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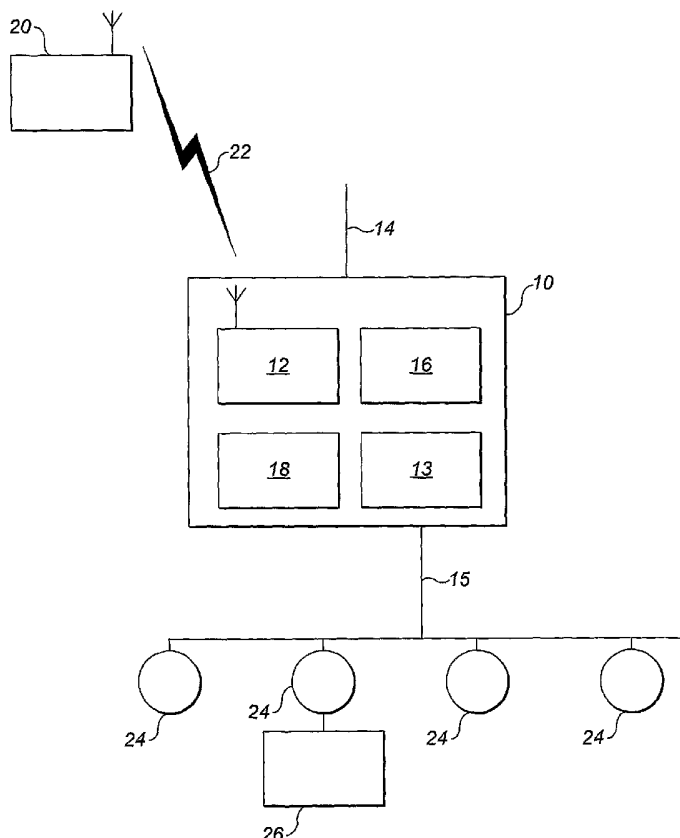
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(54) Title: RADIO CONTROLLED POWER LINE CARRIER SYSTEM



(57) Abstract: A radio controlled power line carrier (PLC) device (10) includes a PLC transceiver (13) and a radio (12), typically a GSM transceiver. A method of transmitting data includes wirelessly transmitting data to a device, and transmitting the received data from the device to a controlled device (26) using a PLC method. A method of prepaid metered control of services such as lighting, interactive television services, and home or personal alarm gateways includes wirelessly transmitting credit to a prepayment meter and the meter controlling the services using PLC method. In one embodiment, the radio is housed in a sealed prepayment meter, in another a coupler to a mobile phone is provided in the prepayment meter.



Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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1 **Radio controlled power line carrier system**

2

3 The present invention relates to a utility meter, for the
4 control using radio and data transmission using power
5 line carrier methods.

6

7 Power line carrier (PLC) methods where data is
8 transferred through the mains electricity cabling is well
9 known, as are methods of reading meters using PLC data
10 transfer.

11

12 A prepayment meter is supplied to measure the amount of a
13 commodity or service, such as electricity, gas or water,
14 that is provided to the consumer by a public utility
15 company. In-built programs within the meter are used to
16 convert the amount of commodity or service purchased or
17 used by the customer to a monetary value. The prepayment
18 meter also features a countdown register and solenoid or
19 switch. It is these elements which define the prepayment
20 meter, as they enable the meter to make the 'decision' to
21 switch of the meter therefore cut off the customer's
22 supply.

23

1 Customers who are deemed not to be capable or trusted
2 with paying their bills in the usual way of the bill
3 being issued and paid after the commodity has been used,
4 are provided with a prepayment meter. They are required
5 to keep the prepayment meter in sufficient advance funds
6 to cover the amount of the utility used by them. The
7 prepayment meter has the ability to disconnect the
8 customer from supply (i.e.- by switching off) until
9 sufficient advance funds are credited to the meter.

10

11 It is an object of at least one embodiment of the present
12 invention to provide a radio-controlled device with a
13 power line carrier connection.

14

15 It is a further object of at least one embodiment of the
16 present invention to provide a method for controlling or
17 transmitting payment to devices via prepayment meter
18 using radio signals.

19

20 According to a first aspect of the present invention
21 there is provided a radio controlled power line carrier
22 device.

23

24 Preferably the device comprises a radio transceiver and a
25 power line carrier transceiver.

26

27 Preferably the device is a utility meter.

28

29 Typically the device is an electricity meter.

30

31 Optionally the device is radio-controlled prepayment
32 meter.

33

1 Preferably the device further comprises a controller
2 means.

3

4 Preferably, the radio-controlled prepayment meter
5 comprises a meter, a radio transceiver, controller means,
6 a power line carrier transceiver, and a countdown
7 register.

8

9 Alternatively, the radio-controlled prepayment meter
10 comprises a meter, an interface to a radio transceiver,
11 controller means, a power line carrier transceiver, and a
12 countdown register.

13

14 Preferably the interface to a radio transceiver is an
15 acoustic coupler.

16

17 Alternatively the interface to the radio transceiver is a
18 secondary radio link.

19

20 Alternatively the interface to the radio transceiver is
21 an infrared link.

22

23 Preferably, the controller means is adapted to
24 communicate via the interface to a radio transceiver.

25

26 Optionally, the radio transceiver utilises GSM signals
27 (Global System for Mobile Communications).

28

29 The meter may be sealed.

30

31 Optionally, the countdown register is situated at a
32 separate site to the meter.

33

1 Preferably, the countdown register counts down power or
2 money units.

3

4 According to a second aspect of the present invention
5 there is provided a method of wirelessly transmitting
6 data, comprising the steps of :

7

8 wirelessly transmitting data to a device;

9

10 receiving data at the device;

11

12 transmitting data using a power line carrier method
13 from the device.

14

15 According to a third aspect of the present invention
16 there is provided a method of providing a pre-paid
17 metered control of a of a controlled device, comprising
18 the steps of :

19

20 wirelessly transmitting credit to a prepayment
21 meter;

22

23 receiving credit at the prepayment meter;

24

25 transmitting control signals using a power line
26 carrier method from the meter to the controlled
27 device; and

28

29 the controlled device being controlled responsive to
30 the control signals.

31

32 Optionally, the wireless transmission is achieved using
33 GSM signals (Global System for Mobile Communications).

1
2 In order to provide a better understanding of the present
3 invention, an example will now be described by way of
4 example only with reference to the accompanying figures
5 in which:

6
7 Figure 1 illustrates a device according to the
8 present invention in its environment;

9
10 Figure 2 illustrates the operation of a prepayment
11 meter system, utilising communication via radio
12 signals;

13
14 Figure 3 illustrates the use of a prepayment meter
15 (and variations thereon) for a number of functions
16 not normally associated with metering;

17
18 Figure 4 illustrates an alternative embodiment with
19 an acoustic coupler in a pre-payment meter and an
20 external radio.

21
22 Referring firstly to Figure 1, a radio controlled power
23 line carrier electricity meter 10 is shown. The device
24 comprises a radio transceiver 12 and a power line carrier
25 transceiver 13. The meter has mains power inputs 14 and
26 mains output 15. The sealed meter also contains a
27 controller 16, such as a microprocessor, and a countdown
28 register 18 for storing and decrementing the amount of
29 remaining power, money, time or other credit available to
30 a consumer.

31

1 In use, a transmitter 20 wirelessly transmits 22 data to
2 the meter which further transmits data through the mains
3 out to a mains socket 24.

4

5 The meter may provide a pre-paid metered control of a of
6 a controlled device, such as a TV set top box 26 by the
7 transmitter wirelessly transmitting credit to the
8 prepayment meter and the meter transmitting control
9 signals using a power line carrier method from the meter
10 to the controlled device and the controlled device being
11 controlled responsive to the control signals.

12

13 Referring to Figure 2, an electronic point of sale
14 terminal 7 communicates via public switch telephone
15 network (PSTN) with payment agent/EPOS terminal operator
16 8. Customer management site 9 can both implement call
17 transfers and provide data for the utility provider 10.
18 The customer management site 9 accepts data from payment
19 agent 8, which identifies the customer, and the monetary
20 value which must be transferred to the prepayment meter
21 1.

22

23 The monetary value is first encrypted, and then
24 transferred to the prepayment meter 1 via the GSM
25 gateway/GSM system 11. The preferred method of the
26 transfer of this data will be short message service (SMS)
27 standard, although other data transfer mechanisms will be
28 implemented and supported. The prepayment meter 1 also
29 has the ability to decrypt the monetary value purchase
30 via EPOS terminal 7, and transfer it to the credit or
31 countdown register 6 in the prepayment meter 1. The
32 meter then controls the usage of appliances attached to

1 the ring mains using the countdown register for decision
2 making.

3

4 As an example, should a customer need to transfer
5 credit/power to their meter, the following steps are
6 taken :

7

8 1. First visit the location where the EPOS terminal is
9 located.

10 2. Pass to the operator a credit/debit card or money.

11 3. Indicate the amount of money which is required to be
12 transferred.

13 4. If money is used, a method of identity will be
14 required to be handed to the operator. This is normally a
15 magnetic stripe card with encoded customer details.

16 5. The required card is inserted in the EPOS terminal
17 which auto-dials the correct location.

18 6. Prepayment agent receives this call and verifies
19 customer is real and who is the commodity vendor
20 (utility) associated with the transaction.

21 7. On completion of the verification process, the EPOS
22 terminal is informed the transaction is OK.

23 8. The EPOS terminal prints a receipt, or transfers the
24 monetary value to the card as required.

25 9. The monetary value of transaction is removed from the
26 EPOS owners bank account and transferred to the commodity
27 vendors bank account, minus commissions. This will not be
28 done in real time.

29 10. Prepayment agent transfers transaction details to the
30 customer management system.

31 11. Details are checked against database records for
32 cross correlation to a GSM telephone number.

1 12. The monetary value is encrypted to a numerical
2 string.

3 13. The numerical string is transferred to the GSM meter
4 using an appropriate technique : probably SMS.

5 14. The meter decrypts the data and recovers the monetary
6 value. The meter then stores it in the meters countdown
7 register.

8 15. Transaction details are made available to the
9 commodity vendor.

10 16. The meter controls the controlled device attached to
11 the mains, responsive to the amount of remaining credit,
12 and updates the countdown register based on usage of the
13 controlled device.

14

15 The above systems use standard techniques to verify each
16 step of the above process to detect and correct errors.

17

18 Referring to Figure 3, the infrastructure surrounding
19 prepayment meter 1 can also be used for a number of
20 functions which are currently not normally associated
21 with payment through a meter. Specifically, services such
22 as lighting, interactive television services, and home or
23 personal alarm gateways can be supported by the
24 infrastructure surrounding prepayment meter 1. In this
25 alternative embodiment, the PLC controller is external to
26 the radio controlled meter, being connected by an IEC1107
27 optical interface.

28

29 Referring to the alternative embodiment of Figure 4, a
30 radio controlled power line carrier electricity meter 10
31 is shown with a radio transceiver 12 that is a
32 cellular/mobile phone. The device comprises a power line
33 carrier transceiver 13. The meter has mains power inputs

1 14 and mains output 15. The sealed meter also contains a
2 controller 16, such as a microprocessor, and a countdown
3 register 18 for storing and decrementing the amount of
4 remaining power, money, time or other credit available to
5 a consumer. The interface between the radio controlled
6 power line carrier electricity meter and the radio in
7 this embodiment is acoustic, using the speaker/microphone
8 pair 27 of the mobile phone and an acoustic coupler 28 as
9 part of the radio controlled power line carrier
10 electricity meter. Alternatively the interface to the
11 radio is a secondary radio link (e.g. Bluetooth™) or an
12 infrared link. The controller means is adapted to
13 communicate via the interface to the mobile/cellular
14 telephone that contains its own acoustic coupler.

15

16 The operation of a payment system using an acoustic
17 coupler to connect a mobile phone to a point of sale
18 terminal is described in International Patent Application
19 WO0233669.

20

21 In use, a transmitter 20 wirelessly transmits 22 data to
22 the meter which further transmits data through the mains
23 out to a mains socket 24.

24

25 The meter may provide a pre-paid metered control of a of
26 a controlled device, such as a TV set top box 26 by the
27 transmitter wirelessly transmitting credit to the
28 prepayment meter and the meter transmitting control
29 signals using a power line carrier method from the meter
30 to the controlled device and the controlled device being
31 controlled responsive to the control signals.

32

1 Further modifications and improvements may be added
2 without departing from the scope of the invention herein
3 described.

4

1 **Claims**

2

3 1. A radio controlled power line carrier device.

4

5 2. The device of Claim 1 comprising a radio transceiver
6 and a power line carrier transceiver.

7

8 3. The device as claimed in any previous claim wherein the
9 device is a utility meter.

10

11 4. The device as claimed in any previous claim wherein the
12 device is an electricity meter.

13

14 5. The device as claimed in any previous claim wherein the
15 device is radio-controlled prepayment meter.

16

17 6. The device as claimed in any previous claim wherein the
18 device further comprises a controller means.

19

20 7. The device as claimed in Claim 5 wherein, the radio-
21 controlled prepayment meter comprises a meter, a radio
22 transceiver, controller means, a power line carrier
23 transceiver, and a countdown register.

24

25 8. The device as claimed in Claim 5 wherein the radio-
26 controlled prepayment meter comprises a meter, an
27 interface to a radio transceiver, controller means, a
28 power line carrier transceiver, and a countdown
29 register.

30

31 9. The device as claimed in Claim 8 wherein the interface
32 to a radio transceiver is an acoustic coupler.

33

1 10. The device as claimed in Claim 8 wherein the
2 interface to the radio transceiver is a secondary radio
3 link.
4

5 11. The device as claimed in Claim 8 wherein the
6 interface to the radio transceiver is an infrared link.
7

8 12. The device as claimed in any of Claims 8 to 11
9 wherein the controller means is adapted to communicate
10 via the interface to a radio transceiver.
11

12 13. The device as claimed in any of Claims 2 to 12
13 wherein the radio transceiver utilises GSM signals
14 (Global System for Mobile Communications).
15

16 14. The device as claimed in any previous claim wherein
17 the meter is sealed.
18

19 15. The device as claimed in any of Claims 7 to 14
20 wherein the countdown register is situated at a
21 separate site to the meter.
22

23 16. The device as claimed in any of Claims 7 to 15
24 wherein the countdown register counts down power or
25 money units.
26

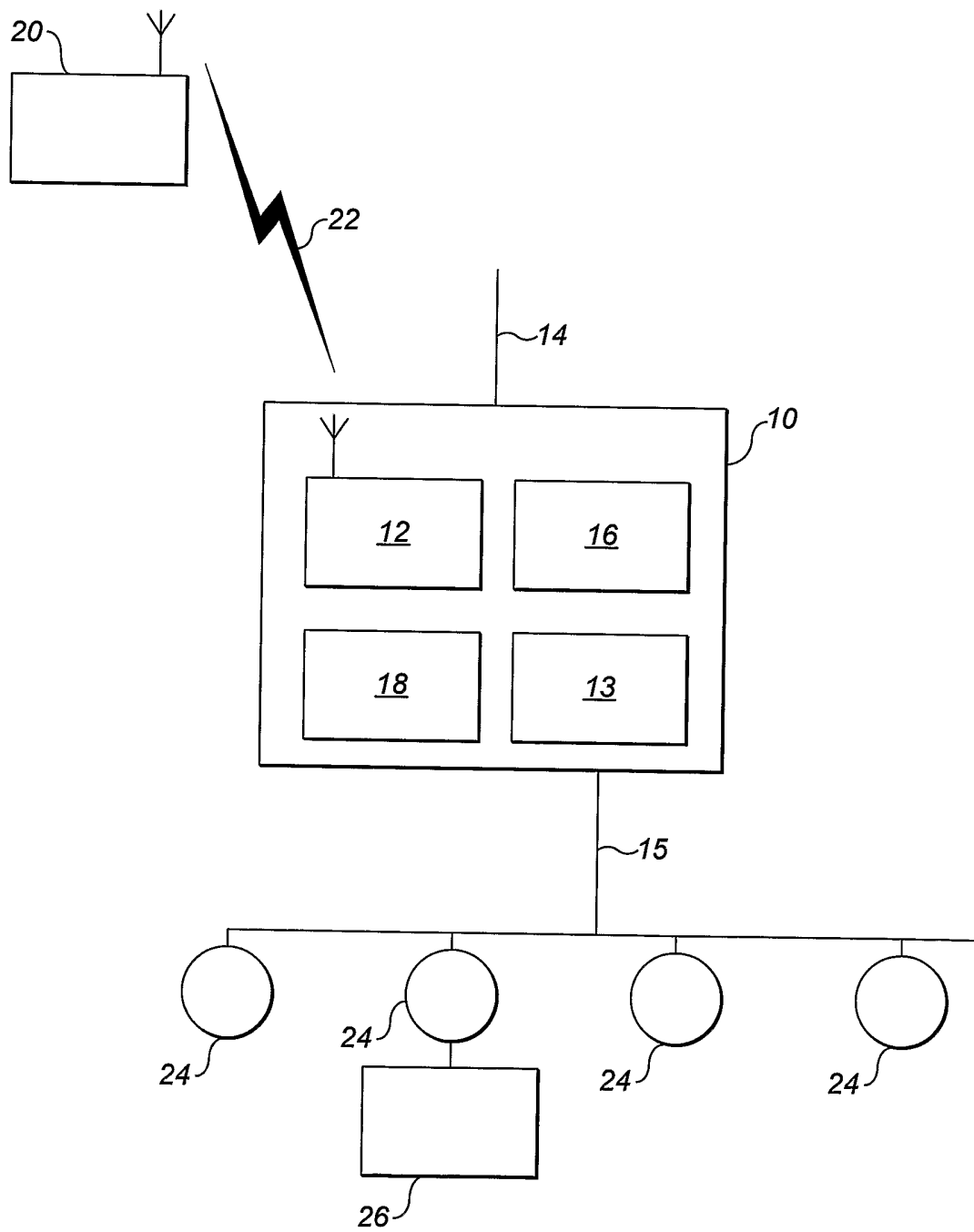
27 17. A method of wirelessly transmitting data, comprising
28 the steps of :
29 wirelessly transmitting data to a device;
30 receiving data at the device; and
31 transmitting data using a power line carrier method
32 from the device.
33

1 18. A method of providing a pre-paid metered control of
2 a of a controlled device, comprising the steps of :
3 wirelessly transmitting credit to a prepayment
4 meter;
5 receiving credit at the prepayment meter;
6 transmitting control signals using a power line
7 carrier method from the meter to the controlled
8 device; and
9 the controlled device being controlled responsive to
10 the control signals.

11

12 19. The method claimed by any previous claim wherein the
13 wireless transmission is achieved using GSM signals
14 (Global System for Mobile Communications).

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**FIG. 1**

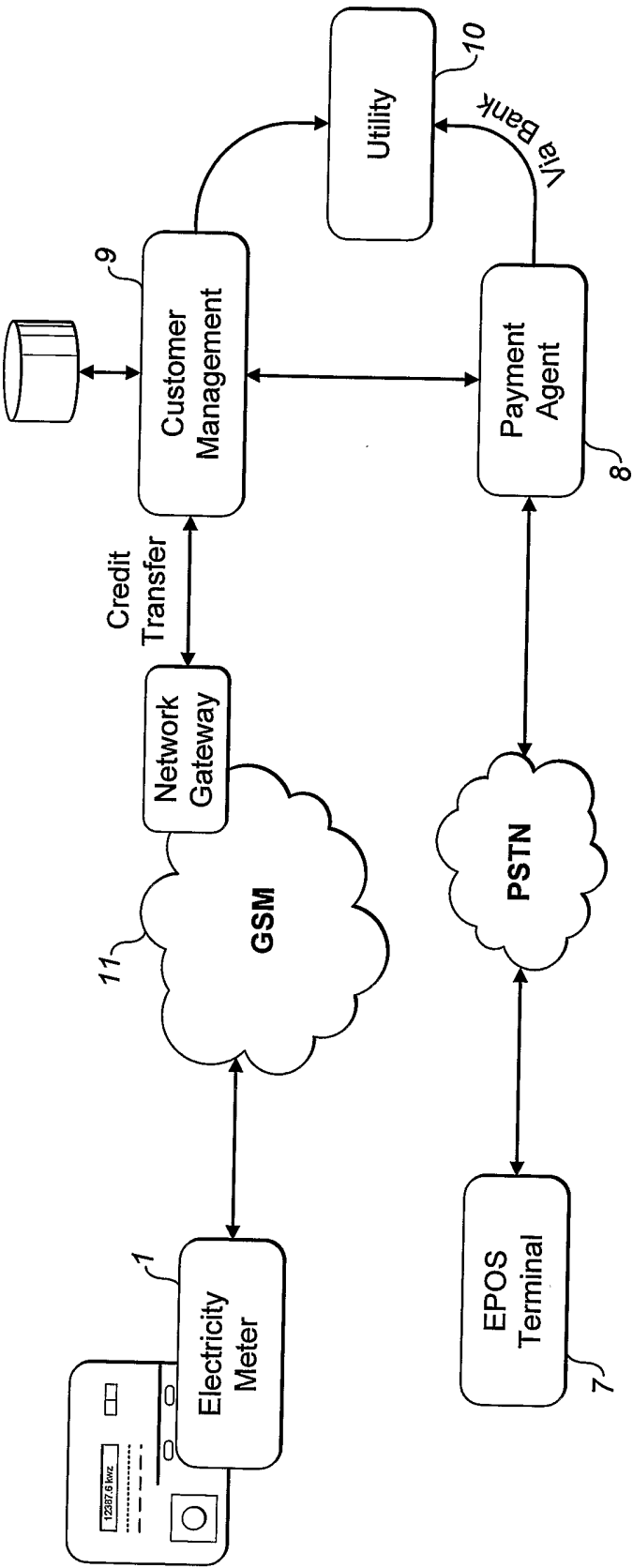


FIG. 2

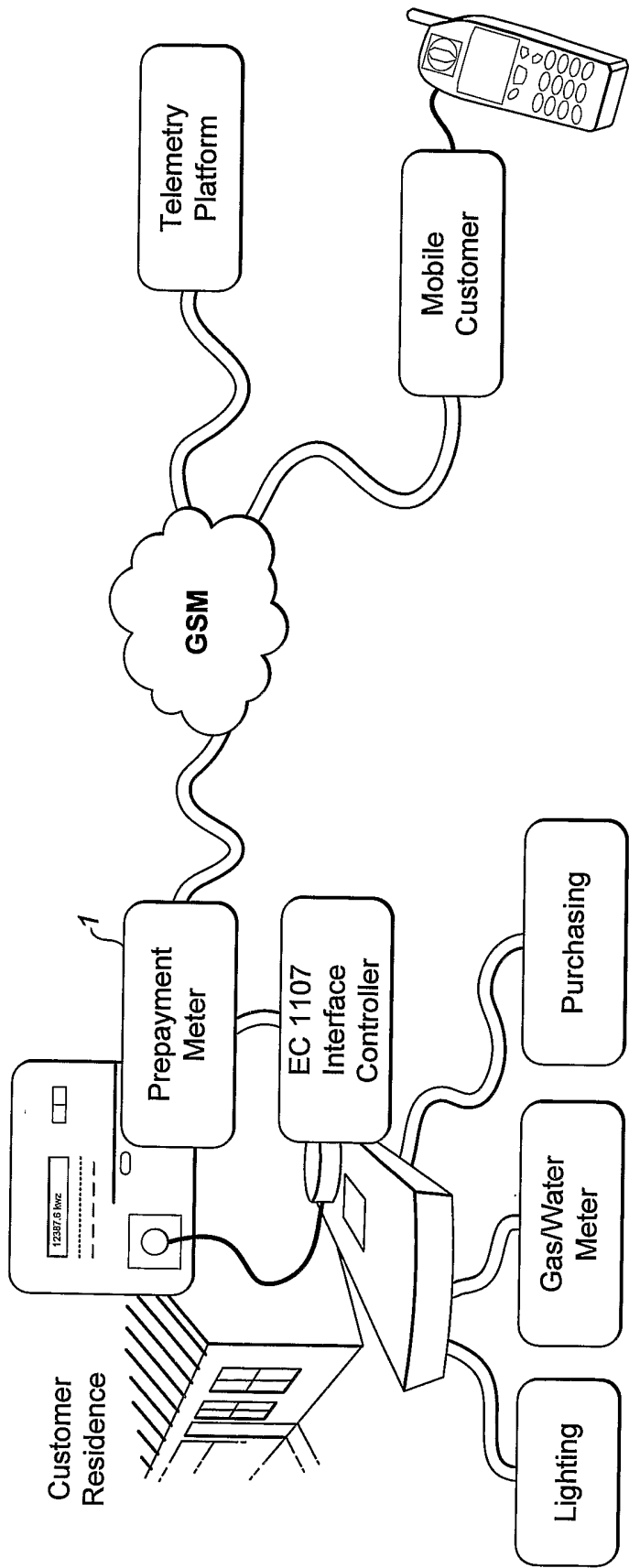
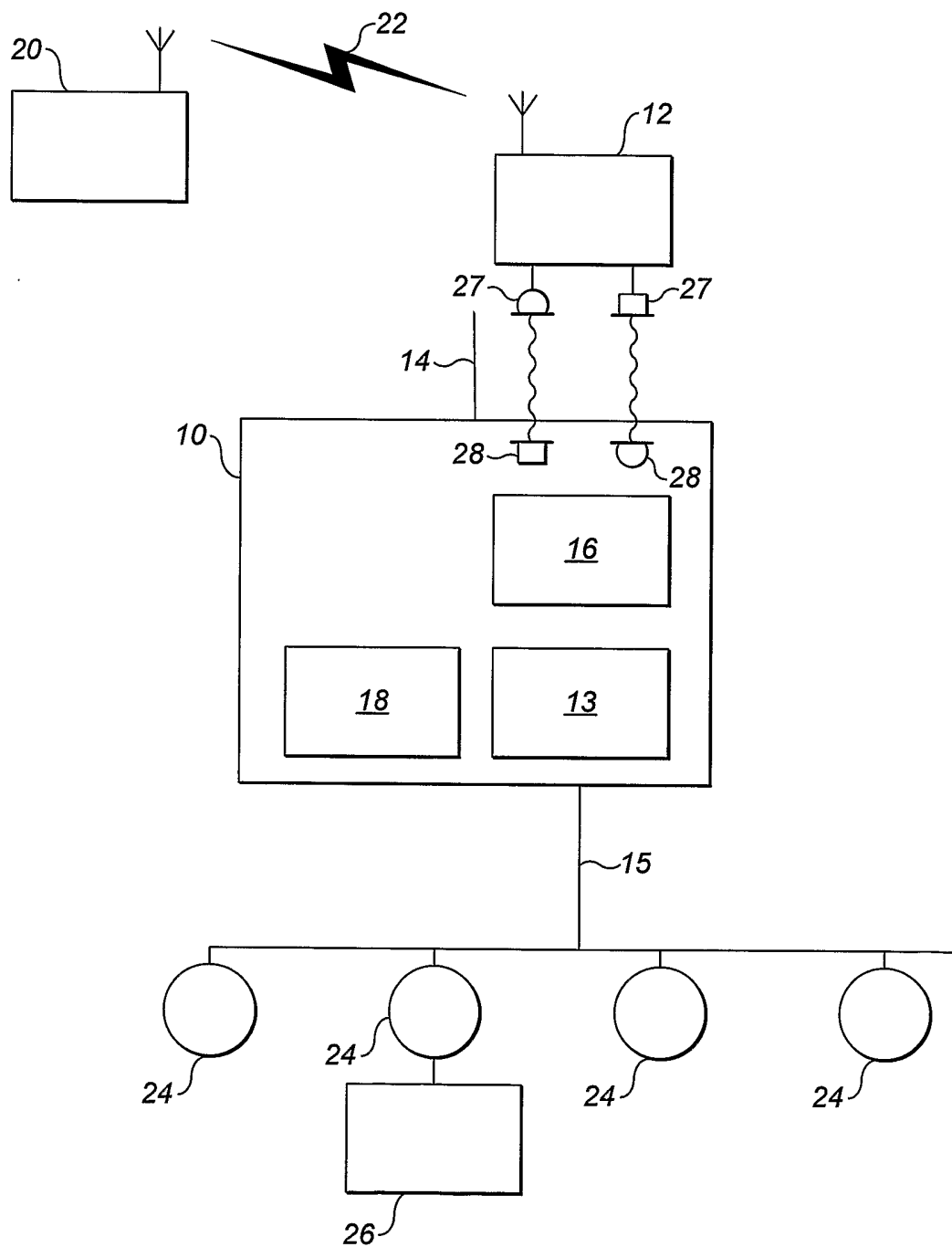


FIG. 3

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**FIG. 4**

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 03/05142

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04B3/54

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)

IPC 7 H04B

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 practical, search terms used)

EPO-Internal, WPI Data

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Y	page 2, line 3 - line 30; figure 1 page 5, line 15 -page 6, line 2; figure 2 page 12, line 15 - line 18	9-12
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X	US 6 300 881 B1 (ARAGAKI TAUL ERIC ET AL) 9 October 2001 (2001-10-09)	1,17
	column 4, line 39 - line 62; figure 2	
	--- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Intern Application No
PCT, ^{sub} 03/05142

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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