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

(11) EP 2 753 234 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
12.08.2015 Bulletin 2015/33

(21) Application number: **12758971.1**

(22) Date of filing: **06.09.2012**

(51) Int Cl.:
A61B 5/00 *(2006.01)* ***A61B 5/02*** *(2006.01)*
A61B 5/024 *(2006.01)* ***A61B 5/07*** *(2006.01)*
A61B 5/11 *(2006.01)* ***A61N 1/372*** *(2006.01)*
H01Q 1/27 *(2006.01)* ***H01Q 1/44*** *(2006.01)*
H01Q 9/27 *(2006.01)*

(86) International application number:
PCT/US2012/053948

(87) International publication number:
WO 2013/036628 (14.03.2013 Gazette 2013/11)

(54) **IMPLANTABLE CARDIAC DEVICE CONFIGURED TO DETECT REDUCED CARDIAC WALL MOTION AND TO ACTIVATE TRANSMITTERS UPON DETECTION**

IMPLANTIERBARE HERZMEDIZINISCHE VORRICHTUNG ZUR ERKENNUNG EINGESCHRÄNKTER HERZWANDBEWEGUNGEN UND ZUR AKTIVIERUNG VON SENDERN BEI SOLCHER ERKENNUNG

DISPOSITIF CARDIAQUE IMPLANTABLE CONFIGURÉ POUR DÉTECTER UN MOUVEMENT DE PAROI CARDIAQUE RÉDUIT ET POUR ACTIVER DES ÉMETTEURS LORS D'UNE TELLE DÉTECTION

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **09.09.2011 US 201113228607**

(43) Date of publication of application:
16.07.2014 Bulletin 2014/29

(73) Proprietor: **Medtronic Inc.**
Minneapolis, Minnesota 55432 (US)

(72) Inventors:
- **RYS, Kenneth D.**
Minneapolis, Minnesota 55401 (US)
- **REINERT, Michael Andrew**
St. Cloud, Minnesota 56301 (US)

(74) Representative: **Hughes, Andrea Michelle**
Dehns
St Bride's House
10 Salisbury Square
London EC4Y 8JD (GB)

(56) References cited:
WO-A1-2011/063848
US-A1- 2005 065 445
US-A1- 2009 082 645
US-B1- 7 338 436

EP 2 753 234 B1

Description

TECHNICAL FIELD

[0001] The present invention pertains to implantable cardiac devices and more particularly to systems employing the devices for controlling wireless communications.

BACKGROUND

[0002] The traditional implantable cardiac monitoring and/or therapy delivery system includes a medical device to which one or more flexible elongate lead wires are coupled. The device is typically implanted in a subcutaneous pocket, remote from the heart, and each of the one or more lead wires extends therefrom to a corresponding cardiac site, either endocardial or epicardial, in order to deliver therapy to and/or to monitor the site. The document 7 338 436 B1 describes an implantable cardiac device comprising a wall motion detector and a wireless communications module. Mechanical complications and/or MRI compatibility issues, which are sometimes associated with elongate lead wires and are well known to those skilled in the art, have motivated the development of relatively compact cardiac medical devices that can be implanted in close proximity to the cardiac site, for example, within the right ventricle (RV) of the heart, so that elongate lead wires are not required. With reference to Figure 1, such a device 100 is illustrated, wherein a fixation member 115 anchors device 100 against the endocardial surface of the RV, for cardiac therapy delivery and/or monitoring, via medical components thereof, for example, a pair of electrodes, a mechanical transducer, and/or any other type of suitable sensor known in the art. Due to size constraints on device 100, limited space is available, within a hermetic enclosure/shell 101 thereof, for a power supply (i.e. battery) and circuitry (i.e. input/output circuit, a microcomputer circuit, memory) in support of the medical components. Device 100 is preferably accessible via wireless telemetry, for example, to update the programming of device 100 and/or to collect information from device 100, so a wireless communications module must also be contained within the limited space and supported by the contained power supply. In order to increase the life of the power supply, the most efficient operation of every component of device 100, including the communications module, is highly desirable.

SUMMARY

[0003] According to the present invention, a relatively compact cardiac medical device includes a wireless communications module that employs a directional antenna; the communications module is adapted to receive input concerning ventricular wall motion in order to stabilize telemetry signal strength from the antenna and thereby make communication more efficient. When such a device is anchored to a ventricular wall, transmitter elements of the communications module are only activated for communication during a detected period of reduced ventricular wall motion. The period of reduced ventricular wall motion may be defined as at least one time interval during which an axis of maximum signal strength for the directional antenna does not rotate significantly out from a baseline orientation, for example, by more than approximately 15 degrees. Wireless communication is conducted with an external programmer-type device or with another implanted device, for example, located at a site remote from the heart.

[0004] The cardiac medical device includes electrodes to detect the period of reduced ventricular wall motion or includes a mechanical transducer to detect the period. The device includes a pulse generator, and, when the device is implanted at an apical location of the right ventricle, pacing pulses are applied in order to create the period of reduced ventricular wall motion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The drawings are not to scale (unless so stated) and are intended for use in conjunction with the explanations in the following detailed description. Devices will hereinafter be described in conjunction with the appended drawings wherein like numerals denote like elements, and

Figure 1 is a schematic showing an exemplary cardiac medical device implanted in a right ventricle of a heart;

Figure 2A is a block diagram showing main modules of an implantable cardiac medical device;

Figure 2B is a plan view of the exemplary device of Figure 1;

Figure 3 is a heart wall motion schematic diagram; and

Figure 4 is schematic diagram illustrating rotation of an antenna axis from a baseline orientation.

DETAILED DESCRIPTION

[0006] The following detailed description is exemplary in nature. The following description provides practical examples, and those skilled in the art will recognize that some of the examples may have suitable alternatives.

[0007] Figure 1 illustrates device 100 with an axis A overlaid thereon to designate the direction of maximum signal strength from a directional antenna 103, which, with reference to Figures 2A-B is part of a wireless communications module 400 contained within shell 101 of device 100. At the time device 100 is implanted, radiopaque markers (not shown) included in device 100 may be viewed, via fluoroscopy, and/or telemetry signal strength, via antenna 103, may be monitored, in order to fix device 100 at the implant site in a particular orientation suitable to establish a favorable orientation of axis A.

Figures 2A-B are a schematic block diagram and a plan view, respectively, for device 100. Figure 1 further illustrates an external device 200, for example, an external programmer-type device, such as is known in the art, and another, optional, implanted device 300, either of which also includes a wireless communications module adapted for entering into wireless communications with device 100, according to any suitable configuration known in the art. A controller 405 of wireless communications module 400 of device 100 may activate receiver elements 401 at predetermined/pre-programmed intervals to listen for an activation signal from another device, such as device 200 or device 300, and once such a signal is detected, may prepare for communication. If device 200 is a communication head of a programmer that requires positioning to align with axis A, for example, for inductive coupling telemetry, device 100 may transmit a beacon-type signal to help with the alignment of device 200. After controller 405 receives an activation signal from device 200, controller 405 activates transmitter elements 402 of communications module 400, but only according to input from a ventricular wall motion detector 440 of device 100.

[0008] With further reference to Figure 2B, ventricular wall motion detector 440 provides input to controller 450 of communications module 400, which, after the aforementioned activation signal is received from device 200, activates transmitter elements 402 only during a detected period of reduced ventricular wall motion. Figure 3 is a schematic diagram showing orthogonal coordinate axes X,Y,Z overlaid on a heart in order to illustrate heart wall motion with each natural contraction of the heart. Those skilled in the art understand that the heart's intrinsic conduction system causes ventricular myocardium to contract with a twisting, or wringing (generally around axis Z), from the apex toward the base (generally along axis Z), per arrows C1 and C2, to squeeze blood out from the ventricles. With reference back to Figure 1, since device 100 is anchored to the right ventricular wall, each natural ventricular contraction causes axis A to shift and rotate, so that an alignment of axis A with a corresponding axis of device 200 (as well as with that of device 300) changes during each contraction and causes a telemetry signal strength delivered via antenna 103 to sinusoidally alternate between approximately 0% and approximately 100%, thereby compromising wireless communication with device 100. According to some methods, the period of reduced ventricular wall motion includes one or more diastolic intervals between contractions (systolic intervals) of the heart. So, rather than powering up for transmission throughout the aforementioned sinusoidal variation caused by ventricular wall motion during systole, transmitter elements 402 are only powered during diastolic intervals, when the ventricular walls are relatively still for filling. During this period, a lower telemetry signal strength, which means less power consumption, is required from antenna 103, since the signal strength is relatively stable, thereby increasing the efficiency of outbound communication.

[0009] In addition to, or as an alternative to diastolic intervals, the period of reduced ventricular wall motion may be created by pacing stimulation, for example, delivered from a pulse generator 420 of device 100, when device 100 is implanted at an apical location, as illustrated in Figure 1, at a rate that is greater (i.e. 10 to 20 beats per minute) than an intrinsic heart rate of the patient. Those skilled in the art understand that the ventricular wall motion, which corresponds to ventricular contractions that are externally stimulated from the apex of the heart, as opposed to those generated, from base to apex, by the heart's intrinsic conduction system, is reduced in the directions indicated by arrows C1 and C2 of Figure 3. Thus pacing stimulation may extend the period of reduced ventricular wall motion into systolic intervals of each cardiac cycle. With reference back to Figures 2A-B, device 100 includes a pair of electrodes 111, 112, by which such pacing stimulation may be applied, wherein electrode 111 is coupled to internal pulse generator circuitry 420 via a hermetic feedthrough, known in the art, and electrode 112 is formed by an exposed conductive portion of shell 101. According to some methods, once an inbound activation signal is received, for example, from device 200 or device 300 (Figure 1), by controller 405 of wireless communications module 400, via receiver elements 401, controller 405 sends a signal to activate pulse generator 420, in order to create the period of reduced ventricular wall motion via pacing stimulation. It should be noted that electrodes 111, 112 may also be employed by ventricular wall motion detector 440 for detection of the period of reduced ventricular wall motion that results from the applied pacing stimulation, as described below. The activation signal to create the period of reduced ventricular wall motion by the applied pacing stimulation is preferably sent by device 200 when the patient is in a clinical setting for a checkup, so that a clinician can monitor the patient's intrinsic heart rate, for example, to assure that the heart rate is a resting heart rate and stable before the higher rate pacing stimulation is applied. Furthermore, controller 406 of device 100 may have a programmable setting to limit the rate of applied pacing stimulation from the activated pulse generator 420, according to the patient's condition, for example, to prevent the stimulation from inadvertently triggering a cardiac arrhythmia.

[0010] Ventricular wall motion detector 440 may include a mechanical transducer adapted to sense mechanical changes indicative of ventricular wall motion, for example, a pressure sensor for indirect detection of the period of reduced ventricular wall motion (i.e. intraventricular pressure changes over each cardiac cycle), an accelerometer for direct detection of reduced ventricular wall motion, a Doppler sensor to detect blood flow, or an auditory/acoustic sensor to detect heart valve, lung and/or blood flow sounds. Alternatively, , ventricular wall motion detector 440 may include a pair of electrodes, for example, electrodes 111, 112 of Figure 2B, which are adapted to sense electrical cardiac signals indicative of

ventricular wall motion, for example, timing of the QRS complex to find diastolic intervals and/or QRS morphology to identify retrograde conduction resulting from applied pacing stimulation, for example, when the pulse generator is employed to create a period of reduced ventricular wall motion, as described above. According to yet further versions a chemical sensor may be employed in device 100, to provide additional input to controller, for example, of blood pH or blood oxygen saturation that may be indicative of a patient's physiological condition.

[0011] Figure 4 is a schematic diagram illustrating a baseline orientation of axis A, designated AB, which corresponds to a best alignment of axis A with the maximum signal strength axis of the communications module antenna of another device, such as device 200 (Figure 1). Figure 4 further illustrates limits of rotation RX and RZ out from AB, about axes X and Z, respectively, within which the period of reduced ventricular wall motion is defined. According to some preferred versions, the limits of rotation RX and RZ are no greater than approximately 15 degrees, and rotation within these limits may be correlated to diastolic intervals and/or to extended intervals during pacing stimulation, as detected by ventricular wall motion detector 440. By means of in vivo experimentation that employed biplane fluoroscopic tracking of radiopaque markers attached to a device similar to device 100, which was implanted at an apical location (similar to Figure 1), we have found that, when pacing stimulation was applied, device rotation during ventricular contractions, from a baseline orientation such as AB, is significantly reduced from that which was typical during intrinsic ventricular contractions.

[0012] With reference back to Figure 1, third device 300 may be implanted at a site remote from the heart, for example, to monitor and/or deliver therapy. Communication between device 300 and device 100 may be necessary to coordinate therapy delivery, from one or both devices, and/or to transfer data/information from device 100 to device 300, for example, for storage in a data storage module of a memory of device 300 until predetermined time periods when an external device, such as device 200, is employed to retrieve the stored data/information. For example, device 300 may be a cardiac defibrillation generator that is implanted in an abdomen of the patient, a neuromodulation generator implanted in the abdomen or pectoral region, or a cardiac monitor implanted in the pectoral region, any of which, in addition to having a more stable axis of maximum wireless communication strength, by virtue of their implant location, may also have a size sufficient to include greater battery capacity and more sophisticated telemetry hardware (relative to device 100), for example, capable of long range and/or automated telemetry with an external device, which is known in the art.

[0013] The invention is defined by the appended claims.

Claims

1. An implantable cardiac medical device configured to be wholly implanted at a cardiac site via anchoring to a heart chamber wall, the device comprising a wall motion detector (440) and a wireless communications module (400) compatible for communication with another medical device; the communications module comprising a receiver, a transmitter and a controller (405), the controller adapted to receive input from the wall motion detector and being programmed to execute a method, the device **characterized in that** the receiver comprises a plurality of receiver elements (401), **in that** the transmitter comprises a plurality of transmitter elements (402) and **in that** the method comprises, the following steps:

   activating the receiver elements at predetermined intervals to receive an inbound activation signal from the other medical device; and
   activating the transmitter elements for outbound communication, once the inbound activation signal is received, but only if a signal from the wall motion detector indicates a present period of reduced wall motion.

2. The device of claim 1, further comprising a pacing pulse generator (420), the pacing pulse generator being adapted to receive input from the controller of the wireless communications module; and wherein the method further comprises sending a signal to activate the pacing pulse generator, once the inbound activation signal is received and before activating the transmitter elements.

3. The device of claim 1 or 2 wherein the wall motion detector comprises electrodes adapted to sense electrical cardiac signals; and the signal from the detector that indicates a present period of reduced wall motion results from sensing electrical cardiac signals.

4. The device of claims 1 or 2 wherein the wall motion detector comprises a mechanical transducer, the transducer being adapted to sense mechanical changes, either pressure or motion; and the signal from the detector that indicates a present period of reduced wall motion results from sensing mechanical changes.

5. A cardiac medical system comprising at least two devices, a first of the devices comprising a wireless communications module (400), and a second of the devices (300) being an implantable cardiac medical device according to claim 1, the wireless communications module of the second device being compatible for communication with the wireless communications module of the first device.

6. The system of claim 5 wherein the first device comprises an external programmer type device.

7. The system of claim 5 further comprising a third device configured to be implanted at a site remote from the heart; the third device being adapted for therapy delivery and/or data storage and including a wireless communications module compatible for communication with the communications modules of both the first and second devices; wherein the outbound communication from the second device is directed to the third device.

8. The system of claim 5 wherein the first device is configured to be implanted at a site remote from the heart; the first device being adapted for therapy delivery and/or data storage.

9. The system of claim 5 wherein the second device further comprises a pacing pulse generator, the pacing pulse generator being adapted to receive input from the controller of the wireless communications module of the second device; and wherein the method executed by the controller of the communications module of the second device further comprises sending a signal to activate the pacing pulse generator, once the inbound activation signal is received and before activating the transmitter elements.

10. The system of claim 5 wherein the wall motion detector of the second device comprises electrodes adapted to sense electrical cardiac signals; and the signal from the detector that indicates a present period of reduced ventricular wall motion results from sensing electrical cardiac signals.

11. The system of claim 5 wherein the wall motion detector of the second device comprises a mechanical transducer, the transducer being adapted to sense mechanical changes, either pressure or motion; and the signal from the detector that indicates a present period of reduced wall motion results from sensing mechanical changes.

Patentansprüche

1. Implantierbare medizinische Herzvorrichtung, die konfiguriert ist, über Verankern an einer Herzkammerwand vollständig an einem Herzort implantiert zu werden, wobei die Vorrichtung einen Wandbewegungsdetektor (440) und ein drahtloses Kommunikationsmodul (400), das mit einer Kommunikation mit einer anderen medizinischen Vorrichtung kompatibel ist, enthält; wobei das Kommunikationsmodul einen Empfänger, einen Sender und eine Steuereinheit (405) enthält, wobei die Steuereinheit ausgelegt ist, eine Eingabe von dem Wandbewegungsdetektor zu empfangen, und programmiert ist, ein Verfahren auszuführen, wobei die Vorrichtung **dadurch gekennzeichnet ist, dass** der Empfänger mehrere Empfängerelemente (401) enthält, dass der Sender mehrere Sendeelemente (402) enthält und dass das Verfahren die folgenden Schritte umfasst:

   Aktivieren der Empfängerelemente zu vorgegebenen Intervallen, um ein eingehendes Aktivierungssignal von der anderen medizinischen Vorrichtung zu empfangen; und
   Aktivieren der Sendeelemente für eine ausgehende Kommunikation, sobald das eingehende Aktivierungssignal empfangen wurde, aber nur dann, wenn ein Signal von dem Wandbewegungsdetektor eine aktuelle Periode einer verringerten Wandbewegung angibt.

2. Vorrichtung nach Anspruch 1, die ferner einen Schrittmacherimpulsgenerator (420) enthält, wobei der Schrittmacherimpulsgenerator ausgelegt ist, eine Eingabe von der Steuereinheit des drahtlosen Kommunikationsmoduls zu empfangen; und wobei das Verfahren ferner umfasst, ein Signal zu senden, um den Schrittmacherimpulsgenerator zu aktivieren, sobald das eingehende Aktivierungssignal empfangen wurde und vor dem Aktivieren der Sendeelemente.

3. Vorrichtung nach Anspruch 1 oder 2, wobei der Wandbewegungsdetektor Elektroden enthält, die ausgelegt sind, elektrische Herzsignale zu erfassen; und sich das Signal von dem Detektor, das eine aktuelle Periode einer verringerten Wandbewegung angibt, aus dem Erfassen der elektrischen Herzsignale ergibt.

4. Vorrichtung nach den Ansprüchen 1 oder 2, wobei der Wandbewegungsdetektor einen mechanischen Wandler enthält, wobei der Wandler ausgelegt ist, mechanische Änderungen, entweder einen Druck oder eine Bewegung, zu erfassen; und sich das Signal von dem Detektor, das eine aktuelle Periode einer verringerten Wandbewegung angibt, aus der Erfassung der mechanischen Änderungen ergibt.

5. Medizinisches Herzsystem, das mindestens zwei Vorrichtungen enthält, wobei eine erste der Vorrichtungen ein drahtloses Kommunikationsmodul (400) enthält und eine zweite der Vorrichtungen (300) eine implantierbare medizinische Herzvorrichtung nach Anspruch 1 ist, wobei das drahtlose Kommunikationsmodul der zweiten Vorrichtung mit einer Kommunikation mit dem drahtlosen Kommunikationsmodul der ersten Vorrichtung kompatibel ist.

6. System nach Anspruch 5, wobei die erste Vorrichtung eine Vorrichtung vom externen Programmiertyp

enthält.

7. System nach Anspruch 5, das ferner eine dritte Vorrichtung enthält, die konfiguriert ist, an einem Ort entfernt vom Herzen implantiert zu werden; wobei die dritte Vorrichtung für eine Therapieverabreichung und/oder ein Datenspeichern ausgelegt ist und ein drahtloses Kommunikationsmodul enthält, das mit der Kommunikation mit den Kommunikationsmodulen sowohl der ersten als auch der zweiten Vorrichtung kompatibel ist; wobei die ausgehende Kommunikation von der zweiten Vorrichtung an die dritte Vorrichtung gerichtet ist.

8. System nach Anspruch 5, wobei die erste Vorrichtung konfiguriert ist, an einem Ort entfernt vom Herzen implantiert zu werden; wobei die erste Vorrichtung für eine Therapieverabreichung und/oder ein Datenspeichern ausgelegt ist.

9. System nach Anspruch 5, wobei die zweite Vorrichtung ferner einen Schrittmacherimpulsgenerator enthält, wobei der Schrittmacherimpulsgenerator ausgelegt ist, eine Eingabe von der Steuereinheit des drahtlosen Kommunikationsmoduls der zweiten Vorrichtung zu empfangen; und wobei das durch die Steuereinheit des Kommunikationsmoduls der zweiten Vorrichtung ausgeführte Verfahren ferner umfasst, ein Signal zu senden, um den Schrittmacherimpulsgenerator zu aktivieren, sobald das eingehende Aktivierungssignal empfangen wurde und vor dem Aktivieren der Sendeelemente.

10. System nach Anspruch 5, wobei der Wandbewegungsdetektor der zweiten Vorrichtung Elektroden enthält, die ausgelegt sind, elektrische Herzsignale zu erfassen; und sich das Signal von dem Detektor, das eine aktuelle Periode einer verringerten ventrikulären Wandbewegung angibt, aus der Erfassung der elektrischen Herzsignale ergibt.

11. System nach Anspruch 5, wobei der Wandbewegungsdetektor der zweiten Vorrichtung einen mechanischen Wandler enthält, wobei der Wandler ausgelegt ist, mechanische Änderungen, entweder Druck oder Bewegung, zu erfassen; und sich das Signal von dem Detektor, das eine aktuelle Periode einer verringerten Wandbewegung angibt, aus der Erfassung mechanischer Änderungen ergibt.

Revendications

1. Dispositif médical cardiaque implantable configuré pour être entièrement implanté sur un site cardiaque par ancrage à une paroi de chambre cardiaque, le dispositif comportant un détecteur de mouvement de paroi (440) et un module de communication sans fil (400) compatible pour une communication avec un autre dispositif médical ; le module de communication comportant un récepteur, un émetteur et un contrôleur (405), le contrôleur étant adapté pour recevoir une entrée provenant du détecteur de mouvement de paroi et étant programmé pour exécuter un procédé, le dispositif étant **caractérisé en ce que** le récepteur comporte une pluralité d'éléments de récepteur (401), **en ce que** l'émetteur comporte une pluralité d'éléments d'émetteur (402) et **en ce que** le procédé comporte les étapes suivantes consistant à :

   activer les éléments de récepteur à des intervalles prédéterminés pour recevoir un signal d'activation entrant provenant de l'autre dispositif médical ; et
   activer les éléments d'émetteur pour une communication sortante, une fois que le signal d'activation entrant est reçu, mais uniquement si un signal provenant du détecteur de mouvement de paroi indique une période présente de mouvement de paroi réduit.

2. Dispositif selon la revendication 1, comportant en outre un générateur d'impulsions de stimulation (420), le générateur d'impulsions de stimulation étant adapté pour recevoir une entrée provenant du contrôleur du module de communication sans fil ; et dans lequel le procédé comporte en outre l'envoi d'un signal pour activer le générateur d'impulsions de stimulation, une fois que le signal d'activation entrant est reçu et avant l'activation des éléments d'émetteur.

3. Dispositif selon la revendication 1 ou 2, dans lequel le détecteur de mouvement de paroi comporte des électrodes adaptées pour détecter des signaux cardiaques électriques ; et le signal provenant du détecteur qui indique une période présente de mouvement de paroi réduit résulte de la détection de signaux cardiaques électriques.

4. Dispositif selon les revendications 1 ou 2, dans lequel le détecteur de mouvement de paroi comporte un transducteur mécanique, le transducteur étant adapté pour détecter des changements mécaniques, soit une pression soit un mouvement ; et le signal provenant du détecteur qui indique une période présente de mouvement de paroi réduit résulte de la détection de changements mécaniques.

5. Système médical cardiaque comportant au moins deux dispositifs, un premier des dispositifs comportant un module de communication sans fil (400), et un deuxième des dispositifs (300) étant un dispositif médical cardiaque implantable selon la revendication 1, le module de communication sans fil du

deuxième dispositif étant compatible pour une communication avec le module de communication sans fil du premier dispositif.

6. Système selon la revendication 5, dans lequel le premier dispositif comporte un dispositif de type programmateur externe.

7. Système selon la revendication 5, comportant en outre un troisième dispositif configuré pour être implanté sur un site éloigné du coeur ; le troisième dispositif étant adapté pour une administration de thérapie et/ou une mémorisation de données et incluant un module de communication sans fil compatible pour une communication avec les modules de communication des premier et deuxième dispositifs ; dans lequel la communication sortante à partir du deuxième dispositif est dirigée vers le troisième dispositif.

8. Système selon la revendication 5, dans lequel le premier dispositif est configuré pour être implanté sur un site éloigné du coeur ; le premier dispositif étant adapté pour une administration de thérapie et/ou une mémorisation de données.

9. Système selon la revendication 5, dans lequel le deuxième dispositif comporte en outre un générateur d'impulsions de stimulation, le générateur d'impulsions de stimulation étant adapté pour recevoir une entrée provenant du contrôleur du module de communication sans fil du deuxième dispositif ; et dans lequel le procédé exécuté par le contrôleur du module de communication du deuxième dispositif comporte en outre l'envoi d'un signal pour activer le générateur d'impulsions de stimulation, une fois que le signal d'activation entrant est reçu et avant d'activer les éléments d'émetteur.

10. Système selon la revendication 5, dans lequel le détecteur de mouvement de paroi du deuxième dispositif comporte des électrodes adaptées pour détecter des signaux cardiaques électriques ; et le signal provenant du détecteur qui indique une période présente de mouvement de paroi ventriculaire réduit résulte de la détection de signaux cardiaques électriques.

11. Système selon la revendication 5, dans lequel le détecteur de mouvement de paroi du deuxième dispositif comporte un transducteur mécanique, le transducteur étant adapté pour détecter des changements mécaniques, soit une pression soit un mouvement ; et le signal provenant du détecteur qui indique une période présente de mouvement de paroi réduit résulte de la détection de changements mécaniques.

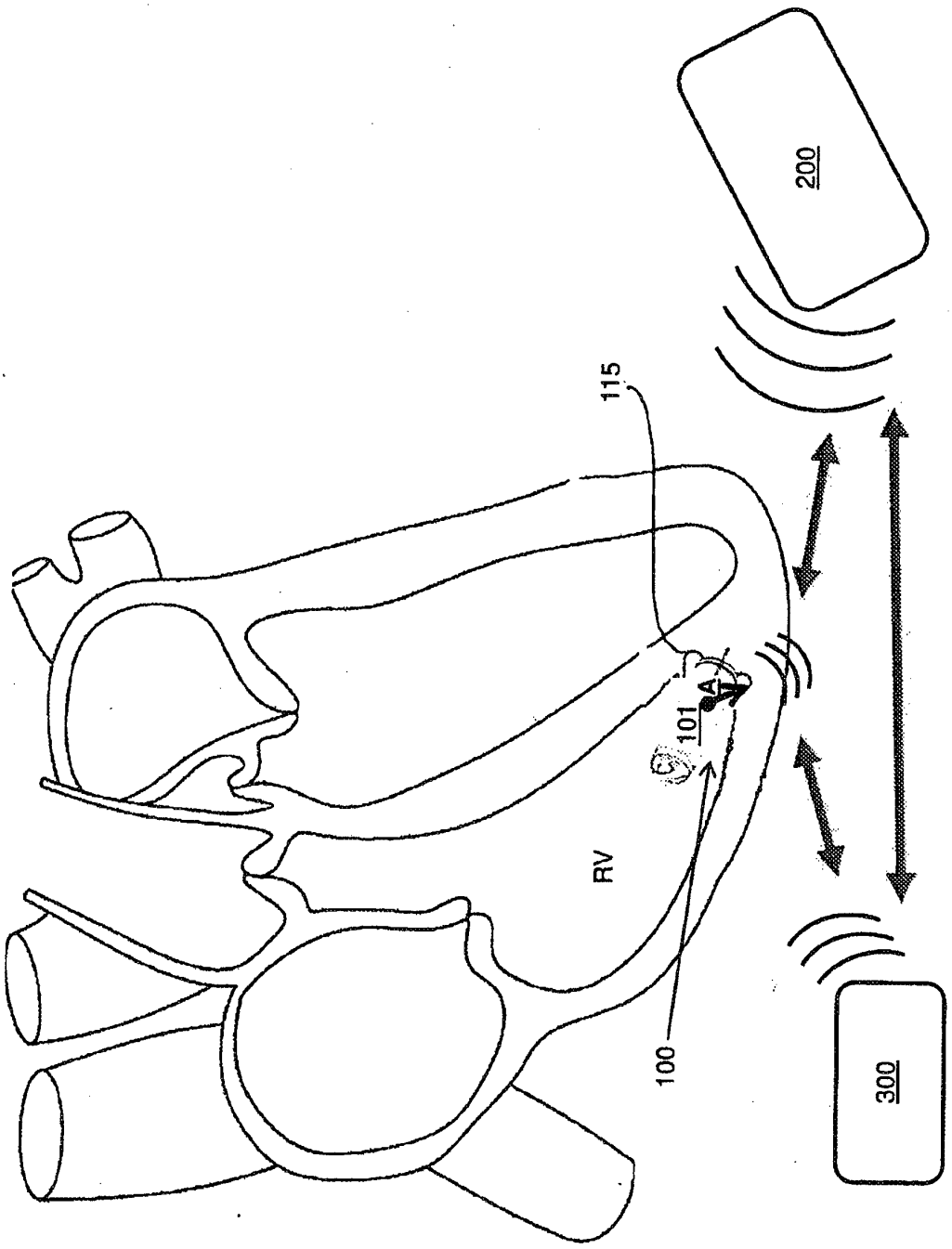

FIGURE 1

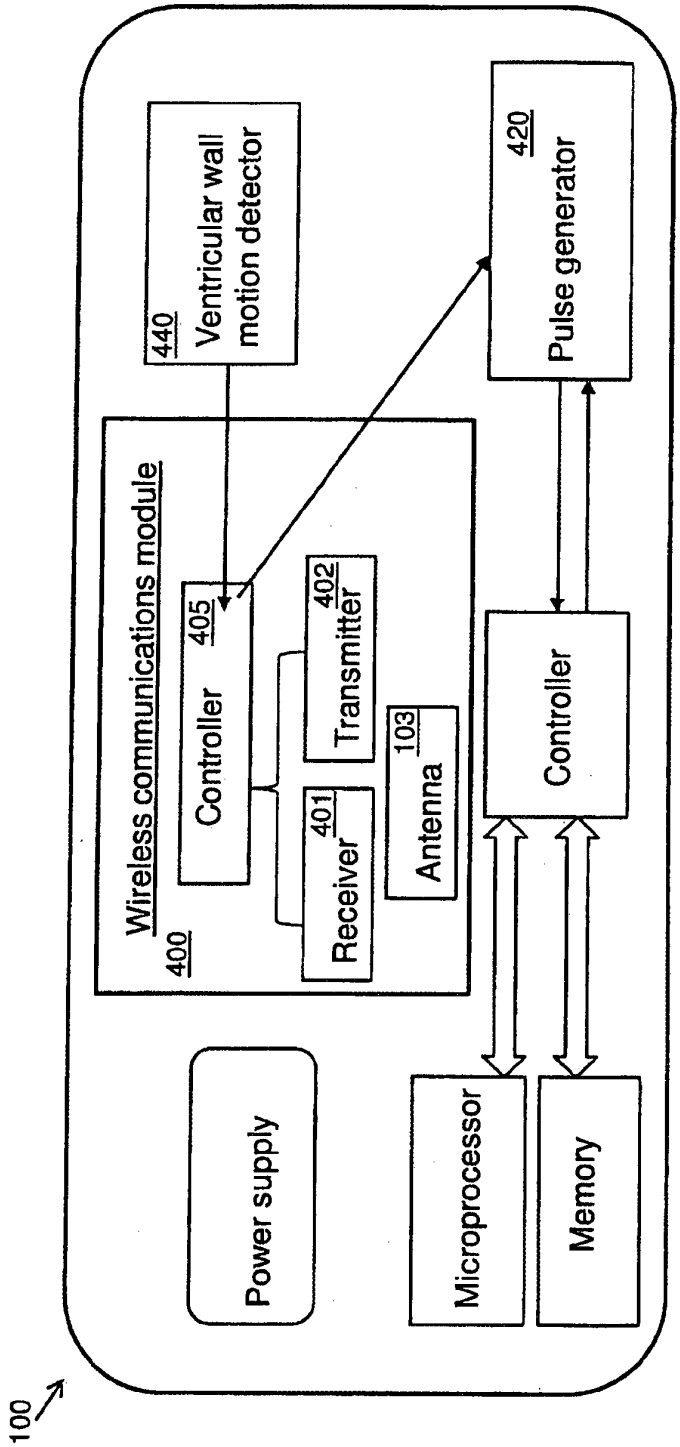

FIGURE 2A

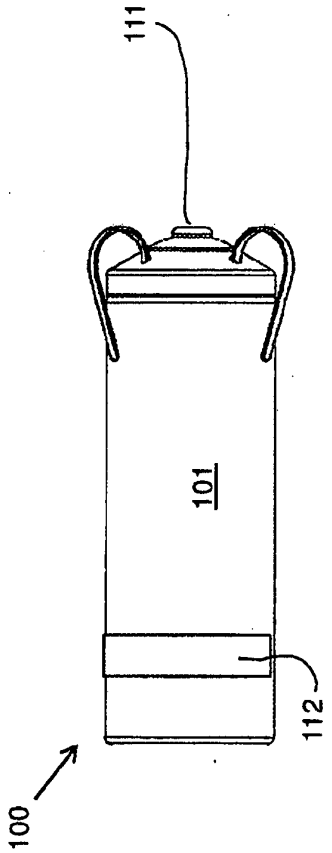

FIGURE 2B

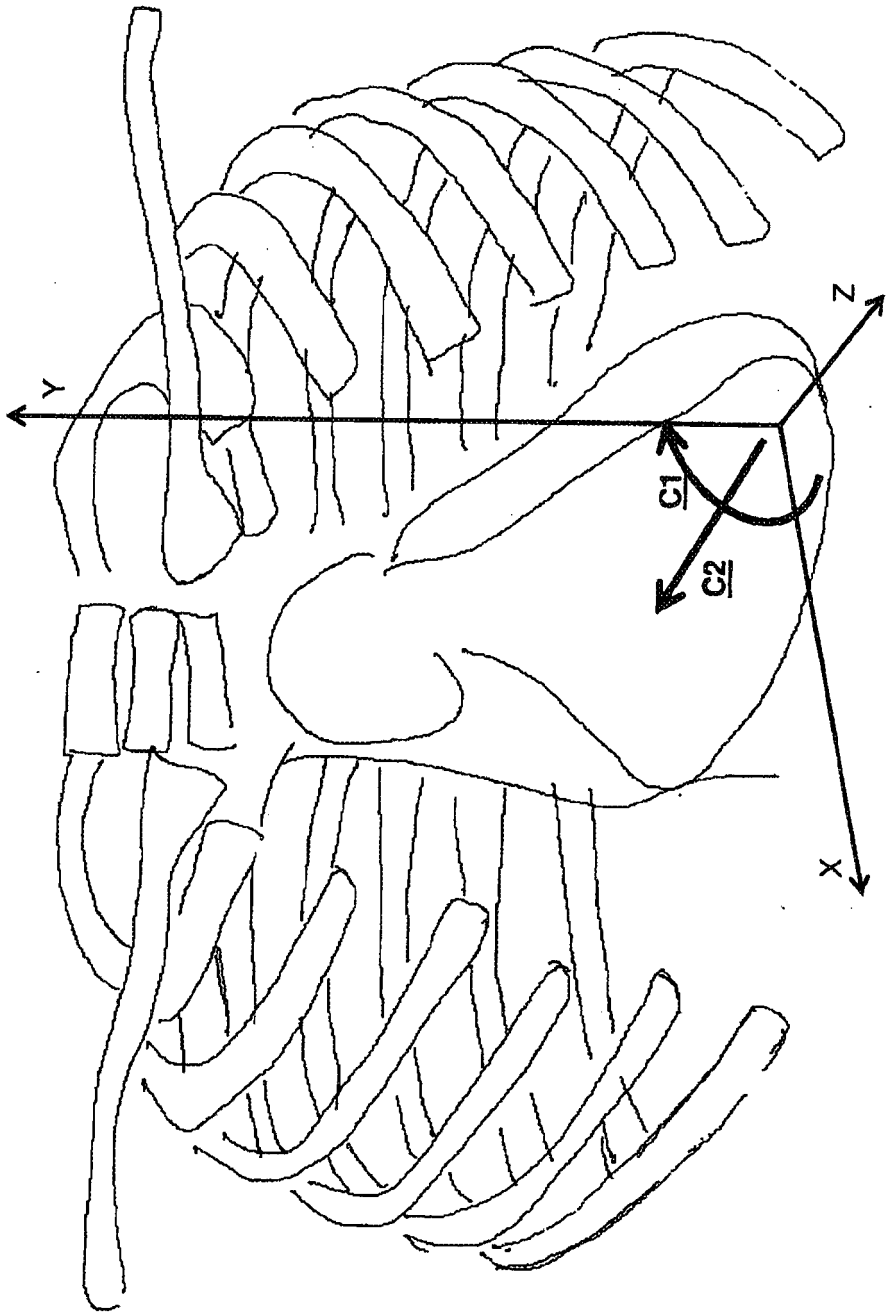

FIGURE 3

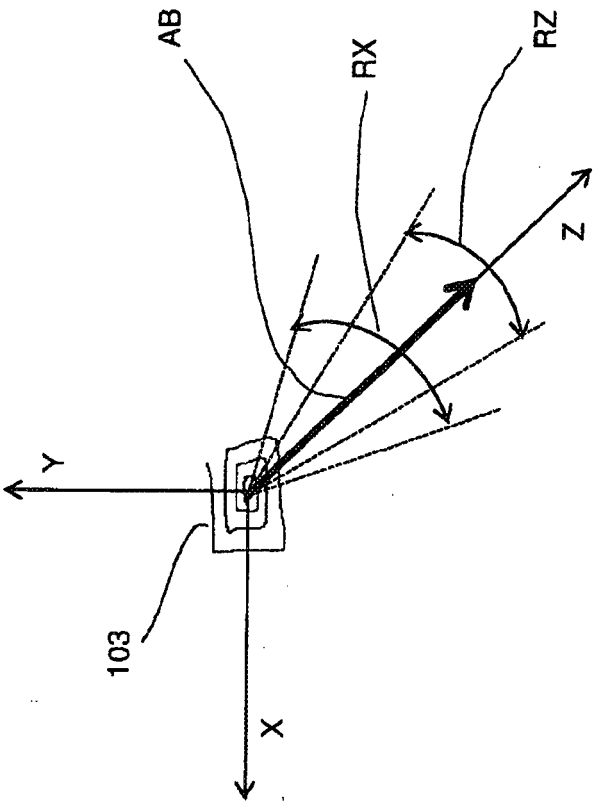

FIGURE 4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 7338436 B1 **[0002]**

专利名称(译)	可植入心脏装置，其被配置为检测减少的心壁运动并在检测时激活发射器		
公开(公告)号	EP2753234B1	公开(公告)日	2015-08-12
申请号	EP2012758971	申请日	2012-09-06
[标]申请(专利权)人(译)	美敦力公司		
申请(专利权)人(译)	美敦力公司.		
当前申请(专利权)人(译)	美敦力公司.		
[标]发明人	RYS KENNETH D REINERT MICHAEL ANDREW		
发明人	RYS, KENNETH D. REINERT, MICHAEL ANDREW		
IPC分类号	A61B5/00 A61B5/02 A61B5/024 A61B5/07 A61B5/11 A61N1/372 H01Q1/27 H01Q1/44 H01Q9/27		
CPC分类号	A61N1/37276 A61B5/02438 A61B5/076 A61B5/1107 A61B5/6869 H01Q1/44 H01Q9/27		
优先权	13/228607 2011-09-09 US		
其他公开文献	EP2753234A1		
外部链接	Espacenet		

摘要(译)

可锚定的可植入心脏医疗设备（100）包括壁运动检测器和无线通信模块，其采用定向天线。通信模块的发射器元件仅在检测到的心室壁运动减少期间被激活用于通信。心室壁运动减少的时段可以包括至少一个时间间隔，在该时间间隔期间定向天线的轴线不会从基线方向旋转超过15度。可以与外部编程器设备（200）或与远离心脏的另一个植入设备（300）进行通信。

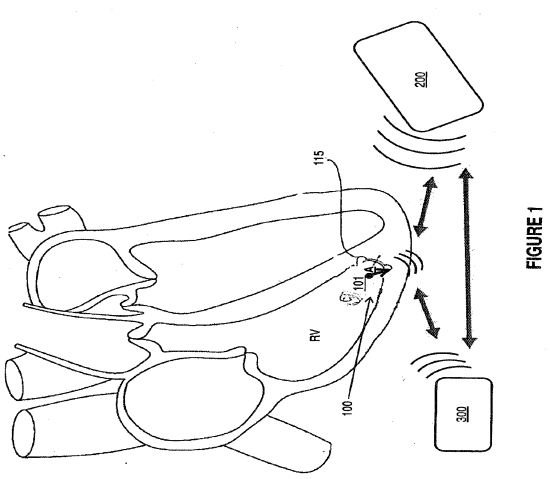

FIGURE 1