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(54) **Title**: A SYSTEM AND METHOD FOR RECHARGING PREPAID ELECTRICITY FROM A SET-TOP BOX

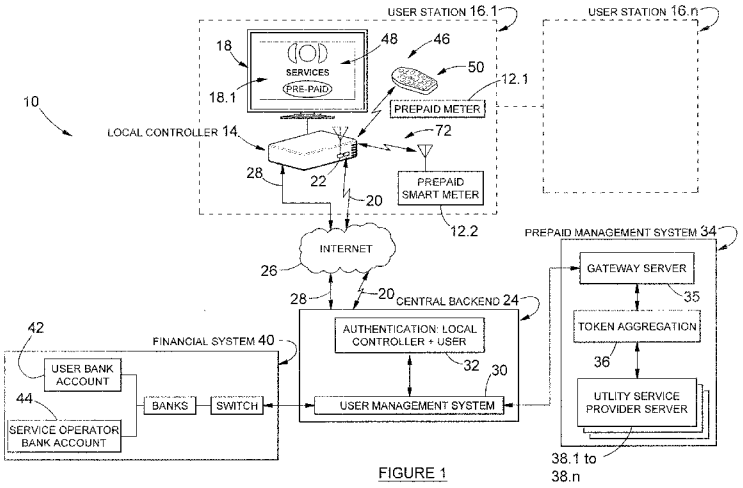

FIGURE 1

(57) **Abstract**: A system (10) for crediting a balance of available utility units associated with utility meter (12.1) which, in use, controls provision of the utility at a user station (16.1) comprises a local controller (14) at the user station. The system further comprises a central backend (24) which is connected to a financial system (40) and to a management system (34) of prepaid utility units. Each local controller is connectable to the backend via a communications path (20). The central backend (24) has preregistered therein each of the local controllers (14), respective associated users and is configured to apply financial rules. A UI enables a user to initiate a utility purchasing transaction comprising a request comprising a number of utility units required, the meter number and data relating to the identity of the local controller. The backend (24) is configured to authenticate the local controller (14) and, upon compliance with the financial rules, to enable the management system to issue a token comprising data relating to the units prepaid for and to forward the token to the local controller (14) at the user station.

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A SYSTEM AND METHOD FOR RECHARGING PREPAID ELECTRICITY FROM A SET-TOP BOX

INTRODUCTION AND BACKGROUND

The present invention relates to a system and method for recharging or crediting an available balance of utility units on a prepaid utility meter, such as a prepaid electricity meter.

The concept of prepaid electricity is well-known. Currently available prepaid electricity systems involve installing a prepaid electricity meter at a user station, generally a user's residence or place of work. The meter comprises an input mechanism, typically in the form of a keypad, for inputting or entering an encoded number or token comprising data relating to an amount of electricity prepaid for. Once the meter has verified that the number is valid, the meter locally updates the available amount of kilowatt hours (kWh), which is represented to the user as an available balance of units on a display of the meter. Currently, there are a number of avenues available to a user by means of which prepaid electricity may be purchased.

The user may visit an authorised vendor (such as a supermarket or other retail store) in person and purchase a desired amount of electricity, which is represented by the encoded number on a physical token, which is made

available to the user over the counter. This method may be considered time-consuming, particularly in the event that the user is required to make a dedicated trip to the vendor just for the purposes of purchasing prepaid electricity.

An alternatively available method comprises purchasing prepaid electricity online. This involves the user registering as a member on a website managed either by a municipality or other authorised electricity vendor. Generally in the process of registering, the user will be required to provide details necessary to identify the user, a meter number or numbers associated with the user and payment details, such as for example debit or credit card details, in order to process payment for any amount of prepaid electricity purchased. Similarly, a user may be able to access a website through an application made available on a mobile device such as a mobile telephone, tablet or the like. Disadvantages associated with these methods include the fact that personal and sensitive information is made available to a third party in an environment which is not sufficiently trusted and/or in which it is not possible to guarantee the security of any transaction or the information itself. Furthermore, a user is required to specifically log onto the website for the purpose of purchasing prepaid electricity. Once a transaction has been completed, the consumer will receive the encoded number, either by way of a text message, email or simply on a page of the website. As stated above, this

number must be punched into the keypad of the meter and, upon verification of the number, the balance of available units is updated in accordance with the amount prepaid for.

OBJECT OF THE INVENION

Accordingly it is object of the present invention to provide a system and method of crediting a balance of available utility units metered by a utility meter with which the applicant believes the aforementioned disadvantages may at least be alleviated or which may provide a useful alternative for the known systems and methods.

SUMMARY OF THE INVENTION

According to the invention there is provided a system for crediting a balance of available utility units associated with a utility meter which, in use, controls, in accordance with available units, provision of the utility, the system comprising:

- a local controller at each of a plurality of user stations, each local controller being associated with a respective unique identification number and with a respective user;
- at least one utility meter at each of the user stations, each utility meter being associated with a unique identification number;

- a central backend which is connected to a financial system and to a management system of prepaid utility units; the central backend comprising at least one database having preregistered therein data relating to the unique identification number of each of the local controllers and the respective associated users, the central backend being configured to apply financial rules relating to transactions for crediting a balance of available units and involving a respective user designated account in the financial system;
- the local controller being configured to initiate in respect of a meter a utility unit purchasing transaction comprising a request comprising data relating to at least a number of utility units required, the unique identification number of the meter and the unique identification number of the local controller;
- the local controllers being connectable to the backend via a communications path;
- the backend being configured to process the request, to identify and authenticate the respective local controller based on the request and, upon compliance with the financial rules, to enable the management system to issue a token comprising data relating to units prepaid for and to forward the token to the local controller at the user station.

The utility may be any reticulated utility such as, but not limited to electricity, water, etc.

Each local controller may be associated with a respective user interface for enabling a user to interact with the local controller.

Each local controller may form part of a set-top box connected to a respective television set and wherein the user interface comprises the television set.

The user interface may comprise a graphical user interface (GUI) which is rendered on the television set and a user operable input device cooperating with the GUI via the respective local controller.

The token may be received at the local controller and displayed on the user interface.

In other embodiments the utility meter may comprise a memory arrangement and may be in data communication with the local controller, the token may automatically be forwarded by the local controller to the utility meter and the data relating to the units prepaid for may be used automatically to credit the balance of available units stored in the memory arrangement.

In some embodiments, the local controller may initiate the purchasing transaction under user control via the user interface.

In other embodiments, the local controller may initiats the purchasing transaction under electronic instruction from the utility meter.

The request may further comprise data relating to an identification token which uniquely identifies the respective local controller and the central backend may be configured to authenticate the local controller utilizing the identification token and preregistered data stored in the at least one database.

The central backend may further be configured to identify the respective user utilizing the respective unique identification number of the local controller and the financial rules may comprise debiting the respective user designated account in the financial system, before enabling the management system to issue the token.

Further according to the invention there is provided a method crediting a balance of available utility units associated with a utility meter, which, in use, controls, in accordance with available units, provision of the utility, the method comprising, at a central backend:

- receiving form a local controller at a user station and which local controller is associated with a user, a request for crediting a balance of available utility units, the request comprising data relating to at least: a number of utility units required, a unique identification number of the meter and identity of the local controller;
- authenticating the local controller based on the data relating to the identity of the local controller and corresponding data which is preregistered at the backend;
- identifying the user based on the data which is preregistered at the backend;
- also based on the data which is preregistered at the backend, identifying a user designated account in a financial system which is connected to the backend;
- performing financial checks involving the request and the account; and
- if the checks are complied with, enabling a management system of prepaid utility units to forward a token comprising data relating to units prepaid for to be forwarded to the local controller.

Also included within the scope of the present invention is a carrier for a computer program which when executed on at least one processor at a

central backend performs the method as defined above. Yet further included within the scope of the invention is a central backend comprising such a carrier and at least one processor.

Still further according to the invention there is provided a method crediting a balance of available utility units associated with a utility meter, which, in use, controls, in accordance with available units, provision of the utility at a user station, the method comprising, at the user station:

- utilizing a local controller at a user station and which local controller is associated with a user to initiate a utility unit purchasing transaction comprising a request comprising data relating to at least a number of utility units required, a unique identification number of the meter and identity of the local controller;
- receiving from the central backend a token comprising data relating to the required units; and
- at least one of: a) displaying the token on a user interface; and b) forwarding data relating to the token to the meter automatically to credit the balance of available units stored in a memory arrangement of the meter.

Also included within the scope of the invention is a local controller comprising a carrier for a computer program, which when executed on at least one processor at the local controller, performs the method above. Yet further included within the scope of the invention is a local controller comprising such a carrier and at least one processor.

BRIEF DESCRIPTION OF THE ACCOMPANYING DIAGRAMS

The invention will now further be described by way of example only with reference to the accompanying diagrams wherein:

figure 1 is a high level block diagram of an example embodiment of a system for crediting an available balance of utility units metered by a utility meter, in this case an electricity meter, at a user station;

figure 2 is a more detailed block diagram showing only relevant parts of a local controller in the form of a set-top box at the user station and of a prepaid meter of a first type and a prepaid meter of a second type connected to the set-top box; and

figure 3 is a high level flow diagram of an associated method.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

A system for crediting an available balance of a utility which is metered by a utility meter 12.1, alternatively 12.2, at a respective user station 16.1 is

generally designated by the reference numeral 10 in figure 1. The user station 16.1 typically is one of a plurality of similar distributed user stations 16.1 to 16.n, each being associated with a respective user. In the rest of this description, reference will mainly be made to user station 16.1.

User station 16.1 comprises a respective local controller 14. In the example embodiment, the local controller is in the form of a set-top box 14 which is connectable to a television set 18 in known manner, to connect the television set to an external signal source (not shown) and to turn the source signal into content in a form that can then be displayed on the television screen or other display device.

The set-top box 14 is in data communication with a backend 24 via a communications path 20. The path may be wireless, may be provided by a mobile network operator and may connect to the Internet 26. To this end, the set-top box comprises a modem 22 which may be any suitable modem, such as, but not limited to a GSM modem. The set-top box 14 may alternatively or in addition also be connected to the Internet 26 and the backend 24 via physical cables 28, including but not limited to an Asymmetric Digital Subscriber Line (ADSL) and fiber to the home (FTTH).

In the example embodiment shown, the utility meters 12.1 and 12.2 are electricity meters, more particularly prepaid electricity meters.

Referring to figure 2, the meter 12.1 is a known meter of a first type comprising a keypad 60 for entering an encoded multi-digit token into the meter. The meter further comprises a controller with processor 62 connected to the keypad. Also connected to the controller with processor 62 are a display 64 and a memory arrangement 66 for storing amongst others, a current balance of available electricity units. The controller controls a switch 68 in a supply line 70 of electricity to the user station.

Still referring to figure 2, the meter 12.2 is a meter of a second type, a so-called prepaid smart meter which, in use, is in data communication with the set-top box 14 via a link 72 comprising a transceiver 74 on the set-top box and a cooperating transceiver 76 on the meter 12.2. In the example embodiment, the transceivers comprise radio frequency transceivers and the a path between them, is a wireless path. The transceivers may support the ZigBee specification, which is based on the IEEE 802.15 standard. The meter 12.2 further comprises a controller with processor 78 connected to the transceiver 76. Also connected to the controller with processor 78 is a memory arrangement 80 for storing amongst others, a current balance of available electricity units. The controller controls a switch 82 in a supply line 84 of electricity to the user station.

Referring again to figure 1, the central backend 24 comprises a user management system 30 comprises at least one database (not shown) wherein each of the distributed local controllers, such as local controller 14 and their associated users are preregistered. The backend further comprises an authentication module 32 for authenticating a local controller and identifying the associated user, as will be described in more detail below.

The backend 24 is connected to a management system 34 of prepaid electricity units which may be expressed in kWh or a currency. The system 34 comprises a gateway 35 and a shared or common prepaid unit service 36 which is connected to electricity suppliers 38.1 to 38.n and which manages prepaid tokens. The suppliers may include municipalities.

The backend 24 is further connected to a financial system 40. The financial system may comprise respective bank accounts of the operator of the service 36 and each of the users, the local controller 14 of which are registered at the backend 24, as explained above. A user designated bank account is illustrated at 42 and a bank account of the operator of the service 36 is shown at 44.

At each user station and associated with the set-top box 14 and television set 18, there is a user interface (UI) 46 comprising a graphical user interface (GUI) 48 on the screen or monitor 18.1 of the television set and data entry means in the form of a remote control unit (RCU) 50.

The user is able to interact with the local controller 14 utilizing the UI. For example, using the RCU 50 and the GUI 48, the user can register one or more meters by inputting criteria such as a respective unique identification number of and a physical address of the meter. Also via the UI, the user can select a preferred payment method and insert the relevant credit or debit card details, or details of account 42, for example. All of this information is preregistered and stored at the central backend 24.

Messages or data transmitted between the local controller 14 and the central backend 24 as well as message or data transmitted via link 72 are secured in any suitable manner, including encryption. In some embodiments the local controller may use a first encryption token, which may be stored in secure silicon in a chip of the local controller, to encrypt and decrypt messages or data transmitted between the local controller and the backend. A second similarly stored encryption token may be utilized to encrypt and decrypt messages or data transmitted via link 72.

Referring to figure 1, there is provided a system 10 for crediting a balance of available utility units associated with utility meter 12.1 which, in use, controls, in accordance with available units, provision of the utility at the user station 16.1. The system comprises the respective local controller 14 at each of the user stations. Each local controller is associated with a respective user. Each utility meter is associated with a respective unique identification number. The system further comprises the central backend 24 which is connected to the financial system 40 and to the management system 34 of prepaid utility units. Each local controller is connectable to the backend via the wireless communications path 20 and/or physical cable path 28. The central backend 24 has preregistered in the at least one database (not shown) thereof each of the local controllers 14 and the respective associated users. The backend is configured to apply financial rules relating to transactions for crediting a balance of available units and involving a respective user designated account 42 in the financial system. The UI at each of the user stations 16.1 to 16.n is used by a user for interacting with the respective local controller 14. In some embodiments, the user interface enables a user to initiate in respect of meter 12.1, a utility purchasing transaction comprising at least data relating to a number of utility units required, the respective unique identification number of the meter and data relating to the identity of the local controller. The backend 24 is configured to process the transaction data, to identify and authenticate the respective local controller 14 based on the data and, upon compliance

with the financial rules, to enable the management system 34 to issue a token comprising data relating to the units prepaid units for and to forward the token to the local controller 14 at the user station.

In the case of meter 12.1 of the first type, the token may comprise an encoded multi-digit number to be keyed into the meter as set out above. The token may be forwarded to the local controller at least via the central backend 24 and the path 20 or 28. The number may be displayed on the GUI. In use, the user is required to key the number into the meter via the keypad. A current balance of available units stored locally in the memory arrangement 66 of the meter is credited locally on the meter in accordance with the amount purchased by the prepayment transaction.

In the case of meter 12.2 of the second type, the token data may be forwarded to the local controller via at least the central backend 24 and the path 20 or 28. From the local controller the data is automatically forwarded via path 72 to the meter 12.2 where the token data is used to credit locally a current balance of available units stored locally in the memory arrangement 80 of the meter in accordance with the amount purchased by the prepayment transaction.

An associated method of crediting a balance of available utility units is illustrated in figure 3. More particularly, in use and using the UI cooperating with the set-top box 14, the user at user station 16.1 makes a selection as to a meter 12.1 to be recharged. The user then initiates at 90 a prepaid purchasing transaction in respect of the meter. Transaction data comprising at least data relating to a number of utility units required, the respective unique identification number of the meter and data relating to the identity of the set-top box and an identification token which uniquely identifies the local controller is then transmitted at 92 securely via path 20 or 28 to the central backend 24. At 94 the request data is received at the central backend. The backend processes at 96 the received data to authenticate the respective local controller based on the identification token data and/or encryption used and corresponding pre-stored data. The central backend 24 is configured to apply at 98 financial rules relating to transactions for crediting a balance and involving the respective user bank account 42. More particularly, the financial rules may comprise checking whether there is sufficient funds available in the user designated account 42 to cover the cost of the proposed crediting and if so, debiting the designated user account with the price or cost of the proposed crediting and crediting the account 44 with the price, before enabling at 100 the system 34 to issue a token representing the required prepaid units in accordance with the request. At 102 the token is forwarded securely via the backend and path 20 or 28 to the local controller. At 104 the

token is received via the aforementioned path at the local controller. If the prepaid meter is of the second type, the token is automatically forwarded securely via link 72 and the available balance in memory 80 (shown in figure 2) is automatically credited. If the prepaid meter is of the first type 16.1, the token is caused to be displayed on the GUI 48 (shown in figure 1). The user then has to enter the token via keypad 60 (shown in figure 2) to credit the available balance in memory arrangement 66.

In some embodiments, the system 10 may be configured to notify the user of the issued token number by a further mechanism in addition to be displayed on the user's screen interface such as, for example, by way of text message and the like. The user can then punch the token number into the prepaid meter and recharge their available electricity.

In some embodiments the controller of meter 16.2 may be able to monitor power consumption and, once the balance of available units of electricity in memory arrangement 80 reaches a predetermined level, the smart meter 16.2 may be configured to initiate a recharge transaction directly to the set-top box 14 via link 72. The user may be required to enter a value of the transaction via the UI 46 before it is initiated by the set-top box or there may be provided for a user selectable default value for an automatic transaction. The recharge

may take place automatically between the set-top-top box and the meter without need for user intervention.

Alternatively or in addition, the controller 78 may be configured to periodically communicate its current electricity store in 80 to the set-top box for selective display on UI 46 under user control. Further still, in accordance with this embodiment, the set-top box 14 may be configured to notify the user via UI 46, once a predetermined threshold is reached. The user may be notified that the predetermined electricity store threshold has been reached via a warning notification which may be displayable on the UI. The user may then elect to initiate an electricity recharge transaction via the UI, which may comprise clicking on a relevant icon. Alternatively, the transaction may be initiated automatically as described above and the recharge may occur automatically in that a purchased token is sent to the meter for recharge without a requirement for further user intervention. Hence, the set-top box may be configured to automatically trigger a recharge transaction upon predetermined parameters being complied with, wherein the recharge transaction may take place without user initiation via the user interface. The parameters may include a predetermined electricity store threshold being reached, a purchase amount and the like.

The crediting of the balance of utility units and financial debiting and crediting steps may take place in a Payment Card Industry Data Security Standard (PCI DSS) compliant and hence a secure environment.

CLAIMS

1. A system for crediting a balance of available utility units associated with a utility meter which, in use, controls, in accordance with available units, provision of the utility, the system comprising:

- a local controller at each of a plurality of user stations, each local controller being associated with a respective unique identification number and with a respective user;
- at least one utility meter at each of the user stations, each utility meter being associated with a unique identification number;
- a central backend which is connected to a financial system and to a management system of prepaid utility units; the central backend comprising at least one database having preregistered therein data relating to the unique identification number of each of the local controllers and the respective associated users, the central backend being configured to apply financial rules relating to transactions for crediting a balance of available units and involving a respective user designated account in the financial system,
- the local controller being configured to initiate in respect of a meter a utility unit purchasing transaction comprising a request comprising data relating to at least a number of utility units

required, the unique identification number of the meter and the unique identification number of the local controller;

- the local controllers being connectable to the backend via a communications path;
- the backend being configured to process the request, to identify and authenticate the respective local controller based on the request and, upon compliance with the financial rules, to enable the management system to issue a token comprising data relating to units prepaid for and to forward the token to the local controller at the user station.

2. The system as claimed in claim 1 wherein each local controller is associated with a respective user interface for enabling a user to interact with the local controller.

3. The system as claimed in claim 2 wherein each local controller forms part of a set-top box connected to a respective television set and wherein the user interface comprises the television set.

4. The system as claimed in claim 3 wherein the user interface comprises a graphical user interface (GUI) which is rendered on the television set

and a user operable input device cooperating with the GUI via the respective local controller.

5. The system as claimed in any one of claims 2 to 4 wherein the token is received at the local controller and displayed on the user interface.

6. The system as claimed in any one of claims 1 to 4 wherein the utility meter comprises a memory arrangement and is in data communication with the local controller, wherein the token is automatically forwarded by the local controller to the utility meter and wherein the data relating to the units prepaid for is used automatically to credit the balance of available units stored in the memory arrangement.

7. The system as claimed in any one of claims 2 to 6 wherein the local controller initiates the purchasing transaction under user control via the user interface.

8. The system as claimed in claim 6 wherein the local controller initiates the purchasing transaction under electronic instruction from the utility meter.

9. The system as claimed in any one of claims 1 to 8 wherein the request further comprises data relating to an identification token which uniquely identifies the respective local controller and wherein the central backend authenticates the local controller utilizing the identification token.

10. The system as claimed in any one of claims 1 to 9 wherein the central backend is configured to identify the respective user utilizing the respective unique identification number of the local controller and wherein the financial rules comprise debiting the respective user designated account in the financial system, before enabling the management system to issue the token.

11. A method crediting a balance of available utility units associated with a utility meter, which, in use, controls, in accordance with available units, provision of the utility, the method comprising, at a central backend:

- receiving form a local controller at a user station and which local controller is associated with a user, a request for crediting a balance of available utility units, the request comprising data relating to at least: a number of utility units required, a unique identification number of the meter and identity of the local controller;

- authenticating the local controller based on the data relating to the identity of the local controller and corresponding data which is preregistered at the backend;
- identifying the user based on the data which is preregistered at the backend;
- also based on the data which is preregistered at the backend, identifying a user designated account in a financial system which is connected to the backend;
- performing financial checks involving the request and the account; and
- if the checks are complied with, enabling a management system of prepaid utility units to forward a token comprising data relating to units prepaid for to be forwarded to the local controller.

12. A method crediting a balance of available utility units associated with a utility meter, which, in use, controls, in accordance with available units, provision of the utility at a user station, the method comprising, at the user station:

- utilizing a local controller at a user station and which local controller is associated with a user to initiate a utility unit purchasing transaction comprising a request comprising data relating to at least a number of utility units required, a unique

identification number of the meter and identity of the local controller;

- receiving from the central backend a token comprising data relating to the required units; and
- at least one of: a) displaying the token on a user interface; and b) forwarding data relating to the token to the meter automatically to credit the balance of available units stored in a memory arrangement of the meter.

13. A carrier comprising a computer program, which when executed on at least one processor at a central backend performs the method as claimed in claim 11.

14. A carrier comprising a computer program, which when executed on at least one processor at a local controller performs the method as claimed in claim 12.

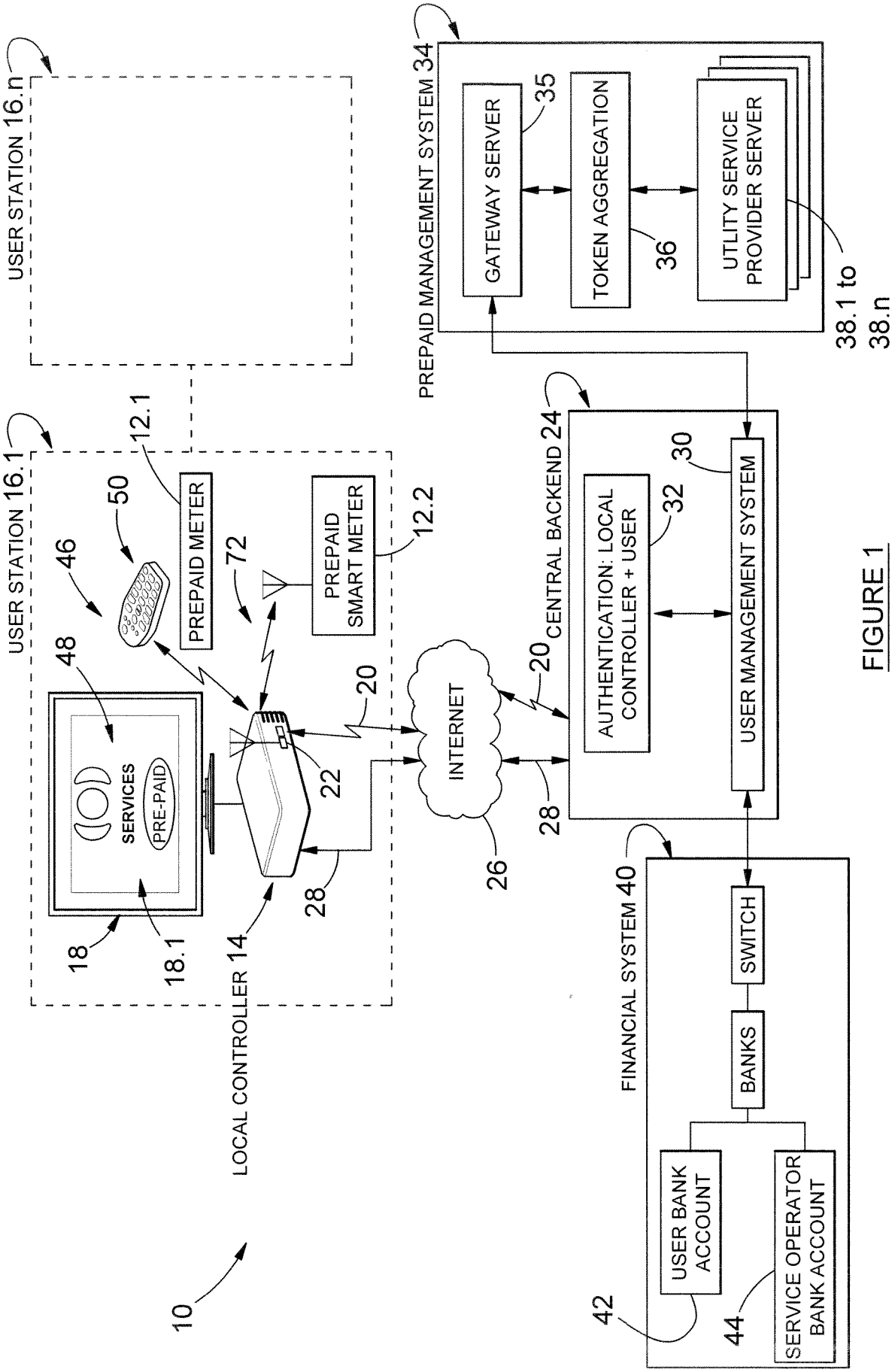
USER STATION 16.n
USER STATION 16.1
12.1
PREPAID METER
50
46
48
SERVICES
PRE-PAID
18
18.1
72
PREPAID SMART METER
12.2
20
22
28
14
LOCAL CONTROLLER
10
INTERNET
26
20
CENTRAL BACKEND 24
AUTHENTICATION: LOCAL CONTROLLER + USER
32
30
USER MANAGEMENT SYSTEM
28
PREPAID MANAGEMENT SYSTEM 34
GATEWAY SERVER
35
TOKEN AGGREGATION
36
UTLITY SERVICE PROVIDER SERVER
38.1 to 38.n
FINANCIAL SYSTEM 40
SWITCH
BANKS
USER BANK ACCOUNT
42
SERVICE OPERATOR BANK ACCOUNT
44

FIGURE 1

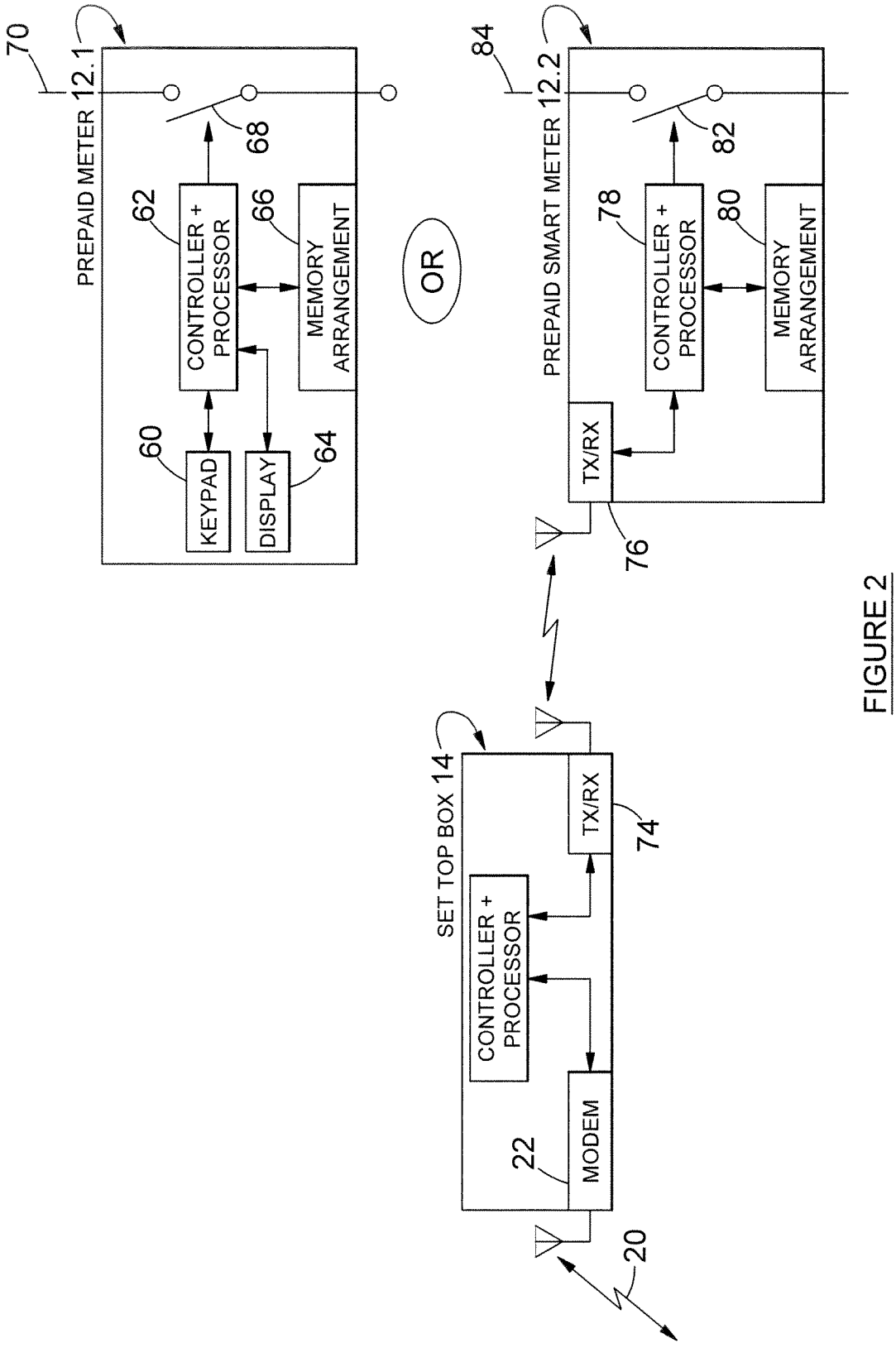
70
PREPAID METER
12.1
68
62
CONTROLLER + PROCESSOR
66
MEMORY ARRANGEMENT
60
KEYPAD
DISPLAY
64
OR
84
PREPAID SMART METER
12.2
82
78
CONTROLLER + PROCESSOR
80
MEMORY ARRANGEMENT
TX/RX
76
SET TOP BOX
14
TX/RX
74
CONTROLLER + PROCESSOR
22
MODEM
20

FIGURE 2

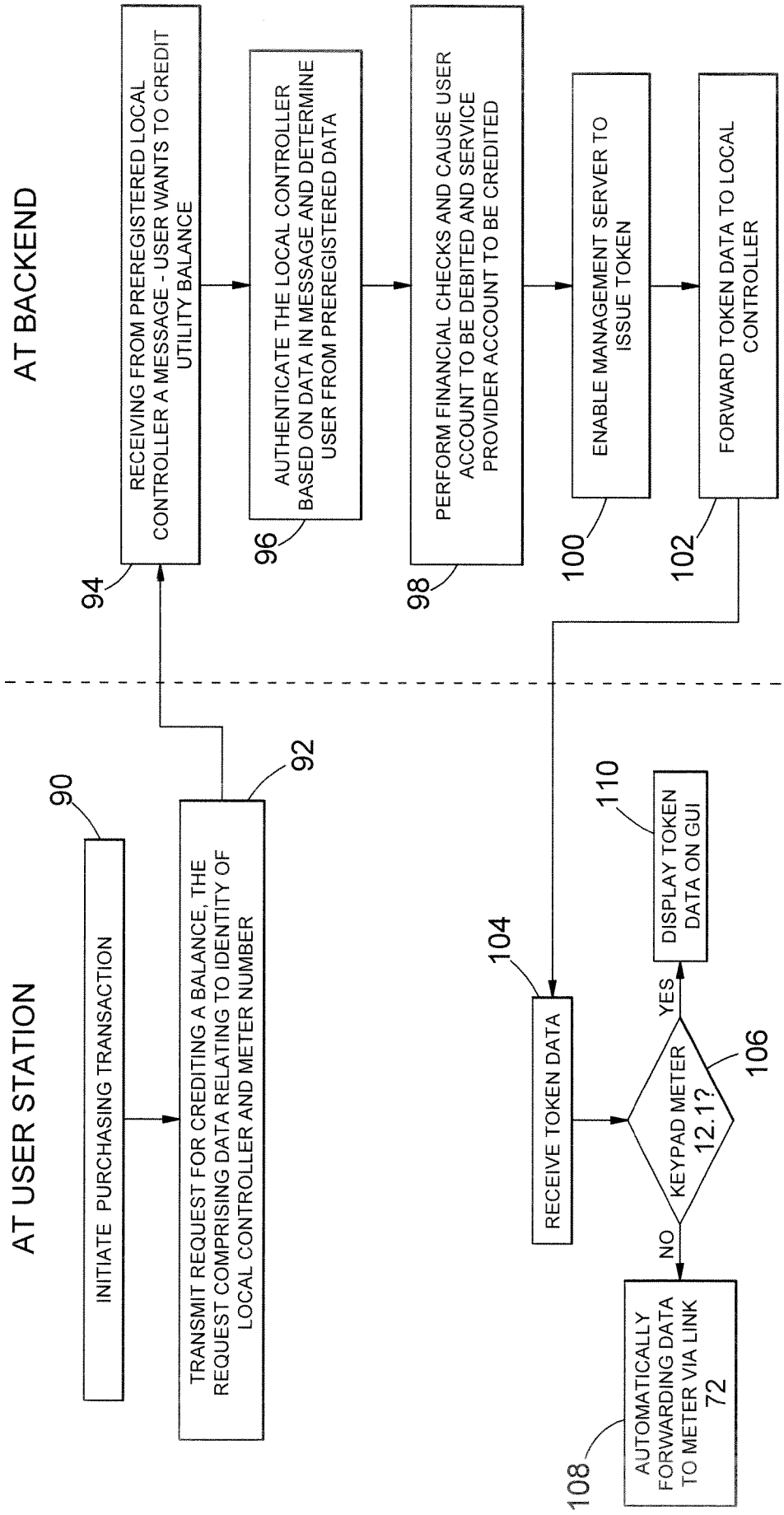
AT BACKEND
AT USER STATION
RECEIVING FROM PREREGISTERED LOCAL CONTROLLER A MESSAGE - USER WANTS TO CREDIT UTILITY BALANCE
AUTHENTICATE THE LOCAL CONTROLLER BASED ON DATA IN MESSAGE AND DETERMINE USER FROM PREREGISTERED DATA
PERFORM FINANCIAL CHECKS AND CAUSE USER ACCOUNT TO BE DEBITED AND SERVICE PROVIDER ACCOUNT TO BE CREDITED
ENABLE MANAGEMENT SERVER TO ISSUE TOKEN
FORWARD TOKEN DATA TO LOCAL CONTROLLER
INITIATE PURCHASING TRANSACTION
TRANSMIT REQUEST FOR CREDITING A BALANCE, THE REQUEST COMPRISING DATA RELATING TO IDENTITY OF LOCAL CONTROLLER AND METER NUMBER
RECEIVE TOKEN DATA
KEYPAD METER 12.1?
YES
NO
DISPLAY TOKEN DATA ON GUI
AUTOMATICALLY FORWARDING DATA TO METER VIA LINK 72
94
96
98
100
102
90
92
104
106
110
108

FIGURE 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/056979

A. CLASSIFICATION OF SUBJECT MATTER
INV. G07F15/06 G07F17/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/001995 A2 (CONTOUR TECHNOLOGY PTY LTD [ZA]) 3 January 2014 (2014-01-03) abstract; figures page 9, line 6 - page 10, line 14 page 12, line 10 - page 20, line 30	1-14
A	US 2010/274725 A1 (HOLBERY JAMES D [US] ET AL) 28 October 2010 (2010-10-28) abstract; figures paragraphs [0015] - [0030]	1-14
A	WO 2006/011019 A1 (ACTARIS MEASUREMENT & SYTEMS P [ZA]; TAYLOR DONALD MICHAEL [ZA]; COETZ) 2 February 2006 (2006-02-02) abstract; figures page 7, line 20 - page 11, line 16	1-14

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 November 2015	16/12/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Breugelmans, Jan

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/056979

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008/154624 A1 (O'NEIL ADRIAN [US]) 26 June 2008 (2008-06-26) abstract; figures paragraphs [0025] - [0053], [0072] - [0083] -----	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2015/056979

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014001995 A2	03-01-2014	NONE	
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		US 2012119922 A1	17-05-2012
		WO 2009076605 A1	18-06-2009