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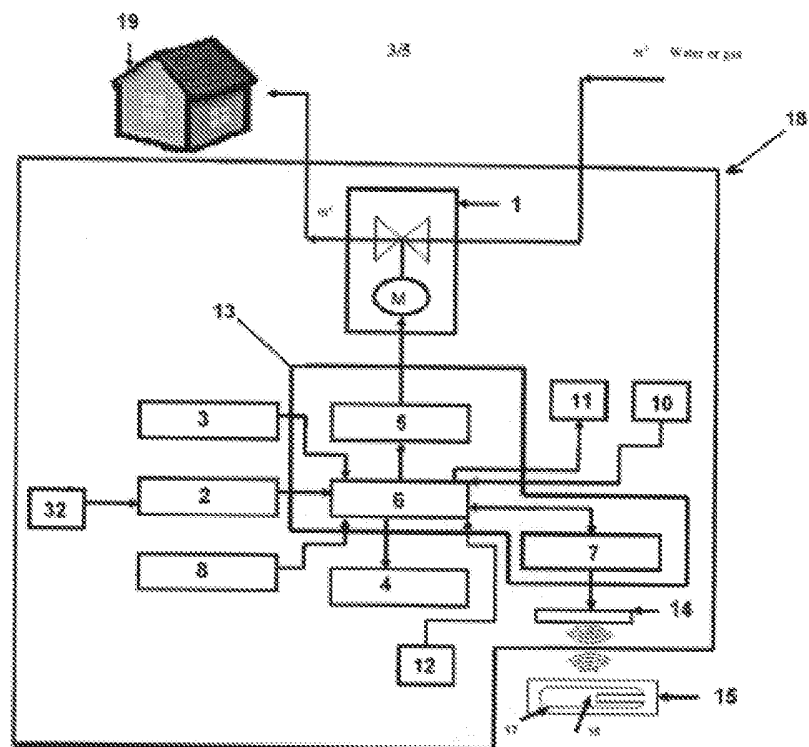
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(54) Benævnelse: **Prepayment system for supplying water or gas by means of a wireless intelligent card and meter for said system**

(57) Sammendrag:

A prepayment system for supplying water or gas by means of a wireless intelligent card is described. The present invention also relates to a bidirectional meter specially designed to electronically record the consumption of water or gas.

fortsættes



CLAIMS

1. A prepayment method for supplying water or gas using i) a wireless intelligent card loaded with a prepaid amount of service, ii)
5 a water or gas meter which comprises upper and lower protective covers, a wireless reader-writer element of wireless intelligent cards and a water or gas supply opening/closing mechanism, and iii) a network which includes at least one point of sale terminal with a pair of safety modules, a server connected via an interface to a billing
10 system which keeps the service supplier's database informed, wherein method comprises:

verifying the status of the water or gas supply meter's opening/closing mechanism in order to determine if it is open or closed,

15 detecting the state of the sensors on the upper and lower protective covers of the meter to determine if the meter has been tampered with,

detecting the presence of a prepayment wireless intelligent card within the meter's detection field,

20 exchanging information between the meter and the prepayment wireless intelligent card through radio frequency,

authenticating the prepayment wireless intelligent card and the wireless reader-writer of prepayment wireless intelligent cards, simultaneously, by means of two or more digital signatures and the
25 meter's serial number, determining if the prepayment wireless

intelligent card has a m³ prepaid balance which is above zero,

downloading the amount of purchased service in prepaid m³ from the prepayment wireless intelligent card and storing it in the meter's memory,

5 uploading all of the meter state information to the prepayment wireless intelligent card and recording it in the memory of said prepayment wireless intelligent card, where the information generated is in relation to the water or gas that has been consumed by the user during the life span of the meter and any unlawful act or
10 manipulation of the meter, and

electronically registering the water or gas consumption.

2. The prepayment method for supplying water or gas as set forth in claim 1, further characterized because the step to detect the presence of the prepayment wireless intelligent card within the
15 detection field of the water or gas meter also includes the steps of:

emitting a radio frequency signal from the meter via a wireless electronic measuring, prepayment and water or gas supply cut device;

determining if there is more than one prepayment wireless
20 intelligent card within the detection field of the water or gas meter; and

selecting the prepayment wireless intelligent card in accordance with a previously determined radio frequency data transmission protocol.

25 3 The prepayment method for supplying water or gas as set

forth in claim 1, further characterized because the step to verify the opening/closing mechanism of the water or gas meter comprises determining if the opening/closing mechanism for the meter's water or gas supply is open or closed in order to send a signal for its
5 subsequent opening or closing.

4 The prepayment method for supplying water or gas as set forth in claim 1, further characterized because the step to detect the state of the sensors on the upper and lower protective covers of the meter includes the transmission of a closing signal to the
10 opening/closing mechanism for the water or gas supply when one or both of the upper and lower covers on the meter are opened.

5. The prepayment method for supplying water as set forth in claim 1, further characterized further characterized because the step to download the amount of service purchased includes the
15 downloading of water supply information at a predetermined time, predetermined m^3 amount or both.

6. The prepayment method for supplying water as set forth in claims 1 and 5, further characterized because it also includes the following steps:

20 verifying if there is information about the water supply at a predetermined time, predetermined m^3 amount or both;

detecting water flow via the meter; and

in the event of not detecting any water flow, sending a signal to open the relief valve in order to release any air contained in the
25 water pipes.

7. The prepayment method for supplying water or gas as set forth in claim 1, further characterized because the step to download the amount of prepaid m^3 from the prepayment wireless intelligent card to the meter can be partial or total depending on the
5 predetermined amount recorded on the prepayment wireless intelligent card.

8. The prepayment method for supplying water or gas as set forth in claims 1 and 7, further characterized because the step to download the amount of prepaid m^3 from the prepayment wireless
10 intelligent card to the electronic meter also includes the steps of:

reading the remaining balance on the meter;

adding the total or partial download balance from the prepayment intelligent card to the remaining balance on the meter;
and

15 storing the new prepaid balance on the meter.

9. The prepayment method for supplying water or gas as set forth in claim 1, further characterized because it also includes the steps of:

reading the prepaid balance in the meter's memory;

20 verifying if the prepaid balance is greater than 0; and

verifying the state of the opening/closing mechanism of the water or gas supply in order to determine if it is open or closed; and

generating a signal to open or close the opening/closing mechanism of the water or gas supply based on the prepaid balance
25 read;

where when the balance is greater than 0, a signal will be generated to open the opening/closing mechanism for the water or gas supply with the aim of allowing the flow of water or gas through the meter; when the balance is not greater than 0, a signal will be
5 generated to close the opening/closing mechanism of the water or gas supply with the aim of cutting off the user's flow of water or gas through the meter.

10. A prepayment system for supplying water or gas by means of a wireless intelligent card which comprises:

- 10 a wireless intelligent card for the meter;
- a water or gas meter;
- a liquid crystal display to show information regarding the state of the meter;
- a feed source of electrical power for the water or gas meter;
- 15 a network which includes at least one point of sale terminal with a pair of safety modules, a server connected via an interface to a billing system which keeps the service provider's database informed;

wherein it is composed of a water or gas consumption meter
20 which includes:

- a) a wireless electronic measuring, prepayment and gas or water supply cut device which includes:
 - i) a wireless reader-writer of intelligent cards to:
 - detect the presence of a prepayment wireless intelligent card;
 - 25 interpret the commands of the prepayment wireless intelligent card;

and generate and send a radio frequency signal; where the wireless reader-writer of cards includes an encryption/decryption module to: verify and validate the authenticity of the prepayment card; encrypt the data transferred; and verify the validity of the information
5 recorded in the microcontroller's memory before downloading;

II) a microcontroller to monitor the functioning of the meter which has a flash memory to store the information generated in the meter in terms of the water or gas consumed by the user during the lifespan of the meter and any unlawful acts done to the meter; and

10 III) a controller for a supply cut device to open and close an opening/closing mechanism for the water or gas supply when the microcontroller thus requires it through a cut or opening signal;

b) a water or gas supply cut device; and

c) a signal transmission/reception element.

15 11. A meter to register the bidirectional consumption of water or gas which comprises:

a meter's main body which includes an entrance hole and an exit hole;

a measuring chamber within the meter's main body;

20 a supply and closing chamber within the meter's main body and in fluid communication with the measuring chamber;

a water or gas supply/cut valve within the supply and closing chamber;

a pair of upper and lower protective covers located on the main
25 body of the meter, and

a liquid crystal display located in the upper protective cover, wherein it is composed of:

a wireless electronic measuring, prepayment and gas or water supply cut device located within the upper protective cover of the meter's body,

wherein which the measuring chamber includes means with which to register the bidirectional consumption of water or gas, where the means to register the bidirectional consumption of water or gas are composed of a nutating disc and upper and lower covers which enclose nutating disc to keep it in position and thus ensure its correct measuring movement, a rod one end of which is located in the center of and extending upwards toward the nutating disc through the upper cover which encloses the nutating disc, and a magnetic element on the opposite end of the rod,

a first sensor element located on the adjacent external surface of the measuring chamber of the meter's main body and within the upper protective cover, where the first sensor element registers the spins of the magnetic element transmitted by the nutating disc in order to then calculate the volume of m^3 circulating within the measuring chamber, where the first sensor element is capable of recording the consumption of water or gas regardless of the flow direction;

a converting device of magnetic signal into digital signal attached to the first sensor element to convert the magnetic signal produced by the spins of the magnetic element into a digital signal,

where the converting device is also electrically connected to the wireless electronic measuring, prepayment control and water or gas supply cut device, where the wireless electronic measuring, prepayment control and water or gas supply cut device receives the digital signal and then transmits it to the liquid crystal display for its subsequent visualization;

a closing mechanism which includes a gear train, a sliding disc and a fixed disc which can open or close the water or gas supply, where the opening or closing gear train is operated by an engine, which is controlled by the wireless electronic measuring, prepayment and water or gas supply cut device which is electrically connected to said engine;

a printed circuit board antenna to communicate the information via radio frequency between the wireless intelligent card and the wireless electronic measuring, prepayment and water or gas supply cut device; and

a battery located above the supply and cut chamber, which provides the energy for the wireless electronic measuring, prepayment and water or gas supply cut device to register the bidirectional consumption of water or gas, to the engine which powers the closing mechanism and to the liquid crystal display.

12. The meter as set forth in claim 11, further characterized because the upper and lower protective covers are each comprised of a second sensor element to register the opening of either of the upper or lower covers, where in the event that at least one of the

upper or lower covers has been unhooked from the meter's main body, the meter will automatically cut off the service until a technician from the company re-establishes it.

13. The meter as set forth in claim 11, further characterized
5 because the water circulating through the entrance hole of the meter's main body enters the measuring chamber causing the nutating disc to spin and thus transmit its rotating movement to the magnetic element via the rod, where the first sensor element detects the number of spins of the magnetic element.

10 14. The meter as set forth in claim 11, further characterized because the closing mechanism also includes a pair of sensors to detect the position of the sliding disc, open or closed, where the sensors are connected to and send the position signal from the sliding disc to the wireless electronic measuring, prepayment and
15 water or gas supply cut device.

15. The meter as set forth in claim 11, further characterized because the meter is composed of, in the event of limited and scheduled water supply, a sensor to detect the flow of water in the supply line and a relief valve.

20 16. The meter as set forth in claim 15, further characterized because the water flow sensor is connected to the wireless electronic measuring, prepayment and supply cut device in order to receive a signal from the sensor which detects water flow, in the event of not detecting any water flow, the wireless electronic measuring,
25 prepayment and supply cut device will send a signal to open the

relief valve in order to release any air contained within the pipes and which could circulate via the meter and be registered as consumption.

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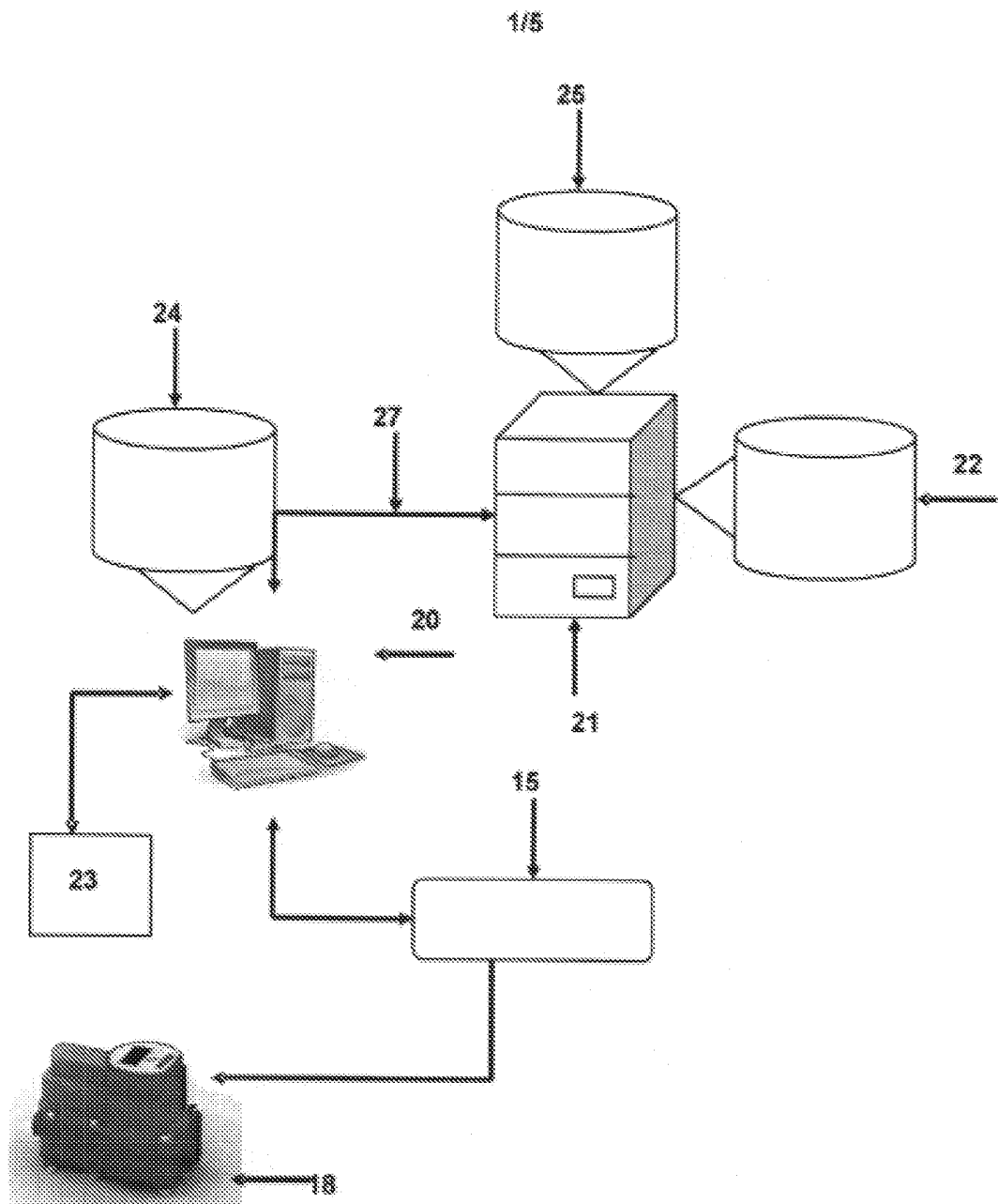
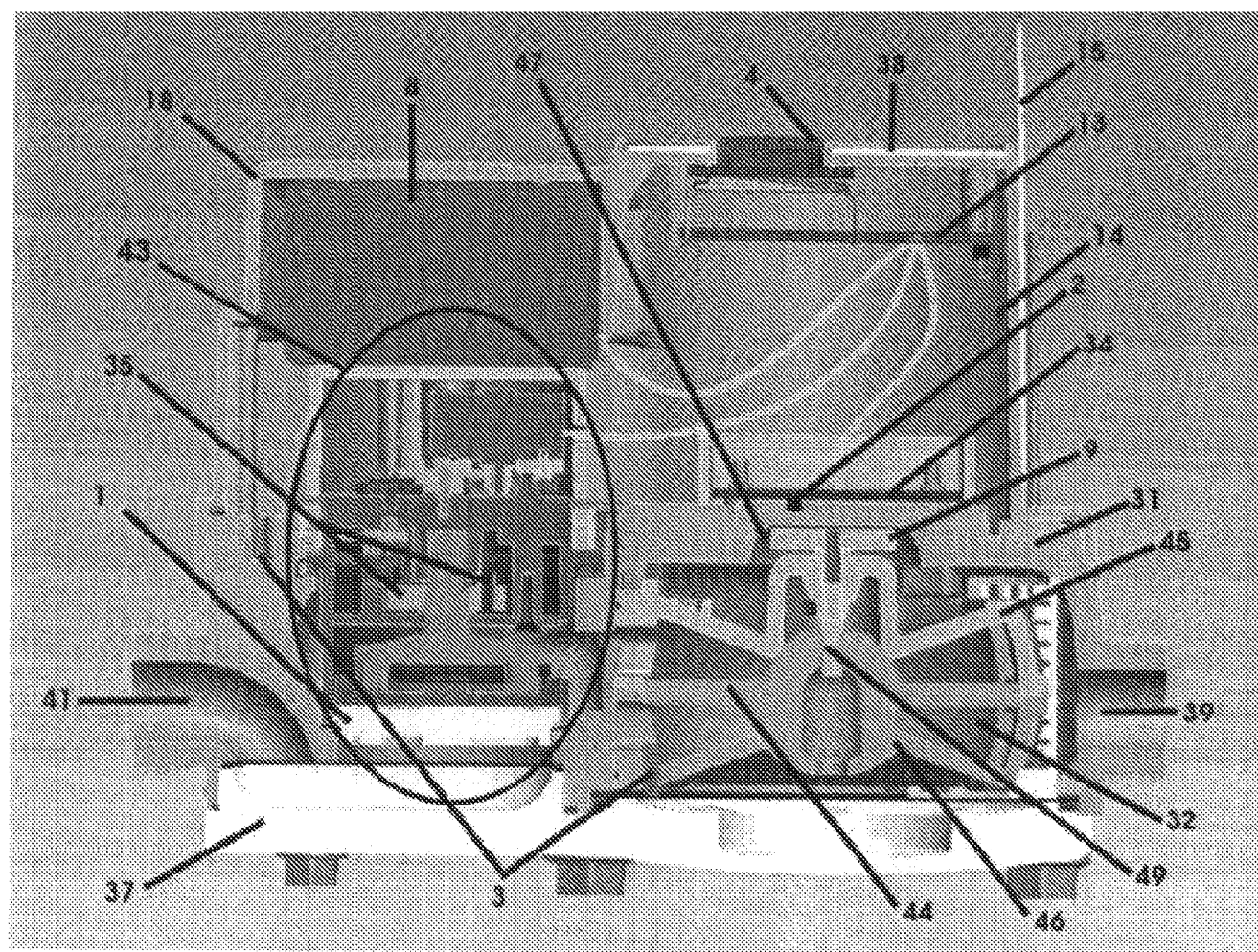


FIGURE 1



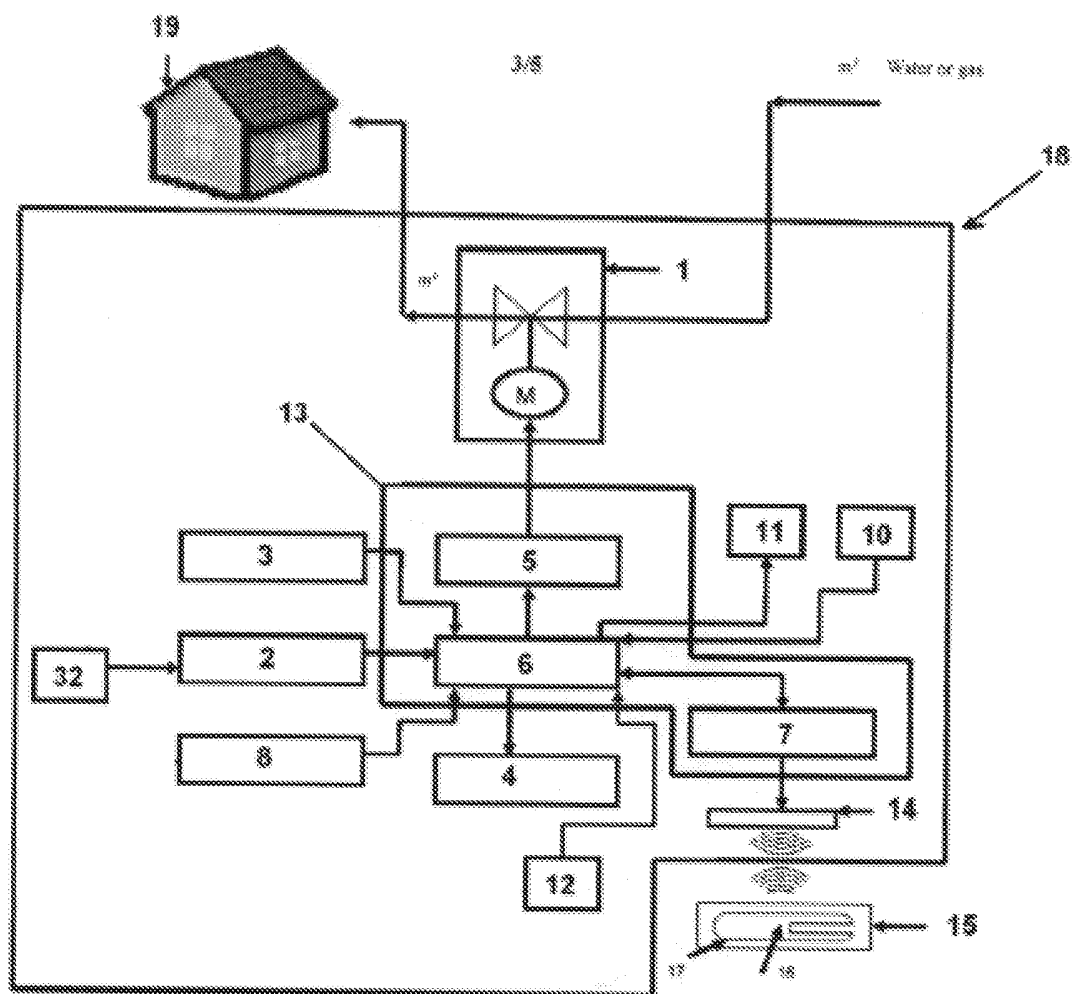


FIGURE 3

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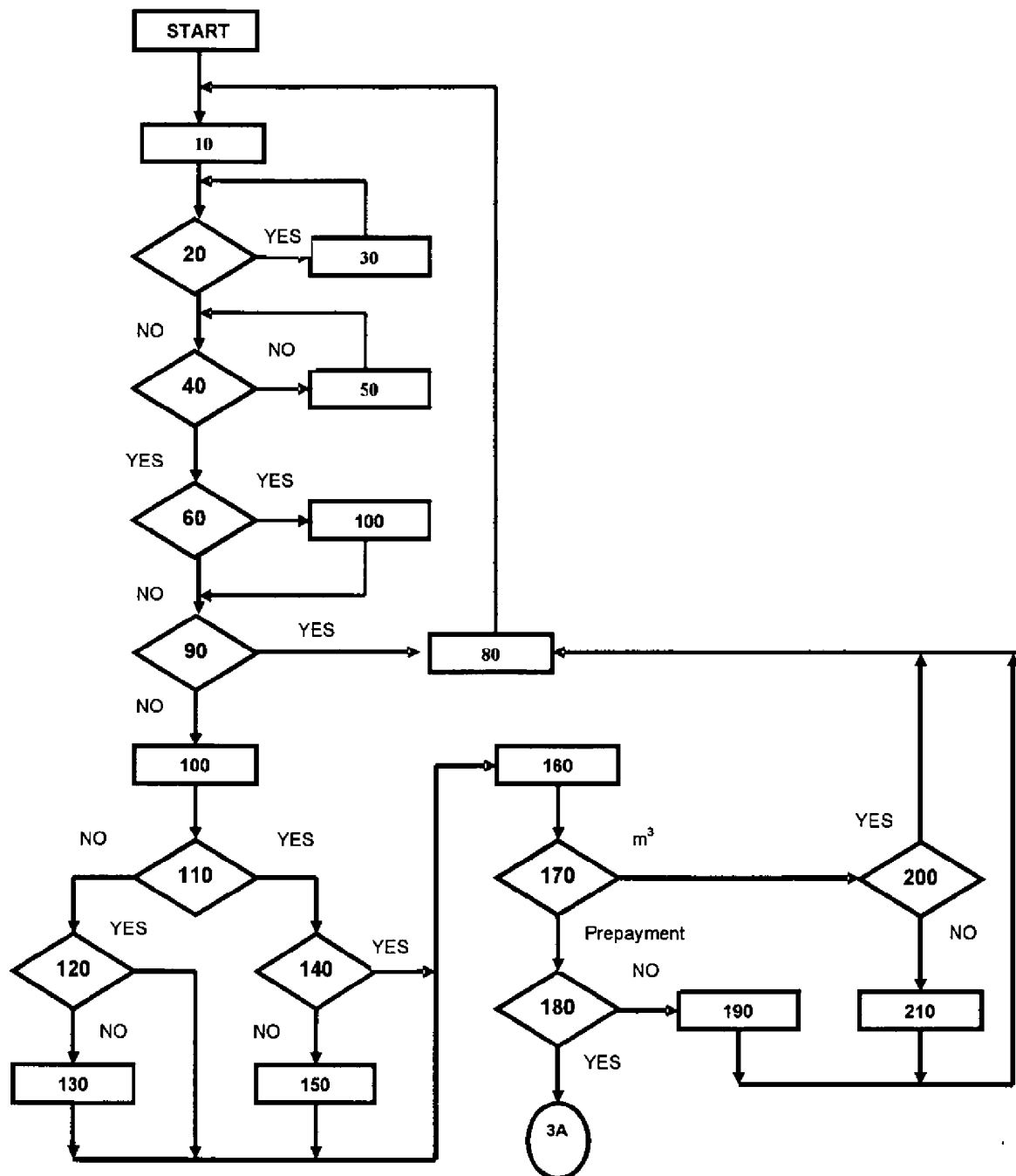


FIGURE 4

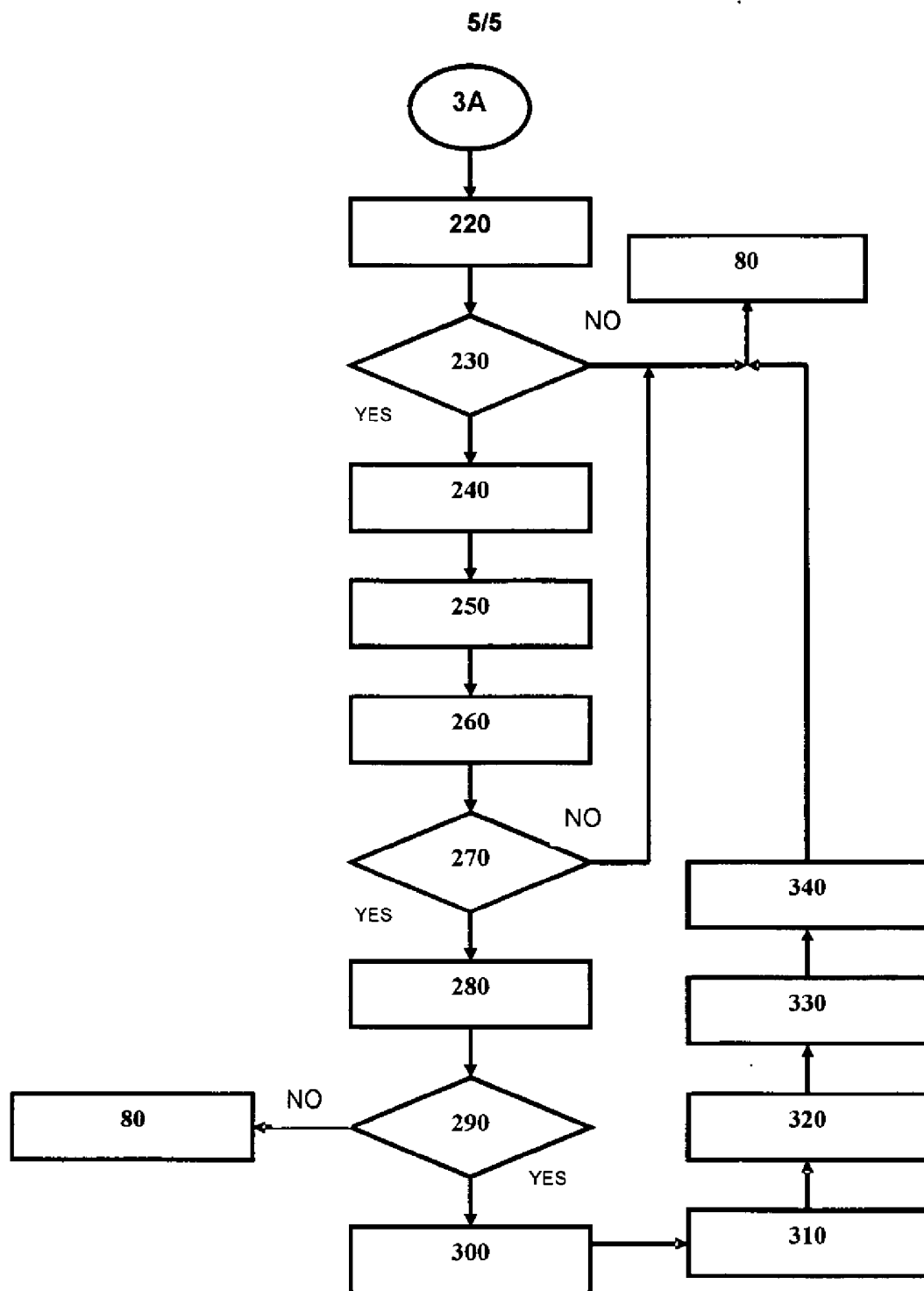


FIGURE 4A