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Labrou et al.

(54) **WIRELESS COMPUTER WALLET FOR PHYSICAL POINT OF SALE (POS) TRANSACTIONS**

(75) Inventors: **Yannis Labrou**, Baltimore, MD (US); **Jonathan Russell Agre**, Brinklow, MD (US)

Correspondence Address:
**STAAS & HALSEY LLP**
**SUITE 700**
**1201 NEW YORK AVENUE, N.W.**
**WASHINGTON, DC 20005 (US)**

(73) Assignee: **Fujitsu Limited**, Kawasaki (JP)

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**Publication Classification**

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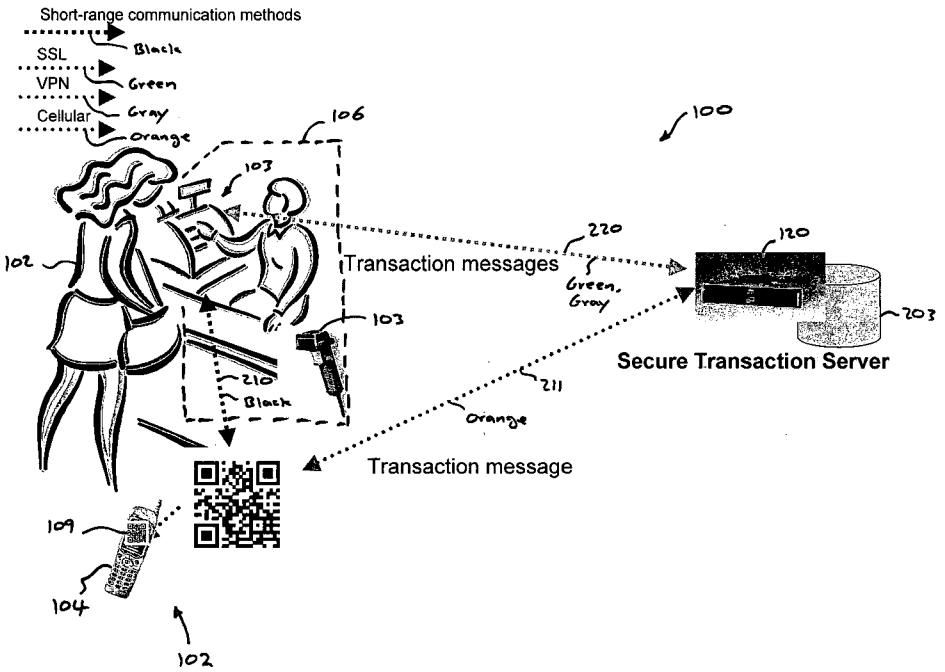
(52) **U.S. Cl.** ..... **705/67**

(57) **ABSTRACT**

Methods and systems provide a secure transaction server (STS); provide an authentic point of sale (POS) device, according to a first authentication parameter of the STS; provide an authentic mobile purchasing device, according to a second authentication parameter of the STS; provide a short-range communication method between the POS device and the mobile purchasing device; correlate by the STS a personal identification entry (PIE) and the authentic mobile purchasing device; transmit, by the POS device, a time dependent transformed secure POS authenticable POS purchase action to the STS; input the PIE to the mobile purchasing device to transmit a time dependent transformed secure user authenticable POS purchase action to the POS device via the short-range communication method; and approve, by the STS, the POS purchase action for the POS device and for the mobile purchasing device, according to the authentic POS device, and according to the authentic mobile purchasing device and the STS correlating of the PIE and the authentic mobile purchasing device.



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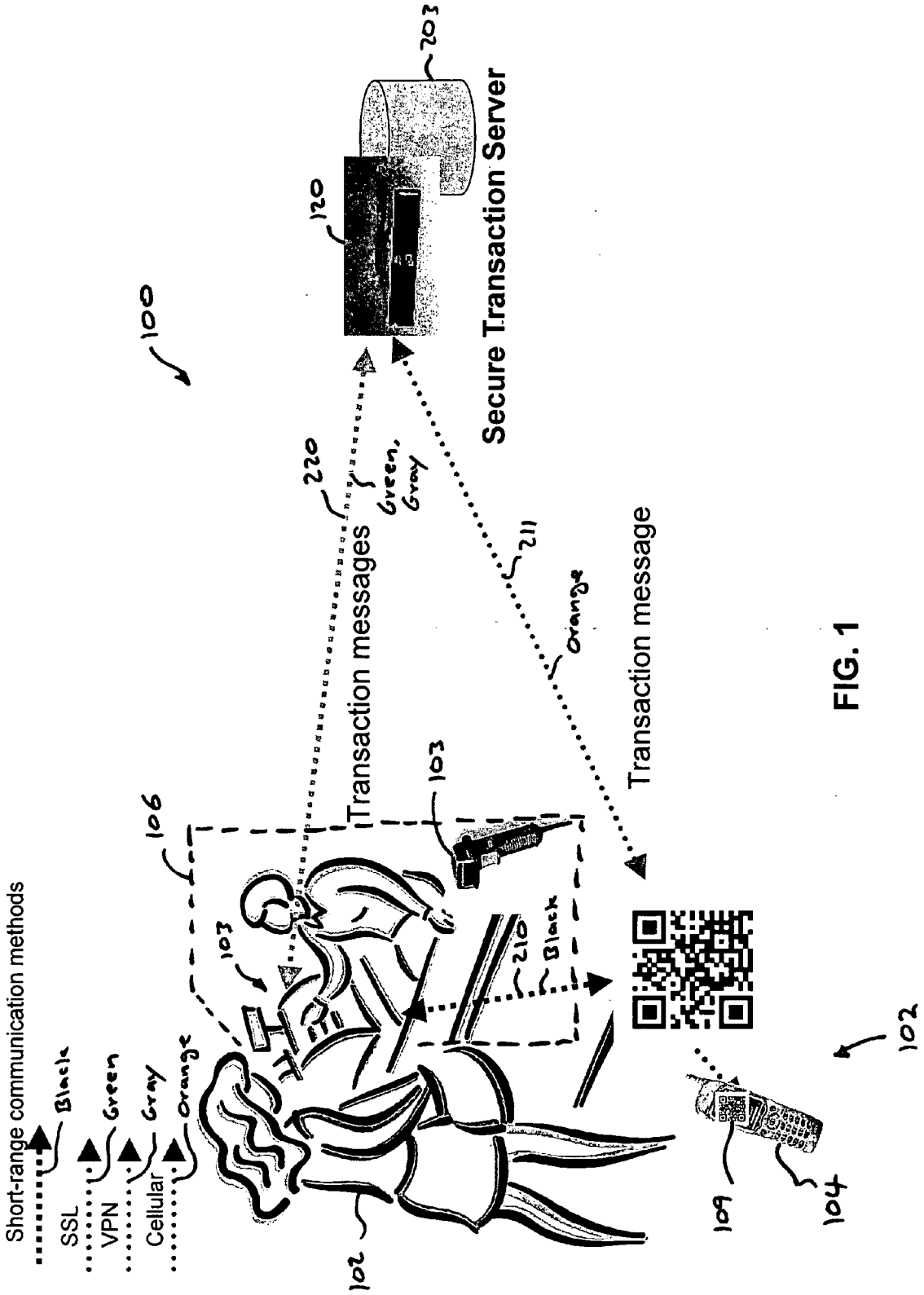
100
Secure Transaction Server
203
120
220
Green, Gray
Transaction messages
211
Orange
Transaction message
106
103
103
210
Black
102
102
109
104
Short-range communication methods
SSL
VPN
Cellular
Black
Green
Gray
Orange

FIG. 1

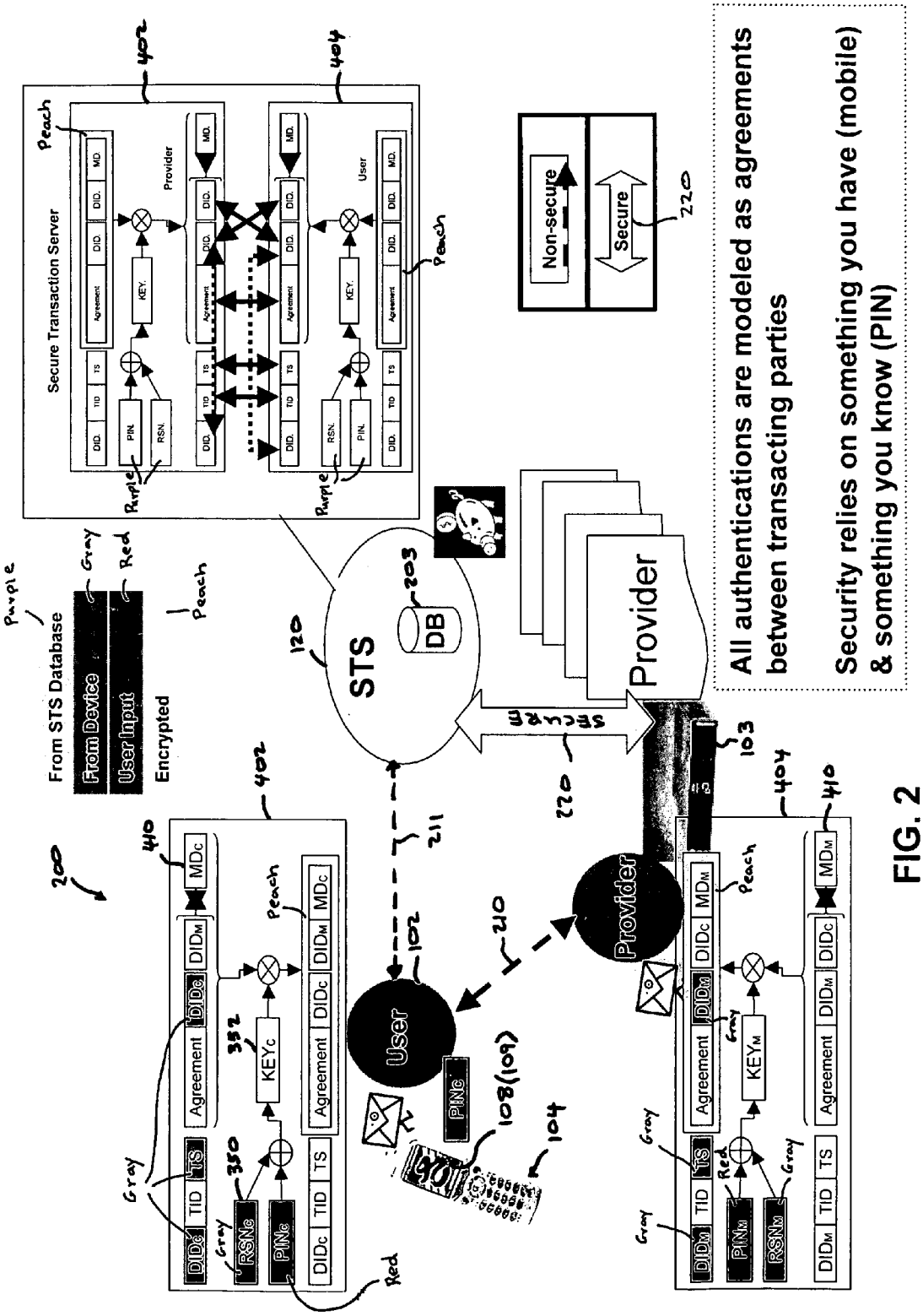
Secure Transaction Server
Provider
User
Non-secure
Secure
All authentications are modeled as agreements between transacting parties
Security relies on something you have (mobile) & something you know (PIN)
From STS Database
From Device
User Input
Encrypted
STS
DB
Provider
User
SECURE

FIG. 2

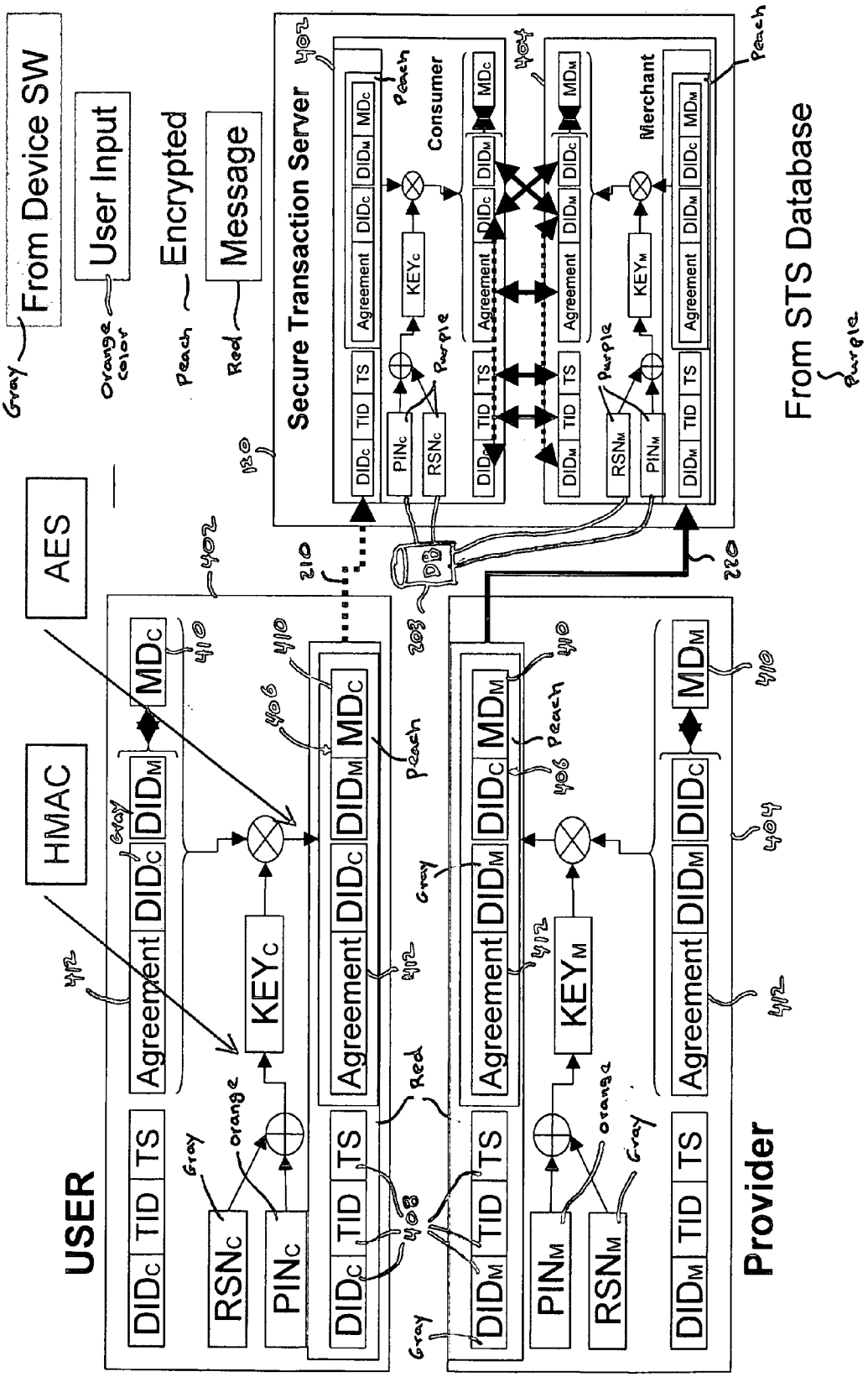
From Device SW
User Input
Encrypted
Message
AES
HMAC
Secure Transaction Server
Consumer
Merchant
From STS Database
USER
Provider
Agreement
DIDC
DIDM
TID
TS
MDC
MDM
KEYC
KEYM
PINC
PINM
RSNC
RSNM
DB
Gray
Orange color
Peach
Red
Orange
Purple

FIG. 3

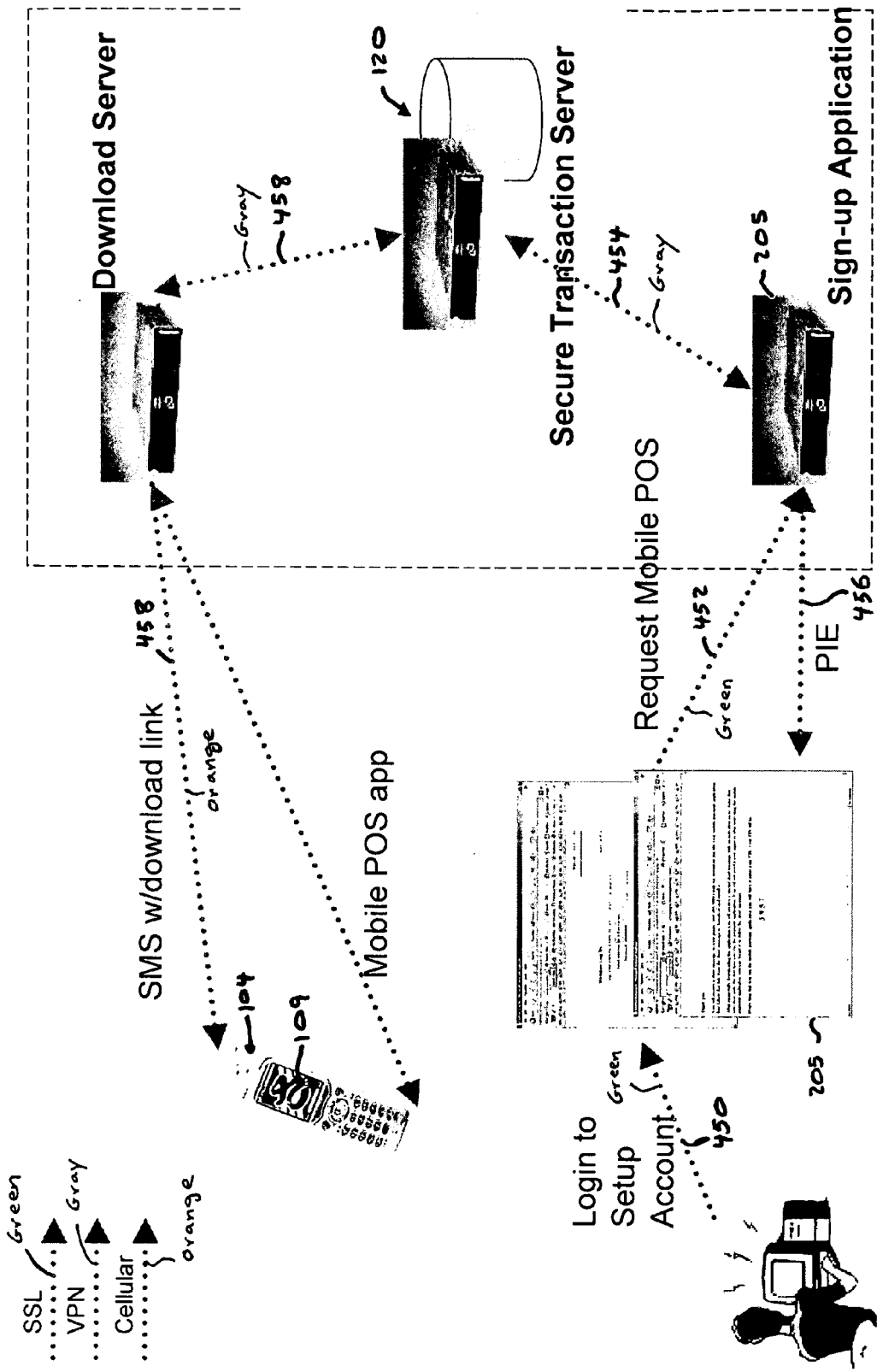
Download Server
Secure Transaction Server
Sign-up Application
120
Gray
458
454
Gray
205
Request Mobile POS
452
Green
PIE
456
SMS w/download link
458
orange
Mobile POS app
104
109
Login to Setup Account
Green
450
205
SSL
Green
VPN
Gray
Cellular
orange

FIG. 4

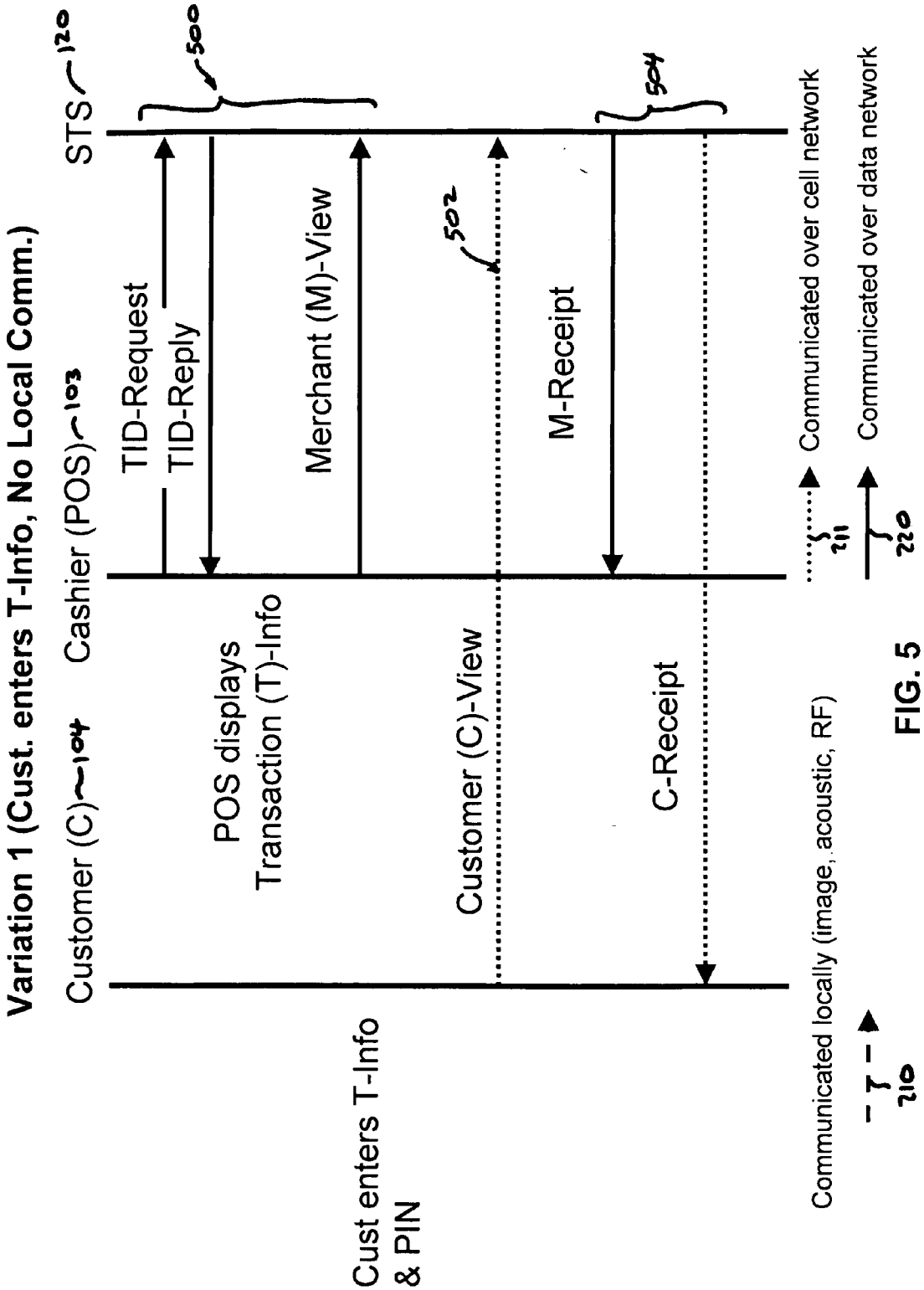
Variation 1 (Cust. enters T-Info, No Local Comm.)
Customer (C)
104
Cashier (POS)
103
STS
120
TID-Request
TID-Reply
Merchant (M)-View
500
POS displays
Transaction (T)-Info
Customer (C)-View
502
M-Receipt
504
C-Receipt
Cust enters T-Info
& PIN
Communicated locally (image, acoustic, RF)
210
Communicated over cell network
211
Communicated over data network
220

FIG. 5

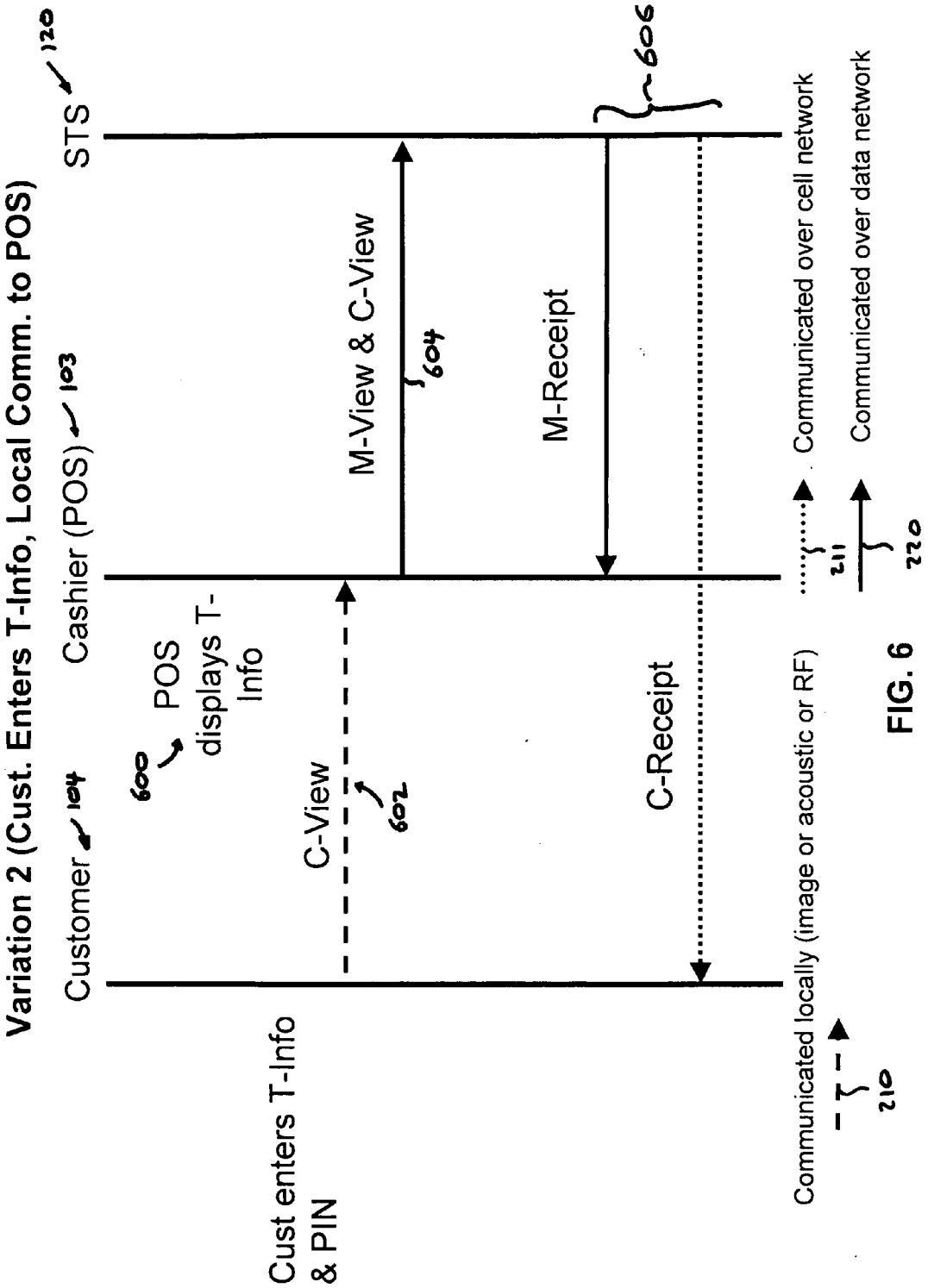
Variation 2 (Cust. Enters T-Info, Local Comm. to POS)
Customer 104
Cashier (POS) 103
STS 120
Cust enters T-Info & PIN
POS displays T-Info
600
C-View
602
M-View & C-View
604
M-Receipt
606
C-Receipt
Communicated locally (image or acoustic or RF)
210
Communicated over cell network
211
Communicated over data network
220

FIG. 6

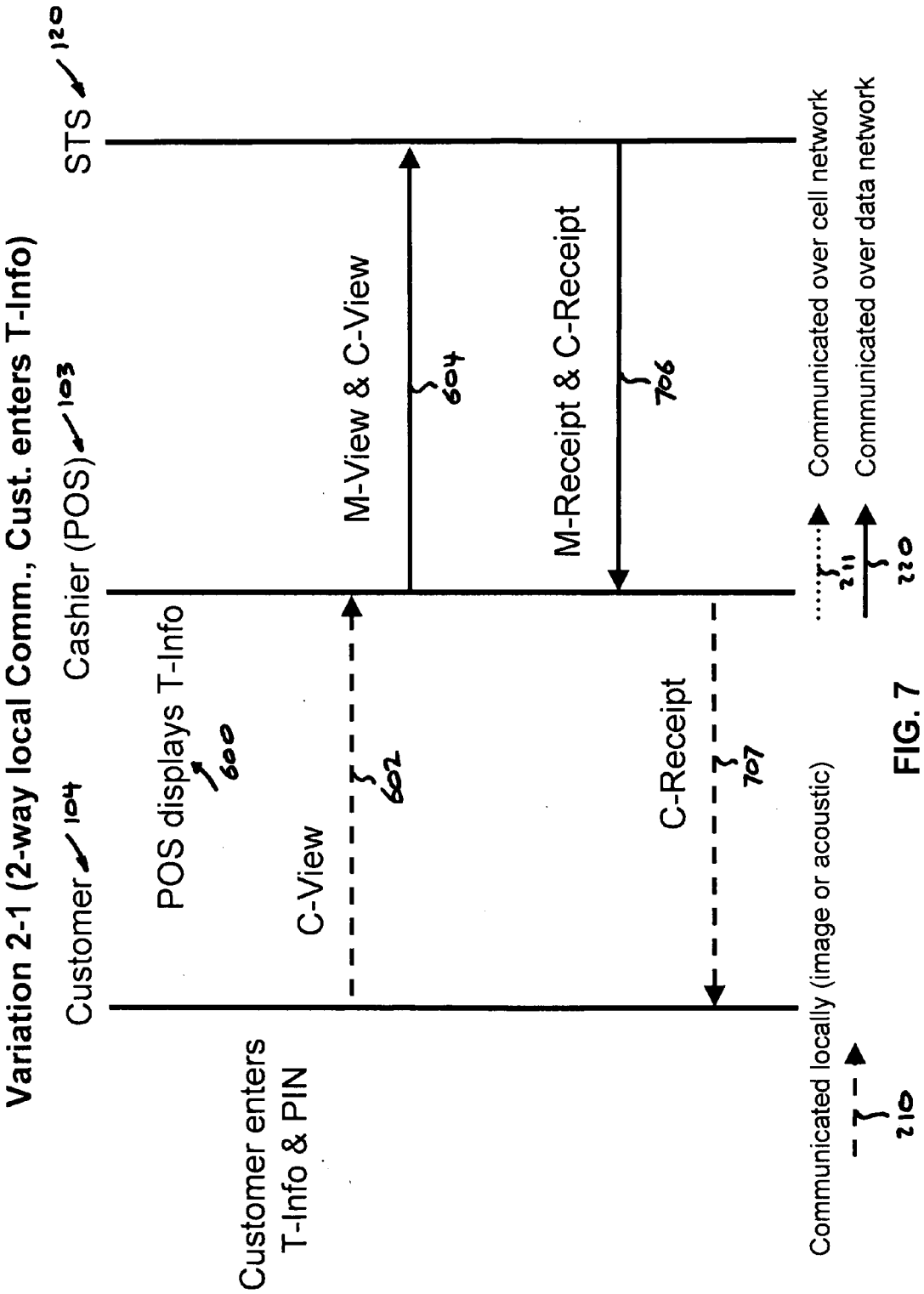
Variation 2-1 (2-way local Comm., Cust. enters T-Info)
Customer 104
Cashier (POS) 103
STS 120
Customer enters T-Info & PIN
POS displays T-Info 600
C-View 602
M-View & C-View 604
M-Receipt & C-Receipt 706
C-Receipt 707
Communicated locally (image or acoustic) 210
211
Communicated over cell network
220
Communicated over data network

FIG. 7

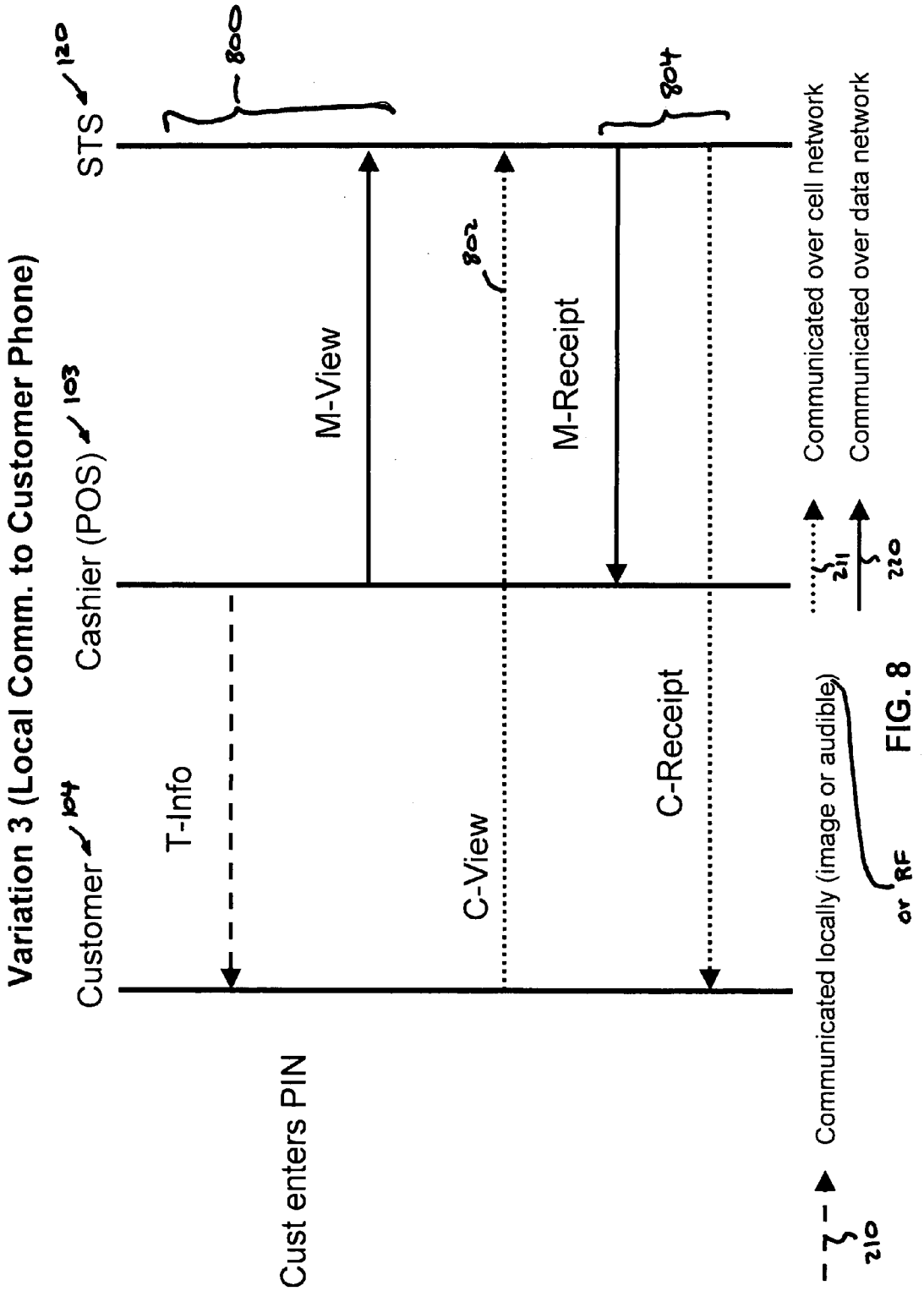
Variation 3 (Local Comm. to Customer Phone)
Customer
104
Cashier (POS)
103
STS
120
T-Info
M-View
C-View
M-Receipt
C-Receipt
800
802
804
Cust enters PIN
Communicated locally (image or audible)
or RF
210
211
220
Communicated over cell network
Communicated over data network

FIG. 8

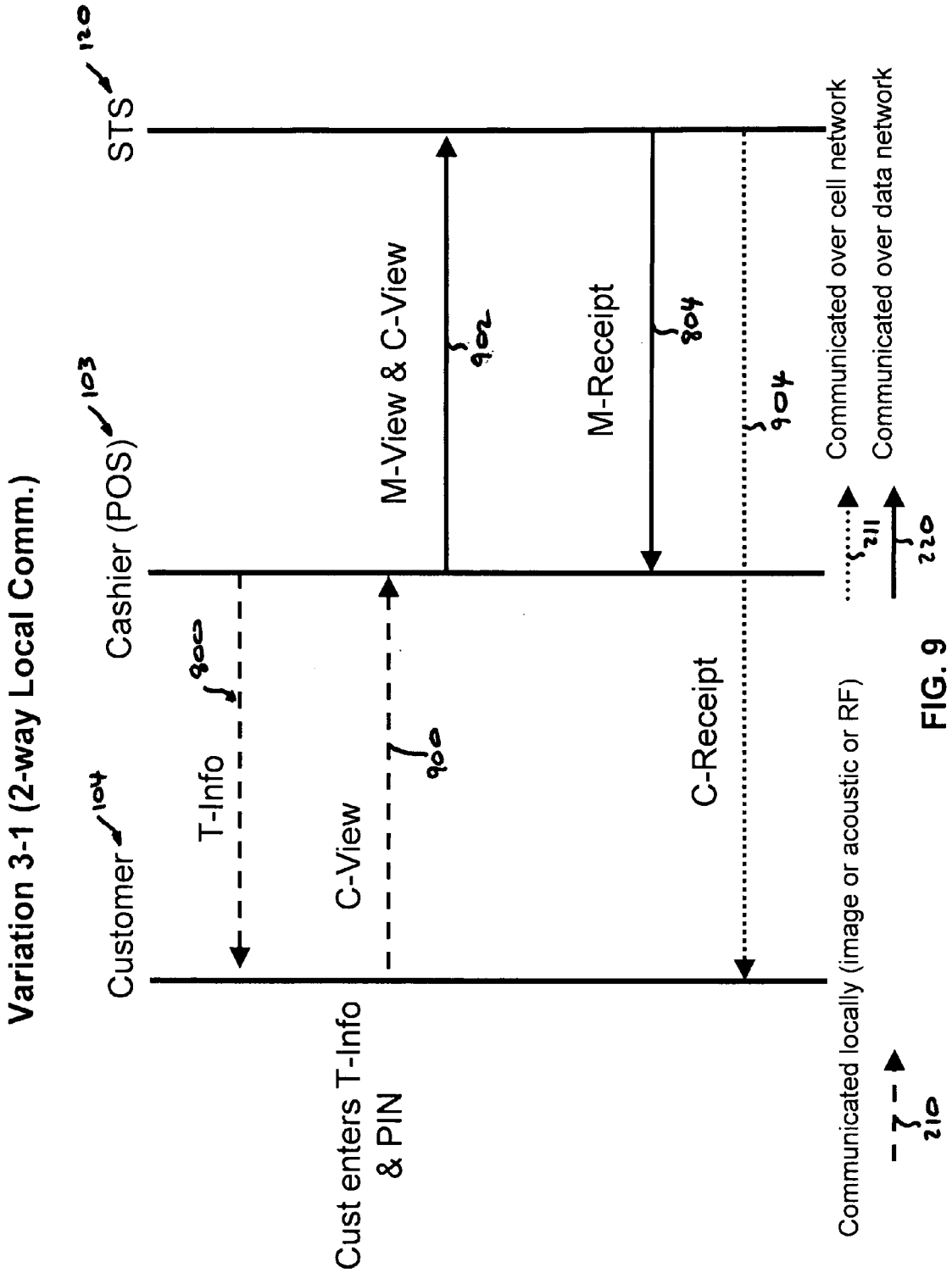
Variation 3-1 (2-way Local Comm.)
Customer
104
Cashier (POS)
103
STS
120
T-Info
900
C-View
900
M-View & C-View
902
M-Receipt
904
C-Receipt
904
Cust enters T-Info & PIN
Communicated locally (image or acoustic or RF)
210
211
Communicated over cell network
220
Communicated over data network

FIG. 9

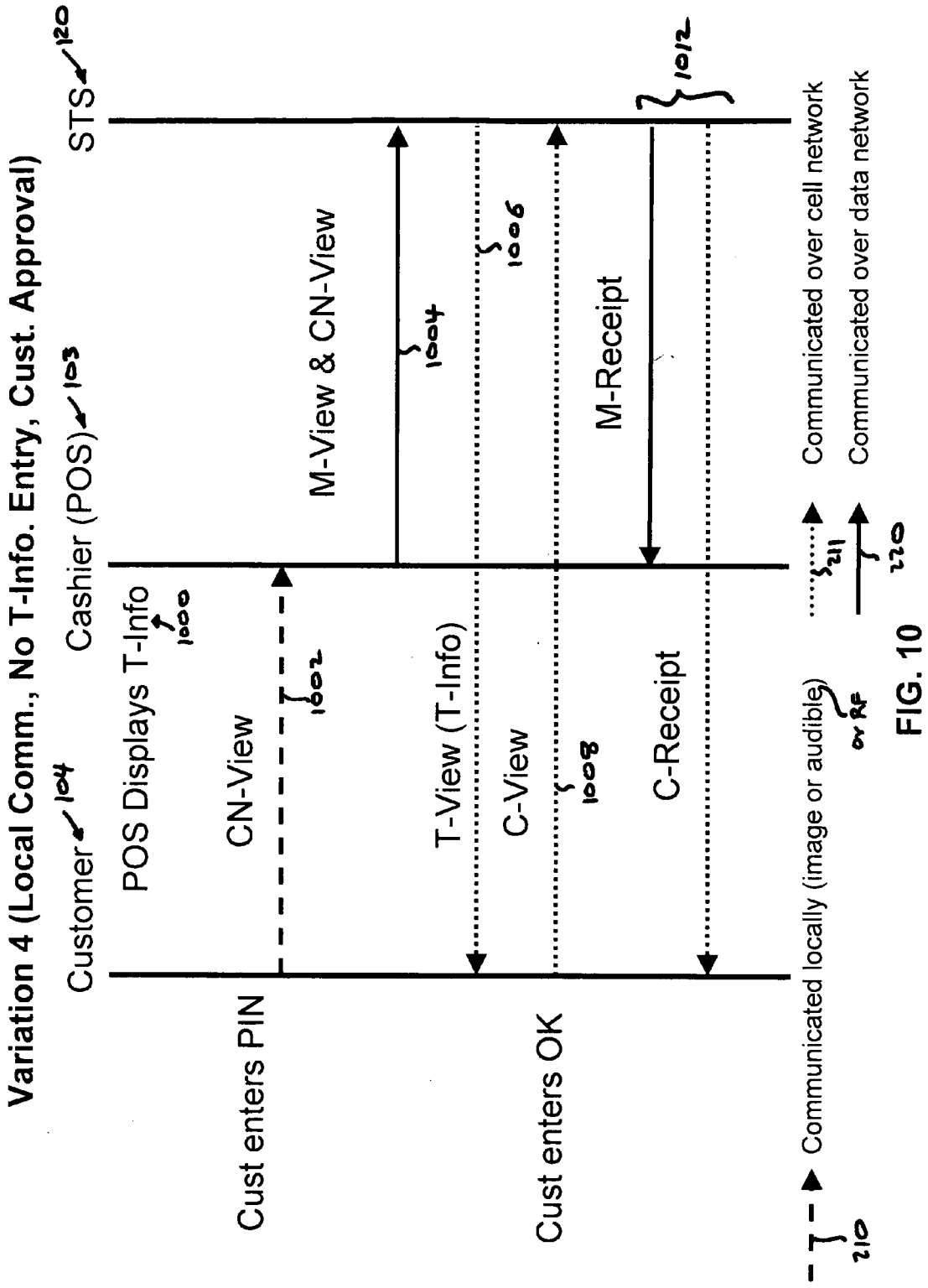
Variation 4 (Local Comm., No T-Info. Entry, Cust. Approval)
Customer 104
Cashier (POS) 103
STS 120
POS Displays T-Info 1000
CN-View 1002
M-View & CN-View 1004
T-View (T-Info) 1006
C-View 1008
M-Receipt 1012
C-Receipt
Cust enters PIN
Cust enters OK
Communicated locally (image or audible) or RF 210
211
Communicated over cell network
220
Communicated over data network

FIG. 10

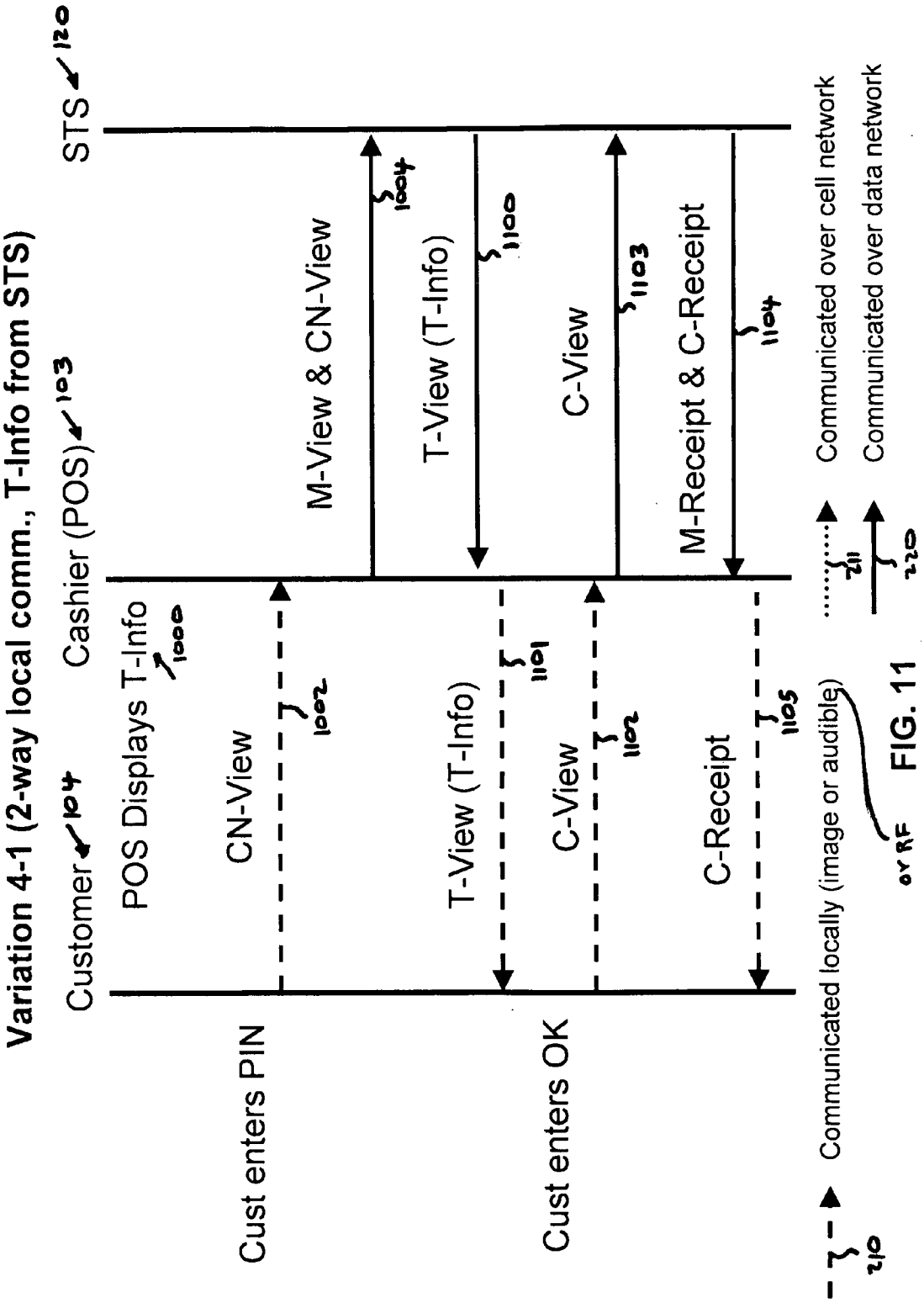
Variation 4-1 (2-way local comm., T-Info from STS)
Customer 104
Cashier (POS) 103
STS 120
POS Displays T-Info 1000
CN-View 1002
M-View & CN-View 1004
T-View (T-Info) 1100
T-View (T-Info) 1101
C-View 1102
C-View 1103
M-Receipt & C-Receipt 1104
C-Receipt 1105
Cust enters PIN
Cust enters OK
210 Communicated locally (image or audible) or RF
211 Communicated over cell network
220 Communicated over data network

FIG. 11

# Legend for Variations 5-8

1200

- "1,2" means 1 followed by 2
- "1 or 2 or 3" means that one of 1,2,3 (and only one can take place)
  - "(1 or 2) or 3" means either one of 1 or 2 takes place, or 3 takes place
- 1 (opt) means that 1 is optional
- Actions denoted alongside arrows denote transmissions

Communicated visually or audibly or RF

240

Communicated wirelessly
(might not be a secure network)

220

Communicated over data network
(might be wired or wireless and
preferably secure)

211

FIG. 12

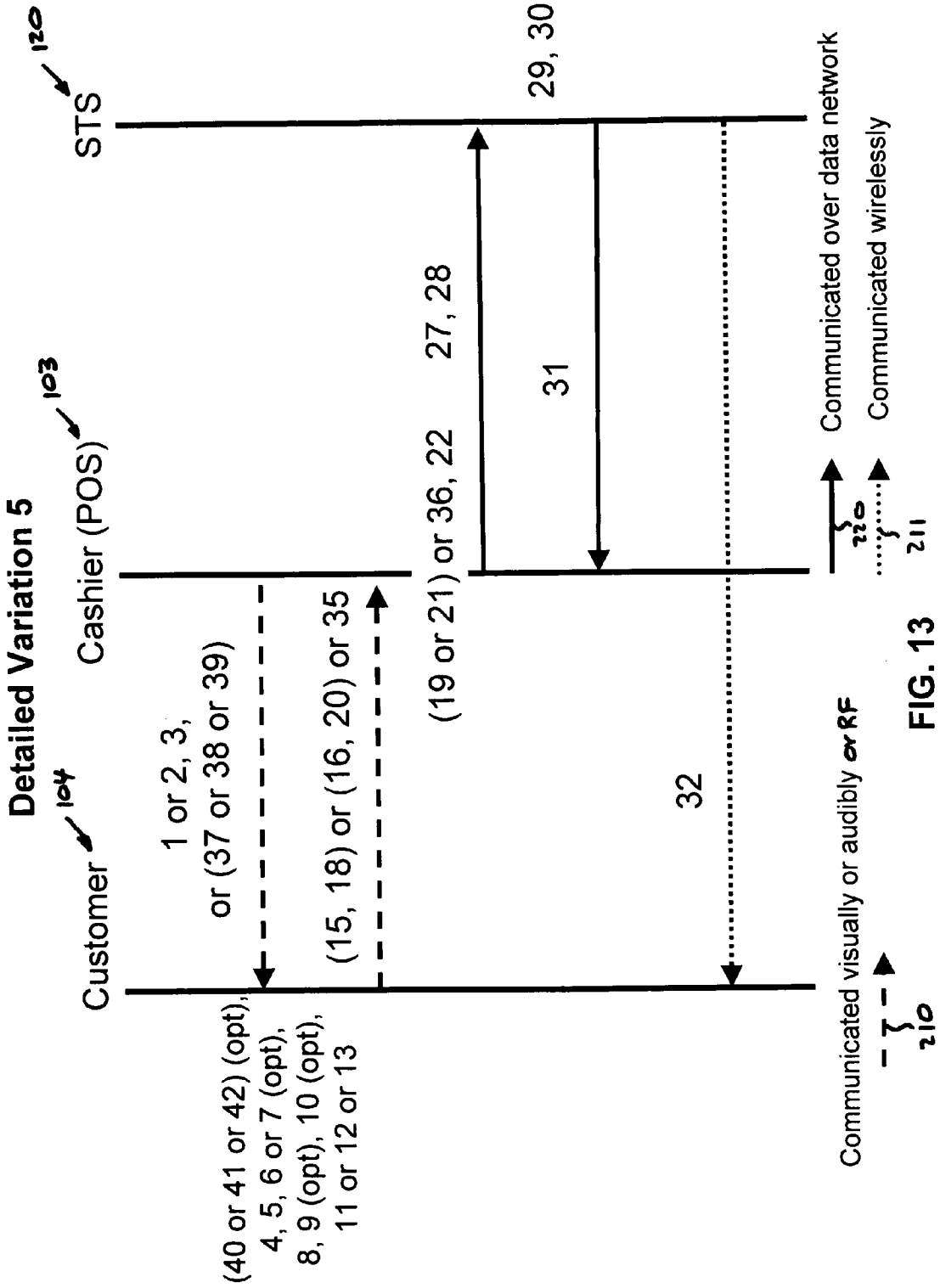
Detailed Variation 5
Customer
104
Cashier (POS)
103
STS
120
1 or 2, 3,
or (37 or 38 or 39)
(40 or 41 or 42) (opt),
4, 5, 6 or 7 (opt),
8, 9 (opt), 10 (opt),
11 or 12 or 13
(15, 18) or (16, 20) or 35
(19 or 21) or 36, 22
27, 28
29, 30
31
32
Communicated visually or audibly or RF
210
Communicated over data network
220
Communicated wirelessly
211

FIG. 13

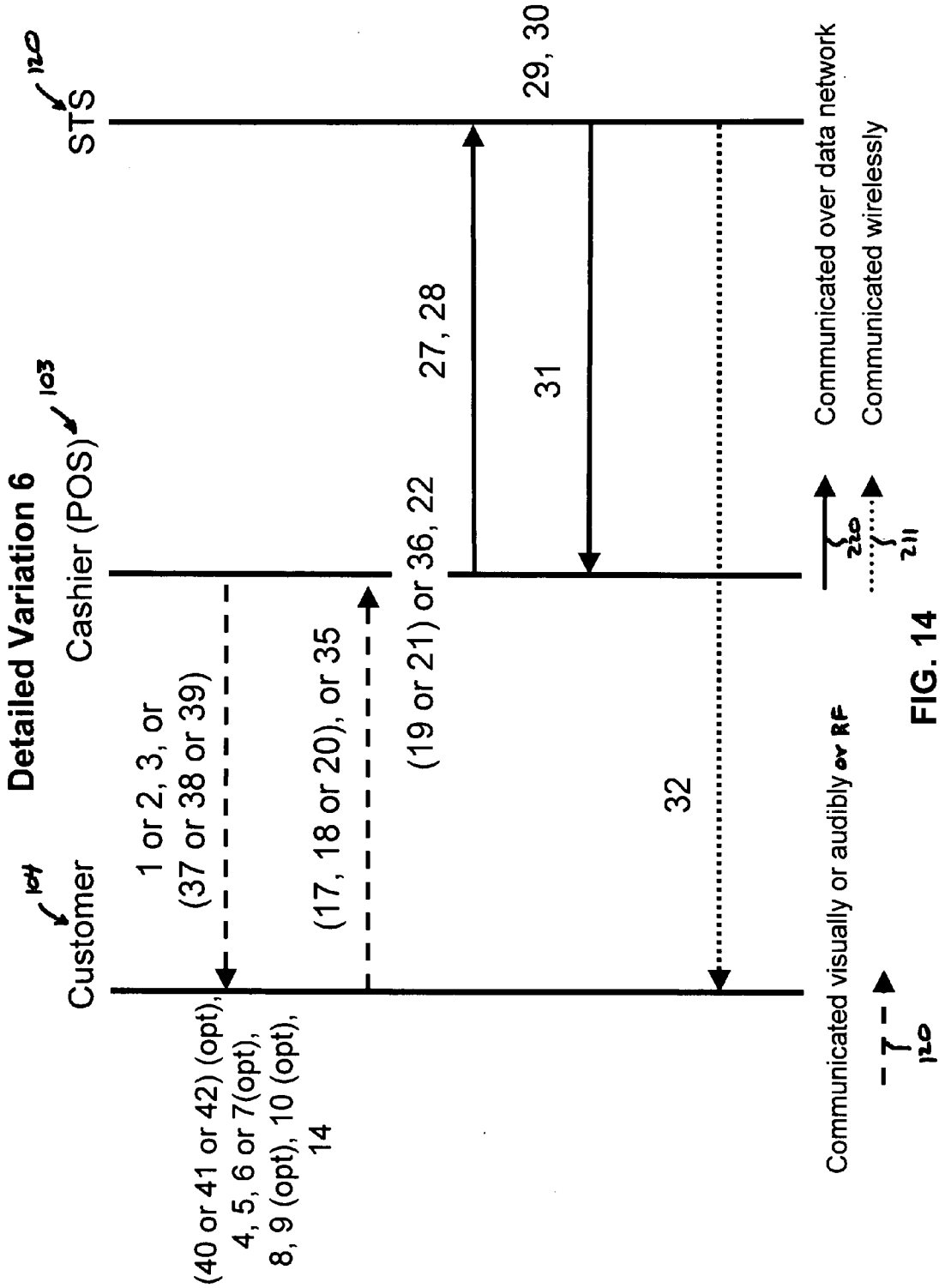
Detailed Variation 6
Customer
104
Cashier (POS)
103
STS
120
1 or 2, 3, or
(37 or 38 or 39)
(17, 18 or 20), or 35
(19 or 21) or 36, 22
27, 28
29, 30
31
32
(40 or 41 or 42) (opt),
4, 5, 6 or 7(opt),
8, 9 (opt), 10 (opt),
14
Communicated visually or audibly or RF
Communicated over data network
Communicated wirelessly
220
211
120

FIG. 14

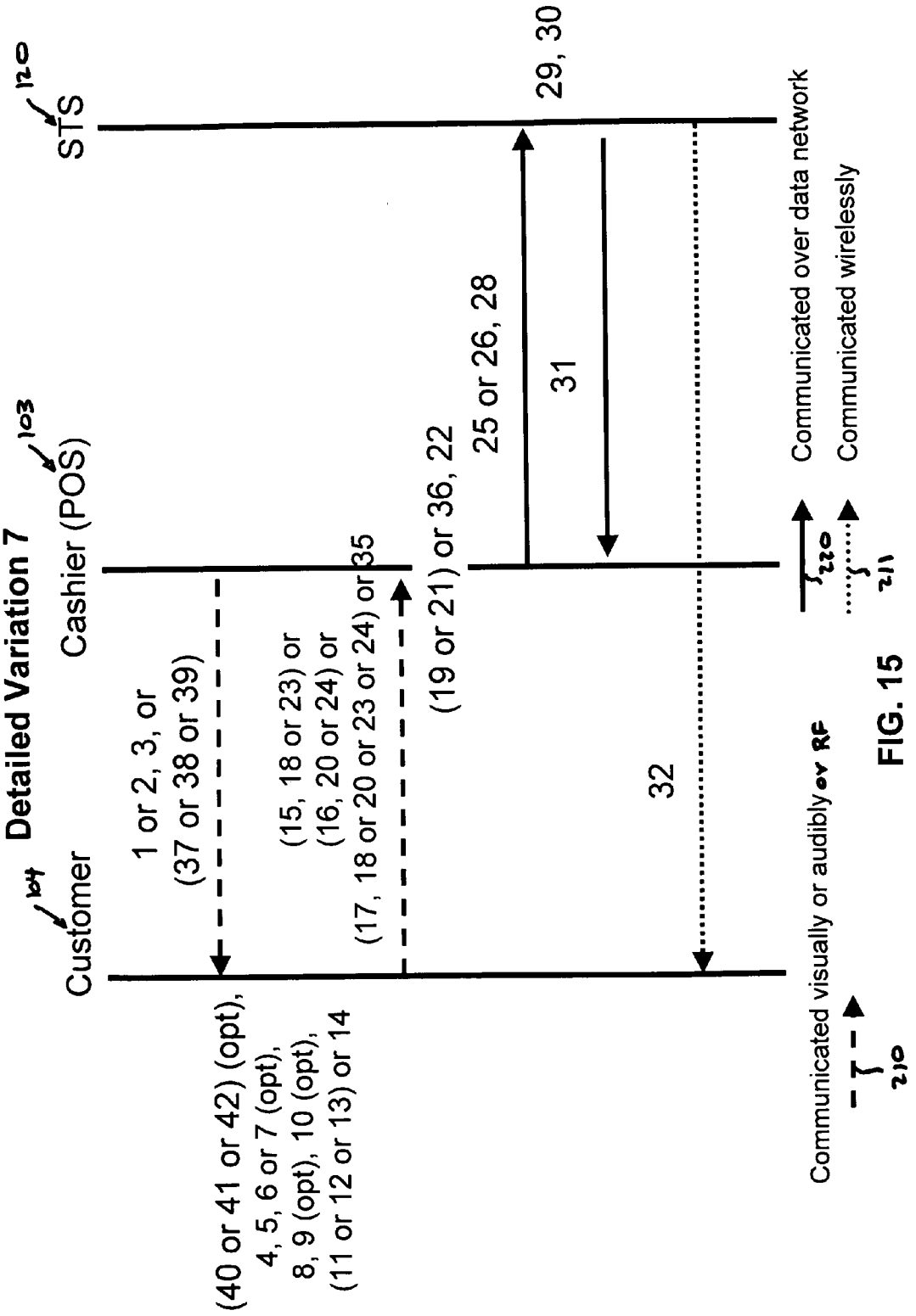
Detailed Variation 7
Customer
104
Cashier (POS)
103
STS
120
1 or 2, 3, or
(37 or 38 or 39)
(40 or 41 or 42) (opt),
4, 5, 6 or 7 (opt),
8, 9 (opt), 10 (opt),
(11 or 12 or 13) or 14
(15, 18 or 23) or
(16, 20 or 24) or
(17, 18 or 20 or 23 or 24) or 35
(19 or 21) or 36, 22
25 or 26, 28
29, 30
31
32
Communicated visually or audibly or RF
210
Communicated over data network
220
Communicated wirelessly
211

FIG. 15

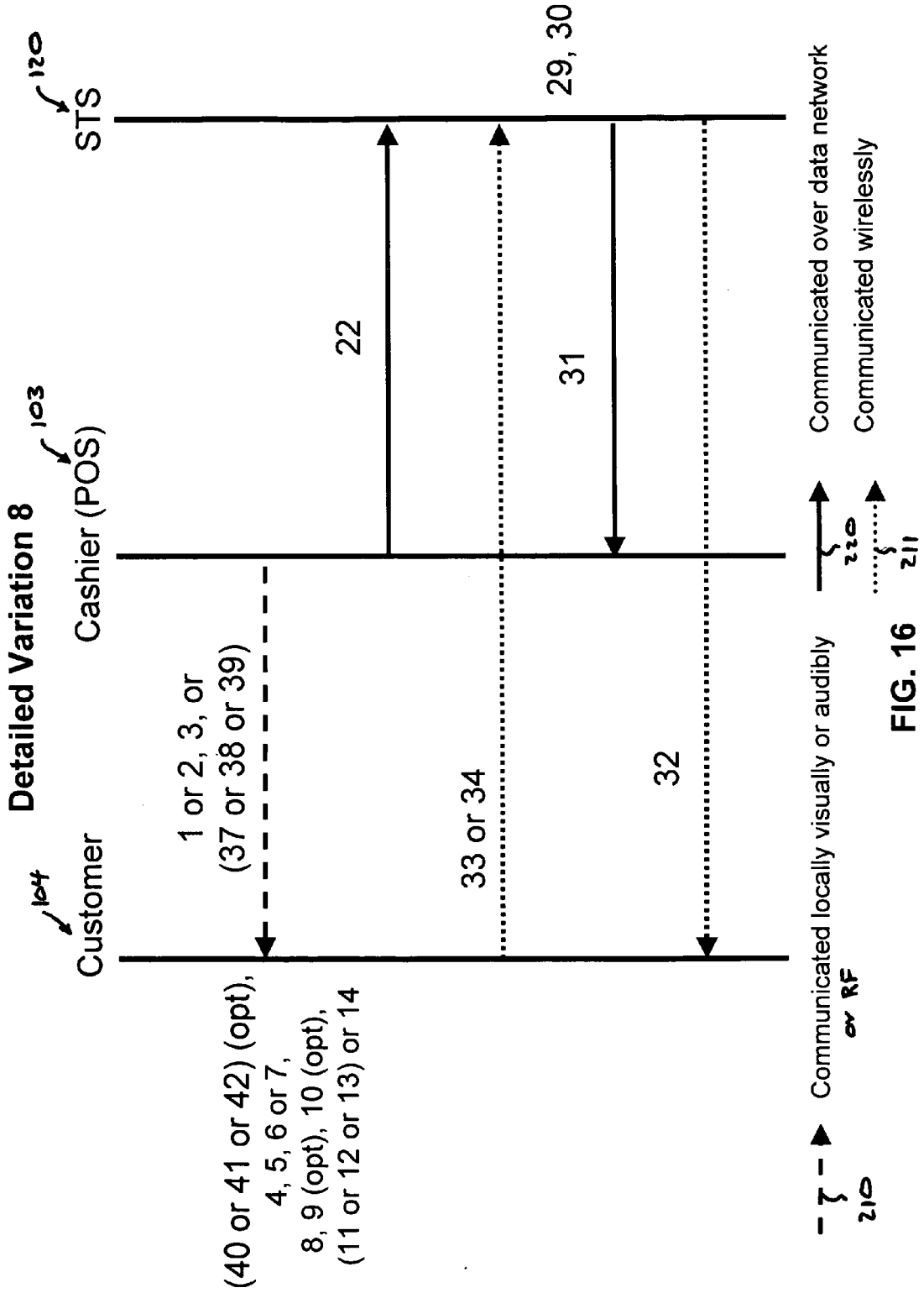
Detailed Variation 8
Customer
104
Cashier (POS)
103
STS
120
1 or 2, 3, or
(37 or 38 or 39)
22
33 or 34
31
32
29, 30
(40 or 41 or 42) (opt),
4, 5, 6 or 7,
8, 9 (opt), 10 (opt),
(11 or 12 or 13) or 14
Communicated locally visually or audibly
or RF
210
Communicated over data network
220
Communicated wirelessly
211

FIG. 16

# WIRELESS COMPUTER WALLET FOR PHYSICAL POINT OF SALE (POS) TRANSACTIONS

## CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority under 35 USC 119(e) to U.S. Provisional Application Ser. No. 60/703,862, entitled WIRELESS WALLET FOR PHYSICAL POINT OF SALE (POS) TRANSACTIONS, by Yannis Labrou and Jonathan Agre, filed Aug. 1, 2005 in the U.S. Patent and Trademark Office, the contents of which is incorporated herein by reference.

[0002] This application is a continuation-in-part of U.S. patent application Ser. No. 11/388,202, filed Mar. 24, 2006, entitled "Authentication Services Using Mobile Device," which claims priority to U.S. Provisional Application Ser. No. 60/669,375 filed Apr. 8, 2005; and also a continuation-in-part of U.S. patent application Ser. No.11/045,484, filed Jan. 31, 2005, entitled "WIRELESS WALLET" which claim priority to U.S. Provisional Application Ser. No. 60/544,300 filed Feb. 17, 2004; and also a continuation-in-part of U.S. application Ser. No. 10/458,205, filed Jun. 11, 2003, which claims the benefit of U.S. provisional application No. 60/401,807, filed Aug. 8, 2002; and also a continuation-in-part of U.S. application Ser. No. 10/628,584 filed Jul. 29, 2003, which claims the benefit of U.S. provisional application No. 60/401,807 filed Aug. 8, 2002; and also a continuation-in-part of U.S. application Ser. No. 10/628,569 filed Jul. 29, 2003, which claims the benefit of U.S. provisional application No. 60/401,807 filed Aug. 8, 2002; and also a continuation-in-part of U.S. application Ser. No. 10/628,583 filed Jul. 29, 2003, which claims the benefit of U.S. provisional application No. 60/401,807 filed Aug. 8, 2002.

[0003] This application is also related to pending U.S. patent application Ser. No. 11/388,202, filed Mar. 24, 2006, entitled AUTHENTICATION SERVICES USING MOBILE DEVICE, the entire disclosure of which is hereby incorporated herein by reference and attached hereto. This application is also related to pending U.S. patent application Ser. No. 11/045,484, filed Jan. 31, 2005, entitled WIRELESS WALLET, the entire disclosure of which is hereby incorporated herein by reference and attached hereto.

[0004] This application is also related to pending U.S. patent application Ser. No. 10/458,205, filed Jun. 11, 2003; Ser. No. 10/628,584, filed Jul. 29, 2003; Ser. No. 10/628,569, filed Jul. 29, 2003; and Ser. No. 10/628,583, filed Jul. 29, 2003, the entire disclosures of all of which are hereby incorporated herein by reference.

## BACKGROUND OF THE INVENTION

[0005] 1. Field of the Invention

[0006] The present invention relates to a wireless computing apparatus/device for physical Point of Sale (POS) transactions.

[0007] 2. Description of the Related Art

[0008] There is a need to improve payment speed at a physical POS. There is also a need to improve the cost of a transaction with the physical POS using a wireless communication computing apparatus. There is also a need to reduce the size of messages for communication efficiency in short-range communication methods.

## SUMMARY OF THE INVENTION

[0009] The present invention provides a wireless communication computing apparatus/device for physical Point of Sale (POS) transactions. For example, a mobile phone and/or a personal digital assistant (PDA) wireless communication wallet for physical POS transactions.

[0010] The above as well as additional aspects and advantages will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the described embodiments.

[0011] Methods and systems providing a secure transaction server (STS); providing an authentic point of sale (POS) device, according to a first authentication parameter of the STS; providing an authentic mobile purchasing device, according to a second authentication parameter of the STS; providing a short-range communication method between the POS device and the mobile purchasing device; correlating by the STS a personal identification entry (PIE) and the authentic mobile purchasing device; transmitting, by the POS device, a time dependent transformed secure POS authenticable POS purchase action to the STS; inputting the PIE to the mobile purchasing device to transmit a time dependent transformed secure user authenticable POS purchase action to the POS device via the short-range communication method; and approving, by the STS, the POS purchase action for the POS device and for the mobile purchasing device, according to the authentic POS device, and according to the authentic mobile purchasing device and the STS correlating of the PIE and the authentic mobile purchasing device.

[0012] According to an aspect of the embodiments, the POS purchase action identifies payment for a good and/or a service.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The above-described aspects and advantages together with other aspects and advantages will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0014] FIG. **1** is a diagram of a computer system **100** to provide a mobile wireless communication apparatus to a physical point of sale (POS) transaction service, according to an embodiment of the present invention,

[0015] FIG. **2** is a functional block diagram of Universal Pervasive Transaction Framework Secure Agreement Submission (UPTF SAS) system architecture to execute a mobile device POS authenticable transaction, according to an embodiment of the present invention,

[0016] FIG. **3** is a diagram of UPTF mobile device POS authenticable transaction messages based upon Secure Agreement Submission (SAS) protocol to provide an authenticable mobile POS service, according to an embodiment of the present invention,

[0017] FIG. **4** is a system flow diagram of provisioning a mobile POS, according to an embodiment of the present invention, and

[0018] FIGS. **5-16** are flowcharts of mobile device to POS authenticable transactions, according to the embodiments of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Reference will now be made in detail to the present embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0020] The described embodiments provide a wireless communication computing apparatus/device for physical Point of Sale (POS) transactions. For example, a mobile phone and/or a personal digital assistant (PDA) wireless communication wallet for physical POS transactions. The discussed methods and apparatuses and variations improve on the speed of a payment at a physical POS, the cost of the transactions since they do not always require that the mobile phone connect to the wireless Internet or cellular telephone network for the transaction to be authenticated and approved. In addition, the size of the messages is reduced for short-range communication methods.

[0021] FIG. **1** is a diagram of a computer system **100** to provide a mobile wireless communication apparatus to a physical point of sale (POS) transaction service, according to an embodiment of the present invention. According to the embodiments, a user **102** uses a mobile device **104**, such as (without limitation) a mobile phone or a PDA, with wireless communication capability, to transact with a Point of Sale (POS) device **103**, such as (without limitation) a cash register, of a provider **106**, for example, to purchase an item or receive a service, etc. According to an aspect of the embodiments, the POS **103** can be another mobile device **104**, such as another mobile phone. According to an aspect of the embodiments, a provider **106** operates one or a plurality of POSs **103**. According to an aspect of the embodiment, the provider **106** and the POS **103** can be collapsed together. The mobile device **104** can be any mobile wireless communication computing device or mobile radio computing device, including, without limitation, a mobile phone, that wirelessly communicates (e.g., wireless Internet or mobile phone network **211**) with other mobile devices **104***a-n,* with a secure transaction server **120**, or with a POS **103**, or any combinations thereof. According to an aspect of the embodiments, the mobile device **104** has one or more short-range communication methods **210** implemented therein, for example (without limitation), image, audio, and/or RF, to communicate with the POS **103**.

[0022] According to an aspect of the embodiments, the invention improves using a mobile device **104**, such as a mobile phone **104**, for physical POS transactions, within the context of the Universal Pervasive Transactions Framework (UPTF). One main concept behind the discussed methods and variations is that the consumer's or customer's mobile phone **104** communicates to the Point of Sale (POS) **103** a transaction message, for example, a UPTF SAS based transaction message, used to authenticate and approve the transaction via:

[0023] (1) An image,

[0024] (2) An audio signal,

[0025] (3) Any short-range wireless connectivity technology, such as (without limitation) a short range RF signal, such as WiFi, Bluetooth, Radio Frequency Identification (RFID), or smart card, Near Field Communication (NFC) signal, or any combinations thereof, or

[0026] (4) Any combinations thereof.

[0027] According to an aspect of the embodiments, the POS **103** has equipment that can send, receive, and interpret a locally transmitted/received message to re-construct a corresponding UPTF SAS message for UPTF transaction verification protocol. For example, an image interpreter at the POS **103** can decode a UPTF SAS message from an image displayed on the mobile phone's **104** display. Another example is to use an audio processor at the POS **103** that can decode a UPTF SAS message from an audio signal "played" through the mobile phone's **104** speaker to the POS **103** microphone. Another example is an RF signal between the POS **103** and mobile phone **104**. The information received by the POS **103** is used to create one or more of the UPTF SAS messages (i.e., POS transaction view or the provider/merchant/payee transaction view) needed for the UPTF transaction verification protocol, which the mobile device **104** and/or the POS **103** (as the case may be) transceive with the STS **120**. According to an aspect of the embodiments, the POS **103** transmits to the Secure Transaction Server (STS) **120** the mobile phone **104** provided RF based UPTF SAS message, or an image, audio after converting the same to a corresponding UPTF SAS message; the result of this conversion being a UPTF SAS based digital message. According to an aspect of the embodiments, the POS also transceives, by passing through any user related UPTF SAS messages (e.g., user transaction view generated at the mobile phone **104**), such as an image or audio, without any prior conversion of the same to/from the STS **120**. The POS **103** can be connected to the STS **120** possibly through a data network that can be a wireless connection and/or a wired connection.

[0028] In the case of an image, the POS **103** equipment can be a barcode scanner, preferably one that is capable of processing 2-Dimensional barcodes. In the case of an audio signal, the POS equipment **103** is an acoustic coupler or a DTMF (Dual Tone Multi-Frequency) tone recognizer. A DTMF recognizer (detector) is usable to recognize touch-tone entries into over-the-phone customer service systems.

[0029] Another method discussed improves on physical POS **103** purchasing by using Short Message Service (SMS) and/or Multimedia Message Service (MMS) messages to transmit UPTF SAS messages among the mobile phone **104**, POS **103** and/or the STS**120**. More generally, SMS messages can be used as the transported mechanism for all types of UPTF transactions (see co-pending UPTF-related patent applications incorporated herein by reference.

[0030] The invention can be implemented in any mobile device **104** capable of executing UPTF SAS based Wireless Wallet software **108**, in a POS **103** (a computing apparatus) capable of executing the UPTF SAS protocol and POS functions, and a UPTF-SAS based Secure Transaction Server (STS) **120**. Companies interested in allowing their users to securely perform transactions from a mobile device **104** can adopt the UPTF SAS protocol.

[0031] Therefore, embodiment(s) described herein relate to a mobile device authenticable transaction with the POS **103**. According to an aspect of the embodiments, an authenticated or authenticable transaction is based upon Universal Pervasive Transaction Framework Secure Agreement Submission (UPTF SAS) protocol. Universal Pervasive Transaction Framework (UPTF) is a framework for authenticating transactions initiated by a mobile (radio) device. The UPTF SAS protocol is discussed in related pending U.S. patent application Ser. No. 11/388,202, filed Mar. 24, 2006; Ser. No. 11/045,484, filed Jan. 31, 2005; Ser. No. 10/458,205, filed Jun. 11, 2003; Ser. No. 10/628,584, filed Jul. 29, 2003; Ser. No. 10/628,569, filed Jul. 29, 2003; and Ser. No. 10/628,583, filed Jul. 29, 2003, the entire disclosures of all of which are hereby incorporated herein by reference. According to an aspect of the embodiments, a mobile device **104** provides authenticated transaction services according to authenticable transaction view(s) of one or more parties (i.e., in a typical embodiment paired and/or more than two authenticated transaction views), wherein the authenticated transaction views are time, user and software dependent, secured (e.g., encrypted), matched (verified against each other), and transaction party anonymous to the POS **103** (e.g., a transacting party does not have to receive personal/private/confidential information (e.g., account information) of the other transacting party. Therefore, according to the embodiments authentication includes transaction or agreement of parties verification.

[0032] FIG. **2** is a functional block diagram of Universal Pervasive Transaction Framework Secure Agreement Submission (UPTF SAS) system **200** architecture to execute an authenticable transaction using a mobile device and a POS, according to an embodiment of the present invention. In FIG. **2** and other figures, color designations are used to highlight features/concepts described, for example, a type of, or a possible type of, communication channel. For example, communication channels may be Virtual Private Network (VPN), mobile phone or cellular network, or unknown by referring to any known type of computer data communication network. The Universal Pervasive Transaction Framework (UPTF) defines a system architecture based upon independent and anonymous transaction agreement views and a communication security protocol called the Secure Agreement Submission (SAS) protocol to transmit the views. Essentially the UPTF offers a vessel, which is able to securely carry the individual views of a transaction agreement, in this case a mobile device POS authenticable transaction (collectively referred to as a mobile device POS transaction), from each party involved in the transaction to a trusted third party for verification, using a communication network which may comprise insecure segments, such as wireless Internet, mobile telephone network or cellular links, short-range communication methods. According to an aspect of the embodiments, a UPTF SAS message is an authorization for a specific transaction at this time. When a mobile POS **104** is used for a POS transaction, the transaction parties are the user **102** and the provider **106** that operates the POS **103** with which the user **102** desires to conduct a transaction. A typical example of a "mobile device POS transaction" agreement view may comprise: "User A, Transaction Token."

[0033] In FIG. **2**, the UPTF SAS protocol encrypts/decrypts a transaction message using a symmetric, secret-key $\mathbf{352}_{c,m}$ approach where the secret key $\mathbf{352}_{c,m}$ is producible only by an individual party's mobile device **104** and a trusted third party (e.g., implemented as STS **120**) and without transmission of the secret key among the parties. In other words, the UPTF SAS provides an implicit user authentication, because decryption by a trusted third party, such as STS **120**, of a sending party's encrypted message, authenticates the sending party. The SAS insures that the authenticity of the parties is verified and during delivery, the privacy of the information is preserved (transaction party anonymity), even when the parties distrust each other and the messages from one party may be forwarded by the other to the third party verification (as the case may be). The UPTF provides the mechanism for the trusted third party **120** to verify that the independent views of the mobile device POS transaction are consistent with each other.

[0034] In FIG. **2**, after the STS **120** extracts the mobile device POS transaction data from the transaction views received from the parties and the STS **120** verifies the received mobile device POS transaction data, further actions may be needed, which, for example, may be realized by the trusted third party **120** interacting with financial institutions associated with the user payer **102** and the provider (merchant) payee **106** to cause the transfer of the specified funds between the user payer **102** and the provider payee **106**.

[0035] In FIG. **2**, a UPTF based mobile device POS authenticable transaction system architecture comprises a user **102** operating a UPTF device (also referred to as Universal Pervasive Transaction Device—UPTD), such as a mobile phone **104** loaded with a mobile point of sale (POS) application **109** (hereinafter referred to as mobile POS application that can be implemented in software and/or computing hardware), a provider **106** operating another UPTF based device **205**, a Secure Transaction Server (STS) **120**, and optionally for additional transactions a number of financial institutions (not shown), and several non-secure and secure (as the case may be) communication channels among them. Typically according to an embodiment, the separation of the STS **120** and the provider **106** as shown in FIG. **2** is a logical separation, as a single entity or separate entities (as the case may be) can implement each.

[0036] In FIG. **2**, according to an aspect of the embodiment described herein, the STS **120** authenticates a mobile device **104** by an authentication parameter(s) **350** to provide an authenticable mobile POS **104**. The authentication parameter(s) of the STS is secret information used for encrypting the messages to/from each user **102** mobile POS **104** and provider **106** (POS **103**), which are stored in a database storage **203**. The STS **120** receives independently generated UPTF SAS mobile device POS authenticable transaction views (described in more detail further below) from both the user **102** and the provider **106** (POS **103**) regarding a transaction conducted between them. The STS **120** is able to decode both of the views based upon information from UPTF SAS mobile device POS authenticable transaction messages and the information stored in the STS **120** database **203**. Following successful decoding, the STS **120** verifies that the view messages are original, authentic, involve the intended user **102** and provider **106** and that the information fields in the transaction views are consistent with each other. The STS **120** can maintain a log of messaging activity for non-repudiation purposes. Therefore, the authenticable mobile POS **104** mobile POS application **109** is based on a general framework, called the Universal

Pervasive Transaction Framework (UPTF), a generic new architecture and security protocol for conducting secure multi-party agreements, using mobile devices over a wireless transport network. The framework is designed to address several key aspects specific to the envisioned pervasive communication, including wireless, environments.

[0037] In FIG. **2**, according to an aspect of the embodiments, the mobile device **104** mobile POS application **109** communicates with the POS **103** of the provider **106** via any short-range communication method **210** comprising an image, audio (sound, oral/written communication and recognition thereof, such as voice recognition), or wireless communication connectivity technology, or any combinations thereof. The range of the short-range communication **210** can be according to application design from a few inches or less to a predetermined area. The short-range communication **210** is typically non-secure by itself (meaning that the communication channel might not be secure, but the communication channel can carry a protocol, such as the UPTF SAS scheme, that has the desired security properties). Although the embodiments are not limited to such a configuration and the short-range communication **210** can be secure by itself and also carry the UPTF SAS protocol. The mobile device **104** mobile POS application **109** can also communicate with the STS **120** via a wireless communication channel **211**, which is typically non-secure, and can be a wireless Internet, a mobile phone network, a local wireless network, or any combinations thereof. According to an aspect of the embodiment, the wireless communication channel **211** includes SMS and/or MMS. Thus, wireless UPTF SAS based messages are transportable over the wireless communication channel **211** using SMS messages to/from the STS **120**, or using HyperText Transfer Protocol (HTTP), or web service calls, or other known wireless message transport services, or any combinations thereof. The provider **106** and the STS **120** can be separate or collapsed (as the case may be), and the provider **106** communicably connects with the STS **120** via known secure, non-secure, wire or wireless, or any combinations thereof communication channel(s) **220**.

[0038] FIG. **3** is a diagram of UPTF mobile device POS authenticable transaction messages based upon Secure Agreement Submission (SAS) protocol to provide an authenticable mobile POS service, according to an embodiment of the present invention. The SAS protocol is used for encrypting and submitting views of desired UPTF based authenticable transactions. The message structure and encryption mechanism of SAS are designed to provide many of the desired security properties in an insecure pervasive communication, including wireless, environment for transactions, such as:

[0039] Authentication: the agreement parties and the verification party are authenticated to each other, as is the integrity of the agreement group;

[0040] Anonymity: agreement parties may remain anonymous to each other and personal and/or other account related information is not revealed to the other party;

[0041] Protection of the agreement content: the agreement is kept private, it is tamper-resistant, non-replayable, and strong non-repudiation properties are provided. In particular, a continuously changing, time dependent, device specific key is used to encrypt each view.

[0042] The underlying SAS algorithms are well-suited for a system using low-cost user devices, which have limited computing resources, while minimizing the complexity of use for the user. In addition, some of the information necessary to use the SAS, in particular a Personal Identification Entry (PIE), is not permanently stored on the mobile POS **104** and not included in any data transmissions, so if the mobile POS **104** is lost or stolen, the mobile POS **104** cannot be used. Additional details of the SAS and the encryption mechanism are provided with reference to FIG. **3**, as follows.

[0043] FIG. **3** shows the internal structure and the generation process of a mobile device POS authenticable transaction view messages **402**, **404** (i.e., UPTF SAS authenticable transaction messages among a mobile device **104**, a POS **103** and an STS **120**). The provider **106** includes a provider device **103**, such as a POS **103**, on which the provider UPTF based transaction messages are implemented. The UPTF SAS based views **402**, **404** are also implemented in software and/or computing hardware as the mobile POS software **109** that is executed in the mobile POS **104**. Since the views **402**, **404** from the user **102** and the provider **106**, respectively, are symmetrical, the user's **102** view **402** is only described. The identifiers used in FIG. **3** are explained below:

[0044] DIDc: device ID, a unique identifier for the mobile POS **104** (the user consumer (c) or source transaction party).

[0045] DIDm: device ID, a unique identifier for the provider **106** POS device **103** (the merchant (m) or destination transaction party).

[0046] RSN: random sequence number.

[0047] TS: local current timestamp.

[0048] TID: transaction ID, a unique identification number assigned to an agreement, which is maintained by the STS **120** to identify corresponding UPTF agreement views **402**, **404**. For example, a purchase transaction identifier uniquely identifying a particular purchase.

[0049] MD: message digest **410**

[0050] PIE: Personal identification entry, a user and STS **120** maintained input secret entry, such as an alphanumeric string. In a typical embodiment described herein, the PIE is only maintained by the user and the STS **120**, is not known to and/or maintained by another party to a transaction and/or any financial institutions and is temporally known as an intermediate parameter to the mobile POS **104** of the user **102** for encrypting the user transaction view **402**. More particularly, the PIE is not included in transaction messages (e.g., UPTF SAS messages and/or SAS based informational messages) and, thus, the mobile POS **109** does not transmit the PIE. The PIE can be non-secure by being a substantially short alphanumeric string, such as a 4 digit number. The user enters the PIE whenever the user attempts a transaction. Preferably the PIE is issued to the user when the user registers for the authenticable mobile POS service using a client device **104**, which executes the mobile POS **109**. The user can also select the PIE at such time of registration. The PIE is, however, a piece of highly secure information in the sense that it is never transmitted during the UPTF protocol execution, it is only known to the user and the STS **120**, and its secrecy should be well protected. The PIE can be input by

the user on a mobile POS **104** in a secure fashion or it may be deterministically generated using a biometric device, such as a fingerprint sensor. For example, a computation applied on the fingerprint data received from a fingerprint sensor can be used to generate a PIE that is initially communicated by the user to the STS **120**. Whenever the user attempts a transaction, the user applies her finger to the fingerprint sensor, thus generating the PIE. The PIE is not kept in permanent storage on the mobile POS **104**, but is used as an intermediate parameter required for the generation of the encryption key for a transaction and the mobile POS **104** should not retain the PIE for a period longer than a transaction execution time as determined according to application criteria. If a particular implementation of the present invention uses a form of PIE that is not convenient for a user to input for each agreement transaction and the device needs to store its user's PIN, the storage must be secure and tamper-resistant. According to another aspect of the embodiment, the PIE can be a user **102** biometric input data.

[**0051**] As shown in the FIG. **3**, a view **402** comprises a cipher text part (or encrypted part) **406** and a perceptible (e.g., plaintext) part **408**. A plaintext part **408** includes the TID, the DIDc of the mobile POS **104** generating the view **402**, and the local current timestamp (TS) of device **104**. The TS, among other functions described herein, is also used to prevent transaction replay. The encrypted part **406** includes two critical fields: the agreement data (transaction data) and the DIDm of the provider's **106** POS **103** device involved in the agreement. The DIDm is the minimum necessary reference field to provide the desired verification properties of the UPTF protocol. According to an aspect of the embodiments, the DIDm is communicably provided to the user **102** and/or the mobile POS **102** via any known methods, for example, via the short-range communication **210**. Therefore, a user can execute a mobile POS **104** authenticable transaction with a transaction party based upon a PIE and a mobile POS application **109** authentication parameter RSN, and authenticable transaction messages comprising an identifier of the mobile device POS **104**, an identifier of the transaction party, and an identifier for the transaction (for example, an identifier and/or other transaction related data, such as a type of transaction, payment amount, etc.), thereby providing the mobile POS **104** based upon a combination of the mobile POS application **109** at the mobile POS **104** and the STS **120** association of the PIE and an authentication parameter, which is known and/or determinable by the devices **103**, **104** and **120**, with the user **102**, and exchange of the authenticable transaction messages among the user **102**, the provider **106** (POS **103**) and the STS **120**.

[**0052**] First, DIDc and the TS obtained from the mobile device **104** local clock (and/or as provided as a part of the agreement data) are utilized by the device's **104** pseudorandom number generator to generate a time-dependent RSN. Therefore, the parameters of the generator are particular to each device **104**. The encryption key K is then generated from the RSN and user input PIE (shown in FIG. **3** with orange coloring), where the PIE is provided from or generated by the STS **120**. Firstly, the RSN and PIE are combined using a function F and then a hash function H is applied to the result (typically a string) to generate the encryption key:

[**0053**] K=H (F ((PIE, RSN))

[**0054**] A message digest **410** function can be applied to the agreement data, the DIDm, and the DIDc to generate a MD of the view. According to an aspect of the embodiments, the MD **410** is generated by applying a hash function to the UPTF SAS agreement data as shown in FIG. **3** to shorten the same. The MD can further strengthen the security by ensuring that no other party has tampered with or modified the contents of the view **402** in any way. The encryption algorithm with the encryption key K is then applied to the MD, the agreement data, the DIDc, and the DIDm to generate the cipher text part of the view **402**, as shown in FIG. **3** with peach coloring. For further protection, the SAS protocol uses random message padding in order to further prevent "known-text" attacks. According to an aspect of the embodiment described herein, the embodiment uses Advanced Encryption Standard (AES) for encryption, a Keyed-Hashing for Message Authentication (HMAC)-based scheme for random number generation, and SHA1 Secure Hash Algorithm for the hash function.

[**0055**] The STS **120** has sufficient prior knowledge of the functions and specific parameters used by each device **104** in the encryption process, so that when combined with the plaintext portions of a message **402**, **404**, it is possible to decrypt the message **402**, **404** by reversing the above process. For example, from the plaintext part **408** of the view **402**, the STS **120** recovers the DIDc and TS, which are used to look-up the customer's **102** PIE and other parameters of the RSN generator that can be stored in the STS **120** database **203**. These are used to compute the RSN. The encryption key K can then be computed using the same method with which the device **104** generates the encryption key. The cipher text part **406** of the view message **402** is then decoded.

[**0056**] After all applicable fields of the user **102** view **402** are acquired, the STS **120** locates the provider's **106** view **404** for the same transaction, using the DIDm and TID included in the previously decoded user **102** view **402**. After going through a similar decryption process, the decoded fields of the agreement data of the provider **106** view **404** are compared with the corresponding fields from the user **102** view **402**. If all applicable corresponding fields match (correspond according to application design), the received views **402**, **404** are considered verified. Further processing is then carried out and external executions are triggered as necessary.

[**0057**] Any responses from the STS **120** to the user **102** or provider **106** are encrypted by the STS **120** using the same encryption methods and using the parameters for the destination devices **104**, **103** and the TS of the original transaction. Only the intended recipient can decrypt the response message, insuring privacy protection and authentication of the STS **120**.

[**0058**] Another example encryption key generation for the UPTF SAS is described herein. In FIG. **3**, using the view **402**, the key KEYc is a hash of a RSNc and a PIEc; the detailed key generation procedure is as follows:

[**0059**] The initialization data for the RSNc are created when the STS **120** creates a new authenticable mobile POS service account (e.g., when the mobile POS **109** is created or initialized by the STS **120**). Specifically:

[**0060**] 1. a random 128-bit seed is generated using a software service function.

[0061] 2. a random 160-bit initialization timestamp is created also at new authenticable mobile POS service account creation time, using software service function. Therefore, the STS **120** can generate or provide device **104** specific initialization parameters of a random number and an initialization time stamp, both of which are provided (installed) via the mobile POS application. **109** to the mobile device **104**.

[0062] The PIE creatable by the STS **120** when a new account is created at the STS **120**, as follows: a 32-byte random value is created using a software service function, convert each byte to a decimal value string, and concatenate them all to produce a long string. Randomly chop 4 digits from this string to create PIE.

[0063] When the key needs to be created in order to encrypt a transaction message, the following steps take place:

[0064] 1. A 160-bit current timestamp is generated, as follows:

[0065] a. Convert current time to string, for example, converting the current time to a 16 characters string, e.g., 5:04 pm, Jan. 26, 2006 is written in "0000170401262006."

[0066] b. Take the string and a one way function to output another value, for example by hashing the current time string using SHA1 algorithm, which produces a 160-bit output.

[0067] 2. XOR an init timestamp and current timestamp to produce a 160-bit output. This operation is essentially a form of deterministically calculating a difference between two values of time (i.e., a deterministic transformation between two values).

[0068] 3. Use the 128-bit seed software authentication parameter as data, and the XORed value of the two time stamps as the key, compute the HMAC result (a 160-bit value). The result of the HMAC is the RSNc. Use of the HMAC accommodates unpredictability in the RSNc generation.

[0069] 4. Chop the first 128-bit of the HMAC result, combine (e.g., concatenate) with the 32-bit PIE (convert from a 4 digit string) for a 160-bit value.

[0070] 5. Compute the hash (SHA1) value of the 160 bit stream in operation (4), and chop the first 128 bit as the final key.

[0071] In the encrypted part of the message a hash of the transaction part of the message (with the padding) using SHA1 (alternatively a CRC can be used) is used.

[0072] In the above-described embodiment, the values of a number of bits are provided as unlimiting examples, and the present invention is not limited to a specific number of bits values. Therefore, as illustrated with reference to FIGS. **2** and **3**, a UPTF SAS based transaction requires a device **104** which provides device-specific parameters that determine a device-specific and time-specific key and an operator for the device **104** who provides a PIE determinable only by the STS **120** and the operator. The combination of the two is required for an encrypted transaction request that can be validated by the STS **120**. Intercepting one (or more) transaction message and successfully decrypting it would not be sufficient for purposes of inferring either the PIE, or the device specific parameters employed in the key generation process. Moreover, a single, time-dependant key is not re-usable because of the pair-wise agreement notion of transactions processed by the STS **120**.

[0073] According to an aspect of the embodiments, the STS **120** can reset the RSN seed after every successful response from STS **120** to a device **103**, **104**; after that the STS **120** will expect the new seed to be used by the devices **103**, **104**. The seed can be derived as follows:

[0074] (1) use a predetermined portion of the message padding, and/or

[0075] (2) include the new seed in the STS's response (in the transactional content of the response) to the devices **103**, **104**.

[0076] FIG. **4** is a system flow diagram of provisioning (i.e., "providing a service," which includes distribution to a user and associated system actions) a mobile POS **104**, according to an embodiment of the present invention. In FIG. **4**, a mobile phone is used as an example mobile POS **104**. A method, comprising, at operation **450**, a user **102** logs into a mobile phone POS service registration site **205**. For example, the provider **106** and/or the STS **120** with which various providers **106** participate can provide the mobile POS service registration. At operation **452**, the user selects a mobile POS service, which according to an embodiment is a mobile POS application **109** download request from the provider **106**. However, the embodiments are not limited to a configuration of downloading a mobile POS application **109** to the mobile phone **104**, and a mobile POS **104** can be activated through other techniques, such as (without limitation) pre-installed software and/or computing hardware (e.g., an integrated circuit), so long as a mobile POS **104** authenticable by the STS **120** is provided. At operation **454**, the provider **106** device **205** communicably connects with the STS **120** for providing a mobile POS **104**.

[0077] In FIG. **4**, the method at operation **454** further comprises initializing, at the STS **120**, a mobile POS application **109** with software authentication parameter(s), as an authentic mobile POS application **109**. Also, at operation **454**, correlating, at the STS **120**, a personal identification entry (PIE) (e.g., a PIN) and an identifier of the mobile phone **104** with the authentic mobile POS application **109**. At operation **456**, the PIN can be communicated to the user **102**. Of course, at operation **450**, the user **102** can supply a PIN. At operation **458**, installing, in the mobile phone **104**, the authentic mobile POS application **109**. According to an aspect of the embodiment, at operation **458**, the mobile phone **104** receives a Short Message Service (SMS) with a download link to the authentic mobile POS application **109**. At operation **462**, the user **102** can download the authentic mobile POS application **109**. When the authentic mobile POS application **109** is installed in the mobile phone **104**, the user can execute, at the mobile phone **104**, the installed authentic mobile POS application **108** using the PIE (e.g., PIN) to execute a mobile phone POS authenticable transaction as an authenticable mobile POS **104**.

[0078] According to an aspect of the embodiment described herein, at operation **454**, one or more software authentication parameters are selected, which can be (without limitation) creation of a new seed, such as a new random seed number, and an initialization time. At operation **454**, the STS **120** stores in a database **203**, a unique identifier

(referred to as Device ID, or DID) for the mobile phone **104**, which can, for example, be a mobile phone number of the mobile phone **104** or some randomly generated globally unique identifier (GUID), a mobile phone carrier (as the case may be), or the software authentication parameter(s), and the generated PIE, or any combinations thereof. According to an aspect of the described embodiment, a mobile phone number can also be used as a device identifier for the mobile phone **104**. The unique identifier (device ID (DID)) of the mobile phone **104** is used by the STS **120** to correlate a transaction message with the authentic mobile POS application **109** (i.e., to correlate the DID with the software authentication parameter(s) and the PIE stored at the STS **120**, so that the STS **120** can generate a key that corresponds to a device **104** having the DID. The mobile phone number can be used to communicate short messages (e.g., notifications, etc.) with the mobile phone **104** (e.g., Short Message Service (SMS), including (and/or) Multimedia Message Service (MMS)). The mobile phone **104** can be an Internet enabled, according to known techniques, mobile phone. According to an aspect of the embodiment(s) described herein, a mobile device POS authenticable transaction message is bound to a unique combination of a user **102** and a mobile POS **104**, the binding to the user is via the PIE and the binding to the device **104** is via the software authentication parameter(s) of the authentic mobile POS app **109**. In particular, a transaction is an SAS based encrypted message and the encrypted message can be traced back to a combination of the user **102** and the device **104** through the PIE and the software authentication parameter(s) of the authentic mobile POS application **109**. Similar binding applies with respect to the POS **103** transaction messages.

[**0079**] According to an aspect of the embodiments, a variation on the sign-up and registration process, which could be particularly useful for person-to-person payments, in which the payer is the payer mobile POS **104***a* and the payee serves as a payee mobile POS **104***b*, is described next. This method has the advantage that it does not require that a payee is already signed-up with a payment service to receive payment by a payer mobile POS **104***a*. A user with mobile POS application **109** on the mobile phone **104** can make a payment to another mobile phone owner that is not registered yet for the mobile POS service. The first user specifies the recipient of the payment via the mobile phone number of the second user. The second user subsequently receives an SMS at the second user's mobile phone with the aforementioned phone number. The SMS informs (with text) the second user of a pending payment to the second user and includes a link for downloading the mobile POS software **109**. A version of the mobile POS software **109** for this specific second user was created at the STS **120** upon receipt of the first payment request to the STS **120** from the first user. Upon completion of the download, the second user needs to register for the mobile POS service to complete receiving payment. To maximize security, it is preferred that the second user does the registration at the provider's website, as discussed with reference to FIG. **4**. Alternatively, the registration can be done from inside the mobile POS application **109**, by invoking a "new account" action.

[**0080**] Wireless communication computing apparatus/device transactions with a physical Point of Sale (POS) are described next. The methods and systems described have several variations that make tradeoffs between various categories, such as convenience to the customer, security, time of transaction, local communication and cellular network communication. For example, whether a customer needs to type any transaction identifying information into the phone is one category. In the case of a mobile phone, another category is whether the transaction can be accomplished with or without any information transmitted over the cellular network.

[**0081**] METHODS (SYSTEMS): The discussed methods/systems consider the following options to better conform to the requirements of the cell phone-POS purchasing environment and constraints:

[**0082**] Communication mechanisms: Several communication mechanisms are utilized by these methods. These are roughly characterized as "local communication" (short-range communication methods **210**) and "remote communication":

[**0083**] Local communication is considered to be

[**0084**] 1. Image, such as any type of barcode and scanner thereof, camera, scanner, or any combinations thereof at the POS **103** and/or the mobile POS **104**. According to an aspect of the embodiments, the barcode system is capable of processing 2-Dimensional barcodes.

[**0085**] 2. Audio, such as any output audio signal or Dual Tone Multi-Frequency tone, or voice, or any combinations thereof, and recognizer(s) thereof at the POS **103** and/or the mobile POS **104**.

[**0086**] 3. Radio Frequency (RF) (Radio Frequency Identification (RFID), Bluetooth, WLAN, NFC, etc., or any combinations thereof at the POS **103** and/or the mobile POS **104**

[**0087**] Remote Communication is considered to be

[**0088**] 1. Short Message Service (SMS), Multimedia Messaging Service (MMS)

[**0089**] 2. Wired Internet

[**0090**] 3. Cellular Internet (wireless Internet access through the mobile telephone network as implemented according to known techniques)

[**0091**] Message Lengths: Several options for decreasing the size of the UPTF messages are incorporated. The messages can be either:

[**0092**] 1. The full UPTF message is used as the transaction authorization message, and/or

[**0093**] 2. The Message Digest MD **410** of the mobile POS **104** UPTF message is used as the transaction authorization message of the consumer; using the MD instead of a full UPTF message results in a shorter message length.

[**0094**] 3. One-time transaction code—A one-time use random number, called the C-Nonce, generated by the phone using the UPTF key generation scheme to indicate that the customer authorizes the transaction.

[**0095**] Computation reductions: To avoid burdening the phone or the POS equipment **103**, the "local send" messages, or rather, their representations (image or audio signal) can be transmitted "as is" by the POS **103** to the STS **120**, i.e., there is no conversion of the signal to a UPTF message at the POS **103**; rather the STS **120** performs such conversion.

[0096] CONSTRAINTS: To understand the described process flows and the related actions, the following constraints should be taken into consideration. The purpose of these constraints is to further the understanding of why the actions have been defined as they have.

[0097] Message Length: If sending a SMS to STS, message length preferably needs to comply with applicable SMS, network, phone model, and/or wireless service provider/carrier (as the case may be) requirements for delivering the short messages. For example, message length might need to be <=160 chars, which means either no padding or use of the UPTF SAS based Message Digest (MD).

[0098] If a MD is used there can be no padding since then the STS **120** will not know where the payload of the encrypted message begins and ends.

[0099] Some barcode types require MD instead of full encrypted message, because they cannot accommodate a full UPTF message length.

[0100] The MD with timestamp and DID requires about 16 bytes (for Timestamp), plus 8 Bytes (for DID), plus possibly 10 Bytes (for TID), plus the MD length (typically 16-20 Bytes, although it can be less), for a total of between 40-54 Bytes (typically). By contrast, a full UPTF message's length can vary between 100 and 1024 bytes depending on the message type and the amount of padding

[0101] If the MD is used and the message is sent by SMS or MMS, a TID is necessary for the STS to identify which merchant message the customer message matches with. An alternative is to provide the POS ID and transaction amount to the mobile POS application **109**. In general, the mobile POS application's **109** and the POS's **103** UPTF messages are not sent in the same communication, although the embodiments are not limited to such a configuration and the mobile POS software **109** and POS **103** UPTF message can be sent in same communication.

[0102] The payment account by the payer **102** selection is always optional, and since some of the embodiments are "off-line" schemes, the selected account can be drawn from default settings.

[0103] Regardless of using MD or full message, the DID and timestamp are necessary in the unencrypted part of the UPTF message so that the STS **120** knows where and when the message came from and the STS **120** can successfully decrypt the UPTF message.

[0104] ACTIONS: Several variations are described based on whether the phone **104** and the POS **103** use short-range communication **210** and whether the transaction details (e.g., merchant ID, amount) are entered by the customer or received automatically via local **210** or remote communication **211**.

[0105] Table 1 lists the embodiments and variations therefore as described herein. Table 1 lists mobile device **104** with POS **103** transaction variations including communication modes of the mobile device **104** with the POS **103** and/or the STS **120**. In particular, for example, in Table 1, variation **1** is applicable when the mobile phone **104** uses SMS to the STS **120** to communicate a UPTF SAS transaction message, and variation **2** is applicable when the mobile phone **104** uses SMS to the STS **120** or when the mobile phone **104** uses a short-range communication method to the POS **103**, and so on.

TABLE 1

| Variation nos./mobile device 104 communication modes | 1 | 2 | 2-1 | 3 | 3-1 | 4 | 4-1 |
|---|---|---|---|---|---|---|---|
| Mobile Device Mode 1: Phone uses SMS to STS | X | X | | X | X | X | |
| Mobile Device Mode 2: Phone uses short-range communication method to POS | | X | X | | | | X |
| Mobile Device Mode 3: Phone receives amount and approves | | | | | | X | X |
| Mobile Device Mode: 4 POS uses short-range communication to phone | | | X | X | X | | X |

[0106] The steps involved with the embodiments and variations thereof are described with reference to FIGS. **5-16**. FIGS. **5-16** are flowcharts of mobile device to POS authenticable transactions, according to the embodiments of the present invention. According to an aspect of the embodiments, the user/customer/client **102** and mobile device **104** can be collapsed together, since the mobile device **104** can automatically generate and/or reply to any UPTF SAS based transaction messages, obviating any user input.

[0107] FIG. **5** is a flow chart of variation **1**: Remote Communications **211** with the mobile POS **104**.

[0108] Step **500**. The merchant (cashier POS **103**) sends a UPTF message to the STS **120** requesting a transaction ID and receives a transaction ID (TID) reply from the STS **120**. The merchant displays the details of the transaction on a monitor (as in a normal store). This information may include the amount, a transaction ID and/or a POS ID to identify the merchant. Then, the merchant sends a UPTF message to the STS **120**, called the M-View **404**, with the encrypted portion **406** containing the POS ID, transaction ID, the amount, the Time stamp (but may or may not contain the device ID of the mobile POS **104**), using its preferred connection. According to an aspect of the embodiments, if the views **402**, **404** do not contain a device ID, the transaction ID (since both the mobile device **104** and the POS **103** point to the transaction identifier) can be usable to bind the views **402**, **404** for STS **120** authentication and verification.

[0109] Step **502**. The customer launches the mobile POS application **109** and enters the transaction ID and/or the POS ID as obtained from the merchant in operation **500**. The customer enters the PIN. The customer selects an account. The mobile POS application **109** sends a UPTF message to the STS **120** using a cellular network **211**, called the C-View **402**. The encrypted portion **406** contains the transaction ID, the account, the time stamp and may or may not contain the POS ID. According to an aspect of the embodiments, the UPTF SAS message **402**, **404** agreement data **412** can be explicit transaction information, and/or implicit or abstracted transaction data, such as the transaction identifier (TID) (as the case may be).

[0110] Step **504**. The STS **120** receives the messages from the merchant **103** and the client **104**. The STS **120** decodes the messages and verifies the identity of the parties. The STS authorizes the transaction. The STS **120** sends receipt mes-

sages to the merchant using its preferred connection **220** and to the customer over the cellular network **211**.

[**0111**] FIG. **5** variation uses the remote messaging over the cellular network **211** to perform the communication from the customer. This customer never explicitly acknowledges the amount of the transaction, except implicitly by optionally typing in the transaction ID and PIN. In general, this method of transaction has been discussed in the above-identified related co-pending patent applications.

[**0112**] FIG. **6** is a flowchart of variation **2**: Local Communication **210** between the mobile POS **104** and the POS **103**.

[**0113**] Step **600**. The merchant optionally sends a UPTF message to the STS requesting a transaction ID (see operation **500**). The merchant provides the details of the transaction, for example, on a monitor (as in a normal store). This transaction information may include the amount, a transaction ID and/or a POS ID to identify the merchant **103**.

[**0114**] Step **602**. The customer launches the mobile POS application **109** and enters the transaction ID and/or the POS ID as obtained from the merchant in operation **600**. The customer enters the PIN. The customer selects a payment account. The mobile POS application **109** locally via a short-range communication **210** sends a UPTF message to the merchant **103** using the preferred local medium **210**. The message can be a complete C-View **402**, where the encrypted portion **408** contains the time stamp, a nonce, and optionally contains the transaction ID, the account, and/or the POS ID. If the length of the message is constrained, it is possible to send a shortened message consisting of the digest or the nonce.

[**0115**] Step **604**. The merchant **103** receives the local communication and sends both its UPTF M-View **404** message and the received C-view **402** to the STS **120** via the communication channel **220**. For example, the encrypted portion **408** of the M-view **404** containing the POS ID, the amount, the Time stamp, optional Transaction ID (but no device ID), is transmitted from the POS **103** to the STS **120** using a preferred connection **220**.

[**0116**] Step **606**. The STS **120** receives both the messages from the merchant **103** and the client **104**. The STS **120** decodes the messages and verifies the identity of the parties. The STS authorizes the transaction. The STS **120** can send receipt messages to the merchant using its preferred connection **220** and to the customer over the cellular network **211**.

[**0117**] FIG. **6** variation uses the local messaging **210** to perform the communication from the customer. For example, after the customer types in the PIN to authorize the transaction, the mobile phone **104** creates a 2-d barcode containing the complete C-View **402** message. The customer holds the phone display to an imager at the POS **103** that records the barcode and creates a digital message. Again, this customer never explicitly acknowledges the amount of the transaction, except implicitly by typing in the transaction ID and PIN. The receipts are delivered by the cellular network **211** to the phone **104**.

[**0118**] FIG. **7** is a flowchart of variation **2-1**: If the phone **104** is capable of receiving local communication via a short-range communication **210** from the POS **103**, then, at operation **706** (**606** in FIG. **6**), the receipts can be delivered by the STS **120** to the POS **103** and the POS **103** can transmit the customer receipt to the phone **104** via local communication **210**. This will avoid the need for the mobile POS **104** to have any remote communication **211**, thus reducing communication **211** traffic and cost.

[**0119**] FIG. **8** is a flowchart of variation **3**: Local Communication **210** from the POS **103** to the mobile phone POS **104**:

[**0120**] Step **800**: The POS **103** generates a local message via a short-range communication **210** to the phone **104**, called the T-Info that contains the transaction ID, the amount and the POS ID. The POS **103** also generates an M-View **404** and sends the same to the STS **120**.

[**0121**] Step **802**. The customer starts the mobile POS application **109**. The phone **104** receives the local message from the POS **103** and decodes the data. The user is asked to approve the transaction by entering the PIN. The Phone **104** generates a C-View message **402** containing a full UPTF message for the transaction. The phone sends the C-View message **402** via the cellular network **211** to the STS **120**.

[**0122**] Step **804**. The STS **120** receives the messages **402**, **404** from the merchant **103** and the client **104**. The STS **120** decodes the messages and verifies the identity of the parties. The STS **120** authorizes the transaction. The STS sends receipt messages to the merchant **103** using its preferred connection **220** and to the customer **104** over the cellular network **211**.

[**0123**] FIG. **9** is a flowchart of variation **3.1**: This variation uses 2-way local communication **210**, i.e., both the phone and the POS are capable of local communication via a short-range communication **210**. At operation **900**, the C-View **402** is first sent to the POS **103** as a local message, and, at operation **902**, the POS **103** relays the same along with the M-view **404** to the STS **120**. Also, at operation **904**, the merchant **103** sends the phone receipt to the phone **104** as a local message via the short-range communication **210**.

[**0124**] FIG. **10** is a flowchart of variation **4**. This variation uses the cellular network **211** to send the transaction data to the phone **104**.

[**0125**] Step **1000**. The merchant **103** provides, for example, displays on a monitor, the details of the transaction (as in a normal store). This information may include the amount, a transaction ID and/or a POS ID to identify the merchant.

[**0126**] Step **1002**. The user starts the mobile POS application **109** and enters the PIN. The phone **104** sends a message to the POS **103** to identify itself using local communication **210**. The message, called a CN-View **402** contains the device ID and a nonce.

[**0127**] Step **1004**. The merchant **103** sends both the M-View **404** and the CN-View **402** to the STS **120**. The M-View **404** has the encrypted portion **406** containing the POS ID, transaction ID, the amount, and the Time stamp (but no device ID).

[**0128**] Step **1006**. The STS **120** generates a UPTF message for the mobile POS **104** called the T-View that contains the transaction information, including amount, via the cel-

lular network **211**, based upon the received M-view **404** and the CN-View **402** in operation **1004**.

[**0129**] Step **1008**. The customer **104** approves the transaction by selecting OK and a C-View message **402** is generated. The C-View message **402** is sent to the STS **120** over the cellular network **211**.

[**0130**] Step **1010**. The STS **120** receives the messages **402**, **404** from the merchant **103** and the client **104**. The STS **120** decodes the messages and verifies the identity of the parties. The STS **120** authorizes the transaction according to the verification. At operation **1012**, the STS **120** sends receipt messages to the merchant **103** using its preferred connection **220** and to the customer **104** over the cellular network **211**.

[**0131**] The FIG. **10** scheme has the STS **120** send the transaction details to the user for approval. It uses both remote **211** and local communication **210** with the mobile POS **104**. FIG. **11** is a variation **4-1** of this scheme that transmits transaction information to/from the STS **120** and the mobile POS **104** by using, at operations **1100**, **1101**, **1102**, **1103**, **1104** and **1105**, only local communication **210** with the mobile POS **104** via the POS **103**.

[**0132**] Benefits of the mobile device **104** communication modes are described next. A benefit of the mobile POS communication mode 1 is the mobile POS **104** only needs to have an SMS plan, but does not need to have a wireless Internet access plan from a wireless communication provider, reducing communication and device cost. A benefit of the mobile POS communication mode 2 is the mobile device **104** only needs short-range communication **210**, but does not need to have a wireless Internet access plan or an SMS plan, reducing communication cost. A benefit of the mobile POS communication modes 3 and 4 are to reduce and minimize (as the case may be) user input at the mobile device **104**, for example, to a single input PIE corresponding to a transaction type (i.e., a purchase) specification or identification at the mobile POS **104** to conclude a transaction, such as a purchase, providing a substantial new effect of inviting a user **102** purchase.

[**0133**] Additional variations **5-8**, mostly derived from the variations discussed above with more detailed options, are discussed with reference to FIGS. **12-16** in which the numerals refer to action numbers described herein. FIG. **12** is an action number legend **1200** for variations **5-8**, according to an embodiment of the present invention. First the following lower layer actions are defined:

[**0134**] In FIGS. **13-16**, actions **1-3** concern the information displayed by the POS **103**.

[**0135**] Action number **1**. POS **103** displays a POS Identifier. Such an identifier, e.g., a phone number or a 10-digit unique ID, could be posted on the POS itself

[**0136**] Action number **2**. POS **103** displays a transaction identifier. The transaction identifier corresponds to the TID in the UPTF message (per the Secure Agreement Submission protocol). The transaction identifier is dynamically created after the POS begins processing for a new transaction and is preferably generated after the amount of the transaction has been identified and so that the transaction identifier can be cross-referenced with the transaction amount.

[**0137**] Action number **3**. The POS **103** displays a purchase amount.

[**0138**] Actions **4-10** concern the information input by the user **102** to the mobile POS **104**.

[**0139**] Action number **4**. The mobile user starts the mobile POS application **109** on the mobile device **104**.

[**0140**] Action number **5**. The mobile user selects the physical POS option on the mobile POS application **109**.

[**0141**] Action number **6**. The mobile user enters the POS identifier in the mobile POS application **109**; a POS identifier is deemed as the DID of the POS **103**.

[**0142**] Action number **7** (optional). The mobile user enters the transaction identifier in the mobile POS application **109**.

[**0143**] Action number **8**. The mobile user types her PIN in the mobile POS application **109**.

[**0144**] Action number **9** (optional). The mobile user types the purchase amount (amount of the transaction) in the mobile POS application **109**.

[**0145**] Action number **10** (optional). The mobile user selects an account from the cache of accounts known to the mobile POS application **109**. If for some reason the chosen account is not eligible for payment, the default account (or some other alternate account of the consumer) will be used for the payment.

[**0146**] Actions **11-14** concern the messages and the formats created by the mobile device POS **104**.

[**0147**] Action number **11**. The mobile POS **104** creates a UPTF message for the specific POS identifier, and optionally an amount of transaction and type of transaction (payment at a physical POS).

[**0148**] Action number **12**. The mobile POS **104** creates a UPTF message for the specific transaction identifier, and optionally an amount of transaction and type of transaction (payment at a physical POS).

[**0149**] Action number **13**. The mobile POS **104** creates a UPTF message for the type of transaction (payment at a physical POS), without specifying the amount of the transaction, a transaction identifier or a POS identifier. When STS **120** processes this message, the STS will assume that the amount of transaction and the POS identifier (essentially the ID of the other transaction party) are those submitted in the POS's UPTF message. This is possible in a case the POS **103** transmits to the STS **120** its message **404** and the mobile phone's message **402** (hence the two messages arrive in the STS **120** together in the same action)

[**0150**] Action number **14**. The mobile phone calculates the message digest (MD) **410** of the encrypted part of **11** or **12** or **13** (FIG. **14**); the message digest of the encrypted part of the UPTF message can be much shorter than the encrypted part of the UPTF message. For example, if MD5 (a hash function) is used on the UPTF message, the MD **410** will be 16 bytes and if SHA1 is used the MD **410** is 20 bytes; by contrast, a UPTF message can vary between 100 and 1024 bytes depending on the message type and the amount of padding. The mobile POS application's **109** UPTF message has no padding in this case of using an MD; since there is no way for the STS to know the padding parameters, if the message includes padding the STS **120** will be unable to

compute the complete UPTF message and then correctly compute the MD for it. The complete UPTF message comprises of the DID of the mobile POS application **109** (DID of the mobile POS **104**) and the timestamp (both unencrypted) and of the aforementioned MD.

[**0151**] Actions **15-21** concerns the generation of the local communication **210** message by the mobile POS **104** and processing of a local communication **210** based message received by the POS **103** from the mobile POS **104**.

[**0152**] Action number **15**. The mobile POS software **109** generates a barcode representation of the message in **11** or **12** or **13**. A 2-D type of barcode is used; 2-D barcodes can "encode" up to 3K bytes. The mobile POS application **109** displays the barcode on a barcode screen, for example, display the barcode on a mobile phone POS **104** display.

[**0153**] Action number **16**. The mobile POS software **109** generates an audio signal from the message in **11** or **12** or **13**.

[**0154**] Action number **17**. The mobile POS software **109** generates a barcode or an audio signal as a series of tones (similar to the tones in touch-tone phones), from the message in action number **14** (message digest based message—FIG. **14**).

[**0155**] Action number **18**. The user of the mobile POS **104** presents the mobile POS **104** display with the displayed barcode image to a barcode reader attached to the POS **103**. The merchant's POS **103** might be equipped with (or is) another mobile POS **103** with a camera that takes a picture of the barcode and either does local processing (extract barcode from image) or sends image to STS **120** for server side processing along with the other POS's message(s).

[**0156**] Action number **19**. For example, a POS **103** barcode reader processes the displayed mobile POS **104** barcode by converting the displayed image (barcode) to a series of characters, thus reproducing the UPTF message that was used to generate the barcode in the first place.

[**0157**] Action number **20**. The user of the mobile POS **104** starts the playback of the audio signal as she presents it to a microphone of an audio signal processing device that will process the audio signal at the POS **103** or sends the same for processing to the STS **120**.

[**0158**] Action number **21**. For example, the audio signal processing device at the POS **103** processes the audio signal and converts it to a series of characters, thus reproducing the UPTF message that was used to generate the audio signal in the first place.

[**0159**] Action Number **22** concerns the message generated by the POS **103** to the STS **120**. At action number **22**, the POS **103** generates its UPTF message for the transaction. The UPTF message does not include the device ID of the mobile phone. This device ID can be inferred by the mobile phone's UPTF message since the POS transmits to the STS its message and the mobile phone's message (hence the two message arrive in the STS together in the same action).

[**0160**] Action numbers **23-26** concern the reception of the local communication by the POS with reference to FIG. **15**.

[**0161**] Action number **23**. The mobile POS **104** user presents the mobile POS's **104** display to a camera that captures the mobile POS's display (as an image); the camera is attached to the POS **103**.

[**0162**] Action number **24**. The mobile POS **104** user presents the mobile POS's speaker to a microphone that captures (records) the mobile POS's audio signal (as an audio signal); the microphone is attached to the POS **103**.

[**0163**] Action number **25**. The camera of **23** transmits the captured image to the STS **120** alongside with the UPTF message generated by the POS **103**.

[**0164**] Action number **26**. The microphone of **24** transmits the captured audio to the STS **120** alongside the UPTF message generated by the POS **103**.

[**0165**] Action numbers **27-32** concern the processing of the messages by the STS **120** and the replies back from the STS **120** to the POS **103** and mobile POS **104**.

[**0166**] Action number **27**. The Secure Transaction Server (STS) receives a UPTF message from the mobile POS software **109** which was transmitted by the POS **103**.

[**0167**] Action number **28**. The STS **120** receives a UPTF message from the POS **103**, which was transmitted by the POS **103**.

[**0168**] Action number **29**. The STS **120** compares the mobile POS **104** and POS **103** messages **402**, **404**, and processes them according to the SAS protocol.

[**0169**] Action number **30**. The STS **120** determines whether the transaction should be authorized, according to the SAS protocol.

[**0170**] Action number **31**. The STS **120** sends a confirmation UPTF message for the transaction to the POS **103**.

[**0171**] Action number **32**. The STS **120** sends a confirmation SMS message for the transaction to the mobile POS **104** of the consumer **102**.

[**0172**] Action numbers **33-34** concern the use of SMS or MMS to transmit messages with reference to FIG. **16**.

[**0173**] Action number **33**. The mobile POS application **109** sends a SMS to the STS **120** adding to its content the message of **11** or **12** or **13** or **14**. The encrypted part of the message is preferably encoded in HEXadecinal

[**0174**] Action number **34**. The mobile POS application **109** sends a MMS to the STS **120** adding to its content the message of **11** or **12** or **13** or **14**. The encrypted part of the message is preferably encoded in HEXadecinal.

[**0175**] Actions **35-36** concern the use of RF as the local communication medium **210**.

[**0176**] **35**. The user of the WW sends a local communication to the POS using a short range RF device such as an RF ID, Bluetooth, UWBV or WiFi. The WW software generates an RF signal from the message in **11** or **12** or **13** or **14**.

[**0177**] **36**. The POS will recognize the RF communication and will receive the UPTF message. The POS **103** will determine whether the message is intended for this POS by matching included information in the unencrypted portion **408** of the UPTF SAS message **402**, such as transaction ID or POS ID.

[**0178**] Action numbers **37-42** concern local communication from the POS **103** to the mobile POS **104**.

[0179] Action number **37**. The POS **103** will display on its monitor a barcode representing information contained in **1**, **2**, or **3** as local communication **210** to the mobile POS software **109**.

[0180] Action number **38**. The POS **103** will play on its speaker audio signals representing information contained in **1**, **2**, or **3** as local communication **210** to the mobile POS software **109**.

[0181] Action number **39**. The POS **103** will transmit on its RF signals on its local RF transmitter device representing information contained in **1**, **2**, or **3** for local communication to the mobile POS software **109**.

[0182] Action number **40**. The camera on the mobile POS **104** and a software module decodes a barcode displayed by the POS **103** for local communication **210** of information contained in **1**, **2** or **3** to the mobile POS **104**.

[0183] Action number **41**. The microphone on the mobile POS **104** and a software module decodes an audio signal from the POS **103** for local communication **210** of information contained in **1**, **2** or **3**.

[0184] Action number **42**. The local RF receiver device on the mobile POS **104** and a software module receives a local RF signal from the POS **103** for local communication **210** of information contained in **1**, **2** or **3**.

[0185] Another variation is the following. The mobile POS **104** is equipped with a RFID chip (any type of RFID tag; passive, active, or any combinations thereof) or Near Field Communication (NFC) chip. This addition might be simply attached to the mobile device **104**, without being integrated to the circuitry of thereof, or it might be part of the circuitry thereof. In the latter case the software **109** of the mobile device **104** can communicate with the RFID or NFC chip. In the former case, the software **109** of the mobile device **104** might not communicate with the RFID or NFC chip; for example the RFID or NFC chip might be issued by the issuer of the mobile POS software **109** and be attached (physically) (e.g., via adhesive or other coupling technology) to the mobile device **104**. When the user performs a transaction, the RFID reader at the POS **103** reads the RFID or NFC presence and thus identifies the transacting party. The owner of the mobile POS **104** using the mobile POS software **109** further confirms the transaction, for example, via remote communication with the STS **120**. The POS **103** upon reading the RFID or NFC identifier transmits its UPTF message to the STS **120** and the STS **120** waits for the consumer's confirmation and/or authorization UPTF message to arrive from the mobile device **104**. In the meantime, the consumer starts the mobile POS application **109**, types in a PIN resulting in the mobile POS software **109** transmission of the appropriate UPTF message to the STS **120**. Upon STS **120** receipt of this message, the STS **120**, according to the UPTF protocol, approves or disapproves the transaction and notifies the transacting parties accordingly. According to an aspect of the embodiments, the STS **120** can authenticably approve the transaction, because the STS **120** has correlated the PIN and the mobile device **120** as identified by the RFID or the NFC. This case requires a wireless transmission of the UPTF message from the mobile device **104** to the STS **120**. Alternatively, the mobile POS software **109** may display a barcode or image (as previously discussed) that is processed by the POS **103** (as previously discussed). The advantage of this variation is that it increases the security of using the RFID or NFC alone for purchasing. Alternatively, if the RFID or NFC, is capable of two-way communication and it is integrated with the circuitry of the mobile POS **104**, the transmission of the UPTF message from the mobile POS **104** to the POS **103** is transmitted over the RFID or NFC, upon entering of the PIN (on the mobile device **104**) by the consumer **102**.

[0186] A method, and apparatus and computer readable medium, thereof, comprises providing a secure transaction server (STS); providing an authentic point of sale (POS) device, according to a first authentication parameter of the STS; providing an authentic mobile purchasing device, according to a second authentication parameter of the STS; providing a short-range communication method between the POS device and the mobile purchasing device; correlating by the STS a personal identification entry (PIE) and the authentic mobile purchasing device; transmitting, by the POS device, a time dependent transformed secure POS authenticable POS purchase action to the STS; inputting (e.g., by a user and/or automatically from a computer readable medium, such as memory, etc.) the PIE to the mobile purchasing device to transmit a time dependent transformed secure user authenticable POS purchase action to the POS device via the short-range communication method; and approving, by the STS, the POS purchase action for the POS device and for the mobile purchasing device, according to the authentic POS device, and according to the authentic mobile purchasing device and the STS correlating of the PIE and the authentic mobile purchasing device.

[0187] An apparatus, comprises means for providing an authentic point of sale (POS) device; means for providing an authentic mobile purchasing device; means for a short-range communication between the authentic POS device and the authentic mobile purchasing device to transmit a time dependent POS purchase action to the authentic POS device; means for receiving the time dependent POS purchase action and for authenticating and verifying the time dependent POS purchase action for the POS device and for the mobile purchasing device, according to the authentic POS device and the authentic mobile purchasing device. According to an aspect of the embodiments, the means for providing the authentic POS, the authentic purchasing device, and the authenticating and verifying the time dependent POS purchase action is the UPTF SAS protocol.

[0188] According to an aspect of the embodiment, the POS device **103** and the mobile purchasing device **104** become authentic and the transaction messages become authenticable, according to the STS correlation of each device with respective PIEs, time dependency (for example, use of the Time Stamp in generating the key **352** as described herein), and the STS authentication parameter. According to an aspect of the embodiment, the expression "transmitting" refers to communicating or conveying information or knowledge via an image (e.g., a bar code image), audio, or wireless communication connectivity technology, as described herein. So according to an aspect of the embodiments, for example, in case of a bar code image displayed on the display of the mobile device **104** or in case of audio as the short-range communication method, the transmitting a time dependent transformed secure user authenticable POS purchase action to the POS device com-

prises generating a bar code image or audio that is a representation of a UPTF SAS protocol transaction message view **402** or **404** as a time dependent transformed secure authenticable transaction message, thus providing a time dependent image or audio to prevent reuse of image or audio for replay or fraudulent transactions.

[**0189**] In view of the above described examples of preferred embodiments, an apparatus **104** suitable for use in implementing the embodiments described herein can be any computing apparatus or machine, such as (in an unlimiting example) a programmable device that can store, retrieve, and process data, allow mobile (wireless or radio) telecommunication with other computing devices and have one or more communicably connected components of computer/computing processors, such as Central Processing Units (CPUs); input unit(s)/device(s) (e.g., microphone for voice command/control, etc., keyboard/keypad, pointing device (e.g., mouse, pointer, stylus), touch screen, camera, scanner, etc.); output unit(s)/device(s) (e.g., computer display screen (including user interface thereof, such as graphical user interface), speaker(s), printer(s), etc.); computer network interface(s), including known communication protocols thereof, (e.g., mobile telephone (voice/data (Internet)) (cellular radio networks, satellite, etc.) network, radio frequency technology, local area network, etc.); and recording media to store information/instructions, such as software (e.g., operating system, wireless wallet software, etc.) and/or data (any known recording media, such as volatile and/or non-volatile memory (Random Access Memory), hard disk, flash memory, magnetic/optical disks, etc.) for execution by a computing apparatus, such as a computer/computing processor and/or electronic circuitry. The embodiments provide methods, apparatuses (computer systems) and/or computer readable media for a wireless computing apparatus/device for physical Point of Sale (POS) transactions. The POS **103** and STS **120** can be any computer.

[**0190**] The many features and advantages of the embodiments described herein are apparent from the detailed specification and, thus, it is intended by the appended claims and equivalents to cover all such features and advantages of the embodiments that fall within the true spirit and scope of the embodiments. Further, since modifications and changes might occur to those skilled in the art, it is not desired to limit the embodiments to the exact construction and operation illustrated and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the embodiments.

What is claimed is:

**1**. A method, comprising:

providing a secure transaction server (STS);

providing an authentic point of sale (POS) device, according to a first authentication parameter of the STS;

providing an authentic mobile purchasing device, according to a second authentication parameter of the STS;

providing a short-range communication method between the POS device and the mobile purchasing device;

correlating by the STS a personal identification entry (PIE) and the authentic mobile purchasing device;

transmitting, by the POS device, a time dependent transformed secure POS authenticable POS purchase action to the STS;

inputting, by a user, the PIE to the mobile purchasing device to transmit a time dependent transformed secure user authenticable POS purchase action to the POS device via the short-range communication method; and

approving, by the STS, the POS purchase action for the POS device and for the mobile purchasing device, according to the authentic POS device, and according to the authentic mobile purchasing device and the STS correlating of the PIE and the authentic mobile purchasing device.

**2**. The method of claim 1, wherein the short-range communication method comprises one or more of an image, audio, or wireless communication connectivity technology, or any combinations thereof.

**3**. The method of claim 1, wherein the POS purchase action is a POS identifier or a purchase transaction identifier.

**4**. The method of claim 1, wherein the POS purchase action is a single user conformation of a purchase.

**5**. The method according to claim 1, further comprising generating the transformed secure user authenticable POS action and the transformed secure POS authenticable POS purchase action to the STS according to Universal Pervasive Transaction Framework Secure Agreement Submission (UPTF SAS) protocol.

**6**. The method according to claim 5, wherein the POS purchase action further comprises a mobile purchasing device identifier and the method further comprises calculating, by the POS device, a message digest of the mobile purchasing device identifier and the POS identifier, the transaction identifier or the single purchase specification, and transmitting the message digest to the POS device via the short-range communication method.

**7**. The method of claim 1, further comprising transmitting, by the POS device via the short-range communication method, the POS purchase action to the mobile purchasing device.

**8**. The method of claim 1, wherein the POS purchase action identifies a payment for a good and/or a service.

**9**. The method of claim 1, further comprising transmitting, by the mobile POS device, via a short message service, or a multimedia message service, or any combinations thereof, the transformed secure user authenticable POS purchase action to the STS.

**10**. The method of claim 1, further comprising transmitting, by the POS device, via a network the transformed secure user authenticable POS purchase action and the transformed secure POS authenticable POS purchase action to the STS for the approving of the POS purchase action.

**11**. The method of claim 10, wherein the approving comprises verifying a match between the transformed secure user authenticable POS purchase action and the transformed secure POS authenticable POS purchase action.

**12**. The method of claim 1, wherein the approving comprises settling by the STS a payment to the POS for the POS purchase action.

**13**. The method of claim 11, wherein the approving comprises transmitting by the STS via a short message service, or a multimedia message service, or any combinations thereof, a POS receipt to the mobile purchasing device.

**14**. The method of claim 1, wherein the POS device is an authentic mobile POS device, and the method further comprises:

correlating by the STS a POS personal identification entry (PIE) and the mobile POS device;

inputting, by another user, the POS PIE and a POS action, to the mobile POS device to transmit the time dependent transformed secure POS authenticable POS action to the STS; and

approving, by the STS, the POS action for the mobile POS device and POS purchase action for the mobile purchase device, according to the STS correlating of the POS PIE and the authentic mobile POS device and according to the STS correlating of the PIE and the authentic mobile purchasing device.

**15**. The method of claim 2, wherein the image as a short-range communication method comprises any type of barcode system, a camera system, a scanner system, or any combinations thereof at the POS device and/or at the mobile purchasing device.

**16**. The method of claim 15, wherein the barcode system processes 2-Dimensional barcodes.

**17**. The method of claim 2, wherein the audio as the short-range communication method is any output audio signal or Dual Tone Multi-Frequency tone, or voice, or any combinations thereof, and recognizer(s) thereof, at the POS device and/or at the mobile purchasing device.

**18**. The method of claim 2, wherein the Radio Frequency (RF) as the short-range communication method is any type of wireless communication connectivity technology, including one or more of Radio Frequency Identification (RFID), Bluetooth, WLAN, Near Field Communication (NFC), or any combinations thereof, at the POS device and/or at the mobile purchasing device.

**19**. The method according to claim 18, wherein the mobile purchasing device comprises the RFID and/or the NFC as integrated with device circuitry or attached to the mobile purchasing device independent of the mobile purchasing device circuitry.

**20**. The method of claim 1, wherein the first and second authentication parameters are each a per-message resettable time-dependent generated random number.

**21**. An apparatus, comprising:

a secure transaction server (STS);

an authentic point of sale (POS) device, according to a first authentication parameter of the STS, the authentic POS communicatively connectable with the STS; and

an authentic mobile purchasing device, according to a second authentication parameter of the STS, and the authentic mobile purchasing device communicatively connectable with the authentic POS device via a short-range communication method,

wherein the authentic POS device transmits a time dependent transformed secure POS authenticable POS purchase action to the STS;

wherein the STS correlates a personal identification entry (PIE) and the authentic mobile purchasing device,

wherein the mobile purchasing device receives the PIE and a POS purchase action to transmit based thereon a time dependent transformed secure user authenticable POS purchase action to the POS device via the short-range communication method between the POS device and the mobile purchasing device, and

wherein the STS approves the POS purchase action for the POS device and for the mobile purchasing device, according to the authentic POS device, and according to the authentic mobile purchasing device and the STS correlating of the PIE and the authentic mobile purchasing device.

**22**. The apparatus of claim 21, wherein the short-range communication method comprises one or more of an image, audio, or wireless communication connectivity technology, or any combinations thereof.

**23**. An apparatus, comprising:

a secure transaction server (STS);

an authentic point of sale (POS) device, according to a first authentication parameter of the STS, the authentic POS communicatively connectable with the STS; and

an authentic mobile purchasing device, according to a second authentication parameter of the STS, and the authentic mobile purchasing device comprising a radio frequency identification tag attached thereto to communicatively connect with the authentic POS device,

wherein the authentic POS device transmits a time dependent transformed secure POS authenticable POS purchase action to the STS;

wherein the STS correlates a personal identification entry (PIE) and the authentic mobile purchasing device,

wherein the mobile purchasing device uses the PIE and a POS purchase action to transmit based thereon a time dependent transformed secure user authenticable POS purchase action to the STS via mobile phone network, a short message service, or a multimedia message service, or any combinations thereof, and

wherein the STS approves the POS purchase action for the POS device and for the mobile purchasing device, according to the authentic POS device, and according to the authentic mobile purchasing device and the STS correlating of the PIE and the authentic mobile purchasing device.

**24**. An apparatus, comprising:

means for providing an authentic point of sale (POS) device;

means for providing an authentic mobile purchasing device;

means for a short-range communication between the authentic POS device and the authentic mobile purchasing device to transmit a time dependent POS purchase action to the authentic POS device;

means for receiving the time dependent POS purchase action and for authenticating and verifying the time dependent POS purchase action for the POS device and for the mobile purchasing device, according to the authentic POS device and the authentic mobile purchasing device.

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