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SYSTEM FOR PAYMENT DATA EXCHANGE AND PAYMENT TERMINAL DEVICE USED THEREIN

The present invention relates to a system for financial transaction data (authentication, authorisation and payment data) exchange between a point of sale device, e.g. vending machine etc. and an authorisation centre (an entity responsible for authentication, authorisation and corresponding payment and settlement procedures of the transaction), and to a payment terminal device to be used in this system.

Mobile telephony is booming throughout the world and provides many recently developed applications in data communication. One of the hottest new services is payment through mobile phone which is generally called "m-commerce". There are available m-commerce solutions, most of them are based on WAP (Wireless Application Protocol) technology which promises to bring all the benefits of internet to a mobile phone. Other solutions use calls to a special payment terminal, those calls being activated either from an authorisation centre or a subscriber or user. But there are severe obstacles preventing faster acceptance of m-commerce, especially in a non-internet domain, which are the costs of the known payment terminals with regard to their acquisition as well as operating costs. Inter alia, this is due to the fact that each payment terminal has to include a fairly sophisticated communication interface which has to cover all the different, possible new and currently established standards of data communication in mobile telephone networks and phones.

Therefore it is an object of the invention to provide a system and a payment terminal to be used in this system which is able to prevent the problems and costs arising from the different

mobile phone standards with regard to coupling a mobile phone to a payment terminal device.

This object is solved by the system of claim 1 and by the payment terminal device of claim 8.
Accordingly, the system of the invention for payment data exchange or communication has a payment terminal device for coupling to a point of sale device and to a mobile phone, an authorisation centre for coupling to a mobile voice network and to a financial information system, a mobile phone for coupling to the mobile voice network and to the payment terminal device, wherein payment data exchange is performed from the payment terminal device via the mobile phone, and the mobile voice network to the authorisation centre and, vice versa, from the authorisation centre via the mobile voice network and the mobile phone to the payment terminal device, wherein the payment data are transferred between the payment terminal device and the mobile phone using voice data information.

The great advantage of the present invention is the transfer of payment data between the mobile phone and the payment terminal device using voice data information which is the only standard to be take into account by all phone makers and which, therefore, helps to reduce strongly the complexity of the communication interface in the payment terminal device and the costs connected thereto. Voice data information or voice information is the specific form of useful or wanted information which is known to be transferred and exchanged in the voice channel of the mobile voice network.

The payment terminal device of the invention for coupling to a point of sale device, vending machine etc. and to a mobile phone comprises interface means for releasable coupling the payment terminal device to the mobile phone.

The telephone connection is established by the user from the phone of the user, so the costs of the payment procedure or the telephone call are directed to the account of the user. Depending on the agreed relationship between the user, owner of the payment terminal device and the owner of the point of sale device, vending machine etc. the cost can be directed also to the account of another participating party. In any case the additional costs for establishing a telephone connection on the side of the operator are avoided.

The interface means of the payment terminal device comprises preferably coupling means for coupling to the mobile phone and a modem being coupled to the coupling means and to the processing means for converting voice data received from the authorisation centre by the mobile phone via the coupling means into data being sent to the processing means, and for converting data from the processing means into voice data prepared for coupling to the mobile phone via the coupling means. The data, encrypted or not, are thus transmitted through the mobile phone voice channel. The data modulation can either be DTMF or any other data modulation which can be transmitted through such a voice channel.

Preferably, the coupling means has an acoustic coupler for transferring voice data information in the form of acoustic signals to the mobile phone and vice versa, i.e. the voice data information is transferred as voice itself or voice as a carrier of information in the frequency band of human voice. Further, a distance between a microphone and a speaker of the acoustic coupler may be adjustable in order to adapt the acoustic coupler to different types of mobile phones. The acoustic coupler allows coupling of the payment terminal device to any type of mobile telephone which is currently used and which might be used in the future without any adaptation

of the different mobile phones themselves. Generally, the shape of the acoustic coupler should enable the mobile phone microphone to fit with the speaker and vice versa in a way that allows operability even in a noisy condition or environment.

In preferred embodiments of the invention, there are several additional options for coupling of the payment terminal to the mobile phone.

In the first option being called the wired option, the coupling means has electrical plug connector means for electrical coupling to a plug connector of the mobile phone in order to exchange information or voice data information in the form of electrical signals between the mobile phone and the coupling means. The plug connector means can have a plurality of different plug connectors for coupling to plug connectors of different types of correspondingly different types of mobile phones.

The second option is IR communication (IR = infrared radiation or light) wherein the coupling means or interface means of the payment terminal comprises an IR interface for communication with a corresponding IR interface of the mobile phone in order to exchange information or voice data information in the form of infrared signals between the payment terminal and the mobile phone. This is applicable on all newest mobile phone models which have, for instance, an IrDA interface. This option enables higher data rates and shorter transaction time.

The third option is RF communication (RF = radio frequency) wherein the coupling means or interface means of the payment terminal comprises a RF interface for communication with a corresponding RF interface of the mobile phone in order to exchange information or voice data information in the form of

RF signals between the payment terminal and the mobile phone. BlueTooth, for instance, is a standard in this area, however other RF communication protocols are possible. The RF communication interface enables non contact transaction for highest user comfort.

In a preferred embodiment, the payment terminal device has data processing means which comprises at least a communication processor having cryptographic capability in order to generate data or to establish a data communication with high security due to secure coding of the data. The cryptographic capability may be of different types, such as DES, RSA, etc.

The payment terminal device of the invention can comprise data input means, such as at least one keyboard. The keyboard allows the user to select predefined services or to specify the amount for POS terminals.

The payment terminal device can comprise a printer or built-in printer in order, for instance, to print a confirmation of the actual payment procedure if the users want any.

The payment terminal device can have a display for showing the user, for instance, the different steps of the payment procedure or for giving him instructions on how to operate the payment terminal device.

Further, the payment terminal device can comprise additional communication means, for instance a PSTN modem, an ISDN modem, cable modem or a GSM modem for coupling to the related networks in order to provide maintenance services etc.

The payment terminal device can be equipped with an additional connection to another computer system, such as a POS computer system or a BOS computer system.

There are a lot of applications which can be realised by means of the system or of the payment terminal device of the invention. The invention can be used, for instance, in vending machines for various products, such as beverages, food, cigarettes, magazines, condoms, etc. Further, public self-service stations as POS stations, such as gas stations, photocopiers, Internet access, car washes, laundries, jukeboxes, carpools, etc., can use the payment terminal device of the invention. Also, various ticket purchasing stations for bus, train, cinema etc. can use the invention. Payment authorisation and execution for various shops (EFTPOS), Internet shopping, TV sales and other business, which use conventional billing methods for purchases, such as credit cards, bank cheques, cash, etc, can use the system or the payment terminal device of the invention.

Further advantageous embodiments of the invention are mentioned in the dependent claims.

Further advantages, advantageous embodiments and additional applications of the invention are provided in the following description of a preferred embodiment of the invention in connection with the only figure being enclosed which shows:

Fig. 1 a schematic view of a system using a payment terminal device in accordance to a preferred embodiment of the invention.

Fig. 1 shows an embodiment of the inventive system that comprises an authorisation centre 1 that is similar to those used for credit card authorisation and that may be connected by means of the data communication connection 6 to an other financial information system, such as a bank, a mobile voice network 5 or mobile telephone network, such as the GSM

network, a mobile telephone 14 and a and a payment terminal device 10 to be coupled to the mobile telephone 14 of a user and to be connected via a data communication connection 13 to a point of sale station or means.

The authorisation centre 1 comprises communication interface 4 for coupling the authorisation centre 1 to the mobile voice network 5, a subscribers database 2 that stores data relating to each of the users, e.g. at least the telephone number, a corresponding PIN code and the agreed method of payment, e.g. from credit card, from bank account etc., assigned to each of the users, and optionally a comprehensive CRM, i.e. the complete information on customer's purchases and thus the possibility of personalised services, advertising, etc., and again optionally the user's secret code, and a transaction interface 3 that is connected by means of the data communication connection 6 to an other financial information system. The transaction interface 3 is connected to the communication interface 4 by means of a bi-directional data connection 21. Further, the subscribers database 2 is connected to the transaction interface 3 and to the communication interface 4 by means of a data communication line 22.

The payment terminal device 10 comprises data processing means 11, interface means 19 being connected to the data processing means 11 by means of a bi-directional data communication line 23 or bus, e.g. a serial or a parallel data connection, and being coupled to the mobile telephone 14 using voice as a carrier of information 24. The data processing means is based on a microcomputer system or a communication processor and is additionally connected to POS means or a request/release mechanism or unit of a POS means or vending machine or similar apparatus by means of the data communication line or signal line 13.

The interface means 19 of the payment terminal device 10 comprises a modem 12 and coupling means 20 for coupling the modem 12 to the mobile phone 14. The coupling means 20 may use an acoustic coupling or an acoustic coupler using the loud speaker 18 and the microphone 17 in order to transfer or couple information using a voice as a carrier to a microphone 16 and a loudspeaker 15, respectively, of the mobile telephone 14 that is attached or mounted to the acoustic coupler of the coupling means 20.

To be able to use the system of the invention the user has to own a mobile telephone 14 and the user has to set up a special account that belongs only to him in the authorisation centre 1. The account set up is basically an agreement between the user and the authorisation centre 1, wherein both parties define the parameters of their co-operation. The parameters comprise one or more mobile phone numbers, e.g. SIM card numbers, the method of payment, e.g. money transfer, credit card, etc., optionally additional services which increase the security of both parties, e.g. transaction limits, security/authentication codes, etc., and optionally additional services which increase the flexibility of the user, e.g. multiple accounts, etc. The user could change the parameters of the agreement which are stored in the subscribers database 2 of the authorisation centre 1 through user support services of the authorisation centre 1, through Internet services, WAP and similar services. The authorisation centre can on request of the user or within the framework of its business policy assign to each user special identification code which is used not to reveal the mobile telephone number of the user to other involved parties and to grant the protection of the privacy of the user when participating in the system of invention.

Next, a typical payment procedure is described if the inventive system of Fig. 1 is used.

In a first step, the user decides to make a purchase at a cashier or device using the payment terminal device 10. The user uses his mobile phone 14 to call the authorisation centre 1 via the mobile voice network 5.

In a second step the authorisation centre 1 uses the caller identity to establish and decide whether the caller is a registered user of the system. If the verification is not successful the authorisation centre 1 terminates the connection to the user or mobile phone calling.

After the successful verification described in previous paragraph, the user is asked to input his security/authentication code, if the account parameters in the subscribers data base 2 require authentication of the user. The user inputs the code by means of a keypad of the mobile telephone 14. In the next step, the authorisation centre 1 checks and compares the security/authentication code received from the mobile telephone 14 via the mobile voice network 5 to a security/authentication code stored in the subscribers data base 2. If the authentication is not successful (i.e. the entered code does not correspond to the code in the database) the authorisation centre 1 terminates the connection. If the authentication is successful the authorisation centre 1 instructs the user to put his mobile telephone onto the acoustic coupler of the coupling means 20 of the payment terminal device 10. The payment terminal device shows the user information, for instance, on a display, on how to put the mobile telephone onto the acoustic coupler.

In the next step, the payment terminal device 10 and the authorisation centre 1 exchange the required transaction data

or payment data via the voice channel established by the mobile telephone 14. The transaction data can be coded by means of cryptographic capability implemented in the processing means 11 on the side of the payment terminal device 10 and in the communications interface 4 in the authorisation centre 1. The processing means 11 controls the transaction data exchange on the side of the payment terminal device 10.

In the next step, the authorisation centre 1 verifies if the transaction data correspond to the specifications on the user's account (transaction limits...) and approves or rejects the transaction. If the transaction was approved by the authorisation centre 1, the payment terminal device 10 sends a signal or data generated by the processing means 11 via the connection 13 to the release mechanism or POS terminal, vending machine, etc. in order to release the paid goods or to approve a service being provided by these units or to display a visual approval if the sale is performed by a salesperson.

Claims

1. Payment terminal device for coupling to a point of sale device and to a mobile phone (14) for coupling to an authorization center (1), wherein said payment terminal device (10) comprises interface means (19) for releasably coupling said payment terminal device (10) to said mobile phone (14) to exchange voice data information between said payment terminal device (10) and said authorization center (1) via said mobile phone (14), wherein said payment terminal device further comprises data processing means (11) coupled to said interface means (19) for processing data received from said interface means (19) and for generating data to be sent to said interface means (19), wherein said interface means (19) comprise coupling means (20) for coupling to said mobile phone (14) and a modem (12) being coupled to said coupling means (20) and to said processing means (11) for converting the data received from said authorization center (1) via said mobile phone and via said coupling means into data being sent to said processing means (11) and for converting data received from said processing means (11) into voice data adapted for being sent to said authorization center (1) via said coupling means and via said mobile phone, and wherein said coupling means (20) has an acoustic coupler for transferring voice data via said mobile phone (14) to said authorization center (1) and vice versa.

2. Payment terminal device according to claim 1, wherein said acoustic coupler has a microphone (17) for coupling to a speaker (15) of said mobile phone (14) and a speaker (18) for coupling to a microphone of said mobile phone (14).

3. Payment terminal device of claim 1 or 2, wherein a distance between the microphone and the coupler is adjustable in order to adapt said acoustic coupler to different types of mobile phones.

4. Payment terminal device according to anyone of claims 1-3, wherein said coupling means (20) has a plug connector means for coupling to a plug connector of said mobile phone in order to exchange voice data information in the form of electrical signals between said mobile phone and said coupling means.

5. Payment terminal device according to anyone of claims 1 to 3, wherein said coupling means has an IR (Infra Red radiation/light) interface for coupling to a corresponding IR interface of said mobile phone in order to exchange voice data information in the form of infrared signals between said coupling means and said mobile phone.

6. Payment terminal device according to anyone of claims 1 to 3, wherein said coupling means has an RF (Radio Frequency) interface for coupling to a corresponding RF interface of said mobile phone in order to exchange voice data information in the form of radio frequency signals between said coupling means and said mobile telephone.

7. Payment terminal device of claim 4, wherein said plug connector means has a plurality of different plug connectors for coupling to plug connectors of different types of correspondingly different types of mobile phones.

8. Payment terminal device of one of the preceding claims, wherein said data processing means (11) comprises at least a communication processor having cryptographic capability.

9. Payment terminal device of one of the preceding claims, wherein said payment terminal device (10) comprises data input means.

10. Payment terminal device of claim 9, wherein said data input means comprises at least one keyboard.

11. Payment terminal device of one of the preceding claims, wherein said payment terminal device comprises a printer.

12. Payment terminal device of one of the preceding claims, wherein said payment terminal device comprises a display.

13. System for payment data exchange, comprising
a payment terminal device (10) for coupling to a point of sale device and to a mobile phone (14),
an authorization center (1) for coupling to a mobile voice network (5) and to a financial information system,
a mobile phone (14) for coupling to the mobile voice network (5) and to the payment terminal device (10),
wherein payment data exchange is performed from the payment terminal device (10) via the

mobile phone (14) and the mobile voice network (5) to the authorization center (1) and, vice versa, from the authorization center (1) via the mobile voice network and the mobile phone to the payment terminal device, wherein the payment data are transferred between the payment terminal device (10) and the mobile phone (14) on voice information.

14. System of claim 13, wherein the payment data exchange is initiated if the authorization center (1) receives a predefined caller identification of the user calling the authorization center via the user's mobile phone.

15. System of claim 13 or claim 14, wherein the payment data exchange is proceeded if the authorization center (1) receives a predefined security/authentication code of the user calling the authorization center via the user's mobile phone (14).

16. System of one of the claims 13 to 15, wherein the authorization center (1) sends information to the mobile phone which asks the user to couple the mobile phone to the payment terminal device (10).

17. System of one of the claims 13 to 16, wherein the payment data exchange comprises transaction information.

18. System of claims 17, wherein the payment data exchange comprises data approving or rejecting a transaction.

19. System of one of the claims 13 to 18, wherein the payment data are coded for security of the payment data exchange.

20. System according to one of claims 13-19, wherein said payment terminal device (10) comprises interface means (19) for releasably coupling said payment terminal device (10) to said mobile phone (14) to exchange voice data information between said payment terminal device (10) and said authorization center (1) via said mobile phone (14), wherein said payment terminal device further comprises data processing means (11) coupled to said interface means (19) for processing data received from said interface means (19) and for generating data to be sent to said interface means (19), wherein said interface means (19) comprise coupling means (20) for coupling to said mobile phone (14) and a modem (12) being coupled to said coupling means (20) and to said processing means (11) for converting the data received from said authorization center (1) via said mobile phone and via said coupling means into data being sent to said processing means (11) and for converting data received from said processing means (11) into voice data

adapted for being sent to said authorization center (1) via said coupling means and via said mobile phone, and wherein said coupling means (20) has an acoustic coupler for transferring voice data via said mobile phone (14) to said authorization center (1) and vice versa.

21. Authentication method for operating a payment terminal device (10), said payment terminal device comprising an acoustic coupler and said payment terminal device being connected to a point of sale (POS) device, said method comprising:

- receiving a mobile phone (14) on said acoustic coupler of said payment terminal device (10), said mobile phone (14) being connected to an authorization center (1),
- exchanging of transaction data with said authorization center (1), via a voice channel established by said mobile phone (14)
- receiving of an approval or a rejection from said authorization center (1), and
- outputting an approval signal to said POS device in case of an approval received from said authorization center.

22. Authentication method according to claim 21, further comprising the step of coding said exchanged transaction data.

23. Authentication method according to claim 21, further comprising the step of printing a confirmation of a payment procedure.

24. Authentication method for operating a system for payment data exchange comprising a point of sale (POS) device, a payment terminal device (10), an authentication center (1) and a mobile phone (14), wherein said POS device is connected to said payment terminal device (10) and said payment terminal device (10) comprises an acoustic coupler, said method comprising:

- establishing a connection between said mobile phone (14) and said authorization center (1) via a mobile voice network (5),
- using, at the authorization center (1), the identity of the caller to decide whether the caller is a registered user of the system,
- sending information from said authorization center (1) to the mobile phone (14), said information asking the user to couple said mobile phone (14) to said payment terminal device (10), if said caller is a registered user of the system,
- receiving said mobile phone (14) on said acoustic coupler of said payment terminal device (10),
- exchanging of transaction data between said payment terminal device (10) and said authorization center (1), via a voice channel established by said mobile telephone (14)
- receiving at said payment terminal device (10) an approval or a rejection from said

authorization center (1), and

- outputting an approval signal from said payment terminal device (10) to said POS device, in case of an approval received from said authorization center.

25. Authentication method according to claim 24, further comprising the step of proceeding said exchanging of transaction data, if said authorization center (1) receives a predefined security/authentication code of the user calling said authorization center (1) via the user's mobile phone (14).

26. Authentication method according to claim 24, further comprising the step of terminating said connection to said mobile phone calling, if the verification at said authorization center (1) that the user is a registered user of the system is not successful.

27. Authentication method according to claim 24, wherein said payment data exchange comprises transaction information.

28. Authentication method according to claim 24, further comprising the steps coding and decoding the payment data for security of the payment data exchange.