(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 508 295 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
17.12.2008 Bulletin 2008/51

(51) Int Cl.:
A61B 5/00 *(2006.01)* ***A61B 5/03*** *(2006.01)*
A61B 5/07 *(2006.01)*

(21) Application number: **04255014.5**

(22) Date of filing: **20.08.2004**

(54) **System and apparatus for sensing pressure in living organisms and inanimate objects**

System und Apparat zur Druckmessung in lebenden Organismen und leblosen Gegenständen

Sytème et dispositif pour la mesure de la pression dans les organismes vivants et les objets inanimés

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR

(30) Priority: **22.08.2003 US 497391 P**

(43) Date of publication of application:
23.02.2005 Bulletin 2005/08

(60) Divisional application:
08011763.3 / 1 969 998

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Printed by Jouve, 75001 PARIS (FR)

Description

FIELD OF THE INVENTION

[0001] The invention relates to an apparatus for measuring pressure.

BACKGROUND OF THE INVENTION

[0002] US 2003/0105388 A1 discloses an implantable telemetric pressure sensing device.

[0003] EP 0 798 016 A2 discloses a pacemaker having a pressure transducer receiving a pressure signal from the heart via a lead.

[0004] US 6, 552, 404 discloses a pressure sensor integrated with an IC circuit.

SUMMARY

[0005] It is an object of the invention to provide an improved apparatus for measuring pressure.

[0006] The invention in various aspects, and preferred and optional features, are set out in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1 is an illustration of a comparative example showing an apparatus for measuring pressure.

FIG. 2 is an exemplary representation of a wheatstone bridge circuit arrangement suitable for measuring pressure.

FIG. 3 is an illustration of an embodiment according to the invention showing an apparatus for measuring pressure.

FIG. 4 is an illustration of an exemplary system utilizing the apparatus for measuring pressure.

DETAILED DESCRIPTION

[0008] In accordance with a comparative example not according to the invention, an apparatus for measuring pressure in association with a living organism or inanimate object is described. The apparatus comprises at least a microelectronic device and a pressure sensor connected thereto. In some circumstances, an interface member may be disposed between the microelectronic device and the pressure sensor. The microelectronic device can be a microstimulator and/or a microsensor. For example, a class of injectable/implantable microelectronic devices described in U.S. Patent Nos. 5,193,539, 5,193,540, 5,312,439, 6,164,284, 6,185,452, 6,208,894, 6,315,721, 6,564,807 provide for stimulation of biological tissue or sensing of signals from biological tissue such as nerves or muscles as well as physiologic parameters such as body temperature. Each device includes electrical stimulation circuitry and electrodes configured in a form that is suitable for injection by means of a hypodermic needle or insertion tool. The devices can be leadless or have leads attached to them. Furthermore, each device may communicate through wireless or wired communication networks. In the case of wireless networks, microelectronic devices receive power by either inductive coupling to an externally applied electro-magnetic field or by means of an internal rechargeable battery as described in U.S. Pat. No. 6,208,894. They receive digital command signals by telemetry. The packaging and materials of the microelectronic device are selected and designed to protect its electronic circuitry from the body fluids and to avoid damage to the electrodes and the surrounding tissues from the presence and operation of the microelectronic device in those tissues. In this regard the microelectronic devices are hermetically sealed and unaffected by body fluids.

[0009] FIG. 1 is an illustration of a comparative example showing an apparatus for measuring pressure. A microelectronic device 10 is connected to a pressure sensor 12 allowing for measurement of pressure associated with any portions of a living organism or inanimate object or environment in the immediate proximity of pressure sensor 12. The living organism may be, among others, a human or an animal, and the inanimate object may be, for example, a vehicle tire or any other equipment that require a pressure measurement. An interface member 14 (shown in dotted lines) may be optionally disposed between the microelectronic device 10 and the pressure sensor 12. The pressure sensor 12 has a flexible portion in a form of a diaphragm 16. There is formed a hermetically sealed cavity 13 within the pressure sensor 12 and between the diaphragm 16 and the interface member 14. It is contemplated that the pressure in the hermetically sealed cavity 13 is set at an initial predetermined pressure. This initial predetermined pressure may be about one (1) atmosphere or any other desired pressure. The pressure sensor 12 may be releasably attached to the microelectronic device or the interface member, or alternatively it may be manufactured as an integrated piece with the microelectronic device or the interface member. Generally, the microelectronic device may be made of ceramic such as zirconia or alumina and the pressure sensor may be made of titanium or titanium alloy. The interface member can be made of, for example, titanium. The diaphragm 16 is responsive to the external pressure exerted thereon. For example, when the external pressure is higher than one-atmosphere, then the diaphragm 16 is pressed inward and creates a deformation which can be utilized to measure the external pressure. One of a number of techniques is to utilize a strain gauge mounted on the diaphragm 16 so that to measure the external pressure. Once the strain gauge is deformed, corresponding voltage changes produced by the gauge may be detected and calibrated as a function of pressure.

[0010] It is contemplated that the interface member 14 is connected to the microelectronic device 10 and the pressure sensor through various other attachment tech-

niques such as brazing, soldering, welding, gluing, or other techniques known to those skilled in the relevant art. For example, when brazing the interface member 14 to microelectronic device 10, nickel or a nickel alloy may be used as the braze material. The pressure sensor is hermetically sealed through various techniques known to those skilled in the art in order to maintain a completely sealed cavity as part of the pressure sensor. To convey electrical signals from the strain gauge 22 to microelectronic device electronics 24 for processing, vias (wires) 26, 27 and 28 (and more if required) are arranged to extend through interface member hermetic feed-through 30, 31 and 32 respectively to electronics 24. To maintain hermeticity, laser welding technology may be used to seal the feed-throughs once the wires 26, 27and 28 have been connected through the feed-throughs. It is further contemplated that the pressure sensor and the interface member may be a single-unit integrated piece.

[0011] Mere examples of pressure sensors contemplated for use in the embodiment of the invention and in the comparative examples are strain gauges, piezoelectric crystals, or any other sensors known to those skilled in the art that produce an output signal as a function of pressure or strain related mechanical disturbances to the sensor. The pressure sensor can be positioned on either the stimulating/active electrode end or the indifferent electrode end 21 of the microelectronic device. Referring to FIG. 1, when the pressure sensor 12 is positioned on the stimulating electrode end of the microelectronic device, the diaphragm of the pressure sensor can be made electrically conductive in order to maintain proper electrical conductivity for stimulation of a desired nerve or muscle. To provide adequate electrical conductivity various techniques such as sputtering may be utilized for adhering or depositing electrically conductive material 20 such as, for example, platinum, and iridium onto the surface of the pressure sensor diaphragm 16. In the alternative, a pressure sensor may be provided where its diaphragm is made of an electrically conductive material suitable for delivering electrical stimulation pulses to selected sites.

[0012] In an embodiment wherein it is desired not to have an interface member between the microelectronic device and the pressure sensor, preferably the pressure in a chamber formed by the microelectronic device and the pressure sensor should be set at the initial predetermined pressure. In order to prevent the pressure inside the chamber from changing because of the gas absorption or emission characteristic of the internal components in the microelectronic device, it is contemplated that the internal components used in the microelectronic device are made of non-gas emissive and non-gas absorbing material. The gas used in the contiguous space/chamber may be any type of inert gas such as argon. Furthermore, it is contemplated that the pressure in the contiguous space/chamber between the pressure sensor and the microelectronic device is calibrated to about one-atmosphere.

[0013] FIG. 2 is an exemplary representation of a Wheatstone Bridge circuit arrangement as part of a strain gauge suitable for measuring pressure. For example, as described above, various types of pressure sensors such as a strain gauge, among others, may be utilized with the microelectronic device. By way of illustration, under pressure changes, the strain gauge flexes such that the resistance values of R1, R2, R3, and R4 or any combination of them (depending on whether a quarter-bridge, half-bridge, or full-bridge is implemented) are changed in proportion to the sensed changing pressure condition. The change in the resistance values results in a change in the voltage value between the nodes 202 and 204. The difference in these voltages is supplied to an operational amplifier 206 which amplifies the differential signal representative of a sensed pressure. The differential signal is further provided to an analog-to-digital (A/D) converter in the microelectronic device for signal conversion and subsequent transmission to an external unit described in further detail below.

[0014] FIG. 3 is an illustration of an embodiment according to the invention showing an apparatus for measuring pressure. In this embodiment, an elongated member 302 is attached to the pressure sensor having a squeezable distal portion 304. It is contemplated that the pressure sensor and the microelectronic device may be manufactured as an integrated piece or two separate pieces attached together. As described above, a contiguous chamber 15 is formed within the microelectronic device 10 and the pressure sensor 12, wherein the pressure therein is at the initial predetermined pressure. The elongated member comprises a body portion having a substantially non-expanding wall with incompressible fluid 306 therein which provides a medium for transferring any pressure imparted on the squeezable distal portion to the proximal end of the elongated member where it is in contact with the flexible portion/diaphragm of the pressure sensor. This embodiment provides for placement of the squeezable distal portion of the elongated member in areas of the body or an object where it is difficult to place the microelectronic device 10 with its associated pressure sensor 12. For example, the elongated member can be implanted subcutaneously near the tip of the finger of a person and the microelectronic device 10 may be placed in palm of the hand of the person. In this manner, when the distal portion is squeezed when subjected to pressure, the incompressible fluid in the elongated member is pressurized and results in a change on the diaphragm of the pressure sensor.

[0015] FIG. 4 is an illustration of an exemplary system utilizing the embodiment or comparative examples of the apparatus described above for measuring pressure. In this system 400, an external unit 402 is provided for communication with the apparatus that may be in the form of an implantable device 404. As shown in FIG. 4, the external unit 402 broadly comprises a transmitter/receiver 406, wherein the transmitter is electrically coupled to an RF amplifier 408, RF oscillator 410, and control circuitry

412 for providing transmission of data communication containing command instructions to the implantable device 404. Although not shown, the external unit has the capability of providing power to the implantable device 404. The receiver of the external unit 402 is electrically coupled to at least an RF detector 414, a preamplifier 416, an A/D converter 418, and a measuring circuit 420 for providing a measurement of the pressure information received from the apparatus. It should be noted that the external unit 402 may also be implantable in a body. The implantable device 404 broadly comprises a transmitter/receiver 422, electronic circuitry 424, an A/D converter 426, an amplifier 428, and the pressure sensor 12. Referring to FIG. 4, in an embodiment of the system the implantable device 404 may be implanted under the skin i.e., subcutaneously, and adjacent to a desired blood vessel, lung, heart, skin pressure point, nerve or muscle for pressure sensing and/or stimulation in the body.

[0016] It should be noted that any of the embodiment or the comparative examples of the apparatus described herein may be implanted subcutaneously or percutaneously in a body of a living organism or placed on the surface of the body. Generally, when the apparatus is implanted subcutaneously, it utilizes wireless communication although in some circumstances it may utilize wired communication with the external unit. The dimensions of the microelectronic device are less than about 100 mm and 10 mm longitudinally (axial) and laterally respectively and preferably 60 mm and 6 mm respectively. This provides for a more efficient injection of the apparatus into the body.

[0017] In any of the embodiment or the comparative examples described herein, the pressure sensor signal may be AC-coupled to the electronic circuitry in the microelectronic device as an example of a technique to monitor rapid pressure changes sensed by a microelectronic device but ignore very slow changes in pressure. For example, this technique is applicable for determining whether a person is walking by having the apparatus implanted in the foot of the person. In this manner, when the person sets his or her foot on the ground, the AC-coupled pressure sensor provides, for example, a voltage for charging an AC-coupled capacitor and when the person lifts his or her foot off the ground the capacitor discharges at a specific rate. If the pressure changes at a rate slower than the discharge rate, the capacitor would not be charged up. If the pressure charges at a rate faster than the discharge rate, then the voltage on the capacitor can be detected. Yet another application of the AC-coupling is for compensating for gradual changes in the atmospheric pressure surrounding the apparatus. By way of example, when the apparatus having the internal initial predetermined pressure of, for example, one (1) atmospheric pressure at sea level is displaced to a higher altitude, the diaphragm will be deformed by bulging outward to equalize the internal pressure with the surrounding pressure. As a result, the strain gauge will be deformed and will provide a voltage change that is translated into a pressure measurement. In instances where the desired pressure measurement is the pressure inside a patient's body or an inanimate object, the effects of the change in altitude could provide a potentially false measurement. The AC-coupling of the electronic circuitry in the microelectronic device to the pressure sensor compensates for the potentially false measurement by allowing relatively more rapid changes in pressure (such as stepping as described above) to be detected by the apparatus in such a way that is independent of a gradual change in pressure due to a change in altitude.

[0018] Another approach for compensating or correcting for a change in pressure due to altitude or weather systems is to provide a secondary pressure sensor means 421 (such as a barometer or another apparatus similar and consistent with the embodiment and comparative examples of the apparatus described herein) associated with the external unit 402 such that the secondary pressure sensor means measures the surrounding environment's atmospheric pressure. The surrounding environment's atmospheric pressure may be communicated through the external unit to the apparatus as a reference pressure. Hence, the apparatus can correctly measure a desired pressure by comparing the reference pressure with the total pressure sensed by it.

[0019] While the invention has been described by means of a specific embodiment and applications thereof, it is understood that numerous modifications and variations could be made thereto by those skilled in the art without departing from scope of the invention.

Claims

1. An apparatus for measuring pressure, comprising:

   a microelectronic device (10);
   a pressure sensor (12) having a flexible diaphragm (16) responsive to external pressure exerted upon the diaphragm (16);
   an elongated member (302) having a proximal end attached and in contact with the diaphragm (16) of the pressure-sensor (12), wherein the elongated member (302) comprises a body portion having a substantially non-expandable wall and a squeezable distal portion (304) and wherein the elongated member contains incompressible fluid (306) therein;

   wherein the pressure sensor (12) is attached to the microelectronic device (10) providing a contiguous chamber (15) within the pressure sensor (12) and the microelectronic device (10), wherein the pressure in the contiguous chamber (15) is set at an initial predetermined pressure.

2. The apparatus of claim 1, wherein the microelectronic device (10) comprises: internal components made

of non-gas emissive and non-gas absorbing material.

3. The apparatus of claim 1 or claim 2, wherein the pressure sensor (12) is releasably attached to the microelectronic device (10).

4. The apparatus of claim 1 or claim 2, wherein the pressure sensor (12) is integrated with the microelectronic device (10).

5. The apparatus of claim 1, further comprising:

an interface member (14) positioned between the microelectronic device (10) and the pressure sensor (12).

6. The apparatus of claim 1, wherein the pressure sensor (12) is hermetically sealed.

7. The apparatus of claim 1, wherein the initial predetermined pressure is about 1 atmosphere.

8. The apparatus of claim 1, wherein the microelectronic device (10) is less than 100 mm in longitudinal dimension and less than 10 mm in lateral dimension.

9. The apparatus of any one of claims 1, 5, 7 or 8, wherein the microelectronic device (10) is a microstimulator or a microsensor.

10. The apparatus of any one of claims 1, 3-5, 7-9, wherein the microelectronic device (10) is adapted to implanted in a living organism.

11. The apparatus of any one of claims 1, 3-5 or 7-9, wherein the microelectronic device (10) is adapted for percutaneous attachment to a living organism.

12. The apparatus of claim 1, wherein the pressure sensor (12) includes electrically conductive material.

13. The apparatus of claim 12, wherein the electrically conductive material is selected from the group consisting of:

iridium, platinum and a combination thereof.

14. The apparatus of claim 12 or 13, wherein the electrically conductive material is deposited on the surface of the pressure sensor (12).

15. The apparatus of claim 12, wherein the pressure sensor (12) is substantially made of titanium alloy.

16. The apparatus of any one of claims 1 or 12-15, wherein the pressure sensor (12) is AC coupled to the microelectronic device (10).

17. The apparatus of any one of claims 1 or 12-16, wherein the pressure sensor (12) is a piezoelectric sensor or is a strain gauge sensor.

18. A system (400) for measuring pressure sensed by an implantable device (404), the system comprising:

an implantable device (404) comprising an apparatus for measuring pressure according to claim 1; and
an external unit (402) for communicating with the implantable device (404).

19. The system of claim 18, wherein the external unit (402) and the implantable device (404) communicate through a wireless medium.

20. The system of claim 19, wherein the external unit (402) and the implantable device (404) are adapted to provide data communication therebetween.

21. The system of claim 20, wherein the external unit (402) is further adapted to provide power to the implantable device (402).

22. The system of any one of claims 18 to 21, wherein the initial predetermined pressure is about 1 atmosphere.

23. The system of any one of claims 18 to 22, wherein the external unit (402) comprises a secondary pressure sensor means (421) for measuring the pressure surrounding said external unit (402) and providing thereby a reference pressure to the external unit (402) or the implantable device (404) for measuring the pressure sensed by the implantable device (404).

Patentansprüche

1. Gerät zur Druckmessung, umfassend:

eine mikroelektronische Vorrichtung (10);
einen Drucksensor (12) mit einer flexiblen Membran (16), der auf externen Druck, der auf die Membran (16) ausgeübt wird, reagiert;
ein längliches Element (302), dessen proximales Ende an der Membran (16) des Drucksensors (12) angebracht ist und mit dieser in Kontakt steht, wobei das längliche Element (302) einen Körperabschnitt mit einer im Wesentlichen nicht ausdehnbaren Wand und einen zusammendrückbaren distalen Abschnitt (304) umfasst, und wobei das längliche Element ein nicht komprimierbares Fluid (306) in diesem enthält;

wobei der Drucksensor (12) an der mikroelektroni-

schen Vorrichtung (10) angebracht ist, wodurch eine zusammenhängende Kammer (15) im Inneren des Drucksensors (12) und der mikroelektronischen Vorrichtung (10) bereitgestellt ist, wobei der Druck in der zusammenhängenden Kammer (15) auf einen vorbestimmten Anfangsdruck eingestellt ist.

2. Gerät nach Anspruch 1, worin die mikroelektronische Vorrichtung (10) Folgendes umfasst: innere Komponenten aus Material, das Gas weder abgibt noch absorbiert.

3. Gerät nach Anspruch 1 oder 2, worin der Drucksensor (12) an der mikroelektronischen Vorrichtung (10) abnehmbar angebracht ist.

4. Gerät nach Anspruch 1 oder 2, worin der Drucksensor (12) mit der mikroelektronischen Vorrichtung (10) einstückig ausgebildet ist.

5. Gerät nach Anspruch 1, ferner umfassend:

ein Zwischenelement (14), das zwischen der mikroelektronischen Vorrichtung (10) und dem Drucksensor (12) angeordnet ist.

6. Gerät nach Anspruch 1, worin der Drucksensor (12) hermetisch abgedichtet ist.

7. Gerät nach Anspruch 1, worin der vorbestimmte Anfangsdruck etwa 1 Atmosphäre beträgt.

8. Gerät nach Anspruch 1, worin die mikroelektronische Vorrichtung (10) weniger als 100 mm lang und weniger als 10 mm breit ist.

9. Gerät nach einem der Ansprüche 1, 5, 7 oder 8, worin die mikroelektronische Vorrichtung (10) ein Mikrostimulator oder ein Mikrosensor ist.

10. Gerät nach einem der Ansprüche 1, 3 bis 5 oder 7 bis 9, worin die mikroelektronische Vorrichtung (10) zur Implantation in einen lebenden Organismus geeignet ist.

11. Gerät nach einem der Ansprüche 1, 3 bis 5 oder 7 bis 9, worin die mikroelektronische Vorrichtung (10) zur perkutanen Anbringung an einem lebenden Organismus geeignet ist.

12. Gerät nach Anspruch 1, worin der Drucksensor (12) elektrisch leitfähiges Material umfasst.

13. Gerät nach Anspruch 12, worin das elektrisch leitfähige Material aus der aus Iridium, Platin und einer Kombination davon bestehenden Gruppe ausgewählt ist.

14. Gerät nach Anspruch 12 oder 13, worin das elektrisch leitfähige Material auf der Oberfläche des Drucksensors (12) abgeschieden ist.

15. Gerät nach Anspruch 12, worin der Drucksensor (12) im Wesentlichen aus einer Titanlegierung besteht.

16. Gerät nach einem der Ansprüche 1 oder 12 bis 15, worin der Drucksensor (12) mit der mikroelektronischen Vorrichtung (10) wechselstromgekoppelt ist.

17. Gerät nach einem der Ansprüche 1 oder 12 bis 16, worin der Drucksensor (12) ein piezoelektrischer Sensor oder ein Dehnungsmessstreifensensor ist.

18. System (400) zur Messung des durch eine implantierbare Vorrichtung (404) abgefühlten Drucks, wobei das System Folgendes umfasst:

eine implantierbare Vorrichtung (404), die ein Gerät zur Druckmessung nach Anspruch 1 umfasst; und
eine externe Einheit (402) zur Kommunikation mit der implantierbaren Vorrichtung (404).

19. System nach Anspruch 18, worin die externe Einheit (402) und die implantierbare Vorrichtung (404) über ein drahtloses Medium kommunizieren.

20. System nach Anspruch 19, worin die externe Einheit (402) und die implantierbare Vorrichtung (404) geeignet sind, um eine Datenkommunikation zwischen diesen bereitzustellen.

21. System nach Anspruch 20, worin die externe Einheit (402) ferner geeignet ist, um die implantierbare Vorrichtung (402) mit Energie zu versorgen.

22. System nach einem der Ansprüche 18 bis 21, worin der vorbestimmte Anfangsdruck etwa 1 Atmosphäre beträgt.

23. System nach einem der Ansprüche 18 bis 22, worin die externe Einheit (402) ein zweites Drucksensormittel (421) zur Messung des die externe Einheit (402) umgebenden Drucks und dadurch zur Bereitstellung eines Referenzdruckwerts für die externe Einheit (402) oder die implantierbare Vorrichtung (404) zur Messung des von der implantierbaren Vorrichtung (404) abgefühlten Drucks umfasst.

Revendications

1. Appareil de mesure de pression, comprenant :

un dispositif microélectronique (10) ;
un capteur de pression (12) comportant une

membrane flexible (16) sensible à une pression externe exercée sur la membrane (16) ;
un élément allongé (302) ayant une extrémité proximale fixée à la membrane (16) du capteur de pression (12) et en contact avec celle-ci, dans lequel l'élément allongé (302) comprend une partie de corps comportant une paroi sensiblement non extensible et une partie distale compressible (304), et

dans lequel l'élément allongé contient un fluide incompressible (306) dans celui-ci ;
dans lequel le capteur de pression (12) est fixé au dispositif microélectronique (10) réalisant une chambre contiguë (15) dans le capteur de pression (12) et le dispositif microélectronique (10), dans lequel la pression dans la chambre contiguë (15) est fixée à une pression initiale prédéterminée.

2. Appareil selon la revendication 1, dans lequel le dispositif microélectronique (10) comprend des composants internes réalisés en un matériau n'émettant pas de gaz et n'absorbant pas les gaz.

3. Appareil selon la revendication 1 ou la revendication 2, dans lequel le capteur de pression (12) est fixé de manière amovible au dispositif microélectronique (10).

4. Appareil selon la revendication 1 ou la revendication 2, dans lequel le capteur de pression (12) est intégré avec le dispositif microélectronique (10).

5. Appareil selon la revendication 1, comprenant en outre :

un élément d'interface (14) positionné entre le dispositif microélectronique (10) et le capteur de pression (12).

6. Appareil selon la revendication 1, dans lequel le capteur de pression (12) est hermétique.

7. Appareil selon la revendication 1, dans lequel la pression initiale prédéterminée est d'environ 1 atmosphère.

8. Appareil selon la revendication 1, dans lequel le dispositif microélectronique (10) a une dimension longitudinale inférieure à 100 mm et une dimension latérale inférieure à 10 mm.

9. Appareil selon l'une quelconque des revendications 1, 5, 7 ou 8, dans lequel le dispositif microélectronique (10) est un microstimulateur ou un microcapteur.

10. Appareil selon l'une quelconque des revendications 1, 3 à 5, ou 7 à 9, dans lequel le dispositif microélectronique (10) est adapté pour être implanté dans un organisme vivant.

11. Appareil selon l'une quelconque des revendications 1, 3 à 5 ou 7 à 9, dans lequel le dispositif microélectronique (10) est adapté pour une fixation percutanée à un organisme vivant.

12. Appareil selon la revendication 1, dans lequel le capteur de pression (12) comprend un matériau électroconducteur.

13. Appareil selon la revendication 12, dans lequel le matériau électroconducteur est sélectionné dans le groupe consistant en :

l'iridium, le platine et une combinaison de ceux-ci.

14. Appareil selon la revendication 12 ou 13, dans lequel le matériau électroconducteur est déposé sur la surface du capteur de pression (12).

15. Appareil selon la revendication 12, dans lequel le capteur de pression (12) est sensiblement réalisé en alliage de titane.

16. Appareil selon l'une quelconque des revendications 1 ou 12 à 15, dans lequel le capteur de pression (12) est couplé alternativement au dispositif microélectronique (10).

17. Appareil selon l'une quelconque des revendications 1 ou 12 à 16, dans lequel le capteur de pression (12) est un capteur piézoélectrique ou un capteur de pression absolue.

18. Système (400) pour mesurer une pression détectée par un dispositif implantable (404), le système comprenant :

un dispositif implantable (404) comprenant un appareil de mesure de pression selon la revendication 1 ; et
une unité externe (402) pour communiquer avec le dispositif implantable (404).

19. Système selon la revendication 18, dans lequel l'unité externe (402) et le dispositif implantable (404) communiquent par l'intermédiaire d'un support sans fil.

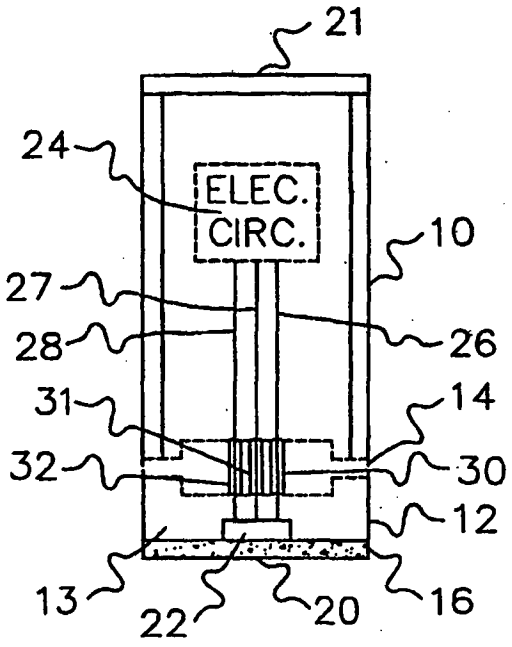
20. Système selon la revendication 19, dans lequel l'unité externe (402) et le dispositif implantable (404) sont adaptés pour réaliser une communication de données entre eux.

21. Système selon la revendication 20, dans lequel l'uni-

té externe (402) est en outre adaptée pour alimenter le dispositif implantable (402).

22. Système selon l'une quelconque des revendications 18 à 21, dans lequel la pression initiale prédéterminée est d'environ 1 atmosphère.

23. Système selon l'une quelconque des revendications 18 à 22, dans lequel l'unité externe (402) comprend des moyens formant capteur de pression secondaire (421) pour mesurer la pression entourant ladite unité externe (402) et fournir, de ce fait, une pression de référence à l'unité externe (402) ou au dispositif implantable (404) pour mesurer la pression détectée par le dispositif implantable (404).


21
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ELEC.
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16

FIG. 1

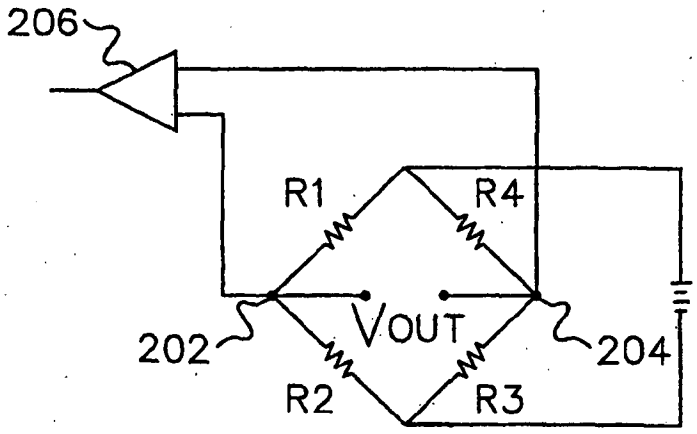
206
R1
R4
202
VOUT
204
R2
R3

FIG. 2

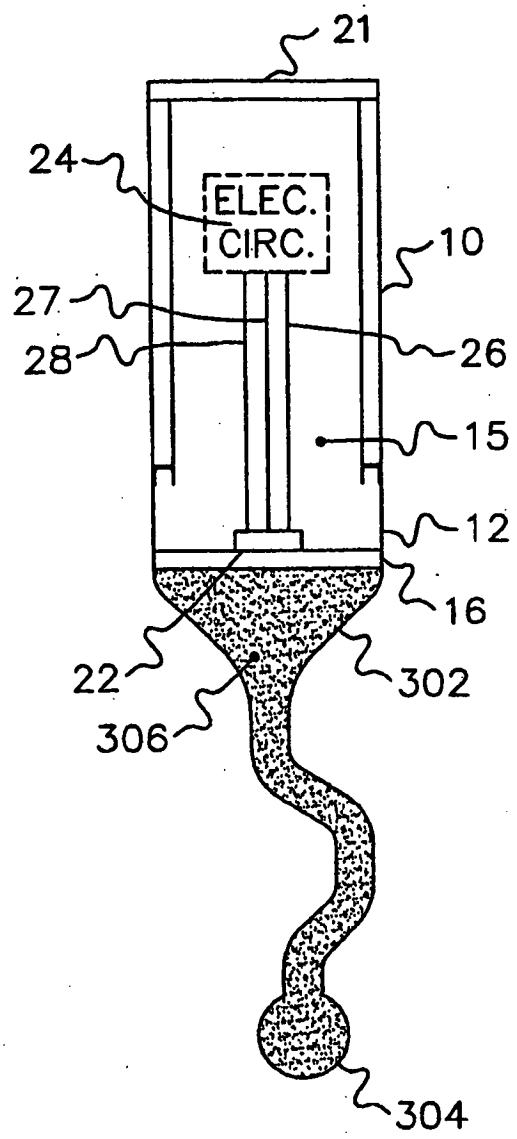

FIG. 3

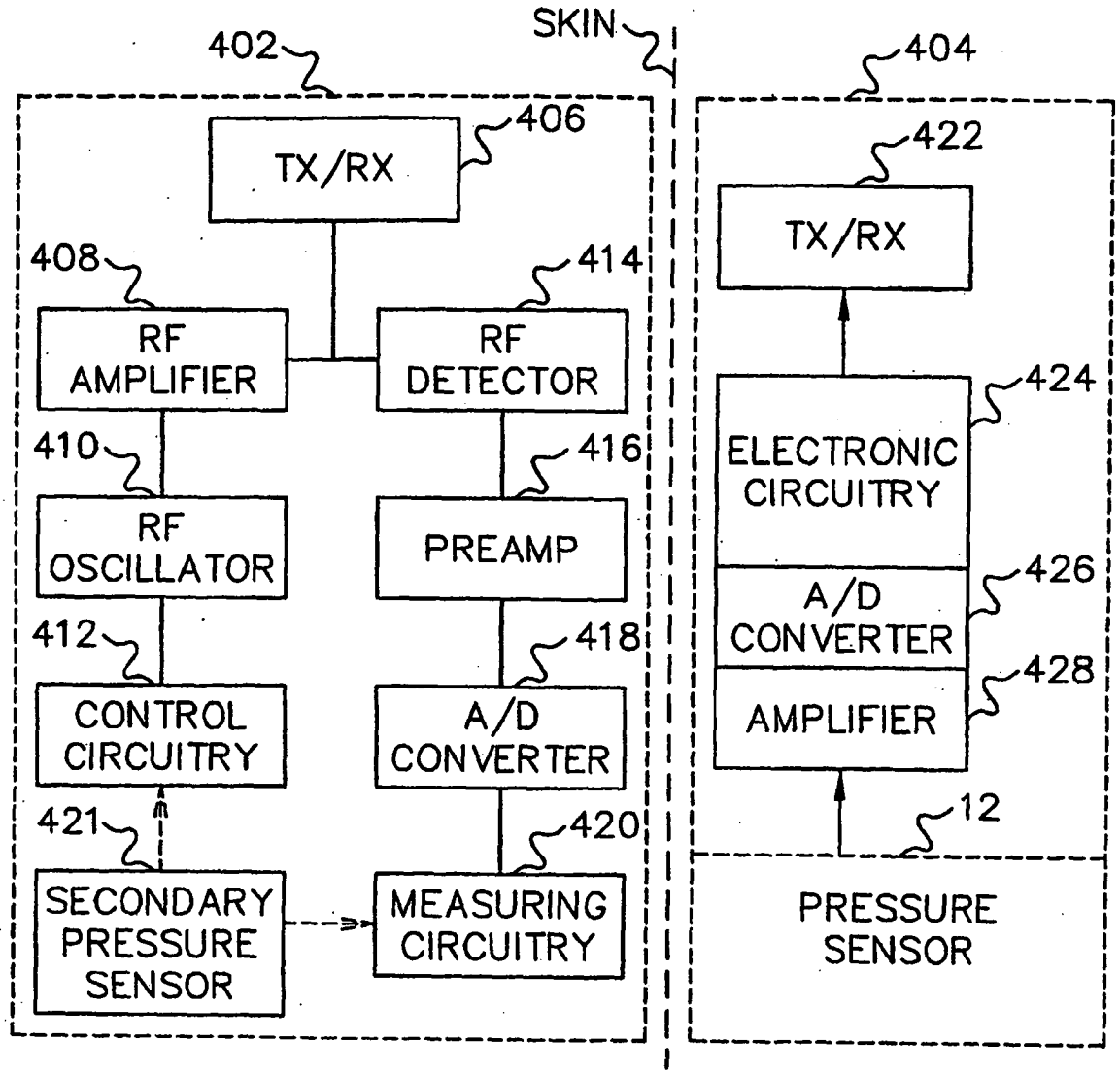
SKIN
402
404
406
TX/RX
422
TX/RX
408
414
RF AMPLIFIER
RF DETECTOR
424
ELECTRONIC CIRCUITRY
410
416
RF OSCILLATOR
PREAMP
426
A/D CONVERTER
412
418
428
CONTROL CIRCUITRY
A/D CONVERTER
AMPLIFIER
421
420
12
SECONDARY PRESSURE SENSOR
MEASURING CIRCUITRY
PRESSURE SENSOR
400

FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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专利名称(译)	用于感测生物体和无生命物体中的压力的系统和设备		
公开(公告)号	EP1508295B1	公开(公告)日	2008-12-17
申请号	EP2004255014	申请日	2004-08-20
申请(专利权)人(译)	艾尔弗雷德·E·曼基金会为科研		
当前申请(专利权)人(译)	艾尔弗雷德·E·曼基金会为科研		
[标]发明人	SCHULMAN JOSEPH H		
发明人	SCHULMAN, JOSEPH H.		
IPC分类号	A61B5/00 A61B5/03 A61B5/07 A61B5/0215 A61N1/372 A61N1/378 G01L9/00 G01L19/08		
CPC分类号	A61B5/0031 A61B5/0215 A61B5/03 A61B5/076 A61B2560/0219 A61B2560/0257 A61B2562/0247 A61N1/37205 A61N1/3787 G01L19/0645 G01L19/086		
代理机构(译)	佩吉特，HUGH CHARLES EDWARD		
优先权	60/497391 2003-08-22 US		
其他公开文献	EP1508295A1		
外部链接	Espacenet		

摘要(译)

用于测量压力的系统和装置包括微电子装置（24），附接到微电子装置的接口构件（14），具有响应于施加在隔膜上的外部压力的隔膜（16）的压力传感器（12）构件（14）定位在微电子装置（24）和压力传感器（12）之间并且附接到压力传感器，从而在压力传感器隔膜（16）和接口构件（14）之间提供第一腔其中所述第一腔中的压力设定为初始预定压力。

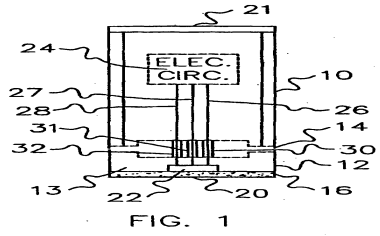

FIG. 1

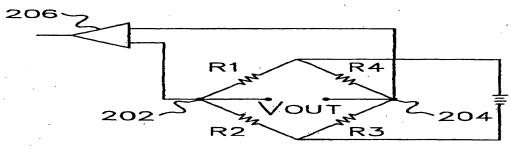

FIG. 2