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McNair

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[54] CENTRALIZED SECURITY CONTROL SYSTEM

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[73] Assignee: AT&T Bell Laboratories, Murray Hill, N.J.

[21] Appl. No.: 763,718

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[51] Int. Cl.[5] H04Q 1/00

[52] U.S. Cl. 340/825.33; 340/825.31; 379/91; 379/112; 379/123

[58] Field of Search 340/825.33, 825.31, 340/825.34, 825.5, 825.79; 379/91, 112, 123

[56] References Cited

U.S. PATENT DOCUMENTS

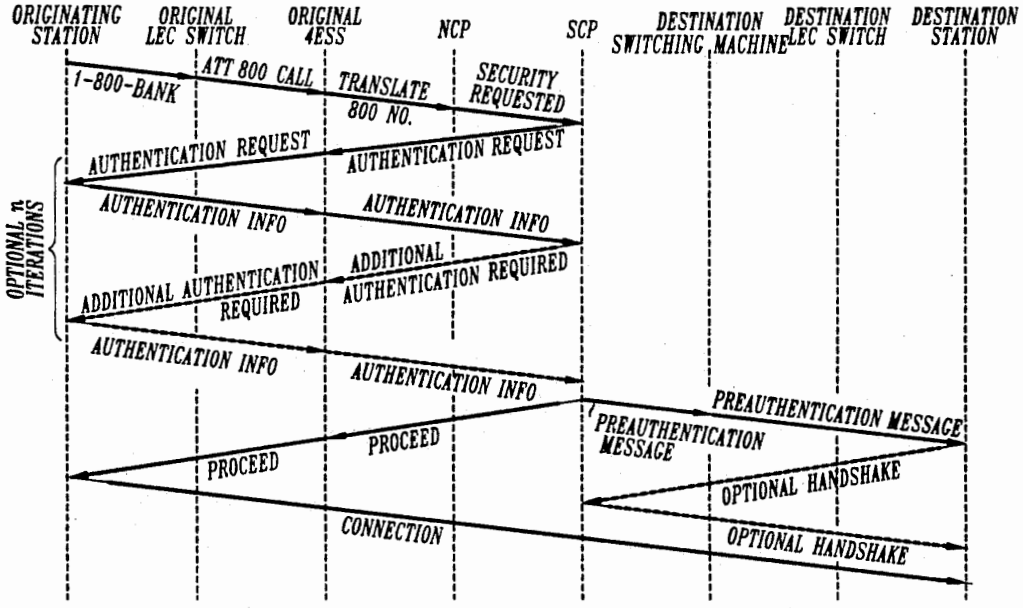
4,481,384 11/1984 Matthews 179/18
4,756,020 7/1988 Fodale 379/112
4,795,890 1/1989 Goldman 340/825.33
4,876,717 10/1989 Barron 340/825.34
4,893,330 1/1990 Franco 379/91
4,896,346 1/1990 Belfield et al. 379/88
5,012,515 4/1991 McVitie 340/825.31
5,052,040 9/1991 Preston 340/825.31
5,086,457 2/1992 Barraud 379/112

Primary Examiner—Donald J. Yusko
Assistant Examiner—Brian Zimmerman
Attorney, Agent, or Firm—Eugene J. Rosenthal

[57] ABSTRACT

A central security control system (security system) interfaces between a plurality of requesters and a plurality of destinations such that it receives from the requesters requests for access to the destinations and communicates to the destinations a level of access that should be granted to a requester by that destination on a per request basis. In a preferred embodiment the security system also a) authenticates the requester to a predetermined level from which the level of access that is to be granted is derived and b) causes a direct connection to be established between the requester and the destination.

23 Claims, 10 Drawing Sheets



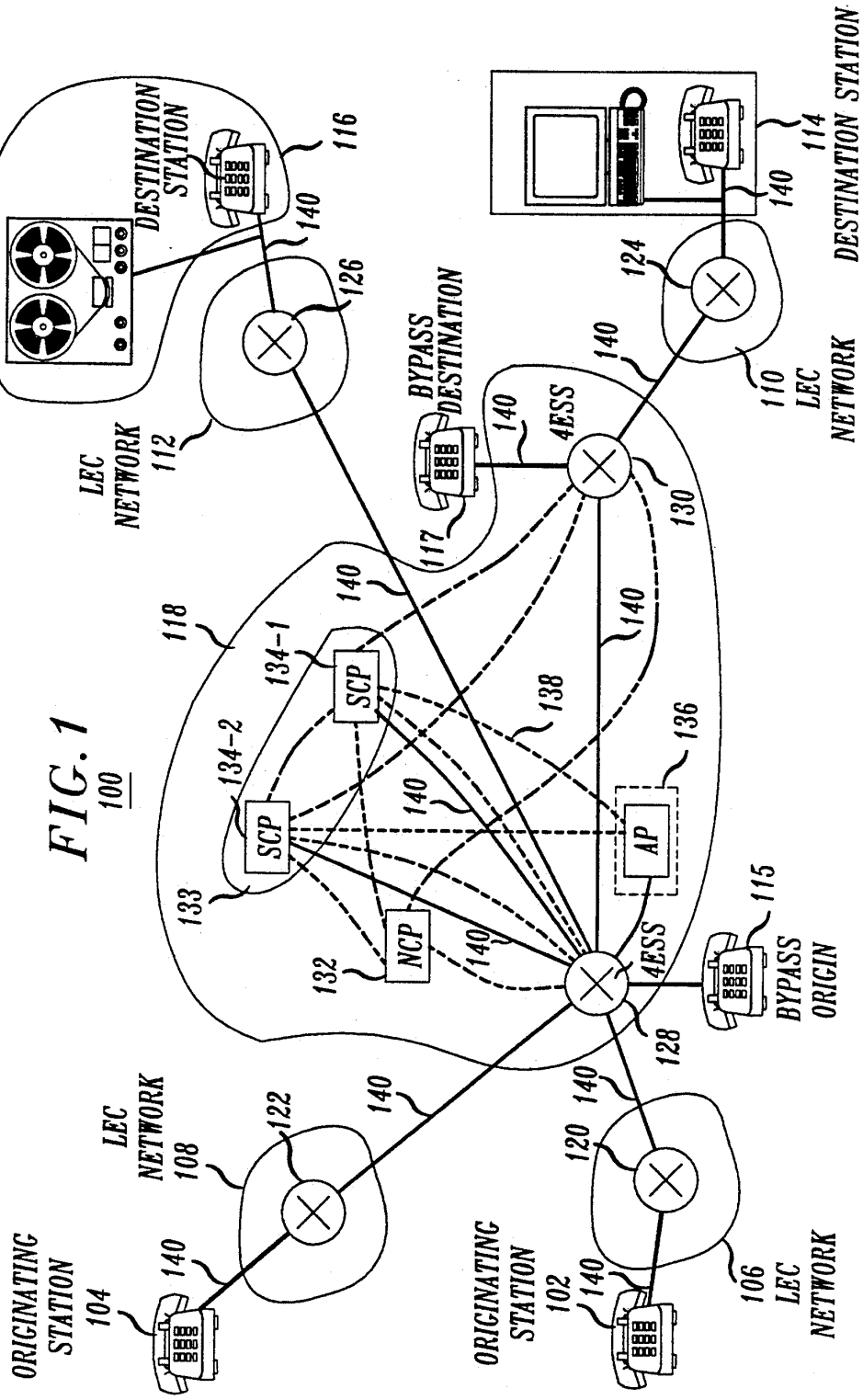

DESTINATION STATION
116
140
126
LEC NETWORK
112
BYPASS DESTINATION
117
140
4ESS
130
140
124
140
114
DESTINATION STATION
110
LEC NETWORK
118
134-1
SCP
140
138
140
136
134-2
SCP
140
AP
133
NCP
132
140
4ESS
128
115
BYPASS ORIGIN
LEC NETWORK
108
122
140
120
140
ORIGINATING STATION
104
140
ORIGINATING STATION
102
140
106
LEC NETWORK

FIG. 1
100

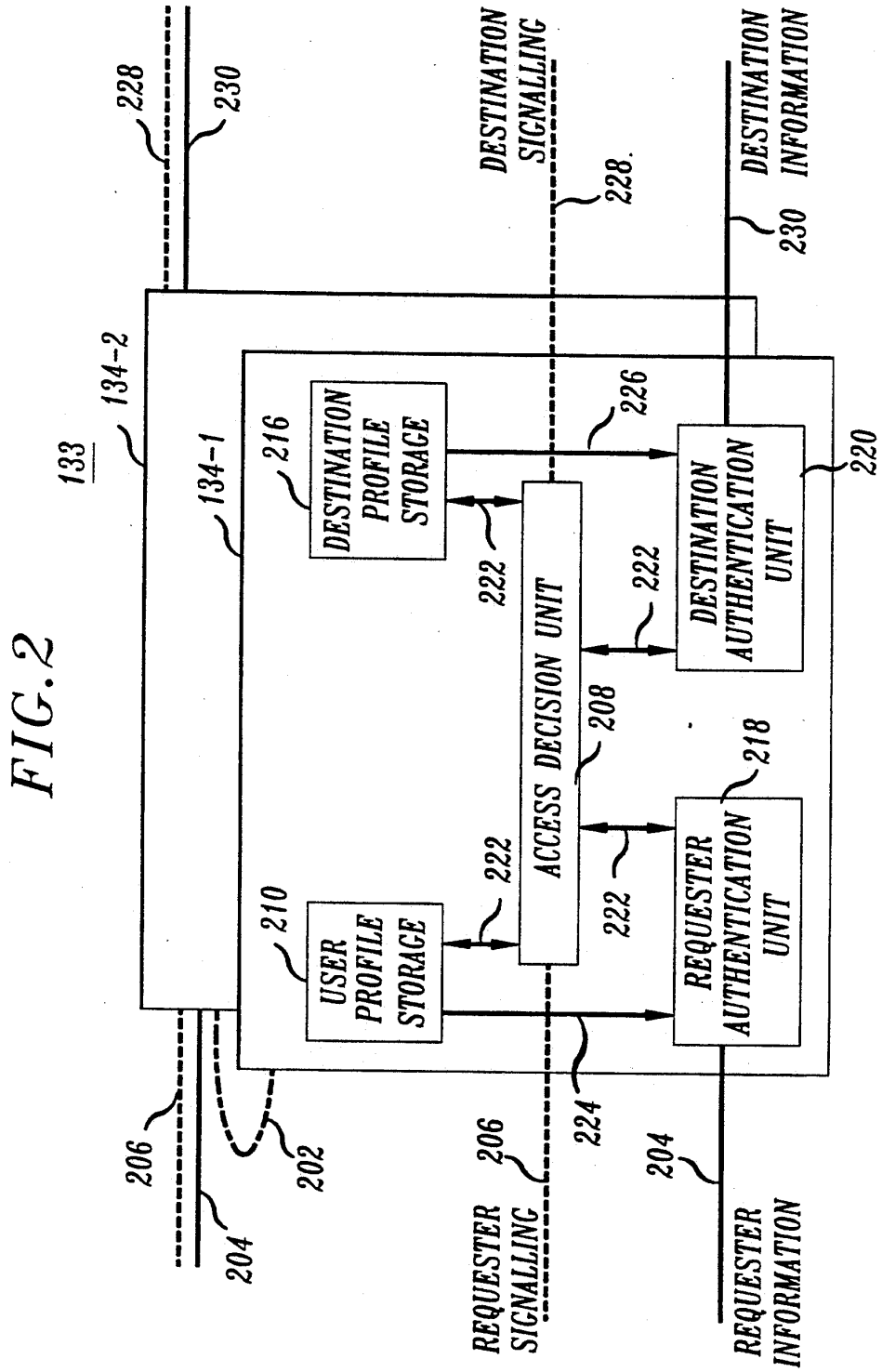

133
134-2
134-1
228
230
DESTINATION SIGNALLING
228.
DESTINATION INFORMATION
230
216
DESTINATION PROFILE STORAGE
226
220
DESTINATION AUTHENTICATION UNIT
222
222
ACCESS DECISION UNIT
208
218
REQUESTER AUTHENTICATION UNIT
222
222
210
USER PROFILE STORAGE
206
204
202
206
REQUESTER SIGNALLING
224
204
REQUESTER INFORMATION

FIG. 2

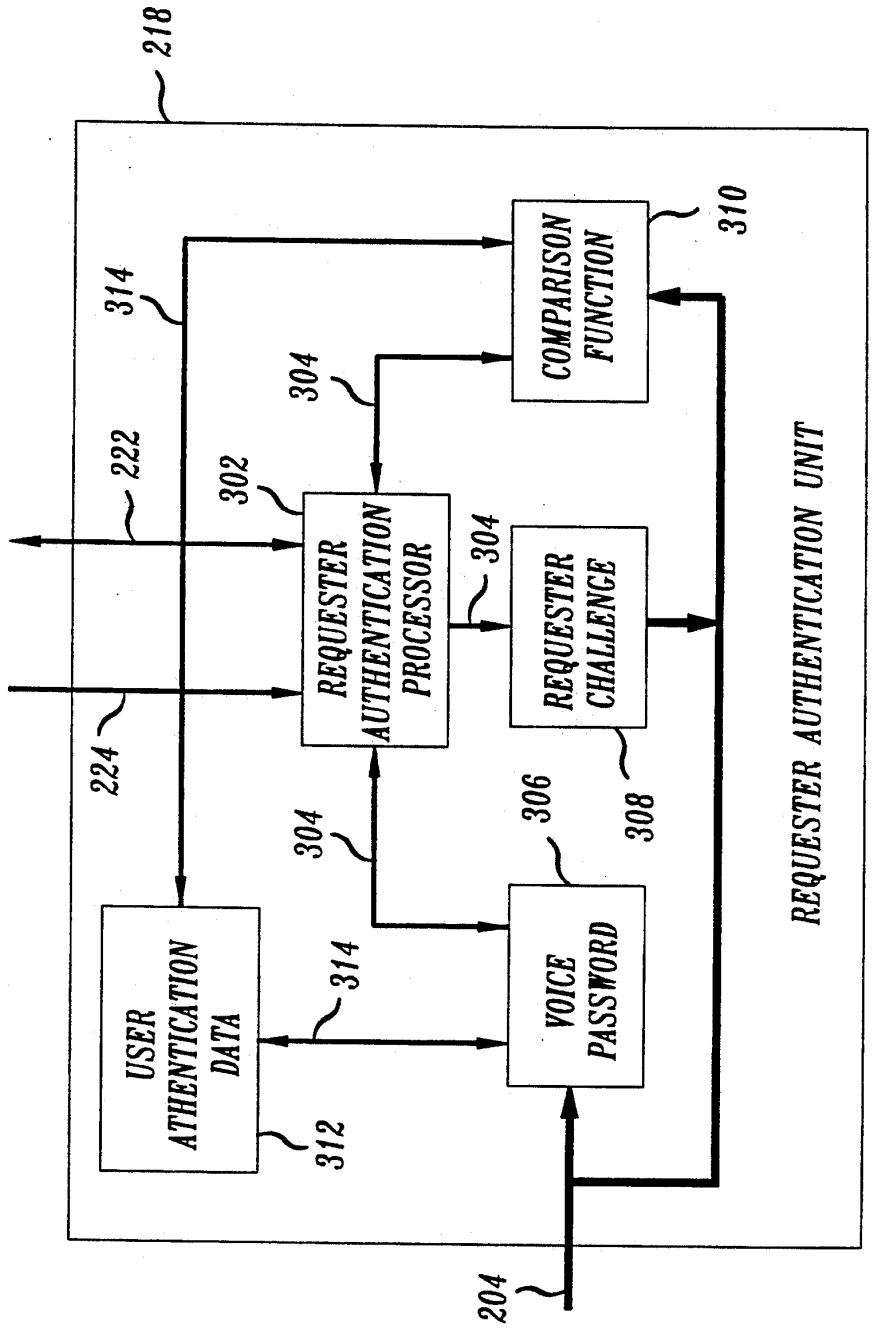
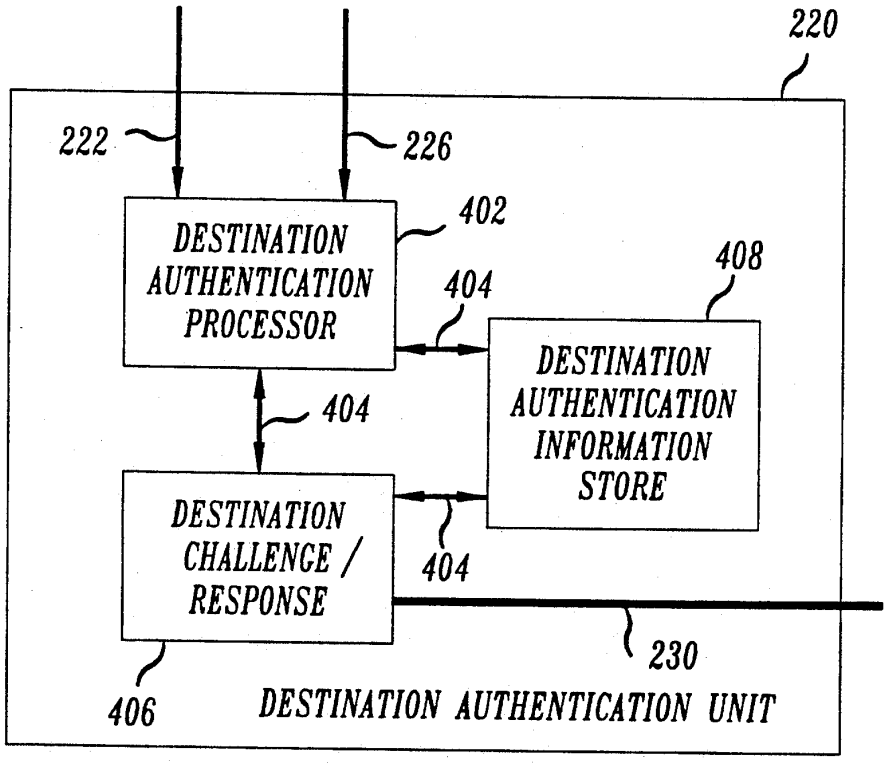

218
314
COMPARISON FUNCTION
310
304
222
302
REQUESTER AUTHENTICATION PROCESSOR
304
REQUESTER CHALLENGE
224
304
306
308
USER ATHENTICATION DATA
314
VOICE PASSWORD
312
REQUESTER AUTHENTICATION UNIT
204

FIG. 3

FIG. 4


220
222
226
402
DESTINATION AUTHENTICATION PROCESSOR
404
408
DESTINATION AUTHENTICATION INFORMATION STORE
404
DESTINATION CHALLENGE / RESPONSE
404
230
406
DESTINATION AUTHENTICATION UNIT

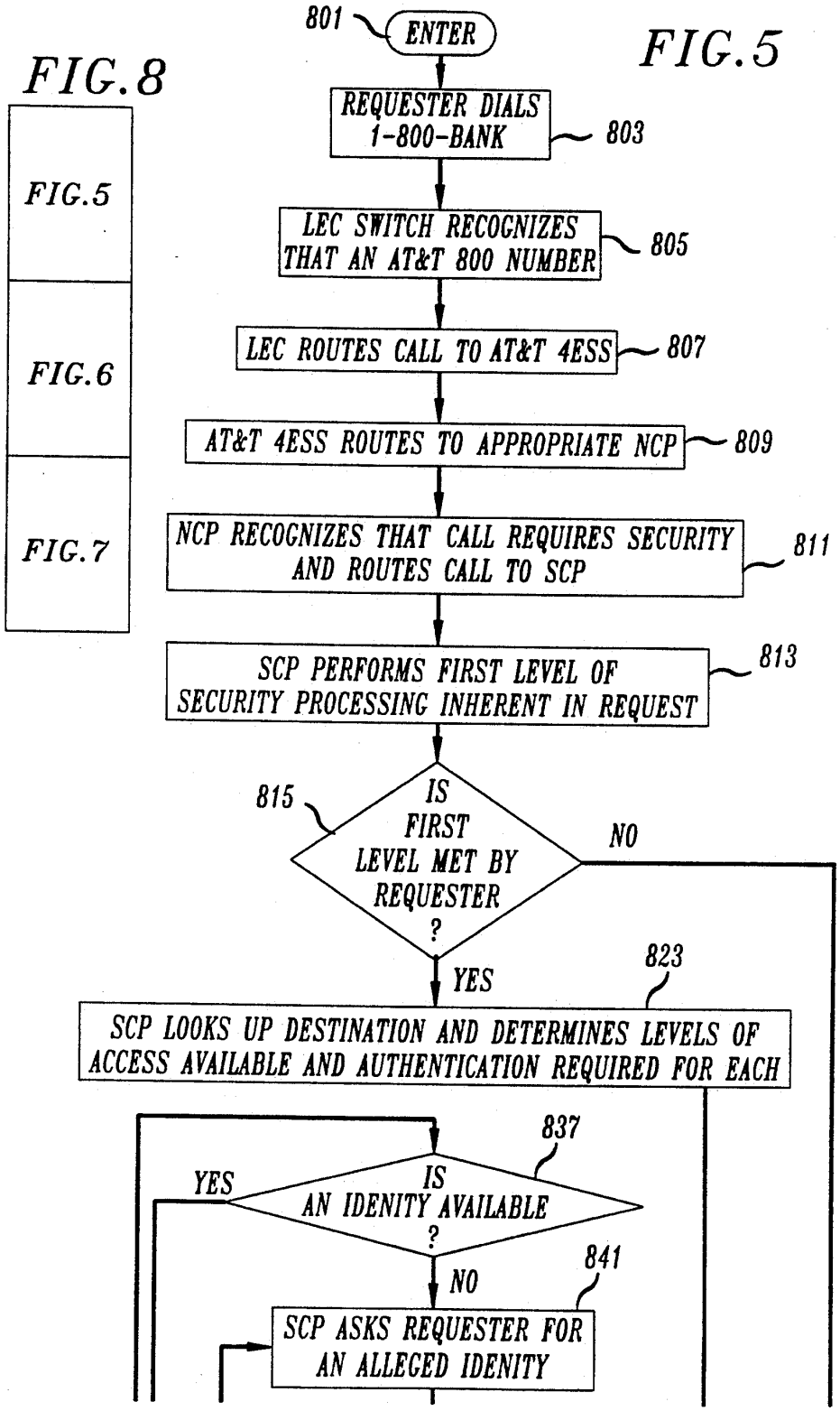


FIG.8
FIG.5
FIG.6
FIG.7
FIG.5
801
ENTER
REQUESTER DIALS 1-800-BANK
803
LEC SWITCH RECOGNIZES THAT AN AT&T 800 NUMBER
805
LEC ROUTES CALL TO AT&T 4ESS
807
AT&T 4ESS ROUTES TO APPROPRIATE NCP
809
NCP RECOGNIZES THAT CALL REQUIRES SECURITY AND ROUTES CALL TO SCP
811
SCP PERFORMS FIRST LEVEL OF SECURITY PROCESSING INHERENT IN REQUEST
813
815
IS FIRST LEVEL MET BY REQUESTER ?
NO
YES
823
SCP LOOKS UP DESTINATION AND DETERMINES LEVELS OF ACCESS AVAILABLE AND AUTHENTICATION REQUIRED FOR EACH
837
YES
IS AN IDENITY AVAILABLE ?
NO
841
SCP ASKS REQUESTER FOR AN ALLEGED IDENITY

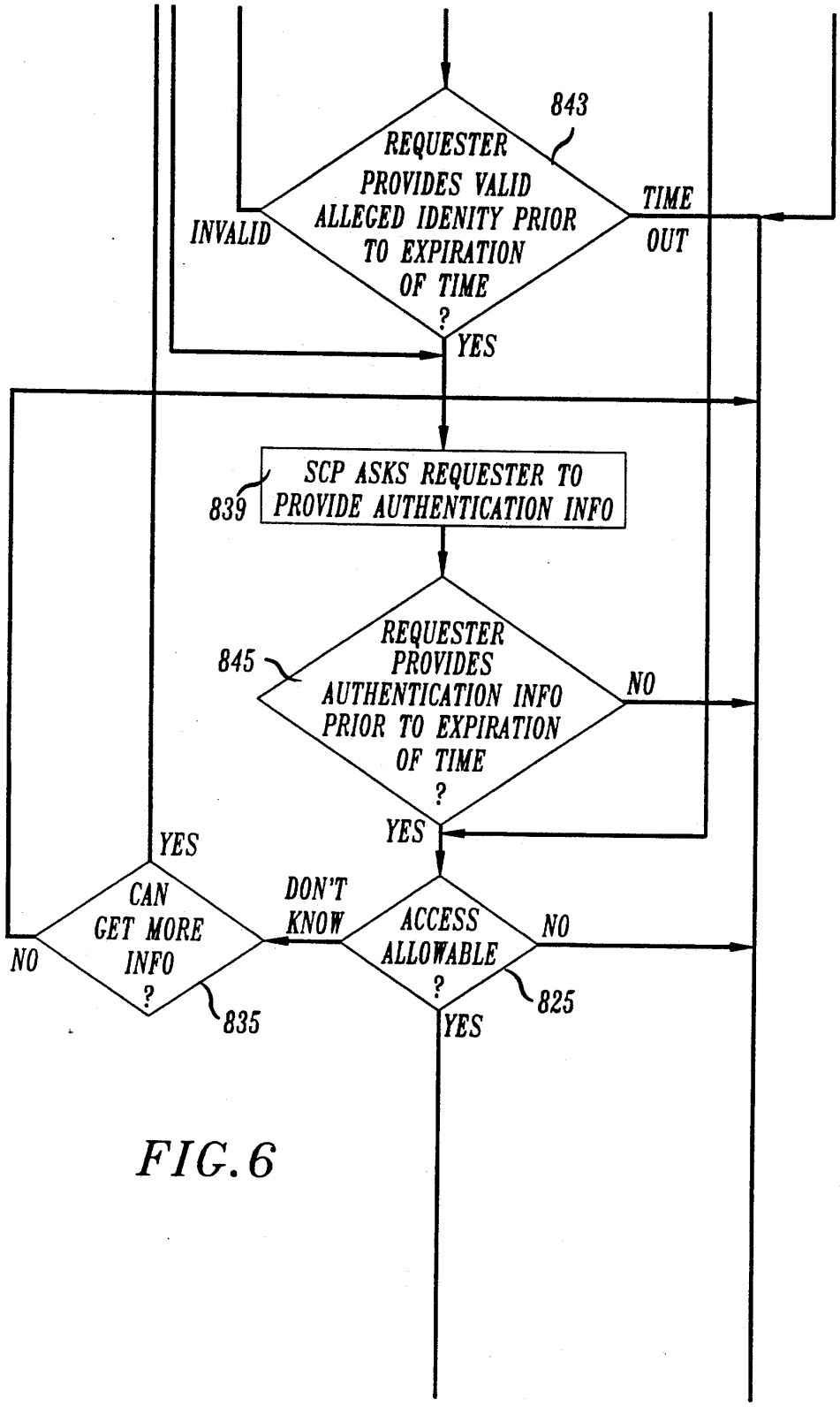
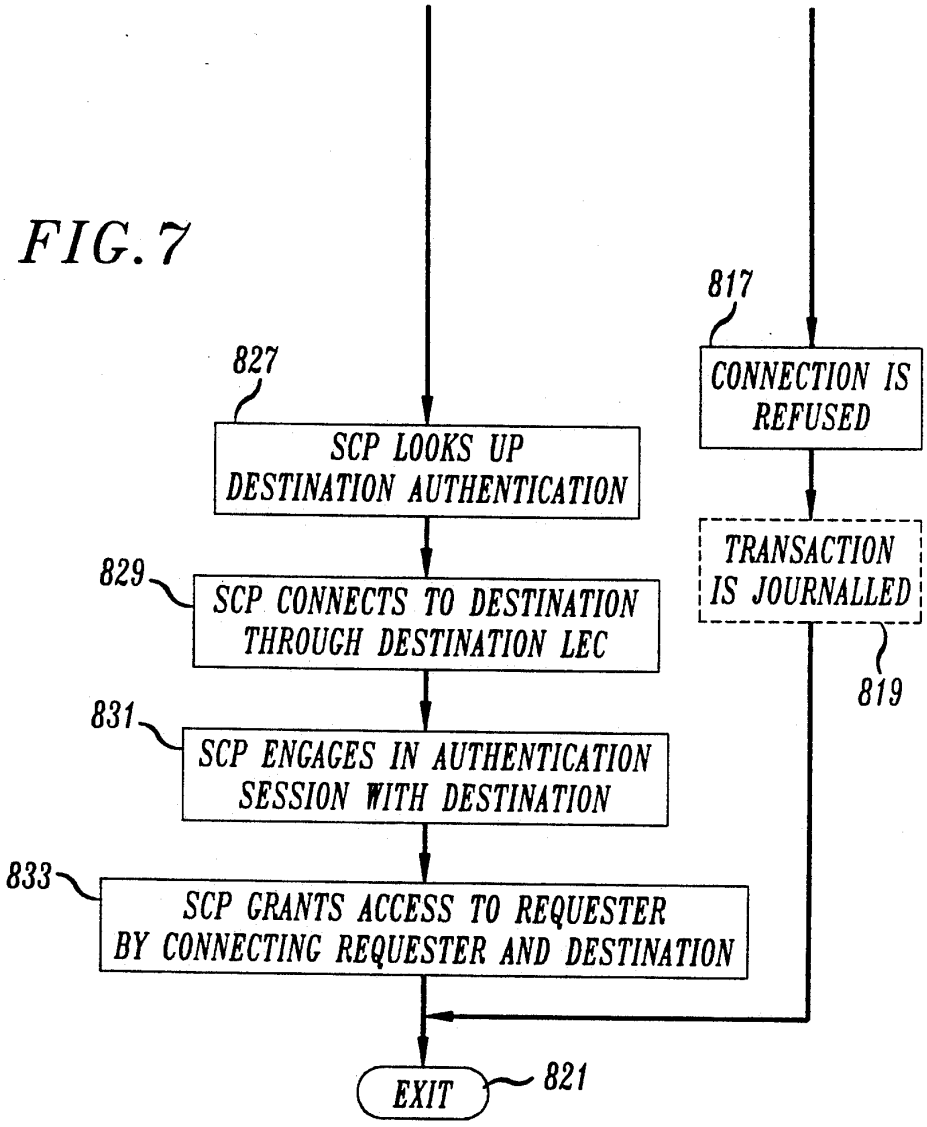

843
REQUESTER PROVIDES VALID ALLEGED IDENITY PRIOR TO EXPIRATION OF TIME ?
INVALID
TIME OUT
YES
SCP ASKS REQUESTER TO PROVIDE AUTHENTICATION INFO
839
845
REQUESTER PROVIDES AUTHENTICATION INFO PRIOR TO EXPIRATION OF TIME ?
NO
YES
YES
CAN GET MORE INFO ?
NO
835
DON'T KNOW
ACCESS ALLOWABLE ?
NO
825
YES

FIG. 6

FIG. 7


817
CONNECTION IS REFUSED
827
SCP LOOKS UP DESTINATION AUTHENTICATION
TRANSACTION IS JOURNALLED
829
SCP CONNECTS TO DESTINATION THROUGH DESTINATION LEC
819
831
SCP ENGAGES IN AUTHENTICATION SESSION WITH DESTINATION
833
SCP GRANTS ACCESS TO REQUESTER BY CONNECTING REQUESTER AND DESTINATION
EXIT
821

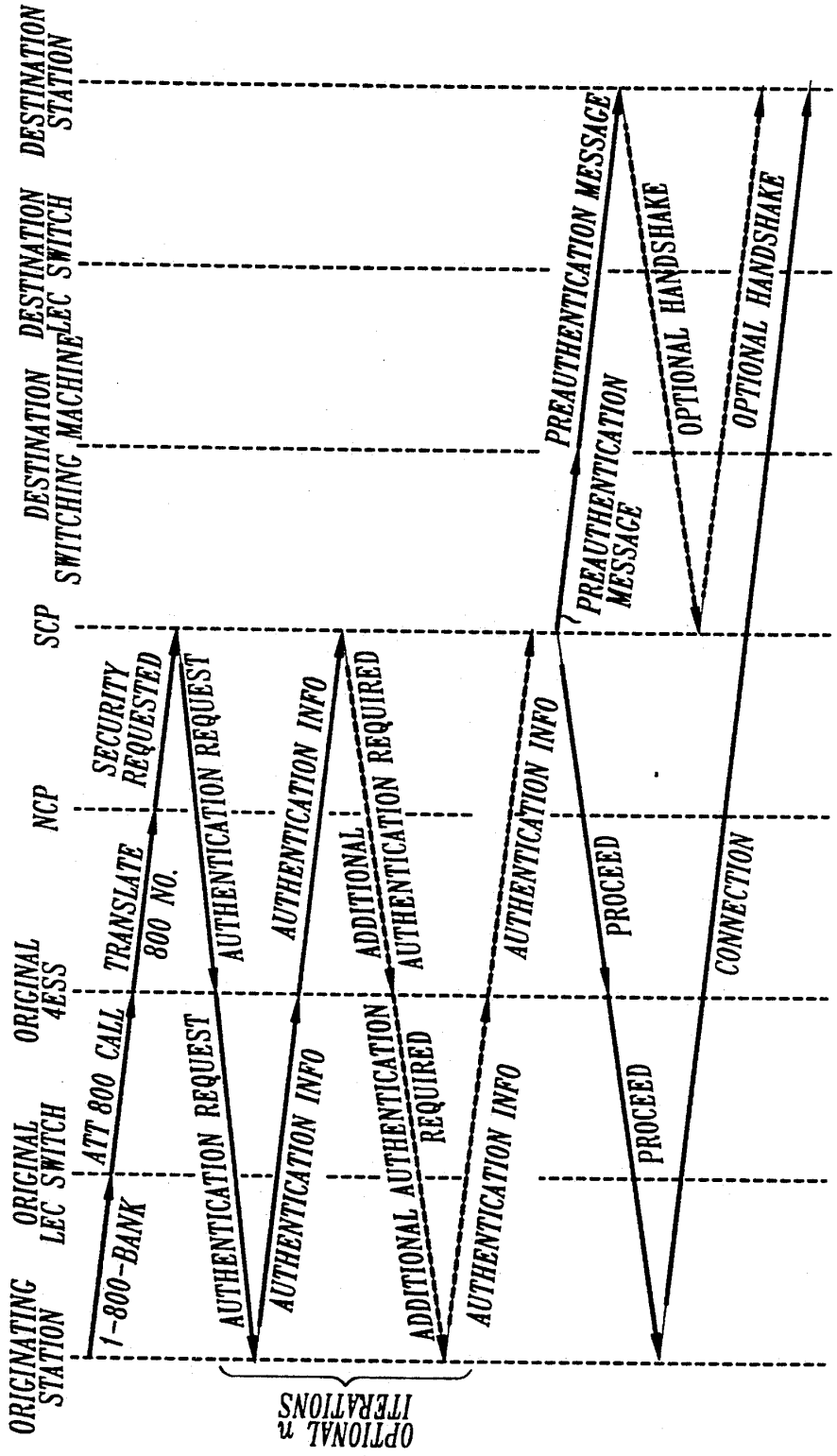

ORIGINATING STATION
ORIGINAL LEC SWITCH
ORIGINAL 4ESS
NCP
SCP
DESTINATION SWITCHING MACHINE
DESTINATION LEC SWITCH
DESTINATION STATION
1-800-BANK
ATT 800 CALL
TRANSLATE 800 NO.
SECURITY REQUESTED
AUTHENTICATION REQUEST
AUTHENTICATION INFO
ADDITIONAL AUTHENTICATION REQUIRED
AUTHENTICATION REQUEST
AUTHENTICATION INFO
ADDITIONAL AUTHENTICATION REQUIRED
AUTHENTICATION INFO
AUTHENTICATION INFO
PROCEED
PROCEED
PREAUTHENTICATION MESSAGE
PREAUTHENTICATION MESSAGE
OPTIONAL HANDSHAKE
OPTIONAL HANDSHAKE
CONNECTION
OPTIONAL n ITERATIONS

FIG. 9

FIG. 12

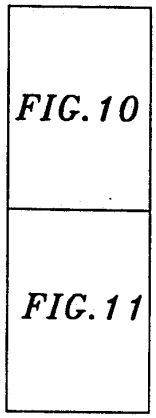


FIG. 10
FIG. 11

FIG. 10

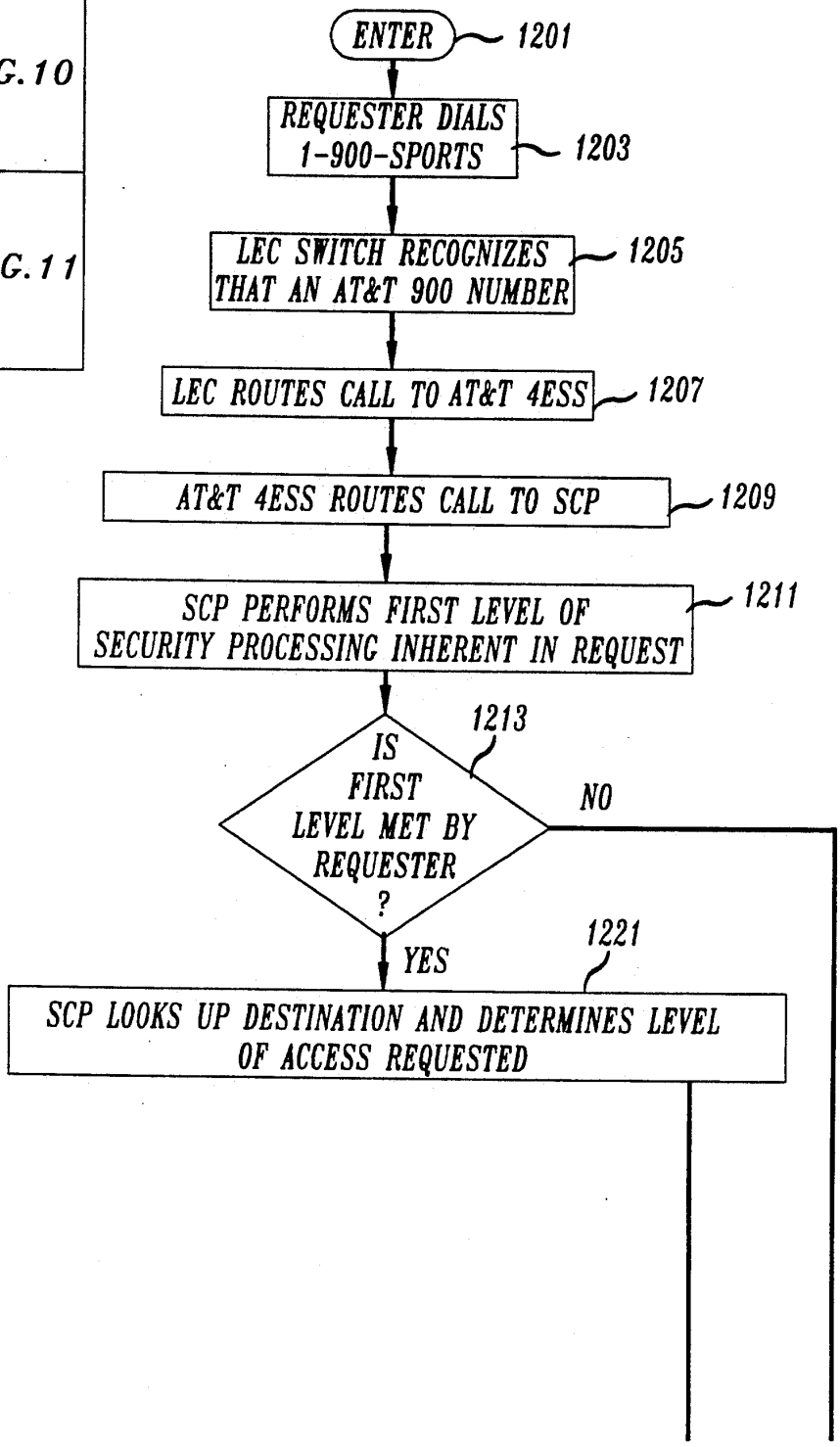
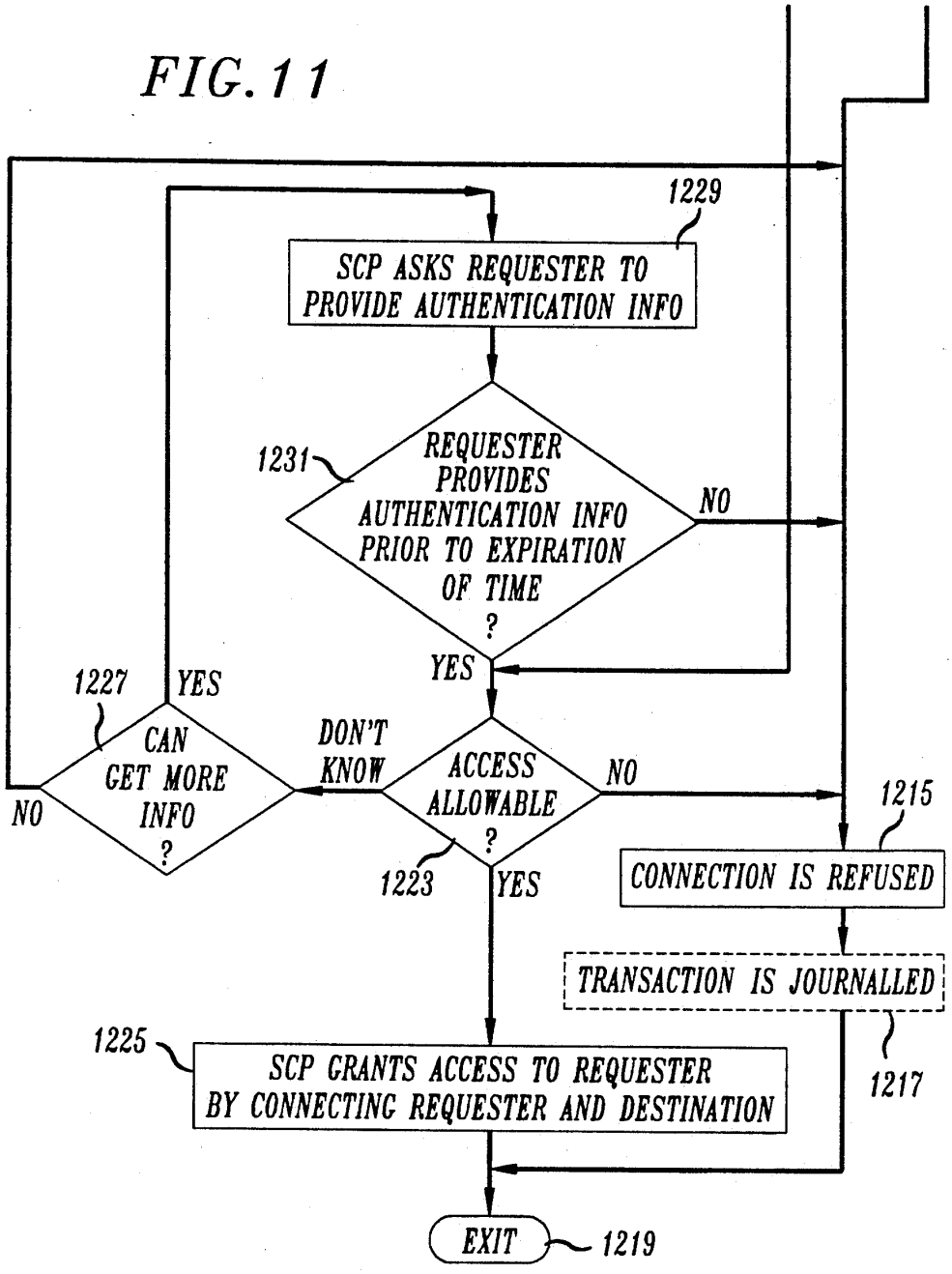

ENTER
1201
REQUESTER DIALS 1-900-SPORTS
1203
LEC SWITCH RECOGNIZES THAT AN AT&T 900 NUMBER
1205
LEC ROUTES CALL TO AT&T 4ESS
1207
AT&T 4ESS ROUTES CALL TO SCP
1209
SCP PERFORMS FIRST LEVEL OF SECURITY PROCESSING INHERENT IN REQUEST
1211
1213
IS FIRST LEVEL MET BY REQUESTER ?
NO
YES
1221
SCP LOOKS UP DESTINATION AND DETERMINES LEVEL OF ACCESS REQUESTED

FIG. 11


1229
SCP ASKS REQUESTER TO PROVIDE AUTHENTICATION INFO
1231
REQUESTER PROVIDES AUTHENTICATION INFO PRIOR TO EXPIRATION OF TIME ?
NO
YES
1227
YES
CAN GET MORE INFO ?
NO
DON'T KNOW
ACCESS ALLOWABLE ?
NO
1215
CONNECTION IS REFUSED
1223
YES
TRANSACTION IS JOURNALLED
1217
1225
SCP GRANTS ACCESS TO REQUESTER BY CONNECTING REQUESTER AND DESTINATION
EXIT
1219

CENTRALIZED SECURITY CONTROL SYSTEM

TECHNICAL FIELD

This invention relates to security systems that regulate access to systems or locations and, more particularly, where access may be sought by multiple authorized users to a plurality of such systems or locations and where each such system or location may have its own distinct security requirements.

BACKGROUND OF THE INVENTION

Only those individuals authorized to have access to any particular system or location, referred to herein as "destinations", should be granted such access. Indeed today, many destinations may be remotely accessed via telecommunications. Typical remotely accessible destinations include remote telephones, systems that provide access to credit and systems that provide value-added telecommunications services. On a regular basis, a large number of authorized individuals must authenticate their identity, i.e., to confirm that the person requesting the access is actually who he alleges that he is, to several destinations to which access is sought.

Typically each destination has its own systems and procedures for authenticating its authorized users. The resulting plurality of authentication systems is expensive. Also, each authentication system must keep a copy of all the information necessary to identify each of its authorized users, thereby creating large storage demands. Further, the compromising of a copy of an individual user's information that is required for access to one system tends to compromise the information contained in other authentication systems. This results because authentication systems tend to require the same basic information. Also, the number of copies of the information increases as the number of destinations to which the user may obtain authorized access increases. Since each copy is independently vulnerable to attackers of the system, the overall likelihood that any of the copies will remain secure decreases. In addition, each authentication system must be secured physically, as well as logically, against attackers which adds additional expense. These problems can be called the problems of a wide security perimeter.

From the viewpoint of a user, a plurality of authentication procedures is cumbersome and repetitive. The perceived constant requirement to comply with security arrangements encourages users to choose trivial identification means. The user typically deals with the most common security requirement of supplying a personal identification number (PIN) by employing an easy-to-remember PIN, such as a birthday, and employing the same PIN for each destination. Choosing the same PIN for each destination results in the undesirable effect that when one destination is compromised, all of the destinations are immediately compromised. Further, in selecting and easy-to-remember PIN, a user almost invariably selects a PIN that is easy to arrive at by guesswork or simple trial and error methods.

Another problem with prior security systems is how to manage the diverse security needs of a plurality of destinations and a plurality of authorized users. In particular, there is a need to insure that the ultimate bearer of the cost of erroneous access is capable of specifying the authentication level, i.e., the level of confidence of the accuracy of an identification, employed for any particular access. Each particular destination may have its own requirements as to the authentication level that is necessary before any particular level of access can be granted. In addition, a particular authorized user may wish to specify an authentication level that should be met before access is allowed for a request that alleges that user's identity. Prior security systems do not provide mechanisms for security level control by the user. Furthermore, if the access control is specified directly at the destination, the problems associated with a wide security perimeter result.

In order to actually authenticate the identity of an access requester, prior systems have made use of representations of various different identifying characteristics of a person. Identifying characteristics that have been employed include: voice samples, fingerprints, retina patterns, personal appearance, handwriting and even the manner in which a wave is polarized as it passes through a portion of the body. Such representations are known as authentication information. These prior systems obtain an identity that is alleged by the access requester. One method employed to obtain such an alleged identity is to require the requester to enter some type of a code. This code may be typed in via a keypad or scanned from a device in the requester's possession. The prior systems then attempt to authenticate that the requester is actually the individual whose identity was alleged by comparing a measure of the authentication information that has been previously stored with a measure of the same authentication information that is taken from the requester during the access request process. If the result of the comparison is that the stored authentication information matches the authentication information taken from the requester during the access request to within a predetermined limit the allegation of identity is confirmed and access is granted. Otherwise, access is denied.

SUMMARY OF THE INVENTION

The difficulties with prior access-authorizing systems are overcome, in accordance with the principles of the invention, by employing a shared centralized security control system (security system) that interfaces between a plurality of requesters and a plurality of destinations such that the security system receives from the requesters requests for access to the destinations and communicates to the destinations indications of a level of access that should be granted to each requester by that destination on a per request basis. In a preferred embodiment, the security system also a) authenticates the requester to a predetermined level from which the level of access that is to be granted is derived and b) causes a direct connection to be established between the requester and the destination. Once a connection is either made or denied between a requester and the corresponding requested destination, the security system is then free to process other requests from other requesters.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 shows, in simplified form, an exemplary telephone network embodying the principles of the invention;

FIG. 2 shows an exemplary central security control system used in the network of FIG. 1;

FIG. 3 depicts an expanded view of an exemplary requester authentication unit shown in the central security control system of FIG. 2;

FIG. 4 shows an expanded view of an destination authentication unit 220 shown in the central security control system of FIG. 2;

FIGS. 5, 6 and 7, when arranged as shown in FIG. 8, depict in flow chart form, an exemplary method of processing an access request by a requester to a destination where the security requirements for the granting of access is specified by the destination;

FIG. 9 shows an example of the call setup messages employed if a security system is to provide secured access by a user to a particular destination; and

FIGS. 10 and 11, when arranged as shown in FIG. 12, depict in flow chart form, an exemplary access request by a requester to a destination where the security requirements for the granting of access is specified by the requester or the network operators.

DETAILED DESCRIPTION

Shown in FIG. 1, in simplified form, is exemplary telephone network 100 embodying the principles of the invention. Telephone network 100 comprises originating stations 102 and 104, local exchange carrier (LEC) networks 106, 108, 110 and 112, destination stations 114 and 116, bypass origin 115, bypass destination station 117 and long distance network 118, illustratively the AT&T network. Originating stations 102 and 104, destination stations 114 and 116, bypass origin 115 and bypass destination station 117 are representative of a plurality of network endpoints, the remainder of which are not shown for clarity of exposition. Only those portions of telephone network 100 necessary for calls to be made from an origin to a destination are shown.

LEC networks 106, 108, 110 and 112 contains switching machines 120, 122, 124, 126, respectively. Switching machines 120, 122, 124, 126 are capable of connecting a plurality of network endpoints to long distance network 118. Such switching machines are well known and may be, for example, AT&T's 5ESS® switch. Long distance network 118 comprises switching machines 128 and 130, network control point (NCP) 132, central security control system (security system) 133 and optional adjunct processor (AP) 136. NCP 132 is of a type well known in the art. Switching machines employed in communications networks are well known. Switching machines 128 and 130 are illustratively AT&T's No. 4 ESS TM switch. Additionally, security system 133 comprises security control points (SCP) 134-1 and SCP 134-2.

Switching machines 128 and 130, NCP 132, security system 133 and AP 136 are interconnected in the manner shown by signaling network 138, represented by dashed lines. Originating stations 102 and 104, destination stations 114 and 116, bypass destination station 117, switching machines 120, 122, 124, 126, switching machines 128 and 130 and SCPs 134 are interconnected by information links 140, in the manner shown. Information links 140 are of the well known types in the art for interconnecting communicating apparatus and can carry at least voice, data and video. Each of information links 140 need not have the same capacity. A typical implementation would comprise a mix of conventionally known digital transmission links, e.g., DS0, DS1 and DS3, provisioned in accordance with the needs of the network providers.

Shown in FIG. 2 is a more detailed view of exemplary security system 133. In the manner shown, security system 133 comprises security control points (SCPs) 134, including security control point (SCP) 134-1 and SCP 134-2 which are networked together by link 202. Link 202 is part of signalling network 138 (FIG. 1). In this embodiment, each of SCPs 134 contains identical copies of all the information required to provide security operations. This interconnection pattern among the SCPs 134 of security system is arranged to provide fully redundant operation. Such an interconnection arrangement may be used to provide load balancing, which reduces waiting time for security processing, as well as providing backup in the case of failure of one of SCPs 134. Alternative embodiments may arrange the interconnection of SCPs 134 so as to allow partitioning of the information required to be stored in security system 133 among each one of SCPs 134. Such partitioning will be discussed further below.

SCP 134-1 and 134-2 are both connected to switching machine 128 by at least one requester information path 204 and at least one destination information path 230, which are each carried over the respective ones of information links 140 that interconnect each of SCPs 134 and switching machine 128. Each connection of a requester to one of SCPs 134 may be routed through a plurality of switching machines until it reaches the appropriate one of SCPs 134 that will handle the request. Each of SCP 134-1 and SCP 134-2 are also connected via at least one requester signalling link 206 and at least one destination signalling link 228, at least indirectly, to NCP 132, switching machines 128 and 130 and AP 136. Each signalling message for the one of SCPs 134 that is to be associated with a call may pass through several NCP 132 (not shown) or SCPs 134 via signalling network 138 (FIG. 1). Signalling links 206 and 228 are part of signaling network 138.

In accordance with an aspect of the invention, each of SCPs 134 includes access decision unit 208 which communicates with user profile storage unit 210, destination profile storage unit 216, requester authentication unit 218 and destination authentication unit 220 over bidirectional links 222. Links 222 need not be of identical type. They may include, at the implementor's discretion, well known links such as: serial links, parallel links, shared memory, or a common bus such that a plurality of elements connected to access decision unit 208 by links 222 share a link 222. Requester authentication unit 218 is also interconnected with user profile storage unit 210 by link 224 and destination authentication unit 220 is interconnected to destination profile storage unit 216 by link 226. In this embodiment, in accordance with an aspect of the invention, it is access decision unit 208 that is connected to requester signaling link 206 and destination signaling link 228. This may be achieved via communication interfaces (not shown) which may be employed in access decision unit 208. Requester authentication unit 218 is connected to requester information path 204 and destination authentication unit 220 is connected to destination information path 230.

FIG. 3 depicts an expanded view of an exemplary requester authentication unit 218. Requester authentication unit 218 includes requester authentication processor 302 which is connected to voice password 306, requester challenge 308 and comparison function 310 via links 304. Voice password 306, requester challenge 308 and comparison function 310 are also interconnected to requester information path 204. User authentication data 312 is interconnected to voice password 306 and comparison function 310 via links 314. In similar fashion as links 222, each of links 304 or 314 need not be of identical type. Links 222 and 224 connect requester

authentication processor 302 to access decision unit 208 and user profile storage unit 210, respectively.

An expanded view of destination authentication unit 220 is shown in FIG. 4. Links 222 and 226 from access decision unit 208 and destination profile storage 216, respectively are interconnected to destination authentication processor 402. In turn, destination authentication processor 402 is interconnected by links 404 to destination challenge response 406 and destination authentication information store 408. Destination challenge response 406 interfaces with destination authentication information store 408 via one of links 404 and with destination information path 230. It is noted that each element of FIGS. 2, 3 and 4 may be implemented as either hardware, software or a combination thereof, at the implementor's discretion.

FIGS. 5, 6 and 7, when arranged as shown in FIG. 8, depict in flow chart form, an exemplary method of processing an access request by a requester to a destination where the security requirements for the granting of access is specified by the destination. The requester is located at originating station 102 (FIG. 1). The destination is the computer system of a bank, which, for purposes of this example is located at destination station 114. Destination station 114 is shown as a computer bridged onto a phone line. The bank has contracted to have its security clearance functions performed by the provider of long distance network 118 using security system 133.

Authorized users of the bank computer system desire to employ the computer system of the bank to perform certain banking transactions. The bank has determined that it will only permit requesters to perform transactions valued at up to $200 if they are authenticated to at least a first level of authentication. Transactions of greater value need to be authenticated to a second, higher, level of authentication. This security information has been stored in destination profile storage 216 (FIG. 2). For the convenience of its authorized users, the bank has provided a toll free 800-type number which requesters can dial to gain access to the computer system. The necessary authentication information has been obtained from authorized users of the bank's computer system. This information has been stored in user profile storage 210 and user authentication data 312 (FIG. 3).

The method begins at step 801 when a requester at originating station 102 is detected to go off hook by switching machine 120. Thereafter, in step 803, the requester dials the number of the destination to which access is sought. In this example, the requester dials from originating station 102 the bank's 800 number, 1-800-BANK. In step 805, switching machine 120 receives the dialed digits and recognizes that the number dialed is an 800 type number for which service is provided via long distance network 118.

Switching machine 120 of LEC network 106, in step 807, routes the call to switching machine 128 in long distance network 118. Switching machines 128 routes the call to its appropriate associated NCP 132, as is typically performed for 800 type calls in step 809. The appropriate NCP 132 is determined from the function to be provided by the NCP to service the call and predetermined internal mapping tables contained within switching machine 128. Exemplary functions which are typically provided by NCP 132 are 800 and 900 number translation and conventional, well known credit card billing verification. Table 1 shows an exemplary NCP 132 translation table wherein the address of one of SCPs 134 may be returned in response to a call that requires security processing. NPA is an abbreviation for numbering plan area, more commonly known as area code.

TABLE 1

NCP Translation Table		
Called number	Originating NPA	Translate to
800-555-1234	908	908-949-3000
800-555-1234	any other	609-555-9876
800-BANK	any	SCP_134-1
800-BANKXYZ	any	SCP_134-1
900-INFOSVC	any	SCP_134-1
800-STOKMKT	212, 516, 718	SCP_134-1
900-555-0001	any	312-411-6543

In step 811, when the address of one of SCPs 134 of security system 133 is supplied in place of number translation or billing verification information, NCP 132 recognizes that this call may require security processing beyond a first level inherent in the nature of the request and accordingly routes the call to security system 133. In a preferred embodiment, as described above, each of SCPs 134 contains all the data necessary to perform all authentications. Therefore, NCP 132 routes the call to the closest one of SCPs 134. For purposes of this example, the closest one of SCPs 134 is SCP 134-1. Therefore, NCP 132 always returns the address of SCP 134-1, as shown in Table 1, when additional security processing beyond the first level may be required.

In an alternate embodiment, each user would have a predetermined "home" one of SCPs 134. This "home" one of SCPs 134 would be assigned based on a determined or inferred user identity. In a further alternate embodiment, each destination would have a predetermined "home" one of SCPs 134. The "home" one of SCPs 134 would be the one of SCPs 134 that is closest to the destination. Each NCP 132 would be associated with one of SCPs 134 and would initially route incoming calls that it receives to that one of SCPs 134. If the one of SCPs 134 to which the call was initially routed was not the "home" one SCPs 134 for the received call, that one of SCPs 134 would contain sufficient information to cause the call to be routed to the "home" one of SCPs 134 of that call for security processing.

SCP 134-1 receives the call information on requester signalling link 206. Upon receiving the call, SCP 134-1, in step 813 causes any first level of security processing specified by the nature of the request to be performed. For a call to be charged to a credit card, such a specification of a first level of security processing is that a valid credit card number, including the PIN portion, must be supplied by the requester. Other requests, such as direct distance dialed calls, 800-type and 900-type calls, have a null first level of security processing. This first level of security processing may be performed by SCP 134-1 itself or SCP 134-1 may request that the first level of security processing be performed by NCP 132 and the results of the processing be returned to SCP 134-1 via signalling network 138.

Step 815 tests if the requester has successfully met the requirements of the first level of security processing. If the test result in step 815 is NO, control is passed to step 817 in which SCP 134-1 causes the connection to be refused. Thereafter, control is passed to optional step 819 which journals an unsuccessful access attempt. The method is then exited at step 821.

If the test result in step **815** is YES, control is passed to step **823** in which access decision unit **208** looks up the destination in destination profile storage **216** to determine what levels of authentication are required to achieve each level of access that can be made available for this type of request. If there is no profile for a particular destination then additional security processing is not required by that destination. Table 2 shows several exemplary destination profiles. The attributes which may be considered for each request in this example are the destination billing (bill) type, list of permitted users and a specified additional attribute. The authentication information which must be supplied to achieve each corresponding authentication level are shown in Table 3. It is noted that the mapping of the authentication level to the access level to be granted is specified by the destination profiles shown in Table 2.

TABLE 2

SCP Destination Table - Attributes and Access Requirements

Destination	Bill Type	Permitted Users	Add'l Attribute	Authentic Level	Access Level
1-800-BANK	—	group 1	—	1	till $200
	—			2	over $200
	—			3	over $200
1-800-BANKXYZ	—	group 2	—	2	till $5000
	—			3	over $5000
	—			4	over $5000
1-900-INFOSVC	—	not group 3	—	0	1 min
	—	group 3		1	20 min.
	—	group 3		2	1 hour
1-800-STOKMKT	—	any	ANI = 212	0	10 min.
	—	any	time = 1000 −1600 local	1	unlimited
Internatn'l Calls to	CC	any	PFO	N/A	none
country group 2	CC	any	NPO	3	20 minutes
Internatn'l Calls to	CC	any	PFO	2	10 minutes
country group 1	CC	any	PFO	5	30 minutes
	CC	any	NPO	2	unlimited
Domestic Calls	CC	any	PFO from S. Bronx	2	unlimited

The "groupX" entries in the Permitted Users column, where X is a number, are pointers to lists of users who are authorized to gain access to the destination. Such lists would be stored in destination profile storage **216**. For example, group **1** would be a pointer to a list of all the identifies of the users who were authorized by the bank to access the bank's computer system. As mentioned above, this information was previously supplied by the bank to the provider of long distance network **118**. Similarly, the "country group X" entries in the destination column are pointers to lists of countries which receive the same security treatment. CC stands for Credit-card Call. PFO stands for Public Phone Origination. NPO stands for Non-public Phone Origination. A dash indicates the particular attribute is not considered for the specified destination. ANI is the abbreviation for Automatic Number Identification which is the source of the request. In this example only the area code of the source is considered. Control is then passed to conditional branch point **825**.

TABLE 3

SCP Authentication Level Table

Authentication Level	Authentication Means
0	None
1	PIN (or Password)
2	Voice Print
3	Finger Print
4	Retina Pattern

TABLE 3-continued

SCP Authentication Level Table

Authentication Level	Authentication Means
5	Keystroke Timing
N/A	No Access allowable

Whether a particular access request will require the requester to actually supply authentication information is dependent upon the any first level of security processing inherent in the request, as well as the specified security needs of the destination and the values of the other attributes of the access request. These attributes typically include the alleged identity of the requester and the available call information. Available call information can include the originating address, e.g., automatic number identification (ANI), which would specify the location from which the access is sought; the destination to which access is sought which can be determined from the number dialed; the cost of the call, which may be expressed as a cost per unit of access or a cost reflecting the overall value of the access, and any other parameters of the call.

In conditional branch point **825**, access decision unit **208** of SCP **134-1** tests to determine, if it can definitely allow access to be granted at the level requested, if it can definitely not allow access to be granted at the requested level or if it doesn't know whether it should allow access to be granted. For purposes of this example, each destination profile stored in destination profile storage **216** specifies the available levels of access and the corresponding set of attributes required to achieve authentication such that access to the destination can be granted at each available level. Again, such profiles are shown in Table 2. Upon the initial iteration of step **825** access will be caused to be granted to a requester since any first level of security processing inherent in the request has been met by the requester, unless a predetermined set of attributes of the particular access request matches a set of specified criteria for those predetermined attributes, in which case additional authentication information is requested from the requester. If the requested additional authentication information is supplied, that information is used as part of the available request attributes, along with the other request attri-

butes, in an attempt to authenticate the alleged identity of the requester. If the requester is authenticated, access is granted. The attributes of a request that can be specified are any information concerning the access request that can be made available to security system **133**.

If the test result in step **825** is YES, the predetermined set of attributes does not match the specified criteria for those attributes and therefore access should be granted at the requested level—if any first level of security inherent in the request is met, which is assumed herein—control is passed to step **827**. In step **827** access decision unit **208** of SCP **134-1** obtains the destination authentication information. Destination authentication information is authentication information supplied by security system **133** to a destination so that the destination knows that it is communicating with security system **133**. This information is stored in destination authentication store **408** (FIG. **4**) and is retrieved therefrom via destination authentication processor **402** over link **404** and supplied via link **222** to access decision unit **208**. This information is stored in destination profile storage **216** and is supplied to access decision unit **208** over link **222**. Table 4 shows the information that SCP **134-1** will supply to each destination to authenticate itself.

TABLE 4

	SCP Destination Protocol Table		
Destination	SCP Login	SCP Authentication	Add'l Authentication
800-BANK	SCP	password = its-me	—
800-BANKXYZ	SCPXYZ	password = qazxswedcvfr	—
900-INFOSVC	ATT	Challenge/response protocol	key = 314159
800-STOKMKT	—	—	—

In step **829**, SCP **134-1** establishes a connection to destination station **114**, in this example, the computer system of the bank. This connection is established by destination authentication unit **220** and connects destination information path **230** to destination station **114** through switching machine **128**, switching machine **130**, LEC network **110**, switching machine **124** and their respective interconnecting links. SCP **134-1** engages in an authentication session with destination station **114** in step **831**. During this authentication session, which will be discussed further below, SCP **134-1** can either identify itself as SCP **134-1** and indicate that it is vouching that the requester is a user who has been authorized to a specific level or SCP **134-1** can mimic the requester's login sequence.

SCP **134-1**, in step **833** causes the requester at originating station **102** to be granted access to destination station **114**. In accordance with the principles of the invention, SCP **134-1** communicates to destination station **114** the level of access which is to be granted to the requester via destination challenge/response **406**. SCP **134-1** then causes originating station **102** to be interconnected to destination station **114**. This interconnection is accomplished, in accordance with an aspect of the invention, by SCP **134-1** transmitting to switching machine **128** the appropriate commands to directly interconnect switching machine **120** of LEC network **106** to switching machine **130** as that connection would have been established had the functions of SCP **134-1** not been invoked. SCP **134-1** also disconnects itself from the call. Thereafter, the method is exited at step **821**.

The test result during the initial pass through step **825** is DON'T KNOW if the predetermined set of attributes matches the specified criteria for those attributes. For the call to the bank, DON'T KNOW is the result for the initial iteration of step **825**, because it is assumed that each requester wishes to be able to perform transactions in excess of $200. The DON'T KNOW result indicates that access should not be granted immediately at the requested level and, instead, additional authentication information, beyond that required for any security processing inherent in the request, should be requested. Therefore, control is passed to conditional branch point **835**.

Conditional branch point **835** tests to determine if there remains authentication information that can be obtained from the access requester, as specified in his profile, or alternatively, if additional authentication features can be extracted from the information which the requester has already supplied. If the test result in step **835** is YES, control is passed to step **837** to obtain the next piece of additional authentication information specified in the profile. Exemplary user profiles are shown in Table 5. If the identity of the requester is unknown during an iteration of step **835**, the test result will be YES. This is because at least an alleged identity can be requested.

TABLE 5

	SCP Originator (User) Table			
Full Name	Identity	Authentic Level	Destination	Access Level
John_Watanabe	watan	2	1-900-WEATHER	10 min./day
		5	1-900-WEATHER	1 hr./day
		3	any other 900	unlimited
		3	1-800-BANKXYZ	till $5000
Joe_Williams	willj	2	1-900-SPORTS	unlimited
		4	1-900-SPORTS	unlimited
		3	1-900-INFOSVC	30 min./call
Sarah_Williams	wills	2	1-900-SPORTS	unlimited
		N/A	1-900-INFOSVC	none
Tom_Williams	willt	N/A	1-900-SPORTS	none
		N/A	1-900-INFOSVC	none
Hank_Williams	willh	N/A	1-900-SPORTS	none
		N/A	1-900-INFOSVC	none
Byron_McDoe	bemc	0	any	unlimited

In step **837**, SCP **134-1**, as directed by access decision unit **208**, tests to determine if an identity alleged by the requester is already available. An identity may be available if it was specified as part of the first level of security processing, if it was already specifically requested as a part of additional security processing or it may be inferred from the characteristics of the request. Such an inference may be drawn if a call is placed from a phone having only one authorized user, e.g., a home phone or a locked phone. If the requester's identity is already available in step **837** the test result is YES and control is

passed to step 839 and the identity available in step 837 will be used as the identity that was alleged by the requester. If an alleged identity is not available in step 837 the test result is NO and control is passed to step 841.

For purposes of this example, requesting and receiving an alleged identity is not part of the first level of security processing inherent in the request. This is because it is well known that the nature of conventional 800-type calls by themselves, as requests for bandwidth connections to remote locations, do not to require any security processing for their completion, i.e., 800-type calls do not require that an identity of the caller be alleged or that any form of authentication information be supplied by the caller. Therefore, the requesting of the identity, including a self-authenticating check sequence which is the user's PIN, is part of the additional security processing required for this particular 800-type call request. This additional processing is invoked based on the destination attribute of the request and the need to satisfy the permitted users attribute of the request before any access can be granted. In accordance with an aspect of the invention, if the requester supplies an identity code including the PIN portion that corresponds to an authorized user, he will be successfully authenticated to authentication level 1 (Table 3). Therefore, the requester will be able to at least perform transactions valued up to a total of $200, as can be seen from Table 2.

In step 841, SCP 134-1 requests that the requester allege his identity. For purposes of this example, the request by SCP 134-1 for authentication information is in the form of computer synthesized speech telling the user to supply the identity that he wishes to allege. This request is generated by requester challenge 308 in response to instructions from requester authentication processor 302 received via link 304. Requester authentication processor 302 is itself responsive to commands received from access decision unit 208 via link 222. The generated request is supplied to requester information path 204 and transported back to the user via information bearing facilities of switching machine 128, LEC network 106, switch 102 and interconnecting links therebetween.

Conditional branch point 843 tests to determine if the user has provided the alleged identity information requested within a predetermined period of time and, if an alleged identity has been supplied, whether it is valid, i.e., whether it is the identity of an authorized user. This step may be accomplished as part of a first level of security processing specified by the nature of the request or it may be separately performed. An identity can be alleged by supplying the digits of an identity code in the form of multi-frequency tones from the telephone keypad. This identity code is unique to each authorized user.

The code is received by comparison function 310, which is a general purpose unit for receiving data supplied from requester information information path 204 and comparing it with prestored information. This prestored information may be stored in user authentication data 312 or it may be supplied by requester authentication processor 302. Comparison function 310 is responsive to requester authentication processor 302 and supplies thereto a probability that the received information was supplied by the same person who supplied the information stored in user authentication data 312. Comparison function 310 may actually be comprised of a number of constituent functions, each of which is invoked to with a particular type of data to be compared. Alternatively, comparison function 310 may be implemented by a general purpose processor.

If the test result in step 843 is TIME-OUT, indicating that the user has failed to supply at least the required number of digits for an identity code, control is passed to step 817 in which SCP 134-1 causes the connection to be refused. If access decision unit 208 determines that the time period has expired, it sends a message via requester authentication unit 218 and requester information path 204 to the requester. This message may be a voice message informing the requester that the time out period has been exceeded and that he is being disconnected. Access decision unit 208 sends a message to switching machine 128 via requester signalling link 206 instructing switching machine 128 to terminate the requester's call. Thereafter, control is passed to optional step 819 which journals an unsuccessful access attempt. The method is then exited at step 821.

If a complete code is received within the allotted time period, the alleged identity is checked for validity, i.e., if it corresponds to a permitted user as defined by the permitted user attribute. Access decision unit 208 looks up the code in the appropriate list of permitted users, if specified, or in user profile storage 210, if a list is not specified. If the test result in step 843 is INVALID, i.e., an invalid code was supplied, which may be determined from the absence of an appropriate entry for that code, control is passed back to step 841 to allow the requester additional attempts to supply a valid identity code. At the implementor's discretion, the number of failed attempts may be limited to a predetermined number. When the predetermined number is exceeded, control is passed to step 817, as if a TIME-OUT occurred. This predetermined number may be one (1). If the test result in step 843 is YES, a valid code was supplied and control is passed back to conditional branch point 825.

In step 839, SCP 134-1, as directed by access decision unit 208, requests that the requester provide information to authenticate the requester's alleged identity to the level corresponding to the level of access desired. It is presumed that initially the highest level of access available is desired. Of course, the requester could initially be prompted to specify the level of access desired within the scope of the invention. Alternatively, if the requester is not successfully authenticated to the level desired but he has been successfully authenticated to some level of access, the requester may be offered the opportunity to accept that level of access as the requested level. For purposes of this example, the request by SCP 134-1 for authentication information is in the form of computer synthesized speech. In a similar manner to the request for an alleged identity, the request is generated by requester challenge 308 in response to instructions from requester authentication processor 302 received via link 304. Again, requester authentication processor 302 is itself responsive to commands received from access decision unit 208 via link 222. The generated request is supplied to requester information path 204 and transported back to the user via information bearing facilities of switching machine 128, LEC network 106, switch 102 and interconnecting links therebetween. In other implementations, the request could be any type of message that may be understood directly or indirectly by either the requester or equipment at the request's location.

For purposes of this example, the request is for a voice sample from the requester. The destination profile shown in Table 2 for destination 1-800-BANK shows that to achieve access at a level over $200 authentication to level 2 is needed. Table 3 shows that authentication level 2 requires a voice print (sample). More particularly, the voice sample requested could be for a predetermined utterance or the request itself could specify what the utterance is to be. The voice sample is received and processed by voice password **306**, which compares a representation of the received sample with a corresponding representation supplied by the authorized user that is alleged. This corresponding sample is stored in user authentication data **312**. Requester authentication processor **302** develops a probability that the new sample was provided by the same individual who had supplied the stored sample. This probability is supplied to requestor authentication processor **302**. Voice password **306** is thus essentially a specialized version of comparison function **310**. Any type of authenticating information that may be understood by either the requester or equipment at the request's location can be employed.

Conditional branch point **845** tests to determine if the user has provided the authenticating information requested within a predetermined period of time. If the test result in step **845** is NO, control is passed to step **817** in which SCP **134-1** causes the connection to be refused as discussed above. Thereafter, control is passed to optional step **819** which journals an unsuccessful access attempt. The method is then exited at step **821**. If the test result in step **845** is YES, control is passed back to conditional branch point **825**.

For each type of authentication information there may be a "try again" threshold which when reached, during an iteration of step **825**, indicates that the received authentication information yields an authentication that is close to the desired level but the authentication remains as yet uncertain. The values of the "try again" threshold may be dependent on the particular set of attributes for any given request. If the "try again" threshold is reached, access should not be granted to the desired level but the requester may be allowed to supply a different form of authentication information to obtain access. Therefore, if the test result in subsequent iterations of step **825** is that access decision unit **208** of SCP **134-1** remains unsure as to whether access should be allowed at the level requested, the test result in step **825** is DON'T KNOW and control is passed to conditional branch point **835**. Table 6 shows several types of authentication information and the requirements to achieve access, to be denied access or to be allowed to "try again" for each type for use in step **825**, X1, X2, Y1, Y2, Z1, Z2 are system dependent implementor chosen parameters that determine the accuracy and tolerances of the particular recognition and comparison system employed. Determination of such parameters will be obvious to one skilled in the art. As seen in Table 6 the following relationships among the parameters are required: X1>X2, Y1<Y2, Z1<Z2. DTW stands for Dynamic Time Warp, which is well known in the art.

TABLE 6

SCP Authentication Decision Table

Authentication Info Type	Access Denied	Try Again	Access Granted
PIN or Password	No Match	80% Match	All Match
Voice Print	DTW>X1	X2<DTW<X1	DTW<X2
Finger Print	# Features Matching<Y1	Y1<# Features Matching<Y2	# Features Matching<Y2
Retina Pattern	# Features Matching<Z1	Z1<# Features Matching<Z2	# Features Matching<Z2

In conditional branch point **825**, access decision unit **208** of SCP **134-1** again tests to determine if it can definitely allow access to be granted at the level requested, if it can definitely not allow access to be granted at the requested level or if it doesn't know whether it should allow access to be granted. This determination is now based on the available call information specified by the destination profile as well as the probability developed by either voice password **306** or comparison function **310** for the most recently received requester authentication information. If a voice password was requested, the "try again" threshold might be reached if a requester supplying a voice password is actually an authorized user suffering from nasal congestion. Such a user would be unlikely to gain access even if permitted to repeat the same voice password. Also, an imitator might improve his imitation if given another chance. An advantage of this system is that the user suffering from nasal congestion would be permitted to provide other identifying information thereby authenticating himself. Also, the imitator would be less likely to be able to simulate and supply all the types of information which may be requested for authentication. Other methods of determining whether access should be allowed may be employed.

In this example, each authentication is evaluated independently even if insufficient. Even if an authentication is insufficient to grant access, it must at least reach the "try again" threshold to continue the process. Other embodiments will be readily apparent without departing from the scope and spirit of the invention. This iterative requesting of additional authentication information may be performed, in accordance with an aspect of the invention, without the knowledge of the requester. This may be achieved by scanning the user without informing him or by more intensely processing the already obtained data so to glean more insight as to the authenticity of the requester. One method of scanning the user without informing him is to activate a video camera at his location and scan an image of the requester. Additional insight as to the authenticity of the requester may be gleaned without obtaining further data from the user by, for example, by processing already obtained voice samples with additional analyzation routines which require an additional period of time to run but yield greater accuracy or by examining the timing relationship between the keystrokes which the user employed to enter his alleged identity.

If the test result in step **825** is NO and access is definitely not allowable at the requested level, control is passed to step **817**, in which SCP **134-1** causes the connection to be refused. Thereafter, control is passed to optional step **819**, which journals an unsuccessful access

attempt. Then, the method is exited at step **821**. In an alternative embodiment, if the requester has been successfully authenticated to a lower level of access, that level of access may be granted. For example, if the requester of access to the bank's computer successfully supplied an identity code including the PIN portion that corresponds to an authorized user, he will be successfully authenticated to authentication level 1. The requester could then be granted access to perform transactions up to $200.

Security system **133** must be implemented securely since if its security is breached it can compromise the entire network. However, no other destination need be secured. If security system **133** vouches for the requester, it may optionally communicate to the destination information that is specific to the requester, such as the confirmed identity of the requester. If security system **133** mimics user login information each destination for which the user is authorized will be supplied with appropriate, but different, login information. Therefore, the compromise of the information for one destination will not compromise any other destination. However, the requester must supply to security system **133** only a single set of login information no matter which destination he seeks to access. SCP **134-1** of security system **133** will automatically translate the requester supplied login information to the destination required login information based on its knowledge of the selected destination.

If a higher level of security is required at a later point in the session, SCP **134-1** could be reinvoked. Such reinvoking could be implemented by having a multi-frequency tone receiver on switching machine **128** monitoring a session between originating station **102** and destination station **114** such that a predetermined tone sequence would alert switching machine **128** to the originator's need for additional security processing by SCP **134-1**. Information and signalling paths could then be established from the originator and destination to SCP **134-1** by alerted switching machine **128**.

The manner in which a wave is polarized as it passes through a portion of the requester's body or a handwriting sample may also be used as authenticating information. Of course, compatible apparatus must be available at the requester's location to obtain each type of authentication information from the requester and to transmit a representation thereof to SCP **134-1**. Apparatus capable of obtaining such information is well known. Such authentication information would be processed by comparison function **310**.

Shown in FIG. **9** is an example of the call setup messages employed when security system **133** is to provide secured access by a user to a particular destination as described above. The call setup messages may be both signalling type messages carried by signalling network **138** and information type messages carried by information links **140**. Such messages are well known to one skilled in the art. A request at an originating station, e.g., originating stations **102** (FIG. **1**) goes off hook and dials the desired destination, e.g., 1-800-BANK. The originating LEC switching machine to which the user is connected, e.g., LEC switching machine **120**, determines that the call is an 800 type call handled by the long distance network **118**. The handling of conventional unsecured 800 type calls is well known to one skilled in the art. A message is sent from LEC switching machine **120** to an originating switching machine in long distance network **118**, e.g. switching machine **128** indicating that there is an incoming 800 type call and the number that has been dialed.

The originating switching machine forwards the 800 number received to NCP **132** for translation to an actual destination address, i.e., a destination phone number in the conventional manner. In accordance with an aspect of the invention, NCP **132** forwards a security requirement message to SCP **134-1** because the address of SCP **134-1** was stored in the NCP table, instead of an actual translation of the destination. After it receives the security request message, SCP **134-1** knows the source of the request, the destination to which access is desired and other parameters obtained SCP **134-1** then determines, by employing its stored profiles what, if any, additional security processing is appropriate for this communication.

If additional security processing is required, SCP **134-1** first sends an authentication request message which is forwarded through NCP **132**, originating switching machine **128**, originating LEC switching machine **120** to originating station **102**. If an alleged identity can not be inferred, the authentication message requests that the user provide identification allegation information thereby alleging who the requester is. The requester then provides the requested authentication information within a predetermined amount of time or the request is terminated as discussed above. If the requester provided the authentication information that was requested, the information is forwarded via originating station **102**, originating LEC switching machine **120**, originating switching machine **128** and NCP **132** to SCP **134-1**.

In accordance with an aspect of the invention, SCP **134-1**, upon receiving the authentication information, analyzes all the currently information available to it concerning the access request to determine to which, if any, level of authentication the user has presently successfully authenticated himself. If the requester has not authenticated himself sufficiently to achieve the desired level of access, SCP **134-1** can send additional authentication request messages, which are forwarded through NCP **132**, originating switching machine **128**, originating LEC switching machine **120** to originating station **102**. These additional authentication messages request that the user provide authentication information that can be used to authenticate the alleged identity of the requester. The requester then provides the requested authentication information within a predetermined amount of time or the request is terminated. If the requester provided the authentication information that was requested, the information is forwarded via originating station **102**, originating LEC switching machine **120**, originating switching machine **128** and NCP **132** to SCP **134-1**. SCP **134-1**, upon receiving the authentication information, again analyzes the information available to it concerning the access request and determines to which, if any level of authentication the user has successfully authenticated himself. If the user has authenticated himself to a level sufficient for access at the level requested to be granted, such access is granted. This process may be repeated n times, where n is a predetermined number selected by the implementor. An exemplary value of n is 2.

Upon successful authentication, SCP **134-1** transmits to originating station **102** a proceed message, which is forwarded through NCP **132**, originating switching machine **128**, originating LEC switching machine **120**. Also, in accordance with the principles of the invention,

a preauthentication message specifying the level of access granted is forwarded to the destination station via destination switching machine and destination LEC switch. Optional handshaking messages may then be exchanged between destination station **114** and SCP **134-1**. A complete connection is the then established directly from the user to the destination thereby giving the user access to the destination at whatever level was previously authorized. SCP **134-1** and NCP **132** are free to process other calls.

FIGS. **10** and **11**, when arranged as shown in FIG. **12**, depict in flow chart form, an exemplary access request by a requester to a destination where the additional security requirements for the granting of access, beyond those inherent in the nature of the request, is specified by the requester or the network operators. Again, the requester is located at originating station **102** (FIG. **1**). The destination is a sports hot line service, which, for purposes of this example, is located at destination station **116**. For the convenience of the public, a pay per use premium billing 900-type access number (1-900-SPORTS) is provided under contract with the network operators by the purveyor of the hot line service.

A man, Joe Williams, desires to allow access to all 900-type services to the hot line service for himself and his wife but not to his two sons who have previously demonstrated an affinity for accumulating large bills for the sports hot line service. The man has therefore arranged that security procedures be employed whenever a 900-type call is to be billed to his account and he has supplied to the network operators identifying information that is to be used for authenticating the identities of himself and his wife. Other users of his account, e.g. guests at his home using his home phone or the two sons, will be allowed access to destinations other than the sports hot line. The two sons are also authorized to use the family phone credit card to charge calls thereto, but again, not for use in accessing the sports hot line. Furthermore, only Joe can access a premium information service (1-900-INFOSVC). This information has been entered into SCP **134-1**. Also, an indication that security services are to be invoked for 900-type calls made from his line has been programmed into switching machine **128** in the same manner as is employed for the well known call block feature. Such programming is well known by one skilled in the art.

Accordingly, the method is entered at step **1201** when a requester at originating station **102** located in the Joe's home is detected going off hook by switching machine **120**. Thereafter, in step **1203**, the requester dials the number of the destination to which access is sought. In this example, the requester dials 1-900-SPORTS at originating station **102**. In step **1205**, switching machine **120** receives the dialed digits and recognizes that the number dialed is an 900-type number for which service is provided via long distance network **118**. Such recognition may be performed by table lookup and is well known in the art. Switching machine **120**, in step **1207** routes the call to switching machine **128** in long distance network **118**. Switching machines **128** recognizes that 900-type calls from this line are to be routed to security system **133** instead of NCP **132**, in step **1209**. For purposes of this example, the closest one of SCPs **134** is SCP **134-1**. SCP **134-1** receives the call information on requester signalling link **206**.

Upon receiving the call, SCP **134-1**, in step **1211**, causes any first level of security processing specified by the nature of the request to be performed. A call to the sports hot line that is directly billed has a null first level of security processing. Contradistinctively, a call to the sports hot line that is to be charged to a credit card requires the first level of security processing inherent in a credit card call, that is the requirement that a valid credit card number, including the PIN portion, be supplied by the requester. Such a call would initially be routed to NCP **132**, in the typical manner of a conventional unsecured credit card call. However, instead of the well known unsecured credit card verification processor being returned by NCP **132** as the node to handle the call, NCP **132** would specify to route the call to security system **133**, and more particularly in this example, to SCP **134-1**.

Conditional branch point **1213** tests to determine if the requester has successfully met the requirements of the first level of security processing. If the test result in step **1213** is NO, control is passed to step **1215** in which SCP **134-1** causes the connection to be refused. Thereafter, control is passed to optional step **1217** which journals an unsuccessful access attempt. The method is then exited at step **1219**.

If the test result in step **1213** is YES, control is passed to step **1221** in which SCP **134-1** looks up the user profile for the alleged identity and determines the predetermined levels of authentication, if any, are required to achieve the various levels of access available for this type of call. The determination of the predetermined levels is made by access decision unit **208** which employs information supplied from user profile storage **210** (see Table 5) over link **222**. For clarity and brevity it is assumed that for this application of the invention there will always be an available alleged identity. This alleged identity is derived either from the line from which the request was placed or from a credit card number supplied to meet a first level of security processing, if the call is billed to a credit card. In an alternative embodiment, if an alleged identity can not be derived, one may be requested as described above in connection with FIG. **8**. Table 5 shows a unique identity code for each user that could be employed in such an embodiment. If no entry or a null entry is found in user profile storage **210** for an alleged identity, additional security processing beyond the first level is never required for that identity.

One exemplary way of organizing the security information when multiple users are authorized to use a single alleged identity, as in the case of the family, is to arrange for separate profiles for each user that are grouped together. Each such profile would include all the attributes for identifying the individual and the conditions under which various types of access would be granted. The identification information supplied is then employed to discriminate among the available profiles to determine which of the authorized users is actually calling. Upon successful authentication of one of the authorized users, access is then granted or denied in accordance with that user's authorization. Such a situation arises when the Williams credit card number is the alleged identity.

Access decision unit **208** of SCP **134-1** tests to determine, in conditional branch point **1223**, if access at the level requested is clearly allowable, clearly not allowable or if it is still not sure. This access decision is based on the requirements specified in the stored user profile

(Table 5), the alleged identity and the available call information as described above for step **825** (FIG. **8**). If the call was an ordinary long distance call or an 800-type of call which did not meet any of the user specified set of attributes required to invoke additional security processing beyond the inherent null first level required for such requests, or neither the user nor the network specified that there ever be any requirement of additional security processing the test result in step **1223** is YES and control is passed to step **1225**. The address of a next switching machine to route the call to would be returned and no security processing would be invoked. In accordance with the principles of the invention, SCP **134-1** will convey to the destination the level of access that has been granted to the requester, as described above. If the access level is a time limit, the destination for purposes of timing and enforcing of the access level is switching machine **128**. This is accomplished by employing the same timing mechanisms employed for billing purposes. The method is then exited via step **1219**.

If the test result in step **1223** is DON'T KNOW indicating that access decision unit **208** of SCP **134-1** remains unsure as to whether access should be allowed, control is passed to step **1227**. The test result during an initial iteration of step **1223** will be DON'T KNOW if authentication information is required before access can be granted. During subsequent iterations of step **1223** the test result will be DON'T KNOW if authentication information was previously obtained and a "try again" threshold was reached. Conditional branch point **1227** tests to determine if there remains additional authentication information that can be obtained from the access requester or, alternatively, if additional authentication features can be extracted from the information which the requester has already supplied.

For example, if the oldest son, Tom Williams, was attempting to reach the sports hot line, during the initial iteration of step **1227** he may sound like his father Joe with nasal congestion. He may therefore be able to reach the "try again" threshold for the requested voice print. If Joe was actually calling but he had nasal congestion he might only be able to meet the "try again" threshold. However, it would be undesirable to deny him access since he is an authorized user. Therefore, additional authentication information, in this case a retina pattern, is also stored for Joe in security system **133**. If during a request for access to the sports hot line the requester reaches the "try again" threshold for the voice print, the retina pattern of the requester can be requested and obtained for authentication purposes during a subsequent iteration of step **1227**. If the obtained retina pattern matches the stored retina pattern, access can be granted and the test result in step **1223** will be YES on the next iteration of that step.

If the test result in step **1227** is YES, control is passed to step **1229** to request additional authentication information from the requester. This iterative requesting of additional authentication information may be performed without the knowledge of the requester, as described above.

In step **1229**, SCP **134-1**, as described above, requests that the requester provide authentication information to confirm the requester's alleged identity. For purposes of this example the request is for a voice print from the requester. As described above, other authenticating information may be requested.

Conditional branch point **1231** tests to determine if the user has provided the authenticating information requested within a predetermined period of time. If the test result in step **1231** is NO, control is passed to step **1215** in which SCP **134-1** causes the connection to be refused. Thereafter, control is passed to optional step **1217** which journals an unsuccessful access attempt. The method is then exited at step **1219**.

If the test results in step **1231** is YES, control is passed to conditional branch point **1223** in which access decision unit **208** of SCP **134-1**, tests to determine in the same manner as described above if access to the destination is clearly allowable, clearly not allowable or if it is still not sure. If the test result in step **1223** is NO, and access is not allowable because the supplied authentication information did not sufficiently match the store authentication information, according to Table 6, control is passed to step **1215**, in which SCP **134-1** causes the connection to be refused. Thereafter, control is passed to optional step **1217**, which journals an unsuccessful access attempt. The method is then exited at step **1219**.

If the test result in step **1223** is YES, because authentication to the level required has been achieved in accordance with Table 6, access should be granted and control is passed to step **1225** wherein SCP **134-1** grants the requester at originating station **102** access to the destination station **114** as described above. Thereafter, the method is exited at step **1137**.

I claim:

1. A central security control system for use in a network, said network having a plurality of switching elements, said security control system for controlling access by a plurality of requesters to a plurality of destinations, said destinations being connected to said security control system by said network, said security control system comprising:

means for receiving a request for access to a particular destination of said plurality of destinations from one of said requesters at a location; and

means for communicating over said network from said security control system, in response to said received request, one of a predetermined plurality of levels of access to said destination that is to be granted by said destination to said requester.

2. The invention as defined in claim **1** further including means for instructing at least one of said network switching elements to establish connectivity from the location of said requester to said destination such that the resulting interconnection between the location of said requester and said destination through said at least one network switching element is independent of the entire central security control system.

3. The invention as defined in claim **1** wherein said means for communicating includes means for storing authentication information which has been supplied by each authorized user of each destination of said plurality of destinations prior to said request for use in determining said level of access when the identity of one of said users is alleged for said request.

4. The invention as defined in claim **1** wherein said means for communicating further includes means for identifying and authenticating said requester at the time of said request in response to authentication information received from said requester.

5. The invention as defined in claim **1** wherein said means for communicating includes means for storing an authentication profile including at least a table of authentication levels and corresponding levels of access that will be communicated to said destination if said

requester is authenticated to within said authentication level.

6. The invention as defined in claim 1 wherein said means for communicating includes:

means for storing authentication information supplied by authorized users of any of said destinations prior to said request;

means for obtaining information adapted for use in identifying and authenticating said requester at the time of said request;

means for storing an authentication profile including at least a table of authentication levels and corresponding levels of access that will be communicated to said destination if said requester is authenticated to within said authentication level; and

means responsive to said request, to said authentication profile and to said stored authentication information for analyzing any information obtained by said means for obtaining to determine to which authentication level stored in said authentication profile said requester is authenticated.

7. The invention as defined in claim 1 wherein said central security control system includes a plurality of security control points networked together.

8. The invention as defined in claim 7 wherein said means for communicating includes means for authenticating said security control point to said destination.

9. The invention as defined in claim 2 wherein said means for communicating includes:

means for storing authentication information supplied by authorized users of any of said destinations prior to said request;

means for obtaining information adapted for use in identifying and authenticating said requester at the time of said request;

means for storing an authentication profile including at least a table of authentication levels and corresponding levels of access that will be communicated to said destination if said requester is authenticated to within said authentication level; and

means responsive to said request, to said authentication profile and to said stored authentication information for analyzing any information obtained by said means for obtaining to determine to which authentication level stored in said authentication profile said requester is authenticated.

10. The invention as defined in claim 5 wherein at least one of said destinations is associated with at least one subscribing entity and said means for storing an authentication profile further includes means for storing at least one authentication profile specified by said at least one subscribing entity.

11. The invention as defined in claim 6 wherein at least one of said destinations is associated with at least one subscribing entity and said means for storing an authentication profile further includes means for storing at least one authentication profile specified by said at least one subscribing entity.

12. The invention as defined in claim 5 wherein said means for storing an authentication profile further includes means for storing at least one authentication profile specified by at least one authorized user of at least one of said destinations.

13. The invention as defined in claim 6 wherein said means for storing an authentication profile further includes means for storing at least one authentication profile specified by one of said of authorized users.

14. The invention as defined in claim 5 wherein said authentication profile is a default profile.

15. The invention as defined in claim 6 wherein said authentication profile is a default profile.

16. The invention as defined in claim 1 wherein said level of access is a predetermined time period duration for said access.

17. The invention as defined in claim 1 wherein said level of access is a predetermined time period that is determined from a per unit cost of access.

18. The invention as defined in claim 1 wherein said level of access is a predetermined limit on the amount of money that can be managed while access is granted for a particular request.

19. A method for use in a central security control system in a network, said network having a plurality of switching elements, said security control system for controlling access by a plurality of requesters to a plurality of destinations, said destinations being connected to said security control system by said network, the method comprising the steps of:

receiving a request for access to a particular destination of said plurality of destinations from one of said requesters at a location; and

communicating over said network from said security control system, in response to said received request, one of a predetermined plurality of levels of access to said destination that is to be granted by said destination to said requester.

20. The invention as defined in claim 19 further including the step of instructing at least one of said network switching elements to establish connectivity from the location of said requester to said destination such that the resulting interconnection between the location of said requester and said destination through each of said at least one network switching element is independent of the entire central security control system.

21. The invention as defined in claim 20 further including the steps of:

storing authentication information supplied by authorized users of any of said destinations prior to said request;

storing an authentication profile, prior to said request, said authentication profile including at least a table of authentication levels and corresponding levels of access that will be communicated to said destination if said requester is authenticated to within said authentication level;

obtaining information adapted for use in identifying and authenticating said requester substantially contemporaneous with said request; and

determining to which authentication level stored in said authentication profile said requester is authenticated to in response to said request, to said authentication profile, to said stored authentication information and said obtained information.

22. A central security control system for controlling access by requesters to a plurality of destinations over a communications network, the system comprising:

means for receiving request from one of the requesters at a location for access to a particular one of the destinations;

means for communicating to the particular destination, over the network, an indication of one of a predetermined plurality of access levels to be granted by the destination to the one requester; and

means for instructing the network, at a time substantially contemporaneous with the communication of

said indication, to interconnect the location to the particular destination over the network in such a way that the interconnection is independent of the entire central security control system.

23. The system of claim 22 wherein the means for communicating includes means for storing authentication information for at least said one requester and for identifying said one access level in response to authentication information received from said one requester.

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