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(54) **SYSTEM AND THE COMPUTER METHODS OF ISSUING, TRANSFERRING AND MANIPULATING VALUE OR GIFT CARDS USING BLOCKCHAIN TECHNOLOGY**

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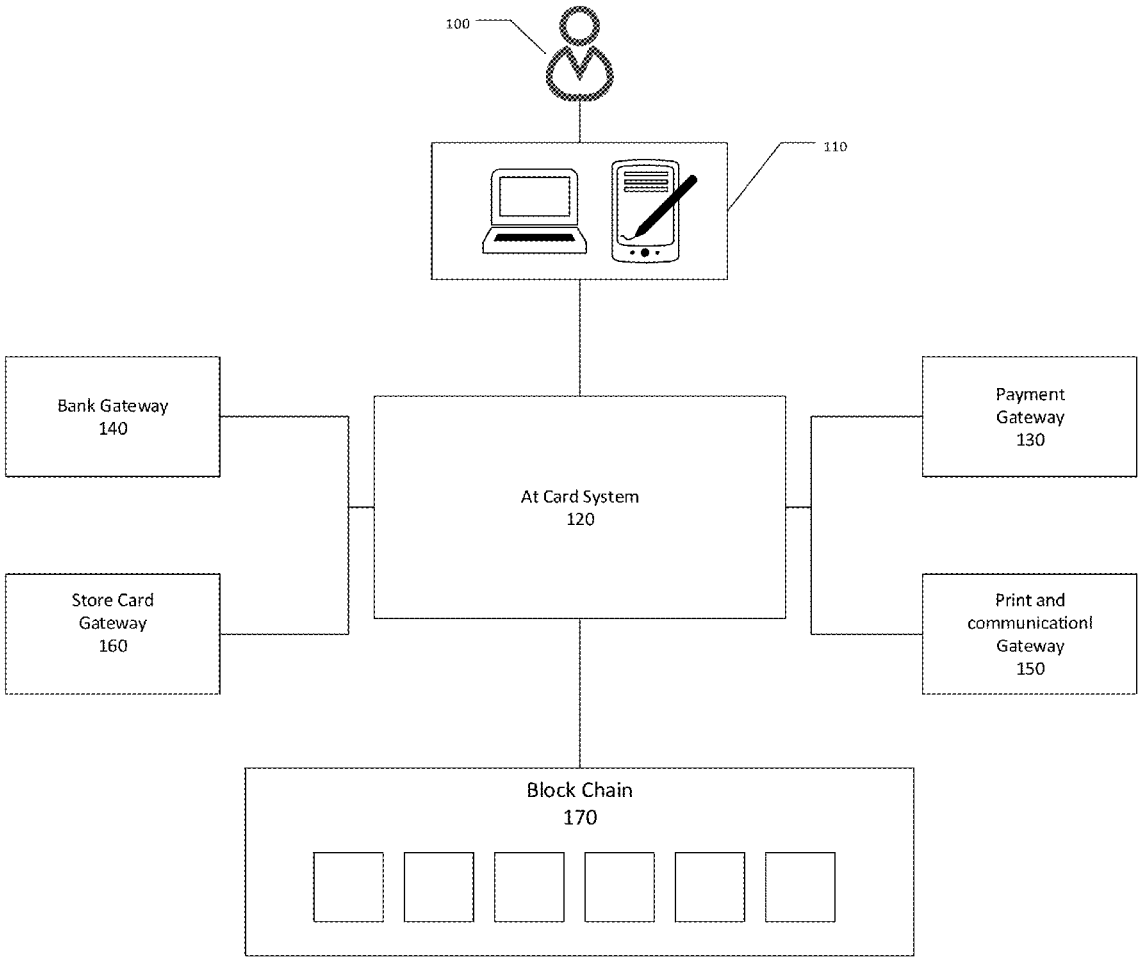
(57) **ABSTRACT**

The described invention consists of system and the computer methods of generating and manipulating value or gift cards which are cryptographically assigned to a person's identity and stored on double entry ledger called block chain. A functional module of the system allows the transfer of such value or gift cards to other persons. The functional module in the system further allows a person owning a card to split it into multiple value or gift cards, merge more than one value or gift cards to a single card, exchange a value or gift card with a specific merchant card, redeem a value or gift card at a store front in exchange for physical or digital good or cash it out in the currency it was issued. Each transaction associated with a customer is cryptographically signed and stored on the block chain.



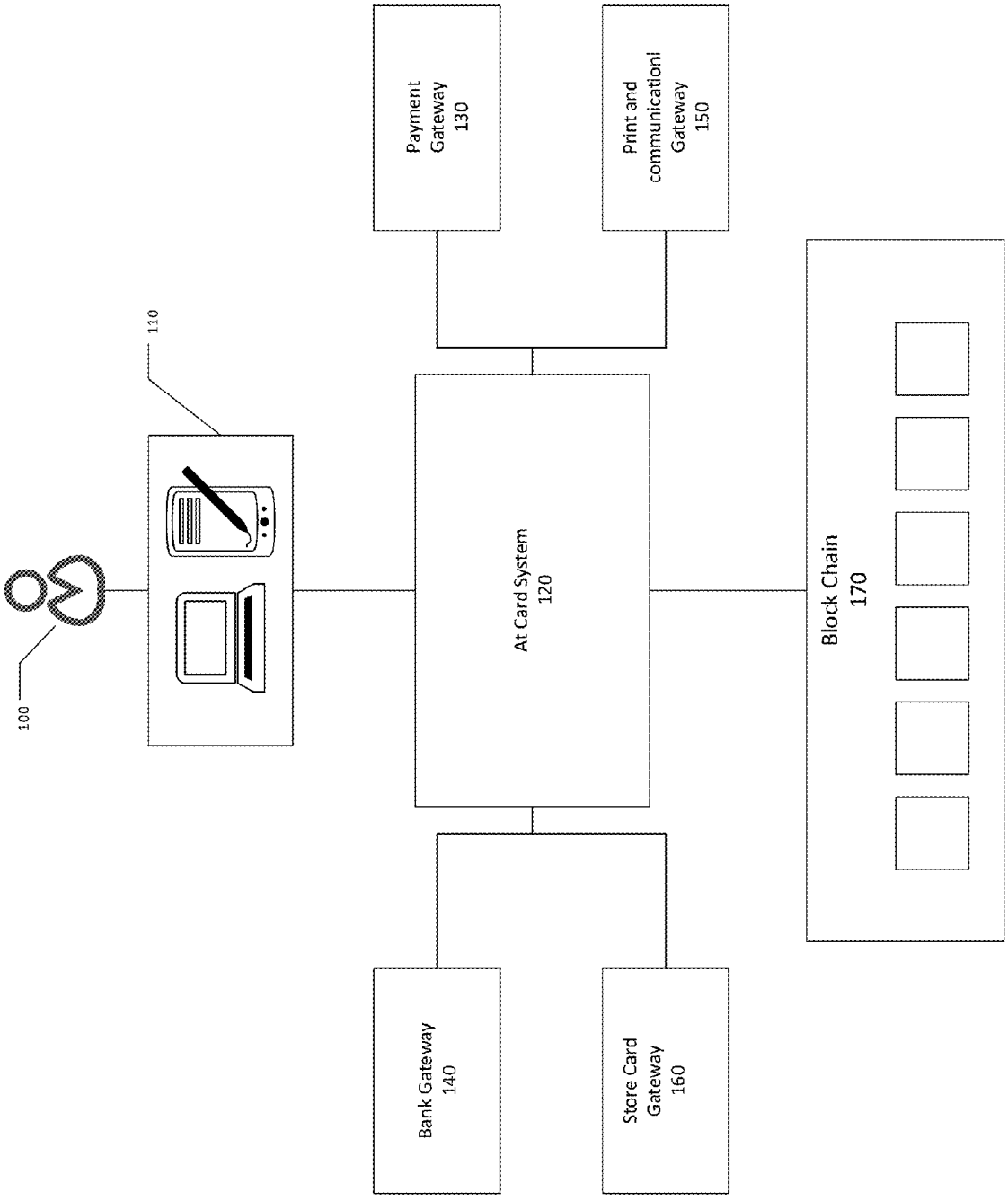

Payment Gateway 130
Print and communication Gateway 150
110
At Card System 120
Block Chain 170
100
Bank Gateway 140
Store Card Gateway 160

FIG. 1

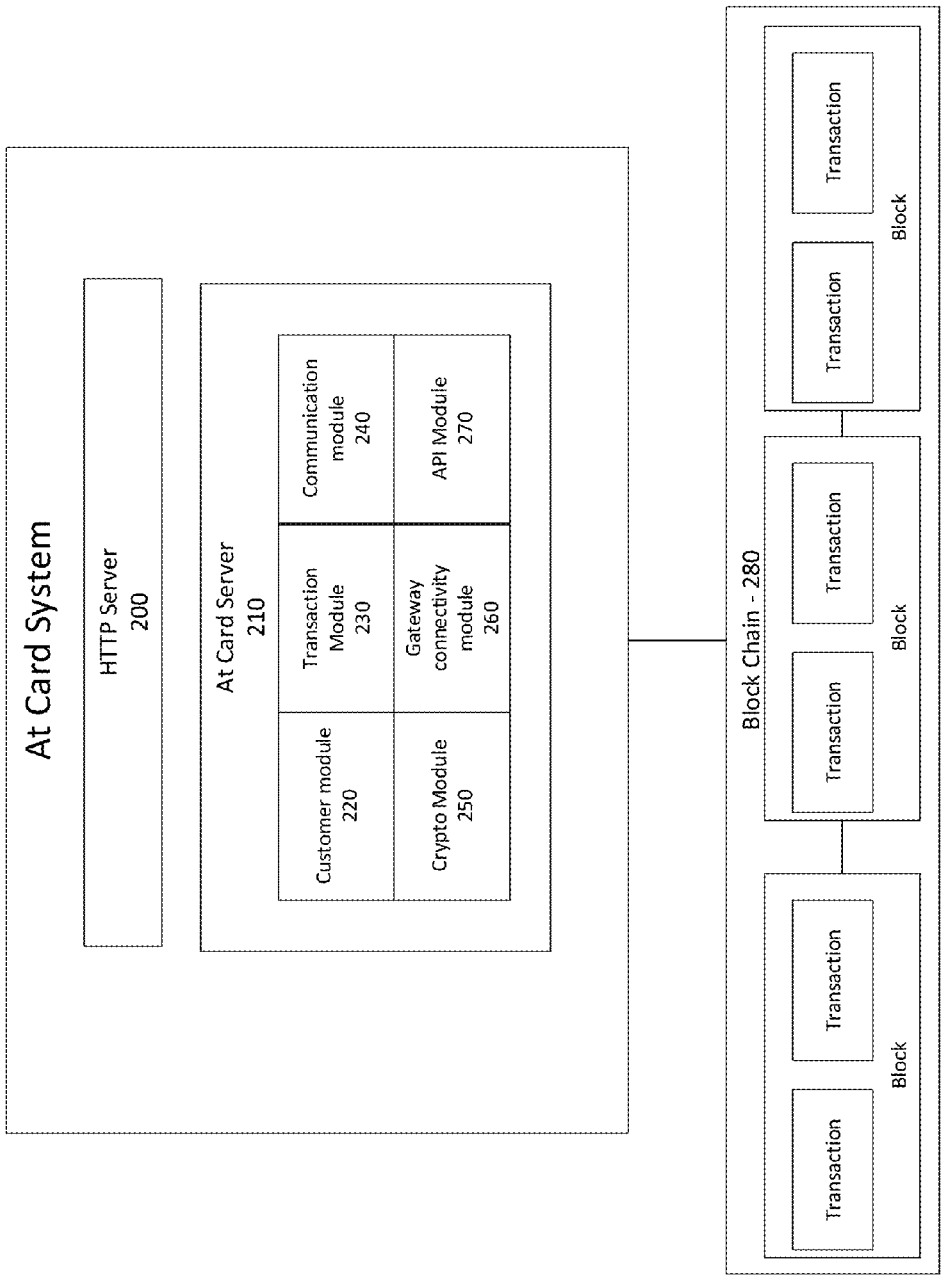

At Card System
HTTP Server
200
At Card Server
210
Customer module
220
Transaction Module
230
Communication module
240
Crypto Module
250
Gateway connectivity module
260
API Module
270
Block Chain - 280
Block
Transaction
Transaction
Block
Transaction
Transaction
Block
Transaction
Transaction

FIG. 2

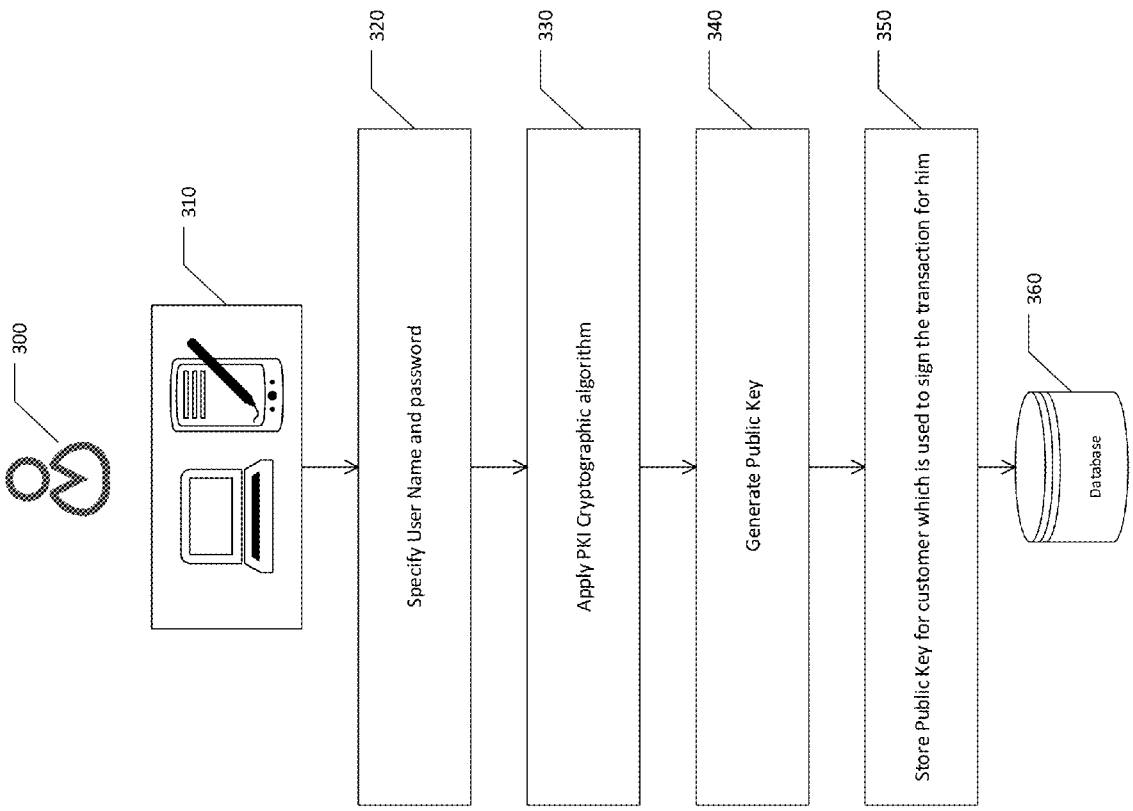

300
310
320
Specify User Name and password
330
Apply PKI Cryptographic algorithm
340
Generate Public Key
350
Store Public Key for customer which is used to sign the transaction for him
360
Database

FIG. 3

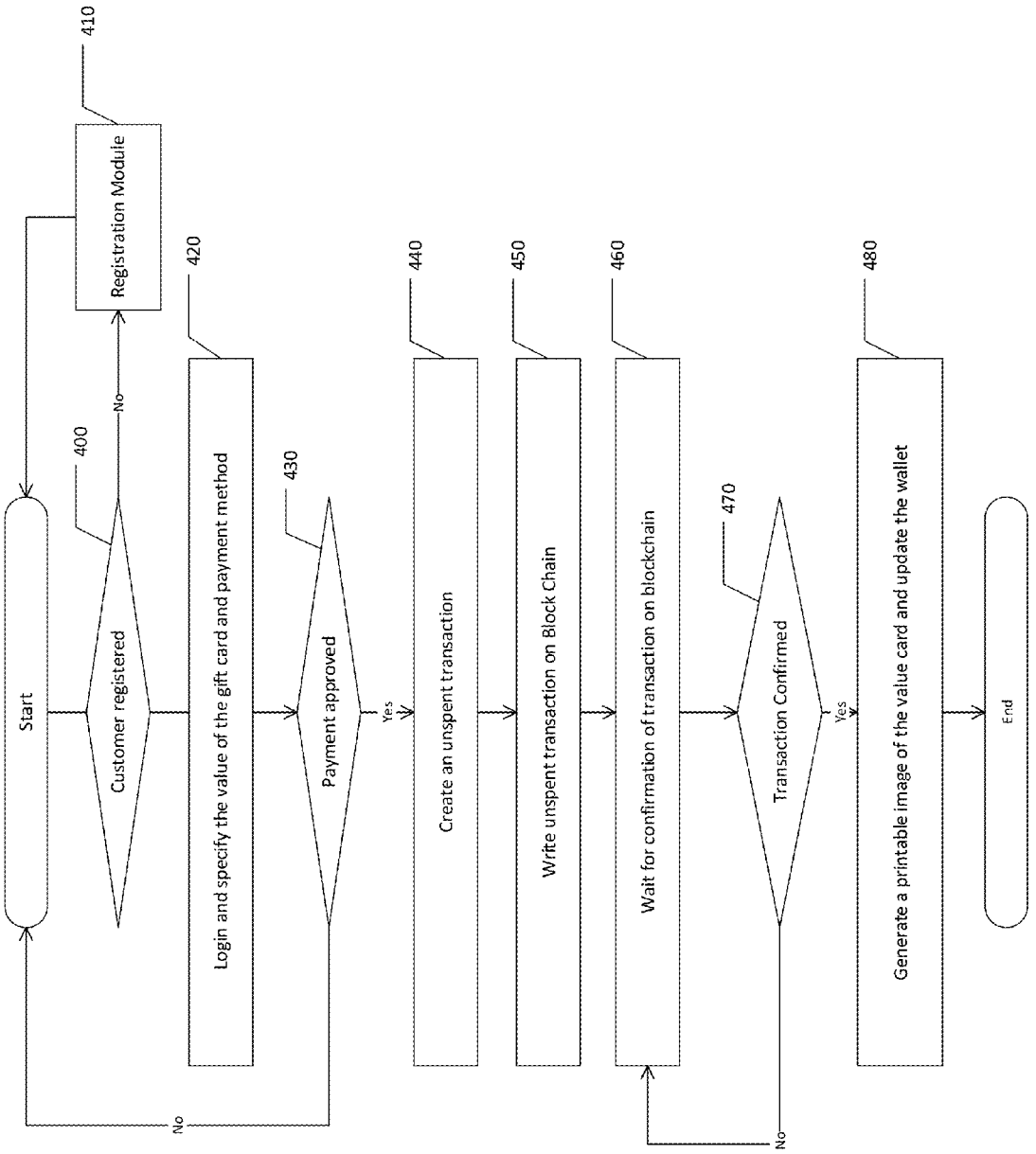

Start
400
Customer registered
No
410
Registration Module
420
Login and specify the value of the gift card and payment method
430
Payment approved
No
Yes
440
Create an unspent transaction
450
Write unspent transaction on Block Chain
460
Wait for confirmation of transaction on blockchain
470
Transaction Confirmed
No
Yes
480
Generate a printable image of the value card and update the wallet
End

FIG. 4

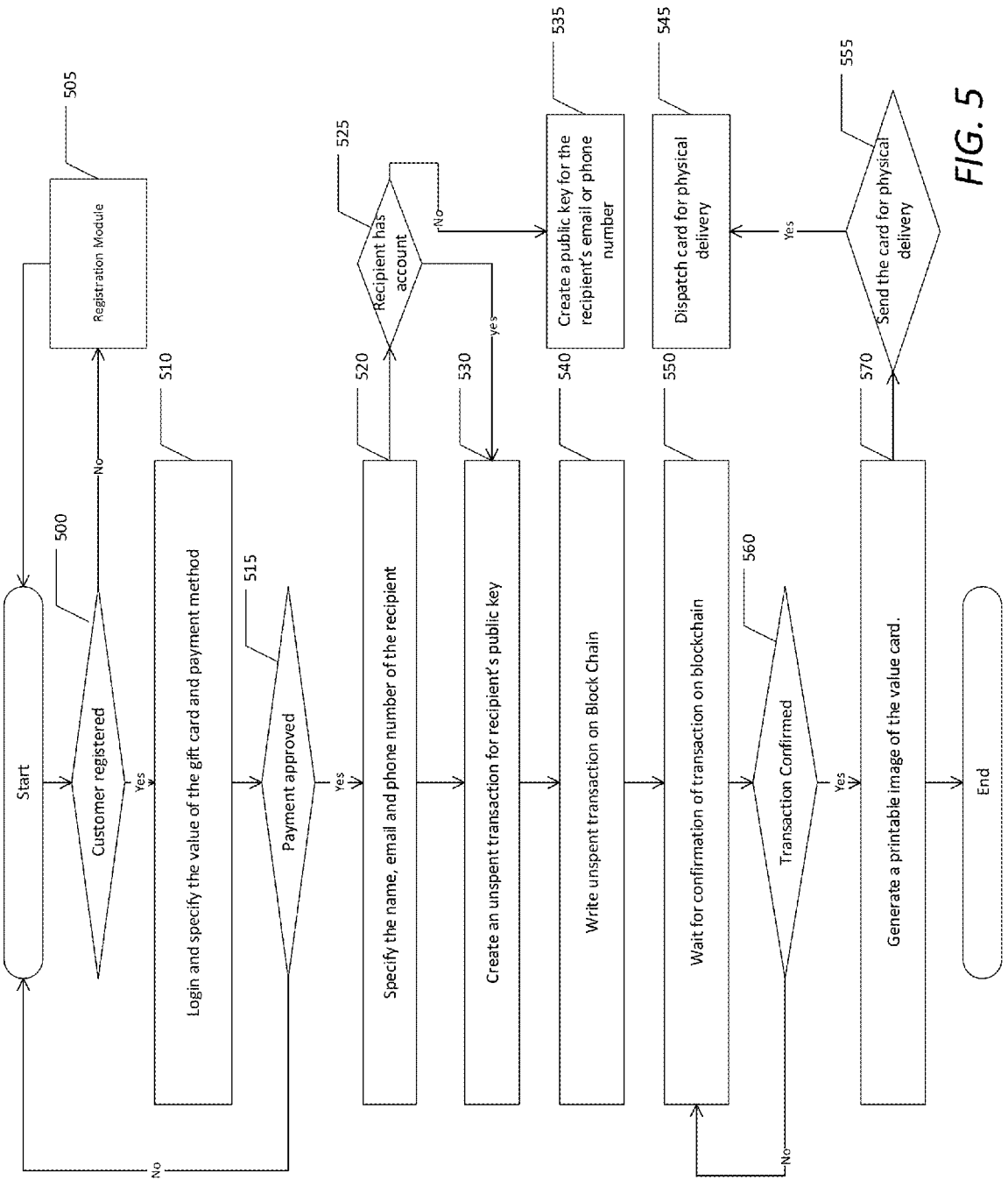

Start
500
Customer registered
No
Yes
505
Registration Module
510
Login and specify the value of the gift card and payment method
515
Payment approved
No
Yes
520
Specify the name, email and phone number of the recipient
525
Recipient has account
No
Yes
530
Create an unspent transaction for recipient's public key
535
Create a public key for the recipient's email or phone number
540
Write unspent transaction on Block Chain
545
Dispatch card for physical delivery
550
Wait for confirmation of transaction on blockchain
560
Transaction Confirmed
No
Yes
555
Send the card for physical delivery
Yes
570
Generate a printable image of the value card.
End

FIG. 5

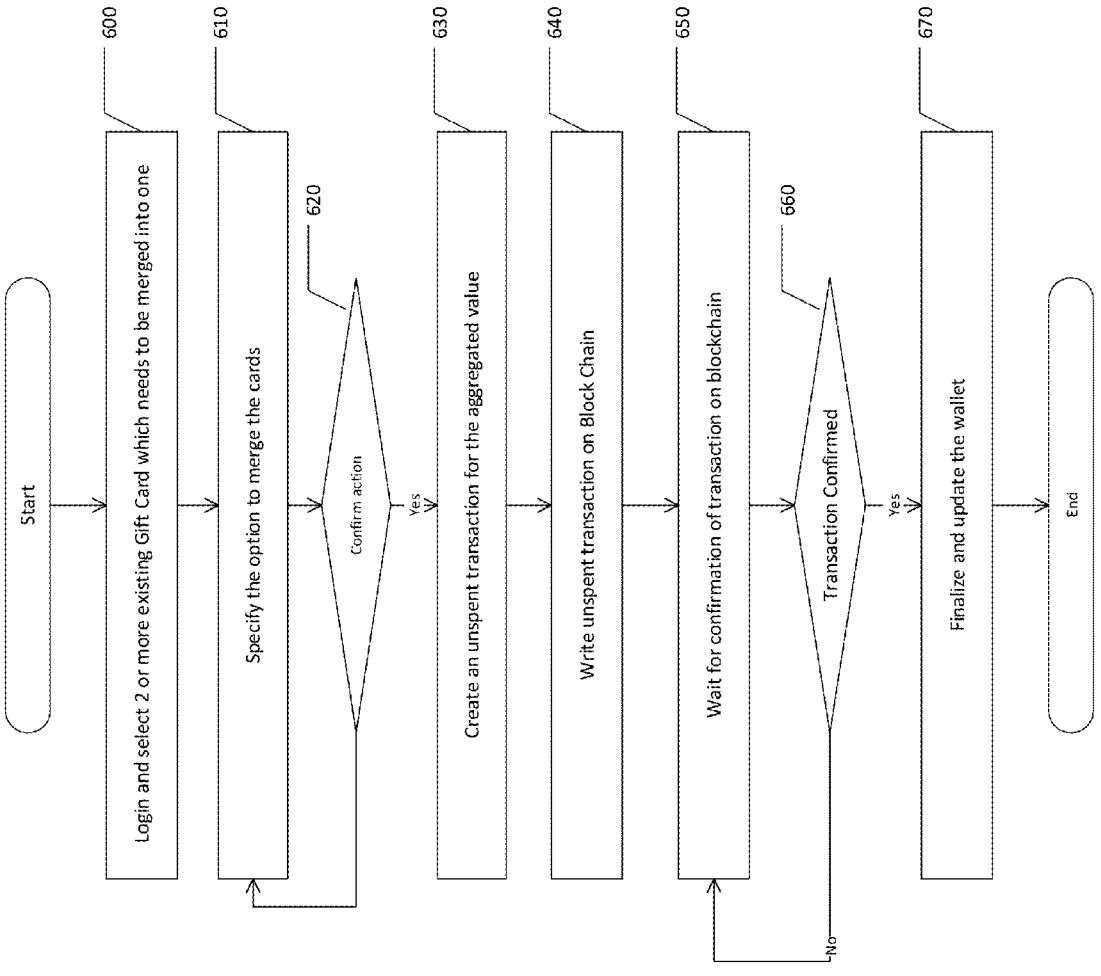

Start
600
Login and select 2 or more existing Gift Card which needs to be merged into one
610
Specify the option to merge the cards
620
Confirm action
Yes
630
Create an unspent transaction for the aggregated value
640
Write unspent transaction on Block Chain
650
Wait for confirmation of transaction on blockchain
660
Transaction Confirmed
No
Yes
670
Finalize and update the wallet
End

FIG. 6

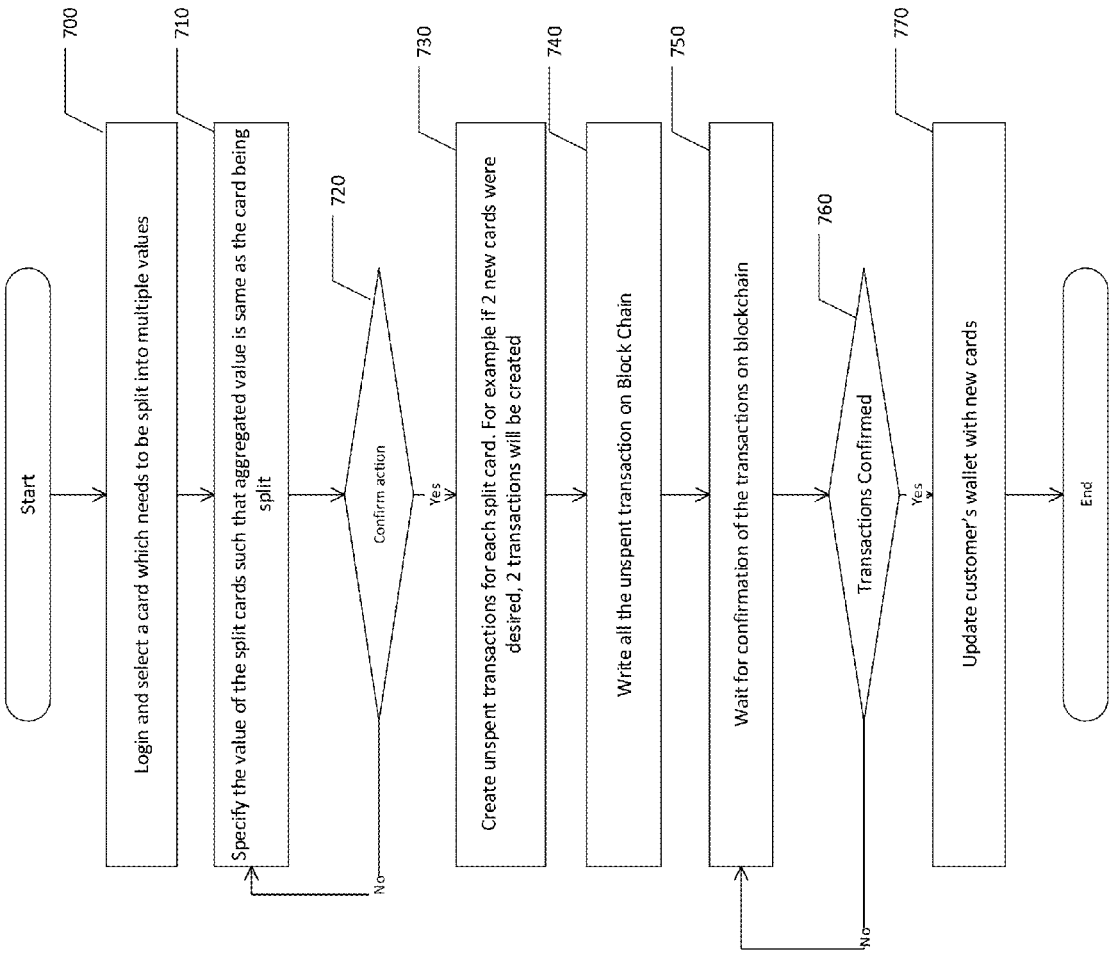

Start
700
Login and select a card which needs to be split into multiple values
710
Specify the value of the split cards such that aggregated value is same as the card being split
720
Confirm action
No
Yes
730
Create unspent transactions for each split card. For example if 2 new cards were desired, 2 transactions will be created
740
Write all the unspent transaction on Block Chain
750
Wait for confirmation of the transactions on blockchain
760
Transactions Confirmed
No
Yes
770
Update customer's wallet with new cards
End

FIG. 7

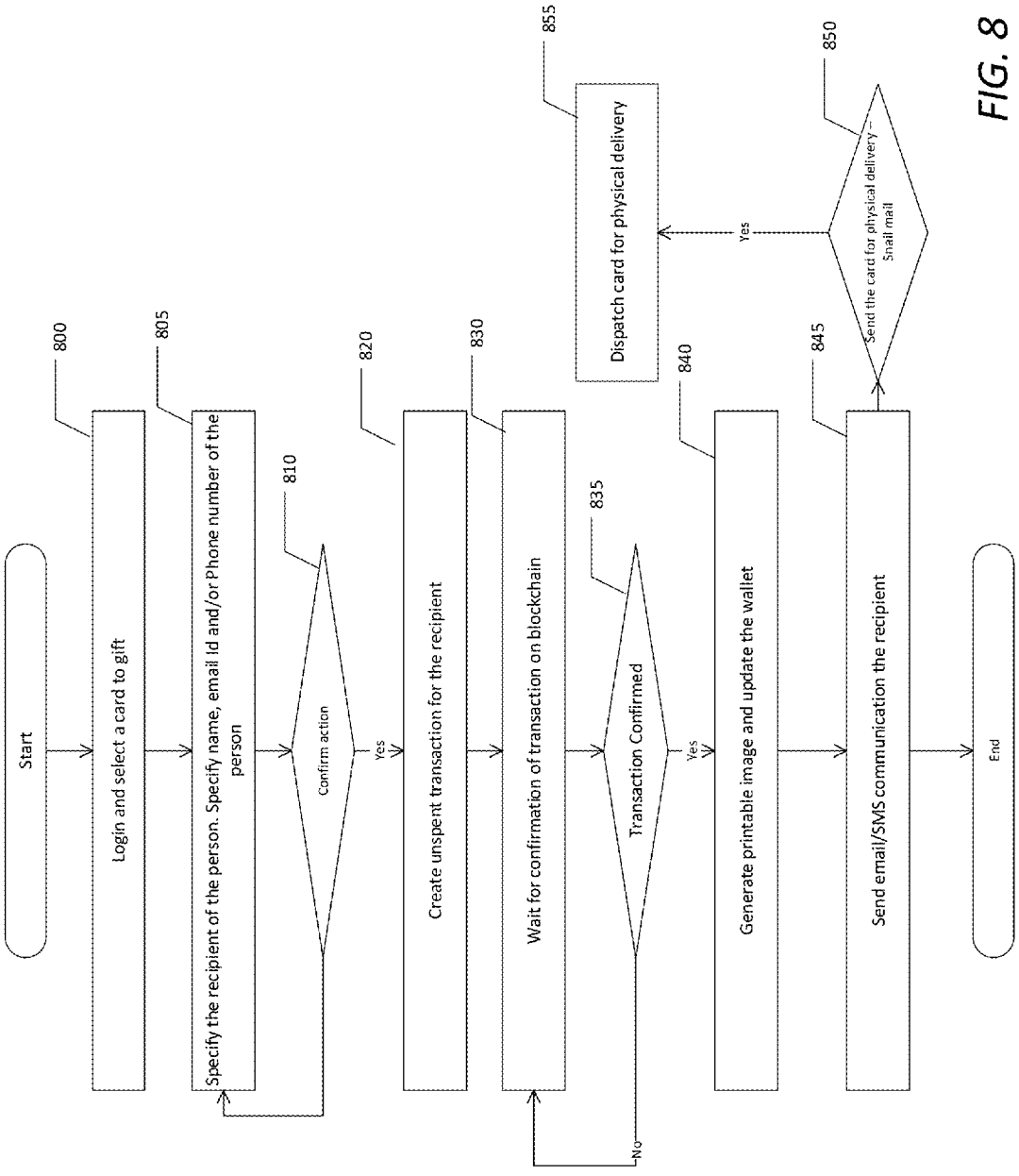

Start
800
Login and select a card to gift
805
Specify the recipient of the person. Specify name, email id and/or Phone number of the person
810
Confirm action
Yes
820
Create unspent transaction for the recipient
830
Wait for confirmation of transaction on blockchain
835
Transaction Confirmed
Yes
No
840
Generate printable image and update the wallet
845
Send email/SMS communication the recipient
End
850
Send the card for physical delivery – Snail mail
Yes
855
Dispatch card for physical delivery

FIG. 8

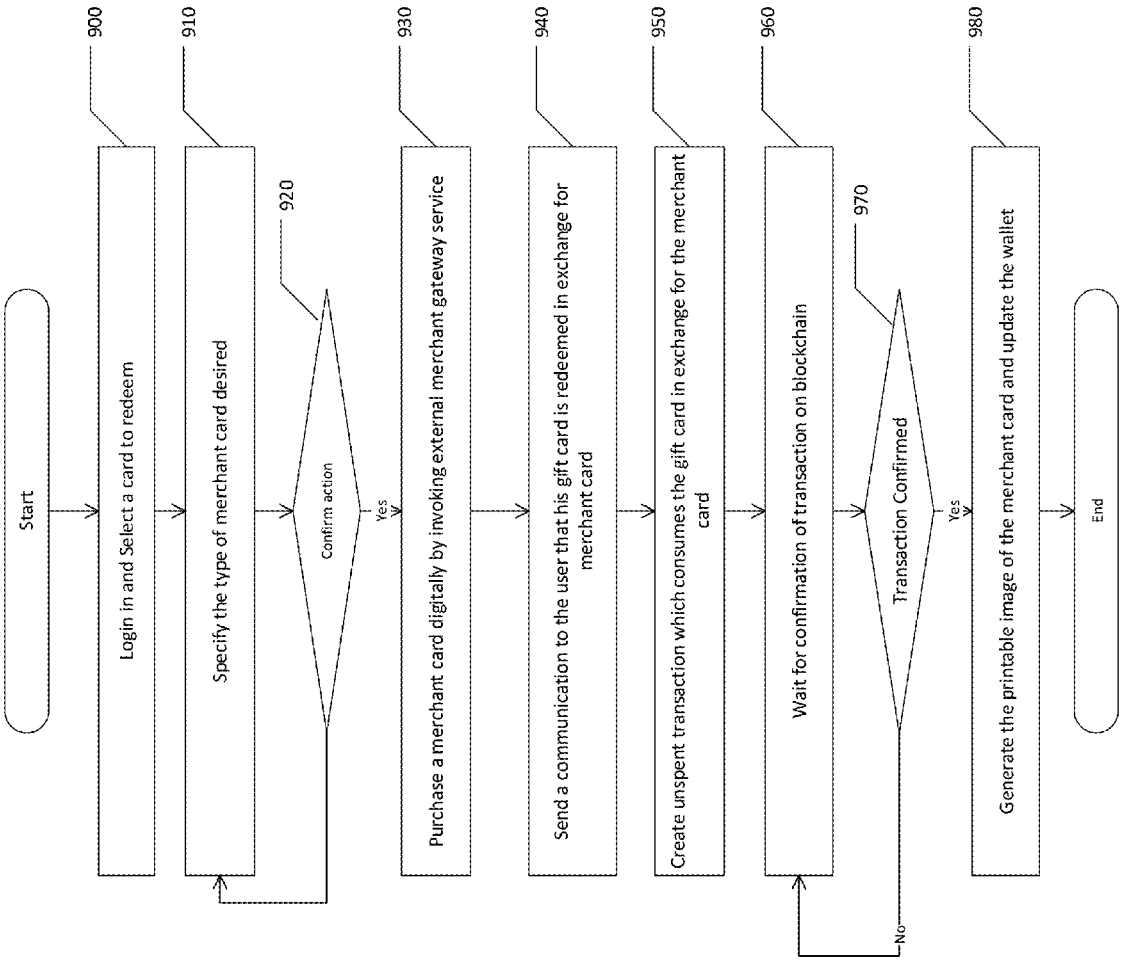

Start
900
Login in and Select a card to redeem
910
Specify the type of merchant card desired
920
Confirm action
Yes
930
Purchase a merchant card digitally by invoking external merchant gateway service
940
Send a communication to the user that his gift card is redeemed in exchange for merchant card
950
Create unspent transaction which consumes the gift card in exchange for the merchant card
960
Wait for confirmation of transaction on blockchain
970
Transaction Confirmed
No
Yes
980
Generate the printable image of the merchant card and update the wallet
End

FIG. 9

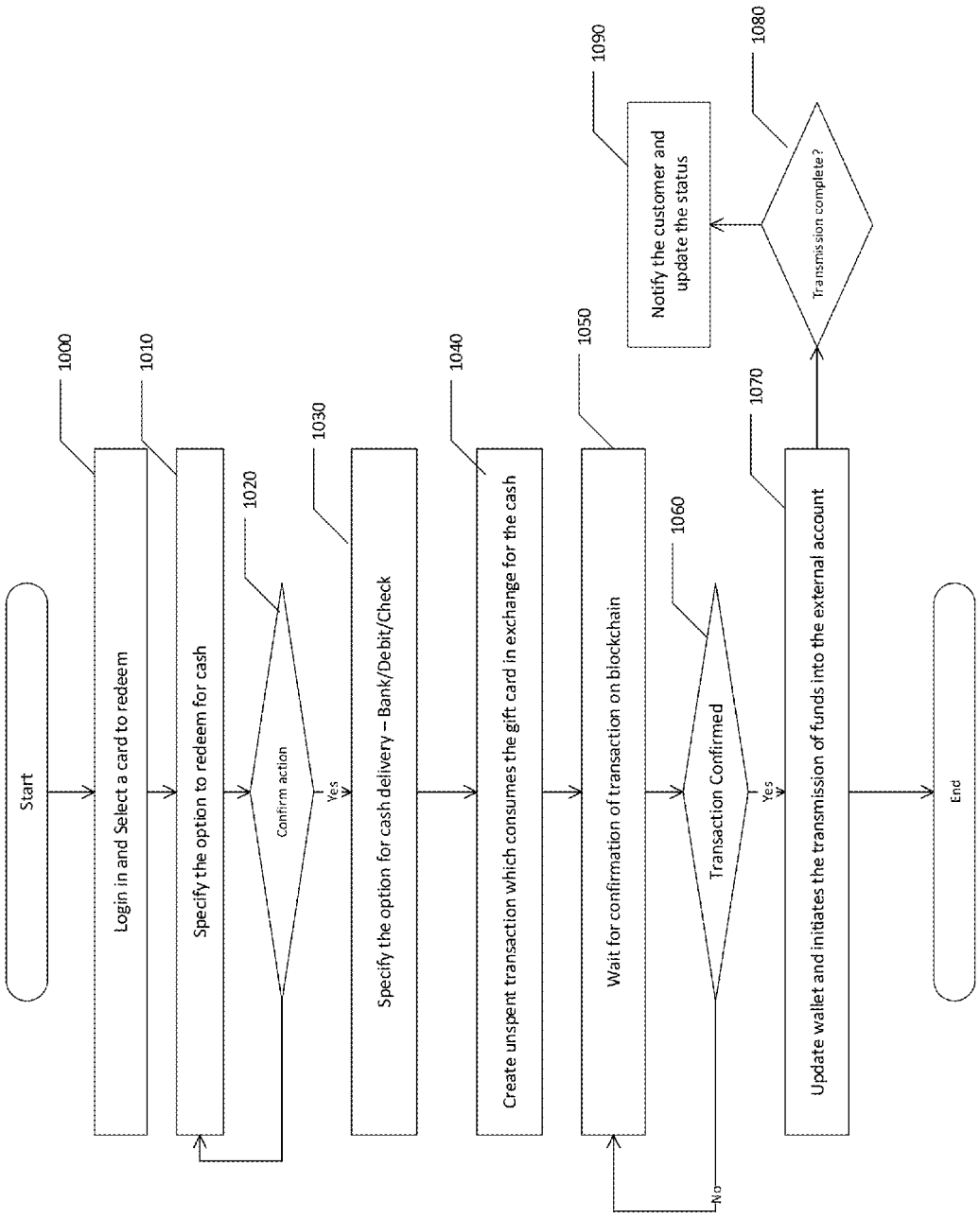

Start
Login in and Select a card to redeem
Specify the option to redeem for cash
Confirm action
Yes
Specify the option for cash delivery – Bank/Debit/Check
Create unspent transaction which consumes the gift card in exchange for the cash
Wait for confirmation of transaction on blockchain
Transaction Confirmed
No
Yes
Update wallet and initiates the transmission of funds into the external account
Transmission complete?
Notify the customer and update the status
End
1000
1010
1020
1030
1040
1050
1060
1070
1080
1090

FIG. 10

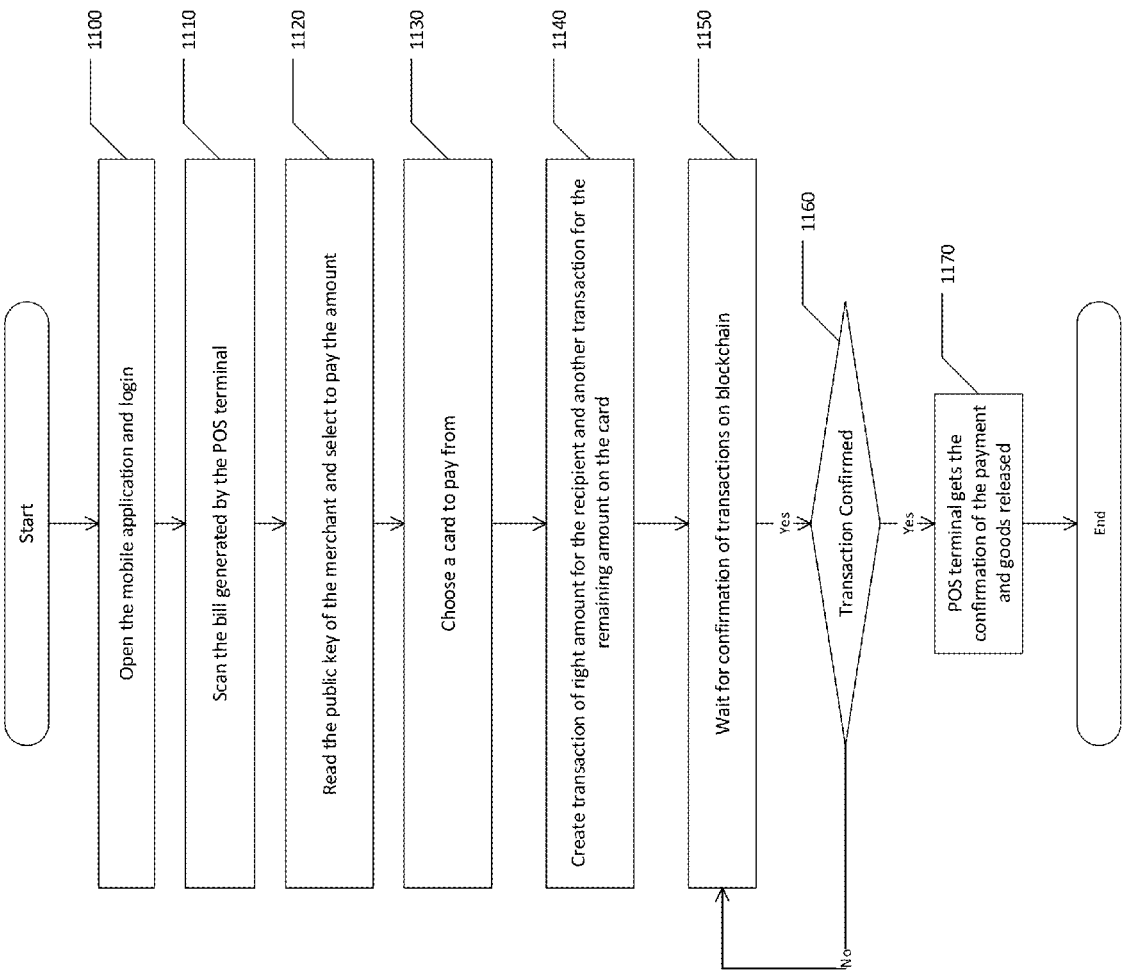
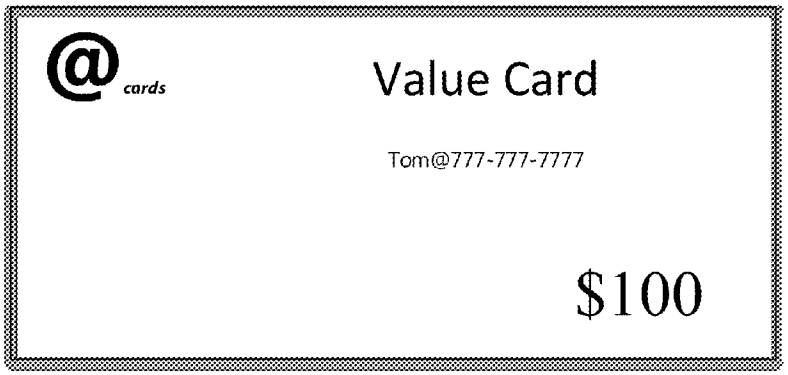
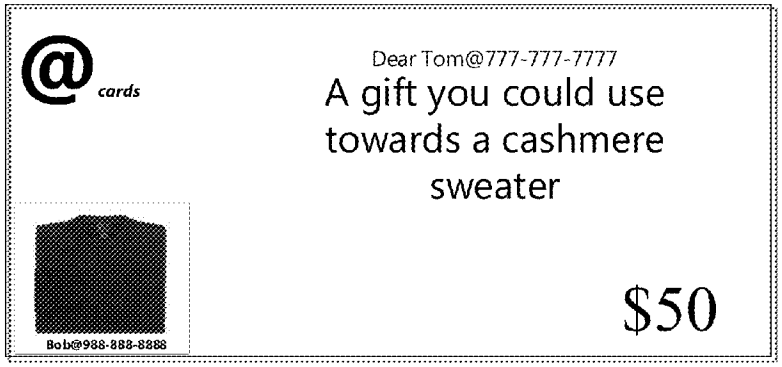

Start
1100
Open the mobile application and login
1110
Scan the bill generated by the POS terminal
1120
Read the public key of the merchant and select to pay the amount
1130
Choose a card to pay from
1140
Create transaction of right amount for the recipient and another transaction for the remaining amount on the card
1150
Wait for confirmation of transactions on blockchain
1160
Transaction Confirmed
Yes
No
Yes
1170
POS terminal gets the confirmation of the payment and goods released
End

FIG. 11


Tom @
777-777-7777


Sam @
123-456-7890


@cards
Value Card
Tom@777-777-7777
$100


@cards
Dear Tom@777-777-7777
A gift you could use towards a cashmere sweater
$50
Bob@988-888-8888

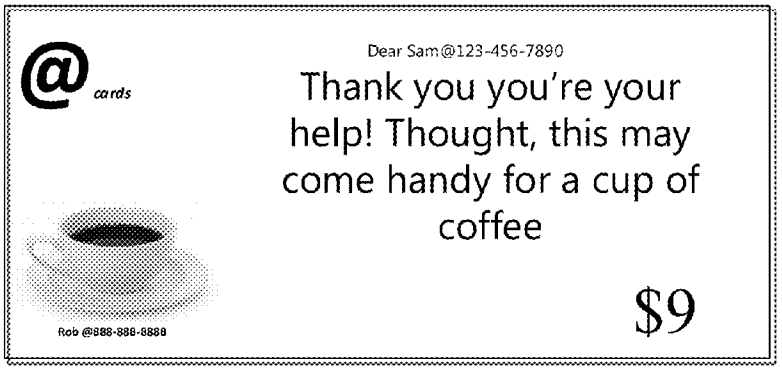

@cards
Dear Sam@123-456-7890
Thank you you're your help! Thought, this may come handy for a cup of coffee
$9
Rob @888-888-8888

FIG. 12

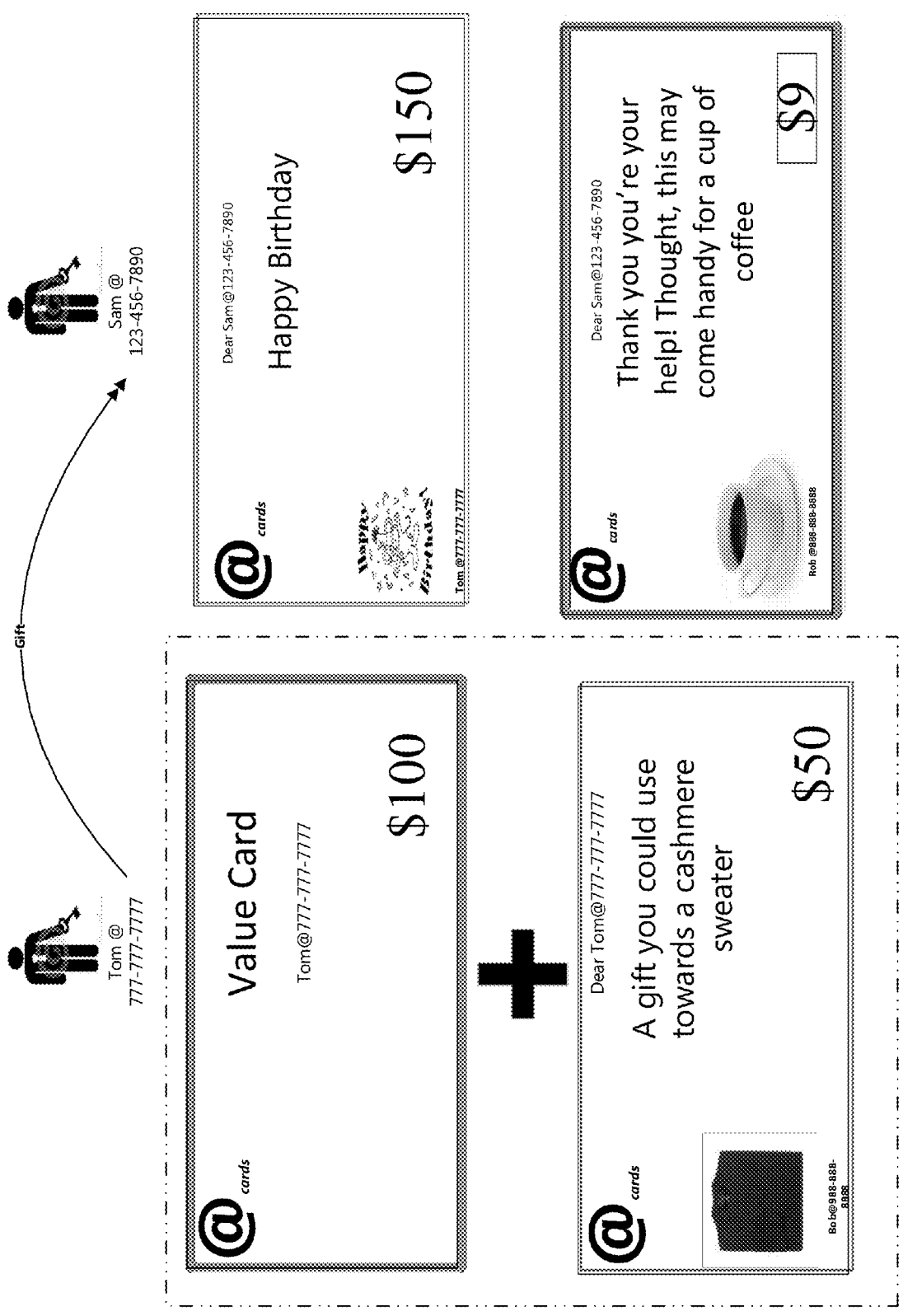

Tom @
777-777-7777
Gift
Sam @
123-456-7890
@cards
Value Card
Tom@777-777-7777
$100
Dear Tom@777-777-7777
A gift you could use towards a cashmere sweater
$50
Dear Sam@123-456-7890
Happy Birthday
$150
Tom @777-777-7777
Dear Sam@123-456-7890
Thank you you're your help! Thought, this may come handy for a cup of coffee
$9
Rob @888-888-8888

FIG. 13

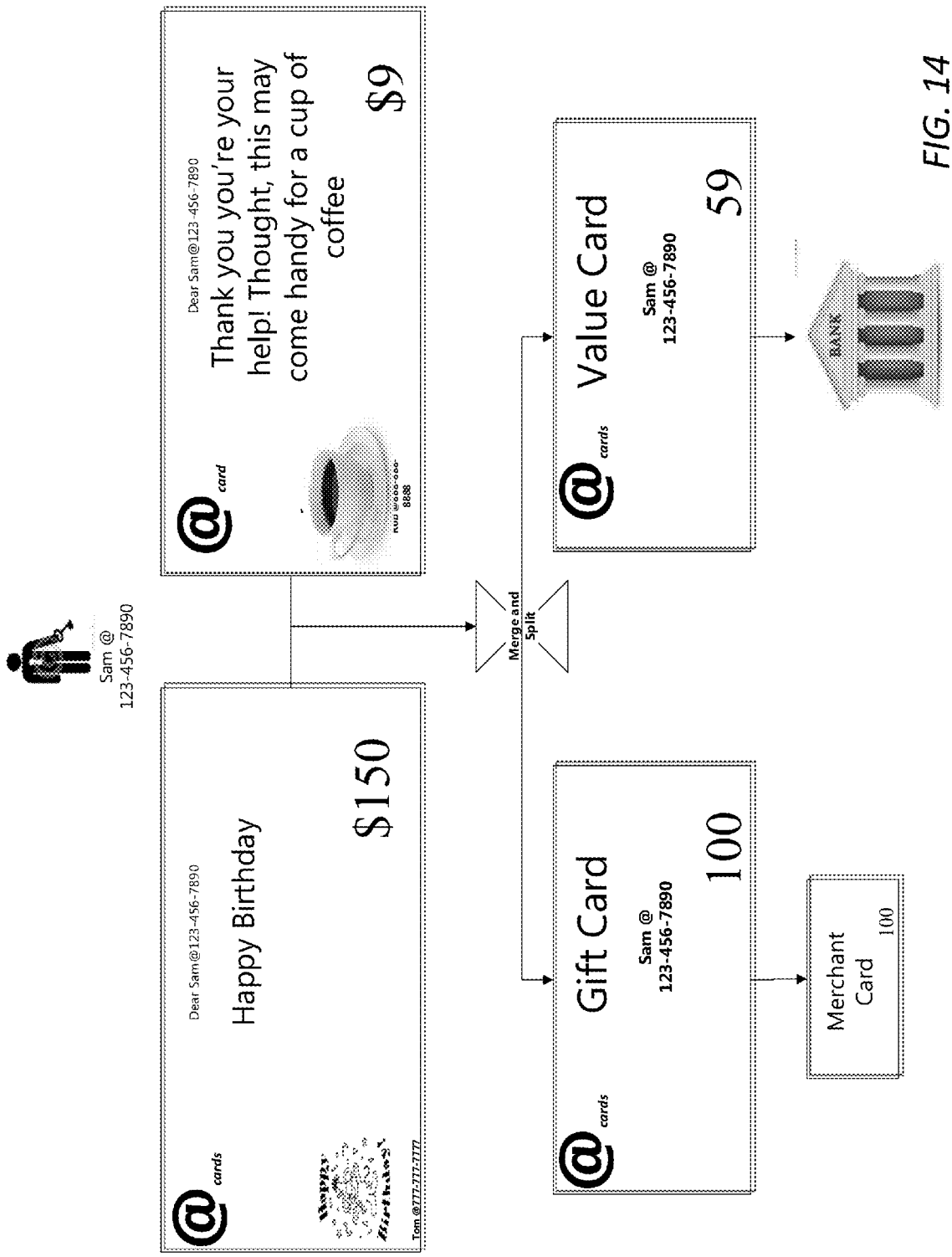

Sam @
123-456-7890
Dear Sam@123-456-7890
Thank you you're your help! Thought, this may come handy for a cup of coffee
$9
@ card
Dear Sam@123-456-7890
Happy Birthday
$150
@ cards
Tom @777-777-7777
Merge and Split
@ cards
Gift Card
Sam @
123-456-7890
100
Merchant Card
100
@ cards
Value Card
Sam @
123-456-7890
59
BANK

FIG. 14

SYSTEM AND THE COMPUTER METHODS OF ISSUING, TRANSFERRING AND MANIPULATING VALUE OR GIFT CARDS USING BLOCKCHAIN TECHNOLOGY

TECHNICAL FIELD

[0001] The current invention is related to the cryptographically secured smart value and gift card system which is capable of issuing and manipulating cryptographically secured value and gift cards using blockchain technology.

BACKGROUND

[0002] The prior art of value or gift card industry has many drawbacks. The gift cards or value cards are not tied to a person's identity, hence vulnerable to the theft or misplacement. The gift cards are issued by proprietary systems and their values and activation is held in privacy by the issuer. Such systems are prime targets for hackers and fraudsters. Some of them come with expiration date and their value decay as function of time. A person usually ends up getting a card which can only be redeemed at particular store, which may not serve his needs. If a holder of a gift card wants to re-gift the same card to someone with a value which is different, he cannot split the value of the card. If a holder of gift cards wants to merge the value of more than one card into a single value, he may not be able to do it. The holder of a gift card may not be able to easily exchange or redeem it. He may have to go to secondary market at steep discounted price. It is also inconvenient to a gift giver as most of them come in fixed denominations.

[0003] It is this inflexibility and inconvenience of using gift card which results in most of them staying unused. According to one estimate some 23 Billion dollar worth of gift cards stayed unused in 2014 within USA.

[0004] The described innovation brings the efficiency to the gift card and value card industry and alleviates above mentioned drawbacks using blockchain technology.

SUMMARY

[0005] Accordingly one embodiment of the current invention comprises of a system and computer methods to:

[0006] a) Accept a request from external systems like mobile application or web server.

[0007] b) Collect customer information including name, user name and password and store key artifacts in memory and on the disk.

[0008] c) Generate public key from the information collected from a customer, hash it and use the hashed value as the account id for the customer.

[0009] d) Accept a customer request for issuing a value or gift card for a certain value in a currency.

[0010] e) Process the payment for the requested value or gift card using external payment processor.

[0011] f) Generate a transaction of the said value, assign it to the public key of the customer and cryptographically sign it.

[0012] g) Write the unspent transaction on the distributed double entry ledger called blockchain.

[0013] h) Confirm the transaction on the blockchain.

[0014] i) Generate the image of the value or gift card and update the digital wallet of the customer.

[0015] In another embodiment, the value or gift card may be issued in any publicly acceptable currency and any denomination.

[0016] In another embodiment a value or gift card can be transferred and gifted to another identifiable person.

[0017] In another embodiment, the value or gift card when gifted may include suggestion to use it for purchasing a physical or digital good.

[0018] In another embedment a value or gift card may be split into more than one cards of equivalent value and each may be transferred independently.

[0019] In another embodiment, more than one value or gift cards can be merged into a single card of aggregated value.

[0020] In another embodiment a value or gift card may be redeemed for a specific merchant card available in the system.

[0021] In another embodiment a value or gift card may be directly used to purchase merchandise in a store front.

[0022] In another embodiment a value or gift card may be customized, printed and given to the recipient in physical form.

[0023] In another embodiment, a customer may track his value and gift cards purchase, transferred and received in a digital wallet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. **1** is a block diagram illustrating the AT Card System environment.

[0025] FIG. **2** is a block diagram illustrating the At Card System server and its modules.

[0026] FIG. **3** is a flow chart illustrating the customer registration in the At Card server environment.

[0027] FIG. **4** is a flow chart illustrating the purchase of value or gift card.

[0028] FIG. **5** is a flow chart illustrating the purchase of a value or gift card by a customer for another person

[0029] FIG. **6** is a flow chart illustrating the merging of 2 or more value or gift cards.

[0030] FIG. **7** is a flow chart illustrating the splitting of a value or gift card into multiple value or gift cards of multiple denominations.

[0031] FIG. **8** is a flow chart illustrating a customer owning a gift or value card to someone else.

[0032] FIG. **9** is a flow chart illustrating the redemption of a value or gift card against a merchant card.

[0033] FIG. **10** is a flow chart illustrating the redemption of a value or gift card with the currency it was issued in.

[0034] FIG. **11** is a flow chart illustrating the redemption of a value or gift card at a store front.

[0035] FIG. **12** illustrates the example digital or paper value or gift cards.

[0036] FIG. **13** illustrates the example merge and gifting of a value or gift cards.

[0037] FIG. **14** illustrates the example split and redemption of value or gift cards.

DETAILED DESCRIPTION

[0038] The systems and methods of generating, transferring, redeeming and manipulating the value or gift cards using blockchain technology are described here in detail. The reference is made to the embodiments of the innovation described in the various illustrations and drawings.

[0039] A system consists of memory, processor and interfaced with network card and storage. The processor is capable of running special computer instructions to perform specific tasks described in the embodiment. The data captured from a customer is loaded in the memory and stored on the disk. The processor is further capable of communicating with external systems running specialized instructions like payment processors, banking interfaces and printers. The specialized computer instructions capable of running on processors may be grouped together called modules. The processor may also run specialized instructions or programs called database.

[0040] A blockchain is defined as sequential transaction database popularized by Bitcoin cryptocurrency and acts as distributed double entry ledger and records all the transactions ever performed by the system in time series sequential order. Each transaction on blockchain is part of an identifiable block which is written on the blockchain by the approved and authorized parties which are sometimes called miners or forgers.

[0041] The FIG. **1** illustrates the AT Card system environment (**120**) receiving request from customer (**100**). The card system (**120**) is accessible but not limited to via Web browsers using HTTP/HTTPs protocol and mobile applications running on mobile operating systems like Android, IOS, and Windows or programmatically using standard APIs. The system accesses external services payment gateway (**130**), bank interface (**140**), printer (**150**), merchant gateway (**160**) and blockchain (**170**) over network running standard communication protocols.

[0042] The FIG. **2** illustrates the AT Card system constituting an HTTP Server (**200**) which executes instructions to process incoming requests and forwards them to the At Card server (**210**) which consists of a collection of specialized computer instructions or programs called modules. The crypto module (**250**) is responsible for generating public and private key pairs. It is also responsible for running one way hash functions on public key to produce customer identifier. The customer module (**220**) provides function for registration and recording of customer on the disk. The transaction module (**230**) provides function of generating an unspent transaction when a value card is purchased, manipulated, transferred or redeemed and writing it on the blockchain (**280**). It also provides function of for splitting a value card or merging more than one value cards into one and transferring the value card or gift card to someone else. The communication module (**240**) provides the functionality to communicate with customers via email or SMS. The gateway connectivity module (**260**) provides functionality of connecting to external services via standard network protocols. The API module (**270**) provides standard runtime services for external programs to communicate with the card system programmatically.

[0043] The FIG. **3** illustrates the flow chart of enrolling a customer in the system. Customer (**300**) accesses system using client interface (**310**). In step **320**, system captures customer information including username and password, applies cryptographic methods in step **330** and generates public key in step **340** and stores all the captured and generated data in database in step **360**. The system gathers user information using system memory during the registration process. In step **320**, user provides username, password information along with other information. In step **330**, system runs specialized computer instructions and cryptographic algorithms and produces public and private key pairs for the user in step **340**. Another computer program is used to create one way hash of the public key which is used as the account identifier for the customer. In step **350**, the generated and other collected data is stored in the database (**360**).

[0044] The FIG. **4** illustrates the flow chart of purchasing a value or gift card by a customer. In this embodiment a registered customer is presented the option to purchase a value or gift card in step **420**. In this embodiment, a user logs into the system via a range of input devices and not limited to mobile and desktop devices using a wide range of protocols and not limited only HTTP/HTTPS. The user makes a selection to purchase the value card of certain value in certain currency. System offers a choice of payments to purchase the value card. Upon a user's selection of payment method in step **430**, system reaches out to external systems and authorizes the payment. Once payment is authorized, system generated an unspent transaction signed by the customer's public key in step **440**. The value of the card is cryptographically locked in the transaction which can only be unlocked by the customer's private key upon approval. The table 1 shows the details captured in the transaction data structure.

Serial Number	Description of the attribute in Transaction
1	Public key of the owner, purchase or recipient
2	Amount of the value or gift card
3	Public key of the sender or the system
4	Block Id
5	Previous block Id
6	Markel root of the transaction
7	Transaction signature signed by sender or system key

[0045] The unspent transaction is then written to the blockchain in step **450** and upon confirmation of the transaction in step **470**, the sale of the value card or gift card is finalized in the name of the customer in step **480**.

[0046] In another embodiment illustrated in flow chart in FIG. **5**, a customer may directly purchase a value card or gift card for some other identifiable person. In this embodiment, in step **520**, a customer specifies the name, address, email address and telephone number of the person a gift card is meant for. If the receiving person is already a customer, an unspent transaction is created and written to the blockchain in step **530** and **540** respectively. However, if the recipient is not a customer, system sends communication to the recipient via email and SMS that he has been gifted a value card by said person for specific value. In step **560**, system will wait for the confirmation of the transaction on blockchain and upon confirmation will generate an image of the gift card in step **570** and initiate physical delivery in step **555**.

[0047] In another embodiment as illustrated in FIG. **6**, a customer owning multiple value or gift cards may merge them into one single card of aggregated value. In step **600**, a user logs into the system and chooses the cards to be merge into one card. Once his selection is finalized in step **610**, system will ask to confirm the selection in step **620** and after confirmation generates a new unspent transaction in step **630** with aggregate value and will write it to the blockchain in

step **640**. The new unified value card is finalized upon the confirmation of the transaction in step **670** on the blockchain.

[0048] In another embodiment as illustrated in FIG. **7** a customer owning a gift card of certain value may choose to split it into multiple cards of different denominations. In step **700**, a user logs into the system and selects an existing card of higher value to split. In step **710**, user chooses the cards and their values to be split into. The system provides option to split into multiple cards of different denominations with sum total value of children card equaling the parent card. In step **720**, user confirms his action and upon confirmation system generated multiple unspent transactions in step **730** and writes them on the blockchain in step **740**. The systems waits for the confirmation of the transaction on the blockchain in step **750** and upon confirmation in step **760**, he children cards get finalized and new cards are made available in the customer's wallet in step **770**. Now each child card can be gifted or transferred independently.

[0049] In another embodiment as illustrated by flow chart in FIG. **8**, a customer owning a value or gift card may like to gift it to someone else by customizing it and transferring the ownership. In this embodiment, in step **800** customer logs into the system and selects the card which he wants to transfer. In step **805**, he specifies the name, email address, phone number and address of the person he intends to gift the card. He may also suggest the purpose of gifting. The purpose may suggest redeeming the card towards purchase of a certain physical or digital good at a certain merchant. Upon approving the intention of transfer by the customer in step **810**, system generates an unspent transaction in step **820** and writes on blockchain in step **830**. In step **835**, system waits for the transaction to be confirmed on blockchain and after confirmation generates the image of new card and updates the wallet in step **840**. In step **845** System notifies the recipient of the card by email/SMS about the new gift card and if physically delivery of the card is desired, system initiates the process of physical delivery in step **850**. In another embodiment, a customer owning a value card may decide to exchange it for a merchant card. In this embodiment, a customer chooses the option of redeeming a value card with a merchant card available in the system. Upon approval of his intent to redeem, system communicates with external merchant card system and purchases a merchant card and places it in the customer's wallet. It then creates a transaction marking the redemption of the value card.

[0050] In another embodiment as illustrated in flow chart in FIG. **9**, a customer owning a value or gift card may decide to redeem it for a store merchant card. In this embodiment, a customer logs into the system and chose a card to redeem in step **900**. In step **910**, customer chose a merchant card he would like to redeem with and confirm his action in step **920**. In step **930**, system communicates with merchant gateway and purchases a merchant store card. In step **940**, system notifies the customer that a store card has been redeemed for his value card. In step **950**, system creates an unspent transaction and writes it on the blockchain in step **960**. In step **970**, system waits for the transactions to be confirmed on the blockchain and upon confirmation generates a printable image of the store merchant card in step **980** and updates the wallet.

[0051] In another embodiment as illustrated in flow chart in FIG. **10**, a customer owning a value card may decide to redeem it for the currency it was issued in. In this embodiment, in step **1000**, a customer logs in and chose to redeem the value or gift card. In step **1010** he chose the option to redeem with currency. In step **1020** he confirms the selection and in step **1030**, he specified the external recipient accounts. In step **1040**, system creates an unspent transaction and writes on blockchain in step **1050**. After confirmation of the transaction on blockchain in step **1060**, system updates the wallet and initiates the transmission of the funds in step **1070**. In step **1080** confirms the delivery of the funds and updates the status in step **1090**.

[0052] In yet another embodiment as illustrated in FIG. **11**, a customer owning a value or gift card may decide to redeem it at participating store front in exchange for goods. In this embodiment, the customer chose to transfer ownership of the value card to the store front in exchange for goods. Upon, approval, system, the value card is transferred to the public key of the store front and an unspent transaction gets written to the blockchain to finalize the transfer. In step **1100**, customer logs into the mobile application. In step **1110**, bill produced by the merchant is scanned by the mobile application and the public key of the store is read in step **1120**. In step **1130**, customer chose a card to pay the bill from. In step **1140**, system creates the transactions for the payment and writes them on the blockchain. In step **1160**, system waits for the transaction to be confirmed on the blockchain. Upon confirmation of the transaction in step **1170**, the store front is notified in step **1180** and goods are released for the customer.

[0053] The FIG. **12** provides screen shots of example value and gift cards. In these examples Tom buys a Value card for $100 and receives a gift card in the amount of @50 from Bob. Another person Sam receives a gift card toward a cup of copy for $9.

[0054] The FIG. **13** demonstrates sample transactions between Tom and Sam. Tom merges the value of cards for $100 and $50 demonstrated in FIG. **12** and creates a merged gift card of $150 and sends this to Sam.

[0055] The FIG. **14** demonstrates the sample transactions where Sam merges his gift cards and splits into different values and redeems them. Sam merges the 2 cards he has in his wallet as demonstrated in FIG. **13**—$150 and $9 and split them into $100 gift card and $50 value cards. He redeems $100 gift card for a store merchant card and $59 value card for currency in his bank.

1. A system comprising:

a. A memory which is coupled with microprocessor and is capable of storing customer and transaction information.

b. HTTP Server operating on or more microprocessors and is capable of accepting plurality of requests from external clients over the network. The HTTP Server executes computer instructions upon receiving the requests and forward to the At Card Server.

c. At Card Server operating on one or more microprocessors and run plurality of components. It executes computer instructions and results the system to:

i. Receive request from HTTP server and collect new user information and upon validation create an account in the system

ii. Generate public and private keys using specialized cryptographic algorithms based upon username and

password information supplied by the user and store public key in the system along with other customer information

iii. Receive request to purchase a value or gift card of a certain value and process request and call external payment gateway to process the payment over TCP/IP network using appropriate communication protocols

iv. Generate an unspent transaction for the value card request and store it on the block chain. The unspent transaction digitally signs the transaction giving the owner of the public key the right to redeem, transfer and use the value associated with the card.

v. Generate a gift or value card for the customer and update the digital wallet

d. Block Chain popularized by cryptocurrencies, operating on one more microprocessors and executes computer instructions which upon execution accepts transactions and stores them in the order of sequence in blocks. A group of transactions form a block and sequence of blocks form block chain.

2. The system of claim **1** where system is extended to execute instructions where a customer owning a value or gift card may transfer it to some other person. The new transaction of the transfer of ownership gets recorded on the block chain.

3. The system of the claim **1** where systems is extended to execute instructions where a customer owning a value or gift card may split it into more than one value cards with sum of the values equaling the parent card value.

4. The system of the claim **3** where systems is extended to execute instructions where a customer owning a value or gift card may split it into more than one value cards with sum of the values equaling the parent card value in a different currency.

5. The system of claim **1** where system is extended to execute instructions where a customer owning more than one value or gift card may merge them into one single aggregated value card.

6. The system of claim **5** where system is extended to execute instructions where a customer owning more than one value or gift card may merge them into one single aggregated value card and issued in different currency.

7. The system of claim **1** where systems is extended to execute instructions where a customer may purchase a value or gift card for some other identifiable person.

8. The system of claim **2** where system is extended to execute instructions where a customer may send the value or gift card to a recipient for some intended purpose

9. The system of claim **2** where system is extended to execute instructions where a customer may send the gift card to a recipient for acquiring a physical or digital good

10. The system of claim **2** where systems is extended to execute instructions where system sends notification to the recipient of the gift card by email or SMS informing about his ownership of the new gift card

11. The system of claim **1** where system is extended to execute instructions where owner of a value card may redeem it for a merchant card.

12. The system of claim **11** where system is extended to execute instructions where it connects with external merchant systems and makes purchase of the merchant store cards.

13. The system of claim **11** where system is extended to execute instructions where a customer is communicated when a value or gift card is redeemed against a merchant store card.

14. The system of claim **1** where system is extended to execute instructions where owner of a value card may redeem it for currency it was purchased in.

15. The system of claim **14** where system is extended to execute instructions where system connect to external financial systems to initiate deposit of the redeemed value

16. The system of claim **1** where system is extended to execute instructions where owner of a value card may redeem it at the store front in exchange for physical or digital goods

17. The system of claim **1** where system is extended to execute instructions where blockchain used may be public blockchain from bitcoin system.

18. The system of claim **17** where system is extended to execute instructions where concept of color coin used to write transactions on public blockchain using open asset protocol.

19. The system of claim **1** where system is extended to execute instructions where blockchain may be shared with other participants in the system who may be given the right to write transactions and create blocks

20. The system of claim **19** where system is extended to execute instructions where proof of work, proof of stake or any other algorithms are used to create block on block chain by the system participants.

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