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Rubenstein

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[54] **PARKING METER**

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Related U.S. Patent Documents

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[52] **U.S. Cl.** **58/142;** 58/39.5; 340/51

[58] **Field of Search** ..... 58/39.5, 141–143; 235/92 PE, 92 T, 92 EA; 340/51; 194/DIG. 22, DIG. 18

[56] **References Cited**

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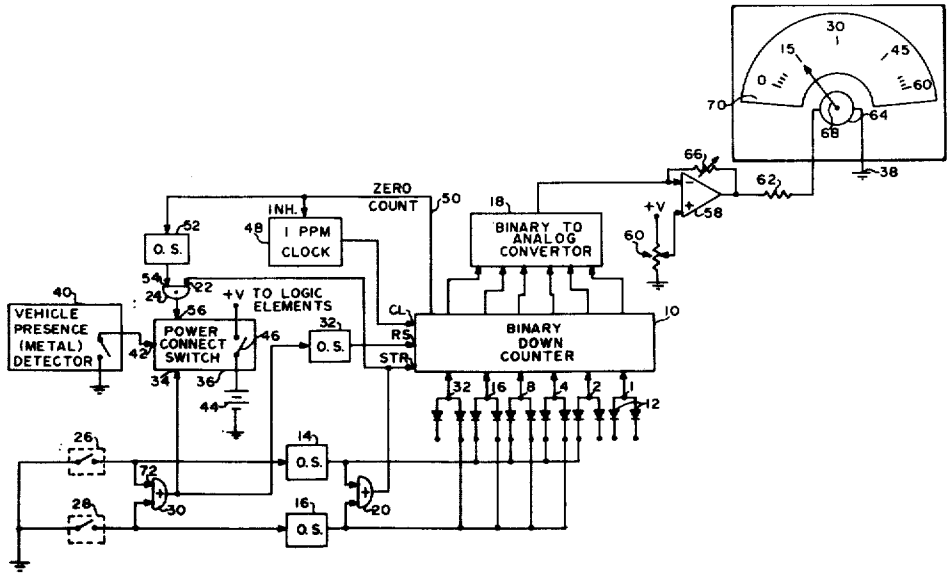
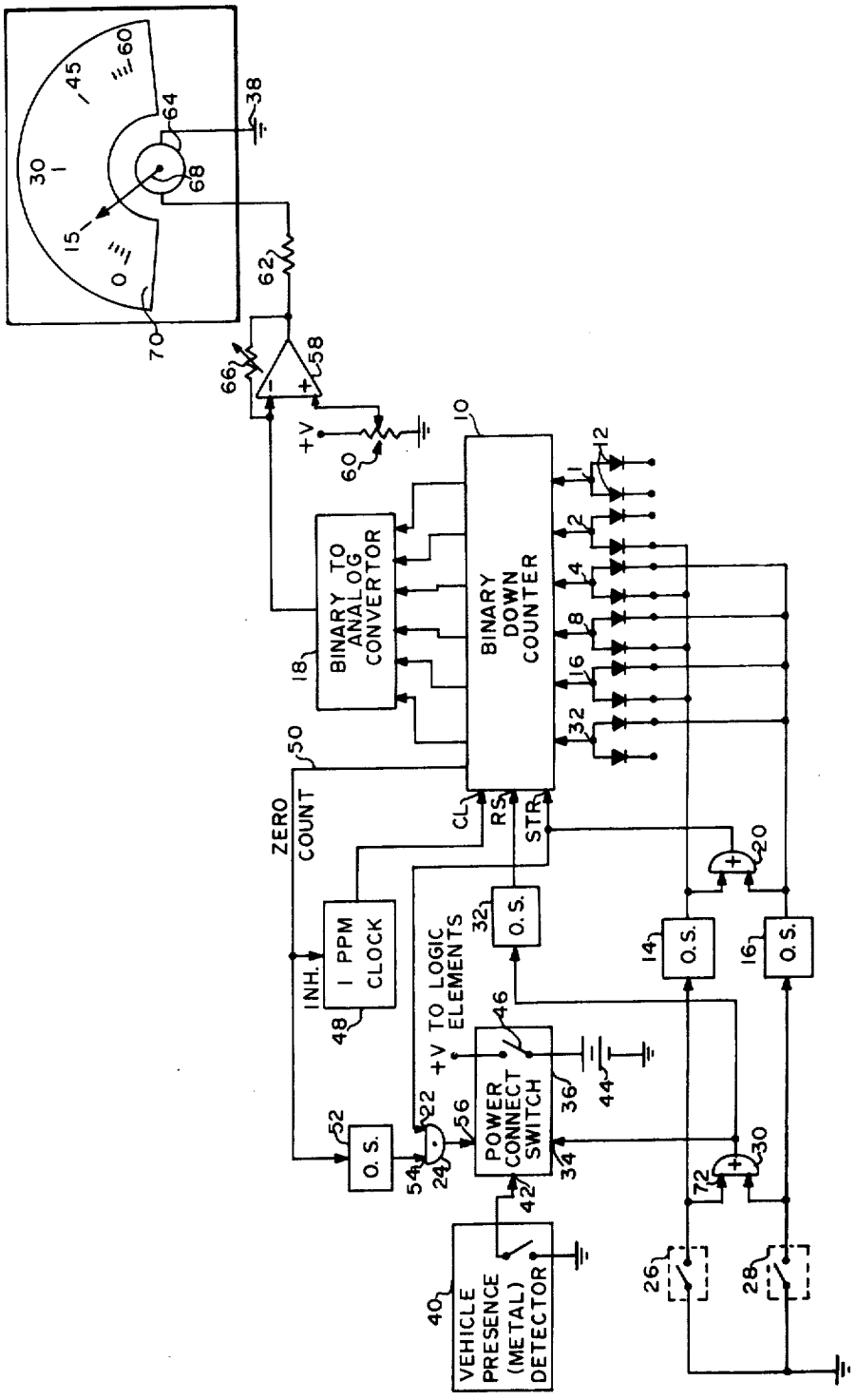
[57] **ABSTRACT**

A parking meter which electrically indicates "remaining time" and which electrically operates only in the presence of a vehicle and when there is "paid-for" time on the meter. Thus, for example, unused time by one departing motorist is cancelled.

6 Claims, 1 Drawing Figure




BINARY TO ANALOG CONVERTOR
BINARY DOWN COUNTER
ZERO COUNT
INH.
1 PPM CLOCK
+V TO LOGIC ELEMENTS
POWER CONNECT SWITCH
VEHICLE PRESENCE (METAL) DETECTOR
O. S.
CL
RS
STR
+V

PARKING METER

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to parking meters, and particularly to an improved digitally-controlled electronic parking meter.

2. General Description of the Prior Art

Conventional parking meters are essentially coin-operated mechanical clocks. They are fairly expensive and require a good deal of service to properly maintain them. Their efficiency insofar as financial return is concerned is seriously impeded by virtue of the fact that the unused time by one motorist may be used by a second motorist without further payment. It is the object of the present invention to overcome these deficiencies.

SUMMARY OF THE INVENTION

In accordance with this invention, a parking meter is constructed utilizing an electronic down counter. [A metal locator positioned on the parking meter is directed toward the parking space to be covered, and it operates a switch which readies the meter; and if the meter is on and a vehicle departs, it turns the meter off.] Appropriate denomination coin-operated switches set the down counter to an appropriate timing count, e.g. a dime coin would set the down counter to 30, representing 30 minutes. The operation of the coin switch starts a one-pulse-per-minute clock, which counts the down counter down. The output of the down counter is connected to a readout (either of the digital or analog types) to display remaining paid-for occupancy of a parking space.

BRIEF DESCRIPTION OF THE DRAWING

The single drawing is an electrical schematic diagram of an embodiment of the invention.

DETAILED DESCRIPTION OF THE DRAWING

Referring to the drawing, there is shown an electrical block diagram of one embodiment of the invention. Basic timing [fur] *of* the parking meter is accomplished by binary down counter **10**, which in this system is a six stage binary counter. The set input of each stage of binary down counter **10** is selectively coupled through an isolation diode **12** to the outputs of one shots **14** and **16**. The set output of each stage of binary down counter is in turn connected as an input to binary to analog converter **18**, which converts the binary output to a voltage which is representative of the binary value stored in binary down counter **10**. The outputs of one shots **14** and **16** are "OR" coupled together by OR gate **20**, the output of which serves as a strobe input STR to the binary counter. The output of OR gate **20** is further connected as an "inhibit" input **22** of AND gate **24**. The inputs of one shots **14** and **16** are connected to the stationary contacts of coin-operated switches **26** and **28**, which are also "OR" coupled together by OR gate **30**. The output of OR gate **30** is coupled as a trigger input to one shot **32**, the output of which is fed as a reset signal RS to reset binary counter **10**. The output of OR

gate **30** is also connected as a "turn on" signal **34** to power connect switch **36**. The movable arms of coin-operated switches **26** and **28** are tied together and to common ground **38**. One contact of vehicle presence detector switch **40** is connected to common ground, and the movable arm is connected as an enable input **42** of power connect switch **36**. Power to operate the system is applied from battery **44**, the negative terminal of which is tied to common ground, and the plus end of which is connected to movable arm **46** [of] *to* power connect switch **36**, having a stationary contact connected as a plus voltage output to all logic elements of the system. A selected count stored in binary down counter **10** is counted down in discrete increments by the output of one PPM clock **48**, the output of which is connected to the clock input CL of binary down counter **10**. Once the down counter counts to zero, or if it has been reset to zero, a pulse is produced on zero count line **50**, which inhibits one PPM clock **48** and applies a trigger pulse to one shot **52**. The output of one shot **52** is connected as one input **54** of AND gate **24**, which is connected as a "turn off" signal **56** to power connect switch **36**. The output of binary down counter **10** is coupled to the input of binary to analog converter [**10**] *18*, which converts the "time remaining" binary count to an analog signal. This signal is coupled to the inverting output of amplifier **58**, which has a positive or noninverting input connected to the wiper of potentiometer **60**. Calibration potentiometer **60** is connected between plus voltage and common ground. The output of amplifier **58** is connected through series meter resistor **62** and meter movement **64** to common ground **38**. The output of amplifier **58** is scaled with respect to the input by feedback resistor **66**, which varies the gain of amplifier **58**. Elongated pointer **68** is attached to meter **64** and serves to indicate remaining parking time in minutes between 0 and 60 minutes, as observed on calibrated scale **70**.

For the purpose of illustrating operation of the system, it is assumed that a 10-cent coin allows parking for a period of 30 minutes, while a 25-cent coin permits one hour of parking. Accordingly, the output of one shot **14** is strapped to the **1**, **2**, **4**, and **8** inputs of binary counter **10** to thus set a count of 30 into binary counter **10**. The output of one shot **16** is connected as shown to the **4**, **8**, **16**, and **32** inputs of binary counter **10**, and thus a count of 60 would be gated by a quarter into binary counter **10**. In operation, once a vehicle has been parked in the space served by the parking meter, presence detector switch **40** (a conventional metal locator adapted to close a switch when metal is determined and which would be pointed at the parking space involved) is closed. This switch provides an enable input to input **42** of power connect switch **36**.

Assuming it is desired to park 30 minutes, a 10-cent coin would be inserted, which would close coin switch **26**. This switch is a roll-over type switch, and hence the coin would simply roll over the switch, close it, and then open it. Upon the closure of the switch, a ground is applied to one input **72** of OR gate **30**, which produces a pulse to input **34** of power connect switch **36**, which closes contacts **46**, applying plus voltage to all logic elements of the parking meter. When the coin rolls over a switch **26**, an output of OR gate **30** triggers one shot **32** and an output of switch **26** triggers one shot **14**. [An output of one shot **32** applies a reset pulse to binary counter **10** and resets counter **10** to a zero condition.] An output of one shot **14**, which is a longer delay

than one shot **32**, applies a true signal through diodes **12** to inputs **1**, **2**, **4**, and **8** of binary counter **10**. An output of OR gate **20** applies a strobe pulse to counter **10** and inhibits input **22** of AND gate **24**. At the end of the reset pulse, and output appears on zero count line **50**, which inhibits one PPM clock **48** and applies a trigger pulse to one shot **52**. The output pulse of one shot **52** occurs at input **54** of AND gate **24**, which does not produce an output to the turn off input **56** of power connect switch **36**, since input **22** is inhibited by an output of OR gate **20**.

Accordingly, at the end of the output from one shot **14**, a count of 30 is gated into binary down counter **10** by the strobe at the output of OR gate **20**. Once the count is gated into the counter, zero count line **50** is no longer true, and one PPM clock **48** is enabled and produces a train of pulses, which occur at one-minute intervals. Each clock pulse at the countdown input CL subtracts one count from binary down counter **10**. A voltage which represents the 30-minute count is fed to amplifier **58** and produces a current which causes the meter to be deflected to the observed 30-minute marker of scale **70**. This is calibrated as follows so as to read an accurate count. With the binary counter set to zero, potentiometer **60** is adjusted so that the indicator reads zero. With a count of 60 in the binary counter, scale adjust resistor **66** has been set to read 60 minutes on the indicator. Once the timer has been energized by the insertion of a coin, 30 discrete counts from one PPM clock **48** subtract the count previously stored in binary counter **10**, and the count now is at zero count. An output of zero count line **50** inhibits clock **48** and triggers one shot **52**. The output of one shot **52** is now coupled through AND gate **24** to the turn off input **56** of power connect switch **36**. This pulse opens power connect switch **36**, disconnecting power from the parking meter.

Thus, regardless of the time the vehicle is left in the [paring] *parking* space, no further energy is drawn from the parking meter battery **44**. A like series of events occur when a 25-cent coin is deposited in the parking meter. The coin rolls over switch **28**, which closes and opens as before described. Before opening of the switch, power connect switch **36** is closed through input **34** and one shot **32** is triggered to reset binary counter **10**. The output of one shot **16** applies a strobe signal to the counter and an inhibit to AND gate **24** through OR gate **20** and presents a true signal to the **4**, **8**, **16**, and **32** inputs of binary counter **10**. In this manner, a count of 60 is now gated into the binary counter. Zero count line **50** is no longer true, which enables clock **48**, and a count of 60 is indicated by indicator **68**. Thus, after 60 counts, the counter counts down to zero, and zero count line **50** again inhibits clock **48** and produces a pulse at the output of one shot **52**, which disconnects power connect switch **36**. Assuming that at any time during the one-hour parking period a vehicle is removed from the parking space, then vehicle presence detector switch **40** would open. Since a ground is required at enable input **42** of power switch **36** in order to maintain the switch at an "on" position, once the vehicle drives off, switch **36** opens and removes power from the meter, which then goes to zero time on the indicator and the battery is disconnected from the logic so as not to drain power from the battery. This also prevents the next vehicle from receiving free parking time, since in order to legally park, a coin must again be deposited in the meter.

What is claimed is:

1. A parking meter comprising:

counting means comprising:

an electrical down counter,

first input means responsive to a selected input for initially setting said down counter to a selected count, and

second input means for providing clock input signals to said down counter, whereby with each signal said down counter is counted down a selected count;

coin-operated switching means including at least one coin switch and means responsive to the receipt of a particular coin for operating said switch and providing a selected count input to said first input means of said down counter;

vehicle detection means responsive to the detection of the presence of a vehicle for applying a circuit operating bias to at least said counting means;

clock means for providing electrical pulses at a selected time rate to said second input means; and

readout means responsive to the output of said down counter for visually indicating an output state of said down counter.

2. A parking meter as set forth in claim **1** wherein said readout means comprises means for indicating whether time remaining on said meter is finite or zero.

3. A parking meter as set forth in claim **2** wherein said readout means comprises means for indicating the remaining "paid for" time on said meter.

4. A parking meter as set forth in claim **1** wherein said readout means is a meter, indicating "remaining time" in minutes.

5. A parking meter as set forth in claim **4** wherein said vehicle detection means comprises metal detection means for applying said operating bias upon the detection of the presence of a metal body.

6. A parking meter comprising:

counting means comprising:

an electrical down counter,

first input means responsive to a selected input for initially setting said down counter to a selected count, and

second input means for providing clock input signals to said down counter, whereby with each signal said down counter is counted down a selected count;

coin-operated switching means including at least one coin switch and means responsive to the receipt of a particular coin for operating said switch and providing a selected count input to said first input means of said down counter;

clock means for providing electrical pulses at a selected time rate to said second input means; and

readout means responsive to the output of said down counter for visually indicating remaining paid-for time.

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