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[54] **USER AUTHENTICATION METHOD AND APPARATUS**

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[52] **U.S. Cl.** **380/25**; 380/4; 380/23; 380/49; 340/825.31; 340/825.34; 235/380

[58] **Field of Search** 380/4, 23, 24, 380/25, 28, 30, 49; 235/379, 380; 340/825.31, 825.34

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[57] **ABSTRACT**

Authorization for a user to use a service is provided by a modified pager which calculates a unique response code to a transmitted challenge code based on the challenge code, an input personal identification number, and an internal key. The response code is input to a simple terminal, such as a telephone and if the unique response code is acceptable, the user may access the desired service, such as cashless transactions or long distance phone service.

37 Claims, 3 Drawing Sheets

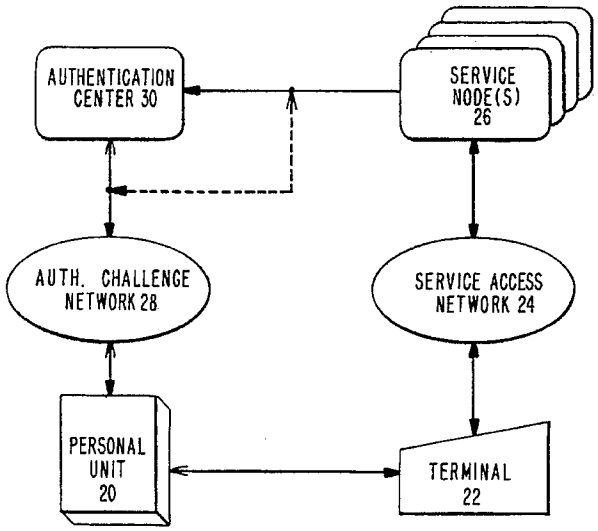


Fig. 1

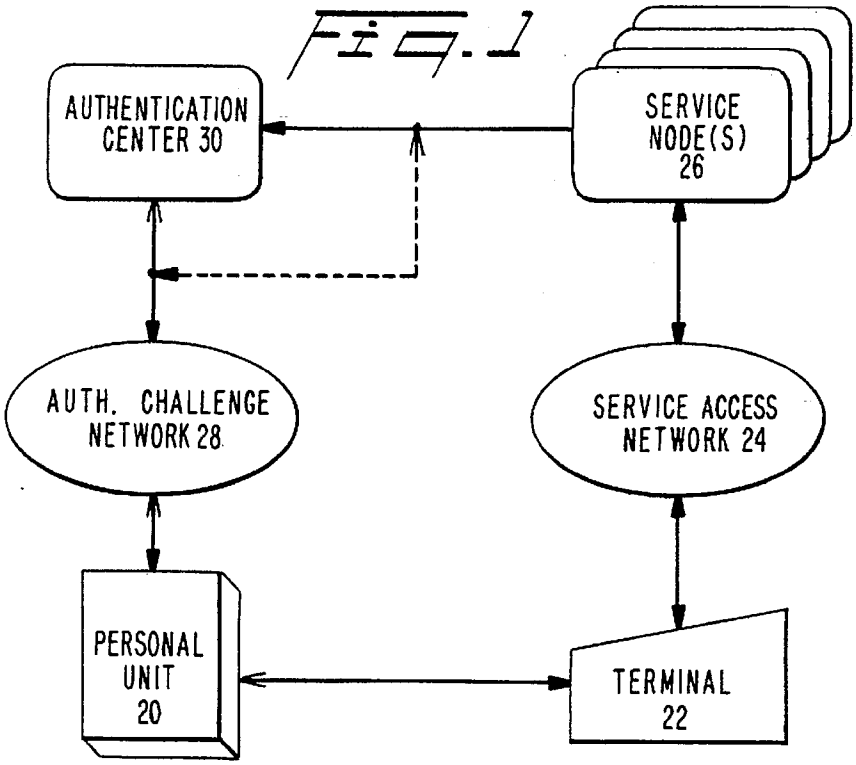


Fig. 1A

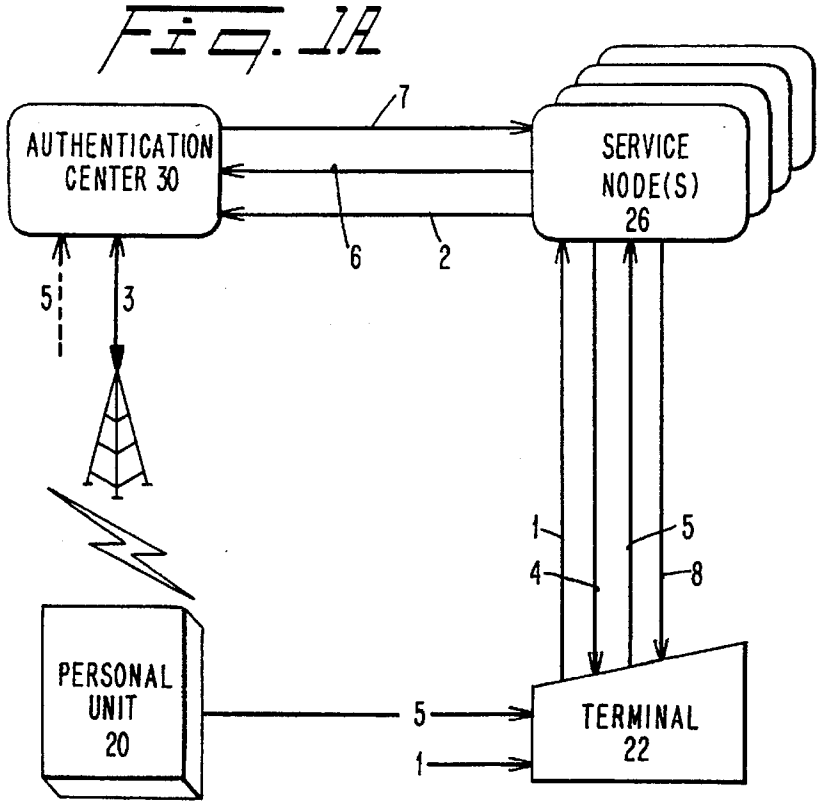


Fig. 2

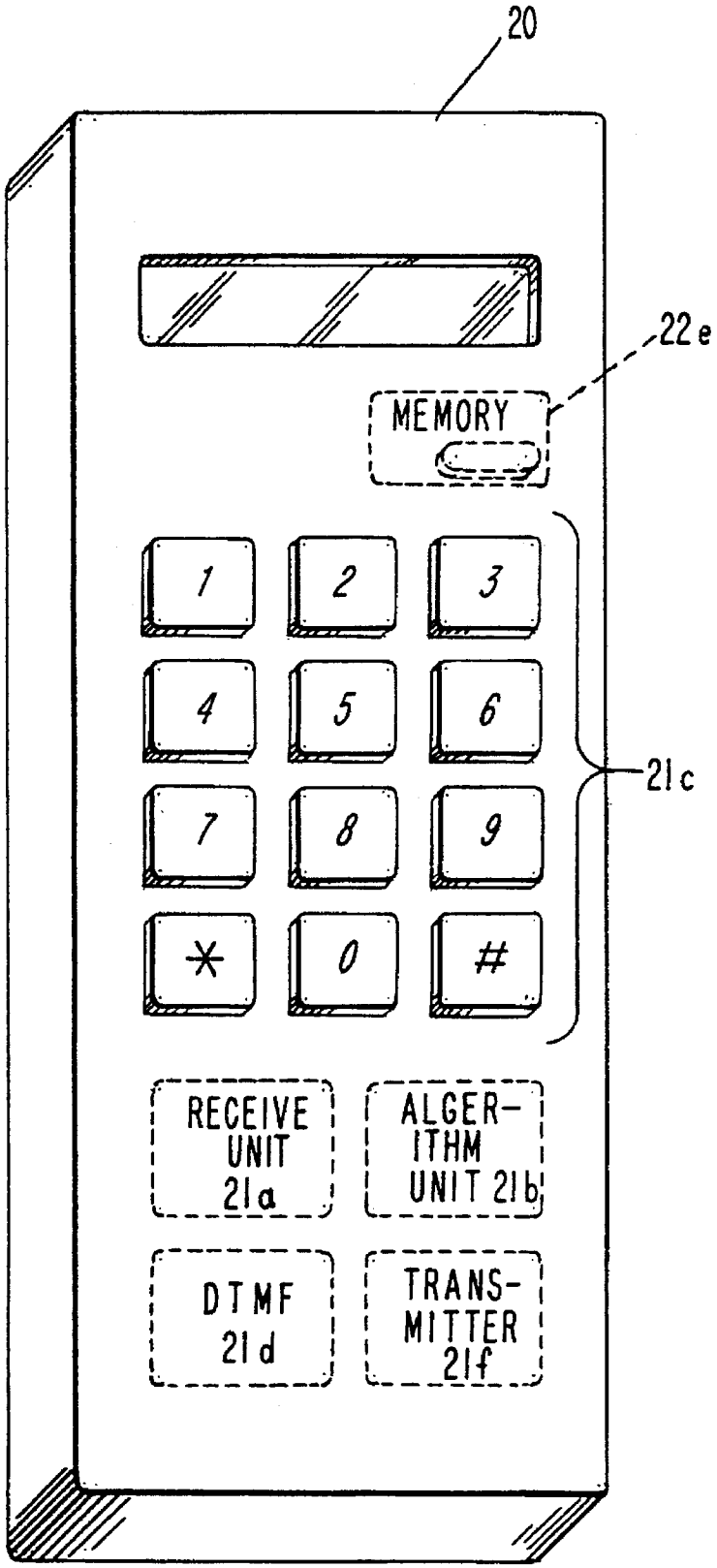
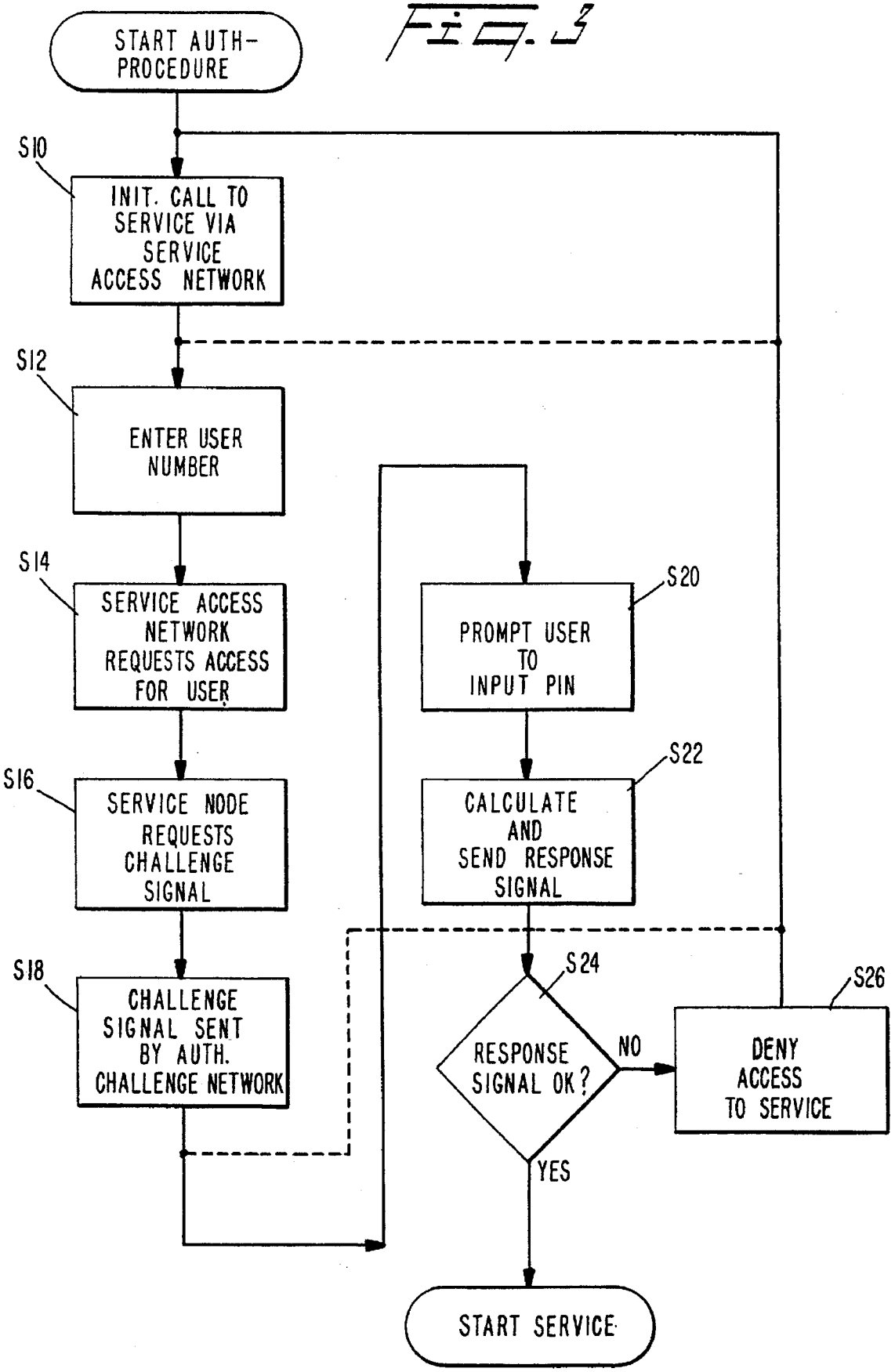


Fig. 3



USER AUTHENTICATION METHOD AND APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention involves a method and an apparatus for authentication of a user attempting to access an electronic service, and, in particular, providing an authentication unit which is separate from preexisting systems.

2. Description of Related Art

Effective authentication methods and apparatuses have been in great demand to prevent fraud and theft of services. This demand increases with the explosion of electronic services in the current information age. Electronic services such as banking services, credit card services, automatic teller machine (ATM) services, account information services such as mortgage, savings and investment accounts, general information services such as data base services and networks, security services and long distance phone services all require that a user be accurately identified for purposes of security, proper billing and avoidance of fraud. Recently, fraud in the cellular mobile telephone industry has placed so great a demand on effective authentication methods that a protocol has been standardized for cellular mobile systems. See, GSM 03.20, European Telecommunications Standards Institute (ETSI), 1993, pp. 19–29 and U.S. Pat. No. 5,282,250, herein incorporated by reference.

However, conventional authentication systems have required specially equipped terminals with card readers such as ATMs or credit card gas station terminals, data terminals using a log-in procedure, or cellular mobile radio stations with built-in authentication capabilities. Credit cards having a magnetic snip provide only minimal security insomuch as the bearer of the card is usually permitted to conduct transactions without further authentication of the user's identification other than perhaps comparing a unauthenticated signature on the card to a signature of the user. Even in transactions when signatures are required, the certainty of the user's identification is minimal.

Other identity cards, such as ATM cards, require a log-on procedure with a password, or PIN. But the PIN, once learned by an unauthorized user, offers no security in authenticating the user if the user can duplicate the ATM card.

These methods of authentication require specially equipped, and often dedicated, terminals, which raises the cost and reduces the availability of the associated electronic service. In other words, the prior art security systems often require a dedicated or customized terminal or modification to existing terminals, which greatly restricts the use of security systems to specific sites. Also, a user may use several electronic services, each service requiring an authentication procedure and/or personal identification number (PIN) or password, each procedure or password different from the others. As a subscriber to several electronic services, a user might end up with numerous passwords to remember. Even worse, he or she may be required to change these passwords periodically, thus having to remember if a password is still valid or not.

Also, transactions requiring relatively certain authentication have been largely unavailable from relatively simple terminals like telephones. For instance, home banking by telephone has been limited to transactions involving the bank customer's own accounts or using only the customer's own telephone.

SUMMARY OF THE INVENTION

The present invention overcomes these and other problems by providing an authentication procedure wherein the user carries a personal unit not limited to use with or physically connected to a terminal of any one specific electronic service. The personal unit can be used to authenticate a user's identity through a variety of terminals associated with a variety of electronic services.

The personal unit includes a receiver for receiving a transmitted challenge code and an algorithm unit which processes the challenge code, a user input such as a personal identification number (PIN) or electronically recognizable signature, and an internally stored security key for calculating a response code according to a pre-stored algorithm. The response code is then sent to the service node and, if it is acceptable, access to the service is authorized.

The basic method involves receiving a challenge code from a system, the user inputting a personal identification number or other recognizable input, and the personal unit generating a response code based on an internally stored algorithm. The PIN or other user input may be changed from time to time, and the challenge code and the response is unique for each transaction. The personal unit may receive and store a plurality of challenge codes for later use.

The personal unit can be used with virtually any existing terminal of an electronic service without requiring the terminal to be modified or customized. For instance, the personal unit can be used with a standard telephone, whether a radio telephone or land-line telephone. The user can input the response code displayed on the personal unit through the telephone keypad or the personal unit can include a DTMF transmitter for direct input of the response code into the microphone of the telephone. It follows that the keypad of any service terminal (e.g., a dam terminal connected to a service computer) can be used to input the response code. If some other input device is used in a terminal, such as an acoustic input, a inductively coupled input, an optical input, radio receiver (particularly if the terminal is by-passed and the response code is transmitted directly to the authentication center), etc., the personal unit can include a compatible output device. In other words, the personal unit can be modified or equipped to be compatible with existing or perspective terminals, rather than having to modify the terminals to suit the authentication procedure.

The same basic authentication procedure can be used for all services the user might wish to engage, the procedure being modifiable to suit any specific requirements of the electronic service. The user may have one personal unit for all the services he may wish to subscribe to, or several personal units, each unit being usable with one or a subset of services to which the user has subscribed.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described with reference to the attached drawing figures in which:

FIG. **1** is a schematic diagram of an authentication pager system in accordance with the present invention;

FIG. **1A** is a schematic diagram of an authentication pager system with reference to specific communications in accordance with the present invention;

FIG. **2** is a perspective view of a personal unit in accordance with the present invention; and

FIG. **3** is a flowchart outlining the authentication process in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hardware of the System

Referring to FIG. **1**, the present invention includes a personal unit **20** for generating a response code, a terminal

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