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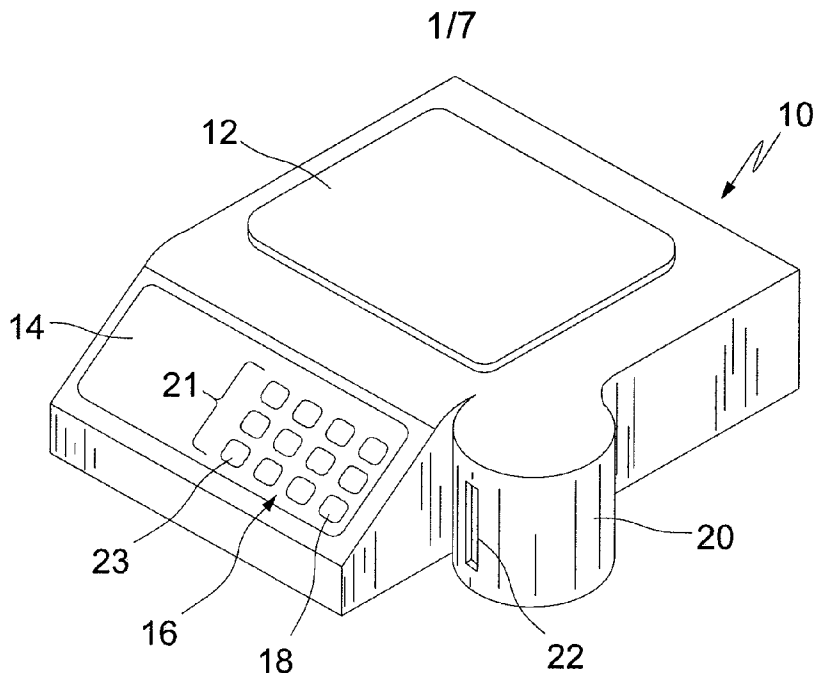


FIG. 1

(57) Abstract: A scale calibration method involves the use of a secure computer device with a GPS function to determine gravity strength at the location of installation of a scale. The scale itself may include a self-calibration feature that enables the scale to automatically determine an appropriate gravity strength value for an operating location of the scale.

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## SCALE CALIBRATION METHOD AND DEVICE

### TECHNICAL FIELD

[0001] The present application relates generally to scales used to weigh items, and more particularly to a scale calibration operation that takes into account gravity strength at a location of scale operation.

### BACKGROUND

[0002] Scales have been used in stores such as supermarkets and groceries to weigh and price food items and to generate a pricing label for such food items. Applicable regulations require a level of precision in such scales that can be defeated by differences in gravity strength depending upon scale location.

[0003] Weighing scales that require accurate readings are often required to be calibrated in accordance to government measures and laws. This is particularly the case where the scale is going to be used to serve goods to the public. Typically the weighing scale is made in a factory and then shipped to an operational site. When at the operational site, a person appointed or qualified under trading standards or other governmental regulations is required to come to the operational site of the weighing scale, calibrate the scale and give an official seal to the scale unit once calibrated. Official seals can usually only be applied or broken by such appointed or qualified people.

[0004] One of the reasons for calibrating on-site, rather than at the point of manufacture is that the gravitational constant 'g' that is required in scale measurements varies with location, even within a country. When a scale is moved from one location to another it may enter a different 'gravity zone' and as such may need to be manually recalibrated at the new site.

Related art in this field includes U.S. Patent document 20020052703 which describes systems and methods for calibrating a scale portion of a scanner in a Point-of-Sale system. One such method describes scale calibration using an auto-locate system such as a GPS disposed on the scanner scale. The GPS accesses satellite signals, calculates a location and provides location information to the scanner. The scale then extracts, from an optional variety of sources, the proper scale calibration data for that location.

[0005] Another related document is JP2003254818 which describes a scale that obtains a value of gravitational acceleration using a GPS satellite, so that masses can be measured correctly.

[0006] It would be desirable to provide a scale including a self-calibration operation to determine the gravity strength applicable to a location of scale operation.

#### SUMMARY

[0007] In one aspect, a method of scale calibration involves: (a) identifying to the scale an operating location for the scale; (b) the scale identifying a gravity value corresponding the operating location; and (c) the scale associating the identifying gravity value into a weighing algorithm stored in memory of the scale. In one implementation of such a method, step (a) involves identifying address information to the scale and step (b) involves (i) accessing one or more databases that provide information to calculate the gravity strength value or retrieve the gravity strength value corresponding to the address information. In another implementation of such a method, step (a) involves identifying address information to the scale and step (b) involves (i) accessing a coordinates database that provides latitude and longitude information corresponding to the address information and (ii) using the latitude and longitude information to calculate the gravity strength value or retrieve the gravity strength value from a database.

[0008] In another aspect, a scale incorporating a self-calibrating feature includes a weighing station for receiving items to be weighed, the weighing station including a load cell for outputting a weight indicative signal. An input device is provided. A controller is operatively connected with the input device and the load cell, the controller including associated memory storing at least one weighing algorithm. The controller includes a calibration mode in which it operates such that upon input of a scale location via the input device, the controller automatically determines a gravity strength value corresponding to the scale location, and the controller stores the gravity strength value in its memory in association with the weighing algorithm.

[0009] In another aspect, a weighing scale calibration device includes means to automatically obtain location data and determine a value indicative of gravity strength from the obtained data. The weighing scale calibration device obtains the location data using a communications device which is typically a GPS system and then uses this data to determine the value indicative of gravity strength and automatically calibrate a weighing

scale. The weighing scale calibration device may be incorporated as part of a weighing scale or a portable calibration unit. A weighing scale comprising the calibration device may further comprise a motion sensor, an internal power source and control means in order to activate the communication means when the scale is being moved and is unplugged from a primary power source. The calibration device may be incorporated into or attached to a weighing scale, or may form part of a portable calibration unit. By having the communications device and its associated communications securely contained within the scale and/or portable calibration unit, a non authorised person such as an ordinary installation technician can set up the scale entirely, without having to call out the local weights and measures official.

**[0010]** A method of scale calibration involves the steps of: (a) providing a scale at an installation site; (b) providing a secure computer device, distinct from the scale, at the installation site, the secure computer device including a GPS system (or other location determining system) and a gravity determination function; (c) the secure computer device determining a location of the installation site using the GPS system (or other location determining system); (d) the secure computer device determining a gravitational strength value for the installation site using the gravity determination function and the location determined in step (c); (e) initiating a secure communication link between the scale and the secure computer device; (f) transferring the determined gravitational strength value from the secure computer device to the scale via the secure communication link; and (g) storing the gravitational strength value in memory of the scale for use in calculating weight.

**[0011]** In the foregoing method: the secure computer device may be one of a PDA, a mobile phone, or any other portable handheld communication device; the secure communications link may be a wireless link or a hard-wired link; the secure computer device may include a gravity strength timeout function that prevents transfer of the gravitational strength value from the secure computer device to the scale after a specified time period, which specified time period may be a specified period after completion of step (c) or step (d); the secure communication link may be established utilizing handshaking functions and secure keys transferred between the secure computer device and the scale; steps (a) through (g) may occur within or in close proximity to a building where the scale is being installed; step (d) may involve utilizing one of a gravity strength calculation or a gravity strength database to determine the gravitational strength value; the method may involve the further step of the secure computer device storing a record of identity of the

scale calibrated, which record may further includes date and/or time data pertaining to calibration of the scale and the gravitational strength value; the method may involve the further step of the scale storing a record of identity of the secure computer device from which the gravitational strength value was received, which record may include date and/or time data pertaining to calibration of the scale.

**[0012]** A weighing scale calibration device includes a control including a secure communication function, a GPS function (or other location determining function) and a gravity calculation function, the GPS function (or other location determining function) operable to determine a location of the scale calibration device, the gravity calculation function operable to determine a gravitational strength value based upon the location, the secure communication function operable to establish a secure communication link with a scale for transferring the gravitational strength value to the scale. The control may also include a gravity strength timeout function that is operable to prevent transfer of the gravitational strength value from the weighing scale calibration device after a specified time period. The control may also include a calibration record function operable to store in memory of the device a record of identity of the scale calibrated, which record may include date and/or time data pertaining to calibration of the scale and may also include the gravitational strength value for the scale.

**[0013]** A weighing scale with an automated calibration function includes means to automatically obtain location data and determine a value of gravitational constant from the obtained data; an internal motion sensor; a primary power source; an internal power source; control means that operates to detect motion of the scale with the internal motion sensor and detects a cut off of the primary power source, the control means responsively providing power to the location data obtaining means using the internal power source upon detection of such motion and primary power source cut off so as to operate the location data obtaining means to obtain location based information.

#### BRIEF DESCRIPTION OF THE DRAWINGS

- [0014]** Fig. 1 is a perspective view of an exemplary food product scale;  
**[0015]** Fig. 2 is a schematic view of the scale of Fig. 1;  
**[0016]** Fig. 3 is a flow diagram of an embodiment of a calibration method.  
**[0017]** Fig. 4 shows a weighing scale incorporating a weighing scale calibration device.

[0018] Fig. 5 shows a weighing scale calibration system comprising a weighing scale and a portable calibration unit incorporating a weighing scale calibration device.

[0019] Figs. 6a and 6b show a weighing scale calibration system when a portable calibration unit physically interfaces with and automatically calibrates the scale.

[0020] Fig. 7 shows a weighing scale incorporating a weighing scale calibration device and means to automatically operate a GPS system when the scale is moved.

#### DETAILED DESCRIPTION

[0021] Referring to Fig. 1 an exemplary scale 10 is shown including a weigh station 12 and a display 14. Weigh station 12 may take the form of a platter-type member supported in relationship to a load cell (internal of the scale housing) that produces a weight indicative signal when a food or other item is placed on the weigh station 12 for weighing. Illustrated display 14 may take the form of an LCD-type display, but other technologies could be used. In the illustrated embodiment the display 14 is a touch screen-type display that also functions as a user input device 16 by displaying buttons/icons 18 that can be triggered by a user. A separate user input device could also be provided, for example, in the form of manually activated keys/buttons located alongside the display 14. A side portion 20 of the scale housing holds a label printer and associated supply of labels, which are dispensed through a label slot 22 in the housing. Although display screen 14 is shown incorporated into the housing of the scale 10, the display could take the form of a marquee-type display located on a support extending upward from the scale housing.

[0022] Referring now to Fig. 2, an exemplary schematic of the scale 10 is shown. The scale includes a controller 30, such as a microprocessor based unit, connected to control the display 14 and user input 16 and connected to receive weight indicative signals from the weighing station 12. A print head 32 and associated supply of label stock 34 that can be moved past the print head 32 is also shown. In one example the print head 32 may be a thermal print head for use with thermally activated label stock. However, other types of printing technologies and label media could also be used. The controller 30 is also connected with a communications interface 36, which may take the form of a standard connector (and associated circuitry) for a USB, RS-232, Ethernet or other hard-wired communication line. In another example the communications interface 36 may be formed by a wireless communication device such as an RF transceiver. The illustrated controller

30 includes associated memory 38 for storing product information and programs/algorithms used during various operating modes of the scale.

**[0023]** A stored weighing algorithm is used to calculate weight based upon an output signal of a load cell. The weighing algorithm incorporates a gravity strength value into the calculation. The controller is configured to perform a self-calibration operation in order to determine and use an appropriate gravity strength value for a location at which the scale operates.

**[0024]** In one example, referring to the process diagram 50 of Fig. 3, an operator selects a scale set-up or calibration mode at 52. Such selection may be via the interface 14, 16. The operator is prompted to enter a full or partial address at 54 (e.g., street address and zip code, or just zip code) of the store in which the scale is located. Based upon this address the scale automatically utilizes the communications interface 36 to access a remote coordinates database that will return a latitude, longitude and altitude for the address. The coordinates database could, for example, be accessed via an Internet web site 80 (see Fig. 2). Alternatively, the coordinates database could be stored in a computer system 82 of the store. In another example, where sufficient memory is provided in the scale, the coordinates database could be stored within the scale memory 38.

**[0025]** The scale controller then uses the coordinates to determine the gravity strength value at 56. In one example, the controller may submit the coordinates (e.g., latitude and longitude, or latitude, longitude and altitude) to a remote computer system (e.g., at a web site) that uses the coordinates to calculate and return a gravity strength value via a gravity strength algorithm or that uses the coordinates to retrieve the gravity strength value from a gravity strength database. In another example, the scale includes the gravity strength algorithm in its memory, and internally makes the gravity strength calculation based upon the coordinates, or the scale may incorporate the gravity strength database in its memory. Alternatively, the database (irrespective of its location) may provide gravity strength values directly corresponding to each full or partial address.

**[0026]** The scale controller subsequently stores the obtained (e.g., calculated or retrieved from a database) gravity strength value in its memory for use in association with the weighing algorithm at 58. In this manner, any given scale can automatically determine an appropriate gravity strength value for its location based upon the input of store address information, or other store location information, simplifying scale calibration and improving scale performance.

[0027] The foregoing operations could be carried out while the scale is actually located in the store or other building (e.g., during delivery and set-up). Alternatively, where the intended scale location is known in advance the operations could be carried out before the scale is located within the store or other building (e.g., at a local distribution site or even at the manufacturing facility).

[0028] In an alternative embodiment, a hand-held unit 84 could be used to communicate store location information to the scale controller via the communications interface 36, or the store computer 82 may communicate the information to the scale controller.

[0029] In another embodiment, the scale could incorporate an internal GPS module 86 that would be used to identify the store location information when triggered to do so during the set-up or calibration mode. Alternatively, the hand-held unit 84 could include the GPS module and communicate the GPS information to the controller. Exemplary implementations of such embodiments are described below with respect to Figs. 4-7.

[0030] Fig. 4 shows an example of a weighing scale 104 incorporating a weighing scale calibration device 102 that comprises a GPS system 108 and control means 110 to facilitate the aforesaid calibration functions including to determine the gravitational constant 'g' from the location data obtained from the GPS system 108 and automatically calibrate the scale. The control means 110 includes hardware such as one or more memory storage devices, one or more processor devices and other electronic circuitry operative to provide the calibration functions of the present invention. The control means 110 may optionally include software modules residing in permanent or removable memory devices operative to provide at least some of the aforesaid calibration functions. Such software modules may include databases and gravitational calculation modules.

[0031] The GPS system 108 acts to pinpoint the location of the scale 104 via satellite signals. Once the calibration device 102 has successfully pinpointed the location of the weighing scale, it then proceeds to calculate an updated value of gravitational constant 'g' or other value indicative of gravitational strength. This may be accomplished via a calculation or a look up table on an internal or any other suitable means to determine the required gravitational strength value. The weighing scale 104 can then use the updated value of gravitational strength value in its future and subsequent measurements.

[0032] Fig. 5 shows a weighing scale calibration system 12 comprising a weighing scale 104 and a portable calibration unit. The portable calibration unit 106 comprises at

least part of the weighing scale calibration device 102. In this example the portable unit 106 comprises a GPS system 108 operable to obtain location-based data and the control means 110 to determine gravitational constant 'g' or a value indicative of gravitational strength. However it may be equally viable in an alternative to this example that the control means 110 to determine gravitational strength resides in the scale 104 whilst the GPS system 108 or other automatic location obtaining means reside in the portable calibration unit. In this example, the location data is obtained over secure communications. The secure communications may be effected by any software, hardware or technique that verifies that the handheld unit 106 is legitimate and/or can be legitimately used by non-authorised or non-appointed calibration personnel.

**[0033]** The person uses the portable calibration unit 106 to automatically obtain the location data. The person then interfaces the portable calibration unit 106 with the weighing scale 104 in order to transfer the location data and/or gravitational strength data to the weighing scale.

**[0034]** The interfacing may be accomplished by a variety of means and methods. These methods could include, but are not limited to, cable transfer such as Universal Serial Bus (USB), wireless transfer such as Bluetooth®, infrared or other wireless communication means and protocols. The portable calibration unit 106 may be a PDA or other portable handheld device with wireless communication access. Alternatively as shown in Figs. 6a and 6b, the portable calibration unit 106 may be designed specifically for weighing scale calibration purposes, and may have a physical interface 114 pluggable into a scale 104 comprising a bespoke complimentary physical interface 116 to that of the portable unit.

**[0035]** By having a portable calibration unit 106 that automatically obtains location-based information, a person using the portable calibration unit 106 may calibrate the scale 104 more quickly than using conventional methods. This may reduce or negate completely the duration of an appointed persons time at the site of the weighing scale, thus reducing the costs associated with performing a single calibration. The fact that the portable calibration unit is automatically verified as legitimate by the secure communication process eliminates the need for the calibration to be carried out by an officially authorized or trusted person, such as a local weights and measure official. The calibration can instead be performed by an ordinary delivery person or setup technician.

**[0036]** By automatically obtaining location data, the need for an appointed or qualified official from a competent body to come and recalibrate a weighing instrument or

scale 104 for a different value of gravitational constant can be minimised or negated completely, as there is no need to break or reapply a seal confirming the updated gravitational constant value 'g'.

**[0037]** Instead, whenever a weighing scale 104 is transferred to a new location or needs updating at its present location, the geographical location is updated with a communications device and a new value of gravitational constant 'g' determined from the obtained data and the scale 104 is automatically calibrated. Such recalibration is required at each site not only to compensate for any changes in gravity zone but also due to the possibilities of tampering during transit, lack of trust in foreign or other external calibrations, or other government regulations.

**[0038]** Having a portable calibration unit 106 with means to automatically obtain location data is also advantageous in situations where a weighing scale 104 has been moved to a new location in which there exists no wireless or cabled communication access. For example, in a large heavily clad building devoid of any cabled or wireless communication access. In this particular situation a GPS 108 or other communication device on the scale 104 would be unable to obtain the required location data necessary for recalibration. As weighing scales or other weighing instruments may be heavy and cumbersome they may be difficult to move to another immediate geographical position where GPS signals are available in order to perform a recalibration of the gravitational constant 'g'. The chances of the scale 104 being dropped or damaged are therefore increased if the scale 104 has to be moved each time a calibration is required. Furthermore, such a location may be outside the building, in which case the scale 104 may be subjected to adverse weather conditions while it is obtaining the location data. Such weather conditions could damage the scale.

**[0039]** The person carrying the portable calibration unit, in this instance, would therefore take the reading of geographical location with the portable calibration unit 106 at a sufficiently close point to the weighing scale 104 that allows for the obtaining of the approximate location data. This would be, for example outside of the building where a GPS or other wireless signal could be transmitted and received.

**[0040]** Once the person obtains the sufficiently accurate proximate value of location, the person then enters the building to interface the portable calibration unit 106 with the scale 104 and automatically update the gravitational strength value. Such a portable calibration unit 106 may also be useful in a similar situation where a weighing

scale 104 fitted with a communication means according to the present invention is in a location devoid of communication access and requires recalibration at the same site.

**[0041]** For additional security and verification the calibration unit may include a timeout function and the calibration unit and/or scale may incorporate calibration record keeping functions. Specifically, the calibration unit (e.g., secure computer device) may include a gravity strength timeout function that prevents transfer of the gravitational strength value from the secure computer device to the scale after a specified time period, which specified time period may be a specified period after completion of determining location or determining gravity strength of the location. In this manner, the possibility of the calibration unit 106 assigning an incorrect gravity strength value to the scale (e.g., a value obtained from a different location) can be reduced. The calibration device 106 may store a record of identity of the scale calibrated, which record may include date and/or time data pertaining to calibration of the scale and the gravitational strength value. Thus, the single calibration device 106 may maintain a complete record of all scales it calibrates. The scale 104 may also store a record of identity of the calibration device from which the gravitational strength value was received, which record may include date and/or time data pertaining to calibration of the scale. Such records may be later used for verification purposes.

**[0042]** Fig. 7 shows another example of where a scale 104 comprises the weighing scale calibration device 102 of the present invention. The weighing scale 104 in this example is primarily powered via a mains electricity cable connection. The weighing scale 104 comprises a GPS system 108 similar to that described and shown in Fig. 4. The weighing scale 104 in this example further comprises a motion sensor 118, an internal power source 120 and control means 122. The internal power source 120 may also be attached to the weighing scale 104 and is primarily used to provide power to the GPS system 108 when primary power 124 from mains electricity is not available. This internal power source 120 is typically, but not limited to, a battery. The scale 104 may have provisions for trickle charging 126 the battery by the primary power source 124 during normal operation.

**[0043]** The motion sensor 118 is internal or attached to the weighing scale 104 and may also be powered by the internal power source 120 or another separate or dedicated power source distinct from the primary power source 124. The motion sensor 118 is operative to detect motion of the weighing scale 104 for example when the scale 104 is

being carried or moved. Such a sensor 118 may comprise a Micro Electrical Mechanical device or other stability or relative motion sensing device.

**[0044]** The control means 122 in this example may comprise, but is not limited to, features such as hardwired driving circuitry, one or more processors, one or more memory devices and software. The control means 122 is operative to control and facilitate the functional aspects of the present invention in this example.

**[0045]** In this example, the weighing scale 104 and its associated components are set up to automatically obtain GPS location data when the scale 104 is being moved. Normally the GPS system 108 obtains operational power from the primary power source 124. Typically when a scale 104 is relocated to another site, the mains cable is unplugged and the scale 104 is picked up and transferred to the new site. In this example of the present invention, when the scale 104 is unplugged or otherwise cut off, the control means 122 sets the weighing scales to an 'unplugged state'. When in the 'unplugged state' the control means 122 monitors signals from the motion sensor 118 in order to detect whether or not the scale 104 is being moved. The control means 122 also routes power so that the internal power source 120 provides power to the GPS system 108 so that the GPS system 108 is set to obtain updates of location data whilst the scale 104 is in the 'unplugged state'. The control means 122 may achieve this in a number of ways.

**[0046]** One way is to continually update relocation information based on periodically activating the GPS system 108 to obtain periodic samples of location data with time. When in the 'unplugged state', the control means 122 waits for a signal from the motion sensor 118 indicating that the scale 104 has been or is being moved. Once both the conditions of movement and 'unplugged state' are present, the control means 122 then activates the GPS system 108 to periodically obtain location-based data. In this manner the weighing scale 104 automatically updates its value of gravitational constant whilst being moved until the primary power source 124 is once again applied to the weighing scale. Alternatively, the GPS system is activated to obtain the location data when no motion is detected and the scale is restored to mains power. Yet alternatively, the motion sensor and internal power supply are omitted and the GPS system is activated and the location and gravity strength data are obtained or calculated each time mains power is restored.

**[0047]** The control means 122 may additionally signal the GPS system 108 to obtain location-based data or may increase the frequency of the periodic sampling of location when further motion is detected by the motion sensor 118. Increasing the periodic

sampling or providing additional values of location when the motion sensor 118 is triggered, allows the weighing scale 104 to advantageously obtain updated location data during periods of high movement, such as when a delivery vehicle has stopped and a delivery person is removing the scale 104 from the vehicle to take to the new site.

**[0048]** When the scale 104 is finally located and deployed at the new building and the primary source is re-applied to the weighing scale, the GPS system 108 is activated in order to obtain the new location data. Where no GPS signal is available in the new building, the control means 122 then proceeds to take the last known value of location data to be the correct value of geographical location for gravitational constant determination and then recalibrates the scale. Because the last value was the value taken immediately outside the building when the scale 104 was being moved, the gravitational constant 'g' calculated would be accurate to the immediate proximity of the final scale 104 location.

**[0049]** Alternatively, the weighing scale 104 may obtain its GPS location data only when the motion sensor 118 is tripped when the scale 104 is in the 'unplugged state'. In this alternative, internal power source 120 power is conserved and the GPS system 108 only operates to obtain location information when the weighing scale 104 is being moved, for example when a removal person is carrying the scale 104 into the new building. Again, once in the building, if the weighing scale 104 cannot then obtain a GPS positional reading, it then reverts to its last taken positional reading. This last positional reading would be the reading taken from the last detected movement of the motion sensor 118 such as the geographical location immediately outside of the new location which was taken when the removal person started to pick up and remove the scale 104 from the delivery vehicle. As such, the last obtained values of location data would be suitable for using as a gravity zone to calculate or determine the new updated gravitational strength value. The weighing scale 104 in this example therefore automatically recalibrates the scale 104 for the gravitational constant 'g' without the need for an authorized person even when GPS signals are unobtainable at the new location.

**[0050]** By having the condition that both the primary power source 124 and movement be required in order to activate the GPS system 108, the weighing scale 104 does not unnecessarily recalibrate for gravitational constant 'g' when there has been a power cut or when someone accidentally knocks the weighing scale. This condition for GPS activation is one possible arrangement within the scope of the present invention. It

may be required that other GPS activation conditions are manually, automatically or permanently set for the scale.

[0051] Furthermore the control means 122 may activate the GPS system 108 only when the motion sensor 118 has been tripped a number of times or has detected sustained weighing scale 104 movement over a specific period of time. In this manner the weighing scale 104 does not unnecessarily recalibrate itself when someone unplugs the scale 104 from the primary source and moves it to a different location within the same building.

[0052] It is also further envisaged with this example that a weighing scale 104 comprising the calibration device 102 of the present invention is not primarily powered by mains electricity. In such a situation the control means 122 may activate the GPS system 108 to update location data just based upon detection of movement from the motion sensor 118.

[0053] In all of the above examples, the GPS system 108 may equally be replaced by or have additional communication devices capable of updating location data, such as mobile phone technology or other suitable wireless devices.

[0054] It is to be clearly understood that the above description is intended by way of illustration and example only and is not intended to be taken by way of limitation. Other changes and modifications could be made.

[0055] What is claimed is:

## CLAIMS

1. A method of scale calibration, comprising the steps of:
  - (a) providing a scale at an installation site;
  - (b) providing a secure computer device, distinct from the scale, at the installation site, the secure computer device including a location determining system and a gravity determination function;
  - (c) the secure computer device determining a location of the installation site using the location determining system;
  - (d) the secure computer device determining a gravitational strength value for the installation site using the gravity determination function and the location determined in step (c);
  - (e) initiating a secure communication link between the scale and the secure computer device;
  - (f) transferring the determined gravitational strength value from the secure computer device to the scale via the secure communication link;
  - (g) storing the gravitational strength value in memory of the scale for use in calculating weight.
2. The method as claimed in claim 1 wherein the secure computer device is one of a PDA, a mobile phone, or any other portable handheld communication device.
3. The method as claimed in claims 1 or 2 wherein the secure communications link is a wireless link.
4. The method as claimed in claims 1 or 2 wherein the secure communications link is a hard-wired link.
5. The method as claimed in any of claims 1 to 4 wherein the secure computer device includes a gravity strength timeout function that prevents transfer of the gravitational strength value from the secure computer device to the scale after a specified time period.

6. The method of claim 5 wherein the specified time period is a specified period after completion of step (c) or step (d).
7. The method as claimed in any of claim 1 to 6 wherein the secure communication link is established utilizing handshaking functions and secure keys transferred between the secure computer device and the scale.
8. The method of claim 1, wherein steps (a) through (g) occur within or in close proximity to a building where the scale is being installed.
9. The method of claim 1 wherein step (d) involves utilizing one of a gravity strength calculation or a gravity strength database to determine the gravitational strength value.
10. The method of any of claims claim 1 to 9, including the further step of the secure computer device storing a record of identity of the scale calibrated.
11. The method of claim 10 wherein the record further includes date and/or time data pertaining to calibration of the scale and the gravitational strength value.
12. The method of any of claims 1 to 11, including the further step of the scale storing a record of identity of the secure computer device from which the gravitational strength value was received.
13. The method of claim 12 wherein the record further includes date and/or time data pertaining to calibration of the scale.
14. The method of any of claims 1 to 13 wherein the location determining system is a GPS system.
15. A weighing scale calibration device, comprising:  
a control including a secure communication function, a location determining function and a gravity calculation function, the location determining function operable to determine a location of the scale calibration device, the gravity calculation function

operable to determine a gravitational strength value based upon the location, the secure communication function operable to establish a secure communication link with a scale for transferring the gravitational strength value to the scale.

16. The weighing scale calibration device of claim 15, wherein the control includes a gravity strength timeout function that is operable to prevent transfer of the gravitational strength value from the weighing scale calibration device after a specified time period.

17. The weighing scale calibration device of claim 15 or claim 16, wherein the control includes a calibration record function operable to store in memory of the device a record of identity of the scale calibrated.

18. The weighing scale calibration device of claim 17 wherein the calibration record function is further operable to store in the record date and/or time data pertaining to calibration of the scale.

19. The weighing scale calibration device of any of claim 18 wherein the calibration record function is further operable to store in the record the gravitational strength value for the scale.

20. A weighing scale with an automated calibration function, the scale comprising:  
means to automatically obtain location data and determine a value of gravitational constant from the obtained data;  
an internal motion sensor;  
a primary power source;  
an internal power source;  
control means that operates to detect motion of the scale with the internal motion sensor and detects a cut off of the primary power source, the control means responsively providing power to the location data obtaining means using the internal power source upon detection of such motion and primary power source cut off so as to operate the location data obtaining means to obtain location based information.

21. A weighing scale, portable calibration unit or weighing scale calibration system substantially as described with reference to or as shown in the drawings.

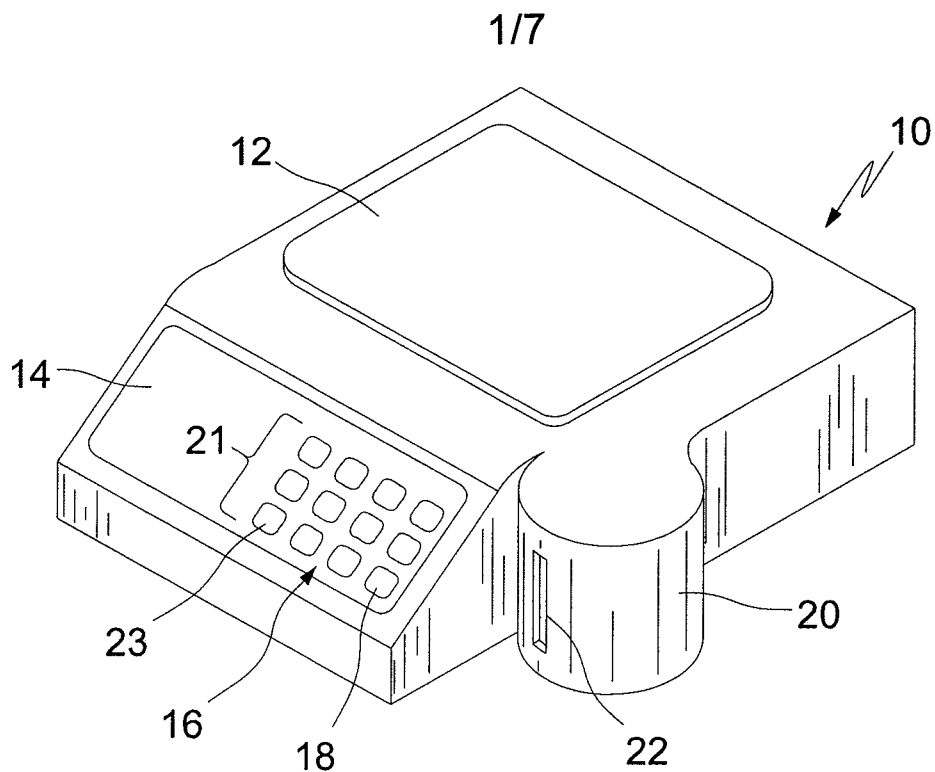


FIG. 1

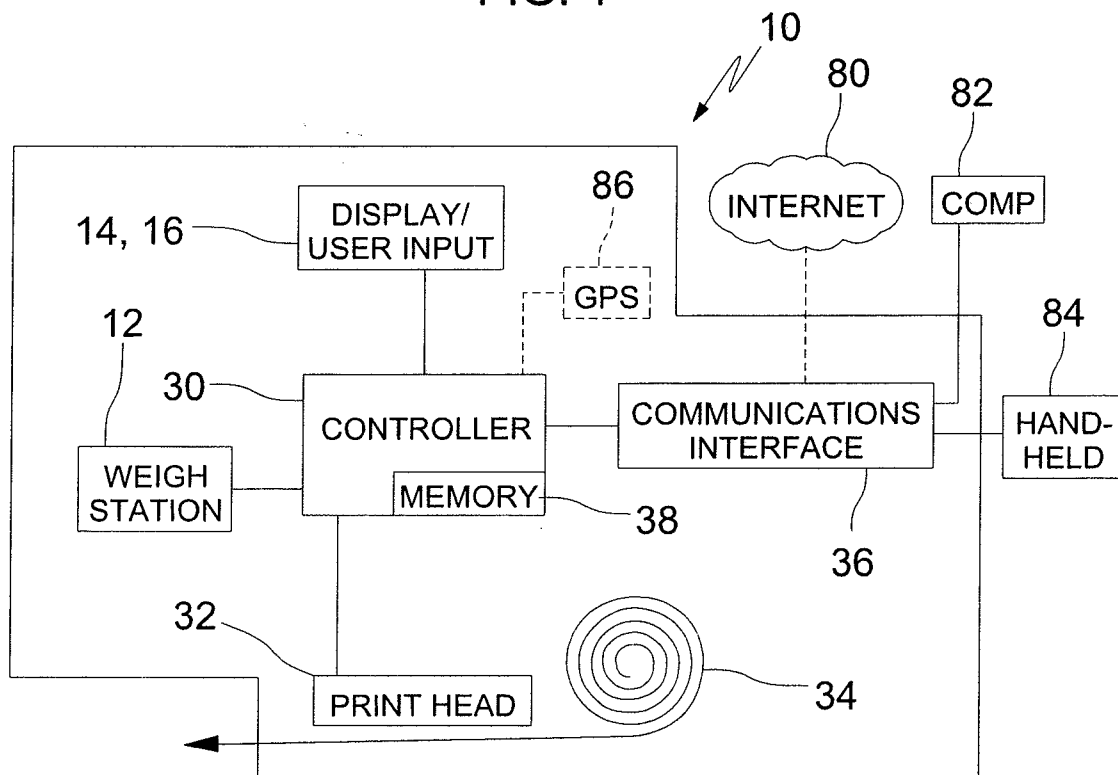


FIG. 2

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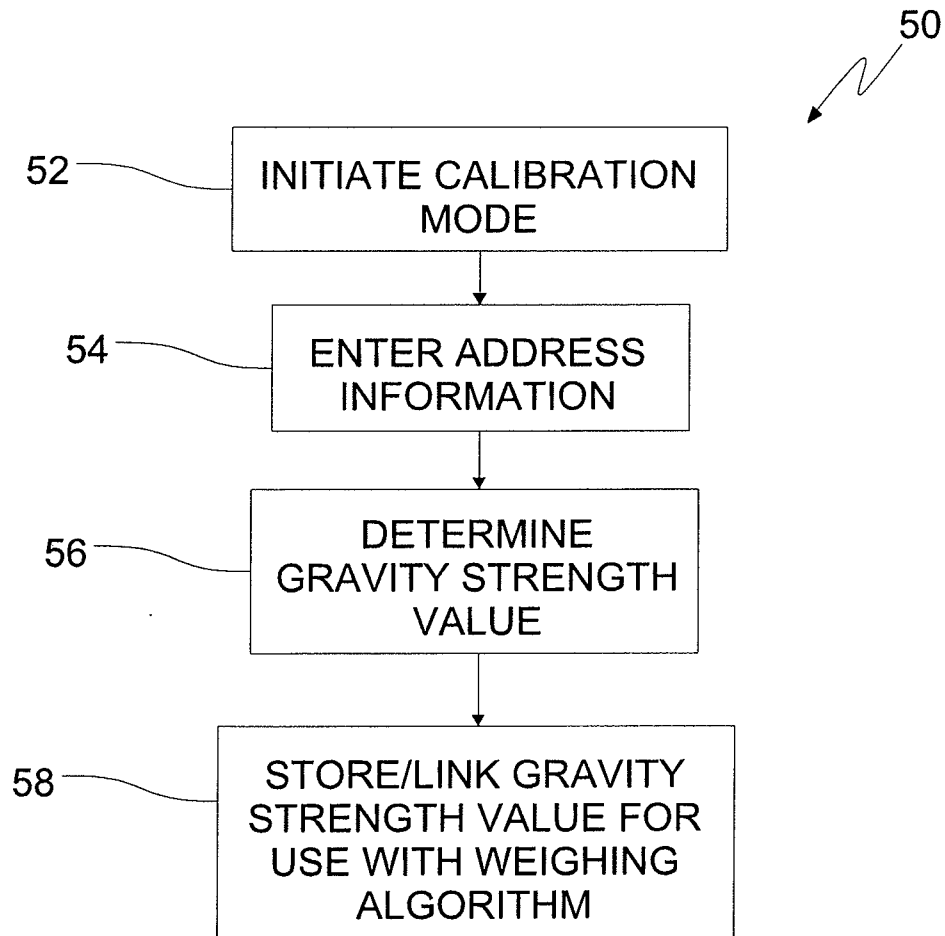


FIG. 3

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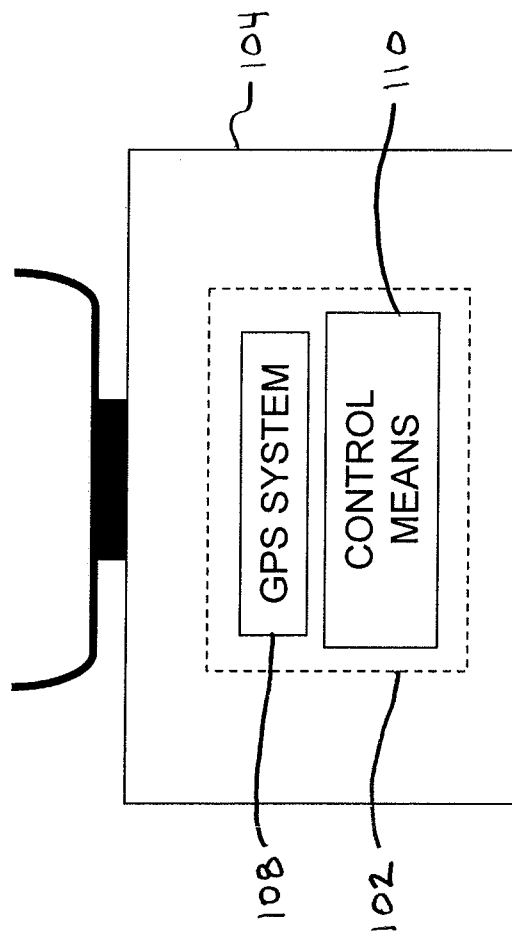
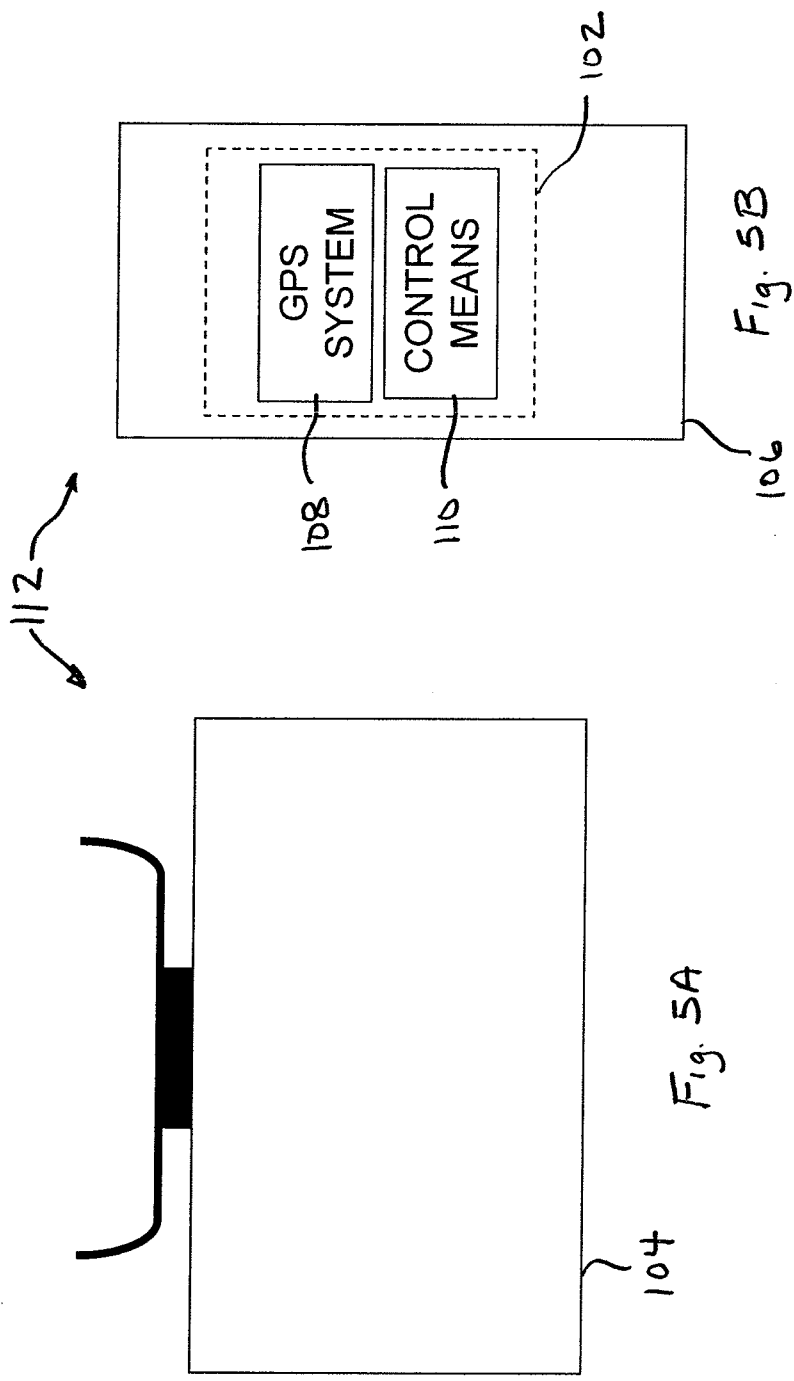


Fig. 4



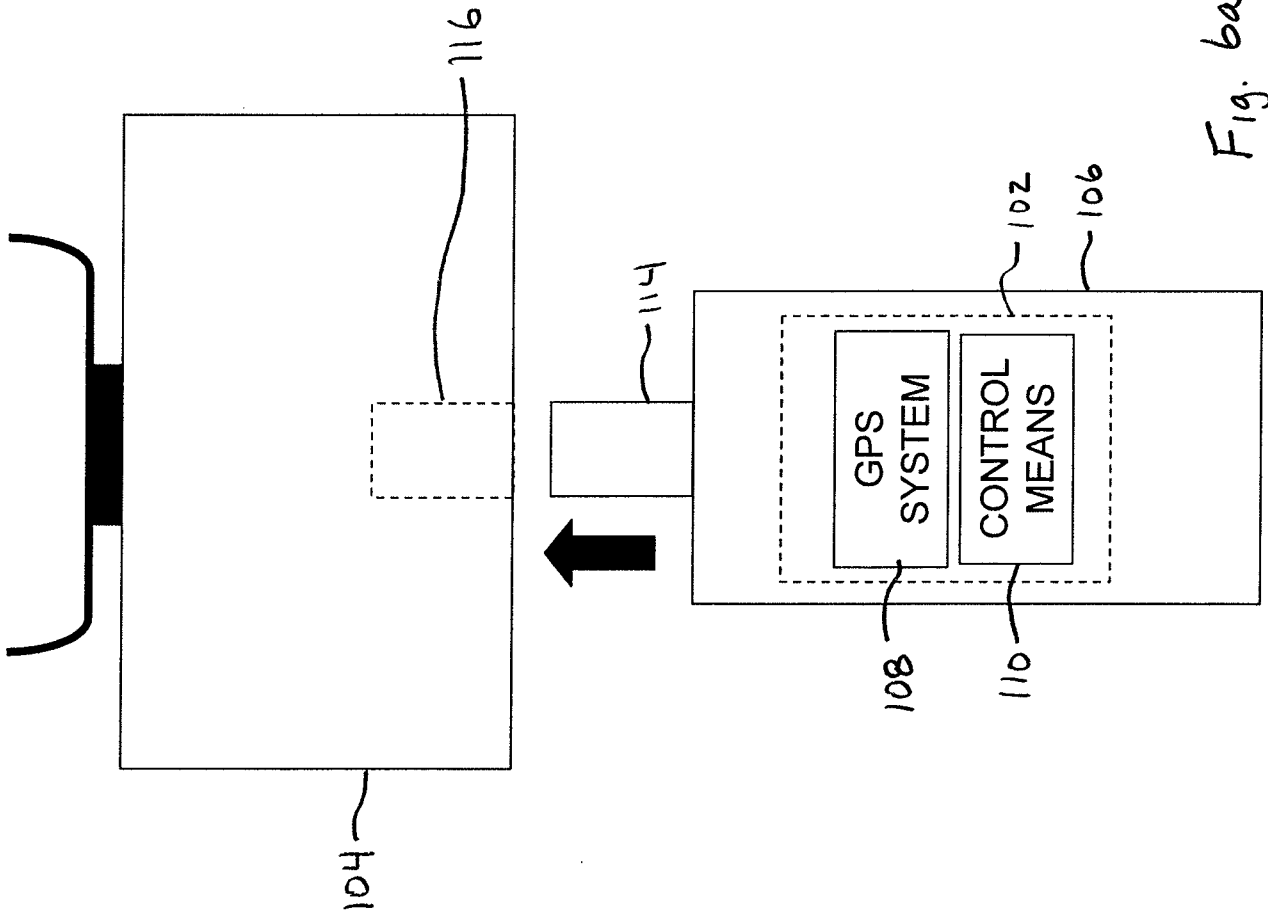


Fig. 6a

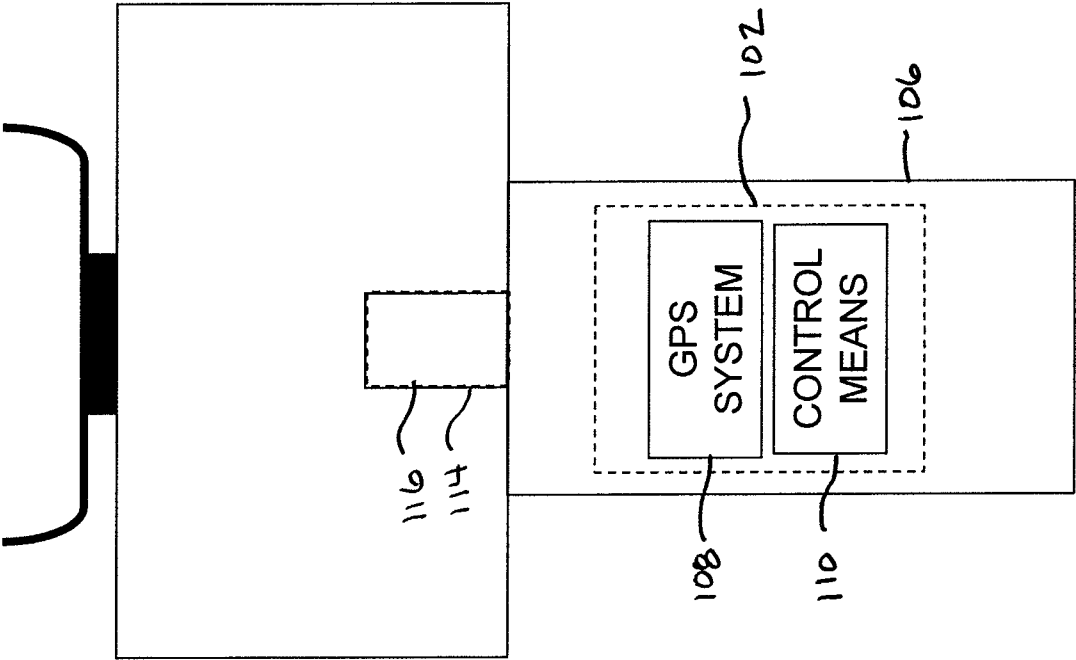


Fig. 6b

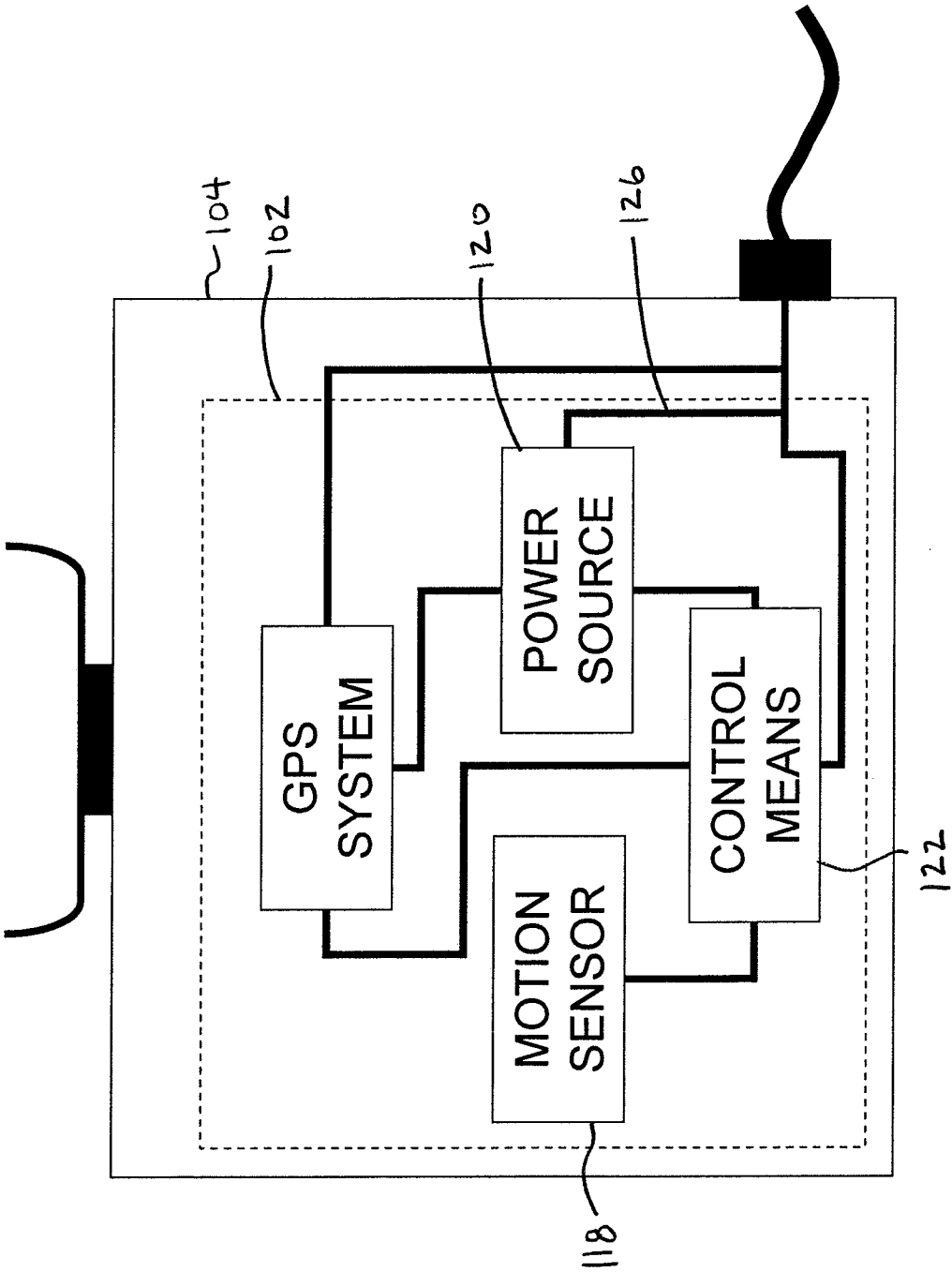


Fig. 7