US 20030001579A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2003/0001579 A1**

Bertness (43) **Pub. Date: Jan. 2, 2003**

(54) **METHOD AND APPARATUS FOR AUDITING A BATTERY TEST**

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(21) Appl. No.: **10/098,741**

(22) Filed: **Mar. 14, 2002**

Related U.S. Application Data

(60) Continuation-in-part of application No. 09/575,629, filed on May 22, 2000, now Pat. No. 6,445,158, which is a continuation-in-part of application No. 09/293,020, filed on Apr. 16, 1999, now Pat. No. 6,351,102, which is a continuation-in-part of application No. 09/426,302, filed on Oct. 25, 1999, now Pat. No. 6,091,245, which is a division of application No. 08/681,730, filed on Jul. 29, 1996, now Pat. No. 6,051,976.

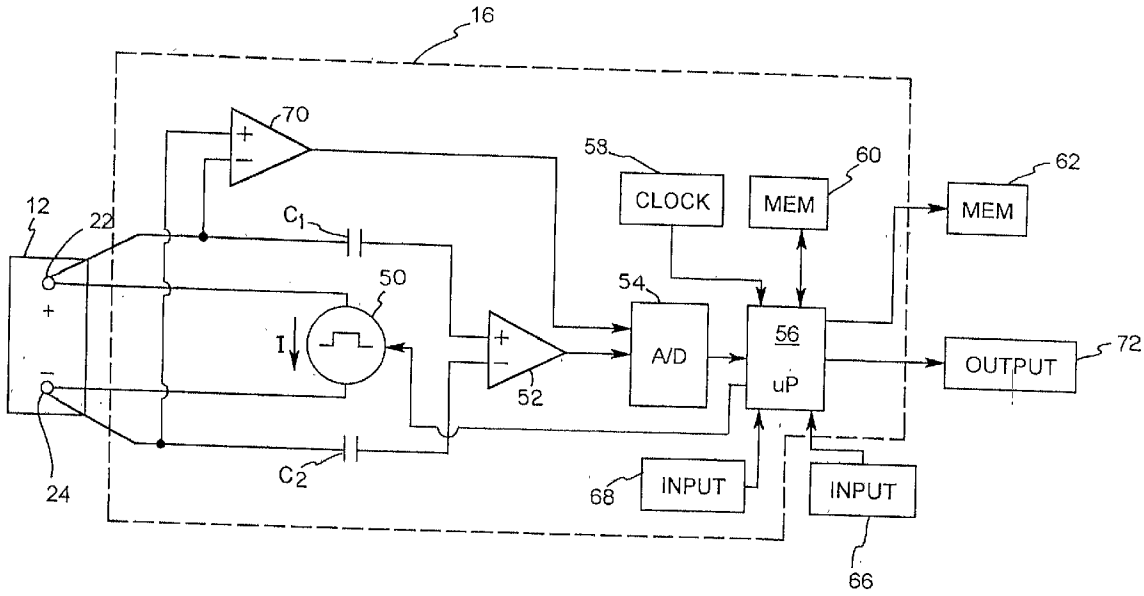
Publication Classification

(51) **Int. Cl.**[7] **G01N 27/416**

(52) **U.S. Cl.** **324/426**

(57) **ABSTRACT**

A method and apparatus for auditing condition of a storage battery performs a battery test on the storage battery to obtain a test result. Subjective information pertaining to the battery is obtained. An audit code is generated based on the battery test result and the subjective information.



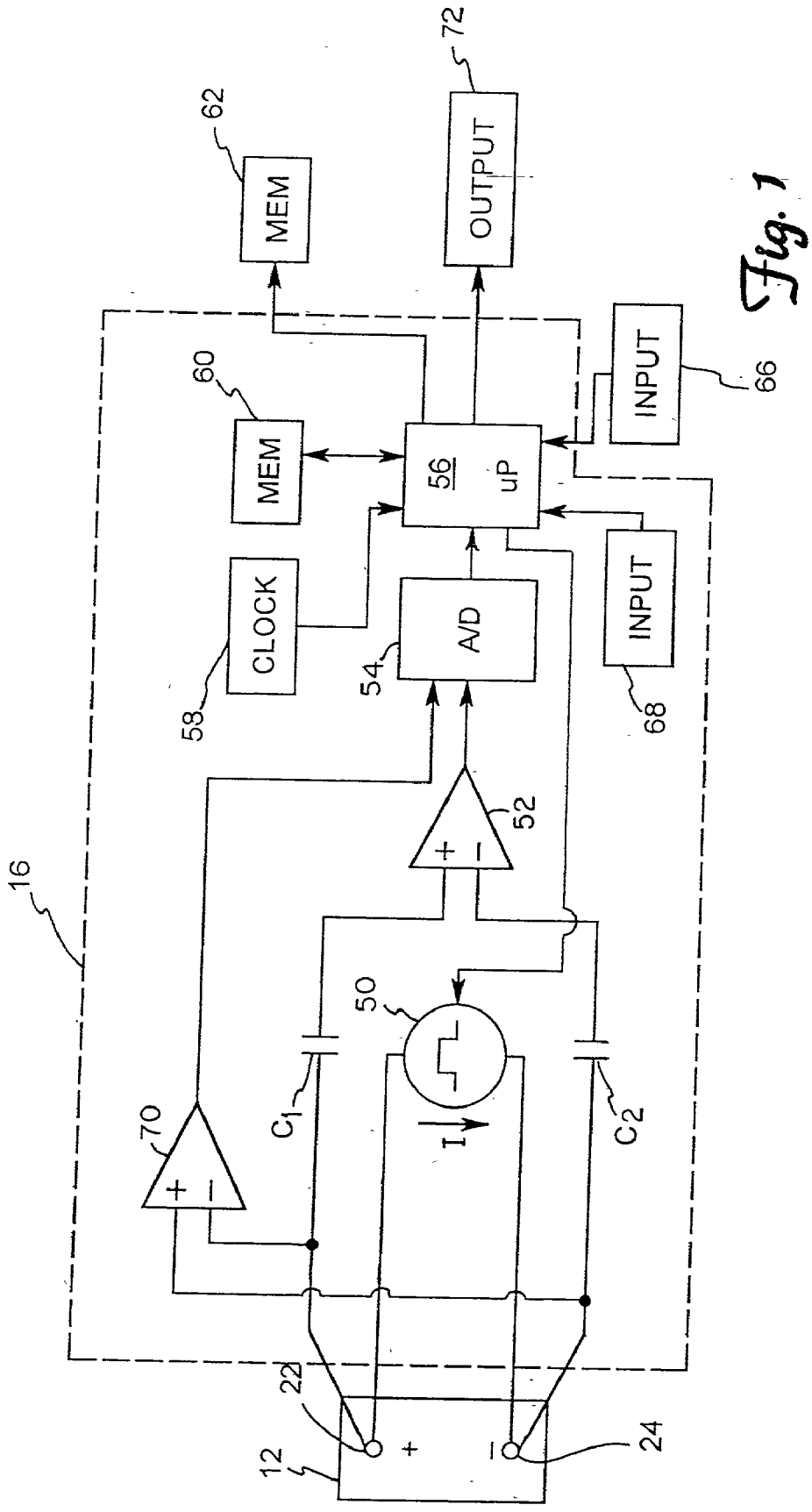

72
OUTPUT
62
MEM
INPUT
66
60
MEM
56
uP
CLOCK
58
A/D
54
INPUT
68
52
16
50
70
C1
I
C2
22
12
+
−
24

Fig. 1

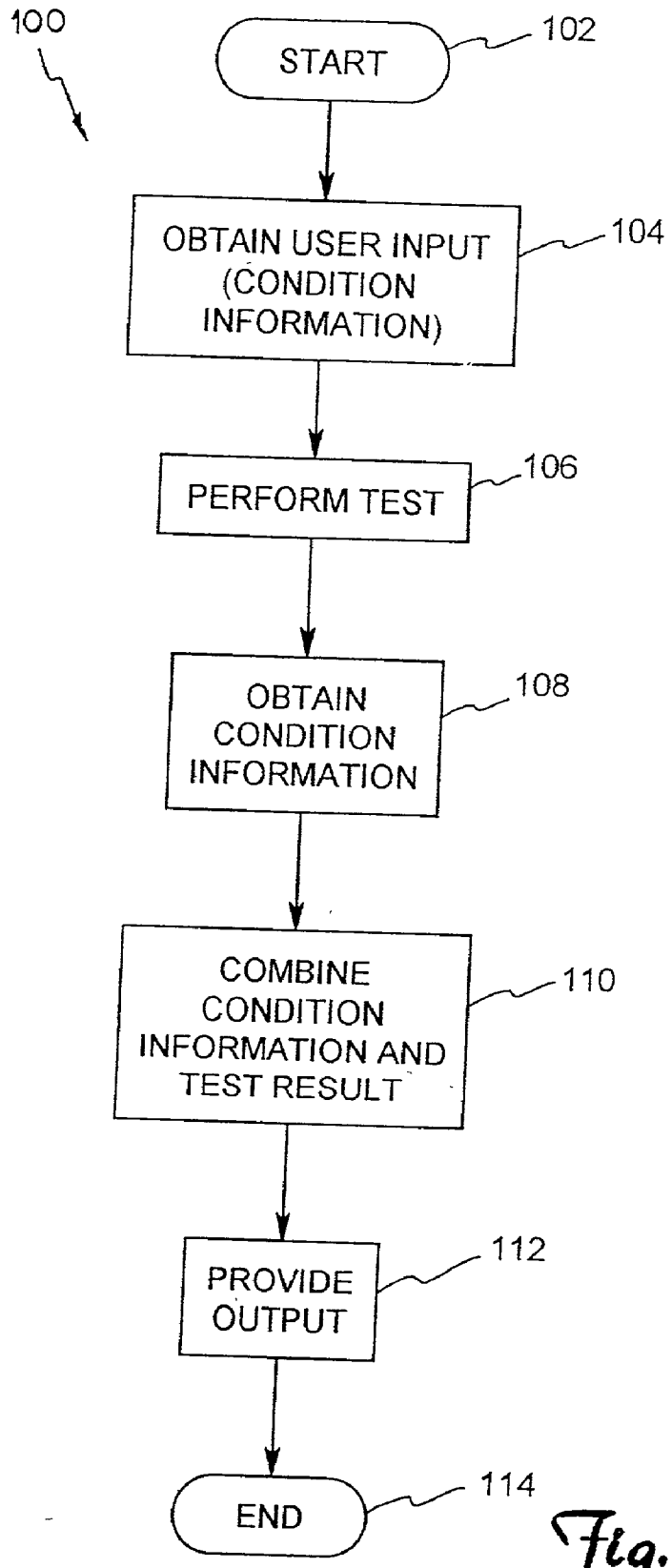

100
START
102
OBTAIN USER INPUT (CONDITION INFORMATION)
104
PERFORM TEST
106
OBTAIN CONDITION INFORMATION
108
COMBINE CONDITION INFORMATION AND TEST RESULT
110
PROVIDE OUTPUT
112
END
114

Fig. 2

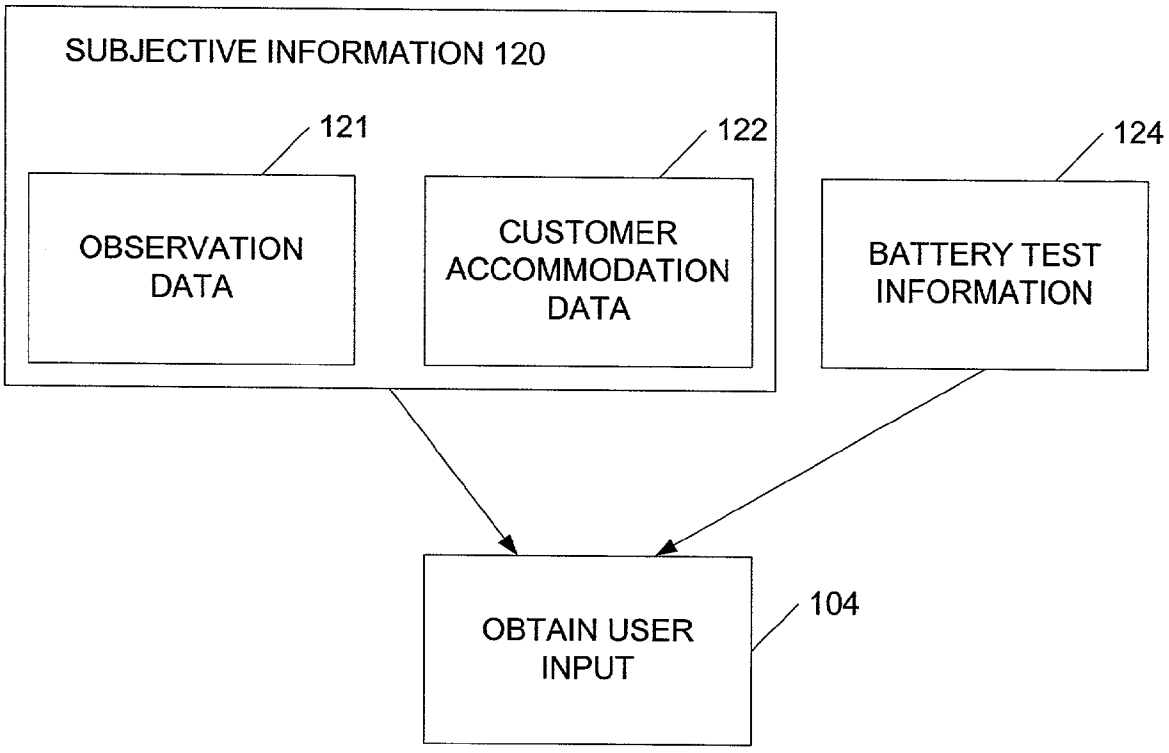

SUBJECTIVE INFORMATION 120
121
122
124
OBSERVATION DATA
CUSTOMER ACCOMMODATION DATA
BATTERY TEST INFORMATION
OBTAIN USER INPUT
104

FIG. 3

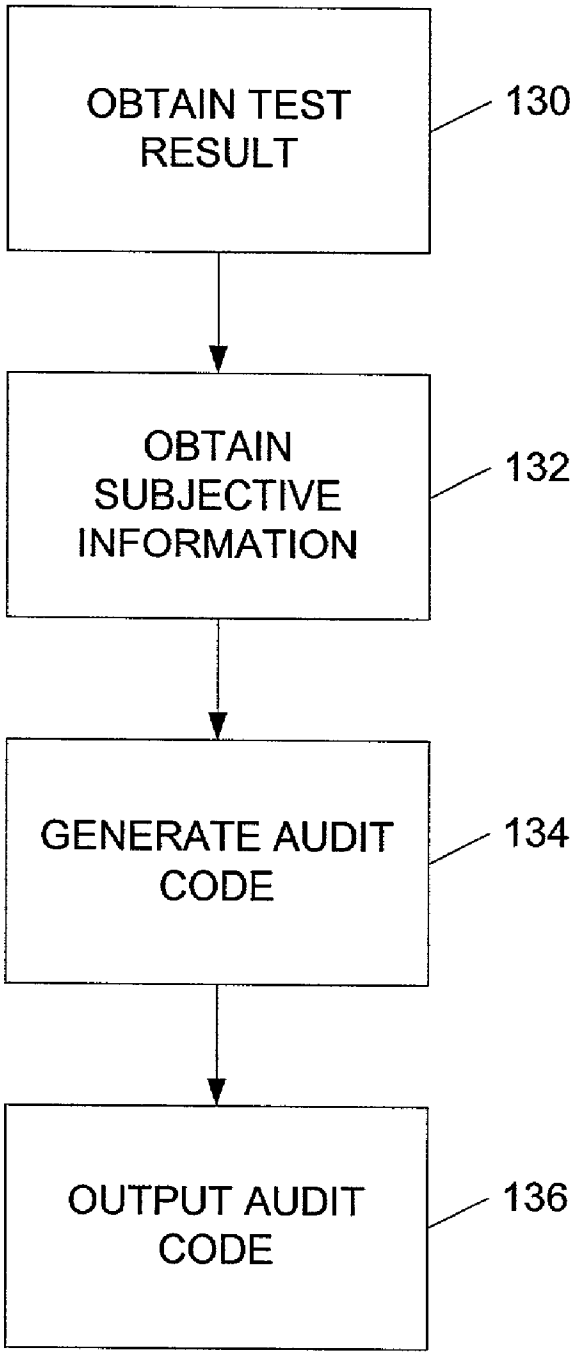

OBTAIN TEST RESULT
130
OBTAIN SUBJECTIVE INFORMATION
132
GENERATE AUDIT CODE
134
OUTPUT AUDIT CODE
136

FIG. 4

METHOD AND APPARATUS FOR AUDITING A BATTERY TEST

CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority from and is a continuation-in-part of U.S. patent application Serial No. 09/575,629, filed May 22, 2000, which is a Continuation-In-Part of U.S. Serial No. 09/293,020, filed Apr. 16, 1999, now U.S. Pat. No. 6,351,102; which is a Continuation-In-Part of U.S. Serial No. 09/426,302, filed Oct. 25, 1999, now U.S. Pat. No. 6,091,245; which is a Divisional of U.S. Serial No. 08/681,730, filed Jul. 29, 1996, now U.S. Pat. No. 6,051,976, the contents of which are hereby incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to testing storage batteries. More specifically, the present invention relates to generating a code related to a battery test.

[0003] Storage batteries, such as lead acid storage batteries of the type used in the automotive industry, have existed for many years. However, understanding the nature of such storage batteries, how such storage batteries operate and how to accurately test such batteries has been an ongoing endeavor and has proved quite difficult. Storage batteries consist of a plurality of individual storage cells electrically connected in series. Typically each cell has a voltage potential of about 2.1 volts. By connecting the cells in series, the voltages of the individual cells are added in a cumulative manner. For example, in a typical automotive storage battery, six storage cells are used to provide a total voltage when the battery is fully charged of 12.6 volts.

[0004] There has been a long history of attempts to accurately test the condition of storage batteries. A simple test is to measure the voltage of the battery. If the voltage is below a certain threshold, the battery is determined to be bad. However, this test is inconvenient because it requires the battery to be charged prior to performing the test. If the battery is discharged, the voltage will be low and a good battery may be incorrectly tested as bad. Furthermore, such a test does not give any indication of how much energy is stored in the battery. Another technique for testing a battery is referred as a load test. In a load test, the battery is discharged using a known load. As the battery is discharged, the voltage across the battery is monitored and used to determine the condition of the battery. This technique requires that the battery be sufficiently charged in order that it can supply current to the load.

[0005] More recently, a technique has been pioneered by Dr. Keith S. Champlin for testing storage batteries by measuring the conductance of the batteries. This technique is described in a number of United States patents obtained by Dr. Champlin, for example, U.S. Pat. No. 3,873,911, issued Mar. 25, 1975, to Champlin, entitled ELECTRONIC BATTERY TESTING DEVICE; U.S. Pat. No. 3,909,708, issued Sep. 30, 1975, to Champlin, entitled ELECTRONIC BATTERY TESTING DEVICE; U.S. Pat. No. 4,816,768, issued Mar. 28, 1989, to Champlin, entitled ELECTRONIC BATTERY TESTING DEVICE; U.S. Pat. No. 4,825,170, issued Apr. 25, 1989, to Champlin, entitled ELECTRONIC BATTERY TESTING DEVICE WITH AUTOMATIC VOLTAGE SCALING; U.S. Pat. No. 4,881,038, issued Nov. 14, 1989, to Champlin, entitled ELECTRONIC BATTERY TESTING DEVICE WITH AUTOMATIC VOLTAGE SCALING TO DETERMINE DYNAMIC CONDUCTANCE; U.S. Pat. No. 4,912,416, issued Mar. 27, 1990, to Champlin, entitled ELECTRONIC BATTERY TESTING DEVICE WITH STATE-OF-CHARGE COMPENSATION; and U.S. Pat. No. 5,140,269, issued Aug. 18, 1992, to Champlin, entitled ELECTRONIC TESTER FOR ASSESSING BATTERY/CELL CAPACITY.

[0006] As battery test results have become more accurate, and the repeatability of those results has increased, we have recognized a new problem. Specifically, if a subsequent battery test is performed at a later time and perhaps at a different location and under different conditions, there is no adequate way to compare the results of the two tests. It is impossible to determine if differences in test results are due to improper use of the test equipment, inaccurately recorded test results or even falsification of the test results. For example, this problem can be particularly vexing to battery manufactures, battery distributors, and automobile companies who offer warranties with their batteries. Further, the precise conditions of the test and test results would be useful in determining the cause of the failure and reducing the likelihood of failure in new batteries by identifying and correcting defects.

SUMMARY OF THE INVENTION

[0007] The present invention offers solutions to problems associated with the aforementioned problems. The present invention provides a method and apparatus for auditing a battery test. In the method, a battery test is performed on a storage battery to obtain a test result. Furthermore, the method includes obtaining subjective information pertaining to the battery. An audit code is generated based on the test result and the subjective information. Similarly, the apparatus includes battery test circuitry for performing a battery test on the storage battery and providing a test result. Input circuitry receives subjective information which pertains to the battery. Calculation circuitry coupled to the battery test circuitry and the input circuitry generates an audit code based on the battery test result and subjective information and responsively provides a code output.

[0008] In various embodiments of the invention, the code output can be used to subsequently analyze the battery test in view of the test conditions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] **FIG. 1** is a simplified schematic diagram showing battery monitoring and auditing circuitry in accordance with the present invention.

[0010] **FIG. 2** is a simplified block diagram shown the steps of a method in accordance with the invention.

[0011] **FIG. 3** is a simplified block diagram of various types of user input information.

[0012] **FIG. 4** is a simplified block diagram of another aspect of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] The present invention provides a new and useful technique for monitoring and auditing a battery test of a

storage battery, such as a lead acid storage battery. The present invention is for use with any battery tester or testing technique and those discussed herein are strictly as examples. The present invention provides a method and apparatus for combining the result of a battery test with information related to conditions of the battery test into a code which can be subsequently accessed As described herein, the present invention is useful in subsequent analysis of batteries which failed the battery test and may be used to monitor batteries returned on warranty, to monitor operator performance and can be used in detecting and identifying a faulty design of a storage battery.

[0014] **FIG. 1** is a simplified block diagram of battery monitoring circuitry **16** in accordance with the present invention. Apparatus **16** is shown coupled to battery **12** which includes a positive battery terminal **22** and a negative battery terminal **24**.

[0015] Circuitry **16** operates in accordance with one embodiment of the present invention and determines the conductance (G_{BAT}) of battery **12** and the voltage potential (V_{BAT}) between terminals **22** and **24** of battery **12**. Circuitry **16** includes current source **50**, differential amplifier **52**, analog-to-digital converter **54** and microprocessor **56**. Amplifier **52** is capacitively coupled to battery **12** through capacitors C_1 and C_2. Amplifier **52** has an output connected to an input of analog-to-digital converter **54**. Microprocessor **56** is connected to system clock **58**, memory **60**, memory **62** and analog-to-digital converter **54**. Microprocessor **56** is also capable of receiving an input from input devices **66** and **68**. Microprocessor **56** also connects to output device **72**.

[0016] In operation, current source **50** is controlled by microprocessor **56** and provides a current I in the direction shown by the arrow in **FIG. 1**. In one embodiment, this is a square wave or a pulse. Differential amplifier **52** is connected to terminals **22** and **24** of battery **12** through capacitors C_1 and C_2, respectively, and provides an output related to the voltage potential difference between terminals **22** and **24**. In a preferred embodiment, amplifier **52** has a high input impedance. Circuitry **16** includes differential amplifier **70** having inverting and noninverting inputs connected to terminals **24** and **22**, respectively. Amplifier **70** is connected to measure the open circuit potential voltage (V_{BAT}) of battery **12** between terminals **22** and **24**. The output of amplifier **70** is provided to analog-to-digital converter **54** such that the voltage across terminals **22** and **24** can be measured by microprocessor **56**.

[0017] Circuitry **16** is connected to battery **12** through a four-point connection technique known as a Kelvin connection. This Kelvin connection allows current I to be injected into battery **12** through a first pair of terminals while the voltage V across the terminals **22** and **24** is measured by a second pair of connections. Because very little current flows through amplifier **52**, the voltage drop across the inputs to amplifier **52** is substantially identical to the voltage drop across terminals **22** and **24** of battery **12**. The output of differential amplifier **52** is converted to a digital format and is provided to microprocessor **56**. Microprocessor **56** operates at a frequency determined by system clock **58** and in accordance with programming instructions stored in memory **60**.

[0018] Microprocessor **56** determines the conductance of battery **12** by applying a current pulse I using current source **50**. The microprocessor determines the change in battery voltage due to the current pulse I using amplifier **52** and analog-to-digital converter **54**. The value of current I generated by current source **50** is known and is stored in memory **60**. In one embodiment, current I is obtained by applying a load to battery **12**. Microprocessor **56** calculates the conductance of battery **12** using the following equation:

$$\text{Conductance} = G_{BAT} = \frac{\Delta I}{\Delta V} \qquad \text{Equation 1}$$

[0019] where ΔI is the change in current flowing through battery **12** due to current source **50** and ΔV is the change in battery voltage due to applied current ΔI.

[0020] Based upon the battery conductance G_{BAT} and the battery voltage, the battery tester **16** determines the condition of battery **12**. For example, if the battery conductance G_{BAT} is lower than a predetermined threshold for a particular battery at a particular voltage, microprocessor **56** determines that battery **12** has failed the battery test. For example, as explained in the Champlin patents, the tester can compare the measured CCA (Cold Cranking Amp) with the rated CCA for that particular battery. Microprocessor **56** uses information input from input device **66** provided by, for example, an operator. This information may consist of the particular type of battery, location, time, the name of the operator. Additional information relating to the conditions of the battery test is received by microprocessor **56** from input device **68**. Input device **68** may comprise one or more sensors, for example, or other elements which provide information such as ambient or battery temperature, time, date, humidity, barometric pressure, noise amplitude or characteristics of noise in the battery or in the test result, or any other information or data which may be sensed or otherwise recovered which relates to the conditions of the test how the battery test was performed, or intermediate results obtained in conducting the test. Additional test condition information is provided by microprocessor **56**. Such additional test condition information may include the values of G_{BAT} and battery voltage, the various inputs provided to battery tester **16** by the operator which may include, for example, type of battery, estimated ambient or battery temperature, type of vehicle (i.e., such as provided through the Vehicle Identification Number (VIN) code for the vehicle) or the particular sequence of steps taken by the operator in conducting the test. In accordance with the present invention, microprocessor **56** uses some, or all, of the various battery test condition information and combines such test condition information with the test result to generate a code. This code is provided to output device **72** which may comprise, for example, a display or a printer. In another embodiment, the code is stored in memory **62** for subsequent use. As used herein, input circuitry refers to any circuitry used to obtain the test condition information and may include inputs **66** and **68**, memory **60**, etc.

[0021] The code of the present invention may be generated through any appropriate technique. Two examples follow.

[0022] For example, the display **72** will indicate: "TEST CODE: A0XXXX1YYYY2222Z". Where the information is encoded as follows:

[0023] A: Alphanumeric code representing geographic territory

[0024] 0: 0=no temperature compensation used in conditioning the test.

[0025] 1=temperature compensation used in conditioning the test.

[0026] XXXX: Entered battery rating in coded CCA (Cold Cranking Amps) (0=A, 1=B, 2=C, etc.) I.E. "0625 CCA" displayed as AGCF

[0027] 1: Result of battery test:

[0028] 0=Good—Return to Service

[0029] 1=Good—Recharge & Return to Service

[0030] 2=Recharge & Retest

[0031] 3=Bad battery

[0032] 4=Bad cell battery

[0033] YYYY: Measured coded battery voltage without decimal point (0=A, 1=B, etc.) I.E. "12.65 Volts" displayed as BCGF

[0034] 2222:Actual CCA measured by tester.

[0035] Z: Alphanumeric code representing state of charge.

[0036] An example using eight characters follows. A pseudo base 26 number, represented by two alpha characters, is used to represent certain values in this test code.

[0037] For example, to convert the coded number "CZ", look up the alpha characters in the following table:

TABLE 1

A = 0	B = 1	C = 2	D = 3	E = 4	F = 5
G = 6	H = 7	I = 8	J = 9	K = 10	L = 11
M = 12	N = 13	O = 14	P = 15	Q = 16	R = 17
S = 18	T = 19	U = 20	V = 21	W = 22	X = 23
Y = 24	Z = 25				

[0038] Take the first letter, "C", and multiply its value by 26. Then add the value of the second letter "Z": {"C"×26}+ "Z". (2)×(26)=52 Equation 2 52+25=77 Equation 3 The coded number is 77. The display **72** will indicate "TEST CODE: XX0YY1ZZ", for example. The information is encoded as follows:

[0039] XX: Entered coded battery rating in 5 CCA increments. For example, 360 CCA would be represented as 72, 650 CCA as 130, etc. CCA will be rounded to the nearest 5 CCA value. The coded CCA is then represented using the Pseudo Base 26 scheme listed above. 360 CCA=72 coded=CU. 650 CCA= 130 =FA.

[0040] 0: Result code:

[0041] 0=Good—Return to Service

[0042] 1=Good—Recharge & Return to Service

[0043] 2=Recharge & Retest

[0044] 3=Bad battery

[0045] 4=Bad cell battery

[0046] 5=Good—Return to Service (temperature compensated during test)

[0047] 6=Good—Recharge & Return to Service (temperature compensated during test)

[0048] 7=Recharge & Retest (temperature compensated during test)

[0049] 8=Bad battery (temperature compensated)

[0050] 9=Bad cell battery (temperature compensated)

[0051] YY: Measured coded voltage in 50 mVolt increments. For example, 10.00 volts would be represented as 200, 12.75 volts as 255, etc. Voltage will be rounded to the nearest 50 mVolt value. The coded voltage is then represented using the Pseudo Base 26 scheme listed above. 10.00 volts=200 coded=HS. 12.75 volts=255=JV.

[0052] 1: Numeric code representing state of charge. The state of charge of the battery is indicated by a single numeric character. "0" represents that SOC is not applicable, such as in Replace Battery or Recharge and Retest. "**5**" represents 100% state of charge. "1"-"4" are divided in equal steps between a selected lower percentage and 100% relative conductance.

[0053] ZZ: Actual measured battery cranking power in 5 CCA increments. For example, 360 CCA would be represented as 72, 650 CCA as 130, etc. CCA will be rounded to the nearest 5 CCA value. The coded CCA is then represented using the Pseudo Base 26 scheme listed above. 360 CCA=72 coded=CU. 650 CCA=130=FA.

[0054] **FIG. 2** is a simplified block diagram showing steps in accordance with the method of the present invention. **FIG. 2** shows flow chart 100 which initiates operation at start block (or step) **102**. At block **104**, user input is obtained. For example, user input is obtained through input device **66** and may constitute instructions for performing a battery test, the rated cold cranking amps (CCA) for the batter under test, estimated temperature during the test for temperature compensation during the test or any other user input related to the test or test environment. This information is provided to microprocessor **56** and is stored in memory **60** for use during the test. Additional information may relate to a particular vehicle in which the battery in installed which may be obtained, for example, using the VIN code for the vehicle. Further, the make, model and manufacturer of the battery **12** may be provided. Other such information includes battery specific information, such as a serial number, digital signature for tracking and identifying the battery, make, model, and date of manufacture of the battery, etc. Such information may be manually input or, for example, read from a bar code carried on the battery.

[0055] At block **106**, microprocessor **56** performs the battery test using the techniques described above. However, it will be understood that those techniques are merely

examples and the battery test may be any battery test including a simple voltage measurement test, a load test, resistance, conductance, impedance, admittance, or other parameter test, battery capacity or state of charge test, digital hygrometer test in which the specific gravity of the battery acid is measured, complex charging and discharging tests which are known in the art, etc. It will be understood that in various embodiments of the present invention, the particular test may be selected from any available or yet to be discovered battery test.

[0056] At block **108**, microprocessor **56** obtains any additional condition information which may be used in accordance with the invention. As explained above, the information may be any information related to the test such as actual ambient or battery temperature sensed by device **68**, various intermediate test results which were obtained in performing the test at step **106**, various battery parameters such as surface charge, voltage, conductance, resistance, float current, noise amplitude, noise frequency or other noise characteristics, etc. At step **110**, microprocessor **56** combines the condition information obtained at step **108** with the test results obtained at step **106** into a string of information. The information may be of any form and is not limited to the character code described above. The information may be digitally encoded into a series of data bytes. However, in one preferred embodiment, an alpha numeric code is preferred. This combination of information is referred to herein as a code. At block **112**, this code is output using an appropriate technique. For example, the code can be output on output device **72** which may be a display, printer, label printer, bar code printer, modem or other data transmission means, etc. In another variation on the invention, the step **112** provides the output to memory **62** for subsequent use. For example, a plurality of codes may be collected in memory for subsequent output or analysis. At block **114**, the procedure ends.

[0057] **FIG. 3** is a block diagram illustrating various types of user input information that is obtained in step **104**. As described earlier, user input is obtained through input device **66**, which may be for example a keyboard, keypad, microphone, scanner or the like. This user input information may be encoded as earlier described with respect to block **110**. Generally, user input information includes subjective information **120** and battery test information **124**.

[0058] Subjective information **120** includes both observation data **121** and customer accommodation data **122**. Observation data **120** includes observations made by a person or persons pertaining to a problem or symptom with a particular battery. For example, a car owner with a battery using a car may observe that the battery does not start the car properly, or at certain times, such as in the morning. In addition, the car owner may complain that power accessories such as power windows, power mirrors, radio, etc. in the vehicle are not working properly, cause headlights to dim, or produce other problems. Various problems or symptoms relating to the battery or how the battery performs can also be provided. Alternatively, such observation data may be observed by a car technician. Other observation data may also be provided related to a physical condition of the battery. For example, terminals of the battery may be worn or the battery may have an acid leak. Observation data **121** may be chosen from a list of common problems stored on the battery tester and selected via a menu or manually input, as desired. Observation data **121** provides useful information for persons who subsequently audit the battery test.

[0059] Customer accommodation data **122** pertains to a particular customer or situation. For example, the customer accommodation data **122** is provided to indicate the accommodation of the customer's desires. Customer accommodation is particularly useful in providing top-rate service and maintaining clients. For example, a battery is replaced or returned in some instances even if the battery being replaced or returned is in proper working condition. Also, a customer may be refunded for the cost of the battery. Providing an indication of customer accommodation data **122** is useful when subsequently auditing the battery test. A manufacturer that receives a battery that has a customer accommodation indication may want to resell or reuse the battery in a different situation. The data will also assist the battery manufacturer in diagnosing problems associated with the battery.

[0060] Battery test information **124** includes any other information that is not subjective information **120**. As discussed earlier, battery test information **124** information may include a VIN code, battery serial number, physical signature for tracking and identifying the battery, make, model, and date of manufacture of the battery, etc. Furthermore, this information can identify a customer, operator, dealer, time of the battery test, date of the battery test, etc. Any combination of subjective information **120**, observation data **121**, customer accommodation data **122** and battery test information **124** can be provided as user input information in order to obtain user input and encoded into an output.

[0061] **FIG. 4** illustrates a flow diagram according to another aspect of the present invention. In this flow diagram, a battery test result is obtained at **130** by performing a battery test. This can be performed using battery tester **16**. Next, subjective information is obtained at step **132**. As described earlier, subjective information can include observation data **121**, customer accommodation data **122**, or combinations thereof. If desired, battery test information **124** may also be provided via input device **66** and/or input device **68**. Next, an audit code is generated at step **134**. This audit code is indicative of customer accommodation data **122** and is usually generated by microprocessor **56**. The code can be generated using the techniques described above or otherwise and encrypted, if desired. Then, the audit code is output at step **136**. The output can be transmitted in a number of different ways to output device **72**, including printed, sent via a communications network, stored on media, displayed on a screen or combinations thereof. Using the flow diagram of **FIG. 4, a** technician may quickly provide an audit code for a particular battery test. As a result, a technician or other person can save a considerable amount of time and include useful information such as the test result, subjective information and battery test information.

[0062] One advantage of the present invention is that it is particularly useful in ensuring compliance with the warranty return policies of manufacturers. For example, if, upon identifying a faulty battery, the operator marks the battery **12** with the code provided on output device **72**, for example, by marking directly on the battery or applying a sticker to the battery when the battery is returned, the manufacturer will have information regarding the test which resulted in the return of the battery. In one preferred embodiment, the code

is encrypted or otherwise difficult to duplicate whereby the code cannot be falsified. Thus, the manufacturer may then perform a subsequent test on the battery and compare the subsequent test result with the result obtained which lead to the warranty return. This will make it very difficult for the unscrupulous individual to return a battery under a warranty policy where the battery is not faulty. Furthermore, the invention provides additional traceability of the batteries which are being returned to the manufacturer in that the particular code may contain geographic and location information used to identify the particular test location and operator which lead to the failed test. Further still, if the battery is in a new car and is being returned to the automobile manufacturer, the manufacturer can retrieve information regarding the vehicle such as through the VIN code of the vehicle.

[0063] The present invention provides a convenient technique for a manufacturer to collect information regarding batteries which fail battery tests. Such information can be used in improving future batteries or identifying faults in existing batteries. For example, the code can contain information regarding the various intermediate steps or measurements which are obtained in providing the battery test. This could be, for example, battery recovery voltage, voltage after a first test, voltage after a second test, surface charge voltage, voltage or current in response to an implied load or signal, temperature compensation input, noise amplitude or other noise characteristics, float current, etc. Further, observation data in the code provides manufactures an easy way to identify problems with faulty batteries, for example ignition problems with car batteries. Further still, manufacturers can easily identify batteries where the customer has been accommodated.

[0064] The present invention may be used with standby batteries such as those used to power remote telephone switching locations, computer facilities, power company facilities, pumping stations, etc. It will be understood by those skilled in the art that the present invention is not limited to automotive storage batteries.

[0065] In one embodiment of the invention, the code is in an encrypted format to thereby reduce the likelihood of code falsification. In the examples described above, the code is encrypted in that it is difficult for a user who is unfamiliar with the particular coding technique to discover the precise technique being used and generate valid codes which contain falsified information. A further embodiment of the invention includes providing a stronger encryption algorithm which may be as simple as an offset or transposition cipher or a more complex technique such as a public key encryption technique. Such a technique can also be used to apply a digital signature to the code containing, for example, information about the particular battery tester being used.

[0066] Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention. For example, one may use other input mechanisms to obtain test condition information or employ other battery tests than those explicitly described. Further, the code may be generated using any appropriate technique.

What is claimed is:

1. A method of monitoring the condition of a storage battery, comprising:

performing a battery test on the storage battery and obtaining a test result;

obtaining subjective information pertaining to the battery; and

generating an audit code based on the test result and the subjective information.

2. The method of claim 1 wherein obtaining subjective information comprises obtaining observation data pertaining to a problem with the battery and generating the audit code based on the observation data.

3. The method of claim 2 wherein the problem relates to a vehicle containing the battery.

4. The method of claim 2 wherein the problem relates to a physical condition of the battery.

5. The method of claim 2 wherein the problem is observed by a technician.

6. The method of claim 2 wherein the problem is observed by a customer using the battery.

7. The method of claim 1 wherein obtaining subjective information comprises obtaining an indication of customer accommodation and generating the audit code based on the indication.

8. The method of claim 1 and further comprising obtaining battery test information related to conditions of the battery test and generating the audit code based on the battery test information.

9. The method of claim 8 wherein the battery test information includes a name of the operator performing the battery test.

10. The method of claim 8 wherein the battery test information includes a location of the dealer performing the battery test.

11. The method of claim 8 wherein the battery test information includes information related to a vehicle containing the battery.

12. The method of claim 8 wherein the battery test information includes obtaining temperature information.

13. The method of claim 8 wherein the battery test information includes rated battery Cold Cranking Amps (CCA).

14. The method of claim 1 wherein performing a battery test includes determining battery conductance.

15. The method of claim 1 wherein performing a test includes applying an electrical load to the battery.

16. The method of claim 1 wherein the audit code comprises an alpha numeric code.

17. The method of claim 1 wherein the audit code is encrypted.

18. The method of claim 1 including placing the audit code on the battery.

19. The method of claim 1 and further comprising obtaining battery test information and wherein obtaining subjective information comprises obtaining observation data and an indication of customer accommodation, and generating the audit code based on the battery test information.

20. An electronic battery tester configured to generate the audit code in accordance with the method of claim 1.

21. An apparatus for monitoring the condition of a storage battery, comprising:

battery test circuitry for performing a battery test on the storage battery and providing a battery test result;

input circuitry receiving subjective information pertaining to the battery;

calculation circuitry coupled to the battery test circuitry and the input circuitry and generating an audit code based on the battery test result and the subjective information.

22. The apparatus of claim 21 wherein the subjective information comprises observation data pertaining to a problem with the battery and the calculation circuitry generates the audit code based on the observation data.

23. The apparatus of claim 22 wherein the problem relates to a vehicle containing the battery.

24. The apparatus of claim 22 wherein the problem relates to a physical condition of the battery.

25. The apparatus of claim 22 wherein the problem is observed by a technician.

26. The apparatus of claim 22 wherein the problem is observed by a customer using the battery.

27. The apparatus of claim 21 wherein the subjective information comprises an indication of customer accommodation and the calculation circuitry generates the audit code based on the indication.

28. The apparatus of claim 21 wherein the input circuitry further receives battery test information related to conditions of the battery test and the calculation circuitry generates the audit code based on the battery test information.

29. The apparatus of claim 28 wherein the battery test information includes a name of the operator performing the battery test.

30. The apparatus of claim 28 wherein the battery test information includes a location of the dealer performing the battery test.

31. The apparatus of claim 28 wherein the battery test information includes information related to a vehicle containing the battery.

32. The apparatus of claim 28 wherein the battery test information includes temperature information.

33. The apparatus of claim 28 wherein the battery test information includes rated battery Cold Cranking Amps (CCA).

34. The apparatus of claim 21 wherein the battery test circuitry includes means for determining battery conductance.

35. The apparatus of claim 21 wherein the battery test circuitry includes means for applying an electrical load to the battery.

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