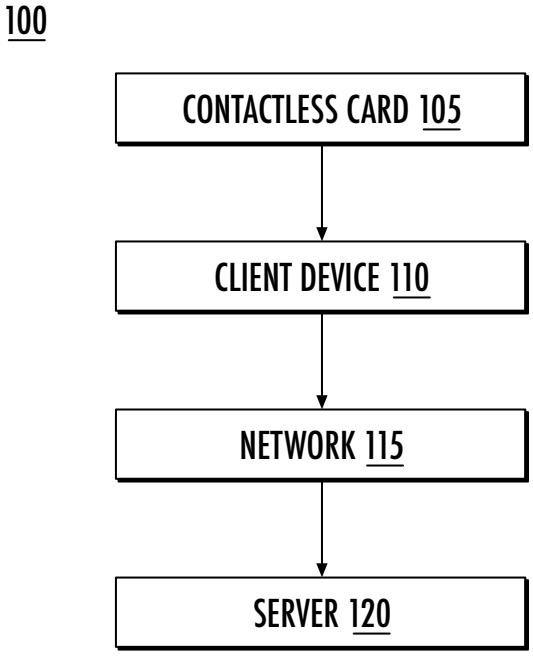

100
CONTACTLESS CARD 105
CLIENT DEVICE 110
NETWORK 115
SERVER 120

FIG. 1A

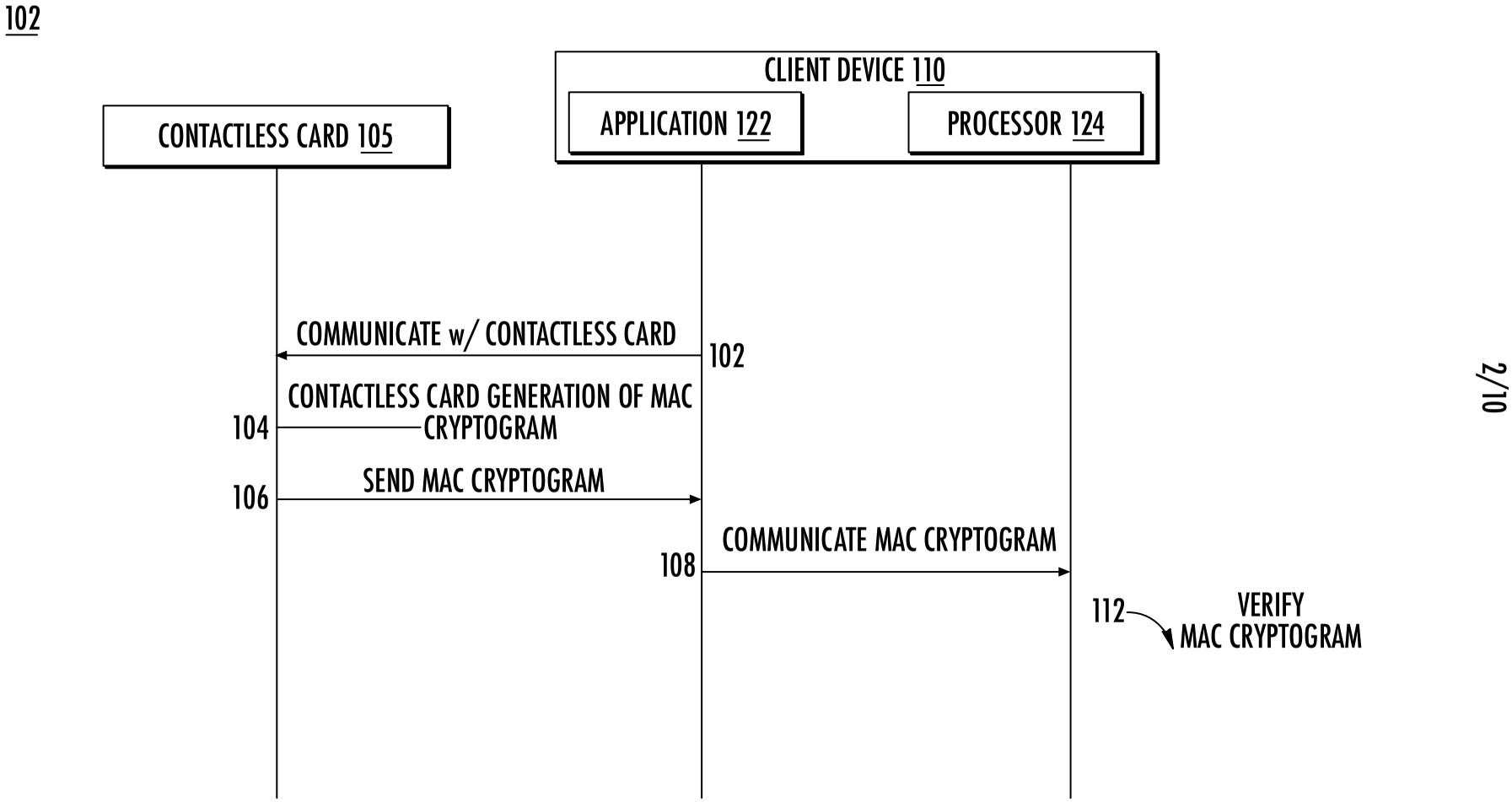

102
CLIENT DEVICE 110
APPLICATION 122
PROCESSOR 124
CONTACTLESS CARD 105
COMMUNICATE w/ CONTACTLESS CARD
102
CONTACTLESS CARD GENERATION OF MAC CRYPTOGRAM
104
SEND MAC CRYPTOGRAM
106
COMMUNICATE MAC CRYPTOGRAM
108
112
VERIFY MAC CRYPTOGRAM

FIG. 1B

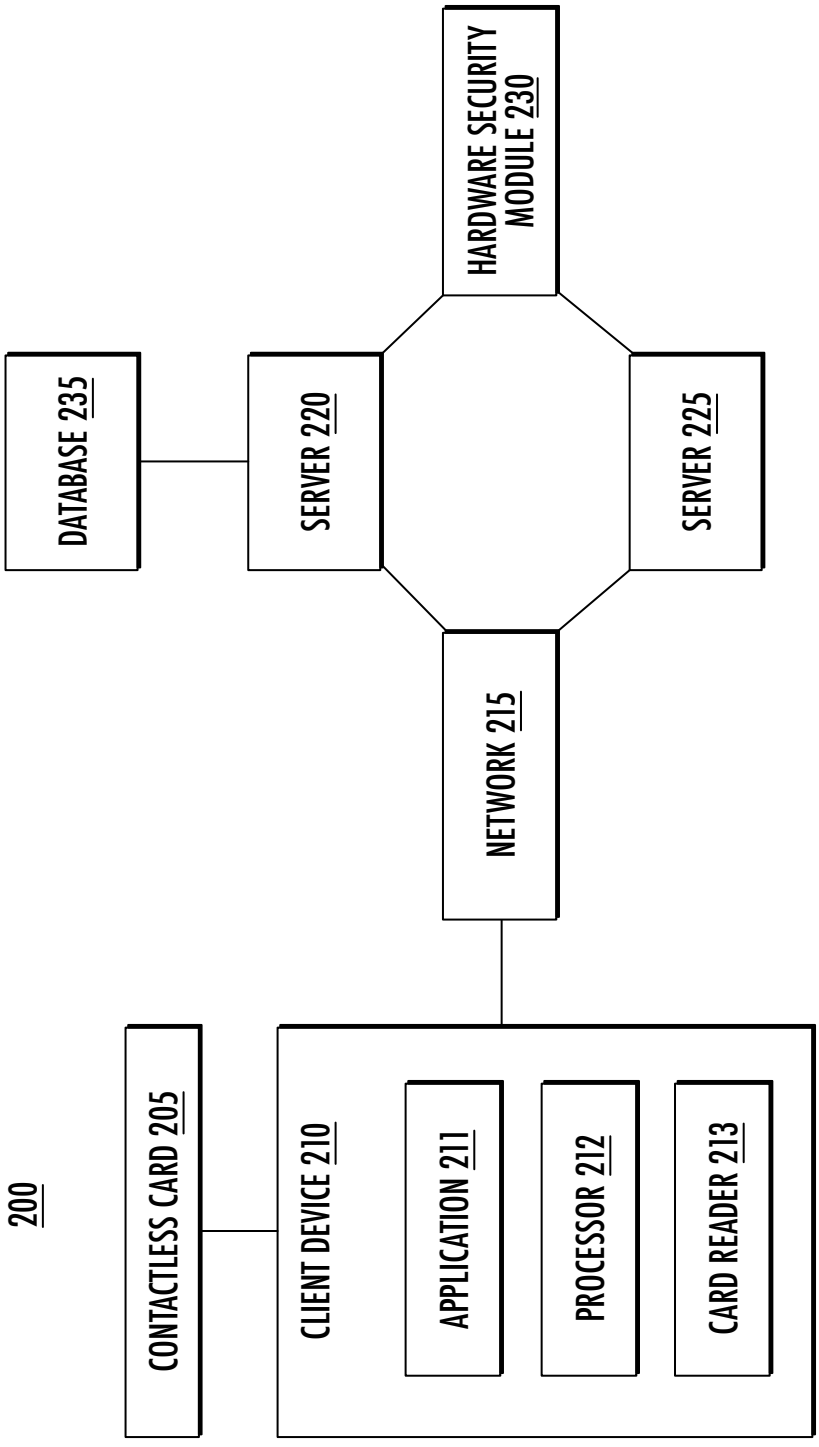

200
CONTACTLESS CARD 205
CLIENT DEVICE 210
APPLICATION 211
PROCESSOR 212
CARD READER 213
NETWORK 215
SERVER 220
SERVER 225
DATABASE 235
HARDWARE SECURITY MODULE 230

FIG. 2

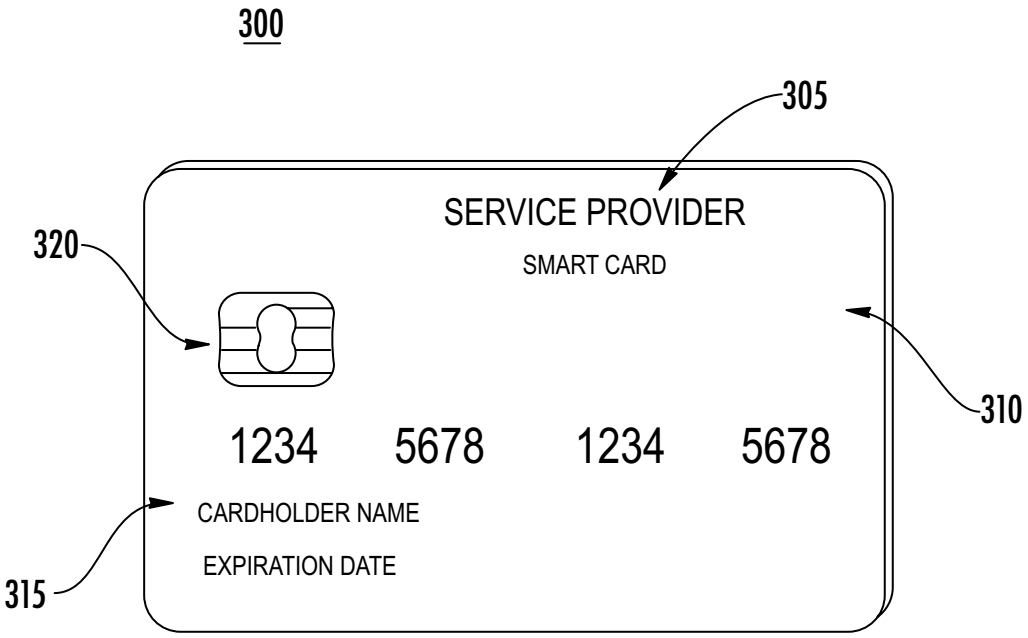

300
305
SERVICE PROVIDER
SMART CARD
320
310
1234 5678 1234 5678
CARDHOLDER NAME
EXPIRATION DATE
315

FIG. 3A

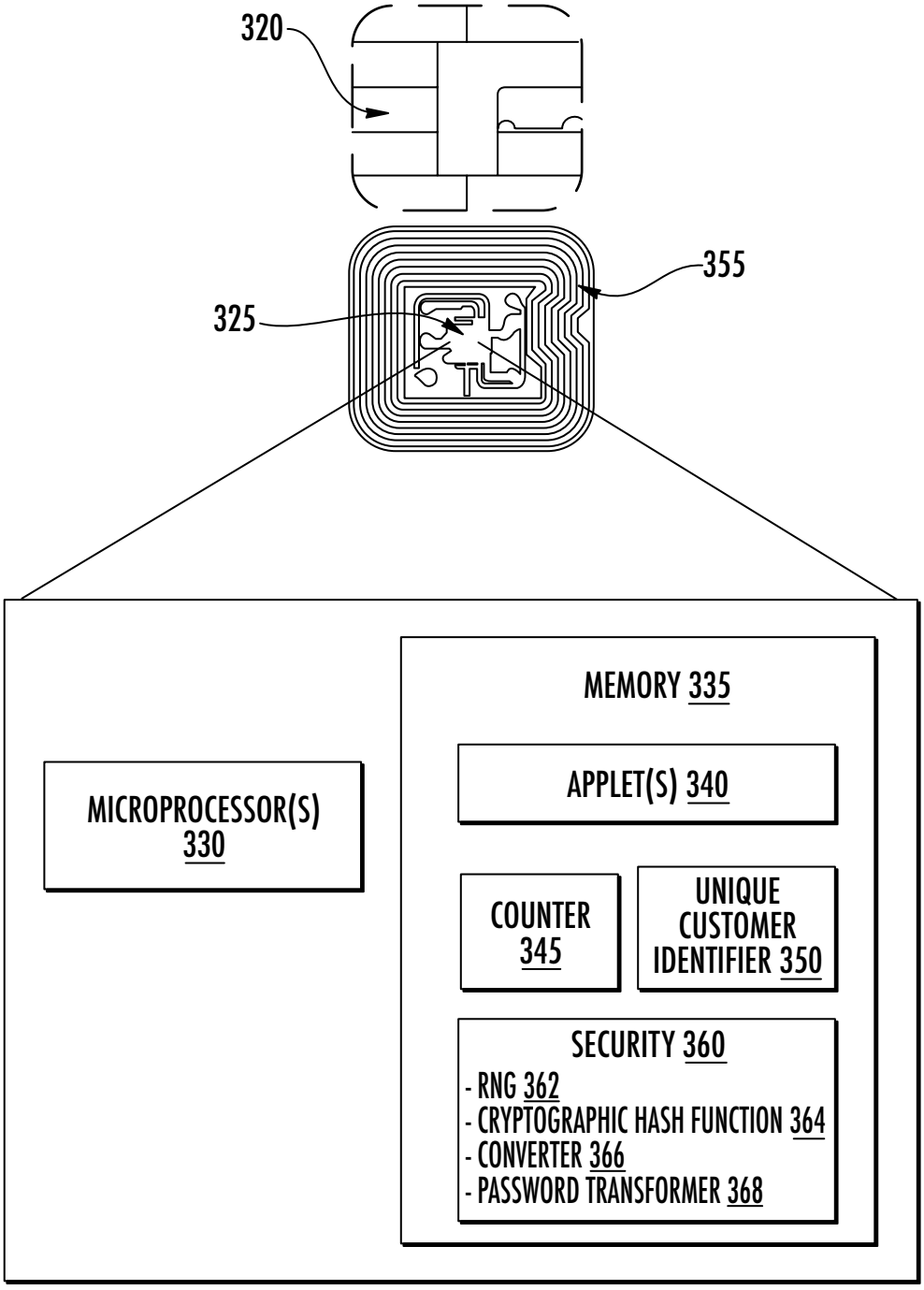

320
355
325
MEMORY 335
APPLET(S) 340
MICROPROCESSOR(S) 330
COUNTER 345
UNIQUE CUSTOMER IDENTIFIER 350
SECURITY 360
- RNG 362
- CRYPTOGRAPHIC HASH FUNCTION 364
- CONVERTER 366
- PASSWORD TRANSFORMER 368

FIG. 3B

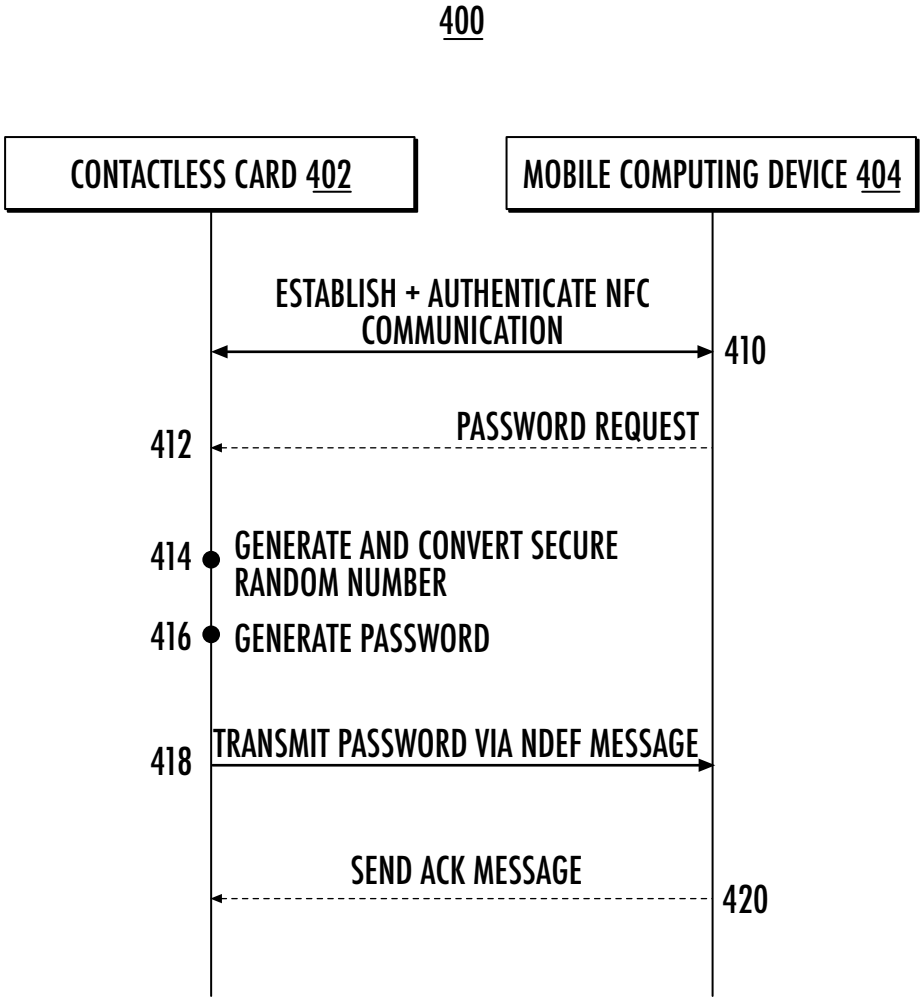

400
CONTACTLESS CARD 402
MOBILE COMPUTING DEVICE 404
ESTABLISH + AUTHENTICATE NFC COMMUNICATION
410
PASSWORD REQUEST
412
414
GENERATE AND CONVERT SECURE RANDOM NUMBER
416
GENERATE PASSWORD
418
TRANSMIT PASSWORD VIA NDEF MESSAGE
SEND ACK MESSAGE
420

FIG. 4

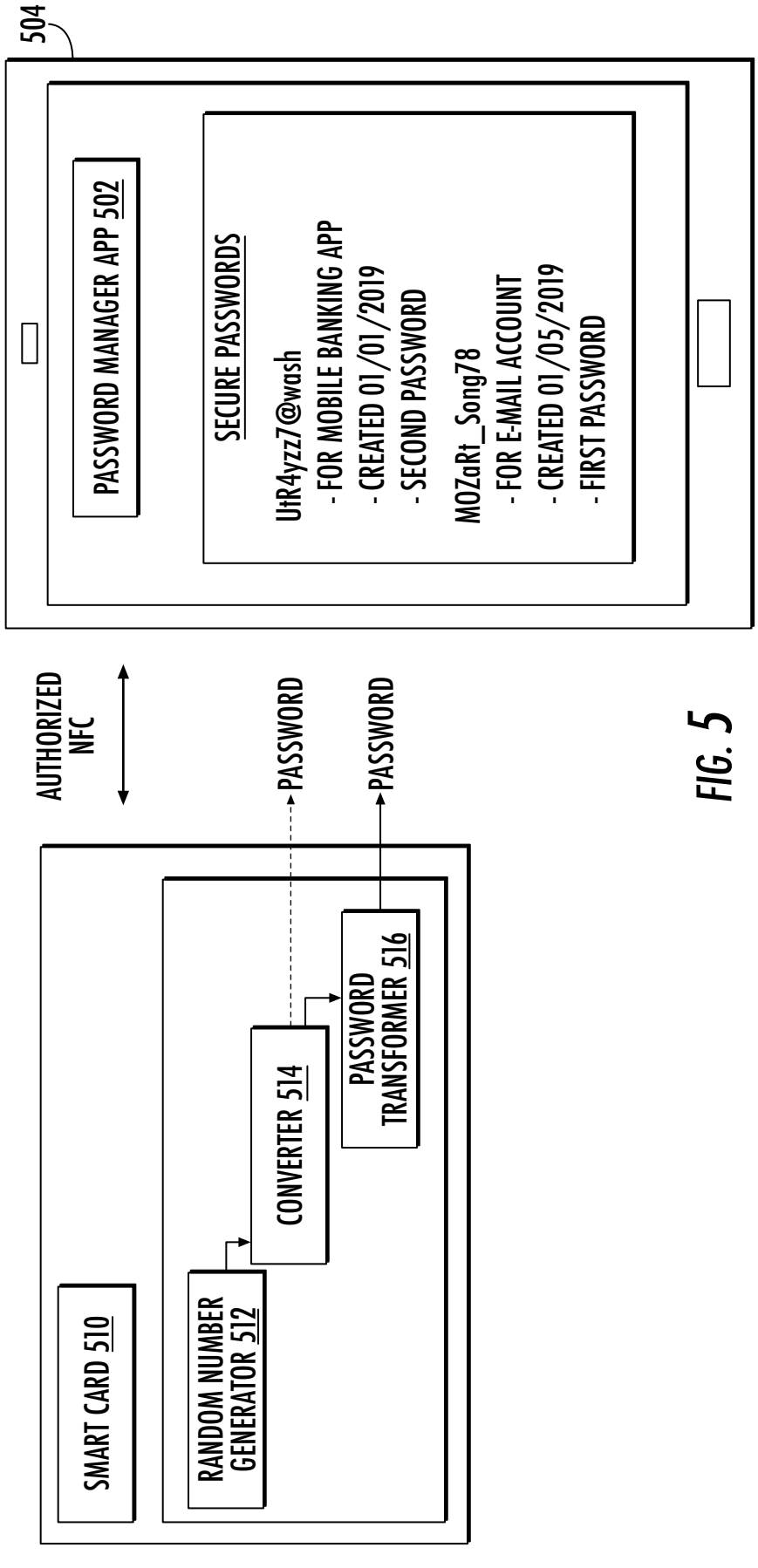

504
PASSWORD MANAGER APP 502
SECURE PASSWORDS
UtR4yzz7@wash
- FOR MOBILE BANKING APP
- CREATED 01/01/2019
- SECOND PASSWORD
MOZaRt_Song78
- FOR E-MAIL ACCOUNT
- CREATED 01/05/2019
- FIRST PASSWORD
AUTHORIZED NFC
PASSWORD
PASSWORD
SMART CARD 510
RANDOM NUMBER GENERATOR 512
CONVERTER 514
PASSWORD TRANSFORMER 516

FIG. 5

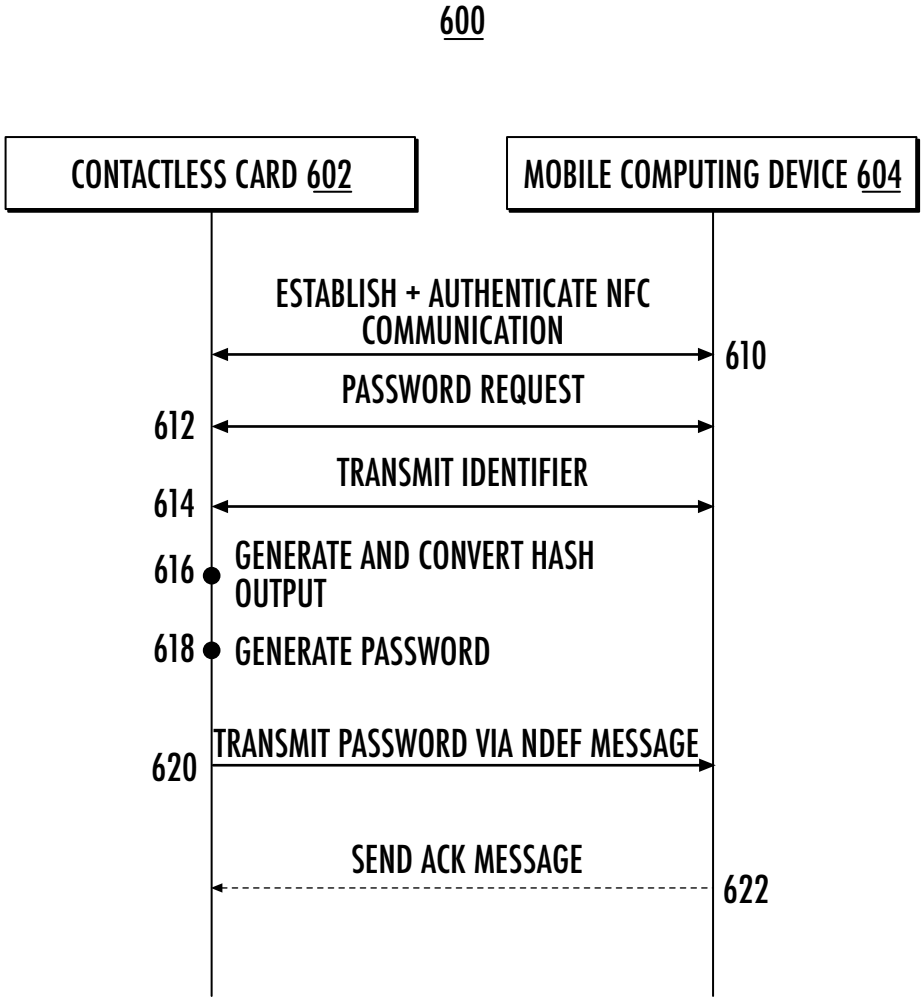

600
CONTACTLESS CARD 602
MOBILE COMPUTING DEVICE 604
ESTABLISH + AUTHENTICATE NFC COMMUNICATION
610
PASSWORD REQUEST
612
TRANSMIT IDENTIFIER
614
GENERATE AND CONVERT HASH OUTPUT
616
GENERATE PASSWORD
618
TRANSMIT PASSWORD VIA NDEF MESSAGE
620
SEND ACK MESSAGE
622

FIG. 6

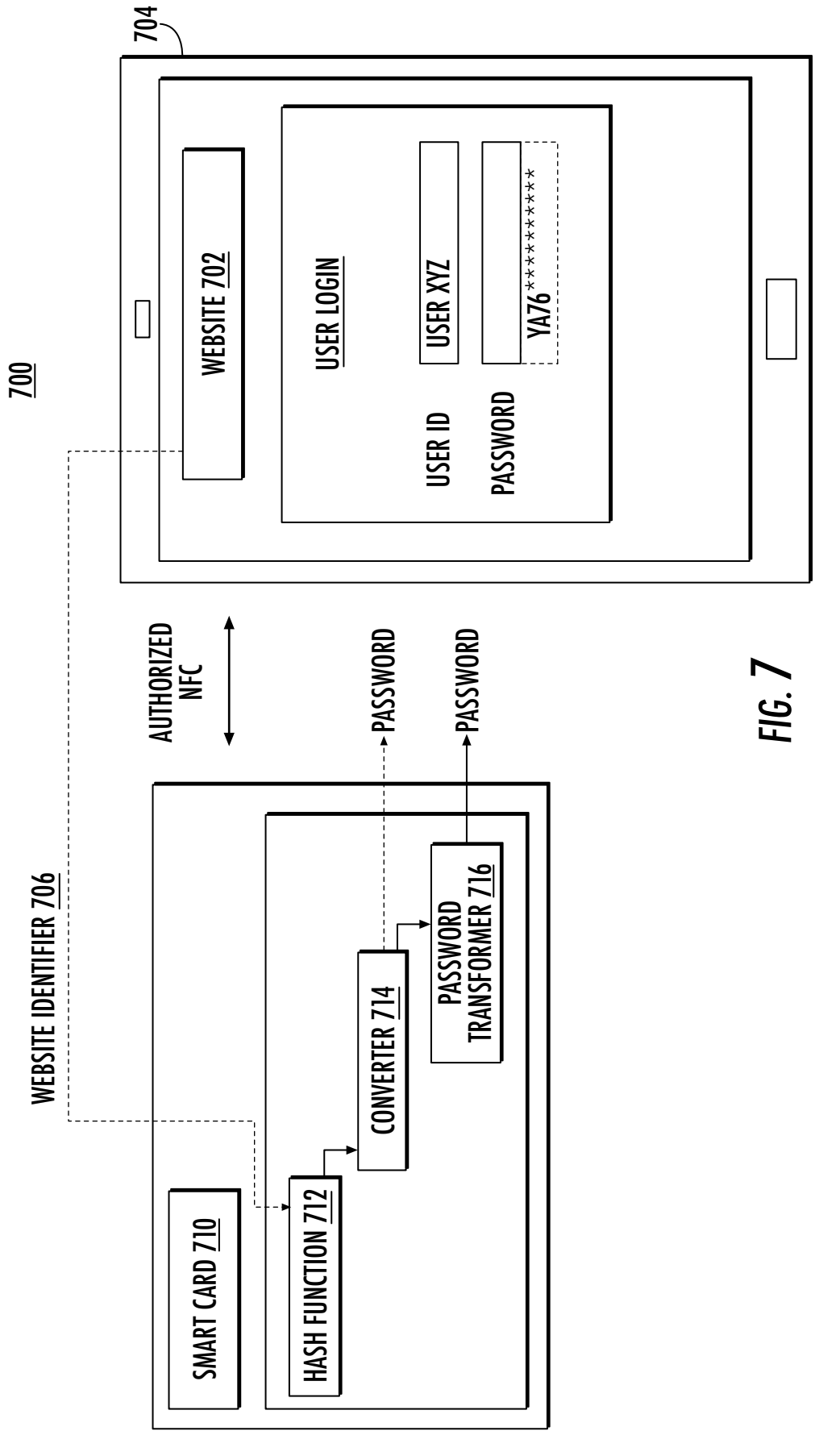

700
704
WEBSITE 702
USER LOGIN
USER XYZ
USER ID
PASSWORD
YA76**********
AUTHORIZED NFC
PASSWORD
PASSWORD
WEBSITE IDENTIFIER 706
SMART CARD 710
HASH FUNCTION 712
CONVERTER 714
PASSWORD TRANSFORMER 716

FIG. 7

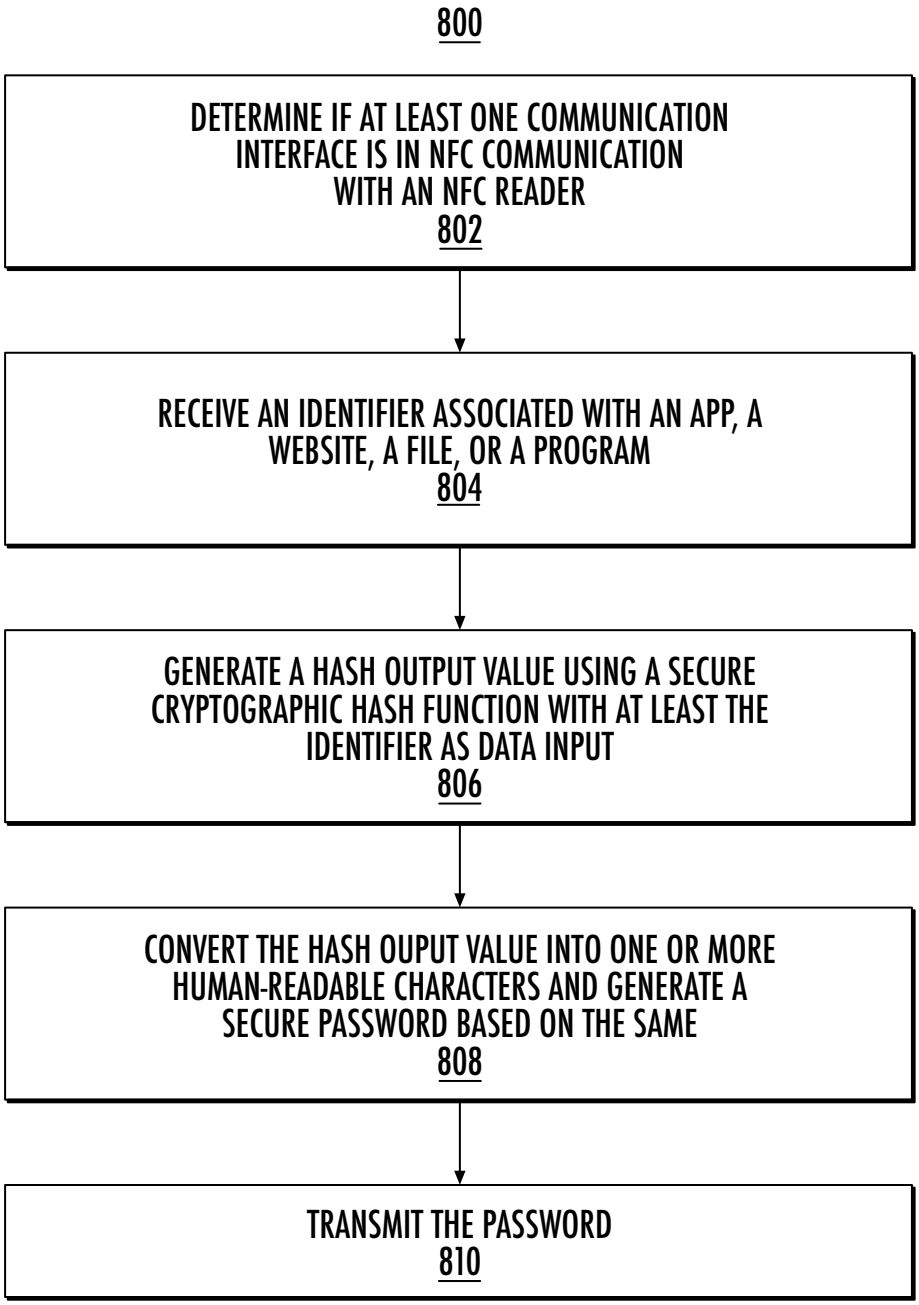

800
DETERMINE IF AT LEAST ONE COMMUNICATION INTERFACE IS IN NFC COMMUNICATION WITH AN NFC READER
802
RECEIVE AN IDENTIFIER ASSOCIATED WITH AN APP, A WEBSITE, A FILE, OR A PROGRAM
804
GENERATE A HASH OUTPUT VALUE USING A SECURE CRYPTOGRAPHIC HASH FUNCTION WITH AT LEAST THE IDENTIFIER AS DATA INPUT
806
CONVERT THE HASH OUPUT VALUE INTO ONE OR MORE HUMAN-READABLE CHARACTERS AND GENERATE A SECURE PASSWORD BASED ON THE SAME
808
TRANSMIT THE PASSWORD
810

FIG. 8