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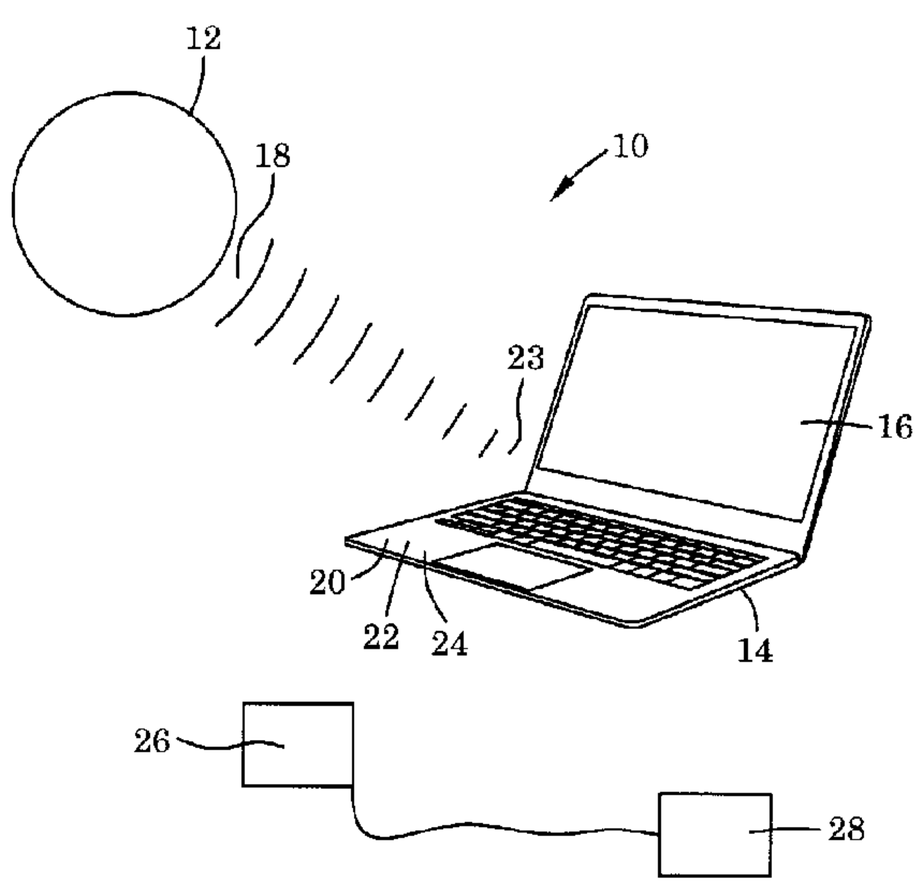
(54) Titre : SYSTEME DE MESURE DE LA SENSIBILITE DESTINE AU DIAGNOSTIC D'UN PATIENT
(54) Title: SENSITIVITY METERING SYSTEM FOR USE IN PATIENT DIAGNOSIS



(57) Abrégé/Abstract:
A patient specific sensitivity metering system for use in patient diagnosis and treatment is provided, the sensitivity metering system comprising: a handheld, deformable device which includes a pressure sensor, a Bluetooth ® radio and a battery, the pressure sensor and the Bluetooth radio in electrical communication with the battery, the pressure sensor in electrical communication with the Bluetooth radio; a computing device, the computing device including a Bluetooth ® receiver, which is in radio communication with the Bluetooth radio, a processor and a memory, the memory having instructions thereon for calibrating the system to a specific patient to provide a calibration, the memory storing the calibration and a sensitivity data set for the specific patient; and a user interface, which is in electronic communication with the computing device.

ABSTRACT

A patient specific sensitivity metering system for use in patient diagnosis and treatment is provided, the sensitivity metering system comprising: a handheld, deformable device which includes a pressure sensor, a Bluetooth® radio and a battery, the pressure sensor and the Bluetooth radio in electrical communication with the battery, the pressure sensor in electrical communication with the Bluetooth radio; a computing device, the computing device including a Bluetooth® receiver, which is in radio communication with the Bluetooth radio, a processor and a memory, the memory having instructions thereon for calibrating the system to a specific patient to provide a calibration, the memory storing the calibration and a sensitivity data set for the specific patient; and a user interface, which is in electronic communication with the computing device.

SENSITIVITY METERING SYSTEM FOR USE IN PATIENT DIAGNOSIS

FIELD

The present technology is directed to a compressible, deformable handheld device that allows a patient to report on relative sensitivity or discomfort. More specifically, it is a system that can be calibrated for different patients and measuring techniques in order to obtain a meaningful assessment of levels of discomfort during manual diagnosis, range of motion assessments and treatment.

BACKGROUND

There are an ever-increasing number of therapies that involve assessing sensitivity, discomfort or mild pain, through to intense pain. Practitioners of these therapies include chiropractors, physiotherapists and massage therapists, osteopaths, naturopaths and medical doctors. The patients can vary greatly in age, strength, cognitive ability and ability to communicate. It is known to be difficult to determine the level of sensitivity, discomfort or pain that a patient is in without repeatedly asking the patient. Further, there are often no visual clues when the patient is experiencing sensitivity or mild discomfort. Often, even if there are indications, such as facial expression, it cannot be seen as the practitioner is not facing the patient's face.

A number of approaches have been developed to assist in measuring patient pain. For example, United States Patent 9,126,043 discloses a patient feedback device for communicating with a programming device of an electrical stimulation system. The device includes a housing, a sensor, a controller, and a communication port. The sensor is supported by the housing and generates a sensor signal in response to an action from the patient. The controller is supported by the housing and is in operative communication with the sensor. The controller receives the sensor signal and sends information to the communication port based on the sensor signal. The communication port is connected to the housing and is in operative communication with the controller. The communication port receives information from the controller and wirelessly transmits a communication signal to the programming device of the electrical stimulation system. The device may also include a feedback mechanism to allow the patient see, hear or feel the level of force that is sensed by the sensor in response to pain level. The feedback mechanism is an additional component, such as lights, dots that rise up or vibration. While the correlation between the level of force applied and the output of the feedback mechanism can be calibrated for each patient, this does not allow for sensitivity adjustments. Hence the practitioner might easily miss a response from an elderly or infirm

person, or an otherwise weak person that is indicative of sensitivity, or discomfort. This is not a portable, handheld device, hence cannot be used to assess range of motion of a patient.

United States Patent Application 20170143971 discloses a grip sensor for quantifying pain experienced by a patient during spinal cord stimulation (SCS). The grip sensor includes an electronics enclosure, an annular outer shell substantially surrounding the electronics enclosure and sized to be held by the patient, a pressure sensor embedded in the outer shell and communicatively coupled to the electronics enclosure, the pressure sensor configured to measure a grip strength of the patient as SCS is applied to the patient, and a plurality of galvanic skin response sensors communicatively coupled to the electronics enclosure and configured to measure an electrical impedance of the skin of the patient as SCS is applied to the patient. The grip sensor is large and requires support rods. This further requires that the rods be supported. This therefore is cumbersome, only useable for patients in a supine position and not a handheld, portable device. The grip sensor is not calibrated for a user. This can make assessment of a patient's condition difficult, especially in fields such as chiropractic, physiotherapy, massage therapy and the like. The practitioner might easily miss a response from an elderly or infirm person, or otherwise weak person that is indicative of sensitivity or discomfort. This is not a portable, handheld device, hence cannot be used to assess range of motion of a patient.

United States Patent Application 20130046205 discloses a device (1) for detecting and measuring pain felt by a person, said device comprising a pressure or force sensor (2), a hollow body (3) having an outer sleeve (3a) and an inner space (3b), and an electronic unit (5) for detecting the signal of the pressure or force sensor (2). The outer sleeve (3a) of the hollow body (3) is embodied in such a way that it can be at least partially surrounded by a hand, the inner space (3b) of the hollow body (3) is filled with a non-gaseous elastic material (4a) or a non-gaseous fluid (4b), and the pressure or force sensor (2) is arranged in such a way that the pressure of the elastic material (4a) or the fluid (4b) can be measured. The device can be calibrated, but only by subjecting the patient to pain. Such an approach is not recommended. There is no means to adjust the sensitivity of the grip sensor. This can make assessment of a patient's condition difficult, especially in fields such as chiropractic, physiotherapy, massage therapy and the like. The practitioner might easily miss a response from an elderly or infirm person, or otherwise weak person that is indicative of sensitivity or discomfort. This is not a portable, handheld device, hence cannot be used to assess range of motion of a patient.

What is needed is a feedback device and system that allows a patient to report on levels of discomfort or sensitivity during a manual assessment. It would be preferable if the system could be calibrated for each

patient, such that it would be able to pick up subtle differences during diagnosis and treatment. It would be further preferable if the system allowed for tracking of patient progress. It would be preferable if the device of the system was small, light and easy for a patient to hold in their hand. It would be further preferable if the device had a surface that could be washed and disinfected. It would be preferable if the device allowed the patient to feel a change in shape of the device in response to the pressure exerted. It would be still more preferable if this deformation of the device in response to the pressure exerted provided stress release to the patient.

It would also be useful if there was a system that could be used to provide real-time feedback sensitivity of the patient's anatomical tissues while the doctor or therapist probes with variations of pressure, whether force or direction, to determine the patient's sensitivity. It would be of further benefit if there was a system to provide feedback when a patient undergoes movement like active ranges of motion. Therefore, there currently exists a need in the industry for a product that records a patient's sensitivity in a variable way as the practitioner provokes through movement of the anatomical tissues to help in the specificity of a diagnosis relating to tissue sensitivity.

SUMMARY

The present technology is a feedback device and system that allows a patient to report on levels of discomfort or sensitivity during a manual assessment such as occurs in chiropractic, physiotherapy, medical and massage therapy assessment. The system can be calibrated for each patient, such that it is able to pick up subtle differences during diagnosis and treatment. A patient is also able to work within their desired compression range as the system can be calibrated for any range of forces. The system can track patient progress. The device of the system is small, light and easy for a patient to hold in their hand. The device had a surface that can be washed and disinfected.

The materials used in the device were selected to allow the patient to feel a change in shape of the device in response to the pressure exerted. This deformation of the device in response to the pressure exerted can provide stress release to the patient.

The system can be used to provide real-time feedback sensitivity of the patient's anatomical tissues while the doctor or therapist probes with variations of pressure, whether force or direction, to determine the patient's sensitivity. It can also be used to provide feedback when a patient undergoes movement like active ranges of motion. The system records a patient's sensitivity in a variable way as the practitioner

provokes through movement of the anatomical tissues to help in the specificity of a diagnosis relating to tissue sensitivity.

In one embodiment, a patient specific sensitivity metering system for use in patient diagnosis and treatment is provided, the sensitivity metering system comprising: a handheld, deformable device which includes a pressure sensor, a Bluetooth® radio and a battery, the pressure sensor and the Bluetooth radio in electrical communication with the battery, the pressure sensor in electrical communication with the Bluetooth radio; a computing device, the computing device including a Bluetooth® receiver, which is in radio communication with the Bluetooth radio, a processor and a memory, the memory having instructions thereon for calibrating the system to a specific patient to provide a calibration, the memory storing the calibration and a sensitivity data set for the specific patient; and a user interface, which is in electronic communication with the computing device.

In the sensitivity metering system, the handheld, deformable device may be portable.

The sensitivity metering system may further comprise a wireless charger.

4. The sensitivity metering system may further comprise a doliometer.

In the sensitivity metering system, the doliometer may include a doliometer Bluetooth radio, the doliometer Bluetooth radio in radio communication with the Bluetooth receiver of the computing device to provide a doliometer data set to the memory.

In the sensitivity metering system, the memory may have instructions thereon for statistically analyzing the sensitivity data set and the doliometer data set to provide a correlation value.

In the sensitivity metering system, the computing device and the user display may be integrated into a handheld, mobile device.

In the sensitivity metering system, the handheld mobile device may be a cell phone or a tablet.

In the sensitivity metering system, the handheld, deformable device may include a skin and a body therein.

In the sensitivity metering system, the body may be a silicone gel.

In the sensitivity metering system, the handheld, deformable device may have a Shore OO rating between OO15 to OO40.

The sensitivity metering system may further comprise one or more of a sound emitter or a patient user interface with a visual scale, the sound emitter and the patient user interface in electronic communication with the computing device.

In the sensitivity metering system, the handheld, deformable device may be spherical.

In another embodiment, a method of assessing sensitivity of a selected body part of a patient to pressure or movement is provided, the method comprising: a practitioner selecting a sensitivity metering system, the sensitivity metering system including a computing device and a deformable device which includes a pressure sensor and an output, the output in electronic communication with the pressure sensor and the computing device; calibrating the sensitivity metering system for the patient to provide a patient specific calibration; storing the patient specific calibration in the system in the computing device; the practitioner exerting pressure or moving the selected body part; the patient squeezing the deformable device at a force commensurate with a perceived level of sensitivity; the pressure sensor sensing the force to provide a signal; the output sending the signal to the computing device; and the computing device analyzing the signal in relation to the patient specific calibration to provide a patient specific sensitivity data set.

The method may further comprise the practitioner selecting a doliometer; and the practitioner assessing an actual pressure exerted on the patient.

In yet another embodiment, a method of assessing sensitivity of a selected body part of a patient to pressure or movement is provided, the method comprising

-a practitioner selecting a sensitivity metering system, the sensitivity metering system comprising: a handheld, deformable device which includes a pressure sensor, a Bluetooth® radio and a battery, the pressure sensor and the Bluetooth radio in electrical communication with the battery, the pressure sensor in electrical communication with the Bluetooth radio; a computing device, the computing device including a Bluetooth® receiver, which is in radio communication with the Bluetooth radio, a processor and a memory, the memory having instructions thereon for calibrating the system to a specific patient to provide a calibration, the memory storing the calibration and a sensitivity data set for the specific patient; and a user interface, which is in electronic communication with the computing device,

- calibrating the sensitivity metering system for the patient to provide a patient specific calibration,

-storing the patient specific calibration in the system in the computing device,

-the practitioner exerting pressure or moving the selected body part,

-the patient squeezing the handheld deformable device at a force commensurate with a perceived level of sensitivity,

-the pressure sensor sensing the force to provide a signal,

-the Bluetooth radio sending the signal to the computing device,

-and the computing device analyzing the signal to provide a patient specific sensitivity data set.

The method may further comprise the practitioner selecting a doliometer, the doliometer including a doliometer Bluetooth radio, the doliometer Bluetooth radio in radio communication with the Bluetooth receiver of the computing device,

-the practitioner exerting pressure with the doliometer,

-the doliometer sensing the pressure to provide a doliometer signal,

-the doliometer Bluetooth radio sending the doliometer signal to the memory to provide a doliometer data set.

The method may further comprise the memory statistically analyzing the patient specific sensitivity data set and the doliometer data set to provide a correlation value.

The method may further comprise the practitioner developing a treatment protocol.

FIGURES

Figure 1 is a schematic of the system of the present technology.

Figure 2 is a cross section of the deformable device of the system of Figure 1.

Figure 3 is a block diagram of the steps of the method of the present technology.

Figure 4 is a schematic of an alternative embodiment of the system.

Figure 5 is a block diagram of the steps of the method using the alternative embodiment.

Figure 6 is a schematic of an alternative embodiment of the deformable device.

Figure 7 is a schematic of another alternative embodiment of the deformable device.

DESCRIPTION

Definitions:

Computing device – in the context of the present technology, a computing device is a cellular phone, a tablet, a laptop, desktop or purpose-built computing device. It has a memory and a processor.

Handheld, mobile device – in the context of the present technology, a handheld, mobile device is a cell phone, a tablet or a laptop.

Specific or selected parts of the body – in the context of the present technology, a specific or a selected part of the body is the part that a patient has concerns about, or is complaining about, or is a part of the body that the practitioner believes needs to be assessed in order to arrive at a diagnosis and treatment protocol.

Detailed Description:

A sensitivity metering system, generally referred to as 10 is shown in Figure 1. It includes a compressible, deformable device 12, which is primarily meant to be handheld, but could be compressed with a foot, or other body part as needed, a computing device 14 and a display or user interface 16. The compressible device 12 communicates via a Bluetooth ® radio 18 to the computing device 14, the computing device 14 having a processor 20 to receive instructions from a memory 22 and a Bluetooth receiver 23. The processor 20, under control of the memory 22, converts the pressure information into data which is then stored in the memory 22. The memory 22 includes an application 24 that calibrates the force exerted by the patient as they squeeze the device 12 on a percentage scale. The computing device 14 is in electronic communication with the user interface 16, which may be integral with the computing device 14, or may be separate to the computing device 14. A wireless charger 26 is in wireless communication with the system to charge the system. The wireless charger 26 is in electrical communication with the computing device 14 or another power source 28.

As shown in Figure 2, the wireless charger 26 has a concavity 27 in which the handheld device 12 can rest during charging or when not in use. The compressible handheld device 12 is preferably spherical or egg-shaped. It is portable. A pressure sensor 30 is located within the body 32 of the device. The preferred pressure sensor is a piezo-electric sensor or a micro-electromechanical (MEMS) pressure sensor connected to the Bluetooth radio 18. A battery 34 is also housed in the body 32 of the device 12. The electronics of the device (the pressure sensor 30, the Bluetooth radio 18 and the battery 34) are small and

do not interfere with deformation of the handheld device 12 in response to pressure. The skin 36 is washable and can be disinfected. The skin 36 and body 32 change shape in response to pressure exerted on the device 12. The skin 36 is flexible and is a plastic polymer. The body 32 is preferably a silicone gel.

Through testing, it was found that the grip strengths of healthy adult patients ranged from about 86 Newtons/centimeter^2 for a grip where the whole hand closes on a dynamometer (referred to as a grip) down to as low as 13 Newtons/centimeter^2 for a tip pinch. For children, the grip strength ranged from about 0 Newtons/centimeter^2 to about 7 Newtons/centimeter^2 for a tip pinch. On this basis, materials with different durometer ratings were considered and tested. It was found that an elastomer with a Shore OO durometer rating of about OO15 to about OO40, preferably about OO20 to about OO30 provided sufficient resiliency to protect the electronics in the body 32 of the device 12, while providing immediate tactile feedback to the patient in terms of deformation of the device 12. It was also found that two sizes could be used, a small pediatric one for children and a larger adult one. One of these two sizes were found to be comfortably held and squeezed by a wide range of patients.

As shown in Figure 3, prior to assessment, the patient holds 46 the device 12 with what they perceive as no pressure. They then are asked to squeeze 48 the device as hard as they possibly can. If they are told to squeeze as hard as they can, they will squeeze as hard as they want. That will be calculated as 100% and the range and sensitivity of measurement adjusted accordingly. If 100% is 7, then data collection will be based, for example, on increments of 0.1. If 100% is 70, then data collection will be based on increments of 1.0. This controls the noise in the system for those patients exerting higher pressures, while keeping the system sensitive enough for the health care professional to be able to see a range of responses in the weaker patients. The data from these two pressures (no pressure and full pressure) are then converted 50 to a percentage, with no pressure being 0% and full pressure being 100%. The patient repeats 52 this at least three time. The application 40 calculates 54 the mean and stores 56 the calibration in the memory 22 in association with a patient identifier. The health care professional then inputs 58 the patient identifier and begins their assessment 60 by one or more of palpating, exerting gentle pressure on a specific part of the patient's body, gently manipulating the patient's body or having the patient move through a range of motion. The specific or selected parts of the body are the parts of the body needing a diagnosis or are parts of the body that the practitioner believes need to be assessed in relation to the patient's concerns or complaints. The patient squeezes 62 the compressible handheld device 12 in response to the sensation that they feel. The pressure sensor registers 64 the pressure and an electrical output representative of the force of the pressure is sent 66 to the Bluetooth radio 18, which wirelessly

transmits 68 the raw data to the application 24, where it is processed 70 using the previously stored calibration for the specific patient. The data are then stored 72 for use in tracking how the patient is responding to treatment. In this manner, an accurate assessment of the patient's areas of sensitivity or discomfort are identified, without the health care provider having to induce pain in order to assess the patient's condition. In patients that are clearly becoming stronger or weaker, calibration can be repeated 74 as needed. Further, the calibration can be done for either a pinch, such as a tip pinch, or a grip, noting that the force exerted in these different holds are very different.

As shown in Figure 4, the sensitivity system can further include a doliometer 80. The doliometer 80 reports on the actual pressure being exerted by the practitioner on the patient. The doliometer 80 communicates via a Bluetooth® radio 88 to the computing device 14. The processor 20, under control of the memory 22, statistically analyzes the correlation between the doliometer reading and the patient's response, in terms of compression of the device 12, expressed in percentage for that patient. The results are stored in the memory 22.

A block diagram of the steps when a doliometer is included in the system is shown in Figure 5. The system is calibrated as described and shown in Figure 3. The health care professional inputs 158 the patient identifier and begins their assessment 160 by one or more of palpating, exerting gentle pressure on specific parts of the patient's body, gently manipulating the patient's body or having the patient move through a range of motion. The specific or selected parts of the body are the parts of the body needing a diagnosis or are parts of the body that the practitioner believes need to be assessed in relation to the patient's concerns or complaints. The health care professional uses 161 the doliometer 80 when palpating or exerting pressure on the patient. Concomitantly, the patient squeezes 162 the compressible handheld device 12 in response to the sensation that they feel. The pressure sensor registers 164 the pressure and an electrical output representative of the force of the pressure is sent to 166 the Bluetooth radio 18, which wirelessly transmits 168 the raw data to the application 24, where it is processed 170 using the previously stored calibration for the specific patient. The doliometer 80 registers 180 the actual pressure exerted and an electrical output representative of the force of the pressure is sent to the Bluetooth radio 88, which wirelessly transmits 182 the raw data to the application 24. The application statistically analyzes 184 the correlation between the doliometer reading and the patient's response, in terms of compression of the device 12, expressed in percentage for that patient. The results are stored in the memory 186. In this manner, an accurate assessment of the patient's areas of sensitivity or discomfort are identified, without the health care provider having to induce pain in order to assess the patient's condition. In

patients that are clearly becoming stronger or weaker, calibration can be repeated 188 as needed. Further, the calibration can be done for either a pinch, such as a tip pinch, or a grip, noting that the force exerted in these different holds are very different.

In another embodiment shown in Figure 6, the system 10 has sound emitter 200 that emits an audible signal. The signal is emitted at the pressure corresponding to about 95% to about 100% pressure for that patient. The system 10 may also include a visual display 202 on a patient user interface 204. The visual display 202 is a dial or bar that shows the patient's feedback in terms of the percentage of pressure for that patient. The sound emitter 200 and the patient user interface 204 are in electronic communication with the computing device 14.

In another embodiment shown in Figure 7, the pressure sensor 430 is in fluid communication with the body 432 of the device 412. The preferred pressure sensor is a piezo-electric sensor connected to the Bluetooth radio 418. The electronics of the device (the pressure sensor 430, the Bluetooth radio 418 and the battery 434) are retained on a board 400, which is attached to the skin 436. The board 400 may include an Arduino board 438.

CLAIMS

1. A patient specific sensitivity metering system for use in patient diagnosis and treatment, the sensitivity metering system comprising: a handheld, deformable device which includes a pressure sensor, a Bluetooth® radio and a battery, the pressure sensor and the Bluetooth radio in electrical communication with the battery, the pressure sensor in electrical communication with the Bluetooth radio; a computing device, the computing device including a Bluetooth® receiver, which is in radio communication with the Bluetooth radio, a processor and a memory, the memory having instructions thereon for calibrating the system to a specific patient to provide a calibration, the memory storing the calibration and a sensitivity data set for the specific patient; and a user interface, which is in electronic communication with the computing device.

2. The sensitivity metering system of claim 1, wherein the handheld, deformable device is portable.

3. The sensitivity metering system of claim 1 or 2, further comprising a wireless charger.

4. The sensitivity metering system of any one of claims 1 to 3, further comprising a doliometer.

5. The sensitivity metering system of claim 4, wherein the doliometer includes a doliometer Bluetooth radio, the doliometer Bluetooth radio in radio communication with the Bluetooth receiver of the computing device to provide a doliometer data set to the memory.

6. The sensitivity metering system of claim 5, the memory having instructions thereon for statistically analyzing the sensitivity data set and the doliometer data set to provide a correlation value.

7. The sensitivity metering system of any one of claims 1 to 6, wherein the computing device and the user display are integrated into a handheld, mobile device.

8. The sensitivity metering system of claim 7, wherein the handheld mobile device is a cell phone or a tablet.

9. The sensitivity metering system of any one of claims 1 to 8, wherein the handheld, deformable device includes a skin and a body therein.

10. The sensitivity metering system of claim 9, wherein the body is a silicone gel.

11. The sensitivity metering system of any one of claims 1 to 10, wherein the handheld, deformable device has a Shore OO rating between OO15 to OO40.

12. The sensitivity metering system of any one of claims 1 to 11, further comprising one or more of a sound emitter or a patient user interface with a visual scale, the sound emitter and the patient user interface in electronic communication with the computing device.

13. The sensitivity metering system of any one of claims 1 to 12, wherein the handheld, deformable device is spherical.

14. A method of assessing sensitivity of a selected body part of a patient to pressure or movement, the method comprising: a practitioner selecting a sensitivity metering system, the sensitivity metering system including a computing device and a deformable device which includes a pressure sensor and an output, the output in electronic communication with the pressure sensor and the computing device; calibrating the sensitivity metering system for the patient to provide a patient specific calibration; storing the patient specific calibration in the system in the computing device; the practitioner exerting pressure or moving the selected body part; the patient squeezing the deformable device at a force commensurate with a perceived level of sensitivity; the pressure sensor sensing the force to provide a signal; the output sending the signal to the computing device; and the computing device analyzing the signal in relation to the patient specific calibration to provide a patient specific sensitivity data set.

15. The method of claim 14, further comprising the practitioner selecting a doliometer; and the practitioner assessing an actual pressure exerted on the patient.

16. A method of assessing sensitivity of a selected body part of a patient to pressure or movement, the method comprising

-a practitioner selecting a sensitivity metering system, the sensitivity metering system comprising: a handheld, deformable device which includes a pressure sensor, a Bluetooth® radio and a battery, the pressure sensor and the Bluetooth radio in electrical communication with the battery, the pressure sensor in electrical communication with the Bluetooth radio; a computing device, the computing device including a Bluetooth® receiver, which is in radio communication with the Bluetooth radio, a processor and a memory, the memory having instructions thereon for calibrating the system to a specific patient to provide a calibration, the memory storing the calibration and a sensitivity data set for the specific patient; and a user interface, which is in electronic communication with the computing device,

-calibrating the sensitivity metering system for the patient to provide a patient specific calibration,

-storing the patient specific calibration in the system in the computing device,

-the practitioner exerting pressure or moving the selected body part,

-the patient squeezing the handheld deformable device at a force commensurate with a perceived level of sensitivity,

-the pressure sensor sensing the force to provide a signal,

-the Bluetooth radio sending the signal to the computing device,

-and the computing device analyzing the signal to provide a patient specific sensitivity data set.

17. The method of claim 16, further comprising the practitioner selecting a doliometer, the doliometer including a doliometer Bluetooth radio, the doliometer Bluetooth radio in radio communication with the Bluetooth receiver of the computing device,

-the practitioner exerting pressure with the doliometer,

-the doliometer sensing the pressure to provide a doliometer signal,

-the doliometer Bluetooth radio sending the doliometer signal to the memory to provide a doliometer data set.

18. The method of claim 17, further comprising the memory statistically analyzing the patient specific sensitivity data set and the doliometer data set to provide a correlation value.

19. The method of any one of claims 16 to 18, further comprising the practitioner developing a treatment protocol.

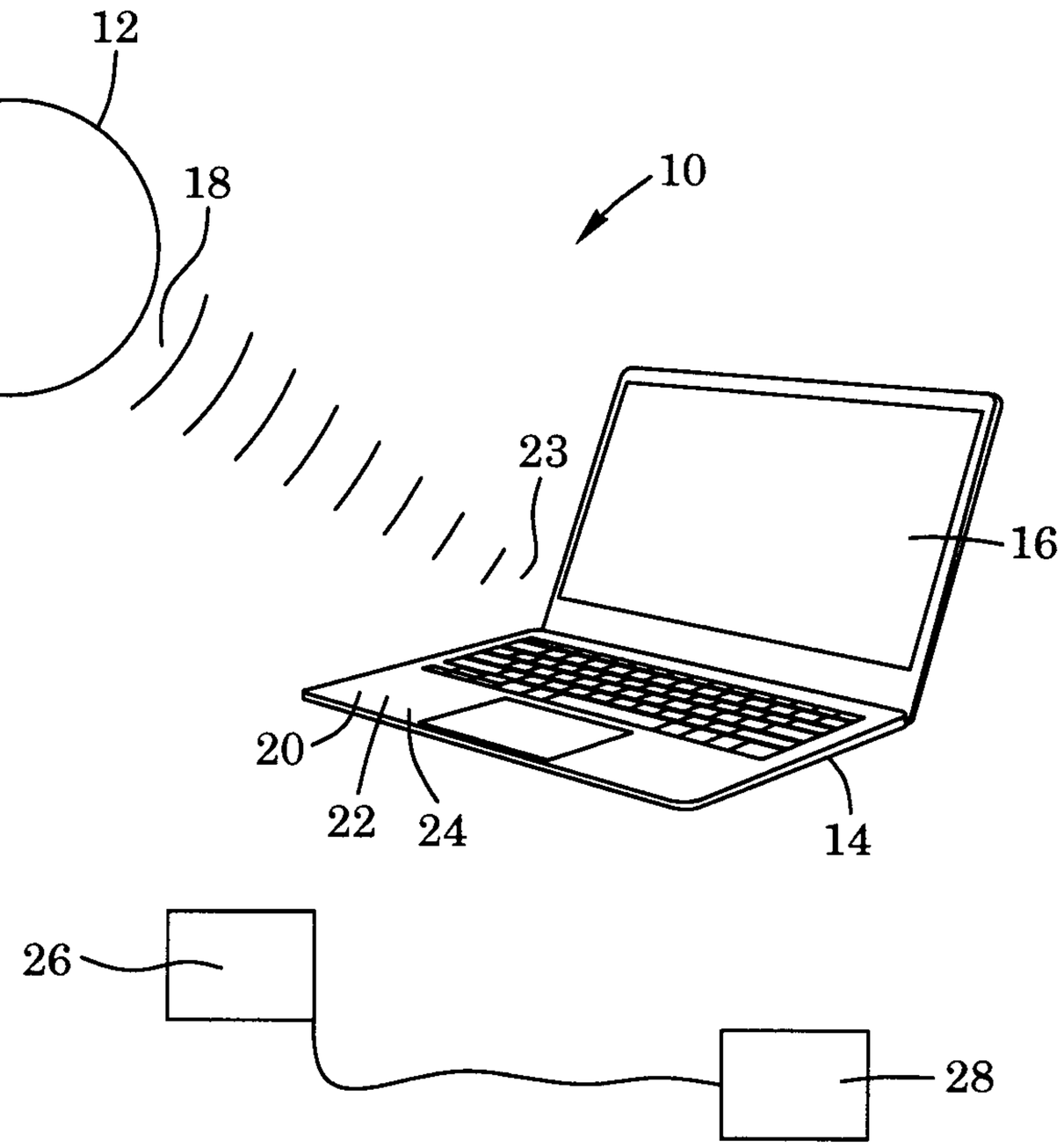


FIG. 1

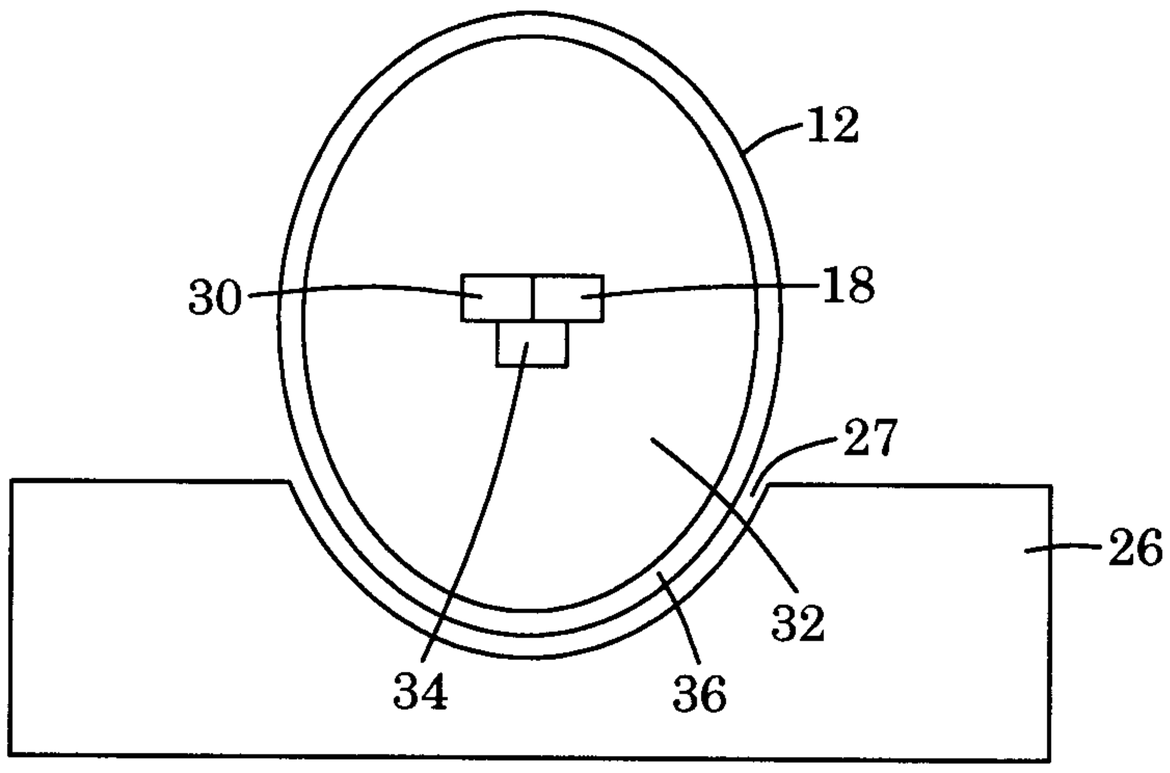


FIG. 2

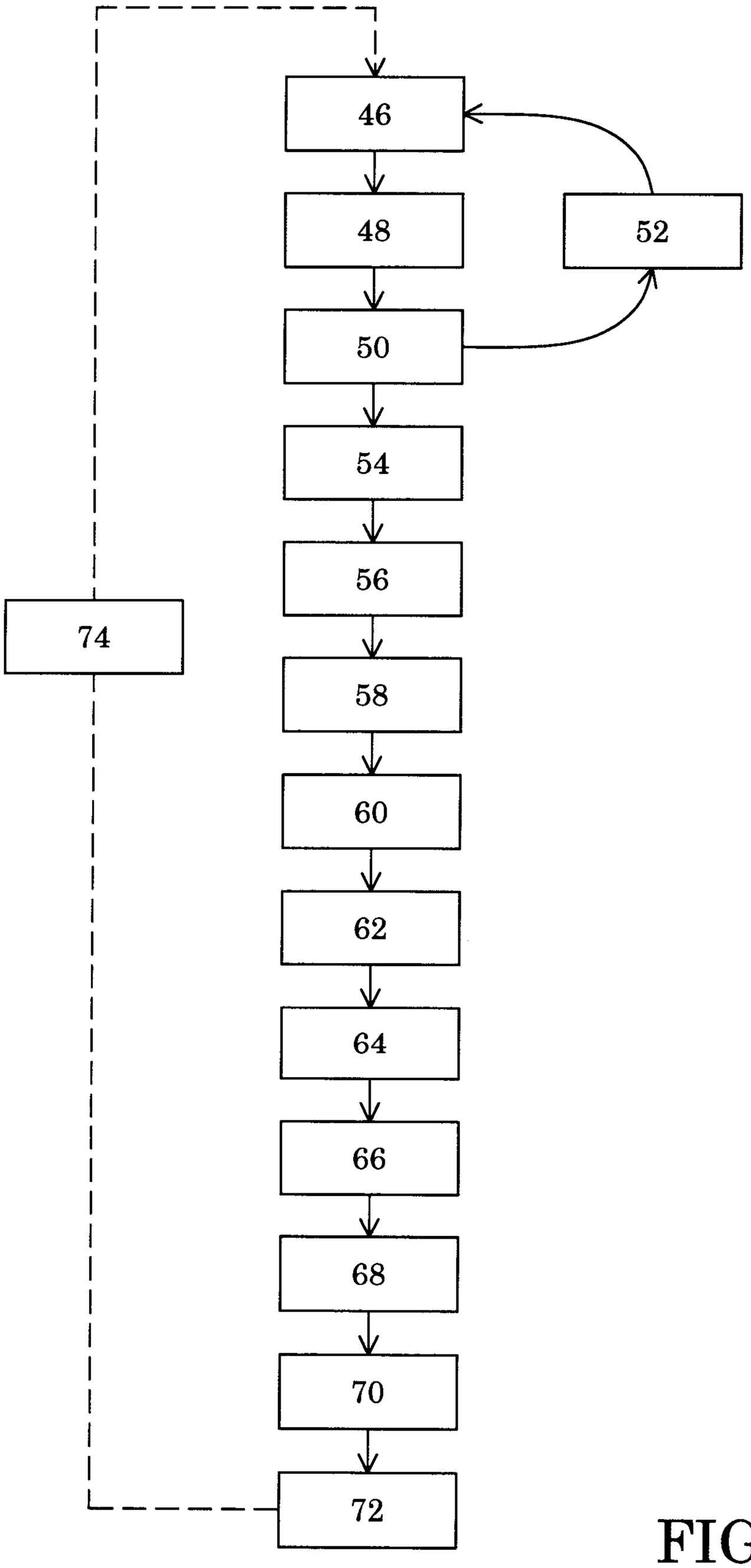


FIG. 3

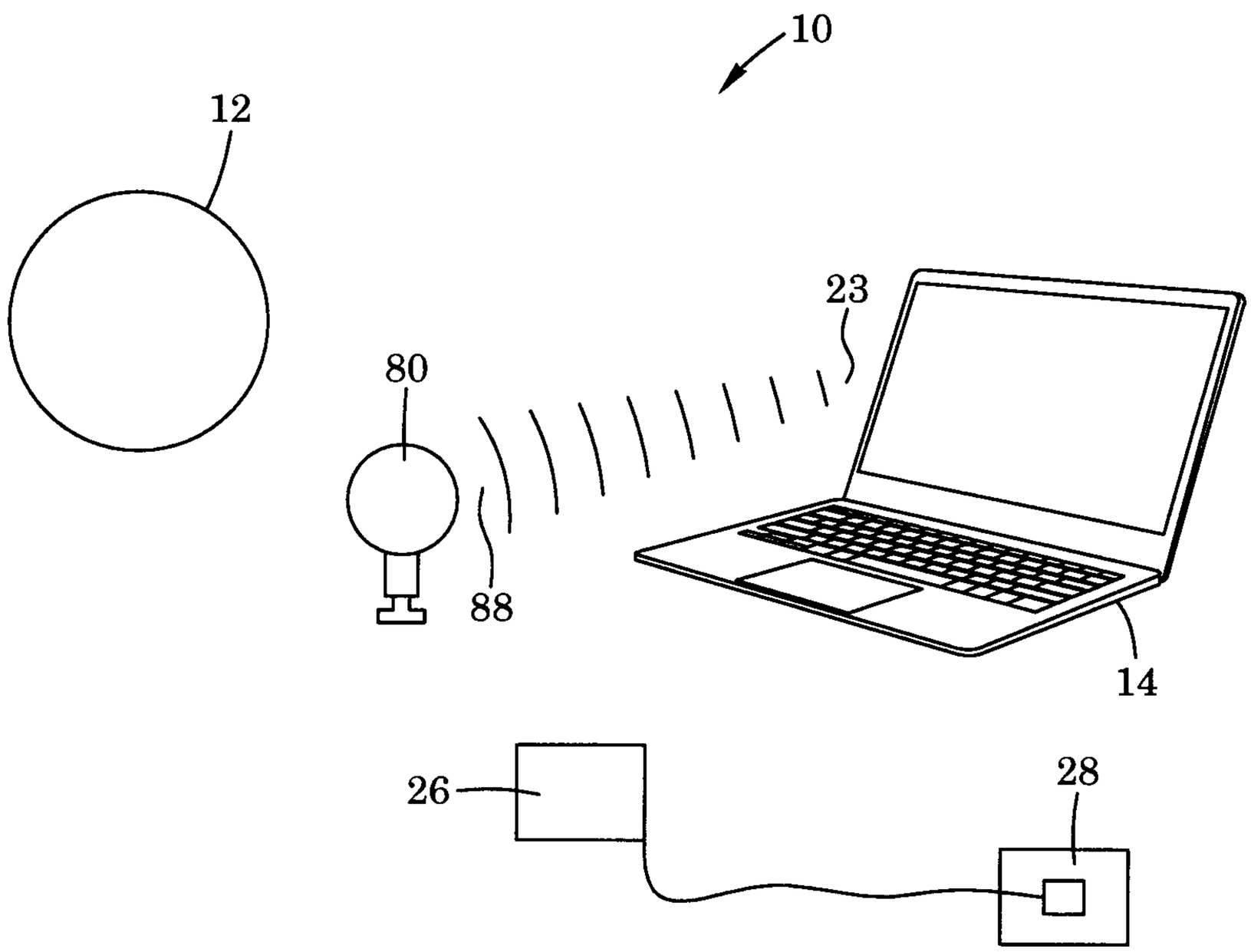


FIG. 4

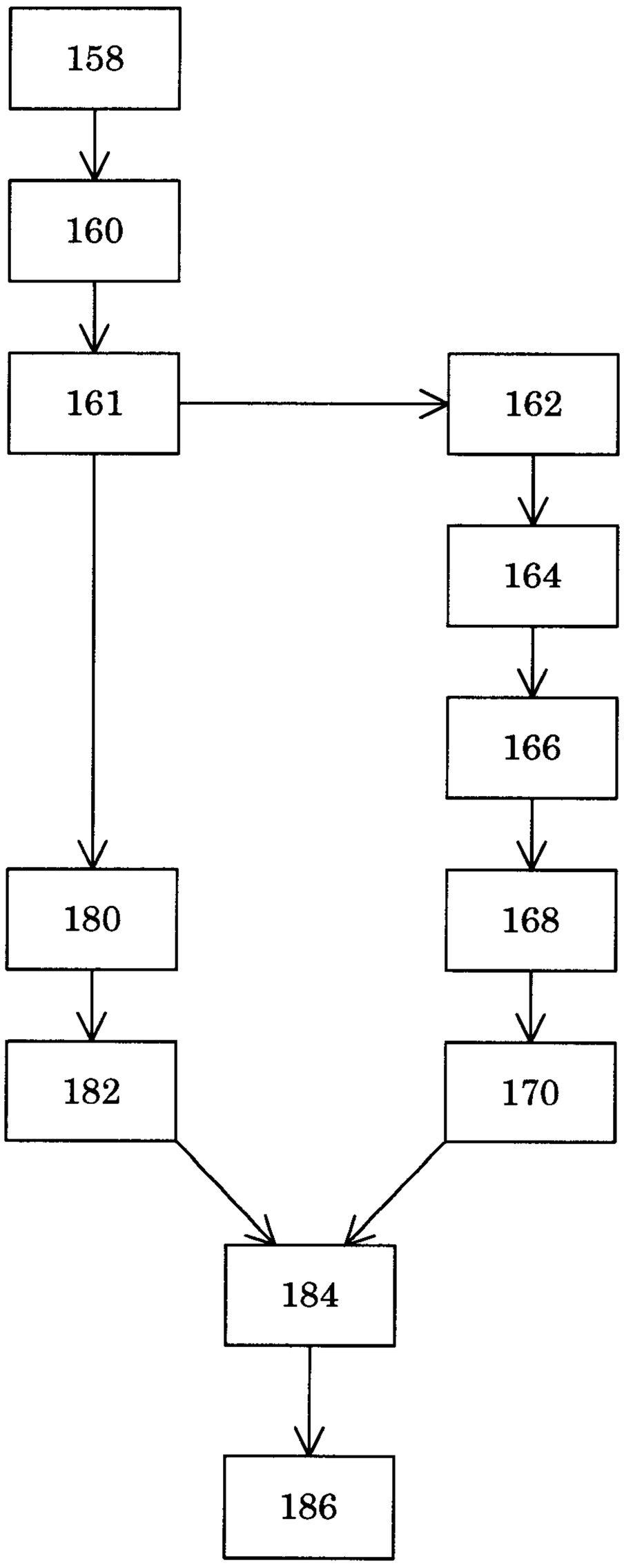


FIG. 5

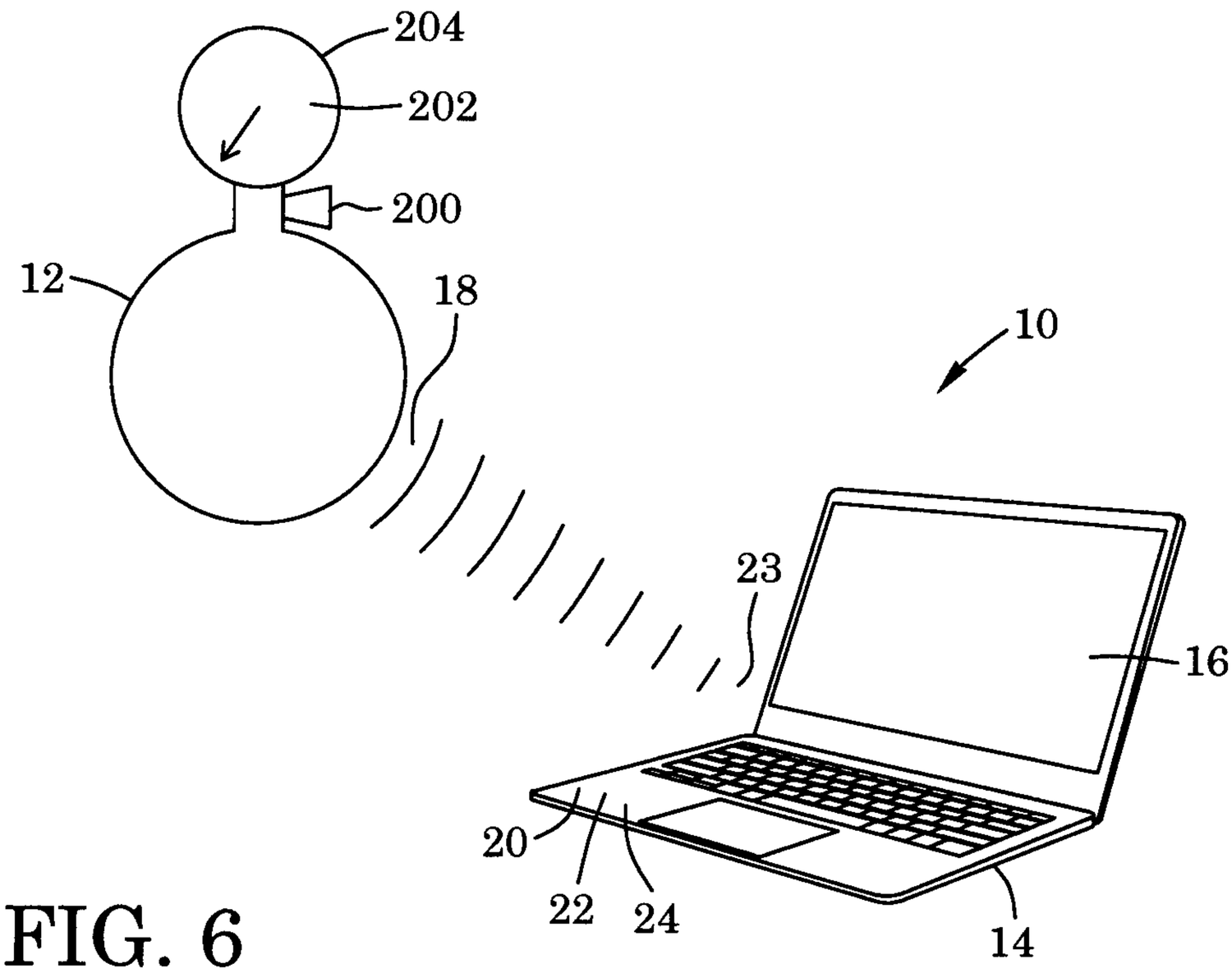

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FIG. 6


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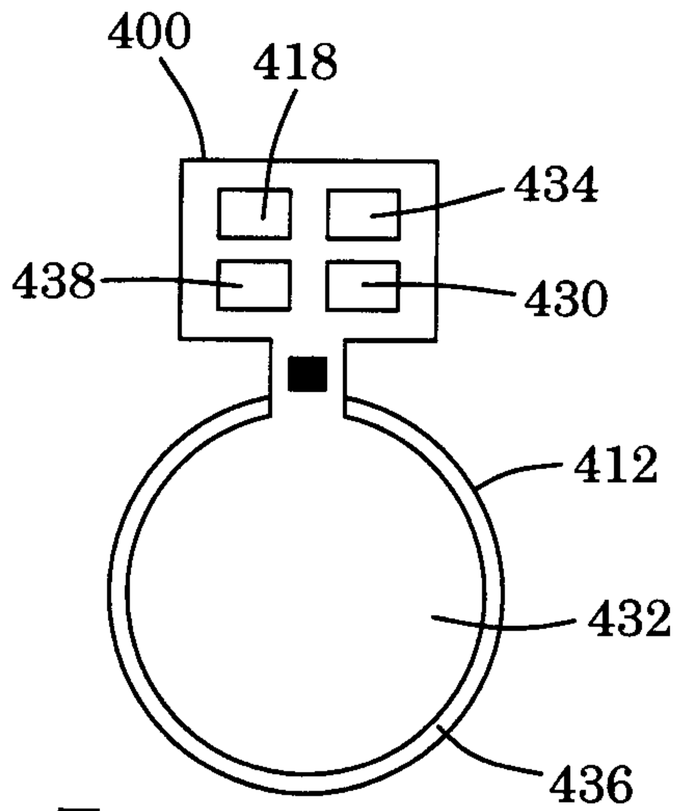
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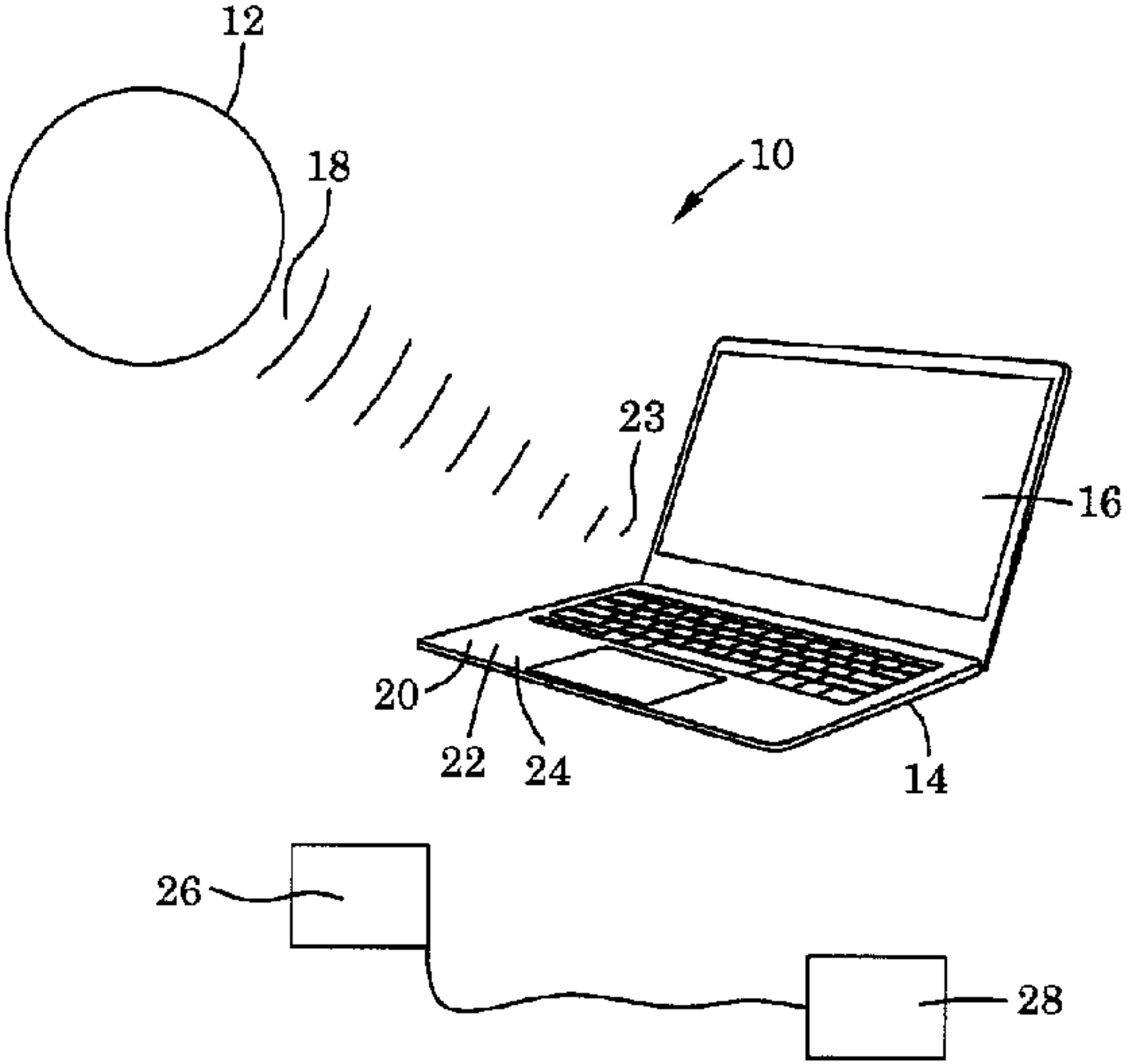
FIG. 7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