ONWARD ?
YES
NO
249
CHANGE DELIVERY STATUS OF DESTINATION y OF MESSAGE xxxxx TO "RELAYED"
250
SAVE COPIES OF MTA NOTICE AND ATTACHMENTS
PROCESSING COMPLETE
251

FIG. 2C

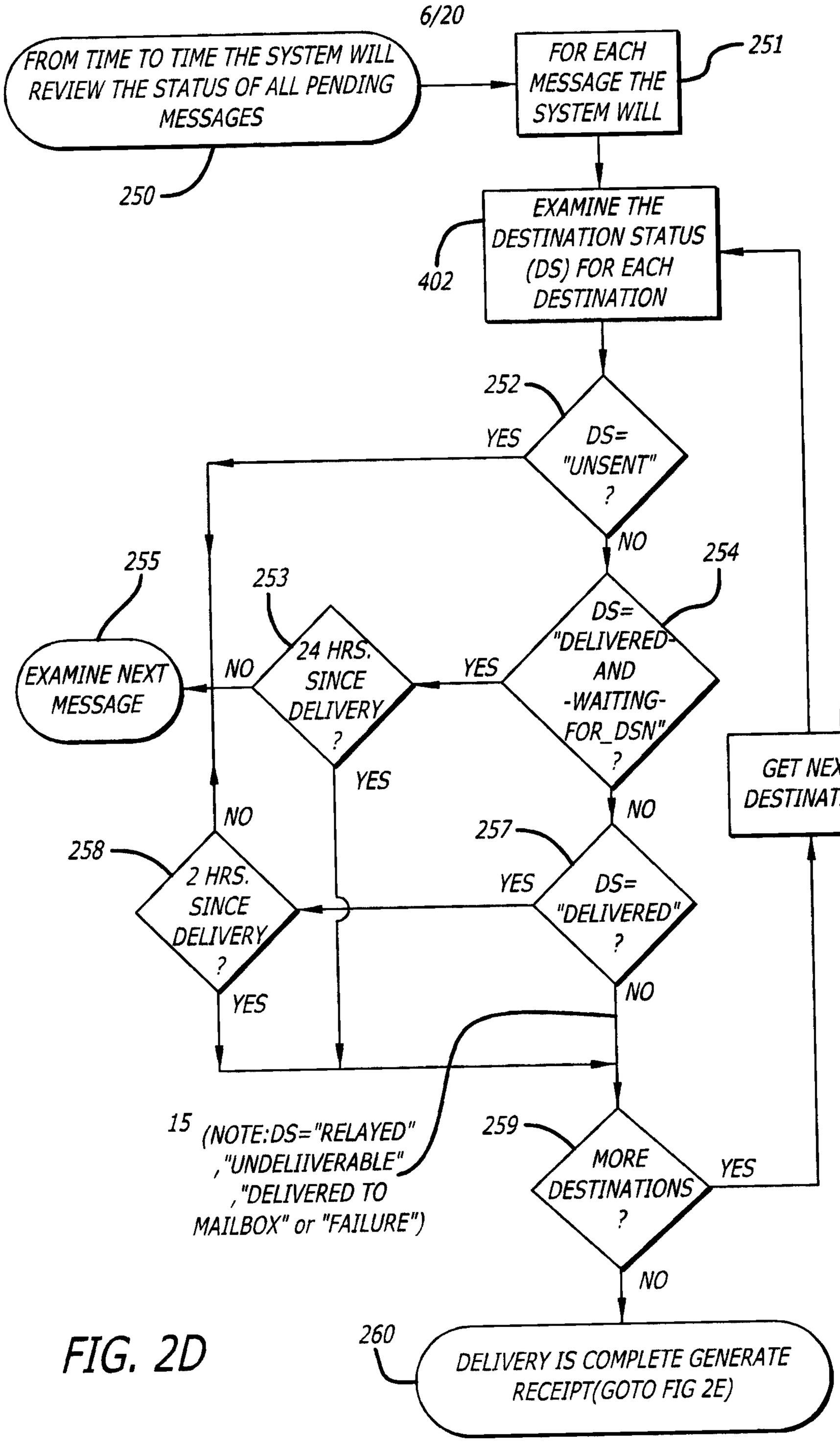
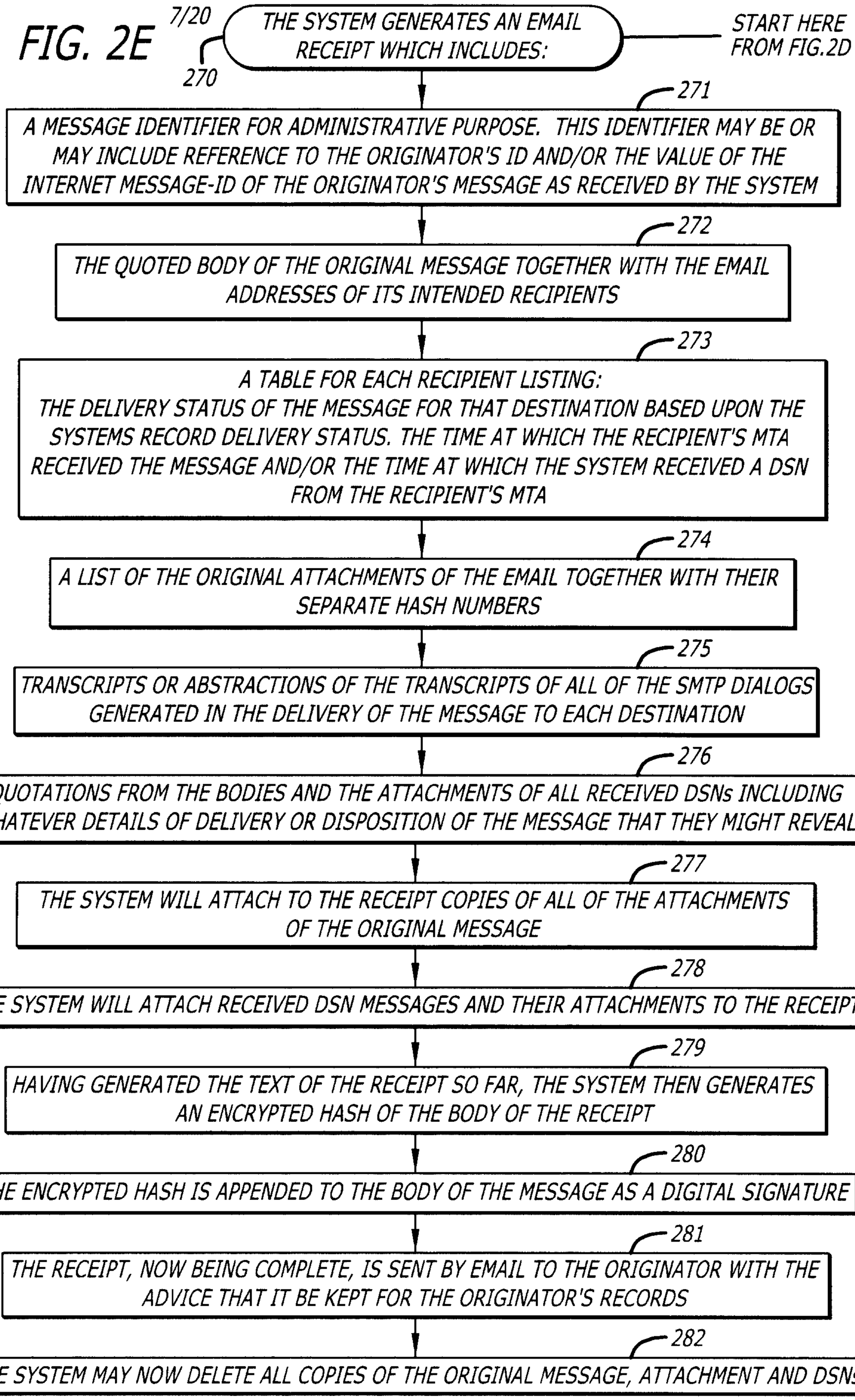

FROM TIME TO TIME THE SYSTEM WILL REVIEW THE STATUS OF ALL PENDING MESSAGES
250
FOR EACH MESSAGE THE SYSTEM WILL
251
EXAMINE THE DESTINATION STATUS (DS) FOR EACH DESTINATION
402
252
DS= "UNSENT" ?
YES
NO
254
DS= "DELIVERED" AND -WAITING- FOR_DSN" ?
YES
NO
253
24 HRS. SINCE DELIVERY ?
YES
NO
255
EXAMINE NEXT MESSAGE
257
DS= "DELIVERED" ?
YES
NO
258
2 HRS. SINCE DELIVERY ?
YES
NO
256
GET NEXT DESTINATION
259
MORE DESTINATIONS ?
YES
NO
15
(NOTE:DS="RELAYED" ,"UNDELIIVERABLE" ,"DELIVERED TO MAILBOX" or "FAILURE")
260
DELIVERY IS COMPLETE GENERATE RECEIPT(GOTO FIG 2E)

FIG. 2D

FIG. 2E


7/20
THE SYSTEM GENERATES AN EMAIL RECEIPT WHICH INCLUDES:
START HERE FROM FIG.2D
270
271
A MESSAGE IDENTIFIER FOR ADMINISTRATIVE PURPOSE. THIS IDENTIFIER MAY BE OR MAY INCLUDE REFERENCE TO THE ORIGINATOR'S ID AND/OR THE VALUE OF THE INTERNET MESSAGE-ID OF THE ORIGINATOR'S MESSAGE AS RECEIVED BY THE SYSTEM
272
THE QUOTED BODY OF THE ORIGINAL MESSAGE TOGETHER WITH THE EMAIL ADDRESSES OF ITS INTENDED RECIPIENTS
273
A TABLE FOR EACH RECIPIENT LISTING:
THE DELIVERY STATUS OF THE MESSAGE FOR THAT DESTINATION BASED UPON THE SYSTEMS RECORD DELIVERY STATUS. THE TIME AT WHICH THE RECIPIENT'S MTA RECEIVED THE MESSAGE AND/OR THE TIME AT WHICH THE SYSTEM RECEIVED A DSN FROM THE RECIPIENT'S MTA
274
A LIST OF THE ORIGINAL ATTACHMENTS OF THE EMAIL TOGETHER WITH THEIR SEPARATE HASH NUMBERS
275
TRANSCRIPTS OR ABSTRACTIONS OF THE TRANSCRIPTS OF ALL OF THE SMTP DIALOGS GENERATED IN THE DELIVERY OF THE MESSAGE TO EACH DESTINATION
276
QUOTATIONS FROM THE BODIES AND THE ATTACHMENTS OF ALL RECEIVED DSNs INCLUDING WHATEVER DETAILS OF DELIVERY OR DISPOSITION OF THE MESSAGE THAT THEY MIGHT REVEAL
277
THE SYSTEM WILL ATTACH TO THE RECEIPT COPIES OF ALL OF THE ATTACHMENTS OF THE ORIGINAL MESSAGE
278
THE SYSTEM WILL ATTACH RECEIVED DSN MESSAGES AND THEIR ATTACHMENTS TO THE RECEIPT
279
HAVING GENERATED THE TEXT OF THE RECEIPT SO FAR, THE SYSTEM THEN GENERATES AN ENCRYPTED HASH OF THE BODY OF THE RECEIPT
280
THE ENCRYPTED HASH IS APPENDED TO THE BODY OF THE MESSAGE AS A DIGITAL SIGNATURE
281
THE RECEIPT, NOW BEING COMPLETE, IS SENT BY EMAIL TO THE ORIGINATOR WITH THE ADVICE THAT IT BE KEPT FOR THE ORIGINATOR'S RECORDS
282
THE SYSTEM MAY NOW DELETE ALL COPIES OF THE ORIGINAL MESSAGE, ATTACHMENT AND DSNs

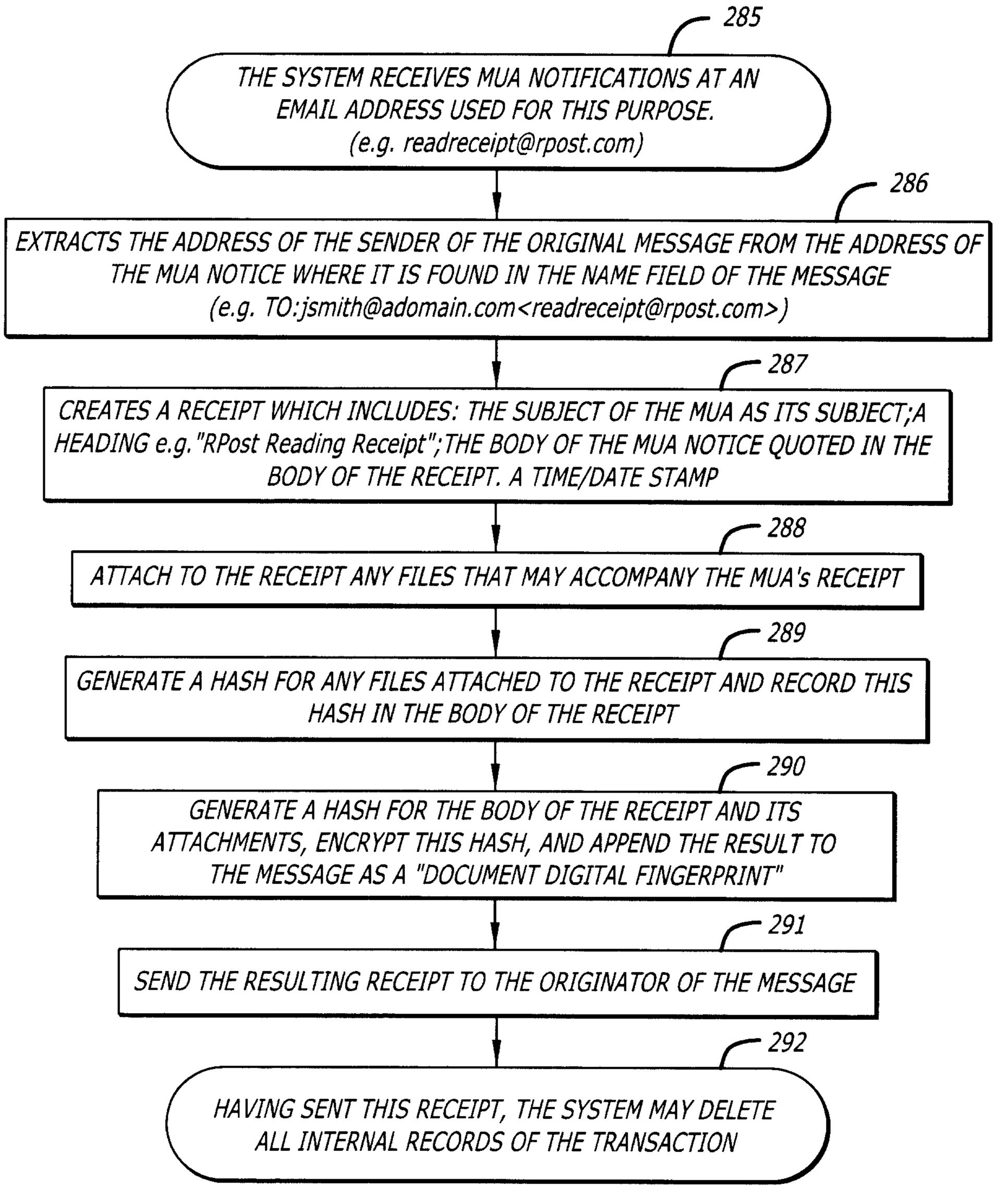

285
THE SYSTEM RECEIVES MUA NOTIFICATIONS AT AN EMAIL ADDRESS USED FOR THIS PURPOSE. (e.g. readreceipt@rpost.com)
286
EXTRACTS THE ADDRESS OF THE SENDER OF THE ORIGINAL MESSAGE FROM THE ADDRESS OF THE MUA NOTICE WHERE IT IS FOUND IN THE NAME FIELD OF THE MESSAGE (e.g. TO:jsmith@adomain.com<readreceipt@rpost.com>)
287
CREATES A RECEIPT WHICH INCLUDES: THE SUBJECT OF THE MUA AS ITS SUBJECT;A HEADING e.g."RPost Reading Receipt";THE BODY OF THE MUA NOTICE QUOTED IN THE BODY OF THE RECEIPT. A TIME/DATE STAMP
288
ATTACH TO THE RECEIPT ANY FILES THAT MAY ACCOMPANY THE MUA's RECEIPT
289
GENERATE A HASH FOR ANY FILES ATTACHED TO THE RECEIPT AND RECORD THIS HASH IN THE BODY OF THE RECEIPT
290
GENERATE A HASH FOR THE BODY OF THE RECEIPT AND ITS ATTACHMENTS, ENCRYPT THIS HASH, AND APPEND THE RESULT TO THE MESSAGE AS A "DOCUMENT DIGITAL FINGERPRINT"
291
SEND THE RESULTING RECEIPT TO THE ORIGINATOR OF THE MESSAGE
292
HAVING SENT THIS RECEIPT, THE SYSTEM MAY DELETE ALL INTERNAL RECORDS OF THE TRANSACTION

FIG. 2F

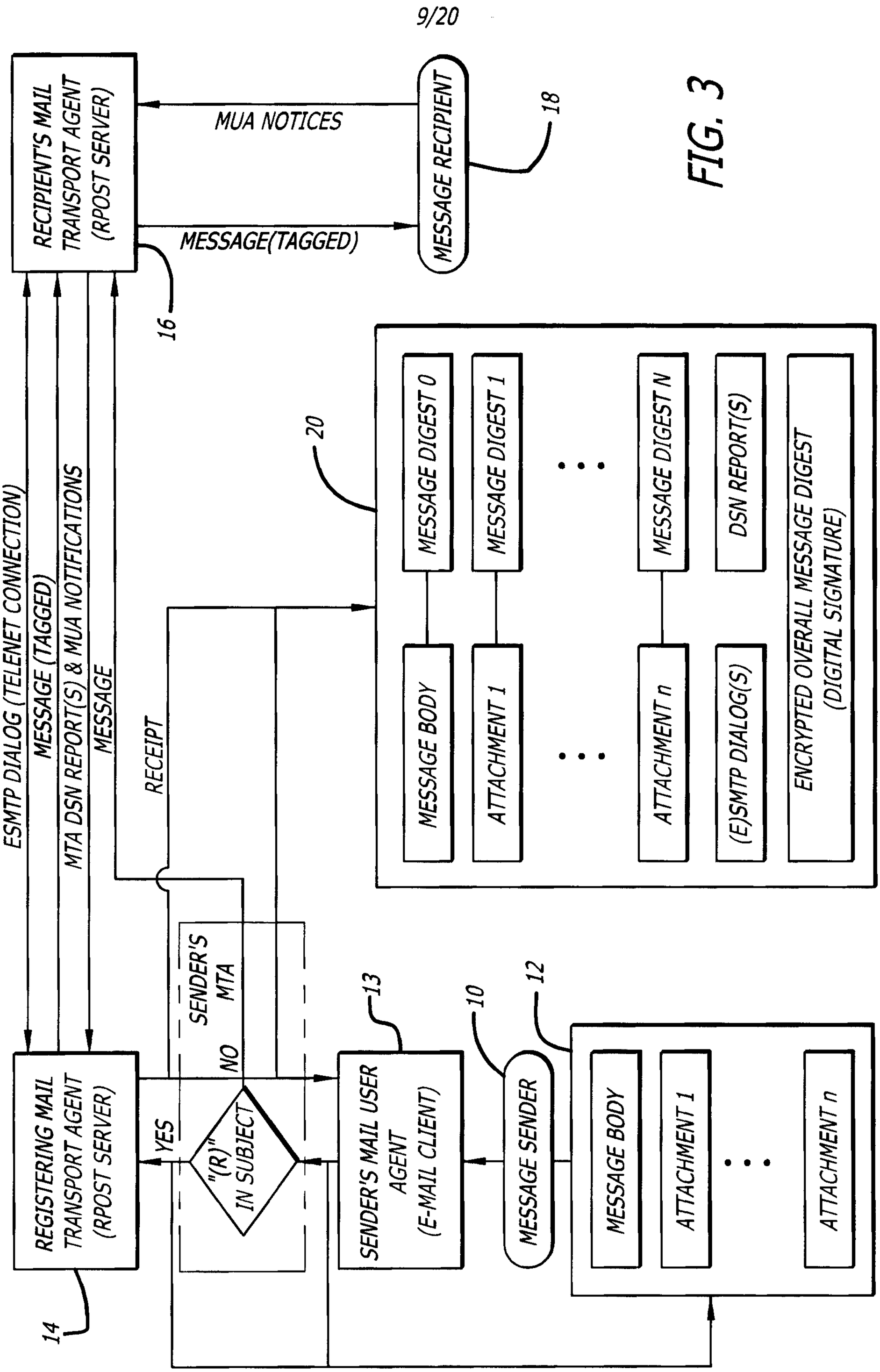

RECIPIENT'S MAIL TRANSPORT AGENT (RPOST SERVER)
MUA NOTICES
MESSAGE(TAGGED)
MESSAGE RECIPIENT
18
16
20
ESMTP DIALOG (TELENET CONNECTION)
MESSAGE (TAGGED)
MTA DSN REPORT(S) & MUA NOTIFICATIONS
MESSAGE
RECEIPT
MESSAGE DIGEST 0
MESSAGE DIGEST 1
MESSAGE DIGEST N
DSN REPORT(S)
ENCRYPTED OVERALL MESSAGE DIGEST (DIGITAL SIGNATURE)
MESSAGE BODY
ATTACHMENT 1
ATTACHMENT n
(E)SMTP DIALOG(S)
SENDER'S MTA
13
10
12
REGISTERING MAIL TRANSPORT AGENT (RPOST SERVER)
YES
NO
"(R)" IN SUBJECT
SENDER'S MAIL USER AGENT (E-MAIL CLIENT)
MESSAGE SENDER
MESSAGE BODY
ATTACHMENT 1
ATTACHMENT n
14

FIG. 3

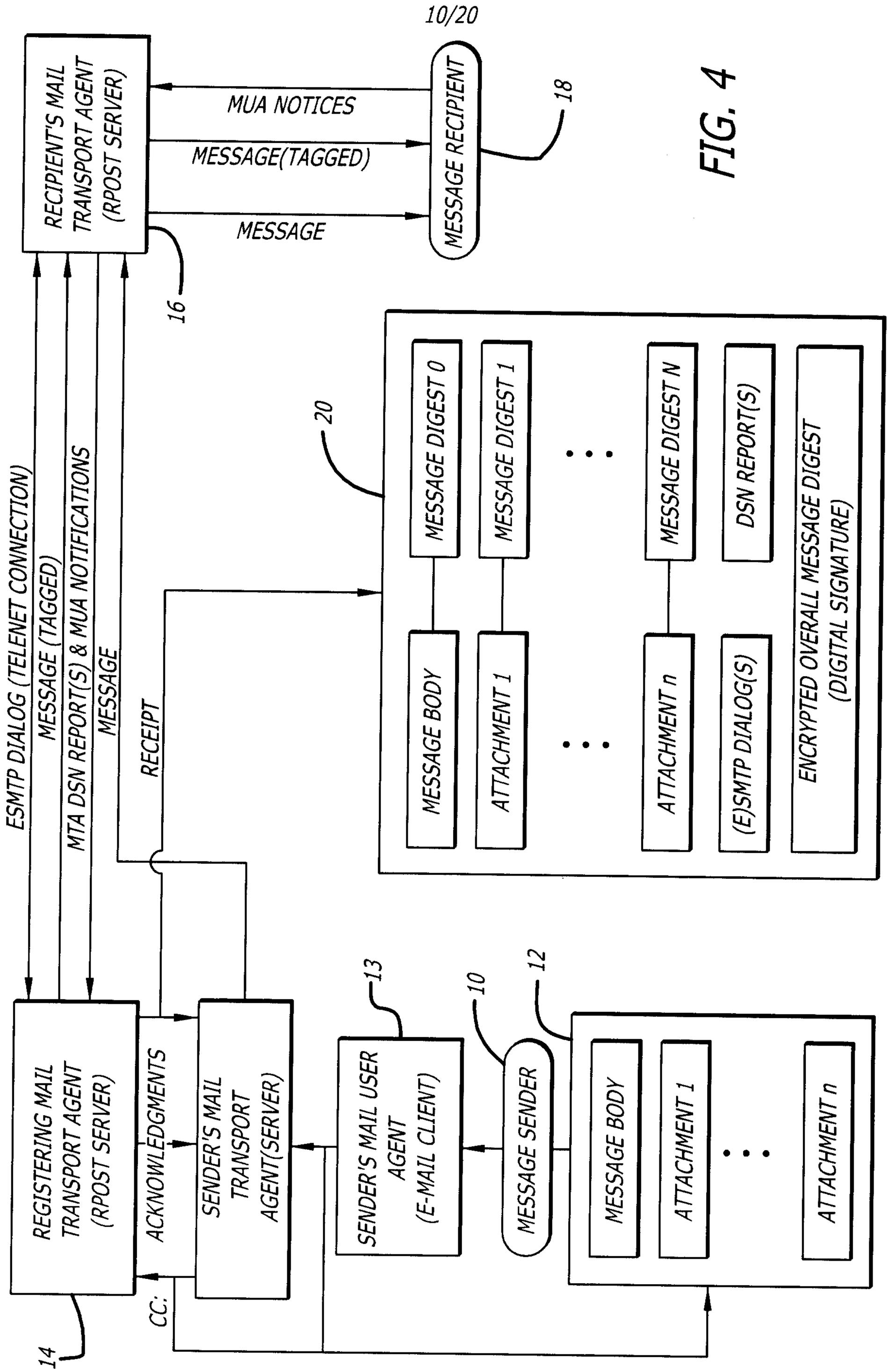

10/20
RECIPIENT'S MAIL TRANSPORT AGENT (RPOST SERVER)
MUA NOTICES
MESSAGE(TAGGED)
MESSAGE
MESSAGE RECIPIENT
18
16
20
MESSAGE DIGEST 0
MESSAGE DIGEST 1
MESSAGE DIGEST N
DSN REPORT(S)
ENCRYPTED OVERALL MESSAGE DIGEST (DIGITAL SIGNATURE)
MESSAGE BODY
ATTACHMENT 1
ATTACHMENT n
(E)SMTP DIALOG(S)
ESMTP DIALOG (TELENET CONNECTION)
MESSAGE (TAGGED)
MTA DSN REPORT(S) & MUA NOTIFICATIONS
MESSAGE
RECEIPT
13
10
12
REGISTERING MAIL TRANSPORT AGENT (RPOST SERVER)
ACKNOWLEDGMENTS
SENDER'S MAIL TRANSPORT AGENT(SERVER)
SENDER'S MAIL USER AGENT (E-MAIL CLIENT)
MESSAGE SENDER
MESSAGE BODY
ATTACHMENT 1
ATTACHMENT n
CC:
14

FIG. 4

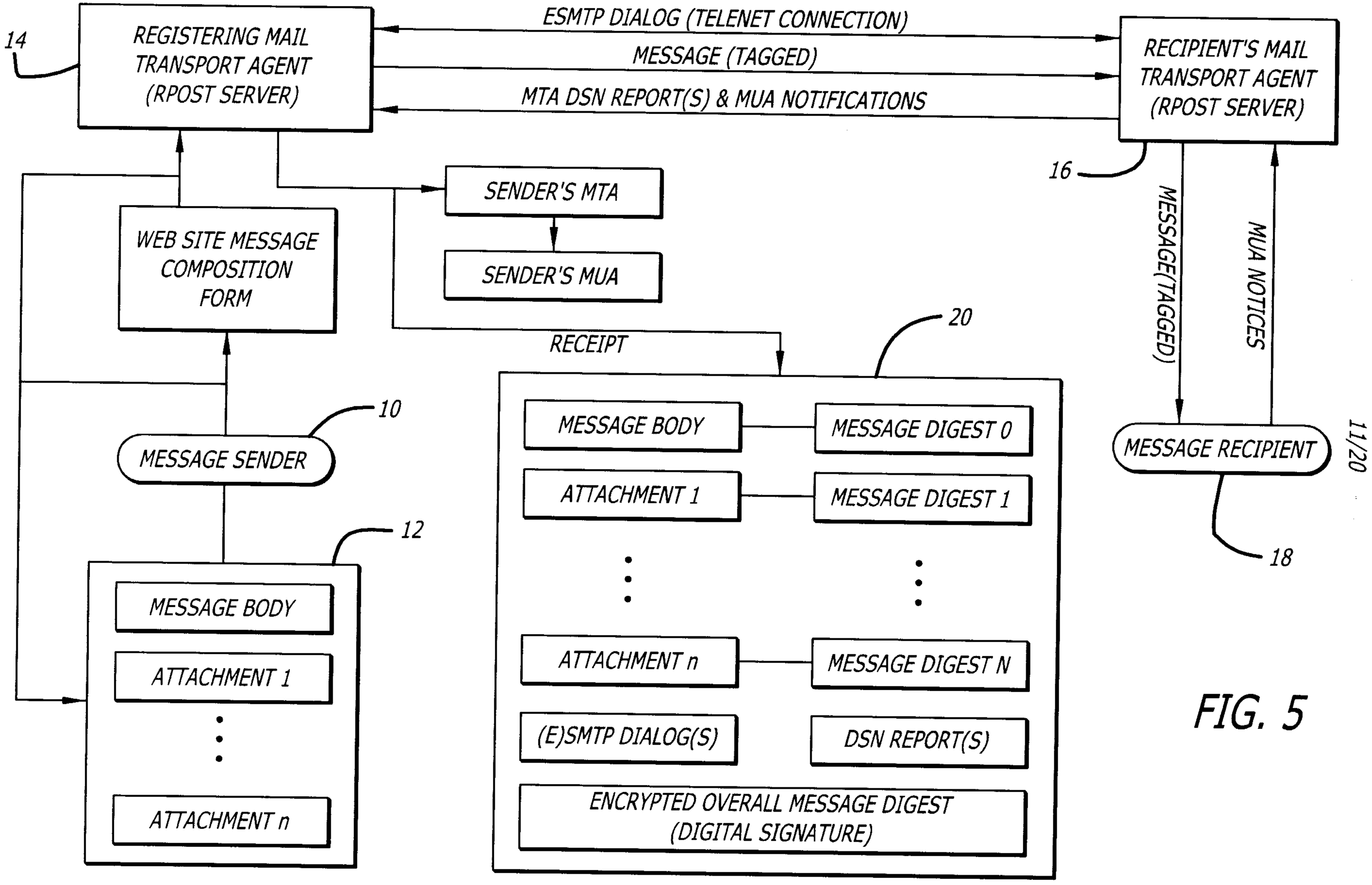


FIG. 5

CA 02476176 2004-09-09

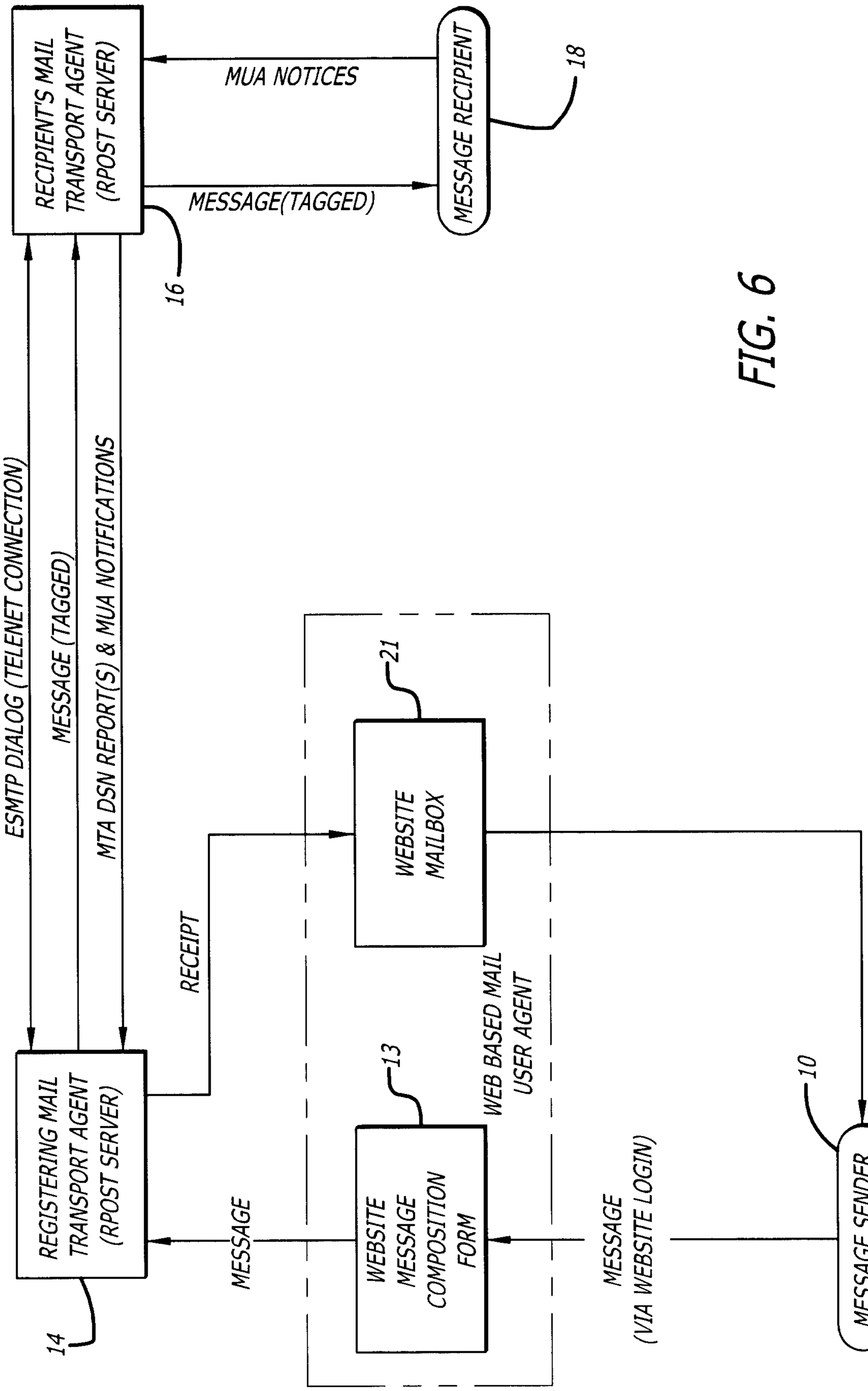

RECIPIENT'S MAIL TRANSPORT AGENT (RPOST SERVER)
MUA NOTICES
MESSAGE(TAGGED)
MESSAGE RECIPIENT
18
16
ESMTP DIALOG (TELENET CONNECTION)
MESSAGE (TAGGED)
MTA DSN REPORT(S) & MUA NOTIFICATIONS
21
WEBSITE MAILBOX
RECEIPT
13
WEB BASED MAIL USER AGENT
WEBSITE MESSAGE COMPOSITION FORM
MESSAGE
MESSAGE (VIA WEBSITE LOGIN)
10
REGISTERING MAIL TRANSPORT AGENT (RPOST SERVER)
MESSAGE SENDER
14

FIG. 6

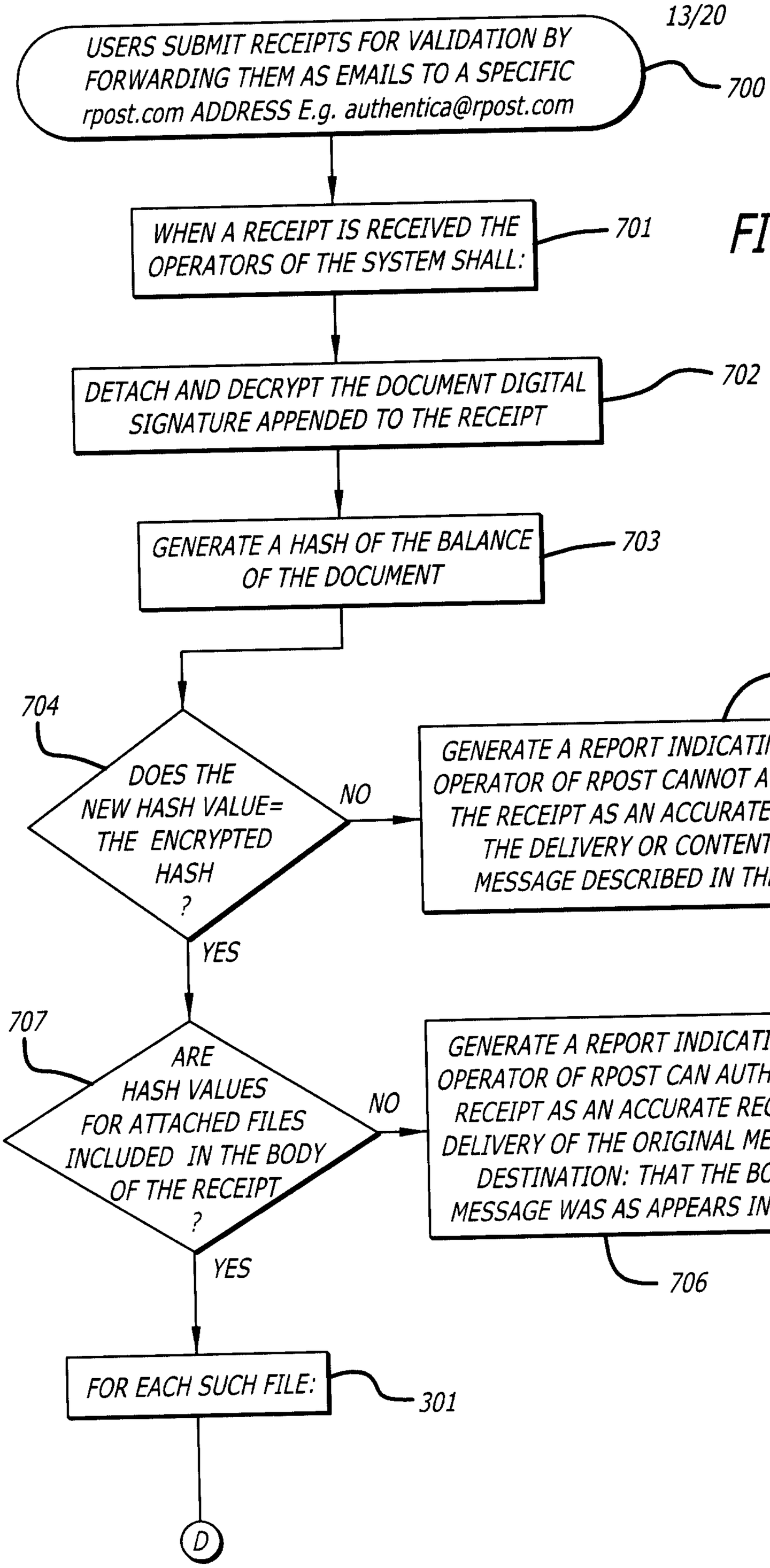

USERS SUBMIT RECEIPTS FOR VALIDATION BY FORWARDING THEM AS EMAILS TO A SPECIFIC rpost.com ADDRESS E.g. authentica@rpost.com
700
WHEN A RECEIPT IS RECEIVED THE OPERATORS OF THE SYSTEM SHALL:
701
DETACH AND DECRYPT THE DOCUMENT DIGITAL SIGNATURE APPENDED TO THE RECEIPT
702
GENERATE A HASH OF THE BALANCE OF THE DOCUMENT
703
704
DOES THE NEW HASH VALUE= THE ENCRYPTED HASH ?
NO
GENERATE A REPORT INDICATING THAT THE OPERATOR OF RPOST CANNOT AUTHENTICATE THE RECEIPT AS AN ACCURATE RECORD OF THE DELIVERY OR CONTENTS OF THE MESSAGE DESCRIBED IN THE RECEIPT
705
YES
707
ARE HASH VALUES FOR ATTACHED FILES INCLUDED IN THE BODY OF THE RECEIPT ?
NO
GENERATE A REPORT INDICATING THAT THE OPERATOR OF RPOST CAN AUTHENTICATE THE RECEIPT AS AN ACCURATE RECORD OF THE DELIVERY OF THE ORIGINAL MESSAGE TO ITS DESTINATION: THAT THE BODY OF THE MESSAGE WAS AS APPEARS IN THE RECEIPT
706
YES
FOR EACH SUCH FILE:
301
D
E

FIG. 7a

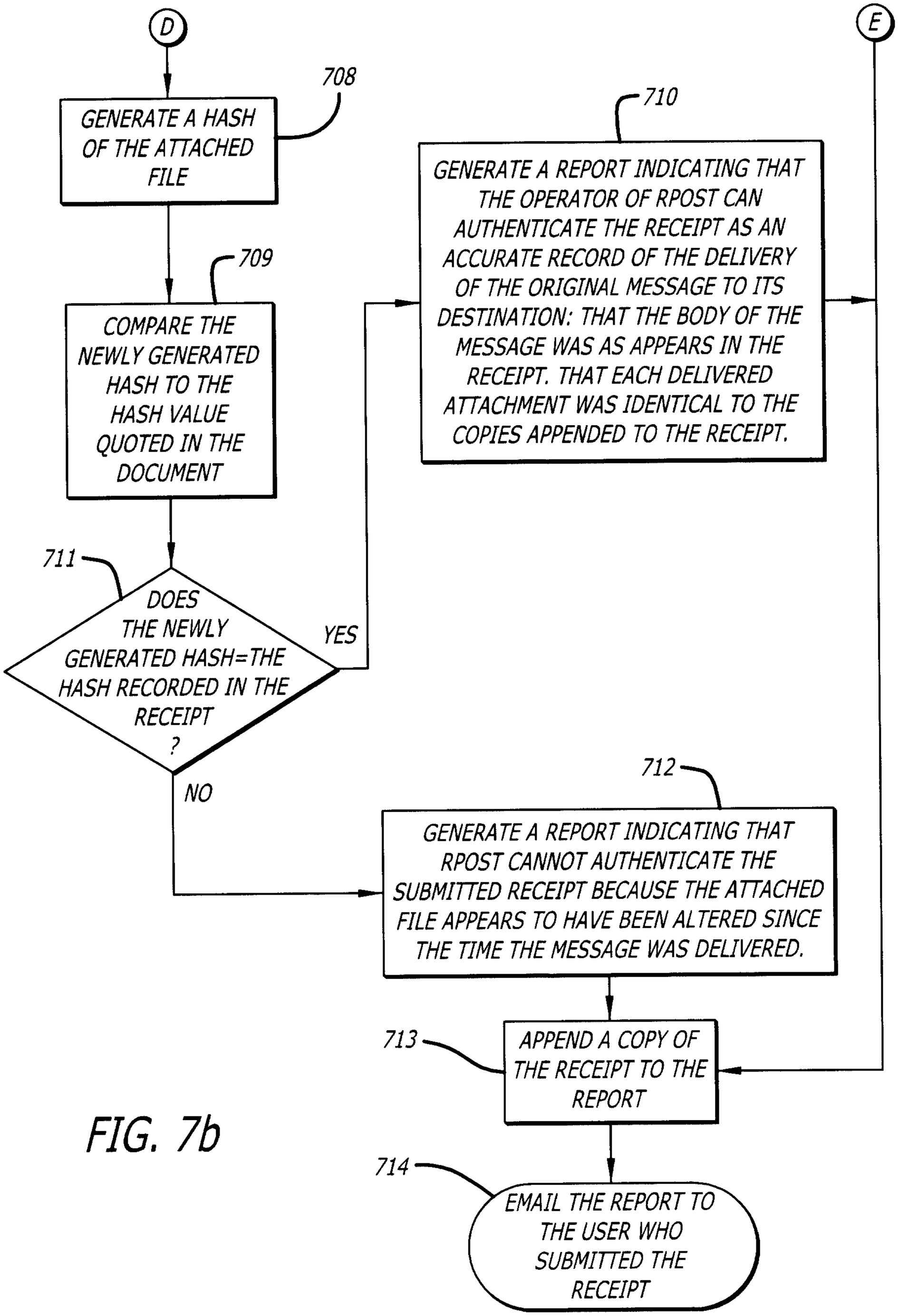

D
708
GENERATE A HASH OF THE ATTACHED FILE
709
COMPARE THE NEWLY GENERATED HASH TO THE HASH VALUE QUOTED IN THE DOCUMENT
711
DOES THE NEWLY GENERATED HASH=THE HASH RECORDED IN THE RECEIPT ?
YES
NO
710
GENERATE A REPORT INDICATING THAT THE OPERATOR OF RPOST CAN AUTHENTICATE THE RECEIPT AS AN ACCURATE RECORD OF THE DELIVERY OF THE ORIGINAL MESSAGE TO ITS DESTINATION: THAT THE BODY OF THE MESSAGE WAS AS APPEARS IN THE RECEIPT. THAT EACH DELIVERED ATTACHMENT WAS IDENTICAL TO THE COPIES APPENDED TO THE RECEIPT.
712
GENERATE A REPORT INDICATING THAT RPOST CANNOT AUTHENTICATE THE SUBMITTED RECEIPT BECAUSE THE ATTACHED FILE APPEARS TO HAVE BEEN ALTERED SINCE THE TIME THE MESSAGE WAS DELIVERED.
713
APPEND A COPY OF THE RECEIPT TO THE REPORT
714
EMAIL THE REPORT TO THE USER WHO SUBMITTED THE RECEIPT
E

FIG. 7b

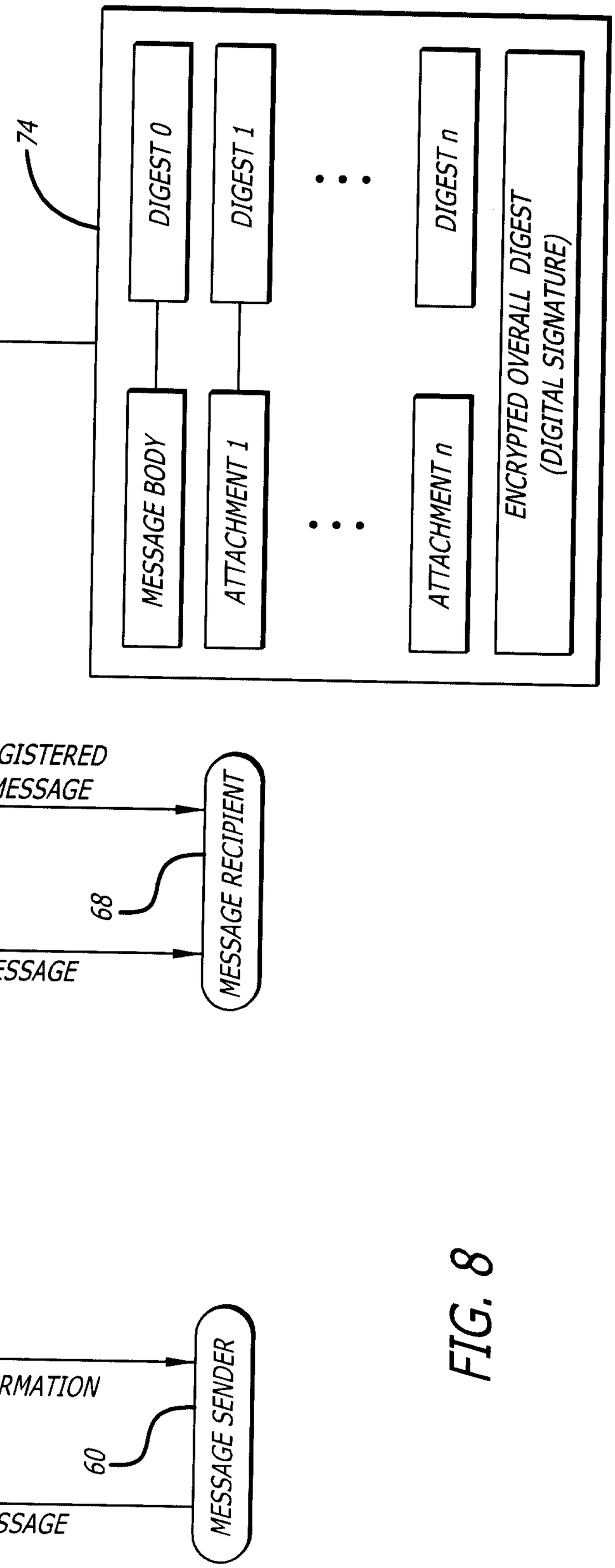
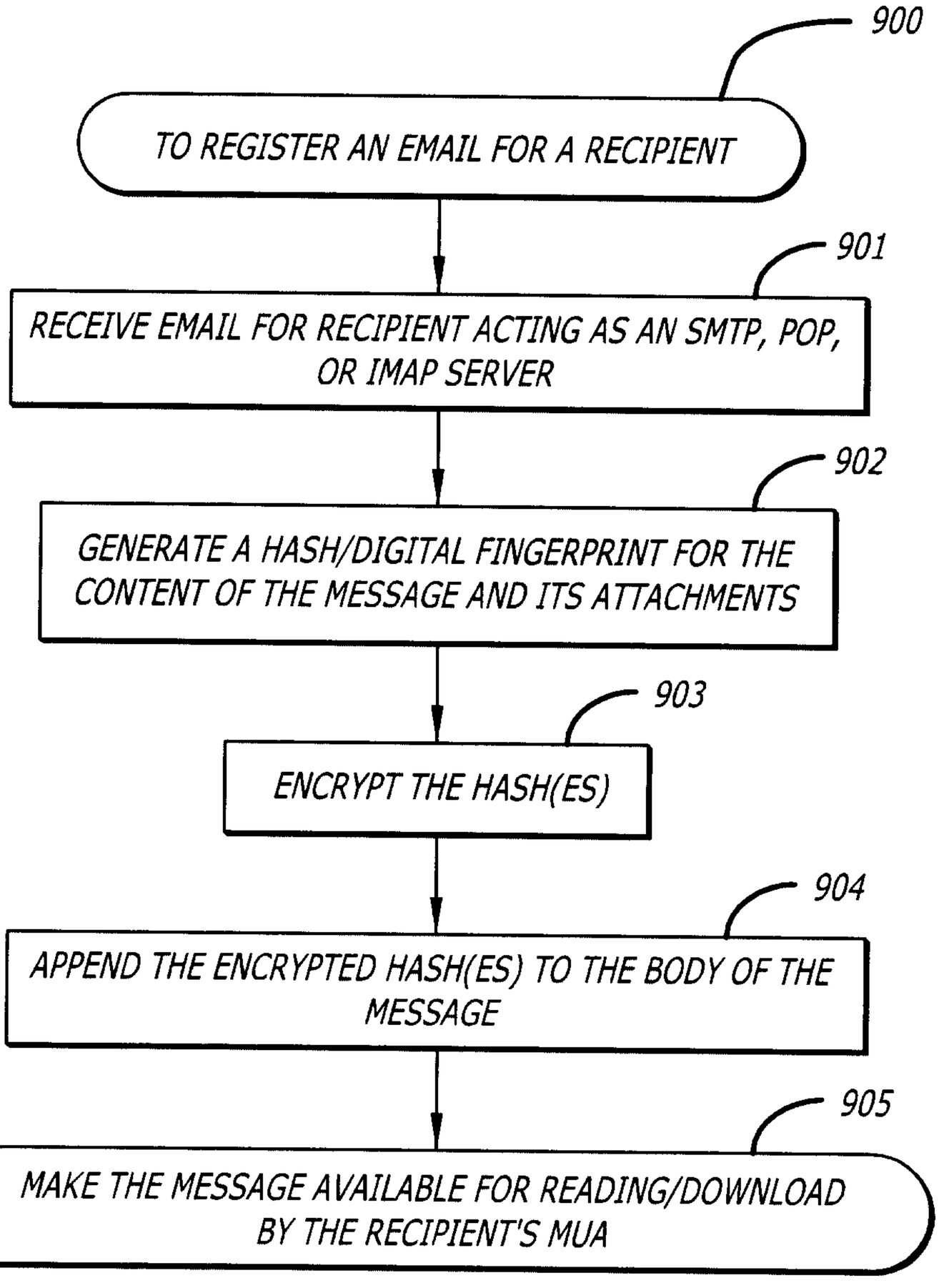

74
DIGEST 0
DIGEST 1
DIGEST n
ENCRYPTED OVERALL DIGEST (DIGITAL SIGNATURE)
MESSAGE BODY
ATTACHMENT 1
ATTACHMENT n
REGISTERED MESSAGE
64
RPOST SERVER (SMTP, POP, POP3, OR IMAP MTA)
68
MESSAGE RECIPIENT
MESSAGE
72
70
MESSAGE
CONFIRMATION
62
SENDER'S MTA
CONFIRMATION
60
MESSAGE SENDER
MESSAGE

FIG. 8

FIG. 9


900
TO REGISTER AN EMAIL FOR A RECIPIENT
901
RECEIVE EMAIL FOR RECIPIENT ACTING AS AN SMTP, POP, OR IMAP SERVER
902
GENERATE A HASH/DIGITAL FINGERPRINT FOR THE CONTENT OF THE MESSAGE AND ITS ATTACHMENTS
903
ENCRYPT THE HASH(ES)
904
APPEND THE ENCRYPTED HASH(ES) TO THE BODY OF THE MESSAGE
905
MAKE THE MESSAGE AVAILABLE FOR READING/DOWNLOAD BY THE RECIPIENT'S MUA

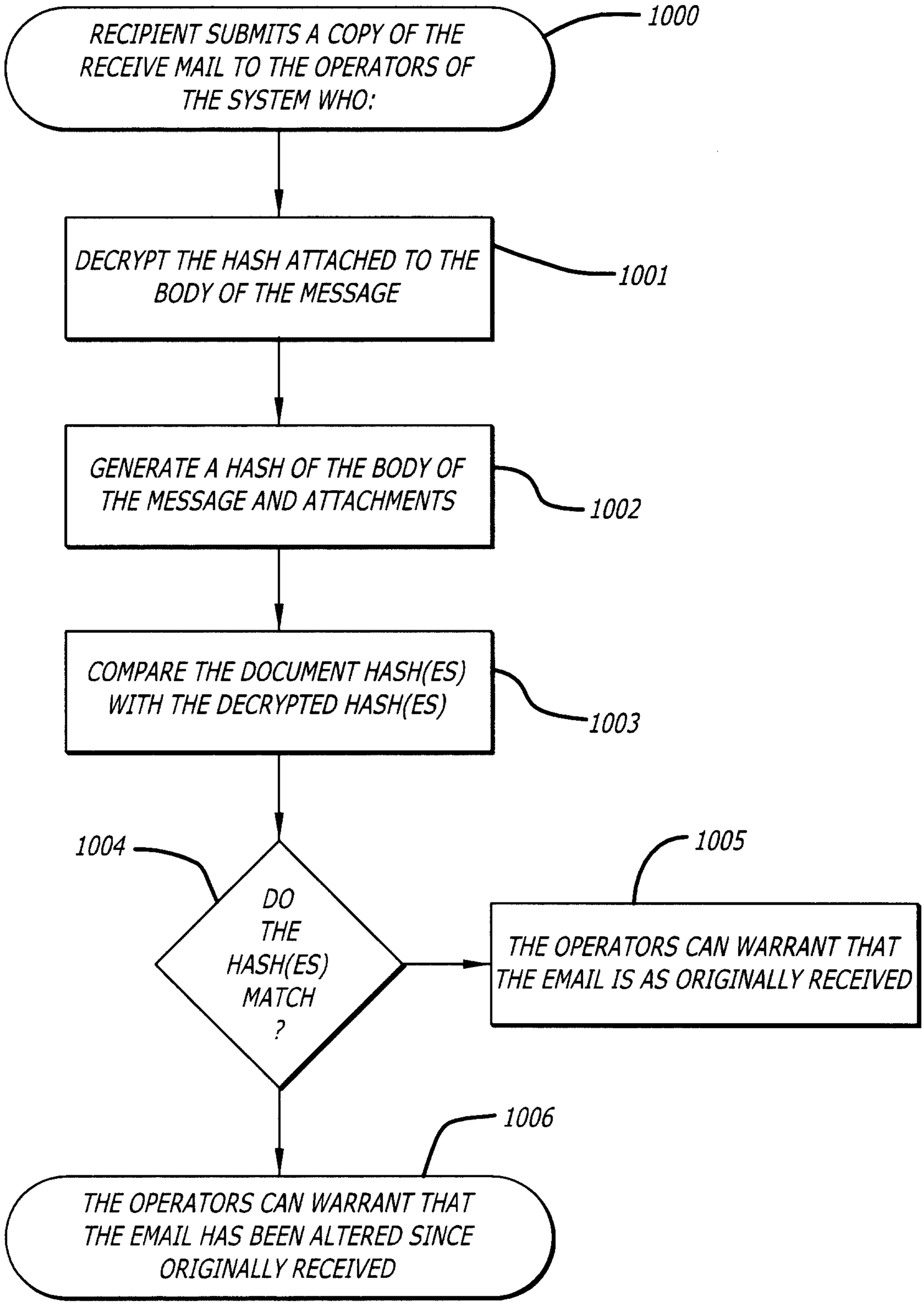

RECIPIENT SUBMITS A COPY OF THE RECEIVE MAIL TO THE OPERATORS OF THE SYSTEM WHO:
1000
DECRYPT THE HASH ATTACHED TO THE BODY OF THE MESSAGE
1001
GENERATE A HASH OF THE BODY OF THE MESSAGE AND ATTACHMENTS
1002
COMPARE THE DOCUMENT HASH(ES) WITH THE DECRYPTED HASH(ES)
1003
1004
DO THE HASH(ES) MATCH ?
1005
THE OPERATORS CAN WARRANT THAT THE EMAIL IS AS ORIGINALLY RECEIVED
1006
THE OPERATORS CAN WARRANT THAT THE EMAIL HAS BEEN ALTERED SINCE ORIGINALLY RECEIVED

FIG. 10

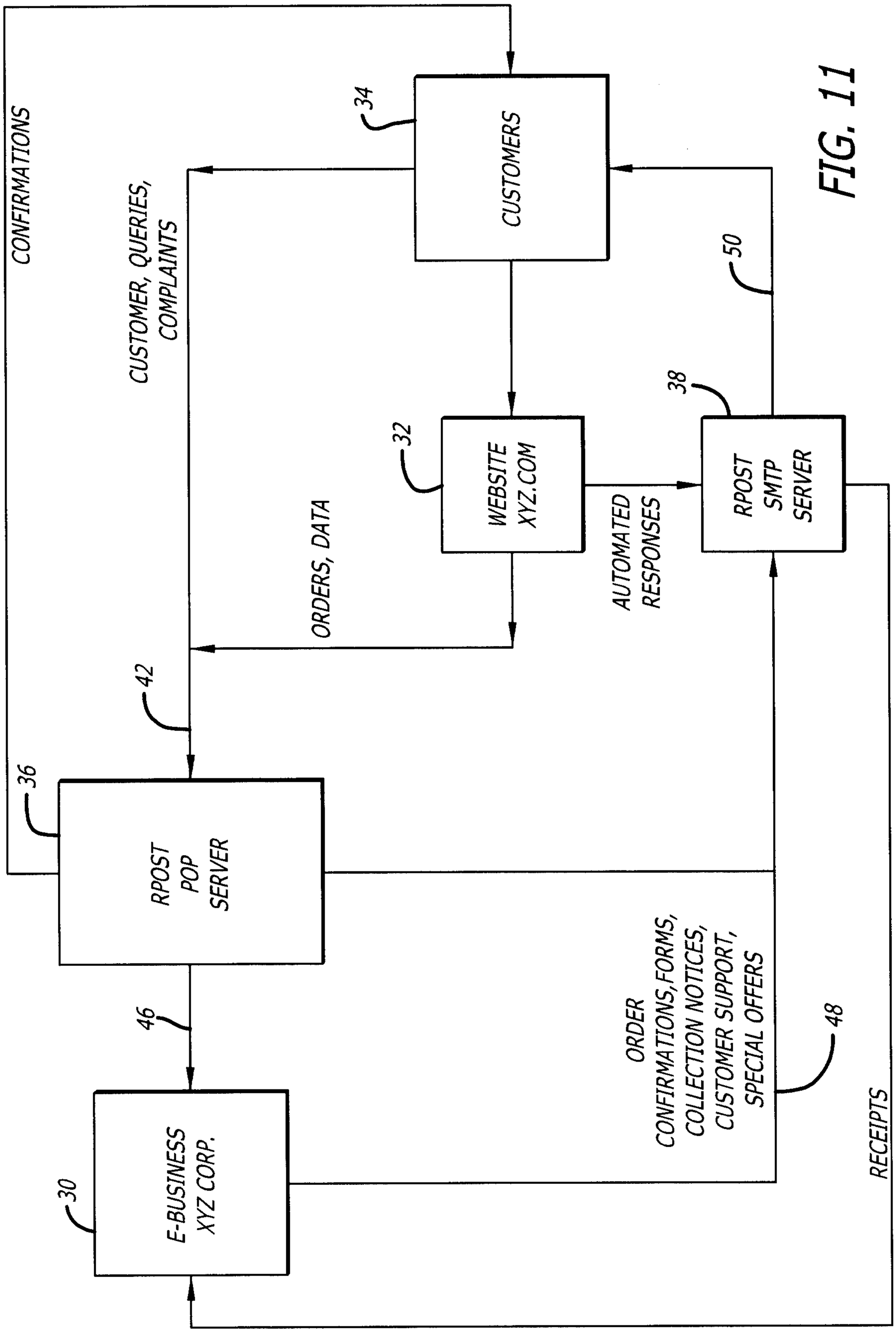

E-BUSINESS XYZ CORP.
30
RPOST POP SERVER
36
RPOST SMTP SERVER
38
WEBSITE XYZ.COM
32
CUSTOMERS
34
ORDERS, DATA
42
CUSTOMER, QUERIES, COMPLAINTS
AUTOMATED RESPONSES
50
46
ORDER CONFIRMATIONS, FORMS, COLLECTION NOTICES, CUSTOMER SUPPORT, SPECIAL OFFERS
48
CONFIRMATIONS
RECEIPTS

FIG. 11

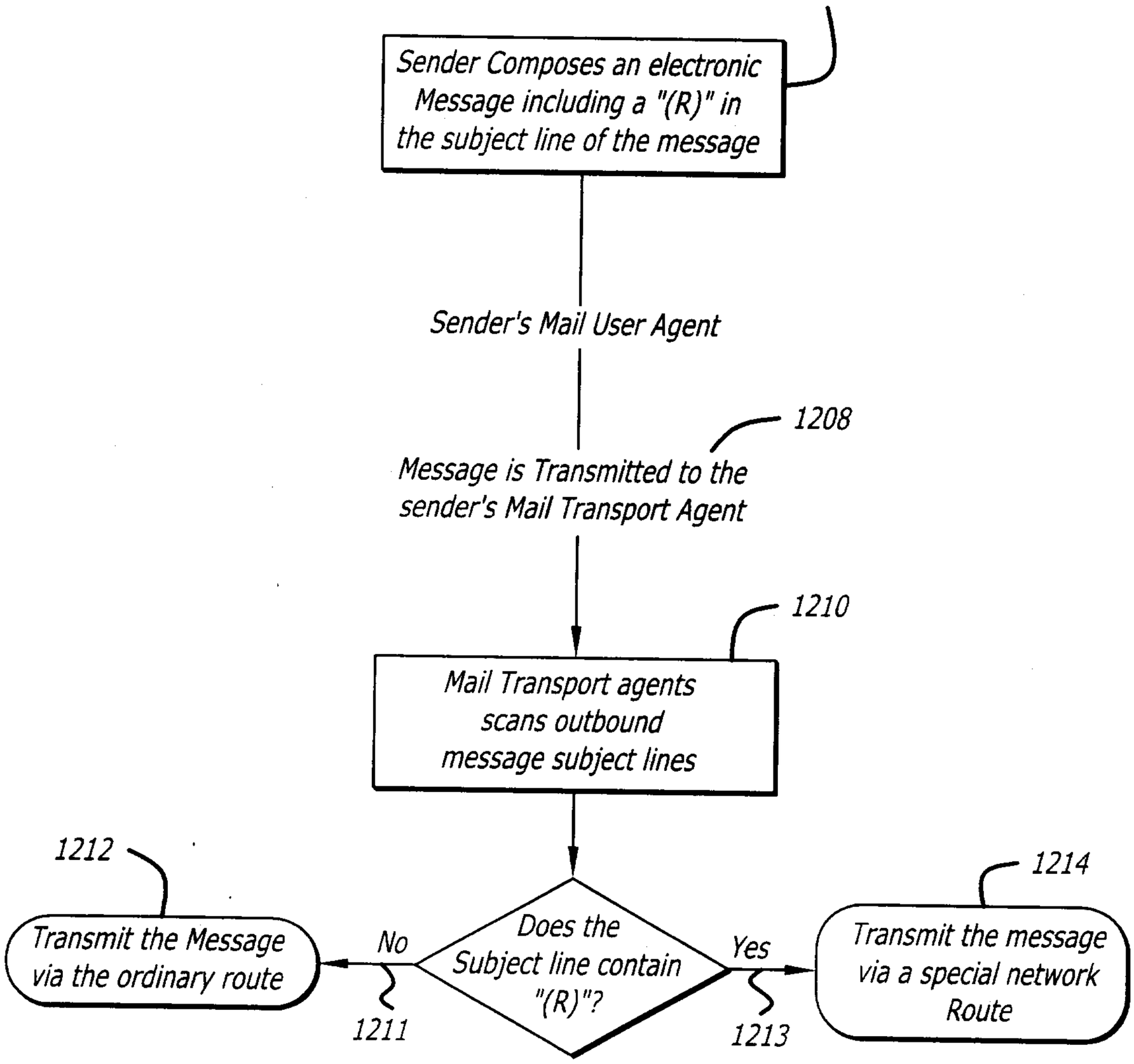

1206
Sender Composes an electronic Message including a "(R)" in the subject line of the message
Sender's Mail User Agent
1208
Message is Transmitted to the sender's Mail Transport Agent
1210
Mail Transport agents scans outbound message subject lines
1212
Transmit the Message via the ordinary route
No
1211
Does the Subject line contain "(R)"?
Yes
1213
1214
Transmit the message via a special network Route
Sender's Mail Transport Agent

FIG. 12

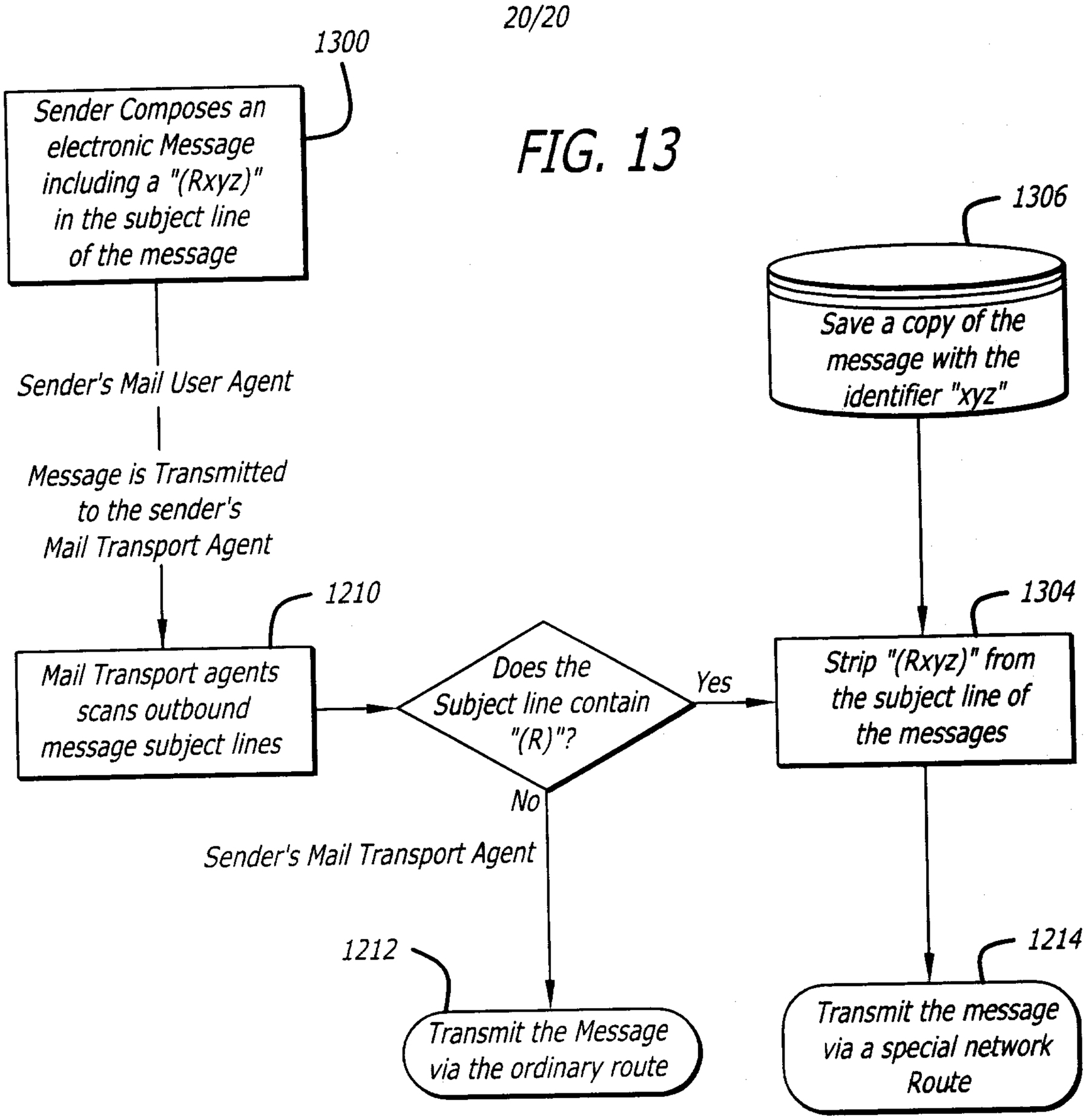

1300
Sender Composes an electronic Message including a "(Rxyz)" in the subject line of the message
Sender's Mail User Agent
Message is Transmitted to the sender's Mail Transport Agent
1210
Mail Transport agents scans outbound message subject lines
Does the Subject line contain "(R)"?
Yes
No
Sender's Mail Transport Agent
1212
Transmit the Message via the ordinary route
1306
Save a copy of the message with the identifier "xyz"
1304
Strip "(Rxyz)" from the subject line of the messages
1214
Transmit the message via a special network Route

FIG. 13

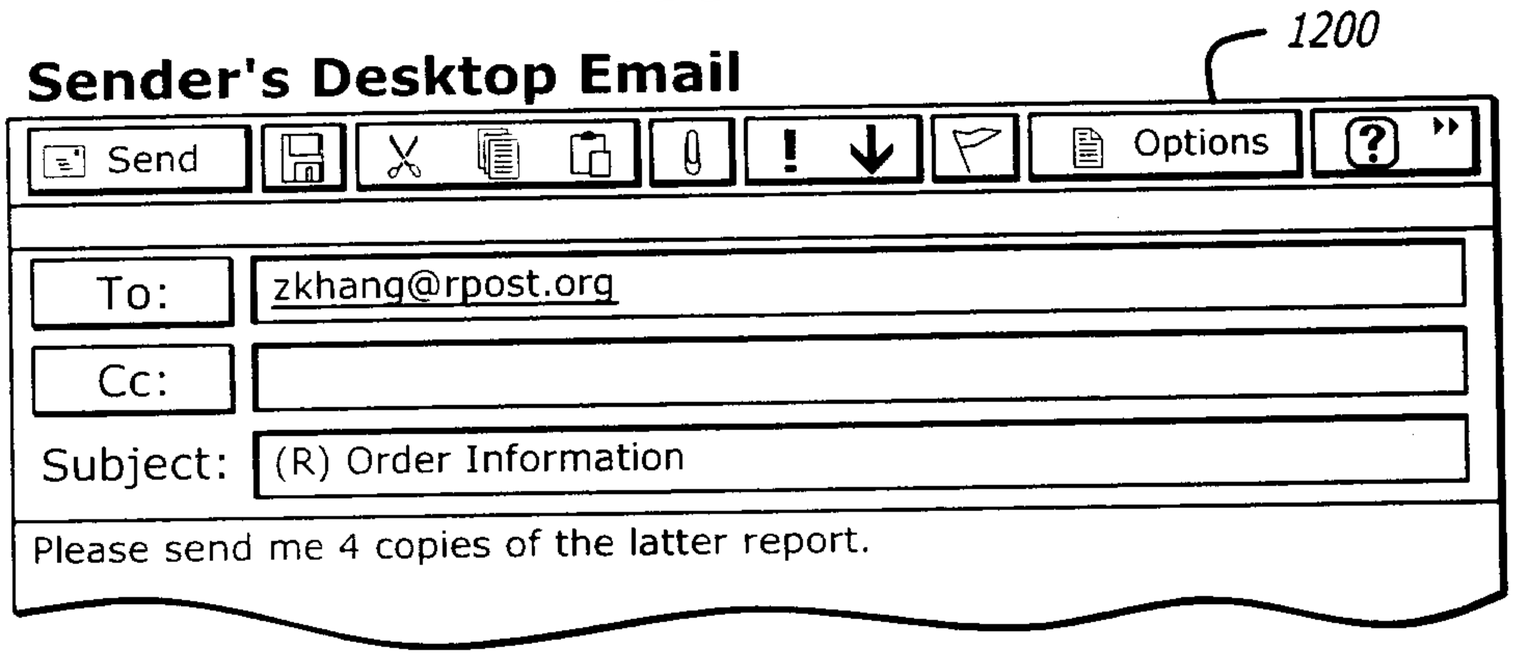
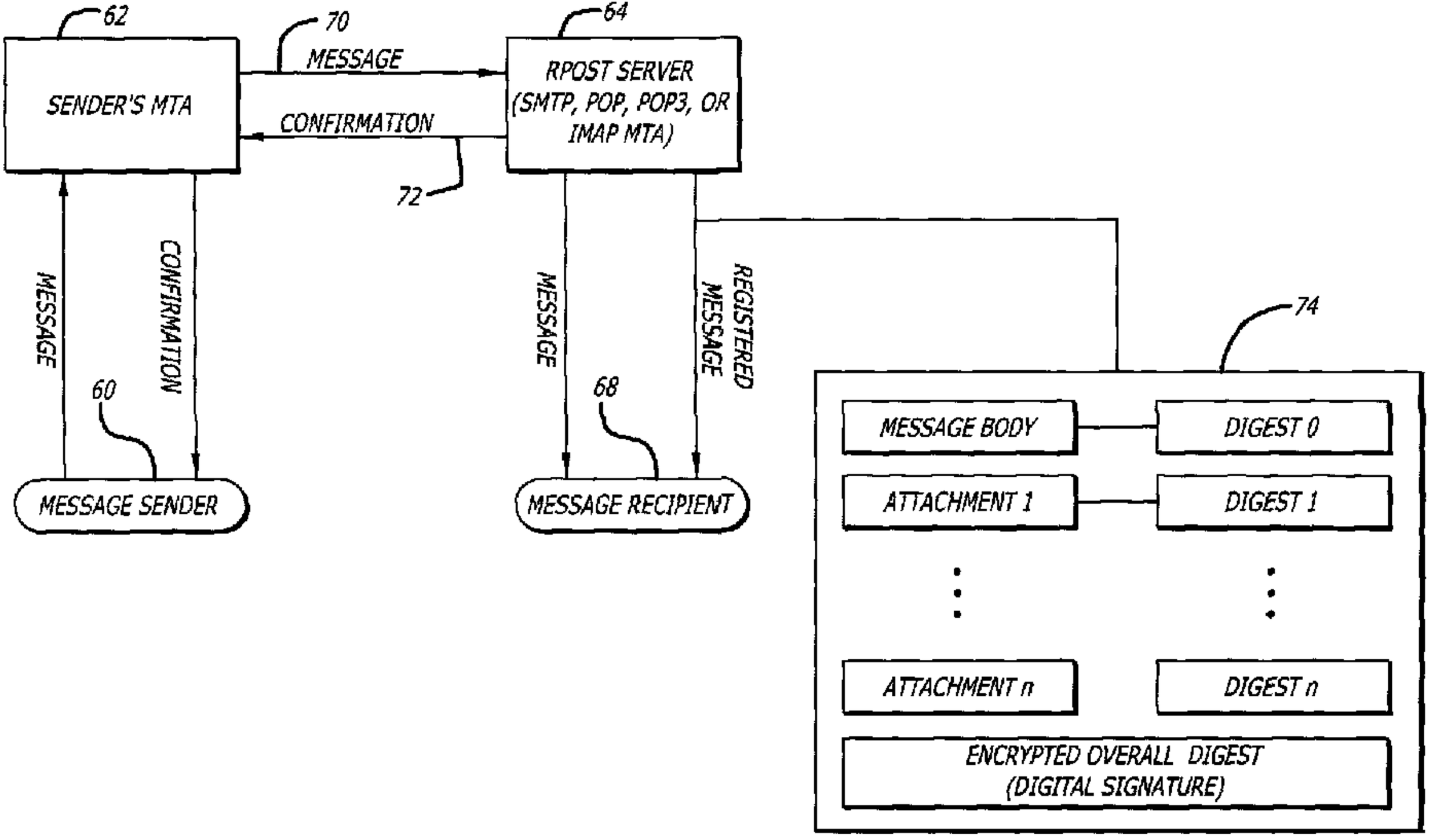

1200
Sender's Desktop Email
Send
Options
To:
zkhang@rpost.org
Cc:
Subject:
(R) Order Information
Please send me 4 copies of the latter report.

FIG. 14


62
70
MESSAGE
64
SENDER'S MTA
RPOST SERVER
(SMTP, POP, POP3, OR
IMAP MTA)
CONFIRMATION
72
MESSAGE
CONFIRMATION
MESSAGE
REGISTERED
MESSAGE
74
60
68
MESSAGE BODY
DIGEST 0
ATTACHMENT 1
DIGEST 1
ATTACHMENT n
DIGEST n
ENCRYPTED OVERALL DIGEST
(DIGITAL SIGNATURE)
MESSAGE SENDER
MESSAGE RECIPIENT