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(54) **INTELLIGENT METERING SYSTEM**

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(52) **U.S. Cl.** **463/25**; 463/47
(58) **Field of Search** 463/25, 30, 31, 463/39, 43, 47

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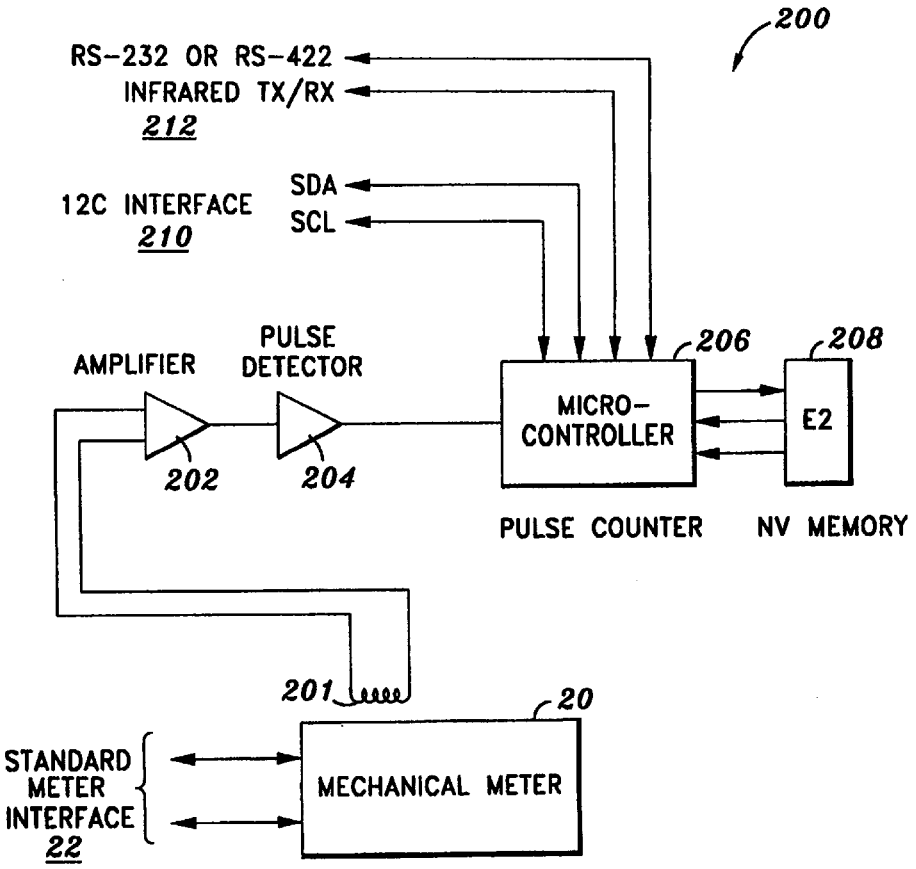
(57) **ABSTRACT**

The present invention is an intelligent metering system for currency-activated devices having an electromechanical meter. The intelligent metering system includes an inductive pickup winding associated with the electromechanical meter. An amplifier is coupled to the inductive pickup winding to boost a signal detected from the inductive pickup winding when electromechanical meter is actuated. A pulse detector, coupled to the amplifier, detects pulses, false triggerings and filters out EMF spikes. A microprocessor is coupled to the pulse detector for counting the pulses detected by the pulse detector and for storing meter data related to the counted pulses in a memory device. An interface is coupled to the microprocessor for transmitting the meter data from the memory device.

15 Claims, 3 Drawing Sheets



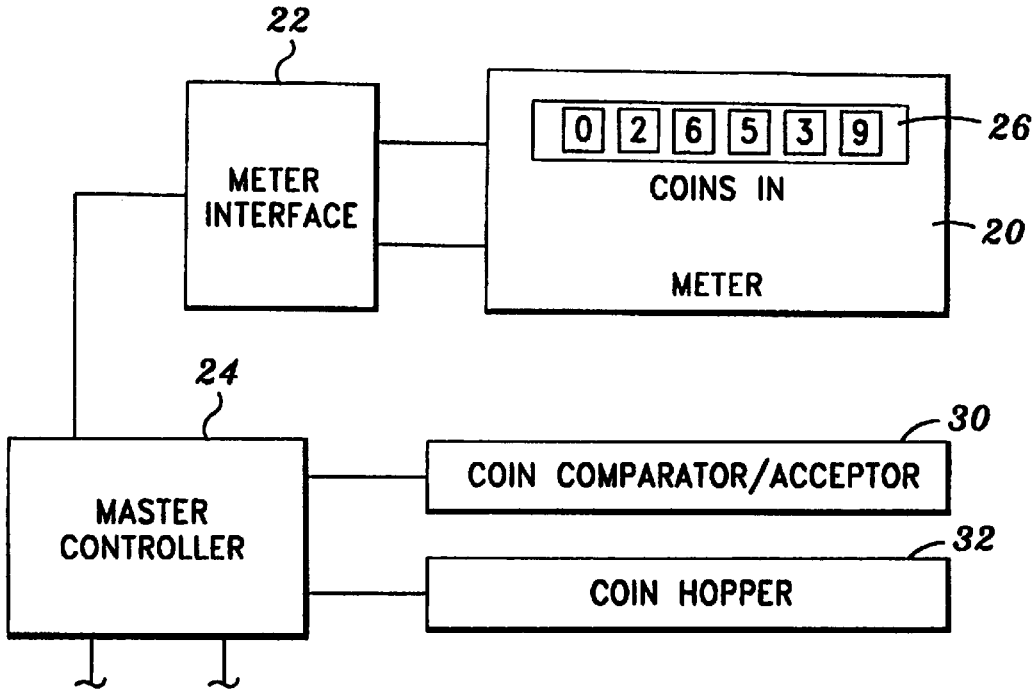


FIG. 1
(PRIOR ART)

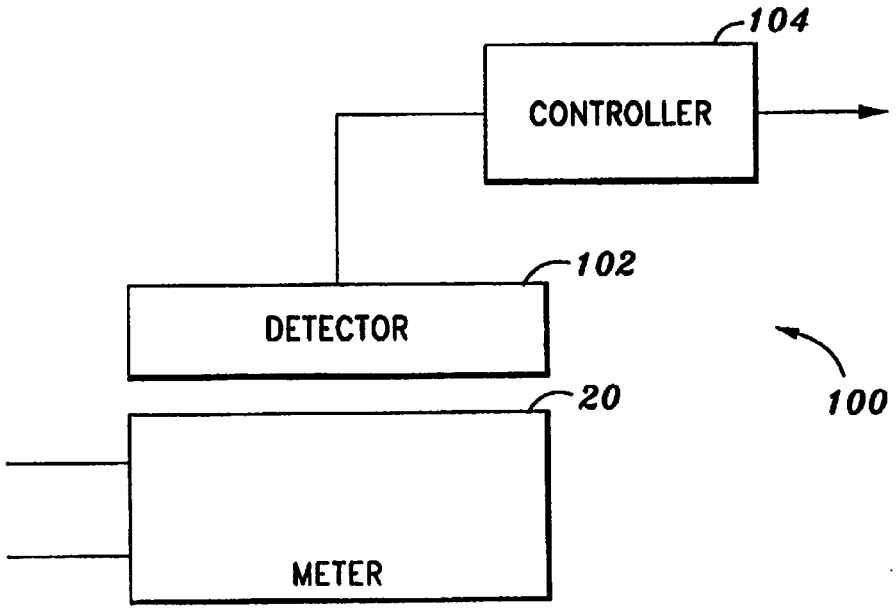


FIG. 2

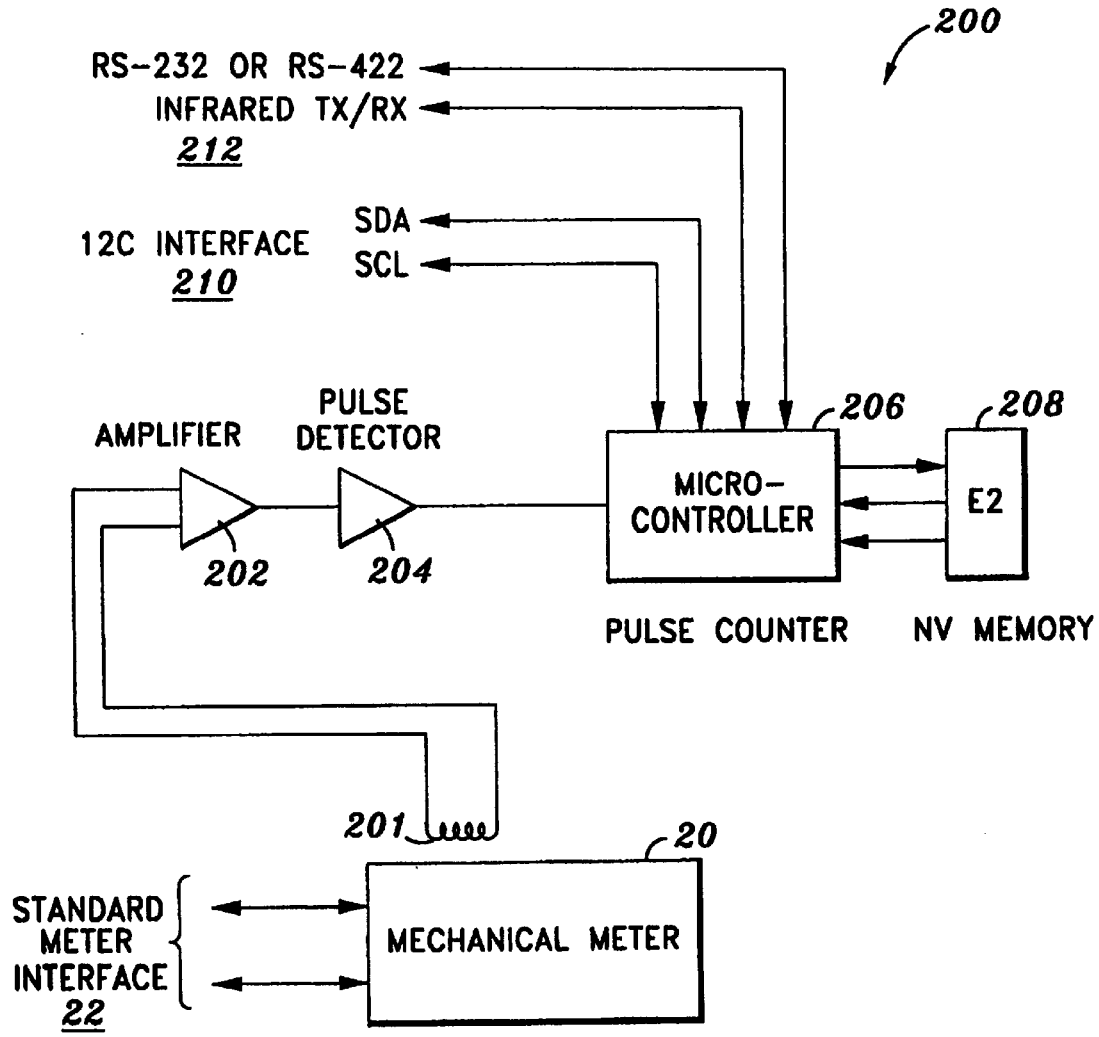


FIG. 3

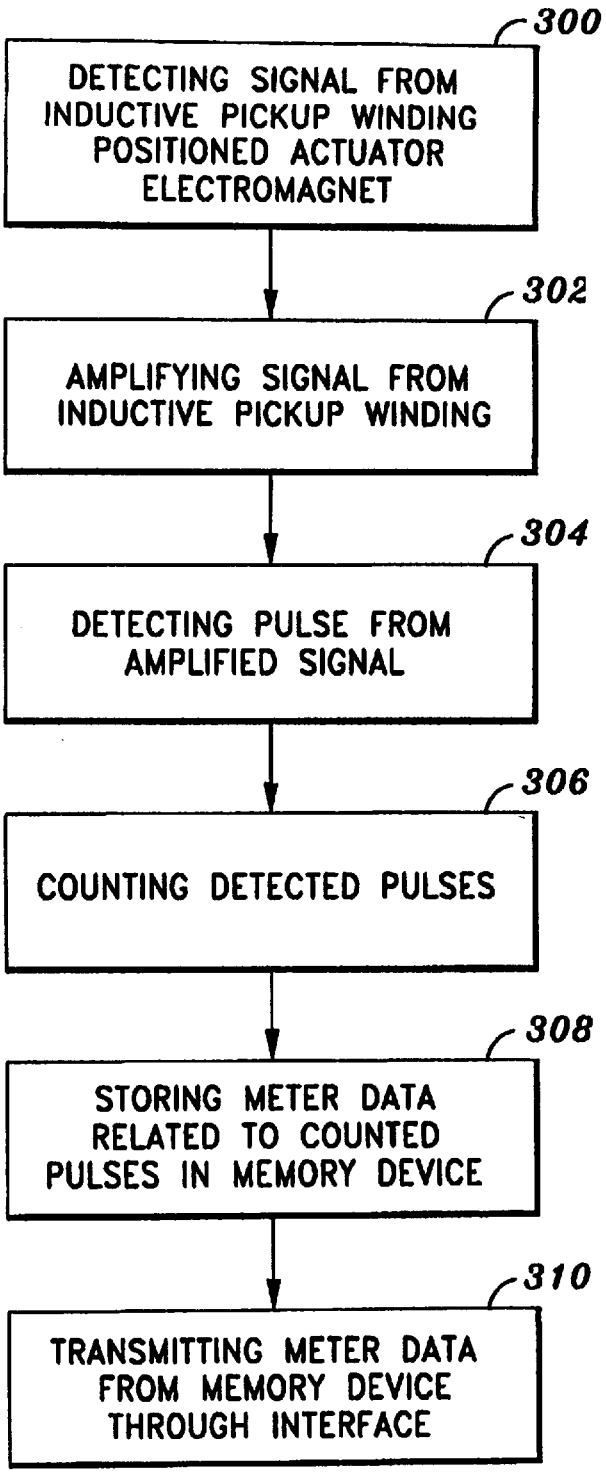


FIG. 4

INTELLIGENT METERING SYSTEM

FIELD OF THE INVENTION

The present invention is directed to metering systems, and more particularly to a method and apparatus for reading electromechanical counters electronically, and/or remotely.

BACKGROUND OF THE INVENTION

The gaming, arcade, and vending machine industry relies heavily on electromechanical counters, otherwise referred to as meters, to count coin and currency input. These electromechanical counters are the default standard used by gaming compliance agencies and other business entities to keep track of the monetary history of these devices. The meters report coin-in, coin-out (coins paid out), coins to drop (coins that go to the drop bucket), the number of games played, the number of jackpots, etc. Vending machines and arcade game machines use meters for similar functions.

FIG. **1** illustrates an example of such a meter as used in a gaming machine for tracking "coins in". As illustrated, the meter **20** is associated with a meter interface **22**. The interface **22** is normally associated with a master gaming machine controller **24**. The meter **20** includes a visible count indicator **26** in the form of rotating wheels having numbers printed thereon, the wheels cooperating to present a value indicative of coin input or other data. A person may visually inspect the count indicator **26** to obtain the data.

In use, a signal may be transmitted from a coin comparitor **30** or hopper **32** indicating that a coin has been received. This signal may be transmitted to the master gaming machine controller **24**. The master gaming machine controller **24** then sends a signal to the meter interface **22** indicating that a coin has been input, and that the meter **20** should be caused to increment the visible count indicator **26**. The signal from the master gaming machine controller **24** to the meter interface **22** is generally in accordance with a unique, and often proprietary communication/data protocol. The importance of this will be understood below. In any event, once the interface receives the data, it sends a signal to the meter **20** causing the meter to mechanically rotate one of the wheels of the count indicator **26** to reflect the coin input.

In the gaming industry, electronic systems have been devised that tap into the wire leads of the electromechanical meters and use an optically-isolated circuit that receives current when the meter is energized. This is used to acquire what is commonly known as the "soft" count (as opposed to a "hard" count, which comprises viewing the visible count indicator to obtain the data), because the machine system software is used to store the updated meter information in the machine logic board, or in a computer database via a network from the machine.

The interface and installation of these systems are labor intensive and require skilled technicians to properly tap into the meters. Errors in the installation can cause the machine and the meter to malfunction. For example, by tapping into the meter leads, the impedance and other electrical characteristics of the circuit may be substantially altered. This alteration may prevent proper operation of the meter. Additionally, the amount of circuitry and cabling required to interface with all of the various types of machines and manufacturers is extensive.

Another problem is that the firmware program required to support all of the different installations and machine types is extensive and requires very specialized programming skills.

In the gaming industry, the more modem slot machine designs provide meter information via a specialized serial interface which, as discussed above, may operate in accordance with a proprietary protocol. Because slot machine vendors often sell electronic slot machine accounting systems, they will charge fees to use the protocol. Some of these protocols have become industry standards, and the owners of these standards charge fees for the latest versions or enhancements. Thus, obtaining the meter information by tapping into the data lines first requires knowledge of ever-changing protocols and complex programming, and may also require payment to the slot machine vendor which owns the rights in the proprietary protocol.

No matter how new the design of the machine is and the protocol for data transfer with its interface, however, the electromechanical meter is still the standard for measurement. Just like an odometer in an automobile, it must be reliable and trusted and not easily tampered with. The electromechanical meter manufacturers design these devices to work reliably for millions of cycles. The meters are placed in machines to function autonomously. They are mounted in the machine housing, and even if the logic board of a machine is changed (such as putting a new game into an old machine, using new hardware and/or software), the meters remain intact. In a gaming environment, a meter change in a slot machine, or any other gaming machine, must be reported to the appropriate gaming compliance agency.

Nevertheless, electromechanical counters are sill prone to tampering. Although these electromechanical counters do not have a reset feature, they still may be physically altered. Furthermore, a person reading the electromechanical counter may mistakenly misread and record the number shown on the meter, or an unscrupulous individual may deliberately record the wrong number. Therefore, inaccurate data of the financial performance of the machines would be reported. The ability to tamper with the counters to meters without detection has lead to abuse by unscrupulous collectors and service personnel who may decrease the number of games played (or coins inserted, etc.) in order to collect the unreported portion of the revenue.

SUMMARY OF THE INVENTION

The present invention comprises an intelligent metering system. In one embodiment, the invention comprises a secondary metering system associated with a primary metering system which includes an electromechanical meter.

In one embodiment, the intelligent metering system includes a detector for passively detecting an event of the electromechanical meter. In a preferred embodiment, such an event comprises the receipt of an electrical signal activating the electromechanical meter for incrementing or decrementing a visible count indicator of the meter. The detector provides an output to a controller. The controller manipulates the detector output, such as by counting output signal pulses and/or transmitting an output.

In one embodiment, the detector comprises an inductive pickup coil or winding. The controller includes an amplifier coupled to the inductive pickup winding to boost a signal detected from the inductive pickup winding, a pulse detector coupled to the amplifier for detecting pulses, a microprocessor coupled to the pulse detector for counting the pulses detected by the pulse detector and for storing meter data related to the counted pulses in a memory device, and an interface coupled to the microprocessor for transmitting the meter data from the memory device.

In one embodiment, the inductive pickup coil comprises a secondary winding on an actuator electromagnet of the

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