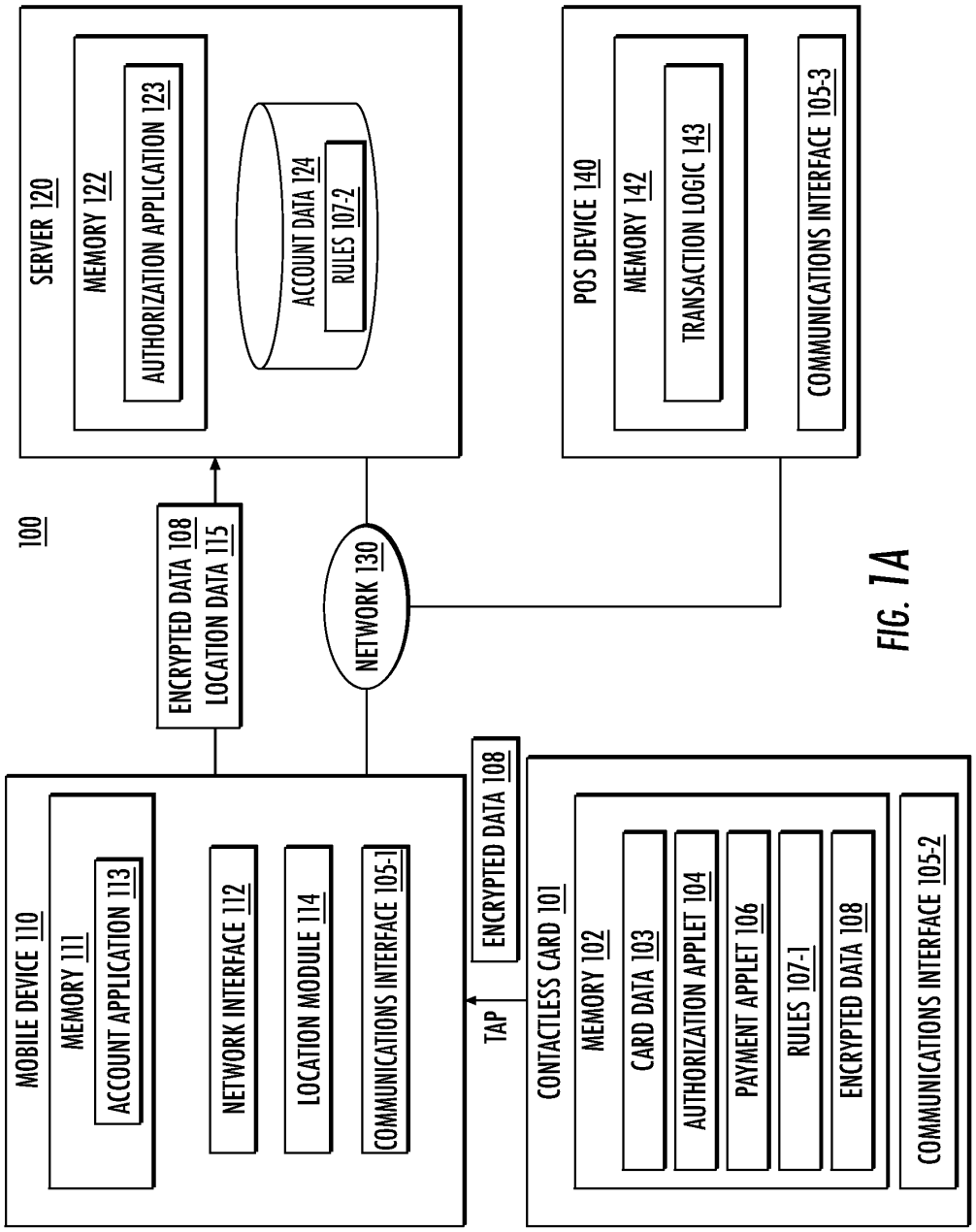

100
MOBILE DEVICE 110
MEMORY 111
ACCOUNT APPLICATION 113
NETWORK INTERFACE 112
LOCATION MODULE 114
COMMUNICATIONS INTERFACE 105-1
ENCRYPTED DATA 108
LOCATION DATA 115
NETWORK 130
SERVER 120
MEMORY 122
AUTHORIZATION APPLICATION 123
ACCOUNT DATA 124
RULES 107-2
POS DEVICE 140
MEMORY 142
TRANSACTION LOGIC 143
COMMUNICATIONS INTERFACE 105-3
TAP
ENCRYPTED DATA 108
CONTACTLESS CARD 101
MEMORY 102
CARD DATA 103
AUTHORIZATION APPLET 104
PAYMENT APPLET 106
RULES 107-1
ENCRYPTED DATA 108
COMMUNICATIONS INTERFACE 105-2

FIG. 1A

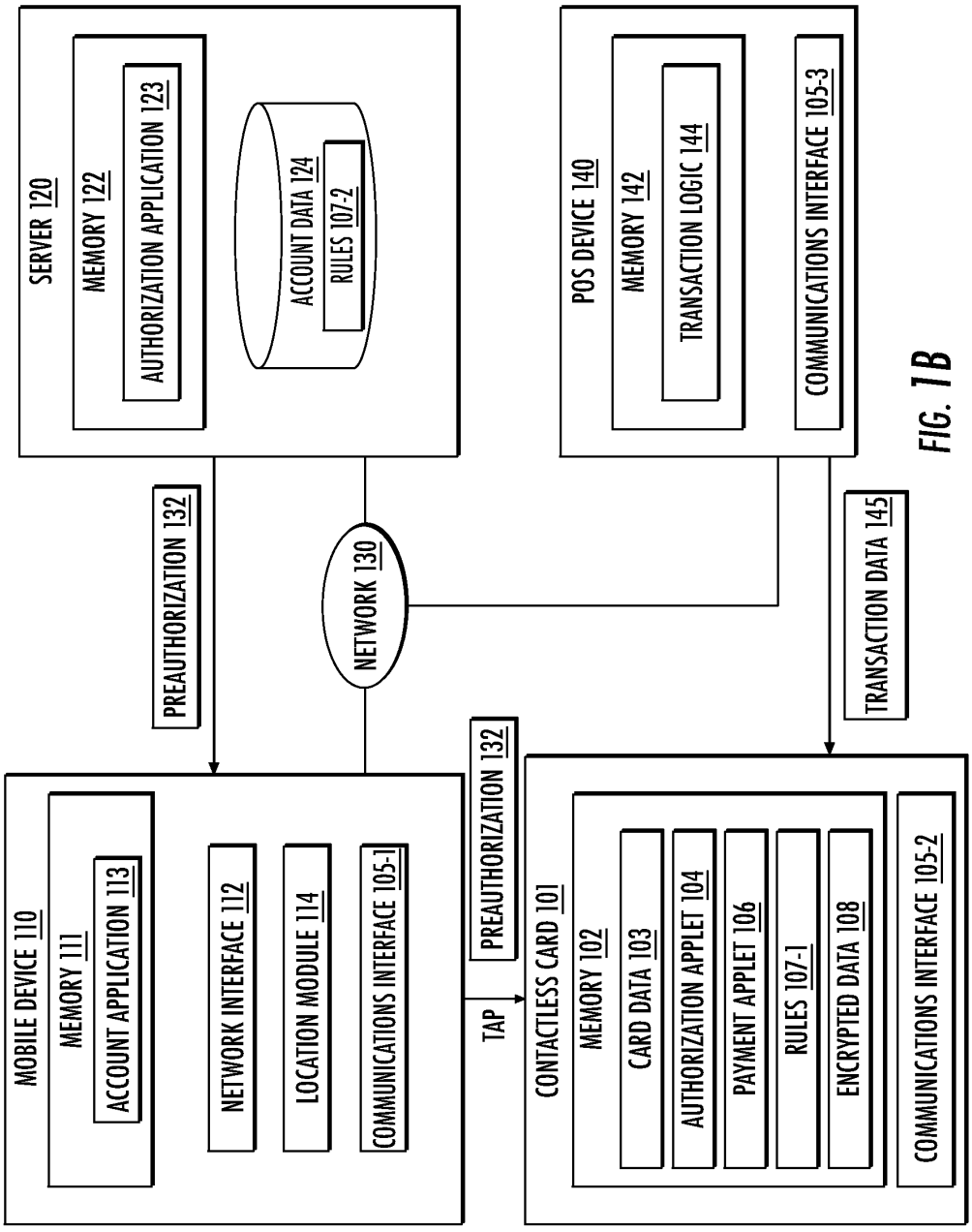

SERVER 120
MEMORY 122
AUTHORIZATION APPLICATION 123
ACCOUNT DATA 124
RULES 107-2
POS DEVICE 140
MEMORY 142
TRANSACTION LOGIC 144
COMMUNICATIONS INTERFACE 105-3
PREAUTHORIZATION 132
NETWORK 130
TRANSACTION DATA 145
MOBILE DEVICE 110
MEMORY 111
ACCOUNT APPLICATION 113
NETWORK INTERFACE 112
LOCATION MODULE 114
COMMUNICATIONS INTERFACE 105-1
PREAUTHORIZATION 132
TAP
CONTACTLESS CARD 101
MEMORY 102
CARD DATA 103
AUTHORIZATION APPLET 104
PAYMENT APPLET 106
RULES 107-1
ENCRYPTED DATA 108
COMMUNICATIONS INTERFACE 105-2

FIG. 1B

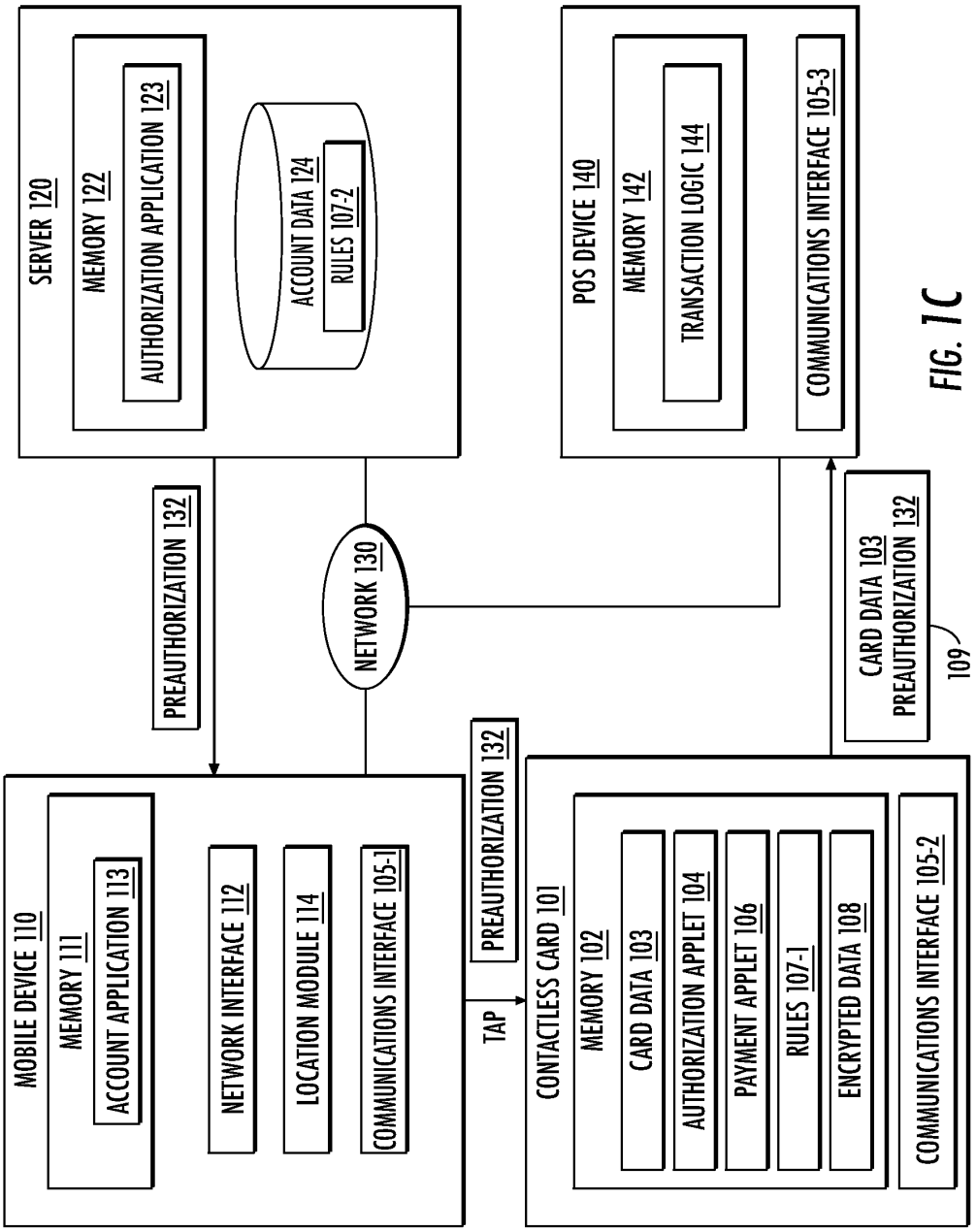

SERVER 120
MEMORY 122
AUTHORIZATION APPLICATION 123
ACCOUNT DATA 124
RULES 107-2
POS DEVICE 140
MEMORY 142
TRANSACTION LOGIC 144
COMMUNICATIONS INTERFACE 105-3
PREAUTHORIZATION 132
NETWORK 130
CARD DATA 103
PREAUTHORIZATION 132
109
MOBILE DEVICE 110
MEMORY 111
ACCOUNT APPLICATION 113
NETWORK INTERFACE 112
LOCATION MODULE 114
COMMUNICATIONS INTERFACE 105-1
TAP
PREAUTHORIZATION 132
CONTACTLESS CARD 101
MEMORY 102
CARD DATA 103
AUTHORIZATION APPLET 104
PAYMENT APPLET 106
RULES 107-1
ENCRYPTED DATA 108
COMMUNICATIONS INTERFACE 105-2

FIG. 1C

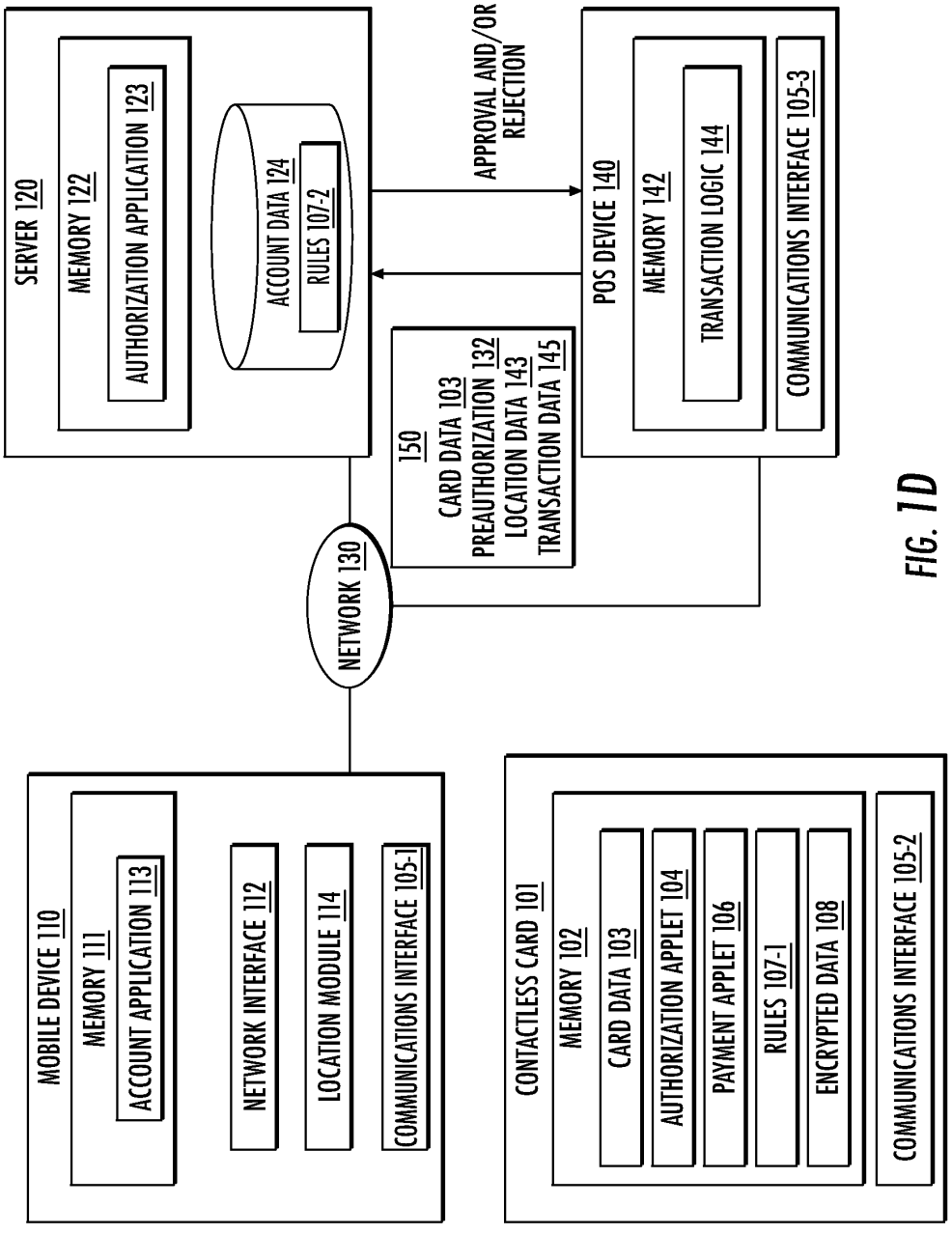

SERVER 120
MEMORY 122
AUTHORIZATION APPLICATION 123
ACCOUNT DATA 124
RULES 107-2
APPROVAL AND/OR REJECTION
POS DEVICE 140
MEMORY 142
TRANSACTION LOGIC 144
COMMUNICATIONS INTERFACE 105-3
150
CARD DATA 103
PREAUTHORIZATION 132
LOCATION DATA 143
TRANSACTION DATA 145
NETWORK 130
MOBILE DEVICE 110
MEMORY 111
ACCOUNT APPLICATION 113
NETWORK INTERFACE 112
LOCATION MODULE 114
COMMUNICATIONS INTERFACE 105-1
CONTACTLESS CARD 101
MEMORY 102
CARD DATA 103
AUTHORIZATION APPLET 104
PAYMENT APPLET 106
RULES 107-1
ENCRYPTED DATA 108
COMMUNICATIONS INTERFACE 105-2

FIG. 1D

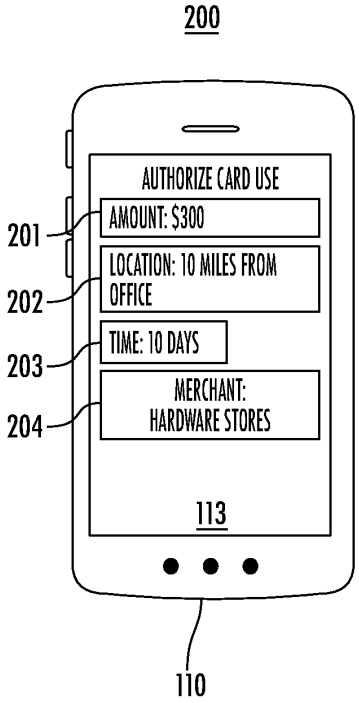

200
AUTHORIZE CARD USE
AMOUNT: $300
LOCATION: 10 MILES FROM OFFICE
TIME: 10 DAYS
MERCHANT: HARDWARE STORES
113
201
202
203
204
110

FIG. 2A

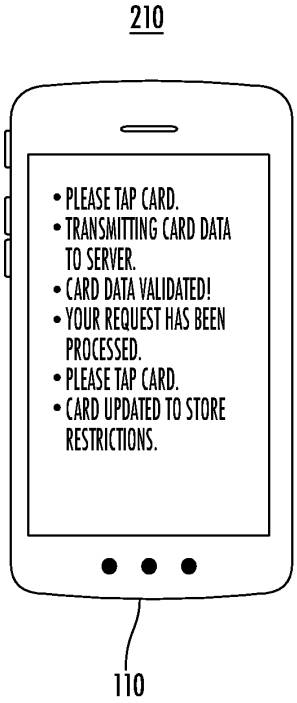
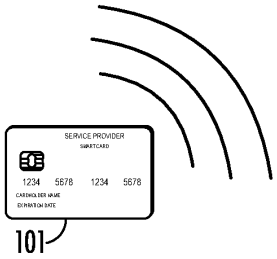

210
• PLEASE TAP CARD.
• TRANSMITTING CARD DATA TO SERVER.
• CARD DATA VALIDATED!
• YOUR REQUEST HAS BEEN PROCESSED.
• PLEASE TAP CARD.
• CARD UPDATED TO STORE RESTRICTIONS.
110

FIG. 2B


SERVICE PROVIDER
1234 5678 1234 5678
101

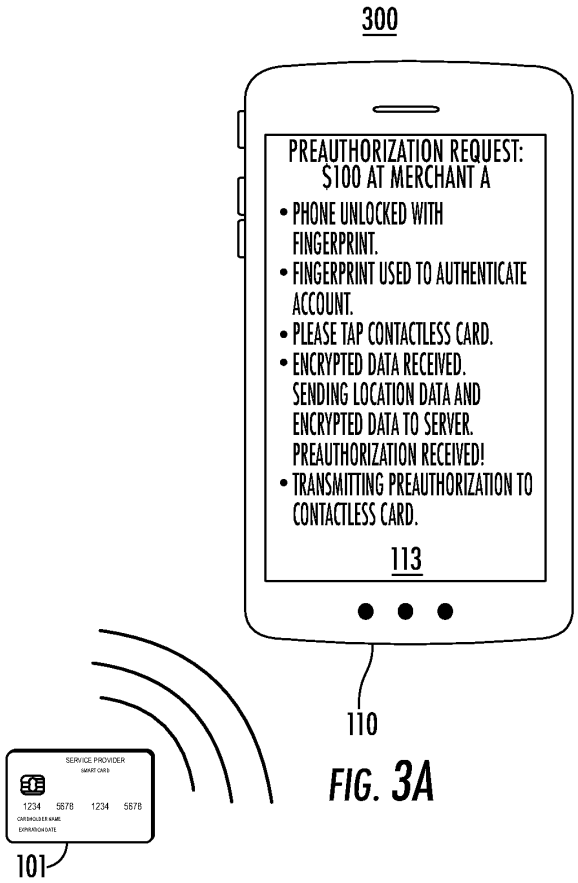

300
PREAUTHORIZATION REQUEST:
$100 AT MERCHANT A
• PHONE UNLOCKED WITH FINGERPRINT.
• FINGERPRINT USED TO AUTHENTICATE ACCOUNT.
• PLEASE TAP CONTACTLESS CARD.
• ENCRYPTED DATA RECEIVED. SENDING LOCATION DATA AND ENCRYPTED DATA TO SERVER. PREAUTHORIZATION RECEIVED!
• TRANSMITTING PREAUTHORIZATION TO CONTACTLESS CARD.
113
110
SERVICE PROVIDER
SMART CARD
1234 5678 1234 5678
CARDHOLDER NAME
EXPIRATION DATE
101

FIG. 3A

310
POS DEVICE 140
WELCOME! YOUR TOTAL IS $20.17.
PLEASE INSERT OR TAP YOUR CARD.
PROCESSING...
SERVICE PROVIDER
SMART CARD
1234 5678 1234 5678
CARDHOLDER NAME
EXPIRATION DATE
101

FIG. 3B

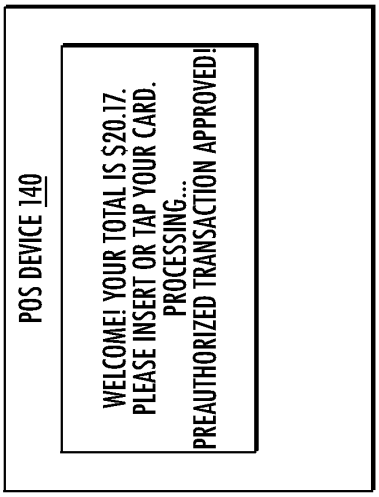

330
POS DEVICE 140
WELCOME! YOUR TOTAL IS $20.17.
PLEASE INSERT OR TAP YOUR CARD.
PROCESSING...
PREAUTHORIZED TRANSACTION APPROVED!

FIG. 3D

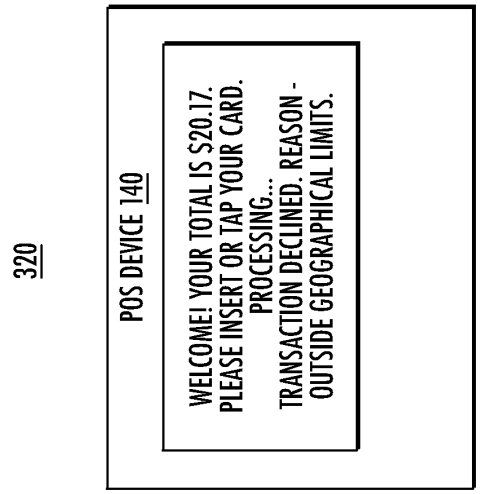

320
POS DEVICE 140
WELCOME! YOUR TOTAL IS $20.17.
PLEASE INSERT OR TAP YOUR CARD.
PROCESSING...
TRANSACTION DECLINED. REASON -
OUTSIDE GEOGRAPHICAL LIMITS.
101

FIG. 3C

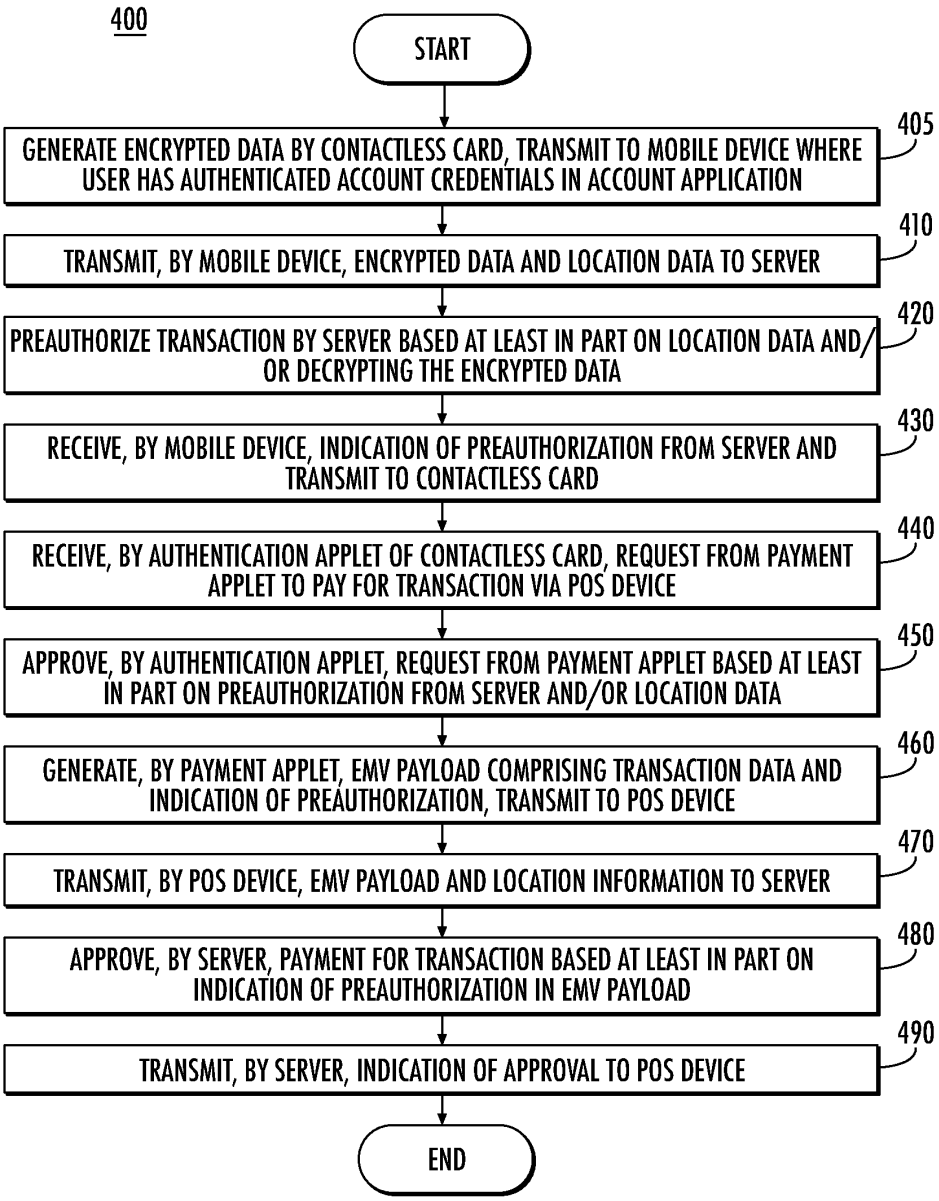

400
START
GENERATE ENCRYPTED DATA BY CONTACTLESS CARD, TRANSMIT TO MOBILE DEVICE WHERE USER HAS AUTHENTICATED ACCOUNT CREDENTIALS IN ACCOUNT APPLICATION
405
TRANSMIT, BY MOBILE DEVICE, ENCRYPTED DATA AND LOCATION DATA TO SERVER
410
PREAUTHORIZE TRANSACTION BY SERVER BASED AT LEAST IN PART ON LOCATION DATA AND/OR DECRYPTING THE ENCRYPTED DATA
420
RECEIVE, BY MOBILE DEVICE, INDICATION OF PREAUTHORIZATION FROM SERVER AND TRANSMIT TO CONTACTLESS CARD
430
RECEIVE, BY AUTHENTICATION APPLET OF CONTACTLESS CARD, REQUEST FROM PAYMENT APPLET TO PAY FOR TRANSACTION VIA POS DEVICE
440
APPROVE, BY AUTHENTICATION APPLET, REQUEST FROM PAYMENT APPLET BASED AT LEAST IN PART ON PREAUTHORIZATION FROM SERVER AND/OR LOCATION DATA
450
GENERATE, BY PAYMENT APPLET, EMV PAYLOAD COMPRISING TRANSACTION DATA AND INDICATION OF PREAUTHORIZATION, TRANSMIT TO POS DEVICE
460
TRANSMIT, BY POS DEVICE, EMV PAYLOAD AND LOCATION INFORMATION TO SERVER
470
APPROVE, BY SERVER, PAYMENT FOR TRANSACTION BASED AT LEAST IN PART ON INDICATION OF PREAUTHORIZATION IN EMV PAYLOAD
480
TRANSMIT, BY SERVER, INDICATION OF APPROVAL TO POS DEVICE
490
END

FIG. 4

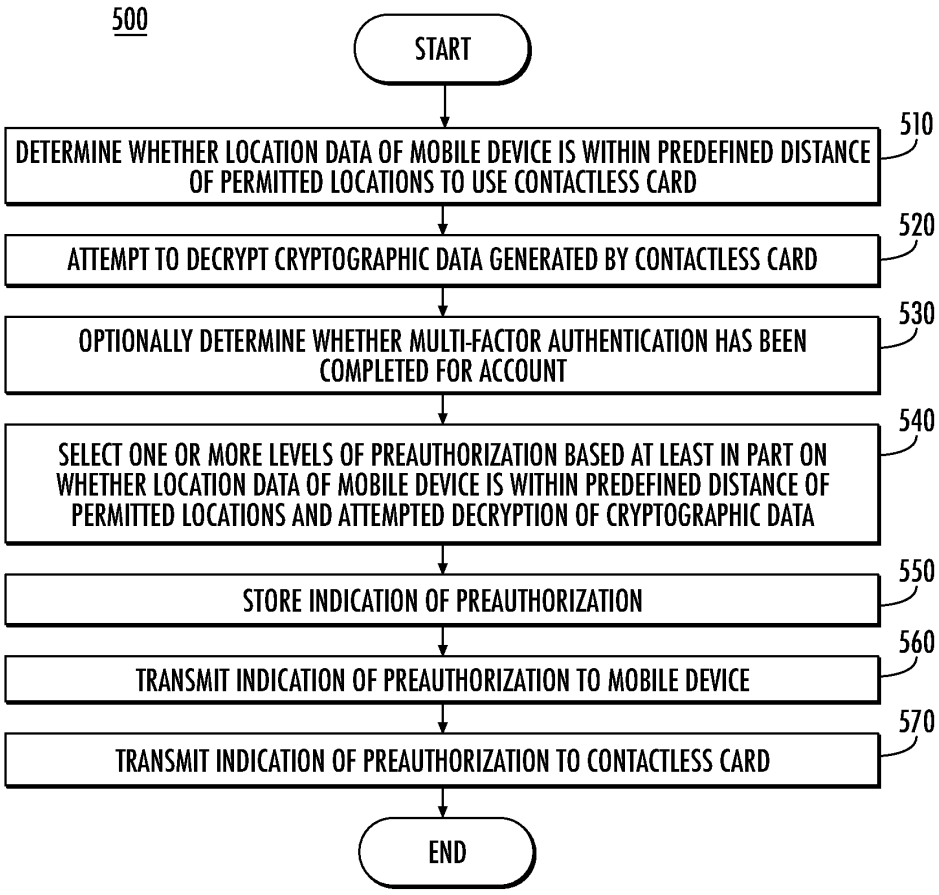

500
START
DETERMINE WHETHER LOCATION DATA OF MOBILE DEVICE IS WITHIN PREDEFINED DISTANCE OF PERMITTED LOCATIONS TO USE CONTACTLESS CARD
510
ATTEMPT TO DECRYPT CRYPTOGRAPHIC DATA GENERATED BY CONTACTLESS CARD
520
OPTIONALLY DETERMINE WHETHER MULTI-FACTOR AUTHENTICATION HAS BEEN COMPLETED FOR ACCOUNT
530
SELECT ONE OR MORE LEVELS OF PREAUTHORIZATION BASED AT LEAST IN PART ON WHETHER LOCATION DATA OF MOBILE DEVICE IS WITHIN PREDEFINED DISTANCE OF PERMITTED LOCATIONS AND ATTEMPTED DECRYPTION OF CRYPTOGRAPHIC DATA
540
STORE INDICATION OF PREAUTHORIZATION
550
TRANSMIT INDICATION OF PREAUTHORIZATION TO MOBILE DEVICE
560
TRANSMIT INDICATION OF PREAUTHORIZATION TO CONTACTLESS CARD
570
END

FIG. 5

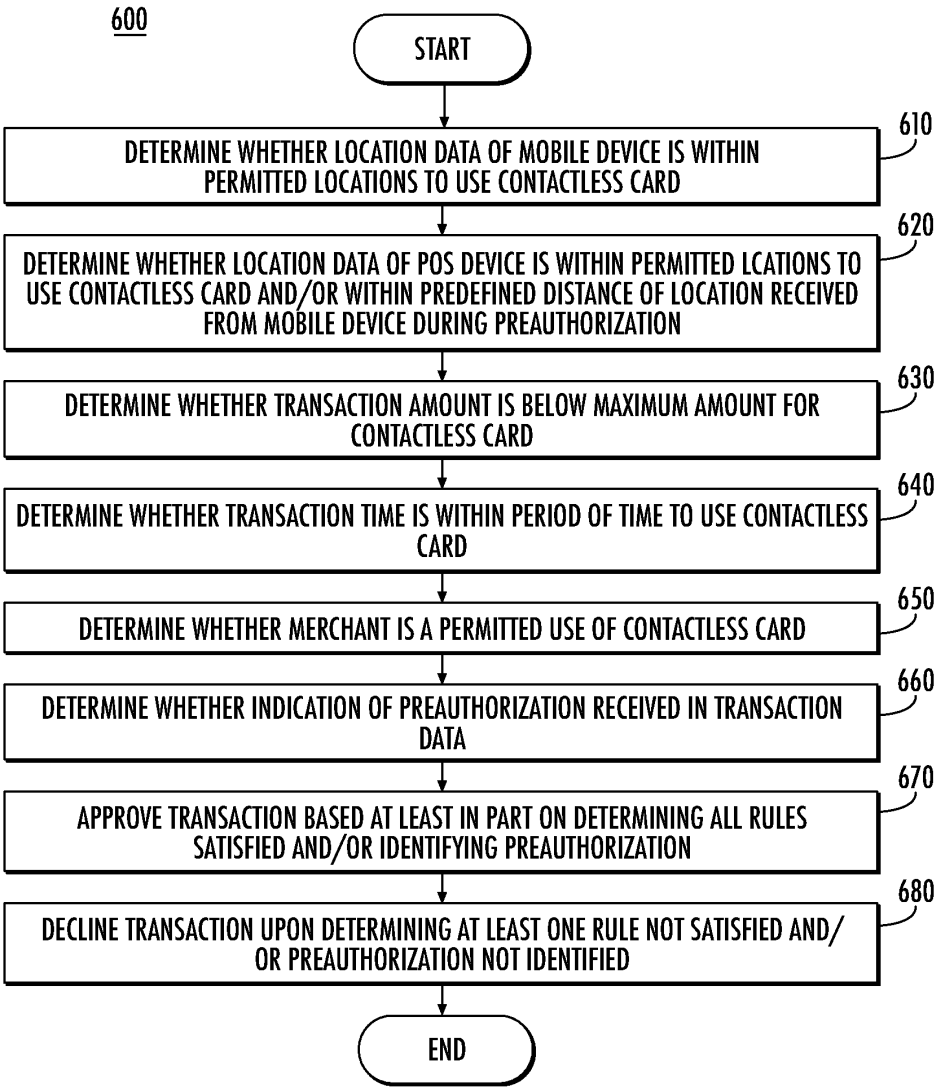

600
START
DETERMINE WHETHER LOCATION DATA OF MOBILE DEVICE IS WITHIN PERMITTED LOCATIONS TO USE CONTACTLESS CARD
610
DETERMINE WHETHER LOCATION DATA OF POS DEVICE IS WITHIN PERMITTED LCATIONS TO USE CONTACTLESS CARD AND/OR WITHIN PREDEFINED DISTANCE OF LOCATION RECEIVED FROM MOBILE DEVICE DURING PREAUTHORIZATION
620
DETERMINE WHETHER TRANSACTION AMOUNT IS BELOW MAXIMUM AMOUNT FOR CONTACTLESS CARD
630
DETERMINE WHETHER TRANSACTION TIME IS WITHIN PERIOD OF TIME TO USE CONTACTLESS CARD
640
DETERMINE WHETHER MERCHANT IS A PERMITTED USE OF CONTACTLESS CARD
650
DETERMINE WHETHER INDICATION OF PREAUTHORIZATION RECEIVED IN TRANSACTION DATA
660
APPROVE TRANSACTION BASED AT LEAST IN PART ON DETERMINING ALL RULES SATISFIED AND/OR IDENTIFYING PREAUTHORIZATION
670
DECLINE TRANSACTION UPON DETERMINING AT LEAST ONE RULE NOT SATISFIED AND/OR PREAUTHORIZATION NOT IDENTIFIED
680
END

FIG. 6

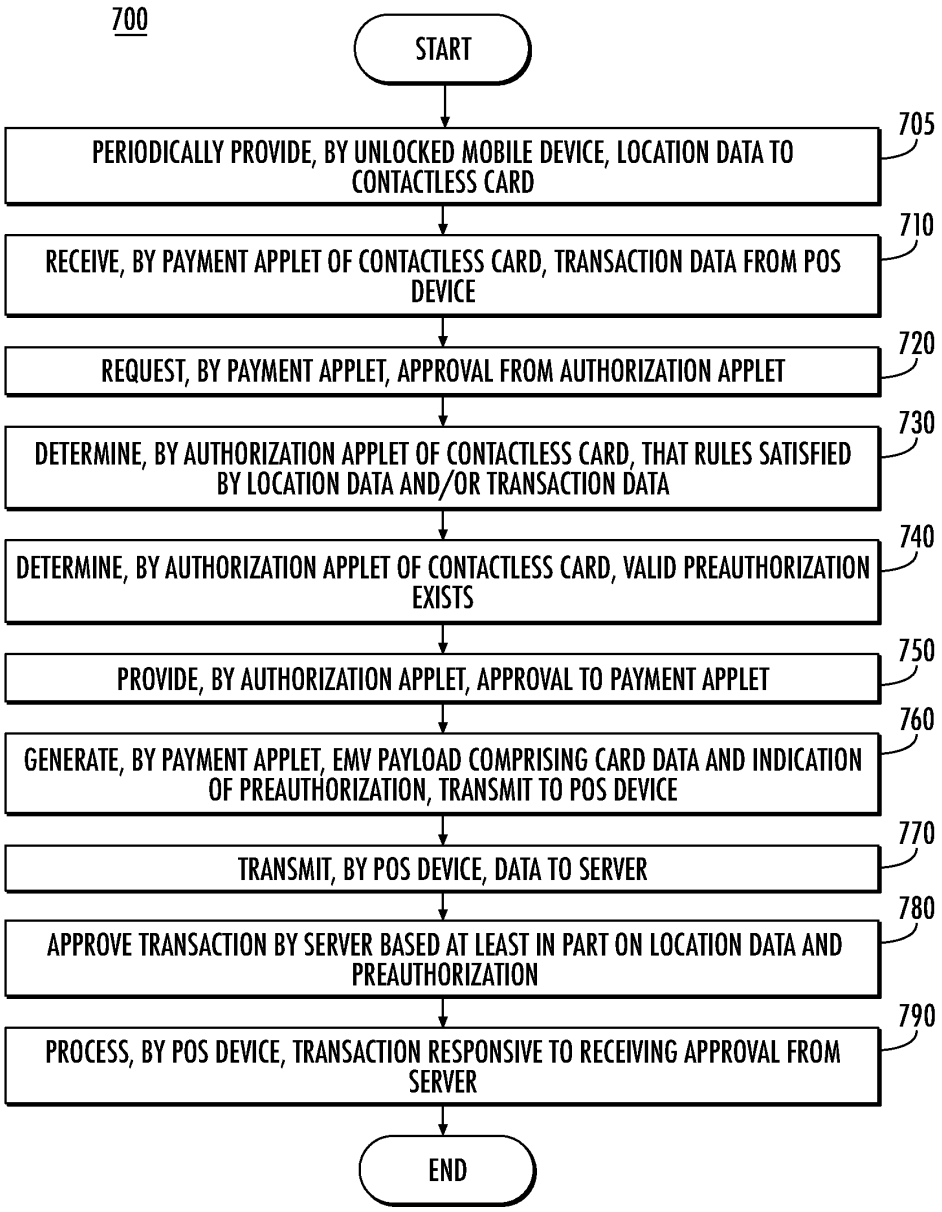

700
START
PERIODICALLY PROVIDE, BY UNLOCKED MOBILE DEVICE, LOCATION DATA TO CONTACTLESS CARD
705
RECEIVE, BY PAYMENT APPLET OF CONTACTLESS CARD, TRANSACTION DATA FROM POS DEVICE
710
REQUEST, BY PAYMENT APPLET, APPROVAL FROM AUTHORIZATION APPLET
720
DETERMINE, BY AUTHORIZATION APPLET OF CONTACTLESS CARD, THAT RULES SATISFIED BY LOCATION DATA AND/OR TRANSACTION DATA
730
DETERMINE, BY AUTHORIZATION APPLET OF CONTACTLESS CARD, VALID PREAUTHORIZATION EXISTS
740
PROVIDE, BY AUTHORIZATION APPLET, APPROVAL TO PAYMENT APPLET
750
GENERATE, BY PAYMENT APPLET, EMV PAYLOAD COMPRISING CARD DATA AND INDICATION OF PREAUTHORIZATION, TRANSMIT TO POS DEVICE
760
TRANSMIT, BY POS DEVICE, DATA TO SERVER
770
APPROVE TRANSACTION BY SERVER BASED AT LEAST IN PART ON LOCATION DATA AND PREAUTHORIZATION
780
PROCESS, BY POS DEVICE, TRANSACTION RESPONSIVE TO RECEIVING APPROVAL FROM SERVER
790
END

FIG. 7

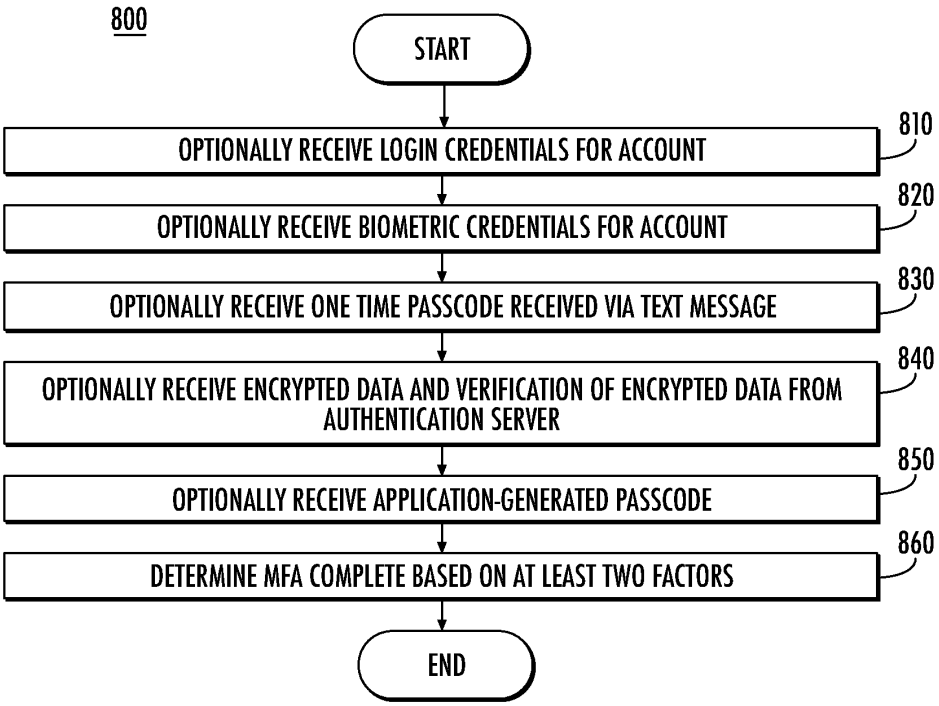

800
START
OPTIONALLY RECEIVE LOGIN CREDENTIALS FOR ACCOUNT
810
OPTIONALLY RECEIVE BIOMETRIC CREDENTIALS FOR ACCOUNT
820
OPTIONALLY RECEIVE ONE TIME PASSCODE RECEIVED VIA TEXT MESSAGE
830
OPTIONALLY RECEIVE ENCRYPTED DATA AND VERIFICATION OF ENCRYPTED DATA FROM AUTHENTICATION SERVER
840
OPTIONALLY RECEIVE APPLICATION-GENERATED PASSCODE
850
DETERMINE MFA COMPLETE BASED ON AT LEAST TWO FACTORS
860
END

FIG. 8

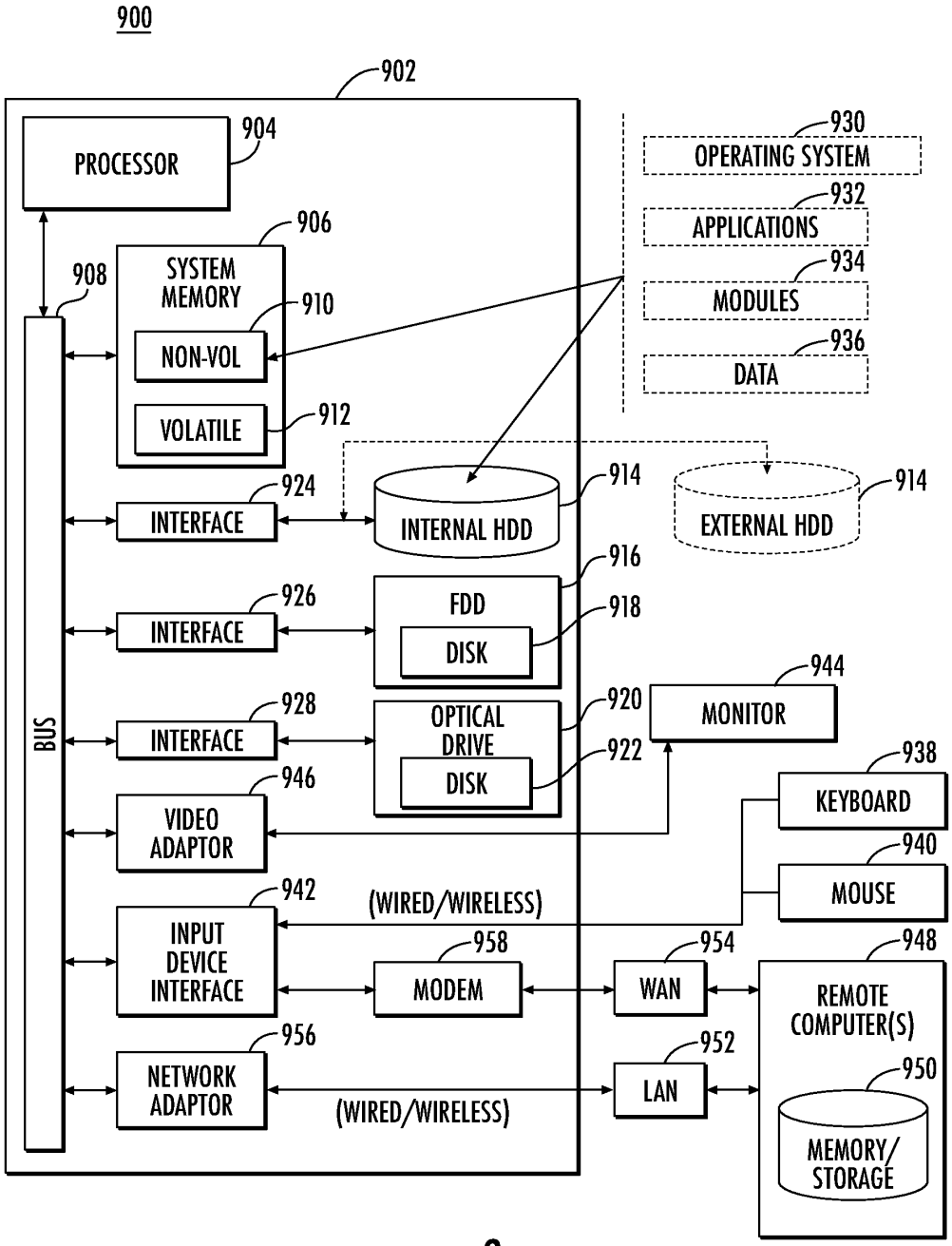

900
902
PROCESSOR
904
SYSTEM MEMORY
906
908
910
NON-VOL
VOLATILE
912
BUS
930
OPERATING SYSTEM
932
APPLICATIONS
934
MODULES
936
DATA
INTERFACE
924
INTERNAL HDD
914
EXTERNAL HDD
914
INTERFACE
926
FDD
916
DISK
918
INTERFACE
928
OPTICAL DRIVE
920
DISK
922
MONITOR
944
VIDEO ADAPTOR
946
KEYBOARD
938
MOUSE
940
(WIRED/WIRELESS)
INPUT DEVICE INTERFACE
942
MODEM
958
WAN
954
REMOTE COMPUTER(S)
948
NETWORK ADAPTOR
956
LAN
952
(WIRED/WIRELESS)
MEMORY/ STORAGE
950

FIG. 9

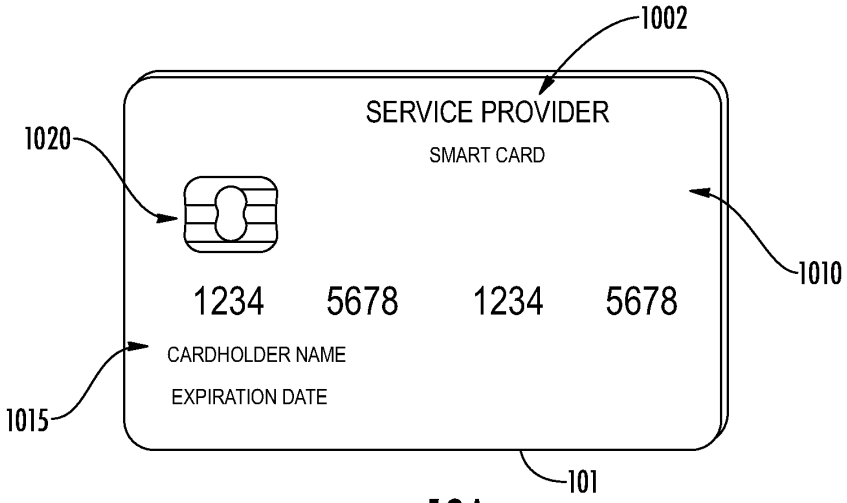

1002
SERVICE PROVIDER
SMART CARD
1020
1010
1234 5678 1234 5678
CARDHOLDER NAME
EXPIRATION DATE
1015
101

FIG. 10A

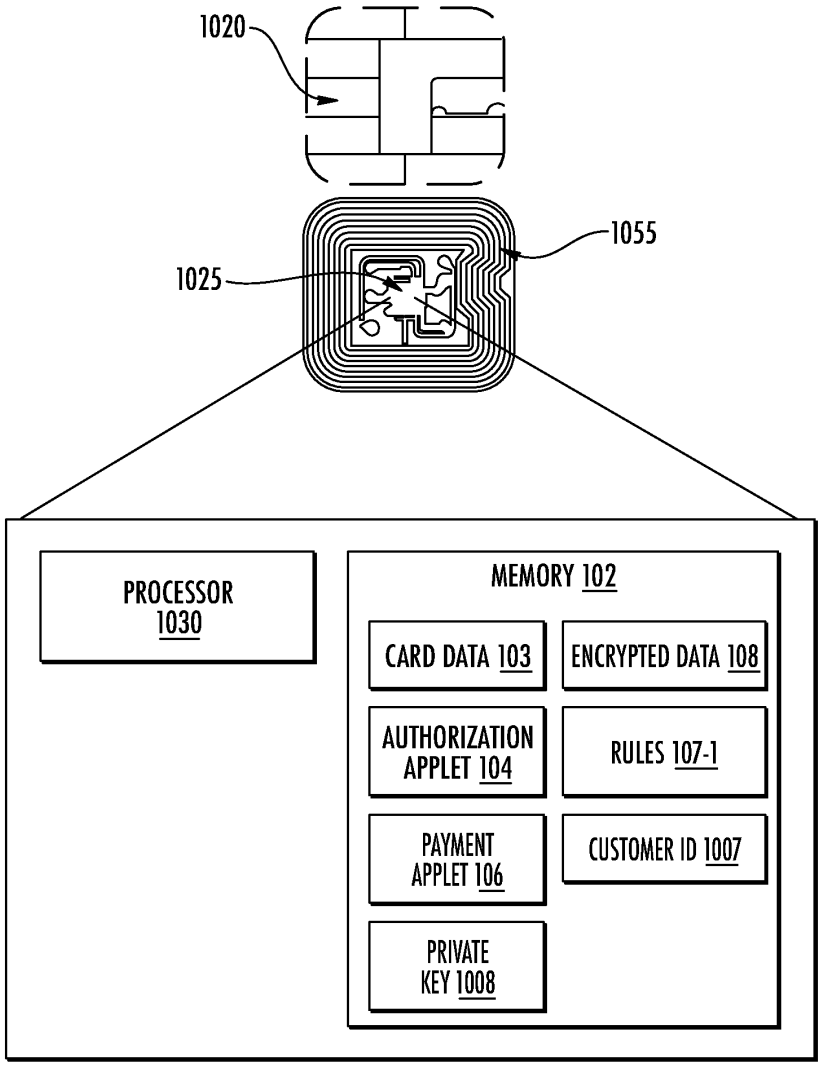

1020
1055
1025
PROCESSOR 1030
MEMORY 102
CARD DATA 103
ENCRYPTED DATA 108
AUTHORIZATION APPLET 104
RULES 107-1
PAYMENT APPLET 106
CUSTOMER ID 1007
PRIVATE KEY 1008

FIG. 10B