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(12) **United States Patent**
Brunet

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(45) **Date of Patent: Aug. 19, 2025**

(54) **INCENTIVE-BASED ELECTRONIC MESSAGING SYSTEM**

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(73) Assignee: **ADP, Inc.**, Roseland, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 596 days.

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(65) **Prior Publication Data**

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(51) **Int. Cl.**

G06Q 30/0214	(2023.01)
G06Q 20/04	(2012.01)
G06Q 20/16	(2012.01)
G06Q 30/0201	(2023.01)
G06Q 30/0207	(2023.01)
H04L 9/32	(2006.01)
H04W 12/106	(2021.01)
G06Q 20/06	(2012.01)
G06Q 30/0226	(2023.01)

(Continued)

(52) **U.S. Cl.**

CPC ***G06Q 30/0214*** (2013.01); ***G06Q 20/047*** (2020.05); ***G06Q 20/16*** (2013.01); ***G06Q 30/0201*** (2013.01); ***G06Q 30/0215*** (2013.01); ***G06Q 30/0225*** (2013.01); ***H04L 9/3239*** (2013.01); ***H04L 9/3247*** (2013.01); ***H04W 12/106*** (2021.01); *G06Q 20/065* (2013.01); *G06Q 30/0226* (2013.01); *H04L 9/50* (2022.05); *H04L 63/08* (2013.01); *H04L 2209/56* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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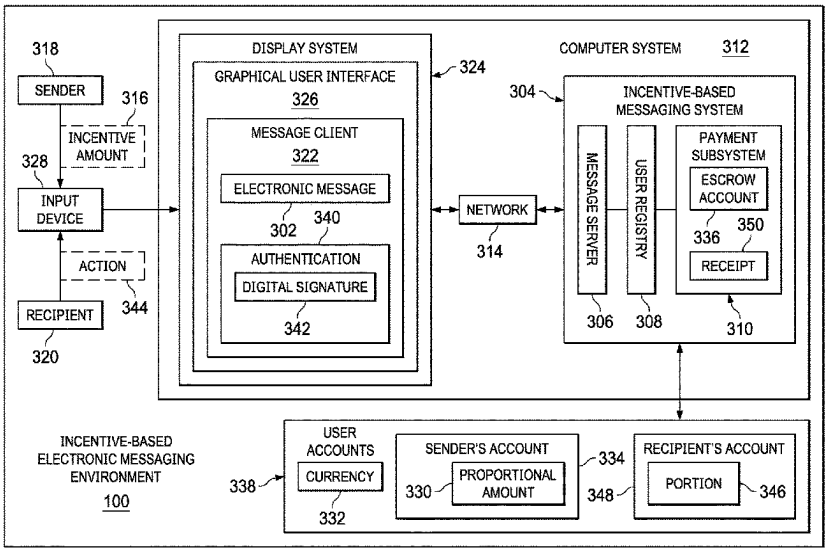
Primary Examiner — Darlene Garcia-Guerra
(74) *Attorney, Agent, or Firm* — Foley & Lardner LLP

(57) **ABSTRACT**

A method, computer system, and computer program product for sending an electronic message using an incentive-based messaging system. The computer system identifies an incentive amount for the electronic message. The computer system reserves a proportional amount of currency from a sender's account. The proportional amount of currency is based on the incentive amount. In response to reserving the proportional amount of currency, the computer system attaches both the incentive amount and an authentication of the incentive amount to the electronic message. The computer system sends the electronic message to a recipient. A portion of the proportional amount of currency is transferred to a recipient's account in response to the recipient performing an action with respect to the electronic message. In response to transferring the portion of the currency to the account of the electronic message recipient, the computer system sends a payment receipt to a sender of the electronic message.

27 Claims, 13 Drawing Sheets



(51) **Int. Cl.**
H04L 9/00 (2022.01)
H04L 9/40 (2022.01)

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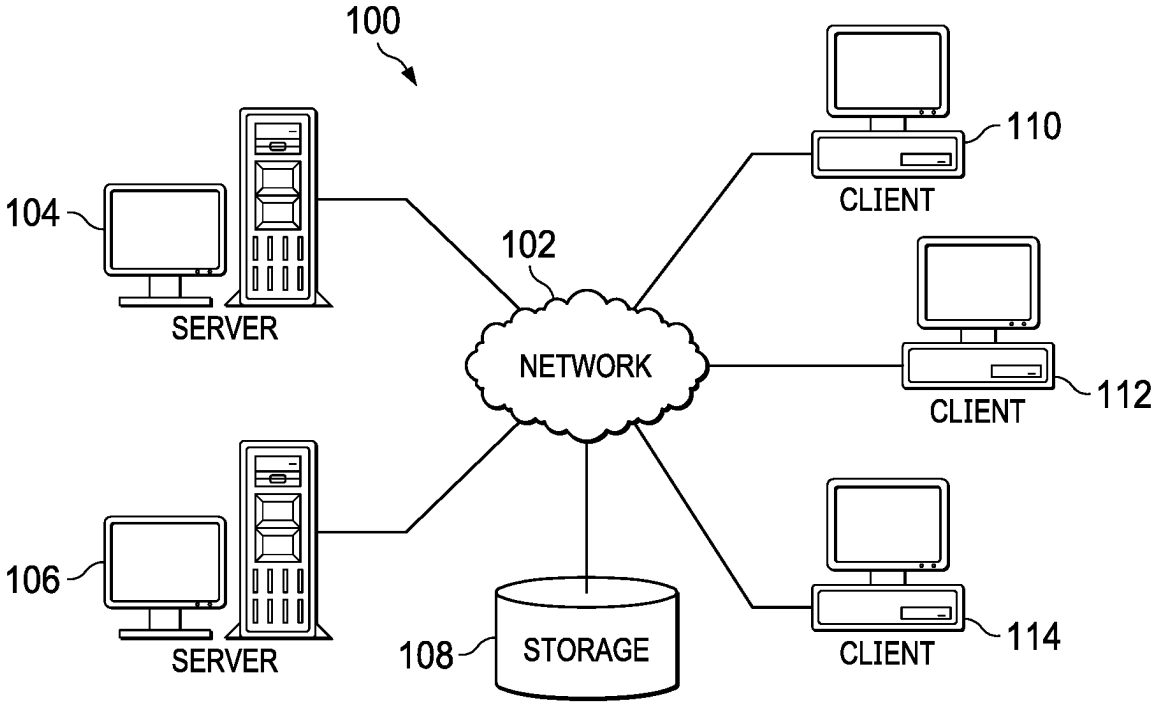
100
104
SERVER
102
NETWORK
110
CLIENT
112
CLIENT
106
SERVER
108
STORAGE
114
CLIENT

FIG. 1

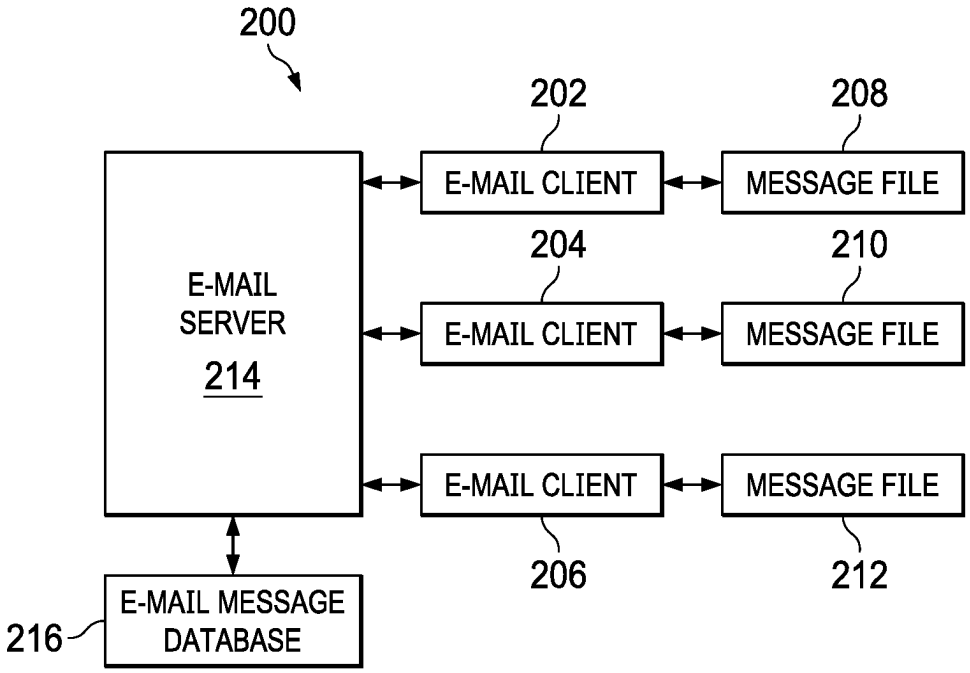
200
202
208
E-MAIL CLIENT
MESSAGE FILE
204
210
E-MAIL SERVER
214
E-MAIL CLIENT
MESSAGE FILE
E-MAIL CLIENT
MESSAGE FILE
206
212
216
E-MAIL MESSAGE DATABASE

FIG. 2

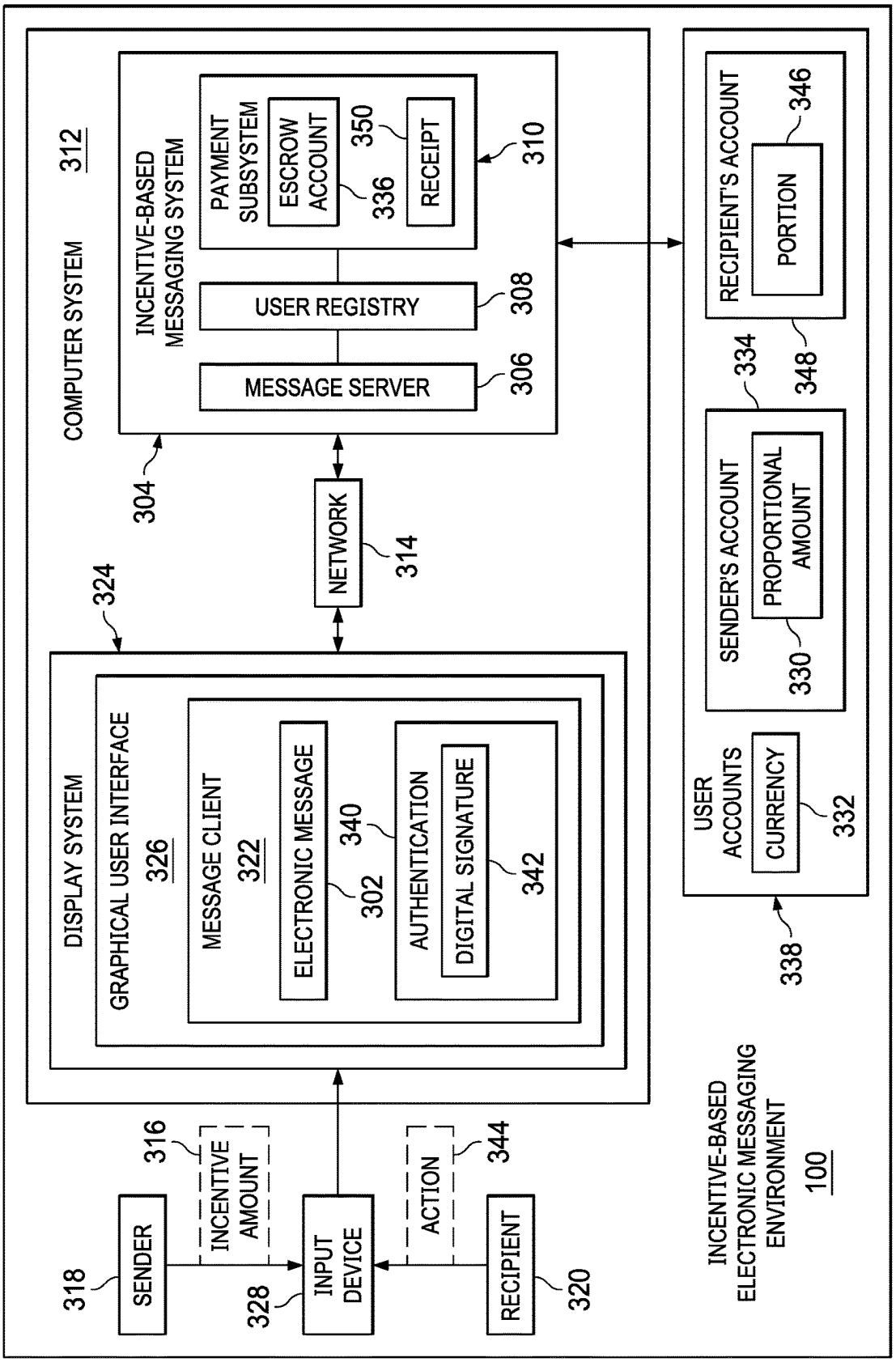
INCENTIVE-BASED ELECTRONIC MESSAGING ENVIRONMENT
100
COMPUTER SYSTEM
312
INCENTIVE-BASED MESSAGING SYSTEM
PAYMENT SUBSYSTEM
ESCROW ACCOUNT
336
350
RECEIPT
310
USER REGISTRY
308
MESSAGE SERVER
306
304
NETWORK
314
324
DISPLAY SYSTEM
GRAPHICAL USER INTERFACE
326
MESSAGE CLIENT
322
ELECTRONIC MESSAGE
302
340
AUTHENTICATION
DIGITAL SIGNATURE
342
USER ACCOUNTS
CURRENCY
332
338
SENDER'S ACCOUNT
334
PROPORTIONAL AMOUNT
330
RECIPIENT'S ACCOUNT
346
PORTION
348
SENDER
318
INCENTIVE AMOUNT
316
INPUT DEVICE
328
ACTION
344
RECIPIENT
320

FIG. 3

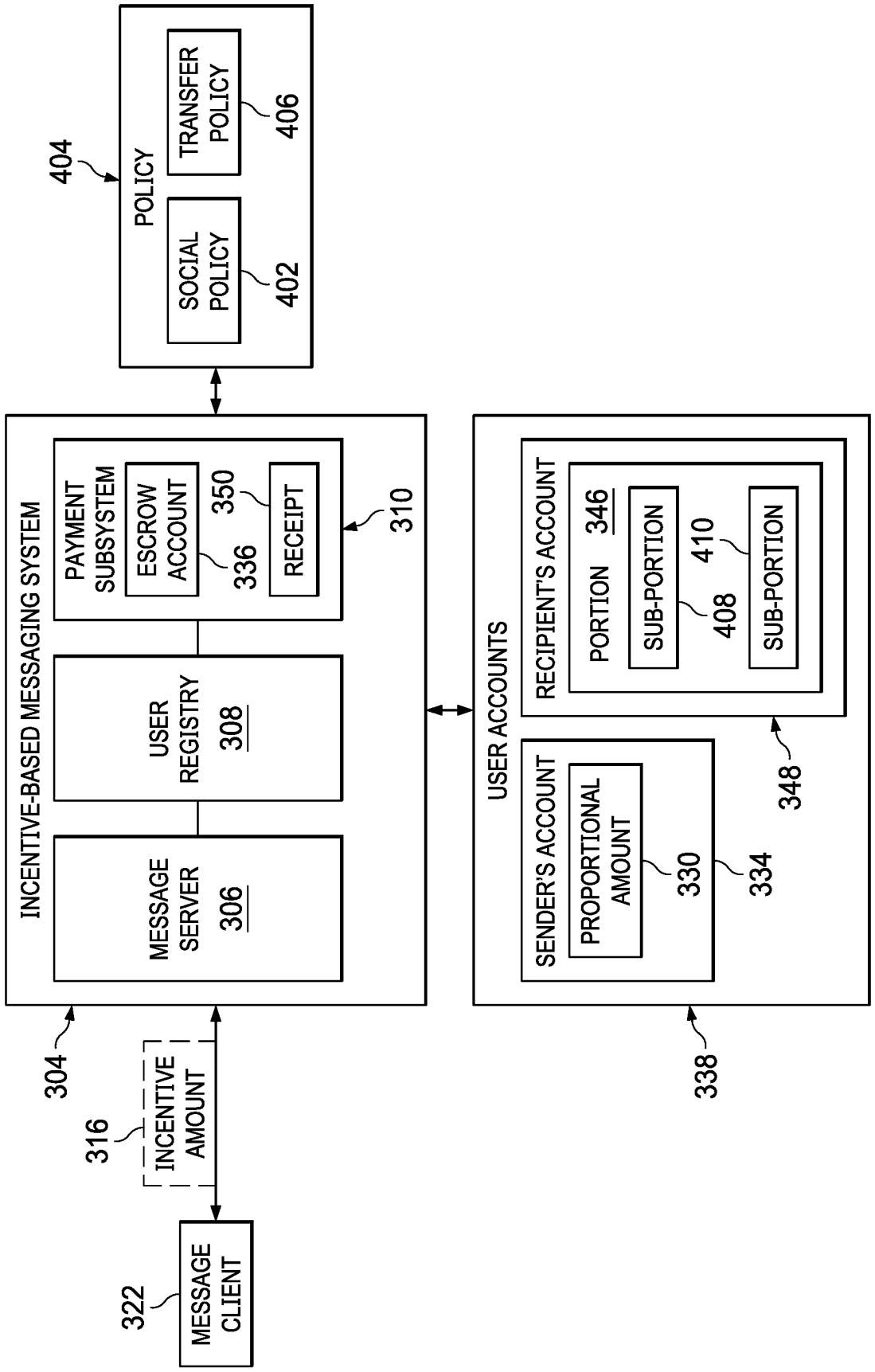
404
POLICY
SOCIAL POLICY
402
TRANSFER POLICY
406
INCENTIVE-BASED MESSAGING SYSTEM
PAYMENT SUBSYSTEM
ESCROW ACCOUNT
336
350
RECEIPT
310
USER REGISTRY
308
MESSAGE SERVER
306
304
316
INCENTIVE AMOUNT
322
MESSAGE CLIENT
USER ACCOUNTS
SENDER'S ACCOUNT
PROPORTIONAL AMOUNT
330
334
RECIPIENT'S ACCOUNT
PORTION
346
SUB-PORTION
408
410
SUB-PORTION
348
338

FIG. 4

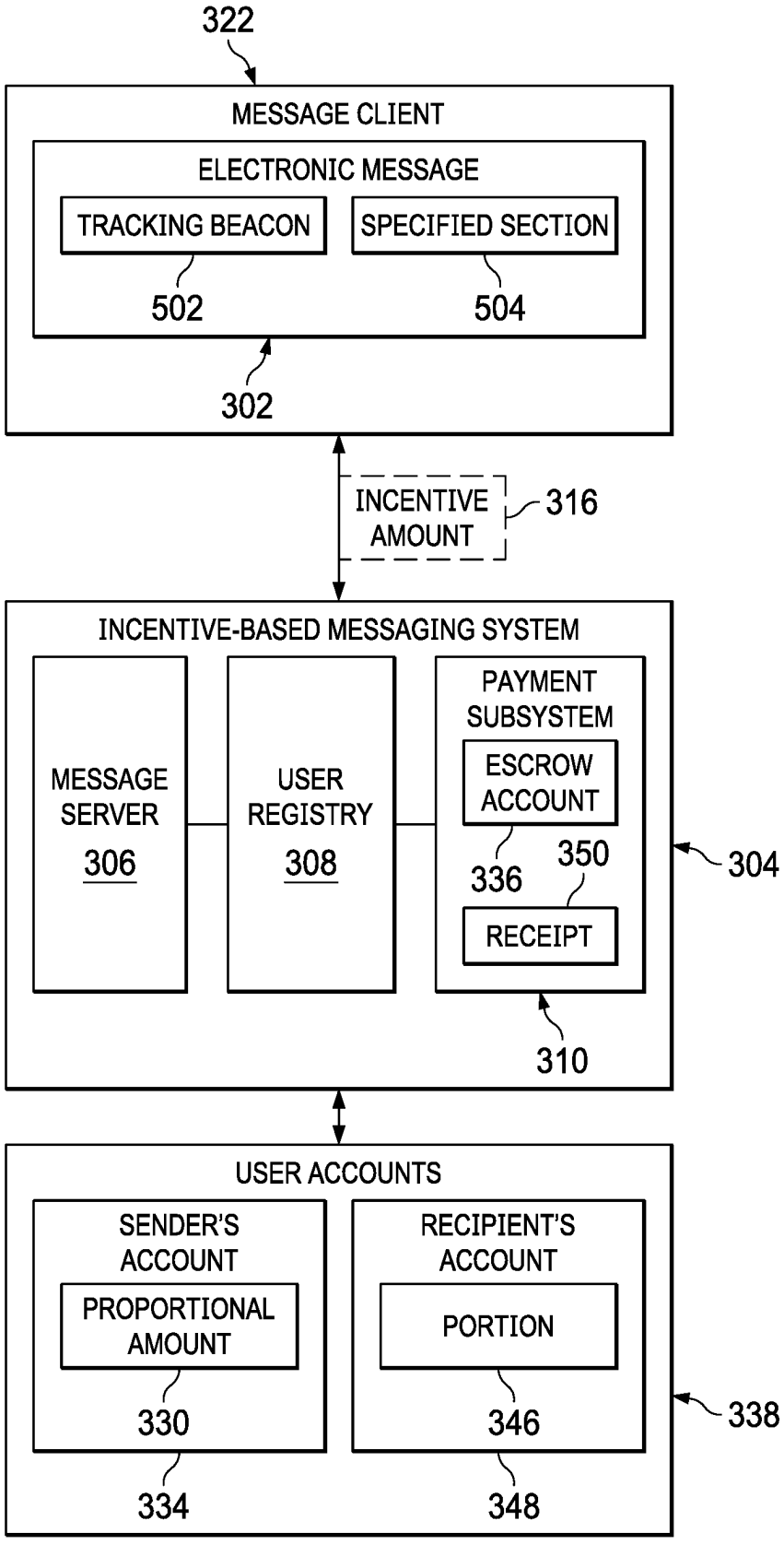
322
MESSAGE CLIENT
ELECTRONIC MESSAGE
TRACKING BEACON
SPECIFIED SECTION
502
504
302
INCENTIVE AMOUNT
316
INCENTIVE-BASED MESSAGING SYSTEM
MESSAGE SERVER
306
USER REGISTRY
308
PAYMENT SUBSYSTEM
ESCROW ACCOUNT
336
350
RECEIPT
304
310
USER ACCOUNTS
SENDER'S ACCOUNT
PROPORTIONAL AMOUNT
330
334
RECIPIENT'S ACCOUNT
PORTION
346
348
338

FIG. 5

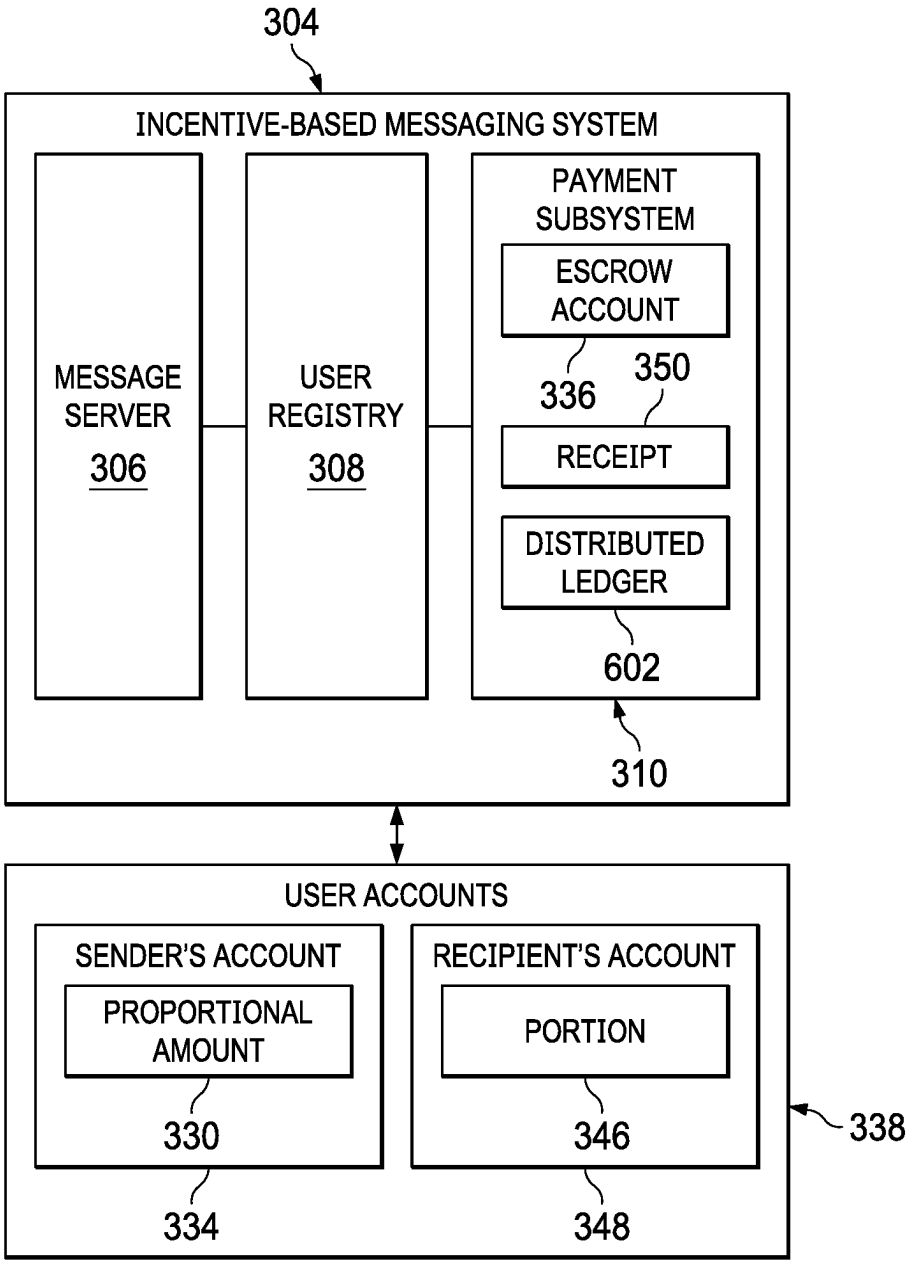
304
INCENTIVE-BASED MESSAGING SYSTEM
MESSAGE SERVER
306
USER REGISTRY
308
PAYMENT SUBSYSTEM
ESCROW ACCOUNT
336
350
RECEIPT
DISTRIBUTED LEDGER
602
310
USER ACCOUNTS
SENDER'S ACCOUNT
PROPORTIONAL AMOUNT
330
334
RECIPIENT'S ACCOUNT
PORTION
346
348
338

FIG. 6

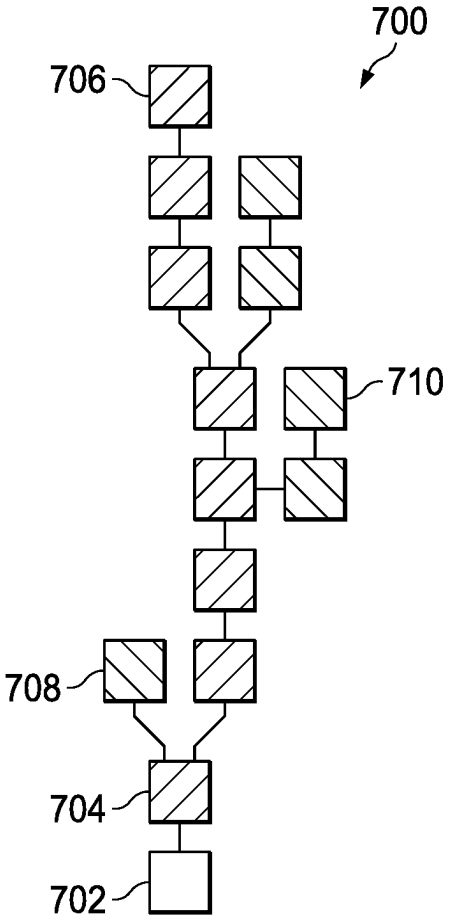

FIG. 7

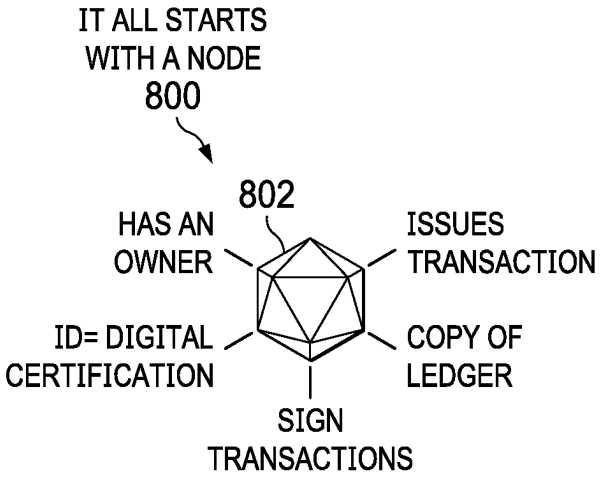

FIG. 8

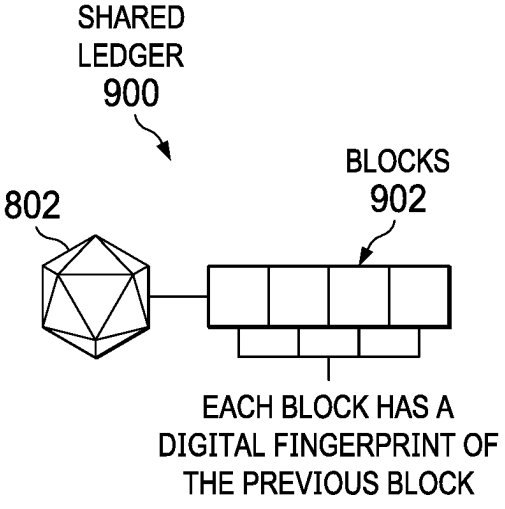

FIG. 9

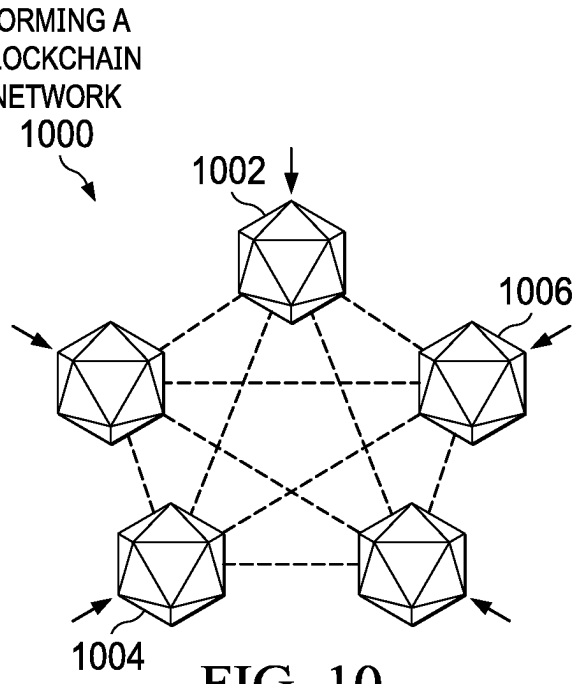
FORMING A
BLOCKCHAIN
NETWORK
1000
1002
1006
1004

FIG. 10

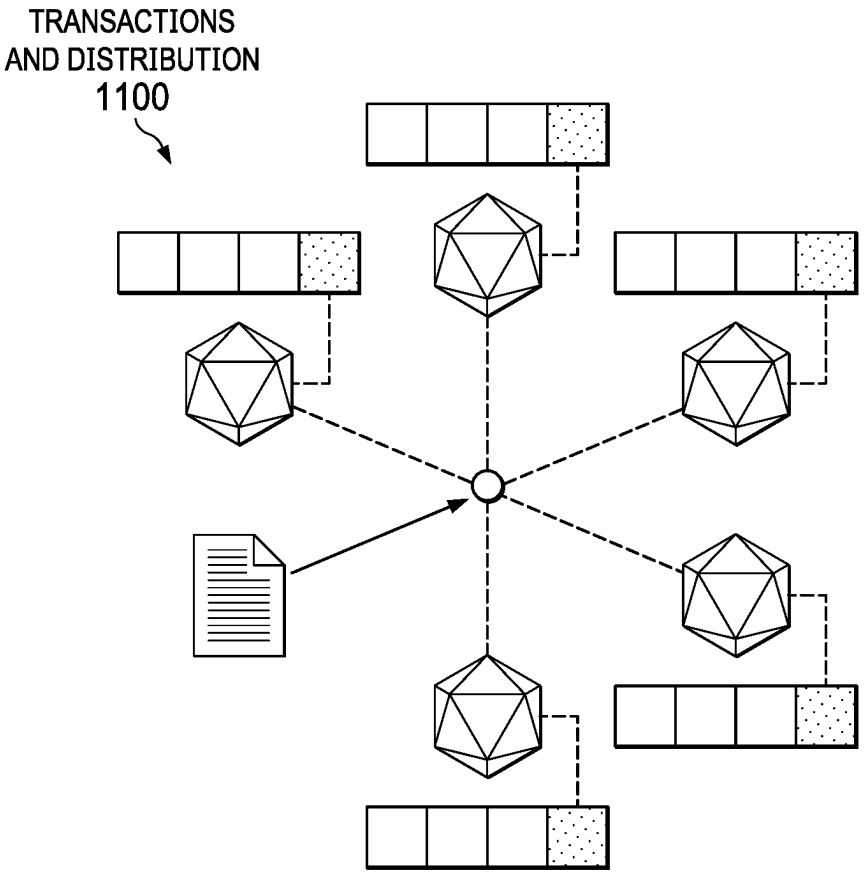
TRANSACTIONS
AND DISTRIBUTION
1100

FIG. 11

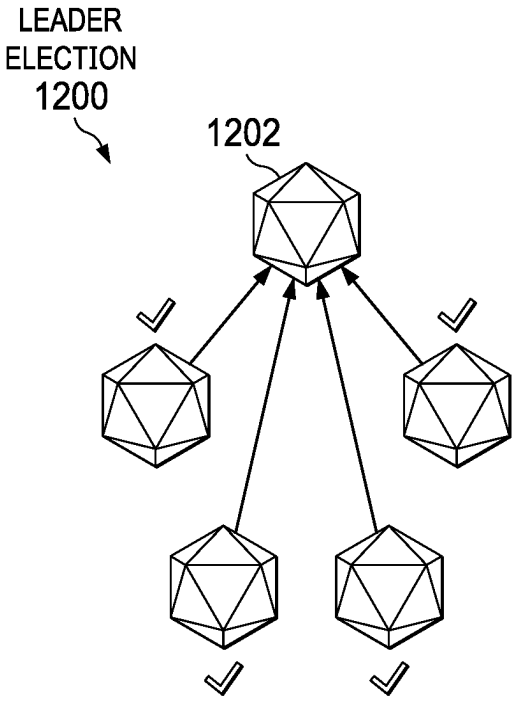
LEADER
ELECTION
1200
1202

FIG. 12

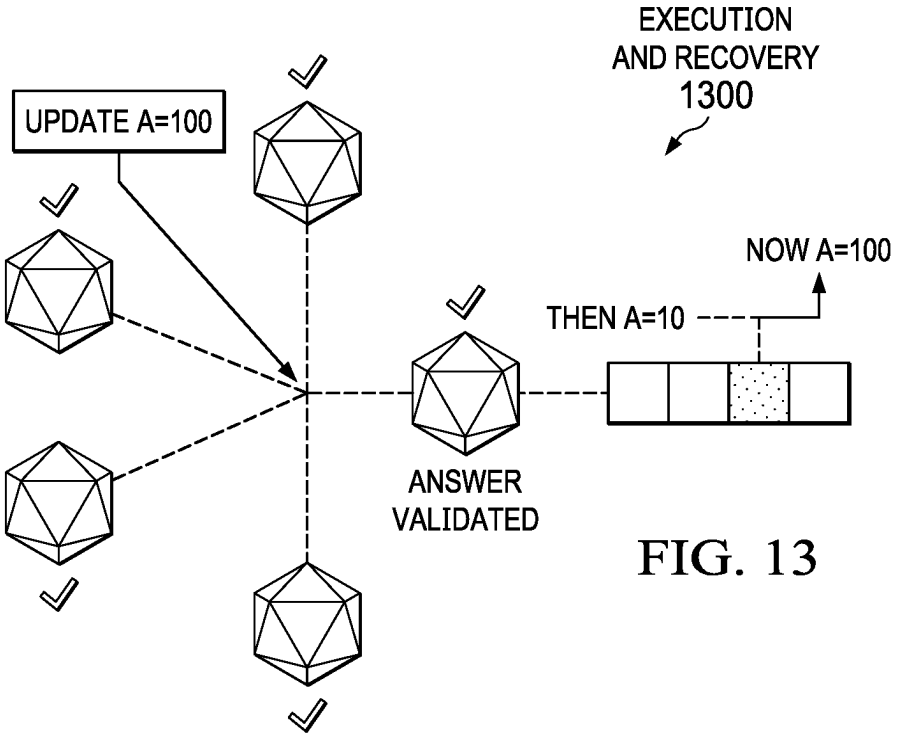
EXECUTION
AND RECOVERY
1300
UPDATE A=100
NOW A=100
THEN A=10
ANSWER
VALIDATED

FIG. 13

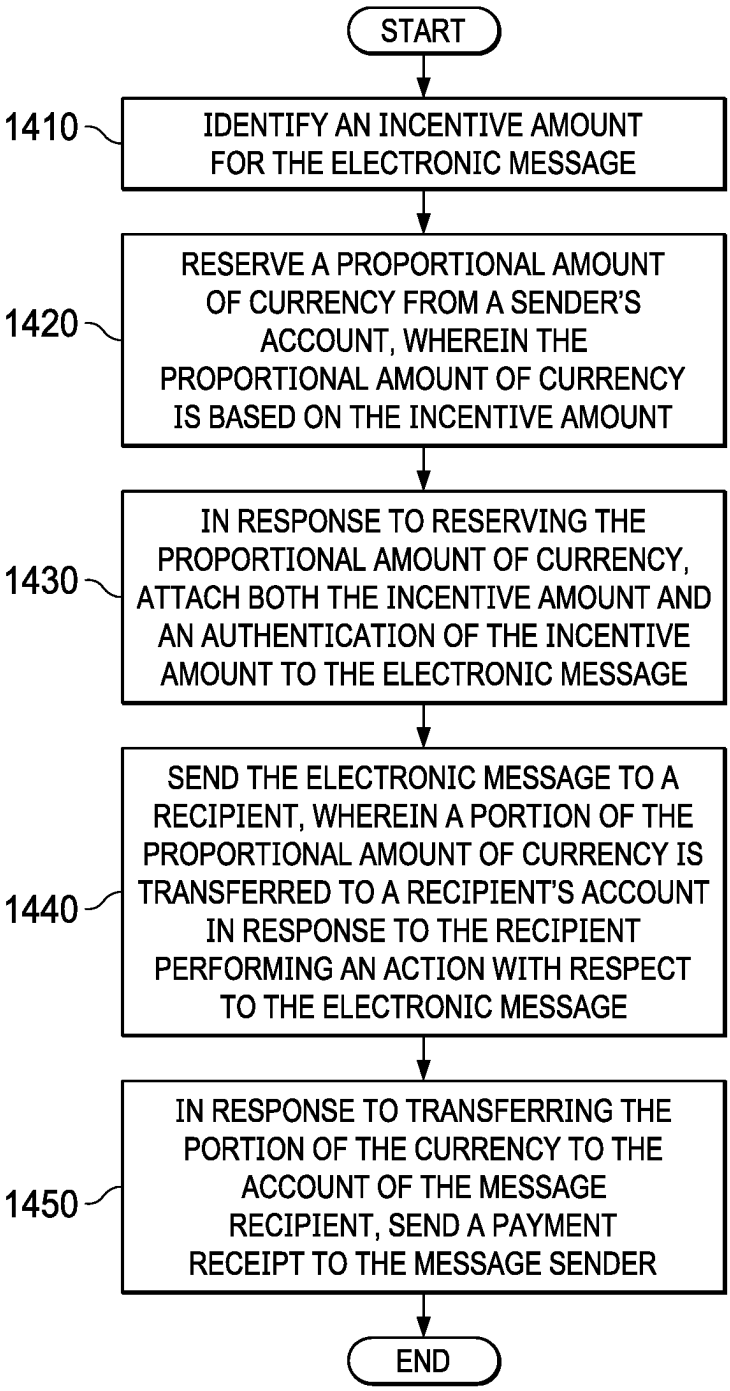
START
1410
IDENTIFY AN INCENTIVE AMOUNT FOR THE ELECTRONIC MESSAGE
1420
RESERVE A PROPORTIONAL AMOUNT OF CURRENCY FROM A SENDER'S ACCOUNT, WHEREIN THE PROPORTIONAL AMOUNT OF CURRENCY IS BASED ON THE INCENTIVE AMOUNT
1430
IN RESPONSE TO RESERVING THE PROPORTIONAL AMOUNT OF CURRENCY, ATTACH BOTH THE INCENTIVE AMOUNT AND AN AUTHENTICATION OF THE INCENTIVE AMOUNT TO THE ELECTRONIC MESSAGE
1440
SEND THE ELECTRONIC MESSAGE TO A RECIPIENT, WHEREIN A PORTION OF THE PROPORTIONAL AMOUNT OF CURRENCY IS TRANSFERRED TO A RECIPIENT'S ACCOUNT IN RESPONSE TO THE RECIPIENT PERFORMING AN ACTION WITH RESPECT TO THE ELECTRONIC MESSAGE
1450
IN RESPONSE TO TRANSFERRING THE PORTION OF THE CURRENCY TO THE ACCOUNT OF THE MESSAGE RECIPIENT, SEND A PAYMENT RECEIPT TO THE MESSAGE SENDER
END

FIG. 14

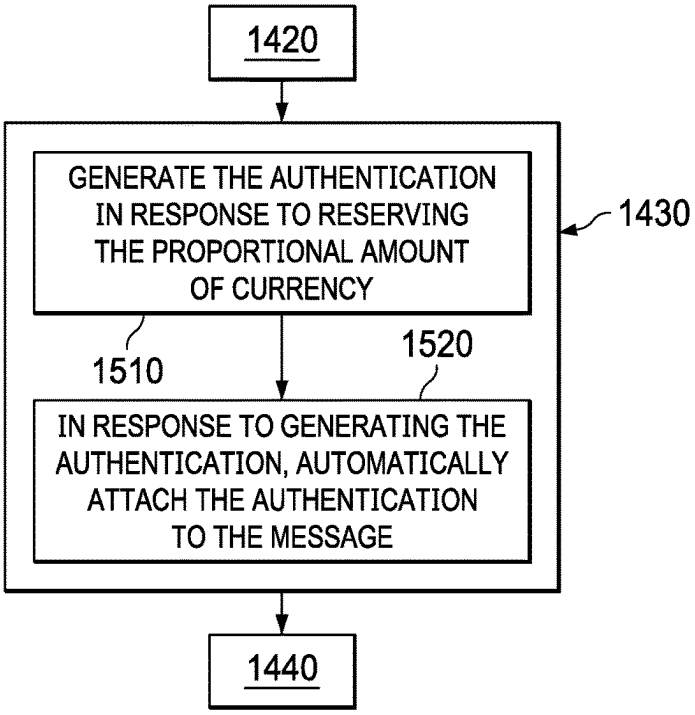
1420
GENERATE THE AUTHENTICATION IN RESPONSE TO RESERVING THE PROPORTIONAL AMOUNT OF CURRENCY
1430
1510
1520
IN RESPONSE TO GENERATING THE AUTHENTICATION, AUTOMATICALLY ATTACH THE AUTHENTICATION TO THE MESSAGE
1440

FIG. 15

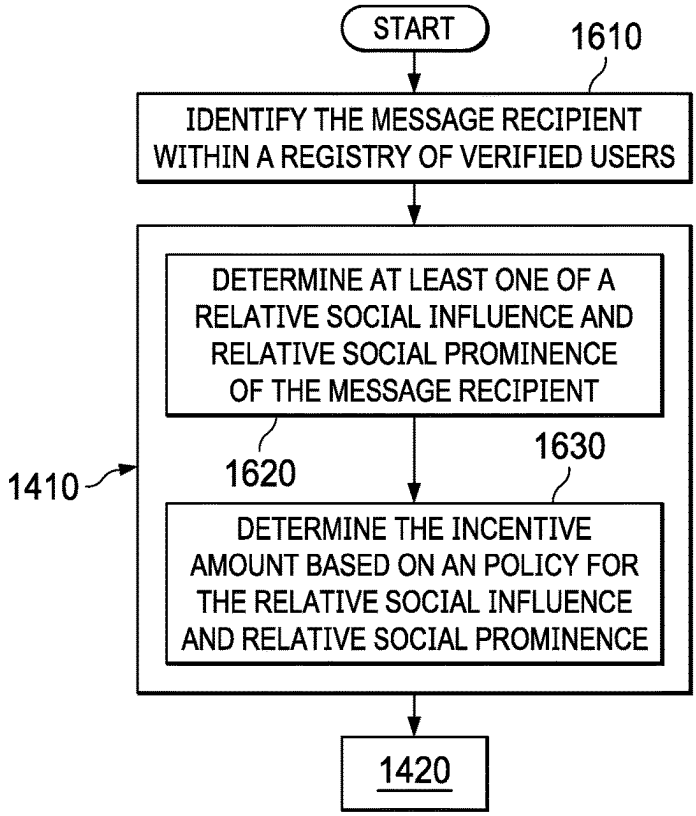
START
1610
IDENTIFY THE MESSAGE RECIPIENT WITHIN A REGISTRY OF VERIFIED USERS
DETERMINE AT LEAST ONE OF A RELATIVE SOCIAL INFLUENCE AND RELATIVE SOCIAL PROMINENCE OF THE MESSAGE RECIPIENT
1410
1620
1630
DETERMINE THE INCENTIVE AMOUNT BASED ON AN POLICY FOR THE RELATIVE SOCIAL INFLUENCE AND RELATIVE SOCIAL PROMINENCE
1420

FIG. 16

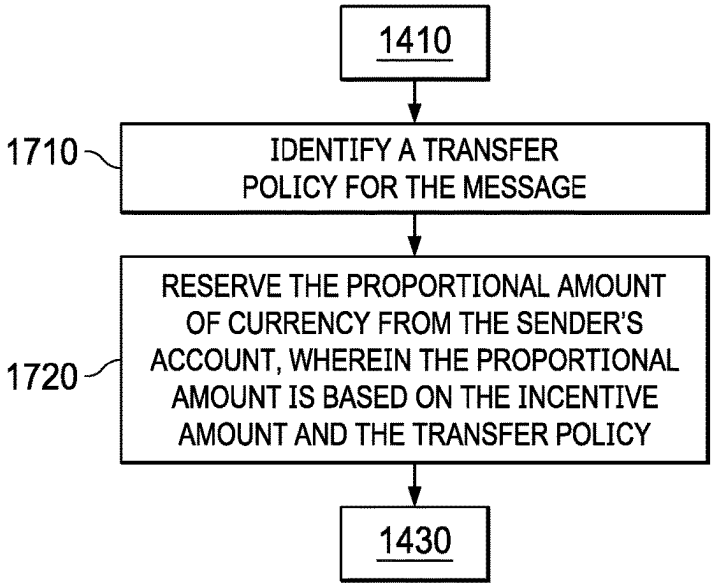
1410
1710
IDENTIFY A TRANSFER POLICY FOR THE MESSAGE
RESERVE THE PROPORTIONAL AMOUNT OF CURRENCY FROM THE SENDER'S ACCOUNT, WHEREIN THE PROPORTIONAL AMOUNT IS BASED ON THE INCENTIVE AMOUNT AND THE TRANSFER POLICY
1720
1430

FIG. 17

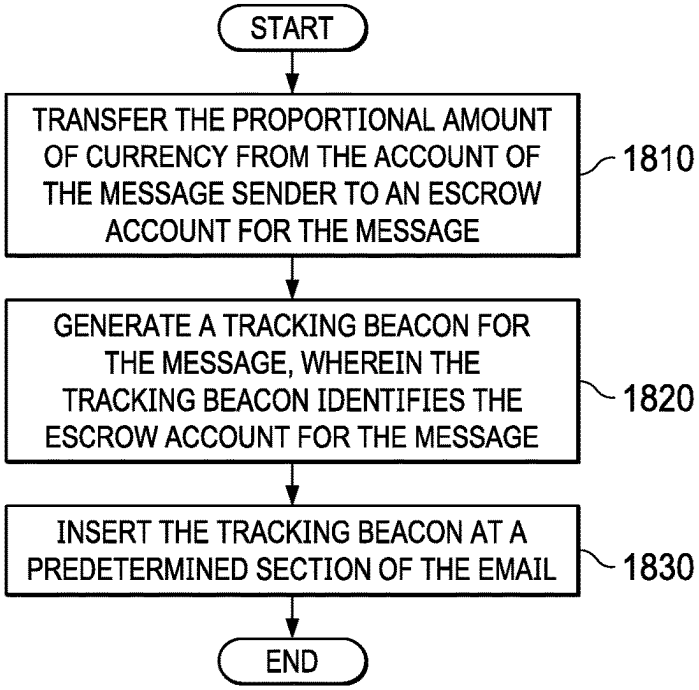
START
TRANSFER THE PROPORTIONAL AMOUNT OF CURRENCY FROM THE ACCOUNT OF THE MESSAGE SENDER TO AN ESCROW ACCOUNT FOR THE MESSAGE
1810
GENERATE A TRACKING BEACON FOR THE MESSAGE, WHEREIN THE TRACKING BEACON IDENTIFIES THE ESCROW ACCOUNT FOR THE MESSAGE
1820
INSERT THE TRACKING BEACON AT A PREDETERMINED SECTION OF THE EMAIL
1830
END

FIG. 18

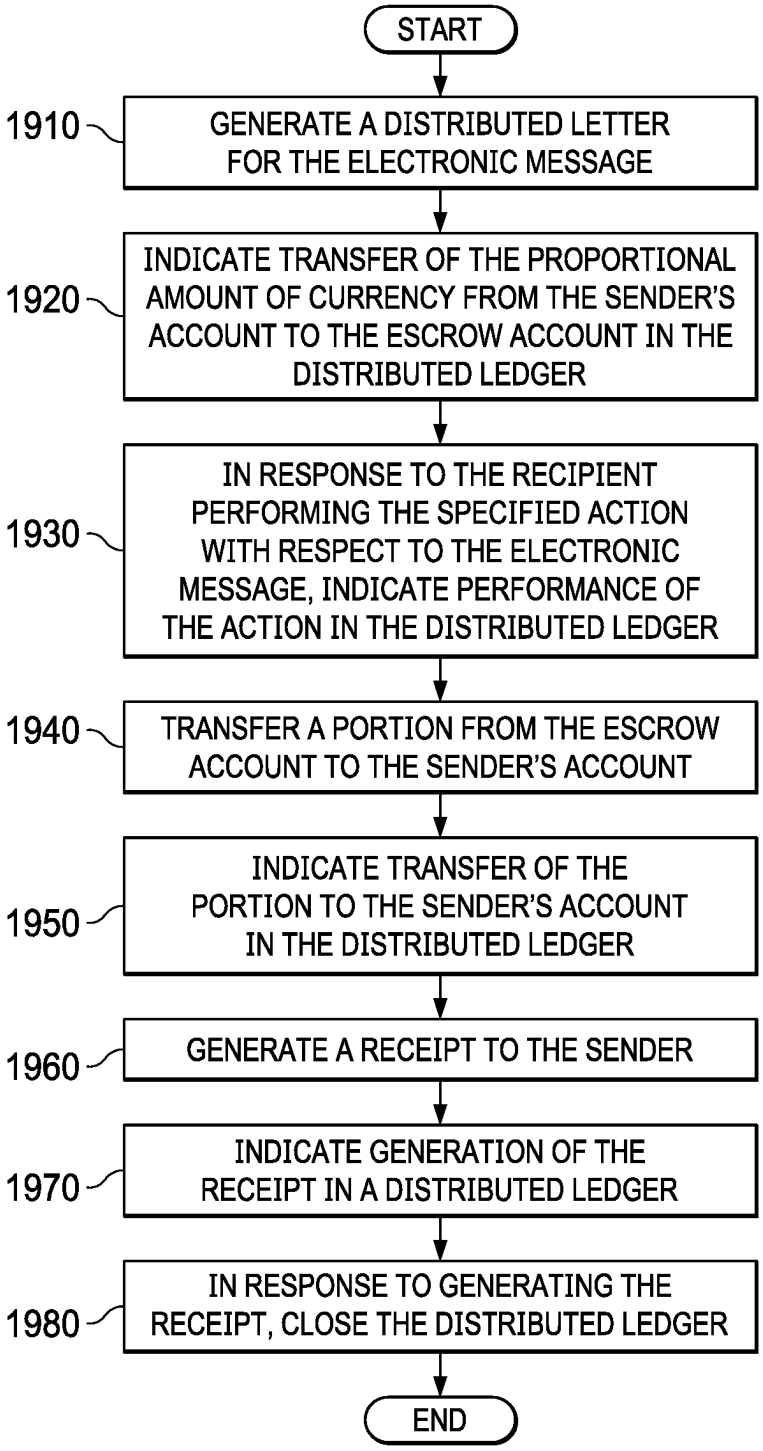
START
1910
GENERATE A DISTRIBUTED LETTER FOR THE ELECTRONIC MESSAGE
1920
INDICATE TRANSFER OF THE PROPORTIONAL AMOUNT OF CURRENCY FROM THE SENDER'S ACCOUNT TO THE ESCROW ACCOUNT IN THE DISTRIBUTED LEDGER
1930
IN RESPONSE TO THE RECIPIENT PERFORMING THE SPECIFIED ACTION WITH RESPECT TO THE ELECTRONIC MESSAGE, INDICATE PERFORMANCE OF THE ACTION IN THE DISTRIBUTED LEDGER
1940
TRANSFER A PORTION FROM THE ESCROW ACCOUNT TO THE SENDER'S ACCOUNT
1950
INDICATE TRANSFER OF THE PORTION TO THE SENDER'S ACCOUNT IN THE DISTRIBUTED LEDGER
1960
GENERATE A RECEIPT TO THE SENDER
1970
INDICATE GENERATION OF THE RECEIPT IN A DISTRIBUTED LEDGER
1980
IN RESPONSE TO GENERATING THE RECEIPT, CLOSE THE DISTRIBUTED LEDGER
END

FIG. 19

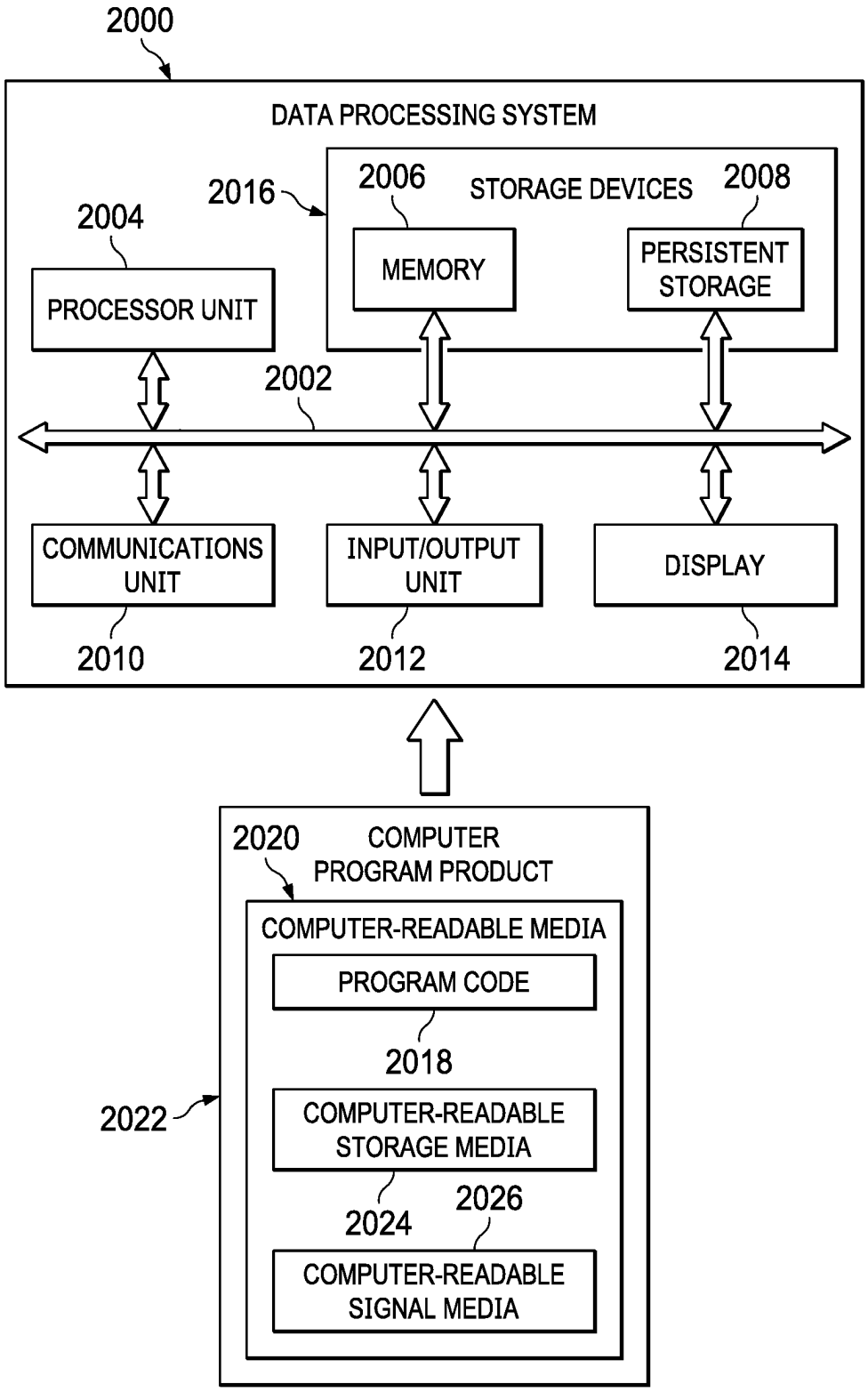
2000
DATA PROCESSING SYSTEM
2016
2006
STORAGE DEVICES
2008
2004
MEMORY
PERSISTENT STORAGE
PROCESSOR UNIT
2002
COMMUNICATIONS UNIT
INPUT/OUTPUT UNIT
DISPLAY
2010
2012
2014
2020
COMPUTER PROGRAM PRODUCT
COMPUTER-READABLE MEDIA
PROGRAM CODE
2018
2022
COMPUTER-READABLE STORAGE MEDIA
2024
2026
COMPUTER-READABLE SIGNAL MEDIA

FIG. 20

INCENTIVE-BASED ELECTRONIC MESSAGING SYSTEM

BACKGROUND INFORMATION

1. Field

The present disclosure relates to an improved computer system and, in particular, to a method and apparatus for an electronic messaging system using an incentive-based messaging system. Still more particularly, the present disclosure relates to a method and apparatus for an electronic messaging system that uses incentive-based messaging.

2. Background

The Internet is a global network of computers and networks joined together by gateways that handle data transfer and the conversion of messages from a protocol of a sending network to a protocol used by a receiving network. On the Internet, any computer may communicate with any other computer. Information between computers travels over the Internet through a variety of languages also referred to as protocols. The set of protocols used on the Internet is called the Transmission Control Protocol/Internet Protocol (TCP/IP).

The Internet has revolutionized communications and commerce as well as being a source of information and entertainment. For many users, e-mail is a widely used format to communicate over the Internet. It is commonplace for users to send e-mail messages to other users through the Internet.

The use of e-mail messages is commonplace for personal and business use. E-mail messages are used by individuals to keep in touch with and communicate with other users. Additionally, e-mail messages provide a medium to collaborate and exchange documents. E-mail also provides a convenient channel for businesses to circulate advertisements, offers, incentives, and other communications to potential and existing clients.

Current electronic messages can be broadly categorized into one of two categories: 1) unsolicited e-mail or text; and 2) e-mail or text from known parties. Unfortunately for businesses, unsolicited electronic messages often go unseen by potential customers.

Users typically view unsolicited messages as undesirable clutter or garbage. Due to the proliferation of unsolicited messages, as well as the dangers posed by hidden viruses or unsafe executables, the majority of these unsolicited messages are discarded, regardless of their potential value to the recipient.

SUMMARY

An embodiment of the present disclosure provides a method for sending an electronic message using an incentive-based messaging system. The method comprises identifying, by a computer system, an incentive amount for the electronic message. The method further comprises reserving, by the computer system, a proportional amount of currency from a sender's account. The proportional amount of currency is based on the incentive amount. The method further comprises, in response to reserving the proportional amount of currency, attaching, by the computer system, both the incentive amount and an authentication of the incentive amount to the electronic message. The method further comprises sending the electronic message to a recipient. A portion of the proportional amount of currency is transferred to a recipient account in response to the recipient performing an action with respect to the electronic message. The method further includes, in response to transferring the portion of the currency to the recipient account, sending, by the computer system, a payment receipt to a sender of the electronic message.

Another embodiment of the present disclosure provides a computer system comprising a hardware processor and an incentive-based messaging system in communication with the hardware processor. The incentive-based messaging system is configured to identify and incentive amount for the electronic message. The incentive-based messaging system is further configured to reserve a proportional amount of currency from a sender's account. The proportional amount of currency is based on the incentive amount. The incentive-based messaging system is further configured to attach both the incentive amount and an authentication of the incentive amount to the electronic message in response to reserving the proportional amount of currency. The incentive-based messaging system is further configured to send the electronic message to a recipient. A portion of the proportional amount of currency is transferred to a recipient's account in response to the recipient performing an action with respect to the electronic message. The incentive-based messaging system is further configured to send a payment receipt to a sender of the electronic message in response to transferring the portion of the currency to the recipient account.

Yet another embodiment of the present disclosure provides a computer program product for sending an electronic message using an incentive-based messaging system. The computer program product comprises a computer readable storage media. Further, the computer program product comprises first program code, stored on the computer readable storage media, for reserving a proportional amount of currency from a sender's account. The proportional amount of currency is based on the incentive amount. Yet further, the computer program product comprises second program code, stored on the computer readable storage media, attaching both the incentive amount and an authentication of the incentive amount to the electronic message in response to reserving the proportional amount of currency. Still further, the computer program product comprises third program code, stored on the computer readable storage media, for sending the electronic message to a recipient. A portion of the proportional amount of currency is transferred to a recipient's account in response to the recipient performing an action with respect to the electronic message. Still yet further, the computer program product comprises fourth program code, stored on the computer readable storage media, for sending a payment receipt to a sender of the electronic message in response to transferring the portion of the currency to the recipient's account.

The features and functions can be achieved independently in various embodiments of the present disclosure or may be combined in yet other embodiments in which further details can be seen with reference to the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the illustrative embodiments are set forth in the appended claims. The illustrative embodiments, however, as well as a preferred mode of use, further objectives, and features thereof, will best be understood by reference to the following detailed

description of an illustrative embodiment of the present disclosure when read in conjunction with the accompanying drawings, wherein:

FIG. **1** is an illustration of a diagram of a network data processing environment in accordance with an illustrative embodiment;

FIG. **2** is an illustration of a block diagram of an e-mail messaging system in accordance with an illustrative embodiment;

FIG. **3** is an illustration of a block diagram of an incentive-based electronic messaging environment in accordance with an illustrative embodiment;

FIG. **4** is an illustration of a block diagram of a data flow for identifying an incentive according to an incentive policy in accordance with an illustrative embodiment;

FIG. **5** is an illustration of a block diagram of a data flow for tracking a user's acceptance of an incentive in accordance with an illustrative embodiment;

FIG. **6** is an illustration of a block diagram of a data flow for managing message incentives and tracking a user's acceptance of an incentive in a distributed ledger in accordance with an illustrative embodiment;

FIG. **7** is an illustration of a block diagram of a distributed ledger in the form of a blockchain in accordance with an illustrative embodiment;

FIG. **8** is an illustration of a block diagram illustrating a first step in creating a blockchain in accordance with an illustrative embodiment;

FIG. **9** is an illustration of a block diagram illustrating a second step in creating a blockchain in accordance with an illustrative embodiment;

FIG. **10** is an illustration of a block diagram illustrating a third step in creating a blockchain in accordance with an illustrative embodiment;

FIG. **11** is an illustration of a block diagram illustrating a fourth step in creating a blockchain in accordance with an illustrative embodiment;

FIG. **12** is an illustration of a block diagram illustrating a fifth step in creating a blockchain in accordance with an illustrative embodiment;

FIG. **13** is an illustration of a block diagram illustrating a sixth step in creating a blockchain in accordance with an illustrative embodiment;

FIG. **14** is an illustration of a flowchart of a process for sending an electronic message using an incentive-based messaging system in accordance with an illustrative embodiment;

FIG. **15** is an illustration of a flowchart of a process for attaching an authentication of an incentive amount to an electronic message in accordance with an illustrative embodiment;

FIG. **16** is an illustration of a flowchart of a process for identifying an incentive amount for an electronic message in accordance with an illustrative embodiment;

FIG. **17** is an illustration of a flowchart of a process for identifying conditions placed on a performance of actions by a message recipient of an electronic message in accordance with an illustrative embodiment;

FIG. **18** is an illustration of a flowchart of a process for tracking a user's acceptance of an incentive in accordance with an illustrative embodiment;

FIG. **19** is an illustration of a flowchart of a process for managing message incentives and tracking a user's acceptance of an incentive in a distributed ledger in accordance with an illustrative embodiment; and

FIG. **20** is an illustration of a block diagram of a data processing system in accordance with an illustrative embodiment.

DETAILED DESCRIPTION

The illustrative embodiments recognize and take into account one or more different considerations. For example, the illustrative embodiments recognize and take into account that existing e-mail systems may not be as effective as desired at distributing relevant content to a user.

For example, users typically view unsolicited messages as undesirable clutter or garbage. Due to the proliferation of unsolicited messages, as well as the dangers posed by hidden viruses or unsafe executables, the majority of these unsolicited messages are discarded, regardless of their potential value to the recipient.

Thus, the illustrative embodiments provide a method, an apparatus, and a computer program product for sending an electronic message using an incentive-based messaging system. In one illustrative example, a computer system that includes an incentive-based messaging system identifies an incentive amount for the electronic message. The computer system reserves a proportional amount of currency from a sender's account. The proportional amount of currency is based on the incentive amount. In response to reserving the proportional amount of currency, the computer system attaches both the incentive amount and an authentication of the incentive amount to the electronic message. The computer system sends the electronic message to a recipient. A portion of the proportional amount of currency is transferred to a recipient's account in response to the recipient performing an action with respect to the electronic message. In response to transferring the portion of the currency to the account of the electronic message recipient, the computer system sends a payment receipt to a sender of the electronic message.

With reference now to the figures and, in particular, with reference to FIG. **1**, an illustration of a diagram of a data processing environment is depicted in accordance with an illustrative embodiment. It should be appreciated that FIG. **1** is only provided as an illustration of one implementation and is not intended to imply any limitation with regard to the environments in which different embodiments may be implemented. Many modifications to the depicted environments may be made.

FIG. **1** depicts a pictorial representation of a network of data processing systems in which illustrative embodiments may be implemented. Network data processing system **100** is a network of computers in which the illustrative embodiments may be implemented. Network data processing system **100** contains network **102**, which is the medium used to provide communications links between various devices and computers connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables.

In the depicted example, server computer **104** and server computer **106** connect to network **102** along with storage unit **108**. In addition, client computers **110**, **112**, and **114** connect to network **102**. Client computers **110**, **112**, and **114** may be, for example, personal computers or network computers. In the depicted example, server computer **104** provides information, such as boot files, operating system images, and applications to client computers **110**, **112**, and **114**. Client computers **110**, **112**, and **114** are clients to server computer **104** in this example. Network data processing

system **100** may include additional server computers, client computers, and other devices not shown.

Program code located in network data processing system **100** may be stored on a computer recordable storage medium and downloaded to a data processing system or other device for use. For example, program code may be stored on a computer recordable storage medium on server computer **104** and downloaded to client computer **110** over network **102** for use on client computer **110**.

In the depicted example, network data processing system **100** is the Internet with network **102** representing a worldwide collection of networks and gateways that use the Transmission Control Protocol/Internet Protocol (TCP/IP) suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers consisting of thousands of commercial, governmental, educational, and other computer systems that route data and messages. Of course, network data processing system **100** also may be implemented as a number of different types of networks, such as, for example, an intranet, a local area network (LAN), or a wide area network (WAN). FIG. **1** is intended as an example, and not as an architectural limitation for the different illustrative embodiments.

Turning now to FIG. **2**, an illustration of a block diagram illustrating an e-mail messaging system is depicted in accordance with an illustrative embodiment. In this example, e-mail messaging system **200** includes e-mail client **202**, e-mail client **204**, and e-mail client **206**, which are programs or applications located at different client data processing systems, such as client computer **110**, client computer **112**, and client computer **114** in FIG. **1**. Message file **208**, message file **210**, and message file **212** are associated with these e-mail clients. These message files store e-mail messages received by the clients and may be organized into various mailboxes. Examples of various mailboxes include, for example, an in folder, a sent folder, a deleted folder, and an outbox folder.

These e-mail programs may employ different protocols depending upon the implementation. For example, simple mail transfer protocol (SMTP) is a standard e-mail protocol that is based on TCP/IP. This protocol defines a message format and the message transfer agent which stores and forwards the mail. Other protocols, such as post office protocol 2 (POP2) or post office protocol 3 (POP3), also may be employed.

These e-mail programs are used to send e-mails back and forth to different users through e-mail server **214**. Messages sent to other e-mail clients are stored in e-mail message database **216**. When an e-mail client connects to e-mail server **214**, any messages for that particular client are then sent to the client. E-mail client **202**, **204**, and **206** may be implemented using presently available e-mail clients.

With reference next to FIG. **3**, an illustration of a block diagram of an incentive-based electronic messaging environment is depicted in accordance with an illustrative embodiment. In this depicted example, incentive-based electronic messaging environment **300** allows users to send and receive electronic message **302** through incentive-based messaging system **304**. In this illustrative example, incentive-based messaging system **304** includes a number of different components. As depicted, incentive-based messaging system **304** includes message server **306**, user registry **308**, and payment subsystem **310**. Incentive-based messaging system **304** may be implemented in computer system **312**.

Computer system **312** is a physical hardware system and includes one or more data processing systems. When more than one data processing system is present, those data processing systems may be in communication with each other using a communications medium. The communications medium may be a network, such as network **314**. The data processing systems may be selected from at least one of a computer, a server computer, a workstation, a tablet computer, a laptop computer, a mobile phone, or some other suitable data processing system.

As used herein, the phrase "at least one of," when used with a list of items, means different combinations of one or more of the listed items may be used and only one of each item in the list may be needed. In other words, "at least one of" means any combination of items and number of items may be used from the list, but not all of the items in the list are required. The item may be a particular object, thing, or a category.

For example, without limitation, "at least one of item A, item B, or item C" may include item A, item A and item B, or item B. This example also may include item A, item B, and item C or item B and item C. Of course, any combinations of these items may be present. In some illustrative examples, "at least one of" may be, for example, without limitation, two of item A; one of item B; and ten of item C; four of item B and seven of item C; or other suitable combinations.

Incentive-based messaging system **304** may be implemented in software, hardware, firmware, or a combination thereof. When software is used, the operations performed by incentive-based messaging system **304** may be implemented in program code configured to run on hardware, such as a processor unit. When firmware is used, the operations performed by incentive-based messaging system **304** may be implemented in program code and data and stored in persistent memory to run on a processor unit. When hardware is employed, the hardware may include circuits that operate to perform the operations in incentive-based messaging system **304**.

In the illustrative examples, the hardware may take the form of a circuit system, an integrated circuit, an application-specific integrated circuit (ASIC), a programmable logic device, or some other suitable type of hardware configured to perform a number of operations. With a programmable logic device, the device may be configured to perform the number of operations. The device may be reconfigured at a later time or may be permanently configured to perform the number of operations. Programmable logic devices include, for example, a programmable logic array, programmable array logic, a field programmable logic array, a field programmable gate array, and other suitable hardware devices. Additionally, the processes may be implemented in organic components integrated with inorganic components and may be comprised entirely of organic components, excluding a human being. For example, the processes may be implemented as circuits in organic semiconductors.

Incentive-based messaging system **304** provides a system and method to encrypt electronic message **302** along with incentives provided by sender **318**. Furthermore, incentive-based electronic messaging system **304** provides a system and method to decrypt electronic message **302** and to process payment of incentives to recipient **320**. These systems and methods can be implemented by one or more of message server **306**, payment subsystem **310**, and message client **322**.

Incentive-based messaging system **304** includes message server **306**. Message server **306** is an application that receives electronic message **302** from sender **318** and forwards electronic message **302** for delivery to recipient **320**. Message server **306** can be an implementation of e-mail server **214** of FIG. **2**. Alternatively, message server **306** system may be implemented as a separate message server, distinct from a traditional e-mail server, which exclusively manages electronic message **302** for incentive-based messaging system **304**. When message server **306** is a separate message server, message server **306** prevents electronic message **302** from being filtered and discarded as unsolicited bulk email, as may otherwise occur when using a traditional e-mail server.

Incentive-based messaging system **304** identifies incentive amount **316** for electronic message **302**. Incentive amount **316** is a remittance from sender **318** to recipient **320**. Incentive amount **316** provides an incentive for recipient **320** to view electronic message **302**. As such, incentive amount **316** directly encourages recipient **320** to review electronic message **302**. Furthermore, incentive amount **316** also conveys to recipient **320** a perceived worth of electronic message **302** as perceived by sender **318**.

In one illustrative example, incentive-based messaging system **304** identifies incentive amount **316** based on interaction of sender **318** with message client **322**, displayed on display system **324** in graphical user interface **326**. An operator, such as sender **318**, may interact with graphical user interface **326** through user input generated by one or more of user input device **328**, such as, for example, a mouse, a keyboard, a trackball, a touchscreen, a stylus, or some other suitable type of input device.

In one illustrative example, message client **322** is one or more programs or applications, such as e-mail clients **202**, **204**, and **206** of FIG. **2**, located at one or more client data processing systems, such as client computer **110**, client computer **112**, and client computer **114** in FIG. **1**. Message client **322** allows users to create, send, receive, and view electronic message **302**. Additionally, message client **322** allows sender **318** to indicate incentive amount **316** for electronic message **302**.

In one illustrative example, message client **322** may be implemented using presently available e-mail clients augmented with one or more software components, plugins, add-ins, or extensions that enable the transfer of electronic message **302** over incentive-based messaging system **304**, as well as the attachment, receipt, and previewing of incentive amount **316**. In another illustrative example, message client **322** may be implemented as a standalone electronic messaging client for transferring electronic message **302** over incentive-based messaging system **304**.

Message client **322** is displayed in graphical user interface **326** on display system **324**. In this illustrative example, display system **324** can be a group of display devices. A display device in display system **324** may be selected from one of a liquid crystal display (LCD), a light emitting diode (LED) display, an organic light emitting diode (OLED) display, and other suitable types of display devices.

In response to identifying incentive amount **316** for electronic message **302**, incentive-based messaging system **304** reserves proportional amount **330** of currency **332** from sender's account **334**. Incentive-based messaging system **304** determines proportional amount **330** of currency **332** based on incentive amount **316**.

In this illustrative example, proportional amount **330** is an amount of currency **332** sufficient to compensate recipient **320**. For example, if sender **318** indicates only one recipient of electronic message **302**, proportional amount **330** may be equivalent to incentive amount **316**. However, if sender **318** indicates multiple recipients of electronic message **302**, proportional amount **330** may be equivalent to a corresponding multiple of incentive amount **316**.

Currency **332** is a medium of exchange for compensating recipient **320**. In an illustrative example, currency **332** can be selected from a physical currency, an electronic currency, a virtual currency, a reward point currency, or any other suitable form of currency for providing compensation to recipient **320**.

In this illustrative example, incentive-based messaging system **304** reserves proportional amount **330** of currency **332** by transferring proportional amount **330** from sender's account **334** to escrow account **336** of payment subsystem **310**. For example, incentive-based messaging system **304** may identify sender's account **334** from a number of different user accounts **338** as indicated in user registry **308**. User accounts **338** can be accounts specific to incentive-based messaging system **304**. Alternatively, user accounts **338** may be accounts maintained by a third-party for the benefit of the user, such as a credit card account, a bank account, a PayPal account, or some other suitable type of account of currency **332**.

In response to reserving proportional amount **330** of currency **332**, both incentive amount **316** and authentication **340** of incentive amount **316** are attached to electronic message **302**. Incentive amount **316** is attached to electronic message **302** in a manner that allows message client **322** to determine and display incentive amount **316** for electronic message **302** notwithstanding any action by recipient **320**. As a result, message client **322** can display, sort, and manage electronic message **302** according to incentive amount **316**.

Authentication **340** is an attestation to the veracity of incentive amount **316**. Authentication **340** can be, for example, digital signature **342**. Digital signature **342** can be a digital signature of at least one of sender **318** and payment subsystem **310**. Because authentication **340** is attached to electronic message **302**, separate from incentive amount **316**, message client **322** can determine the veracity of incentive amount **316** based on authentication **340**. Recipient **320** can therefore rely on the veracity of incentive amount **316** as attached to electronic message **302** and displayed by message client **322**.

In one illustrative example, authentication **340** is generated in response to reserving proportional amount **330** of currency **332** from sender's account **334**. In response to generating authentication **340**, authentication **340** can be automatically attached to electronic message **302**.

After attaching both incentive amount **316** and authentication **340** to electronic message **302**, electronic message **302** is sent to recipient **320**. Message client **322** can determine and display incentive amount **316** for electronic message **302**. As a result, message client **322** can display, sort, and manage electronic message **302** according to incentive amount **316** notwithstanding action **344** by recipient **320**.

In this illustrative example, action **344** is an interaction of recipient **320** with electronic message **302** in message client **322**, displayed on display system **324** in graphical user interface **326**. Recipient **320** may perform action **344** by interacting with graphical user interface **326** through user input generated by user input device **328**. In an illustrative example, action **344** can be at least one of opening electronic message **302**, scrolling to a predetermined section of electronic message **302**, opening an attachment attached to electronic message **302**, forwarding electronic message **302**

to a subsequent recipient, as well as some other suitable types of action that can be performed with respect to electronic message **302**.

In response to recipient **320** performing action **344** with respect to electronic message **302**, incentive-based messaging system **304** transfers portion **346** of proportional amount **330** of currency **332** to recipient's account **348**. In this manner, incentive-based messaging system **304** provides compensation to recipient **320** for performing action **344** with respect to electronic message **302** in the form of proportional amount **330**.

In this illustrative example, portion **346** can be a part of or all of proportional amount **330**. Portion **346** can correspond to incentive amount **316** indicated in electronic message **302**. Incentive-based messaging system **304** can transfer portion **346** to recipient's account **348** by transferring portion **346** from escrow account **336** of payment subsystem **310**.

In response to transferring portion **346** to recipient's account **348**, incentive-based messaging system **304** generates and sends receipt **350** to sender **318**. In this manner, incentive-based messaging system **304** provides sender **318** with a record showing that recipient **320** has accepted compensation for performing action **344** with respect to electronic message **302**.

Thus, the illustrative embodiments provide a method, an apparatus, and a computer program product for sending an electronic message using an incentive-based messaging system. Sending an electronic message using an incentive-based messaging system allows the sender to attach a payment incentive with the message. The recipient can view the attached amount before opening the message, which can be prioritized within the message client according to the attached amount. The incentive payment is received only when the recipient performs an action with respect to the message, such as opening or reading the message.

In this manner, the incentive-based messaging system provides a secure alternative to traditional e-mail. The incentive-based messaging system provides storage and encryption of the electronic messages, as well as the user interactions and incentive amounts. The incentive-based messaging system allows micro-payments from a message sender in the form of an incentive, which is held in an escrow account separate from the electronic message. The incentive-based messaging system keeps the incentive amounts separate from the message text to prevent spoofing by the message sender or interception by outside parties. The incentive amounts can be encrypted, together along with any required transaction keys, and provided to the users in the form of a distributed ledger.

In this manner, the use of the incentive-based messaging system has a technical effect of incentivizing an electronic message to overcome a problem that is particular to computer systems, thereby allowing the sender of an electronic message to ensure visibility and penetration of an electronic message to one or more message recipients. In this manner, distributing relevant information to message recipients may be performed more efficiently as compared to currently used systems that do not include the incentive-based messaging system.

As a result, a computer system that includes incentive-based messaging system operates as a special purpose computer system. For example, when the computer system uses the incentive-based messaging system to send an electronic message, the computer system identifies an incentive amount for the electronic message. The computer system reserves a proportional amount of currency from a sender's account. The proportional amount of currency is based on the incentive amount. In response to reserving the proportional amount of currency, the computer system attaches both the incentive amount and an authentication of the incentive amount to the electronic message. The computer system sends the electronic message to a recipient. A portion of the proportional amount of currency is transferred to a recipient's account in response to the recipient performing an action with respect to the electronic message. In response to transferring the portion of the currency to the account of the electronic message recipient, the computer system sends a payment receipt to a sender of the electronic message.

Thus, the incentive-based messaging system transforms a computer system into a special purpose computer system as compared to currently available general computer systems that do not have an incentive-based messaging system, such as incentive-based messaging system **304** of FIG. **3**. Currently used general computer systems do not reduce the time or effort needed to distributing relevant information to one or more message recipients and ensure visibility and penetration of the electronic message to the recipients.

With reference next to FIG. **4**, an illustration of a block diagram of a data flow for identifying an incentive according to one or more policies is depicted in accordance with an illustrative embodiment.

In this illustrative example, incentive-based messaging system **304** identifies recipient **320** within user registry **308**. In this example, user registry **308** is a registry of verified users that provides additional assurances as to the identity of recipient **320**. For example, as part of a registration process, users of incentive-based messaging system **304**, including recipient **320**, may be required to provide evidence as to their identity. In one illustrative example, this evidence can be provided through a manual vetting process, or a federated identity system having the requisite level of veracity as to the identity of its users.

Having been provided with adequate assurances of the identity of recipient **320**, incentive-based messaging system **304** can determine a relative social influence or relative social prominence of recipient **320**. In this illustrative example, social influence is the ability of recipient **320** to influence or alter a behavior in another person based on a relationship with recipient **320**. Social prominence is a state of being well-known or famous.

In this illustrative example, incentive-based messaging system **304** determines incentive amount **316** based on social policy **402** of policy **404**. Policy **404** is a group of rules and may also include data for applying those rules. In this illustrative example, social policy **402** is a rule for determining incentive amount **316** based on the relative social influence or relative social prominence of recipient **320**.

For example, social policy **402** may include rules on identifying the relative social influence or relative social prominence. Incentive-based messaging system **304** can determine a relative social influence or relative social prominence of recipient **320** from, for example, a number of followers, friends, and relationships of recipient **320** within an online social network. These rules in social policy **402** specify a degree of influence or prominence of recipient **320**. For example, social policy **402** may be applied to a social network profile of recipient **320** to determine a relative social influence or prominence of recipient **320** based on the number of followers, friends, and relationships of recipient **320** within the online social network.

Additionally, incentive-based messaging system **304** may use social policy **402** to identify incentive amount **316** for

recipient **320**. For example, incentive-based messaging system **304** may determine incentive amount **316** relative to a measure of social influence or prominence of recipient **320**.

In another illustrative example, incentive-based messaging system **304** identifies transfer policy **406** of policy **404**. In this illustrative example, transfer policy **406** is one or more rules for determining proportional amount **330** and conditions placed upon action **344**. In this illustrative example, when incentive-based messaging system **304** reserves proportional amount **330** of currency **332** from sender's account **334**, proportional amount **330** is based on both incentive amount **316** and transfer policy **406**.

For example, transfer policy **406** may include rules that delineate a total amount of currency **332** to be transferred from sender's account **334**. For example, sender **318** may desire to widely distribute electronic message **302**. In this illustrative example, transfer policy **406** provides an indirect limit to a number of message recipients, such that proportional amount **330** does not exceed an amount of currency **332** indicated by transfer policy **406**.

As a further example, transfer policy **406** may include rules that delineate a number of e-mail recipients to which portion **346** can be transferred. For example, sender **318** may wish to limit the number of recipients receiving portion **346**. In this illustrative example, transfer policy **406** limits the award of portion **346** to a predetermined number of recipients as indicated by transfer policy **406**.

As yet another example, transfer policy **406** may include rules that delineate an amount of time during which recipient **320** can perform action **344** with respect to electronic message **302**. For example, electronic message **302** may contain time-sensitive information or offers. In this illustrative example, transfer policy **406** limits the amount of time, as indicated in transfer policy **406**, during which portion **346** is awarded to recipient **320** for performing action **344**.

As yet another example, transfer policy **406** may include rules indicating whether action **344** is transferable from recipient **320** by forwarding electronic message **302** to a subsequent recipient. For example, sender **318** may desire to widely distribute electronic message **302**, and may not be concerned with the identity of whom performs action **344**. In this illustrative example, transfer policy **406** may indicate that electronic message **302** is transferable from recipient **320** by forwarding electronic message **302** to a subsequent recipient. Conversely, due to the content or nature of electronic message **302**, sender **318** may desire to limit electronic message **302** only to sender **318**. In this illustrative example, transfer policy **406** may indicate that electronic message **302** is not transferable from recipient **320** by forwarding electronic message **302** to a subsequent recipient.

Additionally, transfer policy **406** may include rules indicating sub-portion **408** and sub-portion **410**. Sub-portion **408** is an amount of portion **346** that is allocated to recipient **320** in response to performance of action **344** by a subsequent recipient to whom recipient **320** has forwarded electronic message **302**. Sub-portion **410** is an amount of portion **346** that is allocated to a subsequent recipient in response to performance of action **344** by the subsequent recipient to whom recipient **320** has forwarded electronic message **302**.

With reference next to FIG. **5**, an illustration of a block diagram of a data flow for tracking a user's acceptance of an incentive is depicted in accordance with an illustrative embodiment. In this illustrative example, incentive-based messaging system **304** transfers proportional amount **330** of currency **332** from sender's account **334** to escrow account **336**. Incentive-based messaging system **304** then generates tracking beacon **502** for electronic message **302** that identifies escrow account **336**. Tracking beacon **502** is inserted at specified section **504** of electronic message **302**.

For example, tracking beacon **502** may be an embedded object, such as a single-pixel gif, within the content of electronic message **302**. When recipient **320** performs action **344**, tracking beacon **502** is referenced, thus enabling incentive-based message system **304** to determine the performance of action **344** by recipient **320**.

With reference next to FIG. **6**, an illustration of a block diagram of a data flow for managing message incentives and tracking a user's acceptance of an incentive in a distributed ledger is depicted in accordance with an illustrative embodiment. In this illustrative example, when proportional amount **330** is reserved within escrow account **336**, payment subsystem **310** generates distributed ledger **602** corresponding to electronic message **302**. As used herein, a distributed ledger is a replicated data structure that is shared and synchronized digital data that enables the distributed recordation of transactions by a network of computers. Distributed ledger **602** is a distributed ledger that enables the distributed recordation of transactions relating to electronic message **302** by sender **318** and recipient **320**. Distributed ledger **602** can be, for example, a blockchain.

Distributed ledger **602** is specific to electronic message **302**. In one illustrative example, incentive-based messaging system **304** maintains separate distributed ledgers for each electronic message having an incentive amount attached thereto.

After generating distributed ledger **602**, payment subsystem **310** indicates the transfer of proportional amount **330** of currency **332** from sender's account **334** to escrow account **336** in distributed ledger **602**. In this manner, distributed ledger **602** provides recipient **320** with assurance that proportional amount **330** has been reserved in escrow account **336**.

When recipient **320** performs action **344** with respect to electronic message **302**, performance of action **344** by recipient **320** is indicated in distributed ledger **602**. In this manner, distributed ledger **602** provides sender **318** with assurance that recipient **320** has performed action **344**.

When payment subsystem **310** transfers portion **346** of proportional amount **330** from escrow account **336** to recipient's account **348**, the transfer is indicated in distributed ledger **602**. In this manner, distributed ledger **602** provides sender **318** and recipient **320** with assurance that portion **346** has been transferred from escrow account **336** to recipient's account **348**.

When payment subsystem **310** generates receipt **350**, the generation of receipt **350** is indicated in distributed ledger **602**. In this manner, distributed ledger **602** provides sender **318** with assurance of the transaction. Thereafter, payment subsystem **310** can close distributed ledger **602**.

With reference next to FIG. **7**, an illustration of a distributed ledger in the form a blockchain is depicted in accordance with an illustrative embodiment. Blockchain **700** is a blockchain, which is a specific implementation of distributed ledger **602** of FIG. **6**. Blockchain **700** is described to introduce blockchain concepts.

Blockchain **700** starts with genesis block **702**. Blocks indicated with a right-leaning hash, such as block **704** or block **706**, are part of the main chain. Blocks with a left-leaning hash, such as block **708** or block **710**, exist outside of blockchain **700**.

Stated more formally, a blockchain is a distributed database that maintains a continuously growing list of ordered records called blocks. Each block contains a timestamp and

a link to a previous block, with the hash of the prior block linking the two. By design, blockchains are inherently resistant to modification of data because, once recorded, the data in a block cannot be altered retroactively. Through the use of a peer-to-peer network and one or more distributed timestamping servers, a blockchain database may be managed autonomously. Thus, blockchains may be used to provide an open, distributed ledger that can record transactions between parties efficiently and in a verifiable and permanent way.

Distributed ledgers, and blockchains in particular, are secure by design. Blockchains have a high byzantine fault tolerance. Thus, a decentralized consensus can be achieved with a blockchain. The first blockchain was created by Satoshi Nakamoto in 2008 and implemented the following year as a core component of the digital currency BITCOIN®, where it serves as the public ledger for all transactions. BITCOIN® was the first digital currency to solve the double spending problem, without the use of a trusted authority or central server.

FIG. **8** through FIG. **13** should be considered together. FIG. **8** is a block diagram illustrating a first step in creating a blockchain in accordance with an illustrative embodiment. FIG. **9** is a block diagram illustrating a second step in creating a blockchain in accordance with an illustrative embodiment. FIG. **10** is a block diagram illustrating a third step in creating a blockchain in accordance with an illustrative embodiment. FIG. **11** is a block diagram illustrating a fourth step in creating a blockchain in accordance with an illustrative embodiment. FIG. **12** is a block diagram illustrating a fifth step in creating a blockchain in accordance with an illustrative embodiment. FIG. **13** is a block diagram illustrating a sixth step in creating a blockchain in accordance with an illustrative embodiment. FIGS. **8-13** may be implemented on a computer or on multiple computers in a network environment. FIGS. **8-13** address a technical problem that only exists in computer programming and execution. As used throughout FIGS. **8-13**, common reference numerals refer to common objects in these figures.

In operation **800** shown in FIG. **8**, node **802** is created which contains initial data for a distributed ledger. Node **802** includes an owner, a digital certificate identification, and a copy of a ledger. Node **802** may issue transactions. Node **802** may sign transactions.

In operation **900** shown in FIG. **9**, blocks **902** are added to node **802**. Each block in the shared ledger has a digital fingerprint of the previous block. In this manner, it is not possible to alter previous blocks without being detected.

In operation **1000** shown in FIG. **10**, blockchain network **1002** is formed. Blockchain network **1002** may include multiple blockchains such as those shown in FIGS. **8-9**. Each blockchain has its own node, such as node **1004** or node **1006**. In operation **1100** shown in FIG. **11**, transactions and distributions are added to the various nodes. Thus, blocks are added to each node.

In operation **1200** shown in FIG. **12**, leader election takes place. In this operation, leader node **1202** is elected. Leader node **1202** takes priority for deciding which information is the most accurate or up-to-date.

In operation **1300** shown in FIG. **13**, data execution and recovery takes place. A query regarding data stored in one or more of the nodes may return a validated answer regarding contents in the blocks.

These digitally recorded "blocks" of data are stored in a linear chain. Each block in the chain contains data indicating a transaction with respect to electronic message **302**, such as transfer of proportional amount **330**, performance of action **344**, and transfer of portion **346**. Each block is cryptographically hashed. The blocks of hashed data draw upon the previous block which came before it in the chain, ensuring all data in the overall blockchain has not been tampered with and remains unchanged.

With reference next to FIG. **14**, an illustration of a flowchart of a process for sending an electronic message using an incentive-based messaging system is depicted in accordance with an illustrative embodiment. Process **1400** may be implemented in computer system **312** of FIG. **3**. For example, process **1400** may be implemented as operations performed by incentive-based messaging system **304**, shown in block form in FIG. **3**.

The process begins by identifying an incentive amount for the electronic message (step **1410**). The incentive amount can be incentive amount **316** for electronic message **302**, both shown in FIG. **3**.

The process then reserves a proportional amount of currency from a sender's account (step **1420**). The proportional amount of currency is based on the proportional amount.

In response to reserving the proportional amount of currency, the process attaches both the incentive amount and an authentication of the incentive amount to the electronic message (step **1430**). The authentication can be authentication **340** in the form of digital signature **342**, both of FIG. **3**.

The process then sends the electronic message to a recipient (step **1440**). In response to the recipient performing an action, such as action **344** of FIG. **3**, with respect to the electronic message, a proportion of the proportional amount of currency is transferred to the recipient's account. In response to transferring the portion of currency to the recipient's account, the process sends a receipt to the sender (step **1450**), with the process terminating thereafter.

With reference next to FIG. **15**, an illustration of a flowchart of a process for attaching an authentication of an incentive amount to an electronic message is depicted in accordance with an illustrative embodiment. The process of FIG. **15** is a more detailed implementation of process step **1430** of FIG. **14**.

In response to process step **1420**, the process generates the authentication in response to reserving the proportional amount of currency (step **1510**). In response to generating the authentication, the process then automatically attaches the authentication to the e-mail (step **1520**), with the process proceeding to process step **1440** of FIG. **14** thereafter.

With reference next to FIG. **16**, an illustration of a flowchart of a process for identifying an incentive amount for an electronic message is depicted in accordance with an illustrative embodiment. The process of FIG. **16** includes a more detailed implementation of process step **1410** of FIG. **14**.

The process begins by identifying a message recipient within a registry of verified users (step **1610**). The registry can be user registry **308** shown in block form in FIG. **3**.

The process then determines at least one of a relative social influence and a relative social prominence of the message recipient (step **1620**). In one illustrative example, a relative social influence and a relative social prominence of the message recipient can be determined using one or more rules of social policy **402** of FIG. **4**.

The process then determines any incentive amount based on an e-mail policy for the relative social influence and relative social prominence of the message recipient (step **1630**), with the process proceeding to process step **1420** thereafter. In one illustrative example, a relative social

influence and a relative social prominence of the message recipient can be determined using one or more rules of social policy **402** of FIG. **4**.

FIG. **17** is an illustration of a flowchart of a process for identifying conditions placed on a performance of actions by a message recipient of an electronic message in accordance with an illustrative embodiment. The process of FIG. **17** is a more detailed implementation of process step **1420** of FIG. **14**.

In response to the performance of process step **1410** shown in FIG. **14**, the process identifies a transfer policy for the electronic message (step **1710**). The transfer policy can be transfer policy **406** of FIG. **4**.

The process reserves the proportional amount of currency from the sender's account (step **1720**). The proportional amount is based on the incentive amount and the transfer policy. The process continues to step **1430** of FIG. **14** thereafter.

FIG. **18** is an illustration of a flowchart of a process for tracking a user's acceptance of an incentive in accordance with an illustrative embodiment. The process begins by transferring the proportional amount of currency from the sender's account to the escrow account (step **1810**). The escrow account can be escrow account **336** of payment subsystem **310**, both of FIG. **3**.

The process then generates a tracking beacon for the electronic message (step **1820**). The tracking beacon identifies the escrow account for the electronic message. The tracking beacon can be tracking beacon **502** of FIG. **5**.

The process then inserts the tracking beacon at a selected section of the electronic message (step **1830**), with the process terminating thereafter. The selected section can be selected section **504** of FIG. **5**.

FIG. **19** is an illustration of a flowchart of a process for managing message incentives and tracking a user's acceptance of an incentive in a distributed ledger in accordance with an illustrative embodiment. The process of FIG. **19** includes a more detailed implementation of process step **1420** of FIG. **14**.

The process begins by generating a distributed ledger for the electronic message (step **1910**). The distributed ledger can be distributed ledger **602** of FIG. **6**. The process then indicates transfer of the proportional amount of currency from the sender's account to the escrow account in the distributed ledger (step **1920**).

In response to the recipient performing a specified action with respect to the electronic message, performance of the action by the recipient is indicated in the distributed ledger for the electronic message (step **1930**). The process transfers a portion from the escrow account to the sender's account (step **1940**), and indicates the transfer of the portion to the sender's account in the distributed ledger (step **1950**).

The process generates a receipt to the sender (step **1960**), and indicates generation of the receipt in the distributed ledger (step **1970**). In response to generating the receipt, the process closes the distributed ledger (step **1980**), with the process terminating thereafter.

The flowcharts and block diagrams in the different depicted embodiments illustrate the architecture, functionality, and operation of some possible implementations of apparatuses and methods in an illustrative embodiment. In this regard, each block in the flowcharts or block diagrams may represent at least one of a module, a segment, a function, or a portion of an operation or step. For example, one or more of the blocks may be implemented as program code.

In some alternative implementations of an illustrative embodiment, the function or functions noted in the blocks may occur out of the order noted in the figures. For example, in some cases, two blocks shown in succession may be performed substantially concurrently, or the blocks may sometimes be performed in the reverse order, depending upon the functionality involved. Also, other blocks may be added in addition to the illustrated blocks in a flowchart or block diagram.

Turning now to FIG. **20**, an illustration of a block diagram of a data processing system is depicted in accordance with an illustrative embodiment. Data processing system **2000** may be used to implement one or more computers and computer system **122** in FIG. **1**. In this illustrative example, data processing system **2000** includes communications framework **2002**, which provides communications between processor unit **2004**, memory **2014**, persistent storage **2016**, communications unit **2008**, input/output unit **2010**, and display **2012**. In this example, communications framework **2002** may take the form of a bus system.

Processor unit **2004** serves to execute instructions for software that may be loaded into memory **2014**. Processor unit **2004** may be a number of processors, a multi-processor core, or some other type of processor, depending on the particular implementation.

Memory **2014** and persistent storage **2016** are examples of storage devices **2006**. A storage device is any piece of hardware that is capable of storing information, such as, for example, without limitation, at least one of data, program code in functional form, or other suitable information either on a temporary basis, a permanent basis, or both on a temporary basis and a permanent basis. Storage devices **2006** may also be referred to as computer-readable storage devices in these illustrative examples. Memory **2014**, in these examples, may be, for example, a random-access memory or any other suitable volatile or non-volatile storage device. Persistent storage **2016** may take various forms, depending on the particular implementation.

For example, persistent storage **2016** may contain one or more components or devices. For example, persistent storage **2016** may be a hard drive, a flash memory, a rewritable optical disk, a rewritable magnetic tape, or some combination of the above. The media used by persistent storage **2016** also may be removable. For example, a removable hard drive may be used for persistent storage **2016**.

Communications unit **2008**, in these illustrative examples, provides for communications with other data processing systems or devices. In these illustrative examples, communications unit **2008** is a network interface card.

Input/output unit **2010** allows for input and output of data with other devices that may be connected to data processing system **2000**. For example, input/output unit **2010** may provide a connection for user input through at least of a keyboard, a mouse, or some other suitable input device. Further, input/output unit **2010** may send output to a printer. Display **2012** provides a mechanism to display information to a user.

Instructions for at least one of the operating system, applications, or programs may be located in storage devices **2006**, which are in communication with processor unit **2004** through communications framework **2002**. The processes of the different embodiments may be performed by processor unit **2004** using computer-implemented instructions, which may be located in a memory, such as memory **2014**.

These instructions are referred to as program code, computer-usable program code, or computer-readable program code that may be read and executed by a processor in

processor unit **2004**. The program code in the different embodiments may be embodied on different physical or computer-readable storage media, such as memory **2014** or persistent storage **2016**.

Program code **2018** is located in a functional form on computer-readable media **2020** that is selectively removable and may be loaded onto or transferred to data processing system **2000** for execution by processor unit **2004**. Program code **2018** and computer-readable media **2020** form computer program product **2022** in these illustrative examples. In one example, computer-readable media **2020** may be computer-readable storage media **2024** or computer-readable signal media **2026**.

In these illustrative examples, computer-readable storage media **2024** is a physical or tangible storage device used to store program code **2018** rather than a medium that propagates or transmits program code **2018**. Alternatively, program code **2018** may be transferred to data processing system **2000** using computer-readable signal media **2026**.

Computer-readable signal media **2026** may be, for example, a propagated data signal containing program code **2018**. For example, computer-readable signal media **2026** may be at least one of an electromagnetic signal, an optical signal, or any other suitable type of signal. These signals may be transmitted over at least one of communications links, such as wireless communications links, optical fiber cable, coaxial cable, a wire, or any other suitable type of communications link.

The different components illustrated for data processing system **2000** are not meant to provide architectural limitations to the manner in which different embodiments may be implemented. The different illustrative embodiments may be implemented in a data processing system including components in addition to or in place of those illustrated for data processing system **2000**. Other components shown in FIG. **20** can be varied from the illustrative examples shown. The different embodiments may be implemented using any hardware device or system capable of running program code **2018**.

Thus, the illustrative embodiments provide a method, apparatus, and computer program product for sending an electronic message using an incentive-based messaging system. Sending an electronic message using an incentive-based messaging system allows the sender to attach a payment incentive with the message. The recipient can view the attached amount before opening the message, which can be prioritized within the message client according to the attached amount. The incentive payment is received only when the recipient performs an action with respect to the message, such as opening or reading the message.

In this manner, the incentive-based messaging system provides a secure alternative to traditional e-mail. The incentive-based messaging system provides storage and encryption of the electronic messages, as well as the user interactions and incentive amounts. The incentive-based messaging system allows micro-payments from a message sender in the form of an incentive, which is held in an escrow account separate from the electronic message. The incentive-based messaging system keeps the incentive amounts separate from the message text to prevent spoofing by the message sender or interception by outside parties. The incentive amounts can be encrypted, together along with any required transaction keys, and provided to the users in the form of a distributed ledger.

In this manner, the use of the incentive-based messaging system has a technical effect of incentivizing an electronic message to overcome a problem that is particular to computer systems, thereby allowing the sender of an electronic message to ensure visibility and penetration of an electronic message to one or more message recipients. In this manner, distributing relevant information to message recipients may be performed more efficiently as compared to currently used systems that do not include the incentive-based messaging system.

As a result, a computer system that includes incentive-based messaging system operates as a special purpose computer system. For example, when the computer system uses the incentive-based messaging system to send an electronic message, the computer system identifies an incentive amount for the electronic message. The computer system reserves a proportional amount of currency from a sender's account. The proportional amount of currency is based on the incentive amount. In response to reserving the proportional amount of currency, the computer system attaches both the incentive amount and an authentication of the incentive amount to the electronic message. The computer system sends the electronic message to a recipient. A portion of the proportional amount of currency is transferred to a recipient's account in response to the recipient performing an action with respect to the electronic message. In response to transferring the portion of the currency to the account of the electronic message recipient, the computer system sends a payment receipt to a sender of the electronic message.

Thus, the incentive-based messaging system transforms a computer system into a special purpose computer system as compared to currently available general computer systems that do not have an incentive-based messaging system, such as incentive-based messaging system **304** of FIG. **3**. Currently used general computer systems do not reduce the time or effort needed to distribute relevant information to one or more message recipients and ensure visibility and penetration of the electronic message to the recipients. Further, currently used general computer systems do not provide for an incentive amount for an electronic message based on a policy, such as policy **404** of FIG. **4**.

The description of the different illustrative embodiments has been presented for purposes of illustration and description and is not intended to be exhaustive or limited to the embodiments in the form disclosed. The different illustrative examples describe components that perform actions or operations. In an illustrative embodiment, a component may be configured to perform the action or operation described. For example, the component may have a configuration or design for a structure that provides the component an ability to perform the action or operation that is described in the illustrative examples as being performed by the component.

Many modifications and variations will be apparent to those of ordinary skill in the art. Further, different illustrative embodiments may provide different features as compared to other desirable embodiments. The embodiment or embodiments selected are chosen and described in order to best explain the principles of the embodiments, the practical application, and to enable others of ordinary skill in the art to understand the disclosure for various embodiments with various modifications as are suited to the particular use contemplated.

What is claimed is:

1. A method for sending an electronic message comprising:

identifying, using a message client in a computer system, an incentive amount for the electronic message associated with a sender device;

selecting, by the computer system, a proportional amount of currency that is greater than the incentive amount,

the proportional amount of currency selected to provide one or more subsequent incentive amounts;

reserving, using an incentive based messaging system in the computer system, the proportional amount of currency from a sender account associated with the sender device;

generating, by the computer system, responsive to reserving the proportional amount of currency, a distributed ledger to indicate possession of the incentive amount;

generating, by the computer system, a digital signature based on application of an encryption protocol to the incentive amount;

identifying, using the message client in the computer system, an authentication of the incentive amount based on the digital signature, wherein the digital signature demonstrates the authenticity of at least the incentive amount, the digital signature signed via the sender device and a payment subsystem of the incentive based messaging system;

in response to reserving the proportional amount of currency, attaching, using the message client in the computer system, both the incentive amount and the authentication of the incentive amount to the electronic message;

sending, using a message server in the computer system, the electronic message to a recipient device;

in response to the recipient device performing an action with respect to the electronic message, transferring, using the incentive based messaging system in the computer system, a portion of the proportional amount of currency to a recipient account;

in response to transferring the portion of the proportional amount of currency to the recipient account, sending, using the message server in the computer system, a payment receipt to the sender device of the electronic message;

in response to transferring the portion of the proportional amount of currency to the recipient account, updating, by the computer system, the distributed ledger to reflect the portion of the proportional amount of currency transferred to the recipient account; and

providing, by the computer system, the distributed ledger to the recipient device to cause the recipient device to compare the incentive amount with the digital signature to validate the incentive amount.

2. The method of claim **1**, wherein attaching, using the message client in the computer system, the authentication of the incentive amount to the electronic message further comprises:

generating, using the message client in the computer system, the authentication in response to reserving the proportional amount of currency; and

in response to generating the authentication, automatically attaching, using the message client in the computer system, the authentication to the electronic message.

3. The method of claim **1**, wherein the proportional amount of currency is selected from:

a physical currency;

an electronic currency;

a virtual currency; and

a reward point currency.

4. The method of claim **1**, wherein the action comprises at least one of:

opening, via the recipient device, the electronic message;

scrolling, via the recipient device, to a predetermined section of the electronic message;

opening, via the recipient device, an attachment attached to the electronic message; or

forwarding, via the recipient device, the electronic message to a subsequent recipient device.

5. The method of claim **1**, further comprising:

identifying, by the computer system, the recipient device within a registry of verified devices, and wherein determining the incentive amount further comprises:

determining at least one of a relative social influence and relative social prominence of a user associated with the recipient device; or

determining the incentive amount based on policy for the relative social influence and relative social prominence.

6. The method of claim **1**, further comprising:

identifying, by the computer system, a transfer policy for the electronic message; and

reserving, by the computer system, the proportional amount of currency from the sender account, wherein the proportional amount of currency is based on the incentive amount and the transfer policy;

wherein the transfer policy comprises at least one of:

a policy delineating a total amount currency to be transferred from the sender account;

a policy delineating a number of recipient devices to which the portion of the proportional amount can be transferred;

a policy delineating an amount of time during which the recipient device can perform the action with respect to the electronic message;

a policy indicating whether the action is transferable from the recipient device by forwarding the electronic message to a subsequent recipient; or

a policy indicating a first sub-portion allocated to the recipient device and a second sub-portion allocated to the subsequent recipient device in response to the subsequent recipient device performing a specified action with respect to the electronic message.

7. The method of claim **1**, further comprising:

transferring, by the computer system, the proportional amount of currency from the sender account to an escrow account for the electronic message;

generating, by the computer system, a tracking beacon for the electronic message, wherein the tracking beacon identifies the escrow account for the electronic message; and

inserting, by the computer system, the tracking beacon at a predetermined section of the electronic message.

8. The method of claim **1**, wherein reserving the proportional amount of currency further comprises:

indicating, by the computer system, the transfer of the proportional amount of currency from the sender account to an escrow account in the distributed ledger.

9. The method of claim **8**, further comprising:

in response to the recipient device performing the action with respect to the electronic message, indicating, by the computer system, the action of the recipient device in the distributed ledger;

transferring, by the computer system, the portion of the proportional amount of currency from the escrow account to the recipient account and indicating a transfer of the portion of the proportional amount of currency from the escrow account to the recipient account in the distributed ledger;

generating, by the computer system, the payment receipt to the sender device and indicating generation of the payment receipt in the distributed ledger; and

in response to generating the payment receipt, closing, by the computer system, the distributed ledger.

10. A computer system comprising:

a message client in the computer system;

a message server in the computer system, wherein the message server is in communication with the message client; and

an incentive based messaging system in the computer system, wherein the incentive based messaging system is in communication with the message client and the message server, wherein the incentive based messaging system is configured:

to identify, using the message client in the computer system, an incentive amount for an electronic message associated with a sender device;

to select a proportional amount of currency that is greater than the incentive amount, the proportional amount of currency selected to provide one or more subsequent incentive amounts;

to reserve the proportional amount of currency from a sender account;

to generate, responsive to reservation of the proportional amount of currency, a distributed ledger to indicate possession of the incentive amount;

to generate, by the computer system, a digital signature based on application of an encryption protocol to the incentive amount;

to identify, using the message client in the computer system, an authentication of the incentive amount based on the digital signature, wherein the digital signature demonstrates the authenticity of at least the incentive amount, the digital signature signed via the sender device and a payment subsystem of the incentive based messaging system in response to generating a digital signature;

to attach, using the message client in the computer system, both the incentive amount and the authentication of the incentive amount to the electronic message in response to reserving the proportional amount of currency;

to send, using a message server in the computer system, the electronic message to a recipient device;

to transfer a portion of the proportional amount of currency to a recipient account in response to the recipient device performing an action with respect to the electronic message;

to send, using the message server in the computer system, a payment receipt to the sender device of the electronic message in response to transferring the portion of the proportional amount of currency to the recipient account;

to update the distributed ledger to reflect the portion of the proportional amount of currency transferred to the recipient account in response to transferring the portion of the proportional amount of currency to the recipient account; and

to provide, by the computer system, the distributed ledger to the recipient device to cause the recipient device to compare the incentive amount with the digital signature to validate the incentive amount.

11. The computer system of claim **10**, wherein attaching the authentication of the incentive amount to the electronic message, the incentive based messaging system is further configured:

to generate, using the message client in the computer system, the authentication in response to reserving the proportional amount of currency; and

to automatically attach, using the message client in the computer system, the authentication to the electronic message in response to generating the authentication.

12. The computer system of claim **10**, wherein the proportional amount of currency is selected from:

a physical currency;

an electronic currency;

a virtual currency; and

a reward point currency.

13. The computer system of claim **10**, wherein the action comprises at least one of:

opening, via the recipient device, the electronic message;

scrolling, via the recipient device, to a predetermined section of the electronic message;

opening, via the recipient device, an attachment attached to the electronic message; and

forwarding, via the recipient device, the electronic message to a subsequent recipient device.

14. The computer system of claim **10**, wherein the incentive based messaging system is further configured:

to identify the recipient device within a registry of verified devices; and

wherein determining the incentive amount, the incentive based messaging system is further configured:

to determine at least one of a relative social influence and relative social prominence of a user associated with the recipient device; or

to determine the incentive amount based on policy for the relative social influence and relative social prominence.

15. The computer system of claim **10**, wherein the incentive based messaging system is further configured:

to identify a transfer policy for the electronic message; and

to reserve the proportional amount of currency from the sender account, wherein the proportional amount of currency is based on the incentive amount and the transfer policy;

wherein the transfer policy comprises at least one of:

a policy delineating a total amount currency to be transferred from the sender account;

a policy delineating a number of recipient devices to which the portion of the proportional amount of currency can be transferred;

a policy delineating an amount of time during which the recipient device can perform the action with respect to the electronic message;

a policy indicating whether the action is transferable from the recipient device by forwarding the electronic message to a subsequent recipient device; and

a policy indicating a first sub-portion allocated to the recipient device and a second sub-portion allocated to the subsequent recipient device in response to the subsequent recipient device performing a specified action with respect to the electronic message.

16. The computer system of claim **10**, wherein the incentive based messaging system is further configured:

to transfer the proportional amount of currency from the sender account to an escrow account for the electronic message;

to generate a tracking beacon for the electronic message, wherein the tracking beacon identifies the escrow account for the electronic message; and

to insert the tracking beacon at a predetermined section of the electronic message.

17. The computer system of claim 10, wherein in reserving the proportional amount, the incentive-based messaging system is further configured:

to indicate the transfer of the proportional amount from the sender account to an escrow account in the distributed ledger.

18. The computer system of claim 17, wherein the incentive based messaging system is further configured:

to indicate the action of the recipient in the distributed ledger in response to the recipient device performing the action with respect to the electronic message;

to transfer the portion of the proportional amount currency from the escrow account to the recipient account and to indicate a transfer of the portion of the proportional amount from the escrow account to the recipient account in the distributed ledger;

to generate the payment receipt to the to the sender device and to indicate generation of the receipt in the distributed ledger; and

to close the distributed ledger in response to generating the payment receipt.

19. A computer program product for sending an electronic message using an incentive-based messaging system, the computer program product comprising:

a computer readable storage media;

zeroth program code, stored on the computer readable storage media, for identifying, using a message client, an incentive amount for the electronic message associated with a sender device;

first program code, stored on the computer readable storage media, for:

selecting, a proportional amount of currency that is greater than the incentive amount, the proportional amount of currency selected to provide one or more subsequent incentive amounts;

reserving, using the incentive based messaging system, the proportional amount of currency from a sender account associated with the sender device;

generating, responsive to reserving the proportional amount of currency, a distributed ledger to indicate possession of the incentive amount;

generating, by the computer system, a digital signature based on application of an encryption protocol to the incentive amount; and

identifying, using the message client, an authentication of the incentive amount, the authentication including a digital signature demonstrating the authenticity of at least the incentive amount, the digital signature signed via the sender device and a payment subsystem of the incentive based messaging system in response to generating a digital signature;

second program code, stored on the computer readable storage media, for attaching, using the message client, both the incentive amount and the authentication of the incentive amount to the electronic message in response to reserving the proportional amount of currency;

third program code, stored on the computer readable storage media, for:

sending, using a message server, the electronic message to a recipient device; and

transferring, using the incentive based messaging system, a portion of the proportional amount of currency to a recipient account in response to the recipient device performing an action with respect to the electronic message; and

fourth program code, stored on the computer readable storage media, for:

sending, using the message server, a payment receipt to the sender device of the electronic message in response to transferring the portion of the proportional amount of currency to the recipient account;

updating the distributed ledger to reflect the portion of the proportional amount of currency transferred to the recipient account in response to transferring the portion of the proportional amount of currency to the recipient account; and

providing, by the computer system, the distributed ledger to the recipient device to cause the recipient device to compare the incentive amount with the digital signature to validate the incentive amount.

20. The computer program product of claim 19, wherein the second program code further comprises further comprises:

program code for generating, using the message client in the computer system, the authentication in response to reserving the proportional amount of currency; and

program code for automatically attaching, using the message client in the computer system, the authentication to the electronic message in response to generating the authentication.

21. The computer program product of claim 19, wherein the proportional amount of currency is selected from:

a physical currency;

an electronic currency;

a virtual currency; and

a reward point currency.

22. The computer program product of claim 19, wherein the action comprises at least one of:

opening, via the recipient device, the electronic message;

scrolling, via the recipient device, to a predetermined section of the electronic message;

opening, via the recipient device, an attachment attached to the electronic message; or

forwarding, via the recipient device, the electronic message to a subsequent recipient device.

23. The computer program product of claim 19, further comprising:

fifth program code, stored on the computer readable storage media, for identifying the recipient within a registry of verified users, and wherein the first program code further comprises:

program code for determining at least one of a relative social influence and relative social prominence of a user associated with the recipient device; or

program code for determining the incentive amount based on policy for the relative social influence and relative social prominence.

24. The computer program product of claim 19, further comprising:

fifth program code, stored on the computer readable storage media, for identifying a transfer policy for the electronic message; and

sixth program code, stored on the computer readable storage media, for reserving the proportional amount of currency from the sender account, wherein the proportional amount of currency is based on the incentive amount and the transfer policy; and

wherein the transfer policy comprises at least one of:

a policy delineating a total amount currency to be transferred from the sender account;

a policy delineating a number of recipients to which the portion of the proportional amount of currency can be transferred;

a policy delineating an amount of time during which the recipient device can perform the action with respect to the electronic message;

a policy indicating whether the action is transferable from the recipient device by forwarding the electronic message to a subsequent recipient; or

a policy indicating a first sub-portion allocated to the recipient device and a second sub-portion allocated to the subsequent recipient device in response to the subsequent recipient performing a specified action with respect to the electronic message.

25. The computer program product of claim **19**, further comprising:

fifth program code, stored on the computer readable storage media, for transferring the proportional amount of currency from the sender account to an escrow account for the electronic message;

sixth program code, stored on the computer readable storage media, for generating a tracking beacon for the electronic message, wherein the tracking beacon identifies the escrow account for the electronic message; and

seventh program code, stored on the computer readable storage media, for inserting the tracking beacon at a predetermined section of the electronic message.

26. The computer program product of claim **19**, wherein the second program code further comprises:

program code for indicating the transfer of the proportional amount from the sender account to an escrow account in the distributed ledger.

27. The computer program product of claim **26**, further comprising:

fifth program code, stored on the computer readable storage media, for indicating the action of the recipient device in the distributed ledger in response to the recipient device performing the action with respect to the electronic message;

sixth program code, stored on the computer readable storage media, for transferring the portion of the currency from the escrow account to the recipient account and for indicating a transfer of the portion of the proportional amount of currency from the escrow account to the recipient account in the distributed ledger;

seventh program code, stored on the computer readable storage media, for generating the payment receipt to the sender device and for indicating generation of the payment receipt in the distributed ledger; and

eighth program code, stored on the computer readable storage media, for closing the distributed ledger in response to generating the payment receipt.

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