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

(11) EP 2 648 641 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
15.04.2020 Bulletin 2020/16

(21) Application number: **11802534.5**

(22) Date of filing: **25.11.2011**

(51) Int Cl.:
A61B 6/03 *(2006.01)* ***A61B 6/00*** *(2006.01)*
A61B 6/12 *(2006.01)* ***A61B 5/00*** *(2006.01)*
A61B 8/00 *(2006.01)* ***A61M 25/01*** *(2006.01)*
A61B 8/08 *(2006.01)* ***A61B 5/055*** *(2006.01)*
A61M 25/00 *(2006.01)* ***A61B 90/98*** *(2016.01)*
A61B 34/20 *(2016.01)* ***A61B 90/00*** *(2016.01)*

(86) International application number:
PCT/IB2011/055295

(87) International publication number:
WO 2012/077011 (14.06.2012 Gazette 2012/24)

(54) **INTERVENTIONAL APPARATUS ACTIVATED COMPUTED TOMOGRAPHY (CT)**
INTERVENTIONELLE GERÄTEAKTIVIERTE COMPUTERTOMOGRAPHIE (CT)
TOMODENSITOMÉTRIE (TDM) ACTIVÉ PAR APPAREIL D’INTERVENTION

(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: **09.12.2010 US 421303 P**

(43) Date of publication of application:
16.10.2013 Bulletin 2013/42

(73) Proprietors:
- **Koninklijke Philips N.V.**
5656 AG Eindhoven (NL)
Designated Contracting States:
AL AT BE BG CH CY CZ 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
- **Philips Intellectual Property & Standards GmbH**
20099 Hamburg (DE)
Designated Contracting States:
DE

(72) Inventors:
- **SCHMITT, Holger**
5656 AE Eindhoven (NL)
- **GRASS, Michael**
5656 AE Eindhoven (NL)

(74) Representative: **Philips Intellectual Property & Standards**
High Tech Campus 5
5656 AE Eindhoven (NL)

(56) References cited:
US-A1- 2005 165 303 **US-A1- 2005 197 557**
US-A1- 2007 103 437 **US-A1- 2007 167 700**

EP 2 648 641 B1

Description

FIELD OF THE INVENTION

[0001] The following generally relates to imaging and more particular to activating an imaging scanner to scan a region of interest of a subject and an interventional instrument (of an interventional apparatus) therein based on movement of the interventional instrument within the region of interest as determined by the interventional apparatus, and is described with particular application to a computed tomography (CT) imaging scanner; however, the following is also amenable to other imaging modalities.

BACKGROUND OF THE INVENTION

[0002] Interventional imaging includes using images to guide minimally invasive interventional procedures such as diagnostic, treatment, and/or other interventional procedures.

[0003] By way of example, with one transcatheter interventional procedure, a local anesthetic is injected or applied into the skin of a patient at an entry area to numb the entry area, a puncture is made to the entry area with a needle, scalpel, etc., and a plastic sheath is inserted into the artery. A catheter supporting an interventional instrument is then inserted and feed through the sheath and into the vessel, and moved to an area of interest of the patient, such as the heart, the brain, the lungs or other anatomical structure of interest, where the interventional procedure is performed.

[0004] The interventional instrument can then be employed to perform the interventional procedure. During the interventional procedure, images are periodically acquired and used to give the interventionalist orientation and update information on the progress of the procedure. Computed tomography (CT) images have been used to guide interventional procedures. However, since CT data acquisitions can deposit a relatively high amount of x-ray radiation dose, images in CT guided interventional procedures generally are acquired very rarely and only when needed. For example, typically, an image update is only acquired after the catheter has been moved or translated, forward or backward, a certain distance, since such movement may result in a change in the interventional situation.

[0005] Unfortunately, the interventionalist performing the interventional procedure has to determine when to acquire an image and manually trigger the CT scanner to acquire the image. As such, the interventionalist may error on the conservative side and initiate scanning before necessary, which may increase patient dose relative to initiating scanning a little later in time, while mitigating initiating scanning later than desired. Furthermore, the interventionalist is tasked with acts outside of the interventional procedure (i.e., determining when to scan and initiating scanning), and time consumed performing these acts could otherwise be used to perform the interventional procedure and/or interact with the patient.

[0006] United States patent application US 2007/167700 A1 discloses an image scanner that is activated to scan a region of interest and the interventional instrument therein for one or more acquisition cycles.

SUMMARY OF THE INVENTION

[0007] Aspects of the present application address the above-referenced matters and others. The invention is defined by the appended claims. All other embodiments are merely exemplary.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The invention may take form in various components and arrangements of components, and in various steps and arrangements of steps. The drawings are only for purposes of illustrating the preferred embodiments and are not to be construed as limiting the invention.

FIGURE 1 schematically illustrates an example imaging system in connection with an interventional apparatus.

FIGURE 2 illustrates an example of an interventional apparatus that includes a position detector that senses a position of a moveable portion of the interventional apparatus moveable during an image-guided procedure to facilitate performing the procedure.

FIGURE 3 illustrates an example of the position detector including a mechanical motion sensor.

FIGURE 4 illustrates another example of the position detector including a mechanical motion sensor.

FIGURE 5 illustrates an example of the position detector including an optical motion sensor.

FIGURE 6 illustrates another example of the position detector including an optical motion sensor.

FIGURE 7 illustrates an example of the position detector including a radio frequency motion sensor.

FIGURE 8 illustrates example method for activating scanning with the interventional apparatus during an image-guided interventional procedure performed using the interventional apparatus.

DETAILED DESCRIPTION

[0009] FIGURE 1 illustrates a system 100 including an imaging scanner 101, such as a computed tomography (CT) imaging scanner, in connection with an interventional apparatus 102.

[0010] The illustrated imaging scanner 101 includes a stationary gantry 104 and a rotating gantry 106, which is rotatably supported by the stationary gantry 104. The rotating gantry 106 rotates around an examination region 108 about a longitudinal or z-axis. A patient support 110, such as a couch, supports a patient in the examination region 108 and is movable along the x, y and/or z-axis in coordination with the rotation of the rotating gantry 106.

[0011] A radiation source 112, such as an x-ray tube, is supported by and rotates with the rotating gantry 106 around the examination region 108. A controller ("CTRLR") 114 controls the radiation source 112. By way of non-limiting example, the illustrated controller 114 is configured to activate the radiation source 112 (i.e., turn the radiation source 112 "on" such that the radiation source 112 emits radiation that traverses the examination region 108) and deactivate the radiation source 112 (i.e., turn the radiation source 112 "off' such that such radiation does not traverses the examination region 108). A radiation sensitive detector array 116 detects radiation that traverses the examination region 108 and generates projection data indicative of the detected radiation.

[0012] A reconstructor 118 reconstructs the projection data and generates volumetric image data indicative of the examination region 108. The image data can be displayed, filmed, etc. A general purpose computing system serves as an operator console 120, and includes an output device such as a display and an input device such as a keyboard, mouse, and/or the like. The console 120 includes a processor(s) and computer readable storage medium (e.g., physical memory) encoded with computer readable instructions, which, when executed by the processor allows a user to operate the scanner 101 such as initiating scanning, display reconstructed images, etc. Additionally or alternatively, the processor can execute computer readable instructions carried in signal medium (e.g., a carrier wave).

[0013] As briefly discussed above, the illustrated imaging scanner 101 is shown in connection with the interventional apparatus 102. As described in greater detail below, the interventional apparatus 102 includes a position detector 122 that is configured to communicate with the imaging scanner 101, for example, to convey a signal to the imaging scanner 101 (e.g., the console 120 and/or the source controller 114) that triggers the imaging scanner 101 (e.g., with or without user interaction) to perform an action, such as activate the radiation source 112 and acquire data (i.e., perform a scan), based on a state such as a movement state or other state of the interventional apparatus 102 with respect to predetermined scan activation criteria, and/or other action.

[0014] As such, in one non-limiting embodiment, during an image-guided interventional procedure utilizing the interventional apparatus 102, the interventionalist does not have to determine when to scan a region of interest of the subject (and the interventional instrument therein) positioned in the examination region 108 or manually trigger the imaging scanner 101 to scan the region of interest. Instead, the position detector 122 senses information about the position state of the interventional procedures and this information is utilized to determine when to scan the portion of the subject in the examination region 108 and to automatically trigger the scanner 101 to scan the subject. The foregoing allows the interventionalist to focus on the procedure and the patient, and may facilitate reducing patient dose relative to a configuration in which the position detector 122 is omitted. Of course, the interventionalist can still manually initiate scanning via the imaging scanner 101 to scan the subject and/or pause or terminate an automatically triggered scan.

[0015] FIGURE 2 schematically illustrates an example of the interventional apparatus 102 in connection with an example image guided procedure.

[0016] In this example, the interventional apparatus 102 includes an elongate flexible catheter 202 with an interventional instrument 204 affixed to an end 205 of the catheter 202 that enters an object or subject 208 and a sheath 206 through which the catheter 202 enters the object or subject 208. The illustrated sheath 206 includes a first end 210, which is inserted into the object or subject 208, and a second end 212 which remains outside of the object or subject 208. The second end 212 includes a hub or port 214, which, generally, is geometrically larger than the first end 210 and sits or rests about an entry or access point 216 into the object or subject 208 created by the sheath 206.

[0017] The object or subject 208 includes a tubular structure 218 that provides a pathway 220 to a region of interest 222 of the object or subject 208. In the illustrated embodiment, the position detector 122 is disposed in connection with the hub 214 of the sheath 206 and can sense positional (e.g., translational, rotational, etc.) information about the catheter 202 relative to the sheath 206. For example, the illustrated position detector 122 senses movement of the catheter 202 in and out of the sheath 206, rotation of the catheter 202 within the sheath 206, etc., and generates a movement signal indicative of the sensed movement.

[0018] The position detector 122 may be variously affixed to the sheath 206. For example, in one embodiment, the position detector 122 may be part of the sheath 206. In another embodiment, the position detector 122 is separate from but fixidly attached to the sheath 206 via an adhesive such as glue. In yet another embodiment, the position detector 122 is removeably attached to the sheath 206. With this embodiment, a position detector 122 may be cleanable (e.g., sterilizeable, disinfectable, etc.) and alternately used with more than one sheath 206. The position detector 122 conveys the movement signal to the controller 114, directly and/or to the console 120, via a wireless or wired (e.g., a cable) communications channel.

[0019] At least one of the console 120 or the controller 114 executes computer readable instructions for evaluating the movement signal and determining whether to activate the imaging scanner 101 to scan. In the illustrated embodiment, the computer readable instructions compute a distance that the catheter 202 has traveled (e.g., from the beginning of the procedure, relative to a last scan, relative to an identified landmark within the object or subject, etc.) based on the movement signal and compares this distance with a stored predetermined threshold distance. In one instance, where the distance in the movement signal satisfies the threshold, the controller 114 transmits a command signal that activates the source 112 to scan for a predetermined number of data acquisition cycles. Optionally, the console 120 can provide a notification indicating that the source 112 will be activated within a predetermined time period before activating the source 112. Otherwise, the controller 114 does not activate the source 112 to scan.

[0020] In a variation of the above, the console 120 visually presents or provides a notification that indicates that data should be acquired and waits for a user confirmation. Such confirmation could be through an audible command such as a voice command from the user. Additionally or alternatively, the confirmation could be through a joystick, a foot pedal, a keyboard, a mouse, and/or other known input device. Additionally or alternatively, the user can manually invoke the imaging scanner 101 to acquire data independent of the trigger signal via an audible command and/or a joystick, a foot pedal, a keyboard, a mouse, the console 120, and/or other known input device.

[0021] In a non-limiting application of the above, the subject 208 is a human patient, the entry point 216 is the femoral artery via the groin, and thus the sheath 206 is partially inserted into the femoral artery at the groin, with a sub-portion of the sheath 206 including the hub 214 remaining outside of the patient at the groin. In this example, the region of interest 222 is anatomical structure such as the heart (or brain, lungs, etc.), and the interventional device 204 affixed to the end of the catheter 202 is configured for performing an interventional procedure at the structure of interest. Examples of cardiac interventional procedures include, but are not limited to, angioplasty, angiography, balloon septostomy, etc.

[0022] The position detector 122 senses movement of the catheter 202 within the region of interest 222 based on movement of the catheter 202 with respect to the position detector 122, and, if it is determined the movement of the catheter 202 corresponds to a distance that satisfies the predetermined distance threshold value, then the controller 114 invokes the scanner 101 to acquire data. The resulting displayed image visually shows the location of the interventional instrument 204 within the region of interest 222. The interventionalist performing the procedure can utilize the displayed image to facilitate guiding and employing the interventional instrument 204 in connection with the interventional procedure.

[0023] FIGURE 3 schematically illustrates a non-limiting embodiment of the position detector 122 including a mechanical based motion sensor.

[0024] In this embodiment, the position detector 122 includes at least one element 300 configured to rotate. For explanatory purposes, the at least one element 300 includes a wheel 302. However, other elements such as a ball, a roller, or other rotating element 300 may additionally or alternatively be used.

[0025] The illustrated wheel 302 is rotatably supported by the position detector 122, for example, via a pin, rod, or the like through a center axis of the wheel 302. Furthermore, the position detector 122 is affixed to the hub 214 such that the wheel 302 physically contacts an outer surface of the catheter 202 in response to the catheter 202 in the sheath 206. A mechanism such as a spring or the like may be used to exert a force that facilitates ensuring physical contact of the wheel 302 with the catheter 202.

[0026] A transducer 304, such as a rotary encoder or the like, senses the rotational position of the wheel 302 relative to a predetermined reference position. The transducer 304 generates an analog or digital signal indicative of the rotational position of the wheel 302 relative to the reference position. The position detector 122 conveys the signal to the console 120 and/or controller 114.

[0027] With this embodiment, each angular increment of the wheel 302 corresponds to a translational distance along the catheter 202. As such, the signal from the position detector 102 is indicative of a translational movement distance of the catheter 202 in the sheath 206 and hence in the region of interest of the subject 208. The wheel 302 is free to rotate in either direction, and the signal indicates the direction and magnitude of the movement, into or out of the sheath 206.

[0028] In the illustrated embodiment, the position detector 122 includes single wheel 302. In a variation, the position detector 122 may include more than one wheel 302 and/or other rotating element 300. With this variation, one or more of the wheels 302 and/or other rotating element 300 may be used to determine the rotational position.

[0029] FIGURE 4 schematically illustrates another non-limiting embodiment of the position detector 122 including a mechanical based motion sensor.

[0030] In this embodiment, the catheter 202 includes a plurality of protrusions or nubs 402, protruding outward from the catheter 202. The plurality of protrusions 402 are separated from each other by a known distance, which correspond to a length of catheter 202 between protrusions 402. The protrusions 402 may be part of the catheter 202 (e.g., ribs) or affixed thereto. The position detector 122 includes a transducer 404 or the like which, in response to physically contacting one of the protrusions 402, generates a signal indicative of the physical contact.

[0031] The position detector 122 conveys the signal to the console 120 and/or controller 114. With this embodiment, since the plurality of protrusions 402 are spaced at known distances, each signal indicating a protrusion 402 has been detected corresponds to a translational distance of the catheter 202. As such, the signal from the position detector 122 is indicative of a translational movement distance of the catheter 202 in the sheath 206 and the region of interest of the object or subject 208. As with the wheel 302, the transducer 404 can indicate the direction and magnitude, and rotational or other motion of the catheter 202 in the sheath 206.

[0032] FIGURE 5 schematically illustrates another non-limiting embodiment of the position detector 122 including an optical based motion sensor.

[0033] In this embodiment, the position detector 122 includes a transmitter 502 and a receiver 504, and the catheter 202 includes a predetermined pattern 506 with a known reflective characteristic. By way of non-limiting example, the illustrated pattern 506 includes a plurality of bars 508 of alternating different colors (e.g., white and black, or red, green, blue, etc.) in which a distance between a given set of bars corresponds to a known translation distance. In other embodiment, the pattern 506 includes other reflective indicia. A power source 510 such as a battery provides power to energize the transmitter 502 and the receiver 504.

[0034] In operation, the transmitter 502 (e.g., a light emitting diode (LED) or other light source) transmits light which illuminates the catheter 202 and reflects off the pattern 506. The receiver 504 receives the reflected light and generates a signal indicative thereof. Since the bars 508 are spaced at known distances, the signal generated by the receiver 504 corresponds to a distance moved by the catheter 202. As such, the signal from the position detector 122 is indicative of a movement distance of the catheter 202 in the sheath 206 and hence in the region of interest of the object or subject 208.

[0035] In a variation, each bar 508 could also have a pattern, which can be used to determine rotational motion of the catheter 202. Similar to above, the pattern can be determined based on the detected reflected signal, and a rotational distance can be determined based on the detected reflected signal.

[0036] FIGURE 6 schematically illustrates a variation of FIGURE 5 in which a plurality of light transmitters 602, powered by a battery or otherwise, are located along the catheter 202 at known distances apart and emit light that is detected by the receiver 504. Since the light transmitters 602 are spaced at known distances, the signal from the receiver 504 corresponds to a translational distance of the catheter 202. As such, the signal from the position detector 122 is indicative of a translational movement distance of the catheter 202 in the sheath 206 and hence in the region of interest of the object or subject 208.

[0037] FIGURE 7 schematically illustrates another non-limiting embodiment of the position detector 122 including a radio frequency based motion sensor.

[0038] In this embodiment, a passive emitter 700 is attached to (e.g., embedded in, affixed to, etc.) the catheter 202, near the interventional instrument 204, and the position detector 122 includes a transceiver 702 that transmits signals having a wavelength within a predetermined wavelength range. The passive emitter 700, in response to receiving signal in the predetermined wavelength range, emits a characteristic signal, which is received by the transceiver 702.

[0039] A signal strength of the received signal indicates a relative distance between the passive emitter 700 and the transceiver 702, and the transceiver 702 generates a signal indicative of the signal strength. Where the distance between the passive emitter 700 and the transceiver 702 corresponds to an length of the catheter 202 inserted into the sheath 206, the signal from transceiver 702 is indicative of the translational movement of the catheter 202.

[0040] It is to be understood that the examples of FIGURES 3-7 are non-limiting and other approaches are contemplated herein. In addition, one or more of the approaches of FIGURES 3-7 and/or other approaches can be combined, modified, etc.

[0041] FIGURE 8 illustrates a method for activating scanning by an imaging scanner during an image-guided interventional procedure by the interventional apparatus.

[0042] It is to be appreciated that the ordering of the following acts is non-limiting. As such, other orderings are also contemplated herein. Furthermore, one or more of the following acts may be omitted and/or one or more acts may be added.

[0043] At 802, an interventional instrument of an interventional apparatus is positioned within a region of interest within a patient as described herein.

[0044] At 804, the interventional instrument is moved within the region of interest, for example, by an interventionalist performing the interventional procedure with the interventional apparatus.

[0045] At 806, a sensor of the interventional apparatus senses the movement and generates a signal indicative thereof.

[0046] At 808, the signal is conveyed to the imaging scanner.

[0047] At 810, the signal is evaluated to determine a relative distance the interventional instrument has moved within the patient.

[0048] At 812, the distance is compared with a predetermined scanning threshold distance.

[0049] At 814, the scanner is activated to scan only in response to the distance satisfying the threshold. As such, scans are performed automatically only when needed.

[0050] At 816, one or more images generated from the scan are displayed.

[0051] Otherwise and/or afterwards, acts 804-814 are repeated one or more times.

[0052] Although described above in connection with computed tomography (CT), it is to be appreciated that the above is also applicable to other imaging modalities such as, but not only, positron emission tomography (PET), single photon emission tomography (SPECT), magnetic resonance imaging (MRI), ultrasound (US), three dimensional (3D) x-ray, and/or other imaging modalities.

Claims

1. A system (100), comprising:

an interventional apparatus (102) including a catheter (202) and an interventional instrument (204) affixed to an end of the catheter configured to perform an image-guided interventional procedure for a patient, the interventional apparatus comprising:

a position detector (122) configured to sense a movement of the catheter within a region of interest and configured to generate a movement signal indicative of the sensed movement;
a sheath (206) configured to provide an entry point into a vessel of the patient when inserted into the patient;
the catheter (202), to which the interventional instrument is affixed, configured to be fed through the sheath and into the vessel and routed through the vessel to a position of the interventional instrument within the region of interest; wherein the position detector (122) is affixed to the sheath and located outside of the patient and is configured to sense the movement of the catheter in and out of the entry point with respect to the sheath and generate the movement signal, which is indicative of the sensed movement of the catheter; and

an imaging scanner (101) including a controller (114) that activates the imaging scanner to scan the region of interest and the interventional instrument therein for one or more data acquisition cycles based on the movement signal satisfying a predetermined threshold.

2. The system of claim 1, wherein the movement signal indicates a distance that the catheter has traveled in the region of interest, and the controller activates the imaging scanner to scan the region of interest and the interventional instrument therein in response to the distance satisfying a predetermined distance threshold.

3. The system of any of claims 1 or 2, wherein the controller automatically activates the imaging scanner without user interaction.

4. The system of any of claims 1 to 3, wherein position detector includes a mechanical based motion sensor that senses the movement of the catheter.

5. The system of any of claims 1 to 4, the position detector, comprising:

at least one element (300, 302) configured to rotate, wherein the position detector is positioned with respect to the catheter such that the at least one element is in physical contact with the catheter and rotates in coordination with the movement of the catheter into and out of the entry point of the sheath; and
a transducer (304) that senses a rotation of the at least one element and generates the movement signal, which is indicative of the sensed rotation.

6. The system of claim 5, wherein a rotational distance of the at least one element corresponds to a translational distance of the catheter.

7. The system of any of claims 1 to 3,
the catheter, comprising: a plurality of protrusions (402), spaced apart along a long axis of the catheter at predetermined distances from each other; and
the position detector, comprising: a transducer (404) that detects a presence of a protrusion passing the transducer and generates the movement signal, which is indicative of the detected protrusion.

8. The system of any of claims 1 to 3, wherein the position detector includes an optical based motion sensor that senses the movement of the catheter.

9. The system of any of claims 1 to 3 or 8, wherein the catheter includes a pattern thereon that is responsive to light, and the motion sensor, comprising:

a transmitter (502) that transmits first light that illuminates the pattern on the catheter; and
a receiver (504) that receives second light reflected off the pattern and generates the movement signal, which is indicative of the detected second light.

10. The system of claim 9, wherein the pattern indicates to a movement distance of the catheter.

11. The system of any of claims 1 to 3, wherein the position detector includes a radio frequency based motion sensor that senses the movement of the catheter.

12. The system of any of claims 1 to 3 or 11,
the catheter, comprising:
an emitter (700) configured to respond to reception of a signal having a predetermined wavelength, wherein, upon receiving the signal having the predetermined wavelength, the emitter emits a signal;
the position detector, comprising:
a tranmitter (502) that transmits the signal based on a predetermined periodicity and receives the emitted signal, and generates the movement signal, which is indicative of a signal strength of the received emitted signal.

13. The system of claim 12, wherein the signal strength of the emitted signal is indicative of a distance between the emitter and the transceiver and indicates a movement distance of the catheter.

Patentansprüche

1. System (100), umfassend:
ein Interventionsgerät (102) enthaltend einen Katheter (202) und ein Interventionsinstrument (204), das an einem Ende des Katheters befestigt ist und so konfiguriert ist, dass es eine bildgeführte Interventionsprozedur für einen Patienten durchführt, wobei das Interventionsgerät umfasst:

    einen Positionsdetektor (122), der konfiguriert ist, um eine Bewegung des Katheters innerhalb eines Bereichs von Interesse zu erkennen, und konfiguriert ist, um ein Bewegungssignal zu erzeugen, das für die erkannte Bewegung indikativ ist;
    eine Hülle (206), die konfiguriert ist, um einen Eintrittspunkt in ein Gefäß des Patienten bereitzustellen, wenn es in den Patienten eingeführt wird;
    den Katheter (202), an dem das Interventionsinstrument befestigt ist, der konfiguriert ist, um durch die Hülle und in das Gefäß zugeführt und durch das Gefäß zu einer Position des Interventionsinstruments innerhalb des Bereichs von Interesse geleitet zu werden; wobei der Positionsdetektor (122) an der Hülle befestigt und außerhalb des Patienten angeordnet ist und konfiguriert ist, um die Bewegung des Katheters in und aus dem Eintrittspunkt in Bezug auf die Hülle zu erkennen und das Bewegungssignal zu erzeugen, das für die erkannte Bewegung des Katheters indikativ ist; und
    einen Bildabtaster (101) enthaltend eine Steuerung (114), die den Bildabtaster aktiviert, um den Bereich von Interesse und das Interventionsinstrument darin für einen oder mehrere Datenerfassungszyklen auf der Grundlage des Bewegungssignals abzutasten, das einen vorbestimmten Schwellenwert erfüllt.

2. System nach Anspruch 1, wobei das Bewegungssignal einen Abstand angibt, den der Katheter in dem Bereich von Interesse zurückgelegt hat, und die Steuerung den Bildabtaster aktiviert, um den Bereich von Interesse und das Interventionsinstrument darin in Reaktion auf den Abstand abzutasten, der eine vorbestimmte Abstandsschwelle erfüllt.

3. System nach einem der Ansprüche 1 oder 2, wobei die Steuerung den Bildabtaster automatisch ohne Benutzerinteraktion aktiviert.

4. System nach einem der Ansprüche 1 bis 3, wobei der Positionsdetektor einen Bewegungssensor auf mechanischer Basis enthält, der die Bewegung des Katheters erkennt.

5. System nach einem der Ansprüche 1 bis 4, wobei der Positionsdetektor umfasst:

    mindestens ein Element (300, 302), das zum Drehen konfiguriert ist, wobei der Positionsdetektor in Bezug auf den Katheter so positioniert ist, dass das mindestens eine Element in physischem Kontakt mit dem Katheter steht und sich in Abstimmung mit der Bewegung des Katheters in und aus dem Eintrittspunkt der Hülle dreht; und
    einen Wandler (304), der eine Drehung des mindestens einen Elements erkennt und das Bewegungssignal erzeugt, das für die erkannte Drehung indikativ ist.

6. System nach Anspruch 5, wobei ein Rotationsabstand des mindestens einen Elements einem Translationsabstand des Katheters entspricht.

7. System nach einem der Ansprüche 1 bis 3,
wobei der Katheter umfasst: eine Vielzahl an Vorsprüngen (402), die entlang einer langen Achse des Katheters in vorbestimmten Abständen voneinander beabstandet sind; und
wobei der Positionsdetektor umfasst: einen Wandler (404), der das Vorhandensein eines Vorsprungs erkennt, der den Wandler durchläuft, und das Bewegungssignal erzeugt, das für den erkannten Vorsprung indikativ ist.

8. System nach einem der Ansprüche 1 bis 3, wobei der Positionsdetektor einen optisch basierten Bewegungssensor enthält, der die Bewegung des Katheters erkennt.

9. System nach einem der Ansprüche 1 bis 3 oder 8, wobei der Katheter ein auf Licht ansprechendes Muster darauf enthält und der Bewegungssensor umfasst:

    einen Sender (502), der erstes Licht aussendet, das das Muster auf dem Katheter beleuchtet; und
    einen Empfänger (504), der von dem Muster reflektiertes zweites Licht empfängt und das Bewegungssignal erzeugt, das für das erkannte zweite Licht indikativ ist.

10. System nach Anspruch 9, wobei das Muster für einen Bewegungsabstand des Katheters indikativ ist.

11. System nach einem der Ansprüche 1 bis 3, wobei

der Positionsdetektor einen auf Hochfrequenz basierenden Bewegungssensor enthält, der die Bewegung des Katheters erkennt.

12. System nach einem der Ansprüche 1 bis 3 oder 11, wobei der Katheter umfasst:

einen Emitter (700), der konfiguriert ist, um auf den Empfang eines Signals mit einer vorbestimmten Wellenlänge zu antworten, wobei der Emitter nach Empfang des Signals mit der vorbestimmten Wellenlänge ein Signal emittiert;
wobei der Positionsdetektor umfasst:
einen Sender (502), der das Signal basierend auf einer vorbestimmten Periodizität sendet und das emittierte Signal empfängt und das Bewegungssignal erzeugt, das für eine Signalstärke des empfangenen emittierten Signals indikativ ist.

13. System nach Anspruch 12, wobei die Signalstärke des emittierten Signals für einen Abstand zwischen dem Emitter und dem Empfänger indikativ ist und einen Bewegungsabstand des Katheters angibt.

Revendications

1. Système (100) comprenant :
un appareil d'intervention (102) incluant un cathéter (202) et un instrument d'intervention (204) attaché à une extrémité du cathéter configuré pour réaliser une intervention guidée par image sur un patient, l'appareil d'intervention comprenant :

un détecteur de position (122) configuré pour détecter un mouvement du cathéter à l'intérieur d'une région d'intérêt et configuré pour générer un signal de mouvement indicatif du mouvement détecté ;
une gaine (206) configurée pour fournir un point d'entrée dans un vaisseau du patient quand introduite dans le patient ;
le cathéter (202), auquel est attaché l'instrument d'intervention, configuré pour être alimenté à travers la gaine et à l'intérieur du vaisseau et acheminé à travers le vaisseau vers une position de l'instrument d'intervention à l'intérieur de la région d'intérêt ; dans lequel le détecteur de position (122) est attaché à la gaine et positionné à l'extérieur du patient et est configuré pour détecter le mouvement du cathéter à l'intérieur et à l'extérieur du point d'entrée par rapport à la gaine et pour générer le signal de mouvement qui est indicatif du mouvement détecté du cathéter ; et
un scanner d'imagerie (101) incluant un contrôleur (114) qui active le scanner d'imagerie pour balayer la région d'intérêt et l'instrument d'intervention qui s'y trouve pendant un ou plusieurs cycles d'acquisition de données en se basant sur le signal de mouvement satisfaisant un seuil prédéterminé.

2. Système selon la revendication 1, dans lequel le signal de mouvement indique une distance que le cathéter a parcourue dans la région d'intérêt, et le contrôleur active le scanner d'imagerie pour balayer la région d'intérêt et l'instrument d'intervention qui s'y trouve selon la distance satisfaisant un seuil de distance prédéterminé.

3. Système selon l'une quelconque des revendications 1 ou 2, dans lequel le contrôleur active automatiquement le scanner d'imagerie sans interaction de l'utilisateur.

4. Système selon l'une quelconque des revendications 1 à 3, dans lequel le détecteur de position inclut un capteur de mouvement mécanique qui détecte le mouvement du cathéter.

5. Système selon l'une quelconque des revendications 1 à 4, le détecteur de position comprenant :

au moins un élément (300, 302) configuré pour tourner, dans lequel le détecteur de position est positionné par rapport au cathéter de sorte que le au moins un élément est en contact physique avec le cathéter et tourne en coordination avec le mouvement du cathéter à l'intérieur et à l'extérieur du point d'entrée de la gaine ; et
un transducteur (304) qui détecte une rotation du au moins un élément et génère le signal de mouvement indicatif de la rotation détectée.

6. Système selon la revendication 5, dans lequel une distance rotationnelle du au moins un élément correspond à une distance translationnelle du cathéter.

7. Système selon l'une quelconque des revendications 1 à 3,
le cathéter comprenant : une pluralité de saillies (402), espacées le long d'un axe long du cathéter à des distances prédéterminées l'une de l'autre ; et
le détecteur de position comprenant : un transducteur (404) qui détecte une présence d'une saillie passant le transducteur et qui génère le signal de mouvement indicatif de la saillie détectée.

8. Système selon l'une quelconque des revendications 1 à 3, dans lequel le détecteur de position inclut un capteur de mouvement optique qui détecte le mouvement du cathéter.

9. Système selon l'une quelconque des revendications

1 à 3 ou 8, dans lequel le cathéter inclut sur lui un dessin sensible à la lumière, et le capteur de mouvement comprenant :

un émetteur (502) qui transmet une première lumière qui éclaire le dessin sur le cathéter ; et un récepteur (504) qui reçoit une seconde lumière réfléchie par le dessin et qui génère le signal de mouvement indicatif de la seconde lumière détectée.

10. Système selon la revendication 9, dans lequel le dessin indique une distance de mouvement du cathéter.

11. Système selon l'une quelconque des revendications 1 à 3, dans lequel le détecteur de position inclut un capteur de mouvement à radiofréquence qui détecte le mouvement du cathéter.

12. Système selon l'une quelconque des revendications 1 à 3 ou 11,
le cathéter comprenant :

un émetteur (700) configuré pour répondre à la réception d'un signal ayant une longueur d'onde prédéterminée, dans lequel, après réception du signal ayant la longueur d'onde prédéterminée, l'émetteur émet un signal ;
le détecteur de position comprenant :
un transmetteur (502) qui transmet le signal selon une périodicité prédéterminée et qui reçoit le signal émis, et génère le signal de mouvement indicatif d'une puissance de signal du signal émis reçu.

13. Système selon la revendication 12, dans lequel la puissance de signal du signal émis est indicative d'une distance entre l'émetteur et l'émetteur-récepteur et indique une distance de mouvement du cathéter.

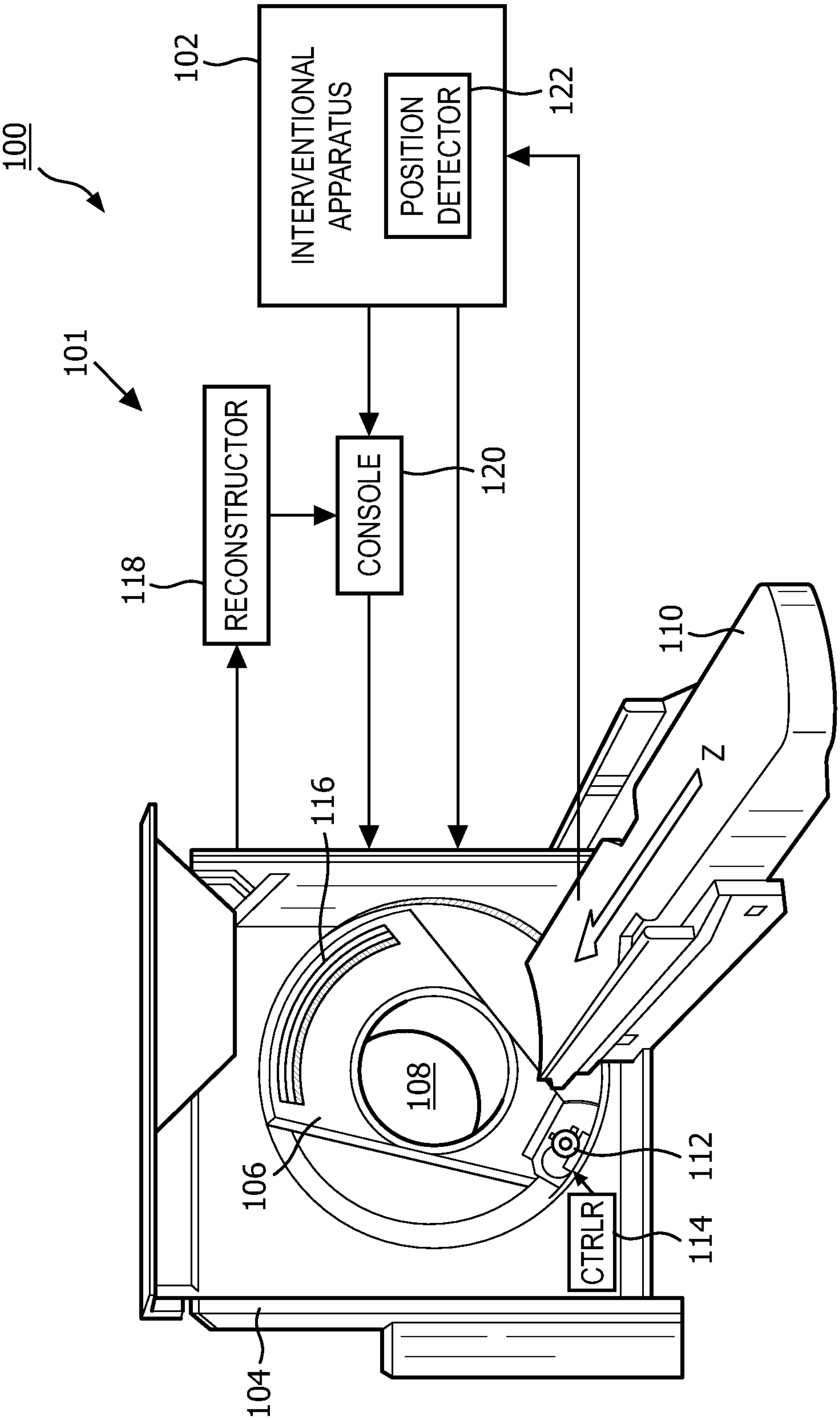
100
101
102
INTERVENTIONAL APPARATUS
POSITION DETECTOR
122
RECONSTRUCTOR
118
CONSOLE
120
110
Z
116
108
106
112
CTRLR
114
104

FIG. 1

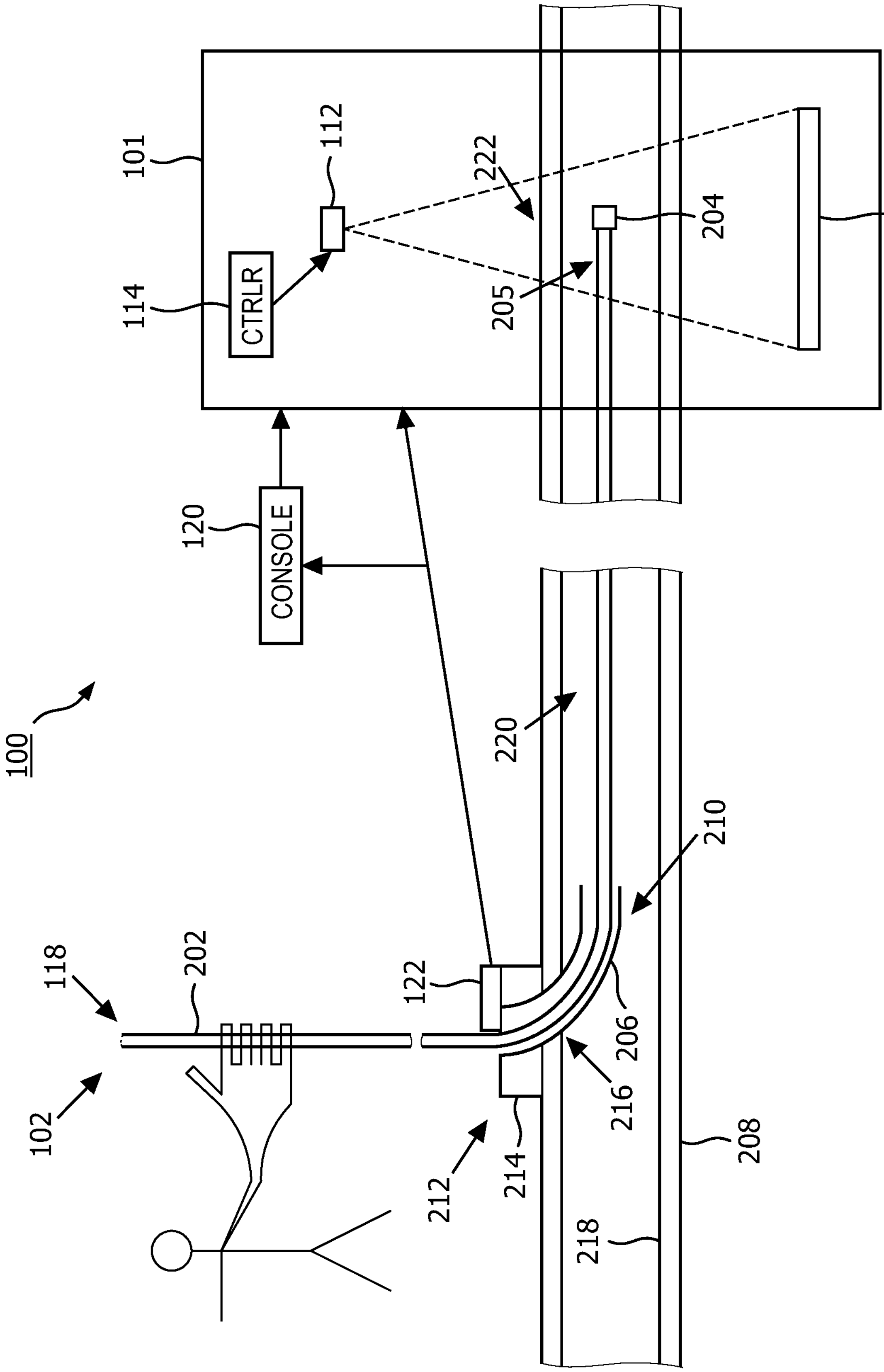
100
101
112
114
CTRLR
222
204
205
116
120
CONSOLE
220
210
118
202
122
206
216
102
212
214
208
218

FIG. 2

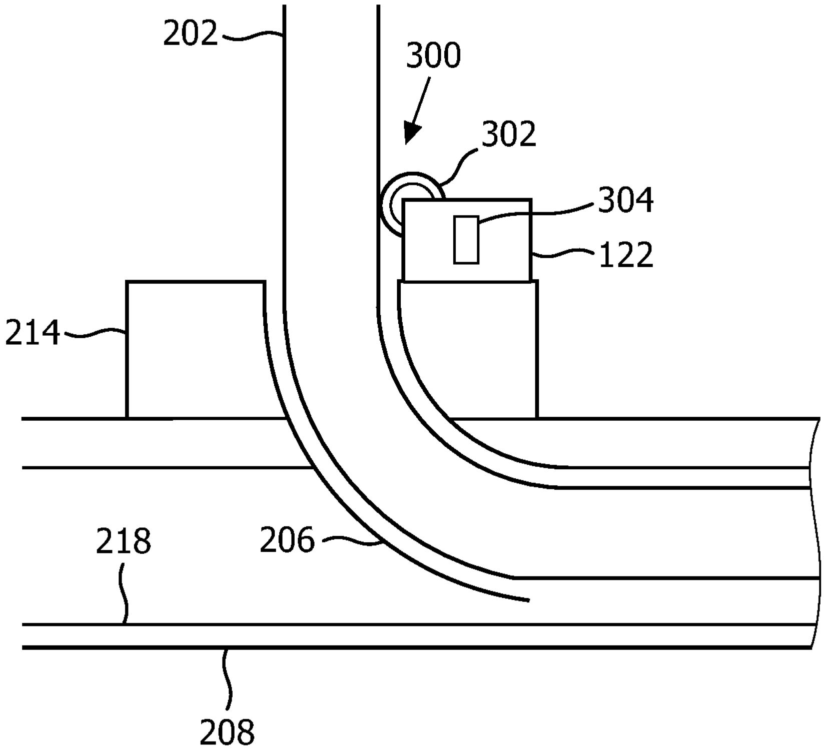
202
300
302
304
122
214
218
206
208

FIG. 3

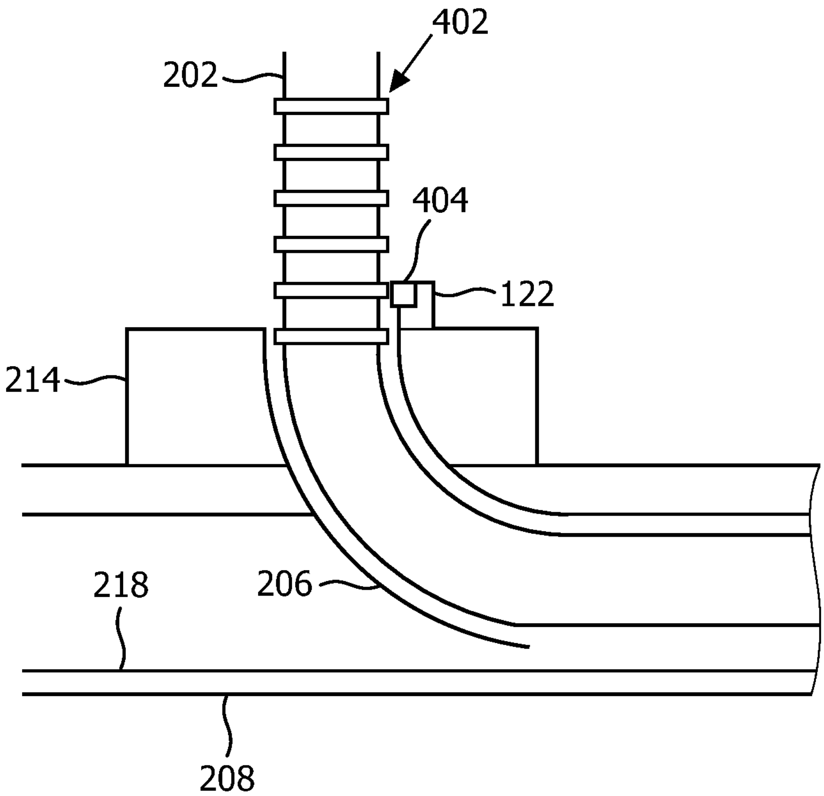
402
202
404
122
214
218
206
208

FIG. 4

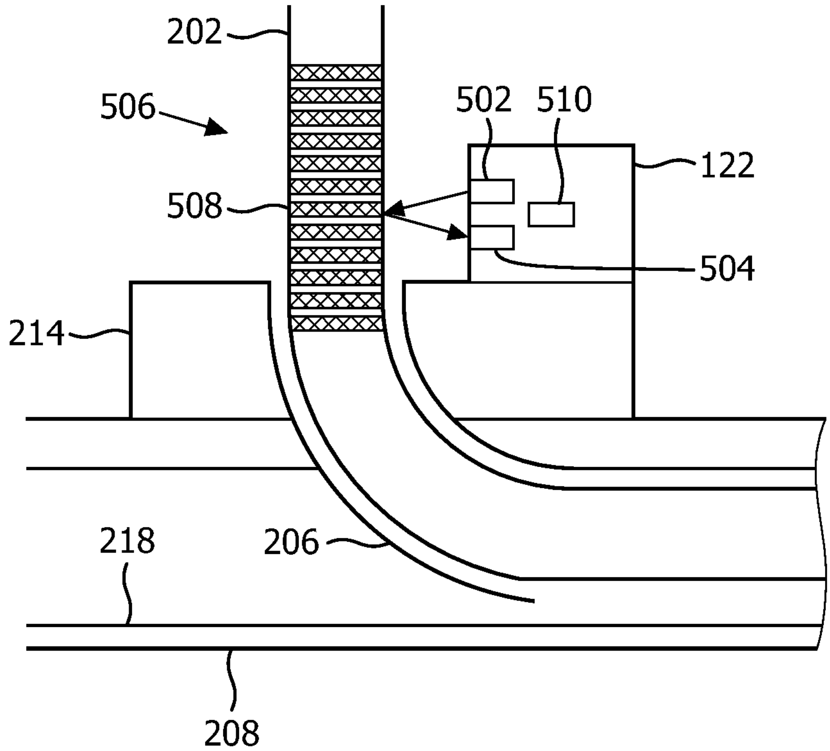
202
506
502
510
122
508
504
214
218
206
208

FIG. 5

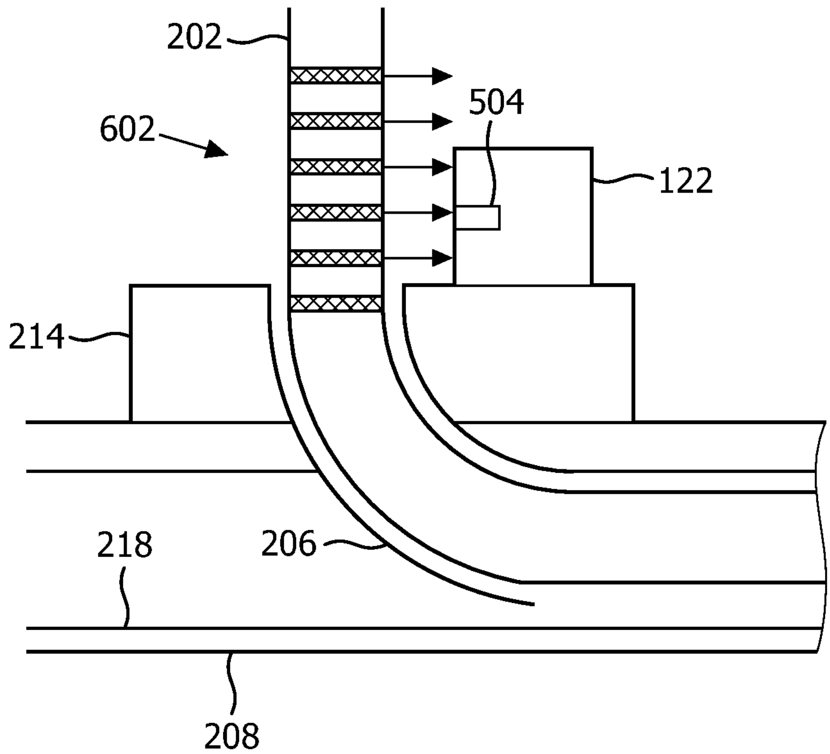
202
602
504
122
214
218
206
208

FIG. 6

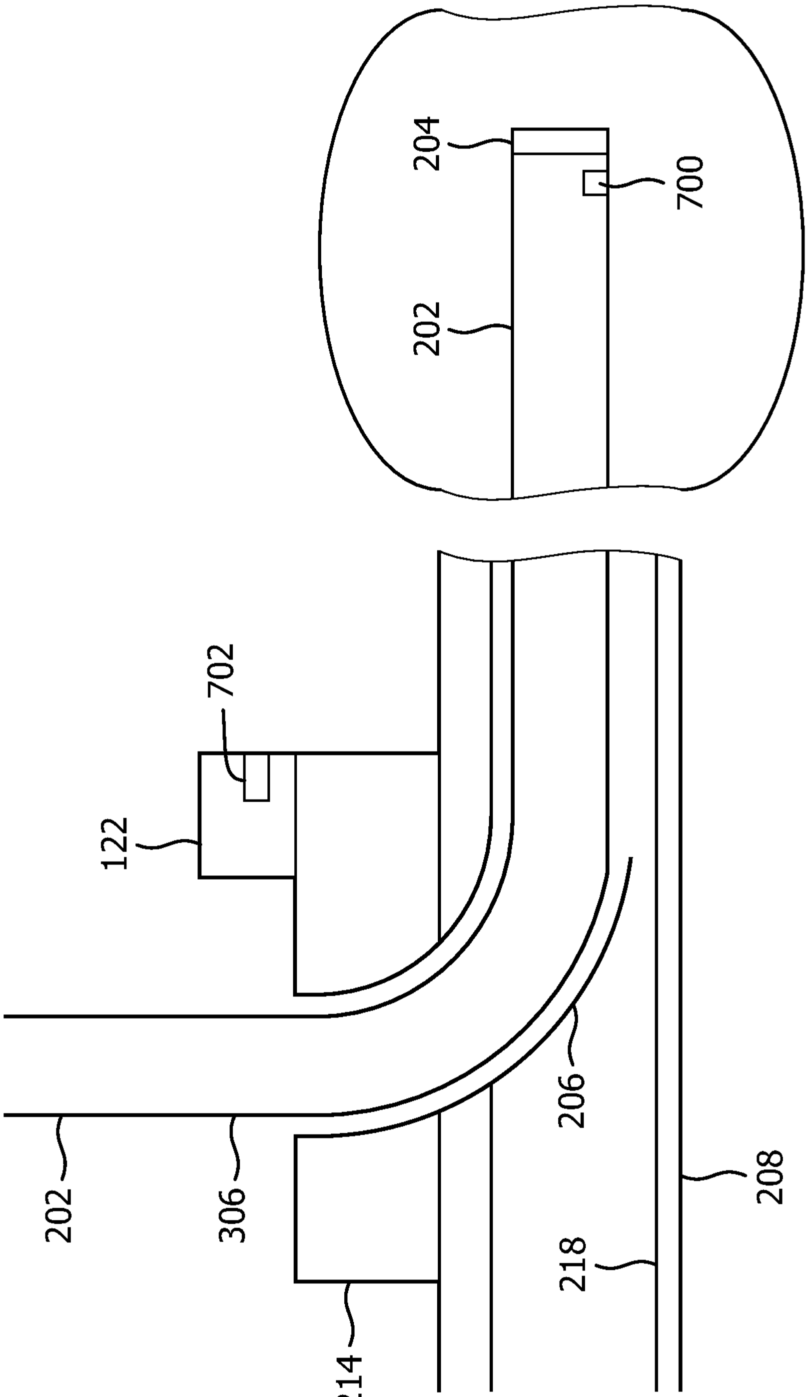

FIG. 7

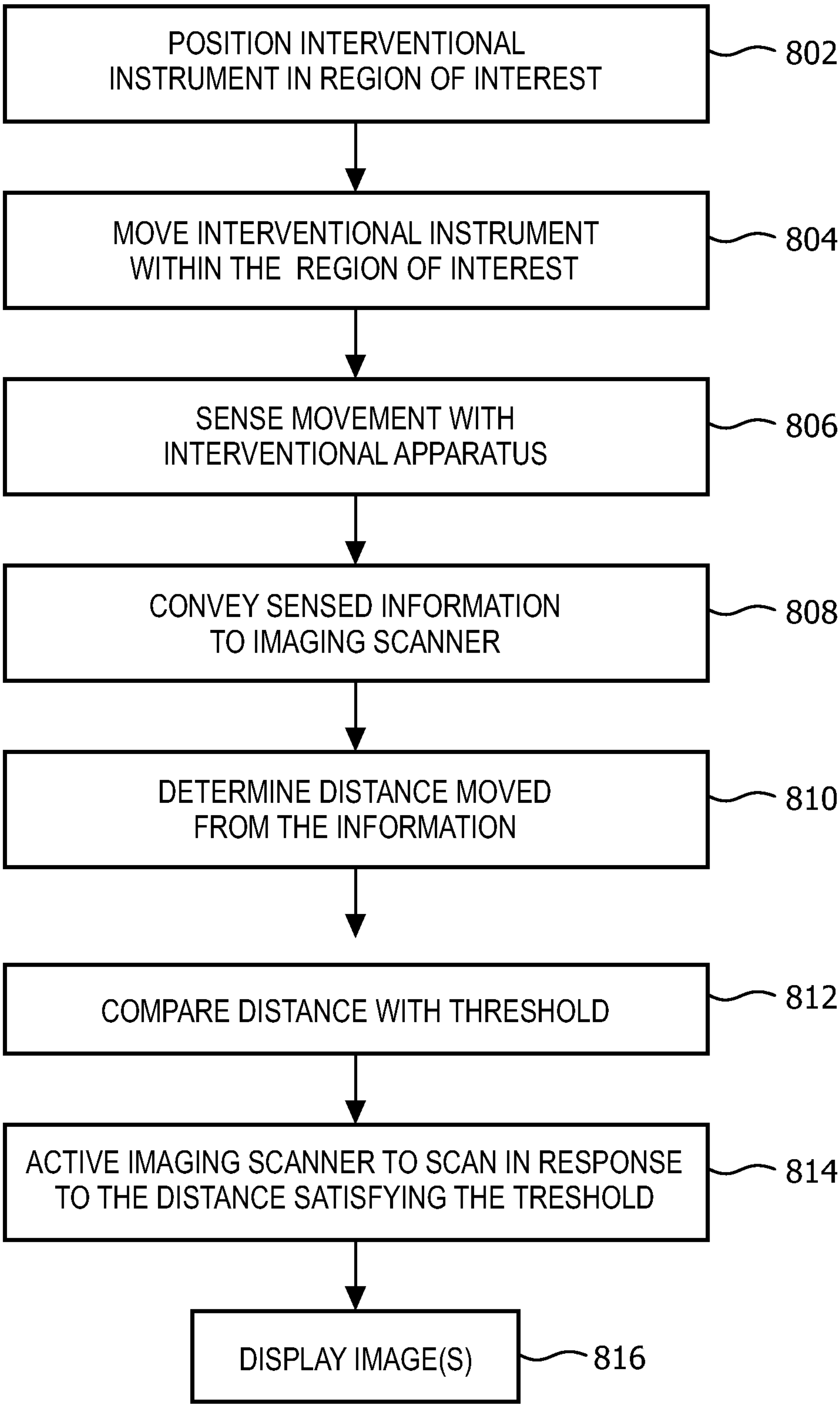
POSITION INTERVENTIONAL INSTRUMENT IN REGION OF INTEREST
802
MOVE INTERVENTIONAL INSTRUMENT WITHIN THE REGION OF INTEREST
804
SENSE MOVEMENT WITH INTERVENTIONAL APPARATUS
806
CONVEY SENSED INFORMATION TO IMAGING SCANNER
808
DETERMINE DISTANCE MOVED FROM THE INFORMATION
810
COMPARE DISTANCE WITH THRESHOLD
812
ACTIVE IMAGING SCANNER TO SCAN IN RESPONSE TO THE DISTANCE SATISFYING THE TRESHOLD
814
DISPLAY IMAGE(S)
816

FIG. 8

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

- US 2007167700 A1 **[0006]**

专利名称(译)	介入式设备激活计算机体层摄影（CT）		
公开(公告)号	[EP2648641B1](EP2648641B1)	公开(公告)日	2020-04-15
申请号	EP2011802534	申请日	2011-11-25
[标]申请(专利权)人(译)	皇家飞利浦电子股份有限公司		
申请(专利权)人(译)	皇家飞利浦N.V. 飞利浦知识产权及标准部GMBH		
当前申请(专利权)人(译)	皇家飞利浦N.V. 飞利浦知识产权及标准部GMBH		
[标]发明人	SCHMITT HOLGER GRASS MICHAEL		
发明人	SCHMITT, HOLGER GRASS, MICHAEL		
IPC分类号	A61B6/03 A61B6/00 A61B6/12 A61B5/00 A61B8/00 A61M25/01 A61B8/08 A61B5/055 A61M25/00 A61B90/98 A61B34/20 A61B90/00		
CPC分类号	A61B6/032 A61B6/12 A61B6/4423 A61B6/542 A61B6/547 A61B34/20 A61B90/98 A61B2034/2055 A61B2034/2059 A61B2034/2065 A61B2090/3945 A61M25/0113 A61M2025/0008 A61M2025/0166 A61B5/0084 A61B5/055 A61B5/742 A61B6/037 A61B6/463 A61B8/0841 A61B8/463 A61M25/0108 A61M25/0127		
代理机构(译)	飞利浦知识产权及标准		
优先权	61/421303 2010-12-09 US		
其他公开文献	EP2648641A1		
外部链接	Espacenet		

摘要(译)

系统（100）包括介入设备（102）和成像扫描仪（101）。 介入设备包括被配置为对患者执行图像引导的介入过程的介入仪器（204）。 介入设备包括位置检测器（122），该位置检测器从感兴趣区域的外部检测在患者的区域中执行图像引导介入过程的区域中的介入仪器的位置，并生成指示检测到的位置的信号。 成像扫描仪包括控制器（114），该控制器基于运动信号激活成像扫描仪以扫描感兴趣区域和其中的介入器械达一个或多个数据采集周期。

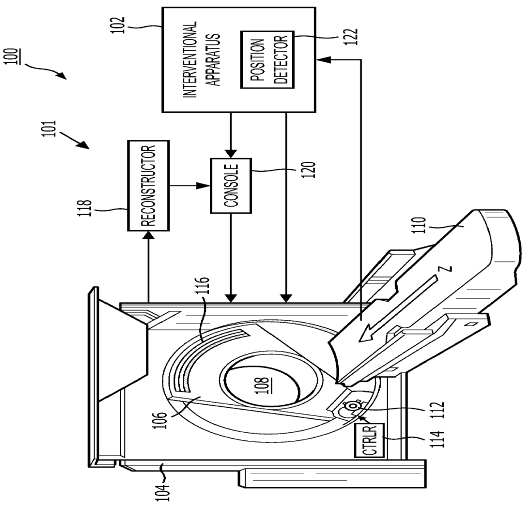

FIG. 1