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(54) **METHOD OF IMPROVING MEDICAL APPARATUS IN ORDER TO REDUCE OR REPLACE ANCILLARY MEDICAL ASSISTANCE BY EMPLOYING AUDIBLE VERBAL HUMAN SOUNDING VOICES WHICH PROVIDE THERAPEUTIC INSTRUCTIONS AND ENCOURAGE USAGE AND GIVE MEASUREMENTS AS NEEDED EMANATING FROM THE APPARATUS'S BY USING ELECTRONIC TECHNOLOGY**

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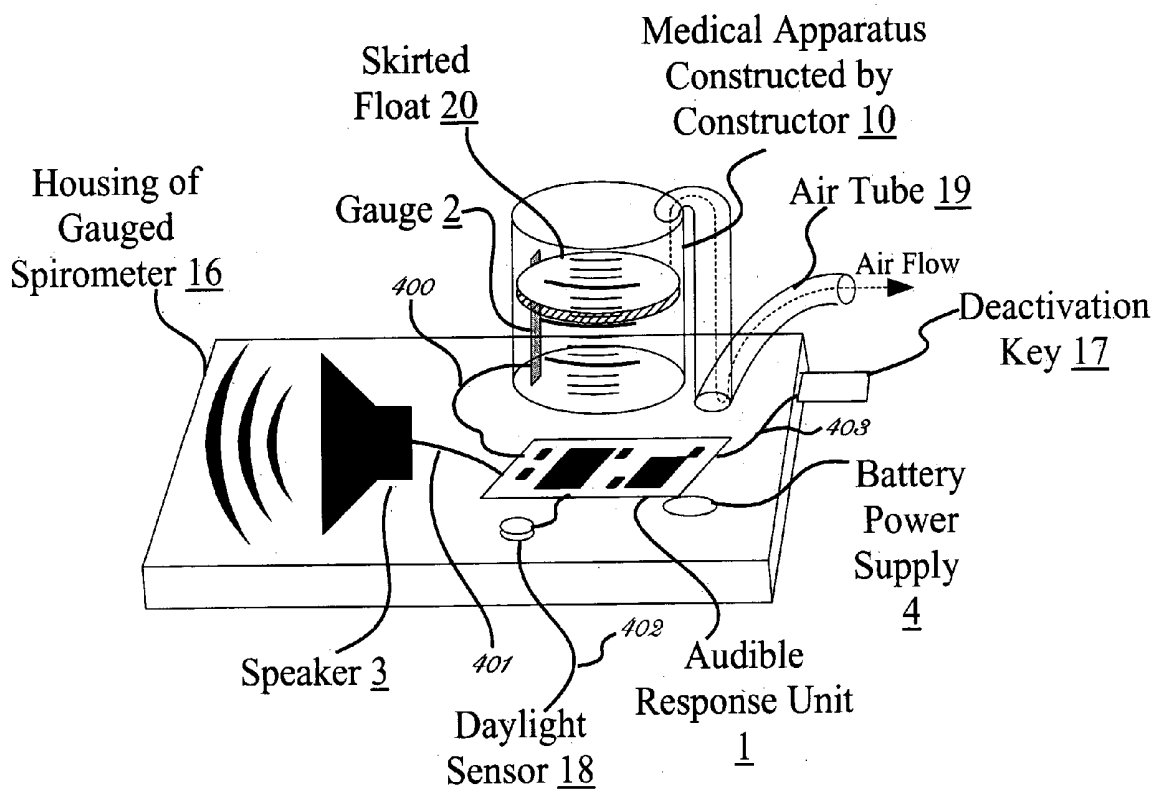
(52) **U.S. Cl.** **600/538**; 600/300

(57) **ABSTRACT**

The present invention relates to an appartus used in the medical industry, in order to increase transpulmonary pressure and respiratory volumes, improve inspiratory muscle performance and re-establish the normal pulmonary hyperinflation, through the employment of electronic technology, providing audible, simulated, verbal, human sounding words, that assist, guide and prompt, increasing patient usage. In the past, lack of usage of this simple plastic, antiquated, disposable unit, by the patient, has contributed to severe problems, such as pneumonia. Without prompting, the patient, finds it hard to inhale into a tube repetitively, to improve their lungs. Previous applications of prior equipment has been poor, thus adding intelligence in the form of electronic technology, which prompts without assistance, is a tremendous advantage in helping not only the sighted, but also the blind as well, since normally only written information accompanies the incentive spirometer, thus, changing the use of this medical device as we know it today.



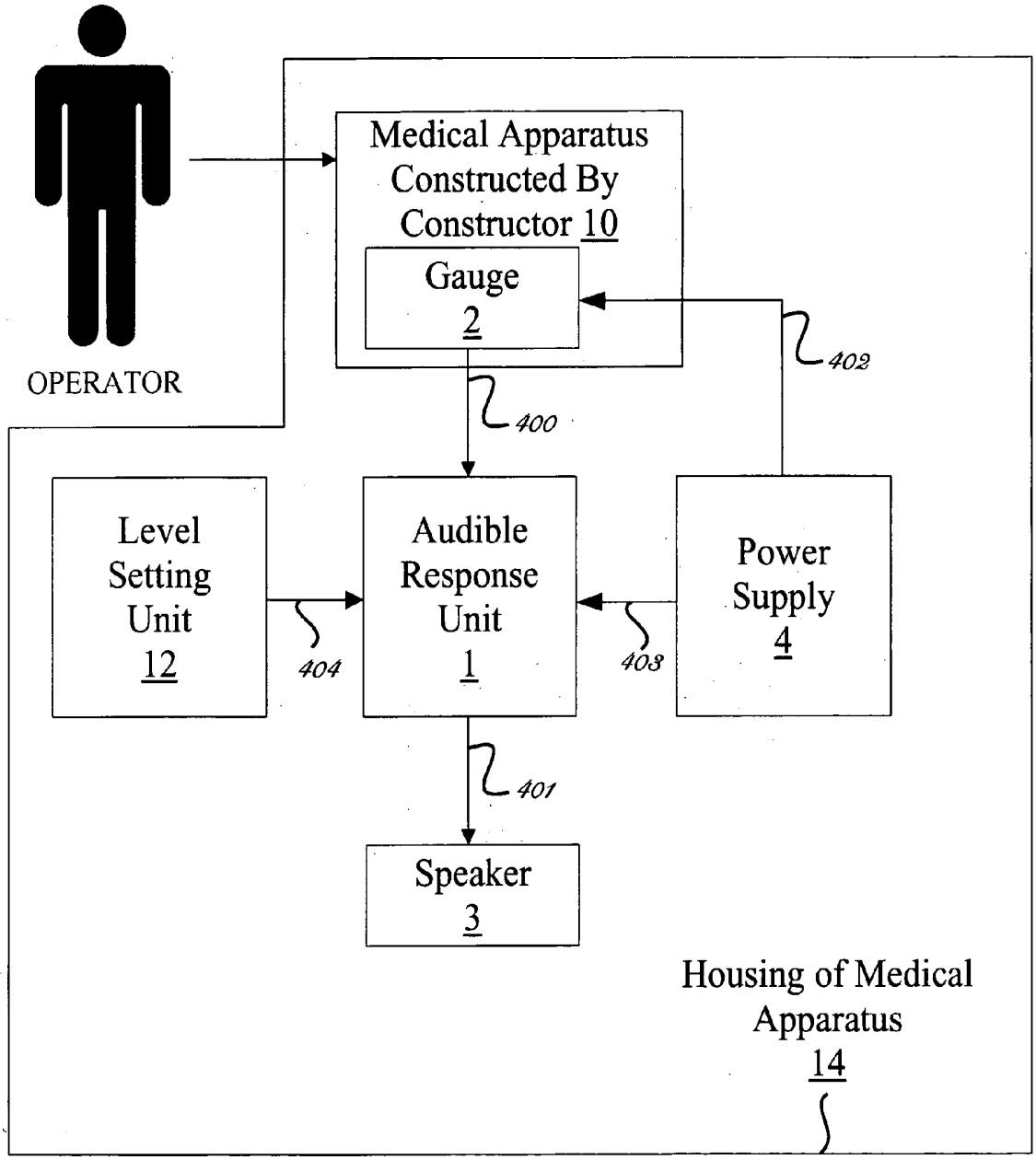


Fig. 1 Present Invention Within Housing of Medical Apparatus

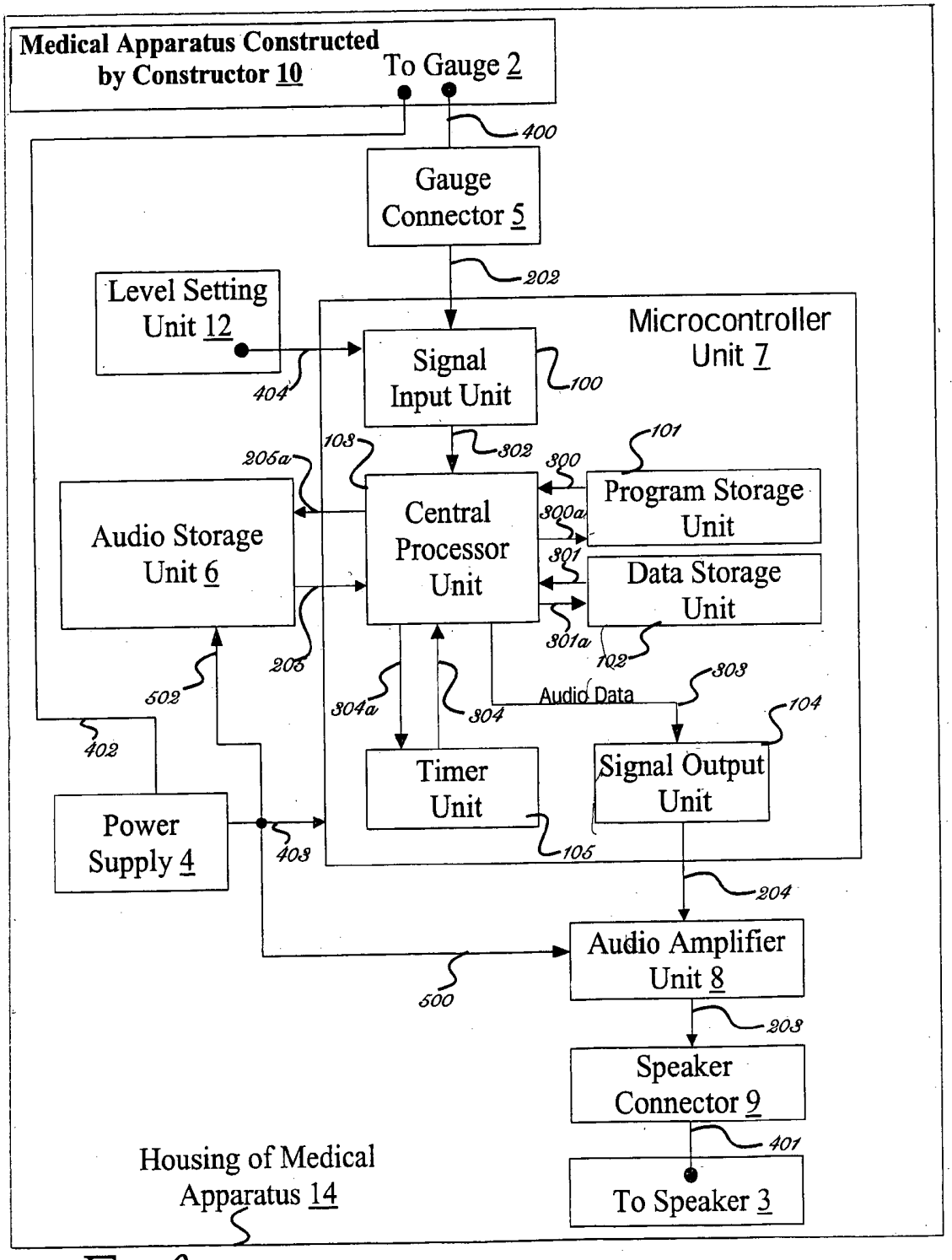


Fig. 2 Present Invention Within Housing of Medical Apparatus

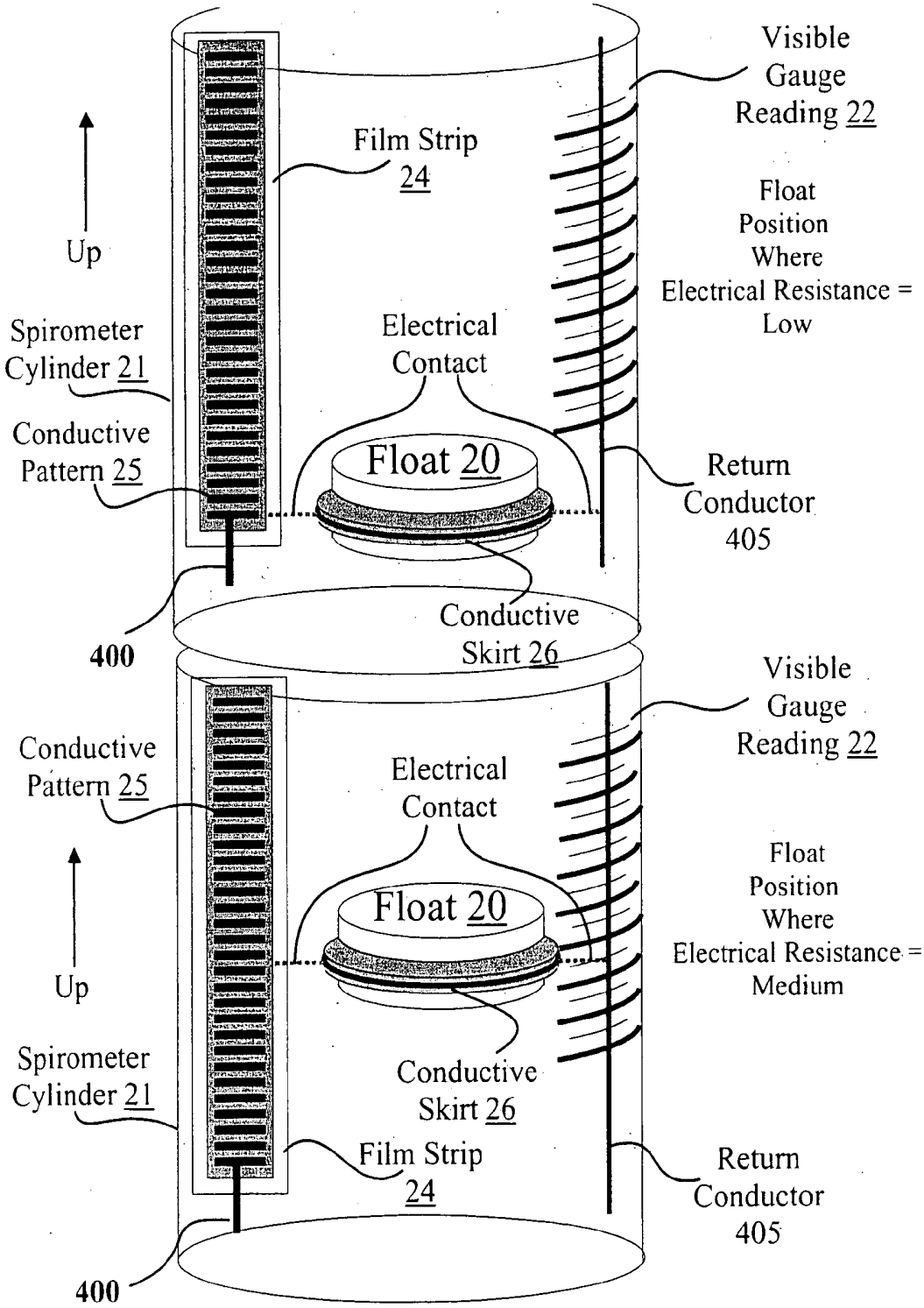


Fig. 3 Perferred Embodiment of Spirometer Gauge 2

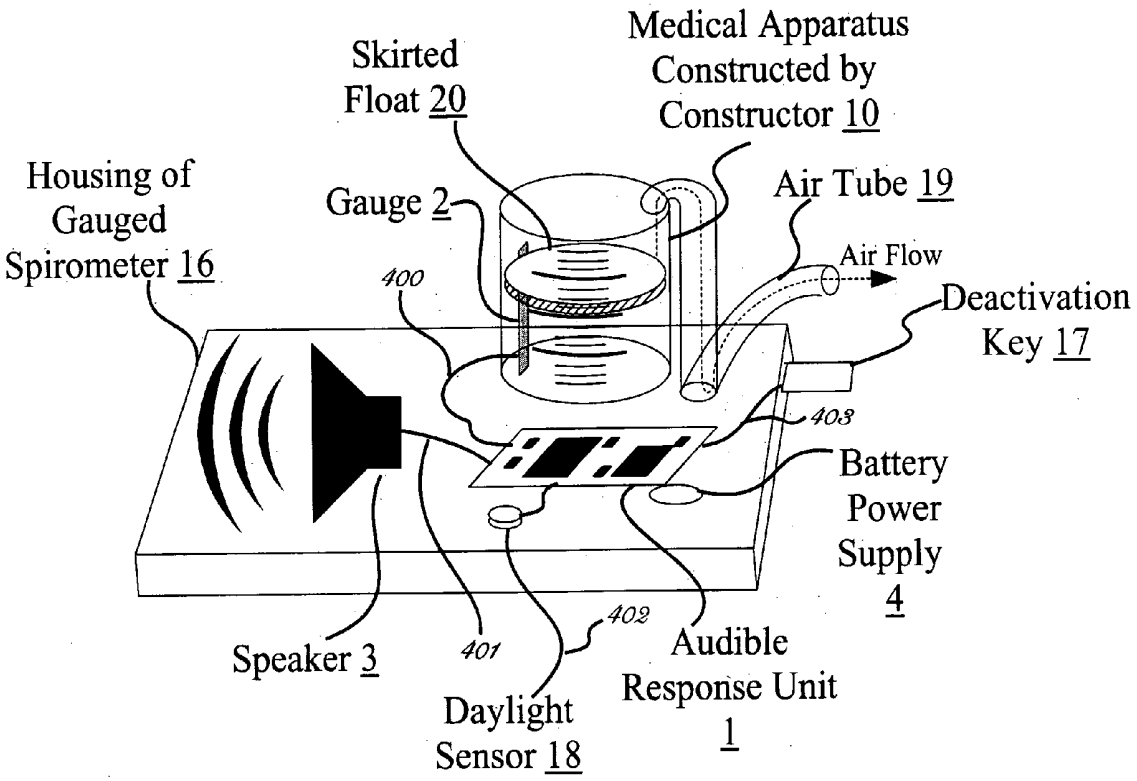


Fig. 4 Present Invention Within Housing of Gauged Spirometer 16

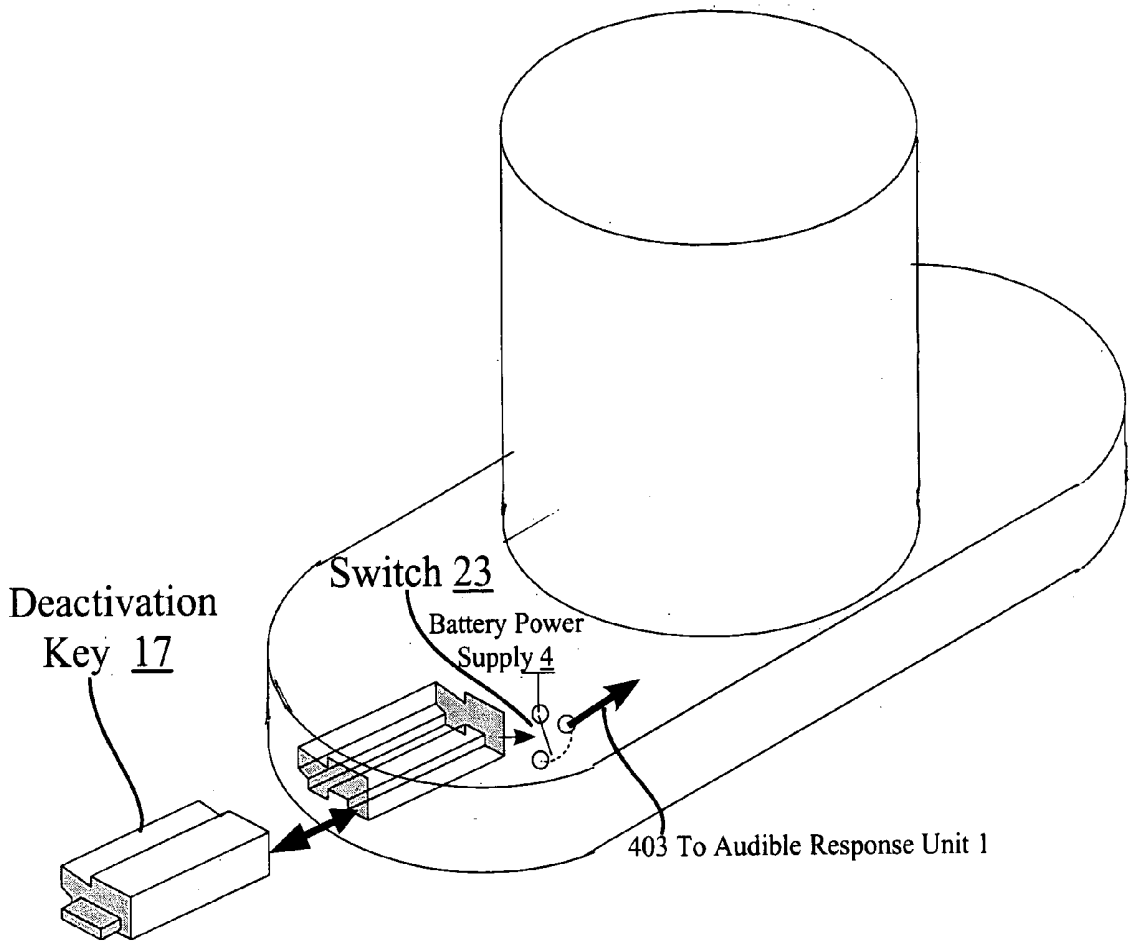


Fig. 5 Perferred Embodiment of Deactivation Key for Present Invention Within Housing of Medical Apparatus

METHOD OF IMPROVING MEDICAL APPARATUS IN ORDER TO REDUCE OR REPLACE ANCILLARY MEDICAL ASSISTANCE BY EMPLOYING AUDIBLE VERBAL HUMAN SOUNDING VOICES WHICH PROVIDE THERAPEUTIC INSTRUCTIONS AND ENCOURAGE USAGE AND GIVE MEASUREMENTS AS NEEDED EMANATING FROM THE APPARATUS'S BY USING ELECTRONIC TECHNOLOGY

BACKGROUND OF THE INVENTION

[0001] The present invention relates to enhancement of the Incentive Spirometer Medical Apparatus, through electronic technology to the medical apparatus which is normally used to help in the rehabilitation of the lungs after an operation, or similar type situations. The Incentive Spirometer consist of a plastic bell jar with a float inside the bell that rises, due to air being inhaled through a tube that is attached to the bell jar. By inhaling in the tube, the patient attempts to reach different volumes that are represented on the bell jar, where the float is used as a measuring device, but the float in the bell jar moves slowly and does not remain at it's apogee for very long, making visual accuracy for reading it's measurements on the scale, (on the bell jar), difficult The purpose of this prior art, is to bring air into the patient's lungs. The more air and use of the device, the better the patient's lungs become and thus the lungs are strengthened, however as recent studies have shown, complications such as pneumonia, are due to the lack of compliance, by the patient. Normally, the patient must utilize this medical apparatus without assistance and is expected to basically read written information on how to use the device, which is often performed improperly. Through the improvement of using electronically simulated, audible, verbal, human sounding word, words, or phrases that emanate from within the Incentive Spirometer itself, the ability of this programmed new invention, has the intelligence to detect the patient's measurements, as well as prompting the exact time, that the patient should begin therapy again accordingly. This new improved apparatus, will also give the measurement of the volume that the patient has performed during their therapy, along with encouraging phrases that continue to lead and guide the patient until the full therapy is completed. Prior art required the patient to do the therapy unsupervised and the present invention will provide verbal instruction and guidance electronically, allowing not only the sighted but the blind to benefit as well, providing a new method of technology in the medical industry.

DESCRIPTION OF THE DRAWINGS

[0002] **FIG. 1** Shows Preferred Embodiment of Present Invention

[0003] A Gauge **2** connects to Audible Response Unit **1** through one or more electrical connections labeled **400**.

[0004] Audible Response Unit 1 connects to Speaker **3** through an electrical connection labeled **401**.

[0005] Power is supplied from Power Supply **4** to Gauge **2** through an electrical connection labeled **402**.

[0006] Power is supplied from Power Supply **4** to Audible Response Unit **1** through an electrical connection labeled **403**.

[0007] **FIG. 2** Shows the Preferred Embodiment of Audible Response Unit **1** of **FIG. 2**.

[0008] Gauge **2** of **FIG. 1** connects to Gauge Connector **5** through one or more electrical connections labeled **400**.

[0009] Gauge Connector **5** connects to Signal Input Unit **100** which is a subunit of the Microcontroller Unit **7** through one or more electrical connections labeled **202**.

[0010] Microcontroller Unit **7** contains subunits Signal Input Unit **100**, Program Storage Unit **101**, Data Storage Unit **102**, Central Processor Unit **103**, Signal Output Unit **104** and Timer Unit **105**.

[0011] Signal Input Unit **100** provides information to Central Processor Unit **103** through a set of signals labeled **302**.

[0012] Central Processor Unit **103** receives a set of program instructions that provide the function of the Audible Response Unit **1** from Program Storage Unit **101** by providing control information through signals labeled **300***a* and receiving instructions through signals labeled **300**. Information used by the program instructions are kept in Data Storage Unit **102** by providing control information and data to be stored through a set of signals labeled **301***a* and by receiving data through a set of signals labeled **301**.

[0013] Central Processor Unit **103** controls a set of timers in Timer Unit **105** through a set of signals labeled **304***a* and receives information from the timers in Timer Unit **105** through a set of signals labeled **304**. The Central Processor Unit **103** uses information from Timer Unit **105** to determine accurate time intervals.

[0014] Central Processor Unit **103** receives audio data from Audio Storage Unit **6** by providing control information through a set of signals labeled **205***a* and by receiving audio data through a set of signals labeled **205**.

[0015] Central Processor Unit **103** relays the audio data received from Audio Storage Unit **6** to Signal Output Unit **104** by transferring the audio data through a set of signals labeled **303**. Signal Output Unit **104** transfers audio data to Audio Amplifier Unit **8** through a set of signals labeled **204**.

[0016] Audio Amplifier Unit **8** transfers amplified audio data to Speaker Connector **9** through a set of signals labeled **203**.

[0017] Speaker Connector **9** connects to Speaker **3** of **FIG. 2** through a set of signals labeled **401**.

[0018] **FIG. 3** Shows the Present invention within the housing of a Medical Apparatus **10**, that implements a Gauged Spirometer whose housing is identified as **16** and which encloses the Medical Apparatus **10**, which is comprised of the Speaker **3**, Audible Response Unit **1**, Battery Power Supply **4**, Daylight Sensor **18**, and Deactivation Key.

[0019] Daylight Sensor **18**, is used by the Audible Response Unit **1**, that detects that it is nighttime by measuring the signal on **402** and comparing it to a value within the Data Storage Unit **102**.

[0020] Deactivation Key **17**, deactivates the Audible Response Unit **1**, that closes a switch that relays a signal over electric conductor **403**, comparing it to a value within the Data Storage Unit **102**, it enters an operational mode called "silent mode".

[0021] **FIG. 4** Detail of Gauge **2**, Film Strip **24** is attached to the inside wall of Spirometer Cylinder **21**, covered with a Conductive Pattern **25**, Float **20** moves freely up and down within the Spirometer Cylinder **21**, making contact with Conductive Pattern **25** of Film Strip **24**, which is covered with Conductive Skirt **26**, this creates a electric path from contact with Film Strip **24** and the Return Conductor **405**.

[0022] Current from electric conductor **400**, through Film Strip **21**, through Conductive Pattern **25**, through Float Skirt **26**, through Return Conductor **405**, is proportional to the position of electrical contact, called "float signal".

[0023] "Float Signal" is relayed to Audible Response Unit **1**, by electric conductor **400**, interpreted in Audible Response Unit **1** and is able to measure and record performance.

[0024] **FIG. 5** Detail of Deactivation Key **17**, which causes switch **23** to close, thus connecting Battery Power Supply **4**, to electrical conductor **403**, causing a signal on electric conductor **403**, relayed to Audible Response Unit **1**, interpreting the signal on electrical conductor **403** as described in **FIG. 6**.

DETAILED DESCRIPTION OF THE INVENTION

[0025] When the Apparatus **10** in **FIG. 1** is used by the operator, a Gauge **2** within the Apparatus produces an electrical signal on electrical conductor **400** proportional to the physical parameter that is measured by the Gauge **2**. The electrical signal on **400** is variable over time and represents an electrical representation of the parameter measured by the Gauge **2** during the duration of time that the Apparatus **10** is used. The electrical signal on **400** is input to the Audible Response Unit **1** where the electrical signal on **400** is evaluated.

[0026] The Gauge Connector **5** on **FIG. 2** relays the electrical signal on **400** to the Signal Input Unit **100** within Microcontroller Unit **7** where the electrical signal on **400** is converted repeatedly at a fixed rate of once every unit of time called the "sampling interval" for the duration of time when the electrical signal on **400** is being evaluated. The Signal Input Unit **100** converts the electrical signal on **400** into a digital numerical format and relays it through a set of digital electrical signals **302** to the Central Processor Unit **302**. This process is repeated after the transpiring of time equal to the sampling interval for the duration of time over which the electrical signal on **400** is being evaluated.

[0027] The parameter being measured by Gauge **2** is thereby converted to a sequence of numerical digital values that represent the magnitude of the parameter over the time duration when the parameter is being evaluated, and each successive numerical digital value represents the magnitude of the parameter measured by Gauge **2** at the time that is one "sampling time" interval later than the preceeding numerical digital value.

[0028] The Central Processor Unit **103** executes a sequence of instructions that are retrieved from the Program Storage Unit **101**. This sequence of instructions is called the "functional program" and defines the series of steps and decisions that are made to constitute the function of the present invention. The Central Processor Unit **103** retrieves the instructions from the Program Storage Unit **101** by presenting an index called a "program address" to the Program Storage Unit **101** through the set of digital electrical signals **300***a*. The "program address" is calculated by the Central Processor Unit **103** as directed by the instructions of the "functional program" that it is executing. The Program Storage Unit **101** responds to the "program address" on **300***a* by retrieving and relaying the instruction corresponding to the "program address" to the Central Processor Unit **103**.

[0029] The instructions representing the "functional program" relayed to the Central Processor Unit **103** by the Program Storage Unit **101** over digital electrical signals **300***a* are executed by the hardware within the Central Processor Unit **103** to perform mathematical caculations, "program address" generation, and decision logic which together constitute the "functional program" of the present invention which in turn defines the behavior and function as defined for the Apparatus **10**.

[0030] Intermediate mathematical and logical calculations that are performed by the Central Processor Unit **103** as it executes the "functional program" result in information collectively called "data" that are stored in the Data Storage Unit **102**. The Central Processor Unit **103** identifies storage locations in the Data Storage Unit **102** for storing or retrieving "data" by presenting an index called the "data address" to the Data Storage Unit **102** through a set of digital electrical signals **301***a*. The Central Processor Unit **103** generates the "data address" by performing calculations that it is directed to peform by the instruction of the "functional program" that is being executed. The Central Processor Unit **103** also presents "data" to be stored through the set of digital electrical signals **301***a* to the Data Storage Unit **102**. If the Central Processor Unit is retrieving data from the Data Storage Unit **102**, the Data Storage Unit **102** presents the retrieved data associated with the "data address" on **301***a* to the Central Processor Unit **103** through a set of digital electrical signals **301**.

[0031] The Central Processor Unit **103** directs the Timer Unit **105** by presenting commands that are calculated during the execution of the "functional program" to the Timer Unit **105** through a set of digital electrical signals **304***a*. The commands instruction Timer Unit **105** on the time intervals that are to be generated. The Timer Unit **105** relays time interval information to the Central Processor Unit **103** through a set of digital electrical signals **304**. The Central Processor Unit **103** uses the timer interval information for purposes of indicating when one or a set of instructions of the "functional program" should execute. The provides the ability of the Central Processor Unit **103** to synchronize the execution of one or a set of instructions of the "functional program" to a precise point in time or an interval of time.

[0032] When the Central Processor Unit **103** determines that an audible response is needed and which audible response is to be generated as determined by the definition of the behavior of the Apparatus **10** and the definition of the "functional program", it is directed by the instructions within the "functional program" to calculate an index called the "audio address" that is used to retrieve the audible response data called "audio data" from the Audio Storage Unit **6**. The Central Processor Unit **103** presents the "audio address" to the Audio Storage Unit **6** through a set of digital electrical signals **205***a*. The Audio Storage Unit **6** responds

by relaying the "audio data" associated with the "audio address" to the Central Processor Unit **103** through a set of digital electrical signals **205**.

[**0033**] The Central Processor Unit **103** retrieves time interval information from Timer Unit **105** to determine the appropriate time when retrieved "audio data" can be relayed to the Signal Output Unit **104**. In this way, the "audio data" is successively relayed to the Signal Output Unit at a rate appropriate for the regeneration of the audible response from the "audio data". The Central Processor Unit **103** relays the "audio data" to the Signal Output Unit **104** through a set of digital electrical signals **303**.

[**0034**] The Signal Output Unit **104** recieves "audio data" from the Central Processor Unit **103** at a rate that is indicated by time interval from the Timer Unit **105**. The time interval is calculated by the Timer Unit **105** as it is commanded to do by the Central Processor Unit **103** when it executes the instructions in the "functional program" that controls setting up of the Timer Unit **105**. The time interval is made to be the value required in order to regenerate the audible response correctly when "audio data" is repetitively output at a rate equal to the time interval.

[**0035**] The Signal Output Unit **104** receives "audio data" in a digital numerical form from the Central Processor Unit **103** repetitively starting from the first unit of "audio data" to the last unit of "audio data". The Signal Output Unit **104** converts the "audio data" to an electrical signal whose magnitude is proportional to the "audio data" repetitively for each "audio data" received. It relays the elecrical signal to the Audio Amplifier Unit **8** through an electrical signal **204**. The Audio Amplifier Unit **8** multiplies the magnitude of the electrical signal relayed on the electrical signal **204** such that the amount of power represented by the electrical signal **204** is increased and output to the Speaker Connector **203**. The Speaker Connector **9** relays the amplified electrical signal on **203** to electrical signal **401** which corresponds to electrical signal **401** on **FIG. 2** The amplified electrical signal **401** is presented to the Speaker **3** in **FIG. 2**.

[**0036**] The Speaker **3** converts the amplified electrical signal **401** to sound energy that represents the audible response that the Audible Reponse Unit **1** has calculated in response to the measurement of a parameter that is determined by the Gauge **2** of the Apparatus **10** in accordance to the defined behavior of the Apparatus **10** and of the defined function of the "functional program."

[**0037**] The present invention describes a method of producing audible response to the measurement of a parameter by an Apparatus **10** so that the audible response is done according to a defined behavior determined by the constructor of the Apparatus **10**. Implementation of the defined behavior of the audible response to measurement of a parameter within the Apparatus **10** is realized by the defined function of the "functional program" that is coupled to the Audible Response Unit **1** by storing the "functional program" in the Program Storage Unit **101** within the Audible Response Unit **1** and by providing a means for the Central Processor Unit **103** within the Audible Response Unit **1** to execute the instructions in the "functional program" and to peform the actions as they direct the Central Processor Unit **103** and the other subunits within the Audible Response Unit **1**.

[**0038**] **FIG. 3** shows the Present Invention within the housing of a Medical Apparatus **10** that implements a Gauged Spirometer whose housing is identified as **16** and which encloses the Medical Apparatus **10** as well as the present invention which is comprised of the Speaker **3**, Audible Response Unit **1**, Battery Power Supply **4**, Daylight Sensor **18**, Deactivation Key **17**. The Medical Apparatus in this embodiment is constructed to perform Spirometry measurements of the medical patient referred herein as the "operator". In this embodiment of the present invention, the Power Supply **4** is implemented as a Battery in order to provide a means of operating the Medical Apparatus without the need to connect to an auxiliary power source through means of wire cords. This means is referred to as using a "cordless" power supply.

[**0039**] The present invention also includes a Daylight Sensor **18** that is used by the Audible Response Unit **1** to distinguish between daytime and nighttime. The Daylight Sensor **18** is constructed as but not limited to a photocell that relays a signal to the Audible Response Unit **1** over electrical conductor **402**. When the Audible Response Unit **1** detects that it is nighttime by measuring the signal on **402** and comparing it to a value within the Data Storage Unit **102**, it enters an operational mode called "silent mode". In "silent mode", the Audible Response Unit **1** activates itself at the same time intervals as it does in daytime, but does so in order to measure the daylight by means of sensing the Daylight Sensor **18**. If sufficient daylight is not detected, the Audible Response Unit **1** does not emit any audible instructions to the operator but instead sets an internal timer to reactivate itself after a prescribed time interval that is defined in the "functional program" of the Audible Response Unit **1** and then deactivates itself. With this method of daytime detection, it is possible for the Audible Response Unit **1** to permit the "operator" to rest during the nighttime and to maintain a regular programmed interval for reactivation. When the Audible Response Unit **1** is reactivated at the transpiring of the programmed time interval as defined in its "functional program" and detects sufficient daylight, the Audible Response Unit **1** enters an operational mode called "standard mode" and begins emitting audible commands to the "operator" as defined by the "functional program" within the Audible Response Unit **1**.

[**0040**] The present invention also includes a Deactivation Key **17** that provides to the means to deactivate the Audible. Response Unit **1** for any period of time in the event that such deactivation is determined to be necessary by qualified personnel responsible for the medical care of the "operator". The Deactivation Key **17** is a mechanically unique shape that matches the same mechanically unique cavity within the Housing of the Gauged Spirometer **16**. The Deactivation Key **17** when inserted into the housing of the Gauged Spirometer **16** closes a switch that relays a signal over electrical conductor **403** to the Audible Response Unit **1** to indicate the presence of the Deactivation Key **17**. When the Audible Response Unit **1** detects that the Deactivation Key **17** is present by measuring the signal on **403** and comparing it to a value within the Data Storage Unit **102**, it enters an operational mode called "silent mode". In "silent mode", the Audible Response Unit **1** activates itself at the same time intervals as it does in "standard mode", but does so in order to measure the presence of the Deactivation Key **17** by sensing the signal on **403**. If the Deactivation Key **17** is is determined to be present, the Audible Response Unit **1** does not emit any audible instructions to the operator but instead sets an internal timer to reactivate itself after a prescribed

time interval that is defined in the "functional program" of the Audible Response Unit **1** and then deactivates itself. With this method of detection of Deactivation Key **17**, it is possible for the Audible Response Unit **1** to permit the qualified personnel to deactivate the Audible Reponse Unit **1** for any period of time and to maintain a regular programmed interval for reactivation. When the Audible Response Unit **1** is reactivated at the transpiring of the programmed time interval as defined in its "functional program" and detects the absence of the Deactivation Key **17**, the Audible Response Unit **1** enters an operational mode called "standard mode" and begins emitting audible commands to the "operator" as defined by the "functional program" within the Audible Response Unit **1**.

[**0041**] **FIG. 4** shows a detail of Gauge **2** as constructed for the Spirometry application show in **FIG. 3** The Gauge **2** is constructed of a thin Film Strip **24** of resistive material typically consisting of but not limited to carbon or graphite. The Film Strip **24** is attached to the inside wall of the Spirometer Cylinder **21** with adhesive. The surface of the Film Strip **24** that faces the interior of the Spirometer Cylinder **21** is covered with a Conductive Pattern **25**. The Float **20** is free to move up and down within the Spirometer Cylinder **21** and makes contact with the interior facing surface's Conductive Pattern **25** of Film Strip **24** at a point that corresponds to the height position of the Float **20**. The outer edge of the Float **20** that contacts the interior facing surface of the Film Strip **24** is covered with a Conductive Skirt **26**. The Conductive Skirt **26** creates an electrical path from the position of contact with the Film Strip **24** and the Return Conductor **405**. The Float **20** rises as the "operator" inhales through the Air Tube **19** of **FIG. 6** so that the gas pressure above the float is lower than the gas pressure beneath the float which is at standard **1** atmosphere. The Float **20** ceases rising when the difference between the gas pressure above and beneath the Float **20** multiplied by the cross sectional surface area (in the direction of the axis of the Spirometer Cylinder **21**) of the Float **20** is equal than the weight of the float **20**. The Float **20** falls when the difference between the gas pressure above and beneath the Float **20** multiplied by the cross sectional surface area (in the direction of the axis of the Spirometer Cylinder **21**) of the Float **20** is less than the weight of the Float **20**.

[**0042**] The amount of electrical current flowing from the electrical conductor **400** through the Film Strip **21** through Conductive Pattern **25** through the Float Skirt **26** through the Return Conductor **405** referred to as the "float signal" is proportional to the position of the electrical contact between the Conductive Pattern **25** and the Float Skirt **26** referred to as the "contact point". The higher the "contact point" is, the more distance there is between the electrical conductor **400** and the "contact point" and hence the more resistive material that comprises the Film Strip **21** there is, and the higher the electrical resistance there is to current flow from electrical conductor **400** to the Return Conductor **405**. The position of the contact point corresponds to the height position of the Float **20**. Therefore, the amount of electrical current of the "float signal" through electrical conductor **400** is proportional to the height position of the Float **20**. The higher the position of the Float **20**, the less electrical current there is flowing through the electrical conductor **400** at the "float signal". The lower the position of the Float **20**, the higher the electrical current there is flowing through the electrical conductor **400** at the "float signal".

[**0043**] The "float signal" is relayed to the Audible Response Unit **1** by electrical conductor **400** and is interpreted by the "functional program" in the Audible Response Unit **1**. The Audible Response Unit **1** takes measurements of the "float signal" and determines the level of the signal that corresponds to when the Float **20** reaches it's apogee and when it settles back down to the bottom of the Spirometer Cylinder. By making this determination, the Audible Response Unit is able to measure and record the performance of the "operator" as measured by the Spirometer.

[**0044**] **FIG. 5** shows a detail of an example of embodiment of the Deactivation Key **17**. It is comprised of a uniquely mechanically shaped device that fits precisely into a cavity within the Housing of the Gauged Spirometer **16**. When successfully inserted into this cavity, the Deactivation Key **17** causes switch **23** to close thereby-connecting the Battery Power Supply **4** to the electrical conductor **403**. The connection of the Battery Power Supply **4** through switch **23** causes a signal on electrical conductor **403** that is relayed to the Audible Reponse Unit **1**. Audible Reponse Unit **1** interprets the signal on **403** as described in the previous description of **FIG. 3**

What I claim my invention is:

I. Electronic technology which has been especially developed to work within the incentive spirometer, that will help the patient by providing simulated audible, verbal, human sounding voices, thus providing instructions, prompting appropriate usage according to therapeutic time schedules, correcting and encouraging patient performance, as well as, giving the appropriate measurement, that the person or patient has performed with the apparatus, eliminating human visual error, help assist the blind and the visually impaired, though the use of today's state of the art equipment, that can produce electronic intelligence within the apparatus at a low cost, thus reducing patients recovery time and complications,

1) a method of providing audibly and verbally, instruction and guidance, to help perform the therapeutic sessions by the patient to improve lung performance, which through medical studies has shown that very few patients perform the required therapy as suggested though the accompanied literature, but through the usage of the present invention, the percentage in regards to lung problems occurring due to failure of patient usage of the incentive Spirometer, will decrease dramatically as the present invention will nag or prompt the patient without stopping, until the patient uses the apparatus and will not stop until the time interval necessary to fulfill the patient's therapeutic need has been accomplished. Through electronic intelligence, the present invention, will prompt the patient to use the medical apparatus, as well as, guide the patient through the proper steps of using said medical apparatus, thus quicker patient recovery will be achieved, through compliance without complication,

2) replacing the normal human visual readings or measurements, eliminating human error of inaccurate readings, due to the prior required float recognition which is imperative to provide visual measurement, since the float doesn't stay always in position long enough to read properly and has to be constantly viewed during therapeutic sessions to observe the exact reading of

measurement, with a human sounding electronically programmed voice or voices giving the same readings or measurements as deemed necessary to provide the sighted, as well as the visually impaired patient, with adequate information, to fulfill the patient's therapeutic regiment for recovery and allowing the blind to hear and respond, to the full operation of the therapeutic regiment, of the present invention;

3) a medical apparatus that because of the inexpensive construction, is comparable to the same concept, in relationship to therapeutic use, as the expensive apparatus, due to today's advanced technology. This breakthrough in modern technology allows the patient to afford the new improved apparatus of the present invention, which basically supplies all of the same healthcare purposes in relationship to the therapy of the apparatus, however, it also gives the patient the advantage of hearing the therapeutic guidance and measurements as an added benefit and cost is virtually the same as most disposable incentive spirometry units;

II. A new method to provide the above function of the present invention through the following electronic technology:

1) a number of the following electronic components in order to provide the function as above claimed:

(a) one or more electronic sensors producing an output signal,

(b) one or more electronic modules that convert said sensor output signal (s) into digital format,

(c) one or more electronic modules that includes but is not limited to a central processing unit,

(d) one or more electronic modules for digital storage of program instructions and data,

(e) one or more electronic modules for digital storage of digital audio sound data,

(f) one or more electronic modules for generation of audible sound,

(g) one or more electronic modules for managing and conserving electrical power,

(h) one or more electronic modules for determining accurate intervals of time,

(i) one or more electronic modules for communicating remotely with separate agent,

(j) one or more electronic sensor for detecting light or the absence of light to turn off or on unit

2) said method of new apparatus capable of measuring output signal of the sensors, converting said output signals into digital format to be stored and processed by the central processing unit, resulting in actions taken by the central processing unit under direction of it's digital program instructions in accordance to it's predetermined set of actions,

3) said pre-determined actions of the digital program instructions include but not limited to the generation of audible audio sound sequences that provide information relating to said output signals,

4) said electronic sensors capable of measuring but not limited to parameters of performance of the human body in various settings relating to medical therapeutic performance, or physical training,

4a) said electronic sensors being comprised of, but not limited to, a resistor that forms a variable resistance to electric current flow, such as a film of carbon, but not limited to, that forms a resistance to electric current flow, in contact with said resistor,

5) said central processing unit capable of performing tasks as specified in the order defined in digital program, including, but not limited to processing of sensor output signals, execution of control functions defined by the digital program, providing actions in accordance to accurate time intervals, generation of audible sound,

6) said digital program defines control functions that implement therapy or physical rehabilitation regimes,

7) said digital program defining control functions that implement tasks for managing and conserving electrical power,

8) said digital program defining control functions that implement tasks for determining accurate intervals of time,

9) said digital program defining control functions that implement tasks for determining time of day, (for those medical apparatus that need to be turned on or off to begin or end therapeutic sessions),

10) said digital program defining control functions that implement tasks for communicating with a separate agent,

11) said digital program being stored in memory within the electronic module that contains the central processing unit, and or being stored in memory that is not within the electronic module that contains the central processing unit but that is accessible by the central processing unit,

12) said digital audio sound data being stored in memory within the electronic module that contains the central processing unit, and or being stored in memory that is not within the electronic module that contains the central processing unit but that is accessible by the central processing unit,

13) directory table containing descriptive information about those commands, responses, measurements, or words as aforementioned about said digital audio sound data that is stored in memory within the electronic module that contains the central processing unit, or being stored in memory that is not within the same electronic module that contains the central processing unit but that is also accessible to the central processing unit,

13a) said digital audio sound data being arranged into multiple units, each unit representing an audible verbal message comprised of a series of words as programmed per the requirements in synthesis with the medical apparatus's therapeutic use,

13b) a method for retrieving and generating the audible sound representing the digital audio data from the start

of the message to the end of the message as corresponds to the therapeutic dialogue needed,

13c) a method for retrieving and generating the audible sound representing the digital audio data from an intermediate point in the message to a subsequent intermediate point in the same message, to allow the medical apparatus to respond to the measurements being produced by the patient accordingly and guide the patient according to the measurement amount,

14) said electronic module for generation of audible sound being the same electronic module that contains the central processing unit, and or a being separate electronic module for the module that contains the processing unit,

15) said electronic module for generation of audible sound including a module that converts digital audio data into continuous analog signal that is amplified to increase the signal power as needed to create audible sound from sound generating modules such as, but not limited to, speakers,

15a) said electronic modules for generation of audible sound providing a sound generating a continuous analog signal that is one half the value of the maximum signal level, such level representing zero sound to be generated,

15b) said electronic module for generation of audible sound providing a sound generating module such, but not limited to, speaker(s) that is capable of receiving a level that is one half the maximum signal level in a way that produces no sound and consumes little or no power,

15c) said sound generating module such as, but not limited to, a speaker(s) whose reference signal level is set at one half the maximum signal level such that it produces no sound when it receives such a signal level,

15d) said sound generating module being provided a reference signal level set at on half the maximum signal level by connecting it between a series of batteries in a way that provides a reference signal that is exactly on half the signal level that is produced by the above said batteries connected in this way,

16) said digital program defining a method for determining the value of a sensor output signal, generating an audible verbal response according to a pre-determined set of controls and functions as described herein, in order to provide instructional information to the operator of whatever medical apparatus is being used for instructional information or guidance,

17) said digital program defining a set of predetermined set of controls and functions relating sensor output signals to audible verbal commands, responses and measurements, comprises of improving medical conditions of the patient through the use of the said medical apparatus accordingly, along with the present invention.

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专利名称(译)	改进医疗设备以减少或替换辅助医疗辅助的方法，其通过使用可听见的口头人类声音来提供治疗指令并鼓励使用并根据需要通过使用电子技术从设备发出测量值		
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摘要(译)

本发明涉及一种用于医疗行业的装置，用于通过使用电子技术，提供听觉，模拟，口头，以增加跨肺压力和呼吸量，改善吸气肌肉性能并重建正常的肺过度充气。人类听起来的单词，协助，指导和提示，增加患者的使用。过去，患者缺乏使用这种简单的塑料，过时的一次性装置，导致严重的问题，例如肺炎。在没有提示的情况下，患者发现难以重复吸入管中以改善肺部。先前设备的先前应用一直很差，因此以电子技术的形式增加智能，这在没有帮助的情况下提示，不仅在帮助视力者而且在帮助盲人方面是一个巨大的优势，因为通常只有书面信息伴随着激励因此，肺活量计改变了我们今天所知的这种医疗设备的使用。